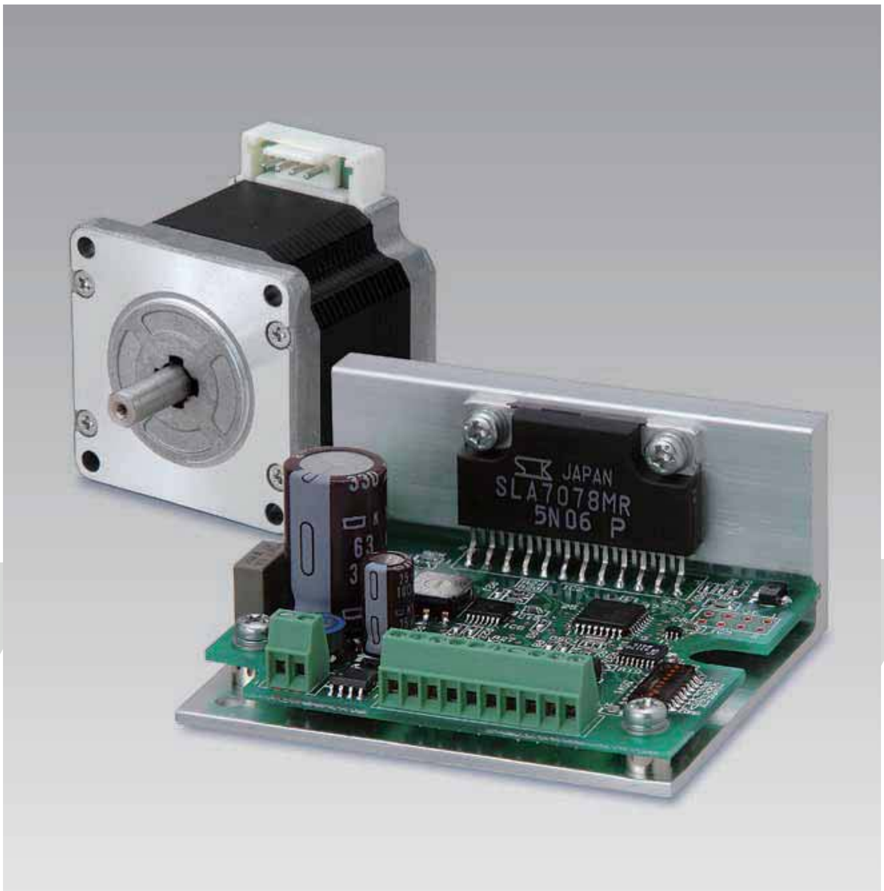
SANMOTION

2-PHASE STEPPING SYSTEMS

F2



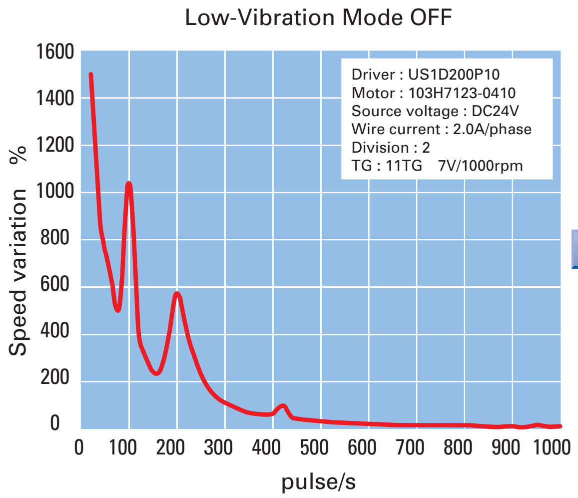
Ver.2

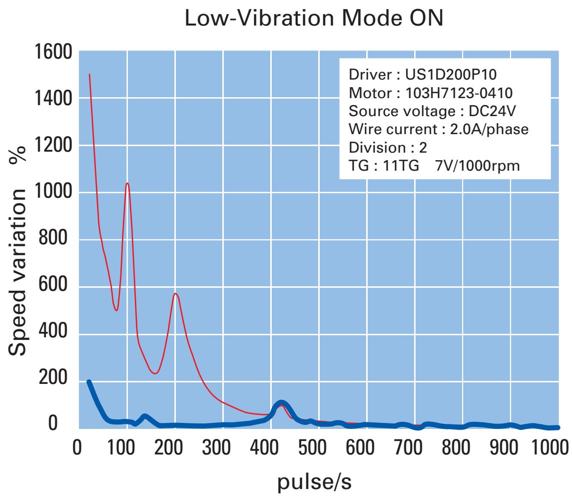
SANYO DENKI

F series DRIVER features

1 Low-vibration mode

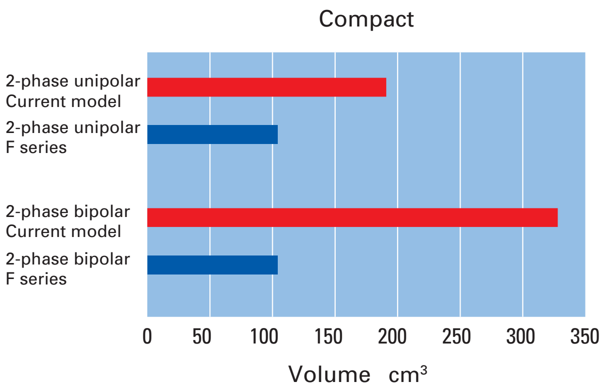
DC input

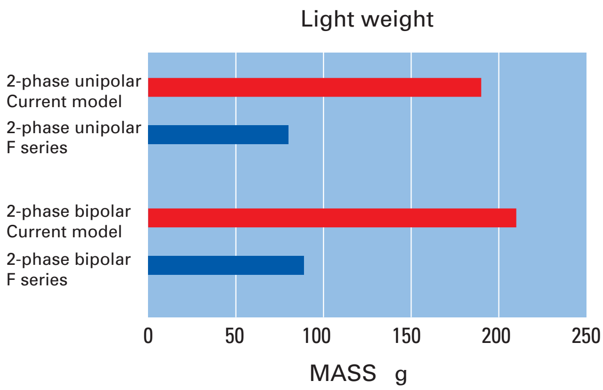




2 Compact / Light weight

DC input





Compliance with international standards

DC input

The standard specification SANMOTION F series stepping driver complies with UL and EN safety standards.Stepping motors complying with UL and EN standards are available upon request.

Set model

DC input

Stepping motors with integrated drivers

P.4

A driver incorporating a motion control function needed for
driving a motor and a 2-phase stepping motor were integrated into a single unit.

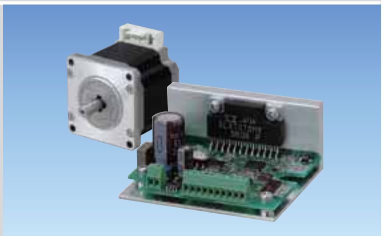
Motor flange size

□42 1.65inch | □60 2.36inch

Unipolar standard standard model

P.13

The standard set includes a F series driver and a H or SH series motor.



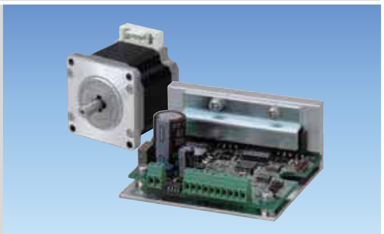
Motor flange size

□28 1.10inch | □42 1.65inch | □56 2.20inch

Bipolar standard standard model

P.14

The standard set includes a F series driver and a H or SH series motor.

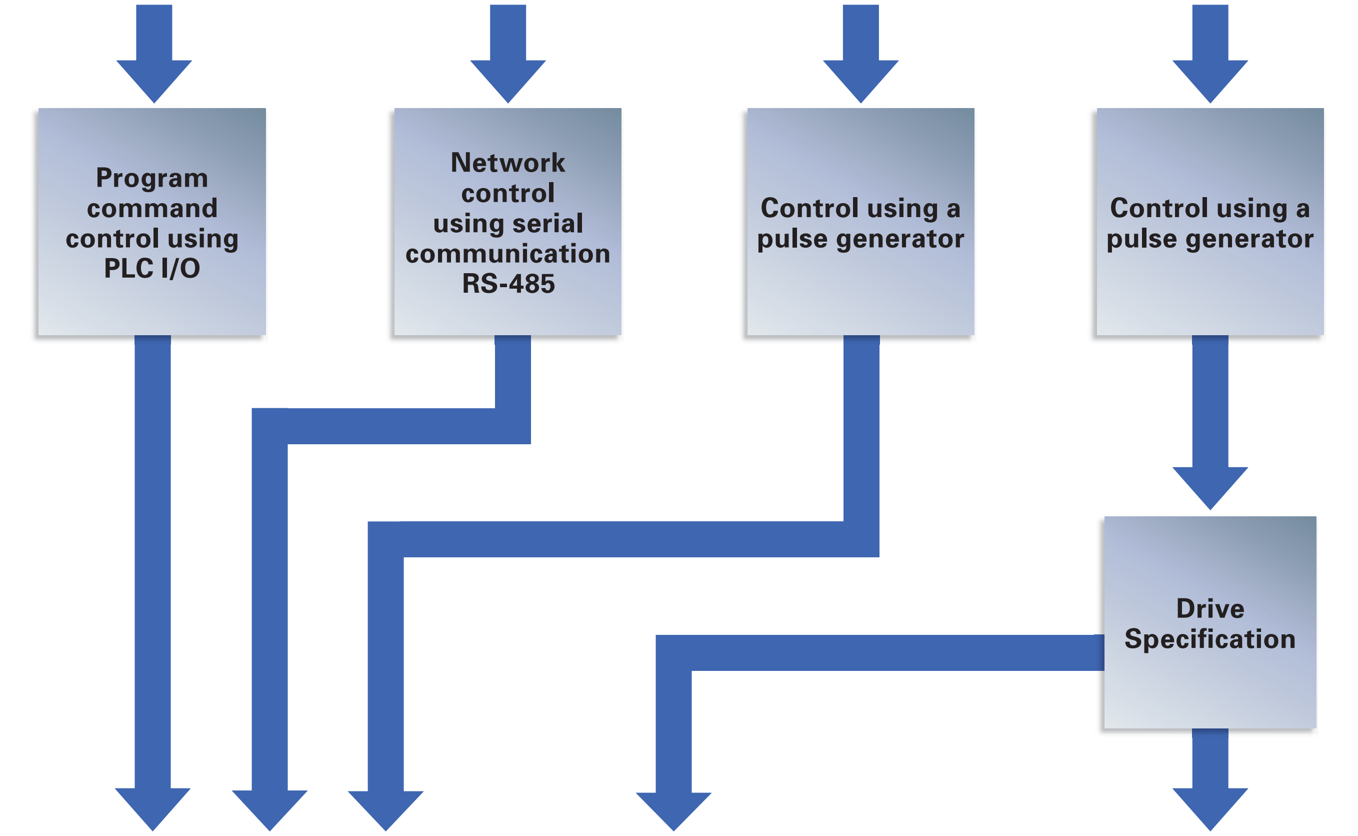


Motor flange size

□28 1.10inch | □42 1.65inch | □50 1.97inch | □56 2.20inch | □60 2.36inch

Control method

How do you want to control the equipment?
The F series offers the choice of 3 different control methods

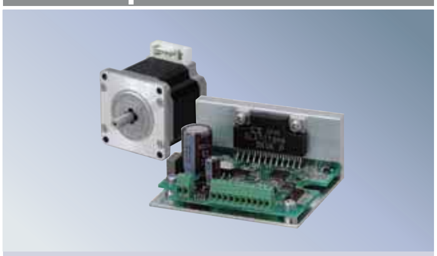


DC input stepping motors with integrated drivers

Startup via I/O :
Initiate program containing speed, acceleration/ deceleration, and travel distance commands stored in the driver via the I/O.

Startup via serial communication :
Control by sending data for speed, acceleration/ deceleration, and travel distance commands via serial communication.

DC input unipolar standard

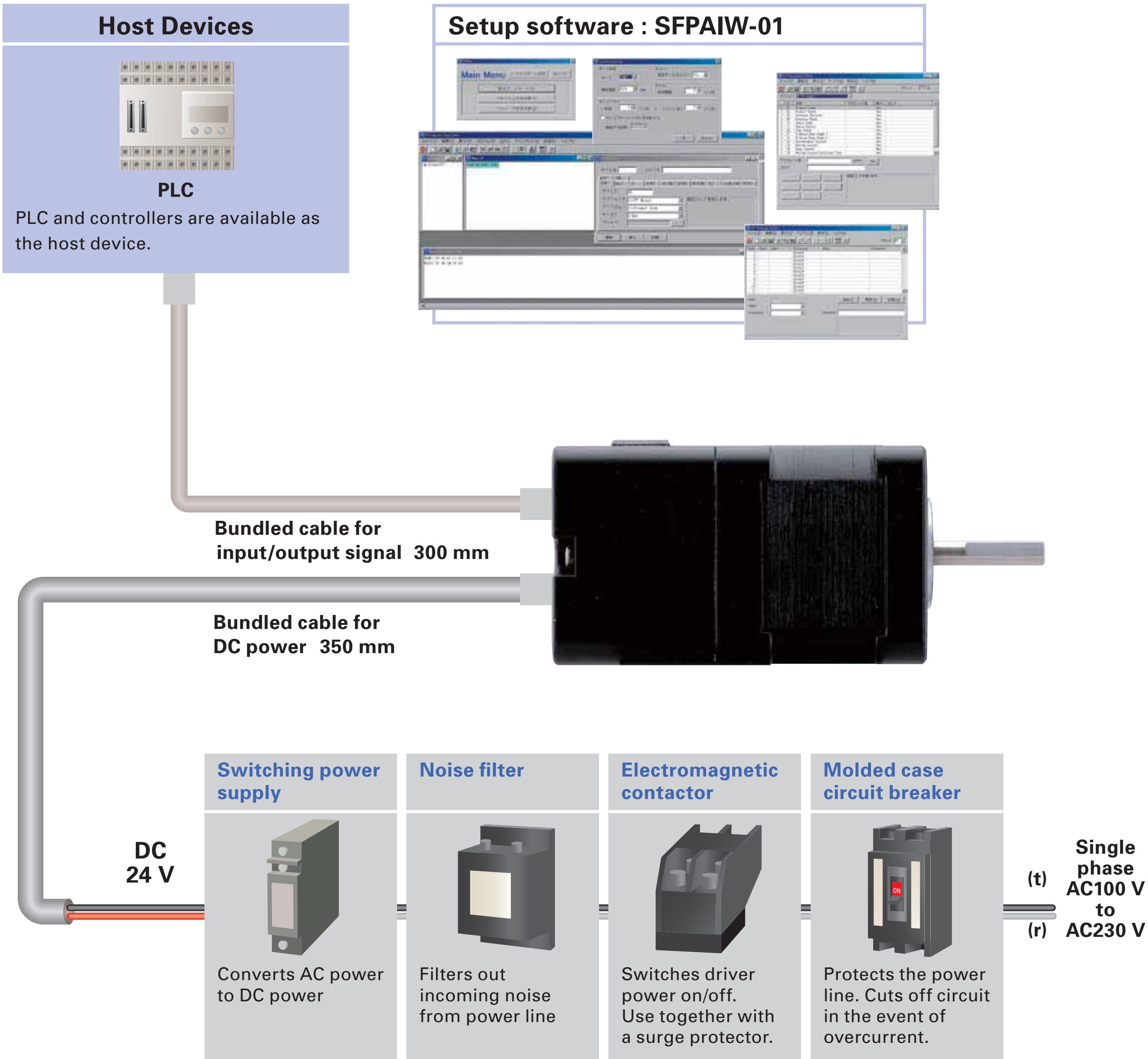


Motion is generated by pulse input commands from an upper-level controller.

DC input bipolar standard

Motion is generated by pulse input commands from an upper-level controller.

Stepping Motors with Integrated drivers



Stepping motors with integrated drivers

Features

1.Driver and motor are now integrated into a single unit.

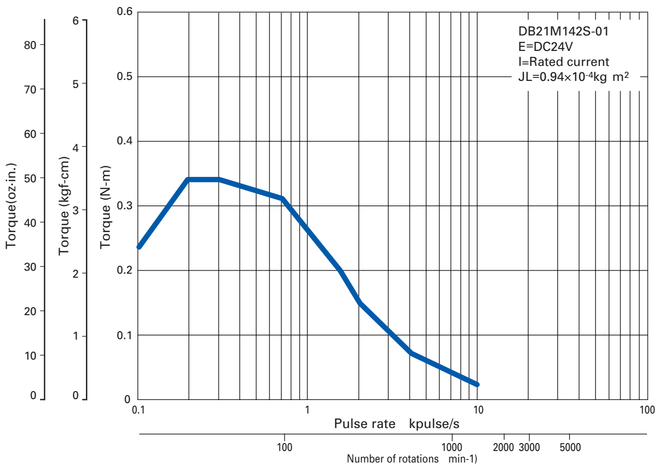
A driver incorporating a motion control function needed for driving a motor and a 2-phase stepping motor were integrated into a single unit for enabling a more compact installation space and less wiring.

2.Three types of operation modes can be selected to match the specific application.

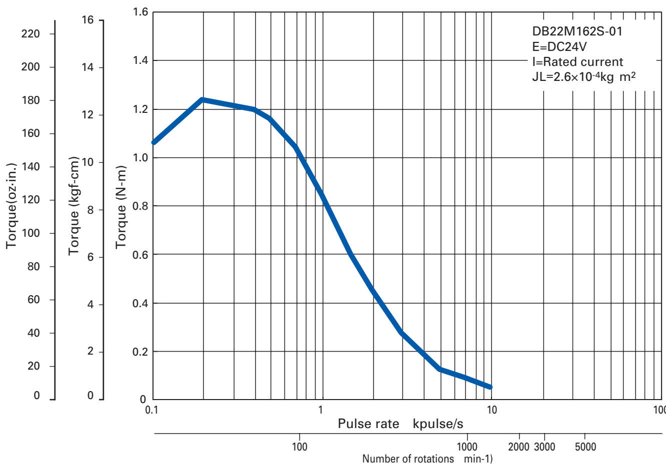
1 Control by command pulses
2 Program control by general-purpose I/O(Parallel)
3 Compliant with RS-485, half-duplex asynchronous communication

Pulse rate-torque characteristics

42mm 1.65inch



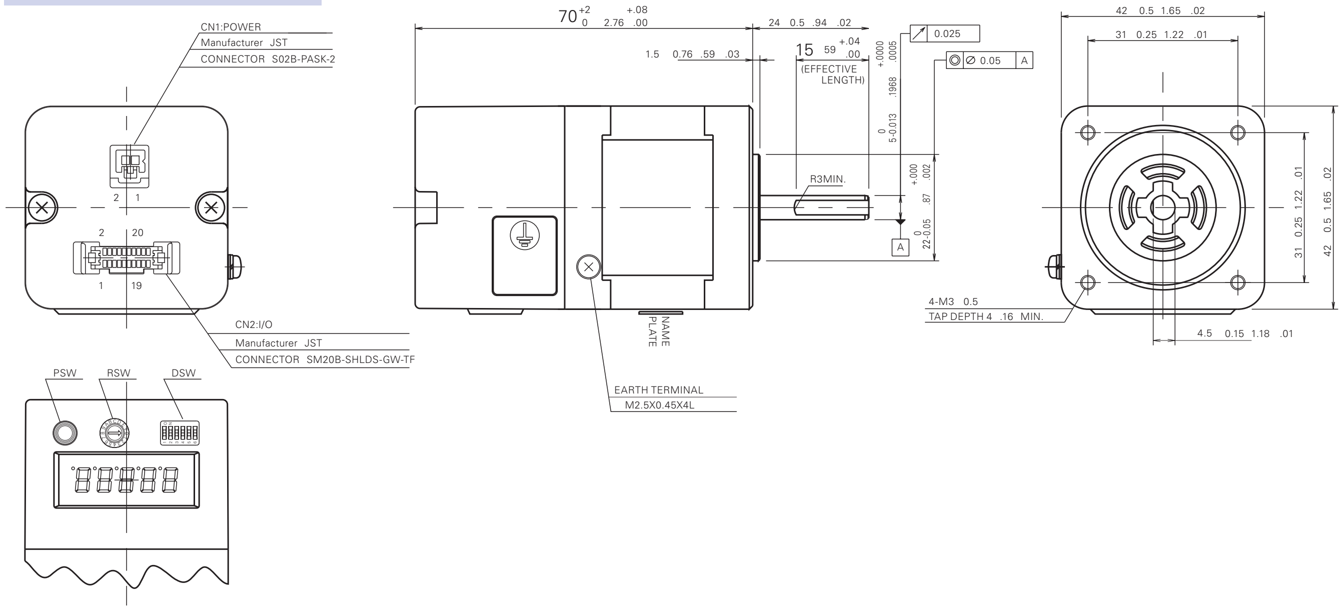
60mm 2.36inch



The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Dimensions Unit : mm inch

42mm 1.65inch

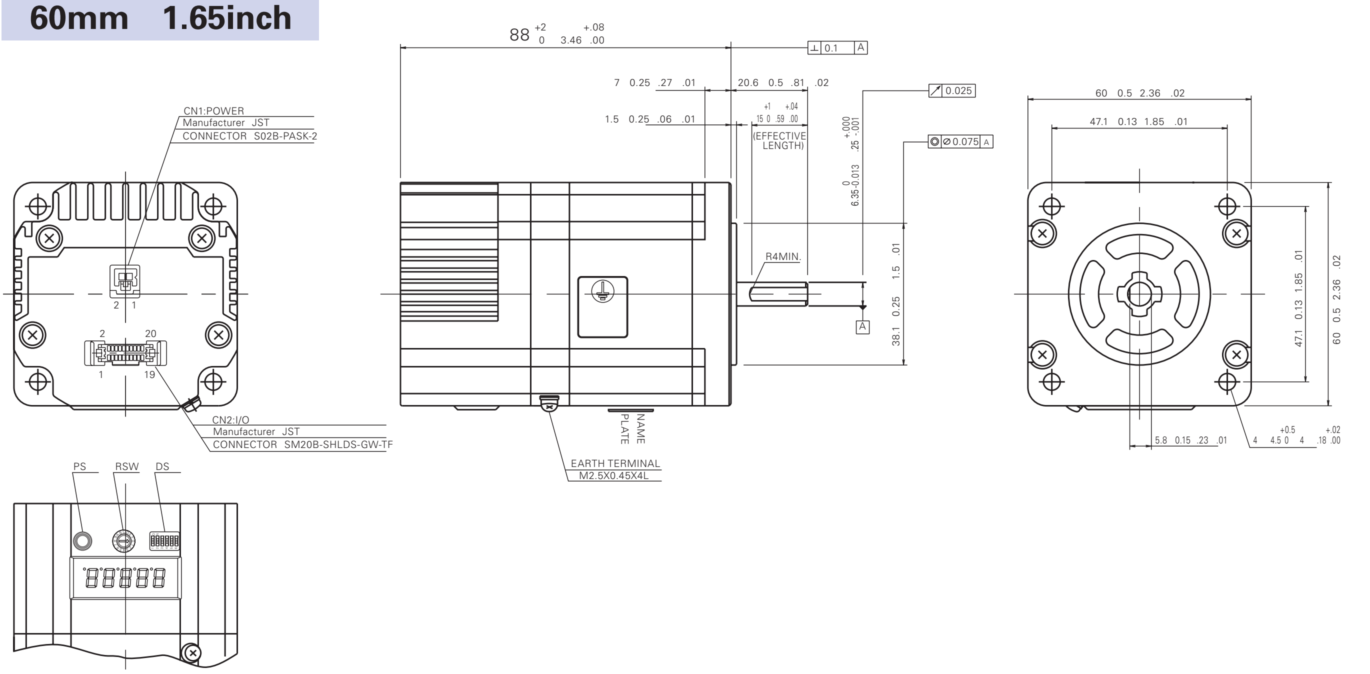


Specifications

Basic specifications	Part number Flange size		**DB21M142S-01 42**	**DB22M162S-01 60**
	Input source Note1		DC24 V 10	
	Getaway torque A		2 MAX.	3 MAX.
	Environment	Protection class	Class I	
		Operation environment	Installation category over-voltage category : II, pollution degree : 2	
		Applied standards	EN61010-1	
		Operating ambient temperature Note2	0 to +40	
		Conservation temperature	-20 to +60	
		Operating ambient humidity	35 to 85%RH no condensation	
		Conservation humidity	10 to 90%RH no condensation	
		Operation altitude	1000 m 3280 feet MAX. above sea level	
		Vibration resistance	Tested under the following conditions ; 4.9m/s2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each	
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .	
		Withstand voltage	Not influenced when 1500V AC is applied between power input terminal and cabinet for one minute.	
		Insulation resistance	10M ohm MIN. when measured with 500V DC megohmmeter between input terminal and cabinet.	
	Mass Weight		0.5kg 1.10lbs	0.87kg 1.92lbs
Function	Protection function		Against driver overheat	
	LED indicator		Alarm monitor	
I/O signals	Command pulse input signal Note3		Photo coupler input method, input resistance 220 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	Power down input signal PD		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	Step angle setting selection input EXT		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	FULL/HALF setting selection input F/H		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	EMG input signal		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	BUSY output signal		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	
	Phase origin monitor output signal MON		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	
	Alarm output signal AL		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	

Note1 Note that the power voltage must not exceed 24VDC + 10% (26.4VDC).
Note2 If the driver is placed in a box, the temperature inside the box must not exceed this specified range.
Note3 The maximum input frequency is 250k pulse/s.

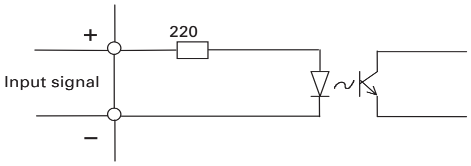
60mm 1.65inch



Input circuit configuration

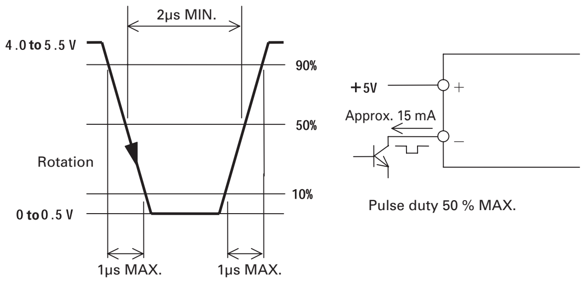
Input interface

Input circuit configuration

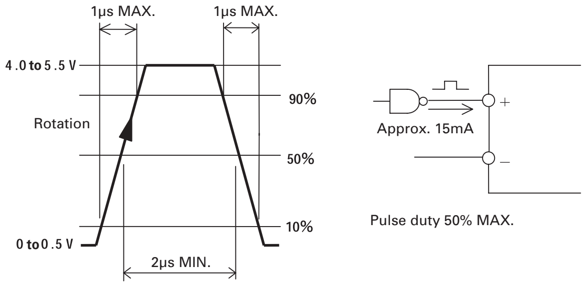


Input signal specifications

Negative logic

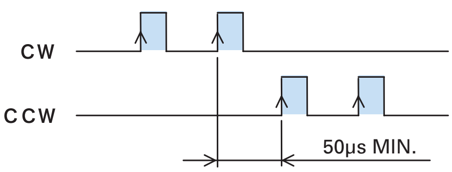


Positive logic



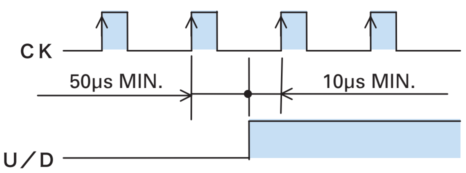
Timing of the command pulse

2-input mode　CW, CCW



- The internal photo coupler turns ON within the and, at its falling edge to OFF, the internal circuit motor is activated.
- When applying the pulse to CW, turn OFF the CCW side internal photo coupler.
- When applying the pulse to CCW, turn OFF the CW side internal photo coupler.

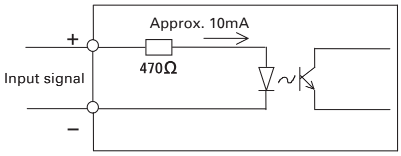
Pulse and direction mode　CK, U/D



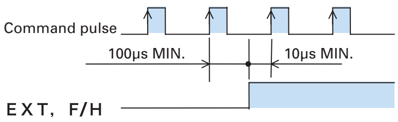
- The H level is input for and, at its rising edge to H level, the internal circuit stepping motor is activated.
- Switching the input signal U/D should be performed while the input level on the CK side is L .

Input circuit configuration

Input circuit configuration　PD EXT F/H EMG



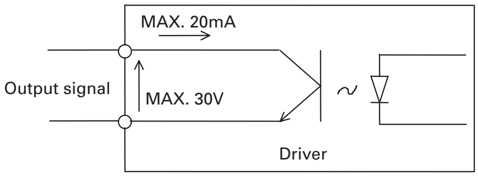
Timing of command pulse, step angle selection, and FULL/HALF selection input signal



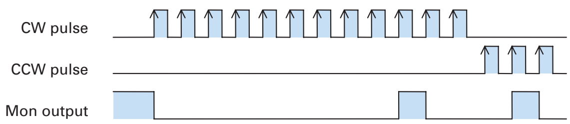
- Shaded area indicates internal photo coupler ON .
- EXT input signal
  EXT photo coupler ON enables a function by external F/H input signal.
  EXT photo coupler OFF enables the setting of a number of micro steps by main unit's rotary switch S.S.
- F/H input signal
  F/H photo coupler ON sets HALF step (2-division) operation.
  F/H photo coupler OFF sets FULL step (1-division) operation.
- Refer to switching EXT and F/H input signal in the [FULL/HALF input signal, command pulse, and step angle select].
- When switching the step angle by EXT and F/H input signal, the phase origin LCD may not turn ON and the phase origin monitor output may not output when stop. Refer to the MON output in the [Output Interface].

Output interface

Output circuit configuration　BUSY MON AL

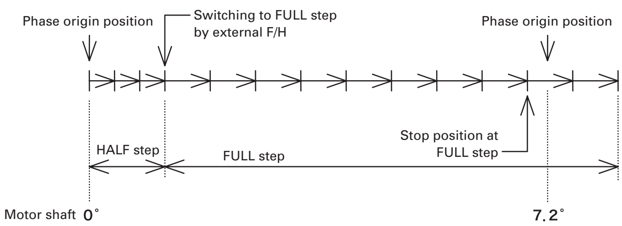


Mon output



- When the motor excitation phase is at the phase origin (power ON status), the photo coupler is turned ON , and the upper D.P of status LED turns on synchronously.
- Output from MON is set to on at every 7.2 degrees of motor output shaft from phase origin.

When changing the division setting by F/H input signal.



- When changing the motor division setting by the external input signal and the rotary switch as shown in the example below, the motor cannot stop where MON output signal can be output. Take this into consideration when using the MON output signal.

WIRING

Specification Summary of Input/Output Signals (Serial I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC 5V is input.
Alarm clear signal standard	ALMC	6	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
General-purpose input 1	IN1	6	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 1 on Internal photo coupler off General purpose input 1 off
Emergency stop input	EMG	6	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler of Emergency stop
Origin signal	ORG	6	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
+ direction overtravel signal	+OT	7	An overtravel signal in the + direction is input. Internal photo coupler on + direction overtravel not arrived Internal photo coupler off + direction overtravel arrived
General-purpose input 2	IN2	7	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 2 on Internal photo coupler off General purpose input 2 off
Emergency stop input	EMG	7	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	7	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	7	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
- direction overtravel signal	OT	8	An overtravel signal in the - direction is input. Internal photo coupler on - direction overtravel not arrived Internal photo coupler off - direction overtravel arrived
General-purpose input 3	IN3	8	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 3 on Internal photo coupler off General purpose input 3 off
Emergency stop input	EMG	8	emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	8	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	8	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear

Signal	Reference Designation	Pin Number	Function Summary
Emergency stop signal	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
General-purpose input 4c	IN4	9	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 4 on Internal photo coupler off General purpose input 4 off
Origin signal	ORG	9	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	9	alarms are cleared. Internal photo coupler off on Alarm clear
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
During program execution	PEND	10	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
Zone signal	ZONE	10	on when the current position is inside the coordinates that were set beforehand.
During program execution	PEND	11	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
During motor operation	BUSY	11	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Zone signal	ZONE	11	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	ALM	12	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor becomes non excited status.
Output signal common	OUT_COM	13	It is for the output signal common.
DATA+	DATA+	14	It is for the serial signal.
DATA	DATA	15	It is for the serial signal.

Specification Summary of Input/Output Signals (Pulse train I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
CW pulse input Standard	CW+ CW	1 2	When 2 input mode , Input drive pulse rotating CW direction.
Pulse train input	CK+ CK	1 2	When 1 input mode , Input drive pulse train for motor rotation.
CCW pulse input Standard	CCW+ CCW	3 4	When 2 input mode , Input drive pulse rotating CCW direction.
Rotational direction input	U/D+ U/D	3 4	When 1 input mode , Input motor rotational direction signal. Internal photo coupler ON CW direction Internal photo coupler OFF CCW direction
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC5V is input.
Power down input	PD	6	Inputting PD signal will cut off power off the current flowing to the Motor With dip switch select, change to the Power low function is possible . PD input signal on internal photo coupler on PD function is valid. PD input signal off internal photo coupler off PD function is invalid.
Step angle select input	EXT	7	FULL/HALF select input will become valid by inputting EXT signal. EXT input signal on internal photo coupler on External input signal F/H is valid EXT input signal off internal photo coupler off Main body rotary switch S.S is valid

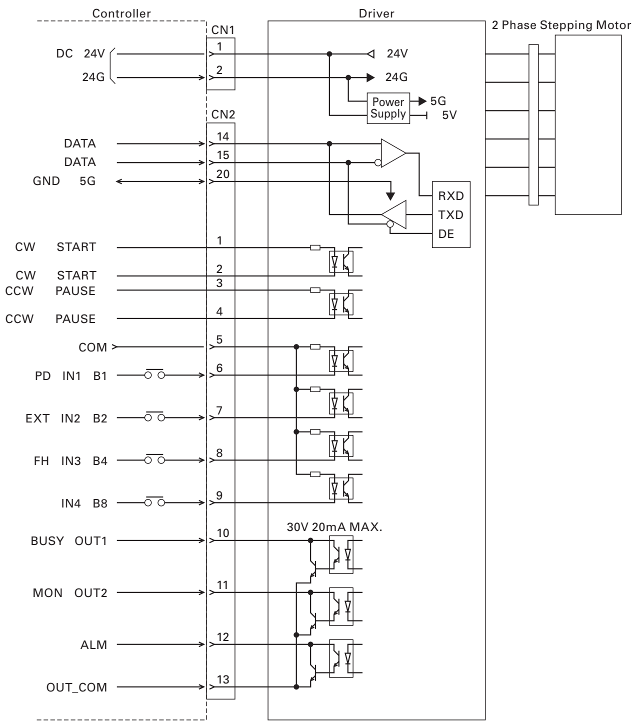
Signal	Reference Designation	Pin Number	Function Summary
FULL/HALF select input	F/H	8	When EXT input signal on internal photo coupler on , F/H input signal on internal photo coupler on HALF step F/H input signal off internal photo coupler off FULL step
Emergency stop	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Phase origin monitor output	MON	11	When the excitation phase is at the origin in power on it turns on. When FULL step, ON once for 4 pulses, when HALF step, ON once for 8 pulses.
Alarm output	ALM	12	When alarm circuits actuated inside the Driver, outputs signals to outside. Then the Stepping motor becomes unexcited status.
Output signal common	OUT_COM	13	It is for the output signal common.

*As for the Motor rotational direction, CW direction is regard as the clockwise revolution by viewing the Motor from output shaft side.

Specification Summary of Input/Output Signals (Parallel I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
Program drive Start/Stop	START+ START-	1 2	Commands the start and stop of program driving. Internal photo coupler on Program driving start Internal photo coupler off Program driving stop
Program pause	PAUSE+ PAUSE-	3 4	When START signal on, a pause in program driving is commanded. Internal photo coupler on Program driving pause Internal photo coupler off Program driving pause release
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC5V is input.
Alarm clear signal standard	ALMC	6	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
General-purpose input 1	IN1	6	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 1 on Internal photo coupler off General purpose input 1 off
Program number selection bit 1	B1	6	The program number is selected along with other bits. Subordinate bit Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	6	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	6	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
+ direction overtravel signal	+OT	7	An overtravel signal in the + direction is input. Internal photo coupler on + direction overtravel not arrived Internal photo coupler off + direction overtravel arrived
General-purpose input 2	IN2	7	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 2 on Internal photo coupler off General purpose input 2 off
Program number selection bit 2	B2	7	The program number is selected along with other bits. The second bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	7	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	7	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	7	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
- direction overtravel signal	-OT	8	An overtravel signal in the - direction is input. Internal photo coupler on - direction overtravel not arrived Internal photo coupler off - direction overtravel arrived
General-purpose input 3	IN3	8	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 3 on Internal photo coupler off General purpose input 3 off
Program number selection bit 4	B4	8	The program number is selected along with other bits. The third bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	8	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	8	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	8	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
Emergency stop signal	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
General-purpose input 4	IN4	9	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 4 on Internal photo coupler off General purpose input 4 off
Program number selection bit 8	B8	9	The program number is selected along with other bits. The fourth bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Origin signal	ORG	9	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	9	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
During program execution	PEND	10	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
Zone signal	ZONE	10	Turns on when the current position is inside the coordinates that were set beforehand.
During program execution	PEND	11	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
During motor operation	BUSY	11	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Zone signal	ZONE	11	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	ALM	12	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor becomes non excited status.
Output signal common	OUT_COM	13	It is for the output signal common.
DATA+	DATA+	14	It is for the serial signal.
DATA	DATA	15	It is for the serial signal.

External Wiring Diagrams



SET UP

Function Select Dip Switch

The functions according to the specification can be selected with this Dip switch.
Confirm the ex-factory setting as follows.

No.	Switch	Setting	Function
1	F/R	OFF	2 input mode (CW/CCW pulse)
2	LV	OFF	Micro step operation
3	PD	OFF	Power OFF
4		OFF	Phase origin excitation
5	I. SEL	OFF	Pulse stream I/F mode
6	S. SEL	OFF	

For pulse stream I/F mode

1 Input mode select　F/R

Input pulse mode selection
This switch setting is only effective in pulse stream I/F mode.

F/R	Input pulse mode
ON	1 input mode　CK,U/D
OFF	2 input mode　CW,CCW

2 Low vibration mode select　LV

Low vibration and smooth operation is enabled even by the rough resolution setting
 e.g. 1 division, 2 division　.
This switch setting is only effective in pulse stream I/F mode.
For parallel I/F mode and serial I/F mode, this is usually a low vibration operation.

LV	Operation
ON	Low vibration operation
OFF	Micro step operation

*When LV select is ON　low vibration mode　, operational process of driving pulse will be carried out inside the Driver. Therefore, the Motor movement delays for the time of 3.2ms pulse per input pulse. Note that depending upon the combined Motor, load,driving profile and etc, it may take a while until the shaft is adjusted when the Motor stops.　In parallel I/F mode and serial I/F mode there is no delay

3 Power down select　PD

Select the Motor winding current value when inputting the power down signal.This switch setting is only effective in pulse stream I/F mode.

PD	Motor winding current
ON	Current value by rotary switch STP　Power Low
OFF	0A　Power OFF

*PD function　the setting selected by PD of the function select dip switch is enabled by PD input signal ON　built-in photo coupler ON　of Input/Output signal connector　CN2　. Power down signal input is prior to all the other current settings except for alarms. The operational status may not be maintained such as power swing due to output torque drop or lower operation due to Motor current OFF　unexcited Motor　. Pay extra attention to the input timing of the power down signal in addition that the security device should be installed to the machine.

4 Excitation select　EORG

*By turning on the EORG, excitation phase when power OFF is saved.

5, 6 Operation mode selection　I.SEL, S.SEL

The operation mode is selected.

I.SEL	S.SEL	Operation mode
OFF		Pulse stream I/F mode
ON	OFF	Parallel I/F mode
	ON	Serial I/F mode

*Change the operation mode selection switch after cutting off the driver　s power supply.

For parallel I/F mode or serial I/F mode

The communication speed of serial communication is set.

Switch	Set value	Communication speed(bps)		
		9,600	19,200	38,400
F/R	OFF			
	ON			
LV	OFF			
	ON			
PD	OFF			
	ON			

*The setting change after the power supply is turned on is invalid. It does not function as a F/R, LV, and PD.
*The communication speed of pulse stream I/F mode is fixed at 9600bps.

Rotary switch(RSW) and the mode change switch(PSW)

For pulse stream I/F mode

When it selects the step angle, the driving current is selected, and stops the current is selected, set by combining rotary switch (RSW) and mode change switch (PSW).

1. Step angle select(S.S)

The divisions of the basic step angle (0.9 /step) when micro step driving can be set.

Gradation	0	1	2	3	4	5	6	7
Partition	1	2	2.5	4	5	8	10	20
Gradation	8	9	A	B	C	D	E	F
Partition	25	40	50	80	100	125	200	250

Ex-factory setting is at 1 (division 2)

*The step angle select switch (S.S) and the number of partitions become invalid by EXT input signal ON (built-in photo coupler ON) of Input/Output signal connector (CN2).

2. Driving current select(RUN)

The Motor operation current value can be selected.

Gradation	0	1	2	3	4	5	6	7
Motor current (%)	100 (rated)	95	90	85	80	75	70	65
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	60	55	50	45	40	35	30	25

Ex-factory setting is at 0 (rated value).

*When there is a sufficient extra motor torque, lowering the operation current value will be effective in the lower vibration. The Motor output torque is almost proportional to the current value. When adjusting the operational torque, confirm the sufficient operation margin and determine the Motor current value.

3. Current Select when Stop (STP)

The motor current value when stop and when power down input signal ON (power low function is selected by dip switch) can be selected.

Gradation	0	1	2	3	4	5	6	7
Motor current (%)	100 (rated)	95	90	85	80	75	70	65
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	60	55	50	45	40	35	30	25

Ex-factory setting is set at A (50%).

*The current setting when stop by STP becomes valid when the Motor stops (approximately 200ms after the last pulse input) and when power down input signal

For parallel I/F mode and serial I/F mode

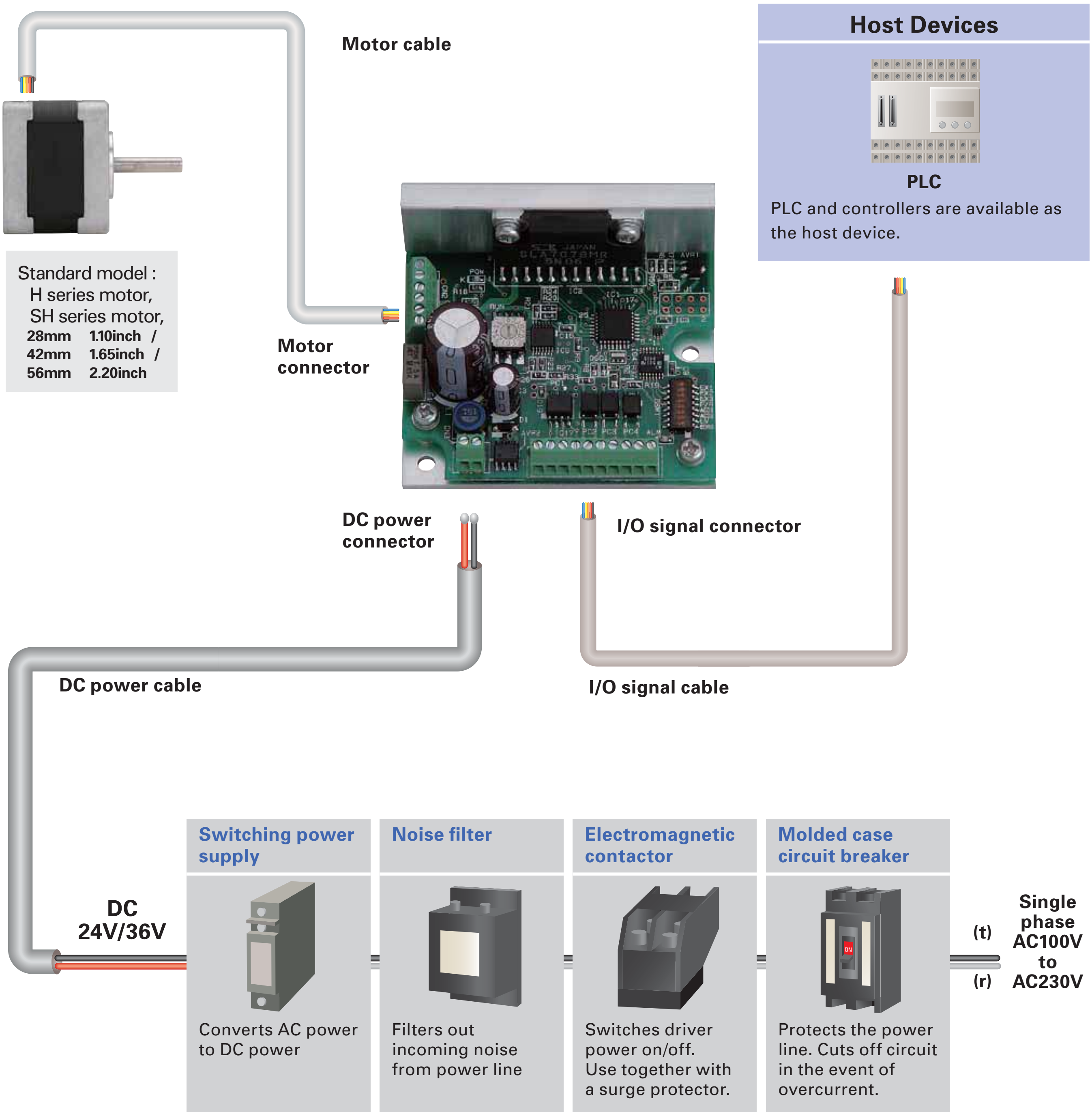
The slave bureau address of serial communications can be set.

RSW	Slave station address (HEX)
0	0
1	1
E	E
F	F

Ex-factory setting is set at 0

*The slave station address of the pulse stream I/F mode is fixed at 0.

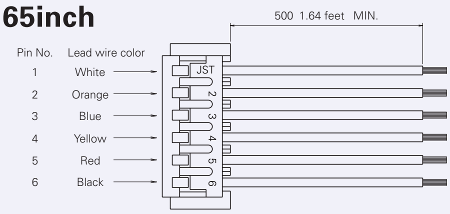
Unipolar standard



Bundled cable(42mm motors only)

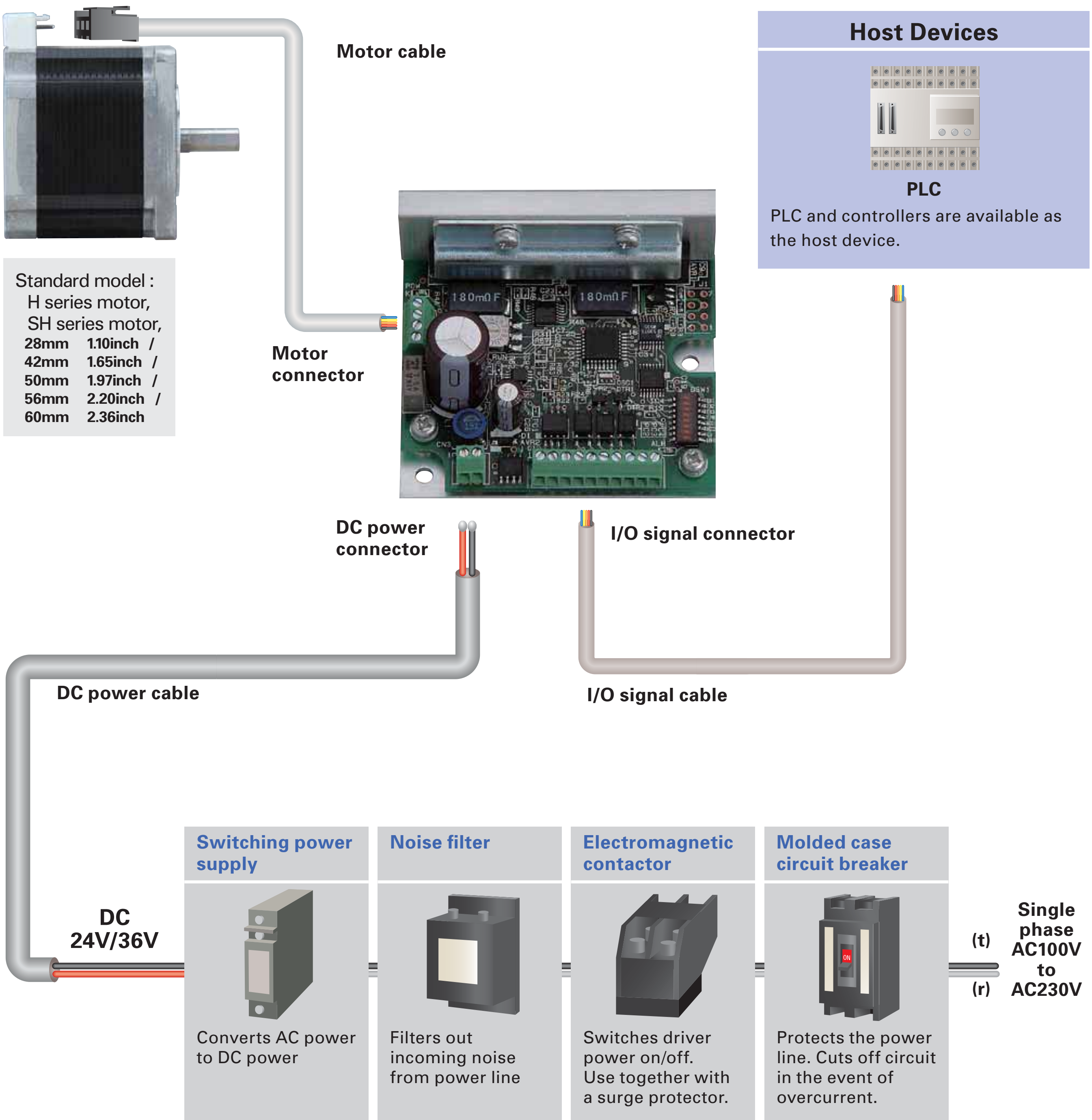
Motor cable

42mm 1.65inch



Lead wire	UL1430 AWG26
Housing	HER-6 BLACK J.S.T Mfg.Co.,Ltd
Pin	SEH-001T-P0.6 J.S.T Mfg.Co.,Ltd

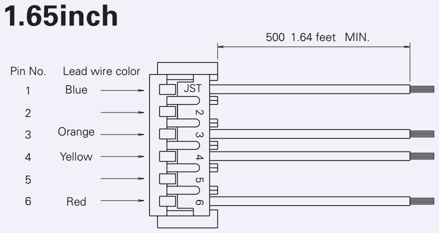
Bipolar standard



Bundled cable(42mm motors only)

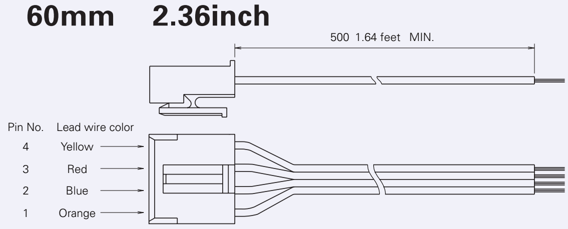
Motor cable

42mm 1.65inch



Lead wire	UL1430 AWG26
Housing	HER-6 BLACK J.S.T Mfg.Co.,Ltd
Pin	SEH-001T-P0.6 J.S.T Mfg.Co.,Ltd

60mm 2.36inch



Lead wire	UL1430 AWG22
Housing	VER-4N J.S.T Mfg.Co.,Ltd
Pin	SVH-21T-P1.1 J.S.T Mfg.Co.,Ltd

Stepping Motors with Internal drivers
Set model
Stepping motor
Dimensions
IC for stepping motor

Part numbering convention

The following set part number specifies a system with an F series unipolar driver type code : US1D200P10 and a single shaft H series motor type code : 103H7121-0440 , 56 mm 2.20 inch square flange, and 41.8 mm 1.65 inch motor length.

D	U	1	6	H	71	1	S

Stepping motor shaft spec (S)
S : Single shaft
D : Double shaft

Stepping motor total length (1)

Code	Stepping motor flange size 28mm 1.10inch		42mm 1.65inch				50mm 1.97inch		56mm 2.20inch		60mm 2.36inch			
	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch
1	2281	32 1.26	5205	33 1.30	1401	33 1.30	6701	39.8 1.57	7121	41.8 1.65	7821	44.8 1.76	1601	42 1.65
2			5208	39 1.54	1402	39 1.54			7123	53.8 2.12	7822	53.8 2.12	1602	54 2.12
3							6703	51.3 2.02	7126	75.8 2.89	7823	85.8 3.38	1603	76 2.99
4			5210	48 1.89	1404	48 1.89								
5	2285	51.5 2.03												

Stepping motor flange size (71) | **Basic step angle**

28 :	28mm	1.10inch	1.8
52 :	42mm	1.65inch	1.8
71 :	56mm	2.20inch	1.8
78 :	60mm	2.36inch	1.8
14 :	42mm	1.65inch	0.9
16 :	60mm	2.36inch	0.9

Stepping motor series name (H)
H : H series
S : SH series

Rated current specification (6)
4 : 1A/phase 5 : 1.2A/phase 6 : 2A/phase

Model (1)

Driver Specification (U)
U : 2-phase unipolar B : 2-phase bipolar

Power specification (D)
D : DC

Combination list of 2-phase unipolar driver

System type	Motor flange size	Basic step angle	Set part number		Motor model number		Rated current
			Single shaft	**Double shaft**	Single shaft	Double shaft	
Standard model	**28mm 1.10inch**	1.8	**DU14S281S**	**DU14S281D**	SH2281-5271	SH2281-5231	1A
		1.8	**DU14S285S**	**DU14S285D**	SH2285-5271	SH2285-5231	1A
	42mm 1.65inch	1.8	**DU15H521S**	**DU15H521D**	103H5205-0440	103H5205-0410	1.2A
		1.8	**DU15H522S**	**DU15H522D**	103H5208-0440	103H5208-0410	1.2A
		1.8	**DU15H524S**	**DU15H524D**	103H5210-0440	103H5210-0410	1.2A
		0.9	**DU15S141S**	**DU15S141D**	SH1421-0441	SH1421-0411	1.2A
		0.9	**DU15S142S**	**DU15S142D**	SH1422-0441	SH1422-0411	1.2A
		0.9	**DU15S144S**	**DU15S144D**	SH1424-0441	SH1424-0411	1.2A
	56mm 2.20inch	1.8	**DU16H711S**	**DU16H711D**	103H7121-0440	103H7121-0410	2A
		1.8	**DU16H713S**	**DU16H713D**	103H7123-0440	103H7123-0410	2A
		1.8	**DU16H716S**	**DU16H716D**	103H7126-0440	103H7126-0410	2A

Combination list of 2-phase bipolar driver

System type	Motor flange size	Basic step angle	Set part number		Motor model number		Rated current
			Single shaft	**Double shaft**	Single shaft	Double shaft	
Standard model	**28mm 1.10inch**	1.8	**DB14S281S**	**DB14S281D**	SH2281-5771	SH2281-5731	1A
		1.8	**DB14S285S**	**DB14S285D**	SH2285-5771	SH2285-5731	1A
	42mm 1.65inch	1.8	**DB14H521S**	**DB14H521D**	103H5205-5240	103H5205-5210	1A
		1.8	**DB14H522S**	**DB14H522D**	103H5208-5240	103H5208-5210	1A
		1.8	**DB14H524S**	**DB14H524D**	103H5210-5240	103H5210-5210	1A
		0.9	**DB16S141S**	**DB16S141D**	SH1421-5241	SH1421-5211	2A
		0.9	**DB16S142S**	**DB16S142D**	SH1422-5241	SH1422-5211	2A
		0.9	**DB16S144S**	**DB16S144D**	SH1424-5241	SH1424-5211	2A
	50mm 1.97inch	1.8	**DB16H671S**	**DB16H671D**	103H6701-5040	103H6701-5010	2A
		1.8	**DB16H672S**	**DB16H672D**	103H6703-5040	103H6703-5010	2A
	56mm 2.20inch	1.8	**DB16H711S**	**DB16H711D**	103H7121-5740	103H7121-5710	2A
		1.8	**DB16H713S**	**DB16H713D**	103H7123-5740	103H7123-5710	2A
		1.8	**DB16H716S**	**DB16H716D**	103H7126-5740	103H7126-5710	2A
	60mm 2.36inch	1.8	**DB16H781S**	**DB16H781D**	103H7821-5740	103H7821-5710	2A
		1.8	**DB16H782S**	**DB16H782D**	103H7822-5740	103H7822-5710	2A
		1.8	**DB16H783S**	**DB16H783D**	103H7823-5740	103H7823-5710	2A
		0.9	**DB16S161S**	**DB16S161D**	SH1601-5240	SH1601-5210	2A
		0.9	**DB16S162S**	**DB16S162D**	SH1602-5240	SH1602-5210	2A
		0.9	**DB16S163S**	**DB16S163D**	SH1603-5240	SH1603-5210	2A

Standard model

F series driver + H or SH series motor

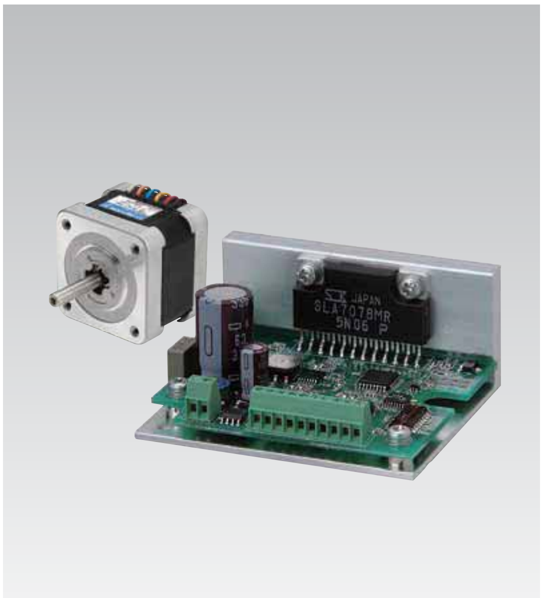
Unipolar

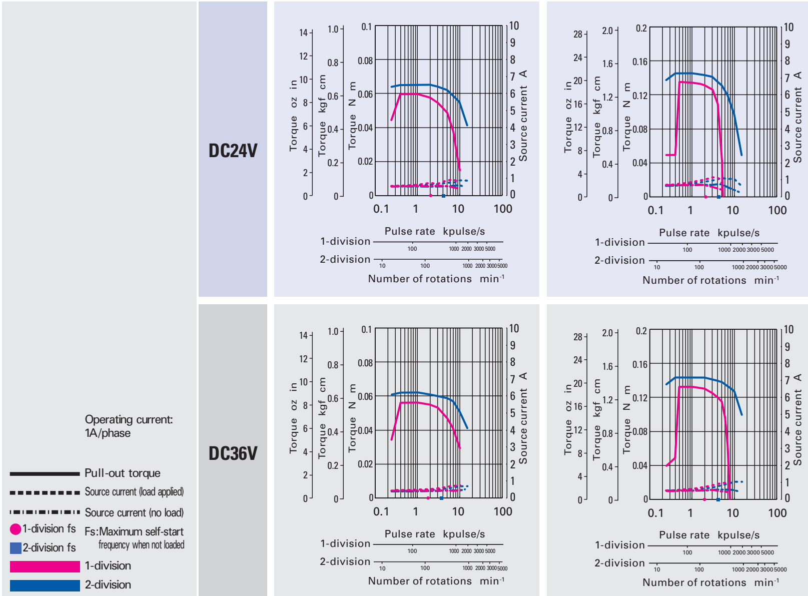
Motor flange size

□28 1.10inch □42 1.65inch □56 2.20inch

Size	Motor flange size		28mm 1.10inch /1.8	
Size	Motor length		32mm 1.26inch	51.5mm 2.03inch
Set part number	Single shaft		DU14S281S	DU14S285S
Set part number	Double shaft		DU14S281D	DU14S285D
Holding torque		N m oz in	0.055 7.79	0.115 16.28
Rotor inertia		10^{-4}kg m² oz in²	0.01 0.05	0.022 0.12
Mass Weight		kg lbs	0.11 0.24	0.2 0.44
Allowable thrust load		N lbs	3 0.67	3 0.67
Allowable radial load Note1		N lbs	42 9.44	49 11.02

Note1 When load is applied at 1/3 length from output shaft edge.

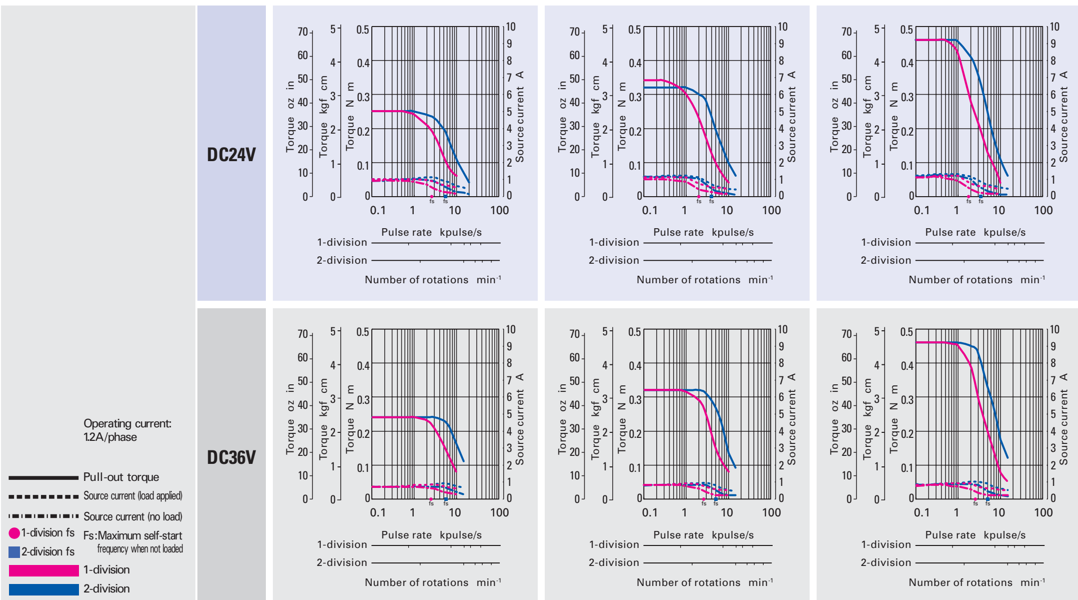




The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

Size	Motor flange size		42mm 1.65inch /0.9		
Size	Motor length		33mm 1.30inch	39mm 1.54inch	48mm 1.89inch
Set part number	Single shaft		DU15S141S	DU15S142S	DU15S144S
Set part number	Double shaft		DU15S141D	DU15S142D	DU15S144D
Holding torque		N m oz in	0.2 28.32	0.29 41.07	0.39 55.23
Rotor inertia		10^{-4}kg m² oz in²	0.044 0.24	0.066 0.361	0.089 0.487
Mass Weight		kg lbs	0.24 0.53	0.29 0.64	0.38 0.84
Allowable thrust load		N lbs	10 2.25	10 2.25	10 2.25
Allowable radial load Note1		N lbs	30 6	30 6	30 6

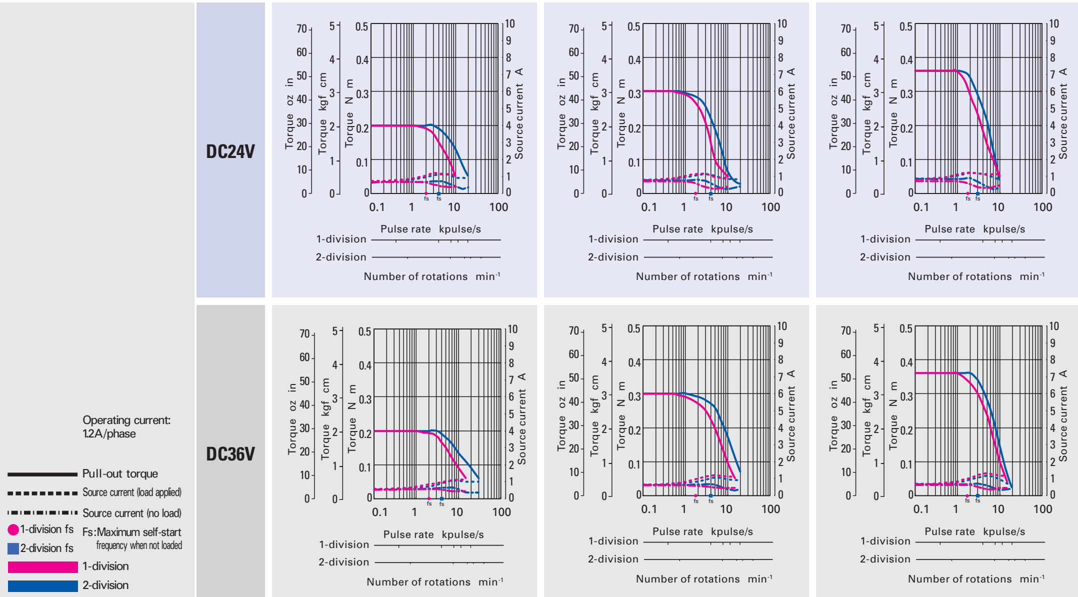
Note1 When load is applied at 1/3 length from output shaft edge.



The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

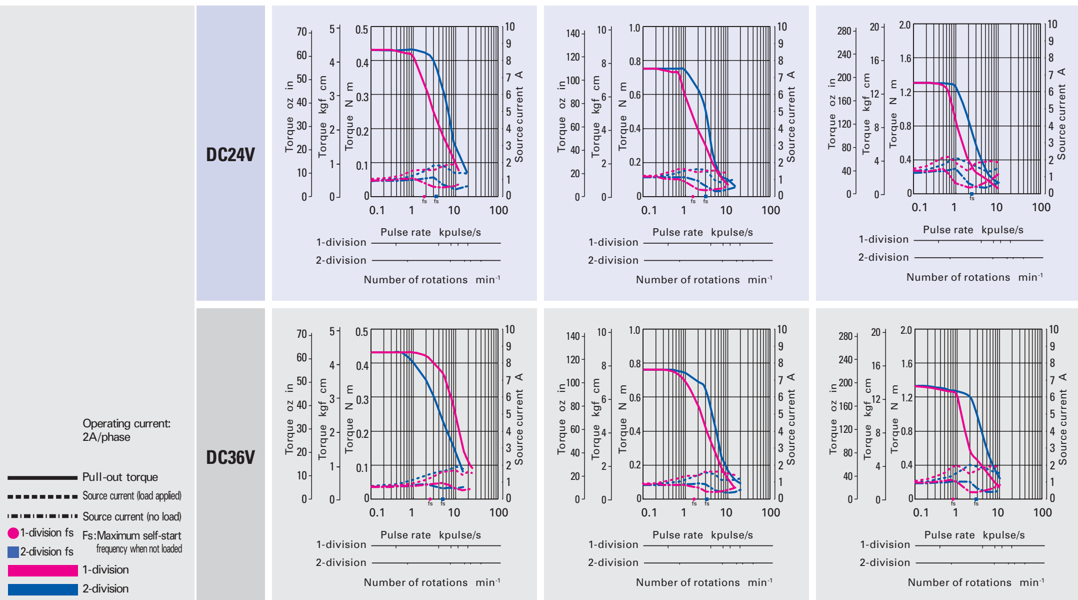
Size		42mm 1.65inch /1.8		
Size	Motor flange size	42mm 1.65inch /1.8		
	Motor length	33mm 1.30inch	39mm 1.54inch	48mm 1.89inch
Set part number	Single shaft	DU15H521S	DU15H522S	DU15H524S
	Double shaft	DU15H521D	DU15H522D	DU15H524D
Holding torque	N m oz in	0.2 28.32	0.3 42.48	0.37 52.39
Rotor inertia	10^{-4}kg m² oz in²	0.036 0.20	0.056 0.31	0.072 0.34
Mass Weight	kg lbs	0.23 0.51	0.29 0.64	0.37 0.82
Allowable thrust load	N lbs	10 2.25	10 2.25	10 2.25
Allowable radial load Note1	N lbs	30 6	30 6	30 6

Note1 When load is applied at 1/3 length from output shaft edge.



Size		56mm 2.20inch /1.8		
Size	Motor flange size	56mm 2.20inch /1.8		
	Motor length	41.8mm 1.65inch	53.8mm 2.12inch	75.8mm 2.98inch
Set part number	Single shaft	DU16H711S	DU16H713S	DU16H716S
	Double shaft	DU16H711D	DU16H713D	DU16H716D
Holding torque	N m oz in	0.39 55.23	0.83 117.5	1.27 179.8
Rotor inertia	10^{-4}kg m² oz in²	0.1 0.55	0.21 1.15	0.36 1.97
Mass Weight	kg lbs	0.47 1.04	0.63 1.39	0.98 2.16
Allowable thrust load	N lbs	15 3.37	15 3.37	15 3.37
Allowable radial load Note1	N lbs	71 15	71 15	71 15

Note1 When load is applied at 1/3 length from output shaft edge.



Standard model

F series driver + H or SH series motor

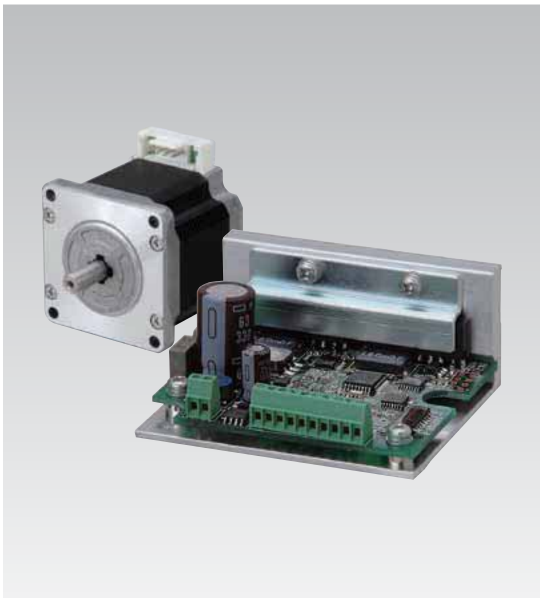
Bipolar

Motor flange size

□28 1.10inch | □42 1.65inch | □50 1.97inch | □56 2.20inch | □60 2.36inch

Size	Motor flange size		28mm 1.10inch /1.8	
	Motor length		32mm 1.26inch	51.5mm 2.03inch
Set part number	Single shaft		DB14S281S	DB14S285S
	Double shaft		DB14S281D	DB14S285D
Holding torque		N m oz in	0.07 9.91	0.145 20.53
Rotor inertia		10^{-4}kg m² oz in²	0.01 0.05	0.022 0.12
Mass Weight		kg lbs	0.11 0.24	0.2 0.44
Allowable thrust load		N lbs	3 0.67	3 0.67
Allowable radial load Note1		N lbs	42 9.44	49 9.44

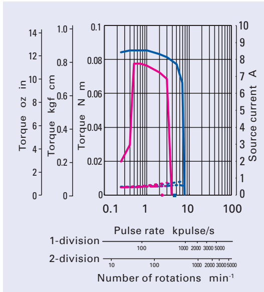
Note1 When load is applied at 1/3 length from output shaft edge.

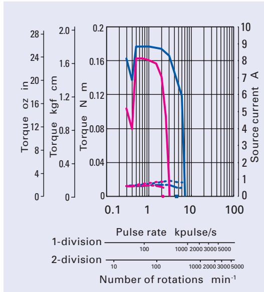


Operating current
28mm (1.10inch)/1.8 :1A/phase
42mm (1.65inch)/1.8 :1A/phase
42mm (1.65inch)/0.9 :2A/phase

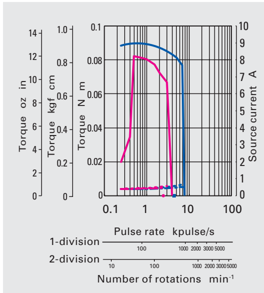
Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs
2-division fs
Fs:Maximum self-start frequency when not loaded
1-division
2-division

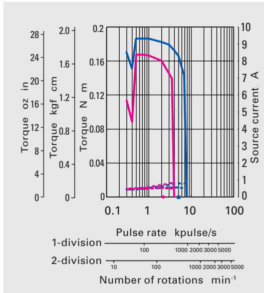
DC24V





DC36V



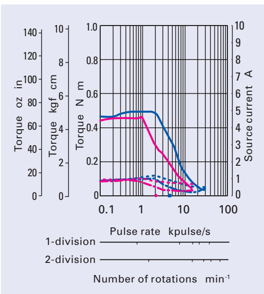


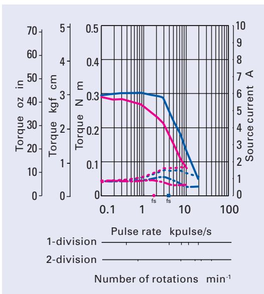
The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

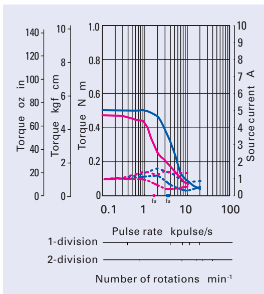
Size	Motor flange size		42mm 1.65inch /0.9	50mm 1.97inch /1.8		56mm 2.20inch /1.8
	Motor length		48mm 1.89inch	39.8mm 1.57inch	51.3mm 2.02inch	41.8mm 1.65inch
Set part number	Single shaft		DB16S144S	DB16H671S	DB16H673S	DB16H711S
	Double shaft		DB16S144D	DB16H671D	DB16H673D	DB16H711D
Holding torque		N m oz in	0.48 67.97	0.28 39.6	0.49 69.4	0.39 55.2
Rotor inertia		10^{-4}kg m² oz in²	0.089 0.487	0.057 0.31	0.118 0.65	0.1 0.55
Mass Weight		kg lbs	0.38 0.84	0.35 0.77	0.5 1.10	0.47 1.04
Allowable thrust load		N lbs	10 2.25	15 3.37	15 3.37	15 3.37
Allowable radial load Note1		N lbs	30 6	99 22	99 22	71 15

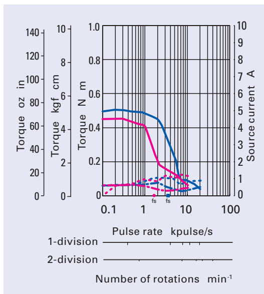
Note1 When load is applied at 1/3 length from output shaft edge.

DC24V





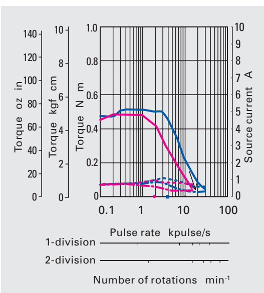


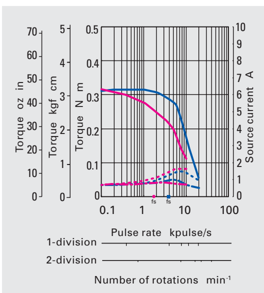


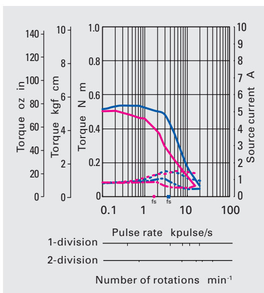
Operating current: 2A/phase

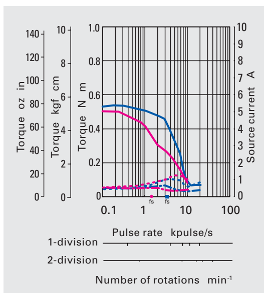
Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs
2-division fs
Fs:Maximum self-start frequency when not loaded
1-division
2-division

DC36V



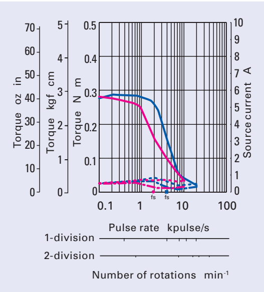
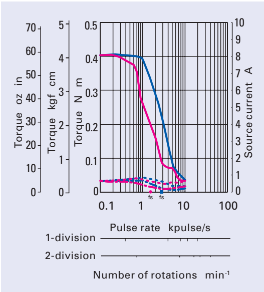
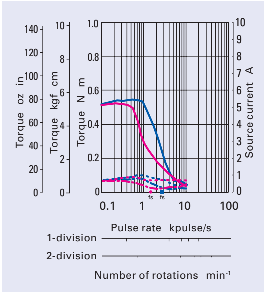
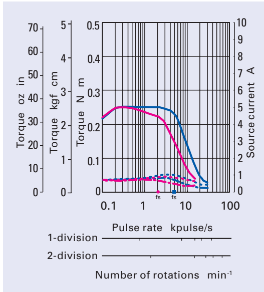
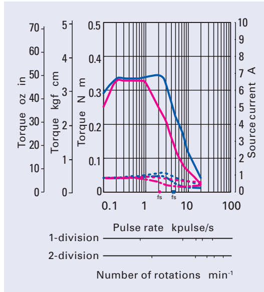
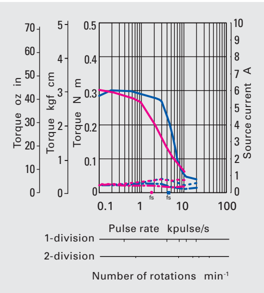
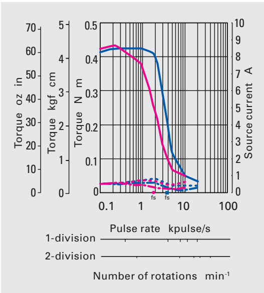
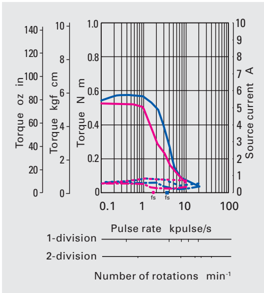
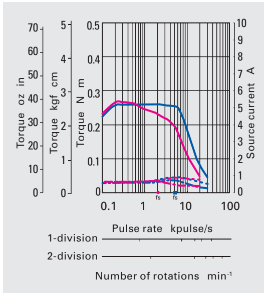
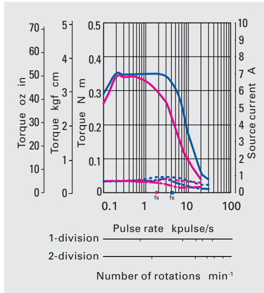




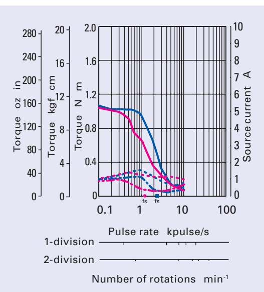
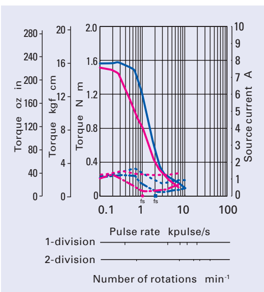
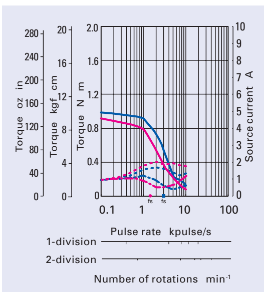
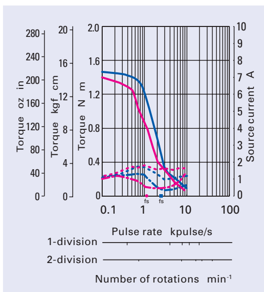
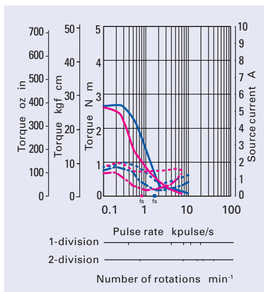
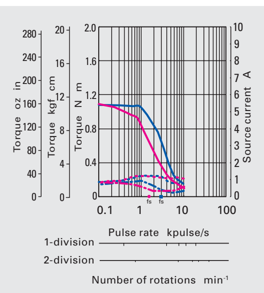
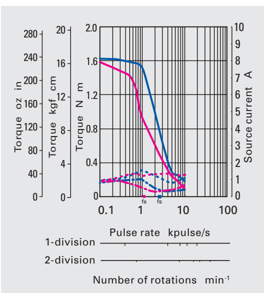
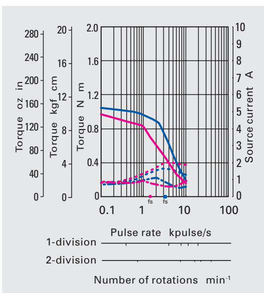
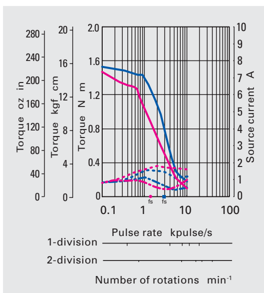
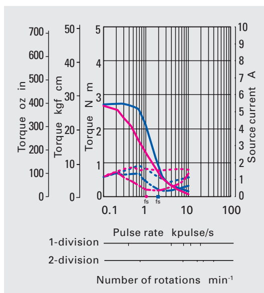


The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

42mm 1.65inch /1.8			42mm 1.65inch /0.9	
33mm 1.30inch	39mm 1.54inch	48mm 1.89inch	33mm 1.30inch	39mm 1.54inch
DB14H521S	DB14H522S	DB14H524S	DB16S141S	DB16S142S
DB14H521D	DB14H522D	DB14H524D	DB16S141D	DB16S142D
0.265 37.53	0.39 55.23	0.51 72.22	0.23 32.57	0.34 48.15
0.036 0.20	0.056 0.31	0.072 0.34	0.044 0.24	0.066 0.361
0.23 0.51	0.29 0.64	0.37 0.82	0.24 0.53	0.29 0.64
10 2.25	10 2.25	10 2.25	10 2.25	10 2.25
30 6	30 6	30 6	30 6	30 6

56mm 2.20inch /1.8		60mm 2.36inch /1.8		
53.8mm 2.12inch	75.8mm 2.98inch	44.8mm 1.76inch	53.8mm 2.12inch	85.8mm 3.38inch
DB16H713S	DB16H716S	DB16H781S	DB16H782S	DB16H783S
DB16H713D	DB16H716D	DB16H781D	DB16H782D	DB16H783D
0.83 117.5	1.27 179.8	0.88 124.6	1.37 194.0	2.7 382.3
0.21 1.15	0.36 1.97	0.275 1.50	0.4 2.19	0.84 4.59
0.65 1.43	0.98 2.16	0.6 1.32	0.77 1.70	1.34 2.95
15 3.37	15 3.37	15 3.37	15 3.37	15 3.37
71 15	71 15	95 21	95 21	95 21

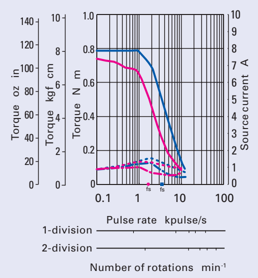











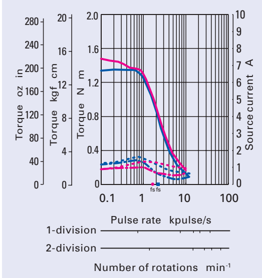
DC input Specifications

Size	Motor flange size		60mm 2.36inch /0.9	
	Motor length		42mm 16.54inch	54mm 21.26inch
Set part number	Single shaft		DB16S161S	DB16S162S
	Double shaft		DB16S161D	DB16S162D
Holding torque		N m oz in	0.69 97.71	1.28 181.26
Rotor inertia		10^{-4}kg m^2 oz in^2	0.24 1.312	0.4 2.187
Mass Weight		kg lbs	0.55 1.21	0.8 1.76
Allowable thrust load		N lbs	15 3.37	15 3.37
Allowable radial load Note1		N lbs	79 18	79 18

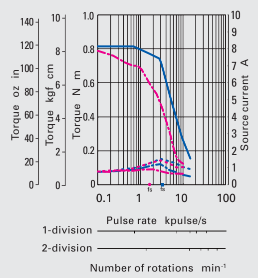
Note1 When load is applied at 1/3 length from output shaft edge.

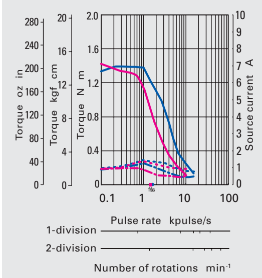
DC24V

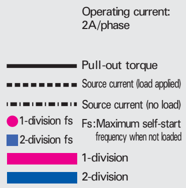




DC36V







The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

Specifications of Drivers

Unipolar

Model number			US1D200P10
Basic specifications	Input source		DC24 V / 36 V 10
	Source current		3 A
	Environment	Protection class	Class III
		Operation environment	Installation category over-voltage category : I, pollution degree : 2
		Applied standards	EN61010-1 UL508C
		Ambient operation temperature	0 to +50
		Conservation temperature	-20 to +70
		Operating ambient humidity	35 to 85% RH no condensation
		Conservation humidity	10 to 90% RH no condensation
		Operation altitude	2000 m 6560 feet or less above sea level
		Vibration resistance	Tested under the following conditions; 4.9 m/s^2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .
		Withstand voltage	Not influenced when 1500 V AC is applied between power input terminal and cabinet for one minute.
		Insulation resistance	10 M MIN. when measured with 500V DC megohmmeter between input terminal and cabinet.
	Mass Weight		0.08 kg 0.18 lbs
Functions	Selection functions		Step angle, Pulse input mode, Step current, Operating current.
	Protection functions		Open phase protection, Main circuit power souce voltage decrease
	LED indication		Power monitor, alarm
I/O signals	Command pulse input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5 V, input-signal L level : 0 to 0.5 V Maximum input frequency : 150 kpulse/s
	Poweer down input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5V, input-signal L level : 0 to 0.5 V
	Phase origin monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.
	Rotation monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.

Bipolar

Model number			BS1D200P10
Basic specifications	Input source		DC24 V / 36 V 10
	Source current		3 A
	Environment	Protection class	Class III
		Operation environment	Installation category over-voltage category : I, pollution degree : 2
		Applied standards	EN61010-1 UL508C
		Ambient operation temperature	0 to +50
		Conservation temperature	-20 to +70
		Operating ambient humidity	35 to 85% RH no condensation
		Conservation humidity	10 to 90% RH no condensation
		Operation altitude	2000 m 6560 feet or less above sea level
		Vibration resistance	Tested under the following conditions; 4.9m/s^2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .
		Withstand voltage	Not influenced when 1500 V AC is applied between power input terminal and cabinet for one minute.
		Insulation resistance	10 M MIN. when measured with 500 V DC megohmmeter between input terminal and cabinet.
	Mass Weight		0.08 kg 0.18 lbs
Functions	Selection functions		Step angle, Pulse input mode, Step current, Operating current.
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I/O signals	Command pulse input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5 V, input-signal L level : 0 to 0.5 V Maximum input frequency : 150 kpulse/s
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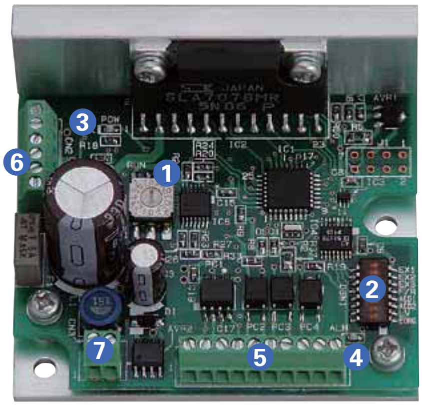
	Phase origin monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.
	Rotation monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.

Operation, Connection, and Function

Each section name of the drivers

Unipolar



1 Driving current selection switch RUN

You can select the value of the motor current when driving.

Dial	0	1	2	3	4	5	6	7
Stepping motor current A	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
Dial	8	9	A	B	C	D	E	F
Stepping motor current A	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5

The factory setting is F (0.5A).
Select the current after checking the rated current of the combination motor.

2 Function selection DIP switchpack

Select the function depending on your specification.

3 LED for power supply monitor POW

Lit up when the main circuit power supply is connected.

Indicator	Explanation
POW is displayed.	Main circuit power supply is switched on.

4 LED for alarm display ALM

Lit when an alarm is generated.

Indicator	Explanation
ALM is displayed.	Motor cable is broken, or switching element in driver is faulty. The main circuit voltage is out of specifications range (Less than DC19V).

When ALM is displayed, the winding current of the stepping motor is cut off and it is in a non-excitation state. At the same time, an output signal is transmitted from the alarm output terminal (AL) to an external source. When the alarm circuit is operating, this state is maintained until it is reset by switching on the power supply again. When an alarm condition has occurred, please take corrective actions to rectify the cause of the alarm before switching on the power supply again.

5 I/O signal connector CN1

Connect the I/O signal.

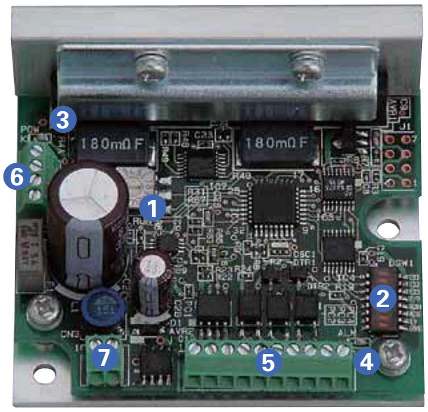
6 Motor connector CN2

Connect the motor s power line.

7 Power supply connector CN3

Connect the main circuit power supply.

Bipolar



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Dial	8	9	A	B	C	D	E	F
Stepping motor current A	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5

The factory setting is F (0.5A).
Select the current after checking the rated current of the combination motor.

2 Function selection DIP switchpack

Select the function depending on your specification.

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Lit up when the main circuit power supply is connected.

Indicator	Explanation
POW is displayed.	Main circuit power supply is switched on.

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Lit when an alarm is generated.

Indicator	Explanation
ALM is displayed.	Motor cable is broken, or switching element in driver is faulty. The main circuit voltage is out of specifications range (Less than DC19V).

When ALM is displayed, the winding current of the stepping motor is cut off and it is in a non-excitation state. At the same time, an output signal is transmitted from the alarm output terminal (AL) to an external source. When the alarm circuit is operating, this state is maintained until it is reset by switching on the power supply again. When an alarm condition has occurred, please take corrective actions to rectify the cause of the alarm before switching on the power supply again.

5 I/O signal connector CN1

Connect the I/O signal.

6 Motor connector CN2

Connect the motor s power line.

7 Power supply connector CN3

Connect the main circuit power supply.

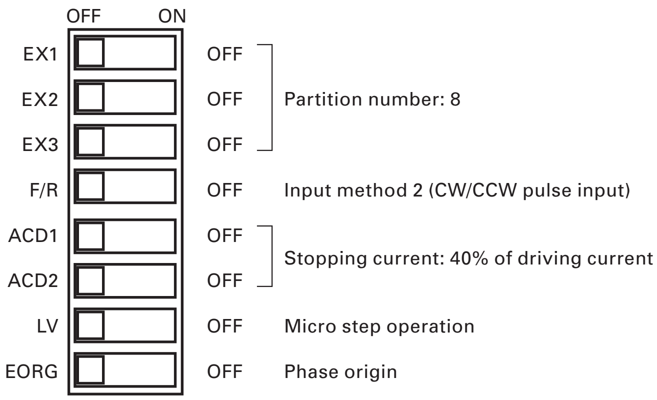
Specification summary of CN1 I/O signal

Signal name	CN1 Pin number	Function
CW pulse input standard	1 2	When using 2-input mode Drive pulse for the CW direction rotation is input.
Pulse column input	1 2	When using Pulse and direction mode Drive pulse train for the stepping motor rotation is input.
CCW pulse input standard	3 4	When using 2-input mode Drive pulse for the CCW direction rotation is input.
Rotation direction input	3 4	The rotation direction signal of stepping motor is input for the Pulse and direction mode . Internal photocoupler ON CW direction Internal photocoupler OFF CCW direction
Power down input	5 6	Inputting the PD signal cuts OFF the current flowing through the stepping motor. Iinternal photocoupler ON PD function enabled Iinternal photocoupler OFF PD function disabled
Phase origin monitor output	7 8	It is turned ON when the excitation phase is at the origin in the state when the power is turned ON It is turned ON once per 4 pulses when setting to HALF step. It is turned ON once per 8 pulses when setting to FULL step.
Alarm output	9 10	The signal is externally output when one of several alarm circuits operates in the PM driver. At this time, the stepping motor is in the unexcited state.

The CW rotation direction of stepping motor means the clockwise direction rotation as viewed from the output shaft side flange side . The CCW rotation direction means the counterclockwise direction rotation as viewed from the output shaft side flange side .

❷ Input circuit configuration　CW and CCW Pulse input

Functions can be selected according to the specification with the dip switch.
Check that the ex-factory settings are as follows.



Step angle select　EX1　EX2　EX3

Select the partition number of the basic step angle.

EX1	EX2	EX3	Partition number
ON	ON	ON	1-division
OFF	ON	OFF	2-division
ON	OFF	OFF	4-division
OFF	OFF	OFF	8-division
OFF	OFF	ON	16-division

Input method select　F/R

Selects input pulse type

F/R	Input pulse type
ON	1 input　Pluse&direction
OFF	2 input　CW, CCW

Current selection when stopping　ACD1　ACD2

Select the current value of the motor when stopping.

ACD2	ACD1	Current value of the motor
ON	ON	100% of driving current
ON	OFF	60% of driving current
OFF	ON	50% of driving current
OFF	OFF	40% of driving current

Initial configuration of factory shipment is set to 40% of rated value. Driver and motor should be operated at around 50% of rated value to reduce heat.

Low-vibration mode select　LV

Provides low-vibration, smooth operation even if resolution is rough　1-division, 2-division, etc

LV	Operation
ON	Auto-micro function
OFF	Micro-step

Excitation select　EORG

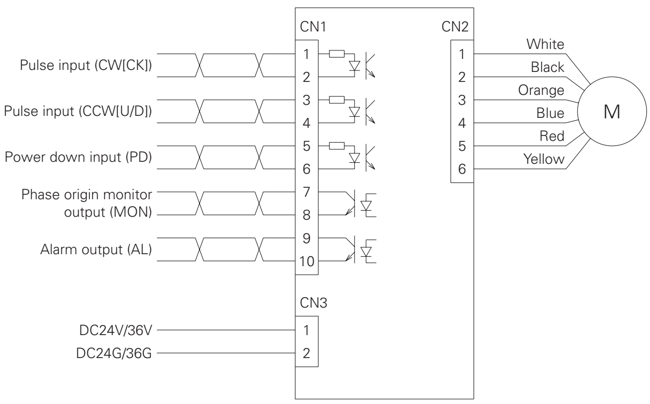
The excitation phase when the power supply is turned on is selected.

EORG	Original excitation phase
ON	Excitation phase at power shut off
OFF	Phase origin

By turning on the EORG, excitation phase when power OFF will be saved. Therefore, there will be no shaft displacement when turning the power ON.

❺❻❼ External wiring diagram

Unipolar



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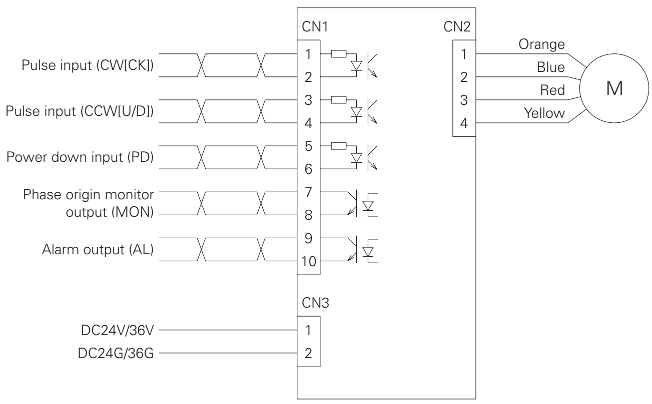
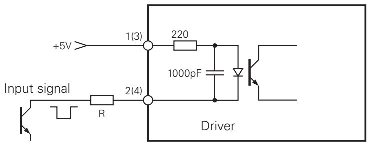


Applicable Wire Sizes

Part	Wire size	Allowable wire length
For power supply	AWG22(0.3 mm^2)	2 m MAX.
For input/output signal	AWG24(0.2 mm^2) to AWG22(0.3 mm^2)	2 m MAX.
For motor	AWG22(0.3 mm^2)	3 m MAX.

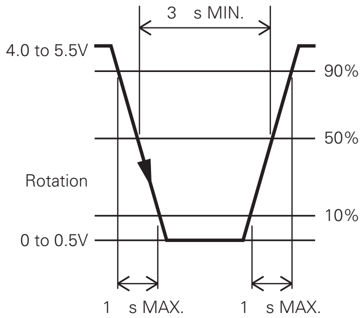
Input circuit configuration of CW CK , CCW U/D



- Pulse duty 50% MAX.
- Maximum input frequency:150kpulse/s
- When the crest value of the input signal exceeds 5V, use the external limit resistance R to limit the input current to approximately 15mA.

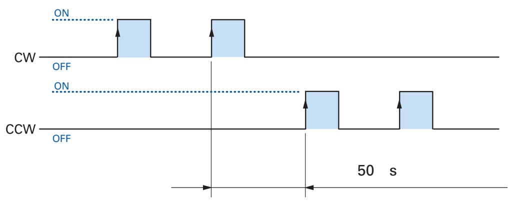
Input signal specifications

Photo coupler type



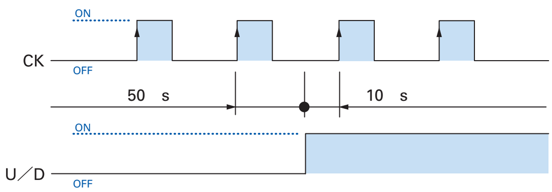
Timing of the command pulse

2-input mode CW, CCW



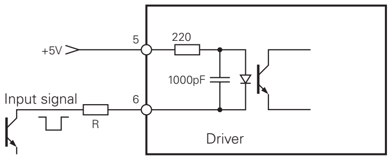
- Shaded area indicates internal photo coupler ON . Internal circuit motor starts operating at leading edge of the photo coupler ON .
- To apply pulse to CW, set CCW side internal photo coupler to OFF .
- To apply pulse to CCW, set CW side internal photo coupler to OFF .

1 input type CW, CCW



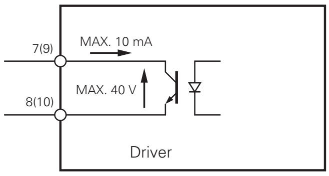
- Shaded area indicates internal photo coupler ON . Internal circuit motor starts operating at leading edge of CK side photo coupler ON .
- Switching of U/D input signal must be done while CK side internal photo coupler is OFF .

Input circuit configuration of PD

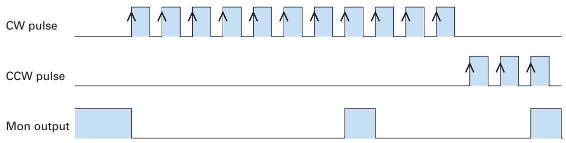


• When the crest value of the input signal exceeds 5V, use the external limit resistance R to limit the input current to approximately 15mA.

Output signal configuration of MON, AL



MON output



• Photo coupler at phase origin of motor excitation is set to ON . setting when number of divisions is 2

• Output from MON is set to on at every 7.2 degrees of motor output shaft from phase origin.

2-phase stepping motor

28mmsq. 1.10inch sq.

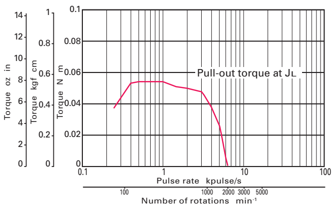
SH228
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH2281-5171	**-5131**	0.055 7.79	0.5	10.5	3.7	0.01 0.05	0.11 0.24
SH2281-5271	**-5231**	0.055 7.79	1	2.85	1	0.01 0.05	0.11 0.24
SH2285-5171	**-5131**	0.115 16.28	0.5	16.5	7.1	0.022 0.12	0.2 0.44
SH2285-5271	**-5231**	0.115 16.28	1	4.1	1.9	0.022 0.12	0.2 0.44

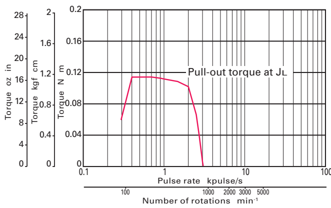
Pulse rate-torque characteristics

SH2281-51



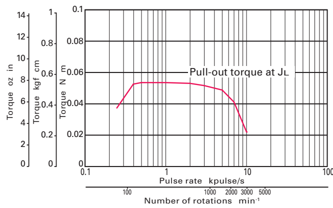
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

SH2285-51



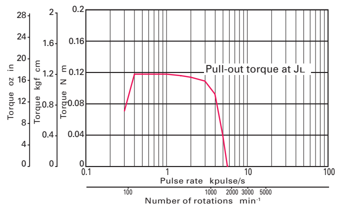
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

SH2281-52



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

SH2285-52



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

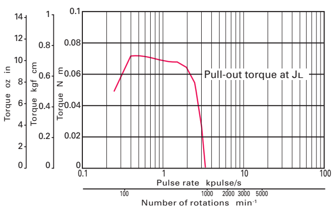
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH2281-5671	**-5631**	0.07 9.91	0.5	10.5	7.2	0.01 0.05	0.11 0.24
SH2281-5771	**-5731**	0.07 9.91	1	2.6	1.85	0.01 0.05	0.11 0.24
SH2285-5671	**-5631**	0.145 20.53	0.5	15	13.5	0.022 0.12	0.2 0.44
SH2285-5771	**-5731**	0.145 20.53	1	3.75	3.4	0.022 0.12	0.2 0.44

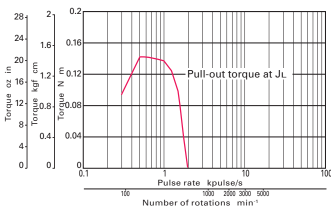
Pulse rate-torque characteristics

SH2281-56



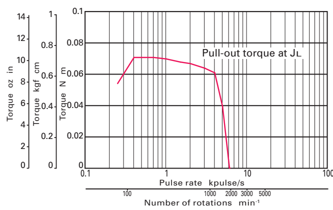
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

SH2285-56



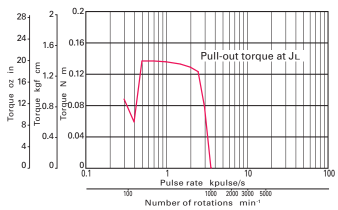
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

SH2281-57



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

SH2285-57



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

35mm sq. 1.38inch sq.

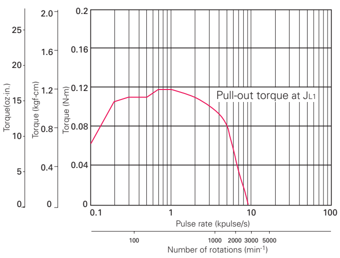
SH35
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH3533-12U40	**-12U10**	0.12 16.99	1.2	2.4	1.3	0.02 1.09	0.17 0.37
SH3537-12U40	**-12U10**	0.15 21.24	1.2	2.7	2	0.025 1.37	0.2 0.44
SH3552-12U40	**-12U10**	0.23 32.57	1.2	3.4	2.8	0.043 2.35	0.3 0.66

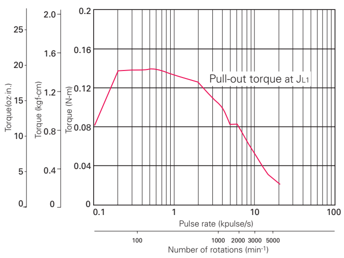
Pulse rate-torque characteristics

SH3533-12U



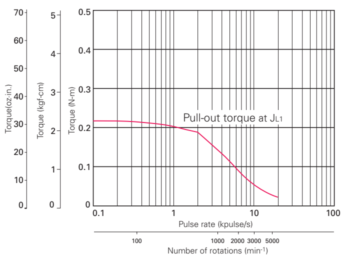
Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.33 10^{-4}kg m^2 (1.80 oz in^2) Use the rubber coupling]

SH3537-12U



Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.33 10^{-4}kg m^2 (1.80 oz in^2) Use the rubber coupling]

SH3552-12U



Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.94 10^{-4}kg m^2 (5.14 oz in^2) Use the rubber coupling]

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

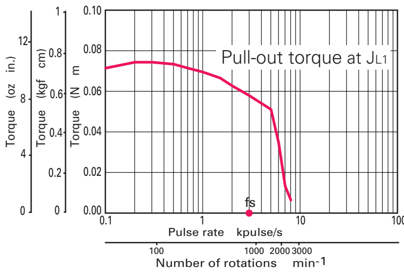
SS242
1.8 / step Bipolar winding

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SS2421-5041	**-5011**	0.083 11.75	1	3.5	1.2	0.015 0.082	0.07 0.15
SS2422-5041	**-5011**	0.186 26.33	1	5.4	2.9	0.028 0.153	0.14 0.31
SS2423-5041	**-5011**	0.240 33.98	1	7.3	5	0.038 0.208	0.20 0.44

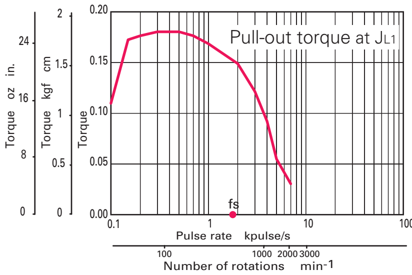
Pulse rate-torque characteristics

SS2421-50



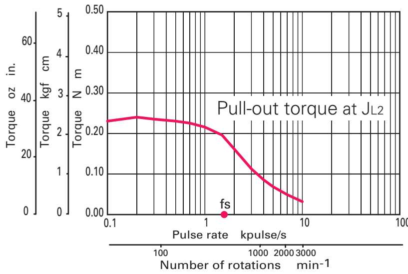
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.33x10^{-4}kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10^{-4}kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

SS2422-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.33x10^{-4}kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10^{-4}kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

SS2423-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.33x10^{-4}kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10^{-4}kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

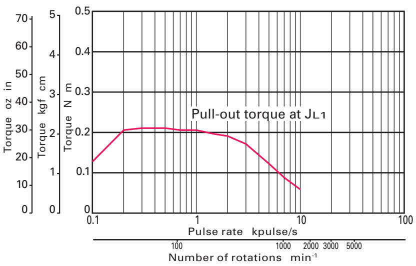
SH142
0.9 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SH1421-0441	**-0411**	0.20 28.32	1.2	2.7	3.2	0.044 0.241	0.24 0.53
SH1422-0441	**-0411**	0.29 41.07	1.2	3.1	5.3	0.066 0.361	0.29 0.64
SH1424-0441	**-0411**	0.39 55.23	1.2	3.5	5.3	0.089 0.487	0.38 0.84

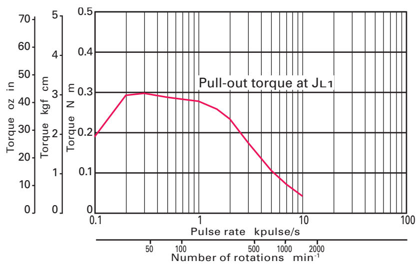
Pulse rate-torque characteristics

SH1421-04



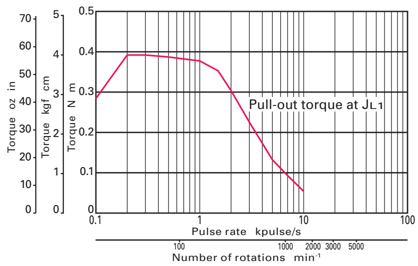
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² Use the rubber coupling

SH1422-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² Use the rubber coupling

SH1424-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² Use the rubber coupling

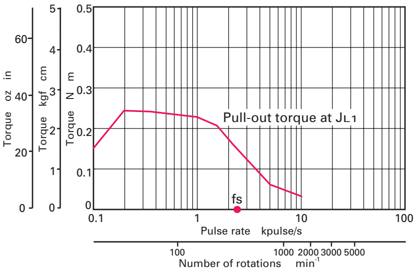
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding　Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass　Weight
Single shaft	Double shafts	[N　m　oz　in　MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg　m^2　oz　in^2]	[kg　lbs]
SH1421-5041	**-5011**	0.23　32.5	1	3.3	8.0	0.044　0.24	0.24　0.53
SH1421-5241	**-5211**	0.23　32.5	2	0.85	2.1	0.044　0.24	0.24　0.53
SH1422-5041	**-5011**	0.34　48.1	1	4.0	14.0	0.066　0.36	0.29　0.64
SH1422-5241	**-5211**	0.34　48.1	2	1.05	3.6	0.066　0.36	0.29　0.64
SH1424-5041	**-5011**	0.48　67.9	1	4.7	15.0	0.089　0.49	0.38　0.84
SH1424-5241	**-5211**	0.48　67.9	2	1.25	3.75	0.089　0.49	0.38　0.84

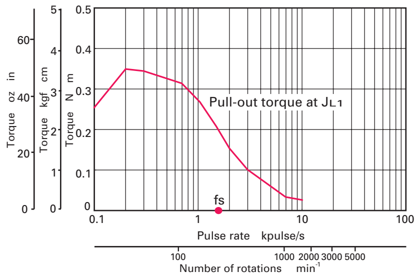
Pulse rate-torque characteristics

SH1421-50



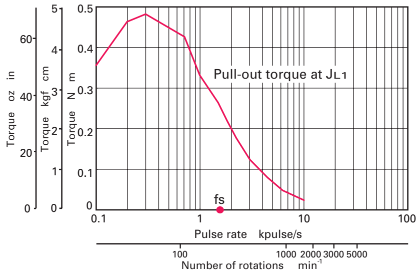
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10^{-4}kg　m^2　5.14 oz　in^2　Use the rubber coupling

SH1422-50



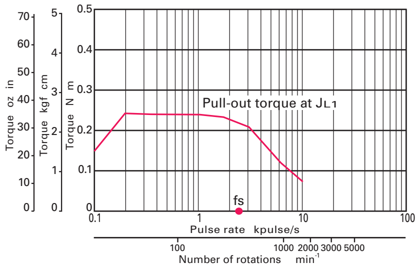
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10^{-4}kg　m^2　5.14 oz　in^2　Use the rubber coupling

SH1424-50



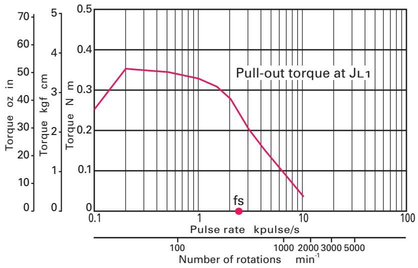
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10^{-4}kg　m^2　5.14 oz　in^2　Use the rubber coupling

SH1421-52



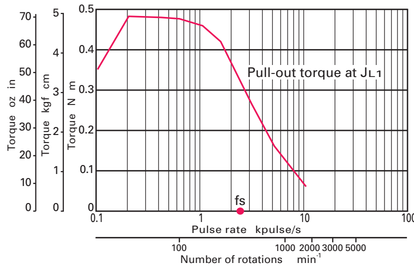
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10^{-4}kg　m^2　5.14 oz　in^2　Use the rubber coupling

SH1422-52



Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10^{-4}kg　m^2　5.14 oz　in^2　Use the rubber coupling

SH1424-52



Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10^{-4}kg　m^2　5.14 oz　in^2　Use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

103H52
1.8 /step

Unipolar winding Connector type

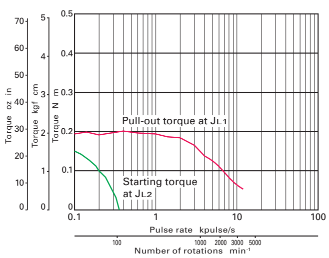
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H5205-0440	**-0410**	0.2 28.32	1.2	2.4	2.3	0.036 0.20	0.23 0.51
103H5208-0440	**-0410**	0.3 42.48	1.2	2.9	3.4	0.056 0.31	0.29 0.64
103H5209-0440	**-0410**	0.32 45.31	1.2	3	3.9	0.062 0.34	0.31 0.68
103H5210-0440	**-0410**	0.37 52.39	1.2	3.3	3.4	0.074 0.40	0.37 0.82

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H5205-5040	**-5010**	0.23 32.57	0.25	54	78	0.036 0.20	0.23 0.51
103H5205-5140	**-5110**	0.25 35.40	0.5	13.4	23.4	0.036 0.20	0.23 0.51
103H5205-5240	**-5210**	0.265 37.53	1	3.4	6.5	0.036 0.20	0.23 0.51
103H5208-5040	**-5010**	0.35 49.56	0.25	66	116	0.056 0.31	0.29 0.64
103H5208-5140	**-5110**	0.38 53.81	0.5	16.5	34	0.056 0.31	0.29 0.64
103H5208-5240	**-5210**	0.39 55.23	1	4.1	9.5	0.056 0.31	0.29 0.64
103H5209-5040	**-5010**	0.38 53.81	0.25	71.4	133	0.062 0.34	0.31 0.68
103H5209-5140	**-5110**	0.41 58.06	0.5	18.2	39	0.062 0.34	0.31 0.68
103H5209-5240	**-5210**	0.425 60.18	1	4.4	11	0.062 0.34	0.31 0.68
103H5210-5040	**-5010**	0.465 65.85	0.25	80	123.3	0.074 0.40	0.37 0.82
103H5210-5140	**-5110**	0.49 69.39	0.5	20	35	0.074 0.40	0.37 0.82
103H5210-5240	**-5210**	0.51 72.22	1	4.8	9.5	0.074 0.40	0.37 0.82

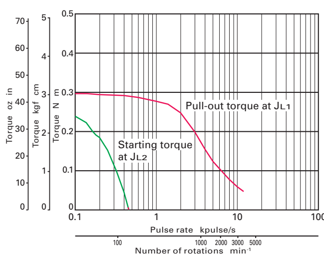
Pulse rate-torque characteristics

103H5205-04



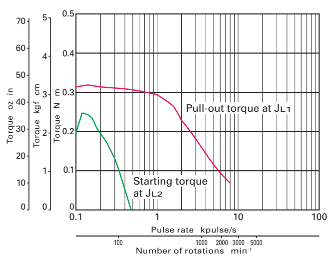
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H5208-04



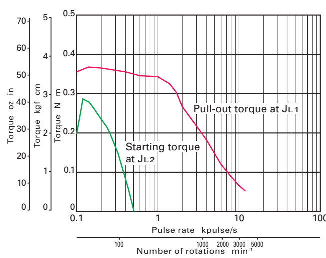
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H5209-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

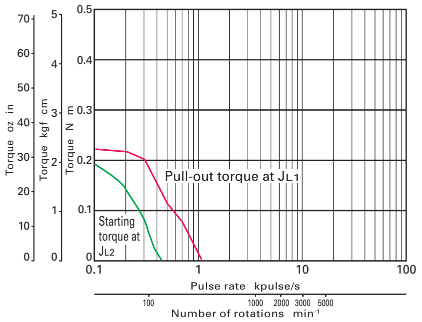
103H5210-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

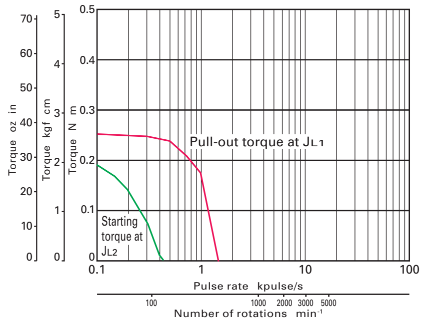
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

103H5205-50



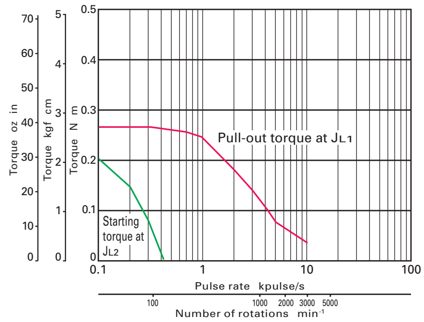
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5205-51



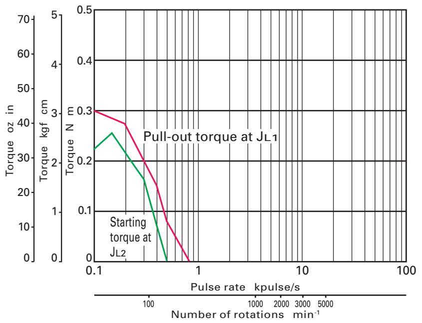
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5205-52



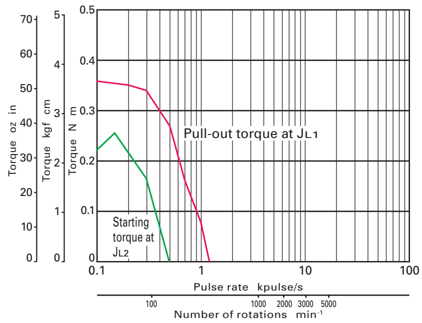
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-50



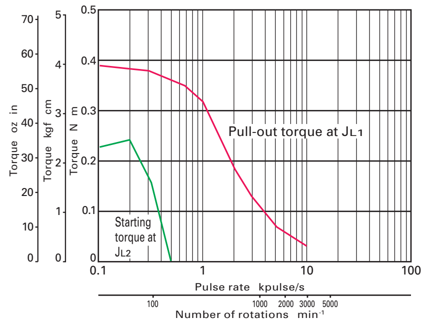
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-51



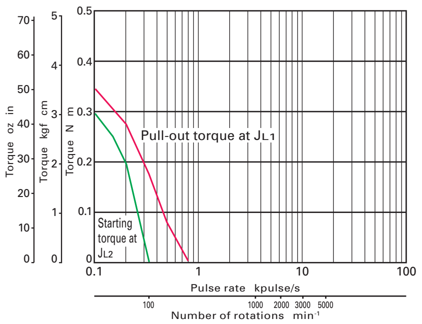
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-52



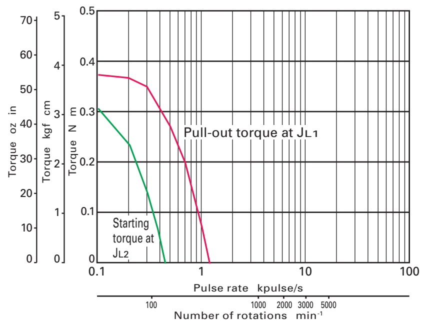
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-50



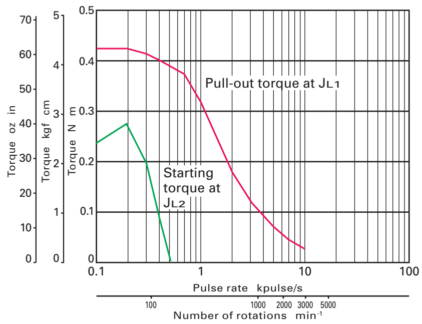
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-51



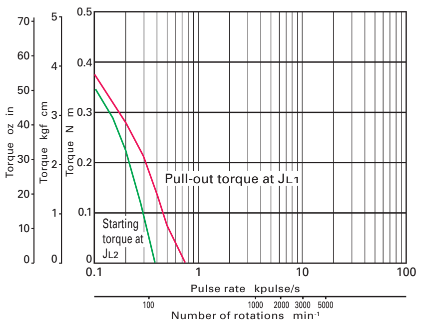
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-52



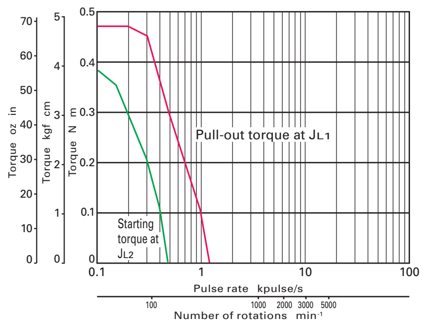
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-50



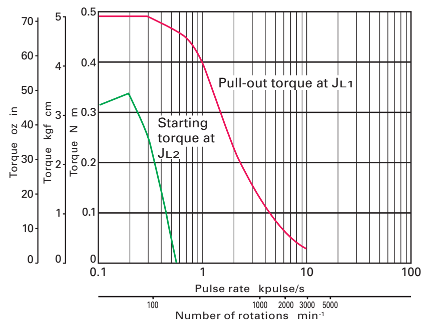
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-51



Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-52



Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

50mm sq. 1.97inch sq.

SS250

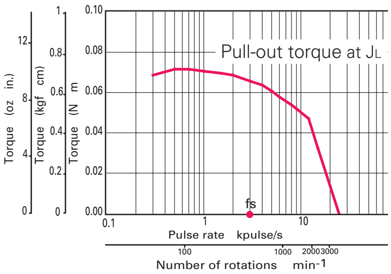
1.8 / step Bipolar winding

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SS2501-5041	**-5011**	0.1 14.16	1	4.5	1.8	0.026 0.142	0.09 0.20
SS2502-5041	**-5011**	0.215 30.44	1	5.9	3.2	0.049 0.268	0.15 0.33

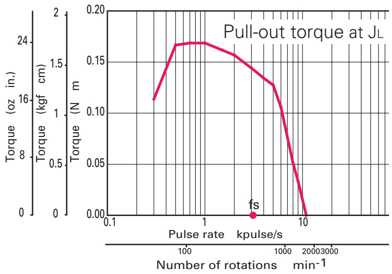
Pulse rate-torque characteristics

SS2501-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 1-2-phase energization half-step
JL = 0.01x10⁻⁴kg m² 0.055 oz in² Pulley barancer system
fs: No load maximum starting pulse rate

SS2502-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 1-2-phase energization half-step
JL = 0.01x10⁻⁴kg m² 0.055 oz in² Pulley barancer system
fs: No load maximum starting pulse rate

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

50mm sq. 1.97inch sq.

103H670
1.8 /step

Unipolar winding Lead wire type

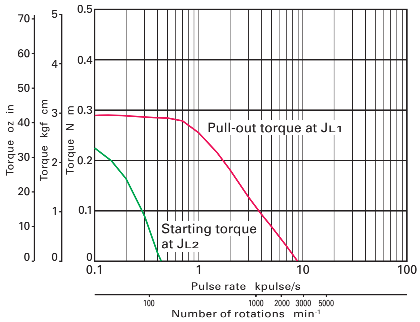
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H6701-0140	**-0110**	0.28 39.6	1	4.3	6.8	0.057 0.31	0.35 0.77
103H6701-0440	**-0410**	0.28 39.6	2	1.1	1.6	0.057 0.31	0.35 0.77
103H6701-0740	**-0710**	0.28 39.6	3	0.6	0.7	0.057 0.31	0.35 0.77
103H6703-0140	**-0110**	0.49 69.4	1	6	13	0.118 0.65	0.5 1.10
103H6703-0440	**-0410**	0.49 69.4	2	1.6	3.2	0.118 0.65	0.5 1.10
103H6703-0740	**-0710**	0.49 69.4	3	0.83	1.4	0.118 0.65	0.5 1.10
103H6704-0140	**-0110**	0.53 75.1	1	6.5	16.5	0.14 0.77	0.55 1.21
103H6704-0440	**-0410**	0.52 73.6	2	1.7	3.8	0.14 0.77	0.55 1.21
103H6704-0740	**-0710**	0.53 75.1	3	0.9	1.7	0.14 0.77	0.55 1.21

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H6701-5040	**-5010**	0.28 39.6	2	0.6	1.6	0.57 0.31	0.35 0.77
103H6703-5040	**-5010**	0.09 12.7	2	0.8	3.2	0.118 0.65	0.5 1.10
103H6704-5040	**-5010**	0.52 73.6	2	0.9	3.8	0.14 0.77	0.55 1.21

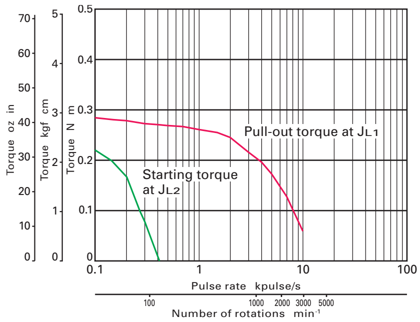
Pulse rate-torque characteristics

103H6701-01



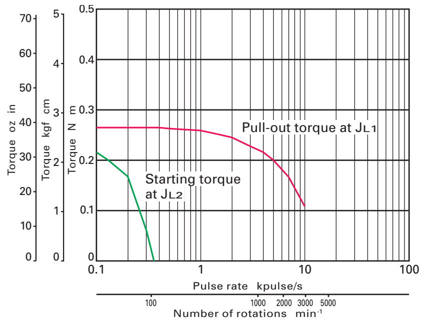
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-04



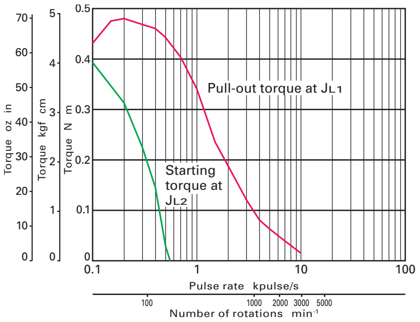
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-07



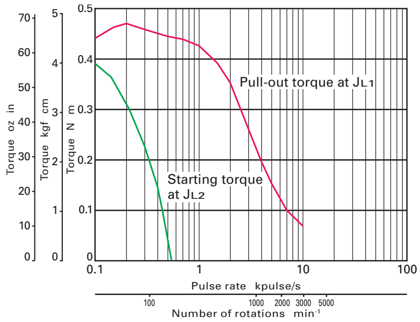
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-01



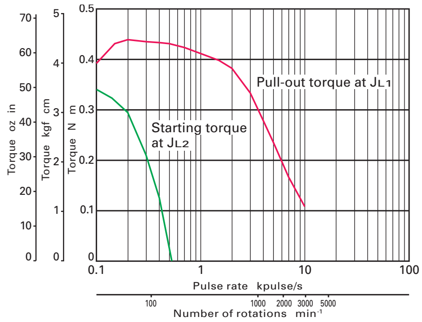
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-04



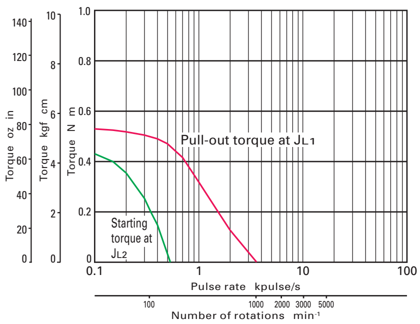
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-07



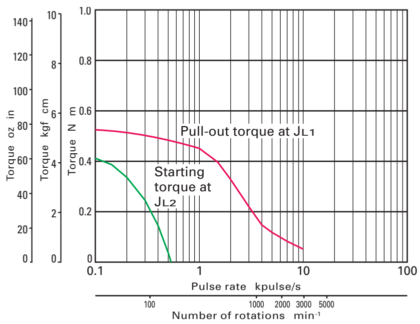
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-01



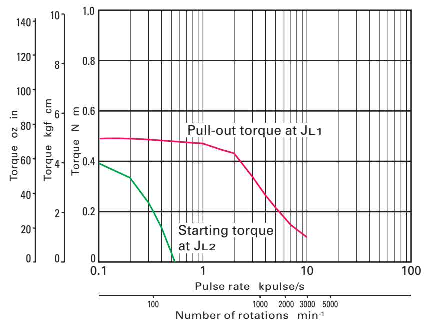
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-04



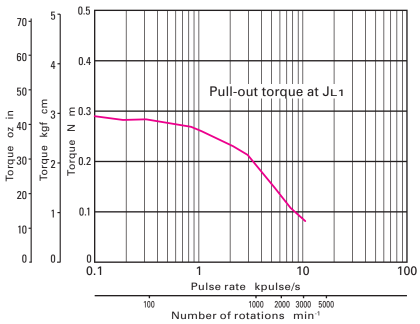
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-07



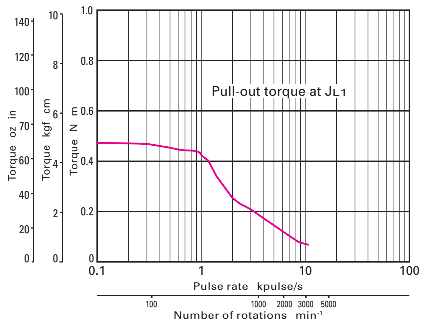
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-50



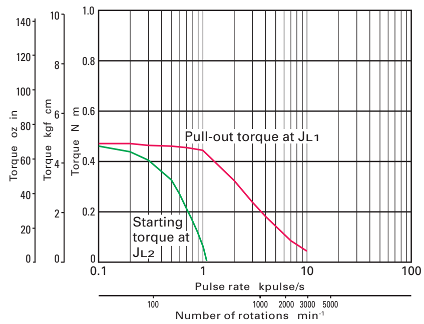
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling

103H6703-50



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling

103H6704-50



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.14×10^{-4}kg m^2 0.77 oz in^2 pulley balancer method

2-phase stepping motor

56mm sq. 2.20inch sq.

103H712
1.8 /step

Unipolar winding Lead wire type

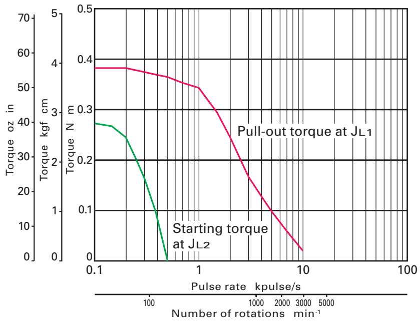
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7121-0140	**-0110**	0.39 55.2	1	4.8	8	0.1 0.55	0.47 1.04
103H7121-0440	**-0410**	0.39 55.2	2	1.25	1.9	0.1 0.55	0.47 1.04
103H7121-0740	**-0710**	0.39 55.2	3	0.6	0.8	0.1 0.55	0.47 1.04
103H7123-0140	**-0110**	0.83 117.	1	6.7	15	0.21 1.15	0.65 1.43
103H7123-0440	**-0410**	0.83 117.5	2	1.6	3.8	0.21 1.15	0.65 1.43
103H7123-0740	**-0710**	0.78 110.5	3	0.77	1.58	0.21 1.15	0.65 1.43
103H7124-0140	**-0110**	0.98 138.8	1	7	14.5	0.245 1.34	0.8 1.76
103H7124-0440	**-0410**	0.98 138.8	2	1.7	3.1	0.245 1.34	0.8 1.76
103H7124-0740	**-0710**	0.98 138.8	3	0.74	1.4	0.245 1.34	0.8 1.76
103H7126-0140	**-0110**	1.27 179.8	1	8.6	19	0.36 1.97	0.98 2.16
103H7126-0440	**-0410**	1.27 179.8	2	2	4.5	0.36 1.97	0.98 2.16
103H7126-0740	**-0710**	1.27 179.8	3	0.9	2.2	0.36 1.97	0.98 2.16

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7121-5640	**-5610**	0.55 77.9	1	4.3	14.5	0.1 0.55	0.47 1.04
103H7121-5740	**-5710**	0.55 77.9	2	1.1	3.7	0.1 0.55	0.47 1.04
103H7121-5840	**-5810**	0.55 77.9	3	0.54	1.74	0.1 0.55	0.47 1.04
103H7123-5640	**-5610**	1.0 141.6	1	5.7	29.4	0.21 1.15	0.65 1.43
103H7123-5740	**-5710**	1.0 141.6	2	1.5	7.5	0.21 1.15	0.65 1.43
103H7123-5840	**-5810**	1.0 141.6	3	0.7	3.5	0.21 1.15	0.65 1.43
103H7126-5640	**-5610**	1.6 226.6	1	7.7	34.6	0.36 1.97	0.98 2.16
103H7126-5740	**-5710**	1.6 226.6	2	2	9.1	0.36 1.97	0.98 2.16
103H7126-5840	**-5810**	1.6 226.6	3	0.94	4	0.36 1.97	0.98 2.16
103H7128-5640	**-5610**	2.0 283.2	1	8.9	40.1	0.49 2.68	1.3 2.87
103H7128-5740	**-5710**	2.0 283.2	2	2.3	10.4	0.49 2.68	1.3 2.87
103H7128-5840	**-5810**	2.0 283.2	3	1.03	4.3	0.49 2.68	1.3 2.87

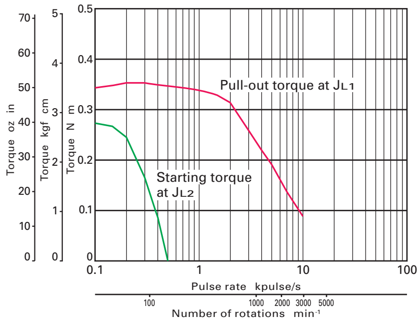
Pulse rate-torque characteristics

103H7121-01



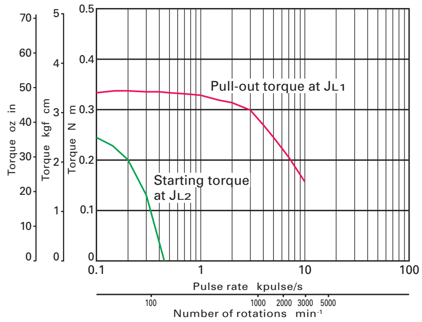
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-04



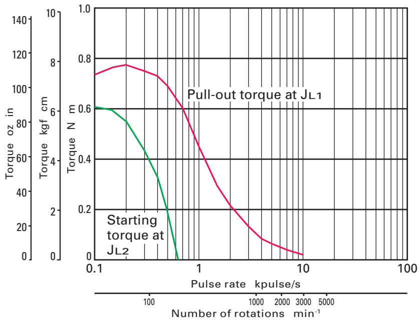
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-07



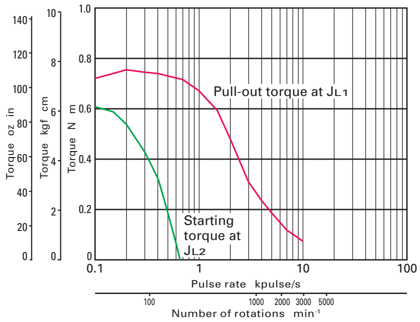
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-01



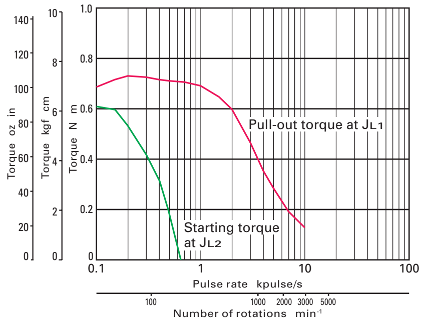
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-04



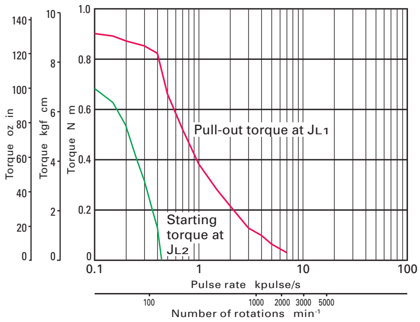
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-07



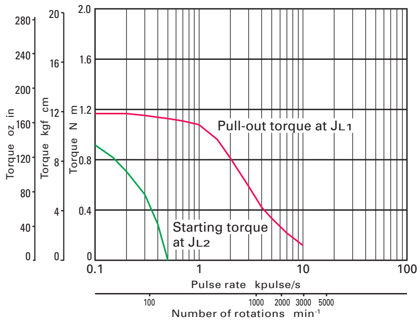
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7124-01



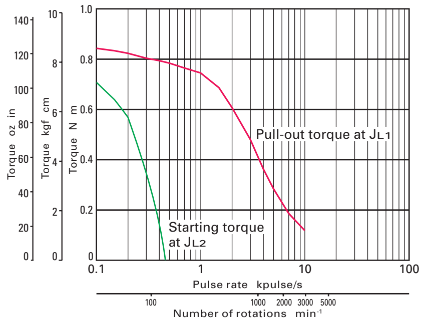
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7124-04



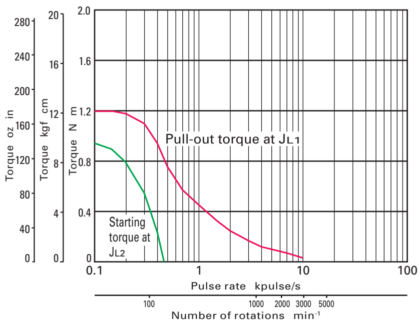
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7124-07



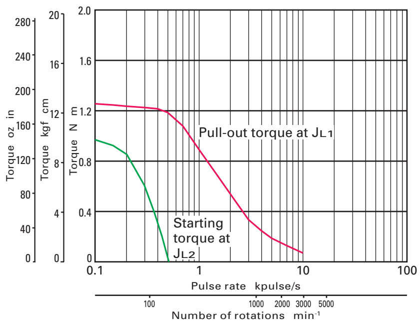
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-01



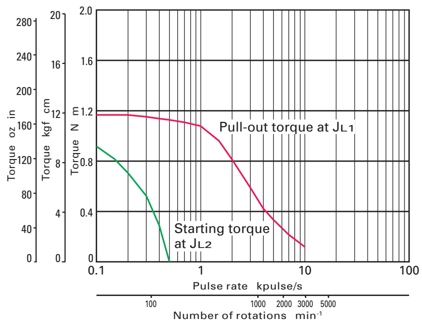
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-04



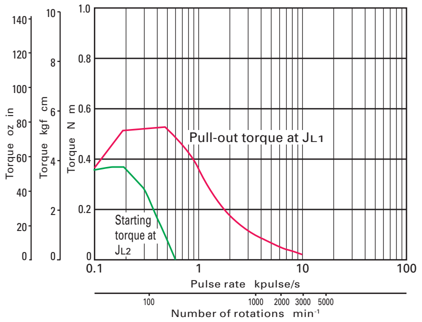
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-07



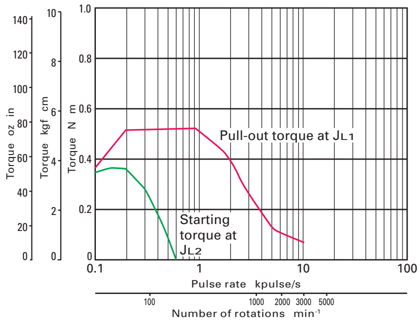
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7121-56



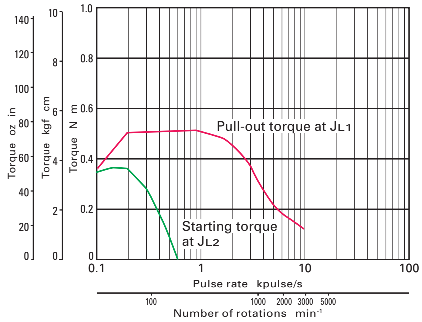
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7121-57



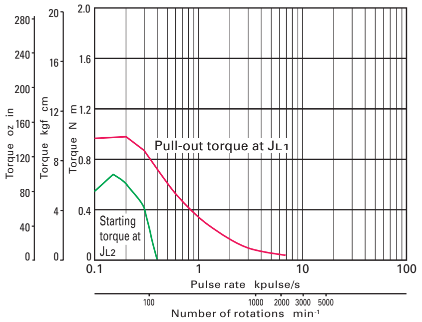
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7121-58



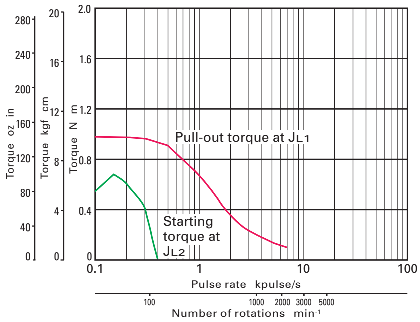
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7123-56



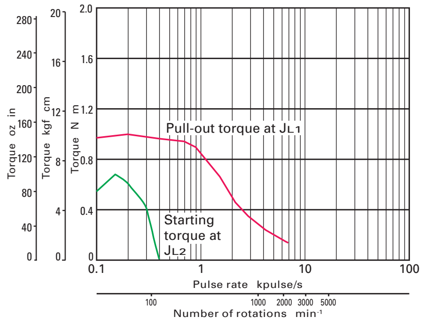
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7123-57



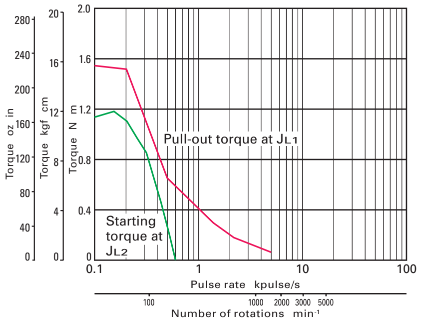
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7123-58



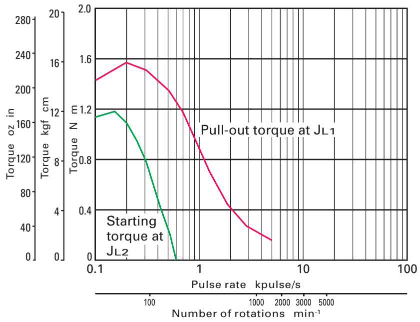
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7126-56



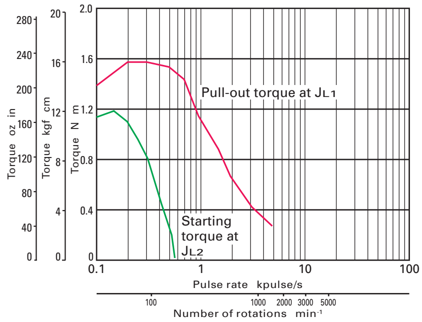
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7126-57



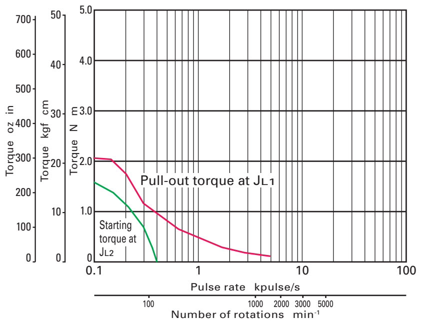
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7126-58



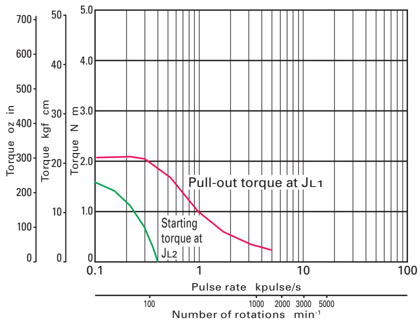
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7128-56



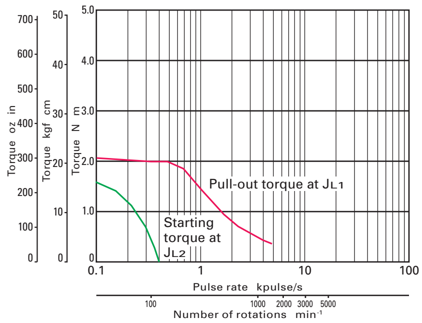
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

103H7128-57



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

103H7128-58



Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

60mm sq. 2.36inch sq.

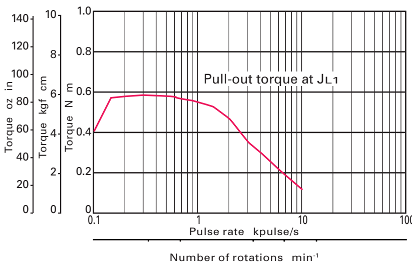
SH160
0.9 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH1601-0440	**-0410**	0.57 80.71	2	1.35	2	0.24 1.312	0.55 1.21
SH1602-0440	**-0410**	1.1 155.77	2	1.8	3.5	0.4 2.187	0.8 1.76
SH1603-0440	**-0410**	1.7 240.74	2	2.3	4.5	0.75 4.101	1.2 2.64

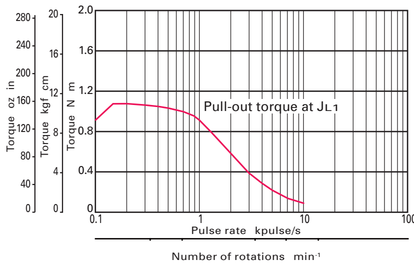
Pulse rate-torque characteristics

SH1601-04



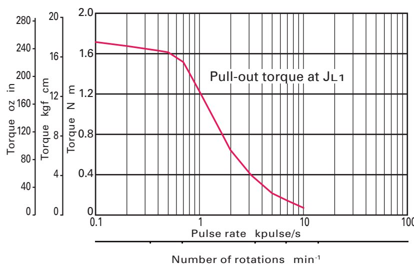
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling

SH1602-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling

SH1603-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling

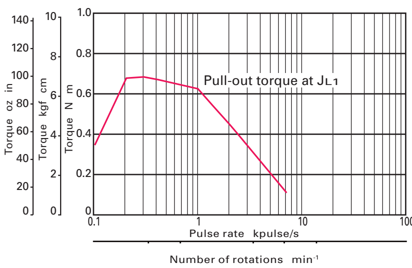
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH1601-5240	**-5210**	0.69 97.7	2	1.2	3.5	0.24 1.31	0.55 1.21
SH1602-5240	**-5210**	1.28 181.2	2	1.65	6.1	0.4 2.19	0.8 1.76
SH1603-5240	**-5210**	2.15 304.4	2	2.3	8.8	0.75 4.10	1.2 2.65

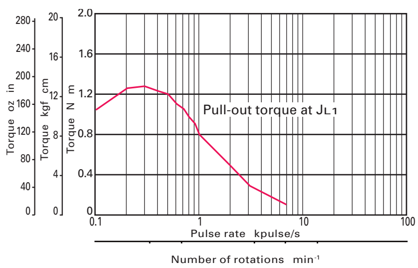
Pulse rate-torque characteristics

SH1601-52



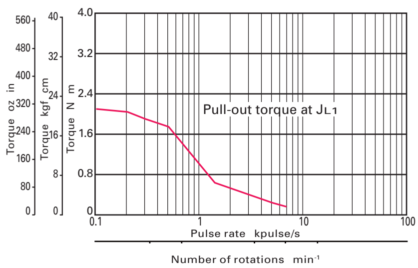
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling

SH1602-52



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling

SH1603-52



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L3} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

60mm sq. 2.36inch sq.

103H782
1.8 /step

Unipolar winding Connector type

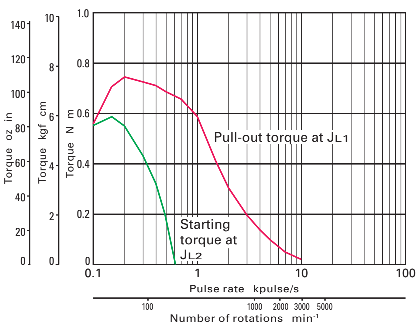
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7821-0140	**-0110**	0.78 110.5	1	5.7	8.3	0.275 1.50	0.6 1.32
103H7821-0440	**-0410**	0.78 110.5	2	1.5	2	0.275 1.50	0.6 1.32
103H7821-0740	**-0710**	0.78 110.5	3	0.68	0.8	0.275 1.50	0.6 1.32
103H7822-0140	**-0110**	1.17 165.7	1	6.9	14	0.4 2.19	0.77 1.70
103H7822-0440	**-0410**	1.17 165.7	2	1.8	3.6	0.4 2.19	0.77 1.70
103H7822-0740	**-0710**	1.17 165.7	3	0.8	1.38	0.4 2.19	0.77 1.70
103H7823-0140	**-0110**	2.1 297.4	1	10	21.7	0.84 4.59	1.34 2.95
103H7823-0440	**-0410**	2.1 297.4	2	2.7	5.6	0.84 4.59	1.34 2.95
103H7823-0740	**-0710**	2.1 297.4	3	1.25	2.4	0.84 4.59	1.34 2.95

Bipolar winding Connector type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7821-1740	**-1710**	0.88 124.6	4	0.35	0.8	0.275 1.50	0.6 1.32
103H7821-5740	**-5710**	0.88 124.6	2	1.27	3.3	0.275 1.50	0.6 1.32
103H7822-1740	**-1710**	1.37 194.0	4	0.43	1.38	0.4 2.19	0.77 1.70
103H7822-5740	**-5710**	1.37 194.0	2	1.55	5.5	0.4 2.19	0.77 1.70
103H7823-1740	**-1710**	2.7 382.3	4	0.65	2.4	0.84 4.59	1.34 2.95
103H7823-5740	**-5710**	2.7 382.3	2	2.4	9.5	0.84 4.59	1.34 2.95

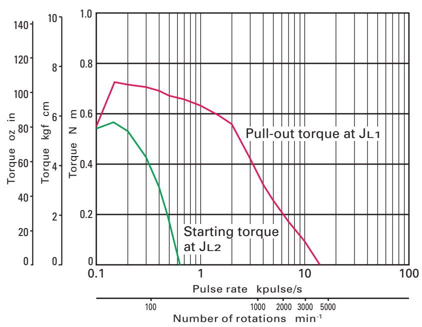
Pulse rate-torque characteristics

103H7821-01



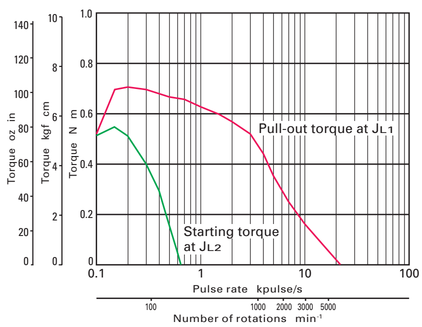
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7821-04



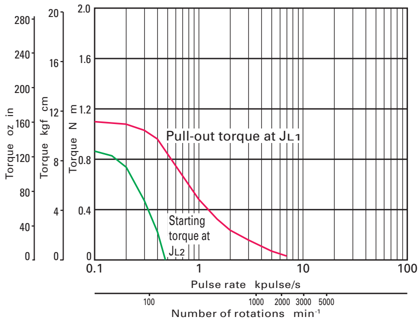
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7821-07



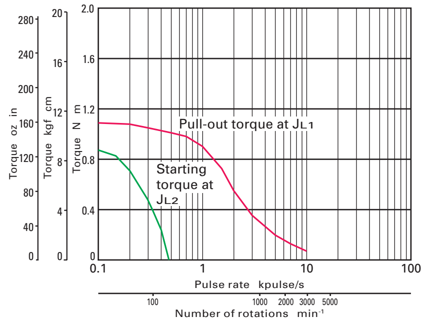
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7822-01



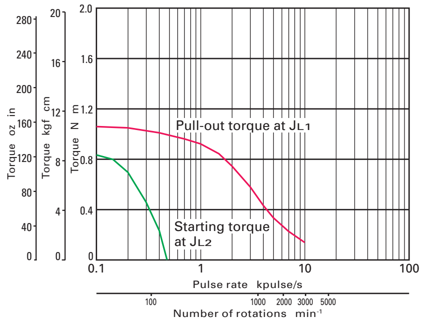
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7822-04



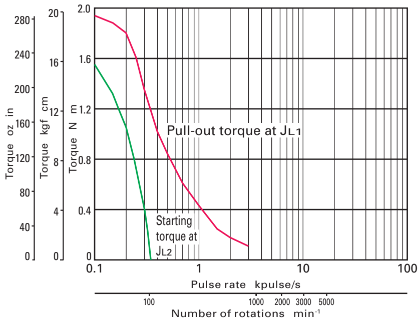
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7822-07



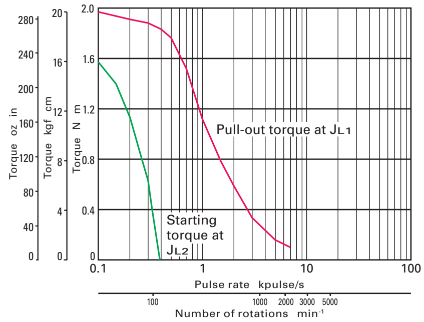
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7823-01



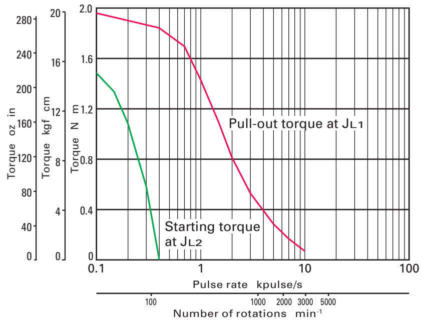
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7823-04



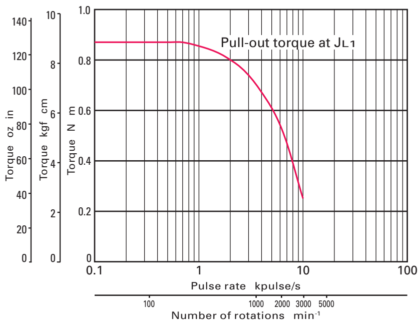
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7823-07



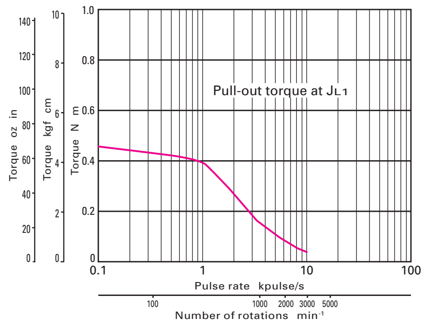
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7821-17



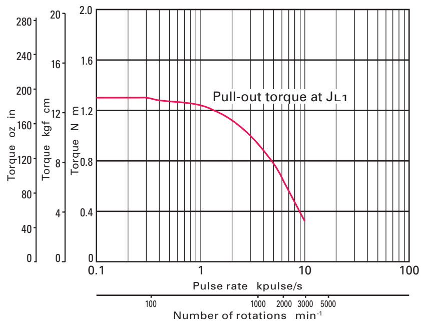
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

103H7821-57



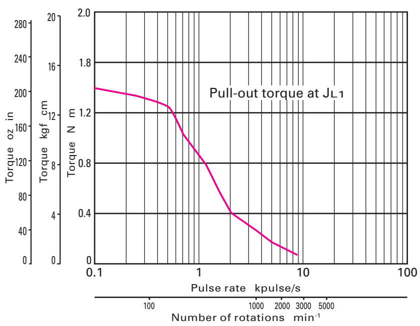
Constant current circuit
Source voltage : AC24V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

103H7822-17



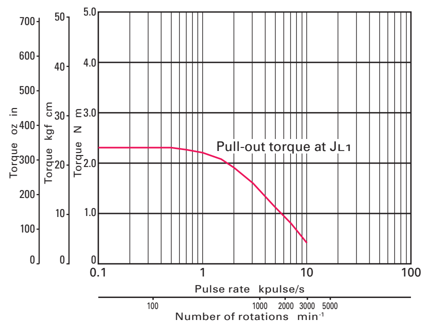
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

103H7822-57



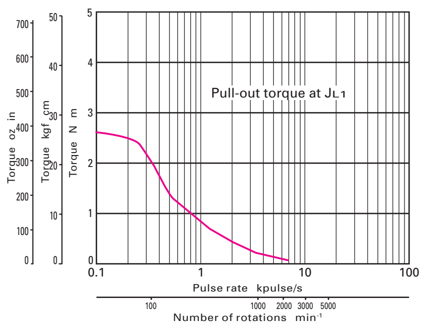
Constant current circuit
Source voltage : AC24V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

103H7823-17



Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

103H7823-57



Constant current circuit
Source voltage : AC24V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

86mm sq. 3.39inch sq.

SH286 /SM286
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH2861-0441	**-0411**	2.5 354	2	2.3	8.0	1.48 8.09	1.75 3.92
SH2861-0941	**-0911**	2.5 354	4	0.6	2.0	1.48 8.09	1.75 3.92
SH2862-0441	**-0411**	4.7 665.6	2	3.2	13.0	3 16.4	2.9 6.5
SH2862-0941	**-0911**	4.7 665.6	4	0.85	3.4	3 16.4	2.9 6.5
SH2863-0441	**-0411**	6.7 948.8	2	4.0	17.0	4.5 24.6	4.0 8.96
SH2863-0941	**-0911**	6.7 948.8	4	0.9	4.2	4.5 24.6	4.0 8.96

Unipolar winding Lead wire type CE UL model

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SM2861-0451	**-0421**	2.5 354	2	2.3	8.0	1.48 8.09	1.75 3.92
SM2861-0951	**-0921**	2.5 354	4	0.6	2.0	1.48 8.09	1.75 3.92
SM2862-0451	**-0421**	4.8 679.7	2	3.2	13.0	3 16.4	2.9 6.5
SM2862-0951	**-0921**	4.8 679.7	4	0.85	3.4	3 16.4	2.9 6.5
SM2863-0451	**-0421**	6.6 934.6	2	4.0	17	4.5 24.6	4.0 8.96
SM2863-0951	**-0921**	6.6 934.6	4	0.9	4.2	4.5 24.6	4.0 8.96

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH2861-5041	**-5011**	3.3 467.3	2	2.2	15	1.48 8.09	1.75 3.92
SH2861-5141	**-5111**	3.3 467.3	4	0.56	3.7	1.48 8.09	1.75 3.92
SH2861-5241	**-5211**	3.3 467.3	6	0.29	1.7	1.48 8.09	1.75 3.92
SH2862-5041	**-5011**	6.4 906.3	2	3.2	25	3.0 16.4	2.9 6.5
SH2862-5141	**-5111**	6.4 906.3	4	0.83	6.4	3.0 16.4	2.9 6.5
SH2862-5241	**-5211**	6.4 906.3	6	0.36	2.8	3.0 16.4	2.9 6.5
SH2863-5041	**-5011**	9 1274.4	2	4.0	32	4.5 24.6	4.0 8.96
SH2863-5141	**-5111**	9 1274.4	4	1.0	7.9	4.5 24.6	4.0 8.96
SH2863-5241	**-5211**	9 1274.4	6	0.46	3.8	4.5 24.6	4.0 8.96

Bipolar winding Lead wire type CE UL model

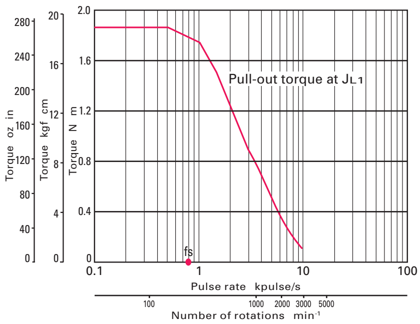
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SM2861-5051	**-5021**	3.3 467.3	2	2.2	15	1.48 8.09	1.75 3.92
SM2861-5151	**-5121**	3.3 467.3	4	0.56	3.7	1.48 8.09	1.75 3.92
SM2861-5251	**-5221**	3.3 467.3	6	0.29	1.7	1.48 8.09	1.75 3.92
SM2862-5051	**-5021**	6.4 906.3	2	3.2	25	3.0 16.4	2.9 6.5
SM2862-5151	**-5121**	6.4 906.3	4	0.83	6.4	3.0 16.4	2.9 6.5
SM2862-5251	**-5221**	6.4 906.3	6	0.36	2.8	3.0 16.4	2.9 6.5
SM2863-5051	**-5021**	9 1274.4	2	4.0	32	4.5 24.6	4.0 8.96
SM2863-5151	**-5121**	9 1274.4	4	1.0	7.9	4.5 24.6	4.0 8.96
SM2863-5251	**-5221**	9 1274.4	6	0.46	3.8	4.5 24.6	4.0 8.96

Bipolar winding Terminal block type

Model	Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SM2861-5066	3.3 467.3	2	2.03	15	1.48 8.09	1.9 4.19
SM2861-5166	3.3 467.3	4	0.52	3.7	1.48 8.09	1.9 4.19
SM2861-5266	3.3 467.3	6	0.27	1.7	1.48 8.09	1.9 4.19
SM2862-5066	6.4 906.3	2	3.08	25	3.0 16.4	3.05 6.72
SM2862-5166	6.4 906.3	4	0.79	6.4	3.0 16.4	3.05 6.72
SM2862-5266	6.4 906.3	6	0.33	2.8	3.0 16.4	3.05 6.72
SM2863-5066	9 1274.4	2	3.83	32	4.5 24.6	4.15 9.15
SM2863-5166	9 1274.4	4	0.96	7.9	4.5 24.6	4.15 9.15
SM2863-5266	9 1274.4	6	0.48	3.8	4.5 24.6	4.15 9.15

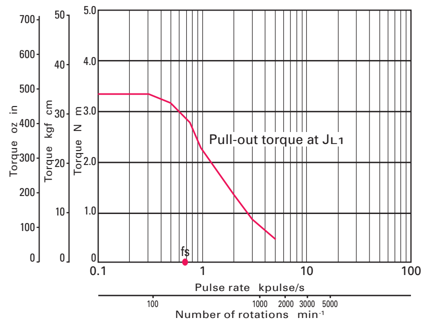
Pulse rate-torque characteristics

SH2861-04



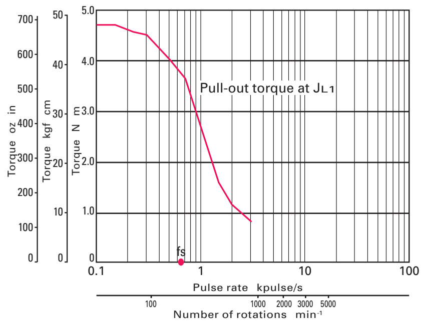
Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10⁻⁴kg m² 40.46 oz in² use the rubber coupling

SH2862-04



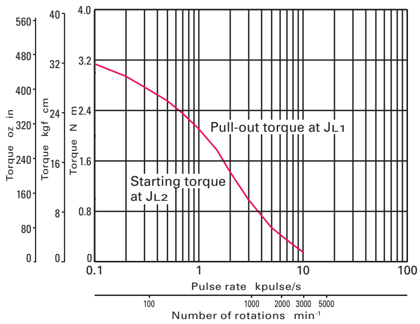
Constant current circuit
Source voltage : DC100V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 15.3x10⁻⁴kg m² 83.65 oz in² use the rubber coupling

SH2863-04



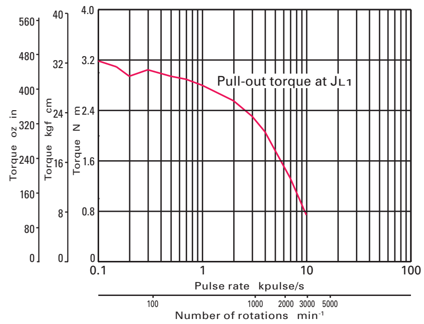
Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 15.3x10⁻⁴kg m² 83.65 oz in² use the rubber coupling

SM2861-50



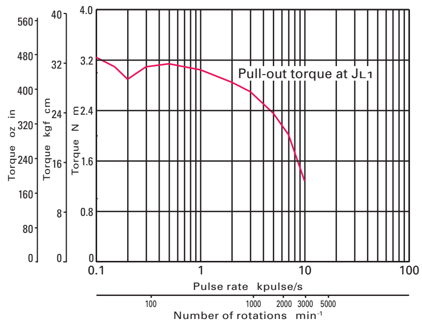
Constant current circuit
Source voltage : DC100V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10⁻⁴kg m² 40.46 oz in² use the rubber coupling

SM2861-51



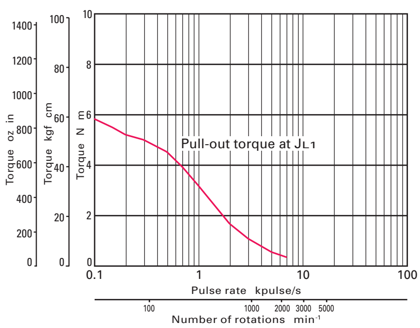
Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10⁻⁴kg m² 40.46 oz in² use the rubber coupling

SM2861-52



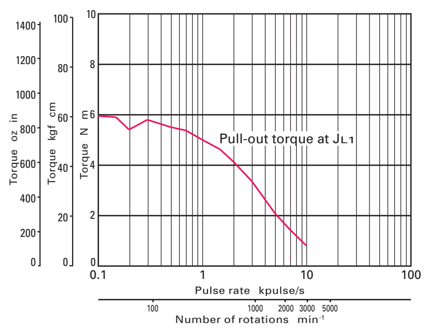
Constant current circuit
Source voltage : DC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 15.3x10⁻⁴kg m² 83.65 oz in² use the rubber coupling

SM2862-50



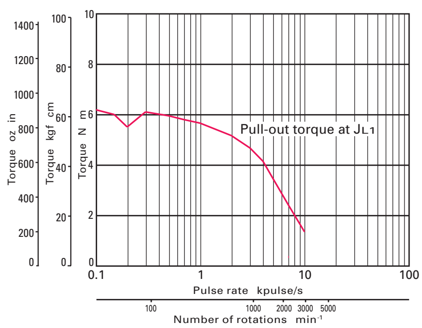
Constant current circuit
Source voltage : DC100V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 15.3x10⁻⁴kg m² 83.65 oz in² use the rubber coupling

SM2862-51



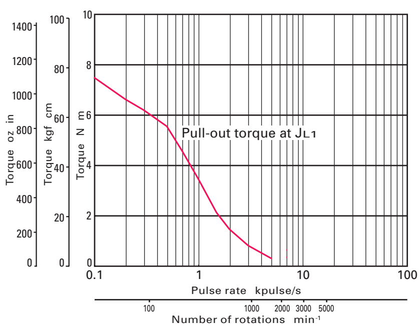
Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 15.3x10⁻⁴kg m² 83.65 oz in² use the rubber coupling

SM2862-52



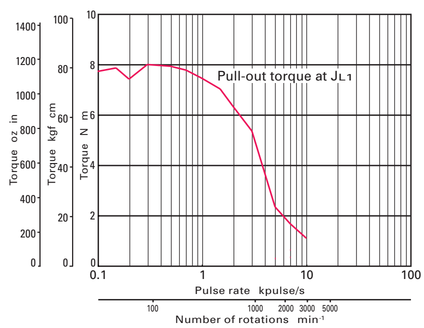
Constant current circuit
Source voltage : DC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 15.3x10⁻⁴kg m² 83.65 oz in² use the rubber coupling

SM2863-50



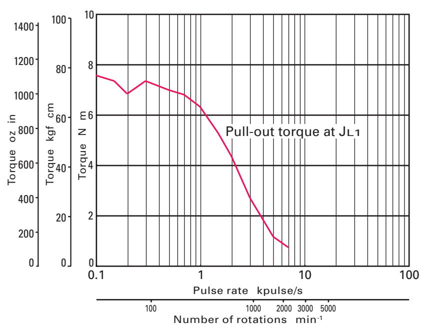
Constant current circuit
Source voltage : DC100V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling

SM2863-51



Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling

SM2863-52



Constant current circuit
Source voltage : DC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling

2-phase stepping motor

106mm cir. 4.17inch cir.

103H8922
1.8 /step

Unipolar winding

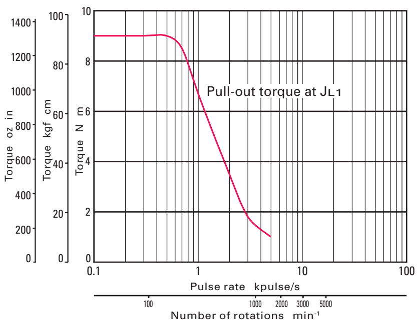
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H89222-0941	**-0911**	10.8 1529.4	4	0.98	6.3	14.6 79.83	7.5 16.53
103H89223-0941	**-0911**	15.5 2194.9	4	1.4	9.7	22 120.28	10.5 23.15

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H89222-5241	**-5211**	13.2 1869.2	6	0.45	5.4	14.6 79.83	7.5 16.53
103H89223-5241	**-5211**	19 2690.5	6	0.63	8	22 120.28	10.5 23.15

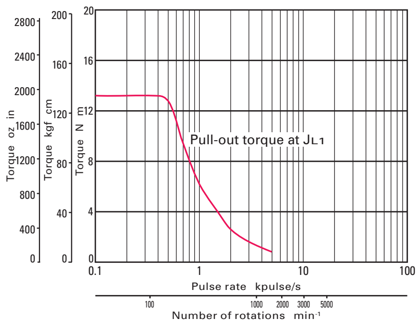
Pulse rate-torque characteristics

103H89222-09



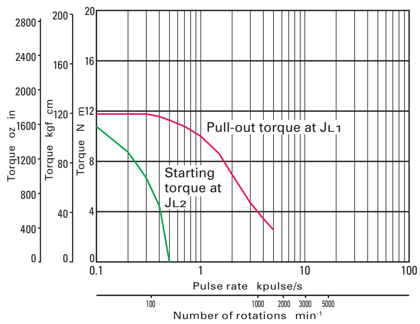
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

103H89223-09



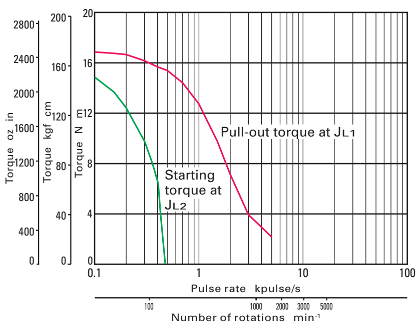
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

103H89222-52



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

103H89223-52



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

56mm sq. 2.20inch sq.

103H712
CE marking
1.8 /step

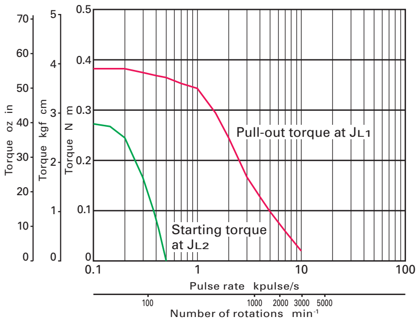
CE

Unipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H7121-6140	**-6110**	0.39 55.2	1	4.8	8	0.1 0.55	0.47 1.04
103H7121-6740	**-6710**	0.39 55.2	3	0.6	0.8	0.1 0.55	0.47 1.04
103H7123-6140	**-6110**	0.83 117.5	1	6.7	15	0.21 1.15	0.65 1.43
103H7123-6740	**-6710**	0.78 110.5	3	0.77	1.58	0.21 1.15	0.65 1.43
103H7126-6140	**-6110**	1.27 179.8	1	8.6	19	0.36 1.97	0.98 2.16
103H7126-6740	**-6710**	1.27 179.8	3	0.9	2.2	0.36 1.97	0.98 2.16

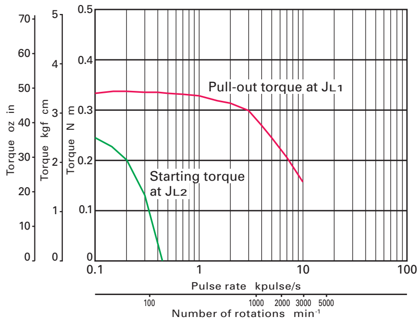
Pulse rate-torque characteristics

103H7121-61



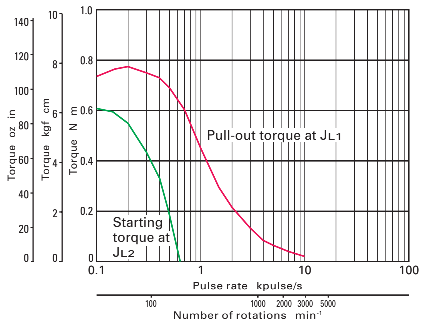
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7121-67



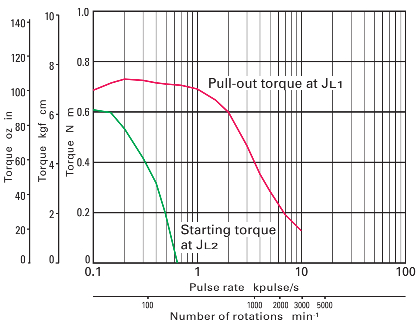
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7123-61



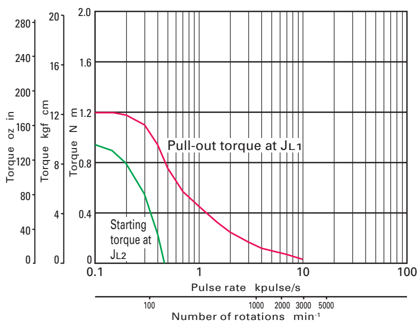
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7123-67



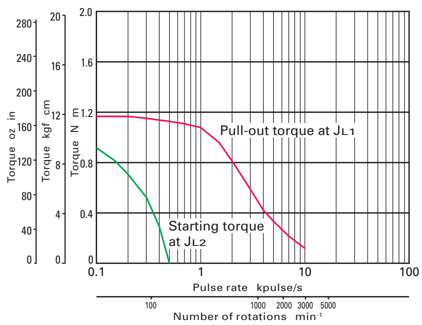
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7126-61



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7126-67



Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the direct coupling

2-phase stepping motor

86mm cir. 3.39inch cir.

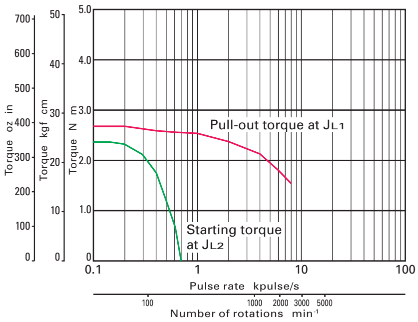
103H822
CE marking
1.8 /step

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H8221-6240	**-6210**	2.74 388.0	6	0.3	1.65	1.45 7.93	1.5 3.31
103H8222-6340	**-6310**	5.09 720.8	6	0.35	2.7	2.9 15.86	2.5 5.51
103H8223-6340	**-6310**	7.44 1053.6	6	0.45	3.4	4.4 24.06	3.5 7.72

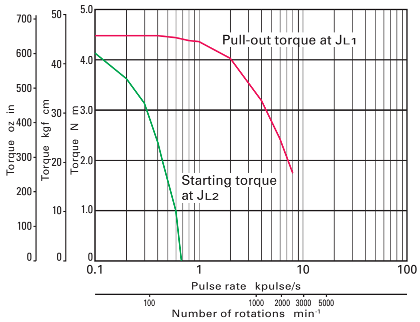
Pulse rate-torque characteristics

103H8221-62



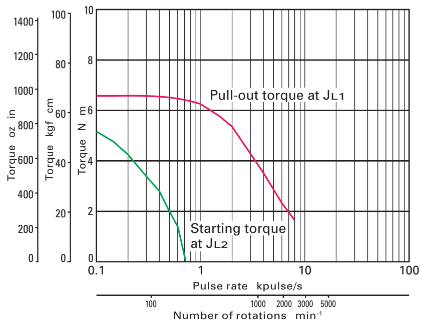
Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

103H8222-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m² 83.65 oz in² use the rubber coupling
J_{L2} = 15.3x10^{-4}kg m² 83.65 oz in² use the direct coupling

103H8223-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

106mm cir. 4.17inch cir.

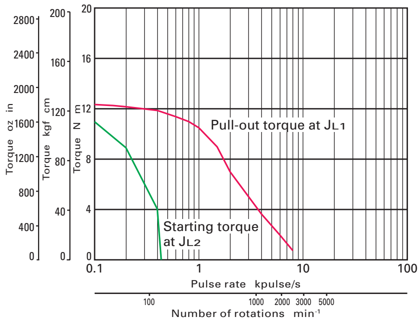
103H8922
CE marking
1.8 /step

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H89222-6341	**-6311**	13.2 1869.2	6	0.45	5.4	14.6 79.83	7.5 16.53
103H89223-6341	**-6311**	19 2690.5	6	0.63	8	22 120.28	10.5 23.15

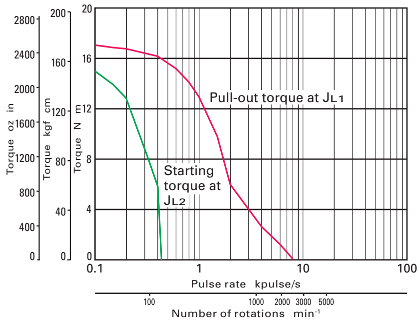
Pulse rate-torque characteristics

103H89222-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = $43x10^{-4}$kg m² 235.10 oz in² use the rubber coupling
J_{L2} = $43x10^{-4}$kg m² 235.10 oz in² use the direct coupling

103H89223-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = $43x10^{-4}$kg m² 235.10 oz in² use the rubber coupling
J_{L2} = $43x10^{-4}$kg m² 235.10 oz in² use the direct coupling

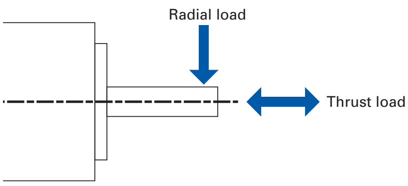
Standard models

Motor type	H series motor
Model number	103H52 /103H67 /103H71 /103H78
Insulation class	Class B 130
Withstand voltage	42 1.65inch AC500V 50/60Hz for 1 minute, 50 1.97inch 56 2.20inch 60 2.36inch AC1000V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Operating ambient temperature	-10 to 50
Operating ambient humidity	90%MAX. : 40 MAX., 57%MAX. : 50 MAX., 35%MAX. : 60 MAX. no condensation

Motor type	SH series motor
Motor model number	SH228 , SH353 , SH142 , SH160 , SH286 ,
Insulation class	Class B 130
Withstand voltage	28 1.10inch 35 1.38inch 42 1.65inch AC500V 50/60Hz for 1 minute, 60 2.36inch / 86 3.38inch AC1000V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Operating ambient temperature	-10 to 50
Operating ambient humidity	90%MAX. : 40 MAX., 57%MAX. : 50 MAX., 35%MAX. : 60 MAX. no condensation

Motor type	SM series motor
Model number	SM286
Type	S1 continuous operation
Insulation class	Class F +155 C
Operation altitude	1000m 3280 feet MAX above sea level
Withstand voltage	86mm 3.39inch : AC1500V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Protection grade	IP43
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Ambient operation temperature	-10 to +50 C
Ambient operation humidity	90% MAX. at less than 40 C, 57% MAX. at less than 50 C , 35% MAX. at 60 C no condensation

Allowable radial / thrust load



Frange size	Model number	Distance from end of shaft : mm inch 0	 5 0.20	 10 0.39	 15 0.59	Thrust load N lbs
		Radial load : N lbs				
28mm 1.10inch	SH228	42 9	48 10	56 12	66 14	3 0.67
35mm 1.38inch	SH353	40 8	50 11	67 15	98 22	10 2.25
42mm 1.65inch	103H52 103-59 SH142	22 4	26 5	33 7	46 10	10 2.25
50mm 1.97inch	103H670	71 15	87 19	115 25	167 37	15 3.37
56mm 2.20inch	103H712	52 11	65 14	85 19	123 27	15 3.37
	103H7128	85 19	105 23	138 31	200 44	15 3.37
60mm 2.36inch	103H782 SH160	70 15	87 19	114 25	165 37	20 4.50
86mm 3.39inch	SM286 SH286	167 37	193 43	229 51	280 62	60 13.488
86mm 3.39inch	103H822	191 42	234 52	301 67	421 93	60 13.488
106mm 4.17inch	103H8922	321 72	356 79	401 90	457 101	100 22.48

CE marked models

Model Number	103H712	103H822 103H8922
Rated voltage	12-200VDC	12-300VDC
Applied standards Low voltage diretive	EN60034-1,IEC34-5(EN60034-5),EN60204-1,EN60950,EN61010-1	
Operation type	S1 continuous rating	
Protection grade	IP43	
Device category	Class I	
Operation environment	Pollution degree 2	
Insulation classI	Class B 130	
Insulation resistance	100M ohm MIN. against DC500V	
Withstand voltage	56mm 2.2inch : AC1500V 50/60Hz for 1 minute 86mm 3.39inch 106mm 4.17inch : AC1600V 50/60Hz for 1 minute	
Ambient operation temperature	-10 to +50 C	
Ambient operation humidity	90% MAX. at less than 40 C, 57% MAX. at less than 50 C , 35% MAX. at 60 C no condensation	
Winding temperature rise	80K MAX. Based on Sanyo Denki standard	

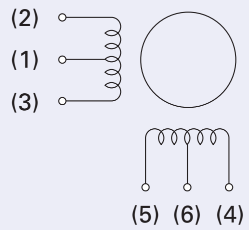
Internal Wiring and Rotation Direction

Unipolar winding

103H52 Connector type

Internal wire connection

( ) connector pin number



Direction of motor rotate

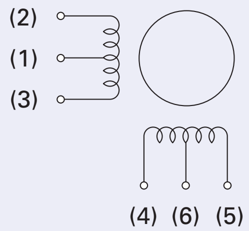
The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Connector type pin number				
		1.6	5	3	4	2
Exciting order	1					
	2					
	3					
	4					

103H782 Connector type

Internal wire connection

( ) connector pin number



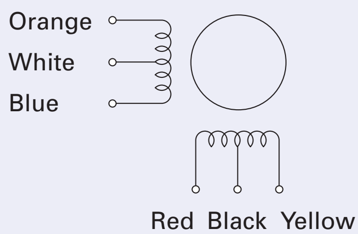
Direction of motor rotate

The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Connector type pin number				
		1.6	4	3	5	2
Exciting order	1					
	2					
	3					
	4					

Lead wire type

Internal wire connection



Direction of motor rotate

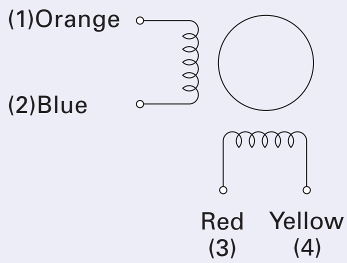
The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Lead wire color				
		White & black	Red	Blue	Yellow	Orange
Exciting order	1					
	2					
	3					
	4					

Bipolar winding

Internal wire connection

( ) connector pin number



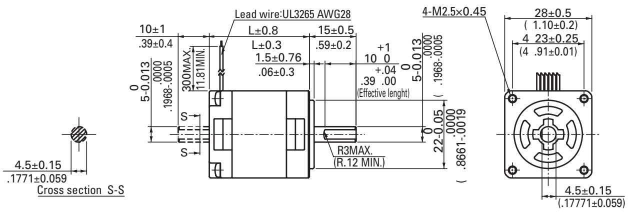
Direction of motor rotate

The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Lead wire color, connector type pin teminal blocknumber			
	Lead wire	Red	Blue	Yellow	Orange
Exciting order	1	−	−	+	+
	2	+	−	−	+
	3	+	+	−	−
	4	−	+	+	−
Connector	103H782	3	2	4	1
Teminal block	SM286	3	2	4	1

Motors Unit: mm inch

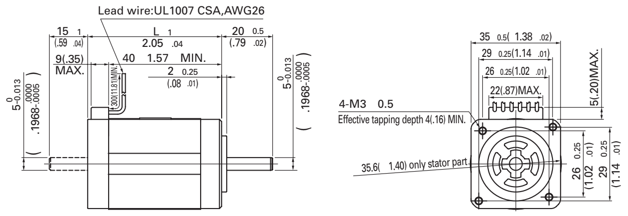
28mm 1.10inch



Connector type Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU14S281	SH2281-51 1	32 1.26	Lead wire
	DU14S281	SH2281-52 1	32 1.26	Lead wire
	DU14S285	SH2285-51 1	51.5 2.03	Lead wire
	DU14S285	SH2285-52 1	51.5 2.03	Lead wire
Bipolar	DB14S281	SH2281-56 1	32 1.26	Lead wire
	DB14S281	SH2281-57 1	32 1.26	Lead wire
	DB14S285	SH2285-56 1	51.5 2.03	Lead wire
	DB14S285	SH2285-57 1	51.5 2.03	Lead wire

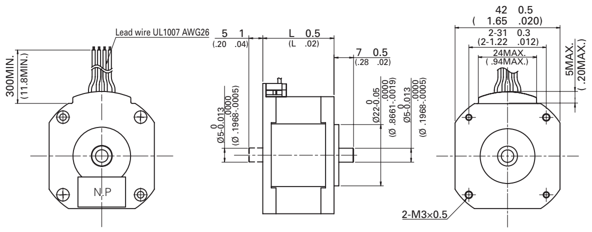
35mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH3533-12U 0	33 1.25	Lead wire
		SH3537-12U 0	37 1.54	Lead wire
		SH3552-12U 0	52 1.89	Lead wire

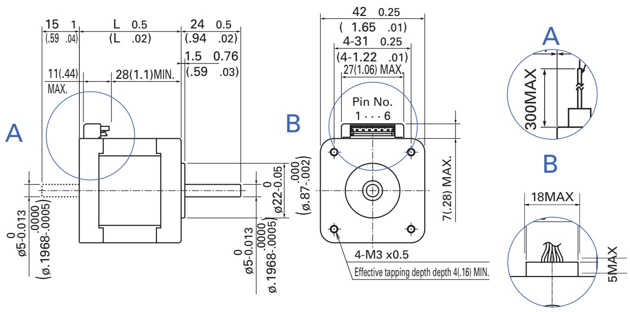
42mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		SS2421-50 1	11.6 .457	Lead wire
		SS2422-50 1	18.6 .732	Lead wire
		SS2423-50 1	25.6 1.008	Lead wire

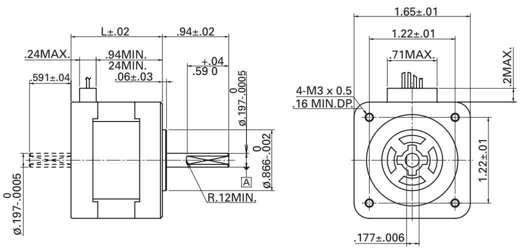
42mm 1.65inch



Connector type Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU15H521	103H5205-04 0	33 1.25	Connector
	DU15H522	103H5208-04 0	39 1.54	Connector
	DU15H524	103H5210-04 0	48 1.89	Connector
		103H5209-04 0	41 1.61	Connector

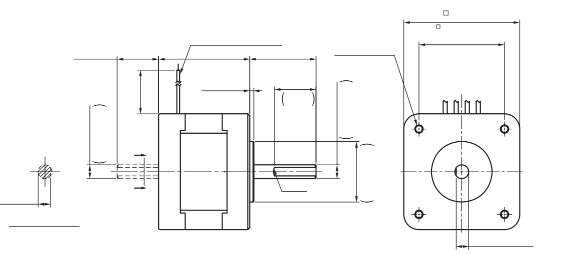
42mm 1.65inch



Connector type Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar	DB14H521	103H5205-52 0	33 1.25	Lead wire
	DB14H522	103H5208-52 0	39 1.54	Lead wire
	DB14H524	103H5210-52 0	48 1.89	Lead wire
		103H5205-50 0	33 1.25	Lead wire
		103H5205-51 0	33 1.25	Lead wire
		103H5208-50 0	39 1.54	Lead wire
		103H5208-51 0	39 1.54	Lead wire
		103H5209-50 0	41 1.61	Lead wire
		103H5209-51 0	41 1.61	Lead wire
		103H5209-52 0	41 1.61	Lead wire
		103H5210-50 0	48 1.89	Lead wire
		103H5210-51 0	48 1.89	Lead wire

42mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU15S141	SH1421-04 1	33 1.25	Lead wire
	DU15S142	SH1422-04 1	39 1.54	Lead wire
	DU15S144	SH1424-04 1	48 1.89	Lead wire
Bipolar	DB16H141	SH1421-52 1	33 1.25	Lead wire
	DB16H142	SH1422-52 1	39 1.54	Lead wire
	DB16H144	SH1424-52 1	48 1.89	Lead wire

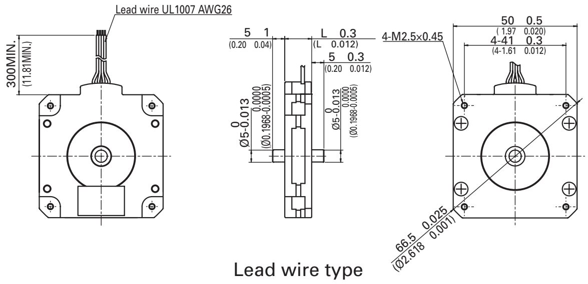
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

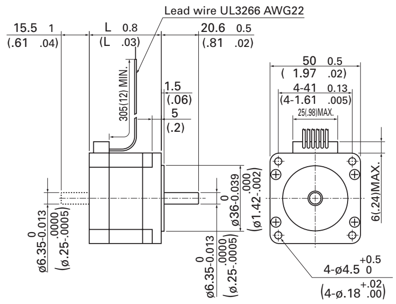
50mm 1.97inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		SS2501-50 1	11 .433	Lead wire
		SS2502-50 1	16 .63	Lead wire

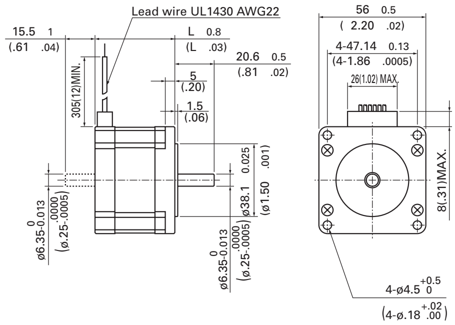
50mm 1.97inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H6701-01 0	39.8 1.57	Lead wire
		103H6701-04 0	39.8 1.57	Lead wire
		103H6701-07 0	39.8 1.57	Lead wire
		103H6703-01 0	51.3 2.02	Lead wire
		103H6703-04 0	51.3 2.02	Lead wire
		103H6703-07 0	51.3 2.02	Lead wire
		103H6704-01 0	55.8 2.20	Lead wire
		103H6704-04 0	55.8 2.20	Lead wire
		103H6704-07 0	55.8 2.20	Lead wire
Bipolar	DB16H671	103H6701-50 0	39.8 1.57	Lead wire
	DB16H672	103H6703-50 0	51.3 2.02	Lead wire
		103H6704-50 0	55.8 2.20	Lead wire

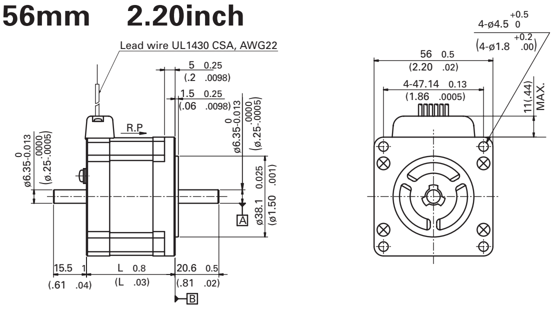
56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU16H711	103H7121-04 0	41.8 1.65	Lead wire
	DU16H713	103H7123-04 0	53.8 2.12	Lead wire
	DU16H716	103H7126-04 0	75.8 2.98	Lead wire
		103H7121-01 0	41.8 1.65	Lead wire
		103H7121-07 0	41.8 1.65	Lead wire
		103H7123-01 0	53.8 2.12	Lead wire
		103H7123-07 0	53.8 2.12	Lead wire
		103H7124-01 0	63.8 2.51	Lead wire
		103H7124-04 0	63.8 2.51	Lead wire
		103H7124-07 0	63.8 2.51	Lead wire
		103H7126-01 0	75.8 2.98	Lead wire
		103H7126-07 0	75.8 2.98	Lead wire

56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H7121-61 0	41.8 1.65	Lead wire CE
		103H7121-67 0	41.8 1.65	Lead wire CE
		103H7123-61 0	53.8 2.12	Lead wire CE
		103H7123-67 0	53.8 2.12	Lead wire CE
		103H7126-61 0	75.8 2.98	Lead wire CE
		103H7126-67 0	75.8 2.98	Lead wire CE

Model number	Shaft diameter(D)	Dcut thickness(L)
103H7121-	6.35	5.8
103H7123-		
103H7126-		
103H7128-	8	7.5

Motor shaft specification code

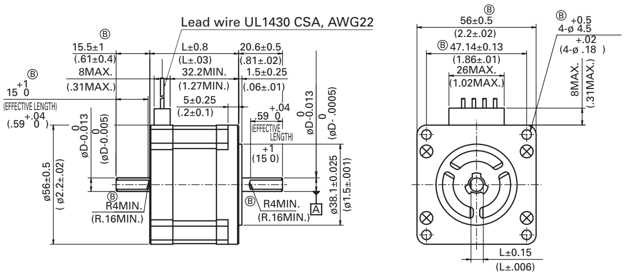
Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Motors Unit: mm inch

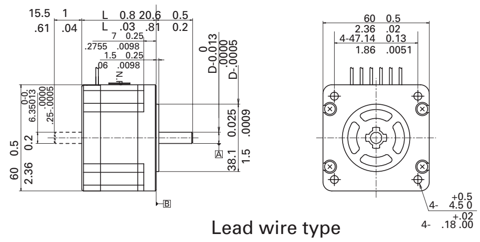
56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar	DB16H711	103H7121-57 0	41.8 1.65	Lead wire
	DB16H713	103H7123-57 0	53.8 2.12	Lead wire
	DB16H716	103H7126-57 0	75.8 2.98	Lead wire
		103H7121-56 0	41.8 1.65	Lead wire
		103H7121-58 0	41.8 1.65	Lead wire
		103H7123-56 0	53.8 2.12	Lead wire
		103H7123-58 0	53.8 2.12	Lead wire
		103H7126-56 0	75.8 2.98	Lead wire
		103H7126-58 0	75.8 2.98	Lead wire
		103H7128-56 0	94.8 3.73	Lead wire
		103H7128-57 0	94.8 3.73	Lead wire
		103H7128-58 0	94.8 3.73	Lead wire

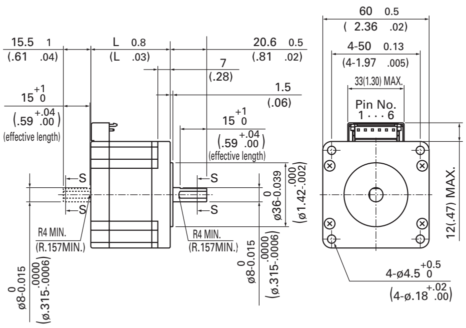
60mm 2.36inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH1601-04 0	42 1.65	Lead wire
		SH1602-04 0	54 2.13	Lead wire
		SH1603-04 0	76 2.99	Lead wire
Bipolar	DB16S161	SH1601-52 0	42 1.65	Lead wire
	DB16S162	SH1602-52 0	54 2.13	Lead wire
	DB16S163	SH1603-52 0	76 2.99	Lead wire

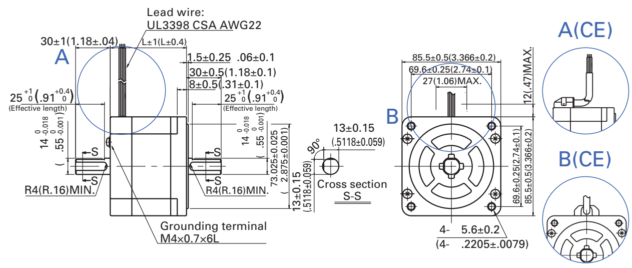
60mm 2.36inch



Connector type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H7821-01 0	44.8 1.76	Connector
		103H7821-04 0	44.8 1.76	Connector
		103H7821-07 0	44.8 1.76	Connector
		103H7822-01 0	53.8 2.12	Connector
		103H7822-04 0	53.8 2.12	Connector
		103H7822-07 0	53.8 2.12	Connector
		103H7823-01 0	85.8 3.38	Connector
		103H7823-04 0	85.8 3.38	Connector
		103H7823-07 0	85.8 3.38	Connector
Bipolar	DB16H781	103H7821-57 0	44.8 1.76	Connector
	DB16H782	103H7822-57 0	53.8 2.12	Connector
	DB16H783	103H7823-57 0	85.8 3.38	Connector
		103H7821-17 0	44.8 1.76	Connector
		103H7822-17 0	53.8 2.12	Connector
		103H7823-17 0	85.8 3.38	Connector

86mm 3.39inch



Lead wire type

CE type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH2861-04 1	66 2.6	Lead wire
		SH2862-04 1	96.5 3.8	Lead wire
		SH2863-04 1	127 5	Lead wire
Bipolar		SM2861-50 1	66 2.6	Lead wire CE
		SM2861-51 1	66 2.6	Lead wire CE
		SM2861-52 1	66 2.6	Lead wire CE
		SM2862-50 1	96.5 3.8	Lead wire CE
		SM2862-51 1	96.5 3.8	Lead wire CE
		SM2862-52 1	96.5 3.8	Lead wire CE
		SM2863-50 1	127 5	Lead wire CE
		SM2863-51 1	127 5	Lead wire CE
		SM2863-52 1	127 5	Lead wire CE

Model number	Shaft diameter(D)	Dcut thickness(L)
103H7121-	6.35	5.8
103H7123-		
103H7126-		
103H7128-	8	7.5

Model number	Shaft diameter(D)	Dcut thickness(L)
SH1601-	6.35	5.8
SH1602-		
SH1603-	8	7.5

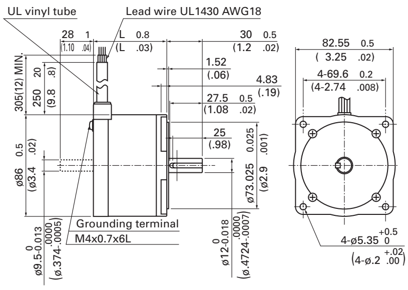
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	5
Double shafts	D	2

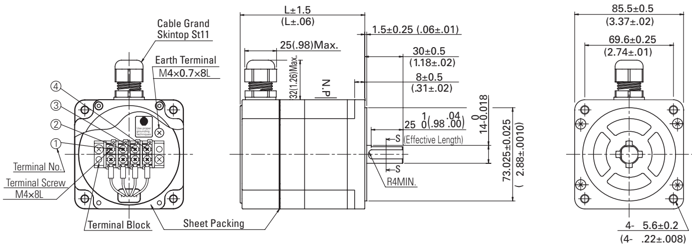
86mm 3.39inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		103H8221-62 0	62 3.31	Lead wire CE
		103H8222-63 0	92.2 5.51	Lead wire CE
		103H8223-63 0	125.9 7.72	Lead wire CE

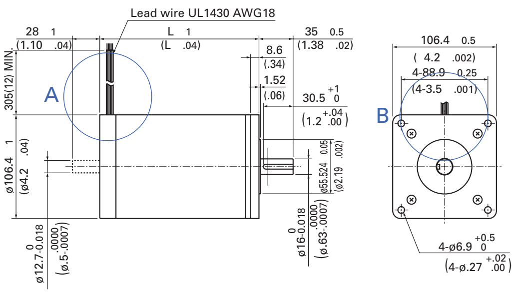
86mm 3.39inch



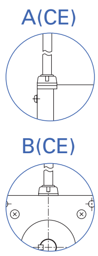
Terminal block type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Terminal block		SM2861-5066	97.9 3.9	Terminal block
		SM2861-5166	97.9 3.9	Terminal block
		SM2861-5266	97.9 3.9	Terminal block
		SM2862-5066	128.4 5.1	Terminal block
		SM2862-5166	128.4 5.1	Terminal block
		SM2862-5266	128.4 5.1	Terminal block
		SM2863-5066	158.8 6.3	Terminal block
		SM2863-5166	158.8 6.3	Terminal block
		SM2863-5266	158.8 6.3	Terminal block

106mm 4.17inch



Lead wire type



CE type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H89222-09 1	163.3 6.4	Lead wire
		103H89223-09 1	221.3 8.7	Lead wire
Bipolar		103H89222-52 1	163.3 6.4	Lead wire
		103H89223-52 1	221.3 8.7	Lead wire CE
		103H89222-63 1	163.3 6.4	Lead wire CE
		103H89223-63 1	221.3 8.7	Lead wire

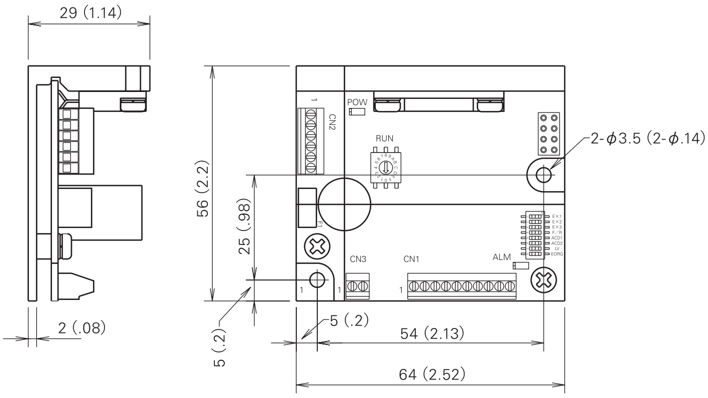
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Drivers Unit: mm inch



Safety standards

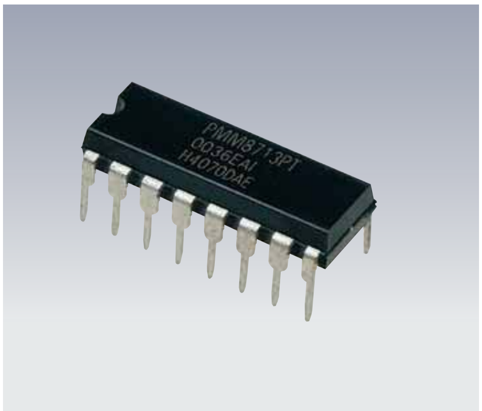
driver

	Acquired standards		File No.	Standard part
UL	UL UL for Canada		E179775	UL508C
CE TÜV	Directives	Category	Name	Standard part
	Low-voltage directives			EN61010-1
	EMC directives	Emission	Terminal disturbance voltage	EN55011-A
			Electromagnetic radiation disturbance	EN55011-A
		Immunity	ESD Electrostatic discharge	EN61000-4-2
			RS Radio-frequency amplitude modulated electromagnetic field	EN61000-4-3
			Fast transionts	EN61000-4-4
			Surges	EN61000-4-6

SM series motor(UL/CE),H series motor(CE)

	Acquired standards	File No.
UL	UL UL for Canada	E208878
CE	Standard category	Standard part
	Low-voltage directives	EN-60034-1 IEC34-5 (EN-60034-5)

EMC characteristics may vary depending on the configuration of the users control panel, which contains the driver or stepping motor, or the arrangement and wiring of other electrical devices.
Parts for EMC noise suppression like noise filters and troidal type ferrite cores may be required depending on circumstances.
Validation test of F series driver has been performed for low-voltage EMC directives at TÜV TÜV product service for self-declaration of CE marking.



Universal controller IC for the 2-phase stepping motor drive

PMM8713PT

Characteristics

Universal controller : The following 3 types of energization mode can be selected by switching at the energization mode switching terminal
1EX/1-2EX/2EX
Source voltage : V_{CC} = 4.5 to 5.5V
High output current : 24mA MIN. sink, source
High noise margin : Schmitt trigger circuit is incorporated for the all input terminals.
2 types of pulse input : 2 input mode CW, CCW input mode
Pulse and direction mode CK, U/D input mode
Excited status verification monitor : Outputs the monitor signal of the controller status.

Maximum Rating Ta=25

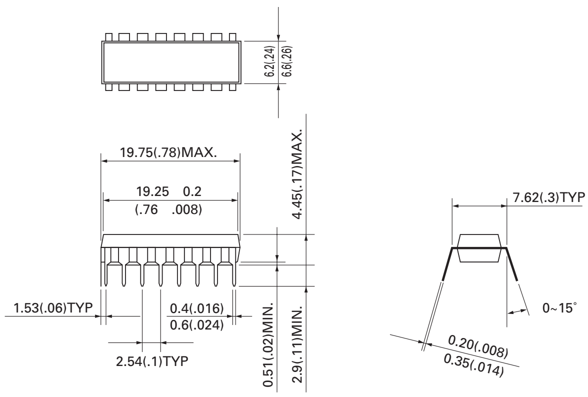
Item		Symbol	Rating	Unit
Source voltage		V_{CC}	-0.3 to 7	V
Output current n	H level	I_{OH}	-35	mA
	L level	I_{OL}	35	
Output current C_O,E_M	H level	I_{OH}		A
	L level	I_{OL}		
Input voltage		V_{IN}	-0.3 to V_{CC} +0.3	V
Input current		I_{IN}	10	mA
operating current		T_{opr}	-20 to 85	
Conservation temperature		T_{stg}	-40 to 125	

Recommended Operating Conditions Ta=-20 to 85

Item		Symbol	Rating			Unit
			MIN.	Standard	MAX.	
Source voltage		V_{CC}	4.5		5.5	V
Output current n	H level	I_{OH}	-24			mA
	L level	I_{OL}	24			
Output current C_O,E_M	H level	I_{OH}	-2			mA
	L level	I_{OL}	2			
Input voltage		V_{IN}	0		VCC	V

Dimensions Unit : mm inch

Pin No.	Name	Function
1.	C_U	Input pulse UP clock input
2.	C_D	Input pulse DOWN clock input
3.	C_K	Input pulse clock input
4.	U/D	Rotation direction conversion
5.	E_A	energization mode switching input
6.	E_B	energization mode switching input
7.	c	energization mode switching input
8.	V_{SS}	GND
9.	R	Reset input
10.	4	4 output
11.	3	3 output
12.	2	2 output
13.	1	1 output
14.	E_M	energization monitor output
15.	C_O	Input pulse monitor output
16.	V_{CC}	4.5 to 5.5V



Stepping Motors with Internal drivers
Set model
Stepping motor
Dimensions
IC for stepping motor

Electrical Characteristics

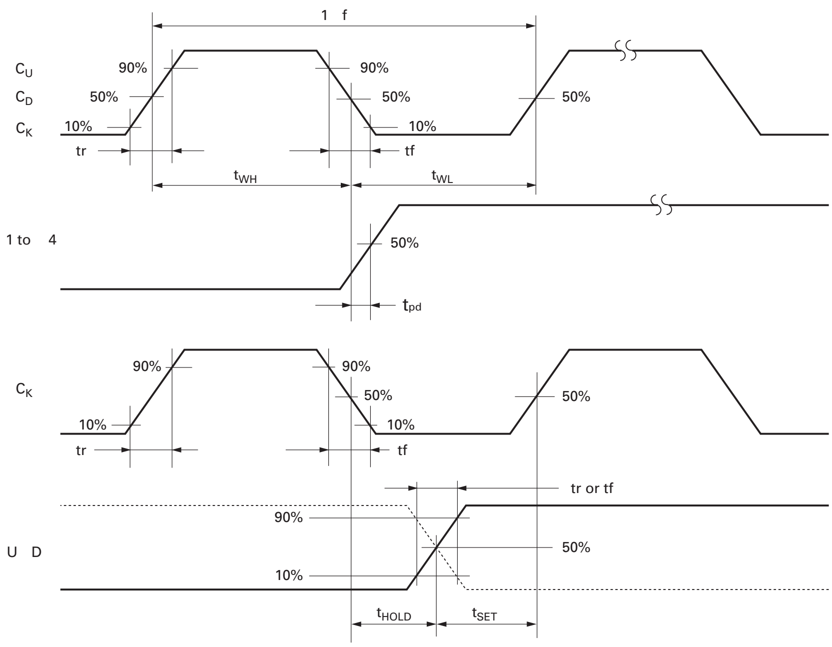
Direct current characteristics Ta = -20 to 85

Item		Symbol	Condition VCC[V]		Standard value MIN.	Standard	MAX.	Unit
Input voltage	H level	V_{IH}	5		3.5			V
	L level	V_{IL}	5				1.5	
Output voltage	H level	V_{OH}	5	V_H=5V V_L=0V IO_H=0	4.9			V
	L level	V_{OL}	5	V_H=5V V_L=0V I_{OH}=0			0.1	
Output current 1 to 4	H level	I_{OH}	5	V_H=5V V_L=0V V_{OUT}=2.4V	-24			mA
	L level	I_{OL}	5	V_H=5V V_L=0V V_{OUT}=0.4V	24			
Output current C_O, E_M	H level	I_{OH}	5	V_H=5V V_L=0V V_{OUT}=2.4V	-2			mA
	L level	I_{OL}	5	V_H=5V V_L=0V V_{OUT}=0.4V	2			
Input current		I	5			10		A
Static current consumption		I_{CC}	5	V_H=5V V_L=0V		1		mA

Switching characteristics Ta = -20 to 85

Item	Symbol	Condition VCC[V]a		Standard value MIN.	Standard	MAX.	Unit
MAX. clock frequency	f_{MAX}	5	tr tf 20ns, CL 50pF	1			MHZ
MIN. width of clock pulse	t_{WL}, t_{WH}	5	tr tf 20ns, CL 50pF			500	ns
MIN. width of reset pulse	t_{WR}	5	tr tf 20ns, CL 50pF			1000	ns
Time delay from clock input to output	t_{pd}	5	tr tf 20ns, CL 50pF			2000	ns
Set time	t_{SET}	5	tr tf 20ns, CL 50pF	0			ns
Holding time	t_{HOLD}	5	tr tf 20ns, CL 50pF	250			ns

Measured waveforms on switching time scale



Function Table

Input modes and rotation direction

Input mode	Input CU	CD	CK	U D	Rotation direction
2 input mode CW, CCW	↓	L	L	L	CW
	L	↓	L	L	CCW
Pulse and direction mode CK, U/D	L	L	↓	H	CW
	L	L	↓	L	CCW

Energization modes

Excitation mode	Input R	EA	EB	C
1 EX	H	H	L	H
1-2EX	H	H	H	H
2 EX	H	L	L	H

Universal controller IC for the 2-phase stepping motor drive

PMM8713PT

Energization Sequence

1EX

Face \ Pulse	0 Reset	1	2	3	4
1	1	0	0	0	1
2	0	1	0	0	0
3	0	0	1	0	0
4	0	0	0	1	0
E_M	0	0	0	0	0
UP	→				
DOWN	←				

2EX

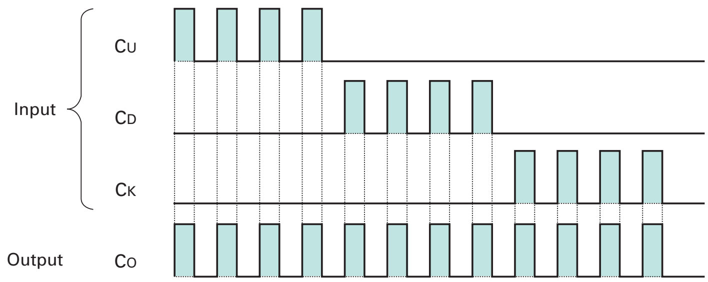
Face \ Pulse	0 Reset	1	2	3	4
1	1	1	0	0	1
2	0	1	1	0	0
3	0	0	1	1	0
4	1	0	0	1	1
E_M	1	1	1	1	1
UP	→				
DOWN	←				

1-2EX

Face \ Pulse	0 Reset	1	2	3	4	5	6	7	8
1	1	1	1	0	0	0	0	0	1
2	0	0	1	1	1	0	0	0	0
3	0	0	0	0	1	1	1	0	0
4	1	0	0	0	0	0	1	1	1
E_M	1	0	1	0	1	0	1	0	1
UP	→								
DOWN	←								

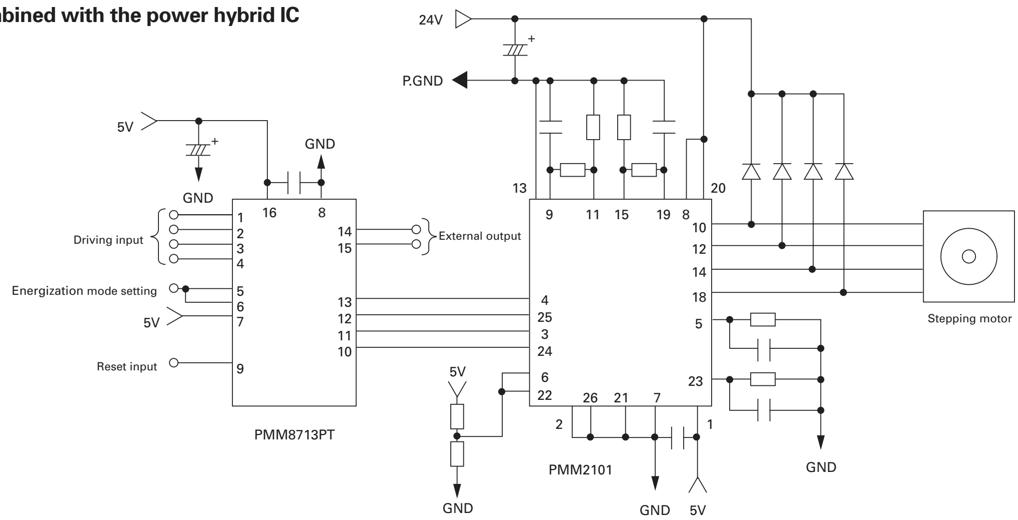
Reset after changing the energization mode.

Input Pulse Monitor



Example of Application Circuit Bipolar wiring motor

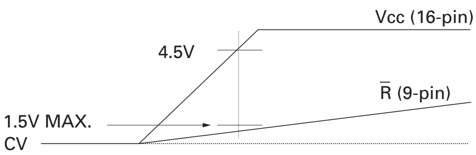
Combined with the power hybrid IC



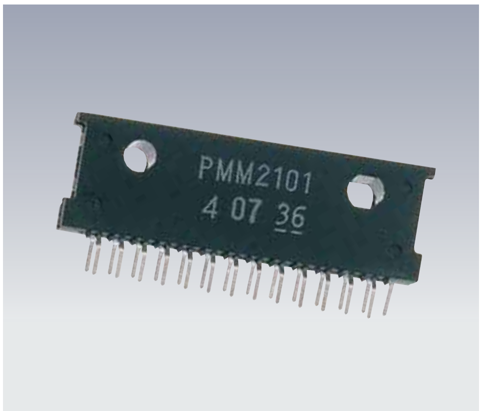
Energization mode setting

Pin No.	Terminal symbol	Input level	Motor operation
5,6	E_A, E_B	H	1-2EX
		L	2EX

The normal initial reset may not be performed during unstable VCC after turning the power ON. For reliable resetting, hold the R terminal 9-pin at the L level till the VCC becomes stable.



Power hybrid IC : Refer to page 47 for the PMM2101 specifications.
Refer to the PMM8713PT Operation Manual for other application circuit examples.



HIC for the 2-phase stepping motor

PMM2101
Full Step / Half Step
Bipolar

Characteristics

Enables high speed and high torque operation by using bipolar constant current switching method.
Enables compact driving circuit configuration with few of externally attached parts.
The overheat protection circuit is incorporated to assist the safety design.

Maximum Rating Tc=25

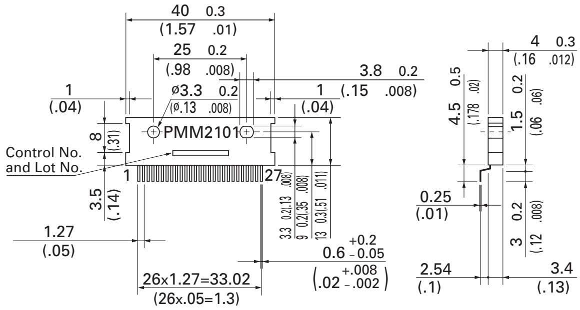
Item	Symbol	Rated value	Unit
Source voltage-1	V_{CC1}	8 to 60	V
Source voltage-2	V_{CC2}	0 to 7	V
Output current	I_O	1.4	A
Allowable loss	P_T	35 Tc 25	W
Thermal resistance	jc	3.57	W
	ja	25	W
Junction temperature	T_{jmax}	150	
Conservation temperature	T_{stg}	-40 150	

Recommended Operating Conditions Tc=25

Item	Symbol	Rated value	Unit
Source voltage-1	V_{CC1}	10 to 50	V
Source voltage-2	V_{CC2}	4.75 to 5.25	V
Output current	I_O	1.0	A
Oscillator frequency	F_C	20 to 27	kHz
Operation temperature	T_C	-25 to 85	

Dimensions Unit : mm inch

Pin No.	Name	Function
1.	V_{CC2}	Power terminal for controller section
2.	ENA A	Enable input terminal
3.	1	Arm drive input
4.	2	Arm drive input
5.	CR A	One shot time constant setting terminal
6.	V_{ref} A	Motor current setting terminal
7.	LG A	GND
8.	V_{CC1} A	Motor driver power terminal
9.	V_SA	Motor current detection terminal
10.	M1	Motor output
11.	R_S A	Detection resistor connecting terminal
12.	M2	Motor output
13.	PG	P.GND
14.	M3	Motor output
15.	R_S B	Detection resistor connecting terminal
16.	NC	
17.	NC	
18.	M4	Motor output
19.	V_S B	Motor current detection terminal
20.	V_{CC1} B	Motor driver power terminal
21.	LG B	GND
22.	V_{ref} B	Motor current setting terminal
23.	CR B	One shot time constant setting terminal
24.	3	Arm drive input
25.	4	Arm drive input
26.	ENA B	Enable terminal
27.	AL	Overheat alarm output terminal



Operational truth value table

ENA A(ENA B)	1(3)	2(4)	M1(M3)	M2(M4)
L	L	L	OFF	OFF
L	L	H	L	H
L	H	L	H	L
L	H	H	OFF	OFF
H			OFF	OFF

HIC for the 2-phase stepping motor

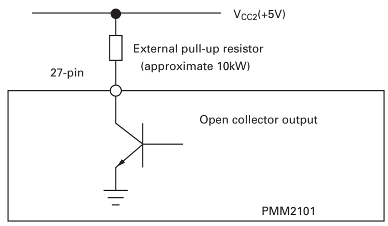
PMM2101 Full Step / Half Step

Electrical Characteristics Ta=25

Item	Symbol	Condition	Rating MIN.	Rating Standard	Rating MAX.	Unit
"H"level input voltage	V_{IH}	V_{CC2} 5V	2.7		V_{CC2}	V
"L"level input voltage	V_{IL}	V_{CC2} 5V	0		1.0	V
"H"level input current	I_{IH}	V_{CC2} 5V V_I 5V			10	A
"L"level input current	I_{IL}	V_{CC2} 5V V_I 0V			-50	A
Reference voltage (V_{ref}) input current	I_{ref}	V_{CC2} 5V V_{ref} 0V			-10	A
Current detection (V_S) input current	I_S	V_{CC2} 5V V_S 0V			-10	A
Forward direction voltage of FET diod	V_F	I_F 1A		1.3	1.5	V
High output saturating voltage	$V_{ce\ (sat)H}$	I_C 1A		1.0	1.4	V
Low output saturating voltage	$V_{ce\ (sat)L}$	I_C 1A		1.0	1.3	V
Low output saturating voltage	I_R	V_{CC1} 60V V_{OUT} 0V			10	A
		V_{OUT} 60V V_{RS} 0V			10	A
Power current to controller section	I_{CC2}	V_{CC2} = 5V during circuit operation			75	mA
Alarm terminal current	I_{alm}	V_{CC2} 5V V_{alm} 0.5V			2	mA
Overheat alarm operating temperature				125		
Overheat protection stop temperature				150		

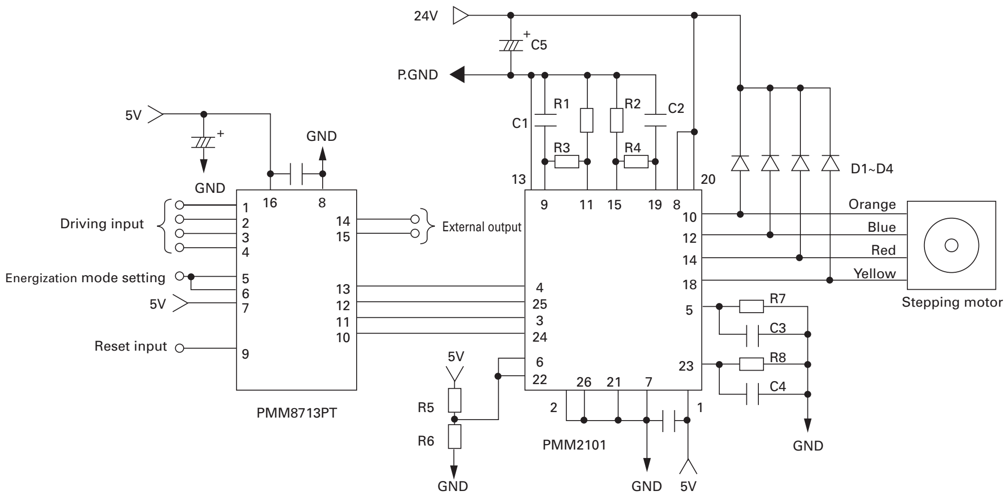
Overheat Alarm Output

The overheat protection circuit outputs an alarm signal at +125 at the internal junction in the IC, and activates motor excitation OFF at +150 .



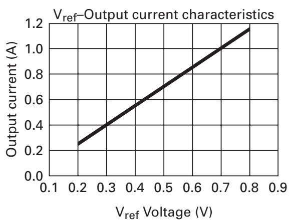
Transistor ON during alarming
Vce ON : 0.5V MAX.
Ialm : 2mA MAX.
The alarming signal output and overheat protection circuit recover automatically when the temperature lowers.

Example of Application Circuit



Refer to page 53 for the PMM8713PT specifications.
Recommended circuit constants for PMM2101

Applicable	Constant	Applicable	Constant
R1,R2	5W 0.68	C1, C2	1000pF
R3,R4	1 4W 3.9k	C3, C4	3300pF
R7,R8	1 4W 15k	C5	330 F



Determine on the R5 and R6 constants referring to the Vref-output current characteristics.
Determine on D1 to D4.
Peak reverse voltage 100V
Output current 1A
Reverse recovery time 100ns

HIC for the 2-phase stepping motor

PMM2301 Micro Step

Unipolar

Characteristics

Sine wave driven micro-step driver.
The current detection resistor is incorporated.
MOSFET is used for the power driving circuit to reduce heating.
Totally packaged to reduce parts for the peripheral circuit.
Enables selection from the 5 various excitation modes by the external bit signal.

Maximum Rating Tc=25

Item	Symbol	Condition	Rated value	Unit
Source voltage-1	$V_{CC1\ MAX.}$	V_{CC2} 0V	52	V
Source voltage-2	$V_{CC2\ MAX.}$	With no signal	7	V
Input voltage	$V_{in\ MAX.}$	Logic input terminal	7	V
Phase current	$I_{OH\ MAX.}$	0.5sec, 1pulse, V_{CC1} applied	4	A
Operating temperature on PCB	$T_{C\ MAX.}$		105	
Junction temperature	$T_{j\ MAX.}$		150	
Conservation temperature	T_{stg}		-40 to 125	

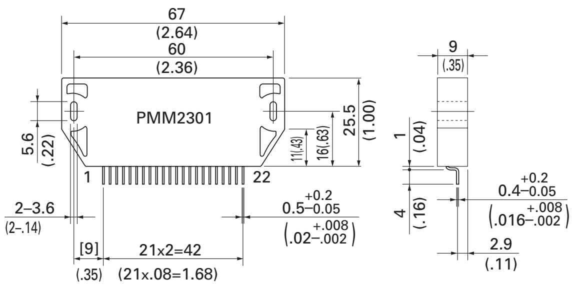
Recommended Operating Conditions Ta=25

Item	Symbol	Condition	Rated value	Unit
Source voltage-1	V_{CC1}	With signal	10 to 45	V
Source voltage-2	V_{CC2}	With signal	5.0 5	V
Input voltage	V_{IH}		0 to V_{CC2}	V
Phase current	I_{OH}	Duty 50	3	A
Clock frequency	Clock		DC to 50	kHz
Withstand voltage of phase driver	V_{DSS}		100	V

Dimensions unit: mm inch

Pin No.	Terminal name
1.	$\overline{B}$
2.	B
3.	P.GND A
4.	P.GND B
5.	A
6.	A
7.	V_{CC2}
8.	V_{ref}
9.	Mode 1
10.	Mode 2
11.	Mode 3

Pin No.	Terminal name
12.	V_{CC2}
13.	V_{CC2}
14.	Clock
15.	CW CCW
16.	Reset
17.	Return
18.	Enable
19.	M_{0I}
20.	M_{01}
21.	M_{02}
22.	GND



Each Terminal Function

Terminal name	Function	Functioning condition				
V_{ref}	Motor current setting input					
Clock	Motor driving pulse input	Mode 3 = H level : Operates at rising edge Mode 3 = L level : Operates at rising and falling edges				
CW / CCW	Motor rotation direction setting input	H level = CW rotation L level = CCW rotation				
Reset	System reset	Reset "L"				
Return	Forced return to phase origin	Forced shift to the origin of the present energization phase with Return = H				
Enable	Power OFF input	Enable "L"				
M_{0I}	Phase origin monitor output	L level output at the phase origin.				
M_{01} M_{02}	Monitor output on phase energization status	Outputs level signal on the present phase energization status.				
		Phase coordinate	A phase	B phase	$\overline{A}$ phase	$\overline{B}$ phase
		M01	H	L	L	H
		M02	L	H	L	H

HIC for the 2-phase stepping motor

PMM2301 Micro Step

Energization Mode Table

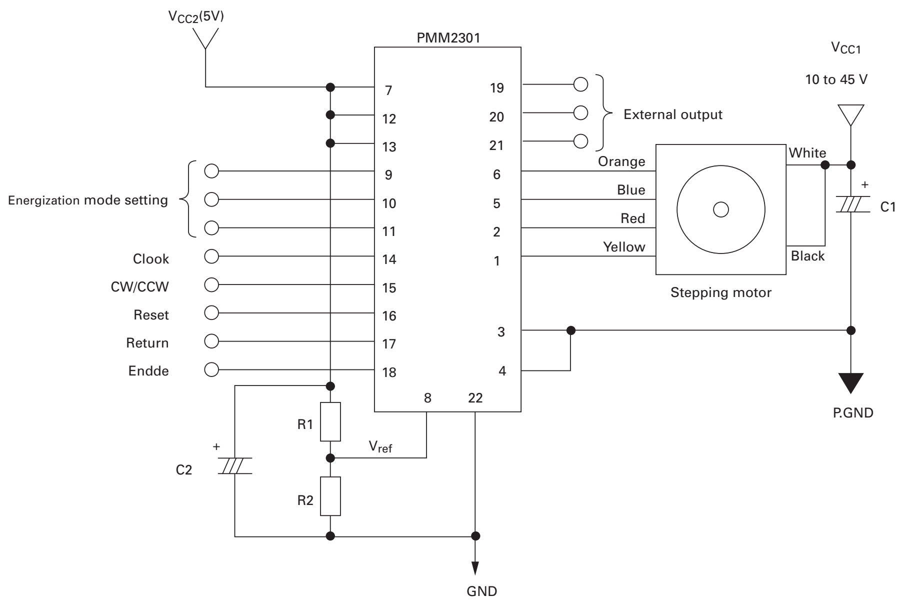
Input condition			Energization mode	1 step angle degree	Number of basic angle division
Mode1	Mode2	Mode3			
L	L	H	2EX	1.8	1/1
H	L	H	1-2EX	0.9	1/2
L	H	H	W1-2EX	0.45	1/4
H	H	H	2W1-2EX	0.225	1/8
H	H	L	4W1-2EX	0.1125	1/16

Conditioned on the Mode 3 = L, one pulse operation is performed at every rising and falling edge of the clock pulse. Accordingly, the operation becomes unstable if the driving pulse duty ratio deviates from 50%.

Electrical Characteristics Tc=25 Vcc1=24V Vcc2=5V

Item	Symbol	Condition	Rating MIN.	Standard	MAX.	Unit
V_{CC2} Power current	I_{CCO}	Enable = L		4.5	15	mA
Effective output current	I_{oave}	Each phase R/L = 3.5 /3.8mH, Vref = 0.6V	0.45	0.50	0.55	A
Forward direction voltage of FET diode	V_{df}	I_f 1A		1.2	1.8	V
Output saturating voltage	V_{sat}	RL = 7.5 I 3.0A		1.4	2.6	V
H level input voltage	V_{IH}	9 to 11, 14 to 18 pins	4.0			V
L level input voltage	V_{IL}	9 to 11, 14 to 18 pins			1.0	V
Input current	I_{IL}	9 to 11, 14 to 18 pins = GND level, Pull-up resistor 20k	125	250	510	A
V_{ref} input voltage	V_r	8-pin	0		V_{CC2} 2	V
V_{ref} input curren	I_r	8-pin		1		A
H level output voltage M_{OI} M_{O1} M_{O2}	V_{OH}	19 to 21 pins I = 3mA, I = -3mA	2.4			V
L level output voltage M_{OI} M_{O1} M_{O2}	V_{OL}	19 to 21 pins I = 3mA, I = -3mA			0.4	V
PWM frequency	Fc		37	47	57	kHz

Example of Application Circuit



Recommended circuit constants

C1	C2
100 F or over	10 F

Determine on the R1 and R2 constants based on the Vref voltage calculated from the following formula.
Vref V = Motor current adjusted value A/phase x 0.6

Safety Consideration

The drivers and stepping motors are the products designed to be used for the general industrial devices.
When using those, pay enough attention to the following points.

Read thoroughly the Operation Manual prior to placement, assembly and/or operation in order to use the product properly.

Refrain from modifying or processing the product in any way.

Consult with the distributor or professional experts for placement or maintenance services of the product.

In case of the following uses of the product, contact with us for the special care required to the operation, maintenance and management such as multiplexing the system, installing an emergency electric generator set, or so forth.

1 Use for the medical devices concerned with a fatal accident.
2 Use for trains, elevators, and so forth that are likely to cause an accident resulting in injury, damage or death.
3 Use in the computer system highly influential to the social life or the public systems.
4 Use in other devices highly influential to maintaining the human safety or the public functions.

In addition to the above, consult with us for use in such a vibration environment as automobile or transportation.

Read the Operation Manual thoroughly prior to the use (placement, operation, maintenance and inspection) to put the product in use properly.

Make yourself knowledgeable and familiarize with the devices, safety issues and cautions before handling the product.

After reading the Operation Manual or the like, keep it in the place where the users can refer to whenever necessary.

Indication by Warning Label on the product

Either or all of the following indications are given by the Warning Labels depending on the type of the driver or stepping motor.


This label is stuck near the high voltage part such as the electrically charged or cover-protected section, warning that the place where it is likely to cause an electric shock.


This label is stuck on the place where the driver or stepping motor body should be easily acknowledged, warning that it is likely to cause burns from high temperature.

This label is stuck near the GND terminals of the driver or stepping motor for which grounding is required, suggesting that the terminals should be actually grounded.

This label is stuck for the driver or stepping motor to which the power source is applied in the voltage exceeding the safety standard, drawing attention against the electric shock.

Safety ranks of the cautions

Following four ranks are provided.

DANGER Improper operations or use is most likely to result in serious injury or death.

CAUTION Improper operations or use is likely to result in average or minor injury, or in property damage.

In spite of the cautions with the CAUTION CAUTION label, it may cause serious results. Either the contents of the labels is describing important cautions to be followed inevitably.

PROHIBITED Indicates what shall not be done.

COMPULSORY Indicates what shall be done.

DANGER

General matters

1. Do not use the product in an explosive, flammable or corrosive atmosphere, watery place or near a combustible material. Doing so may cause injury or fire.

2. Have a person with expert knowledge for performing the transportation, placement, wiring, operation, maintenance or inspection of the product. Without such knowledge, it may cause an electric shock, injury or fire.

3. Do not work for wiring, maintenance servicing or inspection with the electric power on. Perform either of those five minutes after turning the power off, or otherwise, it may cause an electric shock.

4. When the protective functions of the product is activated, turn the power off immediately and eliminate the cause. If continuing the operation without eliminating the cause, the product may operate improperly and cause injury or a breakdown of the system devices.

5. Stepping motor may run out of order at the operating and stopping occasions, depending on the magnitude of the load. Put the product into use after confirming with the adequate trial test operation in the maximum load conditions that the product performs reliable operation. Doing otherwise may cause a breakdown of the system. (Should the product run out of order in the use to drive upward/downward, it may cause a fall of the load.)

6. Do not touch the internal parts of the driver. Doing so may cause an electric shock.

Wiring

7. Do not connect the stepping motor directly with the commercial power outlet. Doing so may cause an electric shock, injury or fire. The power shall be supplied to the stepping motor through the driving circuit.

8. Use the electric power source within the rated input voltage. Using otherwise may cause fire or an electric shock.

9. Connect the driver and stepping motor to the ground. Using without grounding may cause an electric shock.

10. Do not harm, forcibly put a stress, or load a heavy article on the cable or get it caught between the articles. Doing so may cause an electric shock.

11. Perform wiring with the power cable as instructed by the wiring diagram or the Operation Manual. Doing otherwise may cause an electric shock or fire.

Operation

12. Be sure not to touch the rotating part of the stepping motor during its operation. Touching it may cause injury.

13. Neither reach or touch the electric terminals while electric power is on. Doing so may cause an electric shock.

14. Never disconnect any of the connectors while electric power is on. Doing so may cause an electric shock and corruption.

General matters

1. Prior to placement, operation, maintenance servicing or inspection, be sure to read the Operation Manual and follow the instructions to perform those. Failure to follow the instructions may cause an electric shock, injury or fire.

2. Do not use the driver or the stepping motor outside the specified conditions. Doing so may cause an electric shock, injury or fire.

3. Do not insert a finger or a thing into the opening of the product. Doing so may cause an electric shock, injury or fire.

4. Do not use the damaged driver or stepping motor. Doing so may cause injury, fire or the like.

5. Use the driver and stepping motor in the designated combination. Using otherwise may cause fire or a trouble.

6. Be careful that the temperature rises in the operating driver, stepping motor or peripheral devices. Failure to be careful may cause a burn.

Unpacking

7. Unpack while confirming the ceiling. Failure to do so may cause injury.

8. Confirm if the product is the one having been ordered. Installing an incorrect product may cause a breakdown.

Wiring

9. Do not perform measurement of the insulation resistance or withstand insulation voltage of the product. Doing so may cause a breakdown. Instead, contact with us for such inspection.

10. Perform wiring conforming to the technical standards of electric facility or the internal rule. Doing otherwise may cause burning or fire.

11. Ensure that wiring has been correctly done. Operating without correct wiring may cause the stepping motor to run out of control and result in injury.

12. Take insulation process for the attached condenser or the external resistance connection terminals. Failure to do so may cause an electric shock.

Placement

13. Do not climb or attach a heavy article on the product. Doing so may cause injury.

14. Neither block nor stuff the aspiration/exhaust vent with a foreign particle. Doing so may cause fire.

15. Follow the instructions for the direction to place. Failure to do so may cause a trouble.

16. Keep a distance as instructed by the Operation Manual for the driver from the inner surface of the control console or other devices. Failure to do so may cause a trouble.

17. Place the product with a great care so as to prevent from the danger such as a tumble or a turnover.

CAUTION

18. Mount the product on an incombustible material such as metal. Doing otherwise may cause fire.

19. Confirm the rotating direction before connecting with the mechanical device. Failure to do so may cause injury or a breakdown.

20. Do not touch the motor output spindle (including the key slot and gears) with a bare hand. Doing so may cause injury.

Operation

21. The stepping motor is not equipped with any protective device. Take protective measures using an over-current protective relay, a ground fault interrupter, a protective device from excess temperature, and an emergency stopping device. Failure to do so may cause injury or fire.

22. Do not touch the product for a period after the power is on or has been turned off, since the driver and stepping motor remain in the high temperature. Doing so may cause burns. Especially the temperature rises considerably of the stepping motor depending on the operating conditions. Use the motor on the condition so that its surface temperature becomes 100°C or under.

23. Stop the operation immediately when an emergency occurs. Failure to do so may cause an electric shock, injury or fire.

24. Do not change adjustment to an extreme, for such a change results in the unstable operation. Doing so may cause injury.

25. When conducting the trial operation, make the stepping motor fixed firmly, and confirm the operation by disconnecting with the mechanical system before connecting with it. Failure to do so may cause injury.

26. When the alarm has been activated, eliminate the cause and ensure the safety to resume operation. Failure to do so may cause injury.

27. When the electric power recovers after the momentary interruption, do not approach the devices because the system may re-start operation by itself. (Set the system so as to secure the safety even when it re-start on such occasion.) Failure to do so may cause injury.

28. Confirm that the electric power supply is all proper conforming to the specifications. Failure to do so may cause a trouble.

29. The brake mechanism of the motor with the electro-magnetic brake is to hold the movable section and the motor position. Do not use it as a safety measure, or doing so may cause the breakdown of the system.

30. Fix the key firmly when operating the motor with key individually. Failure to do so may cause injury.

Maintenance services

31. Be careful when performing maintenance services or inspection about the temperature which rises highly in the driver and stepping motor frame. Failure to do so may cause burns.

32. It is recommended to replace the electrolytic condenser of the driver with a new one for securing the preventive measure after using for 5 years, the expected life in the average 40°C. The expected life of the fuse is 10 years in the average 40°C. Thus, the periodical replacement is recommended.

33. Contact with us for repair. If the product is disassembled by the user, it may put it out of action.

Transportation

34. Handle the product with care during transportation so as to prevent from the danger such as a tumble or a turnover.

35. Do not hold with the cable or the motor spindle. Doing so may cause a trouble or injury.

Retirement

36. When scrapping the driver or stepping motor, treat it for the general industrial waste.

PROHIBITED

Storage

1. Avoid the place exposed to rain or water drops, or in an environment with hazardous gas or liquid for storing the product. Failure to do so may cause a trouble.

Maintenance services

2. Do not assemble or repair the product. Doing so may cause fire or an electric shock.

General matters

3. Do not remove the rating plate.

COMPULSORY

Storage

1. Store the product within the specified conservation temperature and humidity in the place not exposed to the sun beam.

2. If the driver has been stored for a long period (3 years or longer for a guide), consult with us. The capacitance may have decreased with the electrolytic condenser due to the long period storage, and it may cause a trouble.

Operation

3. Install an external emergency stop circuit to turn the power off for the instant halt of operation.

4. Put the product into operation in the specified ambient temperature and humidity.

Transportation

5. Excess loading of the product on the carrier may cause the load to fall in pieces. Follow the instructions given outside the package.

Inquiry Check Sheet

For more information regarding any products or services described here in, please contact your nearest office listed on the back of this catalog.

To SANYO DENKI Co.,LTD.   Date ____________

____

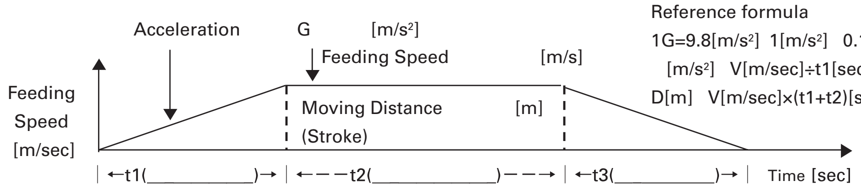
Company: ____________________

Department: ____________________

Name: ____________________

Tel: ____________________ FAX: ____________________

E-mail: ____________________

	Item	Contents
1	Name of target equipment	Equipment name, category (transport, processing, test, other)
2	Name of servo axis	Axis name, axial mechanism (horizontal/vertical), brake mechanism (yes/no)
3	Current condition of above axis	Manufacturer Name ( ) Series Name ( ) Motor Capacity ( ) Hydraulic, Mechanical, or New System ( )
4	Positioning accuracy	± mm ± m
5	Operation pattern	 Reference formula 1G=9.8$[m/s^2]$ 1$[m/s^2]$ 0.1G $[m/s^2]$ V[m/sec]÷t1[sec] D[m] V[m/sec]×(t1+t2)[sec]
6	Mechanism	Ball-screw/screw-rotation type (horizontal), ball-screw/nut-rotation type (horizontal), rack and pinion (horizontal), belt/chain (horizontal), rotary table, roll feed, instability
7	Mechanical structure	WT table mass kg WL work mass kg WA mass of other drive parts kg WR rack mass kg WB belt/chain mass kg WC counterbalance mass kg Fa external force axial direction N Fb ball-screw preload N T roll pushing force N Dr1 drive-side roll diameter mm Dr2 follower-side roll diameter mm
		Lr1 drive-side roll length mm Lr2 follower-side roll length mm G reduction ratio JG speed-reducer inertia kg m² JC coupling inertia kg m² JN nut inertia kg m² JO other motor-axis conversion inertia kg m² Db ball-screw diameter mm Lb ball-screw axial length mm Pb ball -screw lead mm
		Dp pinion/pulley diameter mm Lp pinion axial length mm tp pully thickness mm Dt table diameter mm Dh table-support dianeter mm LW load shift from axis mm Ds table shaft diameter mm Ls table shaft length mm specific gravity of ball-screw/pinion/pulley/table-shaft material kg cm³
		friction coefficient between sheet and shiliding-surface/support-section/roll 1 specific gravity of roll-1 material kg cm³ 2 specific gravity of roll-2 material kg cm³ internal friction coefficient of preload nut mechanical efficiency JL load inertia of motor-axis conversion kg m² TF friction torque of motor axis conversion N m Tu imbalance torque of motor axis conversion N m
8	Speed reducer	Customer-provided ( ) Sanyo denki standard(planet/spur/no-backlash-planet) other( )
9	Encoder type	Encoder type specified (yes / no) Yes:(incremental , optical absolute , optical absolute with incremental function, resolver absolute) Resolution
10	Input format	Position , velocity , torque , other ( )
11	Host equipment (controller)	Sequencer , laptop , customer-developed product , Sanyo dennki-provided , other ( )
12	Usage environment and other requirements	Cutting , clean-room use , anti-dust measures , other ( )
13	Estimated production	Single product: ( ) units/mouth ( ) units/year
14	Development schedule	Prototype period: ( )Year ( ) Month Production period: ( )Year ( ) Month
15	Various measures	Related documentation (already submitted; send later by mail) Visit/PR desired (yes / no) Meeting desired (yes / no)
16	Miscellaneous (questions, pending problems, unresolved issues, etc.)	

Precautions For Adoption

⚠ Cautions

Failure to follow the precautions on the right may cause moderate injury and property damage, or in some circumstances, could lead to a serious accident. Always follow all listed precautions.

⚠ Cautions

- Read the accompanying Instruction Manual carefully prior to using the product.
- If applying to medical devices and other equipment affecting people's lives, please contact us beforehand and take appropriate safety measures.
- If applying to equipment that can have significant effects on society and the general public, please contact us beforehand.
- Do not use this product in an environment where vibration is present, such as in a moving vehicle or shipping vessel.
- Do not perform any retrofitting, re-engineering, or modification to this equipment.
- The drivers and motors presented in this catalog are meant to be used for general industrial applications. If using for special applications related to aviation and space, nuclear power, electric power, submarine repeaters, etc., please contact us beforehand.

For any question or inquiry regarding the above, contact our Sales Department.

http://www.sanyodenki.co.jp

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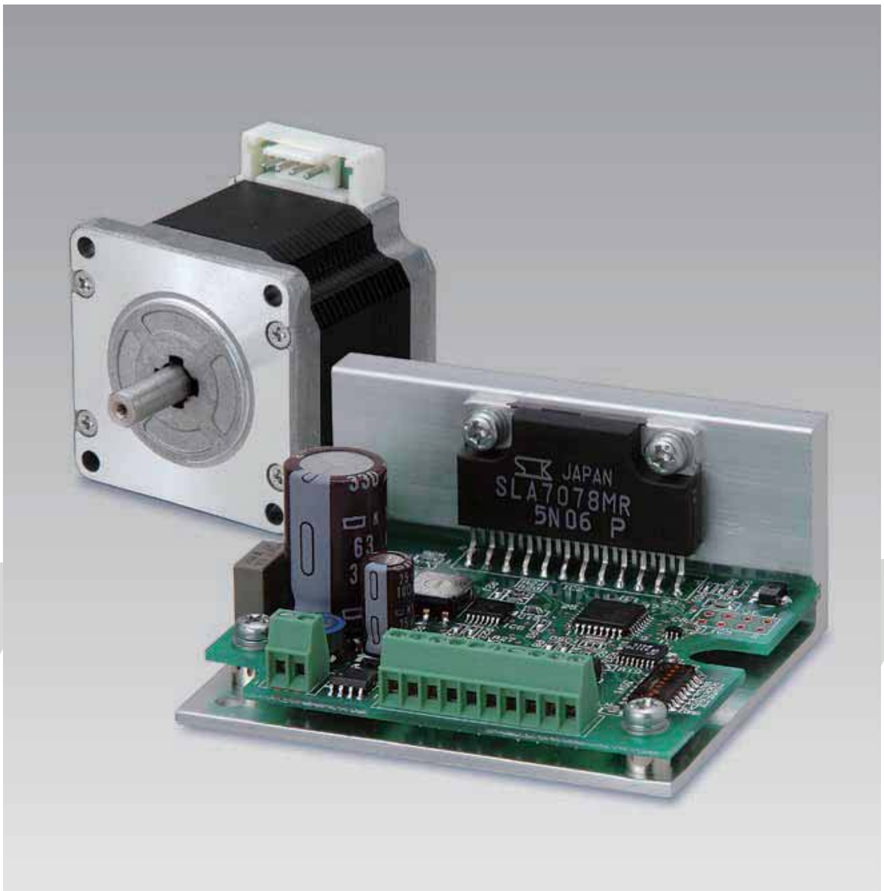
CATALOG No. 832-6 '09.3.N

SANMOTION

2-PHASE STEPPING SYSTEMS

F2



Ver.2

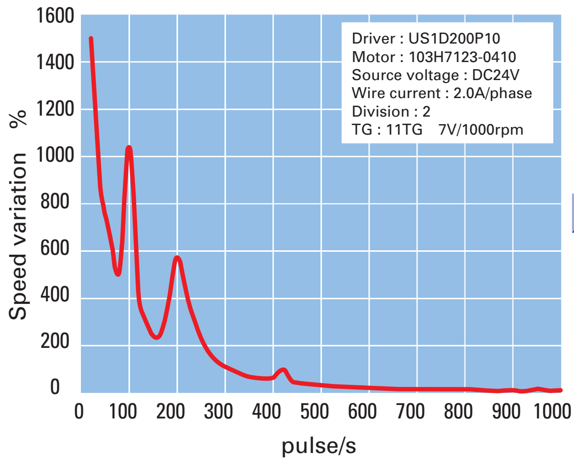
SANYO DENKI

F series DRIVER features

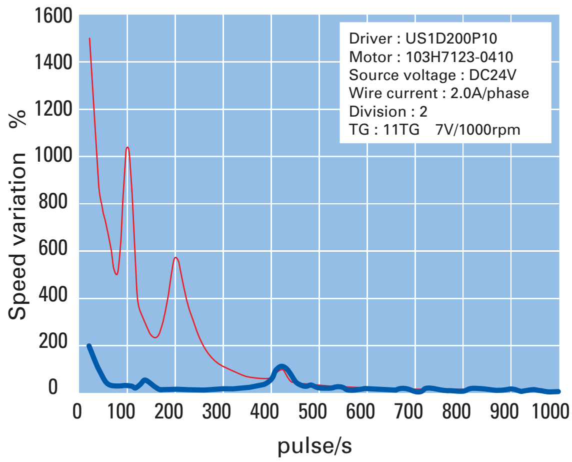
1 Low-vibration mode

DC input

Low-Vibration Mode OFF



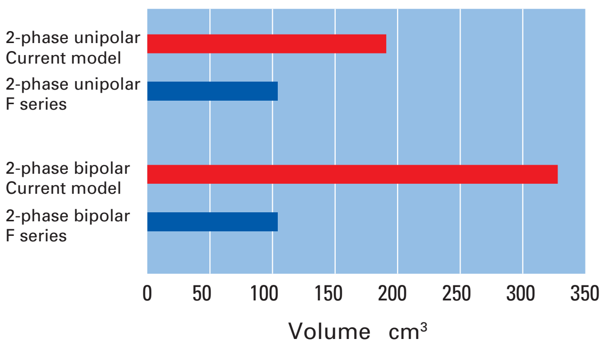
Low-Vibration Mode ON



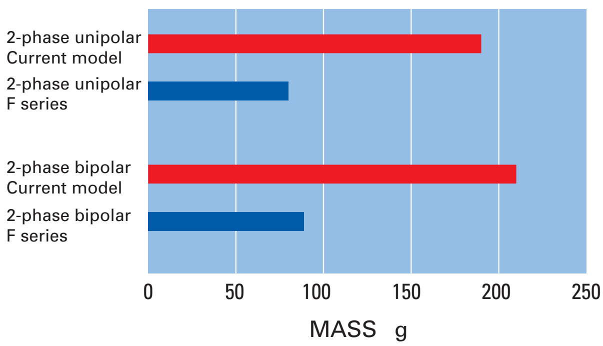
2 Compact / Light weight

DC input

Compact



Light weight



Compliance with international standards

DC input

The standard specification SANMOTION F series stepping driver complies with UL and EN safety standards.Stepping motors complying with UL and EN standards are available upon request.

Set model

DC input

Stepping motors with integrated drivers

P.4

A driver incorporating a motion control function needed for driving a motor and a 2-phase stepping motor were integrated into a single unit.

Motor flange size

□42 1.65inch □60 2.36inch

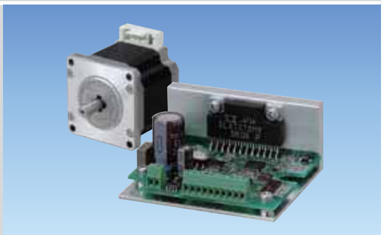
Unipolar standard   standard model

P.13

The standard set includes a F series driver and a H or SH series motor.

Motor flange size

□28 1.10inch □42 1.65inch □56 2.20inch



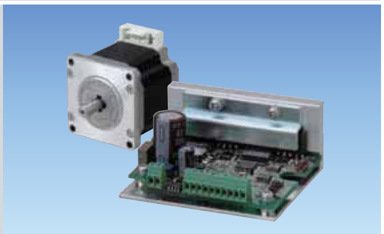
Bipolar standard   standard model

P.14

The standard set includes a F series driver and a H or SH series motor.

Motor flange size

□28 1.10inch □42 1.65inch □50 1.97inch □56 2.20inch □60 2.36inch



Control method

How do you want to control the equipment?

The F series offers the choice of 3 different control methods

- Program command control using PLC I/O
- Network control using serial communication RS-485
- Control using a pulse generator
- Control using a pulse generator → Drive Specification

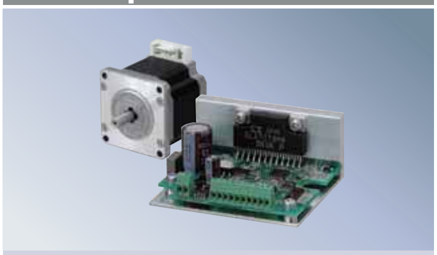
DC input stepping motors with integrated drivers

Startup via I/O : Initiate program containing speed, acceleration/ deceleration, and travel distance commands stored in the driver via the I/O.

Startup via serial communication : Control by sending data for speed, acceleration/ deceleration, and travel distance commands via serial communication.

System configuration diagram	P4
Specifications	P6
Dimensions	P5 to 6

DC input unipolar standard



Motion is generated by pulse input commands from an upper-level controller.

System configuration diagram	P13
Set part number nomenclature	P16
Motor specifications	P27 to 48
General specifications	P49 50
Motor dimension drawing	P51 to 54
Driver dimension drawing	P55

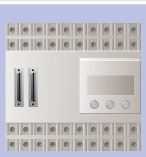
DC input bipolar standard

Motion is generated by pulse input commands from an upper-level controller.

System configuration diagram	P14
Set part number nomenclature	P16
Motor specifications	P27 to 48
General specifications	P49 50
Motor dimension drawing	P51 to 54
Driver dimension drawing	P55

Stepping Motors with Integrated drivers

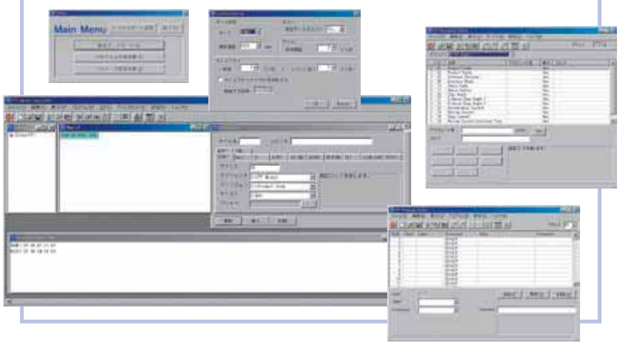
Host Devices



PLC

PLC and controllers are available as the host device.

Setup software : SFPAIW-01

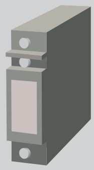


Bundled cable for input/output signal 300 mm

Bundled cable for DC power 350 mm

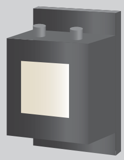
DC 24 V

Switching power supply



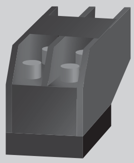
Converts AC power to DC power

Noise filter



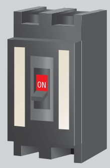
Filters out incoming noise from power line

Electromagnetic contactor



Switches driver power on/off. Use together with a surge protector.

Molded case circuit breaker



Protects the power line. Cuts off circuit in the event of overcurrent.

(t)
(r)

Single phase AC100 V to AC230 V

Stepping motors with integrated drivers

Features

1.Driver and motor are now integrated into a single unit.

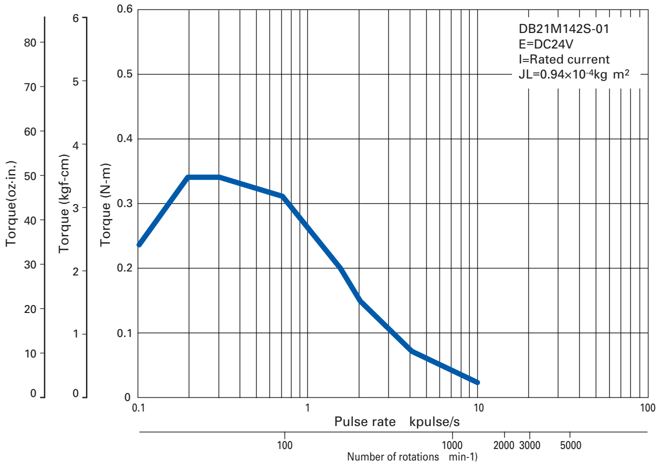
A driver incorporating a motion control function needed for driving a motor and a 2-phase stepping motor were integrated into a single unit for enabling a more compact installation space and less wiring.

2.Three types of operation modes can be selected to match the specific application.

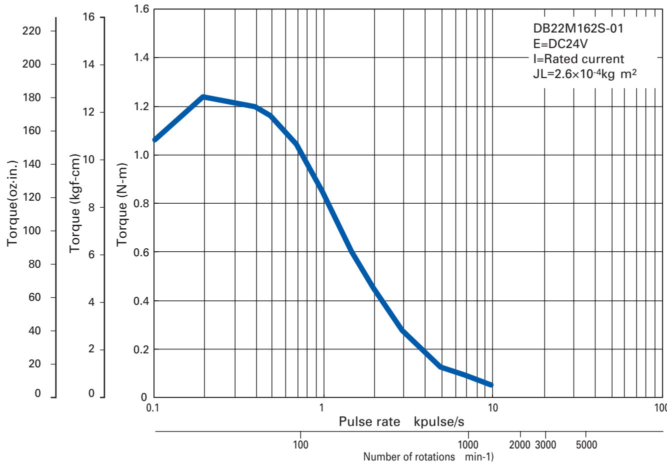
1 Control by command pulses
2 Program control by general-purpose I/O(Parallel)
3 Compliant with RS-485, half-duplex asynchronous communication

Pulse rate-torque characteristics

42mm 1.65inch



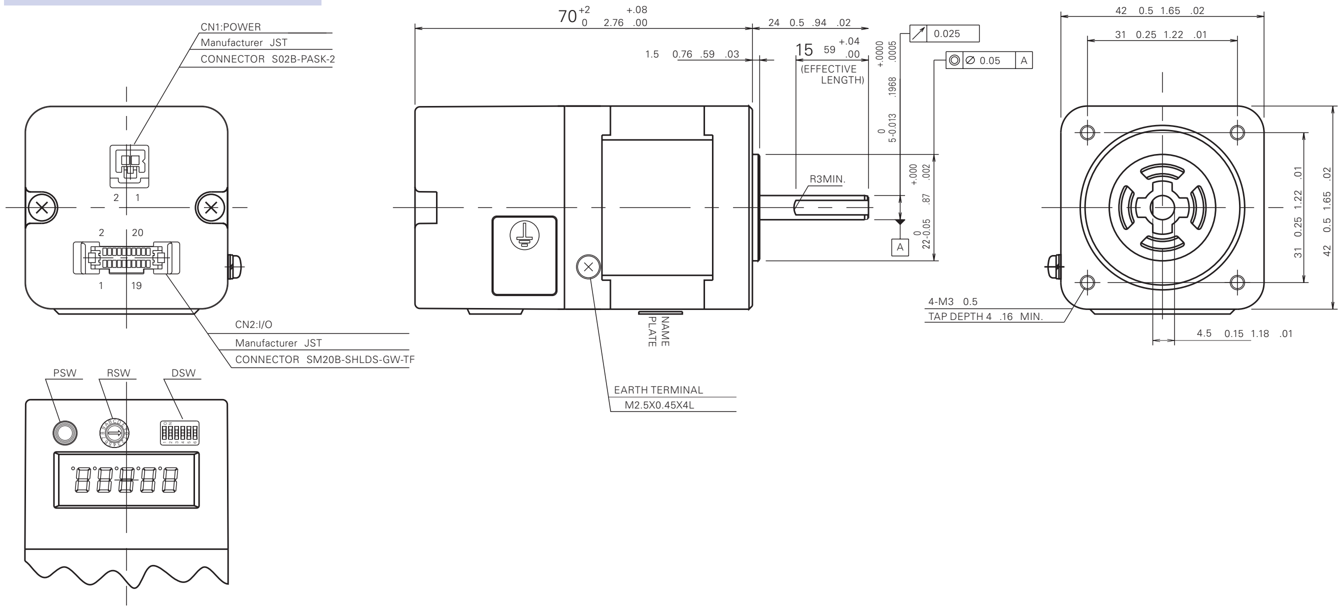
60mm 2.36inch



The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Dimensions Unit : mm inch

42mm 1.65inch

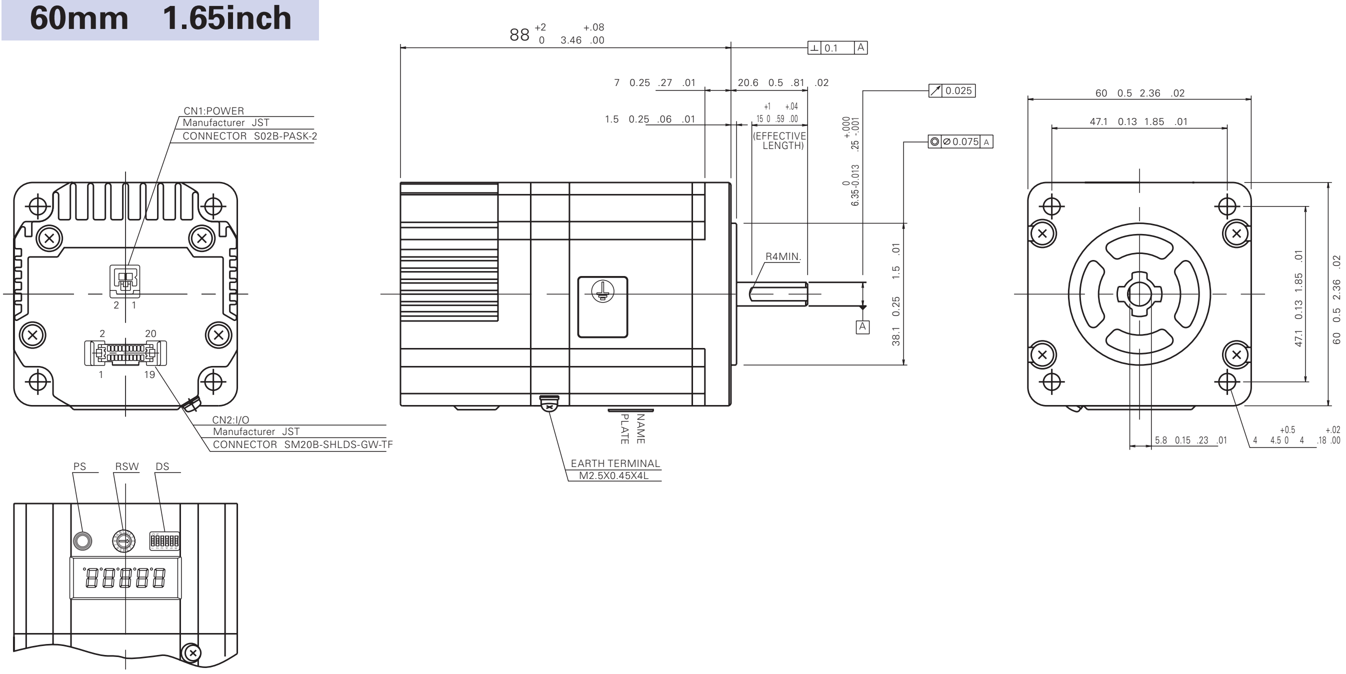


Specifications

Basic specifications	Part number Flange size		**DB21M142S-01 42**	**DB22M162S-01 60**
	Input source Note1		DC24 V 10	
	Getaway torque A		2 MAX.	3 MAX.
	Environment	Protection class	Class I	
		Operation environment	Installation category over-voltage category : II, pollution degree : 2	
		Applied standards	EN61010-1	
		Operating ambient temperature Note2	0 to +40	
		Conservation temperature	-20 to +60	
		Operating ambient humidity	35 to 85%RH no condensation	
		Conservation humidity	10 to 90%RH no condensation	
		Operation altitude	1000 m 3280 feet MAX. above sea level	
		Vibration resistance	Tested under the following conditions ; 4.9m/s2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each	
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .	
		Withstand voltage	Not influenced when 1500V AC is applied between power input terminal and cabinet for one minute.	
		Insulation resistance	10M ohm MIN. when measured with 500V DC megohmmeter between input terminal and cabinet.	
	Mass Weight		0.5kg 1.10lbs	0.87kg 1.92lbs
Function	Protection function		Against driver overheat	
	LED indicator		Alarm monitor	
I/O signals	Command pulse input signal Note3		Photo coupler input method, input resistance 220 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	Power down input signal PD		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	Step angle setting selection input EXT		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	FULL/HALF setting selection input F/H		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	EMG input signal		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	BUSY output signal		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	
	Phase origin monitor output signal MON		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	
	Alarm output signal AL		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	

Note1 Note that the power voltage must not exceed 24VDC + 10% (26.4VDC).
Note2 If the driver is placed in a box, the temperature inside the box must not exceed this specified range.
Note3 The maximum input frequency is 250k pulse/s.

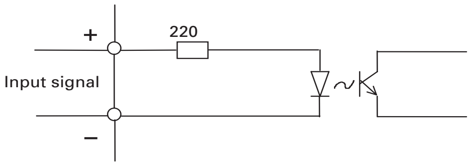
60mm 1.65inch



Input circuit configuration

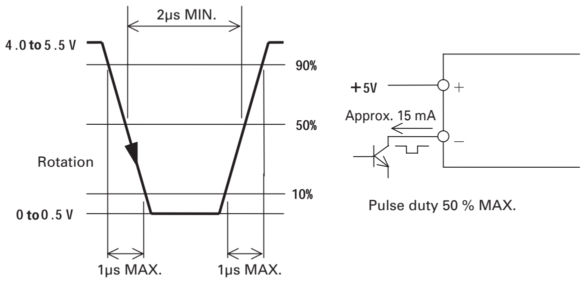
Input interface

Input circuit configuration

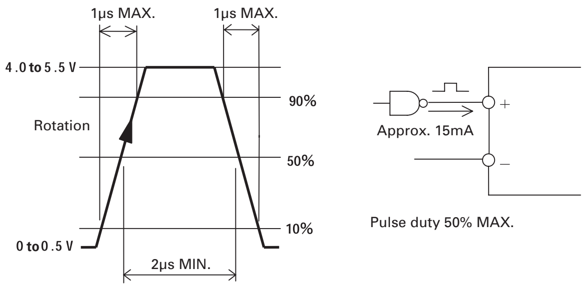


Input signal specifications

Negative logic

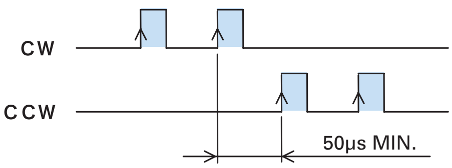


Positive logic



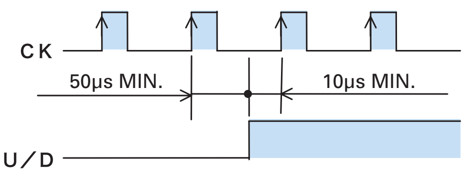
Timing of the command pulse

2-input mode CW, CCW



- The internal photo coupler turns ON within the and, at its falling edge to OFF, the internal circuit motor is activated.
- When applying the pulse to CW, turn OFF the CCW side internal photo coupler.
- When applying the pulse to CCW, turn OFF the CW side internal photo coupler.

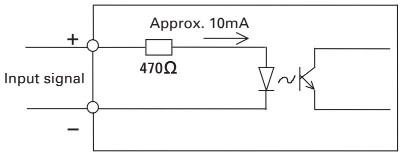
Pulse and direction mode CK, U/D



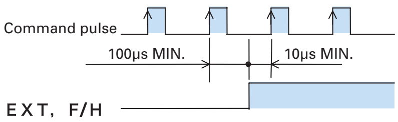
- The H level is input for and, at its rising edge to H level, the internal circuit stepping motor is activated.
- Switching the input signal U/D should be performed while the input level on the CK side is L .

Input circuit configuration

Input circuit configuration　PD EXT F/H EMG



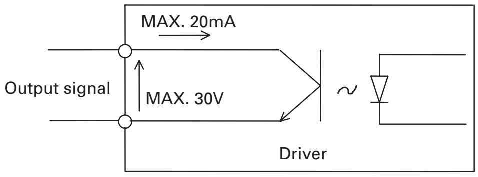
Timing of command pulse, step angle selection, and FULL/HALF selection input signal



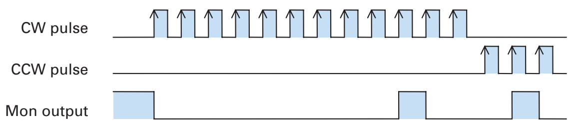
- Shaded area indicates internal photo coupler ON .
- EXT input signal
  EXT photo coupler ON enables a function by external F/H input signal.
  EXT photo coupler OFF enables the setting of a number of micro steps by main unit's rotary switch S.S.
- F/H input signal
  F/H photo coupler ON sets HALF step (2-division) operation.
  F/H photo coupler OFF sets FULL step (1-division) operation.
- Refer to switching EXT and F/H input signal in the [FULL/HALF input signal, command pulse, and step angle select].
- When switching the step angle by EXT and F/H input signal, the phase origin LCD may not turn ON and the phase origin monitor output may not output when stop. Refer to the MON output in the [Output Interface].

Output interface

Output circuit configuration BUSY MON AL

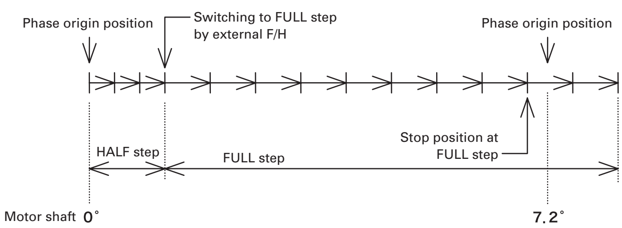


Mon output



- When the motor excitation phase is at the phase origin (power ON status), the photo coupler is turned ON , and the upper D.P of status LED turns on synchronously.
- Output from MON is set to on at every 7.2 degrees of motor output shaft from phase origin.

When changing the division setting by F/H input signal.



- When changing the motor division setting by the external input signal and the rotary switch as shown in the example below, the motor cannot stop where MON output signal can be output. Take this into consideration when using the MON output signal.

WIRING

Specification Summary of Input/Output Signals (Serial I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC 5V is input.
Alarm clear signal standard	ALMC	6	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
General-purpose input 1	IN1	6	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 1 on Internal photo coupler off General purpose input 1 off
Emergency stop input	EMG	6	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler of Emergency stop
Origin signal	ORG	6	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
+ direction overtravel signal	+OT	7	An overtravel signal in the + direction is input. Internal photo coupler on + direction overtravel not arrived Internal photo coupler off + direction overtravel arrived
General-purpose input 2	IN2	7	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 2 on Internal photo coupler off General purpose input 2 off
Emergency stop input	EMG	7	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	7	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	7	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
- direction overtravel signal	OT	8	An overtravel signal in the - direction is input. Internal photo coupler on - direction overtravel not arrived Internal photo coupler off - direction overtravel arrived
General-purpose input 3	IN3	8	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 3 on Internal photo coupler off General purpose input 3 off
Emergency stop input	EMG	8	emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	8	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	8	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear

Signal	Reference Designation	Pin Number	Function Summary
Emergency stop signal	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
General-purpose input 4c	IN4	9	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 4 on Internal photo coupler off General purpose input 4 off
Origin signal	ORG	9	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	9	alarms are cleared. Internal photo coupler off on Alarm clear
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
During program execution	PEND	10	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
Zone signal	ZONE	10	on when the current position is inside the coordinates that were set beforehand.
During program execution	PEND	11	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
During motor operation	BUSY	11	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Zone signal	ZONE	11	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	ALM	12	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor becomes non excited status.
Output signal common	OUT_COM	13	It is for the output signal common.
DATA+	DATA+	14	It is for the serial signal.
DATA	DATA	15	It is for the serial signal.

Specification Summary of Input/Output Signals (Pulse train I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
CW pulse input Standard	CW+ CW	1 2	When 2 input mode , Input drive pulse rotating CW direction.
Pulse train input	CK+ CK	1 2	When 1 input mode , Input drive pulse train for motor rotation.
CCW pulse input Standard	CCW+ CCW	3 4	When 2 input mode , Input drive pulse rotating CCW direction.
Rotational direction input	U/D+ U/D	3 4	When 1 input mode , Input motor rotational direction signal. Internal photo coupler ON CW direction Internal photo coupler OFF CCW direction
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC5V is input.
Power down input	PD	6	Inputting PD signal will cut off power off the current flowing to the Motor With dip switch select, change to the Power low function is possible . PD input signal on internal photo coupler on PD function is valid. PD input signal off internal photo coupler off PD function is invalid.
Step angle select input	EXT	7	FULL/HALF select input will become valid by inputting EXT signal. EXT input signal on internal photo coupler on External input signal F/H is valid EXT input signal off internal photo coupler off Main body rotary switch S.S is valid

Signal	Reference Designation	Pin Number	Function Summary
FULL/HALF select input	F/H	8	When EXT input signal on internal photo coupler on , F/H input signal on internal photo coupler on HALF step F/H input signal off internal photo coupler off FULL step
Emergency stop	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Phase origin monitor output	MON	11	When the excitation phase is at the origin in power on it turns on. When FULL step, ON once for 4 pulses, when HALF step, ON once for 8 pulses.
Alarm output	ALM	12	When alarm circuits actuated inside the Driver, outputs signals to outside. Then the Stepping motor becomes unexcited status.
Output signal common	OUT_COM	13	It is for the output signal common.

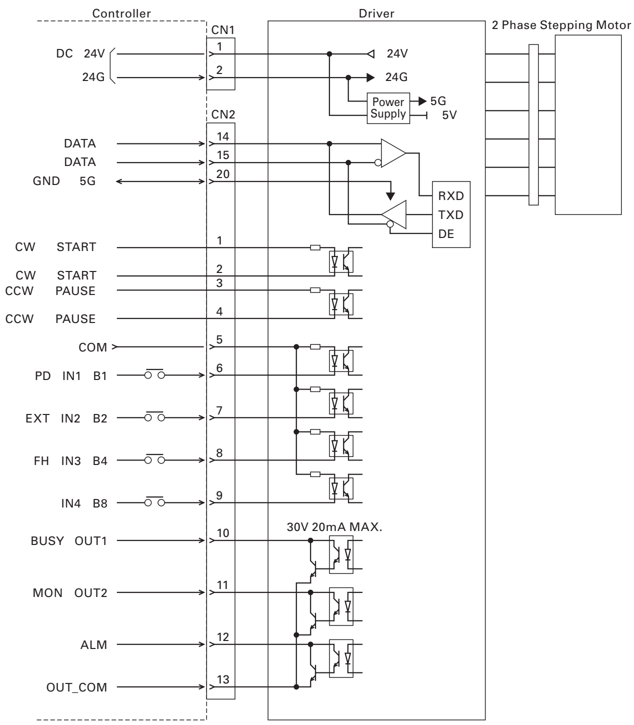
*As for the Motor rotational direction, CW direction is regard as the clockwise revolution by viewing the Motor from output shaft side.

Specification Summary of Input/Output Signals (Parallel I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
Program drive Start/Stop	START+ START-	1 2	Commands the start and stop of program driving. Internal photo coupler on Program driving start Internal photo coupler off Program driving stop
Program pause	PAUSE+ PAUSE-	3 4	When START signal on, a pause in program driving is commanded. Internal photo coupler on Program driving pause Internal photo coupler off Program driving pause release
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC5V is input.
Alarm clear signal standard	ALMC	6	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
General-purpose input 1	IN1	6	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 1 on Internal photo coupler off General purpose input 1 off
Program number selection bit 1	B1	6	The program number is selected along with other bits. Subordinate bit Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	6	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	6	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
+ direction overtravel signal	+OT	7	An overtravel signal in the + direction is input. Internal photo coupler on + direction overtravel not arrived Internal photo coupler off + direction overtravel arrived
General-purpose input 2	IN2	7	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 2 on Internal photo coupler off General purpose input 2 off
Program number selection bit 2	B2	7	The program number is selected along with other bits. The second bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	7	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	7	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	7	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
- direction overtravel signal	-OT	8	An overtravel signal in the - direction is input. Internal photo coupler on - direction overtravel not arrived Internal photo coupler off - direction overtravel arrived
General-purpose input 3	IN3	8	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 3 on Internal photo coupler off General purpose input 3 off
Program number selection bit 4	B4	8	The program number is selected along with other bits. The third bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	8	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	8	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	8	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear

Signal	Reference Designation	Pin Number	Function Summary
Emergency stop signal	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
General-purpose input 4	IN4	9	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 4 on Internal photo coupler off General purpose input 4 off
Program number selection bit 8	B8	9	The program number is selected along with other bits. The fourth bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Origin signal	ORG	9	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	9	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
During program execution	PEND	10	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
Zone signal	ZONE	10	Turns on when the current position is inside the coordinates that were set beforehand.
During program execution	PEND	11	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
During motor operation	BUSY	11	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Zone signal	ZONE	11	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	ALM	12	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor becomes non excited status.
Output signal common	OUT_COM	13	It is for the output signal common.
DATA+	DATA+	14	It is for the serial signal.
DATA	DATA	15	It is for the serial signal.

External Wiring Diagrams



SET UP

Function Select Dip Switch

The functions according to the specification can be selected with this Dip switch.
Confirm the ex-factory setting as follows.

Switch	OFF / ON	Setting	Function
1 F/R		OFF	2 input mode (CW/CCW pulse)
2 LV		OFF	Micro step operation
3 PD		OFF	Power OFF
4		OFF	Phase origin excitation
5 I. SEL		OFF	Pulse stream I/F mode
6 S. SEL		OFF	

For pulse stream I/F mode

1 Input mode select F/R

Input pulse mode selection
This switch setting is only effective in pulse stream I/F mode.

F/R	Input pulse mode
ON	1 input mode CK,U/D
OFF	2 input mode CW,CCW

2 Low vibration mode select LV

Low vibration and smooth operation is enabled even by the rough resolution setting
e.g. 1 division, 2 division .
This switch setting is only effective in pulse stream I/F mode.
For parallel I/F mode and serial I/F mode, this is usually a low vibration operation.

LV	Operation
ON	Low vibration operation
OFF	Micro step operation

*When LV select is ON low vibration mode , operational process of driving pulse will be carried out inside the Driver. Therefore, the Motor movement delays for the time of 3.2ms pulse per input pulse. Note that depending upon the combined Motor, load,driving profile and etc, it may take a while until the shaft is adjusted when the Motor stops. In parallel I/F mode and serial I/F mode there is no delay

3 Power down select PD

Select the Motor winding current value when inputting the power down signal.This switch setting is only effective in pulse stream I/F mode.

PD	Motor winding current
ON	Current value by rotary switch STP Power Low
OFF	0A Power OFF

*PD function the setting selected by PD of the function select dip switch is enabled by PD input signal ON built-in photo coupler ON of Input/Output signal connector CN2 . Power down signal input is prior to all the other current settings except for alarms. The operational status may not be maintained such as power swing due to output torque drop or lower operation due to Motor current OFF unexcited Motor . Pay extra attention to the input timing of the power down signal in addition that the security device should be installed to the machine.

4 Excitation select EORG

*By turning on the EORG, excitation phase when power OFF is saved.

5, 6 Operation mode selection I.SEL, S.SEL

The operation mode is selected.

I.SEL	S.SEL	Operation mode
OFF		Pulse stream I/F mode
ON	OFF	Parallel I/F mode
	ON	Serial I/F mode

*Change the operation mode selection switch after cutting off the driver s power supply.

For parallel I/F mode or serial I/F mode

The communication speed of serial communication is set.

Switch	Set value	Communication speed(bps)		
		9,600	19,200	38,400
F/R	OFF			
	ON			
LV	OFF			
	ON			
PD	OFF			
	ON			

*The setting change after the power supply is turned on is invalid. It does not function as a F/R, LV, and PD.
*The communication speed of pulse stream I/F mode is fixed at 9600bps.

Rotary switch(RSW) and the mode change switch(PSW)

For pulse stream I/F mode

When it selects the step angle, the driving current is selected, and stops the current is selected, set by combining rotary switch (RSW) and mode change switch (PSW).

1. Step angle select(S.S)

The divisions of the basic step angle (0.9 /step) when micro step driving can be set.

Gradation	0	1	2	3	4	5	6	7
Partition	1	2	2.5	4	5	8	10	20
Gradation	8	9	A	B	C	D	E	F
Partition	25	40	50	80	100	125	200	250

Ex-factory setting is at 1 (division 2)

*The step angle select switch (S.S) and the number of partitions become invalid by EXT input signal ON (built-in photo coupler ON) of Input/Output signal connector (CN2).

2. Driving current select(RUN)

The Motor operation current value can be selected.

Gradation	0	1	2	3	4	5	6	7
Motor current (%)	100 (rated)	95	90	85	80	75	70	65
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	60	55	50	45	40	35	30	25

Ex-factory setting is at 0 (rated value).

*When there is a sufficient extra motor torque, lowering the operation current value will be effective in the lower vibration. The Motor output torque is almost proportional to the current value. When adjusting the operational torque, confirm the sufficient operation margin and determine the Motor current value.

3. Current Select when Stop (STP)

The motor current value when stop and when power down input signal ON (power low function is selected by dip switch) can be selected.

Gradation	0	1	2	3	4	5	6	7
Motor current (%)	100 (rated)	95	90	85	80	75	70	65
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	60	55	50	45	40	35	30	25

Ex-factory setting is set at A (50%).

*The current setting when stop by STP becomes valid when the Motor stops (approximately 200ms after the last pulse input) and when power down input signal

For parallel I/F mode and serial I/F mode

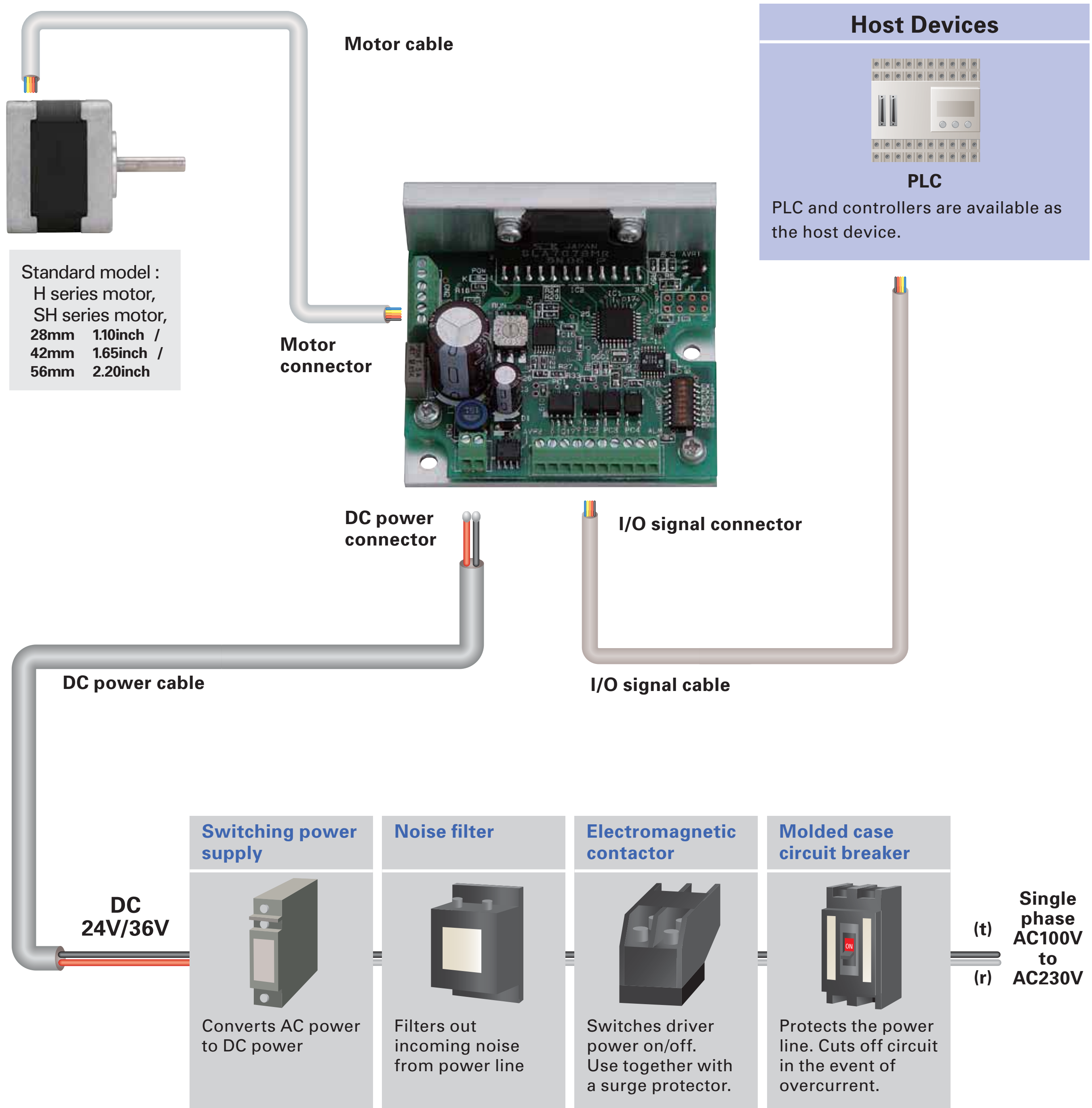
The slave bureau address of serial communications can be set.

RSW	Slave station address (HEX)
0	0
1	1
E	E
F	F

Ex-factory setting is set at 0

*The slave station address of the pulse stream I/F mode is fixed at 0.

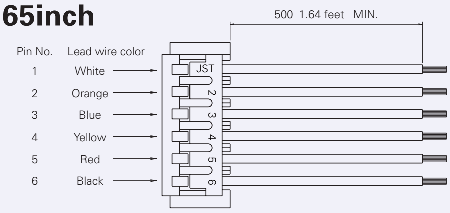
Unipolar standard



Bundled cable(42mm motors only)

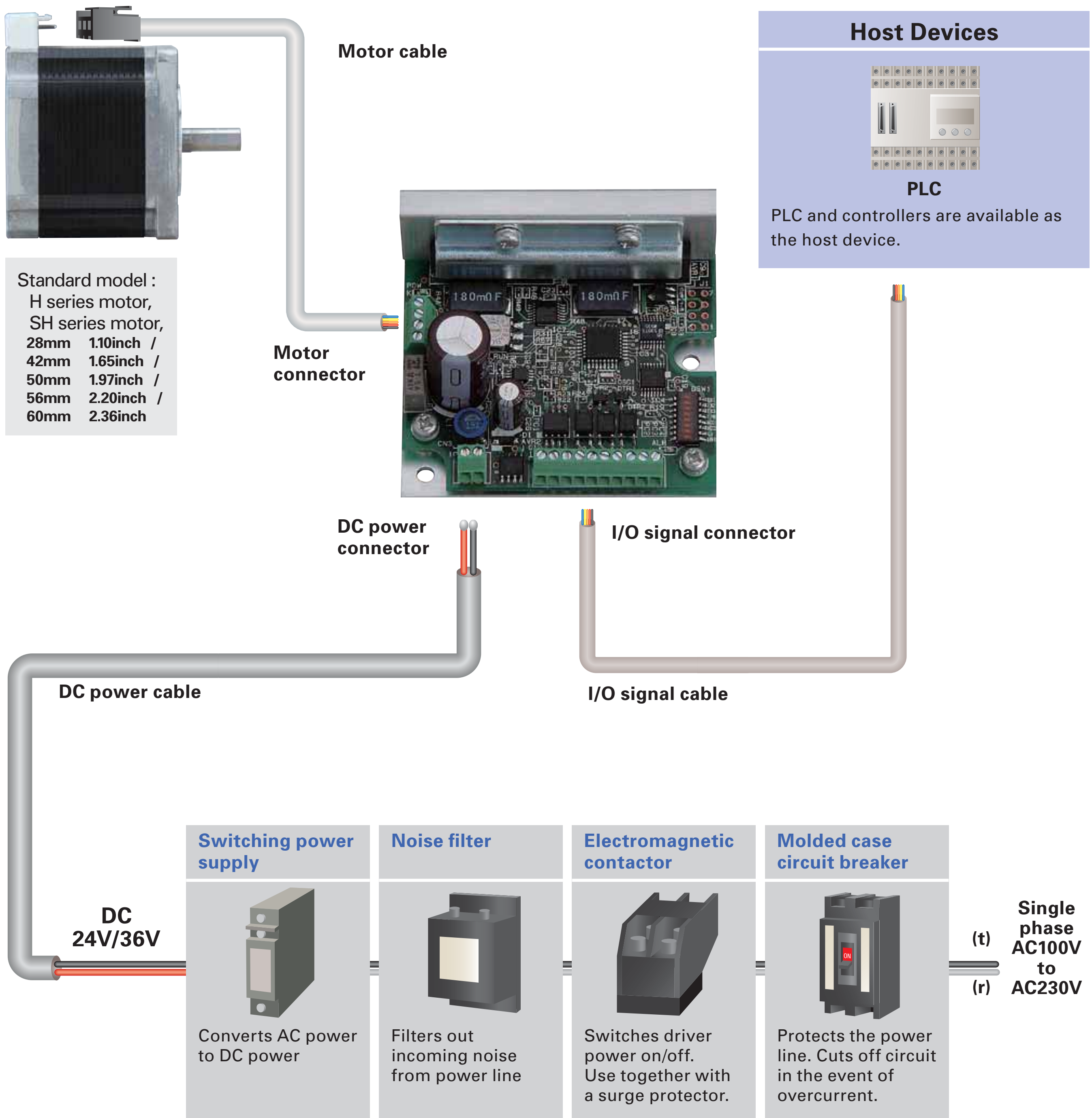
Motor cable

42mm 1.65inch



Lead wire	UL1430 AWG26
Housing	HER-6 BLACK J.S.T Mfg.Co.,Ltd
Pin	SEH-001T-P0.6 J.S.T Mfg.Co.,Ltd

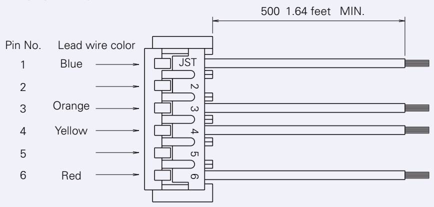
Bipolar standard



Bundled cable(42mm motors only)

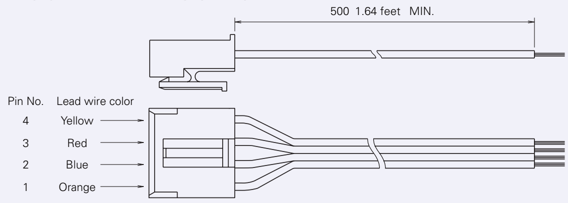
Motor cable

42mm 1.65inch



Lead wire	UL1430 AWG26
Housing	HER-6 BLACK J.S.T Mfg.Co.,Ltd
Pin	SEH-001T-P0.6 J.S.T Mfg.Co.,Ltd

60mm 2.36inch



Lead wire	UL1430 AWG22
Housing	VER-4N J.S.T Mfg.Co.,Ltd
Pin	SVH-21T-P1.1 J.S.T Mfg.Co.,Ltd

Part numbering convention

The following set part number specifies a system with an F series unipolar driver type code : US1D200P10 and a single shaft H series motor type code : 103H7121-0440 , 56 mm 2.20 inch square flange, and 41.8 mm 1.65 inch motor length.

D U 1 6 H 71 1 S

Stepping motor shaft spec
S : Single shaft
D : Double shaft

Stepping motor total length

Code	Stepping motor flange size													
	28mm 1.10inch		42mm 1.65inch				50mm 1.97inch		56mm 2.20inch		60mm 2.36inch			
	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch
1	2281	32 1.26	5205	33 1.30	1401	33 1.30	6701	39.8 1.57	7121	41.8 1.65	7821	44.8 1.76	1601	42 1.65
2			5208	39 1.54	1402	39 1.54			7123	53.8 2.12	7822	53.8 2.12	1602	54 2.12
3							6703	51.3 2.02	7126	75.8 2.89	7823	85.8 3.38	1603	76 2.99
4			5210	48 1.89	1404	48 1.89								
5	2285	51.5 2.03												

Stepping motor flange size			Basic step angle
28 :	28mm	1.10inch	1.8
52 :	42mm	1.65inch	1.8
71 :	56mm	2.20inch	1.8
78 :	60mm	2.36inch	1.8
14 :	42mm	1.65inch	0.9
16 :	60mm	2.36inch	0.9

Stepping motor series name
H : H series
S : SH series

Rated current specification
4 : 1A/phase 5 : 1.2A/phase 6 : 2A/phase

Model

Driver Specification
U : 2-phase unipolar B : 2-phase bipolar

Power specification
D : DC

Combination list of 2-phase unipolar driver

System type	Motor flange size	Basic step angle	Set part number		Motor model number		Rated current
			Single shaft	**Double shaft**	Single shaft	Double shaft	
Standard model	**28mm 1.10inch**	1.8	**DU14S281S**	**DU14S281D**	SH2281-5271	SH2281-5231	1A
		1.8	**DU14S285S**	**DU14S285D**	SH2285-5271	SH2285-5231	1A
	42mm 1.65inch	1.8	**DU15H521S**	**DU15H521D**	103H5205-0440	103H5205-0410	1.2A
		1.8	**DU15H522S**	**DU15H522D**	103H5208-0440	103H5208-0410	1.2A
		1.8	**DU15H524S**	**DU15H524D**	103H5210-0440	103H5210-0410	1.2A
		0.9	**DU15S141S**	**DU15S141D**	SH1421-0441	SH1421-0411	1.2A
		0.9	**DU15S142S**	**DU15S142D**	SH1422-0441	SH1422-0411	1.2A
		0.9	**DU15S144S**	**DU15S144D**	SH1424-0441	SH1424-0411	1.2A
	56mm 2.20inch	1.8	**DU16H711S**	**DU16H711D**	103H7121-0440	103H7121-0410	2A
		1.8	**DU16H713S**	**DU16H713D**	103H7123-0440	103H7123-0410	2A
		1.8	**DU16H716S**	**DU16H716D**	103H7126-0440	103H7126-0410	2A

Combination list of 2-phase bipolar driver

System type	Motor flange size	Basic step angle	Set part number		Motor model number		Rated current
			Single shaft	**Double shaft**	Single shaft	Double shaft	
Standard model	**28mm 1.10inch**	1.8	**DB14S281S**	**DB14S281D**	SH2281-5771	SH2281-5731	1A
		1.8	**DB14S285S**	**DB14S285D**	SH2285-5771	SH2285-5731	1A
	42mm 1.65inch	1.8	**DB14H521S**	**DB14H521D**	103H5205-5240	103H5205-5210	1A
		1.8	**DB14H522S**	**DB14H522D**	103H5208-5240	103H5208-5210	1A
		1.8	**DB14H524S**	**DB14H524D**	103H5210-5240	103H5210-5210	1A
		0.9	**DB16S141S**	**DB16S141D**	SH1421-5241	SH1421-5211	2A
		0.9	**DB16S142S**	**DB16S142D**	SH1422-5241	SH1422-5211	2A
		0.9	**DB16S144S**	**DB16S144D**	SH1424-5241	SH1424-5211	2A
	50mm 1.97inch	1.8	**DB16H671S**	**DB16H671D**	103H6701-5040	103H6701-5010	2A
		1.8	**DB16H672S**	**DB16H672D**	103H6703-5040	103H6703-5010	2A
	56mm 2.20inch	1.8	**DB16H711S**	**DB16H711D**	103H7121-5740	103H7121-5710	2A
		1.8	**DB16H713S**	**DB16H713D**	103H7123-5740	103H7123-5710	2A
		1.8	**DB16H716S**	**DB16H716D**	103H7126-5740	103H7126-5710	2A
	60mm 2.36inch	1.8	**DB16H781S**	**DB16H781D**	103H7821-5740	103H7821-5710	2A
		1.8	**DB16H782S**	**DB16H782D**	103H7822-5740	103H7822-5710	2A
		1.8	**DB16H783S**	**DB16H783D**	103H7823-5740	103H7823-5710	2A
		0.9	**DB16S161S**	**DB16S161D**	SH1601-5240	SH1601-5210	2A
		0.9	**DB16S162S**	**DB16S162D**	SH1602-5240	SH1602-5210	2A
		0.9	**DB16S163S**	**DB16S163D**	SH1603-5240	SH1603-5210	2A

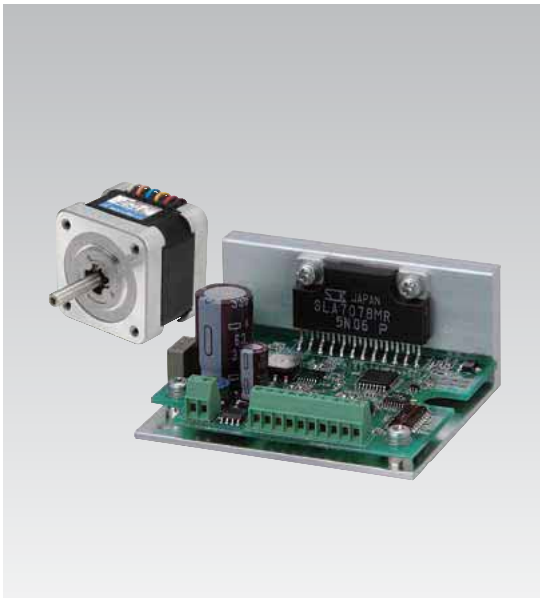
Standard model

F series driver + H or SH series motor

Unipolar

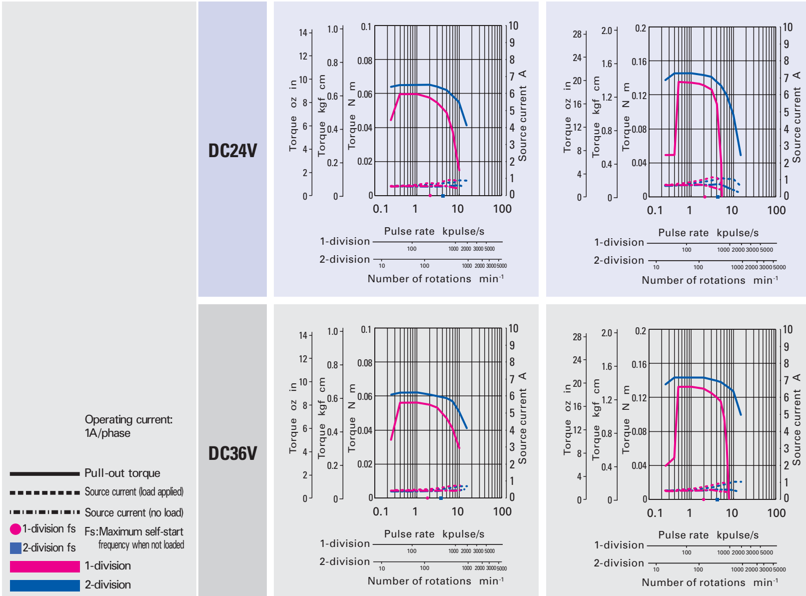
Motor flange size

□28 1.10inch □42 1.65inch □56 2.20inch



Size	Motor flange size		28mm 1.10inch /1.8	
	Motor length		32mm 1.26inch	51.5mm 2.03inch
Set part number	Single shaft		DU14S281S	DU14S285S
	Double shaft		DU14S281D	DU14S285D
Holding torque		N m oz in	0.055 7.79	0.115 16.28
Rotor inertia		10^{-4}kg m^2 oz in^2	0.01 0.05	0.022 0.12
Mass Weight		kg lbs	0.11 0.24	0.2 0.44
Allowable thrust load		N lbs	3 0.67	3 0.67
Allowable radial load Note1		N lbs	42 9.44	49 11.02

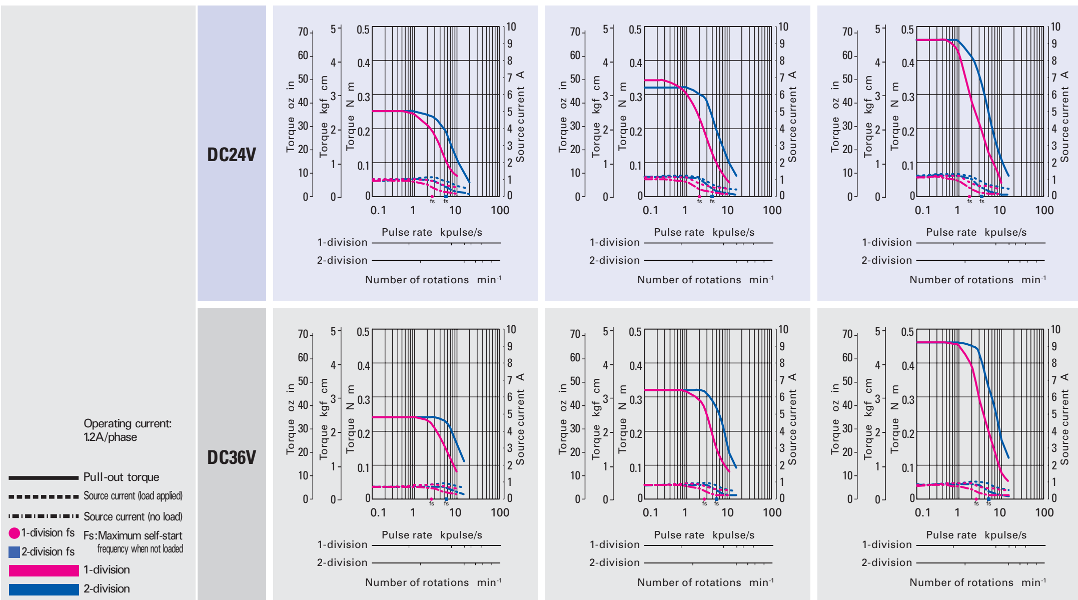
Note1 When load is applied at 1/3 length from output shaft edge.



The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

Size	Motor flange size		42mm 1.65inch /0.9		
	Motor length		33mm 1.30inch	39mm 1.54inch	48mm 1.89inch
Set part number	Single shaft		DU15S141S	DU15S142S	DU15S144S
	Double shaft		DU15S141D	DU15S142D	DU15S144D
Holding torque		N m oz in	0.2 28.32	0.29 41.07	0.39 55.23
Rotor inertia		10^{-4}kg m^2 oz in^2	0.044 0.24	0.066 0.361	0.089 0.487
Mass Weight		kg lbs	0.24 0.53	0.29 0.64	0.38 0.84
Allowable thrust load		N lbs	10 2.25	10 2.25	10 2.25
Allowable radial load Note1		N lbs	30 6	30 6	30 6

Note1 When load is applied at 1/3 length from output shaft edge.

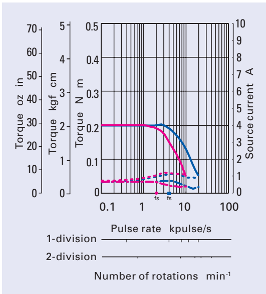


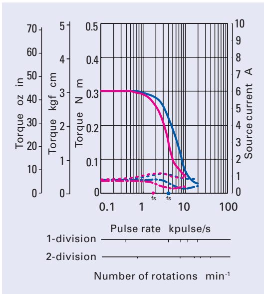
The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

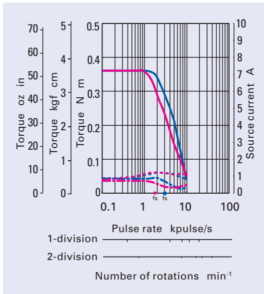
Size	Motor flange size	42mm 1.65inch /1.8		
	Motor length	33mm 1.30inch	39mm 1.54inch	48mm 1.89inch
Set part number	Single shaft	DU15H521S	DU15H522S	DU15H524S
	Double shaft	DU15H521D	DU15H522D	DU15H524D
Holding torque	N m oz in	0.2 28.32	0.3 42.48	0.37 52.39
Rotor inertia	10^{-4}kg m^2 oz in^2	0.036 0.20	0.056 0.31	0.072 0.34
Mass Weight	kg lbs	0.23 0.51	0.29 0.64	0.37 0.82
Allowable thrust load	N lbs	10 2.25	10 2.25	10 2.25
Allowable radial load Note1	N lbs	30 6	30 6	30 6

Note1 When load is applied at 1/3 length from output shaft edge.

DC24V

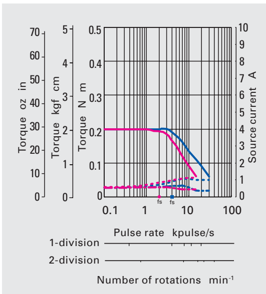


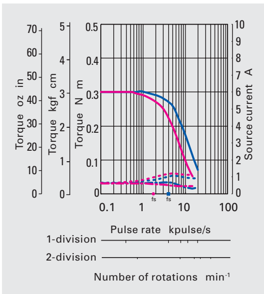


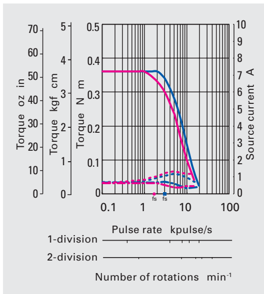


Operating current:
1.2A/phase

DC36V





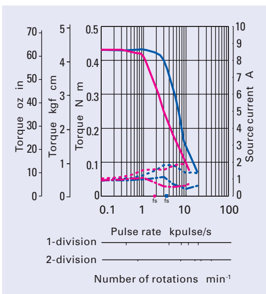


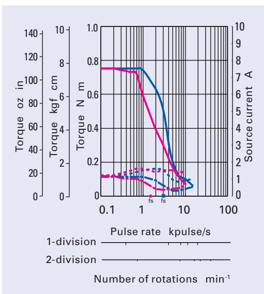
Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs
2-division fs
Fs:Maximum self-start frequency when not loaded
1-division
2-division

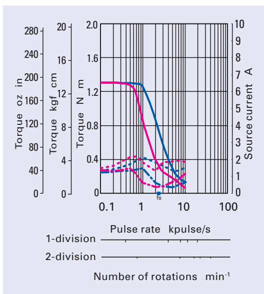
Size	Motor flange size	56mm 2.20inch /1.8		
	Motor length	41.8mm 1.65inch	53.8mm 2.12inch	75.8mm 2.98inch
Set part number	Single shaft	DU16H711S	DU16H713S	DU16H716S
	Double shaft	DU16H711D	DU16H713D	DU16H716D
Holding torque	N m oz in	0.39 55.23	0.83 117.5	1.27 179.8
Rotor inertia	10^{-4}kg m^2 oz in^2	0.1 0.55	0.21 1.15	0.36 1.97
Mass Weight	kg lbs	0.47 1.04	0.63 1.39	0.98 2.16
Allowable thrust load	N lbs	15 3.37	15 3.37	15 3.37
Allowable radial load Note1	N lbs	71 15	71 15	71 15

Note1 When load is applied at 1/3 length from output shaft edge.

DC24V

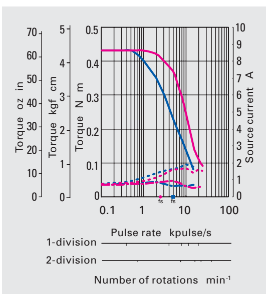


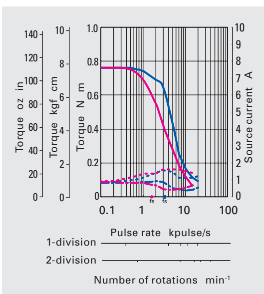


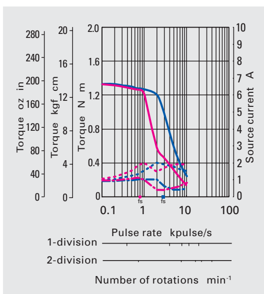


Operating current:
2A/phase

DC36V







Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs
2-division fs
Fs:Maximum self-start frequency when not loaded
1-division
2-division

Standard model

F series driver + H or SH series motor

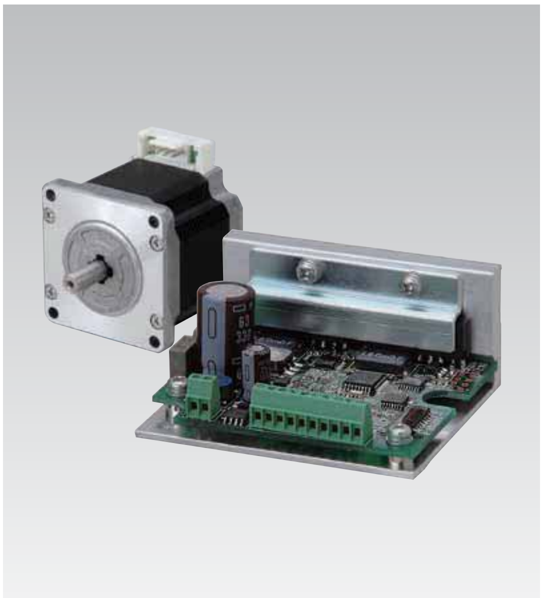
Bipolar

Motor flange size

□28 1.10inch, □42 1.65inch, □50 1.97inch, □56 2.20inch, □60 2.36inch

Size	Motor flange size		28mm 1.10inch /1.8	
	Motor length		32mm 1.26inch	51.5mm 2.03inch
Set part number	Single shaft		DB14S281S	DB14S285S
	Double shaft		DB14S281D	DB14S285D
Holding torque		N m oz in	0.07 9.91	0.145 20.53
Rotor inertia		10^{-4}kg m² oz in²	0.01 0.05	0.022 0.12
Mass Weight		kg lbs	0.11 0.24	0.2 0.44
Allowable thrust load		N lbs	3 0.67	3 0.67
Allowable radial load Note1		N lbs	42 9.44	49 9.44

Note1 When load is applied at 1/3 length from output shaft edge.

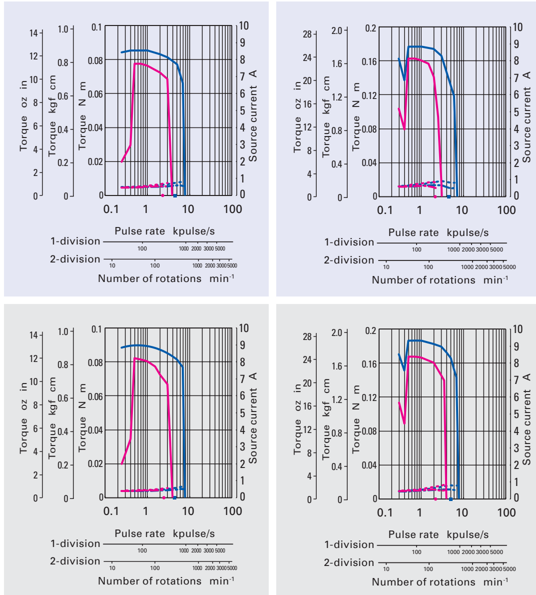


Operating current
28mm (1.10inch)/1.8 :1A/phase
42mm (1.65inch)/1.8 :1A/phase
42mm (1.65inch)/0.9 :2A/phase

Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs / 2-division fs — Fs:Maximum self-start frequency when not loaded
1-division
2-division

DC24V

DC36V



The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

Size	Motor flange size		42mm 1.65inch /0.9	50mm 1.97inch /1.8		56mm 2.20inch /1.8
	Motor length		48mm 1.89inch	39.8mm 1.57inch	51.3mm 2.02inch	41.8mm 1.65inch
Set part number	Single shaft		DB16S144S	DB16H671S	DB16H673S	DB16H711S
	Double shaft		DB16S144D	DB16H671D	DB16H673D	DB16H711D
Holding torque		N m oz in	0.48 67.97	0.28 39.6	0.49 69.4	0.39 55.2
Rotor inertia		10^{-4}kg m² oz in²	0.089 0.487	0.057 0.31	0.118 0.65	0.1 0.55
Mass Weight		kg lbs	0.38 0.84	0.35 0.77	0.5 1.10	0.47 1.04
Allowable thrust load		N lbs	10 2.25	15 3.37	15 3.37	15 3.37
Allowable radial load Note1		N lbs	30 6	99 22	99 22	71 15

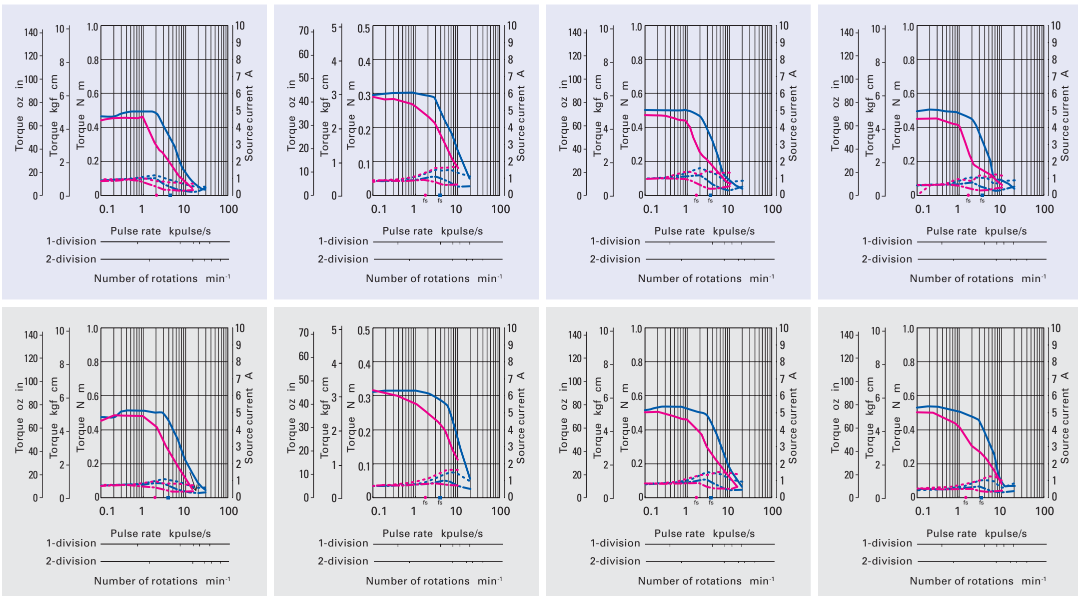
Note1 When load is applied at 1/3 length from output shaft edge.

DC24V

DC36V

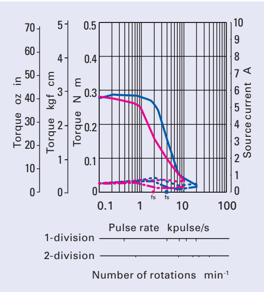
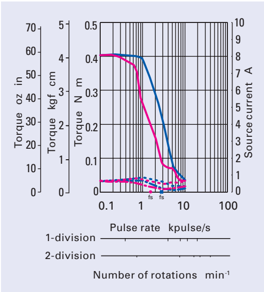
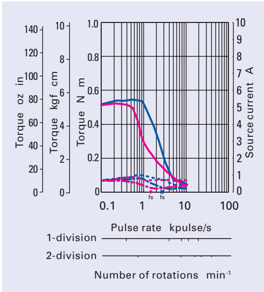
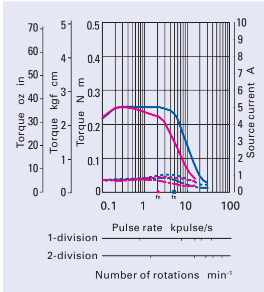
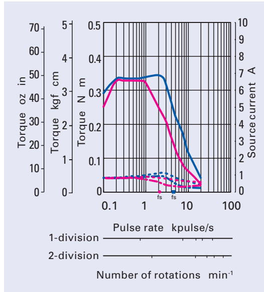
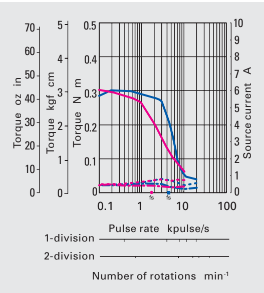
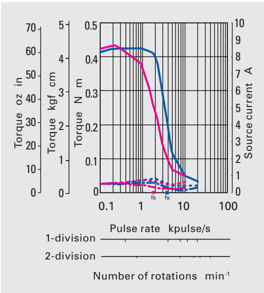
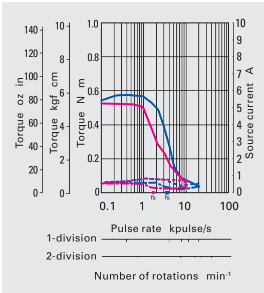
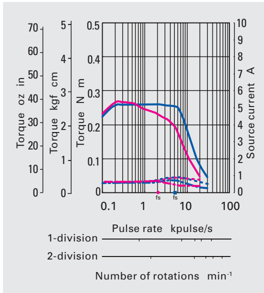
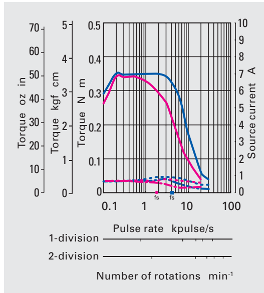
Operating current:
2A/phase

Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs / 2-division fs — Fs:Maximum self-start frequency when not loaded
1-division
2-division

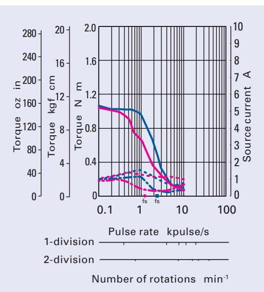
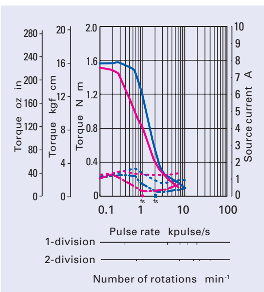
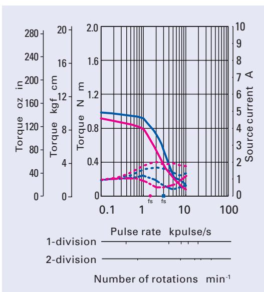
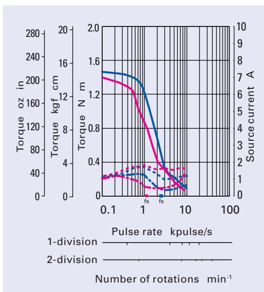
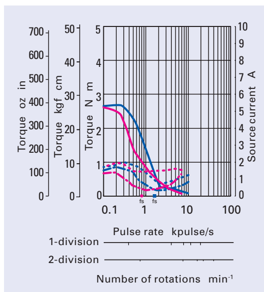
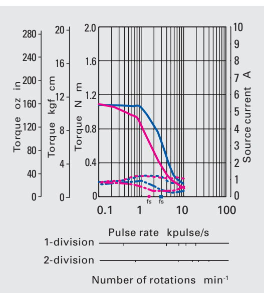
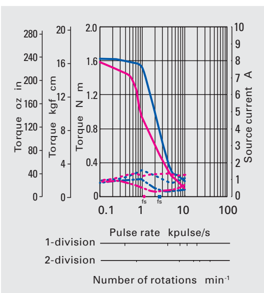
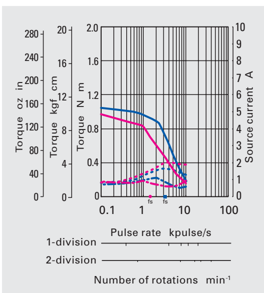
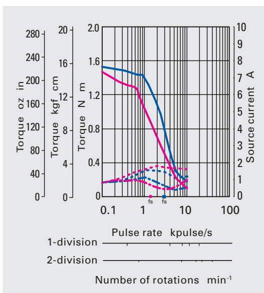
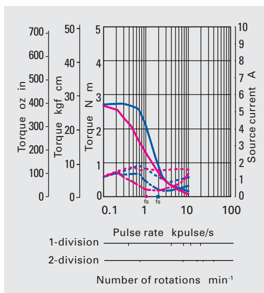


The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

42mm 1.65inch /1.8			42mm 1.65inch /0.9	
33mm 1.30inch	39mm 1.54inch	48mm 1.89inch	33mm 1.30inch	39mm 1.54inch
DB14H521S	DB14H522S	DB14H524S	DB16S141S	DB16S142S
DB14H521D	DB14H522D	DB14H524D	DB16S141D	DB16S142D
0.265 37.53	0.39 55.23	0.51 72.22	0.23 32.57	0.34 48.15
0.036 0.20	0.056 0.31	0.072 0.34	0.044 0.24	0.066 0.361
0.23 0.51	0.29 0.64	0.37 0.82	0.24 0.53	0.29 0.64
10 2.25	10 2.25	10 2.25	10 2.25	10 2.25
30 6	30 6	30 6	30 6	30 6

56mm 2.20inch /1.8		60mm 2.36inch /1.8		
53.8mm 2.12inch	75.8mm 2.98inch	44.8mm 1.76inch	53.8mm 2.12inch	85.8mm 3.38inch
DB16H713S	DB16H716S	DB16H781S	DB16H782S	DB16H783S
DB16H713D	DB16H716D	DB16H781D	DB16H782D	DB16H783D
0.83 117.5	1.27 179.8	0.88 124.6	1.37 194.0	2.7 382.3
0.21 1.15	0.36 1.97	0.275 1.50	0.4 2.19	0.84 4.59
0.65 1.43	0.98 2.16	0.6 1.32	0.77 1.70	1.34 2.95
15 3.37	15 3.37	15 3.37	15 3.37	15 3.37
71 15	71 15	95 21	95 21	95 21

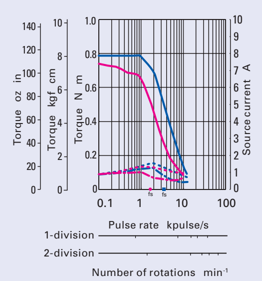











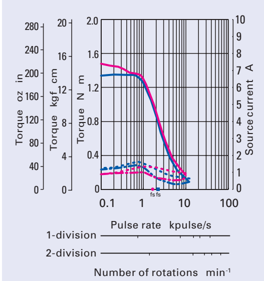
DC input Specifications

Size	Motor flange size		60mm 2.36inch /0.9	
	Motor length		42mm 16.54inch	54mm 21.26inch
Set part number	Single shaft		DB16S161S	DB16S162S
	Double shaft		DB16S161D	DB16S162D
Holding torque		N m oz in	0.69 97.71	1.28 181.26
Rotor inertia		10^{-4}kg m² oz in²	0.24 1.312	0.4 2.187
Mass Weight		kg lbs	0.55 1.21	0.8 1.76
Allowable thrust load		N lbs	15 3.37	15 3.37
Allowable radial load Note1		N lbs	79 18	79 18

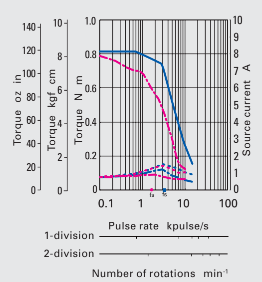
Note1 When load is applied at 1/3 length from output shaft edge.

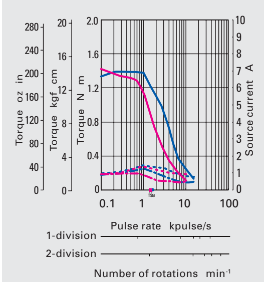
DC24V





DC36V





Operating current: 2A/phase

Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs
2-division fs
Fs:Maximum self-start frequency when not loaded
1-division
2-division

The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

Specifications of Drivers

Unipolar

Model number			US1D200P10
Basic specifications	Input source		DC24 V / 36 V 10
	Source current		3 A
	Environment	Protection class	Class III
		Operation environment	Installation category over-voltage category : I, pollution degree : 2
		Applied standards	EN61010-1 UL508C
		Ambient operation temperature	0 to +50
		Conservation temperature	-20 to +70
		Operating ambient humidity	35 to 85% RH no condensation
		Conservation humidity	10 to 90% RH no condensation
		Operation altitude	2000 m 6560 feet or less above sea level
		Vibration resistance	Tested under the following conditions; 4.9 m/s^2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .
		Withstand voltage	Not influenced when 1500 V AC is applied between power input terminal and cabinet for one minute.
		Insulation resistance	10 M MIN. when measured with 500V DC megohmmeter between input terminal and cabinet.
	Mass Weight		0.08 kg 0.18 lbs
Functions	Selection functions		Step angle, Pulse input mode, Step current, Operating current.
	Protection functions		Open phase protection, Main circuit power souce voltage decrease
	LED indication		Power monitor, alarm
I/O signals	Command pulse input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5 V, input-signal L level : 0 to 0.5 V Maximum input frequency : 150 kpulse/s
	Poweer down input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5V, input-signal L level : 0 to 0.5 V
	Phase origin monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.
	Rotation monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.

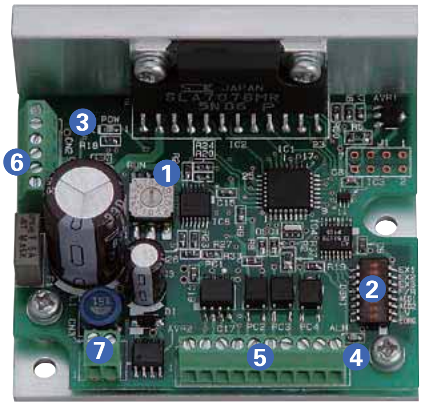
Bipolar

Model number			BS1D200P10
Basic specifications	Input source		DC24 V / 36 V 10
	Source current		3 A
	Environment	Protection class	Class III
		Operation environment	Installation category over-voltage category : I, pollution degree : 2
		Applied standards	EN61010-1 UL508C
		Ambient operation temperature	0 to +50
		Conservation temperature	-20 to +70
		Operating ambient humidity	35 to 85% RH no condensation
		Conservation humidity	10 to 90% RH no condensation
		Operation altitude	2000 m 6560 feet or less above sea level
		Vibration resistance	Tested under the following conditions; 4.9m/s^2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .
		Withstand voltage	Not influenced when 1500 V AC is applied between power input terminal and cabinet for one minute.
		Insulation resistance	10 M MIN. when measured with 500 V DC megohmmeter between input terminal and cabinet.
	Mass Weight		0.08 kg 0.18 lbs
Functions	Selection functions		Step angle, Pulse input mode, Step current, Operating current.
	Protection functions		Open phase protection, Main circuit power souce voltage decrease
	LED indication		Open phase protection, Power monitor, alarm
I/O signals	Command pulse input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5 V, input-signal L level : 0 to 0.5 V Maximum input frequency : 150 kpulse/s
	Poweer down input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5V, input-signal L level : 0 to 0.5 V
	Phase origin monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.
	Rotation monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.

Operation, Connection, and Function

Each section name of the drivers

Unipolar



❶ Driving current selection switch RUN
You can select the value of the motor current when driving.

Dial	0	1	2	3	4	5	6	7
Stepping motor current A	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
Dial	8	9	A	B	C	D	E	F
Stepping motor current A	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5

The factory setting is F (0.5A).
Select the current after checking the rated current of the combination motor.

❷ Function selection DIP switchpack
Select the function depending on your specification.

❸ LED for power supply monitor POW
Lit up when the main circuit power supply is connected.

Indicator	Explanation
POW is displayed.	Main circuit power supply is switched on.

❹ LED for alarm display ALM
Lit when an alarm is generated.

Indicator	Explanation
ALM is displayed.	Motor cable is broken, or switching element in driver is faulty. The main circuit voltage is out of specifications range (Less than DC19V).

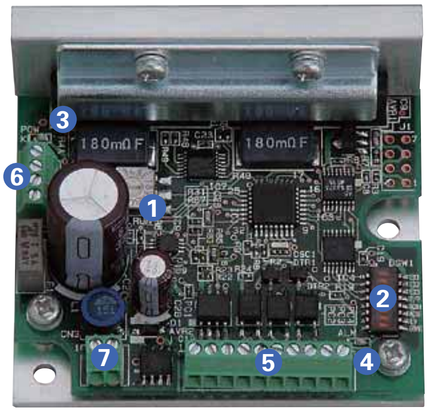
When ALM is displayed, the winding current of the stepping motor is cut off and it is in a non-excitation state. At the same time, an output signal is transmitted from the alarm output terminal (AL) to an external source. When the alarm circuit is operating, this state is maintained until it is reset by switching on the power supply again. When an alarm condition has occurred, please take corrective actions to rectify the cause of the alarm before switching on the power supply again.

❺ I/O signal connector CN1
Connect the I/O signal.

❻ Motor connector CN2
Connect the motor s power line.

❼ Power supply connector CN3
Connect the main circuit power supply.

Bipolar



❶ Driving current selection switch RUN
You can select the value of the motor current when driving.

Dial	0	1	2	3	4	5	6	7
Stepping motor current A	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
Dial	8	9	A	B	C	D	E	F
Stepping motor current A	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5

The factory setting is F (0.5A).
Select the current after checking the rated current of the combination motor.

❷ Function selection DIP switchpack
Select the function depending on your specification.

❸ LED for power supply monitor POW
Lit up when the main circuit power supply is connected.

Indicator	Explanation
POW is displayed.	Main circuit power supply is switched on.

❹ LED for alarm display ALM
Lit when an alarm is generated.

Indicator	Explanation
ALM is displayed.	Motor cable is broken, or switching element in driver is faulty. The main circuit voltage is out of specifications range (Less than DC19V).

When ALM is displayed, the winding current of the stepping motor is cut off and it is in a non-excitation state. At the same time, an output signal is transmitted from the alarm output terminal (AL) to an external source. When the alarm circuit is operating, this state is maintained until it is reset by switching on the power supply again. When an alarm condition has occurred, please take corrective actions to rectify the cause of the alarm before switching on the power supply again.

❺ I/O signal connector CN1
Connect the I/O signal.

❻ Motor connector CN2
Connect the motor s power line.

❼ Power supply connector CN3
Connect the main circuit power supply.

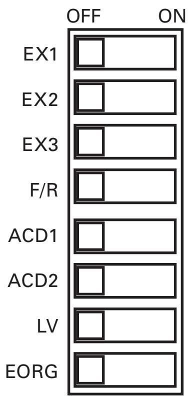
Specification summary of CN1 I/O signal

Signal name	CN1 Pin number	Function
CW pulse input standard	1 2	When using 2-input mode Drive pulse for the CW direction rotation is input.
Pulse column input	1 2	When using Pulse and direction mode Drive pulse train for the stepping motor rotation is input.
CCW pulse input standard	3 4	When using 2-input mode Drive pulse for the CCW direction rotation is input.
Rotation direction input	3 4	The rotation direction signal of stepping motor is input for the Pulse and direction mode . Internal photocoupler ON CW direction Internal photocoupler OFF CCW direction
Power down input	5 6	Inputting the PD signal cuts OFF the current flowing through the stepping motor. Iinternal photocoupler ON PD function enabled Iinternal photocoupler OFF PD function disabled
Phase origin monitor output	7 8	It is turned ON when the excitation phase is at the origin in the state when the power is turned ON It is turned ON once per 4 pulses when setting to HALF step. It is turned ON once per 8 pulses when setting to FULL step.
Alarm output	9 10	The signal is externally output when one of several alarm circuits operates in the PM driver. At this time, the stepping motor is in the unexcited state.

The CW rotation direction of stepping motor means the clockwise direction rotation as viewed from the output shaft side flange side . The CCW rotation direction means the counterclockwise direction rotation as viewed from the output shaft side flange side .

❷ Input circuit configuration　CW and CCW Pulse input

Functions can be selected according to the specification with the dip switch.
Check that the ex-factory settings are as follows.



EX1	OFF	Partition number: 8
EX2	OFF	
EX3	OFF	
F/R	OFF	Input method 2 (CW/CCW pulse input)
ACD1	OFF	Stopping current: 40% of driving current
ACD2	OFF	
LV	OFF	Micro step operation
EORG	OFF	Phase origin

Step angle select　EX1　EX2　EX3

Select the partition number of the basic step angle.

EX1	EX2	EX3	Partition number
ON	ON	ON	1-division
OFF	ON	OFF	2-division
ON	OFF	OFF	4-division
OFF	OFF	OFF	8-division
OFF	OFF	ON	16-division

Input method select　F/R

Selects input pulse type

F/R	Input pulse type
ON	1 input　Pluse&direction
OFF	2 input　CW, CCW

Current selection when stopping　ACD1　ACD2

Select the current value of the motor when stopping.

ACD2	ACD1	Current value of the motor
ON	ON	100% of driving current
ON	OFF	60% of driving current
OFF	ON	50% of driving current
OFF	OFF	40% of driving current

Initial configuration of factory shipment is set to 40% of rated value. Driver and motor should be operated at around 50% of rated value to reduce heat.

Low-vibration mode select　LV

Provides low-vibration, smooth operation even if resolution is rough　1-division, 2-division, etc

LV	Operation
ON	Auto-micro function
OFF	Micro-step

Excitation select　EORG

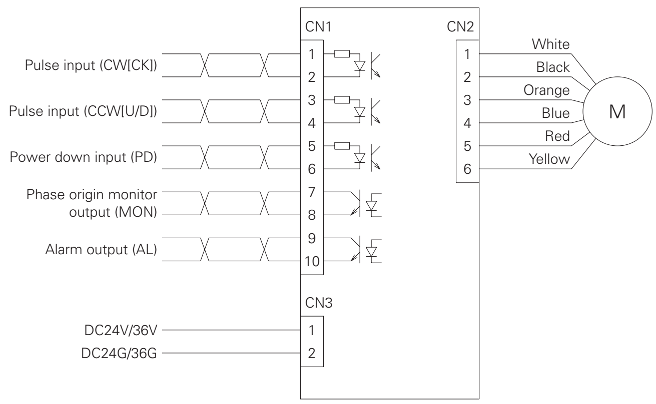
The excitation phase when the power supply is turned on is selected.

EORG	Original excitation phase
ON	Excitation phase at power shut off
OFF	Phase origin

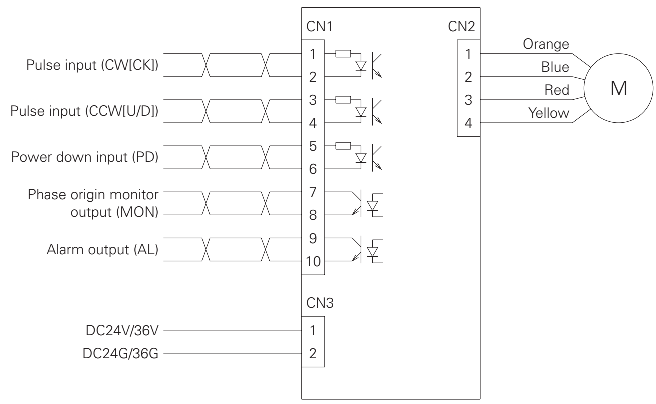
By turning on the EORG, excitation phase when power OFF will be saved. Therefore, there will be no shaft displacement when turning the power ON.

❺❻❼ External wiring diagram

Unipolar



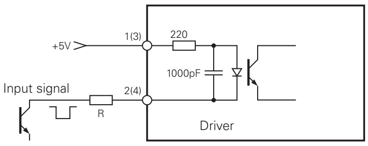
Bipolar



Applicable Wire Sizes

Part	Wire size	Allowable wire length
For power supply	AWG22(0.3 mm²)	2 m MAX.
For input/output signal	AWG24(0.2 mm²) to AWG22(0.3 mm²)	2 m MAX.
For motor	AWG22(0.3 mm²)	3 m MAX.

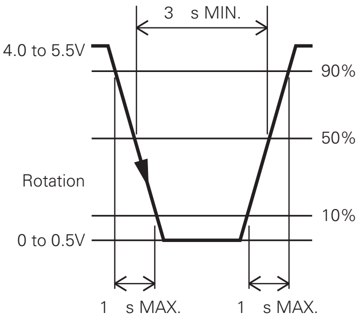
Input circuit configuration of CW CK , CCW U/D



- Pulse duty 50% MAX.
- Maximum input frequency:150kpulse/s
- When the crest value of the input signal exceeds 5V, use the external limit resistance R to limit the input current to approximately 15mA.

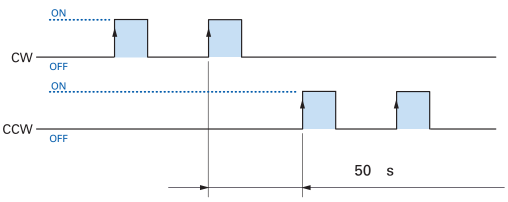
Input signal specifications

Photo coupler type



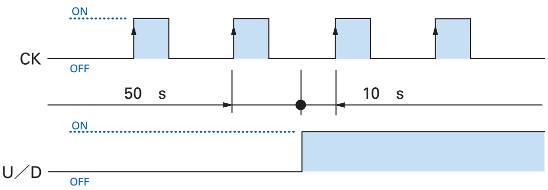
Timing of the command pulse

2-input mode CW, CCW



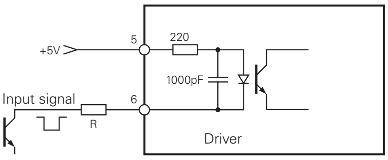
- Shaded area indicates internal photo coupler ON . Internal circuit motor starts operating at leading edge of the photo coupler ON .
- To apply pulse to CW, set CCW side internal photo coupler to OFF .
- To apply pulse to CCW, set CW side internal photo coupler to OFF .

1 input type CW, CCW



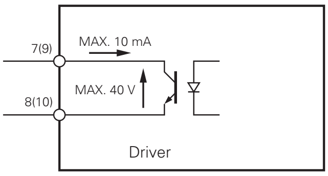
- Shaded area indicates internal photo coupler ON . Internal circuit motor starts operating at leading edge of CK side photo coupler ON .
- Switching of U/D input signal must be done while CK side internal photo coupler is OFF .

Input circuit configuration of PD

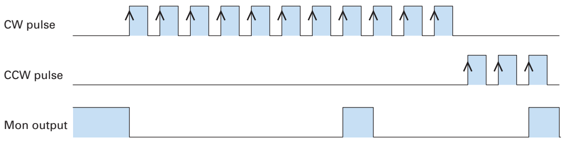


- When the crest value of the input signal exceeds 5V, use the external limit resistance R to limit the input current to approximately 15mA.

Output signal configuration of MON, AL



MON output



- Photo coupler at phase origin of motor excitation is set to ON . setting when number of divisions is 2
- Output from MON is set to on at every 7.2 degrees of motor output shaft from phase origin.

2-phase stepping motor

28mmsq. 1.10inch sq.

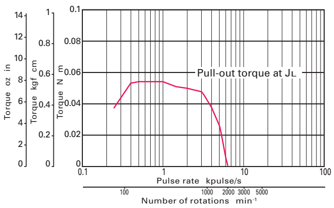
SH228
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH2281-5171	**-5131**	0.055 7.79	0.5	10.5	3.7	0.01 0.05	0.11 0.24
SH2281-5271	**-5231**	0.055 7.79	1	2.85	1	0.01 0.05	0.11 0.24
SH2285-5171	**-5131**	0.115 16.28	0.5	16.5	7.1	0.022 0.12	0.2 0.44
SH2285-5271	**-5231**	0.115 16.28	1	4.1	1.9	0.022 0.12	0.2 0.44

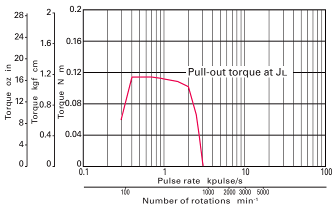
Pulse rate-torque characteristics

SH2281-51



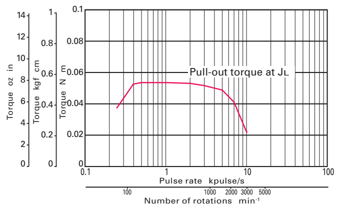
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

SH2285-51



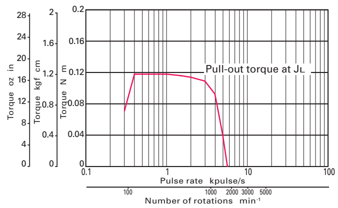
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

SH2281-52



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

SH2285-52



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

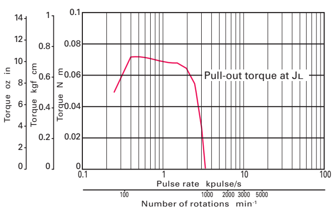
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH2281-5671	**-5631**	0.07 9.91	0.5	10.5	7.2	0.01 0.05	0.11 0.24
SH2281-5771	**-5731**	0.07 9.91	1	2.6	1.85	0.01 0.05	0.11 0.24
SH2285-5671	**-5631**	0.145 20.53	0.5	15	13.5	0.022 0.12	0.2 0.44
SH2285-5771	**-5731**	0.145 20.53	1	3.75	3.4	0.022 0.12	0.2 0.44

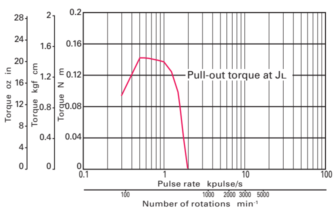
Pulse rate-torque characteristics

SH2281-56



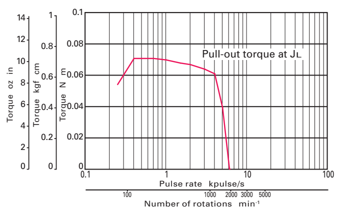
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

SH2285-56



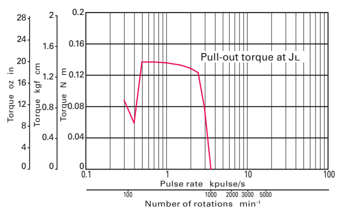
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

SH2281-57



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

SH2285-57



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m² (1.80 oz in²) pulley balancer method]

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

35mm sq. 1.38inch sq.

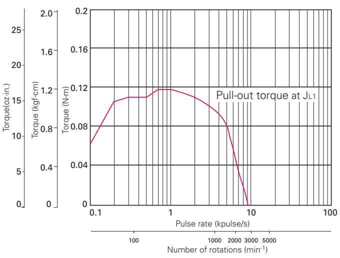
SH35
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH3533-12U40	**-12U10**	0.12 16.99	1.2	2.4	1.3	0.02 1.09	0.17 0.37
SH3537-12U40	**-12U10**	0.15 21.24	1.2	2.7	2	0.025 1.37	0.2 0.44
SH3552-12U40	**-12U10**	0.23 32.57	1.2	3.4	2.8	0.043 2.35	0.3 0.66

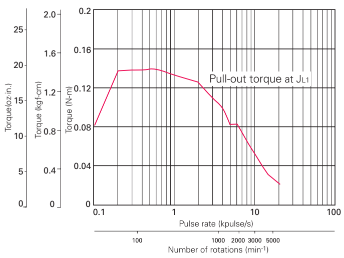
Pulse rate-torque characteristics

SH3533-12U



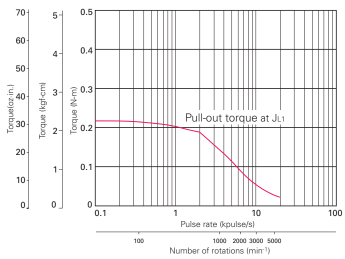
Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.33 10^{-4}kg m² (1.80 oz in²) Use the rubber coupling]

SH3537-12U



Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.33 10^{-4}kg m² (1.80 oz in²) Use the rubber coupling]

SH3552-12U



Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.94 10^{-4}kg m² (5.14 oz in²) Use the rubber coupling]

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

SS242

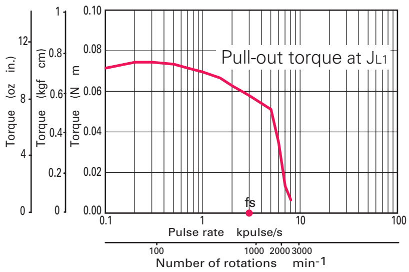
1.8 / step Bipolar winding

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SS2421-5041	**-5011**	0.083 11.75	1	3.5	1.2	0.015 0.082	0.07 0.15
SS2422-5041	**-5011**	0.186 26.33	1	5.4	2.9	0.028 0.153	0.14 0.31
SS2423-5041	**-5011**	0.240 33.98	1	7.3	5	0.038 0.208	0.20 0.44

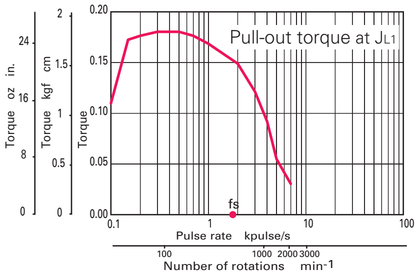
Pulse rate-torque characteristics

SS2421-50



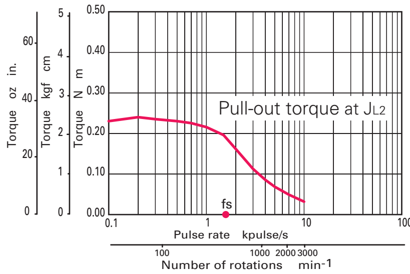
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.33x10^{-4}kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10^{-4}kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

SS2422-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.33x10^{-4}kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10^{-4}kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

SS2423-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.33x10^{-4}kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10^{-4}kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

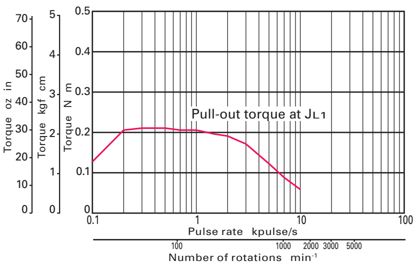
SH142
0.9 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH1421-0441	**-0411**	0.20 28.32	1.2	2.7	3.2	0.044 0.241	0.24 0.53
SH1422-0441	**-0411**	0.29 41.07	1.2	3.1	5.3	0.066 0.361	0.29 0.64
SH1424-0441	**-0411**	0.39 55.23	1.2	3.5	5.3	0.089 0.487	0.38 0.84

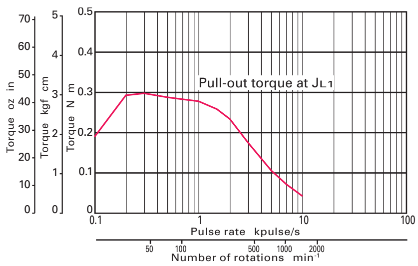
Pulse rate-torque characteristics

SH1421-04



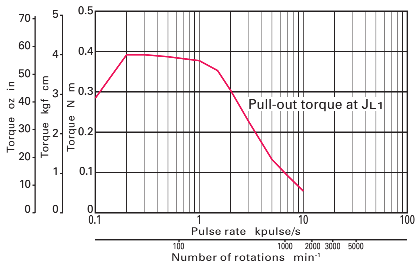
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² Use the rubber coupling

SH1422-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² Use the rubber coupling

SH1424-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² Use the rubber coupling

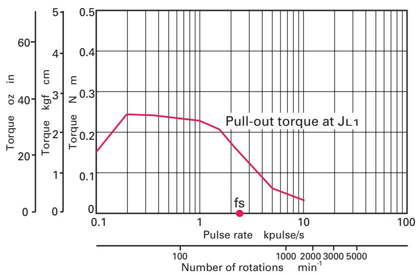
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding　Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass　Weight
Single shaft	Double shafts	[N　m　oz　in　MIN.]	A/phase	/phase	mH/phase	[　10⁻⁴kg　m²　oz　in²　]	[kg　lbs　]
SH1421-5041	**-5011**	0.23　32.5	1	3.3	8.0	0.044　0.24	0.24　0.53
SH1421-5241	**-5211**	0.23　32.5	2	0.85	2.1	0.044　0.24	0.24　0.53
SH1422-5041	**-5011**	0.34　48.1	1	4.0	14.0	0.066　0.36	0.29　0.64
SH1422-5241	**-5211**	0.34　48.1	2	1.05	3.6	0.066　0.36	0.29　0.64
SH1424-5041	**-5011**	0.48　67.9	1	4.7	15.0	0.089　0.49	0.38　0.84
SH1424-5241	**-5211**	0.48　67.9	2	1.25	3.75	0.089　0.49	0.38　0.84

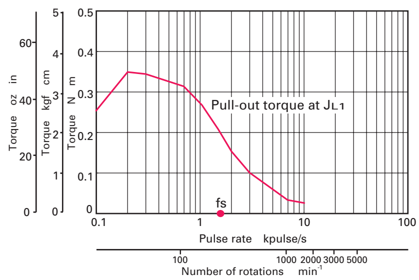
Pulse rate-torque characteristics

SH1421-50



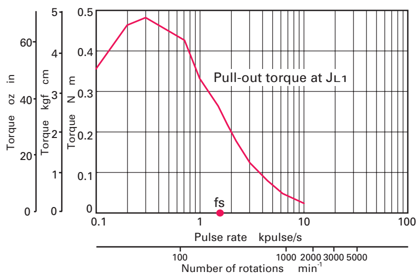
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10⁻⁴kg　m²　5.14 oz　in²　Use the rubber coupling

SH1422-50



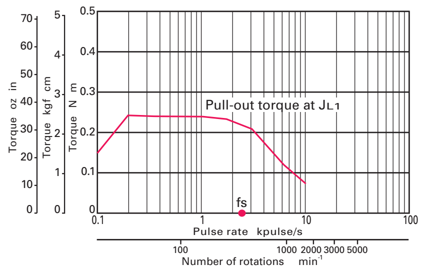
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10⁻⁴kg　m²　5.14 oz　in²　Use the rubber coupling

SH1424-50



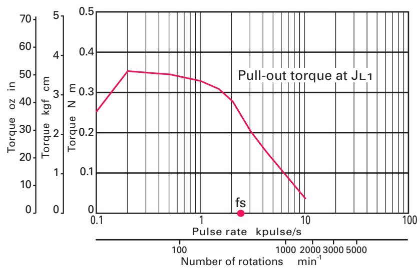
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10⁻⁴kg　m²　5.14 oz　in²　Use the rubber coupling

SH1421-52



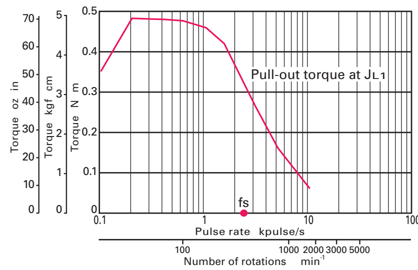
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10⁻⁴kg　m²　5.14 oz　in²　Use the rubber coupling

SH1422-52



Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10⁻⁴kg　m²　5.14 oz　in²　Use the rubber coupling

SH1424-52



Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10⁻⁴kg　m²　5.14 oz　in²　Use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

103H52
1.8 /step

Unipolar winding Connector type

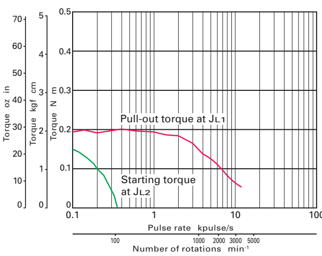
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H5205-0440	**-0410**	0.2 28.32	1.2	2.4	2.3	0.036 0.20	0.23 0.51
103H5208-0440	**-0410**	0.3 42.48	1.2	2.9	3.4	0.056 0.31	0.29 0.64
103H5209-0440	**-0410**	0.32 45.31	1.2	3	3.9	0.062 0.34	0.31 0.68
103H5210-0440	**-0410**	0.37 52.39	1.2	3.3	3.4	0.074 0.40	0.37 0.82

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H5205-5040	**-5010**	0.23 32.57	0.25	54	78	0.036 0.20	0.23 0.51
103H5205-5140	**-5110**	0.25 35.40	0.5	13.4	23.4	0.036 0.20	0.23 0.51
103H5205-5240	**-5210**	0.265 37.53	1	3.4	6.5	0.036 0.20	0.23 0.51
103H5208-5040	**-5010**	0.35 49.56	0.25	66	116	0.056 0.31	0.29 0.64
103H5208-5140	**-5110**	0.38 53.81	0.5	16.5	34	0.056 0.31	0.29 0.64
103H5208-5240	**-5210**	0.39 55.23	1	4.1	9.5	0.056 0.31	0.29 0.64
103H5209-5040	**-5010**	0.38 53.81	0.25	71.4	133	0.062 0.34	0.31 0.68
103H5209-5140	**-5110**	0.41 58.06	0.5	18.2	39	0.062 0.34	0.31 0.68
103H5209-5240	**-5210**	0.425 60.18	1	4.4	11	0.062 0.34	0.31 0.68
103H5210-5040	**-5010**	0.465 65.85	0.25	80	123.3	0.074 0.40	0.37 0.82
103H5210-5140	**-5110**	0.49 69.39	0.5	20	35	0.074 0.40	0.37 0.82
103H5210-5240	**-5210**	0.51 72.22	1	4.8	9.5	0.074 0.40	0.37 0.82

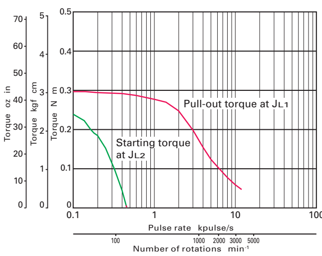
Pulse rate-torque characteristics

103H5205-04



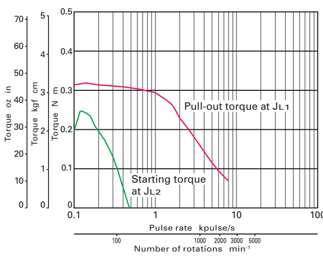
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H5208-04



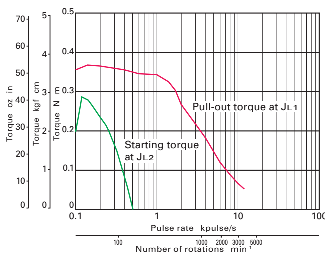
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H5209-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

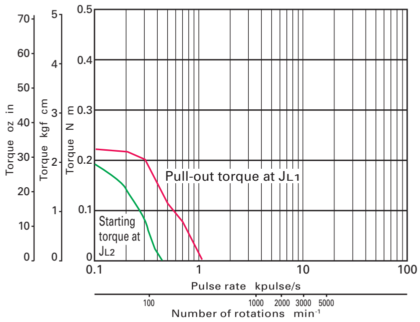
103H5210-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

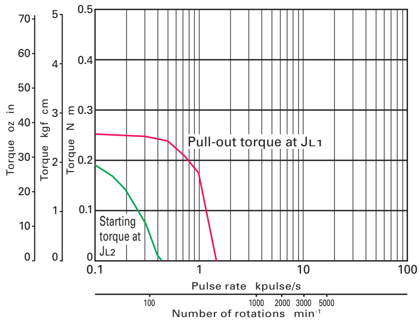
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

103H5205-50



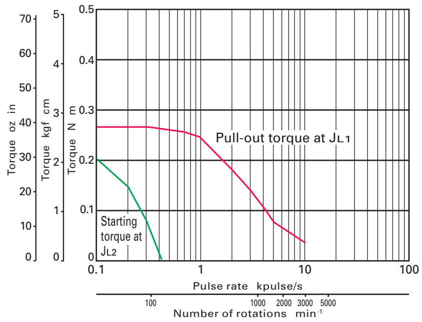
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5205-51



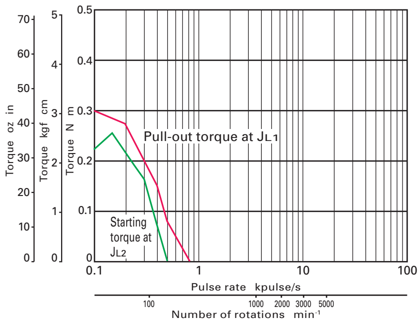
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5205-52



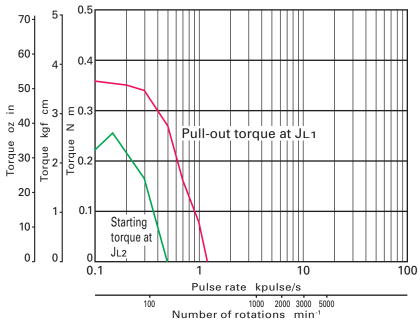
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-50



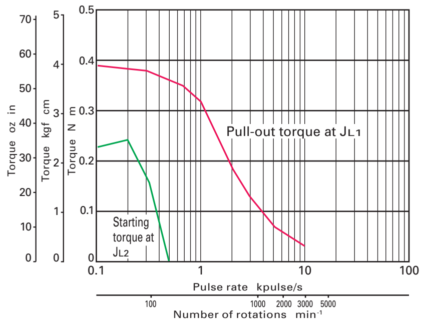
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-51



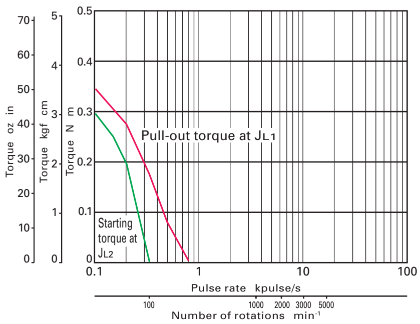
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-52



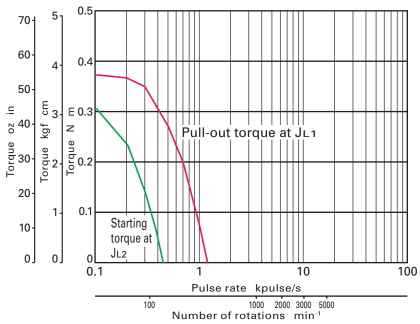
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-50



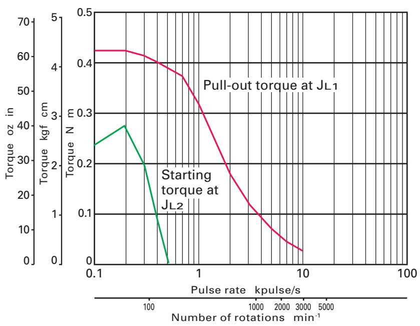
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-51



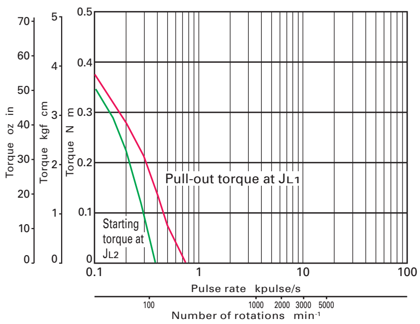
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-52



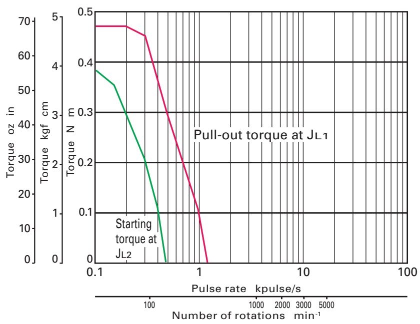
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-50



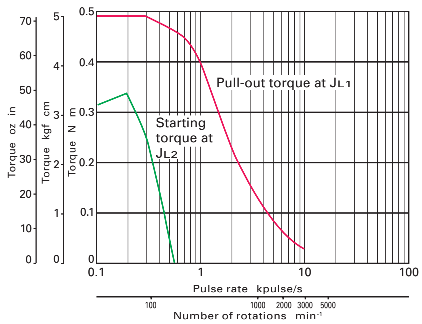
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-51



Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-52



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

50mm sq. 1.97inch sq.

SS250

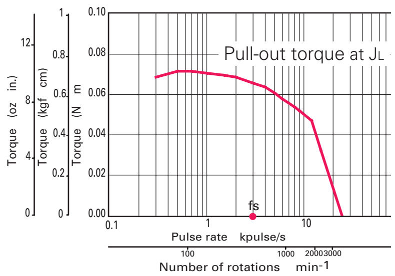
1.8 / step Bipolar winding

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SS2501-5041	**-5011**	0.1 14.16	1	4.5	1.8	0.026 0.142	0.09 0.20
SS2502-5041	**-5011**	0.215 30.44	1	5.9	3.2	0.049 0.268	0.15 0.33

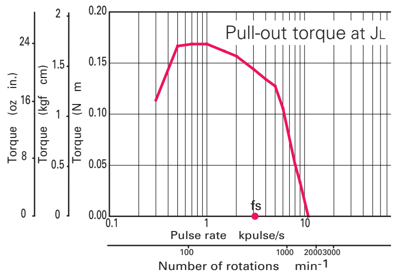
Pulse rate-torque characteristics

SS2501-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 1-2-phase energization half-step
JL = 0.01x10^{-4}kg m² 0.055 oz in² Pulley barancer system
fs: No load maximum starting pulse rate

SS2502-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 1-2-phase energization half-step
JL = 0.01x10^{-4}kg m² 0.055 oz in² Pulley barancer system
fs: No load maximum starting pulse rate

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

50mm sq. 1.97inch sq.

103H670
1.8 /step

Unipolar winding Lead wire type

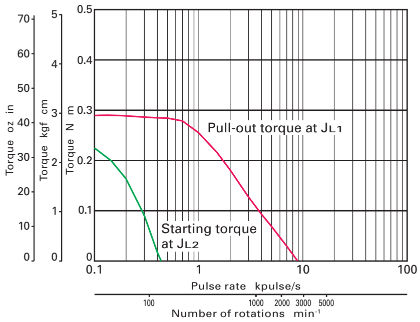
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H6701-0140	**-0110**	0.28 39.6	1	4.3	6.8	0.057 0.31	0.35 0.77
103H6701-0440	**-0410**	0.28 39.6	2	1.1	1.6	0.057 0.31	0.35 0.77
103H6701-0740	**-0710**	0.28 39.6	3	0.6	0.7	0.057 0.31	0.35 0.77
103H6703-0140	**-0110**	0.49 69.4	1	6	13	0.118 0.65	0.5 1.10
103H6703-0440	**-0410**	0.49 69.4	2	1.6	3.2	0.118 0.65	0.5 1.10
103H6703-0740	**-0710**	0.49 69.4	3	0.83	1.4	0.118 0.65	0.5 1.10
103H6704-0140	**-0110**	0.53 75.1	1	6.5	16.5	0.14 0.77	0.55 1.21
103H6704-0440	**-0410**	0.52 73.6	2	1.7	3.8	0.14 0.77	0.55 1.21
103H6704-0740	**-0710**	0.53 75.1	3	0.9	1.7	0.14 0.77	0.55 1.21

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H6701-5040	**-5010**	0.28 39.6	2	0.6	1.6	0.57 0.31	0.35 0.77
103H6703-5040	**-5010**	0.09 12.7	2	0.8	3.2	0.118 0.65	0.5 1.10
103H6704-5040	**-5010**	0.52 73.6	2	0.9	3.8	0.14 0.77	0.55 1.21

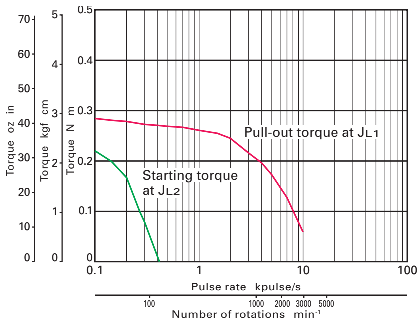
Pulse rate-torque characteristics

103H6701-01



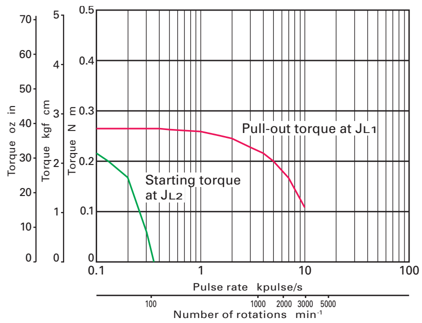
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-04



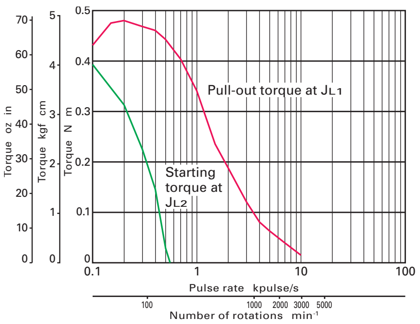
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-07



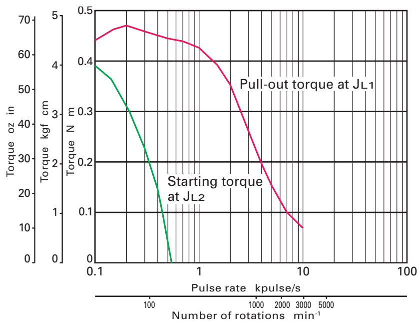
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-01



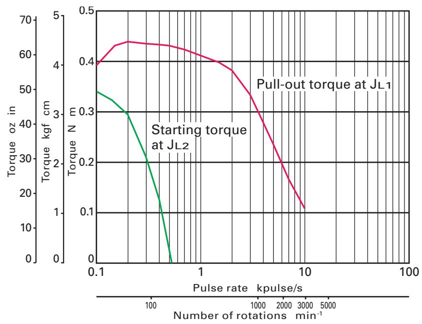
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-04



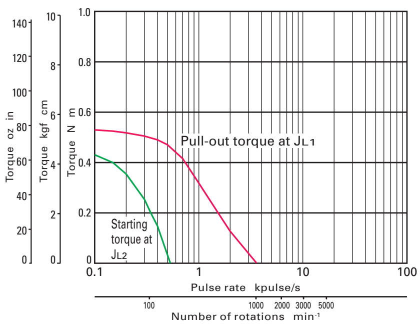
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-07



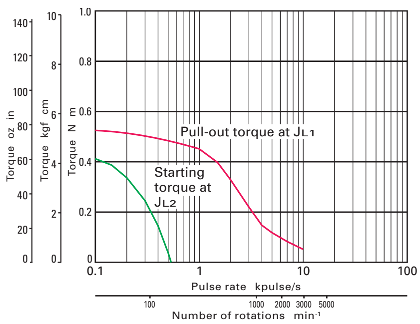
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-01



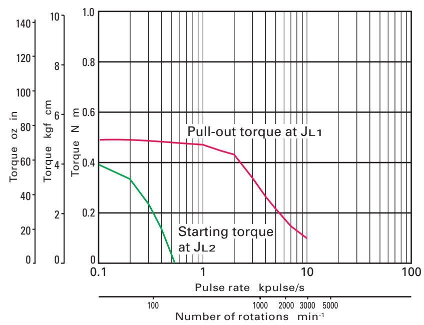
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-04



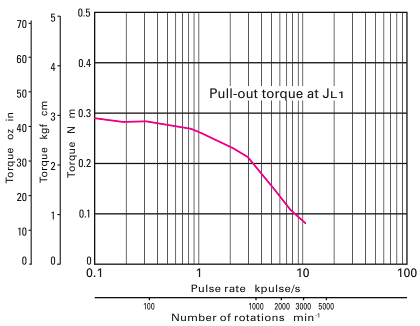
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-07



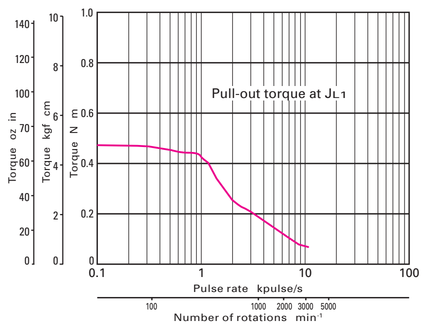
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-50



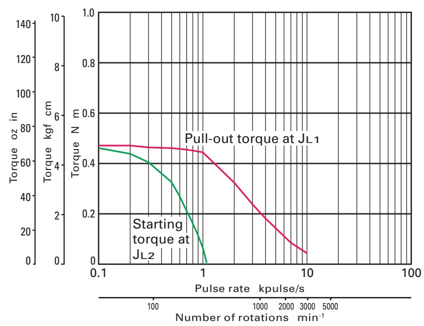
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling

103H6703-50



Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling

103H6704-50



Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.14x10^{-4}kg m^2 0.77 oz in^2 pulley balancer method

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

56mm sq. 2.20inch sq.

103H712
1.8 /step

Unipolar winding Lead wire type

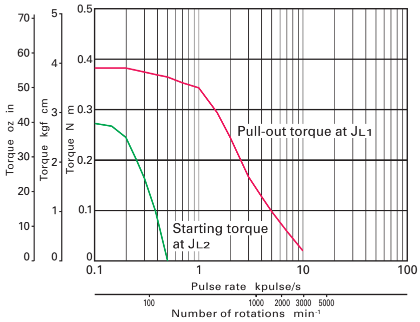
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H7121-0140	**-0110**	0.39 55.2	1	4.8	8	0.1 0.55	0.47 1.04
103H7121-0440	**-0410**	0.39 55.2	2	1.25	1.9	0.1 0.55	0.47 1.04
103H7121-0740	**-0710**	0.39 55.2	3	0.6	0.8	0.1 0.55	0.47 1.04
103H7123-0140	**-0110**	0.83 117.	1	6.7	15	0.21 1.15	0.65 1.43
103H7123-0440	**-0410**	0.83 117.5	2	1.6	3.8	0.21 1.15	0.65 1.43
103H7123-0740	**-0710**	0.78 110.5	3	0.77	1.58	0.21 1.15	0.65 1.43
103H7124-0140	**-0110**	0.98 138.8	1	7	14.5	0.245 1.34	0.8 1.76
103H7124-0440	**-0410**	0.98 138.8	2	1.7	3.1	0.245 1.34	0.8 1.76
103H7124-0740	**-0710**	0.98 138.8	3	0.74	1.4	0.245 1.34	0.8 1.76
103H7126-0140	**-0110**	1.27 179.8	1	8.6	19	0.36 1.97	0.98 2.16
103H7126-0440	**-0410**	1.27 179.8	2	2	4.5	0.36 1.97	0.98 2.16
103H7126-0740	**-0710**	1.27 179.8	3	0.9	2.2	0.36 1.97	0.98 2.16

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H7121-5640	**-5610**	0.55 77.9	1	4.3	14.5	0.1 0.55	0.47 1.04
103H7121-5740	**-5710**	0.55 77.9	2	1.1	3.7	0.1 0.55	0.47 1.04
103H7121-5840	**-5810**	0.55 77.9	3	0.54	1.74	0.1 0.55	0.47 1.04
103H7123-5640	**-5610**	1.0 141.6	1	5.7	29.4	0.21 1.15	0.65 1.43
103H7123-5740	**-5710**	1.0 141.6	2	1.5	7.5	0.21 1.15	0.65 1.43
103H7123-5840	**-5810**	1.0 141.6	3	0.7	3.5	0.21 1.15	0.65 1.43
103H7126-5640	**-5610**	1.6 226.6	1	7.7	34.6	0.36 1.97	0.98 2.16
103H7126-5740	**-5710**	1.6 226.6	2	2	9.1	0.36 1.97	0.98 2.16
103H7126-5840	**-5810**	1.6 226.6	3	0.94	4	0.36 1.97	0.98 2.16
103H7128-5640	**-5610**	2.0 283.2	1	8.9	40.1	0.49 2.68	1.3 2.87
103H7128-5740	**-5710**	2.0 283.2	2	2.3	10.4	0.49 2.68	1.3 2.87
103H7128-5840	**-5810**	2.0 283.2	3	1.03	4.3	0.49 2.68	1.3 2.87

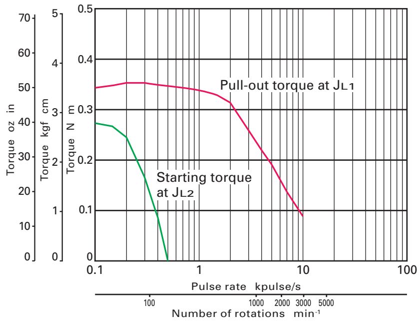
Pulse rate-torque characteristics

103H7121-01



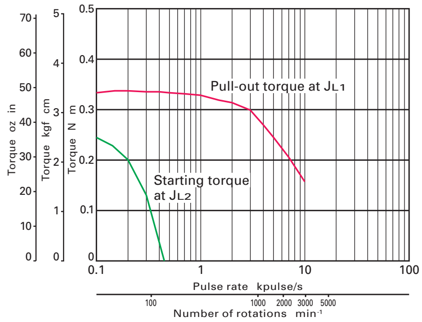
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-04



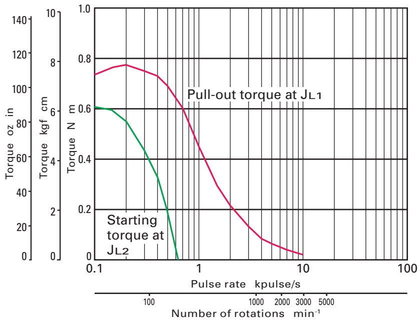
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-07



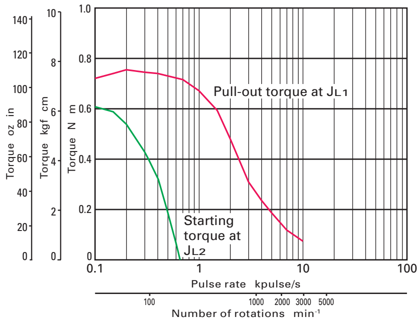
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-01



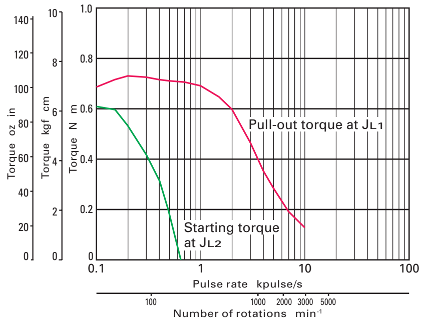
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-04



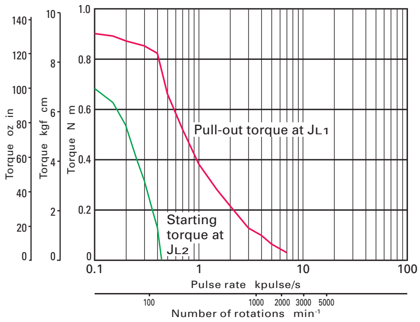
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-07



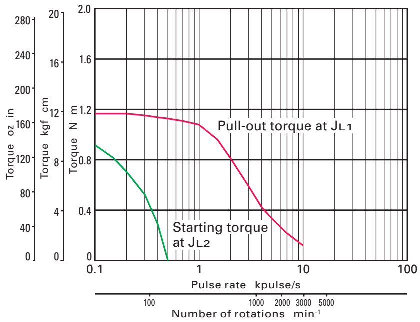
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7124-01



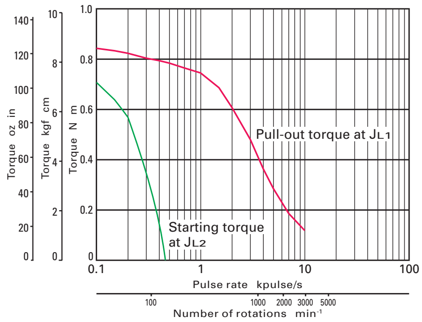
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7124-04



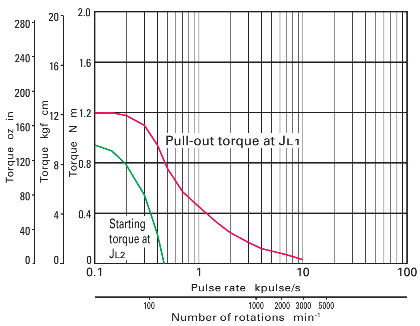
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7124-07



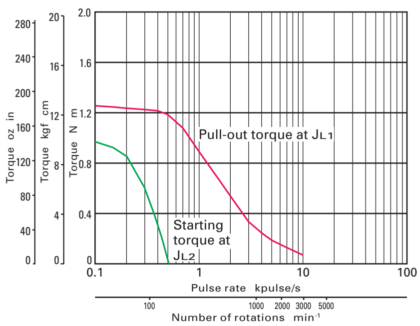
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-01



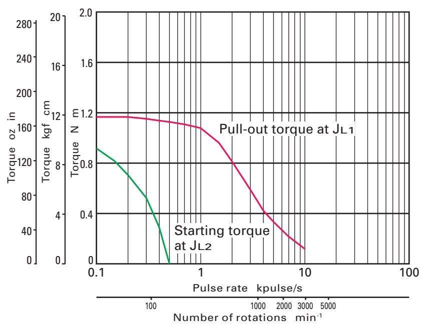
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

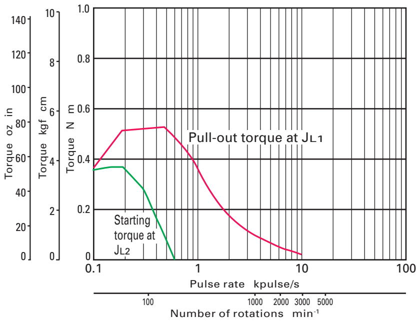
103H7126-07



Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

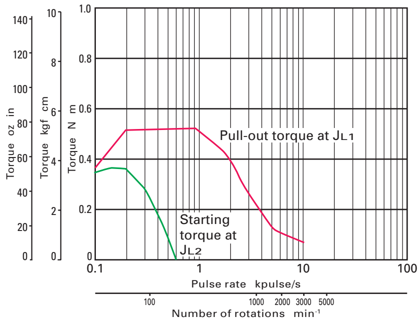
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

103H7121-56



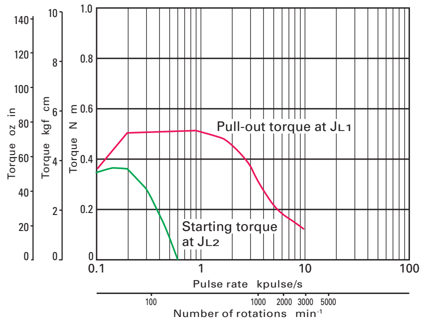
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-57



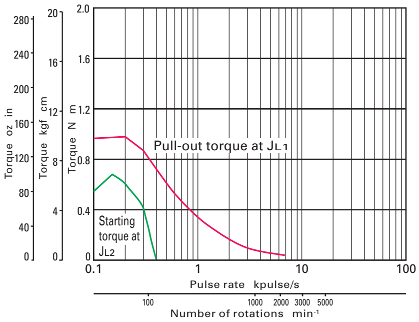
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-58



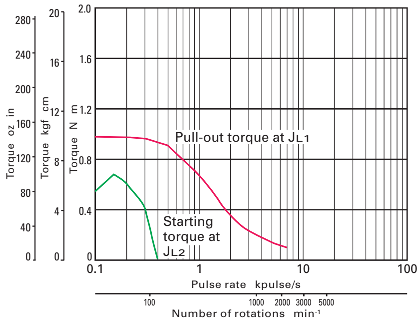
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-56



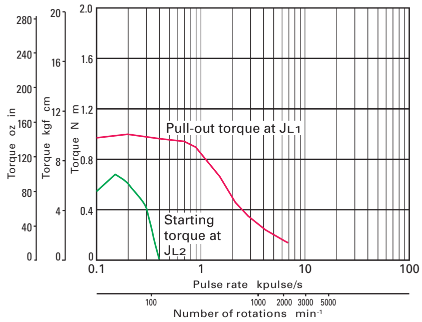
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7123-57



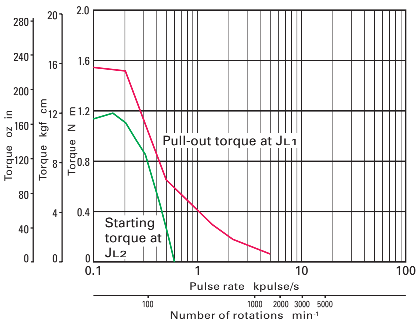
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7123-58



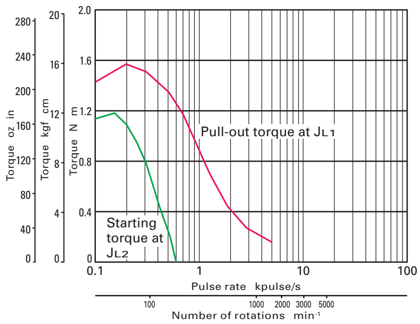
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-56



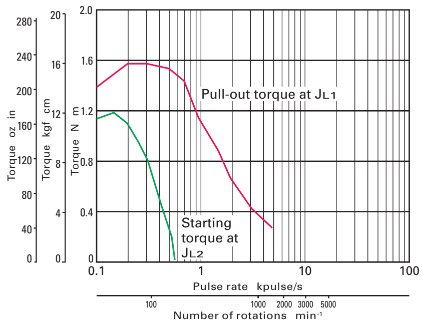
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-57



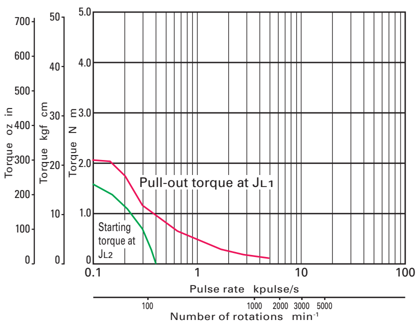
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-58



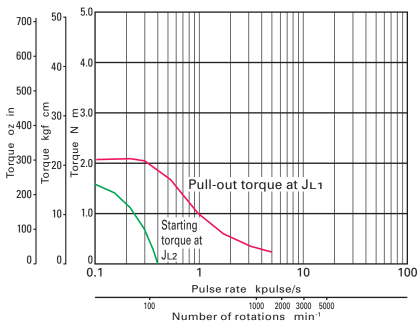
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7128-56



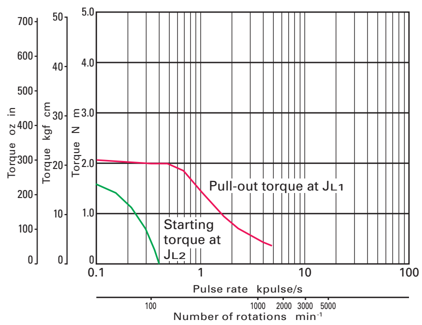
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7128-57



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7128-58



Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

60mm sq. 2.36inch sq.

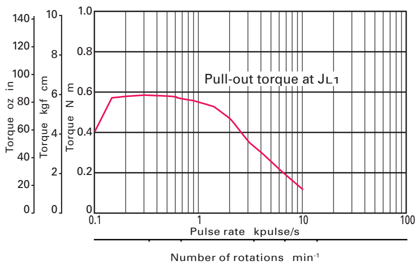
SH160
0.9 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH1601-0440	**-0410**	0.57 80.71	2	1.35	2	0.24 1.312	0.55 1.21
SH1602-0440	**-0410**	1.1 155.77	2	1.8	3.5	0.4 2.187	0.8 1.76
SH1603-0440	**-0410**	1.7 240.74	2	2.3	4.5	0.75 4.101	1.2 2.64

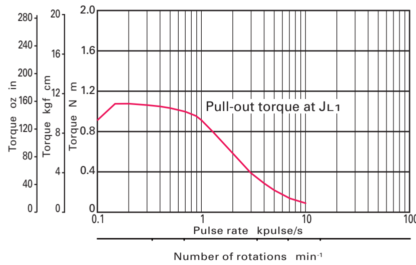
Pulse rate-torque characteristics

SH1601-04



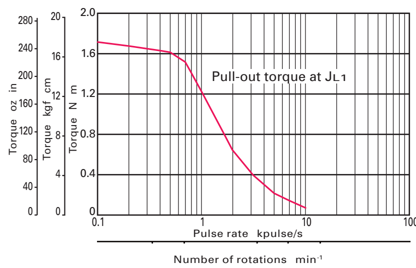
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling

SH1602-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

SH1603-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

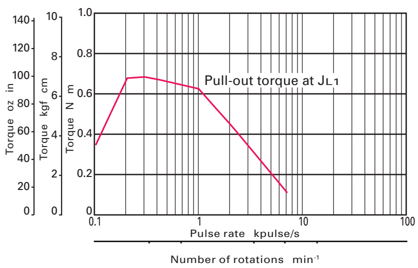
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH1601-5240	**-5210**	0.69 97.7	2	1.2	3.5	0.24 1.31	0.55 1.21
SH1602-5240	**-5210**	1.28 181.2	2	1.65	6.1	0.4 2.19	0.8 1.76
SH1603-5240	**-5210**	2.15 304.4	2	2.3	8.8	0.75 4.10	1.2 2.65

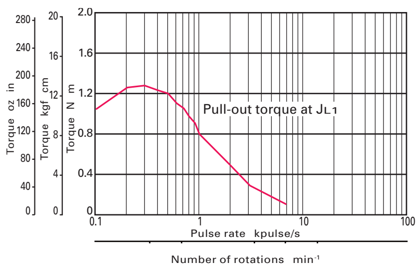
Pulse rate-torque characteristics

SH1601-52



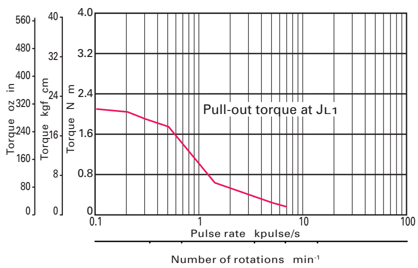
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling

SH1602-52



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

SH1603-52



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L3} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

60mm sq. 2.36inch sq.

103H782
1.8 /step

Unipolar winding Connector type

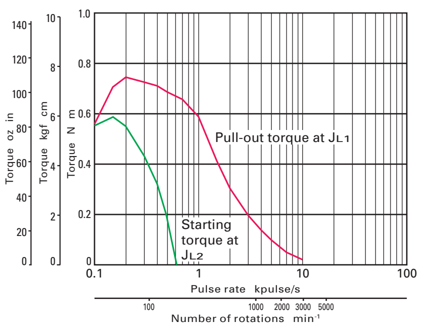
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7821-0140	**-0110**	0.78 110.5	1	5.7	8.3	0.275 1.50	0.6 1.32
103H7821-0440	**-0410**	0.78 110.5	2	1.5	2	0.275 1.50	0.6 1.32
103H7821-0740	**-0710**	0.78 110.5	3	0.68	0.8	0.275 1.50	0.6 1.32
103H7822-0140	**-0110**	1.17 165.7	1	6.9	14	0.4 2.19	0.77 1.70
103H7822-0440	**-0410**	1.17 165.7	2	1.8	3.6	0.4 2.19	0.77 1.70
103H7822-0740	**-0710**	1.17 165.7	3	0.8	1.38	0.4 2.19	0.77 1.70
103H7823-0140	**-0110**	2.1 297.4	1	10	21.7	0.84 4.59	1.34 2.95
103H7823-0440	**-0410**	2.1 297.4	2	2.7	5.6	0.84 4.59	1.34 2.95
103H7823-0740	**-0710**	2.1 297.4	3	1.25	2.4	0.84 4.59	1.34 2.95

Bipolar winding Connector type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7821-1740	**-1710**	0.88 124.6	4	0.35	0.8	0.275 1.50	0.6 1.32
103H7821-5740	**-5710**	0.88 124.6	2	1.27	3.3	0.275 1.50	0.6 1.32
103H7822-1740	**-1710**	1.37 194.0	4	0.43	1.38	0.4 2.19	0.77 1.70
103H7822-5740	**-5710**	1.37 194.0	2	1.55	5.5	0.4 2.19	0.77 1.70
103H7823-1740	**-1710**	2.7 382.3	4	0.65	2.4	0.84 4.59	1.34 2.95
103H7823-5740	**-5710**	2.7 382.3	2	2.4	9.5	0.84 4.59	1.34 2.95

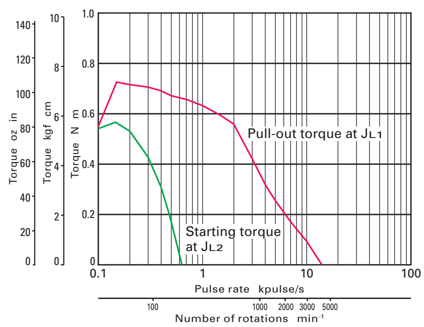
Pulse rate-torque characteristics

103H7821-01



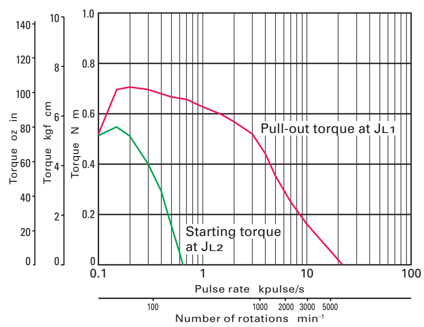
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7821-04



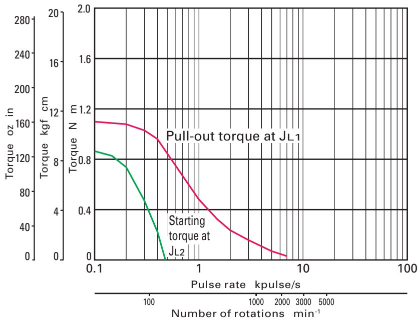
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7821-07



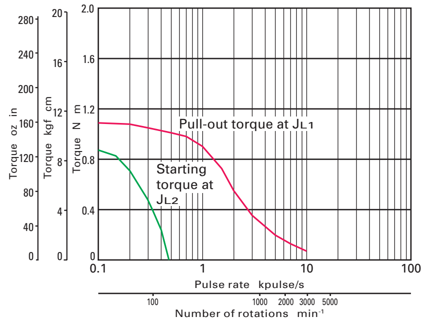
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7822-01



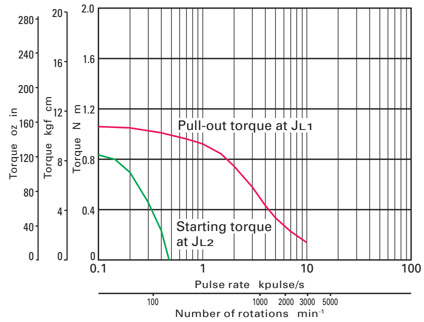
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7822-04



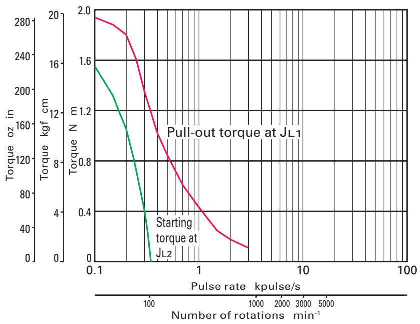
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7822-07



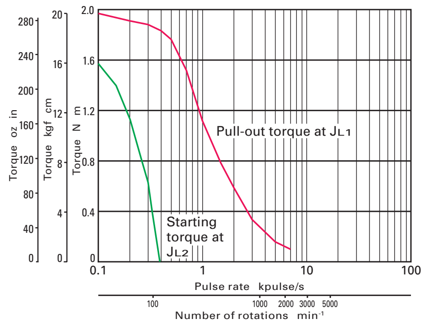
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7823-01



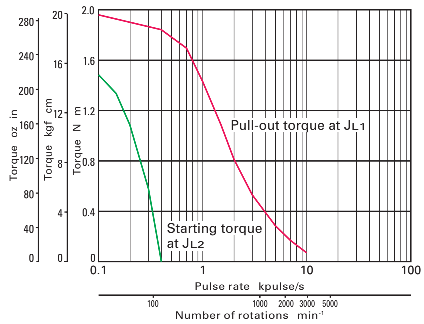
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7823-04



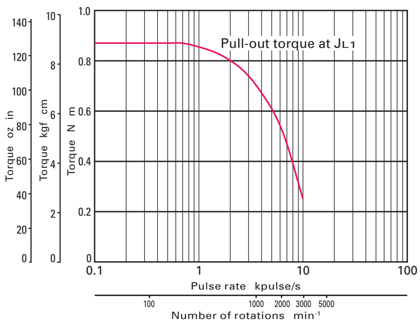
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7823-07



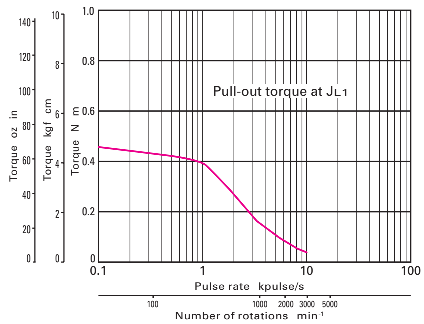
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7821-17



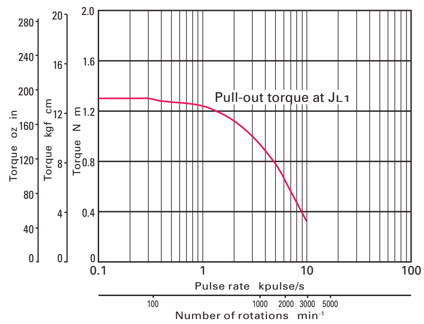
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

103H7821-57



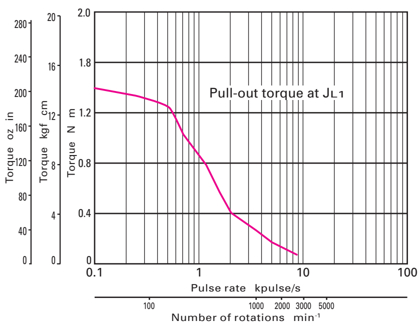
Constant current circuit
Source voltage : AC24V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

103H7822-17



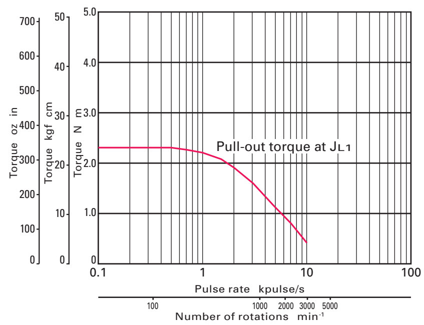
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

103H7822-57



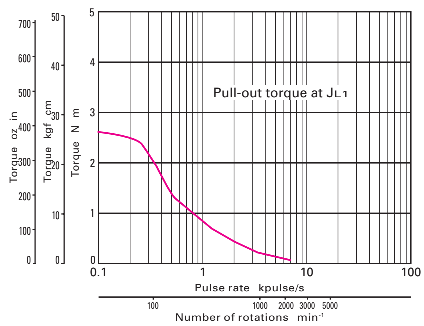
Constant current circuit
Source voltage : AC24V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

103H7823-17



Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

103H7823-57



Constant current circuit
Source voltage : AC24V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

2-phase stepping motor

86mm sq. 3.39inch sq.

SH286　/SM286
1.8　/step

Unipolar winding　Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass　Weight
Single shaft	Double shafts	[N　m　oz　in　MIN.]	A/phase	/phase	mH/phase	[　10⁻⁴kg　m²　oz　in²　]	[kg　lbs　]
SH2861-0441	**-0411**	2.5　354	2	2.3	8.0	1.48　8.09	1.75　3.92
SH2861-0941	**-0911**	2.5　354	4	0.6	2.0	1.48　8.09	1.75　3.92
SH2862-0441	**-0411**	4.7　665.6	2	3.2	13.0	3　16.4	2.9　6.5
SH2862-0941	**-0911**	4.7　665.6	4	0.85	3.4	3　16.4	2.9　6.5
SH2863-0441	**-0411**	6.7　948.8	2	4.0	17.0	4.5　24.6	4.0　8.96
SH2863-0941	**-0911**	6.7　948.8	4	0.9	4.2	4.5　24.6	4.0　8.96

Unipolar winding　Lead wire type　CE　UL model

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass　Weight
Single shaft	Double shafts	[N　m　oz　in　MIN.]	A/phase	/phase	mH/phase	[　10⁻⁴kg　m²　oz　in²　]	[kg　lbs　]
SM2861-0451	**-0421**	2.5　354	2	2.3	8.0	1.48　8.09	1.75　3.92
SM2861-0951	**-0921**	2.5　354	4	0.6	2.0	1.48　8.09	1.75　3.92
SM2862-0451	**-0421**	4.8　679.7	2	3.2	13.0	3　16.4	2.9　6.5
SM2862-0951	**-0921**	4.8　679.7	4	0.85	3.4	3　16.4	2.9　6.5
SM2863-0451	**-0421**	6.6　934.6	2	4.0	17	4.5　24.6	4.0　8.96
SM2863-0951	**-0921**	6.6　934.6	4	0.9	4.2	4.5　24.6	4.0　8.96

Bipolar winding　Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass　Weight
Single shaft	Double shafts	[N　m　oz　in　MIN.]	A/phase	/phase	mH/phase	[　10⁻⁴kg　m²　oz　in²　]	[kg　lbs　]
SH2861-5041	**-5011**	3.3　467.3	2	2.2	15	1.48　8.09	1.75　3.92
SH2861-5141	**-5111**	3.3　467.3	4	0.56	3.7	1.48　8.09	1.75　3.92
SH2861-5241	**-5211**	3.3　467.3	6	0.29	1.7	1.48　8.09	1.75　3.92
SH2862-5041	**-5011**	6.4　906.3	2	3.2	25	3.0　16.4	2.9　6.5
SH2862-5141	**-5111**	6.4　906.3	4	0.83	6.4	3.0　16.4	2.9　6.5
SH2862-5241	**-5211**	6.4　906.3	6	0.36	2.8	3.0　16.4	2.9　6.5
SH2863-5041	**-5011**	9　1274.4	2	4.0	32	4.5　24.6	4.0　8.96
SH2863-5141	**-5111**	9　1274.4	4	1.0	7.9	4.5　24.6	4.0　8.96
SH2863-5241	**-5211**	9　1274.4	6	0.46	3.8	4.5　24.6	4.0　8.96

Bipolar winding　Lead wire type　CE　UL model

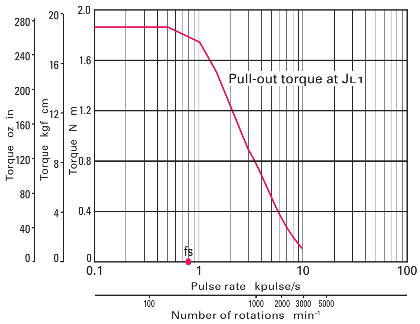
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass　Weight
Single shaft	Double shafts	[N　m　oz　in　MIN.]	A/phase	/phase	mH/phase	[　10⁻⁴kg　m²　oz　in²　]	[kg　lbs　]
SM2861-5051	**-5021**	3.3　467.3	2	2.2	15	1.48　8.09	1.75　3.92
SM2861-5151	**-5121**	3.3　467.3	4	0.56	3.7	1.48　8.09	1.75　3.92
SM2861-5251	**-5221**	3.3　467.3	6	0.29	1.7	1.48　8.09	1.75　3.92
SM2862-5051	**-5021**	6.4　906.3	2	3.2	25	3.0　16.4	2.9　6.5
SM2862-5151	**-5121**	6.4　906.3	4	0.83	6.4	3.0　16.4	2.9　6.5
SM2862-5251	**-5221**	6.4　906.3	6	0.36	2.8	3.0　16.4	2.9　6.5
SM2863-5051	**-5021**	9　1274.4	2	4.0	32	4.5　24.6	4.0　8.96
SM2863-5151	**-5121**	9　1274.4	4	1.0	7.9	4.5　24.6	4.0　8.96
SM2863-5251	**-5221**	9　1274.4	6	0.46	3.8	4.5　24.6	4.0　8.96

Bipolar winding　Terminal block type

Model	Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass　Weight
Single shaft	[N　m　oz　in　MIN.]	A/phase	/phase	mH/phase	[　10⁻⁴kg　m²　oz　in²　]	[kg　lbs　]
SM2861-5066	3.3　467.3	2	2.03	15	1.48　8.09	1.9　4.19
SM2861-5166	3.3　467.3	4	0.52	3.7	1.48　8.09	1.9　4.19
SM2861-5266	3.3　467.3	6	0.27	1.7	1.48　8.09	1.9　4.19
SM2862-5066	6.4　906.3	2	3.08	25	3.0　16.4	3.05　6.72
SM2862-5166	6.4　906.3	4	0.79	6.4	3.0　16.4	3.05　6.72
SM2862-5266	6.4　906.3	6	0.33	2.8	3.0　16.4	3.05　6.72
SM2863-5066	9　1274.4	2	3.83	32	4.5　24.6	4.15　9.15
SM2863-5166	9　1274.4	4	0.96	7.9	4.5　24.6	4.15　9.15
SM2863-5266	9　1274.4	6	0.48	3.8	4.5　24.6	4.15　9.15

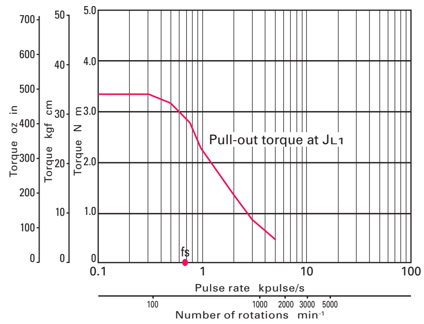
Pulse rate-torque characteristics

SH2861-04



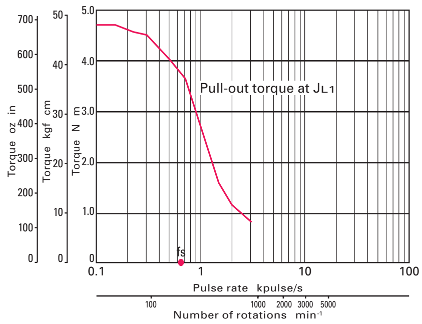
Constant current circuit
Source voltage : DC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m² 40.46 oz in² use the rubber coupling

SH2862-04



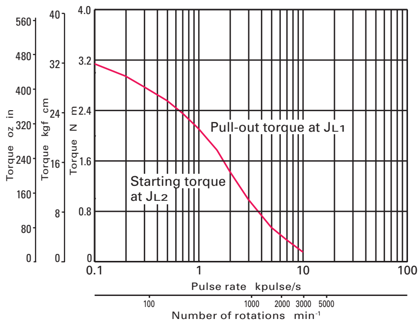
Constant current circuit
Source voltage : DC100V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 15.3×10^{-4}kg m² 83.65 oz in² use the rubber coupling

SH2863-04



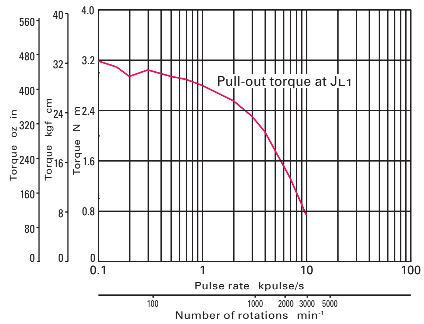
Constant current circuit
Source voltage : DC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 15.3×10^{-4}kg m² 83.65 oz in² use the rubber coupling

SM2861-50



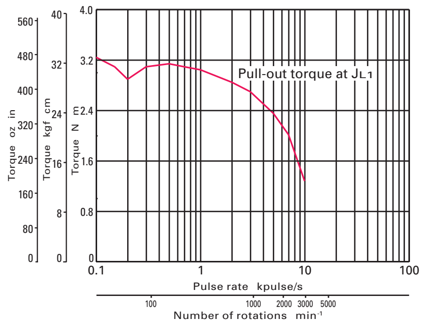
Constant current circuit
Source voltage : DC100V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m² 40.46 oz in² use the rubber coupling

SM2861-51



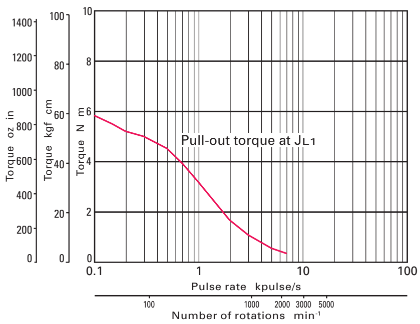
Constant current circuit
Source voltage : DC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m² 40.46 oz in² use the rubber coupling

SM2861-52



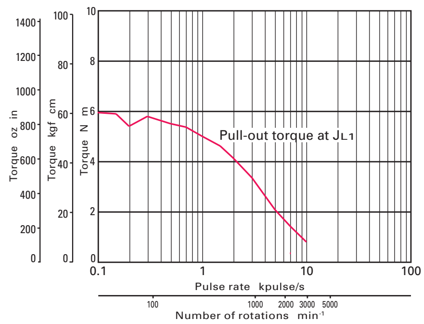
Constant current circuit
Source voltage : DC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 15.3×10^{-4}kg m² 83.65 oz in² use the rubber coupling

SM2862-50



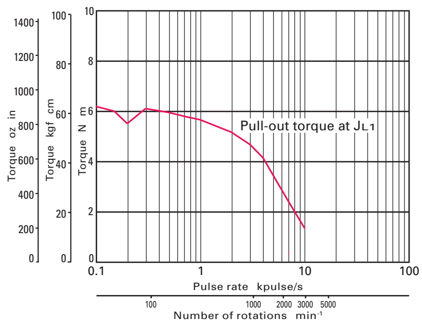
Constant current circuit
Source voltage : DC100V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 15.3×10^{-4}kg m² 83.65 oz in² use the rubber coupling

SM2862-51



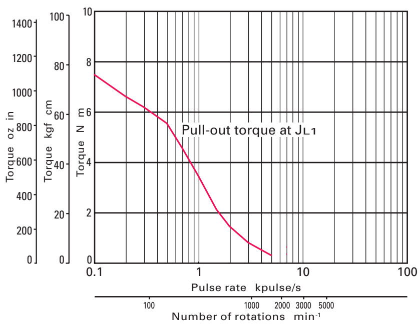
Constant current circuit
Source voltage : DC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 15.3×10^{-4}kg m² 83.65 oz in² use the rubber coupling

SM2862-52



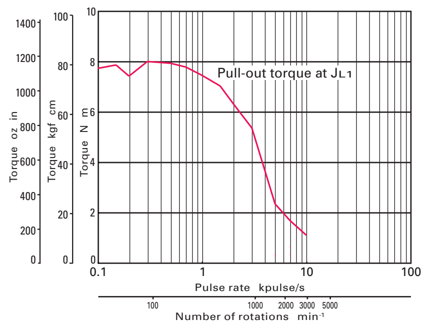
Constant current circuit
Source voltage : DC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 15.3×10^{-4}kg m² 83.65 oz in² use the rubber coupling

SM2863-50



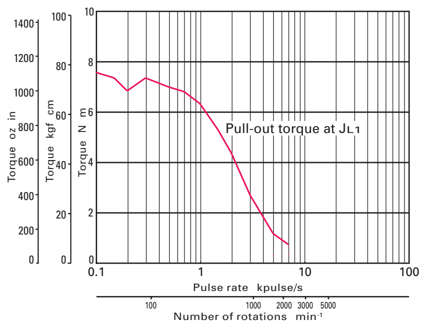
Constant current circuit
Source voltage : DC100V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 43×10^{-4}kg m² 235.10 oz in² use the rubber coupling

SM2863-51



Constant current circuit
Source voltage : DC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 43×10^{-4}kg m² 235.10 oz in² use the rubber coupling

SM2863-52



Constant current circuit
Source voltage : DC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 43×10^{-4}kg m² 235.10 oz in² use the rubber coupling

2-phase stepping motor

106mm cir. 4.17inch cir.

103H8922
1.8 /step

Unipolar winding

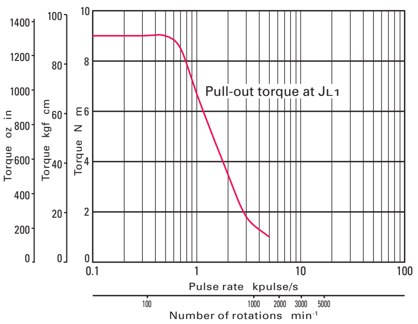
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H89222-0941	**-0911**	10.8 1529.4	4	0.98	6.3	14.6 79.83	7.5 16.53
103H89223-0941	**-0911**	15.5 2194.9	4	1.4	9.7	22 120.28	10.5 23.15

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H89222-5241	**-5211**	13.2 1869.2	6	0.45	5.4	14.6 79.83	7.5 16.53
103H89223-5241	**-5211**	19 2690.5	6	0.63	8	22 120.28	10.5 23.15

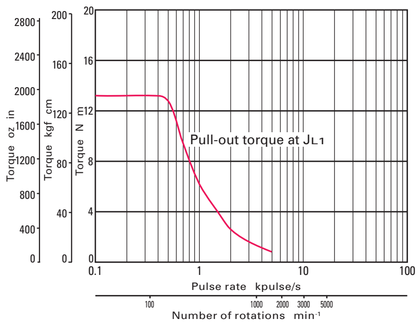
Pulse rate-torque characteristics

103H89222-09



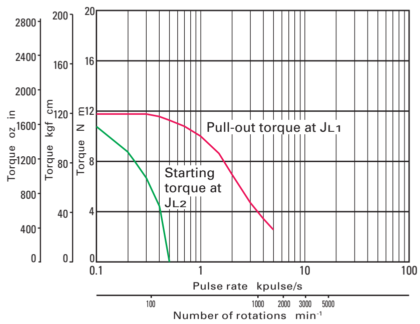
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

103H89223-09



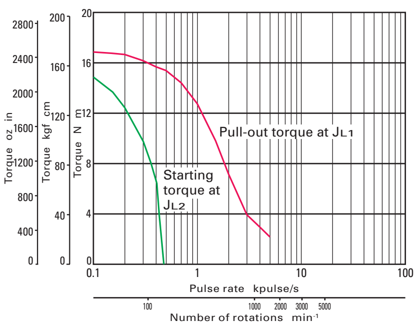
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

103H89222-52



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

103H89223-52



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

56mm sq. 2.20inch sq.

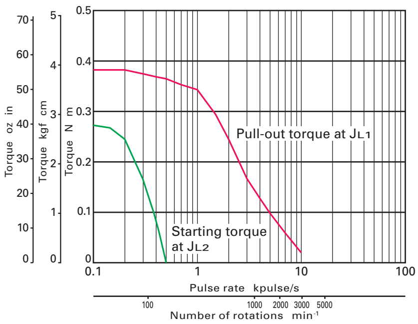
103H712
CE marking
1.8 /step

Unipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H7121-6140	**-6110**	0.39 55.2	1	4.8	8	0.1 0.55	0.47 1.04
103H7121-6740	**-6710**	0.39 55.2	3	0.6	0.8	0.1 0.55	0.47 1.04
103H7123-6140	**-6110**	0.83 117.5	1	6.7	15	0.21 1.15	0.65 1.43
103H7123-6740	**-6710**	0.78 110.5	3	0.77	1.58	0.21 1.15	0.65 1.43
103H7126-6140	**-6110**	1.27 179.8	1	8.6	19	0.36 1.97	0.98 2.16
103H7126-6740	**-6710**	1.27 179.8	3	0.9	2.2	0.36 1.97	0.98 2.16

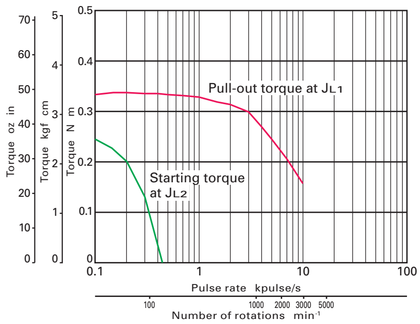
Pulse rate-torque characteristics

103H7121-61



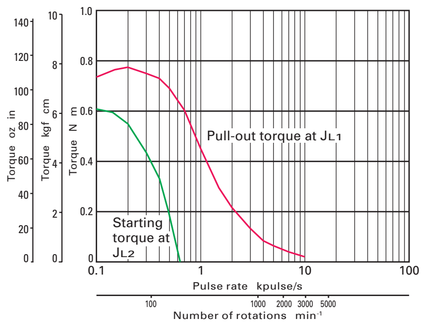
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-67



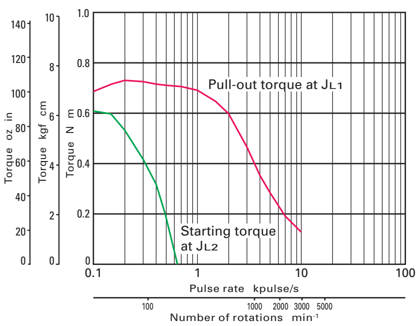
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-61



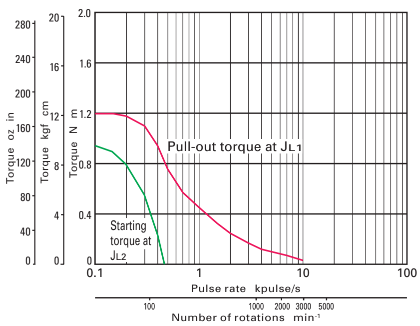
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-67



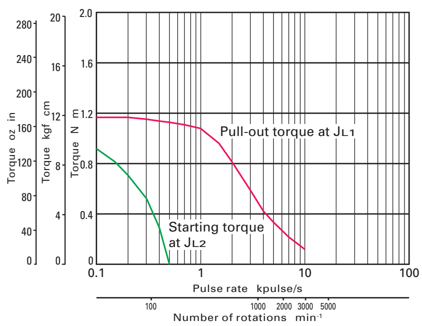
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7126-61



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-67



Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

86mm cir. 3.39inch cir.

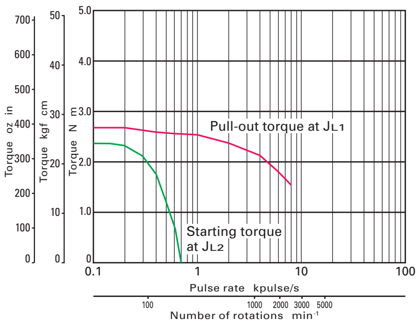
103H822
CE marking
1.8 /step

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H8221-6240	**-6210**	2.74 388.0	6	0.3	1.65	1.45 7.93	1.5 3.31
103H8222-6340	**-6310**	5.09 720.8	6	0.35	2.7	2.9 15.86	2.5 5.51
103H8223-6340	**-6310**	7.44 1053.6	6	0.45	3.4	4.4 24.06	3.5 7.72

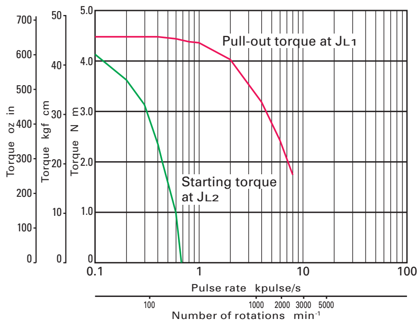
Pulse rate-torque characteristics

103H8221-62



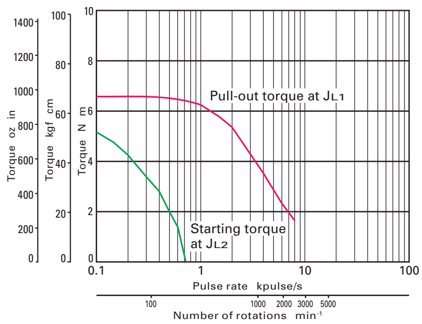
Constant current circuit
Source voltage : AC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

103H8222-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m² 83.65 oz in² use the rubber coupling
J_{L2} = 15.3x10^{-4}kg m² 83.65 oz in² use the direct coupling

103H8223-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

106mm cir. 4.17inch cir.

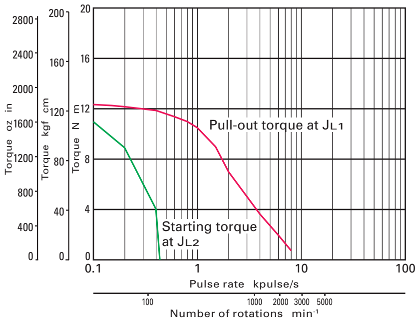
103H8922
CE marking
1.8 /step

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H89222-6341	**-6311**	13.2 1869.2	6	0.45	5.4	14.6 79.83	7.5 16.53
103H89223-6341	**-6311**	19 2690.5	6	0.63	8	22 120.28	10.5 23.15

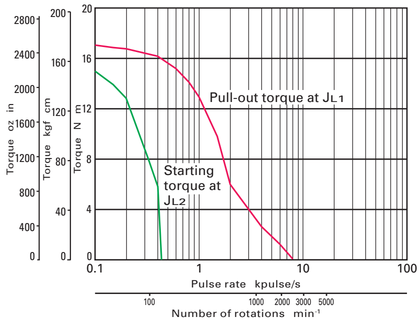
Pulse rate-torque characteristics

103H89222-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10⁻⁴kg m² 235.10 oz in² use the direct coupling

103H89223-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10⁻⁴kg m² 235.10 oz in² use the direct coupling

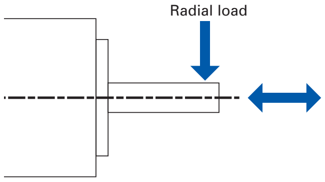
Standard models

Motor type	H series motor
Model number	103H52 /103H67 /103H71 /103H78
Insulation class	Class B 130
Withstand voltage	42 1.65inch AC500V 50/60Hz for 1 minute, 50 1.97inch 56 2.20inch 60 2.36inch AC1000V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Operating ambient temperature	-10 to 50
Operating ambient humidity	90%MAX. : 40 MAX., 57%MAX. : 50 MAX., 35%MAX. : 60 MAX. no condensation

Motor type	SH series motor
Motor model number	SH228 , SH353 , SH142 , SH160 , SH286 ,
Insulation class	Class B 130
Withstand voltage	28 1.10inch 35 1.38inch 42 1.65inch AC500V 50/60Hz for 1 minute, 60 2.36inch / 86 3.38inch AC1000V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Operating ambient temperature	-10 to 50
Operating ambient humidity	90%MAX. : 40 MAX., 57%MAX. : 50 MAX., 35%MAX. : 60 MAX. no condensation

Motor type	SM series motor
Model number	SM286
Type	S1 continuous operation
Insulation class	Class F +155 C
Operation altitude	1000m 3280 feet MAX above sea level
Withstand voltage	86mm 3.39inch : AC1500V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Protection grade	IP43
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Ambient operation temperature	-10 to +50 C
Ambient operation humidity	90% MAX. at less than 40 C, 57% MAX. at less than 50 C , 35% MAX. at 60 C no condensation

Allowable radial / thrust load



Frange size	Model number	Distance from end of shaft : mm inch				Thrust load N lbs
		0	5 0.20	10 0.39	15 0.59	
		Radial load : N lbs				
28mm 1.10inch	SH228	42 9	48 10	56 12	66 14	3 0.67
35mm 1.38inch	SH353	40 8	50 11	67 15	98 22	10 2.25
42mm 1.65inch	103H52 103-59 SH142	22 4	26 5	33 7	46 10	10 2.25
50mm 1.97inch	103H670	71 15	87 19	115 25	167 37	15 3.37
56mm 2.20inch	103H712	52 11	65 14	85 19	123 27	15 3.37
	103H7128	85 19	105 23	138 31	200 44	15 3.37
60mm 2.36inch	103H782 SH160	70 15	87 19	114 25	165 37	20 4.50
86mm 3.39inch	SM286 SH286	167 37	193 43	229 51	280 62	60 13.488
86mm 3.39inch	103H822	191 42	234 52	301 67	421 93	60 13.488
106mm 4.17inch	103H8922	321 72	356 79	401 90	457 101	100 22.48

CE marked models

Model Number	103H712	103H822 103H8922
Rated voltage	12-200VDC	12-300VDC
Applied standards Low voltage diretive	EN60034-1,IEC34-5(EN60034-5),EN60204-1,EN60950,EN61010-1	
Operation type	S1 continuous rating	
Protection grade	IP43	
Device category	Class I	
Operation environment	Pollution degree 2	
Insulation classl	Class B 130	
Insulation resistance	100M ohm MIN. against DC500V	
Withstand voltage	56mm 2.2inch : AC1500V 50/60Hz for 1 minute 86mm 3.39inch 106mm 4.17inch : AC1600V 50/60Hz for 1 minute	
Ambient operation temperature	-10 to +50 C	
Ambient operation humidity	90% MAX. at less than 40 C, 57% MAX. at less than 50 C , 35% MAX. at 60 C no condensation	
Winding temperature rise	80K MAX. Based on Sanyo Denki standard	

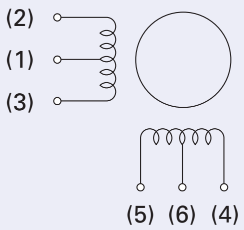
Internal Wiring and Rotation Direction

Unipolar winding

103H52 Connector type

Internal wire connection

( ) connector pin number



Direction of motor rotate

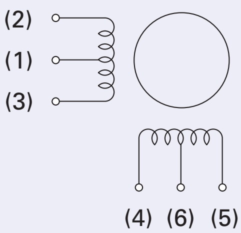
The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Connector type pin number				
		1.6	5	3	4	2
Exciting order	1					
	2					
	3					
	4					

103H782 Connector type

Internal wire connection

( ) connector pin number



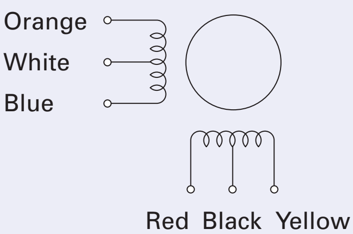
Direction of motor rotate

The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Connector type pin number				
		1.6	4	3	5	2
Exciting order	1					
	2					
	3					
	4					

Lead wire type

Internal wire connection



Direction of motor rotate

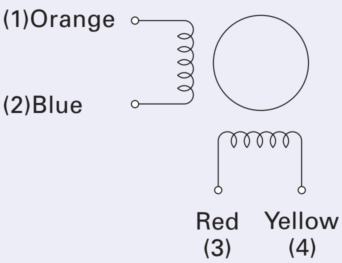
The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Lead wire color				
		White & black	Red	Blue	Yellow	Orange
Exciting order	1					
	2					
	3					
	4					

Bipolar winding

Internal wire connection

( ) connector pin number



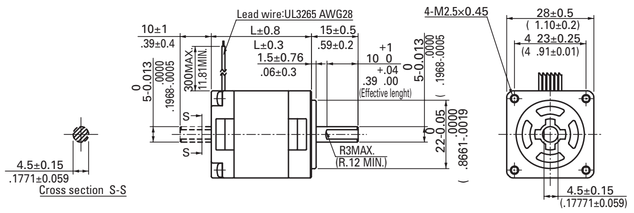
Direction of motor rotate

The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Lead wire color, connector type pin teminal blocknumber			
	Lead wire	Red	Blue	Yellow	Orange
Exciting order	1	–	–	+	+
	2	+	–	–	+
	3	+	+	–	–
	4	–	+	+	–
Connector	103H782	3	2	4	1
Teminal block	SM286	3	2	4	1

Motors Unit: mm inch

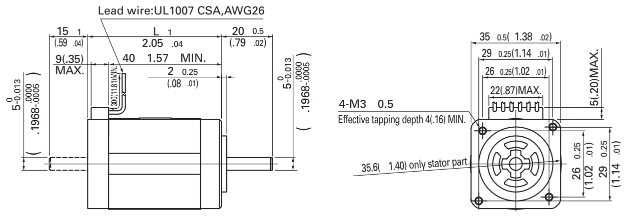
28mm 1.10inch



Connector type Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU14S281	SH2281-51 1	32 1.26	Lead wire
	DU14S281	SH2281-52 1	32 1.26	Lead wire
	DU14S285	SH2285-51 1	51.5 2.03	Lead wire
	DU14S285	SH2285-52 1	51.5 2.03	Lead wire
Bipolar	DB14S281	SH2281-56 1	32 1.26	Lead wire
	DB14S281	SH2281-57 1	32 1.26	Lead wire
	DB14S285	SH2285-56 1	51.5 2.03	Lead wire
	DB14S285	SH2285-57 1	51.5 2.03	Lead wire

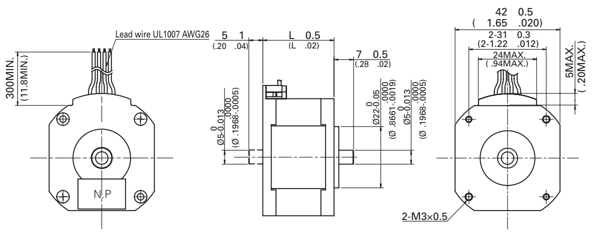
35mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH3533-12U 0	33 1.25	Lead wire
		SH3537-12U 0	37 1.54	Lead wire
		SH3552-12U 0	52 1.89	Lead wire

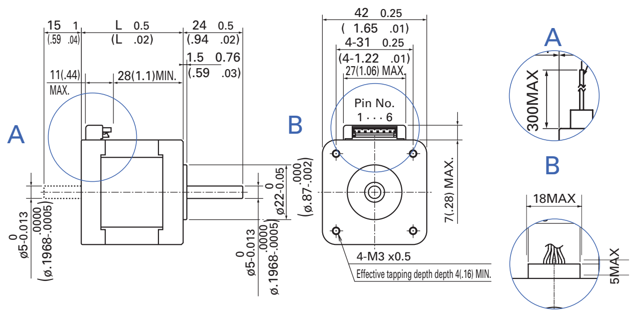
42mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		SS2421-50 1	11.6 .457	Lead wire
		SS2422-50 1	18.6 .732	Lead wire
		SS2423-50 1	25.6 1.008	Lead wire

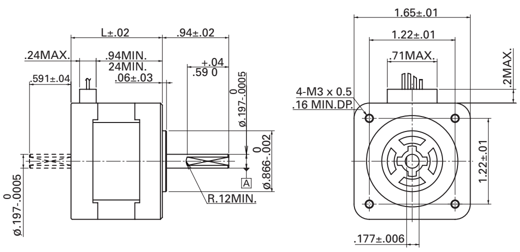
42mm 1.65inch



Connector type Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU15H521	103H5205-04 0	33 1.25	Connector
	DU15H522	103H5208-04 0	39 1.54	Connector
	DU15H524	103H5210-04 0	48 1.89	Connector
		103H5209-04 0	41 1.61	Connector

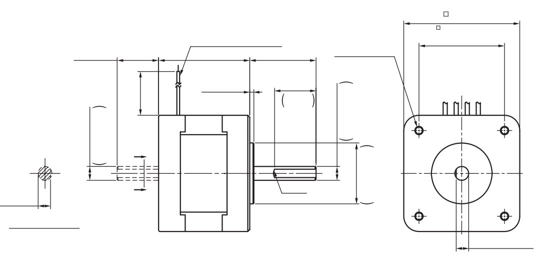
42mm 1.65inch



Connector type Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar	DB14H521	103H5205-52 0	33 1.25	Lead wire
	DB14H522	103H5208-52 0	39 1.54	Lead wire
	DB14H524	103H5210-52 0	48 1.89	Lead wire
		103H5205-50 0	33 1.25	Lead wire
		103H5205-51 0	33 1.25	Lead wire
		103H5208-50 0	39 1.54	Lead wire
		103H5208-51 0	39 1.54	Lead wire
		103H5209-50 0	41 1.61	Lead wire
		103H5209-51 0	41 1.61	Lead wire
		103H5209-52 0	41 1.61	Lead wire
		103H5210-50 0	48 1.89	Lead wire
		103H5210-51 0	48 1.89	Lead wire

42mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU15S141	SH1421-04 1	33 1.25	Lead wire
	DU15S142	SH1422-04 1	39 1.54	Lead wire
	DU15S144	SH1424-04 1	48 1.89	Lead wire
Bipolar	DB16H141	SH1421-52 1	33 1.25	Lead wire
	DB16H142	SH1422-52 1	39 1.54	Lead wire
	DB16H144	SH1424-52 1	48 1.89	Lead wire

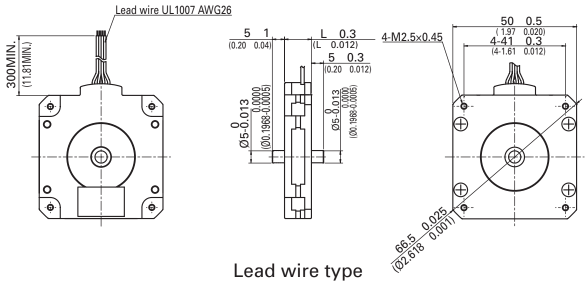
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

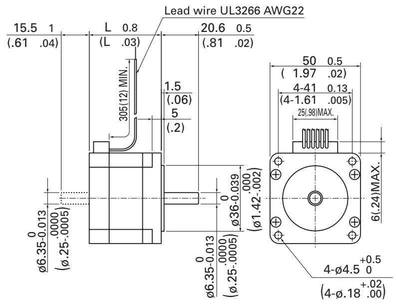
50mm 1.97inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		SS2501-50 1	11 .433	Lead wire
		SS2502-50 1	16 .63	Lead wire

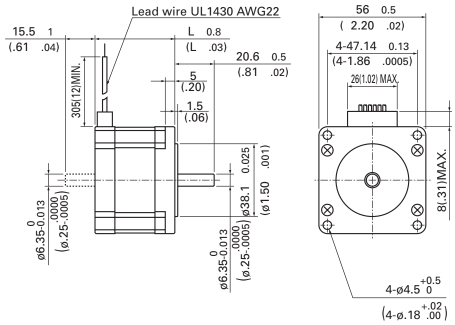
50mm 1.97inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H6701-01 0	39.8 1.57	Lead wire
		103H6701-04 0	39.8 1.57	Lead wire
		103H6701-07 0	39.8 1.57	Lead wire
		103H6703-01 0	51.3 2.02	Lead wire
		103H6703-04 0	51.3 2.02	Lead wire
		103H6703-07 0	51.3 2.02	Lead wire
		103H6704-01 0	55.8 2.20	Lead wire
		103H6704-04 0	55.8 2.20	Lead wire
		103H6704-07 0	55.8 2.20	Lead wire
Bipolar	DB16H671	103H6701-50 0	39.8 1.57	Lead wire
	DB16H672	103H6703-50 0	51.3 2.02	Lead wire
		103H6704-50 0	55.8 2.20	Lead wire

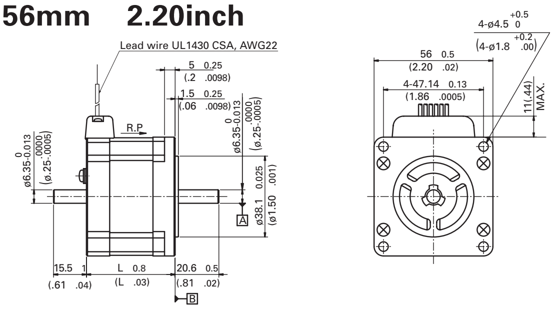
56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU16H711	103H7121-04 0	41.8 1.65	Lead wire
	DU16H713	103H7123-04 0	53.8 2.12	Lead wire
	DU16H716	103H7126-04 0	75.8 2.98	Lead wire
		103H7121-01 0	41.8 1.65	Lead wire
		103H7121-07 0	41.8 1.65	Lead wire
		103H7123-01 0	53.8 2.12	Lead wire
		103H7123-07 0	53.8 2.12	Lead wire
		103H7124-01 0	63.8 2.51	Lead wire
		103H7124-04 0	63.8 2.51	Lead wire
		103H7124-07 0	63.8 2.51	Lead wire
		103H7126-01 0	75.8 2.98	Lead wire
		103H7126-07 0	75.8 2.98	Lead wire

56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H7121-61 0	41.8 1.65	Lead wire CE
		103H7121-67 0	41.8 1.65	Lead wire CE
		103H7123-61 0	53.8 2.12	Lead wire CE
		103H7123-67 0	53.8 2.12	Lead wire CE
		103H7126-61 0	75.8 2.98	Lead wire CE
		103H7126-67 0	75.8 2.98	Lead wire CE

Model number	Shaft diameter(D)	Dcut thickness(L)
103H7121-	6.35	5.8
103H7123-		
103H7126-		
103H7128-	8	7.5

Motor shaft specification code

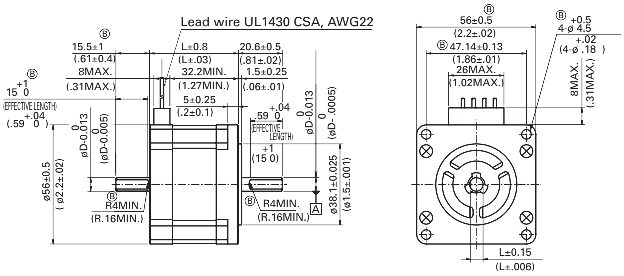
Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Motors Unit: mm inch

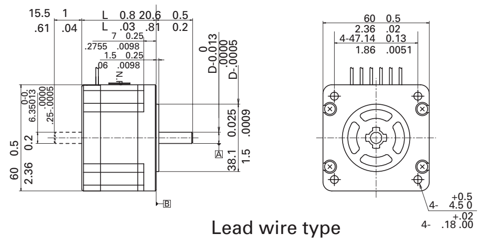
56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar	DB16H711	103H7121-57 0	41.8 1.65	Lead wire
	DB16H713	103H7123-57 0	53.8 2.12	Lead wire
	DB16H716	103H7126-57 0	75.8 2.98	Lead wire
		103H7121-56 0	41.8 1.65	Lead wire
		103H7121-58 0	41.8 1.65	Lead wire
		103H7123-56 0	53.8 2.12	Lead wire
		103H7123-58 0	53.8 2.12	Lead wire
		103H7126-56 0	75.8 2.98	Lead wire
		103H7126-58 0	75.8 2.98	Lead wire
		103H7128-56 0	94.8 3.73	Lead wire
		103H7128-57 0	94.8 3.73	Lead wire
		103H7128-58 0	94.8 3.73	Lead wire

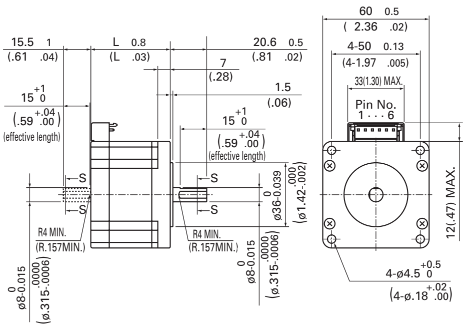
60mm 2.36inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH1601-04 0	42 1.65	Lead wire
		SH1602-04 0	54 2.13	Lead wire
		SH1603-04 0	76 2.99	Lead wire
Bipolar	DB16S161	SH1601-52 0	42 1.65	Lead wire
	DB16S162	SH1602-52 0	54 2.13	Lead wire
	DB16S163	SH1603-52 0	76 2.99	Lead wire

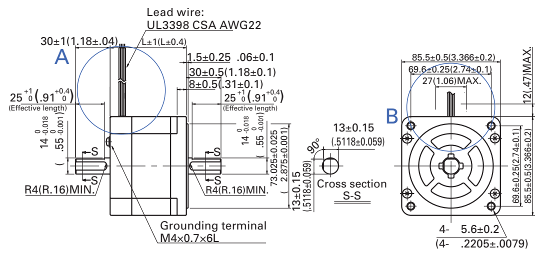
60mm 2.36inch

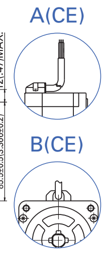


Connector type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H7821-01 0	44.8 1.76	Connector
		103H7821-04 0	44.8 1.76	Connector
		103H7821-07 0	44.8 1.76	Connector
		103H7822-01 0	53.8 2.12	Connector
		103H7822-04 0	53.8 2.12	Connector
		103H7822-07 0	53.8 2.12	Connector
		103H7823-01 0	85.8 3.38	Connector
		103H7823-04 0	85.8 3.38	Connector
		103H7823-07 0	85.8 3.38	Connector
Bipolar	DB16H781	103H7821-57 0	44.8 1.76	Connector
	DB16H782	103H7822-57 0	53.8 2.12	Connector
	DB16H783	103H7823-57 0	85.8 3.38	Connector
		103H7821-17 0	44.8 1.76	Connector
		103H7822-17 0	53.8 2.12	Connector
		103H7823-17 0	85.8 3.38	Connector

86mm 3.39inch





Lead wire type

CE type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH2861-04 1	66 2.6	Lead wire
		SH2862-04 1	96.5 3.8	Lead wire
		SH2863-04 1	127 5	Lead wire
Bipolar		SM2861-50 1	66 2.6	Lead wire CE
		SM2861-51 1	66 2.6	Lead wire CE
		SM2861-52 1	66 2.6	Lead wire CE
		SM2862-50 1	96.5 3.8	Lead wire CE
		SM2862-51 1	96.5 3.8	Lead wire CE
		SM2862-52 1	96.5 3.8	Lead wire CE
		SM2863-50 1	127 5	Lead wire CE
		SM2863-51 1	127 5	Lead wire CE
		SM2863-52 1	127 5	Lead wire CE

Model number	Shaft diameter(D)	Dcut thickness(L)
103H7121-	6.35	5.8
103H7123-		
103H7126-		
103H7128-	8	7.5

Model number	Shaft diameter(D)	Dcut thickness(L)
SH1601-	6.35	5.8
SH1602-		
SH1603-	8	7.5

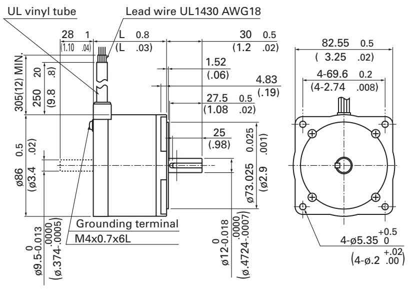
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	5
Double shafts	D	2

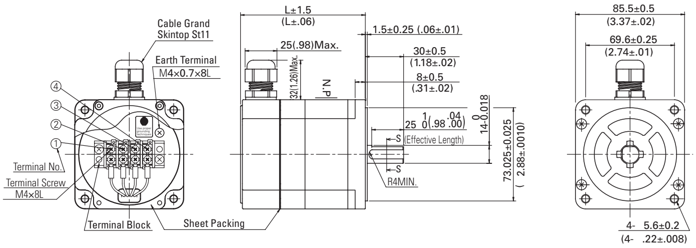
86mm 3.39inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		103H8221-62 0	62 3.31	Lead wire CE
		103H8222-63 0	92.2 5.51	Lead wire CE
		103H8223-63 0	125.9 7.72	Lead wire CE

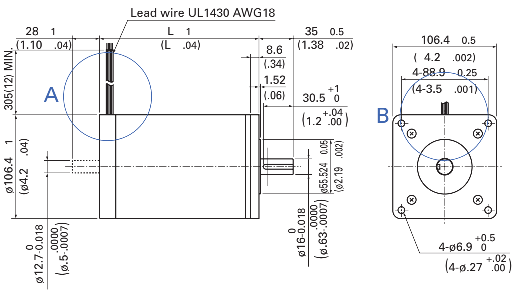
86mm 3.39inch



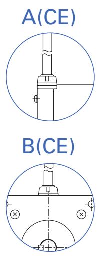
Terminal block type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Terminal block		SM2861-5066	97.9 3.9	Terminal block
		SM2861-5166	97.9 3.9	Terminal block
		SM2861-5266	97.9 3.9	Terminal block
		SM2862-5066	128.4 5.1	Terminal block
		SM2862-5166	128.4 5.1	Terminal block
		SM2862-5266	128.4 5.1	Terminal block
		SM2863-5066	158.8 6.3	Terminal block
		SM2863-5166	158.8 6.3	Terminal block
		SM2863-5266	158.8 6.3	Terminal block

106mm 4.17inch



Lead wire type



CE type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H89222-09 1	163.3 6.4	Lead wire
		103H89223-09 1	221.3 8.7	Lead wire
Bipolar		103H89222-52 1	163.3 6.4	Lead wire
		103H89223-52 1	221.3 8.7	Lead wire CE
		103H89222-63 1	163.3 6.4	Lead wire CE
		103H89223-63 1	221.3 8.7	Lead wire

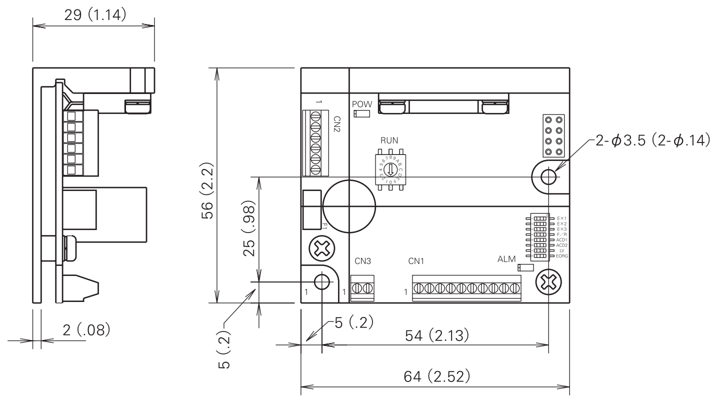
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Drivers Unit: mm inch



Safety standards

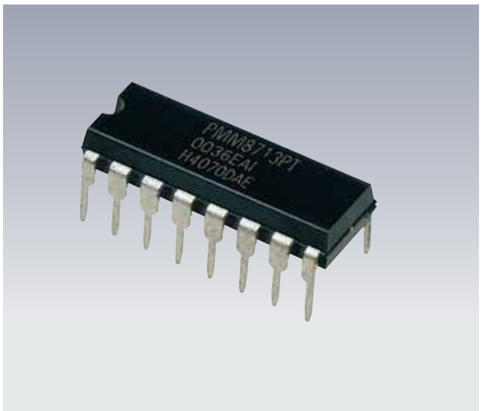
driver

	Acquired standards		File No.	Standard part
UL	UL		E179775	UL508C
	UL for Canada			
CE TÜV	Directives	Category	Name	Standard part
	Low-voltage directives			EN61010-1
	EMC directives	Emission	Terminal disturbance voltage	EN55011-A
			Electromagnetic radiation disturbance	EN55011-A
		Immunity	ESD Electrostatic discharge	EN61000-4-2
			RS Radio-frequency amplitude modulated electromagnetic field	EN61000-4-3
			Fast transionts	EN61000-4-4
			Surges	EN61000-4-6

SM series motor(UL/CE),H series motor(CE)

	Acquired standards	File No.
UL	UL	E208878
	UL for Canada	
CE	Standard category	Standard part
	Low-voltage directives	EN-60034-1
		IEC34-5
		(EN-60034-5)

EMC characteristics may vary depending on the configuration of the users control panel, which contains the driver or stepping motor, or the arrangement and wiring of other electrical devices.
Parts for EMC noise suppression like noise filters and troidal type ferrite cores may be required depending on circumstances.
Validation test of F series driver has been performed for low-voltage EMC directives at TÜV TÜV product service for self-declaration of CE marking.



Universal controller IC for the 2-phase stepping motor drive

PMM8713PT

Characteristics

Universal controller : The following 3 types of energization mode can be selected by switching at the energization mode switching terminal
1EX/1-2EX/2EX

Source voltage : V_{CC} = 4.5 to 5.5V

High output current : 24mA MIN. sink, source

High noise margin : Schmitt trigger circuit is incorporated for the all input terminals.

2 types of pulse input : 2 input mode CW, CCW input mode
Pulse and direction mode CK, U/D input mode

Excited status verification monitor : Outputs the monitor signal of the controller status.

Maximum Rating Ta=25

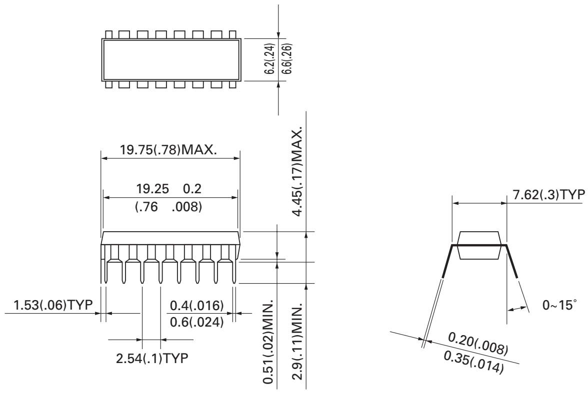
Item		Symbol	Rating	Unit
Source voltage		V_{CC}	-0.3 to 7	V
Output current n	H level	I_{OH}	-35	mA
	L level	I_{OL}	35	
Output current C_O,E_M	H level	I_{OH}		A
	L level	I_{OL}		
Input voltage		V_{IN}	-0.3 to V_{CC} +0.3	V
Input current		I_{IN}	10	mA
operating current		T_{opr}	-20 to 85	
Conservation temperature		T_{stg}	-40 to 125	

Recommended Operating Conditions Ta=-20 to 85

Item		Symbol	Rating			Unit
			MIN.	Standard	MAX.	
Source voltage		V_{CC}	4.5		5.5	V
Output current n	H level	I_{OH}	-24			mA
	L level	I_{OL}	24			
Output current C_O,E_M	H level	I_{OH}	-2			mA
	L level	I_{OL}	2			
Input voltage		V_{IN}	0		VCC	V

Dimensions Unit : mm inch

Pin No.	Name	Function
1.	C_U	Input pulse UP clock input
2.	C_D	Input pulse DOWN clock input
3.	C_K	Input pulse clock input
4.	U/D	Rotation direction conversion
5.	E_A	energization mode switching input
6.	E_B	energization mode switching input
7.	c	energization mode switching input
8.	V_{SS}	GND
9.	R	Reset input
10.	4	4 output
11.	3	3 output
12.	2	2 output
13.	1	1 output
14.	E_M	energization monitor output
15.	C_O	Input pulse monitor output
16.	V_{CC}	4.5 to 5.5V



Electrical Characteristics

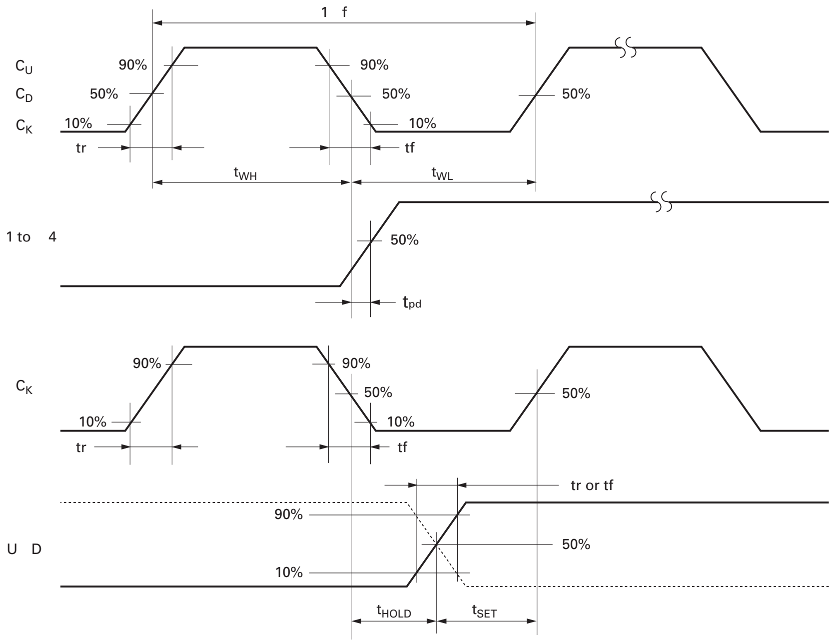
Direct current characteristics Ta = -20 to 85

Item		Symbol	Condition VCC[V]	Condition	Standard value MIN.	Standard	MAX.	Unit
Input voltage	H level	V_{IH}	5		3.5			V
	L level	V_{IL}	5				1.5	
Output voltage	H level	V_{OH}	5	V_H=5V V_L=0V IO_H=0	4.9			V
	L level	V_{OL}	5	V_H=5V V_L=0V I_{OH}=0			0.1	
Output current 1 to 4	H level	I_{OH}	5	V_H=5V V_L=0V V_{OUT}=2.4V	-24			mA
	L level	I_{OL}	5	V_H=5V V_L=0V V_{OUT}=0.4V	24			
Output current C_O, E_M	H level	I_{OH}	5	V_H=5V V_L=0V V_{OUT}=2.4V	-2			mA
	L level	I_{OL}	5	V_H=5V V_L=0V V_{OUT}=0.4V	2			
Input current		I	5			10		A
Static current consumption		I_{CC}	5	V_H=5V V_L=0V		1		mA

Switching characteristics Ta = -20 to 85

Item	Symbol	Condition VCC[V]a	Condition	Standard value MIN.	Standard	MAX.	Unit
MAX. clock frequency	f_{MAX}	5	tr tf 20ns, CL 50pF	1			MHZ
MIN. width of clock pulse	t_{WL}, t_{WH}	5	tr tf 20ns, CL 50pF			500	ns
MIN. width of reset pulse	t_{WR}	5	tr tf 20ns, CL 50pF			1000	ns
Time delay from clock input to output	t_{pd}	5	tr tf 20ns, CL 50pF			2000	ns
Set time	t_{SET}	5	tr tf 20ns, CL 50pF	0			ns
Holding time	t_{HOLD}	5	tr tf 20ns, CL 50pF	250			ns

Measured waveforms on switching time scale



Function Table

Input modes and rotation direction

Input mode	Input CU	CD	CK	U D	Rotation direction
2 input mode CW, CCW	↓	L	L	L	CW
	L	↓	L	L	CCW
Pulse and direction mode CK, U/D	L	L	↓	H	CW
	L	L	↓	L	CCW

Energization modes

Excitation mode	Input R	EA	EB	C
1 EX	H	H	L	H
1-2EX	H	H	H	H
2 EX	H	L	L	H

Universal controller IC for the 2-phase stepping motor drive

PMM8713PT

Energization Sequence

1EX

Pulse / Face	0 Reset	1	2	3	4
1	1	0	0	0	1
2	0	1	0	0	0
3	0	0	1	0	0
4	0	0	0	1	0
E_M	0	0	0	0	0
UP	→				
DOWN	←				

2EX

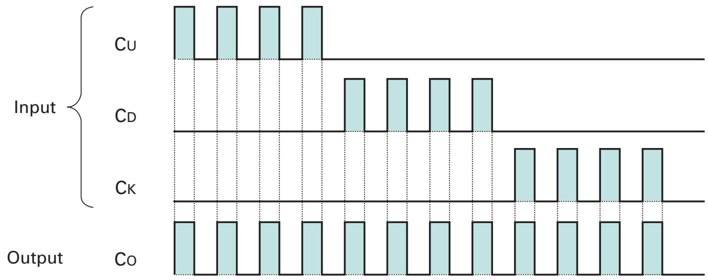
Pulse / Face	0 Reset	1	2	3	4
1	1	1	0	0	1
2	0	1	1	0	0
3	0	0	1	1	0
4	1	0	0	1	1
E_M	1	1	1	1	1
UP	→				
DOWN	←				

1-2EX

Pulse / Face	0 Reset	1	2	3	4	5	6	7	8
1	1	1	1	0	0	0	0	0	1
2	0	0	1	1	1	0	0	0	0
3	0	0	0	0	1	1	1	0	0
4	1	0	0	0	0	0	1	1	1
E_M	1	0	1	0	1	0	1	0	1
UP	→								
DOWN	←								

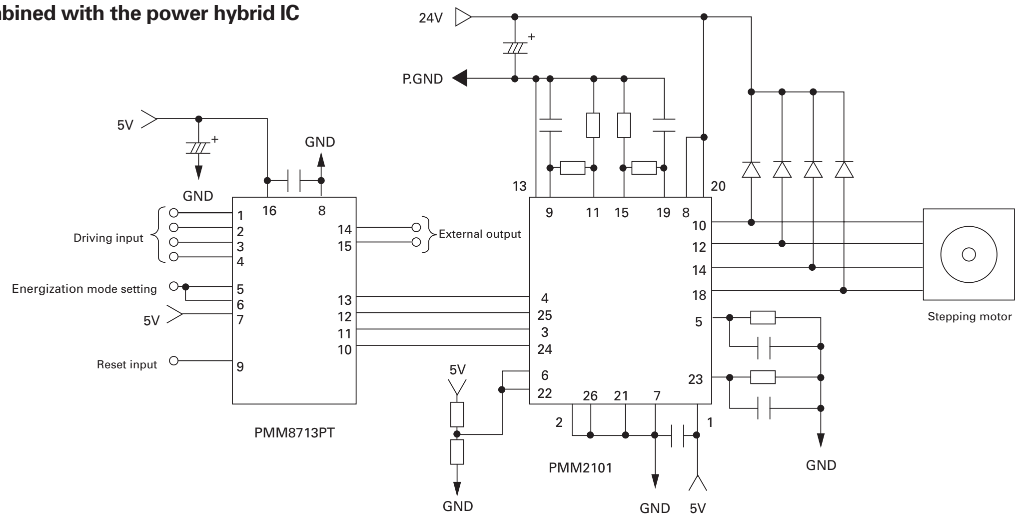
Reset after changing the energization mode.

Input Pulse Monitor



Example of Application Circuit Bipolar wiring motor

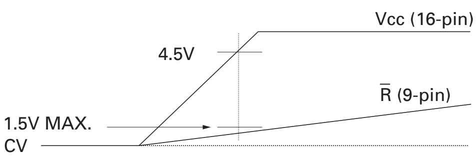
Combined with the power hybrid IC



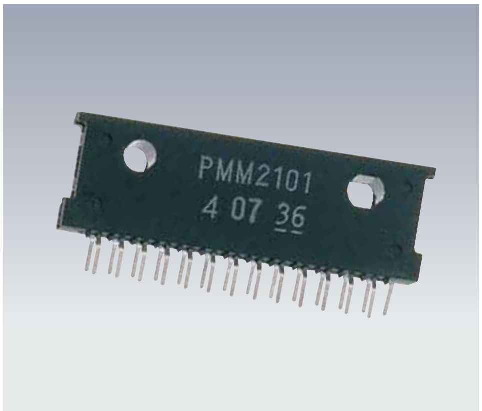
Energization mode setting

Pin No.	Terminal symbol	Input level	Motor operation
5,6	E_A, E_B	H	1-2EX
		L	2EX

The normal initial reset may not be performed during unstable VCC after turning the power ON. For reliable resetting, hold the R terminal 9-pin at the L level till the VCC becomes stable.



Power hybrid IC : Refer to page 47 for the PMM2101 specifications.
Refer to the PMM8713PT Operation Manual for other application circuit examples.



HIC for the 2-phase stepping motor

PMM2101
Full Step / Half Step
Bipolar

Characteristics

Enables high speed and high torque operation by using bipolar constant current switching method.
Enables compact driving circuit configuration with few of externally attached parts.
The overheat protection circuit is incorporated to assist the safety design.

Maximum Rating Tc=25

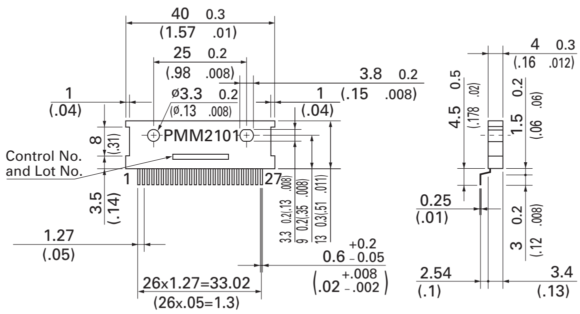
Item	Symbol	Rated value	Unit
Source voltage-1	V_{CC1}	8 to 60	V
Source voltage-2	V_{CC2}	0 to 7	V
Output current	I_O	1.4	A
Allowable loss	P_T	35 Tc 25	W
Thermal resistance	jc	3.57	W
	ja	25	W
Junction temperature	T_{jmax}	150	
Conservation temperature	T_{stg}	-40 150	

Recommended Operating Conditions Tc=25

Item	Symbol	Rated value	Unit
Source voltage-1	V_{CC1}	10 to 50	V
Source voltage-2	V_{CC2}	4.75 to 5.25	V
Output current	I_O	1.0	A
Oscillator frequency	F_C	20 to 27	kHz
Operation temperature	T_C	-25 to 85	

Dimensions Unit : mm inch

Pin No.	Name	Function
1.	V_{CC2}	Power terminal for controller section
2.	ENA A	Enable input terminal
3.	1	Arm drive input
4.	2	Arm drive input
5.	CR A	One shot time constant setting terminal
6.	V_{ref} A	Motor current setting terminal
7.	LG A	GND
8.	V_{CC1} A	Motor driver power terminal
9.	V_SA	Motor current detection terminal
10.	M1	Motor output
11.	R_S A	Detection resistor connecting terminal
12.	M2	Motor output
13.	PG	P.GND
14.	M3	Motor output
15.	R_S B	Detection resistor connecting terminal
16.	NC	
17.	NC	
18.	M4	Motor output
19.	V_S B	Motor current detection terminal
20.	V_{CC1} B	Motor driver power terminal
21.	LG B	GND
22.	V_{ref} B	Motor current setting terminal
23.	CR B	One shot time constant setting terminal
24.	3	Arm drive input
25.	4	Arm drive input
26.	ENA B	Enable terminal
27.	AL	Overheat alarm output terminal



Operational truth value table

ENA A(ENA B)	1(3)	2(4)	M1(M3)	M2(M4)
L	L	L	OFF	OFF
L	L	H	L	H
L	H	L	H	L
L	H	H	OFF	OFF
H			OFF	OFF

HIC for the 2-phase stepping motor

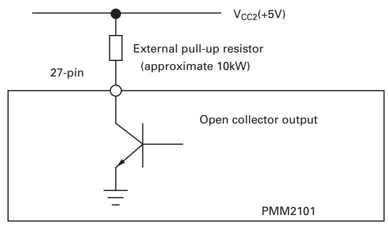
PMM2101 Full Step / Half Step

Electrical Characteristics Ta=25

Item	Symbol	Condition	Rating MIN.	Rating Standard	Rating MAX.	Unit
"H"level input voltage	V_{IH}	V_{CC2} 5V	2.7		V_{CC2}	V
"L"level input voltage	V_{IL}	V_{CC2} 5V	0		1.0	V
"H"level input current	I_{IH}	V_{CC2} 5V V_I 5V			10	A
"L"level input current	I_{IL}	V_{CC2} 5V V_I 0V			-50	A
Reference voltage (V_{ref}) input current	I_{ref}	V_{CC2} 5V V_{ref} 0V			-10	A
Current detection (V_s) input current	I_S	V_{CC2} 5V V_S 0V			-10	A
Forward direction voltage of FET diod	V_F	I_F 1A		1.3	1.5	V
High output saturating voltage	$V_{ce\,(sat)H}$	I_C 1A		1.0	1.4	V
Low output saturating voltage	$V_{ce\,(sat)L}$	I_C 1A		1.0	1.3	V
Low output saturating voltage	I_R	V_{CC1} 60V V_{OUT} 0V			10	A
		V_{OUT} 60V V_{RS} 0V			10	A
Power current to controller section	I_{CC2}	V_{CC2} = 5V during circuit operation			75	mA
Alarm terminal current	I_{alm}	V_{CC2} 5V V_{alm} 0.5V			2	mA
Overheat alarm operating temperature				125		
Overheat protection stop temperature				150		

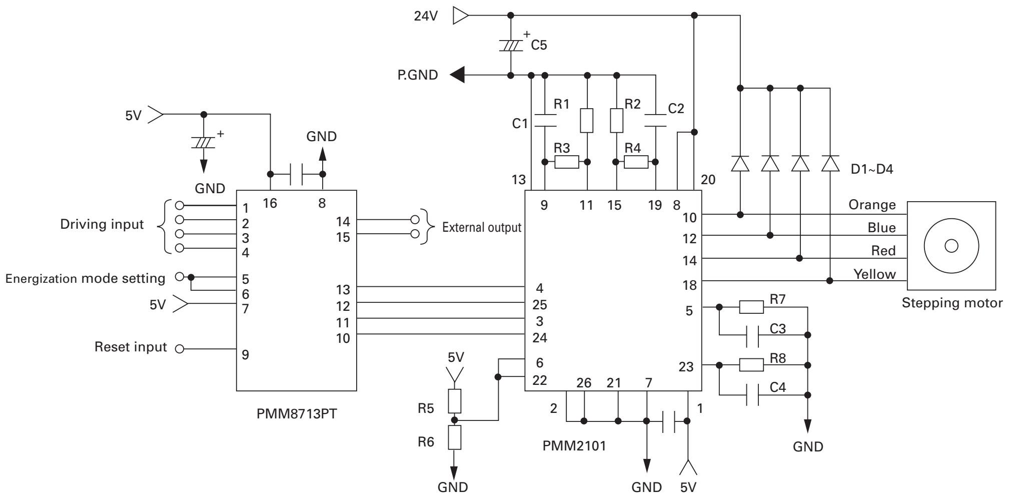
Overheat Alarm Output

The overheat protection circuit outputs an alarm signal at +125 at the internal junction in the IC, and activates motor excitation OFF at +150 .



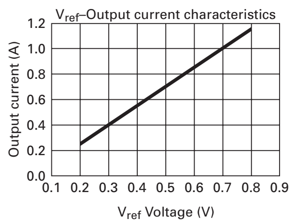
Transistor ON during alarming
Vce ON : 0.5V MAX.
Ialm : 2mA MAX.
The alarming signal output and overheat protection circuit recover automatically when the temperature lowers.

Example of Application Circuit



Refer to page 53 for the PMM8713PT specifications.
Recommended circuit constants for PMM2101

Applicable	Constant	Applicable	Constant
R1,R2	5W 0.68	C1, C2	1000pF
R3,R4	1 4W 3.9k	C3, C4	3300pF
R7,R8	1 4W 15k	C5	330 F



Determine on the R5 and R6 constants referring to the Vref-output current characteristics.
Determine on D1 to D4.
Peak reverse voltage 100V
Output current 1A
Reverse recovery time 100ns

HIC for the 2-phase stepping motor

PMM2301
Micro Step
Unipolar

Characteristics

Sine wave driven micro-step driver.
The current detection resistor is incorporated.
MOSFET is used for the power driving circuit to reduce heating.
Totally packaged to reduce parts for the peripheral circuit.
Enables selection from the 5 various excitation modes by the external bit signal.

Maximum Rating Tc=25

Item	Symbol	Condition	Rated value	Unit
Source voltage-1	$V_{CC1\,MAX.}$	V_{CC2} 0V	52	V
Source voltage-2	$V_{CC2\,MAX.}$	With no signal	7	V
Input voltage	$V_{in\,MAX.}$	Logic input terminal	7	V
Phase current	$I_{OH\,MAX.}$	0.5sec, 1pulse, V_{CC1} applied	4	A
Operating temperature on PCB	$T_{C\,MAX.}$		105	
Junction temperature	$T_{j\,MAX.}$		150	
Conservation temperature	T_{stg}		-40 to 125	

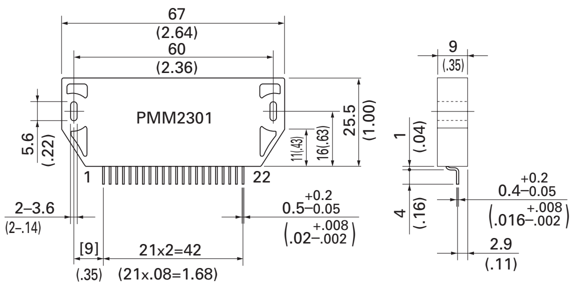
Recommended Operating Conditions Ta=25

Item	Symbol	Condition	Rated value	Unit
Source voltage-1	V_{CC1}	With signal	10 to 45	V
Source voltage-2	V_{CC2}	With signal	5.0 5	V
Input voltage	V_{IH}		0 to V_{CC2}	V
Phase current	I_{OH}	Duty 50	3	A
Clock frequency	Clock		DC to 50	kHz
Withstand voltage of phase driver	V_{DSS}		100	V

Dimensions unit: mm inch

Pin No.	Terminal name
1.	$\overline{B}$
2.	B
3.	P.GND A
4.	P.GND B
5.	A
6.	A
7.	V_{CC2}
8.	V_{ref}
9.	Mode 1
10.	Mode 2
11.	Mode 3

Pin No.	Terminal name
12.	V_{CC2}
13.	V_{CC2}
14.	Clock
15.	CW CCW
16.	Reset
17.	Return
18.	Enable
19.	M_{0I}
20.	M_{01}
21.	M_{02}
22.	GND



Each Terminal Function

Terminal name	Function	Functioning condition				
V_{ref}	Motor current setting input					
Clock	Motor driving pulse input	Mode 3 = H level : Operates at rising edge Mode 3 = L level : Operates at rising and falling edges				
CW / CCW	Motor rotation direction setting input	H level = CW rotation L level = CCW rotation				
Reset	System reset	Reset "L"				
Return	Forced return to phase origin	Forced shift to the origin of the present energization phase with Return = H				
Enable	Power OFF input	Enable "L"				
M_{0I}	Phase origin monitor output	L level output at the phase origin.				
M_{01} M_{02}	Monitor output on phase energization status	Outputs level signal on the present phase energization status.				
		Phase coordinate	A phase	B phase	$\overline{A}$ phase	$\overline{B}$ phase
		M01	H	L	L	H
		M02	L	H	L	H

HIC for the 2-phase stepping motor

PMM2301 Micro Step

Energization Mode Table

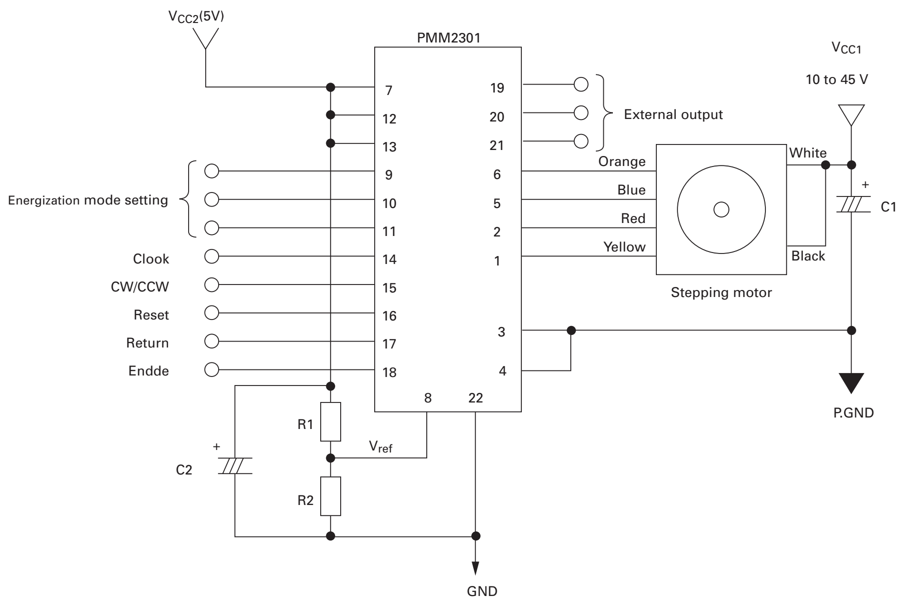
Input condition			Energization	1 step angle	Number of basic
Mode1	Mode2	Mode3	mode	degree	angle division
L	L	H	2EX	1.8	1/1
H	L	H	1-2EX	0.9	1/2
L	H	H	W1-2EX	0.45	1/4
H	H	H	2W1-2EX	0.225	1/8
H	H	L	4W1-2EX	0.1125	1/16

Conditioned on the Mode 3 = L, one pulse operation is performed at every rising and falling edge of the clock pulse. Accordingly, the operation becomes unstable if the driving pulse duty ratio deviates from 50%.

Electrical Characteristics Tc=25 Vcc1=24V Vcc2=5V

Item	Symbol	Condition	Rating			Unit
			MIN.	Standard	MAX.	
V_{CC2} Power current	I_{CCO}	Enable = L		4.5	15	mA
Effective output current	I_{oave}	Each phase R/L = 3.5 /3.8mH, Vref = 0.6V	0.45	0.50	0.55	A
Forward direction voltage of FET diode	V_{df}	I_f 1A		1.2	1.8	V
Output saturating voltage	V_{sat}	RL = 7.5 I 3.0A		1.4	2.6	V
H level input voltage	V_{IH}	9 to 11, 14 to 18 pins	4.0			V
L level input voltage	V_{IL}	9 to 11, 14 to 18 pins			1.0	V
Input current	I_{IL}	9 to 11, 14 to 18 pins = GND level, Pull-up resistor 20k	125	250	510	A
V_{ref} input voltage	V_r	8-pin	0		V_{CC2} 2	V
V_{ref} input curren	I_r	8-pin		1		A
H level output voltage M_{0I} M_{01} M_{02}	V_{OH}	19 to 21 pins I = 3mA, I = -3mA	2.4			V
L level output voltage M_{0I} M_{01} M_{02}	V_{OL}	19 to 21 pins I = 3mA, I = -3mA			0.4	V
PWM frequency	F_C		37	47	57	kHz

Example of Application Circuit



Recommended circuit constants

C1	C2
100 F or over	10 F

Determine on the R1 and R2 constants based on the Vref voltage calculated from the following formula.
Vref V = Motor current adjusted value A/phase x 0.6

Safety Consideration

The drivers and stepping motors are the products designed to be used for the general industrial devices.
When using those, pay enough attention to the following points.

Read thoroughly the Operation Manual prior to placement, assembly and/or operation in order to use the product properly.

Refrain from modifying or processing the product in any way.

Consult with the distributor or professional experts for placement or maintenance services of the product.

In case of the following uses of the product, contact with us for the special care required to the operation, maintenance and management such as multiplexing the system, installing an emergency electric generator set, or so forth.

1 Use for the medical devices concerned with a fatal accident.
2 Use for trains, elevators, and so forth that are likely to cause an accident resulting in injury, damage or death.
3 Use in the computer system highly influential to the social life or the public systems.
4 Use in other devices highly influential to maintaining the human safety or the public functions.

In addition to the above, consult with us for use in such a vibration environment as automobile or transportation.

Read the Operation Manual thoroughly prior to the use (placement, operation, maintenance and inspection) to put the product in use properly.

Make yourself knowledgeable and familiarize with the devices, safety issues and cautions before handling the product.

After reading the Operation Manual or the like, keep it in the place where the users can refer to whenever necessary.

Indication by Warning Label on the product

Either or all of the following indications are given by the Warning Labels depending on the type of the driver or stepping motor.


This label is stuck near the high voltage part such as the electrically charged or cover-protected section, warning that the place where it is likely to cause an electric shock.


This label is stuck on the place where the driver or stepping motor body should be easily acknowledged, warning that it is likely to cause burns from high temperature.

This label is stuck near the GND terminals of the driver or stepping motor for which grounding is required, suggesting that the terminals should be actually grounded.

This label is stuck for the driver or stepping motor to which the power source is applied in the voltage exceeding the safety standard, drawing attention against the electric shock.

Safety ranks of the cautions

Following four ranks are provided.

DANGER Improper operations or use is most likely to result in serious injury or death.

CAUTION Improper operations or use is likely to result in average or minor injury, or in property damage.

In spite of the cautions with the CAUTION CAUTION label, it may cause serious results. Either the contents of the labels is describing important cautions to be followed inevitably.

PROHIBITED Indicates what shall not be done.

COMPULSORY Indicates what shall be done.

DANGER

General matters

1. Do not use the product in an explosive, flammable or corrosive atmosphere, watery place or near a combustible material. Doing so may cause injury or fire.

2. Have a person with expert knowledge for performing the transportation, placement, wiring, operation, maintenance or inspection of the product. Without such knowledge, it may cause an electric shock, injury or fire.

3. Do not work for wiring, maintenance servicing or inspection with the electric power on. Perform either of those five minutes after turning the power off, or otherwise, it may cause an electric shock.

4. When the protective functions of the product is activated, turn the power off immediately and eliminate the cause. If continuing the operation without eliminating the cause, the product may operate improperly and cause injury or a breakdown of the system devices.

5. Stepping motor may run out of order at the operating and stopping occasions, depending on the magnitude of the load. Put the product into use after confirming with the adequate trial test operation in the maximum load conditions that the product performs reliable operation. Doing otherwise may cause a breakdown of the system. (Should the product run out of order in the use to drive upward/downward, it may cause a fall of the load.)

6. Do not touch the internal parts of the driver. Doing so may cause an electric shock.

Wiring

7. Do not connect the stepping motor directly with the commercial power outlet. Doing so may cause an electric shock, injury or fire. The power shall be supplied to the stepping motor through the driving circuit.

8. Use the electric power source within the rated input voltage. Using otherwise may cause fire or an electric shock.

9. Connect the driver and stepping motor to the ground. Using without grounding may cause an electric shock.

10. Do not harm, forcibly put a stress, or load a heavy article on the cable or get it caught between the articles. Doing so may cause an electric shock.

11. Perform wiring with the power cable as instructed by the wiring diagram or the Operation Manual. Doing otherwise may cause an electric shock or fire.

Operation

12. Be sure not to touch the rotating part of the stepping motor during its operation. Touching it may cause injury.

13. Neither reach or touch the electric terminals while electric power is on. Doing so may cause an electric shock.

14. Never disconnect any of the connectors while electric power is on. Doing so may cause an electric shock and corruption.

CAUTION

General matters

1. Prior to placement, operation, maintenance servicing or inspection, be sure to read the Operation Manual and follow the instructions to perform those. Failure to follow the instructions may cause an electric shock, injury or fire.

2. Do not use the driver or the stepping motor outside the specified conditions. Doing so may cause an electric shock, injury or fire.

3. Do not insert a finger or a thing into the opening of the product. Doing so may cause an electric shock, injury or fire.

4. Do not use the damaged driver or stepping motor. Doing so may cause injury, fire or the like.

5. Use the driver and stepping motor in the designated combination. Using otherwise may cause fire or a trouble.

6. Be careful that the temperature rises in the operating driver, stepping motor or peripheral devices. Failure to be careful may cause a burn.

Unpacking

7. Unpack while confirming the ceiling. Failure to do so may cause injury.

8. Confirm if the product is the one having been ordered. Installing an incorrect product may cause a breakdown.

Wiring

9. Do not perform measurement of the insulation resistance or withstand insulation voltage of the product. Doing so may cause a breakdown. Instead, contact with us for such inspection.

10. Perform wiring conforming to the technical standards of electric facility or the internal rule. Doing otherwise may cause burning or fire.

11. Ensure that wiring has been correctly done. Operating without correct wiring may cause the stepping motor to run out of control and result in injury.

12. Take insulation process for the attached condenser or the external resistance connection terminals. Failure to do so may cause an electric shock.

Placement

13. Do not climb or attach a heavy article on the product. Doing so may cause injury.

14. Neither block nor stuff the aspiration/exhaust vent with a foreign particle. Doing so may cause fire.

15. Follow the instructions for the direction to place. Failure to do so may cause a trouble.

16. Keep a distance as instructed by the Operation Manual for the driver from the inner surface of the control console or other devices. Failure to do so may cause a trouble.

17. Place the product with a great care so as to prevent from the danger such as a tumble or a turnover.

18. Mount the product on an incombustible material such as metal. Doing otherwise may cause fire.

19. Confirm the rotating direction before connecting with the mechanical device. Failure to do so may cause injury or a breakdown.

20. Do not touch the motor output spindle (including the key slot and gears) with a bare hand. Doing so may cause injury.

Operation

21. The stepping motor is not equipped with any protective device. Take protective measures using an over-current protective relay, a ground fault interrupter, a protective device from excess temperature, and an emergency stopping device. Failure to do so may cause injury or fire.

22. Do not touch the product for a period after the power is on or has been turned off, since the driver and stepping motor remain in the high temperature. Doing so may cause burns. Especially the temperature rises considerably of the stepping motor depending on the operating conditions. Use the motor on the condition so that its surface temperature becomes 100°C or under.

23. Stop the operation immediately when an emergency occurs. Failure to do so may cause an electric shock, injury or fire.

24. Do not change adjustment to an extreme, for such a change results in the unstable operation. Doing so may cause injury.

25. When conducting the trial operation, make the stepping motor fixed firmly, and confirm the operation by disconnecting with the mechanical system before connecting with it. Failure to do so may cause injury.

26. When the alarm has been activated, eliminate the cause and ensure the safety to resume operation. Failure to do so may cause injury.

27. When the electric power recovers after the momentary interruption, do not approach the devices because the system may re-start operation by itself. (Set the system so as to secure the safety even when it re-start on such occasion.) Failure to do so may cause injury.

28. Confirm that the electric power supply is all proper conforming to the specifications. Failure to do so may cause a trouble.

29. The brake mechanism of the motor with the electro-magnetic brake is to hold the movable section and the motor position. Do not use it as a safety measure, or doing so may cause the breakdown of the system.

30. Fix the key firmly when operating the motor with key individually. Failure to do so may cause injury.

Maintenance services

31. Be careful when performing maintenance services or inspection about the temperature which rises highly in the driver and stepping motor frame. Failure to do so may cause burns.

32. It is recommended to replace the electrolytic condenser of the driver with a new one for securing the preventive measure after using for 5 years, the expected life in the average 40°C. The expected life of the fuse is 10 years in the average 40°C. Thus, the periodical replacement is recommended.

33. Contact with us for repair. If the product is disassembled by the user, it may put it out of action.

Transportation

34. Handle the product with care during transportation so as to prevent from the danger such as a tumble or a turnover.

35. Do not hold with the cable or the motor spindle. Doing so may cause a trouble or injury.

Retirement

36. When scrapping the driver or stepping motor, treat it for the general industrial waste.

PROHIBITED

Storage

1. Avoid the place exposed to rain or water drops, or in an environment with hazardous gas or liquid for storing the product. Failure to do so may cause a trouble.

Maintenance services

2. Do not assemble or repair the product. Doing so may cause fire or an electric shock.

General matters

3. Do not remove the rating plate.

COMPULSORY

Storage

1. Store the product within the specified conservation temperature and humidity in the place not exposed to the sun beam.

2. If the driver has been stored for a long period (3 years or longer for a guide), consult with us. The capacitance may have decreased with the electrolytic condenser due to the long period storage, and it may cause a trouble.

Operation

3. Install an external emergency stop circuit to turn the power off for the instant halt of operation.

4. Put the product into operation in the specified ambient temperature and humidity.

Transportation

5. Excess loading of the product on the carrier may cause the load to fall in pieces. Follow the instructions given outside the package.

Inquiry Check Sheet

For more information regarding any products or services described here in, please contact your nearest office listed on the back of this catalog.

To SANYO DENKI Co.,LTD.

Date

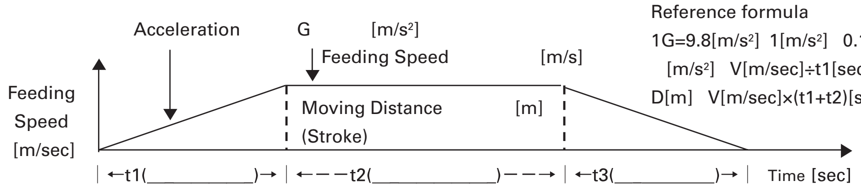
Company:

Department:

Name:

Tel: FAX:

E-mail:

	Item	Contents
1	Name of target equipment	Equipment name, category (transport, processing, test, other)
2	Name of servo axis	Axis name, axial mechanism (horizontal/vertical), brake mechanism (yes/no)
3	Current condition of above axis	Manufacturer Name ( ) Series Name ( ) Motor Capacity ( ) Hydraulic, Mechanical, or New System ( )
4	Positioning accuracy	± mm ± m
5	Operation pattern	 Reference formula 1G=9.8[m/s²] 1[m/s²] 0.1G [m/s²] V[m/sec]÷t1[sec] D[m] V[m/sec]×(t1+t2)[sec]
6	Mechanism	Ball-screw/screw-rotation type (horizontal), ball-screw/nut-rotation type (horizontal), rack and pinion (horizontal), belt/chain (horizontal), rotary table, roll feed, instability
7	Mechanical structure	WT table mass kg WL work mass kg WA mass of other drive parts kg WR rack mass kg WB belt/chain mass kg WC counterbalance mass kg Fa external force axial direction N Fb ball-screw preload N T roll pushing force N Dr1 drive-side roll diameter mm Dr2 follower-side roll diameter mm Lr1 drive-side roll length mm Lr2 follower-side roll length mm G reduction ratio JG speed-reducer inertia kg m² JC coupling inertia kg m² JN nut inertia kg m² JO other motor-axis conversion inertia kg m² Db ball-screw diameter mm Lb ball-screw axial length mm Pb ball -screw lead mm Dp pinion/pulley diameter mm Lp pinion axial length mm tp pully thickness mm Dt table diameter mm Dh table-support dianeter mm LW load shift from axis mm Ds table shaft diameter mm Ls table shaft length mm specific gravity of ball-screw/pinion/pulley/table-shaft material kg cm³ friction coefficient between sheet and shiliding-surface/support-section/roll 1 specific gravity of roll-1 material kg cm³ 2 specific gravity of roll-2 material kg cm³ internal friction coefficient of preload nut mechanical efficiency JL load inertia of motor-axis conversion kg m² TF friction torque of motor axis conversion N m Tu imbalance torque of motor axis conversion N m
8	Speed reducer	Customer-provided ( ) Sanyo denki standard(planet/spur/no-backlash-planet) other( )
9	Encoder type	Encoder type specified (yes / no) Yes:(incremental , optical absolute , optical absolute with incremental function, resolver absolute) Resolution
10	Input format	Position , velocity , torque , other ( )
11	Host equipment (controller)	Sequencer , laptop , customer-developed product , Sanyo dennki-provided , other ( )
12	Usage environment and other requirements	Cutting , clean-room use , anti-dust measures , other ( )
13	Estimated production	Single product: ( ) units/mouth ( ) units/year
14	Development schedule	Prototype period: ( ) Year ( ) Month Production period: ( ) Year ( ) Month
15	Various measures	Related documentation (already submitted; send later by mail) Visit/PR desired (yes / no) Meeting desired (yes / no)
16	Miscellaneous (questions, pending problems, unresolved issues, etc.)	

Precautions For Adoption

⚠ Cautions

Failure to follow the precautions on the right may cause moderate injury and property damage, or in some circumstances, could lead to a serious accident.
Always follow all listed precautions.

⚠ Cautions

- Read the accompanying Instruction Manual carefully prior to using the product.
- If applying to medical devices and other equipment affecting people's lives, please contact us beforehand and take appropriate safety measures.
- If applying to equipment that can have significant effects on society and the general public, please contact us beforehand.
- Do not use this product in an environment where vibration is present, such as in a moving vehicle or shipping vessel.
- Do not perform any retrofitting, re-engineering, or modification to this equipment.
- The drivers and motors presented in this catalog are meant to be used for general industrial applications. If using for special applications related to aviation and space, nuclear power, electric power, submarine repeaters, etc., please contact us beforehand.

For any question or inquiry regarding the above, contact our Sales Department.

http://www.sanyodenki.co.jp

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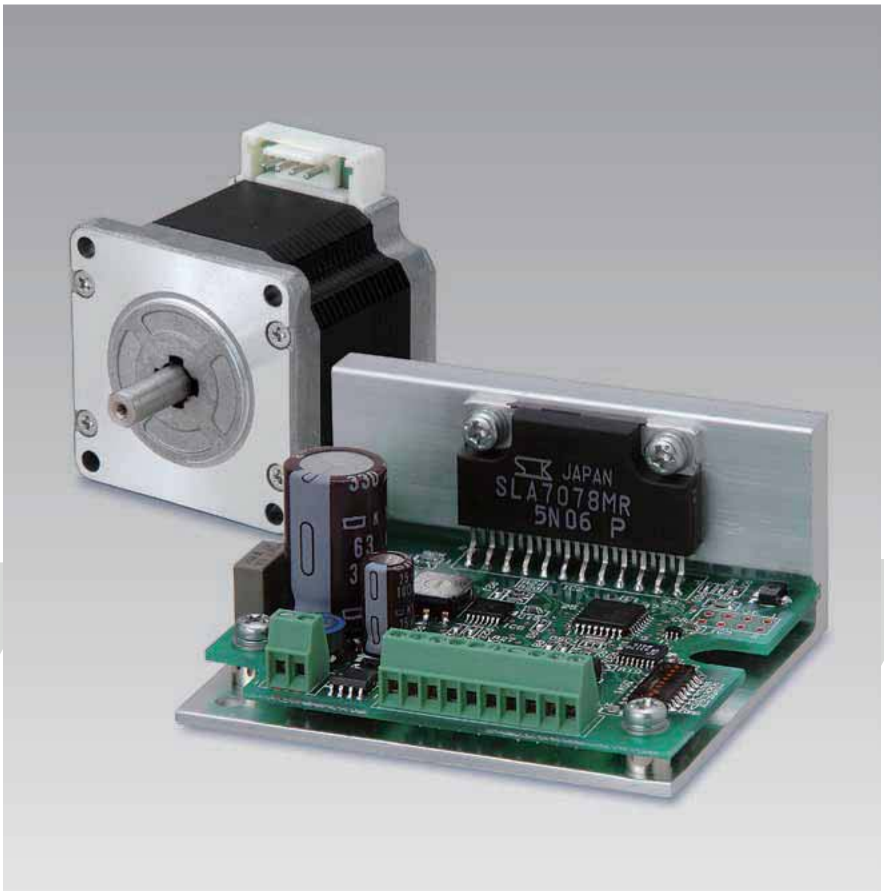
CATALOG No. 832-6 '09.3.N

SANMOTION

2-PHASE STEPPING SYSTEMS

F2



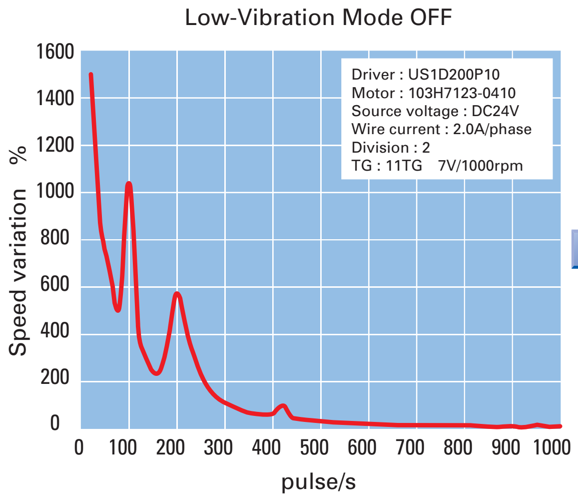
Ver.2

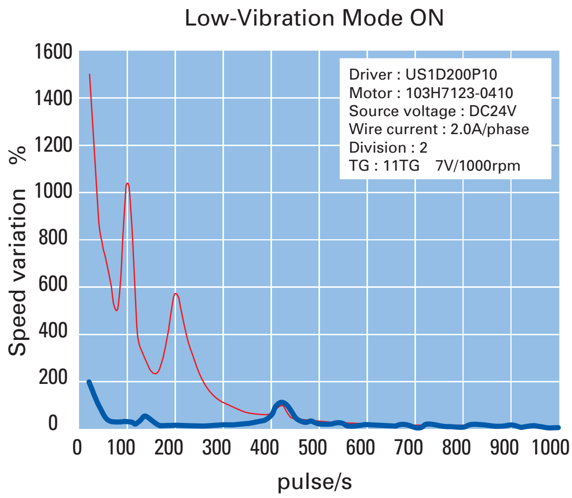
SANYO DENKI

F series DRIVER features

1 Low-vibration mode

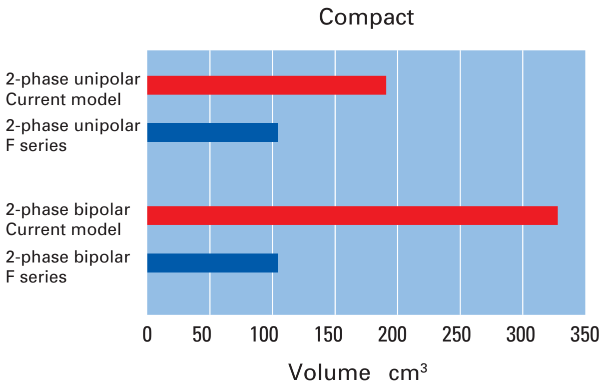
DC input

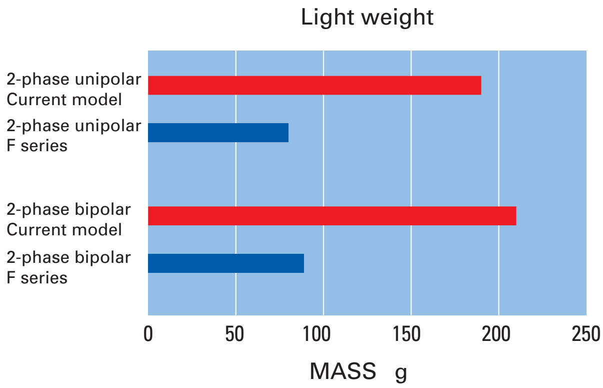




2 Compact / Light weight

DC input





Compliance with international standards

DC input

The standard specification SANMOTION F series stepping driver complies with UL and EN safety standards.Stepping motors complying with UL and EN standards are available upon request.

Set model

DC input

Stepping motors with integrated drivers

P.4

A driver incorporating a motion control function needed for
driving a motor and a 2-phase stepping motor were integrated into a single unit.

Motor flange size

□42 1.65inch □60 2.36inch

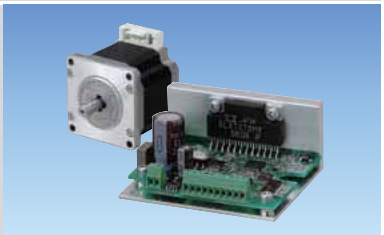
Unipolar standard standard model

P.13

The standard set includes a F series driver and a H or SH series motor.

Motor flange size

□28 1.10inch □42 1.65inch □56 2.20inch



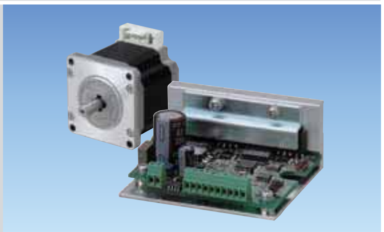
Bipolar standard standard model

P.14

The standard set includes a F series driver and a H or SH series motor.

Motor flange size

□28 1.10inch □42 1.65inch □50 1.97inch □56 2.20inch □60 2.36inch



Control method

How do you want to control the equipment?

The F series offers the choice of 3 different control methods

Program command control using PLC I/O

Network control using serial communication RS-485

Control using a pulse generator

Control using a pulse generator

Drive Specification

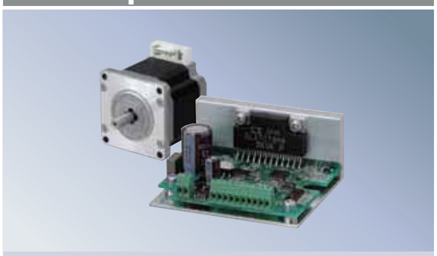
DC input
stepping motors with integrated drivers

Startup via I/O :
Initiate program containing speed, acceleration/ deceleration, and travel distance commands stored in the driver via the I/O.

Startup via serial communication :
Control by sending data for speed, acceleration/ deceleration, and travel distance commands via serial communication.

System configuration diagram	P4
Specifications	P6
Dimensions	P5 to 6

DC input
unipolar standard



Motion is generated by pulse input commands from an upper-level controller.

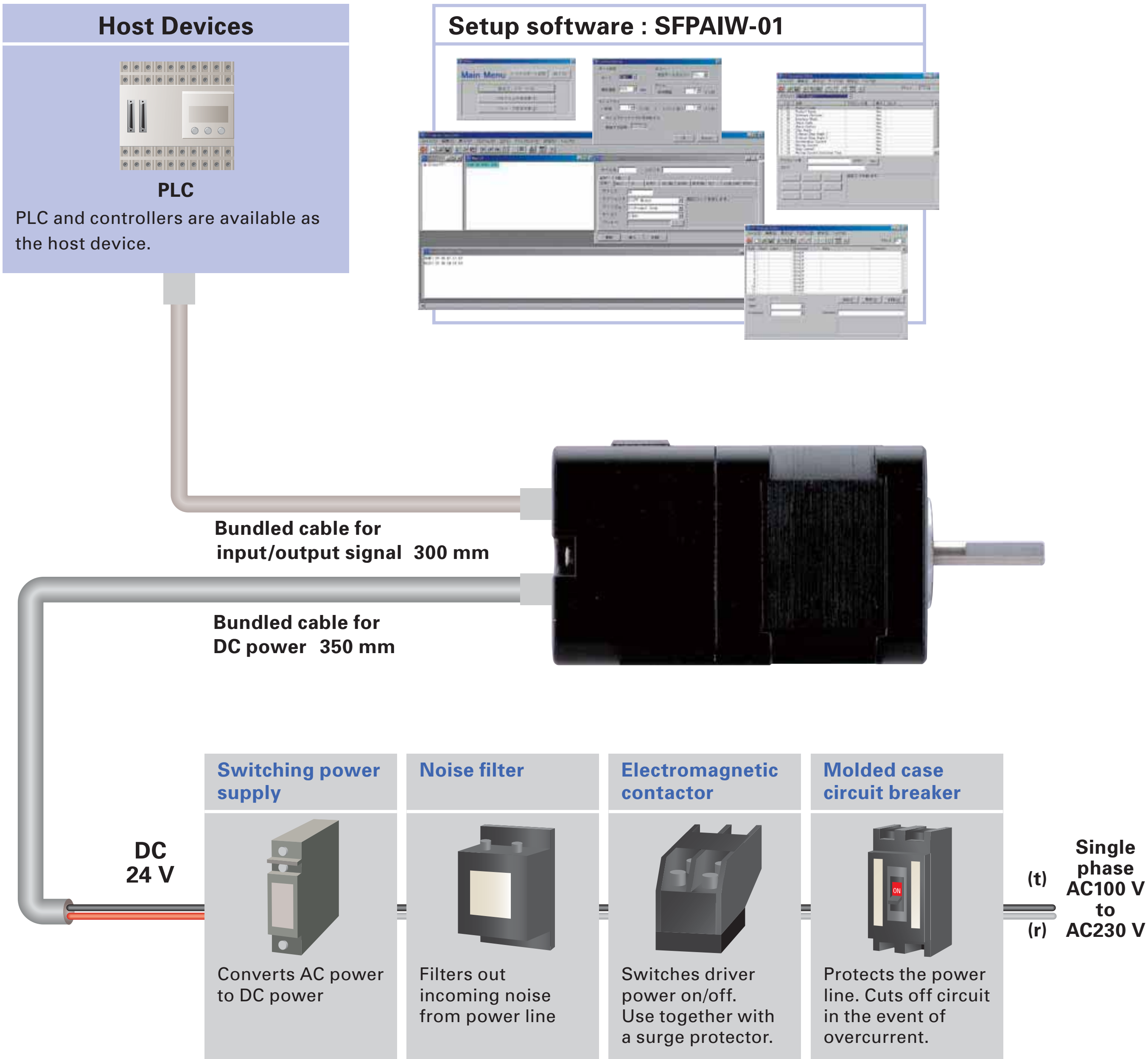
System configuration diagram	P13
Set part number nomenclature	P16
Motor specifications	P27 to 48
General specifications	P49 50
Motor dimension drawing	P51 to 54
Driver dimension drawing	P55

DC input
bipolar standard

Motion is generated by pulse input commands from an upper-level controller.

System configuration diagram	P14
Set part number nomenclature	P16
Motor specifications	P27 to 48
General specifications	P49 50
Motor dimension drawing	P51 to 54
Driver dimension drawing	P55

Stepping Motors with Integrated drivers



Stepping motors with integrated drivers

Features

1.Driver and motor are now integrated into a single unit.

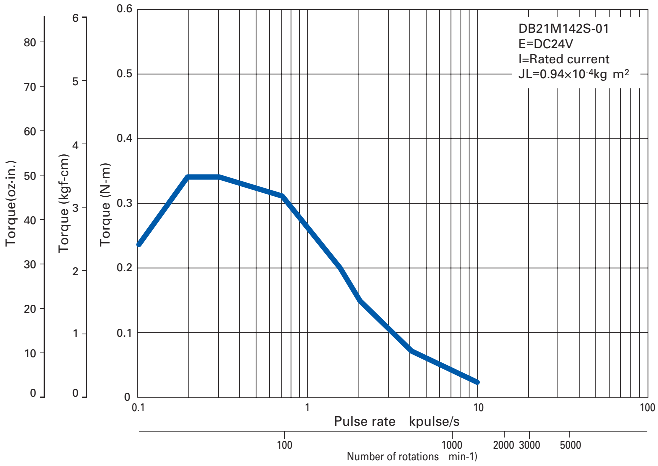
A driver incorporating a motion control function needed for driving a motor and a 2-phase stepping motor were integrated into a single unit for enabling a more compact installation space and less wiring.

2.Three types of operation modes can be selected to match the specific application.

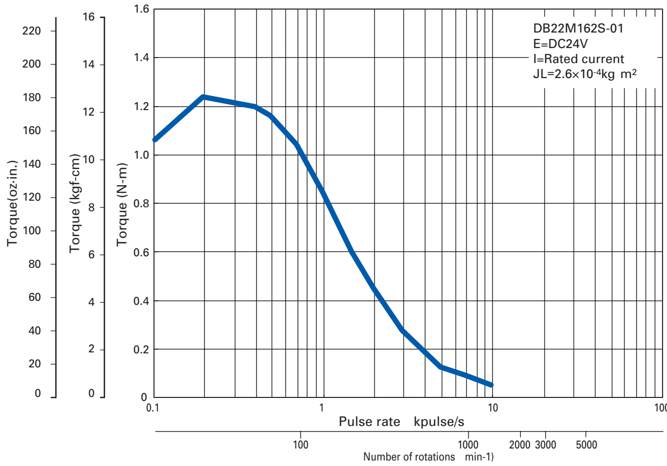
1 Control by command pulses
2 Program control by general-purpose I/O(Parallel)
3 Compliant with RS-485, half-duplex asynchronous communication

Pulse rate-torque characteristics

42mm 1.65inch



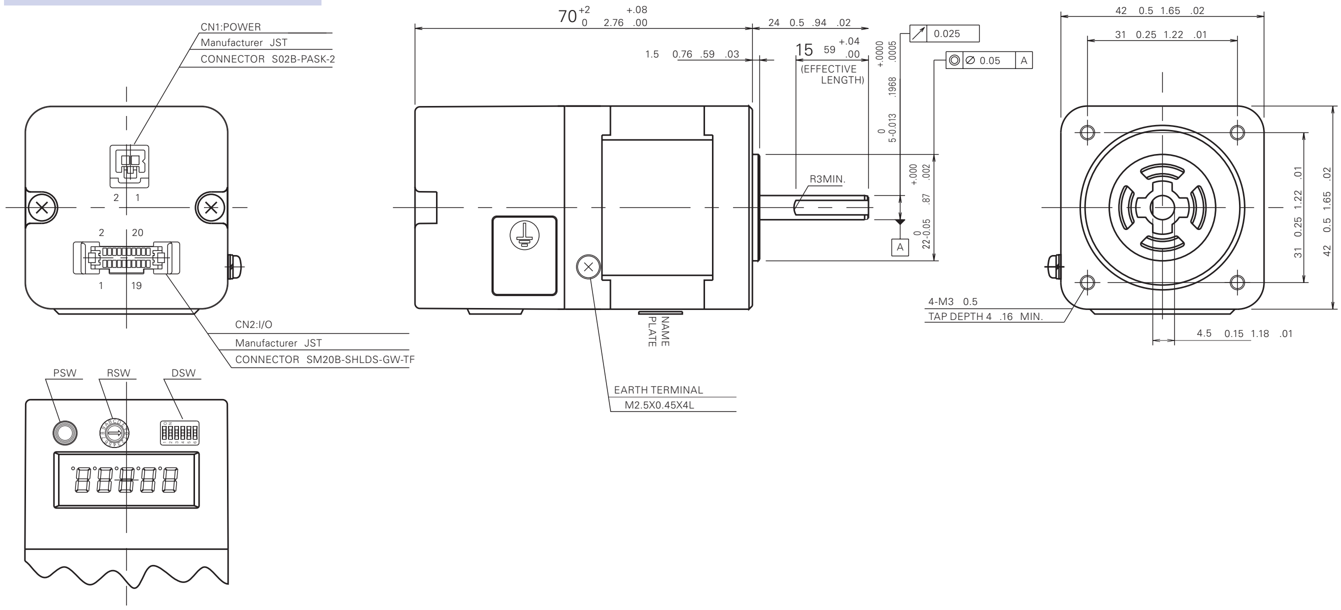
60mm 2.36inch



The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Dimensions Unit : mm inch

42mm 1.65inch

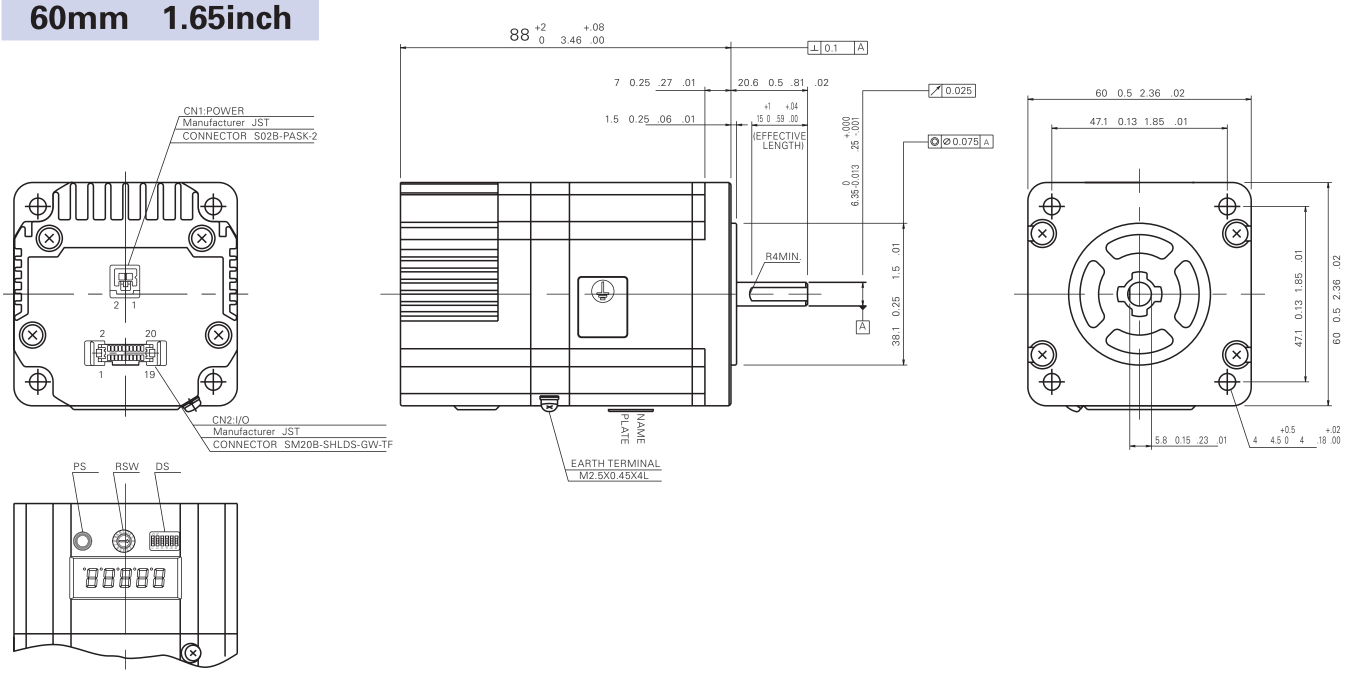


Specifications

Basic specifications	Part number Flange size		**DB21M142S-01 42**	**DB22M162S-01 60**
	Input source Note1		DC24 V 10	
	Getaway torque A		2 MAX.	3 MAX.
	Environment	Protection class	Class I	
		Operation environment	Installation category over-voltage category : II, pollution degree : 2	
		Applied standards	EN61010-1	
		Operating ambient temperature Note2	0 to +40	
		Conservation temperature	-20 to +60	
		Operating ambient humidity	35 to 85%RH no condensation	
		Conservation humidity	10 to 90%RH no condensation	
		Operation altitude	1000 m 3280 feet MAX. above sea level	
		Vibration resistance	Tested under the following conditions ; 4.9m/s2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each	
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .	
		Withstand voltage	Not influenced when 1500V AC is applied between power input terminal and cabinet for one minute.	
		Insulation resistance	10M ohm MIN. when measured with 500V DC megohmmeter between input terminal and cabinet.	
	Mass Weight		0.5kg 1.10lbs	0.87kg 1.92lbs
Function	Protection function		Against driver overheat	
	LED indicator		Alarm monitor	
I/O signals	Command pulse input signal Note3		Photo coupler input method, input resistance 220 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	Power down input signal PD		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	Step angle setting selection input EXT		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	FULL/HALF setting selection input F/H		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	EMG input signal		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	BUSY output signal		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	
	Phase origin monitor output signal MON		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	
	Alarm output signal AL		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	

Note1 Note that the power voltage must not exceed 24VDC + 10% (26.4VDC).
Note2 If the driver is placed in a box, the temperature inside the box must not exceed this specified range.
Note3 The maximum input frequency is 250k pulse/s.

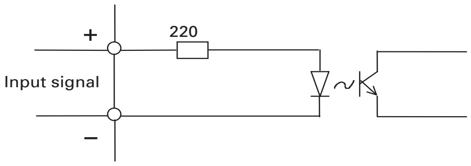
60mm 1.65inch



Input circuit configuration

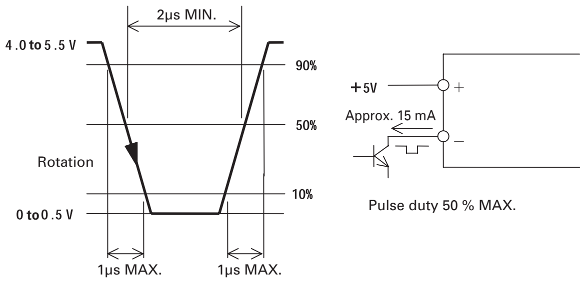
Input interface

Input circuit configuration

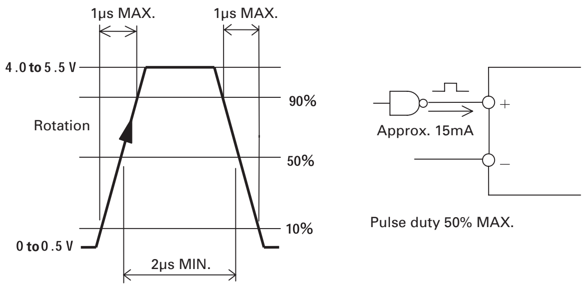


Input signal specifications

Negative logic

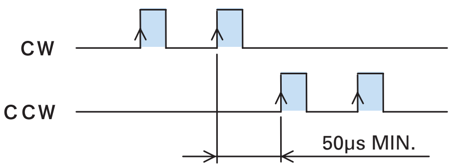


Positive logic



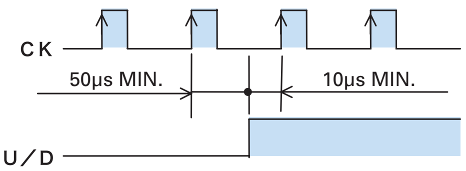
Timing of the command pulse

2-input mode CW, CCW



- The internal photo coupler turns ON within the and, at its falling edge to OFF, the internal circuit motor is activated.
- When applying the pulse to CW, turn OFF the CCW side internal photo coupler.
- When applying the pulse to CCW, turn OFF the CW side internal photo coupler.

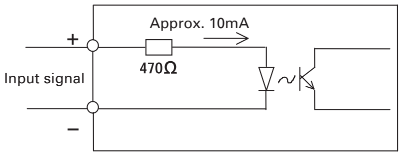
Pulse and direction mode CK, U/D



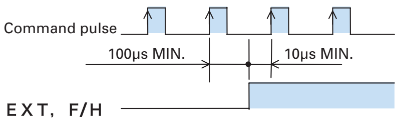
- The H level is input for and, at its rising edge to H level, the internal circuit stepping motor is activated.
- Switching the input signal U/D should be performed while the input level on the CK side is L .

Input circuit configuration

Input circuit configuration　PD EXT F/H EMG



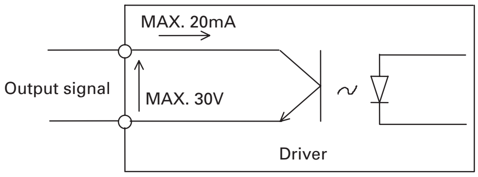
Timing of command pulse, step angle selection, and FULL/HALF selection input signal



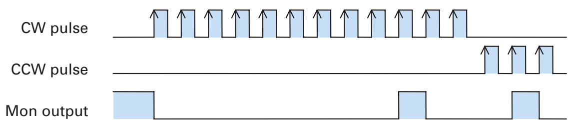
- Shaded area indicates internal photo coupler ON .
- EXT input signal
  EXT photo coupler ON enables a function by external F/H input signal.
  EXT photo coupler OFF enables the setting of a number of micro steps by main unit's rotary switch S.S.
- F/H input signal
  F/H photo coupler ON sets HALF step (2-division) operation.
  F/H photo coupler OFF sets FULL step (1-division) operation.
- Refer to switching EXT and F/H input signal in the [FULL/HALF input signal, command pulse, and step angle select].
- When switching the step angle by EXT and F/H input signal, the phase origin LCD may not turn ON and the phase origin monitor output may not output when stop. Refer to the MON output in the [Output Interface].

Output interface

Output circuit configuration BUSY MON AL

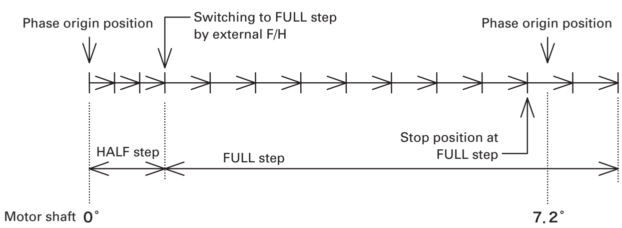


Mon output



- When the motor excitation phase is at the phase origin (power ON status), the photo coupler is turned ON , and the upper D.P of status LED turns on synchronously.
- Output from MON is set to on at every 7.2 degrees of motor output shaft from phase origin.

When changing the division setting by F/H input signal.



- When changing the motor division setting by the external input signal and the rotary switch as shown in the example below, the motor cannot stop where MON output signal can be output. Take this into consideration when using the MON output signal.

Stepping Motors with Internal drivers
Set model
Stepping motor
Dimensions
IC for stepping motor

WIRING

Specification Summary of Input/Output Signals (Serial I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC 5V is input.
Alarm clear signal standard	ALMC	6	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
General-purpose input 1	IN1	6	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 1 on Internal photo coupler off General purpose input 1 off
Emergency stop input	EMG	6	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler of Emergency stop
Origin signal	ORG	6	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
+ direction overtravel signal	+OT	7	An overtravel signal in the + direction is input. Internal photo coupler on + direction overtravel not arrived Internal photo coupler off + direction overtravel arrived
General-purpose input 2	IN2	7	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 2 on Internal photo coupler off General purpose input 2 off
Emergency stop input	EMG	7	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	7	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	7	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
- direction overtravel signal	OT	8	An overtravel signal in the - direction is input. Internal photo coupler on - direction overtravel not arrived Internal photo coupler off - direction overtravel arrived
General-purpose input 3	IN3	8	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 3 on Internal photo coupler off General purpose input 3 off
Emergency stop input	EMG	8	emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	8	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	8	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear

Signal	Reference Designation	Pin Number	Function Summary
Emergency stop signal	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
General-purpose input 4c	IN4	9	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 4 on Internal photo coupler off General purpose input 4 off
Origin signal	ORG	9	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	9	alarms are cleared. Internal photo coupler off on Alarm clear
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
During program execution	PEND	10	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
Zone signal	ZONE	10	on when the current position is inside the coordinates that were set beforehand.
During program execution	PEND	11	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
During motor operation	BUSY	11	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Zone signal	ZONE	11	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	ALM	12	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor becomes non excited status.
Output signal common	OUT_COM	13	It is for the output signal common.
DATA+	DATA+	14	It is for the serial signal.
DATA	DATA	15	It is for the serial signal.

Specification Summary of Input/Output Signals (Pulse train I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
CW pulse input Standard	CW+ CW	1 2	When 2 input mode , Input drive pulse rotating CW direction.
Pulse train input	CK+ CK	1 2	When 1 input mode , Input drive pulse train for motor rotation.
CCW pulse input Standard	CCW+ CCW	3 4	When 2 input mode , Input drive pulse rotating CCW direction.
Rotational direction input	U/D+ U/D	3 4	When 1 input mode , Input motor rotational direction signal. Internal photo coupler ON CW direction Internal photo coupler OFF CCW direction
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC5V is input.
Power down input	PD	6	Inputting PD signal will cut off power off the current flowing to the Motor With dip switch select, change to the Power low function is possible . PD input signal on internal photo coupler on PD function is valid. PD input signal off internal photo coupler off PD function is invalid.
Step angle select input	EXT	7	FULL/HALF select input will become valid by inputting EXT signal. EXT input signal on internal photo coupler on External input signal F/H is valid EXT input signal off internal photo coupler off Main body rotary switch S.S is valid

Signal	Reference Designation	Pin Number	Function Summary
FULL/HALF select input	F/H	8	When EXT input signal on internal photo coupler on , F/H input signal on internal photo coupler on HALF step F/H input signal off internal photo coupler off FULL step
Emergency stop	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Phase origin monitor output	MON	11	When the excitation phase is at the origin in power on it turns on. When FULL step, ON once for 4 pulses, when HALF step, ON once for 8 pulses.
Alarm output	ALM	12	When alarm circuits actuated inside the Driver, outputs signals to outside. Then the Stepping motor becomes unexcited status.
Output signal common	OUT_COM	13	It is for the output signal common.

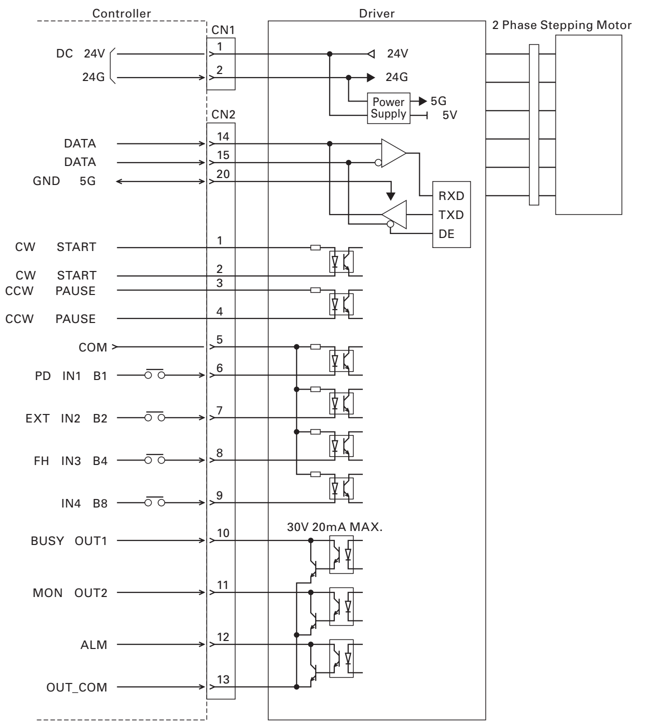
*As for the Motor rotational direction, CW direction is regard as the clockwise revolution by viewing the Motor from output shaft side.

Specification Summary of Input/Output Signals (Parallel I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
Program drive Start/Stop	START+ START-	1 2	Commands the start and stop of program driving. Internal photo coupler on Program driving start Internal photo coupler off Program driving stop
Program pause	PAUSE+ PAUSE-	3 4	When START signal on, a pause in program driving is commanded. Internal photo coupler on Program driving pause Internal photo coupler off Program driving pause release
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC5V is input.
Alarm clear signal standard	ALMC	6	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
General-purpose input 1	IN1	6	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 1 on Internal photo coupler off General purpose input 1 off
Program number selection bit 1	B1	6	The program number is selected along with other bits. Subordinate bit Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	6	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	6	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
+ direction overtravel signal	+OT	7	An overtravel signal in the + direction is input. Internal photo coupler on + direction overtravel not arrived Internal photo coupler off + direction overtravel arrived
General-purpose input 2	IN2	7	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 2 on Internal photo coupler off General purpose input 2 off
Program number selection bit 2	B2	7	The program number is selected along with other bits. The second bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	7	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	7	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	7	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
- direction overtravel signal	-OT	8	An overtravel signal in the - direction is input. Internal photo coupler on - direction overtravel not arrived Internal photo coupler off - direction overtravel arrived
General-purpose input 3	IN3	8	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 3 on Internal photo coupler off General purpose input 3 off
Program number selection bit 4	B4	8	The program number is selected along with other bits. The third bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	8	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	8	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	8	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear

Signal	Reference Designation	Pin Number	Function Summary
Emergency stop signal	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
General-purpose input 4	IN4	9	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 4 on Internal photo coupler off General purpose input 4 off
Program number selection bit 8	B8	9	The program number is selected along with other bits. The fourth bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Origin signal	ORG	9	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	9	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
During program execution	PEND	10	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
Zone signal	ZONE	10	Turns on when the current position is inside the coordinates that were set beforehand.
During program execution	PEND	11	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
During motor operation	BUSY	11	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Zone signal	ZONE	11	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	ALM	12	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor becomes non excited status.
Output signal common	OUT_COM	13	It is for the output signal common.
DATA+	DATA+	14	It is for the serial signal.
DATA	DATA	15	It is for the serial signal.

External Wiring Diagrams



SET UP

Function Select Dip Switch

The functions according to the specification can be selected with this Dip switch.
Confirm the ex-factory setting as follows.

Switch	OFF / ON	Setting	Function
1 F/R	OFF	OFF	2 input mode (CW/CCW pulse)
2 LV	OFF	OFF	Micro step operation
3 PD	OFF	OFF	Power OFF
4	OFF	OFF	Phase origin excitation
5 I. SEL	OFF	OFF	Pulse stream I/F mode
6 S. SEL	OFF	OFF	

For pulse stream I/F mode

1 Input mode select F/R

Input pulse mode selection
This switch setting is only effective in pulse stream I/F mode.

F/R	Input pulse mode
ON	1 input mode CK,U/D
OFF	2 input mode CW,CCW

2 Low vibration mode select LV

Low vibration and smooth operation is enabled even by the rough resolution setting
e.g. 1 division, 2 division .
This switch setting is only effective in pulse stream I/F mode.
For parallel I/F mode and serial I/F mode, this is usually a low vibration operation.

LV	Operation
ON	Low vibration operation
OFF	Micro step operation

*When LV select is ON low vibration mode , operational process of driving pulse will be carried out inside the Driver. Therefore, the Motor movement delays for the time of 3.2ms pulse per input pulse. Note that depending upon the combined Motor, load,driving profile and etc, it may take a while until the shaft is adjusted when the Motor stops. In parallel I/F mode and serial I/F mode there is no delay

3 Power down select PD

Select the Motor winding current value when inputting the power down signal.This switch setting is only effective in pulse stream I/F mode.

PD	Motor winding current
ON	Current value by rotary switch STP Power Low
OFF	0A Power OFF

*PD function the setting selected by PD of the function select dip switch is enabled by PD input signal ON built-in photo coupler ON of Input/Output signal connector CN2 . Power down signal input is prior to all the other current settings except for alarms. The operational status may not be maintained such as power swing due to output torque drop or lower operation due to Motor current OFF unexcited Motor . Pay extra attention to the input timing of the power down signal in addition that the security device should be installed to the machine.

4 Excitation select EORG

*By turning on the EORG, excitation phase when power OFF is saved.

5, 6 Operation mode selection I.SEL, S.SEL

The operation mode is selected.

I.SEL	S.SEL	Operation mode
OFF		Pulse stream I/F mode
ON	OFF	Parallel I/F mode
	ON	Serial I/F mode

*Change the operation mode selection switch after cutting off the driver s power supply.

For parallel I/F mode or serial I/F mode

The communication speed of serial communication is set.

Switch	Set value	Communication speed(bps)		
		9,600	19,200	38,400
F/R	OFF			
	ON			
LV	OFF			
	ON			
PD	OFF			
	ON			

*The setting change after the power supply is turned on is invalid. It does not function as a F/R, LV, and PD.

*The communication speed of pulse stream I/F mode is fixed at 9600bps.

Rotary switch(RSW) and the mode change switch(PSW)

For pulse stream I/F mode

When it selects the step angle, the driving current is selected, and stops the current is selected, set by combining rotary switch (RSW) and mode change switch (PSW).

1. Step angle select(S.S)

The divisions of the basic step angle (0.9 /step) when micro step driving can be set.

Gradation	0	1	2	3	4	5	6	7
Partition	1	2	2.5	4	5	8	10	20
Gradation	8	9	A	B	C	D	E	F
Partition	25	40	50	80	100	125	200	250

Ex-factory setting is at 1 (division 2)

*The step angle select switch (S.S) and the number of partitions become invalid by EXT input signal ON (built-in photo coupler ON) of Input/Output signal connector (CN2).

2. Driving current select(RUN)

The Motor operation current value can be selected.

Gradation	0	1	2	3	4	5	6	7
Motor current (%)	100 (rated)	95	90	85	80	75	70	65
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	60	55	50	45	40	35	30	25

Ex-factory setting is at 0 (rated value).

*When there is a sufficient extra motor torque, lowering the operation current value will be effective in the lower vibration. The Motor output torque is almost proportional to the current value. When adjusting the operational torque, confirm the sufficient operation margin and determine the Motor current value.

3. Current Select when Stop (STP)

The motor current value when stop and when power down input signal ON (power low function is selected by dip switch) can be selected.

Gradation	0	1	2	3	4	5	6	7
Motor current (%)	100 (rated)	95	90	85	80	75	70	65
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	60	55	50	45	40	35	30	25

Ex-factory setting is set at A (50%).

*The current setting when stop by STP becomes valid when the Motor stops (approximately 200ms after the last pulse input) and when power down input signal

For parallel I/F mode and serial I/F mode

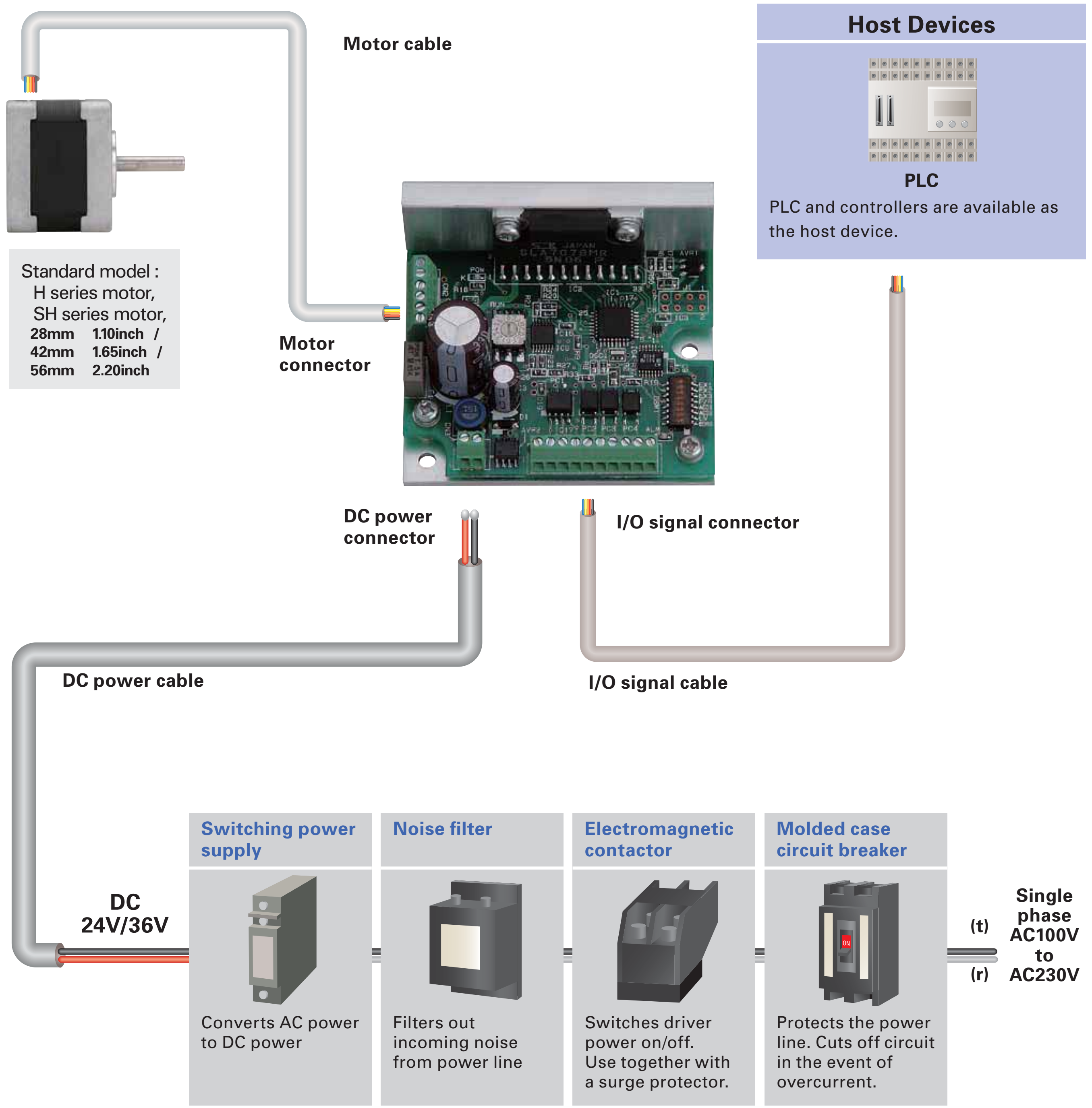
The slave bureau address of serial communications can be set.

RSW	Slave station address (HEX)
0	0
1	1
E	E
F	F

Ex-factory setting is set at 0

*The slave station address of the pulse stream I/F mode is fixed at 0.

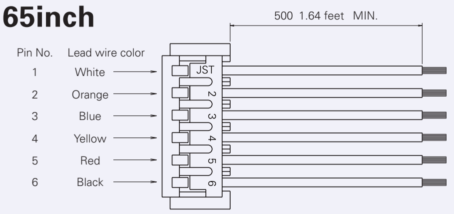
Unipolar standard



Bundled cable(42mm motors only)

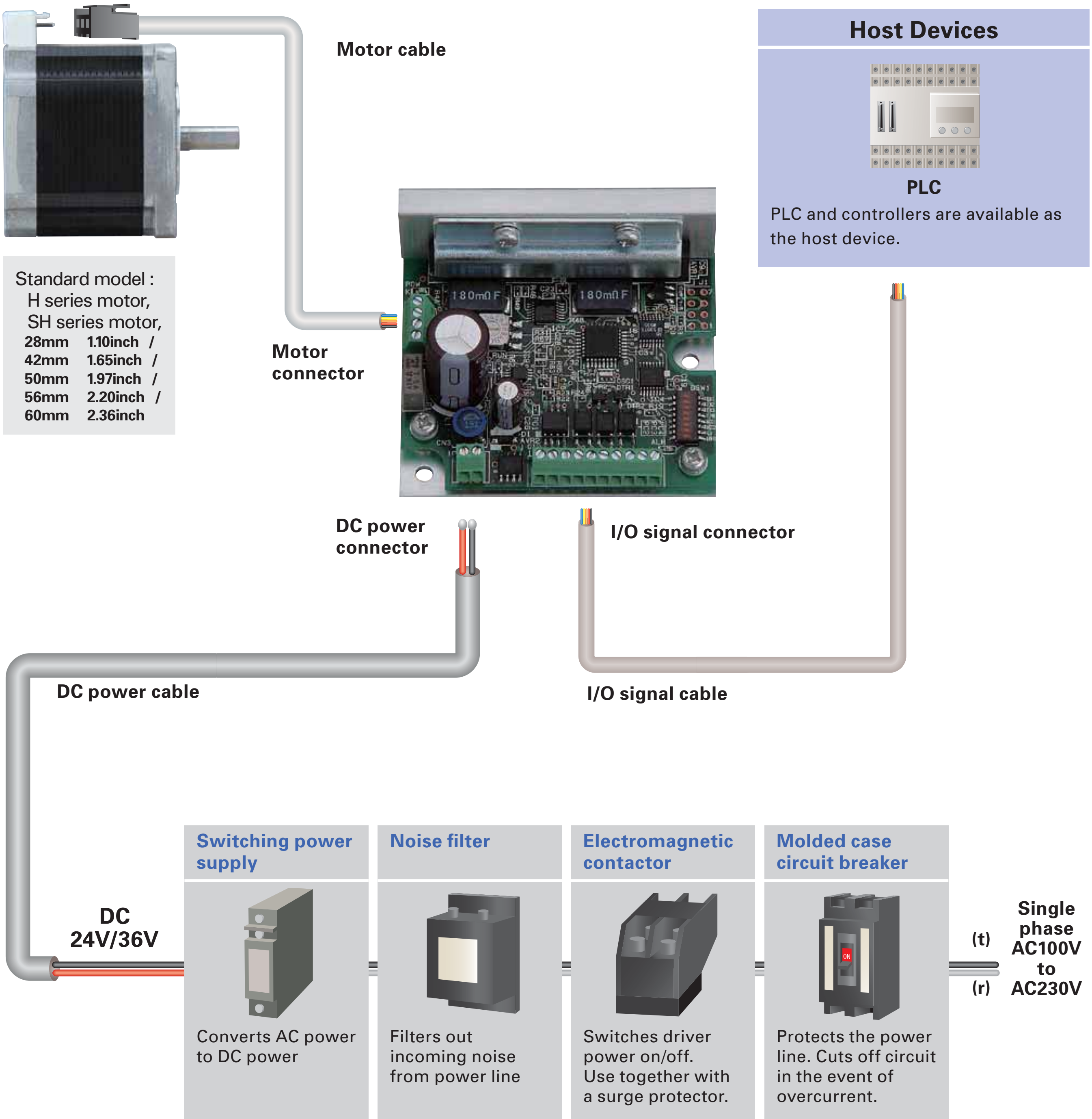
Motor cable

42mm 1.65inch



Lead wire	UL1430 AWG26
Housing	HER-6 BLACK J.S.T Mfg.Co.,Ltd
Pin	SEH-001T-P0.6 J.S.T Mfg.Co.,Ltd

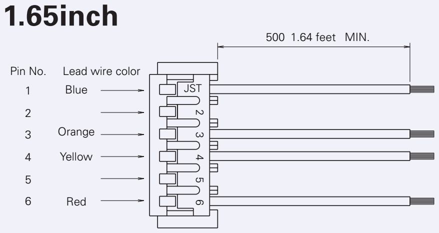
Bipolar standard



Bundled cable(42mm motors only)

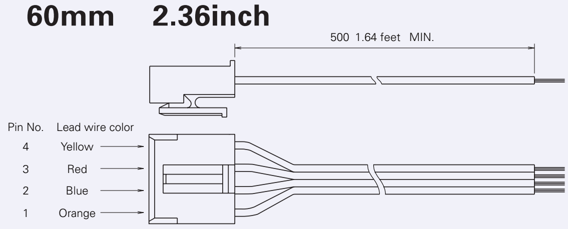
Motor cable

42mm 1.65inch



Lead wire	UL1430 AWG26
Housing	HER-6 BLACK J.S.T Mfg.Co.,Ltd
Pin	SEH-001T-P0.6 J.S.T Mfg.Co.,Ltd

60mm 2.36inch



Lead wire	UL1430 AWG22
Housing	VER-4N J.S.T Mfg.Co.,Ltd
Pin	SVH-21T-P1.1 J.S.T Mfg.Co.,Ltd

Part numbering convention

The following set part number specifies a system with an F series unipolar driver type code : US1D200P10 and a single shaft H series motor type code : 103H7121-0440 , 56 mm 2.20 inch square flange, and 41.8 mm 1.65 inch motor length.

D	U	1	6	H	71	1	S

Stepping motor shaft spec
S : Single shaft
D : Double shaft

Stepping motor total length

Code	Stepping motor flange size 28mm 1.10inch		42mm 1.65inch				50mm 1.97inch		56mm 2.20inch		60mm 2.36inch			
	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch
1	2281	32 1.26	5205	33 1.30	1401	33 1.30	6701	39.8 1.57	7121	41.8 1.65	7821	44.8 1.76	1601	42 1.65
2			5208	39 1.54	1402	39 1.54			7123	53.8 2.12	7822	53.8 2.12	1602	54 2.12
3							6703	51.3 2.02	7126	75.8 2.89	7823	85.8 3.38	1603	76 2.99
4			5210	48 1.89	1404	48 1.89								
5	2285	51.5 2.03												

Stepping motor flange size			Basic step angle
28 :	28mm	1.10inch	1.8
52 :	42mm	1.65inch	1.8
71 :	56mm	2.20inch	1.8
78 :	60mm	2.36inch	1.8
14 :	42mm	1.65inch	0.9
16 :	60mm	2.36inch	0.9

Stepping motor series name
H : H series
S : SH series

Rated current specification
4 : 1A/phase 5 : 1.2A/phase 6 : 2A/phase

Model

Driver Specification
U : 2-phase unipolar B : 2-phase bipolar

Power specification
D : DC

Combination list of 2-phase unipolar driver

System type	Motor flange size	Basic step angle	Set part number		Motor model number		Rated current
			Single shaft	**Double shaft**	Single shaft	Double shaft	
Standard model	**28mm 1.10inch**	1.8	**DU14S281S**	**DU14S281D**	SH2281-5271	SH2281-5231	1A
		1.8	**DU14S285S**	**DU14S285D**	SH2285-5271	SH2285-5231	1A
	42mm 1.65inch	1.8	**DU15H521S**	**DU15H521D**	103H5205-0440	103H5205-0410	1.2A
		1.8	**DU15H522S**	**DU15H522D**	103H5208-0440	103H5208-0410	1.2A
		1.8	**DU15H524S**	**DU15H524D**	103H5210-0440	103H5210-0410	1.2A
		0.9	**DU15S141S**	**DU15S141D**	SH1421-0441	SH1421-0411	1.2A
		0.9	**DU15S142S**	**DU15S142D**	SH1422-0441	SH1422-0411	1.2A
		0.9	**DU15S144S**	**DU15S144D**	SH1424-0441	SH1424-0411	1.2A
	56mm 2.20inch	1.8	**DU16H711S**	**DU16H711D**	103H7121-0440	103H7121-0410	2A
		1.8	**DU16H713S**	**DU16H713D**	103H7123-0440	103H7123-0410	2A
		1.8	**DU16H716S**	**DU16H716D**	103H7126-0440	103H7126-0410	2A

Combination list of 2-phase bipolar driver

System type	Motor flange size	Basic step angle	Set part number		Motor model number		Rated current
			Single shaft	**Double shaft**	Single shaft	Double shaft	
Standard model	**28mm 1.10inch**	1.8	**DB14S281S**	**DB14S281D**	SH2281-5771	SH2281-5731	1A
		1.8	**DB14S285S**	**DB14S285D**	SH2285-5771	SH2285-5731	1A
	42mm 1.65inch	1.8	**DB14H521S**	**DB14H521D**	103H5205-5240	103H5205-5210	1A
		1.8	**DB14H522S**	**DB14H522D**	103H5208-5240	103H5208-5210	1A
		1.8	**DB14H524S**	**DB14H524D**	103H5210-5240	103H5210-5210	1A
		0.9	**DB16S141S**	**DB16S141D**	SH1421-5241	SH1421-5211	2A
		0.9	**DB16S142S**	**DB16S142D**	SH1422-5241	SH1422-5211	2A
		0.9	**DB16S144S**	**DB16S144D**	SH1424-5241	SH1424-5211	2A
	50mm 1.97inch	1.8	**DB16H671S**	**DB16H671D**	103H6701-5040	103H6701-5010	2A
		1.8	**DB16H672S**	**DB16H672D**	103H6703-5040	103H6703-5010	2A
	56mm 2.20inch	1.8	**DB16H711S**	**DB16H711D**	103H7121-5740	103H7121-5710	2A
		1.8	**DB16H713S**	**DB16H713D**	103H7123-5740	103H7123-5710	2A
		1.8	**DB16H716S**	**DB16H716D**	103H7126-5740	103H7126-5710	2A
	60mm 2.36inch	1.8	**DB16H781S**	**DB16H781D**	103H7821-5740	103H7821-5710	2A
		1.8	**DB16H782S**	**DB16H782D**	103H7822-5740	103H7822-5710	2A
		1.8	**DB16H783S**	**DB16H783D**	103H7823-5740	103H7823-5710	2A
		0.9	**DB16S161S**	**DB16S161D**	SH1601-5240	SH1601-5210	2A
		0.9	**DB16S162S**	**DB16S162D**	SH1602-5240	SH1602-5210	2A
		0.9	**DB16S163S**	**DB16S163D**	SH1603-5240	SH1603-5210	2A

Standard model

F series driver + H or SH series motor

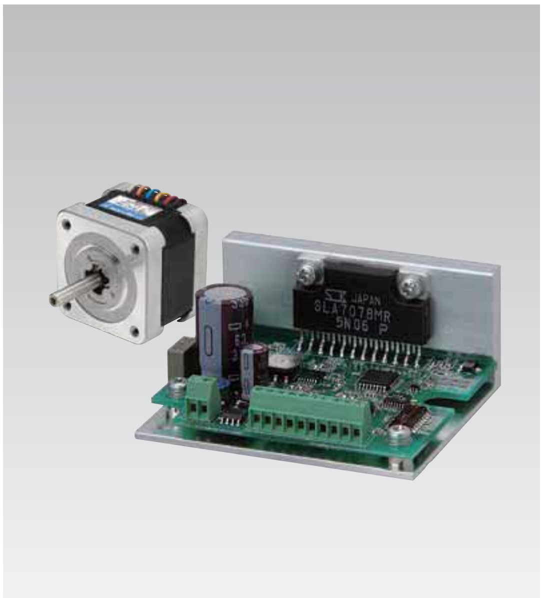
Unipolar

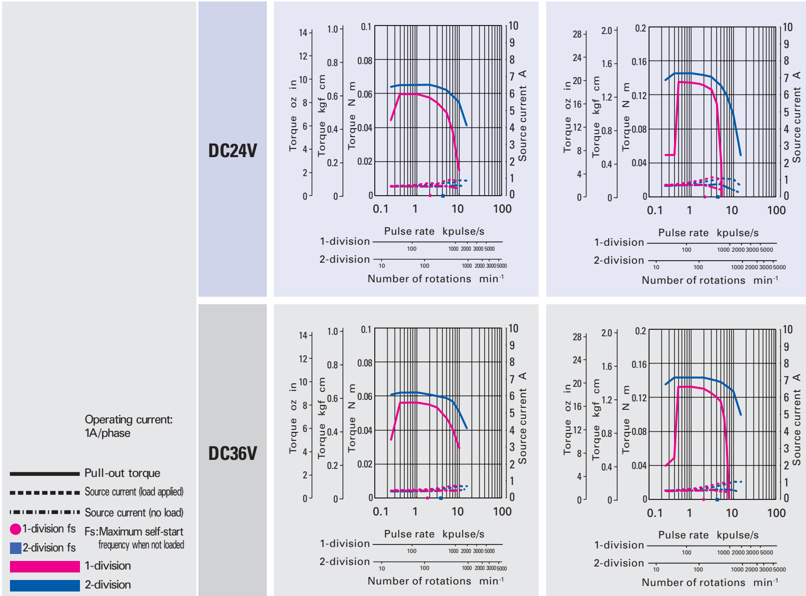
Motor flange size

□28 1.10inch □42 1.65inch □56 2.20inch

Size	Motor flange size		28mm 1.10inch □1.8	
Size	Motor length		32mm 1.26inch	51.5mm 2.03inch
Set part number	Single shaft		DU14S281S	DU14S285S
Set part number	Double shaft		DU14S281D	DU14S285D
Holding torque		N m oz in	0.055 7.79	0.115 16.28
Rotor inertia		10^{-4}kg m^2 oz in^2	0.01 0.05	0.022 0.12
Mass Weight		kg lbs	0.11 0.24	0.2 0.44
Allowable thrust load		N lbs	3 0.67	3 0.67
Allowable radial load Note1		N lbs	42 9.44	49 11.02

Note1 When load is applied at 1/3 length from output shaft edge.

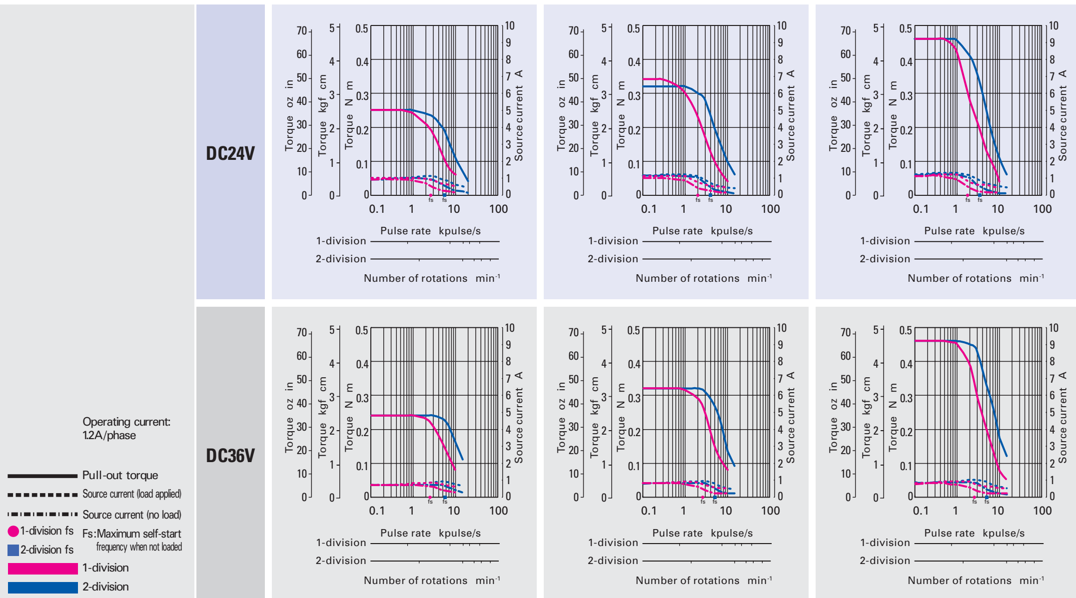




The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

Size	Motor flange size		42mm 1.65inch □0.9		
Size	Motor length		33mm 1.30inch	39mm 1.54inch	48mm 1.89inch
Set part number	Single shaft		DU15S141S	DU15S142S	DU15S144S
Set part number	Double shaft		DU15S141D	DU15S142D	DU15S144D
Holding torque		N m oz in	0.2 28.32	0.29 41.07	0.39 55.23
Rotor inertia		10^{-4}kg m^2 oz in^2	0.044 0.24	0.066 0.361	0.089 0.487
Mass Weight		kg lbs	0.24 0.53	0.29 0.64	0.38 0.84
Allowable thrust load		N lbs	10 2.25	10 2.25	10 2.25
Allowable radial load Note1		N lbs	30 6	30 6	30 6

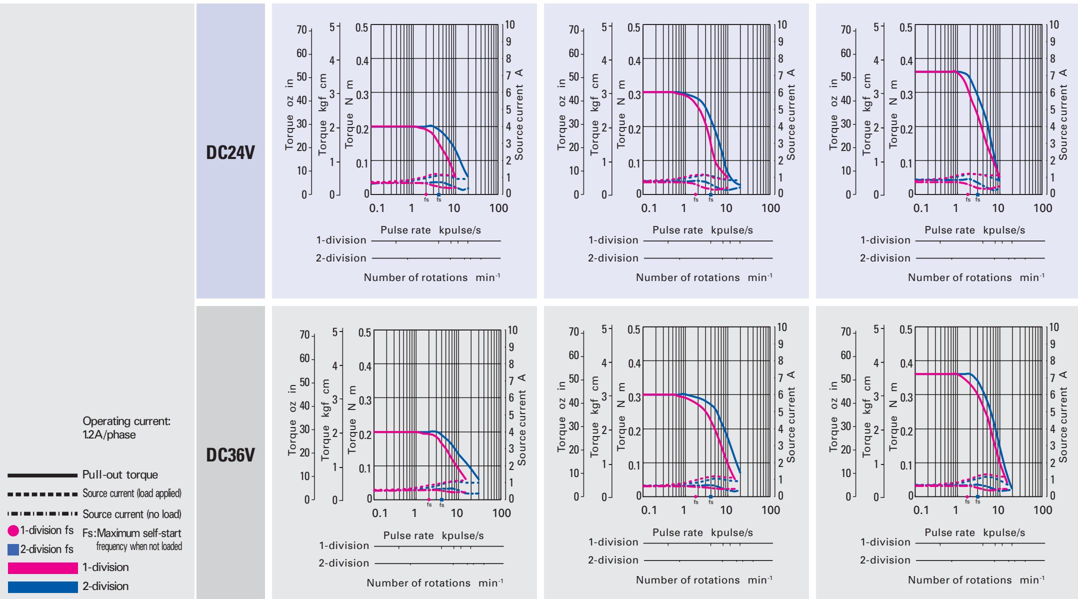
Note1 When load is applied at 1/3 length from output shaft edge.



The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

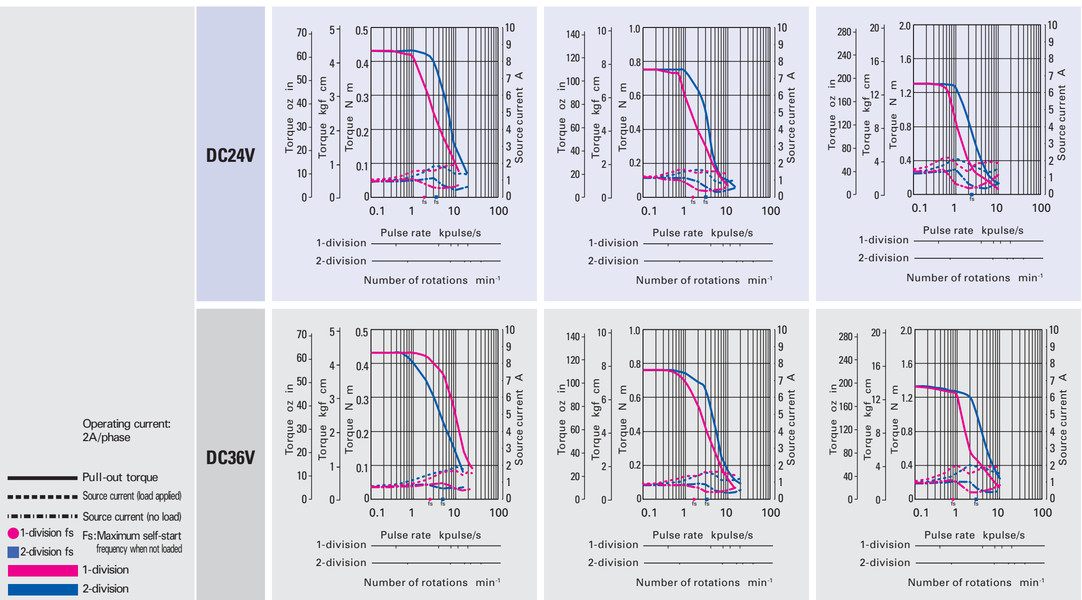
Size	Motor flange size	42mm 1.65inch /1.8		
	Motor length	33mm 1.30inch	39mm 1.54inch	48mm 1.89inch
Set part number	Single shaft	DU15H521S	DU15H522S	DU15H524S
	Double shaft	DU15H521D	DU15H522D	DU15H524D
Holding torque	N m oz in	0.2 28.32	0.3 42.48	0.37 52.39
Rotor inertia	10^{-4}kg m² oz in²	0.036 0.20	0.056 0.31	0.072 0.34
Mass Weight	kg lbs	0.23 0.51	0.29 0.64	0.37 0.82
Allowable thrust load	N lbs	10 2.25	10 2.25	10 2.25
Allowable radial load Note1	N lbs	30 6	30 6	30 6

Note1 When load is applied at 1/3 length from output shaft edge.



Size	Motor flange size	56mm 2.20inch /1.8		
	Motor length	41.8mm 1.65inch	53.8mm 2.12inch	75.8mm 2.98inch
Set part number	Single shaft	DU16H711S	DU16H713S	DU16H716S
	Double shaft	DU16H711D	DU16H713D	DU16H716D
Holding torque	N m oz in	0.39 55.23	0.83 117.5	1.27 179.8
Rotor inertia	10^{-4}kg m² oz in²	0.1 0.55	0.21 1.15	0.36 1.97
Mass Weight	kg lbs	0.47 1.04	0.63 1.39	0.98 2.16
Allowable thrust load	N lbs	15 3.37	15 3.37	15 3.37
Allowable radial load Note1	N lbs	71 15	71 15	71 15

Note1 When load is applied at 1/3 length from output shaft edge.



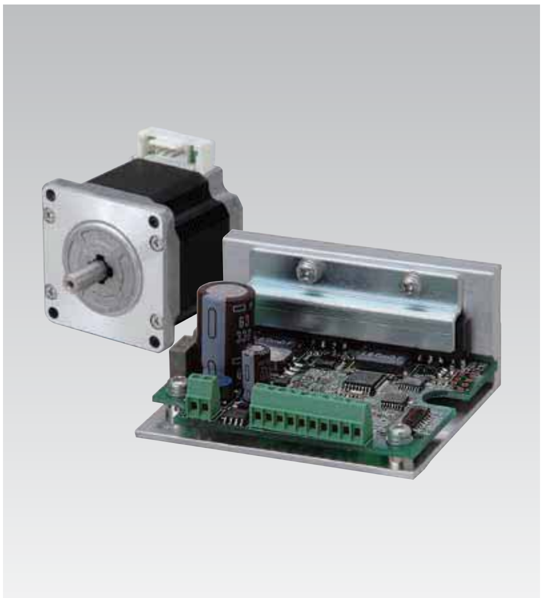
Standard model

F series driver + H or SH series motor

Bipolar

Motor flange size

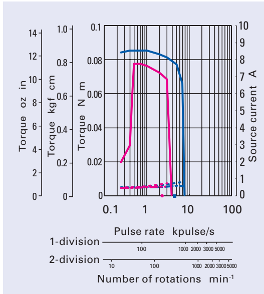
□28 1.10inch | □42 1.65inch | □50 1.97inch | □56 2.20inch | □60 2.36inch

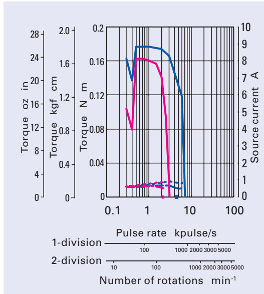


Size	Motor flange size		28mm 1.10inch /1.8	
	Motor length		32mm 1.26inch	51.5mm 2.03inch
Set part number	Single shaft		DB14S281S	DB14S285S
	Double shaft		DB14S281D	DB14S285D
Holding torque		N m oz in	0.07 9.91	0.145 20.53
Rotor inertia		10^{-4}kg m² oz in²	0.01 0.05	0.022 0.12
Mass Weight		kg lbs	0.11 0.24	0.2 0.44
Allowable thrust load		N lbs	3 0.67	3 0.67
Allowable radial load Note1		N lbs	42 9.44	49 9.44

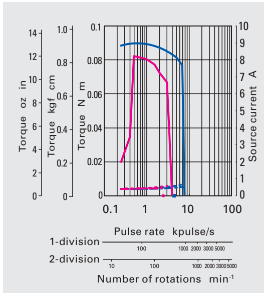
Note1 When load is applied at 1/3 length from output shaft edge.

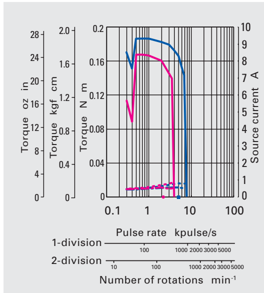
DC24V





DC36V





Operating current
28mm (1.10inch)/1.8 :1A/phase
42mm (1.65inch)/1.8 :1A/phase
42mm (1.65inch)/0.9 :2A/phase

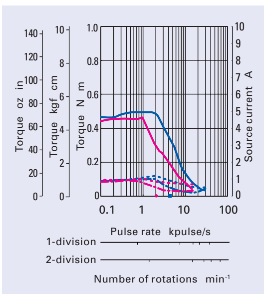
Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs
2-division fs
Fs:Maximum self-start frequency when not loaded
1-division
2-division

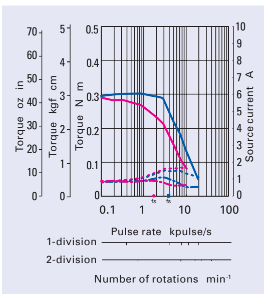
The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

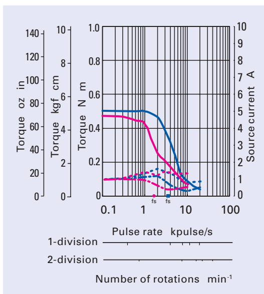
Size	Motor flange size		42mm 1.65inch /0.9	50mm 1.97inch /1.8		56mm 2.20inch /1.8
	Motor length		48mm 1.89inch	39.8mm 1.57inch	51.3mm 2.02inch	41.8mm 1.65inch
Set part number	Single shaft		DB16S144S	DB16H671S	DB16H673S	DB16H711S
	Double shaft		DB16S144D	DB16H671D	DB16H673D	DB16H711D
Holding torque		N m oz in	0.48 67.97	0.28 39.6	0.49 69.4	0.39 55.2
Rotor inertia		10^{-4}kg m² oz in²	0.089 0.487	0.057 0.31	0.118 0.65	0.1 0.55
Mass Weight		kg lbs	0.38 0.84	0.35 0.77	0.5 1.10	0.47 1.04
Allowable thrust load		N lbs	10 2.25	15 3.37	15 3.37	15 3.37
Allowable radial load Note1		N lbs	30 6	99 22	99 22	71 15

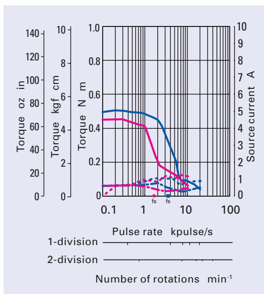
Note1 When load is applied at 1/3 length from output shaft edge.

DC24V









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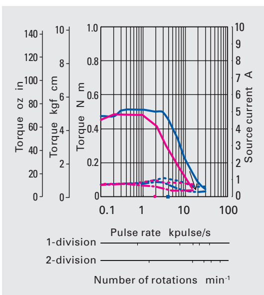
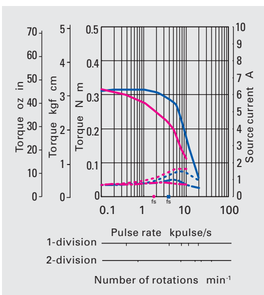
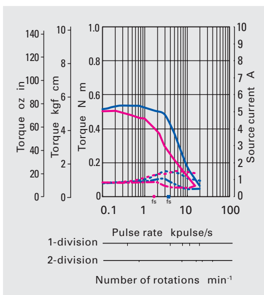
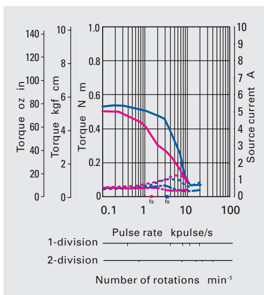






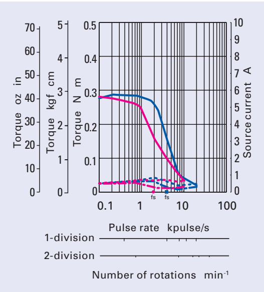


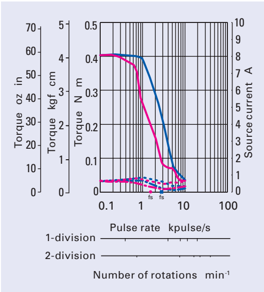
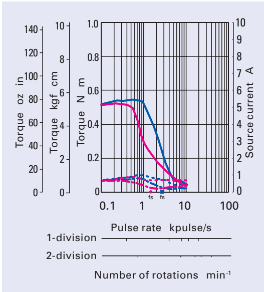
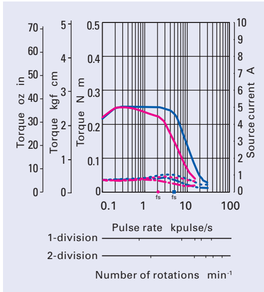
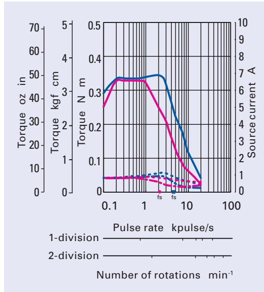
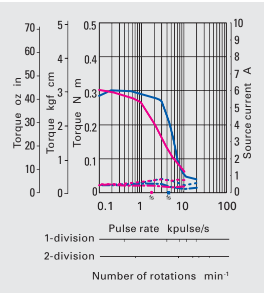
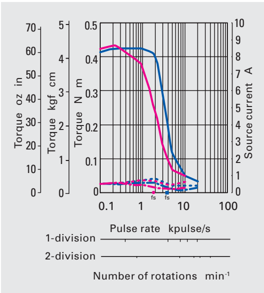
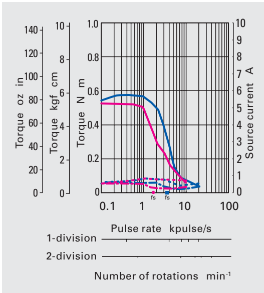
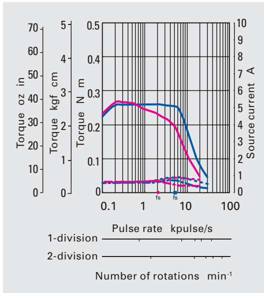
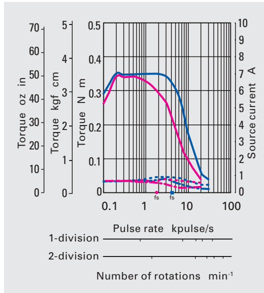
Operating current: 2A/phase

Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs
2-division fs
Fs:Maximum self-start frequency when not loaded
1-division
2-division

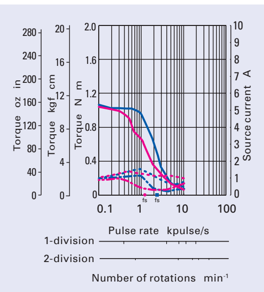
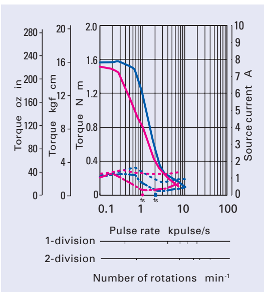
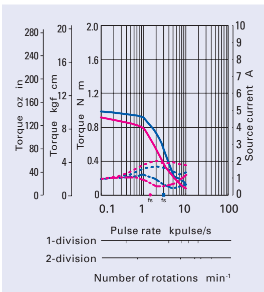
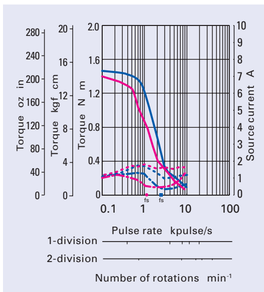
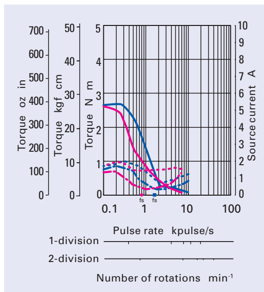
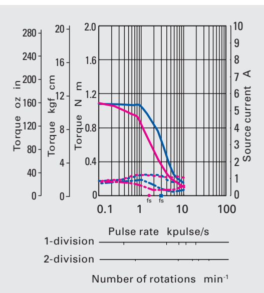
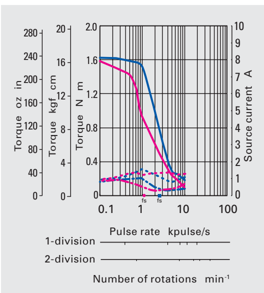
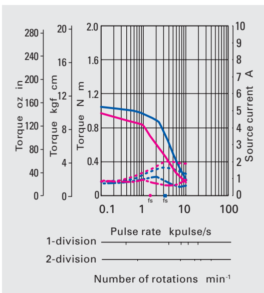
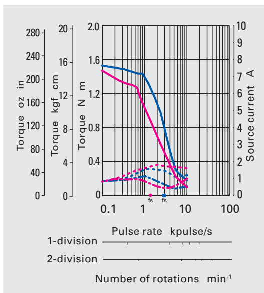
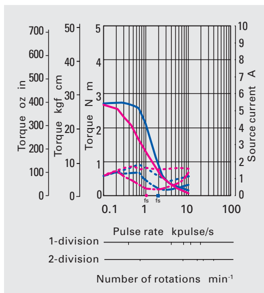
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

42mm 1.65inch /1.8			42mm 1.65inch /0.9	
33mm 1.30inch	39mm 1.54inch	48mm 1.89inch	33mm 1.30inch	39mm 1.54inch
DB14H521S	DB14H522S	DB14H524S	DB16S141S	DB16S142S
DB14H521D	DB14H522D	DB14H524D	DB16S141D	DB16S142D
0.265 37.53	0.39 55.23	0.51 72.22	0.23 32.57	0.34 48.15
0.036 0.20	0.056 0.31	0.072 0.34	0.044 0.24	0.066 0.361
0.23 0.51	0.29 0.64	0.37 0.82	0.24 0.53	0.29 0.64
10 2.25	10 2.25	10 2.25	10 2.25	10 2.25
30 6	30 6	30 6	30 6	30 6



56mm 2.20inch /1.8		60mm 2.36inch /1.8		
53.8mm 2.12inch	75.8mm 2.98inch	44.8mm 1.76inch	53.8mm 2.12inch	85.8mm 3.38inch
DB16H713S	DB16H716S	DB16H781S	DB16H782S	DB16H783S
DB16H713D	DB16H716D	DB16H781D	DB16H782D	DB16H783D
0.83 117.5	1.27 179.8	0.88 124.6	1.37 194.0	2.7 382.3
0.21 1.15	0.36 1.97	0.275 1.50	0.4 2.19	0.84 4.59
0.65 1.43	0.98 2.16	0.6 1.32	0.77 1.70	1.34 2.95
15 3.37	15 3.37	15 3.37	15 3.37	15 3.37
71 15	71 15	95 21	95 21	95 21

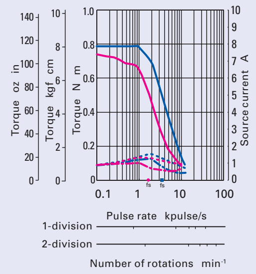











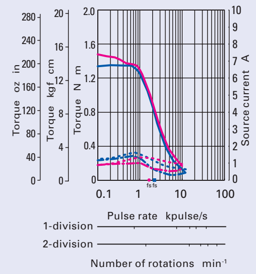
DC input Specifications

Size	Motor flange size		60mm 2.36inch /0.9	
	Motor length		42mm 16.54inch	54mm 21.26inch
Set part number	Single shaft		DB16S161S	DB16S162S
	Double shaft		DB16S161D	DB16S162D
Holding torque		N m oz in	0.69 97.71	1.28 181.26
Rotor inertia		10^{-4}kg m² oz in²	0.24 1.312	0.4 2.187
Mass Weight		kg lbs	0.55 1.21	0.8 1.76
Allowable thrust load		N lbs	15 3.37	15 3.37
Allowable radial load Note1		N lbs	79 18	79 18

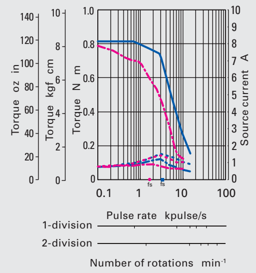
Note1 When load is applied at 1/3 length from output shaft edge.

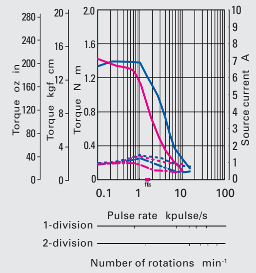
DC24V





DC36V





Operating current: 2A/phase

- Pull-out torque
- Source current (load applied)
- Source current (no load)
- 1-division fs
- 2-division fs
- Fs: Maximum self-start frequency when not loaded
- 1-division
- 2-division

The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

Specifications of Drivers

Unipolar

Model number			US1D200P10
Basic specifications	Input source		DC24 V / 36 V 10
	Source current		3 A
	Environment	Protection class	Class III
		Operation environment	Installation category over-voltage category : I, pollution degree : 2
		Applied standards	EN61010-1 UL508C
		Ambient operation temperature	0 to +50
		Conservation temperature	-20 to +70
		Operating ambient humidity	35 to 85% RH no condensation
		Conservation humidity	10 to 90% RH no condensation
		Operation altitude	2000 m 6560 feet or less above sea level
		Vibration resistance	Tested under the following conditions; 4.9 m/s^2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .
		Withstand voltage	Not influenced when 1500 V AC is applied between power input terminal and cabinet for one minute.
		Insulation resistance	10 M MIN. when measured with 500V DC megohmmeter between input terminal and cabinet.
	Mass Weight		0.08 kg 0.18 lbs
Functions	Selection functions		Step angle, Pulse input mode, Step current, Operating current.
	Protection functions		Open phase protection, Main circuit power souce voltage decrease
	LED indication		Power monitor, alarm
I/O signals	Command pulse input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5 V, input-signal L level : 0 to 0.5 V Maximum input frequency : 150 kpulse/s
	Poweer down input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5V, input-signal L level : 0 to 0.5 V
	Phase origin monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.
	Rotation monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.

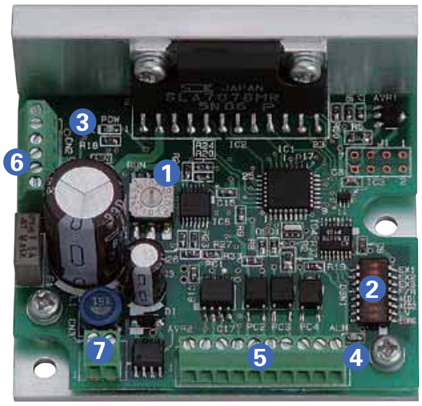
Bipolar

Model number			BS1D200P10
Basic specifications	Input source		DC24 V / 36 V 10
	Source current		3 A
	Environment	Protection class	Class III
		Operation environment	Installation category over-voltage category : I, pollution degree : 2
		Applied standards	EN61010-1 UL508C
		Ambient operation temperature	0 to +50
		Conservation temperature	-20 to +70
		Operating ambient humidity	35 to 85% RH no condensation
		Conservation humidity	10 to 90% RH no condensation
		Operation altitude	2000 m 6560 feet or less above sea level
		Vibration resistance	Tested under the following conditions; 4.9m/s^2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .
		Withstand voltage	Not influenced when 1500 V AC is applied between power input terminal and cabinet for one minute.
		Insulation resistance	10 M MIN. when measured with 500 V DC megohmmeter between input terminal and cabinet.
	Mass Weight		0.08 kg 0.18 lbs
Functions	Selection functions		Step angle, Pulse input mode, Step current, Operating current.
	Protection functions		Open phase protection, Main circuit power souce voltage decrease
	LED indication		Open phase protection, Power monitor, alarm
I/O signals	Command pulse input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5 V, input-signal L level : 0 to 0.5 V Maximum input frequency : 150 kpulse/s
	Poweer down input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5V, input-signal L level : 0 to 0.5 V
	Phase origin monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.
	Rotation monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.

Operation, Connection, and Function

Each section name of the drivers

Unipolar



1 Driving current selection switch RUN

You can select the value of the motor current when driving.

Dial	0	1	2	3	4	5	6	7
Stepping motor current A	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
Dial	8	9	A	B	C	D	E	F
Stepping motor current A	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5

The factory setting is F (0.5A).
Select the current after checking the rated current of the combination motor.

2 Function selection DIP switchpack

Select the function depending on your specification.

3 LED for power supply monitor POW

Lit up when the main circuit power supply is connected.

Indicator	Explanation
POW is displayed.	Main circuit power supply is switched on.

4 LED for alarm display ALM

Lit when an alarm is generated.

Indicator	Explanation
ALM is displayed.	Motor cable is broken, or switching element in driver is faulty. The main circuit voltage is out of specifications range (Less than DC19V).

When ALM is displayed, the winding current of the stepping motor is cut off and it is in a non-excitation state. At the same time, an output signal is transmitted from the alarm output terminal (AL) to an external source. When the alarm circuit is operating, this state is maintained until it is reset by switching on the power supply again. When an alarm condition has occurred, please take corrective actions to rectify the cause of the alarm before switching on the power supply again.

5 I/O signal connector CN1

Connect the I/O signal.

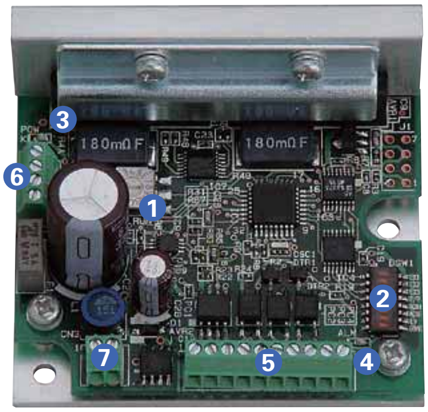
6 Motor connector CN2

Connect the motor s power line.

7 Power supply connector CN3

Connect the main circuit power supply.

Bipolar



1 Driving current selection switch RUN

You can select the value of the motor current when driving.

Dial	0	1	2	3	4	5	6	7
Stepping motor current A	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
Dial	8	9	A	B	C	D	E	F
Stepping motor current A	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5

The factory setting is F (0.5A).
Select the current after checking the rated current of the combination motor.

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Select the function depending on your specification.

3 LED for power supply monitor POW

Lit up when the main circuit power supply is connected.

Indicator	Explanation
POW is displayed.	Main circuit power supply is switched on.

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Lit when an alarm is generated.

Indicator	Explanation
ALM is displayed.	Motor cable is broken, or switching element in driver is faulty. The main circuit voltage is out of specifications range (Less than DC19V).

When ALM is displayed, the winding current of the stepping motor is cut off and it is in a non-excitation state. At the same time, an output signal is transmitted from the alarm output terminal (AL) to an external source. When the alarm circuit is operating, this state is maintained until it is reset by switching on the power supply again. When an alarm condition has occurred, please take corrective actions to rectify the cause of the alarm before switching on the power supply again.

5 I/O signal connector CN1

Connect the I/O signal.

6 Motor connector CN2

Connect the motor s power line.

7 Power supply connector CN3

Connect the main circuit power supply.

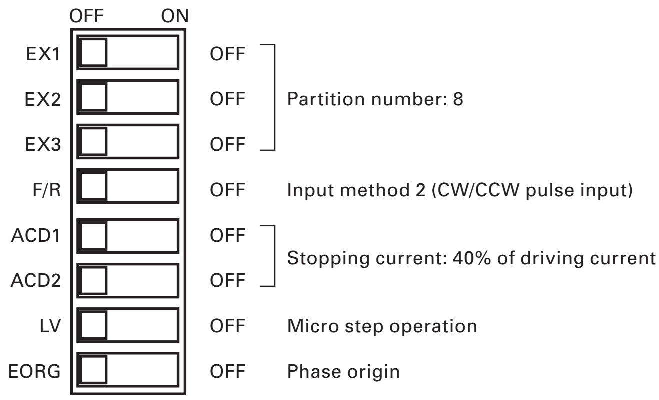
Specification summary of CN1 I/O signal

Signal name	CN1 Pin number	Function
CW pulse input standard	1 2	When using 2-input mode Drive pulse for the CW direction rotation is input.
Pulse column input	1 2	When using Pulse and direction mode Drive pulse train for the stepping motor rotation is input.
CCW pulse input standard	3 4	When using 2-input mode Drive pulse for the CCW direction rotation is input.
Rotation direction input	3 4	The rotation direction signal of stepping motor is input for the Pulse and direction mode . Internal photocoupler ON CW direction Internal photocoupler OFF CCW direction
Power down input	5 6	Inputting the PD signal cuts OFF the current flowing through the stepping motor. Iinternal photocoupler ON PD function enabled Iinternal photocoupler OFF PD function disabled
Phase origin monitor output	7 8	It is turned ON when the excitation phase is at the origin in the state when the power is turned ON It is turned ON once per 4 pulses when setting to HALF step. It is turned ON once per 8 pulses when setting to FULL step.
Alarm output	9 10	The signal is externally output when one of several alarm circuits operates in the PM driver. At this time, the stepping motor is in the unexcited state.

The CW rotation direction of stepping motor means the clockwise direction rotation as viewed from the output shaft side flange side . The CCW rotation direction means the counterclockwise direction rotation as viewed from the output shaft side flange side .

❷ Input circuit configuration CW and CCW Pulse input

Functions can be selected according to the specification with the dip switch.
Check that the ex-factory settings are as follows.



Step angle select EX1 EX2 EX3

Select the partition number of the basic step angle.

EX1	EX2	EX3	Partition number
ON	ON	ON	1-division
OFF	ON	OFF	2-division
ON	OFF	OFF	4-division
OFF	OFF	OFF	8-division
OFF	OFF	ON	16-division

Input method select F/R

Selects input pulse type

F/R	Input pulse type
ON	1 input Pluse&direction
OFF	2 input CW, CCW

Current selection when stopping ACD1 ACD2

Select the current value of the motor when stopping.

ACD2	ACD1	Current value of the motor
ON	ON	100% of driving current
ON	OFF	60% of driving current
OFF	ON	50% of driving current
OFF	OFF	40% of driving current

Initial configuration of factory shipment is set to 40% of rated value. Driver and motor should be operated at around 50% of rated value to reduce heat.

Low-vibration mode select LV

Provides low-vibration, smooth operation even if resolution is rough 1-division, 2-division, etc

LV	Operation
ON	Auto-micro function
OFF	Micro-step

Excitation select EORG

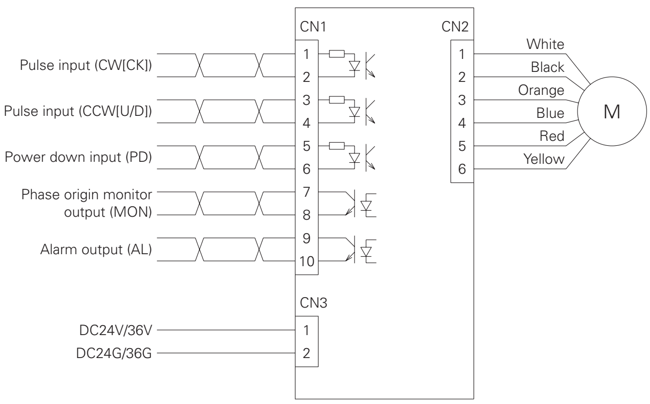
The excitation phase when the power supply is turned on is selected.

EORG	Original excitation phase
ON	Excitation phase at power shut off
OFF	Phase origin

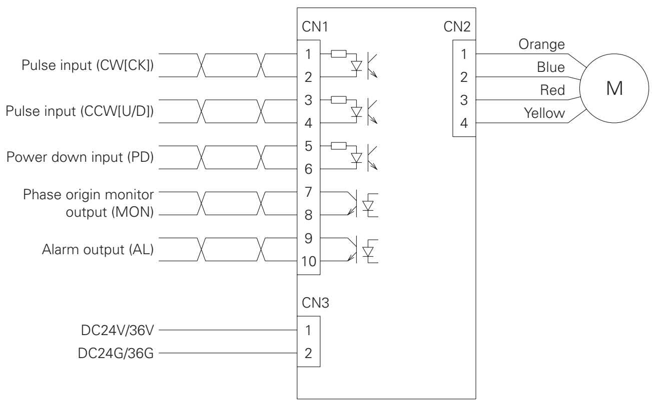
By turning on the EORG, excitation phase when power OFF will be saved. Therefore, there will be no shaft displacement when turning the power ON.

❺❻❼ External wiring diagram

Unipolar



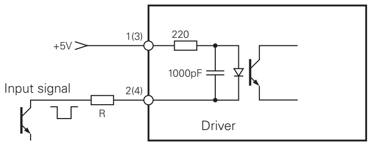
Bipolar



Applicable Wire Sizes

Part	Wire size	Allowable wire length
For power supply	AWG22(0.3 mm²)	2 m MAX.
For input/output signal	AWG24(0.2 mm²) to AWG22(0.3 mm²)	2 m MAX.
For motor	AWG22(0.3 mm²)	3 m MAX.

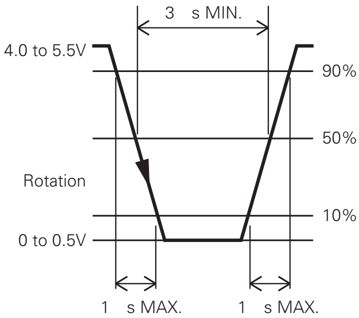
Input circuit configuration of CW CK , CCW U/D



- Pulse duty 50% MAX.
- Maximum input frequency:150kpulse/s
- When the crest value of the input signal exceeds 5V, use the external limit resistance R to limit the input current to approximately 15mA.

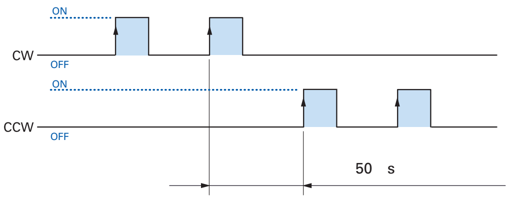
Input signal specifications

Photo coupler type



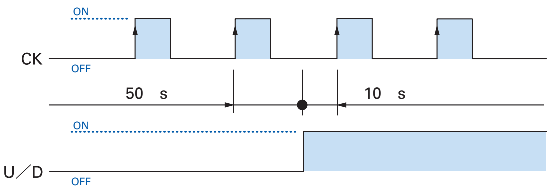
Timing of the command pulse

2-input mode CW, CCW



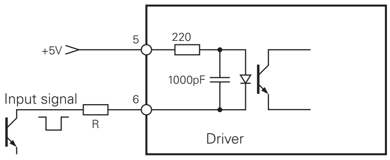
- Shaded area indicates internal photo coupler ON . Internal circuit motor starts operating at leading edge of the photo coupler ON .
- To apply pulse to CW, set CCW side internal photo coupler to OFF .
- To apply pulse to CCW, set CW side internal photo coupler to OFF .

1 input type CW, CCW



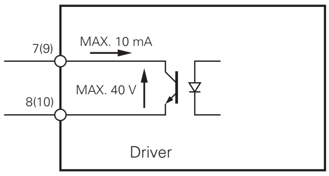
- Shaded area indicates internal photo coupler ON . Internal circuit motor starts operating at leading edge of CK side photo coupler ON .
- Switching of U/D input signal must be done while CK side internal photo coupler is OFF .

Input circuit configuration of PD

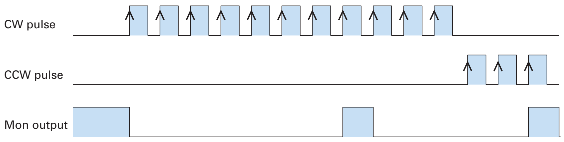


- When the crest value of the input signal exceeds 5V, use the external limit resistance R to limit the input current to approximately 15mA.

Output signal configuration of MON, AL



MON output



- Photo coupler at phase origin of motor excitation is set to ON . setting when number of divisions is 2
- Output from MON is set to on at every 7.2 degrees of motor output shaft from phase origin.

2-phase stepping motor

28mmsq. 1.10inch sq.

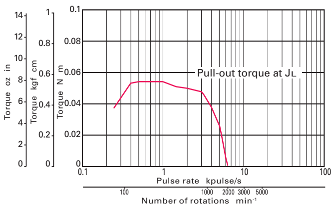
SH228
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH2281-5171	**-5131**	0.055 7.79	0.5	10.5	3.7	0.01 0.05	0.11 0.24
SH2281-5271	**-5231**	0.055 7.79	1	2.85	1	0.01 0.05	0.11 0.24
SH2285-5171	**-5131**	0.115 16.28	0.5	16.5	7.1	0.022 0.12	0.2 0.44
SH2285-5271	**-5231**	0.115 16.28	1	4.1	1.9	0.022 0.12	0.2 0.44

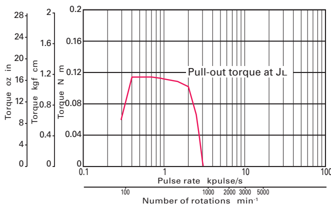
Pulse rate-torque characteristics

SH2281-51



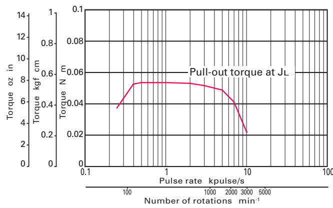
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2285-51



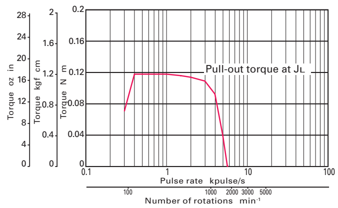
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2281-52



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2285-52



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

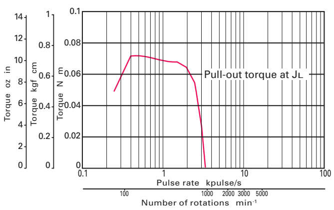
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH2281-5671	**-5631**	0.07 9.91	0.5	10.5	7.2	0.01 0.05	0.11 0.24
SH2281-5771	**-5731**	0.07 9.91	1	2.6	1.85	0.01 0.05	0.11 0.24
SH2285-5671	**-5631**	0.145 20.53	0.5	15	13.5	0.022 0.12	0.2 0.44
SH2285-5771	**-5731**	0.145 20.53	1	3.75	3.4	0.022 0.12	0.2 0.44

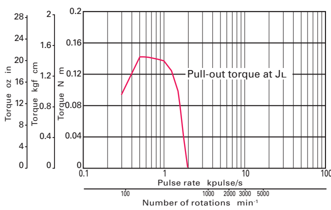
Pulse rate-torque characteristics

SH2281-56



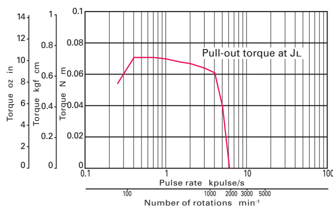
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2285-56



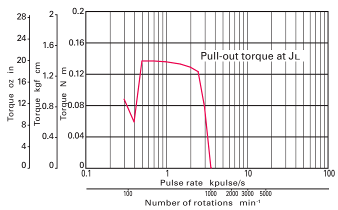
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2281-57



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2285-57



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

35mm sq. 1.38inch sq.

SH35

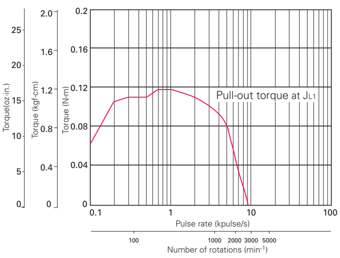
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH3533-12U40	**-12U10**	0.12 16.99	1.2	2.4	1.3	0.02 1.09	0.17 0.37
SH3537-12U40	**-12U10**	0.15 21.24	1.2	2.7	2	0.025 1.37	0.2 0.44
SH3552-12U40	**-12U10**	0.23 32.57	1.2	3.4	2.8	0.043 2.35	0.3 0.66

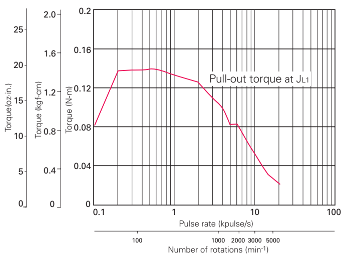
Pulse rate-torque characteristics

SH3533-12U



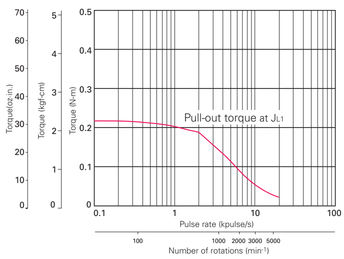
Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.33 10^{-4}kg m² (1.80 oz in²) Use the rubber coupling]

SH3537-12U



Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.33 10^{-4}kg m² (1.80 oz in²) Use the rubber coupling]

SH3552-12U



Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.94 10^{-4}kg m² (5.14 oz in²) Use the rubber coupling]

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

SS242

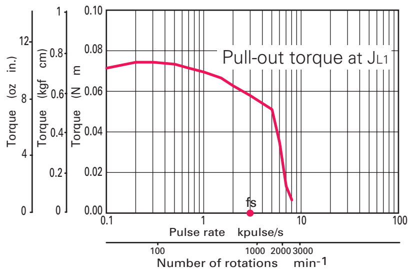
1.8 / step Bipolar winding

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SS2421-5041	**-5011**	0.083 11.75	1	3.5	1.2	0.015 0.082	0.07 0.15
SS2422-5041	**-5011**	0.186 26.33	1	5.4	2.9	0.028 0.153	0.14 0.31
SS2423-5041	**-5011**	0.240 33.98	1	7.3	5	0.038 0.208	0.20 0.44

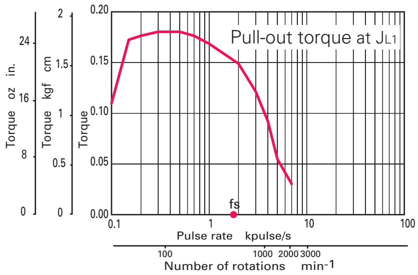
Pulse rate-torque characteristics

SS2421-50



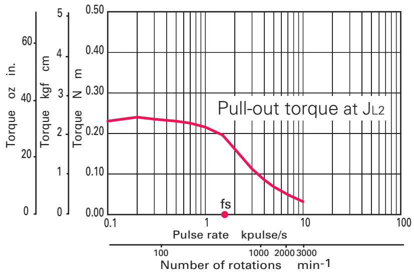
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.33x10^{-4}kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10^{-4}kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

SS2422-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.33x10^{-4}kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10^{-4}kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

SS2423-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.33x10^{-4}kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10^{-4}kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

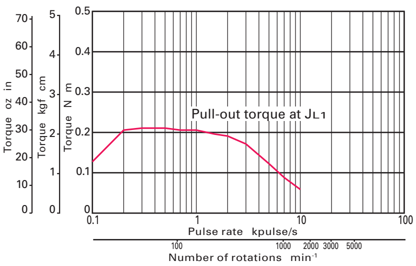
SH142
0.9 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH1421-0441	**-0411**	0.20 28.32	1.2	2.7	3.2	0.044 0.241	0.24 0.53
SH1422-0441	**-0411**	0.29 41.07	1.2	3.1	5.3	0.066 0.361	0.29 0.64
SH1424-0441	**-0411**	0.39 55.23	1.2	3.5	5.3	0.089 0.487	0.38 0.84

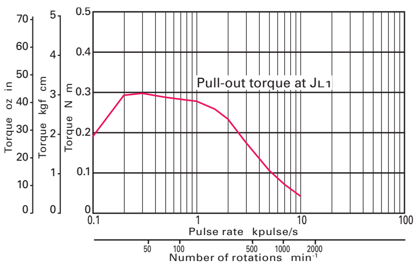
Pulse rate-torque characteristics

SH1421-04



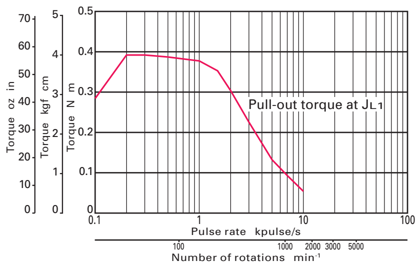
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² Use the rubber coupling

SH1422-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² Use the rubber coupling

SH1424-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² Use the rubber coupling

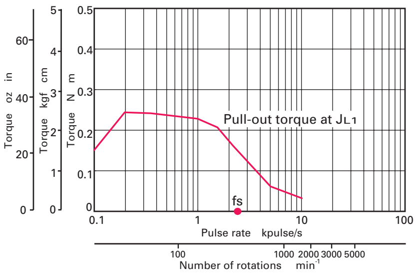
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding　Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass　Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SH1421-5041	**-5011**	0.23　32.5	1	3.3	8.0	0.044　0.24	0.24　0.53
SH1421-5241	**-5211**	0.23　32.5	2	0.85	2.1	0.044　0.24	0.24　0.53
SH1422-5041	**-5011**	0.34　48.1	1	4.0	14.0	0.066　0.36	0.29　0.64
SH1422-5241	**-5211**	0.34　48.1	2	1.05	3.6	0.066　0.36	0.29　0.64
SH1424-5041	**-5011**	0.48　67.9	1	4.7	15.0	0.089　0.49	0.38　0.84
SH1424-5241	**-5211**	0.48　67.9	2	1.25	3.75	0.089　0.49	0.38　0.84

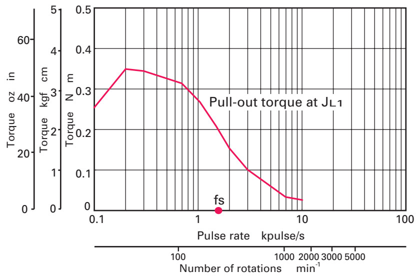
Pulse rate-torque characteristics

SH1421-50



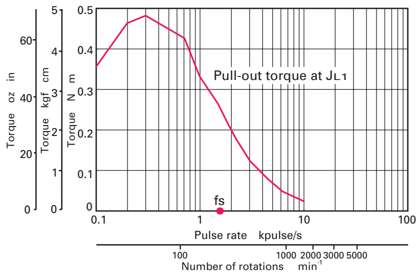
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10⁻⁴kg m²　5.14 oz in²　Use the rubber coupling

SH1422-50



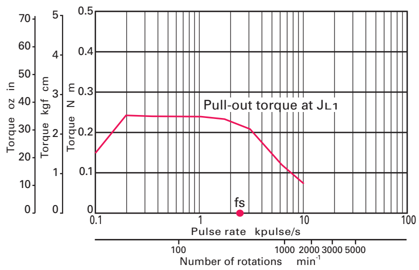
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10⁻⁴kg m²　5.14 oz in²　Use the rubber coupling

SH1424-50



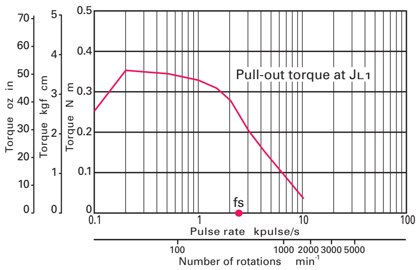
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10⁻⁴kg m²　5.14 oz in²　Use the rubber coupling

SH1421-52



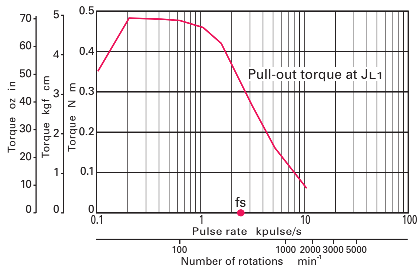
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10⁻⁴kg m²　5.14 oz in²　Use the rubber coupling

SH1422-52



Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10⁻⁴kg m²　5.14 oz in²　Use the rubber coupling

SH1424-52



Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10⁻⁴kg m²　5.14 oz in²　Use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

103H52
1.8 /step

Unipolar winding Connector type

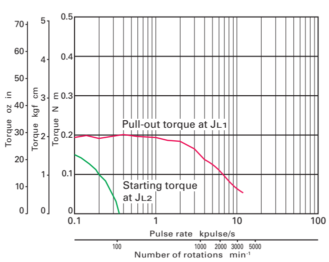
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H5205-0440	**-0410**	0.2 28.32	1.2	2.4	2.3	0.036 0.20	0.23 0.51
103H5208-0440	**-0410**	0.3 42.48	1.2	2.9	3.4	0.056 0.31	0.29 0.64
103H5209-0440	**-0410**	0.32 45.31	1.2	3	3.9	0.062 0.34	0.31 0.68
103H5210-0440	**-0410**	0.37 52.39	1.2	3.3	3.4	0.074 0.40	0.37 0.82

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H5205-5040	**-5010**	0.23 32.57	0.25	54	78	0.036 0.20	0.23 0.51
103H5205-5140	**-5110**	0.25 35.40	0.5	13.4	23.4	0.036 0.20	0.23 0.51
103H5205-5240	**-5210**	0.265 37.53	1	3.4	6.5	0.036 0.20	0.23 0.51
103H5208-5040	**-5010**	0.35 49.56	0.25	66	116	0.056 0.31	0.29 0.64
103H5208-5140	**-5110**	0.38 53.81	0.5	16.5	34	0.056 0.31	0.29 0.64
103H5208-5240	**-5210**	0.39 55.23	1	4.1	9.5	0.056 0.31	0.29 0.64
103H5209-5040	**-5010**	0.38 53.81	0.25	71.4	133	0.062 0.34	0.31 0.68
103H5209-5140	**-5110**	0.41 58.06	0.5	18.2	39	0.062 0.34	0.31 0.68
103H5209-5240	**-5210**	0.425 60.18	1	4.4	11	0.062 0.34	0.31 0.68
103H5210-5040	**-5010**	0.465 65.85	0.25	80	123.3	0.074 0.40	0.37 0.82
103H5210-5140	**-5110**	0.49 69.39	0.5	20	35	0.074 0.40	0.37 0.82
103H5210-5240	**-5210**	0.51 72.22	1	4.8	9.5	0.074 0.40	0.37 0.82

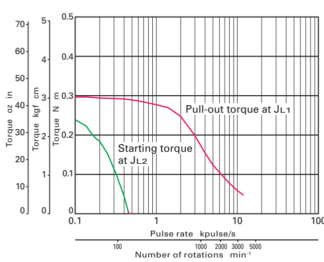
Pulse rate-torque characteristics

103H5205-04



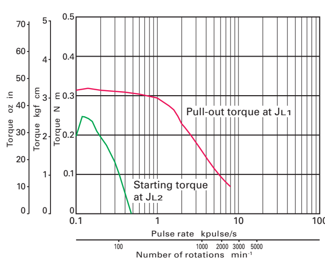
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H5208-04



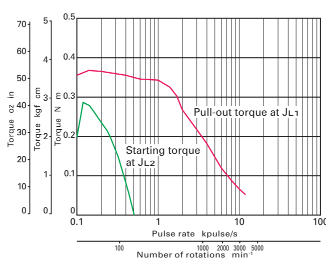
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H5209-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

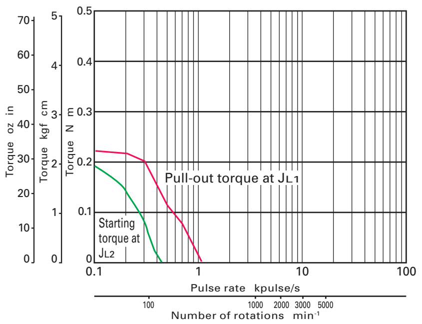
103H5210-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

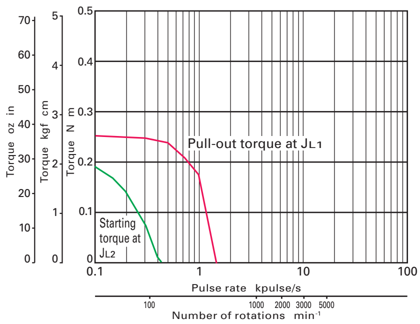
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

103H5205-50



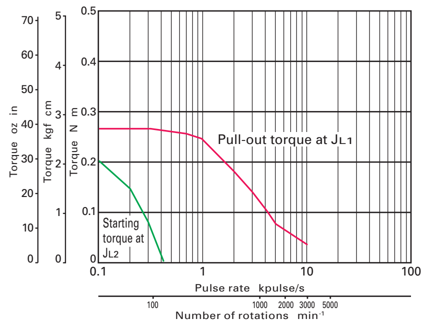
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5205-51



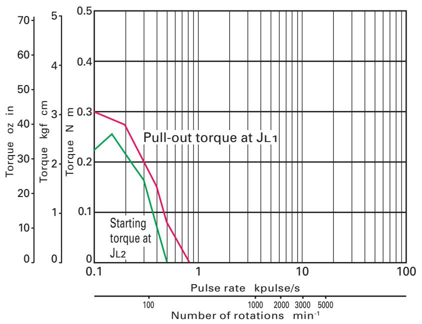
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5205-52



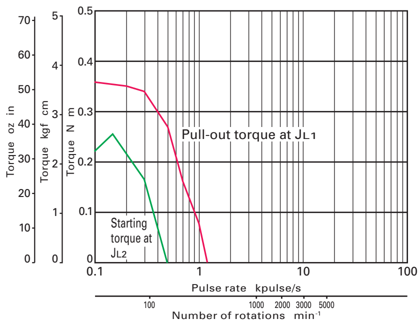
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-50



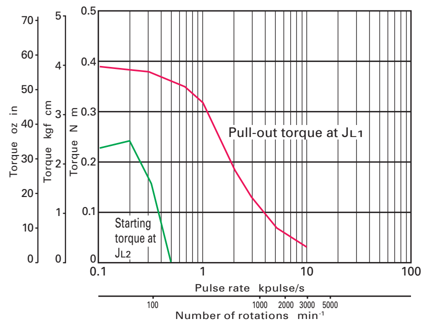
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-51



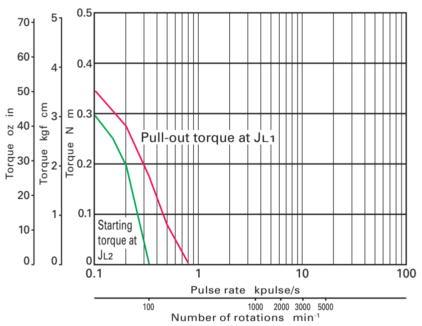
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-52



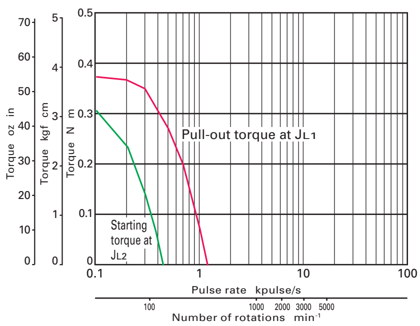
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-50



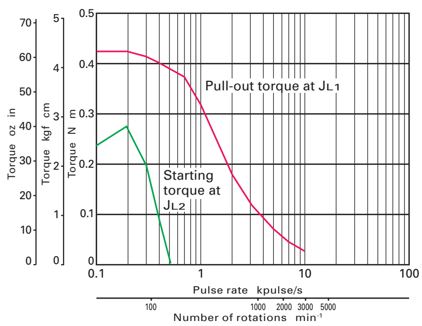
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-51



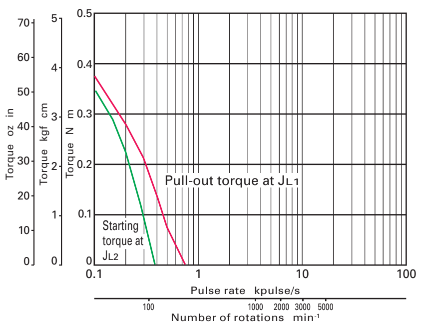
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-52



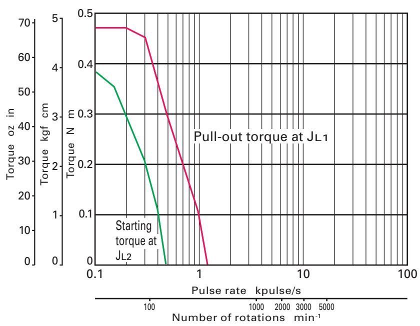
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-50



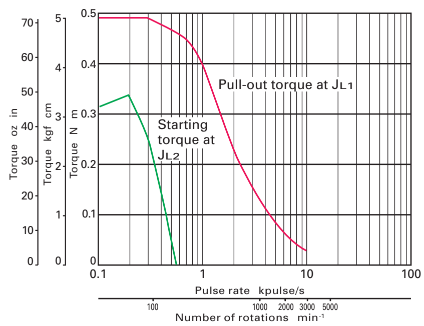
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-51



Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-52



Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

50mm sq. 1.97inch sq.

SS250

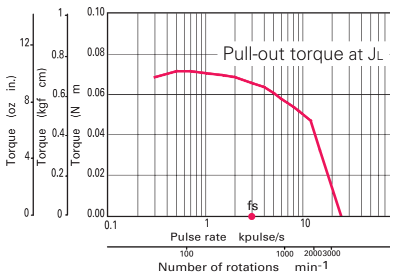
1.8 / step Bipolar winding

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SS2501-5041	**-5011**	0.1 14.16	1	4.5	1.8	0.026 0.142	0.09 0.20
SS2502-5041	**-5011**	0.215 30.44	1	5.9	3.2	0.049 0.268	0.15 0.33

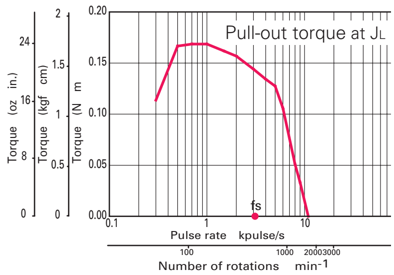
Pulse rate-torque characteristics

SS2501-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 1-2-phase energization half-step
JL = 0.01x10⁻⁴kg m² 0.055 oz in² Pulley barancer system
fs: No load maximum starting pulse rate

SS2502-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 1-2-phase energization half-step
JL = 0.01x10⁻⁴kg m² 0.055 oz in² Pulley barancer system
fs: No load maximum starting pulse rate

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

50mm sq. 1.97inch sq.

103H670
1.8 /step

Unipolar winding Lead wire type

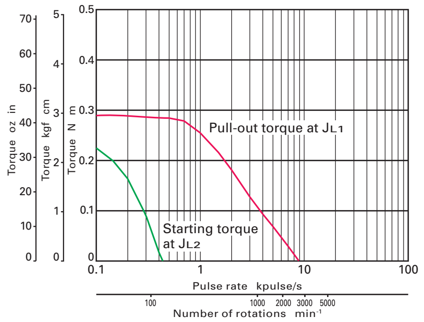
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H6701-0140	**-0110**	0.28 39.6	1	4.3	6.8	0.057 0.31	0.35 0.77
103H6701-0440	**-0410**	0.28 39.6	2	1.1	1.6	0.057 0.31	0.35 0.77
103H6701-0740	**-0710**	0.28 39.6	3	0.6	0.7	0.057 0.31	0.35 0.77
103H6703-0140	**-0110**	0.49 69.4	1	6	13	0.118 0.65	0.5 1.10
103H6703-0440	**-0410**	0.49 69.4	2	1.6	3.2	0.118 0.65	0.5 1.10
103H6703-0740	**-0710**	0.49 69.4	3	0.83	1.4	0.118 0.65	0.5 1.10
103H6704-0140	**-0110**	0.53 75.1	1	6.5	16.5	0.14 0.77	0.55 1.21
103H6704-0440	**-0410**	0.52 73.6	2	1.7	3.8	0.14 0.77	0.55 1.21
103H6704-0740	**-0710**	0.53 75.1	3	0.9	1.7	0.14 0.77	0.55 1.21

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H6701-5040	**-5010**	0.28 39.6	2	0.6	1.6	0.57 0.31	0.35 0.77
103H6703-5040	**-5010**	0.09 12.7	2	0.8	3.2	0.118 0.65	0.5 1.10
103H6704-5040	**-5010**	0.52 73.6	2	0.9	3.8	0.14 0.77	0.55 1.21

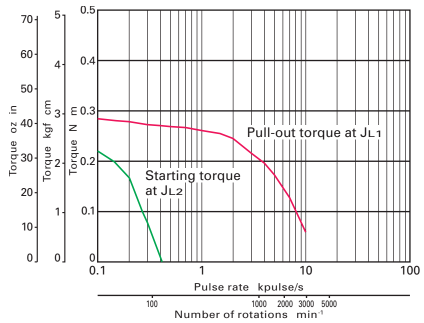
Pulse rate-torque characteristics

103H6701-01



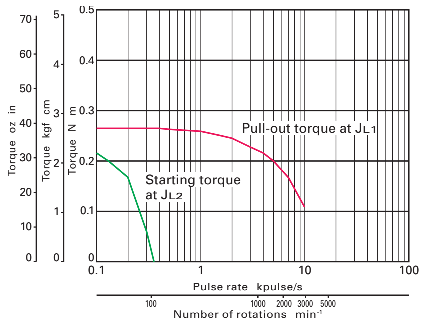
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-04



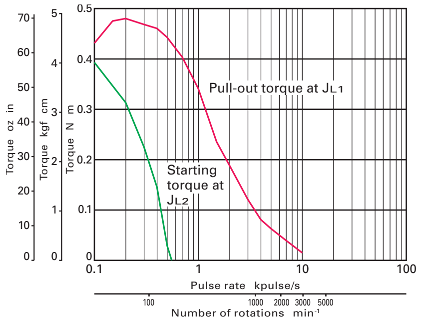
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-07



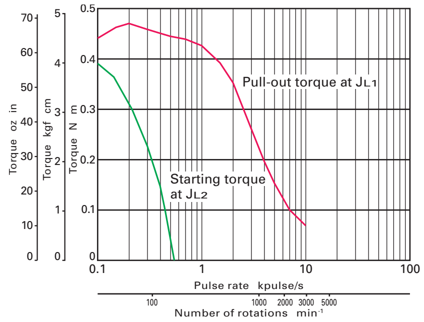
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-01



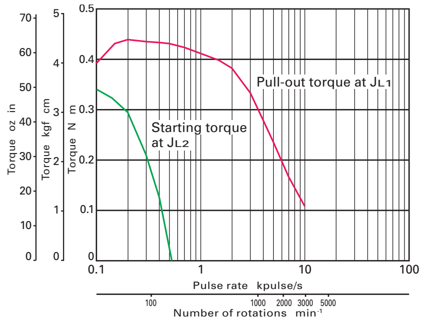
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-04



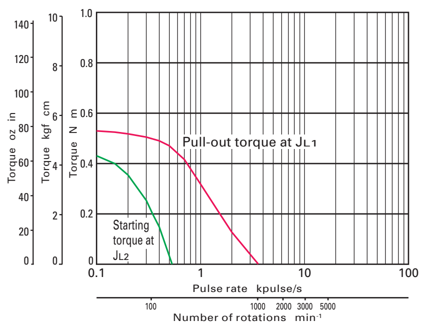
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-07



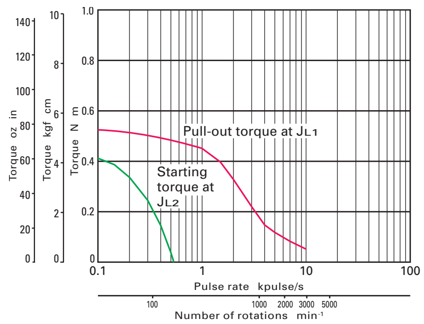
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-01



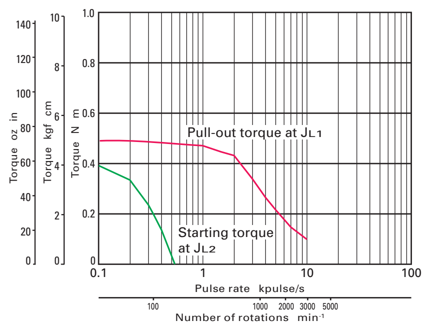
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-04



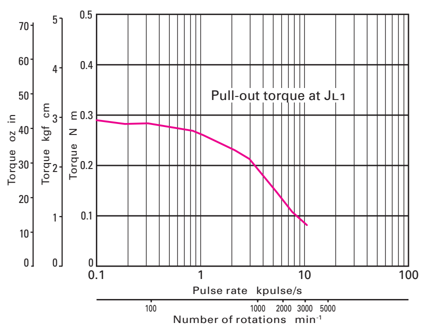
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-07



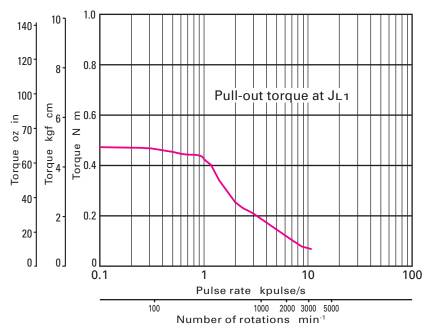
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-50



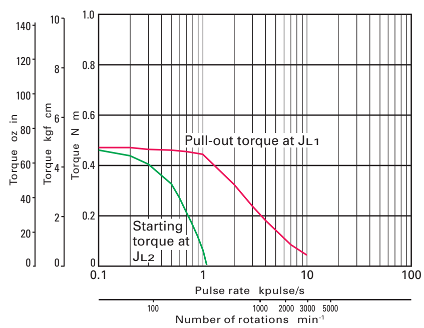
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling

103H6703-50



Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling

103H6704-50



Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.14×10^{-4}kg m^2 0.77 oz in^2 pulley balancer method

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Stepping motor Specifications

2-phase stepping motor

56mm sq. 2.20inch sq.

103H712
1.8 /step

Unipolar winding Lead wire type

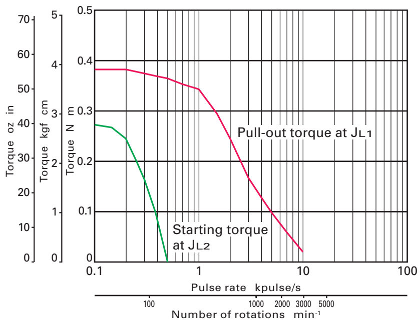
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7121-0140	**-0110**	0.39 55.2	1	4.8	8	0.1 0.55	0.47 1.04
103H7121-0440	**-0410**	0.39 55.2	2	1.25	1.9	0.1 0.55	0.47 1.04
103H7121-0740	**-0710**	0.39 55.2	3	0.6	0.8	0.1 0.55	0.47 1.04
103H7123-0140	**-0110**	0.83 117.	1	6.7	15	0.21 1.15	0.65 1.43
103H7123-0440	**-0410**	0.83 117.5	2	1.6	3.8	0.21 1.15	0.65 1.43
103H7123-0740	**-0710**	0.78 110.5	3	0.77	1.58	0.21 1.15	0.65 1.43
103H7124-0140	**-0110**	0.98 138.8	1	7	14.5	0.245 1.34	0.8 1.76
103H7124-0440	**-0410**	0.98 138.8	2	1.7	3.1	0.245 1.34	0.8 1.76
103H7124-0740	**-0710**	0.98 138.8	3	0.74	1.4	0.245 1.34	0.8 1.76
103H7126-0140	**-0110**	1.27 179.8	1	8.6	19	0.36 1.97	0.98 2.16
103H7126-0440	**-0410**	1.27 179.8	2	2	4.5	0.36 1.97	0.98 2.16
103H7126-0740	**-0710**	1.27 179.8	3	0.9	2.2	0.36 1.97	0.98 2.16

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7121-5640	**-5610**	0.55 77.9	1	4.3	14.5	0.1 0.55	0.47 1.04
103H7121-5740	**-5710**	0.55 77.9	2	1.1	3.7	0.1 0.55	0.47 1.04
103H7121-5840	**-5810**	0.55 77.9	3	0.54	1.74	0.1 0.55	0.47 1.04
103H7123-5640	**-5610**	1.0 141.6	1	5.7	29.4	0.21 1.15	0.65 1.43
103H7123-5740	**-5710**	1.0 141.6	2	1.5	7.5	0.21 1.15	0.65 1.43
103H7123-5840	**-5810**	1.0 141.6	3	0.7	3.5	0.21 1.15	0.65 1.43
103H7126-5640	**-5610**	1.6 226.6	1	7.7	34.6	0.36 1.97	0.98 2.16
103H7126-5740	**-5710**	1.6 226.6	2	2	9.1	0.36 1.97	0.98 2.16
103H7126-5840	**-5810**	1.6 226.6	3	0.94	4	0.36 1.97	0.98 2.16
103H7128-5640	**-5610**	2.0 283.2	1	8.9	40.1	0.49 2.68	1.3 2.87
103H7128-5740	**-5710**	2.0 283.2	2	2.3	10.4	0.49 2.68	1.3 2.87
103H7128-5840	**-5810**	2.0 283.2	3	1.03	4.3	0.49 2.68	1.3 2.87

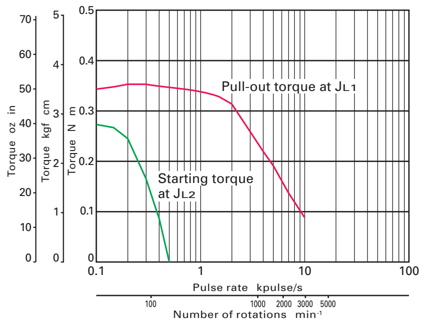
Pulse rate-torque characteristics

103H7121-01



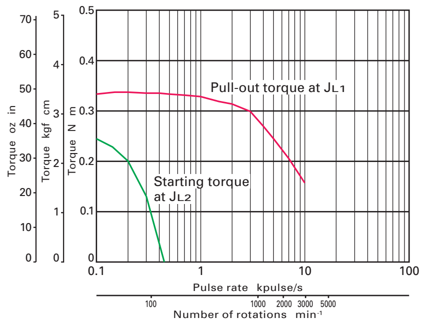
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-04



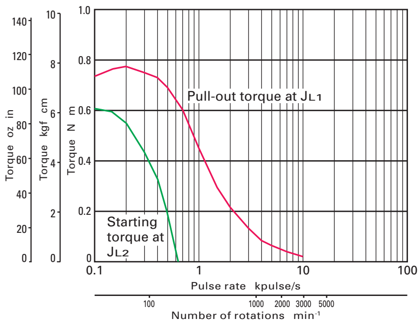
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-07



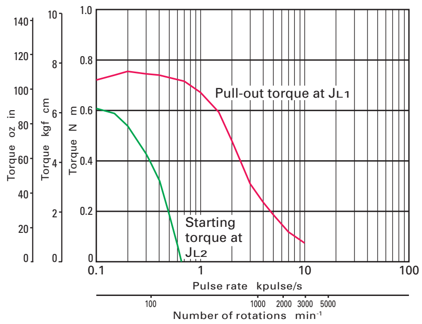
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-01



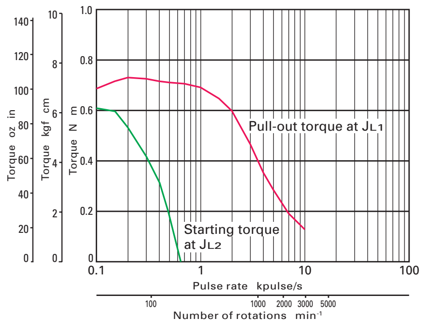
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-04



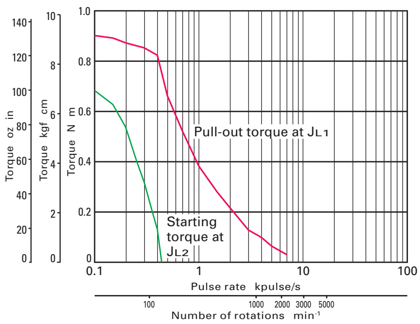
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-07



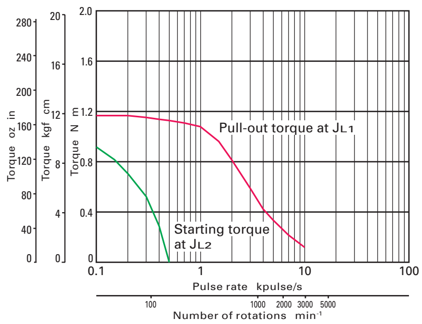
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7124-01



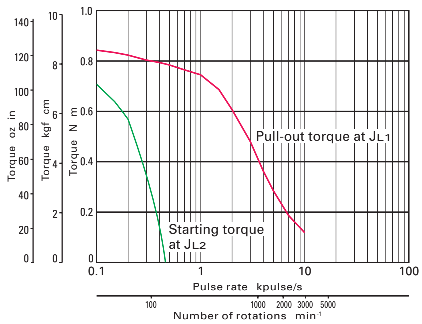
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7124-04



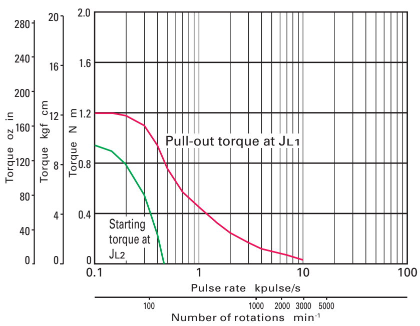
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7124-07



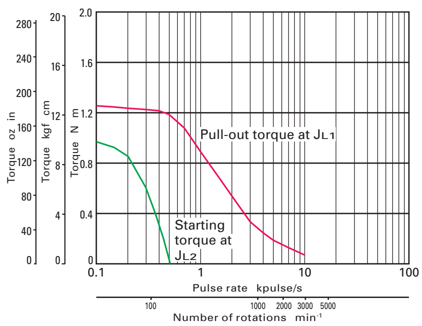
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-01



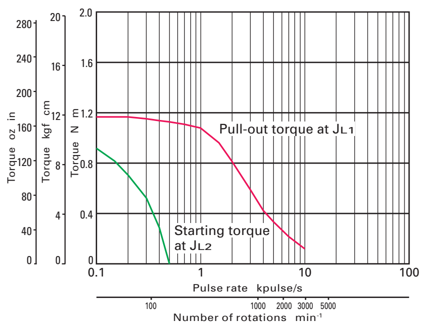
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

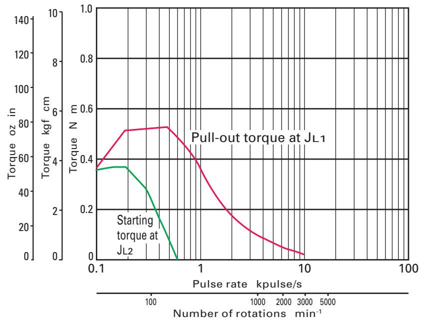
103H7126-07



Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

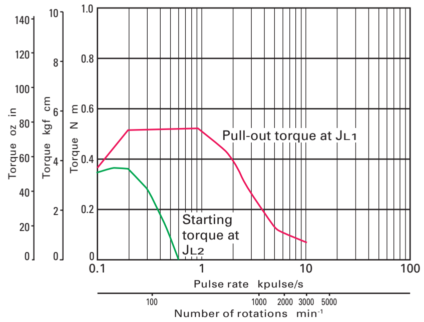
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

103H7121-56



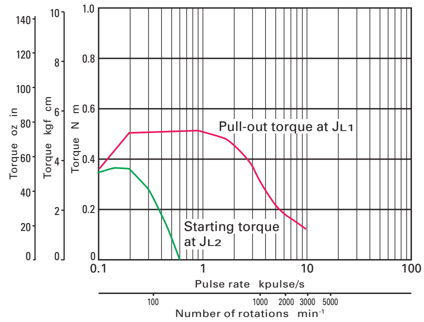
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-57



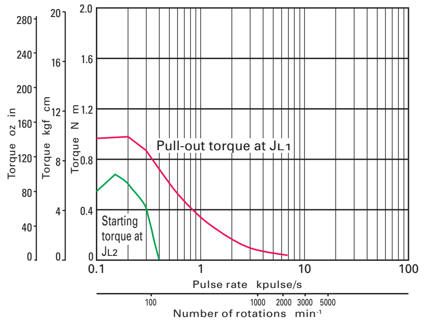
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-58



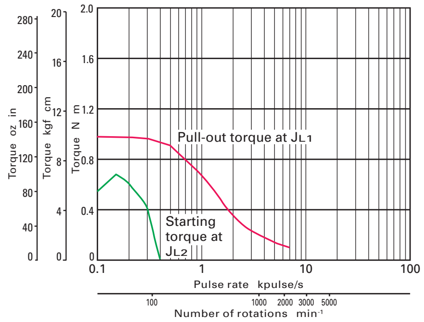
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-56



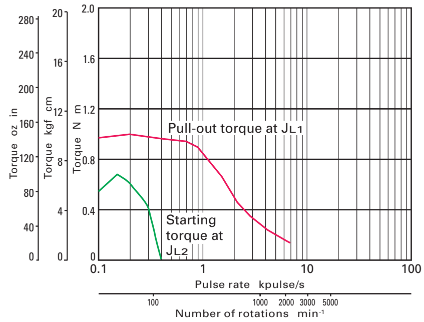
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7123-57



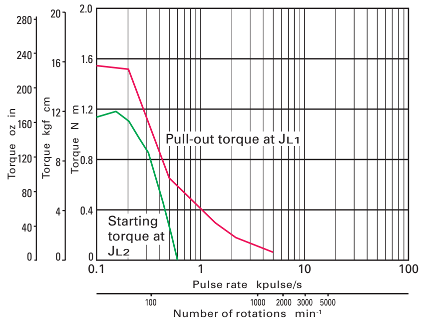
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7123-58



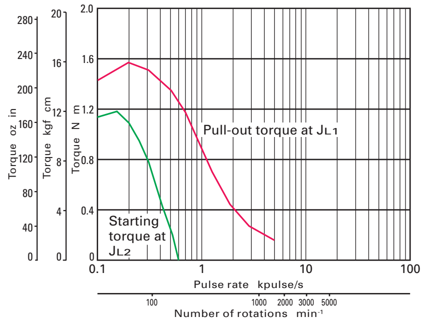
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-56



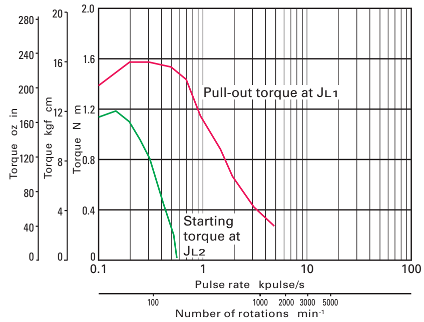
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-57



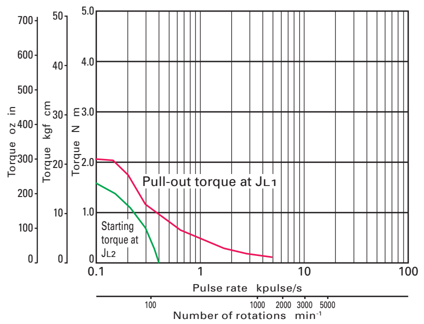
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-58



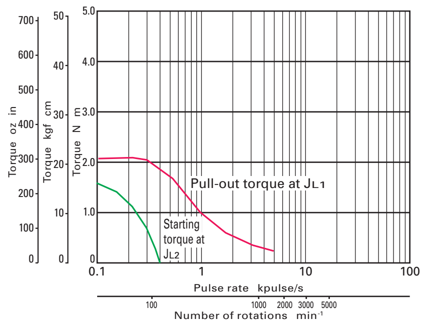
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7128-56



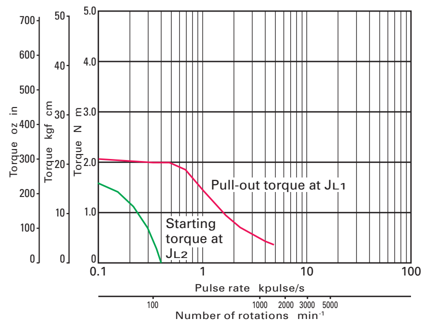
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7128-57



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7128-58



Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

60mm sq. 2.36inch sq.

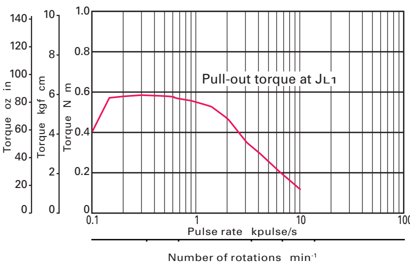
SH160
0.9 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SH1601-0440	**-0410**	0.57 80.71	2	1.35	2	0.24 1.312	0.55 1.21
SH1602-0440	**-0410**	1.1 155.77	2	1.8	3.5	0.4 2.187	0.8 1.76
SH1603-0440	**-0410**	1.7 240.74	2	2.3	4.5	0.75 4.101	1.2 2.64

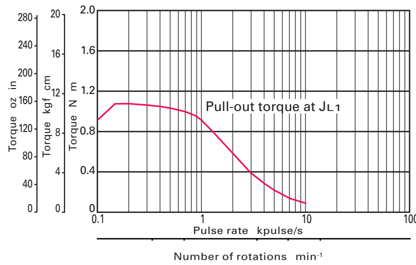
Pulse rate-torque characteristics

SH1601-04



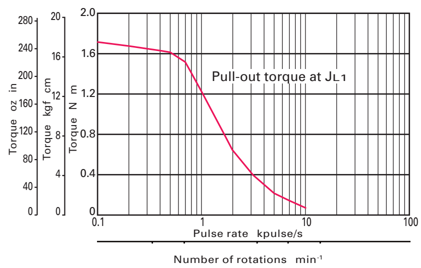
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling

SH1602-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10⁻⁴kg m² 14.22 oz in² use the rubber coupling

SH1603-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10⁻⁴kg m² 40.46 oz in² use the rubber coupling

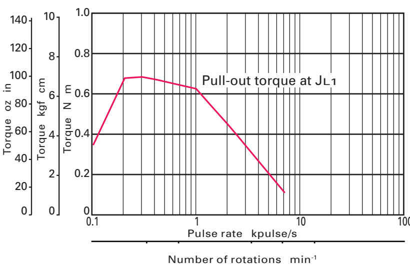
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SH1601-5240	**-5210**	0.69 97.7	2	1.2	3.5	0.24 1.31	0.55 1.21
SH1602-5240	**-5210**	1.28 181.2	2	1.65	6.1	0.4 2.19	0.8 1.76
SH1603-5240	**-5210**	2.15 304.4	2	2.3	8.8	0.75 4.10	1.2 2.65

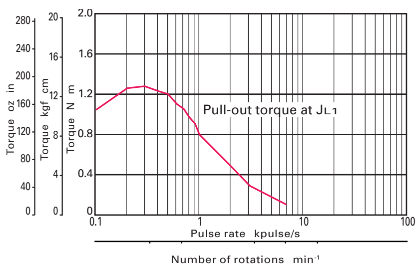
Pulse rate-torque characteristics

SH1601-52



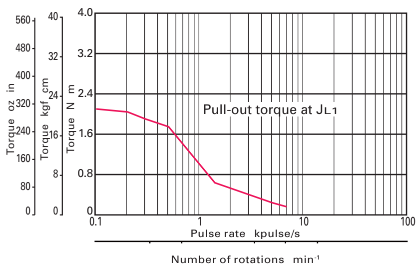
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling

SH1602-52



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L2} = 2.6x10⁻⁴kg m² 14.22 oz in² use the rubber coupling

SH1603-52



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L3} = 7.4x10⁻⁴kg m² 40.46 oz in² use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

60mm sq. 2.36inch sq.

103H782
1.8 /step

Unipolar winding Connector type

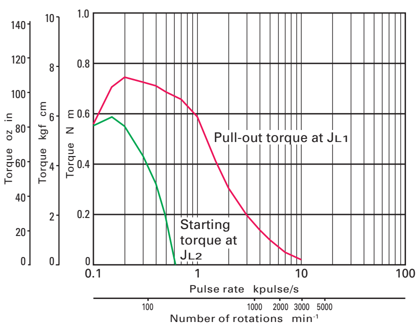
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7821-0140	**-0110**	0.78 110.5	1	5.7	8.3	0.275 1.50	0.6 1.32
103H7821-0440	**-0410**	0.78 110.5	2	1.5	2	0.275 1.50	0.6 1.32
103H7821-0740	**-0710**	0.78 110.5	3	0.68	0.8	0.275 1.50	0.6 1.32
103H7822-0140	**-0110**	1.17 165.7	1	6.9	14	0.4 2.19	0.77 1.70
103H7822-0440	**-0410**	1.17 165.7	2	1.8	3.6	0.4 2.19	0.77 1.70
103H7822-0740	**-0710**	1.17 165.7	3	0.8	1.38	0.4 2.19	0.77 1.70
103H7823-0140	**-0110**	2.1 297.4	1	10	21.7	0.84 4.59	1.34 2.95
103H7823-0440	**-0410**	2.1 297.4	2	2.7	5.6	0.84 4.59	1.34 2.95
103H7823-0740	**-0710**	2.1 297.4	3	1.25	2.4	0.84 4.59	1.34 2.95

Bipolar winding Connector type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7821-1740	**-1710**	0.88 124.6	4	0.35	0.8	0.275 1.50	0.6 1.32
103H7821-5740	**-5710**	0.88 124.6	2	1.27	3.3	0.275 1.50	0.6 1.32
103H7822-1740	**-1710**	1.37 194.0	4	0.43	1.38	0.4 2.19	0.77 1.70
103H7822-5740	**-5710**	1.37 194.0	2	1.55	5.5	0.4 2.19	0.77 1.70
103H7823-1740	**-1710**	2.7 382.3	4	0.65	2.4	0.84 4.59	1.34 2.95
103H7823-5740	**-5710**	2.7 382.3	2	2.4	9.5	0.84 4.59	1.34 2.95

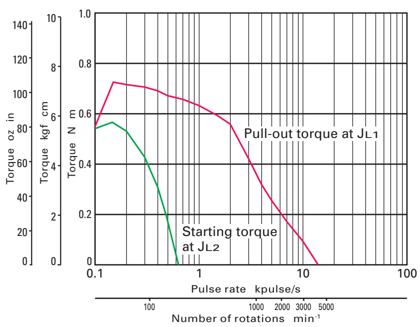
Pulse rate-torque characteristics

103H7821-01



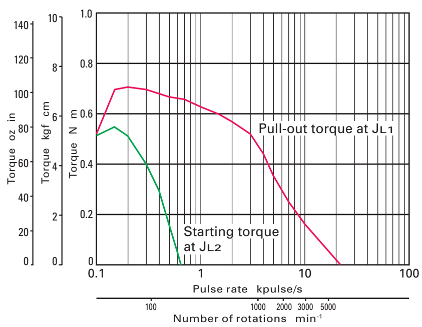
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7821-04



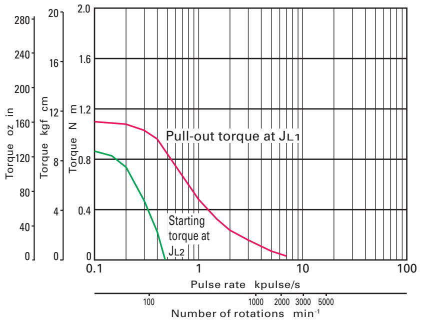
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7821-07



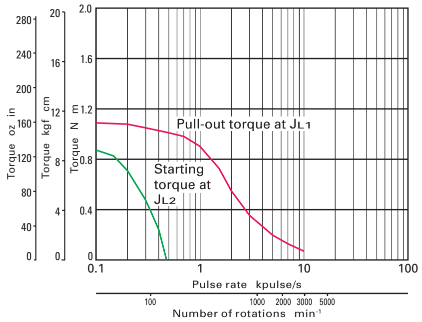
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7822-01



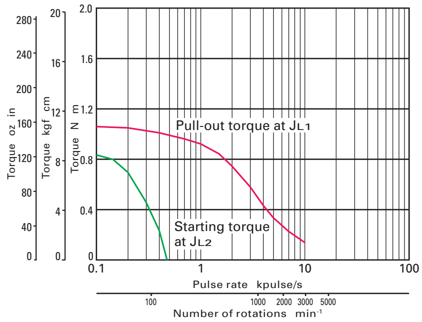
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

103H7822-04



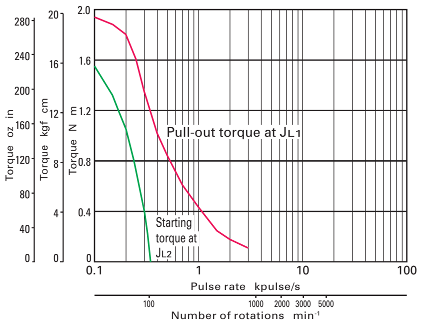
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

103H7822-07



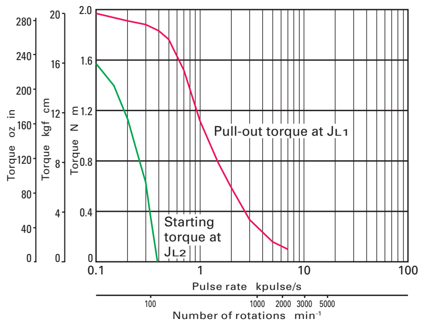
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

103H7823-01



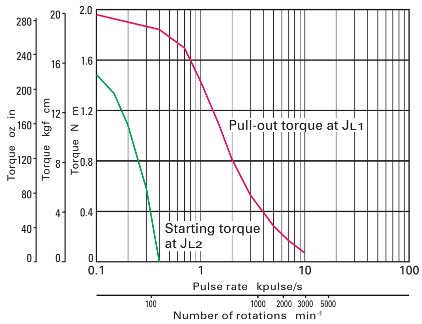
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

103H7823-04



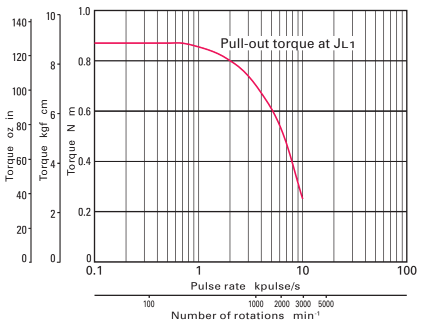
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

103H7823-07



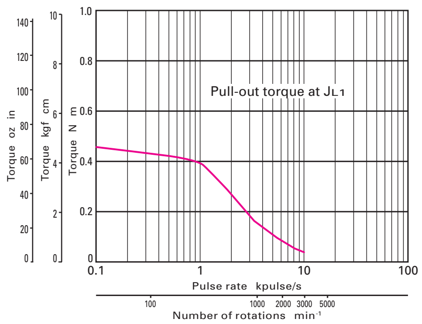
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

103H7821-17



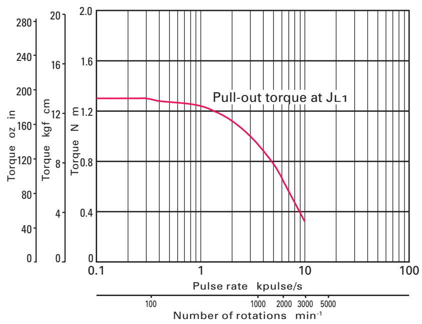
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling

103H7821-57



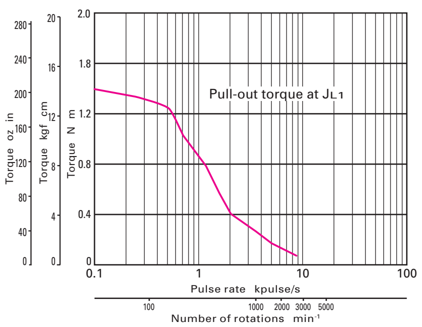
Constant current circuit
Source voltage : AC24V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling

103H7822-17



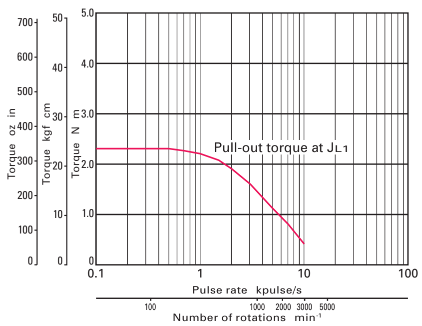
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling

103H7822-57



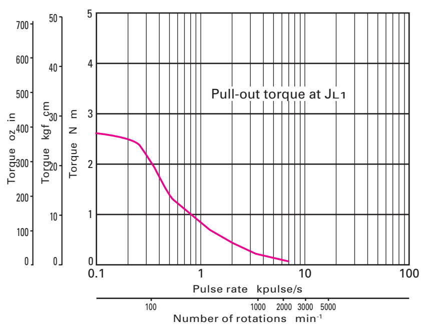
Constant current circuit
Source voltage : AC24V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling

103H7823-17



Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling

103H7823-57



Constant current circuit
Source voltage : AC24V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

86mm sq. 3.39inch sq.

SH286 /SM286
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SH2861-0441	**-0411**	2.5 354	2	2.3	8.0	1.48 8.09	1.75 3.92
SH2861-0941	**-0911**	2.5 354	4	0.6	2.0	1.48 8.09	1.75 3.92
SH2862-0441	**-0411**	4.7 665.6	2	3.2	13.0	3 16.4	2.9 6.5
SH2862-0941	**-0911**	4.7 665.6	4	0.85	3.4	3 16.4	2.9 6.5
SH2863-0441	**-0411**	6.7 948.8	2	4.0	17.0	4.5 24.6	4.0 8.96
SH2863-0941	**-0911**	6.7 948.8	4	0.9	4.2	4.5 24.6	4.0 8.96

Unipolar winding Lead wire type CE UL model

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SM2861-0451	**-0421**	2.5 354	2	2.3	8.0	1.48 8.09	1.75 3.92
SM2861-0951	**-0921**	2.5 354	4	0.6	2.0	1.48 8.09	1.75 3.92
SM2862-0451	**-0421**	4.8 679.7	2	3.2	13.0	3 16.4	2.9 6.5
SM2862-0951	**-0921**	4.8 679.7	4	0.85	3.4	3 16.4	2.9 6.5
SM2863-0451	**-0421**	6.6 934.6	2	4.0	17	4.5 24.6	4.0 8.96
SM2863-0951	**-0921**	6.6 934.6	4	0.9	4.2	4.5 24.6	4.0 8.96

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SH2861-5041	**-5011**	3.3 467.3	2	2.2	15	1.48 8.09	1.75 3.92
SH2861-5141	**-5111**	3.3 467.3	4	0.56	3.7	1.48 8.09	1.75 3.92
SH2861-5241	**-5211**	3.3 467.3	6	0.29	1.7	1.48 8.09	1.75 3.92
SH2862-5041	**-5011**	6.4 906.3	2	3.2	25	3.0 16.4	2.9 6.5
SH2862-5141	**-5111**	6.4 906.3	4	0.83	6.4	3.0 16.4	2.9 6.5
SH2862-5241	**-5211**	6.4 906.3	6	0.36	2.8	3.0 16.4	2.9 6.5
SH2863-5041	**-5011**	9 1274.4	2	4.0	32	4.5 24.6	4.0 8.96
SH2863-5141	**-5111**	9 1274.4	4	1.0	7.9	4.5 24.6	4.0 8.96
SH2863-5241	**-5211**	9 1274.4	6	0.46	3.8	4.5 24.6	4.0 8.96

Bipolar winding Lead wire type CE UL model

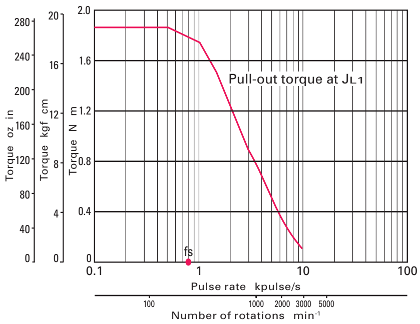
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SM2861-5051	**-5021**	3.3 467.3	2	2.2	15	1.48 8.09	1.75 3.92
SM2861-5151	**-5121**	3.3 467.3	4	0.56	3.7	1.48 8.09	1.75 3.92
SM2861-5251	**-5221**	3.3 467.3	6	0.29	1.7	1.48 8.09	1.75 3.92
SM2862-5051	**-5021**	6.4 906.3	2	3.2	25	3.0 16.4	2.9 6.5
SM2862-5151	**-5121**	6.4 906.3	4	0.83	6.4	3.0 16.4	2.9 6.5
SM2862-5251	**-5221**	6.4 906.3	6	0.36	2.8	3.0 16.4	2.9 6.5
SM2863-5051	**-5021**	9 1274.4	2	4.0	32	4.5 24.6	4.0 8.96
SM2863-5151	**-5121**	9 1274.4	4	1.0	7.9	4.5 24.6	4.0 8.96
SM2863-5251	**-5221**	9 1274.4	6	0.46	3.8	4.5 24.6	4.0 8.96

Bipolar winding Terminal block type

Model	Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SM2861-5066	3.3 467.3	2	2.03	15	1.48 8.09	1.9 4.19
SM2861-5166	3.3 467.3	4	0.52	3.7	1.48 8.09	1.9 4.19
SM2861-5266	3.3 467.3	6	0.27	1.7	1.48 8.09	1.9 4.19
SM2862-5066	6.4 906.3	2	3.08	25	3.0 16.4	3.05 6.72
SM2862-5166	6.4 906.3	4	0.79	6.4	3.0 16.4	3.05 6.72
SM2862-5266	6.4 906.3	6	0.33	2.8	3.0 16.4	3.05 6.72
SM2863-5066	9 1274.4	2	3.83	32	4.5 24.6	4.15 9.15
SM2863-5166	9 1274.4	4	0.96	7.9	4.5 24.6	4.15 9.15
SM2863-5266	9 1274.4	6	0.48	3.8	4.5 24.6	4.15 9.15

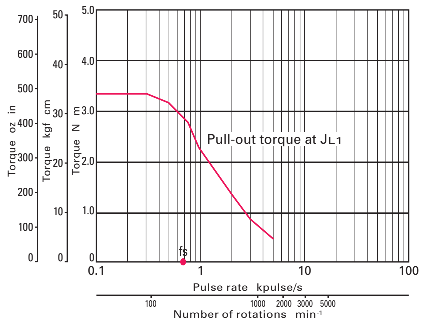
Pulse rate-torque characteristics

SH2861-04



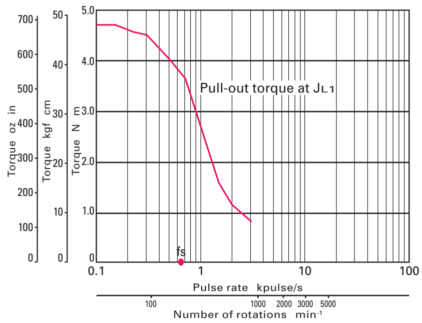
Constant current circuit
Source voltage : DC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

SH2862-04



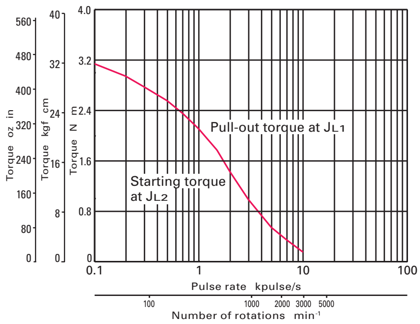
Constant current circuit
Source voltage : DC100V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SH2863-04



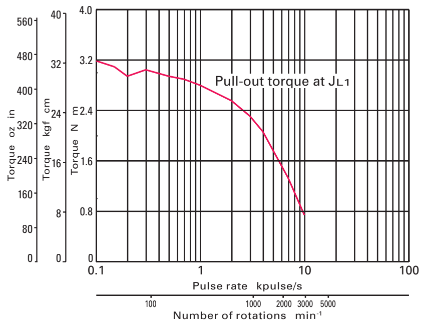
Constant current circuit
Source voltage : DC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2861-50



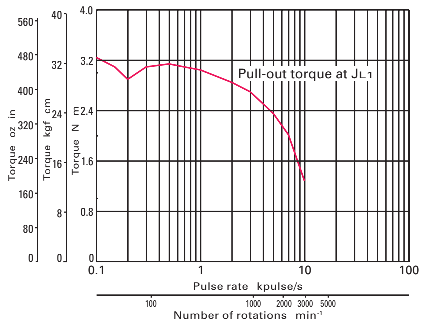
Constant current circuit
Source voltage : DC100V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

SM2861-51



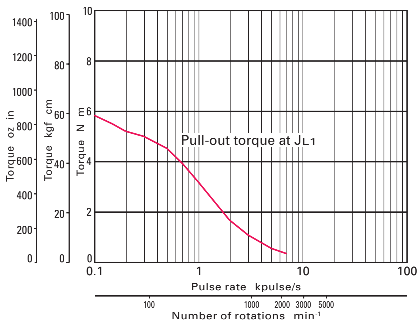
Constant current circuit
Source voltage : DC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

SM2861-52



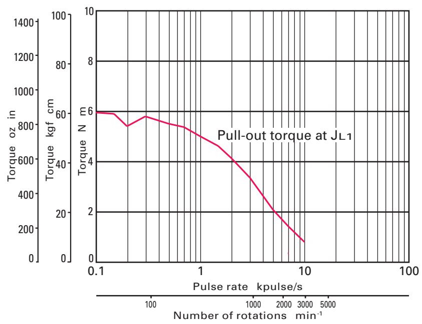
Constant current circuit
Source voltage : DC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2862-50



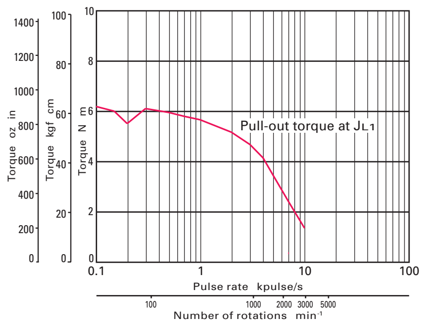
Constant current circuit
Source voltage : DC100V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2862-51



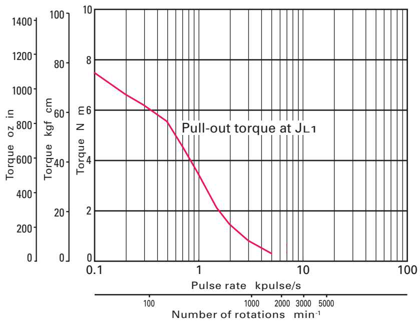
Constant current circuit
Source voltage : DC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2862-52



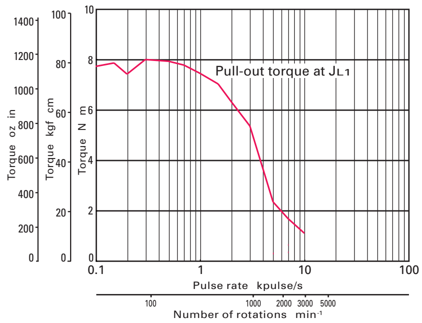
Constant current circuit
Source voltage : DC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2863-50



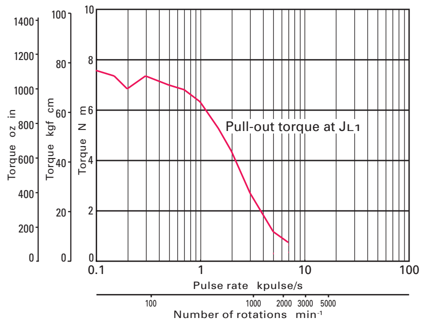
Constant current circuit
Source voltage : DC100V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 43x10^{-4}kg m^2 235.10 oz in^2 use the rubber coupling

SM2863-51



Constant current circuit
Source voltage : DC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 43x10^{-4}kg m^2 235.10 oz in^2 use the rubber coupling

SM2863-52



Constant current circuit
Source voltage : DC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 43x10^{-4}kg m^2 235.10 oz in^2 use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

106mm cir. 4.17inch cir.

103H8922
1.8 /step

Unipolar winding

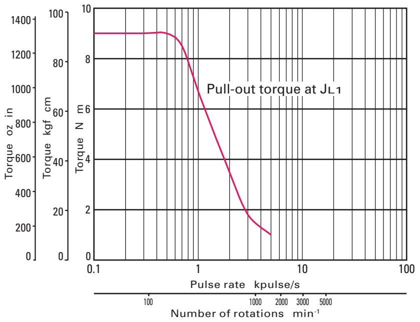
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H89222-0941	**-0911**	10.8 1529.4	4	0.98	6.3	14.6 79.83	7.5 16.53
103H89223-0941	**-0911**	15.5 2194.9	4	1.4	9.7	22 120.28	10.5 23.15

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H89222-5241	**-5211**	13.2 1869.2	6	0.45	5.4	14.6 79.83	7.5 16.53
103H89223-5241	**-5211**	19 2690.5	6	0.63	8	22 120.28	10.5 23.15

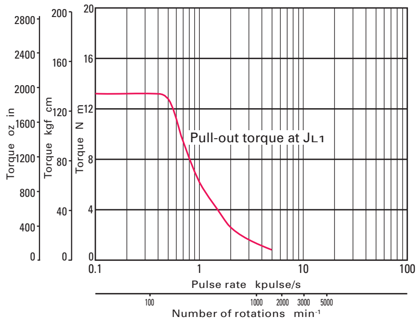
Pulse rate-torque characteristics

103H89222-09



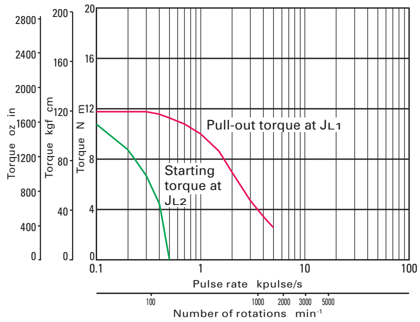
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

103H89223-09



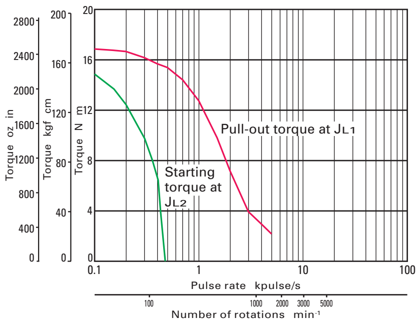
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

103H89222-52



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

103H89223-52



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

56mm sq. 2.20inch sq.

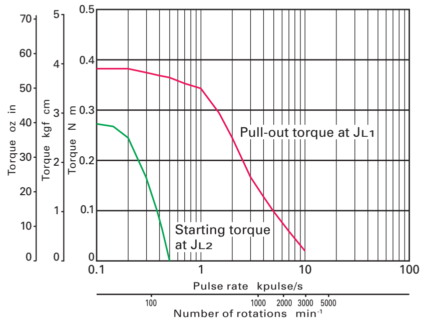
103H712
CE marking
1.8 /step

Unipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7121-6140	**-6110**	0.39 55.2	1	4.8	8	0.1 0.55	0.47 1.04
103H7121-6740	**-6710**	0.39 55.2	3	0.6	0.8	0.1 0.55	0.47 1.04
103H7123-6140	**-6110**	0.83 117.5	1	6.7	15	0.21 1.15	0.65 1.43
103H7123-6740	**-6710**	0.78 110.5	3	0.77	1.58	0.21 1.15	0.65 1.43
103H7126-6140	**-6110**	1.27 179.8	1	8.6	19	0.36 1.97	0.98 2.16
103H7126-6740	**-6710**	1.27 179.8	3	0.9	2.2	0.36 1.97	0.98 2.16

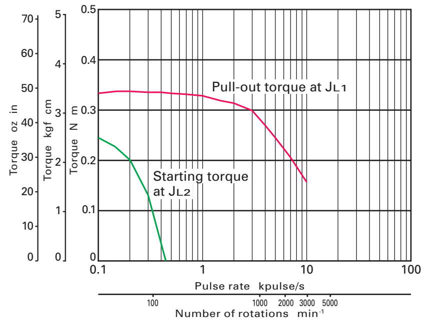
Pulse rate-torque characteristics

103H7121-61



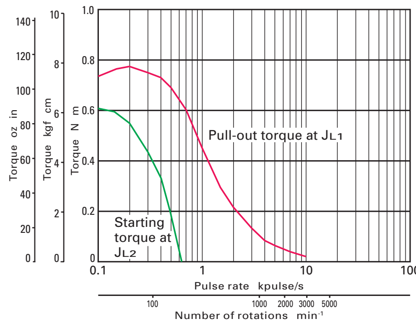
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7121-67



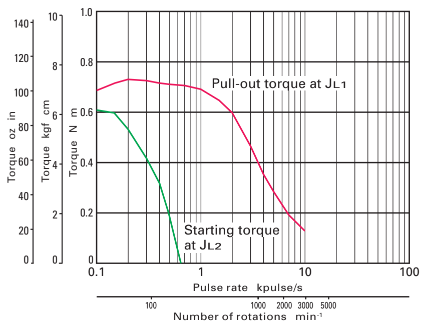
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7123-61



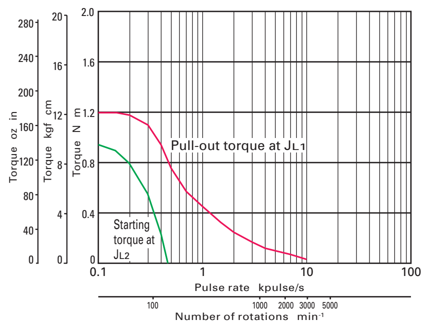
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7123-67



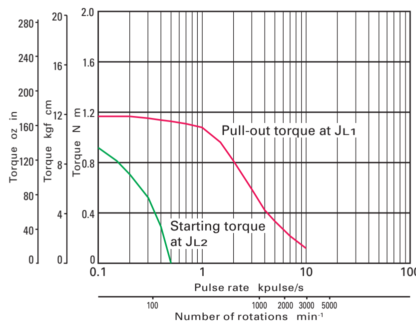
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7126-61



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 2.6x10⁻⁴kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10⁻⁴kg m² 14.22 oz in² use the direct coupling

103H7126-67



Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 2.6x10⁻⁴kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10⁻⁴kg m² 14.22 oz in² use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

86mm cir. 3.39inch cir.

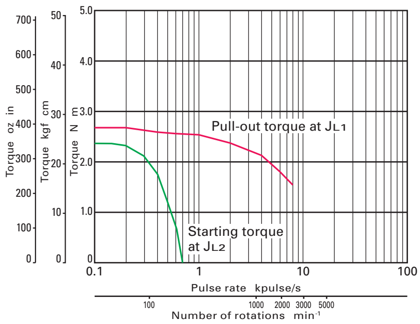
103H822
CE marking
1.8 /step

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H8221-6240	**-6210**	2.74 388.0	6	0.3	1.65	1.45 7.93	1.5 3.31
103H8222-6340	**-6310**	5.09 720.8	6	0.35	2.7	2.9 15.86	2.5 5.51
103H8223-6340	**-6310**	7.44 1053.6	6	0.45	3.4	4.4 24.06	3.5 7.72

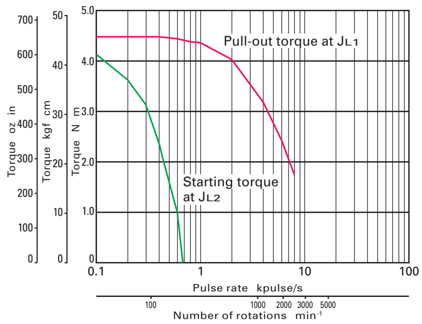
Pulse rate-torque characteristics

103H8221-62



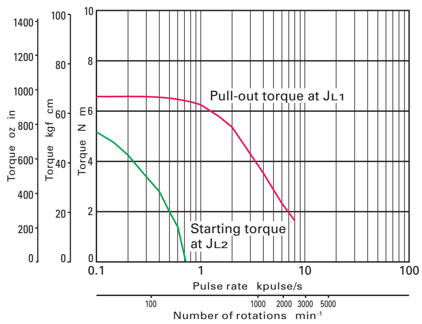
Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

103H8222-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m² 83.65 oz in² use the rubber coupling
J_{L2} = 15.3x10^{-4}kg m² 83.65 oz in² use the direct coupling

103H8223-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

106mm cir. 4.17inch cir.

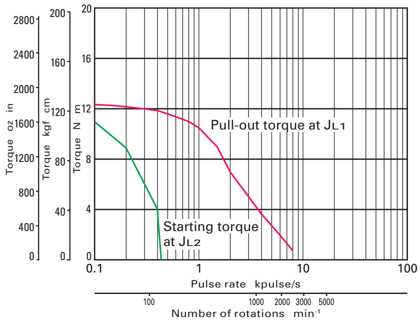
103H8922
CE marking
1.8 /step

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H89222-6341	**-6311**	13.2 1869.2	6	0.45	5.4	14.6 79.83	7.5 16.53
103H89223-6341	**-6311**	19 2690.5	6	0.63	8	22 120.28	10.5 23.15

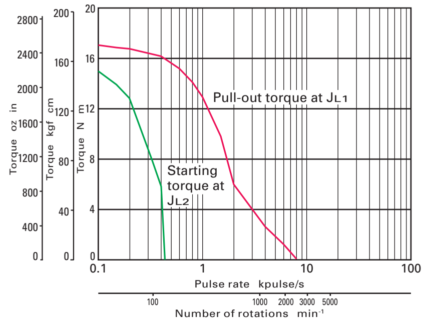
Pulse rate-torque characteristics

103H89222-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10⁻⁴kg m² 235.10 oz in² use the direct coupling

103H89223-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10⁻⁴kg m² 235.10 oz in² use the direct coupling

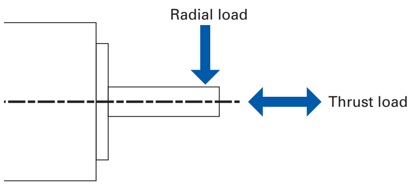
Standard models

Motor type	H series motor
Model number	103H52 /103H67 /103H71 /103H78
Insulation class	Class B 130
Withstand voltage	42 1.65inch AC500V 50/60Hz for 1 minute, 50 1.97inch 56 2.20inch 60 2.36inch AC1000V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Operating ambient temperature	-10 to 50
Operating ambient humidity	90%MAX. : 40 MAX., 57%MAX. : 50 MAX., 35%MAX. : 60 MAX. no condensation

Motor type	SH series motor
Motor model number	SH228 , SH353 , SH142 , SH160 , SH286 ,
Insulation class	Class B 130
Withstand voltage	28 1.10inch 35 1.38inch 42 1.65inch AC500V 50/60Hz for 1 minute, 60 2.36inch / 86 3.38inch AC1000V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Operating ambient temperature	-10 to 50
Operating ambient humidity	90%MAX. : 40 MAX., 57%MAX. : 50 MAX., 35%MAX. : 60 MAX. no condensation

Motor type	SM series motor
Model number	SM286
Type	S1 continuous operation
Insulation class	Class F +155 C
Operation altitude	1000m 3280 feet MAX above sea level
Withstand voltage	86mm 3.39inch : AC1500V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Protection grade	IP43
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Ambient operation temperature	-10 to +50 C
Ambient operation humidity	90% MAX. at less than 40 C, 57% MAX. at less than 50 C , 35% MAX. at 60 C no condensation

Allowable radial / thrust load



Frange size	Model number	Distance from end of shaft : mm inch				Thrust load N lbs
		0	5 0.20	10 0.39	15 0.59	
		Radial load : N lbs				
28mm 1.10inch	SH228	42 9	48 10	56 12	66 14	3 0.67
35mm 1.38inch	SH353	40 8	50 11	67 15	98 22	10 2.25
42mm 1.65inch	103H52 103-59 SH142	22 4	26 5	33 7	46 10	10 2.25
50mm 1.97inch	103H670	71 15	87 19	115 25	167 37	15 3.37
56mm 2.20inch	103H712	52 11	65 14	85 19	123 27	15 3.37
	103H7128	85 19	105 23	138 31	200 44	15 3.37
60mm 2.36inch	103H782 SH160	70 15	87 19	114 25	165 37	20 4.50
86mm 3.39inch	SM286 SH286	167 37	193 43	229 51	280 62	60 13.488
86mm 3.39inch	103H822	191 42	234 52	301 67	421 93	60 13.488
106mm 4.17inch	103H8922	321 72	356 79	401 90	457 101	100 22.48

CE marked models

Model Number	103H712	103H822 103H8922
Rated voltage	12-200VDC	12-300VDC
Applied standards Low voltage diretive	EN60034-1,IEC34-5(EN60034-5),EN60204-1,EN60950,EN61010-1	
Operation type	S1 continuous rating	
Protection grade	IP43	
Device category	Class I	
Operation environment	Pollution degree 2	
Insulation classl	Class B 130	
Insulation resistance	100M ohm MIN. against DC500V	
Withstand voltage	56mm 2.2inch : AC1500V 50/60Hz for 1 minute 86mm 3.39inch 106mm 4.17inch : AC1600V 50/60Hz for 1 minute	
Ambient operation temperature	-10 to +50 C	
Ambient operation humidity	90% MAX. at less than 40 C, 57% MAX. at less than 50 C , 35% MAX. at 60 C no condensation	
Winding temperature rise	80K MAX. Based on Sanyo Denki standard	

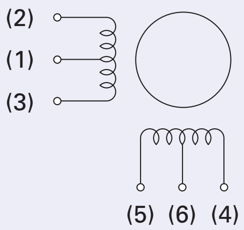
Internal Wiring and Rotation Direction

Unipolar winding

103H52 Connector type

Internal wire connection

( ) connector pin number



Direction of motor rotate

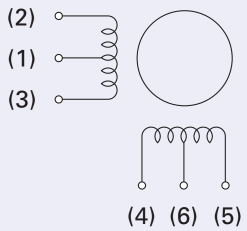
The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Connector type pin number				
		1.6	5	3	4	2
Exciting order	1					
	2					
	3					
	4					

103H782 Connector type

Internal wire connection

( ) connector pin number



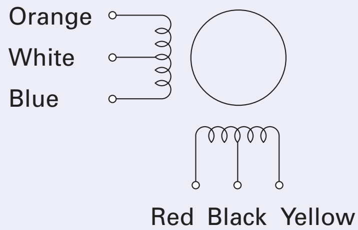
Direction of motor rotate

The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Connector type pin number				
		1.6	4	3	5	2
Exciting order	1					
	2					
	3					
	4					

Lead wire type

Internal wire connection



Direction of motor rotate

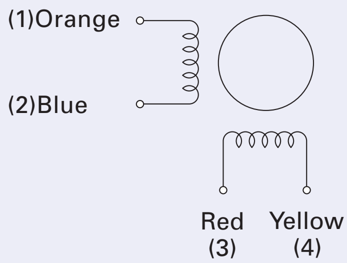
The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Lead wire color				
		White & black	Red	Blue	Yellow	Orange
Exciting order	1					
	2					
	3					
	4					

Bipolar winding

Internal wire connection

( ) connector pin number



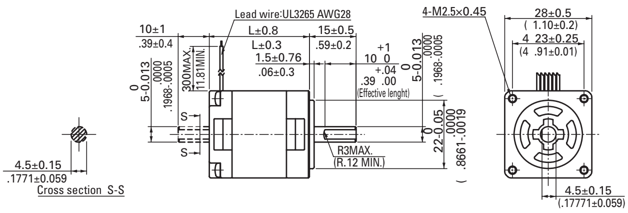
Direction of motor rotate

The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Lead wire color, connector type pin teminal blocknumber			
	Lead wire	Red	Blue	Yellow	Orange
Exciting order	1	–	–	+	+
	2	+	–	–	+
	3	+	+	–	–
	4	–	+	+	–
Connector	103H782	3	2	4	1
Teminal block	SM286	3	2	4	1

Motors Unit: mm inch

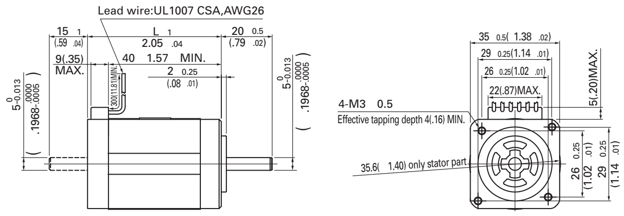
28mm 1.10inch



Connector type Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU14S281	SH2281-51 1	32 1.26	Lead wire
	DU14S281	SH2281-52 1	32 1.26	Lead wire
	DU14S285	SH2285-51 1	51.5 2.03	Lead wire
	DU14S285	SH2285-52 1	51.5 2.03	Lead wire
Bipolar	DB14S281	SH2281-56 1	32 1.26	Lead wire
	DB14S281	SH2281-57 1	32 1.26	Lead wire
	DB14S285	SH2285-56 1	51.5 2.03	Lead wire
	DB14S285	SH2285-57 1	51.5 2.03	Lead wire

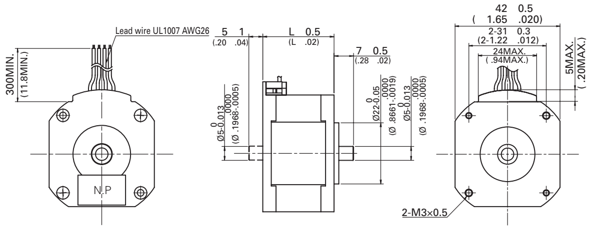
35mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH3533-12U 0	33 1.25	Lead wire
		SH3537-12U 0	37 1.54	Lead wire
		SH3552-12U 0	52 1.89	Lead wire

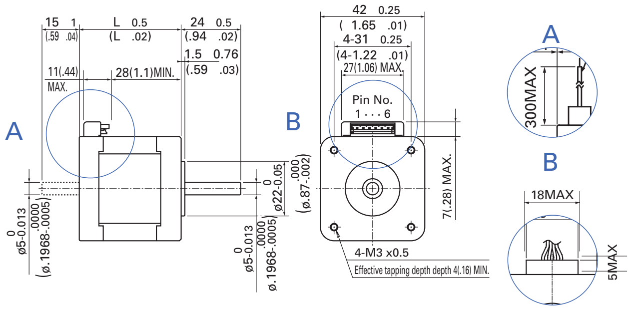
42mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		SS2421-50 1	11.6 .457	Lead wire
		SS2422-50 1	18.6 .732	Lead wire
		SS2423-50 1	25.6 1.008	Lead wire

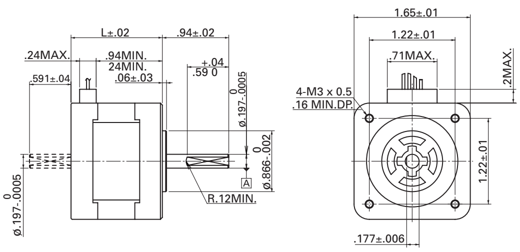
42mm 1.65inch



Connector type Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU15H521	103H5205-04 0	33 1.25	Connector
	DU15H522	103H5208-04 0	39 1.54	Connector
	DU15H524	103H5210-04 0	48 1.89	Connector
		103H5209-04 0	41 1.61	Connector

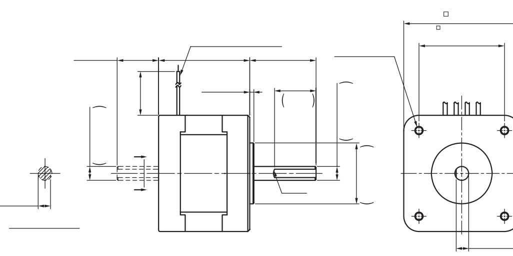
42mm 1.65inch



Connector type Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar	DB14H521	103H5205-52 0	33 1.25	Lead wire
	DB14H522	103H5208-52 0	39 1.54	Lead wire
	DB14H524	103H5210-52 0	48 1.89	Lead wire
		103H5205-50 0	33 1.25	Lead wire
		103H5205-51 0	33 1.25	Lead wire
		103H5208-50 0	39 1.54	Lead wire
		103H5208-51 0	39 1.54	Lead wire
		103H5209-50 0	41 1.61	Lead wire
		103H5209-51 0	41 1.61	Lead wire
		103H5209-52 0	41 1.61	Lead wire
		103H5210-50 0	48 1.89	Lead wire
		103H5210-51 0	48 1.89	Lead wire

42mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU15S141	SH1421-04 1	33 1.25	Lead wire
	DU15S142	SH1422-04 1	39 1.54	Lead wire
	DU15S144	SH1424-04 1	48 1.89	Lead wire
Bipolar	DB16H141	SH1421-52 1	33 1.25	Lead wire
	DB16H142	SH1422-52 1	39 1.54	Lead wire
	DB16H144	SH1424-52 1	48 1.89	Lead wire

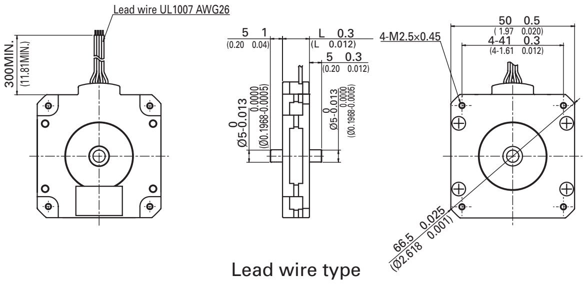
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

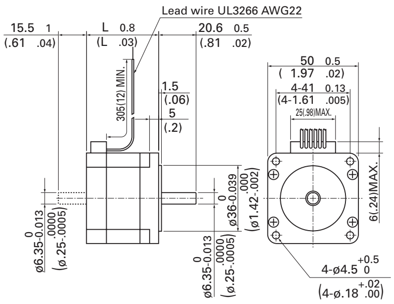
50mm 1.97inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		SS2501-50 1	11 .433	Lead wire
		SS2502-50 1	16 .63	Lead wire

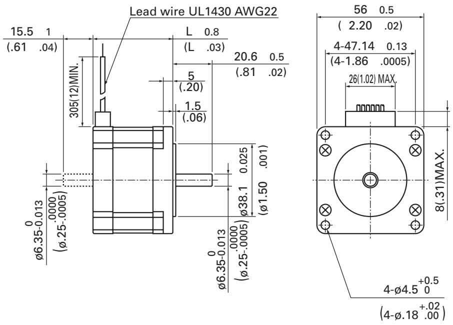
50mm 1.97inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H6701-01 0	39.8 1.57	Lead wire
		103H6701-04 0	39.8 1.57	Lead wire
		103H6701-07 0	39.8 1.57	Lead wire
		103H6703-01 0	51.3 2.02	Lead wire
		103H6703-04 0	51.3 2.02	Lead wire
		103H6703-07 0	51.3 2.02	Lead wire
		103H6704-01 0	55.8 2.20	Lead wire
		103H6704-04 0	55.8 2.20	Lead wire
		103H6704-07 0	55.8 2.20	Lead wire
Bipolar	DB16H671	103H6701-50 0	39.8 1.57	Lead wire
	DB16H672	103H6703-50 0	51.3 2.02	Lead wire
		103H6704-50 0	55.8 2.20	Lead wire

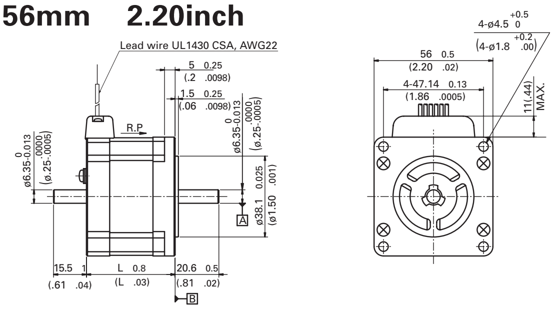
56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU16H711	103H7121-04 0	41.8 1.65	Lead wire
	DU16H713	103H7123-04 0	53.8 2.12	Lead wire
	DU16H716	103H7126-04 0	75.8 2.98	Lead wire
		103H7121-01 0	41.8 1.65	Lead wire
		103H7121-07 0	41.8 1.65	Lead wire
		103H7123-01 0	53.8 2.12	Lead wire
		103H7123-07 0	53.8 2.12	Lead wire
		103H7124-01 0	63.8 2.51	Lead wire
		103H7124-04 0	63.8 2.51	Lead wire
		103H7124-07 0	63.8 2.51	Lead wire
		103H7126-01 0	75.8 2.98	Lead wire
		103H7126-07 0	75.8 2.98	Lead wire

56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H7121-61 0	41.8 1.65	Lead wire CE
		103H7121-67 0	41.8 1.65	Lead wire CE
		103H7123-61 0	53.8 2.12	Lead wire CE
		103H7123-67 0	53.8 2.12	Lead wire CE
		103H7126-61 0	75.8 2.98	Lead wire CE
		103H7126-67 0	75.8 2.98	Lead wire CE

Model number	Shaft diameter(D)	Dcut thickness(L)
103H7121-	6.35	5.8
103H7123-		
103H7126-		
103H7128-	8	7.5

Motor shaft specification code

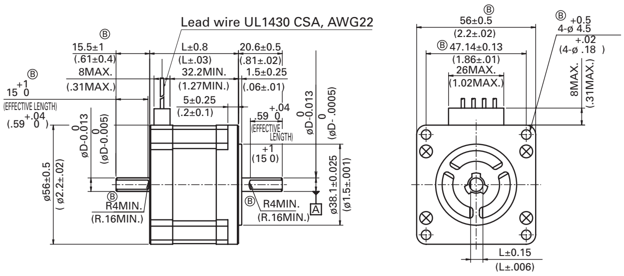
Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Motors Unit: mm inch

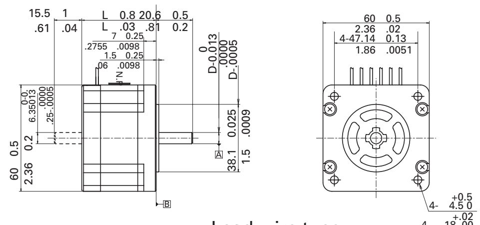
56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar	DB16H711	103H7121-57 0	41.8 1.65	Lead wire
	DB16H713	103H7123-57 0	53.8 2.12	Lead wire
	DB16H716	103H7126-57 0	75.8 2.98	Lead wire
		103H7121-56 0	41.8 1.65	Lead wire
		103H7121-58 0	41.8 1.65	Lead wire
		103H7123-56 0	53.8 2.12	Lead wire
		103H7123-58 0	53.8 2.12	Lead wire
		103H7126-56 0	75.8 2.98	Lead wire
		103H7126-58 0	75.8 2.98	Lead wire
		103H7128-56 0	94.8 3.73	Lead wire
		103H7128-57 0	94.8 3.73	Lead wire
		103H7128-58 0	94.8 3.73	Lead wire

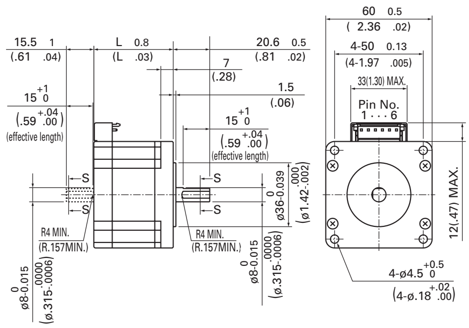
60mm 2.36inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH1601-04 0	42 1.65	Lead wire
		SH1602-04 0	54 2.13	Lead wire
		SH1603-04 0	76 2.99	Lead wire
Bipolar	DB16S161	SH1601-52 0	42 1.65	Lead wire
	DB16S162	SH1602-52 0	54 2.13	Lead wire
	DB16S163	SH1603-52 0	76 2.99	Lead wire

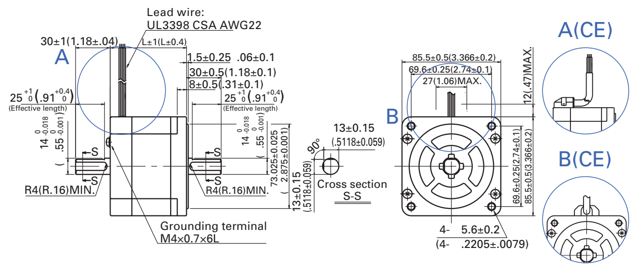
60mm 2.36inch



Connector type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H7821-01 0	44.8 1.76	Connector
		103H7821-04 0	44.8 1.76	Connector
		103H7821-07 0	44.8 1.76	Connector
		103H7822-01 0	53.8 2.12	Connector
		103H7822-04 0	53.8 2.12	Connector
		103H7822-07 0	53.8 2.12	Connector
		103H7823-01 0	85.8 3.38	Connector
		103H7823-04 0	85.8 3.38	Connector
		103H7823-07 0	85.8 3.38	Connector
Bipolar	DB16H781	103H7821-57 0	44.8 1.76	Connector
	DB16H782	103H7822-57 0	53.8 2.12	Connector
	DB16H783	103H7823-57 0	85.8 3.38	Connector
		103H7821-17 0	44.8 1.76	Connector
		103H7822-17 0	53.8 2.12	Connector
		103H7823-17 0	85.8 3.38	Connector

86mm 3.39inch



Lead wire type

CE type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH2861-04 1	66 2.6	Lead wire
		SH2862-04 1	96.5 3.8	Lead wire
		SH2863-04 1	127 5	Lead wire
Bipolar		SM2861-50 1	66 2.6	Lead wire CE
		SM2861-51 1	66 2.6	Lead wire CE
		SM2861-52 1	66 2.6	Lead wire CE
		SM2862-50 1	96.5 3.8	Lead wire CE
		SM2862-51 1	96.5 3.8	Lead wire CE
		SM2862-52 1	96.5 3.8	Lead wire CE
		SM2863-50 1	127 5	Lead wire CE
		SM2863-51 1	127 5	Lead wire CE
		SM2863-52 1	127 5	Lead wire CE

Model number	Shaft diameter(D)	Dcut thickness(L)
103H7121-	6.35	5.8
103H7123-		
103H7126-		
103H7128-	8	7.5

Model number	Shaft diameter(D)	Dcut thickness(L)
SH1601-	6.35	5.8
SH1602-		
SH1603-	8	7.5

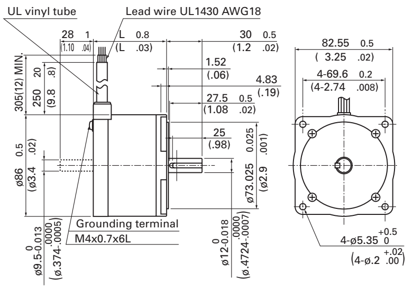
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	5
Double shafts	D	2

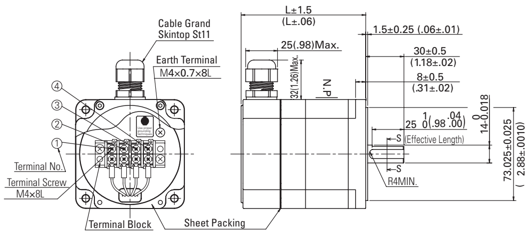
86mm 3.39inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		103H8221-62 0	62 3.31	Lead wire CE
		103H8222-63 0	92.2 5.51	Lead wire CE
		103H8223-63 0	125.9 7.72	Lead wire CE

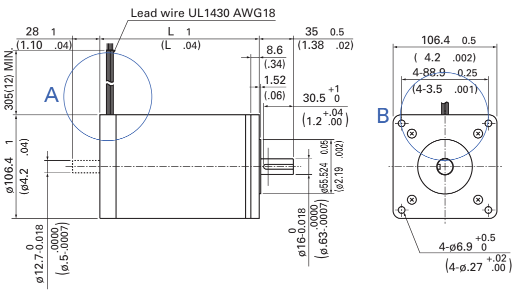
86mm 3.39inch



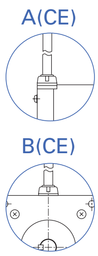
Terminal block type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Terminal block		SM2861-5066	97.9 3.9	Terminal block
		SM2861-5166	97.9 3.9	Terminal block
		SM2861-5266	97.9 3.9	Terminal block
		SM2862-5066	128.4 5.1	Terminal block
		SM2862-5166	128.4 5.1	Terminal block
		SM2862-5266	128.4 5.1	Terminal block
		SM2863-5066	158.8 6.3	Terminal block
		SM2863-5166	158.8 6.3	Terminal block
		SM2863-5266	158.8 6.3	Terminal block

106mm 4.17inch



Lead wire type



CE type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H89222-09 1	163.3 6.4	Lead wire
		103H89223-09 1	221.3 8.7	Lead wire
Bipolar		103H89222-52 1	163.3 6.4	Lead wire
		103H89223-52 1	221.3 8.7	Lead wire CE
		103H89222-63 1	163.3 6.4	Lead wire CE
		103H89223-63 1	221.3 8.7	Lead wire

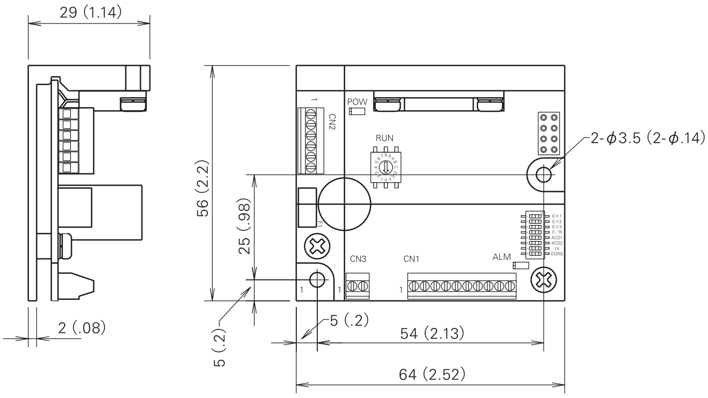
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Drivers Unit: mm inch



Safety standards

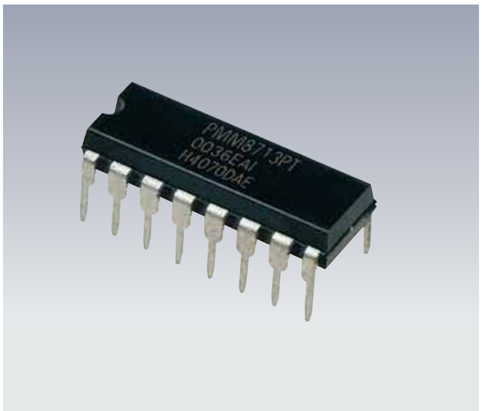
driver

	Acquired standards		File No.	Standard part
UL	UL		E179775	UL508C
	UL for Canada			
CE TÜV	Directives	Category	Name	Standard part
	Low-voltage directives			EN61010-1
	EMC directives	Emission	Terminal disturbance voltage	EN55011-A
			Electromagnetic radiation disturbance	EN55011-A
		Immunity	ESD Electrostatic discharge	EN61000-4-2
			RS Radio-frequency amplitude modulated electromagnetic field	EN61000-4-3
			Fast transionts	EN61000-4-4
			Surges	EN61000-4-6

SM series motor(UL/CE),H series motor(CE)

	Acquired standards	File No.
UL	UL	E208878
	UL for Canada	
CE	Standard category	Standard part
	Low-voltage directives	EN-60034-1
		IEC34-5
		(EN-60034-5)

EMC characteristics may vary depending on the configuration of the users control panel, which contains the driver or stepping motor, or the arrangement and wiring of other electrical devices.
Parts for EMC noise suppression like noise filters and troidal type ferrite cores may be required depending on circumstances.
Validation test of F series driver has been performed for low-voltage EMC directives at TÜV TÜV product service for self-declaration of CE marking.



Universal controller IC for the 2-phase stepping motor drive

PMM8713PT

Characteristics

Universal controller : The following 3 types of energization mode can be selected by switching at the energization mode switching terminal
1EX/1-2EX/2EX
Source voltage : Vcc = 4.5 to 5.5V
High output current : 24mA MIN. sink, source
High noise margin : Schmitt trigger circuit is incorporated for the all input terminals.
2 types of pulse input : 2 input mode CW, CCW input mode
Pulse and direction mode CK, U/D input mode
Excited status verification monitor : Outputs the monitor signal of the controller status.

Maximum Rating Ta=25

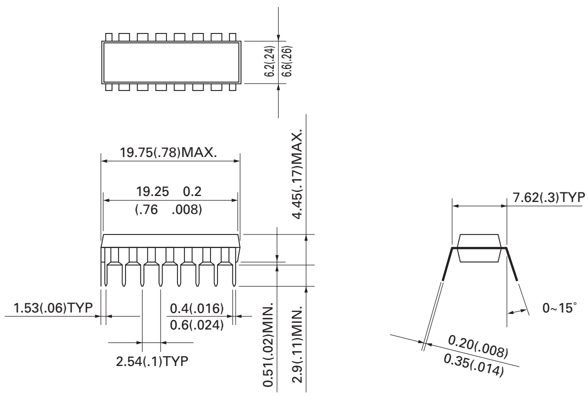
Item		Symbol	Rating	Unit
Source voltage		V_{CC}	-0.3 to 7	V
Output current n	H level	I_{OH}	-35	mA
	L level	I_{OL}	35	
Output current C_O,E_M	H level	I_{OH}		A
	L level	I_{OL}		
Input voltage		V_{IN}	-0.3 to V_{CC} +0.3	V
Input current		I_{IN}	10	mA
operating current		T_{opr}	-20 to 85	
Conservation temperature		T_{stg}	-40 to 125	

Recommended Operating Conditions Ta=-20 to 85

Item		Symbol	Rating MIN.	Rating Standard	Rating MAX.	Unit
Source voltage		V_{CC}	4.5		5.5	V
Output current n	H level	I_{OH}	-24			mA
	L level	I_{OL}	24			
Output current C_O,E_M	H level	I_{OH}	-2			mA
	L level	I_{OL}	2			
Input voltage		V_{IN}	0		VCC	V

Dimensions Unit : mm inch

Pin No.	Name	Function
1.	C_U	Input pulse UP clock input
2.	C_D	Input pulse DOWN clock input
3.	C_K	Input pulse clock input
4.	U/D	Rotation direction conversion
5.	E_A	energization mode switching input
6.	E_B	energization mode switching input
7.	c	energization mode switching input
8.	V_{SS}	GND
9.	R	Reset input
10.	4	4 output
11.	3	3 output
12.	2	2 output
13.	1	1 output
14.	E_M	energization monitor output
15.	C_O	Input pulse monitor output
16.	V_{CC}	4.5 to 5.5V



Electrical Characteristics

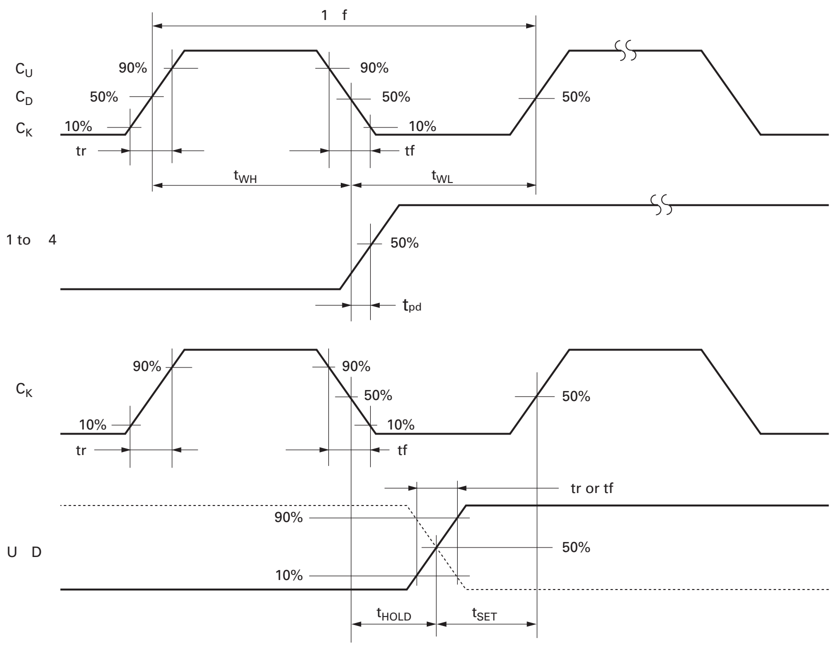
Direct current characteristics Ta = -20 to 85

Item		Symbol	Condition VCC[V]		Standard value MIN.	Standard	MAX.	Unit
Input voltage	H level	V_{IH}	5		3.5			V
	L level	V_{IL}	5				1.5	
Output voltage	H level	V_{OH}	5	V_H=5V V_L=0V IO_H=0	4.9			V
	L level	V_{OL}	5	V_H=5V V_L=0V I_{OH}=0			0.1	
Output current 1 to 4	H level	I_{OH}	5	V_H=5V V_L=0V V_{OUT}=2.4V	-24			mA
	L level	I_{OL}	5	V_H=5V V_L=0V V_{OUT}=0.4V	24			
Output current C_O, E_M	H level	I_{OH}	5	V_H=5V V_L=0V V_{OUT}=2.4V	-2			mA
	L level	I_{OL}	5	V_H=5V V_L=0V V_{OUT}=0.4V	2			
Input current		I	5			10		A
Static current consumption		I_{CC}	5	V_H=5V V_L=0V		1		mA

Switching characteristics Ta = -20 to 85

Item	Symbol	Condition VCC[V]a		Standard value MIN.	Standard	MAX.	Unit
MAX. clock frequency	f_{MAX}	5	tr tf 20ns, CL 50pF	1			MHZ
MIN. width of clock pulse	t_{WL}, t_{WH}	5	tr tf 20ns, CL 50pF			500	ns
MIN. width of reset pulse	t_{WR}	5	tr tf 20ns, CL 50pF			1000	ns
Time delay from clock input to output	t_{pd}	5	tr tf 20ns, CL 50pF			2000	ns
Set time	t_{SET}	5	tr tf 20ns, CL 50pF	0			ns
Holding time	t_{HOLD}	5	tr tf 20ns, CL 50pF	250			ns

Measured waveforms on switching time scale



Function Table

Input modes and rotation direction

Input mode	Input CU	CD	CK	U D	Rotation direction
2 input mode CW, CCW	↓	L	L	L	CW
	L	↓	L	L	CCW
Pulse and direction mode CK, U/D	L	L	↓	H	CW
	L	L	↓	L	CCW

Energization modes

Excitation mode	Input R	EA	EB	C
1 EX	H	H	L	H
1-2EX	H	H	H	H
2 EX	H	L	L	H

Universal controller IC for the 2-phase stepping motor drive

PMM8713PT

Energization Sequence

1EX

Pulse / Face	0 Reset	1	2	3	4
1	1	0	0	0	1
2	0	1	0	0	0
3	0	0	1	0	0
4	0	0	0	1	0
E_M	0	0	0	0	0
UP	→				
DOWN	←				

2EX

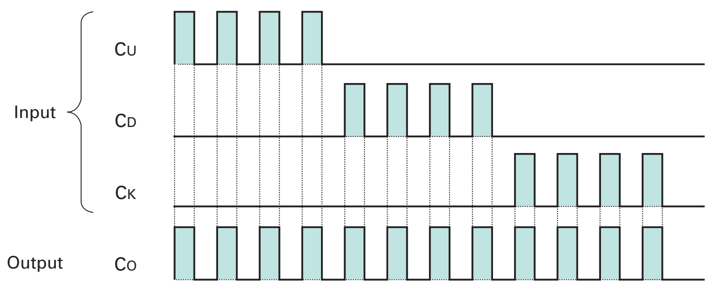
Pulse / Face	0 Reset	1	2	3	4
1	1	1	0	0	1
2	0	1	1	0	0
3	0	0	1	1	0
4	1	0	0	1	1
E_M	1	1	1	1	1
UP	→				
DOWN	←				

1-2EX

Pulse / Face	0 Reset	1	2	3	4	5	6	7	8
1	1	1	1	0	0	0	0	0	1
2	0	0	1	1	1	0	0	0	0
3	0	0	0	0	1	1	1	0	0
4	1	0	0	0	0	0	1	1	1
E_M	1	0	1	0	1	0	1	0	1
UP	→								
DOWN	←								

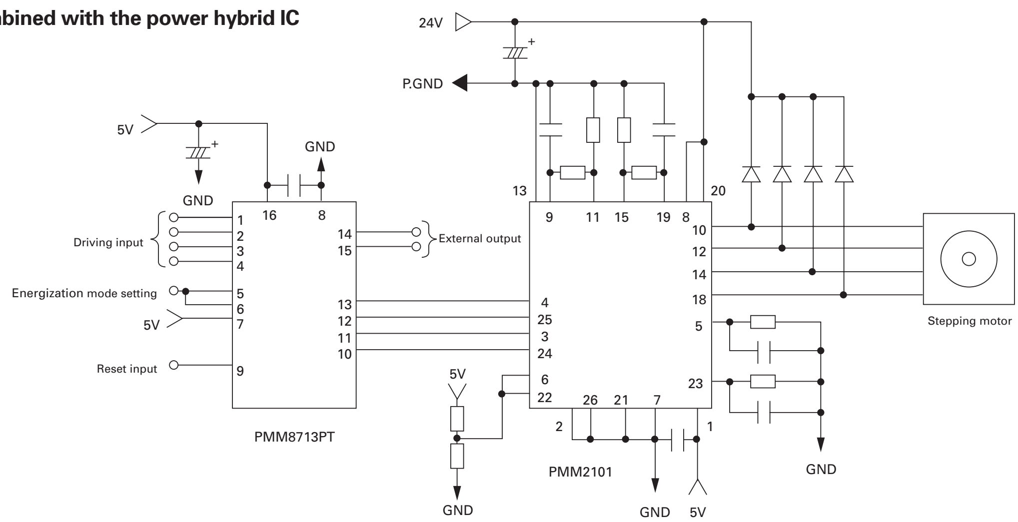
Reset after changing the energization mode.

Input Pulse Monitor



Example of Application Circuit Bipolar wiring motor

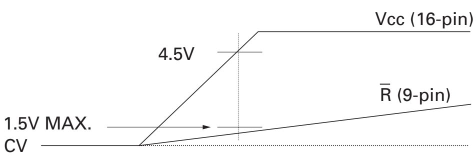
Combined with the power hybrid IC



Energization mode setting

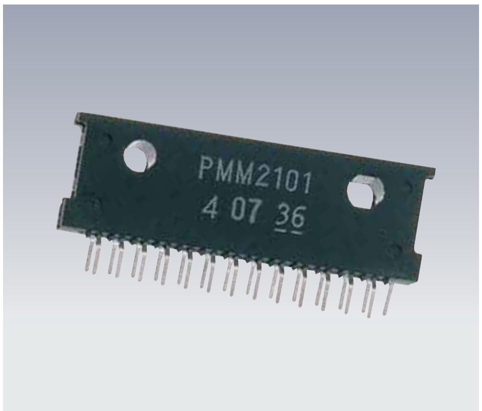
Pin No.	Terminal symbol	Input level	Motor operation
5,6	E_A, E_B	H	1-2EX
		L	2EX

The normal initial reset may not be performed during unstable VCC after turning the power ON. For reliable resetting, hold the R terminal 9-pin at the L level till the VCC becomes stable.



Power hybrid IC : Refer to page 47 for the PMM2101 specifications.
Refer to the PMM8713PT Operation Manual for other application circuit examples.

Stepping Motors with Internal drivers
Set model
Stepping motor
Dimensions
IC for stepping motor



HIC for the 2-phase stepping motor

PMM2101
Full Step / Half Step
Bipolar

Characteristics

Enables high speed and high torque operation by using bipolar constant current switching method.
Enables compact driving circuit configuration with few of externally attached parts.
The overheat protection circuit is incorporated to assist the safety design.

Maximum Rating Tc=25

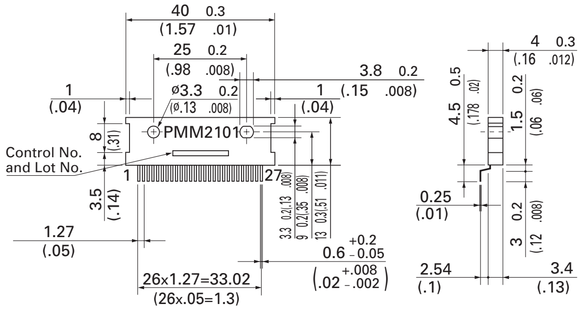
Item	Symbol	Rated value	Unit
Source voltage-1	V_{CC1}	8 to 60	V
Source voltage-2	V_{CC2}	0 to 7	V
Output current	I_O	1.4	A
Allowable loss	P_T	35 Tc 25	W
Thermal resistance	jc	3.57	W
	ja	25	W
Junction temperature	T_{jmax}	150	
Conservation temperature	T_{stg}	-40 150	

Recommended Operating Conditions Tc=25

Item	Symbol	Rated value	Unit
Source voltage-1	V_{CC1}	10 to 50	V
Source voltage-2	V_{CC2}	4.75 to 5.25	V
Output current	I_O	1.0	A
Oscillator frequency	F_C	20 to 27	kHz
Operation temperature	T_C	-25 to 85	

Dimensions Unit : mm inch

Pin No.	Name	Function
1.	V_{CC2}	Power terminal for controller section
2.	ENA A	Enable input terminal
3.	1	Arm drive input
4.	2	Arm drive input
5.	CR A	One shot time constant setting terminal
6.	V_{ref} A	Motor current setting terminal
7.	LG A	GND
8.	V_{CC1} A	Motor driver power terminal
9.	V_SA	Motor current detection terminal
10.	M1	Motor output
11.	R_S A	Detection resistor connecting terminal
12.	M2	Motor output
13.	PG	P.GND
14.	M3	Motor output
15.	R_S B	Detection resistor connecting terminal
16.	NC	
17.	NC	
18.	M4	Motor output
19.	V_S B	Motor current detection terminal
20.	V_{CC1} B	Motor driver power terminal
21.	LG B	GND
22.	V_{ref} B	Motor current setting terminal
23.	CR B	One shot time constant setting terminal
24.	3	Arm drive input
25.	4	Arm drive input
26.	ENA B	Enable terminal
27.	AL	Overheat alarm output terminal



Operational truth value table

ENA A(ENA B)	1(3)	2(4)	M1(M3)	M2(M4)
L	L	L	OFF	OFF
L	L	H	L	H
L	H	L	H	L
L	H	H	OFF	OFF
H			OFF	OFF

HIC for the 2-phase stepping motor

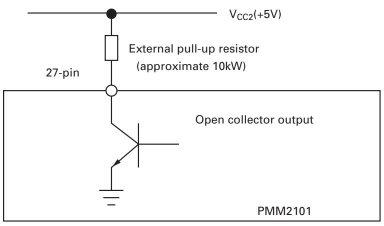
PMM2101 Full Step / Half Step

Electrical Characteristics Ta=25

Item	Symbol	Condition	Rating MIN.	Rating Standard	Rating MAX.	Unit
"H"level input voltage	V_{IH}	V_{CC2} 5V	2.7		V_{CC2}	V
"L"level input voltage	V_{IL}	V_{CC2} 5V	0		1.0	V
"H"level input current	I_{IH}	V_{CC2} 5V V_I 5V			10	A
"L"level input current	I_{IL}	V_{CC2} 5V V_I 0V			-50	A
Reference voltage (V_{ref}) input current	I_{ref}	V_{CC2} 5V V_{ref} 0V			-10	A
Current detection (V_S) input current	I_S	V_{CC2} 5V V_S 0V			-10	A
Forward direction voltage of FET diod	V_F	I_F 1A		1.3	1.5	V
High output saturating voltage	$V_{ce\,(sat)H}$	I_C 1A		1.0	1.4	V
Low output saturating voltage	$V_{ce\,(sat)L}$	I_C 1A		1.0	1.3	V
Low output saturating voltage	I_R	V_{CC1} 60V V_{OUT} 0V			10	A
		V_{OUT} 60V V_{RS} 0V			10	A
Power current to controller section	I_{CC2}	V_{CC2} = 5V during circuit operation			75	mA
Alarm terminal current	I_{alm}	V_{CC2} 5V V_{alm} 0.5V			2	mA
Overheat alarm operating temperature				125		
Overheat protection stop temperature				150		

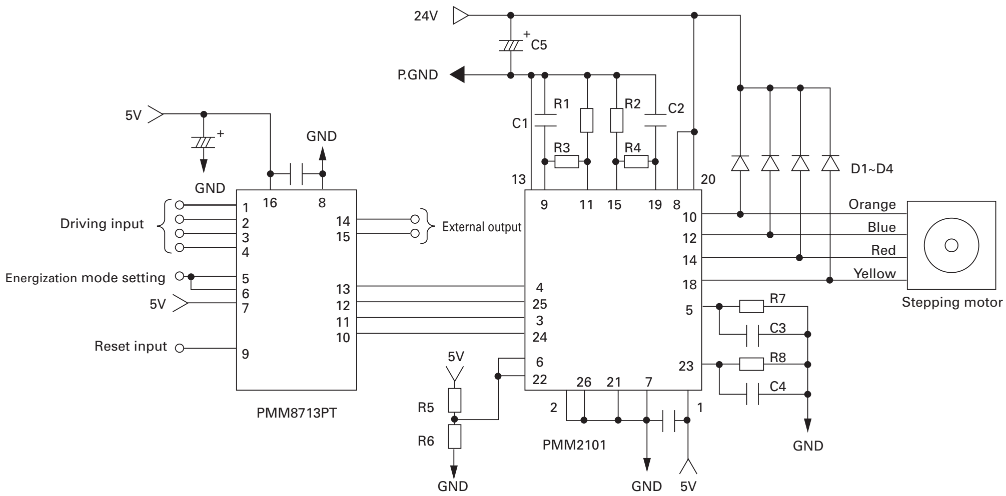
Overheat Alarm Output

The overheat protection circuit outputs an alarm signal at +125 at the internal junction in the IC, and activates motor excitation OFF at +150 .



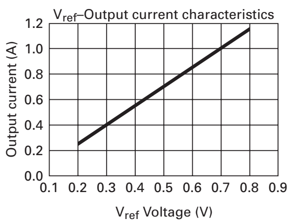
Transistor ON during alarming
Vce ON : 0.5V MAX.
Ialm : 2mA MAX.
The alarming signal output and overheat protection circuit recover automatically when the temperature lowers.

Example of Application Circuit



Refer to page 53 for the PMM8713PT specifications.
Recommended circuit constants for PMM2101

Applicable	Constant	Applicable	Constant
R1,R2	5W 0.68	C1, C2	1000pF
R3,R4	1 4W 3.9k	C3, C4	3300pF
R7,R8	1 4W 15k	C5	330 F



Determine on the R5 and R6 constants referring to the Vref-output current characteristics.
Determine on D1 to D4.
Peak reverse voltage 100V
Output current 1A
Reverse recovery time 100ns

HIC for the 2-phase stepping motor

PMM2301
Micro Step
Unipolar

Characteristics

Sine wave driven micro-step driver.
The current detection resistor is incorporated.
MOSFET is used for the power driving circuit to reduce heating.
Totally packaged to reduce parts for the peripheral circuit.
Enables selection from the 5 various excitation modes by the external bit signal.

Maximum Rating Tc=25

Item	Symbol	Condition	Rated value	Unit
Source voltage-1	$V_{CC1\,MAX.}$	V_{CC2} 0V	52	V
Source voltage-2	$V_{CC2\,MAX.}$	With no signal	7	V
Input voltage	$V_{in\,MAX.}$	Logic input terminal	7	V
Phase current	$I_{OH\,MAX.}$	0.5sec, 1pulse, V_{CC1} applied	4	A
Operating temperature on PCB	$T_{C\,MAX.}$		105	
Junction temperature	$T_{j\,MAX.}$		150	
Conservation temperature	T_{stg}		-40 to 125	

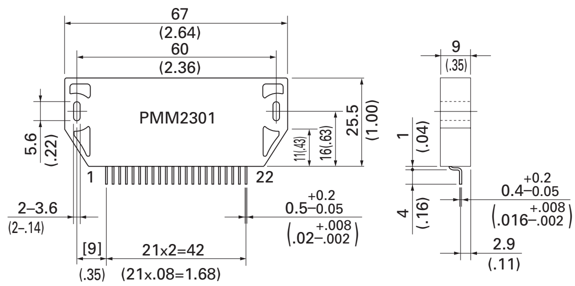
Recommended Operating Conditions Ta=25

Item	Symbol	Condition	Rated value	Unit
Source voltage-1	V_{CC1}	With signal	10 to 45	V
Source voltage-2	V_{CC2}	With signal	5.0 5	V
Input voltage	V_{IH}		0 to V_{CC2}	V
Phase current	I_{OH}	Duty 50	3	A
Clock frequency	Clock		DC to 50	kHz
Withstand voltage of phase driver	V_{DSS}		100	V

Dimensions unit: mm inch

Pin No.	Terminal name
1.	$\overline{B}$
2.	B
3.	P.GND A
4.	P.GND B
5.	A
6.	A
7.	V_{CC2}
8.	V_{ref}
9.	Mode 1
10.	Mode 2
11.	Mode 3

Pin No.	Terminal name
12.	V_{CC2}
13.	V_{CC2}
14.	Clock
15.	CW CCW
16.	Reset
17.	Return
18.	Enable
19.	M_{0I}
20.	M_{01}
21.	M_{02}
22.	GND



Each Terminal Function

Terminal name	Function	Functioning condition				
V_{ref}	Motor current setting input					
Clock	Motor driving pulse input	Mode 3 = H level : Operates at rising edge Mode 3 = L level : Operates at rising and falling edges				
CW / CCW	Motor rotation direction setting input	H level = CW rotation L level = CCW rotation				
Reset	System reset	Reset "L"				
Return	Forced return to phase origin	Forced shift to the origin of the present energization phase with Return = H				
Enable	Power OFF input	Enable "L"				
M_{0I}	Phase origin monitor output	L level output at the phase origin.				
M_{01} M_{02}	Monitor output on phase energization status	Outputs level signal on the present phase energization status.				
		Phase coordinate	A phase	B phase	$\overline{A}$ phase	$\overline{B}$ phase
		M01	H	L	L	H
		M02	L	H	L	H

HIC for the 2-phase stepping motor

PMM2301 Micro Step

Energization Mode Table

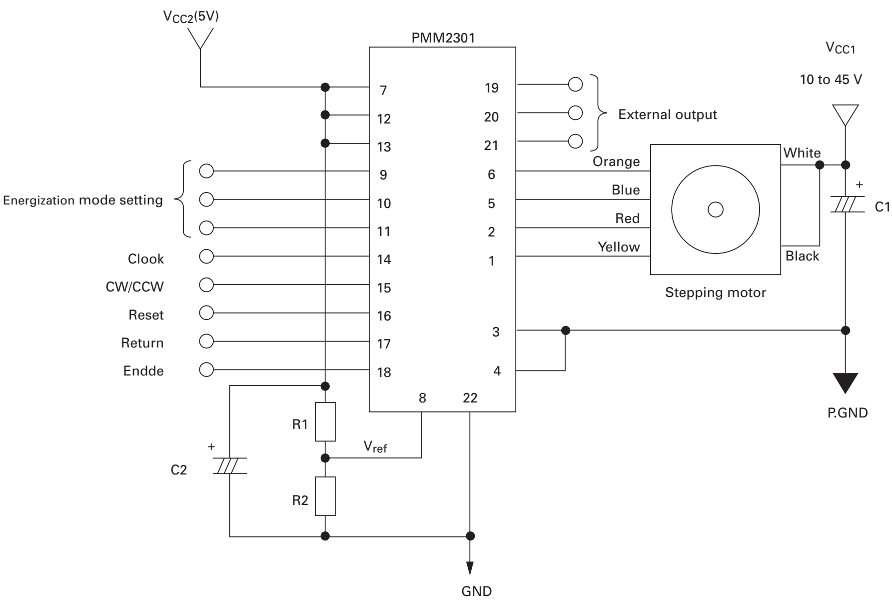
Input condition			Energization	1 step angle	Number of basic
Mode1	Mode2	Mode3	mode	degree	angle division
L	L	H	2EX	1.8	1/1
H	L	H	1-2EX	0.9	1/2
L	H	H	W1-2EX	0.45	1/4
H	H	H	2W1-2EX	0.225	1/8
H	H	L	4W1-2EX	0.1125	1/16

Conditioned on the Mode 3 = L, one pulse operation is performed at every rising and falling edge of the clock pulse. Accordingly, the operation becomes unstable if the driving pulse duty ratio deviates from 50%.

Electrical Characteristics Tc=25 Vcc1=24V Vcc2=5V

Item	Symbol	Condition	Rating MIN.	Standard	MAX.	Unit
V_{CC2} Power current	I_{CCO}	Enable = L		4.5	15	mA
Effective output current	I_{oave}	Each phase R/L = 3.5 /3.8mH, Vref = 0.6V	0.45	0.50	0.55	A
Forward direction voltage of FET diode	V_{df}	I_f 1A		1.2	1.8	V
Output saturating voltage	V_{sat}	RL = 7.5 I 3.0A		1.4	2.6	V
H level input voltage	V_{IH}	9 to 11, 14 to 18 pins	4.0			V
L level input voltage	V_{IL}	9 to 11, 14 to 18 pins			1.0	V
Input current	I_{IL}	9 to 11, 14 to 18 pins = GND level, Pull-up resistor 20k	125	250	510	A
V_{ref} input voltage	V_r	8-pin	0		V_{CC2} 2	V
V_{ref} input curren	I_r	8-pin		1		A
H level output voltage M_{OI} M_{O1} M_{O2}	V_{OH}	19 to 21 pins I = 3mA, I = -3mA	2.4			V
L level output voltage M_{OI} M_{O1} M_{O2}	V_{OL}	19 to 21 pins I = 3mA, I = -3mA			0.4	V
PWM frequency	F_C		37	47	57	kHz

Example of Application Circuit



Recommended circuit constants

C1	C2
100 F or over	10 F

Determine on the R1 and R2 constants based on the Vref voltage calculated from the following formula.
Vref V = Motor current adjusted value A/phase x 0.6

Safety Consideration

The drivers and stepping motors are the products designed to be used for the general industrial devices.
When using those, pay enough attention to the following points.

Read thoroughly the Operation Manual prior to placement, assembly and/or operation in order to use the product properly.

Refrain from modifying or processing the product in any way.

Consult with the distributor or professional experts for placement or maintenance services of the product.

In case of the following uses of the product, contact with us for the special care required to the operation, maintenance and management such as multiplexing the system, installing an emergency electric generator set, or so forth.

1 Use for the medical devices concerned with a fatal accident.
2 Use for trains, elevators, and so forth that are likely to cause an accident resulting in injury, damage or death.
3 Use in the computer system highly influential to the social life or the public systems.
4 Use in other devices highly influential to maintaining the human safety or the public functions.

In addition to the above, consult with us for use in such a vibration environment as automobile or transportation.

Read the Operation Manual thoroughly prior to the use (placement, operation, maintenance and inspection) to put the product in use properly.

Make yourself knowledgeable and familiarize with the devices, safety issues and cautions before handling the product.

After reading the Operation Manual or the like, keep it in the place where the users can refer to whenever necessary.

Indication by Warning Label on the product

Either or all of the following indications are given by the Warning Labels depending on the type of the driver or stepping motor.


This label is stuck near the high voltage part such as the electrically charged or cover-protected section, warning that the place where it is likely to cause an electric shock.


This label is stuck on the place where the driver or stepping motor body should be easily acknowledged, warning that it is likely to cause burns from high temperature.

This label is stuck near the GND terminals of the driver or stepping motor for which grounding is required, suggesting that the terminals should be actually grounded.

This label is stuck for the driver or stepping motor to which the power source is applied in the voltage exceeding the safety standard, drawing attention against the electric shock.

Safety ranks of the cautions

Following four ranks are provided.

DANGER Improper operations or use is most likely to result in serious injury or death.

CAUTION Improper operations or use is likely to result in average or minor injury, or in property damage.

In spite of the cautions with the CAUTION label, it may cause serious results. Either the contents of the labels is describing important cautions to be followed inevitably.

PROHIBITED Indicates what shall not be done.

COMPULSORY Indicates what shall be done.

DANGER

General matters

1. Do not use the product in an explosive, flammable or corrosive atmosphere, watery place or near a combustible material. Doing so may cause injury or fire.

2. Have a person with expert knowledge for performing the transportation, placement, wiring, operation, maintenance or inspection of the product. Without such knowledge, it may cause an electric shock, injury or fire.

3. Do not work for wiring, maintenance servicing or inspection with the electric power on. Perform either of those five minutes after turning the power off, or otherwise, it may cause an electric shock.

4. When the protective functions of the product is activated, turn the power off immediately and eliminate the cause. If continuing the operation without eliminating the cause, the product may operate improperly and cause injury or a breakdown of the system devices.

5. Stepping motor may run out of order at the operating and stopping occasions, depending on the magnitude of the load. Put the product into use after confirming with the adequate trial test operation in the maximum load conditions that the product performs reliable operation. Doing otherwise may cause a breakdown of the system. (Should the product run out of order in the use to drive upward/downward, it may cause a fall of the load.)

6. Do not touch the internal parts of the driver. Doing so may cause an electric shock.

Wiring

7. Do not connect the stepping motor directly with the commercial power outlet. Doing so may cause an electric shock, injury or fire. The power shall be supplied to the stepping motor through the driving circuit.

8. Use the electric power source within the rated input voltage. Using otherwise may cause fire or an electric shock.

9. Connect the driver and stepping motor to the ground. Using without grounding may cause an electric shock.

10. Do not harm, forcibly put a stress, or load a heavy article on the cable or get it caught between the articles. Doing so may cause an electric shock.

11. Perform wiring with the power cable as instructed by the wiring diagram or the Operation Manual. Doing otherwise may cause an electric shock or fire.

Operation

12. Be sure not to touch the rotating part of the stepping motor during its operation. Touching it may cause injury.

13. Neither reach or touch the electric terminals while electric power is on. Doing so may cause an electric shock.

14. Never disconnect any of the connectors while electric power is on. Doing so may cause an electric shock and corruption.

General matters

1. Prior to placement, operation, maintenance servicing or inspection, be sure to read the Operation Manual and follow the instructions to perform those. Failure to follow the instructions may cause an electric shock, injury or fire.

2. Do not use the driver or the stepping motor outside the specified conditions. Doing so may cause an electric shock, injury or fire.

3. Do not insert a finger or a thing into the opening of the product. Doing so may cause an electric shock, injury or fire.

4. Do not use the damaged driver or stepping motor. Doing so may cause injury, fire or the like.

5. Use the driver and stepping motor in the designated combination. Using otherwise may cause fire or a trouble.

6. Be careful that the temperature rises in the operating driver, stepping motor or peripheral devices. Failure to be careful may cause a burn.

Unpacking

7. Unpack while confirming the ceiling. Failure to do so may cause injury.

8. Confirm if the product is the one having been ordered. Installing an incorrect product may cause a breakdown.

Wiring

9. Do not perform measurement of the insulation resistance or withstand insulation voltage of the product. Doing so may cause a breakdown. Instead, contact with us for such inspection.

10. Perform wiring conforming to the technical standards of electric facility or the internal rule. Doing otherwise may cause burning or fire.

11. Ensure that wiring has been correctly done. Operating without correct wiring may cause the stepping motor to run out of control and result in injury.

12. Take insulation process for the attached condenser or the external resistance connection terminals. Failure to do so may cause an electric shock.

Placement

13. Do not climb or attach a heavy article on the product. Doing so may cause injury.

14. Neither block nor stuff the aspiration/exhaust vent with a foreign particle. Doing so may cause fire.

15. Follow the instructions for the direction to place. Failure to do so may cause a trouble.

16. Keep a distance as instructed by the Operation Manual for the driver from the inner surface of the control console or other devices. Failure to do so may cause a trouble.

17. Place the product with a great care so as to prevent from the danger such as a tumble or a turnover.

CAUTION

18. Mount the product on an incombustible material such as metal. Doing otherwise may cause fire.

19. Confirm the rotating direction before connecting with the mechanical device. Failure to do so may cause injury or a breakdown.

20. Do not touch the motor output spindle (including the key slot and gears) with a bare hand. Doing so may cause injury.

Operation

21. The stepping motor is not equipped with any protective device. Take protective measures using an over-current protective relay, a ground fault interrupter, a protective device from excess temperature, and an emergency stopping device. Failure to do so may cause injury or fire.

22. Do not touch the product for a period after the power is on or has been turned off, since the driver and stepping motor remain in the high temperature. Doing so may cause burns. Especially the temperature rises considerably of the stepping motor depending on the operating conditions. Use the motor on the condition so that its surface temperature becomes 100°C or under.

23. Stop the operation immediately when an emergency occurs. Failure to do so may cause an electric shock, injury or fire.

24. Do not change adjustment to an extreme, for such a change results in the unstable operation. Doing so may cause injury.

25. When conducting the trial operation, make the stepping motor fixed firmly, and confirm the operation by disconnecting with the mechanical system before connecting with it. Failure to do so may cause injury.

26. When the alarm has been activated, eliminate the cause and ensure the safety to resume operation. Failure to do so may cause injury.

27. When the electric power recovers after the momentary interruption, do not approach the devices because the system may re-start operation by itself. (Set the system so as to secure the safety even when it re-start on such occasion.) Failure to do so may cause injury.

28. Confirm that the electric power supply is all proper conforming to the specifications. Failure to do so may cause a trouble.

29. The brake mechanism of the motor with the electro-magnetic brake is to hold the movable section and the motor position. Do not use it as a safety measure, or doing so may cause the breakdown of the system.

30. Fix the key firmly when operating the motor with key individually. Failure to do so may cause injury.

Maintenance services

31. Be careful when performing maintenance services or inspection about the temperature which rises highly in the driver and stepping motor frame. Failure to do so may cause burns.

32. It is recommended to replace the electrolytic condenser of the driver with a new one for securing the preventive measure after using for 5 years, the expected life in the average 40°C. The expected life of the fuse is 10 years in the average 40°C. Thus, the periodical replacement is recommended.

33. Contact with us for repair. If the product is disassembled by the user, it may put it out of action.

Transportation

34. Handle the product with care during transportation so as to prevent from the danger such as a tumble or a turnover.

35. Do not hold with the cable or the motor spindle. Doing so may cause a trouble or injury.

Retirement

36. When scrapping the driver or stepping motor, treat it for the general industrial waste.

PROHIBITED

Storage

1. Avoid the place exposed to rain or water drops, or in an environment with hazardous gas or liquid for storing the product. Failure to do so may cause a trouble.

Maintenance services

2. Do not assemble or repair the product. Doing so may cause fire or an electric shock.

General matters

3. Do not remove the rating plate.

COMPULSORY

Storage

1. Store the product within the specified conservation temperature and humidity in the place not exposed to the sun beam.

2. If the driver has been stored for a long period (3 years or longer for a guide), consult with us. The capacitance may have decreased with the electrolytic condenser due to the long period storage, and it may cause a trouble.

Operation

3. Install an external emergency stop circuit to turn the power off for the instant halt of operation.

4. Put the product into operation in the specified ambient temperature and humidity.

Transportation

5. Excess loading of the product on the carrier may cause the load to fall in pieces. Follow the instructions given outside the package.

Inquiry Check Sheet

For more information regarding any products or services described here in, please contact your nearest office listed on the back of this catalog.

To SANYO DENKI Co.,LTD. Date

____

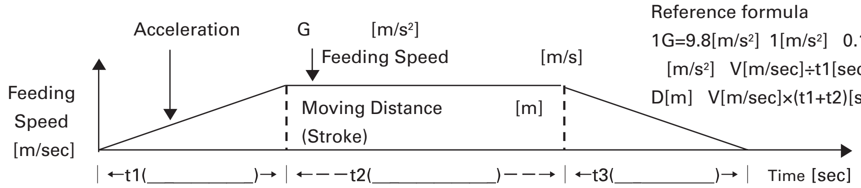
Company:

Department:

Name:

Tel: FAX:

E-mail:

	Item	Contents
1	Name of target equipment	Equipment name, category (transport, processing, test, other)
2	Name of servo axis	Axis name, axial mechanism (horizontal/vertical), brake mechanism (yes/no)
3	Current condition of above axis	Manufacturer Name ( ) Series Name ( ) Motor Capacity ( ) Hydraulic, Mechanical, or New System ( )
4	Positioning accuracy	± mm ± m
5	Operation pattern	 Reference formula 1G=9.8[m/s²] 1[m/s²] 0.1G [m/s²] V[m/sec]÷t1[sec] D[m] V[m/sec]×(t1+t2)[sec]
6	Mechanism	Ball-screw/screw-rotation type (horizontal), ball-screw/nut-rotation type (horizontal), rack and pinion (horizontal), belt/chain (horizontal), rotary table, roll feed, instability
7	Mechanical structure	WT table mass kg WL work mass kg WA mass of other drive parts kg WR rack mass kg WB belt/chain mass kg WC counterbalance mass kg Fa external force axial direction N Fb ball-screw preload N T roll pushing force N Dr1 drive-side roll diameter mm Dr2 follower-side roll diameter mm Lr1 drive-side roll length mm Lr2 follower-side roll length mm G reduction ratio JG speed-reducer inertia kg m² JC coupling inertia kg m² JN nut inertia kg m² JO other motor-axis conversion inertia kg m² Db ball-screw diameter mm Lb ball-screw axial length mm Pb ball -screw lead mm Dp pinion/pulley diameter mm Lp pinion axial length mm tp pully thickness mm Dt table diameter mm Dh table-support dianeter mm LW load shift from axis mm Ds table shaft diameter mm Ls table shaft length mm specific gravity of ball-screw/pinion/pulley/table-shaft material kg cm³ friction coefficient between sheet and shiliding-surface/support-section/roll 1 specific gravity of roll-1 material kg cm³ 2 specific gravity of roll-2 material kg cm³ internal friction coefficient of preload nut mechanical efficiency JL load inertia of motor-axis conversion kg m² TF friction torque of motor axis conversion N m Tu imbalance torque of motor axis conversion N m
8	Speed reducer	Customer-provided ( ) Sanyo denki standard(planet/spur/no-backlash-planet) other( )
9	Encoder type	Encoder type specified (yes / no) Yes:(incremental , optical absolute , optical absolute with incremental function, resolver absolute) Resolution
10	Input format	Position , velocity , torque , other ( )
11	Host equipment (controller)	Sequencer , laptop , customer-developed product , Sanyo dennki-provided , other ( )
12	Usage environment and other requirements	Cutting , clean-room use , anti-dust measures , other ( )
13	Estimated production	Single product: ( ) units/mouth ( ) units/year
14	Development schedule	Prototype period: ( )Year ( ) Month Production period: ( )Year ( ) Month
15	Various measures	Related documentation (already submitted; send later by mail) Visit/PR desired (yes / no) Meeting desired (yes / no)
16	Miscellaneous (questions, pending problems, unresolved issues, etc.)	

Precautions For Adoption

⚠ Cautions

Failure to follow the precautions on the right may cause moderate injury and property damage, or in some circumstances, could lead to a serious accident. Always follow all listed precautions.

⚠ Cautions

- Read the accompanying Instruction Manual carefully prior to using the product.
- If applying to medical devices and other equipment affecting people's lives, please contact us beforehand and take appropriate safety measures.
- If applying to equipment that can have significant effects on society and the general public, please contact us beforehand.
- Do not use this product in an environment where vibration is present, such as in a moving vehicle or shipping vessel.
- Do not perform any retrofitting, re-engineering, or modification to this equipment.
- The drivers and motors presented in this catalog are meant to be used for general industrial applications. If using for special applications related to aviation and space, nuclear power, electric power, submarine repeaters, etc., please contact us beforehand.

For any question or inquiry regarding the above, contact our Sales Department.

http://www.sanyodenki.co.jp

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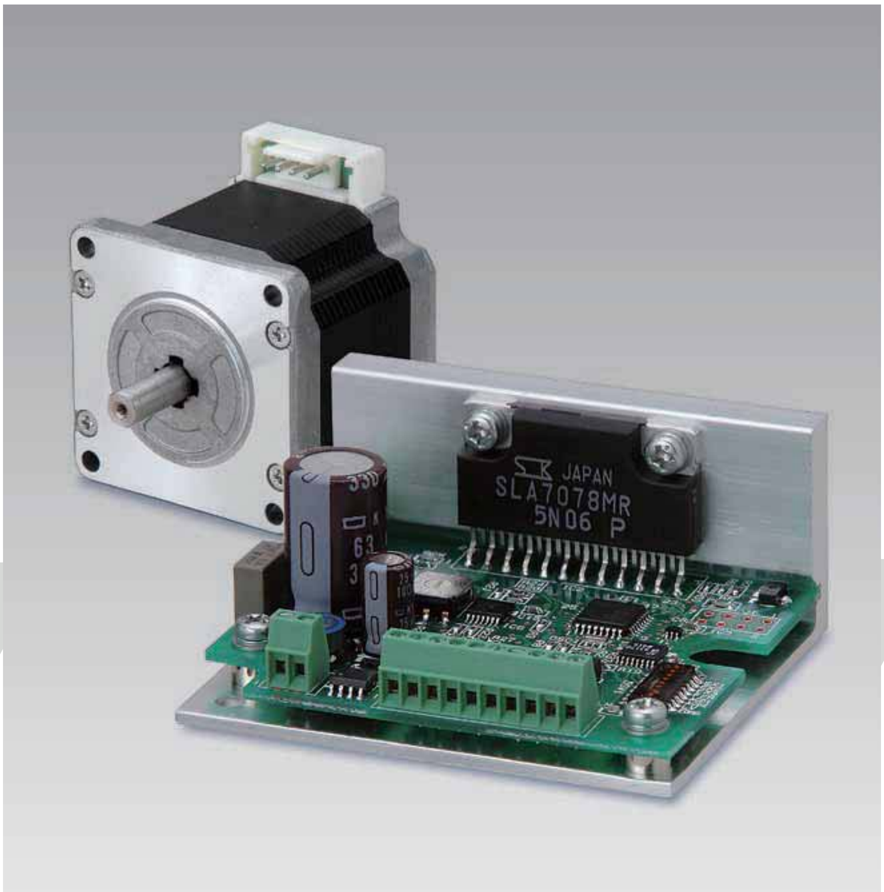
CATALOG No. 832-6 '09.3.N

SANMOTION

2-PHASE STEPPING SYSTEMS

F2



Ver.2

SANYO DENKI

SANMOTION
2-phase STEPPING SYSTEMS

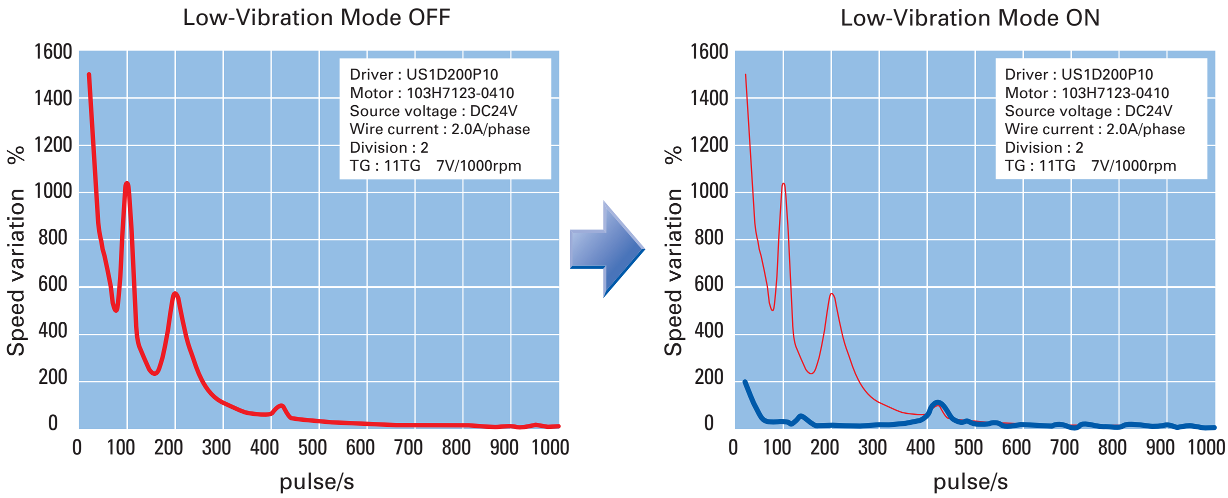
F2

F series DRIVER
H series MOTOR
SH series MOTOR

F series DRIVER features

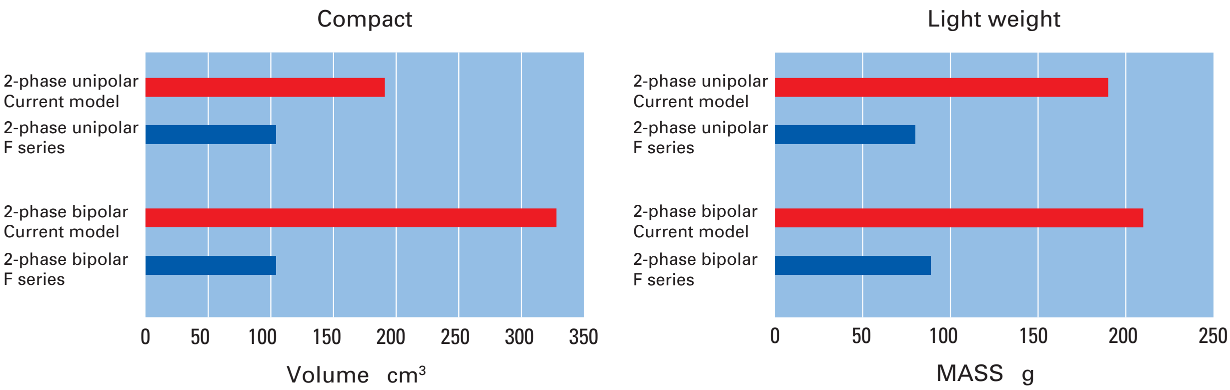
1 Low-vibration mode

DC input



2 Compact / Light weight

DC input



Compliance with international standards

DC input

The standard specification SANMOTION F series stepping driver complies with UL and EN safety standards.Stepping motors complying with UL and EN standards are available upon request.

Set model

DC input

Stepping motors with integrated drivers

P.4

A driver incorporating a motion control function needed for driving a motor and a 2-phase stepping motor were integrated into a single unit.

Motor flange size

□42 1.65inch □60 2.36inch

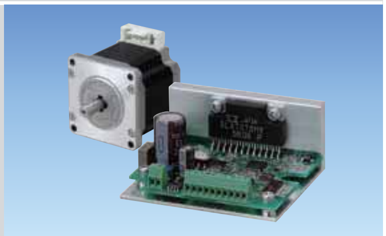
Unipolar standard standard model

P.13

The standard set includes a F series driver and a H or SH series motor.

Motor flange size

□28 1.10inch □42 1.65inch □56 2.20inch



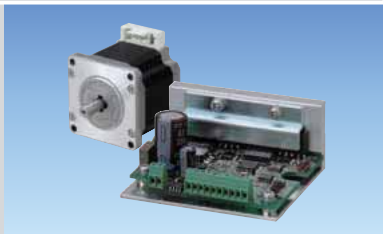
Bipolar standard standard model

P.14

The standard set includes a F series driver and a H or SH series motor.

Motor flange size

□28 1.10inch □42 1.65inch □50 1.97inch □56 2.20inch □60 2.36inch



Control method

How do you want to control the equipment?

The F series offers the choice of 3 different control methods

Program command control using PLC I/O

Network control using serial communication RS-485

Control using a pulse generator

Control using a pulse generator

Drive Specification

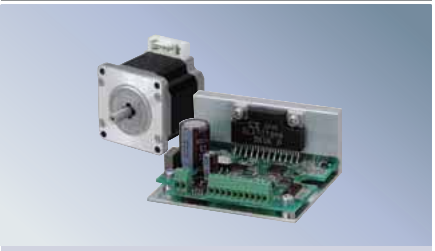
DC input
stepping motors with integrated drivers

Startup via I/O :
Initiate program containing speed, acceleration/deceleration, and travel distance commands stored in the driver via the I/O.

Startup via serial communication :
Control by sending data for speed, acceleration/deceleration, and travel distance commands via serial communication.

System configuration diagram	P4
Specifications	P6
Dimensions	P5 to 6

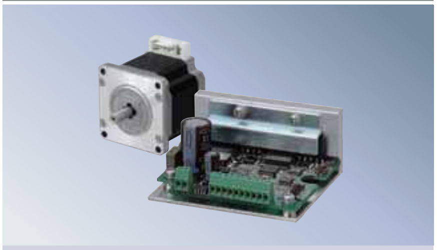
DC input
unipolar standard



Motion is generated by pulse input commands from an upper-level controller.

System configuration diagram	P13
Set part number nomenclature	P16
Motor specifications	P27 to 48
General specifications	P49 50
Motor dimension drawing	P51 to 54
Driver dimension drawing	P55

DC input
bipolar standard



Motion is generated by pulse input commands from an upper-level controller.

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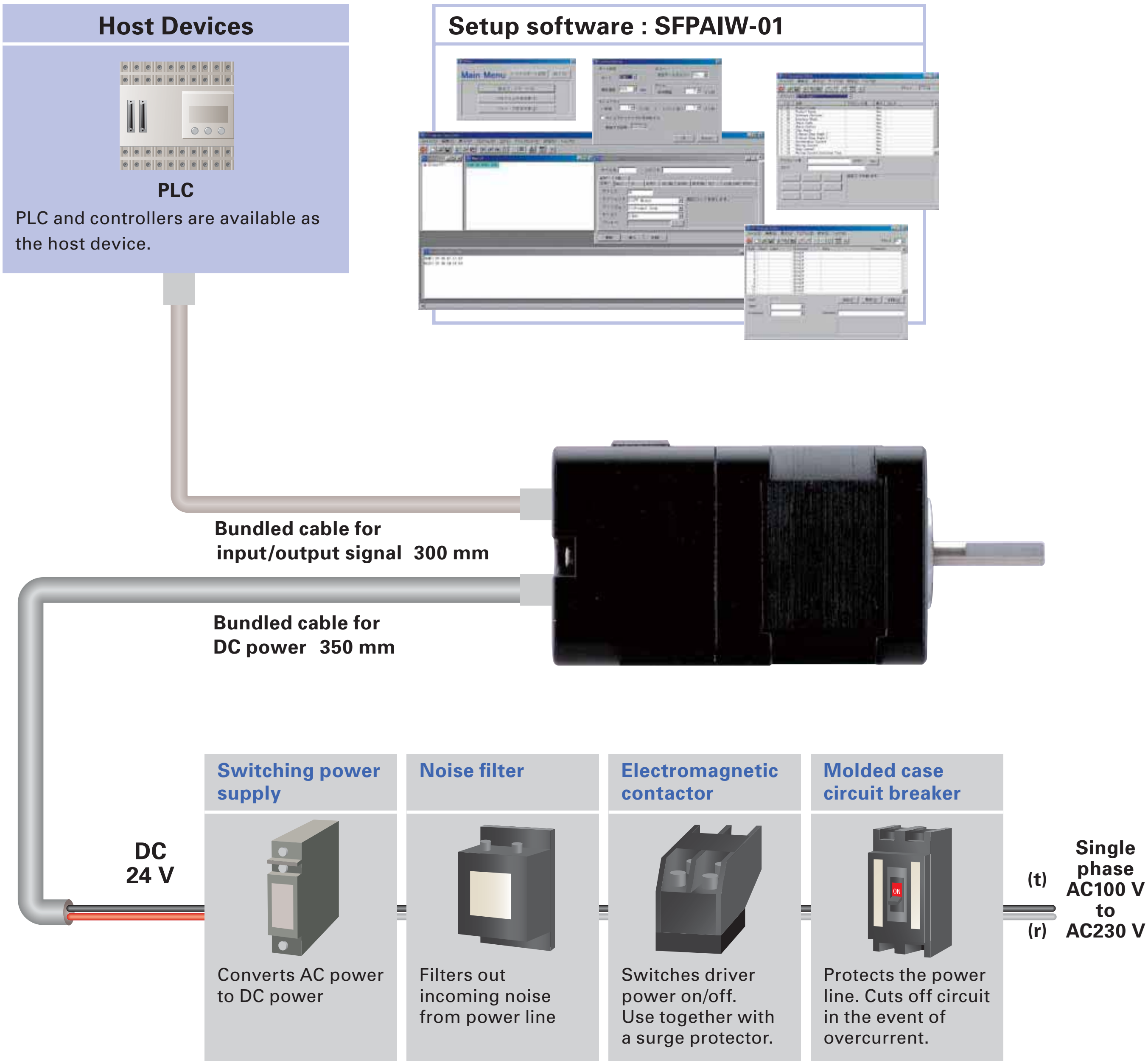
Motor dimension drawing	P51 to 54
Driver dimension drawing	P55

Stepping Motors with Integrated drivers



Stepping motors with integrated drivers

Features

1.Driver and motor are now integrated into a single unit.

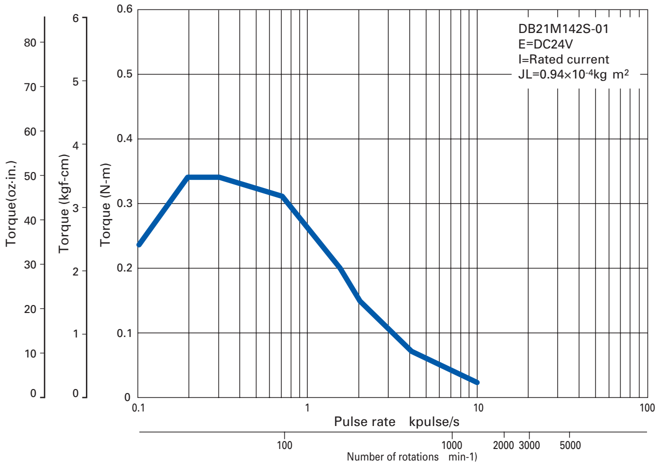
A driver incorporating a motion control function needed for driving a motor and a 2-phase stepping motor were integrated into a single unit for enabling a more compact installation space and less wiring.

2.Three types of operation modes can be selected to match the specific application.

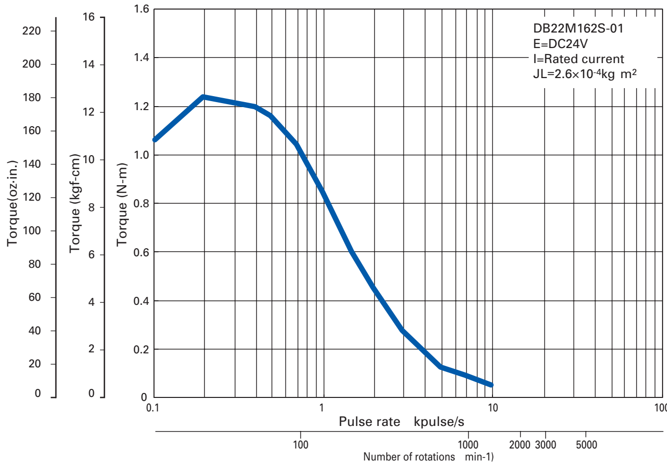
1 Control by command pulses
2 Program control by general-purpose I/O(Parallel)
3 Compliant with RS-485, half-duplex asynchronous communication

Pulse rate-torque characteristics

42mm 1.65inch



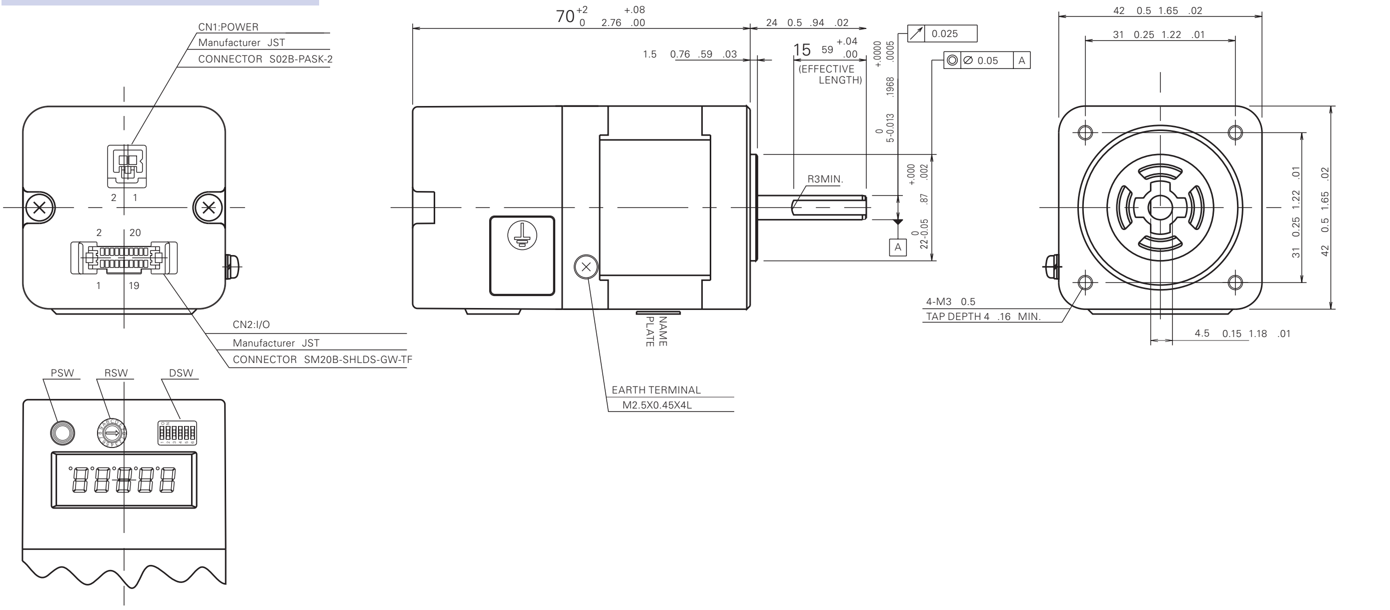
60mm 2.36inch



The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Dimensions Unit : mm inch

42mm 1.65inch

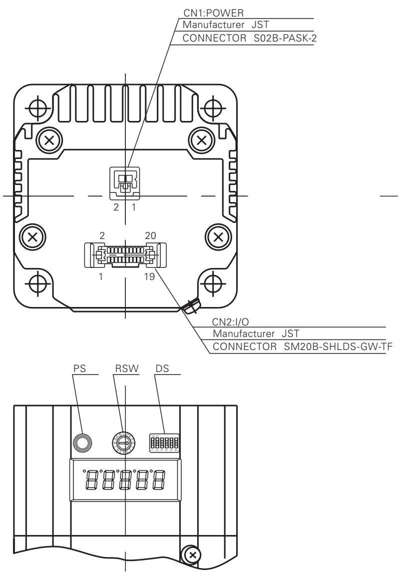


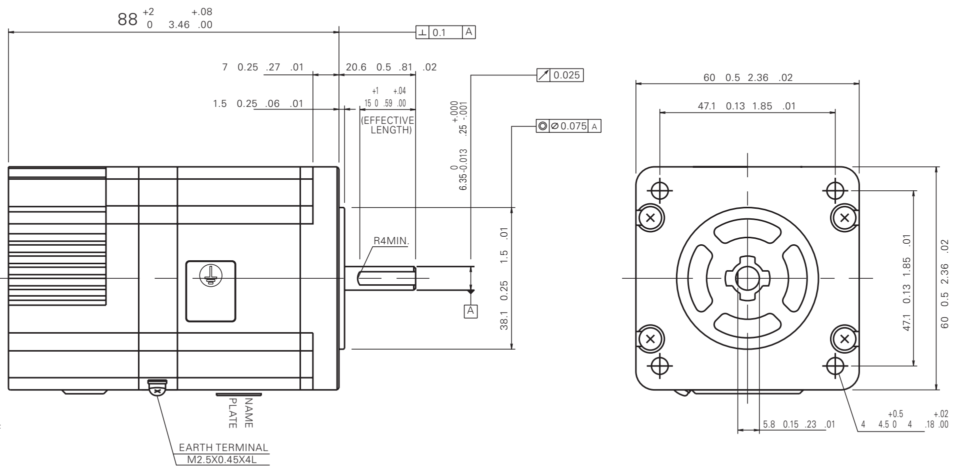
Specifications

Basic specifications	Part number Flange size		**DB21M142S-01 42**	**DB22M162S-01 60**
	Input source Note1		DC24 V 10	
	Getaway torque A		2 MAX.	3 MAX.
	Environment	Protection class	Class I	
		Operation environment	Installation category over-voltage category : II, pollution degree : 2	
		Applied standards	EN61010-1	
		Operating ambient temperature Note2	0 to +40	
		Conservation temperature	-20 to +60	
		Operating ambient humidity	35 to 85%RH no condensation	
		Conservation humidity	10 to 90%RH no condensation	
		Operation altitude	1000 m 3280 feet MAX. above sea level	
		Vibration resistance	Tested under the following conditions ; 4.9m/s2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each	
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .	
		Withstand voltage	Not influenced when 1500V AC is applied between power input terminal and cabinet for one minute.	
		Insulation resistance	10M ohm MIN. when measured with 500V DC megohmmeter between input terminal and cabinet.	
	Mass Weight		0.5kg 1.10lbs	0.87kg 1.92lbs
Function	Protection function		Against driver overheat	
	LED indicator		Alarm monitor	
I/O signals	Command pulse input signal Note3		Photo coupler input method, input resistance 220 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	Power down input signal PD		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	Step angle setting selection input EXT		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	FULL/HALF setting selection input F/H		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	EMG input signal		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	BUSY output signal		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	
	Phase origin monitor output signal MON		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	
	Alarm output signal AL		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	

Note1 Note that the power voltage must not exceed 24VDC + 10% (26.4VDC).
Note2 If the driver is placed in a box, the temperature inside the box must not exceed this specified range.
Note3 The maximum input frequency is 250k pulse/s.

60mm 1.65inch

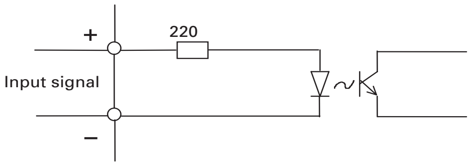




Input circuit configuration

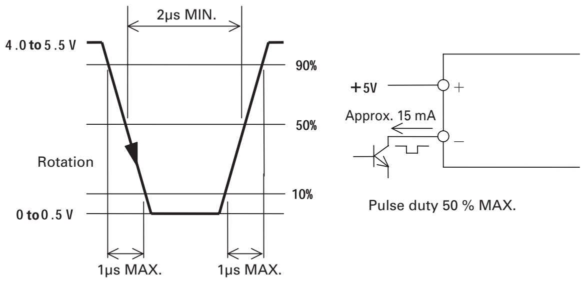
Input interface

Input circuit configuration

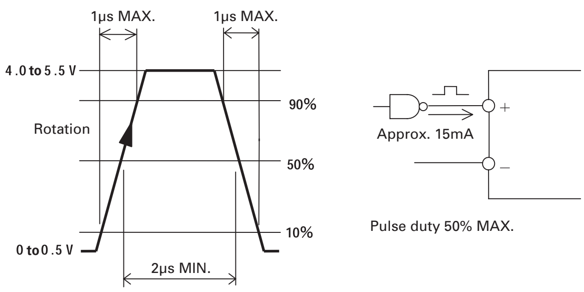


Input signal specifications

Negative logic

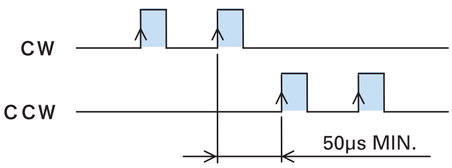


Positive logic



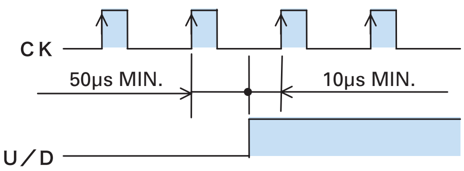
Timing of the command pulse

2-input mode CW, CCW



- The internal photo coupler turns ON within the and, at its falling edge to OFF, the internal circuit motor is activated.
- When applying the pulse to CW, turn OFF the CCW side internal photo coupler.
- When applying the pulse to CCW, turn OFF the CW side internal photo coupler.

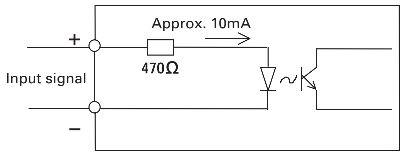
Pulse and direction mode CK, U/D



- The H level is input for and, at its rising edge to H level, the internal circuit stepping motor is activated.
- Switching the input signal U/D should be performed while the input level on the CK side is L .

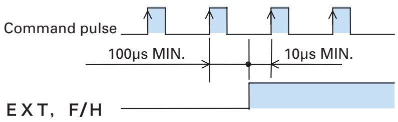
Input circuit configuration

Input circuit configuration　PD EXT F/H EMG



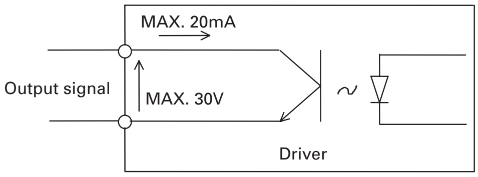
- Shaded area indicates internal photo coupler ON .
- EXT input signal
  EXT photo coupler ON enables a function by external F/H input signal.
  EXT photo coupler OFF enables the setting of a number of micro steps by main unit's rotary switch S.S.
- F/H input signal
  F/H photo coupler ON sets HALF step (2-division) operation.
  F/H photo coupler OFF sets FULL step (1-division) operation.
- Refer to switching EXT and F/H input signal in the [FULL/HALF input signal, command pulse, and step angle select].
- When switching the step angle by EXT and F/H input signal, the phase origin LCD may not turn ON and the phase origin monitor output may not output when stop. Refer to the MON output in the [Output Interface].

Timing of command pulse, step angle selection, and FULL/HALF selection input signal

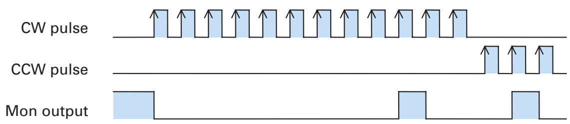


Output interface

Output circuit configuration BUSY MON AL

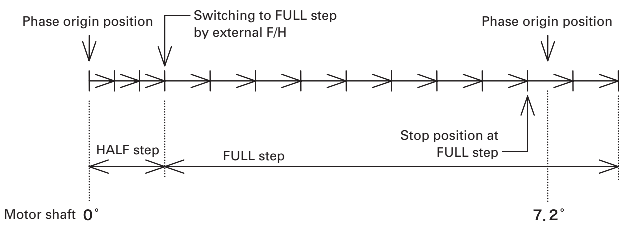


Mon output



- When the motor excitation phase is at the phase origin (power ON status), the photo coupler is turned ON , and the upper D.P of status LED turns on synchronously.
- Output from MON is set to on at every 7.2 degrees of motor output shaft from phase origin.

When changing the division setting by F/H input signal.



- When changing the motor division setting by the external input signal and the rotary switch as shown in the example below, the motor cannot stop where MON output signal can be output. Take this into consideration when using the MON output signal.

WIRING

Specification Summary of Input/Output Signals (Serial I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC 5V is input.
Alarm clear signal standard	ALMC	6	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
General-purpose input 1	IN1	6	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 1 on Internal photo coupler off General purpose input 1 off
Emergency stop input	EMG	6	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler of Emergency stop
Origin signal	ORG	6	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
+ direction overtravel signal	+OT	7	An overtravel signal in the + direction is input. Internal photo coupler on + direction overtravel not arrived Internal photo coupler off + direction overtravel arrived
General-purpose input 2	IN2	7	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 2 on Internal photo coupler off General purpose input 2 off
Emergency stop input	EMG	7	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	7	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	7	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
- direction overtravel signal	OT	8	An overtravel signal in the - direction is input. Internal photo coupler on - direction overtravel not arrived Internal photo coupler off - direction overtravel arrived
General-purpose input 3	IN3	8	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 3 on Internal photo coupler off General purpose input 3 off
Emergency stop input	EMG	8	emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	8	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	8	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear

Signal	Reference Designation	Pin Number	Function Summary
Emergency stop signal	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
General-purpose input 4c	IN4	9	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 4 on Internal photo coupler off General purpose input 4 off
Origin signal	ORG	9	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	9	alarms are cleared. Internal photo coupler off on Alarm clear
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
During program execution	PEND	10	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
Zone signal	ZONE	10	on when the current position is inside the coordinates that were set beforehand.
During program execution	PEND	11	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
During motor operation	BUSY	11	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Zone signal	ZONE	11	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	ALM	12	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor becomes non excited status.
Output signal common	OUT_COM	13	It is for the output signal common.
DATA+	DATA+	14	It is for the serial signal.
DATA	DATA	15	It is for the serial signal.

Specification Summary of Input/Output Signals (Pulse train I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
CW pulse input Standard	CW+ CW	1 2	When 2 input mode , Input drive pulse rotating CW direction.
Pulse train input	CK+ CK	1 2	When 1 input mode , Input drive pulse train for motor rotation.
CCW pulse input Standard	CCW+ CCW	3 4	When 2 input mode , Input drive pulse rotating CCW direction.
Rotational direction input	U/D+ U/D	3 4	When 1 input mode , Input motor rotational direction signal. Internal photo coupler ON CW direction Internal photo coupler OFF CCW direction
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC5V is input.
Power down input	PD	6	Inputting PD signal will cut off power off the current flowing to the Motor With dip switch select, change to the Power low function is possible . PD input signal on internal photo coupler on PD function is valid. PD input signal off internal photo coupler off PD function is invalid.
Step angle select input	EXT	7	FULL/HALF select input will become valid by inputting EXT signal. EXT input signal on internal photo coupler on External input signal F/H is valid EXT input signal off internal photo coupler off Main body rotary switch S.S is valid

Signal	Reference Designation	Pin Number	Function Summary
FULL/HALF select input	F/H	8	When EXT input signal on internal photo coupler on , F/H input signal on internal photo coupler on HALF step F/H input signal off internal photo coupler off FULL step
Emergency stop	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Phase origin monitor output	MON	11	When the excitation phase is at the origin in power on it turns on. When FULL step, ON once for 4 pulses, when HALF step, ON once for 8 pulses.
Alarm output	ALM	12	When alarm circuits actuated inside the Driver, outputs signals to outside. Then the Stepping motor becomes unexcited status.
Output signal common	OUT_COM	13	It is for the output signal common.

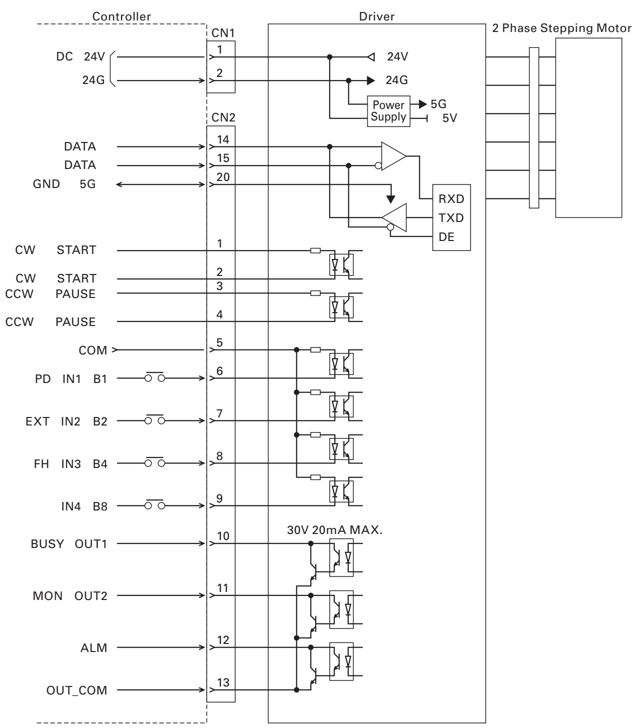
*As for the Motor rotational direction, CW direction is regard as the clockwise revolution by viewing the Motor from output shaft side.

Specification Summary of Input/Output Signals (Parallel I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
Program drive Start/Stop	START+ START-	1 2	Commands the start and stop of program driving. Internal photo coupler on Program driving start Internal photo coupler off Program driving stop
Program pause	PAUSE+ PAUSE-	3 4	When START signal on, a pause in program driving is commanded. Internal photo coupler on Program driving pause Internal photo coupler off Program driving pause release
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC5V is input.
Alarm clear signal standard	ALMC	6	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
General-purpose input 1	IN1	6	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 1 on Internal photo coupler off General purpose input 1 off
Program number selection bit 1	B1	6	The program number is selected along with other bits. Subordinate bit Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	6	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	6	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
+ direction overtravel signal	+OT	7	An overtravel signal in the + direction is input. Internal photo coupler on + direction overtravel not arrived Internal photo coupler off + direction overtravel arrived
General-purpose input 2	IN2	7	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 2 on Internal photo coupler off General purpose input 2 off
Program number selection bit 2	B2	7	The program number is selected along with other bits. The second bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	7	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	7	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	7	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
- direction overtravel signal	-OT	8	An overtravel signal in the - direction is input. Internal photo coupler on - direction overtravel not arrived Internal photo coupler off - direction overtravel arrived
General-purpose input 3	IN3	8	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 3 on Internal photo coupler off General purpose input 3 off
Program number selection bit 4	B4	8	The program number is selected along with other bits. The third bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	8	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	8	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	8	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear

Signal	Reference Designation	Pin Number	Function Summary
Emergency stop signal	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
General-purpose input 4	IN4	9	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 4 on Internal photo coupler off General purpose input 4 off
Program number selection bit 8	B8	9	The program number is selected along with other bits. The fourth bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Origin signal	ORG	9	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	9	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
During program execution	PEND	10	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
Zone signal	ZONE	10	Turns on when the current position is inside the coordinates that were set beforehand.
During program execution	PEND	11	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
During motor operation	BUSY	11	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Zone signal	ZONE	11	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	ALM	12	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor becomes non excited status.
Output signal common	OUT_COM	13	It is for the output signal common.
DATA+	DATA+	14	It is for the serial signal.
DATA	DATA	15	It is for the serial signal.

External Wiring Diagrams



SET UP

Function Select Dip Switch

The functions according to the specification can be selected with this Dip switch.
Confirm the ex-factory setting as follows.

Switch	Setting	Function
1 F/R	OFF	2 input mode (CW/CCW pulse)
2 LV	OFF	Micro step operation
3 PD	OFF	Power OFF
4	OFF	Phase origin excitation
5 I. SEL	OFF	Pulse stream I/F mode
6 S. SEL	OFF	

For pulse stream I/F mode

1 Input mode select　F/R

Input pulse mode selection
This switch setting is only effective in pulse stream I/F mode.

F/R	Input pulse mode
ON	1 input mode　CK,U/D
OFF	2 input mode　CW,CCW

2 Low vibration mode select　LV

Low vibration and smooth operation is enabled even by the rough resolution setting
e.g. 1 division, 2 division　.
This switch setting is only effective in pulse stream I/F mode.
For parallel I/F mode and serial I/F mode, this is usually a low vibration operation.

LV	Operation
ON	Low vibration operation
OFF	Micro step operation

*When LV select is ON　low vibration mode　, operational process of driving pulse will be carried out inside the Driver. Therefore, the Motor movement delays for the time of 3.2ms pulse per input pulse. Note that depending upon the combined Motor, load,driving profile and etc, it may take a while until the shaft is adjusted when the Motor stops.　In parallel I/F mode and serial I/F mode there is no delay

3 Power down select　PD

Select the Motor winding current value when inputting the power down signal.This switch setting is only effective in pulse stream I/F mode.

PD	Motor winding current
ON	Current value by rotary switch STP　Power Low
OFF	0A　Power OFF

*PD function　the setting selected by PD of the function select dip switch is enabled by PD input signal ON　built-in photo coupler ON　of Input/Output signal connector　CN2　. Power down signal input is prior to all the other current settings except for alarms. The operational status may not be maintained such as power swing due to output torque drop or lower operation due to Motor current OFF　unexcited Motor　. Pay extra attention to the input timing of the power down signal in addition that the security device should be installed to the machine.

4 Excitation select　EORG

*By turning on the EORG, excitation phase when power OFF is saved.

5, 6 Operation mode selection　I.SEL, S.SEL

The operation mode is selected.

I.SEL	S.SEL	Operation mode
OFF		Pulse stream I/F mode
ON	OFF	Parallel I/F mode
	ON	Serial I/F mode

*Change the operation mode selection switch after cutting off the driver　s power supply.

For parallel I/F mode or serial I/F mode

The communication speed of serial communication is set.

Switch	Set value	Communication speed(bps)		
		9,600	19,200	38,400
F/R	OFF			
	ON			
LV	OFF			
	ON			
PD	OFF			
	ON			

*The setting change after the power supply is turned on is invalid. It does not function as a F/R, LV, and PD.
*The communication speed of pulse stream I/F mode is fixed at 9600bps.

Rotary switch(RSW) and the mode change switch(PSW)

For pulse stream I/F mode

When it selects the step angle, the driving current is selected, and stops the current is selected, set by combining rotary switch (RSW) and mode change switch (PSW).

1. Step angle select(S.S)

The divisions of the basic step angle (0.9 /step) when micro step driving can be set.

Gradation	0	1	2	3	4	5	6	7
Partition	1	2	2.5	4	5	8	10	20
Gradation	8	9	A	B	C	D	E	F
Partition	25	40	50	80	100	125	200	250

Ex-factory setting is at 1 (division 2)

*The step angle select switch (S.S) and the number of partitions become invalid by EXT input signal ON (built-in photo coupler ON) of Input/Output signal connector (CN2).

2. Driving current select(RUN)

The Motor operation current value can be selected.

Gradation	0	1	2	3	4	5	6	7
Motor current (%)	100 (rated)	95	90	85	80	75	70	65
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	60	55	50	45	40	35	30	25

Ex-factory setting is at 0 (rated value).

*When there is a sufficient extra motor torque, lowering the operation current value will be effective in the lower vibration. The Motor output torque is almost proportional to the current value. When adjusting the operational torque, confirm the sufficient operation margin and determine the Motor current value.

3. Current Select when Stop (STP)

The motor current value when stop and when power down input signal ON (power low function is selected by dip switch) can be selected.

Gradation	0	1	2	3	4	5	6	7
Motor current (%)	100 (rated)	95	90	85	80	75	70	65
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	60	55	50	45	40	35	30	25

Ex-factory setting is set at A (50%).

*The current setting when stop by STP becomes valid when the Motor stops (approximately 200ms after the last pulse input) and when power down input signal

For parallel I/F mode and serial I/F mode

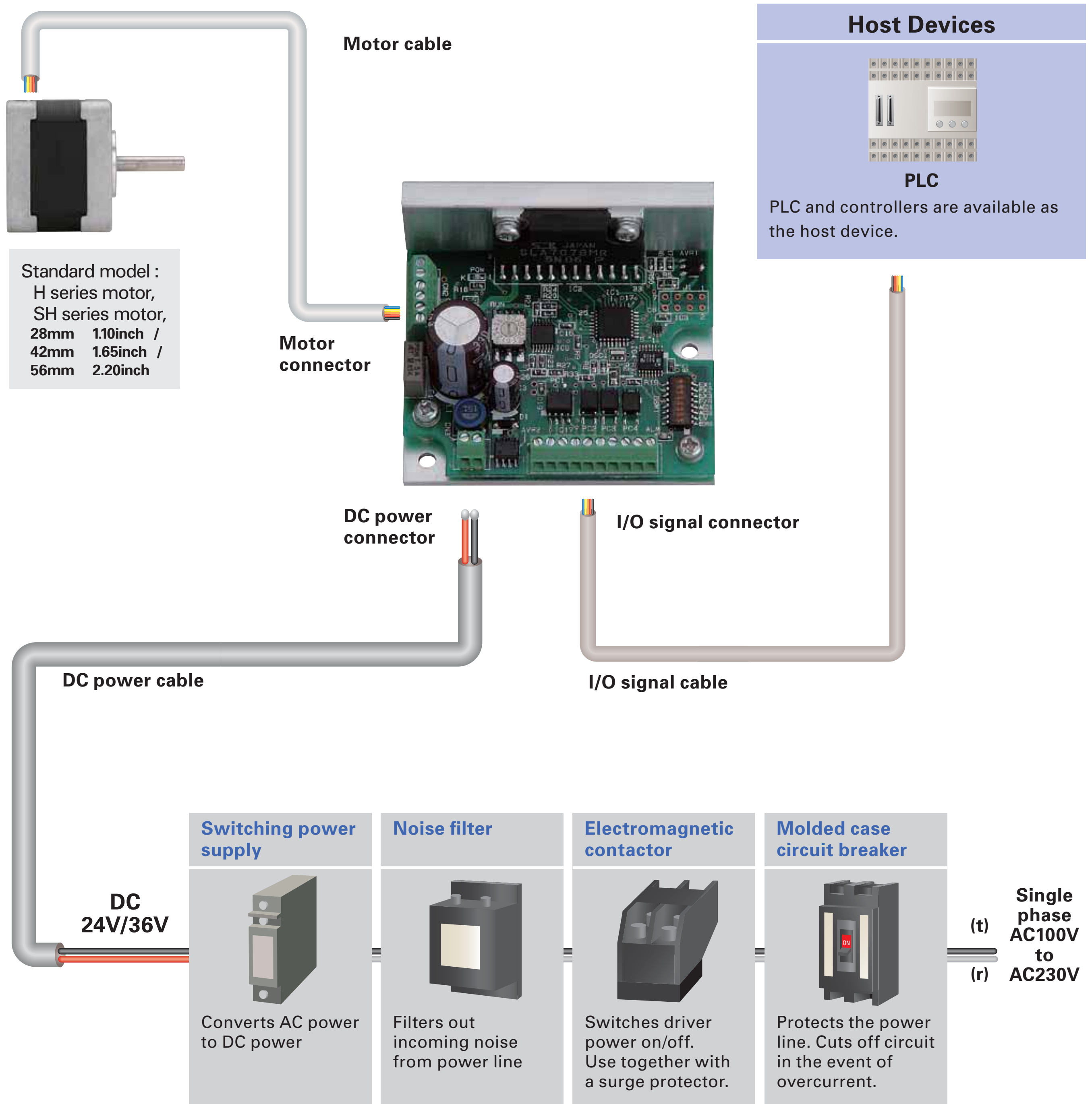
The slave bureau address of serial communications can be set.

RSW	Slave station address (HEX)
0	0
1	1
E	E
F	F

Ex-factory setting is set at 0

*The slave station address of the pulse stream I/F mode is fixed at 0.

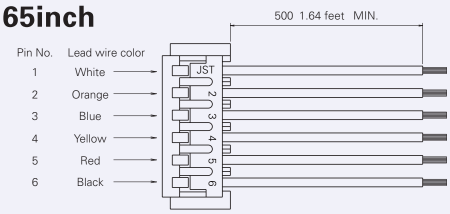
Unipolar standard



Bundled cable(42mm motors only)

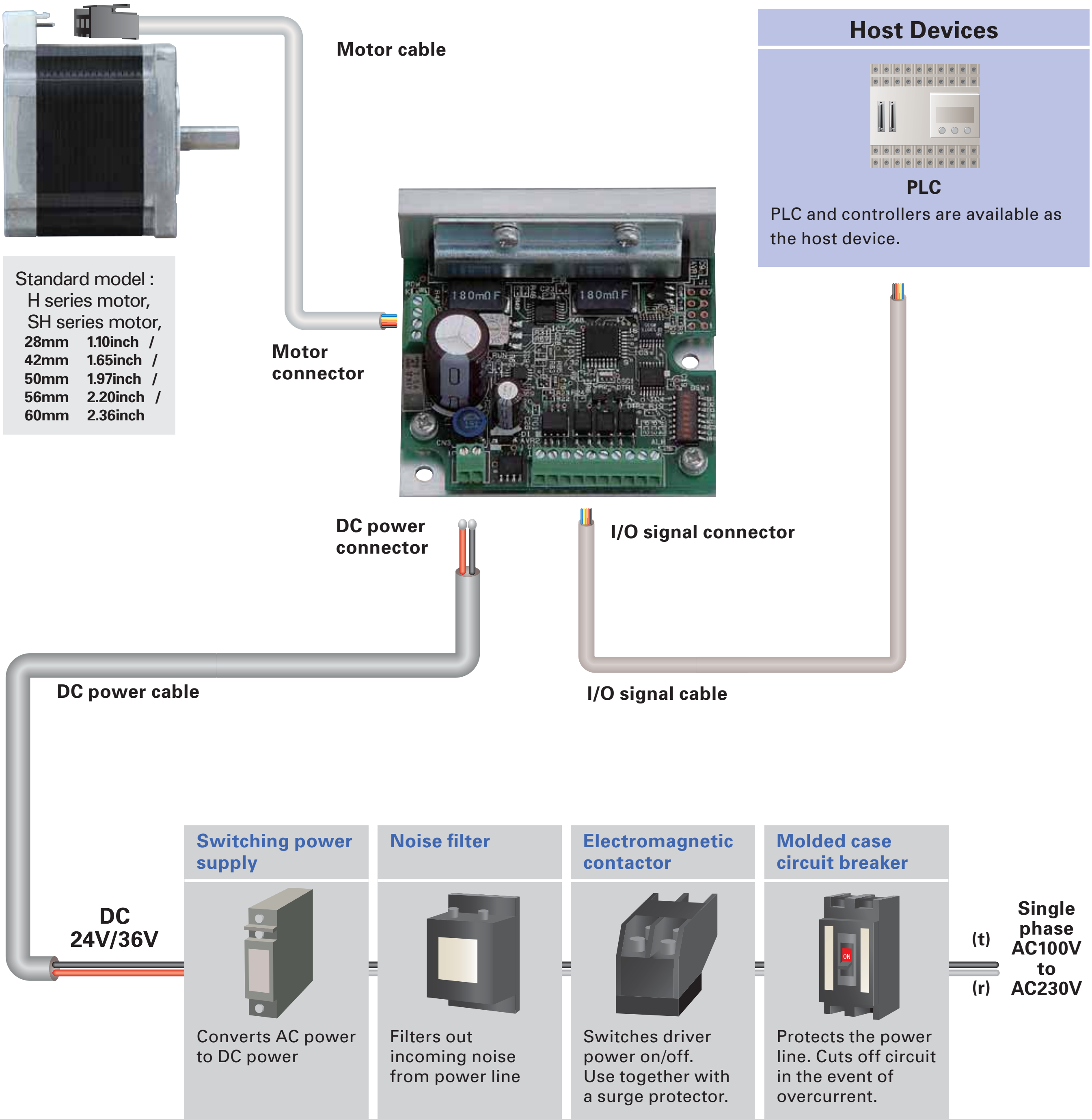
Motor cable

42mm 1.65inch



Lead wire	UL1430 AWG26
Housing	HER-6 BLACK J.S.T Mfg.Co.,Ltd
Pin	SEH-001T-P0.6 J.S.T Mfg.Co.,Ltd

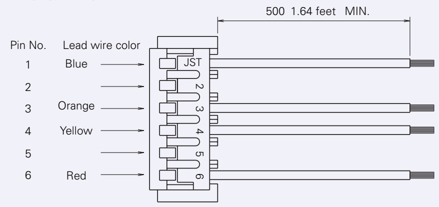
Bipolar standard



Bundled cable(42mm motors only)

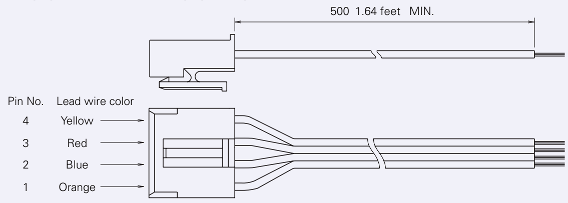
Motor cable

42mm 1.65inch



Lead wire	UL1430 AWG26
Housing	HER-6 BLACK J.S.T Mfg.Co.,Ltd
Pin	SEH-001T-P0.6 J.S.T Mfg.Co.,Ltd

60mm 2.36inch



Lead wire	UL1430 AWG22
Housing	VER-4N J.S.T Mfg.Co.,Ltd
Pin	SVH-21T-P1.1 J.S.T Mfg.Co.,Ltd

Part numbering convention

The following set part number specifies a system with an F series unipolar driver type code : US1D200P10 and a single shaft H series motor type code : 103H7121-0440 , 56 mm 2.20 inch square flange, and 41.8 mm 1.65 inch motor length.

D U 1 6 H 71 1 S

Stepping motor shaft spec
S : Single shaft
D : Double shaft

Stepping motor total length

Code	Stepping motor flange size													
	28mm 1.10inch		42mm 1.65inch				50mm 1.97inch		56mm 2.20inch		60mm 2.36inch			
	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch
1	2281	32 1.26	5205	33 1.30	1401	33 1.30	6701	39.8 1.57	7121	41.8 1.65	7821	44.8 1.76	1601	42 1.65
2			5208	39 1.54	1402	39 1.54			7123	53.8 2.12	7822	53.8 2.12	1602	54 2.12
3							6703	51.3 2.02	7126	75.8 2.89	7823	85.8 3.38	1603	76 2.99
4			5210	48 1.89	1404	48 1.89								
5	2285	51.5 2.03												

Stepping motor flange size			Basic step angle
28 :	28mm	1.10inch	1.8
52 :	42mm	1.65inch	1.8
71 :	56mm	2.20inch	1.8
78 :	60mm	2.36inch	1.8
14 :	42mm	1.65inch	0.9
16 :	60mm	2.36inch	0.9

Stepping motor series name
H : H series
S : SH series

Rated current specification
4 : 1A/phase 5 : 1.2A/phase 6 : 2A/phase

Model

Driver Specification
U : 2-phase unipolar B : 2-phase bipolar

Power specification
D : DC

Combination list of 2-phase unipolar driver

System type	Motor flange size	Basic step angle	Set part number Single shaft	Set part number Double shaft	Motor model number Single shaft	Motor model number Double shaft	Rated current
Standard model	**28mm 1.10inch**	1.8	**DU14S281S**	**DU14S281D**	SH2281-5271	SH2281-5231	1A
		1.8	**DU14S285S**	**DU14S285D**	SH2285-5271	SH2285-5231	1A
	42mm 1.65inch	1.8	**DU15H521S**	**DU15H521D**	103H5205-0440	103H5205-0410	1.2A
		1.8	**DU15H522S**	**DU15H522D**	103H5208-0440	103H5208-0410	1.2A
		1.8	**DU15H524S**	**DU15H524D**	103H5210-0440	103H5210-0410	1.2A
		0.9	**DU15S141S**	**DU15S141D**	SH1421-0441	SH1421-0411	1.2A
		0.9	**DU15S142S**	**DU15S142D**	SH1422-0441	SH1422-0411	1.2A
		0.9	**DU15S144S**	**DU15S144D**	SH1424-0441	SH1424-0411	1.2A
	56mm 2.20inch	1.8	**DU16H711S**	**DU16H711D**	103H7121-0440	103H7121-0410	2A
		1.8	**DU16H713S**	**DU16H713D**	103H7123-0440	103H7123-0410	2A
		1.8	**DU16H716S**	**DU16H716D**	103H7126-0440	103H7126-0410	2A

Combination list of 2-phase bipolar driver

System type	Motor flange size	Basic step angle	Set part number Single shaft	Set part number Double shaft	Motor model number Single shaft	Motor model number Double shaft	Rated current
Standard model	**28mm 1.10inch**	1.8	**DB14S281S**	**DB14S281D**	SH2281-5771	SH2281-5731	1A
		1.8	**DB14S285S**	**DB14S285D**	SH2285-5771	SH2285-5731	1A
	42mm 1.65inch	1.8	**DB14H521S**	**DB14H521D**	103H5205-5240	103H5205-5210	1A
		1.8	**DB14H522S**	**DB14H522D**	103H5208-5240	103H5208-5210	1A
		1.8	**DB14H524S**	**DB14H524D**	103H5210-5240	103H5210-5210	1A
		0.9	**DB16S141S**	**DB16S141D**	SH1421-5241	SH1421-5211	2A
		0.9	**DB16S142S**	**DB16S142D**	SH1422-5241	SH1422-5211	2A
		0.9	**DB16S144S**	**DB16S144D**	SH1424-5241	SH1424-5211	2A
	50mm 1.97inch	1.8	**DB16H671S**	**DB16H671D**	103H6701-5040	103H6701-5010	2A
		1.8	**DB16H672S**	**DB16H672D**	103H6703-5040	103H6703-5010	2A
	56mm 2.20inch	1.8	**DB16H711S**	**DB16H711D**	103H7121-5740	103H7121-5710	2A
		1.8	**DB16H713S**	**DB16H713D**	103H7123-5740	103H7123-5710	2A
		1.8	**DB16H716S**	**DB16H716D**	103H7126-5740	103H7126-5710	2A
	60mm 2.36inch	1.8	**DB16H781S**	**DB16H781D**	103H7821-5740	103H7821-5710	2A
		1.8	**DB16H782S**	**DB16H782D**	103H7822-5740	103H7822-5710	2A
		1.8	**DB16H783S**	**DB16H783D**	103H7823-5740	103H7823-5710	2A
		0.9	**DB16S161S**	**DB16S161D**	SH1601-5240	SH1601-5210	2A
		0.9	**DB16S162S**	**DB16S162D**	SH1602-5240	SH1602-5210	2A
		0.9	**DB16S163S**	**DB16S163D**	SH1603-5240	SH1603-5210	2A

DC input Specifications

Standard model

F series driver + H or SH series motor

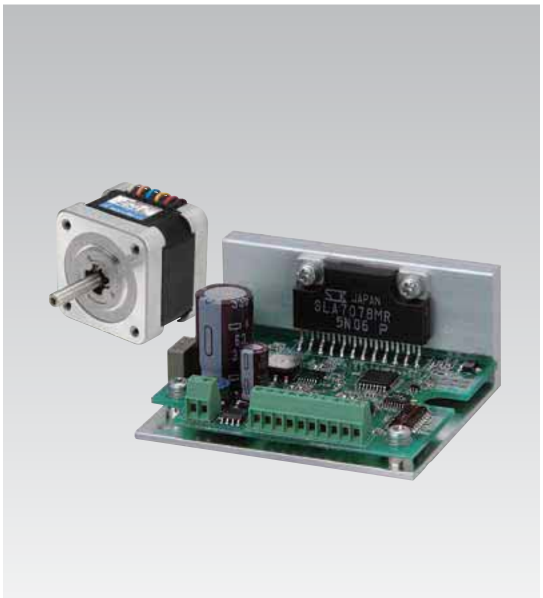
Unipolar

Motor flange size

□28 1.10inch □42 1.65inch □56 2.20inch

Size	Motor flange size		28mm 1.10inch /1.8	
	Motor length		32mm 1.26inch	51.5mm 2.03inch
Set part number	Single shaft		DU14S281S	DU14S285S
	Double shaft		DU14S281D	DU14S285D
Holding torque		N m oz in	0.055 7.79	0.115 16.28
Rotor inertia		10^{-4}kg m² oz in²	0.01 0.05	0.022 0.12
Mass Weight		kg lbs	0.11 0.24	0.2 0.44
Allowable thrust load		N lbs	3 0.67	3 0.67
Allowable radial load Note1		N lbs	42 9.44	49 11.02

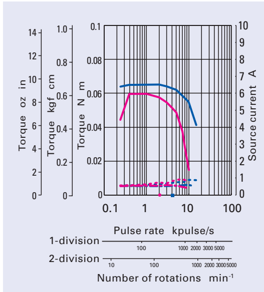
Note1 When load is applied at 1/3 length from output shaft edge.

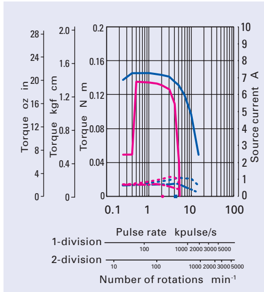


Operating current: 1A/phase

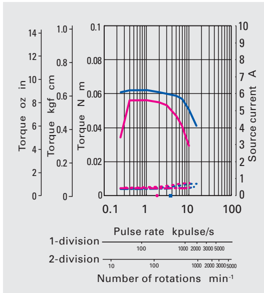
Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs / 2-division fs Fs:Maximum self-start frequency when not loaded
1-division
2-division

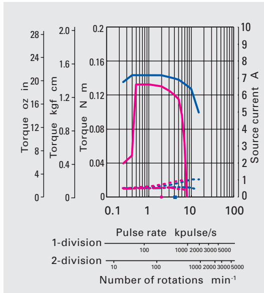
DC24V





DC36V





The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

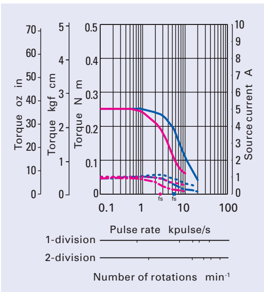
Size	Motor flange size		42mm 1.65inch /0.9		
	Motor length		33mm 1.30inch	39mm 1.54inch	48mm 1.89inch
Set part number	Single shaft		DU15S141S	DU15S142S	DU15S144S
	Double shaft		DU15S141D	DU15S142D	DU15S144D
Holding torque		N m oz in	0.2 28.32	0.29 41.07	0.39 55.23
Rotor inertia		10^{-4}kg m² oz in²	0.044 0.24	0.066 0.361	0.089 0.487
Mass Weight		kg lbs	0.24 0.53	0.29 0.64	0.38 0.84
Allowable thrust load		N lbs	10 2.25	10 2.25	10 2.25
Allowable radial load Note1		N lbs	30 6	30 6	30 6

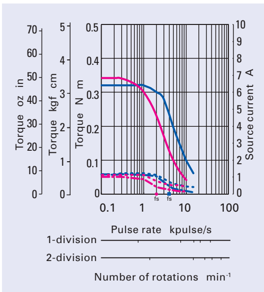
Note1 When load is applied at 1/3 length from output shaft edge.

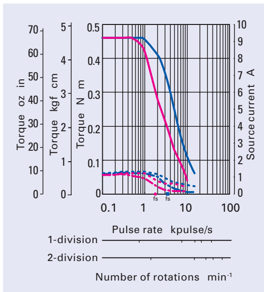
Operating current: 1.2A/phase

Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs / 2-division fs Fs:Maximum self-start frequency when not loaded
1-division
2-division

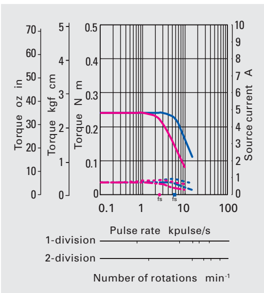
DC24V

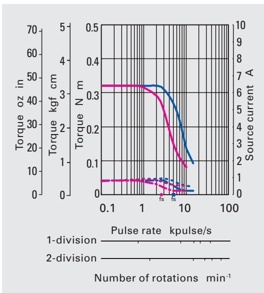


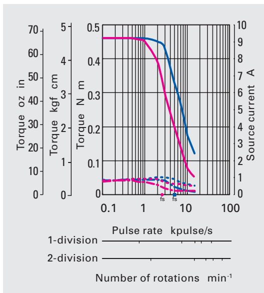




DC36V





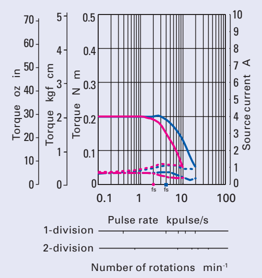


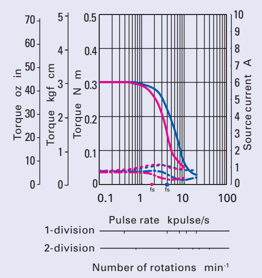
The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

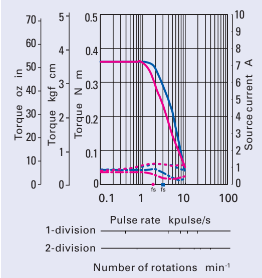
Size	Motor flange size	42mm 1.65inch /1.8		
	Motor length	33mm 1.30inch	39mm 1.54inch	48mm 1.89inch
Set part number	Single shaft	DU15H521S	DU15H522S	DU15H524S
	Double shaft	DU15H521D	DU15H522D	DU15H524D
Holding torque	N m oz in	0.2 28.32	0.3 42.48	0.37 52.39
Rotor inertia	10^{-4}kg m² oz in²	0.036 0.20	0.056 0.31	0.072 0.34
Mass Weight	kg lbs	0.23 0.51	0.29 0.64	0.37 0.82
Allowable thrust load	N lbs	10 2.25	10 2.25	10 2.25
Allowable radial load Note1	N lbs	30 6	30 6	30 6

Note1 When load is applied at 1/3 length from output shaft edge.

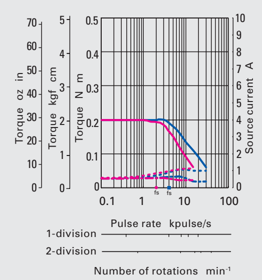
DC24V

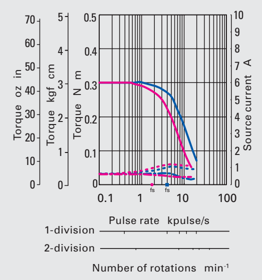


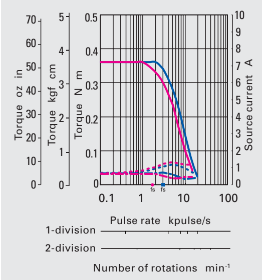




DC36V







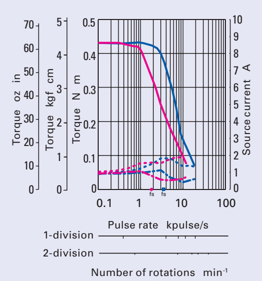
Operating current: 1.2A/phase

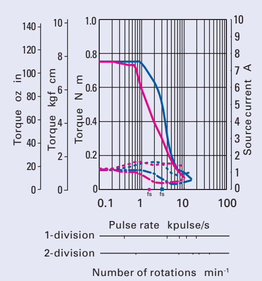
- Pull-out torque
- Source current (load applied)
- Source current (no load)
- 1-division fs / 2-division fs — Fs:Maximum self-start frequency when not loaded
- 1-division
- 2-division

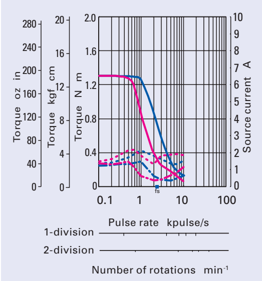
Size	Motor flange size	56mm 2.20inch /1.8		
	Motor length	41.8mm 1.65inch	53.8mm 2.12inch	75.8mm 2.98inch
Set part number	Single shaft	DU16H711S	DU16H713S	DU16H716S
	Double shaft	DU16H711D	DU16H713D	DU16H716D
Holding torque	N m oz in	0.39 55.23	0.83 117.5	1.27 179.8
Rotor inertia	10^{-4}kg m² oz in²	0.1 0.55	0.21 1.15	0.36 1.97
Mass Weight	kg lbs	0.47 1.04	0.63 1.39	0.98 2.16
Allowable thrust load	N lbs	15 3.37	15 3.37	15 3.37
Allowable radial load Note1	N lbs	71 15	71 15	71 15

Note1 When load is applied at 1/3 length from output shaft edge.

DC24V







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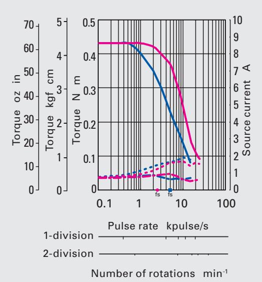
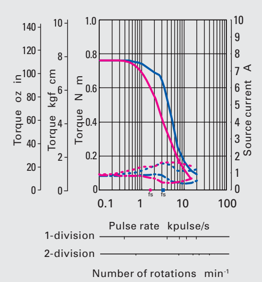
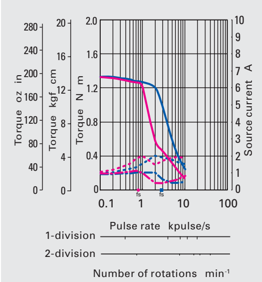






Operating current: 2A/phase

- Pull-out torque
- Source current (load applied)
- Source current (no load)
- 1-division fs / 2-division fs — Fs:Maximum self-start frequency when not loaded
- 1-division
- 2-division

Standard model

F series driver + H or SH series motor

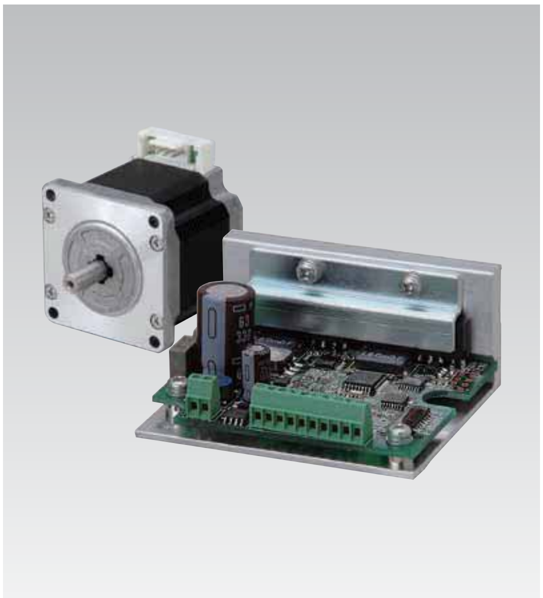
Bipolar

Motor flange size

□28 1.10inch | □42 1.65inch | □50 1.97inch | □56 2.20inch | □60 2.36inch

Size	Motor flange size		28mm 1.10inch /1.8	
	Motor length		32mm 1.26inch	51.5mm 2.03inch
Set part number	Single shaft		DB14S281S	DB14S285S
	Double shaft		DB14S281D	DB14S285D
Holding torque		N m oz in	0.07 9.91	0.145 20.53
Rotor inertia		10^{-4}kg m² oz in²	0.01 0.05	0.022 0.12
Mass Weight		kg lbs	0.11 0.24	0.2 0.44
Allowable thrust load		N lbs	3 0.67	3 0.67
Allowable radial load Note1		N lbs	42 9.44	49 9.44

Note1 When load is applied at 1/3 length from output shaft edge.

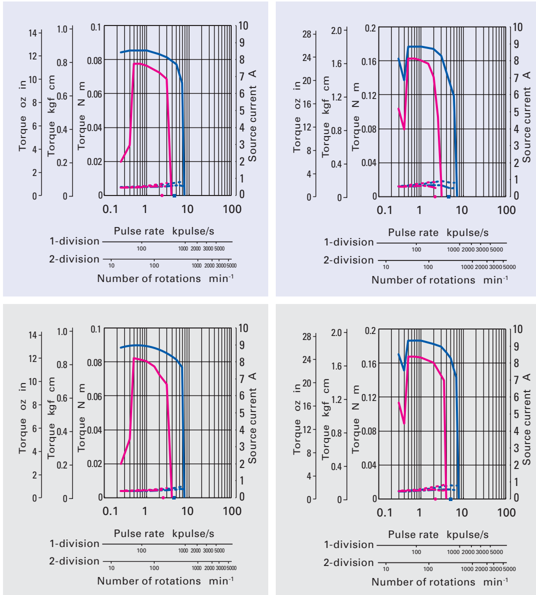


Operating current
28mm (1.10inch)/1.8 :1A/phase
42mm (1.65inch)/1.8 :1A/phase
42mm (1.65inch)/0.9 :2A/phase

Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs / 2-division fs — Fs:Maximum self-start frequency when not loaded
1-division
2-division

DC24V

DC36V



The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

Size	Motor flange size		42mm 1.65inch /0.9	50mm 1.97inch /1.8		56mm 2.20inch /1.8
	Motor length		48mm 1.89inch	39.8mm 1.57inch	51.3mm 2.02inch	41.8mm 1.65inch
Set part number	Single shaft		DB16S144S	DB16H671S	DB16H673S	DB16H711S
	Double shaft		DB16S144D	DB16H671D	DB16H673D	DB16H711D
Holding torque		N m oz in	0.48 67.97	0.28 39.6	0.49 69.4	0.39 55.2
Rotor inertia		10^{-4}kg m² oz in²	0.089 0.487	0.057 0.31	0.118 0.65	0.1 0.55
Mass Weight		kg lbs	0.38 0.84	0.35 0.77	0.5 1.10	0.47 1.04
Allowable thrust load		N lbs	10 2.25	15 3.37	15 3.37	15 3.37
Allowable radial load Note1		N lbs	30 6	99 22	99 22	71 15

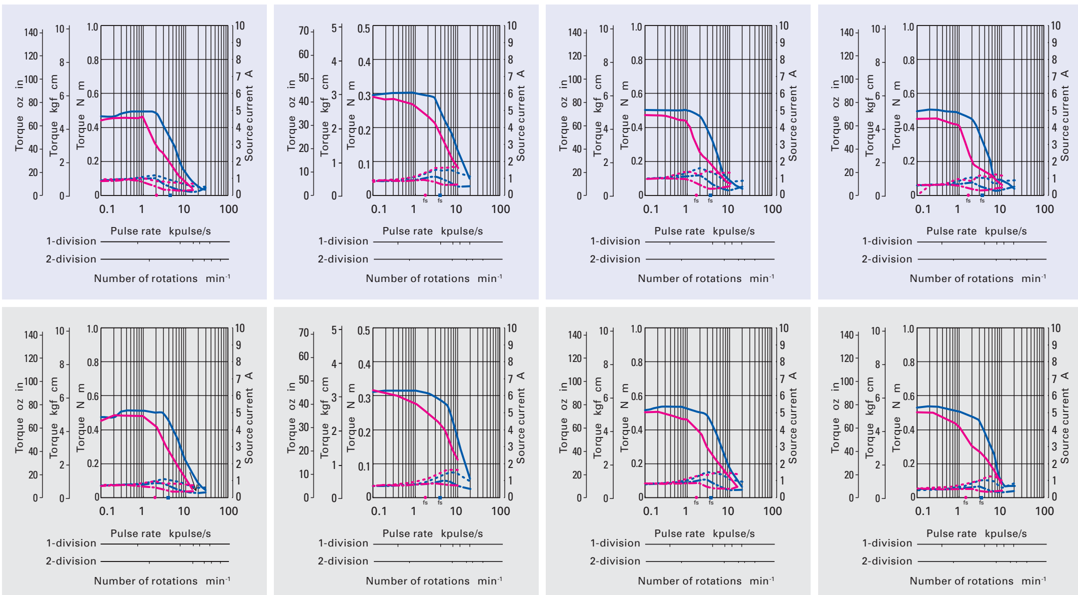
Note1 When load is applied at 1/3 length from output shaft edge.

DC24V

DC36V

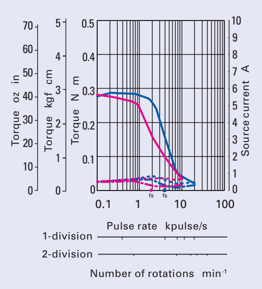
Operating current:
2A/phase

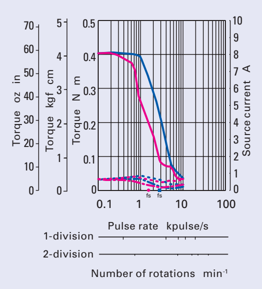
Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs / 2-division fs — Fs:Maximum self-start frequency when not loaded
1-division
2-division

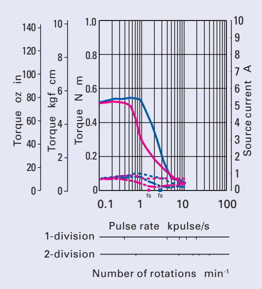


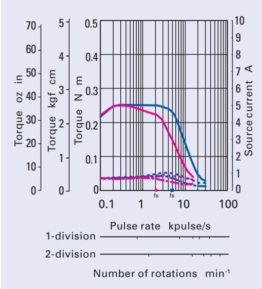
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

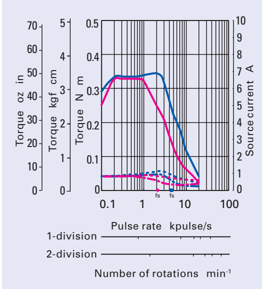
42mm 1.65inch /1.8			42mm 1.65inch /0.9	
33mm 1.30inch	39mm 1.54inch	48mm 1.89inch	33mm 1.30inch	39mm 1.54inch
DB14H521S	DB14H522S	DB14H524S	DB16S141S	DB16S142S
DB14H521D	DB14H522D	DB14H524D	DB16S141D	DB16S142D
0.265 37.53	0.39 55.23	0.51 72.22	0.23 32.57	0.34 48.15
0.036 0.20	0.056 0.31	0.072 0.34	0.044 0.24	0.066 0.361
0.23 0.51	0.29 0.64	0.37 0.82	0.24 0.53	0.29 0.64
10 2.25	10 2.25	10 2.25	10 2.25	10 2.25
30 6	30 6	30 6	30 6	30 6

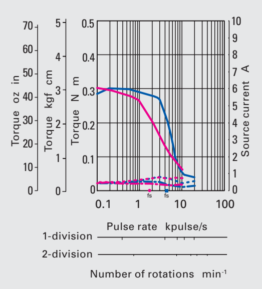


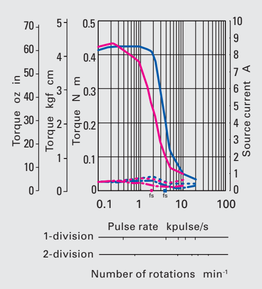


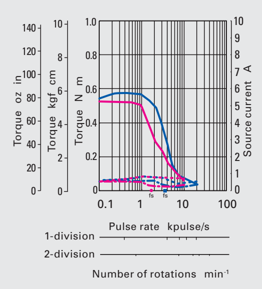


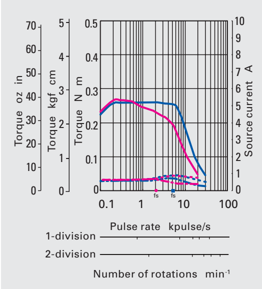


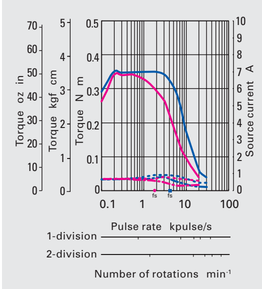




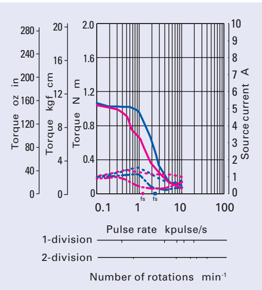


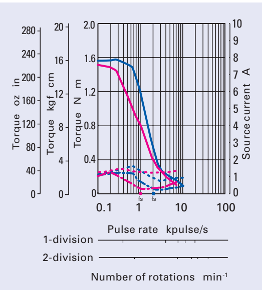


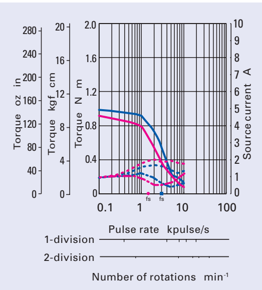


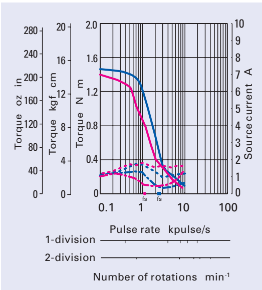


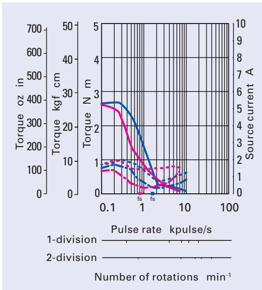
56mm 2.20inch /1.8		60mm 2.36inch /1.8		
53.8mm 2.12inch	75.8mm 2.98inch	44.8mm 1.76inch	53.8mm 2.12inch	85.8mm 3.38inch
DB16H713S	DB16H716S	DB16H781S	DB16H782S	DB16H783S
DB16H713D	DB16H716D	DB16H781D	DB16H782D	DB16H783D
0.83 117.5	1.27 179.8	0.88 124.6	1.37 194.0	2.7 382.3
0.21 1.15	0.36 1.97	0.275 1.50	0.4 2.19	0.84 4.59
0.65 1.43	0.98 2.16	0.6 1.32	0.77 1.70	1.34 2.95
15 3.37	15 3.37	15 3.37	15 3.37	15 3.37
71 15	71 15	95 21	95 21	95 21

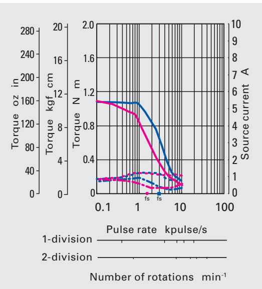


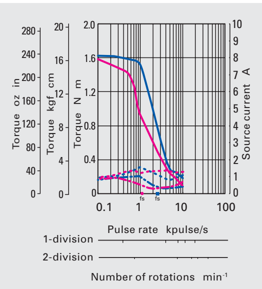


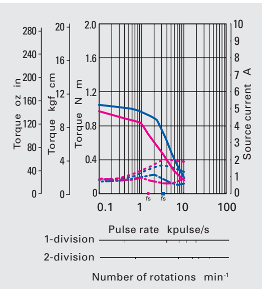


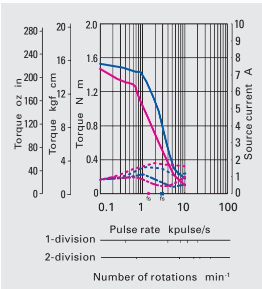


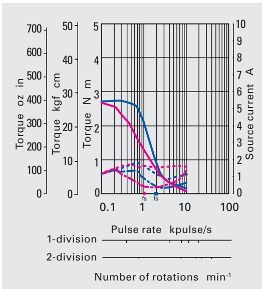












DC input Specifications

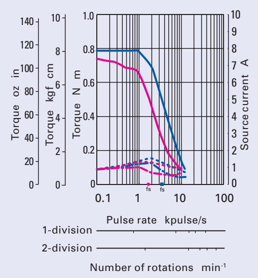
Size	Motor flange size		60mm 2.36inch /0.9	
	Motor length		42mm 16.54inch	54mm 21.26inch
Set part number	Single shaft		DB16S161S	DB16S162S
	Double shaft		DB16S161D	DB16S162D
Holding torque		N m oz in	0.69 97.71	1.28 181.26
Rotor inertia		10^{-4}kg m^2 oz in^2	0.24 1.312	0.4 2.187
Mass Weight		kg lbs	0.55 1.21	0.8 1.76
Allowable thrust load		N lbs	15 3.37	15 3.37
Allowable radial load Note1		N lbs	79 18	79 18

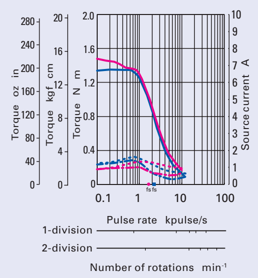
Note1 When load is applied at 1/3 length from output shaft edge.

Operating current: 2A/phase

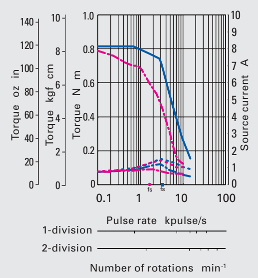
Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs
2-division fs
Fs:Maximum self-start frequency when not loaded
1-division
2-division

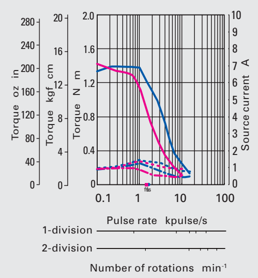
DC24V





DC36V





The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

Specifications of Drivers

Unipolar

Model number			US1D200P10
Basic specifications	Input source		DC24 V / 36 V 10
	Source current		3 A
	Environment	Protection class	Class III
		Operation environment	Installation category over-voltage category : I, pollution degree : 2
		Applied standards	EN61010-1 UL508C
		Ambient operation temperature	0 to +50
		Conservation temperature	-20 to +70
		Operating ambient humidity	35 to 85% RH no condensation
		Conservation humidity	10 to 90% RH no condensation
		Operation altitude	2000 m 6560 feet or less above sea level
		Vibration resistance	Tested under the following conditions; 4.9 m/s^2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .
		Withstand voltage	Not influenced when 1500 V AC is applied between power input terminal and cabinet for one minute.
		Insulation resistance	10 M MIN. when measured with 500V DC megohmmeter between input terminal and cabinet.
	Mass Weight		0.08 kg 0.18 lbs
Functions	Selection functions		Step angle, Pulse input mode, Step current, Operating current.
	Protection functions		Open phase protection, Main circuit power souce voltage decrease
	LED indication		Power monitor, alarm
I/O signals	Command pulse input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5 V, input-signal L level : 0 to 0.5 V Maximum input frequency : 150 kpulse/s
	Poweer down input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5V, input-signal L level : 0 to 0.5 V
	Phase origin monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.
	Rotation monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.

Bipolar

Model number			BS1D200P10
Basic specifications	Input source		DC24 V / 36 V 10
	Source current		3 A
	Environment	Protection class	Class III
		Operation environment	Installation category over-voltage category : I, pollution degree : 2
		Applied standards	EN61010-1 UL508C
		Ambient operation temperature	0 to +50
		Conservation temperature	-20 to +70
		Operating ambient humidity	35 to 85% RH no condensation
		Conservation humidity	10 to 90% RH no condensation
		Operation altitude	2000 m 6560 feet or less above sea level
		Vibration resistance	Tested under the following conditions; 4.9m/s^2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .
		Withstand voltage	Not influenced when 1500 V AC is applied between power input terminal and cabinet for one minute.
		Insulation resistance	10 M MIN. when measured with 500 V DC megohmmeter between input terminal and cabinet.
	Mass Weight		0.08 kg 0.18 lbs
Functions	Selection functions		Step angle, Pulse input mode, Step current, Operating current.
	Protection functions		Open phase protection, Main circuit power souce voltage decrease
	LED indication		Open phase protection, Power monitor, alarm
I/O signals	Command pulse input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5 V, input-signal L level : 0 to 0.5 V Maximum input frequency : 150 kpulse/s
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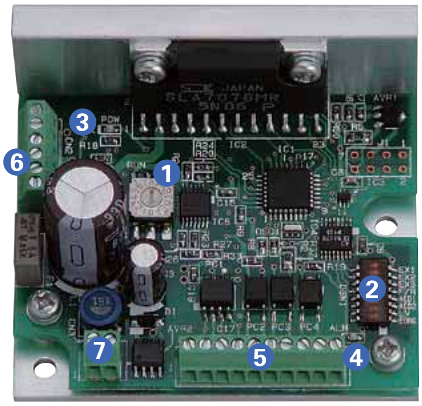
	Phase origin monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.
	Rotation monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.

Operation, Connection, and Function

Each section name of the drivers

Unipolar



❶ Driving current selection switch RUN

You can select the value of the motor current when driving.

Dial	0	1	2	3	4	5	6	7
Stepping motor current A	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
Dial	8	9	A	B	C	D	E	F
Stepping motor current A	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5

The factory setting is F (0.5A).
Select the current after checking the rated current of the combination motor.

❷ Function selection DIP switchpack

Select the function depending on your specification.

❸ LED for power supply monitor POW

Lit up when the main circuit power supply is connected.

Indicator	Explanation
POW is displayed.	Main circuit power supply is switched on.

❹ LED for alarm display ALM

Lit when an alarm is generated.

Indicator	Explanation
ALM is displayed.	Motor cable is broken, or switching element in driver is faulty. The main circuit voltage is out of specifications range (Less than DC19V).

When ALM is displayed, the winding current of the stepping motor is cut off and it is in a non-excitation state. At the same time, an output signal is transmitted from the alarm output terminal (AL) to an external source. When the alarm circuit is operating, this state is maintained until it is reset by switching on the power supply again. When an alarm condition has occurred, please take corrective actions to rectify the cause of the alarm before switching on the power supply again.

❺ I/O signal connector CN1

Connect the I/O signal.

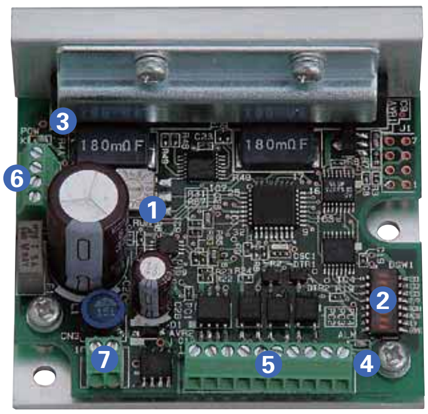
❻ Motor connector CN2

Connect the motor s power line.

❼ Power supply connector CN3

Connect the main circuit power supply.

Bipolar



❶ Driving current selection switch RUN

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Dial	0	1	2	3	4	5	6	7
Stepping motor current A	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
Dial	8	9	A	B	C	D	E	F
Stepping motor current A	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5

The factory setting is F (0.5A).
Select the current after checking the rated current of the combination motor.

❷ Function selection DIP switchpack

Select the function depending on your specification.

❸ LED for power supply monitor POW

Lit up when the main circuit power supply is connected.

Indicator	Explanation
POW is displayed.	Main circuit power supply is switched on.

❹ LED for alarm display ALM

Lit when an alarm is generated.

Indicator	Explanation
ALM is displayed.	Motor cable is broken, or switching element in driver is faulty. The main circuit voltage is out of specifications range (Less than DC19V).

When ALM is displayed, the winding current of the stepping motor is cut off and it is in a non-excitation state. At the same time, an output signal is transmitted from the alarm output terminal (AL) to an external source. When the alarm circuit is operating, this state is maintained until it is reset by switching on the power supply again. When an alarm condition has occurred, please take corrective actions to rectify the cause of the alarm before switching on the power supply again.

❺ I/O signal connector CN1

Connect the I/O signal.

❻ Motor connector CN2

Connect the motor s power line.

❼ Power supply connector CN3

Connect the main circuit power supply.

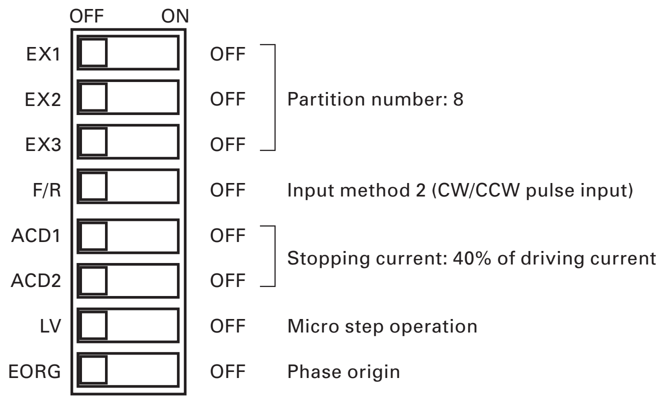
Specification summary of CN1 I/O signal

Signal name	CN1 Pin number	Function
CW pulse input standard	1 2	When using 2-input mode Drive pulse for the CW direction rotation is input.
Pulse column input	1 2	When using Pulse and direction mode Drive pulse train for the stepping motor rotation is input.
CCW pulse input standard	3 4	When using 2-input mode Drive pulse for the CCW direction rotation is input.
Rotation direction input	3 4	The rotation direction signal of stepping motor is input for the Pulse and direction mode . Internal photocoupler ON CW direction Internal photocoupler OFF CCW direction
Power down input	5 6	Inputting the PD signal cuts OFF the current flowing through the stepping motor. Iinternal photocoupler ON PD function enabled Iinternal photocoupler OFF PD function disabled
Phase origin monitor output	7 8	It is turned ON when the excitation phase is at the origin in the state when the power is turned ON It is turned ON once per 4 pulses when setting to HALF step. It is turned ON once per 8 pulses when setting to FULL step.
Alarm output	9 10	The signal is externally output when one of several alarm circuits operates in the PM driver. At this time, the stepping motor is in the unexcited state.

The CW rotation direction of stepping motor means the clockwise direction rotation as viewed from the output shaft side flange side . The CCW rotation direction means the counterclockwise direction rotation as viewed from the output shaft side flange side .

❷ Input circuit configuration CW and CCW Pulse input

Functions can be selected according to the specification with the dip switch.
Check that the ex-factory settings are as follows.



Step angle select EX1 EX2 EX3

Select the partition number of the basic step angle.

EX1	EX2	EX3	Partition number
ON	ON	ON	1-division
OFF	ON	OFF	2-division
ON	OFF	OFF	4-division
OFF	OFF	OFF	8-division
OFF	OFF	ON	16-division

Input method select F/R

Selects input pulse type

F/R	Input pulse type
ON	1 input Pluse&direction
OFF	2 input CW, CCW

Current selection when stopping ACD1 ACD2

Select the current value of the motor when stopping.

ACD2	ACD1	Current value of the motor
ON	ON	100% of driving current
ON	OFF	60% of driving current
OFF	ON	50% of driving current
OFF	OFF	40% of driving current

Initial configuration of factory shipment is set to 40% of rated value. Driver and motor should be operated at around 50% of rated value to reduce heat.

Low-vibration mode select LV

Provides low-vibration, smooth operation even if resolution is rough 1-division, 2-division, etc

LV	Operation
ON	Auto-micro function
OFF	Micro-step

Excitation select EORG

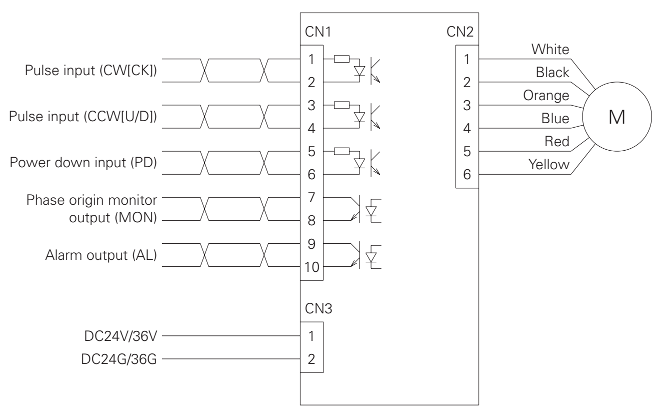
The excitation phase when the power supply is turned on is selected.

EORG	Original excitation phase
ON	Excitation phase at power shut off
OFF	Phase origin

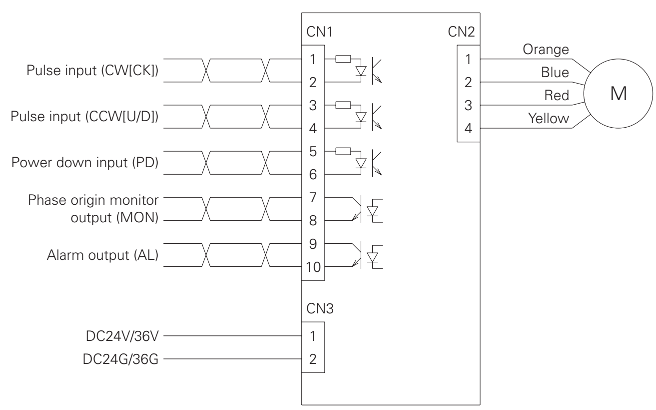
By turning on the EORG, excitation phase when power OFF will be saved. Therefore, there will be no shaft displacement when turning the power ON.

❺❻❼ External wiring diagram

Unipolar



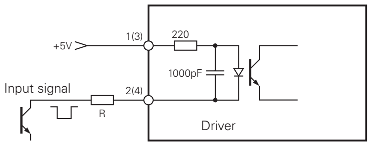
Bipolar



Applicable Wire Sizes

Part	Wire size	Allowable wire length
For power supply	AWG22(0.3 mm^2)	2 m MAX.
For input/output signal	AWG24(0.2 mm^2) to AWG22(0.3 mm^2)	2 m MAX.
For motor	AWG22(0.3 mm^2)	3 m MAX.

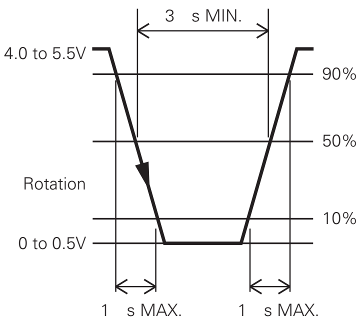
Input circuit configuration of CW CK , CCW U/D



- Pulse duty 50% MAX.
- Maximum input frequency:150kpulse/s
- When the crest value of the input signal exceeds 5V, use the external limit resistance R to limit the input current to approximately 15mA.

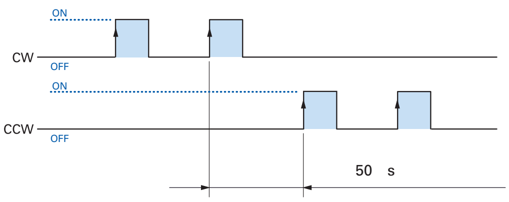
Input signal specifications

Photo coupler type



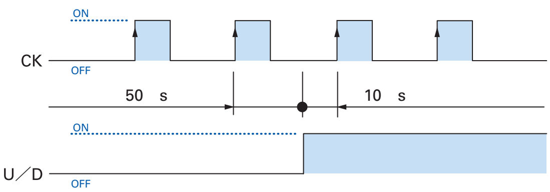
Timing of the command pulse

2-input mode CW, CCW



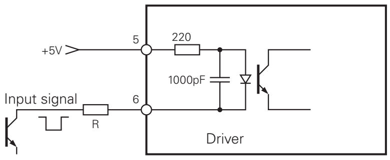
- Shaded area indicates internal photo coupler ON . Internal circuit motor starts operating at leading edge of the photo coupler ON .
- To apply pulse to CW, set CCW side internal photo coupler to OFF .
- To apply pulse to CCW, set CW side internal photo coupler to OFF .

1 input type CW, CCW



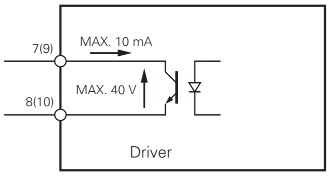
- Shaded area indicates internal photo coupler ON . Internal circuit motor starts operating at leading edge of CK side photo coupler ON .
- Switching of U/D input signal must be done while CK side internal photo coupler is OFF .

Input circuit configuration of PD

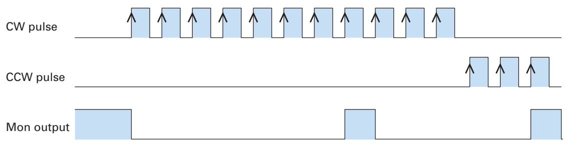


• When the crest value of the input signal exceeds 5V, use the external limit resistance R to limit the input current to approximately 15mA.

Output signal configuration of MON, AL



MON output



• Photo coupler at phase origin of motor excitation is set to ON . setting when number of divisions is 2

• Output from MON is set to on at every 7.2 degrees of motor output shaft from phase origin.

2-phase stepping motor

28mmsq. 1.10inch sq.

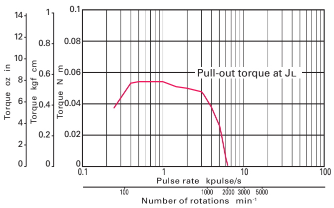
SH228
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH2281-5171	**-5131**	0.055 7.79	0.5	10.5	3.7	0.01 0.05	0.11 0.24
SH2281-5271	**-5231**	0.055 7.79	1	2.85	1	0.01 0.05	0.11 0.24
SH2285-5171	**-5131**	0.115 16.28	0.5	16.5	7.1	0.022 0.12	0.2 0.44
SH2285-5271	**-5231**	0.115 16.28	1	4.1	1.9	0.022 0.12	0.2 0.44

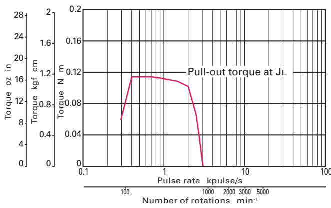
Pulse rate-torque characteristics

SH2281-51



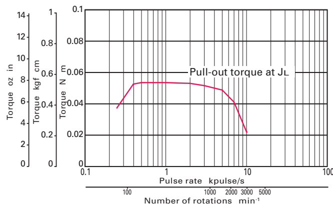
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2285-51



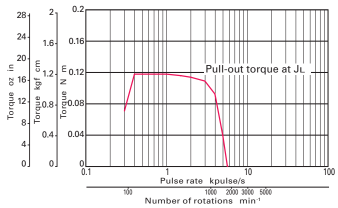
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2281-52



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2285-52



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

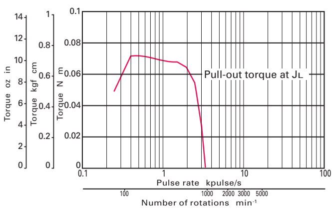
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH2281-5671	**-5631**	0.07 9.91	0.5	10.5	7.2	0.01 0.05	0.11 0.24
SH2281-5771	**-5731**	0.07 9.91	1	2.6	1.85	0.01 0.05	0.11 0.24
SH2285-5671	**-5631**	0.145 20.53	0.5	15	13.5	0.022 0.12	0.2 0.44
SH2285-5771	**-5731**	0.145 20.53	1	3.75	3.4	0.022 0.12	0.2 0.44

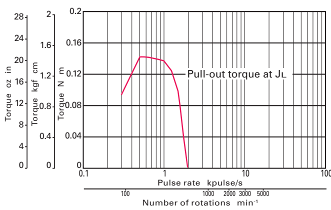
Pulse rate-torque characteristics

SH2281-56



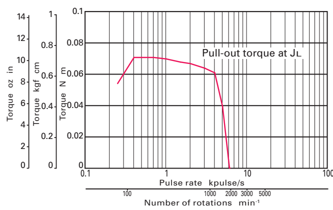
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2285-56



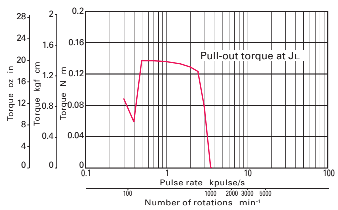
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2281-57



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2285-57



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

35mm sq. 1.38inch sq.

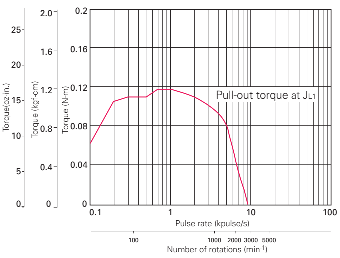
SH35
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH3533-12U40	**-12U10**	0.12 16.99	1.2	2.4	1.3	0.02 1.09	0.17 0.37
SH3537-12U40	**-12U10**	0.15 21.24	1.2	2.7	2	0.025 1.37	0.2 0.44
SH3552-12U40	**-12U10**	0.23 32.57	1.2	3.4	2.8	0.043 2.35	0.3 0.66

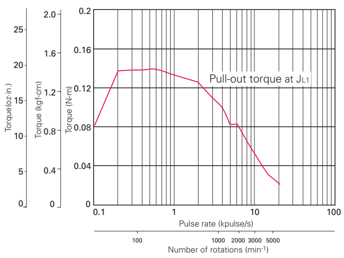
Pulse rate-torque characteristics

SH3533-12U



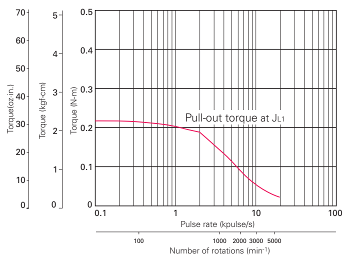
Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.33 10^{-4}kg m² (1.80 oz in²) Use the rubber coupling]

SH3537-12U



Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.33 10^{-4}kg m² (1.80 oz in²) Use the rubber coupling]

SH3552-12U



Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.94 10^{-4}kg m² (5.14 oz in²) Use the rubber coupling]

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

SS242

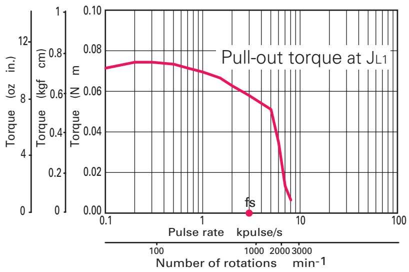
1.8 / step Bipolar winding

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SS2421-5041	**-5011**	0.083 11.75	1	3.5	1.2	0.015 0.082	0.07 0.15
SS2422-5041	**-5011**	0.186 26.33	1	5.4	2.9	0.028 0.153	0.14 0.31
SS2423-5041	**-5011**	0.240 33.98	1	7.3	5	0.038 0.208	0.20 0.44

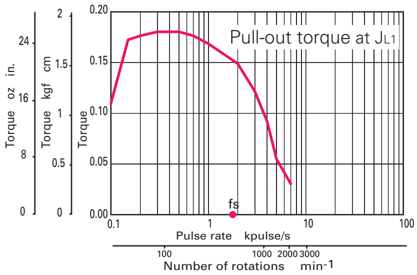
Pulse rate-torque characteristics

SS2421-50



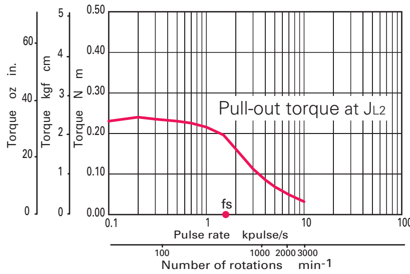
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.33x10^{-4}kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10^{-4}kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

SS2422-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.33x10^{-4}kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10^{-4}kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

SS2423-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.33x10^{-4}kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10^{-4}kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

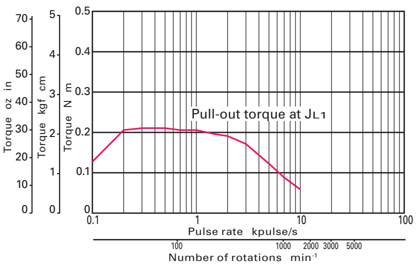
SH142
0.9 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH1421-0441	**-0411**	0.20 28.32	1.2	2.7	3.2	0.044 0.241	0.24 0.53
SH1422-0441	**-0411**	0.29 41.07	1.2	3.1	5.3	0.066 0.361	0.29 0.64
SH1424-0441	**-0411**	0.39 55.23	1.2	3.5	5.3	0.089 0.487	0.38 0.84

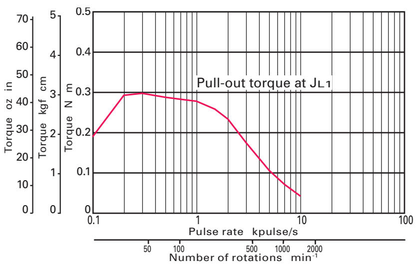
Pulse rate-torque characteristics

SH1421-04



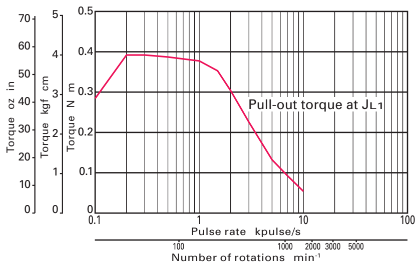
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² Use the rubber coupling

SH1422-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² Use the rubber coupling

SH1424-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² Use the rubber coupling

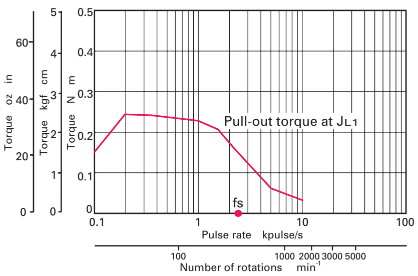
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH1421-5041	**-5011**	0.23 32.5	1	3.3	8.0	0.044 0.24	0.24 0.53
SH1421-5241	**-5211**	0.23 32.5	2	0.85	2.1	0.044 0.24	0.24 0.53
SH1422-5041	**-5011**	0.34 48.1	1	4.0	14.0	0.066 0.36	0.29 0.64
SH1422-5241	**-5211**	0.34 48.1	2	1.05	3.6	0.066 0.36	0.29 0.64
SH1424-5041	**-5011**	0.48 67.9	1	4.7	15.0	0.089 0.49	0.38 0.84
SH1424-5241	**-5211**	0.48 67.9	2	1.25	3.75	0.089 0.49	0.38 0.84

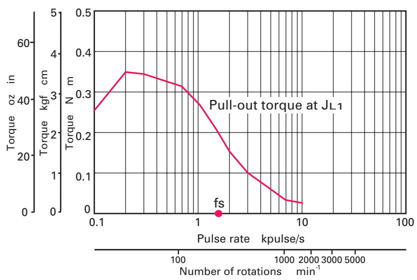
Pulse rate-torque characteristics

SH1421-50



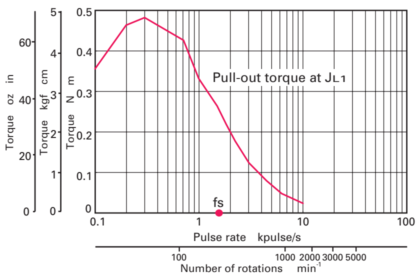
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 Use the rubber coupling

SH1422-50



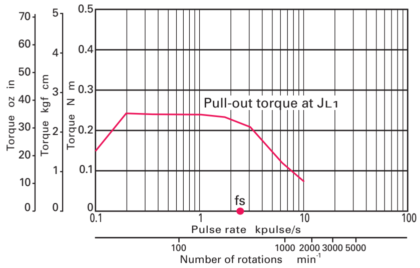
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 Use the rubber coupling

SH1424-50



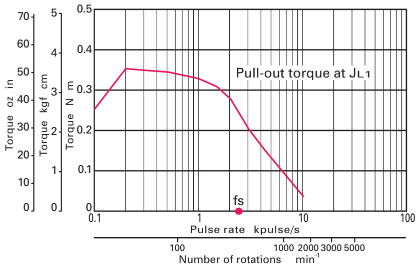
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 Use the rubber coupling

SH1421-52



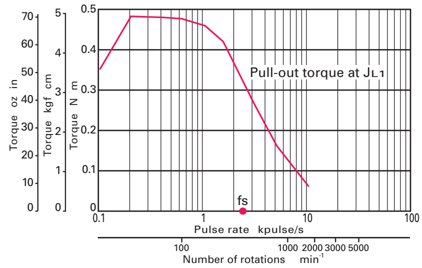
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 Use the rubber coupling

SH1422-52



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 Use the rubber coupling

SH1424-52



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 Use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

103H52
1.8 /step

Unipolar winding Connector type

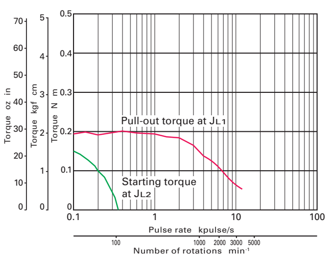
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H5205-0440	**-0410**	0.2 28.32	1.2	2.4	2.3	0.036 0.20	0.23 0.51
103H5208-0440	**-0410**	0.3 42.48	1.2	2.9	3.4	0.056 0.31	0.29 0.64
103H5209-0440	**-0410**	0.32 45.31	1.2	3	3.9	0.062 0.34	0.31 0.68
103H5210-0440	**-0410**	0.37 52.39	1.2	3.3	3.4	0.074 0.40	0.37 0.82

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H5205-5040	**-5010**	0.23 32.57	0.25	54	78	0.036 0.20	0.23 0.51
103H5205-5140	**-5110**	0.25 35.40	0.5	13.4	23.4	0.036 0.20	0.23 0.51
103H5205-5240	**-5210**	0.265 37.53	1	3.4	6.5	0.036 0.20	0.23 0.51
103H5208-5040	**-5010**	0.35 49.56	0.25	66	116	0.056 0.31	0.29 0.64
103H5208-5140	**-5110**	0.38 53.81	0.5	16.5	34	0.056 0.31	0.29 0.64
103H5208-5240	**-5210**	0.39 55.23	1	4.1	9.5	0.056 0.31	0.29 0.64
103H5209-5040	**-5010**	0.38 53.81	0.25	71.4	133	0.062 0.34	0.31 0.68
103H5209-5140	**-5110**	0.41 58.06	0.5	18.2	39	0.062 0.34	0.31 0.68
103H5209-5240	**-5210**	0.425 60.18	1	4.4	11	0.062 0.34	0.31 0.68
103H5210-5040	**-5010**	0.465 65.85	0.25	80	123.3	0.074 0.40	0.37 0.82
103H5210-5140	**-5110**	0.49 69.39	0.5	20	35	0.074 0.40	0.37 0.82
103H5210-5240	**-5210**	0.51 72.22	1	4.8	9.5	0.074 0.40	0.37 0.82

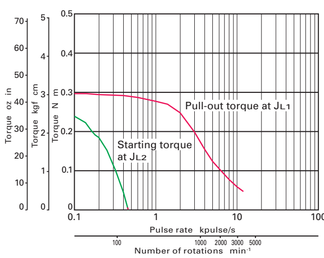
Pulse rate-torque characteristics

103H5205-04



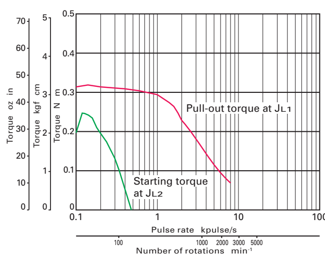
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H5208-04



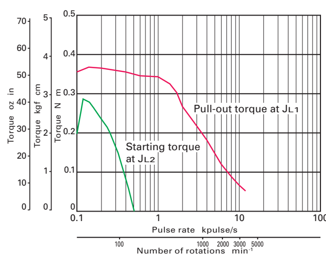
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H5209-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

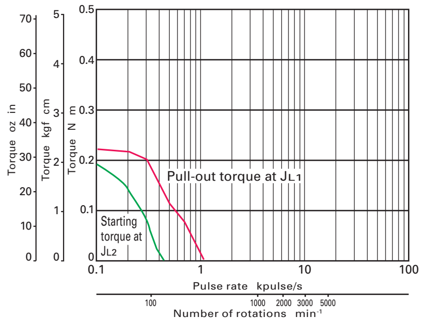
103H5210-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

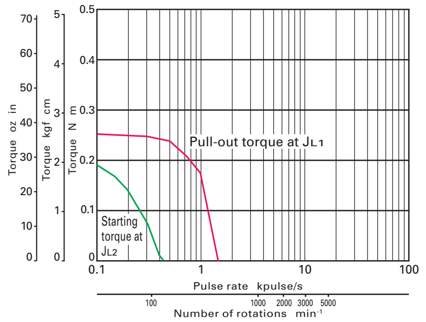
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

103H5205-50



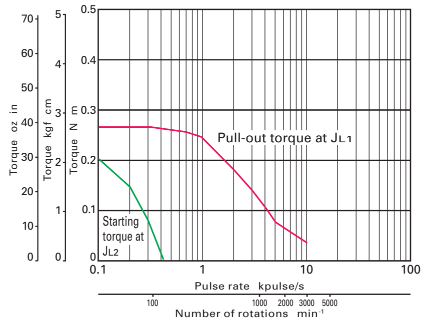
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5205-51



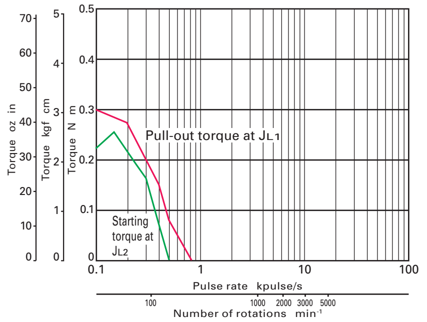
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5205-52



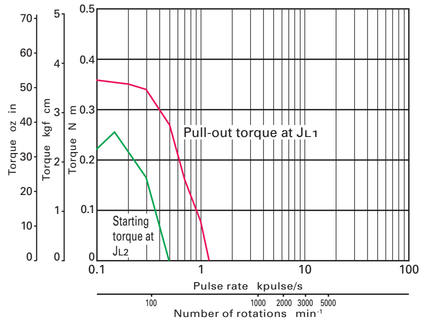
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-50



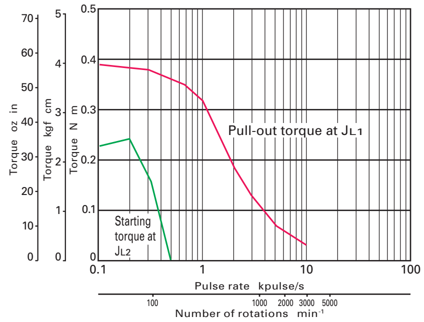
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-51



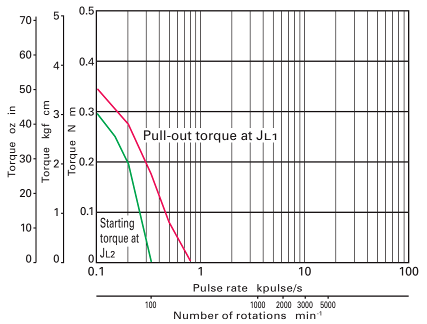
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-52



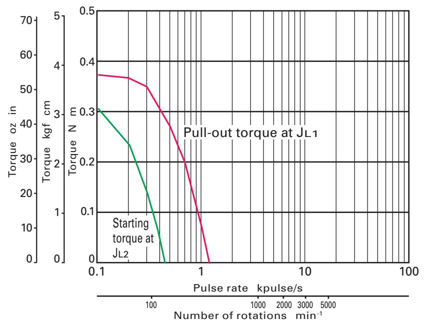
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-50



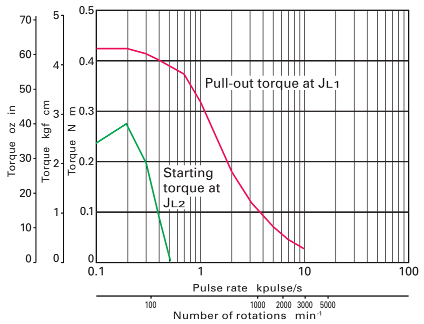
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-51



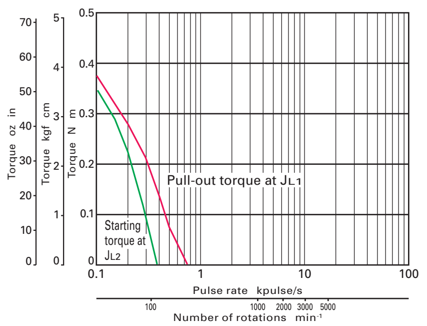
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-52



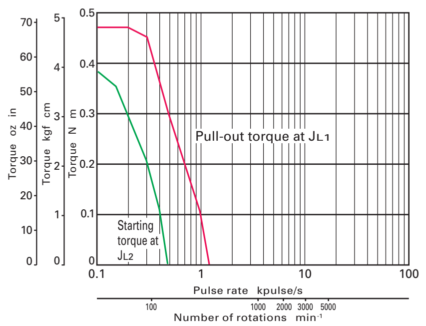
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-50



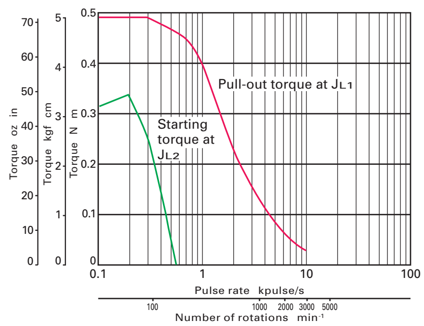
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-51



Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-52



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

50mm sq. 1.97inch sq.

SS250

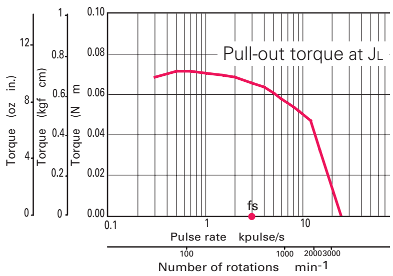
1.8 / step Bipolar winding

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SS2501-5041	**-5011**	0.1 14.16	1	4.5	1.8	0.026 0.142	0.09 0.20
SS2502-5041	**-5011**	0.215 30.44	1	5.9	3.2	0.049 0.268	0.15 0.33

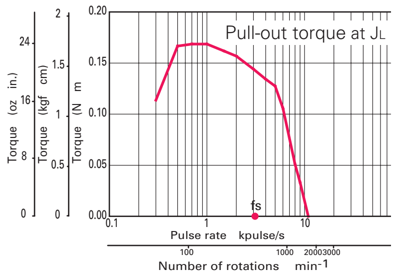
Pulse rate-torque characteristics

SS2501-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
1-2-phase energization half-step
JL = 0.01x10⁻⁴kg m² 0.055 oz in² Pulley barancer system
fs: No load maximum starting pulse rate

SS2502-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
1-2-phase energization half-step
JL = 0.01x10⁻⁴kg m² 0.055 oz in² Pulley barancer system
fs: No load maximum starting pulse rate

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

50mm sq. 1.97inch sq.

103H670
1.8 /step

Unipolar winding Lead wire type

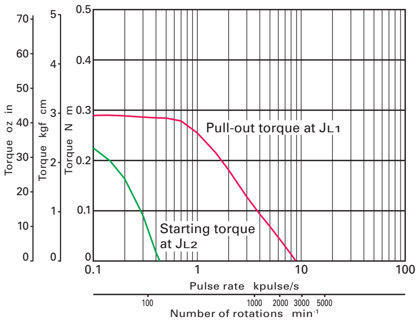
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H6701-0140	**-0110**	0.28 39.6	1	4.3	6.8	0.057 0.31	0.35 0.77
103H6701-0440	**-0410**	0.28 39.6	2	1.1	1.6	0.057 0.31	0.35 0.77
103H6701-0740	**-0710**	0.28 39.6	3	0.6	0.7	0.057 0.31	0.35 0.77
103H6703-0140	**-0110**	0.49 69.4	1	6	13	0.118 0.65	0.5 1.10
103H6703-0440	**-0410**	0.49 69.4	2	1.6	3.2	0.118 0.65	0.5 1.10
103H6703-0740	**-0710**	0.49 69.4	3	0.83	1.4	0.118 0.65	0.5 1.10
103H6704-0140	**-0110**	0.53 75.1	1	6.5	16.5	0.14 0.77	0.55 1.21
103H6704-0440	**-0410**	0.52 73.6	2	1.7	3.8	0.14 0.77	0.55 1.21
103H6704-0740	**-0710**	0.53 75.1	3	0.9	1.7	0.14 0.77	0.55 1.21

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H6701-5040	**-5010**	0.28 39.6	2	0.6	1.6	0.57 0.31	0.35 0.77
103H6703-5040	**-5010**	0.09 12.7	2	0.8	3.2	0.118 0.65	0.5 1.10
103H6704-5040	**-5010**	0.52 73.6	2	0.9	3.8	0.14 0.77	0.55 1.21

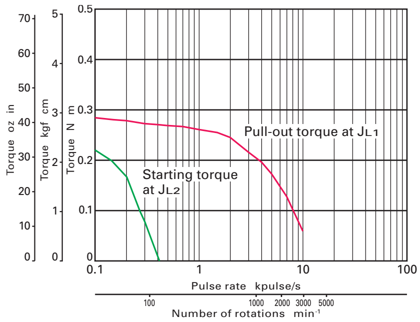
Pulse rate-torque characteristics

103H6701-01



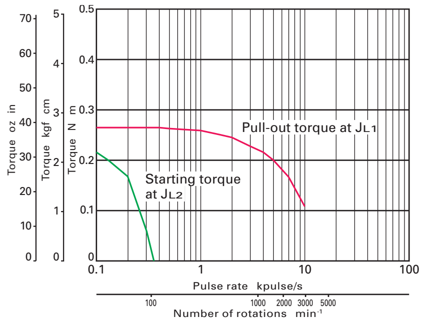
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-04



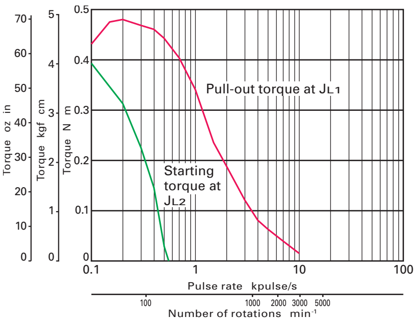
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-07



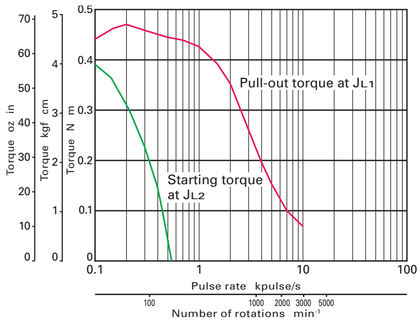
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-01



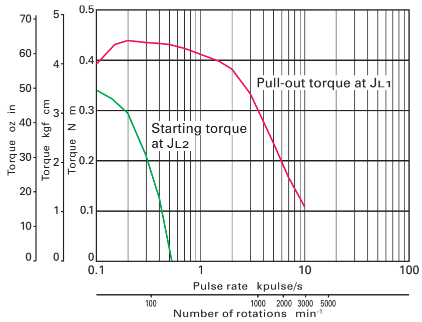
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-04



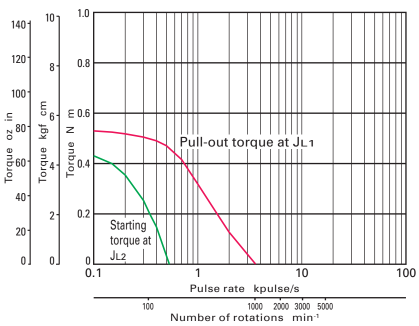
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-07



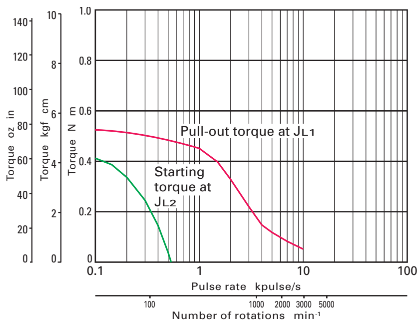
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-01



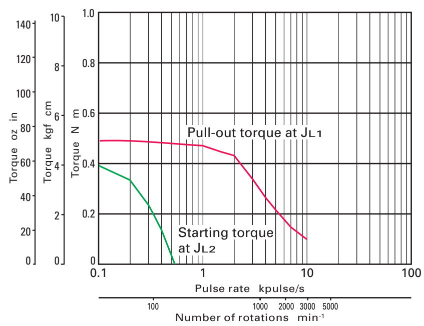
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-04



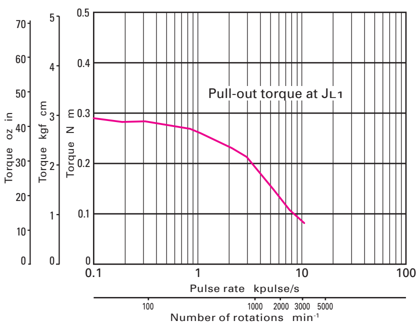
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-07



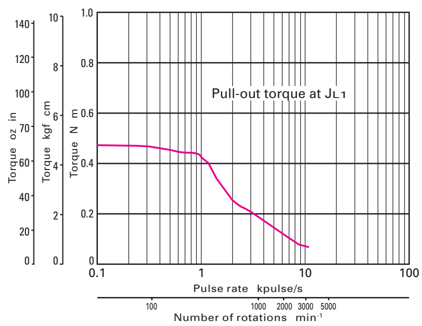
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-50



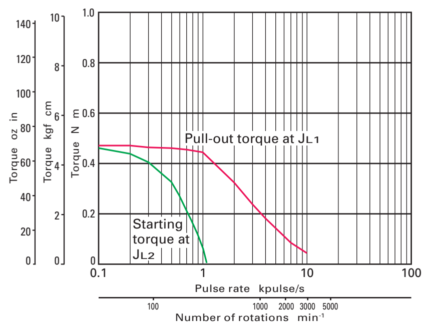
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling

103H6703-50



Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling

103H6704-50



Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.14x10^{-4}kg m^2 0.77 oz in^2 pulley balancer method

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

56mm sq. 2.20inch sq.

103H712
1.8 /step

Unipolar winding Lead wire type

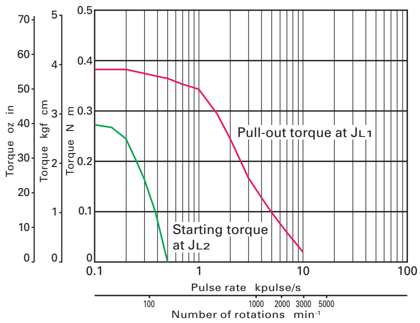
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H7121-0140	**-0110**	0.39 55.2	1	4.8	8	0.1 0.55	0.47 1.04
103H7121-0440	**-0410**	0.39 55.2	2	1.25	1.9	0.1 0.55	0.47 1.04
103H7121-0740	**-0710**	0.39 55.2	3	0.6	0.8	0.1 0.55	0.47 1.04
103H7123-0140	**-0110**	0.83 117.	1	6.7	15	0.21 1.15	0.65 1.43
103H7123-0440	**-0410**	0.83 117.5	2	1.6	3.8	0.21 1.15	0.65 1.43
103H7123-0740	**-0710**	0.78 110.5	3	0.77	1.58	0.21 1.15	0.65 1.43
103H7124-0140	**-0110**	0.98 138.8	1	7	14.5	0.245 1.34	0.8 1.76
103H7124-0440	**-0410**	0.98 138.8	2	1.7	3.1	0.245 1.34	0.8 1.76
103H7124-0740	**-0710**	0.98 138.8	3	0.74	1.4	0.245 1.34	0.8 1.76
103H7126-0140	**-0110**	1.27 179.8	1	8.6	19	0.36 1.97	0.98 2.16
103H7126-0440	**-0410**	1.27 179.8	2	2	4.5	0.36 1.97	0.98 2.16
103H7126-0740	**-0710**	1.27 179.8	3	0.9	2.2	0.36 1.97	0.98 2.16

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H7121-5640	**-5610**	0.55 77.9	1	4.3	14.5	0.1 0.55	0.47 1.04
103H7121-5740	**-5710**	0.55 77.9	2	1.1	3.7	0.1 0.55	0.47 1.04
103H7121-5840	**-5810**	0.55 77.9	3	0.54	1.74	0.1 0.55	0.47 1.04
103H7123-5640	**-5610**	1.0 141.6	1	5.7	29.4	0.21 1.15	0.65 1.43
103H7123-5740	**-5710**	1.0 141.6	2	1.5	7.5	0.21 1.15	0.65 1.43
103H7123-5840	**-5810**	1.0 141.6	3	0.7	3.5	0.21 1.15	0.65 1.43
103H7126-5640	**-5610**	1.6 226.6	1	7.7	34.6	0.36 1.97	0.98 2.16
103H7126-5740	**-5710**	1.6 226.6	2	2	9.1	0.36 1.97	0.98 2.16
103H7126-5840	**-5810**	1.6 226.6	3	0.94	4	0.36 1.97	0.98 2.16
103H7128-5640	**-5610**	2.0 283.2	1	8.9	40.1	0.49 2.68	1.3 2.87
103H7128-5740	**-5710**	2.0 283.2	2	2.3	10.4	0.49 2.68	1.3 2.87
103H7128-5840	**-5810**	2.0 283.2	3	1.03	4.3	0.49 2.68	1.3 2.87

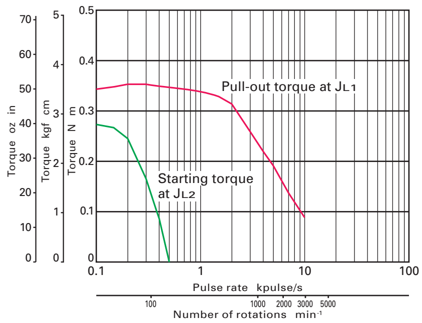
Pulse rate-torque characteristics

103H7121-01



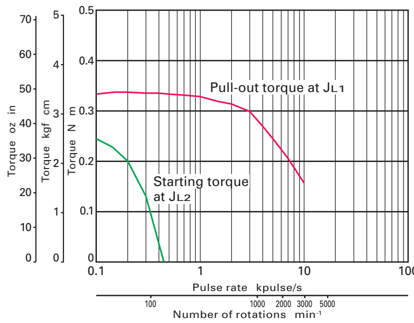
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-04



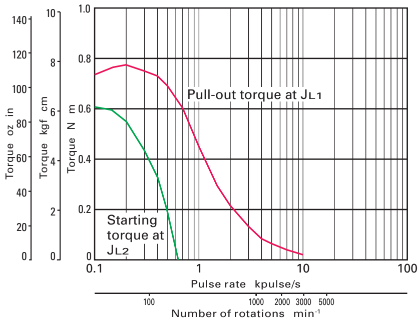
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-07



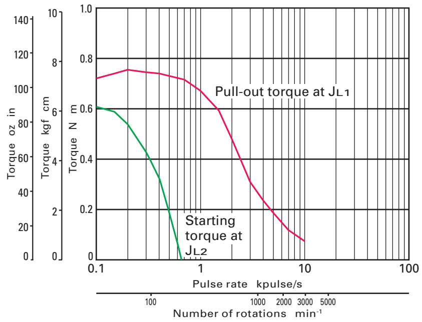
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-01



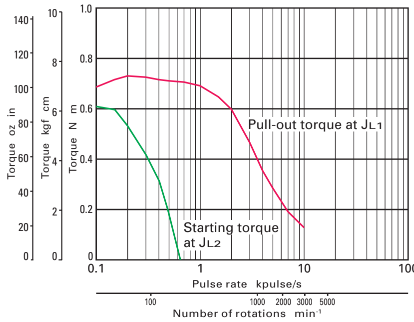
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-04



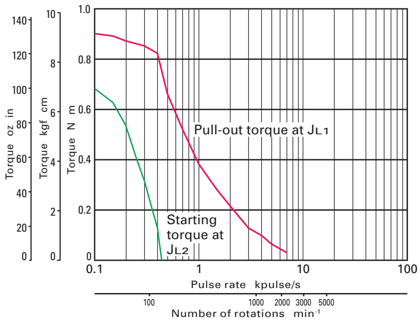
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-07



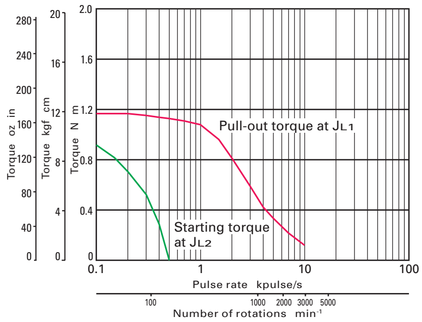
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7124-01



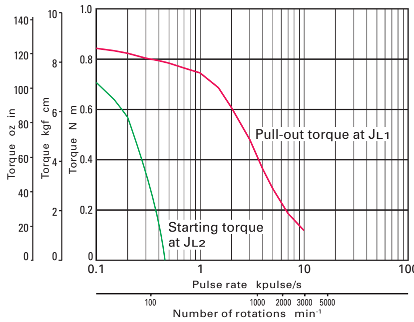
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7124-04



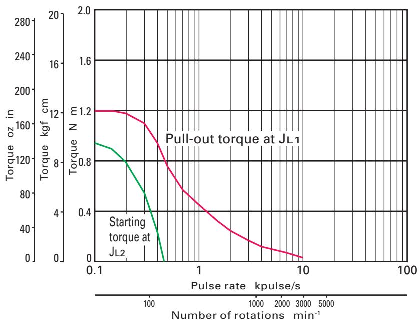
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7124-07



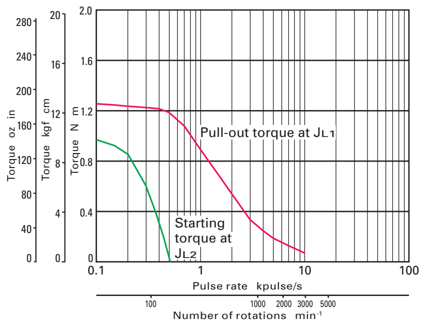
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-01



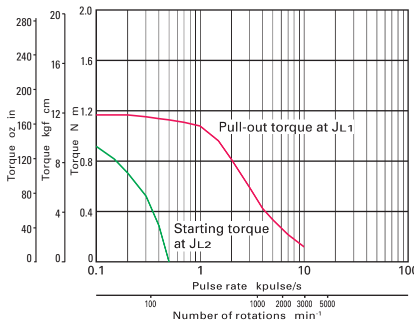
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

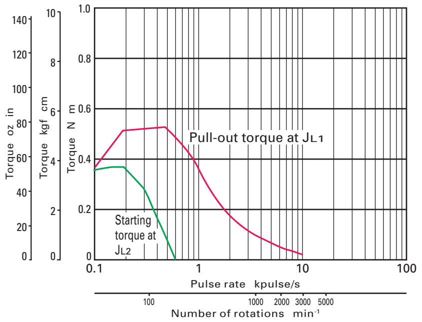
103H7126-07



Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

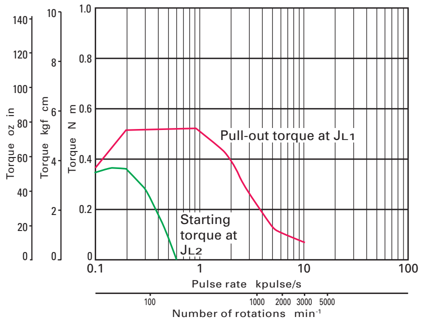
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

103H7121-56



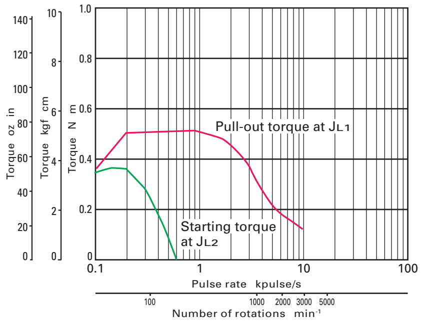
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-57



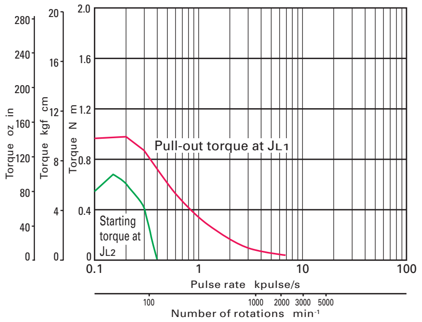
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-58



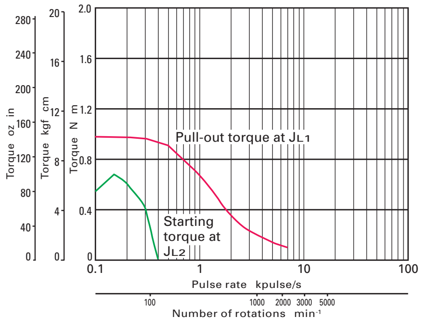
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-56



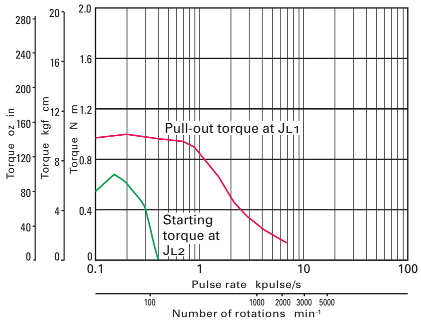
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7123-57



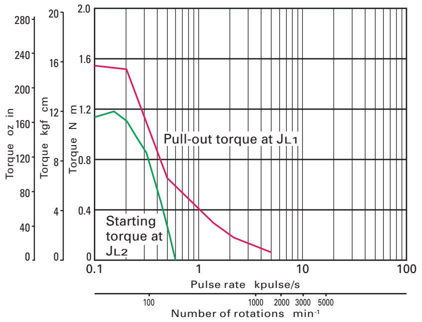
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7123-58



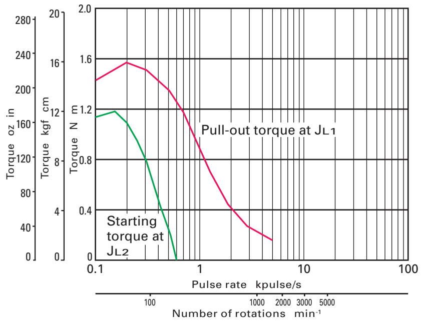
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-56



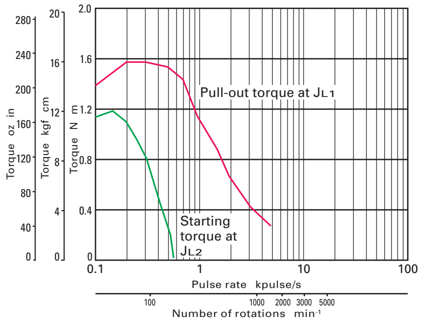
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-57



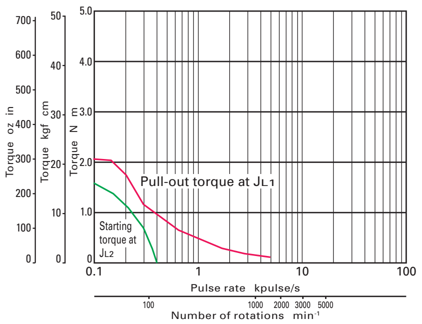
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-58



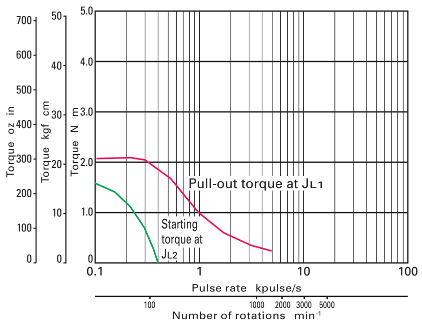
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7128-56



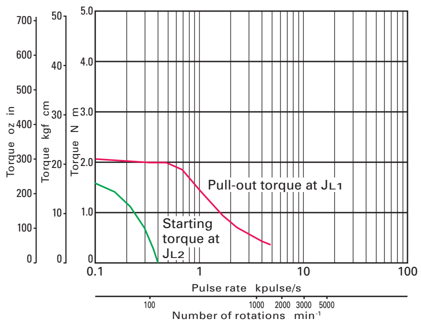
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7128-57



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7128-58



Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

60mm sq. 2.36inch sq.

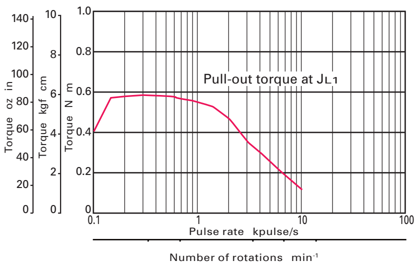
SH160
0.9 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH1601-0440	**-0410**	0.57 80.71	2	1.35	2	0.24 1.312	0.55 1.21
SH1602-0440	**-0410**	1.1 155.77	2	1.8	3.5	0.4 2.187	0.8 1.76
SH1603-0440	**-0410**	1.7 240.74	2	2.3	4.5	0.75 4.101	1.2 2.64

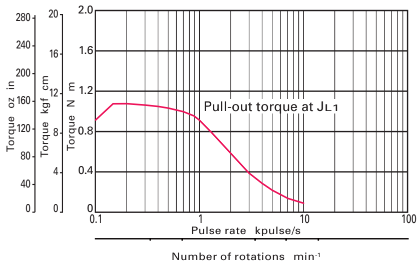
Pulse rate-torque characteristics

SH1601-04



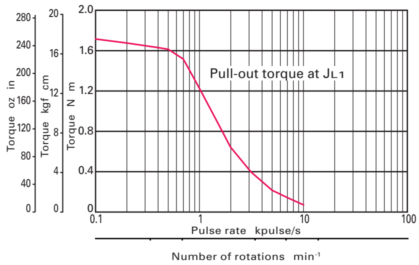
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling

SH1602-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling

SH1603-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling

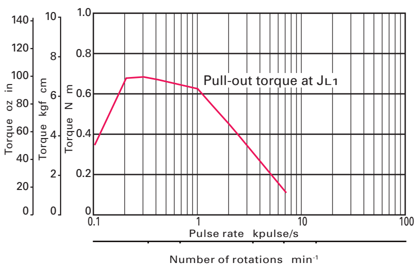
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH1601-5240	**-5210**	0.69 97.7	2	1.2	3.5	0.24 1.31	0.55 1.21
SH1602-5240	**-5210**	1.28 181.2	2	1.65	6.1	0.4 2.19	0.8 1.76
SH1603-5240	**-5210**	2.15 304.4	2	2.3	8.8	0.75 4.10	1.2 2.65

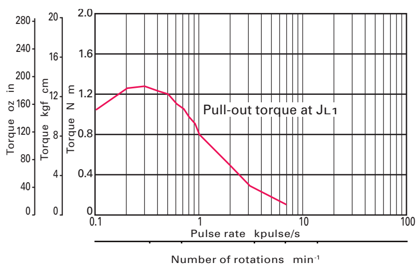
Pulse rate-torque characteristics

SH1601-52



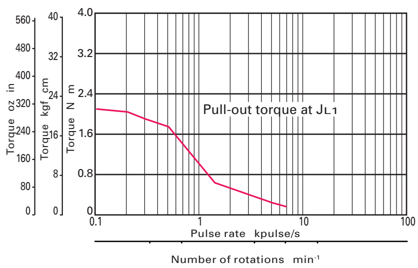
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling

SH1602-52



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling

SH1603-52



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L3} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

60mm sq. 2.36inch sq.

103H782
1.8 /step

Unipolar winding Connector type

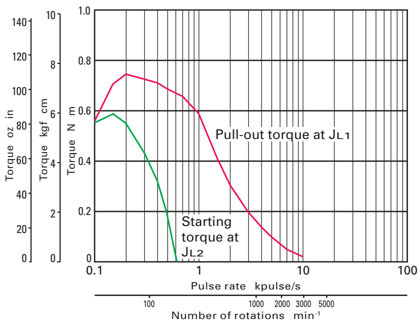
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H7821-0140	**-0110**	0.78 110.5	1	5.7	8.3	0.275 1.50	0.6 1.32
103H7821-0440	**-0410**	0.78 110.5	2	1.5	2	0.275 1.50	0.6 1.32
103H7821-0740	**-0710**	0.78 110.5	3	0.68	0.8	0.275 1.50	0.6 1.32
103H7822-0140	**-0110**	1.17 165.7	1	6.9	14	0.4 2.19	0.77 1.70
103H7822-0440	**-0410**	1.17 165.7	2	1.8	3.6	0.4 2.19	0.77 1.70
103H7822-0740	**-0710**	1.17 165.7	3	0.8	1.38	0.4 2.19	0.77 1.70
103H7823-0140	**-0110**	2.1 297.4	1	10	21.7	0.84 4.59	1.34 2.95
103H7823-0440	**-0410**	2.1 297.4	2	2.7	5.6	0.84 4.59	1.34 2.95
103H7823-0740	**-0710**	2.1 297.4	3	1.25	2.4	0.84 4.59	1.34 2.95

Bipolar winding Connector type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H7821-1740	**-1710**	0.88 124.6	4	0.35	0.8	0.275 1.50	0.6 1.32
103H7821-5740	**-5710**	0.88 124.6	2	1.27	3.3	0.275 1.50	0.6 1.32
103H7822-1740	**-1710**	1.37 194.0	4	0.43	1.38	0.4 2.19	0.77 1.70
103H7822-5740	**-5710**	1.37 194.0	2	1.55	5.5	0.4 2.19	0.77 1.70
103H7823-1740	**-1710**	2.7 382.3	4	0.65	2.4	0.84 4.59	1.34 2.95
103H7823-5740	**-5710**	2.7 382.3	2	2.4	9.5	0.84 4.59	1.34 2.95

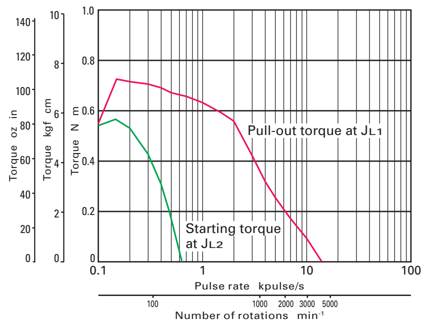
Pulse rate-torque characteristics

103H7821-01



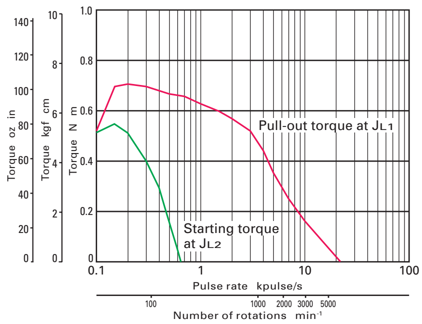
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7821-04



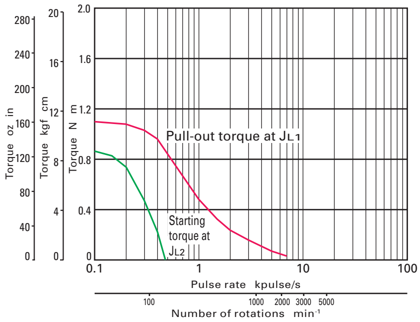
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7821-07



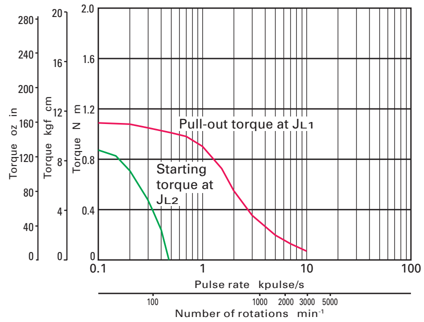
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7822-01



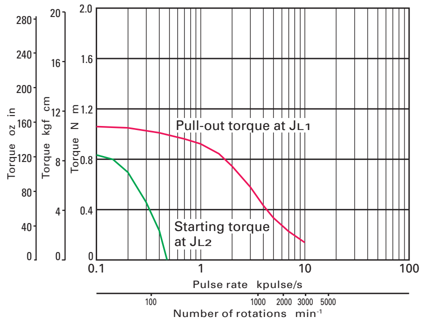
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7822-04



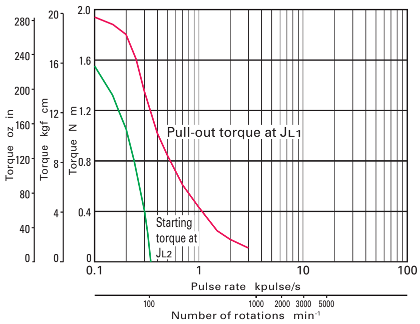
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7822-07



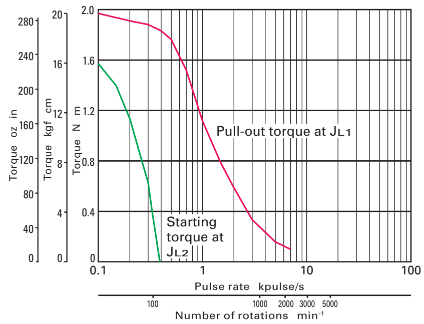
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7823-01



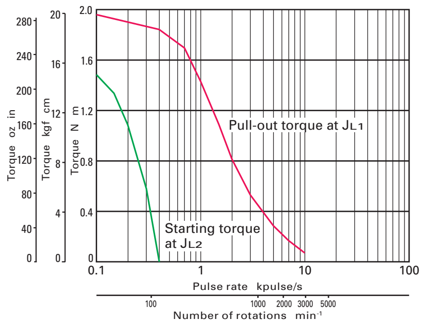
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7823-04



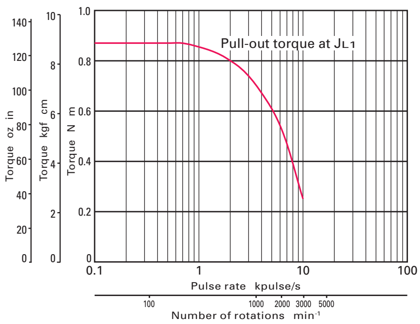
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7823-07



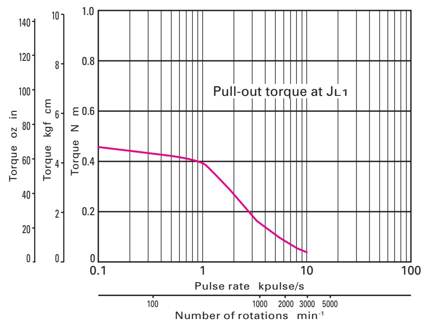
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7821-17



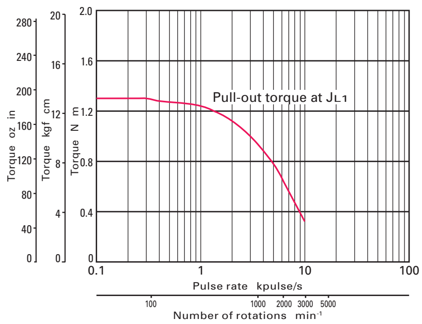
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

103H7821-57



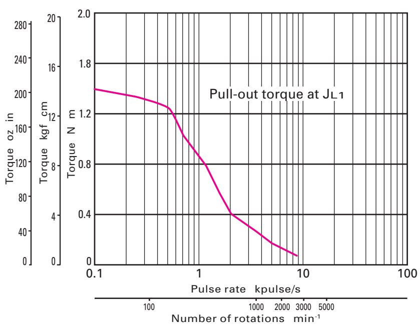
Constant current circuit
Source voltage : AC24V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

103H7822-17



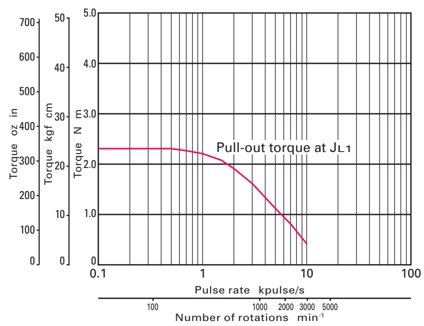
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

103H7822-57



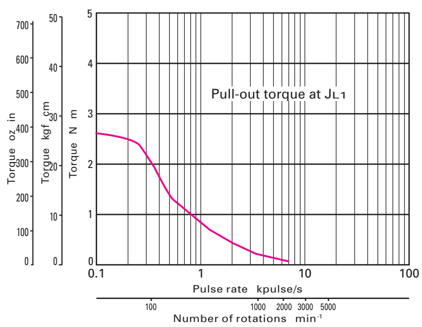
Constant current circuit
Source voltage : AC24V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

103H7823-17



Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

103H7823-57



Constant current circuit
Source voltage : AC24V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

86mm sq. 3.39inch sq.

SH286 /SM286
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH2861-0441	**-0411**	2.5 354	2	2.3	8.0	1.48 8.09	1.75 3.92
SH2861-0941	**-0911**	2.5 354	4	0.6	2.0	1.48 8.09	1.75 3.92
SH2862-0441	**-0411**	4.7 665.6	2	3.2	13.0	3 16.4	2.9 6.5
SH2862-0941	**-0911**	4.7 665.6	4	0.85	3.4	3 16.4	2.9 6.5
SH2863-0441	**-0411**	6.7 948.8	2	4.0	17.0	4.5 24.6	4.0 8.96
SH2863-0941	**-0911**	6.7 948.8	4	0.9	4.2	4.5 24.6	4.0 8.96

Unipolar winding Lead wire type CE UL model

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SM2861-0451	**-0421**	2.5 354	2	2.3	8.0	1.48 8.09	1.75 3.92
SM2861-0951	**-0921**	2.5 354	4	0.6	2.0	1.48 8.09	1.75 3.92
SM2862-0451	**-0421**	4.8 679.7	2	3.2	13.0	3 16.4	2.9 6.5
SM2862-0951	**-0921**	4.8 679.7	4	0.85	3.4	3 16.4	2.9 6.5
SM2863-0451	**-0421**	6.6 934.6	2	4.0	17	4.5 24.6	4.0 8.96
SM2863-0951	**-0921**	6.6 934.6	4	0.9	4.2	4.5 24.6	4.0 8.96

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH2861-5041	**-5011**	3.3 467.3	2	2.2	15	1.48 8.09	1.75 3.92
SH2861-5141	**-5111**	3.3 467.3	4	0.56	3.7	1.48 8.09	1.75 3.92
SH2861-5241	**-5211**	3.3 467.3	6	0.29	1.7	1.48 8.09	1.75 3.92
SH2862-5041	**-5011**	6.4 906.3	2	3.2	25	3.0 16.4	2.9 6.5
SH2862-5141	**-5111**	6.4 906.3	4	0.83	6.4	3.0 16.4	2.9 6.5
SH2862-5241	**-5211**	6.4 906.3	6	0.36	2.8	3.0 16.4	2.9 6.5
SH2863-5041	**-5011**	9 1274.4	2	4.0	32	4.5 24.6	4.0 8.96
SH2863-5141	**-5111**	9 1274.4	4	1.0	7.9	4.5 24.6	4.0 8.96
SH2863-5241	**-5211**	9 1274.4	6	0.46	3.8	4.5 24.6	4.0 8.96

Bipolar winding Lead wire type CE UL model

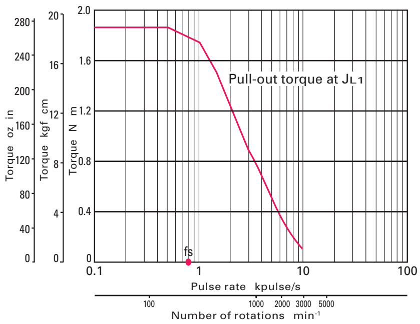
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SM2861-5051	**-5021**	3.3 467.3	2	2.2	15	1.48 8.09	1.75 3.92
SM2861-5151	**-5121**	3.3 467.3	4	0.56	3.7	1.48 8.09	1.75 3.92
SM2861-5251	**-5221**	3.3 467.3	6	0.29	1.7	1.48 8.09	1.75 3.92
SM2862-5051	**-5021**	6.4 906.3	2	3.2	25	3.0 16.4	2.9 6.5
SM2862-5151	**-5121**	6.4 906.3	4	0.83	6.4	3.0 16.4	2.9 6.5
SM2862-5251	**-5221**	6.4 906.3	6	0.36	2.8	3.0 16.4	2.9 6.5
SM2863-5051	**-5021**	9 1274.4	2	4.0	32	4.5 24.6	4.0 8.96
SM2863-5151	**-5121**	9 1274.4	4	1.0	7.9	4.5 24.6	4.0 8.96
SM2863-5251	**-5221**	9 1274.4	6	0.46	3.8	4.5 24.6	4.0 8.96

Bipolar winding Terminal block type

Model	Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SM2861-5066	3.3 467.3	2	2.03	15	1.48 8.09	1.9 4.19
SM2861-5166	3.3 467.3	4	0.52	3.7	1.48 8.09	1.9 4.19
SM2861-5266	3.3 467.3	6	0.27	1.7	1.48 8.09	1.9 4.19
SM2862-5066	6.4 906.3	2	3.08	25	3.0 16.4	3.05 6.72
SM2862-5166	6.4 906.3	4	0.79	6.4	3.0 16.4	3.05 6.72
SM2862-5266	6.4 906.3	6	0.33	2.8	3.0 16.4	3.05 6.72
SM2863-5066	9 1274.4	2	3.83	32	4.5 24.6	4.15 9.15
SM2863-5166	9 1274.4	4	0.96	7.9	4.5 24.6	4.15 9.15
SM2863-5266	9 1274.4	6	0.48	3.8	4.5 24.6	4.15 9.15

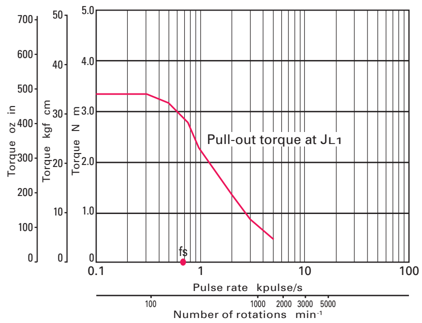
Pulse rate-torque characteristics

SH2861-04



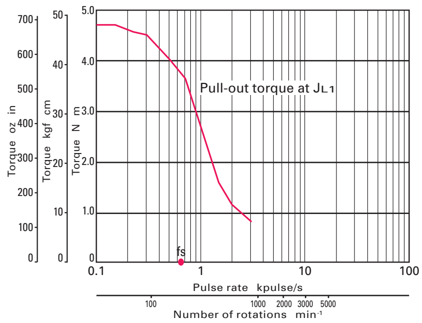
Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

SH2862-04



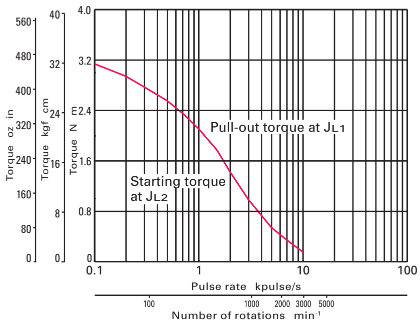
Constant current circuit
Source voltage : DC100V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SH2863-04



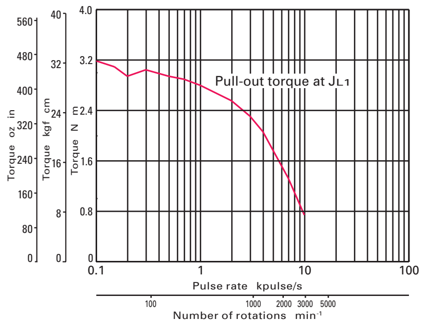
Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2861-50



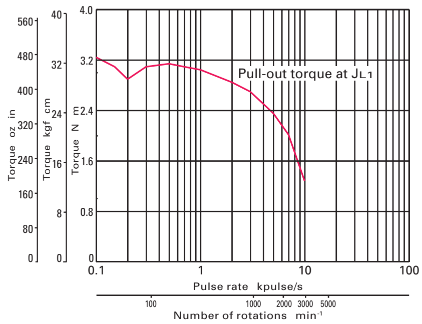
Constant current circuit
Source voltage : DC100V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

SM2861-51



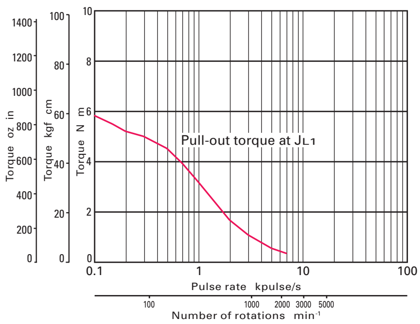
Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

SM2861-52



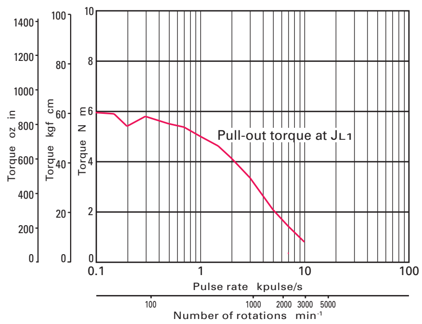
Constant current circuit
Source voltage : DC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2862-50



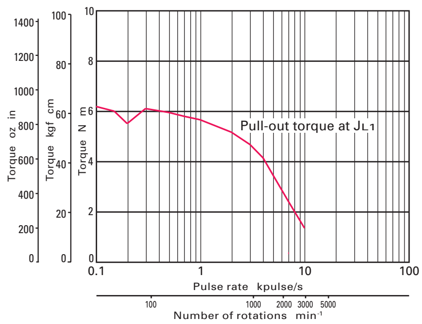
Constant current circuit
Source voltage : DC100V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2862-51



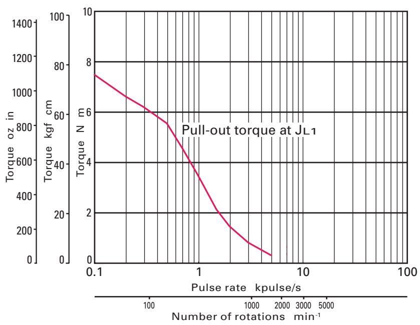
Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2862-52



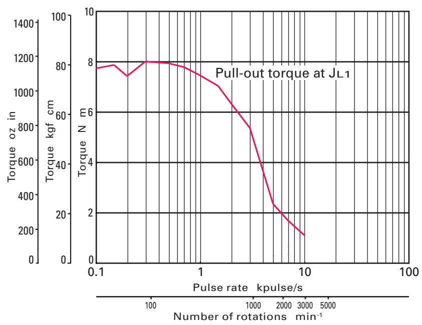
Constant current circuit
Source voltage : DC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2863-50



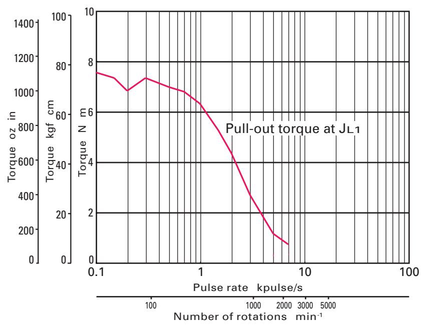
Constant current circuit
Source voltage : DC100V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m^2 235.10 oz in^2 use the rubber coupling

SM2863-51



Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m^2 235.10 oz in^2 use the rubber coupling

SM2863-52



Constant current circuit
Source voltage : DC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m^2 235.10 oz in^2 use the rubber coupling

2-phase stepping motor

106mm cir. 4.17inch cir.

103H8922
1.8 /step

Unipolar winding

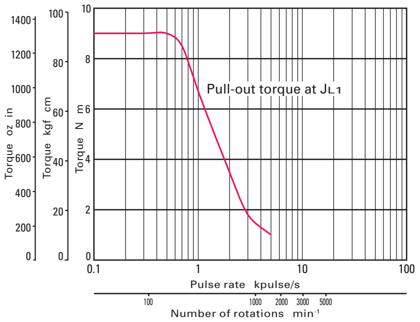
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H89222-0941	**-0911**	10.8 1529.4	4	0.98	6.3	14.6 79.83	7.5 16.53
103H89223-0941	**-0911**	15.5 2194.9	4	1.4	9.7	22 120.28	10.5 23.15

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H89222-5241	**-5211**	13.2 1869.2	6	0.45	5.4	14.6 79.83	7.5 16.53
103H89223-5241	**-5211**	19 2690.5	6	0.63	8	22 120.28	10.5 23.15

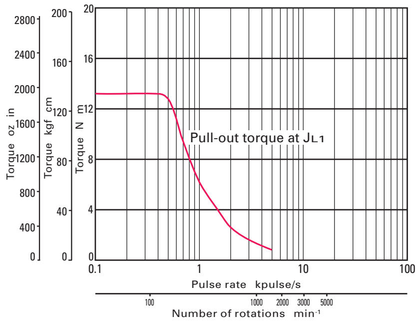
Pulse rate-torque characteristics

103H89222-09



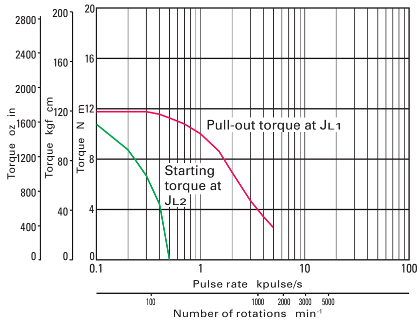
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling

103H89223-09



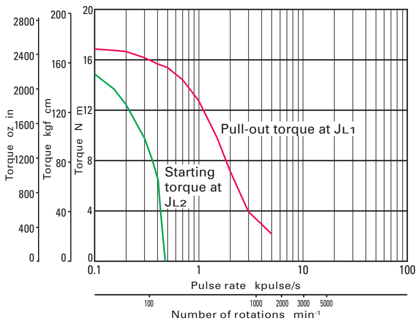
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling

103H89222-52



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling

103H89223-52



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10⁻⁴kg m² 235.10 oz in² use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

56mm sq. 2.20inch sq.

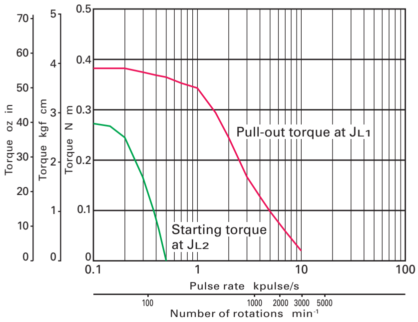
103H712
CE marking
1.8 /step

Unipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H7121-6140	**-6110**	0.39 55.2	1	4.8	8	0.1 0.55	0.47 1.04
103H7121-6740	**-6710**	0.39 55.2	3	0.6	0.8	0.1 0.55	0.47 1.04
103H7123-6140	**-6110**	0.83 117.5	1	6.7	15	0.21 1.15	0.65 1.43
103H7123-6740	**-6710**	0.78 110.5	3	0.77	1.58	0.21 1.15	0.65 1.43
103H7126-6140	**-6110**	1.27 179.8	1	8.6	19	0.36 1.97	0.98 2.16
103H7126-6740	**-6710**	1.27 179.8	3	0.9	2.2	0.36 1.97	0.98 2.16

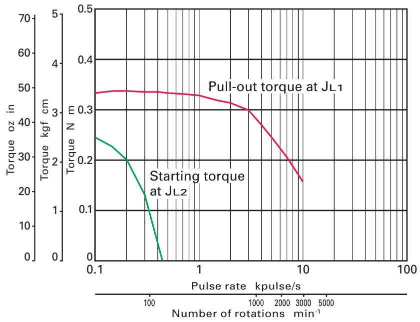
Pulse rate-torque characteristics

103H7121-61



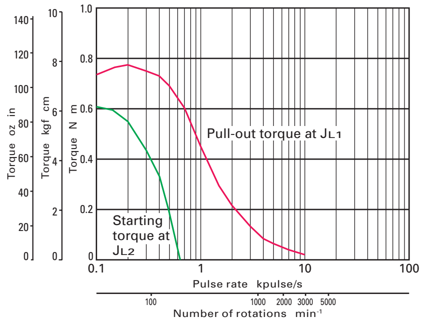
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7121-67



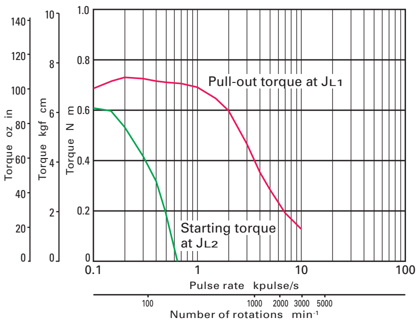
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7123-61



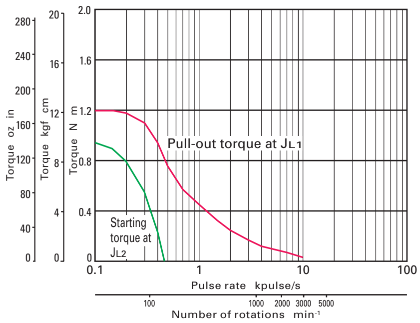
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7123-67



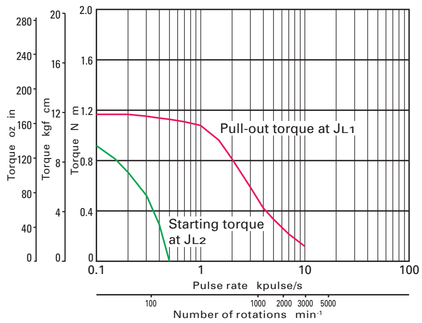
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7126-61



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7126-67



Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

86mm cir. 3.39inch cir.

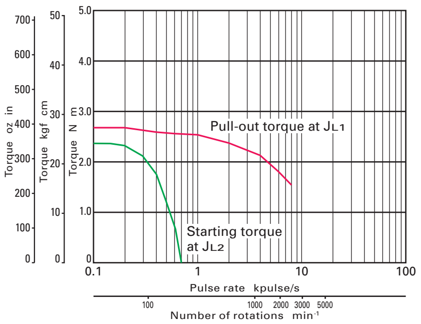
103H822
CE marking
1.8 /step

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
103H8221-6240	**-6210**	2.74 388.0	6	0.3	1.65	1.45 7.93	1.5 3.31
103H8222-6340	**-6310**	5.09 720.8	6	0.35	2.7	2.9 15.86	2.5 5.51
103H8223-6340	**-6310**	7.44 1053.6	6	0.45	3.4	4.4 24.06	3.5 7.72

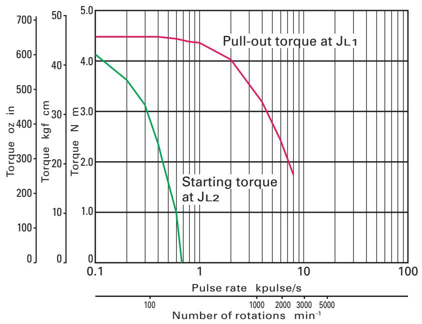
Pulse rate-torque characteristics

103H8221-62



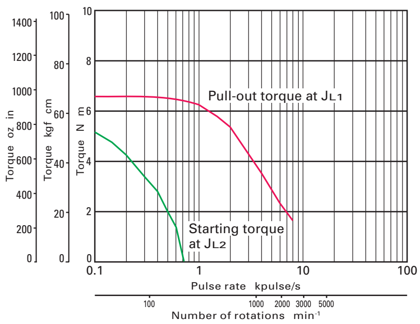
Constant current circuit
Source voltage : AC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H8222-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling
J_{L2} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the direct coupling

103H8223-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 43x10^{-4}kg m^2 235.10 oz in^2 use the rubber coupling
J_{L2} = 43x10^{-4}kg m^2 235.10 oz in^2 use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

106mm cir. 4.17inch cir.

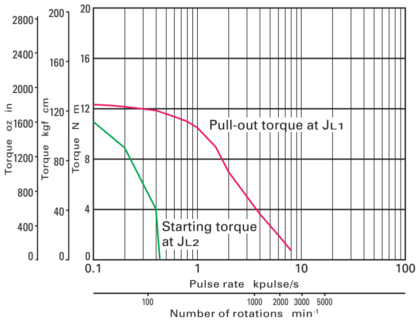
103H8922
CE marking
1.8 /step

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H89222-6341	**-6311**	13.2 1869.2	6	0.45	5.4	14.6 79.83	7.5 16.53
103H89223-6341	**-6311**	19 2690.5	6	0.63	8	22 120.28	10.5 23.15

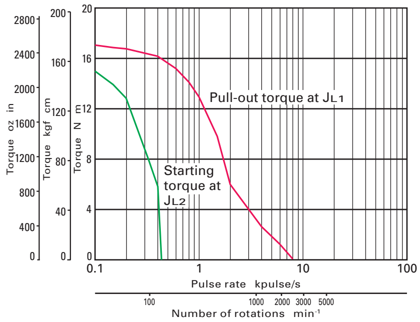
Pulse rate-torque characteristics

103H89222-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the direct coupling

103H89223-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the direct coupling

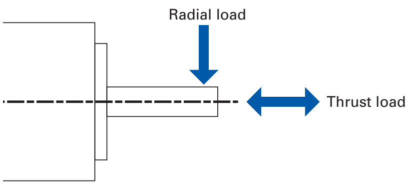
Standard models

Motor type	H series motor
Model number	103H52 /103H67 /103H71 /103H78
Insulation class	Class B 130
Withstand voltage	42 1.65inch AC500V 50/60Hz for 1 minute, 50 1.97inch 56 2.20inch 60 2.36inch AC1000V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Operating ambient temperature	-10 to 50
Operating ambient humidity	90%MAX. : 40 MAX., 57%MAX. : 50 MAX., 35%MAX. : 60 MAX. no condensation

Motor type	SH series motor
Motor model number	SH228 , SH353 , SH142 , SH160 , SH286 ,
Insulation class	Class B 130
Withstand voltage	28 1.10inch 35 1.38inch 42 1.65inch AC500V 50/60Hz for 1 minute, 60 2.36inch / 86 3.38inch AC1000V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Operating ambient temperature	-10 to 50
Operating ambient humidity	90%MAX. : 40 MAX., 57%MAX. : 50 MAX., 35%MAX. : 60 MAX. no condensation

Motor type	SM series motor
Model number	SM286
Type	S1 continuous operation
Insulation class	Class F +155 C
Operation altitude	1000m 3280 feet MAX above sea level
Withstand voltage	86mm 3.39inch : AC1500V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Protection grade	IP43
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Ambient operation temperature	-10 to +50 C
Ambient operation humidity	90% MAX. at less than 40 C, 57% MAX. at less than 50 C , 35% MAX. at 60 C no condensation

Allowable radial / thrust load



Frange size	Model number	Distance from end of shaft : mm inch				Thrust load N lbs
		0	5 0.20	10 0.39	15 0.59	
		Radial load : N lbs				
28mm 1.10inch	SH228	42 9	48 10	56 12	66 14	3 0.67
35mm 1.38inch	SH353	40 8	50 11	67 15	98 22	10 2.25
42mm 1.65inch	103H52 103-59 SH142	22 4	26 5	33 7	46 10	10 2.25
50mm 1.97inch	103H670	71 15	87 19	115 25	167 37	15 3.37
56mm 2.20inch	103H712	52 11	65 14	85 19	123 27	15 3.37
	103H7128	85 19	105 23	138 31	200 44	15 3.37
60mm 2.36inch	103H782 SH160	70 15	87 19	114 25	165 37	20 4.50
86mm 3.39inch	SM286 SH286	167 37	193 43	229 51	280 62	60 13.488
86mm 3.39inch	103H822	191 42	234 52	301 67	421 93	60 13.488
106mm 4.17inch	103H8922	321 72	356 79	401 90	457 101	100 22.48

CE marked models

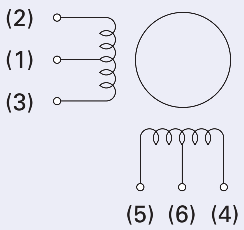
Model Number	103H712	103H822 103H8922
Rated voltage	12-200VDC	12-300VDC
Applied standards Low voltage diretive	EN60034-1,IEC34-5(EN60034-5),EN60204-1,EN60950,EN61010-1	
Operation type	S1 continuous rating	
Protection grade	IP43	
Device category	Class I	
Operation environment	Pollution degree 2	
Insulation classl	Class B 130	
Insulation resistance	100M ohm MIN. against DC500V	
Withstand voltage	56mm 2.2inch : AC1500V 50/60Hz for 1 minute 86mm 3.39inch 106mm 4.17inch : AC1600V 50/60Hz for 1 minute	
Ambient operation temperature	-10 to +50 C	
Ambient operation humidity	90% MAX. at less than 40 C, 57% MAX. at less than 50 C , 35% MAX. at 60 C no condensation	
Winding temperature rise	80K MAX. Based on Sanyo Denki standard	

Internal Wiring and Rotation Direction

Unipolar winding

103H52 Connector type

Internal wire connection
( ) connector pin number

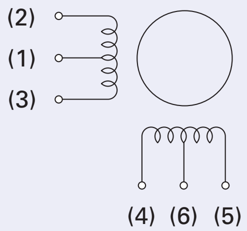


Direction of motor rotate
The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Connector type pin number				
		1.6	5	3	4	2
Exciting order	1					
	2					
	3					
	4					

103H782 Connector type

Internal wire connection
( ) connector pin number

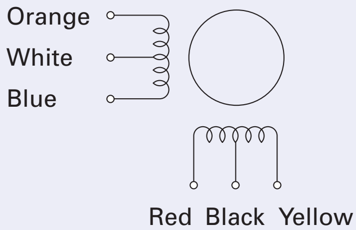


Direction of motor rotate
The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Connector type pin number				
		1.6	4	3	5	2
Exciting order	1					
	2					
	3					
	4					

Lead wire type

Internal wire connection

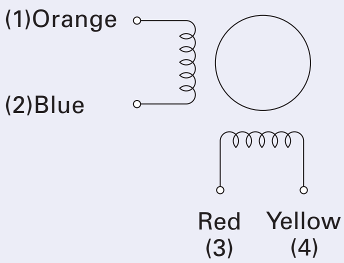


Direction of motor rotate
The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Lead wire color				
		White & black	Red	Blue	Yellow	Orange
Exciting order	1					
	2					
	3					
	4					

Bipolar winding

Internal wire connection
( ) connector pin number

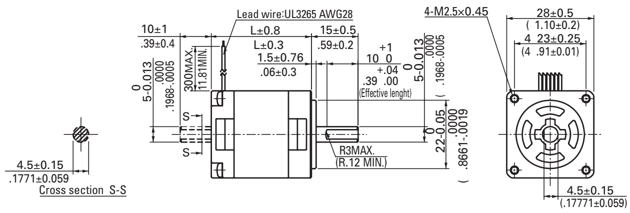


Direction of motor rotate
The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Lead wire color, connector type pin teminal blocknumber			
	Lead wire	Red	Blue	Yellow	Orange
Exciting order	1	–	–	+	+
	2	+	–	–	+
	3	+	+	–	–
	4	–	+	+	–
Connector	103H782	3	2	4	1
Teminal block	SM286	3	2	4	1

Motors Unit: mm inch

28mm 1.10inch

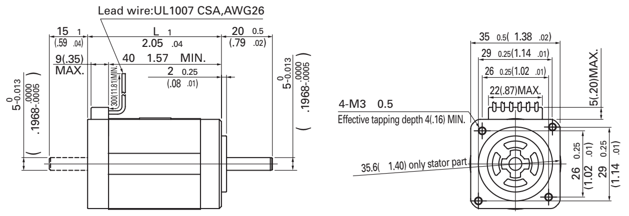


Connector type

Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU14S281	SH2281-51 1	32 1.26	Lead wire
	DU14S281	SH2281-52 1	32 1.26	Lead wire
	DU14S285	SH2285-51 1	51.5 2.03	Lead wire
	DU14S285	SH2285-52 1	51.5 2.03	Lead wire
Bipolar	DB14S281	SH2281-56 1	32 1.26	Lead wire
	DB14S281	SH2281-57 1	32 1.26	Lead wire
	DB14S285	SH2285-56 1	51.5 2.03	Lead wire
	DB14S285	SH2285-57 1	51.5 2.03	Lead wire

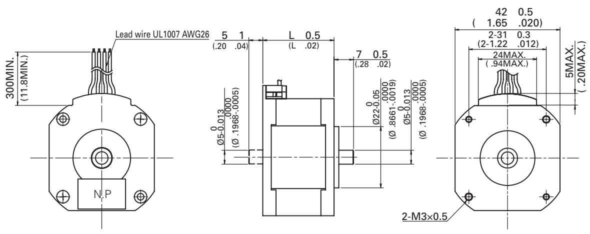
35mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH3533-12U 0	33 1.25	Lead wire
		SH3537-12U 0	37 1.54	Lead wire
		SH3552-12U 0	52 1.89	Lead wire

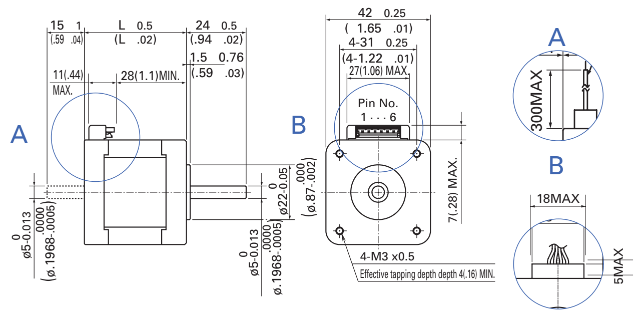
42mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		SS2421-50 1	11.6 .457	Lead wire
		SS2422-50 1	18.6 .732	Lead wire
		SS2423-50 1	25.6 1.008	Lead wire

42mm 1.65inch

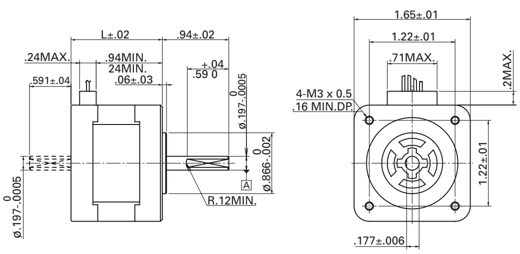


Connector type

Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU15H521	103H5205-04 0	33 1.25	Connector
	DU15H522	103H5208-04 0	39 1.54	Connector
	DU15H524	103H5210-04 0	48 1.89	Connector
		103H5209-04 0	41 1.61	Connector

42mm 1.65inch

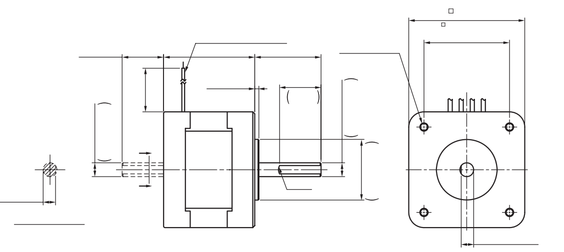


Connector type

Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar	DB14H521	103H5205-52 0	33 1.25	Lead wire
	DB14H522	103H5208-52 0	39 1.54	Lead wire
	DB14H524	103H5210-52 0	48 1.89	Lead wire
		103H5205-50 0	33 1.25	Lead wire
		103H5205-51 0	33 1.25	Lead wire
		103H5208-50 0	39 1.54	Lead wire
		103H5208-51 0	39 1.54	Lead wire
		103H5209-50 0	41 1.61	Lead wire
		103H5209-51 0	41 1.61	Lead wire
		103H5209-52 0	41 1.61	Lead wire
		103H5210-50 0	48 1.89	Lead wire
		103H5210-51 0	48 1.89	Lead wire

42mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU15S141	SH1421-04 1	33 1.25	Lead wire
	DU15S142	SH1422-04 1	39 1.54	Lead wire
	DU15S144	SH1424-04 1	48 1.89	Lead wire
Bipolar	DB16H141	SH1421-52 1	33 1.25	Lead wire
	DB16H142	SH1422-52 1	39 1.54	Lead wire
	DB16H144	SH1424-52 1	48 1.89	Lead wire

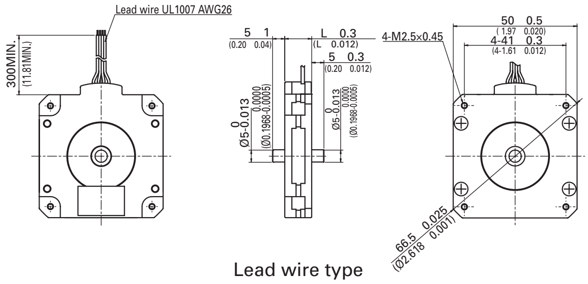
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

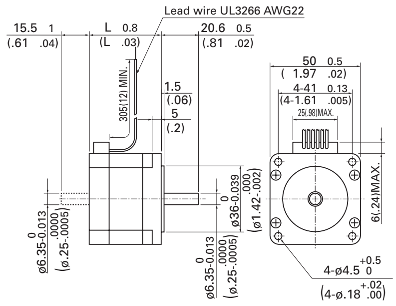
50mm 1.97inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		SS2501-50 1	11 .433	Lead wire
		SS2502-50 1	16 .63	Lead wire

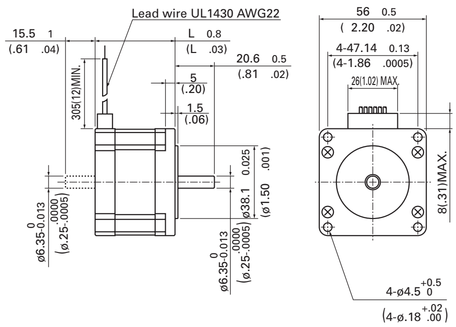
50mm 1.97inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H6701-01 0	39.8 1.57	Lead wire
		103H6701-04 0	39.8 1.57	Lead wire
		103H6701-07 0	39.8 1.57	Lead wire
		103H6703-01 0	51.3 2.02	Lead wire
		103H6703-04 0	51.3 2.02	Lead wire
		103H6703-07 0	51.3 2.02	Lead wire
		103H6704-01 0	55.8 2.20	Lead wire
		103H6704-04 0	55.8 2.20	Lead wire
		103H6704-07 0	55.8 2.20	Lead wire
Bipolar	DB16H671	103H6701-50 0	39.8 1.57	Lead wire
	DB16H672	103H6703-50 0	51.3 2.02	Lead wire
		103H6704-50 0	55.8 2.20	Lead wire

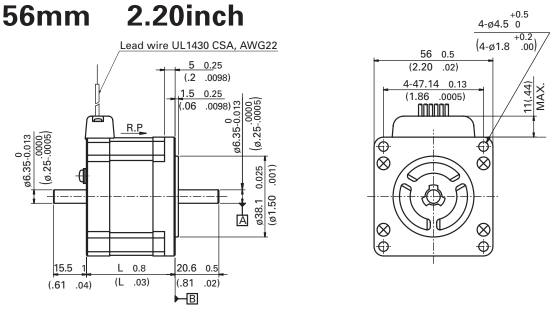
56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU16H711	103H7121-04 0	41.8 1.65	Lead wire
	DU16H713	103H7123-04 0	53.8 2.12	Lead wire
	DU16H716	103H7126-04 0	75.8 2.98	Lead wire
		103H7121-01 0	41.8 1.65	Lead wire
		103H7121-07 0	41.8 1.65	Lead wire
		103H7123-01 0	53.8 2.12	Lead wire
		103H7123-07 0	53.8 2.12	Lead wire
		103H7124-01 0	63.8 2.51	Lead wire
		103H7124-04 0	63.8 2.51	Lead wire
		103H7124-07 0	63.8 2.51	Lead wire
		103H7126-01 0	75.8 2.98	Lead wire
		103H7126-07 0	75.8 2.98	Lead wire

56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H7121-61 0	41.8 1.65	Lead wire CE
		103H7121-67 0	41.8 1.65	Lead wire CE
		103H7123-61 0	53.8 2.12	Lead wire CE
		103H7123-67 0	53.8 2.12	Lead wire CE
		103H7126-61 0	75.8 2.98	Lead wire CE
		103H7126-67 0	75.8 2.98	Lead wire CE

Model number	Shaft diameter(D)	Dcut thickness(L)
103H7121-	6.35	5.8
103H7123-		
103H7126-		
103H7128-	8	7.5

Motor shaft specification code

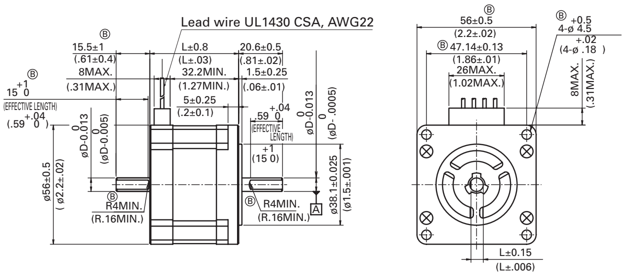
Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Motors Unit: mm inch

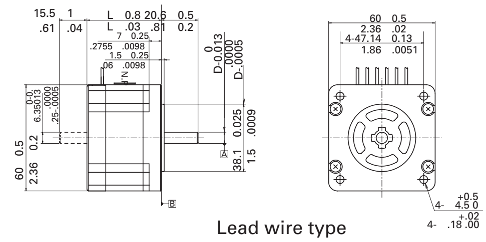
56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar	DB16H711	103H7121-57 0	41.8 1.65	Lead wire
	DB16H713	103H7123-57 0	53.8 2.12	Lead wire
	DB16H716	103H7126-57 0	75.8 2.98	Lead wire
		103H7121-56 0	41.8 1.65	Lead wire
		103H7121-58 0	41.8 1.65	Lead wire
		103H7123-56 0	53.8 2.12	Lead wire
		103H7123-58 0	53.8 2.12	Lead wire
		103H7126-56 0	75.8 2.98	Lead wire
		103H7126-58 0	75.8 2.98	Lead wire
		103H7128-56 0	94.8 3.73	Lead wire
		103H7128-57 0	94.8 3.73	Lead wire
		103H7128-58 0	94.8 3.73	Lead wire

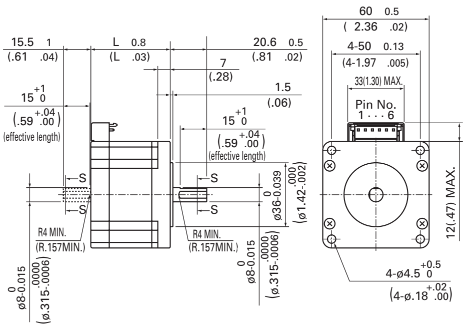
60mm 2.36inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH1601-04 0	42 1.65	Lead wire
		SH1602-04 0	54 2.13	Lead wire
		SH1603-04 0	76 2.99	Lead wire
Bipolar	DB16S161	SH1601-52 0	42 1.65	Lead wire
	DB16S162	SH1602-52 0	54 2.13	Lead wire
	DB16S163	SH1603-52 0	76 2.99	Lead wire

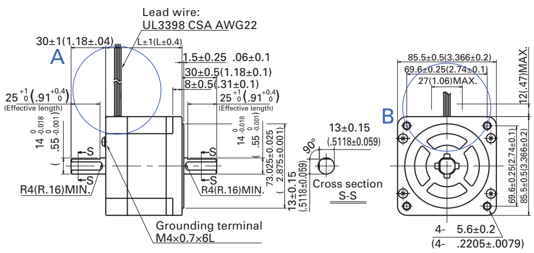
60mm 2.36inch

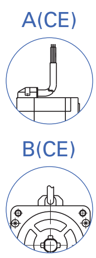


Connector type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H7821-01 0	44.8 1.76	Connector
		103H7821-04 0	44.8 1.76	Connector
		103H7821-07 0	44.8 1.76	Connector
		103H7822-01 0	53.8 2.12	Connector
		103H7822-04 0	53.8 2.12	Connector
		103H7822-07 0	53.8 2.12	Connector
		103H7823-01 0	85.8 3.38	Connector
		103H7823-04 0	85.8 3.38	Connector
		103H7823-07 0	85.8 3.38	Connector
Bipolar	DB16H781	103H7821-57 0	44.8 1.76	Connector
	DB16H782	103H7822-57 0	53.8 2.12	Connector
	DB16H783	103H7823-57 0	85.8 3.38	Connector
		103H7821-17 0	44.8 1.76	Connector
		103H7822-17 0	53.8 2.12	Connector
		103H7823-17 0	85.8 3.38	Connector

86mm 3.39inch





Lead wire type

CE type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH2861-04 1	66 2.6	Lead wire
		SH2862-04 1	96.5 3.8	Lead wire
		SH2863-04 1	127 5	Lead wire
Bipolar		SM2861-50 1	66 2.6	Lead wire CE
		SM2861-51 1	66 2.6	Lead wire CE
		SM2861-52 1	66 2.6	Lead wire CE
		SM2862-50 1	96.5 3.8	Lead wire CE
		SM2862-51 1	96.5 3.8	Lead wire CE
		SM2862-52 1	96.5 3.8	Lead wire CE
		SM2863-50 1	127 5	Lead wire CE
		SM2863-51 1	127 5	Lead wire CE
		SM2863-52 1	127 5	Lead wire CE

Model number	Shaft diameter(D)	Dcut thickness(L)
103H7121-	6.35	5.8
103H7123-		
103H7126-		
103H7128-	8	7.5

Model number	Shaft diameter(D)	Dcut thickness(L)
SH1601-	6.35	5.8
SH1602-		
SH1603-	8	7.5

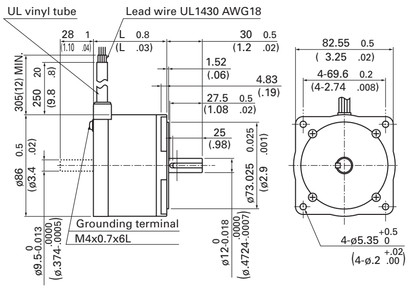
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	5
Double shafts	D	2

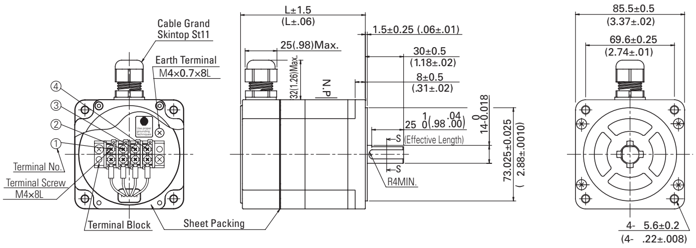
86mm 3.39inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		103H8221-62 0	62 3.31	Lead wire CE
		103H8222-63 0	92.2 5.51	Lead wire CE
		103H8223-63 0	125.9 7.72	Lead wire CE

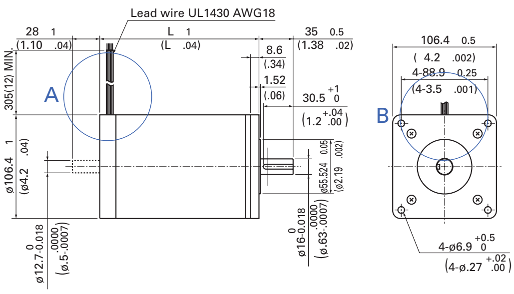
86mm 3.39inch

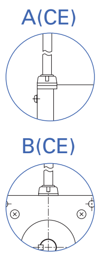


Terminal block type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Terminal block		SM2861-5066	97.9 3.9	Terminal block
		SM2861-5166	97.9 3.9	Terminal block
		SM2861-5266	97.9 3.9	Terminal block
		SM2862-5066	128.4 5.1	Terminal block
		SM2862-5166	128.4 5.1	Terminal block
		SM2862-5266	128.4 5.1	Terminal block
		SM2863-5066	158.8 6.3	Terminal block
		SM2863-5166	158.8 6.3	Terminal block
		SM2863-5266	158.8 6.3	Terminal block

106mm 4.17inch





Lead wire type

CE type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H89222-09 1	163.3 6.4	Lead wire
		103H89223-09 1	221.3 8.7	Lead wire
Bipolar		103H89222-52 1	163.3 6.4	Lead wire
		103H89223-52 1	221.3 8.7	Lead wire CE
		103H89222-63 1	163.3 6.4	Lead wire CE
		103H89223-63 1	221.3 8.7	Lead wire

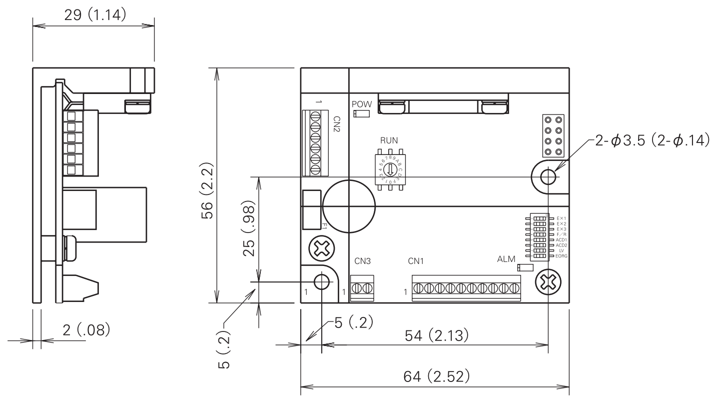
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Drivers Unit: mm inch



Safety standards

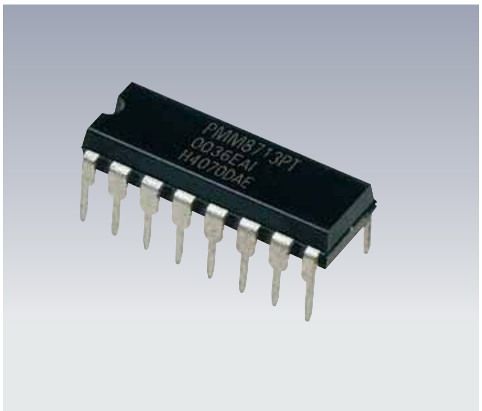
driver

	Acquired standards		File No.	Standard part
UL	UL		E179775	UL508C
	UL for Canada			
CE TÜV	Directives	Category	Name	Standard part
	Low-voltage directives			EN61010-1
	EMC directives	Emission	Terminal disturbance voltage	EN55011-A
			Electromagnetic radiation disturbance	EN55011-A
		Immunity	ESD Electrostatic discharge	EN61000-4-2
			RS Radio-frequency amplitude modulated electromagnetic field	EN61000-4-3
			Fast transionts	EN61000-4-4
			Surges	EN61000-4-6

SM series motor(UL/CE),H series motor(CE)

	Acquired standards	File No.
UL	UL	E208878
	UL for Canada	
CE	Standard category	Standard part
	Low-voltage directives	EN-60034-1
		IEC34-5
		(EN-60034-5)

EMC characteristics may vary depending on the configuration of the users control panel, which contains the driver or stepping motor, or the arrangement and wiring of other electrical devices.
Parts for EMC noise suppression like noise filters and troidal type ferrite cores may be required depending on circumstances.
Validation test of F series driver has been performed for low-voltage EMC directives at TÜV TÜV product service for self-declaration of CE marking.



Universal controller IC for the 2-phase stepping motor drive

PMM8713PT

Characteristics

Universal controller :	The following 3 types of energization mode can be selected by switching at the energization mode switching terminal 1EX/1-2EX/2EX
Source voltage :	Vcc = 4.5 to 5.5V
High output current :	24mA MIN. sink, source
High noise margin :	Schmitt trigger circuit is incorporated for the all input terminals.
2 types of pulse input :	2 input mode CW, CCW input mode Pulse and direction mode CK, U/D input mode
Excited status verification monitor :	Outputs the monitor signal of the controller status.

Maximum Rating Ta=25

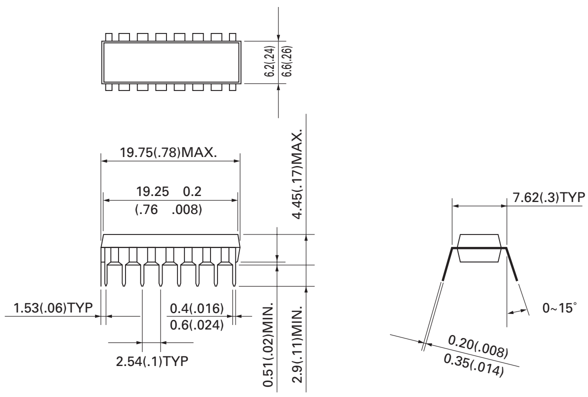
Item		Symbol	Rating	Unit
Source voltage		V_{CC}	-0.3 to 7	V
Output current n	H level	I_{OH}	-35	mA
	L level	I_{OL}	35	
Output current C_O,E_M	H level	I_{OH}		A
	L level	I_{OL}		
Input voltage		V_{IN}	-0.3 to V_{CC} +0.3	V
Input current		I_{IN}	10	mA
operating current		T_{opr}	-20 to 85	
Conservation temperature		T_{stg}	-40 to 125	

Recommended Operating Conditions Ta=-20 to 85

Item		Symbol	Rating			Unit
			MIN.	Standard	MAX.	
Source voltage		V_{CC}	4.5		5.5	V
Output current n	H level	I_{OH}	-24			mA
	L level	I_{OL}	24			
Output current C_O,E_M	H level	I_{OH}	-2			mA
	L level	I_{OL}	2			
Input voltage		V_{IN}	0		VCC	V

Dimensions Unit : mm inch

Pin No.	Name	Function
1.	C_U	Input pulse UP clock input
2.	C_D	Input pulse DOWN clock input
3.	C_K	Input pulse clock input
4.	U/D	Rotation direction conversion
5.	E_A	energization mode switching input
6.	E_B	energization mode switching input
7.	c	energization mode switching input
8.	V_{SS}	GND
9.	R	Reset input
10.	4	4 output
11.	3	3 output
12.	2	2 output
13.	1	1 output
14.	E_M	energization monitor output
15.	C_O	Input pulse monitor output
16.	V_{CC}	4.5 to 5.5V



Stepping Motors with Internal drivers
Set model
Stepping motor
Dimensions
IC for stepping motor

Electrical Characteristics

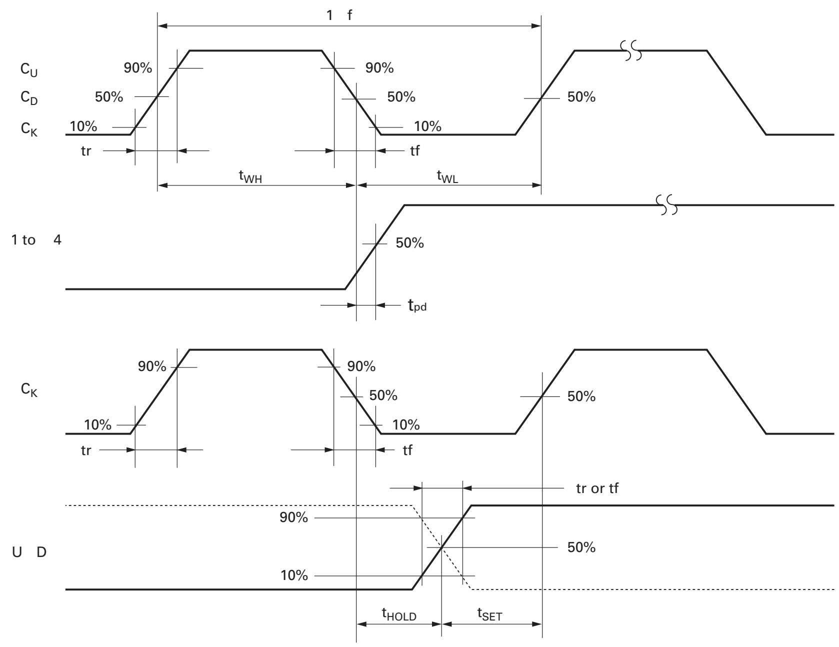
Direct current characteristics Ta = -20 to 85

Item		Symbol	Condition VCC[V]		Standard value MIN.	Standard	MAX.	Unit
Input voltage	H level	V_{IH}	5		3.5			V
	L level	V_{IL}	5				1.5	
Output voltage	H level	V_{OH}	5	V_H=5V V_L=0V IO_H=0	4.9			V
	L level	V_{OL}	5	V_H=5V V_L=0V I_{OH}=0			0.1	
Output current 1 to 4	H level	I_{OH}	5	V_H=5V V_L=0V V_{OUT}=2.4V	-24			mA
	L level	I_{OL}	5	V_H=5V V_L=0V V_{OUT}=0.4V	24			
Output current C_O, E_M	H level	I_{OH}	5	V_H=5V V_L=0V V_{OUT}=2.4V	-2			mA
	L level	I_{OL}	5	V_H=5V V_L=0V V_{OUT}=0.4V	2			
Input current		I	5			10		A
Static current consumption		I_{CC}	5	V_H=5V V_L=0V		1		mA

Switching characteristics Ta = -20 to 85

Item	Symbol	Condition VCC[V]a		Standard value MIN.	Standard	MAX.	Unit
MAX. clock frequency	f_{MAX}	5	tr tf 20ns, CL 50pF	1			MHZ
MIN. width of clock pulse	t_{WL}, t_{WH}	5	tr tf 20ns, CL 50pF			500	ns
MIN. width of reset pulse	t_{WR}	5	tr tf 20ns, CL 50pF			1000	ns
Time delay from clock input to output	t_{pd}	5	tr tf 20ns, CL 50pF			2000	ns
Set time	t_{SET}	5	tr tf 20ns, CL 50pF	0			ns
Holding time	t_{HOLD}	5	tr tf 20ns, CL 50pF	250			ns

Measured waveforms on switching time scale



Function Table

Input modes and rotation direction

Input mode	Input CU	CD	CK	U D	Rotation direction
2 input mode CW, CCW		L	L	L	CW
	L		L	L	CCW
Pulse and direction mode CK, U/D	L	L		H	CW
	L	L		L	CCW

Energization modes

Excitation mode	Input R	EA	EB	C
1 EX	H	H	L	H
1-2EX	H	H	H	H
2 EX	H	L	L	H

Universal controller IC for the 2-phase stepping motor drive

PMM8713PT

Energization Sequence

1EX

Pulse / Face	0 Reset	1	2	3	4
1	1	0	0	0	1
2	0	1	0	0	0
3	0	0	1	0	0
4	0	0	0	1	0
E_M	0	0	0	0	0
UP	→				
DOWN	←				

2EX

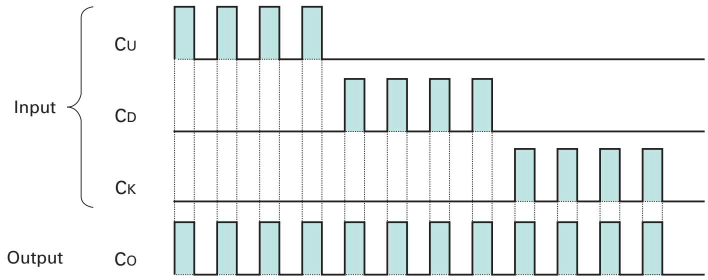
Pulse / Face	0 Reset	1	2	3	4
1	1	1	0	0	1
2	0	1	1	0	0
3	0	0	1	1	0
4	1	0	0	1	1
E_M	1	1	1	1	1
UP	→				
DOWN	←				

1-2EX

Pulse / Face	0 Reset	1	2	3	4	5	6	7	8
1	1	1	1	0	0	0	0	0	1
2	0	0	1	1	1	0	0	0	0
3	0	0	0	0	1	1	1	0	0
4	1	0	0	0	0	0	1	1	1
E_M	1	0	1	0	1	0	1	0	1
UP	→								
DOWN	←								

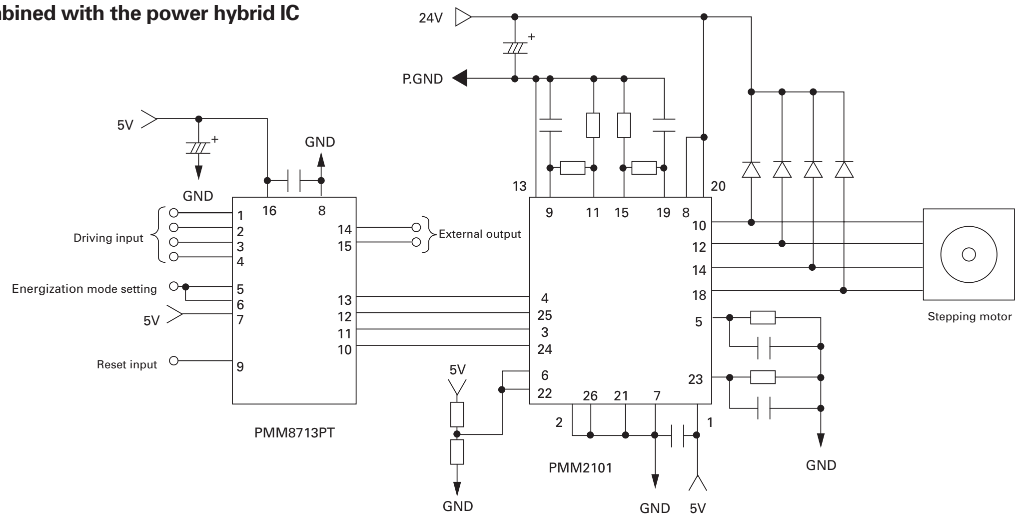
Reset after changing the energization mode.

Input Pulse Monitor



Example of Application Circuit Bipolar wiring motor

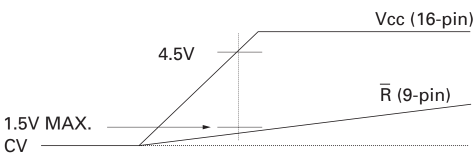
Combined with the power hybrid IC



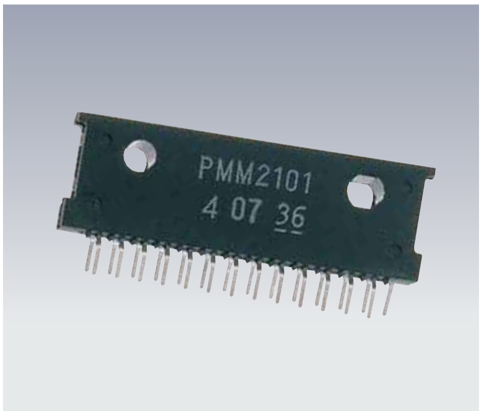
Energization mode setting

Pin No.	Terminal symbol	Input level	Motor operation
5,6	E_A, E_B	H	1-2EX
		L	2EX

The normal initial reset may not be performed during unstable VCC after turning the power ON. For reliable resetting, hold the R terminal 9-pin at the L level till the VCC becomes stable.



Power hybrid IC : Refer to page 47 for the PMM2101 specifications.
Refer to the PMM8713PT Operation Manual for other application circuit examples.



HIC for the 2-phase stepping motor

PMM2101
Full Step / Half Step
Bipolar

Characteristics

Enables high speed and high torque operation by using bipolar constant current switching method.
Enables compact driving circuit configuration with few of externally attached parts.
The overheat protection circuit is incorporated to assist the safety design.

Maximum Rating Tc=25

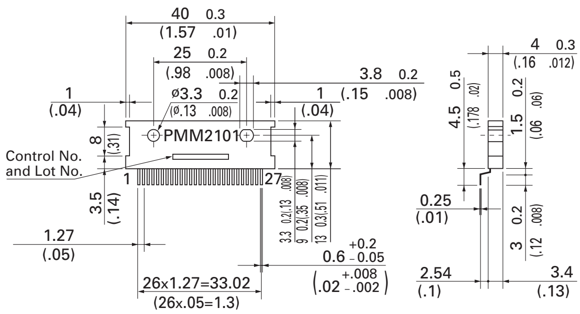
Item	Symbol	Rated value	Unit
Source voltage-1	V_{CC1}	8 to 60	V
Source voltage-2	V_{CC2}	0 to 7	V
Output current	I_O	1.4	A
Allowable loss	P_T	35 Tc 25	W
Thermal resistance	jc	3.57	W
	ja	25	W
Junction temperature	T_{jmax}	150	
Conservation temperature	T_{stg}	-40 150	

Recommended Operating Conditions Tc=25

Item	Symbol	Rated value	Unit
Source voltage-1	V_{CC1}	10 to 50	V
Source voltage-2	V_{CC2}	4.75 to 5.25	V
Output current	I_O	1.0	A
Oscillator frequency	F_C	20 to 27	kHz
Operation temperature	T_C	-25 to 85	

Dimensions Unit : mm inch

Pin No.	Name	Function
1.	V_{CC2}	Power terminal for controller section
2.	ENA A	Enable input terminal
3.	1	Arm drive input
4.	2	Arm drive input
5.	CR A	One shot time constant setting terminal
6.	V_{ref} A	Motor current setting terminal
7.	LG A	GND
8.	V_{CC1} A	Motor driver power terminal
9.	V_SA	Motor current detection terminal
10.	M1	Motor output
11.	R_S A	Detection resistor connecting terminal
12.	M2	Motor output
13.	PG	P.GND
14.	M3	Motor output
15.	R_S B	Detection resistor connecting terminal
16.	NC	
17.	NC	
18.	M4	Motor output
19.	V_S B	Motor current detection terminal
20.	V_{CC1} B	Motor driver power terminal
21.	LG B	GND
22.	V_{ref} B	Motor current setting terminal
23.	CR B	One shot time constant setting terminal
24.	3	Arm drive input
25.	4	Arm drive input
26.	ENA B	Enable terminal
27.	AL	Overheat alarm output terminal



Operational truth value table

ENA A(ENA B)	1(3)	2(4)	M1(M3)	M2(M4)
L	L	L	OFF	OFF
L	L	H	L	H
L	H	L	H	L
L	H	H	OFF	OFF
H			OFF	OFF

HIC for the 2-phase stepping motor

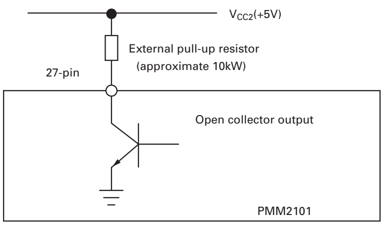
PMM2101 Full Step / Half Step

Electrical Characteristics Ta=25

Item	Symbol	Condition	Rating MIN.	Rating Standard	Rating MAX.	Unit
"H"level input voltage	V_{IH}	V_{CC2} 5V	2.7		V_{CC2}	V
"L"level input voltage	V_{IL}	V_{CC2} 5V	0		1.0	V
"H"level input current	I_{IH}	V_{CC2} 5V V_I 5V			10	A
"L"level input current	I_{IL}	V_{CC2} 5V V_I 0V			-50	A
Reference voltage (V_{ref}) input current	I_{ref}	V_{CC2} 5V V_{ref} 0V			-10	A
Current detection (V_s) input current	I_S	V_{CC2} 5V V_S 0V			-10	A
Forward direction voltage of FET diod	V_F	I_F 1A		1.3	1.5	V
High output saturating voltage	$V_{ce\ (sat)H}$	I_C 1A		1.0	1.4	V
Low output saturating voltage	$V_{ce\ (sat)L}$	I_C 1A		1.0	1.3	V
Low output saturating voltage	I_R	V_{CC1} 60V V_{OUT} 0V			10	A
		V_{OUT} 60V V_{RS} 0V			10	A
Power current to controller section	I_{CC2}	V_{CC2} = 5V during circuit operation			75	mA
Alarm terminal current	I_{alm}	V_{CC2} 5V V_{alm} 0.5V			2	mA
Overheat alarm operating temperature				125		
Overheat protection stop temperature				150		

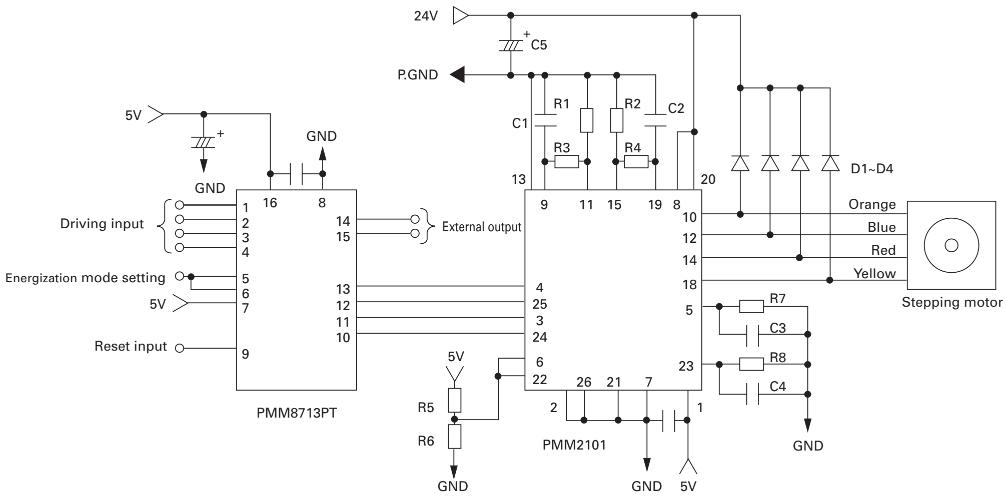
Overheat Alarm Output

The overheat protection circuit outputs an alarm signal at +125 at the internal junction in the IC, and activates motor excitation OFF at +150 .



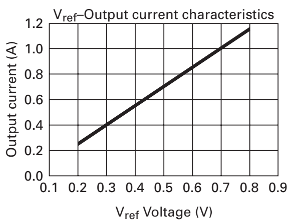
Transistor ON during alarming
Vce ON : 0.5V MAX.
Ialm : 2mA MAX.
The alarming signal output and overheat protection circuit recover automatically when the temperature lowers.

Example of Application Circuit



Refer to page 53 for the PMM8713PT specifications.
Recommended circuit constants for PMM2101

Applicable	Constant	Applicable	Constant
R1,R2	5W 0.68	C1, C2	1000pF
R3,R4	1 4W 3.9k	C3, C4	3300pF
R7,R8	1 4W 15k	C5	330 F



Determine on the R5 and R6 constants referring to the Vref-output current characteristics.
Determine on D1 to D4.
Peak reverse voltage 100V
Output current 1A
Reverse recovery time 100ns

HIC for the 2-phase stepping motor

PMM2301 Micro Step

Unipolar

Characteristics

Sine wave driven micro-step driver.
The current detection resistor is incorporated.
MOSFET is used for the power driving circuit to reduce heating.
Totally packaged to reduce parts for the peripheral circuit.
Enables selection from the 5 various excitation modes by the external bit signal.

Maximum Rating Tc=25

Item	Symbol	Condition	Rated value	Unit
Source voltage-1	$V_{CC1\ MAX.}$	V_{CC2} 0V	52	V
Source voltage-2	$V_{CC2\ MAX.}$	With no signal	7	V
Input voltage	$V_{in\ MAX.}$	Logic input terminal	7	V
Phase current	$I_{OH\ MAX.}$	0.5sec, 1pulse, V_{CC1} applied	4	A
Operating temperature on PCB	$T_{C\ MAX.}$		105	
Junction temperature	$T_{j\ MAX.}$		150	
Conservation temperature	T_{stg}		-40 to 125	

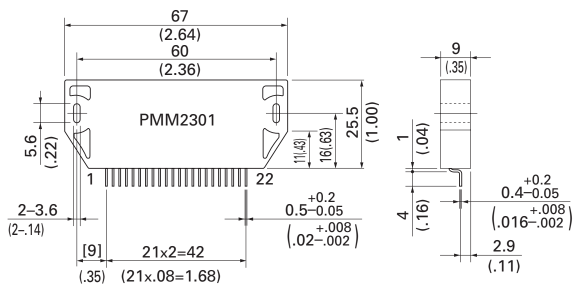
Recommended Operating Conditions Ta=25

Item	Symbol	Condition	Rated value	Unit
Source voltage-1	V_{CC1}	With signal	10 to 45	V
Source voltage-2	V_{CC2}	With signal	5.0 5	V
Input voltage	V_{IH}		0 to V_{CC2}	V
Phase current	I_{OH}	Duty 50	3	A
Clock frequency	Clock		DC to 50	kHz
Withstand voltage of phase driver	V_{DSS}		100	V

Dimensions unit: mm inch

Pin No.	Terminal name
1.	$\overline{B}$
2.	B
3.	P.GND A
4.	P.GND B
5.	A
6.	A
7.	V_{CC2}
8.	V_{ref}
9.	Mode 1
10.	Mode 2
11.	Mode 3

Pin No.	Terminal name
12.	V_{CC2}
13.	V_{CC2}
14.	Clock
15.	CW CCW
16.	Reset
17.	Return
18.	Enable
19.	M_{0I}
20.	M_{01}
21.	M_{02}
22.	GND



Each Terminal Function

Terminal name	Function	Functioning condition
V_{ref}	Motor current setting input	
Clock	Motor driving pulse input	Mode 3 = H level : Operates at rising edge Mode 3 = L level : Operates at rising and falling edges
CW / CCW	Motor rotation direction setting input	H level = CW rotation L level = CCW rotation
Reset	System reset	Reset "L"
Return	Forced return to phase origin	Forced shift to the origin of the present energization phase with Return = H
Enable	Power OFF input	Enable "L"
M_{0I}	Phase origin monitor output	L level output at the phase origin.
M_{01} M_{02}	Monitor output on phase energization status	Outputs level signal on the present phase energization status.

Phase coordinate	A phase	B phase	$\overline{A}$ phase	$\overline{B}$ phase
M01	H	L	L	H
M02	L	H	L	H

HIC for the 2-phase stepping motor

PMM2301 Micro Step

Energization Mode Table

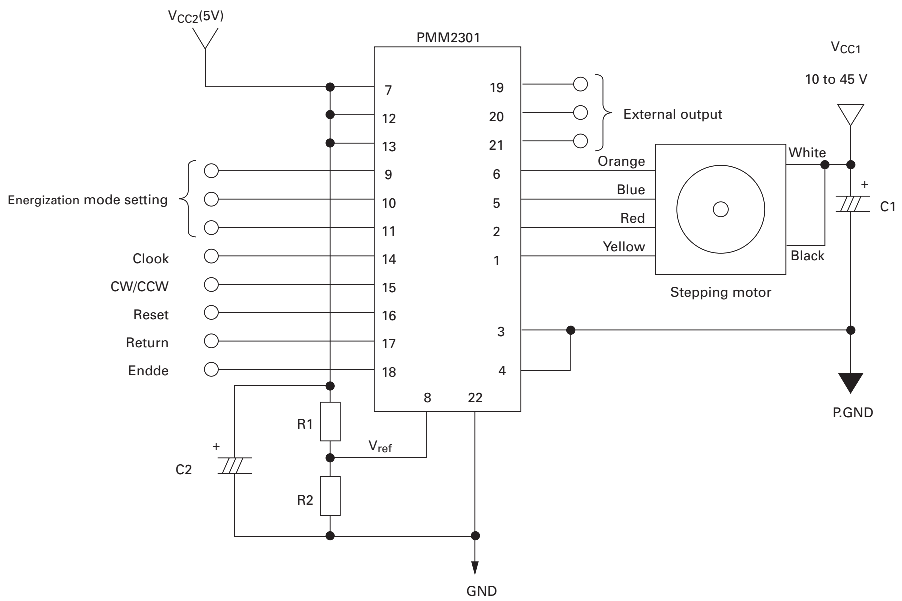
Input condition			Energization mode	1 step angle degree	Number of basic angle division
Mode1	Mode2	Mode3			
L	L	H	2EX	1.8	1/1
H	L	H	1-2EX	0.9	1/2
L	H	H	W1-2EX	0.45	1/4
H	H	H	2W1-2EX	0.225	1/8
H	H	L	4W1-2EX	0.1125	1/16

Conditioned on the Mode 3 = L, one pulse operation is performed at every rising and falling edge of the clock pulse. Accordingly, the operation becomes unstable if the driving pulse duty ratio deviates from 50%.

Electrical Characteristics Tc=25 Vcc1=24V Vcc2=5V

Item	Symbol	Condition	Rating MIN.	Standard	MAX.	Unit
V_{CC2} Power current	I_{CCO}	Enable = L		4.5	15	mA
Effective output current	I_{oave}	Each phase R/L = 3.5 /3.8mH, Vref = 0.6V	0.45	0.50	0.55	A
Forward direction voltage of FET diode	V_{df}	I_f 1A		1.2	1.8	V
Output saturating voltage	V_{sat}	RL = 7.5 I 3.0A		1.4	2.6	V
H level input voltage	V_{IH}	9 to 11, 14 to 18 pins	4.0			V
L level input voltage	V_{IL}	9 to 11, 14 to 18 pins			1.0	V
Input current	I_{IL}	9 to 11, 14 to 18 pins = GND level, Pull-up resistor 20k	125	250	510	A
V_{ref} input voltage	V_r	8-pin	0		V_{CC2} 2	V
V_{ref} input curren	I_r	8-pin		1		A
H level output voltage M_{0I} M_{01} M_{02}	V_{OH}	19 to 21 pins I = 3mA, I = -3mA	2.4			V
L level output voltage M_{0I} M_{01} M_{02}	V_{OL}	19 to 21 pins I = 3mA, I = -3mA			0.4	V
PWM frequency	Fc		37	47	57	kHz

Example of Application Circuit



Recommended circuit constants

C1	C2
100 F or over	10 F

Determine on the R1 and R2 constants based on the Vref voltage calculated from the following formula.
Vref V = Motor current adjusted value A/phase x 0.6

Safety Consideration

The drivers and stepping motors are the products designed to be used for the general industrial devices.
When using those, pay enough attention to the following points.

Read thoroughly the Operation Manual prior to placement, assembly and/or operation in order to use the product properly.

Refrain from modifying or processing the product in any way.

Consult with the distributor or professional experts for placement or maintenance services of the product.

In case of the following uses of the product, contact with us for the special care required to the operation, maintenance and management such as multiplexing the system, installing an emergency electric generator set, or so forth.

> 1 Use for the medical devices concerned with a fatal accident.
> 2 Use for trains, elevators, and so forth that are likely to cause an accident resulting in injury, damage or death.
> 3 Use in the computer system highly influential to the social life or the public systems.
> 4 Use in other devices highly influential to maintaining the human safety or the public functions.

In addition to the above, consult with us for use in such a vibration environment as automobile or transportation.

Read the Operation Manual thoroughly prior to the use (placement, operation, maintenance and inspection) to put the product in use properly.

Make yourself knowledgeable and familiarize with the devices, safety issues and cautions before handling the product.

After reading the Operation Manual or the like, keep it in the place where the users can refer to whenever necessary.

Indication by Warning Label on the product

Either or all of the following indications are given by the Warning Labels depending on the type of the driver or stepping motor.


This label is stuck near the high voltage part such as the electrically charged or cover-protected section, warning that the place where it is likely to cause an electric shock.


This label is stuck on the place where the driver or stepping motor body should be easily acknowledged, warning that it is likely to cause burns from high temperature.

This label is stuck near the GND terminals of the driver or stepping motor for which grounding is required, suggesting that the terminals should be actually grounded.

This label is stuck for the driver or stepping motor to which the power source is applied in the voltage exceeding the safety standard, drawing attention against the electric shock.

Safety ranks of the cautions

Following four ranks are provided.

DANGER Improper operations or use is most likely to result in serious injury or death.

CAUTION Improper operations or use is likely to result in average or minor injury, or in property damage.

> In spite of the cautions with the CAUTION label, it may cause serious results. Either the contents of the labels is describing important cautions to be followed inevitably.

PROHIBITED Indicates what shall not be done.

COMPULSORY Indicates what shall be done.

DANGER

General matters

1. Do not use the product in an explosive, flammable or corrosive atmosphere, watery place or near a combustible material. Doing so may cause injury or fire.

2. Have a person with expert knowledge for performing the transportation, placement, wiring, operation, maintenance or inspection of the product. Without such knowledge, it may cause an electric shock, injury or fire.

3. Do not work for wiring, maintenance servicing or inspection with the electric power on. Perform either of those five minutes after turning the power off, or otherwise, it may cause an electric shock.

4. When the protective functions of the product is activated, turn the power off immediately and eliminate the cause. If continuing the operation without eliminating the cause, the product may operate improperly and cause injury or a breakdown of the system devices.

5. Stepping motor may run out of order at the operating and stopping occasions, depending on the magnitude of the load. Put the product into use after confirming with the adequate trial test operation in the maximum load conditions that the product performs reliable operation. Doing otherwise may cause a breakdown of the system. (Should the product run out of order in the use to drive upward/downward, it may cause a fall of the load.)

6. Do not touch the internal parts of the driver. Doing so may cause an electric shock.

Wiring

7. Do not connect the stepping motor directly with the commercial power outlet. Doing so may cause an electric shock, injury or fire. The power shall be supplied to the stepping motor through the driving circuit.

8. Use the electric power source within the rated input voltage. Using otherwise may cause fire or an electric shock.

9. Connect the driver and stepping motor to the ground. Using without grounding may cause an electric shock.

10. Do not harm, forcibly put a stress, or load a heavy article on the cable or get it caught between the articles. Doing so may cause an electric shock.

11. Perform wiring with the power cable as instructed by the wiring diagram or the Operation Manual. Doing otherwise may cause an electric shock or fire.

Operation

12. Be sure not to touch the rotating part of the stepping motor during its operation. Touching it may cause injury.

13. Neither reach or touch the electric terminals while electric power is on. Doing so may cause an electric shock.

14. Never disconnect any of the connectors while electric power is on. Doing so may cause an electric shock and corruption.

General matters

1. Prior to placement, operation, maintenance servicing or inspection, be sure to read the Operation Manual and follow the instructions to perform those. Failure to follow the instructions may cause an electric shock, injury or fire.

2. Do not use the driver or the stepping motor outside the specified conditions. Doing so may cause an electric shock, injury or fire.

3. Do not insert a finger or a thing into the opening of the product. Doing so may cause an electric shock, injury or fire.

4. Do not use the damaged driver or stepping motor. Doing so may cause injury, fire or the like.

5. Use the driver and stepping motor in the designated combination. Using otherwise may cause fire or a trouble.

6. Be careful that the temperature rises in the operating driver, stepping motor or peripheral devices. Failure to be careful may cause a burn.

Unpacking

7. Unpack while confirming the ceiling. Failure to do so may cause injury.

8. Confirm if the product is the one having been ordered. Installing an incorrect product may cause a breakdown.

Wiring

9. Do not perform measurement of the insulation resistance or withstand insulation voltage of the product. Doing so may cause a breakdown. Instead, contact with us for such inspection.

10. Perform wiring conforming to the technical standards of electric facility or the internal rule. Doing otherwise may cause burning or fire.

11. Ensure that wiring has been correctly done. Operating without correct wiring may cause the stepping motor to run out of control and result in injury.

12. Take insulation process for the attached condenser or the external resistance connection terminals. Failure to do so may cause an electric shock.

Placement

13. Do not climb or attach a heavy article on the product. Doing so may cause injury.

14. Neither block nor stuff the aspiration/exhaust vent with a foreign particle. Doing so may cause fire.

15. Follow the instructions for the direction to place. Failure to do so may cause a trouble.

16. Keep a distance as instructed by the Operation Manual for the driver from the inner surface of the control console or other devices. Failure to do so may cause a trouble.

17. Place the product with a great care so as to prevent from the danger such as a tumble or a turnover.

CAUTION

18. Mount the product on an incombustible material such as metal. Doing otherwise may cause fire.

19. Confirm the rotating direction before connecting with the mechanical device. Failure to do so may cause injury or a breakdown.

20. Do not touch the motor output spindle (including the key slot and gears) with a bare hand. Doing so may cause injury.

Operation

21. The stepping motor is not equipped with any protective device. Take protective measures using an over-current protective relay, a ground fault interrupter, a protective device from excess temperature, and an emergency stopping device. Failure to do so may cause injury or fire.

22. Do not touch the product for a period after the power is on or has been turned off, since the driver and stepping motor remain in the high temperature. Doing so may cause burns. Especially the temperature rises considerably of the stepping motor depending on the operating conditions. Use the motor on the condition so that its surface temperature becomes 100°C or under.

23. Stop the operation immediately when an emergency occurs. Failure to do so may cause an electric shock, injury or fire.

24. Do not change adjustment to an extreme, for such a change results in the unstable operation. Doing so may cause injury.

25. When conducting the trial operation, make the stepping motor fixed firmly, and confirm the operation by disconnecting with the mechanical system before connecting with it. Failure to do so may cause injury.

26. When the alarm has been activated, eliminate the cause and ensure the safety to resume operation. Failure to do so may cause injury.

27. When the electric power recovers after the momentary interruption, do not approach the devices because the system may re-start operation by itself. (Set the system so as to secure the safety even when it re-start on such occasion.) Failure to do so may cause injury.

28. Confirm that the electric power supply is all proper conforming to the specifications. Failure to do so may cause a trouble.

29. The brake mechanism of the motor with the electro-magnetic brake is to hold the movable section and the motor position. Do not use it as a safety measure, or doing so may cause the breakdown of the system.

30. Fix the key firmly when operating the motor with key individually. Failure to do so may cause injury.

Maintenance services

31. Be careful when performing maintenance services or inspection about the temperature which rises highly in the driver and stepping motor frame. Failure to do so may cause burns.

32. It is recommended to replace the electrolytic condenser of the driver with a new one for securing the preventive measure after using for 5 years, the expected life in the average 40°C. The expected life of the fuse is 10 years in the average 40°C. Thus, the periodical replacement is recommended.

33. Contact with us for repair. If the product is disassembled by the user, it may put it out of action.

Transportation

34. Handle the product with care during transportation so as to prevent from the danger such as a tumble or a turnover.

35. Do not hold with the cable or the motor spindle. Doing so may cause a trouble or injury.

Retirement

36. When scrapping the driver or stepping motor, treat it for the general industrial waste.

PROHIBITED

Storage

1. Avoid the place exposed to rain or water drops, or in an environment with hazardous gas or liquid for storing the product. Failure to do so may cause a trouble.

Maintenance services

2. Do not assemble or repair the product. Doing so may cause fire or an electric shock.

General matters

3. Do not remove the rating plate.

COMPULSORY

Storage

1. Store the product within the specified conservation temperature and humidity in the place not exposed to the sun beam.

2. If the driver has been stored for a long period (3 years or longer for a guide), consult with us. The capacitance may have decreased with the electrolytic condenser due to the long period storage, and it may cause a trouble.

Operation

3. Install an external emergency stop circuit to turn the power off for the instant halt of operation.

4. Put the product into operation in the specified ambient temperature and humidity.

Transportation

5. Excess loading of the product on the carrier may cause the load to fall in pieces. Follow the instructions given outside the package.

Inquiry Check Sheet

For more information regarding any products or services described here in, please contact your nearest office listed on the back of this catalog.

To SANYO DENKI Co.,LTD.

Date

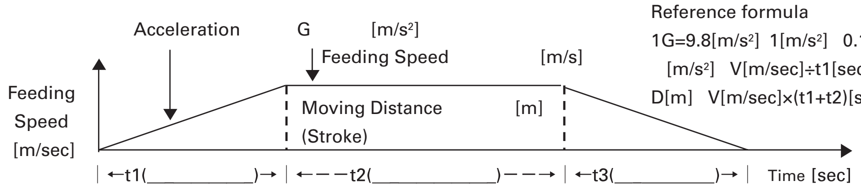
Company:

Department:

Name:

Tel: FAX:

E-mail:

	Item	Contents
1	Name of target equipment	Equipment name, category (transport, processing, test, other)
2	Name of servo axis	Axis name, axial mechanism (horizontal/vertical), brake mechanism (yes/no)
3	Current condition of above axis	Manufacturer Name ( ) Series Name ( ) Motor Capacity ( ) Hydraulic, Mechanical, or New System ( )
4	Positioning accuracy	± mm ± m
5	Operation pattern	 Reference formula 1G=9.8[m/s²] 1[m/s²] 0.1G [m/s²] V[m/sec]÷t1[sec] D[m] V[m/sec]×(t1+t2)[sec]
6	Mechanism	Ball-screw/screw-rotation type (horizontal), ball-screw/nut-rotation type (horizontal), rack and pinion (horizontal), belt/chain (horizontal), rotary table, roll feed, instability
7	Mechanical structure	WT table mass kg WL work mass kg WA mass of other drive parts kg WR rack mass kg WB belt/chain mass kg WC counterbalance mass kg Fa external force axial direction N Fb ball-screw preload N T roll pushing force N Dr1 drive-side roll diameter mm Dr2 follower-side roll diameter mm Lr1 drive-side roll length mm Lr2 follower-side roll length mm G reduction ratio JG speed-reducer inertia kg m² JC coupling inertia kg m² JN nut inertia kg m² JO other motor-axis conversion inertia kg m² Db ball-screw diameter mm Lb ball-screw axial length mm Pb ball -screw lead mm Dp pinion/pulley diameter mm Lp pinion axial length mm tp pully thickness mm Dt table diameter mm Dh table-support dianeter mm LW load shift from axis mm Ds table shaft diameter mm Ls table shaft length mm specific gravity of ball-screw/pinion/pulley/table-shaft material kg cm³ friction coefficient between sheet and shiliding-surface/support-section/roll 1 specific gravity of roll-1 material kg cm³ 2 specific gravity of roll-2 material kg cm³ internal friction coefficient of preload nut mechanical efficiency JL load inertia of motor-axis conversion kg m² TF friction torque of motor axis conversion N m Tu imbalance torque of motor axis conversion N m
8	Speed reducer	Customer-provided ( ) Sanyo denki standard(planet/spur/no-backlash-planet) other( )
9	Encoder type	Encoder type specified (yes / no) Yes:(incremental , optical absolute , optical absolute with incremental function, resolver absolute) Resolution
10	Input format	Position , velocity , torque , other ( )
11	Host equipment (controller)	Sequencer , laptop , customer-developed product , Sanyo dennki-provided , other ( )
12	Usage environment and other requirements	Cutting , clean-room use , anti-dust measures , other ( )
13	Estimated production	Single product: ( ) units/mouth ( ) units/year
14	Development schedule	Prototype period: ( ) Year ( ) Month Production period: ( ) Year ( ) Month
15	Various measures	Related documentation (already submitted; send later by mail) Visit/PR desired (yes / no) Meeting desired (yes / no)
16	Miscellaneous (questions, pending problems, unresolved issues, etc.)	

Precautions For Adoption

⚠ Cautions

Failure to follow the precautions on the right may cause moderate injury and property damage, or in some circumstances, could lead to a serious accident. Always follow all listed precautions.

⚠ Cautions

- Read the accompanying Instruction Manual carefully prior to using the product.
- If applying to medical devices and other equipment affecting people's lives, please contact us beforehand and take appropriate safety measures.
- If applying to equipment that can have significant effects on society and the general public, please contact us beforehand.
- Do not use this product in an environment where vibration is present, such as in a moving vehicle or shipping vessel.
- Do not perform any retrofitting, re-engineering, or modification to this equipment.
- The drivers and motors presented in this catalog are meant to be used for general industrial applications. If using for special applications related to aviation and space, nuclear power, electric power, submarine repeaters, etc., please contact us beforehand.

For any question or inquiry regarding the above, contact our Sales Department.

http://www.sanyodenki.co.jp

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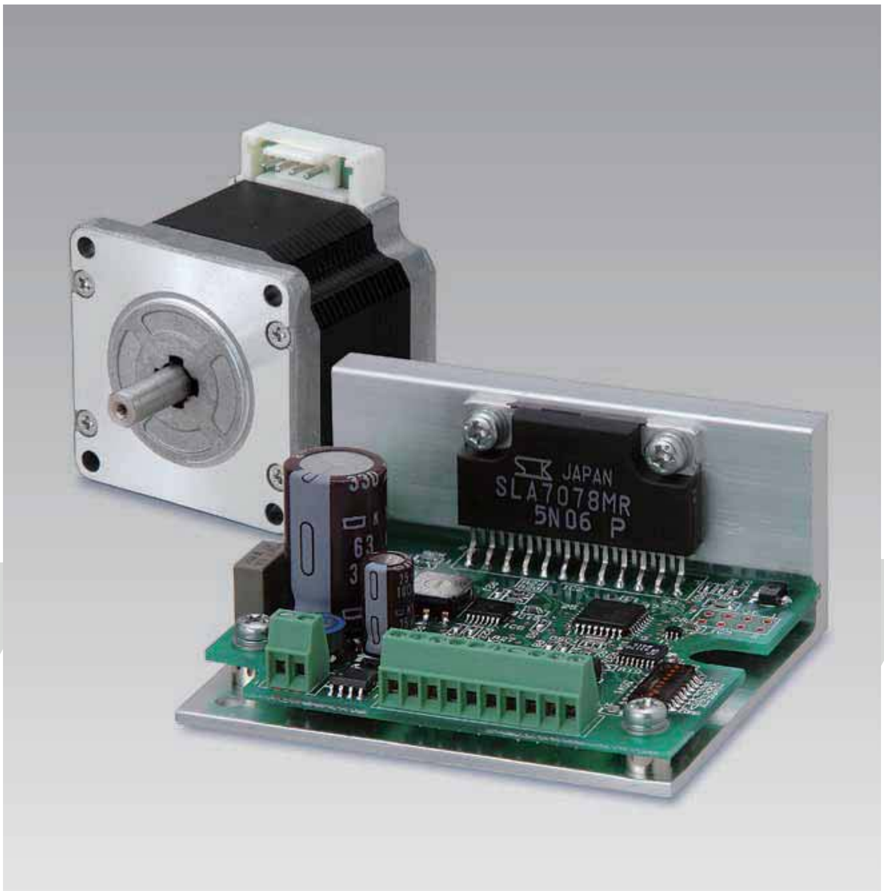
CATALOG No. 832-6 '09.3.N

SANMOTION

2-PHASE STEPPING SYSTEMS

F2



Ver.2

SANYO DENKI

SANMOTION
2-phase STEPPING SYSTEMS

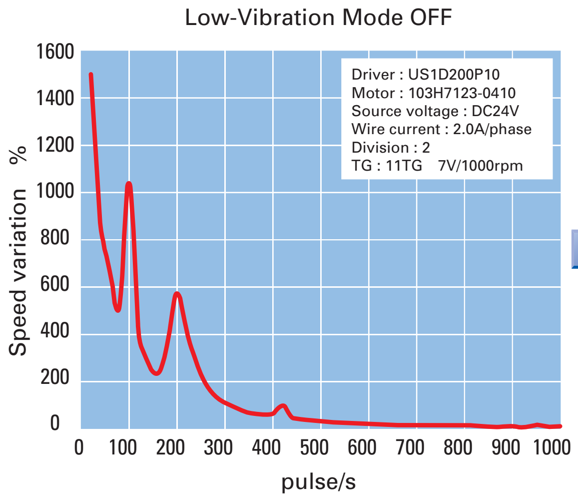
F2

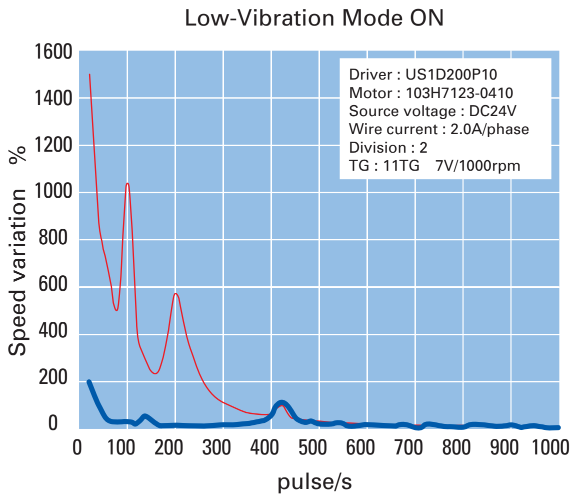
F series DRIVER
H series MOTOR
SH series MOTOR

F series DRIVER features

1 Low-vibration mode

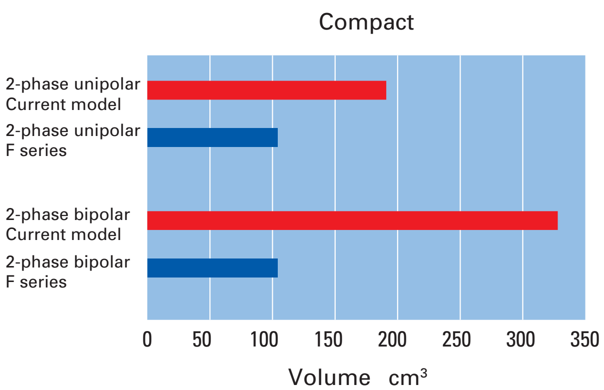
DC input

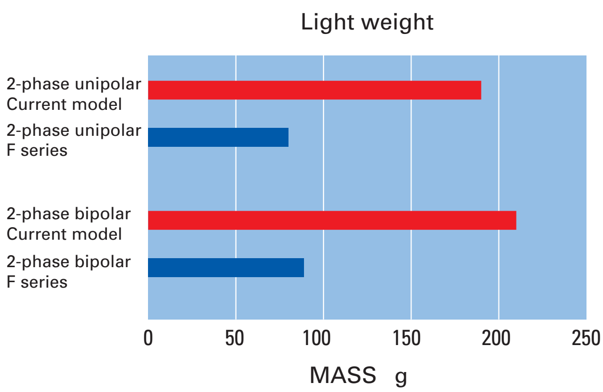




2 Compact / Light weight

DC input





Compliance with international standards

DC input

The standard specification SANMOTION F series stepping driver complies with UL and EN safety standards.Stepping motors complying with UL and EN standards are available upon request.

Set model

DC input

Stepping motors with integrated drivers

P.4

A driver incorporating a motion control function needed for
driving a motor and a 2-phase stepping motor were integrated into a single unit.

Motor flange size

□42 1.65inch □60 2.36inch

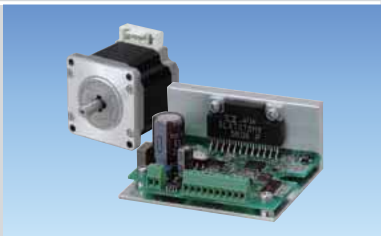
Unipolar standard standard model

P.13

The standard set includes a F series driver and a H or SH series motor.

Motor flange size

□28 1.10inch □42 1.65inch □56 2.20inch



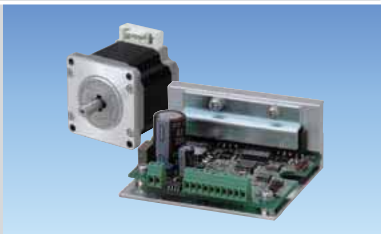
Bipolar standard standard model

P.14

The standard set includes a F series driver and a H or SH series motor.

Motor flange size

□28 1.10inch □42 1.65inch □50 1.97inch □56 2.20inch □60 2.36inch



Control method

How do you want to control the equipment?

The F series offers the choice of 3 different control methods

Program command control using PLC I/O

Network control using serial communication RS-485

Control using a pulse generator

Control using a pulse generator

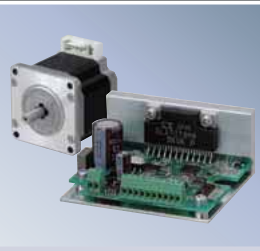
Drive Specification

DC input stepping motors with integrated drivers

Startup via I/O :
Initiate program containing speed, acceleration/deceleration, and travel distance commands stored in the driver via the I/O.

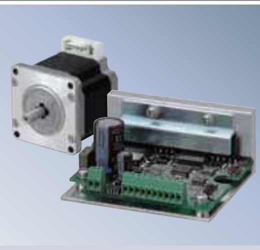
Startup via serial communication :
Control by sending data for speed, acceleration/deceleration, and travel distance commands via serial communication.

DC input unipolar standard



Motion is generated by pulse input commands from an upper-level controller.

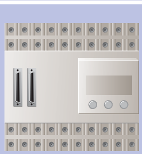
DC input bipolar standard



Motion is generated by pulse input commands from an upper-level controller.

Stepping Motors with Integrated drivers

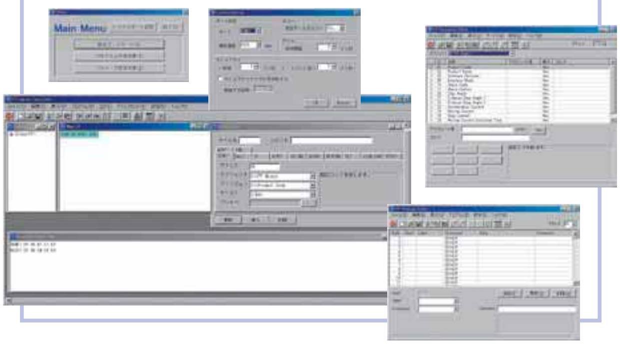
Host Devices



PLC

PLC and controllers are available as the host device.

Setup software : SFPAIW-01

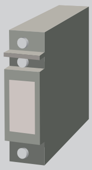


Bundled cable for input/output signal 300 mm

Bundled cable for DC power 350 mm

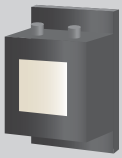
DC 24 V

Switching power supply



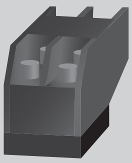
Converts AC power to DC power

Noise filter



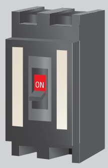
Filters out incoming noise from power line

Electromagnetic contactor



Switches driver power on/off. Use together with a surge protector.

Molded case circuit breaker



Protects the power line. Cuts off circuit in the event of overcurrent.

(t)
(r)

Single phase AC100 V to AC230 V

Stepping motors with integrated drivers

Features

1.Driver and motor are now integrated into a single unit.

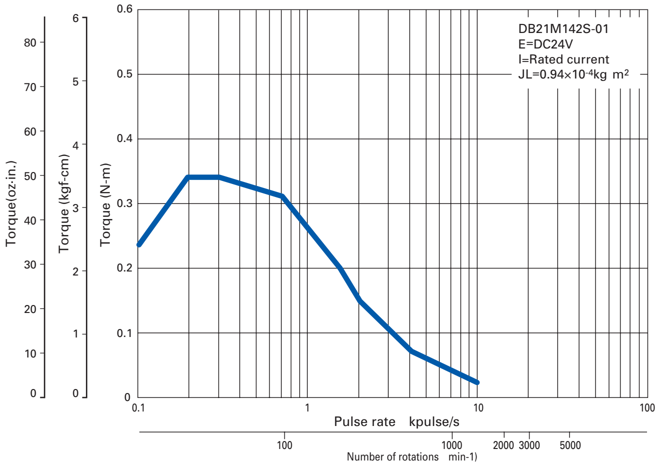
A driver incorporating a motion control function needed for driving a motor and a 2-phase stepping motor were integrated into a single unit for enabling a more compact installation space and less wiring.

2.Three types of operation modes can be selected to match the specific application.

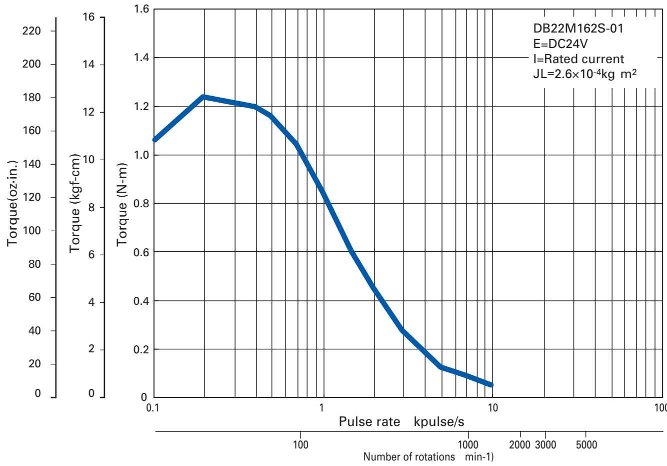
1 Control by command pulses
2 Program control by general-purpose I/O(Parallel)
3 Compliant with RS-485, half-duplex asynchronous communication

Pulse rate-torque characteristics

42mm 1.65inch



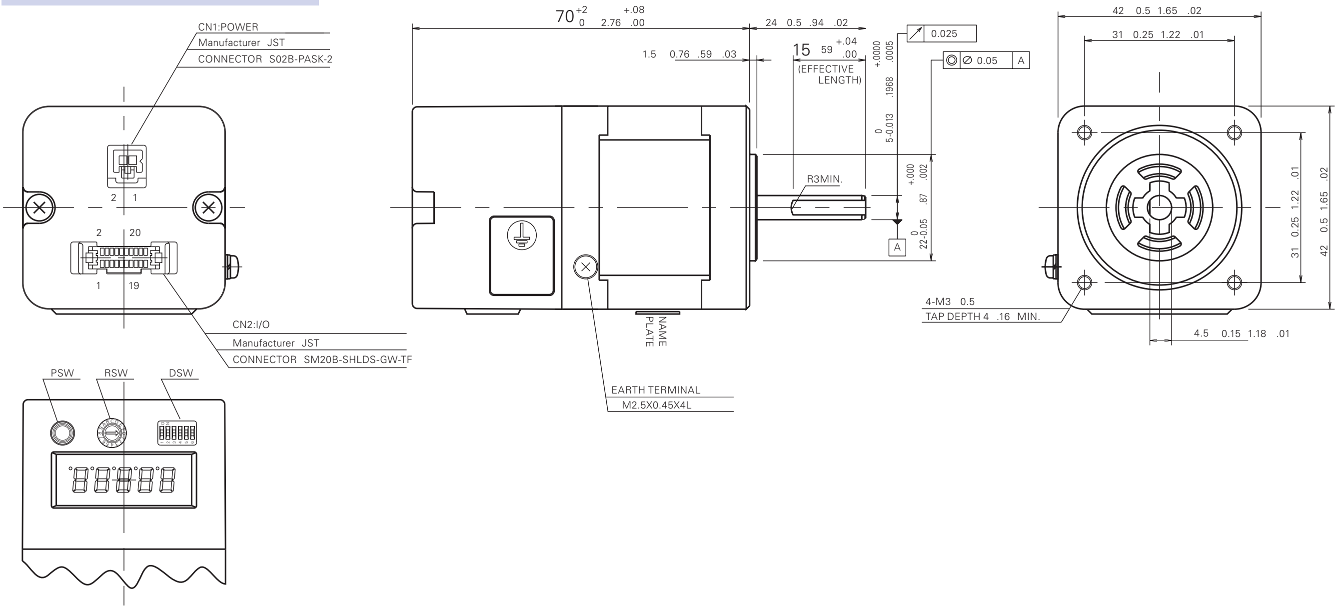
60mm 2.36inch



The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Dimensions Unit : mm inch

42mm 1.65inch

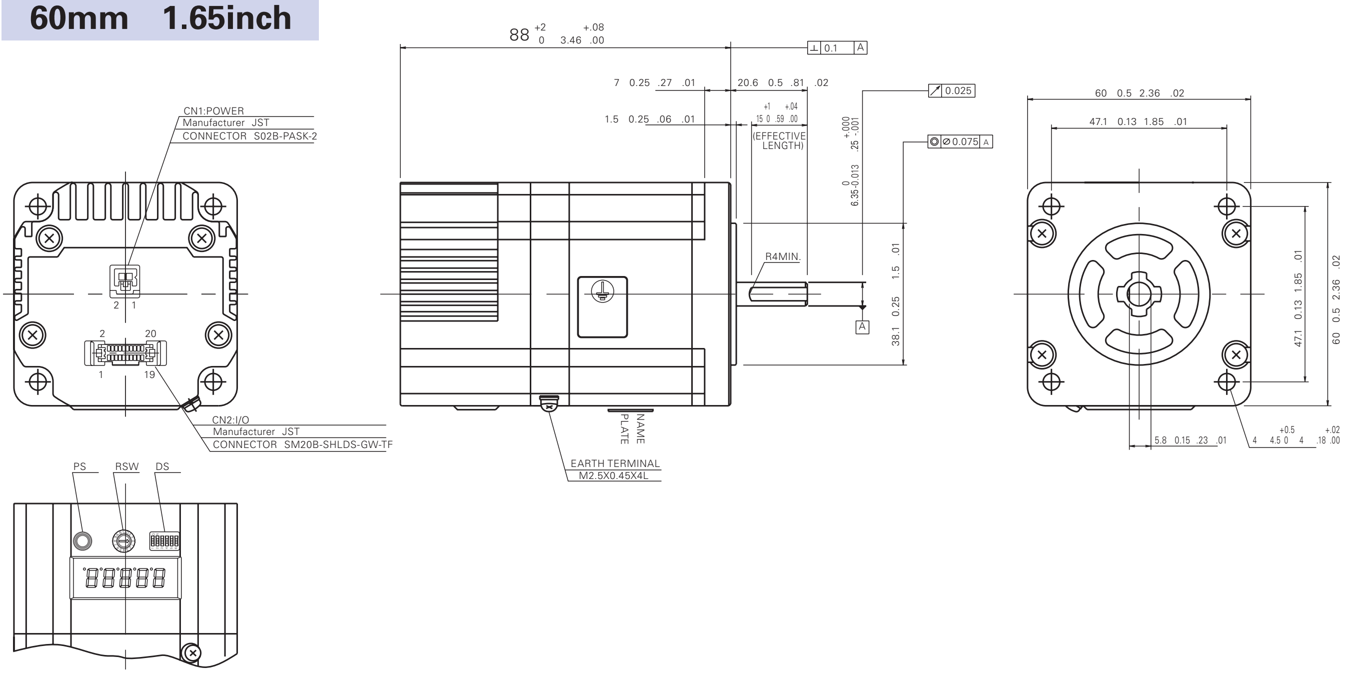


Specifications

Basic specifications	Part number Flange size		**DB21M142S-01 42**	**DB22M162S-01 60**
	Input source Note1		DC24 V 10	
	Getaway torque A		2 MAX.	3 MAX.
	Environment	Protection class	Class I	
		Operation environment	Installation category over-voltage category : II, pollution degree : 2	
		Applied standards	EN61010-1	
		Operating ambient temperature Note2	0 to +40	
		Conservation temperature	-20 to +60	
		Operating ambient humidity	35 to 85%RH no condensation	
		Conservation humidity	10 to 90%RH no condensation	
		Operation altitude	1000 m 3280 feet MAX. above sea level	
		Vibration resistance	Tested under the following conditions ; 4.9m/s2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each	
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .	
		Withstand voltage	Not influenced when 1500V AC is applied between power input terminal and cabinet for one minute.	
		Insulation resistance	10M ohm MIN. when measured with 500V DC megohmmeter between input terminal and cabinet.	
	Mass Weight		0.5kg 1.10lbs	0.87kg 1.92lbs
Function	Protection function		Against driver overheat	
	LED indicator		Alarm monitor	
I/O signals	Command pulse input signal Note3		Photo coupler input method, input resistance 220 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	Power down input signal PD		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	Step angle setting selection input EXT		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	FULL/HALF setting selection input F/H		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	EMG input signal		Photo coupler input method, input resistance 470 Input signal voltage : H = 4.0 to 5.5V, L = 0 to 0.5V	
	BUSY output signal		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	
	Phase origin monitor output signal MON		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	
	Alarm output signal AL		Open collector output by photo coupler Output signal standard : Vceo = 30V MAX., Ic = 20mA MAX.	

Note1 Note that the power voltage must not exceed 24VDC + 10% (26.4VDC).
Note2 If the driver is placed in a box, the temperature inside the box must not exceed this specified range.
Note3 The maximum input frequency is 250k pulse/s.

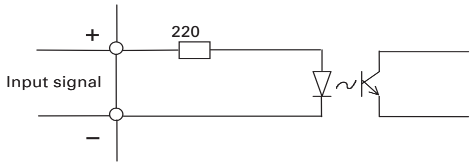
60mm 1.65inch



Input circuit configuration

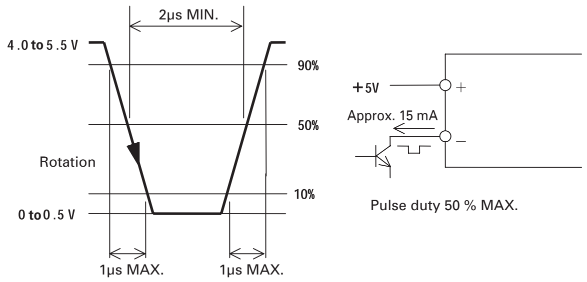
Input interface

Input circuit configuration

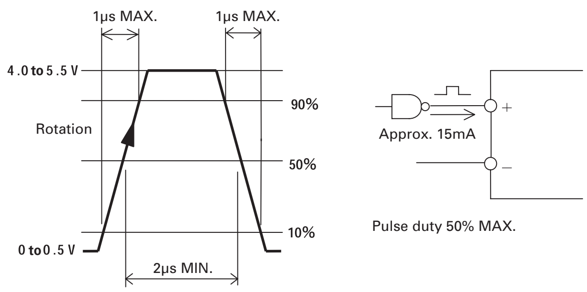


Input signal specifications

Negative logic

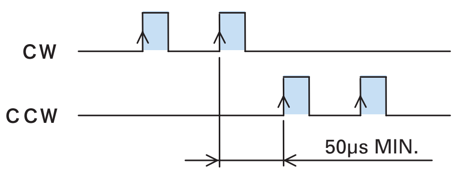


Positive logic



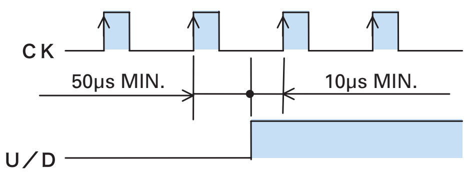
Timing of the command pulse

2-input mode CW, CCW



- The internal photo coupler turns ON within the and, at its falling edge to OFF, the internal circuit motor is activated.
- When applying the pulse to CW, turn OFF the CCW side internal photo coupler.
- When applying the pulse to CCW, turn OFF the CW side internal photo coupler.

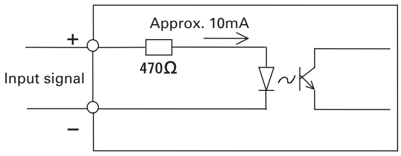
Pulse and direction mode CK, U/D



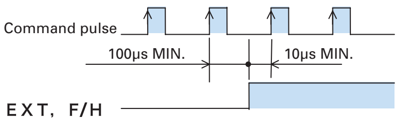
- The H level is input for and, at its rising edge to H level, the internal circuit stepping motor is activated.
- Switching the input signal U/D should be performed while the input level on the CK side is L .

Input circuit configuration

Input circuit configuration PD EXT F/H EMG



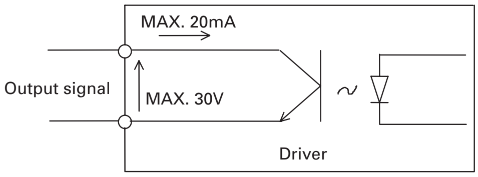
Timing of command pulse, step angle selection, and FULL/HALF selection input signal



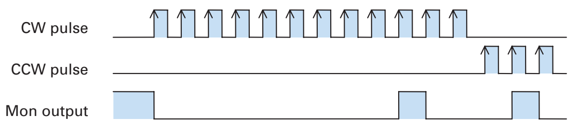
- Shaded area indicates internal photo coupler ON .
- EXT input signal
  EXT photo coupler ON enables a function by external F/H input signal.
  EXT photo coupler OFF enables the setting of a number of micro steps by main unit's rotary switch S.S.
- F/H input signal
  F/H photo coupler ON sets HALF step (2-division) operation.
  F/H photo coupler OFF sets FULL step (1-division) operation.
- Refer to switching EXT and F/H input signal in the [FULL/HALF input signal, command pulse, and step angle select].
- When switching the step angle by EXT and F/H input signal, the phase origin LCD may not turn ON and the phase origin monitor output may not output when stop. Refer to the MON output in the [Output Interface].

Output interface

Output circuit configuration BUSY MON AL

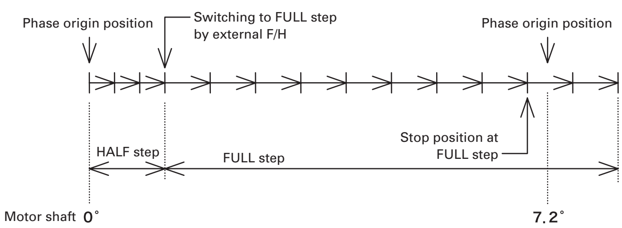


Mon output



- When the motor excitation phase is at the phase origin (power ON status), the photo coupler is turned ON , and the upper D.P of status LED turns on synchronously.
- Output from MON is set to on at every 7.2 degrees of motor output shaft from phase origin.

When changing the division setting by F/H input signal.



- When changing the motor division setting by the external input signal and the rotary switch as shown in the example below, the motor cannot stop where MON output signal can be output. Take this into consideration when using the MON output signal.

WIRING

Specification Summary of Input/Output Signals (Serial I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC 5V is input.
Alarm clear signal standard	ALMC	6	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
General-purpose input 1	IN1	6	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 1 on Internal photo coupler off General purpose input 1 off
Emergency stop input	EMG	6	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler of Emergency stop
Origin signal	ORG	6	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
+ direction overtravel signal	+OT	7	An overtravel signal in the + direction is input. Internal photo coupler on + direction overtravel not arrived Internal photo coupler off + direction overtravel arrived
General-purpose input 2	IN2	7	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 2 on Internal photo coupler off General purpose input 2 off
Emergency stop input	EMG	7	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	7	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	7	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
- direction overtravel signal	OT	8	An overtravel signal in the - direction is input. Internal photo coupler on - direction overtravel not arrived Internal photo coupler off - direction overtravel arrived
General-purpose input 3	IN3	8	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 3 on Internal photo coupler off General purpose input 3 off
Emergency stop input	EMG	8	emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	8	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	8	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
Emergency stop signal	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
General-purpose input 4c	IN4	9	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 4 on Internal photo coupler off General purpose input 4 off
Origin signal	ORG	9	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	9	alarms are cleared. Internal photo coupler off on Alarm clear
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
During program execution	PEND	10	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
Zone signal	ZONE	10	on when the current position is inside the coordinates that were set beforehand.
During program execution	PEND	11	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
During motor operation	BUSY	11	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Zone signal	ZONE	11	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	ALM	12	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor becomes non excited status.
Output signal common	OUT_COM	13	It is for the output signal common.
DATA+	DATA+	14	It is for the serial signal.
DATA	DATA	15	It is for the serial signal.

Specification Summary of Input/Output Signals (Pulse train I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
CW pulse input Standard	CW+ CW	1 2	When 2 input mode , Input drive pulse rotating CW direction.
Pulse train input	CK+ CK	1 2	When 1 input mode , Input drive pulse train for motor rotation.
CCW pulse input Standard	CCW+ CCW	3 4	When 2 input mode , Input drive pulse rotating CCW direction.
Rotational direction input	U/D+ U/D	3 4	When 1 input mode , Input motor rotational direction signal. Internal photo coupler ON CW direction Internal photo coupler OFF CCW direction
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC5V is input.
Power down input	PD	6	Inputting PD signal will cut off power off the current flowing to the Motor With dip switch select, change to the Power low function is possible . PD input signal on internal photo coupler on PD function is valid. PD input signal off internal photo coupler off PD function is invalid.
Step angle select input	EXT	7	FULL/HALF select input will become valid by inputting EXT signal. EXT input signal on internal photo coupler on External input signal F/H is valid EXT input signal off internal photo coupler off Main body rotary switch S.S is valid
FULL/HALF select input	F/H	8	When EXT input signal on internal photo coupler on , F/H input signal on internal photo coupler on HALF step F/H input signal off internal photo coupler off FULL step
Emergency stop	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Phase origin monitor output	MON	11	When the excitation phase is at the origin in power on it turns on. When FULL step, ON once for 4 pulses, when HALF step, ON once for 8 pulses.
Alarm output	ALM	12	When alarm circuits actuated inside the Driver, outputs signals to outside. Then the Stepping motor becomes unexcited status.
Output signal common	OUT_COM	13	It is for the output signal common.

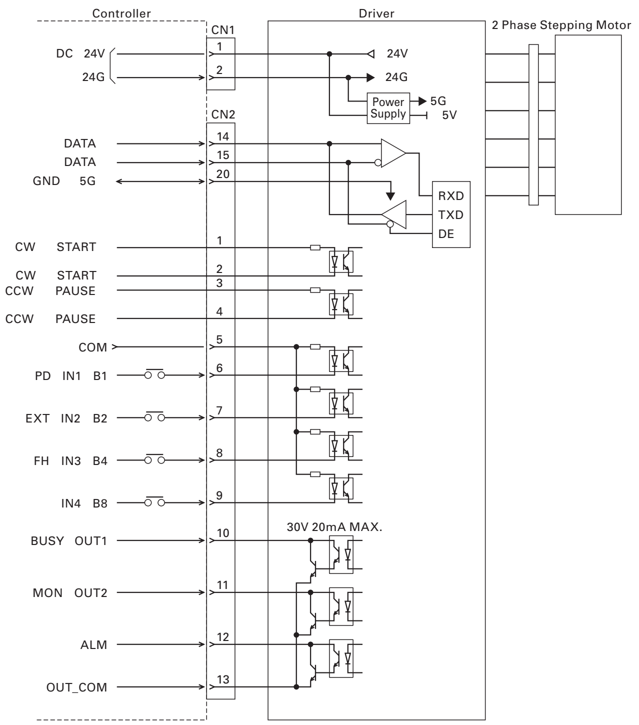
*As for the Motor rotational direction, CW direction is regard as the clockwise revolution by viewing the Motor from output shaft side.

Specification Summary of Input/Output Signals (Parallel I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
Program drive Start/Stop	START+ START-	1 2	Commands the start and stop of program driving. Internal photo coupler on Program driving start Internal photo coupler off Program driving stop
Program pause	PAUSE+ PAUSE-	3 4	When START signal on, a pause in program driving is commanded. Internal photo coupler on Program driving pause Internal photo coupler off Program driving pause release
General-purpose input common	+COM	6	Input signal common of the 6 to 9 pins DC5V is input.
Alarm clear signal standard	ALMC	6	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
General-purpose input 1	IN1	6	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 1 on Internal photo coupler off General purpose input 1 off
Program number selection bit 1	B1	6	The program number is selected along with other bits. Subordinate bit Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	6	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	6	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
+ direction overtravel signal	+OT	7	An overtravel signal in the + direction is input. Internal photo coupler on + direction overtravel not arrived Internal photo coupler off + direction overtravel arrived
General-purpose input 2	IN2	7	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 2 on Internal photo coupler off General purpose input 2 off
Program number selection bit 2	B2	7	The program number is selected along with other bits. The second bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	7	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	7	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	7	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
- direction overtravel signal	-OT	8	An overtravel signal in the - direction is input. Internal photo coupler on - direction overtravel not arrived Internal photo coupler off - direction overtravel arrived
General-purpose input 3	IN3	8	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 3 on Internal photo coupler off General purpose input 3 off
Program number selection bit 4	B4	8	The program number is selected along with other bits. The third bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Emergency stop input	EMG	8	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
Origin signal	ORG	8	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	8	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear

Signal	Reference Designation	Pin Number	Function Summary
Emergency stop signal	EMG	9	The emergency stop signal is input. Internal photo coupler on No emergency stop Internal photo coupler off Emergency stop
General-purpose input 4	IN4	9	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on General purpose input 4 on Internal photo coupler off General purpose input 4 off
Program number selection bit 8	B8	9	The program number is selected along with other bits. The fourth bit from the subordinate Internal photo coupler on Corresponding bit 1 Internal photo coupler off Corresponding bit 0
Origin signal	ORG	9	The origin signal used for the return to origin operation is input. Internal photo coupler on Origin signal on Internal photo coupler off Origin signal off
Alarm clear signal	ALMC	9	Recoverable alarms are cleared. Internal photo coupler off on Alarm clear
During motor operation	BUSY	10	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
During program execution	PEND	10	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
Zone signal	ZONE	10	Turns on when the current position is inside the coordinates that were set beforehand.
During program execution	PEND	11	The execution status of the program is output. Internal photo coupler on During program execution Internal photo coupler off Program execution complete
During motor operation	BUSY	11	The operation status of the motor is output. Internal photo coupler on During motor operation Internal photo coupler off During motor stop
Zone signal	ZONE	11	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	ALM	12	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor becomes non excited status.
Output signal common	OUT_COM	13	It is for the output signal common.
DATA+	DATA+	14	It is for the serial signal.
DATA	DATA	15	It is for the serial signal.

External Wiring Diagrams



SET UP

Function Select Dip Switch

The functions according to the specification can be selected with this Dip switch.
Confirm the ex-factory setting as follows.

	OFF / ON		
1 F/R		OFF	2 input mode (CW/CCW pulse)
2 LV		OFF	Micro step operation
3 PD		OFF	Power OFF
4		OFF	Phase origin excitation
5 I. SEL		OFF	Pulse stream I/F mode
6 S. SEL		OFF	

For pulse stream I/F mode

1 Input mode select F/R

Input pulse mode selection
This switch setting is only effective in pulse stream I/F mode.

F/R	Input pulse mode
ON	1 input mode CK,U/D
OFF	2 input mode CW,CCW

2 Low vibration mode select LV

Low vibration and smooth operation is enabled even by the rough resolution setting
e.g. 1 division, 2 division .
This switch setting is only effective in pulse stream I/F mode.
For parallel I/F mode and serial I/F mode, this is usually a low vibration operation.

LV	Operation
ON	Low vibration operation
OFF	Micro step operation

*When LV select is ON low vibration mode , operational process of driving pulse will be carried out inside the Driver. Therefore, the Motor movement delays for the time of 3.2ms pulse per input pulse. Note that depending upon the combined Motor, load,driving profile and etc, it may take a while until the shaft is adjusted when the Motor stops. In parallel I/F mode and serial I/F mode there is no delay

3 Power down select PD

Select the Motor winding current value when inputting the power down signal.This switch setting is only effective in pulse stream I/F mode.

PD	Motor winding current
ON	Current value by rotary switch STP Power Low
OFF	0A Power OFF

*PD function the setting selected by PD of the function select dip switch is enabled by PD input signal ON built-in photo coupler ON of Input/ Output signal connector CN2 . Power down signal input is prior to all the other current settings except for alarms. The operational status may not be maintained such as power swing due to output torque drop or lower operation due to Motor current OFF unexcited Motor . Pay extra attention to the input timing of the power down signal in addition that the security device should be installed to the machine.

4 Excitation select EORG

*By turning on the EORG, excitation phase when power OFF is saved.

5, 6 Operation mode selection I.SEL, S.SEL

The operation mode is selected.

I.SEL	S.SEL	Operation mode
OFF		Pulse stream I/F mode
ON	OFF	Parallel I/F mode
	ON	Serial I/F mode

*Change the operation mode selection switch after cutting off the driver s power supply.

For parallel I/F mode or serial I/F mode

The communication speed of serial communication is set.

Switch	Set value	Communication speed(bps)		
		9,600	19,200	38,400
F/R	OFF			
	ON			
LV	OFF			
	ON			
PD	OFF			
	ON			

*The setting change after the power supply is turned on is invalid. It does not function as a F/R, LV, and PD.
*The communication speed of pulse stream I/F mode is fixed at 9600bps.

Rotary switch(RSW) and the mode change switch(PSW)

For pulse stream I/F mode

When it selects the step angle, the driving current is selected, and stops the current is selected, set by combining rotary switch (RSW) and mode change switch (PSW).

1. Step angle select(S.S)

The divisions of the basic step angle (0.9 /step) when micro step driving can be set.

Gradation	0	1	2	3	4	5	6	7
Partition	1	2	2.5	4	5	8	10	20
Gradation	8	9	A	B	C	D	E	F
Partition	25	40	50	80	100	125	200	250

Ex-factory setting is at 1 (division 2)

*The step angle select switch (S.S) and the number of partitions become invalid by EXT input signal ON (built-in photo coupler ON) of Input/Output signal connector (CN2).

2. Driving current select(RUN)

The Motor operation current value can be selected.

Gradation	0	1	2	3	4	5	6	7
Motor current (%)	100 (rated)	95	90	85	80	75	70	65
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	60	55	50	45	40	35	30	25

Ex-factory setting is at 0 (rated value).

*When there is a sufficient extra motor torque, lowering the operation current value will be effective in the lower vibration. The Motor output torque is almost proportional to the current value. When adjusting the operational torque, confirm the sufficient operation margin and determine the Motor current value.

3. Current Select when Stop (STP)

The motor current value when stop and when power down input signal ON (power low function is selected by dip switch) can be selected.

Gradation	0	1	2	3	4	5	6	7
Motor current (%)	100 (rated)	95	90	85	80	75	70	65
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	60	55	50	45	40	35	30	25

Ex-factory setting is set at A (50%).

*The current setting when stop by STP becomes valid when the Motor stops (approximately 200ms after the last pulse input) and when power down input signal

For parallel I/F mode and serial I/F mode

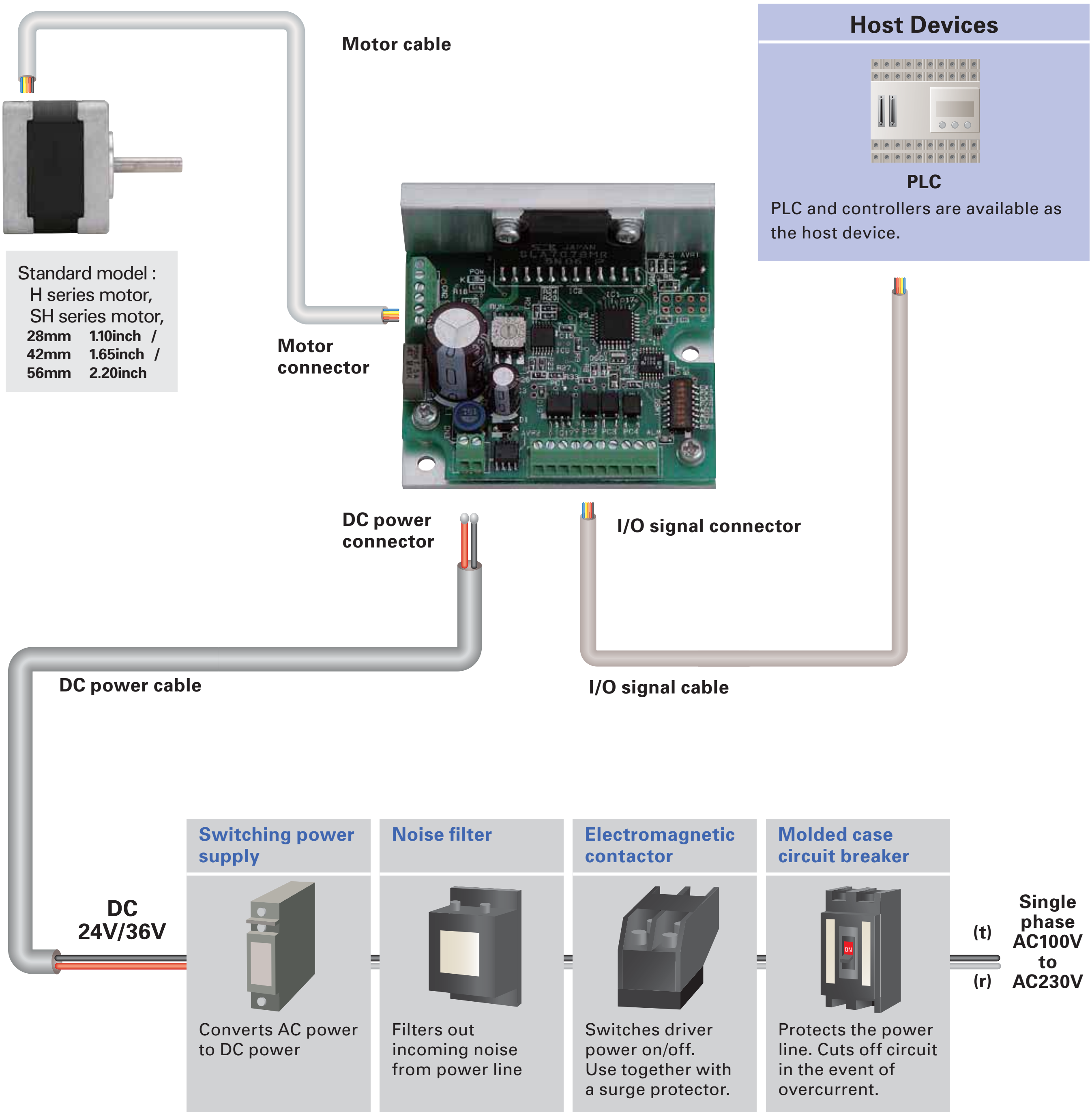
The slave bureau address of serial communications can be set.

RSW	Slave station address (HEX)
0	0
1	1
E	E
F	F

Ex-factory setting is set at 0

*The slave station address of the pulse stream I/F mode is fixed at 0.

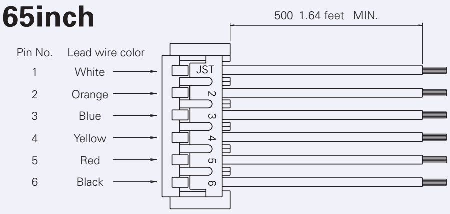
Unipolar standard



Bundled cable(42mm motors only)

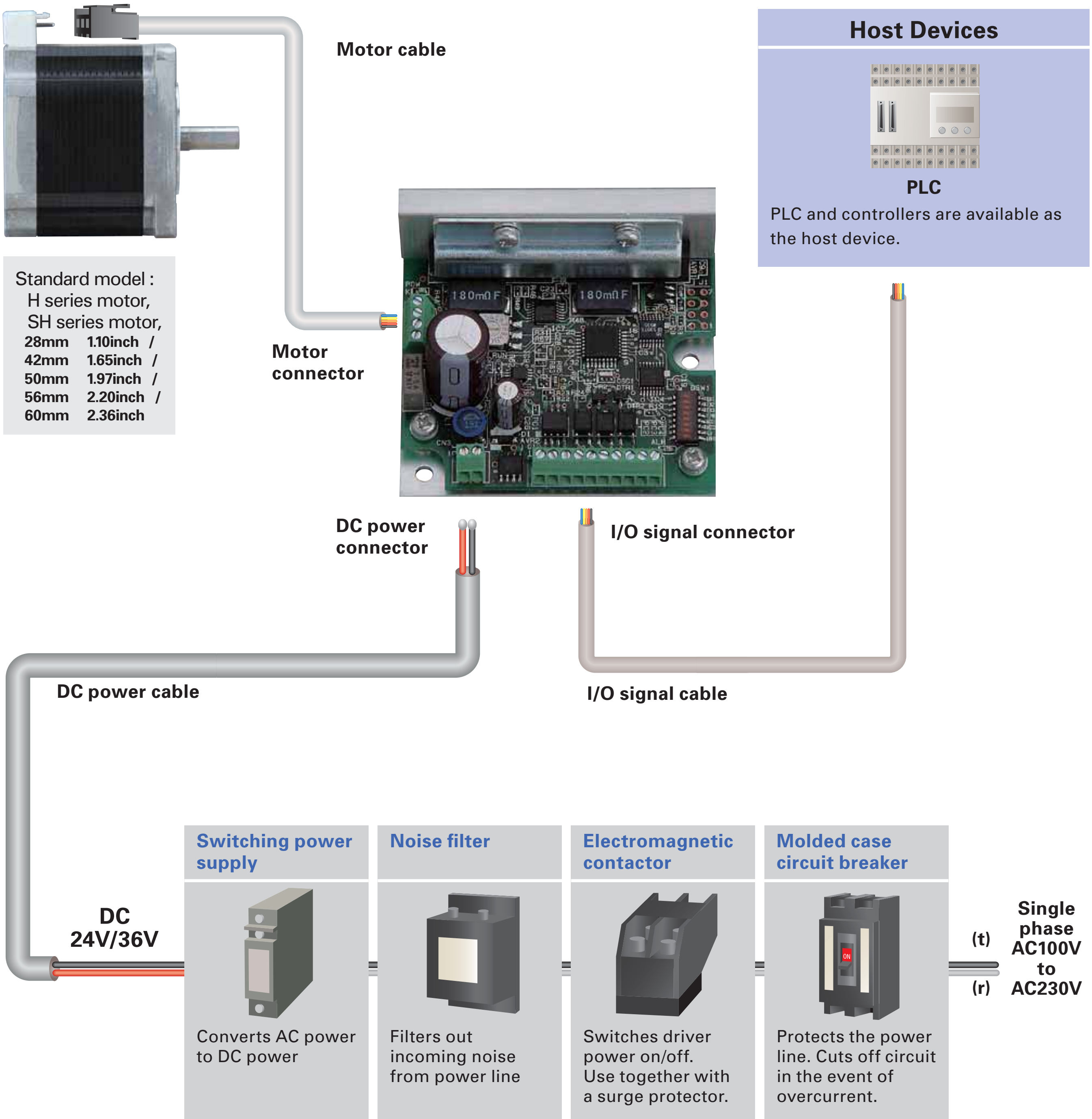
Motor cable

42mm 1.65inch



Lead wire	UL1430 AWG26
Housing	HER-6 BLACK J.S.T Mfg.Co.,Ltd
Pin	SEH-001T-P0.6 J.S.T Mfg.Co.,Ltd

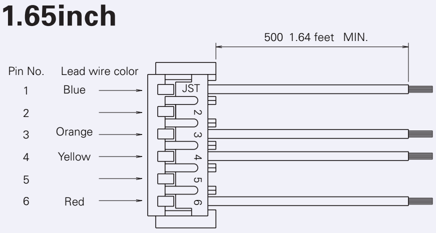
Bipolar standard



Bundled cable(42mm motors only)

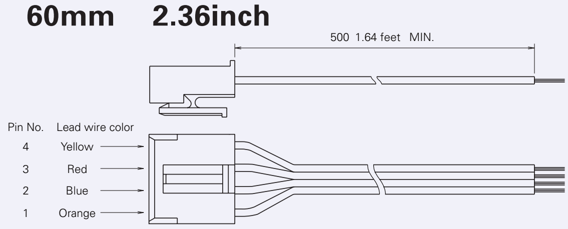
Motor cable

42mm 1.65inch



Lead wire	UL1430 AWG26
Housing	HER-6 BLACK J.S.T Mfg.Co.,Ltd
Pin	SEH-001T-P0.6 J.S.T Mfg.Co.,Ltd

60mm 2.36inch



Lead wire	UL1430 AWG22
Housing	VER-4N J.S.T Mfg.Co.,Ltd
Pin	SVH-21T-P1.1 J.S.T Mfg.Co.,Ltd

Part numbering convention

The following set part number specifies a system with an F series unipolar driver type code : US1D200P10 and a single shaft H series motor type code : 103H7121-0440 , 56 mm 2.20 inch square flange, and 41.8 mm 1.65 inch motor length.

D	U	1	6	H	71	1	S

Stepping motor shaft spec
S : Single shaft
D : Double shaft

Stepping motor total length

Code	Stepping motor flange size 28mm 1.10inch		42mm 1.65inch				50mm 1.97inch		56mm 2.20inch		60mm 2.36inch			
	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch	Type code	Motor length : mm inch
1	2281	32 1.26	5205	33 1.30	1401	33 1.30	6701	39.8 1.57	7121	41.8 1.65	7821	44.8 1.76	1601	42 1.65
2			5208	39 1.54	1402	39 1.54			7123	53.8 2.12	7822	53.8 2.12	1602	54 2.12
3							6703	51.3 2.02	7126	75.8 2.89	7823	85.8 3.38	1603	76 2.99
4			5210	48 1.89	1404	48 1.89								
5	2285	51.5 2.03												

Stepping motor flange size			Basic step angle
28 :	28mm	1.10inch	1.8
52 :	42mm	1.65inch	1.8
71 :	56mm	2.20inch	1.8
78 :	60mm	2.36inch	1.8
14 :	42mm	1.65inch	0.9
16 :	60mm	2.36inch	0.9

Stepping motor series name
H : H series
S : SH series

Rated current specification
4 : 1A/phase 5 : 1.2A/phase 6 : 2A/phase

Model

Driver Specification
U : 2-phase unipolar B : 2-phase bipolar

Power specification
D : DC

Combination list of 2-phase unipolar driver

System type	Motor flange size	Basic step angle	Set part number		Motor model number		Rated current
			Single shaft	**Double shaft**	Single shaft	Double shaft	
Standard model	**28mm 1.10inch**	1.8	**DU14S281S**	**DU14S281D**	SH2281-5271	SH2281-5231	1A
		1.8	**DU14S285S**	**DU14S285D**	SH2285-5271	SH2285-5231	1A
	42mm 1.65inch	1.8	**DU15H521S**	**DU15H521D**	103H5205-0440	103H5205-0410	1.2A
		1.8	**DU15H522S**	**DU15H522D**	103H5208-0440	103H5208-0410	1.2A
		1.8	**DU15H524S**	**DU15H524D**	103H5210-0440	103H5210-0410	1.2A
		0.9	**DU15S141S**	**DU15S141D**	SH1421-0441	SH1421-0411	1.2A
		0.9	**DU15S142S**	**DU15S142D**	SH1422-0441	SH1422-0411	1.2A
		0.9	**DU15S144S**	**DU15S144D**	SH1424-0441	SH1424-0411	1.2A
	56mm 2.20inch	1.8	**DU16H711S**	**DU16H711D**	103H7121-0440	103H7121-0410	2A
		1.8	**DU16H713S**	**DU16H713D**	103H7123-0440	103H7123-0410	2A
		1.8	**DU16H716S**	**DU16H716D**	103H7126-0440	103H7126-0410	2A

Combination list of 2-phase bipolar driver

System type	Motor flange size	Basic step angle	Set part number		Motor model number		Rated current
			Single shaft	**Double shaft**	Single shaft	Double shaft	
Standard model	**28mm 1.10inch**	1.8	**DB14S281S**	**DB14S281D**	SH2281-5771	SH2281-5731	1A
		1.8	**DB14S285S**	**DB14S285D**	SH2285-5771	SH2285-5731	1A
	42mm 1.65inch	1.8	**DB14H521S**	**DB14H521D**	103H5205-5240	103H5205-5210	1A
		1.8	**DB14H522S**	**DB14H522D**	103H5208-5240	103H5208-5210	1A
		1.8	**DB14H524S**	**DB14H524D**	103H5210-5240	103H5210-5210	1A
		0.9	**DB16S141S**	**DB16S141D**	SH1421-5241	SH1421-5211	2A
		0.9	**DB16S142S**	**DB16S142D**	SH1422-5241	SH1422-5211	2A
		0.9	**DB16S144S**	**DB16S144D**	SH1424-5241	SH1424-5211	2A
	50mm 1.97inch	1.8	**DB16H671S**	**DB16H671D**	103H6701-5040	103H6701-5010	2A
		1.8	**DB16H672S**	**DB16H672D**	103H6703-5040	103H6703-5010	2A
	56mm 2.20inch	1.8	**DB16H711S**	**DB16H711D**	103H7121-5740	103H7121-5710	2A
		1.8	**DB16H713S**	**DB16H713D**	103H7123-5740	103H7123-5710	2A
		1.8	**DB16H716S**	**DB16H716D**	103H7126-5740	103H7126-5710	2A
	60mm 2.36inch	1.8	**DB16H781S**	**DB16H781D**	103H7821-5740	103H7821-5710	2A
		1.8	**DB16H782S**	**DB16H782D**	103H7822-5740	103H7822-5710	2A
		1.8	**DB16H783S**	**DB16H783D**	103H7823-5740	103H7823-5710	2A
		0.9	**DB16S161S**	**DB16S161D**	SH1601-5240	SH1601-5210	2A
		0.9	**DB16S162S**	**DB16S162D**	SH1602-5240	SH1602-5210	2A
		0.9	**DB16S163S**	**DB16S163D**	SH1603-5240	SH1603-5210	2A

Standard model

F series driver + H or SH series motor

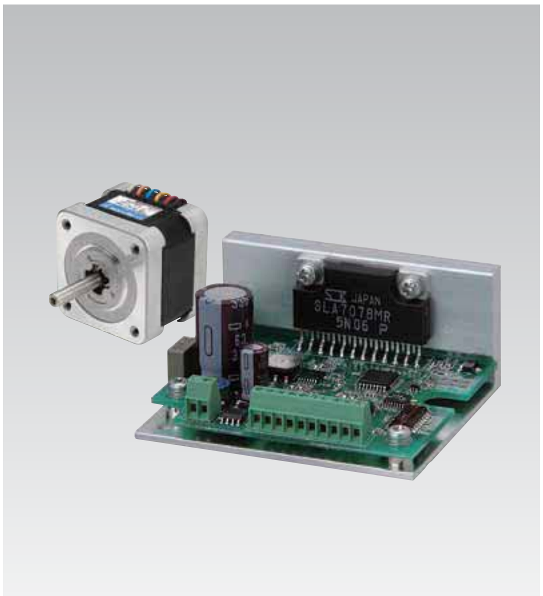
Unipolar

Motor flange size

□28 1.10inch | □42 1.65inch | □56 2.20inch

Size	Motor flange size		28mm 1.10inch /1.8	
	Motor length		32mm 1.26inch	51.5mm 2.03inch
Set part number	Single shaft		DU14S281S	DU14S285S
	Double shaft		DU14S281D	DU14S285D
Holding torque		N m oz in	0.055 7.79	0.115 16.28
Rotor inertia		10^{-4}kg m² oz in²	0.01 0.05	0.022 0.12
Mass Weight		kg lbs	0.11 0.24	0.2 0.44
Allowable thrust load		N lbs	3 0.67	3 0.67
Allowable radial load Note1		N lbs	42 9.44	49 11.02

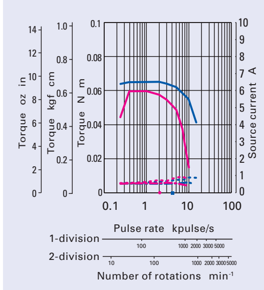
Note1 When load is applied at 1/3 length from output shaft edge.

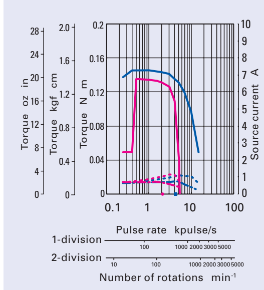


Operating current: 1A/phase

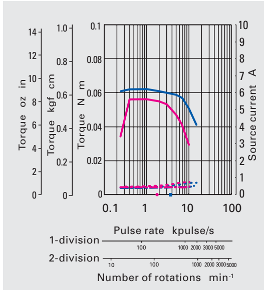
Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs / 2-division fs — Fs:Maximum self-start frequency when not loaded
1-division
2-division

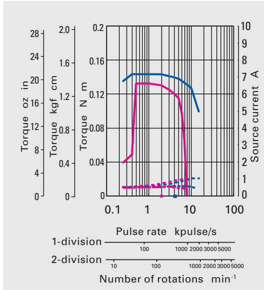
DC24V





DC36V



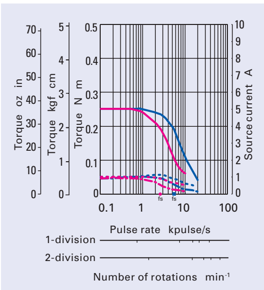


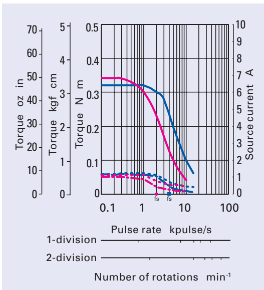
The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

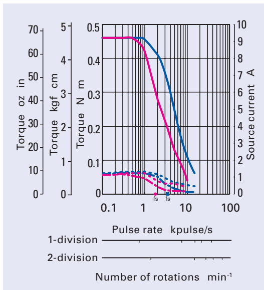
Size	Motor flange size		42mm 1.65inch /0.9		
	Motor length		33mm 1.30inch	39mm 1.54inch	48mm 1.89inch
Set part number	Single shaft		DU15S141S	DU15S142S	DU15S144S
	Double shaft		DU15S141D	DU15S142D	DU15S144D
Holding torque		N m oz in	0.2 28.32	0.29 41.07	0.39 55.23
Rotor inertia		10^{-4}kg m² oz in²	0.044 0.24	0.066 0.361	0.089 0.487
Mass Weight		kg lbs	0.24 0.53	0.29 0.64	0.38 0.84
Allowable thrust load		N lbs	10 2.25	10 2.25	10 2.25
Allowable radial load Note1		N lbs	30 6	30 6	30 6

Note1 When load is applied at 1/3 length from output shaft edge.

DC24V



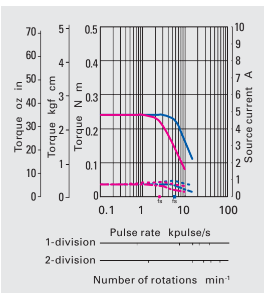


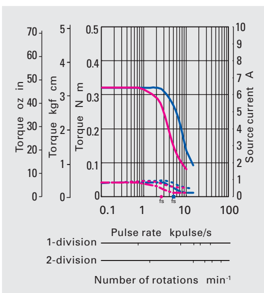


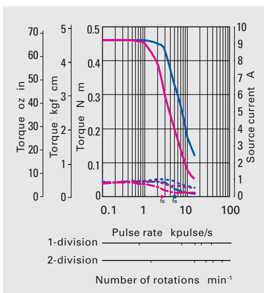
Operating current: 1.2A/phase

Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs / 2-division fs — Fs:Maximum self-start frequency when not loaded
1-division
2-division

DC36V



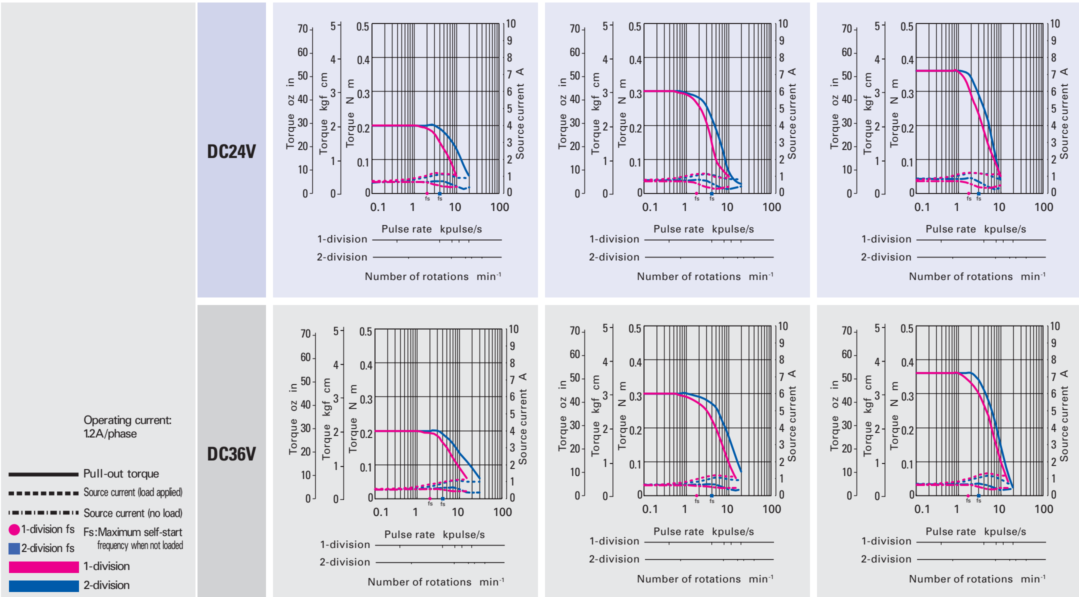




The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

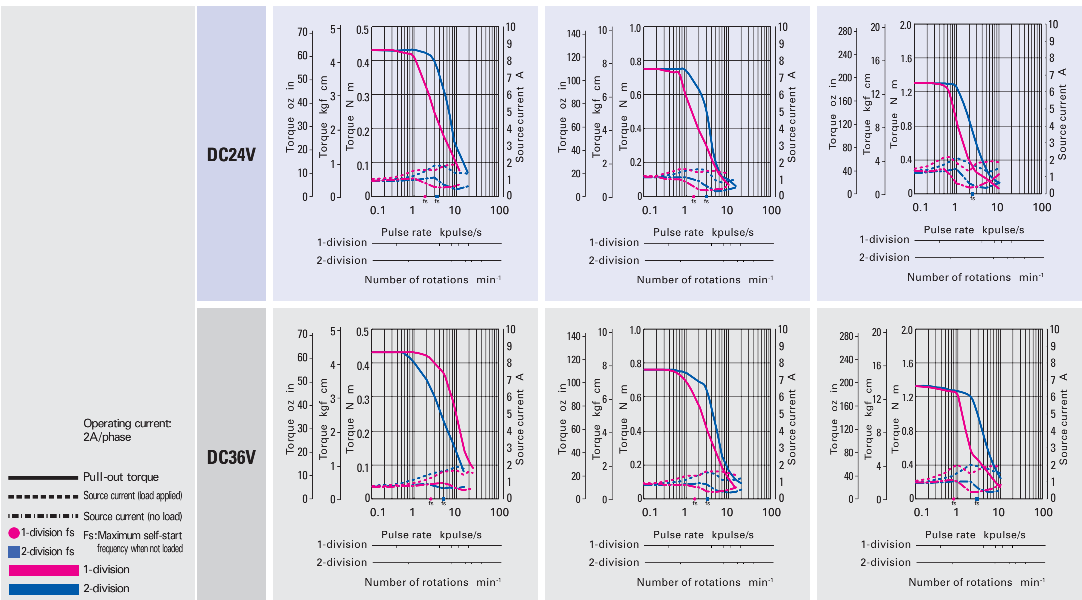
Size	Motor flange size	42mm 1.65inch /1.8		
	Motor length	33mm 1.30inch	39mm 1.54inch	48mm 1.89inch
Set part number	Single shaft	DU15H521S	DU15H522S	DU15H524S
	Double shaft	DU15H521D	DU15H522D	DU15H524D
Holding torque	N m oz in	0.2 28.32	0.3 42.48	0.37 52.39
Rotor inertia	10^{-4}kg m² oz in²	0.036 0.20	0.056 0.31	0.072 0.34
Mass Weight	kg lbs	0.23 0.51	0.29 0.64	0.37 0.82
Allowable thrust load	N lbs	10 2.25	10 2.25	10 2.25
Allowable radial load Note1	N lbs	30 6	30 6	30 6

Note1 When load is applied at 1/3 length from output shaft edge.



Size	Motor flange size	56mm 2.20inch /1.8		
	Motor length	41.8mm 1.65inch	53.8mm 2.12inch	75.8mm 2.98inch
Set part number	Single shaft	DU16H711S	DU16H713S	DU16H716S
	Double shaft	DU16H711D	DU16H713D	DU16H716D
Holding torque	N m oz in	0.39 55.23	0.83 117.5	1.27 179.8
Rotor inertia	10^{-4}kg m² oz in²	0.1 0.55	0.21 1.15	0.36 1.97
Mass Weight	kg lbs	0.47 1.04	0.63 1.39	0.98 2.16
Allowable thrust load	N lbs	15 3.37	15 3.37	15 3.37
Allowable radial load Note1	N lbs	71 15	71 15	71 15

Note1 When load is applied at 1/3 length from output shaft edge.



Standard model

F series driver + H or SH series motor

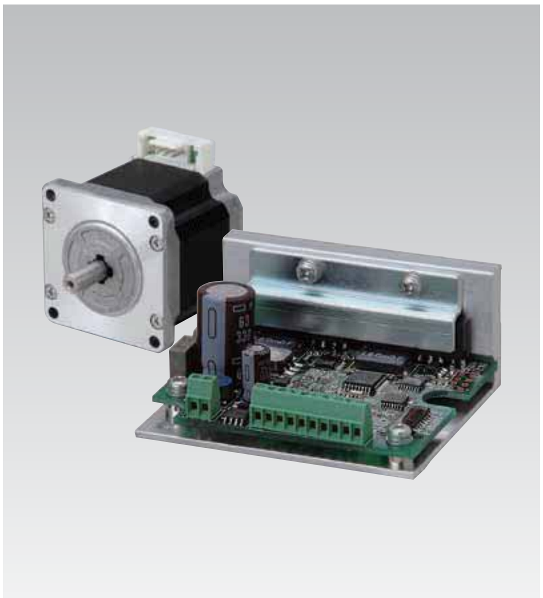
Bipolar

Motor flange size

□28 1.10inch | □42 1.65inch | □50 1.97inch | □56 2.20inch | □60 2.36inch

Size	Motor flange size		28mm 1.10inch /1.8	
	Motor length		32mm 1.26inch	51.5mm 2.03inch
Set part number	Single shaft		DB14S281S	DB14S285S
	Double shaft		DB14S281D	DB14S285D
Holding torque		N m oz in	0.07 9.91	0.145 20.53
Rotor inertia		10^{-4}kg m² oz in²	0.01 0.05	0.022 0.12
Mass Weight		kg lbs	0.11 0.24	0.2 0.44
Allowable thrust load		N lbs	3 0.67	3 0.67
Allowable radial load Note1		N lbs	42 9.44	49 9.44

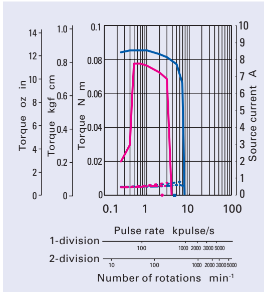
Note1 When load is applied at 1/3 length from output shaft edge.

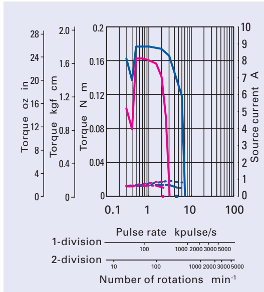


Operating current
28mm (1.10inch)/1.8 :1A/phase
42mm (1.65inch)/1.8 :1A/phase
42mm (1.65inch)/0.9 :2A/phase

Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs / 2-division fs — Fs:Maximum self-start frequency when not loaded
1-division
2-division

DC24V





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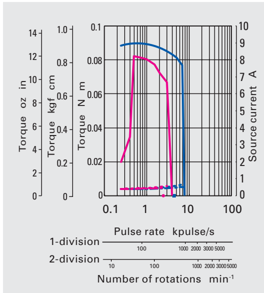
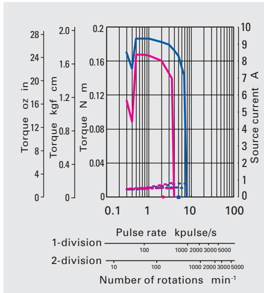




The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

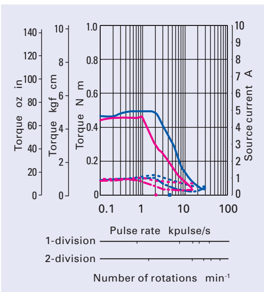
Size	Motor flange size		42mm 1.65inch /0.9	50mm 1.97inch /1.8		56mm 2.20inch /1.8
	Motor length		48mm 1.89inch	39.8mm 1.57inch	51.3mm 2.02inch	41.8mm 1.65inch
Set part number	Single shaft		DB16S144S	DB16H671S	DB16H673S	DB16H711S
	Double shaft		DB16S144D	DB16H671D	DB16H673D	DB16H711D
Holding torque		N m oz in	0.48 67.97	0.28 39.6	0.49 69.4	0.39 55.2
Rotor inertia		10^{-4}kg m² oz in²	0.089 0.487	0.057 0.31	0.118 0.65	0.1 0.55
Mass Weight		kg lbs	0.38 0.84	0.35 0.77	0.5 1.10	0.47 1.04
Allowable thrust load		N lbs	10 2.25	15 3.37	15 3.37	15 3.37
Allowable radial load Note1		N lbs	30 6	99 22	99 22	71 15

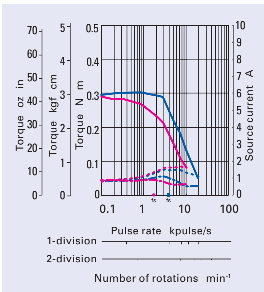
Note1 When load is applied at 1/3 length from output shaft edge.

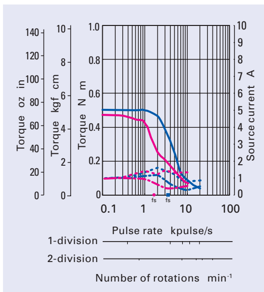
Operating current: 2A/phase

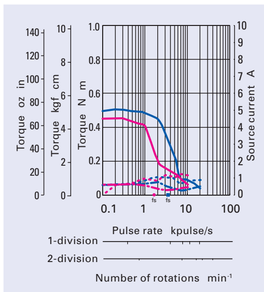
Pull-out torque
Source current (load applied)
Source current (no load)
1-division fs / 2-division fs — Fs:Maximum self-start frequency when not loaded
1-division
2-division

DC24V









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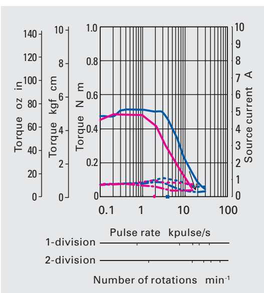
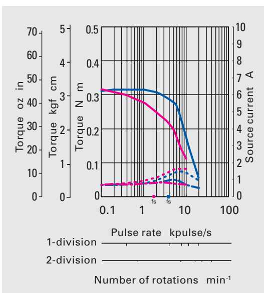
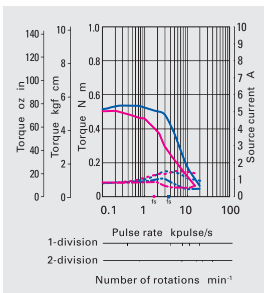
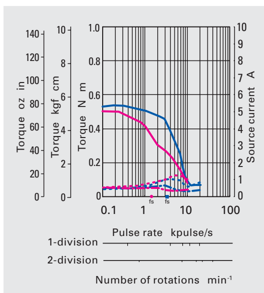


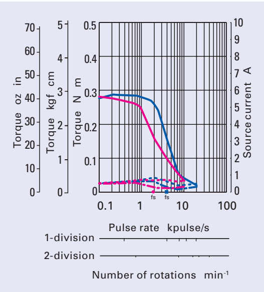
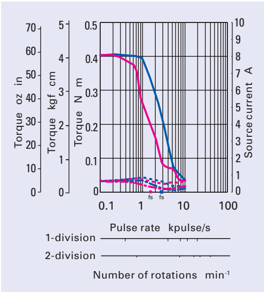
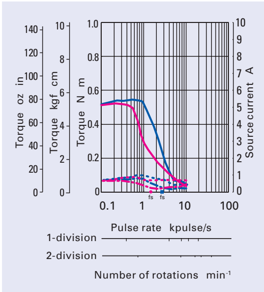
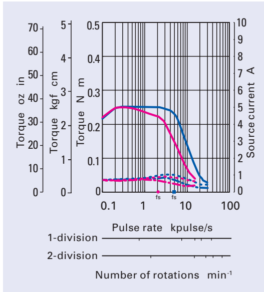
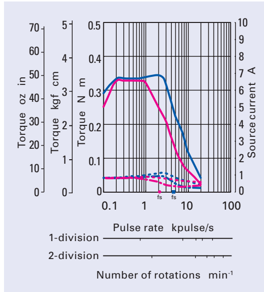
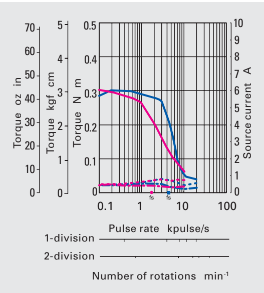
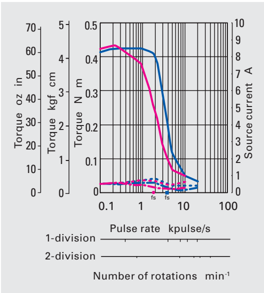
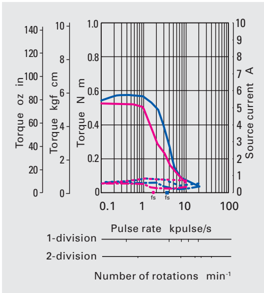
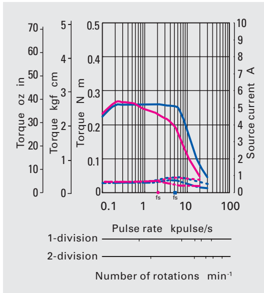
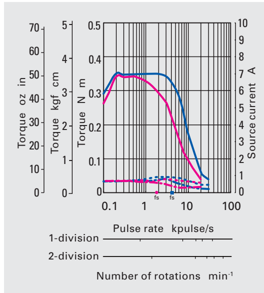




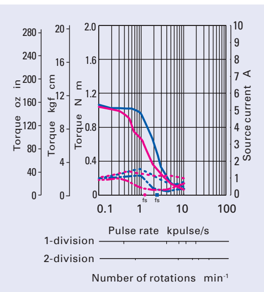
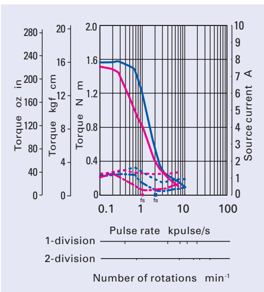
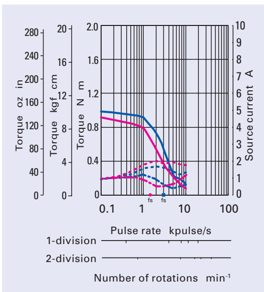
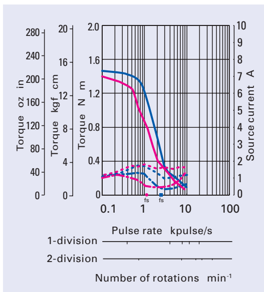
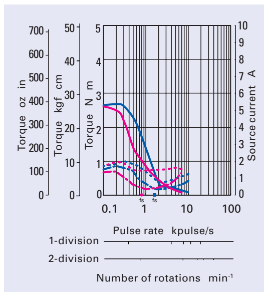
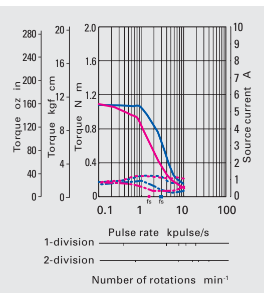
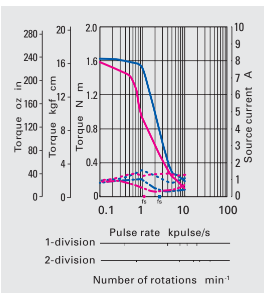
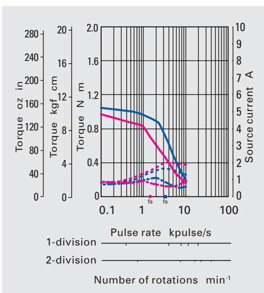
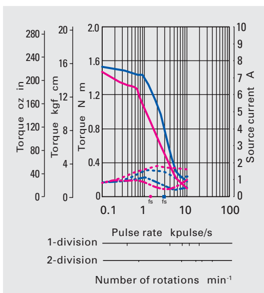
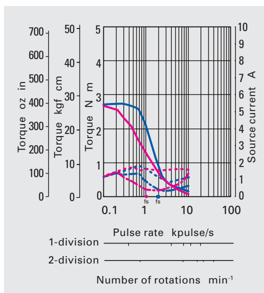


The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

42mm 1.65inch /1.8			42mm 1.65inch /0.9	
33mm 1.30inch	39mm 1.54inch	48mm 1.89inch	33mm 1.30inch	39mm 1.54inch
DB14H521S	DB14H522S	DB14H524S	DB16S141S	DB16S142S
DB14H521D	DB14H522D	DB14H524D	DB16S141D	DB16S142D
0.265 37.53	0.39 55.23	0.51 72.22	0.23 32.57	0.34 48.15
0.036 0.20	0.056 0.31	0.072 0.34	0.044 0.24	0.066 0.361
0.23 0.51	0.29 0.64	0.37 0.82	0.24 0.53	0.29 0.64
10 2.25	10 2.25	10 2.25	10 2.25	10 2.25
30 6	30 6	30 6	30 6	30 6

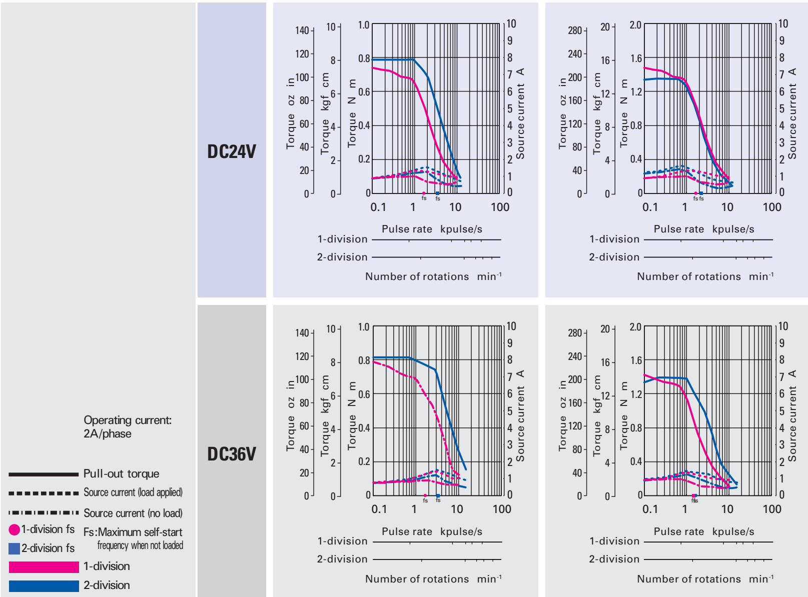
56mm 2.20inch /1.8		60mm 2.36inch /1.8		
53.8mm 2.12inch	75.8mm 2.98inch	44.8mm 1.76inch	53.8mm 2.12inch	85.8mm 3.38inch
DB16H713S	DB16H716S	DB16H781S	DB16H782S	DB16H783S
DB16H713D	DB16H716D	DB16H781D	DB16H782D	DB16H783D
0.83 117.5	1.27 179.8	0.88 124.6	1.37 194.0	2.7 382.3
0.21 1.15	0.36 1.97	0.275 1.50	0.4 2.19	0.84 4.59
0.65 1.43	0.98 2.16	0.6 1.32	0.77 1.70	1.34 2.95
15 3.37	15 3.37	15 3.37	15 3.37	15 3.37
71 15	71 15	95 21	95 21	95 21

DC input Specifications

Size	Motor flange size		60mm 2.36inch /0.9	
	Motor length		42mm 16.54inch	54mm 21.26inch
Set part number	Single shaft		DB16S161S	DB16S162S
	Double shaft		DB16S161D	DB16S162D
Holding torque		N m oz in	0.69 97.71	1.28 181.26
Rotor inertia		10^{-4}kg m² oz in²	0.24 1.312	0.4 2.187
Mass Weight		kg lbs	0.55 1.21	0.8 1.76
Allowable thrust load		N lbs	15 3.37	15 3.37
Allowable radial load Note1		N lbs	79 18	79 18

Note1 When load is applied at 1/3 length from output shaft edge.



The date are measured under the drive condition of our company.
The drive torque may very depending on the accuracy of customer-side equipment.

Specifications of Drivers

Unipolar

Model number			**US1D200P10**
Basic specifications	Input source		DC24 V / 36 V 10
	Source current		3 A
	Environment	Protection class	Class III
		Operation environment	Installation category over-voltage category : I, pollution degree : 2
		Applied standards	EN61010-1 UL508C
		Ambient operation temperature	0 to +50
		Conservation temperature	-20 to +70
		Operating ambient humidity	35 to 85% RH no condensation
		Conservation humidity	10 to 90% RH no condensation
		Operation altitude	2000 m 6560 feet or less above sea level
		Vibration resistance	Tested under the following conditions; 4.9 m/s^2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .
		Withstand voltage	Not influenced when 1500 V AC is applied between power input terminal and cabinet for one minute.
		Insulation resistance	10 M MIN. when measured with 500V DC megohmmeter between input terminal and cabinet.
	Mass Weight		0.08 kg 0.18 lbs
Functions	Selection functions		Step angle, Pulse input mode, Step current, Operating current.
	Protection functions		Open phase protection, Main circuit power souce voltage decrease
	LED indication		Power monitor, alarm
I/O signals	Command pulse input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5 V, input-signal L level : 0 to 0.5 V Maximum input frequency : 150 kpulse/s
	Poweer down input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5V, input-signal L level : 0 to 0.5 V
	Phase origin monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.
	Rotation monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.

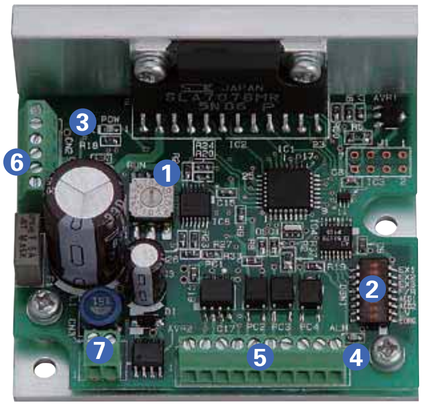
Bipolar

Model number			**BS1D200P10**
Basic specifications	Input source		DC24 V / 36 V 10
	Source current		3 A
	Environment	Protection class	Class III
		Operation environment	Installation category over-voltage category : I, pollution degree : 2
		Applied standards	EN61010-1 UL508C
		Ambient operation temperature	0 to +50
		Conservation temperature	-20 to +70
		Operating ambient humidity	35 to 85% RH no condensation
		Conservation humidity	10 to 90% RH no condensation
		Operation altitude	2000 m 6560 feet or less above sea level
		Vibration resistance	Tested under the following conditions; 4.9m/s^2, frequency range 10 to 55Hz, direction along X, Y and Z axes, for 2 hours each
		Impact resistance	Not influenced at NDS-C-0110 standard section 3.2.2 division C .
		Withstand voltage	Not influenced when 1500 V AC is applied between power input terminal and cabinet for one minute.
		Insulation resistance	10 M MIN. when measured with 500 V DC megohmmeter between input terminal and cabinet.
	Mass Weight		0.08 kg 0.18 lbs
Functions	Selection functions		Step angle, Pulse input mode, Step current, Operating current.
	Protection functions		Open phase protection, Main circuit power souce voltage decrease
	LED indication		Open phase protection, Power monitor, alarm
I/O signals	Command pulse input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5 V, input-signal L level : 0 to 0.5 V Maximum input frequency : 150 kpulse/s
	Poweer down input signal		Photo-coupler input system, input resistance : 220 input-signal H level : 4.0 to 5.5V, input-signal L level : 0 to 0.5 V
	Phase origin monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.
	Rotation monitor output signal		From the photo coupler by the open collector output Output specification : Vceo = 40 V MAX., Ic = 10 mA MAX.

Operation, Connection, and Function

Each section name of the drivers

Unipolar



1 Driving current selection switch RUN

You can select the value of the motor current when driving.

Dial	0	1	2	3	4	5	6	7
Stepping motor current A	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
Dial	8	9	A	B	C	D	E	F
Stepping motor current A	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5

The factory setting is F (0.5A).
Select the current after checking the rated current of the combination motor.

2 Function selection DIP switchpack

Select the function depending on your specification.

3 LED for power supply monitor POW

Lit up when the main circuit power supply is connected.

Indicator	Explanation
POW is displayed.	Main circuit power supply is switched on.

4 LED for alarm display ALM

Lit when an alarm is generated.

Indicator	Explanation
ALM is displayed.	Motor cable is broken, or switching element in driver is faulty. The main circuit voltage is out of specifications range (Less than DC19V).

When ALM is displayed, the winding current of the stepping motor is cut off and it is in a non-excitation state. At the same time, an output signal is transmitted from the alarm output terminal (AL) to an external source. When the alarm circuit is operating, this state is maintained until it is reset by switching on the power supply again. When an alarm condition has occurred, please take corrective actions to rectify the cause of the alarm before switching on the power supply again.

5 I/O signal connector CN1

Connect the I/O signal.

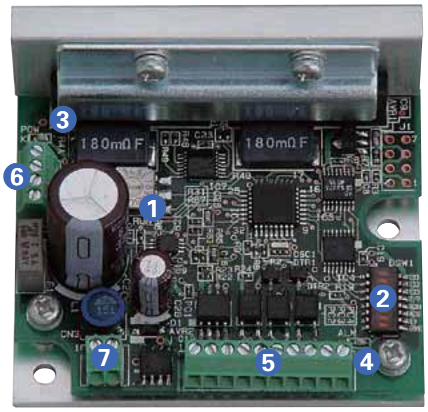
6 Motor connector CN2

Connect the motor s power line.

7 Power supply connector CN3

Connect the main circuit power supply.

Bipolar



1 Driving current selection switch RUN

You can select the value of the motor current when driving.

Dial	0	1	2	3	4	5	6	7
Stepping motor current A	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
Dial	8	9	A	B	C	D	E	F
Stepping motor current A	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5

The factory setting is F (0.5A).
Select the current after checking the rated current of the combination motor.

2 Function selection DIP switchpack

Select the function depending on your specification.

3 LED for power supply monitor POW

Lit up when the main circuit power supply is connected.

Indicator	Explanation
POW is displayed.	Main circuit power supply is switched on.

4 LED for alarm display ALM

Lit when an alarm is generated.

Indicator	Explanation
ALM is displayed.	Motor cable is broken, or switching element in driver is faulty. The main circuit voltage is out of specifications range (Less than DC19V).

When ALM is displayed, the winding current of the stepping motor is cut off and it is in a non-excitation state. At the same time, an output signal is transmitted from the alarm output terminal (AL) to an external source. When the alarm circuit is operating, this state is maintained until it is reset by switching on the power supply again. When an alarm condition has occurred, please take corrective actions to rectify the cause of the alarm before switching on the power supply again.

5 I/O signal connector CN1

Connect the I/O signal.

6 Motor connector CN2

Connect the motor s power line.

7 Power supply connector CN3

Connect the main circuit power supply.

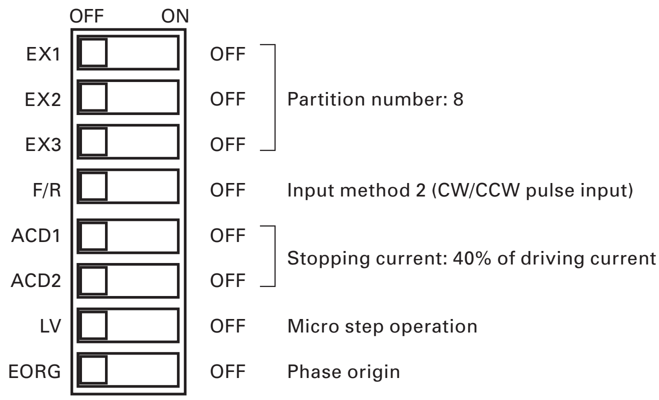
Specification summary of CN1 I/O signal

Signal name	CN1 Pin number	Function
CW pulse input standard	1 2	When using 2-input mode Drive pulse for the CW direction rotation is input.
Pulse column input	1 2	When using Pulse and direction mode Drive pulse train for the stepping motor rotation is input.
CCW pulse input standard	3 4	When using 2-input mode Drive pulse for the CCW direction rotation is input.
Rotation direction input	3 4	The rotation direction signal of stepping motor is input for the Pulse and direction mode . Internal photocoupler ON CW direction Internal photocoupler OFF CCW direction
Power down input	5 6	Inputting the PD signal cuts OFF the current flowing through the stepping motor. Iinternal photocoupler ON PD function enabled Iinternal photocoupler OFF PD function disabled
Phase origin monitor output	7 8	It is turned ON when the excitation phase is at the origin in the state when the power is turned ON It is turned ON once per 4 pulses when setting to HALF step. It is turned ON once per 8 pulses when setting to FULL step.
Alarm output	9 10	The signal is externally output when one of several alarm circuits operates in the PM driver. At this time, the stepping motor is in the unexcited state.

The CW rotation direction of stepping motor means the clockwise direction rotation as viewed from the output shaft side flange side . The CCW rotation direction means the counterclockwise direction rotation as viewed from the output shaft side flange side .

② Input circuit configuration　CW and CCW Pulse input

Functions can be selected according to the specification with the dip switch.
Check that the ex-factory settings are as follows.



Step angle select　EX1　EX2　EX3

Select the partition number of the basic step angle.

EX1	EX2	EX3	Partition number
ON	ON	ON	1-division
OFF	ON	OFF	2-division
ON	OFF	OFF	4-division
OFF	OFF	OFF	8-division
OFF	OFF	ON	16-division

Input method select　F/R

Selects input pulse type

F/R	Input pulse type
ON	1 input　Pluse&direction
OFF	2 input　CW, CCW

Current selection when stopping　ACD1　ACD2

Select the current value of the motor when stopping.

ACD2	ACD1	Current value of the motor
ON	ON	100% of driving current
ON	OFF	60% of driving current
OFF	ON	50% of driving current
OFF	OFF	40% of driving current

Initial configuration of factory shipment is set to 40% of rated value. Driver and motor should be operated at around 50% of rated value to reduce heat.

Low-vibration mode select　LV

Provides low-vibration, smooth operation even if resolution is rough　1-division, 2-division, etc

LV	Operation
ON	Auto-micro function
OFF	Micro-step

Excitation select　EORG

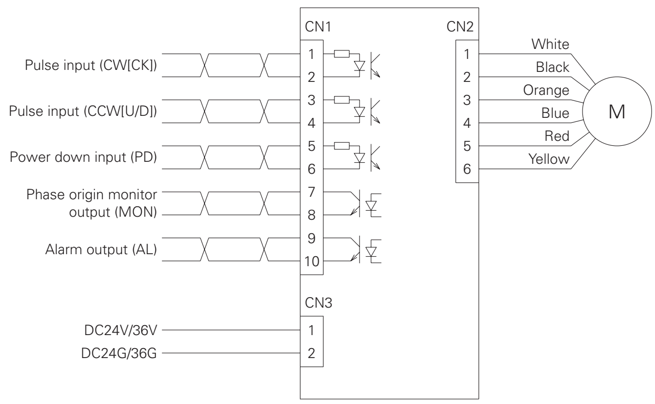
The excitation phase when the power supply is turned on is selected.

EORG	Original excitation phase
ON	Excitation phase at power shut off
OFF	Phase origin

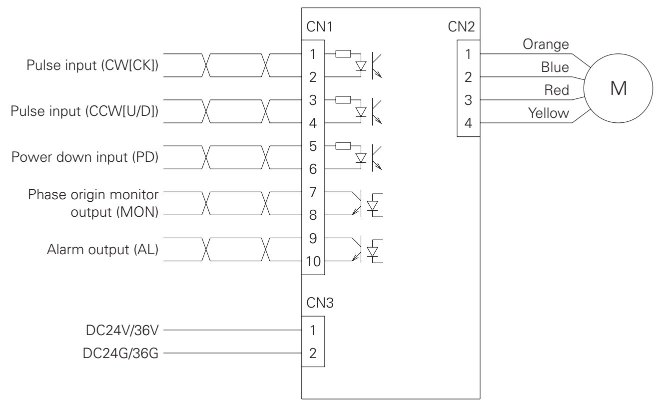
By turning on the EORG, excitation phase when power OFF will be saved. Therefore, there will be no shaft displacement when turning the power ON.

⑤⑥⑦ External wiring diagram

Unipolar



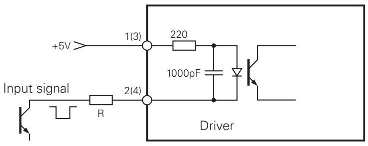
Bipolar



Applicable Wire Sizes

Part	Wire size	Allowable wire length
For power supply	AWG22(0.3 mm^2)	2 m MAX.
For input/output signal	AWG24(0.2 mm^2) to AWG22(0.3 mm^2)	2 m MAX.
For motor	AWG22(0.3 mm^2)	3 m MAX.

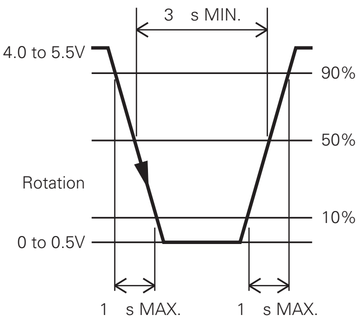
Input circuit configuration of CW CK , CCW U/D



- Pulse duty 50% MAX.
- Maximum input frequency:150kpulse/s
- When the crest value of the input signal exceeds 5V, use the external limit resistance R to limit the input current to approximately 15mA.

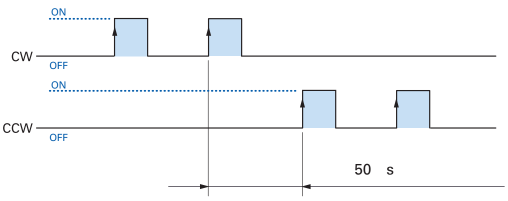
Input signal specifications

Photo coupler type



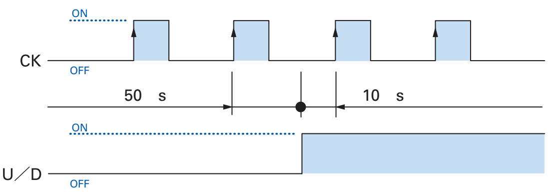
Timing of the command pulse

2-input mode CW, CCW



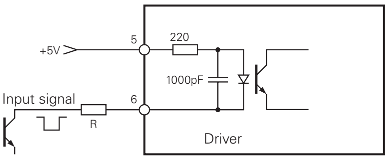
- Shaded area indicates internal photo coupler ON . Internal circuit motor starts operating at leading edge of the photo coupler ON .
- To apply pulse to CW, set CCW side internal photo coupler to OFF .
- To apply pulse to CCW, set CW side internal photo coupler to OFF .

1 input type CW, CCW



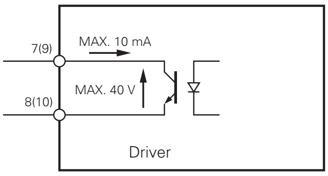
- Shaded area indicates internal photo coupler ON . Internal circuit motor starts operating at leading edge of CK side photo coupler ON .
- Switching of U/D input signal must be done while CK side internal photo coupler is OFF .

Input circuit configuration of PD

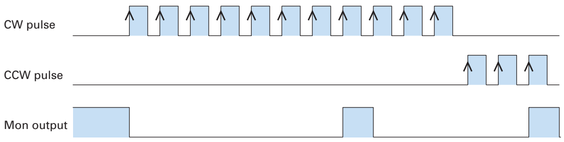


• When the crest value of the input signal exceeds 5V, use the external limit resistance R to limit the input current to approximately 15mA.

Output signal configuration of MON, AL



MON output



• Photo coupler at phase origin of motor excitation is set to ON . setting when number of divisions is 2

• Output from MON is set to on at every 7.2 degrees of motor output shaft from phase origin.

2-phase stepping motor

28mmsq. 1.10inch sq.

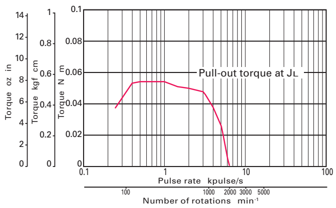
SH228
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH2281-5171	**-5131**	0.055 7.79	0.5	10.5	3.7	0.01 0.05	0.11 0.24
SH2281-5271	**-5231**	0.055 7.79	1	2.85	1	0.01 0.05	0.11 0.24
SH2285-5171	**-5131**	0.115 16.28	0.5	16.5	7.1	0.022 0.12	0.2 0.44
SH2285-5271	**-5231**	0.115 16.28	1	4.1	1.9	0.022 0.12	0.2 0.44

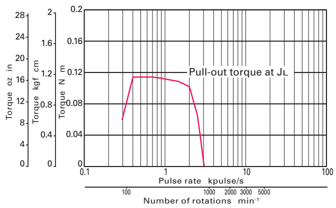
Pulse rate-torque characteristics

SH2281-51



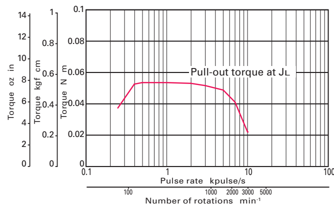
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2285-51



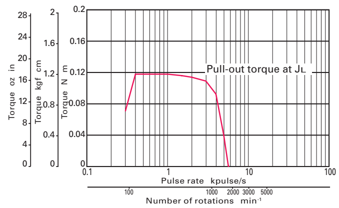
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2281-52



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2285-52



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

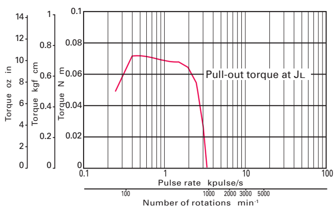
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH2281-5671	**-5631**	0.07 9.91	0.5	10.5	7.2	0.01 0.05	0.11 0.24
SH2281-5771	**-5731**	0.07 9.91	1	2.6	1.85	0.01 0.05	0.11 0.24
SH2285-5671	**-5631**	0.145 20.53	0.5	15	13.5	0.022 0.12	0.2 0.44
SH2285-5771	**-5731**	0.145 20.53	1	3.75	3.4	0.022 0.12	0.2 0.44

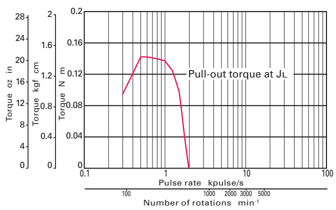
Pulse rate-torque characteristics

SH2281-56



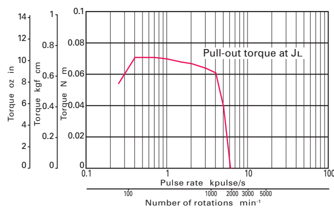
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2285-56



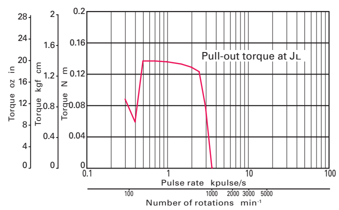
Constant current circuit
Source voltage : DC24V Operating current : 0.5A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2281-57



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

SH2285-57



Constant current circuit
Source voltage : DC24V Operating current : 1A/phase, 2-phase energization (full-step)
J_L=[0.01 10^{-4}kg m^2 (1.80 oz in^2) pulley balancer method]

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

35mm sq. 1.38inch sq.

SH35

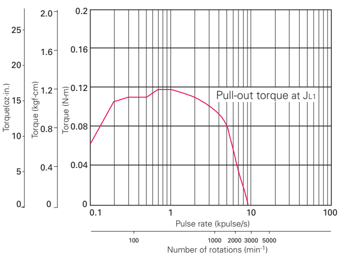
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH3533-12U40	**-12U10**	0.12 16.99	1.2	2.4	1.3	0.02 1.09	0.17 0.37
SH3537-12U40	**-12U10**	0.15 21.24	1.2	2.7	2	0.025 1.37	0.2 0.44
SH3552-12U40	**-12U10**	0.23 32.57	1.2	3.4	2.8	0.043 2.35	0.3 0.66

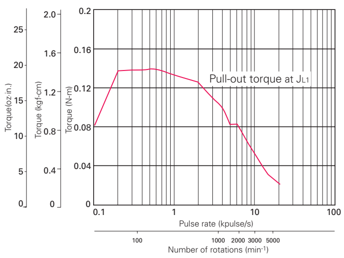
Pulse rate-torque characteristics

SH3533-12U



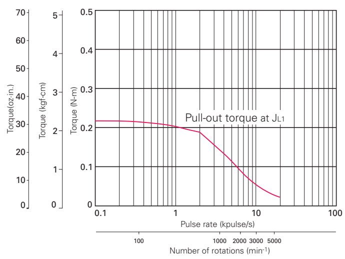
Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.33 10^{-4}kg m² (1.80 oz in²) Use the rubber coupling]

SH3537-12U



Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.33 10^{-4}kg m² (1.80 oz in²) Use the rubber coupling]

SH3552-12U



Constant current circuit
Source voltage : DC24V Operating current : 1.2A/phase,
2-phase energization (full-step)
J_{L1}=[0.94 10^{-4}kg m² (5.14 oz in²) Use the rubber coupling]

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

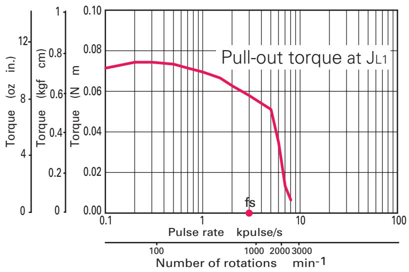
SS242
1.8 / step Bipolar winding

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
SS2421-5041	**-5011**	0.083 11.75	1	3.5	1.2	0.015 0.082	0.07 0.15
SS2422-5041	**-5011**	0.186 26.33	1	5.4	2.9	0.028 0.153	0.14 0.31
SS2423-5041	**-5011**	0.240 33.98	1	7.3	5	0.038 0.208	0.20 0.44

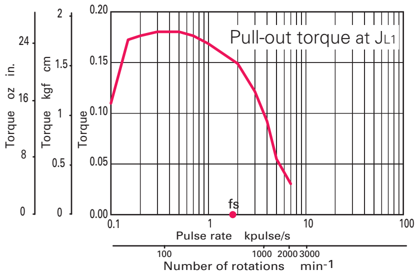
Pulse rate-torque characteristics

SS2421-50



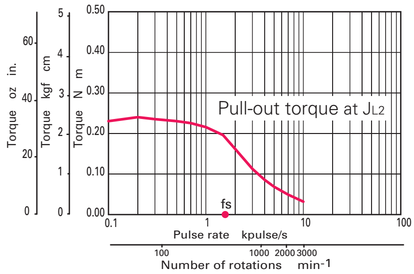
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.33x10⁻⁴kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10⁻⁴kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

SS2422-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.33x10⁻⁴kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10⁻⁴kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

SS2423-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.33x10⁻⁴kg m² 1.80 oz in² inertia of rubber coupling is in cluded
J_{L2} = 0.94x10⁻⁴kg m² 5.14 oz in² inertia of rubber coupling is in cluded
fs: No load maximum starting pulse rate

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

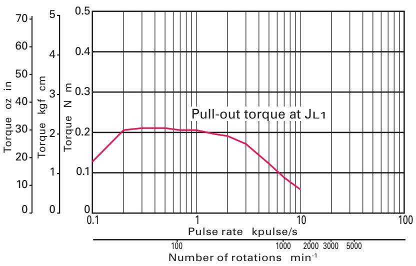
SH142
0.9 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH1421-0441	**-0411**	0.20 28.32	1.2	2.7	3.2	0.044 0.241	0.24 0.53
SH1422-0441	**-0411**	0.29 41.07	1.2	3.1	5.3	0.066 0.361	0.29 0.64
SH1424-0441	**-0411**	0.39 55.23	1.2	3.5	5.3	0.089 0.487	0.38 0.84

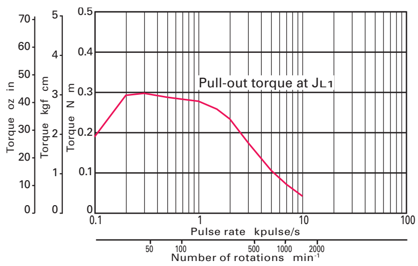
Pulse rate-torque characteristics

SH1421-04



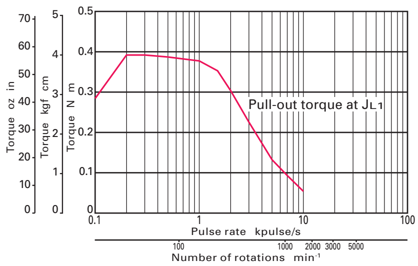
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² Use the rubber coupling

SH1422-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² Use the rubber coupling

SH1424-04



Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² Use the rubber coupling

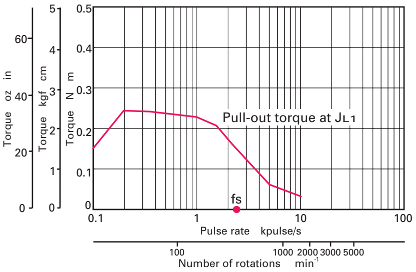
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding　Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass　Weight
Single shaft	Double shafts	[N　m　oz　in　MIN.]	A/phase	/phase	mH/phase	[　10^{-4}kg　m^2　oz　in^2　]	[kg　lbs　]
SH1421-5041	**-5011**	0.23　32.5	1	3.3	8.0	0.044　0.24	0.24　0.53
SH1421-5241	**-5211**	0.23　32.5	2	0.85	2.1	0.044　0.24	0.24　0.53
SH1422-5041	**-5011**	0.34　48.1	1	4.0	14.0	0.066　0.36	0.29　0.64
SH1422-5241	**-5211**	0.34　48.1	2	1.05	3.6	0.066　0.36	0.29　0.64
SH1424-5041	**-5011**	0.48　67.9	1	4.7	15.0	0.089　0.49	0.38　0.84
SH1424-5241	**-5211**	0.48　67.9	2	1.25	3.75	0.089　0.49	0.38　0.84

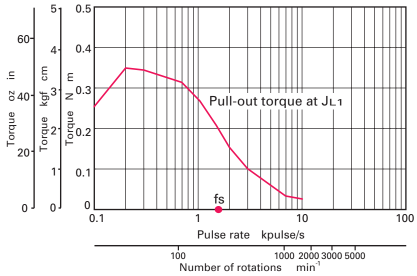
Pulse rate-torque characteristics

SH1421-50



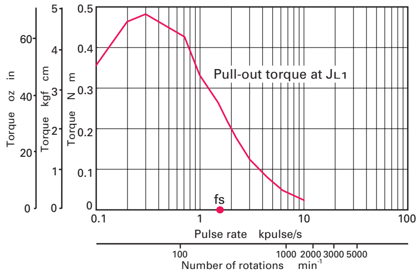
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10^{-4}kg　m^2　5.14 oz　in^2　Use the rubber coupling

SH1422-50



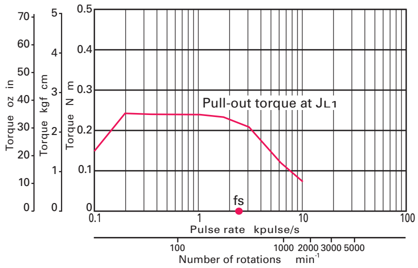
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10^{-4}kg　m^2　5.14 oz　in^2　Use the rubber coupling

SH1424-50



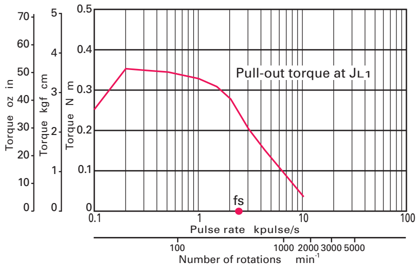
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10^{-4}kg　m^2　5.14 oz　in^2　Use the rubber coupling

SH1421-52



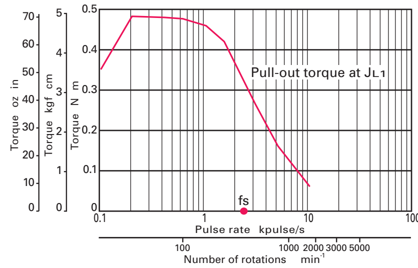
Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10^{-4}kg　m^2　5.14 oz　in^2　Use the rubber coupling

SH1422-52



Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10^{-4}kg　m^2　5.14 oz　in^2　Use the rubber coupling

SH1424-52



Constant current circuit
Source voltage : DC24V　operating current : 2A/phase,
2-phase energization　full-step
J_{L1} = 0.94x10^{-4}kg　m^2　5.14 oz　in^2　Use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

42mm sq. 1.65inch sq.

103H52
1.8 /step

Unipolar winding Connector type

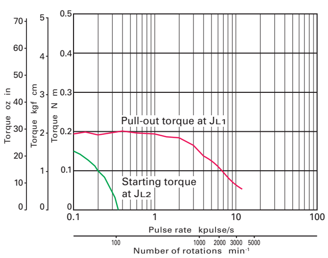
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H5205-0440	**-0410**	0.2 28.32	1.2	2.4	2.3	0.036 0.20	0.23 0.51
103H5208-0440	**-0410**	0.3 42.48	1.2	2.9	3.4	0.056 0.31	0.29 0.64
103H5209-0440	**-0410**	0.32 45.31	1.2	3	3.9	0.062 0.34	0.31 0.68
103H5210-0440	**-0410**	0.37 52.39	1.2	3.3	3.4	0.074 0.40	0.37 0.82

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H5205-5040	**-5010**	0.23 32.57	0.25	54	78	0.036 0.20	0.23 0.51
103H5205-5140	**-5110**	0.25 35.40	0.5	13.4	23.4	0.036 0.20	0.23 0.51
103H5205-5240	**-5210**	0.265 37.53	1	3.4	6.5	0.036 0.20	0.23 0.51
103H5208-5040	**-5010**	0.35 49.56	0.25	66	116	0.056 0.31	0.29 0.64
103H5208-5140	**-5110**	0.38 53.81	0.5	16.5	34	0.056 0.31	0.29 0.64
103H5208-5240	**-5210**	0.39 55.23	1	4.1	9.5	0.056 0.31	0.29 0.64
103H5209-5040	**-5010**	0.38 53.81	0.25	71.4	133	0.062 0.34	0.31 0.68
103H5209-5140	**-5110**	0.41 58.06	0.5	18.2	39	0.062 0.34	0.31 0.68
103H5209-5240	**-5210**	0.425 60.18	1	4.4	11	0.062 0.34	0.31 0.68
103H5210-5040	**-5010**	0.465 65.85	0.25	80	123.3	0.074 0.40	0.37 0.82
103H5210-5140	**-5110**	0.49 69.39	0.5	20	35	0.074 0.40	0.37 0.82
103H5210-5240	**-5210**	0.51 72.22	1	4.8	9.5	0.074 0.40	0.37 0.82

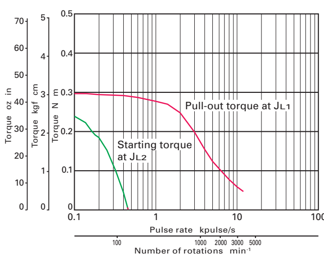
Pulse rate-torque characteristics

103H5205-04



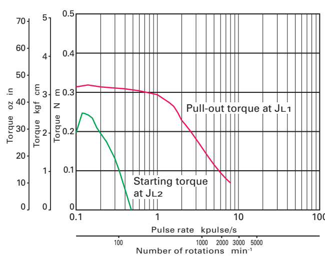
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H5208-04



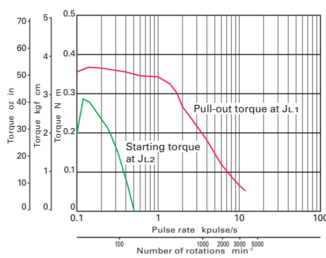
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H5209-04



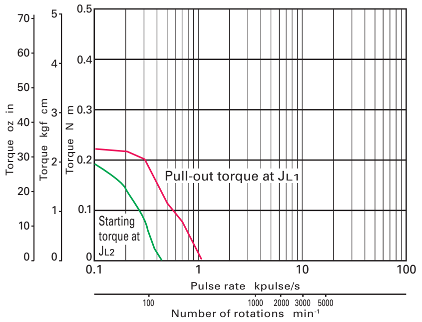
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H5210-04



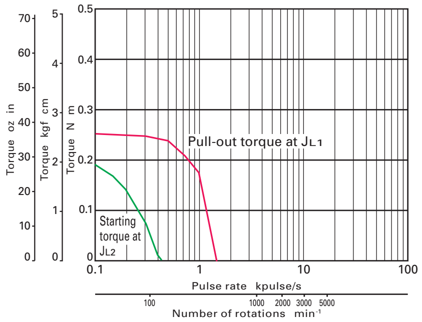
Constant current circuit
Source voltage : DC24V operating current : 1.2A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H5205-50



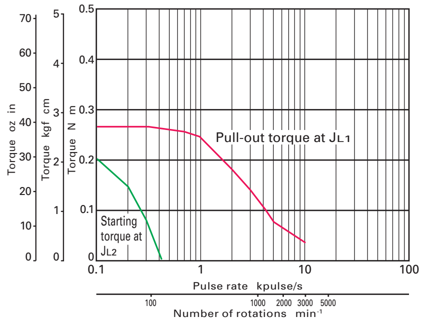
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5205-51



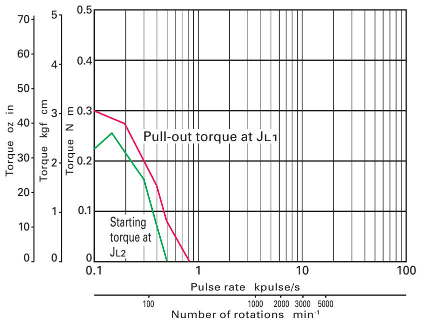
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5205-52



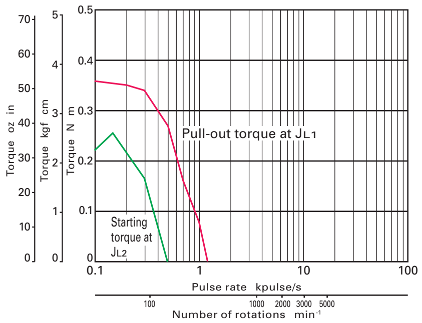
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-50



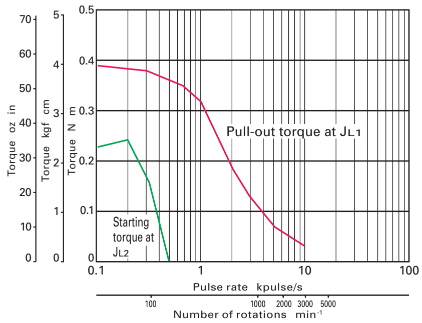
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-51



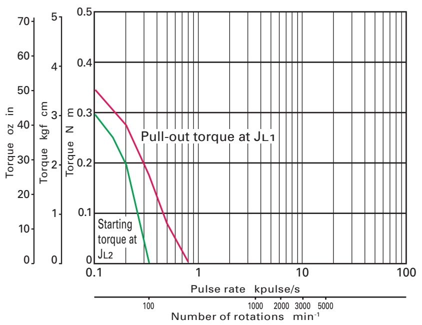
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5208-52



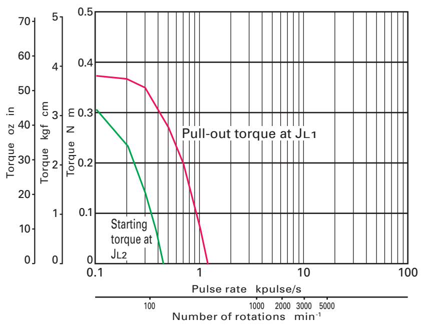
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-50



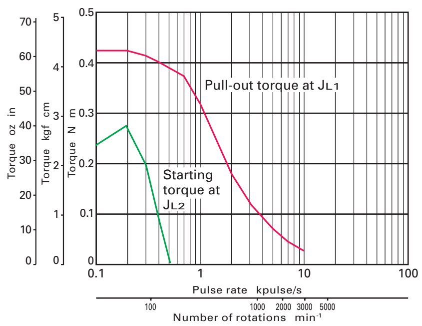
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-51



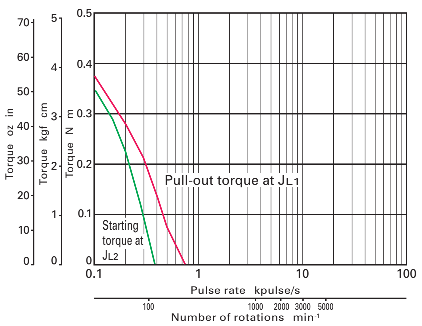
Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5209-52



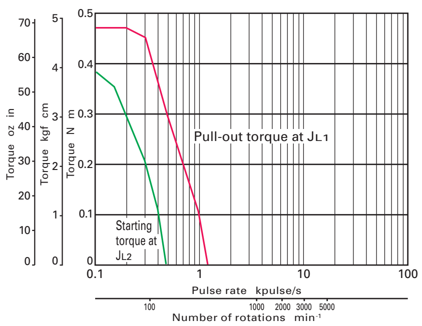
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-50



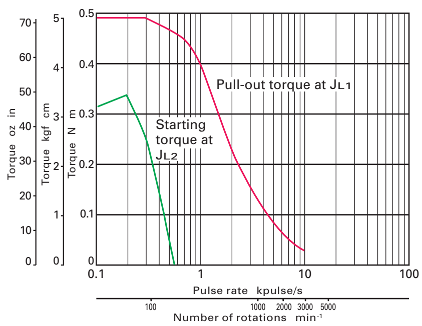
Constant current circuit
Source voltage : DC24V operating current : 0.25A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-51



Constant current circuit
Source voltage : DC24V operating current : 0.5A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H5210-52



Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8x10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

50mm sq. 1.97inch sq.

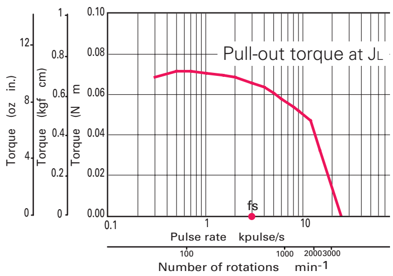
SS250
1.8 / step Bipolar winding

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SS2501-5041	**-5011**	0.1 14.16	1	4.5	1.8	0.026 0.142	0.09 0.20
SS2502-5041	**-5011**	0.215 30.44	1	5.9	3.2	0.049 0.268	0.15 0.33

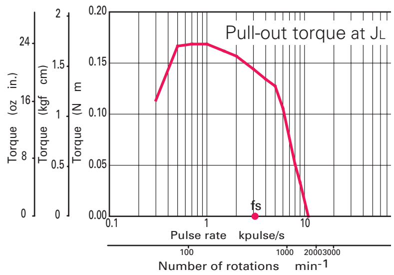
Pulse rate-torque characteristics

SS2501-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 1-2-phase energization half-step
JL = 0.01x10^{-4}kg m² 0.055 oz in² Pulley barancer system
fs: No load maximum starting pulse rate

SS2502-50



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 1-2-phase energization half-step
JL = 0.01x10^{-4}kg m² 0.055 oz in² Pulley barancer system
fs: No load maximum starting pulse rate

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

50mm sq. 1.97inch sq.

103H670
1.8 /step

Unipolar winding Lead wire type

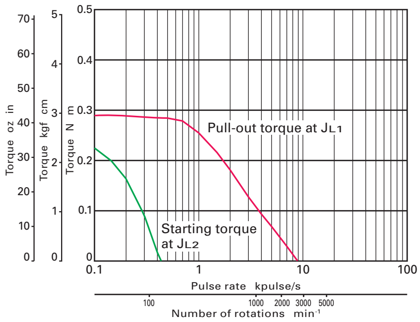
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H6701-0140	**-0110**	0.28 39.6	1	4.3	6.8	0.057 0.31	0.35 0.77
103H6701-0440	**-0410**	0.28 39.6	2	1.1	1.6	0.057 0.31	0.35 0.77
103H6701-0740	**-0710**	0.28 39.6	3	0.6	0.7	0.057 0.31	0.35 0.77
103H6703-0140	**-0110**	0.49 69.4	1	6	13	0.118 0.65	0.5 1.10
103H6703-0440	**-0410**	0.49 69.4	2	1.6	3.2	0.118 0.65	0.5 1.10
103H6703-0740	**-0710**	0.49 69.4	3	0.83	1.4	0.118 0.65	0.5 1.10
103H6704-0140	**-0110**	0.53 75.1	1	6.5	16.5	0.14 0.77	0.55 1.21
103H6704-0440	**-0410**	0.52 73.6	2	1.7	3.8	0.14 0.77	0.55 1.21
103H6704-0740	**-0710**	0.53 75.1	3	0.9	1.7	0.14 0.77	0.55 1.21

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H6701-5040	**-5010**	0.28 39.6	2	0.6	1.6	0.57 0.31	0.35 0.77
103H6703-5040	**-5010**	0.09 12.7	2	0.8	3.2	0.118 0.65	0.5 1.10
103H6704-5040	**-5010**	0.52 73.6	2	0.9	3.8	0.14 0.77	0.55 1.21

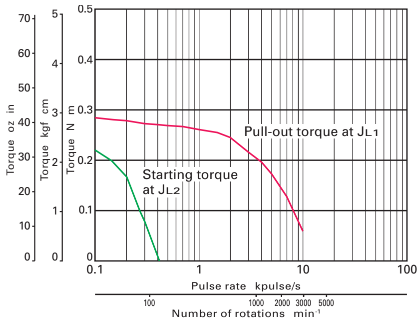
Pulse rate-torque characteristics

103H6701-01



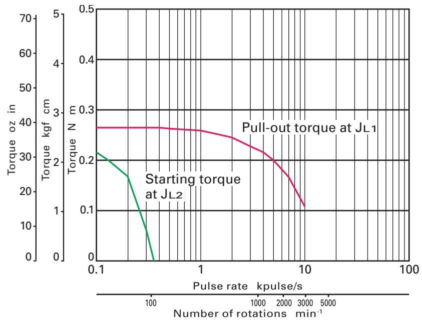
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-04



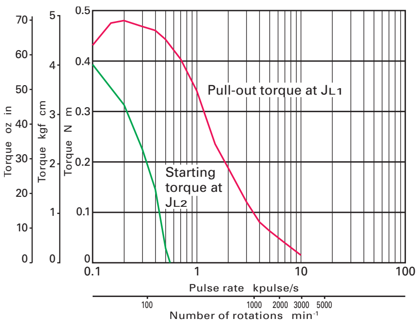
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-07



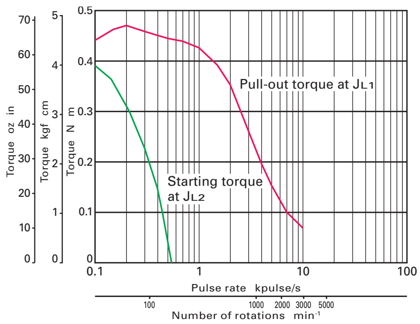
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-01



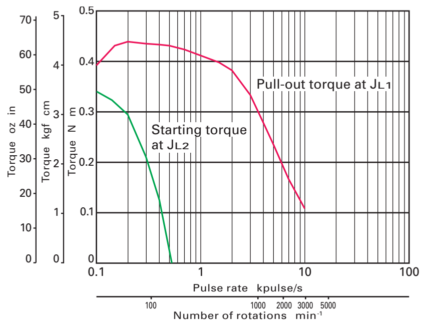
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-04



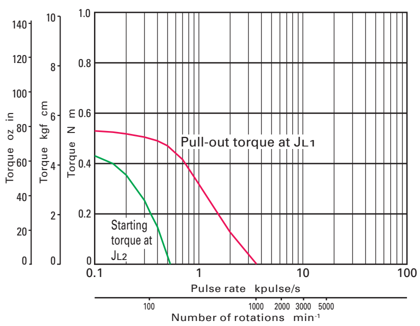
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6703-07



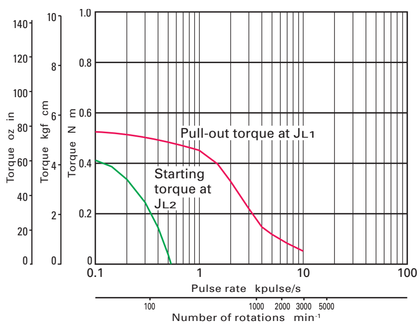
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-01



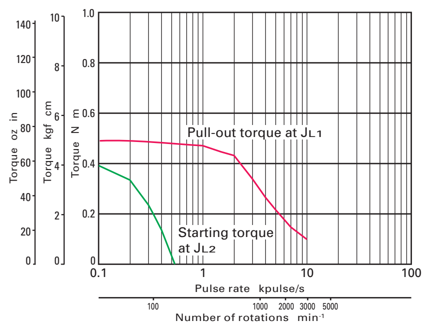
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-04



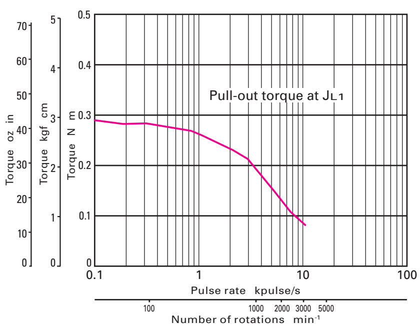
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6704-07



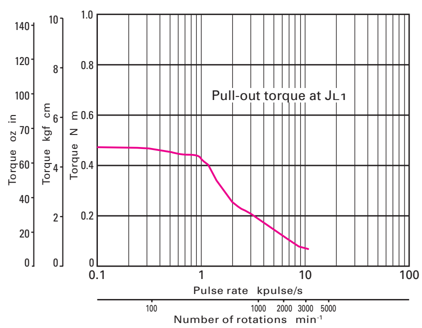
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H6701-50



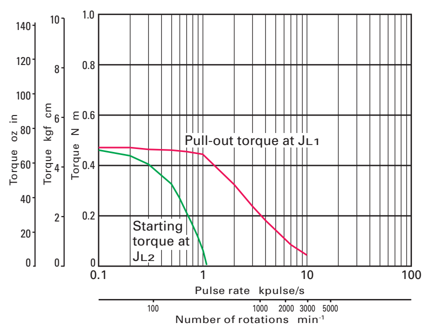
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling

103H6703-50



Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling

103H6704-50



Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.14×10^{-4}kg m^2 0.77 oz in^2 pulley balancer method

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

56mm sq. 2.20inch sq.

103H712
1.8 /step

Unipolar winding Lead wire type

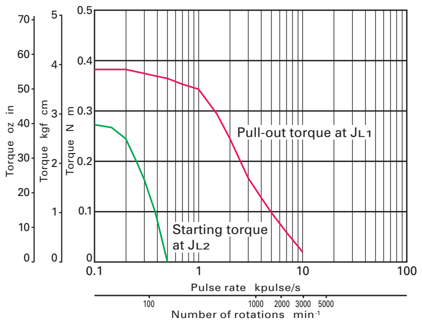
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H7121-0140	**-0110**	0.39 55.2	1	4.8	8	0.1 0.55	0.47 1.04
103H7121-0440	**-0410**	0.39 55.2	2	1.25	1.9	0.1 0.55	0.47 1.04
103H7121-0740	**-0710**	0.39 55.2	3	0.6	0.8	0.1 0.55	0.47 1.04
103H7123-0140	**-0110**	0.83 117.	1	6.7	15	0.21 1.15	0.65 1.43
103H7123-0440	**-0410**	0.83 117.5	2	1.6	3.8	0.21 1.15	0.65 1.43
103H7123-0740	**-0710**	0.78 110.5	3	0.77	1.58	0.21 1.15	0.65 1.43
103H7124-0140	**-0110**	0.98 138.8	1	7	14.5	0.245 1.34	0.8 1.76
103H7124-0440	**-0410**	0.98 138.8	2	1.7	3.1	0.245 1.34	0.8 1.76
103H7124-0740	**-0710**	0.98 138.8	3	0.74	1.4	0.245 1.34	0.8 1.76
103H7126-0140	**-0110**	1.27 179.8	1	8.6	19	0.36 1.97	0.98 2.16
103H7126-0440	**-0410**	1.27 179.8	2	2	4.5	0.36 1.97	0.98 2.16
103H7126-0740	**-0710**	1.27 179.8	3	0.9	2.2	0.36 1.97	0.98 2.16

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H7121-5640	**-5610**	0.55 77.9	1	4.3	14.5	0.1 0.55	0.47 1.04
103H7121-5740	**-5710**	0.55 77.9	2	1.1	3.7	0.1 0.55	0.47 1.04
103H7121-5840	**-5810**	0.55 77.9	3	0.54	1.74	0.1 0.55	0.47 1.04
103H7123-5640	**-5610**	1.0 141.6	1	5.7	29.4	0.21 1.15	0.65 1.43
103H7123-5740	**-5710**	1.0 141.6	2	1.5	7.5	0.21 1.15	0.65 1.43
103H7123-5840	**-5810**	1.0 141.6	3	0.7	3.5	0.21 1.15	0.65 1.43
103H7126-5640	**-5610**	1.6 226.6	1	7.7	34.6	0.36 1.97	0.98 2.16
103H7126-5740	**-5710**	1.6 226.6	2	2	9.1	0.36 1.97	0.98 2.16
103H7126-5840	**-5810**	1.6 226.6	3	0.94	4	0.36 1.97	0.98 2.16
103H7128-5640	**-5610**	2.0 283.2	1	8.9	40.1	0.49 2.68	1.3 2.87
103H7128-5740	**-5710**	2.0 283.2	2	2.3	10.4	0.49 2.68	1.3 2.87
103H7128-5840	**-5810**	2.0 283.2	3	1.03	4.3	0.49 2.68	1.3 2.87

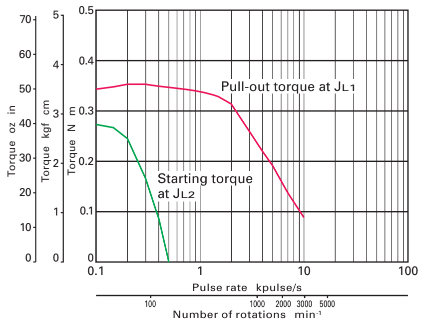
Pulse rate-torque characteristics

103H7121-01



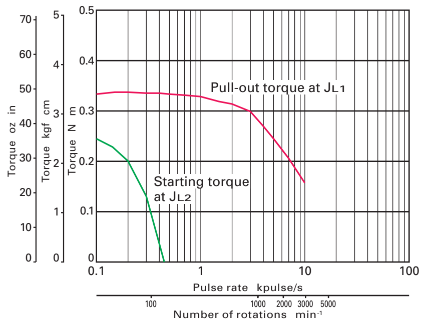
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-04



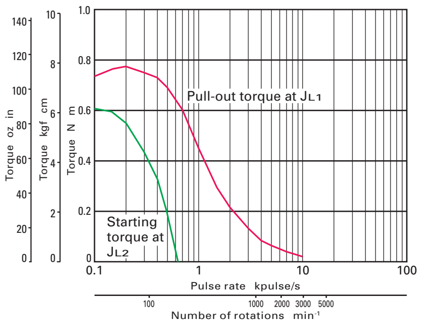
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7121-07



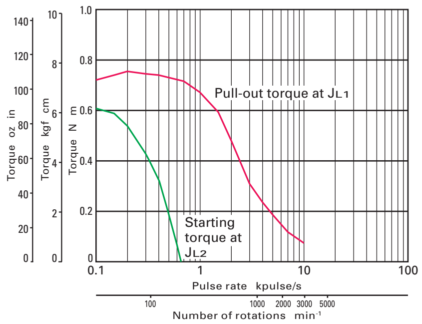
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-01



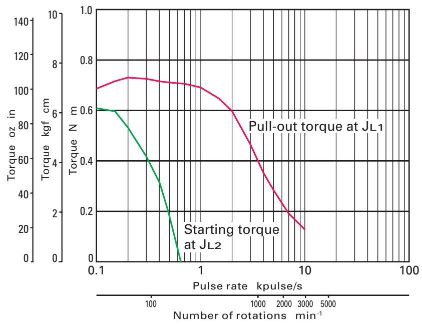
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-04



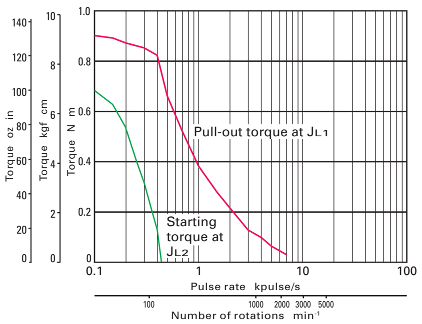
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7123-07



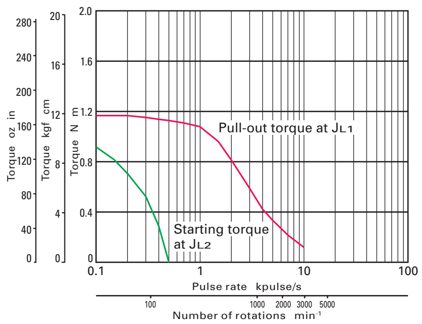
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m^2 5.14 oz in^2 use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m^2 4.37 oz in^2 use the direct coupling

103H7124-01



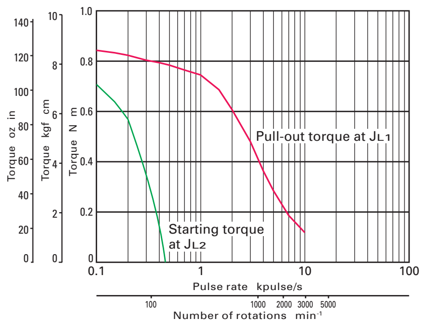
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7124-04



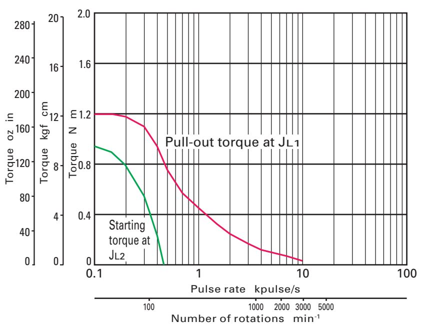
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7124-07



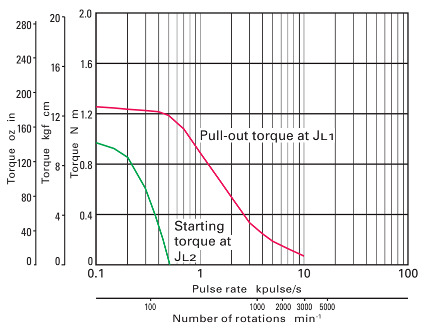
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-01



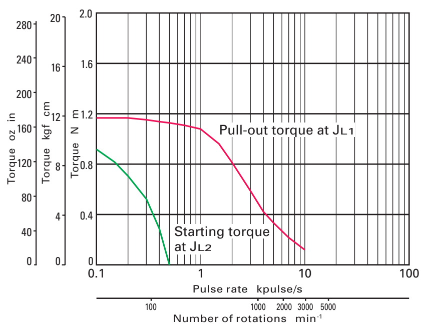
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

103H7126-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

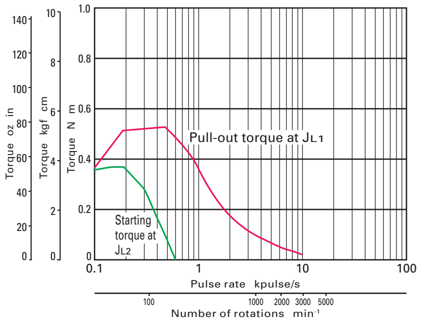
103H7126-07



Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the direct coupling

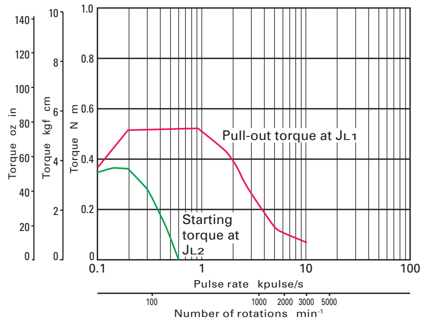
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

103H7121-56



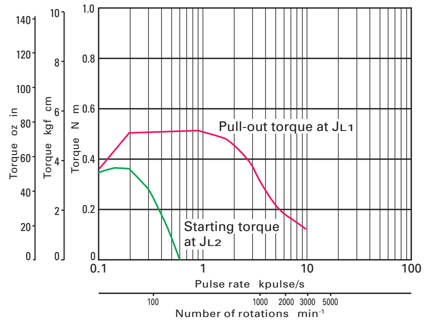
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7121-57



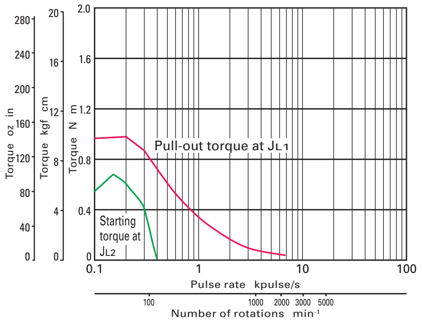
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7121-58



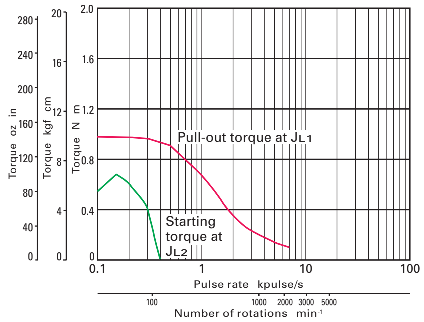
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94×10^{-4}kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8×10^{-4}kg m² 4.37 oz in² use the direct coupling

103H7123-56



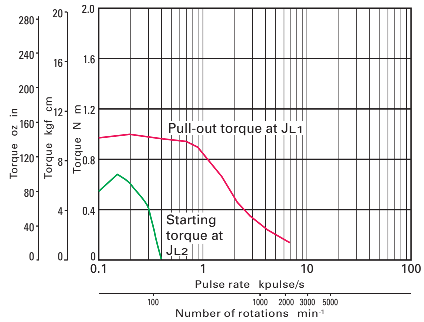
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7123-57



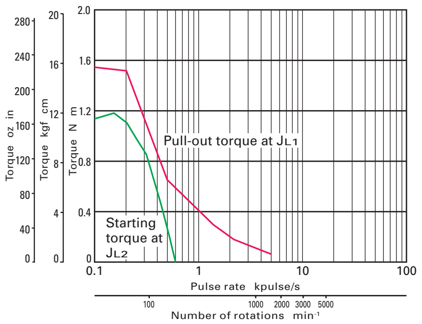
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7123-58



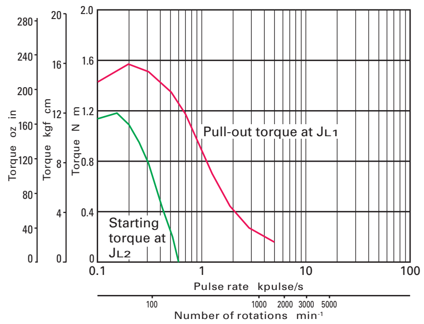
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7126-56



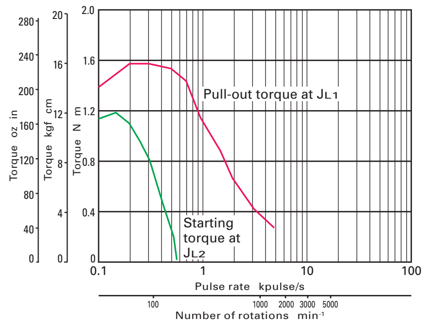
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7126-57



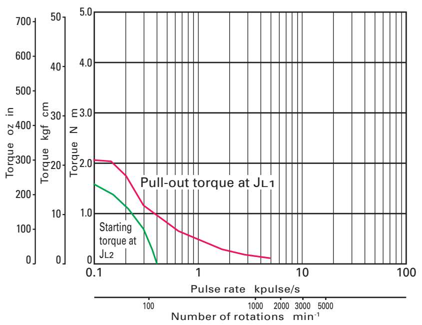
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7126-58



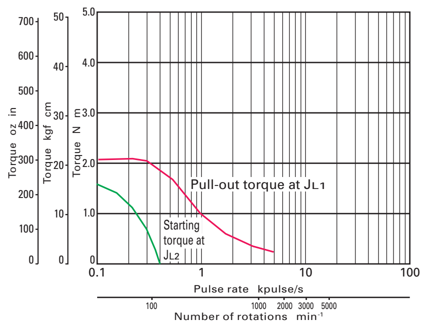
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6×10^{-4}kg m² 14.22 oz in² use the direct coupling

103H7128-56



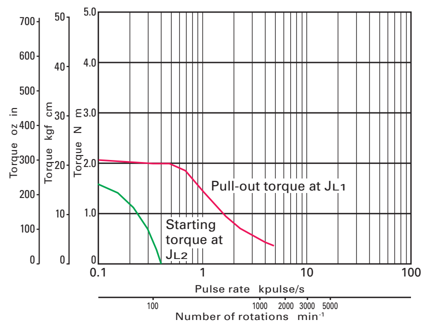
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m² 40.46 oz in² use the direct coupling

103H7128-57



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m² 40.46 oz in² use the direct coupling

103H7128-58



Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m² 40.46 oz in² use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

60mm sq. 2.36inch sq.

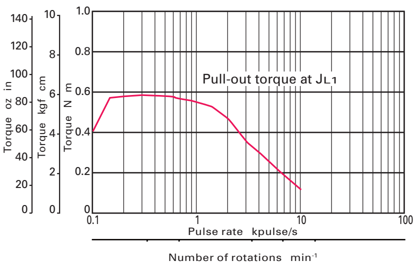
SH160
0.9 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH1601-0440	**-0410**	0.57 80.71	2	1.35	2	0.24 1.312	0.55 1.21
SH1602-0440	**-0410**	1.1 155.77	2	1.8	3.5	0.4 2.187	0.8 1.76
SH1603-0440	**-0410**	1.7 240.74	2	2.3	4.5	0.75 4.101	1.2 2.64

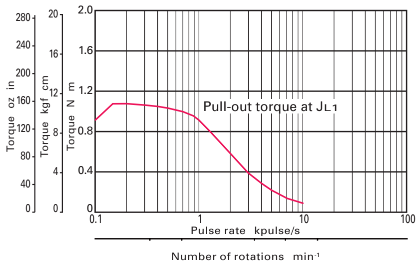
Pulse rate-torque characteristics

SH1601-04



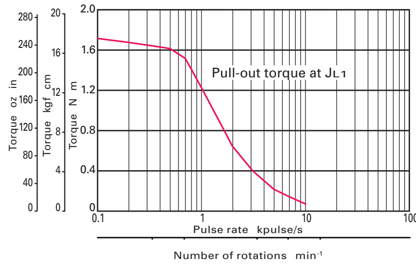
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling

SH1602-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling

SH1603-04



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling

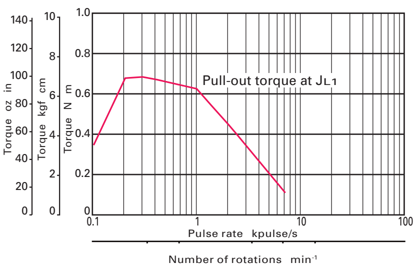
The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
SH1601-5240	**-5210**	0.69 97.7	2	1.2	3.5	0.24 1.31	0.55 1.21
SH1602-5240	**-5210**	1.28 181.2	2	1.65	6.1	0.4 2.19	0.8 1.76
SH1603-5240	**-5210**	2.15 304.4	2	2.3	8.8	0.75 4.10	1.2 2.65

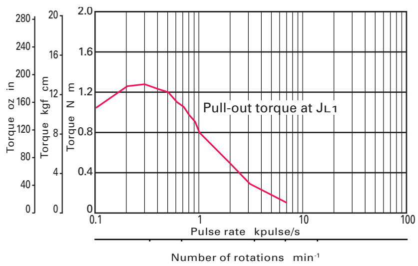
Pulse rate-torque characteristics

SH1601-52



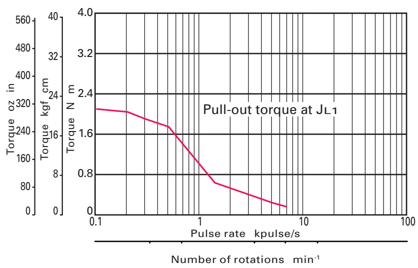
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10^{-4}kg m² 5.14 oz in² use the rubber coupling

SH1602-52



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L2} = 2.6x10^{-4}kg m² 14.22 oz in² use the rubber coupling

SH1603-52



Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L3} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

60mm sq. 2.36inch sq.

103H782
1.8 /step

Unipolar winding Connector type

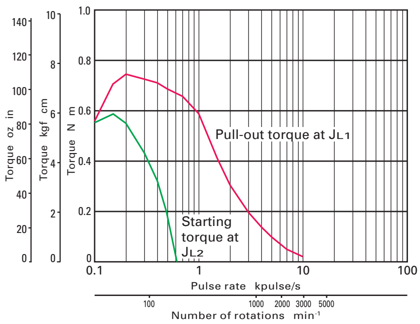
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7821-0140	**-0110**	0.78 110.5	1	5.7	8.3	0.275 1.50	0.6 1.32
103H7821-0440	**-0410**	0.78 110.5	2	1.5	2	0.275 1.50	0.6 1.32
103H7821-0740	**-0710**	0.78 110.5	3	0.68	0.8	0.275 1.50	0.6 1.32
103H7822-0140	**-0110**	1.17 165.7	1	6.9	14	0.4 2.19	0.77 1.70
103H7822-0440	**-0410**	1.17 165.7	2	1.8	3.6	0.4 2.19	0.77 1.70
103H7822-0740	**-0710**	1.17 165.7	3	0.8	1.38	0.4 2.19	0.77 1.70
103H7823-0140	**-0110**	2.1 297.4	1	10	21.7	0.84 4.59	1.34 2.95
103H7823-0440	**-0410**	2.1 297.4	2	2.7	5.6	0.84 4.59	1.34 2.95
103H7823-0740	**-0710**	2.1 297.4	3	1.25	2.4	0.84 4.59	1.34 2.95

Bipolar winding Connector type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7821-1740	**-1710**	0.88 124.6	4	0.35	0.8	0.275 1.50	0.6 1.32
103H7821-5740	**-5710**	0.88 124.6	2	1.27	3.3	0.275 1.50	0.6 1.32
103H7822-1740	**-1710**	1.37 194.0	4	0.43	1.38	0.4 2.19	0.77 1.70
103H7822-5740	**-5710**	1.37 194.0	2	1.55	5.5	0.4 2.19	0.77 1.70
103H7823-1740	**-1710**	2.7 382.3	4	0.65	2.4	0.84 4.59	1.34 2.95
103H7823-5740	**-5710**	2.7 382.3	2	2.4	9.5	0.84 4.59	1.34 2.95

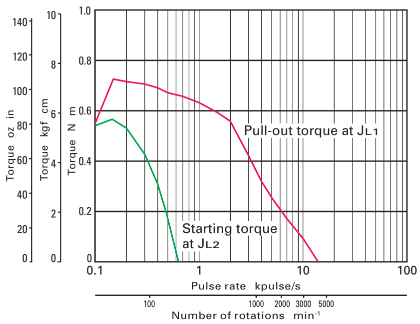
Pulse rate-torque characteristics

103H7821-01



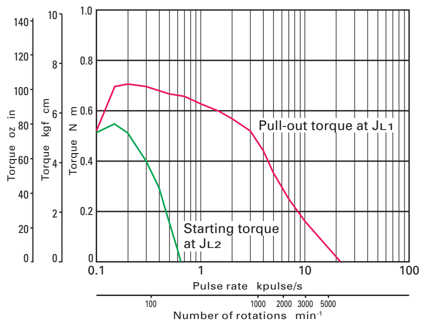
Constant current circuit
Source voltage : DC24V operating current : 1A/phase,
2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7821-04



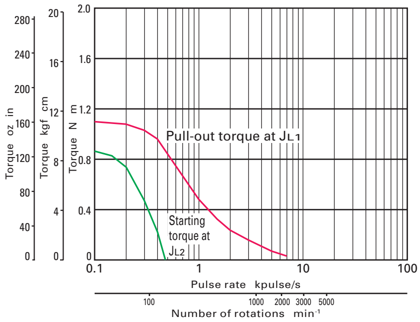
Constant current circuit
Source voltage : DC24V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7821-07



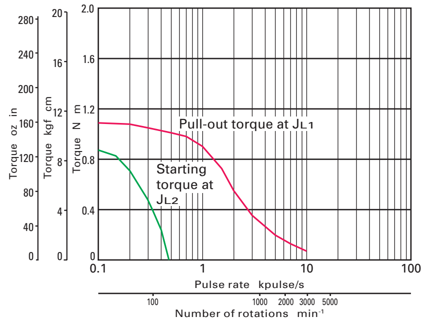
Constant current circuit
Source voltage : DC24V operating current : 3A/phase,
2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7822-01



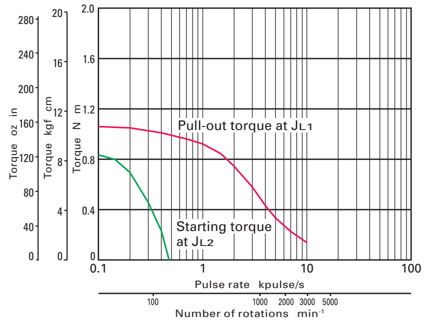
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7822-04



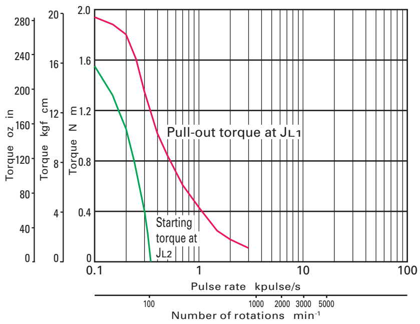
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7822-07



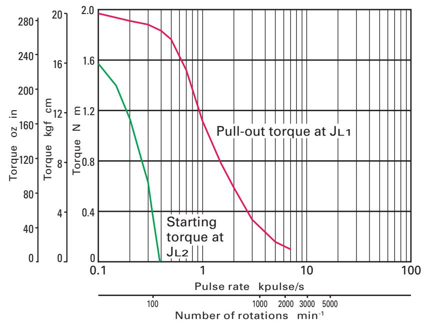
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7823-01



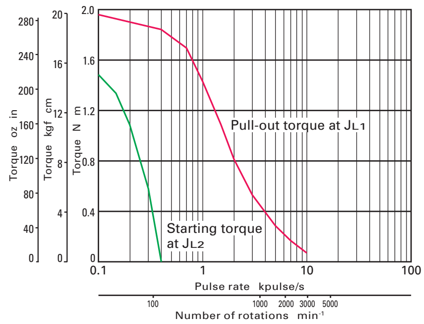
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7823-04



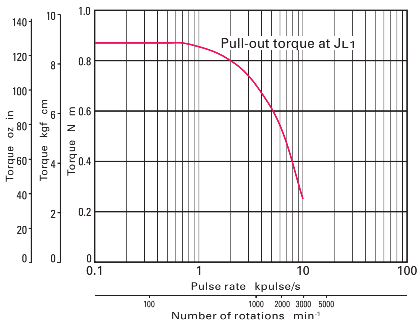
Constant current circuit
Source voltage : DC24V operating current : 2A/phase, 2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7823-07



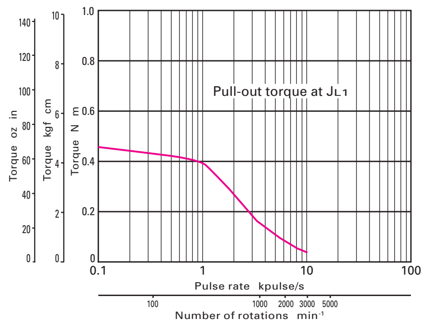
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling
J_{L2} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the direct coupling

103H7821-17



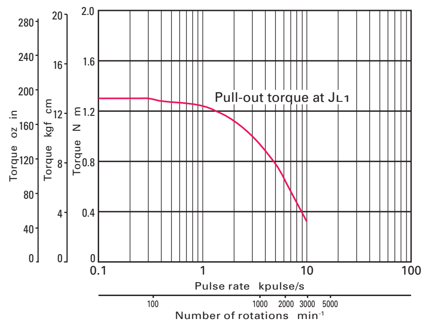
Constant current circuit
Source voltage : AC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

103H7821-57



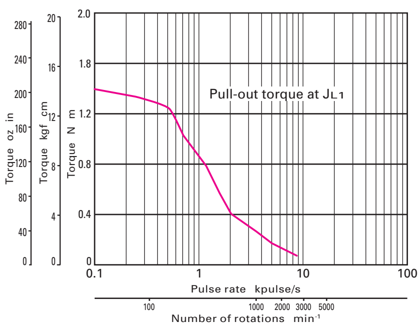
Constant current circuit
Source voltage : AC24V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

103H7822-17



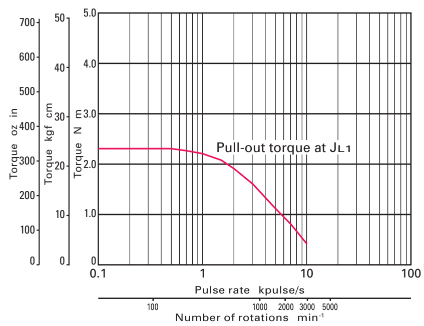
Constant current circuit
Source voltage : AC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 2.6×10^{-4}kg m^2 14.22 oz in^2 use the rubber coupling

103H7822-57



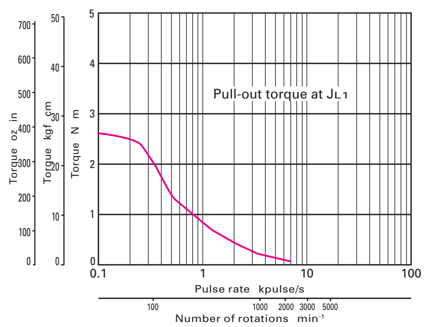
Constant current circuit
Source voltage : AC24V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

103H7823-17



Constant current circuit
Source voltage : AC100V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

103H7823-57



Constant current circuit
Source voltage : AC24V operating current : 4A/phase, 2-phase energization full-step
J_{L1} = 7.4×10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

86mm sq. 3.39inch sq.

SH286 /SM286
1.8 /step

Unipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH2861-0441	**-0411**	2.5 354	2	2.3	8.0	1.48 8.09	1.75 3.92
SH2861-0941	**-0911**	2.5 354	4	0.6	2.0	1.48 8.09	1.75 3.92
SH2862-0441	**-0411**	4.7 665.6	2	3.2	13.0	3 16.4	2.9 6.5
SH2862-0941	**-0911**	4.7 665.6	4	0.85	3.4	3 16.4	2.9 6.5
SH2863-0441	**-0411**	6.7 948.8	2	4.0	17.0	4.5 24.6	4.0 8.96
SH2863-0941	**-0911**	6.7 948.8	4	0.9	4.2	4.5 24.6	4.0 8.96

Unipolar winding Lead wire type CE UL model

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SM2861-0451	**-0421**	2.5 354	2	2.3	8.0	1.48 8.09	1.75 3.92
SM2861-0951	**-0921**	2.5 354	4	0.6	2.0	1.48 8.09	1.75 3.92
SM2862-0451	**-0421**	4.8 679.7	2	3.2	13.0	3 16.4	2.9 6.5
SM2862-0951	**-0921**	4.8 679.7	4	0.85	3.4	3 16.4	2.9 6.5
SM2863-0451	**-0421**	6.6 934.6	2	4.0	17	4.5 24.6	4.0 8.96
SM2863-0951	**-0921**	6.6 934.6	4	0.9	4.2	4.5 24.6	4.0 8.96

Bipolar winding Lead wire type

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SH2861-5041	**-5011**	3.3 467.3	2	2.2	15	1.48 8.09	1.75 3.92
SH2861-5141	**-5111**	3.3 467.3	4	0.56	3.7	1.48 8.09	1.75 3.92
SH2861-5241	**-5211**	3.3 467.3	6	0.29	1.7	1.48 8.09	1.75 3.92
SH2862-5041	**-5011**	6.4 906.3	2	3.2	25	3.0 16.4	2.9 6.5
SH2862-5141	**-5111**	6.4 906.3	4	0.83	6.4	3.0 16.4	2.9 6.5
SH2862-5241	**-5211**	6.4 906.3	6	0.36	2.8	3.0 16.4	2.9 6.5
SH2863-5041	**-5011**	9 1274.4	2	4.0	32	4.5 24.6	4.0 8.96
SH2863-5141	**-5111**	9 1274.4	4	1.0	7.9	4.5 24.6	4.0 8.96
SH2863-5241	**-5211**	9 1274.4	6	0.46	3.8	4.5 24.6	4.0 8.96

Bipolar winding Lead wire type CE UL model

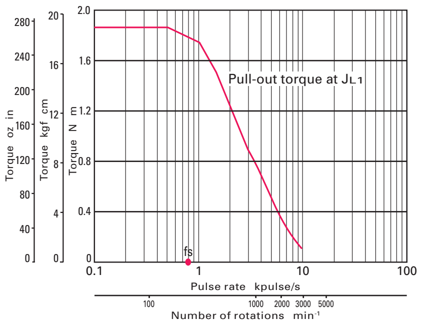
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SM2861-5051	**-5021**	3.3 467.3	2	2.2	15	1.48 8.09	1.75 3.92
SM2861-5151	**-5121**	3.3 467.3	4	0.56	3.7	1.48 8.09	1.75 3.92
SM2861-5251	**-5221**	3.3 467.3	6	0.29	1.7	1.48 8.09	1.75 3.92
SM2862-5051	**-5021**	6.4 906.3	2	3.2	25	3.0 16.4	2.9 6.5
SM2862-5151	**-5121**	6.4 906.3	4	0.83	6.4	3.0 16.4	2.9 6.5
SM2862-5251	**-5221**	6.4 906.3	6	0.36	2.8	3.0 16.4	2.9 6.5
SM2863-5051	**-5021**	9 1274.4	2	4.0	32	4.5 24.6	4.0 8.96
SM2863-5151	**-5121**	9 1274.4	4	1.0	7.9	4.5 24.6	4.0 8.96
SM2863-5251	**-5221**	9 1274.4	6	0.46	3.8	4.5 24.6	4.0 8.96

Bipolar winding Terminal block type

Model	Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m^2 oz in^2]	[kg lbs]
SM2861-5066	3.3 467.3	2	2.03	15	1.48 8.09	1.9 4.19
SM2861-5166	3.3 467.3	4	0.52	3.7	1.48 8.09	1.9 4.19
SM2861-5266	3.3 467.3	6	0.27	1.7	1.48 8.09	1.9 4.19
SM2862-5066	6.4 906.3	2	3.08	25	3.0 16.4	3.05 6.72
SM2862-5166	6.4 906.3	4	0.79	6.4	3.0 16.4	3.05 6.72
SM2862-5266	6.4 906.3	6	0.33	2.8	3.0 16.4	3.05 6.72
SM2863-5066	9 1274.4	2	3.83	32	4.5 24.6	4.15 9.15
SM2863-5166	9 1274.4	4	0.96	7.9	4.5 24.6	4.15 9.15
SM2863-5266	9 1274.4	6	0.48	3.8	4.5 24.6	4.15 9.15

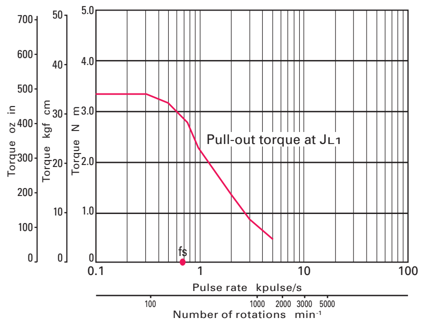
Pulse rate-torque characteristics

SH2861-04



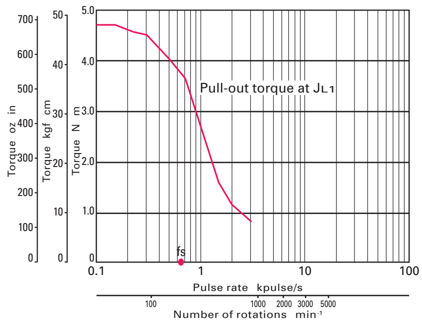
Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

SH2862-04



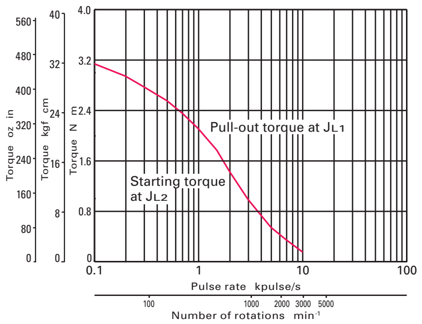
Constant current circuit
Source voltage : DC100V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SH2863-04



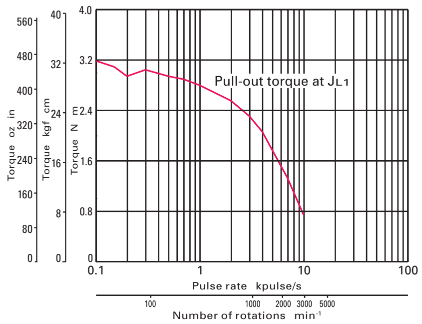
Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2861-50



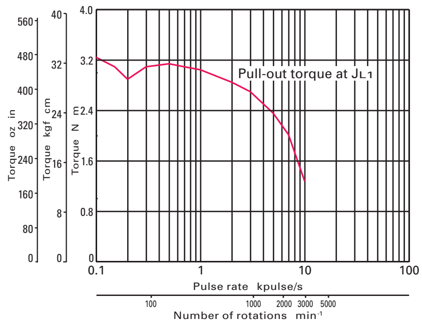
Constant current circuit
Source voltage : DC100V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

SM2861-51



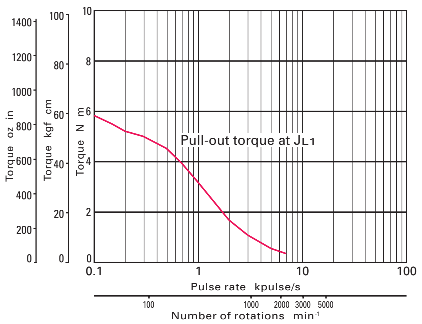
Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m^2 40.46 oz in^2 use the rubber coupling

SM2861-52



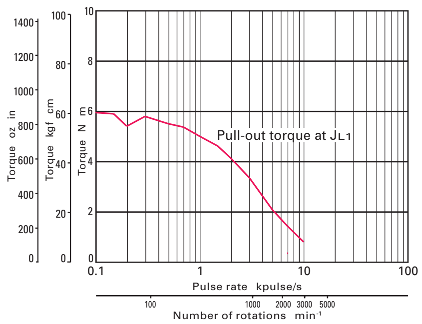
Constant current circuit
Source voltage : DC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2862-50



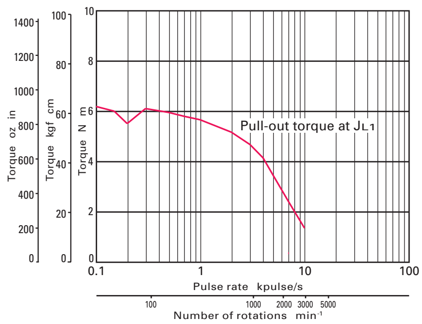
Constant current circuit
Source voltage : DC100V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2862-51



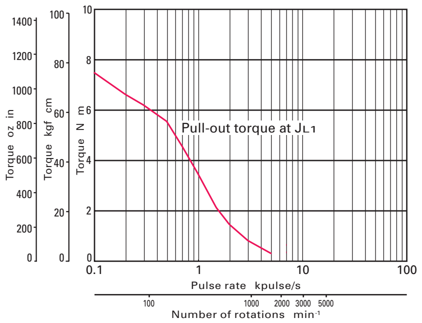
Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2862-52



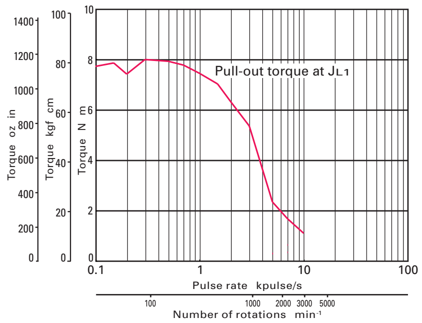
Constant current circuit
Source voltage : DC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m^2 83.65 oz in^2 use the rubber coupling

SM2863-50



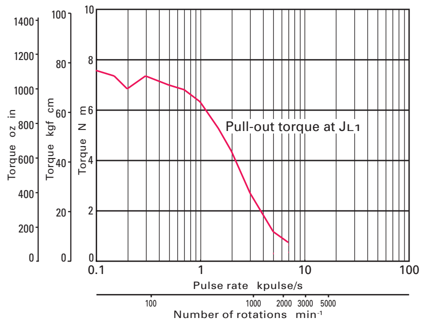
Constant current circuit
Source voltage : DC100V operating current : 2A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m^2 235.10 oz in^2 use the rubber coupling

SM2863-51



Constant current circuit
Source voltage : DC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m^2 235.10 oz in^2 use the rubber coupling

SM2863-52



Constant current circuit
Source voltage : DC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m^2 235.10 oz in^2 use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

106mm cir. 4.17inch cir.

103H8922
1.8   /step

Unipolar winding

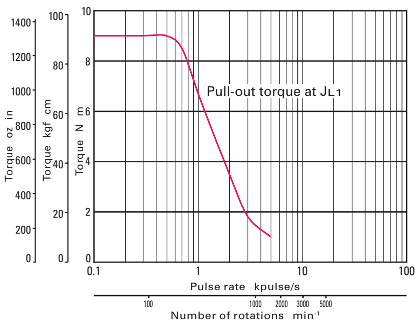
Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H89222-0941	**-0911**	10.8 1529.4	4	0.98	6.3	14.6 79.83	7.5 16.53
103H89223-0941	**-0911**	15.5 2194.9	4	1.4	9.7	22 120.28	10.5 23.15

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H89222-5241	**-5211**	13.2 1869.2	6	0.45	5.4	14.6 79.83	7.5 16.53
103H89223-5241	**-5211**	19 2690.5	6	0.63	8	22 120.28	10.5 23.15

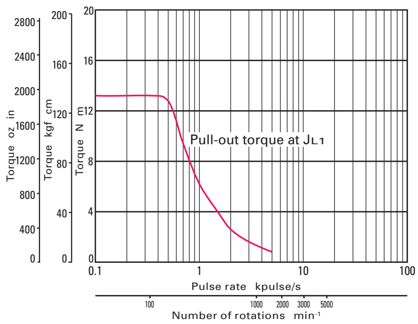
Pulse rate-torque characteristics

103H89222-09



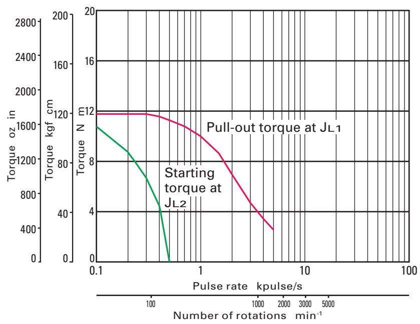
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

103H89223-09



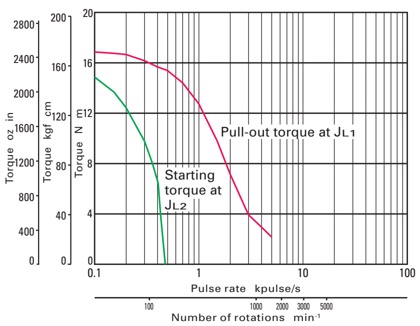
Constant current circuit
Source voltage : AC100V operating current : 4A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

103H89222-52



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

103H89223-52



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

56mm sq. 2.20inch sq.

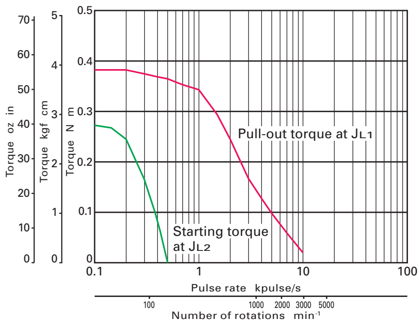
103H712
CE marking
1.8 /step

Unipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10⁻⁴kg m² oz in²]	[kg lbs]
103H7121-6140	**-6110**	0.39 55.2	1	4.8	8	0.1 0.55	0.47 1.04
103H7121-6740	**-6710**	0.39 55.2	3	0.6	0.8	0.1 0.55	0.47 1.04
103H7123-6140	**-6110**	0.83 117.5	1	6.7	15	0.21 1.15	0.65 1.43
103H7123-6740	**-6710**	0.78 110.5	3	0.77	1.58	0.21 1.15	0.65 1.43
103H7126-6140	**-6110**	1.27 179.8	1	8.6	19	0.36 1.97	0.98 2.16
103H7126-6740	**-6710**	1.27 179.8	3	0.9	2.2	0.36 1.97	0.98 2.16

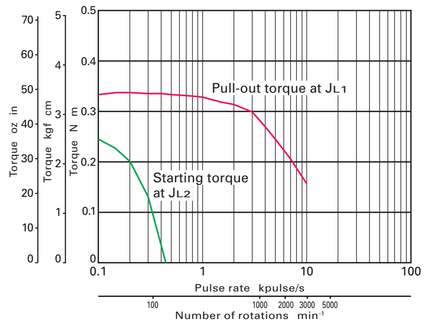
Pulse rate-torque characteristics

103H7121-61



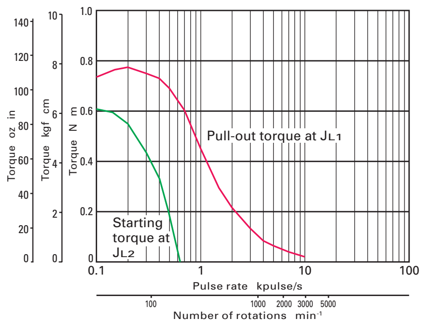
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7121-67



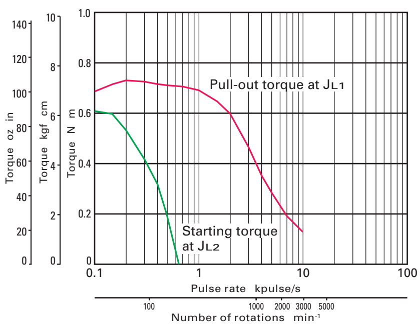
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7123-61



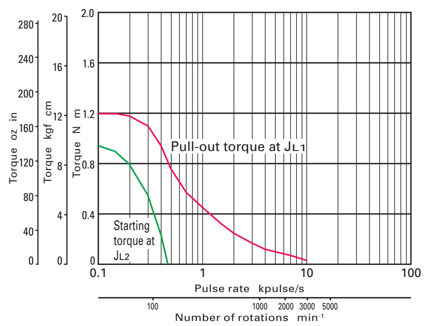
Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7123-67



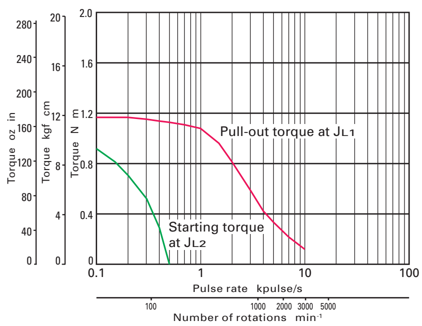
Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 0.94x10⁻⁴kg m² 5.14 oz in² use the rubber coupling
J_{L2} = 0.8x10⁻⁴kg m² 4.37 oz in² use the direct coupling

103H7126-61



Constant current circuit
Source voltage : DC24V operating current : 1A/phase, 2-phase energization full-step
J_{L1} = 2.6x10⁻⁴kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10⁻⁴kg m² 14.22 oz in² use the direct coupling

103H7126-67



Constant current circuit
Source voltage : DC24V operating current : 3A/phase, 2-phase energization full-step
J_{L1} = 2.6x10⁻⁴kg m² 14.22 oz in² use the rubber coupling
J_{L2} = 2.6x10⁻⁴kg m² 14.22 oz in² use the direct coupling

2-phase stepping motor

86mm cir. 3.39inch cir.

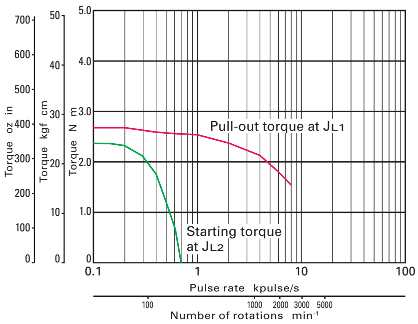
103H822
CE marking
1.8 /step

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H8221-6240	**-6210**	2.74 388.0	6	0.3	1.65	1.45 7.93	1.5 3.31
103H8222-6340	**-6310**	5.09 720.8	6	0.35	2.7	2.9 15.86	2.5 5.51
103H8223-6340	**-6310**	7.44 1053.6	6	0.45	3.4	4.4 24.06	3.5 7.72

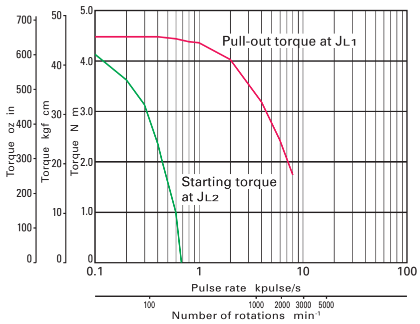
Pulse rate-torque characteristics

103H8221-62



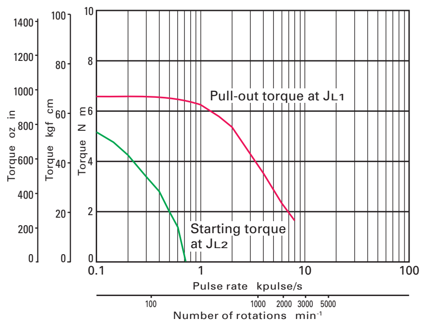
Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 7.4x10^{-4}kg m² 40.46 oz in² use the rubber coupling
J_{L2} = 7.4x10^{-4}kg m² 40.46 oz in² use the direct coupling

103H8222-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 15.3x10^{-4}kg m² 83.65 oz in² use the rubber coupling
J_{L2} = 15.3x10^{-4}kg m² 83.65 oz in² use the direct coupling

103H8223-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase,
2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the direct coupling

The date are measured under the drive condition of our company. The drive torque may very depending on the accuracy of customer-side equipment.

2-phase stepping motor

106mm cir. 4.17inch cir.

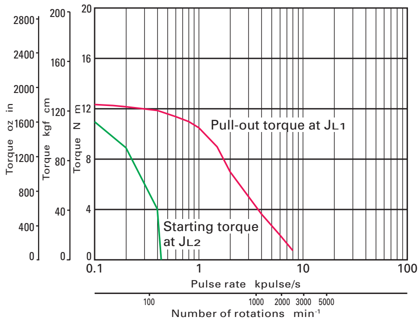
103H8922
CE marking
1.8 /step

Bipolar winding

Model		Holding torque at 2-phase energization	Rated current	Wiring resistance	Winding inductance	Rotor inertia	Mass Weight
Single shaft	Double shafts	[N m oz in MIN.]	A/phase	/phase	mH/phase	[10^{-4}kg m² oz in²]	[kg lbs]
103H89222-6341	**-6311**	13.2 1869.2	6	0.45	5.4	14.6 79.83	7.5 16.53
103H89223-6341	**-6311**	19 2690.5	6	0.63	8	22 120.28	10.5 23.15

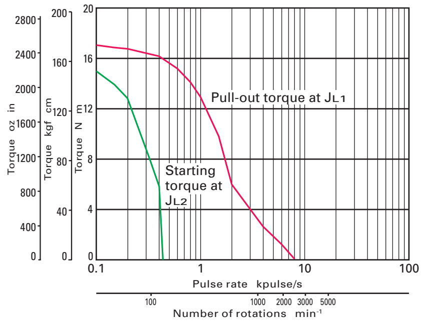
Pulse rate-torque characteristics

103H89222-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the direct coupling

103H89223-63



Constant current circuit
Source voltage : AC100V operating current : 6A/phase, 2-phase energization full-step
J_{L1} = 43x10^{-4}kg m² 235.10 oz in² use the rubber coupling
J_{L2} = 43x10^{-4}kg m² 235.10 oz in² use the direct coupling

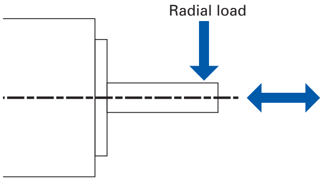
Standard models

Motor type	H series motor
Model number	103H52 /103H67 /103H71 /103H78
Insulation class	Class B 130
Withstand voltage	42 1.65inch AC500V 50/60Hz for 1 minute, 50 1.97inch 56 2.20inch 60 2.36inch AC1000V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Operating ambient temperature	-10 to 50
Operating ambient humidity	90%MAX. : 40 MAX., 57%MAX. : 50 MAX., 35%MAX. : 60 MAX. no condensation

Motor type	SH series motor
Motor model number	SH228 , SH353 , SH142 , SH160 , SH286 ,
Insulation class	Class B 130
Withstand voltage	28 1.10inch 35 1.38inch 42 1.65inch AC500V 50/60Hz for 1 minute, 60 2.36inch / 86 3.38inch AC1000V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Operating ambient temperature	-10 to 50
Operating ambient humidity	90%MAX. : 40 MAX., 57%MAX. : 50 MAX., 35%MAX. : 60 MAX. no condensation

Motor type	SM series motor
Model number	SM286
Type	S1 continuous operation
Insulation class	Class F +155 C
Operation altitude	1000m 3280 feet MAX above sea level
Withstand voltage	86mm 3.39inch : AC1500V 50/60Hz for 1 minute
Insulation resistance	100M ohm MIN. against DC500V
Protection grade	IP43
Vibration resistance	Amplitude of 1.52mm 0.06inch P-P at frequency range 10 to 500Hz for 15 minutes sweep time along X, Y, and Z axes for 12 times.
Impact resistance	490m/s² of acceleration for 11 ms with half-sine wave applying three times for X, Y, and Z axes each, 18 times in total.
Ambient operation temperature	-10 to +50 C
Ambient operation humidity	90% MAX. at less than 40 C, 57% MAX. at less than 50 C , 35% MAX. at 60 C no condensation

Allowable radial / thrust load



Frange size	Model number	Distance from end of shaft : mm inch				Thrust load N lbs
		0	5 0.20	10 0.39	15 0.59	
		Radial load : N lbs				
28mm 1.10inch	SH228	42 9	48 10	56 12	66 14	3 0.67
35mm 1.38inch	SH353	40 8	50 11	67 15	98 22	10 2.25
42mm 1.65inch	103H52 103-59 SH142	22 4	26 5	33 7	46 10	10 2.25
50mm 1.97inch	103H670	71 15	87 19	115 25	167 37	15 3.37
56mm 2.20inch	103H712	52 11	65 14	85 19	123 27	15 3.37
	103H7128	85 19	105 23	138 31	200 44	15 3.37
60mm 2.36inch	103H782 SH160	70 15	87 19	114 25	165 37	20 4.50
86mm 3.39inch	SM286 SH286	167 37	193 43	229 51	280 62	60 13.488
86mm 3.39inch	103H822	191 42	234 52	301 67	421 93	60 13.488
106mm 4.17inch	103H8922	321 72	356 79	401 90	457 101	100 22.48

CE marked models

Model Number	103H712	103H822 103H8922
Rated voltage	12-200VDC	12-300VDC
Applied standards Low voltage diretive	EN60034-1,IEC34-5(EN60034-5),EN60204-1,EN60950,EN61010-1	
Operation type	S1 continuous rating	
Protection grade	IP43	
Device category	Class I	
Operation environment	Pollution degree 2	
Insulation classl	Class B 130	
Insulation resistance	100M ohm MIN. against DC500V	
Withstand voltage	56mm 2.2inch : AC1500V 50/60Hz for 1 minute 86mm 3.39inch 106mm 4.17inch : AC1600V 50/60Hz for 1 minute	
Ambient operation temperature	-10 to +50 C	
Ambient operation humidity	90% MAX. at less than 40 C, 57% MAX. at less than 50 C , 35% MAX. at 60 C no condensation	
Winding temperature rise	80K MAX. Based on Sanyo Denki standard	

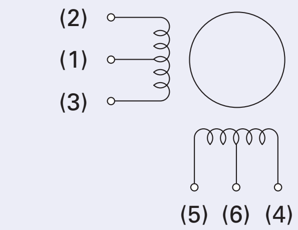
Internal Wiring and Rotation Direction

Unipolar winding

103H52 Connector type

Internal wire connection

( ) connector pin number



Direction of motor rotate

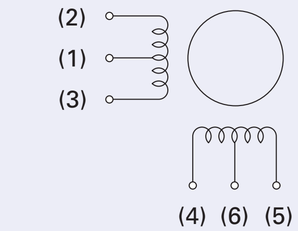
The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Connector type pin number				
		1.6	5	3	4	2
Exciting order	1					
	2					
	3					
	4					

103H782 Connector type

Internal wire connection

( ) connector pin number



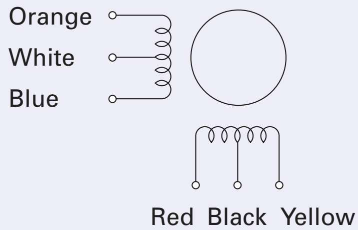
Direction of motor rotate

The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Connector type pin number				
		1.6	4	3	5	2
Exciting order	1					
	2					
	3					
	4					

Lead wire type

Internal wire connection



Direction of motor rotate

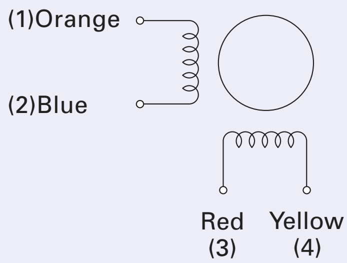
The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Lead wire color				
		White & black	Red	Blue	Yellow	Orange
Exciting order	1					
	2					
	3					
	4					

Bipolar winding

Internal wire connection

( ) connector pin number



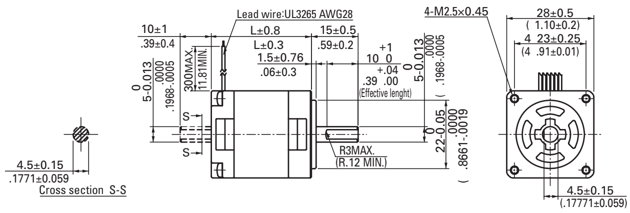
Direction of motor rotate

The output shaft shall rotate clockwise as seen from the shaft side, when excited by DC in the following order.

		Lead wire color, connector type pin teminal blocknumber			
	Lead wire	Red	Blue	Yellow	Orange
Exciting order	1	–	–	+	+
	2	+	–	–	+
	3	+	+	–	–
	4	–	+	+	–
Connector	103H782	3	2	4	1
Teminal block	SM286	3	2	4	1

Motors Unit: mm inch

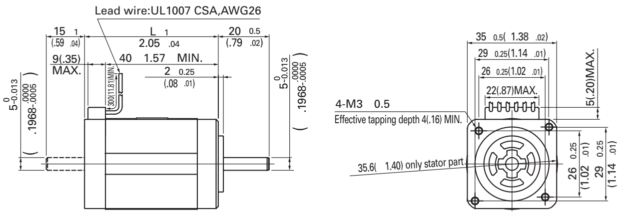
28mm 1.10inch



Connector type Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU14S281	SH2281-51 1	32 1.26	Lead wire
	DU14S281	SH2281-52 1	32 1.26	Lead wire
	DU14S285	SH2285-51 1	51.5 2.03	Lead wire
	DU14S285	SH2285-52 1	51.5 2.03	Lead wire
Bipolar	DB14S281	SH2281-56 1	32 1.26	Lead wire
	DB14S281	SH2281-57 1	32 1.26	Lead wire
	DB14S285	SH2285-56 1	51.5 2.03	Lead wire
	DB14S285	SH2285-57 1	51.5 2.03	Lead wire

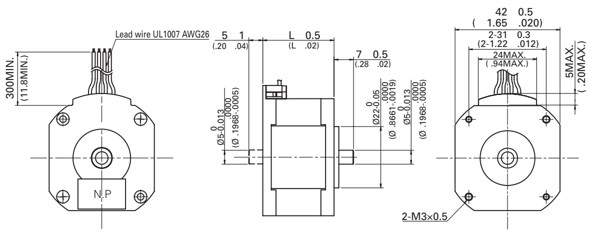
35mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH3533-12U 0	33 1.25	Lead wire
		SH3537-12U 0	37 1.54	Lead wire
		SH3552-12U 0	52 1.89	Lead wire

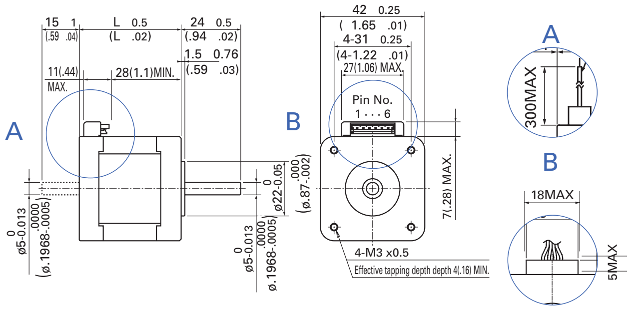
42mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		SS2421-50 1	11.6 .457	Lead wire
		SS2422-50 1	18.6 .732	Lead wire
		SS2423-50 1	25.6 1.008	Lead wire

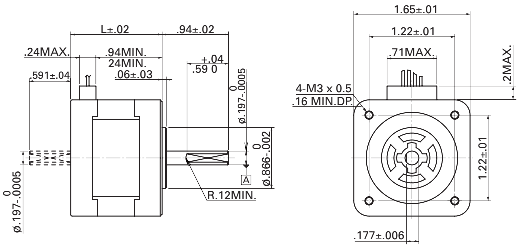
42mm 1.65inch



Connector type Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU15H521	103H5205-04 0	33 1.25	Connector
	DU15H522	103H5208-04 0	39 1.54	Connector
	DU15H524	103H5210-04 0	48 1.89	Connector
		103H5209-04 0	41 1.61	Connector

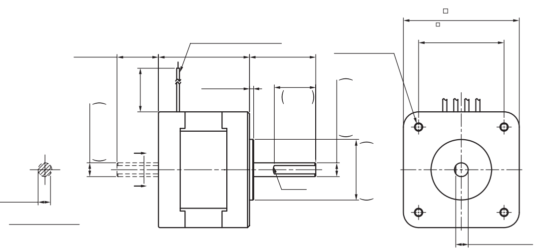
42mm 1.65inch



Connector type Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar	DB14H521	103H5205-52 0	33 1.25	Lead wire
	DB14H522	103H5208-52 0	39 1.54	Lead wire
	DB14H524	103H5210-52 0	48 1.89	Lead wire
		103H5205-50 0	33 1.25	Lead wire
		103H5205-51 0	33 1.25	Lead wire
		103H5208-50 0	39 1.54	Lead wire
		103H5208-51 0	39 1.54	Lead wire
		103H5209-50 0	41 1.61	Lead wire
		103H5209-51 0	41 1.61	Lead wire
		103H5209-52 0	41 1.61	Lead wire
		103H5210-50 0	48 1.89	Lead wire
		103H5210-51 0	48 1.89	Lead wire

42mm 1.65inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU15S141	SH1421-04 1	33 1.25	Lead wire
	DU15S142	SH1422-04 1	39 1.54	Lead wire
	DU15S144	SH1424-04 1	48 1.89	Lead wire
Bipolar	DB16H141	SH1421-52 1	33 1.25	Lead wire
	DB16H142	SH1422-52 1	39 1.54	Lead wire
	DB16H144	SH1424-52 1	48 1.89	Lead wire

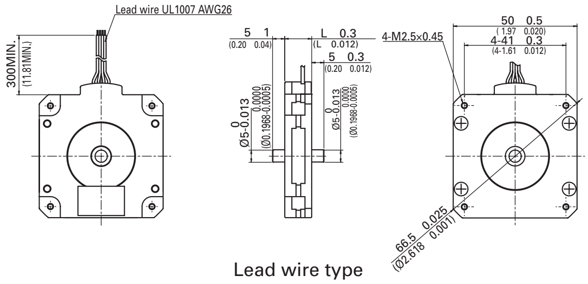
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

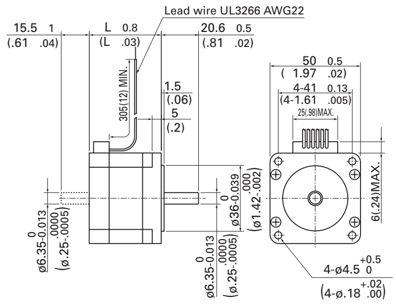
50mm 1.97inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		SS2501-50 1	11 .433	Lead wire
		SS2502-50 1	16 .63	Lead wire

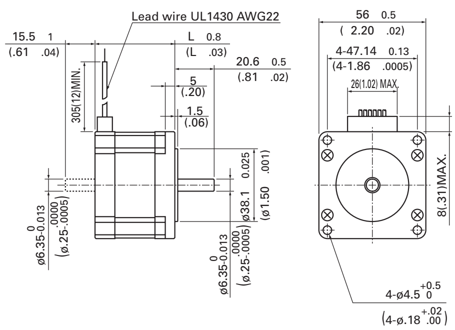
50mm 1.97inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H6701-01 0	39.8 1.57	Lead wire
		103H6701-04 0	39.8 1.57	Lead wire
		103H6701-07 0	39.8 1.57	Lead wire
		103H6703-01 0	51.3 2.02	Lead wire
		103H6703-04 0	51.3 2.02	Lead wire
		103H6703-07 0	51.3 2.02	Lead wire
		103H6704-01 0	55.8 2.20	Lead wire
		103H6704-04 0	55.8 2.20	Lead wire
		103H6704-07 0	55.8 2.20	Lead wire
Bipolar	DB16H671	103H6701-50 0	39.8 1.57	Lead wire
	DB16H672	103H6703-50 0	51.3 2.02	Lead wire
		103H6704-50 0	55.8 2.20	Lead wire

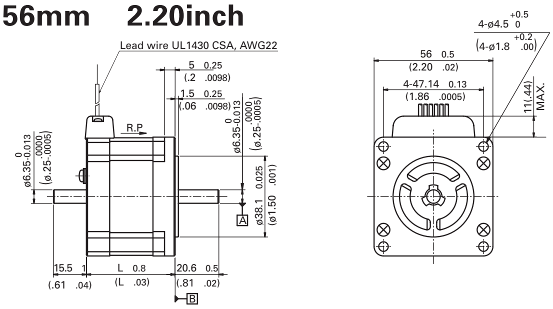
56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar	DU16H711	103H7121-04 0	41.8 1.65	Lead wire
	DU16H713	103H7123-04 0	53.8 2.12	Lead wire
	DU16H716	103H7126-04 0	75.8 2.98	Lead wire
		103H7121-01 0	41.8 1.65	Lead wire
		103H7121-07 0	41.8 1.65	Lead wire
		103H7123-01 0	53.8 2.12	Lead wire
		103H7123-07 0	53.8 2.12	Lead wire
		103H7124-01 0	63.8 2.51	Lead wire
		103H7124-04 0	63.8 2.51	Lead wire
		103H7124-07 0	63.8 2.51	Lead wire
		103H7126-01 0	75.8 2.98	Lead wire
		103H7126-07 0	75.8 2.98	Lead wire

56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H7121-61 0	41.8 1.65	Lead wire CE
		103H7121-67 0	41.8 1.65	Lead wire CE
		103H7123-61 0	53.8 2.12	Lead wire CE
		103H7123-67 0	53.8 2.12	Lead wire CE
		103H7126-61 0	75.8 2.98	Lead wire CE
		103H7126-67 0	75.8 2.98	Lead wire CE

Model number	Shaft diameter(D)	Dcut thickness(L)
103H7121-	6.35	5.8
103H7123-		
103H7126-		
103H7128-	8	7.5

Motor shaft specification code

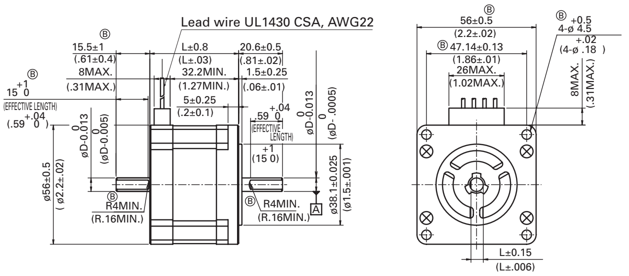
Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Motors Unit: mm inch

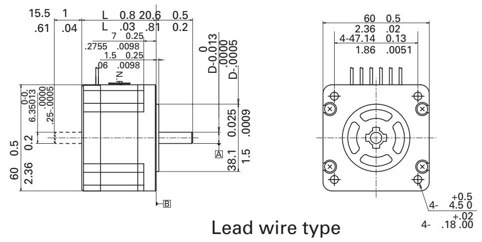
56mm 2.20inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar	DB16H711	103H7121-57 0	41.8 1.65	Lead wire
	DB16H713	103H7123-57 0	53.8 2.12	Lead wire
	DB16H716	103H7126-57 0	75.8 2.98	Lead wire
		103H7121-56 0	41.8 1.65	Lead wire
		103H7121-58 0	41.8 1.65	Lead wire
		103H7123-56 0	53.8 2.12	Lead wire
		103H7123-58 0	53.8 2.12	Lead wire
		103H7126-56 0	75.8 2.98	Lead wire
		103H7126-58 0	75.8 2.98	Lead wire
		103H7128-56 0	94.8 3.73	Lead wire
		103H7128-57 0	94.8 3.73	Lead wire
		103H7128-58 0	94.8 3.73	Lead wire

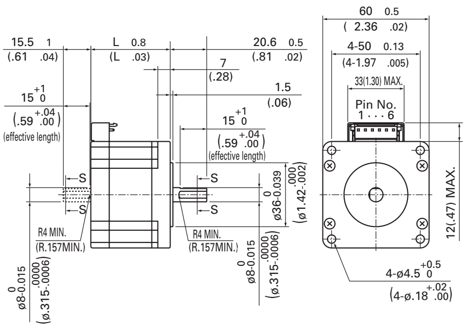
60mm 2.36inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH1601-04 0	42 1.65	Lead wire
		SH1602-04 0	54 2.13	Lead wire
		SH1603-04 0	76 2.99	Lead wire
Bipolar	DB16S161	SH1601-52 0	42 1.65	Lead wire
	DB16S162	SH1602-52 0	54 2.13	Lead wire
	DB16S163	SH1603-52 0	76 2.99	Lead wire

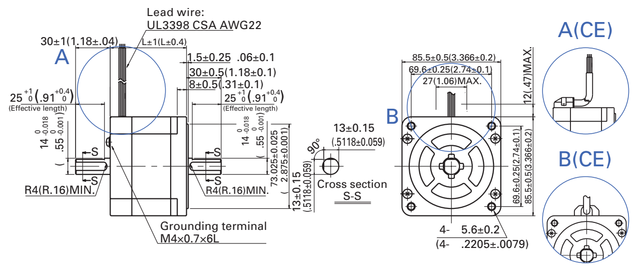
60mm 2.36inch



Connector type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H7821-01 0	44.8 1.76	Connector
		103H7821-04 0	44.8 1.76	Connector
		103H7821-07 0	44.8 1.76	Connector
		103H7822-01 0	53.8 2.12	Connector
		103H7822-04 0	53.8 2.12	Connector
		103H7822-07 0	53.8 2.12	Connector
		103H7823-01 0	85.8 3.38	Connector
		103H7823-04 0	85.8 3.38	Connector
		103H7823-07 0	85.8 3.38	Connector
Bipolar	DB16H781	103H7821-57 0	44.8 1.76	Connector
	DB16H782	103H7822-57 0	53.8 2.12	Connector
	DB16H783	103H7823-57 0	85.8 3.38	Connector
		103H7821-17 0	44.8 1.76	Connector
		103H7822-17 0	53.8 2.12	Connector
		103H7823-17 0	85.8 3.38	Connector

86mm 3.39inch



Lead wire type

CE type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		SH2861-04 1	66 2.6	Lead wire
		SH2862-04 1	96.5 3.8	Lead wire
		SH2863-04 1	127 5	Lead wire
Bipolar		SM2861-50 1	66 2.6	Lead wire CE
		SM2861-51 1	66 2.6	Lead wire CE
		SM2861-52 1	66 2.6	Lead wire CE
		SM2862-50 1	96.5 3.8	Lead wire CE
		SM2862-51 1	96.5 3.8	Lead wire CE
		SM2862-52 1	96.5 3.8	Lead wire CE
		SM2863-50 1	127 5	Lead wire CE
		SM2863-51 1	127 5	Lead wire CE
		SM2863-52 1	127 5	Lead wire CE

Model number	Shaft diameter(D)	Dcut thickness(L)
103H7121-	6.35	5.8
103H7123-		
103H7126-		
103H7128-	8	7.5

Model number	Shaft diameter(D)	Dcut thickness(L)
SH1601-	6.35	5.8
SH1602-		
SH1603-	8	7.5

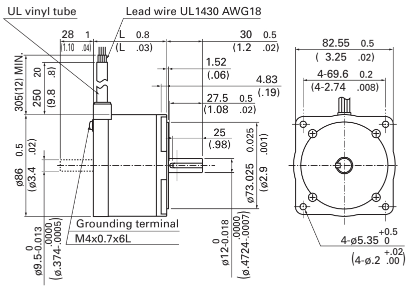
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	5
Double shafts	D	2

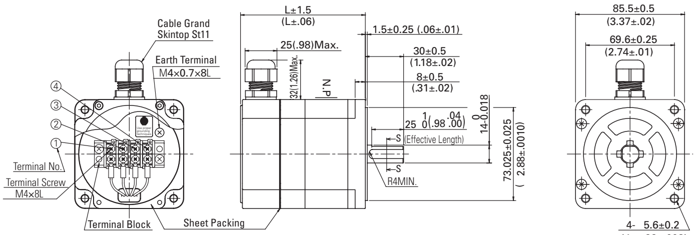
86mm 3.39inch



Lead wire type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Bipolar		103H8221-62 0	62 3.31	Lead wire CE
		103H8222-63 0	92.2 5.51	Lead wire CE
		103H8223-63 0	125.9 7.72	Lead wire CE

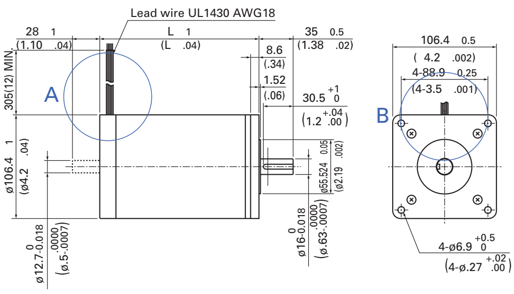
86mm 3.39inch



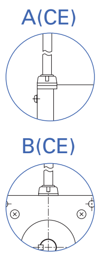
Terminal block type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Terminal block		SM2861-5066	97.9 3.9	Terminal block
		SM2861-5166	97.9 3.9	Terminal block
		SM2861-5266	97.9 3.9	Terminal block
		SM2862-5066	128.4 5.1	Terminal block
		SM2862-5166	128.4 5.1	Terminal block
		SM2862-5266	128.4 5.1	Terminal block
		SM2863-5066	158.8 6.3	Terminal block
		SM2863-5166	158.8 6.3	Terminal block
		SM2863-5266	158.8 6.3	Terminal block

106mm 4.17inch



Lead wire type



CE type

	Set part number	Motor model number	Motor length : mm inch	Cable type
Unipolar		103H89222-09 1	163.3 6.4	Lead wire
		103H89223-09 1	221.3 8.7	Lead wire
Bipolar		103H89222-52 1	163.3 6.4	Lead wire
		103H89223-52 1	221.3 8.7	Lead wire CE
		103H89222-63 1	163.3 6.4	Lead wire CE
		103H89223-63 1	221.3 8.7	Lead wire

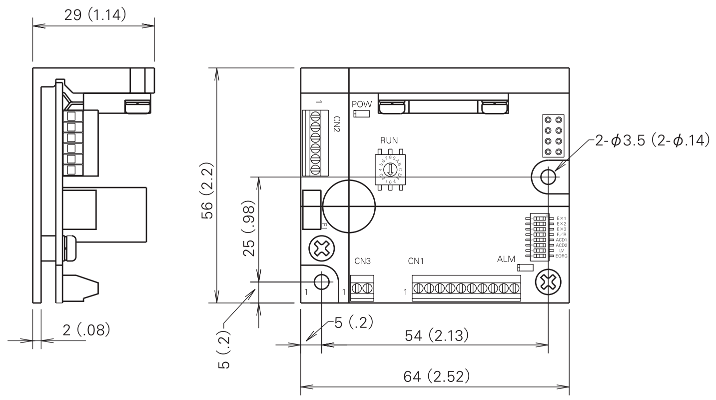
Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	4
Double shafts	D	1

Motor shaft specification code

Motor shaft spec	Set type code	Motor type code
Single shaft	S	7
Double shafts	D	3

Drivers Unit: mm inch



Safety standards

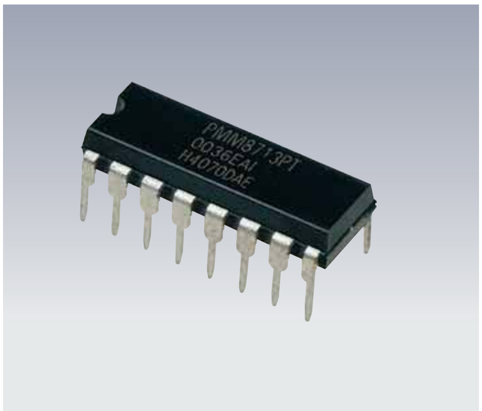
driver

UL	Acquired standards		File No.	Standard part
	UL		E179775	UL508C
	UL for Canada			
CE TÜV	Directives	Category	Name	Standard part
	Low-voltage directives			EN61010-1
	EMC directives	Emission	Terminal disturbance voltage	EN55011-A
			Electromagnetic radiation disturbance	EN55011-A
		Immunity	ESD Electrostatic discharge	EN61000-4-2
			RS Radio-frequency amplitude modulated electromagnetic field	EN61000-4-3
			Fast transionts	EN61000-4-4
			Surges	EN61000-4-6

SM series motor(UL/CE),H series motor(CE)

UL	Acquired standards	File No.
	UL	E208878
	UL for Canada	
CE	Standard category	Standard part
	Low-voltage directives	EN-60034-1
		IEC34-5
		(EN-60034-5)

EMC characteristics may vary depending on the configuration of the users control panel, which contains the driver or stepping motor, or the arrangement and wiring of other electrical devices.
Parts for EMC noise suppression like noise filters and troidal type ferrite cores may be required depending on circumstances.
Validation test of F series driver has been performed for low-voltage EMC directives at TÜV TÜV product service for self-declaration of CE marking.



Universal controller IC for the 2-phase stepping motor drive

PMM8713PT

Characteristics

Universal controller : The following 3 types of energization mode can be selected by switching at the energization mode switching terminal
1EX/1-2EX/2EX
Source voltage : Vcc = 4.5 to 5.5V
High output current : 24mA MIN. sink, source
High noise margin : Schmitt trigger circuit is incorporated for the all input terminals.
2 types of pulse input : 2 input mode CW, CCW input mode
Pulse and direction mode CK, U/D input mode
Excited status verification monitor : Outputs the monitor signal of the controller status.

Maximum Rating Ta=25

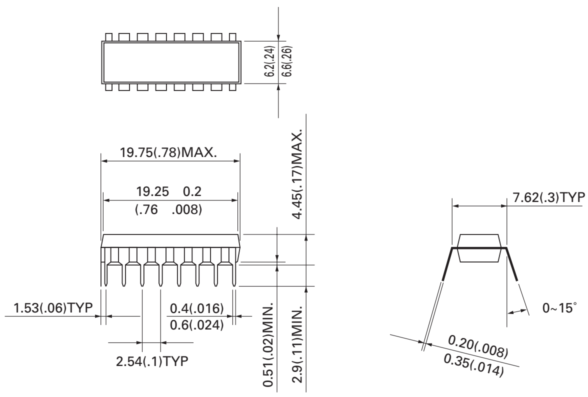
Item		Symbol	Rating	Unit
Source voltage		V_{CC}	-0.3 to 7	V
Output current n	H level	I_{OH}	-35	mA
	L level	I_{OL}	35	
Output current C_O,E_M	H level	I_{OH}		A
	L level	I_{OL}		
Input voltage		V_{IN}	-0.3 to V_{CC} +0.3	V
Input current		I_{IN}	10	mA
operating current		T_{opr}	-20 to 85	
Conservation temperature		T_{stg}	-40 to 125	

Recommended Operating Conditions Ta=-20 to 85

Item		Symbol	Rating			Unit
			MIN.	Standard	MAX.	
Source voltage		V_{CC}	4.5		5.5	V
Output current n	H level	I_{OH}	-24			mA
	L level	I_{OL}	24			
Output current C_O,E_M	H level	I_{OH}	-2			mA
	L level	I_{OL}	2			
Input voltage		V_{IN}	0		VCC	V

Dimensions Unit : mm inch

Pin No.	Name	Function
1.	C_U	Input pulse UP clock input
2.	C_D	Input pulse DOWN clock input
3.	C_K	Input pulse clock input
4.	U/D	Rotation direction conversion
5.	E_A	energization mode switching input
6.	E_B	energization mode switching input
7.	c	energization mode switching input
8.	V_{SS}	GND
9.	R	Reset input
10.	4	4 output
11.	3	3 output
12.	2	2 output
13.	1	1 output
14.	E_M	energization monitor output
15.	C_O	Input pulse monitor output
16.	V_{CC}	4.5 to 5.5V



Electrical Characteristics

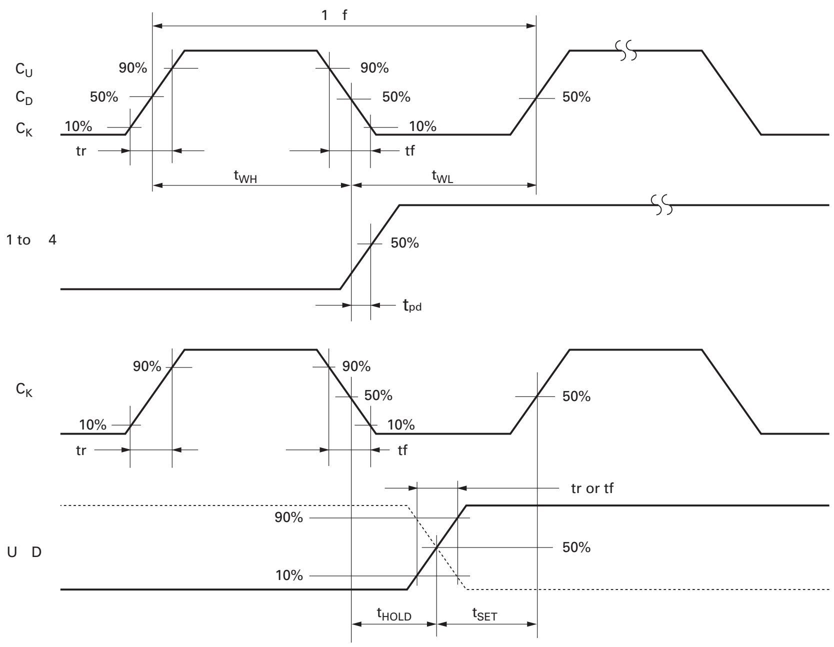
Direct current characteristics Ta = -20 to 85

Item		Symbol	Condition VCC[V]		Standard value MIN.	Standard	MAX.	Unit
Input voltage	H level	V_{IH}	5		3.5			V
	L level	V_{IL}	5				1.5	
Output voltage	H level	V_{OH}	5	V_H=5V V_L=0V IO_H=0	4.9			V
	L level	V_{OL}	5	V_H=5V V_L=0V I_{OH}=0			0.1	
Output current 1 to 4	H level	I_{OH}	5	V_H=5V V_L=0V V_{OUT}=2.4V	-24			mA
	L level	I_{OL}	5	V_H=5V V_L=0V V_{OUT}=0.4V	24			
Output current C_O, E_M	H level	I_{OH}	5	V_H=5V V_L=0V V_{OUT}=2.4V	-2			mA
	L level	I_{OL}	5	V_H=5V V_L=0V V_{OUT}=0.4V	2			
Input current		I	5			10		A
Static current consumption		I_{CC}	5	V_H=5V V_L=0V		1		mA

Switching characteristics Ta = -20 to 85

Item	Symbol	Condition VCC[V]a		Standard value MIN.	Standard	MAX.	Unit
MAX. clock frequency	f_{MAX}	5	tr tf 20ns, CL 50pF	1			MHZ
MIN. width of clock pulse	t_{WL}, t_{WH}	5	tr tf 20ns, CL 50pF			500	ns
MIN. width of reset pulse	t_{WR}	5	tr tf 20ns, CL 50pF			1000	ns
Time delay from clock input to output	t_{pd}	5	tr tf 20ns, CL 50pF			2000	ns
Set time	t_{SET}	5	tr tf 20ns, CL 50pF	0			ns
Holding time	t_{HOLD}	5	tr tf 20ns, CL 50pF	250			ns

Measured waveforms on switching time scale



Function Table

Input modes and rotation direction

Input mode	Input CU	CD	CK	U D	Rotation direction
2 input mode CW, CCW	↓	L	L	L	CW
	L	↓	L	L	CCW
Pulse and direction mode CK, U/D	L	L	↓	H	CW
	L	L	↓	L	CCW

Energization modes

Excitation mode	Input R	EA	EB	C
1 EX	H	H	L	H
1-2EX	H	H	H	H
2 EX	H	L	L	H

Universal controller IC for the 2-phase stepping motor drive

PMM8713PT

Energization Sequence

1EX

Pulse / Face	0 Reset	1	2	3	4
1	1	0	0	0	1
2	0	1	0	0	0
3	0	0	1	0	0
4	0	0	0	1	0
EM	0	0	0	0	0
UP	→				
DOWN	←				

2EX

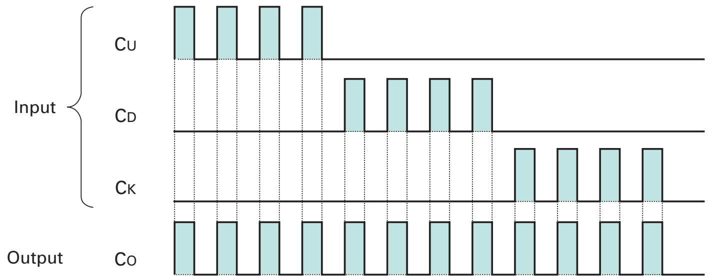
Pulse / Face	0 Reset	1	2	3	4
1	1	1	0	0	1
2	0	1	1	0	0
3	0	0	1	1	0
4	1	0	0	1	1
EM	1	1	1	1	1
UP	→				
DOWN	←				

1-2EX

Pulse / Face	0 Reset	1	2	3	4	5	6	7	8
1	1	1	1	0	0	0	0	0	1
2	0	0	1	1	1	0	0	0	0
3	0	0	0	0	1	1	1	0	0
4	1	0	0	0	0	0	1	1	1
EM	1	0	1	0	1	0	1	0	1
UP	→								
DOWN	←								

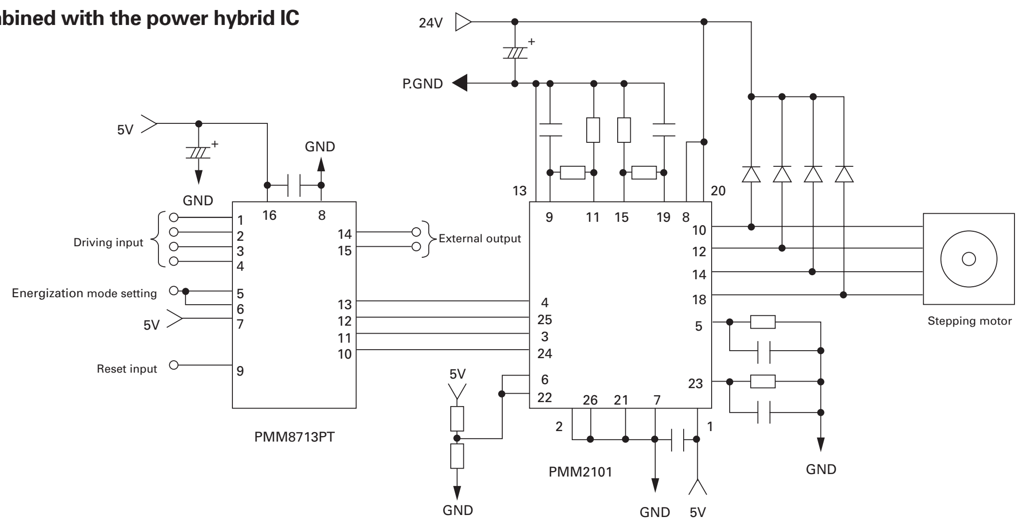
Reset after changing the energization mode.

Input Pulse Monitor



Example of Application Circuit Bipolar wiring motor

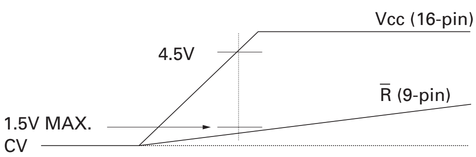
Combined with the power hybrid IC



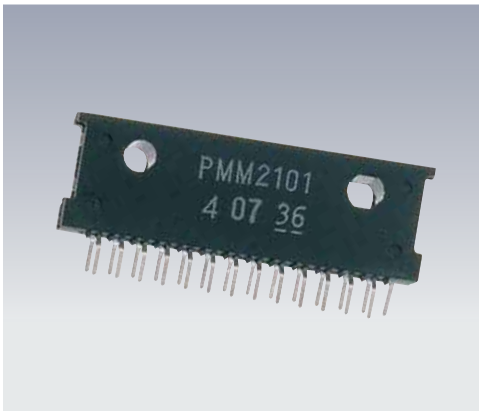
Energization mode setting

Pin No.	Terminal symbol	Input level	Motor operation
5,6	EA, EB	H	1-2EX
		L	2EX

The normal initial reset may not be performed during unstable VCC after turning the power ON. For reliable resetting, hold the R terminal 9-pin at the L level till the VCC becomes stable.



Power hybrid IC : Refer to page 47 for the PMM2101 specifications.
Refer to the PMM8713PT Operation Manual for other application circuit examples.



HIC for the 2-phase stepping motor

PMM2101
Full Step / Half Step
Bipolar

Characteristics

Enables high speed and high torque operation by using bipolar constant current switching method.
Enables compact driving circuit configuration with few of externally attached parts.
The overheat protection circuit is incorporated to assist the safety design.

Maximum Rating Tc=25

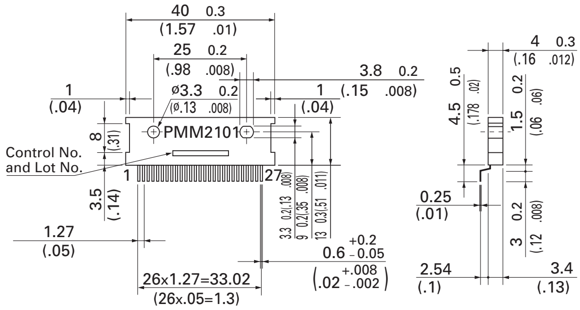
Item	Symbol	Rated value	Unit
Source voltage-1	V_{CC1}	8 to 60	V
Source voltage-2	V_{CC2}	0 to 7	V
Output current	I_O	1.4	A
Allowable loss	P_T	35 Tc 25	W
Thermal resistance	jc	3.57	W
	ja	25	W
Junction temperature	T_{jmax}	150	
Conservation temperature	T_{stg}	-40 150	

Recommended Operating Conditions Tc=25

Item	Symbol	Rated value	Unit
Source voltage-1	V_{CC1}	10 to 50	V
Source voltage-2	V_{CC2}	4.75 to 5.25	V
Output current	I_O	1.0	A
Oscillator frequency	F_C	20 to 27	kHz
Operation temperature	T_C	-25 to 85	

Dimensions Unit : mm inch

Pin No.	Name	Function
1.	V_{CC2}	Power terminal for controller section
2.	ENA A	Enable input terminal
3.	1	Arm drive input
4.	2	Arm drive input
5.	CR A	One shot time constant setting terminal
6.	V_{ref} A	Motor current setting terminal
7.	LG A	GND
8.	V_{CC1} A	Motor driver power terminal
9.	V_SA	Motor current detection terminal
10.	M1	Motor output
11.	R_S A	Detection resistor connecting terminal
12.	M2	Motor output
13.	PG	P.GND
14.	M3	Motor output
15.	R_S B	Detection resistor connecting terminal
16.	NC	
17.	NC	
18.	M4	Motor output
19.	V_S B	Motor current detection terminal
20.	V_{CC1} B	Motor driver power terminal
21.	LG B	GND
22.	V_{ref} B	Motor current setting terminal
23.	CR B	One shot time constant setting terminal
24.	3	Arm drive input
25.	4	Arm drive input
26.	ENA B	Enable terminal
27.	AL	Overheat alarm output terminal



Operational truth value table

ENA A(ENA B)	1(3)	2(4)	M1(M3)	M2(M4)
L	L	L	OFF	OFF
L	L	H	L	H
L	H	L	H	L
L	H	H	OFF	OFF
H			OFF	OFF

HIC for the 2-phase stepping motor

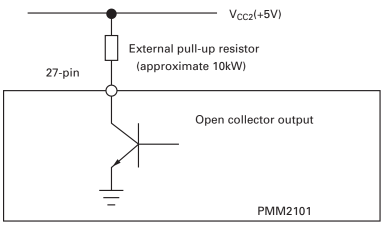
PMM2101 Full Step / Half Step

Electrical Characteristics Ta=25

Item	Symbol	Condition	Rating MIN.	Rating Standard	Rating MAX.	Unit
"H"level input voltage	V_{IH}	V_{CC2} 5V	2.7		V_{CC2}	V
"L"level input voltage	V_{IL}	V_{CC2} 5V	0		1.0	V
"H"level input current	I_{IH}	V_{CC2} 5V V_I 5V			10	A
"L"level input current	I_{IL}	V_{CC2} 5V V_I 0V			-50	A
Reference voltage (V_{ref}) input current	I_{ref}	V_{CC2} 5V V_{ref} 0V			-10	A
Current detection (V_S) input current	I_S	V_{CC2} 5V V_S 0V			-10	A
Forward direction voltage of FET diod	V_F	I_F 1A		1.3	1.5	V
High output saturating voltage	$V_{ce\ (sat)H}$	I_C 1A		1.0	1.4	V
Low output saturating voltage	$V_{ce\ (sat)L}$	I_C 1A		1.0	1.3	V
Low output saturating voltage	I_R	V_{CC1} 60V V_{OUT} 0V			10	A
		V_{OUT} 60V V_{RS} 0V			10	A
Power current to controller section	I_{CC2}	V_{CC2} = 5V during circuit operation			75	mA
Alarm terminal current	I_{alm}	V_{CC2} 5V V_{alm} 0.5V			2	mA
Overheat alarm operating temperature				125		
Overheat protection stop temperature				150		

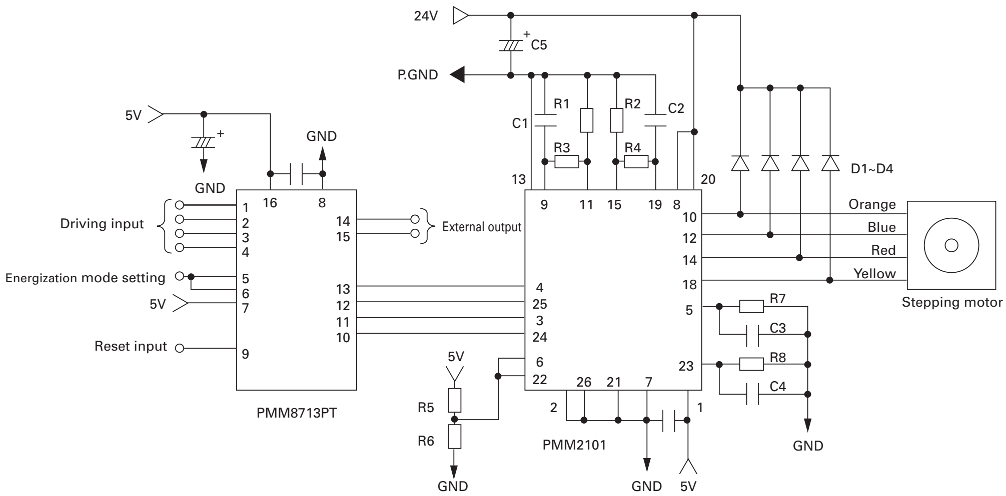
Overheat Alarm Output

The overheat protection circuit outputs an alarm signal at +125 at the internal junction in the IC, and activates motor excitation OFF at +150 .



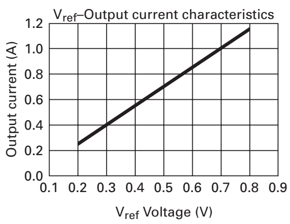
Transistor ON during alarming
Vce ON : 0.5V MAX.
Ialm : 2mA MAX.
The alarming signal output and overheat protection circuit recover automatically when the temperature lowers.

Example of Application Circuit



Refer to page 53 for the PMM8713PT specifications.
Recommended circuit constants for PMM2101

Applicable	Constant	Applicable	Constant
R1,R2	5W 0.68	C1, C2	1000pF
R3,R4	1 4W 3.9k	C3, C4	3300pF
R7,R8	1 4W 15k	C5	330 F



Determine on the R5 and R6 constants referring to the Vref-output current characteristics.
Determine on D1 to D4.
Peak reverse voltage 100V
Output current 1A
Reverse recovery time 100ns

HIC for the 2-phase stepping motor

PMM2301 Micro Step

Unipolar

Characteristics

Sine wave driven micro-step driver.
The current detection resistor is incorporated.
MOSFET is used for the power driving circuit to reduce heating.
Totally packaged to reduce parts for the peripheral circuit.
Enables selection from the 5 various excitation modes by the external bit signal.

Maximum Rating Tc=25

Item	Symbol	Condition	Rated value	Unit
Source voltage-1	$V_{CC1\,MAX.}$	V_{CC2} 0V	52	V
Source voltage-2	$V_{CC2\,MAX.}$	With no signal	7	V
Input voltage	$V_{in\,MAX.}$	Logic input terminal	7	V
Phase current	$I_{OH\,MAX.}$	0.5sec, 1pulse, V_{CC1} applied	4	A
Operating temperature on PCB	$T_{C\,MAX.}$		105	
Junction temperature	$T_{j\,MAX.}$		150	
Conservation temperature	T_{stg}		-40 to 125	

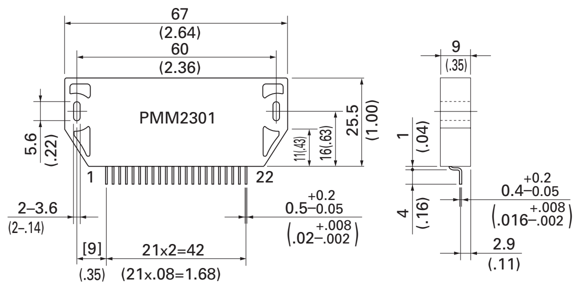
Recommended Operating Conditions Ta=25

Item	Symbol	Condition	Rated value	Unit
Source voltage-1	V_{CC1}	With signal	10 to 45	V
Source voltage-2	V_{CC2}	With signal	5.0 5	V
Input voltage	V_{IH}		0 to V_{CC2}	V
Phase current	I_{OH}	Duty 50	3	A
Clock frequency	Clock		DC to 50	kHz
Withstand voltage of phase driver	V_{DSS}		100	V

Dimensions unit: mm inch

Pin No.	Terminal name
1.	$\overline{B}$
2.	B
3.	P.GND A
4.	P.GND B
5.	A
6.	$\overline{A}$
7.	V_{CC2}
8.	V_{ref}
9.	Mode 1
10.	Mode 2
11.	Mode 3

Pin No.	Terminal name
12.	V_{CC2}
13.	V_{CC2}
14.	Clock
15.	CW CCW
16.	Reset
17.	Return
18.	Enable
19.	M_{0I}
20.	M_{01}
21.	M_{02}
22.	GND



Each Terminal Function

Terminal name	Function	Functioning condition				
V_{ref}	Motor current setting input					
Clock	Motor driving pulse input	Mode 3 = H level : Operates at rising edge Mode 3 = L level : Operates at rising and falling edges				
CW / CCW	Motor rotation direction setting input	H level = CW rotation L level = CCW rotation				
Reset	System reset	Reset "L"				
Return	Forced return to phase origin	Forced shift to the origin of the present energization phase with Return = H				
Enable	Power OFF input	Enable "L"				
M_{0I}	Phase origin monitor output	L level output at the phase origin.				
M_{01} M_{02}	Monitor output on phase energization status	Outputs level signal on the present phase energization status.				
		Phase coordinate	A phase	B phase	$\overline{A}$ phase	$\overline{B}$ phase
		M01	H	L	L	H
		M02	L	H	L	H

HIC for the 2-phase stepping motor

PMM2301 Micro Step

Energization Mode Table

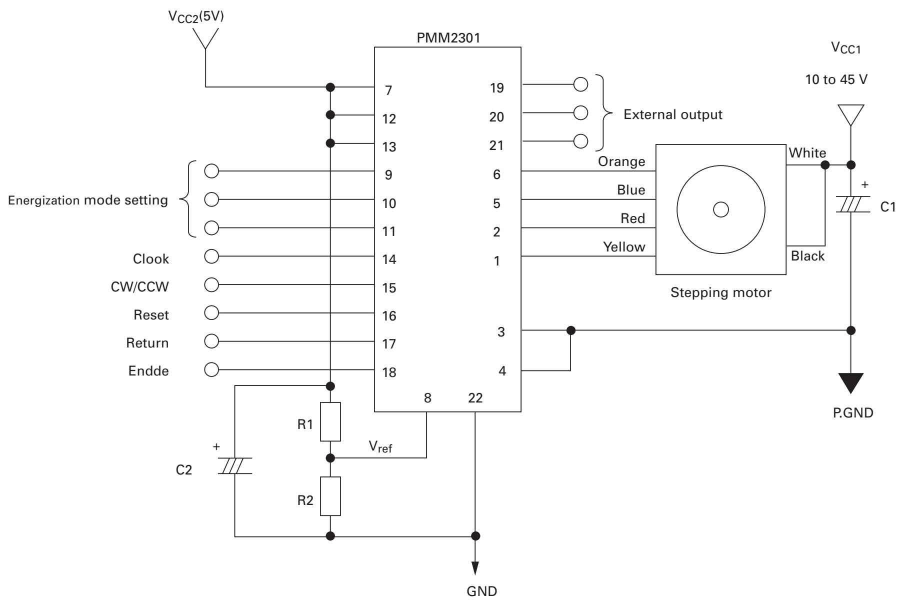
Input condition			Energization	1 step angle	Number of basic
Mode1	Mode2	Mode3	mode	degree	angle division
L	L	H	2EX	1.8	1/1
H	L	H	1-2EX	0.9	1/2
L	H	H	W1-2EX	0.45	1/4
H	H	H	2W1-2EX	0.225	1/8
H	H	L	4W1-2EX	0.1125	1/16

Conditioned on the Mode 3 = L, one pulse operation is performed at every rising and falling edge of the clock pulse. Accordingly, the operation becomes unstable if the driving pulse duty ratio deviates from 50%.

Electrical Characteristics Tc=25 Vcc1=24V Vcc2=5V

Item	Symbol	Condition	Rating MIN.	Standard	MAX.	Unit
V_{CC2} Power current	I_{CCO}	Enable = L		4.5	15	mA
Effective output current	I_{oave}	Each phase R/L = 3.5 /3.8mH, Vref = 0.6V	0.45	0.50	0.55	A
Forward direction voltage of FET diode	V_{df}	I_f 1A		1.2	1.8	V
Output saturating voltage	V_{sat}	RL = 7.5 I 3.0A		1.4	2.6	V
H level input voltage	V_{IH}	9 to 11, 14 to 18 pins	4.0			V
L level input voltage	V_{IL}	9 to 11, 14 to 18 pins			1.0	V
Input current	I_{IL}	9 to 11, 14 to 18 pins = GND level, Pull-up resistor 20k	125	250	510	A
V_{ref} input voltage	V_r	8-pin	0		V_{CC2} 2	V
V_{ref} input curren	I_r	8-pin		1		A
H level output voltage M_{OI} M_{O1} M_{O2}	V_{OH}	19 to 21 pins I = 3mA, I = -3mA	2.4			V
L level output voltage M_{OI} M_{O1} M_{O2}	V_{OL}	19 to 21 pins I = 3mA, I = -3mA			0.4	V
PWM frequency	Fc		37	47	57	kHz

Example of Application Circuit



Recommended circuit constants

C1	C2
100 F or over	10 F

Determine on the R1 and R2 constants based on the Vref voltage calculated from the following formula.
Vref V = Motor current adjusted value A/phase x 0.6

Safety Consideration

The drivers and stepping motors are the products designed to be used for the general industrial devices.
When using those, pay enough attention to the following points.

Read thoroughly the Operation Manual prior to placement, assembly and/or operation in order to use the product properly.

Refrain from modifying or processing the product in any way.

Consult with the distributor or professional experts for placement or maintenance services of the product.

In case of the following uses of the product, contact with us for the special care required to the operation, maintenance and management such as multiplexing the system, installing an emergency electric generator set, or so forth.

1 Use for the medical devices concerned with a fatal accident.
2 Use for trains, elevators, and so forth that are likely to cause an accident resulting in injury, damage or death.
3 Use in the computer system highly influential to the social life or the public systems.
4 Use in other devices highly influential to maintaining the human safety or the public functions.

In addition to the above, consult with us for use in such a vibration environment as automobile or transportation.

Read the Operation Manual thoroughly prior to the use (placement, operation, maintenance and inspection) to put the product in use properly.

Make yourself knowledgeable and familiarize with the devices, safety issues and cautions before handling the product.

After reading the Operation Manual or the like, keep it in the place where the users can refer to whenever necessary.

Indication by Warning Label on the product

Either or all of the following indications are given by the Warning Labels depending on the type of the driver or stepping motor.

This label is stuck near the high voltage part such as the electrically charged or cover-protected section, warning that the place where it is likely to cause an electric shock.

This label is stuck on the place where the driver or stepping motor body should be easily acknowledged, warning that it is likely to cause burns from high temperature.

This label is stuck near the GND terminals of the driver or stepping motor for which grounding is required, suggesting that the terminals should be actually grounded.

This label is stuck for the driver or stepping motor to which the power source is applied in the voltage exceeding the safety standard, drawing attention against the electric shock.

Safety ranks of the cautions

Following four ranks are provided.

DANGER Improper operations or use is most likely to result in serious injury or death.

CAUTION Improper operations or use is likely to result in average or minor injury, or in property damage.

In spite of the cautions with the CAUTION label, it may cause serious results. Either the contents of the labels is describing important cautions to be followed inevitably.

PROHIBITED Indicates what shall not be done.

COMPULSORY Indicates what shall be done.

DANGER

General matters

1. Do not use the product in an explosive, flammable or corrosive atmosphere, watery place or near a combustible material. Doing so may cause injury or fire.

2. Have a person with expert knowledge for performing the transportation, placement, wiring, operation, maintenance or inspection of the product. Without such knowledge, it may cause an electric shock, injury or fire.

3. Do not work for wiring, maintenance servicing or inspection with the electric power on. Perform either of those five minutes after turning the power off, or otherwise, it may cause an electric shock.

4. When the protective functions of the product is activated, turn the power off immediately and eliminate the cause. If continuing the operation without eliminating the cause, the product may operate improperly and cause injury or a breakdown of the system devices.

5. Stepping motor may run out of order at the operating and stopping occasions, depending on the magnitude of the load. Put the product into use after confirming with the adequate trial test operation in the maximum load conditions that the product performs reliable operation. Doing otherwise may cause a breakdown of the system. (Should the product run out of order in the use to drive upward/downward, it may cause a fall of the load.)

6. Do not touch the internal parts of the driver. Doing so may cause an electric shock.

Wiring

7. Do not connect the stepping motor directly with the commercial power outlet. Doing so may cause an electric shock, injury or fire. The power shall be supplied to the stepping motor through the driving circuit.

8. Use the electric power source within the rated input voltage. Using otherwise may cause fire or an electric shock.

9. Connect the driver and stepping motor to the ground. Using without grounding may cause an electric shock.

10. Do not harm, forcibly put a stress, or load a heavy article on the cable or get it caught between the articles. Doing so may cause an electric shock.

11. Perform wiring with the power cable as instructed by the wiring diagram or the Operation Manual. Doing otherwise may cause an electric shock or fire.

Operation

12. Be sure not to touch the rotating part of the stepping motor during its operation. Touching it may cause injury.

13. Neither reach or touch the electric terminals while electric power is on. Doing so may cause an electric shock.

14. Never disconnect any of the connectors while electric power is on. Doing so may cause an electric shock and corruption.

General matters

1. Prior to placement, operation, maintenance servicing or inspection, be sure to read the Operation Manual and follow the instructions to perform those. Failure to follow the instructions may cause an electric shock, injury or fire.

2. Do not use the driver or the stepping motor outside the specified conditions. Doing so may cause an electric shock, injury or fire.

3. Do not insert a finger or a thing into the opening of the product. Doing so may cause an electric shock, injury or fire.

4. Do not use the damaged driver or stepping motor. Doing so may cause injury, fire or the like.

5. Use the driver and stepping motor in the designated combination. Using otherwise may cause fire or a trouble.

6. Be careful that the temperature rises in the operating driver, stepping motor or peripheral devices. Failure to be careful may cause a burn.

Unpacking

7. Unpack while confirming the ceiling. Failure to do so may cause injury.

8. Confirm if the product is the one having been ordered. Installing an incorrect product may cause a breakdown.

Wiring

9. Do not perform measurement of the insulation resistance or withstand insulation voltage of the product. Doing so may cause a breakdown. Instead, contact with us for such inspection.

10. Perform wiring conforming to the technical standards of electric facility or the internal rule. Doing otherwise may cause burning or fire.

11. Ensure that wiring has been correctly done. Operating without correct wiring may cause the stepping motor to run out of control and result in injury.

12. Take insulation process for the attached condenser or the external resistance connection terminals. Failure to do so may cause an electric shock.

Placement

13. Do not climb or attach a heavy article on the product. Doing so may cause injury.

14. Neither block nor stuff the aspiration/exhaust vent with a foreign particle. Doing so may cause fire.

15. Follow the instructions for the direction to place. Failure to do so may cause a trouble.

16. Keep a distance as instructed by the Operation Manual for the driver from the inner surface of the control console or other devices. Failure to do so may cause a trouble.

17. Place the product with a great care so as to prevent from the danger such as a tumble or a turnover.

CAUTION

18. Mount the product on an incombustible material such as metal. Doing otherwise may cause fire.

19. Confirm the rotating direction before connecting with the mechanical device. Failure to do so may cause injury or a breakdown.

20. Do not touch the motor output spindle (including the key slot and gears) with a bare hand. Doing so may cause injury.

Operation

21. The stepping motor is not equipped with any protective device. Take protective measures using an over-current protective relay, a ground fault interrupter, a protective device from excess temperature, and an emergency stopping device. Failure to do so may cause injury or fire.

22. Do not touch the product for a period after the power is on or has been turned off, since the driver and stepping motor remain in the high temperature. Doing so may cause burns. Especially the temperature rises considerably of the stepping motor depending on the operating conditions. Use the motor on the condition so that its surface temperature becomes 100°C or under.

23. Stop the operation immediately when an emergency occurs. Failure to do so may cause an electric shock, injury or fire.

24. Do not change adjustment to an extreme, for such a change results in the unstable operation. Doing so may cause injury.

25. When conducting the trial operation, make the stepping motor fixed firmly, and confirm the operation by disconnecting with the mechanical system before connecting with it. Failure to do so may cause injury.

26. When the alarm has been activated, eliminate the cause and ensure the safety to resume operation. Failure to do so may cause injury.

27. When the electric power recovers after the momentary interruption, do not approach the devices because the system may re-start operation by itself. (Set the system so as to secure the safety even when it re-start on such occasion.) Failure to do so may cause injury.

28. Confirm that the electric power supply is all proper conforming to the specifications. Failure to do so may cause a trouble.

29. The brake mechanism of the motor with the electro-magnetic brake is to hold the movable section and the motor position. Do not use it as a safety measure, or doing so may cause the breakdown of the system.

30. Fix the key firmly when operating the motor with key individually. Failure to do so may cause injury.

Maintenance services

31. Be careful when performing maintenance services or inspection about the temperature which rises highly in the driver and stepping motor frame. Failure to do so may cause burns.

32. It is recommended to replace the electrolytic condenser of the driver with a new one for securing the preventive measure after using for 5 years, the expected life in the average 40°C. The expected life of the fuse is 10 years in the average 40°C. Thus, the periodical replacement is recommended.

33. Contact with us for repair. If the product is disassembled by the user, it may put it out of action.

Transportation

34. Handle the product with care during transportation so as to prevent from the danger such as a tumble or a turnover.

35. Do not hold with the cable or the motor spindle. Doing so may cause a trouble or injury.

Retirement

36. When scrapping the driver or stepping motor, treat it for the general industrial waste.

PROHIBITED

Storage

1. Avoid the place exposed to rain or water drops, or in an environment with hazardous gas or liquid for storing the product. Failure to do so may cause a trouble.

Maintenance services

2. Do not assemble or repair the product. Doing so may cause fire or an electric shock.

General matters

3. Do not remove the rating plate.

COMPULSORY

Storage

1. Store the product within the specified conservation temperature and humidity in the place not exposed to the sun beam.

2. If the driver has been stored for a long period (3 years or longer for a guide), consult with us. The capacitance may have decreased with the electrolytic condenser due to the long period storage, and it may cause a trouble.

Operation

3. Install an external emergency stop circuit to turn the power off for the instant halt of operation.

4. Put the product into operation in the specified ambient temperature and humidity.

Transportation

5. Excess loading of the product on the carrier may cause the load to fall in pieces. Follow the instructions given outside the package.

Inquiry Check Sheet

For more information regarding any products or services described here in, please contact your nearest office listed on the back of this catalog.

To SANYO DENKI Co.,LTD.

Date

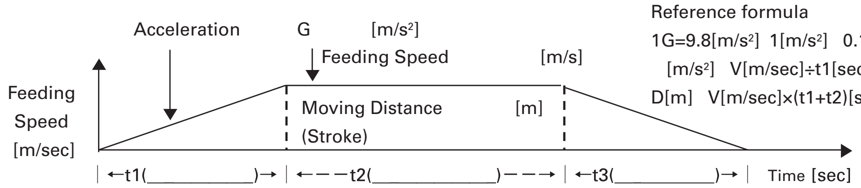
Company:

Department:

Name:

Tel: FAX:

E-mail:

	Item	Contents
1	Name of target equipment	Equipment name, category (transport, processing, test, other)
2	Name of servo axis	Axis name, axial mechanism (horizontal/vertical), brake mechanism (yes/no)
3	Current condition of above axis	Manufacturer Name ( ) Series Name ( ) Motor Capacity ( ) Hydraulic, Mechanical, or New System ( )
4	Positioning accuracy	± mm ± m
5	Operation pattern	 Reference formula 1G=9.8$[m/s^2]$ 1$[m/s^2]$ 0.1G $[m/s^2]$ V[m/sec]÷t1[sec] D[m] V[m/sec]×(t1+t2)[sec]
6	Mechanism	Ball-screw/screw-rotation type (horizontal), ball-screw/nut-rotation type (horizontal), rack and pinion (horizontal), belt/chain (horizontal), rotary table, roll feed, instability
7	Mechanical structure	WT table mass kg WL work mass kg WA mass of other drive parts kg WR rack mass kg WB belt/chain mass kg WC counterbalance mass kg Fa external force axial direction N Fb ball-screw preload N T roll pushing force N Dr1 drive-side roll diameter mm Dr2 follower-side roll diameter mm Lr1 drive-side roll length mm Lr2 follower-side roll length mm G reduction ratio JG speed-reducer inertia kg m^2 JC coupling inertia kg m^2 JN nut inertia kg m^2 JO other motor-axis conversion inertia kg m^2 Db ball-screw diameter mm Lb ball-screw axial length mm Pb ball -screw lead mm Dp pinion/pulley diameter mm Lp pinion axial length mm tp pully thickness mm Dt table diameter mm Dh table-support dianeter mm LW load shift from axis mm Ds table shaft diameter mm Ls table shaft length mm specific gravity of ball-screw/pinion/pulley/table-shaft material kg cm^3 friction coefficient between sheet and shiliding-surface/support-section/roll 1 specific gravity of roll-1 material kg cm^3 2 specific gravity of roll-2 material kg cm^3 internal friction coefficient of preload nut mechanical efficiency JL load inertia of motor-axis conversion kg m^2 TF friction torque of motor axis conversion N m Tu imbalance torque of motor axis conversion N m
8	Speed reducer	Customer-provided ( ) Sanyo denki standard(planet/spur/no-backlash-planet) other( )
9	Encoder type	Encoder type specified (yes / no) Yes:(incremental , optical absolute , optical absolute with incremental function, resolver absolute) Resolution
10	Input format	Position , velocity , torque , other ( )
11	Host equipment (controller)	Sequencer , laptop , customer-developed product , Sanyo dennki-provided , other ( )
12	Usage environment and other requirements	Cutting , clean-room use , anti-dust measures , other ( )
13	Estimated production	Single product: ( ) units/mouth ( ) units/year
14	Development schedule	Prototype period: ( ) Year ( ) Month Production period: ( ) Year ( ) Month
15	Various measures	Related documentation (already submitted; send later by mail) Visit/PR desired (yes / no) Meeting desired (yes / no)
16	Miscellaneous (questions, pending problems, unresolved issues, etc.)	

Precautions For Adoption

⚠ Cautions

Failure to follow the precautions on the right may cause moderate injury and property damage, or in some circumstances, could lead to a serious accident.
Always follow all listed precautions.

⚠ Cautions

- Read the accompanying Instruction Manual carefully prior to using the product.
- If applying to medical devices and other equipment affecting people's lives, please contact us beforehand and take appropriate safety measures.
- If applying to equipment that can have significant effects on society and the general public, please contact us beforehand.
- Do not use this product in an environment where vibration is present, such as in a moving vehicle or shipping vessel.
- Do not perform any retrofitting, re-engineering, or modification to this equipment.
- The drivers and motors presented in this catalog are meant to be used for general industrial applications. If using for special applications related to aviation and space, nuclear power, electric power, submarine repeaters, etc., please contact us beforehand.

For any question or inquiry regarding the above, contact our Sales Department.

http://www.sanyodenki.co.jp

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