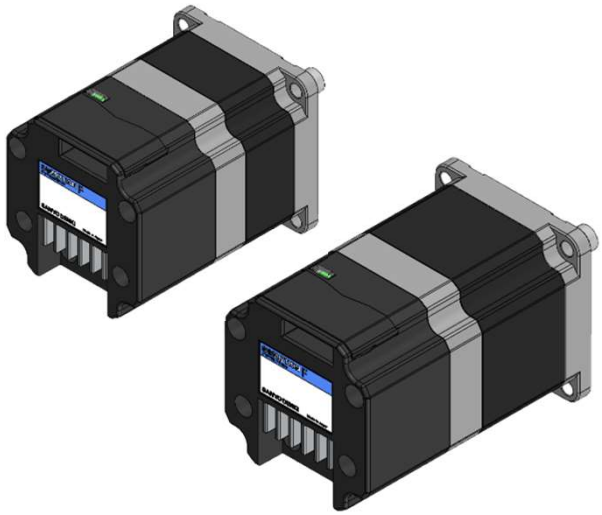
SANYO DENKI

SANMOTION

SANMOTION F

STEPPING SYSTEMS

56 mm sq. Stepping Motor
with Integrated Driver



Features

- **Space saving and wire saving**
  Motor wirings are reduced by integrating motor and driver. The motor can be controlled with as few as five wires for power and communication.
  Additionally, signals such as limit sensors and homing can be connected directly to the motor, further reducing internal wiring within the equipment.

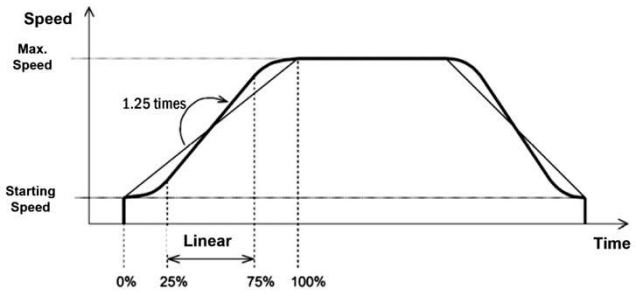
- **Accurate movement trajectory**
  The use of a stepping motor ensures precise motion along defined trajectories, regardless of load conditions. It reliably stops at accurate positions, making it ideal for applications like conveyor belts.

- **Simple design**
  The new product supports operation commands including positioning, continuous rotation, and homing.
  It allows for easy operation through simple parameter settings such as position, speed, acceleration, and command selection.

- **Smooth movement**
  In addition to linear acceleration/deceleration, two types of S-curve acceleration and deceleration mode are available. By using S-curve acceleration and deceleration, shocks at the end of acceleration and deceleration phases are reduced.

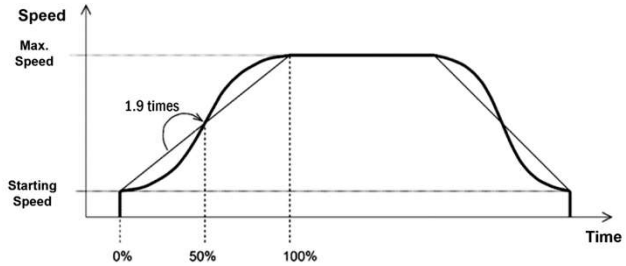
Type 1 (including linear acceleration/deceleration mode)

The peak of the acceleration/deceleration is applied uniformly within the 25% to 75% range of the total acceleration/deceleration time.
Maximum acceleration/deceleration: 1.25 times that of linear acceleration/deceleration.



Type 2 (excluding linear acceleration/deceleration mode)

The peak of acceleration and deceleration occurs at the midpoint (50%) of the total acceleration/deceleration duration.
The maximum acceleration/deceleration is 1.9 times greater than that of a linear acceleration/deceleration profile.

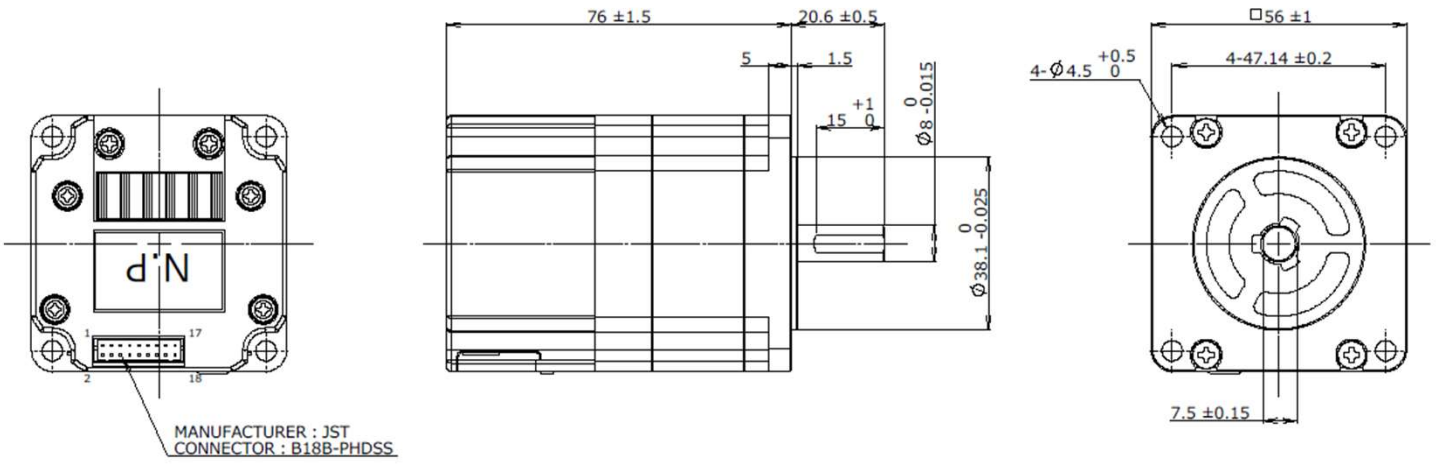


Specifications

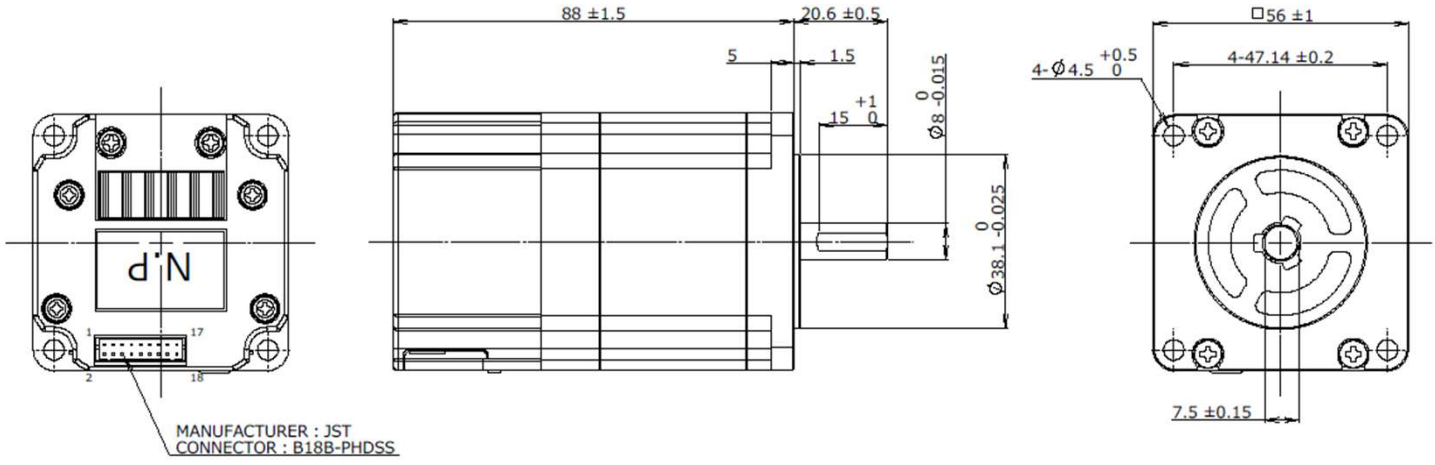
Item		Short type	Long type
Model no.		DB31F561S-50	DB31F562S-50
Basic specifications	Input voltage, current	24 VDC ±10%, 2A	
	Operating temp./humidity	0～+50℃, 20～90%RH (non-condensing)	
	Operating altitude	Up to 1000 m above sea level	
	Vibration resistance	20m/s^2, freq. range 10 to 2000 Hz tested for 2 hours in X-, Y- and Z-axis directions	
	Dimension (mm)	□56 x 76	□56 x 88
	Mass (kg)	0.57	0.79
	Control method	Open-loop control, 1/8 Micro-step	
Functions	Protective function	Main circuit voltage monitoring, fuse protection, CPU fault	
	LED indicator	Power display, alarm display	
	Communication	RS-485 compliant baud rate 38400 bps, can connect up to 16 axes	
	Operation commands	Homing, continuous rotation, relative/absolute positioning	
I/O signal	Input	5 points (homing signal, ±limit sensor signal, rotation direction definition signal, emergency stop signal) Photocoupler input method (input resistance 5.6kΩ) 4mA typ. 24 VDC±10%	
	Output	2 points (Operating signal, alarm signal) Photocoupler input method (Open collector) 30V 10mA max.	

Dimensions [Unit: mm]

Short Type



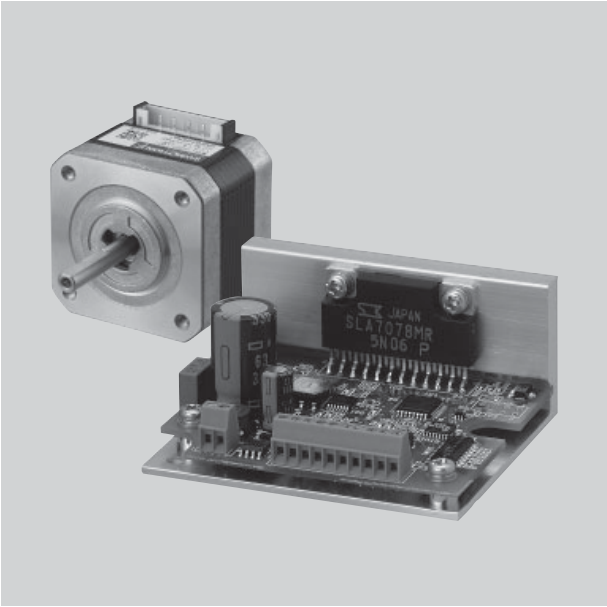
Long Type



DC Input Set Orders

Unipolar/Bipolar

Items included in a set... ▶p. 12 Specifications/Characteristics... ▶p. 13 to 21
Motor dimensions... ▶p. 22 to 23 Motor specifications... ▶p. 24
Driver dimensions... ▶p. 26 Driver specifications... ▶p. 26



Items included in a set RoHS

Driver Terminal block type

Unipolar Model no.: US1D200P10 Input voltage: 24/36 VDC
Bipolar Model no.: BS1D200P10 Input voltage: 24/36 VDC

- The Instruction Manual is available for download from our website.
- Drivers are available for separate purchase.

Connector-type drivers are also available. Contact us for details.

Motor (Only for 56 mm sq. motors)

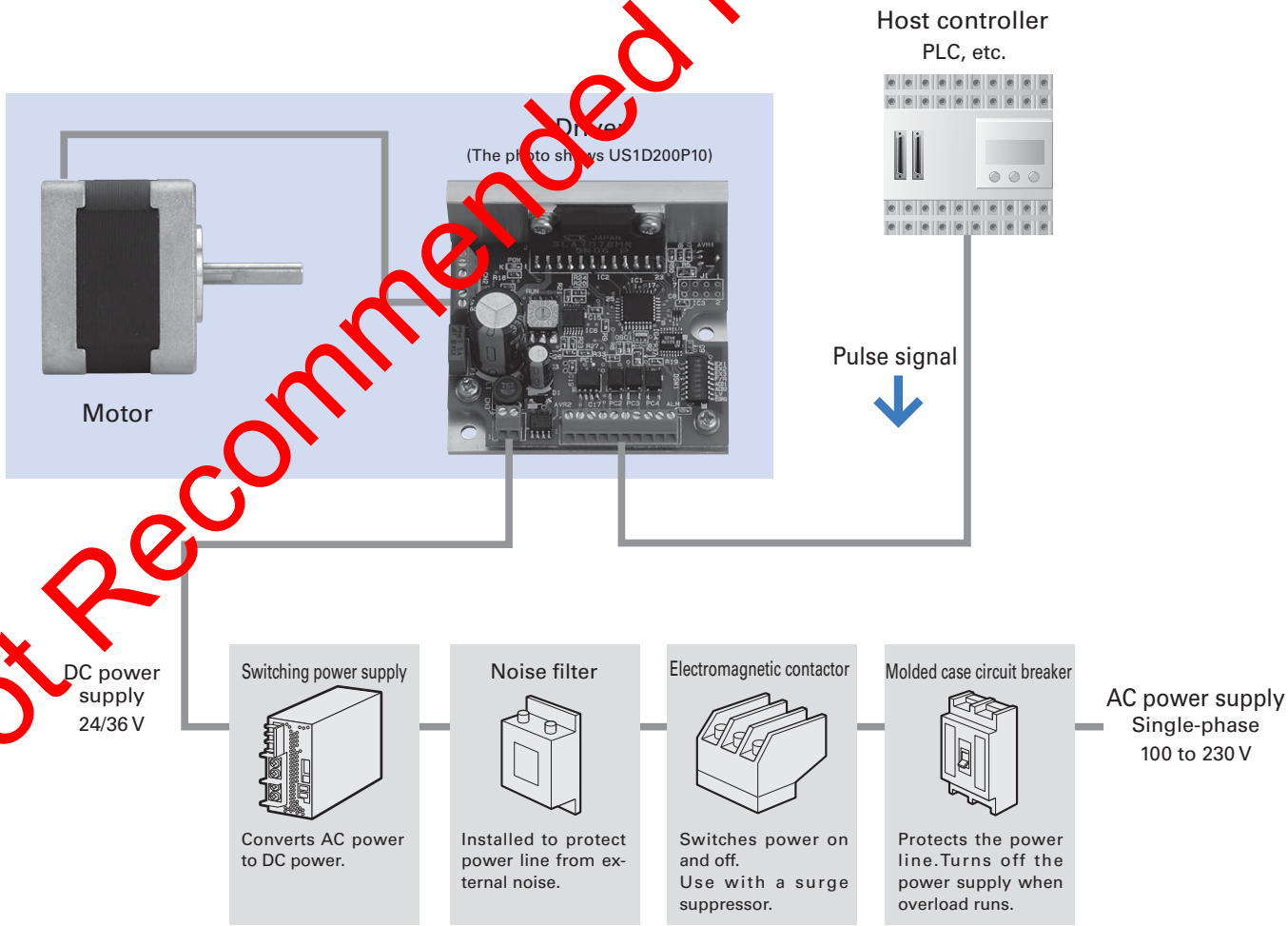
Unipolar motor sizes: 28 mm sq., 42 mm sq., 56 mm sq.
Bipolar motor sizes: 28 mm sq., 42 mm sq., 50 mm sq., 56 mm sq., 60 mm sq.

Cable with connectors

Supplied only with connector-type motors

Not Recommended for new designs

System Configuration



How to Read Set Order Numbers

Note that not all possible parameter combinations are valid. Contact us or see Items Included in a Set on the next page for details of the items included in individual sets.

e.g., The model number shown below is a set of a DC input driver (US1D200P10) and a motor (SM2561C20U41). The motor's specifications are: 56 mm sq. size, 41.8 mm length, and single shaft.

D U 1 6 M 71 1 S

- **S**: Stepping motor shaft — S: Single shaft, D: Dual shaft
- **1**: Stepping motor length

Name	Motor size											
	28 mm sq.		42 mm sq.				50 mm sq.		56 mm sq.		60 mm sq.	
	Motor model no.	Motor length [mm]	Motor model no.	Motor length [mm]	Motor model no.	Motor length [mm]	Motor model no.	Motor length [mm]	Motor model no.	Motor length [mm]	Motor model no.	Motor length [mm]
1	SH2281	32	SF2421	33	SH1421	33	103H5701	39.8	SM2561	41.8	SH1601	42
2			SF2422	39	SH1422	39			SM2562	53.8	SH1602	54
3			SF2423	48			103H7303	51.3	SM2563	75.8		
4			SF2424	59.5	SH1424	48			SM2564	85.8		
5	SH2285	51.5										

- **6**: Motor size / Full step angle
  - 28: 28 mm sq., 1.8°
  - 42: 42 mm sq., 1.8°
  - 14: 42 mm sq., 0.9°
  - 67: 50 mm sq., 1.8°
  - 71: 56 mm sq., 1.8°
  - 16: 60 mm sq., 0.9°
- **M**: Stepping motor series
  - H : H series
  - S : SH or SF series
  - M : SM series
- **1**: Rated current — 1: 1 A/phase, 5: 1.2 A/phase, 6: 2 A/phase
- **U**: Model
- **U**: Windings — U: Unipolar, B: Bipolar
- **D**: D: DC input

Not Recommended for new designs

Items Included in a Set These sets include a driver, motor, and motor cable with connectors.

Motors marked with Ⓛ are lead-type motors. 300 mm or longer leads are attached to the motor.
Motors marked with Ⓒ are connector-type motors. The following motor cables with connectors are included.

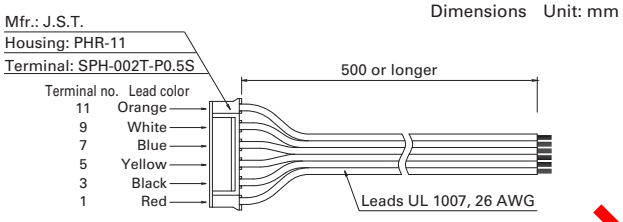
Unipolar Bundled driver model no.: US1D200P10

Motor size	Single shaft				Dual shaft				Full step angle	Rated current [A/phase]	Page	
	Set order no.	Items included in a set			Set order no.	Items included in a set					Specifications	Dimensions
		Motor model no.		Motor cable with connectors model no.		Motor model no.		Motor cable with connectors model no.				
28 mm sq.	DU14S281S	SH2281-5271	Ⓛ	–	DU14S281D	SH2281-5231	Ⓛ	–	1.8°	1	p. 13	p. 22
	DU14S285S	SH2285-5271	Ⓛ	–	DU14S285D	SH2285-5231	Ⓛ	–	1.8°	1	p. 13	p. 22
42 mm sq.	DU15S421S	SF2421-12U41	Ⓒ	4835774-1	DU15S421D	SF2421-12U11	Ⓒ	4835774-1	1.8°	1.2	p. 13	p. 22
	DU15S422S	SF2422-12U41	Ⓒ	4835774-1	DU15S422D	SF2422-12U11	Ⓒ	4835774-1	1.8°	1.2	p. 13	p. 22
	DU15S423S	SF2423-12U41	Ⓒ	4835774-1	DU15S423D	SF2423-12U11	Ⓒ	4835774-1	1.8°	1.2	p. 14	p. 22
	DU15S424S	SF2424-12U41	Ⓒ	4835774-1	DU15S424D	SF2424-12U11	Ⓒ	4835774-1	1.8°	1.2	p. 14	p. 22
	DU15S141S	SH1421-0441	Ⓛ	–	DU15S141D	SH1421-0411	Ⓛ	–	0.9°	1.2	p. 14	p. 22
	DU15S142S	SH1422-0441	Ⓛ	–	DU15S142D	SH1422-0411	Ⓛ	–	0.9°	1.2	p. 14	p. 22
	DU15S144S	SH1424-0441	Ⓛ	–	DU15S144D	SH1424-0411	Ⓛ	–	0.9°	1.2	p. 15	p. 22
56 mm sq.	DU16M711S	SM2561C20U41	Ⓒ	4837798-1	DU16M711D	SM2561C20U11	Ⓒ	4837798-1	1.8°	2	p. 15	p. 23
	DU16M712S	SM2562C20U41	Ⓒ	4837798-1	DU16M712D	SM2562C20U11	Ⓒ	4837798-1	1.8°	2	p. 15	p. 23
	DU16M713S	SM2563C20U41	Ⓒ	4837798-1	DU16M713D	SM2563C20U11	Ⓒ	4837798-1	1.8°	2	p. 15	p. 23
	DU16M714S	SM2564C20U41	Ⓒ	4837798-1	DU16M714D	SM2564C20U11	Ⓒ	4837798-1	1.8°	2	p. 16	p. 23

• Motor cable with connectors Note: Included with connector-type motors only

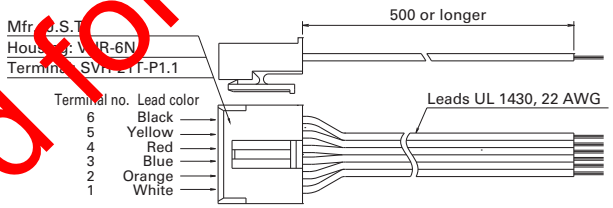
For 42 mm sq. unipolar motors (Model no.: 4835774-1)

Dimensions Unit: mm



For 56 mm sq. unipolar motors (Model no.: 4837798-1)

Dimensions Unit: mm



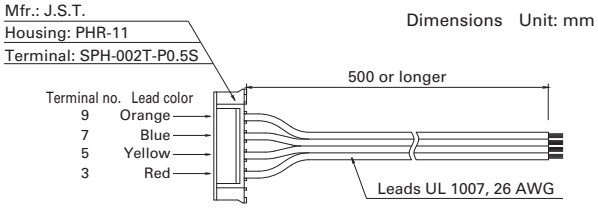
Bipolar Bundled driver model no.: BS1D200P10

Motor size	Single shaft				Dual shaft				Full step angle	Rated current [A/phase]	Page	
	Set order no.	Items included in a set			Set order no.	Items included in a set					Specifications	Dimensions
		Motor model no.		Motor cable with connectors model no.		Motor model no.		Motor cable with connectors model no.				
28 mm sq.	DB14S281S	SH2281-5771	Ⓛ	–	DB14S281D	SH2281-5731	Ⓛ	–	1.8°	1	p. 17	p. 22
	DB14S285S	SH2285-5771	Ⓛ	–	DB14S285D	SH2285-5731	Ⓛ	–	1.8°	1	p. 17	p. 22
42 mm sq.	DB14S421S	SF2421-10B41	Ⓒ	4835775-1	DB14S421D	SF2421-10B11	Ⓒ	4835775-1	1.8°	1	p. 17	p. 22
	DB14S422S	SF2422-10B41	Ⓒ	4835775-1	DB14S422D	SF2422-10B11	Ⓒ	4835775-1	1.8°	1	p. 17	p. 22
	DB14S423S	SF2423-10B41	Ⓒ	4835775-1	DB14S423D	SF2423-10B11	Ⓒ	4835775-1	1.8°	1	p. 18	p. 22
	DB14S424S	SF2424-10B41	Ⓒ	4835775-1	DB14S424D	SF2424-10B11	Ⓒ	4835775-1	1.8°	1	p. 18	p. 22
	DB16S141S	SH1421-5241	Ⓛ	–	DB16S141D	SH1421-5211	Ⓛ	–	0.9°	2	p. 18	p. 22
	DB16S142S	SH1422-5241	Ⓛ	–	DB16S142D	SH1422-5211	Ⓛ	–	0.9°	2	p. 18	p. 22
	DB16S144S	SH1424-5241	Ⓛ	–	DB16S144D	SH1424-5211	Ⓛ	–	0.9°	2	p. 19	p. 22
50 mm sq.	DB16H671S	103H6701-5040	Ⓛ	–	DB16H671D	103H6701-5010	Ⓛ	–	1.8°	2	p. 19	p. 23
	DB16H673S	103H6703-5040	Ⓛ	–	DB16H673D	103H6703-5010	Ⓛ	–	1.8°	2	p. 19	p. 23
56 mm sq.	DB16M711S	SM2561C20B41	Ⓒ	4837961-1	DB16M711D	SM2561C20B11	Ⓒ	4837961-1	1.8°	2	p. 19	p. 23
	DB16M712S	SM2562C20B41	Ⓒ	4837961-1	DB16M712D	SM2562C20B11	Ⓒ	4837961-1	1.8°	2	p. 20	p. 23
	DB16M713S	SM2563C20B41	Ⓒ	4837961-1	DB16M713D	SM2563C20B11	Ⓒ	4837961-1	1.8°	2	p. 20	p. 23
	DB16M714S	SM2564C20B41	Ⓒ	4837961-1	DB16M714D	SM2564C20B11	Ⓒ	4837961-1	1.8°	2	p. 20	p. 23
60 mm sq.	DB16S161S	SH1601-5240	Ⓛ	–	DB16S161D	SH1601-5210	Ⓛ	–	0.9°	2	p. 20	p. 23
	DB16S162S	SH1602-5240	Ⓛ	–	DB16S162D	SH1602-5210	Ⓛ	–	0.9°	2	p. 21	p. 23

• Motor cable with connectors Note: Included with connector-type motors only

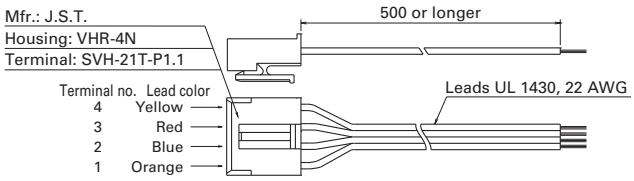
For 42 mm sq. bipolar motors (Model no.: 4835775-1)

Dimensions Unit: mm



For 56 mm sq. bipolar motors (Model no.: 4837961-1)

Dimensions Unit: mm



Not Recommended for new designs

Unipolar DC input driver (model: US1D200P10) and stepping motor

RoHS

Size			28 mm sq. (1.8° full step angle)		42 mm sq. (1.8° full step angle)	
	Motor size					
	Motor length		32 mm	51.5 mm	33 mm	39 mm
Single shaft	Set order no.		DU14S281S	DU14S285S	DU15S421S	DU15S422S
	Motor model no.		SH2281-5271	SH2285-5271	SF2421-12U41	SF2422-12U41
Dual shaft	Set order no.		DU14S281D	DU14S285D	DU15S421D	DU15S422D
	Motor model no.		SH2281-5231	SH2285-5231	SF2421-12U11	SF2422-12U11
Holding torque		N·m	0.055	0.115	0.22	0.33
Rotor inertia		× 10^{-4}kg·m²	0.01	0.022	0.031	0.046
Rated current		A/phase	1	1	1.2	1.2
Motor mass(1)		kg	0.11	0.2	0.23	0.3
Allowable thrust load		N	3	3	10	10
Allowable radial load(2)		N	42	49	39	37

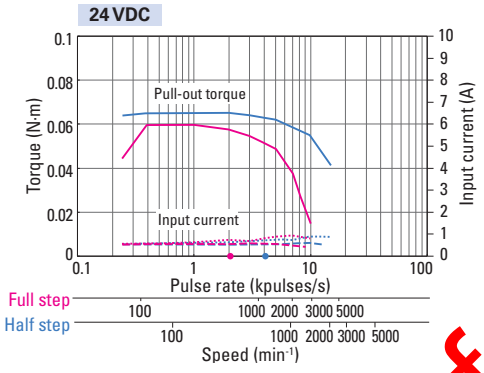
(1) For the driver mass, see ▶p. 26 (2) Load is exerted to the shaft end.

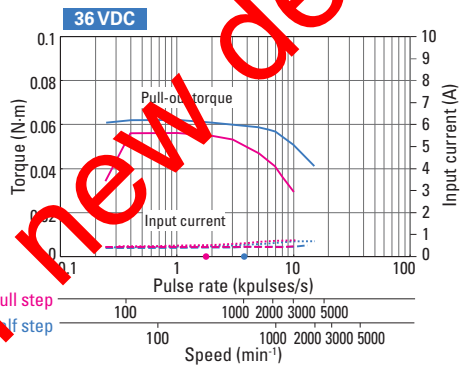
Characteristics

With rubber coupling used

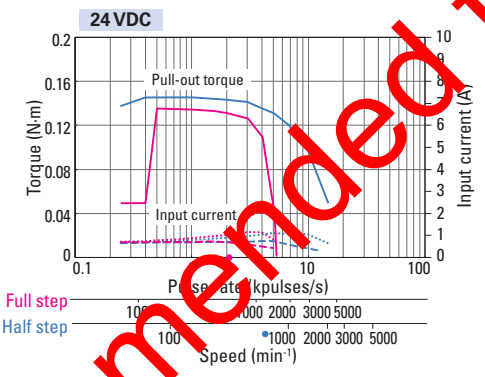
Pull-out torque Full step —— Half step —— fs: Maximum starting pulse rate with no load Full step ● Half step ●
Input current (with no load) Full step - - - Half step - - - Input current (with load) Full step ····· Half step ·····

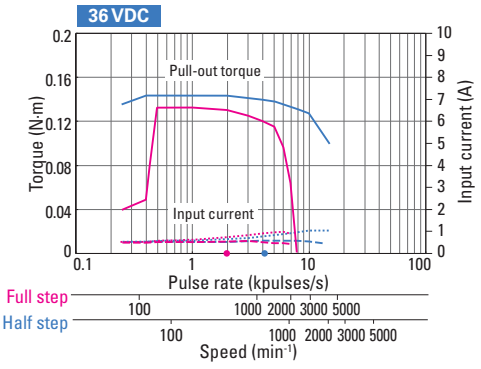
DU14S281S DU14S281D



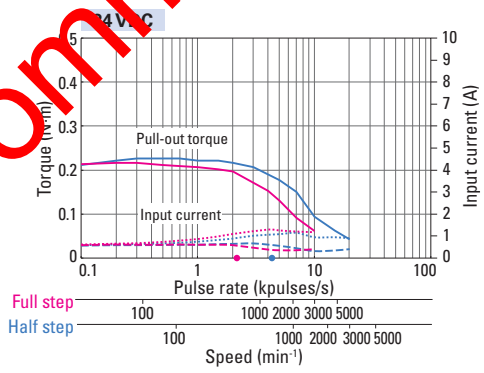


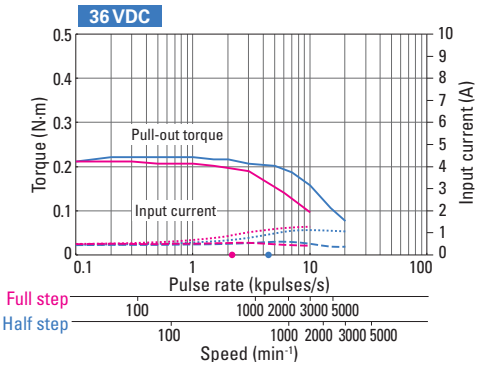
DU14S285S DU14S285D



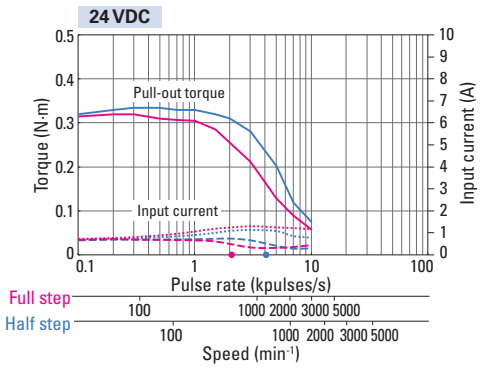


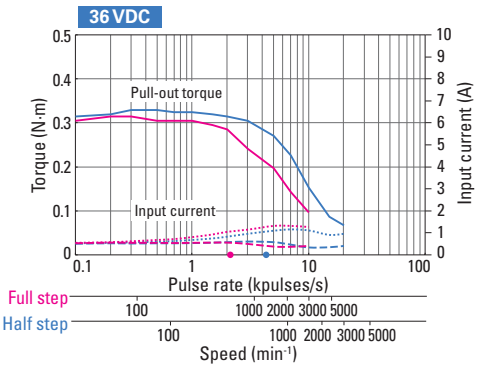
DU15S421S DU15S421D





DU15S422S DU15S422D





Not Recommended for new designs

System configuration... ▶p. 10 Items included in a set... ▶p. 12 Motor dimensional drawing... ▶p. 22 to 23 Driver dimensional drawing... ▶p. 26

Data is measured under the drive conditions of SANYO DENKI. Drive torque may vary depending on the actual machine precision.

Unipolar DC input driver (model: US1D200P10) and stepping motor

RoHS

Size	Motor size		42 mm sq. (1.8° full step angle)		42 mm sq. (0.9° full step angle)	
	Motor length		48 mm	59.5 mm	33 mm	39 mm
Single shaft	Set order no.		DU15S423S	DU15S424S	DU15S141S	DU15S142S
	Motor model no.		SF2423-12U41	SF2424-12U41	SH1421-0441	SH1422-0441
Dual shaft	Set order no.		DU15S423D	DU15S424D	DU15S141D	DU15S142D
	Motor model no.		SF2423-12U11	SF2424-12U11	SH1421-0411	SH1422-0411
Holding torque		N·m	0.4	0.58	0.2	0.29
Rotor inertia		× 10^{-4}kg·m²	0.063	0.094	0.044	0.066
Rated current		A/phase	1.2	1.2	1.2	1.2
Motor mass(1)		kg	0.38	0.51	0.24	0.29
Allowable thrust load		N	10	10	10	10
Allowable radial load(2)		N	35	29	25	24

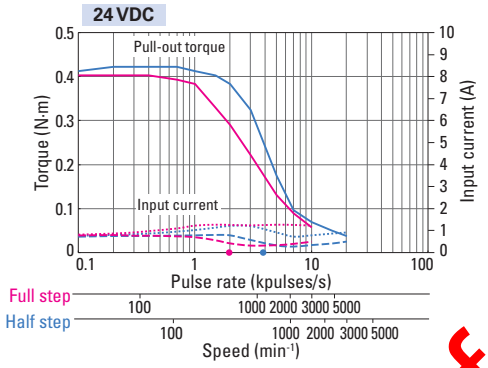
(1) For the driver mass, see ▶p. 26 (2) Load is exerted to the shaft end.

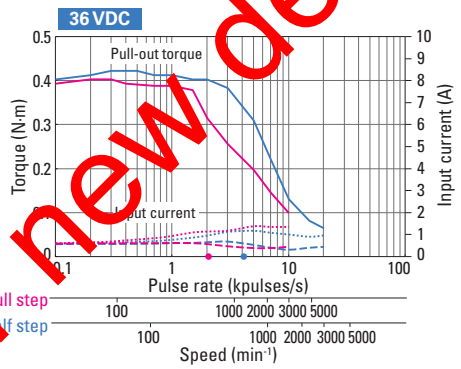
Characteristics

With rubber coupling used

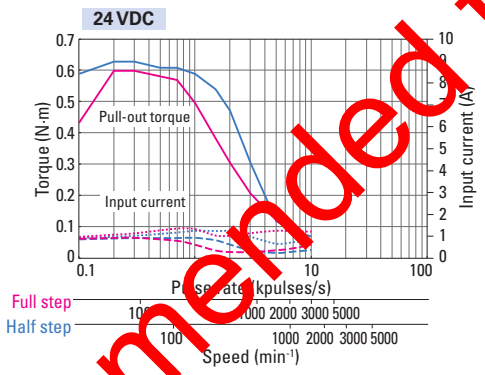
Pull-out torque Full step —— Half step —— fs: Maximum starting pulse rate with no load Full step ● Half step ●
Input current (with no load) Full step - - - Half step - - - Input current (with load) Full step ····· Half step ·····

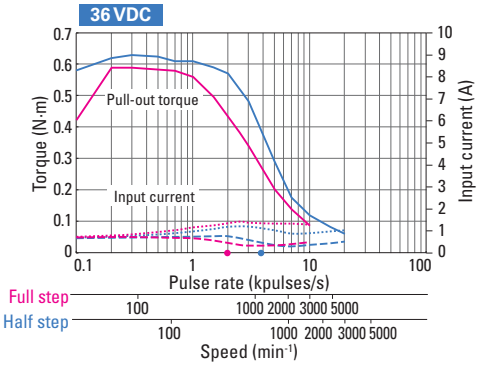
DU15S423S DU15S423D



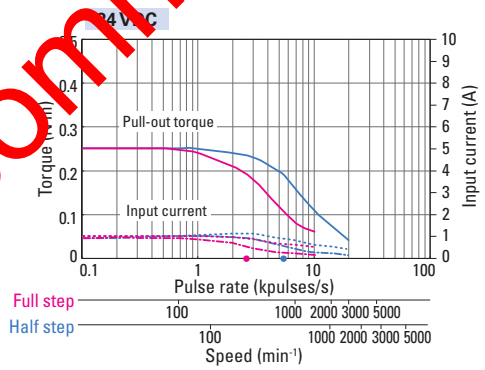


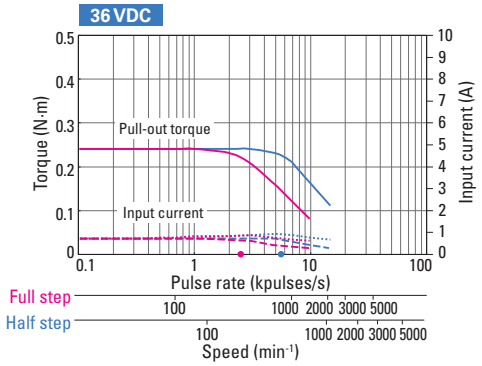
DU15S424S DU15S424D



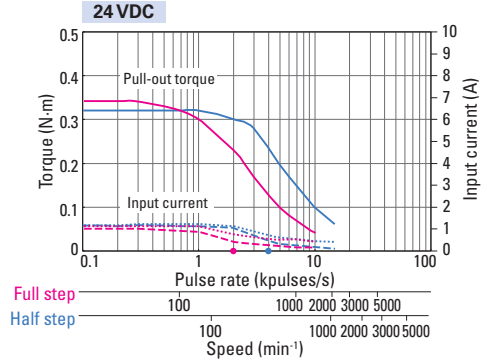


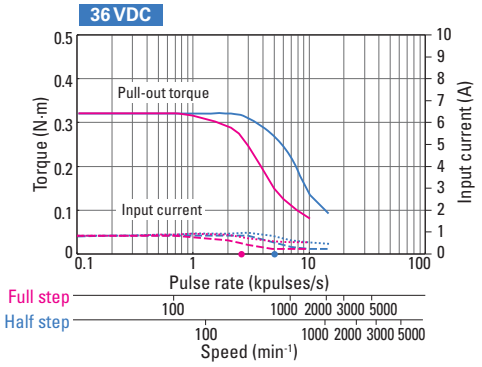
DU15S141S DU15S141D





DU15S142S DU15S142D





Not Recommended for new designs

System configuration... ▶p. 10 Items included in a set... ▶p. 12 Motor dimensional drawing... ▶p. 22 to 23 Driver dimensional drawing... ▶p. 26

Data is measured under the drive conditions of SANYO DENKI. Drive torque may vary depending on the actual machine precision.

Unipolar DC input driver (model: US1D200P10) and stepping motor

RoHS

Size	Motor size		42 mm sq. (0.9° full step angle)	56 mm sq. (1.8° full step angle)		
	Motor length		48 mm	41.8 mm	53.8 mm	75.8 mm
Single shaft	Set order no.		DU15S144S	DU16M711S	DU16M712S	DU16M713S
	Motor model no.		SH1424-0441	SM2561C20U41	SM2562C20U41	SM2563C20U41
Dual shaft	Set order no.		DU15S144D	DU16M711D	DU16M712D	DU16M713D
	Motor model no.		SH1424-0411	SM2561C20U11	SM2562C20U11	SM2563C20U11
Holding torque		N·m	0.39	0.53	1.1	1.7
Rotor inertia		× 10^{-4}kg·m²	0.089	0.14	0.28	0.5
Rated current		A/phase	1.2	2	2	2
Motor mass(1)		kg	0.38	0.49	0.69	1.1
Allowable thrust load		N	10	20	20	20
Allowable radial load(2)		N	20	115	106	93

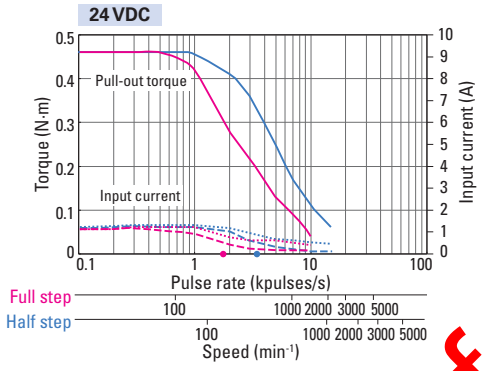
(1) For the driver mass, see ▶p. 26 (2) Load is exerted to the shaft end.

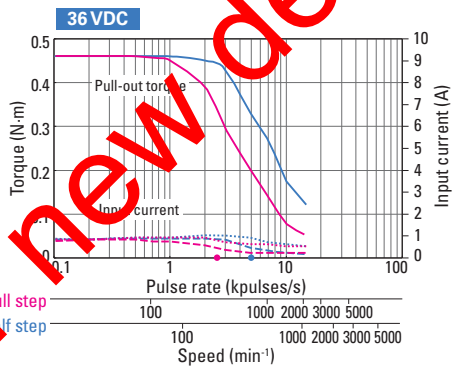
Characteristics

With rubber coupling used

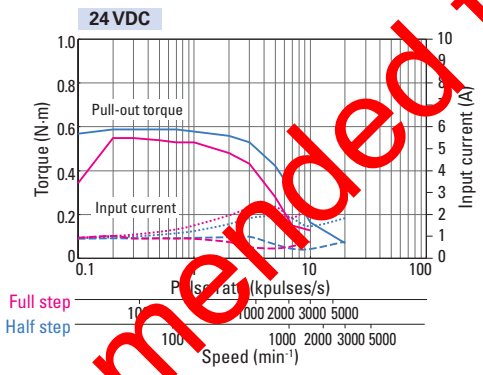
Pull-out torque Full step ——— Half step ——— fs: Maximum starting pulse rate with no load Full step ● Half step ●
Input current (with no load) Full step - - - Half step - - - Input current (with load) Full step ····· Half step ·····

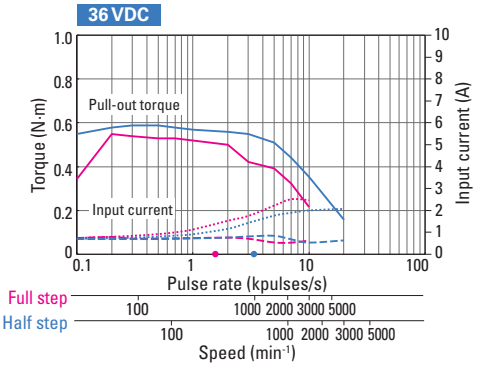
DU15S144S DU15S144D



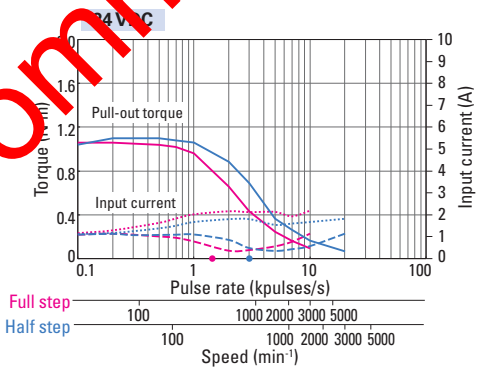


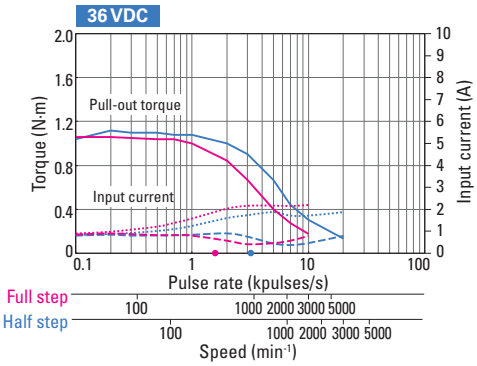
DU16M711S DU16M711D



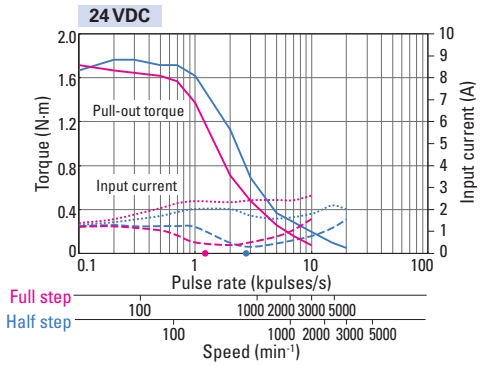


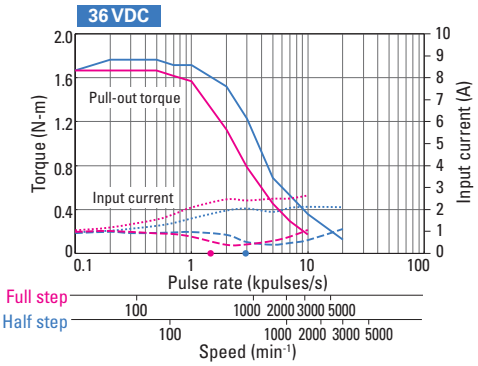
DU16M712S DU16M712D





DU16M713S DU16M713D





Not Recommended for new designs

System configuration... ▶p. 10 Items included in a set... ▶p. 12 Motor dimensional drawing... ▶p. 22 to 23 Driver dimensional drawing... ▶p. 26

Data is measured under the drive conditions of SANYO DENKI. Drive torque may vary depending on the actual machine precision.

Unipolar DC input driver (model: US1D200P10) and stepping motor

RoHS

Size	Motor size		56 mm sq. (1.8° full step angle)
	Motor length		85.8 mm
Single shaft	Set order no.		DU16M714S
	Motor model no.		SM2564C20U41
Dual shaft	Set order no.		DU16M714D
	Motor model no.		SM2564C20U11
Holding torque		N·m	1.75
Rotor inertia		× 10^{-4}kg·m²	0.6
Rated current		A/phase	2
Motor mass(1)		kg	1.27
Allowable thrust load		N	20
Allowable radial load(2)		N	86

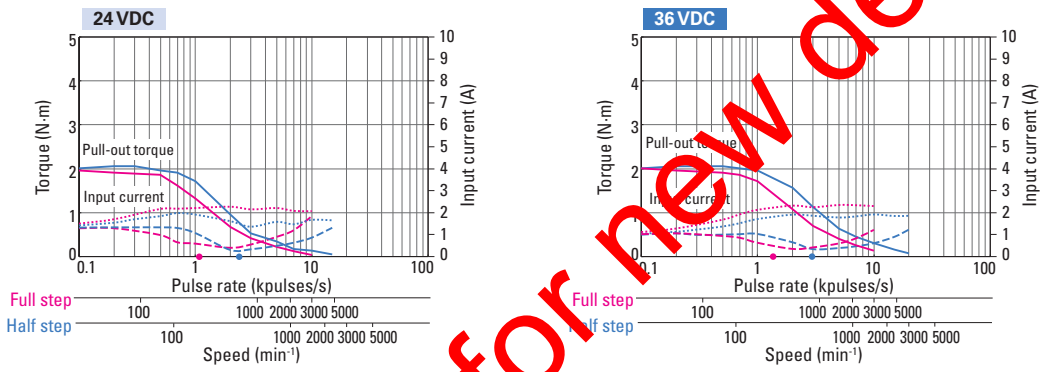
(1) For the driver mass, see ▶p. 26 (2) Load is exerted to the shaft end.

Characteristics

With rubber coupling used

Pull-out torque Full step Half step fs: Maximum starting pulse rate with no load
Input current (with no load) Full step Half step Input current (with load) Full step Half step

DU16M714S
DU16M714D



Not Recommended for new designs

Data is measured under the drive conditions of SANYO DENKI. Drive torque may vary depending on the actual machine precision.

Bipolar DC input driver (model: BS1D200P10) and stepping motor

RoHS

Size			28 mm sq. (1.8° full step angle)		42 mm sq. (1.8° full step angle)	
	Motor size		32 mm	51.5 mm	33 mm	39 mm
Single shaft	Set order no.		DB14S281S	DB14S285S	DB14S421S	DB14S422S
	Motor model no.		SH2281-5771	SH2285-5771	SF2421-10B41	SF2422-10B41
Dual shaft	Set order no.		DB14S281D	DB14S285D	DB14S421D	DB14S422D
	Motor model no.		SH2281-5731	SH2285-5731	SF2421-10B11	SF2422-10B11
Holding torque		N·m	0.07	0.145	0.29	0.43
Rotor inertia		× 10^{-4}kg·m²	0.01	0.022	0.031	0.046
Rated current		A/phase	1	1	1	1
Motor mass(1)		kg	0.11	0.2	0.23	0.3
Allowable thrust load		N	3	3	10	10
Allowable radial load(2)		N	42	49	38	34

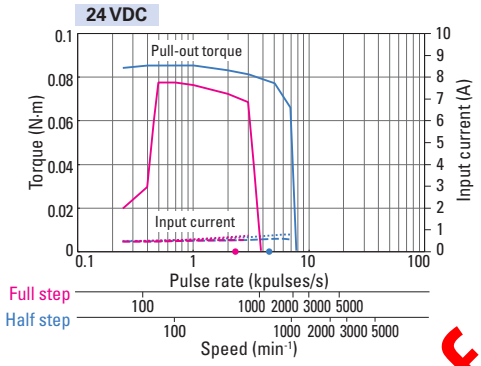
(1) For the driver mass, see ▶p. 26 (2) Load is exerted to the shaft end.

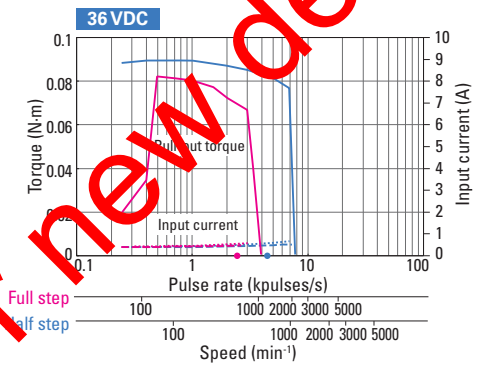
Characteristics

With rubber coupling used

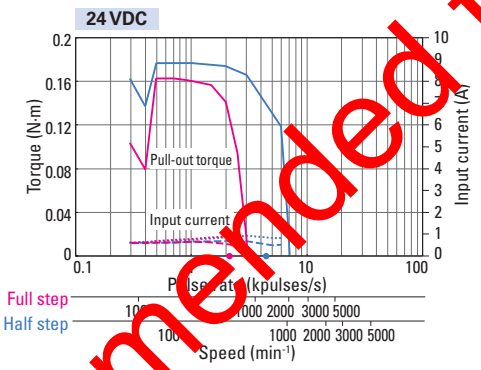
Pull-out torque Full step —— Half step —— fs: Maximum starting pulse rate with no load Full step ● Half step ●
Input current (with no load) Full step - - - Half step - - - Input current (with load) Full step ····· Half step ·····

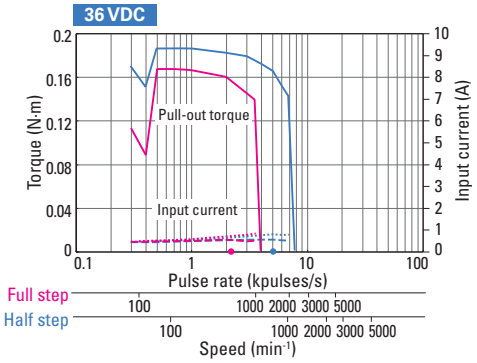
DB14S281S DB14S281D



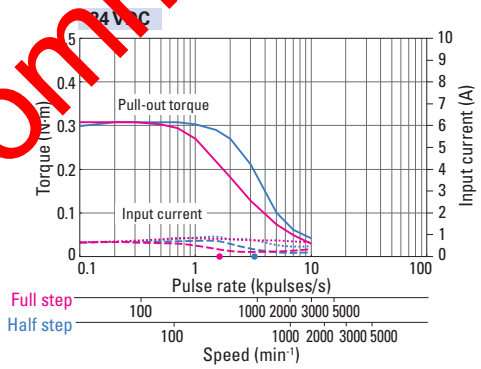


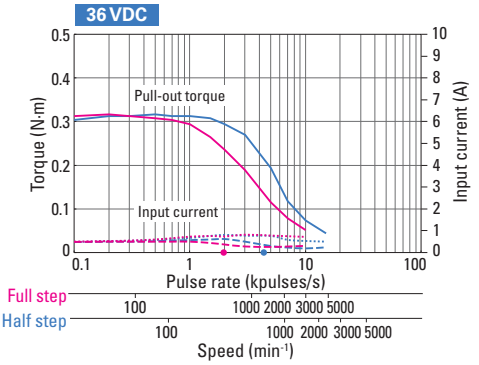
DB14S285S DB14S285D



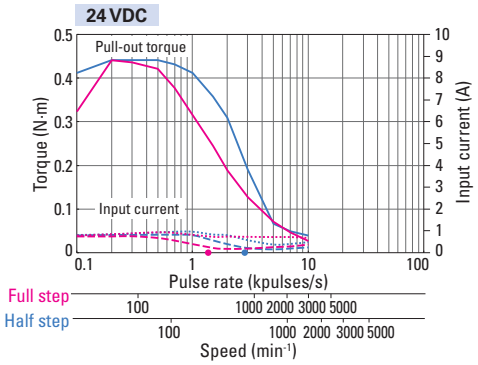


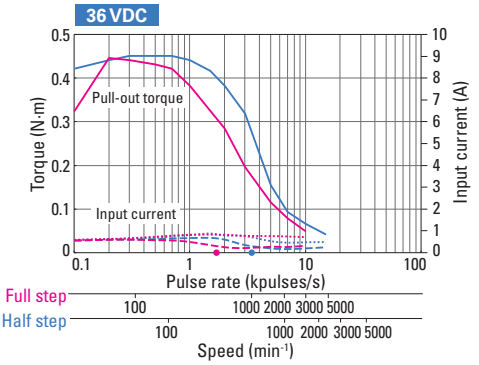
DB14S421S DB14S421D





DB14S422S DB14S422D





Not Recommended for new designs

System configuration... ▶p. 10 Items included in a set... ▶p. 12 Motor dimensional drawing... ▶p. 22 to 23 Driver dimensional drawing... ▶p. 26

Data is measured under the drive conditions of SANYO DENKI. Drive torque may vary depending on the actual machine precision.

Bipolar DC input driver (model: BS1D200P10) and stepping motor

RoHS

Size	Motor size		42 mm sq. (1.8° full step angle)		42 mm sq. (0.9° full step angle)	
	Motor length		48 mm	59.5 mm	33 mm	39 mm
Single shaft	Set order no.		DB14S423S	DB14S424S	DB16S141S	DB16S142S
	Motor model no.		SF2423-10B41	SF2424-10B41	SH1421-5241	SH1422-5241
Dual shaft	Set order no.		DB14S423D	DB14S424D	DB16S141D	DB16S142D
	Motor model no.		SF2423-10B11	SF2424-10B11	SH1421-5211	SH1422-5211
Holding torque		N·m	0.56	0.8	0.23	0.34
Rotor inertia		× 10^{-4}kg·m²	0.063	0.094	0.044	0.066
Rated current		A/phase	1	1	2	2
Motor mass(1)		kg	0.38	0.51	0.24	0.29
Allowable thrust load		N	10	10	10	10
Allowable radial load(2)		N	30	20	25	24

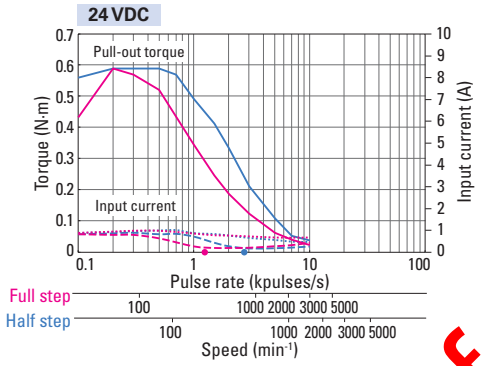
(1) For the driver mass, see ▶p. 26 (2) Load is exerted to the shaft end.

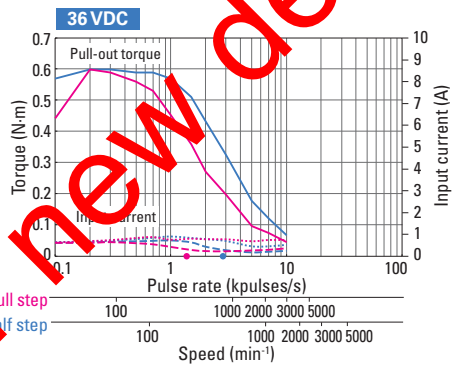
Characteristics

With rubber coupling used

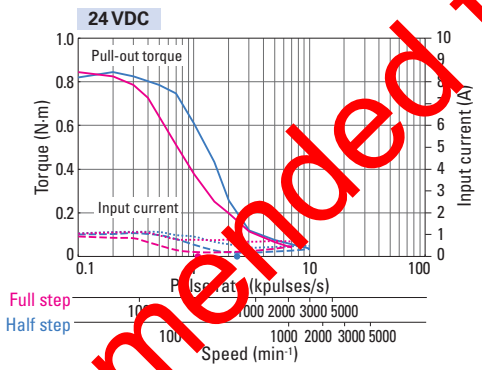
Pull-out torque Full step —— Half step —— fs: Maximum starting pulse rate with no load Full step ● Half step ●
Input current (with no load) Full step - - - Half step - - - Input current (with load) Full step ····· Half step ·····

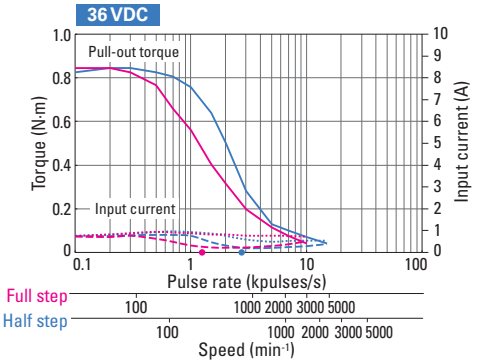
DB14S423S DB14S423D



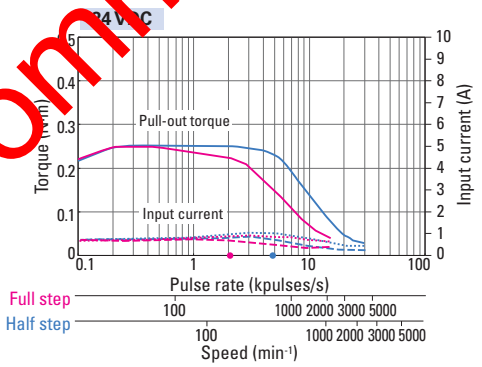


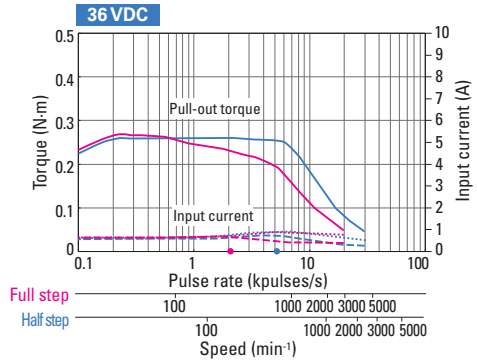
DB14S424S DB14S424D



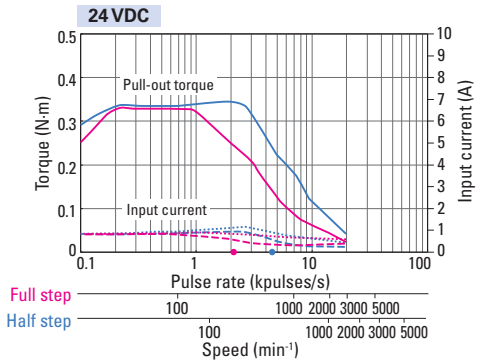


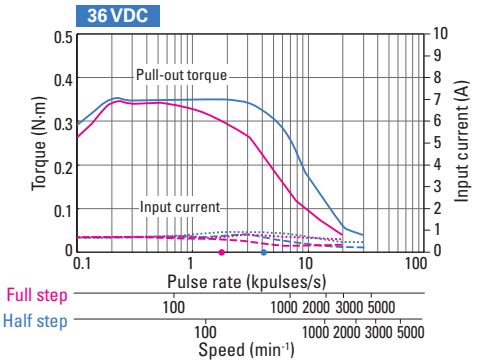
DB16S141S DB16S141D





DB16S142S DB16S142D





Not Recommended for new designs

Data is measured under the drive conditions of SANYO DENKI. Drive torque may vary depending on the actual machine precision.

Bipolar DC input driver (model: BS1D200P10) and stepping motor

RoHS

Size		42 mm sq. (0.9° full step angle)	50 mm sq. (1.8° full step angle)		56 mm sq. (1.8° full step angle)
Motor size		48 mm	39.8 mm	51.3 mm	41.8 mm
Motor length					
Single shaft	Set order no.	DB16S144S	DB16H671S	DB16H673S	DB16M711S
	Motor model no.	SH1424-5241	103H6701-5040	103H6703-5040	SM2561C20B41
Dual shaft	Set order no.	DB16S144D	DB16H671D	DB16H673D	DB16M711D
	Motor model no.	SH1424-5211	103H6701-5010	103H6703-5010	SM2561C20B11
Holding torque	N·m	0.48	0.28	0.49	0.75
Rotor inertia	× 10^{-4}kg·m²	0.089	0.057	0.118	0.14
Rated current	A/phase	2	2	2	2
Motor mass(1)	kg	0.38	0.35	0.5	0.49
Allowable thrust load	N	10	15	15	20
Allowable radial load(2)	N	20	79	75	113

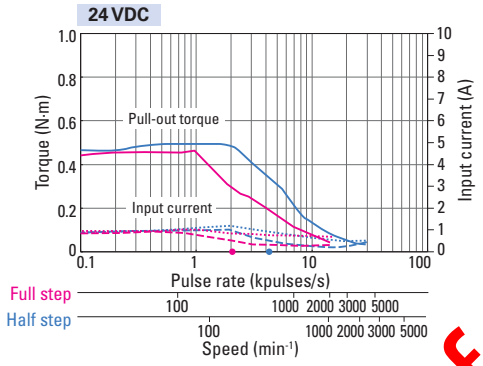
(1) For the driver mass, see ▶p. 26 (2) Load is exerted to the shaft end.

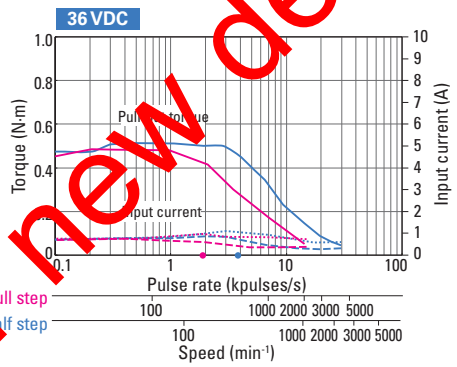
Characteristics

With rubber coupling used

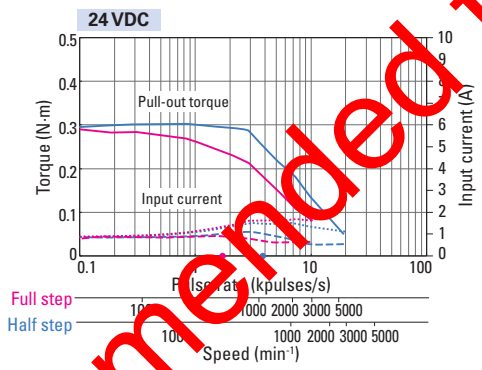
Pull-out torque Full step —— Half step —— fs: Maximum starting pulse rate with no load Full step ● Half step ●
Input current (with no load) Full step - - - Half step - - - Input current (with load) Full step ····· Half step ·····

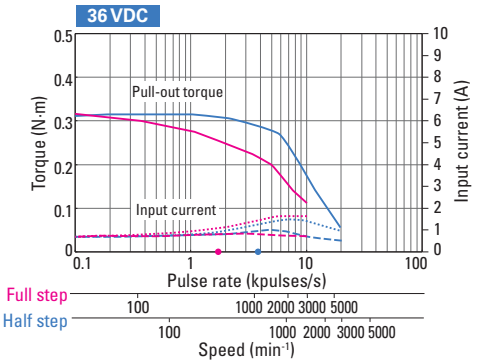
DB16S144S DB16S144D



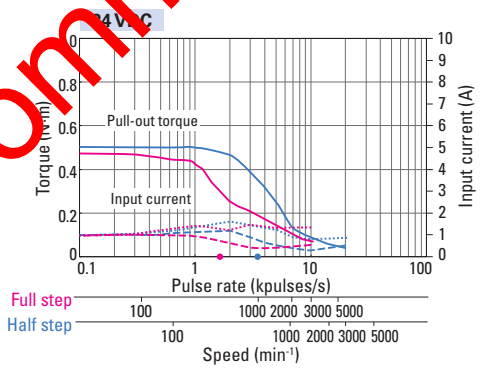


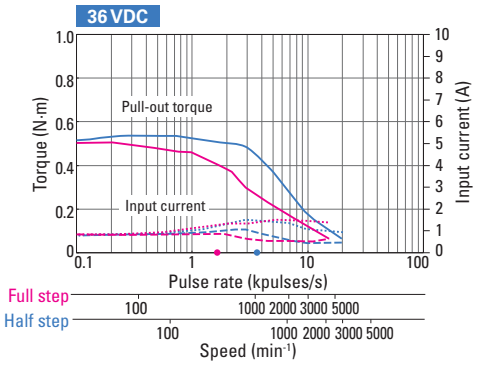
DB16H671S DB16H671D



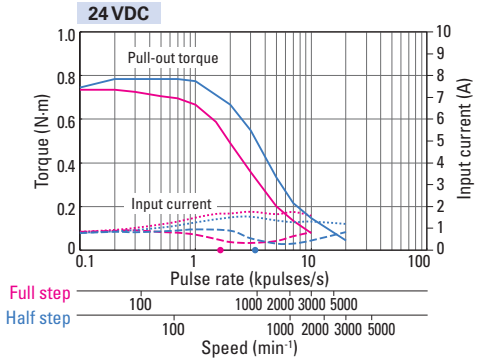


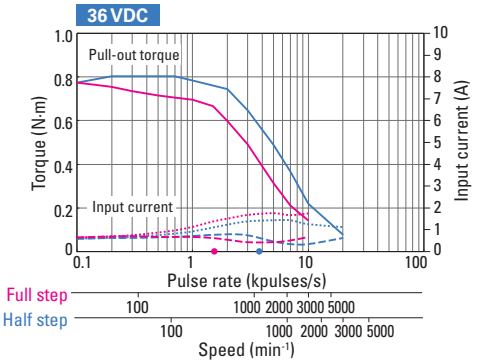
DB16H673S DB16H673D





DB16M711S DB16M711D





Not Recommended for new designs

System configuration... ▶p. 10 Items included in a set... ▶p. 12 Motor dimensional drawing... ▶p. 22 to 23 Driver dimensional drawing... ▶p. 26

Data is measured under the drive conditions of SANYO DENKI. Drive torque may vary depending on the actual machine precision.

Bipolar DC input driver (model: BS1D200P10) and stepping motor

RoHS

Size	Motor size		56 mm sq. (1.8° full step angle)			60 mm sq. (0.9° full step angle)
	Motor length		53.8 mm	75.8 mm	85.8 mm	42 mm
Single shaft	Set order no.		DB16M712S	DB16M713S	DB16M714S	DB16S161S
	Motor model no.		SM2562C20B41	SM2563C20B41	SM2564C20B41	SH1601-5240
Dual shaft	Set order no.		DB16M712D	DB16M713D	DB16M714D	DB16S161D
	Motor model no.		SM2562C20B11	SM2563C20B11	SM2564C20B11	SH1601-5210
Holding torque		N·m	1.4	2.35	2.5	0.69
Rotor inertia		× 10^{-4}kg·m²	0.28	0.5	0.6	0.24
Rated current		A/phase	2	2	2	2
Motor mass(1)		kg	0.69	1.1	1.27	0.55
Allowable thrust load		N	20	20	20	15
Allowable radial load(2)		N	102	78	70	78

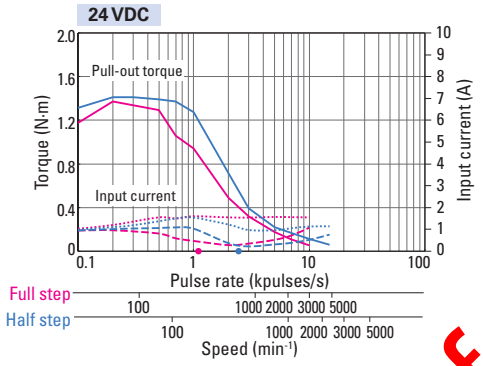
(1) For the driver mass, see ▶p. 26 (2) Load is exerted to the shaft end.

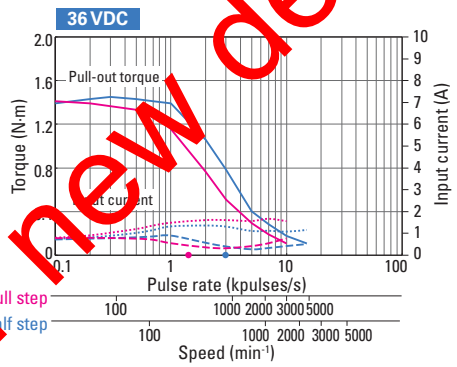
Characteristics

With rubber coupling used

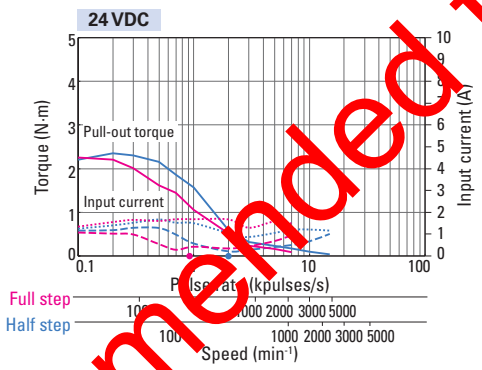
Pull-out torque Full step ——— Half step ——— fs: Maximum starting pulse rate with no load Full step ● Half step ●
Input current (with no load) Full step - - - Half step - - - Input current (with load) Full step ····· Half step ·····

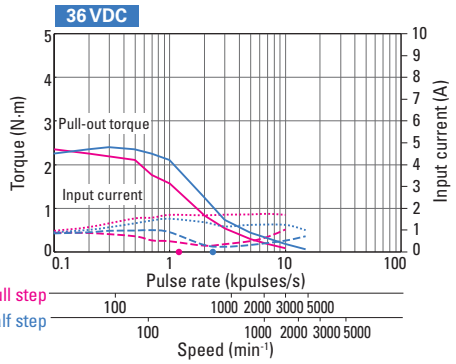
DB16M712S DB16M712D



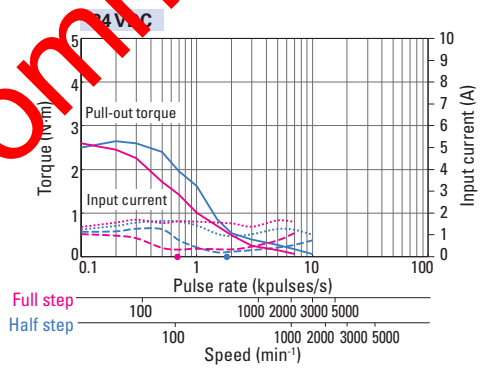


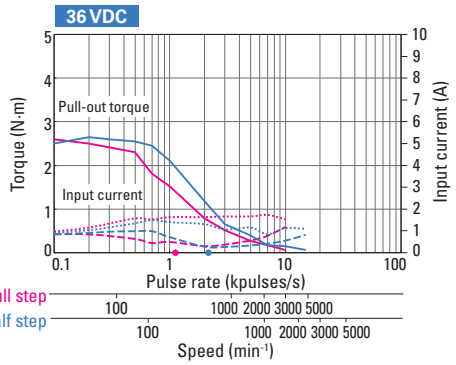
DB16M713S DB16M713D



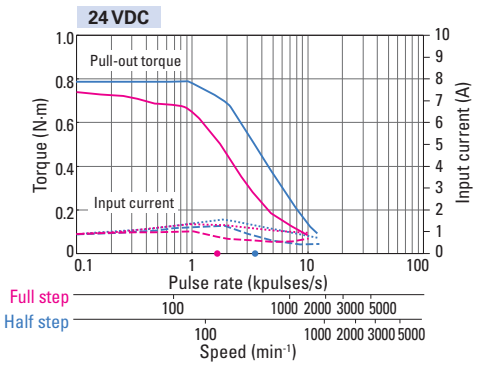


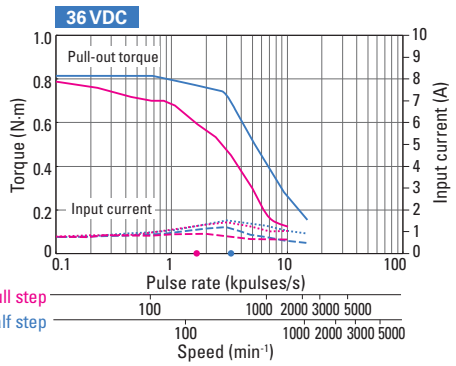
DB16M714S DB16M714D





DB16S161S DB16S161D





Not Recommended for new designs

Data is measured under the drive conditions of SANYO DENKI. Drive torque may vary depending on the actual machine precision.

Bipolar DC input driver (model: BS1D200P10) and stepping motor

RoHS

Size	Motor size		60 mm sq. (0.9° full step angle)
	Motor length		54 mm
Single shaft	Set order no.		DB16S162S
	Motor model no.		SH1602-5240
Dual shaft	Set order no.		DB16S162D
	Motor model no.		SH1602-5210
Holding torque		N·m	1.28
Rotor inertia		× 10^{-4}kg·m²	0.4
Rated current		A/phase	2
Motor mass(1)		kg	0.8
Allowable thrust load		N	15
Allowable radial load(2)		N	65

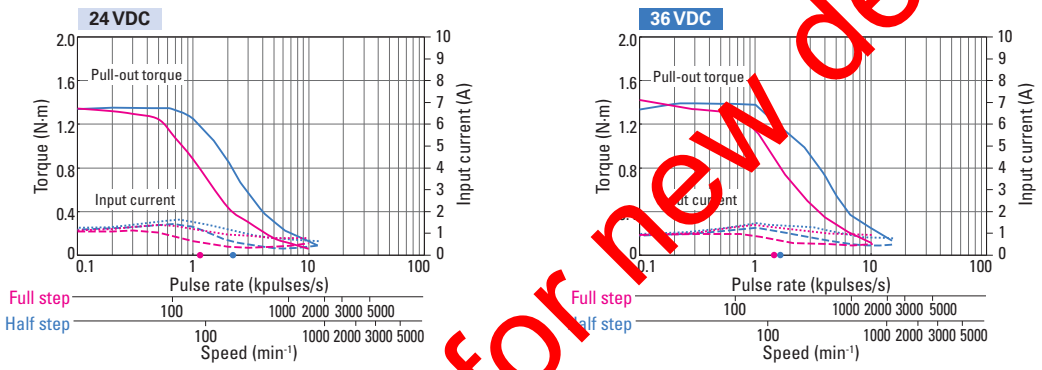
(1) For the driver mass, see ▶p. 26 (2) Load is exerted to the shaft end.

Characteristics

With rubber coupling used

Pull-out torque Full step Half step fs: Maximum starting pulse rate with no load
Input current (with no load) Full step Half step Input current (with load) Full step Half step

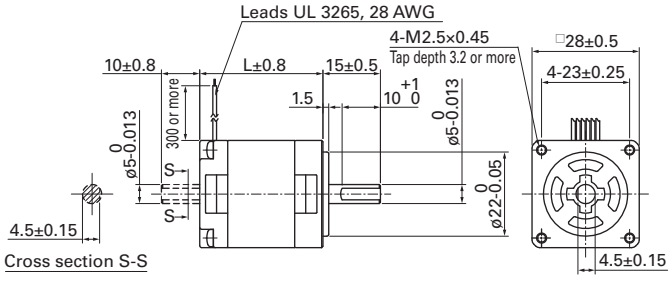
DB16S162S
DB16S162D



Not Recommended for new designs

Stepping Motor Dimensions Unit: mm

28 mm sq.



Note: The figure above shows a unipolar motor. The bipolar variant has four leads.

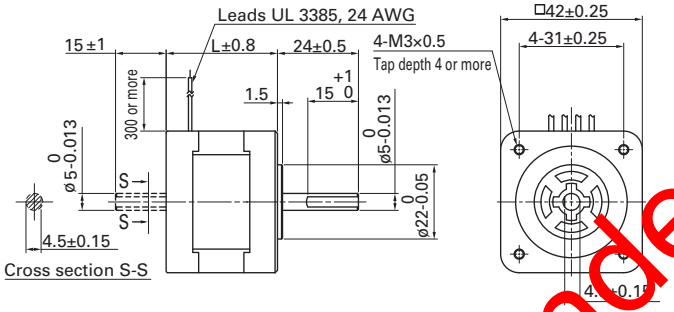
Unipolar

Set order no.		Motor model no.		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DU14S281S	DU14S281D	SH2281-5271	SH2281-5231	32
DU14S285S	DU14S285D	SH2285-5271	SH2285-5231	51.5

Bipolar

Set order no.		Motor model no.		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB14S281S	DB14S281D	SH2281-5771	SH2281-5731	32
DB14S285S	DB14S285D	SH2285-5771	SH2285-5731	51.5

42 mm sq.



Note: The figure above shows a bipolar motor. The unipolar variant has six leads.

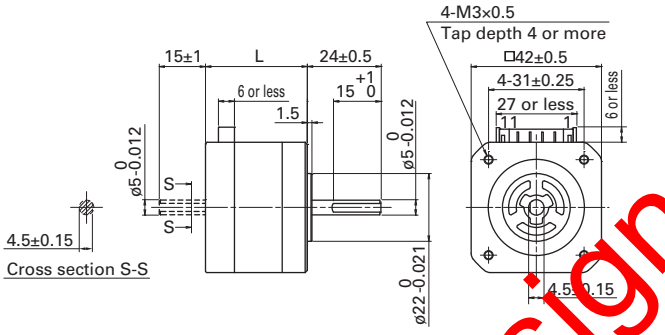
Unipolar

Set order no.		Motor model no.		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DU15S141S	DU15S141D	SH1421-0441	SH1421-0411	33
DU15S142S	DU15S142D	SH1422-0441	SH1422-0411	39
DU15S144S	DU15S144D	SH1424-0441	SH1424-0411	48

Bipolar

Set order no.		Motor model no.		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB16S141S	DB16S141D	SH1421-5241	SH1421-5211	33
DB16S142S	DB16S142D	SH1422-5241	SH1422-5211	39
DB16S144S	DB16S144D	SH1424-5241	SH1424-5211	48

42 mm sq.



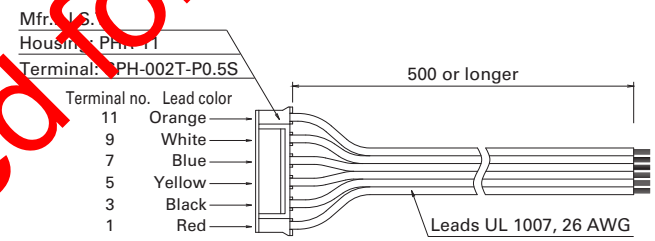
Unipolar

Set order no.		Motor model no.		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DU15S421S	DU15S421D	SF2421-12U41	SF2421-12U11	33 ± 0.5
DU15S422S	DU15S422D	SF2422-12U41	SF2422-12U11	39 ± 0.5
DU15S423S	DU15S423D	SF2423-12U41	SF2423-12U11	48 ± 0.5
DU15S424S	DU15S424D	SF2424-12U41	SF2424-12U11	59.5 ± 1

Bipolar

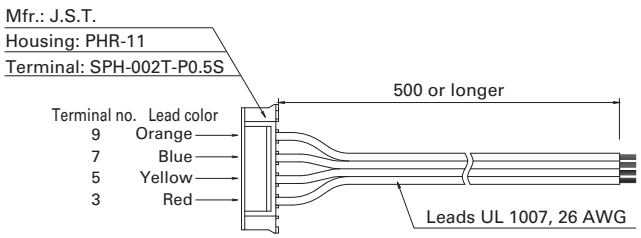
Set order no.		Motor model no.		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB14S421S	DB14S421D	SF2421-10B41	SF2421-10B11	33 ± 0.5
DB14S422S	DB14S422D	SF2422-10B41	SF2422-10B11	39 ± 0.5
DB14S423S	DB14S423D	SF2423-10B41	SF2423-10B11	48 ± 0.5
DB14S424S	DB14S424D	SF2424-10B41	SF2424-10B11	59.5 ± 1

Unipolar motor cable 4835774-1



This is a motor–driver cable for use with SF242□-12U□1 motors.

Bipolar motor cable 4835775-1

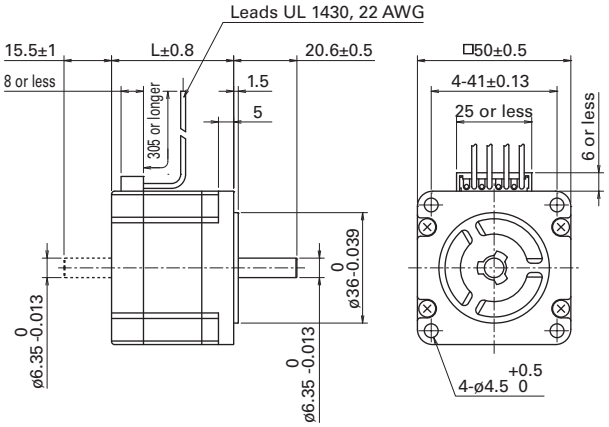


This is a motor–driver cable for use with SF242□-10B□1 motors.

Not Recommended for new designs

Stepping Motor Dimensions Unit: mm

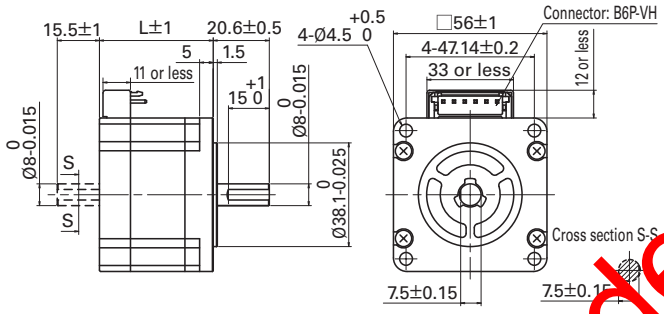
50 mm sq.



Bipolar

Set order no.		Motor model no.		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB16H671S	DB16H671D	103H6701-5040	103H6701-5010	39.8
DB16H673S	DB16H673D	103H6703-5040	103H6703-5010	51.3

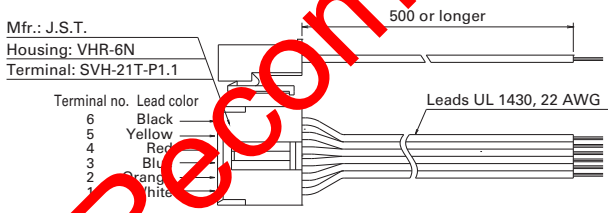
56 mm sq.



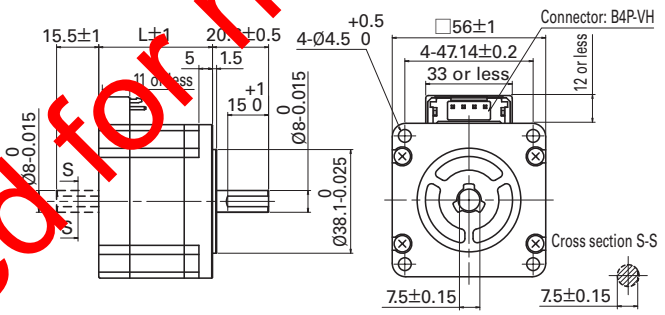
Unipolar

Set order no.		Motor model no.		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DU16M711S	DU16M711D	SM2561C20U41	SM2561C20U11	41.8
DU16M712S	DU16M712D	SM2562C20U41	SM2562C20U11	53.8
DU16M713S	DU16M713D	SM2563C20U41	SM2563C20U11	75.8
DU16M714S	DU16M714D	SM2564C20U41	SM2564C20U11	85.8

Unipolar motor cable 4837798-1



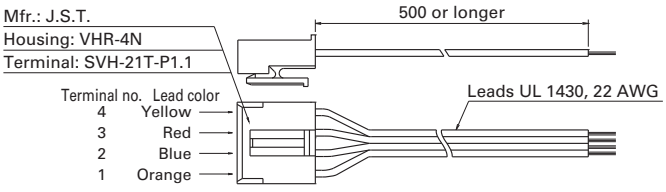
56 mm sq.



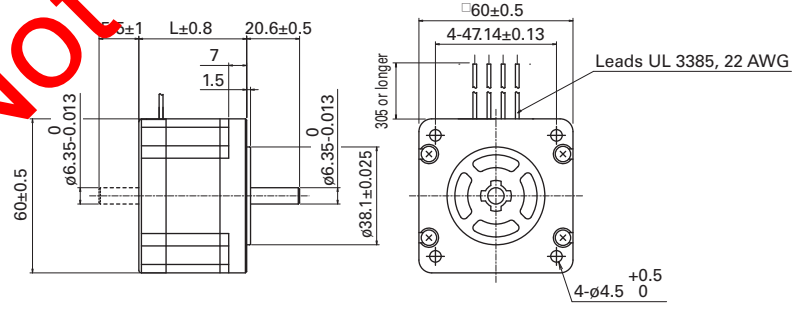
Bipolar

Set order no.		Motor model no.		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB16M711S	DB16M711D	SM2561C20B41	SM2561C20B11	41.8
DB16M712S	DB16M712D	SM2562C20B41	SM2562C20B11	53.8
DB16M713S	DB16M713D	SM2563C20B41	SM2563C20B11	75.8
DB16M714S	DB16M714D	SM2564C20B41	SM2564C20B11	85.8

Bipolar motor cable 4837961-1



60 mm sq.



Bipolar

Set order no.		Motor model no.		Motor length (L)
Single shaft	Dual shaft	Single shaft	Dual shaft	
DB16S161S	DB16S161D	SH1601-5240	SH1601-5210	42
DB16S162S	DB16S162D	SH1602-5240	SH1602-5210	54

Not Recommended for new designs

General Specifications of Stepping Motors

Motor model no.	SH228□	SH142□	SF242□	103H670□	SM256□	SH160□
Operation type	–					
Operating ambient temperature	-10 to +50°C					
Storage temperature	-20 to +65°C					
Operating ambient humidity	20 to 90% RH (non-condensing)					
Storage humidity	5 to 95 % RH (non-condensing)					
Operating altitude	Up to 1000 m above sea level					
Vibration resistance	Frequency 10 to 500 Hz, amplitude 1.52 mm (10 to 70 Hz), acceleration 150 m/s² (70 to 500 Hz), sweep time 15 min/cycle, 12 cycles for each of both directions in each X, Y, and Z axes.					
Shock resistance	Acceleration 500 m/s², duration 11 ms, half sine wave, tested 3 times in both directions for each X, Y, and Z axis for a total of 18 times					
Thermal class	B (+130°C)				B (+130°C) (A for UL models)	B (+130°C)
Dielectric strength	500 VAC for one minute (between motor winding and frame)			1000 VAC for one minute (between motor winding and frame)	1120 VAC for one minute (between motor winding and frame)	1000 VAC for one minute (between motor winding and frame)
Insulation resistance	100 MΩ or more at 500 VDC (between motor winding and frame)					
Protection rating	–					
Winding temperature rise	80 K or less (based on our own standard)					
Positional accuracy tolerance	± 0.09°	± 0.054°	± 0.09°		± 0.054°	± 0.054°
Thrust play (1)	0.075 mm or less (With a 1.5 N load)	0.075 mm or less (With a 5 N load)	0.075 mm (With a 5 N load)	0.075 mm (With a 10 N load)	0.075 mm (With a 10 N load)	0.075 mm (With a 10 N load)
Radial play (2)	0.025 mm (With a 5 N load)					
Shaft runout	0.025 mm					
Concentricity of motor shaft and fitting part	ø0.05 mm	ø0.05 mm	ø0.05 mm	ø0.075 mm	ø0.075 mm	ø0.075 mm
Perpendicularity of mounting surface and motor shaft surface	0.1 mm	0.1 mm	0.1 mm	0.1 mm	0.1 mm	0.1 mm
Motor mounting orientation	Can be installed vertically or horizontally.					

(1) Thrust play: Shaft position displacement when a load is exerted in a direction parallel to the motor shaft.
(2) Radial play: Maximum shaft position displacement when a load is exerted in a direction perpendicular to the motor shaft. Load is exerted on the point 1/3 the shaft length from the shaft end.

Safety standards

Model no.: SM256□ UL models

	Classification	Standards	File no.
UL	UL	UL 1004-1, UL 1004-6	E17
	UL for Canada (cUL)	CSA C22.2 No. 100	

Not Recommended for new designs

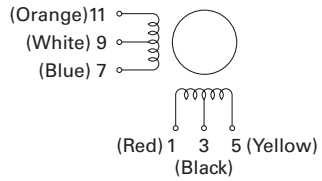
Internal Wiring and Rotational Directions

Unipolar winding

Connector type, model no.: SF242 □

Internal wiring

In parentheses are lead colors of the motor cable



Direction of motor rotation

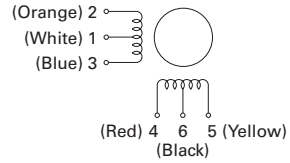
When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

		Connector pin no.				
		3, 9	1	7	5	11
Excitation sequence	1	+	−	−		
	2	+		−	−	
	3	+			−	−
	4	+	−			−

Connector type, model no.: SM256 □

Internal wiring

In parentheses are lead colors of the motor cable



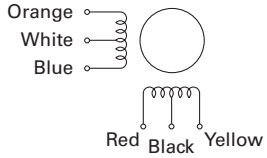
Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

		Connector pin no.				
		1, 6	4	3	5	2
Excitation sequence	1	+	−	−		
	2	+		−	−	
	3	+			−	−
	4	+	−			−

Lead type

Internal wiring



Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

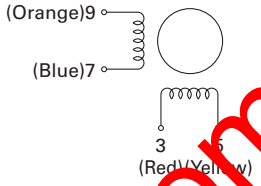
		Lead color				
		White, Bla	Red	Blue	Yellow	Orange
Excitation sequence	1	+	−	−		
	2	+		−	−	
	3	+			−	−
	4	+	−			−

Bipolar winding

Connector type, model no.: SF242 □

Internal wiring

In parentheses are lead colors of the motor cable



Direction of motor rotation

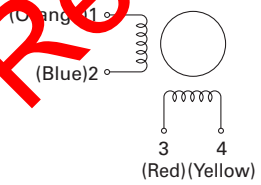
When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

		Connector pin no.			
		3	7	5	9
Excitation sequence	1	−	−	+	+
	2	+	−	−	+
	3	+	+	−	−
	4	−	+	+	−

Connector type, model no.: SM256 □

Internal wiring

In parentheses are lead colors of the motor cable



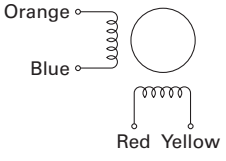
Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

		Connector pin no.			
		3	2	4	1
Excitation sequence	1	−	−	+	+
	2	+	−	−	+
	3	+	+	−	−
	4	−	+	+	−

Lead type

Internal wiring



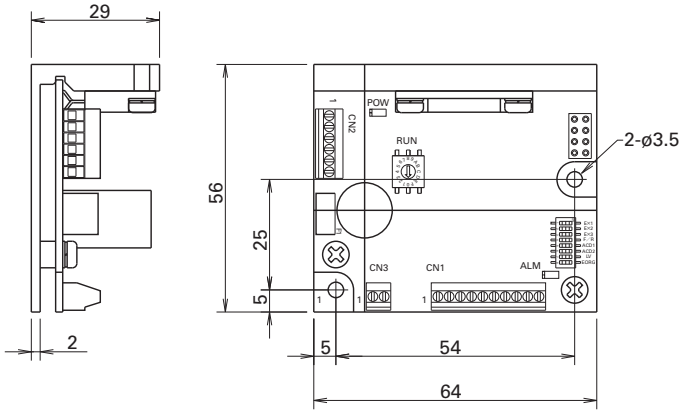
Direction of motor rotation

When excited by a direct current in the order shown below, the direction of rotation is clockwise as viewed from the output shaft side.

		Lead color			
		Red	Blue	Yellow	Orange
Excitation sequence	1	−	−	+	+
	2	+	−	−	+
	3	+	+	−	−
	4	−	+	+	−

Not Recommended for new designs

Driver Dimensions Unit: mm



Driver Specifications

General specifications

			Unipolar	Bipolar
Basic specifications	Model no.		**US1D200P10**	**BS1D200P10**
	Input voltage		24/36 VDC ± 10%	
	Input current		3 A	
	Environment	Protection class	Class III	
		Operating environment	Installation category (Overvoltage category): I, pollution level: 2	
		Operating ambient temperature	0 to +50˚ C	
		Storage temperature	-20 to +70˚ C	
		Operating ambient humidity	35 to 85 % RH (non-condensing)	
		Storage humidity	10 to 90% RH (non-condensing)	
		Operating altitude	Up to 1000 m above sea level	
		Vibration resistance	5 m/s² freq. range 10 to 55 Hz tested for 2 hours in each X, Y and Z-axis directions	
		Shock resistance	Not abnormality observed as per NDS-[illegible]-0110 section 3.2.2 category C.	
		Dielectric strength	500 VAC for one minute (between power input terminal and chassis)	
		Insulation resistance	10 MΩ or more at 500 VDC between power input terminal and chassis)	
	Mass		0.09 kg	
Functions	Mode selection		Step angle mode, input pulse mode, low vibration mode, current at rest, operating current, initial excitation phase	
	Protective functions		Open phase, main circuit power supply undervoltage	
	LED indicators		Power supply monitoring, alarm indicator	
I/O signal	Command pulse input signal		Photocoupler input method; input resistance: 220 Ω, high-level input signal voltage: 4.0 to 5.5 V, low-level input signal voltage: 0 to 0.5 V, maximum starting pulse rate 150 pulses/s	
	Power down input signal		Photocoupler input method; input resistance: 220 Ω, high-level input signal voltage: 4.0 to 5.5 V, low-level input signal voltage: 0 to 0.5 V	
	Phase origin monitor output		Open-collector output through photo coupler, Vceo: 40 V or less, Ic: 10 mA or less	
	Alarm output signal		Open-collector output through photo coupler, Vceo: 40 V or less, Ic: 10 mA or less	

Safety standards

CE(TÜV)		UKCA In compliance from July 2022 production onwards.		
Directive	Category	Directive	Standards	Name
Low Voltage Directive	—	Electrical Equipment (Safety) Regulations 2016	EN 61010-1	—
EMC Directive	Emission	Electromagnetic Compatibility Regulations 2016	EN 61000-6-4	Terminal disturbance voltage
			EN 61000-6-4	Electromagnetic radiation disturbance
	Immunity		EN 61000-4-2	ESD (Electrostatic discharge)
			EN 61000-4-3	Radiated, radio-frequency, electromagnetic field
			EN 61000-4-4	Fast transients/burst
			EN 61000-4-6	Conducted disturbances

RoHS	Directive	Standards
	RoHS Directive 2011/65/EU	EN 63000:2018

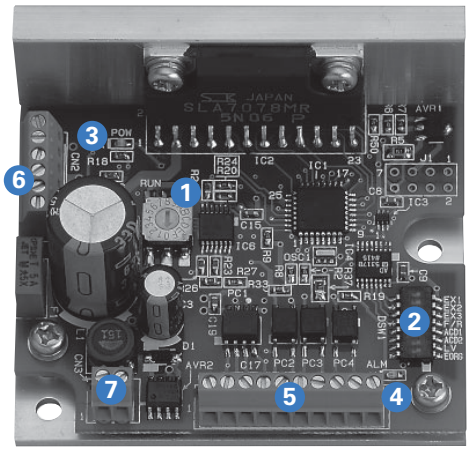
UL	Classification	Standards	File no.
	UL	UL 508C	E179775
	UL for Canada (cUL)		

- Actual EMC levels vary depending on the configuration of the users' control panel where a driver and stepping motor are built in, and the placement layout of other electrical devices and wiring. EMC noise solution parts such as noise filters and toroidal type ferrite cores may be required in some cases.
- Validation test of drivers was performed as per Low-Voltage and EMC Directives at TÜV (TÜV product service) for self-declaration of CE and UKCA marking.
- Drivers can be purchased not only as a set but also as a single item. Connector-type drivers are also available. Contact us for details.

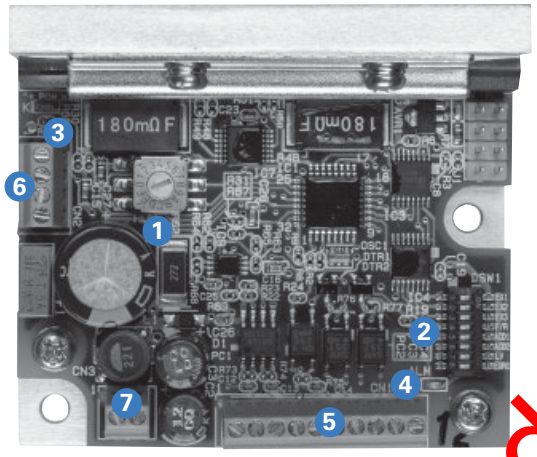
Not Recommended for new designs

Driver Part Names and Functions

Unipolar



Bipolar



1 Operating current selection switch (RUN)

The value of the motor operating current can be set with a rotary switch.

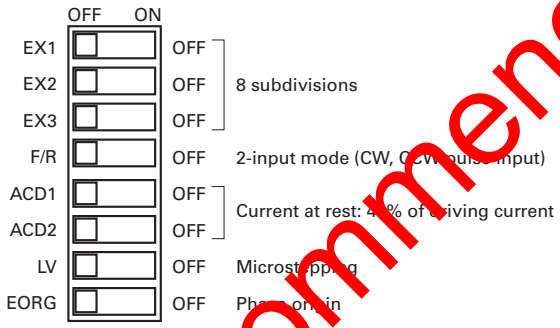
Dial	0	1	2	3	4	5	6	7
Motor current (A)	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
Dial	8	9	A	B	C	D	E	F
Motor current (A)	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5

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

2 Function selection DIP switchpack

Functions can be selected to suit your application.

Factory settings



1. Step angle selection (EX1, EX2, EX3)
Number of full step angle subdivisions can be selected.

EX1	EX2	EX3	Microsteps
ON	ON	ON	1 subdivision
OFF	ON	OFF	2 subdivisions
ON	OFF	OFF	4 subdivisions
OFF	OFF	OFF	8 subdivisions
OFF	OFF	ON	16 subdivisions

2. Input mode selection (F/R)
Input pulse mode can be selected.

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

3. Current selection when stopping (ACD1, ACD2)
Select the current value of the motor when stopping.

ACD2	ACD1	Motor current
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 factory setting is 40% of the rated value. Driver and motor should be operated at around 50% of rated value to reduce heat.

4. Low vibration mode selection (LV)
Motors can smoothly operate even at low resolution settings such as full-step (1 subdivision) and half-step (2 subdivisions) modes.

LV	Initial excitation phase
ON	Low vibration
OFF	Microstepping

5. Excitation selection (EORG)
The excitation phase at the time of power activation is selected.

EORG	Initial excitation phase
ON	Excitation phase at power shutdown
OFF	Phase origin

・By turning on EORG, the excitation phase at the time of power shutdown will be saved. Therefore, there will be no shaft displacement when the power is turned on next time.

3 Power supply monitoring LED (POW)

Lights up when the main circuit power supply is turned on.

4 Alarm indicator LED (ALM)

The LED lights up in either of the followings:

・Motor cable is damaged
・The switching device in the driver is damaged
・The main circuit power supply voltage is outside the specification range (below 19 VDC).

When "ALM" is lit, the winding current of the stepping motor is cut off and the status will shift to a "non-excitation" state. At the same time, an output signal (photocoupler ON) is transmitted from the alarm output terminal (AL) to outside. When the alarm circuit is activated, this state is maintained until it is reset by turning on the power supply again. When an alarm goes off, please take corrective actions to eliminate the cause of the alarm before turning on the power supply again.

5 I/O signal terminals (CN1)

For input/output signal connections.

6 Motor connection terminals (CN2)

For motor power connection.

7 Power supply connection terminals (CN3)

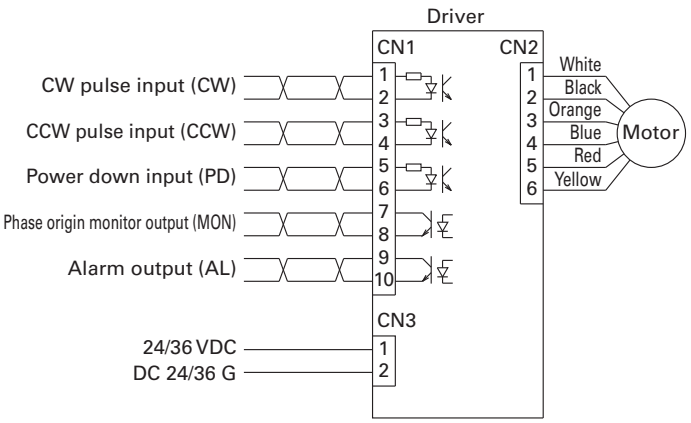
For main circuit power supply connection.

Not Recommended for new designs

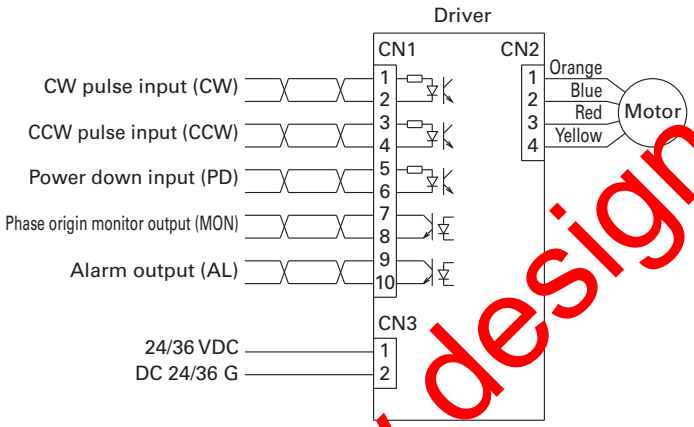
Connections and Signals

External wiring diagram

Unipolar



Bipolar



Cable size

Type	Cable Size	Maximum length
Power cable	22 AWG (0.3 mm²)	2 m or less
I/O signal cable	24 AWG (0.2 mm²) to 22 AWG (0.3 mm²)	2 m or less
Motor cable	22 AWG (0.3 mm²)	Below 3 m

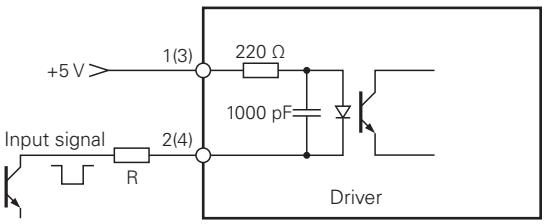
Input/output signal specification overview

Signal	CN1 Pin no.	Function overview
CW pulse input (CW) (Standard)	1 2	When in 2-input mode, a CW-direction pulse is input.
Drive pulse input (CK)	1 2	When in 1-input mode, a drive pulse is input to rotate the motor.
CCW pulse input (CCW) (Standard)	3 4	When in 2-input mode, a CCW-direction pulse is input.
Rotational direction input (U/D)	3 4	When in 1-input mode, a drive pulse is input to designate the rotational direction. Internal photocoupler ON ··· CW direction Internal photocoupler OFF ··· CCW direction
Power down input (PD)	5 6	A PD signal input will cut off (power off) the current flowing to the motor. PD input signal on (internal photocoupler on) ··· PD function is enabled. PD input signal off (internal photocoupler off) ··· PD function is disabled.
Phase origin monitor output (MON)	8	Turned on when the excitation phase is at the origin (when power is turned on). In full step mode, turned on once for 4 pulses. In half step mode, turned on once for 8 pulses.
Alarm output (AL)	9 10	When the alarm circuit is activated inside the driver, an alarm signal (photocoupler on) is output to outside, which turns the stepping motor to non-excited state.

Note: The CW direction refers to the clockwise direction when the motor is viewed from the output shaft side.
The CCW direction refers to the counter-clockwise direction when the motor is viewed from the output shaft side.

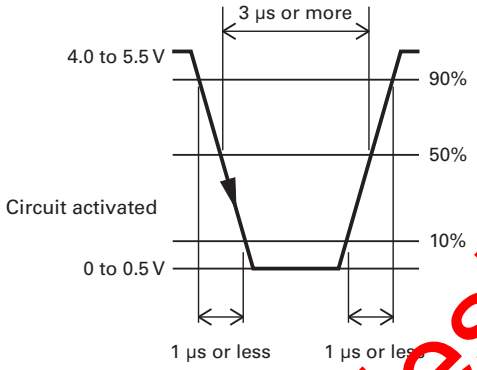
Not Recommended for new designs

Circuit Configuration of Pulse Input CW (CK), CCW (U/D)



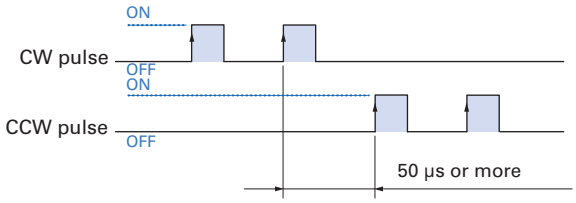
- Ensure that the pulse duty is 50% or less.
- Maximum starting pulse rate is 150 pulses/s.
- If the peak voltage of the input signal exceeds 5.5 V, add an external current-limiting resistor R to limit the input current to around 15 mA. (Take the photocoupler forward voltage of 1.5 V into consideration.)

Input signal specifications



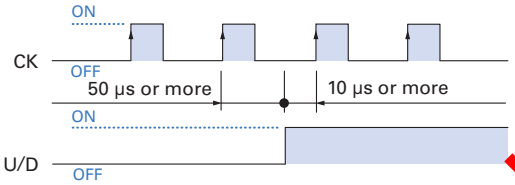
Command pulse timing

2-input mode (CW, CCW)



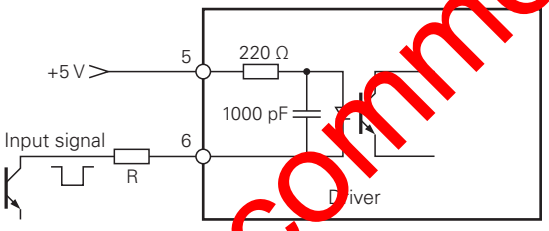
- Shaded areas indicate that internal photocoupler is ON. Internal circuit (motor) starts operating at leading edge of the photocoupler ON.
- When applying a pulse to CW, set the CCW side internal photocoupler to OFF.
- When applying a pulse to CCW, set the CW side internal photocoupler to OFF.

1-input mode (CK, U/D)



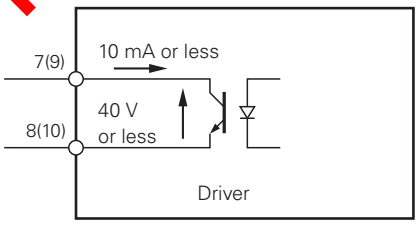
- Shaded areas indicate that internal photocoupler is ON. Internal circuit (motor) starts operating at leading edge of the CK-side photocoupler ON.
- Switching of U/D input signal must be done while the CK-side internal photocoupler is OFF.

Circuit Configuration of Power Down (PD) Input

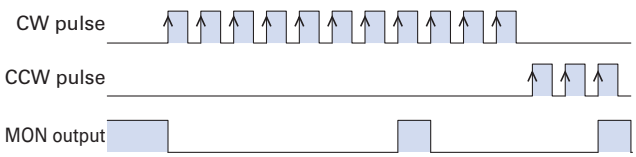


- If the peak voltage of the input signal exceeds 5.5 V, add an external current-limiting resistor R to limit the input current to around 15 mA. (Take the photocoupler forward voltage of 1.5 V into consideration.)

Circuit Configuration of Phase Origin Monitor Output (MON) and Alarm Output (AL)



MON output



- Photo coupler is turned on when the motor's excitation phase is at the origin (when power is turned on).
- MON output is output every 7.2 ° rotation of the motor output shaft from the phase origin. (The figure on the left is for when the step angle setting is in a half-step mode)

Not Recommended for new designs