

Cylindrical Linear Motors

LINEAR SHAFT DRIVES

Application Optical equipment, semiconductor manufacturing equipment, food machinery, inspection equipment

Cylindrical Linear Motor System with Unique Control Method

A permanent magnet is placed in the shaft. A coil is wrapped around the magnet to make the cylindrical linear motor system. A cylindrical shape enables the coil to capture magnetic flux around its whole circumference to ensure it can be efficiently converted to thrust. Thus, high thrust can be obtained even with a small-diameter shaft. The most significant feature is the unique control method. It can detect the position using magnetic flux generated from the shaft so devices such as an external linear scale can be eliminated and a simple system can be built.



Linear Scale Is Not Required

Since magnetic flux generated from the shaft is used to detect the position, you do not need to provide an external position sensor and origin sensor.

Positioning Operation Function Is Included

Since a positioning operation function is included in the driver, an external controller is not required to perform positioning operation. Pressing operation and continuous operation can also easily be performed. (Repeated positioning accuracy: $\pm 10 \mu\text{m}$)

Dustproof and Waterproof

The moving part is made of A6063S, the shaft is made of SUS304, and the product is dustproof and waterproof with JIS protection class IP65. The product can be used in various environments. (With the exception of the connector area and driver)

Automatic Magnetic Pole Detection Is Available

Since a built-in position sensor detects the magnetic pole position of the shaft, thrust is generated immediately after power-on.

Available Models

Series	Thrust	Lineup
LINEAR SHAFTS	Thrust: 11 N to 25 N	SHM-16+SHD2-06
	Thrust: 28 N to 118 N	SHM-16+SHD2-06
	Thrust: 150 N	SHM-35+SHD-16

Rated Thrust: 11 N to 25 N (Max. Thrust 51 N to 117 N)

- Shaft diameter: $\varnothing 16$ mm
- Number of coil sets: 2, 3, or 5
- Max. speed: 4,000 mm/s
- Effective stroke length: 199 to 1,045 mm
- Number of positioning points: 32
- Number of speed settings: 32
- Vibration suppression control



Rated Thrust: 28 N to 118 N (Max. Thrust 126N to 532N)

- Shaft diameter: $\varnothing 25$ mm
- Number of coil sets: 2, 4, 6, or 8
- Max. speed: 2,600 to 4,000 mm/s
- Effective stroke length: 117 to 1,041 mm
- Number of positioning points: 32
- Number of speed settings: 32
- Vibration suppression control



Rated Thrust: 150 N (Max. Thrust: 700 N)

- Shaft diameter: $\varnothing 35$ mm
- Number of coil sets: 6
- Max. speed: 2,500 mm/s
- Effective stroke length: 233 to 1,253 mm
- Number of positioning points: 32
- Number of speed settings: 10



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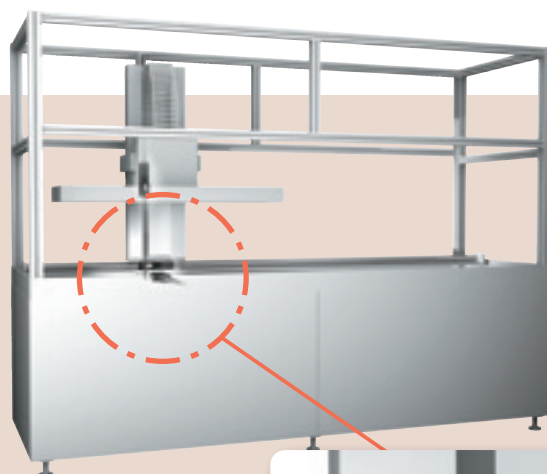
MODELS

SHM-16+SHD2-06

SHM-25+SHD2-08

SHM-35+SHD-16

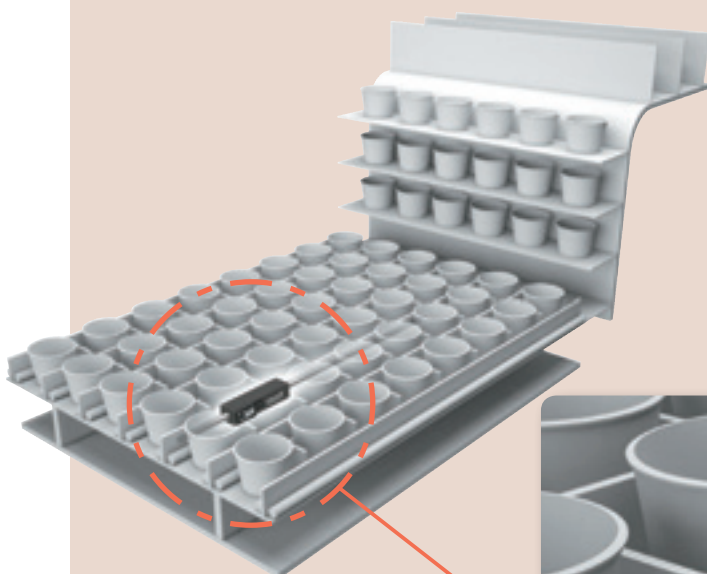
Applications



Product model Linear Shaft Drive

Employed device Food Container Inspection Equipment

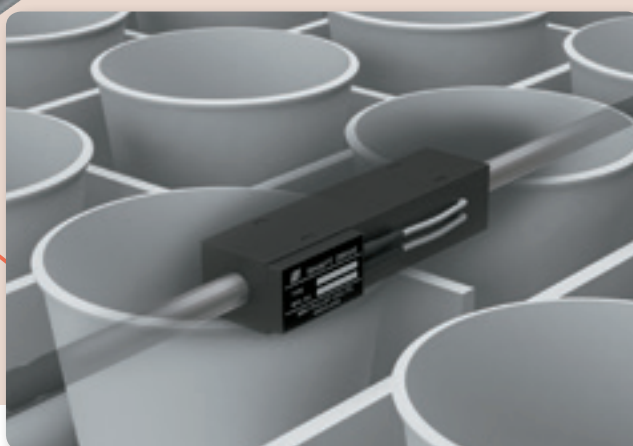
A cylindrical linear motor system can be used in the conveyor drive unit.
The JIS protection class is IP65.



Product model Linear Shaft Drive

Employed device Food Production Equipment

For conveying cups containing liquid.
The speed can be fine-tuned different from air systems, and the equipment can be easily cleaned because the JIS protection class is IP65.



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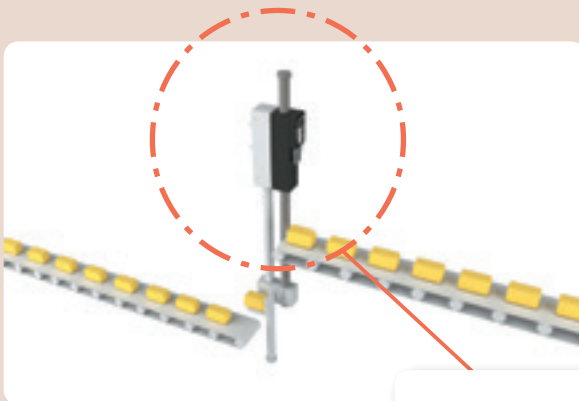


Product model Linear Shaft Drive

Employed device FPD Manufacturing Equipment

A cylindrical linear motor system can be used in the LCD repair equipment.

The speed is increased and the dust is reduced.



Product model Linear Shaft Drive

Employed device Food Conveyor

Linear shaft drive can be used for conveying the rolled eggs with a conveyor.

Motorized by securing the movable element and replacing the air cylinder.



MODELS

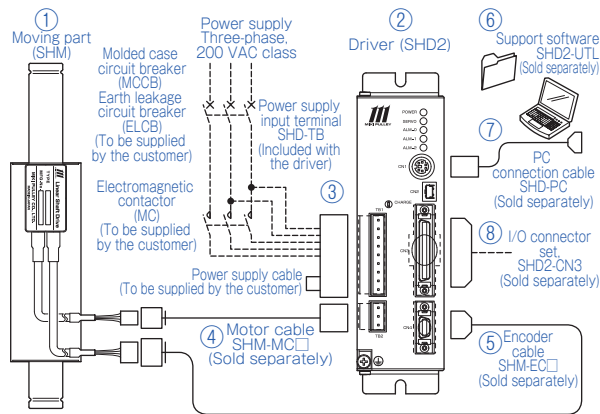
SHM-16+SHD2-06

SHM-25+SHD2-08

SHM-35+SHD-16

Rated Thrust: 11 N to 25 N

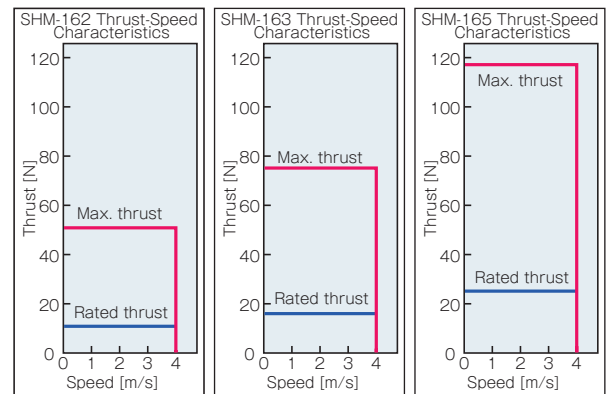
System Configuration



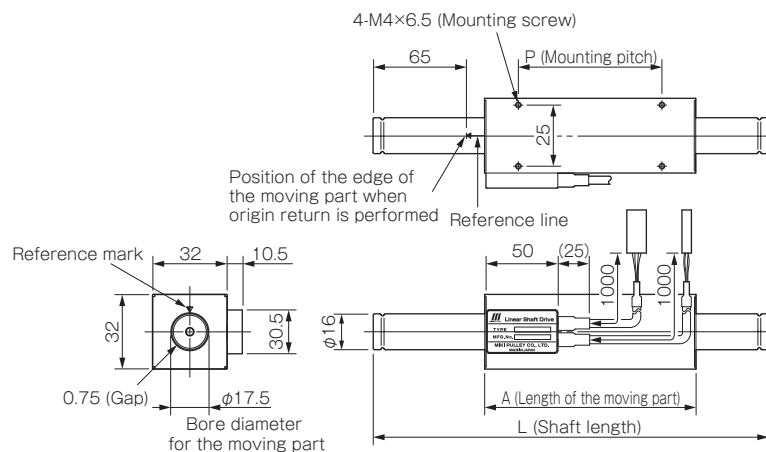
No.	Name	Description
①	Moving part	Consists of a moving part (coil) and shaft (magnet).
②	Driver	For operating the moving part.
③	Power supply input terminal	For connecting the power cable. (Included in the driver)
④	Motor cable	For connecting the driver and the motor of the moving part. (Sold separately)
⑤	Encoder cable	For connecting the driver and the encoder of the moving part. (Sold separately)
⑥	Support software	For configuring and changing the settings of the driver on a PC. (Sold separately)
⑦	PC connection cable	For connecting to a PC. (Sold separately)
⑧	I/O connector set	Connector for inputting/outputting command signals to the driver (Sold separately)

Moving Part Specifications

Model	SHM-162	SHM-163	SHM-165
Number of coil sets	2	3	5
Rated thrust	11 N	16 N	25 N
Max. thrust	51 N	75 N	117 N
Max. speed	4000 mm/s		
Rated current	0.64 A rms		
Max. current	3.0 A rms		
Time rating	Continuous		
Ambient temperature	0 ~ 40 °C		
Ambient humidity	80% relative humidity or under (with no condensation)		
Insulating resistance	500 VDC 10 M Ω or more		
Dielectric strength voltage	1,500 VAC for 1 minute		
Heat resistance class	Class F (coil part)		
Structure	Fully-closed, self-cooling		
Shaft unit mass	0.0015 kg/mm		
Moving part mass	0.25 kg	0.33 kg	0.50 kg



Moving Part Dimensions

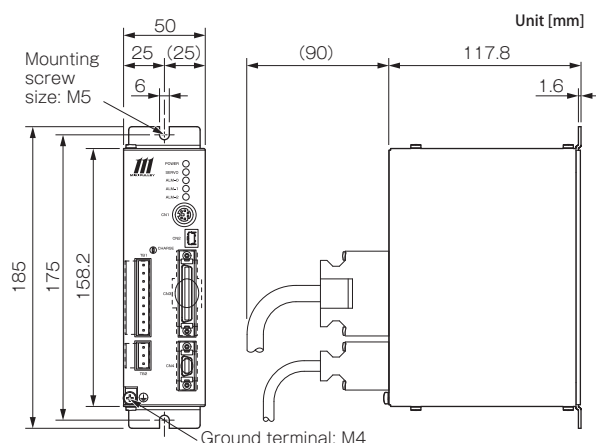


Model	A	P	Effective stroke length							Unit [mm]
			L=472	L=600	L=728	L=856	L=984	L=1112	L=1240	
SHM-162	94	64	277	405	533	661	789	917	1045	
SHM-163	120	90	251	379	507	635	763	891	1019	
SHM-165	172	142	199	327	455	583	711	839	967	

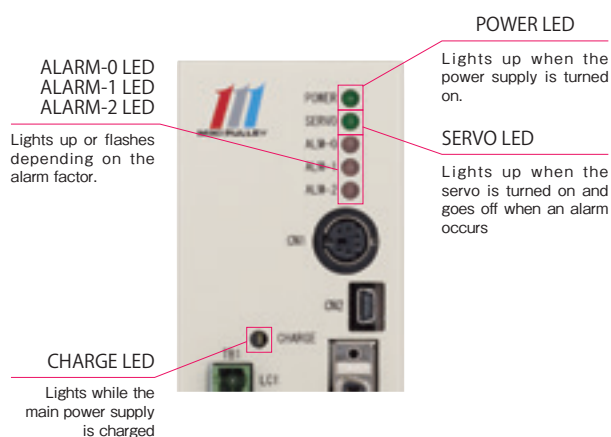
Driver Specifications

Model	SHD2-06-162	SHD2-06-163	SHD2-06-165
Number of coil sets in moving part	2	3	5
Input voltage	Main power supply: Three-phase 200 VAC, Control power supply: Single-phase 200 VAC		
Input power supply range (common)	200 to 230 VAC +10 to -15% 50/60 Hz ± 5%		
Rated continuous output current	0.64 A rms		
Max. current (limit)	3.0 A rms		
Max. instantaneous current (peak value)	6.0 A peak		
Power supply equipment capacity	0.6 kVA		
Position command pulse input	Signal	Line driver signal	
	Input method	Select one from 2-pulse, 1-pulse, and 2-phase pulse	
	Max. frequency	4 M pulses/s	
Input signal	Total 20 dedicated inputs and general-purpose inputs		
Output signal	Total 20 dedicated outputs and general-purpose outputs		
Limit function	Speed limit, thrust limit, and movable range limit		
Protection function	Overload, overcurrent, overvoltage, sensor disconnection, memory error		
Built-in positioning function	Number of positioning points: 32, Number of speed settings: 32		
Support software (SHD2-UTL)	Parameter configuration, monitor display, program editing/configuration, saving data and transferring data to driver		
Ambient temperature	0 ~ 40°C (with no condensation)		
Ambient humidity	80% relative humidity or under (with no condensation)		
Mass	0.9 kg		

Driver Dimensions



Driver Display Panel



How to Place an Order

● Moving Part

SHM - 162 - 472

Shaft diameter (φ16)
No. of coil sets
Shaft length (L dimension)

● Driver Part

SHD2 - 06 - 162

Max. instantaneous current
6.0 A peak: 06
Shaft diameter of the corresponding moving part (φ16)
No. of coil sets for the corresponding moving part

*The moving part, shaft, and driver are finely adjusted as a set and can only be run in the combination put together at the time of shipment.

MODELS

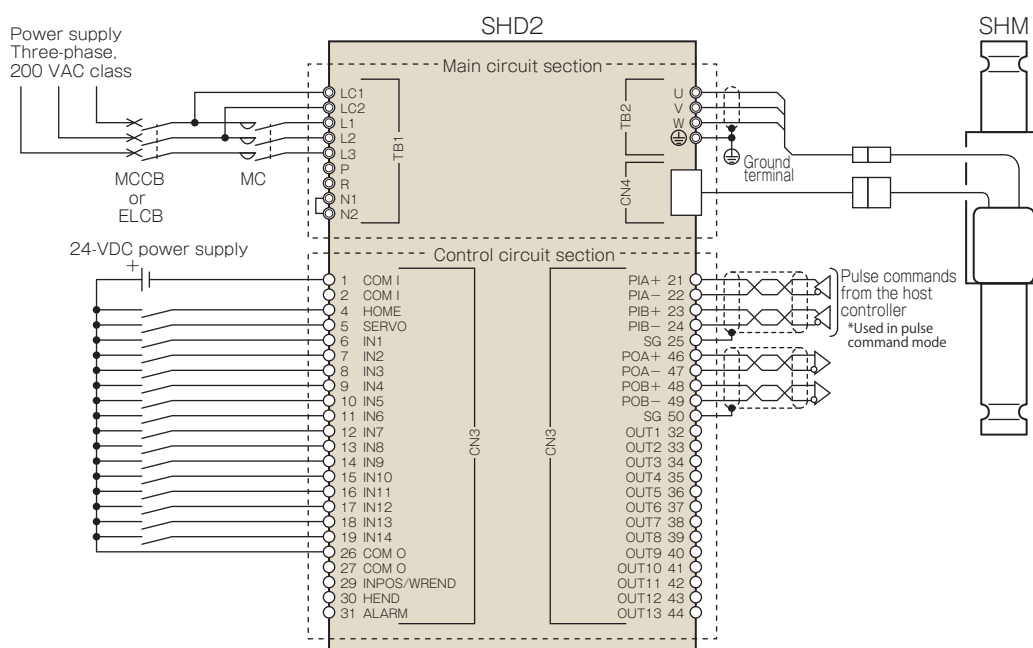
SHM-16+SHD2-06

SHM-25+SHD2-08

SHM-35+SHD-16

Rated Thrust: 11 N to 25 N

Basic Wiring Diagram



Input/Output Signal Connector Array (CN3)

Input Part

Pin no.	Terminal symbol	Signal name
1	COMI	Coupler input common
2	COMI	Coupler input common
3	NC	Not used
4	HOME	Origin return
5	SERVO	Servo ON
6 ~ 19	IN1 ~ IN14	General-purpose inputs 1 to 14
20	NC	Not used
21	PIA +	Command pulse A input +
22	PIA -	Command pulse A input -
23	PIB +	Command pulse B input +
24	PIB -	Command pulse B input -
25	SG	Signal ground

Arbitrary assignment in the general-purpose input assignment function (IN1 to IN14)

Start signal
Pause
Program reset/alarm clear
Point selection (1, 2, 4, 8, 16)
Point write
Emergency stop input
Gain switching
+ jog drive / - jog drive
Deviation counter clear input
Thrust limit selection (1, 2, 4, 8, 16)
Electronic gear switching
Operation mode selection

Output Part

Pin no.	Terminal symbol	Signal name
26	COMO	Coupler output common
27	COMO	Coupler output common
28	NC	Not used
29	INPOS	Positioning completion
30	HEND	Origin return completion
31	ALARM	Alarm
32 ~ 44	OUT1 ~ OUT13	General-purpose outputs 1 to 13
45	NC	Not used
46	POA +	Command pulse A output +
47	POA -	Command pulse A output -
48	POB +	Command pulse B output +
49	POB -	Command pulse B output -
50	SG	Signal ground

Arbitrary assignment in the general-purpose output assignment function (OUT1 to OUT13)

Alarm code output (1 to 3)
Ready output
Point completion output (1, 2, 4, 8, 16)
Point write completion
Output when thrust is limited
Zone output (0 to 7)
Zero speed
Moving
Overload alarm
Brake release output
Current operation mode

- * Install the molded case circuit breaker (MCCB) or earth leakage circuit breaker (ELCB) (with overcurrent protection function) on the input side (primary side) of the driver for wiring protection. Do not use a circuit breaker with a capacity greater than the recommended capacity. * Install an electromagnetic contactor (MC) if you want to isolate the driver from the power supply separate from MCCB or ELCB.
- * Use a twisted wire for the control signal wire.
- * Ground the shielded wire. * To prevent malfunction caused by noise, place the main circuit wire so that it is as far away as possible from the control signal wire, and never place the wires in the same duct.
- * Be sure to refer to the instruction manual when you actually connect wires.

Parameters

Category	Name	Default	Unit	Description
Common	Control mode	Procon	—	Set the control mode of the driver [Procon] Program control [Pulse] Control by pulse command input
	Sensor selection	Built-in	—	Set the type of position sensor [Built-in] Built-in sensor of the moving part [Incremental combination] Combined use of the built-in sensor and external incremental encoder
	External sensor resolution	100000	nm	Set the resolution of the external encoder. Setting range: 0 to 100000
	Pulse output setting numerator	1	—	Set the number of pulses to output from the pulse output (CN3 46 to 49 pins). Setting range: 1 to 9999
	Pulse output setting denominator	1	—	Amount of movement for one output pulse = (feedback pulse electronic gear denominator / feedback pulse electronic gear numerator) x sensor resolution
	Positioning completion range	100	(Pulse)	Set a value to determine the positioning completion output (deviation amount). Setting range: 1 to 40000000
	Positioning completion condition	Command & Deviation	—	Set the positioning determination condition [Command & Deviation] Determine that the positioning is completed when there is no command and the deviation amount is less than the set value [Command & Deviation + Zero Speed] Determine that the positioning is completed when there is no command, the deviation amount is less than the set value, and the speed is less than the lower limit of the zero speed range
	Allowable position deviation	1000	(Pulse)	Set a value to determine the allowable deviation error. Setting range: 0 to 40000000 "Deviation error" alarm occurs when this range is exceeded.
	Thrust limit	1000	%	Set this value when the user wants to reduce the maximum thrust. Setting range: 0 to 1000 100% is equivalent to the rated thrust of the motor * A value greater than the maximum thrust of the motor cannot be set.
	Movable limit +	30000	(Pulse)	Set this value to narrow the movable range. Setting range: -40000000 to 40000000
	Movable limit -	0	(Pulse)	
	Brake operation A delay time	0	ms	Set the time from when the brake release output is turned off to when the motor power is turned off in order to turn off the servo while the moving part is stopped. Setting range: 0 to 1000
	Brake operation B delay time	0	ms	Set the time from the detection of the off state of the servo on input signal to when the brake release output is turned off in order to turn off the servo while the moving part is moving. Setting range: 0 to 1000
	Brake operation switching value	1000	(Pulses/s)	Speed setting to determine whether to perform brake operation while the motor is stopped or in operation. Setting range: 0 to 40000000 * The brake operation is performed while the motor is stopped if the speed is less than the set value, and while in operation if the speed is the same or greater than the set value.
	Zero speed range	1000	(Pulses/s)	Set a value to determine the zero speed. Setting range: 0 to 40000000 * Zero speed is determined when the speed is less than the set value.
	Overload warning detection value	0	%	Set a value to determine the overload warning output. Setting range: 0 to 100 * When the load factor exceeds this value, the "overload warning output" turns on.
Origin return	Origin return method	Built-in Origin	—	Select the origin return method. [Built-in Origin] Turns around at the built-in origin and is completed at the reference position. [External Origin] Turns around at the built-in origin and is completed when leaving the external origin. [Combination Origin] Turns around when entering the external origin and is completed when leaving the external origin. [Mechanical End] Completed when detecting the mechanical end.
	External origin logic	Positive Logic	—	Select the logic of the external origin sensor. [Positive Logic] Origin signal turns on when entering the origin. [Negative Logic] Origin signal turns off when entering the origin.
	Origin return first speed	5000	(Pulses/s)	Origin limit detection drive speed when returning to origin. Setting range: 0 to 40000000 * Origin limit: Built-in origin, external origin, and mechanical end
	Origin return second speed	1000	(Pulses/s)	Origin zero position drive speed when returning to origin. Setting range: 0 to 40000000 * Zero position: Zero position, reference position, leaving the external origin
	Origin return acceleration/deceleration speed	100000	(Pulses/s ²)	Origin return drive acceleration/deceleration speed. Setting range: 1 to 40000000
	Origin return offset	0	(Pulses/s)	Offset between the origin position and the absolute origin position of the motor. Setting range: -40000000 to 40000000 * Offset movement occurs after returning to origin
	Mechanical end origin detection thrust	0	%	Thrust to detect the mechanical end when selecting the mechanical end for the origin return method. Setting range: 0 to 1000 * Percentage of the rated thrust
	Mechanical end origin detection time	0	ms	Time to detect the mechanical end when selecting the mechanical end for the origin return method. Setting range: 0 to 1000

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MODELS

SHM-16+SHD2-06

SHM-25+SHD2-08

SHM-35+SHD-16

Rated Thrust: 11 N to 25 N

Parameters

Category	Name	Default	Unit	Description
Communication	COM1 communication baud rate	115200	bit/s	Set the COM1 communication baud rate. Communication method: RS-232C Setting values: [4800] [9600] [19200] [38400] [57600] [76800] [115200] * If you selected any of 57600 to 115200 for COM1, set one of 4800 to 38400 for COM2.
	COM2 communication baud rate	38400	bit/s	Set the COM2 communication baud rate. Communication method: RS485 Setting values: [4800] [9600] [19200] [38400] [57600] [76800] [115200] * If you selected any of 57600 to 115200 for COM2, set one of 4800 to 38400 for COM1.
	COM2 communication protocol	Standard	—	Select the COM2 communication protocol. Setting values: [Standard] [Touch Panel]
	COM2 communication latency	10	ms	Set the latency for the COM2 communication from receiving a command to responding to it. Setting range: 0 to 1000
	Communication station number	0	—	Set the communication station number of the driver. Setting range: 0 to 31 * Common to Standard and Touch Panel
Procon mode	Positioning determination time	100	ms	Set time to determine the positioning completion. Setting range: 0 to 1000 * No determination if 0 is set
Pulse mode	Command pulse input switching	2-pulse	—	Select the command pulse signal type Setting values: [2-pulse] [1-pulse] [2-phase 4 multiplication] [2-phase 2 multiplication]
4 pcs for built-in sensor, 4 pcs for external encoder	Tuning method	Type 1	—	Select the gain tuning method [Type 1] Control mode 1 (normal) [Type 2] Control mode 2 [Type 3] Vibration suppression control mode
	Load mass estimation	Enable	—	Automatic estimation of the mass of the mechanism attached to the moving part. Setting values: [Enable] [Disable]
	Load mass	1.2	kg	Set the mass of the mechanism attached to the moving part. Setting range: 0.0 to 3276.7
	Responsiveness	100	rad/s	Parameter to determine the servo loop frequency. Setting range: 1 to 6000
	Servo stiffness	1.0	—	Parameter to adjust the servo loop frequency. Setting range: 0.1 to 10.0
	Following characteristic	1.0	—	Adjust the MFC response frequency. Setting range: 0.1 to 10.0
	Position FF gain	0	%	Position loop feed forward gain. Setting range: 0 to 100
	Speed proportional gain		—	Speed loop proportional gain (the default depends on the moving part)
	Speed integration gain		—	Speed loop integration gain (the default depends on the moving part)
	Notch filter 1 enable/disable	Disable	—	Notch filter function. Setting values: [Enable] [Disable]
	Notch filter 1 frequency	4000	Hz	Set the resonant frequency. Setting range: 50 to 4000
	Notch filter 1 Q-value	0.5	Hz	Set the notch filter width. Setting range: 0.5 to 5.0
	Notch filter 2 enable/disable	Disable	—	Notch filter function. Setting values: [Enable] [Disable]
	Notch filter 2 frequency	4000	Hz	Set the resonant frequency. Setting range: 50 to 4000
	Notch filter 2 Q-value	0.5	Hz	Set the notch filter width. Setting range: 0.5 to 5.0
	Low-pass filter enable/disable	Disable	—	Low-pass filter function. Setting values: [Enable] [Disable]
	Low-pass filter frequency	1000	Hz	Setting a larger value reduces noise generated from the motor. Setting range: 10 to 8000
	Vibration suppression control 1	1.0	—	Setting range: 0.1 to 1.0
	Vibration suppression control 2	1.01	—	Setting range: 1.00 to 2.00

Support Software Function

Main menu	Submenu	Function description
Status display	Input/output status	Used to view the input/output status of the CN3 I/O connector of the driver
	Measurement (waveform display)	Used to simultaneously display the waveforms of up to 3 items of the following: command speed, feedback speed, command thrust, speed deviation, position deviation, main power supply voltage, load factor, and mass.
	Alarm history	Used to view the current alarm and up to 8 alarm history records.
Program operation mode	Program	Create, edit, and save position data files. Upload/download position data to and from the driver.
	Speed	Create, edit, and save speed data files. Upload/download speed data to and from the driver.
	Macro settings	Create, edit, and save macro data files. Upload/download macro data to and from the driver.
	Pressing/thrust limits	Create, edit, and save pressing/thrust data files. Upload/download pressing/thrust data to and from the driver.
Input/output	Input/output settings	Used to configure the assignment of the input/output signals of the CN3 I/O connector of the driver to the input/output functions.
	Zone output	Configure the settings of the zone output.
Direct drive	Jog inching	Configure the jog inching settings.
	Electronic gear	Configure the command pulse electronic gear settings.
Settings	Parameter settings	Configure the settings of parameters that determine the driver operation.
	Tuning	Adjust the servo gain.
Communication line	Communication start	Establish a connection between the PC and the driver.
	Disconnection	Disconnect the connection between the PC and the driver.
	Communication settings	Configure the communication settings for the PC.

Display Screen



MODELS

SHM-16+SHD2-06

SHM-25+SHD2-08

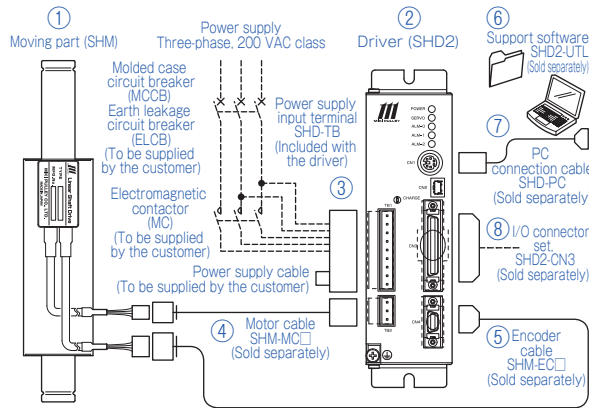
SHM-35+SHD-16

Operating Environment

Item	Minimum operating environment	Recommended operating environment
Processor	Intel Pentium 4 1.6 GHz processor or equivalent	Intel 2.4 GHz processor or equivalent
Memory	256 MB or more of free memory when the OS is started up	512 MB or more of free memory when the OS is started up
Hard disk space	10 MB or more	
Display resolution	SVGA (800 x 600 pixel) or higher	XGA (1024 x 768 pixel) or higher
Graphic	Graphic display capability with 16-bit color (32768 colors) or greater at the above resolution	Minimum operating environment plus 2D acceleration function available
OS	Windows XP (Pro/Home)/Service Pack 2 (32-bit version)	Windows XP (Pro/Home)/Service Pack 3 (32-bit version)
Communication port	RS-232C (USB-serial converter can be used)	
Others	Keyboard, mouse, and optical drive (for installation)	

Rated Thrust: 28 N to 118 N

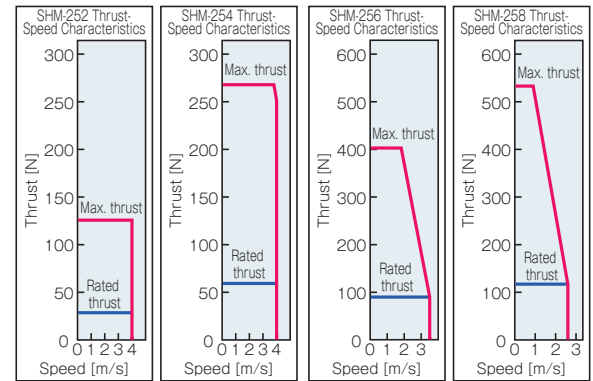
System Configuration



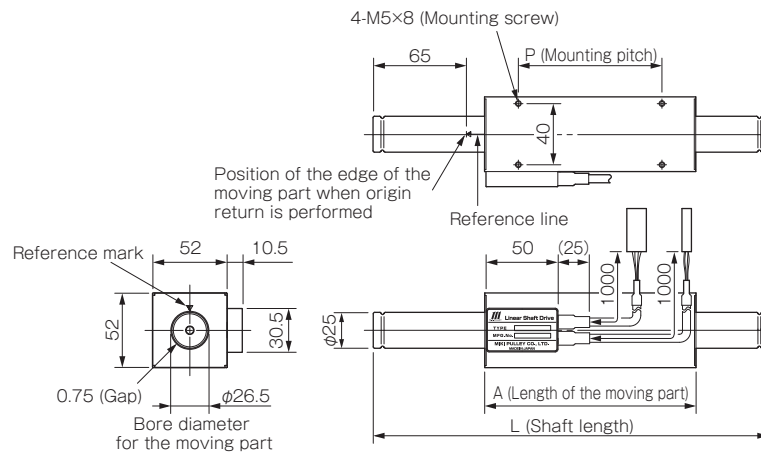
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④	Motor cable	For connecting the driver and the motor of the moving part. (Sold separately)
⑤	Encoder cable	For connecting the driver and the encoder of the moving part. (Sold separately)
⑥	Support software	For configuring and changing the settings of the driver on a PC. (Sold separately)
⑦	PC connection cable	For connecting to a PC. (Sold separately)
⑧	I/O connector set	Connector for inputting/outputting command signals to the driver (Sold separately)

Moving Part Specifications

Model	SHM-252	SHM-254	SHM-256	SHM-258
Number of coil sets	2	4	6	8
Rated thrust	28 N	59 N	90 N	118 N
Max. thrust	126 N	267 N	403 N	532 N
Max. speed	4000 mm/s	4000 mm/s	3500 mm/s	2600 mm/s
Rated current	1.2 A rms			
Max. current	5.6 A rms			
Time rating	Continuous			
Ambient temperature	0 ~ 40 °C			
Ambient humidity	80% relative humidity or under (with no condensation)			
Insulating resistance	500 VDC 10 M Ω or more			
Dielectric strength voltage	1,500 VAC for 1 minute			
Heat resistance class	Class F (coil part)			
Structure	Fully-closed, self-cooling			
Shaft unit mass	0.0037 kg/mm			
Moving part mass	0.70 kg	1.10 kg	1.60 kg	2.00 kg



Moving Part Dimensions



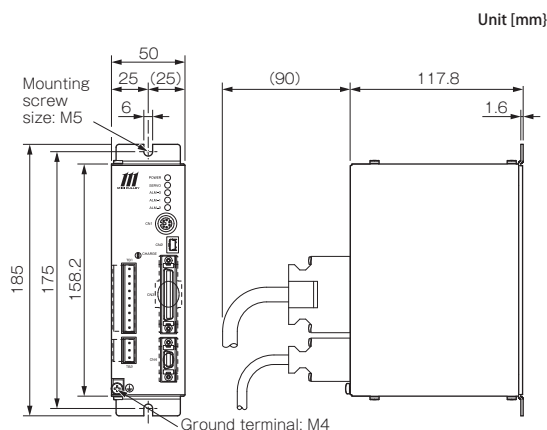
Model	A	P	Effective stroke length						
			L=472	L=600	L=728	L=856	L=984	L=1112	L=1240
SHM-252	98	60	273	401	529	657	785	913	1041
SHM-254	150	110	221	349	477	605	733	861	989
SHM-256	202	162	169	297	425	553	681	809	937
SHM-258	254	214	117	245	373	501	629	757	885

Unit [mm]

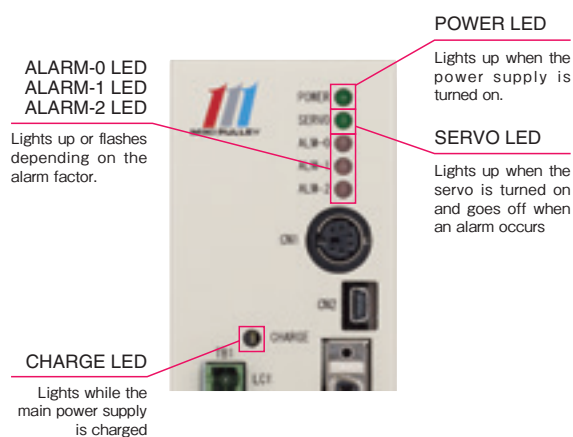
Driver Specifications

Model		SHD2-08-252	SHD2-08-254	SHD2-08-256	SHD2-08-258
Number of coil sets in moving part		2	4	6	8
Input voltage		Main power supply: Three-phase 200 VAC, Control power supply: Single-phase 200 VAC			
Input power supply range (common)		200 to 230 VAC +10 to -15% 50/60 Hz ± 5%			
Rated continuous output current		1.22 A rms			
Max. current (limit)		5.6 A rms			
Max. instantaneous current (peak value)		8.0 A peak			
Power supply equipment capacity		0.9 kVA			
Position command pulse input	Signal	Line driver signal			
	Input method	Select one from 2-pulse, 1-pulse, and 2-phase pulse			
	Max. frequency	4 M pulses/s			
Input signal		Total 20 dedicated inputs and general-purpose inputs			
Output signal		Total 20 dedicated outputs and general-purpose outputs			
Limit function		Speed limit, thrust limit, and movable range limit			
Protection function		Overload, overcurrent, overvoltage, sensor disconnection, memory error			
Built-in positioning function		Number of positioning points: 32, Number of speed settings: 32			
Support software (SHD2-UTL)		Parameter configuration, monitor display, program editing/configuration, saving data and transferring data to driver			
Ambient temperature		0 ~ 40 °C			
Ambient humidity		80% relative humidity or under (with no condensation)			
Mass		0.9 kg			

Driver Dimensions



Driver Display Panel



How to Place an Order

Moving Part

SHM - 252 - 472

Shaft diameter (φ25)
No. of coil sets
Shaft length (L dimension)

Driver Part

SHD2 - 08 - 252

Max. instantaneous current 8.0 A peak: 08
Shaft diameter of the corresponding moving part (φ25)
No. of coil sets for the corresponding moving part

*The moving part, shaft, and driver are finely adjusted as a set and can only be run in the combination put together at the time of shipment.

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ROSTA

MODELS

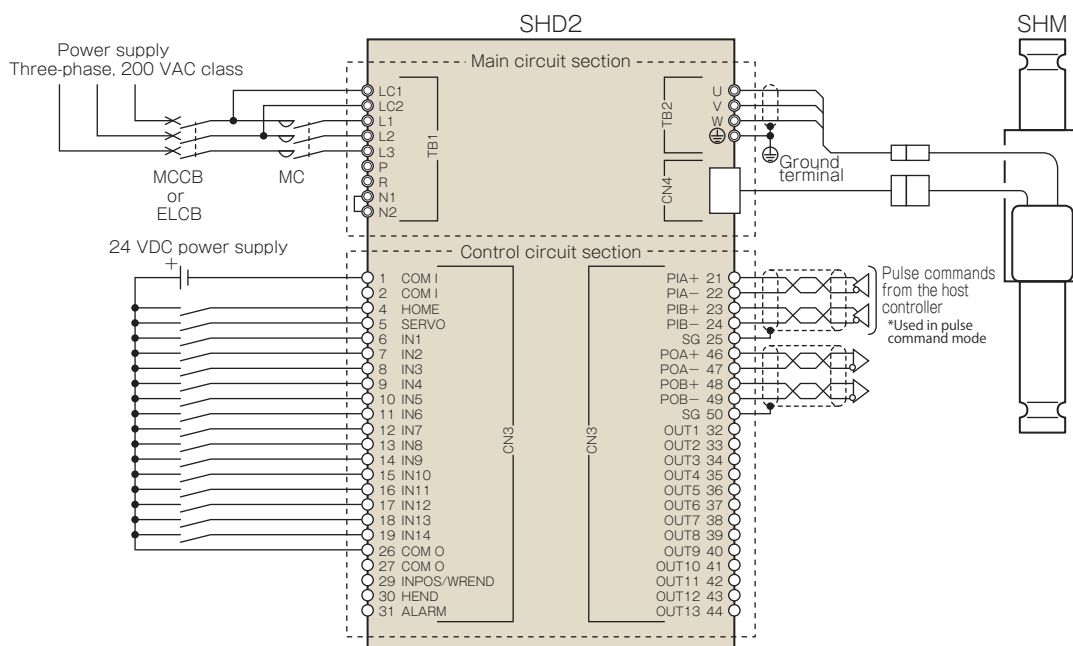
SHM-16+SHD2-06

SHM-25+SHD2-08

SHM-35+SHD-16

Rated Thrust: 28 N to 118 N

Basic Wiring Diagram



Input/Output Signal Connector Array (CN3)

Input Part

Pin no.	Terminal symbol	Signal name
1	COMI	Coupler input common
2	COMI	Coupler input common
3	NC	Not used
4	HOME	Origin return
5	SERVO	Servo ON
6 ~ 19	IN1 ~ IN14	General-purpose inputs 1 to 14
20	NC	Not used
21	PIA +	Command pulse A input +
22	PIA -	Command pulse A input -
23	PIB +	Command pulse B input +
24	PIB -	Command pulse B input -
25	SG	Signal ground

Arbitrary assignment in the general-purpose input assignment function (IN1 to IN14)

Start signal
Pause
Program reset/alarm clear
Point selection (1, 2, 4, 8, 16)
Point write
Emergency stop input
Gain switching
+ jog drive / - jog drive
Deviation counter clear input
Thrust limit selection (1, 2, 4, 8, 16)
Electronic gear switching
Operation mode selection

Output Part

Pin no.	Terminal symbol	Signal name
26	COMO	Coupler output common
27	COMO	Coupler output common
28	NC	Not used
29	INPOS	Positioning completion
30	HEND	Origin return completion
31	ALARM	Alarm
32 ~ 44	OUT1 ~ OUT13	General-purpose outputs 1 to 13
45	NC	Not used
46	POA +	Command pulse A output +
47	POA -	Command pulse A output -
48	POB +	Command pulse B output +
49	POB -	Command pulse B output -
50	SG	Signal ground

Arbitrary assignment in the general-purpose output assignment function (OUT1 to OUT13)

Alarm code output (1 to 3)
Ready output
Point completion output (1, 2, 4, 8, 16)
Point write completion
Output when thrust is limited
Zone output (0 to 7)
Zero speed
Moving
Overload alarm
Brake release output
Current operation mode

- * Install the molded case circuit breaker (MCCB) or earth leakage circuit breaker (ELCB) (with overcurrent protection function) on the input side (primary side) of the driver for wiring protection. Do not use a circuit breaker with a capacity greater than the recommended capacity. * Install an electromagnetic contactor (MC) if you want to isolate the driver from the power supply separate from MCCB or ELCB.
- * Use a twisted wire for the control signal wire.
- * Ground the shielded wire. * To prevent malfunction caused by noise, place the main circuit wire so that it is as far away as possible from the control signal wire, and never place the wires in the same duct.
- * Be sure to refer to the instruction manual when you actually connect wires.

Parameters

Category	Name	Default	Unit	Description
Common	Control mode	Procon	—	Set the control mode of the driver [Procon] Program control [Pulse] Control by pulse command input
	Sensor selection	Built-in	—	Set the type of position sensor [Built-in] Built-in sensor of the moving part [Incremental combination] Combined use of the built-in sensor and external incremental encoder
	External sensor resolution	100000	nm	Set the resolution of the external encoder. Setting range: 0 to 100000
	Pulse output setting numerator	1	—	Set the number of pulses to output from the pulse output (CN3 46 to 49 pins) Setting range: 1 to 9999
	Pulse output setting denominator	1	—	Amount of movement for one output pulse = (feedback pulse electronic gear denominator / feedback pulse electronic gear numerator) x sensor resolution
	Positioning completion range	100	(Pulse)	Set a value to determine the positioning completion output (deviation amount). Setting range: 1 to 40000000
	Positioning completion condition	Command & Deviation	—	Set the positioning determination condition [Command & Deviation] Determine that the positioning is completed when there is no command and the deviation amount is less than the set value [Command & Deviation + Zero Speed] Determine that the positioning is completed when there is no command, the deviation amount is less than the set value, and the speed is less than the lower limit of the zero speed range
	Allowable position deviation	1000	(Pulse)	Set a value to determine the allowable deviation error. Setting range: 0 to 40000000 "Deviation error" alarm occurs when this range is exceeded.
	Thrust limit	1000	%	Set this value when the user wants to reduce the maximum thrust. Setting range: 0 to 1000 100% is equivalent to the rated thrust of the motor * A value greater than the maximum thrust of the motor cannot be set.
	Movable limit +	30000	(Pulse)	Set this value to narrow the movable range. Setting range: -40000000 to 40000000
	Movable limit -	0	(Pulse)	
	Brake operation A delay time	0	ms	Set the time from when the brake release output is turned off to when the motor power is turned off in order to turn off the servo while the moving part is stopped. Setting range: 0 to 1000
	Brake operation B delay time	0	ms	Set the time from the detection of the off state of the servo on input signal to when the brake release output is turned off in order to turn off the servo while the moving part is moving. Setting range: 0 to 1000
	Brake operation switching value	1000	(Pulses/s)	Speed setting to determine whether to perform brake operation while the motor is stopped or in operation. Setting range: 0 to 40000000 * The brake operation is performed while the motor is stopped if the speed is less than the set value, and while in operation if the speed is the same or greater than the set value.
	Zero speed range	1000	(Pulses/s)	Set a value to determine the zero speed. Setting range: 0 to 40000000 * Zero speed is determined when the speed is less than the set value.
	Overload warning detection value	0	%	Set a value to determine the overload warning output. Setting range: 0 to 100 * When the load factor exceeds this value, the "overload warning output" turns on.
Origin return	Origin return method	Built-in Origin	—	Select the origin return method. [Built-in Origin] Turns around at the built-in origin and is completed at the reference position. [External Origin] Turns around at the built-in origin and is completed when leaving the external origin. [Combination Origin] Turns around when entering the external origin and is completed when leaving the external origin. [Mechanical End] Completed when detecting the mechanical end.
	External origin logic	Positive Logic	—	Select the logic of the external origin sensor. [Positive Logic] Origin signal turns on when entering the origin. [Negative Logic] Origin signal turns off when entering the origin.
	Origin return first speed	5000	(Pulses/s)	Origin limit detection drive speed when returning to origin. Setting range: 0 to 40000000 * Origin limit: Built-in origin, external origin, and mechanical end
	Origin return second speed	1000	(Pulses/s)	Origin zero position drive speed when returning to origin. Setting range: 0 to 40000000 * Zero position: Zero position, reference position, leaving the external origin
	Origin return acceleration/deceleration speed	100000	(Pulses/s ²)	Origin return drive acceleration/deceleration speed. Setting range: 1 to 40000000
	Origin return offset	0	(Pulses/s)	Offset between the origin position and the absolute origin position of the motor. Setting range: -40000000 to 40000000 * Offset movement occurs after returning to origin
	Mechanical end origin detection thrust	0	%	Thrust to detect the mechanical end when selecting the mechanical end for the origin return method. Setting range: 0 to 1000 * Percentage of the rated thrust
	Mechanical end origin detection time	0	ms	Time to detect the mechanical end when selecting the mechanical end for the origin return method. Setting range: 0 to 1000

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MODELS

SHM-16+SHD2-06

SHM-25+SHD2-08

SHM-35+SHD-16

Rated Thrust: 28 N to 118 N

Parameters

Category	Name	Default	Unit	Description
Communication	COM1 communication baud rate	115200	bit/s	Set the COM1 communication baud rate, Communication method: RS-232C Setting values: [4800] [9600] [19200] [38400] [57600] [76800] [115200] * If you selected any of 57600 to 115200 for COM1, set one of 4800 to 38400 for COM2.
	COM2 communication baud rate	38400	bit/s	Set the COM2 communication baud rate, Communication method: RS485 Setting values: [4800] [9600] [19200] [38400] [57600] [76800] [115200] * If you selected any of 57600 to 115200 for COM2, set one of 4800 to 38400 for COM1.
	COM2 communication protocol	Standard	—	Select the COM2 communication protocol. Setting values: [Standard] [Touch Panel]
	COM2 communication latency	10	ms	Set the latency for the COM2 communication from receiving a command to responding to it. Setting range: 0 to 1000
	Communication station number	0	—	Set the communication station number of the driver. Setting range: 0 to 31 * Common to Standard and Touch Panel
Procon mode	Positioning determination time	100	ms	Set time to determine the positioning completion. Setting range: 0 to 1000 * No determination if 0 is set
Pulse mode	Command pulse input switching	2-pulse	—	Select the command pulse signal method Setting values: [2-pulse] [1-pulse] [2-phase 4 multiplication] [2-phase 2 multiplication]
Tuning 4 pcs for built-in sensor, 4 pcs for external encoder	Tuning method	Type 1	—	Select the gain tuning method [Type 1] Control mode 1 (normal) [Type 2] Control mode 2 [Type 3] Vibration suppression control mode
	Load mass estimation	Enable	—	Automatic estimation of the mass of the mechanism attached to the moving part. Setting values: [Enable] [Disable]
	Load mass	1.2	kg	Set the mass of the mechanism attached to the moving part. Setting range: 0.0 to 3276.7
	Responsiveness	100	rad/s	Parameter to determine the servo loop frequency. Setting range: 1 to 6000
	Servo stiffness	1.0	—	Parameter to adjust the servo loop frequency. Setting range: 0.1 to 10.0
	Following characteristic	1.0	—	Adjust the MFC response frequency. Setting range: 0.1 to 10.0
	Position FF gain	0	%	Position loop feed forward gain. Setting range: 0 to 100
	Speed proportional gain		—	Speed loop proportional gain (the default depends on the moving part)
	Speed integration gain		—	Speed loop integration gain (the default depends on the moving part)
	Notch filter 1 enable/disable	Disable	—	Notch filter function. Setting values: [Enable] [Disable]
	Notch filter 1 frequency	4000	Hz	Set the resonant frequency. Setting range: 50 to 4000
	Notch filter 1 Q-value	0.5	Hz	Set the notch filter width. Setting range: 0.5 to 5.0
	Notch filter 2 enable/disable	Disable	—	Notch filter function. Setting values: [Enable] [Disable]
	Notch filter 2 frequency	4000	Hz	Set the resonant frequency. Setting range: 50 to 4000
	Notch filter 2 Q-value	0.5	Hz	Set the notch filter width. Setting range: 0.5 to 5.0
	Low-pass filter enable/disable	Disable	—	Low-pass filter function. Setting values: [Enable] [Disable]
	Low-pass filter frequency	1000	Hz	Setting a larger value reduces noise generated from the motor. Setting range: 10 to 8000
	Vibration suppression control 1	1.0	—	Setting range: 0.1 to 1.0
	Vibration suppression control 2	1.01	—	Setting range: 1.00 to 2.00

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MODELS

SHM-16+SHD2-06

SHM-25+SHD2-08

SHM-35+SHD-16

Support Software Function

Main menu	Submenu	Function description
Status display	Input/output status	Used to view the input/output status of the CN3 I/O connector of the driver.
	Measurement (waveform display)	Used to simultaneously display the waveforms of up to 3 items of the following: command speed, feedback speed, command thrust, speed deviation, position deviation, main power supply voltage, load factor, and mass.
	Alarm history	Used to view the current alarm and up to 8 alarm history records.
Programme operation style	Program	Create, edit, and save position data files. Upload/download position data to and from the driver.
	Speed	Create, edit, and save speed data files. Upload/download speed data to and from the driver.
	Macro settings	Create, edit, and save macro data files. Upload/download macro data to and from the driver.
	Pressing/thrust limits	Create, edit, and save pressing/thrust data files. Upload/download pressing/thrust data to and from the driver.
Input/output	Input/output settings	Used to configure the assignment of the input/output signals of the CN3 I/O connector of the driver to the input/output functions.
	Zone output	Configure the settings of the zone output.
Direct drive	Jog inching	Configure the jog inching settings.
	Electronic gear	Configure the command pulse electronic gear settings.
Settings	Parameter settings	Configure the settings of parameters that determine the driver operation.
	Tuning	Adjust the servo gain.
Communication line	Communication start	Establish a connection between the PC and the driver.
	Disconnection	Disconnect the connection between the PC and the driver.
	Communication settings	Configure the communication settings for the PC.

Display Screen

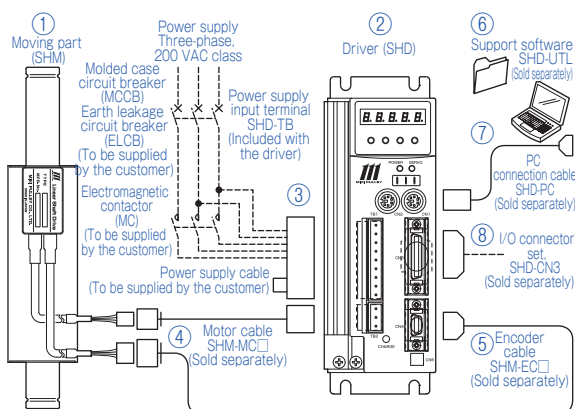


Operating Environment

Item	Minimum operating environment	Recommended operating environment
Processor	Intel Pentium 4 1.6 GHz processor or equivalent	Intel 2.4 GHz processor or equivalent
Memory	256 MB or more of free memory when the OS is started up	512 MB or more of free memory when the OS is started up
Hard disk space	10 MB or more	
Display resolution	SVGA (800 x 600 pixel) or higher	XGA (1024 x 768 pixel) or higher
Graphic	Graphic display capability with 16-bit color (32768 colors) or greater at the above resolution	Minimum operating environment plus 2D acceleration function available
OS	Windows XP (Pro/Home)/Service Pack 2 (32-bit version)	Windows XP (Pro/Home)/Service Pack 3 (32-bit version)
Communication port	RS-232C (USB-serial converter can be used)	
Others	Keyboard, mouse, and optical drive (for installation)	

Rated Thrust: 150 N

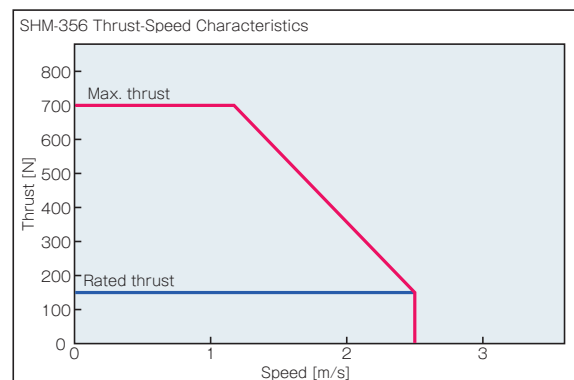
System Configuration



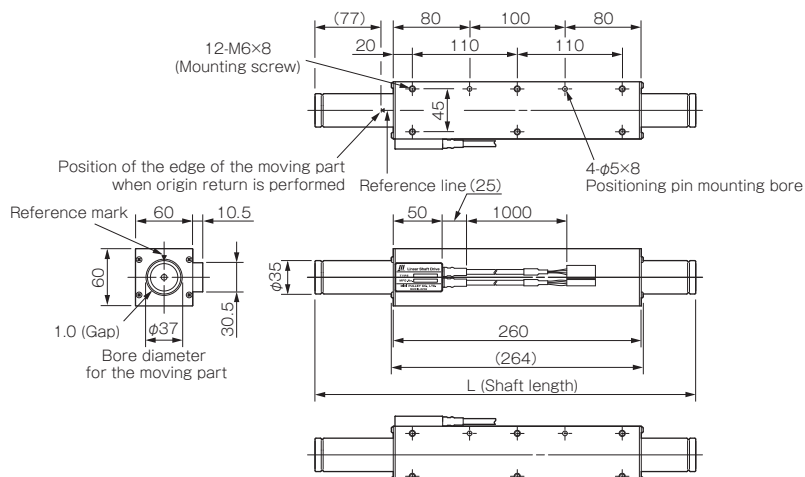
No.	Name	Description
①	Moving part	Consists of a moving part (coil) and shaft (magnet).
②	Driver	For operating the moving part.
③	Power supply input terminal	For connecting the power cable. (Included in the driver)
④	Motor cable	For connecting the driver and the motor of the moving part. (Sold separately)
⑤	Encoder cable	For connecting the driver and the encoder of the moving part. (Sold separately)
⑥	Support software	For configuring and changing the settings of the driver on a PC. (Sold separately)
⑦	PC connection cable	For connecting to a PC. (Sold separately)
⑧	I/O connector set	Connector for inputting/outputting command signals to the driver (Sold separately)

Moving Part Specifications

Model	SHM-356
Number of coil sets	6
Rated thrust	150 N
Max. thrust	700 N
Max. speed	2500 mm/s
Rated current	2.4 A rms
Max. current	11.3 A rms
Time rating	Continuous
Ambient temperature	0 ~ 40 °C
Ambient humidity	80% relative humidity or under (With no condensation)
Insulating resistance	500 VDC 10 M Ω or more
Dielectric strength voltage	1,500 VAC for 1 minute
Heat resistance class	Class F (coil part)
Structure	Fully-closed, self-cooling
Shaft unit mass	0.0073 kg/mm
Moving part mass	2.0 kg



Moving Part Dimensions

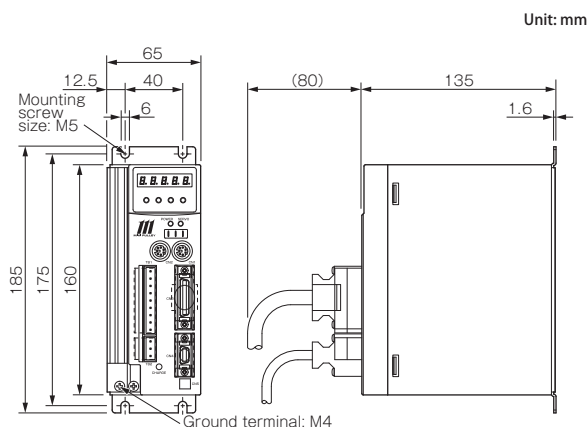


Model	Effective stroke length						Unit [mm]
	L=610	L=780	L=950	L=1120	L=1290	L=1460	L=1630
SHM-356	233	403	573	743	913	1083	1253

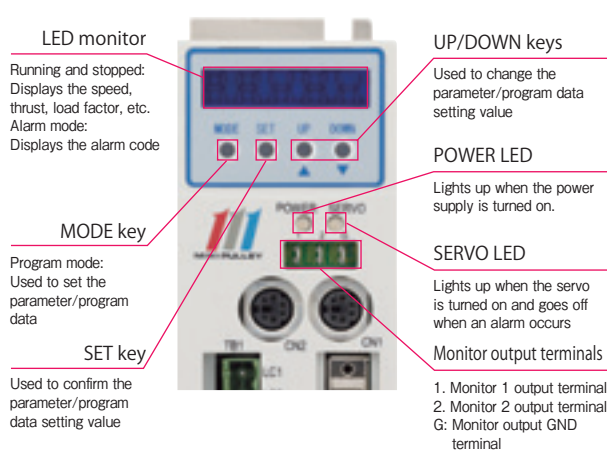
Driver Specifications

Model	SHD-16-356	
Number of coil sets in moving part	6	
Input voltage	Main power supply: Three-phase 200 VAC, Control power supply: Single-phase 200 VAC	
Input power supply range (common)	200 to 230 VAC +10 to -15% 50/60 Hz $\pm 5\%$	
Rated continuous output current	2.4 A rms	
Max. current (limit)	11.3 A rms	
Max. instantaneous current (peak value)	16.0 A peak	
Power supply equipment capacity	1.6 kVA	
Position command pulse input	Signal	Line driver signal
	Input method	Select one from 2-pulse, 1-pulse, and 2-phase pulse
	Max. frequency	4 M pulses/s
Input signal	Total 16 dedicated inputs and general-purpose inputs	
Output signal	Total 16 dedicated outputs and general-purpose outputs	
Monitor output	Operation status analog voltage output	
Control function	Smoothing function, auto-tuning function	
Limit function	Speed limit, thrust limit, and movable range limit	
Built-in positioning function	Number of positioning points: 32, Number of speed settings: 10	
Protection function	Overload, overcurrent, overvoltage, sensor disconnection, memory error	
Support Software (SHD-UTL)	Parameter configuration, monitor display, program editing/configuration, saving data and transferring auto-tuning data to driver	
Ambient temperature	0 ~ 40 °C	
Ambient humidity	80% relative humidity or under (with no condensation)	
Mass	1.2 kg	

Driver Dimensions



Driver Display Panel



How to Place an Order

Moving Part

SHM - 356 - 610

Shaft diameter (φ35)
No. of coil sets
Shaft length (L dimension)

Driver Part

SHD - 16 - 356

Max. instantaneous current
16.0 A peak: 16
Shaft diameter of the corresponding moving part (φ35)
No. of coil sets for the corresponding moving part

*The moving part, shaft, and driver are finely adjusted as a set and can only be run in the combination put together at the time of shipment.

MODELS

SHM-16+SHD2-06

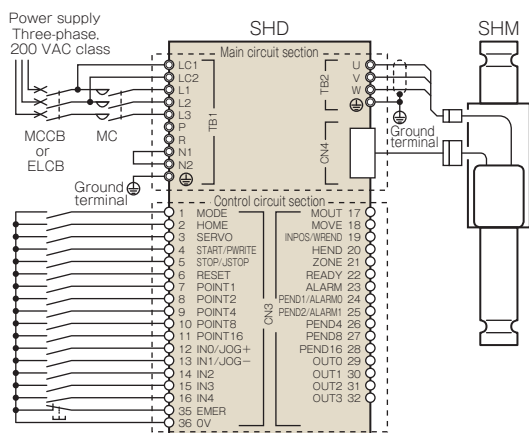
SHM-25+SHD2-08

SHM-35+SHD-16

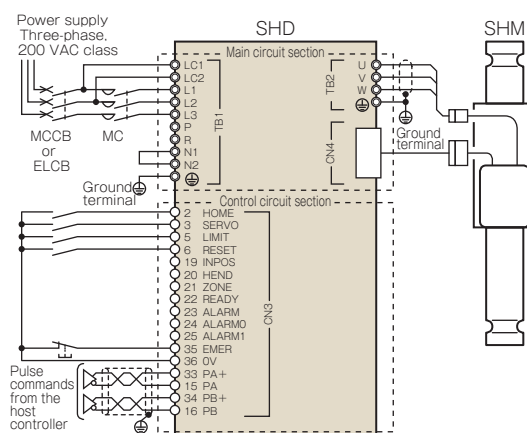
Rated Thrust: 150 N

Basic Wiring Diagram

Procon Mode (Built-in Positioning Function)



Pulse Control Mode



Input/Output Signal Connector Array (CN3)

Procon Mode (Built-in Positioning Function)

Pin no.	Terminal symbol	Signal name
1	MODE	Operation mode selection
2	HOME	Origin return
3	SERVO	Servo ON/OFF
4	START / PWRITE	Start command / Point write
5	STOP / JSTOP	Pause / Movement prohibited
6	RESET	Reset
7	POINT1	Point selection 1
8	POINT2	Point selection 2
9	POINT4	Point selection 4
10	POINT8	Point selection 8
11	POINT16	Point selection 16
12	IN0 / JOG +	General-purpose input 0 / + jog / + inching
13	IN1 / JOG -	General-purpose input 1 / - jog / - inching
14	IN2 / JOG HI	General-purpose input 2 / High-speed jog
15	IN3	General-purpose input 3
16	IN4	General-purpose input 4
17	MOUT	Current operation mode
18	MOVE	Moving
19	INPOS / WREND	Positioning completion / Point write completion
20	HEND	Origin return completion
21	ZONE	Zone output
22	READY	Ready output
23	ALARM	Alarm output
24	PEND1 / ALARM0	Point completion 1 output / Alarm code 0 output
25	PEND2 / ALARM1	Point completion 2 output / Alarm code 1 output
26	PEND4	Point completion 4 output
27	PEND8	Point completion 8 output
28	PEND16	Point completion 16 output
29	OUT0	General-purpose output 0
30	OUT1	General-purpose output 1
31	OUT2	General-purpose output 2
32	OUT3	General-purpose output 3
33	—	Not used
34	—	Not used
35	EMER	Emergency stop input
36	OV	Input/output common

Pulse Control Mode

Pin no.	Terminal symbol	Signal name
1	—	Not used
2	HOME	Origin return
3	SERVO	Servo ON/OFF
4	—	Not used
5	LIMIT	Thrust limit
6	RESET	Reset
7	—	Not used
8	—	Not used
9	—	Not used
10	—	Not used
11	—	Not used
12	—	Not used
13	—	Not used
14	—	Not used
15	PA	Command pulse input A —
16	PB	Command pulse input B —
17	—	Not used
18	—	Not used
19	INPOS	Positioning completion
20	HEND	Origin return completion
21	ZONE	Zone output
22	READY	Ready output
23	ALARM	Alarm output
24	ALARM0	Alarm code 0 output
25	ALARM1	Alarm code 1 output
26	—	Not used
27	—	Not used
28	—	Not used
29	—	Not used
30	—	Not used
31	—	Not used
32	—	Not used
33	PA +	Command pulse input A +
34	PB +	Command pulse input B +
35	EMER	Emergency stop input
36	OV	Input/output common

* Install the molded case circuit breaker (MCCB) or earth leakage circuit breaker (ELCB) (with overcurrent protection function) on the input side (primary side) of the driver for wiring protection. Do not use a circuit breaker with a capacity greater than the recommended capacity.

* Install an electromagnetic contactor (MC) if you want to isolate the driver from the power supply separate from MCCB or ELCB. * Use a twisted wire for the control signal wire. * Ground the shielded wire.

* To prevent malfunction caused by noise, place the main circuit wire so that it is as far away as possible from the control signal wire, and never place the wires in the same duct.

* Be sure to refer to the instruction manual when you actually connect wires.

Parameters

Name	Setting value	Unit	Description
Control mode	0: Procon	—	Set the control mode of the driver 0: Procon (Program control) 1: Pulse (Control by pulse command input)
Sensor selection	0: Internal	—	Set the type of the position sensor. 0: Internal, 1: External
External sensor resolution	10	0.1 μ m	Set the resolution of the external sensor. Setting range: 1 to 1000
HLS selection	0: Built-in	—	Select the type of the origin limit, 0: Built-in, 1: External positive logic, 2: External negative logic
Positioning completion range	50	(10 μ m)	Set a value to determine the positioning completion output. Setting range: 0 to 40000000
Allowable position deviation	1000	(10 μ m)	Set a value to determine the allowable deviation error. Setting range: 0 to 40000000
Origin return first speed	5000	(10 μ m / s)	Origin limit detection drive speed when returning to origin. Setting range: 1 to 40000000
Origin return second speed	1000	(10 μ m / s)	Origin zero position drive speed when returning to origin. Setting range: 1 to 40000000
Origin return accel./decel. speed	500000	(10 μ m / s ²)	Origin return drive acceleration/deceleration speed. Setting range: 1 to 40000000
Origin return offset	0	(10 μ m)	Set the offset amount between the origin position and the absolute origin position of the motor. Setting range: 0 to 40000000
Thrust limit	100	%	Set the thrust. Setting range: 0 to 1000
Zone output range +	1000	(10 μ m / s)	Set the position range for which to perform zone output. Setting range: -40000000 to 40000000 * When the current position is within this range, the zone output is on.
Zone output range -	0	(10 μ m / s)	
+ Movable limit	30000	(10 μ m)	Set this value to narrow the movable range. Setting range: 0 to 40000000
Inspection terminal 1 output selection	1: Feedback speed	—	Set the output item for the inspection terminal 0: Command speed, 1: Feedback speed, 2: Command thrust, 3: Generated thrust, 4: Position deviation, 5: Main power supply voltage, 6: Load factor
Inspection terminal 2 output selection	3: Generated thrust	—	
Inspection terminal 1 output coefficient	100000	Selectable	Set the voltage coefficient to output to the inspection terminal. Setting range: 0 to 40000000
Inspection terminal 2 output coefficient	300	Selectable	Speed: (Pulse/s)/10 V, Thrust: %/10 V, Deviation: Pulse/10 V, Load factor: %/10 V, Intermediate DC voltage: V / 10V
Initial display	—	—	Set the status display item to be displayed on the 7-segment LED at power-on
Position proportional gain	1500	—	Set the proportional gain of the position amplifier. Setting range: 0 to 10000
Position FF gain	0	—	Set the feed forward gain of the position amplifier. Setting range: 0 to 100
Speed proportional gain	100	—	Set the proportional gain of the speed amplifier. Setting range: 0 to 10000
Speed integration gain	500	—	Set the integration gain of the speed amplifier. Setting range: 0 to 10000
CN1 communication speed	6:115200	bit/s	Set the communication speed 0: 4800 1: 9600 2: 19200 3: 38400 4: 57600 5: 76800 6: 115200
CN2 communication speed	6:115200	bit/s	
CN2 communication protocol	0: Standard	—	Select the communication protocol for CN2 communication. 0: Standard, 1: Touch Panel
CN2 communication signal type	0: RS-232C	—	Set the communication type for CN2 communication. 0: RS-232C 1: RS-485
CN2 communication RS-485 latency	10	ms	Set the latency from receiving a command to responding to it when using RS-485 for CN2 communication. Setting range: 0 to 1000
Communication station number	0	—	Set the communication station number of the driver when daisy-chaining multiple drivers via RS-485. Setting range: 0 to 127
Load mass	—	0.1 kg	Set the load mass. Setting range: 0 to 3000 * The estimated result is set when selecting real-time tuning
Response characteristic	—	—	Set a response characteristic corresponding to the machine stiffness. Setting range: 0 to 300
Tuning type	2: Manual	—	Set the type of tuning 0: Real-time (Estimate the load mass and perform auto-tuning) 1: Mass setting (Perform tuning based on the set load mass) 2: Manual (Perform tuning based on the control gain value set manually)
Tuning operation	0: Disable	—	Set the tuning operation 0: Disable (Enable manual tuning) 1: Enable (Enable real-time tuning and mass setting tuning)
Smoothing	0: Disable	—	Change the control gain using a speed pattern 0: Disable (no change in the control gain using a speed pattern) 1: Small, 2: Intermediate, 3: Large (the rate of change in the gain can be selected), 4: Special
Low-speed jog operation	1000	(10 μ m / s)	Set the speed for low-speed jog operation and inching operation. Setting range: 1 to 40000000
High-speed jog operation	10000	(10 μ m / s)	Set the speed for high-speed jog operation and inching operation. Setting range: 1 to 40000000
Inching travel distance	10	(10 μ m)	Set the amount of movement for the inching operation. Setting range: 0 to 40000000
Jog / inching operation acceleration	100000	(10 μ m / s ²)	Set the acceleration/deceleration speed for the jog operation (low-speed/high-speed) and inching operation. Setting range: 1 to 1000000000
Pressing range	80	%	Set the range for which to perform pressing operation. Setting range: 0 to 100
Pressing speed	1000	(10 μ m / s)	Set the speed for the pressing operation. Setting range: 1 to 40000000
Positioning determination time	100	ms	Set the time to determine positioning completion. Setting range: 0 to 1000 * No determination if 0 is set
Command pulse input type	0: 2-pulse	—	Select the signal type of command pulse, 0: 2-pulse, 1: 1-pulse, 2: 2-phase 4-multiplication, 3: 2-phase 2-multiplication
Accel./decel. speed limit	0	ms	Set the acceleration/deceleration speed limit for the command pulse. Setting range: 0 to 10000
S-shaped accel./decel.	0	ms	Set this value to add S-shaped acceleration/deceleration to the command pulse, Setting range: 0 to 1000

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MODELS

SHM-16+SHD2-06

SHM-25+SHD2-08

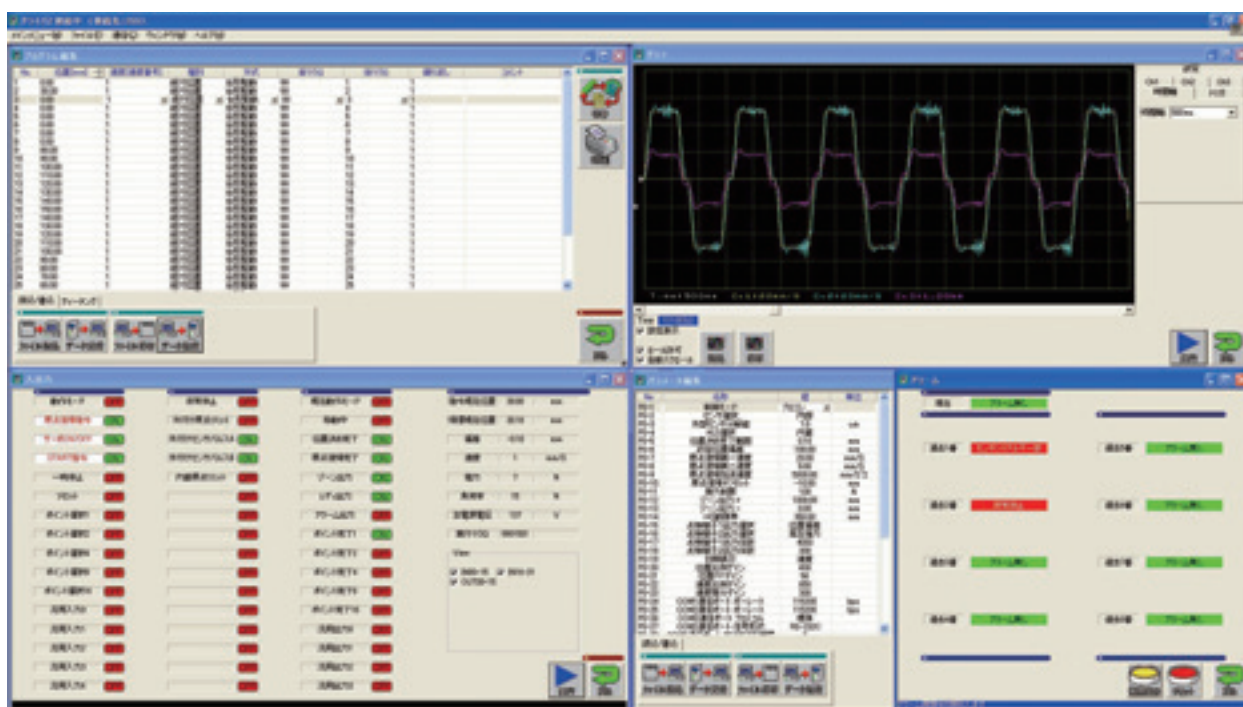
SHM-35+SHD-16

Rated Thrust: 150 N

Support Software Function

Main menu	Submenu	Function description
Program editing	—	Create, edit, and save position data files. Upload/download position data to and from the driver.
Speed editing	—	Create, edit, and save speed data files. Upload/download speed data to and from the driver.
Parameter editing	—	Create, edit, and save parameter data files. Upload/download parameter data to and from the driver.
Macro editing	—	Create, edit, and save macro data files. Upload/download macro data to and from the driver.
Connection	—	Establish a connection between the PC and the driver.
Disconnection	—	Disconnect the connection between the PC and the driver.
Status display	Input/output	Used to view the input/output status of the CN3 I/O connector of the driver
	Flag	Used to view the internal flag status of the driver
	Waveform	Used to simultaneously display the waveforms of up to 3 items of the following: command speed, feedback speed, command thrust, generated thrust, position deviation, main power supply voltage, and load factor.
	Alarm	Used to view the current alarm and up to 8 alarm history records. Also used to erase history records and reset alarms.
Tuning	—	Used to configure the smoothing settings and select the tuning method.
File	—	Used to create files of program, speed, parameter, and macro data stored in the driver and save them to the PC. Also used to transfer files stored on the PC to the driver.
Settings	—	Configure the communication settings for the PC.
Help	—	Used to refer to the operation method of the support software.

Display Screen



Operating Environment

Item	Minimum operating environment	Recommended operating environment
Processor	Intel Pentium 4 1.6 GHz processor or equivalent	Intel 2.4 GHz processor or equivalent
Memory	128 MB or more of free memory when the OS is started up	512 MB or more of free memory when the OS is started up
Hard disk space	10 MB or more	
Display resolution	SVGA (800 x 600 pixel) or higher	XGA (1024 x 768 pixel) or higher
Graphic	Graphic display capability with 16-bit color (32768 colors) or greater at the above resolution	Minimum operating environment plus 2D acceleration function available
OS	Windows 2000(SP4)/Windows XP (SP2)	Windows XP (Pro/Home)/Service Pack 3 (32-bit version)
Communication port	RS-232C (USB-serial converter can be used)	
Others	Keyboard, mouse, and optical drive (for installation)	

Linear Shaft Drive

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Options

Separately Sold Items

Motor Cable



For connecting the driver and the motor of the moving part.

Model	Cable length
SHM-MC050	500mm
SHM-MC100	1000mm
SHM-MC200	2000mm
SHM-MC300	3000mm

Encoder Cable



For connecting the driver and the encoder of the moving part.

Model	Cable length
SHM-EC050	500mm
SHM-EC100	1000mm
SHM-EC200	2000mm
SHM-EC300	3000mm

Support Software



For configuring and changing the settings of the driver on a PC. The support software varies depending on the driver.

Model	Applied driver		
	SHD2-06	SHD2-08	SHD-16
SHD2-UTL	●	●	
SHD-UTL			●

PC Connection Cable



For connecting the driver and the DOS/V PC.

Cable length 2000 mm

Model: SHD-PC

I/O Connector Set



Connector for inputting/outputting command signals to the I/O connector. The connector varies depending on the driver.

Model	Applied driver		
	SHD2-06	SHD2-08	SHD-16
SHD2-CN3	●	●	
SHD-CN3			●

Various Connectors

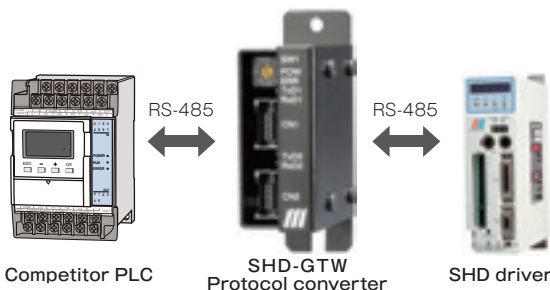
If you will make the various cables yourself, the connectors in the following table can be used for them.

For power supply input terminal (TB1N)	FRONT MSTB 2,5 / 9-ST	Made by Phoenix Contact
For moving part output terminal (TB2N)	FRONT MSTB 2,5 / 3-ST	Made by Phoenix Contact
For driver communication connector (CN1)	E6-200J-100	Made by Chuo Musen Denki
For I/O connector (CN3) (SHD2)	10150-3000PE / 10350-52A0-008	Made by Sumitomo 3M
For I/O connector (CN3) (SHD)	10136-3000PE / 10336-52A0-008	Made by Sumitomo 3M
For sensor connector (CN4)	10114-3000PE / 10314-52A0-008	Made by Sumitomo 3M

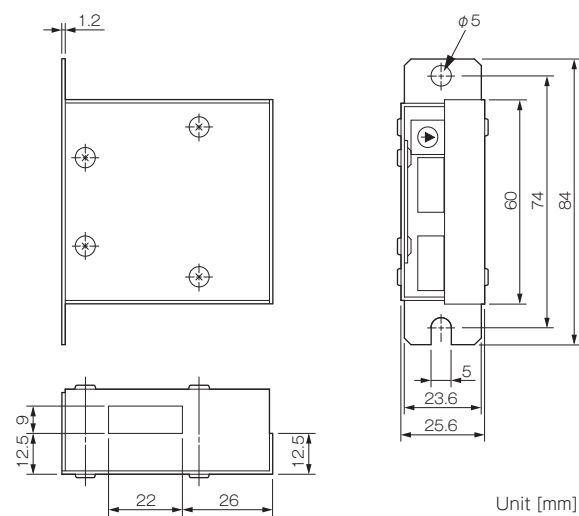
Protocol Converter

Protocol converter for converting the parameters, position data, and speed data of the PLC (sequencer) to those of the linear shaft drive driver.

Standard support for the communication protocol of Mitsubishi PLC (type 4) and Omron PLC (host link mode) is available. (Support for other manufacturers is also available)



D90 execution flag	Set D91 to D95 and then set "1" to start transmitting and receiving data. (Up to 14 data sets can be continuously transmitted and received)
D91 command	Set the type of the command to execute. 0: Read, 1: Write, 2: Save to FLASH
D92 SHD station number	Set the station number of the linear shaft drive with which to communicate.
D93 PLC address	Set the address number of the memory area in the PLC for reading and writing data.
D94 SHD address	Set the address number of the memory area in the SHD.
D95 number of data sets	Set the number of data sets to transfer after the addresses set in D93 and D94.



Model: SHD-GTW

MODELS

SHM-16+SHD2-06

SHM-25+SHD2-08

SHM-35+SHD-16

Linear Shaft Drive

Items Checked for Design Purposes

Selection Flow

- (1) Preliminary selection of the moving part
Preliminarily select the applied moving part based on the moving speed, the mass of the workpiece, etc.
- (2) Confirming the preliminary selection
Confirm that the preliminarily selected linear shaft drive meets the conditions.
- (3) Selecting the shaft length
Select a shaft length that meets the operating stroke.
- (4) Selecting the driver
Select a driver that fits to the selected moving part.
- (5) Determining the peripheral devices
If necessary, determine the length of the separately sold motor cable and encoder cable and select them. Also determine whether or not the support software is required.

General Procedure to Select the Moving Part

Machine configuration	<p>Mass of the workpiece WW [kg] Mass of the table WT [kg] Mass of the movable element WM [kg] Coefficient of friction μ Acceleration α [m/s²]</p>
Steady-state thrust L [N]	$F_L = (WW + WT + WM) \times 9.8$
Running power Po [W]	$P_O = \frac{F_L \times V_L}{60}$
Thrust during acceleration Fp [N] Thrust during deceleration Fs [N] Effective thrust Frms [N]	<p> $F_P = (WW + WT + WM) \times \alpha + F_L$ $F_S = (WW + WT + WM) \times \alpha - F_L$ $F_{rms} = \sqrt{\frac{F_P^2 \times t_a + F_L^2 \times t_c + F_S^2 \times t_d}{T}}$ </p>

Selection Example

Selection conditions		
Operating stroke	$l = 800\text{mm}$	
Transfer speed	$V_L = 120\text{m/min}$	
Mass of the workpiece	$W_W = 1\text{kg}$	
Mass of the table	$W_T = 2\text{kg}$	
Coefficient of friction	$\mu = 0.2$	
Positioning time	$T_m = 0.5\text{s}$	
Acceleration and deceleration time	$t_a, t_d = 0.1\text{s}$	
Length of time for one cycle	$T = 1\text{s}$	

- (1) Preliminary selection of the moving part
 - Thrust under steady-state load $F_L = 0.2 \times (1 + 2) \times 9.8 = 5.88\text{ N}$
 - Load acceleration thrust $F_P = (1 + 2) \times 120/60/0.1 + 5.88 \div 66\text{ N}$
Based on the load acceleration thrust, preliminarily select the SHM-254 whose maximum thrust is 267 [N].
 - SHM-254 specifications
Rated thrust: 59N, Max. thrust: 267N, Moving part mass: 1.10kg
For other details, refer to P544 of this catalog.
- (2) Confirming the preliminary selection
 - Steady-state thrust $F_L = 0.2 \times (1 + 2 + 1.1) \times 9.8 = 8.1\text{ N}$
 - Thrust during acceleration $F_P = (1 + 2 + 1.1) \times 120/60/0.1 + 8.1 \div 90.1\text{ N}$
Confirm that the thrust is less than the maximum one.
 - Thrust during deceleration $F_S = (1 + 2 + 1.1) \times 120/60/0.1 - 8.1 \div 73.9\text{ N}$
Confirm that the thrust is less than the maximum one.
 - Effective thrust

$$F_{rms} = \sqrt{\frac{90.1^2 \times 0.1 + 8.1^2 \times 0.3 + 74^2 \times 0.1}{1}} = \sqrt{\frac{8118 \times 0.1 + 65.61 \times 0.3 + 5476 \times 0.1}{1}} = \sqrt{\frac{811.8 + 19.68 + 547.6}{1}} = 37.14\text{ N}$$

Confirm that the thrust is less than the rated one.

- (3) Selecting the shaft length
Select a shaft length that meets the following stroke from the "effective stroke lengths" in Moving Part Dimensions.

Operating stroke (800 mm) < effective stroke length

If the effective stroke length for the SHM-254 is greater than 800 mm, select effective stroke 861 mm from P544 of this catalog. Since shaft length L is 1112 in this case, the model is as follows.

Selected moving part model: SHM-254-1112

- (4) Selecting the driver
The moving part model is SHM-254-1112, and since the applied driver is determined by the shaft diameter and the number of coil sets, the driver model is as follows.

Selected driver model: SHD2-08-254

- (5) Selecting the applied peripheral devices (sold separately)
If the driver is SHD2, the following support software is required.

Support software model: SHD2-UTL

PC connection cable model: SHD-PC

If the distance between the driver and the moving part is 2m, the required motor cable and encoder cable are as follows.

Motor cable model: SHM-MC200

Encoder cable model: SHM-EC200

* Other options such as an I/O connector set and protocol converter are also available. For details, check the page on options.

Handling the Moving Part

A powerful permanent magnet is placed in the shaft. If a magnetic material such as iron or a tool is near the moving part, the material may be attracted to the shaft. Be careful not to bring a watch or precision device close to the moving part. Doing so may damage it due to the influence of the magnet. In particular, do not assemble the moving part without using protective material.

Installing the Moving Part

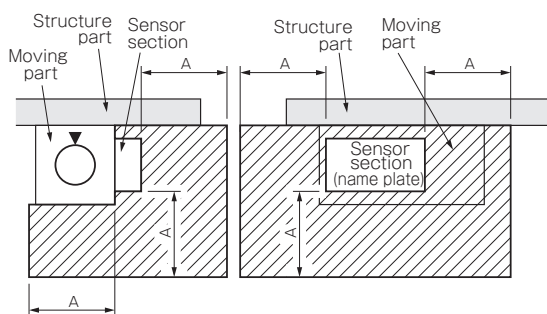
Install the moving part in an indoor location where it will not be exposed to rainwater and direct sunlight, the ventilation is good, and there is very little moisture, dirt, and dust, and select an atmosphere where it will not be exposed to, for example, corrosive/flammable gases, cutting oil/oil mist, and iron powder/chips. Furthermore, install the moving part away from heat sources such as a furnace. Note that if the moving part is used in a sealed environment, the temperature will increase and the life will be affected.

Item	Item
Ambient temperature	0 to 40°C (no freezing)
Ambient humidity	80% RH or less (no condensation)
Storage temperature	-15 to 80°C (no freezing)
Storage humidity	90% RH or less (no condensation)
Altitude	1000m or less
Vibration	24.5 m/s ² (2.5G) or less
Impact	49 m/s ² (5G) or less
Protective structure	IP65 (excluding the tip of the lead)

Mounting the Moving Part

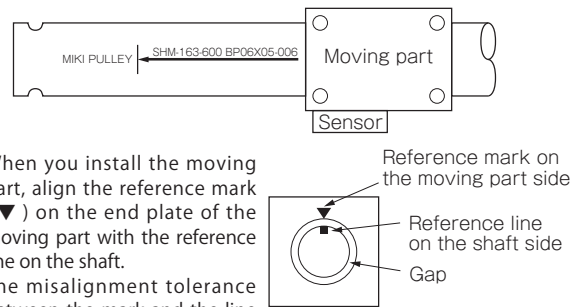
The moving part can be mounted both horizontally and vertically. Pay attention to the following points when you mount it.

- Do not use the moving part in an environment where the main body of the moving part and cable connection area are exposed to oil or water.
- Do not use the moving part while the cables are submerged in oil or water.
- When you mount the moving part vertically, place the cable outlet downward to prevent penetration of oil or water.
- Make sure that stress by bending or caused by its own mass is not applied to the cable outlet and connection area.
- Place the cable included with the moving part away in the cable tray to minimize stress by bending.
- Provide the cable with as large a bend radius as possible. (The minimum bend radius is 55 mm.)
- Make sure that the center of the shaft and that of the moving part are aligned with each other. If not, the positioning accuracy decreases.
- Do not place metal or magnetic material within the range of dimension A from the sensor section (shaded area) in the figure below.
- Use non-magnetic screws to mount the moving part to the structure.
- Secure the moving part to the non-magnetic (e.g. aluminum) structure.



Moving part models	SHM-16 □	SHM-25 □	SHM-356
Dimension A [mm]	51.2	51.2	68

Mount the moving part to the shaft as shown in the figure below. If this relationship is reversed, malfunction may occur.

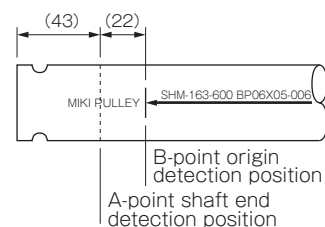


When you install the moving part, align the reference mark (▼) on the end plate of the moving part with the reference line on the shaft.
The misalignment tolerance between the mark and the line is ± 5 degrees, and note that if the misalignment increases, the positioning accuracy decreases.

Origin Return Operation

When the moving part returns to the origin, it moves to the position about 43 mm from the shaft end on the origin side. Accordingly, install the clamp and stopper within 43 mm from the shaft end.

The origin is on the side of the MIKI PULLEY mark.
It is the return direction.
Note that the dimensions in parentheses are approximate.
They vary in the range of about ± 1 mm depending on the individual product.



Installing the Driver

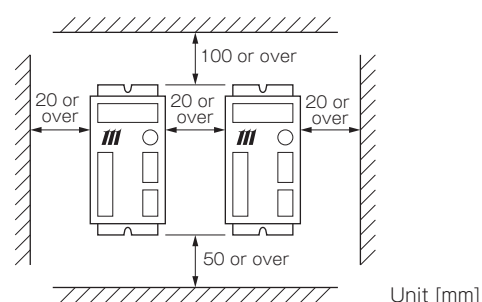
Install the driver in an indoor location where it will not be exposed to rainwater and direct sunlight, the ventilation is good, and there is very little moisture, dirt, and dust, and select an atmosphere where it will not be exposed to, for example, corrosive/flammable gases, cutting oil/oil mist, and iron powder/chips.

Item	Item
Ambient temperature	0 to 40°C (no freezing)
Ambient humidity	80% RH or less (no condensation)
Storage temperature	-15 to 80°C (no freezing)
Storage humidity	90% RH or less (no condensation)
Altitude	1000m or less
Vibration	5.9 m/s ² (0.6G) or less, 10 to 60 Hz

Be sure to install the driver vertically so that the letters are eligible as shown in the figure below. Install the driver so that it is away from other devices and walls.

The above applies when multiple drivers are installed in a row. If you install multiple drivers on top of each other, put a partition plate between them to prevent heat generated by the driver in the lower row from being transmitted to the driver in the upper row. Provide a distance of 100 mm or more between the main body and the partition plate.

Note that it is recommended to install drivers in a place where the heat does not build up and to ventilate the place with a fan.



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