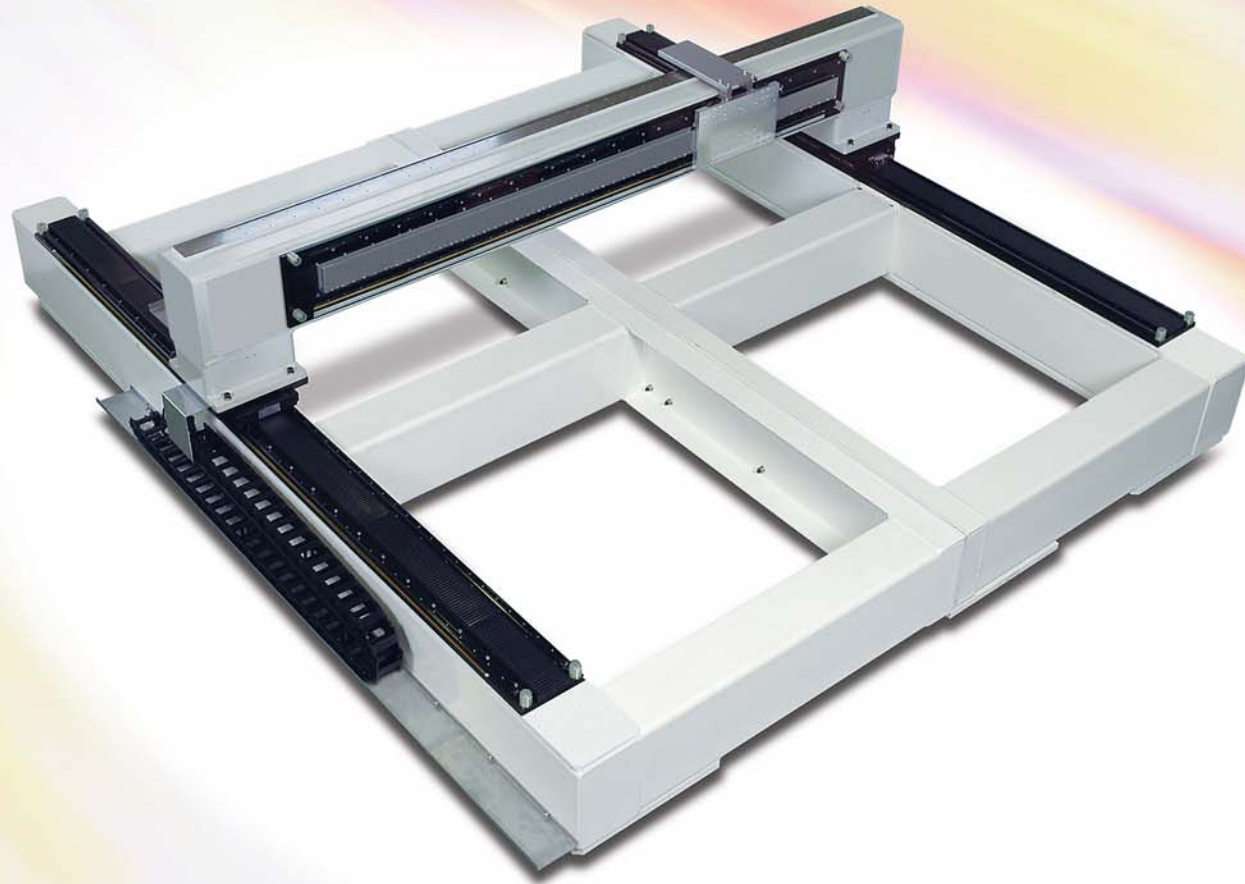# Example of usage

Large-scale precision stage structure

HD Motor

Rotary Type

Linear Type

⚠ **For safe and reliable operation, it is essential to read the user's manual carefully before using this equipment.**

SINFONIA TECHNOLOGY CO., LTD. continually upgrades and improves its products.
Actual features and specifications may therefore differ slightly from those described in this catalog.

Printed in Japan 2006 10BⅡⓈ

Capable of heavy load high-precision transportation with strong thrust motor.

■Features

●Notable Thrust

Standard lineup generates thrust up to 1700N.

●Low Heat Generation

Continuous high thrust output enables low heat generation.
High frequency operation maintained without anxiety.

●Compact in size

Compact size comes from the high thrust per unit area.

●High Precision

Optical encoder utilizes high precision positioning.

●Magnet-less Stator

Unique magnetic circuit removes permanent magnets from
the stator side.（See P.2 Structure Comparison）

■Applications

●Placement of large and heavy loads—FPD manufacturing equipment
●High precision positioning————Semiconductor manufacturing equipment
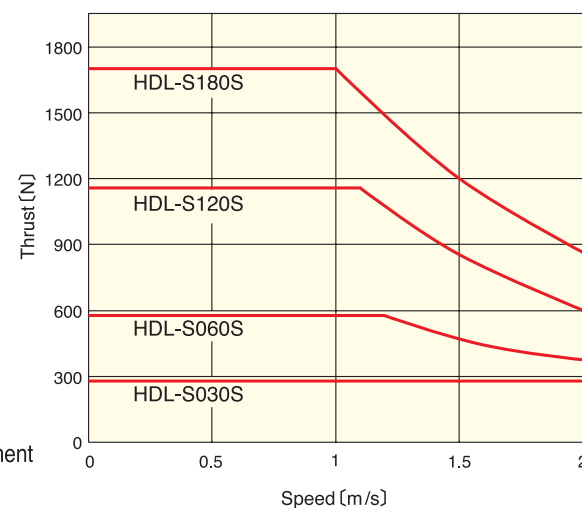●High frequency operation ————Chip mount, bonder, etc.

■Operation

●Magnet Circuit of the HD Motor Linear Type

Unique magnetic circuit with embedded high performance
permanent magnet offers strong magnetic flux and
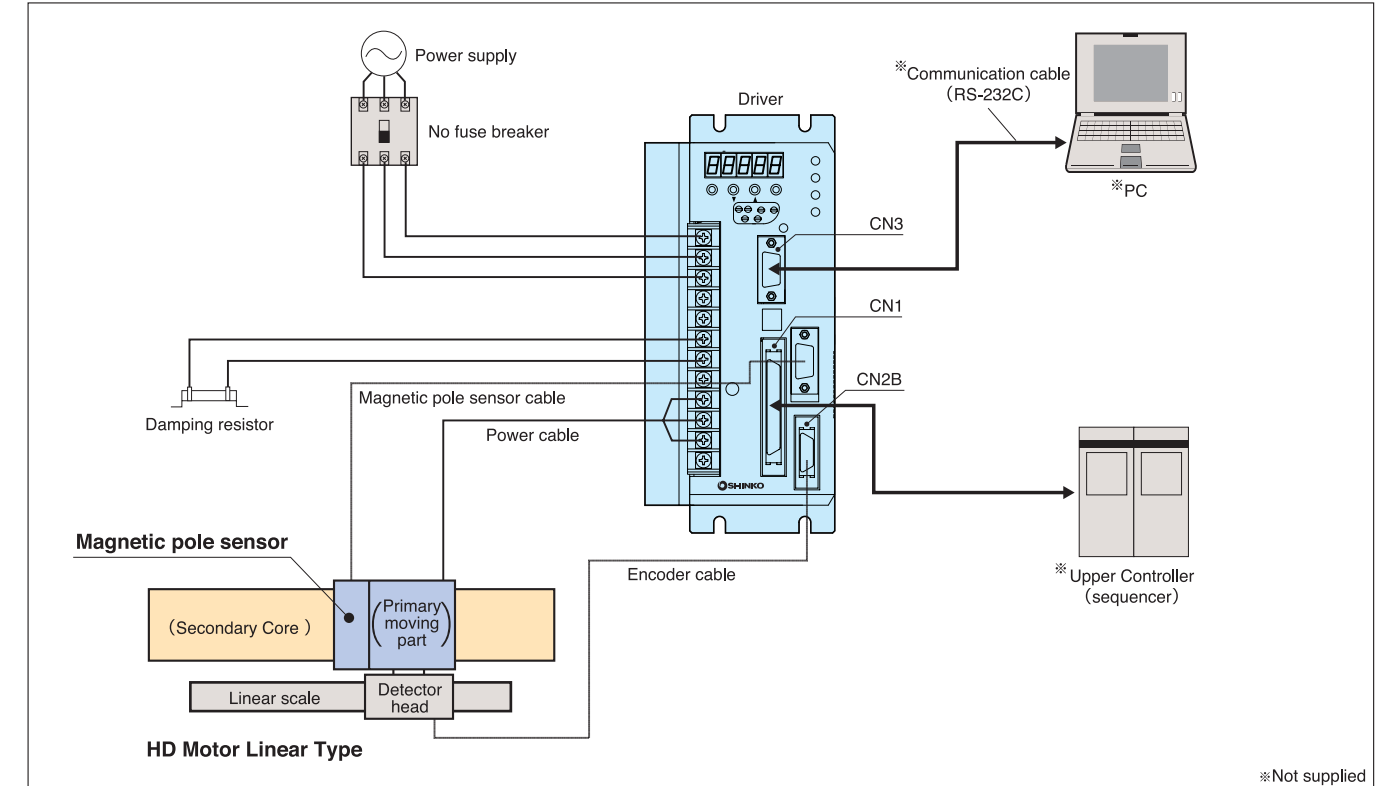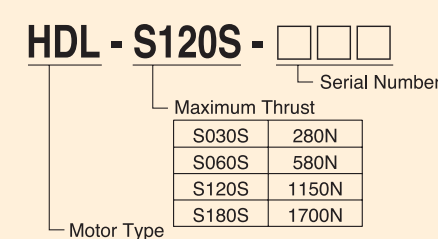creates higher thrust than other linear motors.

U
Primary Side
Pole A   Pole /A
N SS NN S   N SS NN S
Secondary Side

■Characteristics

Thrust〔N〕

1800			
HDL-S180S			
1500			
1200			
HDL-S120S			
900			
600			
HDL-S060S			
300			
HDL-S030S			
0	0.5	1	1.5	2

Speed〔m/s〕

■System configuration

Power supply
No fuse breaker
Driver
※Communication cable（RS-232C）
※PC
CN3
CN1
CN2B
Damping resistor
Magnetic pole sensor cable
Power cable
Encoder cable
SHINKO
※Upper Controller（sequencer）

Magnetic pole sensor
（Secondary Core ）
Primary moving part
Linear scale
Detector head

HD Motor Linear Type

※Not supplied

■Comparing Structure

Name	HD Motor Linear Type	PM Linear motor	Coreless Linear Motor
Structural Drawing			
Movable Unit	Slit form permanent magnets are placed in the space where the laminated core forms, and it equips the winding.	Laminated core is equipped with the winding.	Without a core, the winding is molded by plastics.
Stator	Blocks of laminated core are lined up, and the grooves are molded with plastics.	On the plate, the plate form permanent magnet is arranged by the number of strokes.	On the plate, the plate form permanent magnet is arranged by the number of strokes and two plates are arranged facing each other.
Permanent Magnet	Not Exposed	Exposed	Exposed

Model designations

Linear Type

HDL - S120S - □□□
└ Serial Number
└ Maximum Thrust

S030S	280N
S060S	580N
S120S	1150N
S180S	1700N

└ Motor Type

Rotary Type

HDM - 1240 M E - □□□
└ Serial Number
└ Detector Type
None: Resolver type
E: Encoder type
└ Motor frame number
M,L,H
└ Max.Torque（see right table）
└ Motor Type

1005	50Nm
1010	100Nm
1020	200Nm
1050	500Nm
1080	800Nm
1100	1000Nm
1120	1200Nm
1200	2000Nm
1240	2400Nm
※ 2020	200Nm

※Aluminum frame type
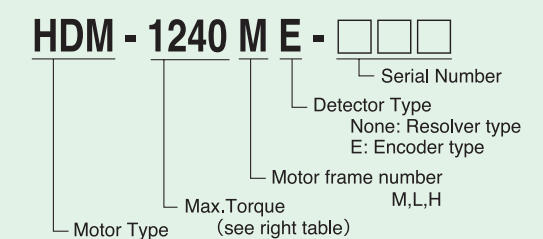
■Standard specification

Items	Type	※ HDL-S030S	HDL-S060S	HDL-S120S	HDL-S180S
Maximum Thrust	N	280	580	1150	1700
Continuous Thrust	N	200	400	800	1100
Maximum winding current	A	10.5	16.5	34	38
Maximum Speed	m/s	0.2 / 1 / 2（in case of the pulse train control）			
Sensor Resolution	μm	0.1 / 0.5 / 1			
Movable Part Weight	kg	4.2	9.5	17	37
Stator Weight	kg/m	37		55	
Environment	Ambient temperature	Operation : 0~50℃（Motor : 40℃）/ Storage : −15~70℃			
	Humidity	90%RH or less（no condensation）			
	Environment	Free from corrosive gas or dust（in house use）			
	Vibration/Impact	Vibration 0.5G or less / Impact 2G or less			
	Altitude	1,000 m or less			

※Magnet-pole-sensor-less type

■Dimensional outline

HDL-S030S

Unit:mm

HDL-S060S

〈 〉Outline dimensions

HDL-S120S

Unit:mm

HDL-S180S

〈 〉Outline dimensions
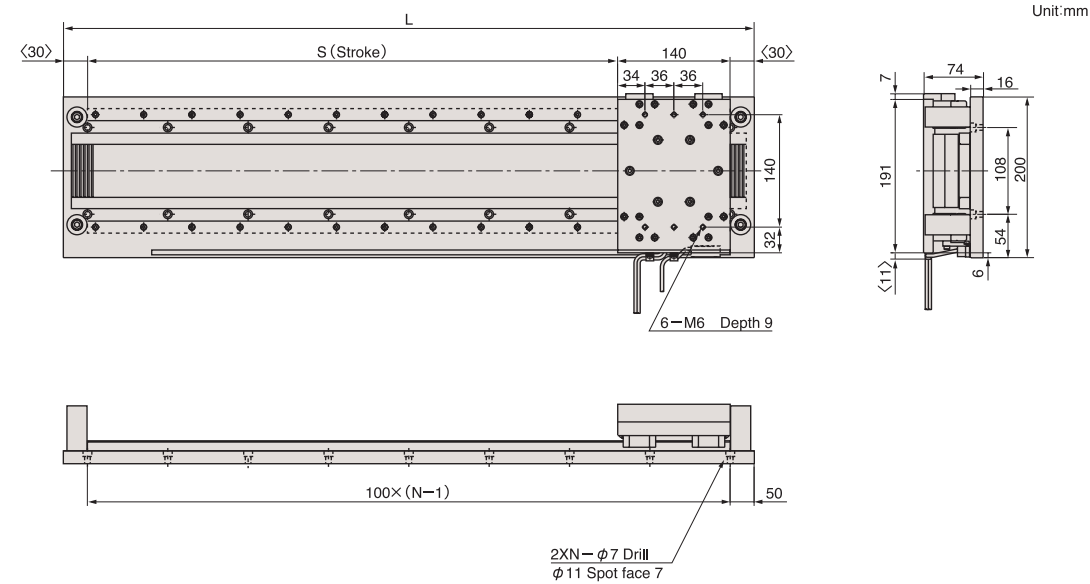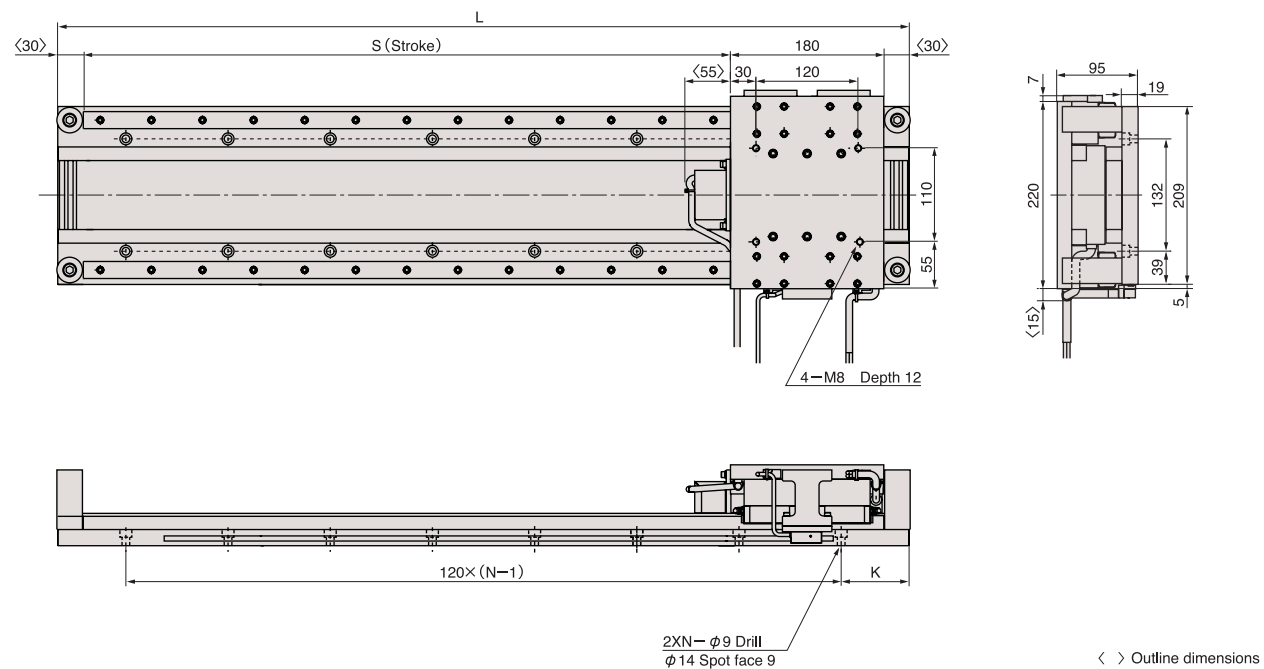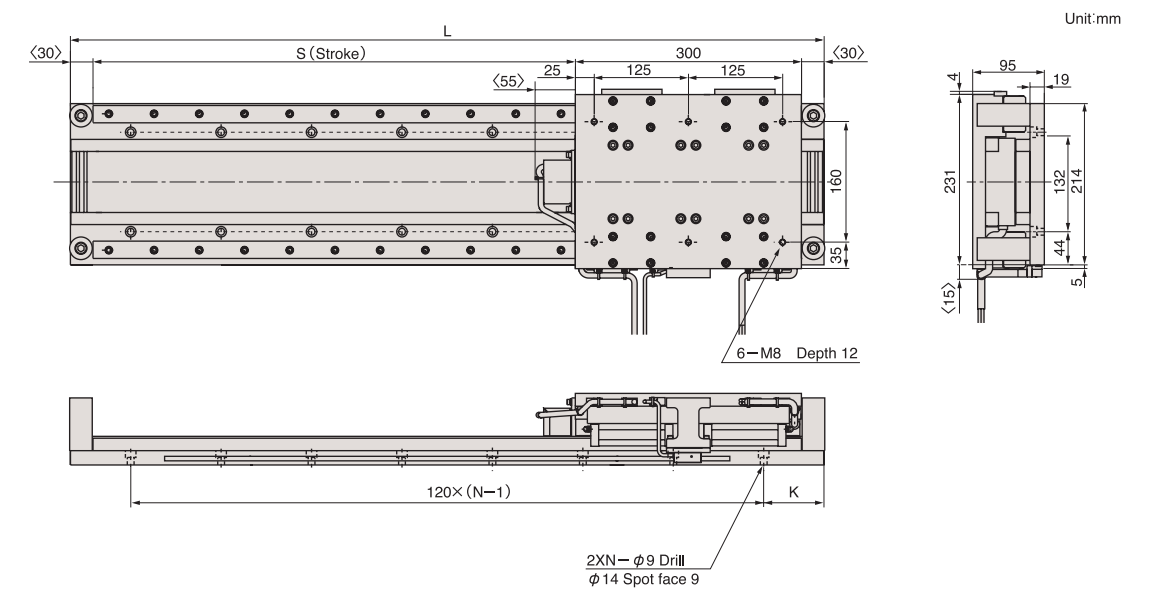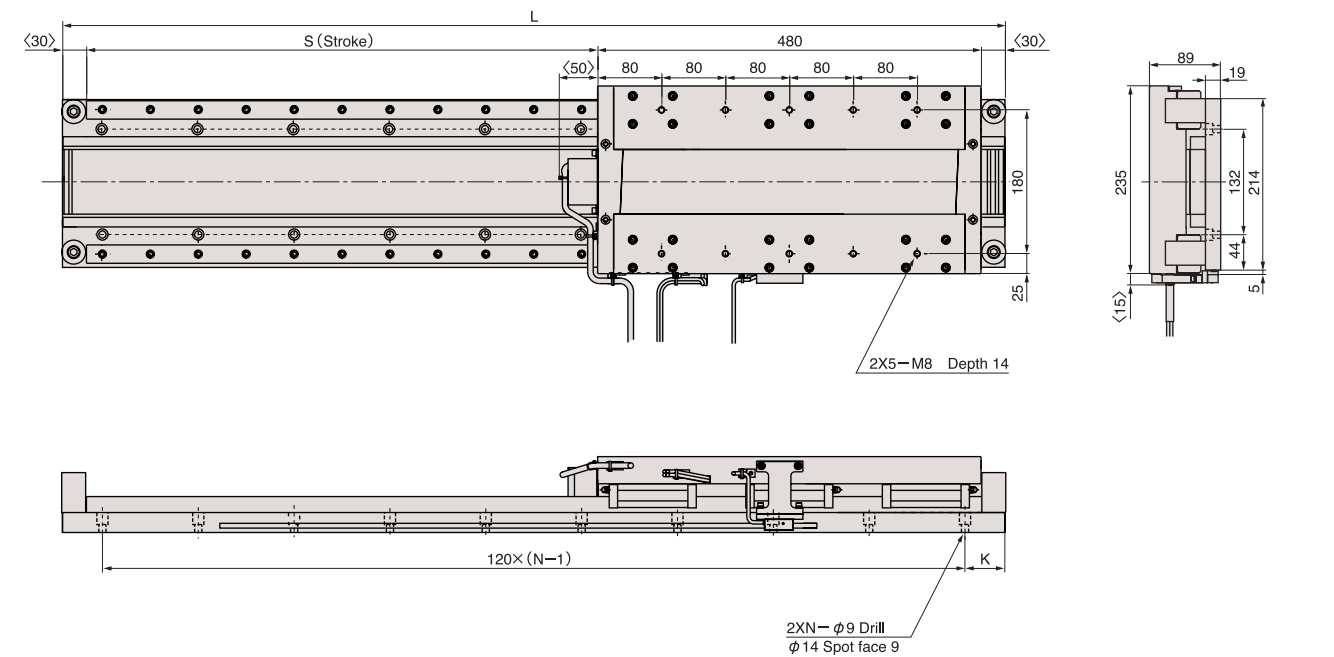
●Dimensional table

Type	HDL-S030S		
Length L（mm）	Stroke S（mm）	Spot face number N（place）	
500	300	5	
900	700	9	
1300	1100	13	
1700	1500	17	

◆Length of the lead wire
Lead wire of the motor: 200±50mm from the edge of the table
Lead wire of the magnet-pole sensor: 200±50mm from the edge of the table
Lead wire of the encoder: 1500mm from the outlet of the encoder body

Type	HDL-S060S			HDL-S120S			HDL-S180S		
Length L（mm）	Stroke S（mm）	K（mm）	Spot face number N（place）	Stroke S（mm）	K（mm）	Spot face number N（place）	Stroke S（mm）	K（mm）	Spot face number N（place）
500	260	70	4	140	70	4	—	70	4
1000	760	80	8	640	80	8	460	80	8
1500	1260	30	13	1140	30	13	960	30	13
2000	1760	40	17	1640	40	17	1460	40	17
2500	2260	50	21	2140	50	21	1960	50	21

High torque of up to 2400Nm meets every needs.

Resolver

Load Set plane

Cross Roller Bearing

Stationary Part

Permanent Magnet

Rotary Part

■Features

●High Torque
New magnetic circuit that doubles the efficiency factor of the core, generates high torque up to 2400Nm.

●Compact in size
Compact size due to high torque per unit area.

●High Frequency Operation
Enables high frequency operation, thanks to the continuous high torque output.

●High Precision
The optical, high-resolution encoder is a lineup type. Greater precision positioning is possible.

●High Rigidity
Cross roller bearing makes motor more rigid and stable.

The unique magnetic circuit generates 2X Torque.

■Applications
- ●Big, heavy load index ——————— FPD equipment
- ●High Precision positioning ——————— Semiconductor manufacturing equipment
- ●High Frequency Operation ——————— Electronic components manufacturing equipment, Inspection instrument
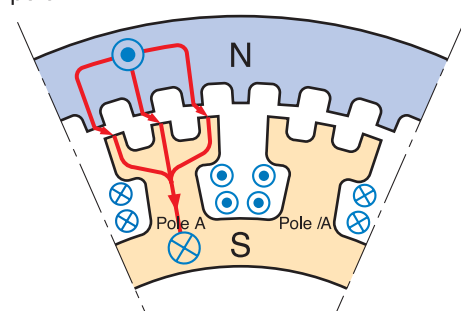- ●Simple Structures ——————— Paper manufacturing, Printer etc.

■Operation

●The Rotary Type magnetic circuit of HD motor
Figure shows one phase of the HD motor. The flux from the excitation of coil A passes through poles A and /A. Then both poles contribute to torque so that 2x the torque is produced.
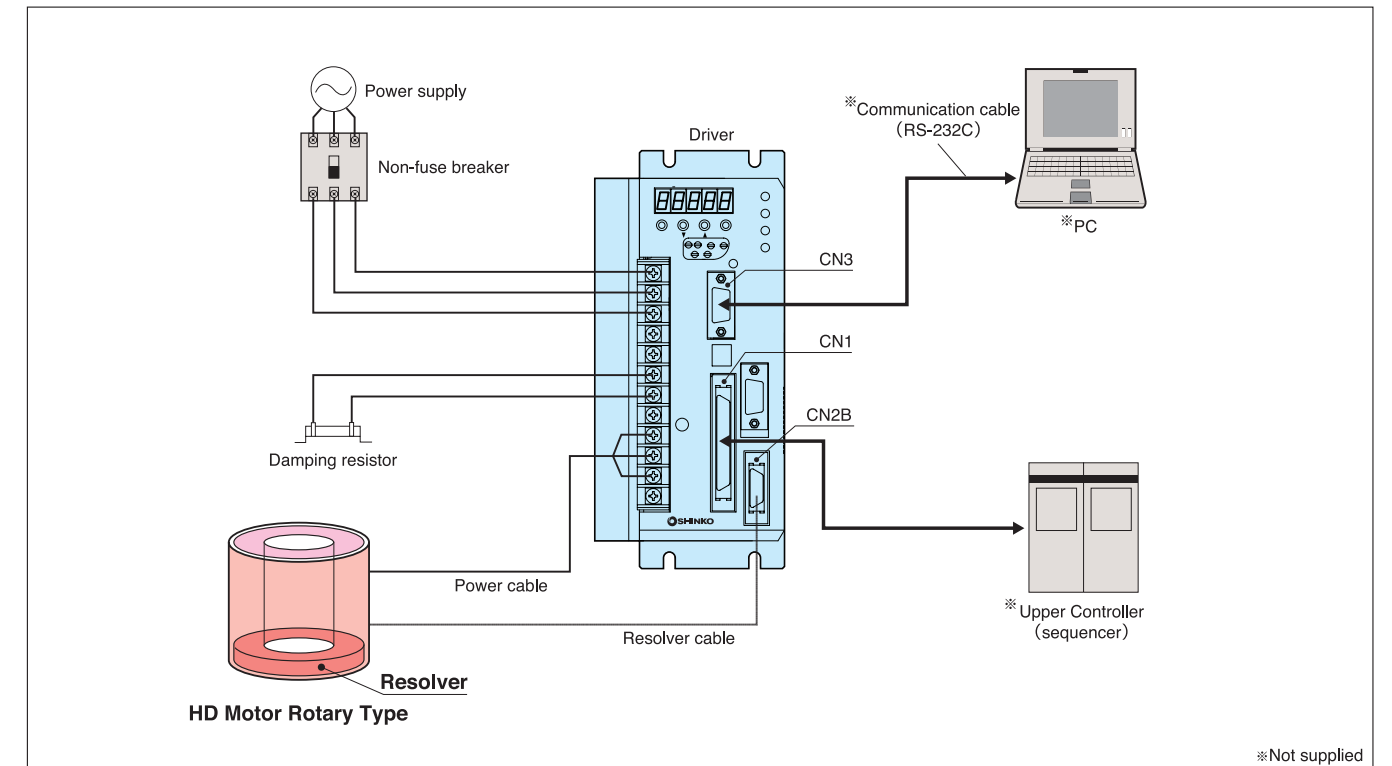
Pole A   Pole /A
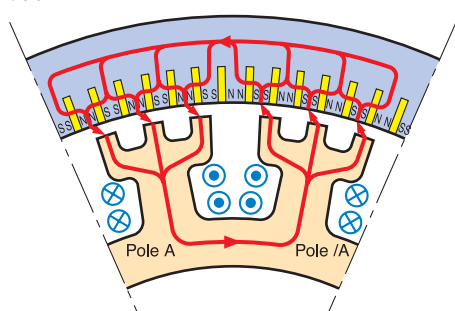
●The magnet circuit of the conventional motor
The magneto-motive forces by phase coil A are in the same direction and enhance each other, but in the inverse direction for pole /A. That means the torque generation is by only pole A.
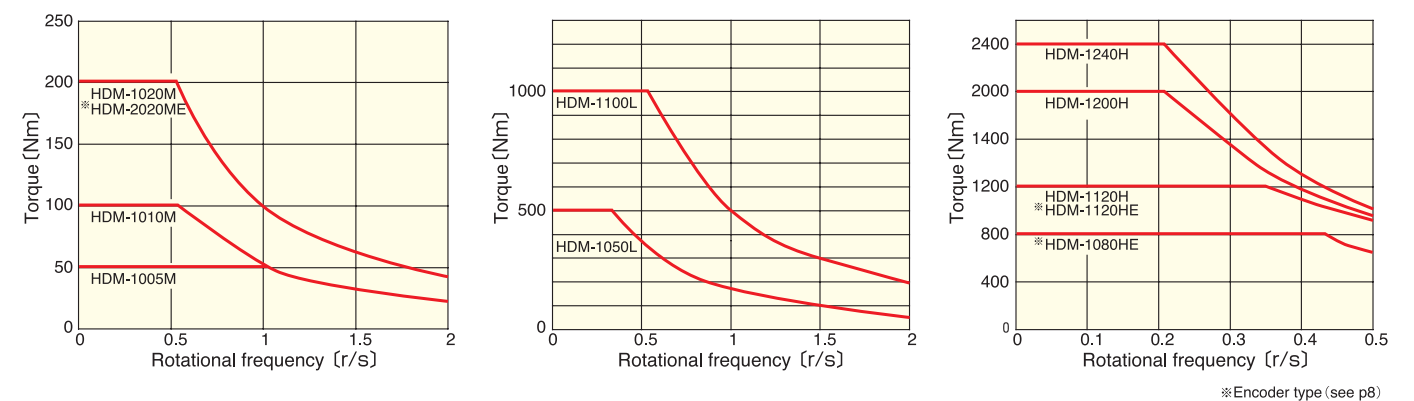
N

Pole A   Pole /A

S

■System configuration

Power supply

Non-fuse breaker

Driver

※Communication cable （RS-232C）

※PC

CN3

CN1

CN2B

Damping resistor

Power cable

Resolver cable

Resolver

HD Motor Rotary Type

※Upper Controller （sequencer）

※Not supplied

■Standard specification

Item	Type	HDM-1005M	HDM-1010M	HDM-1020M	HDM-1050L	HDM-1100L	HDM-1120H	HDM-1200H	HDM-1240H
Maximum Torque	Nm	50	100	200	500	1000	1200	2000	2400
Continuous Torque	Nm	35	66	133	330	660	800	1330	1100
Maximum Winding Current	A	8.7	8.7	16.5	28.5		71		85
Maximum Rotation	r/s				2			0.5	
Sensor Resolution	p/r				204,800（6.3 sec）4x base				
Allowed Axial Load	N	5500	5500	5500	10000	10000	21000	21000	21000
Allowed Moment	Nm	150	150	150	400	400	850	850	850
Axial Rigidity	mm/N	1.47×10^{-6}	1.47×10^{-6}	1.47×10^{-6}	1.30×10^{-6}	1.30×10^{-6}	5.92×10^{-7}	5.92×10^{-7}	5.92×10^{-7}
Moment Rigidity	rad/Nm	1.6×10^{-6}	1.6×10^{-6}	1.6×10^{-6}	4.0×10^{-7}	4.0×10^{-7}	1.17×10^{-7}	1.17×10^{-7}	1.17×10^{-7}
Rotor Inertia	J（GD²/4） kgm²	0.11	0.13	0.17	0.59	0.103	2.57	4.05	4.5
	kgfms²	0.011	0.0133	0.0174	0.06	0.0105	0.262	0.413	0.459
Mass	kg	20.5	26	35	72	133	215	282	340
Environment	Ambient Temperature	Operation : 0~50℃（Motor : 40℃）/ Storage : −15~70℃							
	Humidity	90%RH or less（no condensation）							
	Environment	Free from corrosive gas or dust（in house use）							
	Vibration/Impact	Vibration 0.5G or less / Impact 2G or less							
	Altitude	1,000 m or less							

■Characteristics

HDM-1020M
※HDM-2020ME

HDM-1010M

HDM-1005M

Torque〔Nm〕 — Rotational frequency〔r/s〕

HDM-1100L

HDM-1050L

Torque〔Nm〕 — Rotational frequency〔r/s〕

HDM-1240H

HDM-1200H

HDM-1120H
※HDM-1120HE

※HDM-1080HE

Torque〔Nm〕 — Rotational frequency〔r/s〕

※Encoder type（see p8）

■Dimensional outline
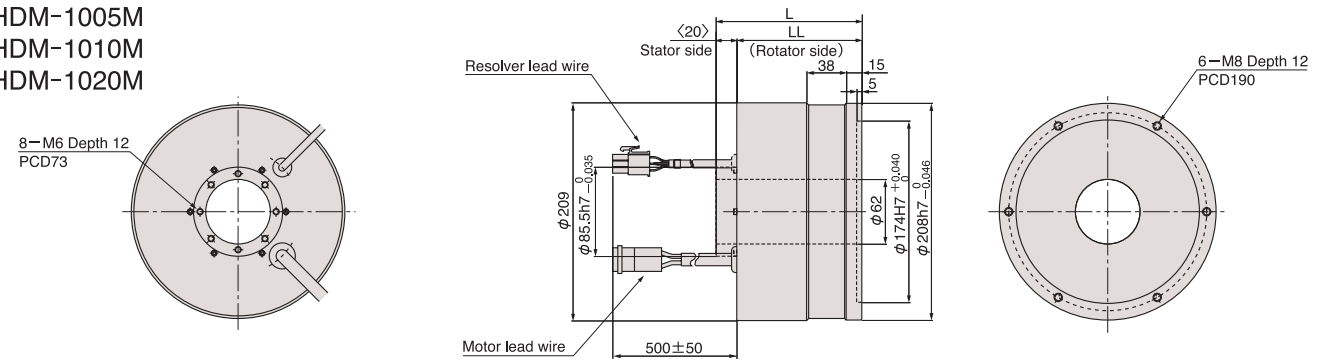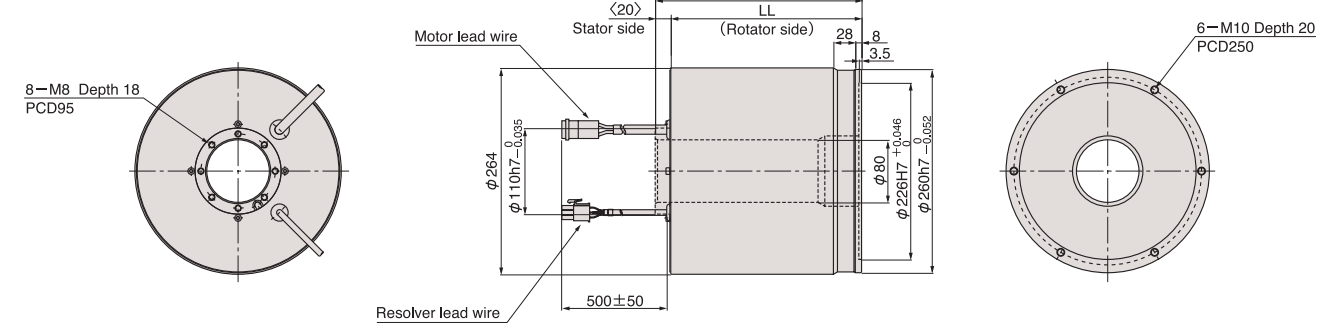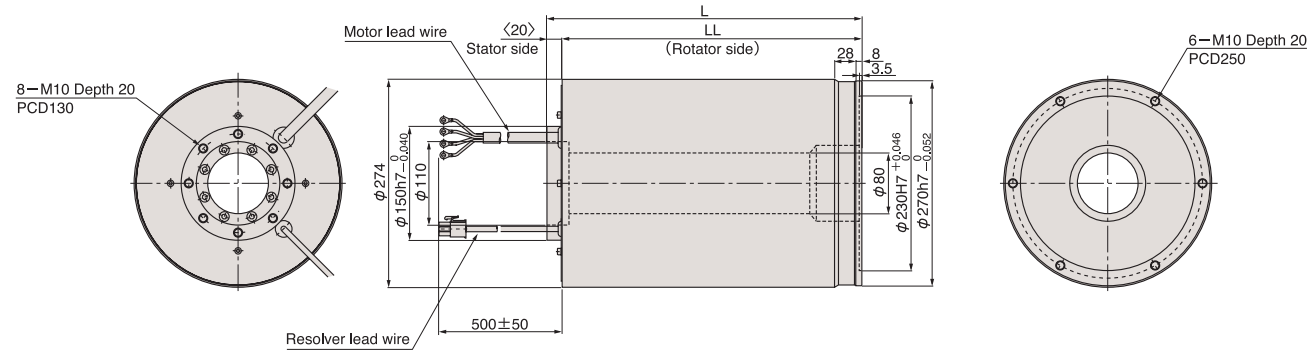
Unit:mm

HDM-1005M
HDM-1010M
HDM-1020M

8−M6 Depth 12 PCD73

⟨20⟩ Stator side
LL (Rotator side)
L
Resolver lead wire
Motor lead wire
500±50

6−M8 Depth 12 PCD190

HDM-1050 L

8−M8 Depth 18 PCD95

⟨20⟩ Stator side
LL (Rotator side)
L
Motor lead wire
Resolver lead wire
500±50

6−M10 Depth 20 PCD250

HDM-1100L

8−M10 Depth 20 PCD130

⟨20⟩ Stator side
LL (Rotator side)
L
Motor lead wire
Resolver lead wire
500±50

6−M10 Depth 20 PCD250

HDM-1120H
HDM-1200H
HDM-1240H

8−M16 Depth 32 PCD152

⟨26⟩ Stator side
LL (Rotator side)
L
Resolver lead wire
Motor lead wire
500±50

8−M16 Depth 32 PCD290

⟨　⟩ Outline dimensions

●Dimensional table

Unit:mm
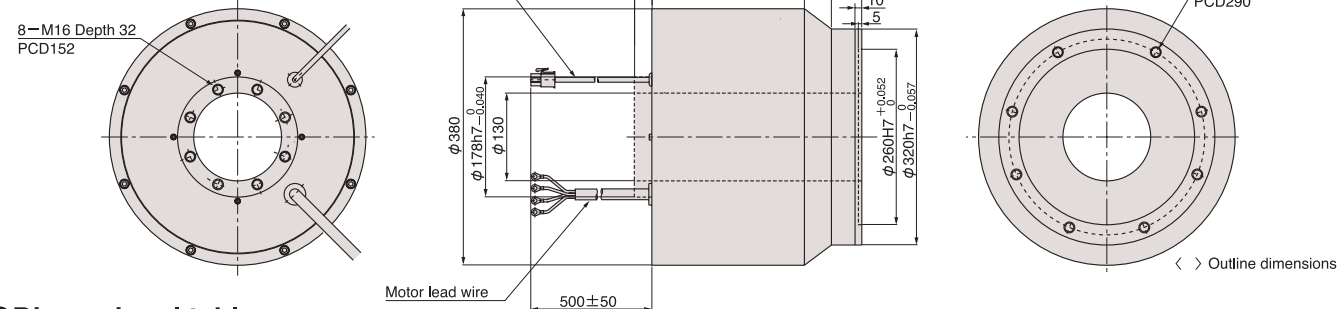
Type	HDM-1005M	HDM-1010M	HDM-1020M	HDM-1050L	HDM-1100L	HDM-1120H	HDM-1200H	HDM-1240H
Length　L	140	176	216	264	415	337	488	538
Rotary side length　LL	120	156	196	244	395	311	462	522

■Standard specification

Item	Type	※ HDM-2020ME	HDM-1080HE	HDM-1120HE
Maximum Torque	Nm	200	800	1200
Continuous Torque	Nm	100	400	600
Maximum Winding Current	A	16.5	71	71
Maximum Rotation	r/s	2	0.5	0.5
Sensor Resolution	p/r	944000（1.4sec）	4720000（0.27sec）	
Allowed Axial Load	N	5200	21000	21000
Allowed Moment	Nm	110	850	850
Axial Rigidity	mm/N	1.9×10^{-6}	5.92×10^{-7}	5.92×10^{-7}
Moment Rigidity	rad/Nm	2.4×10^{-6}	1.17×10^{-7}	1.17×10^{-7}
Rotor Inertia	J（GD²/4）　kgm²	0.11	2.6	3.2
	kgfms²	0.011	0.25	0.31
Mass	kg	30	190	225
Environment	Ambient Temperature	Operation : 0~50℃（Motor : 40℃）/ Storage : −15~70℃		
	Humidity	90%RH or less（no condensation）		
	Environment	Free from corrosive gas or dust（in house use）		
	Vibration/Impact	Vibration 0.5G or less / Impact 2G or less		
	Altitude	1,000 m or less		

※Magnet pole sensor less type

■Dimensional outline

Unit:mm

HDM-2020ME

8−M8 Depth 12 PCD73

⟨46⟩ Stator side
LL (Rotator side)
L
250±50
Motor lead wire
Encoder lead wire
（1500mm from the outlet of the encoder）

6−M8 Depth 18 PCD190

HDM-1080HE
HDM-1120HE

Encoder lead wire（1500mm from the outlet of the encoder）
Resolver lead wire
Motor lead wire
500±50

8−M16 Depth 32 PCD210

⟨64⟩ Stator side
LL (Rotator side)
L

6−M12 Depth 24 PCD290

⟨　⟩ Outline dimensions

●Dimensional table

Unit:mm

Type	HDM-2020ME	HDM-1080HE	HDM-1120HE
Length　L	225	352	400
Rotary side length　LL	179	288	336

■Features

●Various functions allows for advance control
Includes various functions such as pulse positioning, speed control, current control, PTP positioning control etc.

●High Frequency Pulse is available
Maximum allowable input pulse of pulse positioning control is 2MHz and the maximum feedback pulse is 10MHz.

●Easy adjustment with PC
Easy-to-use PC Loader Software is prepared. Various settings and easy monitoring can be performed by connecting PC and driver with RS232C cable.

●Easy Frequency analysis of the mechanical system
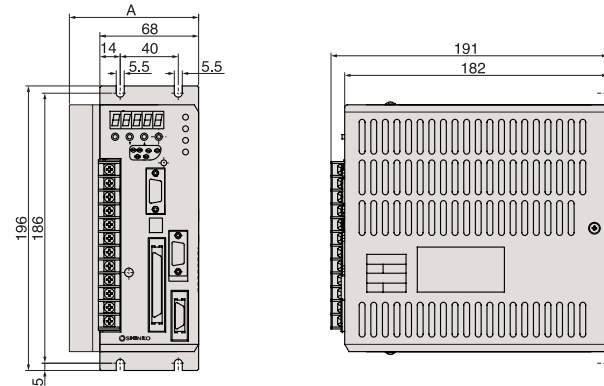Analyzing wide range frequency is simple, owing to PC Loader Software with FFT analyzer.

●Equipped with vibration inhibitor filter
It has various filters, which inhibit vibration of the machine. You can set up the filter with frequency analysis via the PC Loader Software, which operates with more precision.

Model designations

SDD-N-20A 4K00 -□-□

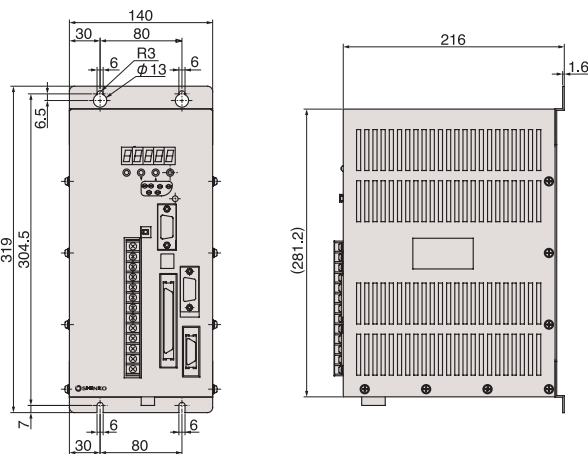- Serial number
- Driver
- 200W…0.2kW
- 750W…0.75KW
- 1K50…1.5KW
- 4K00…4.0KW
- 7K50…7.5KW

■Dimensional outline

Unit:mm

SDD-N-20A200W
SDD-N-20A750W

●Dimensional table

Type of Driver	A size
SDD-N-20A200W	73
SDD-N-20A750W	89

SDD-N-20A1K50
SDD-N-20A4K00

SDD-N-20A7K50

■Driver specification

Driver Type			SDD-N-20AC200W-□-□	SDD-N-20A750W-□-□	SDD-N-20A1K50-□-□	SDD-N-20A4K00-□-□	SDD-N-20A7K50-□-□
Power Supply	Main		3 Phase AC200／230V（−15%〜＋10%） 50／60Hz				
	Control		Single Phase AC200／230V（−15%〜＋10%） 50／60Hz				
Maximum Output Currency［A］			1.4	3.5	8.5	19	33
Maximum Motor Currency［A］			4.2	10.5	25.5	57	66
Control Method			Sine Wave PWM Method（Carrier Frequency : 10kHz)				
Cooling Method			Air-cooling without blower			Air-cooling with blower	
Mass [kg]			2.1	2.5	6.4	6.4	12.7
HD Motor Type	Linear Type		Xyθ Table	HDL-S030S	HDL-S060S	HDL-S120S/HDL-S030S	HDL-5F
	Rotary Type		Xyθ Table	HDM-1005M/HDM-1010M	HDM-1020M	HDM-1050L/HDM2020ME	HDM-1080L and above
Standard Type	Pulse Position Control	Interface	Line Driver Drive MAX 2［MHz]				
		Pulse Pattern	F/R, Sign/Pulse, A/B				
	Velocity Control	Speed Protocol	7 points can be registered on parameter（Setting resolution 1［r/min］）				
	Currency Control	Currency Protocol	Plus / minus direction can be registered independently（Setting resolution 1% / maximum current ratio）				
Positional Type	PTP Positioning Control	PTP Positioning	Mechanical zero return, electric zero return, INC move, ABS move, constant speed JOG, constant rate JOG				
		Coordinate System	Linear limited, Rotation limited, Rotation cycle, Equal segregation				
		Optional Function	Pause*, Order cancel*, Emergency stop, S letter acceleration-deceleration, beeline（* is not available in particular coordinate systems.）				

■Damping Resistor

●Dimensional table

Type	Driver	Resistance（Ω）	Capacity（W）	A	B	C	D	E	F	G	H	J
BR-15003	SDD-N-20A-200W-□-□	150	30	6	3.2	101	110	18	4.5	16	35	19
BR-06008	SDD-N-20A-750W-□-□	60	80	8	3.2	148	167	26	6	22	54	28
BR-03015	SDD-N-20A-1K50-□-□	30	150	8	3.2	228	247	26	6	22	54	28
BR-01530	SDD-N-20A-4K00-□-□	15	300	10	5.5	309	335	40	9.5	40	78	42
BR-01040	SDD-N-20A-7K50-□-□	10	400	10	5.5	385	411	40	9.5	40	78	42
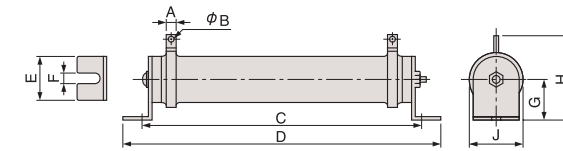
※If the resistor is very often started, contact us to increase resistor capacity.

PC Loader Software

Via RS232C serial communications, you can change parameters and monitor the process with your PC.

①Edit parameters
You can set the parameters and manage the parameter file.

②Monitor Display
Numerical monitor and I/O monitor are displayed.

③Waveform Monitor
Motor operational waveform is displayed.

④Test Running
Without order to CN1, simple motor running can be performed.

⑤Teaching Function
Mechanical zero return, electric zero return, INC move, ABS move, constant velocity JOG, constant rate JOG, Zero teaching, and order teaching can be performed.

⑥Transfer Function measurement
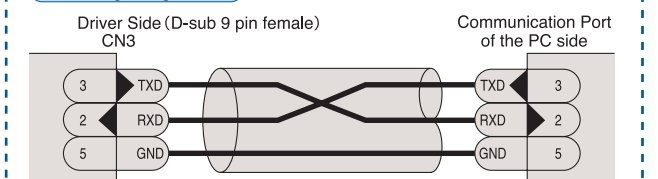Transfer function specification can be measured including motor and load.
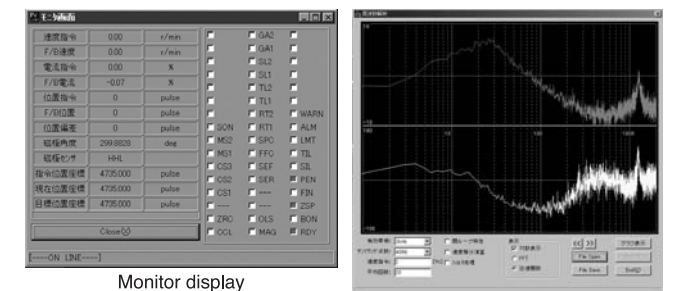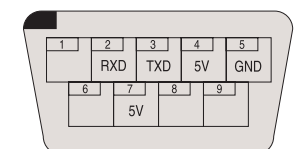
Monitor display

TF specification measurement

■Hardware Requirements

Communication Method	RS232C
Transfer Rate	9600、19200、38400bps
Compatible PC	Windows 98/NT/Me/2000/XP Hard disk Drive with 6MB available space

※Windows is a registered trademark of the Microsoft Corporation.

Connection cable for PC loader ※ Not supplied

Wiring Diagram

Driver Side（D-sub 9 pin female）CN3

Communication Port of the PC side

3	TXD		TXD	3
2	RXD		RXD	2
5	GND		GND	5

Connector pin layout

1	2	3	4	5
	RXD	TXD	5V	GND
6	7	8	9
		5V	