HIWIN®

AC Servo Motor & D2T Drive

Technical Information

MOTR SET
LS05XX1

HIWIN® INDUSTRIE 4.0 Best Partner

Linear Motor Stage
Automated transport / AOI application /
Precision / Semiconductor
- With Iron Core
- Ironless Type
- Linear Turbo LMT
- Planar Servo Motor
- Air Bearing Platform
- X-Y Stage • Gantry Systems
- Single-Axis Linear Motor Stage

Linear Motor
Machine tool / Touch panel industry /
Semiconductor industry /
Laser manufacturing machine /
Glass cutting machine
- Iron Core linear motor-LMFA series,
  LMSA series, LMSC series
- Ironless linear motor-LMC series,
  LMT series

Torque Motor & Direct Drive Motor
Machine Tools
- Torque Motor--
  TM-2/IM-2, TMRW Series

Inspection / Testing Equipment / Robot
- Direct Drive Motor--
  DMS, DMY, DMN, DMT Series

AC Servo Motor & Drive
Semiconductor / Packaging machine /
SMT / Food industry / LCD
- Drives-D1, D2T/D2T-LM, E1
- Motors-50W~2000W

Linear Actuator
Hospital bed / Automatic window / Home
care facility / Riveting /
Press-fitting / Surface checks / Bending
- Servo Actuator-LAA series
- LAM series
- LAS series
- LAN series
- LAC series

Positioning Measurement System
Cutting machines /
Traditional gantry milling machines /
Programmable drilling machines
- High Resolution
- Signal Translator
- High-precision Enclosed
- High Efficiency Counter

Multi-Axis Robot
Pick-and-place / Assembly /
Array and packaging / Semiconductor /
Electro-Optical industry /
Automotive industry / Food industry
- Articulated Robot
- Delta Robot
- SCARA Robot
- Wafer Robot
- Electric Gripper
- Integrated Electric Gripper
- Rotary Joint

Single-Axis Robot
Precision / Semiconductor /
Medical / FPD
- KK, SK
- KS, KA
- KU, KE, KC

Torque Motor Rotary Table
Medical / Automotive industry /
Machine tools / Machinery industry
- RAB Series
- RAS Series
- RCV Series
- RCH Series

Ballscrew
Precision Ground / Rolled
- Super S series
- Super T series
- Mini Roller
- Ecological & Economical lubrication
  Module E2
- Rotating Nut (R1)
- Energy-Saving & Thermal-Controlling (C1)
- Heavy Load Series (RD)
- Ball Spline

Linear Guideway
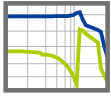Automation / Semiconductor / Medical
- Ball Type--HG, EG, WE, MG, CG
- Quiet Type--QH, QE, QW, QR
- Other--RG, E2, PG, SE, RC

AC Servo Motor & Drive / D2T series

With High-tech control technology,
HIWIN AC Servo motors achieve a great cost-performance
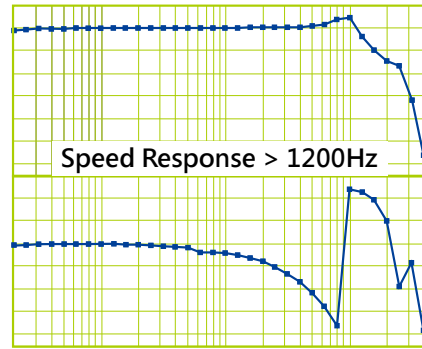ratio for a complete motor drive solution.

Contents

1. Features

Excellent performance

Excellently high speed response

With the help of a semiconductor high-end motion control algorithm and advanced common gain concept, a high speed response is achieved, satisfying all motion control needs.
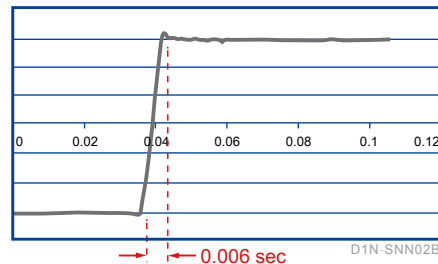
Speed Response > 1200Hz

D1N-SNN01C

High acceleration responses

Using advanced controller design tools, and space vector current control technology, high level servo performance is achieved.

AC servo motor speed can change from -3000 to +3000 rpms in as little as 0.006 seconds.

0.006 sec

D1N-SNN02B
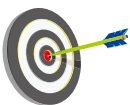
Built-in accuracy improvement feature

D2T drive includes features to improve total positioning accuracy of the mechanical system. The table size can be up to 5000 points. It is implemented in all control modes to optimize system behavior.
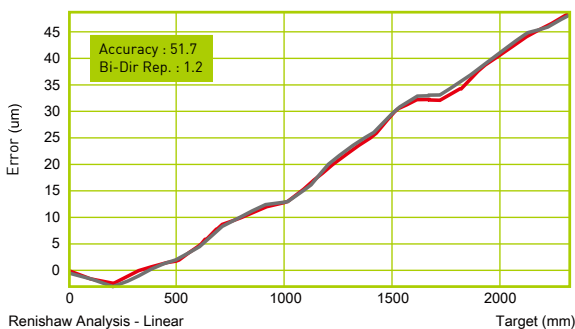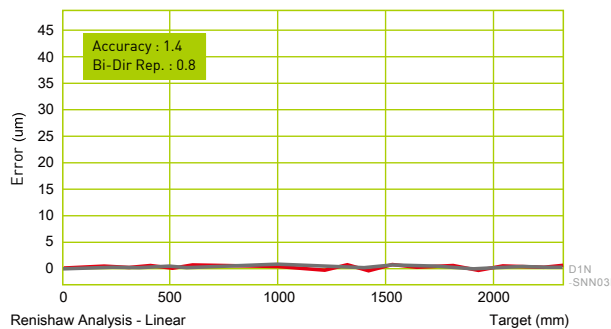
Accuracy : 51.7
Bi-Dir Rep. : 1.2

Renishaw Analysis - Linear

Without accuracy improvement feature

Accuracy : 1.4
Bi-Dir Rep. : 0.8

D1N -SNN03B

Renishaw Analysis - Linear

With accuracy improvement feature

Vibration Suppression Feature

D2T drive can remove vibration frequency that occurs during movement.

It reduces vibrations caused by system's structure and improves the machine's production efficiency.

Without vibration
suppression feature

With vibration
suppression feature

D2T-LPN01A
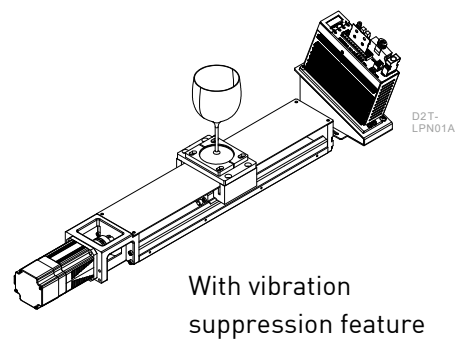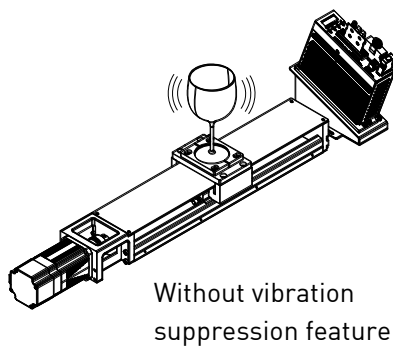
Electronic gear ratio and Encoder Emulator

The drive can help users adjust pulse resolution for the host controller, and to work with a variety of position encoders with different resolutions; it can also adjust analog position encoder output resolution to the host controller and meet the pulse receiving capability of different host controllers.

D2T Drive

1 um

Host
Controller

Electronic
Gear

Encoder
Emulator

Encoder
input circuit

1 um

D2T-CNN01A
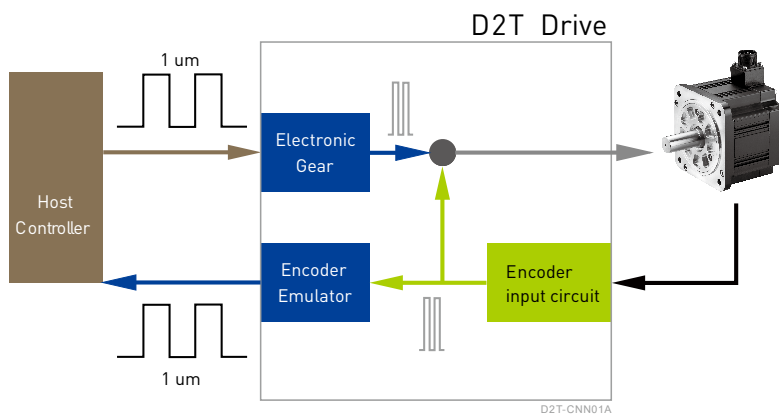
Simple Operation

Simple setup

Auto phase center

Selection

Initialization

Adjustment
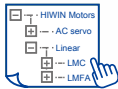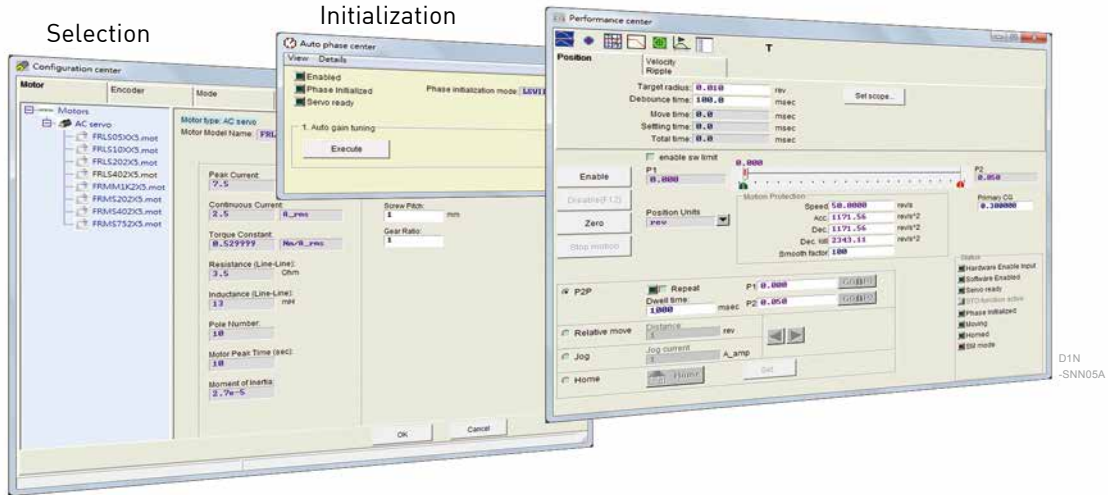
Easy Operation

Parameters are categorized according to features. Only necessary parameters are shown. No confusing parameter list.

LCD Display

No need to connect to a PC to complete all of the settings and operations.

LCD display provides instant status monitoring and displays error messages. Gain and test running can be quickly set by panel keys.

Test running

Parameter setting

Fine-tune

Complete tool sets

Real-time scope, accuracy enhancement function, frequency analysis tools , gain scheduling tool, analysis tool, I/O setting functions, encoder output ratio adjustment function, Z phase signal width adjustment function, PDL , ZeroTune function and filter.

Accuracy enhancement function

To improve on the positioning accuracy of motion systems, the drive amplifier is featured with an error compensation function. By taking the measurements from a laser interferometer, the positioning error table can be built inside the drive, so that high positioning accuracy is achieved.

D1N-SNN08A

Frequency analysis tools

A powerful and easy to use tool for frequency analysis is provided. You can use the frequency analysis tools to display the real response in the form of a graph. You can easily set the best gain value for the system based on the real response, even first time users can easily get started.
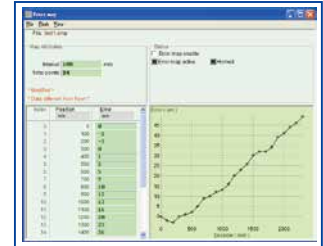

D1N-SNN10B

Advanced gain scheduling feature

After setting gains through frequency analysis tools, there is only one value to adjust: the common gain. The drive provides a gain scheduling function. You can adjust the gain according to different phases of motion, such as moving phase, settling phase, and in-position phase.

D1N-SNN09B
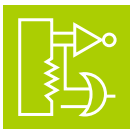
Variety of I / O functions

To support a number of different functions, you are free to configure the I/O pin functionality and adapt different hardware interface needs. This satisfies diverse requirements for different motion controllers with regards to their pin assignments and hardware interfaces.

D1N-SNN11B

Analysis Tools

To solve a resonance problem, the drive offers a filter design tool for improving the control performance, a Fast Fourier Transform (FFT) and other mathematical operation tools. You can use the functions to calculate the resonant frequency of the system easily, and to make the filter design more accurate.

D1N-SNN12A

PDL (Process Description Language)

Easy-use process description language is provided.

Complex motions can be designated via PDL, such as extrusion process, point-to-point motion, fixed speed control, homing process and so on. PDL gains the advantages of flexibility and programmability. For quick learning, a number of sample programs are provided in the PDL manual.
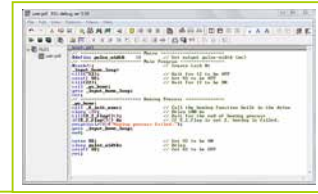
D2-SNN04A
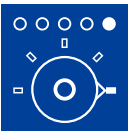
ZeroTune function

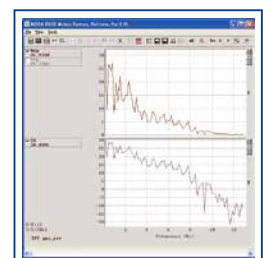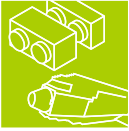Servo loop gains can be easily set without complex procedures via ZeroTune.

Only by selecting the load level of the motor, will stable velocity response be achieved. Even a beginner who has no knowledge of servo control can easily drive a motor.

D2-SNN05A

Filter

Drive supports two sets of bi-quad filters.

According to filter parameters, the bi-quad filters can be transformed into different filter types, such as low-pass filter, notch filter, ..., etc. Through well-defined filters, stage vibration can be easily suppressed, and control accuracy can be significantly increased.
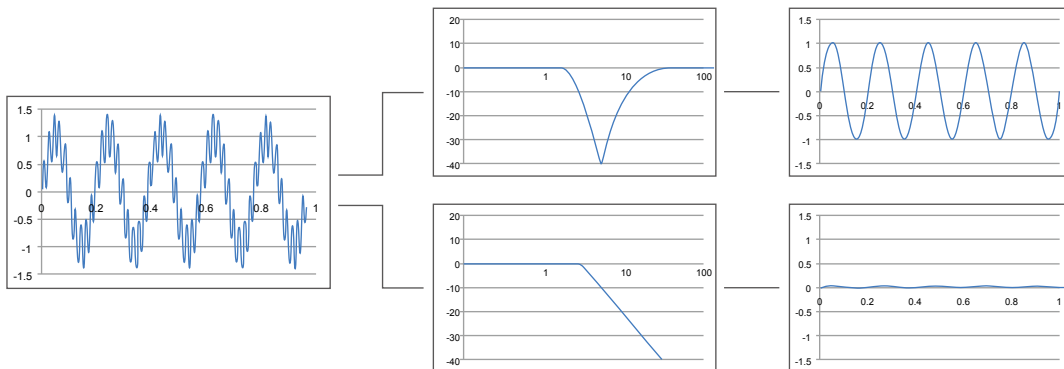
Easy integration

A complete solution with positioning module, motor and drive

In addition to providing motor and drive, a variety of linear positioning modules are provided. We provide customers with integrated services and a total solution.

High-speed network communications interface

D2T Drive is equipped with Industrial Ethernet communications (EtherCAT) interface, and also supports CoE (CANopen over EtherCAT) servo drive protocol. For of multi-axis control, it provides simple wiring, low cost, noise immunity, remote and distributed control needs.

2. Safety Certification

2.1 RoHS compliant

Components and finished product all meet RoHS(Restriction of Hazardous Substances Regulation) requirements which ensure the compliance to relevant laws of quality of goods.

RoHS regulations limit six hazardous substances are: Lead (Pb), mercury (Hg), hexavalent chromium (Cr6 +), Polybrominated Biphenyls (PBB), the maximum allowable content of Polybrominated diphenyl ethers (PBDE) is 0.1% (1000ppm), Cadmium (Cd) is 0.01% (100ppm).

2.2 Comply with CE & UL regulations

		Drive	Motor
CE Directives CE	EMC Directives	EMC: EN61800-3 EN55011 EN61000-6-2 EN61000-6-4 EN61000-2-4 IEC60146-1-1 IEC61000-2-1	EN55011 EN61000-6-2 EN61000-6-4
	Low-Voltage Directives	LVDS:EN61800-5-1	EN60034-1 EN60034-5
UL Directives		UL:E348161 (D2T 100W/400W/1000W)	UL1004-1 UL1004-6

3. Model Descriptions

3.1 Servo drive

Code	1	2	2a	3	4	5	6	7	8	9	10	11	12
Example	D	2	T	-	0	4	2	3	-	S	-	B	0

Product type

Rated output

100W	= 01
400W	= 04
1000W	= 10
2000W	= 20

Voltage range

1/3 phase 220VAC (For A,B,C frame)	= 23
3 phase 220VAC (Only for D frame)	= 32

Interface

Standard	= S
EtherCAT(CoE)	= E
EtherCAT(mega-ulink)	= F
Standard with extension I/O modules	= K

Frame size

A frame(suggestion: 100W rated output)	= A
B frame(suggestion: 400W rated output)	= B
C frame(suggestion: 1000W rated output)	= C
D frame(suggestion: 2000W rated output)	= D

Encoder type

17bit serial incermental encoder(HIWIN17)	= 4
Dual Loop (Full closed loop) and 17bit serial absolute encoder	= 5

3.2 Servo motor

Code	1	2	3	4	5	6	7	8	9	10	11	12
Example	F	R	L	S	4	0	2	0	6	0	6	A

Product

HIWIN AC servo motor series .... = FR

Type

Low inertia, small capacity(50W~400W) .... = LS
Medium inertia, small capacity(50W/100W/
400W/750W) .... = MS
Medium inertia, medium capacity(1000W/2000W) = MM

Output Power

50W... = 05
100W.. = 10
200W.. = 20
400W(Low inertia) .... = 40
400W(Medium inertia) .... = 4B
750W.. = 75
1000W.. = 1K
2000W.. = 2K

Drive input voltage

220V... = 2

Holding brake options

Without holding brake...= 0
With holding brake ....= B

Encoder type

17bit absolute encoder... = 4
HIWIN 17 incremental encoder .... = 6

Frame size

40mm(MS 50W/100W) ....= 04
42mm(LS 50W/100W) ....= A4
60 mm(200W/400W) ....= 06
80 mm(750W) ....= 08
130 mm(1000W/2000W) ....= 13

Motor shaft

Round shaft / without oil seal .... = A
Round shaft / with oil seal[2] .... = B
With key and center tap / without oil seal .... = C
With key and center tap / with oil seal[2] .... = D

3.3 Motor cable

Code	1	2	3	4	5	6	7	8	9	10	11	12
Example	H	V	P	S	0	4	A	A	0	5	M	B

Type

HIWIN motor cable .... = HVP

Capacity

Small capacity (50W~750W) .... = S
Medium capacity (1000W/2000W) .... = M

Number of pin

Motor cable without holding brake .... = 04
Motor cable with holding brake .... = 06

Motor side connector

AMP connector (50W~750W) .... = A
Straight waterproof connector (1000W/2000W) .... = B
L-type waterproof connector (1000W/2000W) .... = C

Drive side connector

Open cable ends (50W~1000W) ....= A
R-type terminals (2000W) ....= B

Cable length

3M..= 03M
5M..= 05M
7M..= 07M
10M..= 10M

Cable type

Highly flexible .... = B

3.4 Encoder cable

Code	1	2	3	4	5	6	7	8	9	10	11	12
Example	H	V	E	1	7	I	A	B	0	5	M	B

Type

HIWIN encoder cable....................... = HVE

Encoder Type

HIWIN 17 incremental encoder .... = 17I
17bit absolute encoder...= 17A

Encoder connector

AMP connector (50W~750W) .... = A
Straight waterproof connector (1000W/2000W) .... = B
L-type waterproof connector (1000W/2000W) .... = C

Drive side connector

SCR connector.. = B

Cable length

3M..= 03M
5M..= 05M
7M..= 07M
10M...= 10M

Cable type

Highly flexible ....= B

4. Interface Directions

4.1 Frame A-C

AC

— Circuit Breaker(MCCB)

— Noise Filter
(optional)

— Magnetic Contactor
(MC)

Regenerative Resistor
(optional)

Common mode filter
(optional)

DC 24V for brake
(applied by Customer)

D2-PFN01C

Servo motor
(Brake option)

LCD Display
Two lines Dot Matrix Indicates
messages and parameters

LED Status
Ready/Error quick guide
(CoE type is STAT)

Connection to PC

Lightening
For Drive
FREE

Please download from
www.hiwinmikro.tw

**Connection to
host controller**
50 pin SCSI connector
(Standard accessory)

Connection to Encoder
Encoder cable (optional)

- - - - Use this cable when
a motor with brake

4.2 Frame D

Circuit Breaker(MCCB)

Noise Filter
(optional)

Magnetic Contactor
(MC)

Charge lamp

Regenerative Resistor
(built-in or externalo)Note1

DC reactor inputs

Common mode filter
(optional)

Servo motor
(Brake option)

Connection to Encoder
Encoder cable (optional)

D2-PFN03A

LCD Display
Two lines Dot Matrix Indicates messages and parameters

LED Status
Ready/Error quick guide
(CoE type is STAT)

Connection to PC

Lightening
For Drive
FREE

Please download from
www.hiwinmikro.tw

Connection to Modbus RS485 or host controller

Connection to Safety by-pass plug

Connection to host controller
50 pin SCSI connector
(Standard accessory)

Note1 Please refer to user guide

5. Part numbers and options

Name	Motor cable			Encoder cable	Other accessories
50W I 750W	without brake		HVPS04AA	HVE17IAB HVE17AAB	Control signal cable: LMACK02D Single phase EMC Pack: D2-EMC1 or D2-EMC3 3 phase EMC Pack: D2-EMC2 Common mode filter MF-CM-S DC reactor B86732G15L712
	with brake		HVPS06AA		
1000W	without brake	Straight type	HVPM04BA	HVE17IBB(Straight type) HVE17ABB(Straight type) HVE17ICB(L-type) HVE17ACB(L-type)	
		L-type	HVPM04CA		
	with brake	Straight type	HVPM06BA		
		L-type	HVPM06CA		
2000W	without brake	Straight type	HVPM04BB	HVE17IBB(Straight type) HVE17ABB(Straight type) HVE17ICB(L-type) HVE17ACB(L-type)	
		L-type	HVPM04CB		
	with brake	Straight type	HVPM06BB		
		L-type	HVPM06CB		

Note Straight type : straight waterproof connector

L-type : waterproof connector

D2T Drive

D2-PPN01B

D1N-CNN02A

AC Servo Motor

D1N-PNN03A

Singel Axis Robot

D2-PPN08A

5.1 AC50W~AC750W－17bit incremental encoder

Motor				Drive		Power capacity (Rated load)
Motor Series		Power supply	Output (W)	Part No. (Note 1)	Part No. (Standard interface)	Frame	

Motor Series		Power supply	Output (W)	Part No. (Note 1)	Part No. (Standard interface)	Frame	Power capacity (Rated load)
Low Inertia	FRLS	single phase/ three phase 220V	50	FRLS05206A4Δ	D2T-0123-S-A4	Frame A	Approx. 0.4kVA
				FRLS052B6A4Δ			
			100	FRLS10206A4Δ			
				FRLS102B6A4Δ			
			200	FRLS2020606Δ	D2T-0423-S-B4	Frame B	Approx. 0.9kVA
				FRLS202B606Δ			
			400	FRLS4020606Δ			
				FRLS402B606Δ			
Middle inertia	FRMS		50	FRMS0520604Δ	D2T-0123-S-A4	Frame A	Approx. 0.4KVA
				FRMS052B604Δ			
			100	FRMS1020604Δ			
				FRMS102B604Δ			
			400	FRMS4B20606Δ	D2T-0423-S-B4	Frame B	Approx. 0.9KVA
				FRMS4B2B606Δ			
			750	FRMS7520608Δ	D2T-1023-S-C4	Frame C	Approx. 1.8KVA
				FRMS752B608Δ			

Note1 Δ：Shaft End & Oil Seal Specification (Please refer to P.9)

Note2 EMC pack model (please refer to P.35)

■ Motor cable / without brake

HVPS04AA □□□ B

Cable length

3M...............................=03M
5M...............................=05M
7M...............................=07M
10M...........................=10M

Cable type

Highly flexible ....= B

■ Motor cable and brake cable
/ with brake

HVPS06AA □□□ B

Cable length

3M...............................=03M
5M...............................=05M
7M...............................=07M
10M...........................=10M

Cable type

Highly flexible ....= B

Note For more information about cables, please refer to P.49-P.55

Optional parts						
Motor cable		Encoder cable	D2T drive accessories			
without brake	with brake	17bit incremental	Control Signal Cable	Single phase EMC Pack (Note 2)	Three phase EMC Pack (Note 2)	External Regenerative Resistor
HVPS04AA☐☐☐B	HVPS06AA☐☐☐B	HVE17IAB☐☐☐B	LMACK02D	D2T-EMC1	D2T-EMC2	N/A
						RG1
				D2T-EMC3		RG2

■ Encoder cable / 17bit incremental

HVE17IAB ☐☐☐ B

Cable length

3M	=03M
5M	=05M
7M	=07M
10M	=10M

Cable type

Highly flexible ....= B

5.2 AC1000W/AC2000W－17bit incremental encoder

Motor				Drive		
Motor Series		Power supply	Output (W)	Part No. (Note 1)	Part No. (Standard interface)	Frame	Power capacity (Rated load)
Middle inertia	FRMM	single phase/ three phase 220V	1000	FRMM1K20613Δ	D2T-1023-S-C4	Frame C	Approx. 1.8kVA
				FRMM1K2B613Δ			
		three phase 220V	2000	FRMM2K20613Δ	D2T-2032-S-D4	Frame D	Approx. 3.5kVA
				FRMM2K2B613Δ			

Note1 Δ：Shaft End & Oil Seal Specification (Please refer to P.9)

Note2 EMC pack model (please refer to P.35)

■ **Motor cable** / without brake

HVPM04☐ A ☐☐☐ B

Motor side connector

Straight Type ....=B
L-Shaped Type ....=C

Drive side connector

Open cable ends ....=A
R-type terminals ....=B

Cable length

3M....................................... =03M
5M....................................... =05M
7M....................................... =07M
10M..................................... =10M

Cable type

Highly flexible .... = B

Note For more information about cables, please refer to P.49-P.55

■ **Motor cable and brake cable**
/ with brake

HVPM06☐ A ☐☐☐ B

Motor side connector

Straight Type ....=B
L-Shaped Type ....=C

Drive side connector

Open cable ends ....=A
R-type terminals ....=B

Cable length

3M....................................... =03M
5M....................................... =05M
7M....................................... =07M
10M..................................... =10M

Cable type

Highly flexible .... = B

Note Medium capacity motor brake power cables are packaged.

Item number HVPM06:

Contains one motor cable and brake cable labeled with HVPM04 and HVPM02.

Optional parts						
Motor cable		Encoder cable	D2T drive accessories			
without brake	with brake	17bit incremental	Control Signal Cable	Single phase EMC Pack (Note 2)	Three phase EMC Pack (Note 2)	External Regenerative Resistor
HVPM04☐A☐☐☐B	HVPM06☐A☐☐☐B	HVE17I☐B☐☐☐B	LMACK02D	D2T-EMC3	D2T-EMC2	RG2
HVPM04☐B☐☐☐B	HVPM06☐B☐☐☐B					

■ **Encoder cable** / 17bit incremental

HVE17I☐B☐☐☐ B

Motor side connector

Straight Type ....=B
L-Shaped Type ....=C

Cable length

3M...=03M
5M...=05M
7M...=07M
10M......................................=10M

Cable type

Highly flexible ....= B

5.3 AC50W~AC750W－17bit absolute encoder

Motor				Drive		Power capacity (Rated load)
Motor Series		Power supply	Output (W)	Part No. (Note 1)	Part No. (Standard interface)	Frame
Low Inertia	FRLS	single phase/ three phase 220V	50	FRLS05204A4Δ	D2T-0123-S-A5	Frame A	Approx. 0.4KVA
				FRLS052B4A4Δ			
			100	FRLS10204A4Δ			
				FRLS102B4A4Δ			
			200	FRLS2020406Δ	D2T-0423-S-B5	Frame B	Approx. 0.9kVA
				FRLS202B406Δ			
			400	FRLS4020406Δ			
				FRLS402B406Δ			
Middle inertia	FRMS		50	FRMS0520404Δ	D2T-0123-S-A5	Frame A	Approx. 0.4KVA
				FRMS052B404Δ			
			100	FRMS1020404Δ			
				FRMS102B404Δ			
			400	FRMS4B20406Δ	D2T-0423-S-B5	Frame B	Approx. 0.9KVA
				FRMS4B2B406Δ			
			750	FRMS7520408Δ	D2T-1023-S-C5	Frame C	Approx. 1.8KVA
				FRMS752B408Δ			

Note1 Δ：Shaft End & Oil Seal Specification (Please refer to P.9)

Note2 EMC pack model (please refer to P.35)

■ **Motor cable** / without brake

HVPS04AA ☐☐☐ **B**

Cable length

3M............................... =03M
5M............................... =05M
7M............................... =07M
10M............................. =10M

Cable type

Highly flexible .... = B

■ **Motor cable and brake cable** / with brake

HVPS06AA ☐☐☐ **B**

Cable length

3M............................... =03M
5M............................... =05M
7M............................... =07M
10M............................. =10M

Cable type

Highly flexible .... = B

Note For more information about cables, please refer to P.49-P.55

Optional parts						
Motor cable		Encoder cable	D2T drive accessories			
without brake	with brake	17bit absolute	Control Signal Cable	Single phase EMC Pack (Note 2)	Three phase EMC Pack (Note 2)	External Regenerative Resistor
						N/A
				D2T-EMC1		RG1
HVPS04AA☐☐☐B	HVPS06AA☐☐☐B	HVE17AAB☐☐☐B	LMACK02D		D2T-EMC2	
				D2T-EMC3		RG2

■ Encoder cable / 17bit absolute

HVE17AAB ☐☐☐ B

Cable length

3M...............................=03M
5M...............................=05M
7M...............................=07M
10M.............................=10M

Cable type

Highly flexible ....= B

5.4 AC1000W/AC2000W－17bit absolute encoder

Motor				Drive		
Motor Series	Power supply	Output (W)	Part No. (Note 1)	Part No. (Standard interface)	Frame	Power capacity (Rated load)
Middle inertia	FRMM	single phase/ three phase 220V	1000	FRMM1K20413Δ	D2T-1023-S-C5	Frame C	Approx. 1.8kVA
				FRMM1K2B413Δ			
		three phase 220V	2000	FRMM2K20413Δ	D2T-2032-S-D5	Frame D	Approx. 3.5kVA
				FRMM2K2B413Δ			

Note1 Δ : Shaft End & Oil Seal Specification (Please refer to P.9)

Note2 EMC pack model (please refer to P.35)

■ Motor cable / without brake

HVPM04☐ A ☐☐☐ B

Motor side connector

Straight Type ....=B
L-Shaped Type ....=C

Drive side connector

Open cable ends .... =A
R-type terminals .... =B

Cable length

3M..................................... =03M
5M..................................... =05M
7M..................................... =07M
10M.................................... =10M

Cable type

Highly flexible .... = B

Note For more information about cables, please refer to P.49-P.55

■ Motor cable and brake cable / with brake

HVPM06☐ A ☐☐☐ B

Motor side connector

Straight Type ....=B
L-Shaped Type ....=C

Drive side connector

Open cable ends .... =A
R-type terminals .... =B

Cable length

3M..................................... =03M
5M..................................... =05M
7M..................................... =07M
10M.................................... =10M

Cable type

Highly flexible .... = B

Note Medium capacity motor brake power cables are packaged.

Item number HVPM06:

Contains one motor cable and brake cable labeled with HVPM04 and HVPM02.

Optional parts						
Motor cable		Encoder cable	D2T drive accessories			
without brake	with brake	17bit absolute	Control Signal Cable	Single phase EMC Pack (Note 2)	Three phase EMC Pack (Note 2)	External Regenerative Resistor
HVPM04□A□□□B	HVPM06□A□□□B	HVE17A□B□□□B	LMACK02D	D2T-EMC3	D2T-EMC2	RG2
HVPM04□B□□□B	HVPM06□B□□□B					

■ Encoder cable / 17bit absolute

HVE17A□B□□□ B

Motor side connector

Straight Type ....=B
L-Shaped Type ....=C

Cable length

3M.......................................=03M
5M.......................................=05M
7M.......................................=07M
10M....................................=10M

Cable type

Highly flexible .... = B

6. Servo Drive

6.1 Servo drive with standard interface

■ **Specifications**

Input power	220V	Main power	Frame A~C	Single/three-phase, 200 to 240V 50/60Hz
			Frame D	Three-phase,200-240 Vac 50/60Hz
		Control power	Frame A~D	Single phase, 200 to 240V 50/60Hz
Environment		Temperature		Operation Temperature: 0℃~45℃ (If temperature is higher than 45℃, ventilation is needed) Storage Temperature: -20℃~65℃
		Humidity		0 to 90%RH (no frost)
		Altitude		Under 1000 Meters
		Vibration		1G (10 to 500Hz)
Control method				IGBT PWM space vector control
Encoder feedback				17bit incremental Dual loop (Full closed loop) and 17bit absolute
I/O signal connector		Control signal	Input	General purpose 9 inputs (D2T:10)
			Output	General purpose 4 outputs (D2T:5)
		Analog signal	Input	1 input (12bit A/D)
			Output	2 outputs (Analog monitor-under construction)
		Pulse signal	Input	2 inputs (Low speed channel, High speed channel)
			Output	4 outputs (Line drive: 3output, open collector: 1 output)
Brake connector		Control signal	Output	Direct brake connection. (no need of extra relay for brake) Also programmable for general purpose output
Communication function			USB	Connection with PC, 115200bps
Front panel				Dot matrix 2*8 characters LCD with 4 buttons LED(green, red)
Regenerative function			Frame A-C	Need external connection, no internal regenerative resistor
			Frame D	Built in or external regenerative resistor (option), 13Ω±5%, continue power 120W, Peak power 600W
Control mode				Switching among the following modes is possible (1)Position control (2)Velocity control (3)Torque control (4)Position/Velocity control (5)Position/Torque control (6)Velocity/Torque control
Dynamic brake			Frame A-C	N/A
			Frame D	Built in line resistance: 2.6 Ω ± 5%, continuous power: 120 W, peak power: 600 W

■ Functions

Position control	**Control input**		(1)Axis enable; (2)Left and right limit switch; (3)Home OK, start err. map; (4)Reset amplifier; (5)Near home sensor; (6)Clear error; (7)Switch to secondary CG and vpg; (8)Inhibit pulse command; (9)Switch HI/LO pulse input; (10)Abort motion; (11)Switch to secondary mode; (12)Start homing; (13)Electronic gear select (DIV1/DIV2)
	Control output		(1)Brake; (2)Servo ready; (3)Axis disable; (4)In-position; (5)Moving; (6)Homed; (7)Emulated index; (8)Zero speed detected; (9)Errors
	Pulse input	**Max. command pulse frequency**	Dedicated interface for Photo-coupler(single end input): 500kpps Dedicated interface for line drive(differential input): 4Mpps(16M cnt/s with AqB)
		Input pulse signal format	(1)Pulse and Direction (2)Pulse Up/Pulse Down (3)Quadrature(AqB)
		Electronic gear (Division/ Multiplication of command pulse)	Gear ratio : pulses/counts pulses : 1~2, 147, 483, 647 counts : 1~2, 147, 483, 647
		Smoothing filter	Smooth factor : 1~500 (0: no smoothing filter)
	Vibration suppression filter(VSF)		VSF can remove the vibration frequency that occurs during movement. It can reduce the vibration caused by the system's structure and improve the machine's productivity.
Velocity control	**Control input**		(1)Axis enable; (2)Left and right limit switch; (3)Home OK, start err. map; (4)Reset amplifier; (5)Near home sensor; (6)Clear error; (7)Invert V command; (8)Switch to secondary CG and vpg; (9)Zero speed clamp; (10)Abort motion; (11)Switch to secondary mode
	Control output		(1)Brake; (2)Servo ready; (3)Axis disable; (4)In-position; (5)Moving; (6)Homed; (7)Emulated index; (8)Zero speed detected; (9)Errors
	PWM input	**Velocity command input**	Speed command input can be provided by means of duty cycle of PWM input. Parameter are used for scale setting and command polarity.
	Analog Input	**Velocity command input**	Speed instruction can be set with analog voltage method, parameters can set ratio and direction +/-10V
	Zero speed clamp		Zero speed clamp input is possible.
Torque control	**Control input**		(1)Axis enable; (2)Left and right limit switch; (3)Home OK, start err. map; (4)Reset amplifier; (5)Near home sensor; (6)Clear error; (7)Invert V command; (8)Switch to secondary CG and vpg; (9)Switch to secondary mode
	Control output		(1)Brake; (2)Servo ready; (3)Axis disable; (4)In-position; (5)Moving; (6)Homed; (7)Emulated index; (8)Zero speed detected; (9)Errors
	PWM input	**Torque command input**	Torque command input can be provided by means of duty cycle of PWM input. Parameter are used for scale setting and command polarity.
	Analog Input	**Torque command input**	Torque command input can be provided by means of analog voltage. Parameter are used for scale setting and command polarity.
	Speed limit function		Speed limit value with parameter is possible
Common	**ZeroTune**		ZeroTune can find the proper gains by clicking one button on LCD when the motor is disable.
	Emulated encoder feedback output		Set up of any value is possible (frequency up to 18M cnt/s, only frame D drive up to 9M cnt/s)
	Protective function		(1)Motor short detection; (2)Over voltage; (3)Position error too big; (4)Encoder error; (5)Soft thermal threshold reached; (6)Motor maybe disconnect; (7)Amplifier over temperature; (8)Under voltage; (9)5V for encoder card fail; (10)Phase init. error; (11)Serial encoder communication error; (12)Hall sensor error; (13)Current control error; (14)Hybrid deviation too big; (15)HFLT inconsistent error; (16)Incompatible motor model for drive; (17)DC bus voltage abnormal; (18)EtherCAT interface disconnected
	Error log		Errors and warnings are saved in non-volatile memory
	Error Mapping		Method: Established compensation table to compensate encoder error by linear interpolation
			Samples: Maximum 5,000 point
			Storage: Flash ROM, Disc file
			Unit: count
			Activation: Activated internally by home complete, or activated externally by input signal
	Others		Friction compensation, Backlash compensation

6.2 Wiring diagram

■ Single-phase

Recommended models: FN2090-6-06 filter	
Maximum continuous operating voltage	250VAC, 50/60Hz
Operating Frequency	DC to 400Hz
Rated Current	6A@40℃
Surge pulse protection	2kV, IEC 61000-4-5
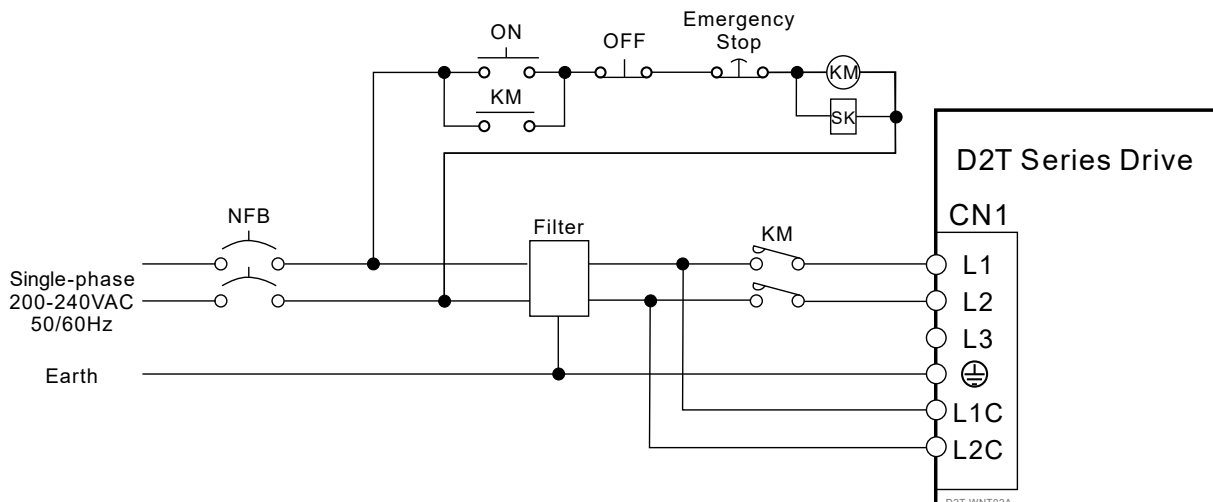
■ Three-phase

Recommended models: FN3025L-20-71 filter	
Maximum continuous operating voltage	3x520/300 VAC
Operating Frequency	DC to 400Hz
Rated Current	20A@50℃

D2T-WNT03A
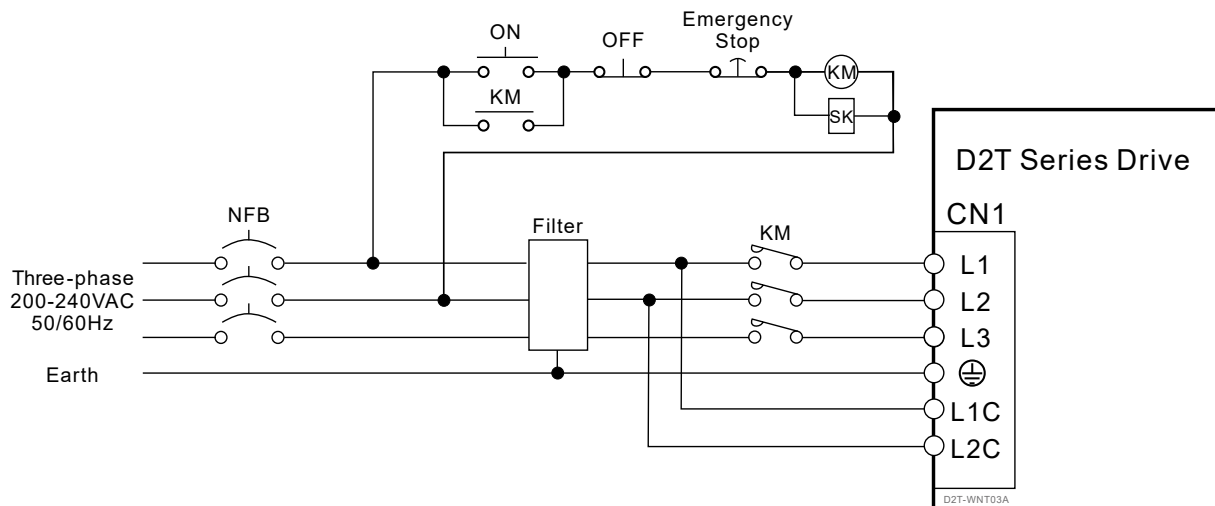
6.3 Control circuit

■ Wiring Example of Position Control Mode
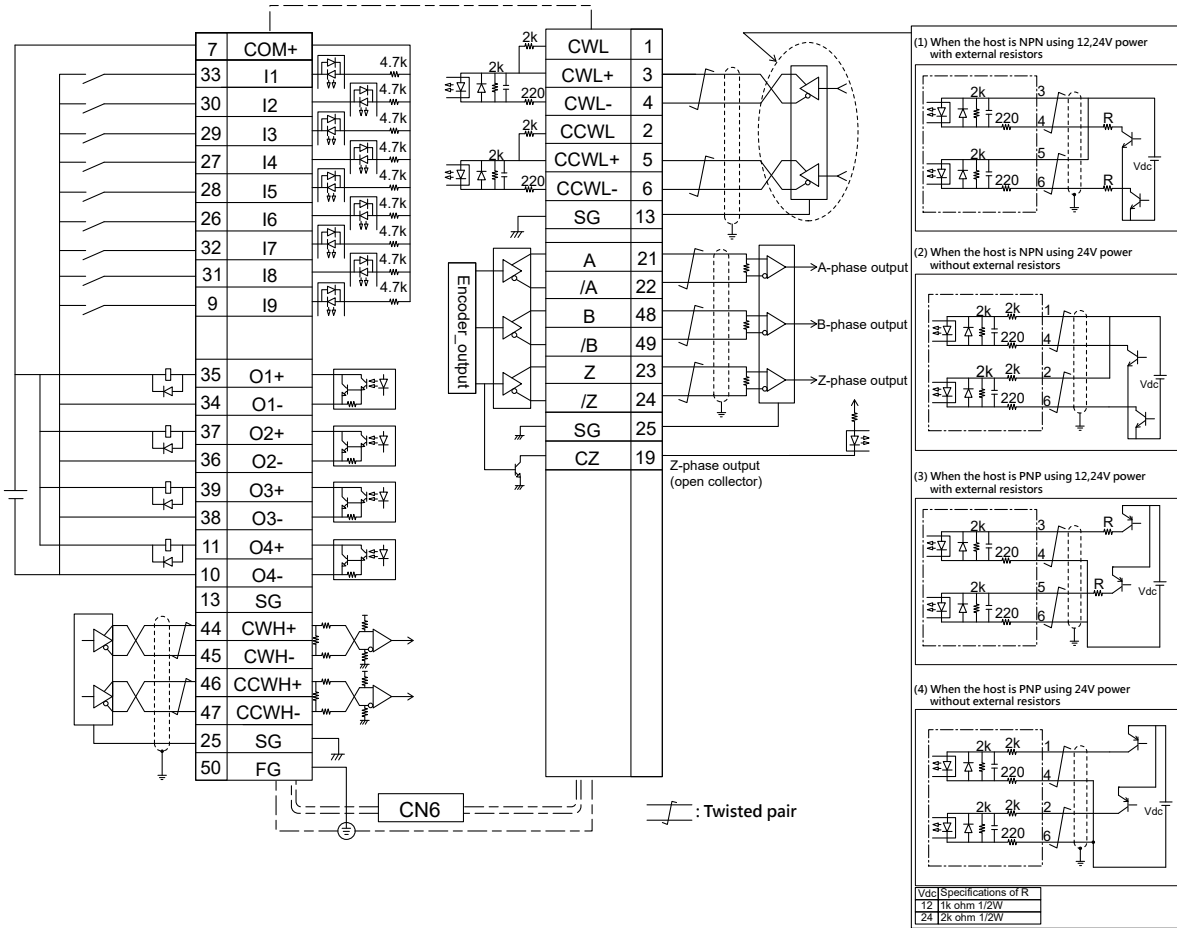
Wiring Example of Velocity/Torque Control Mode

7	COM+
33	I1	4.7k
30	I2	4.7k
29	I3	4.7k
27	I4	4.7k
28	I5	4.7k
26	I6	4.7k
32	I7	4.7k
31	I8	4.7k
9	I9	4.7k

35	O1+
34	O1-
37	O2+
36	O2-
39	O3+
38	O3-
11	O4+
10	O4-
13	SG

| 25 | SG |
| 50 | FG |

Encoder_output

A	21	A-phase output
/A	22	
B	48	B-phase output
/B	49	
Z	23	Z-phase output
/Z	24	
SG	25	
CZ	19	Z-phase output (open collector)
ADC0+	14	Voltage Iutput (+/-10V)
ADC0-	15	

CN6

⌐⌐ : Twisted pair

D2T-ENT18B
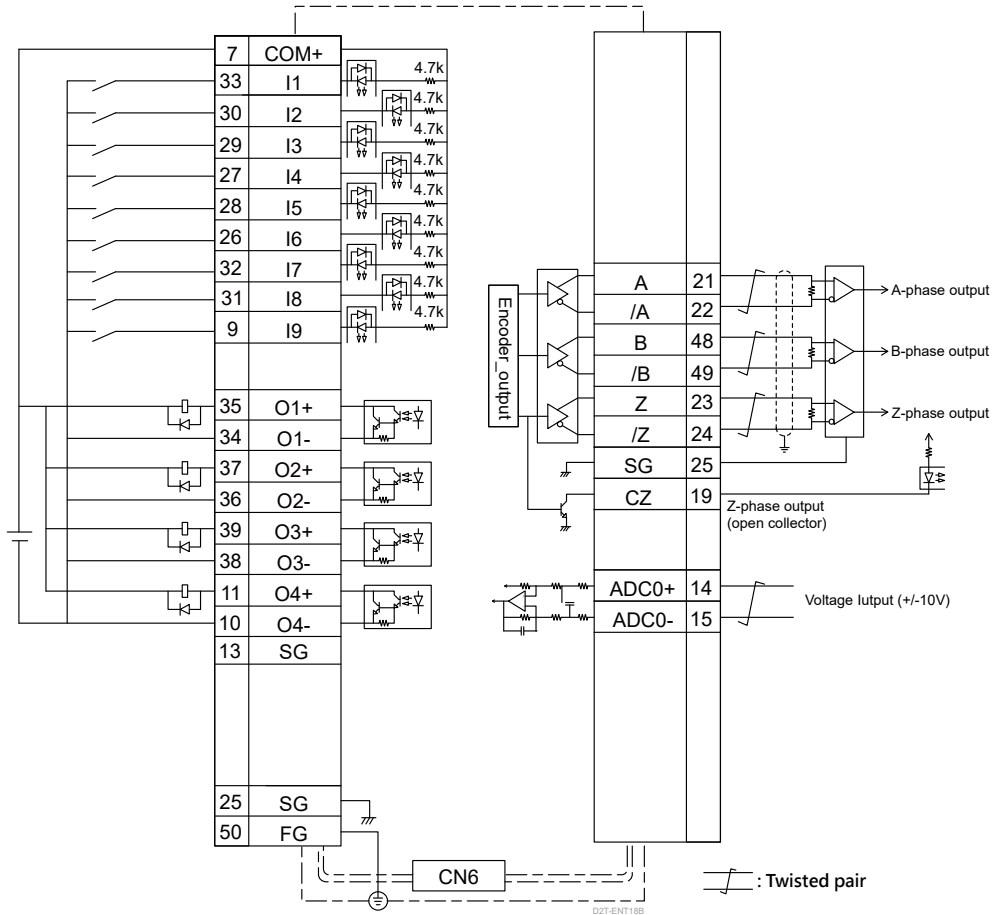
Additional I/O pins (Only for D2T drive)

7	COM+	4.7k
8	I10	
40	O5+	
12	O5-	

CN6

D2T-ENT19A
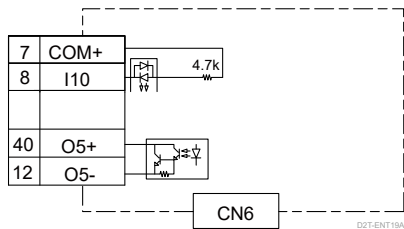
6.4 Dimensions of drive

■ Frame A (DT2x-01xx-S(T)-Ax)

135.5
5
44

(3.5)
7 31±0.1
169
162±0.1
3.5
(38)
6
2-Ø4.2

180
60
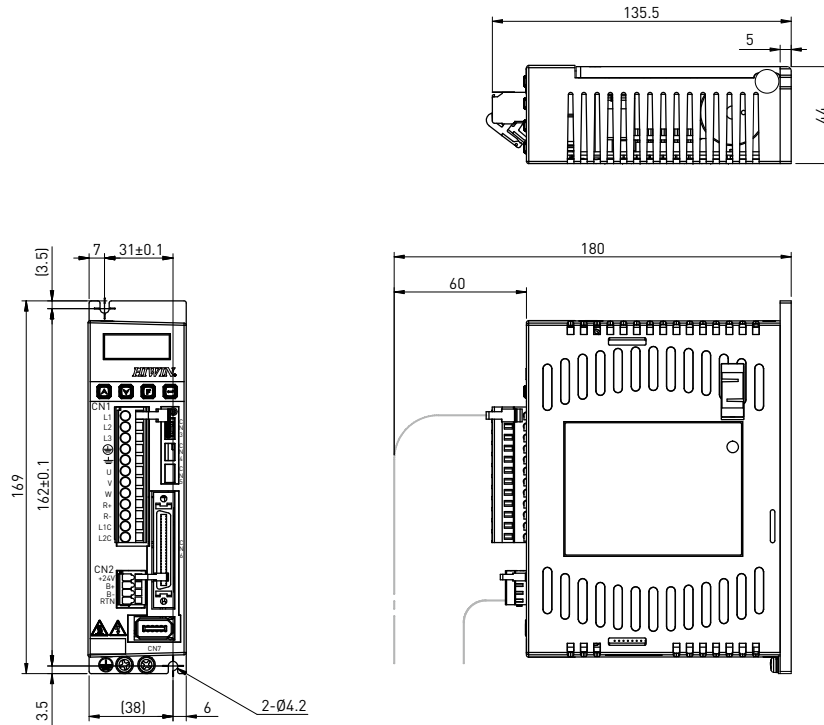
Unit:mm
D2T-DNN01B

■ Frame B (D2Tx-04xx-S(T)-Bx)

135.5
5
52.8

(3.5)
5 41.8±0.1
159.5
152.5±0.1
3.5
(46.8)
2-Ø4.2

180
60
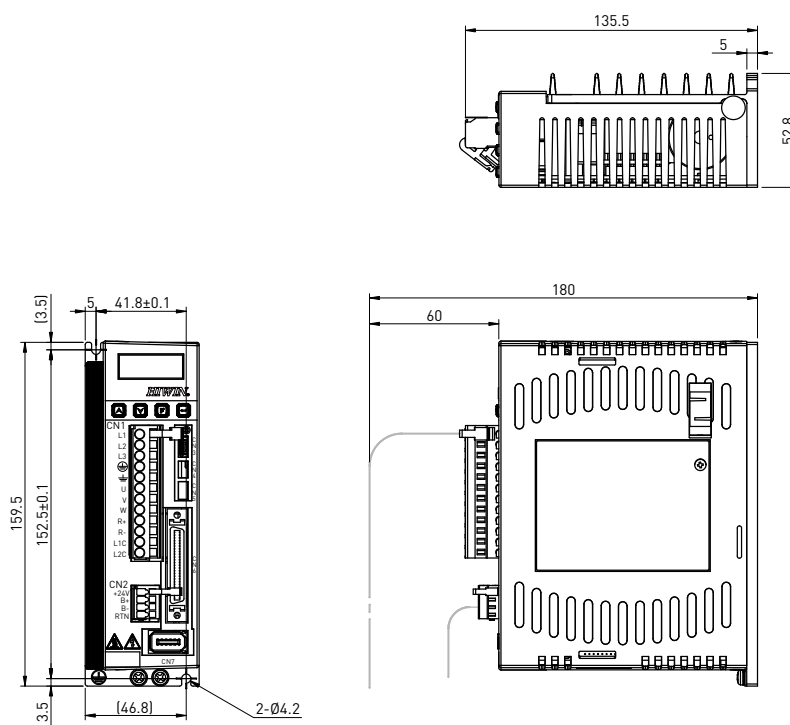
Unit:mm
D2T-DNN02B

■ Frame C (D2Tx-10xx-S(T)-Cx)

180

66

(4) 6.5 28±0.1

173.5
165.5±0.1

CN1
L1
L2
L3

U
V
W
R+
R-
L1C
L2C

CN2
+24V
B+
B-
RTN

CN7

4

47

4-Ø4.4

227

60

1.5
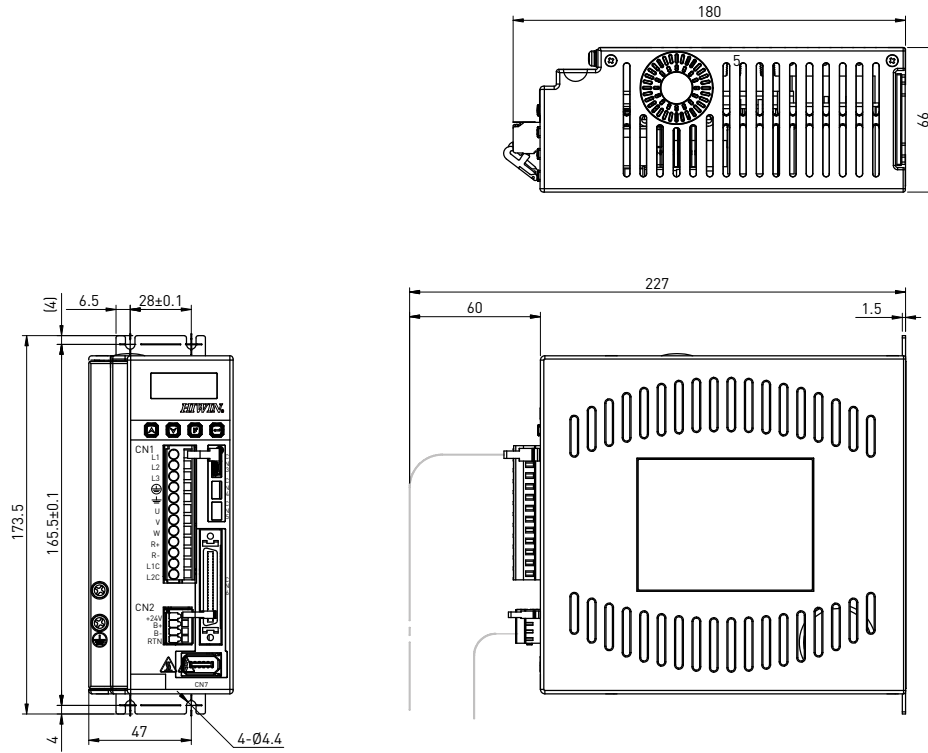
Unit:mm
D2T-DNN03B

■ Frame D (D2Tx-20xx-S(T)-Dx)

209

5

90

45 (39)

3-Ø6

(6)

168
156±0.2

CN1
CHARGE
STAT
L1
L2
L3
L1C
L2C
B1
B2
B3

CN2
U
V
W

6
6

78±0.2

255

60
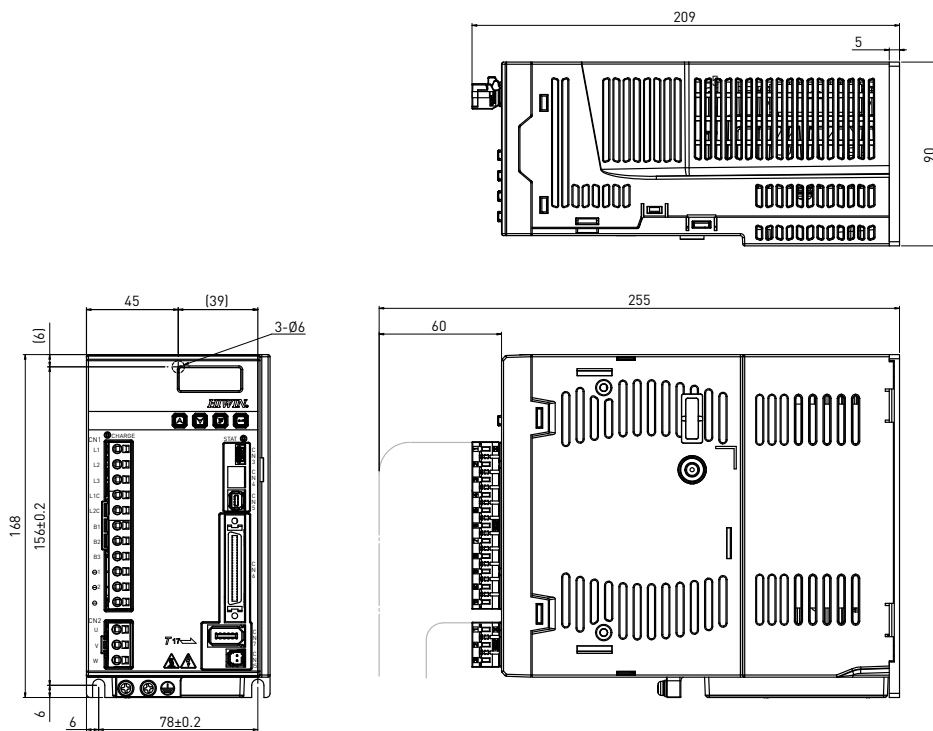
Unit:mm
D2T-DNN52A

■ Frame A (D2Tx-01xx-E(Note)-Ax)

135.5
5
64.5

7 31±0.1
(3.5)
169
162±0.1
3.5
(38)
2-Ø4.2

CN1
L1
L2
L3
U
V
W
R+
R-
L1C
L2C

CN2
+24V
B-
B-
RTN

CN7

180
60
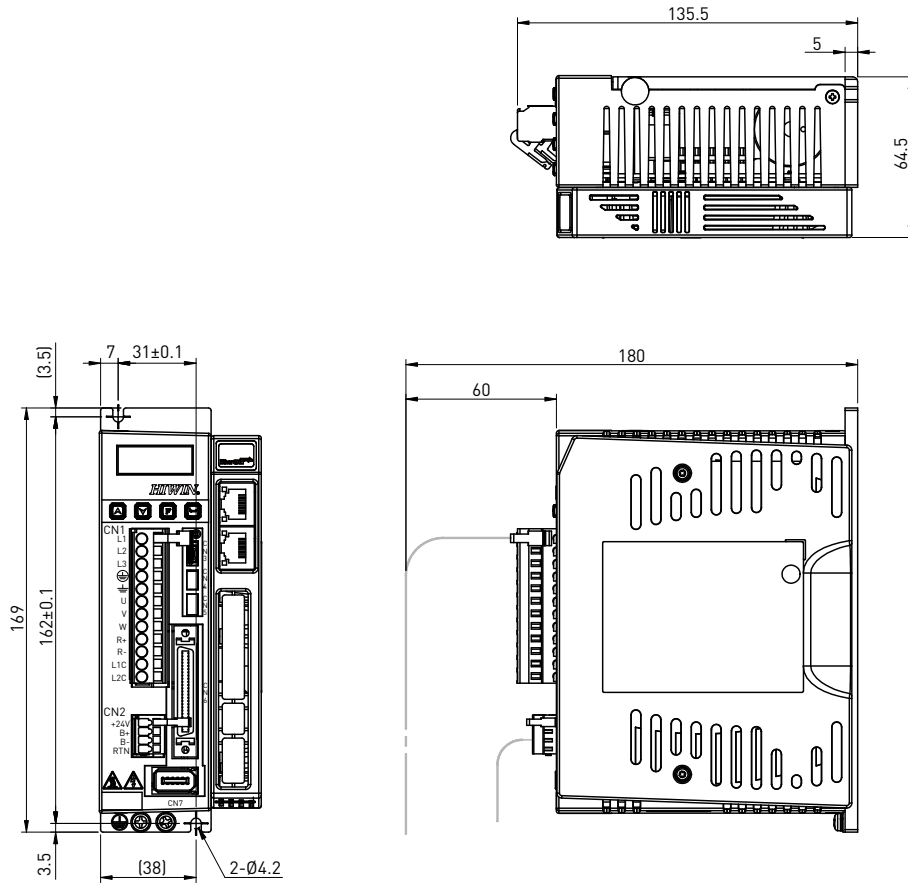
Unit:mm
D2T-DNN49B

■ Frame B (D2Tx-04xx-E(Note)-Bx)

135.5
5
72.8

5 41.8±0.1
(3.5)
159.5
152.5±0.1
3.5
(46.8)
2-Ø4.2

CN1
L1
L2
L3
U
V
W
R+
R-
L1C
L2C

CN2
+24V
B-
B-
RTN

CN7

180
60
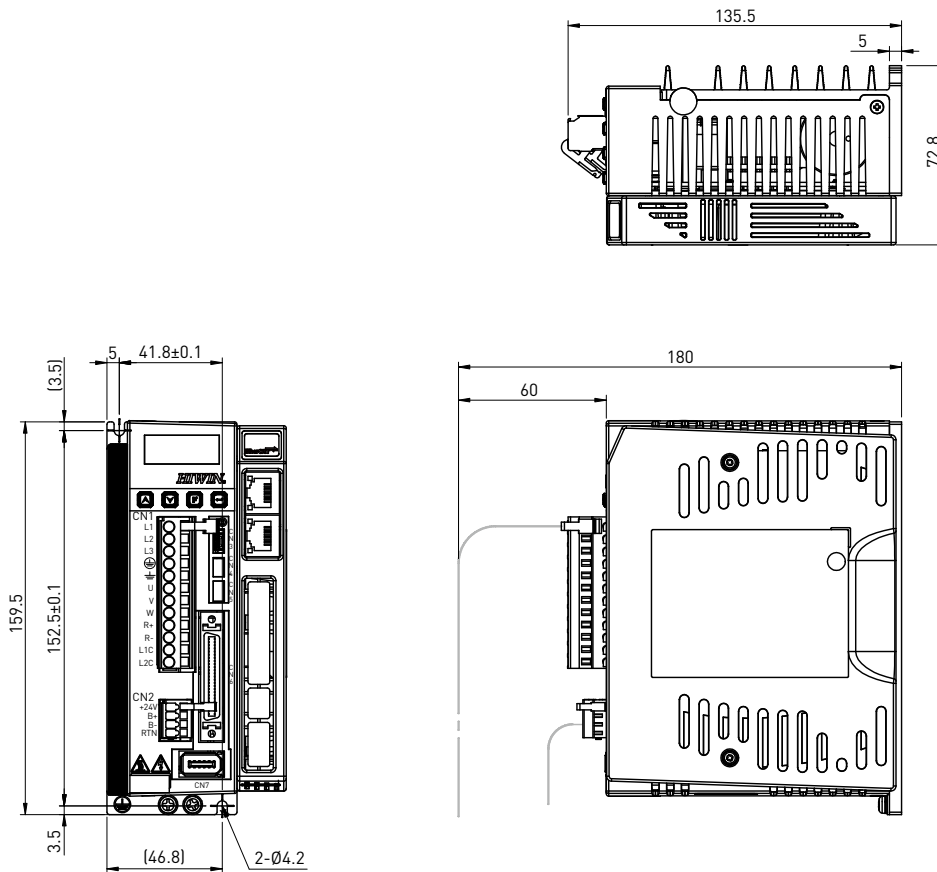
Unit:mm
D2T-DNN50B

■ Frame C (D2Tx-10xx-E(Note)-Cx)

181
86
5

(4)
6.5
28±0.1
173.5
165.5±0.1
CN1
L1
L2
L3
U
V
W
R+
R-
L1C
L2C
CN2
+24V
B+
B-
RTN
CN7
4
47
4-Ø4.2

227
60
1.5
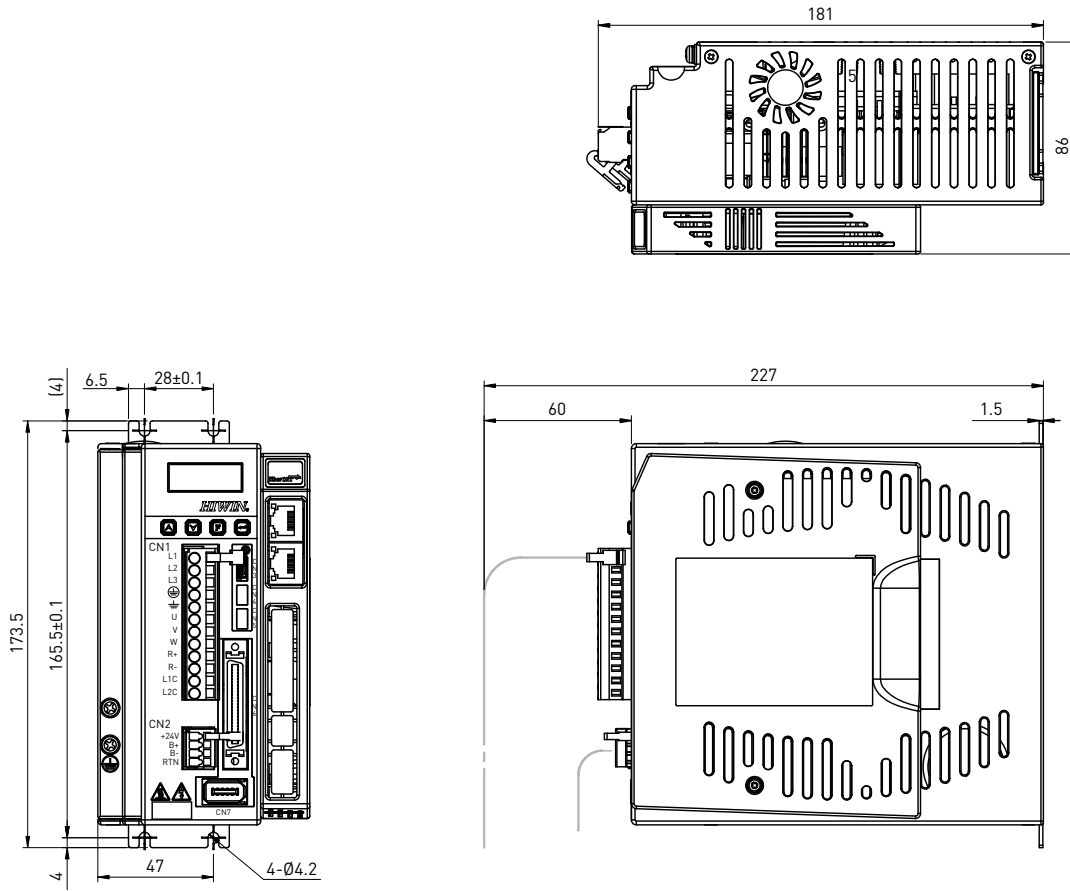
Unit:mm
D2T-DNN51B

■ Frame D (D2Tx-20xx-E(Note)-Dx)

209
5
105

45
(39)
3-Ø6
(6)
CN1 CHARGE
L1
L2
L3
L1C
L2C
B1
B2
B3
CN2
U
V
W
STAT
168
156±0.2
6
6
78±0.2

255
60
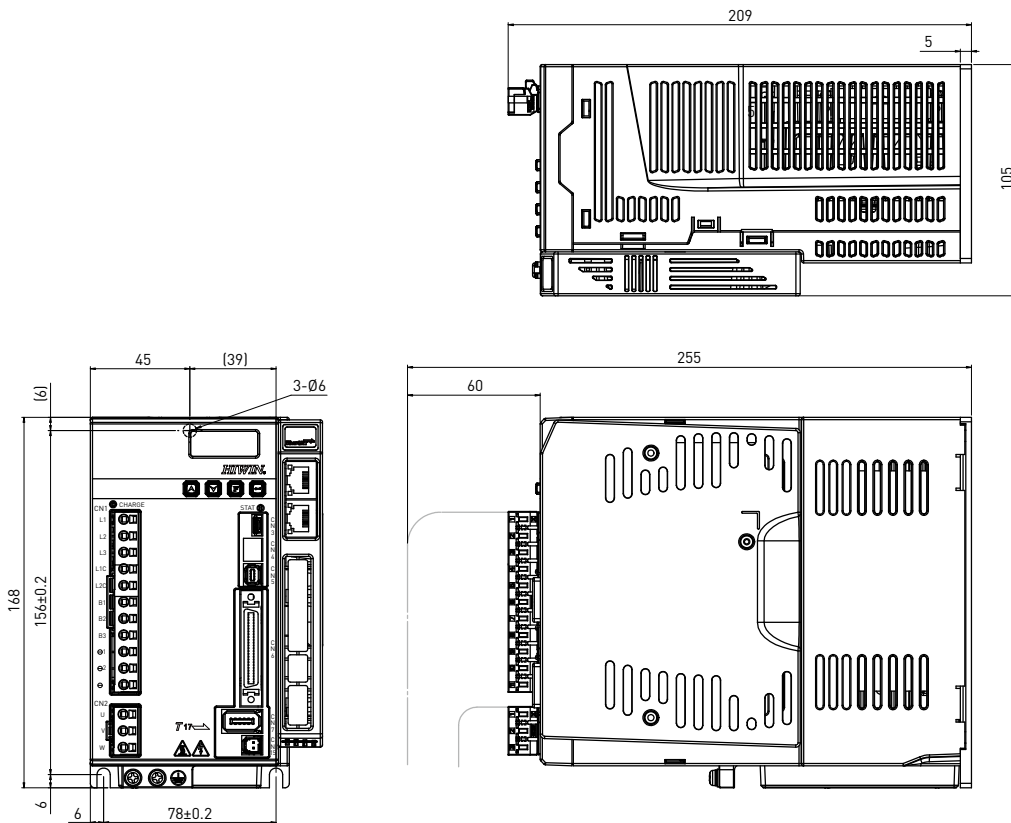
Note Interface E/F/K/U are plug-in module

Unit:mm
D2T-DNN53A

6.5 Drive peripheral kits

■ Connector Kit

Part Name	Model		Description	Quantity
Frame A-C	D2-CK3	CN1	Main power, motor power, regenerative resistor and control power connector / 12pins, pitch5mm (051500400249)	1
		CN2	Brake connector: 4pins, pitch 3.5mm (051500400285)	1
		CN6	Control signal connector: 50 pins welded type(051500100127)	1
		CN1	Connector fixture tool (051800400035)	1
		CN2	Connector fixture tool (051800400066)	1
Frame D	D2-CK5	CN1	Connectors of AC power, drive control power, regenerative resistor, and DC reactor. 11 pins, TE 1-2229794-1-PT1.	1
		CN2	Motor power connector. 3 pins,TE 3-22297894-1.	1
		CN5	Safety function connector. TE 1971153-1.	1
		CN6	Control signal connector. 50 pins welded type, EUMAX XDR-10350AS.	1
		CN1 CN2	Connector fixture tools: TE 1981045-1.	2

■ EMC Accessory Kit

Part Name	Model	Description	Quantity
D2 EMC accessory kit for single phase	D2-EMC1 (051800200074)	Single phase filter FN2090-6-06 for 50W to 400W (Rated current:6A, leakage current: 0.67mA)	1
		EMI core KCF-130-B	2
	D2-EMC3 (051800200077)	Single phase filter FN2090-10-06 for 750W and 1000W (Rated current:10A, leakage current: 0.67mA)	1
		EMI magnet rings KCF-130-B	2
D2 EMC accessory kit for three phase	D2-EMC2 (051800200075)	Three phase filter FN3025HL-20-71 (Rated current:20A, leakage current:0.4mA)	1
		EMI magnet rings KCF-130-B	2
	D2-EMC4 (051800200078)	Three phase filter B84743C0035R166 (Rated current:35A, leakage current: <0.5mA)	1
		EMI magnet rings KCF-130-B	2

The EMI magnetic ring has the function of reducing interference, which can be used for the main power cables, motor power cables, encoder cables or pulse control cables.

⚠ 1. The noise filter of some models has a larger leakage current. In addition, the leakage current will also increase due to grounding conditions. When using leakage current detectors and leakage circuit breakers, please take grounding conditions and the leakage current of the noise filter into consideration for the selection. Please contact the noise filter manufacturer for more details.
2. The filter can be connected to multi-axis drives as long as it does not exceed the rated current load.

■ Regenerative Resistor

Part Name	Model	Description	L1	L2	W	H	L
Regenerative resistor	RG1	68Ω Rated power 100W Peak power 500W (050100700001)	165 ± 2	150 ± 2	40 ± 0.5	40 ± 0.5	500
	RG2	120Ω Rated power 300W Peak power 1500W (050100700009)	215 ± 2	200 ± 2	60 ± 0.5	30 ± 0.5	500

(Unit:mm)

D2T-DNN04A

7. Servo Motor

7.1 Motor specifications and application environment

Motor			Rated output (W)	Voltage	Rated speed (No-load maximum speed) (rpm)	Encoder	IP level	Application	Environment
Low Inertia	FRLS	D2T-PPN02A	50W	220V	3000 (4500)	17bit	IP65	Semiconductor Equipment Packaging Machine SMT Machine Food industry machine LCD equipment	■ Storage condition - Indoor illumination - Keep away from following environment a. corrosive gases b. flammable gas c. grease and dirt ■ Application temperature 0 °C ~ 40 °C ■ Storage Temperature -15 °C ~ 70 °C ■ Humidity 80% RH or less ■ Storage humidity 80% RH or less ■ Elevation above sea level 1000m under ■ Vibration resistance 49m/s^2 or less
		D2T-PPN03A	100W						
		D2T-PPN04A	200W						
		D2T-PPN05A	400W						

	Motor		Rated output (W)	Voltage	Rated speed (No-load maximum speed) (rpm)	Encoder	IP level	Application	Environment
Middle inertia	FRMS		50W	220V	3000 (4500)	17bit	IP65	Semiconductor Equipment Packaging Machine SMT Machine Food industry machine LCD equipment	■ Storage condition - Indoor illumination - Keep away from following environment a. corrosive gases b. flammable gas c. grease and dirt ■ Application temperature 0 ° C ~ 40 ° C ■ Storage Temperature -15 ° C ~ 70 ° C ■ Humidity 80% RH or less ■ Storage humidity 80% RH or less ■ Elevation above sea level 1000m under ■ Vibration resistance 49m/s^2 or less
			100W						
			400W						
		D2-PPN06A	750W			17bit			
	FRMM	D2-PPN07A	1000W	220V	2000 (3000)	17bit		Machine Tools Conveyor Equipment Textile Machine Mechanical arm	
		D2-PPN11A	2000W			17bit			

7.2 Low inertia, Small capacity

7.2.1 50W
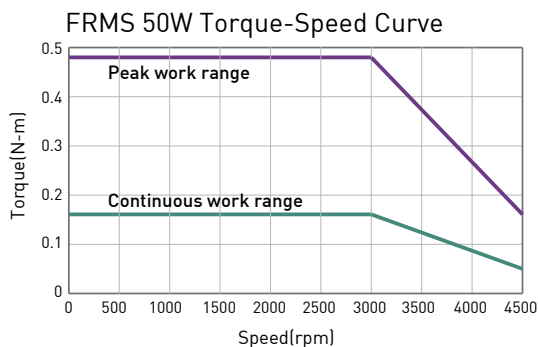
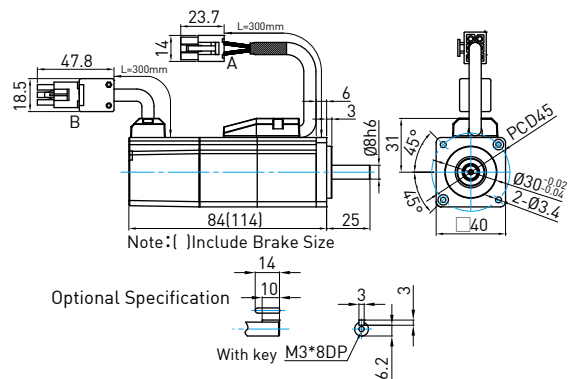| Parameter	Symbol	Unit	FRLS052□□A4□
Drive Input Voltage	V	V	AC220
Rated Power	W	W	50
Rated Torque	Tc	N.m	0.16
Rated Current	Ic	A(rms)	0.9
Peak Max. Torque	Tp	N.m	0.48
Peak Max. Current	Ip	A(rms)	2.7
Rated Speed	ωc	rpm	3000
Max. Speed	ωp	rpm	4500
Torque Constant	Kt	N.m / Arms	0.178
Back EMF Constant	Ke	Vrms / krpm	10.74
Resistance (line to line)	R	Ω	4.7
Inductance (line to line)	L	mH	4.7
Inertia of Rotating Parts (with brake)	J	kg-m^2(×10^{-4})	0.02(0.022)
Weight (with brake)	M	kg	0.45(0.58)
Motor Insulation Grade			Class A (UL)
Motor protect			Total enclosed, self-cooled, IP65 (Except for shaft and connector)
Insulation resistance			10MΩ, DC500V
Insulation voltage resistance			AC1500V, 60 second
Brake specifications (Note)			
Static friction torque (Minimum)	Tb	N.m	0.3
Magnetizing current	Ab	A	0.25A
Brake input voltage	V	V	DC24±10%
Suction time (Maximum)	to	ms	30
Release time (Maximum)	tr	ms	20

Note: Brake is used to keep the object stopped. Do not apply it to deceleration, dynamic braking or emergency stop. The engaging time and releasing time of brake vary from circuit to circuit. Pay attention to the actual delay time during operation.
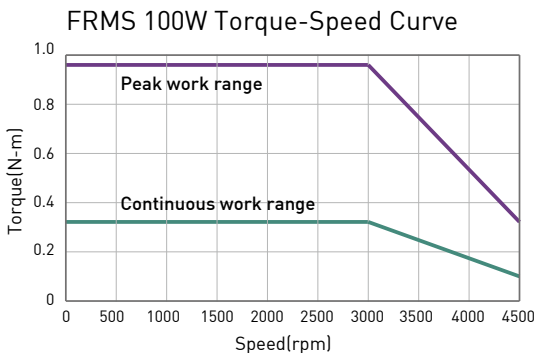
■ Torque-Speed Curve

■ Dimensions

Unit:mm

7.2.2 100W

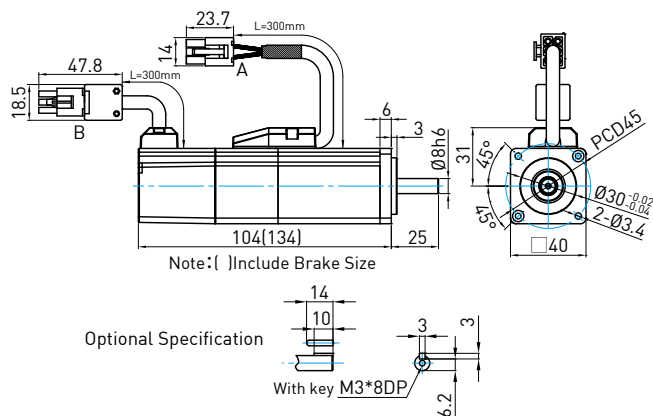| Parameter	Symbol	Unit	FRLS102☐☐A4☐
Drive Input Voltage	V	V	AC220
Rated Power	W	W	100
Rated Torque	Tc	N.m	0.32
Rated Current	Ic	A(rms)	0.9
Peak Max. Torque	Tp	N.m	0.96
Peak Max. Current	Ip	A(rms)	2.7
Rated Speed	ωc	rpm	3000
Max. Speed	ωp	rpm	4500
Torque Constant	Kt	N.m / Arms	0.356
Back EMF Constant	Ke	Vrms / krpm	21.98
Resistance (line to line)	R	Ω	8
Inductance (line to line)	L	mH	8.45
Inertia of Rotating Parts (with brake)	J	kg-m^2(×10^{-4})	0.036(0.038)
Weight (with brake)	M	kg	0.63(0.76)
Motor Insulation Grade			Class A (UL)
Motor protect			Total enclosed, self-cooled, IP65 (Except for shaft and connector)
Insulation resistance			10MΩ, DC500V
Insulation voltage resistance			AC1500V, 60 second
Brake specifications (Note)			
Static friction torque (Minimum)	Tb	N.m	0.3
Magnetizing current	Ab	A	0.25A
Brake input voltage	V	V	DC24±10%
Suction time (Maximum)	to	ms	30
Release time (Maximum)	tr	ms	20

Note Brake is used to keep the object stopped. Do not apply it to deceleration, dynamic braking or emergency stop. The engaging time and releasing time of brake vary from circuit to circuit. Pay attention to the actual delay time during operation.
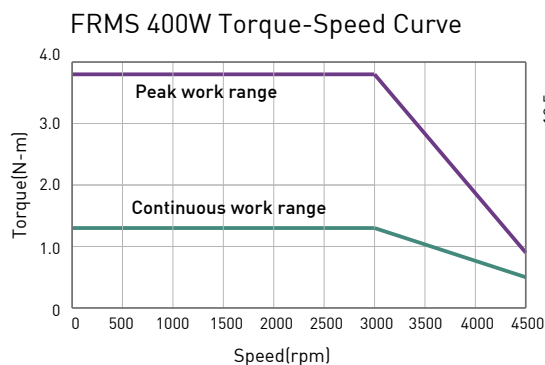
■ Torque-Speed Curve　　■ Dimensions

FRLS 100W Torque-Speed Curve

Note：( )Include Brake Size

Optional Specification

With key　M3*8DP

Unit:mm

7.2.3 200W

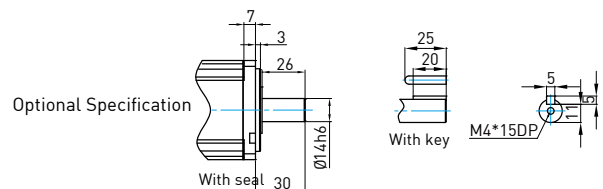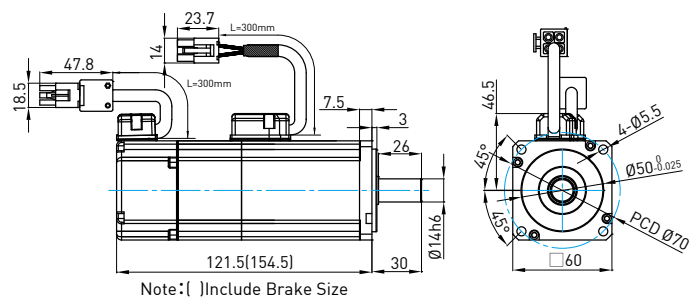| Parameter	Symbol	Unit	FRLS202□□06□
Drive Input Voltage	V	V	AC220
Rated Power	W	W	200
Rated Torque	Tc	N.m	0.64
Rated Current	Ic	A(rms)	1.7
Peak Max. Torque	Tp	N.m	1.92
Peak Max. Current	Ip	A(rms)	5.1
Rated Speed	ωc	rpm	3000
Max. Speed	ωp	rpm	4500
Torque Constant	Kt	N.m / Arms	0.38
Back EMF Constant	Ke	Vrms / krpm	23
Resistance (line to line)	R	Ω	4.3
Inductance (line to line)	L	mH	13
Inertia of Rotating Parts (with brake)	J	kg-m^2(×10^{-4})	0.17(0.21)
Weight (with brake)	M	kg	0.95(1.5)
Motor Insulation Grade			Class A (UL)
Motor protect			Total enclosed, self-cooled, IP65 (Except for shaft and connector)
Insulation resistance			10MΩ, DC500V
Insulation voltage resistance			AC1500V, 60 second

Brake specifications (Note)

Parameter	Symbol	Unit	
Static friction torque (Minimum)	Tb	N.m	1.3
Magnetizing current	Ab	A	0.32A
Brake input voltage	V	V	DC24±10%
Suction time (Maximum)	to	ms	30
Release time (Maximum)	tr	ms	20

Note Brake is used to keep the object stopped. Do not apply it to deceleration, dynamic braking or emergency stop.
The engaging time and releasing time of brake vary from circuit to circuit. Pay attention to the actual delay time during operation.

■ Torque-Speed Curve
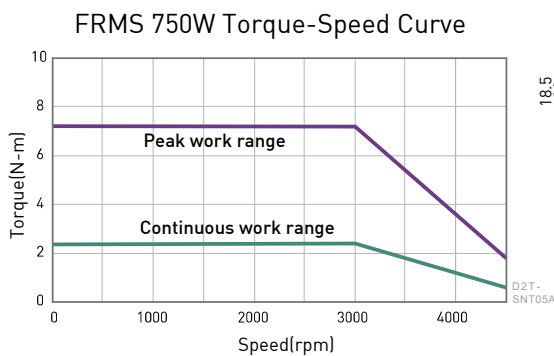

■ Dimensions

Unit:mm

7.2.4 400W

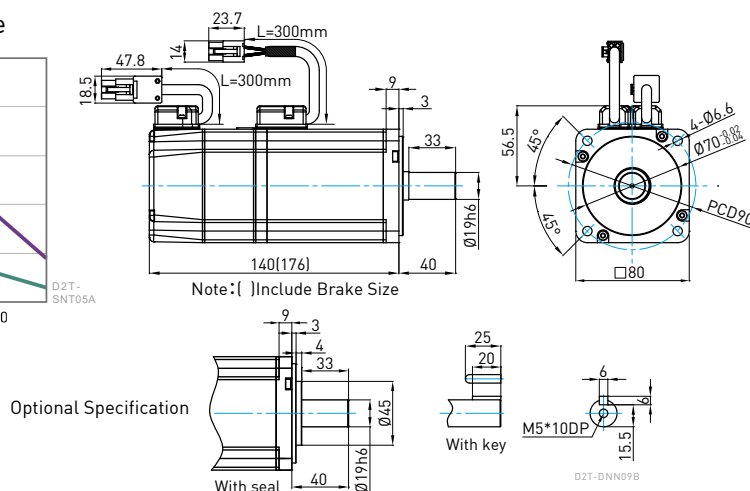| Parameter	Symbol	Unit	FRLS402□□06□
Drive Input Voltage	V	V	AC220
Rated Power	W	W	400
Rated Torque	Tc	N.m	1.27
Rated Current	Ic	A(rms)	2.5
Peak Max. Torque	Tp	N.m	3.81
Peak Max. Current	Ip	A(rms)	7.5
Rated Speed	ωc	rpm	3000
Max. Speed	ωp	rpm	4500
Torque Constant	Kt	N.m / Arms	0.51
Back EMF Constant	Ke	Vrms / krpm	31.9
Resistance (line to line)	R	Ω	3.5
Inductance (line to line)	L	mH	13
Inertia of Rotating Parts (with brake)	J	kg-m^2($\times 10^{-4}$)	0.27 (0.31)
Weight (with brake)	M	kg	1.31(1.86)
Motor Insulation Grade			Class A (UL)
Motor protect			Total enclosed, self-cooled, IP65 (Except for shaft and connector)
Insulation resistance			10MΩ, DC500V
Insulation voltage resistance			AC1500V, 60 second
Brake specifications (Note)			
Static friction torque (Minimum)	Tb	N.m	1.3
Magnetizing current	Ab	A	0.32A
Brake input voltage	V	V	DC24±10%
Suction time (Maximum)	to	ms	30
Release time (Maximum)	tr	ms	20

Note ▸ Brake is used to keep the object stopped. Do not apply it to deceleration, dynamic braking or emergency stop.

The engaging time and releasing time of brake vary from circuit to circuit. Pay attention to the actual delay time during operation.

■ Torque-Speed Curve　　■ Dimensions

FRLS 400W Torque-Speed Curve

Peak work range

Continuous work range

D2T-SNT04A

Note：( )Include Brake Size

Optional Specification

With seal

With key

M4*15DP

D2T-DNN08B

Unit:mm

7.3 Middle inertia, Small capacity

7.3.1 50W
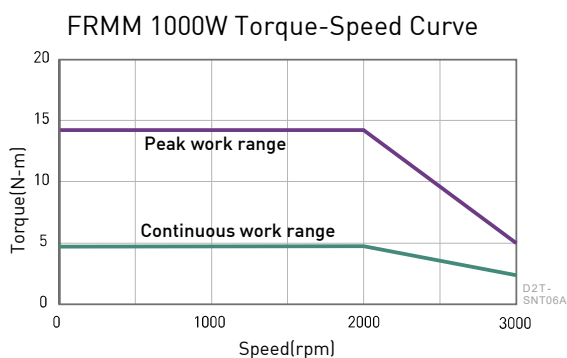
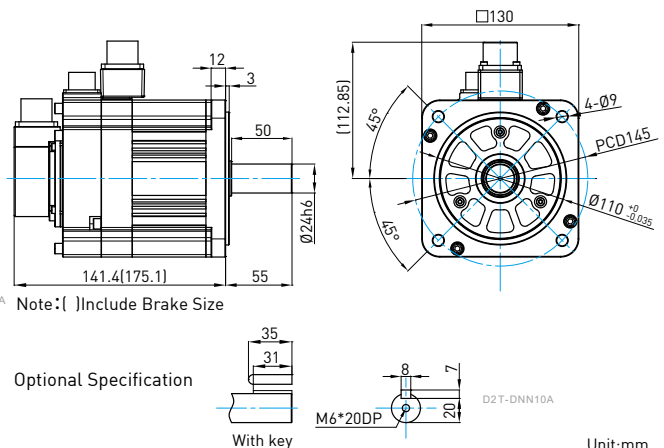| Parameter	Symbol	Unit	FRMS052□□04□
Drive Input Voltage	V	V	AC220
Rated Power	W	W	50
Rated Torque	Tc	N.m	0.16
Rated Current	Ic	A(rms)	0.9
Peak Max. Torque	Tp	N.m	0.48
Peak Max. Current	Ip	A(rms)	2.7
Rated Speed	ωc	rpm	3000
Max. Speed	ωp	rpm	4500
Torque Constant	Kt	N.m / Arms	0.178
Back EMF Constant	Ke	Vrms / krpm	11.51
Resistance (line to line)	R	Ω	13.17
Inductance (line to line)	L	mH	11.75
Inertia of Rotating Parts (with brake)	J	kg-m^2(×10^{-4})	0.025(0.027)
Weight (with brake)	M	kg	0.38(0.51)
Motor Insulation Grade			Class A (UL)
Motor protect			Total enclosed, self-cooled, IP65 (Except for shaft and connector)
Insulation resistance			10MΩ, DC500V
Insulation voltage resistance			AC1500V, 60 second
Brake specifications (Note)			
Static friction torque (Minimum)	Tb	N.m	0.32
Magnetizing current	Ab	A	0.25A
Brake input voltage	V	V	DC24±10%
Suction time (Maximum)	to	ms	40
Release time (Maximum)	tr	ms	20

Note Brake is used to keep the object stopped. Do not apply it to deceleration, dynamic braking or emergency stop.

The engaging time and releasing time of brake vary from circuit to circuit. Pay attention to the actual delay time during operation.
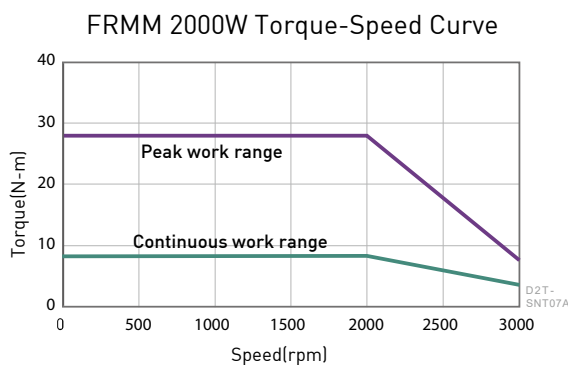
■ Torque-Speed Curve   ■ Dimensions

FRMS 50W Torque-Speed Curve

Peak work range

Continuous work range

Note：( )Include Brake Size

Optional Specification

With key M3*8DP

Unit:mm

7.3.2 100W

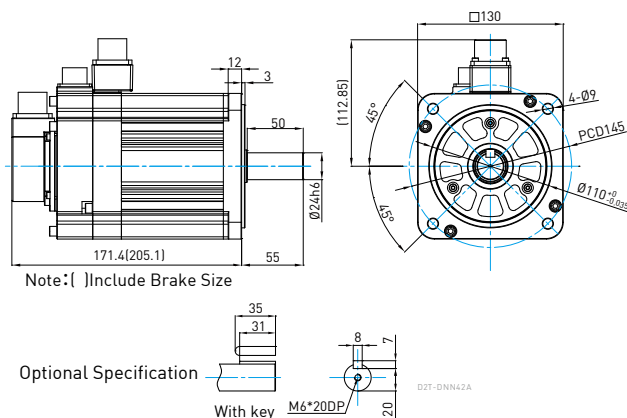| Parameter	Symbol	Unit	FRMS102☐☐04☐
Drive Input Voltage	V	V	AC220
Rated Power	W	W	100
Rated Torque	Tc	N.m	0.32
Rated Current	Ic	A(rms)	0.9
Peak Max. Torque	Tp	N.m	0.96
Peak Max. Current	Ip	A(rms)	2.7
Rated Speed	ωc	rpm	3000
Max. Speed	ωp	rpm	4500
Torque Constant	Kt	N.m / Arms	0.356
Back EMF Constant	Ke	Vrms / krpm	20.93
Resistance (line to line)	R	Ω	19
Inductance (line to line)	L	mH	23.78
Inertia of Rotating Parts (with brake)	J	kg-m^2($\times10^{-4}$)	0.051(0.055)
Weight (with brake)	M	kg	0.54(0.67)
Motor Insulation Grade		Class A (UL)	
Motor protect		Total enclosed, self-cooled, IP65 (Except for shaft and connector)	
Insulation resistance		10MΩ, DC500V	
Insulation voltage resistance		AC1500V, 60 second	

Brake specifications (Note)

Static friction torque (Minimum)	Tb	N.m	0.32
Magnetizing current	Ab	A	0.25A
Brake input voltage	V	V	DC24±10%
Suction time (Maximum)	to	ms	40
Release time (Maximum)	tr	ms	20

Note Brake is used to keep the object stopped. Do not apply it to deceleration, dynamic braking or emergency stop.
The engaging time and releasing time of brake vary from circuit to circuit. Pay attention to the actual delay time during operation.
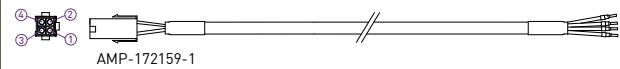
■ Torque-Speed Curve　　■ Dimensions

FRMS 100W Torque-Speed Curve

Note：( )Include Brake Size

Optional Specification
With key M3*8DP

Unit:mm

7.3.3　400W

Parameter	Symbol	Unit	FRMS4B2☐☐06☐
Drive Input Voltage	V	V	AC220
Rated Power	W	W	400
Rated Torque	Tc	N.m	1.27
Rated Current	Ic	A(rms)	2.6
Peak Max. Torque	Tp	N.m	3.81
Peak Max. Current	Ip	A(rms)	7.8
Rated Speed	ωc	rpm	3000
Max. Speed	ωp	rpm	4500
Torque Constant	Kt	N.m / Arms	0.48
Back EMF Constant	Ke	Vrms / krpm	29.61
Resistance (line to line)	R	Ω	4.13
Inductance (line to line)	L	mH	9.9
Inertia of Rotating Parts (with brake)	J	kg-m^2($\times10^{-4}$)	0.44(0.48)
Weight (with brake)	M	kg	1.31(1.86)
Motor Insulation Grade			Class A (UL)
Motor protect			Total enclosed, self-cooled, IP65 (Except for shaft and connector)
Insulation resistance			10MΩ, DC500V
Insulation voltage resistance			AC1500V, 60 second

Brake specifications (Note)

Static friction torque (Minimum)	Tb	N.m	1.3
Magnetizing current	Ab	A	0.32
Brake input voltage	V	V	DC24±10%
Suction time (Maximum)	to	ms	30
Release time (Maximum)	tr	ms	20

Note　Brake is used to keep the object stopped. Do not apply it to deceleration, dynamic braking or emergency stop.
The engaging time and releasing time of brake vary from circuit to circuit. Pay attention to the actual delay time during operation.
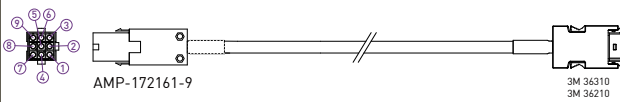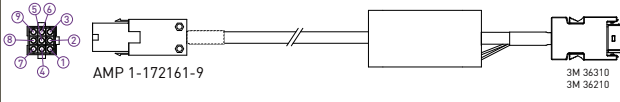
■ Torque-Speed Curve

FRMS 400W Torque-Speed Curve

Peak work range

Continuous work range

■ Dimensions

Note：(　)Include Brake Size

Optional Specification

With seal

With key

M4*15DP

Unit:mm

7.3.4 750W

Parameter	Symbol	Unit	FRMS752□□08□
Drive Input Voltage	V	V	AC220
Rated Power	W	W	750
Rated Torque	Tc	N.m	2.4
Rated Current	Ic	A(rms)	5.1
Peak Max. Torque	Tp	N.m	7.2
Peak Max. Current	Ip	A(rms)	15.3
Rated Speed	ωc	rpm	3000
Max. Speed	ωp	rpm	4500
Torque Constant	Kt	N.m / Arms	0.47
Back EMF Constant	Ke	Vrms / krpm	28.4
Resistance (line to line)	R	Ω	0.813
Inductance (line to line)	L	mH	3.4
Inertia of Rotating Parts (with brake)	J	kg-m^2(×10^{-4})	1.4(1.46)
Weight (with brake)	M	kg	2.66(3.32)
Motor Insulation Grade			Class A (UL)
Motor protect			Total enclosed, self-cooled, IP65 (Except for shaft and connector)
Insulation resistance			10MΩ, DC500V
Insulation voltage resistance			AC1500V, 60 second
Brake specifications (Note)			
Static friction torque (Minimum)	Tb	N.m	2.4
Magnetizing current	Ab	A	0.358A
Brake input voltage	V	V	DC24±10%
Suction time (Maximum)	to	ms	45
Release time (Maximum)	tr	ms	10

Note Brake is used to keep the object stopped. Do not apply it to deceleration, dynamic braking or emergency stop. The engaging time and releasing time of brake vary from circuit to circuit. Pay attention to the actual delay time during operation.

■ Torque-Speed Curve　　■ Dimensions

FRMS 750W Torque-Speed Curve

Peak work range

Continuous work range

Note：( )Include Brake Size

Optional Specification

With seal

With key

Unit:mm

7.4 Middle inertia, Middle capacity

7.4.1 1000W

Parameter	Symbol	Unit	FRMM1K2□□13□
Drive Input Voltage	V	V	AC220
Rated Power	W	W	1000
Rated Torque	Tc	N.m	4.77
Rated Current	Ic	A(rms)	5.1
Peak Max. Torque	Tp	N.m	14.3
Peak Max. Current	Ip	A(rms)	15.3
Rated Speed	ωc	rpm	2000
Max. Speed	ωp	rpm	3000
Torque Constant	Kt	N.m / Arms	0.94
Back EMF Constant	Ke	Vrms / krpm	54.7
Resistance (line to line)	R	Ω	0.81
Inductance (line to line)	L	mH	8
Inertia of Rotating Parts (with brake)	J	kg-m^2(×10^{-4})	7.6(8.7)
Weight (with brake)	M	kg	5.4(6.2)
Motor Insulation Grade			Class A (UL)
Motor protect			Total enclosed, self-cooled, IP65 (Except for shaft and connector)
Insulation resistance			10MΩ, DC500V
Insulation voltage resistance			AC1500V, 60 second
Brake specifications (Note)			
Static friction torque (Minimum)	Tb	N.m	10
Magnetizing current	Ab	A	0.56A
Brake input voltage	V	V	DC24
Suction time (Maximum)	to	ms	80
Release time (Maximum)	tr	ms	30

Note Brake is used to keep the object stopped. Do not apply it to deceleration, dynamic braking or emergency stop.
The engaging time and releasing time of brake vary from circuit to circuit. Pay attention to the actual delay time during operation.

■ Torque-Speed Curve   ### ■ Dimensions

FRMM 1000W Torque-Speed Curve

Note：( )Include Brake Size

Optional Specification
With key

Unit:mm

7.4.2 2000W

Parameter	Symbol	Unit	FRMM2K2☐☐13☐
Drive Input Voltage	V	V	AC220
Rated Power	W	W	2000
Rated Torque	Tc	N.m	9.55
Rated Current	Ic	A(rms)	11
Peak Max. Torque	Tp	N.m	28.65
Peak Max. Current	Ip	A(rms)	33
Rated Speed	ωc	rpm	2000
Max. Speed	ωp	rpm	3000
Torque Constant	Kt	N.m / Arms	0.87
Back EMF Constant	Ke	Vrms / krpm	57.8
Resistance (line to line)	R	Ω	0.41
Inductance (line to line)	L	mH	3.7
Inertia of Rotating Parts (with brake)	J	kg-m^2($\times 10^{-4}$)	13(14.1)
Weight (with brake)	M	kg	8(8.8)
Motor Insulation Grade			Class A (under certification)
Motor protect			Total enclosed, self-cooled, IP65 (Except for shaft and connector)
Insulation resistance			10MΩ, DC500V
Insulation voltage resistance			AC1500V, 60 second
Brake specifications (Note 1)			
Static friction torque (Minimum)	Tb	N.m	10
Magnetizing current	Ab	A	0.56A
Brake input voltage	V	V	DC24
Suction time	to	ms	80
Release time	tr	ms	30

Note Brake is used to keep the object stopped. Do not apply it to deceleration, dynamic braking or emergency stop.

The engaging time and releasing time of brake vary from circuit to circuit. Pay attention to the actual delay time during operation.

■ Torque-Speed Curve   ■ Dimensions

FRMM 2000W Torque-Speed Curve

Note：( )Include Brake Size

Optional Specification

With key   M6*20DP

Unit:mm
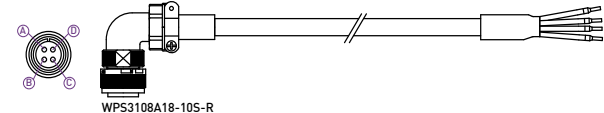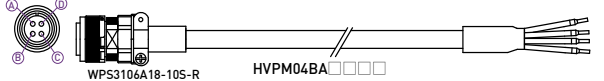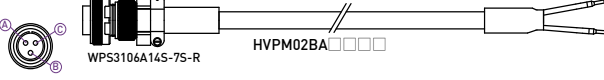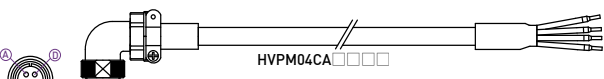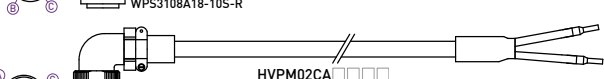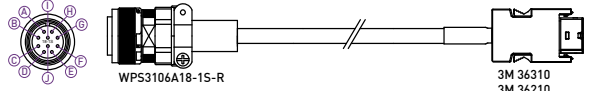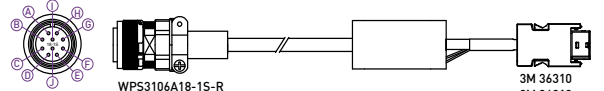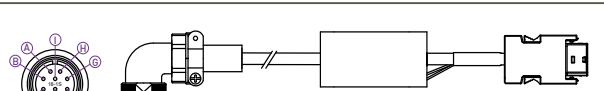
8. Cable and connector

8.1 Cable

■ Small Capacity
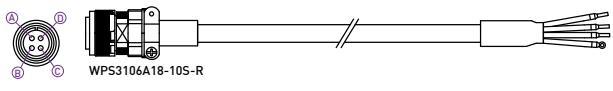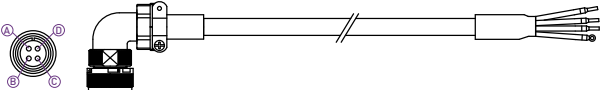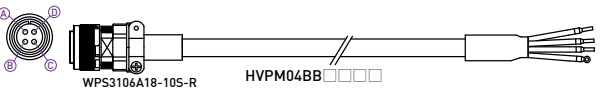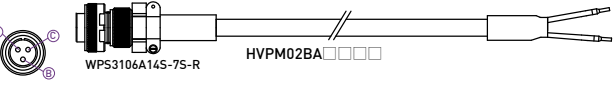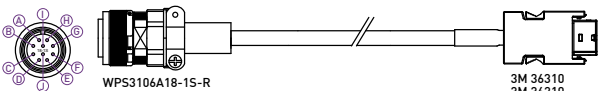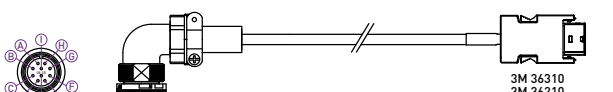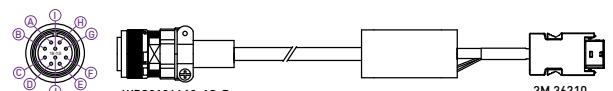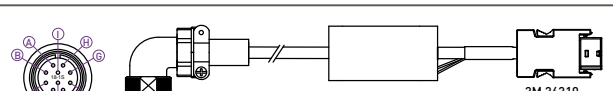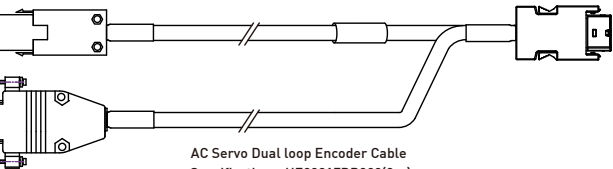
Name	Type	Connect	Description : 50W~750W
AC Servo Motor Power Cable	HVPS04AA□□□B	CN1	 AMP-172159-1
AC Servo Motor Power and Brake Extension Cable	HVPS06AA□□□B	CN1 CN2	 AMP-172160-1
AC Servo Motor Encoder Cable (17bit incremental)	HVE17IAB□□□B	CN7	 AMP-172161-9 3M 36310 / 3M 36210
AC Servo Motor Encoder Cable (17bit absolute)	HVE17AAB□□□B		 AMP 1-172161-9 3M 36310 / 3M 36210

■ Middle Capacity－1000W

Name	Type	Connect	Description：1000W
AC Servo Motor Power Cable	HVPM04BA□□□B Straight Connector	CN1	WPS3106A18-10S-R
	HVPM04CA□□□B L-Type Connector		WPS3108A18-10S-R
AC Servo Motor Power Cable and Brake Cable (Note)	HVPM06BA□□□B Straight Connector	CN1	WPS3106A18-10S-R HVPM04BA□□□ WPS3106A14S-7S-R HVPM02BA□□□
	HVPM06CA□□□B L-Type Connector		HVPM04CA□□□ WPS3108A18-10S-R HVPM02CA□□□ WPS3108A14S-7S-R
AC Servo Motor Encoder Cable (17bit incremental)	HVE17IBB□□□B Straight Connector	CN7	WPS3106A18-1S-R 3M 36310 3M 36210
	HVE17ICB□□□B L-Type Connector		WPS3108A18-1S-R 3M 36310 3M 36210
AC Servo Motor Encoder Cable (17bit absolute)	HVE17ABB□□□B Straight Connector		WPS3106A18-1S-R 3M 36310 3M 36210
	HVE17ACB□□□B L-Type Connector		WPS3108A18-1S-R 3M 36310 3M 36210
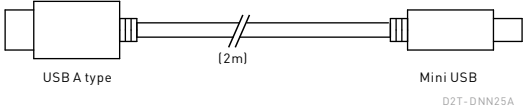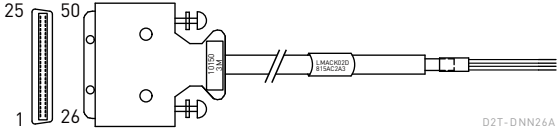
Note   For middle capacity motors with brake, please remember to use power cable and brake cable simultaneously.

■ Middle Capacity－2000W

Name	Type	Connect	Description：2000W
AC Servo Motor Power Cable	HVPM04BB□□□B Straight Connector	CN1	WPS3106A18-10S-R
	HVPM04CB□□□B L-Type Connector		WPS3108A18-10S-R
AC Servo Motor Power Cable and Brake Cable (Note)	HVPM06BB□□□B Straight Connector	CN1	WPS3106A18-10S-R HVPM04BB□□□ WPS3106A14S-7S-R HVPM02BA□□□
	HVPM06CB□□□B L-Type Connector		HVPM04CB□□□ WPS3108A18-10S-R HVPM02CA□□□ WPS3108A14S-7S-R
AC Servo Motor Encoder Cable (17bit incremental)	HVE17IBB□□□B Straight Connector	CN7	WPS3106A18-1S-R 3M 36310 3M 36210
	HVE17ICB□□□B L-Type Connector		WPS3108A18-1S-R 3M 36310 3M 36210
AC Servo Motor Encoder Cable (17bit absolute)	HVE17ABB□□□B Straight Connector		WPS3106A18-1S-R 3M 36310 3M 36210
	HVE17ACB□□□B L-Type Connector		WPS3108A18-1S-R 3M 36310 3M 36210
	HE00817DR300(3m)		AC Servo Dual loop Encoder Cable Specification：HE00817DR300(3m)

Note For middle capacity motors with brake, please remember to use power cable and brake cable simultaneously.

■ Communication and Interface Cable

Name	Type	Connect	
Mini USB Cable	051700800366	CN3	USB A type　　(2m)　　Mini USB D2T-DNN25A
Interface Cable	LMACK02D	CN6	25　50 1　26 LMACK02D B15AC2A3 D2T-DNN26A

8.2 Connector

Small Capacity Series 50W~750W	
Middle Capacity Series 1000W/2000W	
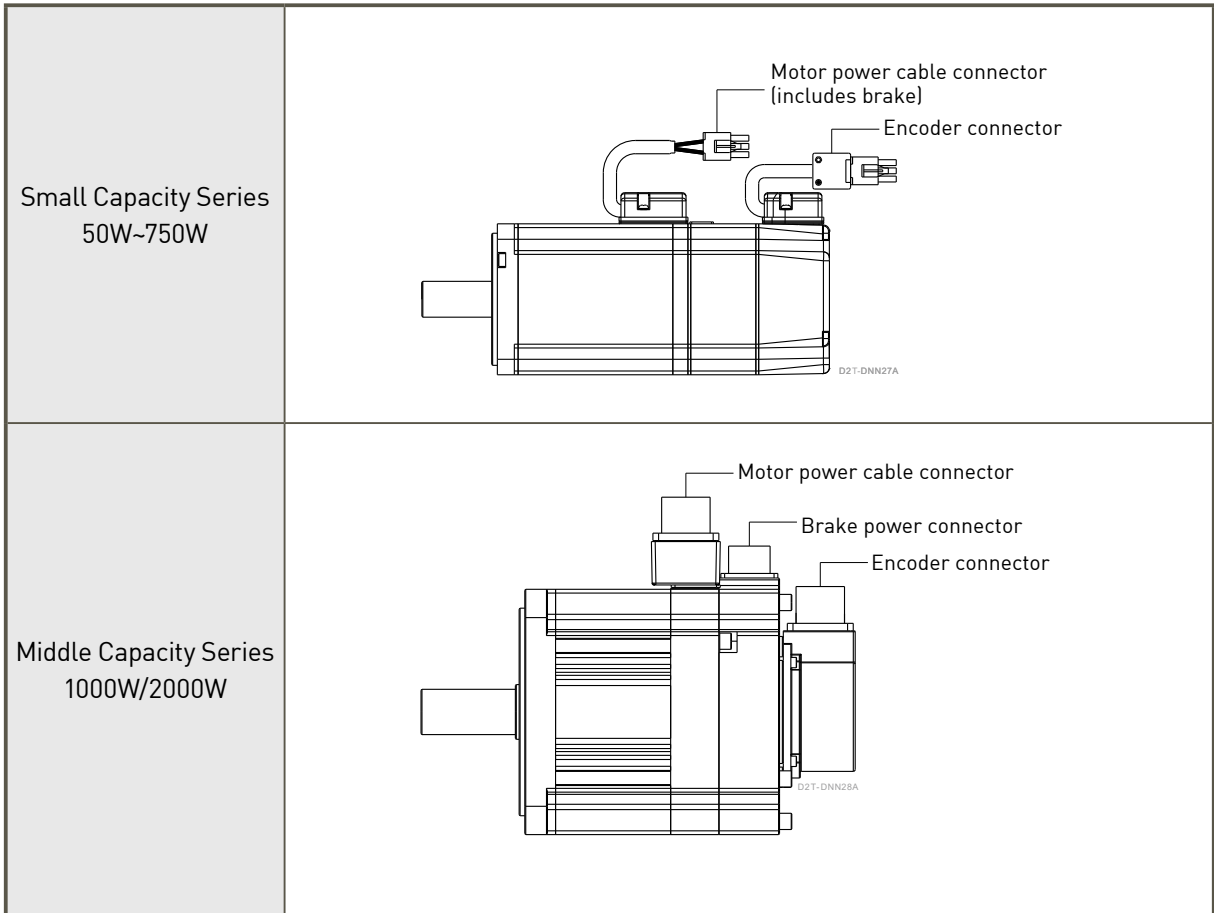
■ Motor Power Connector

Small Capacity Series / 50W~750W

Signal	AMP-172167-1 (without brake)	AMP-172168-1 (with brake)
U	3	3
V	2	2
W	1	1
GND	4	4
B+	--	5
B-	--	6

Connect Pins Position Definition

(without brake)

(with brake)
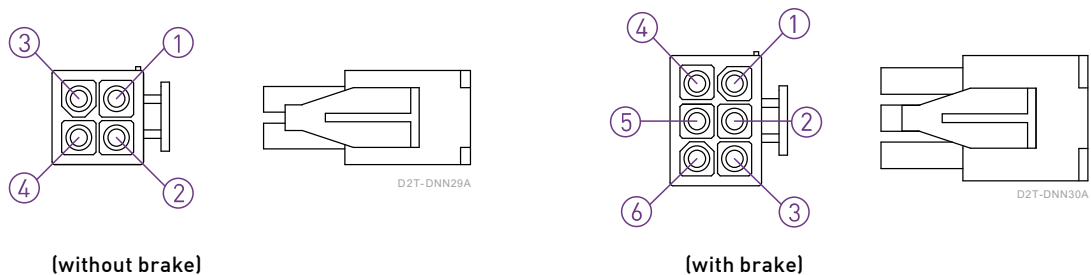
Middle Capacity Series /1000W·2000W (Note)

Signal	WPS3102A18-10P-R	WPS3102A14S-7P-R
U	A	--
V	B	--
W	C	--
GND	D	--
B+	--	A
B-	--	C

Connect Pins Position Definition
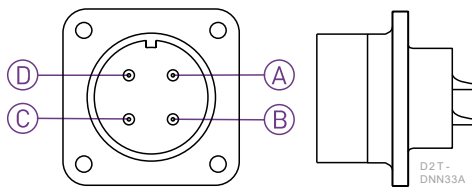
WPS3102A18-10P-R
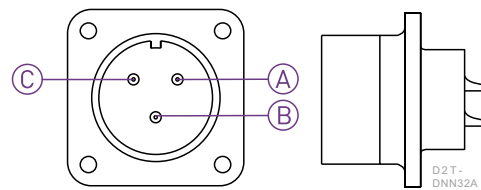
WPS3102A14S-7P-R

Note By brake Type, two connectors must be used simultaneously

■ Encoder Connector

17bit incremental / 50W~750W

Function	Signal	AMP1-172169-9
Power	5V±5%	1
	0V	2
Serial Data Signal	SL+	3
	SL-	4
	MA+	7
	MA-	8
Shielding	Shielding	9
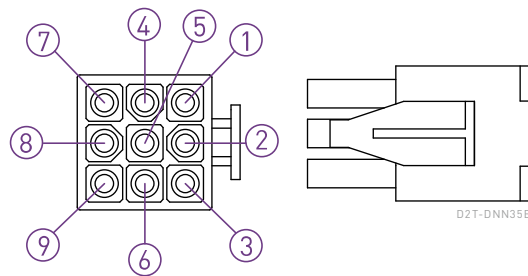
17bit incremental / 1000W·2000W

Function	Signal	WPS3102A18-1P-R
Power	5V±5%	A
	0V	B
Serial Data Signal	SL+	C
	SL-	D
	MA+	G
	MA-	H
Shielding	Shielding	I
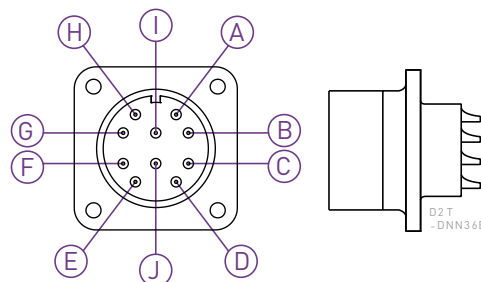
17bit absolute / 50W~750W

Function	Signal	AMP-1-172169-9
Power	5V	1
	0V	2
Battery	VB	5
	GND	6
Serial Data Signal	SD+	7
	SD-	8
Shielding	Shielding	9

D2T-DNN37B
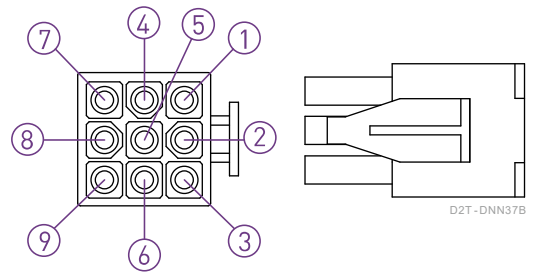
17bit absolute / 1000W·2000W

Function	Signal	WPS3102A18-1P-R
Power	5V	A
	0V	B
Battery	VB	E
	GND	F
Serial Data Signal	SD+	G
	SD-	H
Shielding	Shielding	I

D2T-DNN38B
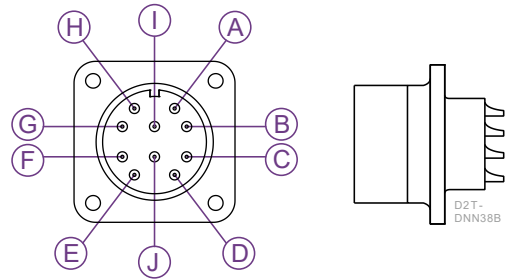
9. HIWIN single axis robot and motor adaptor flange

AC Servo Motor		HIWIN single axis robot							Drive
		KK40	KK50	KK60	KK80	KK86	KK100	KK130	
50W	FRLS052XXA4X	F2	F2	F2	F3	F3	F1	-	D2Tx-01xx-x-Ax
100W	FRLS102XXA4X	F2	F2	F2	F3	F3	-	-	D2Tx-01xx-x-Ax
200W	FRLS202XX06X	-	-	-	F0	F0	F0	F1	D2Tx-04xx-x-Bx
400W	FRLS402XX06X	-	-	-	F0	F0	F0	F1	D2Tx-04xx-x-Bx
750W	FRMS752XX08X	-	-	-	-	-	F1	F2	D2Tx-10xx-x-Cx
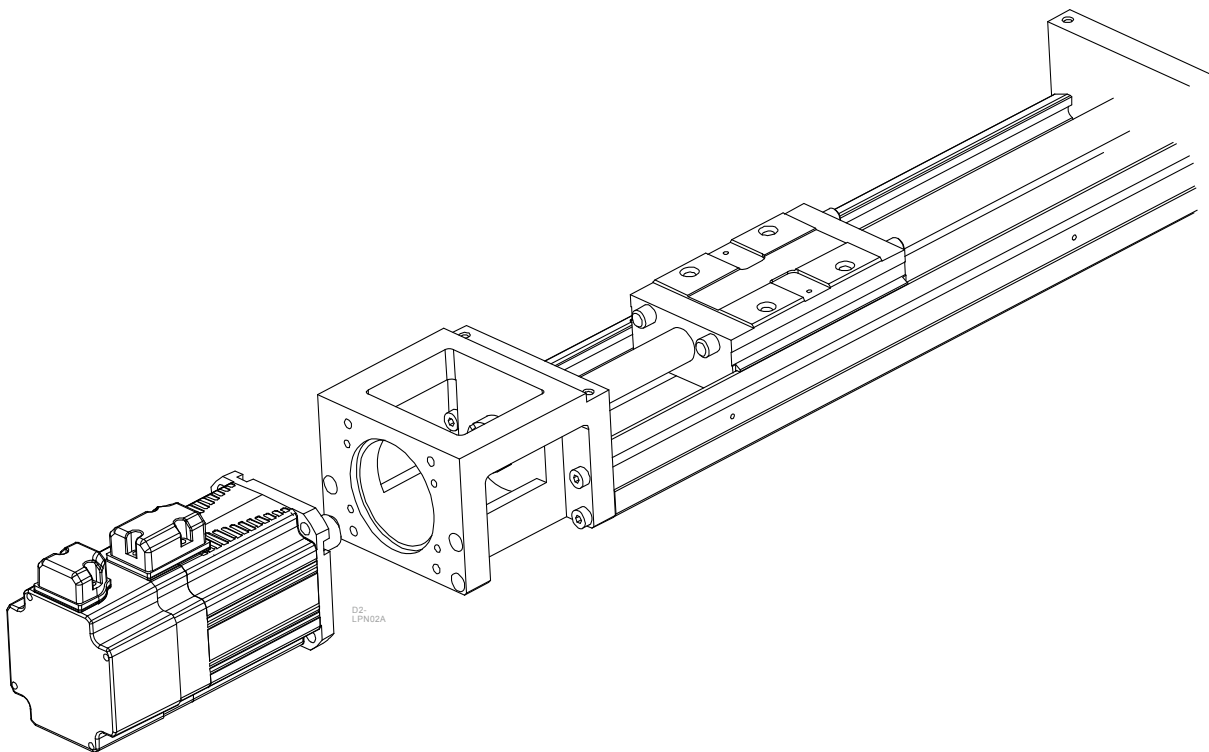
10. Servo Motor Selection Guide

The motor selection guide in this chapter is located on-line at
http://www.hiwinmikro.tw/hiwincal.aspx

1. Definition of mechanism to be driven by the motor.

Define detailed dimentions of individual mechanical components (ex: ball screw length, lead and pulley diameter)
Typical servo mechanisms are listed as follows:
[Ball screw mechanism]
[Belt mechanism]
[Rack and pinion mechanism]
[Reduction gear mechanism]

2. Definition of operating pattern (motion velocity profile).

The operating pattern can be defined by the following parameters: acceleration/deceleration time, constant-velocity time, stop time, cycle time, travel distance.

3. Calculation of load inertia and motor inertia ratio.

Calculate load inertia for each mechanical component. (Refer to "General inertia calculation method" described later.)
Then, divide the calculated load inertia by the inertia of the selected motor then check the inertia ratio. Note that the ratio should less than 10, if the selected motor is less than 750W. If the power of selected motor is higher than 1000W, the ratio should less than 10.

4. Calculation of motor velocity.

Calculate the motor velocity from the moving distance, acceleration/deceleration time and constant-velocity time.

5. Calculation of torque.

Calculate the required motor torque from the load inertia, acceleration/deceleration time and constant-velocity time.

6. Calculation of motor

Select a motor that meets the above 3 to 5 requirements.

10.1 Introduction of motor selection relevant parameters

■ Peak torque

Peak torque indicates the maximum torque that the motor requires during operation (mainly in acceleration and deceleration steps). The reference value is 80% or less of the maximum motor torque. If the torque is a negative value, a regenerative discharge resistor may be required.

■ Traveling torque, stop holding torque

Traveling torque indicates the torque that the motor requires for a long time. Stop holding torque indicates that the amount of torque required for a motor to remain in a fixed position.
Traveling torque calculation formula for each mechanism.

List of symbol :
W : Workpiece weight [kg]
B_P : Lead [m]
D : Pulley diameter [m]
F : External force [N]
B_{eff} : Mechanical efficiency
μ : Coefficient of friction
g: Acceleration of gravity 9.8[m/s^2]
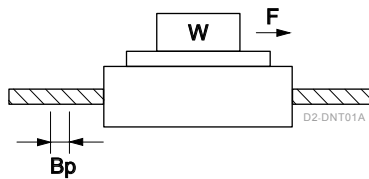
Traveling torque

$$T_f = \frac{B_P}{2\pi B_{eff}}(\mu g W + F)$$
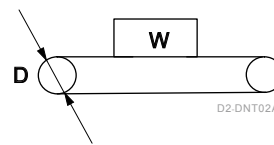
Traveling torque

$$T_f = \frac{D}{2\pi B_{eff}}(\mu g W + F)$$

■ Effective torque

Effective torque indicates a root-mean- square value of the total required for running and stopping the motor per unit time. The reference value is approximate 80% or less of the rated motor torque.

$$T_{rms} = \sqrt{\frac{T_a^2 \times t_a + T_f^2 \times t_b + T_d^2 \times t_d}{t_c}}$$

T_a: Acceleration torque [N-m]
T_f: Traveling torque [N-m]
T_d: Deceleration torque [N-m]
t_c: Cycle time [s] (Run time + Stop time)

t_a: Acceleration time [s]
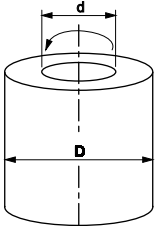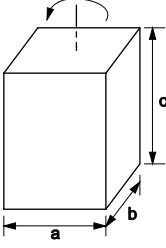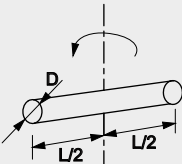t_b: constant-velocity time [s]
t_d: Deceleration time [s]
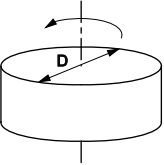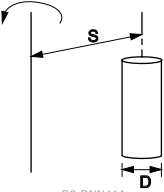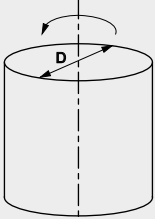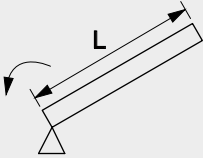
■ Motor velocity

Maximum velocity of motor in operation: The reference value is the rated velocity or lower value. When the motor operates at the maximum velocity, you must pay attention to the motor torque and temperature rise.

■ Load inertia and motor inertia ratio

Inertia is like the force to retain the current moving condition. Inertia ration is calculated by dividing load inertia by rotor inertia. Generally, for motor with 750W or lower capacity, the inertia ratio should be "10" or less. For motor with 1000W or higher capacity, the inertia ratio should be "10" or less. If the system need quicker response, a lower inertia ratio is required.
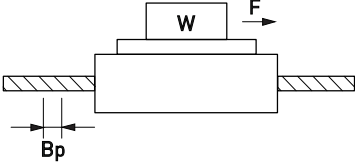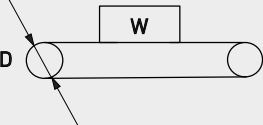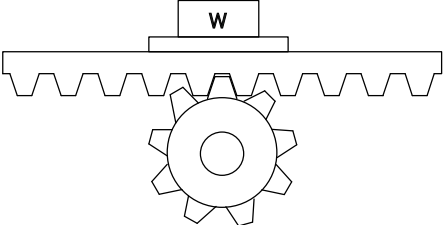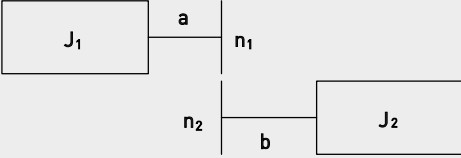
10.2 General inertia calculation for various rigid objects of uniform composition

Shape	J calculation formula	Shape	J calculation formula
Disk	$J = \dfrac{1}{8} MD^2$	Separated rod	$J = \dfrac{1}{8} MD^2 + M\,S^2$
Solid cylinder	$J = \dfrac{1}{8} MD^2$	Straight rod	$J = \dfrac{1}{3} ML^2$
Hollow cylinder	$J = \dfrac{1}{8} M(D^2 + d^2)$	Prism	$J = \dfrac{1}{12} M(a^2 + b^2)$
Uniform rod	$J = \dfrac{1}{48} M(3D^2 + 4L^2)$		

List of symbol :
J : Inertia [kg-m^2]
M : Mass [kg]
D : Outer diameter [m]
d : Inner diameter [m]
L : Length [m]
a, b, c : Side length [m]
S : Distance [m]

If mass (M [kg]) is unknown, calculate it with the following formula :
Mass M[kg] = Density ρ [kg/m^3] x Volume V[m^3]
Density of each material
Iron ρ = 7.9 x 10^3 [kg/m^3]
Brass ρ = 8.5 x 10^3 [kg/m^3]
Aluminum ρ = 2.8 x 10^3 [kg/m^3]

## 10.3 Equivalent inertia calculation for mechanism

| Mechanism	J calculation formula
Ball screw	$J = J_B + \dfrac{MB_P{}^2}{4\pi^2}$
Belt(Conveyor)	$J = \dfrac{1}{4} W_b D^2$ *Excluding drum J
Rack and pinion	$J = J_p + (M_r + W_r) \dfrac{D^2}{4}$
Reduction gear	$J = J_1 + (\dfrac{n_2}{n_1})^2 J_2$ Inertia on shaft "a"

List of symbol:
J : Inertia [kg-m^2]
J_B : J of ball screw
J_P : J of pinion
M : Mass [kg]
M_r : Mass of rack [kg]
W_b : Workpiece weight on belt [kg]
W_r : Workpiece weight on rack [kg]
P : Lead
D : Drum diameter [m]
n_1 : A rotational speed of a shaft [r/min]
n_2 : A rotational speed of b shaft [r/min]

10.4 Operating pattern (motion velocity profile)
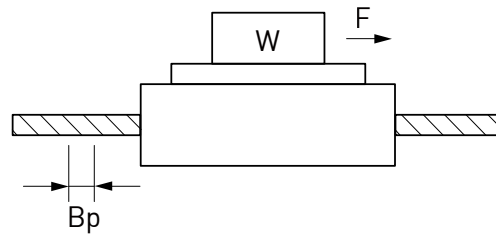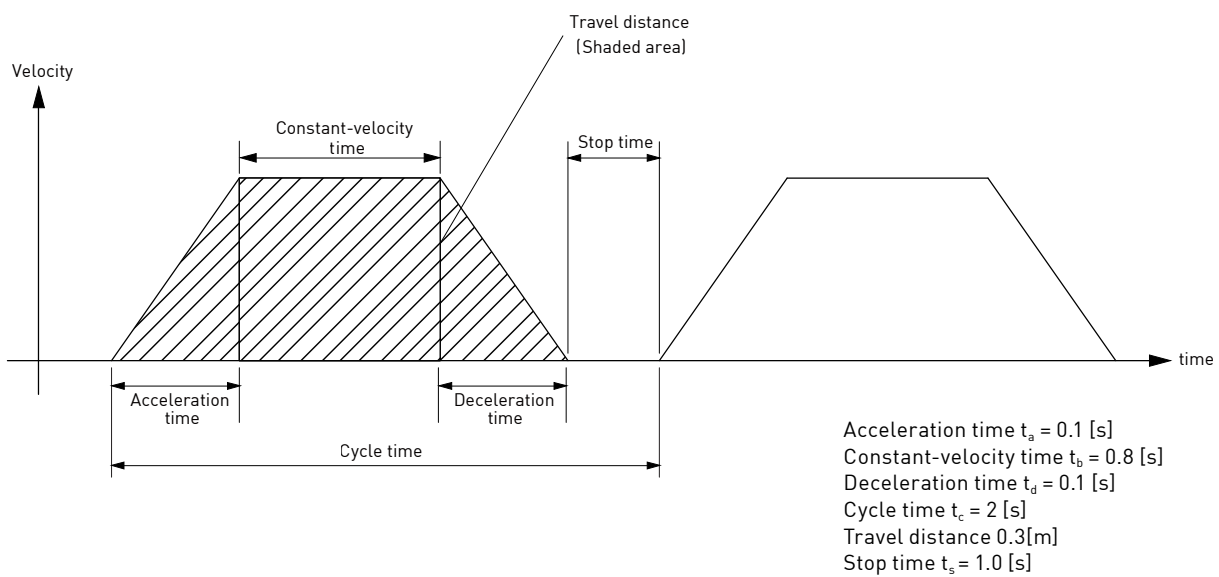
■ Trapezoidal profile
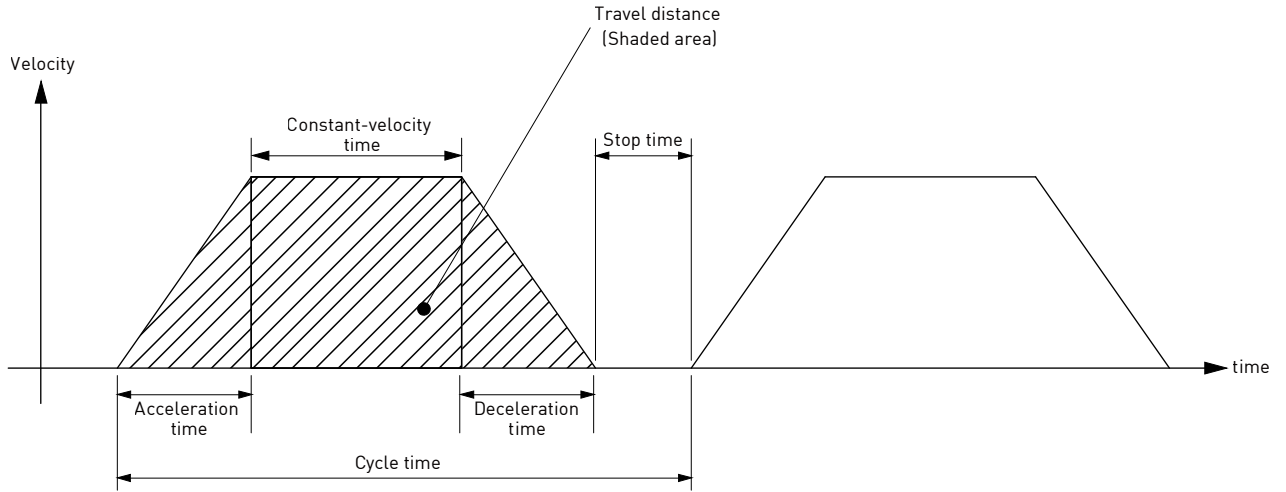
■ Triangle profile
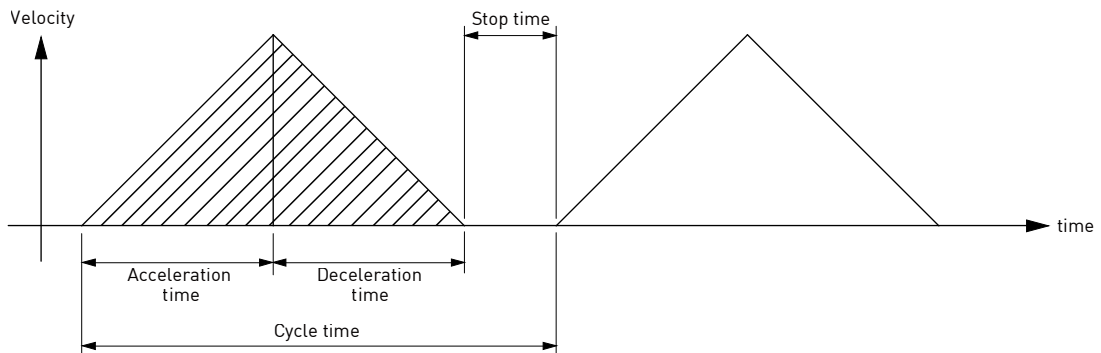
10.5 Motor selection example - ballscrews mechanism

Workpiece weight W = 5 [kg]
Ball screw length B_L = 0.5 [m]
Ball screw diameter B_D = 0.02 [m]
Ball screw lead B_P = 0.02 [m]
Ball screw efficiency B_{eff} = 0.9
Travel distance 0.3 [m]
Coupling inertia J_c = 10 x 10^{-6} [kg-m^2]

■ Running pattern(velocity profile)

Acceleration time t_a = 0.1 [s]
Constant-velocity time t_b = 0.8 [s]
Deceleration time t_d = 0.1 [s]
Cycle time t_c = 2 [s]
Travel distance 0.3[m]
Stop time t_s = 1.0 [s]

■ Ball screw weight

$$B_W = \rho \times \pi \times \left(\frac{B_D}{2}\right)^2 \times B_L$$

$$= 7.9 \times 10^3 \times \pi \times \left(\frac{0.02}{2}\right)^2 \times 0.5$$

$$= 1.24 \text{ [kg]}$$

■ Load inertia

$$J_L = J_C + J_B + J_W = J_C + \frac{1}{8} B_W \times B_D^{\,2} + \frac{W \times B_P^{\,2}}{4\pi^2}$$

$$= 0.00001 + \frac{1.24 \times 0.02^2}{8} + \frac{5 \times 0.02^2}{4\pi^2}$$

$$= 1.226 \times 10^{-4} \ [kg-m^2]$$

■ Provisional motor selection

Choose Hiwin 200W Servo motor : $J_M = 0.17 \times 10^{-4} \ [kg-m^2]$

■ Calculation of inertia ratio

$$\frac{J_L}{J_M} = \frac{1.226 \times 10^{-4}}{0.17 \times 10^{-4}} = 7.21$$

The inertia ratio is less than 10.

■ Calculation of maximum velocity (Vmax)

$$\frac{1}{2} \times t_a \times V_{max} + t_b \times V_{max} + \frac{1}{2} \times t_d \times V_{max} = \text{Travel distance}$$

$$\frac{1}{2} \times 0.1 \times V_{max} + 0.8 \times V_{max} + \frac{1}{2} \times 0.1 \times V_{max} = 0.3$$

$$V_{max} = 0.334 \ [m/s]$$

■ Calculation of motor velocity (N [r/min])

Ball screw lead $B_P = 0.02$ [m]

$$N = \frac{V_{max}}{B_P} = \frac{0.334}{0.02} = 16.7 \, [rps] = 1002 [rpm]$$

1002[rpm] is less than 3000[rpm] (rated velocity of Hiwin 200W Servo motor)

■ Calculation of torque

Traveling torque	$T_f = \dfrac{B_P}{2B\pi_{eff}}(\mu g W + F) = \dfrac{0.02}{20\pi.9}(0.1 \times 9.8 \times 5 + 0) = 0.017 \, [N-m]$
Acceleration torque	$T_a = \dfrac{(J_L + J_M) \times \frac{2\pi N}{60}}{t_a} + T_f$ $= \dfrac{(1.226 \times 10^{-4} + 0.7 \times 10^{-4}) \times \frac{2\pi \times 1002}{60}}{0.1} + 0.017$ $= 0.163 \, [N-m]$
Deceleration torque	$T_d = \dfrac{(J_L + J_M) \times \frac{2\pi N}{60}}{t_d} - T_f$ $= \dfrac{(1.226 \times 10^{-4} + 0.7 \times 10^{-4}) \times \frac{2\pi \times 1002}{60}}{0.1} - 0.017$ $= 0.129 \, [N-m]$

■ Verification of maximum torque

Ta = 0.163 [N-m] < 1.91 [N-m] (Maximum torque of Hiwin 200W Servo motor)

■ Verification of effective torque

$$T_{rms} = \sqrt{\dfrac{T_a^2 \times t_a + T_f^2 \times t_b + T_d^2 \times t_d}{t_c}}$$

$$= \sqrt{\dfrac{0.163^2 \times 0.1 + 0.017^2 \times 0.8 + 0.129^2 \times 0.1}{2}}$$

$$= 0.048 \, [N-m]$$

0.048[N-m] < 0.64[N-m](Rated torque of Hiwin 200W Servo motor)

■ Evaluation

Judging from the inertia ratio calculated above, selection of 200W motor is preferable, although the torque margin is significantly large.

11. Motor / Drive Requirements List

Customer:		Date:
		Contact Person:
Email:		Title:
Drive series	■ D2T	Note:
AC Motor Series*	Low inertia: ☐ 50W ☐ 100W ☐ 200W ☐ 400W Middle inertia: ☐ 50W ☐ 100W ☐ 400W ☐ 750W ☐ 1000W ☐ 2000W Format: ☐ 17bit incremental ☐ 17bit absolute	
Key*	☐ No ☐ Yes	
Brake*	☐ No ☐ Yes	
Seal*	☐ No ☐ Yes	
AC input voltage(V)	☐ Single phase 220V ☐ Three phase 220V	
Servo motor connecting wires*	Motor power (flexure resistance) Cable Length: ☐ 3M ☐ 5M ☐ 7M ☐ 10M Encoder (flexure resistance) Cable Length: ☐ 3M ☐ 5M ☐ 7M ☐ 10M	
Related accessory requirements*	☐ Pulse Wire ☐ USB cable ☐ Single-phase filter ☐ Three-phase filter	
Control mode*	☐ Position control ☐ Velocity control ☐ Torque control ☐ EtherCAT(CoE) ☐ Others	
Match method	☐ Slide/model no: ☐ Reducer/reduction ratio: ☐ Timing belt ☐ Gear rack ☐ Ball screw/guiding distance: screw outer diameter:	
Host	☐ PLC/manufacture: model: ☐ Axis card/manufacture: model:	
Special Need		
Installation	☐ Horizontal ☐ Vertical	
Speed requirement		
Accelaration requirement		
Weight requirement		

The information below is to be filled out by HIWIN or authorized agents.

Recommended specifications:

Fields with * must be filled   Salesperson:

12. Safety Precautions

Thank you for purchasing HIWIN's AC servo motor. Installation and operation of the motor must be in accordance with the HIWIN manual. Before using the servo motor, please read these safety instructions and precautions carefully.

■ Unpacking instructions

1. Before using the servo motor, please read these safety instructions and precautions carefully. HIWIN is not responsible for any damage, accident, or injury caused by incorrect handling.
2. Examine the appearance of the motor for any unusual marks or damage from shipment.
3. Inspect the wires for damage.
4. Do not disassemble the motor. Since the product design has been based on structure calculations, computer simulations, and prototype testing, do not disassemble the product without the permission of HIWIN engineers.
5. Supervise children when handling this product.
6. People with psychosomatic illness or insufficient experience should not handle this product, unless under the direct supervision of managers or product narrators.

* If any items are damaged or incorrect, please contact your distributor or HIWIN sales representative.

■ Safety instructions

1. The product can only be repaired by HIWIN engineers. Please send the product back to us if there is any unusual phenomenon.
2. Do not hold the motor by its wire harness or shaft.
3. Do not hit the motor or shaft. Shock can damage the encoder inside the motor.
4. Do not apply loads to the motor shaft that are in excess of the specified value.
5. Protect the motor and encoder from high electrical noise, vibration, and unusual temperatures.
6. Do not change the motor parts or disassemble the screws. HIWIN will not be responsible for any damages, injuries, or accidents that may occur.

■ Wiring instructions

1. Ensure the specified power input value before using the product, and verify that the proper power supply is being used.
2. Before operation, please ensure that the motor, brake, and encoder are connected correctly. Incorrect wiring may cause abnormal motor operation or even cause permanent damage to the motor.
3. To avoid voltage coupling and electrical noise on the encoder, ensure adequate separation of the motor power wires and the encoder wires.
4. Ensure that the motor ground wire is connected to the ground terminal on the servo drive.
5. Do not perform a dielectric voltage-withstand test on any encoder terminal. The test may cause damage to the encoder.

■ Operation instructions

1. Higher than maximum specified current may cause demagnetization of magnetic components inside the motor.
2. The AC servo motor is designed to operate through a dedicated servo drive. Do not connect to a commercial power source (100/200V AC, 50/60 HZ). The motor will not operate correctly and may cause permanent damage.
3. The motor must be operated within its specified range.

4. Attention should be given to ensure adequate cooling and ventilation of the motor during operation.
5. For long term use, the motor shaft should be resupplied with proper and sufficient oil during the period of operation.
6. If any abnormal odor, noise, smoke, temperature rises or vibration is detected, stop the motor immediately. Remove power from the servo drive and isolated the motor.

■ Motor International Standard

		Drive	Motor
CE Directives ℂℰ	EMC Directives	EMC: EN61800-3 EN55011 EN61000-6-2 EN61000-6-4 EN61000-2-4 IEC60146-1-1 IEC61000-2-1	EN55011 EN61000-6-2 EN61000-6-4
	Low-Voltage Directives	LVDS:EN61800-5-1	EN60034-1 EN60034-5
UL Directives		UL:E348161 (D2T 100W/400W/1000W)	UL1004-1 UL1004-6

■ Maintenance and Storage instructions

1. Do not store the product in an inflammable environment or with chemical agents.
2. Store the product in a place without humidity, dust, harmful gases, or liquids.
3. The motor shaft opening is neither waterproof nor oil-proof. Do not install the motor in an environment where there is harmful gas, liquid, excessive moisture, or water vapor.
4. Do not store the servo motor where it will be subjected to vibration or shock in excess of the specified limit.
5. The storage and transportation temperature of this product: -20℃~+65℃
6. Clean：Wipe with Alcohol (70%)
7. Before shipping, the motor shaft is coated with antirust oil to protect the motor shaft against rust formation. However, the material of the motor shaft is not entirely rust-proof. When the motor storage time has exceeded six months, please inspect and examine the motor shaft and resupply with proper and sufficient antirust oil at least once every three months thereafter.
8. Product disposal：Follow the local laws and regulations for recycling.

A one year guarantee is provided from the date of delivery. For product damage caused by improper operation (Please refer to the notes and instructions in this operation manual). HIWIN will not be held responsible for replacing or maintaining the product as a result of any natural disasters that may occur during this period.

⚠ Warning：For the proper use of the HIWIN AC servo motor read these safety precautions carefully before installation, operation, and maintenance.

⚠ Warning：Do not touch when motor operating to avoid being scalded.

■ Please read "warning signs".
■ Turn power off before clean product.
■ Read manual before use.
■ If the product is used under overload condition shell temperature rises.
■ Without manufacturer's permission, please do not arbitrarily modify the device.
■ It is difficult to ensure electromagnetic compatibility (EMC) problems do not occur in some environments.
■ Removal of damaged power cable fasteners, with care and with attention for power cable fasteners.
■ Avoid impact on of shaft end and encoder.
■ Products cannot be used in environment with flammable materials.

MEMO

AC Servo Motor & D2T Drive Technical Information

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