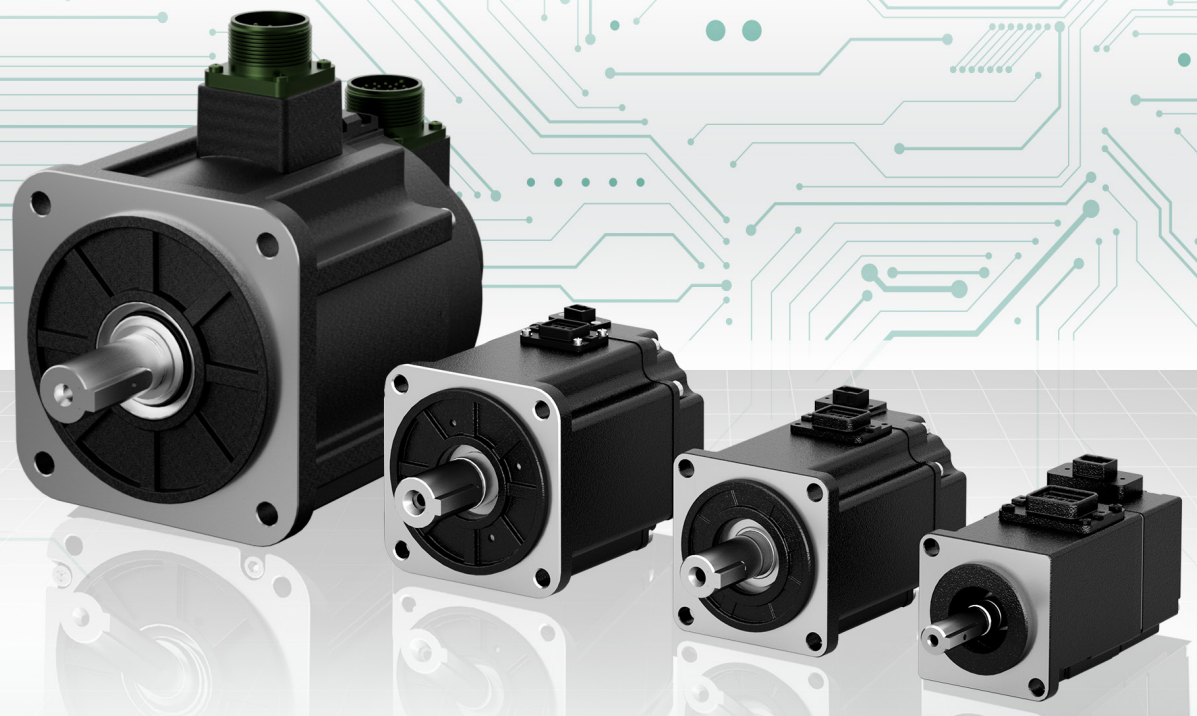
SERVOTRONIX
always in motion

High Performance

Permanent Magnet Synchronous Rotary Servo Motor

PH3E/S Series Selection Manual



www.servotronix.cn

Ver.2026b1

Company

Founded in lsrael in 1987, Servotronix Motion Control Ltd, as a comprehensive solution provider for development, production, and sales of servomechanism, control systems, and other products, is committed to making continuous breakthrough in the field of automation and facilitating the rapid development of China's high-end manufacturing industry. lt owns two brands namely Servotronix and Dorna.

Servotronix and Dorna are dedicated to designing and providing standardized and customized motion control solutions for equipment manufacturers and automation system suppliers, providing professional services to more than 1000+ customers in over 30 countries around the globe. In particular, Servotronix has been leading the direct-driver industry in the Chinese market, As an international company Servotronix has set up R&D teams in lsrael, Shanghai, Jiashan, and Shunde.

Product & Applications

Our motion control solutions cover most industries and automation equipment, such as lithium battery industry, semiconductor industry, robot industry, robotic arms industry, electronics industry, laser industry, photovoltaic industry, etc.

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1 PH3E/S Series Servo Motor Product Overview

The PH3E/S series high-performance rotary servo motors are third-generation products built on Servotronix's new platform. Compared with the PH2 series, the PH3E/S series has been comprehensively upgraded in terms of electrical characteristics, structural characteristics, control accuracy, ease of use, and manufacturability!

1.1 PH3E/S Series Servo Motor Naming Rules

PH	3	S	-	M	04	A	0	06	S	T	-	***
1	2	3	4	5	6	7	8	9	10	11	12	13

1 Series

Mark	Meaning
PH	PH series

2 Generation

Mark	Meaning
3	3rd generation

3 Performance category

Mark	Meaning
S	Standard edition (optical encoder)
E	Economical edition (magnetic encoder)

4 12: Connector, with no special meaning

5 Motor type (construction)

Mark	Meaning
L	Low-inertia high-speed motor
M	Medium-inertia high-speed motor
G	Medium-inertia high-torque motor

6 Rated power

Mark	Specification	Mark	Specification
01	0.1kW	10	1.0 kW
02	0.2 kW	09	0.85 kW
04	0.4 kW	13	1.3 kW
06	0.6 kW	18	1.8 kW
08	0.75 kW		

7 Voltage class

Mark	Specification
A	220V
B	380V

8 Electromagnetic design serial number

Mark	Meaning
0	Electromagnetic design serial number 0
Others	Other electromagnetic designs

9 Frame size

Mark	Specification	Mark	Specification
04	40mm	08	80mm
06	60mm	13	130mm

10 Brake/oil seal/shaft configuration

Mark	Specification
S	W/ oil seal, w/o brake
E	W/ oil seal, w/ brake
N	W/o oil seal, w/o brake
B	W/o oil seal, w/ brake

11 Encoder configuration

Mark	Specification
T	Optical encoder: 23-bit single-turn resolution encoder + 16-bit multi-turn count encoder (The 23-bit Tamagawa data protocol is used)
M	Magnetic encoder: 20-bit single-turn resolution encoder + 16-bit multi-turn count encoder (The 23-bit Tamagawa data protocol is used)
G	Magnetic encoder: 20-bit, single-turn, resolution (The 23-bit Tamagawa data protocol is used)

13 Customization code

Mark	Specification
Blank	Standard product (standard structure, standard keyway, standard shaft)
**	For other customization codes, refer to the specifications of custom products.

Note:
The example given herein is only for explaining the meaning of the characters, and does not suggest that a model designation contains all the characters listed herein.

1.2 PH3E/S Series Servo Motor Product Map

PH3 □ -L	PH3 □ -M	PH3 □ -G
		
Low-inertia High-speed Motor Rated 3000 rpm Max 7000 rpm	Medium-inertia High-speed Motor Rated 3000 rpm Max 7000 rpm	Medium-inertia High-torque Motor Rated 1500 rpm Max 4500 rpm

Rated power (kW)	0.1	0.2	0.4	0.6	0.75	0.85	1.0	1.3	1.8
Motor type	40	60	60	60	80	130	80	130	130

Motor type description:

1. The shape " □ " represents a square frame;

2. The number "40/60/80/130" represents the frame size;

3. The color represents the motor type: PH3-L low-inertia high-speed motor ; PH3-M medium-inertia high-speed motor; PH3-G medium-inertia high-torque motor;

4. The superscript in the upper right corner represents the voltage class: ○ 220V ; ◑ 220V+380V

1.3 PH3E/S Series Servo Motor Product Highlights

Higher Performance

☐ 40/60/80 frame motors

Maximum torque overload ≥
3.5 times

Max speed
7000RPM

☐ 130 frame motors

Maximum torque overload ≥
2.5 times

Max speed
4500RPM

More Products

A standard product line including ☐ 40 frame low-inertia products and ☐ 60/80/130 frame medium-inertia products, with a power ranging from 0.1 kW to 1.8 kW;
A 0.6 kW medium-inertia model with a 60mm flange and a 1.0 kW medium-inertia model with an 80mm flange newly developed compared to PH2 series, offering more flexible selection

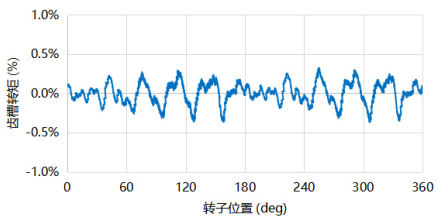
Electronic Nameplate

Built-in electronic nameplate, which includes cogging torque data to optimize torque ripple



High Stability

Cogging torque optimized to below 1%



Low Temperature Rise

Patented electromagnetic circuit design, ensuring an enclosure temperature rise under typical load conditions of
below 60K

Low Noise

Optimized magnetic circuit and structural design for lower operating noise

Quick-Plug Design

Quick-plug connectors designed to eliminate cable tail presence on the body and prevent in-air connector mating, ensuring higher interface reliability and more convenient, flexible wiring.

High Protection IP67

An enclosure with protection rating up to IP67 (including the connector, but excluding the shaft-through part) available for the whole series

High Energy Efficiency

Models of 550 W and above: meeting the Level 1 energy efficiency requirements in GB30253



Comprehensive Certifications

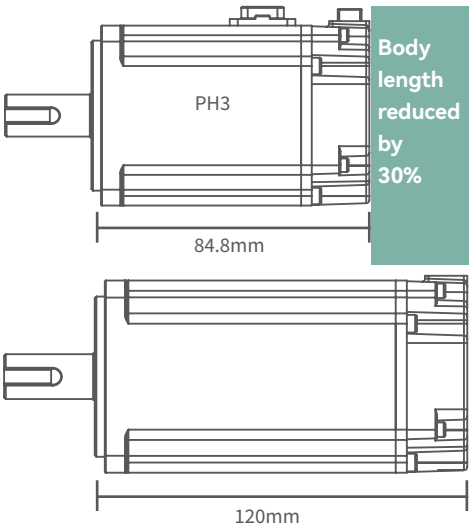
(Certification is in progress, please consult sales service for details)

UL, CE, and UKCA certified



Short Body

Up to 30% smaller than the PH2 series, significantly reducing footprint



Multiple Encoder Configurations

Multiple encoders available for selection, and Tamagawa protocol applied by default for greater versatility

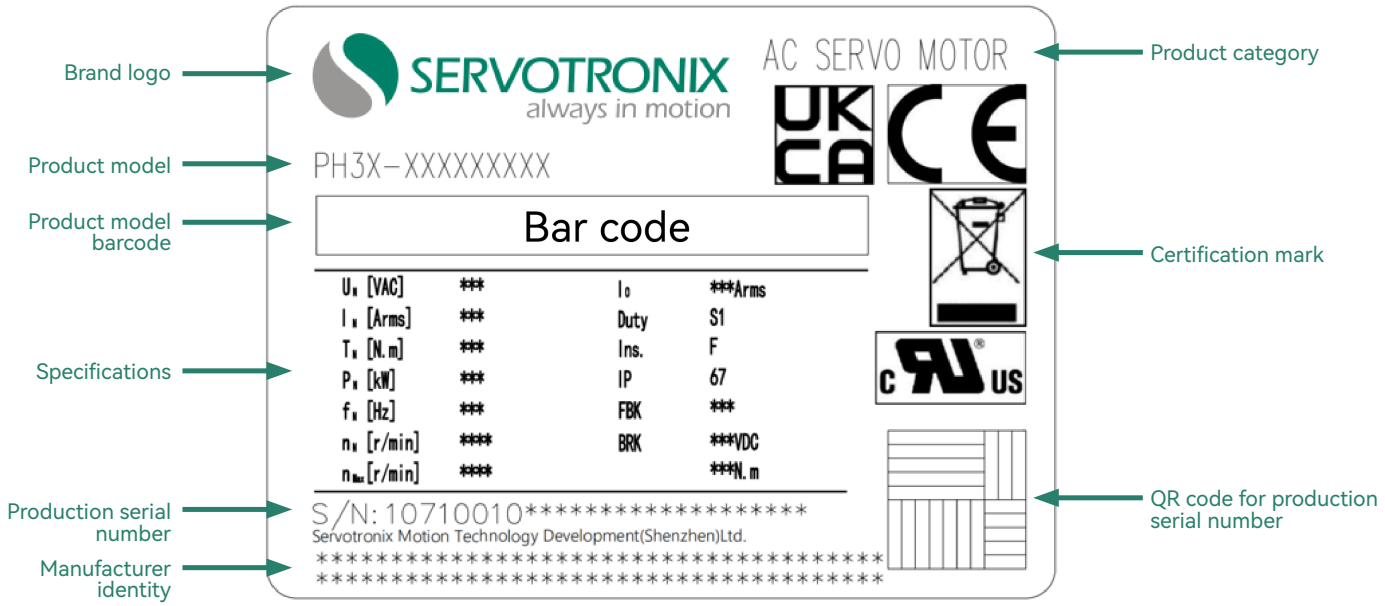
20-bit Magnetic Encoder

Repeated positioning accuracy up to 50 arc-seconds

23-bit Optical Encoder

Repeated positioning accuracy up to 20 arc-seconds

PH3E/S Nameplate Description



Nameplate Specification Parameter Definitions

U_N	Rated voltage: The input voltage of the AC servo drive.
P_N	Rated power: The maximum power output of the motor in the continuous duty zone.
n_N	Rated speed: The motor speed at rated power in the continuous duty zone.
T_N	Rated torque: The output torque of the motor at rated power and rated speed.
I_N	Rated phase current: The phase current RMS value of the motor at rated speed and rated torque.
I_0	Continuous stall current: The winding current RMS value of the motor at continuous stall torque in the continuous duty zone.
f_N	Rated frequency: The frequency of the power supply (UVW) when the motor is at rated speed.
n_{max}	Maximum speed: The maximum allowable speed of the motor.
Duty	Duty cycle: A description of the series of load conditions the motor can withstand, including starting, electric braking, no-load, stopping, and de-energization, as well as their duration and sequence. S1 indicates that the motor can operate under a constant load until thermal stability is reached.
Ins.	Insulation class: The maximum temperature rating of the motor winding insulation. Class F is rated at 155° C.
IP	IP rating: The ingress protection rating of the motor enclosure. IP67 means the motor is completely dust-tight and that water entry will not cause harm when the motor is immersed in water under specified pressure for a specified time.
FBK	Encoder parameters: Including the single-turn resolution and multi-turn data capacity of the encoder. S23M16bit: 23-bit single-turn resolution, 16-bit multi-turn counting capacity; S20M16bit: 20-bit single-turn resolution, 16-bit multi-turn counting capacity; S20bit: 20-bit single-turn resolution.
BRK	Brake specifications: Including the rated power supply voltage and static holding torque of the brake.

1.4 PH3E/S Series Servo Motor Specification Overview

20 20-bit single-turn absolute magnetic encoder

20 20-bit multi-turn absolute magnetic encoder

23 23-bit multi-turn absolute optical encoder

Inertia Class	Specification	100W
PH3 □ -L low-inertia high-speed motor	Model	L01A004
	Flange [mm]	40
	Rated/Peak torque [N·m]	0.32/1.12
	Rated/Peak speed [rpm]	3000/7000
	Inertia (w/o or w/ brake) [kg*cm^2]	0.044/0.046
	Voltage class [VAC]	220
	Encoder type [bit]	20 20 23

Inertia Class	Specification	200W	400W	600W	750W	1000W
PH3 □ -M medium-inertia high-speed motor	Model	M02A006	M04A006	M06A006	M08A008	M10A008
	Flange [mm]	60	60	60	80	80
	Rated/Peak torque [N·m]	0.64/2.30	1.27/4.45	1.91/7.50	2.39/8.37	3.18/11.13
	Rated/Peak speed [rpm]	3000/7000	3000/7000	3000/7000	3000/7000	3000/7000
	Inertia (w/o or w/ brake) [kg*cm^2]	0.24/0.25	0.47/0.48	0.68/0.69	1.46/1.51	2.00/2.05
	Voltage class [VAC]	220	220	220	220	220
	Encoder type [bit]	20 20 23	20 20 23	20 20 23	20 20 23	20 20 23

Inertia Class	Specification	850W	1300W	1800W
PH3 □ -G medium-inertia high-torque motor	Model	G09A013/G09B013	G13A013/G13B013	G18A013/G18B013
	Flange [mm]	130	130	130
	Rated/Peak torque [N·m]	5.39/13.5	8.28/20.85	11.5/28.75
	Rated/Peak speed [rpm]	1500/4500	1500/4500	1500/4500
	Inertia (w/o or w/ brake) [kg*cm^2]	12.21/14.22	18.03/20.05	23.94/25.95
	Voltage class [VAC]	220/380	220/380	220/380
	Encoder type [bit]	20 20 23	20 20 23	20 20 23

Note:

1. The speed/torque performance was tested with Servotronix's BD3 series drives.

1.5 PH3E/S Series Servo Motor Catalog

Motor type	Frame size	Rated power (kW)	Voltage Class (VAC)	Torque N·m (rated/peak)	Speed rpm (rated/max)	Inertia kg*cm^2 (w/o brake / w/ brake)	Current Arms (rated/peak)	Oil seal	Brake	20-bit magnetic encoder single-turn, absolute	20-bit magnetic encoder multi-turn, absolute	23-bit optical encoder multi-turn, absolute
L Low inertia high-speed motor	40	0.1	220	0.32/1.12	300/7000	0.044/0.046	1.24/4.25	×	√	PH3E-L01A004BG	PH3E-L01A004BM	PH3S-L01A004BT
								×	×	PH3E-L01A004NG	PH3E-L01A004NM	PH3S-L01A004NT
								√	√	PH3E-L01A004EG	PH3E-L01A004EM	PH3S-L01A004ET
								√	×	PH3E-L01A004SG	PH3E-L01A004SM	PH3S-L01A004ST
M Medium inertia high-speed motor	60	0.2	220	0.64/2.30	3000/7000	0.24/0.25	1.42/5.80	√	√	PH3E-M02A006EG	PH3E-M02A006EM	PH3S-M02A006ET
								√	×	PH3E-M02A006SG	PH3E-M02A006SM	PH3S-M02A006ST
		0.4	220	1.27/4.45	3000/7000	0.47/0.48	2.40/9.60	√	√	PH3E-M04A006EG	PH3E-M04A006EM	PH3S-M04A006ET
								√	×	PH3E-M04A006SG	PH3E-M04A006SM	PH3S-M04A006ST
		0.6	220	1.91/7.50	3000/7000	0.68/0.69	3.95/16.60	√	√	PH3E-M06A006EG	PH3E-M06A006EM	PH3S-M06A006ET
								√	×	PH3E-M06A006SG	PH3E-M06A006SM	PH3S-M06A006ST
	80	0.75	220	2.39/8.37	3000/7000	1.46/1.51	4.20/16.90	√	√	PH3E-M08A008EG	PH3E-M08A008EM	PH3S-M08A008ET
								√	×	PH3E-M08A008SG	PH3E-M08A008SM	PH3S-M08A008ST
		1.0	220	3.18/11.13	3000/7000	2.00/2.05	5.60/23.00	√	√	PH3E-M10A008EG	PH3E-M10A008EM	PH3S-M10A008ET
								√	×	PH3E-M10A008SG	PH3E-M10A008SM	PH3S-M10A008ST
G Medium inertia high-torque motor	130	0.85	220	5.39/13.50	1500/4500	12.21/14.22	5.73/16.28	√	√	PH3E-G09A013EG	PH3E-G09A013EM	PH3S-G09A013ET
								√	×	PH3E-G09A013SG	PH3E-G09A013SM	PH3S-G09A013ST
			380	5.39/13.50	1500/4500	12.21/14.22	3.30/8.85	√	√	PH3E-G09B013EG	PH3E-G09B013EM	PH3S-G09B013ET
								√	×	PH3E-G09B013SG	PH3E-G09B013SM	PH3S-G09B013ST
		1.3	220	8.28/20.85	1500/4500	18.03/20.05	9.70/26.09	√	√	PH3E-G13A013EG	PH3E-G13A013EM	PH3S-G13A013ET
								√	×	PH3E-G13A013SG	PH3E-G13A013SM	PH3S-G13A013ST
			380	8.28/20.85	1500/4500	18.03/20.05	5.15/13.35	√	√	PH3E-G13B013EG	PH3E-G13B013EM	PH3S-G13B013ET
								√	×	PH3E-G13B013SG	PH3E-G13B013SM	PH3S-G13B013ST
		1.8	220	11.5/28.75	1500/4500	23.94/25.95	11.60/31.35	√	√	PH3E-G18A013EG	PH3E-G18A013EM	PH3S-G18A013ET
								√	×	PH3E-G18A013SG	PH3E-G18A013SM	PH3S-G18A013ST
			380	11.5/28.75	1500/4500	23.94/25.95	7.14/19.12	√	√	PH3E-G18B013EG	PH3E-G18B013EM	PH3S-G18B013ET
								√	×	PH3E-G18B013SG	PH3E-G18B013SM	PH3S-G18B013ST

The 40# frame motor does not come with an oil seal by default. If an oil seal is required, please contact our sales service for customization;

2 General Technical Specifications

Product Series		PH3E/S series	
Voltage class		220V model	380V model
Withstand voltage class		1500 VAC for 1 minute	1800 VAC for 1 minute
Duty cycle		S1	
Insulation class		F	
Insulation resistance		≥ 10MΩ @ 500 VDC	
Excitation method		Permanent magnet	
Installation		Flange	
Drive connection method		Direction connection to drive via an extension cable	
Rotation direction		When viewed from the motor shaft extension end/load end, counterclockwise (CCW) rotation of the rotor is defined as the positive direction, and the phase relationship of the motor's back EMF is: U>V>W.	
Vibration grade		V15	
Enclosure IP rating		IP67 (excluding shaft-through part, under secure connector connection)	
Vibration resistance		Vibration frequency 10~150Hz, amplitude 0.175mm, or acceleration 25m/s2, sweep cycles 10	
Shock resistance		Peak acceleration 50m/s2, pulse duration 30ms, half-sine wave; 18 cycles in total, with 3 times in each direction	
Environmental conditions	Storage environment	When storing the motor unpowered, follow the environmental requirements below:	
		Ambient temperature: -10° C ~ +40° C (no freezing)	
		Ambient humidity: 20%RH ~ 85%RH (non condensation)	
	Operating environment	Ambient temperature: -10° C ~ 40° C	
		Ambient humidity: 20%RH ~ 85%RH (non condensation)	
	Installation location	• Indoor locations free from corrosive or explosive gases	
		• Well-ventilated locations with minimal dust, debris, and moisture	
		• Locations that are easily accessible for inspection and cleaning	
		• Altitudes below 1000 m (derating recommended at an altitude between 1000 m and 2000)	
		• Locations free from strong magnetic fields	

3 Electrical Specifications

3.1 PH3E/S-L Electrical Specifications

40 Motor specification: 0.1kW

Item		Unit	L01A004
Rated voltage		VAC	220
Inertia type		/	Low inertia
Mounting flange		mm	40
Rated power		W	100
Rated torque		N·m	0.32
Max torque*1		N·m	1.12
Rated speed		r/min	3000
Max speed*1		r/min	7000
Rated current*1		Arms	1.24
Max current*1		Arms	4.25
Torque constant*1		N·m/Arms	0.31
Number of pole pairs		/	5
Line voltage constant*1		Vrms/krpm (±10%)	18.60
Electrical time constant		ms	0.40
Line resistance (at 20℃)*1		Ω (±5%)	13.57
Line inductance*1		mH (±10%)	5.43
Inductance	q-axis	mH (±10%)	2.97
	q-axis	mH (±10%)	2.46
Rotor inertia	W/o brake	$x10^{-4}kg.m^2$	0.044
	W/ brake	$x10^{-4}kg.m^2$	0.046
Mechanical time constant	W/o brake	ms	0.94
	W/ brake	ms	0.99
Mass	W/o brake	kg	0.34
	W/ brake	kg	0.51
Allowable load	Radial load	N	78
	Axial load	N	54
Brake specifications*2	Rated voltage	VDC (±10%)	24
	Rated current	A	0.30
	Rated power	W (@20℃)	7.2
	Holding torque	N·m	≥ 0.32
	Pull-in voltage	VDC	≤ 16.8
	Pull-in time	ms	≤ 50
	Release voltage	VDC	≥ 0.5
	Release time	ms	≤ 20
	Rotation angle	°	≤ 1
Encoder configuration		/	20 20 23
Test heatsink specifications		mm	200*200*6

Note:
*1 All parameters are typical values measured on test prototypes at an ambient temperature of 25° C. The tests were conducted using Servotronix BD3 series servo drives. Performance may vary when the motor is used with other drives.
*2 The brake is intended for static holding only and shall not be used for dynamic braking.

3.2 PH3E/S-M Electrical Specifications

60 80 Motor specification: 0.2/0.4/0.6kW 0.75/1.0kW

Item		Unit	M02A006	M04A006	M06A006	M08A008	M10A008
Rated voltage		VAC	220	220	220	220	220
Inertia type		/	Medium inertia	Medium inertia	Medium inertia	Medium inertia	Medium inertia
Mounting flange		mm	60	60	60	80	80
Rated power		W	200	400	600	750	1000
Rated torque		N·m	0.64	1.27	1.91	2.39	3.18
Max torque*1		N·m	2.30	4.45	7.50	8.37	11.13
Rated speed		r/min	3000	3000	3000	3000	3000
Max speed*1		r/min	7000	7000	7000	7000	7000
Rated current*1		Arms	1.42	2.40	3.95	4.20	5.60
Max current*1		Arms	5.80	9.60	16.60	16.90	23.00
Torque constant*1		N·m/Arms	0.51	0.56	0.56	0.60	0.60
Number of pole pairs		/	5	5	5	5	5
Line voltage constant*1		Vrms/krpm (±10%)	30.78	33.80	33.78	36.06	36.20
Electrical time constant		ms	1.22	1.67	1.56	3.05	2.91
Line resistance (at 20℃)*1		Ω (±5%)	8.63	3.08	1.87	1.15	0.79
Line inductance*1		mH (±10%)	10.57	5.13	2.92	3.51	2.30
Inductance	d-axis	mH (±10%)	5.12	2.40	1.37	1.64	1.08
	q-axis	mH (±10%)	5.45	2.73	1.55	1.87	1.22
Rotor inertia	W/o brake	$x10^{-4}kg.m^2$	0.24	0.47	0.68	1.46	2.00
	W/ brake	$x10^{-4}kg.m^2$	0.25	0.48	0.69	1.51	2.05
Mechanical time constant	W/o brake	ms	1.20	0.69	0.61	0.71	0.66
	W/ brake	ms	1.25	0.71	0.62	0.73	0.68
Mass	W/o brake	kg	0.71	1.02	1.30	1.98	2.38
	W/ brake	kg	1.09	1.39	1.67	2.27	2.76
Allowable load	Radial load	N	245	245	245	393	393
	Axial load	N	74	74	74	147	147
Brake specifications*2	Rated voltage	VDC (±10%)	24	24	24	24	24
	Rated current	A	0.40	0.40	0.40	0.44	0.35
	Rated power	W (@20℃)	9.6	9.6	9.6	10.5	8.5
	Holding torque	N·m	≥ 1.6	≥ 1.6	≥ 2.3	≥ 3.2	≥ 3.8
	Pull-in voltage	VDC	≤ 18	≤ 18	≤ 18.6	≤ 18.6	≤ 16.8
	Pull-in time	ms	≤ 60	≤ 60	≤ 70	≤ 70	≤ 60
	Release voltage	VDC	≥ 1.5	≥ 1.5	≥ 0.5	≥ 0.5	≥ 0.5
	Release time	ms	≤ 20	≤ 20	≤ 20	≤ 20	≤ 40
	Rotation angle	°	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5
Encoder configuration*3		/	20 20 23	20 20 23	20 20 23	20 20 23	20 20 23
Test heatsink specifications		mm	250*250*6	250*250*6	250*250*6	250*250*6	250*250*6

Note:

*1 All parameters are typical values measured on test prototypes at an ambient temperature of 25° C. The tests were conducted using Servotronix BD3 series servo drives. Performance may vary when the motor is used with other drives.

*2 The brake is intended for static holding only and shall not be used for dynamic braking.

3.3 PH3E/S-G Electrical Specifications

130 Motor specification: 0.85/1.3/1.8kW

Item		Unit	G09A013	G09B013	G13A013	G13B013	G18A013	G18B013
Rated voltage		VAC	220	380	220	380	220	380
Inertia type		/	Medium inertia	Medium inertia	Medium inertia	Medium inertia	Medium inertia	Medium inertia
Mounting flange		mm	130	130	130	130	130	130
Rated power		W	850	850	1300	1300	1800	1800
Rated torque		N·m	5.39	5.39	8.28	8.28	11.50	11.50
Max torque*1		N·m	13.50	13.50	20.85	20.85	28.75	28.75
Rated speed		r/min	1500	1500	1500	1500	1500	1500
Max speed*1		r/min	4500	4500	4500	4500	4500	4500
Rated current*1		Arms	5.73	3.30	9.70	5.15	11.60	7.14
Max current*1		Arms	16.28	8.85	26.09	13.35	31.35	19.12
Torque constant*1		N·m/Arms	0.94	1.72	0.90	1.77	1.02	1.67
Number of pole pairs		/	5	5	5	5	5	5
Line voltage constant*1		Vrms/krpm (±10%)	56.81	103.93	54.21	106.92	61.52	100.73
Electrical time constant		ms	7.81	7.51	8.91	9.04	9.38	9.90
Line resistance (at 20℃)*1		Ω (±5%)	0.99	3.46	0.46	1.79	0.40	1.00
Line inductance*1		mH (±10%)	7.73	26.00	4.10	16.19	3.75	9.90
Inductance	d-axis	mH (±10%)	3.60	12.10	1.87	7.54	1.71	4.60
	q-axis	mH (±10%)	4.13	13.90	2.23	8.65	2.04	5.30
Rotor inertia	W/o brake	$x10^{-4}kg.m^2$	12.21	12.21	18.03	18.03	23.94	23.94
	W/ brake	$x10^{-4}kg.m^2$	14.22	14.22	20.05	20.05	25.95	25.95
Mechanical time constant	W/o brake	ms	2.05	2.14	1.55	1.55	1.39	1.29
	W/ brake	ms	2.39	2.50	1.72	1.72	1.50	1.40
Mass	W/o brake	kg	5.75	5.75	7.20	7.20	8.70	8.70
	W/ brake	kg	7.20	7.20	8.70	8.70	10.20	10.20
Allowable load	Radial load	N	686	686	686	686	686	686
	Axial load	N	196	196	196	196	196	196
Brake specifications *2	Rated voltage	VDC (±10%)	24	24	24	24	24	24
	Rated current	A	0.96	0.96	0.96	0.96	0.96	0.96
	Rated power	W (@20℃)	23.0	23.0	23.0	23.0	23.0	23.0
	Holding torque	N·m	≥ 16	≥ 16	≥ 16	≥ 16	≥ 16	≥ 16
	Pull-in voltage	VDC	≤ 18	≤ 18	≤ 18	≤ 18	≤ 18	≤ 18
	Pull-in time	ms	≤ 80	≤ 80	≤ 80	≤ 80	≤ 80	≤ 80
	Release voltage	VDC	≥ 0.5	≥ 0.5	≥ 0.5	≥ 0.5	≥ 0.5	≥ 0.5
	Release time	ms	≤ 40	≤ 40	≤ 40	≤ 40	≤ 40	≤ 40
	Rotation angle	°	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5
Encoder configuration*3		/	20 20 23	20 20 23	20 20 23	20 20 23	20 20 23	20 20 23
Test heatsink specifications		mm	400*400*20	400*400*20	400*400*20	400*400*20	400*400*20	400*400*20

Note:

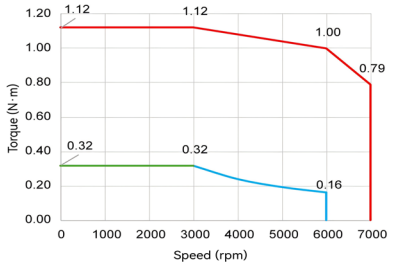
*1 All parameters are typical values measured on test prototypes at an ambient temperature of 25° C. The tests were conducted using Servotronix BD3 series servo drives. Performance may vary when the motor is used with other drives.

*2 The brake is intended for static holding only and shall not be used for dynamic braking.

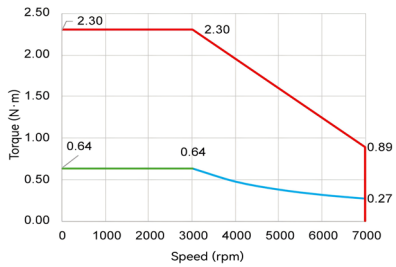
3.4 T-N Curve

Continuous Duty Zone - Constant Torque Zone
Continuous Duty Zone - Constant Power Zone
Intermittent Duty Zone

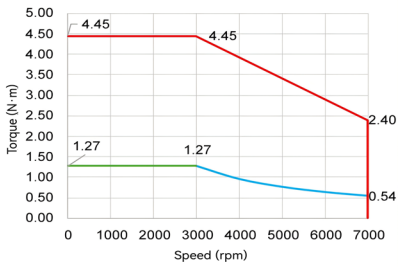
L01A004 Duty Zone



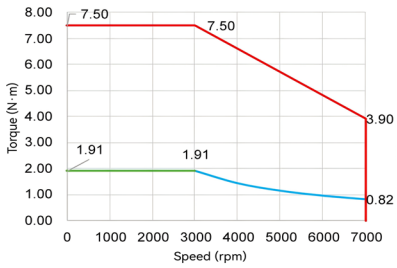
M02A006 Duty Zone



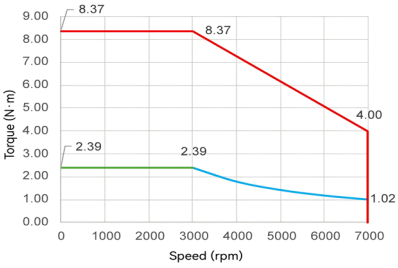
M04A006 Duty Zone



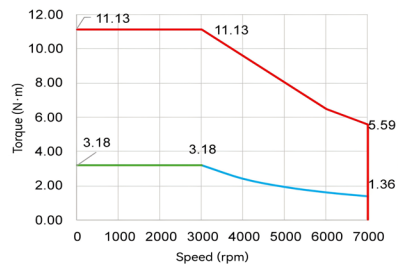
M06A006 Duty Zone



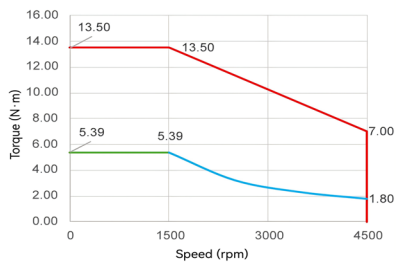
M08A008 Duty Zone



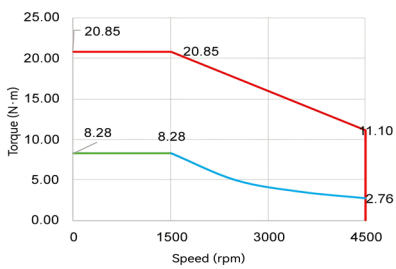
M10A008 Duty Zone



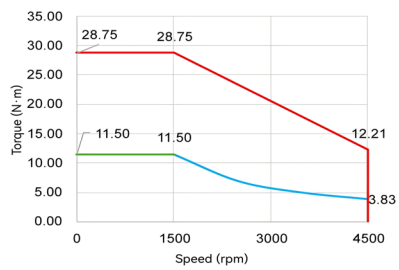
G09A013 Duty Zone



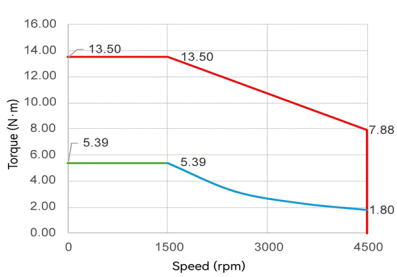
G13A013 Duty Zone



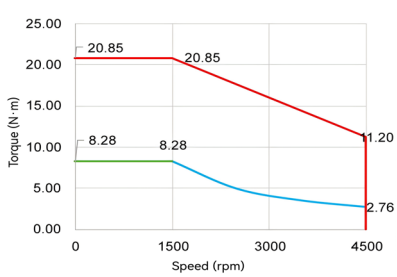
G18A013 Duty Zone



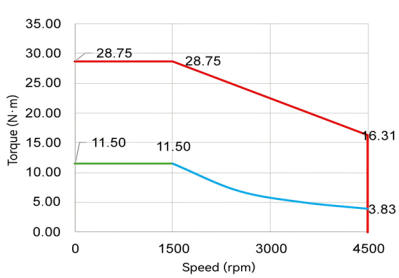
G09B013 Duty Zone



G13B013 Duty Zone



G18B013 Duty Zone

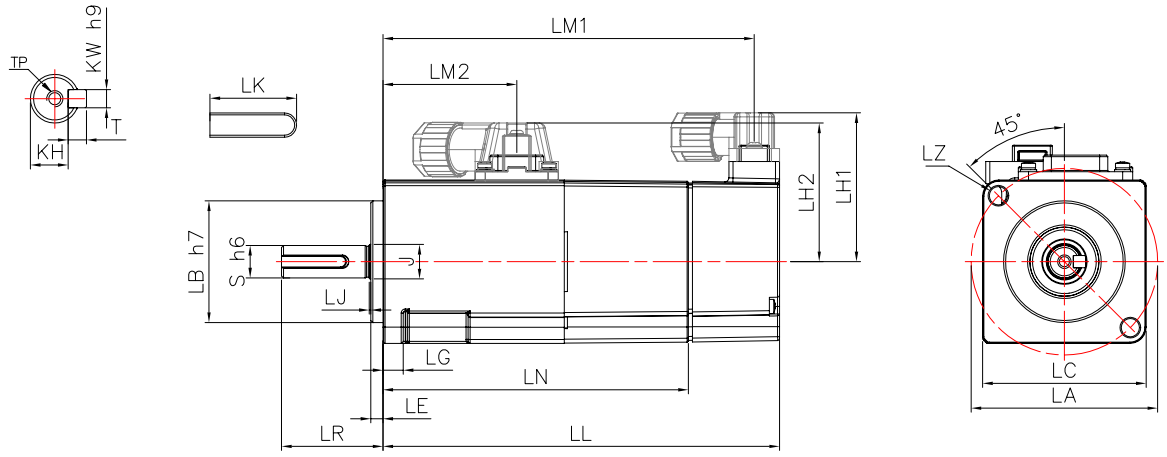


4 Structural Characteristics

4.1 PH3E/S-L Structure & Dimensions

40

Motor specification: L01



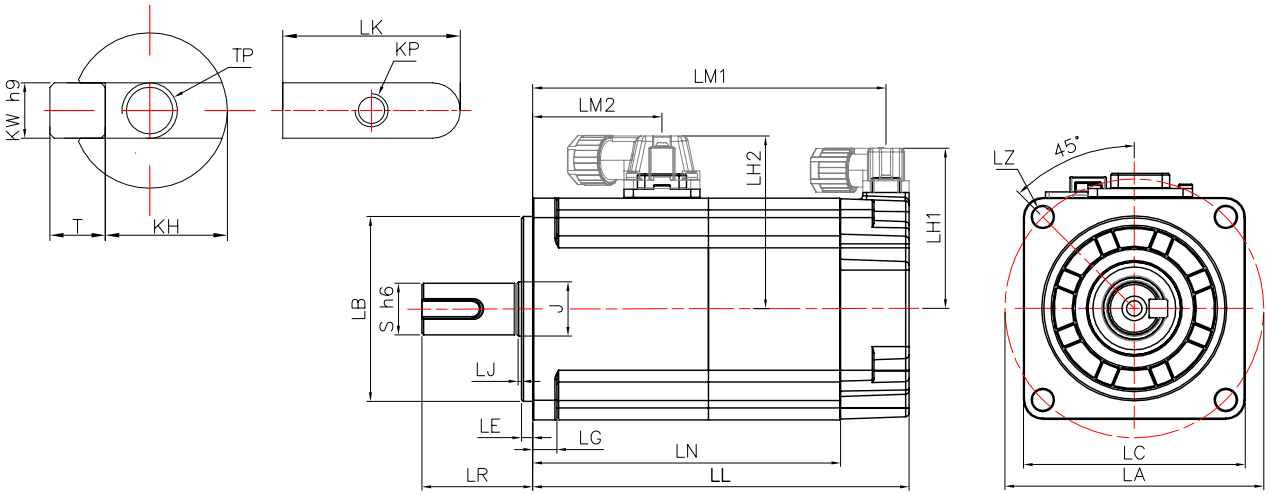
Model		L01A004
LA		ϕ46
LB		ϕ30
LC		40
LZ		2ϕ4.5
S		ϕ8h6
J		ϕ8.5
LH1*		36.7
LH2*		34.2
LR		25
LE		3
LG		5
LJ		0.4
LL (magnetic encoder)	W/o brake	71
	W/ brake	97.5
LL (optical encoder)	W/o brake	71
	W/ brake	97.5
LN	W/o brake	48.7
	W/ brake	75.3
LM1 (magnetic encoder)	W/o brake	64.9
	W/ brake	91.5
LM1 (optical encoder)	W/o brake	64.9
	W/ brake	91.5
LM2	W/o brake	33
	W/ brake	33
Key type		C
LK key length		16
KP key access hole		None
T key thickness		3
KW key width		3
KH		6.2
TP threaded hole		M3 depth 7

Notes: 1. The standard unit of measurement is mm.
2. Explanation of symbol "*": The motor body does not include the connector on the extension cable. LH1 and LH2 are used to indicate the maximum height after the connector on the extension cable is installed.
3. The connector of the extension cable needs to be locked with an appropriate tool. Therefore, please ensure there is enough space above the connector to operate the tool; otherwise, it may be necessary to disassemble the motor to remove the extension cable.

4.2 PH3E/S-M Structure & Dimensions

60 80

Motor specification: M02/04/06/08/10



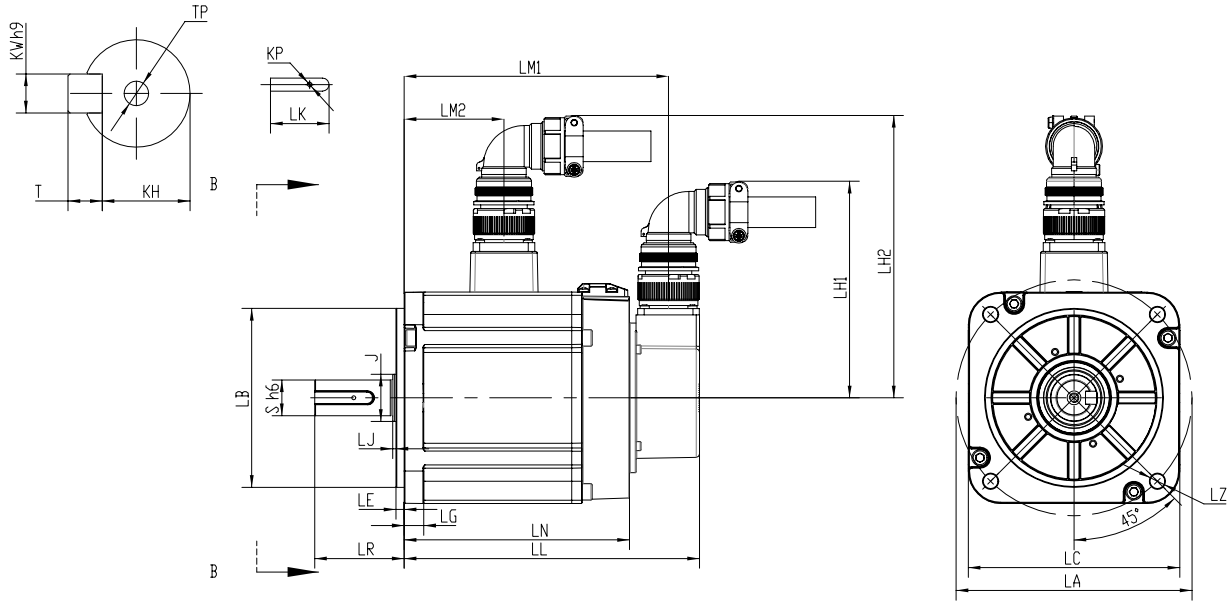
Model		M02A006	M04A006	M06A006	M08A008	M10A008
LA		ϕ70	ϕ70	ϕ70	ϕ90	ϕ90
LB		ϕ50	ϕ50	ϕ50	ϕ70	ϕ70
LC		60	60	60	80	80
LZ		4ϕ5.7	4ϕ5.7	4ϕ5.7	4ϕ6.6	4ϕ6.6
S		ϕ14h6	ϕ14h6	ϕ14h6	ϕ19h6	ϕ19h6
J		ϕ14.7	ϕ14.7	ϕ14.7	ϕ19.8	ϕ19.8
LH1*		43.5	43.5	43.5	53.5	53.5
LH2*		44.4	44.4	44.4	54.5	54.5
LR		30	30	30	35	35
LE		3	3	3	3	3
LG		6.5	6.5	6.5	8	8
LJ		1	1	1	1	1
LL (magnetic encoder)	W/o brake	69.3	84.8	100.3	96	108
	W/ brake	101.8	117.3	132.8	126	145
LL (optical encoder)	W/o brake	69.3	84.8	100.3	96	108
	W/ brake	101.8	117.3	132.8	126	145
LN	W/o brake	47.5	63	78.5	77.5	89.5
	W/ brake	83.3	98.8	114.3	107.5	126.5
LM1 (magnetic encoder)	W/o brake	63.05	78.55	94.05	87	99
	W/ brake	95.55	111.05	126.55	116	137
LM1 (optical encoder)	W/o brake	63.05	78.55	94.05	87	99
	W/ brake	95.55	111.05	126.55	116	137
LM2	W/o brake	34.95	50.45	65.95	60	72
	W/ brake	34.95	50.45	65.95	60	72
Key type		C	C	C	C	C
LK key length		16	16	16	25	25
KP key access hole		M3	M3	M3	M3	M3
T key thickness		5	5	5	6	6
KW key width		5	5	5	6	6
KH		11	11	11	15.5	15.5
TP threaded hole		M5 depth 12	M5 depth 12	M5 depth 12	M6 depth 14	M6 depth 14

Note:
1. The standard unit of measurement is mm.
2. Explanation of symbol "*": The motor body does not include the connector on the extension cable. LH1 and LH2 are used to indicate the maximum height after the connector on the extension cable is installed.
3. The connector of the extension cable needs to be locked with an appropriate tool. Therefore, please ensure there is enough space above the connector to operate the tool; otherwise, it may be necessary to disassemble the motor to remove the extension cable.

4.3 PH3E/S-G Structure & Dimensions

130

Motor specification: G09/13/18



Model		G09A013 G09B013	G13A013 G13B013	G18A013 G18B013
LA		ϕ145	ϕ145	ϕ145
LB		ϕ110	ϕ110	ϕ110
LC		130	130	130
LZ		4ϕ9	4ϕ9	4ϕ9
S		ϕ22h6	ϕ22h6	ϕ22h6
J		ϕ29	ϕ29	ϕ29
LH1*		133.07	133.07	133.07
LH2*		173.57	173.57	173.57
LR		55	55	55
LE		5	5	5
LG		12	12	12
LJ		2	2	2
LL (magnetic encoder)	W/o brake	131.9	148.4	164.9
	W/ brake	160.9	177.4	193.9
LL (optical encoder)	W/o brake	141.4	157.9	174.4
	W/ brake	170.4	186.9	203.4
LN	W/o brake	88.9	105.4	121.9
	W/ brake	117.9	134.4	150.9
LM1 (magnetic encoder)	W/o brake	112.9	129.4	145.9
	W/ brake	141.9	158.4	174.9
LM1 (optical encoder)	W/o brake	122.4	138.9	155.4
	W/ brake	151.4	167.9	184.4
LM2	W/o brake	60.72	77.22	93.95
	W/ brake	60.72	77.22	93.95
Key type		C	C	C
LK key length		36	36	36
KP key access hole		M3	M3	M3
T key thickness		7	7	7
KW key width		8	8	8
KH		18	18	18
TP threaded hole		M6 depth 16	M6 depth 16	M6 depth 16

Note:
1. The standard unit of measurement is mm.
2. Explanation of symbol "*": The motor body does not include the connector on the extension cable. LH1 and LH2 are used to indicate the maximum height after the connector on the extension cable is installed.
3. The connector of the extension cable needs to be locked with an appropriate tool. Therefore, please ensure there is enough space above the connector to operate the tool; otherwise, it may be necessary to disassemble the motor to remove the extension cable.

5 Motor interface

The PH3E/S servo motor comes standard with SUNCHU MC series connectors and MIL-DTL-5015 IP67 connectors, providing enhanced overall protection, a longer interface lifecycle, reliable connections, and flexible wiring.

*The brand of the connectors referred to in this manual is SUNCHU.

SUNCHU 三竹机电

*Connectors are key components for reliable electrical connections. Please be sure to use the connectors of brands and models officially designated by Servotronix.

*Servotronix shall not be liable for any faults or losses arising from the unauthorized use of connectors from other brands.

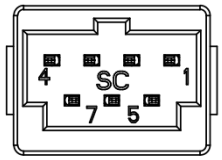
5.1 Interface Description for □40/60/80 Frame Motors and Extension Cables (MC Series Connectors)

Encoder Interface

Motor Connector

Connector:
Model: SC-MC7P-MDDL

Pin No.	Signal
1	Shield
2	VCC
3	GND
4	Data+
5	Data-
6	Bat+
7	Bat-

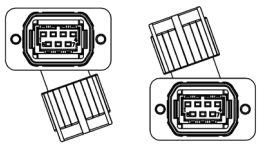


Extension Cable Connector

Connector:
Model:
SC-MC7S-AB20-000-10

Pin No.	Signal	Wire Color
1	Shield	Shield
2	VCC	Red
3	GND	Black
4	Data+	Blue
5	Data-	Blue/black
6	Bat+	Green
7	Bat-	Green/black

Pin: Model:
Forward: S-FMC19012220 (*7)
Reverse: S-FMC19012220 (*7)



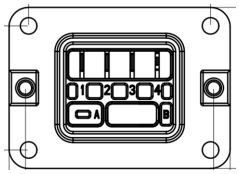
D-direction (forward) N-direction (reverse)

Power cable Interface (W/o brake)

Motor Connector

Connector:
Model: SC-MC6P-AP2G-054-19

Pin No.	Signal
1	U
2	V
3	W
4	PE

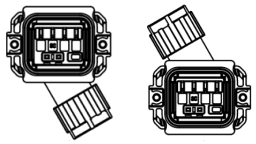


Extension Cable Connector

Connector:
Model:
SC-MC6S-AP20-00

Pin No.	Signal	Wire Color
1	U	Red
2	V	White
3	W	Black
4	PE	Yellow/ green

Pin: Model:
Forward: S-FMCK6012220 (*4)
Reverse: S-FMCK6092220 (*4)



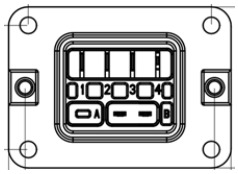
D-direction (forward) N-direction (reverse)

Power cable Interface (W/ brake)

Motor Connector

Connector:
Model: SC-MC6P-AP2G-044-19

Pin No.	Signal
1	U
2	V
3	W
4	PE
A	BRK+
B	BRK-

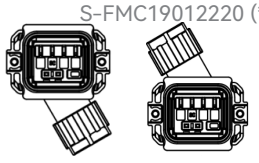


Extension Cable Connector

Connector:
Model: SC-MC6S-AP20-00

Pin No.	Signal	Wire Color
1	U	Red
2	V	White
3	W	Black
4	PE	Yellow/ green
A	BRK+	Blue
B	BRK-	Brown

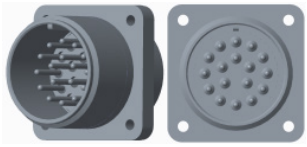
Pin: Model:
Forward: S-FMCK6012220 (*4)
S-FMC19012220 (*2)
Reverse: S-FMCK6092220 (*4)
S-FMC19012220 (*2)

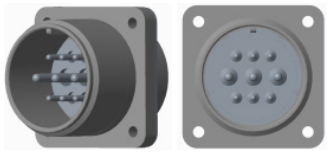
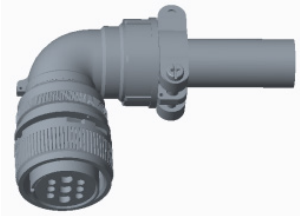
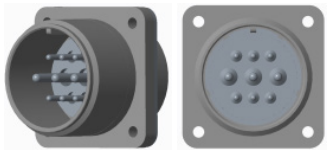
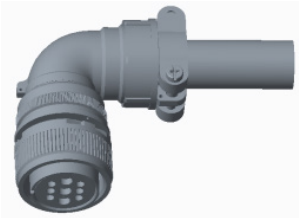


D-direction (forward) N-direction (reverse)

Note:
1. The wire colors in the table are for recommendation only. In case of any different color, please refer to the definition of pin No. to confirm the signal.
2. As for the encoder interface, pins 6 and 7 are the external battery power supply interfaces for the multi-turn encoder, and are compatible with models using multi-turn encoder only.
3. The connectors in this table are not available for individual purchase. Please order the corresponding connector kit if required.
4. The brake power supply is polarity-sensitive. Be sure to connect the wires with the correct polarity; otherwise, the servo system may malfunction or the motor may not reach its maximum performance.

5.2 Interface Description for □ 130 Frame Motors and Extension Cables (5015 MIL-SPEC Connectors)

<table>
<tr><th></th><th>Motor Connector</th><th>Extension Cable Connector</th></tr>
<tr><td>Encoder Interface</td><td>
Connector:
Model: CMS3102A20-29P
P/N: 12119400001081
<table>
<tr><th>Pin No.</th><th>Signal</th></tr>
<tr><td>E</td><td>SD+</td></tr>
<tr><td>F</td><td>SD-</td></tr>
<tr><td>G</td><td>GND</td></tr>
<tr><td>H</td><td>VCC</td></tr>
<tr><td>J</td><td>Shield</td></tr>
<tr><td>S</td><td>Bat-</td></tr>
<tr><td>T</td><td>Bat+</td></tr>
</table>

</td><td>
Connector:
Model: CMS3108A20-29SI
P/N: 12119400000501
<table>
<tr><th>Pin No.</th><th>Signal</th><th>Wire Color</th></tr>
<tr><td>E</td><td>SD+</td><td>Blue</td></tr>
<tr><td>F</td><td>SD-</td><td>Blue/black</td></tr>
<tr><td>G</td><td>GND</td><td>Black</td></tr>
<tr><td>H</td><td>VCC</td><td>Red</td></tr>
<tr><td>J</td><td>Shield</td><td>Shield</td></tr>
<tr><td>S</td><td>Bat-</td><td>Green/ black</td></tr>
<tr><td>T</td><td>Bat+</td><td>Green</td></tr>
</table>

</td></tr>
<tr><td>Power cable Interface (W/o brake)</td><td>
Connector:
Model: CMS3102A20-18P
P/N: 12119400000841
<table>
<tr><th>Pin No.</th><th>Signal</th></tr>
<tr><td>E</td><td>PE</td></tr>
<tr><td>F</td><td>U</td></tr>
<tr><td>I</td><td>V</td></tr>
<tr><td>B</td><td>W</td></tr>
</table>

</td><td>
Connector:
Model: CMS3108A20-18SI
P/N: 12119400000502
<table>
<tr><th>Pin No.</th><th>Signal</th><th>Wire Color</th></tr>
<tr><td>E</td><td>PE</td><td>Yellow/ green</td></tr>
<tr><td>F</td><td>U</td><td>Red</td></tr>
<tr><td>I</td><td>V</td><td>White</td></tr>
<tr><td>B</td><td>W</td><td>Black</td></tr>
</table>

</td></tr>
<tr><td>Power cable Interface (W/ brake)</td><td>
Connector:
Model: CMS3102A20-18P
P/N: 12119400000841
<table>
<tr><th>Pin No.</th><th>Signal</th></tr>
<tr><td>E</td><td>PE</td></tr>
<tr><td>F</td><td>U</td></tr>
<tr><td>I</td><td>V</td></tr>
<tr><td>B</td><td>W</td></tr>
<tr><td>C</td><td>BRK+</td></tr>
<tr><td>D</td><td>BRK-</td></tr>
</table>

</td><td>
Connector:
Model: CMS3108A20-18SI
P/N: 12119400000502
<table>
<tr><th>Pin No.</th><th>Signal</th><th>Wire Color</th></tr>
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<tr><td>F</td><td>U</td><td>Red</td></tr>
<tr><td>I</td><td>V</td><td>White</td></tr>
<tr><td>B</td><td>W</td><td>Black</td></tr>
<tr><td>C</td><td>BRK+</td><td>Brown</td></tr>
<tr><td>D</td><td>BRK-</td><td>Blue</td></tr>
</table>

</td></tr>
</table>

Note:

1. The wire colors in the table are for recommendation only. In case of any different color, please refer to the definition of pin No. to confirm the signal.
2. As for the encoder interface, pins S and T are the external battery power supply interfaces for the multi-turn encoder, and are compatible with models using multi-turn encoder only.
3. The brake power supply is polarity-sensitive. Be sure to connect the wires with the correct polarity; otherwise, the servo system may malfunction or the motor may not reach its maximum performance.

6 Accessory Selection

① Servo cables and connector kits are optional and must be ordered separately.
② Customers only need to choose either the servo cable or the connector kit;
③ Each servo cable is paired with a corresponding connector kit. Please select the connector kit based on the cable required by the servo system.
④ The connector kit includes connectors and accessories for both ends of the cable, but does not include wires. Customers will therefore need to prepare wires for harness fabrication.
⑤ Servotronix only provides selection and ordering for servo cables and connector kits. Selection and ordering of individual parts within the kit are not currently available.

6.1 Power Cable and Connector Kit Catalog

PH3 Motor Model	Compatible Drive Type	Brake Configuration	Length (m)	Cable Model (Standard Flexible Cable)		Connector Kit Model (choose either connector kit or cable)
				Front cable outlet (D-direction)	Rear cable outlet (N-direction)	
L01, M02/04/06	BD3 series, CDHD2S series	W/o brake	3	SPC-A61011-0303-F	SPC-A63011-0303-F	Front cable outlet (D-direction): CAP-A6-01-A Rear cable outlet (N-direction): CAP-A6-01-B
			5	SPC-A61011-0305-F	SPC-A63011-0305-F	
			10	SPC-A61011-0310-F	SPC-A63011-0310-F	
			15	SPC-A61011-0315-F	SPC-A63011-0315-F	
			20	SPC-A61011-0320-F	SPC-A63011-0320-F	
		W/ brake	3	SPC-A62021-0403-F	SPC-A64021-0403-F	Front cable outlet (D-direction): CAP-A6-02-A Rear cable outlet (N-direction): CAP-A6-02-B
			5	SPC-A62021-0405-F	SPC-A64021-0405-F	
			10	SPC-A62021-0410-F	SPC-A64021-0410-F	
			15	SPC-A62021-0415-F	SPC-A64021-0415-F	
			20	SPC-A62021-0420-F	SPC-A64021-0420-F	
M08/10	BD3 series CDHD2S series	W/o brake	3	SPC-A61031-0503-F	SPC-A63031-0503-F	Front cable outlet (D-direction): CAP-A6-03-A Rear cable outlet (N-direction): CAP-A6-03-B
			5	SPC-A61031-0505-F	SPC-A63031-0505-F	
			10	SPC-A61031-0510-F	SPC-A63031-0510-F	
			15	SPC-A61031-0515-F	SPC-A63031-0515-F	
			20	SPC-A61031-0520-F	SPC-A63031-0520-F	
M08/10	BD3 series, CDHD2S series	W/ brake	3	SPC-A62041-0603-F	SPC-A64041-0603-F	Front cable outlet (D-direction): CAP-A6-04-A Rear cable outlet (N-direction): CAP-A6-04-B
			5	SPC-A62041-0605-F	SPC-A64041-0605-F	
			10	SPC-A62041-0610-F	SPC-A64041-0610-F	
			15	SPC-A62041-0615-F	SPC-A64041-0615-F	
			20	SPC-A62041-0620-F	SPC-A64041-0620-F	
G09/13/18	BD3 series, CDHD2S series	W/o brake	3	CBL-PWPH220000A003		CAP-PWPH20000A0
			5	CBL-PWPH220000A005		
			10	CBL-PWPH220000A010		
			15	CBL-PWPH220000A015		
			20	CBL-PWPH220000A020		
G09/13/18	BD3 series, CDHD2S series	W/ brake	3	CBL-PWPH220001A003		CBL-PWPH20001A0
			5	CBL-PWPH220001A005		
			10	CBL-PWPH220001A010		
			15	CBL-PWPH220001A015		
			20	CBL-PWPH220001A020		

Note: The power cable for M08/10 motors is backward compatible with the power cables for L01, M02/04/06 motors.

6.2 Encoder Cable and Connector Kit Catalog

PH3 Motor Model	Compatible Drive Type	Encoder configuration	Length (m)	Cable Model (Standard Flexible Cable)		Connector Kit Model (choose either connector kit or cable)
				Front cable outlet (D-direction)	Rear cable outlet (N-direction)	
L01, M02/04/06 /08/10 M08/10 M08/10	BD3 series	Single-turn encoder	3	SFC-A71A41-0103-F	SFC-A73A41-0103-F	CAP-A7-A4-1
			5	SFC-A71A41-0105-F	SFC-A73A41-0105-F	
			10	SFC-A71A41-0110-F	SFC-A73A41-0110-F	
			15	SFC-A71A41-0115-F	SFC-A73A41-0115-F	
			20	SFC-A71A41-0120-F	SFC-A73A41-0120-F	
		Multi-turn encoder	3	SFC-A72A43-0103-F	SFC-A74A43-0103-F	CAP-A7-A4-3
			5	SFC-A72A43-0105-F	SFC-A74A43-0105-F	
			10	SFC-A72A43-0110-F	SFC-A74A43-0110-F	
			15	SFC-A72A43-0115-F	SFC-A74A43-0115-F	
			20	SFC-A72A43-0120-F	SFC-A74A43-0120-F	
	CDHD2S series	Single-turn encoder	3	SFC-A71A51-0103-F	SFC-A73A51-0103-F	CAP-A7-A5-1
			5	SFC-A71A51-0105-F	SFC-A73A51-0105-F	
			10	SFC-A71A51-0110-F	SFC-A73A51-0110-F	
			15	SFC-A71A51-E015-F	SFC-A73A51-E015-F	
			20	SFC-A71A51-E020-F	SFC-A73A51-E020-F	
		Multi-turn encoder	3	SFC-A72A52-0103-F	SFC-A74A52-0103-F	CAP-A7-A5-2
			5	SFC-A72A52-0105-F	SFC-A74A52-0105-F	
			10	SFC-A72A52-0110-F	SFC-A74A52-0110-F	
			15	SFC-A72A52-E015-F	SFC-A74A52-E015-F	
			20	SFC-A72A52-E020-F	SFC-A74A52-E020-F	
G09/13/18 G09/13/18	BD3 series	Single-turn encoder	3	CBL-FBPH22S301A003		CAP-FBPH2S301A0
			5	CBL-FBPH22S301A005		
			10	CBL-FBPH22S301A010		
			15	CBL-FBPH22S301A015		
			20	CBL-FBPH22S301A020		
		Multi-turn encoder	3	CBL-FBPH22T203A003		CAP-FBPH2T203A0
			5	CBL-FBPH22T203A005		
			10	CBL-FBPH22T203A010		
			15	CBL-FBPH22T203A015		
			20	CBL-FBPH22T203A020		
	CDHD2S series	Single-turn encoder	3	CBL-FBPH22S300A003		CAP-FBPH2S300A0
			5	CBL-FBPH22S300A005		
			10	CBL-FBPH22S300A010		
			15	CBL-FBPH22S3E0A015		
			20	CBL-FBPH22S3E0A020		
		Multi-turn encoder	3	CBL-FBPH22T200A003		CAP-FBPH2T200A0
			5	CBL-FBPH22T200A005		
			10	CBL-FBPH22T200A010		
			15	CBL-FBPH22T2E0A015		
			20	CBL-FBPH22T2E0A020		

Note:
1. For motors equipped with a multi-turn encoder, if the multi-turn function is not required, a cable model designed for a single-turn encoder configuration may be used. A cable or connector kit with a battery needs be selected only when the multi-turn counting function of the encoder is to be used.
2. BD3 series battery assembly: Model BT01 (3.6V, 2700mAh), purchase code 17419450001421, as shown in Figure A.
3. CDHD2S series battery box assembly: Model DCH, including battery box and battery assembl purchase code 12119400000139; model of battery with cable: EVE ER14505 (3.6V, 2700mAh) (part ⑥ as shown in Figure B), purchase code 12119400000621.
4. The encoder cable connector kits for L01, M02/04/06, and M08/10 are compatible with both front and rear outlets: the motor connector consists of a "terminal" and a "housing". If the cable made by the user is used, it is only required to adjust the orientation of the "housing" according to the desired outlet direction.

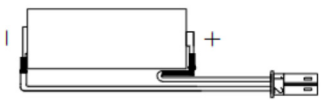


Figure A

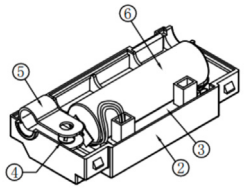


Figure B

6.3 PH3 Interface Adapter Cable and Connector Kit Catalog

Purpose:
1. This kit is designed to convert the interface of PH3 series L01, M02/04/06/08/10 motors to the AMP connector interface adopted on the old-generation PH2/PM2/PM1 series 40#/60#/80# frame motors, enabling a good compatibility with the cable harnesses of old series, and meeting the application needs of more servo drives from different generations;
2. If a customer requests an upgrade from an old-generation Servotronix PM1/PM2/PH2 series servo motor to a standard PH3 series 60/80 frame motor, please note that the PH3 motor uses quick-plug interfaces and therefore cannot be connected directly to the AMP plastic connector cables on the customer's equipment. This adapter cable is designed to convert the PH3 motor interface to the AMP connector on old-generation motors, allowing it to connect to the existing cables on the equipment.
3. The adapter cables given in this list are intended for replacing old-generation standard motors equipped with Tamagawa encoders, and may not be applicable to motors with other encoder types (such as M3/M4 type ServoSense encoders, R1/R5 resolvers) or custom motors. For any questions about model selection, please consult our sales service or technical support.

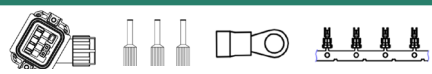
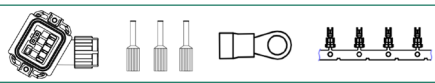
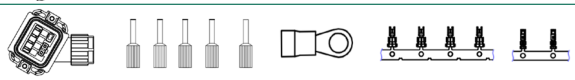
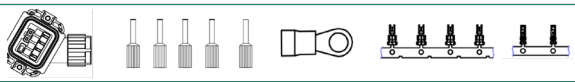
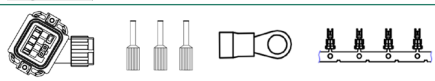
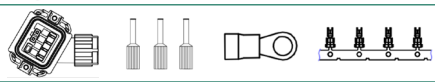
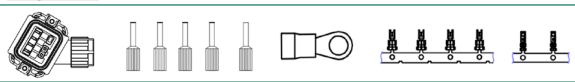
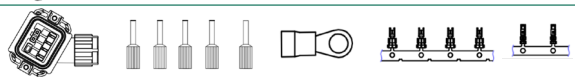
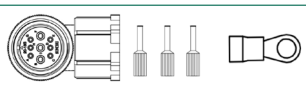
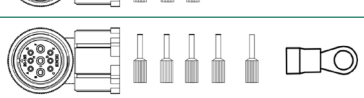
Motor type	Length (m)	High-flex cable		Connector kit
		Front cable outlet (D-direction)	Rear cable outlet (N-direction)	
Power cable - w/o brake	0.3	SPC-A61D11-05A3-F	SPC-A63D11-05A3-F	Front cable outlet (D-direction): CAP-A6-D1-A Rear cable outlet (N-direction): CAP-A6-D1-B
Power cable - w/ brake	0.3	SPC-A62D31-06A3-F	SPC-A64D31-06A3-F	Front cable outlet (D-direction): CAP-A6-D3-A Rear cable outlet (N-direction): CAP-A6-D3-B
Encoder cable - universal for single-turn/multi-turn encoders	0.3	SFC-A72D51-01A3-F	SFC-A74D51-01A3-F	CAP-A7-D5

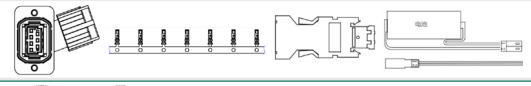
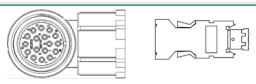
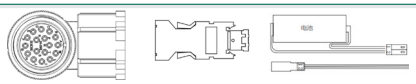
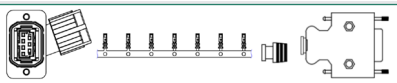
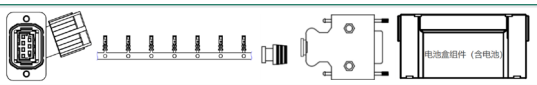
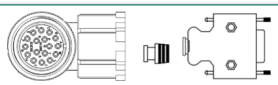
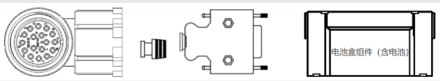
Example:
1. The customer's original on-site setup includes a PH2-M06B23035T40D motor and a CDHD series drive, with the power cable CBL-PWPH220000D0** and the encoder cable CBL-FBPH2T200D0**;
2. To replace a PH2 motor with a PH3 motor with the customer's drive unchanged, two solutions are available, depending on whether the on-site cables are replaced, as detailed below:

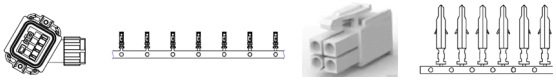
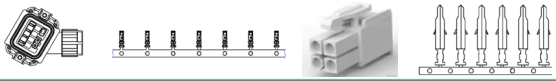
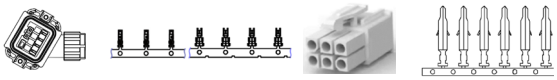
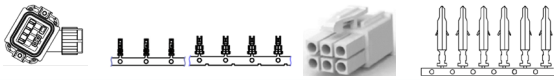
Type	Drive	Motor	Power cable	Encoder cable	Note
Current Solution	CDHD drive	PH2-M06B23035T40D	CBL-PWPH220000D0**	CBL-FBPH2T200D0**	/
Replacement solution 1	CDHD drive	PH3S-M04A006ST	SPC-A61D11-05A3-F CBL-PWPH220000D0**	SFC-A72D51-01A3-F CBL-FBPH2T200D0**	The customer's on-site cables remain unchanged, and an interface adapter cable is used to convert the PH3 motor interface to the same outlet interface as the PH2 for the replacement of the PH2 motor with a PH3 motor.
Replacement solution 2	CDHD drive	PH3S-M04A006ST	SPC-A61011-03**-F	SFC-A72A52-0103-F	The customer's on-site cables are all replaced with standard PH3 cables for the replacement of the PH2 motor with a PH3 motor.

Note: This example is provided only to illustrate the use of the interface adapter cable. The specific adapter cable to be used should be selected according to the actual application.

6.4 Connector Kit Information

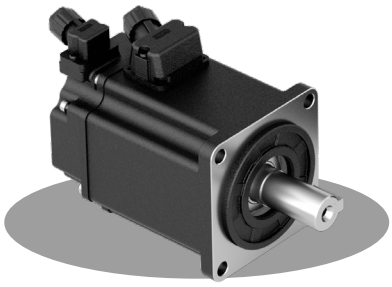
Kit Type	Applicable Drive	Applicable Motor	Brake Configuration	Cable Outlet Direction	Model/Part No.	Connector's Picture
Power cable connector kit	BD3E/ BD3S/ CDHD2S-RO	PH3 series L01/M02/ M04/M06	W/o brake	Front cable outlet (D-direction)	CAP-A6-01-A	
				Rear cable outlet (N-direction)	CAP-A6-01-B	
			W/ brake	Front cable outlet (D-direction)	CAP-A6-02-A	
				Rear cable outlet (N-direction)	CAP-A6-02-B	
		PH3 series M08/M10	W/o brake	Front cable outlet (D-direction)	CAP-A6-03-A	
				Rear cable outlet (N-direction)	CAP-A6-03-B	
			W/ brake	Front cable outlet (D-direction)	CAP-A6-04-A	
				Rear cable outlet (N-direction)	CAP-A6-04-B	
		PH3 series G09/G13/ G18	W/o brake	/	CAP-PWPH20000A0	
			W/ brake	/	CAP-PWPH20001A0	

Kit Type	Applicable Drive	Applicable Motor	Encoder configuration	Cable Outlet Direction	Model/Part No.	Connector's Picture
Encoder cable connector kit	BD3E/BD3S	PH3 series L01/M02/M04/M06/M08/M10	Single-turn encoder	Universal for front/rear cable outlet	CAP-A7-A4-1	
			Multi-turn encoder	Universal for front/rear cable outlet	CAP-A7-A4-3	
		PH3 series G09/G13/G18	Single-turn encoder	/	CAP-FBPH2S301A0	
			Multi-turn encoder	/	CAP-FBPH2T203A0	
	CDHD2S-RO	PH3 series L01/M02/M04/M06/M08/M10	Single-turn encoder	Universal for front/rear cable outlet	CAP-A7-A5-1	
			Multi-turn encoder	Universal for front/rear cable outlet	CAP-A7-A5-2	
		PH3 series G09/G13/G18	Single-turn encoder	/	CAP-FBPH2S300A0	
			Multi-turn encoder	/	CAP-FBPH2T200A0	

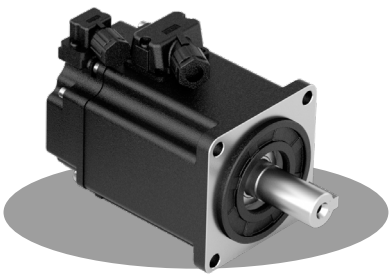
Kit Type	Applicable Drive	Applicable Motor	Kit Application	Cable Outlet Direction	Model/Part No.	Connector's Picture
Interface adapter cable connector kit	BD3E/BD3S/CDHD2S-RO	PH3 series L01/M02/M04/M06/M08/M10	For power cable (w/o brake)	Front cable outlet (D-direction)	CAP-A6-D1-A	
				Rear cable outlet (N-direction)	CAP-A6-D1-B	
			For power cable (w/ brake)	Front cable outlet (D-direction)	CAP-A6-D3-A	
				Rear cable outlet (N-direction)	CAP-A6-D3-B	
			Encoder cable (universal for single-turn/multi-turn encoders)	Universal for front/rear cable outlet	CAP-A7-D5	

Note:
1. The picture of the MC connector for the encoder used with L01/M02/M04/M06/M08/M10 motors shows the fully assembled product. The actual kit is supplied as boxed, unassembled components;
2. The MC connector for the encoder used with L01/M02/M04/M06/M08/M10 motors is of a universal specification for both front and rear cable outlets. Users can adjust the orientation of the core to match the desired outlet direction;
3. The picture is only for illustrating the shape of the connector in the kit. For the model and specification of the connector, please refer to the Connector Kit Specification.
4. Selection and ordering of individual parts within the kit are not currently available!

6.5 Front Cable Outlet/Rear Cable Outlet Diagram



N-direction cable outlet
None Drive
(Rear cable outlet/Reverse cable outlet)



D-direction cable outlet
Drive
(Front cable outlet/Forward cable outlet)

Note:
1. The figure shows the MC connector installed on a terminal-type motor (40/60/80 frame);
2. The MC connector is not a standard accessory, and is only intended for showing the orientation of the connector after the cables with different outlet directions are installed on the motor;
3. The outlet direction combination of the power cable and encoder cable can be selected flexibly according to actual needs, for example, N+N, D+D, N+D, D+N, etc.;

6.6 Cable Replacement Solutions for Replacing Old-Generation Servo Motors with PH3 Series Servo Motors

(1) Depending on the servo system replacement solution, three cable replacement solutions are available:

1 Original servo cables 2 Original servo cables + interface adapter cable 3 New servo cables

(2) The following table lists different servo system replacement solutions and their corresponding cable replacement solutions:

Original Servo System Solution			Servo system replacement solution 1 (drive unchanged, motor replaced)			Servo system replacement solution 2 (drive replaced, motor unchanged)			Servo system replacement solution 3 (both drive and motor replaced)		
Drive Series	Motor Series	Motor Specifications/ Configuration	Drive Series	Motor Series	Cable Replacement Solution	Drive Series	Motor Series	Cable Replacement Solution	Drive Series	Motor Series	Cable Replacement Solution
CDHD series	PM1 series	40/60/80 frame	Drive unchanged	PH3	2 3						
		130 frame		PH3	1						
	PM2 series	40/60/80 frame		PH3	2 3						
		100 frame		P3C	3						
		130 frame		PH3	1						
	PH2 series	PH2-L/M/R 40/60/80 frame (T1/T4/S3/M5 encoder)		PH3	2 3						
		PH2-L/M 40/60/80 frame (M3/ M4 encoder)		PH3	3						
		PH2-M 130 frame		PH3	1						
		PH2-L 100 frame		P3C	3						
		PH2-L 130 frame		P3C	3						
		PH2-M 130 frame		PH3	1						
		PH2-M 180 frame		P3C	3						
BDHDE series	PM1 series	40/60/80 frame	Drive unchanged	PH3	2 3	BD3 series	Motor unchanged	1	BD3 series	PH3	2 3
		130 frame		PH3	1		Motor unchanged	1		PH3	1
	PM2 series	40/60/80 frame		PH3	2 3		Motor unchanged	1		PH3	2 3
		100 frame		P3C	3		Motor unchanged	1		P3C	3
		130 frame		PH3	1		Motor unchanged	1		PH3	1
	PH2 series	PH2-L/M/R 40/60/80 frame (T1/T4/S3/M5 encoder)		PH3	2 3		Motor unchanged	1		PH3	2 3
		PH2-L/M 40/60/80 frame (M3/ M4 encoder)		PH3	3		Motor unchanged	1		PH3	3
		PH2-M 130 frame		PH3	1		Motor unchanged	1		PH3	1
		PH2-L 100 frame		P3C	3		Motor unchanged	1		P3C	3
		PH2-L 130 frame		P3C	3		Motor unchanged	1		P3C	3
		PH2-M 130 frame		PH3	1		Motor unchanged	1		PH3	1
BD3 series	PM1 series	40/60/80 frame	Drive unchanged	PH3	2 3						
		130 frame		PH3	1						

Original Servo System Solution			Servo system replacement solution 1 (drive unchanged, motor replaced)			Servo system replacement solution 2 (drive replaced, motor unchanged)			Servo system replacement solution 3 (both drive and motor replaced)		
BD3 series	PM2 series	40/60/80 frame	Drive unchanged	PH3	② ③						
		100 frame		P3C	③						
		130 frame		PH3	①						
	PH2 series	PH2-L/M/R 40/60/80 frame (T1/T4/S3/M5 encoder)		PH3	② ③						
		PH2-L/M 40/60/80 frame (M3/ M4 encoder)		PH3	③						
		PH2-M 130 frame		PH3	①						
		PH2-L 100 frame		P3C	③						
		PH2-L 130 frame		P3C	③						
		PH2-M 130 frame		PH3	①						
		PH2-M 180 frame		P3C	③						

Example of Replacing an Old-generation Servo System with a New Servo Solution

Example:
1. Original servo system solution: The customer's original on-site setup includes a PH2-M06B23035T40D motor and a CDHD series drive, with the power cable CBL-PWPH220000D0** and the encoder cable CBL-FBPH2T200D0**;
2. New servo system replacement solution: To replace a PH2 motor with a PH3 motor with the customer's drive unchanged, two solutions are available, depending on whether the on-site cables are replaced, as detailed below:

Type	Drive	Motor	Power cable	Encoder cable	Note
Original Servo System Solution	CDHD drive	PH2-M06B23035T40D	CBL-PWPH220000D0**	CBL-FBPH2T200D0**	/
Cable Replacement Solution: ② adapter cable + original cable	CDHD drive	PH3S-M04A006ST	SPC-A61D11-05A3-F CBL-PWPH220000D0**	SFC-A72D51-01A3-F CBL-FBPH2T200D0**	The customer's on-site cables remain unchanged, and an interface adapter cable is used to convert the PH3 motor interface to the same outlet interface as the PH2 for the replacement of the PH2 motor with a PH3 motor.
Cable Replacement Solution: ③ new cables	CDHD drive	PH3S-M04A006ST	SPC-A61011-03**-F	SFC-A72A52-0103-F	The customer's on-site cables are all replaced with standard PH3 cables for the replacement of the PH2 motor with a PH3 motor.

Note:
1. Please note the drive firmware versions that support PH3 and P3C series MTP.
(1) BD3-EB supports PH3 MTP starting from version 2.4.32R24.12.27 (as from December 27, 2024);
(2) BD3-EB supports P3C MTP starting from version 2.4.34R25.8.8 (as from August 8, 2025);
(3) CDHD2S supports PH3/P3C MTP starting from version 2.41.12 (as from June 1, 2025);
(4) BDHDE does not support the PH3/P3C's electronic nameplate feature, and needs to be reconfigured as a third-party motor;

7 Encoder Configuration Description

Three types of rotary encoders are available for the PH3E/S series servo motors referred to in this manual: 20-bit single-turn magnetic encoder, 20-bit multi-turn magnetic encoder, and 23-bit multi-turn optical encoder;

7.1 Encoder Specification Overview

Encoder Type	20-bit single-turn absolute magnetic encoder 20	20-bit multi-turn absolute magnetic encoder 20	23-bit multi-turn absolute optical encoder 23
Brand	Servotronix	Servotronix	Servotronix
Single-turn resolution	Output format: 23-bit (the lower 3 bits are 000) Resolution: 20-bit	Output format: 23-bit (the lower 3 bits are 000) Resolution: 20-bit	Output format: 23-bit Resolution: 23-bit
Multi-turn data capacity	/	65536 (16-bit) turns	65536 (16-bit) turns
Communication data protocol	Tamagawa 23bit NRZ	Tamagawa 23bit NRZ	Tamagawa 23bit NRZ
Communication rate	2.5Mbps	2.5Mbps	2.5Mbps
Power supply voltage	4.00 VDC~5.25 VDC	4.75 VDC~5.25 VDC	4.75 VDC~5.25 VDC
Power supply current consumption	85 mA	113 mA	100 mA
Battery voltage	-	3.6 VDC	3.6 VDC
Battery supply voltage consumption	-	11 uA	11 uA
Max ambient temperature	105℃	125℃	125℃

7.2 Description of 20-bit Single-turn Resolution for Magnetic Encoder

This manual only covers the 20-bit single-turn resolution parameter of the 20-bit encoder. Other details are not included. If you need further information, please contact our technical support.

1. The Data Field (DF) of the encoder data frame varies in length depending on the command type (DF0-DF7), as shown in the following table:

Data ID	DF0	DF1	DF2	DF3	DF4	DF5	DF6	DF7
Data ID 0	ABS0	ABS1	ABS2					
Data ID 1	ABM0	ABM1	ABM2					
Data ID 2	ENID							
Data ID 3	ABS0	ABS1	ABS2	ENID	ABM0	ABM1	ABM2	ALMC
Data ID 7	ABS0	ABS1	ABS2					
Data ID 8	ABS0	ABS1	ABS2					
Data ID C	ABS0	ABS1	ABS2					

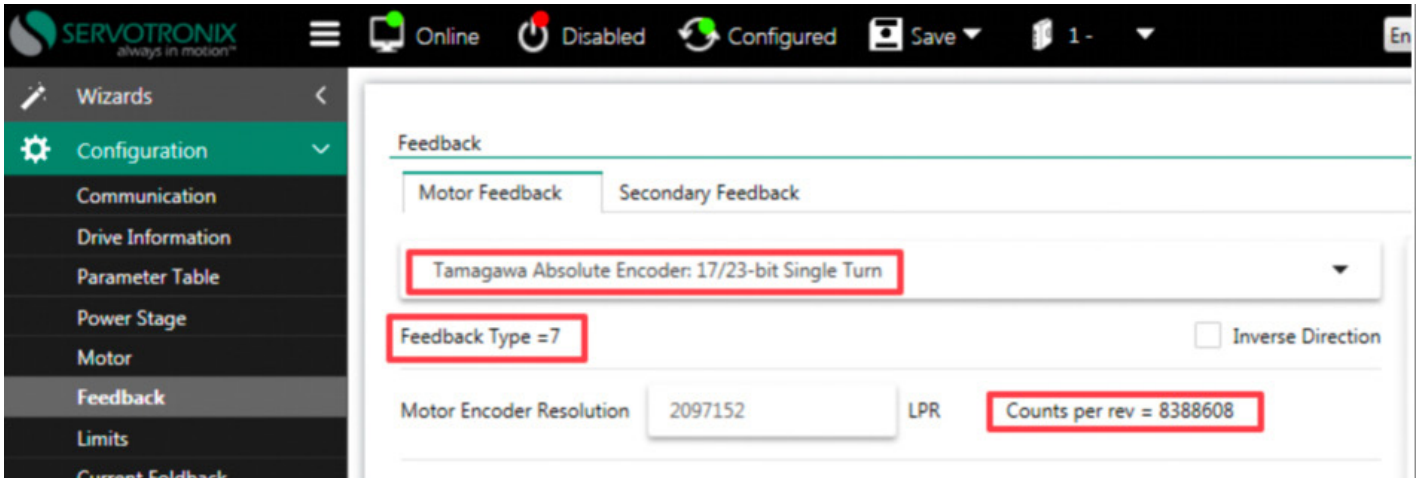
2. ABS0-ABS2 are the low, middle, and high bits of the encoder's single-turn position, respectively. The most significant bit of ABS2 is 0, and the remaining 23 bits constitute the single-turn position information.
3. In the 23-bit single-turn binary position data, the lower 3 bits [2:0] are padded with zeros, and the upper 20 bits [22:3] are used to output the 20-bit single-turn position data.
4. ABM0-ABM2 are the low, middle, and high bits of the encoder's multi-turn position, respectively. ABM2 is 0, and the remaining 16 bits constitute the multi-turn position information.
5. ENID is the encoder ID, which is 0x17 by default.
6. ALMC is the encoder fault flag bit, as described in the table below:

Bit	Dn0	Dn1	Dn2	Dn3	Dn4	Dn5	Dn6	Dn7
Logic when each error occurs	1	1	1	1	1	1	1	1
Name and symbol	Overspeed	Internal error	Counting error	Counting overflow	Overheat	Multi-turn information error	Battery error	Battery warning
	OS	FS	CE	OF	OH	ME	BE	BA

7.3 "Motor Feedback" Display in ServoStudio

* ServoStudio is the supporting debugging software specially designed for Servotronix servo drives.
* When the servo motor is connected to the BD3 series or CDHD2S-RO series drives, the motor feedback information displayed in the ServoStudio for these three rotary encoders is as follows:

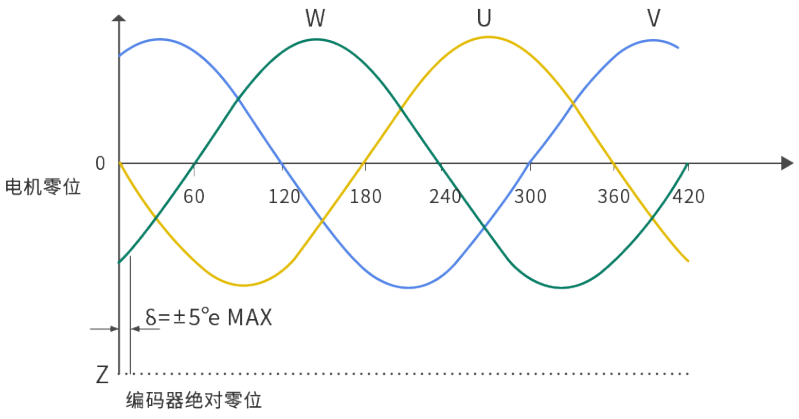
Motor Encoder Configuration	Motor Feedback (Drop-down Option)	Feedback Type	LPR	PPR
20-bit single-turn magnetic encoder	Tamagawa absolute encoder: 17/23-bit, single-turn	7	Auto-fill	8388608
20-bit multi-turn magnetic encoder	Tamagawa absolute encoder: 17/23-bit, multi-turn	6	Auto-fill	8388608
23-bit multi-turn optical encoder	Tamagawa absolute encoder: 17/23-bit, multi-turn	6	Auto-fill	8388608



Note: The interface may vary with ServoStudio updates. The electronic nameplate is automatically recognized and does not require manual setting.

7.4 Phase Relationship Between Motor and Feedback Signal

The phase relationship between the motor back EMF and the encoder signal is zero-calibrated before delivery as shown in the figure below:



Note:
1. The figure shows the phase relationship of the back EMF when the motor rotates in the counterclockwise direction as viewed from the shaft extension end;
2. Mechanical angle = Electrical angle / Number of motor pole pairs.
3. By connecting the positive pole of a 24V DC current, equal in magnitude to the motor's rated current, to the U-phase winding, and the negative pole to the V-phase winding and W-phase winding, the motor shaft can be locked at the "0" position of the coordinate axis, with a deviation not exceeding ±5° e.

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