FL20 Series

Parker Servo Drives & Motors for Film Line

Power Range 220V 0.05kW ~ 4.5kW
380/400V 1kW ~ 37kW

ENGINEERING YOUR SUCCESS.

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Parker Servo Drives & Motors – FL20 series

FL20 Servo Drive

Servo Motor

Parker Hannifin

The global leader in motion and control technologies

Global Product Design

Parker Hannifin has more than 40 years experience in the design and manufacturing of drives, controls, motors and mechanical products. With dedicated global product development teams, Parker draws on industry-leading technological leadership and experience from engineering teams in Europe, North America and Asia.

Local Application Expertise

Parker has local engineering resources committed to adapting and applying our current products and technologies to best fit our customers' needs.

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Electromechanical Worldwide Manufacturing Locations

Europe
Littlehampton, United Kingdom
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Offenburg, Germany
Filderstadt, Germany
Milan, Italy

Asia
Wuxi, China
Jangan, Korea
Chennai, India

North America
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Chennai, India

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Charlotte NC, USA

Jangan, Korea

FL20 series Servo Drives for Film Line Applications

Overview

Description

FL20-S Series Servo Drives is a high performance drive particularly suitable for Film Line and similar applications. It has a 1.2kHz frequency response with a full closed loop functionality. The feedback options are incremental encoder, absolute encoder and resolver.

The FL20-S has in-built RS485/232 port for PC monitoring. It also has CANopen and EtherCAT communication as options. The Parker PAC controller with its EtherCAT communication can be used as a complete solution for applications that need a controller as well as servo drives and motors.

FL20C is the in built EtherCAT version of the FL20S. The I/Os are optimized as most of the commands would be through the EtherCAT communication.

Features

- Flexibility
- Full closed loop control or multi-position control or interrupted position control
- Gantry synchronization
- Gain switching

Faster

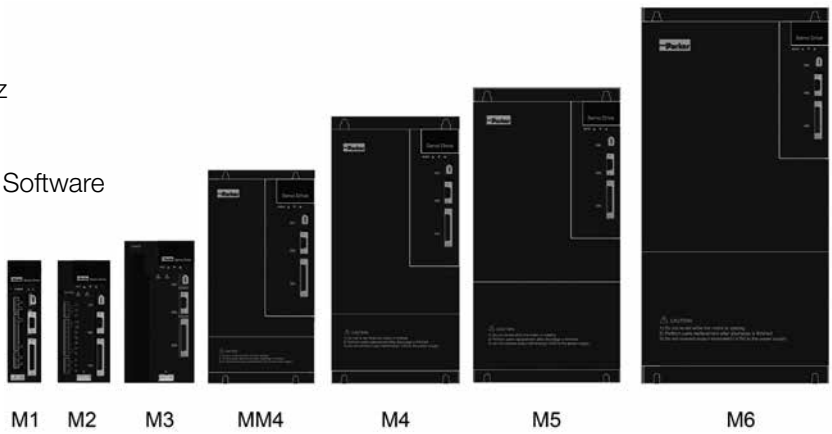
- Frequency response 1.2kHz
- Dual-core processors
- 23-bit absolute encoder

Powerful

- Built-in PLC Function
- Pulse command Frequency up to 4Mhz
- RS485/232, CANopen, EtherCAT
- RS485/232 interface connected to PC Software

Technical Characteristics

FL20 Servo drive	
Supply voltage	220 VAC -15% ~ +10% Single / Three Phase 380/400 VAC ±10% Three Phase
Power range	Single Phase 220V 0.05kW ~ 1.8kW Three Phase 220V 0.05kW ~ 4.5kW Three Phase 380V 1kW ~ 37kW
Frequency response	PMSM : 1.2kHz
Operating temperature	-10 °C ~ +40 °C
Humidity	Below 90%
Altitude	1000m or below
Vibration	Below 0.5G (4.9 m/s²)
IP rating	IP20



Technical Characteristics

FL20-S Servo Drive Specifications

Input power		220VAC -15%~+10% 1Phase/3Phase 50/60Hz 380/400VAC ±10% 3Phase 50 / 60Hz
Control mode		**PT**: Position pulse mode **PR**: Internal register position mode **SZ**: Analogue speed mode **SR**: Internal register speed mode **TZ**: Analog torque mode **TR**: Internal register torque mode
Braking		Bulit-in braking unit or dynamic brake (refer to page 16) Frame size M1, MM4, M4, M5, M6: without built-in resistor (External resistor need to order separately)
Control	Control method	PMSM
	Frequency response	1.2kHz
	Speed accuracy	± 0.01% (load fluctuation 0~100%)
	Speed fluctuation	PMSM : ± 0.01% (VC, load fluctuation 0~100%)
	Speed ratio	1 : 10000
	Input pulse frequency	1) 500kHz (line drive) ; 200kHz (Open collector) 2) 4MHz (Pulse command frequency / line drive)
Input	Control input	Servo on, Alarm reset, Pulse clear, Pulse prohibited, Reverse run prohibited, Emergency stop, Forward torque limit, Reverse torque limit, Internal speed selection, Internal position triggered, Searching triggered, Zero speed clamp, etc.
	Speed feedback	1) 17 bit and 23bit absolute encoder 2) 2500 lines and 23 bit incremental encoder 3) Resolver
Output	Control output	Servo ready, Servo alarm activated, At position completed, At speed reached, Electromagnetic brake control, Rotation detection, At speed limit, Homing completed, At torque limit
	Encoder signal	1) Open collector output encoder Z phase; 2) Encoder A, B phase signal is frequency division output. Z phase has no frequency-division output. 3) Z pulse time expansion capability;
Position control	Input mode	1) A phase + B phase 2) Forward pulse + Reverse pulse 3) Pulse + Direction 4) Internal register
	Electronic gear	0.01≤ B / A ≤100 (Setting 2 electronic gears)
Analog signal control		-10V ~ +10V analog speed signal input
Analog torque control		-10V ~ +10V analog torque signal input
Accel / Deceleration		Accel / deceleration time 1 ~ 30000ms (0 ← → rated speed)
Communication		1) RS485 / 232 interface is connected PC, to set control parameters and monitoring 2) CANopen, EtherCAT (Optional communication card should be selected and purchased)
Parameter setting	Keypad	The parameters are set by keypad, which is displayed by 5 LED
	PC software	RS485 interface can set parameters by PC software
Monitoring		Output current, PN voltage, Motor speed, Motor feedback pulse, Motor feedback rotation, given pulse, given pulse error, given speed, given torque, analog speed reference, analog torque reference, etc.
Protection		Over-voltage, Under-voltage, Overload, Overcurrent, Encoder error, Over-speed, Abnormal pulse control command, Emergency stop, Servo overheat, Input power phase loss, Regenerative braking error, Over-position, Battery alarm, etc
Applicable load inertia		Lower than 5 times of servo motor inertia

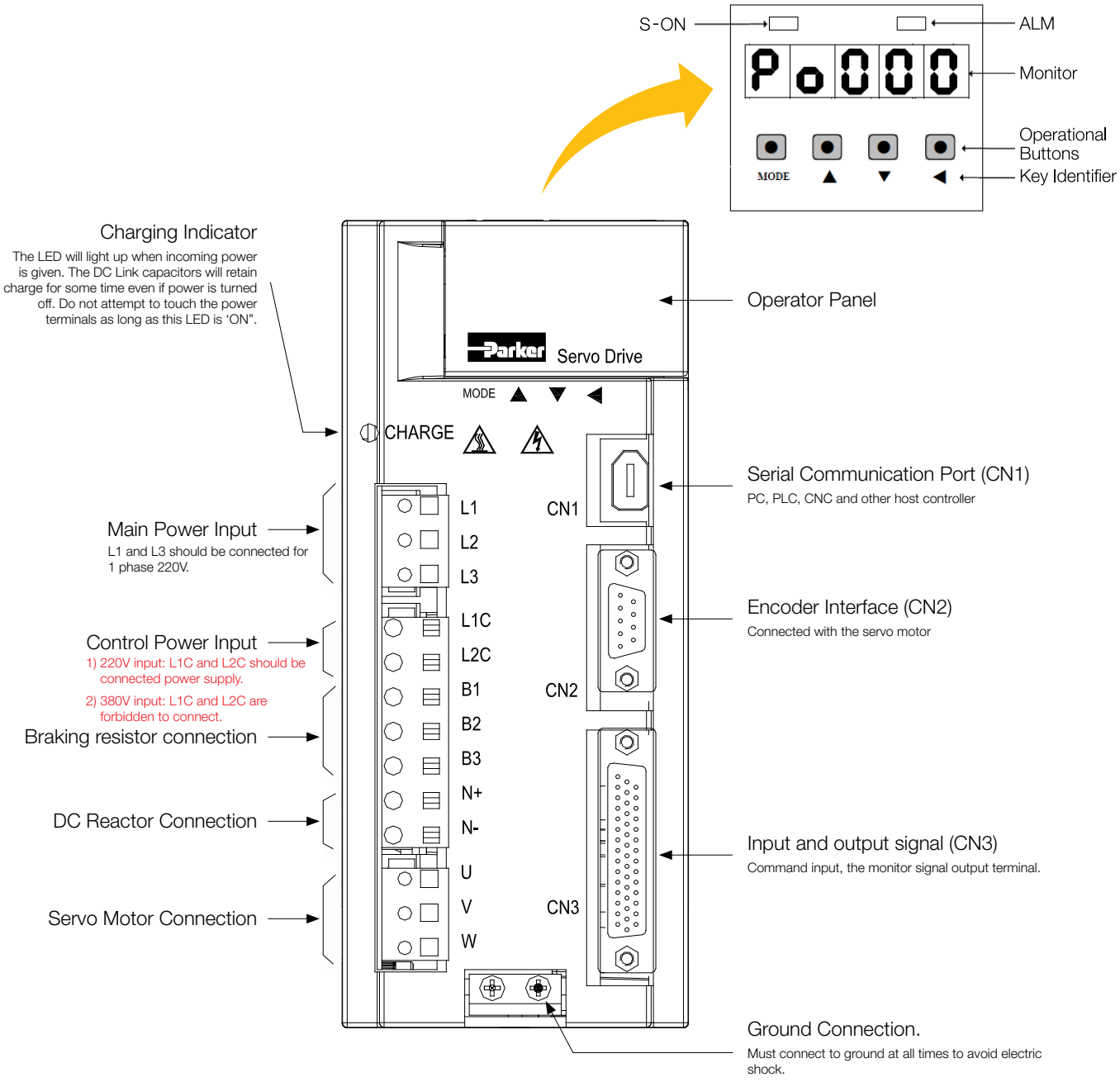
Technical Characteristics

FL20-C Servo Drive Specifications

Input power		S2 / T2: 220VAC -10~+10% 50/60Hz T3: 380/400VAC -10~+10% 50/60Hz
Control mode		**PP**: Profile position control mode **PV**: Profile velocity mode **PT**: Profile torque mode **HM**: Homing mode **CSP**: Cycle synchronous position mode **CSV**: Cycle synchronous velocity mode **CST**: Cycle synchronous torque mode
Braking		Bulit-in braking unit or dynamic brake (refer to page 17) Frame size M1, MM4, M4, M5, M6: without built-in resistor (External resistor need to order separately)
Control feature	Control type	PMSM motor
	Response frequency	1.2KHz
	Baud rate	±0.01% (load 0~100%)
	Speed fluctuation	PMSM: ±0.01% (VC, load fluctuation 0 to 100%)
	Speed ratio	1: 10000
EtherCAT specification	Communication protocol	EtherCAT protocol
	Support service	CoE (PDO, SDO)
	Synchronous method	DC distributed clock
	Physical layer	100BASE-TX
	Transmission speed	100 Mbit/s (100Base-TX)
	Duplex mode	Full duplex
	Transmission media	CAT5E class and above shielded cable
	Transmission distance	The distance between 2 nodes <100M (good surroundings and cables)
	Slave station	Max 65535 (lower than 100 in practical use)
	Synchronization jitter	<1us
	Minimum communication cycle	500us
Input signal	Control input	Servo enabled, alarm reset, command pulse clear, command pulse prohibited, forward prohibited, reverse prohibited, forward torque limit, reverse torque limit, internal speed selection, internal position triggered, origin/mechanical origin searching triggered, zero speed clamp, probe etc.
	Speed feedback	1) 17 bit and 23bit absolute encoder 2) 2500 lines and 23 bit incremental encoder 3) Resolver
Output signal	Control output	Servo ready, servo alarm, positioning reach, speed reach, electromagnetic brake output, rotation detection, speed limit, homing completed, torque limit etc.
	Encoder signal frequency dividing output	1. Encoder Z phases open-collector output; 2. Phase -A, -B: frequency-division differential output (not isolated, any frequency-division ratio) Phase-Z is not frequency-division output. 3. Z pulse time extended function.
Position control	Input mode	EtherCAT communication set / internal register / high-speed pulse input
	Electronic gear ratio	1. 0.01≤ B / A ≤100 2. Support 2 groups of electronic gear, which can be selected or switchover by users
Acceleration / Deceleration		The setting range of accel/decel time is 1~30000ms (from 0 accelerated to rated speed)
Communication		1. RS485/RS232 communication port is connected with PC, to set control parameters and to monitor servo. 2. Support EtherCAT bus.
Parameter setting	Keypad	Use 4 keys to set parameter, which is displayed by 5 LEDs.
	PC / PLC	PC/PLC software can be used to set servo parameter through RS485 communication interface.
Monitor function		Output current, PN voltage, motor speed, motor feedback pulse, motor feedback revolution, given pulse, given pulse error, given speed, given torque etc.
Protection function		Main circuit overvoltage, undervoltage, overload, overcurrent, encoder error, overspeed, abnormal pulse control command, emergency stop, servo overheat, main-circuit power phase-loss, regeneration brake error, position, over position control, lithium battery alarm, Sync. loss, network initialization failure, sync. cycle setting error, sync. cycle excessive error etc.
Applicable load inertia		Lower than 5 times of servo motor inertia.

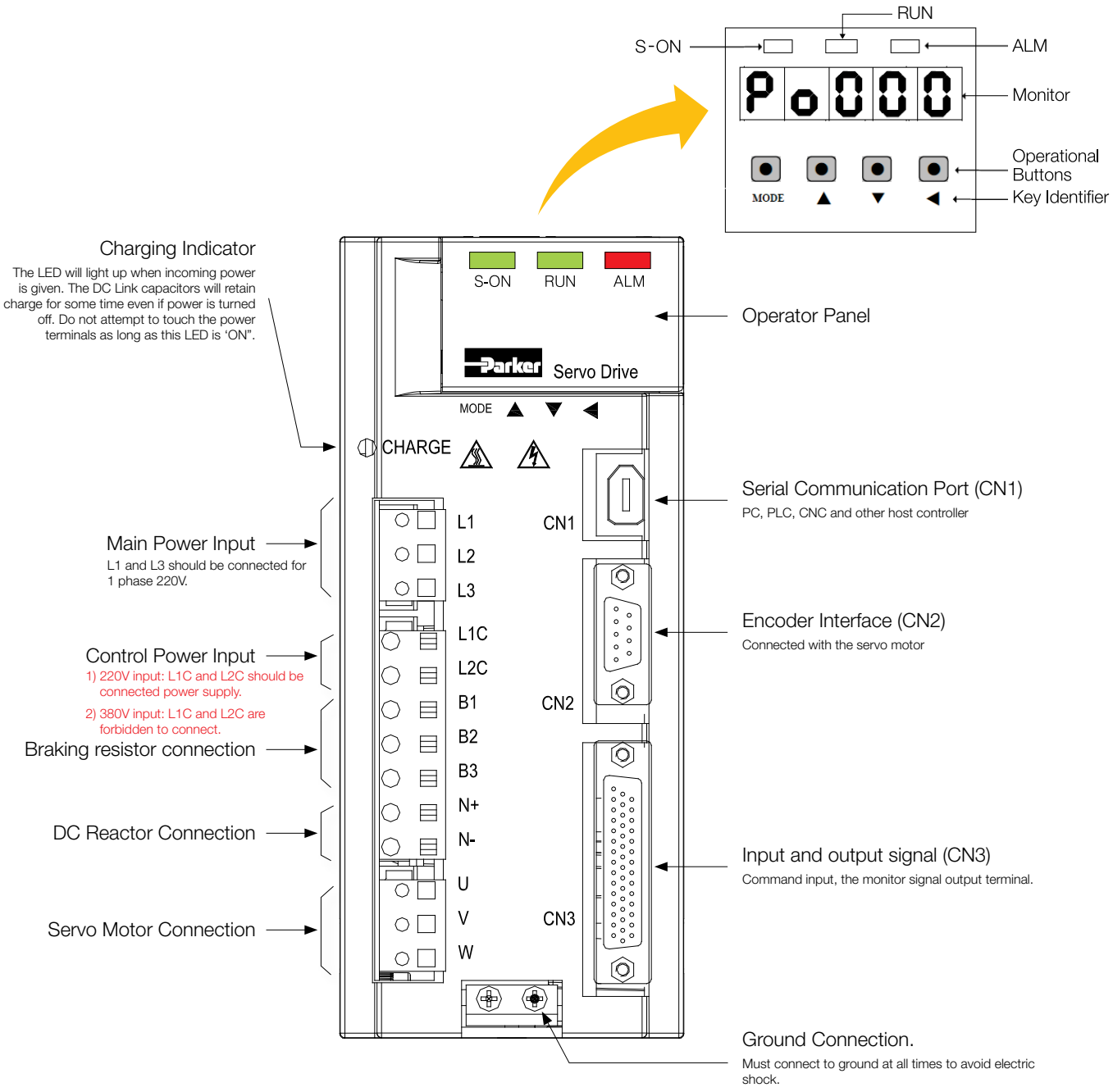
Drive Component

Input Signal for FL20-S Drives



Drive Component

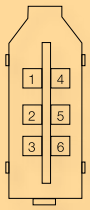
Input Signal for FL20-C Drives



Identifier	Name	Function
S-ON	Indicator (green)	Indicating that Servo is on.(Light on when servo on)
ALM	Indicator (red)	Indicating that malfunction occurs.(Light on when faulty occurs)
RUN	EtherCAT state indicator	EtherCAT state machine indicator

Terminal Details

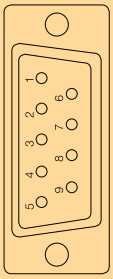
CN1 Terminal Definition



Terminal No.	Symbol	Definition
CN1-1	VCC	5V Power supply
CN1-2	RS232-RXD	RS232 Receiving end
CN1-3	B-	Differential Output -
CN1-4	GND	Reference terminal
CN1-5	RS232-TXD	RS232 tranFLission side
CN1-6	A+	Differential output +

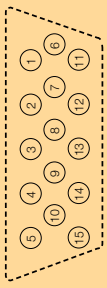
Figure: CN1 terminal definition (from the wire side to drive side view)

CN2 Terminal Definition



Absolute Encoder			Resolver Feedback		
Terminal No.	Name	Definition	Terminal No.	Name	Definition
CN2- 1	NC	No connection	CN2- 1	RE2	Resolver signal stimulus
CN2- 2	VCC	+5V power	CN2- 2	VCC	Power of motor temperature sensor
CN2- 3	PS	PG serial signal	CN2- 3	KTY	Signal of motor temperature sensor
CN2- 4	/PS	PG serial signal	CN2- 4	NC	No connection
CN2- 5	GND	Grounding	CN2- 5	RE1	Resolver signal stimulus
CN2- 6			CN2- 6	COS-	Resolver differential signal
CN2- 7	NC	No connection	CN2- 7	COS+	Resolver differential signal
CN2- 8	NC	No connection	CN2- 8	SIN-	Resolver differential signal
CN2- 9	NC	No connection	CN2- 9	SIN+	Resolver differential signal

Figure: From the wire side to drive side look

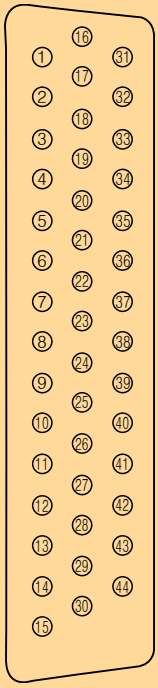


Incremental Encoder		
Terminal No.	Name	Definition
CN2- 1	V	Encoder V phase input
CN2- 2	U	Encoder U phase input
CN2- 3	Z	Encoder Z phase input
CN2- 4	B	Encoder B phase input
CN2- 5	A	Encoder A phase input
CN2- 6	/V	Encoder /V phase input
CN2- 7	/U	Encoder /U phase input
CN2- 8	/Z	Encoder /Z phase input
CN2- 9	/B	Encoder /B phase input
CN2-10	/A	Encoder /A phase input
CN2-11	/W	Encoder /W phase input
CN2-12	W	Encoder W phase input
CN2-13	VCC	+5V power
CN2-14	GND	Grounding
CN2-15	— —	— —

Figure: From the wire side to drive side look

Terminal Details

CN3 Terminal Definition for FL20-S Drives



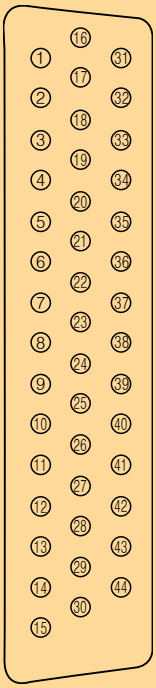
Signal Category	Terminal No.	Name	Definition	Input	Remark
Programmable Input Terminals	CN3-18	DI1	Digital input 1	Switching signal	NOTE: DI1~DI8 are digital input terminals, input mode is ON/OFF signal. DI input pulse frequency range is 0~3KHz
	CN3-19	DI2	Digital input 2		
	CN3-20	DI3	Digital input 3		
	CN3-21	DI4	Digital input 4		
	CN3-22	DI5	Digital input 5		
	CN3-38	DI6	Digital input 6		
	CN3-39	DI7	Digital input 7		
	CN3-13	DI8	Digital input 8		
Analog Input	CN3-23	AS1+	Analog speed command input	Analog signal	Analog speed command input to AGND to power ground
	CN3-25	AS2+	Analog speed command input	Analog signal	
Position	CN3-44 CN3-15	PULS /PULS	Pulse command input (5V)	Differential signal or Open Collector	Receive instructions in the form of: 1. Difference 2. Open collector It can only receive 5V command input.
	CN3-12 CN3-27	SIGN /SIGN	Pulse command input (5V)	Differential signal or Open Collector	
Location	CN3-28	PL1	Pulse direction input (24V)	Differential signal or Open Collector	1. Pulse + direction 2. A, B-phase quadrature pulses 3. Pulse + puls
	CN3-43	PL2	Pulse command input (24V)	Differential signal or Open Collector	
	CN3-4 CN3-3	HPULS+ HPULS-	High-speed input pulse command	Differential signal	This signal can only accept 5V quad differential pulse signal, while the reference terminal must be connected to together with CN3-24
	CN3-5 CN3-6	HSIGN+ HSIGN-	High-speed pulse direction command		
Signal Category	**Terminal No.**	**Name**	**Definition**	**Output**	**Remark**
Programmable Output Terminals	CN3-9 CN3-10	DO1+ DO1-	Digital output 1	Switching signal	
	CN3-26 CN3-11	DO2+ DO2-	Digital output 2		
	CN3-41 CN3-42	DO3+ DO3-	Digital output 3		
	CN3-32 CN3-31	DO4+ DO4-	Digital output 4		
	CN3-7 CN3-8	ALM+ ALM-	Servo alarm output		When the servo drive motion detection alarm occurs
Pulse output terminal	CN3-37	OZ	Encoder ZRN signal output	Open collector	Encoder ZRN signal open collector output
	CN3-34 CN3-33	PB0+ PB0-	Encoder B-phase pulse output	Differential signal	Encoder B-phase pulse output
	CN3-36 CN3-35	PA0+ PA0-	Encoder A-phase pulse output		Encoder A-phase pulse output
	CN3-16 CN3-17	PZ0+ PZ0-	Encoder Z-phase pulse output		Encoder Z-phase pulse output
Analog output terminal	CN3-1	AO1	Analog output 1	Monitoring	0~10V
	CN3-14	AO2	Analog output 2		

Other Signal

Signal	Terminal No.	Name	Definition	Output	Remark
DC 24V	CN3-29	+24V	+ 24V Output	+ 24V Output	24V power supply, 100mA(Max)
24V GND	CN3-30	CM	24V Ground	24V Ground	Alarm code output ground; Internal 24V power supply ground
Input Common	CN3-2	GP	Input Common	Common	Programmable input to common terminal
AI GND	CN3-24 CN3-40	AGND	Analog Input Ground	Analog Input Ground	Analog speed command, analog torque command and analog monitor Input ground

Terminal Details

CN3 Terminal Definition for FL20-C Drives

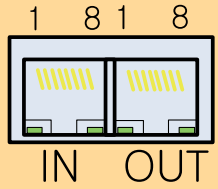


Signal Category	Terminal No.	Name	Definition	Input	Remark
Programmable Input Terminals	CN3-18	DI1	Digital input 1	Switching signal	NOTE: DI1~DI8 are digital input terminals, input mode is ON/OFF signal. DI input pulse frequency range is 0~3KHz
	CN3-19	DI2	Digital input 2		
	CN3-20	DI3	Digital input 3		
	CN3-21	DI4	Digital input 4		
	CN3-22	DI5	Digital input 5		
	CN3-38	DI6	Digital input 6		
	CN3-39	DI7	Digital input 7		
	CN3-13	DI8	Digital input 8		
Location	CN3-4 CN3-3	HPULS+ HPULS-	High-speed input pulse command	Differential signal	This signal can only accept 5V quad differential pulse signal, while the reference terminal must be connected to together with CN3-24
	CN3-5 CN3-6	HSIGN+ HSIGN-	High-speed pulse direction command		
Signal Category	**Terminal No.**	**Name**	**Definition**	**Output**	**Remark**
Programmable Output Terminals	CN3-9	DO1+	Digital output 1	Switching signal	
	CN3-10	DO1-			
	CN3-26	DO2+	Digital output 2		
	CN3-11	DO2-			
	CN3-41	DO3+	Digital output 3		
	CN3-42	DO3-			
	CN3-32	DO4+	Digital output 4		
	CN3-31	DO4-			
	CN3-7 CN3-8	ALM+ ALM-	Servo alarm output		When the servo drive motion detection alarm occurs
Pulse output terminal	CN3-37	OZ	Encoder ZRN signal output	Open collector	Encoder ZRN signal open collector output
	CN3-34 CN3-33	PB0+ PB0-	Encoder B-phase pulse output	Differential signal	Encoder B-phase pulse output
	CN3-36 CN3-35	PA0+ PA0-	Encoder A-phase pulse output		Encoder A-phase pulse output
	CN3-16 CN3-17	PZ0+ PZ0-	Encoder Z-phase pulse output		Encoder Z-phase pulse output
Analog output terminal	CN3-1	AO1	Analog output 1	Monitoring	0~10V
	CN3-14	AO2	Analog output 2		

Other Signal

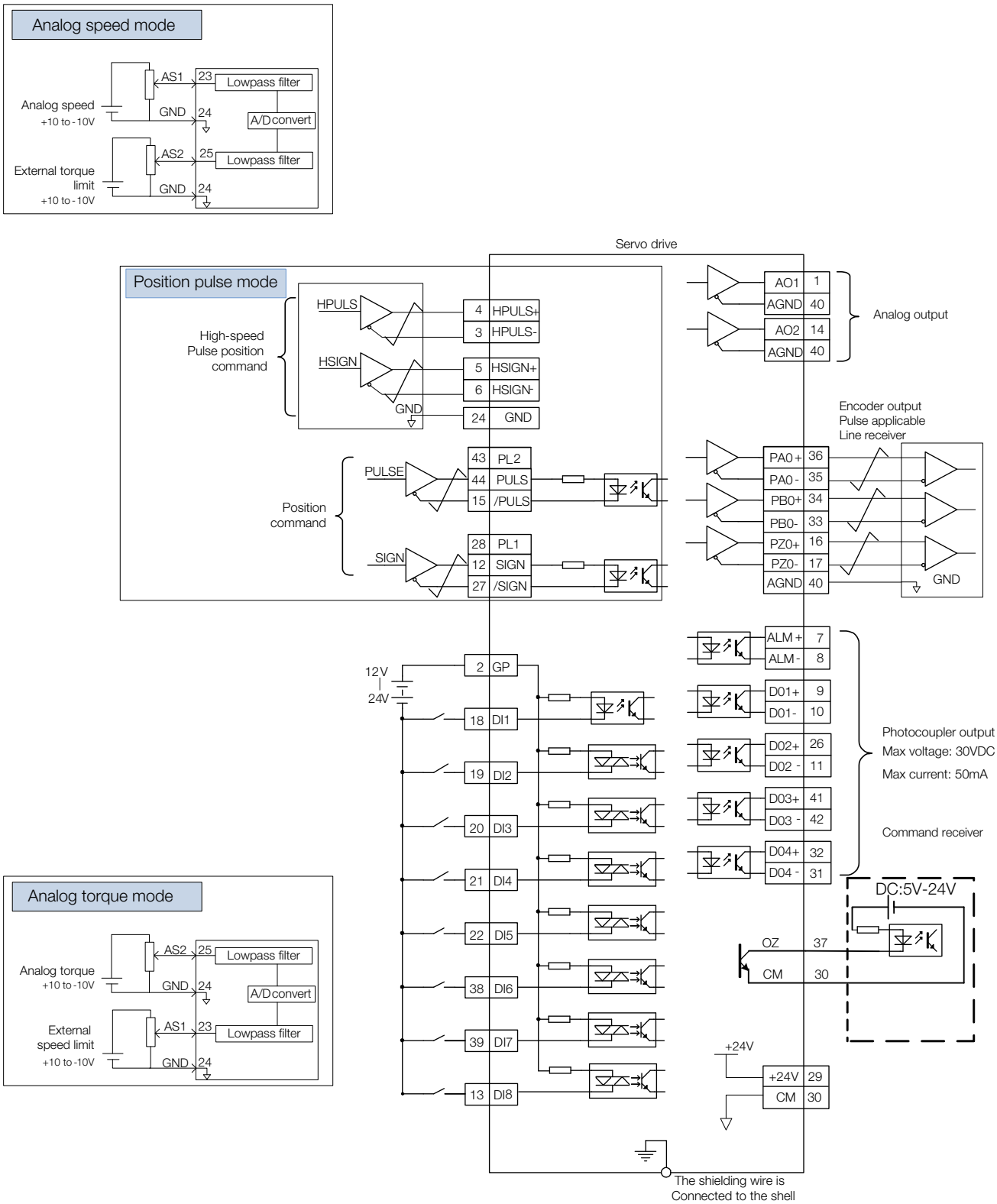
Signal	Terminal No.	Name	Definitino	Output	Remark
DC 24V	CN3-29	+24V	+ 24V Output	+ 24V Output	24V power supply, 100mA(Max)
24V GND	CN3-30	CM	24V Ground	24V Ground	Alarm code output ground; Internal 24V power supply ground
Input Common	CN3-2	GP	Input Common	Common	Programmable input to common terminal
AI GND	CN3-24 CN3-40	AGND	Analog Input Ground	Analog Input Ground	Analog speed command, analog torque command and analog monitor Input ground

Communication Port



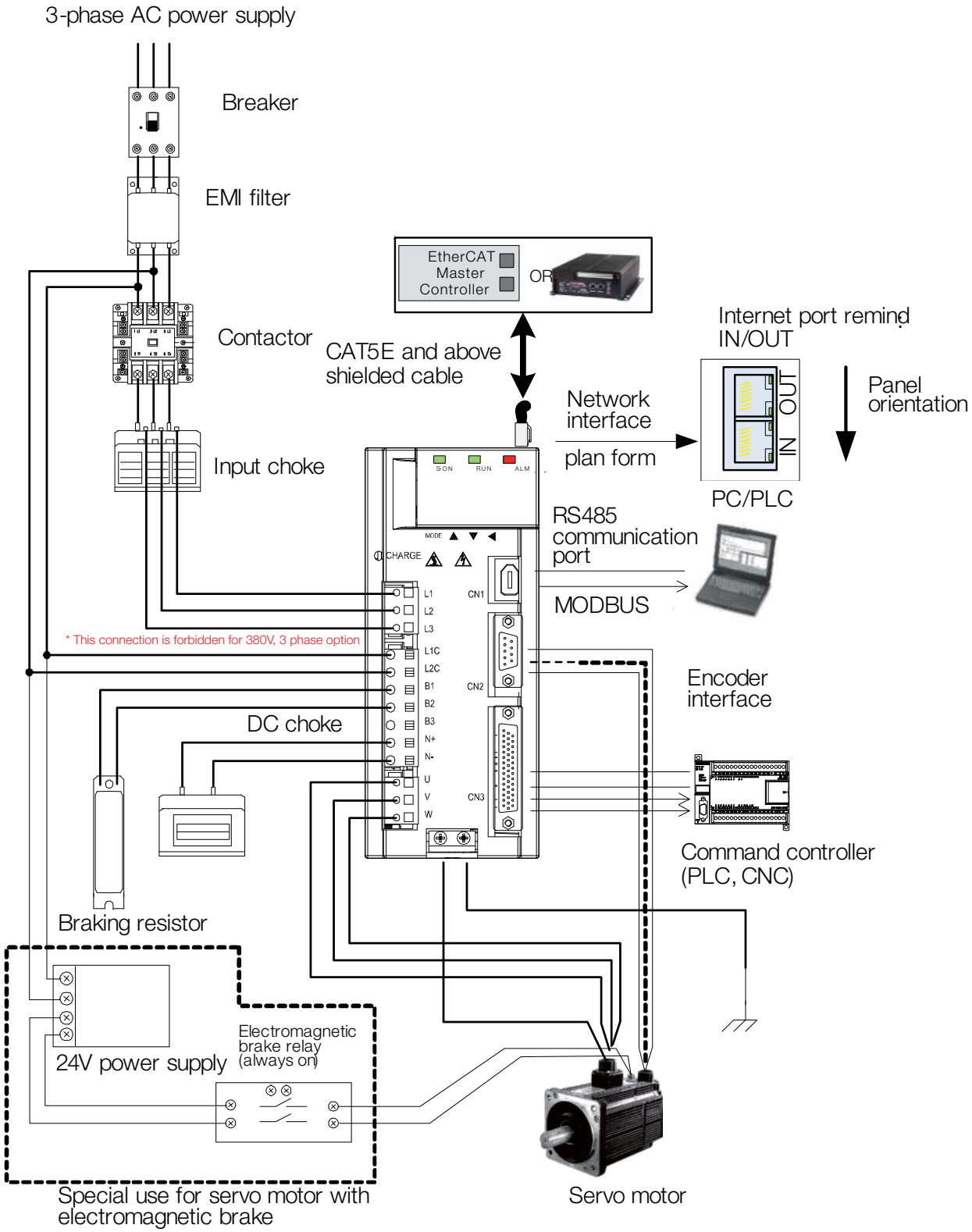
Pin	Definition	Description
1	TX+	Data send +
2	TX-	Data send -
3	RX+	Data receive +
4	Reserved	Reserved
5	Reserved	Reserved
6	RX-	Data receive -
7	Reserved	Reserved
8	Reserved	Reserved

Wiring diagram



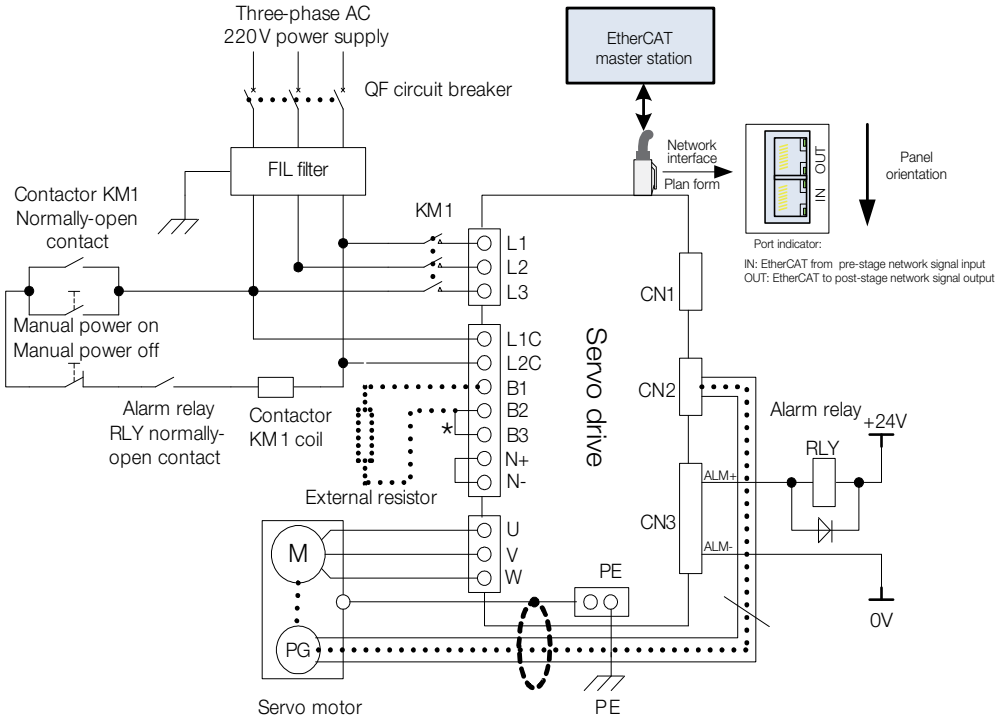
Connection to Peripheral Devices

(1 phase 220V, only L1 and L3 should be connected.)



Typical main circuit wiring

For 220V servo drive

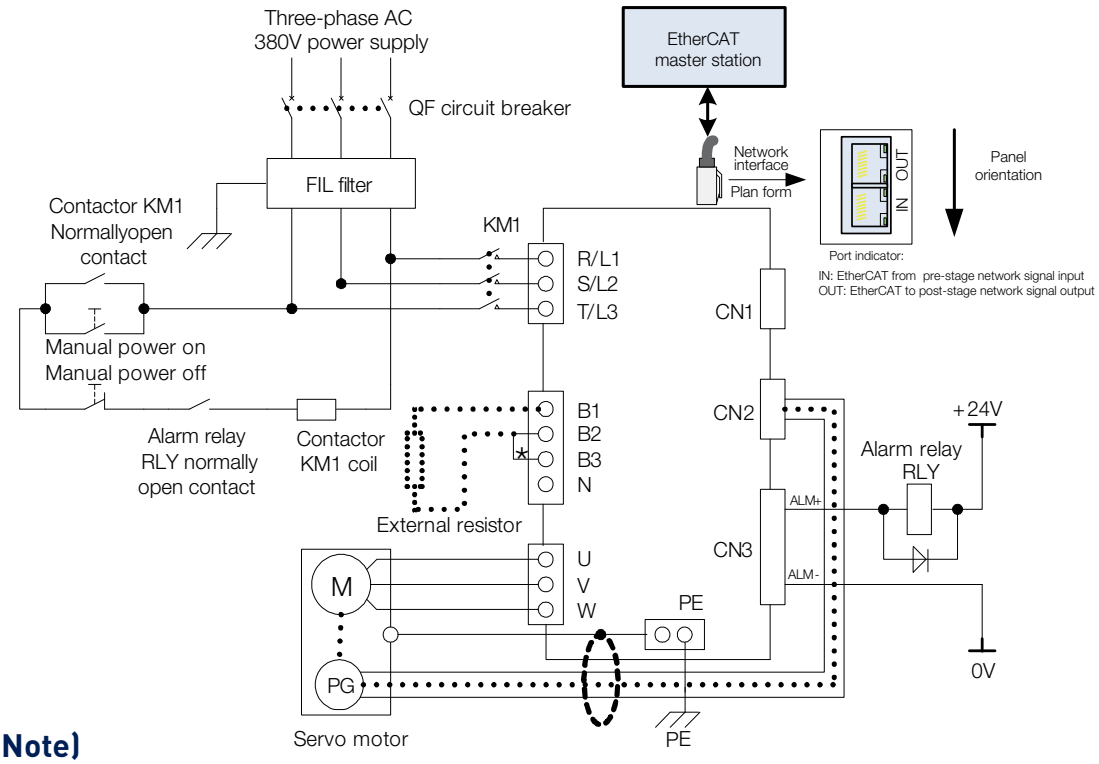


Note)

For 220V input servo drive, L1C and L2C should be connected to power supply.

For 220V single phase connect to L1 and L3.

For 380V servo drive



Note)

For 380V input servo drive, L1C and L2C are forbidden to connect

Ordering Code

FL20-S Series Drive

	1		2	3			4	5	6
Order example	FL20	-	S	152	T3	M2	F11	D20	B3

1	Device Family	
	FL20	Servo Drive for Film line Application
2	Function	
	S	Standard Type
3	Power Rating, Voltage and Frame Size	
	220V 1phase	
	500 S2 M1	0.05kW, M1 Frame
	101 S2 M1	0.1kW. M1 Frame
	201 S2 M1	0.2kW, M1 Frame
	401 S2 M1	0.4kW, M1 Frame
	751 S2 M1	0.75kW, M1 Frame
	102 S2 M2	1kW, M2 Frame
	122 S2 M2	1.2kW, M2 Frame
	182 S2 M2	1.8kW, M2 Frame
	220V 3phase	
	500 T2 M1	0.05kW, M1 Frame
	101 T2 M1	0.1kW, M1 Frame
	201 T2 M1	0.2kW, M1 Frame
	401 T2 M1	0.4kW, M1 Frame
	751 T2 M1	0.75kW, M1 Frame
	102 T2 M2	1kW, M2 Frame
	122 T2 M2	1.2kW, M2 Frame
	182 T2 M2	1.8kW, M2 Frame
	302 T2 M3	3kW, M3 Frame
	452 T2 M3	4.5kW, M3 Frame
	380V 3phase	
	102 T3 M2	1.0kW, M2 Frame
	152 T3 M2	1.5kW, M2 Frame
	202 T3 M3	2kW, M3 Frame
	302 T3 M3	3kW, M3 Frame
	452 T3 M3	4.5kW, M3 Frame
	552 T3 M3	5.5kW, M3 Frame
	752 T3 MM4	7.5kW, MM4 Frame
	113 T3 MM4	11kW, MM4 Frame
	153 T3 M4	15kW, M4 Frame
	183 T3 M5	18kW, M5 Frame
	223 T3 M5	22kW, M5 Frame
	303 T3 M6	30kW, M6 Frame
	373 T3 M6	37kW, M6 Frame

4	Communication	
	F11	Modbus External EtherCAT External CANopen

Note)

- External EtherCAT and CANopen card should be ordered separately. Please see below or contact to Parker Engineers.

5	Encoder Type	
	D2	Resolver
	D5	14-core 2500 ppr Incremental Encoder
	D51	8-core 2500 ppr Incremental Encoder
	D52	4-core 23-bit Incremental Encoder
	D7	4-core 17-bit Absolute Encoder
	D71	4-core 23-bit Absolute Encoder

6	Brake Unit	
	B1	Built in Brake Unit
	B3	Built in Brake Unit + Dynamic Brake

Note)

- For build in and external resistors details please see “Brake resister” note or product manual.

Frame	Size (WxHxD)	Supported Brake type
M1	48 x 175 x 195	B3(no braking resister)
M2	75 x 175 x 195	B1, B3
M3	100 x 203 x 218	B1, B3
M3(5.5kW)	100 x 203 x 218	B1
MM4	150 x 336 x 203	B1(no braking resister)
M4	185 x 380 x 215	B1(no braking resister)
M5	210 x 420 x 215	B1(no braking resister)
M6	268.4 x 498 x 234	B1(no braking resister)

Note)

- Specification subject to change without notice.

Optional Communication Card

Item	Description
20S-0006	EtherCAT Communication Card
20S-0007	CANopen Communication Card

Note)

- EtherCAT, CANopen communication cards

Ordering Code

FL20-C Series Drive

	1		2	3			4	5	6
Order example	FL20	-	C	102	T2	M2	F5	D7	B3

1	Device Family	
	FL20	Servo Drive for Film line Application
2	Function	
	C	EtherCAT communication Type
3	Power Rating, Voltage and Frame Size	
	220V 1phase	
	500 S2 M1	0.05kW, M1 Frame
	101 S2 M1	0.1kW, M1 Frame
	201 S2 M1	0.2kW, M1 Frame
	401 S2 M1	0.4kW, M1 Frame
	751 S2 M1	0.75kW, M1 Frame
	102 S2 M2	1kW, M2 Frame
	122 S2 M2	1.2kW, M2 Frame
	182 S2 M2	1.8kW, M2 Frame
	220V 3phase	
	500 T2 M1	0.05kW, M1 Frame
	101 T2 M1	0.1kW, M1 Frame
	201 T2 M1	0.2kW, M1 Frame
	401 T2 M1	0.4kW, M1 Frame
	751 T2 M1	0.75kW, M1 Frame
	102 T2 M2	1kW, M2 Frame
	122 T2 M2	1.2kW, M2 Frame
	182 T2 M2	1.8kW, M2 Frame
	302 T2 M3	3kW, M3 Frame
	452 T2 M3	4.5kW, M3 Frame
	552 T2 M4	5.5kW, M4 Frame
	752 T2 M4	7.5kW, M4 Frame
	380V 3phase	
	152 T3 M2	1.5kW, M2 Frame
	202 T3 M3	2kW, M3 Frame
	302 T3 M3	3kW, M3 Frame
	452 T3 M3	4.5kW, M3 Frame
	552 T3 M3	5.5kW, M3 Frame
	752 T3 MM4	7.5kW, MM4 Frame
	113 T3 MM4	11kW, MM4 Frame
	153 T3 M4	15kW, M4 Frame
	183 T3 M5	18kW, M5 Frame
	223 T3 M5	22kW, M5 Frame
	303 T3 M6	30kW, M6 Frame
	373 T3 M6	37kW, M6 Frame

4	Communication	
	F5	Built-in EtherCAT
5	Feedback Type	
	D2	Resolver
	D5	14-core 2500 ppr Incremental Encoder
	D51	8-core 2500 ppr Incremental Encoder
	D52	4-core 23-bit Incremental Encoder
	D7	4-core 17-bit Absolute Encoder
	D71	4-core 23-bit Absolute Encoder
6	Brake Unit	
	B1	Built-in Brake Unit
	B3	Built-in Brake Unit + Dynamic Brake

Note)

- For build in and external resistors details please see“Brake resister” note or product manual.

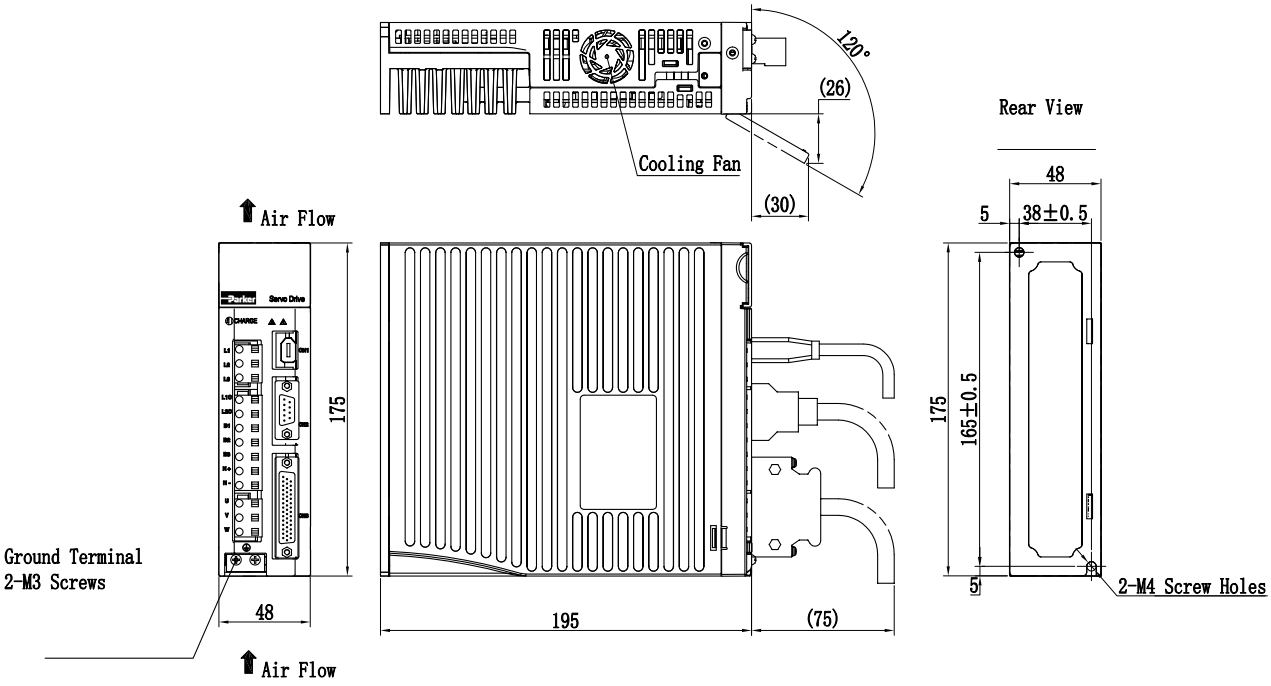
Frame	Size (WxHxD)	Supported Brake type
M1	48 x 175 x 195	B3(No buit-in braking resistor)
M2	75 x 175 x 195	B1, B3
M3	100 x 203 x 218	B1, B3
M3(5.5kW)	100 x 203 x 218	B1
MM4	150 x 336 x 203	B1(No built-in braking resistor)
M4	185 x 380 x 215	B1(No built-in braking resistor)
M5	210 x 420 x 215	B1(No built-in braking resistor)
M6	268.4 x 498 x 234	B1(No built-in braking resistor)

Note)

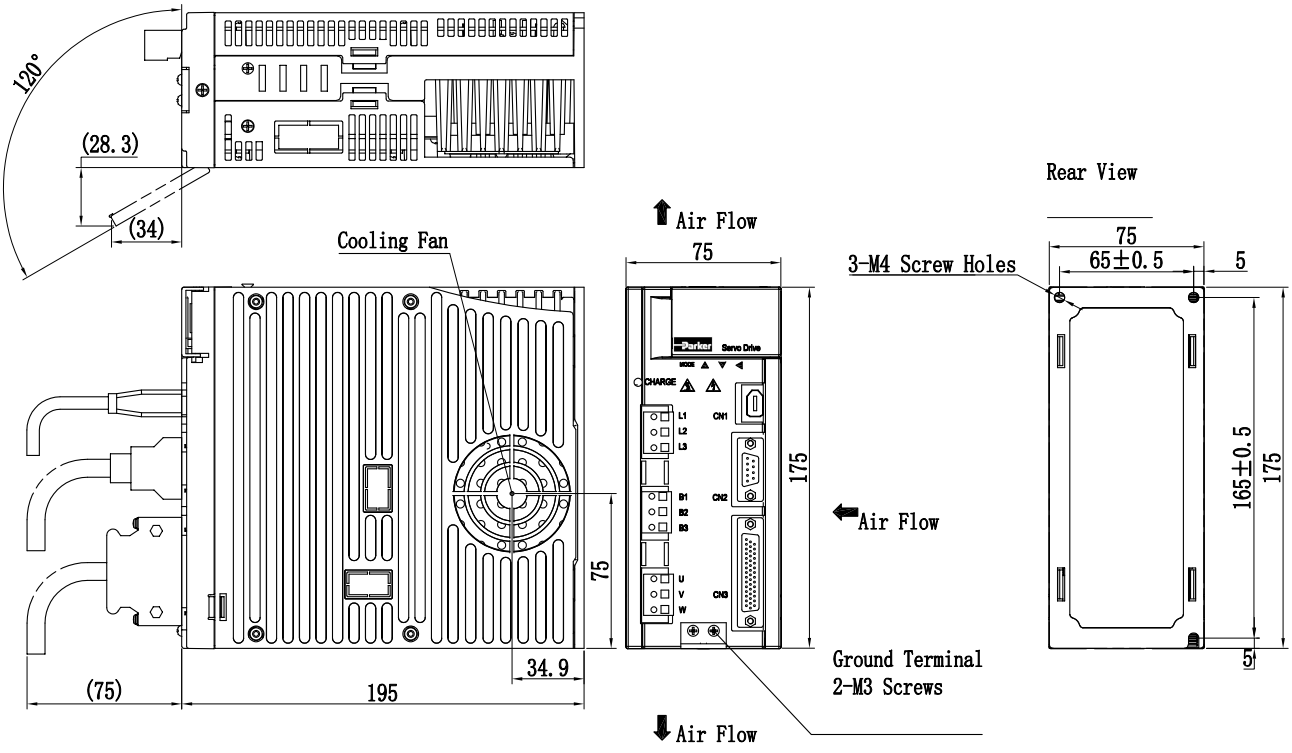
- Specification subject to change without notice.

Drive Dimensions

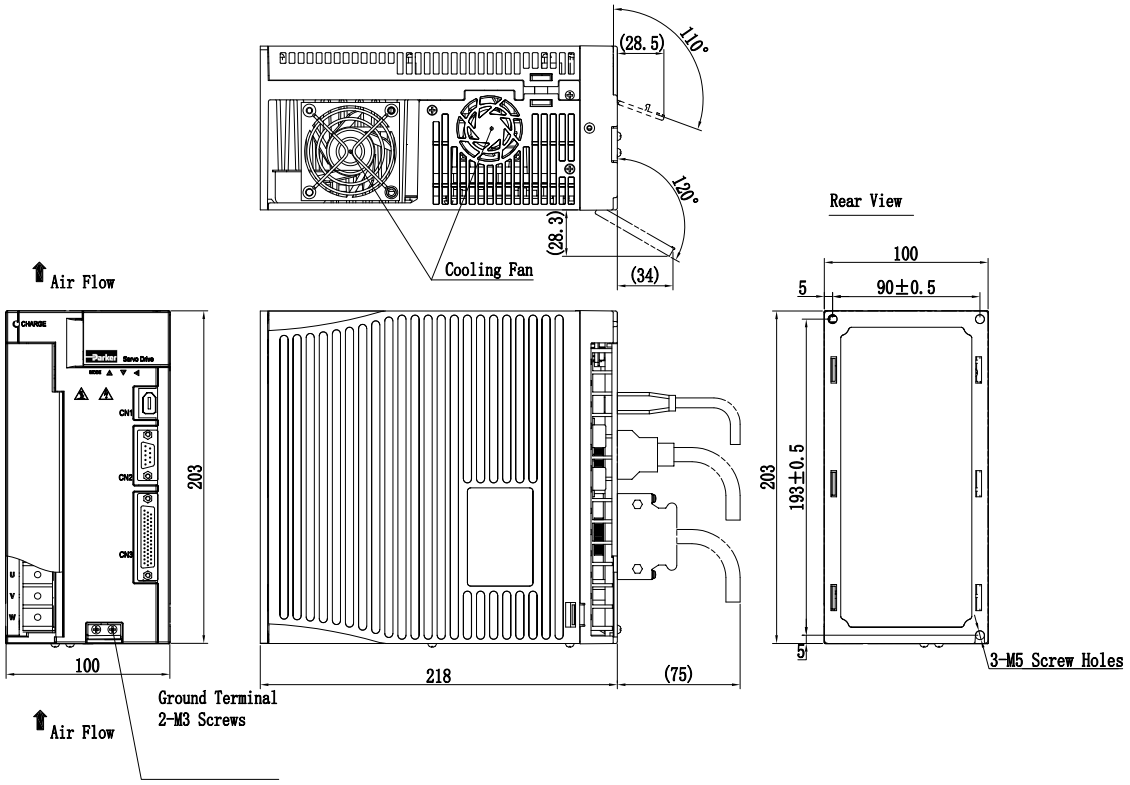
M1 Frame dimensions



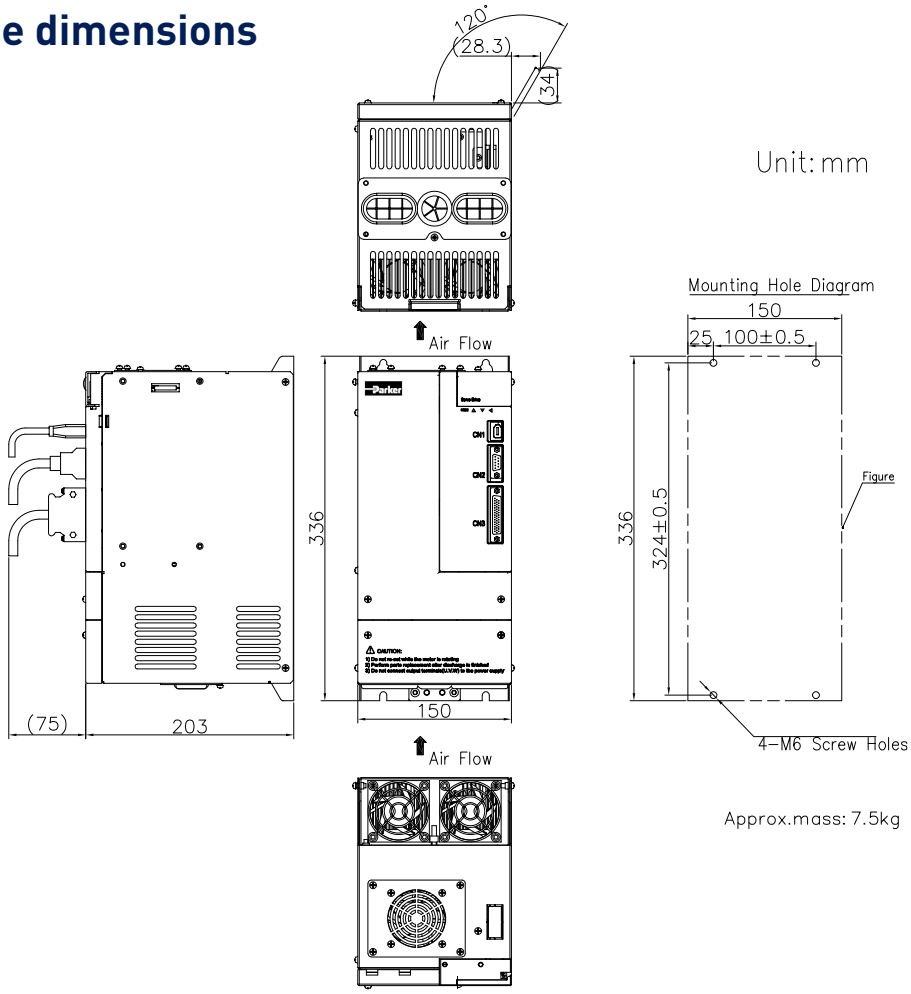
M2 Frame dimensions



M3 Frame dimensions

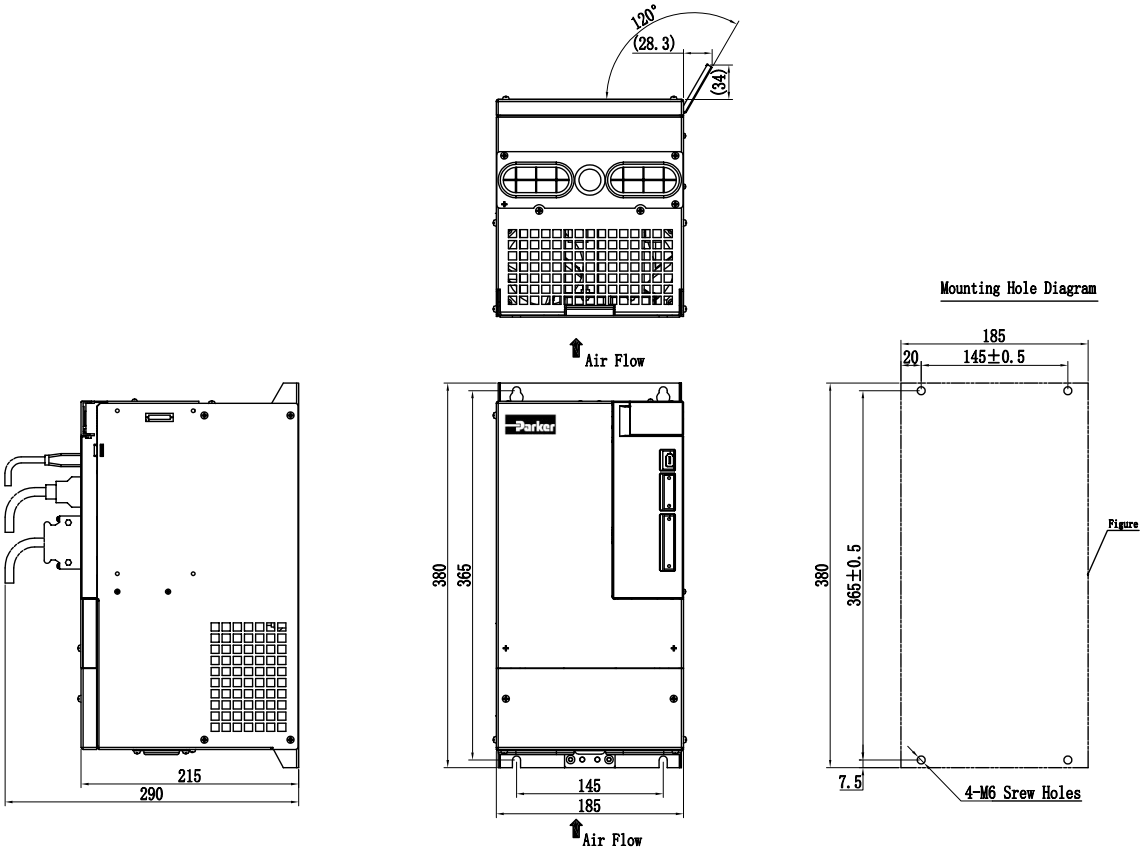


MM4 Frame dimensions

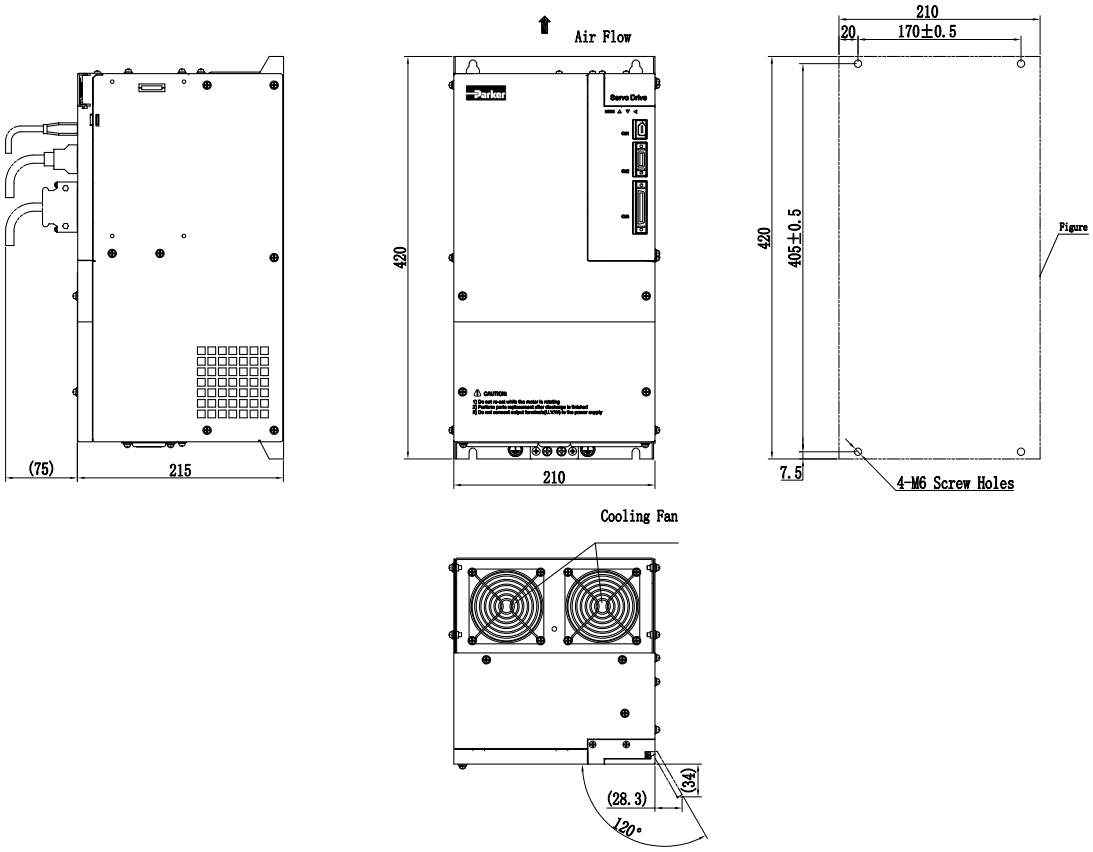


Drive Dimensions

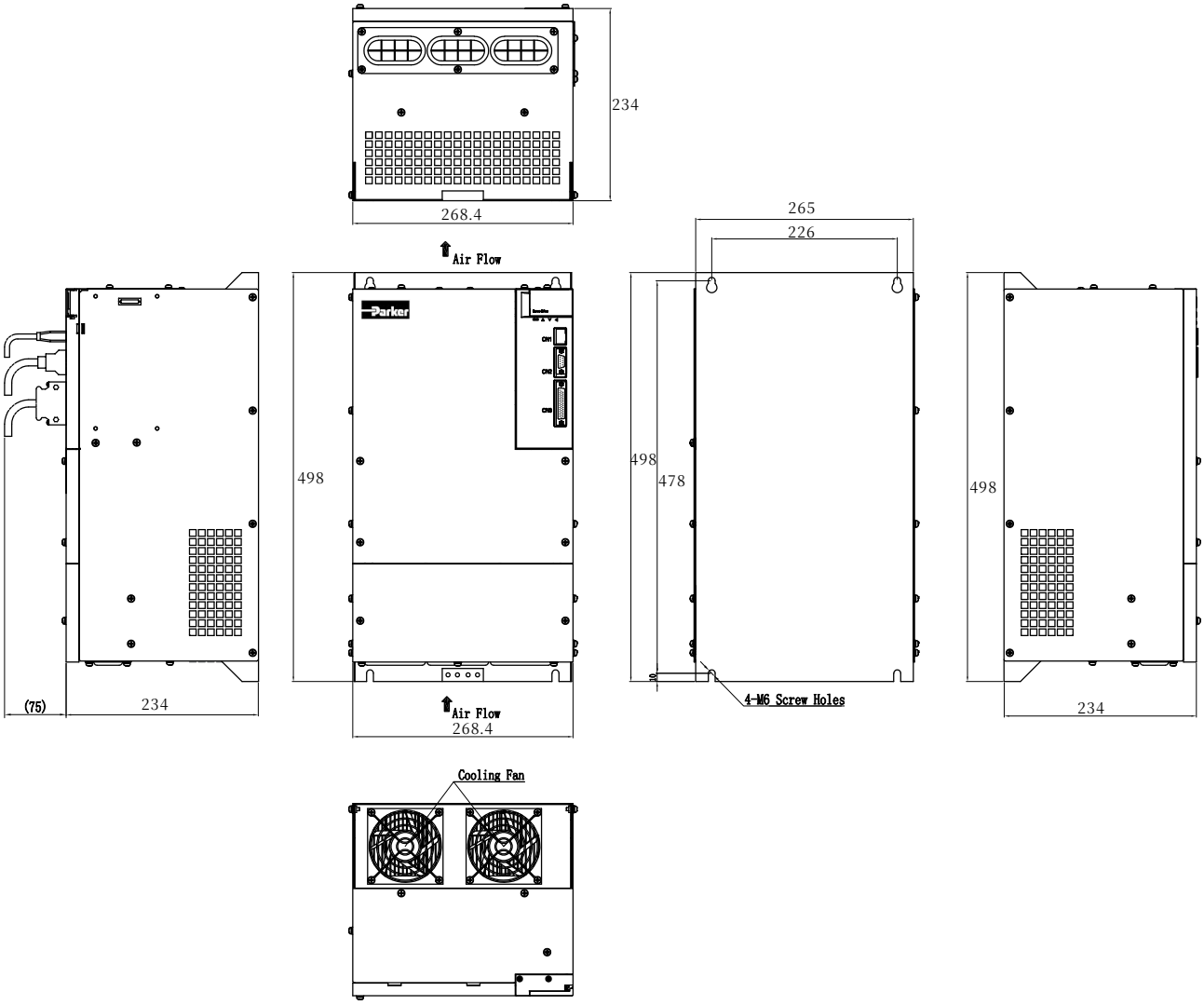
M4 Frame dimensions



M5 Frame dimensions



M6 Frame dimensions



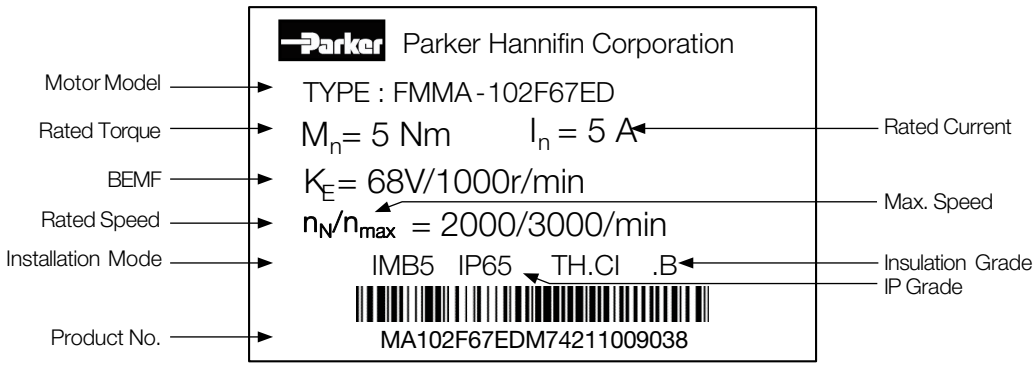
Servo motor

Overview

Description

Servo motor is the latest development of a high-performance motor to meet the customer‘s requirement and the needs of actual market; supports wiring flexible, cost-effective standard AC servo position system.

Servo motor nameplate



FM17-0110R6EEDFL		
Rated Power : 11 kW	Rated voltage : 380 V	Rated Torque : 64 N·M
Speed : 1700 r/min	Rated Current : 23 A	Fan Voltage: 220 V
TH. CI .F IP54	No. :	
Magnetic Field Angle :	Production Date :	
AC permanent magnetic synchronous servo motor		

Ordering Code

Servo Motor (for 180 Flange and less)

	1	2		3	4	5	6	7	8
Order example	FM	SA	-	102	F	6	3	B	D

1	**Device Family**	
	FM	FM Series
2	**Rated Speed**	
	SA	3000 rpm
	MA	2000 rpm
	MB	1500 rpm
	LA	1000 rpm
3	**Rated Power**	
	201	0.2kW
	401	0.4kW
	751	0.75kW
	102	1kW
	....	....
4	**Encoder Type**	
	R	Resolver
	F	14-core 2500 ppr Incremental encoder
	G	8-core 2500 ppr Incremental encoder
	H	4-core 23-bit Incremental encoder
	S	4-core 17-bit Absolute encoder
	T	4-core 23-bit Absolute encoder

5	**Bus Voltage**	
	3	300V
	6	600V
6	**Flange Size**	
	2	60 Flange
	3	80 Flange
	5	110 Flange
	7	130 Flange
	A	180 Flange
7	**Optional**	
	B	With brake, without fan
	E	Without brake and fan
8	**Shaft Type**	
	C	Smooth shaft with C hole
	D	Keyway shaft with C hole

Servo Motor (for 180 and 250 spigot motor)

	1		2	3	4	5	6	7	8	9	10
Order example	FM	-	17	0110	R	6	E	E	D	F	L

1	**Device Family**	
	FM	FM Series
2	**Rated Speed**	
	15	1500 rpm
	17	1700 rpm
	20	2000 rpm
3	**Rated Power**	
	0070	7kW
	0075	7.5kW
	0110	11kW
	0180	18kW
	0240	24kW
	0330	33kW
	....	....
4	**Encoder Type**	
	R	Resolver
	F	14-core 2500 ppr Incremental encoder
	G	8-core 2500 ppr Incremental encoder
	H	4-core 23-bit Incremental encoder
	S	4-core 17-bit Absolute encoder
	T	4-core 23-bit Absolute encoder

5	**Bus Voltage**	
	6	600V
6	**Flange Size**	
	E	180 Spigot
	F	250 Spigot
7	**Optional**	
	E	Without Brake
8	**Shaft Type**	
	C	Smooth Shaft
	D	Keyway Shaft
9	**Cooling Mode**	
	F	Air Cooling Fan
	N	Without cooling fan
10	**Optional**	
	S,L···	Design Code

Note)

The servo motors are used for both 220V and 380V.

Technical Characteristics

Servo Motor Specifications (220V – Incremental, Absolute Encoder and Resolver)

Motor type	Part Number (with incremental)	Rated speed	Rated power	Rated torque	Rated current	Adaptable servo drive	
		r/min	KW	Nm	A	1-phase 220V	3-phase 220V
FMSA	FMSA-201F32ED	3000	0.2	0.64	1.2	FL20 -S(C)201S2M1	FL20 -S(C)201T2M1
	FMSA-401F32ED	3000	0.4	1.27	2.8	FL20 -S(C)401S2M1	FL20 -S(C)401T2M1
	FMSA-751F33ED	3000	0.75	2.39	3.5	FL20 -S(C)751S2M1	FL20 -S(C)751T2M1
	FMSA-102F33ED	3000	1	3.5	4.5	FL20 -S(C)102S2M2	FL20 -S(C)102T2M2
	FMSA-122F35ED	3000	1.2	4	5	FL20 -S(C)122S2M2	FL20 -S(C)122T2M2
	FMSA-152F37ED	3000	1.5	5	7.5	FL20 -S(C)182S2M2	FL20 -S(C)182T2M2
	FMSA-182F35ED	3000	1.8	6	8		
	FMSA-232F37ED	3000	2.3	7.7	10	—	FL20 -S(C)302T2M3
	FMSA-302F37ED	3000	3	10	15.5	—	FL20 -S(C)452T2M3
FMMA	FMMA-801F35ED	2000	0.8	4	3.5	FL20 -S(C)102S2M2	FL20 -S(C)102T2M2
	FMMA-851F37ED	2000	0.85	4	4		
	FMMA-102F37ED	2000	1	5	5	FL20 -S(C)122S2M2	FL20 -S(C)122T2M2
	FMMA-122F35ED	2000	1.2	6	5		
	FMMA-132F37ED	2000	1.3	6	6	FL20 -S(C)182S2M2	FL20 -S(C)182T2M2
	FMMA-152F37ED	2000	1.5	7.7	7.5		
	FMMA-202F37ED	2000	2	10	10	—	FL20 -S(C)302T2M3
	FMMA-312F37ED	2000	3.1	15	14	—	FL20 -S(C)452T2M3
	FMMA-352F3AED	2000	3.5	17.2	16	—	
FMMB	FMMB-122F37ED	1500	1.2	7.7	5	FL20 -S(C)122S2M2	FL20 -S(C)122T2M2
	FMMB-152F37ED	1500	1.5	10	6	FL20 -S(C)182S2M2	FL20 -S(C)182T2M2
	FMMB-232F37ED	1500	2.3	14.6	10	—	FL20 -S(C)302T2M3
	FMMB-272F3AED	1500	2.7	17.2	11	—	
	FMMB-302F3AED	1500	3	19	12	—	
	FMMB-432F3AED	1500	4.3	27	16	—	FL20 -S(C)452T2M3
FMLA	FMLA-102F37ED	1000	1	10	4.5	FL20 -S(C)102S2M2	FL20 -S(C)102T2M2
	FMLA-152F37ED	1000	1.5	14.3	7	FL20 -S(C)182S2M2	FL20 -S(C)182T2M2
	FMLA-292F3AED	1000	2.9	27	12	—	FL20 -S(C)302T2M3
	FMLA-372F3AED	1000	3.7	35	16	—	FL20 -S(C)452T2M3

Note)

- These part numbers are based on Incremental Encoder Type.
- Three-phase AC servo motor type permanent magnet synchronous motor, natural cooling, protection class IP65.
- The matched servo drive and motor can work with the most situation. But for some special situation, please contact to Parker sales team.

Servo Motor Specifications (380V – Incremental, Absolute Encoder and Resolver)

Motor type	Part Number (with incremental)	Rated speed	Rated power	Rated torque	Rated current	Adaptable servo drive
		r/min	KW	Nm	A	3-phase 380V
FMSA	FMSA-751F63ED	3000	0.75	2.39	2	FL20-S(C)102T3M2
	FMSA-102F63ED	3000	1	3.5	3	
	FMSA-122F65ED	3000	1.2	4	4	FL20 -S(C)202T3M3
	FMSA-152F67ED	3000	1.5	5	5	
	FMSA-182F65ED	3000	1.8	6	6	
	FMSA-232F67ED	3000	2.3	7.7	7	FL20 -S(C)302T3M3
	FMSA-302F67ED	3000	3	10	8	
FMMA	FMMA-801F65ED	2000	0.8	4	2.5	FL20 -S(C)102T3M2
	FMMA-851F67ED	2000	0.85	4	3	
	FMMA-102F67ED	2000	1	5	3	
	FMMA-122F65ED	2000	1.2	6	3.5	FL20 -S(C)152T3M2
	FMMA-132F67ED	2000	1.3	6	3.5	
	FMMA-152F67ED	2000	1.5	7.7	4.5	
	FMMA-202F67ED	2000	2	10	5.5	FL20 -S(C)202T3M3
	FMMA-312F67ED	2000	3.1	15	9	FL20 -S(C)452T3M3
	FMMA-352F6AED	2000	3.5	17.2	8	
	FMMA-452F6AED	2000	4.5	21.5	10	
	FMMA-602F6AED	2000	6	27	14	FL20 -S(C)752T3MM4
	FMMA-802F6AED	2000	8	35	18	
	FMMA-103F6AED	2000	10	48	24	FL20 -S(C)153T3M4
FMMB	FMMB-122F67ED	1500	1.2	7.7	4	FL20 -S(C)152T3M3
	FMMB-152F67ED	1500	1.5	10	4	FL20 -S(C)202T3M3
	FMMB-232F67ED	1500	2.3	14.6	6	
	FMMB-232F67ED	1500	3	14.6	7.5	FL20 -S(C)302T3M3
	FMMB-272F6AED	1500	2.7	17.2	8	
	FMMB-302F6AED	1500	3	19	8	
	FMMB-432F6AED	1500	4.3	27	10	FL20 -S(C)452T3M3
	FMMB-552F6AED	1500	5.5	35	12.5	FL20 -S(C)552T3M3
	FMMB-752F6AED	1500	7.5	48	17	FL20 -S(C)752T3MM4
FMLA	FMLA-102F67ED	1000	1	10	3	FL20 -S(C)152T3M2
	FMLA-292F6AED	1000	2.9	27	7	FL20 -S(C)302T3M3
	FMLA-372F6AED	1000	3.7	35	9	FL20 -S(C)452T3M3

Note)

- These part numbers are based on Incremental Encoder Type.
- Three-phase AC servo motor type permanent magnet synchronous motor, natural cooling, protection class IP65.
- The matched servo drive and motor can work with the most situation. But for some special situation, please contact to Parker sales team.

Servo Motor Specifications (380V – Incremental, Absolute Encoder and Resolver)

Motor type	Part Number (with incremental)	Rated speed	Rated power	Rated torque	Rated current	Adaptable servo drive
		r/min	kW	Nm	A	3-phase 380V
FM15	FM15-0082F6EEDFL	1500	8.2	52	16.6	FL20 -S(C)752T3MM4
	FM15-0100F6EEDFL	1500	10	64	20.7	FL20 -S(C)113T3MM4
	FM15-0124F6EEDFL	1500	12	80	24.7	FL20 -S(C)153T3M4
	FM15-0160F6EEDFL	1500	16	102	33.5	FL20 -S(C)183T3M5
	FM15-0180F6EEDFL	1500	18	118	40	FL20 -S(C)223T3M5
	FM15-0210F6EEDFL	1500	21	135	43.2	
	FM15-0240F6EEDFL	1500	24	152	46.7	FL20 -S(C)303T3M6
	FM15-0290F6FEDFL	1500	29	185	57.5	
	FM15-0350F6FEDFL	1500	35	225	71.7	FL20 -S(C)373T3M6
FM17	FM17-0075F6EEDFL	1700	7.5	42	13.7	FL20 -S(C)752T3MM4
	FM17-0092F6EEDFL	1700	9.2	52	18	FL20 -S(C)113T3MM4
	FM17-0110F6EEDFL	1700	11	64	23	
	FM17-0140F6EEDFL	1700	14	80	29.2	FL20 -S(C)153T3M4
	FM17-0180F6EEDFL	1700	18	102	38.5	FL20 -S(C)183T3M5
	FM17-0210F6EEDFL	1700	21	118	45	FL20 -S(C)223T3M5
	FM17-0240F6EEDFL	1700	24	135	48.5	FL20 -S(C)303T3M6
	FM17-0270F6EEDFL	1700	27	152	57.5	
	FM17-0330F6FEDFL	1700	33	185	68	FL20 -S(C)373T3M6
FM20	FM20-0070F6EEDFL	2000	7	33.6	14.8	FL20 -S(C)752T3MM4
	FM20-0100F6EEDFL	2000	10	52	22	FL20 -S(C)113T3MM4
	FM20-0140F6EEDFL	2000	14	64	30	FL20 -S(C)153T3M4
	FM20-0180F6EEDFL	2000	18	80	37	FL20 -S(C)183T3M5
	FM20-0220F6EEDFL	2000	22	102	43	FL20 -S(C)223T3M5
	FM20-0250F6EEDFL	2000	25	118	49	FL20 -S(C)303T3M6
	FM20-0280F6EEDFL	2000	28	135	56.9	
	FM20-0300F6EEDFL	2000	30	152	67	FL20 -S(C)373T3M6
	FM20-0360F6FEDFL	2000	36	185	74	
	FM20-0071F6EEDNL	2000	7.1	34	14.5	FL20 -S(C)752T3MM4
	FM20-0094F6EEDNL	2000	9.4	45	18.8	
	FM20-0117F6EEDNL	2000	11.7	56	24.4	FL20 -S(C)153T3M4
	FM20-0140F6EEDNL	2000	14	67	28.6	

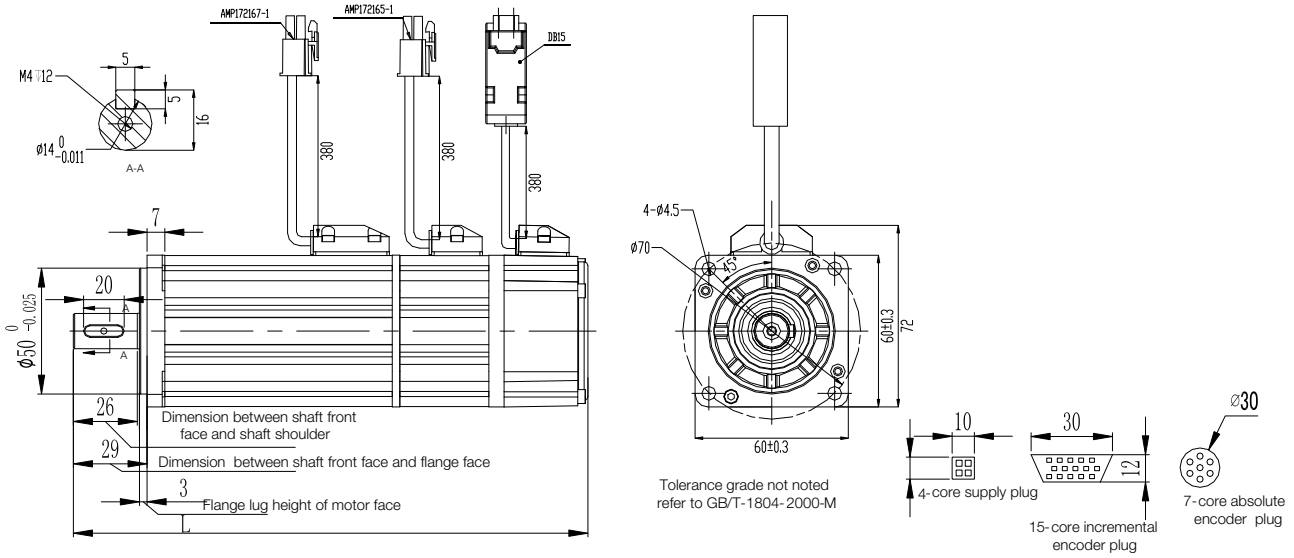
Note)

- These part numbers are based on Incremental Encoder Type.
- On behalf of the motor shaft extension brake category, please refer to [naming rules servo motor] in this manual.
- The matched servo drive and motor can work with the most situation. But for some special situation, please contact to Parker sales team.

Motor Dimensions

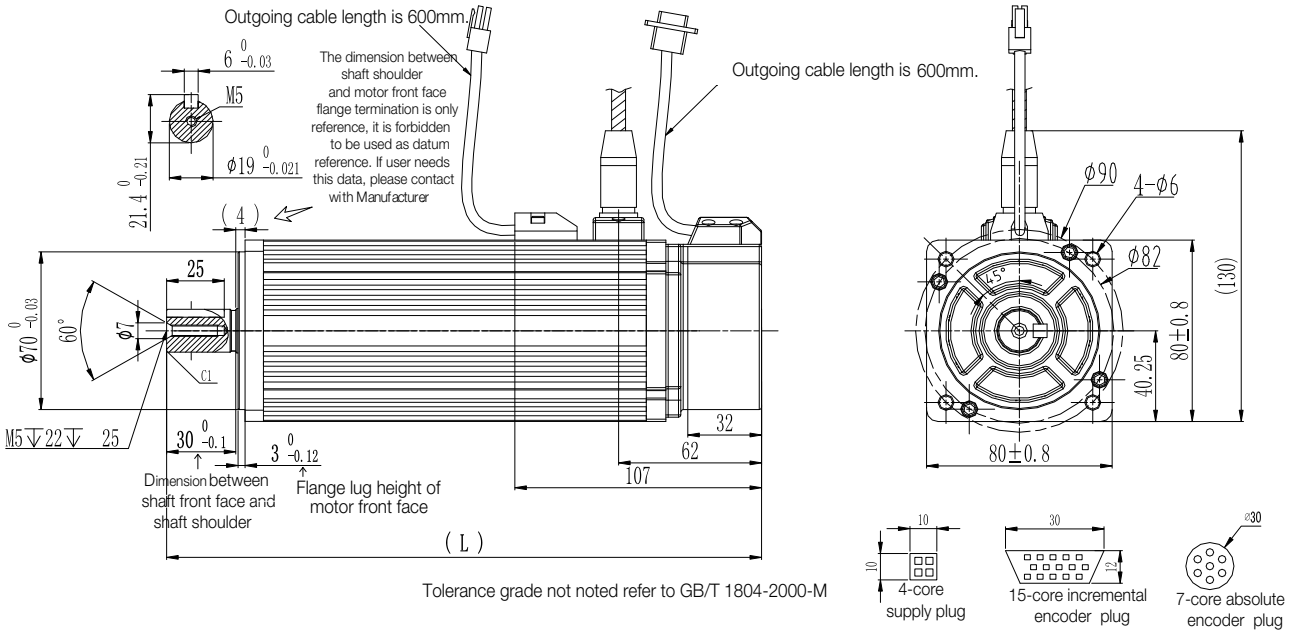
Servo motor

60 Flange



Model	L(mm)	L(mm) with brake	Weight(kg)	Remark
FMSA-201F/S32***	130.5	162.5	1.2	The screw hole size is M4 x 12
FMSA-401F/S32***	163	195	1.6	

80 Flange

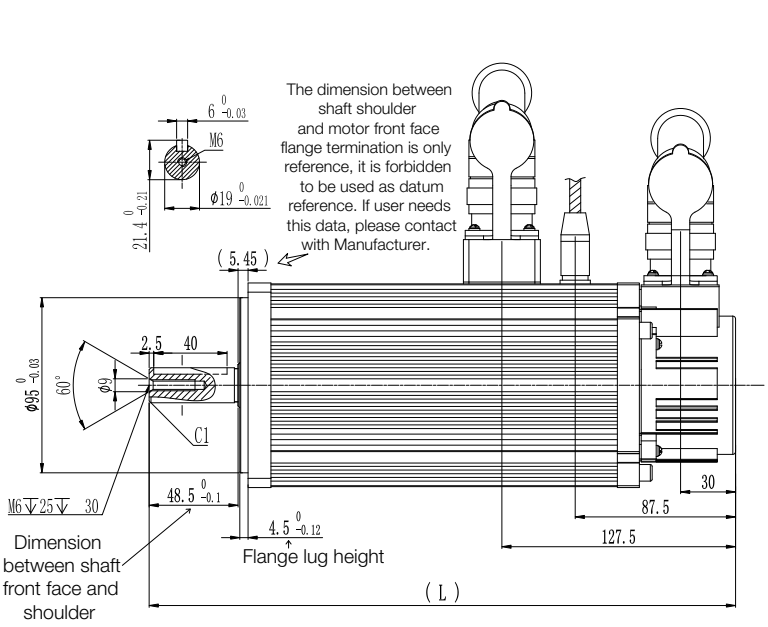


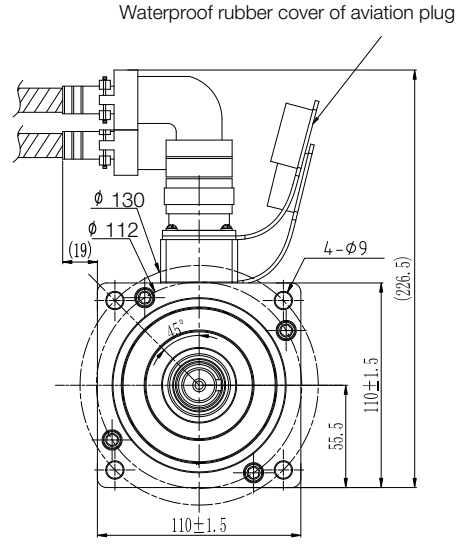
Model	L(mm)	L(mm) with brake	Weight(kg)	Remark
FMSA-751**3***	192	231	2.8	The screw hole size is M5 x 22
FMSA-102**3***	219	258	3.8	
FMSB-102*33***				

Motor Dimensions

Servo motor

110 Flange

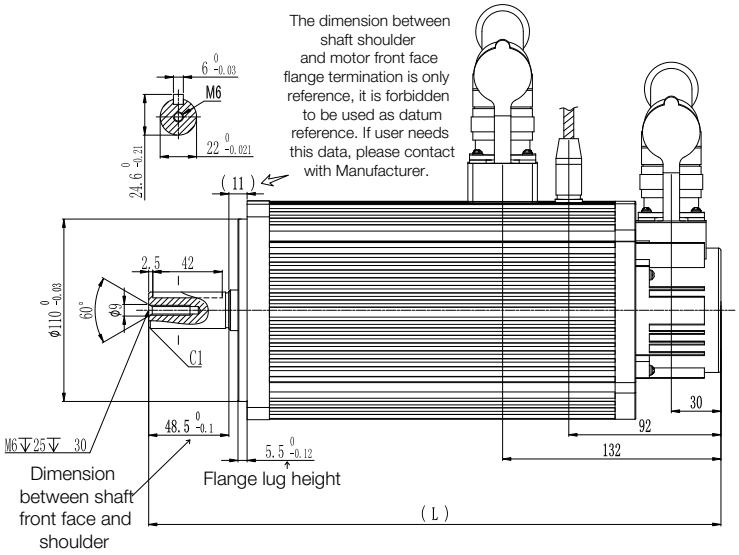


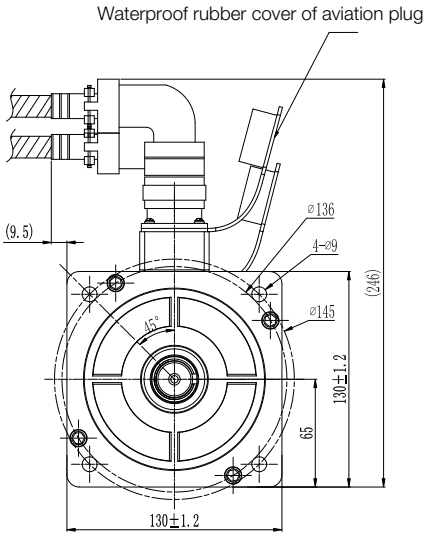


Tolerance grade not noted refer to GB/T 1804-2000-M

Model	L(mm)	L(mm) with brake	Weight(kg)	Remark
FMSA-122**5***	250	290	6.5	The screw hole size is M6 x 25
FMMA-801**5***				
FMSA-182**5***	280	320	8	
FMMA-122**5***				

130 Flange





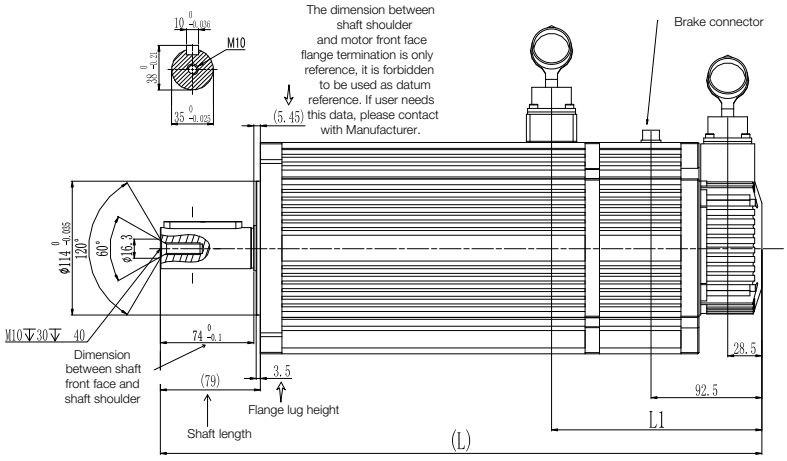
Tolerance grade not noted refer to GB/T 1804-2000-M

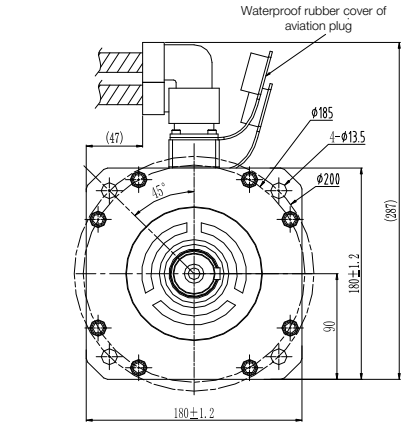
Model	L(mm)	L(mm) with brake	Weight(kg)	Remark
FMMA-851**7***	230	275	7	The screw hole size is M6 X 25
FMSA-152**7***				
FMMA-102**7***				
FMMA-132**7***	238	283	7.7	
FMSA-232**7***	251	296	8	
FMMA-152**7***				
FMMB-122**7***				
FMSA-302**7***	274	319	10	
FMMA-202**7***				
FMMB-152**7***				
FMLA-102**7***				
FMMA-312**7***	301	346	12	
FMLA-152*37***				
FMMB-232**7***				

Motor Dimensions

Servo motor

180 Flange Motor

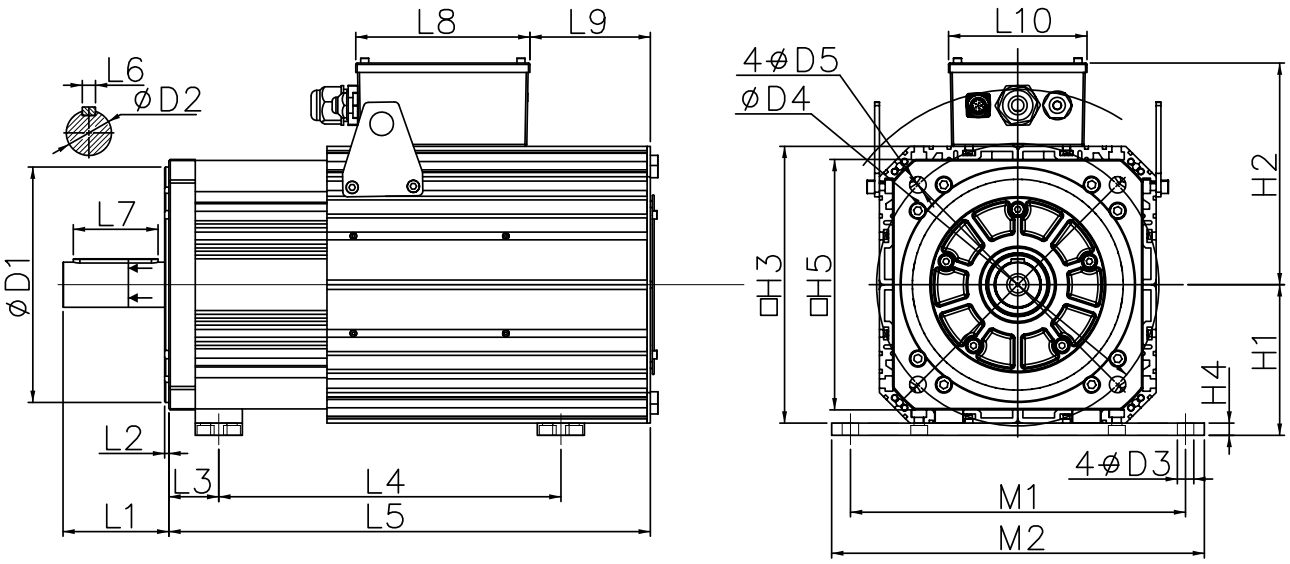




Tolerance grade not noted refer to GB/T 1804-2000-M

Model	L(mm)	L(mm) with brake	L1(mm)	L1(mm) with brake	Weight(kg)	Remark
FMMA-352**A***	300	382	149.5	175.5	18	The screw hole size is M10 x 30
FMMB-272**A***						
FMMA-452**A***	320	402	149.5	175.5	20	
FMMB-302**A***						
FMMA-602*6A***	332	414	149.5	175.5	23	
FMMB-432**A***						
FMLA-292**A***						
FMMA-802*6A***	370	452	149.5	175.5	29	
FMMB-552**A***						
FMLA-372**A***						
FMMA-103*6A***	416	498	149.5	175.5	36	
FMMB-752**A***						

FM15, FM17, FM20 series, Air-cooling



Stand spigot	D1	D2	D3	D4	D5	L1	L2	L3	L6	L7	L8	L9	L10	H1	H2	H3	H4	H5	M1	M2
E	180	42	14	215	14.5	77	5	39	12	56	185	75.5	147	124	200	224	12	200	254	278
F	250	48	18	300	17.5	112.5	4.5	53	14	90	185	128	147	160	240	294	13	266	356	396

Motor rated torque Nm ΔT=100°C	46	68	84	96	130	147	160	196	220	275	330	380	428	481
Motor rated torque Nm ΔT=65°C	42	52	64	80	102	118	135	152	185	225	270	307	324	385
Base front edge	E	E	E	E	E	E	E	E	F	F	F	F	F	F
L4 (mm)	267	285	312	354	396	436	478	520	317	370	423	476	529	583
L5 (mm)	345	397	429	471	513	555	597	619	511.5	560.5	609.5	658.5	707.5	756.5

Note)

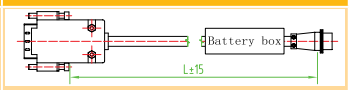
- 1-phase 220V power supply of 50 /60 Hz is usable for servomotor fan.
- Green terminal definition: K-220VAC, L-220VAC, M-PE.

Accessories

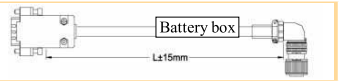
Feedback Cable

• Absolute Encoder Cable (Maximun length : 30m)

1) Encoder cable with round plug (applicable for 80 flange and below 80 flange servo motor)

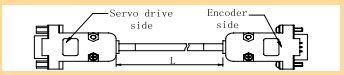
Item	Part No	Cable length(m)	Cable Assembly
Absolute encoder cable (for D7, D71)	DB9-4BS02-** - 0.2 (with battery)	**	
	DB9-4GS02-** - 0.2	**	

2) Encoder cable with L aviation plug (applicable for 110, 130 and 180 flange servo motor)

Item	Part No	Cable length(m)	Cable Assembly
Absolute encoder cable (for D7, D71)	DB9-4BS03-** - 0.2 (with battery)	**	
	DB9-4GS03-** - 0.2	**	

• Incremental Encoder Cable (Maximun length : 30m)

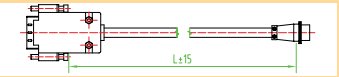
1) Encoder cable with DB plug (applicable for 80 flange and below 80 flange servo motor)

Item	Part No	Cable length(m)	Cable Assembly
15-core encoder cable (for D5)	DB15-15GP02-** - 0.2	**	
8-core encoder cable (for D51)	DB15-8GP02-** - 0.2		
4-core encoder cable (for D52)	DB9-4GS02-** - 0.2	**	

2) Encoder cable with L aviation plug (applicable for 110, 130 and 180 flange servo motor)

Item	Part No	Cable length(m)	Cable Assembly
15-core encoder cable (for D5)	DB15-15GP01-**	**	
8-core encoder cable (for D51)	DB15-8GP01-**		
4-core encoder cable (for D52)	DB9-4GS03-**		

3) Encoder cable with I aviation plug (applicable for servo motor with base No. E, F)

Item	Part No	Cable length(m)	Cable Assembly
15-core encoder cable (for D5)	DB15-15GP03-**	**	
8-core encoder cable (for D51)	DB15-8GP03-**		

• Resolver Feedback Cable (Maximun length : 30m)

1) Feedback cable with L aviation plug (applicable for 180 flange and below 180 flange motor)

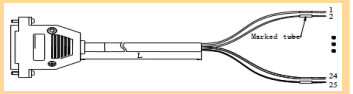
Item	Part No	Cable length(m)	Cable Assembly
Resolver feedback cable (for D2)	DB9-8GR01-** - 0.2	**	

2) Feedback cable with I aviation plug (applicable for servo motor with base No. E, F)

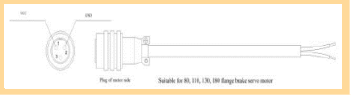
Item	Part No	Cable length(m)	Cable Assembly
Resolver feedback cable (for D2)	DB9-8GR02-** - 0.2	**	

Control Cable

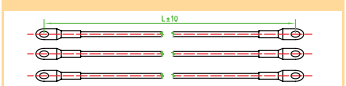
• Control cable (Maximum length : 30m)

Item	Part No	Cable length(m)	Cable Assembly
Control Cable	DB44-15PC-** - 0.2	**	

• Brake cable (Maximum length : 30m)

Item	Part No	Cable length(m)	Cable Assembly
Brake cable (for ≤180 flange Servo motor)	HK3-2BR-** - 0.75	**	
Brake cable	DB2-2BR-** - 0.75	**	

Power Cable

Item	Part No	Cable length(M)	Cable Assembly
Power cable (for ≤80 flange Servo motor)	DB4-4PO-**	**	
Power cable (for 110, 130 flange Servo motor)	HK4A-4PO-**	**	
Power cable (for 180 flange Servo motor)	HK4B-4PO-**	**	
Power cable (for 180, 250 spigpot Servo motor)	ZL4-4PO-**	**	

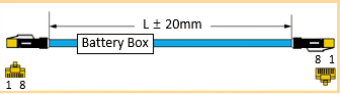
Note)

• ZL4-4PO-XXX is single strand cable, grounding cable is yellow-green cable of 2.5 mm2.

Accessories

Communication Cable

• EtherCAT cable (Maximum length : 30m)

Item	Part No	Cable length(m)	Cable Assembly
Communication Cable for built-in EtherCAT	SC-ECT-**M-C	**	

Power Cable

(Servo motor power line form L- Plug power line (for 800W of Servo motors), Maximum length : 30m)

[220V Servo Motor Power cable]

Motor model		Servo drive model		Power cable model
FMS series 3000r/min	FMSA-201*32***	FL20-S(C)201S2M1	FL20-S(C)201T2M1	DB4-4PO - ** - 0.75-B
	FMSA-401*32***	FL20-S(C)401S2M1	FL20-S(C)401T2M1	
	FMSA-751*33***	FL20-S(C)751S2M1	FL20-S(C)751T2M1	
	FMSA-102*33***	FL20-S(C)102S2M2	FL20-S(C)102T2M2	DB4-4PO- length -1.0-B
	FMSA-122*35***	FL20-S(C)122S2M2	FL20-S(C)122T2M2	
	FMSA-152*37***	FL20-S(C)182S2M2	FL20-S(C)182T2M2	HK4A-4PO - ** - 1.5-B
	FMSA-182*35***			HK4A-4PO - ** - 2.5-B
	FMSA-232*37***	—	FL20-S(C)302T2M3	HK4A-4PO - ** - 2.5
	FMSA-302*37***	—	FL20-S(C)452T2M3	HK4A-4PO - ** - 4.0
FMM series 2000r/min	FMMA-801*35***	FL20-S(C)102S2M2	FL20-S(C)102T2M2	HK4A-4PO - ** - 0.75-B
	FMMA-851*37***			HK4A-4PO - ** - 1.0-B
	FMMA-122*35***	FL20-S(C)122S2M2	FL20-S(C)122T2M2	HK4A-4PO - ** - 1.0-B
	FMMA-102*37***			
	FMMA-132*37***	FL20-S(C)182S2M2	FL20-S(C)182T2M2	HK4A-4PO - ** - 1.5-B
	FMMA-152*37***			
	FMMA-202*37***	—	FL20-S(C)302T2M3	HK4A-4PO - ** - 2.5
	FMMA-312*37***	—	FL20-S(C)452T2M3	HK4B-4PO - ** - 4.0
	FMMA-352*3A***	—		
FMM series 1500r/min	FMMB-122*37***	FL20-S(C)122S2M2	FL20-S(C)122T2M2	HK4A-4PO - ** - 1.0-B
	FMMB-152*37***	FL20-S(C)182S2M2	FL20-S(C)182T2M2	HK4A-4PO - ** - 1.5-B
	FMMB-232*37***	—	FL20-S(C)302T2M3	HK4A-4PO - ** - 2.5
	FMMB-272*3A***	—		HK4B-4PO - ** - 2.5
	FMMB-302*3A***	—	FL20-S(C)452T2M3	HK4B-4PO - ** - 4.0
	FMMB-432*3A***	—	FL20-S(C)452T2M3	
FML series 1000r/min	FMLA-102*37***	FL20-S(C)102S2M2	FL20-S(C)102T2M2	HK4A-4PO - ** - 1.0-B
	FMLA-152*37***	FL20-S(C)182S2M2	FL20-S(C)182T2M2	HK4A-4PO - ** - 1.5-B
	FMLA-292*3A***	—	FL20-S(C)302T2M3	HK4B-4PO - ** - 2.5
	FMLA-372*3A***	—	FL20-S(C)452T2M3	HK4B-4PO - ** - 4.0

Note)

- HK4A cable is suitable for flange below 180 with aviation plug.
- HK4B is suitable for 180 flange with aviation plug.
- The unit of length is m.

[380V Servo Motor Power cable]

Motor model		Servo drive model	Power cable model
FMS series 3000r/min	FMSA-751*63***	FL20-S(C)152T3M2	DB4-4PO - ** - 0.75-H
	FMSA-102*63***		
	FMSA-122*65***	FL20-S(C)202T3M3	HK4A-4PO-*M-1.0
	FMSA-152*67***		
	FMSA-182*65***		HK4A-4PO-*M-1.5
	FMSA-232*67***	FL20-S(C)302T3M3	HK4A-4PO-*M-1.5
	FMSA-302*67***	FL20-S(C)452T3M3	HK4A-4PO-*M-2.5
FMM series 2000r/min	FMMA-801*65***	FL20-S(C)102T3M2	HK4A-4PO - ** - 0.75-H
	FMMA-851*67***		
	FMMA-102*67***		
	FMMA-122*65***	FL20-S(C)152T3M2	
	FMMA-132*67***		
	FMMA-152*67***		HK4A-4PO - ** - 1.0
	FMMA-202*67***	FL20-S(C)202T3M3	HK4A-4PO - ** - 1.5
	FMMA-312*67***	FL20-S(C)452T3M3	HK4A-4PO - ** - 2.5
	FMMA-352*6A***		HK4B-4PO - ** - 2.5
	FMMA-452*6A***		
	FMMA-602*6A***	FL20-S(C)752T3MM4	HK4B-4PO - ** - 4.0
	FMMA-802*6A***		
	FMMA-103*6A***	FL20-S(C)153T3M4	HK4B-4PO - ** - 6.0
FMM series 1500r/min	FMMB-122*67***	FL20-S(C)202T3M3	HK4A-4PO - ** - 1.0
	FMMB-152*67***		
	FMMB-232*67***		HK4A-4PO - ** - 1.5
	FMMB-302*67***	FL20-S(C)302T3M3	HK4A-4PO - ** - 2.5
	FMMB-272*6A***	FL20-S(C)302T3M3	HK4B-4PO - ** - 2.5
	FMMB-302*6A***	FL20-S(C)302T3M3	HK4B-4PO - ** - 1.5
	FMMB-432*6A***	FL20-S(C)452T3M3	HK4B-4PO - ** - 2.5
	FMMB-552*6A***	FL20-S(C)552T3M3	
	FMMB-752*6A***	FL20-S(C)752T3MM4	HK4B-4PO - ** - 4.0
	FM15-0082*6EE*FL	FL20-S(C)752T3MM4	ZL4-4PO - ** - 4.0
	FM15-0100*6EE*FL	FL20-S(C)113T3MM4	ZL4-4PO - ** - 6.0
	FM15-0124*6EE*FL	FL20-S(C)153T3M4	
	FM15-0160*6EE*FL	FL20-S(C)183T3M5	ZL4-4PO - ** - 10.0
	FM15-0180*6EE*FL		
	FM15-0210*6FE*FL	FL20-S(C)223T3M5	
	FM15-0240*6EE*FL	FL20-S(C)303T3M6	ZL4-4PO - ** - 16.0
	FM15-0290*6FE*FL	FL20-S(C)303T3M6	
	FM15-0350*6FE*FL	FL20-S(C)373T3M6	ZL4-4PO - ** - 25.0

Note)

- HK4A cable is suitable for flange below 180 with aviation plug.
- HK4B is suitable for 180 flange with aviation plug.
- The unit of length is m.

Accessories

Power Cable

(Servo motor power line form L- Plug power line (for 800W of Servo motors), Maximum length : 30m)

[380V Servo Motor Power cable for >180Frame]

Motor model		Servo drive model	Power cable model
FML series 1000r/min	FMLA-372*6A***	FL20-S(C)452T3M3	HK4B-4PO - ** - 2.5
	FMLA-102*67***	FL20-S(C)152T3M2	HK4B-4PO - ** - 0.75-B
	FMLA-292*6A***	FL20-S(C)302T3M3	HK4B-4PO - ** - 1.5
FMM series 1700r/min	FM17-0075*6EE*FL	FL20-S(C)752T3MM4	ZL4-4PO - ** - 4.0
	FM17-0092*6EE*FL	FL20-S(C)113T3MM4	ZL4-4PO - ** - 6.0
	FM17-0110*6EE*FL	FL20-S(C)113T3MM4	
	FM17-0140*6EE*FL	FL20-S(C)153T3M4	
	FM17-0180*6EE*FL	FL20-S(C)183T3M5	ZL4-4PO - ** - 10.0
	FM17-0210*6FE*FL	FL20-S(C)223T3M5	
	FM17-0240*6EE*FL	FL20-S(C)303T3M6	ZL4-4PO - ** - 16.0
	FM17-0270*6EE*FL	FL20-S(C)303T3M6	
	FM17-0330*6FE*FL	FL20-S(C)373T3M6	ZL4-4PO - ** - 25.0
FMM series 2000r/min	FM20-0070*6EE*FL	FL20-S(C)752T3MM4	ZL4-4PO - ** - 4.0
	FM20-0100*6EE*FL	FL20-S(C)113T3MM4	ZL4-4PO - ** - 6.0
	FM20-0140*6EE*FL	FL20-S(C)153T3M4	
	FM20-0180*6EE*FL	FL20-S(C)183T3M5	ZL4-4PO - ** - 10.0
	FM20-0220*6EE*FL	FL20-S(C)223T3M5	
	FM20-0250*6EE*FL	FL20-S(C)303T3M6	ZL4-4PO - ** - 16.0
	FM20-0280*6EE*FL		
	FM20-0300*6EE*FL	FL20-S(C)373T3M6	
	FM20-0360*6FE*FL		ZL4-4PO - ** - 25.0

Note) The unit of length is m.

Braking Resistor

- Built-in braking resistor and min resistor value of external braking resistor for 220V servo.

Drive Frame	Built-in resistor value and power	Min. resistor value of external braking resistor	Spec. of external braking resistor
M1	-	40Ω	60Ω/200 W
M2	50W/50Ω	25Ω	40Ω/400 W
M3	100W/20Ω	15Ω	15Ω/1000 W

- Built-in braking resistor and min resistor value of external braking resistor for 380V servo.

Drive Frame	Built-in resistor value and power	Min. resistor value of external braking resistor	Spec. of external braking resistor
M2	50W/50Ω	50Ω	50Ω/1000W
M3	100W/60Ω	50Ω	50Ω/1000W
MM4/M4	—	40Ω	40Ω/1000W
M5	—	20Ω	20Ω/1000W
M6	—	20Ω	20Ω/2200W

Memo

Memo

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Aerospace

Key Markets

Aftermarket services
Commercial transports
Engines
General & business aviation
Helicopters
Launch vehicles
Military aircraft
Missiles
Power generation
Regional transports
Unmanned aerial vehicles

Key Products

Control systems & actuation products
Engine systems & components
Fluid conveyance systems & components
Fluid metering, delivery & atomization devices
Fuel systems & components
Fuel tank inerting systems
Hydraulic systems & components
Thermal management
Wheels & brakes

Climate Control

Key Markets

Agriculture
Air conditioning
Construction Machinery
Food & beverage
Industrial machinery
Life sciences
Oil & gas
Precision cooling
Process
Refrigeration
Transportation

Key Products

Accumulators
Advanced actuators
CO_2 controls
Electronic controllers
Filter driers
Hand shut-off valves
Heat exchangers
Hose & fittings
Pressure regulating valves
Refrigerant distributors
Safety relief valves
Smart pumps
Solenoid valves
Thermostatic expansion valves

Electromechanical

Key Markets

Aerospace
Factory automation
Life science & medical
Machine tools
Packaging machinery
Paper machinery
Plastics machinery & converting
Primary metals
Semiconductor & electronics
Textile
Wire & cable

Key Products

AC/DC drives & systems
Electric actuators, gantry robots & slides
Electrohydrostatic actuation systems
Electromechanical actuation systems
Human machine interface
Linear motors
Stepper motors, servo motors, drives & controls
Structural extrusions

Filtration

Key Markets

Aerospace
Food & beverage
Industrial plant & equipment
Life sciences
Marine
Mobile equipment
Oil & gas
Power generation & renewable energy
Process
Transportation
Water Purification

Key Products

Analytical gas generators
Compressed air filters & dryers
Engine air, coolant, fuel & oil filtration systems
Fluid condition monitoring systems
Hydraulic & lubrication filters
Hydrogen, nitrogen & zero air generators
Instrumentation filters
Membrane & fiber filters
Microfiltration
Sterile air filtration
Water desalination & purification filters & systems

Fluid & Gas Handling

Key Markets

Aerial lift
Agriculture
Bulk chemical handling
Construction machinery
Food & beverage
Fuel & gas delivery
Industrial machinery
Life sciences
Marine
Mining
Mobile
Oil & gas
Renewable energy
Transportation

Key Products

Check valves
Connectors for low pressure fluid conveyance
Deep sea umbilicals
Diagnostic equipment
Hose couplings
Industrial hose
Mooring systems & power cables
PTFE hose & tubing
Quick couplings
Rubber & thermoplastic hose
Tube fittings & adapters
Tubing & plastic fittings

Hydraulics

Key Markets

Aerial lift
Agriculture
Alternative energy
Construction machinery
Forestry
Industrial machinery
Machine tools
Marine
Material handling
Mining
Oil & gas
Power generation
Refuse vehicles
Renewable energy
Truck hydraulics
Turf equipment

Key Products

Accumulators
Cartridge valves
Electrohydraulic actuators
Human machine interfaces
Hybrid drives
Hydraulic cylinders
Hydraulic motors & pumps
Hydraulic systems
Hydraulic valves & controls
Hydrostatic steering
Integrated hydraulic circuits
Power take-offs
Power units
Rotary actuators
Sensors

Pneumatics

Key Markets

Aerospace
Conveyor & material handling
Factory automation
Life science & medical
Machine tools
Packaging machinery
Transportation & automotive

Key Products

Air preparation
Brass fittings & valves
Manifolds
Pneumatic accessories
Pneumatic actuators & grippers
Pneumatic valves & controls
Quick disconnects
Rotary actuators
Rubber & thermoplastic hose & couplings
Structural extrusions
Thermoplastic tubing & fittings
Vacuum generators, cups & sensors

Process Control

Key Markets

Alternative fuels
Biopharmaceuticals
Chemical & refining
Food & beverage
Marine & shipbuilding
Medical & dental
Microelectronics
Nuclear Power
Offshore oil exploration
Oil & gas
Pharmaceuticals
Power generation
Pulp & paper
Steel
Water/wastewater

Key Products

Analytical Instruments
Analytical sample conditioning products & systems
Chemical injection fittings & valves
Fluoropolymer chemical delivery fittings, valves & pumps
High purity gas delivery fittings, valves, regulators & digital flow controllers
Industrial mass flow meters/ controllers
Permanent no-weld tube fittings
Precision industrial regulators & flow controllers
Process control double block & bleeds
Process control fittings, valves, regulators & manifold valves

Sealing & Shielding

Key Markets

Aerospace
Chemical processing
Consumer
Fluid power
General industrial
Information technology
Life sciences
Microelectronics
Military
Oil & gas
Power generation
Renewable energy
Telecommunications
Transportation

Key Products

Dynamic seals
Elastomeric o-rings
Electro-medical instrument design & assembly
EMI shielding
Extruded & precision-cut, fabricated elastomeric seals
High temperature metal seals
Homogeneous & inserted elastomeric shapes
Medical device fabrication & assembly
Metal & plastic retained composite seals
Shielded optical windows
Silicone tubing & extrusions
Thermal management
Vibration dampening

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