### MEGMEET

# M6 Series Servo System



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Global Leading Solution Provider In Electrical Automation

# **About Megmeet**

Megmeet (stock code: 002851) is a comprehensive solution provider in the field of electrical automation, integrating software and hardware R&D, production, sales and services. Mastering the core technologies in electrical automation, we are engaged in six core business areas: Industrial Automation, EV & Railway Solutions, Intelligent Equipment, Power Solutions, Home Appliance Control Solutions, and Precision Connection.

Megmeet has established a strong R&D, manufacturing, marketing and service platform, empowered by an active team of more than 7800 employees, among which more than 2800 work as R&D engineers. We have set up R&D centers in cities including Shenzhen, Zhuzhou, Changsha, Wuhan, Xi'an, Hangzhou, Taizhou (Zhejiang) and Chengdu, as well as research institutes in Germany, Sweden and the United States. We have also established manufacturing centers in Zhuzhou, Heyuan, Dongguan, Hangzhou, Taizhou (Zhejiang) and Yiwu, as well as factories in Thailand and India. Our marketing and service resources have been allocated to the United States, Japan, South Korea, Germany, Poland, Romania, Sweden, Türkiye, India, as well as Southeast Asia.

To ensure a better living environment for all human beings, Megmeet will continue the effort to improve the efficient use of electricity, promote clean energy, and maximize production efficiency in the pursuit of a worldleading position in the power electronics industry.



# **R&D** Capability

### High R&D expense ratio



R&D personnel >2800為≣ Valid patents & copyrights 1800 +

standard formulation

**150+** newly added in 2023

R&D personnel ratio

23

• Key role in 5 standards

R&D expense ratio > 11% 🗠 Industry standards 27 • Key role in 16 standards

### Certified test ability and management system by authorities



Lab test ability and management system certified by authorities CNAS, TUV, UL-WTDP, UL-CTF and other certificates, with globally acknowledged test results





# Introduction

Megmeet's new-generation M6 series servo system is featured with high response, high precision and high synchronization, and equipped with advanced functions such as online inertia identification, gain auto-tuning, vibration suppression, and quadrant compensation. Together with the intelligent Megmeet host controller, M6 is able to meet market requirements for mechanical equipment by high precision, high stability, high efficiency and ease of use.

# High response

- Increase from 1.0 kHz to 2.6 kHz
- High current loop and speed loop refresh frequency
- Faster response to commands
- High rigidity

### High overload

• 3 times overload capacity





# High bandwidth

- Input and output pulse up to 4 Mpps
- Supports differential and open-collector input
- Three pulse modes: A/B orthogonal, direction + pulse and CW/CCW

# Multiple series motors

- High, medium and low inertia motors, select the appropriate inertia to obtain the best inertia ratio
- Different speed motors meet the operation requirements of different equipment
- High-inertia motors are used in occasions where speed stability is required, and have strong resistance to external load impacts, such as machine tools.
- Low inertia motors are used for fast response occasions, high-speed positioning and reciprocating motion, such as electronic equipment



### Integrated interface for encoders

23-bit multi-turn absolute encoder

- High resolution, 8388608 p/r, 65535 turns of absolute position for maximum record
- The low-speed torque is more stable and the positioning is more accurate
- The motor still remains in its position after the servo unit is powered off

Incremental encoder

- Economical, easy wiring
- Accurate angle identification

Sin/Cos encoder

- Internal 16-bit A/D subdivision
- Improved positioning accuracy and low-speed stability

# Fully closed-loop control

Fully closed-loop control to reduce control errors caused by defects such as mechanical clearance and elasticity and improve control accuracy and system rigidity

Support two kinds of encoder interfaces

- Absolute encoder
- ABZ incremental encoder

Fully closed-loop control with the local encoder







# **Important Functions**

### Inertia identification

Both offline and online inertia identification can be performed. Through inertia identification, the load inertia ratio can be accurately obtained, which is helpful to complete the commissioning quickly and achieve the best control effect.

### **Gain adjustment**

- Automatic gain adjustment: By selecting the rigidity level, matching gain parameters are automatically generated to meet the requirements of rapidity and stability.
- Manual gain adjustment: Manually fine-tune the gain to optimize the control effect.
- Speed feedforward: The function is used in the position control mode to reduce position following errors.
- Torque feedforward: In the position control mode, it can reduce the position deviation during acceleration and deceleration; and in the speed control mode, it can reduce the speed deviation when the speed is fixed.
- Multiple gain switchover modes

### Torque disturbance observation

In a non-torque control mode, by detecting and estimating the external disturbance torque received by the system, the torque reference can be compensated to reduce the influence of external disturbance on the servo so as to reduce vibration

### High-frequency mechanical resonance suppression

Automatically search for high-frequency mechanical resonance frequency points, and reduce the gain at a specific frequency through 4 sets of traps, which can suppress mechanical resonance.

### Low-frequency mechanical resonance suppression

For long-end mechanical loads, the low-frequency resonance suppression function can effectively reduce the end jitter caused by positioning completion or emergency stop.

### Friction compensation

For loads with high friction, such as drive shafts of belts, friction compensation can shorten positioning time and reduce machining errors caused by friction.

### Quadrant compensation

In the application of arc trajectory interpolation with more than 2 axes, guadrant compensation can reduce the arc distortion caused by friction non-linearity (the trajectory protrusion at the alternation of the four quadrants), and increase the accuracy of servo system control and the uniformity of motion.

# M6-N Communication Specifications

	Communication standar
	IEC 61158 Type12, IEC 61800-7 CiA402 Driv
	Physical layer
Transmission protocol	100 BASE-TX (IEEE 802.3)
Transmission distance	Less than 100 m between two nodes
Interface	CN4 (RJ45): EtherCAT Signal IN CN5 (RJ45): EtherCAT Signal OUT
Cable	Category 5 twisted pair
	Application layer
SDO	SDO request, SDO response
PDO	Mutable PDO mapping
	Profile Position Mode
	Profile Velocity Mode
CiA402 Drive Profile	Homing Mode
	Interpolated Position Mode
	Cyclic Synchronous Position Mode
	Cyclic Synchronous Velocity Mode
	Sync mode
	Distributed clock (DC) mode

# **Network Synchronization**

- The EtherCAT network selects the first slave clock as the reference clock, and the clocks of all other devices (including master and slave) are synchronized with this reference clock.
- Through the synchronization signal (SYNC), all EtherCAT devices can use the same system clock to control the synchronous task execution of each device, and realize the synchronization of local tasks of each device with the reference clock.
- The system can achieve a jitter of 20 ns and a synchronization error of 15 ns, even through 300 nodes are between two devices with the cable length up to 120 m.



# ndard 102 Drive Profile (CoE)



# **Specifications**

Basic specification								
Main circuit power supply	200 to 240 V, -10% to +10%, 50/60 HZ or 380 to 480 V, -15% to +10%, 50/60 HZ							
Control circuit power supply	Single-phase 200 to 240 V, -15% to +10%, 50/60 HZ							
Control mode	IGBT, PWM control, and sine wave current drive mode							
Encoder	Rotating motor:Linear motor:Second encoder:Absolute encoderAbsolute encoderAbsolute encoderIncremental encoderIncremental encoderIncremental encoderSin/Cos encoderSin/Cos encoderSin/Cos encoder							
	Interface							
Button	5 buttons							
LED display	Five 8-segment LEDs							
Power indicator	CHARGE indicator							
STO function	General safety STO function, optional							
Fully closed-loop interface	Fully closed-loop function, optional							
Expansion card interface	Extensible motion control card, optional							
	10							
DI (various functions defined by parameters)	10 general inputs, optocoupler isolation, NPN and PNP inputs available Input voltage range 20 to 30 V, input impedance 3.9 K							
DO (various functions defined by parameters)	6 general outputs, optocoupler isolation, NPN and PNP outputs available Maximum operating voltage 30 V, maximum current 100 mA							
Al (functions configured according to modes)	2 analog inputs, +/-10 V, 16 bits for Al1, 12 bits for Ai2 Input impedance: Al1 impedance 12 K, Al2 impedance 17 K Signal delay: Al1 delay 70 uS, Al2 delay 80 uS							
	Communication function							
RS485	Modbus communication protocol, only for the M6-P series							
CAN	CANopen communication protocol, in compliance with CiA402 profile, only for the M6-P series							
EtherCAT	CoE and SoE communication protocols, in compliance with CiA402 profile, only for the M6-N series							
MECHATROLINK-III	MECHATROLINK-III bus protocol, only for the M6-M series							
PROFINET	PROFINET bus communication protocol, PROFIdrive profile integrated, only for the M6-F series							
USB	Connect the computer and the servo drive for commissioning and relevant tuning							
	General function							
Auto-adjustment	The host computer issues an action command to run the motor, during which the load moment of inertia ratio is estimated in real time and the rigidity level is automatically set							
Switchover of multiple control modes	Position mode; Speed mode; Torque mode; Position/Speed mode switchover; Speed/Torque mode switchover; Position/Torque mode switchover; Fully closed-loop control; CANopen mode; EtherCAT mode							
Pulse frequency division	Arbitrary frequency division							
Protection function	Overvoltage, undervoltage, overcurrent, overspeed, stall, overheat, overload, encoder abnormality, input phase loss, output phase loss, excessive position deviation							

	General functi
High-frequency vibration suppression	4 sets of traps, suppressing the vibration fro
End vibration suppression	2 sets of filters, suppressing the end low-freq
Homing mode	Multiple homing modes
Gantry control	Gantry synchronization function
Reverse clearance compensation	Used to improve the response delay that occ
Mechanical analyzer	Used to analyze frequency features of the n
Inertia identification	Offline and online system inertia identification
Torque observer	Load torque observation and compensation
Electronic cam	512 points electronic cam curve
Friction compensation	System friction compensation

# **Host Computer Software**





om 100 Hz to 4000 Hz

quency vibration from 1 Hz to 100Hz

ccurs when the traveling direction of the machine is reversed

mechanical system through the host computer software

ion

- Parameter auto-tuning
- Friendly HMI
- Shared USB port for firmware upgrade and host computer communication
- Real-time online data monitoring with 32 bit \* 4-channel real-time oscilloscope display and sampling frequency up to 16 K
- Input and output of 30 s data

# **Servo Drive Model**



# Servo Drive Electrical Specifications

Voltage	Model	SIZE	Phase	Rated input current (A)	Rated output current (A)	Max. output current (A)	Braking resistor		
	M6-*S1R6AX		Single-	2.2	1.6	5.8	No built-in		
	M6-*S2R8AX		phase	4	2.8	9.3	braking resistor		
220 V	M6-*S5R5AX	SIZE A	Single/three- phase	7.6/4.2	5.5	16.9			
	M6-*S7R6BX			5.1	7.6	17	Built-in		
	M6-*S7R6AX				Three-	5.1	7.6	22	braking resistor
	M6-*S012AX	SIZE B	phase	8	11.6	28			
	M6-*T3R5AX			2.4	3.5	8.5			
	M6-*T5R4AX			3.6	5.4	14	Built-in		
	M6-*T8R4AX	SIZE B	_	5.5	8.8	22	braking resistor		
380 V	M6-*T012AX		Three-	8	11.9	28			
-	M6-*T017AX		pridee	12	17	42			
	M6-*T021AX	SIZE C		16	21	55	No built-in braking resistor		
	M6-*T026AX			21	26	65			

# Servo Motor Model



$\frac{5}{6}  \frac{02}{6}  \frac{M}{7}$	$\frac{A}{8}  \frac{K}{9}  \frac{-X}{10}$	
vel	3 Speed A: 1000 rpm D: 1500 rpm E: 2000 rpm B: 2500 rpm	C: 3000 rpm F: 4000 rpm G: 5000 rpm
nber	6 Power 5A: 50 W 01: 100 W 02: 200 W 04: 400 W 07: 750 W 10: 1000 W 11: 1100 W 17: 1700 W	26: 2600 W 29: 2900 W 36: 3600 W 44: 4400 W 45: 4500 W 55: 5500 W 75: 7500 W
ay without oil seal ft with oil seal ay and oil seal ft with oil seal ard shaft	10 Motor design	number

# **System Overview**

# M6 Outline and Mounting Dimensions









SIZE A

SIZE B

SIZE C

P11 M6 Series Servo System

# System Configuration Table -**Medium Inertia Motor**

Voltage	Rated speed (rpm)	Max. speed (rpm)	Power (W)	Motor model	Rated torque (N∙m)	Motor frame	Matched drive model	Drive SIZE
	3000	6000	50	SPM-SC6045AM**-L	0.16	40	M6-*S1R6AX	А
	3000	6000	50	SPM-SC8045AM**-L	0.16	40	M6-*S1R6AX	А
	3000	6000	100	SPM-SC60401M**-L	0.32	40	M6-*S1R6AX	А
	3000	6000	100	SPM-SC80401M**-L	0.32	40	M6-*S1R6AX	А
	3000	6500	200	SPM-SC60602M**-L	0.64	60	M6-*S1R6AX	А
	3000	6500	200	SPM-SC80602M**-L	0.64	60	M6-*S1R6AX	А
	3000	5000	400	SPM-SC60604M**-L	1.27	60	M6-*S2R8AX	А
220V	3000	5000	400	SPM-SC80604M**-L	1.27	60	M6-*S2R8AX	А
	3000	5000	750	SPM-SC60807M**-L	2.39	80	M6-*S5R5AX	А
	3000	5000	750	SPM-SC80807M**-L	2.39	80	M6-*S5R5AX	А
	3000	5000	1000	SPM-SC60810M**-L	3.19	80	M6-*S7R6BX	А
	3000	5000	1000	SPM-SC80810M**-L	3.19	80	M6-*S7R6BX	А
	3000	5000	1700	SPM-SC61317M**-W	5.399	130	M6-*S012AX	В
	2000	4000	1100	SPM-SE61311M**-W	5.39	130	M6-*S7R6AX	В
	2000	4000	1700	SPM-SE61317M**-W	8.34	130	M6-*S012AX	В

Voltage	Rated speed (rpm)	Max. speed (rpm)	Power (W)	Motor model	Rated torque (N∙m)	Motor frame	Matched drive model	Drive SIZE
	2000	4000	1100	SPM-TE61311M**-W	5.39	130	M6-*T5R4AX	В
	2000	4000	1700	SPM-TE61317M**-W	8.34	130	M6-*T8R4AX	В
	2000	4000	2400	SPM-TE61324M**-W	9.5	130	M6-*T017AX	С
	2000	4000	3000	SPM-TE61330M**-W	14.3	130	M6-*T017AX	С
	3000	5000	1700	SPM-TC61317M**-W	5.399	130	M6-*T8R4AX	В
	3000	5000	2600	SPM-TC61326M**-W	8.34	130	M6-*T012AX	В
	3000	3000 5000 3600	3600	SPM-TC61336M**-W	11.5	130	M6-*T012AX	В
7001/	3000	5000	4500	SPM-TC61345M**-W	14.3	130	M6-*T017AX	С
58UV	1500	3000	2900	SPM-TD11829M**-P	18.6	180	M6-*T012AX	В
	1500	3000	2900	SPM-TD61829M**-P	18.6	180	M6-*T012AX	В
	1500	3000	4400	SPM-TD11844M**-P	28.4	180	M6-*T017AX	С
	1500	3000	4400	SPM-TD61844M**-P	28.4	180	M6-*T017AX	С
	1500	3000	5500	SPM-TD11855M**-P	35	180	M6-*T021AX	С
	1500	3000	5500	SPM-TD61855M**-P	35	180	M6-*T021AX	С
	1500	3000	7500	SPM-TD11875M**-P	48	180	M6-*T026AX	С
	1500	3000	7500	SPM-TD61875M**-P	48	180	M6-*T026AX	С

# **Overview of Servo Motors**

# 40/60/80 medium inertia motors

Motor model	Rated voltage (V)	Rated power (W)	Rated speed (rpm)	Max. speed (rpm)	Rated torque (N∙m)	Peak torque (N∙m)	Rated current (A)	Peak current (A)	Rotor inertia (10⁻⁴ kg∙m²)
SPM-SC6045AM**-L	220	50	3000	6000	0.16	0.48	0.93	2.88	0.036(0.046)
SPM-SC8045AM**-L	220	50	3000	6000	0.16	0.48	0.93	2.88	0.036(0.046)
SPM-SC60401M**-L	220	100	3000	6000	0.32	0.95	0.92	2.85	0.062(0.072)
SPM-SC80401M**-L	220	100	3000	6000	0.32	0.95	0.92	2.85	0.062(0.072)
SPM-SC60602M**-L	220	200	3000	6500	0.64	1.91	1.5	4.66	0.28(0.3)
SPM-SC80602M**-L	220	200	3000	6500	0.64	1.91	1.5	4.66	0.28(0.3)
SPM-SC60604M**-L	220	400	3000	5000	1.27	3.81	2.1	6.5	0.56(0.58)
SPM-SC80604M**-L	220	400	3000	5000	1.27	3.81	2.1	6.5	0.56(0.58)
SPM-SC60807M**-L	220	750	3000	5000	2.39	7.17	4.1	13.4	1.5(1.65)
SPM-SC80807M**-L	220	750	3000	5000	2.39	7.17	4.1	13.4	1.5(1.65)
SPM-SC60810M**-L	220	1000	3000	5000	3.19	9.56	5.7	17.7	2(2.15)
SPM-SC80810M**-L	220	1000	3000	5000	3.19	9.56	5.7	17.7	2(2.15)

Note: The parameters in "()" belong to motors with brakes.

# **4**0 frame medium inertia motors



Model	L (mm)
SPM-SC6045AM**-L	56(84)
SPM-SC8045AM**-L	56(84)
SPM-SC60401M**-L	67.7(95)
SPM-SC80401M**-L	67.7(95)

Note: The parameters in "()" belong to motors with brakes.

# 60 frame medium inertia motors



Model	L (mm)
SPM-SC60602M**-L	71.8(101.2)
SPM-SC80602M**-L	71.8(101.2)
SPM-SC60604M**-L	88.8(118.2)
SPM-SC80604M**-L	88.8(118.2)

Note: The parameters in "()" belong to motors with brakes.

### 80 frame medium inertia motors



Model	L (mm)
SPM-SC60807M**-L	90(121.9)
SPM-SC80807M**-L	90(121.9)
SPM-SC60810M**-L	103.9(134.9)
SPM-SC80810M**-L	103.9(134.9)

Note: The parameters in "()" belong to motors with brakes.

# 130/180 medium inertia motors

Motor model	Rated voltage (V)	Rated power (W)	Rated speed (rpm)	Max. speed (rpm)	Rated torque (N∙m)	Peak torque (N∙m)	Rated current (A)	Peak current (A)	Rotor inertia (10 <sup>-4</sup> kg∙m²)
SPM-SE61311M**-W	220	1100	2000	4000	5.39	16.17	7.5	22.5	10.9(12.3)
SPM-SE61317M**-W	220	1700	2000	4000	8.34	25.22	12	36	16.9(18.3)
SPM-SC61317M**-W	220	1700	3000	5000	5.399	10.78	9.5	19	10.9(12.3)
SPM-TE61311M**-W	380	1100	2000	4000	5.39	16.17	4.5	13.5	10.9(12.3)
SPM-TE61317M**-W	380	1700	2000	4000	8.34	25.2	6.6	19.8	16.9(18.3)
SPM-TE61324M**-W	380	2400	2000	4000	9.5	28.5	11.5	34.5	21.4(22.6)
SPM-TE61330M**-W	380	3000	2000	4000	14.3	40	11.5	32.2	27.1(28.4)
SPM-TC61317M**-W	380	1700	3000	5000	5.399	10.78	9.5	19	10.9(12.3)
SPM-TC61326M**-W	380	2600	3000	5000	8.34	16.7	9.5	19	16.9(18.3)
SPM-TC61336M**-W	380	3600	3000	5000	11.5	23	12	24	18.3(21.4)
SPM-TC61345M**-W	380	4500	3000	5000	14.3	28.6	14.5	29	27.1(28.4)
SPM-TD11829M**-P	380	2900	1500	3000	18.6	54	11.9	34.5	44(59)
SPM-TD61829M**-P	380	2900	1500	3000	18.6	54	11.9	34.5	44(59)
SPM-TD11844M**-P	380	4400	1500	3000	28.4	71	16.5	41.3	66(80)
SPM-TD61844M**-P	380	4400	1500	3000	28.4	71	16.5	41.3	66(80)
SPM-TD11855M**-P	380	5500	1500	3000	35	87.5	21	52.5	102(110)
SPM-TD61855M**-P	380	5500	1500	3000	35	87.5	21	52.5	102(110)
SPM-TD11875M**-P	380	7500	1500	3000	48	96	25.5	51	146(156)
SPM-TD61875M**-P	380	7500	1500	3000	48	96	25.5	51	146(156)

Note: The parameters in "()" belong to motors with brakes.

### **1**30 frame medium inertia motors



Model	L (mm)	LR (mm)	φS (mm)	W (mm)	T (mm)
SPM-SE61311M**-W	135(187)	57	22	6	24.5
SPM-SE61317M**-W	152.5(204)	57	22	6	24.5
SPM-SC61317M**-W	135(187)	57	22	6	24.5
SPM-TE61311M**-W	135(187)	57	22	6	24.5
SPM-TE61317M**-W	152.5(204)	57	22	6	24.5
SPM-TE61324M**-W	170(222)	57	22	6	24.5
SPM-TE61330M**-W	200(252)	57	22	6	24.5
SPM-TC61317M**-W	135(187)	57	22	6	24.5
SPM-TC61326M**-W	152.5(204)	57	22	6	24.5
SPM-TC61336M**-W	170(222)	57	22	6	24.5
SPM-TC61345M**-W	200(252)	57	22	6	24.5

Note: The parameters in "()" belong to motors with brakes.

### 180 frame medium inertia motors



Model	L (mm)	LR (mm)	φS (mm)	W (mm)
SPM-TD11829M**-P	176(224)	79	35	10
SPM-TD61829M**-P	176(224)	79	35	10
SPM-TD11844M**-P	200(248)	79	35	10
SPM-TD61844M**-P	200(248)	79	35	10
SPM-TD11855M**-P	237(285)	113	42	12
SPM-TD61855M**-P	237(285)	113	42	12
SPM-TD11875M**-P	283(331)	113	42	12
SPM-TD61875M**-P	283(331)	113	42	12

Note: The parameters in "()" belong to motors with brakes.

# **Included Cables**

No.	Model	Name	Description	Length	Diameter (mm²)
1	SPL-MA04-xx-x	Main motor cable (60/80 frame)	Main motor cable, AMP female connector at the motor side	3/5/10 m	0.75
2	SPL-MA01-xx-x	Main motor cable (60/80 frame)	Main motor cable, straight pin aviation plug at the motor side	3/5/10 m	0.75
3	SPL-MC04-xx-x	Main motor cable (130 frame)	Main motor cable, straight pin aviation plug at the motor side	3/5/10 m	1.0
4	SPL-MD01-xx-x	Main motor cable (180 frame)	One end: AMP 4-core female connector The other end: straight terminal (SIZE B)	3/5/10 m	1.5
5	SPL-MD02-xx-x	Main motor cable (180 frame)	One end: AMP 4-core female connector The other end: U-type terminal (SIZE C)	3/5/10 m	2.5
6	SPL-E09-xx-x	Single-turn absolute encoder cable	One end: 3-row 15-core DB male connector The other end: 3-row 7-core AMP female connector	3/5/10 m	-
7	SPL-E07-xx-x	Multi-turn absolute encoder cable	One end: 3-row 15-core DB male connector The other end: 3-row 7-core AMP female connector	3/5/10 m	-
8	SPL-E01-xx-x	23-bit absolute encoder cable (60/80 frame)	One end: 3-row 15-core DB male connector The other end: 3-row 15-core DB male connector	3/5/10 m	-
9	SPL-E02-xx-x	23-bit absolute encoder cable (130/180 frame medium inertia)	One end: 3-row 15-core DB male connector The other end: 10-core aviation female connector	3/5/10 m	-
10	SPL-E11-xx-x	Incremental encoder cable (60/80 frame)	One end: 3-row 15-core DB male connector The other end: 3-row 15-core DB male connector	3/5/10 m	-
11	SPL-E12-xx-x	Incremental encoder cable (130/180 frame medium inertia)	One end: 3-row 15-core DB female connector The other end: 15-core aviation plug (SUNCHU)	3/5/10 m	-
12	SPL-B01-xx-x	Brake cable (60/80 frame)	One end: AMP 2-core female connector The other end: straight terminal	3/5/10 m	0.5
13	SPL-B02-xx-x	Brake cable (130/180 frame medium inertia)	One end: 3-core female straight aviation plug The other end: straight terminal	3/5/10 m	0.5
14	SPL-BMC04-xx-x	Brake & Power cable (130 frame medium inertia)	Main motor cable, straight pin aviation plug at the motor side, with brake	3/5/10 m	1.0

Note: "xx" indicates the cable length. "x" indicates the flexible cable: R1 means 5 million times flexible cable and R2 means 10 million times flexible cable.