

SMH Product Manual

High Torque Density AC Synchronous Servo Motor



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Kinavo Servo Motor (Changzhou) Limited

NO.7 Kunlun Road Sanjin Industrial Park, Changzhou, Jiangsu province, China

Tel: +86 519 83021397

Fax: +86 519 83021387

Web: <http://www.kinavo.com>

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1. Servo Motor Description

1.1 The SMH Servo Motor Typical Specification

The SMH series servo motors based on rare earth neodymium-iron-boron permanent magnet rotors that provide .

- An economical, compact design that can function in harsh environments.
- Neodymium-iron-boron magnet rotors that provide low rotor inertia, small size, high power density and high peak torques, a high torque-to-inertia ratio for faster light machinery acceleration and more than three time than rated torque for intermittent use.
- The special segmented stator design prevents unbalances of inner radial forces and ensures low noise, small vibration and a significant longer life of the bearings. A three-phase, sinusoidal wound stator field for smooth operation at slow speeds, low ripple and small cogging effects.
- Epoxy encapsulated windings provide a high du/dt immunity, an excellent thermal coupling and increased housing stiffness The integrated temperature sensors make usage of working mode in insulation material class “F” possible and a high reliability of the motor at the same time.
- The feedback device encoder (incremental or absolute) or resolver.
- IP65, quick release connectors for easy installation and maintenance.
- The ability to be vertically mounted at any angle with the shaft up or down.

1.2 The SMH Servo Motor Named Principle

S M H 60 — 40 30 2 6 E B C — 1

S — Synchronous

M — Motor

H — High power density

60 — Flange dimension 60x60 (unit: mm)

40 — Rated power 40x10 (W)

30 — Rated speed 30x100 (rpm)

2 — Input voltage 2---220VAC (50/60Hz)
3---380VAC (50/60Hz)

6 — 6 Pole (3 polepairs)

E — Feedback device E --- Encoder(incremental 2500p/rev)
R --- Resolver

B — B --- Brake

N --- No Brake

C — C --- M17 connector

D --- Supply M23, feedback M17 connector

L --- Line

M--- Chinese connectors

1 — Design serial number

2. General Information

2.1 Target Group

This manual addresses personnel with the following qualifications:

Transport : only by personnel with knowledge of handling electrostatically sensitive components.

Mech. Installation : only by mechanically qualified personnel.

Electr. Installation : only by electrically qualified personnel.

Setup : only by qualified personnel with extensive knowledge of electrical engineering and drive technology

The operator must ensure that the safety instructions in this manual are followed. The operator must ensure that all personnel responsible for working with the motor have read and understood the product manual.

2.2 Safety Notes

Read the available documentation before assembly and setup. Incorrect handling of the motors can result in injury and damage to persons and machinery. Keep strictly to the technical data and the information on the connection requirements (nameplate and documentation).

Only properly qualified personnel are permitted to perform such tasks as transport, assembly, setup and maintenance. Properly qualified personnel are persons who are familiar with the transport, assembly, installation, setup and operation of motors, and who have the appropriate qualifications for their jobs.

2.3 Thermal Protection

SMH servomotors are fitted with a Philips type KTY84-130 thermal sensor. The resistance of this sensor varies with temperature as indicated below.

Resistance change with temperature

Temperature(°C)	Resistance(Ω)
0	474~522
25	577~629
100	970~1030
150	1282~1385
160	1350~1463

The current in the sensor should be between 1mA and 3mA.

To protect the winding, the drive should shut down if the resistance exceeds 1400 Ohms.

2.4 Storage

Storage temperature - 25...+55°C, max. variation 20K/h.

Humidity rel. humidity 5% - 95%, no condensation

Max. stacking height see table under Packaging

Far away active gas, combustible gas, oil drop, ash

Storage time unlimited

3. Technical Description

3.1 General Technical Information

Ambient temperature 5-----+40°C for site altitude up to 1000m alms (at rated values) It is vital to consult our applications department for ambient temperatures above 40°C and encapsulated mounting of the motors.

Permissible humidity 95% rel. humidity, no condensation (at rated values)

Power derating 1.5% / K in range 40°C----50°C up to 1000m alms
(currents and torques) for site altitude above 1000m alms and 40°C

Holding Brake Options

At present only a spring applied holding brake is available with SMH servomotors as standard. However, it may be possible to fit a permanent magnet brake if required. For further information, please contact SMH for more details.

Spring Applied Brake

The brake is of the “spring set” fail to safe type. This is primarily a holding brake e.g. to hold a load under a no voltage condition. However, the brake can also be used in some applications for emergency stopping. Connection should be such that when the motor is powered the brake coil is energized and the brake released. Under normal conditions, no maintenance is required other than ensuring that the hub and stationary plates are kept free from foreign matter.

Radial force

If the motors drive via pinions or toothed belts, then high radial forces will occur. The maximum values at rated speed you will find at the technical data. Power take-off from the middle of the free end of the shaft allows a 10% increase in FR.

Axial force

When pinions or wheels being assembled to the shaft or e.g. angular gear heads being used, axial forces arise. The maximum values at rated speed you will find at the technical data.

Bearings

All SMH servomotors are fitted with double shell protected, single row radial ball bearings.

Ball-bearing life: The bearings are selected to give a minimum of 20,000 hours life.

Under normal conditions, no maintenance is required.

3.2 Electrical Technical Information

The motors contain electrical / electronic systems liable to cause an electromagnetic disturbance.

The motors contain electrical / electronic systems which may have their performance affected by an electromagnetic disturbance.

The motor housing must be connected to PE by the motor cable PE wire. Take care of the related national or international standards for maximum resistance of the PE connection!

The motor power cable and the feedback cable must be shielded and the cable shields must be connected to the mounting plate of the electric cabinet by low RF resistance (large surface contact). If the feedback cable contains inner shielding it's recommended to connect this inner shielding to the feedback signal ground.

To wire up the motor, use the wiring diagrams in the Installation and Setup Instructions of the servo amplifier which is used.

Requirements to cable material:

Capacity

Motor cable less than 150 pF/m
Resolver cable less than 120 pF/m

3.3 Mechanical Installation

It is recommended that a general inspection be made at regular intervals to check all bolts, nuts couplings etc to ensure that they are still tightened to the correct torque

Protect the motor from unacceptable stresses.

Take care, especially during transport and handling, that components are not bent and that insulation clearances are not altered. Attended to holding the tolerance of shaft extension run-out, concentricity of and shaft and perpendicularity of mounting face to shaft.

Check the compliance to the permitted radial and axial forces F_r and F_a .

When you use a toothed belt drive, the minimal permitted diameter of the pinion which is directly assembled to the motor shaft e.g. follows from the equation: $d_{min} \geq 2 \times T_m / F_r$ while T_m is the applied maximum torque of the motor.

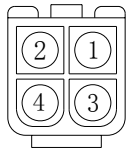

Caution: toothbelts are usually pre-loaded by tension force up to the force (or even more) to be transmitted. This kind of pre-load force F_p will cause a radial shaft load force of $F_r = 2 \times F_p$.

That's why $F_p < F_r/2$ should be respected and thus the equation $d_{min} \geq 2 \times T_m / F_p$ is recommended

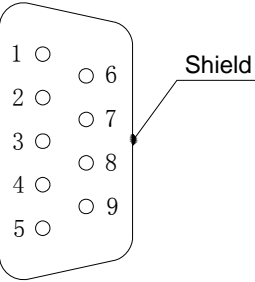
4. Connection Details

4.1 L series diagram for motors fit Encoder or Resolver (SMH60 & SMH80) connectors

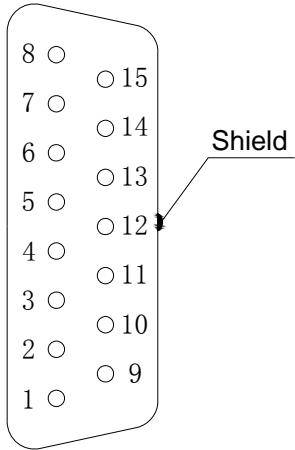
Motor Wire

PIN	FUNCTION	 H66L6-04P T66L6-A
1	MOTOR U	
2	MOTOR V	
3	MOTOR W	
4	Motor PE 	

Resolver Wire

PIN	FUNCTION		 DB 9M
1	Ref+	10KHz, 7V	
2	Ref-	Pulse power	
3	Cos+		
4	Cos-		
5	Sin+		
6	Sin-		
7	KTY (+)		
8	KTY (-)		

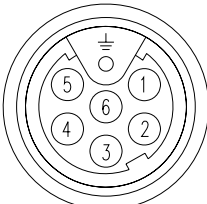
Encoder Wire

PIN	FUNCTION	 DB 15M
1	DC +5 V	
2	A	
3	B	
4	Z	
5	U	
6	V	
7	W	
8	NC	
9	GND	
10	/A	
11	/B	
12	/Z	
13	/U	
14	/V	
15	/W	
Shield	Shield	

4.2 SMH Motor C and D series connectors

Motor M17 C series connectors

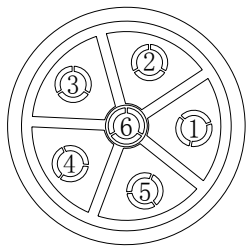
PIN	FUNCTION	
1	Motor U	
2	Motor V	
3	Motor W	
4	Brake B+	(IF FITTED)
5	Brake B-	
6	NC	
\perp	Motor PE \perp	



M17 7 PIN

Motor M23 D series connector

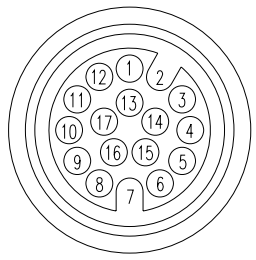
PIN	FUNCTION	
1	MOTOR U	
2	MOTOR V	
3	Motor PE \perp	
4	MOTOR W	
5	Brake B+	(IF FITTED)
6	Brake B-	



M23 6 PIN

Feedback M17 C and D series connector (Resolver)

PIN	FUNCTION
1	Ref+
2	Ref-
3	Cos+
4	Cos-
5	Sin+
6	Sin-
7	KTY1 (+)
8	KTY2 (-)
9	
10	
11	
12	
13	
14	
15	
16	
17	

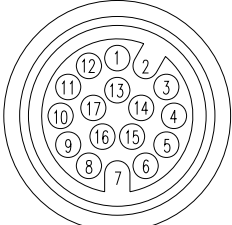


M17 17 PIN

Connectors viewed from customer side

Feedback M17 C and D series connector (Encoder)

PIN	FUNCTION
1	Up(5V)
2	Un(0V)
3	A
4	/A
5	B
6	/B
7	KTY(+)
8	KTY(-)
9	U
10	/U
11	V
12	/V
13	NC
14	N
15	/N
16	W
17	/W



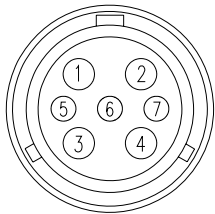
M17 17 PIN

Connectors viewed from customer side

4.3 SMH110 M series connectors

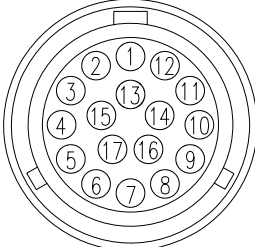
Motor connector

PIN	FUNCTION
1	Motor PE \perp
2	MOTOR U
3	MOTOR V
4	MOTOR W
5	Brake B+
6	Brake B-
(IF FITTED)	
7	NC



Feedback Connector (Resolver)

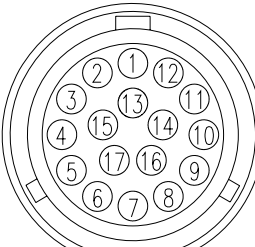
PIN	FUNCTION
1	Ref+
2	Ref-
3	Cos+
4	Cos-
5	Sin+
6	Sin-
7	KTY1 (+)
8	KTY2 (-)
9	
10	
11	
12	
13	
14	
15	
16	
17	



17 PIN

Feedback Connector (Encoder)

PIN	FUNCTION
1	Up(5V)
2	Un(0V)
3	A
4	/A
5	B
6	/B
7	KTY(+)
8	KTY(-)
9	U
10	/U
11	V
12	/V
13	NC
14	N
15	/N
16	W
17	/W



17 PIN

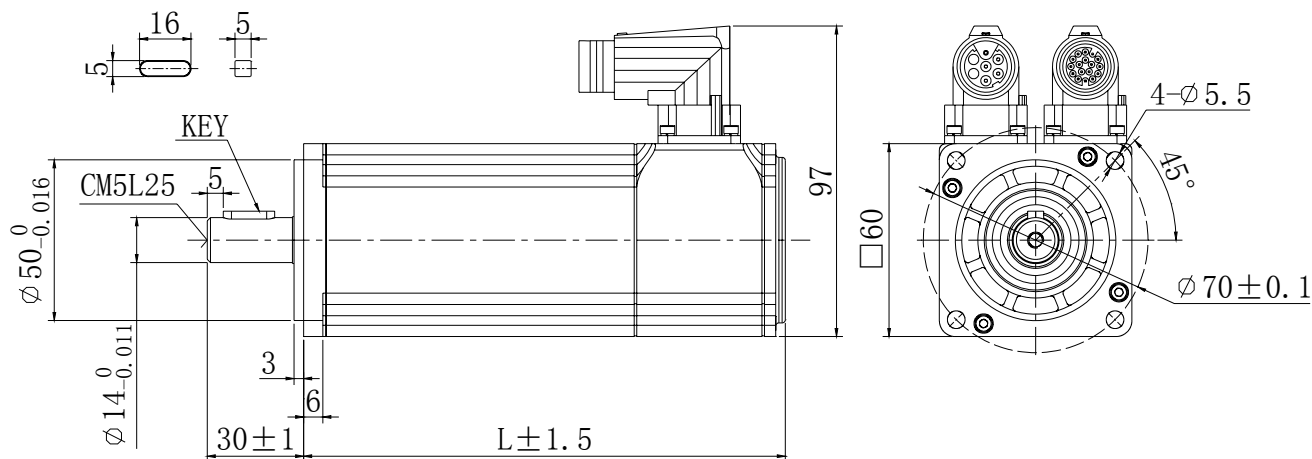
5. SMH60 Technical Information

5.1 Technical Data

Motor Type		SMH60—203026xxL SMH60—203026xxC	SMH60—403026xxL SMH60—403026xxC
Rated power	P_n (W)	200	400
Rated torque	T_n (Nm)	0.64	1.27
Rated speed	n_n (rpm)	3000	3000
Rated current	I_n (A)	1.63	3.08
DC Link Voltage	U_{DC} (V)	300	300
Maximum torque	T_m (Nm)	1.92	3.81
Maximum current	I_m (A)	4.89	9.24
Standstill torque	T_s (Nm)	0.7	1.39
Standstill current	I_s (A)	1.79	3.38
Voltage constant	K_e (V/krpm)	29	29
Torque constant	K_t (Nm/A)	0.48	0.48
Resistance line-line	R_L (Ω)	8.02	3.52
Inductance line-line	L_L (m H)	16.3	7.8
Electrical time constant	τ_e (ms)	2.03	2.22
Mechanical time constant	τ_m (ms)	2.26	1.35
Rotor moment of inertia	J_m (kgcm ²)	0.375	0.51
Pole number		6	6
Max. voltage rising	du/dt (kV/ μ s)	8	8
Insulation class		F	F
Max. radial force	F_r (N)	180	180
Max. axial force	F_a (N)	90	90
Weight	(Kg)	1.3	1.8
Feedback device		2500p/rev incremental encoder or Resolver (sin--cos)	
Temperature sensor		n.a.	
Cooling method		Totally enclosed non-ventilated	
Protection level		IP65,shaft sealing IP54	
Environmental conditions	Temperature	-20 $^{\circ}$ C ~ 40 $^{\circ}$ C	
	Humidity	Below 90%RH (No dewing)	
	Environment	Far away active gas, combustible gas, oil drop, ash.	
	Installation altitude	Up to 1000m: rated power Above 1000m: 1.5% power Decreasing per 100m,max.4000m	
Rating conditions	Mounting	Aluminum flange 255 \times 255 \times 6mm	
	Temperature	60K housing temperature ring at 40 $^{\circ}$ C ambient	

5.2 Product Dimension Drawing

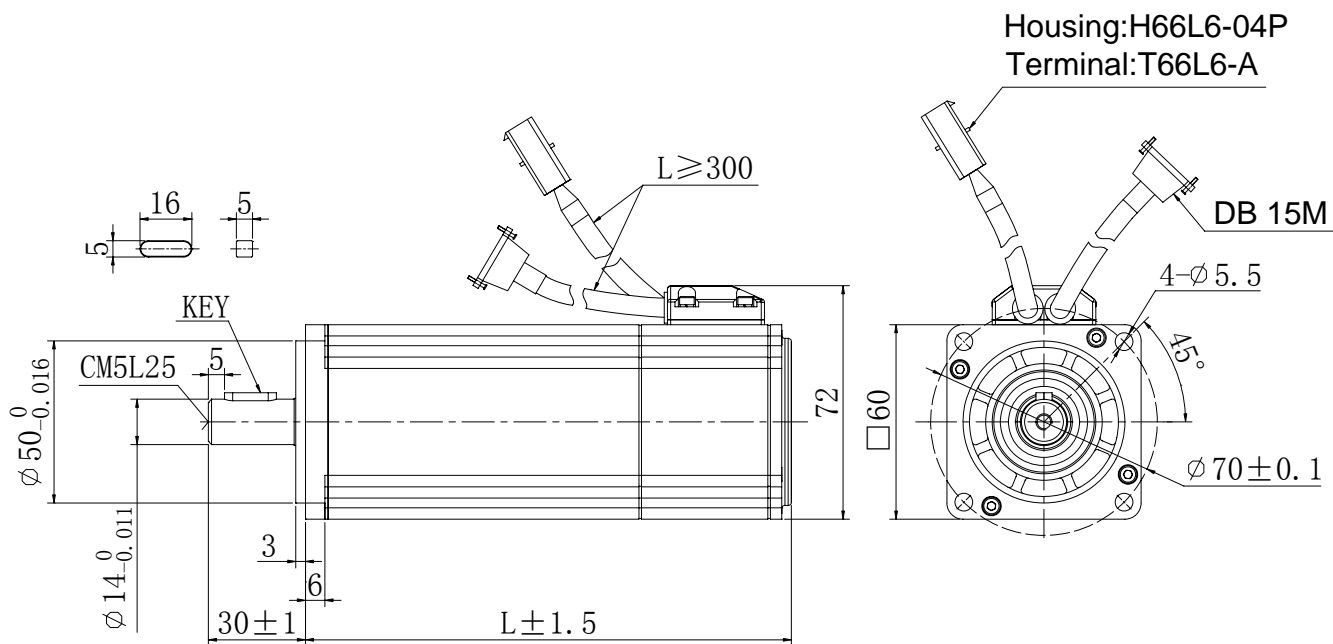
5.2.1 SMH60 C series dimension (unit: mm)



SMH60 C series Length (Unit: mm)

Power(W) \ L	L	
	No Brake	Brake
200	120	164
400	150	194

5.2.2 SMH60 L series dimension (unit: mm)

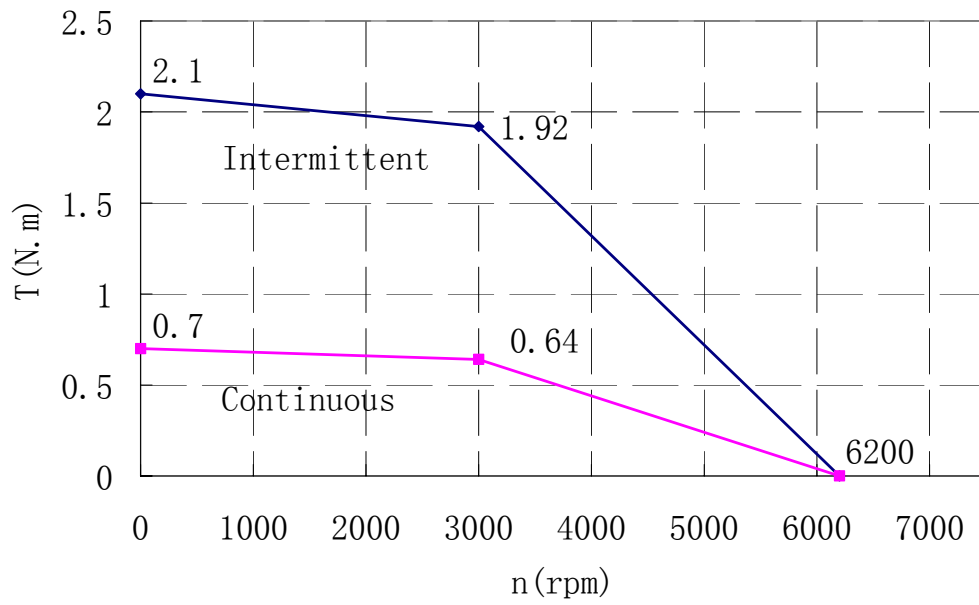


SMH60 L series Length (Unit: mm)

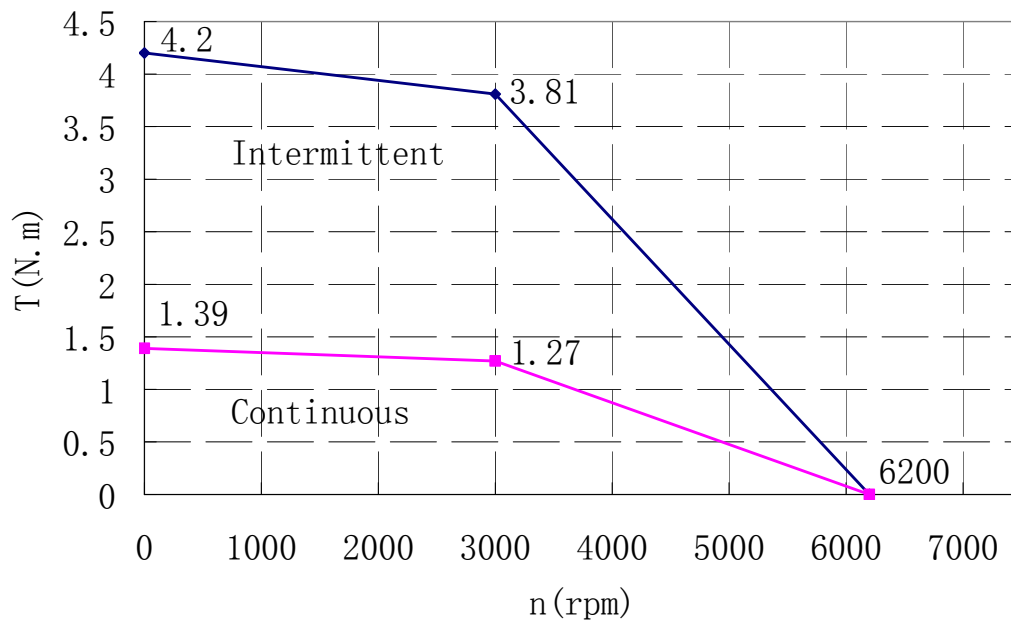
Power(W) \ L	No Brake		Brake	
	Fit Encoder	Fit Resolver	Fit Encoder	Fit Resolver
200	120	115	159	154
400	150	145	189	184

5.3 SMH60 Series Performance Curve

SMH60-203026xxx



SMH60-403026xxx



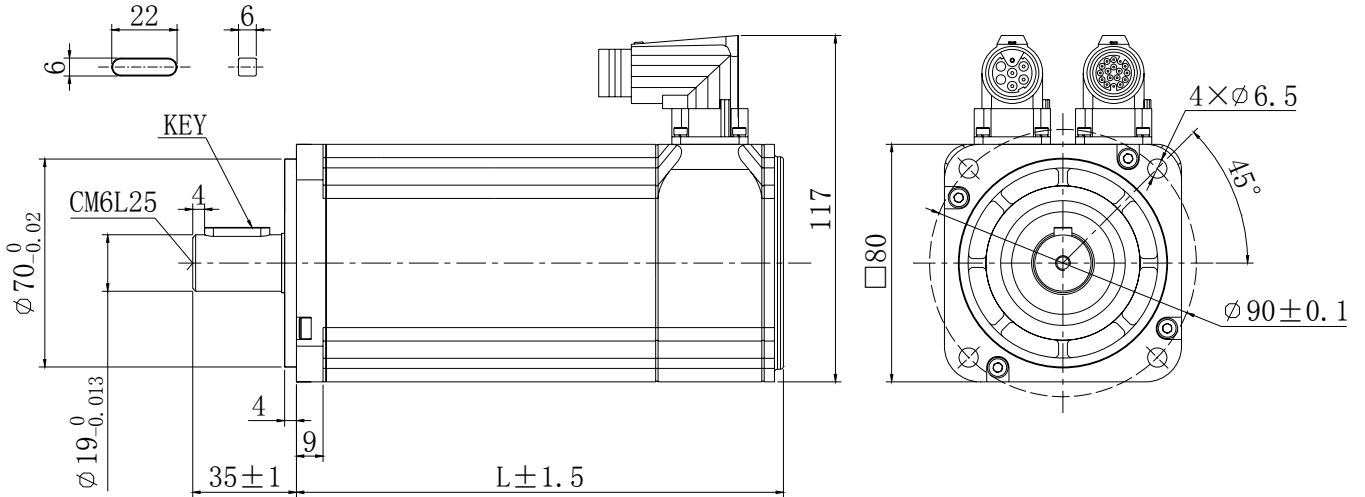
6. SMH80 Technical Information

6.1 Technical Data

Motor Type	SMH80—753026xxL SMH80—753026xxC	SMH80—1003026xxL SMH80—1003026xxC
Rated power P_n (W)	750	1000
Rated torque T_n (Nm)	2.39	3.18
Rated speed n_n (rpm)	3000	3000
Rated current I_n (A)	4.8	6.3
DC Link Voltage U_{DC} (V)	300	300
Maximum torque T_m (Nm)	7.17	9.48
Maximum current I_m (A)	14.4	18.9
Standstill torque T_s (Nm)	2.63	3.3
Standstill current I_s (A)	5.28	6.93
Voltage constant K_e (V/krpm)	34	34
Torque constant K_t (Nm/A)	0.562	0.562
Resistance line-line R_L (Ω)	1.15	0.86
Inductance line-line L_L (m H)	5.8	4.5
Electrical time constant τ_e (ms)	5.04	5.23
Mechanical time constant τ_m (ms)	0.86	0.89
Rotor moment of inertia J_m (kgcm ²)	1.36	1.9
Pole number	6	6
Max. voltage rising du/dt (kV/ μ s)	8	8
Insulation class	F	F
Max. radial force F_r (N)	335	335
Max. axial force F_a (N)	167.5	167.5
Weight (Kg)	3.3	3.9
Feed back device	2500p/rev incremental encoder or Resolver (sin--cos)	
Temperature sensor	n.a.	
Cooling method	Totally enclosed non-ventilated	
Protection level	IP65,shaft sealing IP54	
Environmental conditions	Temperature	-20 $^{\circ}$ C ~ 40 $^{\circ}$ C
	Humidity	Below 90%RH (No dewing)
	Environment	Far away active gas, combustible gas, oil drop, ash.
	Installation altitude	Up to 1000m: rated power Above 1000m: 1.5% power Decreasing per 100m,max.4000m
Rating conditions	Mounting	Aluminum flange 255 \times 255 \times 6mm
	Temperature	60K housing temperature ring at 40 $^{\circ}$ C ambient

6.2 Product Dimension Drawing

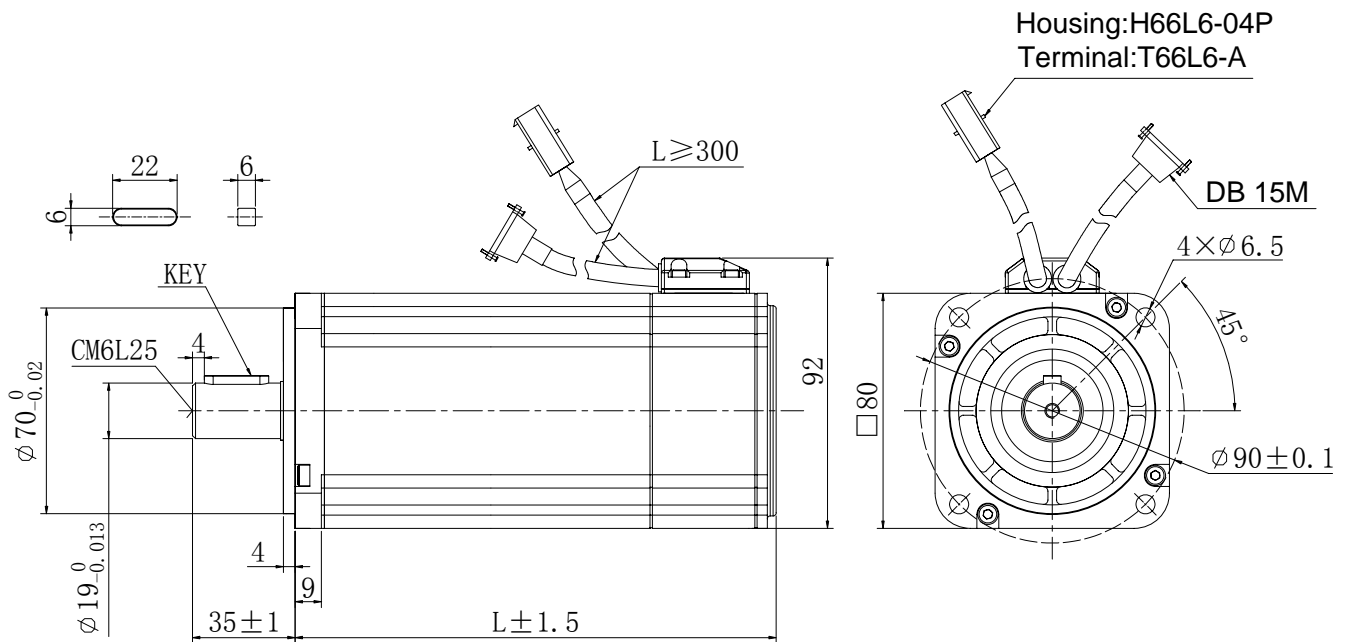
6.2.1 SMH80 C series dimension (unit: mm)



SMH80 C series Length (Unit: mm)

Power(W) \ L	No Brake	Brake
750	147	197
1000	167	217

6.2.2 SMH80 L series dimension (Unit: mm)

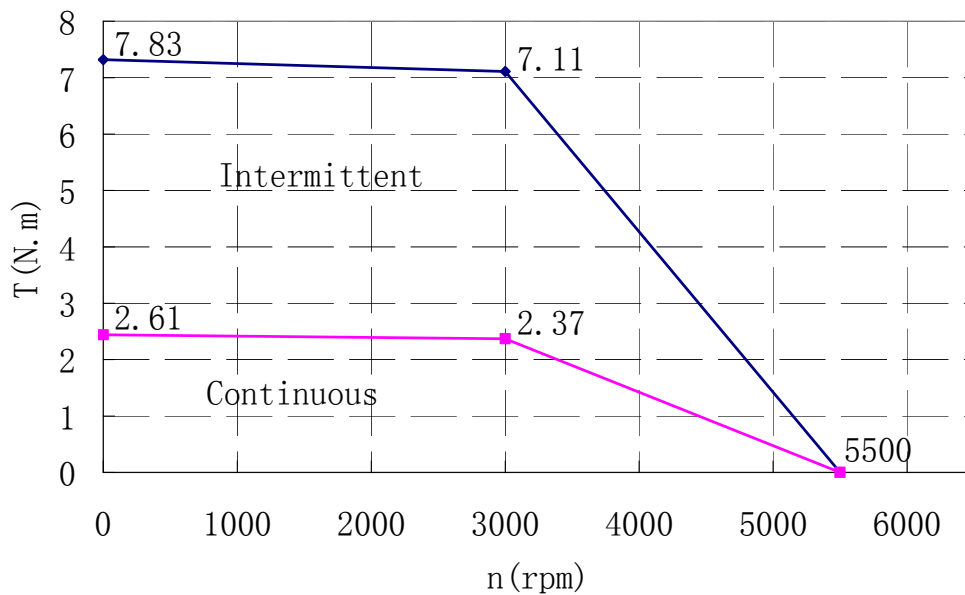


SMH80 L series Length (Unit: mm)

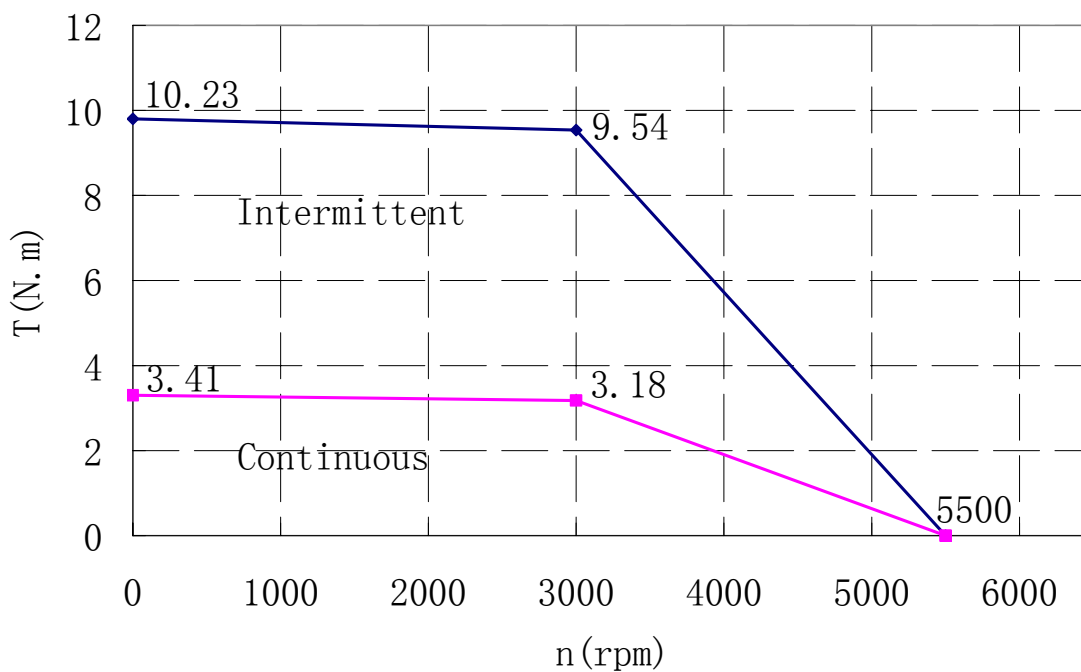
Power(W) \ L	No Brake		Brake	
	Fit Encoder	Fit Resolver	Fit Encoder	Fit Resolver
750	147	142	197	192
1000	167	162	217	212

6.3 SMH80 Series Performance Curve

SMH80-753026xxx



SMH80—1003026xxx



7. SMH110 Technical Information

7.1 SMH110 (UDC 300V) Technical Data

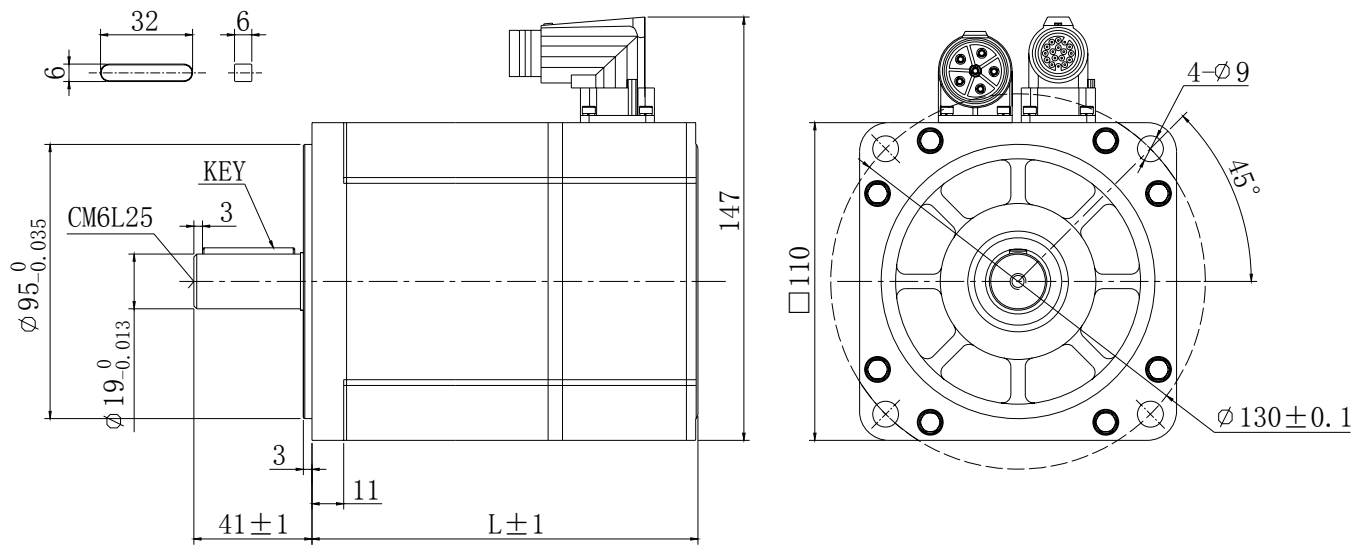
Motor Type	SMH110— 842028xxx	SMH110— 842028xxx-1	SMH110— 1263028xxx	SMH110— 1052028xxx	SMH110— 1573028xxx	SMH110— 1262028xxx	SMH110— 1883028xxx
Rated power P_n (W)	840	840	1260	1050	1570	1260	1880
Rated torque T_n (Nm)	4.0			5.0		6.0	
Rated speed n_n (rpm)	2000	2000	3000	2000	3000	2000	3000
Rated current I_n (A)	4.3	6.2	7.7	5.4	9.6	6.15	11
DC Link Voltage U_{DC} (V)	300	300	300	300	300	300	300
Maximum torque T_m (Nm)	12.0	12.0	12.0	15.0	15.0	18.0	18.0
Maximum current I_m (A)	12.9	18.6	23.1	16.2	28.8	18.45	33
Standstill torque T_s (Nm)	4.4	4.4	4.4	5.5	5.5	6.6	6.6
Standstill current I_s (A)	4.73	6.82	8.47	5.94	10.56	6.765	12.1
Voltage constant K_e (V/krpm)	64	45	35	60	35	64	35
Torque constant K_t (Nm/A)	1.058	0.744	0.578	0.992	0.578	1.058	0.578
Resistance line-line R_L (Ω)	1.83	0.8	0.492	1.37	0.5	1.258	0.45
Inductance line-line L_L (m H)	13.5	6.4	4.3	10.5	3.3	9.62	2.9
Electrical time constant τ_e (ms)	7.37	7.9	8.74	7.66	6.6	7.64	6.44
Mechanical time constant τ_m (ms)	1.63	1.4	1.47	1.85	1.86	1.65	1.98
Rotor moment of inertia J_m (kgcm ²)	5.8	5.8	5.8	7.2	7.2	8.5	8.5
Pole number	8	8	8	8	8	8	8
Max. voltage rising du/dt (kV/ μ s)	8	8	8	8	8	8	8
Insulation class	F	F	F	F	F	F	F
Max. radial force F_r (N)	630	630	630	630	630	630	630
Max. axial force F_a (N)	315	315	315	315	315	315	315
Weight (Kg)	6.2			7.2		8.2	
Feed back device	2500p/rev incremental encoder or Resolver (sin--cos)						
Temperature sensor	KTY84-130						
Cooling method	Totally enclosed non-ventilated						
Protection level	IP65,shaft sealing IP54						
Environmental conditions	Temperature	-20 $^{\circ}$ C ~ 40 $^{\circ}$ C					
	Humidity	Below 90%RH (No dewing)					
	Environment	Far away active gas, combustible gas, oil drop, ash.					
	Installation altitude	Up to 1000m: rated power Above 1000m: 1.5% power Decreasing per 100m,max.4000m					
Rating conditions	Mounting	Aluminum flange 305 \times 305 \times 13mm					
	Temperature	60K housing temperature ring at 40 $^{\circ}$ C ambient					

7.2 SMH110 (UDC 560V) Technical Data

Motor Type	SMH110— 1263038xxx	SMH110— 1573038xxx	SMH110— 1883038xxx
Rated power P_n (W)	1260	1570	1880
Rated torque T_n (Nm)	4.0	5.0	6.0
Rated speed n_n (rpm)	3000	3000	3000
Rated current I_n (A)	4.3	5.6	6.4
DC Link Voltage U_{DC} (V)	560	560	560
Maximum torque T_m (Nm)	12.0	15.0	18.0
Maximum current I_m (A)	12.9	16.8	19.2
Standstill torque T_s (Nm)	4.4	5.5	6.6
Standstill current I_s (A)	4.73	6.16	7.04
Voltage constant K_e (V/krpm)	63.7	65	66
Torque constant K_t (Nm/A)	1.05	1.07	1.09
Resistance line-line R_L (Ω)	1.23	1.21	1.12
Inductance line-line L_L (m H)	14	10.7	9.9
Electrical time constant τ_e (ms)	11.3	8.84	8.84
Mechanical time constant τ_m (ms)	1.12	1.31	1.31
Rotor moment of inertia J_m (kgcm ²)	5.8	7.2	8.5
Pole number	8	8	8
Max. voltage rising du/dt (kV/ μ s)	8	8	8
Insulation class	F	F	F
Max. radial force F_r (N)	630	630	630
Max. axial force F_a (N)	315	315	315
Weight (Kg)	6.2	7.2	8.2
Feed back device	2500p/rev incremental encoder or Resolver (sin--cos)		
Temperature sensor	KTY84-130		
Cooling method	Totally enclosed non-ventilated		
Protection level	IP65,shaft sealing IP54		
Environmental conditions	Temperature	-20°C ~ 40°C	
	Humidity	Below 90%RH (No dewing)	
	Environment	Far away active gas, combustible gas, oil drop, ash.	
	Installation altitude	Up to 1000m: rated power Above 1000m: 1.5% power Decreasing per 100m,max.4000m	
Rating conditions	Mounting	Aluminum flange 305×305×13mm	
	Temperature	60K housing temperature ring at 40°C ambient	

7.3 SMH110 Product Dimension Drawing

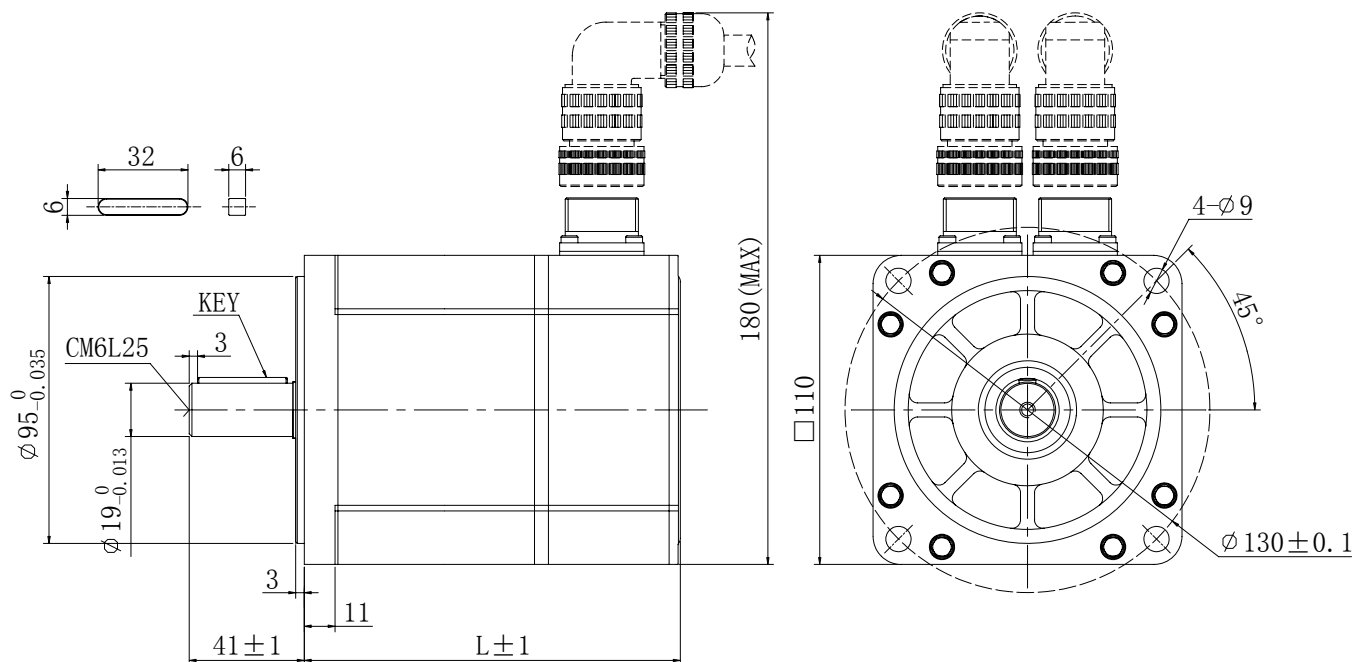
7.3.1 SMH110 D series dimensions (unit: mm)



SMH110 D series Length

Torque \ L	No Brake		Fit Brake	
	Encoder	Resolver	Encoder	Resolver
4 N.m	168	163	228	223
5 N.m	185	180	245	240
6 N.m	202	197	262	257

7.3.2 SMH110 M series dimensions (unit: mm)

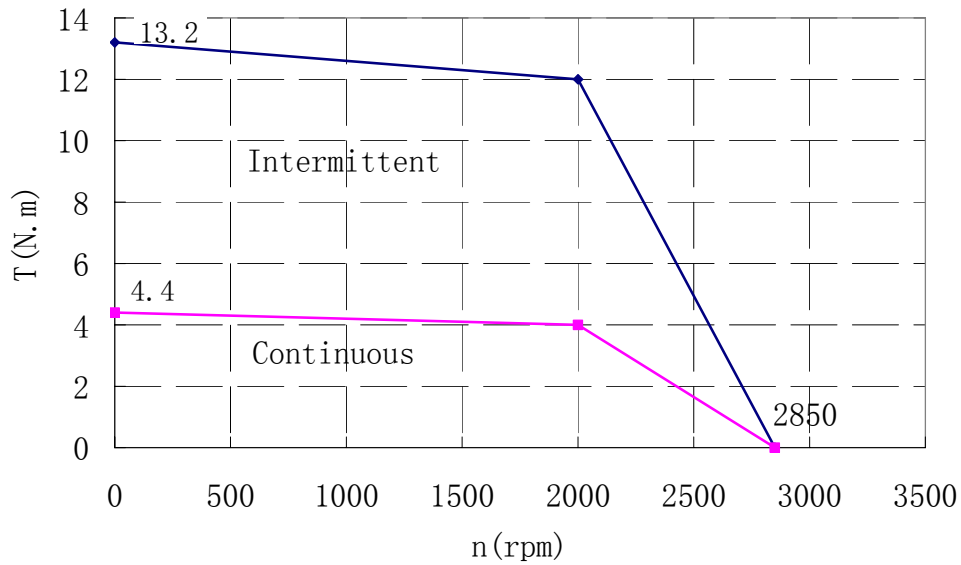


SMH110 M series Length (Unit: mm)

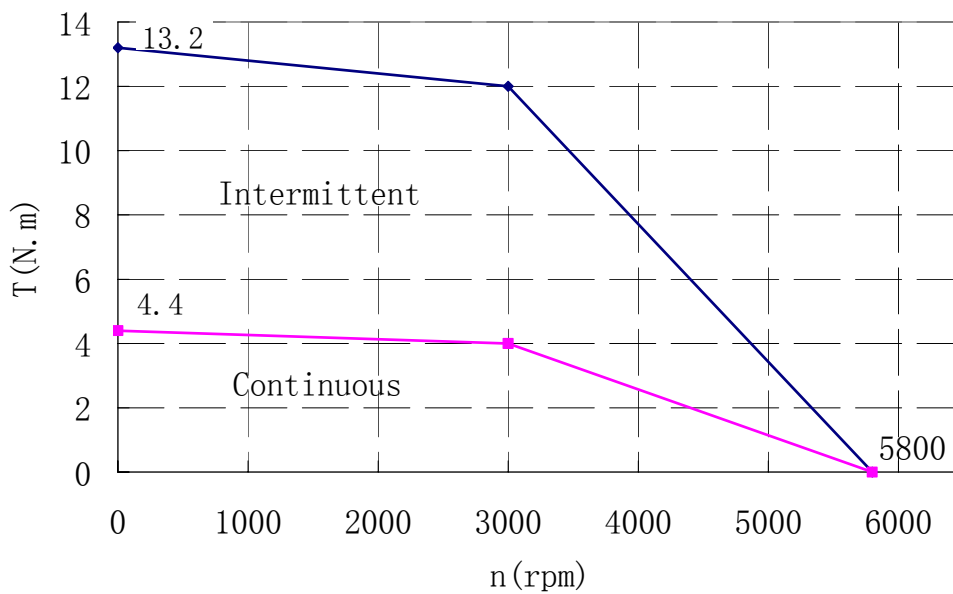
L Torque	No Brake		Fit Brake	
	Encoder	Resolver	Encoder	Resolver
4 N.m	168	163	228	223
5 N.m	185	180	245	240
6 N.m	202	197	262	257

7.4 SMH110 Series Performance Curve

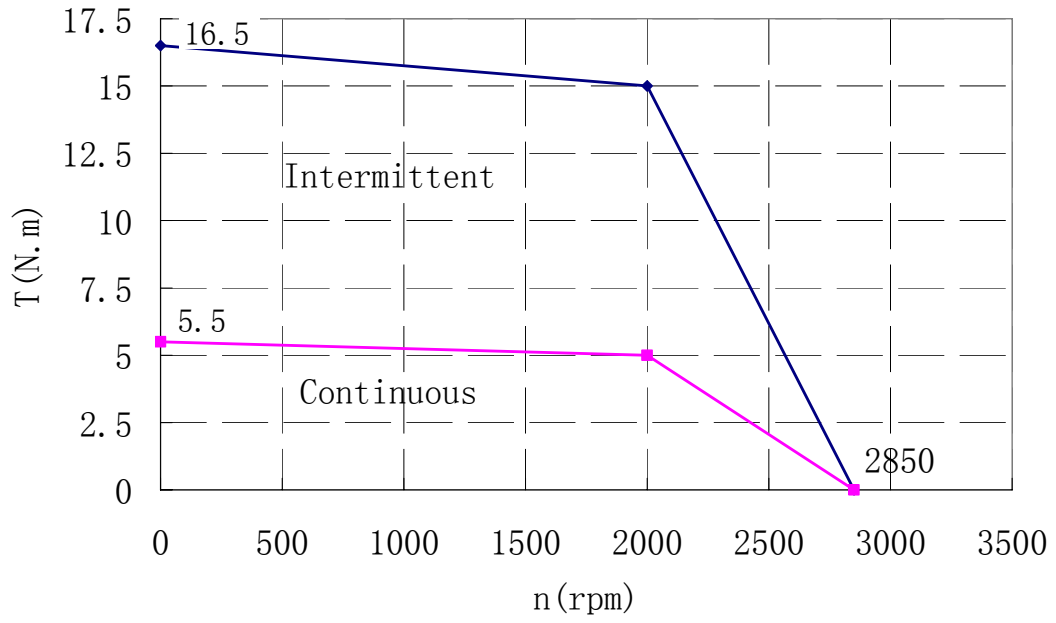
SMH110-842028xxx



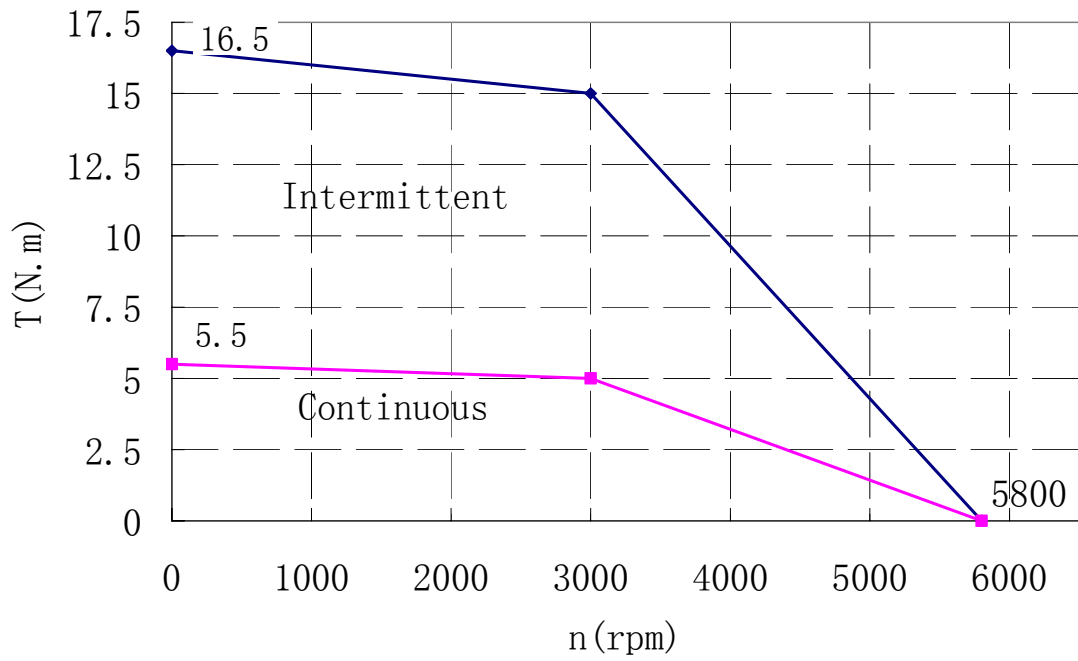
SMH110-1263028xxx



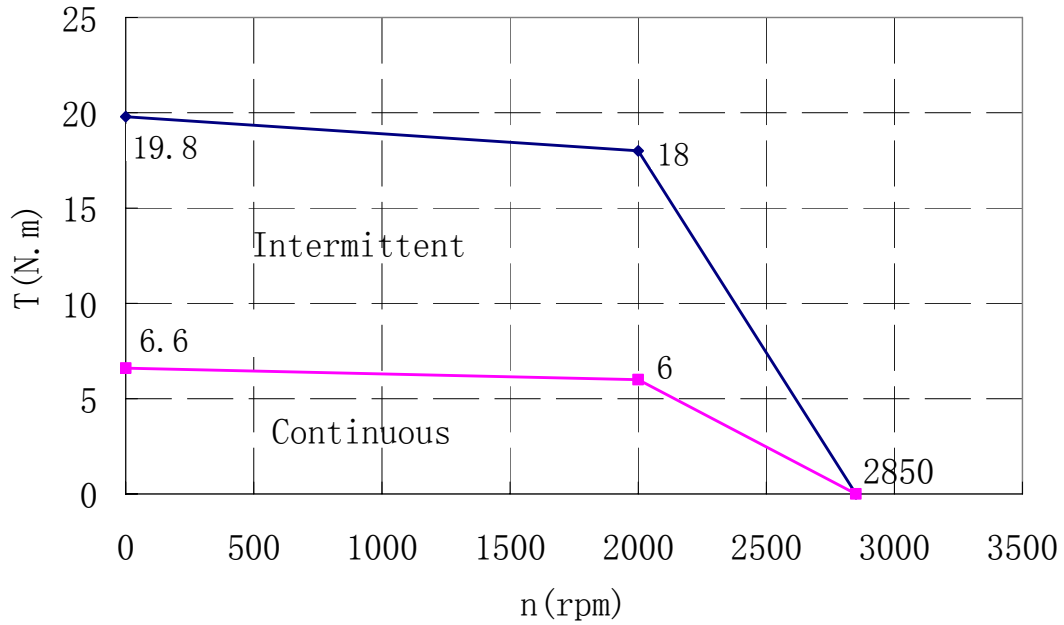
SMH110-1052028xxx



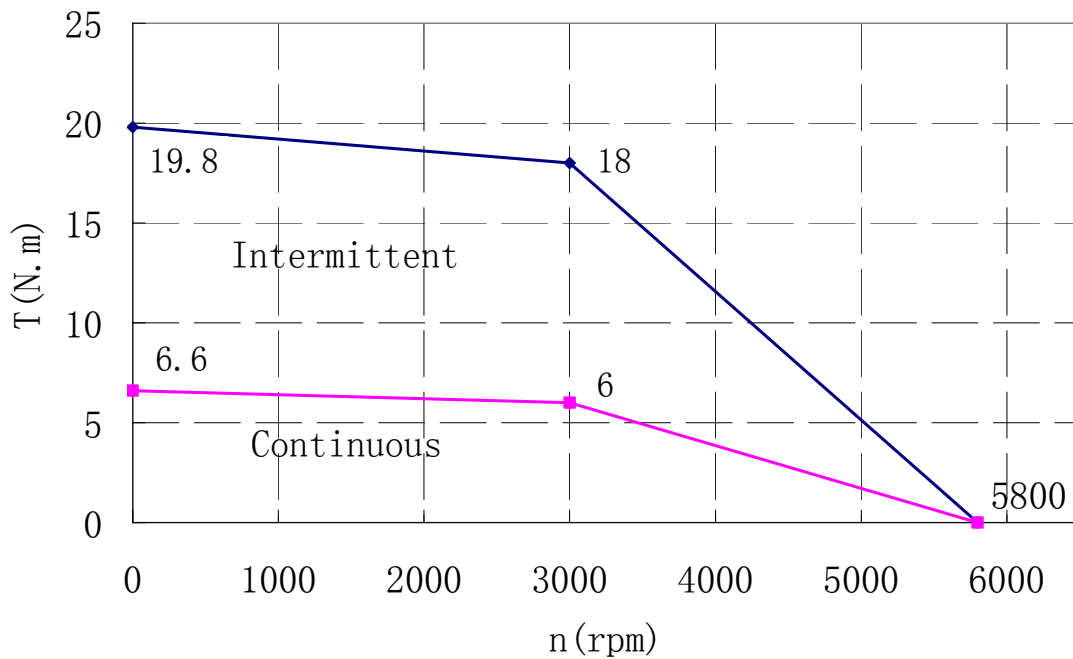
SMH110-1573028xxx



SMH110-1262028xxx



SMH110-1883028xxx



Technical changes to improve the performance of the equipment may be made without prior notice!

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