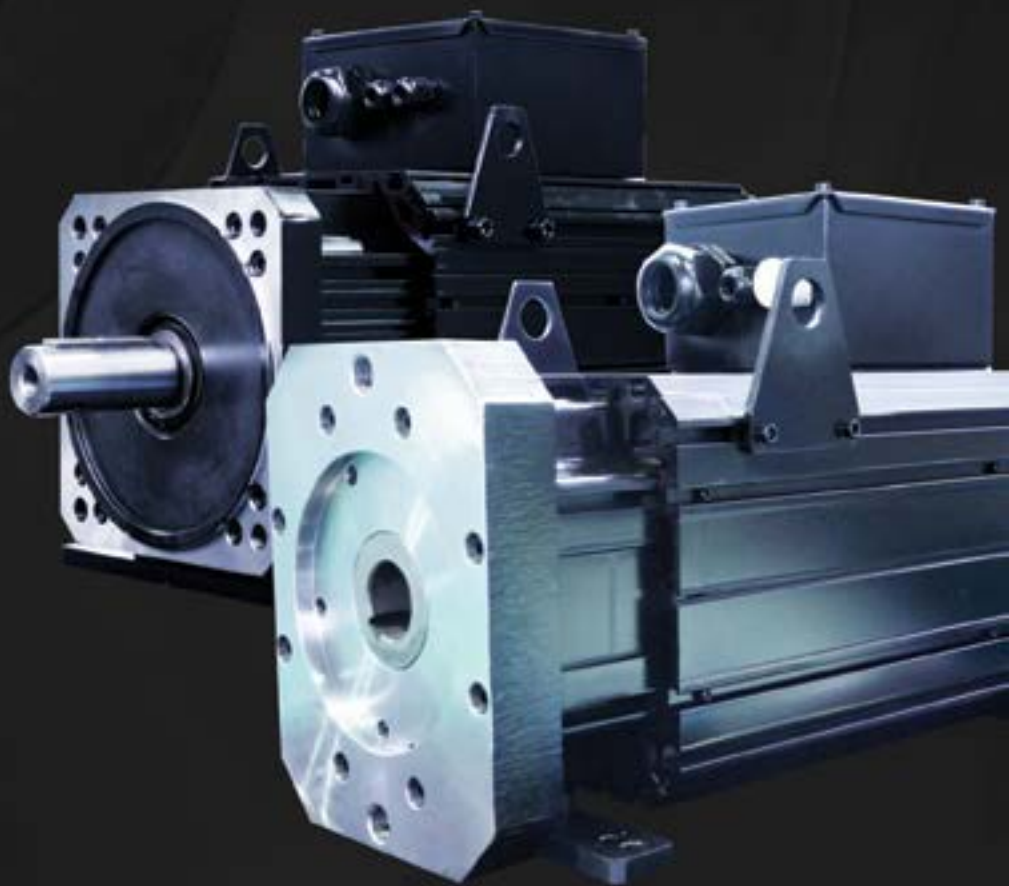




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Servo Motor
S-SERIES

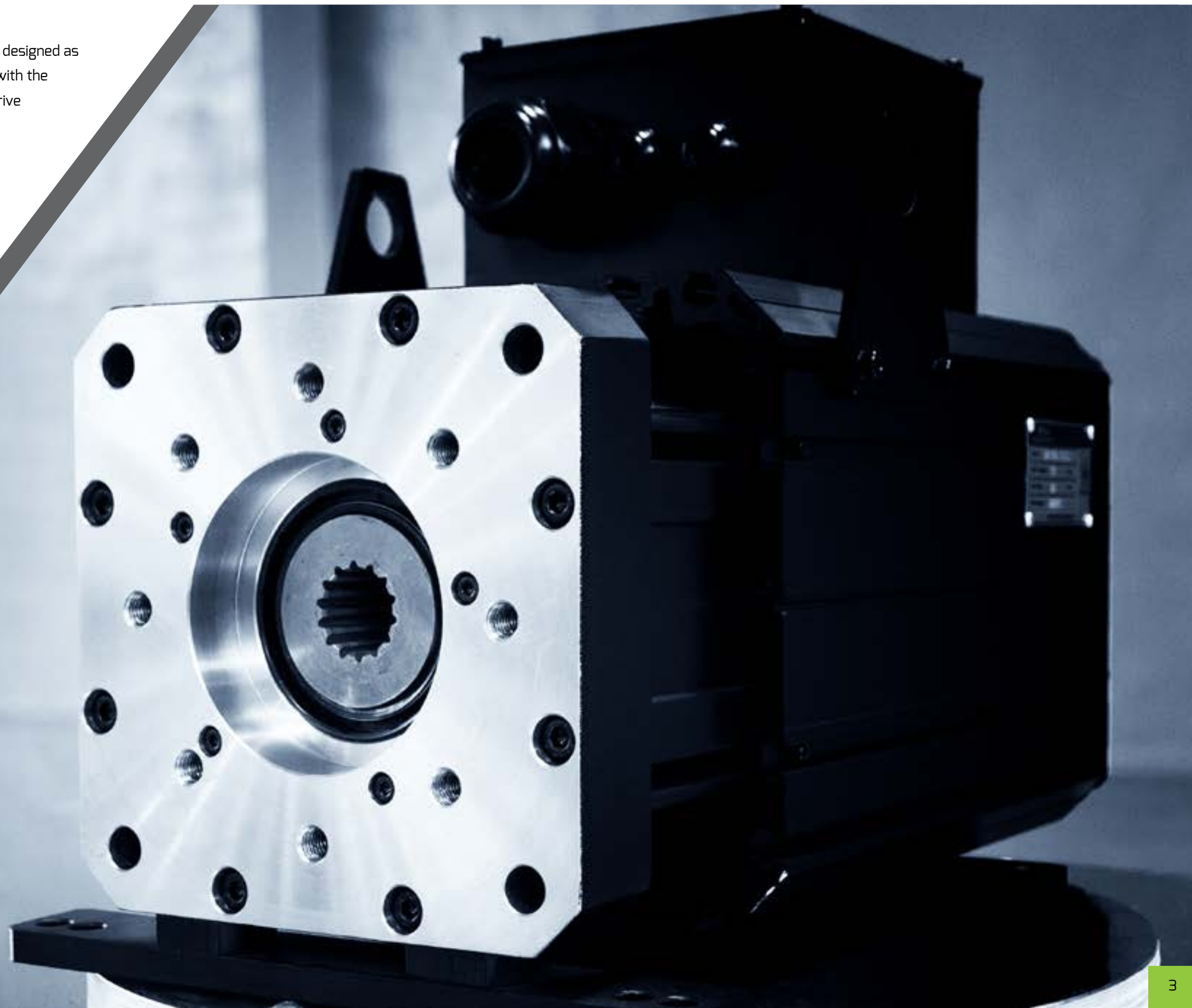


General Data

S series of rare earth 3 phase permanent magnet servo motors was conceived and designed as an advanced and homogeneous range of high performance servo actuators, in line with the evolving demands of the automation industry, and is particularly suited for direct drive applications.

S series servo motors reach the highest torque/size and power/size ratios in the industry. They are designed for sinusoidal control and embody, as standard feedback devices, inductive encoder, custom designed for motor operation, which offers resolution up to 4096p/rev thus affording the best motion uniformity even at the lowest speed. With this feature, the limits of mechanical transmissions are overcome and a vast range of applications can be transferred to direct drive technology.

S series servo motors have two frame bases: S18 series and S25 series, under 54 working situation, the rated power accordingly range from 4kw to 37kw and from 20kw to 85kw., Intended for direct, distributed drive of continuous process lines, in view of the progressive elimination of long transmission shafts. The rated speed has the range from 1000rpm to 3000rpm. S18 and S25 series' windings are for 380/440Vac.

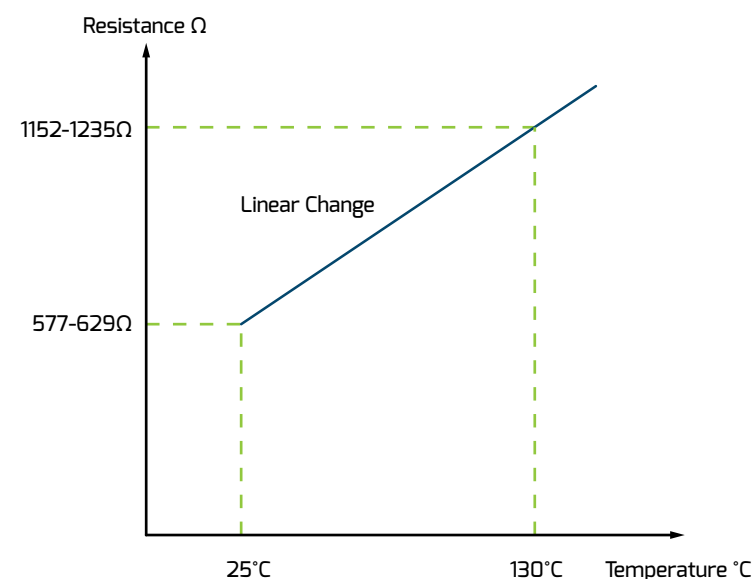




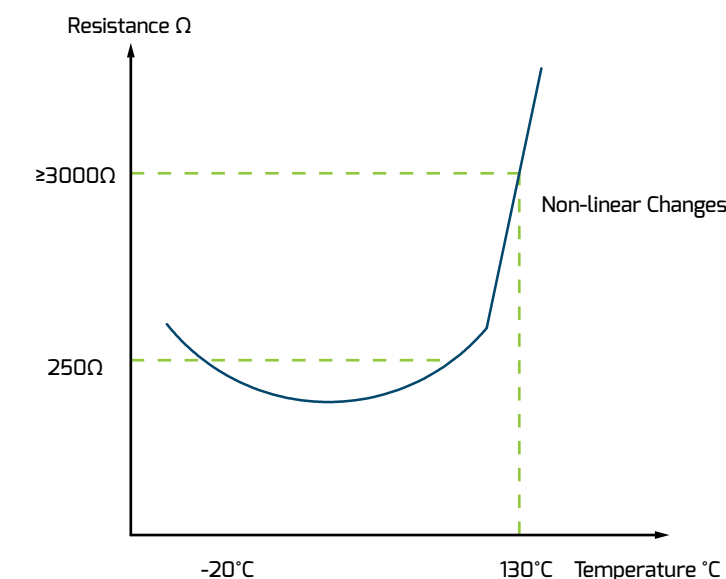
Specifications Of Standard Models

Type	Low Inertia PM3Φ AC SERVO MOTOR
Rotor	Sintered, high temperature rare earth, mechanically fastened magnets.
Insulation	Class F according to GB755-2008L / IEC 60034-1:2010
Thermal Protection	PTC+KTY B4 Linear probe
Bearings	Heavy duty, life lubricated; Sizes S18 and S25: front bearing locked in high strength steel.
Balancing	Grade R (reduced tolerance)
Concentricity & Squareness Of Mounting Flange	According GB/T 4772.1-1999 and IEC72-1:1991
Shaft	Cylindrical had keyway, tolerance K6, axial threaded hole.
Cooling Options	GB755-2008L; Designed for process lines and sustained operation at high speed, option F, Forced cooling over frame with fan servo controlled by the motor.
Working Position	Any
Mounting	Flanged B5
Protection	IP 54
Position Sensor	Sine encoder 4076p/rev, Operating temperature up to 155°C

KTY / PTC Motor & Machine Protection



KTY Thermal Sensor, option W
Type: KTY84 - 130°C



PTC Protection Device Characteristics
Tant: = 130°C

The Technical Characteristics Of The Servo Motor Qualification



Rotor

- High performance low loss silicon steel sheet W300.
- High performance rare earth magnets with latest surface assembly technology.



Encoder

- Tamagawa BRX Smart syn encoder.



Overall Performance

- Low rotor inertia, fast response.
- High demagnetization resistance ability.
- Smooth and stable running in high speed, low noise.

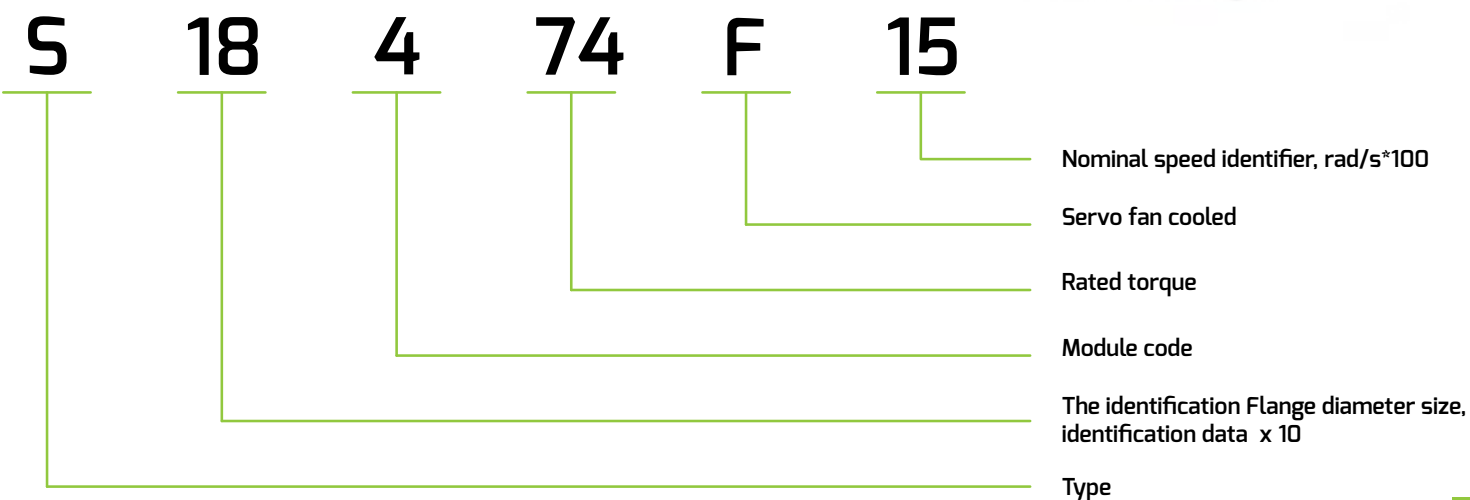


Temperature Protection

- PTC130 and KTY84



S Series Models Coding

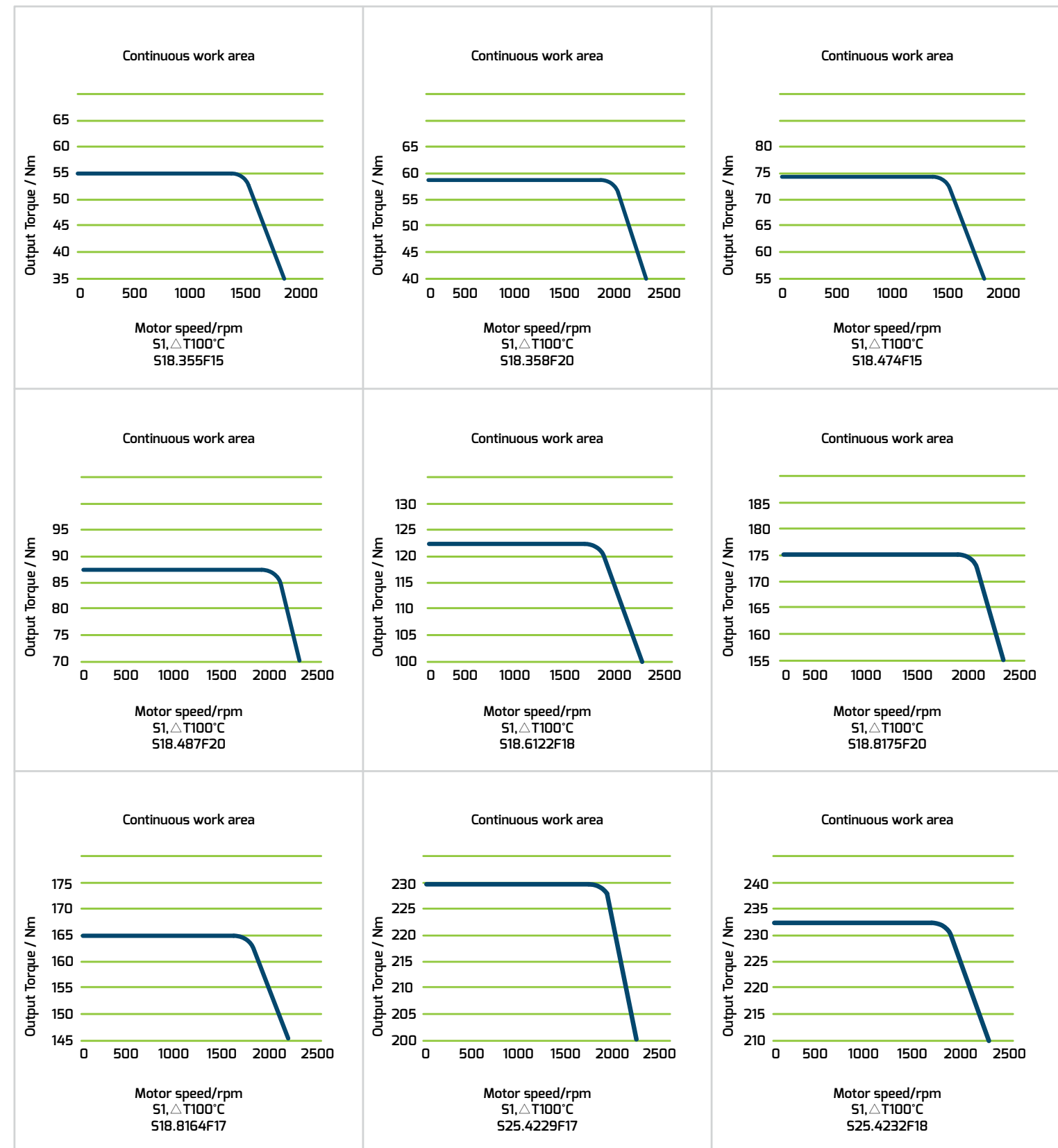


Technical Data Summary S Frame Size S18 Series

Type	Rated Torque Nm	Stall Torque Nm	Rated Speed RPM	Maximum Speed RPM	Rated Current A	Rated Power Kw	Rated Frequency Hz	Rated Voltage V
S18.238F10	38	41	1000	1450	7.0	4	66.7	380
S18.238F15	38.0	39.0	1500	1950	12.2	6.0	100	380
S18.239F17	39.0	40.0	1700	2150	14.0	6.9	113	380
S18.242F20	42.0	44.0	2000	2450	18.0	8.8	133	380
S18.237F25	37.4	40.0	2500	3000	20.0	9.8	167	380
S18.224F30	24.0	25.2	3000	3000	22.0	7.5	200	380
S18.353F10	53.0	54.2	1000	1450	11.6	5.5	66.7	380
S18.355F15	55.0	60.7	1500	1950	17.2	8.6	100	380
S18.357F17	57.0	59.5	1700	2150	20.0	10.1	113	380
S18.358F20	58.0	60.7	2000	2450	24.0	12.1	133	380
S18.357F25	57.6	60.7	2500	3000	30.0	15.1	167	380
S18.335F30	35.0	37.0	3000	3000	22.2	11.0	200	380
S18.472F10	72.0	75.8	1000	1450	15.3	7.5	66.7	380
S18.474F15	74.0	81.7	1500	1950	23.5	11.6	100	380
S18.480F17	80.0	83.0	1700	2150	28.0	14.2	113	380
S18.487F20	87.0	92.1	2000	2450	36.5	18.2	133	380
S18.486F25	86.9	91.0	2500	3000	44.0	22.8	167	380
S18.448F30	48.0	50.0	3000	3000	30.3	15.0	200	380
S18.586F10	86.0	90.0	1000	1450	17.5	9.0	66.7	380
S18.5103F15	103.0	106.0	1500	1950	32.0	16.2	100	380
S18.596F17	96.0	100.0	1700	2150	33.5	17.1	113	380
S18.596F20	96.0	100.0	2000	2450	39.5	20.1	133	380
S18.598F25	98.6	105.0	2500	3000	53.5	25.8	167	381
S18.559F30	59.0	61.3	3000	3000	38.7	18.5	200	380
S18.6105F10	105.0	107.5	1000	1450	20.8	11.0	66.7	380
S18.6128F15	128.0	130.0	1500	1950	40.0	20.1	100	380
S18.6122F18	122.0	126.6	1800	2250	41.8	23.0	113	380
S18.6135F20	135.0	139.0	2000	2450	51.5	28.3	133	380
S18.6122F25	122.9	131.2	2500	3000	63.0	32.2	167	380
S18.670F30	70.0	71.8	3000	3000	42.0	22.0	200	380
S18.8124F10	124.0	128.5	1000	1450	24.1	13.0	66.7	380
S18.8186F15	186.0	190.0	1500	1950	52.0	29.2	100	380
S18.8164F17	164.0	170.0	1700	2150	54.0	29.2	113	380
S18.8175F20	175.0	185.0	2000	2450	71.0	36.7	133	380
S18.896F30	96.0	98.2	3000	3000	62.2	30.0	200	380
S18.8118F30	118.0	120.3	3000	3000	76.5	37.0	200	380

Note: The rated speed of 3000RPM motors rated power for S1 and the rest are for S4 working system.

Safe Operating Areas



Technical Data Summary S Frame Size S18 Series

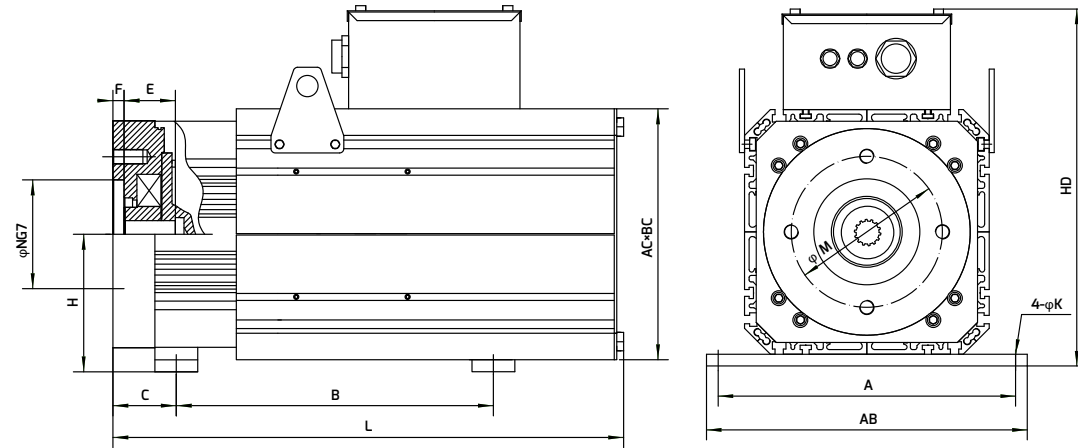


Chart 2 Frame with foot, flange (with through holes) on the motor cover

Type	A	B	C	E	F	H	K	AB	AC x BC	L	HD	kg
S18.2	254	267	49	40	11	124	11.8	278	222*222	350	347	44
S18.3		285								390		51
S18.4		312								425		58
S18.5		354								498		65
S18.6		396								535		72
S18.8		471								575		86

R Flange mating surface to axial extending shoulder distance.

Technical Data Summary S Frame Size S18 Series

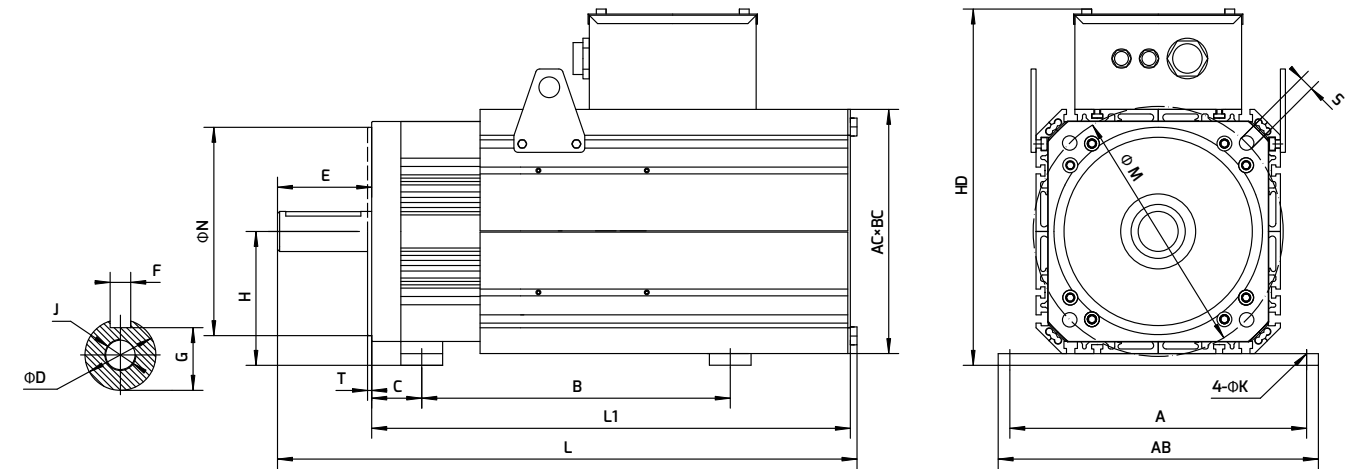
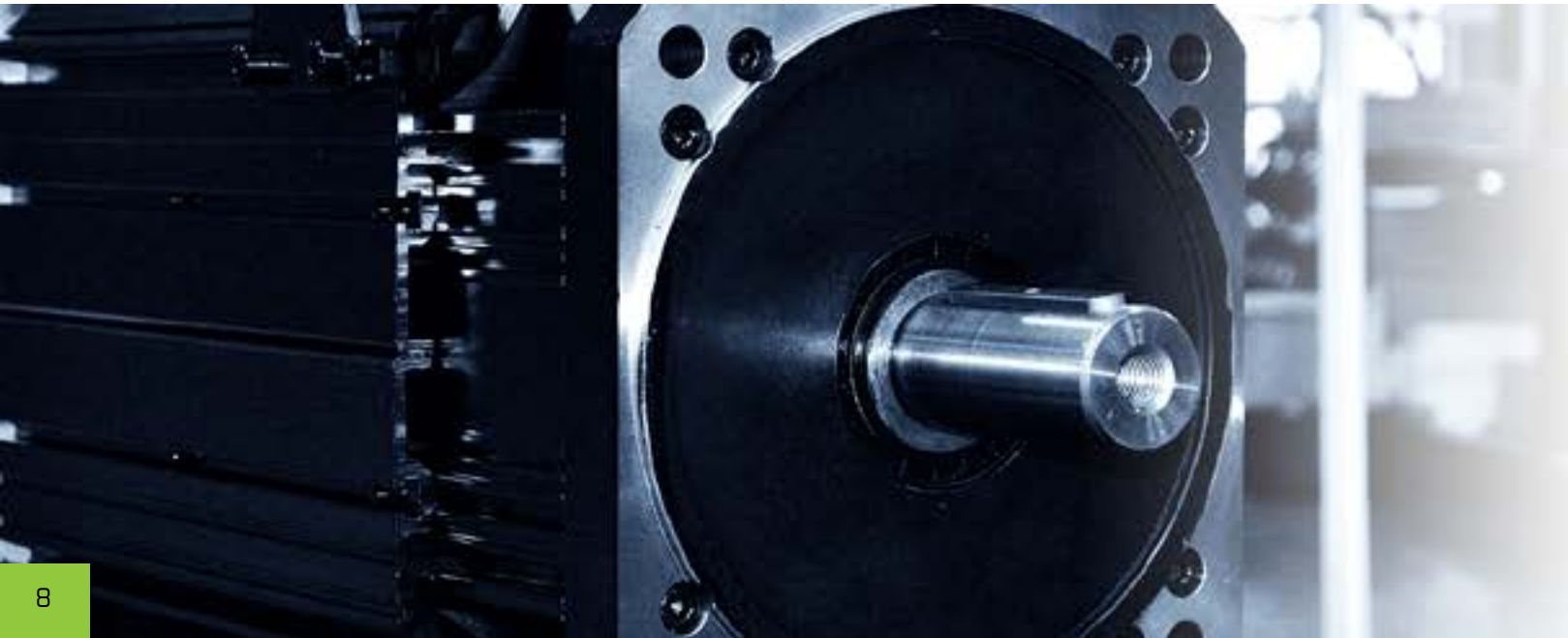


Chart 1 Frame with foot, flange (with through holes) on the motor cover

Type	A	B	C	D	E	F	G	J	H	K	M	N	R	S	T	AB	AC*BC	L1	L	HD	Key	kg	
S18.2	254	267	39	φ42k6 ^{+0.018} / _{+0.002}	82	12H8 ^{+0.027} / ₀	36.7 ⁰ / _{-0.10}	M10	30	124	11.8	215	φ180h7 ⁰ / _{-0.040}	0±0.2	14.5	5	278	222*222	344	428	347	56*12*8	37
S18.3		285																	383	466			44
S18.4		312																	420	503			51
S18.5		354																	458	541			58
S18.6		396																	495	583			65
S18.8		471																	570	658			80

R Flange mating surface to axial extending shoulder distance.

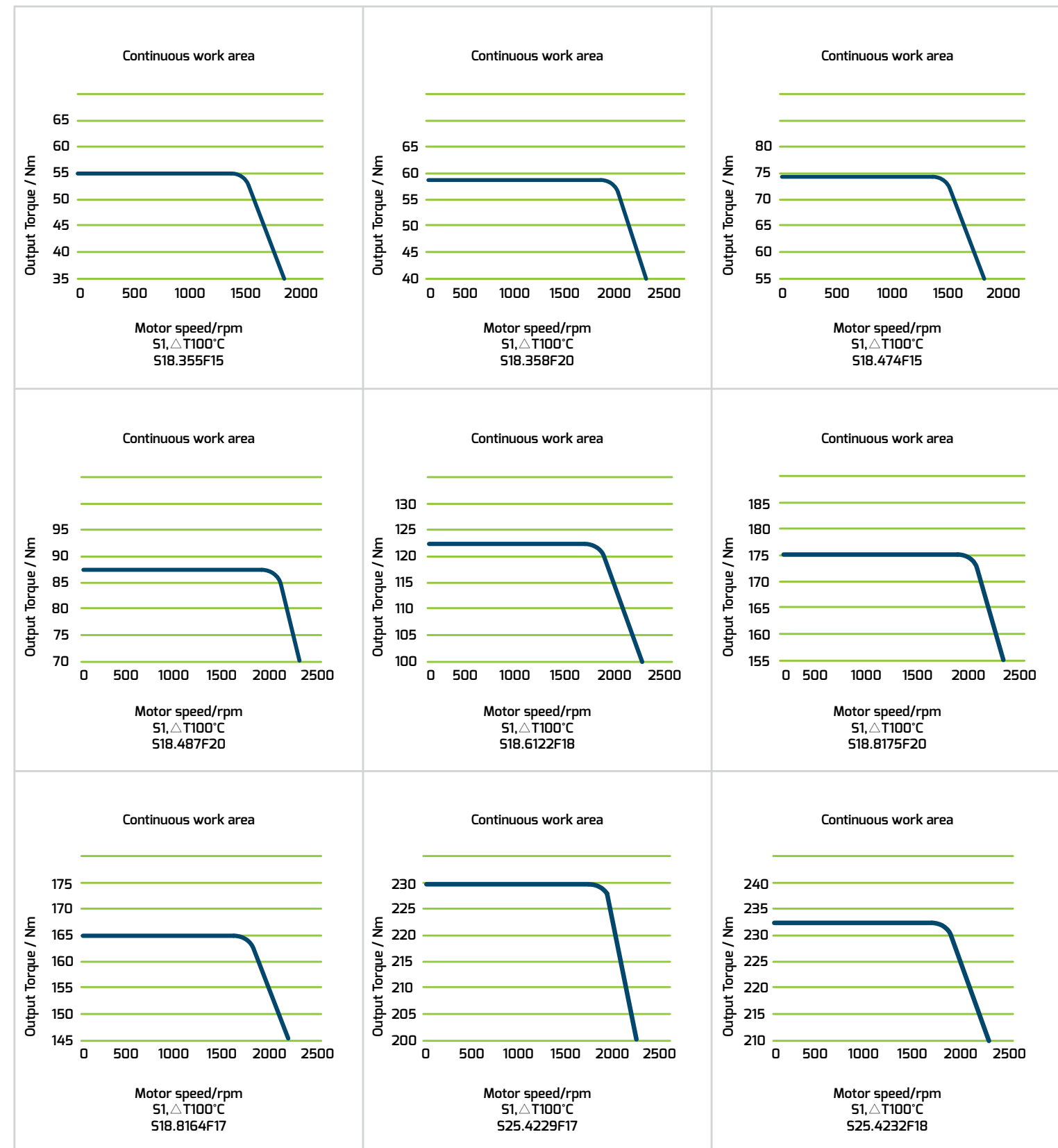


Technical Data Summary S Frame Size S25 Series

Type	Rated Torque Nm	Stall Torque Nm	Rated Speed RPM	Maximum Speed RPM	Rated Current A	Rated Power Kw	Rated Frequency Hz	Rated Voltage V
S25.3143F10	143.0	155.2	1000	1450	27.2	15.0	66.7	380
S25.3180F15	180.0	189.0	1500	1950	51.0	28.3	100	380
S25.3212F18	212.2	222.8	1800	2250	87.6	40.0	120	380
S25.3215F20	214.8	225.5	2000	2450	103.4	45.0	133.3	380
S25.3118F30	118.0	120.3	3000	3000	66.7	37.0	200	380
S25.4177F10	177.0	184.6	1000	1450	33.4	18.5	66.7	380
S25.4230F15	230.0	241.0	1500	1950	68.0	36.1	100	380
S25.4229F17	229.0	236.0	1700	2150	79.0	40.8	113	380
S25.4255F18	254.6	264.0	1800	2250	105.0	48.0	120	380
S25.4269F20	269.0	286.0	2000	2450	112.5	56.3	133	380
S25.4143F30	143.0	150.0	3000	3000	90.0	45.0	200	380
S25.5210F10	210.0	216.2	1000	1450	39.0	22.0	66.7	380
S25.5267F15	267.0	275.6	1500	1950	66.0	42.0	100	380
S25.5270F17	270.0	286.3	1700	2150	83.5	48.0	113	380
S25.5269F20	269.0	276.5	2000	2450	109.0	56.3	133	380
S25.5267F25	267.0	275.1	2500	3000	113.2	70.0	167	380
S25.5175F30	175.0	182.2	3000	3000	104.0	55.0	200	380
S25.6286F10	286.0	295.2	1000	1450	53.0	30.0	66.7	380
S25.6380F15	380.0	416.0	1500	1950	106.0	59.7	100	380
S25.6349F17	349.0	363.0	1700	2150	120.0	62.1	113	380
S25.6389F20	389.0	417.0	2000	2450	155.0	81.5	133	380
S25.6325F25	325.0	328.2	2500	3000	148.0	85.0	167	380
S25.6239F30	239.0	246.2	3000	3000	138.0	75.0	200	380
S25.8353F10	353.0	368.2	1000	1450	97.3	37.0	66.7	380
S25.8450F15	450.0	530.0	1500	1950	130.0	70.7	100	380
S25.8481F18	481.0	499.0	1800	2250	196.0	90.7	120	380
S25.8511F20	511.0	550.0	2000	2450	230.0	107.0	133	380
S25.8287F30	287	293.3	3000	3000	158.0	90	200	380

Note: The rated speed of 3000RPM motors rated power for S1 and the rest are for S4 working system.

Safe Operating Areas



Technical Data Summary S Frame Size S25 Series

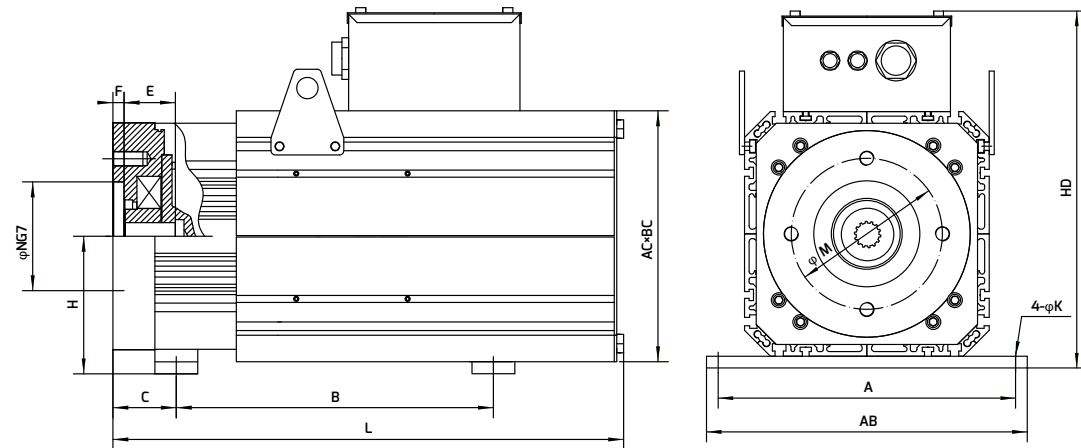


Chart 2 Frame with foot, flange (with through holes) on the motor cover

Type	A	B	C	E	F	H	K	AB	AC x BC	L	HD	kg
S25.3		316								543		92
S25.4		370								596		115
S25.5	356	423	74	60	13	161	18	384	292 x 292	648	430	138
S25.6		476								701		161
S25.8		583								801		207

R Flange mating surface to axial extending shoulder distance.

Technical Data Summary S Frame Size S25 Series

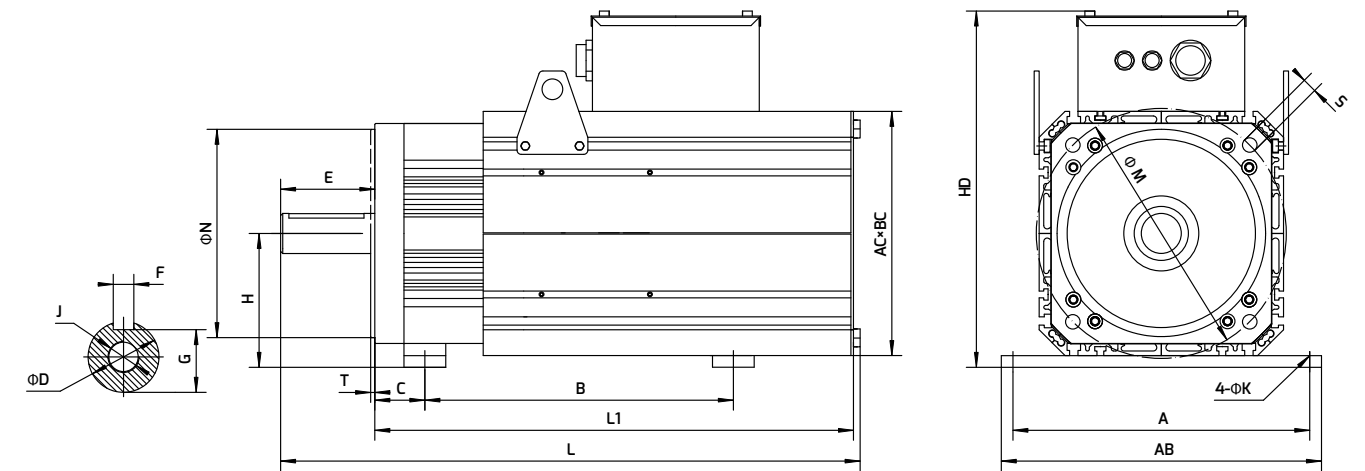
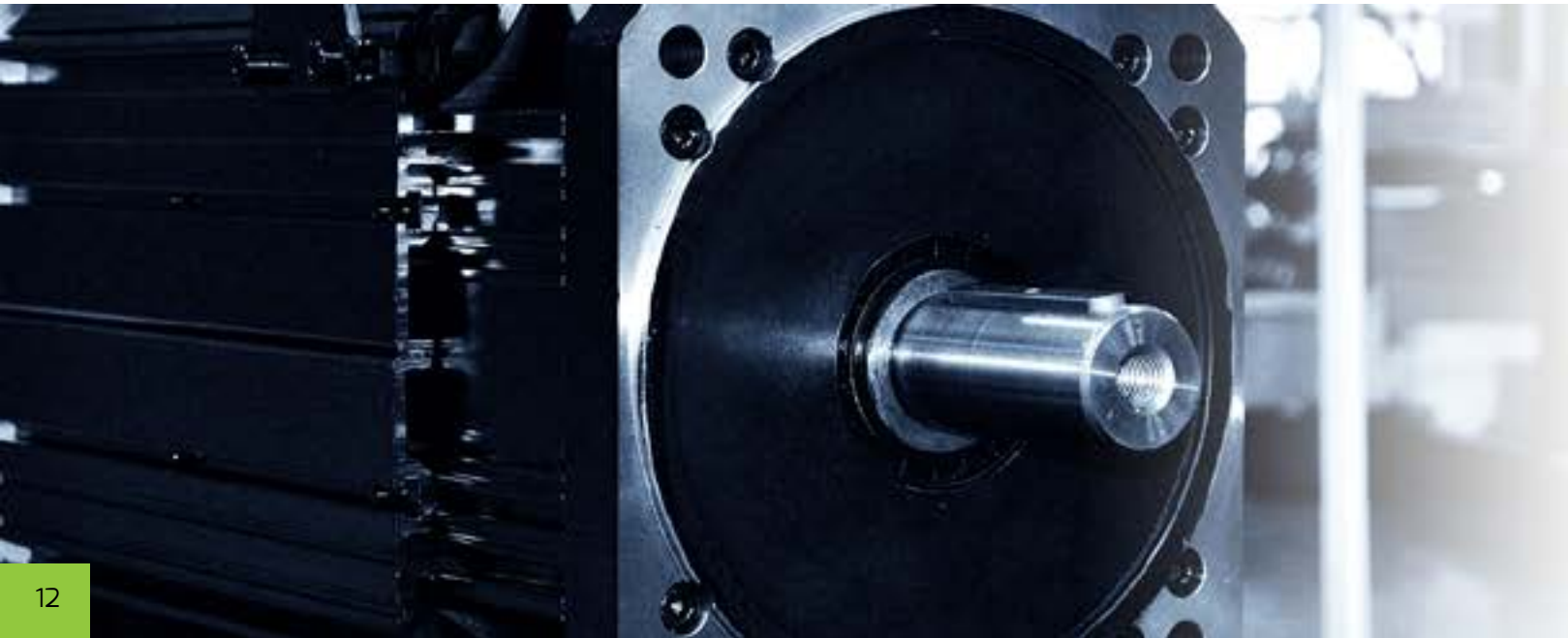


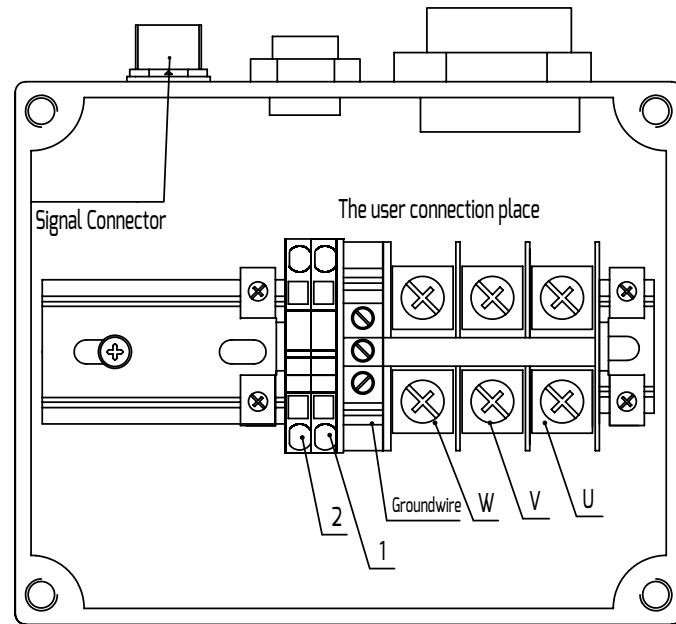
Chart 1 Frame with foot, flange (with through holes) on the motor cover



Type	A	B	C	D	E	F	G	J	H	K	M	N	R	S	T	AB	AC x BC	L1	L	HD	Key	kg	
S25.3		316																529	641			116	
S25.4		370																582	694			139	
S25.5	356	423	60	φ48k6 ^{+0.018} / _{+0.002}	112	14H8 ⁻⁸ / _{0.027}	42.5 ⁰ / _{-0.2}	M20	35	161	18	300	φ250j6 ^{+0.016} / _{-0.013}	0±0.2	17.5	5	384	292 x 292	634	746	430	90 x 14 x 9	162
S25.6		476																687	799			185	
S25.8		583																787	899			231	

R Flange mating surface to axial extending shoulder distance.



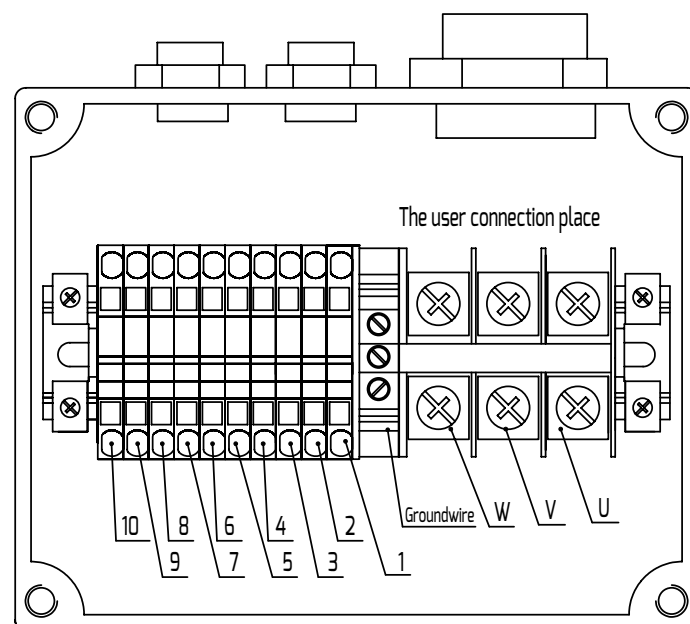
S18 Series Connectors Specification





Terminal 1	 Fan AC220V		
Terminal 2	 Fan AC220V		
4	sin-	Black	Encoder
5	cos+	Yellow	
6	cos-	Blue	
7	Resex+	Red & White	
10	Resex-	Yellow & White	
14	sin+	Red	Temperature Protection PTC+KTY84
8	KYT+	Yellow	
9	KTY-	Green	
16	PTC	Blue	
17	PTC	Blue	

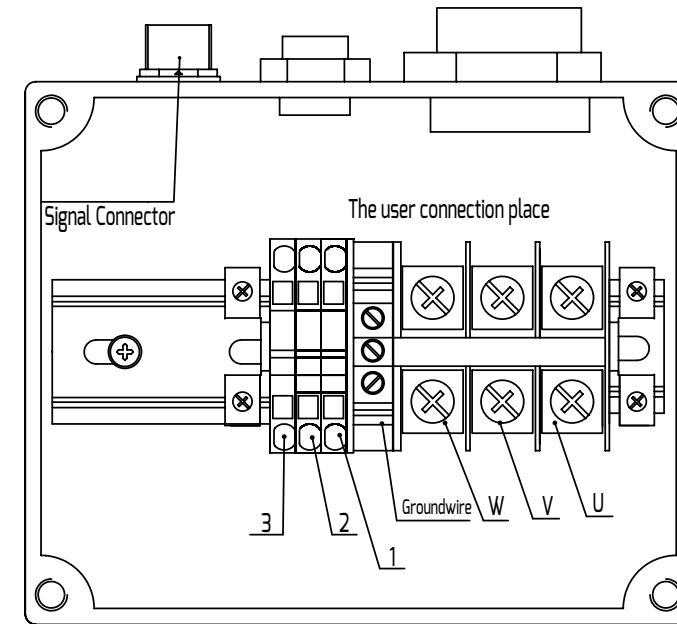
Fan Supply



Fan Voltage	Fan Current	Frequency	Temperature Threshold
220±15% VAC, 1Φ	0.66 Arms	50-60Hz	80 °C



Terminal 1	 Fan AC220V		
Terminal 2	 Fan AC220V		
3	Resex+	Red & White	Encoder
4	Resex-	Yellow & White	
5	sin+	Red	Temperature Protection PTC+KTY84
6	sin-	Black	
7	cos-	Blue	
8	cos+	Yellow	
9	PTC	Blue	
10	PTC-	Blue	
	KYT+	Yellow Alternative	
	KYT-	Green Alternative	

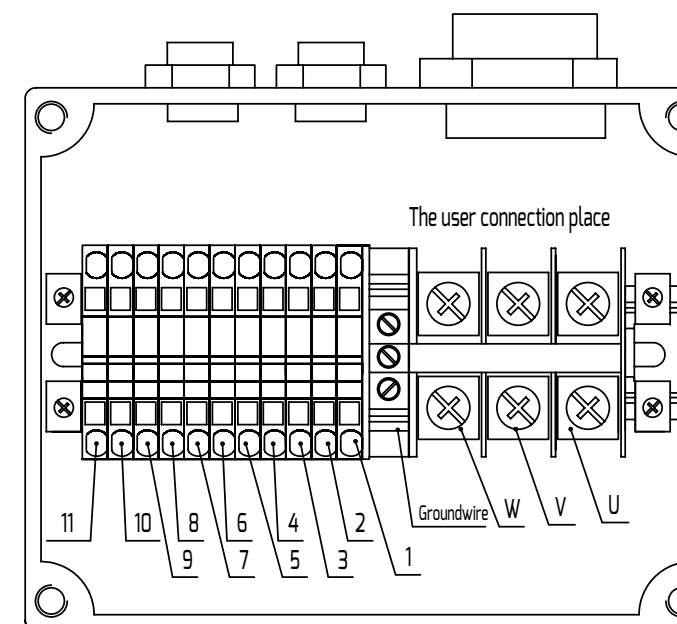
S25 Series Connectors Specification





Terminal 2	 Fan AC220V		
Terminal 3	 Fan AC220V		
4	sin-	Black	Encoder
5	cos+	Yellow	
6	cos-	Blue	
7	Resex+	Red & White	
10	Resex-	Yellow & White	
14	sin+	Red	Temperature Protection PTC+KTY84
8	KYT+	Yellow	
9	KTY-	Green	
16	PTC	Blue	
17	PTC	Blue	

Fan Supply

Fan Voltage	Fan Current	Frequency	Temperature Threshold
220±15% VAC, 1Φ	0.66 Arms	50-60Hz	80 °C



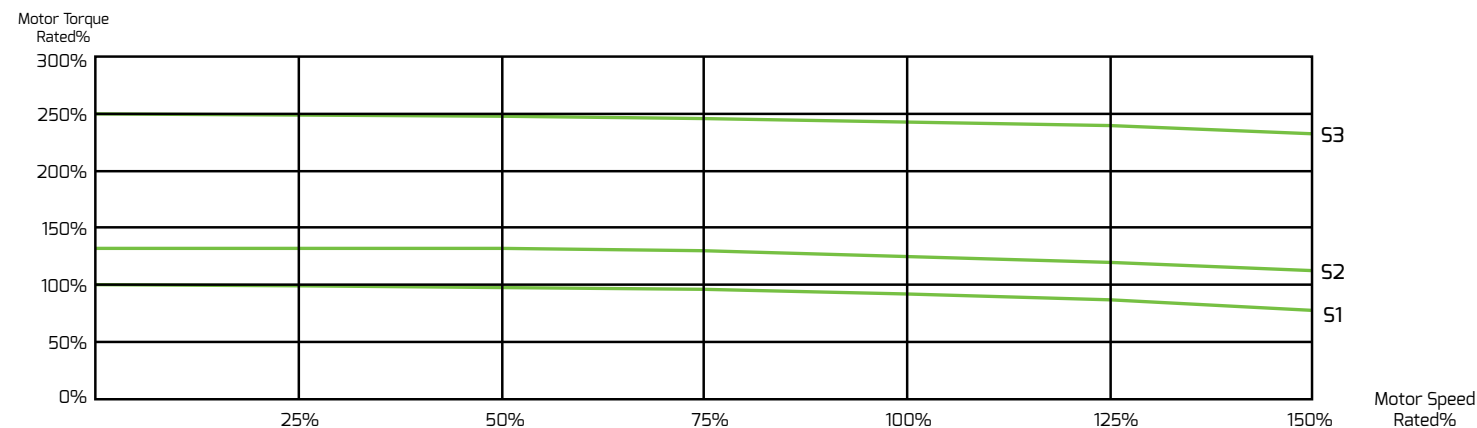
Terminal 2	 Fan AC220V		
Terminal 3	 Fan AC220V		
4	Resex+	Red & White	Encoder
5	Resex-	Yellow & White	
6	sin+	Red	Temperature Protection PTC+KTY84
7	sin-	Black	
8	cos-	Blue	
9	cos+	Yellow	
10	PTC	Blue	
11	PTC-	Blue	
	KYT+	Yellow Alternative	
	KYT-	Green Alternative	

The SD Servo Motor Selection

1) Servo motor rated speed selected

Servo motor (permanent magnet synchronous servo motor) characteristic curve as shown in the figure below.

Motor Speed Torque Diagram



As shown above, when the motor speed is higher than the rated speed, with the ascension of motor speed, motor torque will gradually decline. When the motor speed is higher than 150% of the rated speed, servo motor gradually achieves magnetic saturation, the motor torque will fall quickly, it is recommended to choose the speed of 140% of rated speed.

The motor rated speed: $V \text{ (RPM)} = V_{\text{max}} \text{ (RPM)} / 140\%$.

To get better control effect, please select highest motor speed of 130% of the rated speed.

2) Servo motor rated torque is selected

Maximum output power of injection molding machine:

$$P2_{\text{max}}(\text{Kw}) = P1(\text{kgf/cC}) \times 0.9807(\text{kgf/cC/bar}) \times Q(\text{L/min})$$

Maximum output power of motor: $P3_{\text{max}}(\text{Kw}) = P2_{\text{max}}(\text{Kw}) / 90\%$ (at 90% of the total energy conversion efficiency)

Maximum motor output torque is: $T_{\text{max}}(\text{Nm}) = P3_{\text{max}}(\text{Kw}) \times 9550 / V \text{ (RPM)}$

According to the characteristic of permanent magnet synchronous motor, the injection molding machine needs continuous high torque output to maintain pressure, servo motor's general working condition should be between S1 and S3.

Maximum torque of motor is 180% of rated torque.

Rated torque motor as follows: $T = T_{\text{max}}(\text{Nm}) (\text{Kw}) / 180\%$

Note: if choose double displacement plunger pump or duplex gear pump, reducing pressure of oil pump displacement can significantly reduce the motor torque output, when servo motor is in S3 working condition, the maximum torque can be 230% of the rated torque.

The Selection Of Pumps, Motors And Drives

1) To calculate flow rate of the original machine

- Flow (L/min) = [oil pump displacement (mL/r) / 1000] x motor speed (r/min)
- So the pump displacement = $(152.25 \times 1000) / 1000 = 76.125 \text{ (mL/r)}$
- Select models GR55-2 v075 oil pump (= 75 mL/r) displacement.

Example: the original machine oil pump displacement = 105 (mL/r), motor speed = 1450 r/min
So the machine flow = $105/1000 \times 1450 = 152.25 \text{ (L/min)}$

2) Pump selection

- According to the flow of the original machine, select displacement and rotating speed of oil pump.
- Oil pump displacement (mL/r) = [flow (L/min) x 1000] / oil pump rotate speed (r/min)

Example: the flow of the original machine = 152.25 (L/min), oil pump rotation speed to 2000 r/min

3) Motor selection

- According to the oil pump displacement and rotating speed, select the motor torque and rotational speed.
- The motor torque (Nm) = pump displacement (mL/r) x 2.333

Example: the oil pump capacity is 75 mL/r)

So the motor torque = $75 \times 2.333 = 174.975 \text{ (Nm)}$

Check the servo motor parameter list, find the rated torque in the vicinity of 174.975 Nm and motor speed of 2000 r/min, select model S18.8175 F20 motor (rated torque of 175 Nm, rated speed of 2000 r/min, rated current is 71 a, rated power is 36.6 Kw).

4) Drive selection

- According to the motor rated current, select the corresponding driver.
- Rated current of the motor should not be higher than 120% of the rated current of the drive to avoid overheating and fast perishing of motor.

Applications

Feature of Servo Motor:

Plastic Machinery, Textile Machinery, Metal Forming Equipment, Air Compressors, Packaging Machineries, Printing Equipments and so on.

Metal Forming Equipments

Spring Making machines
 Die Casting machines

Plastic Injection machines

Energy Saving Injection machines

The shortages of the traditional energy saving system:

- Squirrel-cage asynchronous induction motor, big inertia moment, low response speed, low productivity, difficult for some products' parameter adjustment.
- Open-loop system, low accuracy control system, instability for production.
- Vane pump can work normally in condition of a certain rotate speed which will have influence on energy-saving effect.
- It's more easy to burn out motor when here is contradiction which caused by a great beating of pressure maintaining and energy conservation of cooling.

Advantages of Phase energy saving servo system:

- Compared to the traditional control system, response time of energy-saving servo system can be achieved 0.03s-0.05s, which is faster obviously.
- Energy-saving servo system makes the work cycle short effectively and improves the production efficiency.
- Servo motor has high repeat precision which can improve the stability of system.
- Energy saving servo system can save energy 50% - 80%.

All-Electric Injection Molding Machine

What Is an All-Electric Injection Molding Machine?

Unlike traditional hydraulic injection molding machines, which use energy even while idle, all-electric injection molding machines consume energy only when required for a given action, and motor output is matched to load requirements. Instead of being driven by a hydraulic system, all-electric machines use digitally controlled, high speed and highly efficient servo motors to drive the whole process. Each axis is controlled by an independent motor for injection, extruder, clamping and ejection.

The result is a faster, cleaner, more repeatable and energy efficient injection molding process. Energy consumption for an all-electric machine can be reduced by 50 to 75% over that for a hydraulic machine.

Air Compressors

Disadvantages of traditional air supply method:

- a) Power-hungry.
- b) Air inlet valve easy to broken.
- c) Air pressure doesn't stable.

Advantages of Phase servo products:

- a) Save energy, save energy efficiency >30%.
- b) Decrease maintenance cost.
- c) Improve pressure control accuracy.
- d) Startup of servo motor will decrease strike for electric parts and mechanical parts. It will enhance reliability of system and improve working life of air compressor.
- e) Decrease air compressor's running noise.



SERVOMOTOR.COM

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