

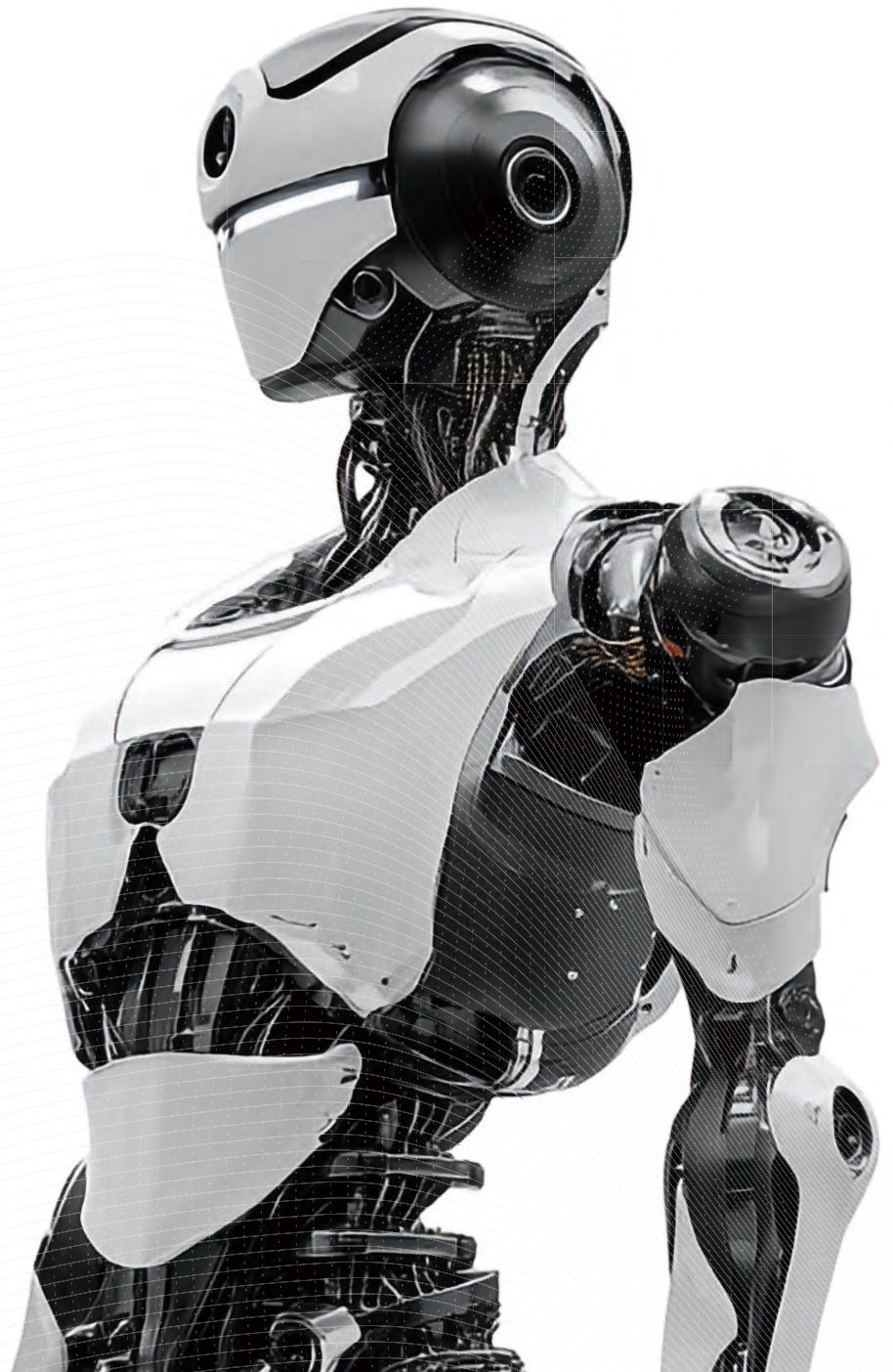


Leadshine

Stock Code: 002979

Robotic Joint Module Core Components

Frameless Motor
Robotic Joint Module



Reliable Motion Control Partner



- Headquarters in Shenzhen



- Shanghai Intelligent Industry Park



- Production base in Shenzhen

- Founded in 1997
- Public Listed Company in China (002979.SZ)
- Dedication in Motion Control
Stepper/Servo systems, Motion Controllers, PLC
Control systems, I/O Modules, Encoders
- A leading supplier of motion control products and solutions in the world
- Customer Oriented, Technology Oriented, Forever Improving, Sharing of Success

 **28+**
History

 **500+**
R&D Engineers

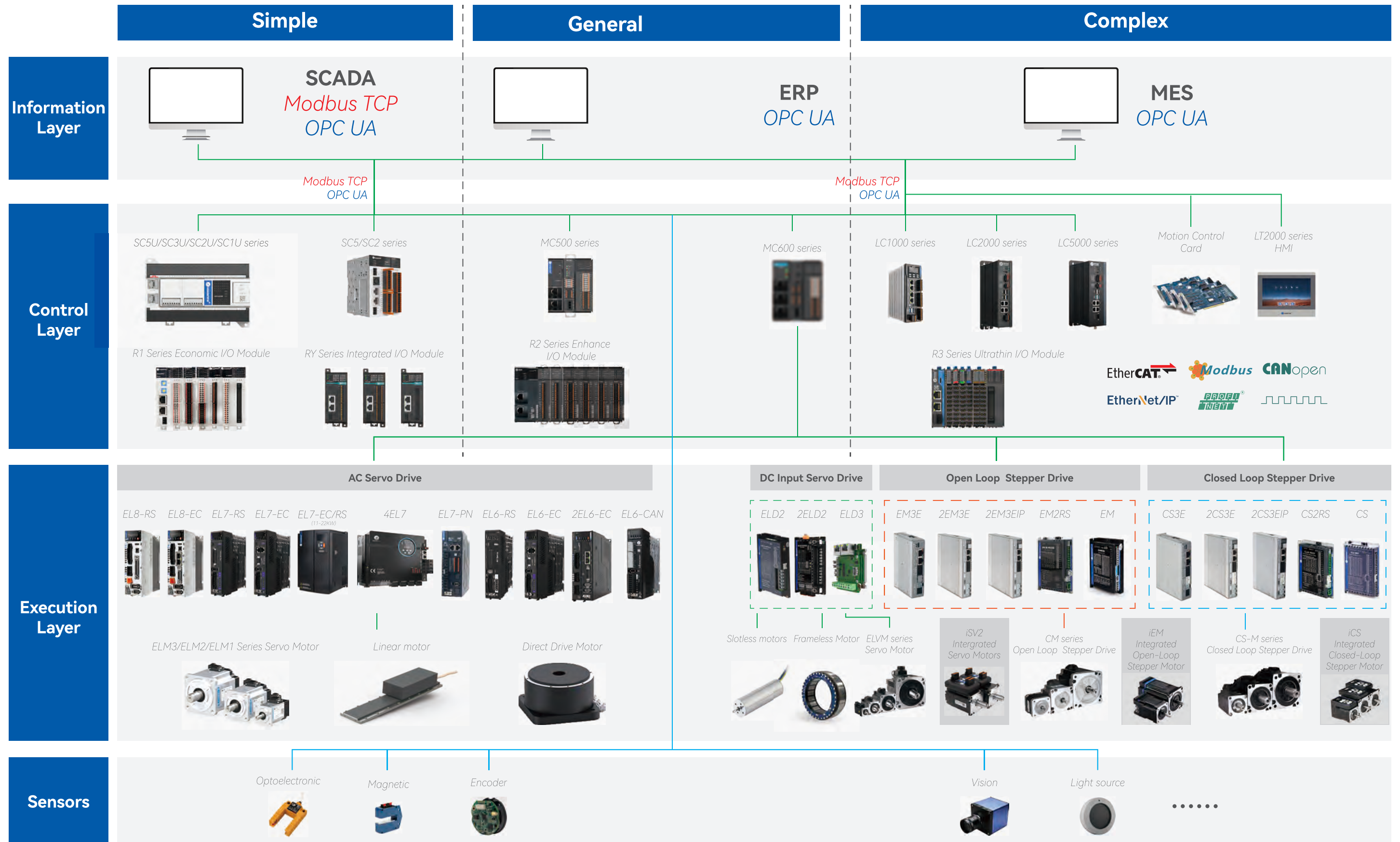
 **1400+**
Global Partners

 **200/40**
AgentChannel

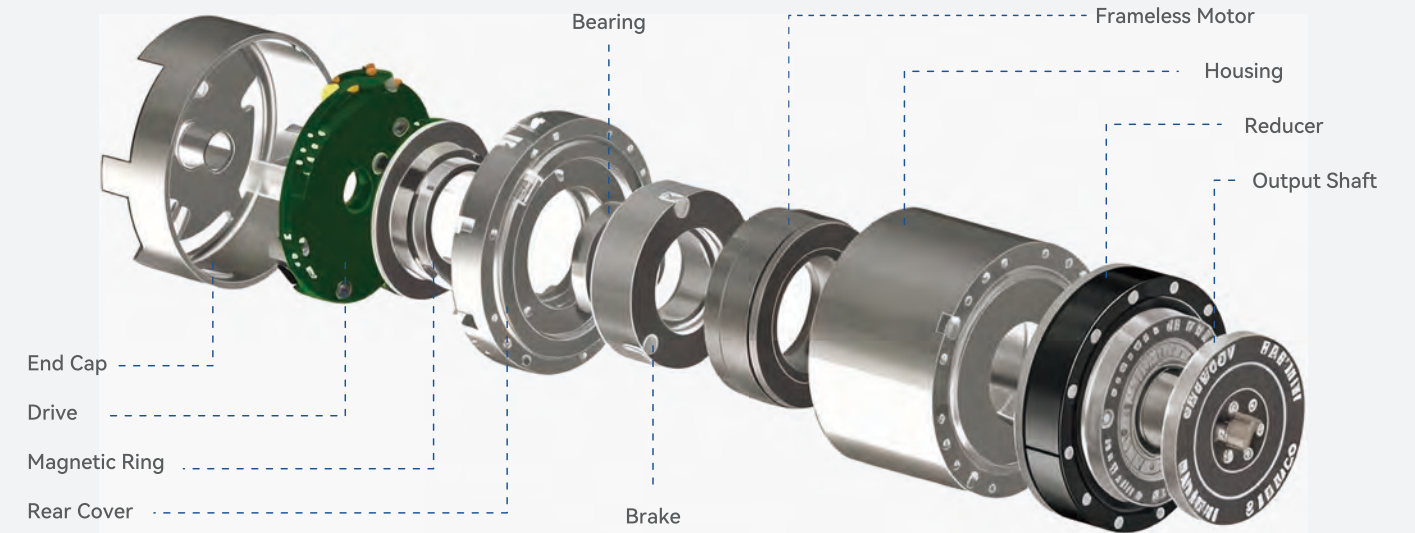
 **20+**
GlobalSales
Offices

 **30million+**
Installed Axes

Leadshine Motion Control Total Product System



Component Solutions



Ultra-high density

Precise control

Compact design

Full protocol compatibility

Long-lasting durability

High cost efficiency

○ Frameless Motor Solutions

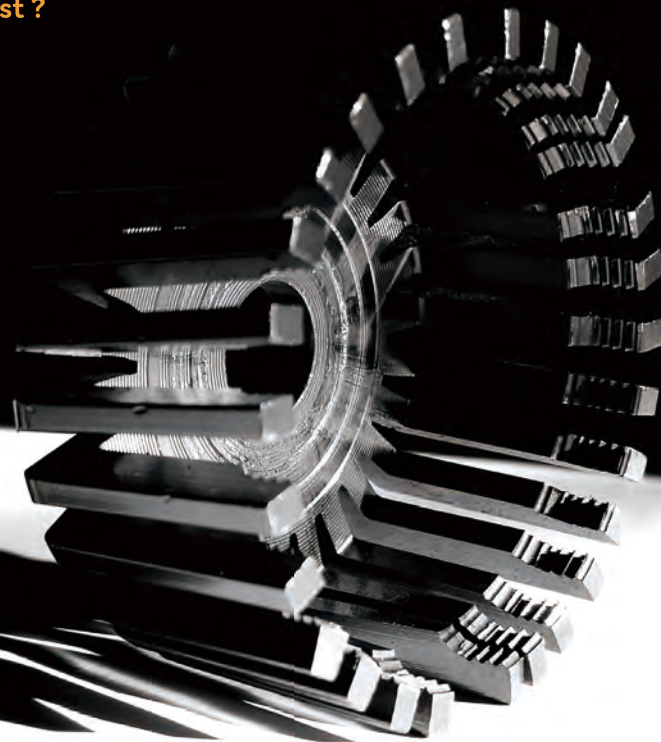
- Dimensions: 50/60/70/85/94/115/127 mm
- Rated Speed: 1800–5500 rpm
- Torque Range: 0.36 N·m–10.56 N·m
- Power Range: 210–1658 W
- Voltage Range: 24~70 V



- **Low Temperature Rise**
20% reduction in motor loss
- **High Density**
10% increase in torque density
- **Extended Endurance**
Longer operational lifespan

INDUSTRY PAIN POINTS

- Large volume ?
- Low efficiency ?
- High self-weight ?
- Low precision ?
- High temperature ?
- Low smoothness ?
- Low degree of freedom ?
- High consumption ?
- High cost ?



Product Portfolio

Compact Design for Basic Needs



FM1 Ultra-High-Density Series
50/70/85/115 mm

- Ultra-compact size
- 15% higher torque density vs. competitors
- Customizable for applications under 25 kg

 Collaborative Robots

 Humanoid Robots

 Quadruped Robots

 Medical Rehabilitation Robots

Higher Performance, More Options Adaptable



FM2 Ultra-High-Density Series
50/60/70/85/94/127 mm

- 20% lower motor loss
- 10% higher torque density vs. previous generation
- Extended endurance

 Collaborative Robots

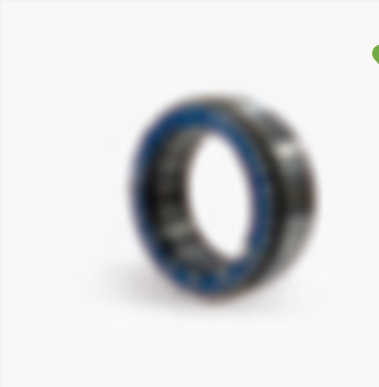
 Humanoid Robots

 Quadruped Robots

 Industrial Robots

 Medical Rehabilitation Robots

Tailored Solutions For Specialized Scenarios



Stay Tuned

FM3 Flagship Series

- Ultra-high power density
- Advanced algorithms optimize electromagnetic design for higher torque in the same volume
-

 Collaborative Robots

 Humanoid Robots

 Quadruped Robots

 Industrial Robots

 Medical Rehabilitation Robots

Part Numbers

FM 2 - 050 08 K T H 30 6 - □□

Motor Classification

FM	Frameless Motor
----	-----------------

Motor Classification

1	1st Gen Frameless Motor
2	2nd Gen Frameless Motor
3	3rd Gen Frameless Motor
*	* Gen Frameless Motor

Stator Outer Diameter

050	050mm
060	060mm
070	070mm
085	085mm
094	094mm
115	115mm
127	127mm
***	***mm

Stator Core Length

08	8mm
10	10mm
13	13mm
26	26mm
**	**mm

Voltage Class

D	380V
E	220V
F	110V
G	72V
H	60V
K	48V
M	36V
N	24V

Derivatives

Lead Wires

5	No wires
6	Standard 200mm wires
7	Customized wires

Rated Speed

Example	40=40*100=4000RPM 36=36*100=3600RPM 3650RPM=37 <i>Rounding to the nearest hundred</i>
---------	--

Hall Sensors

N	No Hall sensors
S	Special

Temperature Sensors

T	NTC sensors
P	PTC sensors
N	No temperature sensors
S	Special

www.leadshine.com | 05/06



Note: "φXX" represents the outer diameter (OD) of the frameless motor stator (unit: mm). Customization of Hall sensors, temperature sensors, and lead-out configurations is supported.

FM2 Series

Ultra-High-Density Frameless Torque Motors

New electromagnetic design with lower temperature rise, higher torque, faster response. Provides robust and stable power in compact spaces, suitable for humanoid robots, collaborative robots, etc. Available in seven standard sizes: 50/60/70/85/94/127 mm, with support for customization to meet diverse needs.



Collaborative Robots



Humanoid Robots



Industrial Robots



Quadruped Robots



Medical Rehabilitation Robots



Highlights

Ultra-High Density

10% higher torque density under the same input current, leading the industry.

Extended Endurance

Optimized magnetic circuits and materials reduce motor loss.

Ultra-Compact Structure

40–50% smaller than industry standards, ideal for high-density layouts.

Easy Integration

Flexible installation and seamless compatibility with mechanical systems.

Ultra-Low Temperature Rise

20% reduction in motor loss through optimized magnetic design.

Ultra-Low Inertia

Lightweight design and composite materials enable rapid dynamic response for frequent start-stop scenarios.



Advantages



Superior Power

- Leading torque, power density, and cogging torque performance.

Flexible Integration

- Adjustable interfaces with optional Hall, temperature, and winding sensors.

Global Service

- Digital manufacturing, global distribution, and rapid local support.

Reliability

- Fully automated production ensures consistent quality.

Excellent Thermal Control

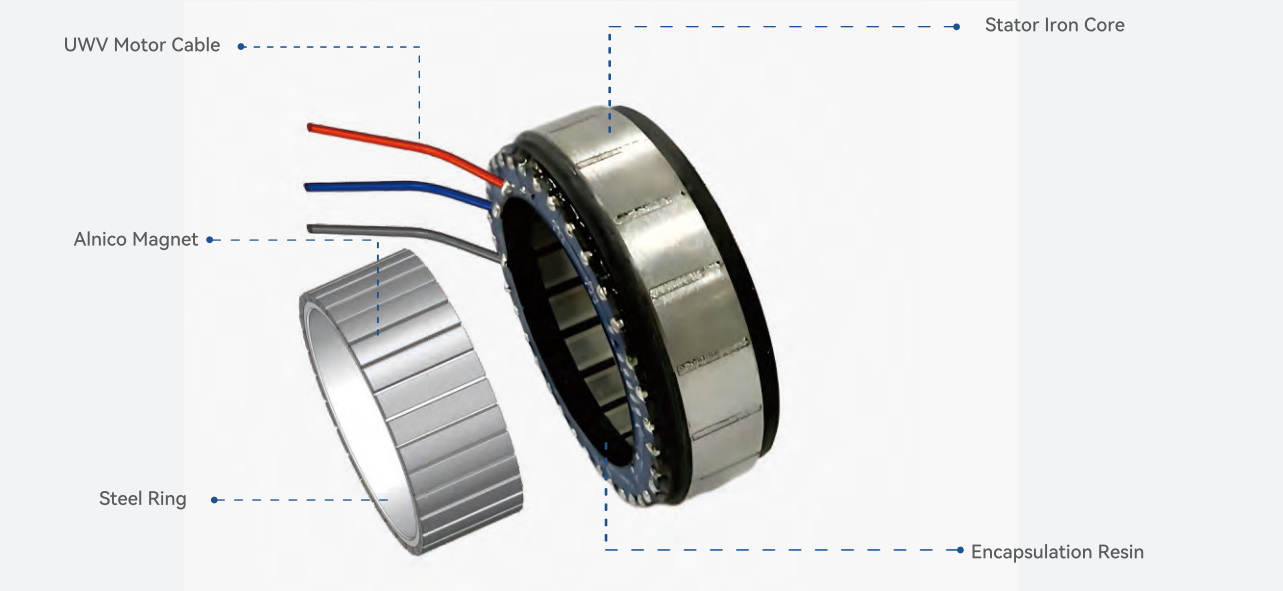
- Digital manufacturing, global distribution, and rapid local support.

Selection Guide

Motor Series	Model	Rated Torque (N·m)	No-load speed (rpm)	Rated current (A)	Rated voltage range (VDC)	Rated Power (W)
Ultra High Density FM2	FM2-05008...	0.36	6300	4.40	24-70	207
	FM2-05014...	0.60	3900	4.60	24-70	211
	FM2-06008...	0.48	6500	6.6	24-70	251
	FM2-06011...	0.65	5000	6.5	24-70	259
	FM2-06026...	1.4	4000	11.3	24-70	440
	FM2-07010...	0.70	3110	4.40	24-70	183
	FM2-07018...	1.4	4000	11.1	24-70	440
	FM2-08513...	1.8	3000	11.0	24-70	471
	FM2-08523...	2.86	3500	21.2	24-70	1048
	FM2-09408...	1.58	4000	14.6	24-70	579
	FM2-09413...	2.1	3500	14.9	24-70	660
	FM2-09416...	2.8	3500	21.2	24-70	880
	FM2-09426...	4	2650	22.9	24-70	838
	FM2-12718...	3.6	3000	23.2	24-70	905
	FM2-12725...	6.4	2900	36.9	24-70	1608

Note: Hall, Temperature Sensors and Outlet Forms are optional.

Structure



Ultra-High-Density

FM2 Series

FM2-05008	φ50mm * 18.95mm	0.36Nm
FM2-05014	φ50mm * 24.9mm	0.60Nm
FM2-06008	φ60mm * 19.05mm	0.48Nm
FM2-06011	φ60mm * 22.05mm	0.65Nm
FM2-06026	φ60mm * 37.45mm	1.40Nm
FM2-07010	φ70mm * 22.55mm	0.70Nm
FM2-07018	φ70mm * 30.6mm	1.40Nm
FM2-08513	φ85mm * 27.7mm	1.80Nm
FM2-08523	φ85mm * 37.5mm	2.86Nm
FM2-09408	φ94mm * 22.25mm	1.58Nm
FM2-09413	φ94mm * 26.65mm	2.1Nm
FM2-09416	φ94mm * 30.45mm	2.8Nm
FM2-09426	φ94mm * 40mm	4.0Nm
FM2-12718	φ127mm * 31.85mm	3.6Nm
FM2-12725	φ127mm * 40mm	6.4Nm

Six Diameters

φ50mm~φ127mm

Rated Speed

1800rpm~5500rpm

Torque Range

0.36Nm~6.40Nm

Power Range

207W~608W

Rated Voltage

24V~70V



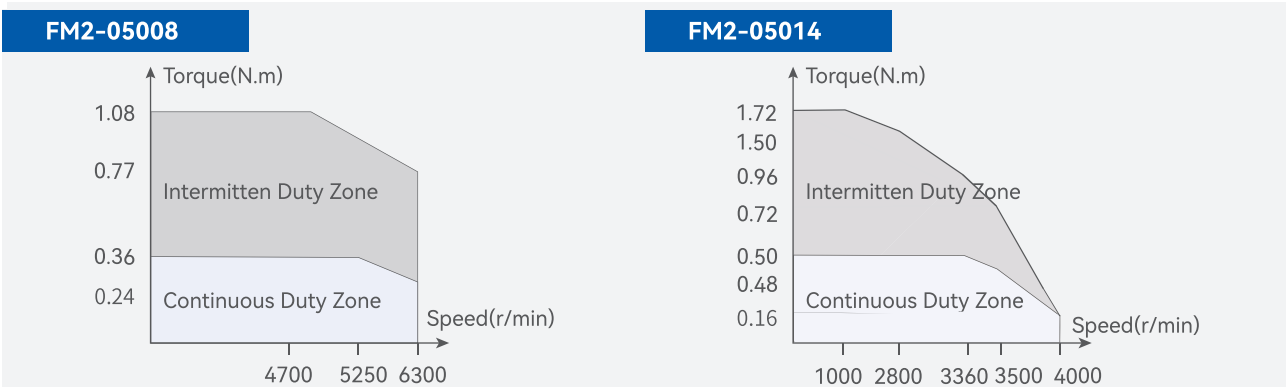
Hall and temperature sensors are available as options for the entire range.

FM2-050XX

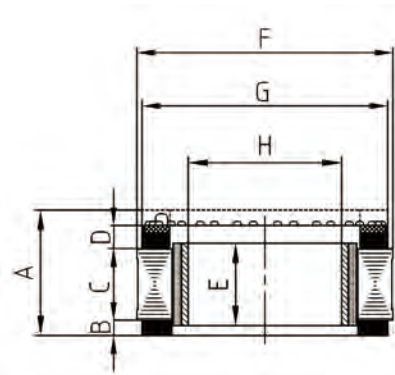


Product Specification	Rated Power (w)	Rated Voltage (VDC)	Rated Current (A)	Rated Torque (Nm)	Maximum Torque (Nm)	Rated Speed (rpm)	Voltage Constant (V/krpm)	Torque Constant (Nm/A)	Inertia (kgm ² *10 ⁻⁴)	Weight (kg)
08	207	48	4.40	0.36	1.08	5500	5.30	0.087	0.057	0.089
14	211	48	4.60	0.60	1.80	3360	8.5	0.141	0.083	0.141

Rotational Speed-Torque Characteristics



Dimensions



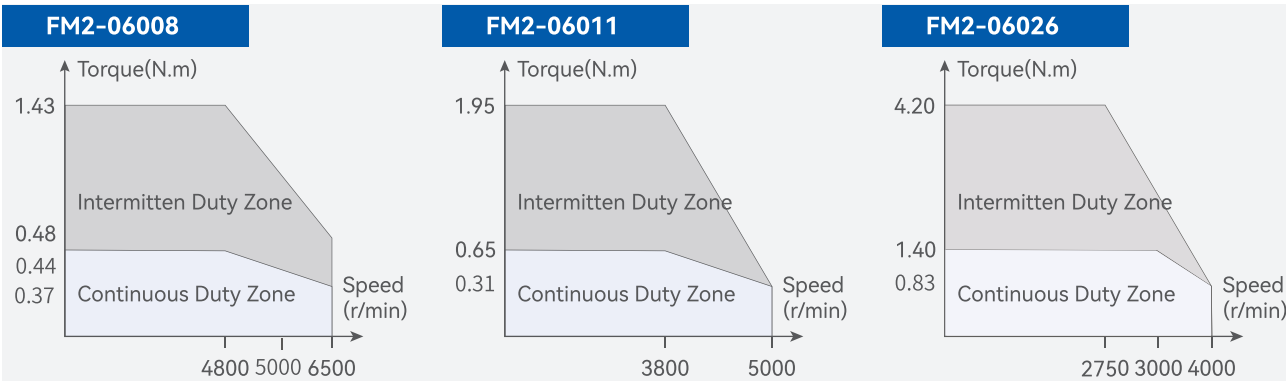
Size (mm)	08	14
A	17.3	23.3
B	3.3	3.3
C	8.00	14
D	4.8	4.8
E	9.9	16.1
F	50	50
G	48.4	48.4
H	30	30

FM2-060XX

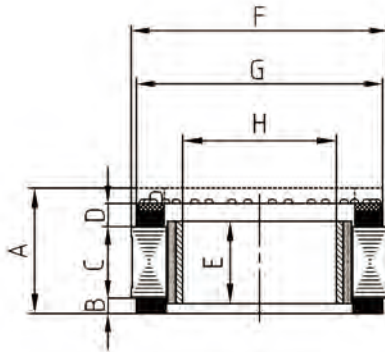


Product Specification	Rated Power (w)	Rated Voltage (VDC)	Rated Current (A)	Rated Torque (Nm)	Maximum Torque (Nm)	Rated Speed (rpm)	Voltage Constant (V/krpm)	Torque Constant (Nm/A)	Inertia (kgm ² *10 ⁻⁴)	Weight (kg)
08	251	48	6.6	0.48	1.43	5000	4.8	0.076	0.12	0.135
11	259	48	6.5	0.65	1.95	3800	6.5	0.108	0.17	0.175
26	440	48	11.3	1.4	4.2	3000	7.8	0.130	0.47	0.345

Rotational Speed-Torque Characteristics



Dimensions



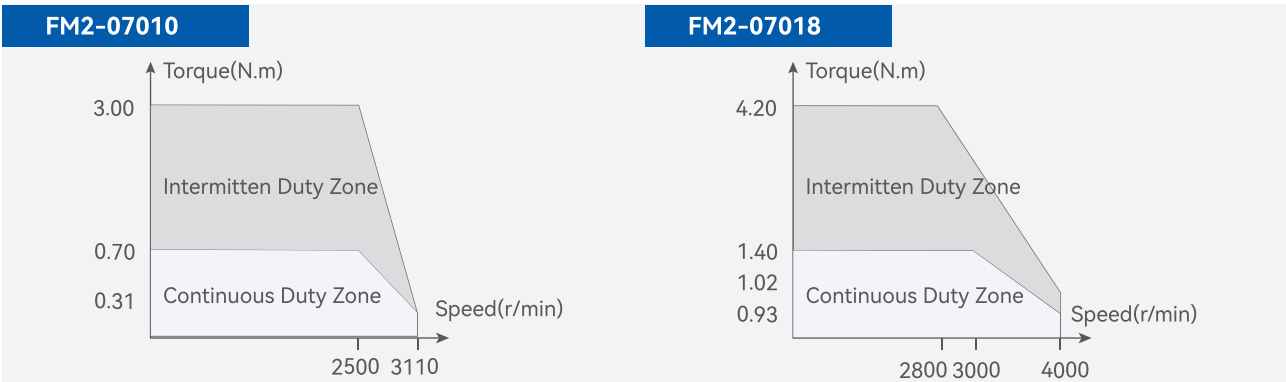
Size (mm)	08	11	26
A	19.05	22.05	37.45
B	3.4	3.4	3.4
C	8.2	11.2	26.2
D	5	5	5
E	10.2	14.7	28.3
F	60	60	60
G	58	58	58
H	36	36	36

FM2-070XX

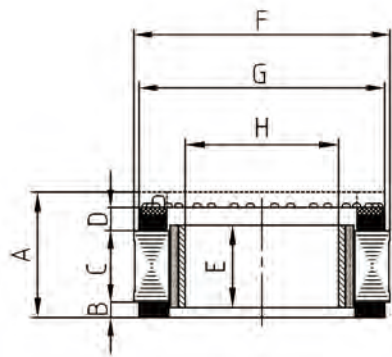


Product Specification	Rated Power (w)	Rated Voltage (VDC)	Rated Current (A)	Rated Torque (Nm)	Maximum Torque (Nm)	Rated Speed (rpm)	Voltage Constant (V/krpm)	Torque Constant (Nm/A)	Inertia (kgm ² *10 ⁻⁴)	Weight (kg)
10	183	48	4.40	0.70	3.00	2500	10.7	0.177	0.221	0.210
18	440	48	11.1	1.4	4.20	3000	8.10	0.135	0.389	0.332

Rotational Speed-Torque Characteristics



Dimensions



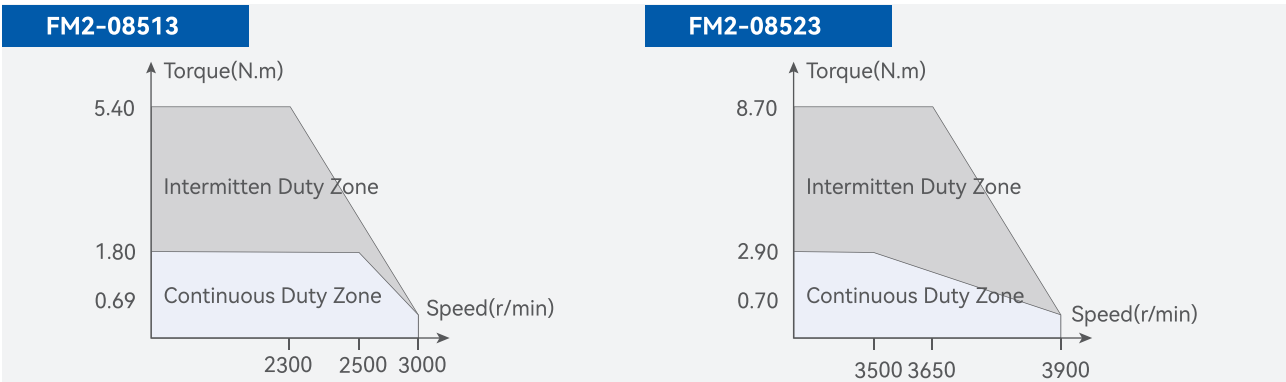
Size (mm)	10	18
A	21.50	29.5
B	4.0	4.0
C	10	18
D	6.1	6.1
E	12.7	20.7
F	69	69
G	66.2	66.2
H	42	42

FM2-085XX

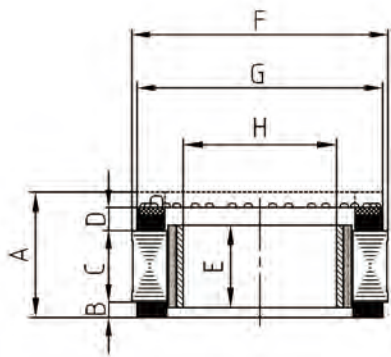


Product Specification	Rated Power (w)	Rated Voltage (VDC)	Rated Current (A)	Rated Torque (Nm)	Maximum Torque (Nm)	Rated Speed (rpm)	Voltage Constant (V/krpm)	Torque Constant (Nm/A)	Inertia (kgm ² *10 ⁻⁴)	Weight (kg)
13	471	48	11.0	1.8	5.4	2500	10.8	0.179	0.606	0.326
23	1063	48	22.3	2.9	8.7	3500	8.40	0.139	1.263	0.629

Rotational Speed-Torque Characteristics



Dimensions



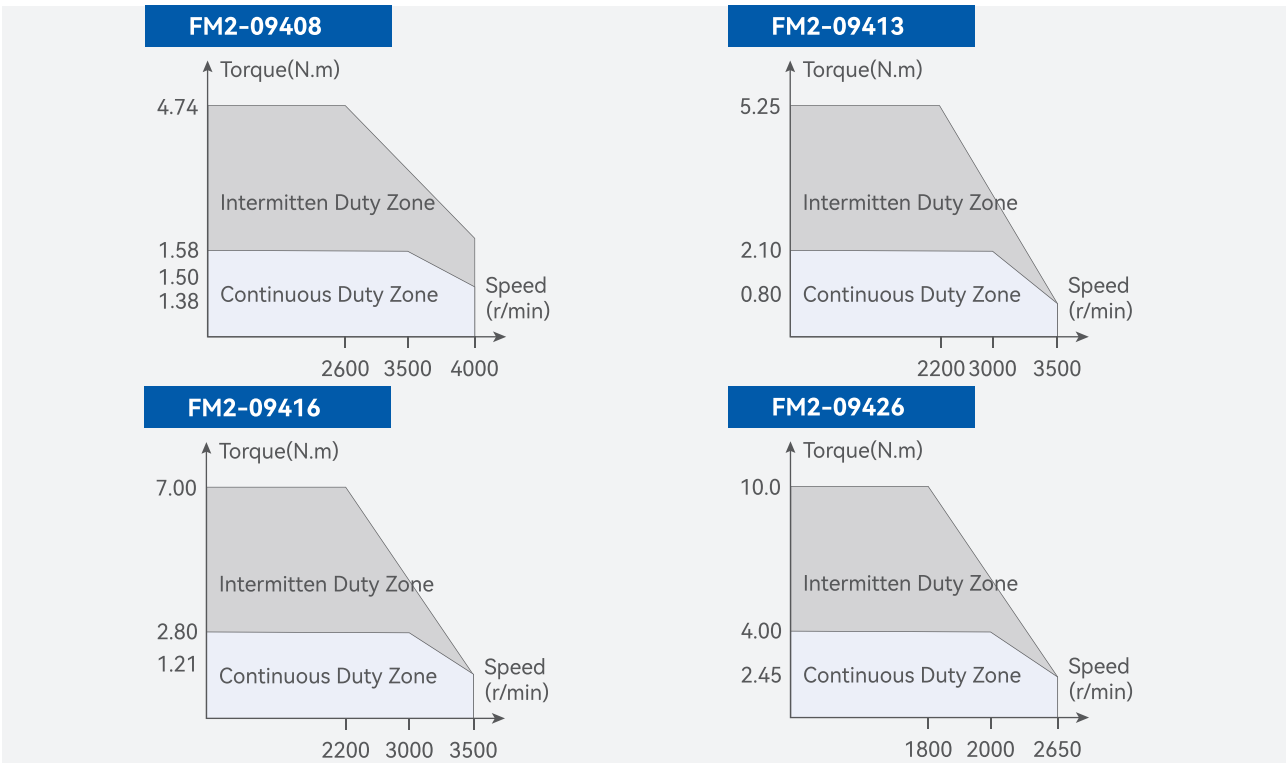
Size (mm)	13	23
A	23.5	33.5
B	4.0	4.0
C	13	23
D	5.2	5.2
E	13.5	23.5
F	85	85
G	82.6	82.6
H	58.5	58.5

FM2-094XX

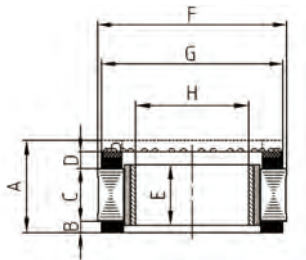


Product Specification	Rated Power (w)	Rated Voltage (VDC)	Rated Current (A)	Rated Torque (Nm)	Maximum Torque (Nm)	Rated Speed (rpm)	Voltage Constant (V/krpm)	Torque Constant (Nm/A)	Inertia (kgm ² *10 ⁻⁴)	Weight (kg)
08	579	48	13.6	1.58	3.96	3500	7.5	0.124	0.68	0.44
13	660	48	14.9	2.1	5.25	3000	9	0.149	0.98	0.58
16	880	48	21.2	2.8	7	3000	8.9	0.147	1.3	0.72
26	838	48	22.9	4	10	2000	11.4	0.189	1.89	1.13

Rotational Speed-Torque Characteristics



Dimensions



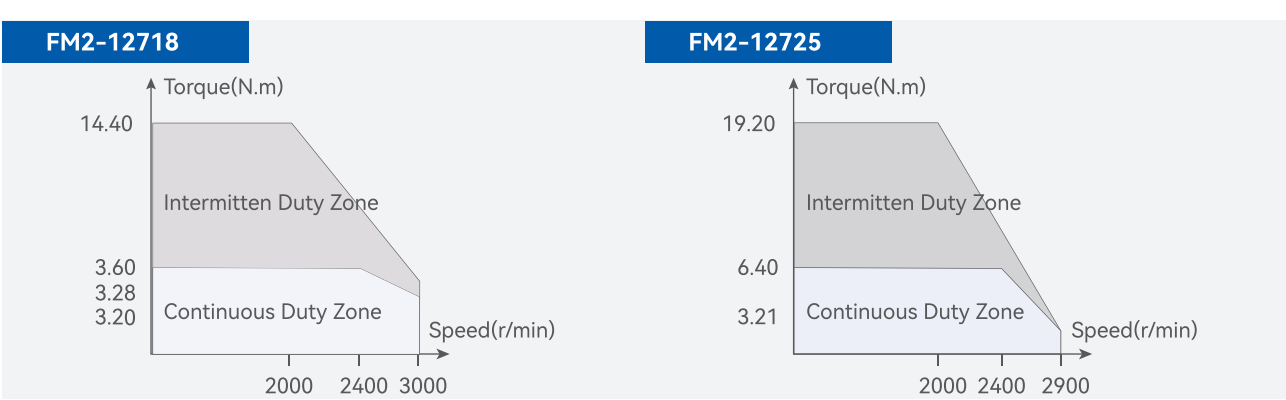
Size (mm)	08	13	16	26
A	22.25	26.65	30.45	40
B	4.7	4.7	4.7	4.7
C	8.2	12.6	16.4	26
D	6.3	6.3	6.3	6.3
E	10.2	14.7	18.4	28.3
F	94	94	94	94
G	91	91	91	91
H	47	47	44.5	47

FM2-127XX

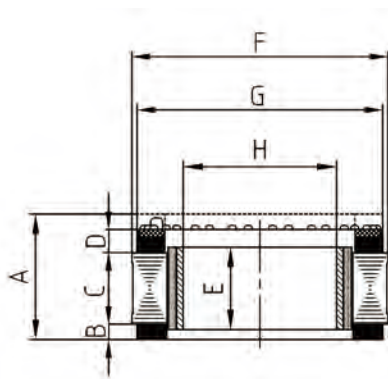


Product Specification	Rated Power (w)	Rated Voltage (VDC)	Rated Current (A)	Rated Torque (Nm)	Maximum Torque (Nm)	Rated Speed (rpm)	Voltage Constant (V/krpm)	Torque Constant (Nm/A)	Inertia (kgm ² *10 ⁻⁴)	Weight (kg)
18	905	48	23.2	3.6	14.4	2400	10.4	0.172	5.3	1.07
25	1608	48	36.9	6.4	19.2	2400	11	0.182	7.4	1.42

Rotational Speed-Torque Characteristics



Dimensions



Size (mm)	18	25
A	31.85	40
B	4.8	4.8
C	18	25
D	6.4	6.4
E	20	28
F	127	127
G	124	124
H	82	82

Selection Guide

Motor Series	Model	Rated Torque (mNm)	No-load speed (rpm)	Rated current (A)	Rated voltage range (VDC)	Rated Power (W)
Exceptionally Cost-Effective FM1	FM1-05008...	0.3	6500	6.60	24-70	165
	FM1-05014...	0.5	5000	6.56	24-70	191
	FM1-07010...	0.62	5000	6.67	24-70	237
	FM1-07018...	1.22	4800	13.3	24-70	256
	FM1-08513...	1.41	4000	12.4	24-70	458
	FM1-08523...	2.51	4000	21.2	24-70	920
	FM1-11525...	3.2	2000	15.5	24-70	603
	FM1-11550...	9.51	1500	32.2	24-70	617

Note: Hall, Temperature Sensors and Outlet Forms are optional.

FM1 Series

Exceptionally Cost-Effective Frameless Torque Motors

Engineered for high-performance and high-reliability applications, featuring an optimized multi-slot pole rotor design and advanced vacuum potting technology to ensure efficient and stable system operation. The product's technical standards align with the world's top frameless motor brands, offering advantages such as high torque density, low inertia, low temperature rise, and compact integration. This enables superior dynamic response and sustained output performance within limited space. The FM1 series provides four standard frame sizes: 50/70/85/115mm, and supports customized solutions to meet diverse requirements.



Collaborative Robots



Humanoid Robots



Industrial Robots



Quadruped Robots



Medical Rehabilitation Robots

Exceptionally Cost-Effective

FM1 Series

FM1-05008 $\phi 50\text{mm} * 18.95\text{mm}$ 0.3Nm

FM1-05014 $\phi 50\text{mm} * 24.9\text{mm}$ 0.5Nm

FM1-07010 $\phi 70\text{mm} * 22.55\text{mm}$ 0.62Nm

FM1-07018 $\phi 70\text{mm} * 30.6\text{mm}$ 1.22Nm

FM1-08513 $\phi 85\text{mm} * 27.7\text{mm}$ 1.41Nm

FM1-08523 $\phi 85\text{mm} * 37.5\text{mm}$ 2.51Nm

FM1-11525 $\phi 115\text{mm} * 40.7\text{mm}$ 3.20Nm

FM1-11550 $\phi 115\text{mm} * 67.2\text{mm}$ 9.51Nm

Four Diameters

$\phi 50\text{mm} \sim \phi 115\text{mm}$

Rated Speed

650rpm~5250rpm

Torque Range

0.3Nm~9.32Nm

Power Range

165W~920W

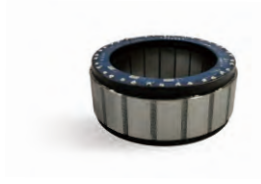
Rated Voltage

24V~70V

Hall and temperature sensors are available as options for the entire range.

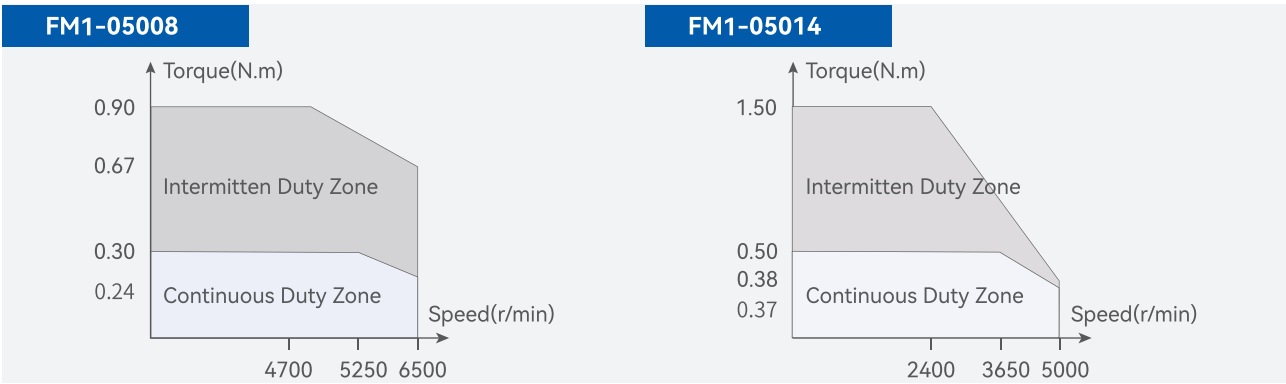


FM1-050XX

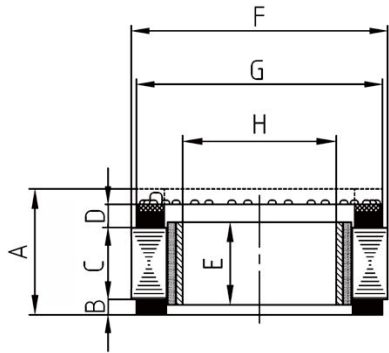


Product Specification	Rated Power (w)	Rated Voltage (VDC)	Rated Current (A)	Rated Torque (Nm)	Maximum Torque (Nm)	Rated Speed (rpm)	Voltage Constant (V/krpm)	Torque Constant (Nm/A)	Inertia (kgm ² *10 ⁻⁴)	Weight (kg)
08	165	48	6.60	0.3	0.9	5250	3.36	0.056	0.088	0.089
14	191	48	6.56	0.5	1.5	3650	5.51	0.091	0.12	0.139

Rotational Speed-Torque Characteristics

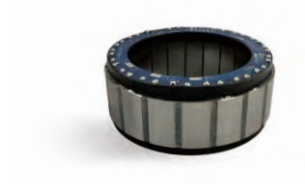


Dimensions



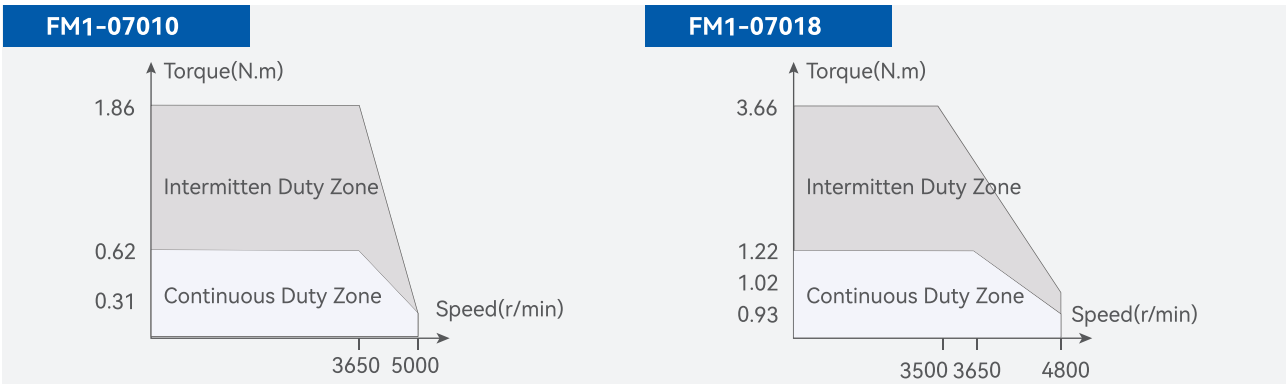
Size (mm)	08	14
A	18.95	24.9
B	3.2	3.2
C	8.05	14
D	4.5	4.5
E	9.9	16.1
F	50	50
G	48	48
H	30	30

FM1-070XX

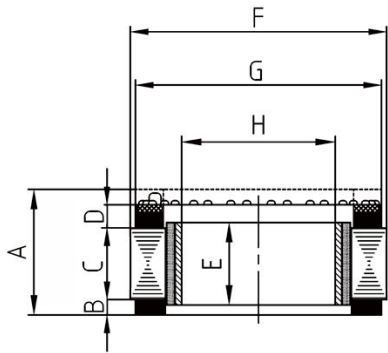


Product Specification	Rated Power (w)	Rated Voltage (VDC)	Rated Current (A)	Rated Torque (Nm)	Maximum Torque (Nm)	Rated Speed (rpm)	Voltage Constant (V/krpm)	Torque Constant (Nm/A)	Inertia (kgm ² *10 ⁻⁴)	Weight (kg)
10	237	48	6.67	0.62	1.86	3650	6.5	0.108	0.32	0.216
18	256	48	13.3	1.22	3.66	2000	6.45	0.107	0.49	0.332

Rotational Speed-Torque Characteristics

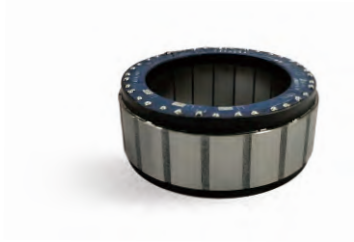


Dimensions



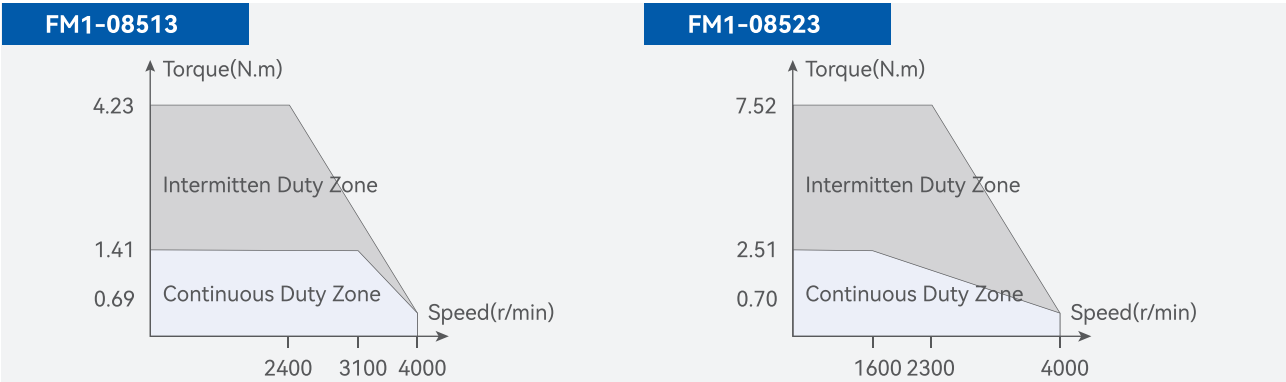
Size (mm)	10	18
A	22.55	30.6
B	3.8	3.8
C	10.15	18.0
D	5.1	5.1
E	12.7	20.7
F	69	69
G	66.4	66.4
H	42	42

FM1-085XX

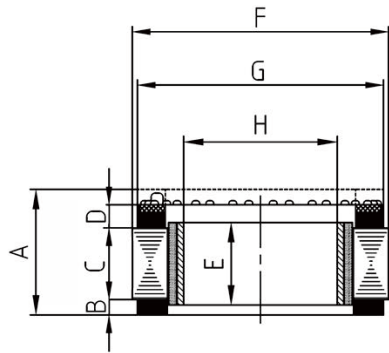


Product Specification	Rated Power (w)	Rated Voltage (VDC)	Rated Current (A)	Rated Torque (Nm)	Maximum Torque (Nm)	Rated Speed (rpm)	Voltage Constant (V/krpm)	Torque Constant (Nm/A)	Inertia (kgm ² *10 ⁻⁴)	Weight (kg)
13	458	48	12.4	1.41	4.23	3100	7.71	0.128	0.93	0.396
23	920	48	21.2	2.51	7.52	3500	8	0.132	1.4	0.629

Rotational Speed-Torque Characteristics

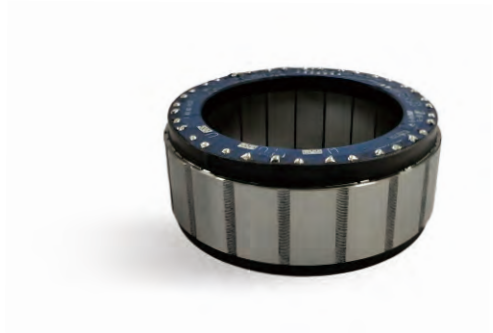


Dimensions



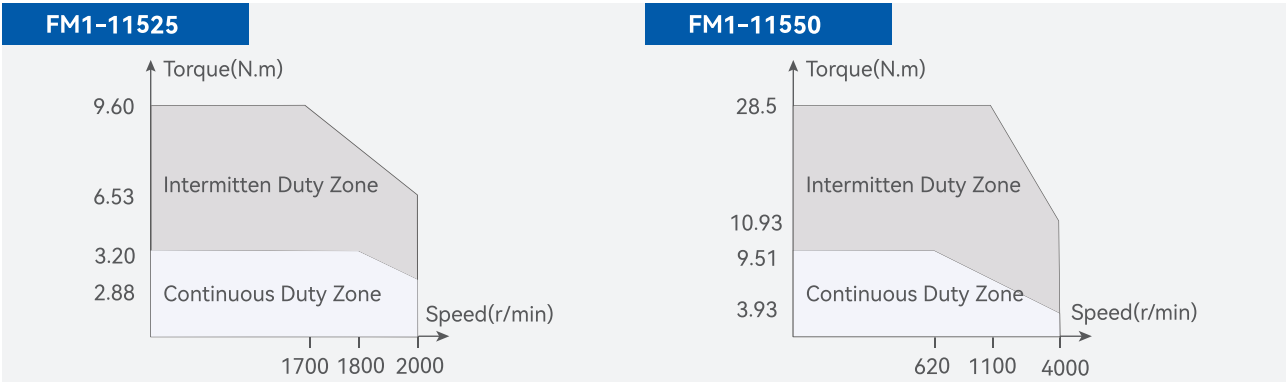
Size (mm)	13	23
A	27.7	37.5
B	4.8	4.8
C	13.3	23.1
D	5.7	5.7
E	15.7	25.1
F	85	85
G	83.4	83.4
H	52	52

FM1-115XX

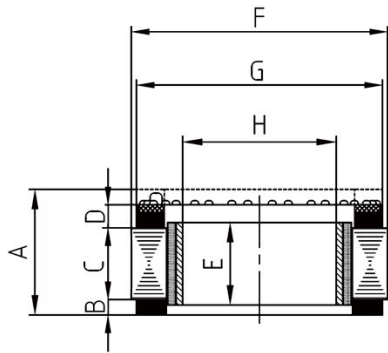


Product Specification	Rated Power (w)	Rated Voltage (VDC)	Rated Current (A)	Rated Torque (Nm)	Maximum Torque (Nm)	Rated Speed (rpm)	Voltage Constant (V/krpm)	Torque Constant (Nm/A)	Inertia (kgm ² *10 ⁻⁴)	Weight (kg)
25	603	48	15.5	3.2	9.6	1800	13.4	0.222	5.2	1.17
50	617	48	32.2	9.51	28.5	620	18.7	0.309	8.7	2.09

Rotational Speed-Torque Characteristics



Dimensions



Size (mm)	25	50
A	40.7	67.2
B	5.9	5.9
C	25.2	50.4
D	6.8	6.8
E	27.1	54.2
F	115	115
G	112	112
H	74	74

Compact and integrated, meeting the fundamental requirements for lightweight robots.



Stay Tuned

HJ1 Economy Series

- Slim and Lightweight: Integrated drive, harmonic reducer, and encoder for a more compact deployment .
- Flexible: Suitable for space-constrained end-execution structures .
- Worry-Free Choice: Proprietary FM motor balances quality and cost, simplifying selection with peace of mind .

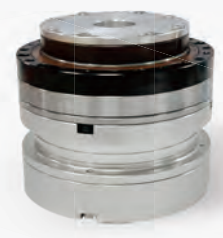
Collaborative Robots

Industrial Turntables

Machine Tools

Humanoid Robots

Comprehensive functionality, outstanding performance, efficient and convenient debugging.



HJ2 Standard Series

52/70/80/90/110 mm

- Hollow Design: Supports wire routing through the shaft, optimizing overall structure .
- Precision stability: High repeatability accuracy, suitable for complex joint motion control .
- High expandability: Supports multi-bus communication .

Collaborative Robots

Industrial Automation

Machine Tools

Humanoid Robots

High water and dust resistance, extended service life, versatile application scenarios, multi-bus and multi-certification support.



Stay Tuned

HJ3 Premium Series

- Ultimate integration: Embedded ring driver and high-precision magnetic ring encoder .
- Excellent dynamic response: Adaptable to frequent actions and complex posture switching requirements .

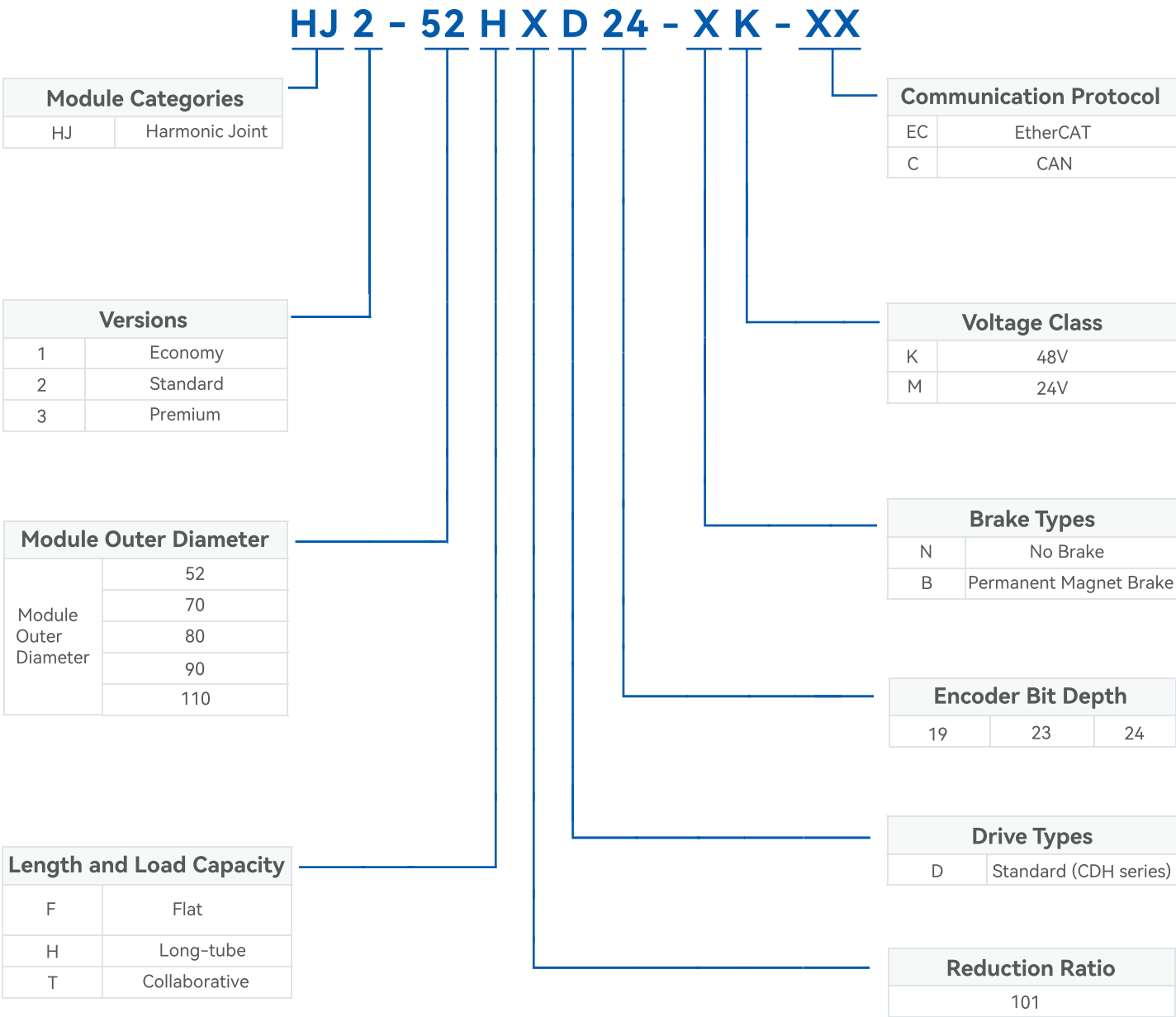
Collaborative Robots

Industrial Automation

Machine Tools

Humanoid Robots

Part Numbers





Note: "52, 70, 80, 90, 110" correspond to harmonic drive specifications.

Highlights

- Ultra-Slim Design**
Utilizes integrated construction to significantly reduce module size and weight, enabling lighter, more agile deployment.
- High Torque Density**
Delivers powerful torque within a compact footprint, meeting demanding dynamic response requirements under heavy loads.
- Precision Control**
Built-in high-accuracy encoders and optimized algorithms enable smoother humanoid motion control.
- High Integration**
Motor, driver, and encoder are encapsulated as a single unit, simplifying overall wiring and assembly.
- Energy-Efficient**
Low-power design extends operational endurance, ideal for extended runtime scenarios.
- Modular Compatibility**
Compatible with various humanoid structures, supporting rapid deployment and multi-joint expansion.

Advantages

HJ2 Series

Planetary Gear Actuators

Integrates high torque density, closed-loop precision control, modular design, and open protocol compatibility. Equipped with long-life harmonic drives for stable and efficient operation. Motor, reducer, and encoder are integrated for flexible motion control. Available in 52/70/80/90/110 mm sizes.



- High-Speed EtherCAT Bus**
Supports EtherCAT high-speed industrial bus for millisecond-level real-time control and multi-axis coordination, delivering faster system response.
- High Torque Density**
Optimized electromagnetic design and material selection deliver greater torque per unit volume, meeting high-performance application demands.
- Ultra-Thin Profile**
Ultra-slim form factor saves installation space, accommodates more compact equipment, and enables flexible integration.
- Lightweight Design**
Combines compact structure with high-strength lightweight materials to reduce overall weight, supporting machine lightweighting and energy optimization.
- Low Heat Generation, Extended Runtime**
Efficient energy conversion reduces system losses and temperature rise, enhancing operational stability and endurance.

- Collaborative Robots
- Humanoid Robots
- Industrial Turntables
- Industrial Robots
- Machine Tools
- Industrial Automation

Industrial Services



Robot Core Components

Frameless motors, drives,
hollow-shaft encoders



Joint Module Solutions &
Components



Customized Co-Development &
OEM Assembly

Selection Guide

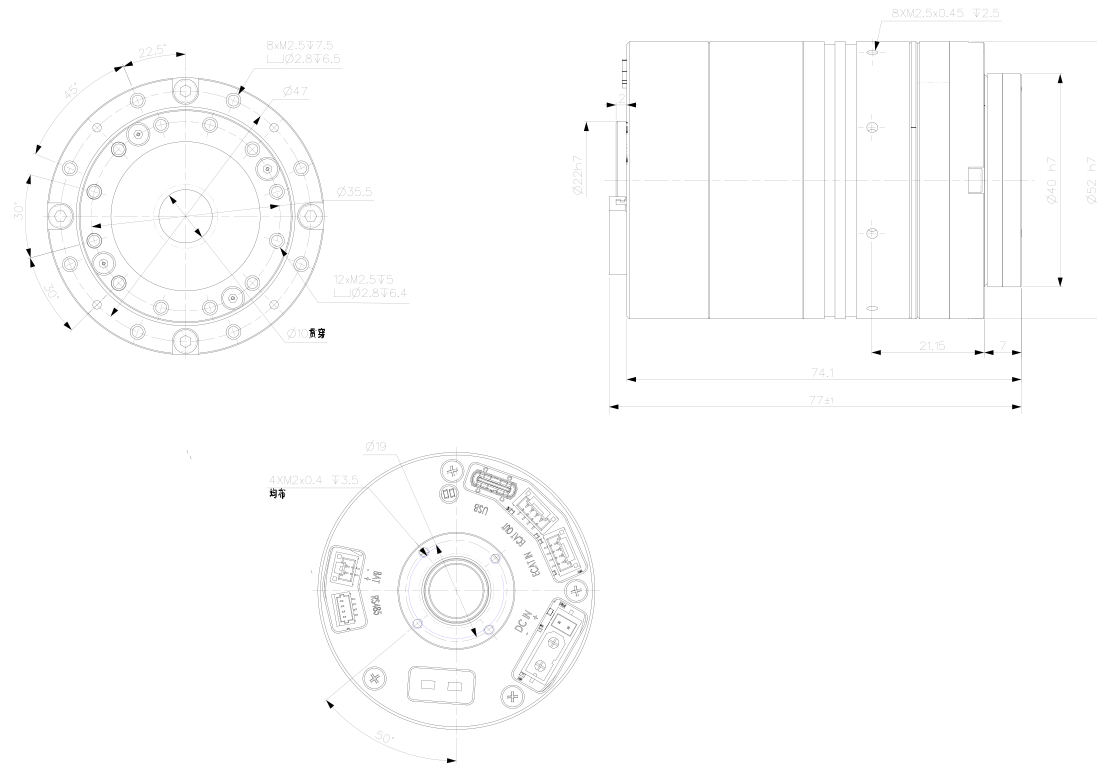
Series	Model	Gear Ratio	Peak Torque (N·m)	Max Allowable Torque At Average Load (N·m)	Rated Torque @2000rp (N·m)	Rated Speed With 1/2 Rated Torque (RPM)
HJ2	HJ2-52H101D24-XK-EC	101	11	8.9	5	37
	HJ2-70F101D24-XK-EC	101	34	13.5	9.6	52
	HJ2-80F101D24-XK-EC	101	66	49	30	36
	HJ2-90F101D24-XK-EC	101	102	61	50	36
	HJ2-110F101D24-XK-EC	101	194	133	84	31

HJ2-52H101D24-XK-EC



Ratio	Peak Torque (N·m)	Max Allowable Torque At Average Load (N·m)	Rated Torque @2000rp (N·m)	Peak Speed (RPM)	Rated Speed With 1/2 Rated Torque (RPM)	Backlash (arcsec)
101	11	8.9	5	50	37	≤ 10
Supply Voltage (VDC)	Max Current (A)	Rated Current (A)	Resistance (Ω)	Inductance (mH)	Pole-pairs	Torque Constant (N·m/A)
48	1.3	0.6	1.9	0.6	10	0.086
Encoder Resolution (bit)	Field Bus	Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)	Mass (g)	Inertia (g·cm ²)
24	EtherCAT	Ø52	Ø10	56.6	289.5	60

Dimensions



HJ2-70F101D24-XK-EC



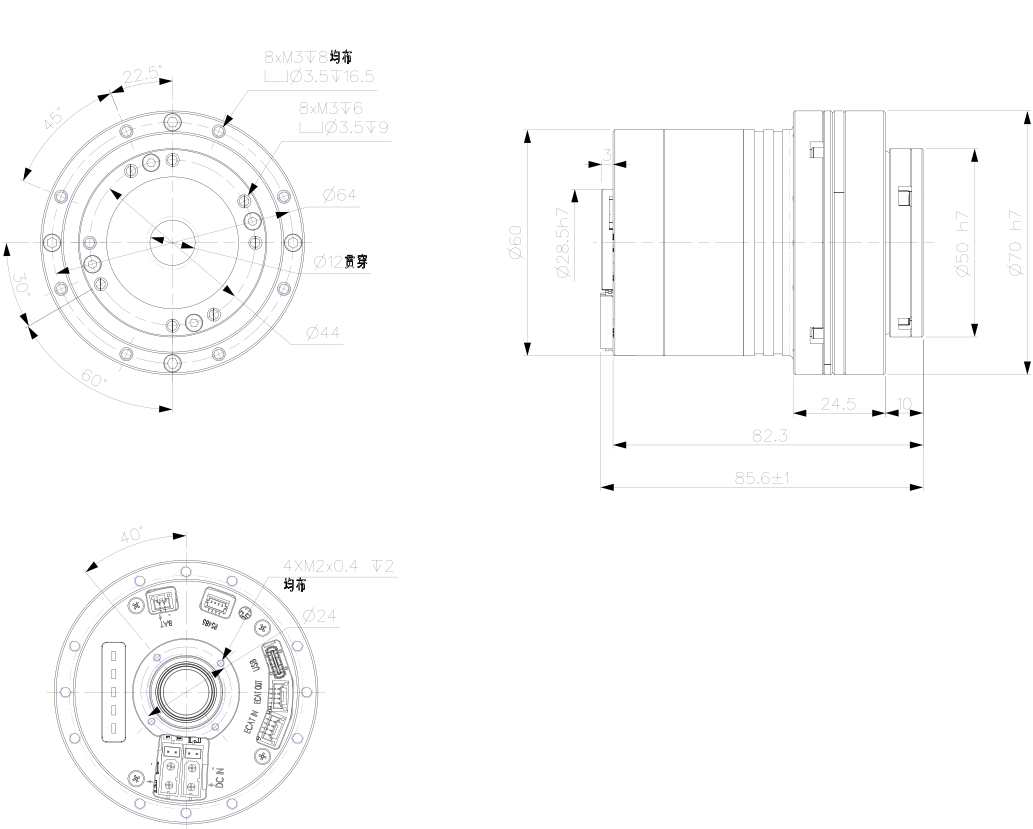
Ratio	Peak Torque (N·m)	Max Allowable Torque At Average Load (N·m)	Rated Torque @2000rp (N·m)	Peak Speed (RPM)	Rated Speed With 1/2 Rated Torque (RPM)	Backlash (arcsec)
101	34	13.5	9.6	64	52	≤ 10
Supply Voltage (VDC)	Max Current (A)	Rated Current (A)	Resistance (Ω)	Inductance (mH)	Pole-pairs	Torque Constant (N·m/A)
48	8.0	2.3	0.37	0.19	10	0.056
Encoder Resolution (bit)	Field Bus	Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)	Mass (g)	Inertia (g.cm ²)
24	EtherCAT	Ø70	Ø12	61.3	597.6	100

HJ2-80F101D24-XK-EC

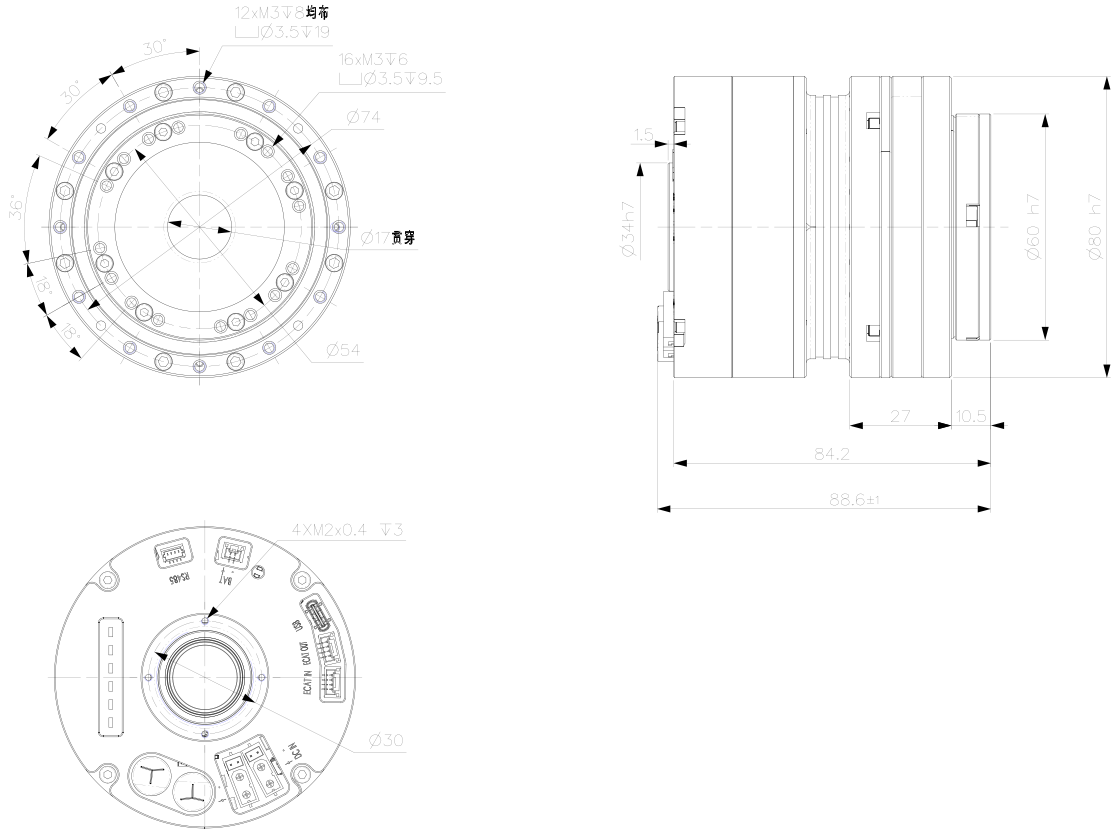


Ratio	Peak Torque (N·m)	Max Allowable Torque At Average Load (N·m)	Rated Torque @2000rp (N·m)	Peak Speed (RPM)	Rated Speed With 1/2 Rated Torque (RPM)	Backlash (arcsec)
101	66	49	30	48	36	≤ 10
Supply Voltage (VDC)	Max Current (A)	Rated Current (A)	Resistance (Ω)	Inductance (mH)	Pole-pairs	Torque Constant (N·m/A)
48	8.0	3.7	0.26	0.19	10	0.108
Encoder Resolution (bit)	Field Bus	Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)	Mass (g)	Inertia (g.cm ²)
24	EtherCAT	Ø80	Ø17	68.2	958.2	240

Dimensions



Dimensions



HJ2-90F101D24-XK-EC



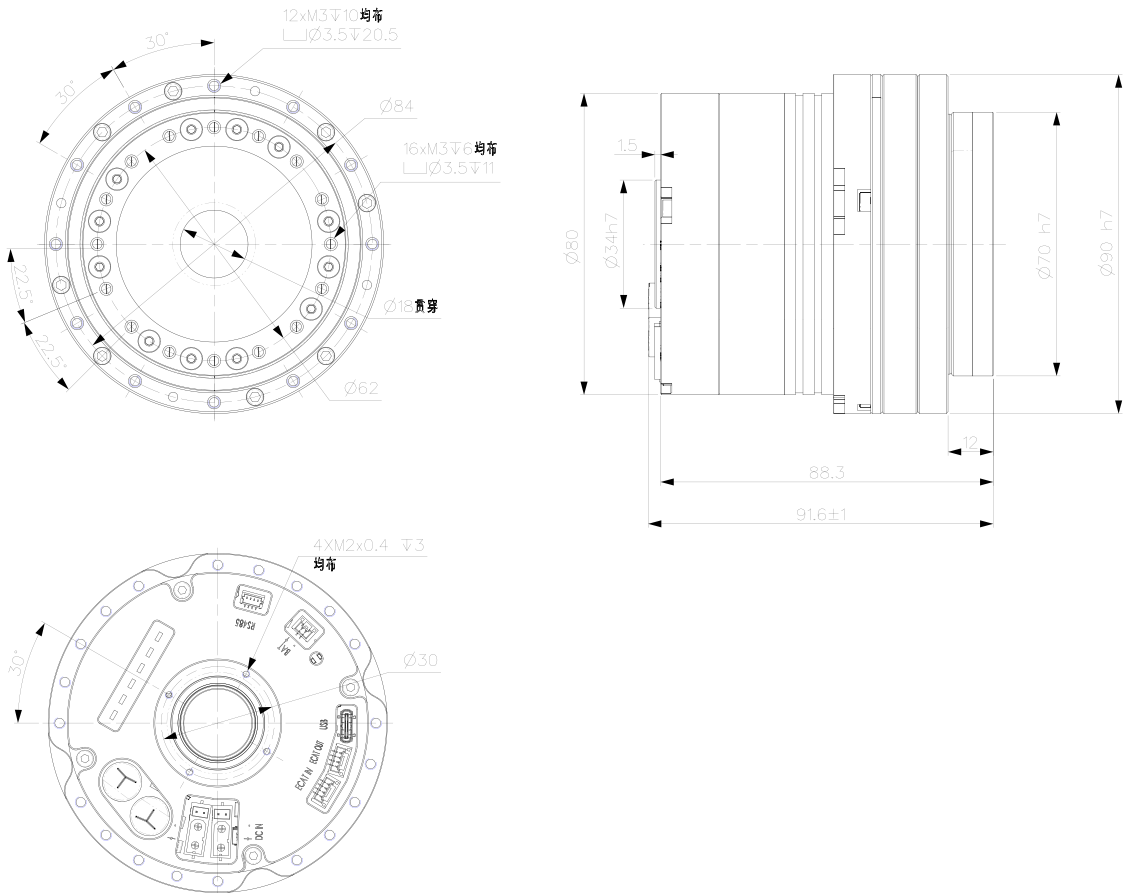
Ratio	Peak Torque (N·m)	Max Allowable Torque At Average Load (N·m)	Rated Torque @2000rp (N·m)	Peak Speed (RPM)	Rated Speed With 1/2 Rated Torque (RPM)	Backlash (arcsec)
101	102	61	50	50	36	≤ 10
Supply Voltage (VDC)	Max Current (A)	Rated Current (A)	Resistance (Ω)	Inductance (mH)	Pole-pairs	Torque Constant (N·m/A)
48	12.4	6.1	0.27	0.31	10	0.108
Encoder Resolution (bit)	Field Bus	Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)	Mass (g)	Inertia (g.cm ²)
24	EtherCAT	Ø90	Ø18	71.2	1229.4	370

HJ2-110F101D24-XK-EC

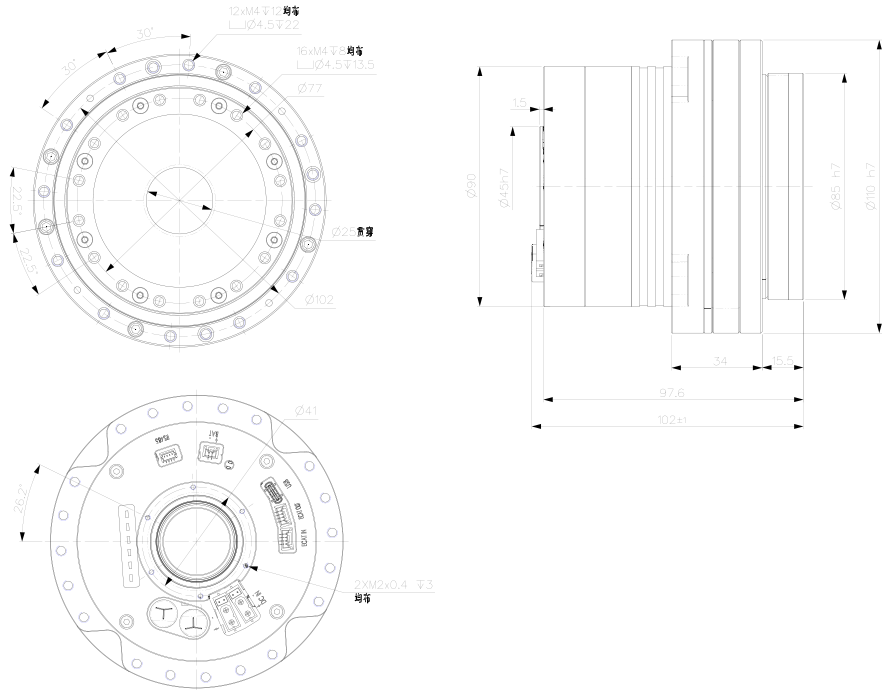


Ratio	Peak Torque (N·m)	Max Allowable Torque At Average Load (N·m)	Rated Torque @2000rp (N·m)	Peak Speed (RPM)	Rated Speed With 1/2 Rated Torque (RPM)	Backlash (arcsec)
101	194	133	84	40	31	≤ 10
Supply Voltage (VDC)	Max Current (A)	Rated Current (A)	Resistance (Ω)	Inductance (mH)	Pole-pairs	Torque Constant (N·m/A)
48	19.9	8.6	0.13	0.22	10	0.128
Encoder Resolution (bit)	Field Bus	Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)	Mass (g)	Inertia (g.cm ²)
24	EtherCAT	Ø110	Ø25	80.2	1981.2	1010

Dimensions



Dimensions



Stable and durable, rapidly adapts to basic humanoid robot motion patterns.



Stay Tuned

PJ1 Economy Series

- High Integration: Delivers excellent output stability and longevity.
- High Rigidity: Ideal for simple tasks and commercial applications.
- Quality and Value: Proprietary FM frameless motors enable customers to achieve stable performance within a reasonable budget.

Collaborative Robots

Industrial Turntables

Machine Tools

Humanoid Robots

Rapid adaptation to basic humanoid robot motion solutions, balancing precision and load capacity.



Stay Tuned

PJ2 Standard Series

- High Torque: Optimized gearbox structure delivers high output with low-noise operation.
- High Precision: Enhanced positioning control for medium-speed, high-stability applications.
- Multi-Interface Compatibility: Supports diverse communication protocols and mechanical mounting options.

Collaborative Robots

Industrial Automation

Machine Tools

Humanoid Robots

Designed for long-cycle, high-intensity operational demands.



PJ3 Premium Series

58/60/75/75C/96B/96C/115mm

- High Torque Output: Suited for heavy-duty tasks like material handling.
- Vibration Damping & Noise Reduction: Utilizes GaN materials to enhance overall operational stability and comfort.
- Intelligent Monitoring Expansion Port: Supports real-time monitoring of parameters like temperature rise.

Collaborative Robots

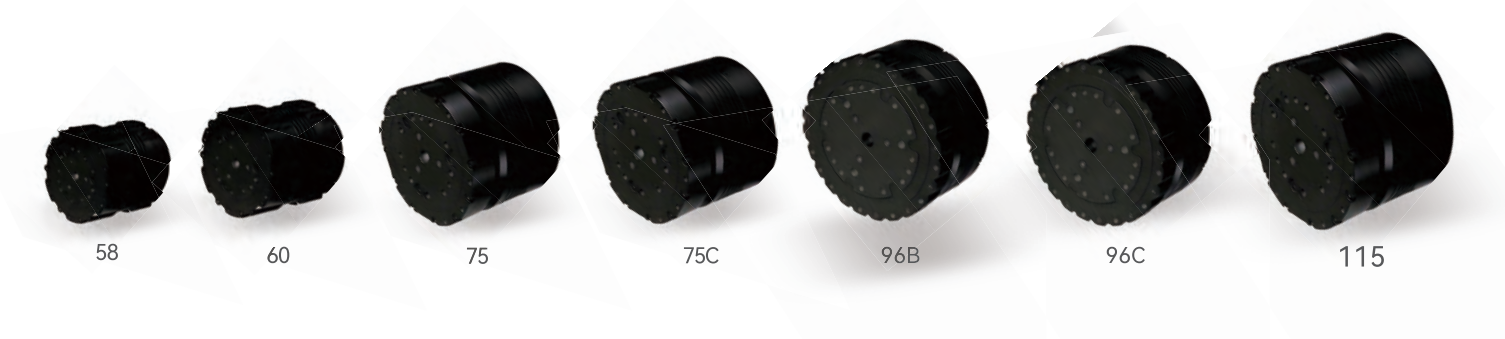
Industrial Automation

Machine Tools

Humanoid Robots

PJ3 Series

Harmonic Gear Actuators



Note: “58, 60, 75, 75C, 96B, 96C, 115” correspond to harmonic drive specifications.

■ PJ3-58HXD17-NK-C

Rated Torque (N·m)	Peak Torque (N·m)	Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)
8.37	30	58	4.5	61

■ PJ3-60HXD17-NK-C

Rated Torque (N·m)	Peak Torque (N·m)	Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)
8.835	36	60	4.5	61

■ PJ3-75HXD17-NK-C

Rated Torque (N·m)	Peak Torque (N·m)	Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)
13.183	60	75	4.5	61

■ PJ3-75CHXD17-NK-C

Rated Torque (N·m)	Peak Torque (N·m)	Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)
18.832	90	75	4.5	67

■ PJ3-96BHXD17-NK-C

Rated Torque (N·m)	Peak Torque (N·m)	Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)
36.828	139	96	4.5	61

■ PJ3-96CHXD17-NK-C

Rated Torque (N·m)	Peak Torque (N·m)	Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)
49.104	220	96	7	70

■ PJ3-115HXD17-NK-C

Rated Torque (N·m)	Peak Torque (N·m)	Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)
87.978	360	115	8	61

Mounting and Installation Guide

HOUSING MATERIAL SELECTION

It is recommended that users adopt a non-magnetic metal housing and assemble the stator using bonding, thermal fitting, or axial fastening methods. Proper structural installation ensures optimal heat dissipation for the entire machine. Aluminum alloy is preferred due to its excellent thermal conductivity and strength-to-weight ratio. The recommended metal material is aluminum alloy. The use of carbon steel, cast iron, 400-series stainless steel alloys, and other ferromagnetic iron-containing metals is not recommended.

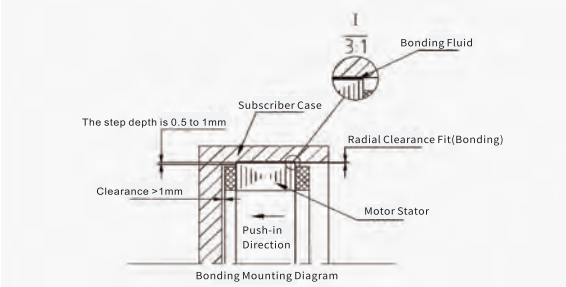
STATOR MOUNTING METHOD

Adhesive Mounting

It is recommended to install submenon using a relatively convenient installation method: **adhesive (usually anaerobic adhesive). However, it should be noted that different types of adhesive require different curing time. However, it should be noted that different types of adhesive require different curing time.**

If the adhesive method is used, the following recommendations should be made when designing the sub-case and installation work:

- Design the housing with a cylindrical cavity.
- Design a step for axial positioning at one end of the inner cavity of the sub-housing. The recommended radial depth of the step is 0.5mm to 1mm.
- The non-lead wire end of the terminal should be used as the axial positioning surface when assembling with the housing, and should be axially fitted with the positioning step inside the housing. The surface of the terminal's center edge should be in good contact with the surface of the step inside the housing, and the bottom surface of the housing should be kept at least 1mm from the surface of the terminal's potting surface to make sure that the terminal is installed in place. Please refer to the recommendations in the user's guide for the water of your choice from the water supplier and design the tolerance zone of the sub-housing in conjunction with the sizing tolerance of the sub-housing; radial sizing of the stator and the inner cavity of the sub-housing should be a clearance fit.
- Please refer to the recommendations in the user's guide for the water of your choice from the water supplier and design the tolerance zone of the sub-housing in conjunction with the sizing tolerance of the sub-housing; radial sizing of the stator and the inner cavity of the sub-housing should be a clearance fit.
- Before applying glue, be sure to clean the surfaces of the terminal and the inner cavity of the housing to ensure good adhesion;
- Apply an appropriate amount of glue evenly to the surface of terminal;
- If the water needs to be heated to cure, the curing temperature should be lower than 155°C to avoid damaging the terminal.



Heat Sleeve Mounting

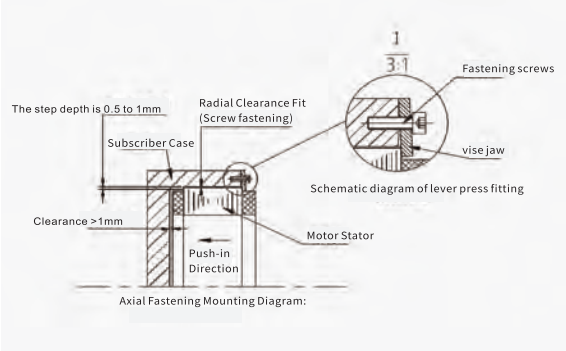
If you want to use the interference fit method of mounting, you can only use the hot sleeve technique to install the terminal, which is complicated. **The terminal itself is a stacked item, and cold press installation will damage the terminal.** To install the terminal by heat-sleeve method, the following recommendations should be made when designing the terminal housing and mounting technique:

- Design a stator housing with a cylindrical cavity.
- The radial fit between the stator and the housing cavity should be an interference fit, and the tolerance zone of the housing ID should be designed with reference to the required strength under actual working conditions and taking into account the effect of the coefficients of thermal expansion of different materials on the assembly to ensure the reliability of the assembly under different actual working conditions.

Axial Fastening Mounting

If the load torque is small and the customer needs to disassemble and reassemble the motor several times, the axial fastening method can be considered for mounting the terminal. However, **this mounting method is not recommended for mass production because of the risk of loosening of the fasteners, which can be amplified by the vibration caused by the motor during operation.** If the terminal is mounted using the axial fastening method, the following recommendations should be made when designing the terminal housing and mounting technique:

- Design the housing with a cylindrical cavity.
- A step for axial positioning should be designed at one end of the housing cavity. The recommended radial depth of the step is 0.5mm to 1mm;
- Use the non-lead wire end of the terminal as the axial positioning surface when assembling with the housing, and fit it axially with the positioning step of the housing cavity. The surface of the terminal's center edge should be in good contact with the surface of the step of the housing cavity, and the bottom surface of the housing should be kept at least 1mm clearance from the surface of the terminal's potting surface to make sure that the terminal is mounted in place.
- Press the center edge of the satellite on the other side with a pressure plate, and design the screw fastening according to the actual situation.
- The radial fit of the terminal to the inner cavity of the housing should be a sliding fit.



INSTALLATION METHOD OF ROTOR

The rotor part of a frameless motor assembly usually has the magnets uniformly attached to the outer diameter of a ring, and the customer uses the inner diameter of this ring for assembly. This ring is a common metal machined part, and the mounting method is not very specific, as it is usually either overcooled or glued, and the specific tolerance zone for the size of the assembly should be designed according to the mounting method used and the actual usage requirements.

IMPORTANT TIPS

The following principles should be followed during the installation of the terminal above:

It is recommended to use workmanship to ensure that the coaxiality of the terminal and the submarine are aligned with the same datum (the datum recommended is the bearing chamber);

Ensure that the centerline of the rotor magnet and the centerline of the stator core are aligned;

During the movement of the rotor to the terminal, as the rotor is a strong magnetic material and the terminal is a magnetically conductive material, proximity to each other creates a strong force of attraction. It is recommended that the customer design the rotor-to-station workpiece with a guide to avoid damage to the motor and injuries to the staff.



Headquarters **China Leadshine Technology Co., Ltd.**

☎ +86 755 26411692 📠 +86 755 26402718
🌐 www.leadshine.com
✉ sales@leadshine.com (Sales)
 tech@leadshine.com (Technical Support)
📍 15-20/F, Block B, Nanshan i-Valley, Shuguang Community,
 Xili Town, Nanshan District, Shenzhen 518055, China

North America Office **Leadshine America, Inc.**

☎ 1-949-608-7270 📠 1-949-638-7298
🌐 www.leadshineusa.com
✉ sales@leadshineusa.com (Sales)
 support@leadshineusa.com (Technical Support)
📍 26050 Towne Centre Dr.Foothill Ranch, CA 92610 USA



🔍 @Leadshine