

Laifual[®]



Rotary Actuator

Catalogue

Zhejiang Laifual Drive Co., Ltd.



About Laifual Drive

Zhejiang Laifual Drive Co., Ltd. (hereinafter Laifual) is a global provider of precision transmission solutions, with fully integrated R&D and manufacturing capabilities. We focus on three core business segments: harmonic reducers, joint modules, and precision components. Our product portfolio includes key components such as harmonic reducers, rotary actuators, and crossed roller bearings.

Laifual offers a complete range of harmonic reducers (sizes 3–58) and rotary actuators (sizes 40–170), backed by a fully integrated supply chain that spans raw materials to finished products. Our 48,000 m² state-of-the-art facility is equipped with imported production and testing equipment, and we enforce rigorous quality control at every stage.

Supported by multiple R&D centers and joint university laboratories, we continuously enhance technological independence and production efficiency, driving down costs and shortening lead times. Today, our products are widely applied in high-precision sectors, including humanoid and industrial robotics, aerospace, CNC machine tools, semiconductor equipment, and precision automation systems.

For more information, please visit our website:
www.laifualdrive.com

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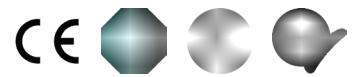
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EXTERNAL DRIVE ROTARY ACTUATORS

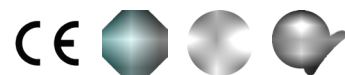
External Drive Rotary Actuator **AC Type**



		M80	M90	M110	M142	M170
Product Photos						
Harmonic Reduction Ratio		51/81/101/121				
Average Torque (N·m)		34-51	44-64	72-140	140-281	255-586
Maximum Torque (N·m)		91-112	127-191	242-395	497-892	892-1530
Weight (kg)		1.53	1.9	2.91	5.64	9.76
Length (mm)		91	95	100	125	149
Diameter (mm)		80	90	110	142	170
Brake		Optional Features: With or Without Brakes				
Communication Protocol						
Encoder Communication Interface		BISS-C/TAMAGAWA				
Encoder Resolution	Single-turn Encoder	17bit(131072 pulses/revolutions)				
	Multi-turn Encoder	16bit(-32768~32767 revolutions)				
Cable Outlet Type		Rear Exit or Side Exit				
Repeatability (Arc-sec)		20				
Positioning Accuracy (Arc-sec)		60				
Power Supply Voltage (V)		AC 220V				

BUILT-IN DRIVE ROTARY ACTUATORS

Built-in Drive Rotary Actuator **DC Type**



		L70I	L80I	L90I	L110I	L142I	L170I
Product Photos							
Harmonic Reduction Ratio		51/81/101	51/81/101/121				
Average Torque (N·m)		9-14	34-51	44-64	72-140	140-281	255-586
Maximum Torque (N·m)		46-70	91-112	127-191	242-395	497-892	892-1530
Weight (kg)		1.0	1.36	1.86	2.7	5.15	9.48
Length (mm)		75.2	81	88.9	80	97.5	134
Diameter (mm)		70	80	90	110	142	170
Brake		Optional Features: With or Without Brakes					
Bus Communication Protocol		  					
Encoder Resolution	Single-turn Encoder	17bit(131072 pulses/revolutions)					
	Multi-turn Encoder	16bit(-32768~32767 revolutions)					
Repeatability (Arc-sec)		20					
Positioning Accuracy (Arc-sec)		60					
Power Supply Voltage (V)		DC 48V					

ALL-IN-ONE

SELF-DEVELOPED & SELF-MANUFACTURED

Precision Harmonic Drive

- High precision
- Zero backlash
- Large hollow for cable routing
- Long life, high precision

Motor

- AC 220V ($\pm 10\%$)
- DC 48V ($\pm 10\%$)

Output Bearing

- Crossed roller bearing
- High torque, high load capacity

Brake

- Without brake
- With brake (customizable without changing structure)

Cable Outlet

- Rear exit
- Side exit

Encoder

- Absolute encoder (17bit)
- Multiple rotation backups (16bit)

Drive

- Open position and speed loops
- Supporting multiple communication protocols: CANopen, EtherCAT (available on DC model only)

Environmental Specifications

- Protection level IP54, support up to IP67 customization

Operating Temperature:

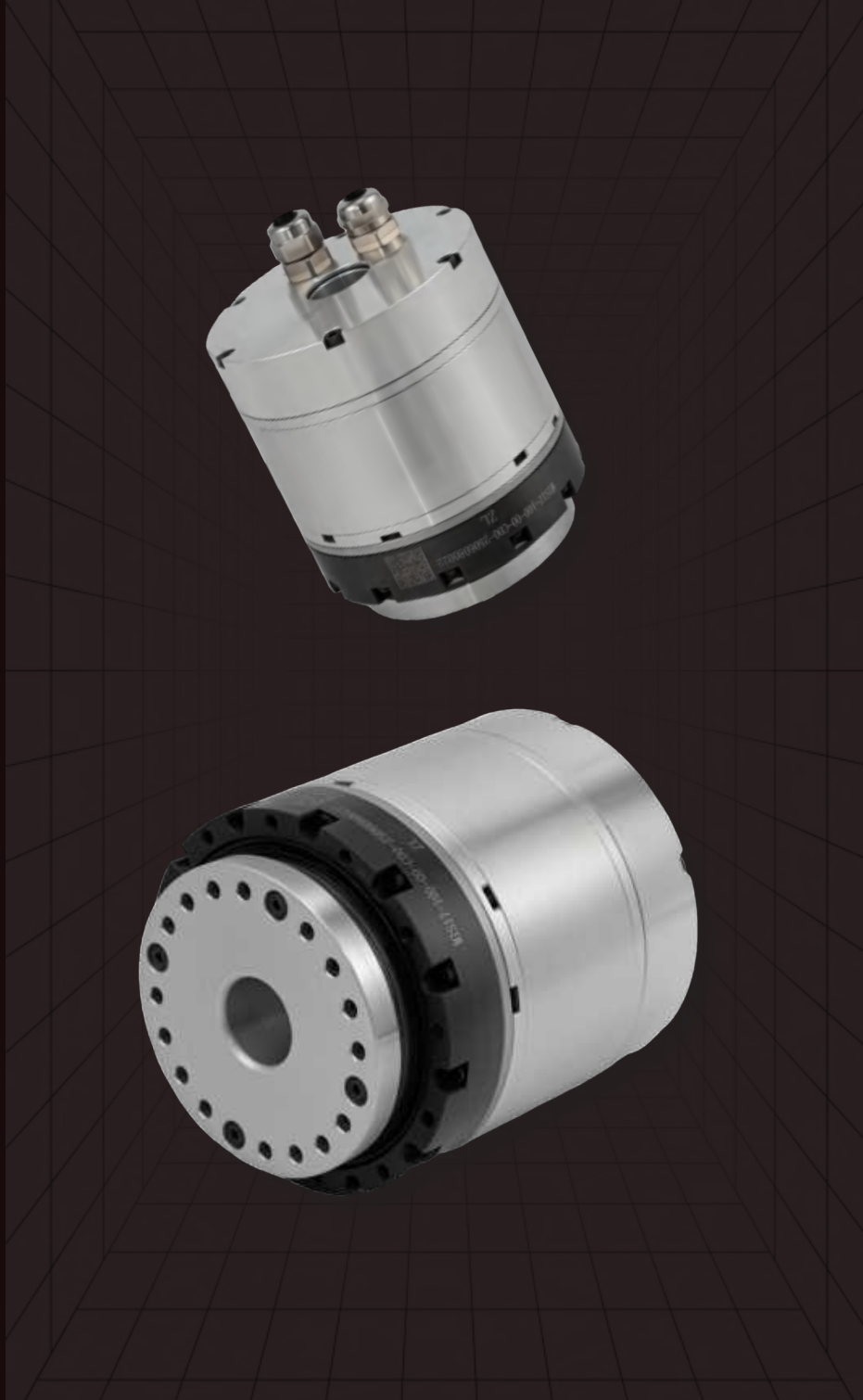
- 10~55 °C (Normal temperature grease)
- 30~55 °C (Low temperature grease)

Standard Optional

T-type Rotary Actuators:

- Compact design, superior performance
- Small size, high torque
- Bring smoother, more precise, and more powerful performance to joint movements.





External Drive Rotary Actuator AC Type

External Drive Rotary Actuator AC Type

Introduction

External Drive Rotary Actuators feature a compact size, high precision, and ample hollow space, simplifying selection, design, and manufacturing for clients. The series includes the basic model with a standard medium hole, single encoder, and no brake, and the standard model with an extra-large medium hole, dual encoders, and a brake. These actuators support BISS-C and TAMAGAWA communication protocols.

Naming Rules

M · 70 · B · 080 · B · F · XXXX



① Type of Rotary Actuator

M: External Drive Rotary Actuator AC Type

② Mounting Outer Diameter

I Series	70: 70mm	80: 80mm	90: 90mm
	110: 110mm	142: 142mm	170: 170mm

③ Communication Protocol

B: BISS-C Protocol
D: TAMAGAWA Protocol

④ Reduction Ratio

030: 31:1	050: 51:1	080: 81:1
100: 101:1	120: 121:1	160: 161:1

⑤ With or Without Brake

B: With Brake
F: Without Brake

⑥ Wiring Method

F: Rear Outlet
S: Side Outlet

⑦ Client Code and Serial Number

XXXX: Customised Products Only

Joints and Components

Product Order Number	Encoder Order Number	Brake Order Number	Motor Order Number
M80D	EM-80D-A	BM-80	MM-80
M80B			
M90D	EM-90D-A	BM-90	MM-90
M90B			
M110D	EM-110D-A	BM-110	MM-110
M110B			
M142D	EM-142D-A	BM-142	MM-142
M142B			
M170D	EM-170D-A	BM-170	MM-170
M170B			

M80D / M80B

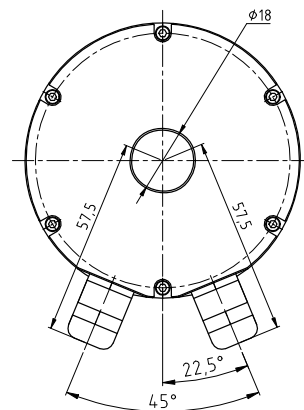
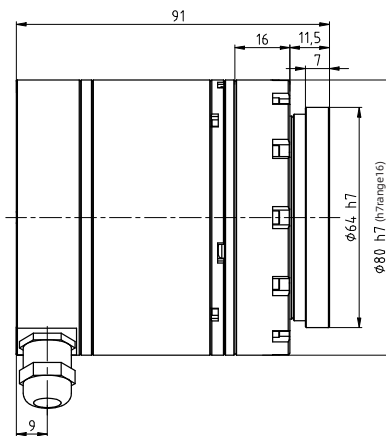
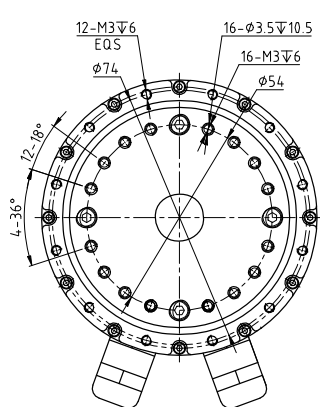
(Encoder: EM-80D-A Brake: BM-80-A Motor: MM-80-A)

Specification

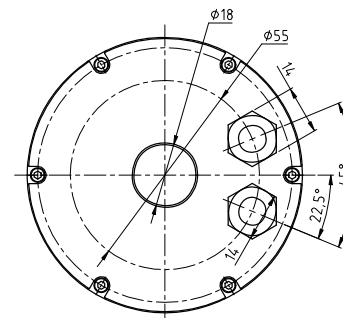
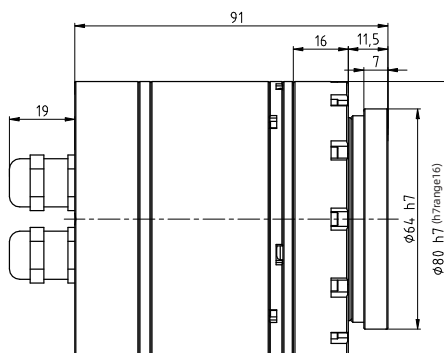
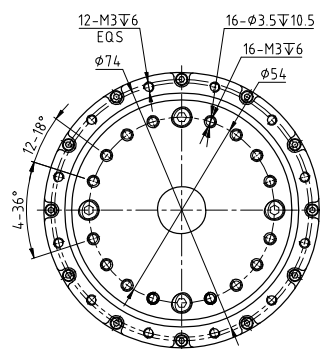


Frame-less Motor		MM-80-A			
Harmonic Drive-Reduction Ratio		51	81	101	121
Peak Torque at Start and Stop	N · m	44	56	70	70
Permissible Maximum Value for Average Load Torque	N · m	34	35	51	51
Permissible Maximum Momentary Torque	N · m	91	113	143	112
Rated Torque of the Motor (for Debugging)	N · m	0.95	0.62	0.72	0.6
Maximum Torque of the Motor (for Debugging)	N · m	1.23	0.99	0.99	0.83
Maximum Rotate Speed	rpm	117.6	74.1	59.4	49.6
Rated Rotate Speed	rpm	58.8	37	29.7	24.8
Maximum Current	Arms	2.89	2.31	2.32	1.94
Rated Current	Arms	2.23	1.45	1.69	1.41
Torque Constant of the Motor	Nm/Arms	0.43	0.43	0.43	0.43
Motor Phase Resistance	Ohms	3.06	3.06	3.06	3.06
Motor Phase Inductance	mH	6.4	6.4	6.4	6.4
Motor line back EMF	Vrms/krpm	30.72	30.72	30.72	30.72
Supply Voltage	V	AC 220V			
Weight	Kg	1.53			
Motor Insulation	Thermal Class:F(155℃) Insulating Resistance: Above500MΩ (DC500V) Withstanding Voltage and Insulation:AC1500V(1min), <5mA				

Structure-Side Outlet



Structure-End Outlet



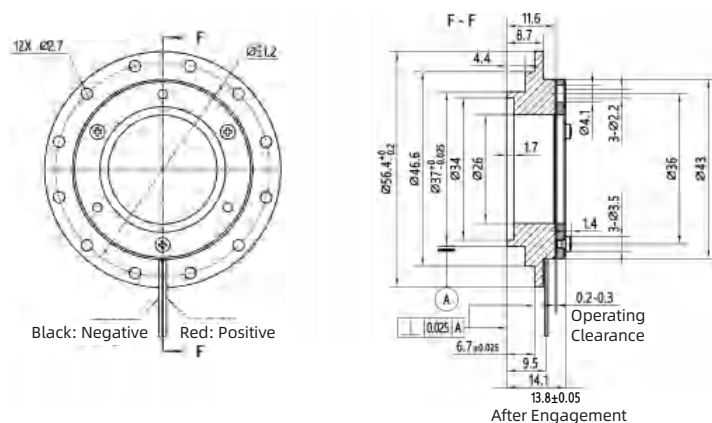
M80D / M80B (Encoder: EM-80D-A Brake: BM-80-A Motor: MM-80-A)

Encoder: EM-80D-A

Resolution	Maximum support 8388608 (23bit), compatible with 17bit	
Number of Laps	65536 (16bit)	
Accessibility	Fault warning *Electromagnetic environment warning	
Interface	RS485	
Communication Frequency	≤16K	
Baud Rate	2.5Mbps	
Input Shaft Allowable Deviation	Axial: ±0.2mm; Radial: ±0.1mm Axial moving: < ±0.03mm	
Spindle Speed	≤6000rpm	
Vibration	Between 10 and 55 Hz, maintain an amplitude of 1.5 mm; between 55 and 2000 Hz, the acceleration is 98 m/s²; XYZ 2 hours per axis, 6 hours in total.	
Mechanical Shock	Impact acceleration: 980m/s², 11ms; 3 impacts in each direction, 18 times in total	
Working Temperature	-40°C to 85°C	
Relative Humidity	≤90% (40°C/21d, based on EN 60068-2-78); No Condensation	
Protection Level	— (Motor rear housing protection)	

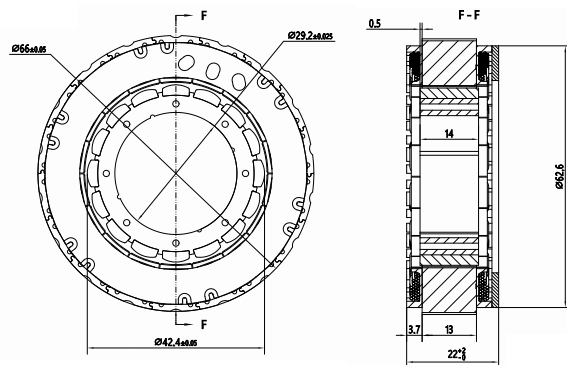
Brake: BM-80-A

Rated Voltage (V)	DC24±5%
Resistance (Ω)	169±5%
Power (W)	3.4
Insulation Class	F
Static Torque (After Run-in)	≥0.71 N·m
Insulation Withstand Voltage	500 V / 5 mA
Operating Temperature	-40 °C ~ 60 °C
Engagement Time (ms)	<50
Release Time (ms)	<50
Operating Clearance (mm)	0.2~0.3
Maximum Backlash (mm)	0.4
Max Rotational Speed (rpm)	6000
Lead Wire Length (mm)	100
Lead Wire Specification	10064 Teflon-30AWG



Motor: MM-80-A

Number of Phases	3	Peak Current (Arms)	4.5
Number of Poles	16	Back EMF Constant (Vrms/krpm)	30.72
Phase Resistance (Ohms@20°C)	3.1	Torque Constant (N·m/A)	0.43
Phase Inductance (mH@1kHz)	6.4	Insulation Level	F 155°C
Rated Voltage (VAC)	220	Dielectric Strength	1500VAC 1SEC
No-load Speed (rpm)	6000	Insulation Resistance	500Mohms @500 VDC
No-load Current (Arms)	0.15	Rotor moment of inertia (kg·mm²)	22.65
Rated Torque (N·m)	0.64	Working Environment	-20°C~60°C
Rated Rotate Speed (rpm)	3000	Storage Environment	-30°C~85°C
Rated Current (Arms)	1.5	Humidity	≤95% No condensation
Peak Torque (N·m)	1.92	Weight (kg)	0.29



M90D / M90B

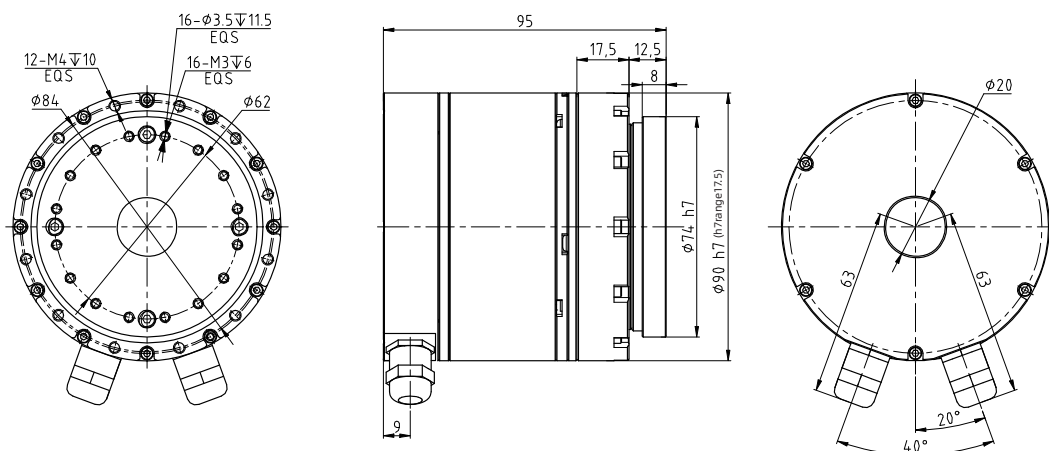
(Encoder: EM-90D-A Brake: BM-90-A Motor: MM-90-A)

Specification

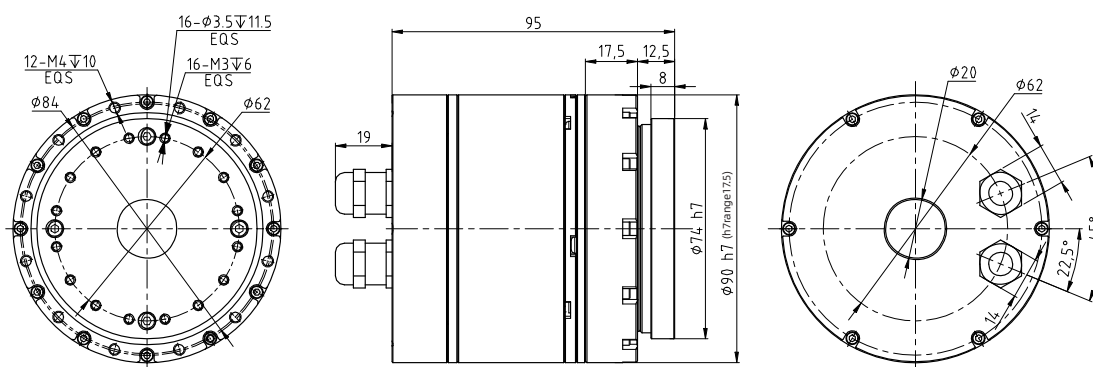


Frame-less Motor		MM-90-A			
Harmonic Drive-Reduction Ratio		51	81	101	121
Peak Torque at Start and Stop	N · m	73	96	107	113
Permissible Maximum Value for Average Load Torque	N · m	44	61	64	64
Permissible Maximum Momentary Torque	N · m	127	165	191	191
Rated Torque of the Motor (for Debugging)	N · m	1.23	1.08	0.91	0.76
Maximum Torque of the Motor (for Debugging)	N · m	2.04	1.69	1.51	1.33
Maximum Rotate Speed	rpm	117.6	74.1	59.4	49.6
Rated Rotate Speed	rpm	58.8	37.0	29.7	24.8
Maximum Current	Arms	5.17	4.28	3.82	3.37
Rated Current	Arms	3.11	2.72	2.29	1.91
Torque Constant of the Motor	Nm/Arms	0.40	0.40	0.40	0.40
Motor Phase Resistance	Ohms	1.56	1.56	1.56	1.56
Motor Phase Inductance	mH	3.67	3.67	3.67	3.67
Motor line back EMF	Vrms/krpm	26.72	26.72	26.72	26.72
Supply Voltage	V	AC 220V			
Weight	Kg	1.9			
Motor Insulation	Thermal Class: F(155℃) Insulating Resistance: Above500MΩ (DC500V) Withstanding Voltage and Insulation: AC1500V(1min), <5mA				

Structure-Side Outlet



Structure-End Outlet



(Encoder: EM-90D-A Brake: BM-90-A Motor: MM-90-A)

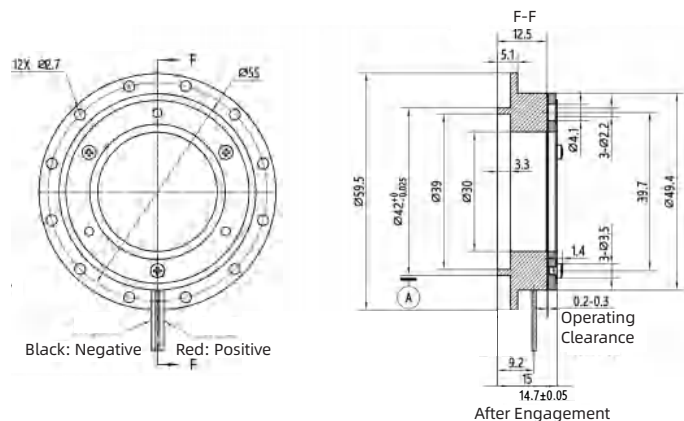
Encoder:EM-90D-A

Resolution	Maximum support 8388608 (23bit), compatible with 17bit	
Number of Laps	65536 (16bit)	
Accessibility	Fault warning *Electromagnetic environment warning	
Interface	RS485	
Communication Frequency	≤16K	
Baud Rate	2.5Mbps	
Input Shaft Allowable Deviation	Axial: ±0.2mm; Radial: ±0.1mm Axial moving: < ±0.03mm	
Spindle Speed	≤6000rpm	
Vibration	Between 10 and 55 Hz, maintain an amplitude of 1.5 mm; between 55 and 2000 Hz, the acceleration is 98 m/s²; XYZ 2 hours per axis, 6 hours in total.	
Mechanical Shock	Impact acceleration: 980m/s², 11ms; 3 impacts in each direction, 18 times in total	
Working Temperature	-40°C to 85°C	
Relative Humidity	≤90% (40°C/21d, based on EN 60068-2-78); No Condensation	
Protection Level	— (Motor rear housing protection)	



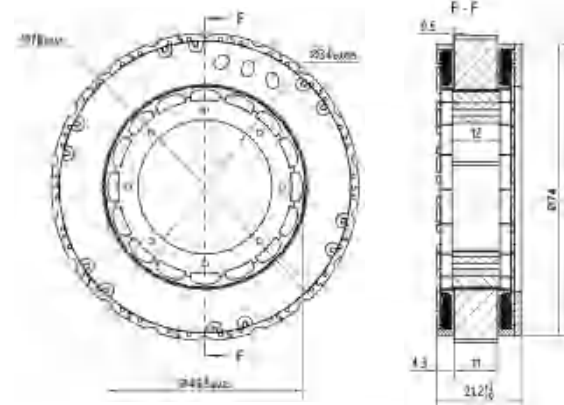
Brake: BM-90-A

Rated Voltage (V)	DC24±5%
Resistance (Ω)	127±5 %
Power (W)	4.5
Insulation Class	F
Static Torque (After Run-in)	≥1N·m
Insulation Withstand Voltage	500 V / 5 mA
Operating Temperature	-40 °C ~ 60 °C
Engagement Time (ms)	<50
Release Time (ms)	<50
Operating Clearance (mm)	0.2-0.3
Maximum Backlash (mm)	0.4
Max Rotational Speed (rpm)	6000
Lead Wire Length (mm)	100
Lead Wire Specification	10064 Teflon-30AWG



Motor: MM-90-A

Number of Phases	3	Peak Current (Arms)	7.2
Number of Poles	16	Back EMF Constant (Vrms/krpm)	26.72
Phase Resistance (Ohms@20°C)	1.56	Torque Constant (N·m/A)	0.4
Phase Inductance (mH@1kHz)	3.67	Insulation Level	F 155°C
Rated Voltage (VAC)	220	Dielectric Strength	1500VAC 1SEC
No-load Speed (rpm)	6000	Insulation Resistance	500Mohms @500 VDC
No-load Current (Arms)	0.24	Rotor moment of inertia (kg·mm²)	36.51
Rated Torque (N·m)	0.95	Working Environment	-20°C~60°C
Rated Rotate Speed (rpm)	3000	Storage Environment	-30°C~85°C
Rated Current (Arms)	2.4	Humidity	≤95% No condensation
Peak Torque (N·m)	2.85	Weight (kg)	0.38



M110D / M110B

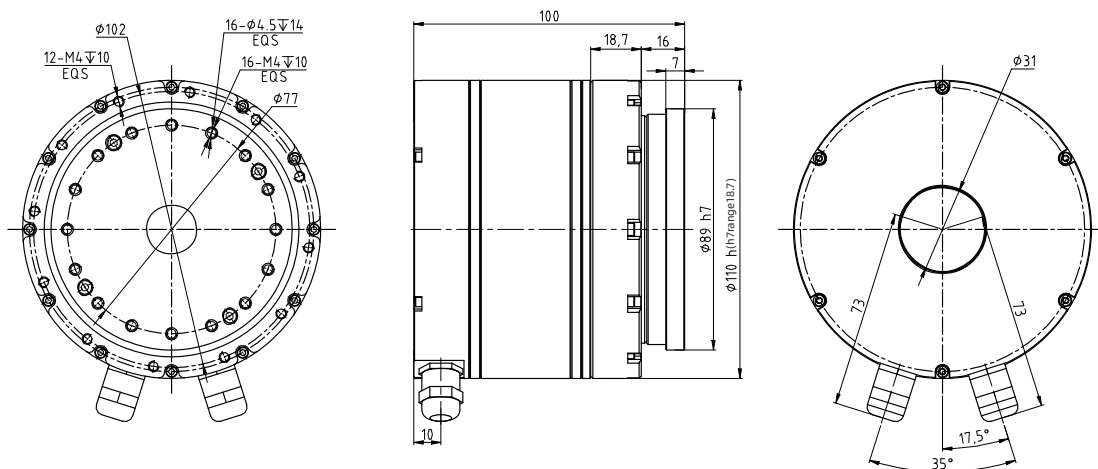
(Encoder: EM-110D-A Brake: BM-110-A Motor: MM-110-A)

Specification

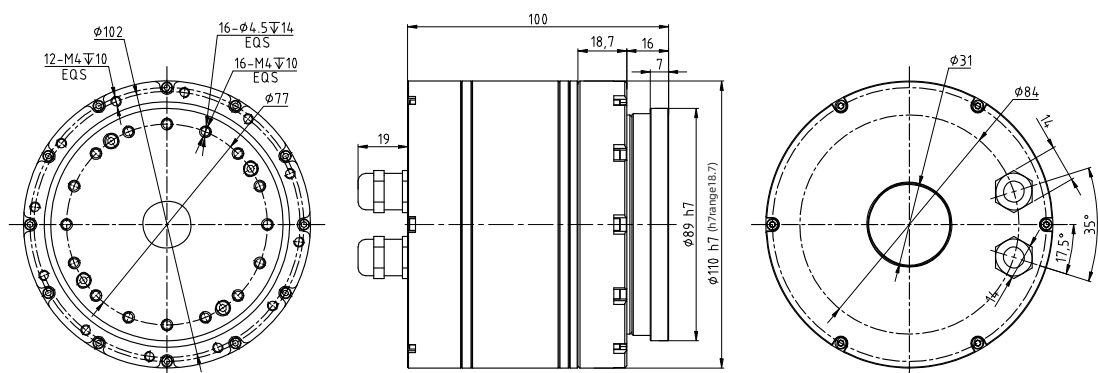


Frame-less Motor		MM-110-A			
Harmonic Drive-Reduction Ratio		51	81	101	121
Peak Torque at Start and Stop	N·m	127	178	204	217
Permissible Maximum Value for Average Load Torque	N·m	72	113	140	140
Permissible Maximum Momentary Torque	N·m	242	332	369	395
Rated Torque of the Motor (for Debugging)	N·m	2.02	1.99	1.98	1.65
Maximum Torque of the Motor (for Debugging)	N·m	3.56	3.14	2.89	2.56
Maximum Rotate Speed	rpm	109.8	69.1	55.4	46.3
Rated Rotate Speed	rpm	58.8	37.0	29.7	24.8
Maximum Current	Arms	8.15	7.19	6.61	5.87
Rated Current	Arms	4.62	4.57	4.54	3.79
Torque Constant of the Motor	Nm/Arms	0.44	0.44	0.44	0.44
Motor Phase Resistance	Ohms	0.51	0.51	0.51	0.51
Motor Phase Inductance	mH	1.75	1.75	1.75	1.75
Motor line back EMF	Vrms/krpm	27.51	27.51	27.51	27.51
Supply Voltage	V	AC 220V			
Weight	Kg	2.91			
Motor Insulation	Thermal Class: F(155℃) Insulating Resistance: Above500MΩ (DC500V) Withstanding Voltage and Insulation: AC1500V(1min), <5mA				

Structure-Side Outlet



Structure-End Outlet

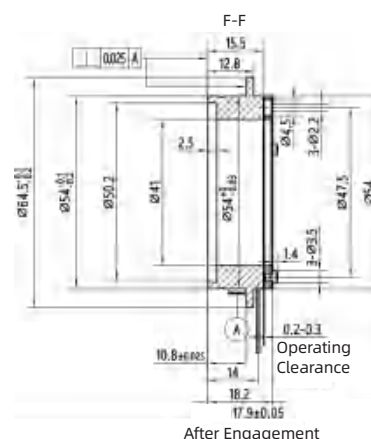


(Encoder: EM-110D-A Brake: BM-110-A Motor: MM-110-A)

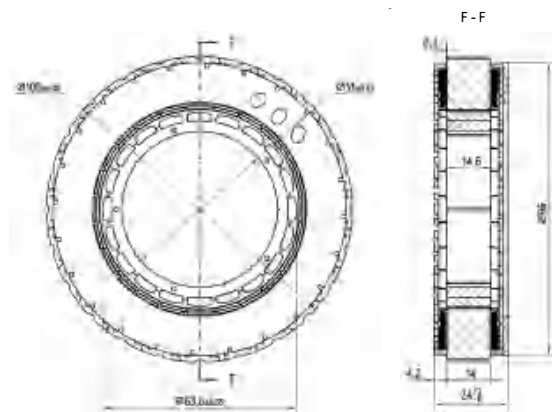
Resolution	Maximum support 8388608 (23bit), compatible with 17bit	
Number of Laps	65536 (16bit)	
Accessibility	Fault warning *Electromagnetic environment warning	
Interface	RS485	
Communication Frequency	≤16K	
Baud Rate	2.5Mbps	
Input Shaft Allowable Deviation	Axial: ±0.2mm; Radial: ±0.1mm Axial moving: < ±0.03mm	
Spindle Speed	≤6000rpm	
Vibration	Between 10 and 55 Hz, maintain an amplitude of 1.5 mm; between 55 and 2000 Hz, the acceleration is 98 m/s²; XYZ 2 hours per axis, 6 hours in total.	
Mechanical Shock	Impact acceleration: 980m/s², 11ms; 3 impacts in each direction, 18 times in total	
Working Temperature	-40°C to 85°C	
Relative Humidity	≤90% (40°C/21d, based on EN 60068-2-78); No Condensation	
Protection Level	— (Motor rear housing protection)	



Rated Voltage (V)	DC24±5%
Resistance (Ω)	71.53±5 %
Power (W)	7.85
Insulation Class	F
Static Torque (After Run-in)	≥2.2 N·m
Insulation Withstand Voltage	500 V / 5 mA
Operating Temperature	-40 °C ~ 60 °C
Engagement Time (ms)	<50
Release Time (ms)	<50
Operating Clearance (mm)	0.2-0.3
Maximum Backlash (mm)	0.4
Max Rotational Speed (rpm)	6000
Lead Wire Length (mm)	100
Lead Wire Specification	10064 Teflon-30AWG



Number of Phases	3	Peak Current (Arms)	13.2
Number of Poles	20	Back EMF Constant (Vrms/krpm)	27.51
Phase Resistance (Ohms@20°C)	0.51	Torque Constant (N·m/A)	0.44
Phase Inductance (mH@1kHz)	1.75	Insulation Level	F 155°C
Rated Voltage (VAC)	220	Dielectric Strength	1500VAC 1SEC
No-load Speed (rpm)	5000	Insulation Resistance	500Mohms @500 VDC
No-load Current (Arms)	0.44	Rotor moment of inertia (kg·mm²)	91.38
Rated Torque (N·m)	1.92	Working Environment	-20°C~60°C
Rated Rotate Speed (rpm)	3000	Storage Environment	-30°C~85°C
Rated Current (Arms)	4.4	Humidity	≤95% No condensation
Peak Torque (N·m)	5.76	Weight (kg)	0.67



M142D / M142B

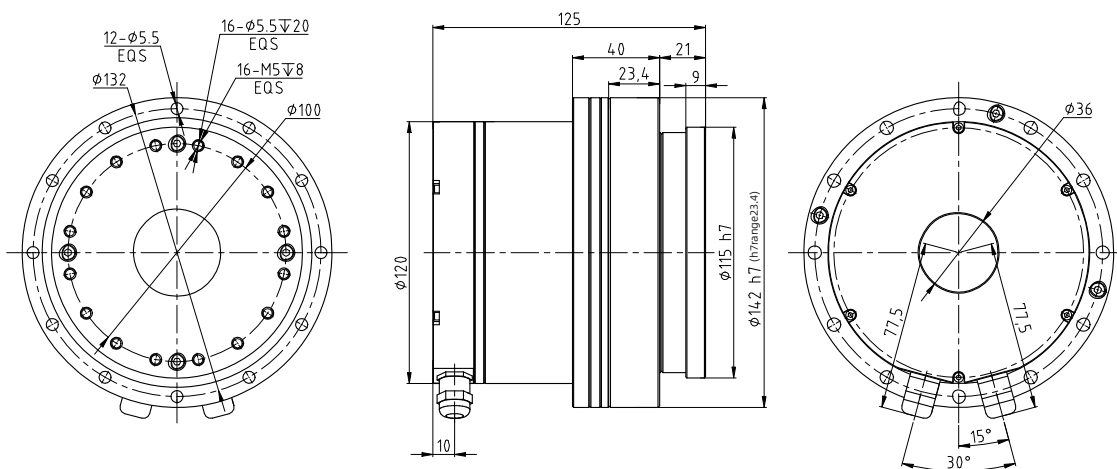
(Encoder: EM-142D-A Brake: BM-142-A Motor: MM-142-A)

Specification

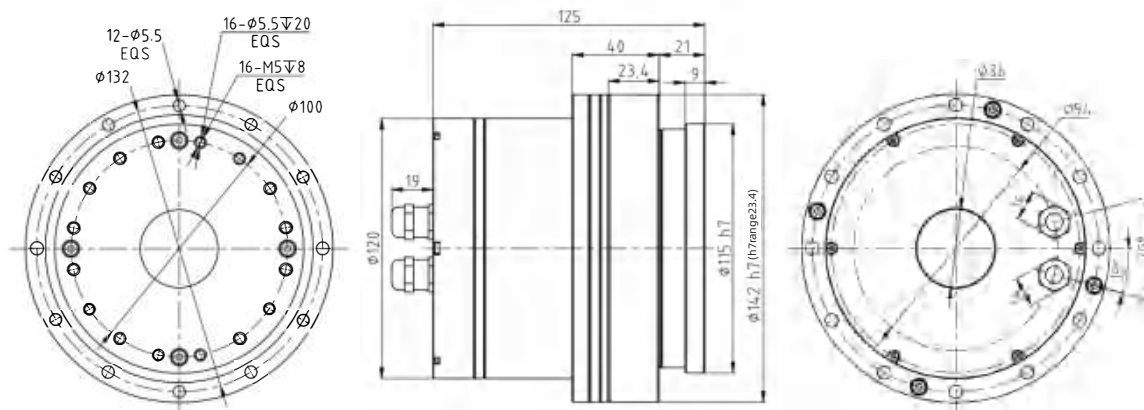


Frame-less Motor		MM-142-A			
Harmonic Drive-Reduction Ratio		51	81	101	121
Peak Torque at Start and Stop	N · m	281	395	433	459
Permissible Maximum Value for Average Load Torque	N · m	140	217	281	281
Permissible Maximum Momentary Torque	N · m	497	738	841	892
Rated Torque of the Motor (for Debugging)	N · m	3.23	3.15	3.27	2.73
Maximum Torque of the Motor (for Debugging)	N · m	6.48	5.74	5.04	4.46
Maximum Rotate Speed	rpm	94.1	59.3	47.5	39.7
Rated Rotate Speed	rpm	58.8	37.0	29.7	24.8
Maximum Current	Arms	10.94	9.68	8.51	7.53
Rated Current	Arms	5.45	5.32	5.52	4.61
Torque Constant of the Motor	Nm/Arms	0.59	0.59	0.59	0.59
Motor Phase Resistance	Ohms	0.46	0.46	0.46	0.46
Motor Phase Inductance	mH	2.5	2.5	2.5	2.5
Motor line back EMF	Vrms/krpm	42.1	42.1	42.1	42.1
Supply Voltage	V	AC 220V			
Weight	Kg	5.64			
Motor Insulation	Thermal Class:F(155°C) Insulating Resistance: Above500MΩ (DC500V) Withstanding Voltage and Insulation:AC1500V(1min), <5mA				

Structure-Side Outlet



Structure-End Outlet

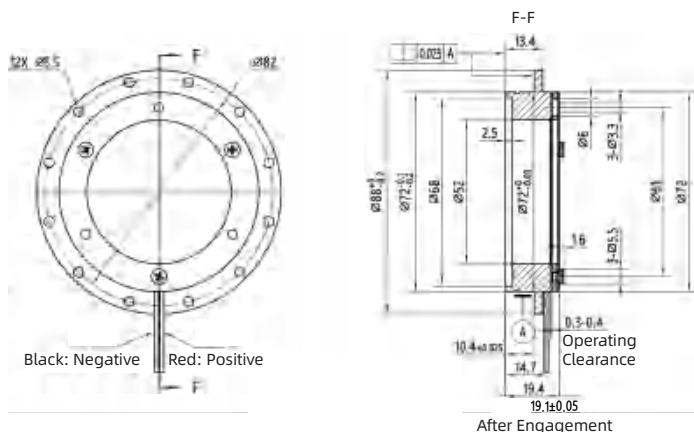


(Encoder: EM-142D-A Brake: BM-142-A Motor: MM-142-A)

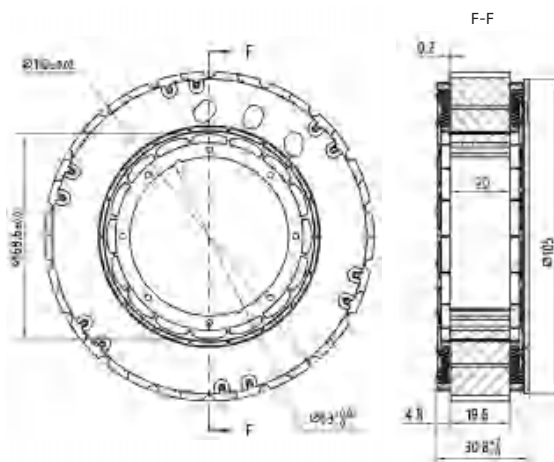
Resolution	Maximum 131072 (17bit)
Number of Laps	65536 (16bit)
Accessibility	Fault warning *Electromagnetic environment warning
Interface	RS485
Communication Frequency	≤16K
Baud Rate	2.5Mbps
Input Shaft Allowable Deviation	Axial: ±0.1mm; Radial: ±0.1mm Axial moving: < ±0.03mm
Spindle Speed	≤6000rpm
Vibration	Between 10 and 55 Hz, maintain an amplitude of 1.5 mm; be XYZ 2 hours per axis, 6 hours in total.
Mechanical Shock	Impact acceleration: 980m/s ² , 11ms; 3 impacts in each direc
Working Temperature	-40°C to 85°C
Relative Humidity	≤90% (40°C/21d, based on EN 60068-2-78); No Condensatio
Protection Level	— (Motor rear housing protection)



Rated Volatge (V)	DC24±5%
Resistance (Ω)	94.8±5 %
Power (W)	6.1
Insulation Class	F
Static Torque (After Run-in)	≥4.4N·m
Insulation Withstand Voltage	500 V / 5 mA
Operating Temperature	-40 °C ~ 60 °C
Engagement Time (ms)	<50
Release Time (ms)	<50
Operating Clearance (mm)	0.3-0.4
Maximum Backlash (mm)	0.5
Max Rotational Speed (rpm)	6000
Lead Wire Length (mm)	100
Lead Wire Specification	10064 Teflon-26AWG



Number of Phases	3	Peak Current (Arms)	13.5
Number of Poles	16	Back EMF Constant (Vrms/krpm)	42.1
Phase Resistance (Ohms@20°C)	0.46	Torque Constant (N · m/A)	0.59
Phase Inductance (mH@1kHz)	2.5	Insulation Level	F 155°C
Rated Voltage (VAC)	220	Dielectric Strength	1500VAC 1SEC
No-load Speed (rpm)	5000	Insulation Resistance	500Mohms @500 VDC
No-load Current (Arms)	0.54	Rotor moment of inertia (kg · mm²)	189.36
Rated Torque (N · m)	3.2	Working Environment	-20°C~60°C
Rated Rotate Speed (rpm)	3000	Storage Environment	-30°C~85°C
Rated Current (Arms)	5.4	Humidity	≤95% No condensation
Peak Torque (N · m)	8	Weight (kg)	1.18



M170D / M170B

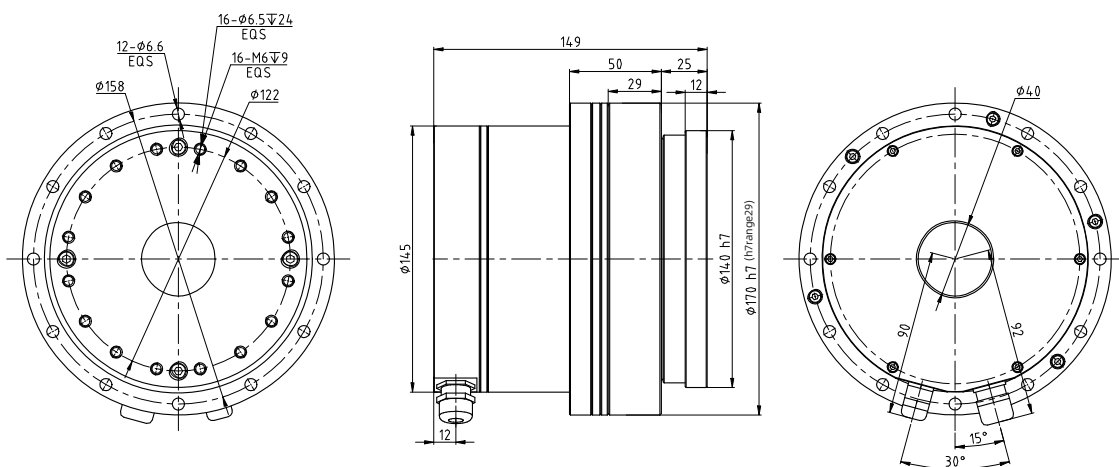
(Encoder: EM-170D-A Brake: BM-170-A Motor: MM-170-A)

Specification

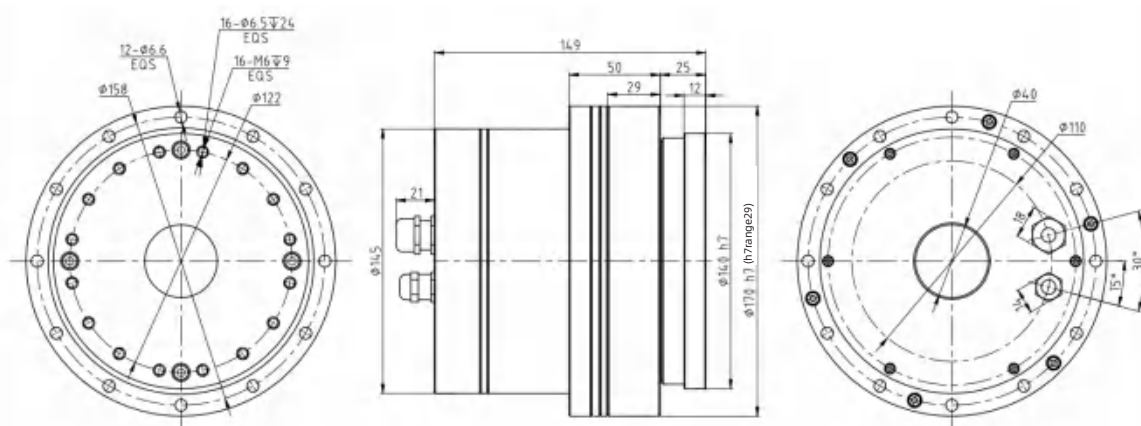


Frame-less Motor		MM-170-A			
Harmonic Drive-Reduction Ratio		51	81	101	121
Peak Torque at Start and Stop	N · m	523	675	738	802
Permissible Maximum Value for Average Load Torque	N · m	255	369	484	586
Permissible Maximum Momentary Torque	N · m	892	1270	1400	1530
Rated Torque of the Motor (for Debugging)	N · m	7.14	6.33	6.65	6.72
Maximum Torque of the Motor (for Debugging)	N · m	14.65	11.57	10.15	9.20
Maximum Rotate Speed	rpm	78.4	49.4	39.6	33.1
Rated Rotate Speed	rpm	39.2	24.7	19.8	16.5
Maximum Current	Arms	21.31	17.32	15.18	13.77
Rated Current	Arms	10.39	9.47	9.96	10.06
Torque Constant of the Motor	Nm/Arms	0.69	0.67	0.67	0.67
Motor Phase Resistance	Ohms	0.3	0.3	0.3	0.3
Motor Phase Inductance	mH	0.98	0.98	0.98	0.98
Motor line back EMF	Vrms/krpm	46.5	46.5	46.5	46.5
Supply Voltage	V	AC 220V			
Weight	Kg	9.76			
Motor Insulation	Thermal Class:F(155°C) Insulating Resistance: Above500MΩ (DC500V) Withstanding Voltage and Insulation:AC1500V(1min), <5mA				

Structure-Side Outlet



Structure-End Outlet



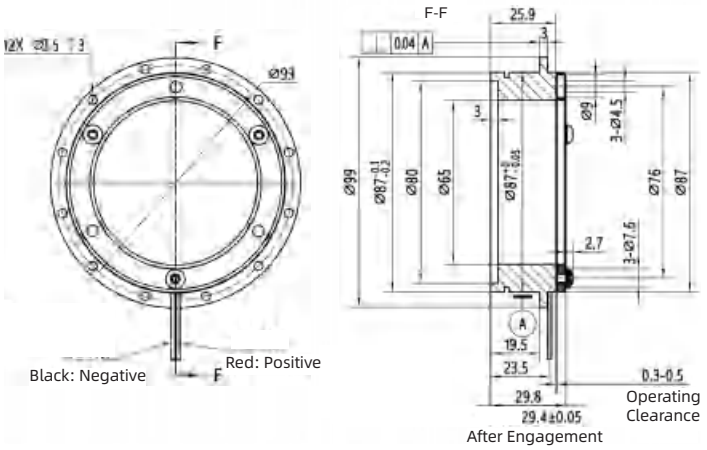
M170D / M170B

(Encoder: EM-170D-A Brake: BM-170-A Motor: MM-170-A)

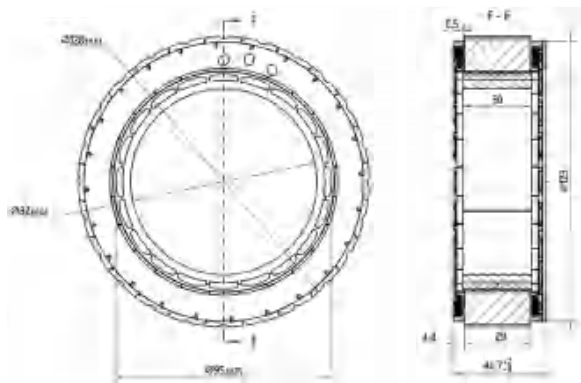
Encoder: EM-170D-A

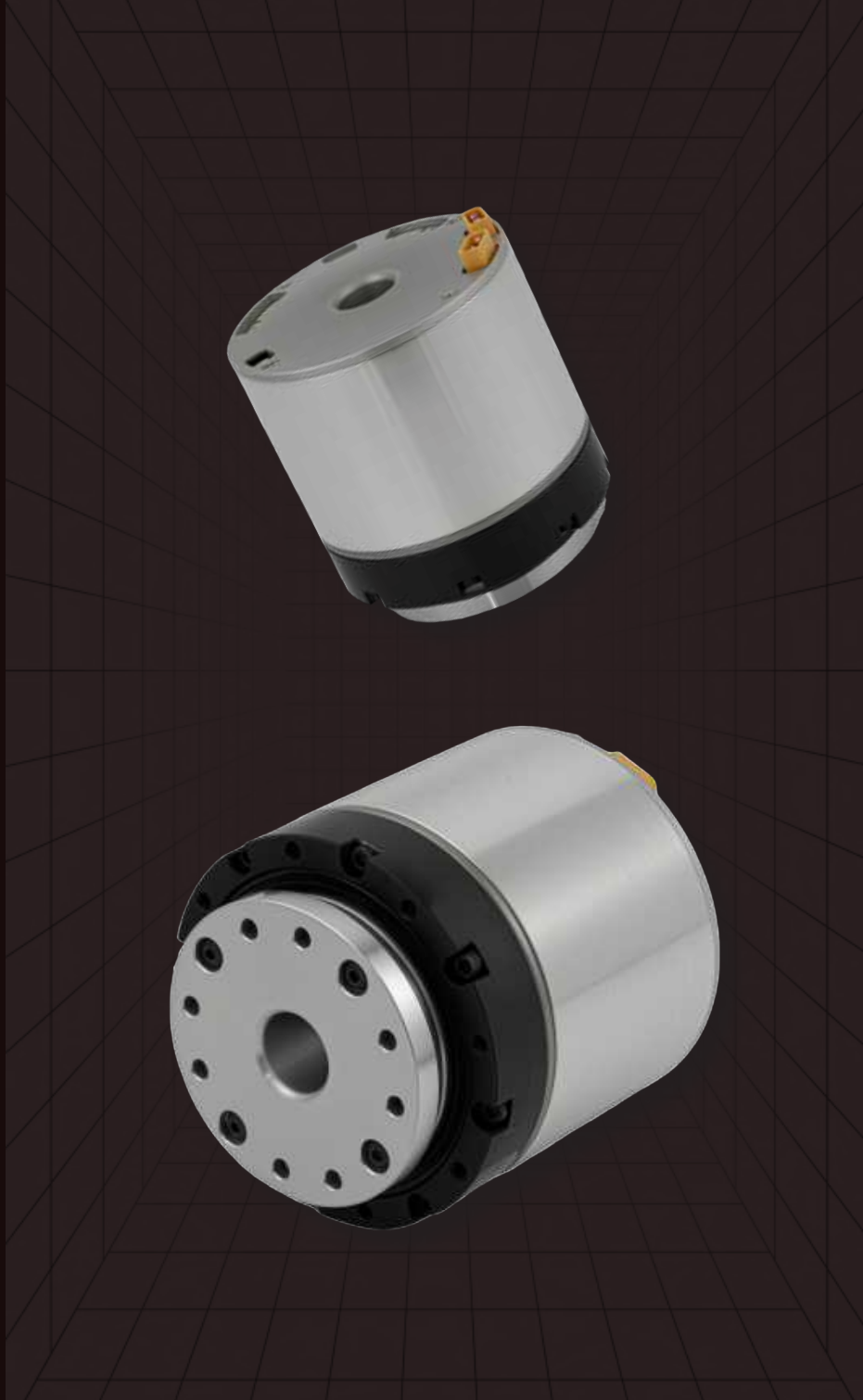
Resolution	Maximum 131072 (17bit)	
Number of Laps	65536 (16bit)	
Accessibility	Fault warning *Electromagnetic environment warning	
Interface	RS485	
Communication Frequency	≤16K	
Baud Rate	2.5Mbps	
Input Shaft Allowable Deviation	Axial: ±0.1mm; Radial: ±0.1mm Axial moving: <±0.03mm	
Spindle Speed	≤6000rpm	
Vibration	Between 10 and 55 Hz, maintain an amplitude of 1.5 mm; between 55 and 2000 Hz, the acceleration is 98 m/s²; XYZ 2 hours per axis, 6 hours in total.	
Mechanical Shock	Impact acceleration: 980m/s² , 11ms;3 impacts in each direction, 18 times in total	
Working Temperature	-40°C to 85°C	
Relative Humidity	≤90% (40°C/21d, based on EN 60068-2-78); No Condensation	
Protection Level	— (Motor rear housing protection)	

Brake: BM-170-A

Rated Voltage (V)	DC24±5%	 Black: Negative Red: Positive After Engagement Operating Clearance
Resistance (Ω)	61.6±5 %	
Power (W)	9.35	
Insulation Class	F	
Static Torque (After Run-in)	≥8.5N·m	
Insulation Withstand Voltage	500 V / 5 mA	
Operating Temperature	-40 °C ~ 60 °C	
Engagement Time (ms)	<50	
Release Time (ms)	<50	
Operating Clearance (mm)	0.3~0.4	
Maximum Backlash (mm)	0.5	
Max Rotational Speed (rpm)	6000	
Lead Wire Length (mm)	100	
Lead Wire Specification	10064 Teflon-26AWG	

Motor: MM-170-A

Number of Phases	3	Peak Current (Arms)	20.8	
Number of Poles	20	Back EMF Constant (Vrms/krpm)	46.5	
Phase Resistance (Ohms@20°C)	0.3	Torque Constant (N·m/A)	0.69	
Phase Inductance (mH@1kHz)	0.98	Insulation Level	F 155°C	
Rated Voltage (VAC)	220	Dielectric Strength	1500VAC 1SEC	
No-load Speed (rpm)	4000	Insulation Resistance	500Mohms @500 VDC	
No-load Current (Arms)	1.04	Rotor moment of inertia (kg·mm²)	725	
Rated Torque (N·m)	7.15	Working Environment	-20°C~60°C	
Rated Rotate Speed (rpm)	3000	Storage Environment	-30°C~85°C	
Rated Current (Arms)	10.4	Humidity	≤95% No condensation	
Peak Torque (N·m)	14.3	Weight (kg)	1.8	



External Drive Rotary Actuator

DC Type

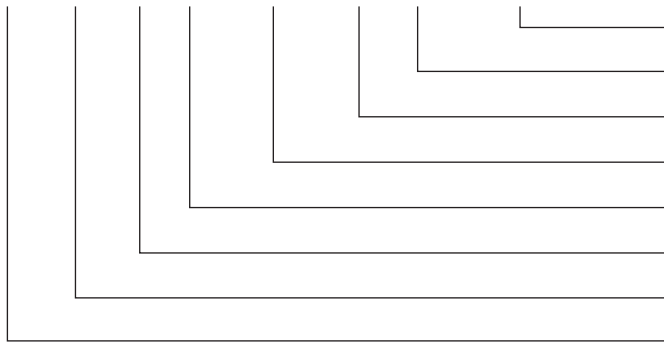
Built-in Drive Rotary Actuator DC Type

Introduction

Built-in Drive Rotary Actuator DC Type exhibits a sleek design and compact structure, housing essential components including servo drivers, motor-end absolute encoders, output-end absolute encoders, frameless torque motors, brakes, and precision harmonic reducers. Available in two models (the I series and T series), both variants come equipped with dual encoders, drivers, and brakes.

Naming Rules

L · 70 · I · C · 080 · B · F · XXXX



⑧ Client Code and Serial Number

⑦ Wiring Method

⑥ With or Without Brake

⑤ Reduction Ratio

④ Bus Communication Protocol

③ Structure of Rotary Actuator

② Mounting Outer Diameter

① Type of Rotary Actuator

① Type of Rotary Actuator

L: External Drive Rotary Actuator DC Type

② Mounting Outer Diameter

70: 70mm 80: 80mm 90: 90mm
110: 110mm 142: 142mm 170: 170mm

③ Structure of Rotary Actuator

I: I Joint (Double Absolute Encoder, Built-in Drive, With/Without Brake)
T: T Joint (Double Absolute Encoder, Built-in Drive, With/Without Brake)

④ Bus Communication Protocol

C: CANopen F: CanFD
E: EtherCAT

⑤ Reduction Ratio

030: 31:1 050: 51:1 080: 81:1
100: 101:1 120: 121:1 160: 161:1

⑥ With or Without Brake

B: With Brake
F: Without Brake

⑦ Wiring Method

F: Rear Outlet

⑧ Client Code and Serial Number

XXXX: Customised products only

Joints and Components

Product Order Number CANopen/EtherCat	Encoder Order Number CANopen/EtherCat	Brake Order Number	Motor Order Number
L70I-C	EL-70C-A	BL-70-A	ML-70-A
L70I-E	EL-70E-A		
L80I-C	EL-80C-A	BM-80-A	ML-80-A
L80I-E	EL-80E-A		
L90I-C	EL-90C-A	BM-90-A	ML-90-A
L90I-E	EL-90E-A		
L110I-C	EL-110C-A	BL-110-A	ML-110-A
L110I-E	EL-110E-A		
L142I-C	EL-142C-A	BL-142-A	ML-142-A
L142I-E	EL-142E-A		
L170I-C	EL-170C-A	BM-170-A	ML-170-A
L170I-E	EL-170E-A		

L70I-C / L70I-E

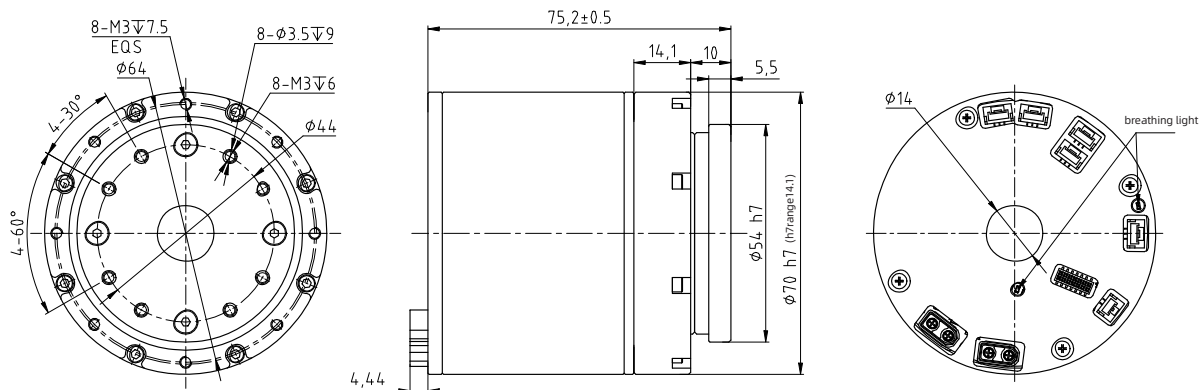
(Encoder: EL-70C-A / EL-70E-A Brake:BL-70-A Motor: ML-70-A)

Specification

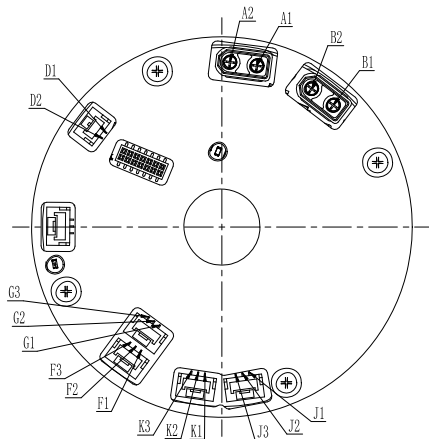


Frame-less Motor		ML-70-A		
Harmonic Drive-Reduction Ratio		51	81	101
Peak Torque at Start and Stop	N · m	23	30	36
Permissible Maximum Value for Average Load Torque	N · m	9	14	14
Permissible Maximum Momentary Torque	N · m	46	61	70
Rated Torque of the Motor (for Debugging)	N · m	0.25	0.25	0.2
Maximum Torque of the Motor (for Debugging)	N · m	0.64	0.53	0.51
Maximum Rotate Speed	rpm	107.8	67.9	54.5
Rated Rotate Speed	rpm	58.8	37	29.7
Maximum Current	Arms	8.25	6.77	6.52
Rated Current	Arms	3.23	3.16	2.53
Torque Constant of the Motor	Nm/Arms	0.08	0.08	0.08
Motor Phase Resistance	Ohms	0.39	0.39	0.39
Motor Phase Inductance	mH	0.3	0.3	0.3
Motor line back EMF	Vrms/krpm	6.15	6.15	6.15
Supply Voltage	V	DC 48V		
Weight	Kg	1.0		
Motor Insulation	Thermal Class:F(155℃) Insulating Resistance: Above500MΩ (DC500V) Withstanding Voltage and Insulation:AC1500V(1min), <5mA			

L70I-C-Structure Drawing



L70I-C-Interface Definition



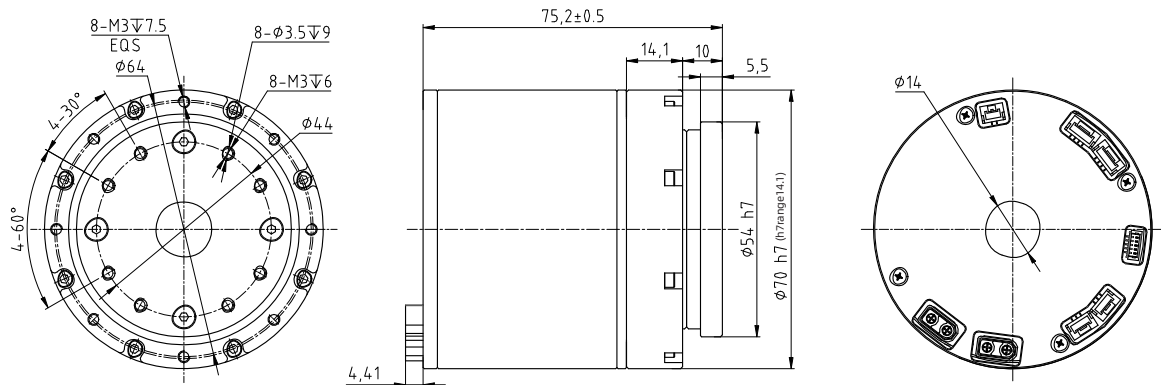
Module Signal Definition

Pin No.	Signal Name	Remarks
A1/B1	VBUS+	Bus Power Input/ Output Positive
A2/B2	VBUS-	Bus Power Input/ Output Negative
D1	BAT+	Multi-turn Encoders Backup Battery Positive
D2	BAT-	Multi-turn Encoders Backup Battery Negative
F1/G1	CAN_H	Can Bus High
F2/G2	CAN_GND	Can Bus Ground
F3/G3	CAN_L	Can Bus low
J1/K1	RS485_A	RS485 Bus A Terminal
J2/K2	RS485_GND	RS485 Bus Ground
J3/K3	RS485_B	RS485 Bus B Terminal

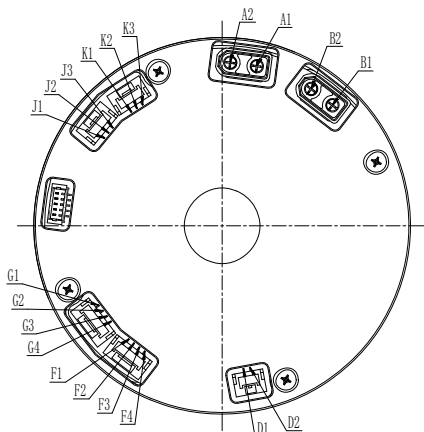
L70I-C / L70I-E

(Encoder: EL-70C-A / EL-70E-A Brake:BL-70-A Motor: ML-70-A)

L70I-E-Structure Drawing



L70I-E-Interface Definition



Module Signal Definition		
Pin NO.	Signal Name	Remarks
A1/B1	VBUS+	Bus Power Input/Output Positive Terminal
A2/B2	VBUS-	Bus Power Input/Output Negative Terminal
D1	BAT+	Multiturn Encoder Backup Battery Positive Terminal
D2	BAT-	Multiturn Encoder Backup Battery Negative Terminal
F1	E1_RX+	EtherCAT Output Receive Positive Terminal
F2	E1_RX-	EtherCAT Output Receive Negative Terminal
F3	E1_TX+	EtherCAT Output Transmit Positive Terminal
F4	E1_TX-	EtherCAT Output Transmit Negative Terminal
G1	EO_RX+	EtherCAT Input Receive Positive Terminal
G2	EO_RX-	EtherCAT Input Receive Negative Terminal
G3	EO_TX+	EtherCAT Input Transmit Positive Terminal
G4	EO_TX-	EtherCAT Input Transmit Negative Terminal
J1/K1	RS485_A	RS485 Bus A Terminal
J2/K2	RS485_GND	RS485 Bus Ground
J3/K3	RS485_B	RS485 Bus B Terminal

Encoder: EL-70C-A / EL-70E-A

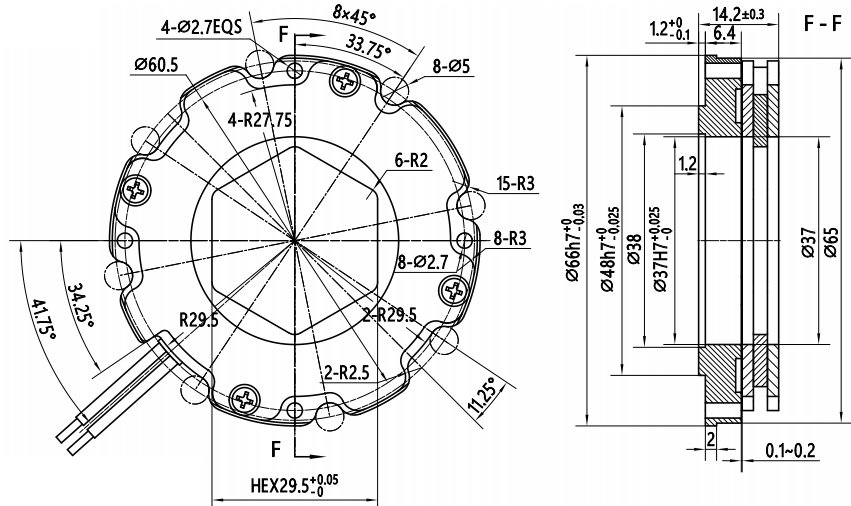
Products	L70I-C	L70I-E
Encoder	CanOpen: EL-70C-A 	EtherCat: EL-70E-A 
		
Supply Voltage	48V ± 10%	
Output Drive Type	3-Phase MOSFET	
Output Rated Phase Current	3.22A	
Output maximum instantaneous phase current (ms level)	8.22A	
Driver Protection	Phase current overcurrent, load short circuit	
Communication Type	CANopen	EtherCat
Baud Rate	≤1Mbps	≤100Mbps
Working Environment Temperature	0~60°C	
Relative Humidity	20%~80%	
Battery Supply Voltage (Typical Value)	3.6V	
Battery Supply Current (Typical Value)	26uA	
Circuit Board Outer Diameter	66mm	
Circuit Board Inner Diameter	19mm	

L70I-C / L70I-E

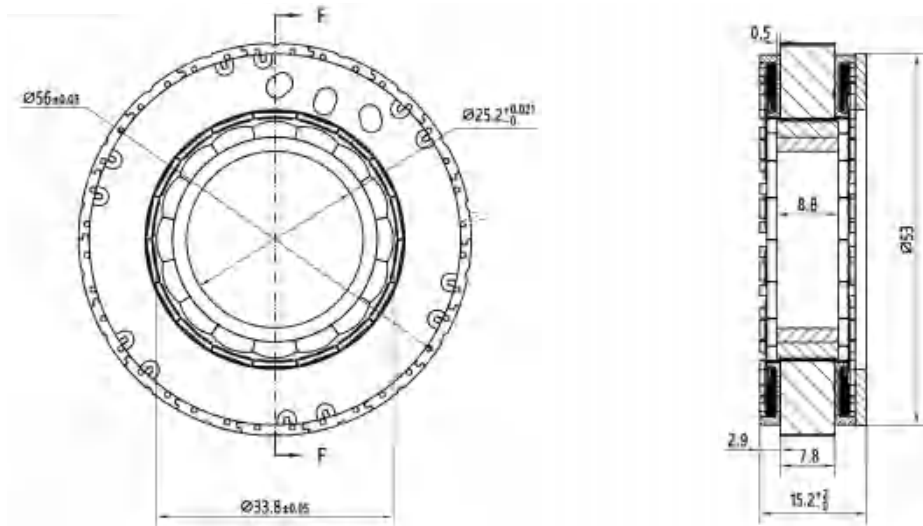
(Encoder: EL-70C-A / EL-70E-A Brake:BL-70-A Motor: ML-70-A)

Brake: BL-70-A

Starting/Holding Voltage(V)	DC 24 /12 ±10 %
Starting/Holding Power(W)	13.5/3.4
Insulation Class	F
Static Torque (After Run-in)	≥0.6 N.m
Insulation Resistance	>100 MΩ
Dielectric Strength	1500 V/5mA/1s
Operating Temperature	-10 °C ~ 40 °C
Engagement Time (ms)	<100
Release Time (ms)	<50 ms
Operating Clearance (mm)	0.1-0.2
Rotational Backlash	<1°
Drop-out Voltage(V)	>1.5
Pull-in Voltage(V)	<19.2
Lead Wire Specification	10064 Teflon- 26AWG



Motor: ML-70-A



Number of Poles	16	Rated Rotate Speed (rpm)	3000	Dielectric Strength	1500VAC 1SEC
Phase Resistance (ohms@20°C)	0.39	Rated Current (Arms)	3.2	Insulation Resistance	100Mohms@500VDC
Phase Inductance (mH@1kHz)	0.3	Peak Torque (N·m)	0.75	Rotor Inertia (kg·mm ²)	5.2
Rated Voltage (VAC)	48	Peak Current (Arms)	9.6	Working Environment	-20°C~60°C
No-load Speed (rpm)	5500	Back EMF Constant (Vrms/krpm)	6.15	Storage Environment	-30°C~85°C
No-load Current (Arms)	0.16	Torque Constant (N·m/A)	0.08	Humidity	≤95%No condensation
Rated Torque (N·m)	0.25	Insulation Level	F 155°C	Weight (kg)	0.14

L80I-C / L80I-E

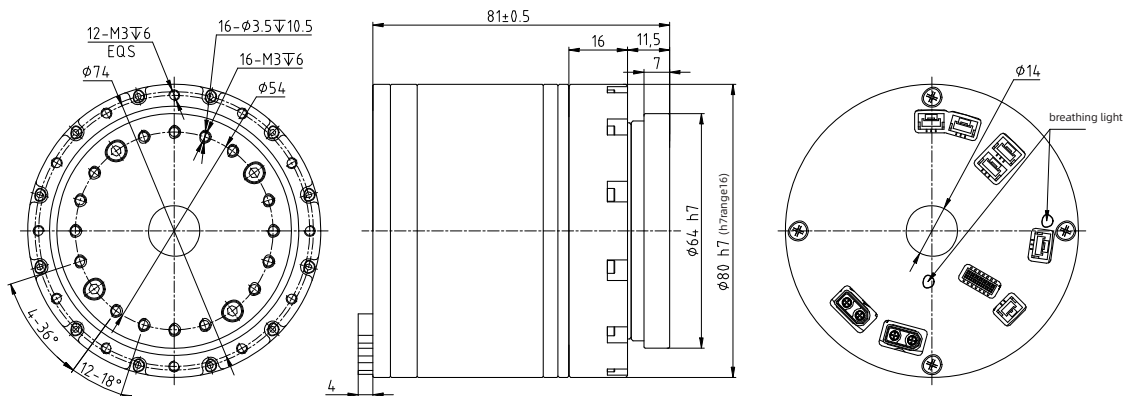
(Encoder: EL-80C-A / EL-80E-A Brake: BM-80-A Motor: ML-80-A)

Specification

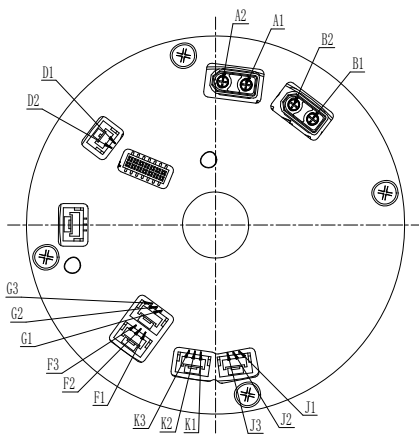


Frame-less Motor		ML-80-A			
Harmonic Drive-Reduction Ratio		51	81	101	121
Peak Torque at Start and Stop	N · m	44	56	70	70
Permissible Maximum Value for Average Load Torque	N · m	34	35	51	51
Permissible Maximum Momentary Torque	N · m	91	113	143	112
Rated Torque of the Motor (for Debugging)	N · m	0.95	0.62	0.72	0.60
Maximum Torque of the Motor (for Debugging)	N · m	1.23	0.99	0.99	0.83
Maximum Rotate Speed	rpm	98.0	61.7	49.5	41.3
Rated Rotate Speed	rpm	58.8	37.0	29.7	24.8
Maximum Current	Arms	13.48	10.80	10.83	9.04
Rated Current	Arms	10.42	6.75	7.89	6.59
Torque Constant of the Motor	Nm/Arms	0.09	0.09	0.09	0.09
Motor Phase Resistance	Ohms	0.140	0.140	0.140	0.140
Motor Phase Inductance	mH	0.3	0.3	0.3	0.3
Motor line back EMF	Vrms/krpm	6.67	6.67	6.67	6.67
Supply Voltage	V	DC 48V			
Weight	Kg	1.36			
Motor Insulation	Thermal Class:F(155°C) Insulating Resistance: Above500MΩ (DC500V) Withstanding Voltage and Insulation:AC1500V(1min), <5mA				

L80I-C-Structure Drawing



L80I-C-Interface Definition

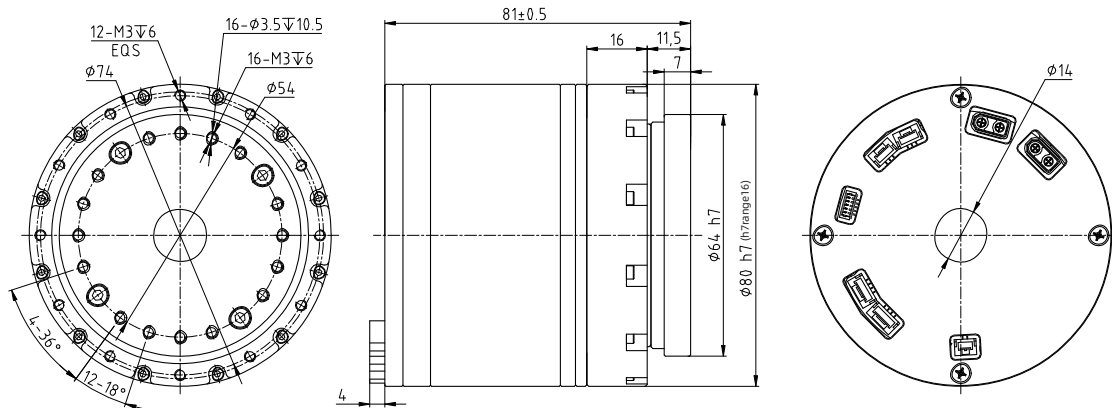


Module Signal Definition		
Pin No.	Signal Name	Remarks
A1/B1	VBUS+	Bus Power Input/ Output Positive
A2/B2	VBUS-	Bus Power Input/ Output Negative
D1	BAT+	Multi-turn Encoders Backup Battery Positive
D2	BAT-	Multi-turn Encoders Backup Battery Negative
F1/G1	CAN_H	Can Bus High
F2/G2	CAN_GND	Can Bus Ground
F3/G3	CAN_L	Can Bus low
J1/K1	RS485_A	RS485 Bus A Terminal
J2/K2	RS485_GND	RS485 Bus Ground
J3/K3	RS485_B	RS485 Bus B Terminal

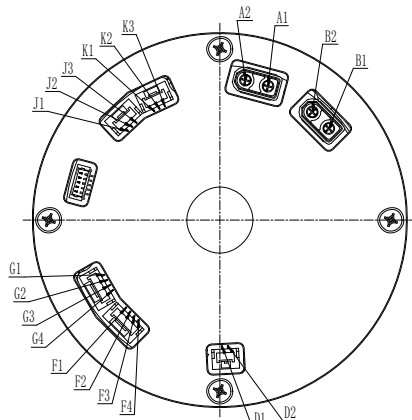
L80I-C / L80I-E

(Encoder: EL-80C-A / EL-80E-A Brake: BM-80-A Motor: ML-80-A)

L80I-E-Structure Drawing



L80I-E-Interface Definition



Module Signal Definition

Pin NO.	Signal Name	Remarks
A1/B1	VBUS+	Bus Power Input/Output Positive Terminal
A2/B2	VBUS-	Bus Power Input/Output Negative Terminal
D1	BAT+	Multiturn Encoder Backup Battery Positive Terminal
D2	BAT-	Multiturn Encoder Backup Battery Negative Terminal
F1	E1_RX+	EtherCAT Output Receive Positive Terminal
F2	E1_RX-	EtherCAT Output Receive Negative Terminal
F3	E1_TX+	EtherCAT Output Transmit Positive Terminal
F4	E1_TX-	EtherCAT Output Transmit Negative Terminal
G1	EO_RX+	EtherCAT Input Receive Positive Terminal
G2	EO_RX-	EtherCAT Input Receive Negative Terminal
G3	EO_TX+	EtherCAT Input Transmit Positive Terminal
G4	EO_TX-	EtherCAT Input Transmit Negative Terminal
J1/K1	RS485_A	RS485 Bus A Terminal
J2/K2	RS485_GND	RS485 Bus Ground
J3/K3	RS485_B	RS485 Bus B Terminal

Encoder: EL-80C-A / EL-80E-A

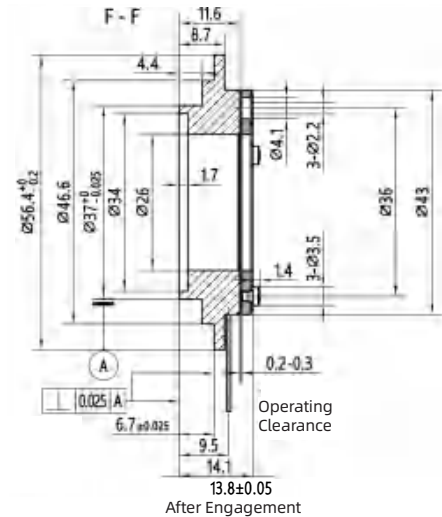
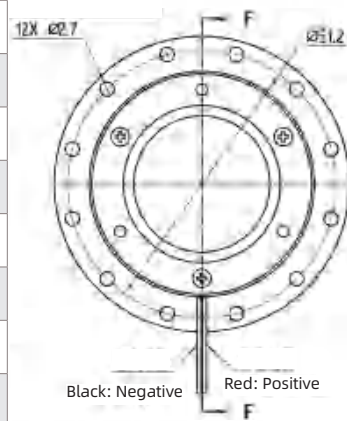
Products	L80I-C	L80I-E
Encoder	CanOpen: EL-80C-A  	EtherCat: EL-80E-A  
Supply Voltage	48V±10%	
Output Drive Type	3-Phase MOSFET	
Output Rated Phase Current	10.56A	
Output maximum instantaneous phase current (ms level)	17.7A	
Driver Protection	Phase current overcurrent, load short circuit	
Communication Type	CANopen	EtherCat
Baud Rate	≤1Mbps	≤100Mbps
Working Environment Temperature	0~60°C	
Relative Humidity	20%~80%	
Battery Supply Voltage (Typical Value)	3.6V	
Battery Supply Current (Typical Value)	26uA	
Circuit Board Outer Diameter	66mm	
Circuit Board Inner Diameter	19mm	

L80I-C / L80I-E

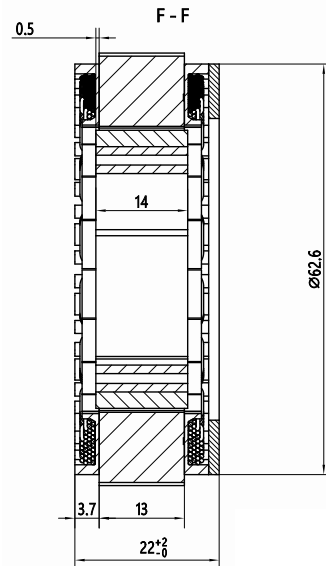
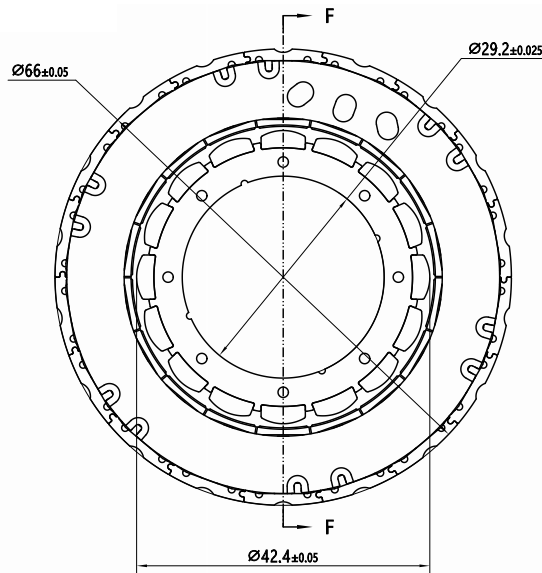
(Encoder: EL-80C-A / EL-80E-A Brake: BM-80-A Motor: ML-80-A)

Brake: BM-80-A

Rated Voltage (V)	DC24±5%
Resistance (Ω)	169±5%
Power (W)	3.4
Insulation Class	F
Static Torque (After Run-in)	≥0.71 N.m
Insulation Withstand Voltage	500V/5mA
Operating Temperature	-40°C~60°C
Engagement Time	<50ms
Release Time	<50ms
Operating Clearance	0.2-0.3mm
Maximum Backlash	0.4mm
Max Rotation Speed	6000rpm
Lead Wire Length	100mm
Lead Wire Specification	10064 Teflon-30AWG



Motor ML-80-A



Number of Poles	16	Rated Rotate Speed (rpm)	3000	Dielectric Strength	1500VAC 1SEC
Phase Resistance (ohms@20°C)	0.14	Rated Current (Arms)	7	Insulation Resistance	100Mohms@500VDC
Phase Inductance (mH@1kHz)	0.3	Peak Torque (N·m)	1.92	Rotor moment of inertia (kg·mm²)	22.65
Rated Voltage (VAC)	48	Peak Current (Arms)	21	Working Environment	-20°C~60°C
No-load Speed (rpm)	5000	Back EMF Constant (Vrms/krpm)	6.67	Storage Environment	-30°C~85°C
No-load Current (Arms)	0.35	Torque Constant (N·m/A)	0.09	Humidity	≤95%No condensation
Rated Torque (N·m)	0.64	Insulation Level	F 155°C	Weight (kg)	0.29

L90I-C / L90I-E

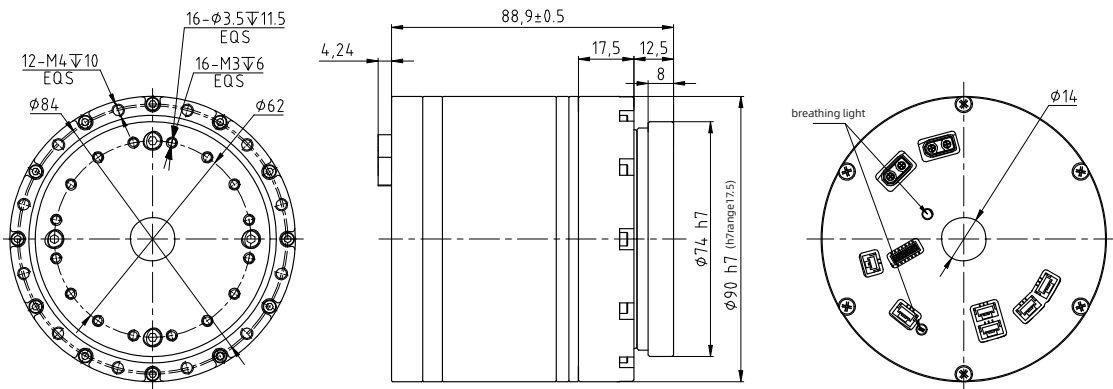
(Encoder: EL-90C-A / EL-90E-A Brake: BM-90-A Motor: ML-90-A)

Specification

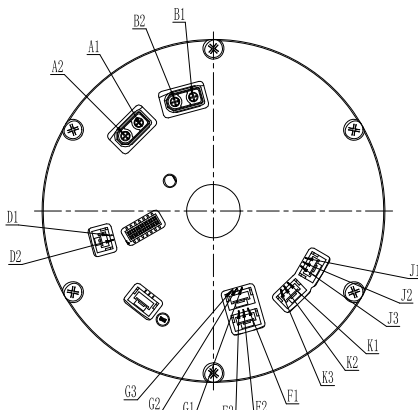


Frame-less Motor		ML-90-A			
Harmonic Drive-Reduction Ratio		51	81	101	121
Peak Torque at Start and Stop	N · m	73	96	107	113
Permissible Maximum Value for Average Load Torque	N · m	44	61	64	64
Permissible Maximum Momentary Torque	N · m	127	165	191	191
Rated Torque of the Motor (for Debugging)	N · m	1.23	1.08	0.91	0.76
Maximum Torque of the Motor (for Debugging)	N · m	2.04	1.69	1.51	1.33
Maximum Rotate Speed	rpm	78.4	49.4	39.6	33.1
Rated Rotate Speed	rpm	58.8	37.0	29.7	24.8
Maximum Current	Arms	19.59	15.15	13.54	11.94
Rated Current	Arms	11.81	9.63	8.10	6.76
Torque Constant of the Motor	Nm/Arms	0.10	0.11	0.11	0.11
Motor Phase Resistance	Ohms	0.11	0.11	0.11	0.11
Motor Phase Inductance	mH	0.24	0.24	0.24	0.29
Motor line back EMF	Vrms/krpm	6.78	6.78	6.78	6.78
Supply Voltage	V	DC 48V			
Weight	Kg	1.86			
Motor Insulation	Thermal Class:F(155℃) Insulating Resistance: Above500MΩ (DC500V) Withstanding Voltage and Insulation:AC1500V(1min), <5mA				

L90I-C-Structure Drawing



L90I-C-Interface Definition

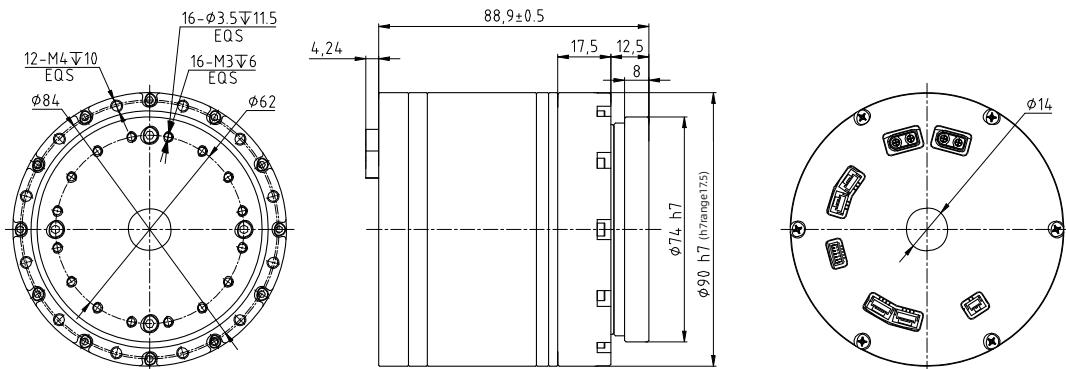


Module Signal Definition		
Pin No.	Signal Name	Remarks
A1/B1	VBUS+	Bus Power Input/ Output Positive
A2/B2	VBUS-	Bus Power Input/ Output Negative
D1	BAT+	Multi-turn Encoders Backup Battery Positive
D2	BAT-	Multi-turn Encoders Backup Battery Negative
F1/G1	CAN_H	Can Bus High
F2/G2	CAN_GND	Can Bus Ground
F3/G3	CAN_L	Can Bus low
J1/K1	RS485_A	RS485 Bus A Terminal
J2/K2	RS485_GND	RS485 Bus Ground
J3/K3	RS485_B	RS485 Bus B Terminal

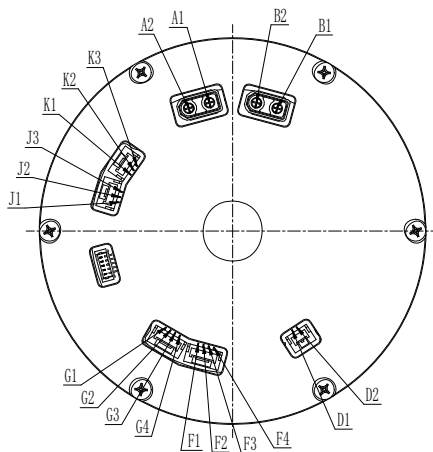
L90I-C / L90I-E

(Encoder: EL-90C-A / EL-90E-A Brake: BM-90-A Motor: ML-90-A)

L90I-E-Structure Drawing



L70I-E-Interface Definition



Module Signal Definition

Pin NO.	Signal Name	Remarks
A1/B1	VBUS+	Bus Power Input/Output Positive Terminal
A2/B2	VBUS-	Bus Power Input/Output Negative Terminal
D1	BAT+	Multiturn Encoder Backup Battery Positive Terminal
D2	BAT-	Multiturn Encoder Backup Battery Negative Terminal
F1	E1_RX+	EtherCAT Output Receive Positive Terminal
F2	E1_RX-	EtherCAT Output Receive Negative Terminal
F3	E1_TX+	EtherCAT Output Transmit Positive Terminal
F4	E1_TX-	EtherCAT Output Transmit Negative Terminal
G1	EO_RX+	EtherCAT Input Receive Positive Terminal
G2	EO_RX-	EtherCAT Input Receive Negative Terminal
G3	EO_TX+	EtherCAT Input Transmit Positive Terminal
G4	EO_TX-	EtherCAT Input Transmit Negative Terminal
J1/K1	RS485_A	RS485 Bus A Terminal
J2/K2	RS485_GND	RS485 Bus Ground
J3/K3	RS485_B	RS485 Bus B Terminal

Encoder: EL-90C-A / EL-90E-A

Products	L90I-C	L90I-E
Encoder	CanOpen: EL-90C-A  	EtherCat: EL-90E-A  
Supply Voltage	48V ± 10%	
Output Drive Type	3-Phase MOSFET	
Output Rated Phase Current	10.56A	
Output maximum instantaneous phase current (ms level)	17.7A	
Driver Protection	Phase current overcurrent, load short circuit	
Communication Type	CANopen	EtherCat
Baud Rate	≤1Mbps	≤100Mbps
Working Environment Temperature	0~60°C	
Relative Humidity	20%~80%	
Battery Supply Voltage (Typical Value)	3.6V	
Battery Supply Current (Typical Value)	26uA	
Circuit Board Outer Diameter	66mm	
Circuit Board Inner Diameter	19mm	

L110I-C / L110I-E

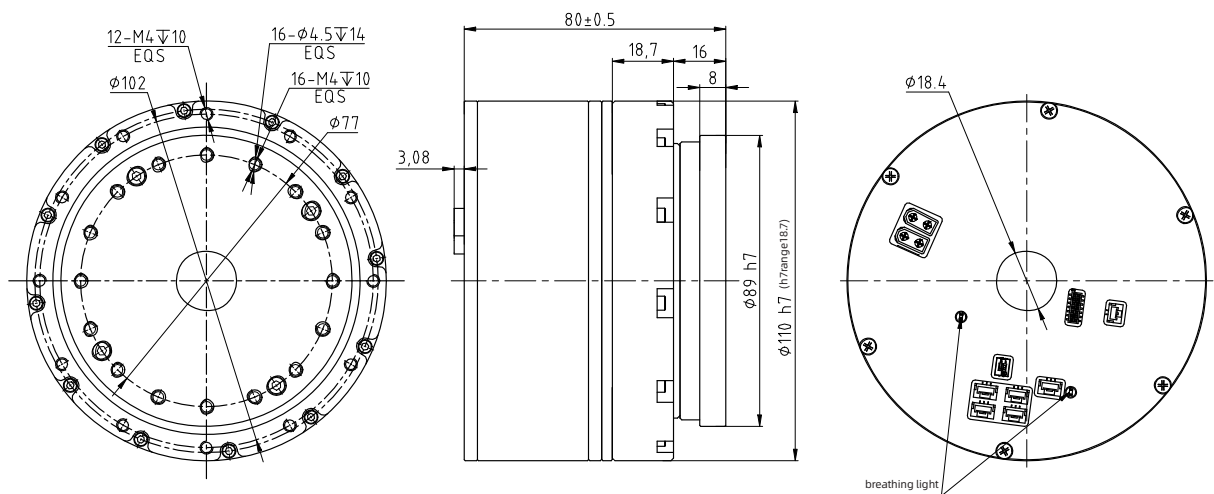
(Encoder: EL-110C-A / EL-110E-A Brake: BM-110-A Motor: ML-110-A)

Specification



Frame-less Motor		ML-110-A			
Harmonic Drive-Reduction Ratio		51	81	101	121
Peak Torque at Start and Stop	N · m	127	178	204	217
Permissible Maximum Value for Average Load Torque	N · m	72	113	140	140
Permissible Maximum Momentary Torque	N · m	242	332	369	395
Rated Torque of the Motor (for Debugging)	N · m	2.02	1.99	1.98	1.65
Maximum Torque of the Motor (for Debugging)	N · m	3.56	3.14	2.89	2.56
Maximum Rotate Speed	rpm	78.4	49.4	39.6	33.1
Rated Rotate Speed	rpm	58.8	37.0	29.7	24.8
Maximum Current	Arms	32.42	28.61	26.30	23.35
Rated Current	Arms	18.38	18.16	18.05	15.07
Torque Constant of the Motor	Nm/Arms	0.11	0.11	0.11	0.11
Motor Phase Resistance	Ohms	0.032	0.032	0.032	0.032
Motor Phase Inductance	mH	0.11	0.11	0.11	0.11
Motor line back EMF	Vrms/krpm	6.88	6.88	6.88	6.88
Supply Voltage	V	DC 48V			
Weight	Kg	2.7			
Motor Insulation	Thermal Class:F(155℃) Insulating Resistance: Above500MΩ (DC500V) Withstanding Voltage and Insulation:AC1500V(1min), <5mA				

L110I-C-Structure Drawing



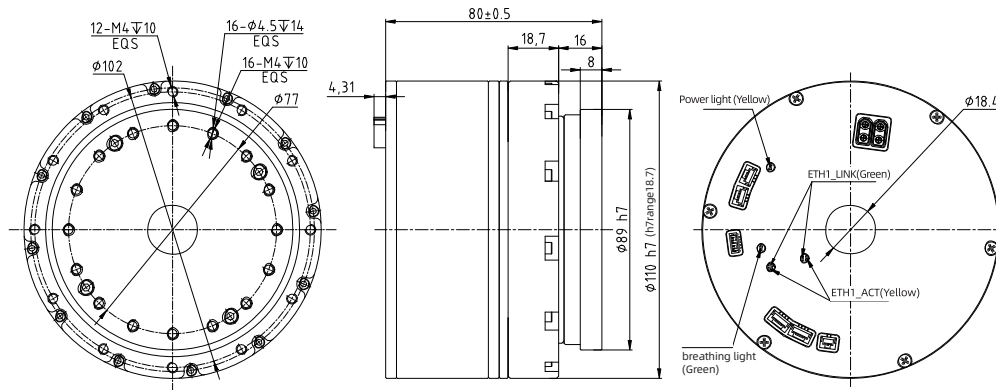
L110I-C-Interface Definition

		Module Signal Definition	
Pin No.	Lead	Signal Name	Remarks
A/B	1	DC+	Power Positive
	2	DC-	Power Negative
D/E	1	CANL	/
	2	GND	CAN GND
	3	CANH	/
F/G	1	485L	/
	2	GND	485 Signal GND
	3	485H	/
I	1	BAT+	Battery Positive
	2	BAT-	Battery Negative

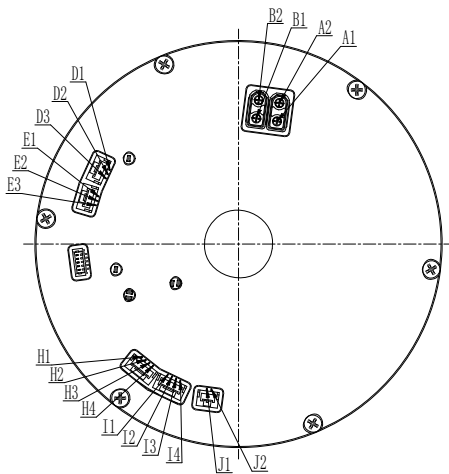
L110I-C / L110I-E

(Encoder: EL-110C-A / EL-110E-A Brake: BM-110-A Motor: ML-110-A)

L110I-E-Structure Drawing



L110I-E-Interface Definition



Module Signal Definition

Pin No.	Lead	Signal Definition	Remarks
A/B	1	DC+	Power Positive
	2	DC-	Power Negative
D/E	1	485L	/
	2	GND	485 Signal GND
	3	485H	/
H	1	RX1_P	Ethercat connector-OUT
	2	RX1_N	
	3	TX1_P	
	4	TX1_N	
I	1	PXO_P	Ethercat connector-IN
	2	PXO_N	
	3	TXO_P	
	4	TXO_N	
J	1	BAT+	Backup Battery Positive Terminal
	2	BAT-	Backup Battery Negative Terminal

Encoder: EL-110C-A / EL-110E-A

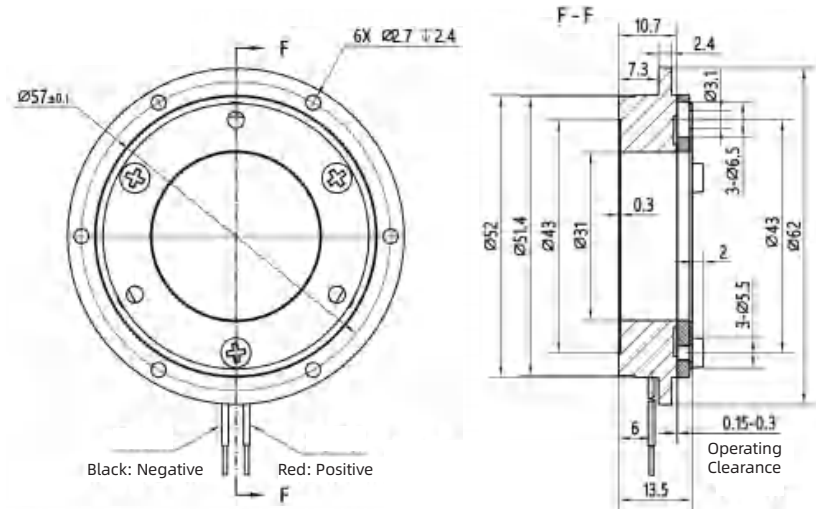
Products	L110I-C	L110I-E
Encoder	CanOpen: EL-110C-A  	EtherCat: EL-110E-A  
Supply Voltage	48V±10%	
Output Drive Type	3-Phase MOSFET	
Output Rated Phase Current	16.89A	
Output maximum instantaneous phase current (ms level)	29.8A	
Driver Protection	Phase current overcurrent, load short circuit	
Communication Type	CANopen	EtherCat
Baud Rate	≤1Mbps	≤100Mbps
Working Environment Temperature	0~60°C	
Relative Humidity	20%~80%	
Battery Supply Voltage (Typical Value)	3.6V	
Battery Supply Current (Typical Value)	26uA	
Circuit Board Outer Diameter	108mm	
Circuit Board Inner Diameter	19mm	

L110I-C / L110I-E

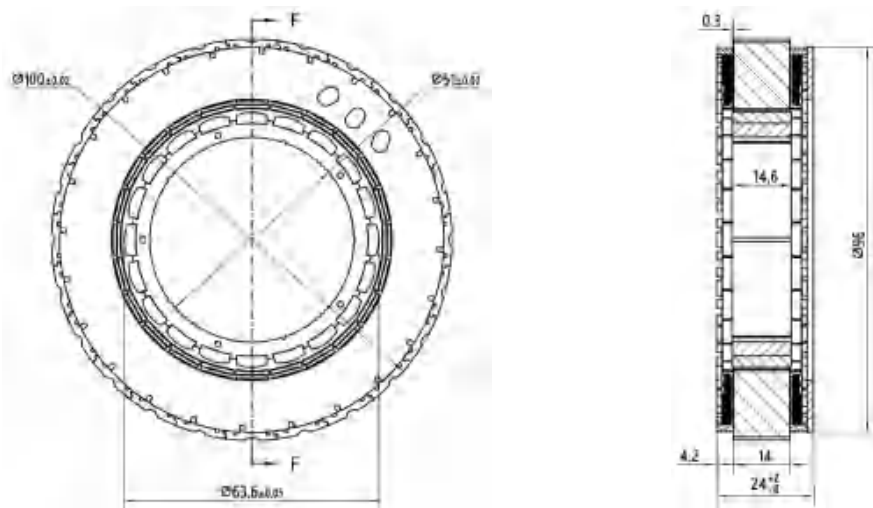
(Encoder: EL-110C-A / EL-110E-A Brake: BM-110-A Motor: ML-110-A)

Brake: BL-110-A

Rated Voltage (V)	DC24±5%
Resistance (Ω)	63±5%
Power (W)	9.1
Insulation Class	F
Static Torque (After Run-in)	≥3N.m
Insulation Withstand Voltage	500V/5mA
Operating Temperature	-40°C~60°C
Engagement Time (ms)	<50
Release Time (ms)	<50
Operating Clearance (mm)	0.15-0.3
Maximum Backlash (mm)	0.4
Max Rotation Speed (rpm)	6000
Lead Wire Length (mm)	100
Lead Wire Specification	10064 Teflon-26AWG



Motor: ML-110-A



Number of Poles	20	Rated Rotate Speed (rpm)	3000	Dielectric Strength	1500VAC 1SEC
Phase Resistance (ohms@20°C)	0.032	Rated Current (Arms)	17.5	Insulation Resistance	100Mohms@500VDC
Phase Inductance (mH@1kHz)	0.11	Peak Torque (N·m)	5.76	Rotor moment of inertia (kg·mm ²)	91.38
Rated Voltage (VAC)	48	Peak Current (Arms)	52.5	Working Environment	-20°C~60°C
No-load Speed (rpm)	4000	Back EMF Constant (Vrms/krpm)	6.88	Storage Environment	-30°C~85°C
No-load Current (Arms)	0.88	Torque Constant (N·m/A)	0.11	Humidity	≤95%No condensation
Rated Torque (N·m)	1.92	Insulation Level	F 155°C	Weight (kg)	0.67

L142I-C / L142I-E

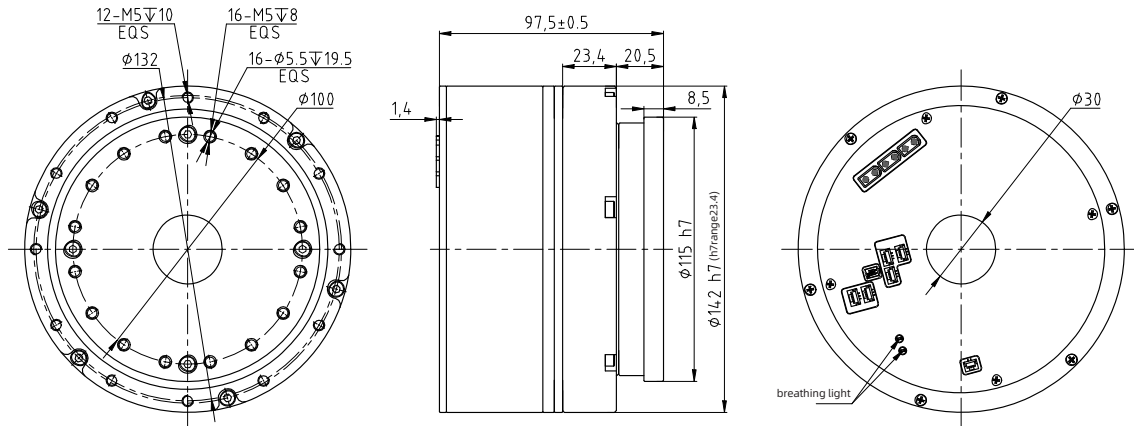
(Encoder: EL-142C-A / EL-142E-A Brake: BL-142-A Motor: ML-142-A)

Specification

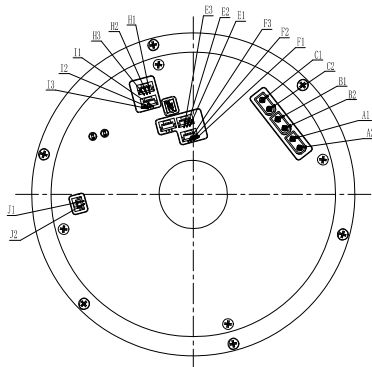


Frame-less Motor		ML-142-A			
Harmonic Drive-Reduction Ratio		51	81	101	121
Peak Torque at Start and Stop	N · m	281	395	433	459
Permissible Maximum Value for Average Load Torque	N · m	140	217	281	281
Permissible Maximum Momentary Torque	N · m	497	738	841	892
Rated Torque of the Motor (for Debugging)	N · m	3.23	3.15	3.27	2.73
Maximum Torque of the Motor (for Debugging)	N · m	6.48	5.74	5.04	4.46
Maximum Rotate Speed	rpm	58.8	37.0	29.7	24.8
Rated Rotate Speed	rpm	39.2	24.7	19.8	16.5
Maximum Current	Arms	38.93	34.45	30.29	26.80
Rated Current	Arms	19.40	18.93	19.66	16.41
Torque Constant of the Motor	Nm/Arms	0.17	0.17	0.17	0.17
Motor Phase Resistance	Ohms	0.036	0.036	0.036	0.036
Motor Phase Inductance	mH	0.12	0.12	0.12	0.12
Motor line back EMF	Vrms/krpm	11.2	11.2	11.2	11.2
Supply Voltage	V	DC 48V			
Weight	Kg	5.15			
Motor Insulation	Thermal Class:F(155°C) Insulating Resistance: Above500MΩ (DC500V) Withstanding Voltage and Insulation:AC1500V(1min), <5mA				

L142I-C-Structure Drawing



L142I-C-Interface Definition

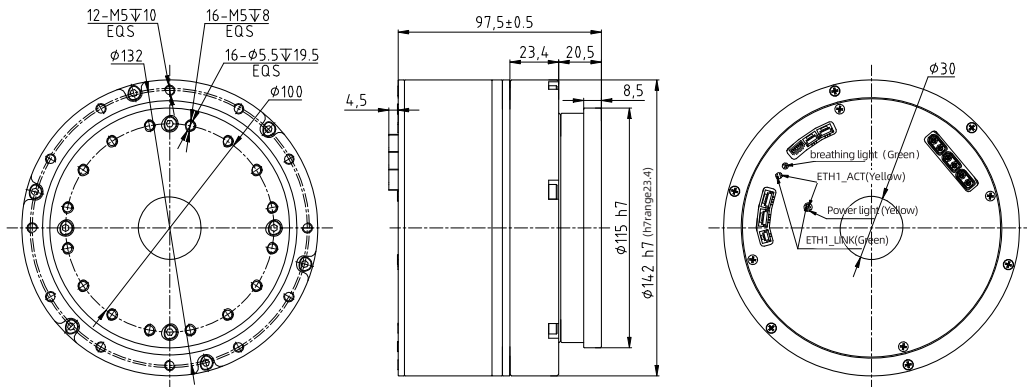


Module Signal Definition			
Pin No.	Lead	Signal Name	Remarks
A/B/C	1	DC+	Power Positive
	2	DC-	Power Negative
E/F	1	CANL	/
	2	GND	CAN GND
	3	CANH	/
H/I	1	485L	/
	2	GND	485 Signal GND
	3	485H	/
J	1	BAT+	Battery Positive
	2	BAT-	Battery Negative

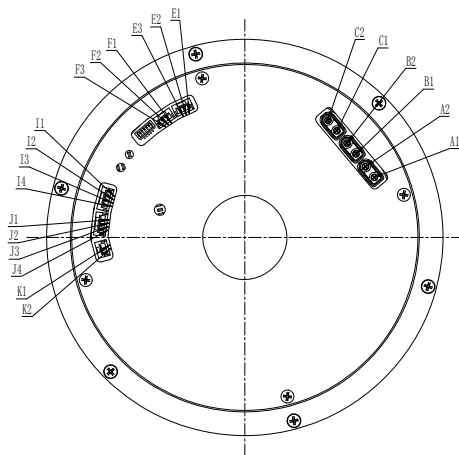
L142I-C / L142I-E

(Encoder: EL-142C-A / EL-142E-A Brake: BL-142-A Motor: ML-142-A)

L142I-E-Structure Drawing



L142I-E-Interface Definition



Module Signal Definition			
Pin No.	Lead	Signal Definition	Remarks
A/B/C	1	DC+	Power Positive
	2	DC-	Power Negative
E/F	1	485L	/
	2	GND	485 Signal GND
	3	485H	/
I	1	RX1_P	Ethercat connector-OUT
	2	RX1_N	
	3	TX1_P	
	4	TX1_N	
J	1	PXO_P	Ethercat connector-IN
	2	PXO_N	
	3	TXO_P	
	4	TXO_N	
K	1	BAT+	Backup Battery Positive Terminal
	2	BAT-	Backup Battery Negative Terminal

Encoder: EL-142C-A / EL-142E-A

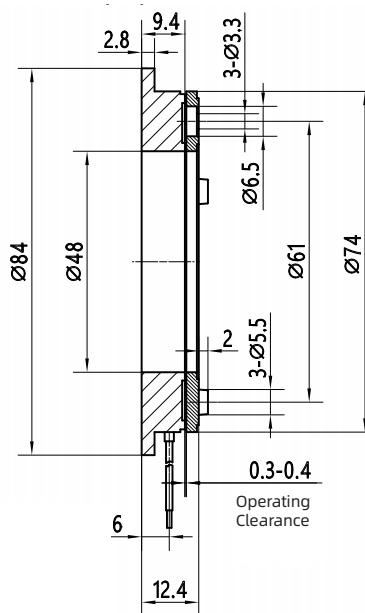
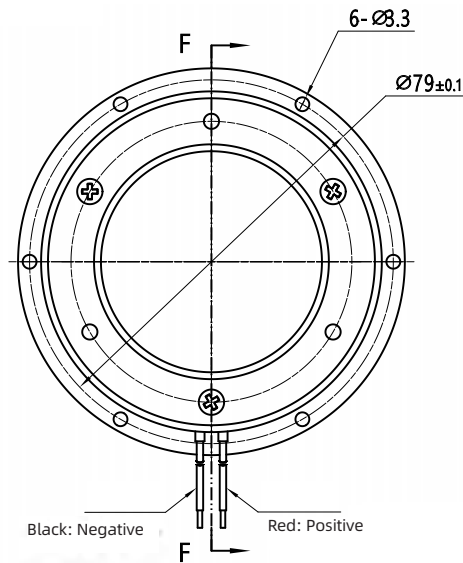
Products	L142I-C	L142I-E
Encoder	CanOpen: EL-142C-A 	EtherCat: EL-142E-A 
		
Supply Voltage	48V $\pm$ 10%	
Output Drive Type	3-Phase MOSFET	
Output Rated Phase Current	23.33A	
Output maximum instantaneous phase current (ms level)	46.83A	
Driver Protection	Phase current overcurrent, load short circuit	
Communication Type	CANopen	EtherCat
Baud Rate	$\leq$ 1Mbps	$\leq$ 100Mbps
Working Environment Temperature	0~60°C	
Relative Humidity	20%~80%	
Battery Supply Voltage (Typical Value)	3.6V	
Battery Supply Current (Typical Value)	26uA	
Circuit Board Outer Diameter	110mm	
Circuit Board Inner Diameter	42mm	

L142I-C / L142I-E

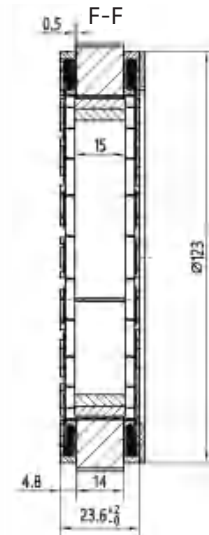
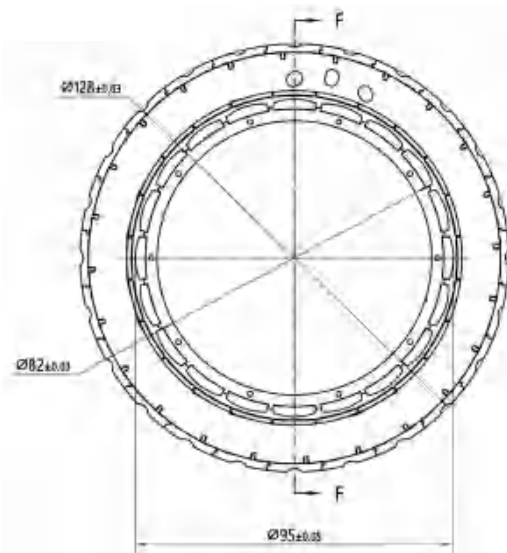
(Encoder: EL-142C-A / EL-142E-A Brake: BL-142-A Motor: ML-142-A)

Brake: BL-142-A

Rated Voltage (V)	DC24±5%
Resistance (Ω)	75±5%
Power (W)	7.6
Insulation Class	F
Static Torque (After Run-in)	≥4N.m
Insulation Withstand Voltage	500V/5mA
Operating Temperature	-40°C~60°C
Engagement Time (ms)	<80
Release Time(ms)	<40
Operating Clearance(mm)	0.3-0.4
Maximum Backlash(mm)	0.5
Max Rotation Speed(rpm)	6000
Lead Wire Length(mm)	100
Lead Wire Specification	10064 Teflon-26AWG



Motor: ML-142-A



Number of Poles	20	Rated Rotate Speed (rpm)	2000	Dielectric Strength	1500VAC 1SEC
Phase Resistance (ohms@20°C)	0.036	Rated Current (Arms)	21.5	Insulation Resistance	100Mohms@500VDC
Phase Inductance (mH@1kHz)	0.12	Peak Torque (N·m)	8.95	Rotor moment of inertia (kg·mm²)	361.21
Rated Voltage (VAC)	48	Peak Current (Arms)	53.75	Working Environment	-20°C~60°C
No-load Speed (rpm)	2500	Back EMF Constant (Vrms/krpm)	11.2	Storage Environment	-30°C~85°C
No-load Current (Arms)	1.08	Torque Constant (N·m/A)	0.17	Humidity	≤95%No condensation
Rated Torque (N·m)	3.58	Insulation Level	F 155°C	Weight (kg)	0.9

L170I-C/L170I-E

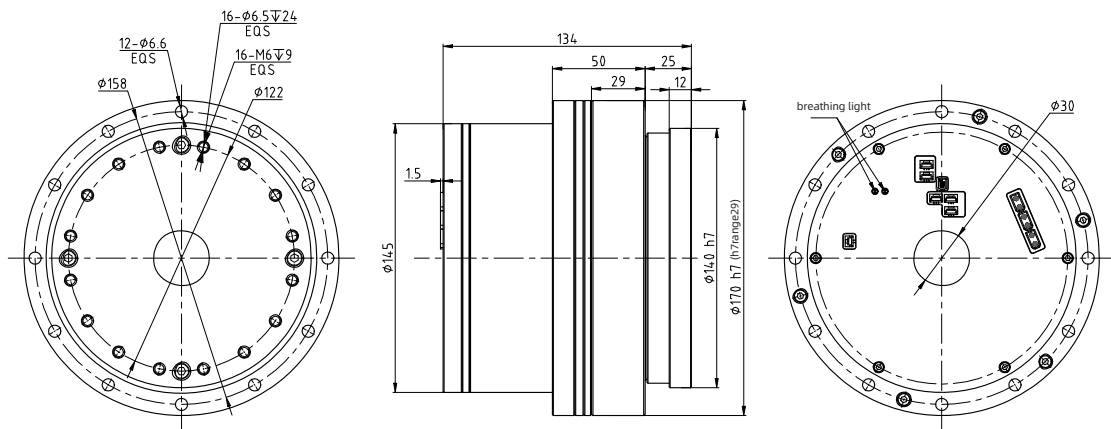
(Encoder: EL-170C-A / EL-170E-A Brake: BL-170-A Motor: ML-170-A)

Specification

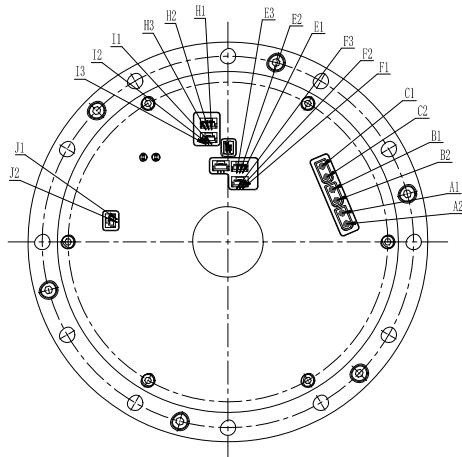


Frame-less Motor		ML-170-A			
Harmonic Drive-Reduction Ratio		51	81	101	121
Peak Torque at Start and Stop	N · m	523	675	738	802
Permissible Maximum Value for Average Load Torque	N · m	255	369	484	586
Permissible Maximum Momentary Torque	N · m	892	1270	1400	1530
Rated Torque of the Motor (for Debugging)	N · m	7.14	6.51	6.85	6.92
Maximum Torque of the Motor (for Debugging)	N · m	14.65	11.90	10.44	9.47
Maximum Rotate Speed	rpm	49.0	30.9	24.8	20.7
Rated Rotate Speed	rpm	39.2	24.7	19.8	16.5
Maximum Current	Arms	87.08	70.76	62.05	56.28
Rated Current	Arms	42.46	38.68	40.69	41.12
Torque Constant of the Motor	Nm/Arms	0.17	0.17	0.17	0.17
Motor Phase Resistance	Ohms	0.016	0.016	0.016	0.016
Motor Phase Inductance	mH	0.059	0.059	0.059	0.059
Motor line back EMF	Vrms/krpm	11.31	11.31	11.31	11.31
Supply Voltage	V	DC 48V			
Weight	Kg	9.48			
Motor Insulation	Thermal Class:F(155°C) Insulating Resistance: Above500MQ (DC500V) Withstanding Voltage and Insulation:AC1500V(1min), <5mA				

L170I-C-Structure Drawing



L170I-C-Interface Definition

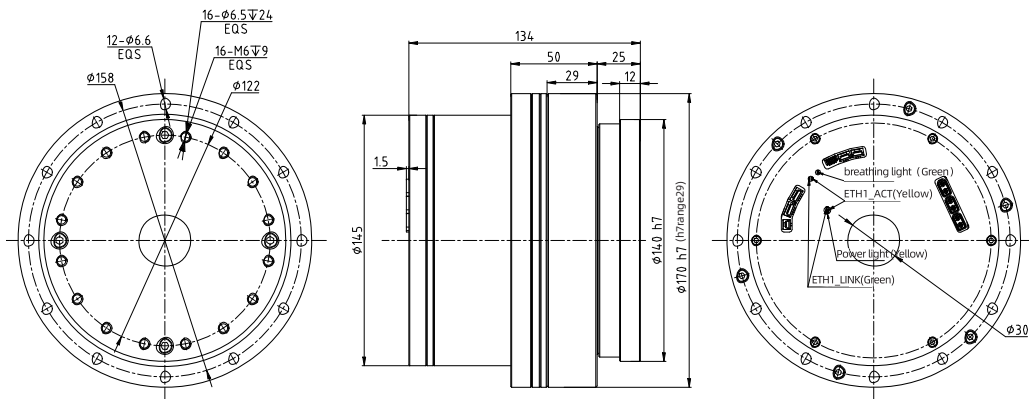


Module Signal Definition			
Pin No.	Lead	Signal Name	Remarks
A/B/C	1	DC+	Power Positive
	2	DC-	Power Negative
E/F	1	CANL	/
	2	GND	CAN GND
	3	CANH	/
H/I	1	485L	/
	2	GND	485 Signal GND
	3	485H	/
J	1	BAT+	Battery Positive
	2	BAT-	Battery Negative

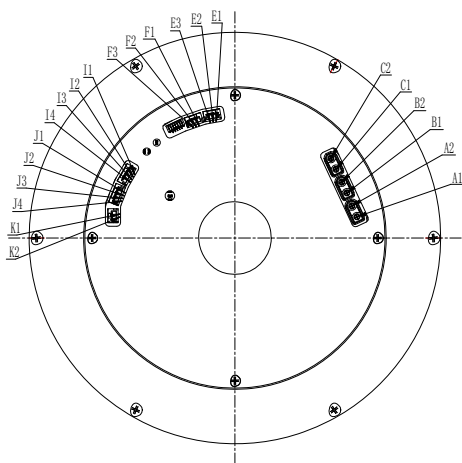
L170I-C/L170I-E

(Encoder: EL-170C-A / EL-170E-A Brake: BL-170-A Motor: ML-170-A)

L170I-E-Structure Drawing



L170I-E-Interface Definition



Module Signal Definition			
Pin No.	Lead	Signal Definition	Remarks
A/B/C	1	DC+	Power Positive
	2	DC-	Power Negative
E/F	1	485L	/
	2	GND	485 Signal GND
	3	485H	/
I	1	RX1_P	Ethercat connector-OUT
	2	RX1_N	
	3	TX1_P	
	4	TX1_N	
J	1	PXO_P	Ethercat connector-IN
	2	PXO_N	
	3	TXO_P	
	4	TXO_N	
K	1	BAT+	Backup Battery Positive Terminal
	2	BAT-	Backup Battery Negative Terminal

Encoder: EL-170C-A / EL-170E-A

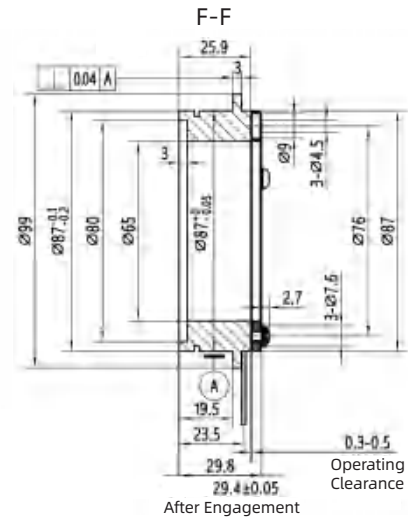
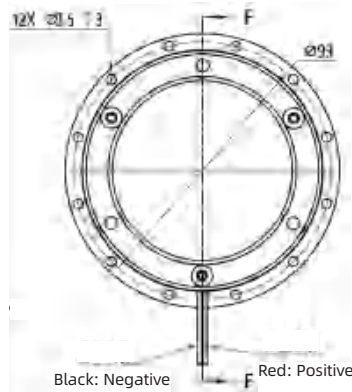
Products	L110I-C	L110I-E
Encoder	CanOpen: EL-170C-A 	EtherCat: EL-170E-A 
		
Supply Voltage	48V±10%	
Output Drive Type	3-Phase MOSFET	
Output Rated Phase Current	23.33A	
Output maximum instantaneous phase current (ms level)	46.83A	
Driver Protection	Phase current overcurrent, load short circuit	
Communication Type	CANopen	EtherCat
Baud Rate	≤1Mbps	≤100Mbps
Working Environment Temperature	0~60°C	
Relative Humidity	20%~80%	
Battery Supply Voltage (Typical Value)	3.6V	
Battery Supply Current (Typical Value)	26uA	
Circuit Board Outer Diameter	110mm	
Circuit Board Inner Diameter	42mm	

L170I-C/L170I-E

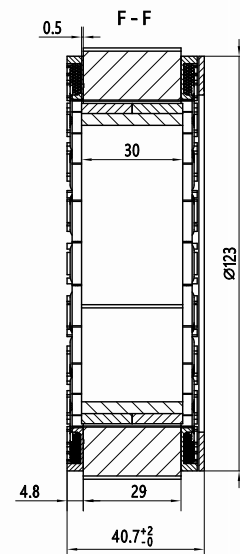
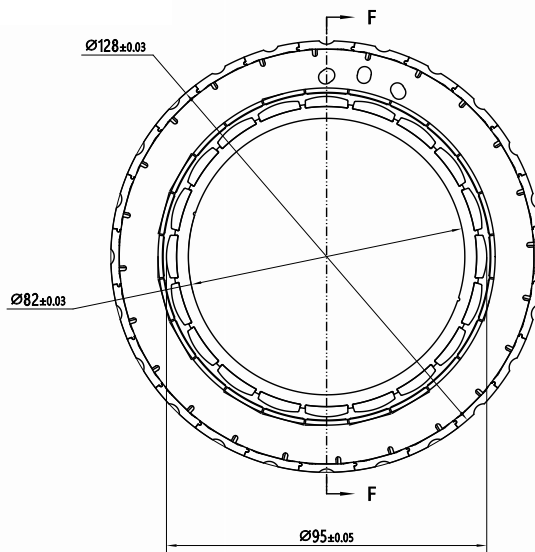
(Encoder: EL-170C-A / EL-170E-A Brake: BL-170-A Motor: ML-170-A)

Brake: BM-170-A

Rated Voltage (V)	DC24±5%
Resistance (Ω)	61.6±5%
Power (W)	9.35
Insulation Class	F
Static Torque (After Run-in)	≥8.5N.m
Insulation Withstand Voltage	500V/5mA
Operating Temperature	-40°C-60°C
Engagement Time (ms)	<50
Release Time(ms)	<50
Operating Clearance(mm)	0.3-0.4
Maximum Backlash(mm)	0.5
Max Rotation Speed(rpm)	6000
Lead Wire Length(mm)	100
Lead Wire Specification	10064 Teflon-26AWG



Motor: ML-170-A



Number of Poles	20	Rated Rotate Speed (rpm)	2000	Dielectric Strength	1500VAC 1SEC
Phase Resistance (ohms@20°C)	0.031	Rated Current (Arms)	32	Insulation Resistance	100Mohms@500VDC
Phase Inductance (mH@1kHz)	0.105	Peak Torque (N·m)	14.3	Rotor moment of inertia (kg·mm²)	725
Rated Voltage (VAC)	48	Peak Current (Arms)	64	Working Environment	-20°C~60°C
No-load Speed (rpm)	2500	Back EMF Constant (Vrms/krpm)	15.08	Storage Environment	-30°C~85°C
No-load Current (Arms)	3.2	Torque Constant (N·m/A)	0.22	Humidity	≤95%No condensation
Rated Torque (N·m)	7.15	Insulation Level	F 155°C	Weight (kg)	1.8



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