

苏州脉塔智能科技有限公司

MyActuator Technical Document.

产品规格书

PRODUCT SPECIFICATION

产品名称 / Product Name	RMD-X4-P12-10-E-L
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1. 外形安装图

External installation drawing

本节展示了电机的外形结构、安装尺寸。

This section presents the external structure and installation dimensions of the motor.

1.1 电机 3D 外观图

3D appearance diagram of the motor



1.2 电机 2D 安装图

2D Installation diagram of motor

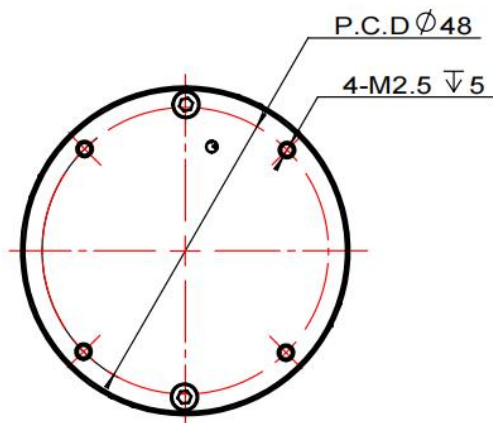


图 1.2 驱动端安装图

Driver end installation diagram

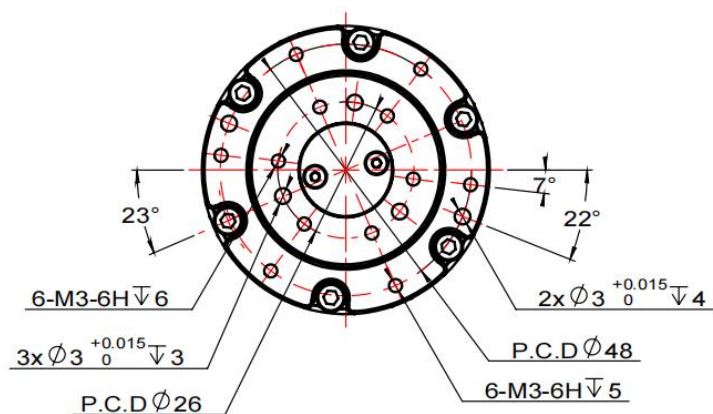


图 1.3 输出端安装图

Output end installation diagram

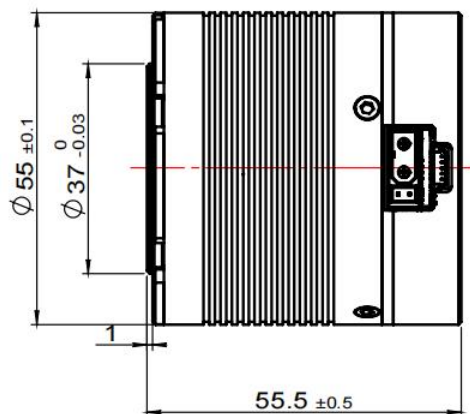


图 1.4 侧视图

Side view

2. 接口定义图

Interface definition diagram

本节展示电机的接口定义，包括电源接口、通信接口及各引脚功能说明。

This section presents the interface definitions of the motor, including the power interface, communication interface, and functional descriptions of each pin.



2.1 引脚定义

Pin definition

下表列出了电机各接口引脚的功能定义：

The following table lists the functional definitions of each interface pin of the motor:

引脚名称 Pin name	功能描述 Function Description	信号类型 Signal type	备注 Note
VCC	电源正极 Power Positive	电源输入 Power Input	24VDC
GND	电源地 Power Ground	电源输入 Power Input	—
CANH	CAN 总线高位 CAN Bus High	通信信号 Communication Signal	差分信号 Differential Signal
CANL	CAN 总线低位 CAN Bus Low	通信信号 Communication Signal	差分信号 Differential Signal
T+/T-	ECAT 发送差分对 ECAT Transmit Differential Pair	通信信号 Communication Signal	差分信号 Differential Signal
R+/R-	ECAT 接收差分对 ECAT Receive Differential Pair	通信信号 Communication Signal	差分信号 Differential Signal
PE	保护地 Protective Earth	接地 Ground	—

注：ECAT 接口区分输入端和输出端，接口依次标注 IN，OUT。

Note: The ECAT interface distinguishes between the input and output ports. The interface is labeled IN and OUT in sequence.

3. 规格参数表

Specification Parameter Table

下表列出了电机的详细规格参数，包括电气参数、机械参数及性能指标。
The table below lists the detailed specification parameters of the motor, including electrical parameters, mechanical parameters and performance indicators.

序号 No.	参数项 Parameter Item	单位 Unit	RMD-X4-P12-10-E-L
1	减速比 Reduction Ratio	-	12.5
2	输入电压 Input Voltage	V	24
3	空载转速 No-load Speed	RPM	317
4	空载输入电流 No-load Input Current	A	1
5	额定转速 Rated Speed	RPM	238
6	额定转矩* Rated Torque*	N · m	4
7	额定输出功率 Rated Output Power	W	100
8	额定相电流 Rated Phase Current	A(rms)	7.8
		A(peak)	11
9	峰值扭矩* Peak Torque*	N · m	11
10	堵转扭矩 Stall Torque	N · m	12
11	堵转相电流 Stall Phase Current	A(rms)	21.2

序号 No.	参数项 Parameter Item	单位 Unit	RMD-X4-P12-10-E-L
12	效率 Efficiency	%	69
13	电机反电势常数 Motor Back EMF Constant	Vdc/Krpm	5
14	模组扭矩常数* Module Torque Constant*	N · m/A(rms)	0.62
		N · m/A(peak)	0.44
15	电机线电阻 Motor Line Resistance	Ω	0.207
16	电机线电感 Motor Line Inductance	mH	0.037
17	极对数 Pole Pairs	-	11
18	接线方式 Wiring Mode	-	Y
19	反驱力矩 Back drive Torque	N · m	0.2
20	背隙 Backlash	Arcmin	15
21	输出端轴承型号 Output Shaft Bearing Model	-	6707-ZZ
22	轴向载荷 C Axial Load C	KN	/
23	径向载荷 Cr Radial Load Cr	KN	/
24	转动惯量 Moment of Inertia	Kg · m ²	0.000022
25	编码器类型 Encoder Type	-	Dual Encoder ABS-17BIT/ABS-18BIT
26	绝对定位精度 Absolute Positioning Accuracy	Degree	0.4

序号 No.	参数项 Parameter Item	单位 Unit	RMD-X4-P12-10-E-L
27	重复定位精度 Repeat Positioning Accuracy	Degree	0.7
28	通信方式 Communication Interface	-	CAN/EtherCAT
29	重量 Weight	Kg	0.33
30	绝缘等级 Insulation Class	-	F
31	尺寸 Dimensions	mm	55×55.5
32	中空直径 Hollow Shaft Diameter	mm	/

注：

1. 额定转矩* 是指电机在额定电压、额定转速条件下，执行正反转 90°摆动并点位维持 5 秒，于最佳效率点邻近区域内可持续输出的扭矩值；
2. 峰值扭矩*是指电机在额定电压、10rpm 转速下，所输出的最大扭矩值；
3. 上位机所示参数中的 KT_OUT 基于相电流峰值测试，对应相电流峰值下的模组扭矩常数*，详情见第 6 节扭矩常数曲线图；
4. 以上额定数据供机器人方向使用，如果自动化行业使用请降低功率。

Note:

1. Rated Torque* refers to the torque that can be continuously output near the optimal efficiency point when the motor performs 90° forward and reverse swing with 5-second position holding under the conditions of rated voltage and rated speed.
2. Peak Torque* refers to the maximum torque value that the motor outputs at the rated voltage and 10 rpm speed.
3. KT_OUT in the parameters displayed on the host computer is tested based on the peak phase current, corresponding to the module torque constant* at peak phase current. See the torque constant curve diagram in Section 6 for details.
4. The above rated data are for the use of the robot. If used in the automation industry, please reduce the power.

4. 特性曲线图

Characteristic curve graph

本节展示电机的特性曲线关系。

This section presents the characteristic curve relationship of the motor.

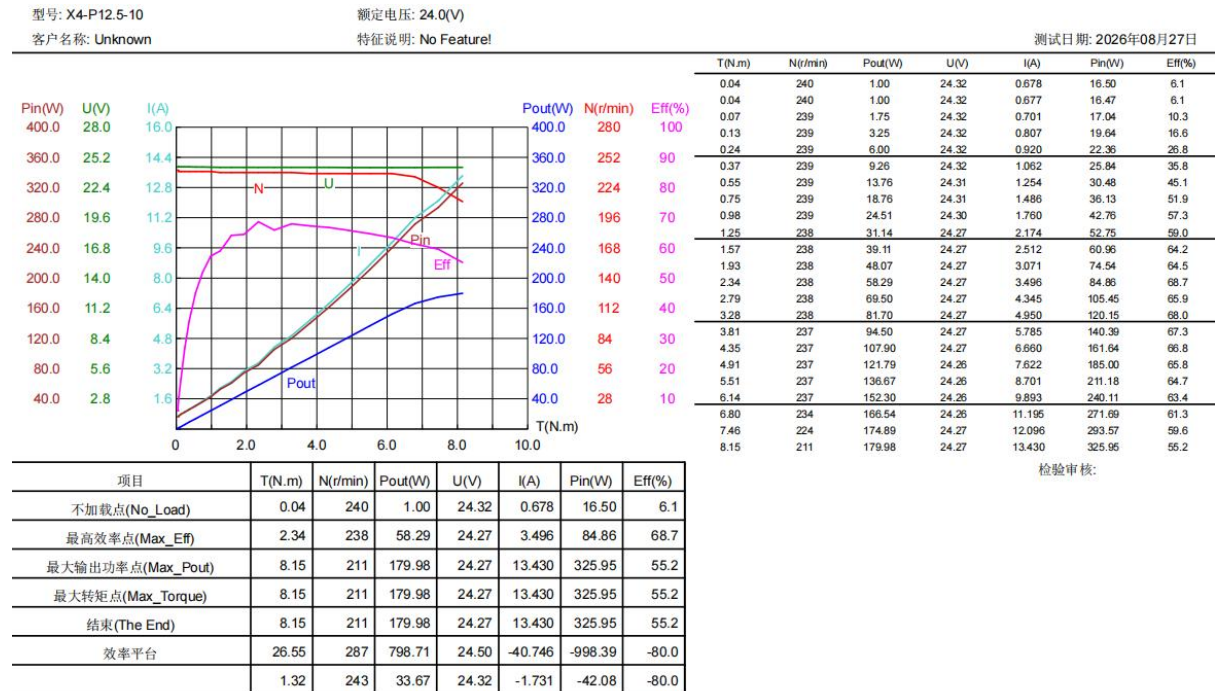


图 4.1 特性曲线图

Characteristic curve graph

5. 温升表

Temperature rise meter

转速 Speed	扭矩 Torque	持续时间 Duration	电机 Motor		板载 Onboard	
			初始温度 °C Initial Temp	结束温度 °C Final Temp	初始温度 °C Initial Temp	结束温度 °C Final Temp
0 rpm	2.9 Nm	90' (热平衡) (Thermal Equilibrium)	27	96	27	76
	4 Nm	2'15"	26	100	27	57
	8 Nm	10"	27	100	27	42
	10 Nm	7"	27	100	27	44
10 rpm	2.8 Nm	90' (热平衡) (Thermal Equilibrium)	26	95	26	80
	4 Nm	4'20"	27	100	27	71
	8 Nm	16"	27	100	27	42
30 rpm	2.8 Nm	90' (热平衡) (Thermal Equilibrium)	27	97	27	83
	4 Nm	4'7"	27	100	27	72
	8 Nm	19"	27	100	27	42
238 rpm	2 Nm	90' (热平衡) (Thermal Equilibrium)	26	96	26	85
	4 Nm	2'13"	27	100	27	68
	6 Nm	35"	27	100	27	50

6. 扭矩常数曲线图

Torque Constant Curve Chart

本节通过 IQ 电流法测得扭矩常数值。

In this section, the torque constant values were measured using the IQ current method.

IQ 电流 IQ Current (A _{peak})	实测 1 Test 1 (N.m)	实测 2 Test 2 (N.m)	实测 3 Test 3 (N.m)	实测均值 Average Measured Torque (N.m)	计算值 Calculation value	偏差百分比 Deviation percentage	KT_OUT (N.m/A _{peak})
25	10.45	10.14	10.29	10.29	11	6.87%	0.44
20	8.58	8.67	9.06	8.77	8.8	0.34%	
15	6.91	6.98	6.86	6.92	6.6	-4.58%	
10	4.65	4.64	4.59	4.63	4.4	-4.90%	
5	2.37	2.24	2.26	2.29	2.2	-3.93%	
-5	-2.44	-2.42	-2.32	-2.39	-2.2	-8.08%	
-10	-4.8	-4.77	-4.95	-4.84	-4.4	-9.09%	
-15	-7.22	-6.9	-6.98	-7.03	-6.6	-6.16%	
-20	-9.27	-8.94	-9.09	-9.10	-8.8	-3.30%	
-25	-11.3	-10.78	-11.61	-11.23	-11	-2.05%	

$KT_OUT = \frac{\sum[(IQ \text{ 电流} - IQ \text{ 电流的平均值})(\text{实测均值} - \text{实测均值的平均值})]}{\sum[(IQ \text{ 电流} - IQ \text{ 电流的平均值})^2]}$

$KT_OUT = \frac{\sum[(IQ \text{ current} - \text{average of IQ current})(\text{measured torque} - \text{average of measured torque})]}{\sum[(IQ \text{ current} - \text{average of IQ current})^2]}$

偏差百分比 = (计算值 - 实测均值) / 实测均值

Percentage Deviation = (Calculated Value - Average Measured Value) / Average Measured Value

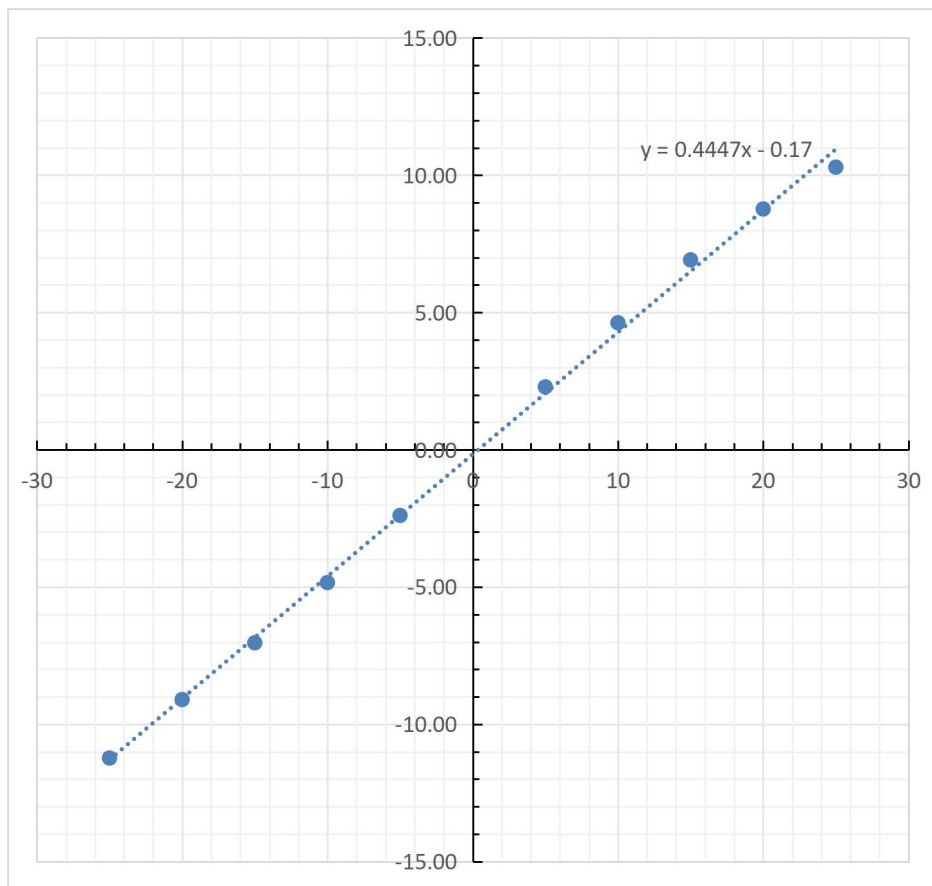


图 6.1 扭矩常数曲线图
Torque constant curve graph