

空心杯（空心轴）伺服电机
Hollow cup (hollow shaft) Servo Motor
CR- HC09-01

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产品概述 Product Overview

直流无刷电机是专为半导体设备开发的高性能驱动模块，采用直流无刷，集成光编码器与实时控制接口，满足芯片贴装（SMT）、晶圆倒装、固晶机等设备对超高速、超高精度、长寿命的核心需求。

High-Performance DC Brushless Drive Module for Semiconductor Equipment. Featuring integrated optical encoders and real-time control, this module delivers the ultra-high speed, precision, and durability required for SMT, wafer flip-chip, and die bonding applications.

电气规格 Electrical Specifications

额定电压(V) Nominal Voltage	额定功率(W) Rated Power	额定电流(A) Rated Current	待机功率(W) Standby Power	待机电流(A) Standby Current
24	6.72	0.28	0.36	0.015

额定电流/功率：电机正常运行过程中能到达的最大运行电流/功率；

待机电流/功率：电机到达运行角度后的待机电流/功率；

注意：电机上电会开环旋转一圈到机械零点位置（不同电机位置不同），电流会比较大。

Rated Current/Power: The maximum operating current/power the motor can reach during normal operation.

Standby Current/Power: The current/power consumed when the motor is in standby mode after reaching the target angle.

Note: Upon power-up, the motor will rotate one full revolution in open-loop mode to find the mechanical zero position (which varies by motor model). The current draw during this process will be relatively high.

电气规格 Electrical Specifications

定义 Definition	大角度距离环增益 Large-angle distance loop gain			中角度距离环增益 Mid-angle distance loop gain			小角度距离环增益 Small-angle distance loop gain		
	KP	KI	KD	KP	KI	KD	KP	KI	KD
变量 Variate									
默认值 Default	8000	0	3500	8000	50	13000	8000	750	16000

KP、KI、KD：对应PID算法中的比例、积分、微分变量

KP, KI, KD: Correspond to the Proportional, Integral, and Derivative variables in the PID algorithm.

其他参数 Other Parameters

定义 Definition	最大到位误差 (°) Maximum in- place error	大中角度参数(°) Large and medium Angle parameters	大小角度参数 (°) Size and Angle parameters	上电归零电流 (5000~30000) Power-on reset current	上电归零速度 (2^n) Power-on reset speed	上电延时时间 (100~2000)ms Power-on delay time	抖动归零次数(1~100) The shake resets to zero	平均电流保护值 (1~9999)mA Average current protection value
默认值 Default	0.3	2000	300	15000	16	400	16	300

最大到位误差：电机设置角度后，是否到位判断角度；

大中角度边界：角度 $\geq$ 边界以大角度模式运行，角度 $<$ 边界以中角度运行，写入角度 $\times 100$ 的值，默认是 20° ；

中小角度边界：角度 $\geq$ 边界以中角度模式运行，角度 $<$ 边界以小角度运行，写入角度 $\times 100$ 的值，默认是 3° ；

上电归零电流：是用来调节电机上电旋转到机械零点时最大电流限制，电流大致为：

上电归零电流值 $\div 32767 \times$ 额定电流

上电归零速度：将电机一圈角度 360° 分为65536份，上电归零速度值就是每次角度变化的份数。上电归零时间可按以下公式估算； $(65536 \div \text{上电归零速度} + \text{抖动归零次数} \times \text{抖动归零次数} \times 8 \div 2 \div \text{上电归零速度}) \times 0.05\text{ms}$

上电延时时间：贴头相邻序号电机上电时间间隔，可根据整机上电电流调整；

抖动归零次数：为了消除机械应力，调整到达机械零点后的左右抖动次数；

平均电流保护值：电机过流故障判断的电流值；

Max. Positioning Error: The tolerance angle used to judge whether the motor has reached the target position after setting the angle.

Large/Medium Angle Threshold: If Angle $\geq$ Threshold, run in Large Angle mode; if Angle $<$ Threshold, run in Medium Angle mode.

Note: Write the value as Angle $\times 100$. Default is 20° .

Medium/Small Angle Threshold: If Angle $\geq$ Threshold, run in Medium Angle mode; if Angle $<$ Threshold, run in Small Angle mode. Note: Write the value as Angle $\times 100$. Default is 3° .

Power-on Homing Current: Used to adjust the maximum current limit when the motor rotates to the mechanical zero point upon power-up.

Formula: Current $\approx (\text{Homing Current Value} \div 32767) \times \text{Rated Current}$.

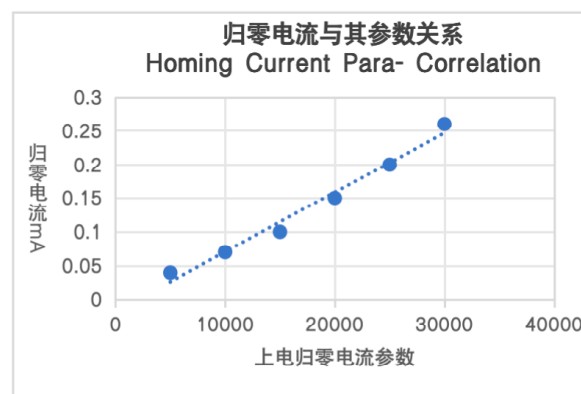
Power-on Homing Speed: Divides the 360° rotation into 65536 units; the value represents the number of units changed per step.

Formula: $(65536 \div \text{Speed} + \text{Jitter Count} \times \text{Jitter Count} \times 8 \div 2 \div \text{Speed}) \times 0.05\text{ms}$

Power-on Delay Time: The time interval between the power-up of adjacent motors (e.g., on a placement head). Can be adjusted based on the total inrush current of the machine.

Homing Jitter Count: The number of left/right oscillations performed after reaching the mechanical zero point to eliminate mechanical stress.

Average Current Protection Limit: The current threshold used to trigger a motor overcurrent fault.

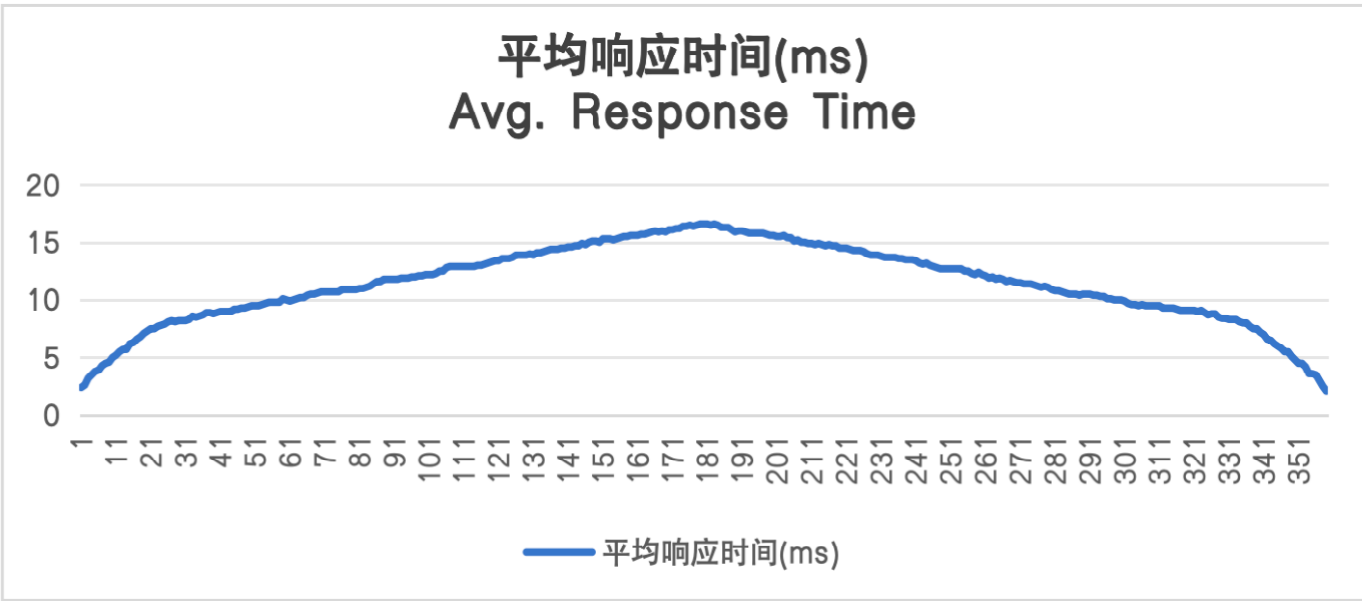


电机运行角度平均响应时间图 Avg. Response Time vs. Motor Angle

测试条件 / Test Conditions:

测试电机个数 Test Quantity	每个电机测试数据量 (从0~360° , 间隔1度, 随机运行角度) Test Data Volume per Motor (0~360° range, 1° step, random operation angles)
10	1000×360

以10个电机，每个电机测试36万个数据，一共360万个数据得到以下平均响应时间：
Based on 3.6 million data points (10 motors × 360,000 samples each), the average response time is as follows:



注意：电机最大运动角度为180°，响应时间在180°最大，图中大于180°的为反转角度。
Note: Max. motion angle is 180° with peak response time. Values >180° indicate reverse rotation.