一体化伺服电机使用说明书

Integrated servo motor instruction manual

PMM60L 系列 RS485/CANopen 通信

PMM60L series RS485 /CANopen Communication

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北京立迈胜控制技术有限责任公司

Beijing NiMotion Control Technology Co., Ltd.

目　录 Contents

1 安全说明和警告 Safety Instructions and Warnings

1.1 重要信息 Important Information

在安装和调试电机控制器之前，必须仔细阅读本说明书。严禁擅自转载、复制本说明书的部分或全部内容。北京立迈胜控制技术有限责任公司有权为了提高产品的性能，进行技术改造，进一步优化改进硬件和软件，恕不另行通知。

You must read this manual carefully before installing and commissioning the motor controller. Reprinting or copying part or all of this manual without permission is strictly prohibited. Beijing NiMotion Control Technology Co., Ltd. has the right to improve the performance of the product, carry out technical transformation, and further optimize and improve hardware and software without notice.

1.2 安全注意事项 Safety Precautions

这里提示的注意事项，目的是为了使您能安全、正确地使用产品，并防患于未然，以免给您和他人造成危害和损伤。请您对其内容充分理解以后再使用本产品。

The precautions here are intended to enable you to use the product safely and correctly, and prevent it from happening in advance, so as not to cause harm and damage to you and others. Please fully understand its content before using this product.

⚠警告 ⚠Warning	在操作时违反本警告事项所示的内容要求，可能会导致人员死亡或负重伤。 Violation of the requirements shown in this warning during operation may result in death or serious injury.
⚠注意 ⚠Note	在操作时违反本警告事项所示的内容要求，可能会导致人员负伤或造成物品损坏。 Violation of the requirements shown in this warning during operation may result in personal injury or damage to items.
⚠重要 ⚠Important	为了使您能正确地使用产品，在正文的相关使用项目中记载着用户务必遵守的事项。 In order to enable you to use the product correctly, the relevant use items in the main text contain the items that users must observe.

⚠ 警告 WARNING

整体 Overall

- 请勿在爆炸性环境、易燃性气体环境、腐蚀性环境、容易沾水的场所以及可燃物附近使用本产品，否则有可能引起火灾或致伤。
  Do not use this product in explosive environment, flammable gas environment, corrosive environment, places prone to water, and near combustible materials, otherwise it may cause fire or injury.

- 设置、连接、运行、操作、检查、故障诊断作业请由具备适当资格的人实施，否则有可能引起火灾、致伤或造成装置破损。
  The installation, connection, operation, operation, inspection, and fault diagnosis should be performed by qualified personnel. Otherwise, it may cause fire, injury, or damage to the device.

- 电机的保护功能起作用时，电机会停止并失去保持力，请采取措施保持可动部位的位置，否则有可能引起装置破损、火灾或者人员损伤。
  When the protection function of the motor works, the motor will stop and lose its holding force. Take measures to maintain the position of the movable part. Otherwise, it may cause damage to the device, fire or personal injury.

- 电机的保护功能起作用时，请先排除原因，然后再解除保护功能。不排除原因而继续运行，就会使电机出现误动作，有可能致伤或造成装置破损。
  When the protective function of the motor is working, please eliminate the cause before releasing the protective function. Continued operation without excluding the cause will cause the motor to malfunction, which may cause injury or damage the device.

- 请勿在通电状态下进行移动、设置、连接和检查作业。请切断电源后再进行作业，否则有可能引起触电。
  Do not move, set, connect, or inspect while the power is on. Please cut off the power before working, otherwise it may cause electric shock.

- 在升降装置上使用时，请采取措施来保持可动部位的位置。在电源断开时，电机会失去保持力，可动部位落下有可能致伤或造成装置破损。
  When using on a lifting device, take measures to maintain the position of the movable part. When the power is disconnected, the motor loses its holding force, and falling of the movable part may cause injury or damage the device.

安装 Installation

- 请将电机安装在指定的、安全的工作环境内，否则有可能致伤。
  Please install the motor in the specified and safe working environment, otherwise it may cause injury.
- 安装时，请采取措施防止碰触电机，或加以有效接地，否则有可能引起触电。
  During installation, please take measures to prevent touching the motor or ground it effectively, otherwise it may cause electric shock.

连接 Connection

- 电机的电源输入电压请务必控制在额定范围内，否则有可能引起火灾。
  The power input voltage of the motor must be controlled within the rated range, otherwise it may cause fire.

- 电机的电源，请使用初级和次级强化绝缘的直流电源，否则有可能引起触电。
  Motor power, please use primary and secondary reinforced insulation DC power, otherwise it may cause electric shock.

- 请严格按照连接图进行连接，否则有可能引起火灾。

Connect strictly according to the connection diagram, otherwise it may cause fire.

- 请勿强行弯曲、拉扯或夹住连接电缆线，否则有可能引起火灾。
  Do not bend, pull or pinch the connecting cable forcibly, otherwise it may cause fire.

运行 Run

- 停电时请切断电机的电源，否则恢复供电后电机会突然起动，有可能致伤或造成装置破损。
  Please cut off the power supply of the motor during power failure, otherwise the motor will start suddenly after power is restored, which may cause injury or damage the device.
- 电机运行中，请务必确保安全的情况下，才可将电机的保持力解除，否则有可能致伤或造成装置故障。
  When the motor is running, you must ensure the safety before releasing the holding force of the motor. Otherwise, it may cause injury or cause device failure.

修理、拆解、改造 Repair, dismantling, alteration

- 请勿将电机进行拆解或改造，否则有可能致伤。需要检查或修理时，请与北京立迈胜控制技术有限责任公司联系。
  Do not disassemble or modify the motor, otherwise it may cause injury. When inspection or repair is needed, please contact Beijing NiMotion Control Technology Co., Ltd.

注意 Note

整体 Overall

- 使用电机时，请勿超过其规格值，否则有可能致伤或造成装置故障。
  When using the motor, do not exceed its specification value, otherwise it may cause injury or equipment failure.
- 请勿将手指或其他物体插入电机的开口部位中，否则有可能引起火灾或致伤。
  Do not insert fingers or other objects into the opening of the motor, otherwise it may cause fire or injury.
- 电机运行中或停止运行后的短时间内，请勿碰触电机，否则有可能因电机表面的高温而引起烫伤。
  Do not touch the motor while the motor is running or for a short period of time after stopping the operation. Otherwise, it may cause burns due to the high temperature of the motor surface.

搬运 Moving

- 搬运时请勿手持电机输出轴或电缆线，否则有可能致伤或造成装置故障。
  Do not hold the motor output shaft or cable during transportation, otherwise it may cause injury or equipment failure.

安装 Installation

- 请在电机的旋转部位（输出轴）上安装保护罩。
  Install a protective cover on the rotating part (output shaft) of the motor.
- 电机周围请勿堆放妨碍通风的障碍物，否则有可能造成装置故障。
  Do not stack obstacles that obstruct ventilation around the motor, otherwise the device may be damaged.

运行 Operation

- 运行中请勿碰触旋转部（输出轴），否则有可能致伤或造成装置故障。
  Do not touch the rotating part (output shaft) during operation, otherwise it may cause injury or equipment failure.
- 请按指定的参数要求使用电机，否则有可能引起火灾。
  Please use the motor according to the specified parameters, otherwise it may cause fire.
- 请在装置外部安装紧急停止装置或紧急停止电路，以便在出现装置故障或运作异常时，装置整体能够朝安全的方向运行，否则有可能致伤。
  Install an emergency stop device or an emergency stop circuit outside the device so that when the device fails or operates abnormally, the entire device can run in a safe direction, otherwise it may cause injury.
- 电机即使处于正常的运行状态，有时其表面温度也会超过 70℃。人有可能接近运行中的电机时，请在显眼的位置张贴警告标志，否则有可能引起烫伤。
  Even when the motor is in normal operation, its surface temperature may exceed 70 ° C. When people may approach the running motor, please put a warning sign in a conspicuous position, otherwise it may cause burns.
- 出现异常时，请立即停止运行，切断电机电源，否则有可能引起火灾或致伤。
  In the event of an abnormality, stop the operation immediately and cut off the power supply of the motor. Otherwise, it may cause fire or injury.

保养、检查 Maintenance and Inspection

- 进行绝缘电阻测量或绝缘耐压试验时，请勿碰触，否则有可能引起触电。
  Do not touch the insulation resistance measurement or insulation withstand voltage test, otherwise it may cause electric shock.

报废 Scrapped

- 电机报废时，请尽可能将其拆解，作为工业废弃物实施处理。
  When the motor is discarded, dismantle it as much as possible and treat it as industrial waste.

重要 Important

- 请由具备电气、机械工业专业知识的人员使用本产品。
  Only use this product if you have expertise in the electrical and mechanical industries.
- 使用前，请熟读并充分理解「安全说明和警告」，以便正确地使用电机。
  Before use, please read and fully understand the "Safety Instructions and Warnings" in order to use the motor correctly.
- 本产品是为在一般工业设备中使用而设计制造的。请勿将其用于其它用途。无视本忠告而造成的损失，本公司将不承担任何赔偿责任，特此声明，敬请谅解。
  This product is designed and manufactured for use in general industrial equipment. Do not use it for other purposes. Regardless of the loss caused by this advice, the company will not be responsible for any compensation, hereby declare, please understand.

2 关于说明书 About the Manual

2.1 简介 Introduction

本说明书用以说明北京立迈胜控制技术有限责任公司所生产的一体化伺服电机的介绍和使用方法。

This manual is used to explain the presentation and operation method of the integrated servo motor produced by Beijing NiMotion Control Technology Co., Ltd.

2.2 适用范围 Scope of Application

适用于 PMM60L 系列 RS485/CANopen 通信一体化伺服电机。

Suitable for PMM60L series RS485/CANopen communication integrated servo motors.

2.3 版本信息 Version Information

说明书版本 Manual version	日期 Date	修改记录 Modify record
A	2021-12-24	创建 Create

3 技术规格 Technical Specification

3.1 产品型号定义 Product Model Definition

PMM60L 系列中具体产品型号的定义如下图所示：

The definition of specific product models in PMM60L series is shown in the following figure:

PMM 60 20 B - 485 - L A - 0 H E B R3

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫

① PMM-一体化伺服电机 PMM- integrated servo motor	② 电机基座宽度：60mm Motor base width: 60mm
③ 电机功率：20-200W Motor power: 20-200W	
④ 编码器性能：B-2500线 Encoder performance: B-2500 lines	⑥ 硬件特征码 Hardware Feature Code
⑤ 通讯方式：485-RS485 CANopen-CANopen Communication method: 485-RS485 CANopen-CANopen	⑦ 硬件版本号 Hardware version
⑧ 轴深长度：0-标准长度轴；1-非标准长度轴 Shaft length: 0-standard length shaft; 1-non-standard length shaft	
⑨ 轴键形式：S-光轴；F-铣扁；K-半圆键；H-平键；M-穿孔安装 Shaft key form: S-light shaft; F-milling flat; K-half-round key; H-flat key; M-perforated installation	
⑩ 特殊加工代码：S-无特殊加工；A-齿轮；B-丝杠；E-中心螺纹孔… Special processing code: S-no special processing; A-gear; B-screw; E-center threaded hole...	
⑪ 刹车标识：缺省：不带刹车；B:带刹车 Brake identification: Default: No brake ; B: With a brake;	⑫ 减速机减速比：3-100 Gearbox deceleration ratio: 3-100

3.2 物理特性 Physical Properties

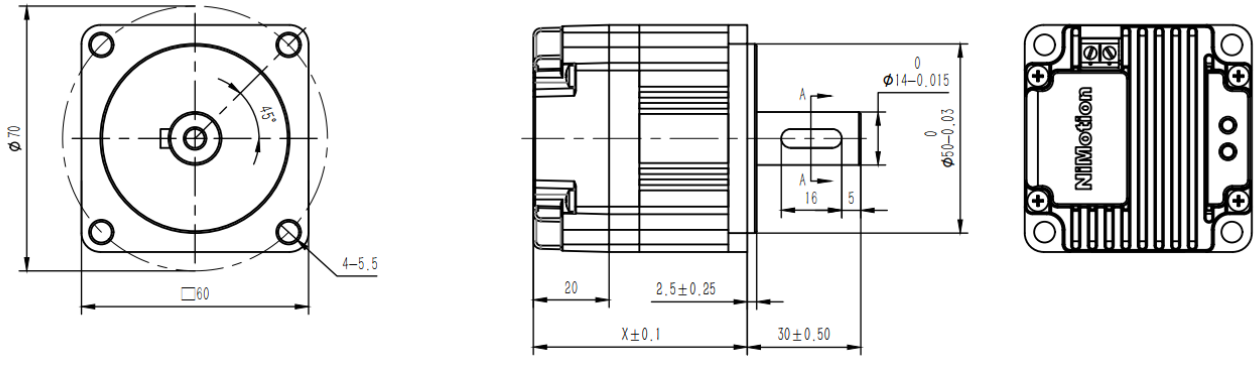

图 Figure 3-1

表 Table 3-1

型号 Model	长度（图中X）Length (X in the figure)（mm）	轴径 Shaft diameter	重量 weight（Kg）
PMM6020B-CANopen-LA-0HE	56.5	Φ14	0.74
PMM6020B-485-LA-0HE	56.5	Φ14	0.74

注：对应电气参数详见 3.4.1。

Note: The corresponding electrical parameters are detailed in 3.4.1.

3.3 电机转矩曲线图 Motor Torque Graph

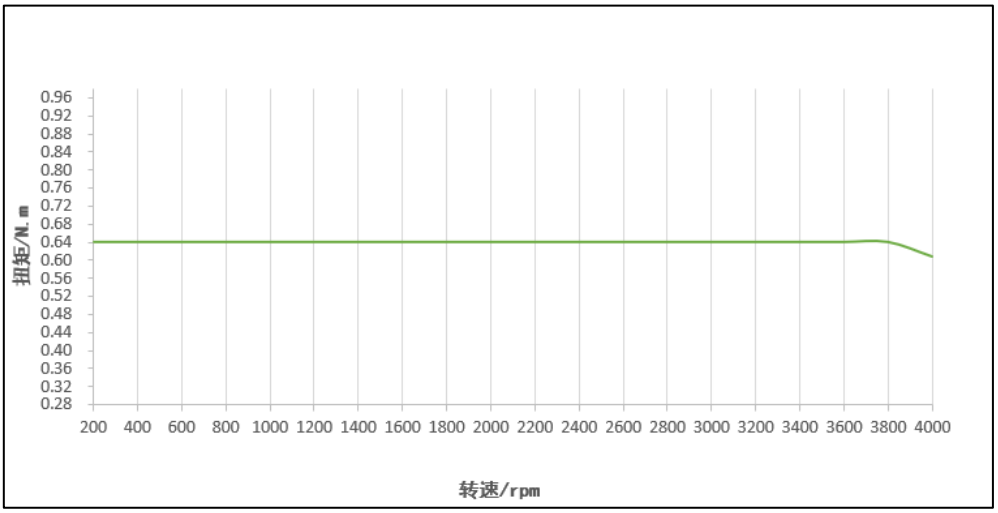

图 3-2 PMM6020B-485/CANopen-LA 矩频特性图（48V 供电电压）

Figure 3-2 PMM6020B-485/ CANopen-LA Torque and Frequency Characteristics (48V supply voltage)

3.4 电气特性 Electrical Characteristics

3.4.1 伺服电机的电气参数 Electrical Parameters of Servo Motor

表 Table 3-2

型号 Model	极对数 Number of poles	额定电压 Rated Voltage（V）	额定功率 Rated power（W）	额定转速 Rated speed（rpm）	额定转矩 Rated torque (N.m)	集成编码器 Integrated encoder
PMM6020B-CANopen-LA-0HE	5	48	200	3000	0.637	有 Yes
PMM6020B-485-LA-0HE	5	48	200	3000	0.637	有 Yes

注：X 表示忽略此位。本产品支持限功率功能，可由参数设置开关。详细设置方法参考《STM、BLM 系列一体化电机 CANopen/485 通信（闭环）用户手册》

Note: X means that this bit is ignored. This product supports the power limit function and can be set by parameters switch. Detailed setup method refers to the STM, BLM series integrated motor CANopen/485 communication (closed-loop) user manual.

3.4.2 硬件规格参数 Hardware Specification

表 Table 3-3

系统供电电源要求 System Power Supply Requirements	
供电电压 Supply voltage	16～52VDC
纹波噪声 Ripple noise	＜240mV
驱动器参数 Drive Parameters	
编码器 Encoder	集成 2500 线编码器 Integrated 2500 lines encoder
制动电阻 Braking resistor	内置+外置，且二者不可并联使用，内置 16W，外置制动电阻可通过配置实体端子的 EXTERNAL_BRAKE 功能实现 Built-in + external, and the two can not be used in parallel, built-in 10W, external brake resistance can be configured through the physical terminal External_Brake function to achieve
DI（数字量输入） Digital input	数量：3 个； Quantity: 3; 均采用高速双向光耦，支持 PWM 脉冲频率范围在 500KHz~2MHz All adopt high-speed bidirectional optocoupler, support PWM 500KHz~2MHz; 高电平时 12～24V，低电平时 0～0.5V； High current level 12 ~ 24V, low current level 0 ~ 0.5V; 功能详见 3.4.3

	See 3.4.3 for functions
DO（数字量输出） Digital output	数量：1 个； Quantity: 1 输出方式：MOS 集电极开漏输出 Output mode :MOS collector leakage output 电流：2A@55V，最大脉冲频率 2MHz Current: 2A@55V ， Maximum pulse frequency is 2MHz 功能详见 3.4.3 See 3.4.3 for functions
AI（模拟量输入） Analog input	数量：1 个； Quantity:1 输入方式：单端输入。信号种类：电压信号。分辨率：12bit Input mode: single end input signal type: voltage signal 电压：0-10V； Voltage：0-10V 功能详见 3.4.3 See 3.4.3 for functions
控制网 Control Net	
CAN	应用层协议：CANopen 协议； Application layer protocol: CANopen protocol
	支持子协议：CiA-301 V4.02 Supported sub-protocols: CIA-301 V4.02, custom CAN
	波特率：1Mbps (默认)、500kbps、250kbps、125kbps、100kbps、50kbps、20kbps； Baud rate: 1Mbps (default), 500Kbps, 250Kbps, 125Kbps, 100Kbps, 50Kbps, 20Kbps
	终端匹配电阻：外接 120Ω； Terminal matching resistance: external 120Ω
RS485	应用层协议：Modbus-RTU； Application layer protocol: Modbus-RTU
	波特率：115.2kbps（默认），1.5Mbps、1Mbps、500kbps、256kbps、115.2kbps、57.6kbps、38.4 kbps、19.2kbps、9.6kbps； Bout rate: Default is 115.2 Kbps, 1.5Mbps, 1Mbps, 500 Kbps, 256Kbps, 115.2 Kbps, 57.6 Kbps, 38.4 Kbps, 19.2 Kbps, 9.6 Kbps
	终端匹配电阻：外接 120Ω 终端匹配电阻：外接 120Ω； Terminal matching resistance: external 120Ω
工作环境 Operation Environment	
工作环境温度 Operation ambient temperature	0℃～40℃
工作环境相对湿度	10%RH～85%RH 无凝结

Relative humidity	10% RH ～ 85% RH without condensation
储存环境温度 Ambient storage temperature	-40℃～85℃
储存环境相对湿度 Storage environment relative humidity	5%RH～95%RH，无凝结 5% RH ～ 95% RH, no condensation
污染程度 Pollution level	SO_2：＜0.5ppm；H_2S：＜0.1ppm
海拔高度 Altitude	-300m～3000m

3.4.3 软件规格参数 Software Specification

表 Table 3-4

驱动器性能 Drive Performance	
驱动方式 Drive method	采用 FOC 磁场定向控制技术和 SVPWM Using FOC magnetic field directional control technology and SVPWM
电流环周期 Current loop cycle	50us（20 kHz）
转速环周期 Speed loop cycle	500us（2 kHz）
位置环周期 Position loop cycle	1ms（1 kHz）
基本功能 Basic Functions	
注：本手册只对基本功能做介绍。具体使用方法请参考《STM、BLM系列一体化电机CANopen通信（闭环）用户手册》、《STM、BLM系列一体化电机Modbus通信（闭环）用户手册》 Note: This manual only describes the basic functions. For specific use, please refer to the STM, BLM series integrated motor CANopen communication (closed-loop) user manual, STM, BLM series all-in-one motor Modbus communication (closed-loop) user manual	
CiA402 模式 CiA402 mode	支持 PP：轮廓位置模式、VM：速度模式、PV：轮廓速度模式、PT：轮廓转矩模式、HM：原点回归模式、IP：插补模式、CSP：循环同步位置模式、CSV：循环同步速度模式、CST：循环同步转矩模式 Supports PP: contour position mode, VM: speed mode, PV: contour speed mode, PT: contour torque mode, HM: origin regression mode, IP: interpolation mode, CSP: cyclic synchronous position mode, CSV: cyclic synchronous speed mode, CST: cyclic synchronous torque mode
NiMotion 速度模式 NiMotion speed mode	支持数字量给定调速（以给定速度运行）、占空比输入调速（占空比 0~100%对应速度为限制转速~0）、50%占空比调速（占空比 0%~50%对应速度为正限制转速~0，50%~100%对应 0~负限制转速）、多段速度模式（支持最多 16 段设置，可以单次、循环、DI 切换）、模拟量速度控制（支持死区，滤波，偏置，

	倍率，方向。区分模式 1、模式 2）。 Support digital set speed regulation (directly run at a given speed), duty cycle input speed regulation (0% to 100% duty cycle corresponds to speed 0 to limit speed), 50% duty cycle debugging (0% to 50% duty cycle corresponds to speed 0 to limit speed 0, 50% to 100% corresponds to speed 0 to positive limit speed), multi-stage speed mode (support up to 16 stage Settings), Single, cyclic, DI switching), analog control (support dead zone, filtering, bias, multiplier, direction
NiMotion 位置模式 NiMotion position mode	支持脉冲给定位置（方式：AB 正交脉冲、脉冲+方向）、步进量给定位置（电机位置根据给定的步进量进行相对运动）、多段位置模式（支持最多 16 段设置，可以单次、循环、DI 切换）、模拟量位置控制（电机运动至模拟量所对应的绝对未知。区分模式 1、模式 2）。 Support pulse a given location (means: AB orthogonal pulse, pulse + direction), step into a given location (stepper motor position according to a given amount of relative motion), more paragraphs position mode (support up to 16 paragraph Settings, can be a single switch, cycle, DI), analog position control (electric motor to analog of the absolute position. Distinguish between pattern 1 and pattern 2).
NiMotion 转矩模式 NiMotion torque mode	支持数字量给定控制转矩（按照设定转矩值直接输出对应转矩）；模拟量控制（输出与模拟量对应的转矩值。区分模式 1 和模式 2） Support digital quantity given control torque (according to the set torque value directly output the corresponding torque); Analog control (output and analog corresponding torque value. Distinguish between pattern 1 and pattern 2.
软限位 Soft limit	通过软件设置位置范围，超出范围电机锁轴且报警 Set the position range through the software, and the motor will lock the shaft and alarm if it exceeds the range
DI 可配置功能 Digital input configurable function	DI 功能可分为两类： 1.作为开关使用：例如：使能（DI 生效后电机进入启动状态）；报警复位（生效后电机清除故障）；暂停（开关在电机运行过程中生效时，电机暂停并保持锁轴；开关失效后，电机继续运行）；正向超程开关（用于电机正方向运行的限位开关）；反向超程开关（用于电机反方向运行的限位开关）；步进量使能（生效后按照给定步进量进行相对运动）；原点开关（用于原点回归模式，寻找位置零点）；设置原点（将当前位置设置为原点）；清除故障历史；清除上电时间 2.作为脉冲输入通道使用，例如：脉冲输入（固定 DI1）、脉冲输入方向（固定 DI2）；占空比输入（固定 DI1）、占空比输入方向（固定 DI2）；正交脉冲输入 A（固定 DI1）、正交脉冲输入 B（固定 DI2） DI functions can be divided into two categories: 1. Use as a switch: For example, enable (the motor enters the starting state after DI takes effect); Alarm reset (the motor removes the fault after it takes effect); Suspension (the motor stops moving when it becomes effective in operation, and continues to move after failure); Forward overrun switch (limit switch for motor running in the positive direction); Reverse overrun switch (limit

	switch for motor running in the opposite direction); Step amount enabling (after effective, relative movement is carried out according to the given step amount); Origin switch (used in origin regression mode to find position zero); Set the origin (sets the current position to the origin); Clear fault history; Clear power on time 2. Used as pulse input channel, for example: pulse input (fixed DI1), pulse input direction (fixed DI2); Duty-cycle input (fixed DI1), duty-cycle input direction (fixed DI2); Orthogonal pulse input A (fixed DI1), orthogonal pulse input B (fixed DI2)
DO 可配置功能 Digital output Configurable functions	1.电机运行停止 2.目标到达 3.报警输出 4.抱闸输出 5.外接制动电阻。（电机状态满足上述条件时，DO 开关量状态发生改变） 1. Motor operation stops 2. Target reaches 3. Alarm output 4. External brake resistor. (When the motor state meets the above conditions, the DO switch quantity changes)
AI 可配置功能 AI configurable functions	模拟量输入通道，支持电压信号。可配置死区、滤波、偏置、倍率、方向。 Analog input channel, support voltage signal. Can be configured with dead zone, filtering, bias, magnification, direction.
可设参数 Configurable parameters	加速度，减速度，加加速度，加减速度，速度前馈增益，位置前馈增益，开环运行电流，温度报警阈值，电子齿轮比，三环 PI 参数等（见参数表） Acceleration, deceleration, jerk, jerk, speed feedforward, position feedforward, running current, temperature alarm threshold, open-loop closed-loop, electronic gear ratio, three-loop PI parameters, following error, slightly (see parameter table)
故障诊断 Troubleshooting	过压\欠压\过温\硬件故障\堵转\过载\超速\初始化故障\存储故障\超限检测\原点回归超时\跟踪故障\目标位置溢出故障\曲线规划参数过小等故障 Over-voltage, under-voltage, over-temperature, hardware failure, stall, overload, over-speed, initialization failure, storage failure, over-limit detection, origin return timeout, tracking failure, target position overflow failure, curve planning parameter too small, etc.
故障复位 Fault reset	报警为自复位，故障为手动复位 Self-reset for alarm, manual reset for failure
特色功能 Special feature	
参数识别 Parameter identification	具备参数辨识和 PI 参数自整定功能 With parameter identification and PI parameter auto-tuning function
限功率 The limited power	当供电电压大于额定电压时。开启限功率功能，将电机的运行功率限制在额定功率以下。 When the supply voltage is greater than the rated voltage. Turn on the power limit function to limit the operating power of the motor below the rated power
位置恢复 And restore	可配置为单圈位置值恢复或者多圈绝对位置值恢复 Can be configured for single turn position value recovery or multiple turns of absolute position value recovery

增益切换 Gain switch	可预设两组增益参数，根据电机运行状态不同，在两组增益间自动切换 Two groups of gain parameters can be preset and automatically switch between the two groups of gain according to the different running state of the motor
共振抑制 Resonance suppression	有效抑制振动频率范围≥300Hz Effectively suppress vibration frequency range ≥300Hz
低频抑制 Low frequency rejection	有效抑制振动频率范围≤100Hz Effectively suppress vibration frequency range ≤100Hz
参数保存恢复 Parameter save and restore	实现参数的保存和恢复默认参数功能 Implement parameter save and restore default parameter function
在线升级 Online upgrade	根据产品实际需求及时更新，提高可维护性和效率 Update in time according to the actual needs of the product to improve maintainability and efficiency

3.5 指示灯信号 Indicator Signal

图 Figure 3-3

表 Table 3-5

含义 meaning	RUN（绿灯）	COM（黄灯）
通信正常，无报警 Communication is normal, no alarm	绿灯常亮 Steady green	黄灯慢闪（1s 闪烁频率） Yellow light flashes slowly (1s flashing frequency)
通信正常，内部有警告产生 Communication is normal, internal warnings are generated	绿灯常亮 Steady green	黄灯闪（0.5s 闪烁频率） Yellow light flashes (0.5s flashing frequency)
通信正常，内部有故障产生 Communication is normal, internal faults occur	绿灯常亮 Steady green	黄灯闪（0.25s 闪烁频率） Flashing yellow (flashing frequency of 0.25s)
通信正常，硬件故障 Communication is normal, hardware failure	绿灯常亮 Steady green	黄灯常灭 Yellow off
通信异常，内部有警告产生 Communication error, internal warning generated	绿灯闪（0.5s 闪烁频率） Flashing green (0.5s flashing frequency)	黄灯闪（0.5s 闪烁频率） Flashing yellow (0.5s flashing frequency)
通信异常，内部有故障产生 Communication abnormality, internal failure	绿灯闪（0.5s 闪烁频率） Flashing green (0.5s flashing frequency)	黄灯闪（0.25s 闪烁频率） Flashing yellow (flashing frequency of 0.25s)
电源供电不正常或有严重故障 The power supply is abnormal or has a serious fault	绿灯常灭 Green off	黄灯常灭 Yellow off
抢占成功 Preempt the success	绿灯常灭 Green off	黄灯慢闪（1s 闪烁频率） Yellow light flashes slowly (1s flashing frequency)

3.6 引脚配置 Pin Configuration

3.6.1 RS485/CAN端口 RS485/CAN Port

通信端口 CNET 用于 CAN 或者 RS485 通信的连接。按下图电机侧卧放置时，直视接口时，CNET 端子最上面的为第 1 引脚。

The communication port CNET is used for CAN or RS485 communication connection. When the motor is placed on its side in the figure below, when looking directly at the interface, the top pin of the CNET terminal is the first pin.

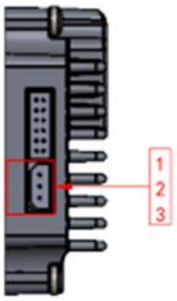

图 Figure 3-4

485 通讯版本，具体接口定义如下：
When used for 485 communication, the specific interface is defined as follows:

表 Table 3-6

引脚 Pin	功能 Function	备注 Remark
1	485-	
2	485+	
3	GND	

CANopen 通讯版本，具体接口定义如下：
When used for CAN communication, the specific interface is defined as follows:

表 Table 3-7

引脚 Pin	功能 Function	备注 Remark
1	CANH	
2	CANL	
3	GND	

3.6.2 数字量输入输出端口（I/O） Digital Input and Output Ports (I / O)

数字量输入和输出连接端口。 Digital input and output connection ports.

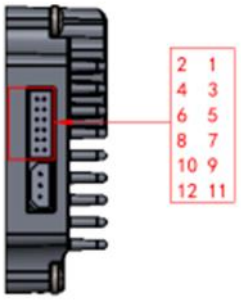

图 Figure 3-5

表 Table 3-8 引脚定义 Pin definition

引脚 Pin	功能 Function	备注 Remark
1	DI1+	具体参数详见：3.4.2 Specific parameters are detailed in: 3.4.2
2	DI1-	
3	DI2+	
4	DI2-	
5	DI3+	
6	DI3-	
7	DO1	具体参数详见：3.4.2 Specific parameters are detailed in: 3.4.2
8	EXTERNAL_BRAKE	具体参数详见：3.4.2 Specific parameters are detailed in: 3.4.2
9	GND	
10	BAT_PWR	绝对式位置编码器外接电池； Absolute encoder external battery;
11	GND	与9引脚共地； Common ground with pin 9;
12	AI1	具体参数详见：3.4.2 Specific parameters are detailed in: 3.4.2

传感器接线图

Sensor wiring diagram

引脚定义中 DI1、DI2、DI3（输入端）接 NPN 传感器示意图：

DI1, DI2, DI3 (input terminal) connected to the NPN sensor in the pin definition:

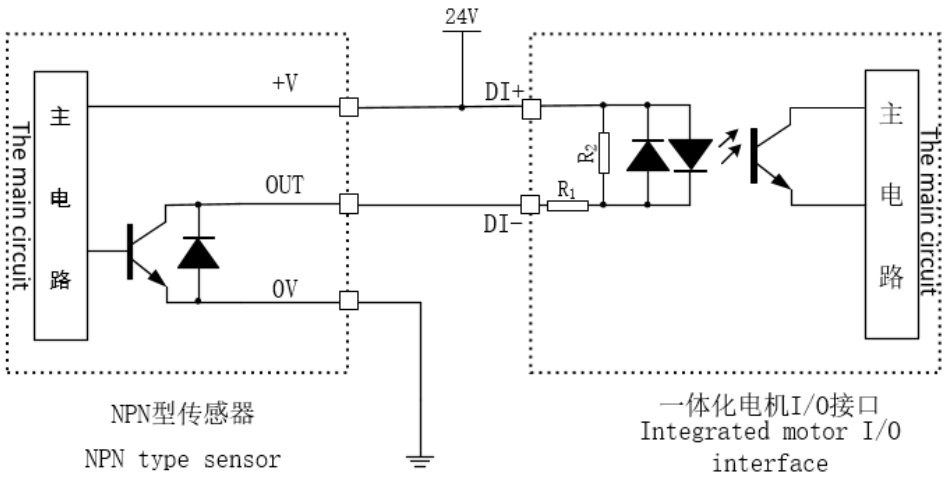

图 3-6 DI 输入端口接 NPN 型传感器示意图

Figure 3-6 DI input port connected to NPN type sensor

传感器+V、I/O接口的DI+、电源24V正极接在一起，传感器0V接电源负极，I/O接口DI-与传感器的OUT相连。

The sensor + V and I / O interface DI+ are connected to the positive 24V power supply, the sensor 0V is connected to the negative power supply, and the I / O interface DI- is connected to the sensor OUT.

引脚定义中 DI1、DI2、DI3（输入端）接 PNP 传感器示意图：
DI1, DI2, DI3 (input terminal) connected to the PNP sensor in the pin definition:

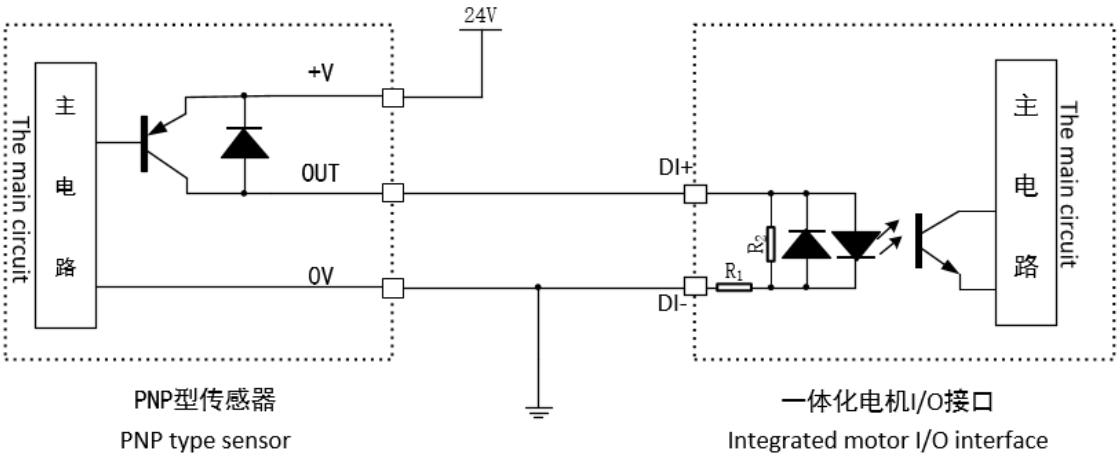

图 3-7 DI 输入端口接 PNP 型传感器示意图

Figure 3-7 DI input port connected to PNP type sensor

电源 24V 正极接传感器+V，传感器 0V 和 I/O 接口 DI-接电源负极，传感器 OUT 与 I/O 接口 DI+相连。

The 24V positive pole of the power supply is connected to the sensor + V, the 0V sensor is connected to the negative pole of the I / O interface DI-, and the sensor OUT is connected to the I / O interface DI+.

引脚定义中 DI1、DI2、DI3（输入端）接开关示意图：
DI1, DI2, DI3 (input terminal) connection switch diagram in the pin definition:

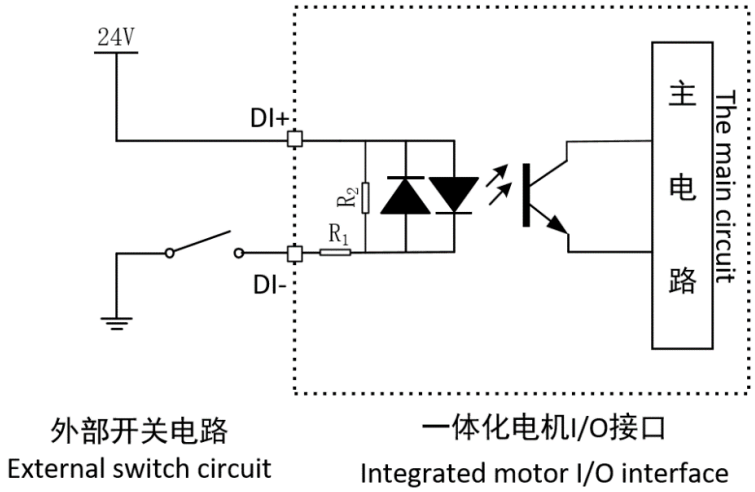

图 3-8 DI 输入端口接开关示意图

Figure 3-8 DI input port schematic diagram (common cathode)

电源 24V 正极接 I/O 接口 DI+，开关一端接 I/O 接口 DI-，开关的另一端与电源负极相连。

The 24Vpositive pole of the power supply is connected to the I / O interface DI+, the end of the switch is connected to the I / O interface DI-, the other end of the switch is connected to the negative pole of the power supply.

引脚定义中 DI1、DI2、DI3（输入端）接脉冲输入示意图：

DI1, DI2, DI3 (input terminal) connected to the pulse input in the pin definition:

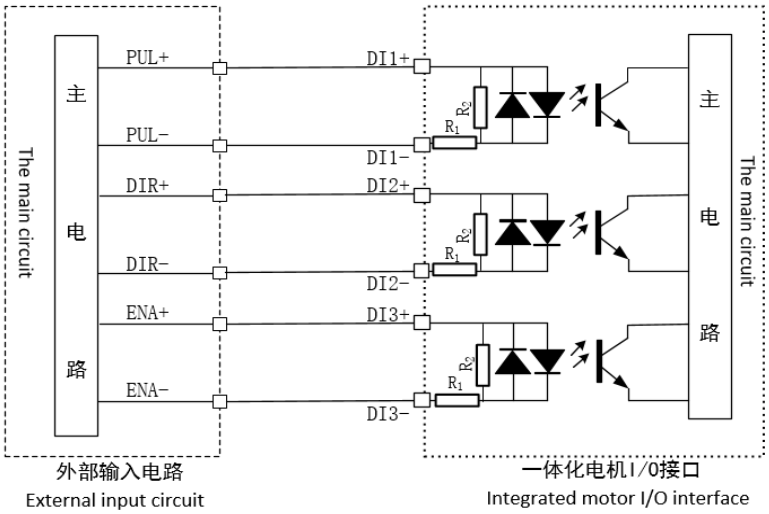

图 Figure 3-9

引脚定义中 DO1（输出端）接 LED 指示灯示意图：

DO1 (output terminal) connected to the LED indicator in the pin definition:

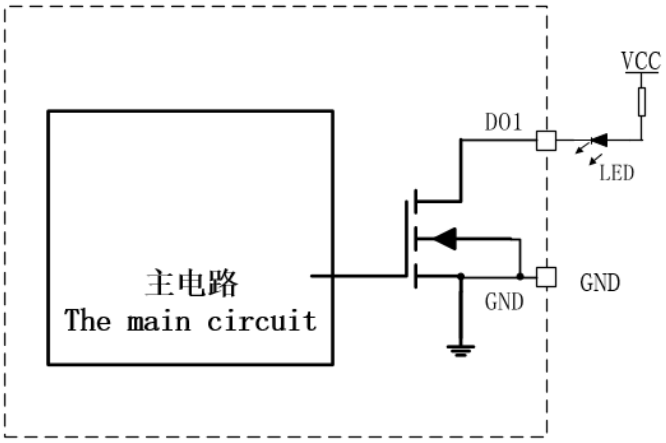

图 3-10 DO 输出端口接 LED 指示灯示意图

Figure 3-10 DO output port connected to the LED indicator

电源 VCC 正极接限流电阻后与 LED 灯正极相连，I/O 接口 DO 接 LED 灯的负极，I/O 接口 GND 与电源负极相连。

The positive terminal of the power supply VCC is connected to the positive electrode of the LED lamp after the current limiting resistor, the I / O interface DO is connected to the negative electrode of the LED lamp, and the I / O interface GND is connected to the negative electrode of the power supply.

串联电阻大小是由电源正极电压 VCC 决定的。电阻的关系式为：

The series resistance is determined by the positive voltage VCC of the power supply. The relationship of resistance is:

$$R=(VCC-Vled)/Iled$$

R：串联电阻阻值；VCC：电源电压；Vled：LED 的导通压降；Iled：通过 LED 的电流。

R: series resistance; VCC: power supply voltage; Vled: voltage through LED; Iled: current through LED.

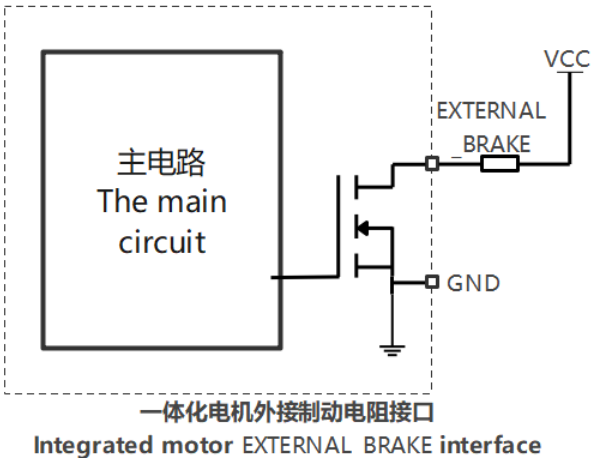

图 3-3 EXTERNAL_BRAKE 端口接制动电阻示意图

Figure 3-11 EXTERNAL_BRAKE port connected to the resistance indicator

电源 VCC 正极接泄压电阻后与 EXTERNAL_BRAKE 接口相连。GND 与电源负极相连。

After the positive pole of the power supply VCC is connected with the relief resistor and the EXTERNAL BRAKE interface, GND is connected with the negative pole of the power supply.

制动电阻选择：一体化电机内置两个串联制动电阻，其规格为 15Ω、16W，可处理功率 16W。使用内置制动电阻时，需通过配置对象 2002 h ： 13 h 为 0(0~内部，1~外部)

Brake resistance selection: integrated servo motor built-in two series brake resistors, its specification is 15Ω 16W, can handle power 10W When using the built-in brake resistor, need to configure the object 2002h :13h for 0(0~ internal,1~ external)

电机在减速、转矩与转动方向相反时会产生再生能量传回驱动器内，使得母线电压值升高，当升高到制动点时，需通过制动电阻来吸收。一体化电机的制动电阻分为内置和外接两种，但不能同时使用。

The motor will generate regenerative energy when deceleration, torque and rotation direction opposite will be transmitted back to the drive, making the bus voltage value rise, when the rise to the braking point, need to be absorbed through the braking resistor. The braking resistor of the integrated motor is divided into two types: built-in and external, but cannot be used at the same time.

往复运动时需要电阻功率计算公式

The formula for calculating the resistance power required for reciprocating motion

$$P = \frac{2 \times （N + 1） \times E}{T}$$

N：负载惯量/电机惯量。E：制动能量。T:往复运动周期

N: Load inertia/motor inertia. E: Braking energy. T: Reciprocating motion period

当电机转矩输出与转动方向相反，此时电机作负功，外部能量通过电机产生电能回灌给伺服驱动器。回馈给电机驱动器的功率的计算如下：

When the motor torque output is opposite to the rotation direction, the motor does negative work, and the external energy is fed back to the servo driver through the electric energy generated by the motor. The power fed back to the stepper motor driver is calculated as follows:

$$P = \frac{50\% \times 2\pi \times N \times M}{60}$$

N：电机转速。M：额定转矩

N: Motor speed. M: Rated torque

注意：考虑制动电阻需要按额定 30%使用。

Note: considering the brake resistance needs to be used at the rated 30%.

3.6.3 电源输入端口（PWR） Power Input Port (PWR)

安全说明 Safety Instructions

⚠ 警告 WARNING

- 连接时请注意电源的极性。电源极性连接错误时，会造成电机的严重损坏，因此原因造成的产品损坏不在保修范围。
  Pay attention to the polarity of the power supply when connecting. If the polarity of the power supply is incorrectly connected, it will cause serious damage to the motor, so product damage caused by the cause is not covered by the warranty.
- 建议电源输入正极串接一个快速熔断保险丝，以实现保险丝可更换。
  It is recommended that a positive-blow fuse be connected in series to the positive pole of the power input to realize the fuse being replaceable.
- 重新接通电源、拔出或插入连接器时，请切断电源，待电机指示灯熄灭后再进行。
  When reconnecting the power, pulling out or inserting the connector, cut off the power and wait until the motor indicator goes out.
- 请勿带电连接或断开电源线。
  Do not connect or disconnect the power cord with power on.
- 电机供电电缆和 I/O 通信电缆应分束、分槽布线，不同类的电缆发生交叉时电缆与电缆之间要成直角。否则有可能因干扰导致误动作。
  Motor power supply cables and I / O communication cables should be bundled and slotted. When different types of cables cross, the cables should be at right angles to the cables. Otherwise, it may cause malfunction due to interference.
- 电机的工作电压为 16～52VDC，请在此范围内使用足够安全和稳定的电源，否则会造成电机的严重损坏。
  The working voltage of the motor is 16～ 52VDC, please use a sufficient safe and stable power supply within this range, otherwise it will cause serious damage to the motor.
- 电机电源需接 1000uF 以上电容，用来吸收电机因外力和过快减速而产生的再生电流。否则会造成电机的严重损坏。
  The power supply of the motor needs to be connected with a capacitor of more than 1000uF to absorb the regenerative current generated by the motor due to external forces and excessive deceleration. Otherwise it will cause serious damage to the motor.

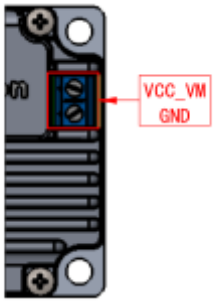

图 Figure 3-4

表 Table 3-9

引脚 Pin	功能 Funtation	备注 Remark
1	VCC	16～52VDC
2	GND	-

4 通讯说明 Communication Instructions

PMM60L 系列支持 CANopen&485 两种通讯方式。请选择正确的转换器后参考对应说明进行通讯

The PMM60L series supports CANopen&485 communication modes. Please select the correct converter to refer to the corresponding instructions for communication

4.1 准备-485 通讯 Preparation-485 Communication

安装所需要的组件：

Installation required components:

- 依据说明书要求的电源
  Power supply according to instructions
- 一体化伺服电机
  Integrated servo motor
- 所需要的通信线缆
  Required communication cables
- 所需要的 RS485 接口组件
  RequiredRS485 interface components
- RS485 主站或者上位机
  RS485 master or host

4.1.1 通信线连接 Communication Cable Connection

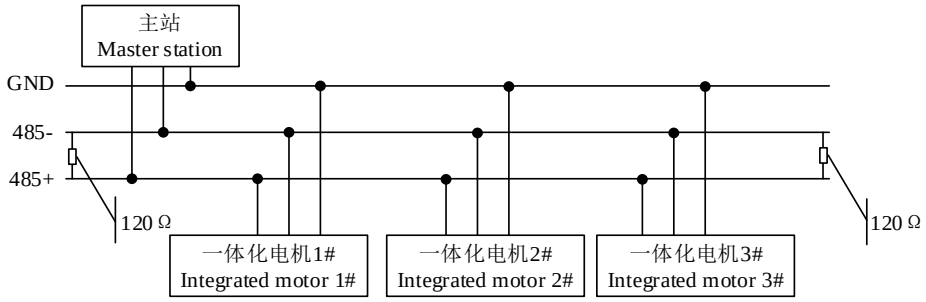

图 Figure 4-1

4.1.2 Modbus通信功能的设置 setup of Modbus Communication Function

一体化伺服电机出厂节点 ID 默认为 1 和波特率为 115200bps。

The node ID of the factory default of the integrated servo motor is 1 and the baud rate is 115 200 bps.

- 连接主站或上位机到 485 连接器 CNET 端口；
  Connect the master or host computer to CNET port of 485 connector;
- 配置 Modbus 主站或上位机，115200Bit/sec 的波特率；8 个数据位、无校验位、1 个停止位的网络数据格式；

Configuring Modbus master station or host computer, the network data format is 115200 Bit/sec baud rate, 8 data bits, no check bits, 1 stop bit;

- 一体化伺服电机正常上电后通过电机调试软件发送 Modbus 报文扫描电机。
  After the integrated servo motor is powered on normally, Modbus message is sent to scan the motor through the motor debugging software.

如果没有收到 Modbus 的返回报文，请检查以下几点：
If you do not receive a return message of Modbus, please check the following points:

1) 观察 RUN 指示灯，是否常亮，若没亮，请检查电机供电电压是否正常；
   Observing the RUN indicator whether it is always on . If it is not on, please checking whether the power supply voltage of the motor is normal.
2) 检查通信线是否已经连接，485-/485+线序是否连接正确；
   Checking whether the communication cable has been connected and the sequence of 485-/485+cable is connected correctly.
3) 检查主站或上位机的是否为 115200Bit/sec 的波特率；8 个数据位、无校验位、1 个停止位；
   Check whether the baud rate of the master station or the upper computer is 115200Bit/sec; 8 data bits, no parity bit, and 1 stop bit;
4) 检查所发的报文是否对应从站地址 1 的报文；
   Checking whether the message that was sent corresponds to the message at slave address 1.
5) 检查主站或上位机帧报文超时时间是否过短；
   Checking whether the timeout of frame message of master or host computer is too short.

如果要调整该节点 ID，继续“设置节点 ID”部分。
If you want to adjust the node ID, continuing the section of “Setting of Node ID”.

如果要调整该波特率，继续“设置 Modbus 波特率”部分。
If you want to adjust the baud rate, continuing the section of "Setting of Modbus baud rate".

如果要调整该网络数据格式，继续“设置网络数据格式”部分。
If you want to adjust the network data format, continuing the section of "Setting of the format of network data ".

4.1.3 设置节点ID Setting of Node ID

设备的地址的通过设置保持寄存器地址 0x0230 值，能够设置的范围 1~247。
The address of the device is set by setting the value of 0x0230 of the register, and the range 485 be set from 1 to 247.

出厂默认从机地址为 0x01，可操作保持寄存器的功能码为 0x03、0x06、0x10
The slave address of the factory default is 0x01, and the functional codes of the operable register are 0x03, 0x06, 0x10

从机地址的设置成功后需要进行保存参数设置，在设备下次开机或者重启之后生效。
After the slave address is set successfully, the parameter setting needs to be saved, which will take effect after the next boot or reboot of the device.

将从机地址为 1 设置为 2 的举例：
Example of setting slave address from 1 to 2:

发送的请求报文
Request message sent

表 Table 4-1

Slave address	function code	Register address	Register value	CRC cksum value
01	0x06	02 30	00 02	Skip

响应报文
response message

表 Table 4-2

Slave address	function code	Register address	Register value	CRC cksum value
01	0x06	02 30	00 02	Skip

保存设置的通信波特率参数
Save the parameters of setting communication baud rate

发送的请求报文
Request message sent

表 Table 4-3

Slave address	function code	Register address	Register number	Byte number	Register value	CRC cksum value
01	0x10	00 26	00 02	04	65 76 61 73	Skip

响应报文
response message

表 Table 4-4

Slave address	function code	Register address	Register number	CRC cksum value
01	0x10	00 26	00 02	Skip

4.1.4 设置Modbus波特率Setting of Modbus Baud Rate

通过设置 RS-485 通信接口的通信波特率寄存器可以改变设备的通信速率，但设置波特率后需要保存参数，在设备下次开机或者重启之后生效。

The communication rate of the device 485 be changed by setting the register of communication baud rate of RS-485 communication interface, but the parameters need to be saved after setting the baud rate, which will take effect after the next boot or restart of the equipment.

波特率参数对应的是地址为0x0231的保存寄存器，可操作保持寄存器的功能码为0x03、0x06、0x10。出厂波特率默认值为 115.2kbps。

The baud rate parameter corresponds to a storage register with an address of 0x0231, and the

functional codes of the operable register are 0x03, 0x06, 0x10. The baud rate of the factory default is 115.2 kbps.

设置从机地址的通信波特率为 57.6kbps 举例

Example of setting the communication baud rate of slave address is 57.6 kbps

发送的请求报文

Request message sent

表 Table 4-5

Slave address	function code	Register address	Register value	CRC cksum value
01	0x06	02 31	00 04	Skip

响应报文

response message

表 Table 4-6

Slave address	function code	Register address	Register value	CRC cksum value
01	0x06	02 31	00 04	Skip

保存设置的通信波特率参数

Save the parameters of setting communication baud rate

发送的请求报文

Request message sent

表 Table 4-7

Slave address	function code	Register address	Register number	Byte number	Register value	CRC cksum value
01	0x10	00 26	00 02	04	65 76 61 73	Skip

响应报文

response message

表 Table 4-8

Slave address	function code	Register address	Register number	CRC cksum value
01	0x10	00 26	00 02	Skip

在电机的通信参数不确定忘记时，可通过广播报文抢占后断电重启。广播抢占请求报文需在电机上电前 1 秒内发送，抢占成功后 RUN 指示灯闪烁。抢占成功后电机的通信参数恢复为默认参数，即通信参数恢复出厂设置，从站地址等于 1，波特率等于 115200，奇偶校验位为无，8 个数据位，1 个停止位。电机序列号采用十六进制高字节在前的字节序。

When the communication parameters of the motor are uncertain and forgotten, the power can be restarted after being seized through broadcast messages. The broadcast preemption request message needs to be sent within 1 second before the motor is powered on. After the preemption is successful, the

RUN indicator flashes. After the preemption is successful, the communication parameters of the motor are restored to the default parameters, that is, the communication parameters are restored to the factory settings, the slave address is equal to 1, the baud rate is equal to 115200, the parity bit is none, 8 data bits, and 1 stop bit. The serial number of the motor adopts the byte order of hexadecimal high byte first.

广播抢占请求报文

Broadcast preemption request message

表 Table 4-9

从机地址 Slave address （1B）	功能码 Function code （1B）	电机序列号 Motor serial number （4B）	CRC 校验值 CRC check value （2B）
0x00	0xD2	0x00 00 00 00	略 Skip

4.1.5 设置网络数据格式 Set network data format

通过设置保持寄存器 0x0232 的值可以改变设备的网络数据格式，能够设置的范围为 0~3。

The network data format of the device can be changed by setting the value of the holding register 0x0232, and the range that can be set is 0~3.

出厂默认的网络数据格式为 0x02，可操作保持寄存器的功能码为 0x03、0x06、0x10

The network data format of the factory default is 0x02, and the functional codes of the operable register are 0x03, 0x06 and 0x10

网络数据格式设置成功后需要进行保存参数设置，在设备下次开机或者重启之后生效。

After the network data format is set successfully, it is necessary to save parameter settings, which will take effect after the next boot or reboot of the device

将网络数据格式由 2 设置为 1 的举例：

Example of setting network data format from 2 to 1:

发送的请求报文

Request message sent

表 Table 4-10

Slave address	function code	Register address	Register value	CRC cksum value
01	0x06	02 32	00 01	Skip

响应报文

response message

表 Table 4-11

Slave address	function code	Register address	Register value	CRC cksum value
01	0x06	02 32	00 01	Skip

保存设置的网络数据格式参数

Save the parameters of the network data format

发送的请求报文
Request message sent

表 Table 4-12

Slave address	function code	Register address	Register number	Byte number	Register value	CRC cksum value
01	0x10	00 26	00 02	04	65 76 61 73	Skip

响应报文
response message

表 Table 4-13

Slave address	function code	Register address	Register number	CRC cksum value
01	0x10	00 26	00 02	Skip

4.2 准备-CAN 通讯 Preparation-CAN Communication

安装所需要的组件：
Install the required components:

- 依据说明书要求的电源
  Power supply according to the instructions
- 一体化伺服电机
  Integrated servo motor
- 所需要的通信线缆
  The required communication cable
- 所需要的 CAN 接口组件
  The required CAN interface components
- CANopen 主站或者上位机
  CANopen master station or host computer
- CAN 帧听器或者分析仪
  CAN frame listener or analyzer

4.2.1 通信线连接 Communication cable connection

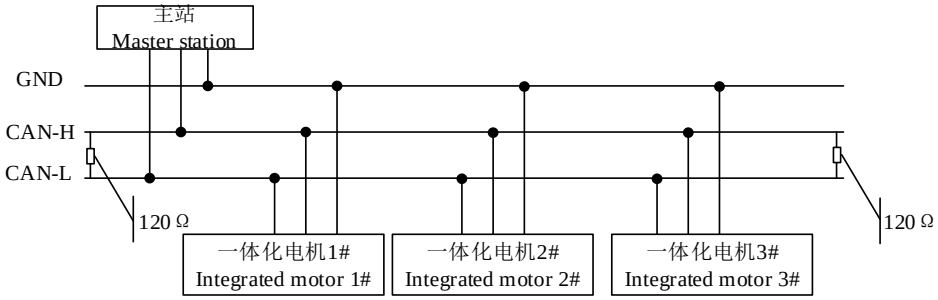

图 4-2

Figure 4-2

4.2.2 CAN设置与安装 CAN setup and installation

一体化伺服电机出厂节点 ID 默认为 1 和波特率为 1 Mbps。
The default node ID of the integrated servo motor is 1 and the baud rate is 1 Mbps.

- 连接主站或上位机到 CAN 连接器端口（见“CAN 端口（CAN）”）；
  Connect the master station or host computer to the CAN connector port (see "CAN port (CAN)");
- 配置 CAN 主站或上位机，1 Mbps 的波特率；
  Configure the CAN master station or host computer, with a baud rate of 1 Mbps;
- 连接电源到一体化伺服电机连接端口 PWR（见“电源输入端口（PWR）”）；
  Connect the power supply to the integrated servo motor connection port PWR (see "Power Input Port (PWR)");
- 一体化伺服电机正常上电后传送一个 CAN 启动消息。
  The integrated servo motor sends a CAN start message after it is powered on normally.

如果此节点 ID 不为 1 或者更改为其他的 ID，继续“设置节点 ID”部分。
If the node ID is not 1 or change to another ID, continue to the "Set Node ID" section.

如果要调整该波特率，继续“设置 CAN 波特率”部分。
If you want to adjust the baud rate, continue to the "Set CAN Baud Rate" section.

如果启动后没有收到 CAN 的启动报文，请检查以下几点：
If you do not receive the CAN start message after starting, please check the following points:

- 观察 LED_RUN 指示灯，若其闪烁则代表通讯故障；若其常亮则代表通讯正常。
  Observe the LED_RUN indicator, if it flashes, it means communication failure; if it is always on, it means communication is normal.
- 检查 CAN 通信线的 CANH/L 线序和连接的正确性，检查 CAN 通信线的 GND。
  Check the CANH/L cable sequence and correctness of the CAN communication cable, and check the GND of the CAN communication cable.

- 检查设置的 CAN 波特率是否为 1Mbps。
  Check whether the set CAN baud rate is 1Mbps.
- 检查电机供电电压是否正常。
  Check whether the motor power supply voltage is normal.
- 检查 CANopen 主站或上位机是否正常启动。
  Check whether the CANopen master station or the upper computer starts normally.

4.2.3 设置节点ID Set Node ID

确保设置的电机是在 CAN 网络中，并且能够正常访问。
Make sure that the set motor is in the CAN network and can be accessed normally.

1) 由对象 **$200C_h$:02_h** 设置节点 ID，节点 ID 的设置范围 1～127，发送包含了准备设置的节点 ID 值 CAN SDO 报文到对象 **$200C_h$:02_h**；
   The node ID is set by the object **$200C_h$:02_h**, the node ID setting range is 1～127, and the CAN SDO message containing the node ID value to be set is sent to the object **$200C_h$:02_h;**
2) 通过发送 **65766173_h** 值到对象 **1010_h:01_h** 保存新的节点 ID；
   Save the new node ID by sending **65766173_h** value to the object **1010_h:01_h**;
3) 断电重新启动一体化伺服电机；
   Restart the integrated servo motor after power failure;
4) 查看收到启动报文的节点 ID 变化为设置值。
   Check that the ID of the node receiving the startup message changes to the set value.

设置报文举例：
Example of setting message:

表 Table 4-14

CAN-ID	传送消息 Send message	备注 Remarks
0x600 + Node ID	2B 0C 20 02 **02 00 00 00**	设置节点 ID 为 2 Set the node ID to 2
0x600 + Node ID	23 10 10 01 **73 61 76 65**	保存参数 Save parameters

4.2.4 设置CAN波特率 Set CAN baud rate

确保设置的电机是在 CAN 网络中，并且能够正常访问。
Make sure that the set motor is in the CAN network and can be accessed normally.

1) 由对象 **$200C_h$:03_h** 设置 CAN 通信波特率，发送包含了准备设置的 CAN 通信波特率值的 SDO 报文到对象 **$200C_h$:03_h**；
   The CAN communication baud rate is set by the object **$200C_h$:03_h**, and the SDO message containing the CAN communication baud rate value to be set is sent to the object **$200C_h$:03_h**;

2) 通过发送 **65766173h** 值到对象 **1010h:01h** 保存新的 CAN 通信波特率；
Save the new CAN communication baud rate by sending **65766173h** value to the object **1010h:01h**;

3) 重新设置 CANopen 主站或者上位机的通信波特率；
Reset the communication baud rate of CANopen master station or upper computer;

4) 断电重新启动一体化伺服电机；
Restart the integrated servo motor after power failure;

5) 查看收到一体化伺服电机启动报文。
Check the received start message of the integrated servo motor.

表 Table 4-15

CAN-ID	传送消息 Send message	备注 Remarks
0x600 + Node ID	2B 0C 20 03 **06 00 00 00**	设置波特率为 500Kbps Set the baud rate to 500Kbps
0x600 + Node ID	23 10 10 01 **73 61 76 65**	保存参数 Save parameters

4.3 安装 Installation

- 电机的安装方向要使散热片的方向与系统的散热风道一致，以保证良好的散热效果。
  The installation direction of the motor should be the same as that of the cooling fins of the system to ensure a good heat dissipation effect.
- 电机的接线端面至少预留 30mm 的空间，以便于维护操作。
  Reserve at least 30mm of space on the end face of the motor to facilitate maintenance operations.
- 电机接线要在离电机 30～40mm 处有硬支撑绑扎，以防止长时间振动插头松动。
  The motor wiring should be tied with a hard support at a distance of 30 ～ 40mm from the motor to prevent the vibration plug from loosening for a long time.

4.4 安全说明 Safety Instructions

⚠ 警告 WARNING

电机在运行中会产生高频干扰，在使用环境中有必要对干扰进行抑制的安排。
The motor will generate high-frequency interference during operation, and it is necessary to arrange interference suppression in the use environment.
电机使用的环境温湿度应当满足 0℃～40℃相对湿度 10%RH～85%RH，且无凝结。
The temperature and humidity of the environment used by the motor should meet the relative humidity of 0 ° C to 40 ° C and 10% RH to 85% RH without condensation.

⚠ 重要 IMPORTANT

当心烫手！ Beware of the heat!

当电机长时间运行后，电机表面温度会升高，应当避免电机在连续运行过程中或者停机后，皮肤接触电机表面，防止烫伤。

When the motor is running for a long time, the surface temperature of the motor will increase. Avoid contact with the skin during the continuous operation or after the machine is stopped to prevent burns.

线缆连接： Cable connection:

交流电缆周围的交变电磁场，特别是在电源和电机的电缆，可能会对电机和其他设备干扰。请注意以下要求：

The alternating electromagnetic fields around AC cables, especially in power and motor cables, can interfere with motors and other equipment. Please note the following requirements:

- 电机电源线采用 16AWG 红黑双色双绞铜导线，耐温要大于 105℃。
  The motor power cable uses 16AWG red and black two-color twisted copper wires, and the temperature resistance is greater than 105 ℃.
- RS485/CAN 通信线采用特性阻抗为 120Ω，22～24AWG 双绞屏蔽线，耐温要大于 105℃。
  RS485/CAN 通信线缆采用特性阻抗为 120Ω，22～24AWG 双绞屏蔽线缆，耐温要大于 105℃。
- IO 通道信号电缆长度不超过 1 米，采用 24AWG 红黑双色双绞线铜导线，耐温要大于 105℃，大于 1 米时信号要选用屏蔽电缆。
  The length of the IO channel signal cable is no more than 1 meter. 24AWG red and black two-color twisted pair copper wire is used. The temperature resistance is greater than 105 ° C. When the signal is greater than 1 meter, a shielded cable is required.
- 各类电缆布线应分束、分槽布线，不同类的电缆发生交叉，电缆与电缆之间要成直角。IO 信号线和 RS485/CAN 通信线离系统电源线＞0.2m。
  All types of cable wiring should be distributed in bundles and slots. Different types of cables should be crossed, and the cables should be at right angles. The IO signal cable and RS485/CAN communication cable are more than 0.2m away from the system power cable.

接地要求： Grounding requirements:

本产品系统采用共地设计， DC 电源、 RS485/CAN 通信和 IO 端口共地。使用时注意以下要求：

This product system uses a common ground design, DC power, RS485 communication and IO port common ground. Pay attention to the following requirements when using:

- 系统接地电阻＜4Ω；
  System ground resistance <4Ω;
- 多台电机并联使用时，各台电机供电接地之间接地电阻≤0.1Ω；
  When multiple motors are used in parallel, the ground resistance between the power supply ground of each motor is ≤0.1Ω;
- 主 RS485/CAN 控制器接地和一体化伺服电机的从站 RS485/CAN 接口要共地，接地电阻≤0.1Ω；
  The grounding of the master RS485/CAN controller and the RS485/CAN interface of the slave station of the integrated servo motor must share the same ground, and the grounding resistance is ≤0.1Ω;
- 电机外壳要通过安装孔安装到电机支架上，支架要可靠接大地，接地电阻≤0.1Ω。
  The motor housing must be installed on the motor bracket through the mounting holes, and the bracket must be reliably connected to the ground, and the ground resistance is ≤0.1Ω.

4.5 其他 Other

- 在给电机供电前，确认正确连接通信线缆、电源线缆、需要使用 IO 功能的要连接 IO 线缆（推荐使用本公司的标准线缆）。
  Before supplying power to the motor, confirm that the communication cables, power cables, and IO cables that need to use the IO function are properly connected (standard cables from our company are recommended).
- 电机的具体操作指令参考本公司的《STM-M、BLM 一体化电机 Modbus 通信用户手册》、《STM-M、BLM 系列一体化电机 CANopen 通讯（闭环）用户手册》。
  For the specific operation instructions of the motor, please refer to the "STM-M,BLM Integrated Motor Modbus Communication User Manual" and "STM-M, BLM Series Integrated Motor CANopen Communication (Closed Loop) User Manual" of our company.

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北京立迈胜控制技术有限责任公司
Beijing NiMotion Control Technology Co., Ltd.
北京市大兴区金星路 12 号院 3 号楼
Building 3, No. 12 Jinxing Road, Daxing District, Beijing
邮编 Postcode ：102628
电话 Tel：(010)60213882　　传真 Fax：(010)60213882
邮箱 Mail:NiMotion@NiMotion.com
http：//www.NiMotion.com