BONENG

AM 驱动器
AM-Series Drive

快速调试手册
QUICK COMMISSIONING MANUAL

中文

EN

CONTACT US

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前言

欢迎使用博能驱动器！

在安装使用前请务必认真阅读本说明书，以便正确安全地使用驱动器。

更多详细资料，请访问博能传动官方网站：
博能传动（www.boneng.com.cn）。

扫码了解产品详情
AM变频驱动器

博能传动官方网站

扫码下载产品使用手册
AM变频驱动器

AM驱动器使用手册

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1. 驱动器技术参数

AM按照尺寸的不同（外形尺寸M1-M2）功率范围覆盖0.75KW~5.5KW。

功能		技术数据
输出电源	24V OUT	• 电压范围：DC 21.6 ••• 26.4V，最大电流：200mA
	10V OUT	• 电压范围：DC 11.1V ••• 12.2V，最大电流：20mA
数字量输入	5个（DI0 ~ DI4）	• 共公共端子DICOM0 • 电压：DC 24V、AC 36V、AC 48V • "1"信号电压：>11V，"0"信号电压：<5V • 响应时间：6~20 ms（含软件滤波）
数字量输出	1个晶体管型（DO1）	• 电压：最大DC 30V • 电流：输出最大50mA
	1个继电器	• 电压：DC 30V、AC 250V • 连续电流：2A，切换电流：2A • 触点类型：NO常开端 NC常闭端 COM公共端
模拟量输入	1个（AI）	• 单端输入 • 电压型，支持0V~10V • 精度：±1%
模拟量输出	1个（AO）	• 单端输出 • 电流型，输出范围0~20mA • 精度：±1%
通信接口	RS485通信端口	• 支持Modbus RTU • 最高通信速率115200bps
	PC通信端口	• RJ45网口 • 支持上位机调试及软件更新

备注：更多详细说明参见官网详细使用手册。

2. 驱动器配线

2.1 驱动器接口一览

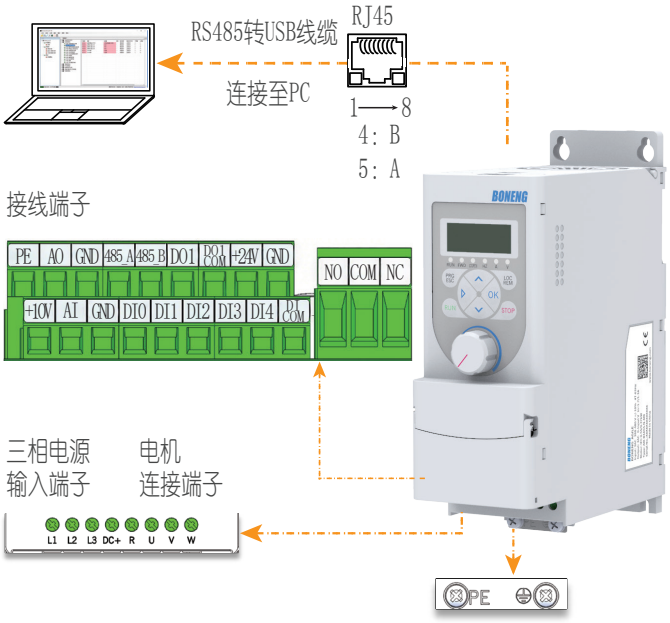

表1. 功率单元端子名称与功能描述

端子编号	端子名称	说明
电源输入端子	L1，L2，L3	三相电源输入端子，380~480V 3AC ±10%。
	PE	三相电源接地保护。
直流母线及制动电阻端子	DC+，R	制动电阻接入端子，需外接能量泄放电阻时，将电阻接于 DC+和 R 之间。
马达连接端子	U，V，W	连接马达 U，V，W 相。
	PE	连接马达接地线。

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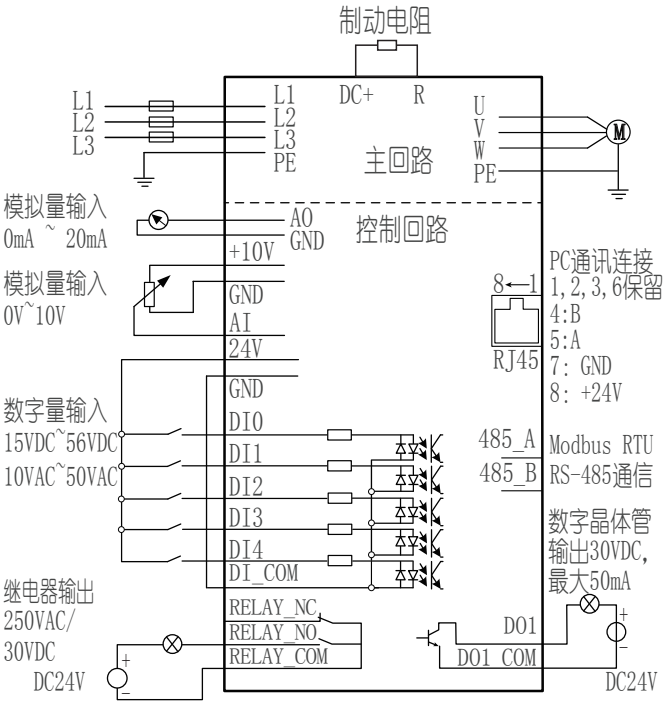
2.2 控制模块端子配线



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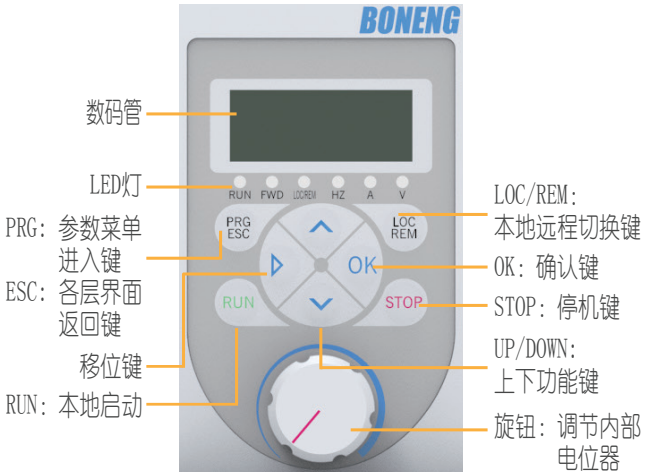
3. 驱动器操作说明

3.1 操作面板说明



图像/名称	名称释义	功能
LED灯	状态显示	RUN: 亮，运行状态；灭，停机状态； LOC/REM: 亮，本地模式；灭，远程模式； FWD: 亮，正向运行；灭，反向运行； 其余三个为单位灯
PRG/ESC	编程/返回	主监控界面时，按此键进入功能选择界面； 其他界面，按此键返回上一级界面或状态
LOC/REM	本地/远程	获取或放弃键盘控制权
STOP	停止键	运行状态时，按此键可用于停止运行操作； 停机状态时，按此键可复位故障状态
RUN	运行键	在键盘操作方式下，用于运行操作
▲	递增键	数据或功能码的递增
▼	递减键	数据或功能码的递减
▶	移位键	在停机显示界面和运行显示界面，可以右移循环显示参数，在修改参数时，可选择参数的修改位
OK	确认键	逐级进入菜单画面、设定参数确认

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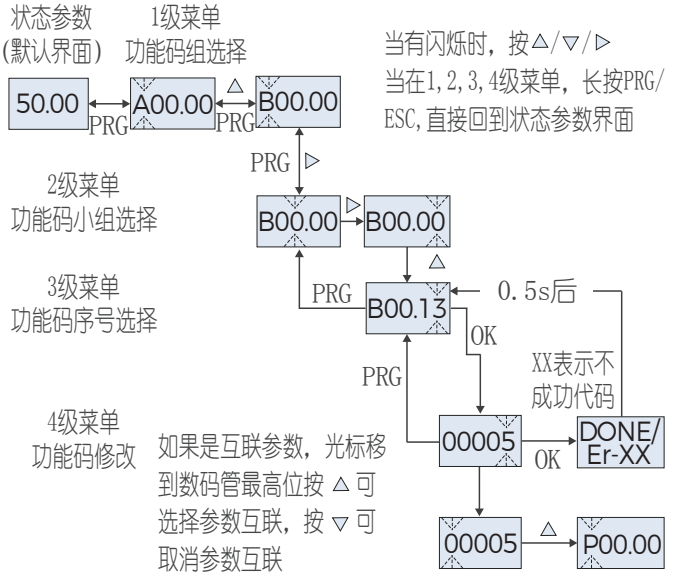
键盘操作流程如下：

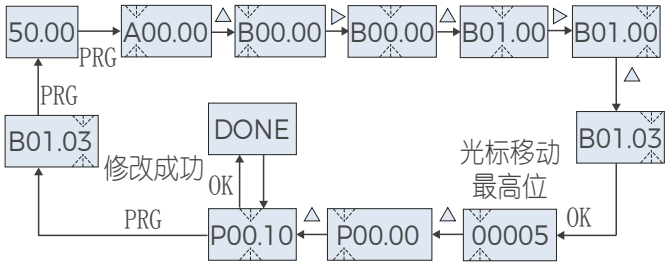
驱动器的操作面板采用四级菜单结构进行参数设置等操作。

四级菜单分别为：功能参数组(1级菜单)→功能码小组选择(2级菜单)→功能码选择(3级菜单)→功能码参数查看与设定(4级菜单)。操作流程如下：



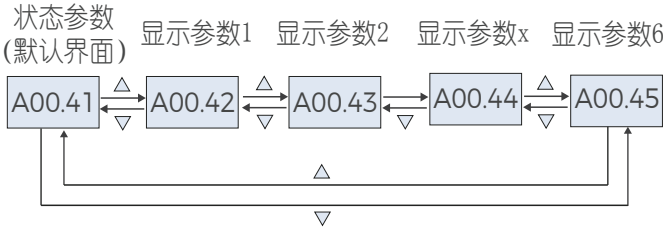
说明：在4级菜单修改功能码的值，只有按下OK键，才将数据写入驱动器，如果成功，显示DONE，否则显示Er-XX，错误代码。0.5秒后，返回到四级菜单。按PRG/ESC可以返回到默认界面。

示例将B01.03互联到P00.10



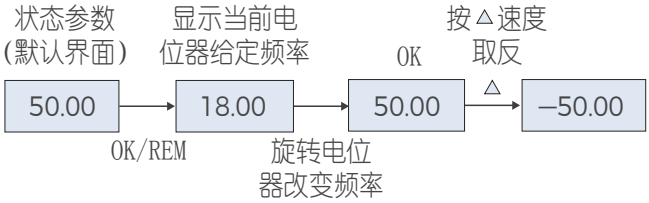
1. 查看驱动器的监视参数

默认界面为显示监控参数，参数的内容由A00.41-A00.45决定，按下▲▼，可以滚动显示监控参数。



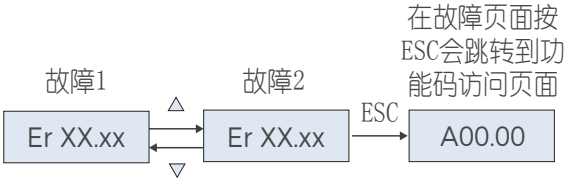
2. 查看电位器给定频率与速度取反

在默认界面下，按下OK键，可以查看电位器给定频率。获取控制权后，界面也会跳转到该界面。按上下键电位器的速度给定取反。



3. 故障显示

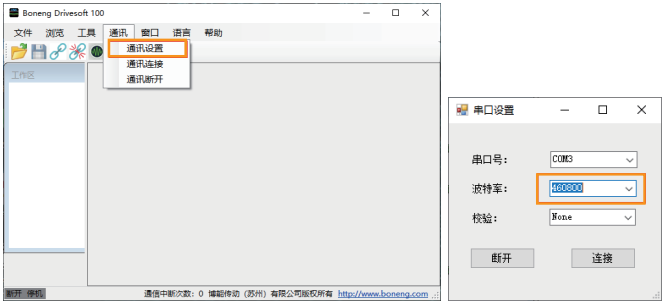
驱动器有故障或警告时，驱动器数码管页面会跳转到故障警告页面，LED显示EXX.xx,其中XX表示故障码，xx表示故障子码。警告会闪烁，显示AL XX.xx。按STOP键，可能消除故障。消除故障后，LED返回显示默认界面。



3.2 调试软件Boneng Drivesoft 100操作说明

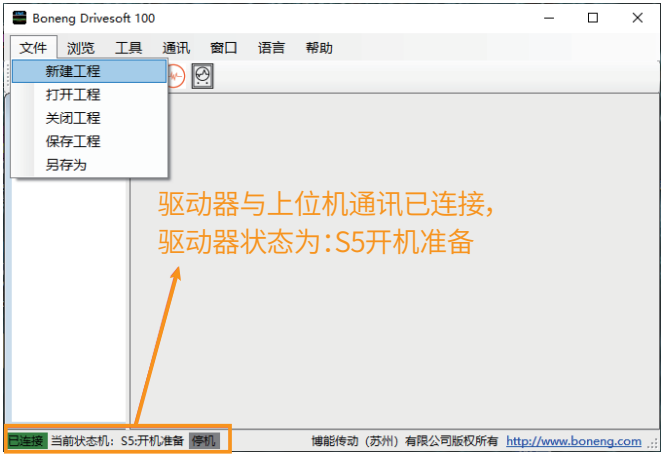
1. 请使用RJ45转RS485线缆连接AM驱动器与PC，确保PC端已安装好博能驱动器上位机软件 Boneng Drivesoft 100。

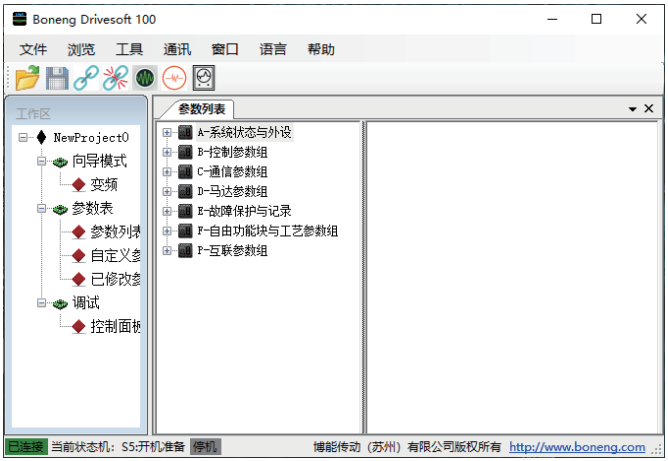
2. 在PC端打开博能上位机软件 Boneng Drivesoft 100，并完成其与驱动器的通讯连接：菜单 -> 通讯 -> 通讯设置 -> 串口号，选择对应的串口号 -> 连接 ，如下图所示。



驱动器与上位机软件Boneng Drivesoft的通讯连接

3. 在上位机软件 Boneng Drivesoft 100中建立工程：文件 -> 新建工程 ->确定 。





上位机软件中建立工程并查看参数

4.快速启动（试运转）

注意：

- 试运转前请务必知悉各个驱动器单元操作的安全与注意事项。

4.1 调试前准备

使用上位机对博能AM变频器带电机进行试运转前需要准备以下设备：

- 博能AM变频驱动器一套；
- 变频驱动器电源线缆及开关若干；
- USB转RS485数据线一条，网线一条（转接用，禁止使用网线直接连接PC网口与驱动器RJ45接口）；
- PC及博能上位机软件Boneng Drivesoft 100。

请按照接线图连接好变频器及电机，并连接好驱动器与PC

4.2 试运转前检查和注意事项

- 电机与外部机械装置

  试运转前请检查电机的安装，务必确保电机安装固定稳定安全可靠。试运转前请务必将电机的输出轴与后级负载分离。

- 安装与配线检查

  a. 送电前请根据驱动器铭牌确认驱动器的供电电源电压是否和其额定工作电压匹配。

  b. 请确保动力线缆及PE信号都已正确接在驱动器上，检查电机铭牌确定电机侧按铭牌上的接法正确连接。

  c. 请确保驱动器的接地保护线缆可靠接地，以防触电。

- 电机制动器接线检查

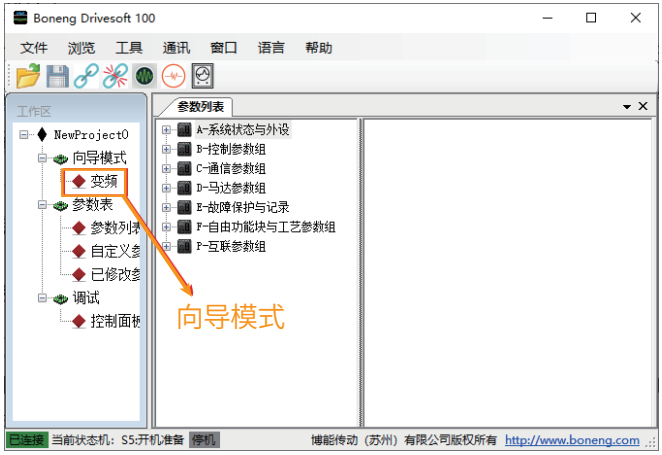
  a. 试运转前请检查电机抱闸的配线是否正确。

4.3 使用BonengDriveSoft 100调试

以下是使用博能驱动器上位机软件 Boneng Drivesoft 100 进行电机试运转的步骤：

- 步骤1：

  在上位机软件 Boneng Drivesoft 100 中建立工程（参见章节3.2），可实时显示当前参数。点击向导模式，进入调试配置，如下图：



- 步骤2：

  （可选项）参数恢复出厂设置：参数复位模式（A04.00）=【3:全部参数恢复出厂】 —> 开始恢复 —>等待参数恢复完成（看调试软件左下角状态机）。

参数复位

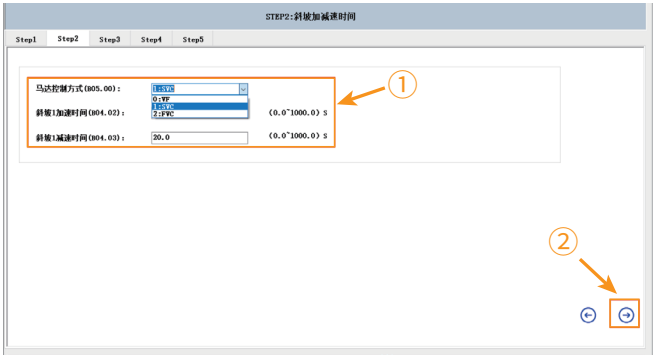
◆ 步骤3：

设置电机参数：根据电机铭牌设置马达参数（D00组：马达基本参数）。若需要矢量控制则在设置完铭牌参数后通过设置B00.21后启动以执行马达参数辨识。

电机参数设定

◆ 步骤4：

马达控制方式及斜坡时间设置：在参数B05.00中，选择需要的电机控制方式，如：【0:VF】，【1:SVC】。并在参数B04.02和参数B04.03中（默认使用斜坡1加减速时间），设置需要的加减速时间。



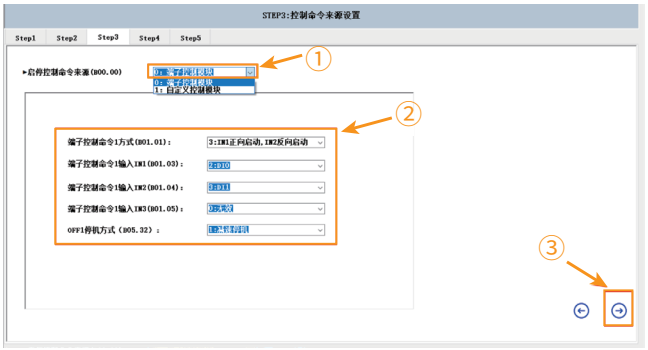
马达控制方式及斜坡时间设置

◆ 步骤5：

若需要矢量控制，修改参数 B05.00 =【1:SVC】。

◆ 步骤6：

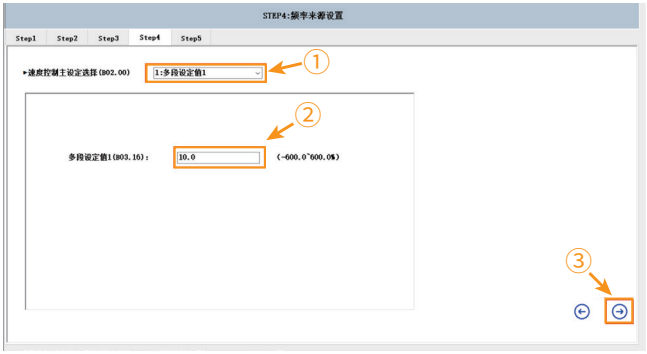
默认的启停控制命令来源是端子控制。DI0控制正向运行，DI1控制反向运行。OFF1停机方式为减速停机。连接好相应的DI端子，DI0置1的时候电机正向运行，DI1置1的时候电机反向运行，DI输入为0时电机减速停机。



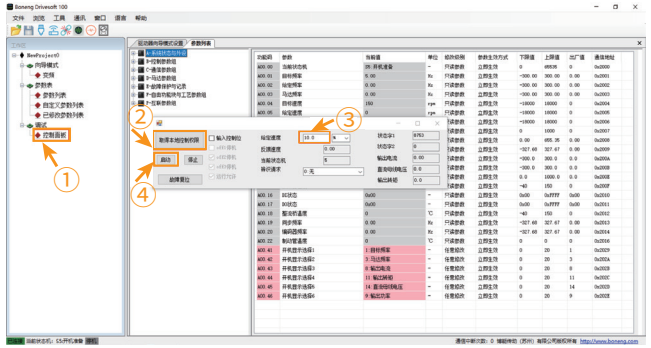
也可修改参数B01.01，选择想要的端子控制命令方式。并连接好对应的DI端子。

◆ 步骤7：

通过参数B03.16设置目标速度。



注：若想用上位机直接控制，可采用以下方式，给定启停指令和目标速度：



5. 常用参数

5.1 常用设置参数

功能序号		功能码名称	功能码说明
A04.00		参数复位模式	3：全部参数复位，需要通过A04.01确认后才可复位参数
A04.01		参数复位确认	0：取消　1：确认（**需等参数复位完成之后方可重新设置驱动器参数**）
D00.01		马达额定功率	应与马达铭牌参数一致。
D00.02		马达额定电压	
D00.03		马达额定电流	
D00.04		马达额定频率	
D00.05		马达额定转速	
B05.00		马达控制方式	0：VF　1：SVC
F04.00		抱闸功能选择	0：不使用抱闸功能，1：使用抱闸功能。通常用于提升设备时需要使用此抱闸功能，若通过DO端子控制抱闸，将DO功能设为P01.11即可。
B01.01		端子控制命令1方式	端子启停命令，详见操作手册。
B01.03		端子控制命令1输入IN1	
B01.04		端子控制命令1输入IN2	
B01.05		端子控制命令1输入IN3	
A06组		数字量输出	可设置DO输出端子功能，详见使用手册。
A07组		模拟量输入	模拟量输入设置，详见使用手册。
B00.21		辨识请求	B05.00设置为1或2时需要辨识。异步机辨识步骤：按LOC/REM键设为本地模式，B00.21设为2，按RUN键启动，等驱动器辨识停止后，按STOP键，再按LOC/REM键切换到远程即可。
B00.23		OFF1停机方式	0：自由停机　1：减速停机
速度控制模式	B02.00	速度控制主设定选择	频率给定来源，详见操作手册。
	B03组	多段速设置	多段速控制，详见使用手册。
	B04.02~B04.09	斜坡加减速时间	速度控制加减速时间设置与选择。同一时刻仅一组有效。

5.2 常用监控参数

功能序号	功能码名称	功能码说明
A00.00	当前状态机	驱动器当前状态。
A00.05	给定速度	速度控制模式下，实时速度给定值；[rpm]。
A00.06	马达转速	实时速度反馈，[rpm]。
A00.08	输出电流	实时输出电流。
A00.09	输出功率	实时输出功率。
P00组	硬件状态	显示DI，DO，DIO等硬件接口物理状态。
P12.14	PC给定值	速度控制模式下通过PC上位机给定的目标速度值。单位由上位机控制面板选择。
P12.16	DI状态	DI实时状态。
P12.17	DO状态	DO实时状态。
P13.00	马达实际速度	马达实时速度反馈值；4096对应100%额定转速。
P13.11	功能最终给定速度	速度控制模式下最终速度指令值；4096对应100%额定转速。
P13.02~P13.11	-	速度控制模式下速度给定监控数据。
E01~E06组	-	显示故障记录与相关信息。

6. 驱动器故障说明

序号	故障名称	子码	子码含义	解决对策
1	过流	1	过流1	1. 排除动力线破损问题 2. 检查接线是否短路 3. 增加加减速时间 4. VF控制下减小VF转矩提升量 5. 请确认马达停止稳定后再启动 6. 减小或取消负载 7. 矢量控制下请确认是否进行过正确的参数辨识操作 8. 联系售后或厂家，寻求技术支持
		2	过流2	
		3	过流3	
2	过压	1	快速检测中母线电压过压	1. 请检查输入电源是否在合理范围 2. 请增长加减速时间 3. 加装制动电阻或制动单元 4. 联系售后或厂家，寻求技术支持
3	欠压	1	母线欠压	1. 请检查输入电源是否在合理范围 2. 请确认电网是否瞬间断电 3. 联系售后或厂家，寻求技术支持
5	驱动器过载	1	驱动器过载	1. 请确认驱动器选型是否合适，或更换更大容量的驱动器 2. VF控制下减小VF转矩提升量 3. 矢量控制下减小转矩限幅值 4. 请确认负载是否过重，或者抱闸等锁死情况 5. 矢量控制时请确认是否进行正确的参数自学习操作 6. 联系售后或厂家，寻求技术支持
6	马达过载	1	马达过载	1. 请确认马达负载是否过大 2. 矢量控制时请确认是否进行过马达参数自学习 3. 带编码器应用下，请确认编码器方向及参数设定是否正确 4. 请确认负载是否过重，或者抱闸等锁死情况 5. 请确认是否正确设定马达铭牌参数 6. 联系售后或厂家，寻求技术支持
7	输入缺相	1	输入缺相检测	1. 请检查动力输入电缆是否接触良好 2. 联系售后或厂家，寻求技术支持

序号	故障名称	子码	子码含义	解决对策
8	输出缺相	1	U相输出缺相	1. 请检查对应的输出电缆是否接线正确及接触良好 2. 请确认电机是否运行平稳 3. 联系售后或厂家，寻求技术支持
		2	V相输出缺相	
		3	W相输出缺相	
		5	三相输出严重不平衡	
		6	定子电阻辨识输出缺相	
		7	SVC输出缺相	
9	驱动器过热	1	驱动器过热	1. 请确认环境温度是否过高 2. 请检查散热器风扇是否正常运转 3. 请检查散热器风道是否堵塞 4. 联系售后或厂家，寻求技术支持
11	电流零飘检测错误	1	U相零漂偏大	1. PM异常，联系售后或厂家，寻求技术支持
		2	V相零漂偏大	
		3	检测时过流	
		4	检测时过压	
12	对地短路检测故障	1	对地短路时U相过流	1. 请检查相应输出相是否对地短接 2. 检查马达线缆是否破损 3. 联系售后或厂家，寻求技术支持
		2	对地短路时V相过流	
		4	对地短路时W相过流	
		5	对地短路电流超过阈值	
		6	对地短路时过压	
13	调谐失败	1	动态调谐异常	1. 请确认马达铭牌参数设置是否正确 2. 联系售后或厂家，寻求技术支持
		2	静态调谐失败	
15	矢量失速报警	1	速度在外力作用下被反向	1. 请确认马达铭牌参数设置是否正确 2. 请确认是否做过马达参数自学习操作 3. 请检查和失速相关的参数设置是否合理 4. 联系售后或厂家，寻求技术支持
		2	速度偏差过大	
17	驱动电源故障	1	驱动电源电压偏低	1. 联系售后或厂家，寻求技术支持
21	机型设置错误	1	机型超过下限	1. 请确认驱动器机型是否和标签一致 2. 联系售后或厂家，寻求技术支持
		2	机型超过上限	
33	驱动器预过载	1	驱动器过载预警告	1. 请确认是否开启驱动器预过载功能 2. 联系售后或厂家，寻求技术支持
34	马达预过载	1	马达过载预警告	1. 请确认是否开启驱动器预过载功能 2. 联系售后或厂家，寻求技术支持

序号	故障名称	子码	子码含义	解决对策
35	通信异常	1	后台启动时异常断开	1.检查驱动器的相关通信线缆是否连接异常 2.检查通信超时参数是否设置合理 3.联系售后或厂家，寻求技术支持
		2	操作面板启动时异常断开	
		3	Modbus通信故障	
37	马达速度超限	1	马达转速超出最大转速限制	1.请检查和马达超速相关的参数设置是否合理 2.联系售后或厂家，寻求技术支持
38	马达速度偏差过大	1	马达转速与给定转速偏差过大	1.请检查和马达速度偏差过大相关的参数设置是否合理 2.联系售后或厂家，寻求技术支持
40	PID反馈丢失	1	PID反馈采样值丢失	1.检查PID反馈输入的信号 2.联系售后或厂家，寻求技术支持
41	外部故障	1	产生外部故障1	1.检查外部输入信号
43	预驱动失败	1	运行命令产生时没有检测到母线电压	1.检查外部供电电压是否异常 2.联系售后或厂家，寻求技术支持
45	抱闸控制异常	1	抱闸打开异常	1.检查外部继电器是否异常 2.联系售后或厂家，寻求技术支持
		2	抱闸关闭异常	
51	ROM故障	1	Flash不能访问	1.重新上电 2.检查修改功能码的频率是否太高 3.联系售后或厂家，寻求技术支持
		2	功能码值不在上下限范围	
		3	Flash写入后回读错误	
		4	功能码修改次数超限	

中文

7. 马达制动器参数（仅适用于博能异步马达）

制动器型号	BN05	BN06	BN10	BN14	BN16	BN18	BN20	BN25	BN30
制动力矩(N.m)	2	4	16	60	80	150	300	600	1000
制动器功率(W)	13	20	30	50	55	85	100	110	200
额定间隙(mm)	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6
最大间隙(mm)	0.5	0.5	0.5	0.75	0.75	1	1	1.25	1.5
交流制动电压(AC-V)	230 or 400	230 or 400	230 or 400	230 or 400	400	400	400	400	400
直流制动电压(DC-V)	103 or 180	103 or 180	103 or 180	103 or 180	180	180	180	180	180
适配马达机座号	63	71	80-90	100-112	132	160	180	200-225	250-280
制动吸合时间(ms)	40	40	70	190	200	260	340	390	420
慢速制动释放时间(ms)	300	300	450	570	600	780	1650	2000	3000
快速制动释放时间(ms)	30	30	45	57	60	78	165	230	380

中文

8. 马达常见故障排查与维修方法

	故障现象	可能原因	处理方法
1	不能起动	a. 定子绕组有一相开路	检查定子绕组，查出断路处，加以修复
		b. 定子绕组匝间及相间短路	测量定子绕组每相电阻和各相空载电流是否平衡，查出所在处，加包绝缘
		c. 定子接线错误	按铭牌上规定的接法和接线图，查出定子绕组的接线，纠正错误联接
		d. 负载或传动机械有故障	把马达和负载分开，如马达能正常起动，应检查被拖动机械，消除障碍
		e. 变频器参数设置不当	检查变频器参数，进行调整（变频马达）
		f. 制动器未动作	检查制动器及其电器（制动马达）
2	变频马达起动后转速低于额定转速	a. 变频器的输出频率与输出电压设定不当	按使用要求重新设定
		b. 负载过重	检查负载传动装置是否正常
3	马达有异常噪声或振动过大	a. 机械摩擦（包括定转子相擦）	检查转动部分与静止部分间隙，找出相擦原因，进行校正
		b. 缺相运行	断电，再合闸，如不能起动，则可能有一相断电，检查电源或马达并加以修复
		c. 轴承缺油或损坏	清洗轴承，加新油，或更换新轴承
		d. 马达接线错误	查明原因，加以更正
		e. 修理后转子平衡被破坏	重新校动平衡

	故障现象	可能原因	处理方法
3	马达有异常噪声或振动过大	f. 轴身弯曲，变形	校直，必要时须更换转轴
		g. 联轴器俩连接松动	查清松动处，把螺栓拧紧
		h. 安装基础不平衡或有缺陷	检查基础固定情况，加以纠正
4	马达温升过高	a. 过载	用电磁式电流表测量定子电流或检查变频器面板上的电流显示值(变频马达)，发现过载时，应减轻负载
		b. 缺相运行	检查马达定子接线或变频器接线（变频马达），并加以修复
		c. 马达接法错误	△接法马达误接成Y 接工作或相反，必须立即断电改接
		d. 定子绕组接地或匝间或相间短路	检查找出短路和通地的部分，进行修复
		e. 定、转子相擦	检查轴承装配有无松动，定子和转子装配有无不良情况，加以修复
		f. 通风不畅	检查风机和风叶有否损坏，风道有否阻塞。风机或风叶损坏应予以修复或更换。风道阻塞应移开妨碍通风的物件，清除风道污垢、灰尘及杂物，使空气流通
		g. 变频器的V/f 参数设置不当，使马达低速轻载时出现过激励，电流大于额定值	调整 V/f 的参数设置(变频马达)

	故障现象	可能原因	处理方法
4	马达温升过高	h. 利用变频器的直流制动功能对马达进行制动时，制动电流太大	调整直流制动电流的设置，根据制动频繁程度，一般设置在额定电流的 100%–150%。（变频马达）
		i. 制动器动作迟缓	检查制动器气隙和直流励磁电压（制动马达）
5	轴承过热	a. 轴承损坏	更换轴承
		b. 轴承润滑脂过多、过少或有杂质	调整或更换润滑脂
		c. 轴承与轴、轴承与端盖配合过松或过紧	修整到合适的配合
		d. 马达两侧端盖或轴承盖没有装配好（不平行）	将两侧端盖或轴承盖止口装平，旋转螺栓
		e. 轴伸端油封安装不良	调整到合适的安装状态
6	马达外壳带电	a. 接地不良	检查接地螺栓，接地线同机壳接触是否紧密
		b. 绕组受潮，绝缘电阻过低	绕组干燥处理
		c. 绝缘损坏，定子线圈碰铁芯	予以修复
		d. 接线板有污垢	清理接线板
		e. 引出线绝缘磨破	破损处用绝缘材料包扎
7	马达在负载时不能起动	a. 定子绕组有匝间短路	检查各相电阻和各相电流
		b. 过载	检查马达负载电流

	故障现象	可能原因	处理方法
8	三相电流不平衡	a. 匝间短路	修理绕组
		b. 接线错误	改正接线
		c. 三相电源电压不平	改善供电质量
9	保险丝融断	a. 两相间短路	修理绕组
		b. 负载过大	减小负载
		c. 电压过低	升高电压
10	绝缘电阻低或击穿	a. 绝缘老化或损伤	检修绝缘
		b. 不清洁	用干燥的压缩空气吹净内部
		c. 绕组或接线板受潮	拆开烘干或处理后再用
		d. 马达过热	拆开检修防止继续过热
11	制动马达制动失灵	a. 摩擦片磨损较大	调整气隙
		b. 弹簧失效	调换弹簧
		c. 动作迟缓	调整气隙，检查励磁电压
		d. 整流器损坏	调换整流器
		e. 制动线路故障	正确排除制动线路故障

注意:

- 用户想获得更详细的资料，请与本公司联系。
- 无需通知，本公司保留对马达使用维护说明书的修改权。

售后服务

售后服务请按以下步骤提交售后流程。

→ 登录“www.boneng.com”

→ 点击“服务”和“售后服务”

→ 登录系统

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Introduction

Welcome to Boneng Drive!

Please read this manual carefully before installation and use so that the driver can be used correctly and safely.

For more details, please visit Boneng Transmission official website:
BONENG (www.boneng.com.cn).

Scan the code to view product details
AM Series Drives

Boneng Transmission official website

Scan to download the product manual
AM Series Drives

AM Series Drive Use Manual

EN

1. Technical Parameters

AM covers a power range of 0.75KW to 5.5KW, depending on the size (outer dimensions M1-M2).

Function		Technical
Power Supply	24V OUT	• Voltage range : DC 21.6V … 26.4V, Maximum current: 200mA
	10V OUT	• Voltage range : DC 11.1V … 12.2V, Maximum current: 20mA
Digital input	5↑(DI0 ~ DI4)	• Common terminal DI COM • Voltage : DC 24V、AC 36V、AC 48V • "1" signal voltage: >11V, "0" signal voltage: <5V • Response time: 6~20ms(Includes software filtering)
Digital output	1 transistor type (DO1)	• Voltage : Maximum DC 30V • Current : Maximum output 50mA
	1 relay	• Voltage : DC 30V、AC 250V • Continuous current: 2A, switching current: 2A • Contact type :NO(Normally open terminal NC (Normally closed terminal) COM(Common terminal)
Analog input	1(AI)	• Single-ended input • Voltage type, supports 0V to 10V • Accuracy: ±1%
Analog output	1(AO)	• Single-ended output • Current type, output range 0~20mA • Accuracy: ±1%
Communication interface	RS485 communication port	• Supports Modbus RTU • Maximum communication rate 115200bps
	PC communication port	• RJ45 network port • Supports host computer debugging and software updates

Note: For more detailed information, please refer to the official website user manual.

2. Driver wiring

2.1 Driver interface overview

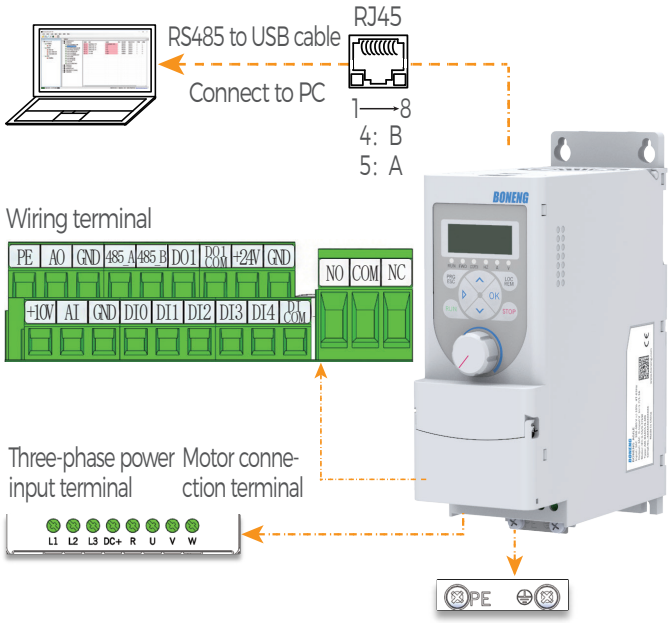

Table 1. Power unit terminal names and function descriptions.

Terminal number	Terminal name	Description
Power input terminal	L1, L2, L3	Three-phase power input terminal, 380~480V 3AC±10%。
	PE	Three-phase power grounding protection.
DC bus and braking resistor terminals	DC+, R	Braking resistor connection terminal. When an external energy dissipation resistor is required, connect the resistor between DC+ and R.
Motor connection terminal	U, V, W	Connect the motor U, V, W phases.
	PE	Connect the motor ground wire.

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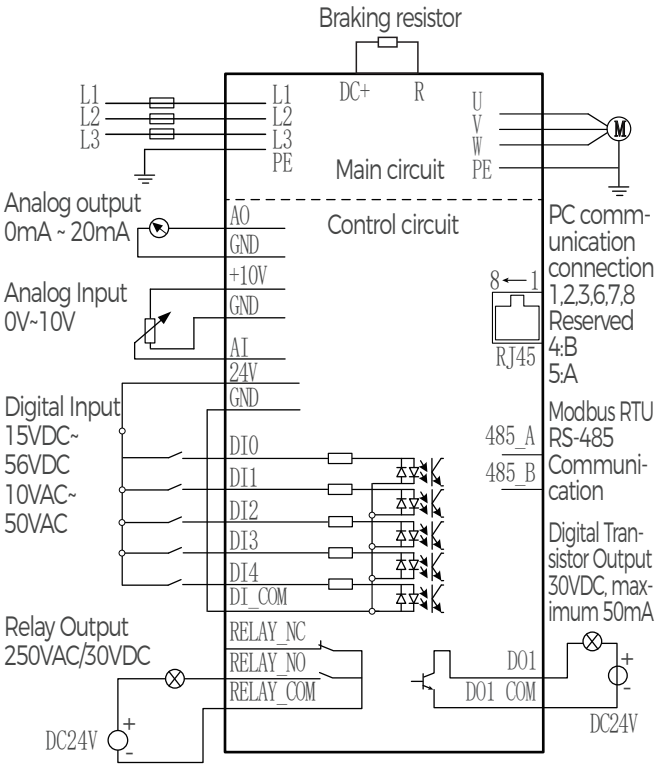
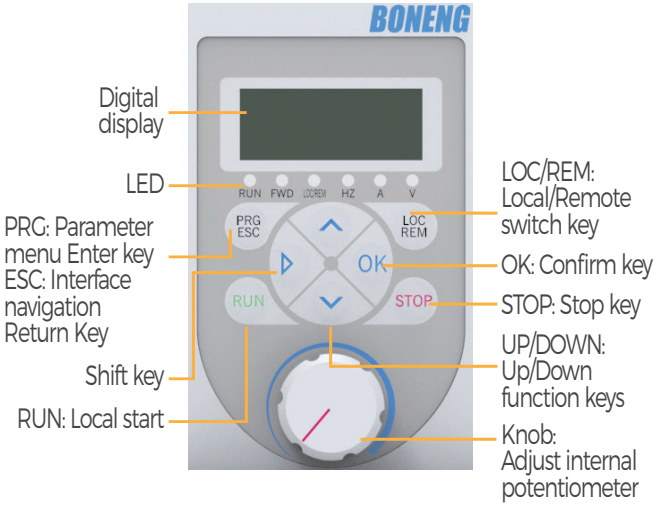
2.2 Control module terminal wiring



3. Driver operation instructions

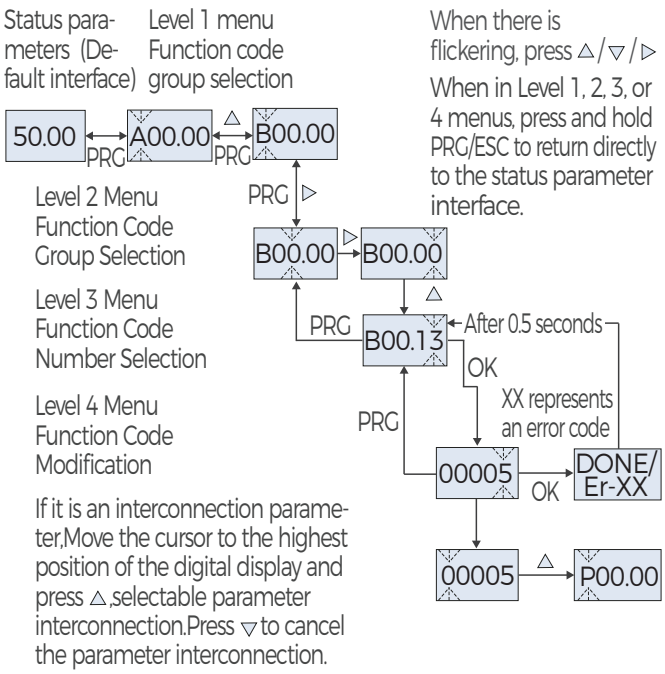
3.1 Operation panel description



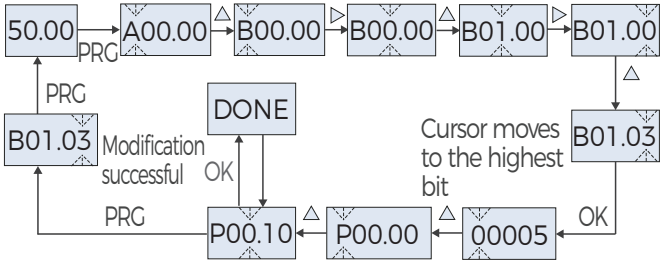
Image/ Name	Name explanation	Function
LED	Status display	RUN: Lights up for running status; off for stopped status; LOC/REM: Lights up for local mode; off for remote mode; FWD: Lights up for forward operation; off for reverse operation; The other three are unit indicators.
PRG/ESC	Programming/ Return	In the main monitoring interface, press this button to enter the function selection interface; in other interfaces, press this button to return to the previous interface or state.
LOC/REM	Local/Remote	Acquire or relinquish keyboard control.
STOP	Stop button	In operating status, pressing this button can be used to stop the operation; in a halted state, pressing this button can reset the fault status.
RUN	Run button	In keyboard operation mode, used for running operations.
▲	Increment button	Increment of data or function code.

Image/ Name	Name explanation	Function
▼	Decrement button	Decrement of data or function code.
▶	Shift key	In the shutdown display interface and the running display interface, you can shift the circular display parameters to the right. When modifying parameters, you can select the modification bit for the parameter.
OK	Confirm button	Step-by-step access to the menu screen and confirmation of parameter settings.

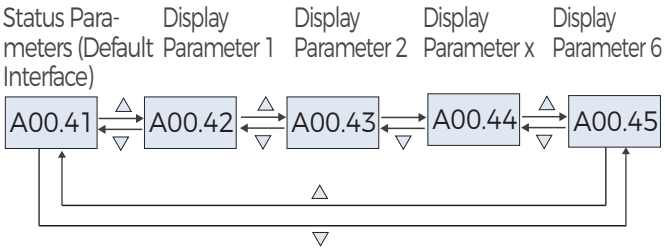
The keyboard operation process is as follows:
The operation panel of Mini Drive adopts 4 level menus structure for parameter setting and other operations.
The 4 level menus are: Function parameters group (1st-level menu)→ selection of the function codes group (2nd-level menu)→ selection of function code (3rd-level menu)→ view and set the parameters of function code (4th-level menu).Operation process is as follow:



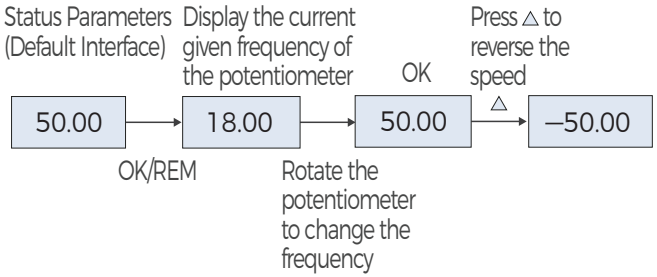
Note: To modify the function code value in the 4-level menu, you must press the OK button to write the data to the drive. If successful, it will display DONE; otherwise, it will display Er-XX, an error code. After 0.5 seconds, it will return to the four-level menu. Press PRG/ESC to return to the default interface. Example: Connect B01.03 to P00.10.



1. View the monitoring parameters of the drive. The default interface displays the monitoring parameters, and the content of the parameters is determined by A00.41 to A00.45. Press down ▲▼, you can scroll to display the monitoring parameters.

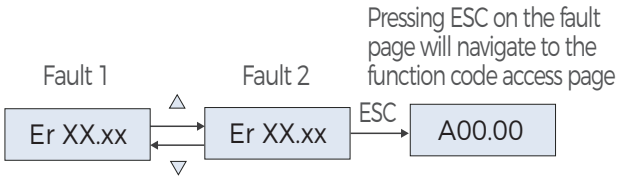


2. Check the potentiometer's given frequency and invert the speed
In the default interface, press the OK key to view the given frequency of the potentiometer. After gaining control, the interface will also switch to this screen. Press the up and down keys to invert the speed setting of the potentiometer.



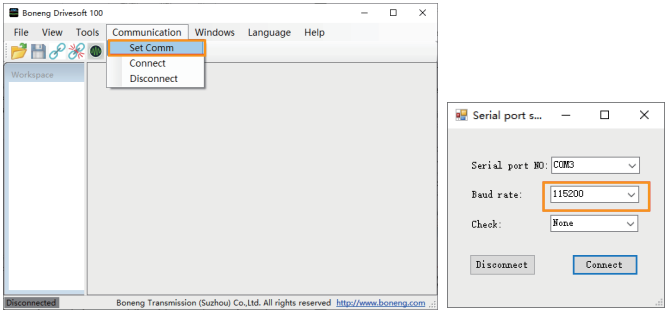
3. Fault display

When the driver encounters a fault or warning, the digital display page will switch to the fault warning page. The LED will show EXX.xx, where XX represents the fault code and xx represents the fault sub-code. Warnings will flash and display as AL XX.xx. Pressing the STOP key may clear the fault. Once the fault is cleared, the LED will return to the default interface.



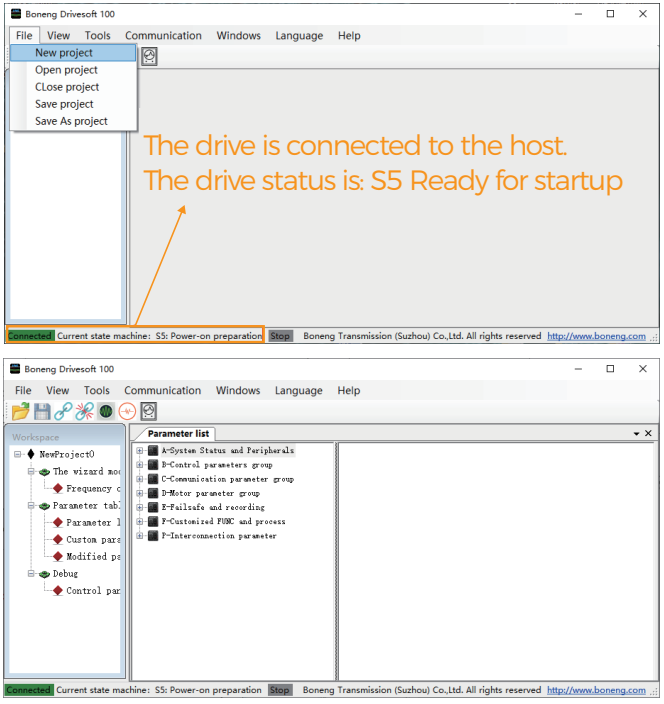
3.2 Operating instructions for debugging software Boneng Drivesoft 100

1. Please use an RJ45 to RS485 cable to connect the AM driver to the PC. Ensure that the Boneng Drivesoft 100 upper computer software is installed on the PC.
2. Open the Boneng Drivesoft 100 upper computer software on the PC and complete the communication connection with the driver: Menu -> Communication -> Communication Settings -> Serial Port Number, select the corresponding serial port number -> Connect as shown in the figure below.



Communication connection between the driver and the upper computer software Boneng Drivesoft

3. Create a project in the upper computer software Boneng Drivesoft 100: File -> New Project -> Confirm.



Create a project and view parameters in the upper computer software.

4. Quick start (test run)

Note:

- Before the test run, please make sure to be aware of the safety precautions and operating instructions for each driver unit.

4.1 Preparation before debugging

Before performing a test run with the Boneng AM inverter and motor using the upper computer, the following equipment needs to be prepared:

- One set of Boneng AM frequency inverter.
- Several power cables and switches for the frequency inverter.
- One USB to RS485 data cable and one network cable (for connection; do not directly connect the PC network port to the driver's RJ45 interface using a network cable);
- PC and Boneng upper computer software Boneng Drivesoft 100.

Please connect the frequency inverter and motor according to the wiring diagram, and ensure the connection between the driver and PC is properly set up.

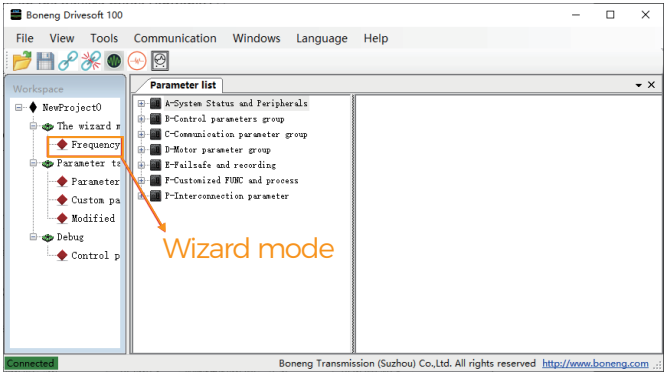
4.2 Pre-test run inspection and precautions

- Motor and external mechanical devices:
  Before the test run, please check the motor installation to ensure it is fixed securely and safely. Be sure to separate the motor's output shaft from the downstream load before the test run.
- Installation and wiring inspection:
  a. Before powering on, please verify that the power supply voltage matches the rated operating voltage of the driver according to the driver's nameplate.
  b. Ensure that the power cables and PE signals are correctly connected to the driver, and check the motor nameplate to confirm the motor side is correctly connected as per the nameplate wiring.
  c. Ensure that the ground protection cable of the driver is securely grounded to prevent electric shock.
- Motor brake wiring inspection:
  a. Before the test run, please check if the motor brake wiring is correct.

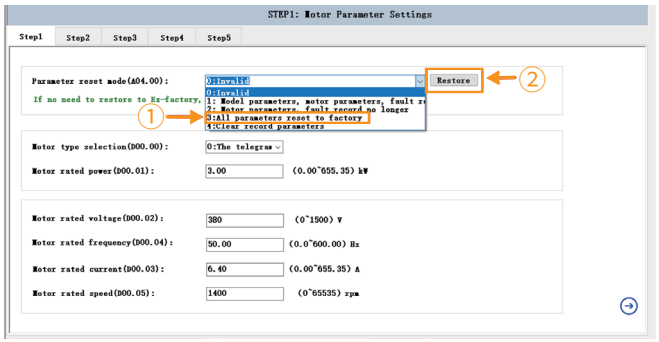
4.3 Debugging using BonengDriveSoft 100

The following are the steps for performing a motor test run using Boneng driver upper computer software Boneng Drivesoft 100:

- Step 1:
  Create a project in the upper computer software Boneng Drivesoft 100 (refer to section 3.2), which allows real-time display of current parameters. Click on the wizard mode (optional).

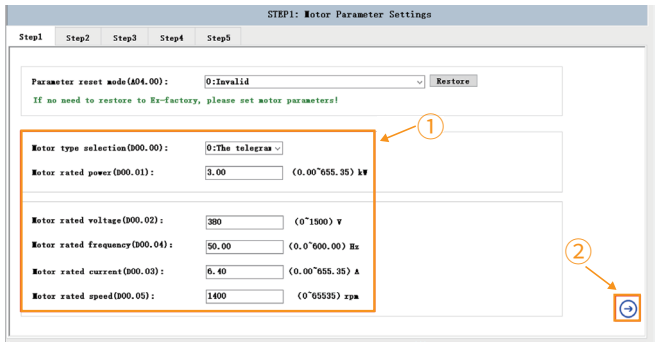


- Step 2:
  To restore factory settings:Parameter reset mode (A04.00) = [3: Restore all parameters to factory settings] → Start recovery → Wait for the parameter recovery to complete (check the status machine at the bottom left corner of the debugging software).



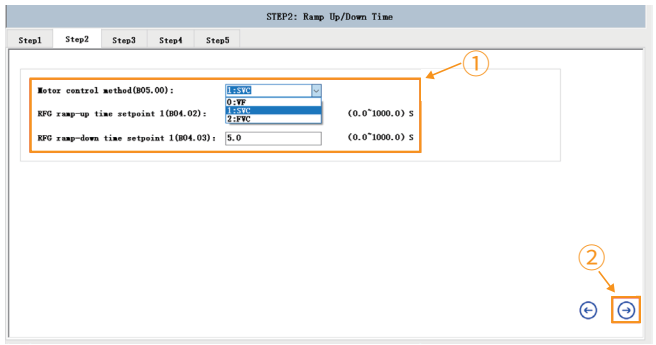
Parameter reset

- Step 3:
  Set the motor parameters:Set the motor parameters based on the motor nameplate (D00 group: Basic motor parameters). If vector control is required, after setting the nameplate parameters, start the motor parameter identification by setting B00.21.



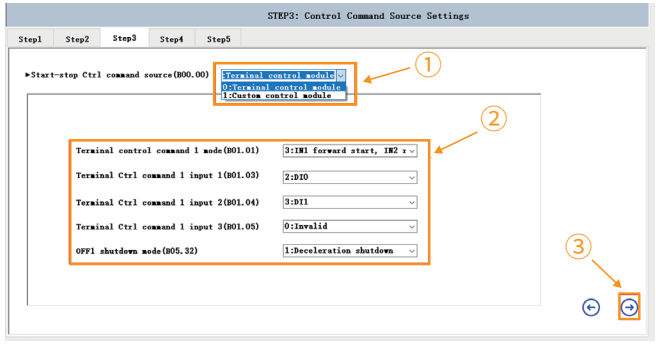
motor parameter setting

- Step 4:
  Motor control mode and ramp time settings:
  In parameter B05.00, select the desired motor control mode, such as: [0: VF], [1: SVC]. Then, in parameters B04.02 and B04.03 (by default, use ramp 1 acceleration and deceleration time), set the required acceleration and deceleration times.



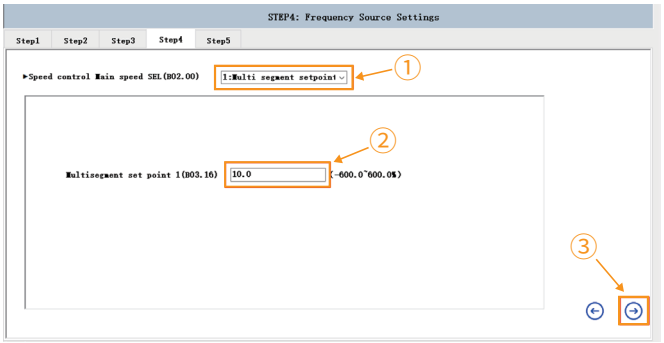
Motor control methods and ramp time settings.

- Step 5:
  If vector control is required, modify parameter B05.00 = [1: SVC].
- Step6:
  The default start/stop control command source is from the terminal control.DI0 controls forward operation, DI1 controls reverse operation. OFF1 is the deceleration stop method. After properly connecting the corresponding DI terminals: When DI0 is set to 1, the motor runs forward. When DI1 is set to 1, the motor runs in reverse. When the DI input is 0, the motor decelerates and stops.

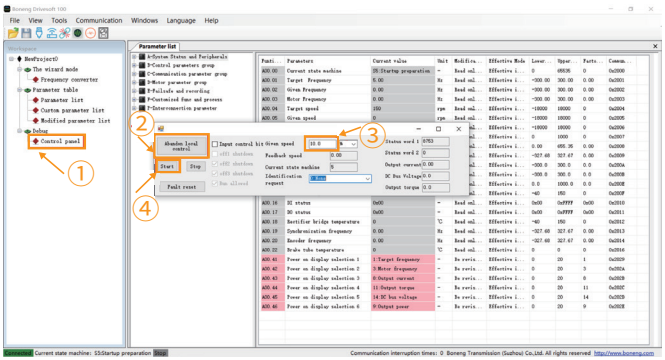


You can also modify the parameters B01.01, Choose the desired terminal control command mode and properly connect the corresponding DI terminals.

- Step7:
  Set the target speed through parameter B03.16.



Note: If you want to directly control via the upper computer, you can use the following method to provide the start/stop command and target speed:



5. Common Parameters

5.1 Commonly Used Setting Parameters

Function Code Number	Function Code Name	Function Code Description
A04.00	Parameter reset mode	3: Reset all parameters. You need to confirm via A04.01 before resetting the parameters.
A04.01	Parameters reset	0: Cancel 1: Confirm
D00.01	Motor type selection	Set according to the motor nameplate
D00.02	Motor rated voltage	
D00.03	Motor rated current	
D00.04	Motor rated frequency	
D00.05	Motor rated speed	
B05.00	Motor control mode	0: VF 1: SVC
F04.00	Holding brake FUNC select	0: Do not use brake function, 1: Use brake function. This brake function is typically required for lifting equipment. If the brake is controlled via the DO terminal, set the DO function to P01.11.
B01.01	Start-stop Ctrl command mode	Terminal start/stop command. See the operation manual for details
B01.03	Start-stop Ctrl command input 1	
B01.04	Start-stop Ctrl command input 2	
B01.05	Start-stop Ctrl command input 3	
Group A06	Digital Output	The DO output terminal function can be set, see the user manual for details.
Group A07	Analog Input	Analog input settings, refer to the user manual for details.
B00.21	Identification request	When B05.00 is set to 1 or 2, identification is required. The identification steps for an asynchronous motor are as follows: Press the LOC/REM button to set to local mode, set B00.21 to 2, then press the RUNbutton to start. After the inverter completes the identification, press the STOP button, then press the LOC/REM button to switch to remote mode.
B00.23	OFF1 shutdown mode	0: Free stop 1: Deceleration stop

Function Code Number		Function Code Name	Function Code Description
Speed control mode	B02.00	Speed control main speed SEL	Frequency setting source, refer to the operation manual
	Group B03	Multi-speed setting	Multi-speed control, see the user manual for details
	B04.02 ~B04.09	Ramp up and down time	Speed control acceleration and deceleration time settings and selections. Only one group is effective at the same time.

5.2 Commonly Used Monitoring Parameters

Function Code Number	Function Code Name	Function Code Description
A00.00	Current state machine	The current status of the drive.
A00.05	Given speed	In speed control mode, real-time speed given value; [rpm].
A00.06	Motor speed	Real-time speed feedback,[rpm].
A00.08	Output current	Real-time output current.
A00.09	Output power	Real-time output power.
Group P00	Hardware Status	Display the physical status of hardware interfaces such as DI, DO, DIO, etc.
P12.14	PC given value	The target speed value given by the PC host computer in speed control mode. The unit is selected by the host computer control panel.
P12.16	DI state	DI real-time status.
P12.17	DO state	DO real-time status.
P13.00	Motor actual speed	Real-time motor speed feedback value; 4096 corresponds to 100% rated speed.
P13.11	Function final given speed	Final speed command value in speed control mode; 4096 corresponds to 100% rated speed.
P13.02~ P13.11	-	Speed given monitoring data in speed control mode.
Group E01~E06	-	Display fault records and related information.

EN

6. Drive Fault Description

Index	Name of fault	Subcode of fault	Meaning of subcode	Countermeasures
1	Overcurrent	1	Overcurrent 1	1. Eliminate the problem of power line damage. 2. Check whether the wiring is short circuited. 3. Increase acceleration and deceleration time. 4. In VF control, reduce the boost of VF torque. 5. Make sure the motor stops stably before starting. 6. Reduce or cancel the lord. 7. In the vector control, please make sure whether the correct. parameter recognition operation has been carried out. 8. Contact after-sales or manufacturer for technical support.
		2	Overcurrent 2	
		3	Overcurrent 3	
2	Overvoltage	1	Quick check the overvoltage of bus voltage	1. Check whether the input power is within a reasonable range. 2. Increase deceleration time. 3. Retrofit braking resistor re braking unit. 4. Contact after-sales or manufacturer for technical support.
3	Undervoltage	1	Bus undervoltage	1. Check whether the input power is within a reasonable range. 2. Make sure whether the power grid is powered off instantaneously. 3. Contact after-sales or manufacturer for technical support.
5	Drive overload	1	Drive overload	1. Verify that the drive is appropriate, or replace a large capacity drive.

EN

Index	Name of fault	Subcode of fault	Meaning of subcode	Countermeasures
5	Drive overload	1	Drive overload	2. In VF control, decrease the boost of VF torque. 3. In vector control, reduce torque limit. 4. Make sure whether the load is too high, or there is a locking situation such as holding brake. 5. In vector control, make sure whether the correct parameter self-learning operation is carried out. 6. Contact after-sales or manufacturer for technical support.
6	Motor overload	1	Motor overload	1. Make sure whether the motor load is too high. 2. In vector control, make sure whether the motor parameter self-learning operation is carried out. 3. Make sure whether the load is too high, or there is a locking situation such as holding brake. 4. Make sure whether the motor nameplate parameters are set correctly 5. Contact after-sales or manufacturer for technical support.
7	Input phase loss	1	Check input phase loss	1. Check whether the power input cable is in good contact. 2. Contact after-sales or manufacturer for technical support.
8	Output phase loss	1	U phase output is missing a phase	1. Please check if the corresponding output cables are correctly wired and have good contact. 2. Please confirm whether the motor is running smoothly.
		2	V phase output is missing a phase	
		3	W phase output is missing a phase	

Index	Name of fault	Subcode of fault	Meaning of subcode	Countermeasures
8	Output phase loss	5	Severe imbalance in the three-phase output	3. Contact after-sales service or the manufacturer for technical support.
		6	Stator resistance identification output is missing a phase	
		7	SVC output is missing a phase	
9	The driver is overheating	1	The driver is overheating	1. Please confirm if the ambient temperature is too high. 2. Please check if the radiator fan is working properly. 3. Please check if the radiator airflow is blocked. 4. Contact after-sales service or the manufacturer for technical support.
11	Current zero drift detection error	1	U phase zero drift is too large	1. PM malfunction, contact after-sales service or the manufacturer for technical support.
		2	V phase zero drift is too large	
		3	Overcurrent during detection	
		4	Overvoltage during detection	
12	Ground short circuit detection fault	1	U phase overcurrent during ground short circuit	1. Please check if the corresponding output phase is shorted to ground. 2. Check if the motor cables are damaged. 3. Contact after-sales service or the manufacturer for technical support.
		2	V phase overcurrent during ground short circuit	
		4	W phase overcurrent during ground short circuit	
		5	Ground short circuit current exceeds the threshold	

Index	Name of fault	Subcode of fault	Meaning of subcode	Countermeasures
12		6	Overvoltage during ground short circuit	
13	Tuning failure	1	Dynamic tuning abnormal	1. Please confirm whether the motor nameplate parameter settings are correct. 2. Contact after-sales service or the manufacturer for technical support.
		2	Static tuning failure	
15	Vector stall alarm	1	The speed is reversed under external force	1. Please confirm if the motor nameplate parameters are set correctly. 2. Please confirm if motor parameter self-learning has been performed. 3. Please check if the parameters related to stall are set reasonably. 4. Contact after-sales service or the manufacturer for technical support.
		2	Speed deviation is too large	
17	Drive power supply fault	1	Drive power supply voltage is too low	1. Contact after-sales service or the manufacturer for technical support.
21	Model setting error	1	Model exceeds the lower limit	1. Please confirm whether the model of the driver matches the label. 2. Contact after-sales service or the manufacturer for technical support.
		2	Model exceeds the upper limit	
33	Driver pre-overload	1	Driver overload warning	1. Please confirm whether the drive's overload protection function is enabled. 2. Contact after-sales service or the manufacturer for technical support.
34	Motor pre-overload	1	Motor overload warning	1. Please confirm if the drive pre-overload function is enabled. 2. Contact after-sales service or the manufacturer for technical support.

Index	Name of fault	Subcode of fault	Meaning of subcode	Countermeasures
35	Communication abnormality	1	Abnormal disconnection during background startup	1. Check if the relevant communication cables of the drive are connected abnormally. 2. Check if the communication timeout parameters are set reasonably. 3. Contact after-sales service or the manufacturer for technical support.
		2	Abnormal disconnection during operation panel startup	
		3	Modbus communication fault	
37	Motor speed exceeds the limit	1	Motor speed exceeds the maximum speed limit	1. Please check if the parameters related to motor overspeed are set reasonably. 2. Contact after-sales service or the manufacturer for technical support.
38	Motor speed deviation is too large	1	The motor speed deviation from the given speed is too large	1. Please check if the parameters related to the large motor speed deviation are set reasonably. 2. Contact after-sales service or the manufacturer for technical support.
40	PID feedback loss	1	PID feedback sampling value lost	1. Check the signal of the PID feedback input. 2. Contact after-sales service or the manufacturer for technical support.
41	External fault	1	Generate external fault 1	1. Check the external input signals.assistance.
43	Pre-driver failure	1	No bus voltage was detected when running the command	1. Check if the external power supply voltage is abnormal. 2. Contact customer service or the manufacturer for technical support.
45	Braking control abnormality	1	Abnormal brake release	1. Check if the external relay is abnormal. 2. Contact customer service or the manufacturer for technical support.
		2	Abnormal brake closure	

Index	Name of fault	Subcode of fault	Meaning of subcode	Countermeasures
51	ROM failure	1	Flash cannot be accessed	1. Power cycle the device. 2. Check if the frequency of modifying the function code is too high. 3. Contact customer support or the manufacturer for technical assistance.
		2	The function code value is outside the upper and lower limit range	
		3	Error reading back after Flash write	
		4	Function code modification limit exceeded	

7. Motor Brake Parameters (Only applicable to Boneng asynchronous motors)

Brake Model	BN05	BN06	BN10	BN14	BN16	BN18	BN20	BN25	BN30
Braking Torque (N.m)	2	4	16	60	80	150	300	600	1000
Brake Power (W)	13	20	30	50	55	85	100	110	200
Rated Clearance (mm)	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6
Maximum Clearance (mm)	0.5	0.5	0.5	0.75	0.75	1	1	1.25	1.5
AC Brake Voltage (AC-V)	230 or 400	230 or 400	230 or 400	230 or 400	400	400	400	400	400
DC Brake Voltage (DC-V)	103 or 180	103 or 180	103 or 180	103 or 180	180	180	180	180	180
Compatible Motor Frame Size	63	71	80-90	100-112	132	160	180	200-225	250-280
Brake Engage Time (ms)	40	40	70	190	200	260	340	390	420
Slow Brake Release Time (ms)	300	300	450	570	600	780	1650	2000	3000
Fast Brake Release Time (ms)	30	30	45	57	60	78	165	230	380

8. Common Motor Fault Trouble-shooting and Repair Methods

Fault Symptoms		Possible Causes	Solutions
1	Cannot start	a. One phase of the stator winding is open	Check the stator winding, locate the open circuit, and repair it.
		b. Short circuit between turns or phases in the stator winding	Measure the resistance of each phase of the stator winding and check if the no-load current of each phase is balanced. Locate the problem area and insulate it
		c. Incorrect stator wiring	Check the stator winding connections according to the wiring diagram and the connections specified on the nameplate. Correct any incorrect connections
		d. Fault in the load or transmission mechanism	Disconnect the motor from the load. If the motor starts normally, check the driven machinery and eliminate any obstacles
		e. Incorrect inverter parameter settings	Check the inverter parameters and make adjustments (for variable frequency motor)
		f. The brake is not acting	Check the brake and its electrical components (for brake motor)
2	The speed of the variable frequency motor is lower than the rated speed after starting	a. Incorrect setting of the output frequency and output voltage of the inverter	Reset according to the usage requirements
		b. Overload	Check if the load transmission mechanism is functioning properly

Fault Symptoms		Possible Causes	Solutions
3	The motor makes abnormal noise or vibrates too much	a. Mechanical friction (including stator and rotor rubbing)	Check the clearance between rotating and stationary parts, identify the cause of contact, and make corrections
		b. Phase loss operation	Disconnect the power and then reconnect. If the motor still cannot start, there may be a phase loss. Check the power supply or motor and repair as necessary
		c. Insufficient lubrication or damaged bearing	Clean the bearing, add fresh oil, or replace the bearing
		d. Motor wiring error	Identify the cause and correct it
		e. Rotor balance is damaged after repair	Rebalance the rotor
		f. Shaft bending or distortion	Straighten the shaft, and replace it if necessary
		g. Coupling connection is loose	Identify the loose parts and tighten the bolts
		h. The installation foundation is unbalanced or defective	Check the foundation fixation and make corrections
4	Motor temperature rise is too high	a. Overload	Use an electromagnetic ammeter to measure the stator current or check the current display on the inverter panel (for variable frequency motor). If overload is detected, reduce the load
		b. Phase loss operation	Check the motor stator wiring or inverter wiring (for variable frequency motor) and repair it
		c. Incorrect motor connection	If a delta-connected motor is mistakenly wired as star or vice versa, power must be immediately disconnected and the wiring corrected

Fault Symptoms		Possible Causes	Solutions
4	Motor temperature rise is too high	d. Stator winding grounding or short turns or phases	Check and locate the short circuit or grounding parts, and repair them
		e. Stator and rotor rubbing	Check if the bearing assembly is loose, and if there are any issues with the stator and rotor assembly. Repair as needed
		f. Poor ventilation	Check if the fan and fan blades are damaged, and if the air duct is blocked. Damaged fans or fan blades should be repaired or replaced. Blocked air ducts should have obstructions removed, and dirt, dust, and debris should be cleared to ensure proper airflow
		g. Incorrect V/f parameter settings of the inverter, causing over-excitation at low speed and light load, with current exceeding the rated value	Adjust the V/f parameter settings (for variable frequency motor)
		h. When using the inverter's DC braking function to brake the motor, the braking current is too high	Adjust the DC braking current settings according to the frequency of braking, generally set between 100% and 150% of the rated current (for variable frequency motor)
		i. Brake action is slow	Check the brake air gap and DC excitation voltage (for brake motor)
5	Bearing overheating	a. Bearing damage	Replace the bearing
		b. Excessive, insufficient, or contaminated bearing lubricant	Adjust or replace the lubricant

Fault Symptoms		Possible Causes	Solutions
5	Bearing overheating	c.Bearing and shaft, or bearing and end cap fit too loose or too tight	Refit to the appropriate fit
		d. Motor side end caps or bearing caps are not properly assembled (not parallel)	Install the stoppers of the end covers or bearing covers on both sides flat, and rotate the bolts
		e. Poor installation of the shaft extension oil seal	Adjust to the proper installation condition
6	Motor casing electrified	a. Poor grounding	Check the grounding bolts and whether the grounding wire is tightly connected to the casing
		b. Winding moisture, insulation resistance too low	Dry the windings
		c. Insulation damage, stator coil touching the iron core	Repair it
		d. Dirt on the terminal block	Clean the terminal block
		e. Insulation of the lead-out conductors worn out	Wrap the damaged area with insulating material
7	The motor cannot start with load	a. Stator winding has turn-to-turn short circuit	Check the resistance and current of each phase
		b. Overload	Check the motor load current
8	Three-phase current imbalance	a. Turn-to-turn short circuit	Repair the winding
		b. Wiring error	Correct the wiring
		c. Three-phase power supply voltage imbalance	Improve the power supply quality

Fault Symptoms		Possible Causes	Solutions
9	Fuse blown	a. Short circuit between two phases	Repair the winding
		b. Load too large	Reduce the load
		c. Voltage too low	Increase the voltage
10	Low insulation resistance or break-down	a. Insulation aging or damage	Inspect the insulation
		b. Not clean	Blow the interior clean with dry compressed air
		c. Windings or terminal block dampened	Disassemble and dry or process before use
		d. Motor overheating	Disassemble for inspection to prevent further overheating
11	Braking failure of the motor brake	a. Friction plate is heavily worn	Adjust the air gap
		b. Spring failure	Replace the spring
		c. Slow action	Adjust the air gap and check the excitation voltage
		d. Rectifier damage	Replace the rectifier
		e. Brake circuit failure	Correctly eliminate brake circuit faults

Note:

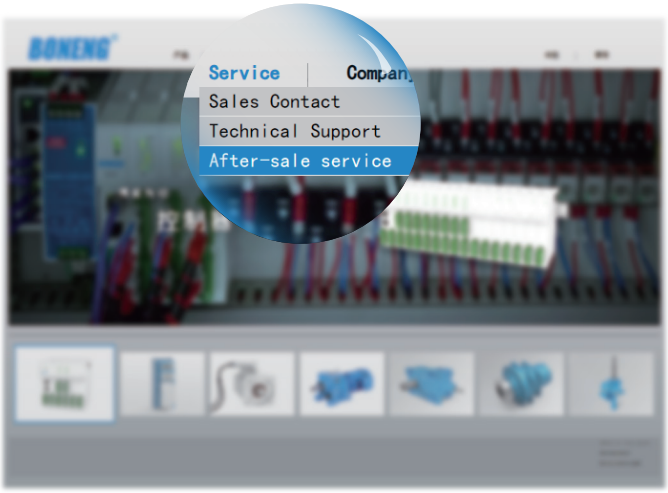
- Users who wish to obtain more detailed information, please contact our company.
- No notification is required. Our company reserves the right to modify the motor usage and maintenance manual.

After-Sale Service

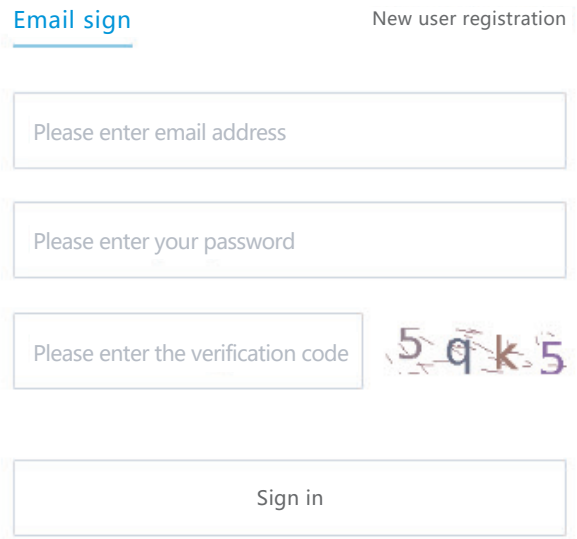
After-sales Service Please follow the steps below to submit the after-sales process.

→ Login “www.boneng.com”

→ Click“Service”and“After-sale Service”



→ Login system



Other District
Controller/Drive : 0512-66182005
Motor/Gear motor/Gearbox : 0512-66189918

BONENG TRANSMISSION(SHEN YANG)CO.,LTD
Controller/Drive : 024-31271571
Motor/Gear motor/Gearbox : 024-31292571

BONENG TRANSMISSION(TIAN JIN)CO.,LTD
Controller/Drive : 022-86928559
Motor/Gear motor/Gearbox : 022-26929558

BONENG TRANSMISSION(KAIFENG)CO.,LTD
Controller/Drive : 0371-23335230
Motor/Gear motor/Gearbox : 0371-23277771

BONENG TRANSMISSION(WEIFANG)CO.,LTD
Controller/Drive : 0536-4699687
Motor/Gear motor/Gearbox : 0536-4699667

BONENG TRANSMISSION(CHANGSHA)CO.,LTD
Controller/Drive : 0731-88386958
Motor/Gear motor/Gearbox : 0731-88380725

BONENG TRANSMISSION EQUIPMENT (CHENGDU)CO.,LTD
Controller/Drive : 028-87740066
Motor/Gear motor/Gearbox : 028-87740066

BONENG TRANSMISSION(ZHAOQING)CO.,LTD
Controller/Drive : 0757-86719757
Motor/Gear motor/Gearbox : 0758-2699830

BONENG TRANSMISSION(SUZHOU)CO.,LTD
Controller/Drive Southern Jiangsu : 0512-66182005
Motor/Gear motor/Gearbox Southern Jiangsu : 0512-66189918
Controller/Drive Zhejiang-Shanghai : 0512-66182005
Motor/Gear motor/Gearbox Zhejiang-Shanghai : 0512-66189918
Controller/Drive Jiangsu-Anhui District : 0512-66182005
Motor/Gear motor/Gearbox Jiangsu-Anhui : 025-52171612

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