

X3010/X3050系列控制器

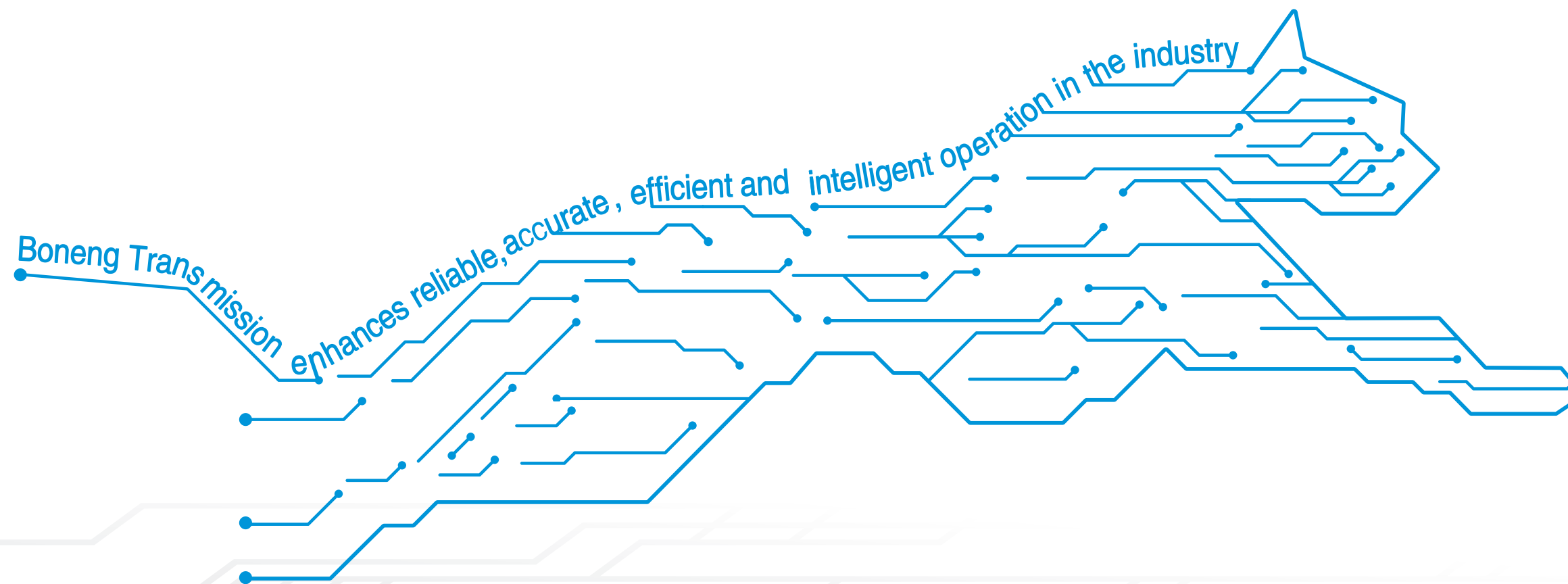
X3010/X3050 Series Controller



X3010/X3050
系列控制器

X3010/X3050
Series Controller

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Selection Catalogue: C05.0051



控制器/驱动器/马达/
齿轮马达/齿轮箱

Controller/ Drive/ Motor/
Gearmotor/ Gearbox

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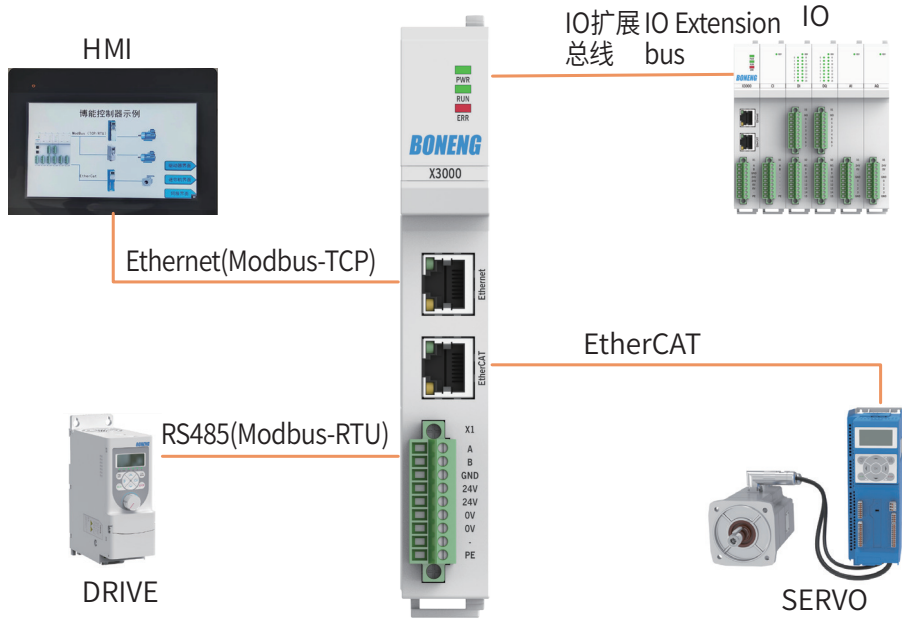
1 概述

X3000系列控制器是博能自主开发的支持5种PLCopen标准语言的智能模块化控制器，此系列控制器支持一路EtherCAT主站，一路Modbus-TCP主从站，2路Modbus-RTU主从站，及最大1+15个本地扩展IO模块，最大数字量IO点数为240点，最大模拟量通道为60路，模块化本地扩展IO有DI, DQ, AI, AQ, CI五种类型，可满足大部分自动化设备及过程控制的需要。
X3000系列控制器包含了多个型号，具体区别如下表所示：

1 Overview

X3000 series controller is an intelligent modular controller independently developed by Boneng that supports 5 PLCopen standard languages, This controller supports one EtherCAT master station, One Modbus-TCP master/slave station, two Modbus-RTU master/slave stations, and a maximum of 1+15 local expansion IO modules, the maximum number of digital IO points is 240, the maximum analog channel is 60, modular local expansion IO has DI, DQ, AI, AQ, CI five types, can meet most of the automation equipment and process control needs.
The X3000 series controller includes multiple models, and the specific differences are shown in the table below:

		X3010	X3050
PLC基本功能	Basic functions of PLC	√	√
最小扫描周期	Minimum scanning period	1ms	1ms
EtherCAT	EtherCAT	√	√
Modbus	Modbus	√	√
Ethernet	Ethernet	√	√
最大EtherCAT轴数	Maximum number of EtherCAT axis	32	32
本体IO	The number of IO on the CPU module	0	0
最大本地扩展IO	Maximum number of local expansion IO	240	240
速度控制	Speed control	√	√
扭矩控制	Torque control	√	√
定位控制	Position control	√	√
PID控制器	PID controler	√	√
MC标准功能块	MC Standard Function Block	-	√
编码器轴	Encoder axis	-	√
虚拟编码器轴	Virtual encoder axis	-	√
伺服轴	Servo axis	-	√
虚拟轴	Virtual axis	-	√
电子齿轮同步	Electronic gear synchronization	-	√
电子凸轮同步	Electronic cam synchronization	-	√
轴组(点到点运动)	Group of Axes(PTP)	-	√
轴组(空间直线插补)	Group of Axes(Spatial linear interpolation)	-	√
轴组(空间圆弧插补)	Group of Axes(Spatial arc interpolation)	-	√
轴组(龙门主从同步)	Group of Axes(Gantry master-slave synchronization)	-	√
轴组(姿态控制)	Group of Axes(posture control)	-	√



X3000系列控制器接口说明

Description of ports on the X3000 series controllers

2 产品特点

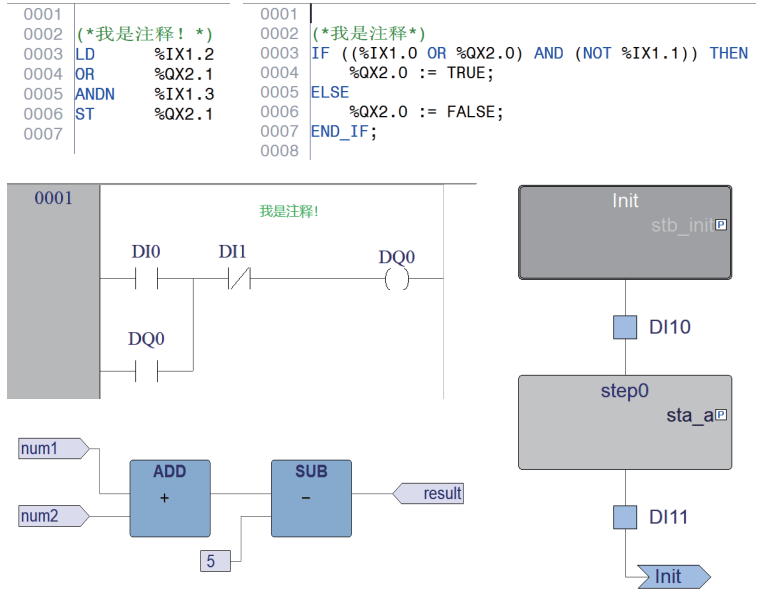
2.1 用户友好, 易于使用

- ◆ 控制器开发软件小巧，安装及使用快捷，轻松上手
- ◆ 支持LD, ST, FBD, SFC, IL五种PLCopen标准编程语言，符合IEC61131-3标准

2 Product Features

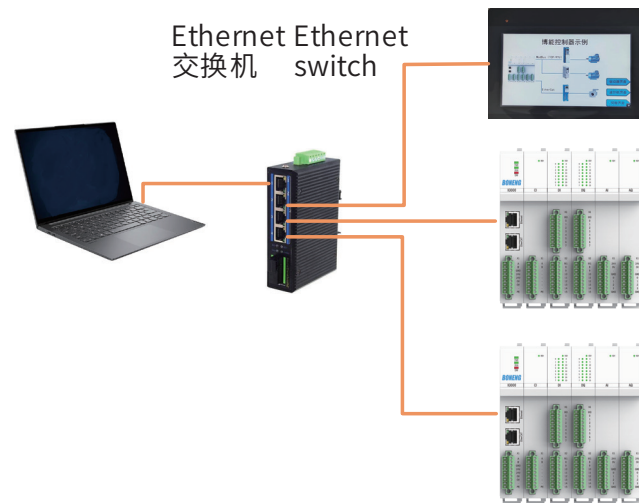
2.1 User-Friendliness, Easy to Use

- ◆ The controller development software is small, easy to install and use
- ◆ Support LD, ST, FBD, SFC, IL five PLCopen standard programming languages, in line with IEC61131-3 standard



- ◆ 支持Ethernet接口编程，无需专用编程器，调试速度快，易于使用

- ◆ Support Ethernet interface programming, no special programmer, debugging speed is fast, easy to use



X3000系列控制器调试网络拓扑

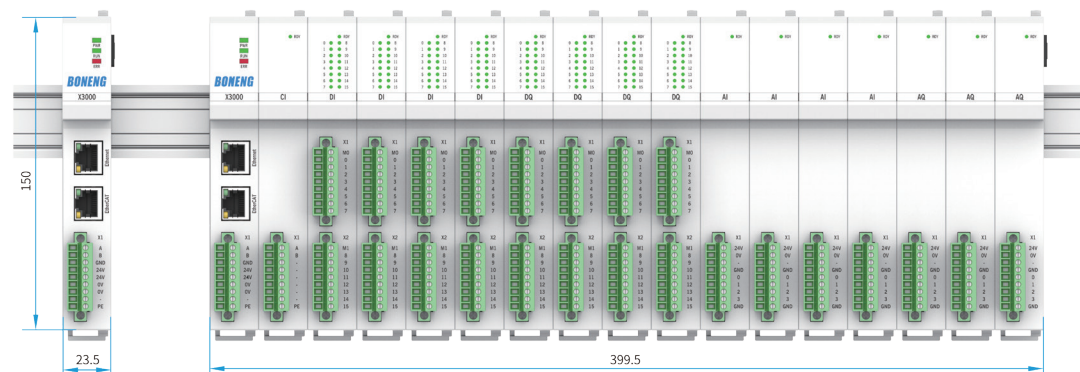
X3000 series controller to debug the network topology

2.2 结构紧凑,灵活配置

- ◆ 书本型窄体设计，结构紧凑，节省安装空间
- ◆ 支持模块化本地IO扩展，灵活配置，最多可支持1+15个IO扩展

2.2 Compact, Flexible Configuration

- ◆ Book type narrow body design, compact structure, save installation space.
- ◆ Support modular local I/O expansion, flexible configuration, up to 1+15 I/O expansion.

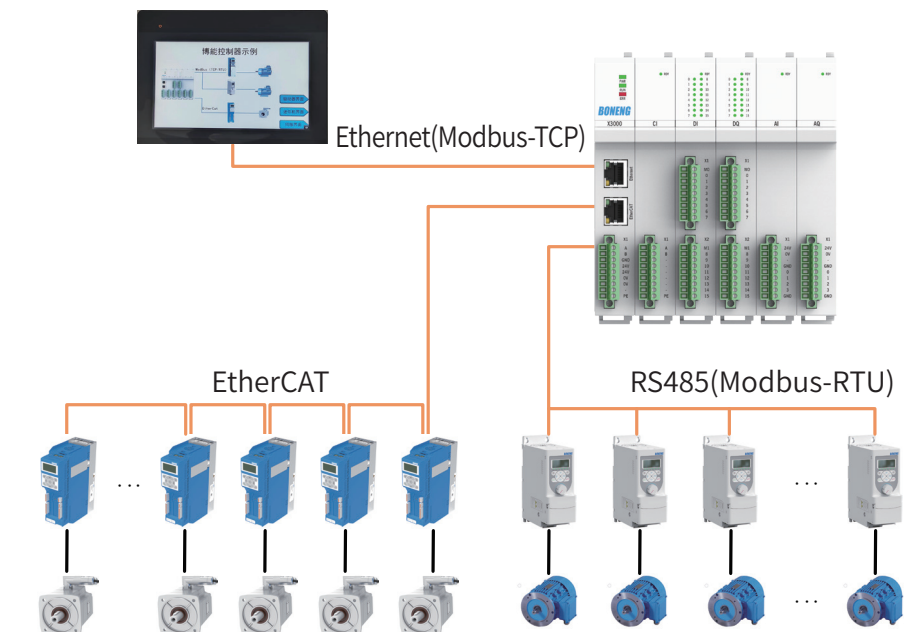


2.3 性能卓越,功能丰富

- ◆ 支持EtherCAT主站
- ◆ EtherCAT主站支持PP单轴定位控制，多轴MC定位控制
- ◆ 支持2路Modbus-RTU主从站
- ◆ 支持一路Modbus-TCP主从站
- ◆ 支持虚拟轴，编码器轴，总线伺服轴
- ◆ 支持齿轮同步，凸轮同步功能
- ◆ 支持轴组运动

2.3 Excellent Performance, Abundant Function

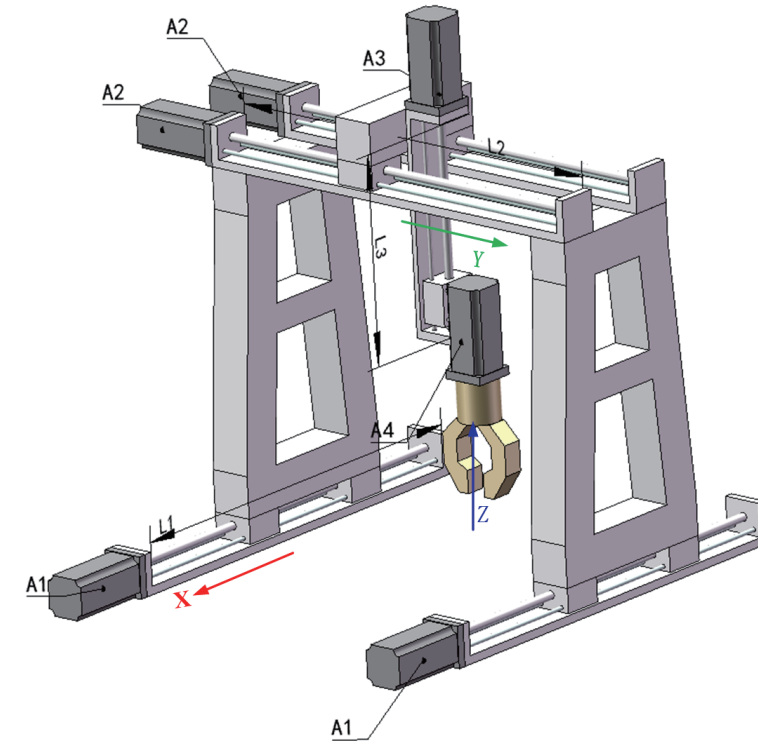
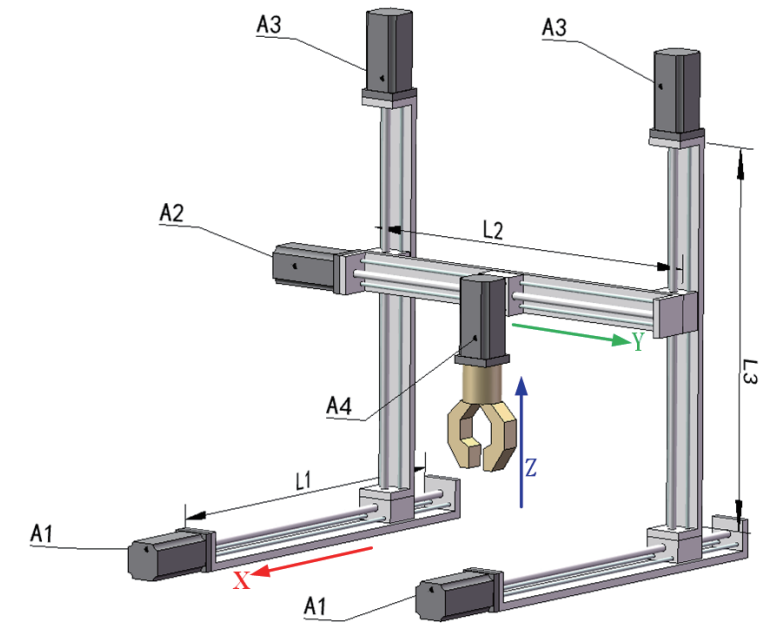
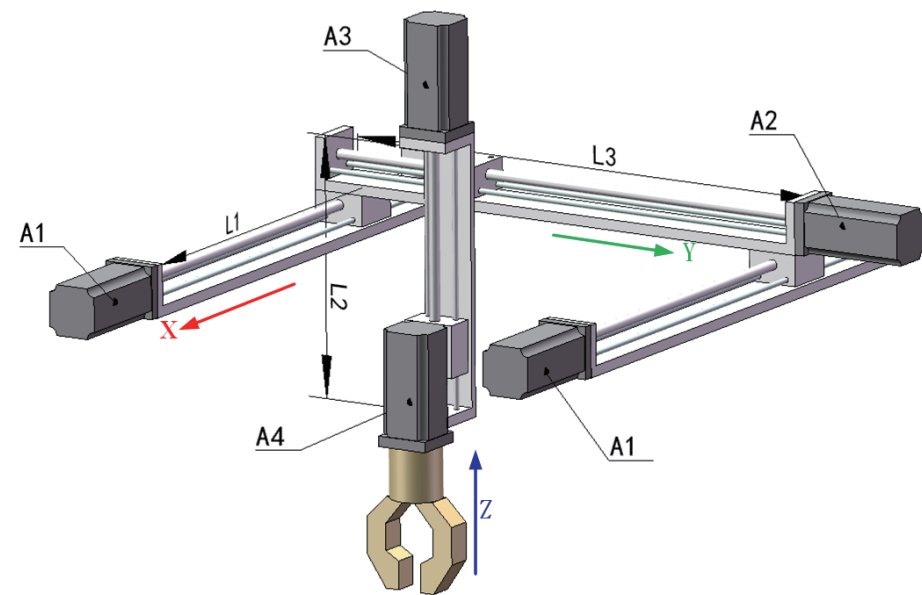
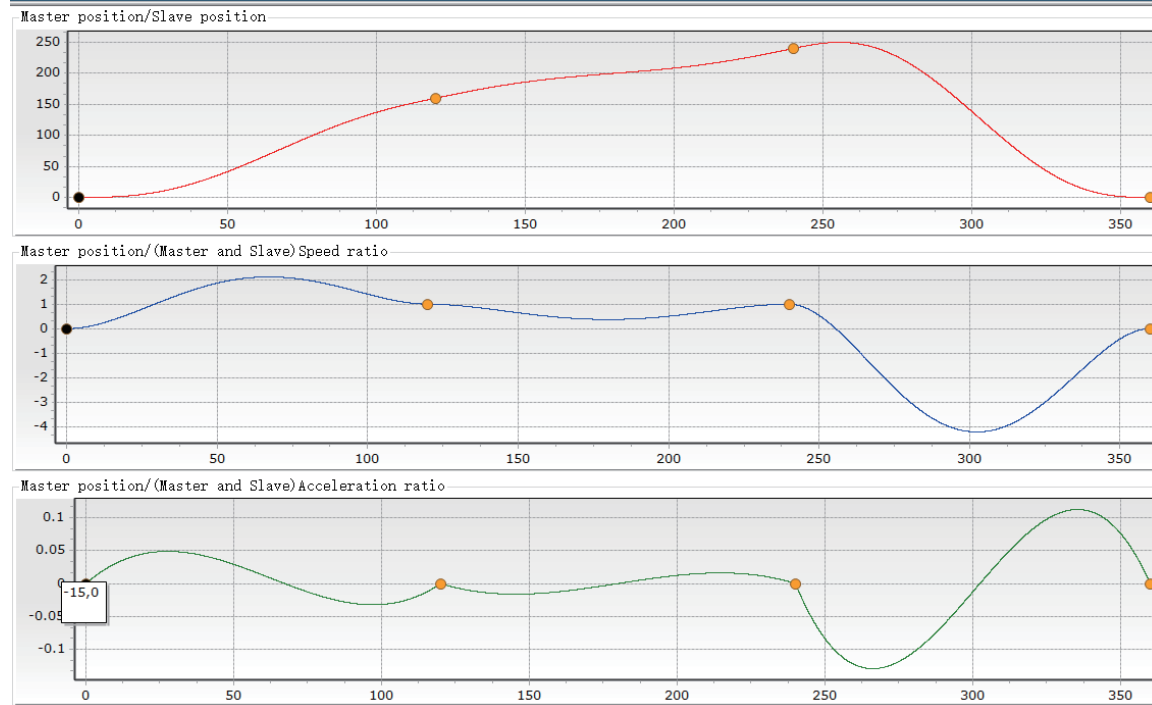
- ◆ Support EtherCAT master station.
- ◆ EtherCAT master station supports PP uniaxial positioning control, Multi-axis MC position control.
- ◆ Supports two modbus-RTU master and slave stations
- ◆ Supports one Modbus-TCP master/slave station
- ◆ Support virtual axis, encoder axis, and bus servo axis
- ◆ Support gear synchronization and cam synchronization
- ◆ Support axes group motion



X3000系列控制器典型配置拓扑

Typical configuration topology of X3000 series controllers

Electronic Cam Configuration



3 控制器应用行业及主机

3 Controller application industry and host

X3050					
X3010					
调速	speed	定位	position	同步/凸轮/轴组 synchronous/CAM/Group	
行车	crane	装箱机	case packer	凹版印刷机	concave-printing machine
门机	door crane	码垛机	palletizer	复合机	laminator
塔机	tower crane	裹包机	wrapping machine	涂布机	coater
拉丝机	Drawbench	叠片机	Laminating machine	复卷机	rewinder
升降机	hoist	串焊机	string welding machine	分切机	slitter
输送机	conveyor	封口机	sealing machine	压花机	embossing machine
辊压机	roller press	桁架	truss	印花机	printing machine
卷板机	veneer reeling machine	伺服转台	servo turntable	拉幅定型机	tensioning machine
搅拌机	mixer	冲压机	punching machine	浆纱机	slasher
		焊接机	welding machine	纺纱机	Spinning machine
		堆垛机	stacker	倍捻机	twister
				着色机	coloring machine
				多线切割机	multi-wire saw
				灌装机	filling machine
				旋盖机	capper
				贴标机	labeller
				装箱机	case packer
				折弯机/弯管机	bending machine
				剪板机	clipper
				成型机	forming machine
				轮切/飞锯	fly saw
				追剪	fly shear
				点胶机	Gluing machine
				桁架机器人	Truss robot
				龙门机床	Gantry machine tool
				智能行车	Intelligent bridge crane

4 选型及订货号

4 Selection ordering data

4.1 CPU模块

4.1 CPU Module

博能X3000系列控制器的CPU模块区分PLC型和运动控制器型，具体订货号如下所示。

The CPU module of Boneng X3000 series controller is divided into PLC type and motion controller type, and the specific order number is as follows

订货号 Order Number	描述 Description
X3010-EC-00-S	支持EtherCAT单轴定位及速度控制的PLC PLC supporting EtherCAT single axis positioning and speed control
X3050-EC-00-S	支持EtherCAT多轴定位及Motion功能的运动控制器 Motion controller supporting EtherCAT multi axis positioning and Motion functions

4.2 本地扩展IO模块

4.2 Local expansion IO module

博能X3000系列本地扩展IO总共有5种类型，其中Modbus通讯模块最多扩展1个，建议安装在最靠近CPU的右侧位置。其他DI，DQ，AI，AQ模块最多支持15个，可灵活选择配置及个数。

There are five types of local expansion IO module of Boneng X3000 series, of which the Modbus communication module can be expanded by up to one. It is recommended to install it on the right side closest to the CPU. Other DI, DQ, AI, AQ modules can support up to 15, and the configuration and number can be flexibly selected

订货号 Order Number	描述 Description
X3000-DI-16-1	数字量输入模块, 16点输入, 24VDC Digital input module, 16 point input, 24VDC
X3000-DQ-16-3	数字量输出模块, 16点输出, 继电器 Digital output module, 16 point relay output
X3000-AI-04-3	模拟量输入模块, 4通道输入, 电压/电流 Analog input module, 4-channel voltage/current input
X3000-AQ-04-1	模拟量输出模块, 4通道输出, 电压 Analog output module, 4-channel voltage output
X3000-CI-01-1	通讯接口模块, 1通道Modbus接口 Communication interface module, 1-channel Modbus interface

5 技术数据

5.1 CPU模块技术数据

5 Technical parameters

5.1 CPU Module technical parameters

运算能力	Computational ability	CPU	CPU	ARM-A8 800MHz	ARM-A8 800MHz
		最小循环周期	Minimum cycle	1ms	1ms
		PLC基本指令速度	PLC basic command speed	0.013us	0.013us
存储	Storage	用户程序容量	User program capacity	1MB	1MB
		用户数据空间	User data space	8MB	8MB
		掉电保存空间	Power-down retaining space	4kB	4kB
工作电源	Working power supply	外部端子供电	External terminal power supply	• 电压: DC19.2~28.8V • 电流: 额定 0.35A, 最大2.6A	• Voltage: DC19.2~28.8V • Current: rated 0.35A, maximum 2.6A
		EtherCAT	EtherCAT	1个RJ45端口	One RJ45 interface
		Ethernet	Ethernet	1个RJ45端口	One RJ45 interface
通讯接口	Communication interface	Modbus	Modbus	无内置端接电阻	No built-in termination resistor
		断电维持一周	Power off for one week		
		编程语言	Programing language	LD	LD
扩展数量	Expanded quantity	ST	ST	√	√
		IL	IL	√	√
		FBD	FBD	√	√
工作温度	Working temperature	SFC	SFC	√	√
		最大1+15个, Modbus扩展模块最多只允许扩展一个,其他类型最多15个	The maximum number is 1+15. Only one Modbus expansion module can be expanded at most, and the maximum number of other types is 15		
		存储温度	Storage temperature	-20℃~+50℃	-20℃~+50℃
相对空气湿度	Relative air humidity	-40℃~+70℃	-40℃~+70℃		
		<95%	<95%	不允许有凝露	No condensation is allowed
		符合 IEC 61800-5-1	Conform IEC 61800-5-1	适用于污染等级2的环境	Suitable for environment with pollution level 2
电磁兼容性	Electromagnetic compatibility	符合 IEC 61800-3	Conform IEC 61800-3		
		IP20	IP20		
		重量	Weight	230g	230g

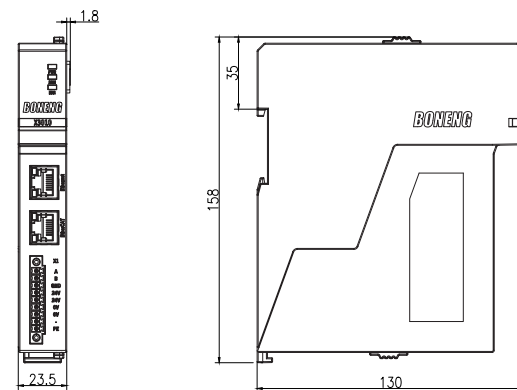
5.2 扩展模块技术数据

5.2 Local expansion IO module technical parameters

通用数据	General data	工作温度	Working temperature	• -20℃~+50℃	• -20℃~+50℃
		存储温度	Storage temperature	• -40℃~+70℃	• -40℃~+70℃
		相对空气湿度	Relative air humidity	• <95%, 不允许有凝露	• <95%, No condensation is allowed
污染	Pollution level	符合IEC61800-5-1, 适用于污染等级2的环境		• 符合IEC61800-3	• Conform to IEC61800-3
		电磁兼容性	Electromagnetic compatibility	• 符合IEC61800-3	• Conform to IEC61800-3
		防护等级	IP Grade	• IP20	• IP20
X3000-DI-16-1	数字量输入模块	16个点	16 point	• 模块电源: CPU模块提供, DC24V±20%/max. 50mA	• Module power supply: provided by CPU module DC24V±20%/max. 50mA
				• 电压: DC24V	• Voltage:DC24V
				• 支持Source和Sink模式	• Support Source and Sink modes
X3000-DQ-16-3	数字量输出模块	16个点	16 point	• "1"信号电压: >11V, "0"信号电压: <5V	• "1"Signal voltage:>11V, "0"Signal voltage:<5V
				• 24V典型电流: 4mA	• 24VTypical current:4mA
				• 模块电源: CPU模块提供, DC24V±20%/max. 150mA	• Module power supply: provided by CPU module DC24V±20%/max. 150mA
X3000-AI-04-3	模拟量输入模块	4个通道	4-channel	• 继电器类型	• Relay type
				• 电压:DC24V、AC36V、AC48V	• Voltage:DC24V、AC36V、AC48V
				• 连续电流: 最大2A, 公共端最大8A	• Continuous current:max.2A, max.8A at common terminal
X3000-AQ-04-1	模拟量输出模块	4个通道	4-channel	• 切换电流: 最大2A, 公共端最大8A	• Switching current:max.2A, max.8A at common terminal
				• 触点类型: 常开	• Contact type: normally open contact
				• 模块电源: 端子提供, DC24V±20%/max. 50mA	• Module power supply:provided by terminal,DC24V±20%/max. 50mA
X3000-CI-01-1	通讯模块	4个通道	4-channel	• 单端输入, 共GND	• Single ended input, total GND
				• 程序切换电压和电流模式	• Program switches voltage and current modes
				• 电压型支持0V~10V	• Voltage type supports 0V~10V
X3000-CI-01-1	通讯模块	4个通道	4-channel	• 电流型支持0mA~20mA、4mA~20mA	• Current type supports 0mA~20mA、4mA~20mA
				• 电流型内阻250Ω	• Current type internal resistance250Ω
				• 精度: ±1%, 12位采样精度	• Precision:±1%, 12 bit sampling precision
X3000-CI-01-1	通讯模块	4个通道	4-channel	• 模块电源: 端子提供, DC24V±20%/max. 50mA	• Module power supply: provided by CPU moduleDC24V±20%/max. 50mA
				• 单端输入, 共GND	• Single ended input, total GND
				• 电压型支持0V~10V	• Voltage type supports 0V~10V
X3000-CI-01-1	通讯模块	4个通道	4-channel	• 电压型负载电阻需大于5kΩ	• Voltage type load resistance shall be greater than5kΩ
				• 精度: ±1%	• Precision:±1%
				• 模块电源: CPU模块提供, DC24V±20%/max. 10mA	• Module power supply: provided by CPU module DC24V±20%/max. 10mA
X3000-CI-01-1	通讯模块	4个通道	4-channel	• 支持Modbus-RTU	• Support
				• 波特率: 最大115200bps	• Baud rate:115200bps maximum
				• 无板载终端电阻	• No board terminal resistance

6 外形尺寸及安装

模块外形及安装尺寸如下图所示，实际安装时，模块上下方至少有50mm的空间，利于安装、散热及接线。

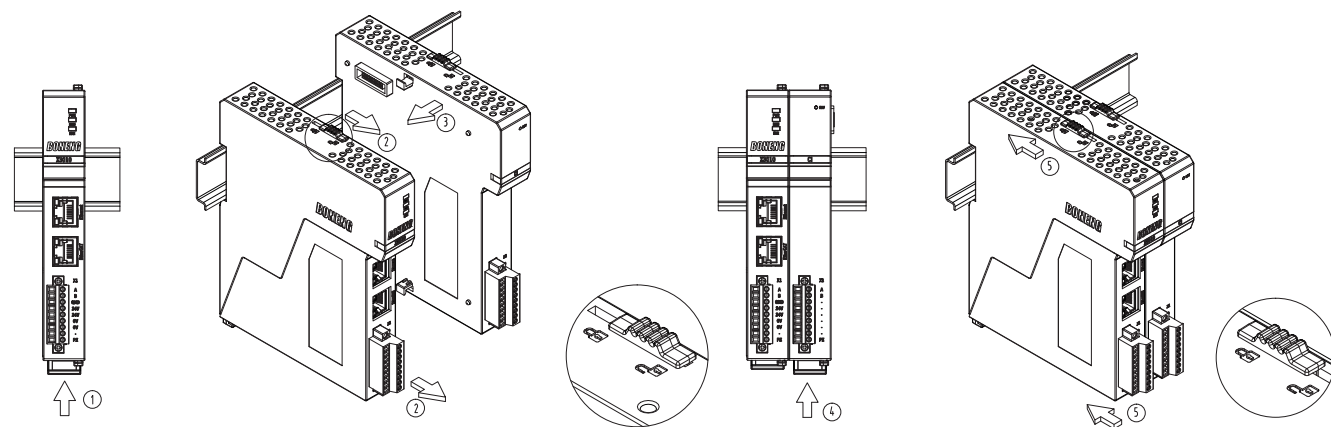


使用标准的35mm宽DIN导轨安装，将CPU安装至导轨上正确位置，底部的卡接滑块向上推使其固定。扩展模块对接完成后，上推卡接滑块使其固定，并将其左侧模块的上方和下方固定锁扣拨至锁定状态。

6 Overall Dimension and Installation

The shape and size of the module are shown in the figure below. During the actual installation, there is at least 50mm space above and below the module to facilitate installation, cooling and wiring.

Use the standard 35mm wide DIN rail installation, install the CPU to the correct position on the rail, push up the splice slider at the bottom to fix it, push up the splice slider of extension module to fix it after the extension module docking is completed, and push up the fix lock on the top and bottom of the left module to lock it.



控制层
CONTROL

驱动层
DRIVE

马达层
MOTOR

齿轮层
GEAR

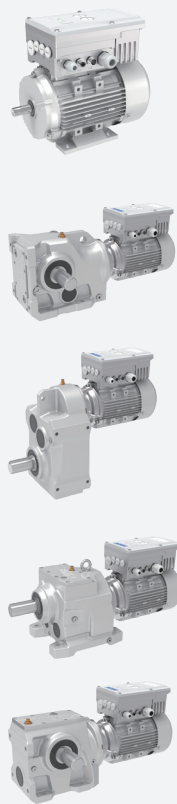


X3010 PLC
EtherCAT&Modbus
24VDC



X3050 运动控制器
Motion Controller
EtherCAT&Modbus
24VDC

C/F/K/S-M
* . . . D
马达分布式
变频驱动器
Integrated
Gearmotor
Drive



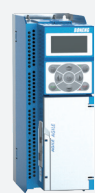
EtherCAT&
Modbus
380~480VAC
0.25~3kW
i=4~355

AM 变频驱动器
Variable Frequency Drive



Modbus
380~480VAC
0.75~5.5kW

A1 变频驱动器
Variable Frequency Drive



Modbus/CANopen
/PROFINET
380~480VAC
0.75~250kW

C/F/K/S/R
齿轮马达
Gearmotor



380~480VAC
0.09~200kW
i=1.25~500

MP/MU/MA
三相交流异步马达
Asynchronous Motor
380~480VAC
0.09~90kW
960/1450r/min
1160/1750r/min

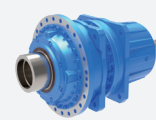


HB/BE/HK
齿轮箱
Gearbox



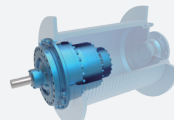
4.2~15775kW
i=5.6~450

P/PK
行星齿轮箱
Planetary
Gearbox



0.4~14000kW
i=25~4000

PW
卷扬齿轮箱
Planetary
Winch
Gearbox



1~1810kW
i=13~940

PS
回转齿轮箱
Planetary
Slewing
Gearbox



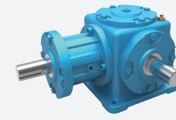
1~1626kW
i=14~947

J/JB
升降机
Jack



0.35~22.63kW
i=5~34

T
转向箱
Spiral Bevel
Gearbox



0.08~303kW
i=1:1~3:1

MX&AX
伺服马达&伺
服驱动器
Permanent
Magnet
Servo Motor
& Servo Drive



EtherCAT/
PROFINET
380~480VAC
0.28~14kW
1500/2000r/min
3000/4500r/min

C/F/K/S-MX
&AX齿轮伺
服马达&伺
服驱动器
Servo
Gearmotor
& Servo Drive



EtherCAT/
PROFINET
380~480VAC
0.28~14kW
i=1.25~315

PX-MX&AX
行星伺服马达
&伺服驱动器
Planetary
Precision Gear
Servo Motor
& Servo Drive



EtherCAT/
PROFINET
380~480VAC
0.38~14kW
i=3~100

PN-MN&AN
行星伺服马达
&伺服驱动器
Planetary
Precision Gear
Servo Motor
& Servo Drive



EtherCAT
PROFINET
380~480VAC
0.28~5.03kW
i=3~100

ME&AN
永磁同步伺服马
达&伺服驱动器
Permanent
Magnet
Servo Motor
& Servo Drive



EtherCAT/
PROFINET
200~240VAC
0.1kW~1.2kW

博能传动(沈阳)有限公司	BONENG TRANSMISSION(SHENYANG)CO.,LTD.
辽宁省沈阳市沈北新区 太平洋工业城A区A73-6号 电话：024-31271571	No. A73-6, Area A, Pacific Industrial City, Shenbei New District, Shenyang, Liaoning Province, China TEL: 024-31271571

博能传动(天津)有限公司	BONENG TRANSMISSION(TIANJIN)CO.,LTD.
天津市北辰区双海道6号 宏鹏工业园7号车间 电话：022-26929556	7th Workshop, Hongpeng Industrial Park, No. 6 Shuanghai Road, Beichen District, Tianjin City,China TEL: 022-26929556

博能传动(潍坊)有限公司	BONENG TRANSMISSION(WEIFANG)CO.,LTD.
山东省潍坊市安丘市经济开发区 汶水路与昆仑大街交叉口往北 100米路东1号车间 电话：0536-2141166	1st Workshop, Economic Development Zone, Anqiu, Weifang City, Shandong Province, China TEL: 0536-2141166

博能传动(开封)有限公司	BONENG TRANSMISSION(KAIFENG)CO.,LTD.
河南省开封市宋城路四大街11号 海神机械院内五号厂房 电话：0371-23335238	5th Workshop, Haishen Machinery, No.11, Fourth Street, Songcheng Road,New District, Kaifeng City, Henan Province, China TEL: 0371-23335238

博能传动(长沙)有限公司	BONENG TRANSMISSION(CHANGSHA)CO.,LTD.
湖南省长沙市望城经济开发区 普瑞大道1288号 电话：0731-88386958	No. 1288 Puri Avenue, Wangcheng Economic Development Zone, Changsha City, Hunan Province, China TEL: 0731-88386958

博能传动设备(成都)有限公司	BONENG TRANSMISSION EQUIPMENT(CHENGDU) CO., LTD.
四川省成都市金牛区金牛坝路9号5栋 向荣中心A座7楼-703 电话：028-87741100	703, 7th Floor, Block A, Xiangrong Center, Building 5, No. 9 Jinniuba Road, Jinniu District, Chengdu City, Sichuan Province, China TEL: 028-87741100

博能传动(肇庆)有限公司	BONENG TRANSMISSION(ZHAOQING)CO.,LTD.
广东省肇庆市鼎湖区肇庆新区 科创大道7号平谦国际现代产业园 一期A12北厂房 电话：0757-86719757	No. 7 Science and Technology Innovation Avenue, Zhaoqing New Area, Dinghu District, Zhaoqing City, Guangdong Province, China TEL: 0757-86719757

博能传动(苏州)有限公司	BONENG TRANSMISSION(SUZHOU)CO.,LTD.
江苏省苏州市相城区如元路100号 电话：0512-66189662	No. 100, Ruyuan Road, Xiangcheng District, Suzhou, Jiangsu Province, China TEL: 0512-66189662

博能传动(美国)有限公司	BONENG TRANSMISSION(USA)LLC.
1250 E 222nd Euclid, OH 44117, United Staes TEL: 1-216-618-0138 TEL: 1-216-618-0496 TEL: 1-216-618-3099	1250 E 222nd Euclid, OH 44117, United Staes TEL: 1-216-618-0138 TEL: 1-216-618-0496 TEL: 1-216-618-3099

博能传动(印度)有限公司	BONENG TRANSMISSION(INDIA)PVT.LTD
Plot No. E-10/3, MIDC sinner (Malegaon) Industrial Area, Nashik, 422123, Maharashtra, India. TEL:+91-11- 4507 6293 (DELHI) TEL:+91-22-2781 3385 (MUMBAI)	Plot No. E-10/3, MIDC sinner (Malegaon) Industrial Area, Nashik, 422123, Maharashtra, India. TEL:+91-11- 4507 6293 (DELHI) TEL:+91-22-2781 3385 (MUMBAI)