

EC-TX509-U8 工业以太网通讯卡

快速使用指南

本指南简要介绍了 EC-TX509-U8 工业以太网通讯卡的产品信息、安装与接线、调试说明。
扫描二维码，查阅工业以太网通讯卡完整电子说明书。
拨打服务热线 400-700-9997 或访问 www.invt.com.cn 获取更多信息和资源下载。保修条款详见完整版电子说明书。

前言

感谢您使用英威腾 EC-TX509-U8 工业以太网通讯卡！

EC-TX509-U8 是一款支持多种协议的工业以太网通讯卡，需与 GD350 等系列变频器配合使用，通过多种通讯协议与以太网主机通讯。

本手册提供了产品信息、安装与接线及调试说明。为确保能正确地安装及操作本产品，发挥其优越性能，请在装机之前，详细阅读该手册。

- 产品特点：**
- 支持通过功能码选择协议。
 - 支持选择多达 8 种协议，支持 PROFINET、EtherCAT、EtherNet/IP、Modbus TCP、EtherNet UDP、PowerLink 等通讯协议，且后续会支持 BACnet/IP 和 CC-Link IE 通讯协议。
 - 部分协议支持同时运行监控功能，满足现场监控需求。
 - 具备 2 个 RJ45 端口。
 - 通讯速率可达 100Mbit/s，通讯周期短。
 - 支持线型和星型网络拓扑，部分协议支持环形网络拓扑。

1 产品信息

1.1 型号说明

图 1-1 产品铭牌和型号

产品型号	EC-TX 509 - U8
区分代码	509:表示默认PROFINET通讯 U8:表示支持8种通讯协议
模块类别	TX:表示通讯卡
产品类别	EC:表示扩展卡

1.2 规格参数

表 1-1 规格参数

参数	指标
工作温度	-10~50℃
存储温度	-20~60℃
相对湿度	5%~95%(无凝结)
使用环境	无腐蚀性气体
安装方式	卡槽加螺钉固定
防护等级	IP00
散热方式	自然风冷
通讯速率	100M bit/s
网络拓扑	支持线型和星型网络拓扑，部分协议支持环形网络拓扑

1.3 产品结构

图 1-2 产品部件示意图

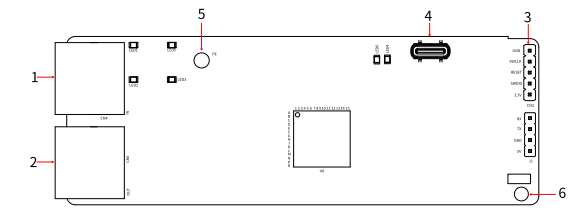


表 1-2 产品部件说明

序号	名称	说明
1	通讯接口	通讯接口 1
2	通讯接口	通讯接口 2
3	调试端口	与调试器之间电气连接
4	烧录配置端口	采用 USB Type-C 与上位机连接

序号	名称	说明
5	安装固定孔位	固定扩展卡，保持 PE 层连接良好
6	定位孔	对齐扩展卡和控制板，便于安装

1.4 指示灯

表 1-3 PROFINET 通讯指示灯

指示灯位号	颜色	定义	功能
LED1(RUN)	绿	常亮	通讯建立成功，且 IO 数据正常交互
		闪烁 (亮 500ms，灭 500ms)	通讯建立成功，但是无有效的 IO 数据交互
		闪烁 (亮 100ms，灭 100ms)	处于通讯配置阶段，如 DCP 配置指令时触发等，会与 ERR 灯同时闪烁
		常灭	通讯卡和 PLC 通讯不在“在线”状态
LED2(HOST)	绿	常亮	通讯卡正在和变频器握手
		闪烁 (亮 500ms，灭 500ms)	通讯卡和变频器处于正常通讯阶段
		常亮	注意：握手完成后的阶段，不管通讯卡和主控制板间是否有数据传输，都应闪烁。
		常灭	通讯卡处于初始化或参数配置阶段
LED3(DATA)	绿	常亮	通讯卡正在和变频器握手
		闪烁 (亮 500ms，灭 500ms)	通讯卡与主控制板间数据更新正常
		常亮	注意：握手完成后的阶段，不管通讯卡和主控制板间是否有数据传输，都应闪烁。
		常灭	通讯卡处于初始化或参数配置阶段
LED4(POWER)	红	常亮	3.3V 电源指示灯
		常亮	无故障
		闪烁 (亮 500ms，灭 500ms)	通讯建立异常
		闪烁 (亮 100ms，灭 100ms)	通讯卡心跳灯 (通讯卡正常运行)
LED6(SYS)	绿	常亮	无故障
		闪烁 (亮 500ms，灭 500ms)	通讯卡心跳灯 (通讯卡正常运行)

表 1-4 EtherCAT 通讯指示灯

指示灯位号	颜色	定义	功能
LED1(RUN)	绿	常亮	处于 Init 状态
		闪烁 (亮 200ms，灭 200ms)	处于 PreOP 状态
		单闪 (亮 200ms，灭 1s)	处于 SafeOP 状态
		常亮	处于 OP 状态
LED2(L/A IN)	绿	常亮	接口 IN Link 确立，无数据收发
		闪烁 (亮 50ms，灭 50ms)	接口 IN Link 确立，有数据收发
		常亮	接口 IN Link 未确立
		常亮	接口 OUT Link 确立，无数据收发
LED3(L/A OUT)	绿	常亮	接口 OUT Link 确立，有数据收发
		闪烁 (亮 50ms，灭 50ms)	接口 OUT Link 未确立
		常亮	通讯卡和 PLC 通讯处于掉线状态
		常亮	操作不支持的 CMD 控制字指令或 PR 功能码值
LED4(POWER)	红	常亮	3.3V 电源指示灯
		常亮	无故障
		闪烁 (亮 200ms，灭 200ms)	出现 Init/Preop 故障
		单闪 (亮 200ms，灭 1s)	出现 Safeop 故障
LED5(ERR)	红	常亮	出现 OP 故障
		闪烁 (亮 500ms，灭 500ms)	通讯卡心跳灯 (通讯卡正常运行)

表 1-5 PowerLink 通讯指示灯

指示灯位号	颜色	定义	功能
LED1(RUN)	绿	常亮	处于 Init 状态
		闪烁 (亮 50ms，灭 50ms)	处于 NMT_CS_BASIC_ETHERNET 状态
		单闪 (亮 500ms，灭 500ms)	处于 NMT_CS_PRE_OPERATIONAL_1 状态
		双闪 (亮 250ms，灭 250ms)	处于 NMT_CS_PRE_OPERATIONAL_2 状态
LED2(HOST)	绿	常亮	处于 NMT_CS_READY_TO_OPERATE 状态
		三闪 (亮 125ms，灭 125ms)	处于 NMT_CS_OPERATIONAL 状态
		常亮	处于 NMT_CS_STOPPED 状态
		常亮	通讯卡正在和变频器握手
LED3(DATA)	绿	常亮	通讯卡和变频器处于正常通讯阶段
		闪烁 (亮 500ms，灭 500ms)	注意：握手完成后的阶段，不管通讯卡和主控制板间是否有数据传输，都应闪烁。
		常亮	通讯卡处于初始化或参数配置阶段
		常亮	通讯卡与主控制板间数据更新或更新异常
LED4(POWER)	红	常亮	3.3V 电源指示灯
		常亮	无故障
		闪烁 (亮 500ms，灭 500ms)	数据帧丢失、通讯断开、NMT 内部严重错误 (非法中断、内存越界等)
		常亮	无故障
LED6(SYS)	绿	常亮	无故障
		闪烁 (亮 500ms，灭 500ms)	通讯卡心跳灯 (通讯卡正常运行)

指示位号	颜色	定义	功能
LED1(RUN)	绿	常亮	通讯卡和 PLC 通讯在线，且可进行数据交互
		闪烁 (亮 500ms，灭 500ms)	通讯卡或 PLC 的 IP 地址配置异常
		常亮	通讯卡正在和变频器握手
		常亮	注意：握手完成后的阶段，不管通讯卡和主控制板间是否有数据传输，都应闪烁。
LED2(HOST)	绿	常亮	通讯卡正在和变频器握手
		闪烁 (亮 500ms，灭 500ms)	通讯卡和变频器处于正常通讯阶段
		常亮	注意：握手完成后的阶段，不管通讯卡和主控制板间是否有数据传输，都应闪烁。
		常灭	通讯卡处于初始化或参数配置阶段
LED3(DATA)	绿	常亮	通讯卡正在和变频器握手
		闪烁 (亮 500ms，灭 500ms)	通讯卡与主控制板间数据更新正常
		常亮	注意：握手完成后的阶段，不管通讯卡和主控制板间是否有数据传输，都应闪烁。
		常灭	通讯卡处于初始化或参数配置阶段
LED4(POWER)	红	常亮	3.3V 电源指示灯
		常亮	无故障
		闪烁 (亮 500ms，灭 500ms)	通讯建立异常
		闪烁 (亮 100ms，灭 100ms)	通讯卡心跳灯 (通讯卡正常运行)
LED5(ERR)	红	常亮	出现 Init/Preop 故障
		单闪 (亮 200ms，灭 1s)	出现 Safeop 故障
		常亮	出现 OP 故障
		闪烁 (亮 500ms，灭 500ms)	通讯卡心跳灯 (通讯卡正常运行)
LED6(SYS)	绿	常亮	无故障
		闪烁 (亮 500ms，灭 500ms)	通讯卡心跳灯 (通讯卡正常运行)

表 1-7 Modbus TCP 通讯指示灯

指示位号	颜色	定义	功能
LED1(RUN)	绿	常亮	通讯卡和 PLC 通讯在线，且可进行数据交互
		闪烁 (亮 500ms，灭 500ms)	通讯卡或 PLC 的 IP 地址配置异常
		常亮	通讯卡正在和变频器握手
		常亮	注意：握手完成后的阶段，不管通讯卡和主控制板间是否有数据传输，都应闪烁。
LED2(HOST)	绿	常亮	通讯卡正在和变频器握手
		闪烁 (亮 500ms，灭 500ms)	通讯卡和变频器处于正常通讯阶段
		常亮	注意：握手完成后的阶段，不管通讯卡和主控制板间是否有数据传输，都应闪烁。
		常灭	通讯卡处于初始化或参数配置阶段
LED3(DATA)	绿	常亮	通讯卡正在和变频器握手
		闪烁 (亮 500ms，灭 500ms)	通讯卡与主控制板间数据更新正常
		常亮	注意：握手完成后的阶段，不管通讯卡和主控制板间是否有数据传输，都应闪烁。
		常灭	通讯卡处于初始化或参数配置阶段
LED4(POWER)	红	常亮	3.3V 电源指示灯
		常亮	无故障
		闪烁 (亮 500ms，灭 500ms)	通讯建立异常
		闪烁 (亮 100ms，灭 100ms)	通讯卡心跳灯 (通讯卡正常运行)
LED5(ERR)	红	常亮	出现 Init/Preop 故障
		单闪 (亮 200ms，灭 1s)	出现 Safeop 故障
		常亮	出现 OP 故障
		闪烁 (亮 500ms，灭 500ms)	通讯卡心跳灯 (通讯卡正常运行)
LED6(SYS)	绿	常亮	无故障
		闪烁 (亮 500ms，灭 500ms)	通讯卡心跳灯 (通讯卡正常运行)

表 1-8 EtherNet UDP 通讯指示灯

指示位号	颜色	定义	功能
LED1(RUN)	绿	常亮	通讯卡和上位机通讯在线，且可进行数据交互
		闪烁 (亮 500ms，灭 500ms)	通讯卡或 PLC 的 IP 配置异常
		常亮	通讯卡正在和变频器握手
		常亮	注意：握手完成后的阶段，不管通讯卡和主控制板间是否有数据传输，都应闪烁。
LED2(HOST)	绿	常亮	通讯卡正在和变频器握手
		闪烁 (亮 500ms，灭 500ms)	通讯卡和变频器处于正常通讯阶段
		常亮	注意：握手完成后的阶段，不管通讯卡和主控制板间是否有数据传输，都应闪烁。
		常灭	通讯卡处于初始化或参数配置阶段
LED3(DATA)	绿	常亮	通讯卡正在和变频器握手
		闪烁 (亮 500ms，灭 500ms)	通讯卡与主控制板间数据更新正常
		常亮	注意：握手完成后的阶段，不管通讯卡和主控制板间是否有数据传输，都应闪烁。
		常灭	通讯卡处于初始化或参数配置阶段
LED4(POWER)	红	常亮	3.3V 电源指示灯
		常亮	无故障
		闪烁 (亮 500ms，灭 500ms)	通讯建立异常
		闪烁 (亮 100ms，灭 100ms)	通讯卡心跳灯 (通讯卡正常运行)
LED5(ERR)	红	常亮	出现 Init/Preop 故障
		单闪 (亮 200ms，灭 1s)	出现 Safeop 故障
		常亮	出现 OP 故障
		闪烁 (亮 500ms，灭 500ms)	通讯卡心跳灯 (通讯卡正常运行)
LED6(SYS)	绿	常亮	无故障
		闪烁 (亮 500ms，灭 500ms)	通讯卡心跳灯 (通讯卡正常运行)

1.5 协议选择

表 1-9 通讯协议选择

功能码	通讯协议	缺省值
P16.00	PROFINET	出厂默认(0)
	EtherCAT	1
	PowerLink	2
	EtherNet IP	3
	Modbus TCP	4

功能码	通讯协议	缺省值
P16.00	EtherNet UDP	5
	PROFINET+EtherNet UDP	6
	EtherCAT+EtherNet UDP	7
	预留	8~15

1.6 协议参数

表 1-10 协议参数说明

功能码	通讯协议	说明
P16.00	PROFINET	- 支持 PROFINET 协议，支持 PROFINET IO 设备，支持介质冗余协议 MRP 和系统冗余协议 S2。搭配从站 GSDML 配置文件，可与西门子 PLC 等主站进行通讯。 - 可实现读写变频器过程量、读取变频器状态量和读写变频器功能码等对变频器的基本操作，本通讯卡支持 32 个 IO。 - 支持线型、星型和环型网络拓扑。
	EtherCAT	- 支持 CIA301、CIA402 CoE 协议，搭配从站 XML 配置文件，可与倍福 PLC、英威腾 AX 控制器等主站进行通讯。 - 支持 PDO 服务、SDO 服务、制造商定义的对象字典和 SDO 读写变频器功能码，满足厂内 EtherCAT 一致性测试认证要求。 - 支持线型、星型和环型网络拓扑。
	PowerLink	- 支持 CIA401 协议，搭配从站 XDD 配置文件，可与贝加莱 PLC 等主站进行通讯。 - 支持 PDO 服务、SDO 服务、制造商定义的对象字典和 SDO 读写变频器功能码。 - 支持线型和星型网络拓扑。
	EtherNet IP	- 支持 ODVA 行规、DLR 环网协议，搭配从站 EDS 配置文件，可与罗克韦尔 PLC 等主站进行通讯。 - 可实现读写变频器过程量、读取变频器状态量、读写变频器功能码等对变频器的基本操作，本通讯卡支持 32 个 IO。 - 支持线型、星型和环型网络拓扑。
	Modbus TCP	- 支持 Modbus TCP 协议、Modbus TCP 从站和与多个主站同时通讯，可与施耐德 PLC、英威腾 AX 控制器等主站进行通讯。 - 可实现读写变频器过程量、读取变频器状态量、读写变频器功能码等对变频器的基本操作。 - 支持线型和星型网络拓扑。
P16.00	EtherNet UDP	- 支持英威腾 Ethernet 协议、连接英威腾上位机 INVT Workshop，可进行监控和示波，允许多组网监控。 - 支持线型和星型网络拓扑。
	PROFINET+EtherNet UDP	支持同一网络同时运行 PROFINET 和 EtherNet UDP 通讯协议。
	EtherCAT+EtherNet UDP	支持同一网络同时运行 EtherCAT 和 EtherNet UDP 通讯协议，且 EtherCAT 处于在线状态。
	PowerLink+EtherNet UDP	支持同一网络同时运行 PowerLink 和 EtherNet UDP 通讯协议，且 PowerLink 处于在线状态。
	EtherNet IP+EtherNet UDP	支持同一网络同时运行 EtherNet IP 和 EtherNet UDP 通讯协议，且 EtherNet IP 处于在线状态。

注意：每次更改 P16.00 后，扩展卡将自动复位，并完成协议切换，需经过一段时间后再按新协议与 PLC 重新建立连接，期间变频器如果出现对应协议通讯超时故障可按下键盘复位键清除。

2 安装与接线

2.1 安装注意事项

⚠	安装前请先对变频器断电。
注意	根据《扩展卡安装位置卡槽位置规范》，对于支持 3 个卡槽的变频器扩展卡推荐安装在 SOLT2；对于仅支持 2 个卡槽的变频器扩展卡推荐安装在 SOLT2。

安装所需工具：十字螺丝刀 PH1；一字螺丝刀 SL3。

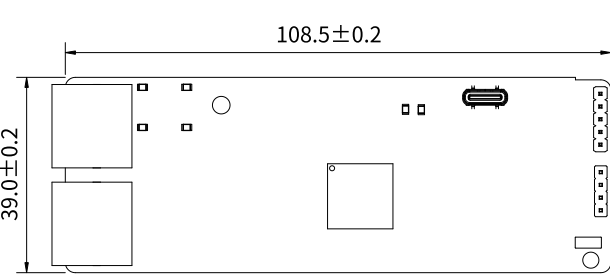
表 2-1 螺丝扭矩要求

螺丝规格	紧固力矩
M3	0.55 N·m

2.2 尺寸说明

尺寸为 108.5×39mm，如下图所示。

图 2-1 产品外形及安装尺寸 (单位: mm)



2.3 安装说明

下面以插槽 3 安装为例进行说明 (如图 b 所示)。

步骤1 将扩展卡置于控制板扩展槽 3 的相应位置，对准槽后扣合。

功能码	通讯协议	缺省值
P16.00	EtherNet UDP	5
	PROFINET+EtherNet UDP	6
	EtherCAT+EtherNet UDP	7
	预留	8~15

2.4 拆卸说明

步骤2 将扩展卡通过定位柱导向定位。

步骤3 固定 M3 螺丝，安装完成。

图 2-2 安装位置示意图



EC-TX509-U8 Industrial Ethernet

Communication Card

Quick Start Guide

This guide briefly introduces the product information, installation and wiring, and commissioning instructions of EC-TX509-U8 industrial Ethernet communication card.

Visit www.invt.com for more information and source download. For details, see the full version of corresponding product e-manual.

Scan the QR code to view the full version of corresponding product e-manual.



Preface

Thank you for choosing INVT EC-TX509-U8 industrial Ethernet communication card.

The EC-TX509-U8 is an industrial Ethernet communication card that supports multiple protocols and is designed to be integrated into VFDs like the GD350 series, enabling communication with Ethernet master stations across various protocols.

This guide provides the product overview, installation, wiring, and commissioning instructions. To ensure safe and proper use of the product and to maximize its performance, please carefully read the guide before installation.

Product features

- Supports protocol selection through the specific function code.
- Supports up to eight protocols, including PROFINET, EtherCAT, EtherNet/IP, Modbus TCP, EtherNet UDP, and PowerLink, with future support for BACnet/IP and CC-Link IE communication protocols.
- Certain protocols support the simultaneous operation of monitoring functions, thereby fulfilling the on-site oscilloscope monitoring requirements.
- Equipped with two RJ45 ports.
- Reaches the communication rate of up to 100 Mbit/s, with a short communication cycle.
- Supports both linear and star network topologies, with certain protocols also accommodating ring network topology.

1 Product overview

1.1 Model description

Figure 1-1 Product nameplate and model

Product model	EC-TX 509 - U8
	Distinguishing code 509: Default PROFINET communication U8: Support for 8 communication protocols
	Card category TX: Communication card
	Product category EC: Expansion card

1.2 Specifications

Table 1-1 Specifications

Parameter	Specification
Working temperature	-10~50°C
Storage temperature	-20~60°C
Relative humidity	5%~95% (No condensation)
Running environment	No corrosive gas
Mounting method	Secured in the slot with screws
Ingress protection (IP) rating	IP00
Heat dissipation method	Natural air cooling
Communication rate	100M bit/s
Network topology	Supports both linear and star network topologies, with certain protocols also accommodating a ring network topology.

1.3 Product structure

Figure 1-2 Component diagram

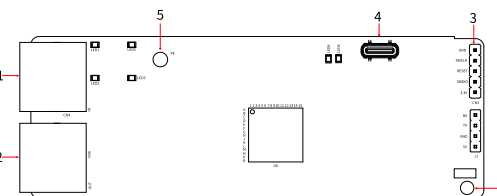


Table 1-2 Component description

No.	Name	Description
1	Communication port	Communication interface 1.
2	Communication port	Communication interface 2.
3	Debugging port	For electrical connection with the debugger.
4	Programming configuration port	Connects to the host controller through USB Type-C.
5	Installation fixing hole	Helps to secure the communication card and ensure a good PE layer connection.
6	Positioning hole	Helps to align the communication card and control board for easy installation.

1.4 Indicator

Table 1-3 PROFINET communication indicators

Indicator	Color	Definition	Description
LED1 (RUN)	Green	Steady on	Communication established successfully, with normal IO data exchange.
		Blinking (on for 500ms, off for 500ms)	Communication established successfully, but without valid IO data exchange.
		Blinking (on for 100ms, off for 100ms)	In the communication configuration phase. For example, when DCP configuration commands are triggered, it will blink simultaneously with the ERR indicator.
		Steady off	The communication between the communication card and PLC is not in Online state.
LED2 (HOST)	Green	Steady on	The communication card is in the process of handshaking with the VFD.
		Blinking (on for 500ms, off for 500ms)	The communication card and VFD communicate normally. Note: After the handshaking is completed, it should blink regardless of whether there is data transmission between the communication card and the main control board.
LED3 (DATA)	Green	Steady off	The communication card is in the initialization or parameter configuration phase.
		Blinking (on for 500ms, off for 500ms)	No data update or abnormal update between the communication card and main control board.
LED4 (POWER)	Red	Steady on	3.3V power indicator.
LED5 (ERR)	Red	Blinking (on for 100ms, off for 100ms)	Communication establishment is abnormal.
LED6 (SYS)	Green	Blinking (on for 500ms, off for 500ms)	Communication card heartbeat indicator (communication card is running normally).

Table 1-4 EtherCAT communication indicators

Indicator	Color	Definition	Description
LED1 (RUN)	Green	Steady off	In Init state.
		Blinking (on for 200ms, off for 200ms)	In PreOP state.
		Single flash (on for 200ms, off for 1s)	In SafeOP state.
		Steady on	In OP state.
LED2 (L/A IN)	Green	Blinking (on for 50ms, off for 50ms)	IN Link established, without data transmission.
		Steady off	IN LINK not established.
LED3 (L/A OUT)	Green	Steady on	OUT Link established, without data transmission.
		Blinking (on for 50ms, off for 50ms)	OUT LINK not established.
LED4 (POWER)	Red	Steady on	3.3V power indicator.
LED5 (ERR)	Red	Steady off	No fault.
		Blinking (on for 200ms, off for 200ms)	The Init/Preop fault occurred.
		Single flash (on for 200ms, off for 1s)	The Safeop fault occurred.
		Steady on	The OP fault occurred.
LED6 (SYS)	Green	Blinking (on for 500ms, off for 500ms)	Communication card heartbeat indicator (communication card is running normally).

Table 1-5 PowerLink communication indicators

Indicator	Color	Definition	Description
LED1 (RUN)	Green	Steady off	In Init state.
		Blinking (on for 50ms, off for 50ms)	In NMT_CS_BASIC_ETHERNET state.
		Single flash (on for 500ms, off for 500ms)	In NMT_CS_PRE_OPERATIONAL_1 state.
		Double flashes (on for 250ms, off for 250ms)	In NMT_CS_PRE_OPERATIONAL_2 state.

Indicator	Color	Definition	Description
LED4 (POWER)	Red	Steady on	(on for 500ms, off for 500ms) and main control board is normal.
		Steady on	3.3V power indicator.
		Blinking (on for 500ms, off for 500ms)	The communication between the communication card and PLC is offline.
		Steady off	The communication between the communication card and PLC is offline.
LED5 (ERR)	Red	Blinking (on for 500ms, off for 500ms)	An attempt to operate an unsupported CMD control word instruction or PR function code value.
		Blinking (on for 62.5ms, off for 62.5ms)	An attempt to operate on a non-existent node address.
LED6 (SYS)	Green	Steady off	The communication between the communication card and PLC is normal.
		Blinking (on for 500ms, off for 500ms)	Communication card heartbeat indicator (communication card is running normally).

Table 1-6 EtherNet/IP communication indicators

Indicator	Color	Definition	Description
LED1 (RUN)	Green	Steady on	The communication between the communication card and the PLC is online, and data exchange is allowed.
		Blinking (on for 500ms, off for 500ms)	Abnormal setting of the IP address for either the communication card or the PLC.
		Steady off	No data update or abnormal update between the communication card and PLC is not in Online state.
		Steady on	The communication between the communication card and PLC is not in Online state.
LED2 (HOST)	Green	Steady on	The communication card is in the process of handshaking with the VFD.
		Blinking (on for 500ms, off for 500ms)	The communication card and VFD communicate normally. Note: After the handshaking is completed, it should blink regardless of whether there is data transmission between the communication card and the main control board.
LED3 (DATA)	Green	Steady off	The communication card is in the initialization or parameter configuration phase.
		Blinking (on for 500ms, off for 500ms)	No data update or abnormal update between the communication card and main control board is normal.
LED4 (POWER)	Red	Steady on	3.3V power indicator.
LED5 (ERR)	Red	Steady off	No fault.
		Blinking (on for 500ms, off for 500ms)	Workshop configuration error (abnormal UDP frame data).
		Blinking (on for 250ms, off for 250ms)	The connection between the communication card and Workshop on the host controller timed out.
		Steady on	Failed to set up data communication between the communication card and PLC.
LED6 (SYS)	Green	Blinking (on for 500ms, off for 500ms)	Communication card heartbeat indicator (communication card is running normally).

Table 1-7 Modbus TCP communication indicators

Indicator	Color	Definition	Description
LED1 (RUN)	Green	Steady on	The communication between the communication card and the PLC is online, and data exchange is allowed.
		Blinking (on for 500ms, off for 500ms)	Abnormal setting of the IP address for either the communication card or the PLC.
		Steady off	The communication between the communication card and PLC is not in Online state.
		Steady on	The communication card is in the process of handshaking with the VFD.
LED2 (HOST)	Green	Blinking (on for 500ms, off for 500ms)	The communication card and VFD communicate normally. Note: After the handshaking is completed, it should blink regardless of whether there is data transmission between the communication card and the main control board.
		Steady off	The communication card is in the initialization or parameter configuration phase.
LED3 (DATA)	Green	Steady off	No data update or abnormal update between the communication card and main control board.
		Blinking	The data update between the communication card and main control board.

Indicator	Color	Definition	Description
LED4 (POWER)	Red	Steady on	(on for 500ms, off for 500ms) and main control board is normal.
		Steady on	3.3V power indicator.
LED5 (ERR)	Red	Steady on	The communication between the communication card and PLC is offline.
		Blinking (on for 500ms, off for 500ms)	An attempt to operate an unsupported CMD control word instruction or PR function code value.
LED6 (SYS)	Green	Steady off	The communication between the communication card and PLC is normal.
		Blinking (on for 500ms, off for 500ms)	Communication card heartbeat indicator (communication card is running normally).

Table 1-8 EtherNet UDP communication indicators

Indicator	Color	Definition	Description
LED1 (RUN)	Green	Steady on	The communication between the communication card and host controller is online, and data exchange is allowed.
		Blinking (on for 500ms, off for 500ms)	Abnormal setting of the IP address for either the communication card or the PLC.
		Steady off	No data update or abnormal update between the communication card and main control board is normal.
		Steady on	The data update between the communication card and main control board is normal.
LED2 (HOST)	Green	Steady on	The communication card is in the process of handshaking with the VFD.
		Blinking (on for 500ms, off for 500ms)	The communication card and VFD communicate normally. Note: After the handshaking is completed, it should blink regardless of whether there is data transmission between the communication card and the main control board.
LED3 (DATA)	Green	Steady off	The communication card is in the initialization or parameter configuration phase.
		Blinking (on for 500ms, off for 500ms)	No data update or abnormal update between the communication card and main control board is normal.
LED4 (POWER)	Red	Steady on	3.3V power indicator.
LED5 (ERR)	Red	Steady off	No fault.
		Blinking (on for 500ms, off for 500ms)	Workshop configuration error (abnormal UDP frame data).
		Blinking (on for 250ms, off for 250ms)	The connection between the communication card and Workshop on the host controller timed out.
		Steady on	Failed to set up data communication between the communication card and PLC.
LED6 (SYS)	Green	Blinking (on for 500ms, off for 500ms)	Communication card heartbeat indicator (communication card is running normally).

1.5 Communication protocol selection

Table 1-9 Communication protocol selection

Function code	Communication protocol	Default
P16.00	PROFINET	Factory setting (0)
	EtherCAT	1
	PowerLink	2
	EtherNet/IP	3
	Modbus TCP	4
	EtherNet UDP	5
	PROFINET+EtherNet UDP	6
	EtherCAT+EtherNet UDP	7
	Reserved	8-15

1.6 Protocol parameter

Table 1-10 Protocol parameter description

Function code	Communication protocol	Description
P16.00	PROFINET	Supports the PROFINET protocol, accommodating PROFINET IO devices, medium redundancy protocol (MRP), and system redundancy protocol (S2). Equipped with the slave station XML configuration file, it can communicate with Siemens PLC and other master stations.
		Enables basic operations on VFDs, such as reading and writing process values, reading status values, and reading/writing function codes. This communication card supports up to 32 IOs.
		Applicable to linear, star, and ring network topologies.
		Supports ODVA standards and DLR ring protocol. When configured with a slave station EDS configuration file, it can communicate with Rockwell PLC and other master stations.
	EtherCAT	Supports concurrent PROFINET and EtherNet UDP communications on the same network.
		Supports concurrent EtherCAT and EtherNet UDP communications on the same network, with EtherCAT required to remain online.
		Supports two RJ45 ports, designated for IN and OUT directions.

Function code	Communication protocol	Description
P16.00	PowerLink	Supports the CiA401 protocol. Configured with a slave station XDD configuration file, it can communicate with B&R PLC and other master stations.
		Supports PDO and SDO services, manufacturer-defined object dictionaries, and SDO reading/writing of VFD function codes.
		Applicable to linear and star network topologies.
		Supports ODVA standards and DLR ring protocol. When configured with a slave station EDS configuration file, it can communicate with Rockwell PLC and other master stations.
P16.01	EtherNet/IP	Enables basic operations on VFDs, such as reading and writing process values, reading status values, and reading/writing function codes. This communication card supports up to 32 IOs.
		Applicable to linear, star, and ring network topologies.
		Supports concurrent PROFINET and EtherNet UDP communications on the same network.
		Supports concurrent EtherCAT and EtherNet UDP communications on the same network, with EtherCAT required to remain online.
P16.02	Modbus TCP	Supports the Modbus TCP protocol. A Modbus TCP slave station can communicate with multiple master stations simultaneously. It can communicate with Schneider PLC, INVT AX controllers, and other master stations.
		Enables basic operations on VFDs, such as reading and writing process values, reading status values, and reading/writing function codes.
		Applicable to linear and star network topologies.
		Supports concurrent PROFINET and EtherNet UDP communications on the same network.
P16.03	EtherNet UDP	Supports INVT Ethernet protocol, connecting to the INVT Workshop for monitoring and oscilloscope functionalities, allowing for multi-card network monitoring.
		Applicable to linear and star network topologies.
		Supports concurrent PROFINET and EtherNet UDP communications on the same network.
		Supports concurrent EtherCAT and EtherNet UDP communications on the same network, with EtherCAT required to remain online.

Note: After each change to P16.00, the expansion card will automatically reset and complete the protocol switchover. It will take some time to re-establish communication with the PLC using the new protocol. If a communication timeout fault occurs on the VFD during this period, you can clear it by pressing the reset key on the keypad.

2 Installation and wiring

2.1 Installation precautions

- Make sure the VFD has been powered off before installation.
- According to the expansion card installation slot position specifications, it is recommended to install this card in SLOT3 for a VFD with three slots and to install this card in SLOT2 for a VFD with only two slots.

Required tools: Phillips screwdriver PH1, straight screwdriver SL3.

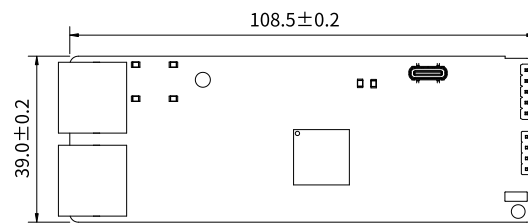
Table 2-1 Screw torque requirements

Screw size	Fastening torque
M3	0.55 N · m

2.2 Dimensions

The dimensions are 108.5×39mm, as shown in the following figure.

Figure 2-1 Product outline and installation dimensions (unit: mm)

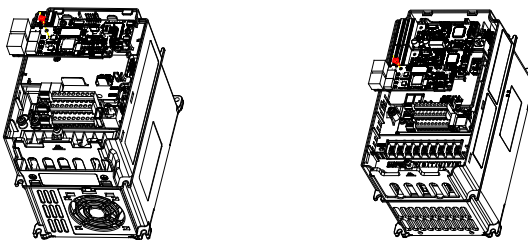


2.3 Installation instructions

The following shows an example of the installation in slot 3 (see figure b).

- Position the communication card in the designated area of slot 3 on the control board, ensuring proper alignment with the slot before securely fastening it together.
- Guide the communication card into place using the positioning stud.
- Secure it in position with M3 screws, completing the installation.

Figure 2-2 Installation position diagram



Note:

- The communication card and control board are electrically connected through slots. Please install them in place.

- To ensure the reliable operation of the communication card and EMC requirements are met, please tighten the screws according to the recommended torque for reliable grounding.

2.4 Disassembly instructions

You can disassemble the product by reversing the order of steps described in section 2.3 Installation instructions.

Step 1 Disconnect the power supply and disassemble all cables connected to the communication card.

Step 2 Use a Phillips screwdriver to remove the grounding screw of the communication card.

Step 3 Pull the communication card out to a suitable position.

2.5 User's wiring terminals

Figure 2-3 RJ45 terminal structure



Table 2-2 RJ45 terminal functions

No.	Terminal	Function
1	TX+	Transmit Data+
2	TX-	Transmit Data-
3	RX+	Receive Data+
4	n/c	Not connected
5	n/c	Not connected
6	RX-	Receive Data-
7	n/c	Not connected
8	n/c	Not connected
9	LED1+	LED1+ (Yellow)
10	LED1-	LED1- (Yellow)
11	LED2+	LED2+ (Green)
12	LED2-	LED2- (Green)

2.6 Wiring precautions

The communication card uses standard RJ45 interfaces, and its electrical connections are shown in Figure 2-4, Figure 2-5, and Figure 2-6.

Note: It is recommended to use double-twisted shielded Category 5e Ethernet cables, with crystal heads equipped with iron shells to meet the grounding shield protection.

Figure 2-4 Linear network topology electrical connection

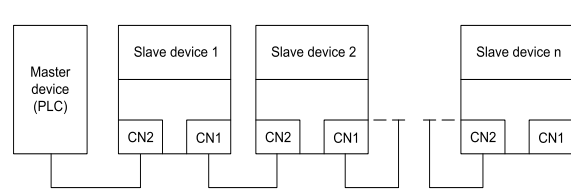


Figure 2-5 Star network topology electrical connection

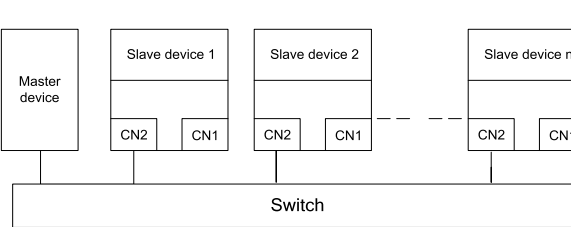
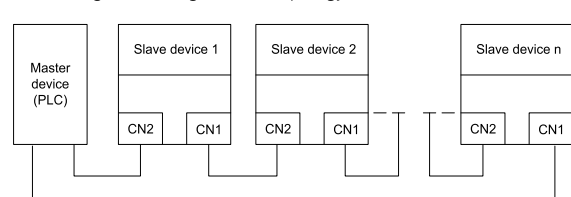


Figure 2-6 Ring network topology electrical connection



3 Commissioning

Figure 3-1 Communication card installation procedure

