

GR10-EC-6SW

6-Port EtherCAT Branch Module User Guide



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Preface

Introduction

Thank you for purchasing the GR10-EC-6SW 6-port EtherCAT branch module developed and manufactured independently by Inovance. This product, which provides one EtherCAT input port and five EtherCAT output ports, is suitable for star networked applications in multi-axis complex equipment and production line networking.

This guide describes the specifications, features and usage of the product. Please read this guide carefully before using to ensure safety. You can obtain the latest version on our website www.inovance.com.

Reader

This guide is intended for users who use or understand Inovance PLC products, including: electrical engineers, software engineers, and system engineers.

Cautions for New User

For the users who use this product for the first time, read the manual carefully. In case of any question about functions or performance, do not hesitate to contact the technical support personnel of Inovance to ensure correct use.

Revision History

Date	Version	Description
2019-11	A00	First release
2020-11	A01	Made minor corrections

Safety Instructions


■ Safety Disclaimers


1. Before installing, using, and maintaining this equipment, read the safety information and precautions thoroughly, and comply with them during operations.
2. To ensure the safety of humans and equipment, follow the signs on the equipment and all the safety instructions in this user guide.
3. The "CAUTION," "WARNING," and "DANGER" signs are only supplements to the safety instructions.
4. Use this equipment according to the designated environment requirements. Damage caused

by improper usage is not covered by warranty.

5. Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

■ Safety Levels and Definitions

 **WARNING** : Indicates that failure to comply with the notice may result in severe personal injuries or even death.

 **CAUTION** : The “CAUTION” sign indicates that failure to comply with the notice may result in minor or moderate personal injury or damage to the equipment.

Please keep this guide well so that it can be read when necessary and forward this guide to the end user.

Control system design

WARNING

- ◆ Provide a safety circuit outside the PLC so that the control system can still work safely once external power failure or PLC fault occurs.
- ◆ Add a fuse or circuit breaker because the module may smoke or catch fire due to long-time overcurrent caused by operation above rated current or load short-circuit.

CAUTION

- ◆ An emergency stop circuit, a protection circuit, a forward/reverse operation interlocked circuit, and a upper position limit and lower position limit interlocked circuit must be set in the external circuits of PLC to prevent damage to the machine.
- ◆ To ensure safe operation, for the output signals that may cause critical accidents, please design external protection circuit and safety mechanism.
- ◆ Once PLC CPU detects abnormality in the system , all outputs may be closed; however, when a fault occurs in the controller circuit, the output may not be under control. Therefore, it is necessary to design an appropriate external control circuit to ensure normal operation.
- ◆ If the PLC's output units such as relays or transistors are damaged, the output may fail to switch between ON and OFF states according to the commands.
- ◆ The PLC is designed to be used in indoor electrical environment (overvoltage category II). The power supply must have a system-level lightning protection device, assuring that overvoltage due to lightning shock cannot be applied to the PLC's power supply input terminals, signal input terminals and output terminals and so forth, so as to avoid damage to the equipment.

Installation



- ◆ Installation must be carried out by the specialists who have received the necessary electrical training and understood enough electrical knowledge.
- ◆ Disconnect all external power supplies of the system before removing/installing the module. Failure to do so may result in electric shock, module fault or malfunction.
- ◆ Do not use the PLC where there are dust, oil smoke, conductive dust, corrosive or combustible gases, or exposed to high temperature, condensation, wind & rain, or subject to vibration and impact. Electric shock, fire and malfunction may also result in damage or deterioration to the product.
- ◆ The PLC is open-type equipment that must be installed in a control cabinet with lock (cabinet housing protection > IP20). Only the personnel who have received the necessary electrical training and understood enough electrical knowledge can open the cabinet.



- ◆ Prevent metal filings and wire ends from dropping into ventilation holes of the PLC during installation. Failure to comply may result in fire, fault and malfunction.
- ◆ Ensure there are no foreign matters on ventilation surface. Failure to comply may result in poor ventilation, which may cause fire, fault and malfunction.
- ◆ Ensure the module is connected to the respective connector securely and hook the module firmly. Improper installation may result in malfunction, fault or fall-off.

Wiring



- ◆ Wiring must be carried out by personnel who have received the necessary electrical training and understood enough electrical knowledge.
- ◆ Disconnect all external power supplies of the system before wiring. Failure to comply may result in electric shock, module fault or malfunction.
- ◆ Install the terminal cover attached to the product before power-on or operation after wiring is completed. Failure to comply may result in electric shock.
- ◆ Perform good insulation on terminals so that insulation distance between cables will not reduce after cables are connected to terminals. Failure to comply may result in electric shock or damage to the equipment.

 CAUTION

- ◆ Prevent dropping metal filings and wire ends drop into ventilation holes of the PLC at wiring. Failure to comply may result in fire, fault and malfunction.
- ◆ The external wiring specification and installation method must comply with local regulations. For details, see the wiring section in this guide.
- ◆ To ensure safety of equipment and operator, use cables with sufficient diameter and connect the cables to ground reliably.
- ◆ Ensure that all cables are connected to the correct interface. Failure to comply may result in module and external equipment fault.
- ◆ Tighten bolts on the terminal block in the specified torque range. If the terminal is not tight, short-circuit, fire or malfunction may be caused. If the terminal is too tight, fall-off, short-circuit, fire or malfunction may be caused.
- ◆ If the connector is used to connect with external equipment, perform correct crimping or welding with the tool specified by manufacturer. If connection is in poor contact, short-circuit, fire or malfunction may be caused.
- ◆ A label on the top of the module is to prevent foreign matters entering the module. Do not remove the label during wiring. Remove it before operation for ventilation.
- ◆ Do not bundle control wires, communication wires and power cables together. They must be run with distance of more than 100 mm. Otherwise, noise may result in malfunction.
- ◆ Select shielded cable for high-frequency signal input/output in applications with serious interference so as to enhance system anti-interference ability.

Operation and Maintenance

 WARNING

- ◆ Maintenance & inspection must be carried out by qualified personnel.
- ◆ Do not touch the terminals while the power is on. Failure to comply may result in electric shock or malfunction.
- ◆ Disconnect all external power supplies of the system before cleaning the module or re-tightening screws on the terminal block or screws of the connector. Failure to comply may result in electric shock.
- ◆ Disconnect all external power supplies of the system before removing the module or connecting/removing communication wirings. Failure to comply may result in electric shock or malfunction.

 CAUTION

- ◆ Get with the guide and ensure safety before online modification, forcible output, and RUN/STOP operation.
- ◆ Disconnect the power supply before installing/removing the extension card.

Disposal

 CAUTION

- ◆ Dispose of the product as industrial waste.

1 Product Information

Model Number and Nameplate

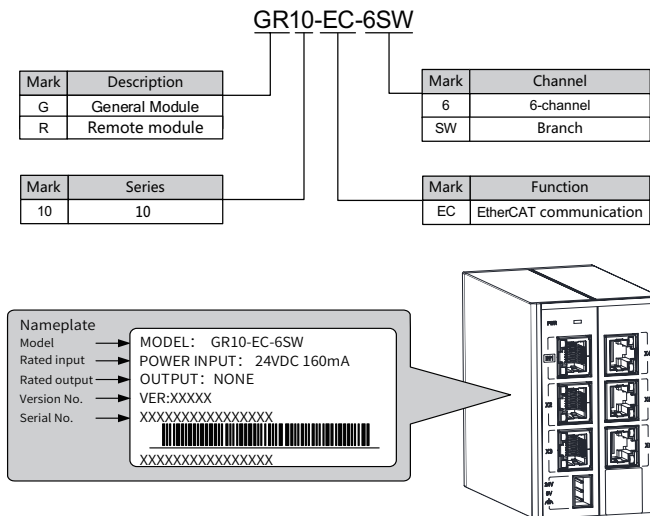


Figure 1 Description of model number and nameplate

Model	Category	Description	Applicable Model
GR10-EC-6SW	Remote EtherCAT branch module	Remote EtherCAT branch module, 1 input, 5 outputs	Refer to the PLC functions

External Interface

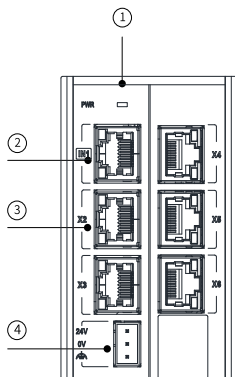


Figure 2 Module interfaces

No.	Interface Name	Function		
①	Power indicator	PWR	Green	ON when power supply is switched on
②	EtherCAT input interface	IN	Port1, EtherCAT output interface for connecting front-end EtherCAT master	
③	EtherCAT Output interface	X2	Port2, EtherCAT output interface for connecting back-end EtherCAT slaves	
		X3	Port3: EtherCAT output interface for connecting back-end EtherCAT slaves	
		X4	Port4, EtherCAT output interface for connecting back-end EtherCAT slaves	
		X5	Port5: EtherCAT output interface for connecting back-end EtherCAT slaves	
		X6	Port6: EtherCAT output interface for connecting back-end EtherCAT slaves	
④	24 V power input terminal	For module power supply input		

General Specifications

Item	Specifications
Rated operating voltage	24 VDC (20.4 VDC to 28.8 VDC) (-15% to +20%)
Internally consumed current	Approx. 160 mA
Communication protocol	EtherCAT industrial real-time bus protocol
EtherCAT channel	1 input and 5 outputs
Max. comm. speed	100 Mbps
Network port/network cable	Standard network port with Cat 5e network cables, cable length not exceeding 100 meters
Operating temperature	-10-55°C
Storage temperature	-25-70°C
Humidity	10-95%, no-condensation

EtherCAT Communication Specifications

Item	Specifications
Communication protocol	EtherCAT industrial real-time bus protocol
Synchronization mode	DC-distributed clock
Duplex mode	Full duplex
Max. communication speed	100 Mbit/s (100Base-TX)
Topological structure	Star
Branch module cascading	Supported
Cable recognition	Auto MDI/MDIX

2 Mechanical Design Reference

Mounting Dimensions

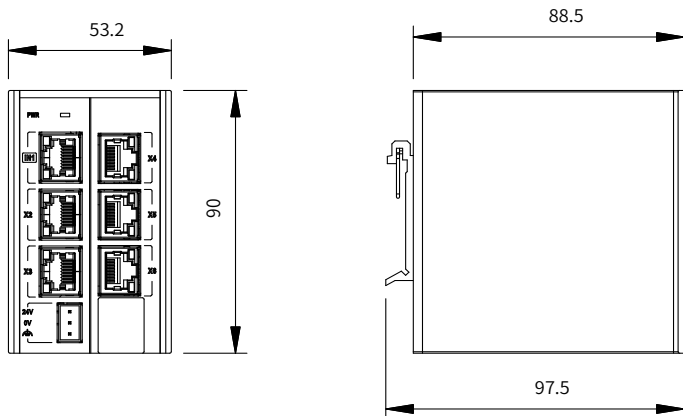


Figure 3 Mounting dimensions diagram (in mm)

3 Electrical Design Reference

Cable Preparation



Figure 4 EtherCAT cable preparation



Use Cat 5e shielded twisted pair (STP) cables, with injection molded and iron shelled connector.

■ Signal pins

Pin	Signal	Signal Direction	Signal Description
1	TD+	Output	Data transmission+
2.	TD-	Output	Data transmission-
3	RD+	Input	Data reception+
4	--	--	Not used
5	--	--	Not used
6	RD-	Input	Data reception-
7	--	--	Not used
8	--	--	Not used

■ Length requirements:

According to FastEthernet technology, when an EtherCAT bus is used, the length of the cable between the devices must not exceed 100 meters. Exceeding this length will attenuate the signal and affect communication.

■ Technical requirements:

100% continuity test, no short circuit, open circuit, misalignment and poor contact. Use a shielded cable as the EtherCAT bus for network data transmission, with the following recommended specifications:

Item	Specifications
Cable type	Flexible crossover cable, S-FTP, Cat 5e
Complied standards:	EIA/TIA568A, EN50173, ISO/IEC11801 EIA/TI Abulletin TSB, EIA/TIA SB40-A&TSB36
Conductor cross section	AWG26
Conductor type	Twisted pair
Pair	4

Communication Wiring

■ EtherCAT connection

Insert the cable connector into the EtherCAT port of the branch module until you hear a click sound.

Removal: press the release tab of the connector to pull out the connector and

module horizontally.

■ Wiring of the communication system

The EtherCAT branch module can connect multiple EtherCAT slave devices. The system wiring diagram is shown below:

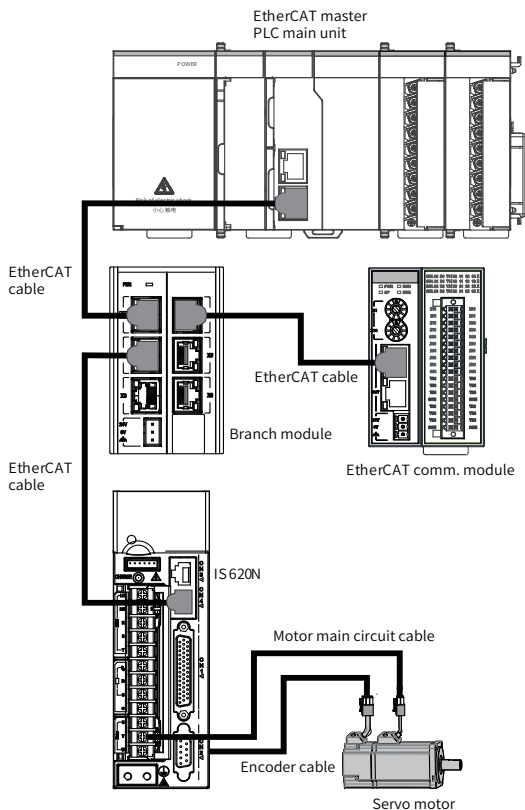


Figure 5 Wiring of the communication system



NOTE

To protect the communication cable from any tension and to ensure communication stability, fix the cable end which is near the device before EtherCAT communication.

Configuration and use

- 1) When using this branch device, run all EtherCAT slaves (including the two stations of this branch device) with an alias, so that an abnormal branch will not affect the others.
- 2) The data flow priority of a 6-way branch device interface is X2>X3>X4>X5>X6, that is, any slave on the X2 branch has priority over all slaves on the X3 branch.
- 3) The DC mode is enabled by default. That is, the branch device has been configured as an EtherCAT slave in DC mode.
- 4) The branch device allows cascade, and the allowable number of nodes is not restricted by the device.
- 5) Each branch device occupies two EtherCAT slave station numbers.

Fault Indication and Solutions

When the module fails, the user can check the signal status through the LED indicator and take corresponding measures:

LED indicator		Indication	Cause	Solution
PWR	Link/ Act			
OFF	OFF	Power failure	1. The power supply is not connected 2. Internal circuit fault	1. Check power supply connection 2. Replace the branch module
ON	OFF	Connection not established	1. The communication cable is disconnected or short-circuited 2. Hardware fault of the branch module 3. The master station is not started	1. Check cable connection. If cable breakage or short circuit is found, replace the communication cable 2. Replace the branch module ③ Check the status of the master

INOVANCE Warranty Agreement

The warranty period of the product is 18 months (The period is subject to the date information indicated by the barcode on the product, or the terms and conditions of the purchase contract if otherwise specified). During the warranty period, if the product fails or is damaged under the condition of normal use by following the instructions, Inovance will be responsible for free maintenance.

Within the warranty period, maintenance will be charged for the damages due to the following causes:

- 6) Improper use or uninstallation/repair/modification without prior permission
- 7) Fire, flood, abnormal voltage, other disasters, and secondary disasters
- 8) Hardware damage caused by dropping or transportation after procurement
- 9) Failure to operate the product by observing the User Manual provided by Inovance
- 10) Faults and damages caused by factors outside of the product (such as peripheral devices)

If there is any failure or damage to the product, correctly fill out the Product Warranty Card.

The maintenance fee is charged as the latest Maintenance Price List of Inovance.

The Product Warranty Card is not re-issued. Keep the card and present it to the maintenance personnel when seeking maintenance.

If there is any problem during the service, contact us or our agent directly.

You are assumed to agree on terms and conditions of this warranty agreement by purchase of the product. This agreement shall be interpreted by Inovance.