INOVANCE

FORWARD, ALWAYS PROGRESSING



19011256A03

GR10-EC-6SW Series

6-Channel EtherCAT Branch Module

User Guide

Suzhou Inovance Technology Co., Ltd.

Add.: No.52, Tian E Dang Road, Wuzhong District,
Suzhou 215104, P.R. China
Tel: (0512) 6637 6666 Fax: (0512) 6285 6720
www.inovance.com

Preface

Introduction

Thank you for purchasing the GR10-EC-6SW 6-channel EtherCAT branch module developed and manufactured independently by Inovance. This product provides one EtherCAT input channel and five EtherCAT output channels. It is suitable for star network topology applications in multi-axis complex equipment and production line networking.

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

Target Audience

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

Precautions for New Users

Read through this user guide carefully before use for the first time. In case of any question about functions or performance, contact the technical support of Inovance to ensure correct use.

Standards Compliance

The following table lists the certifications, directives, and standards of the product may comply with. For details about the acquired certificates, see the certification marks on the product nameplate.

Certification	Directive		Standard
CE Certification	EMC Directive	2014/30/EU	24 VDC products: EN 61131-2 220 VAC products: EN 61131-2 EN 61000-3-2 EN 61000-3-3
	LVD Directive	2014/35/EU	EN 61010-1 EN 61010-2-201
	RoHS Directive	2011/65/EU amended by (EU)2015/863	EN IEC 63000
UL/cUL Certification	-		UL 61010-1 UL 61010-2-201 CAN/CSA-C22.2 No. 61010-1 CSA C22.2 NO. 61010-2-201
KCC Certification	-		-

Certification	Directive		Standard
EAC Certification	-		-
UKCA Certification	Safety Regulations	Electrical Equipment (Safety) Regulations 2016	EN 61010-1 EN 61010-2-201
	EMC Regulations	Electromagnetic Compatibility Regulations 2016	24 VDC products: EN 61131-2 220 VAC products: EN 61131-2 EN 61000-3-2 EN 61000-3-3
	RoHS Regulations	Directive (RoHS) Regulations 2012	EN IEC 63000

Revision History

Date	Version	Revision
August 2026	A07	Updated the Fundamental Safety Instructions
January 2025	A06	◆ Added "Standard Compliance". ◆ Added "Installation Method". ◆ Made minor corrections.
August 2024	A05	Made minor corrections.
February 2024	A04	Made minor corrections.
January 2024	A03	Made minor corrections.
November 2020	A02	Made minor corrections.
September 2020	A01	Added descriptions on configuration and use in "Communication Connection".
November 2019	A00	Initial release.

Fundamental Safety Instructions

■ Safety disclaimer

1. Read and comply with the safety instructions during installation, operation, and maintenance of the product.

2. To ensure the safety of humans and the products, follow the marks on the products and all the safety instructions in this document.

3. The "CAUTION", "WARNING", and "DANGER" are only supplements to the safety instructions.

4. Use this product according to the designated environment requirements. Damage caused by improper use is not covered by warranty.

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

■ Safety levels and definitions

DANGER indicates that failure to comply with the notice will result in death or severe injury.

WARNING indicates that failure to comply with the notice may result in death or severe injury.

CAUTION indicates that failure to comply with the notice may result in minor or moderate injury, or equipment damage.

Unpacking

WARNING

- Do not install the product in case of any damage, rust, or signs of use on the product or accessories upon unpacking.
- Do not install the product in case of water seepage into the product or missing or damaged components upon unpacking.
- Do not install the product in the case of any discrepancy between the product you received and the product name on the packing list.

CAUTION

- Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking.
- Unpack the package by following the unpacking sequence. Do not strike the package violently. Once the CPU of the PLC detects an exception in the system, all outputs may be closed. When a fault occurs in the controller circuit, the output may not be under control. Therefore, it is necessary to set up an external control circuit to ensure normal operation.
- Check for damage, rust, or dents on the surfaces of the product and accessories upon unpacking.
- After unpacking, check the contents against the packing list to ensure that the equipment and accessories are in the correct quantities, and that all documentation is complete.

Storage and transpostation

WARNING

- Large or heavy equipment must be handled by qualified professionals using specialized hoisting equipment. Failure to comply could result in personal injury or equipment damage.
- Before hoisting the equipment, ensure that components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injury or equipment damage.
- Never stand or stay under the equipment while it is being hoisted.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply could result in personal injury or equipment damage.

CAUTION

- Handle the equipment with care during transportation and mind your step to prevent personal injury or equipment damage.
- When carrying the equipment with bare hands, hold the casing firmly with care to prevent parts from falling. Failure to comply could result in personal injury.
- Do not store or transport the equipment in locations where the equipment may be exposed to splashing water or rain, direct sunlight, strong electric field, strong magnetic field, or strong vibration.
- Store the equipment for up to three months. Take stricter protective measures and carry out the necessary inspections for a longer storage time.
- Pack the equipment securely and properly before transportation. Use a fully enclosed container for long-distance transportation.
- Never transport the equipment with other devices or items that could impact or cause harm to the equipment.

Design

DANGER

- Provide a safety circuit and include an error handling program in the software to ensure that the product remains in a safe state in case of an external power failure or an internal fault.
- If a sustained overcurrent occurs due to overload or load short circuit, the product may smoke or catch fire. An external safety device (such as a fuse or circuit breaker) must be installed.

WARNING

- Any damaged output components such as relays or transistors in this product may result in uncontrolled output that stays in a constant ON or OFF state.
- The product design must comply with the overvoltage category requirements specified in the Environmental Specifications. The system-level power supply must have a lightning protection device, assuring that overvoltage due to lightning shock is not applied to the controller's terminals such as power supply input terminals, signal input terminals, and control output terminals, to prevent damage to the product.
- Ensure that appropriate actions have been taken to prevent product malfunction caused by a communication fault between the product and related devices. Failure to comply could cause personal injury or equipment damage.

CAUTION

- Switches that could cause personal injury or equipment damage cannot be configured on the touch screen. Use independent switches for performing critical operations. Failure to comply could result in accidents caused by wrong outputs or faults.

Installation

DANGER

- This equipment must be operated only by trained and qualified electrical personnel.

WARNING

- Read through the guide and safety instructions before installation.
- Do not install this equipment in places with strong electric or magnetic field.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply may result in mechanical hazards.
- Before installation, ensure that the installation site meets the required environmental conditions. Failure to comply could result in equipment damage.
- Do not wear loose clothes or accessories during installation. Failure to comply could result in electric shock.
- When installing the equipment in an enclosed environment (such as a cabinet or case), use cooling devices (such as fans or air conditioners) to cool the space and meet the installation environment requirements. Failure to do so could result in equipment overheating or fire.
- Do not modify this equipment.
- Never loosen the fixing bolts on components and modules, or any bolts marked in red.
- This equipment must be installed inside an indoor cabinet or terminal equipment. The cabinet or terminal equipment itself must be provided with the necessary protective enclosures, such as a fireproof enclosure, an electrical protective enclosure, and a mechanical protective enclosure. The IP rating of these enclosures must comply with the relevant IEC standards, and applicable local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for this equipment to prevent malfunction.
- Install the equipment onto a non-combustible object such as metal. Keep the equipment away from combustible objects. Failure to comply may result in fire.
- For products not supporting hot swapping, disconnect all external power supplies of the system before installing/removing the product. Failure to comply could result in electric shock, product failure, or malfunction.

CAUTION

- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the product and causing faults. After installation, remove the cloth or paper for effective ventilation and cooling.
- During installation, ensure the equipment is connected to the respective connector securely and hook the equipment firmly. Improper installation may cause the equipment malfunction, failure, or loosening.

Battery Usage

WARNING

- Do not use batteries that do not meet the product requirements. Failure to comply could result in death, personal injury, explosion, or fire.
- Do not throw batteries into a fire or heat oven. Do not crush or cut the battery. Failure to comply could result in death, personal injury, explosion, or fire.
- Do not expose the battery to extremely high temperatures. Failure to comply could result in death, personal injury, explosion, or fire.
- Do not swallow batteries. Failure to comply could result in chemical burns.
- Seek for medical treatment immediately if a button battery is swallowed by accident, because this may cause severe internal burns within two hours and even death.

CAUTION

- Keep batteries out of reach of children.
- If the battery compartment is not securely closed, stop using the product immediately and keep it out of reach of children.

Maintenance

DANGER

- Maintenance must be performed only by trained and qualified electrical personnel.
- Do not maintain the equipment with power ON. Failure to comply could result in electric shock.
- Before maintenance, disconnect all the power supplies of the equipment and wait for at least the time specified on the warning label.
- Disconnect all external power supplies of the system before cleaning the equipment or re-tightening screws on the terminal block or screws of the connectors. Failure to comply could result in electric shock.
- Disconnect all external power supplies of the system before removing or installing the product, or connecting or disconnecting cables. Failure to comply could result in electric shock or malfunction.

WARNING

- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

Repair

DANGER

- Repair must be performed only by trained and qualified electrical personnel.
- Do not repair the equipment with power ON. Failure to comply could result in electric shock.
- Before inspection or repair, disconnect all the power supplies of the equipment and wait for at least the time specified on the warning label.

WARNING

- Submit a request for repair based on the warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage circuit breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply could result in equipment damage, personal injury, or death.
- Troubleshooting and repair of a faulty or damaged equipment must be performed by professionals based on the repair instructions, with the repair records kept properly.
- Replace quick-wear parts of the equipment according to the replacement instructions.
- Do not use damaged equipment. Failure to comply could result in death, personal injury, or severe equipment damage.
- Recheck the wiring and reset the parameters after equipment replacement.

Disposal

WARNING

- Dispose of the retired equipment in accordance with applicable national regulations and standards. Failure to comply could result in property damage, personal injury, or death.
- Recycle retired equipment in accordance with industry waste disposal standards to avoid environmental pollution.
- Treat the retired equipment as industrial waste. Dispose of used batteries according to local laws and regulations.

Safety Labels

To ensure safe operation, comply with safety labels on the equipment and do not damage or remove the labels. The following table describes the meanings of the safety labels.

Safety label	Description
	◆ Before using the equipment, read the guide and safety precautions carefully. Failure to comply could result in personal injury, death, or equipment damage. ◆ Do not touch the terminals or remove the cover with power-on or within 10 min after power-off. Failure to comply could result in electric shock. ◆ The surface of the running equipment may become very hot. Do not touch these hot areas. Failure to comply may cause burns.

Contents

Preface 1
Introduction 1
Target Audience 1
Precautions for New Users 1
Standards Compliance 1
Revision History 2
Fundamental Safety Instructions 3
1 Product Information 10
1.1 Model and Nameplate 10
1.2 External Interfaces 11
1.3 General Specifications 12
1.4 EtherCAT Communication Specifications 12
2 Mechanical Design 13
2.1 Installation Dimensions 13
2.2 Installation Method 13
3 Electrical Design 14
3.1 Network Cable Preparation 14
3.2 Communication Connection 15
3.3 Fault Indication and Solutions 16

1 Product Information

1.1 Model and Nameplate

GR 10 - EC - 6 SW

① ② ③ ④ ⑤

①	Product Type GR: General module	③	Communication Protocol EC: EtherCAT bus communication	⑤	Module Type SW: Branch device
②	Series Number 10: 10 series	④	Number of channels 6: Six channels	-	

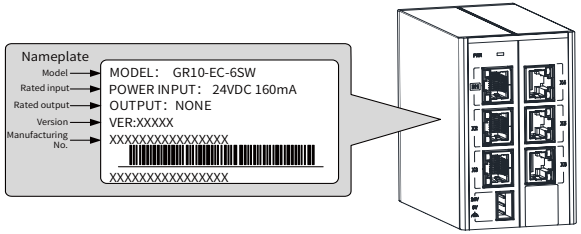


Figure 1 Model and nameplate

Model	Type	Description	Applicable Model
GR10-EC-6SW	Remote EtherCAT branch module	Remote EtherCAT branch module with one EtherCAT input and five EtherCAT outputs	Refer to the PLC functions

1.2 External Interfaces

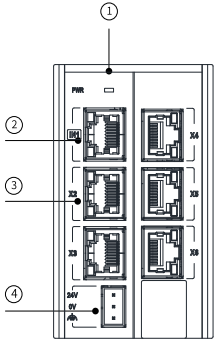


Figure 2 External interfaces of the GR10-EC-6SW module

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

Note: For details about application, see "Communication Connection".

1.3 General Specifications

Item	Specification
IP rating	IP20
Rated operating voltage	24 VDC (20.4 VDC to 28.8 VDC) (-15% to +20%)
Internally consumed current	About 160 mA
Anti-reverse connection of power supply	Supported
Communication protocol	EtherCAT industrial real-time bus protocol
Number of EtherCAT channels	One input and five outputs
Maximum communication speed	100 Mbps
Network port/network cable	Standard network port with Cat 5e network cables below 100 m
Operating temperature	-10° C to +55° C
Storage temperature	-25° C to +70° C
Humidity	10% RH to 95% RH, without condensation
Altitude	2000 m (with 80 kPa)

1.4 EtherCAT Communication Specifications

Item	Specification
Communication protocol	EtherCAT industrial real-time bus protocol
Synchronization mode	DC/SM
Duplex mode	Full duplex
Maximum communication speed	100 Mbps (100Base-TX)
Topology	Star
Branch module cascading	Supported
Cable detection	Auto MDI/MDIX

2 Mechanical Design

2.1 Installation Dimensions

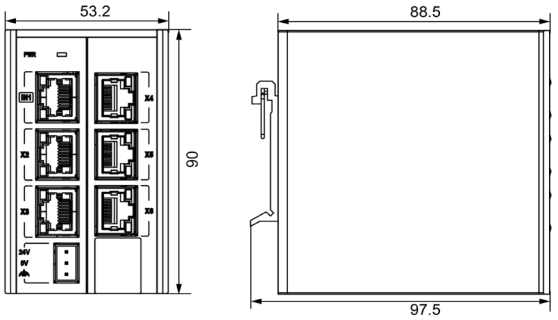
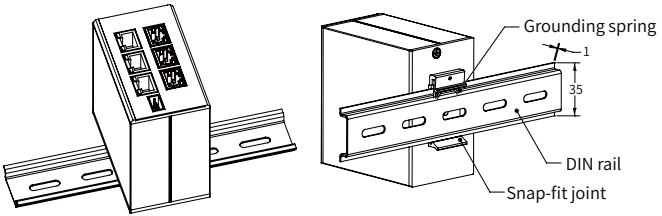


Figure 3 Installation dimensions (in mm)

2.2 Installation Method

1. Install the module onto a DIN rail and fix it using a snap-fit joint. The internal grounding spring of the module is electrically connected to the rail, as shown below (in mm).



2. Check whether the module is fixed securely to the rail.

3 Electrical Design

3.1 Network Cable Preparation

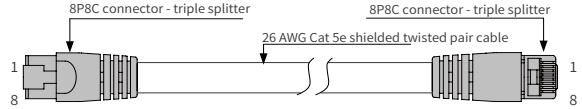
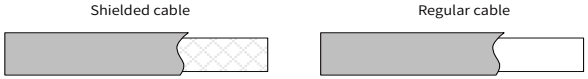


Figure 4 EtherCAT cable preparation



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

■ Signal pin assignment

Pin	Signal	Type	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 m. Exceeding this length will attenuate the signal and affect communication.

■ Technical requirements:

The product is required to pass the 100% continuity test and show no sign of short circuit, open circuit, misalignment, or poor contact.

Use a shielded cable as the EtherCAT bus for network data transmission, with the following recommended specifications:

Item	Specification
Cable type	Flexible crossover cable, S-FTP, Cat 5e
Standard	EIA/TIA568A, EN50173, ISO/IEC11801 EIA/TI Abulletin TSB, EIA/TIA SB40-A&TSB36
Cross sectional area	AWG26
Conductor type	Twisted pair
Number of pairs	4

3.2 Communication Connection

■ EtherCAT connection and removal

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

Removal: Press the tail of the registered jacket to pull out the connector.

■ Communication system wiring

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

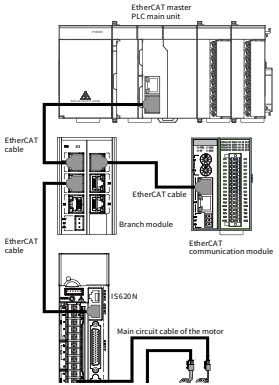


Figure 5 Communication system wiring

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 module, operate all EtherCAT slaves (including the two stations of this branch module) with an alias, so that an abnormality in one branch will not affect the others.

2) The data flow priority of the 6-channel branch module 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 branch module is configured as an EtherCAT slave in DC mode by default.

4) The branch module supports 3-level cascading. The number of cascaded units is independent of the module functions.

5) Each branch module occupies two EtherCAT slave station numbers.

3.3 Fault Indication and Solutions

When the module encounters a fault, users can check the signal status through the LED indicator and take corresponding measures:

LED Indicator		Description	Cause	Solution
PWR	Link/ Act			
OFF	OFF	Power failure	1. Power supply not connected 2. Internal circuit fault	1. Check the power supply connection. 2. Replace the branch module.
ON	OFF	Connection not established	1. Communication cable disconnected or short-circuited 2. Hardware fault of the branch module 3. EtherCAT master station disabled	1. Check the communication cable connection. Replace the communication cable in case of cable breakage or short circuit. 2. Replace the branch module. 3. Check the status of the master.

INOVANCE Warranty Agreement

Inovance provides an 18-month free warranty (subject to information indicated by the barcode on the product or the contract terms) to the equipment itself from the date of manufacturing for the failure or damage under normal use conditions.

Within the warranty period, maintenance will be charged for the following damage:

1) Damage caused by improper use or unauthorized disassembly, repair, or retrofit;
2) Damage caused by fire, flood, abnormal voltage, other disasters, or secondary disasters;
3) Hardware damage caused by equipment fall-off or that caused during transportation;
4) Damage caused by failure to operate the product according to the user guide provided by Inovance;
5) Faults and damage caused by external factors, such as peripheral devices;

If the equipment is faulty or damaged, fill in the Product Warranty Card correctly.

The maintenance fee is charged based on 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 during maintenance.

If there is any problem during the service, contact Inovance or Inovance agents.

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

INOVANCE Warranty Card

Customer Information	Company address:	
	Company name: Post code:	Contact person: Tel.:
Product Information	Product model:	
	Product barcode (attached here):	
	Agent name:	
Fault Information	(Service date and description): Serviced by:	