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PS00007356A08

GR20-16EMPL
Digital Input and Output Module

User Guide

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■ Disclaimer of Liability

Due to continuous updates and improvements of products and technologies, the content of this documentation may not fully match the actual products. In the event of any discrepancies, the actual products shall prevail.

The contents are subject to change without notice due to product upgrade.

■ Waste Disposal

The storage, use, and disposal of this product (including optional accessories) must comply with local laws and regulations.

■ Qualified Personnel

The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel can identify the risks of the product/system and prevent possible dangers.

■ Proper Use of the Product

Proper transportation, storage, assembly, installation, commissioning, operation, and maintenance are required to ensure the safe operation of the product without any problems. The required ambient conditions must be met. All operations must follow the guidelines provided in this documentation.

Preface

■ Introduction

The GR20-16EMPL is a transistor PNP module with 16 digital inputs and outputs. Each of the 16 channels can be configured as either an input or an output. The module is used together with the Class A IO-Link master.

This guide describes the mechanical installation, electrical installation, configuration, commissioning, troubleshooting, and object list of the product.

■ Standards compliance

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

Certification	Directive		Standards compliance
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		Standards compliance
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

■ More documents

Name	Code	Description
GS20-ECT-8L High Protection IO-Link Master Module User Guide	PS00007354	This guide describes the mechanical installation, electrical installation, configuration, commissioning, and troubleshooting of the product.
GR20-16EMPL Digital Input and Output Module User Guide (This guide)	PS00007356	This guide describes the mechanical installation, electrical installation, configuration, commissioning, and troubleshooting of the product.

■ Revision history

Date	Version	Revision
2026-04	A08	• Updated product images in *"2.1 Model and Nameplate" on page 15* and *"2.2 Components" on page 17*. • Updated *"1.1 安全注意事项" on page 7*.
2025-11	A07	• Updated product illustrations and product codes in *"2.1 Model and Nameplate" on page 15* and *"2.2 Components" on page 17*. • Updated the reference dimensions for "Cable connection" in *"3.2 安装尺寸" on page 24*. • *"4.3 Terminal Wiring" on page 35* Added tightening torque specifications to "Terminal Wiring".
2025-07	A06	• Updated *"4.1 线缆选型" on page 33*. • Made minor corrections.
2024-12	A05	**Addition** *" 附录：版本匹配说明" on page 46*. **Revision** • Updated "Software specifications" in *"2.3 Technical Specifications" on page 19*. • Updated *" 故障诊断" on page 39* . • Updated "0x49: Mode configuration (R/W)" in *"7.3 Product Data" on page 41*.

Date	Version	Revision
2024-08	A04	**Addition** *"3.1 Installation Precautions" on page 24*. **Revision** • Updated "Undervoltage detection" in *"2.3 Technical Specifications" on page 19*. • Update "0x44: System Monitoring (R) for UA and US Power Supply Voltages" in *"7.3 Product Data" on page 41*.
2023-11	A03	Made minor corrections.
2023-09	A02	**Revision** • *" 故障诊断" on page 39* Added the error code "0x7710" in the section. • *"7.3 Product Data" on page 41* Modified the index "0x42" and added the index "0x43" in the section.
2023-01	A01	Made minor corrections. Added environmental specifications.
2022-11	A00	First release.

■ Access to the guide

This guide is not delivered with the product. You can download the PDF version in the following ways:

- Visit **https://www.inovance.com/global**, and choose Service&Support > Support > Documentation Download.
- Scan the **QR code** on the product with your smartphone.
- Scan the QR code below to install **My Inovance** app, where you can search for and download the guide.

■ Warranty

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is not caused by improper operation of the user. Maintenance will be charged after the warranty expires.

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

- Damage caused by operations not following the instructions in the guide
- Damage caused by fire, flood, or abnormal voltage
- Damage caused by using the product for unintended functions
- Damage caused by using the product outside the specified scope
- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance fee will be charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see the Warranty Card.

1 Fundamental Safety Instructions

1.1 安全注意事项

■ 安全声明

1. 在安装、操作、维护产品时，请先阅读并遵守本安全注意事项。
2. 为保障人身和设备安全，在安装、操作和维护产品时，请遵循产品上标识及手册中说明的所有安全注意事项。
3. 手册中的“注意”、“警告”和“危险”事项，并不代表所应遵守的所有安全事项，只作为所有安全注意事项的补充。
4. 本产品应在符合设计规格要求的环境下使用，否则可能造成故障，因未遵守相关规定引发的功能异常或部件损坏等不在产品质量保证范围之内。
5. 因违规操作产品引发的人身安全事故、财产损失等，汇川将不承担任何法律责任。

■ 安全等级定义

DANGER “危险”表示如果不按规定操作，则导致死亡或严重身体伤害。

WARNING “警告”表示如果不按规定操作，则可能导致死亡或严重身体伤害。

CAUTION 表示如果不按规定操作，则可能导致轻微身体伤害或设备损坏。

开箱验收
WARNING • 开箱时发现产品及产品附件有损伤、锈蚀、使用过的迹象等问题，请勿安装！ • 开箱时发现产品内部进水、部件缺少或有部件损坏时，请勿安装！ • 请仔细对照装箱单，发现装箱单与产品名称不符时，请勿安装！
CAUTION • 开箱前请检查设备的外包装是否完好， 有无破损、浸湿、受潮、变形等情况。 • 请按照层次顺序打开包装，严禁猛烈敲打！ • 开箱时请检查设备及附件表面有无残损、锈蚀、碰伤等情况。 • 开箱后请仔细对照装箱清单，查验设备及附件数量、资料是否齐全。

储存与运输时

WARNING

- 请务必使用专业的起重设备，且由具有操作资质的专业人员搬运大型或重型产品。否则有导致受伤或产品损坏的危险！
- 垂直起吊产品前，请确认产品的前外罩、端子排等产品构成部件已用螺丝固定牢靠，否则部件脱落有导致人员受伤或产品损坏的危险！
- 产品被起重设备吊起时，产品下方禁止人员站立或停留。
- 用钢丝绳吊起产品时，请平稳匀速吊起，勿使产品受到振动或冲击，勿使产品翻转，也不要使产品长时间处于被吊起状态，否则有导致人员受伤或产品损坏的危险！

CAUTION

- 搬运产品时请务必轻抬轻放，随时注意脚下物体，防止绊倒或坠落，否则有导致受伤或产品损坏的危险！
- 徒手搬运产品时，请务必抓牢产品壳体，避免产品部件掉落，否则有导致受伤的危险！
- 请严格按照产品要求的储存与运输条件进行储存与运输，否则有导致产品损坏的危险。
- 避免在水溅雨淋、阳光直射、强电场、强磁场、强烈振动等场所储存与运输。
- 避免产品储存时间超过3个月，储存时间过长时，请进行更严密的防护和必要的检验。
- 请将产品进行严格包装后再进行车辆运输，长途运输时必须使用封闭的箱体。
- 严禁将本产品与可能对本产品构成影响或损害的设备或物品一起混装运输。

设计时

DANGER

- 请务必设计安全电路，在软件中加入出错处理程序，保证当外部电源掉电或本产品故障时，本产品依然处于安全状态。
- 超过额定负载电流或者负载短路等导致长时间过电流时，本产品可能冒烟或着火，应在外部设置保险丝或断路器等安全装置。

WARNING

- 本产品的继电器、晶体管等输出单元损坏时，会使其输出不受控制，可能长期处于为ON或OFF状态。
- 本产品设计应符合环境规格中过电压等级要求，其电源系统级应有防雷保护装置，确保雷击过电压不施加于本产品的电源输入端或信号输入端、控制输出端等端口，避免损坏设备。
- 确保本产品与其相关设备的通信故障不会造成产品功能异常，避免人身伤害或设备损坏。

CAUTION

请勿在触摸面板上设计可能导致操作员人身伤害或设备损坏的开关，请单独设计执行重要操作的开关，否则错误输出或故障可能引发事故。

安装时

DANGER

只有受过电气设备相关培训，具有电气知识的专业人员才能操作。严禁非专业人员操作!

WARNING

- 安装前请务必仔细阅读产品手册和安全注意事项!
- 请勿在强电场或强电磁波干扰的场所安装本产品!
- 进行安装作业前，请确保安装位置的机械强度足以支撑设备重量，否则会导致机械危险。
- 进行安装作业前，请确保安装环境符合环境规格要求，否则可能导致产品损坏。
- 进行安装作业时，请勿穿着宽松的衣服或佩戴饰品，否则可能会有触电的危险!
- 将产品安装到封闭环境（如机柜内或机箱内）中时，请用冷却装置（如冷却风扇或冷却空调）充分冷却，以满足安装环境要求，否则可能导致产品过热或火灾。
- 严禁改装本产品!
- 严禁拧动产品零部件及元器件的固定螺栓和红色标记的螺栓!
- 本产品应安装在室内柜体或终端设备中，柜体或终端设备需要提供相应的防火外壳、电气防护外壳和机械防护外壳等防护装置，防护等级应符合相关IEC标准和当地法律法规要求。
- 在需要安装变压器等强电磁波干扰的设备时，请安装屏蔽保护装置，避免本产品出现误动作!
- 请将产品安装在金属等阻燃物体上，勿使易燃物接触产品或将易燃物附着在产品上，否则会有引发火灾的危险。
- 不支持热插拔的产品在拆装时，必须将系统使用的外部供应电源全部断开之后再执行操作。如果未全部断开电源，有可能导致触电或产品故障及误动作。

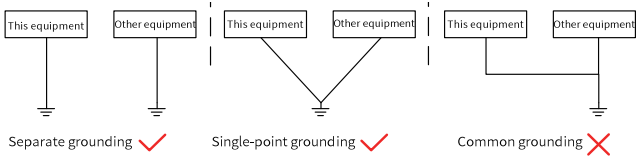
CAUTION

- 进行安装作业时，请用布或纸等遮住产品顶部，以防止钻孔时的金属屑、油、水等异物进入产品内部，导致产品故障。作业结束后，请拿掉遮盖物，避免遮盖物堵住通风孔影响散热，导致产品异常发热。
- 进行安装作业时，应使本产品与各自的连接器紧密连接，将本产品连接挂钩牢固锁定。如果本产品安装不当，可能导致误动作、故障及脱落。

接线时

DANGER

- 只有受过电气设备相关培训，具有电气知识的专业人员才能操作。严禁非专业人员操作！
- 接线前，请切断所有设备的电源。切断电源后设备内部电容有残余电压，请至少等待产品上警告标签规定的时间再进行接线等操作。测量主回路直流电压，确认处在安全电压之下，否则会有触电的危险。
- 请在切断电源的状态下进行接线作业、拆产品外罩或触碰电路板，否则会有触电的危险。
- 请务必保证设备和产品的良好接地，否则会有电击危险。 接地宜采用单独接地或单点接地，不可采用公共接地。



- 线缆端子应做好绝缘，确保线缆安装到端子台后，线缆之间的绝缘距离不会减少。否则会导致触电或者设备损坏。
- 接线作业结束后进行通电、运行时，必须安装产品附带的端子盖。如果未安装端子盖，可能导致触电。

WARNING

- 严禁将输入电源连接到设备或产品的输出端，否则会引起设备损坏，甚至引发火灾。
- 接线时使用到的线缆必须符合相应的线径和屏蔽等要求，使用屏蔽线缆的屏蔽层需要单端可靠接地！
- 请按照手册中规定的紧固力矩进行端子螺丝紧固，紧固力矩不足或过大，可能导致连接部分过热、损坏，引发火灾危险。
- 接线完成后，请确保所有线缆接线正确，产品内部没有掉落的螺钉、垫片或裸露线缆，否则可能有触电危险或损坏产品。

CAUTION

- 请遵守静电防护措施（ESD）规定的步骤，并佩戴静电手环进行接线等操作，避免损坏设备或产品内部的电路。
- 对控制回路接线时，请使用双绞屏蔽线，将屏蔽层连接到产品的接地端子上进行接地，否则会导致产品动作异常。

上电时

DANGER

- 只有受过电气设备相关培训，具有电气知识的专业人员才能操作。严禁非专业人员操作！
- 上电前，请确认产品安装完好和接线牢固。
- 上电前，请确认电源符合产品要求，避免造成产品损坏或引发火灾！
- 严禁在通电状态下打开产品柜门或产品防护盖板、触摸产品的任何接线端子、拆卸产品的任何装置或零部件，否则可能导致人员受伤或死亡！

WARNING

接线作业完成后，请进行产品试运行，确认产品能够安全动作，否则可能导致人员受伤或设备损坏。

运行时

DANGER

- 严禁非专业人员进行产品运行，否则会有导致人员受伤或死亡危险！
- 严禁在运行状态下触摸设备的任何接线端子、拆卸设备和产品的任何装置或零部件，否则有触电危险！

WARNING

- 严禁触摸设备外壳、风扇或电阻等以试探温度，否则可能引起灼伤！
- 运行时避免其他物品或金属物体等掉入设备中，否则可能引起火灾或产品损坏！
- 运行时请勿将带电物体接触产品金属外壳，否则可能引起火灾或产品损坏！

CAUTION

- 请严格按照产品要求的工作环境进行运行，否则可能导致产品故障或损坏。
- 在使用过程中要注意对HMI面板进行保护，使用手进行触摸操作，避免使用工具去触摸显示面板，对外力过大造成面板损坏由用户负责。

安全性建议

- 在操作人员直接接触机械部分的位置，如装载和卸载机械工具的位置，或者机械自动运转的地方，必须仔细考虑现场手动装置或其他备用手段的功能，它需要独立于本产品之外，可以启动或者中断系统的自动运行。
- 如需在系统运转的情况下修改程序，须考虑采用加锁或其它防护措施，确保只有获授权的人员才能进行必要的修改。

使用电池时

WARNING

- 请勿更换不符合产品要求的电池，否则可能引起爆炸，火灾，人员受伤或死亡！
- 请勿将电池丢入火中或热炉中，请勿机械压碎或切割电池，否则可能引起爆炸，火灾，人员受伤或死亡！
- 请勿将电池放在极端高温的环境中，否则可能引发爆炸，火灾，人员受伤或死亡！
- 请勿吞食电池，有化学灼伤危险。
- 若不小心吞入纽扣电池，请立即就医，否则在 2 小时内将造成人体内部严重灼伤，并可能导致死亡。

CAUTION

- 请将电池远离儿童。
- 如果电池仓未关紧，请停止使用本产品并远离儿童。

保养时

DANGER

- 只有受到过电气设备相关培训，具有充分电气知识的专业维护人员才能进行产品的保养！
- 严禁在通电状态下进行设备保养，否则有触电危险！
- 切断所有设备的电源后，请至少等待产品上警告标签规定的时间再进行设备保养等操作。
- 清洁本产品或重新紧固端子排上的螺栓、连接器安装螺栓时，必须完全断开系统使用的外部供应电源。否则可能导致触电。
- 拆装本产品或进行线缆的连接或拆除时，必须先将系统使用的外部供应电源全部断开。如果未全部断开，有可能导致导致触电或误动作。

WARNING

请按照设备维护和保养要求对设备和产品进行日常和定期检查与保养，并做好保养记录。

维修时

DANGER

- 只有受到过电气设备相关培训，具有充分电气知识的专业维护人员才能进行产品的维修！
- 严禁在通电状态下进行设备维修，否则有触电危险！
- 切断所有设备的电源后，请至少等待产品上警告标签规定的时间再进行设备检查、维修等操作。

维修时
WARNING • 请按照产品保修协议进行设备报修。 • 当保险丝熔断、断路器跳闸或漏电断路器（ELCB）跳闸时，请至少等待产品上警告标签规定的时间后，再接通电源或进行机器操作，否则可能导致人员伤亡及设备损坏。 • 设备出现故障或损坏时，务必由专业人员按照维修指导对设备和产品进行故障排除和维修，并做好维修记录。 • 请按照产品易损件更换指导进行更换。 • 请勿继续使用已经损坏的机器，否则可能会造成人员伤亡或产品更大程度的损坏。 • 更换设备后，请务必重新进行设备接线检查与参数设置。

报废时
WARNING • 请按照国家有关规定与标准进行设备、产品的报废，以免造成财产损失或人员伤亡！ • 报废的设备与产品请按照工业废弃物处理标准进行处理回收，避免污染环境。 • 请按工业废弃物处理；废弃电池时应根据各地区制定的法令单独进行。

■ 安全标识

为了保障安全作业，请务必遵守粘贴在设备上的安全标识，请勿损坏、剥下安全标识。安全标识说明如下：

安全标识	内容说明
	• 使用产品之前请仔细阅读安全相关手册和使用说明，否则会有人员伤亡或产品损坏的危险！ • 在通电状态下和电源切断后10分钟内，请勿触摸端子部分或拆下盖板，否则会有电击危险！ • 产品运行过程中表面会产生高温，请勿触摸此高温位置，否则可能导致烫伤！

1.2 Industrial Information Security

The product provides an interface to connect to the network and transmits data through the network interface. To protect factories, systems, machines, and networks from cyber attacks and ensure safe operation, a proper industrial information security protection mechanism must be implemented.

Customers are responsible for providing and maintaining a secure connection between the product and their network or any other network to protect their

factories, systems, machines, and networks from unauthorized access. The system or machine can be connected to the enterprise network or the Internet only when secure connections are establishes and appropriate security measures are taken (such as using anti-virus software or installing firewalls).

Inovance continuously develops and improves products and solutions to improve safety. It is strongly recommended to keep your products updated and always use the latest version.



Tampering with software (such as viruses, Trojans, and Worms) can lead to unsafe drive state, which can put the device in an unsafe operation state. This may result in death, serious injury, and property damage. Observe the following strictly.

- Always use the latest software version. If the product version is no longer supported or the latest version of the program is not applied, customers are at increased risk of cyber-attacks.
- Take proper protection measures (including but not limited to deploying antivirus software, firewall, WAF, IPS/IDS, situational awareness system, ID verification, and data encryption) to prevent files in the mobile storage device from being damaged by malware and protect products, networks, systems, and interfaces from unauthorized access, disturbance, intrusion, data disclosure, or information theft.
- Check all safety-related interfaces and settings after commissioning.

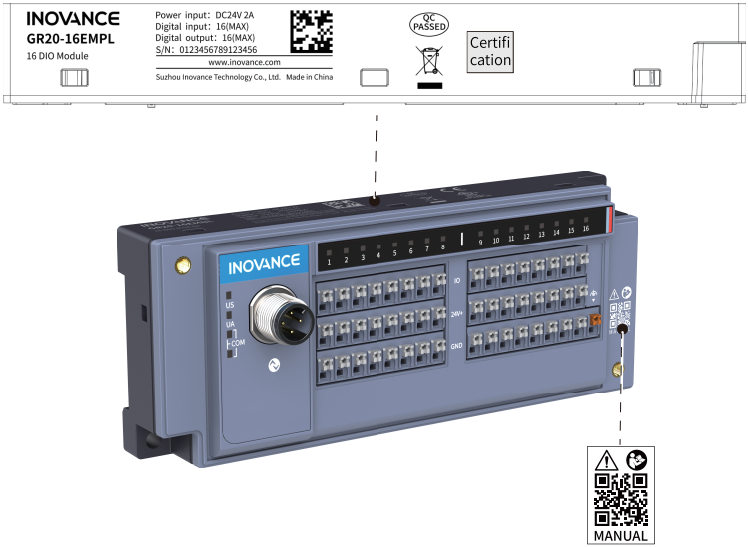
2 Product Information

2.1 Model and Nameplate

G R 20 - 16 E MP L

① ② ③ ④ ⑤ ⑥ ⑦

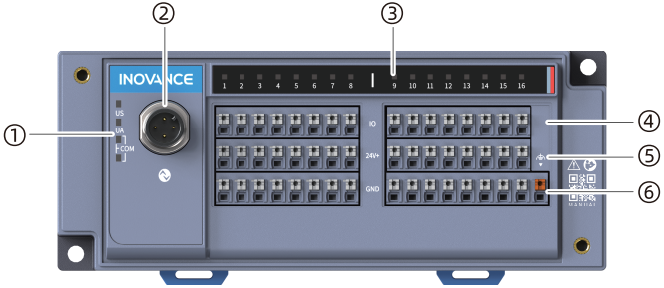
① **Product family** G: Inovance controller common module	⑤ **Module type** E: Logic I/O expansion module
② **Product type** R: Remote module	⑥ **I/O type** MP: Each channel can be configured as either a PNP input or output.
③ **Series** 20: 20 series	⑦ **Connection type** L: IO-Link
④ **Number of I/O channels** 16: 16 channels	-



Based on the above description of model number and nameplate, the relevant ordering data of this product is described in the table below.

Model	Description	Product code	Applicable model
GR20-16EMPL-INT	GR20 series transistor PNP module with configurable 16 digital outputs and inputs	01441081	Class A I/O-Link master

2.2 Components



No.	Name	Description			
①	Status indicator	US	System power supply indicator	Green	• Solid on: Voltage normal • Single flashing: 11 V < voltage < 18 V • Flashing: Voltage > 30.2 V • Off: No power supply is provided.
		UA	Activator power supply indicator	Green	• Solid on: Voltage normal • Single flashing: 11 V < voltage < 18 V • Flashing: Voltage > 30.2 V • Off: No power supply is provided.
		COM	IO-Link communication indicator	Green/ Red	• Steady green: No communication • Slow flashing green: The IO-Link communication is normal. • Slow flashing red: The module has reported a fault. • Off: The module has no voltage.
②	IO-Link port	It is used for IO-Link data transmission. For details, see *"4.2 Terminal Assignment" on page 34*			
③	I/O indicator	1 to 16	I/O signal indicator	Green	• Solid on: State 1 • Off: State 0
④	I/O Terminal	I/O	16 configurable terminals		

No.	Name	Description			
⑤	24 V terminal	24 V+	24 VDC power supply	-	-
⑥	Grounding terminal	• GND (gray) • PE (orange)	-	-	-

Note

- Single flashing: The indicator is on for 200 ms and off for 1000 ms and repeats this cycle.
- Flashing: The indicator is on for 200 ms and off for 200 ms and repeats this cycle.
- Slow flashing: The indicator is on for 900 ms and off for 100 ms and repeats this cycle.

2.3 Technical Specifications

■ General specifications

Item	Specification
IP rating	IP20
Dimensions (W x H x D)	150 mm x 60 mm x 29 mm
Weight	Approx. 152 g

■ Power supply specifications

Item	Specification
Rated voltage of US power supply	24 VDC (18 VDC to 30.2 VDC)
Maximum current of US power supply	2 A (@24 V)
US reverse polarity protection	Supported
Undervoltage detection	Supported

Item	Specification
Rated voltage of UA power supply	24 VDC (18 VDC to 30.2 VDC, common ground with US)
Maximum current of UA power supply	2 A (@24 V)
UA reverse polarity protection	Supported
Undervoltage detection	Supported

■ Input specifications

Item	Specification
Input type	Digital input
Input mode	PNP
Number of input channels	16
Input voltage class	24 VDC (18 VDC to 30.2 VDC)
Input current (typical)	4 mA (typical@24 V)
ON-state voltage	> 15 VDC
OFF-state voltage	< 5 VDC
Hardware response time (ON/OFF)	100 µs/100 µs
Input impedance	6.6 kΩ to 7.6 kΩ
Isolation	No
Input status display	When the drive state is inputted, the input indicator turns on.

■ Output specifications

Item	Specification
Output type	Digital output; transistor output
Output mode	PNP
Output channel	16
Output voltage class	24 VDC (18 VDC to 30.2 VDC)

Item	Specification
Output load (resistive load)	0.5 A/channel; 2 A/module
Output load (inductive load)	7.2 W/channel; 12 W/module
Output load (lamp load)	5 W/channel; 9 W/module
Hardware response time (ON/OFF)	100 µs/100 µs
OFF-state leakage current	10 uA
Switching frequency	Resistive load: 100 Hz; inductive load: 0.5 Hz; lamp load: 10 Hz
Isolation	No
Output action display	The output indicator turns on when the DO circuit is in the driving state.

■ Software specifications

Item	Specification
Input/output configuration	The I/O channel of the module can be configured as input or output based on the actual application.
Output state mode during fault stop	Output zero, last value, or preset value
Preset output value during fault stop	0 or 1
State reverse	The I/O channel state of the module can be inverted based on the actual I/O channel state. For example, assume that the external input is 0x00. When the state reverse function is disabled, the input process data is 0x00. When the state reverse function is enabled, the input process data is 0xFF.
Output status feedback	When the module is used for output, the output status is fed back to the master through aperiodic data.
Undervoltage detection	When the voltage of the activator power supply and system power supply is below 18 V, the status is fed back to the master through aperiodic data. bit2 and bit3 indicate the activator power supply state, and bit0 and bit1 indicate the system power supply state.

Item	Specification
Module type and basic information reading	When the master communicates with the slave normally, the master can read the basic information of the slave through the index. The basic information includes the Vendor ID, Device ID. Vendor name, Vendor text, Product name, Product ID, Hardware Revision, and Firmware Revision.
Mode configuration	The 0x49 parameter allows you to configure the work mode of the module. Simple mode: Parameter configurations are not required and the parameter configuration function is invalid. All I/O channels can be used as inputs or outputs. Expert mode: All parameters can be configured. By default, 16 inputs are configured. The I/O channels can be quickly configured as 8 inputs and 8 outputs or 16 outputs.
Diagnostic information acquisition (application layer)	Errors, alarms, and maintenance data are obtained through events and are sent from the slave to the master.
Diagnostic information acquisition (link layer)	The diagnostic information is acquired through aperiodic data.

2.4 Environmental Specifications

Item	Operation specification	Tranport specification	Storage specification
IP rating	IP20		
Pollution degree	2		
Overvoltage category	II		
Temperature	-20°C to +55°C	-40°C to +70°C	-25°C to +70°C
Humidity	10% to 95% RH, non-condensing		

Item		Operation specification	Tranport specification	Storage specification
Vibration	Frequency	5 Hz to 200 Hz	2 M2	1 M2
	Displacement	3.5 mm (direct installation) (< 9 Hz)		
	Acceleration	1 g (direct installation) (> 9 Hz)		
	Direction	3 axial directions		
Impact (collision)		15 g, 11 ms, half sine wave, 3 axial directions		
Altitude/air pressure		0 m to 2000 m	0 m to 3000 m (> 70 kPa)	

3 Mechanical Installation

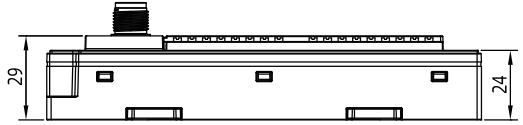
3.1 Installation Precautions

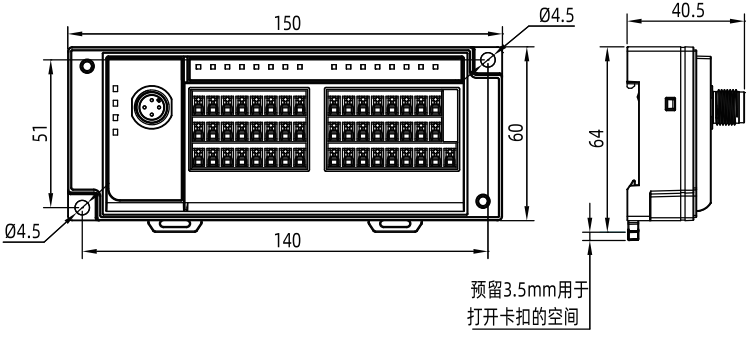
- Make sure the module is powered off before installing or removing.
- Do not hot swap the modules. Otherwise, the modules may be damaged by overcurrent or overvoltage, and the communication interface module or PLC may be subject to restart, user data loss or corruption.
- Do not drop or shock the housing or terminals of the module to avoid damage.

3.2 安装尺寸

■ 模块

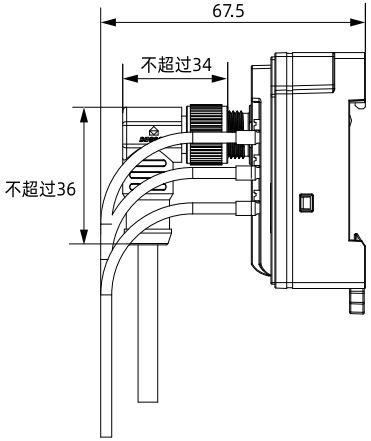
模块安装参考尺寸，如下图所示（单位为mm）。





■ 连接线缆

M12A型4芯母弯头IO-Link线缆连接时参考尺寸，如下图所示（单位为mm）。



Note

如自行接线，请注意IO-Link线缆连接时高度不得高于34mm，如上图所示，否则可能导致无法正确安装防尘罩（GR20-FCZ）。

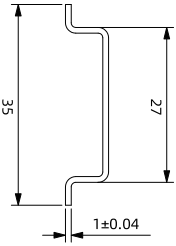
3.3 安装模块

■ 模块安装

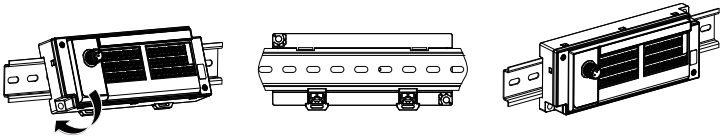
模块支持DIN导轨和螺钉安装。

- **DIN导轨安装**

  DIN导轨需符合IEC 60715标准（35mm宽，1mm厚），尺寸信息如下图所示，单位为（mm）。

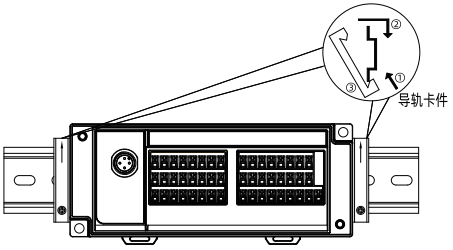


将模块顶部卡槽挂在DIN导轨上，向后旋转模块，安装到位后有明显的卡合声音，如下图所示。



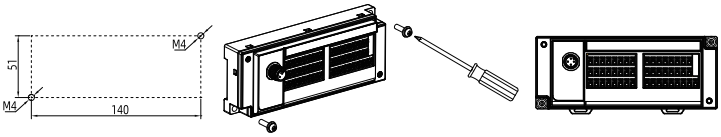
说明：模块安装完成后锁扣会自动向上活动进行锁紧，若锁扣没有向上活动，需向上按压锁扣顶部锁紧导轨。

在模块的两端分别安装一个DIN导轨卡件。安装导轨卡件时，将导轨卡件底部钩住导轨的底部后转动导轨卡件，使导轨卡件上端钩住导轨上端，最后紧固螺钉锁住导轨卡件，如下图所示。



- **螺钉安装**

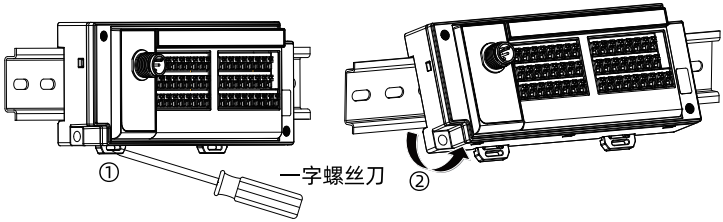
  螺钉、垫片（可选）要求：M4螺钉长度≥14mm，垫片直径≤9mm；螺钉安装孔要求：140mm × 51mm的对角孔，安装孔尺寸和安装示意如下图所示。



■ 模块拆卸

- **DIN导轨拆卸**

  使用一字螺丝刀或类似工具向下撬动导轨锁扣，再将模块向外旋出DIN导轨，如下图所示。



- **螺钉拆卸**

  使用螺丝刀将两颗M4螺钉旋出，取下模块。

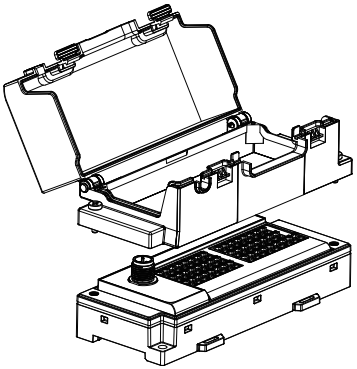
3.4 安装防尘罩（可选）

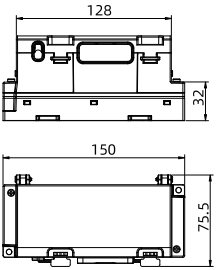
本产品可选配GR20-FCZ系列防尘罩配件，相关订货数据如下表所示：

型号	描述	整机编码
GR20-FCZ	GR20-FCZ系列防尘罩配件	01480038

防尘罩具有防尘、防飞溅和防磕碰的作用，采用透明PC材质，可随时观察模块的运行状态，美观大方，适用于安装在非标设备、智能产线等工业现场。

防尘罩安装在模块上方，预留IO-Link和输入输出等线缆的出线空间，可免工具翻转防尘罩上盖，免拆盖维护，易用性强。产品示意图与尺寸规格如下图所示。

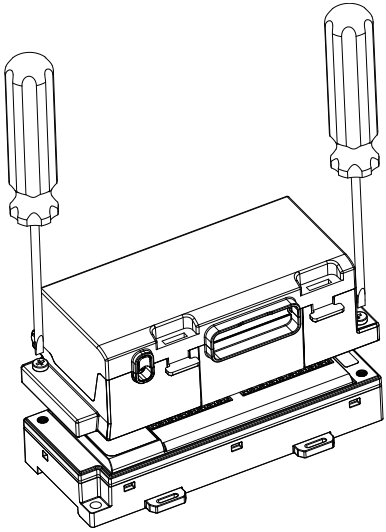




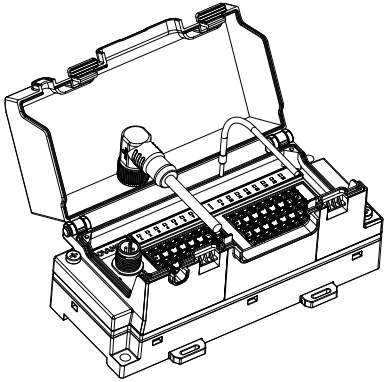
防尘罩自带两颗松不脱螺钉，支持两种安装场景：安装前未接线和安装前已接线。

■ 安装前未接线

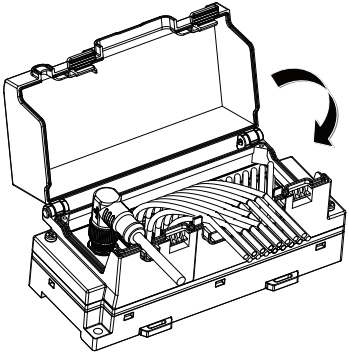
1. 使用十字螺丝刀将螺钉与模块螺孔匹配锁紧（扭力：5kgf.cm），如下图所示。

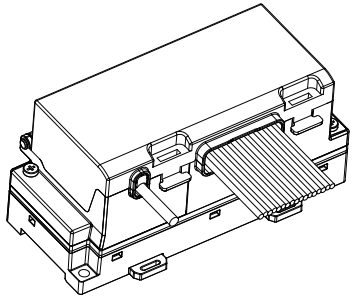


2. 连接线缆（IO-Link通信、IO、24V电源+和接地），如下图所示。



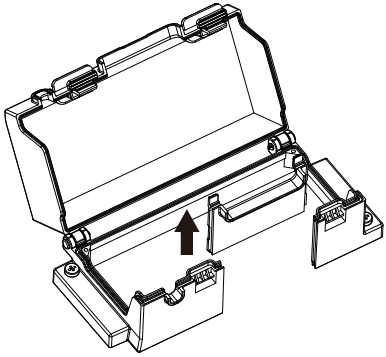
3. 将防尘罩上盖朝箭头方向旋转并扣住底壳，安装示意如下图所示。



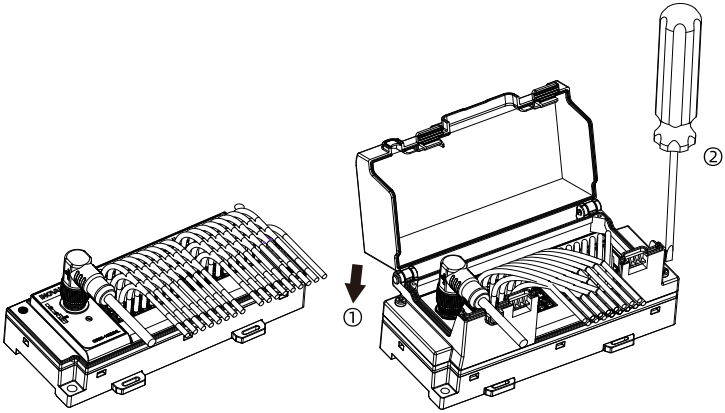


■ 安装前已接线

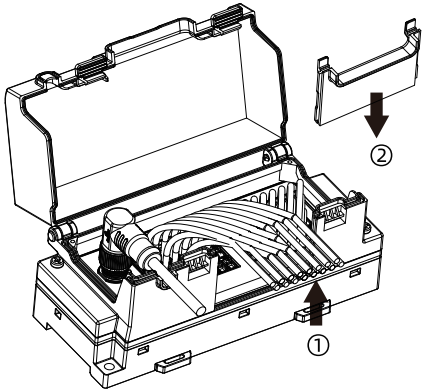
1. 按箭头所示方向取出防尘罩侧盖，如下图所示。



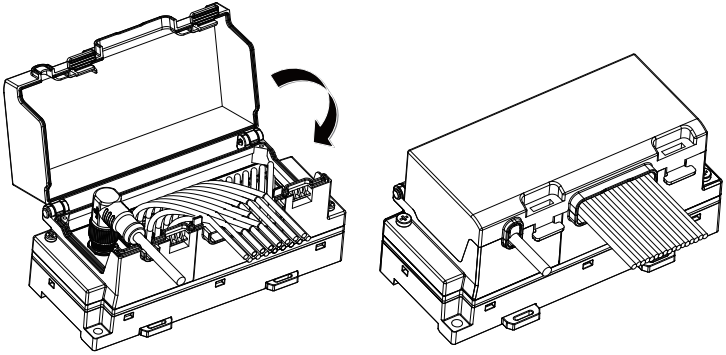
2. 防尘罩通过侧盖的开口穿过IO信号线与通信电缆并组装固定在模块上，并使用十字螺丝刀将2颗螺钉与模块螺孔匹配锁紧（扭力：5kgf.cm），如下图所示。



3. 将IO、24V电源+和接地线缆从插槽中托起，侧盖插进防尘罩的插槽中，再将线缆整理放在侧盖的缺口内。

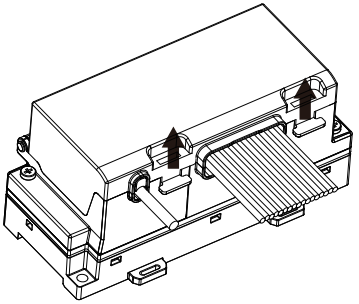


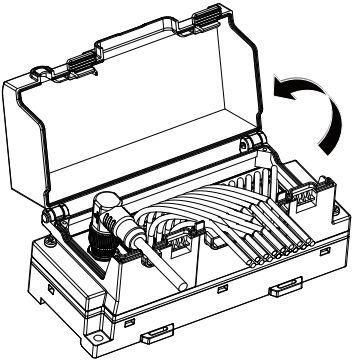
4. 将防尘罩上盖朝箭头方向旋转并扣住底壳，如下图所示。



■ 维护接线

当需要维护接线时，往上提起两侧卡扣，打开防尘罩上盖，此时可维护接线。





4 Electrical Installation

4.1 线缆选型

■ IO-Link线缆

GR20-FCZ需要搭配汇川线缆或者选择组装式接头CON-M12AFL4-L，线缆需采用M12A型4芯母弯头线缆，相关订货数据如下表所示：

型号	描述	长度	物料编码
CAB-M12AMS4-M12AFL4-3	线缆组件-IO-Link线缆-公直头-22AWG-黑色-母弯头-85°C（IO-Link主站连接IO-Link从站的线缆）	3m	15310142
CAB-M12AMS4-M12AFL4-5		5m	15310184
CAB-M12AMS4-M12AFL4-8		8m	15310230
CAB-M12AMS4-M12AFL4-10		10m	15310183
CAB-M12AMS4-M12AFL4-15		15m	15310182
CAB-M12AMS4-M12AFL4-3-T-taiyo	线缆组件-IO-Link线缆-公直头-22AWG-黑色-母弯头-85°C-高柔线缆，可300～500万次（IO-Link主站连接IO-Link从站的线缆（高柔线缆，可进拖链））	3m	15310232
CAB-M12AMS4-M12AFL4-5-T-taiyo		5m	15310231
CAB-M12AMS4-M12AFL4-8-T-taiyo		8m	15310229
CAB-M12AMS4-M12AFL4-10-T-taiyo		10m	15310228
CAB-M12AMS4-M12AFL4-15-T-taiyo		15m	15310227

Note

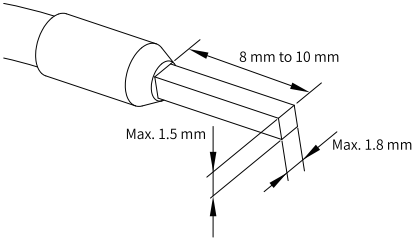
If you have additional requirements for IO-Link cables, contact Inovance for customization.

■ IO/24V电源+/接地线缆

以下表中线耳线径仅做参考，可根据实际使用进行合理计算，另行调整。

配套物料名称	适配线径		KST		苏州源利	
	国标/mm^2	美标/AWG	型号	压线钳	型号	压线钳
管型线耳	0.3	22	E0308	KST2000L	0308	YAC-5
	0.5	20	E0508		0508	
	0.75	18	E7508		7508	
	1.0	18	E1008		1008	

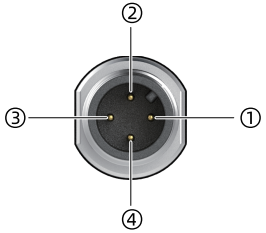
如使用其他管型线耳，请将其压接到绞线，形状和尺寸要求如下图所示。



4.2 Terminal Assignment

■ IO-Link port pins

The IO-Link port is an M12A male port. The following figure describes pin numbers and the following table describes pins in details.

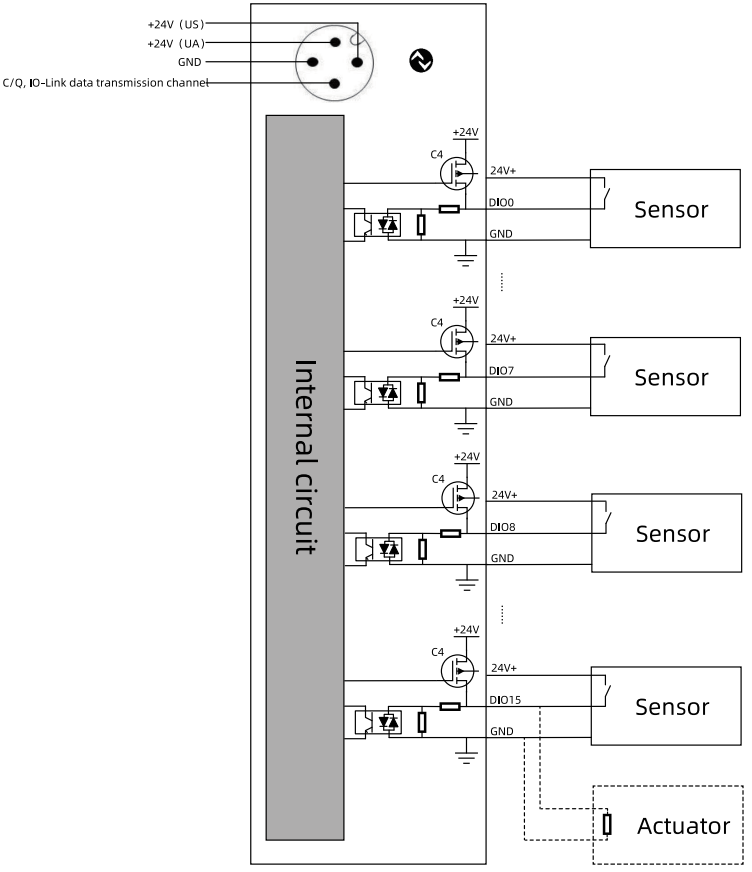


No.	Description
①	System and sensor power supply US, +24V
②	Activator power supply UA, +24V

No.	Description
③	GND
④	C/Q, IO-Link data transmission

4.3 Terminal Wiring

When the sensor is connected, configure the port as an input channel. When the activator is connected, configure the port as an output channel.


+24V (US)
+24V (UA)
GND
C/Q, IO-Link data transmission channel
Internal circuit
+24V
C4
24V+
DIO0
GND
Sensor
+24V
C4
24V+
DIO7
GND
Sensor
+24V
C4
24V+
DIO8
GND
Sensor
+24V
C4
24V+
DIO15
GND
Sensor
Actuator

Note

本产品的IO-Link端口使用M12-A-coded接口，该接口的线缆拧装力矩推荐值为0.5N·m，最大0.8N·m，如超过1.0N·m将存在破坏电路板的风险。

Note

该模块支持汇川的“ADP”（自适应DIO）技术。根据接线连接的设备类型：

- 连接DI设备时：直接在PLC程序中为“IO_Link_CHN_input byte”变量赋值即可读取输入状态。
- 连接DO设备时：直接在PLC程序中为“IO_Link_CHN_output byte”变量赋值即可控制输出状态。

ADP技术自动适配端口功能，用户无需更改硬件配置或跳线，仅需在程序中访问对应的变量。

5 Program Commissioning

The configuration and commissioning are described when the module is used together with the GS20-ECT-8L high-protection IO-Link master module and the medium-sized PLC of Inovance. For details, see the "Configuration and Commissioning" section in the "GS20-ECT-8L High Protection IO-Link Master Module User Guide".

6 Troubleshooting

错误代码及含义请参见下表。

错误代码	类型	名称	解决措施
0x4210	Warning	温度超限	工作环境温度较高，请降低温度使用
0x4220	Warning	温度不足	工作环境温度较低，请提升温度使用
0x5011	Error	掉电保存数据丢失	配置参数保存失败，重新修改配置参数
0x5100	Error	设备供电错误	模块UA电源未供电，使能主站PIN2供电或进行外部UA供电
0x5110	Warning	系统电源电压超限	模块US电源供电高于设备正常工作电压，降低电源US供电电压
0x5111	Warning	系统电源电压欠载	模块US电源供电低于设备正常工作电压，提高电源US供电电压
0x7710	Error	短路	模块存在短路，请检查外部接线
0x6320	Error	参数错误	模块参数配置有误，根据产品数据正确配置
0x6321	Error	缺少参数	专家模式下，配置为输出检测到输入信号，修改0x41输入输出配置参数与实际使用一致

7 Object List

7.1 Protocol Stack Data

Baud rate	COM2 (38.4 kbaud)
Minimum cycle time for process data	3 ms
IO-Link version	1.1.3
Vendor ID	0x0659
Device ID	-

7.2 Process Data

Input data	Byte	0							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1	DIO0
	Byte	1							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO15	DIO14	DIO13	DIO12	DIO11	DIO10	DIO9	DIO8
-	Input data refers to the data sent from the slave to the master.								

Output data	Byte	0							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1	DIO0
	Byte	1							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO15	DIO14	DIO13	DIO12	DIO11	DIO10	DIO9	DIO8
-	Output data refers to the data sent by the master to the slave.								

7.3 Product Data

Index	Sub-index	Object name	Length	Range	Default value
0x07	-	Vendor ID	2 bytes	-	0x0659
0x08	-	Device ID	2 bytes		0xF42D10
0x10	-	Vendor name	8 bytes		INOVANCE
0x11	-	Vendor text	16 bytes		www.inovance.com
0x12	-	Product name	21 bytes		GR20-16EMNL
0x13	-	Product ID	7 bytes		01440355
0x14	-	Product text	23 bytes		GL20-16DIO:IO Sensor/Actuator Hub IP20 16Bit
0x16	-	Hardware Revision	4 bytes		1.0.0.0
0x17	-	Firmware Revision	4 bytes		1.0.0.0
0x40	0	Inversion	2 bytes	0x0000 to 0xFFFF	0x0000
0x41	0	Configuration Input/Output	2 bytes	0x0000 to 0xFFFF	0x0000
0x42	0	DIO0-DO07 Safe State	2 bytes	0x0000 to 0xFFFF	0x0000
0x43	0	DIO8-DIO15 Safe State	2 bytes	0x0000 to 0xFFFF	0x0000
0x44	0	Under Voltage	2 bytes	0x0000 to 0xFFFF	0x0000
0x47	0	Feedback	2 bytes	0x0000 to 0xFFFF	0x0000
0x48	0	Temperature detection	2 bytes	0x0000 to 0xFFFF	0x0050
0x49	0	Mode configurable	2 bytes	0x0000 to 0xFFFF	0x0000

Input data	Byte	0							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1	DIO0
	Byte	1							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO15	DIO14	DIO13	DIO12	DIO11	DIO10	DIO9	DIO8

Output data	Byte	0							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1	DIO0
	Byte	1							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO15	DIO14	DIO13	DIO12	DIO11	DIO10	DIO9	DIO8

0x40: Status reverse (R/W)	Byte	0							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1	DIO0
	Default	0	0	0	0	0	0	0	0
	Byte	1							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO15	DIO14	DIO13	DIO12	DIO11	DIO10	DIO9	DIO8
	Default	0	0	0	0	0	0	0	0
	0 = Disable reverse; 1 = Enable reverse								

0x41: Input and output configuration (R/W)	Byte	0							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1	DIO0
	Default	0	0	0	0	0	0	0	0
	Byte	1							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO15	DIO14	DIO13	DIO12	DIO11	DIO10	DIO9	DIO8
	Default	0	0	0	0	0	0	0	0
	0: Input; 1: Output								

0x42: Action of DIO0 to DIO7 (R/W) when a fault occurs	Byte	0							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO3		DIO2		DIO1		DIO0	
	Subindex	4		3		2		1	
	Default	00		00		00		00	
	Byte	1							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO7		DIO6		DIO5		DIO4	
	Subindex	8		7		6		5	
	Default	00		00		00		00	
	00: Low level; 01: High level; 10: Last state; 11: Reserved								

0x43: Action of DIO8 to DIO15 (R/W) when a fault occurs	Byte	0							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO11		DIO10		DIO9		DIO8	
	Subindex	4		3		2		1	
	Default	00		00		00		00	
	Byte	1							
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO15		DIO14		DIO13		DIO12	
	Subindex	8		7		6		5	
	Default	00		00		00		00	
	00: Low level; 01: High level; 10: Last state; 11: Reserved								

0x44: System monitoring (R)	Byte	0						
	Bit	7	6	5	4	3	2	1	0
	Pin	-	-	-	-	-	-	-	T
	Default	-	-	-	-	-	-	-	0
	Byte	1						
	Bit	7	6	5	4	3	2	1	0
	Pin	-	-	-	-	UA		US	
	Default	-	-	-	-	0	0	0	0
	US: System power supply voltage. 00: Normal; 01: Below 18 VDC; 10: Above 30.2 VDC; 11: Reserved.								
	UA: Actuator power supply voltage. 00: Normal; 01: Below 18 VDC; 10: Above 30.2 VDC; 11: Reserved.								
	T: MCU temperature. 0: MCU temperature below setpoint; 1: MCU temperature above setpoint.								
	-: Reserved								

0x47: Output state feedback (R)	Byte	0						
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1	DIO0
	Subindex	8	7	6	5	4	3	2	1
	Default	0	0	0	0	0	0	0	0
	Byte	1						
	Bit	7	6	5	4	3	2	1	0
	Pin	DIO15	DIO14	DIO13	DIO12	DIO11	DIO10	DIO9	DIO8
	Subindex	16	15	14	13	12	11	10	9
	Default	0	0	0	0	0	0	0	0
	0: 0 is output; 1: 1 is output.								

0x48: MCU temperature setting (R/W)	Byte	1								0							
	Bit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pin	-		-		-		-		-		-		-		-	
	Subindex	-		-		-		-		-		-		-		-	
	Default	0x50															
	Function	Set MCU operating temperature detection upper limit (not storage temperature): 120°C															

0x49: Mode configuration (R/W)	Byte	0						
	Bit	7	6	5	4	3	2	1	0
	Pin	-	-	-	-	-	0016	0808	Mode configuration
	Default	-	-	-	-	-	0	0	0
	Byte	1							
	Bit	7	6	5	4	3	2	1	0
	Pin	-	-	-	-	-	-	-	-
	Default	-	-	-	-	-	-	-	-
	Mode configuration: 0 = Simple mode; 1 = Expert mode For pin 0808, 0 indicates quick configuration is disabled; 1 indicates quick configuration as 8 outputs and 8 inputs. This feature is valid only in expert mode. Pins 1 to 8 are set to the input mode, and Pins 9 to 16 are set to the output mode. When pin 0808 is configured, the configuration parameter 0x41 becomes invalid. For pin 0016, 0 indicates quick configuration is disabled; 1 indicates quick configuration as 16 outputs. This feature is valid only in expert mode. Pins 1 to 16 are set to the output mode. When pin 0016 is configured, the configuration parameter 0x41 becomes invalid. All parameters are available in expert mode, while in simple mode, parameters 0x41 to 0x43 are unavailable. If the configuration is not set as mentioned above, a 0x6320 error is reported, requiring you to revert to the last valid configuration.							

8 Appendix: Version Matching Information

模块固件和通信接口模块固件请联系汇川技术人员获取，InoProShop软件从官网GL20系列产品页面“软件与调试工具”下方获取，具体链接请参见*www.inovance.com*，版本匹配说明如下表所示。

模块固件版本	InoProShop版本
1.3.0.0	V1.7.3 SP2及以上

Service and Support

Should you encounter a safety accident during the use or operation of the product, or face challenges in operating and maintaining the equipment, which remain unresolved after the relevant documentation is consulted, we provide multiple channels to ensure prompt resolution:

- Channel #1: Contact service@inovance.com.
- Channel #2: Visit https://www.inovance.com/global to access document downloads, after-sales support, spare parts ordering, repair applications, and authenticity verification services.
- Channel #3: Download My Inovance app (https://zshc-eu.inovance.com/download-pc/) where you can access products info and documentation, and query product parameters.

We are committed to providing you with quick and professional technical support, and we look forward to your satisfaction and trust.