

MANUAL

**RocketLinx**

**ICRL-U-8M12-G60**



With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship".



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# 1. Safety Instructions

## 1.1. Warning

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### UNCONTROLLED MACHINE ACTIONS

To avoid uncontrolled machine actions caused by data loss, configure all the data transmission devices individually.

Before you start any machine that is controlled through data transmission, be sure to complete the configuration of all data transmission devices.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## 1.2. General Safety Instructions

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Improper usage of the device entails the risk of physical injury or significant property damage. The proper and safe operation of this device depends on proper handling during transportation, proper storage and installation, and careful operation and maintenance procedures.

- Before connecting any cable, read this document, and the safety instructions and warnings.
- Operate the ICRL-U-8M12-G60 with undamaged components exclusively.
- The ICRL-U-8M12-G60 is a potted device and there are not any serviceable components. In the event of a failure, turn off the supply voltage and contact Pepperl+Fuchs for return procedures.

## 1.3. Certified Usage

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Use the following guidelines:

- Use the ICRL-U-8M12-G60 only for the application cases described in the Pepperl+Fuchs product information, including this manual.
- Operate the product only according to the technical specifications.
- Connect to the product only components suitable for the requirements of the specific application case.

Operational environment:

- On the inside of vehicles
- On the inside of buildings

## 1.4. Installation Site Requirements

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- When you are selecting the installation location, make sure you observe the climatic threshold values specified in the technical data.
- Operate the device at the specified ambient temperature (temperature of the ambient air at a distance of 2 in (5 cm) from the device) and at the specified relative humidity exclusively.

- Use the device in an environment with a maximum pollution degree that complies with the specifications in the technical data. See *Technical Data* on Page 16 for more information.

**Note:** *Operation of the device in high humidity or condensing atmospheres is exclusively allowed when using recommended accessories with IP67 rating.*

## 1.5. Device Casing

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At ambient air temperatures > 140 °F (+60 °C): The surfaces of the device housing may become hot. Avoid touching the device while it is operating.

## 1.6. Qualification Requirements for Personnel

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Only allow qualified personnel to work on the device. Qualified personnel have the following characteristics:

- Qualified personnel are properly trained. Training as well as practical knowledge and experience make up their qualifications. This is the prerequisite for grounding and labeling circuits, devices, and systems in accordance with current standards in safety technology.
- Qualified personnel are aware of the dangers that exist in their work.
- Qualified personnel are familiar with appropriate measures against these hazards in order to reduce the risk for themselves and others.
- Qualified personnel receive training on a regular basis.

## 1.7. National and International Safety Regulations

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Verify that the electrical installation meets local or nationally applicable safety regulations.

## 1.8. Shielding Ground

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The overall shield of a connected shielded twisted pair cable is connected to the ground connection on the metal housing as a conductor.

Beware of possible short circuits when connecting a cable section with conductive shielding braiding.

## 1.9. Requirements For Connecting Electrical Wires

Before connecting the electrical wires, always verify that the requirements listed are complied with.

### 1.9.1. General Requirements for Connecting Electrical Wires

The following requirements apply without restrictions:

- The electrical wires are not connected to a power source.
- The cables used are permitted for the temperature range of the application case.
- Ground the device via the ground screw. Disconnect the grounding only after disconnecting all other cables.
- Exclusively use 60/75 °C (140/167 °F) or 75 °C (167 °F) copper (Cu) wire.
- The power supply cable to be connected is suitable for ambient air temperature of at least 212 °F (100 °C).
- The power supply complies with the requirements for a safety extra-low voltage (SELV) as per IEC/EN 60950-1.

### 1.9.2. Requirements for Connecting the Supply Voltage

The following requirements apply without restrictions:

All of the following requirements are complied with:

- The supply voltage corresponds to the voltage specified on the type plate of the device.
- The power supply conforms to over-voltage category I or II.
- The power supply has an easily accessible disconnecting device (for example a switch or a plug). This disconnecting device is clearly identified. So in the case of an emergency, it is clear which disconnecting device belongs to which power supply cable.
- The power supply cable is suitable for the voltage, the current and the physical load. Pepperl+Fuchs recommends a wire diameter of 0.5 mm<sup>2</sup> to 0.75 mm<sup>2</sup> (AWG20 up to AWG18).

The following requirements apply alternatively.

Requirements for Connecting the Supply Voltage	
<b>Relevant when the device is supplied via 1 voltage input</b>	
Alternative 1	The power supply complies with the requirements for a limited power source (LPS) as per EN 60950-1.
Alternative 2	Relevant for North America: The power supply complies with the requirements according to NEC Class 2.
Alternative 3	All of the following requirements are complied with: The power supply complies with the requirements for a safety extra-low voltage (SELV) as per IEC/EN 60950-1. Install a fuse suitable for DC voltage in the plus conductor of the power supply. Connect the minus conductor to the ground potential. If the minus conductor is not connected to the ground potential, also install an external fuse in the minus conductor. See the notes below.
<b>Relevant when the device is supplied via 2 voltage inputs</b>	
Alternative 1	The total voltage supply meets the requirements for a limited power source (LPS) as per EN 60950-1.

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Requirements for Connecting the Supply Voltage	
Alternative 2	Relevant for North America: The total voltage supply complies with the requirements as per NEC Class 2.
Alternative 3	All of the following requirements are complied with: The power supply complies with the requirements for a safety extra-low voltage (SELV) as per IEC/EN 60950-1. In both voltage inputs, install a fuse suitable for DC voltage in the plus conductor of the power supply. In both voltage inputs, connect the minus conductor to the ground potential. If the minus conductor is not connected to the ground potential, also install an external fuse in the minus conductor. See the note below.
<p><b>Note:</b> <i>Back-up fuse for each voltage input when supplied via 1 input.</i></p> <p>Nominal rating: 1 A ... 4 A Characteristic: slow blow</p> <p><b>Note:</b> <i>Back-up fuse for each voltage input when supply is via 2 inputs.</i></p> <p>Nominal rating: 1A ... 2 A Characteristic: slow blow</p>	

### 1.9.3. Relevant for Use in Explosion Hazard Areas (Hazardous Locations, Class I, Division 2)

This equipment is exclusively suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations.

**WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.**

**WARNING - EXPLOSION HAZARD - SUBSTITUTION OF ANY COMPONENT MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.**

Avertissement - Risque d'explosion - Ne pas débrancher tant que le circuit est sous tension à moins que l'emplacement soit connu pour ne contenir aucune concentration de gaz inflammable.

Avertissement - Risque d'explosion - La substitution de tout composant peut rendre ce matériel incompatible pour une utilisation en classe I, division 2.

This device is an open-type device that is to be installed in an enclosure suitable for the environment.

Exclusively use the device for the application cases specified by the manufacturer. Failure to follow these instructions can impair device protection.

### 1.9.4. FCC Note

The ICRL-U-8M12-G60 complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference; (2) this device must accept any interference received, including interference that may cause undesired operation.

Appropriate testing has established that this device fulfills the requirements of a class A digital device in line with part 15 of the FCC regulations.

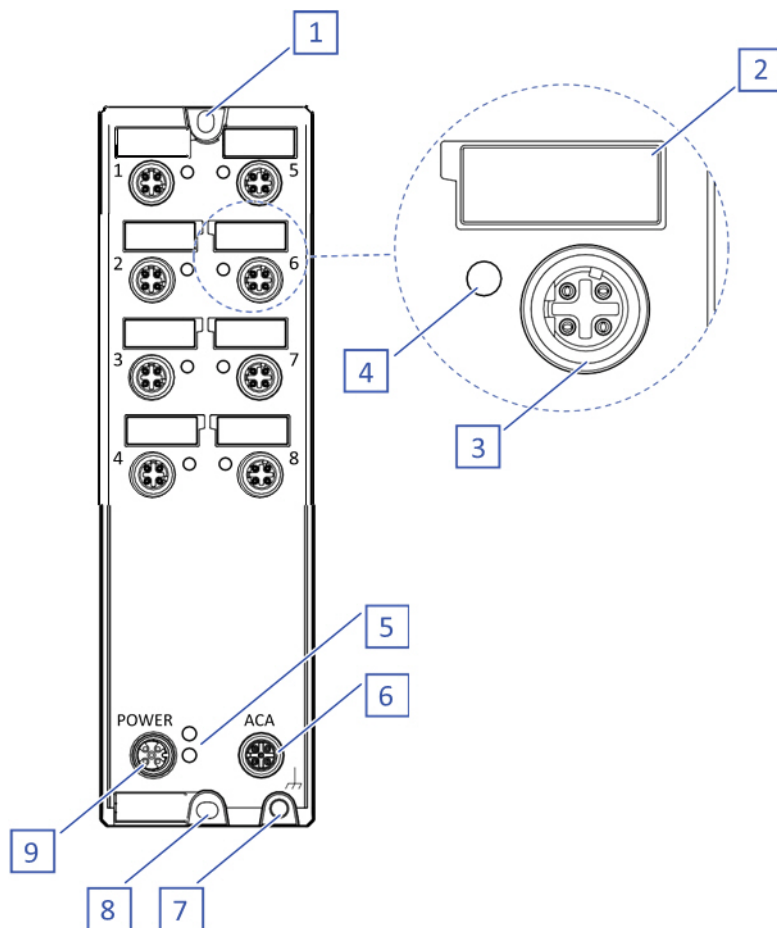
These requirements are designed to provide sufficient protection against interference when the device is being used in a business environment. The device creates and uses high frequencies and can also radiate these frequencies. If it is not installed and used in accordance with this operating manual, it can cause radio transmission interference. The use of this device in a residential area can also cause interference, and in this case the user is obliged to cover the costs of removing the interference.



## 2. Product Overview

The RocketLinX ICRL-U-8M12-G60 is an 8-port unmanaged field-mountable Ethernet switch designed for use in industrial applications. With eight 10/100 Mbps Ethernet ports and redundant power inputs all utilizing M12 connections, it achieves an IP65/67 protection rating. Its passively cooled design ensures long-term reliability while supporting a wide operating temperature range from -40 to +70 °C making it appropriate for use in extreme conditions. Further flexibility is provided by its wide input voltage range of 9.6 to 45 VDC.

ICRL-U-8M12-G60	
1	Mounting hole
2	8 × Indicator plate
3	8 × 4-pin, D-coded M12 socket for 10/100 Mbps twisted pair connections. See <i>Connecting Data Cables</i> on Page 15 for more information.
4	8 × Port Status LEDs. See <i>Port Status</i> on Page 11 for more information.
5	Power supply LEDs. See <i>Device State</i> on Page 10 for more information.
6	M12 interface used during manufacture at Pepperl+Fuchs
7	Ground connection. See <i>Installing and Grounding the ICRL-U-8M12-G60</i> on Page 12 for more information.
8	Mounting hole
9	Supply voltage connector. See <i>Wiring the Connector for the Supply Voltage</i> on Page 14 for more information.



### 2.1. Power Supply

The supply voltage is connected by means of a 5-pin, A-coded M12 connector (PG7). See *Wiring the Connector for the Supply Voltage* on Page 14 for more information.

## 2.2. Ethernet Ports (10BASE-T/100BASE-TX)

You can connect terminal devices and other segments at the ports of the ICRL-U-8M12-G60 using twisted pair cables. The Ethernet ports are 4-pin, D-coded M12 sockets.

The 10/100 Mbps twisted pair port allows you to connect network components according to the IEEE 802.3 10BASE-T/100BASE-TX standard. This port supports:

- Auto-negotiation
- Auto-polarity
- Auto-crossing
- 100 Mbps half-duplex mode, 100 Mbps full duplex mode
- 10 Mbps half-duplex mode, 10 Mbps full duplex mode

The screw threads of the M12 ports are electrically connected to the device casing.

Ethernet Pin Assignment ICRL-U-8M12-G60		
1	TD+	Transmit Data+
2	RD+	Receive Data+
3	TD-	Transmit Data-
4	RD-	Receive Data-
Housing: shield		

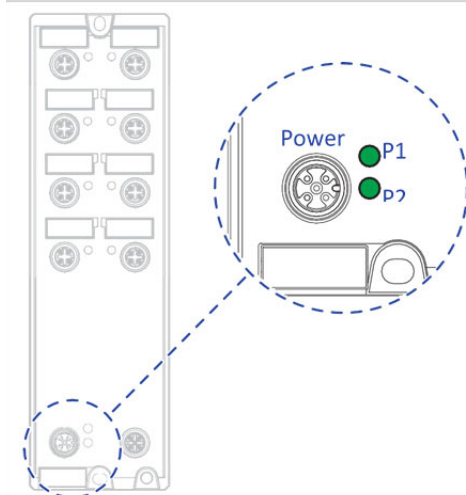
## 2.3. LEDs

After the supply voltage is set up, the software starts and initializes itself. During this process, various LEDs light up.

### 2.3.1. Device State

These LEDs provide information about conditions which affect the operation of the ICRL-U-8M12-G60.

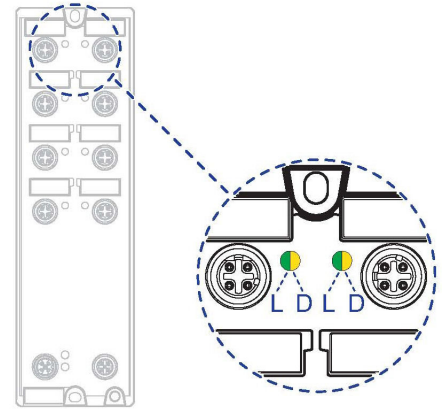
LED	Display	Color	Activity	Meaning
P1	Supply voltage 1	green	lights up	Supply voltage is on
			none	Supply voltage is too low
P2	Supply voltage 2	green	lights up	Supply voltage is on
			none	Supply voltage is too low



### 2.3.2. Port Status

These LEDs provide port-related information.

LED	Display	Color	Activity	Meaning
L/D	Link state/ data traffic	—	none	Device detects an invalid or missing link
		green	lights up	Device detects a valid link
		yellow	flashing	Device is transmitting and/or receiving data
		green/ yellow	flashing alternately	Update of the configuration via the M12 interface



### 2.3.3. ACA Connector

The ACA connector is a 5-pin, A-coded M12 socket with shielding that used by Pepperl+Fuchs during the manufacture process.

## 3. Installation

The ICRL-U-8M12-G60 has been developed for practical application in a harsh industrial environment. On delivery, the device is ready for operation.

Perform the following steps to install the ICRL-U-8M12-G60:

- Checking the package contents
- Installing and grounding the device
- Wiring the connector for the supply voltage
- Operating the device
- Connecting data cables

### 3.1. Checking the Package Contents

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Before installation, verify that the following are available.

- ICRL-U-8M12-G60 switch
- 1 × Transport protection cap for supply voltage connection
- 7 × Protection screws for M12 socket, plastic
- 15 × Indicator plates
- 1 × Right-angle cable socket (PG7, 4 Pin, Female connector)
- Safety and general information sheet

### 3.2. Installing and Grounding the ICRL-U-8M12-G60

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#### 3.2.1. Mounting on a Flat Surface

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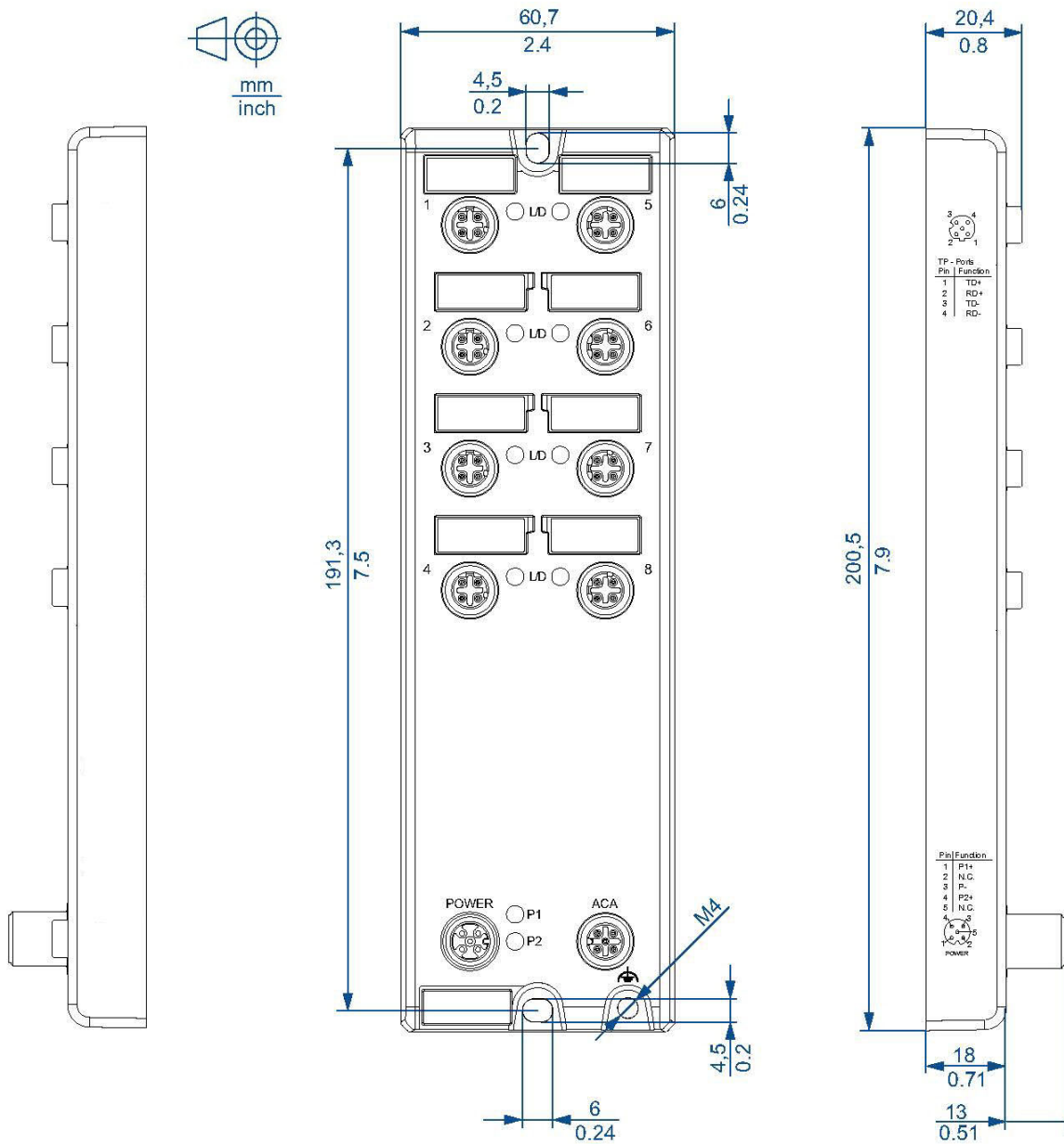
The following requirements should be met to mount the ICRL-U-8M12-G60 on a flat surface:

- Select the installation site so that the climatic threshold values listed in the technical data are observed. See *Technical Data* on Page 16.
- Protect the exposed uninstalled contacts of the components from dirt and connect the individual system components in a dry and clean working area.
- Make sure to seal all unused connections and ports with the provided plastic protection screws to maintain the IP65/67 suitability for your device,
- Make sure to only connect components with degree of protection IP65/67 to sustain the IP65/67 suitability for your device.

**Note:** The torque for tightening the protection screws on the device is 5.3 lb- in (0.6 Nm).

Install the ICRL-U-8M12-G60 accordingly.

1. Prepare the drill holes at the installation point.
2. Mount the device on a level surface with two M4 screws.



### 3.2.2. Grounding the ICRL-U-8M12-G60

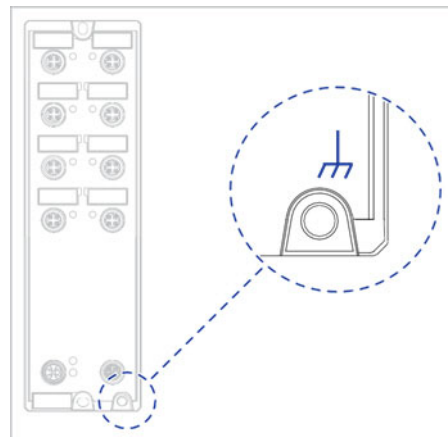
Use the following information to ground the ICRL-U-8M12-G60:

- Use a suitable wire diameter for the functional grounding. Pepperl+Fuchs recommends a wire diameter of 0.5 mm<sup>2</sup> (AWG20).
- Use toothed washers to ensure good electrical conductivity at the connection.
- Ground the device via an M4 screw.

**Note:** The grounding screw is not included with the product and must be supplied by the installation personnel.

Use the following information to ground the ICRL-U-8M12-G60:

- Ground the ICRL-U-8M12-G60 is by means of a separate ground connection on the ICRL-U-8M12-G60.
- Ground the ICRL-U-8M12-G60 before connecting any other cables.
- Disconnect the ground only after disconnecting all of the other cables.



### 3.3. Wiring the Connector for the Supply Voltage

The following requirements need to be met before wiring the power supply.

- The power supply cable is suitable for the voltage, the current and the physical load. Pepperl+Fuchs recommends a wire diameter of 0.5 mm<sup>2</sup> to 0.75 mm<sup>2</sup> (AWG20 up to AWG18).
- The permitted cable diameter for connector PG7 is 0.15 in (4 mm) to 0.23 in (6 mm). To ensure the watertightness of the ICRL-U-8M12-G60, only use voltage supply cables with a diameter within the specified range.

Pin assignment ICRL-U-8M12-G60 (5-Pin, A-Coded)		
	Pin	Description
	1	Power supply (1): + 12/24/36 V DC (1)
	2	Not connected
	3	P-
	4	Power supply (2): + 12/24/36 V DC (2)
	5	Not connected

- Make sure that you can easily disconnect the ICRL-U-8M12-G60 from the main voltage.

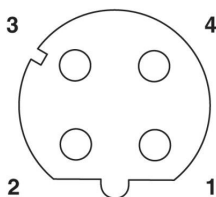
**Note:** The supply voltage can be connected redundantly. Both plus connections are uncoupled. There is no distributed load. With redundant supply, the power supply unit with the higher output voltage supplies the device on its own.

When you connect the supply voltage, the ICRL-U-8M12-G60 starts up.

### 3.4. Connecting Data Cables

Use the following guidelines when connecting the data cables.

- Shielded CAT5e cable or better.
- SF/UTP cables as per ISO/IEC 11801:2002.
- Shielded D-coded, 4-pin M12 connectors.
- Keep the length of the data cables as short as possible.
- When using copper cables, provide a sufficient separation between the power supply cables and the data cables.
- Verify that power supply cables and data cables do not run parallel over longer distances, and that ideally they are installed in separate cable channels. If reducing the inductive coupling is necessary, verify that the power supply cables and data cables cross at a 90° angle.
- Seal all unused connections and ports with the provided plastic protection screws.
- Make sure the cable shielding is connected to the M12 plug thread.



D-Coded, M12	
Pin	Signal
1	Tx+
2	Rx+
3	Tx-
4	Rx-

**Note:** The torque for tightening the protection screws on the device is 5.3 lb- in (0.6 Nm).

## 4. Technical Data

ICRL-U-8M12-G60 General Technical Data		
Power supply	Safety extra-low voltage (SELV) Relevant for North America:	NEC Class 2 power source max. 2A.
	Rated voltage DC:	12/24/36V DC
	Voltage range DC incl. maximum tolerances:	9.6V DC ... 45V DC
	Connection type	5-pin, "A"-coded M12 connector
	Power loss buffer	>10 ms
	Peak inrush current	<1.4 A (1ms)
	Current integral $I^2t$	0.15 A <sup>2</sup> s
Climatic conditions during operation	Ambient air temperature (Temperature of the ambient air at a distance of 2 in (5 cm) from the ICRL-U-8M12-G60)	up to 6562 ft ASL (2000 m ASL)      -40°F to +158°F (-40°C to +70°C) 6562 ft ASL to 13123 ft ASL (2000 m ASL to 4000 m ASL)      -40°F to +149°F (-40°C to +65°C)
	Humidity	5% to 100% (also in condensing atmospheres)
	Air pressure without de-rating	min. 795 hPa (+6562 ft; +2000 m)
	Air pressure with de-rating	max. 1060 hPa (-1312 ft; -400 m)
Climatic conditions during storage	Ambient air temperature (Temperature of the ambient air at a distance of 2 in (5 cm) from the ICRL-U-8M12-G60)	up to 3 months: -40 °F to +185 °F (-40 °C to +85 °C) up to 1 year: -40 °F to +158 °F (-40 °C to +70 °C) up to 2 years: -40 °F to +122 °F (-40 °C to +50 °C) up to 10 years: +32 °F to +86 °F (0 °C to +30 °C)
	Humidity	5% to 100% (also in condensing atmospheres)
	Air pressure	min. 700 hPa (+9842 ft; +3000 m) max. 1060 hPa (-1312 ft; -400 m)
Protection class	Degree of protection	IP65/67
Pollution degree		4



# FACTORY AUTOMATION – SENSING YOUR NEEDS



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