

## CANnector

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## Important User Information

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# 1. User Guide

Please read the manual carefully. Make sure you fully understand the manual before using the product.

This manual contains several products with different hardware and software features. Observe the information about your product variant.

## CANnector Automotive Device Variants

Article number	Name
1.01.0091.00000	CANnector S
1.01.0091.00010	CANnector L
1.01.0091.00011	CANnector LA
1.01.0091.00100	CANnector SE
1.01.0091.00110	CANnector LE

## Pre-Configured CANnector Product Variants

Concerning the hardware features the pre-configured CANnector product variants are based on the CANnector S device variant.

Article number	Name
1.01.0091.01000	CANnector Log
1.01.0091.02000	CANnector Bridge
1.01.0091.03000	CANnector Range

### 1.1. Target Audience

This manual addresses trained personnel who are familiar with CAN, CAN FD, LIN, and the applicable national standards. The contents of the manual must be made available to any person authorized to use or operate the product and who want to use the device during the development and/or testing of their products.

### 1.2. Related Documents

Document	Author
IxAdmin Online Help	HMS
ACT Installation Manual	HMS
User Manual CANnector Log	HMS
User Manual CANnector Bridge	HMS
User Manual CANnector Range	HMS

### 1.3. Document History

Version	Date	Description
1.0	July 2020	First release
1.1	September 2020	Corrected pin allocation X1, added LED blink pattern description, corrections technical data
1.2	October 2020	Added product variants CANnector Log, Bridge and Range
1.3	August 2021	Added LED S1-S4 description, minor corrections, added variant CANnector LA

## 1.4. Trademark Information

ixxat® is a registered trademark of HMS Industrial Networks. All other trademarks mentioned in this document are the property of their respective holders.

## 1.5. Conventions

### Instructions, Results and Lists

Instructions and results are structured as follows:

1. instruction 1
2. instruction 2
  - result 1
  - result 2

Lists are structured as follows:

- item 1
- item 2

### Code

This font is used to represent program code and other types of data input and output such as configuration scripts.

```
Code
```

### User Interaction Elements

User interaction elements (buttons etc.) are indicated with bold text.

### Cross-References and Links

Cross-reference within this document: [Document Conventions](#)

External link (URL): [www.ixxat.com](http://www.ixxat.com)

### Safety Symbols



#### DANGER

Instructions that must be followed to avoid an imminently hazardous situation which, if not avoided, will result in death or serious injury.



#### WARNING

Instructions that must be followed to avoid a potential hazardous situation that, if not avoided, could result in death or serious injury.



#### CAUTION

Instruction that must be followed to avoid a potential hazardous situation that, if not avoided, could result in minor or moderate injury.



#### IMPORTANT

Instruction that must be followed to avoid a risk of reduced functionality and/or damage to the equipment, or to avoid a network security risk.

## Information Symbols

**NOTE**

Additional information which may facilitate installation and/or operation.

**TIP**

Helpful advice and suggestions.

## 2. Safety Instructions



### IMPORTANT

Risk of interference to radio and television if used in office or home environment! The product is a class A device.

Use exclusively included accessories or HMS accessories that are intended for use with the device.  
Use exclusively shielded cables.

Make sure that the shield of the interface is connected with the device plug and the plug on the other side.

### 2.1. General Safety Instructions

- Protect product from moisture and humidity.
- Protect product from too high or too low temperature (see [Technical Data](#)).
- Protect product from fire.
- Do not paint the product.
- Do not modify or disassemble the product. Service must be carried out by HMS Industrial Networks.
- Store products in dry and dust-free place.
- Only use indoors (without corrosive gas, flammable gas, dust and dirt etc.).

### 2.2. Intended Use

The devices are intended for installation on standard DIN rail or for use with adhesive feet on an even surface.

#### CANnector Device Variants S, L, SE, LE, LA

This manual describes the external interfaces of the device, their functionality and pin allocation. The device does not contain any application beside the operating system. Adding functionality to the device is provided by the Advanced Configuration Tool (ACT) or the Software Development Kit. For further information refer to the corresponding manuals or online help. The device is intended to be used in the office, stationary applications, test benches or test vehicles.

#### CANnector Log, Range, Bridge

Each product variant is ready-to-use due to the pre-configured basic configuration which is already loaded on the device. CANnector Log is used to log CAN, CAN FD, and LIN communication. CANnector Bridge is used to connect computer systems to CAN and CAN FD networks, to connect the networks with each other, and to change or manipulate the network data. CANnector Range is used to forward CAN, CAN FD, and LIN networks through Ethernet networks and to connect the networks to computer systems over a long distance.

## 3. Scope of Delivery

Included in scope of delivery:

- selected CANnector variant
- adhesive device feet
- Installation Guide CANnector
- power supply connector
- USB cable
- Ethernet cable
- with CANnector Log: USB memory storage device

## 4. Product Description

### 4.1. CANnector Device Variants S, L, SE, LE, LA

The CANnector is a platform for the analysis, diagnostics and simulation of CAN, CAN-FD, LIN, and EtherCAT networks.

#### Common Features

- measurement and analysis platform
- 1 x Mini USB device interface
- 2 x USB 2.0 host interface
- 1 x 10/100 Base-T Ethernet interface
- 8 x LEDs, of which 7 are freely configurable
- real-time clock
- 2 D-Sub 9 galvanically isolated (4 kV for 1 s)

#### Device Variants

The CANnector is available in four device variants that provide different interfaces.

The CANnector S device variant provides the following interfaces:

- 4 x high speed Classic CAN interfaces
- 2 x CAN/CAN FD interfaces
- 2 x LIN interfaces
- 2 x digital I/Os

Additional interfaces compared to the device variant CANnector S:

Article number	Name	Additional interfaces
1.01.0091.00000	CANnector S	—
1.01.0091.00010	CANnector L	2 x CAN/CAN FD interfaces
1.01.0091.00011	CANnector LA	2 x CAN/CAN FD interfaces
1.01.0091.00100	CANnector SE	EtherCAT Slave
1.01.0091.00110	CANnector LE	2 x CAN FD interfaces EtherCAT Slave

Device variant CANnector LA provides an extended Switch-on on CAN functionality, see [Switch-on on CAN, p. 14](#) for more information.

#### Software for Configuration

The CANnector is a Linux platform that is able to work standalone without any connected PC. For the standalone function a configuration is needed, that can be created and downloaded to the device via a the PC based *Advanced Configuration Tool (ACT)*. For more information see [Creating Configurations for CANnector S, L, SE, LE, LA, p. 10](#).

### 4.2. CANnector Log, Bridge, Range

The pre-configured CANnector is available in the product variants Log, Bridge and Range. Each product variant is ready-to-use due to the basic configurations for the specific use of the variant which are already loaded on the device. With the Ixxat ACT tool individual configurations with further functions can be created additionally.

## Common Features

- 4 x high speed Classic CAN interfaces
- 2 x CAN FD interfaces
- 2 x LIN interfaces
- 2 x digital I/Os
- 1 x Mini USB device interface
- 2 x USB 2.0 host interface
- 1 x 10/100 Base-T Ethernet interface
- 8 x LEDs, of which 7 are freely configurable
- real-time clock
- 2 D-Sub 9 galvanically isolated (4 kV for 1s)



### NOTE

Concerning the hardware features the pre-configured CANnector product variants correspond to the CANnector S device variant.

## Pre-Configured Product Variants

### CANnector Log

With the CANnector Log the communication of the connected busses can be logged. The four provided basic CAN logging configurations (125 Kbit/s, 250 Kbit/s, 500 Kbit/s, and 1000 Kbit/s), that initializes all 6 CAN interfaces with the selected baud rate log all received data in csv format. With the ACT configurations can be created, that allow for example to log individual messages and individual signals and to define trigger messages. By default the configuration with 250 Kbit/s is loaded.

### CANnector Bridge

The CANnector Bridge can act as Bridge and as Gateway. The four provided basic configurations (125 Kbit/s, 250 Kbit/s, 500 Kbit/s, and 1000 Kbit/s) initialize all 6 CAN interfaces with the selected baud rate and forward all received data as follows:

- CAN 1 to CAN 2 and vice versa
- CAN 3 to CAN 4 and vice versa
- CAN 5 to CAN 6 and vice versa

By default the configuration with 250 Kbit/s is loaded. With the ACT tool new configuration can be created for example to forward individual messages and signals and to change message ID and content. Signal manipulation and the creation of specific algorithms that are executed directly on the device is possible by writing own C code extensions with Eclipse IDE.

### CANnector Range

With the CANnector Range the connected busses can transfer data over a long distance via Ethernet. The eight provided basic configurations (four Master configurations and four Slave configurations with 125 Kbit/s, 250 Kbit/s, 500 Kbit/s, and 1000 Kbit/s) initialize all 6 CAN interfaces with the selected baud rate and allow to extend the transmission range of the six available CAN busses via Ethernet. For the provided configurations two CANnector Range devices (Master and Slave) are required. The Master device establishes a connection to the Slave device via Ethernet and forwards all CAN data transparently from Master to Slave and vice versa. By default the Master configuration with 250 Kbit/s is loaded. An application on a Windows PC that is based on the Ixxat VCI driver can be extended with one CANnector Range, that is connected to the Windows PC. In that case the CANnector Range acts as remote PC interface connected via Ethernet.

## Software for Configuration and Visualization

The CANnector provides various possibilities to manage configurations.

**Dashboard**

With the dashboard, that is accessible via a web browser and the IP address, the state of the CANnector and the connected bus systems can be monitored, the different basic configurations can be selected and downloaded to the device, log files can be uploaded to the PC, and data can be visualized.

**ACT Tool**

The ACT is Windows based and allows the easy creation of configurations with or without bus description files via drag and drop. The ACT tool provides further configuration possibilities depending on the device variant (e.g. changing message content, trigger for messages).

**lXAdmin**

lXAdmin is included in the ACT. With lXAdmin the different basic configurations can be selected, started and stopped and downloaded to the device. Changing baud rate settings and uploading log files to the PC is also possible as well as updating the firmware and managing the connected devices.

## 5. Installation

The device can be installed on a grounded 35 mm DIN rail or used with the adhesive feet on an even surface.

### 5.1. Installing on DIN Rail

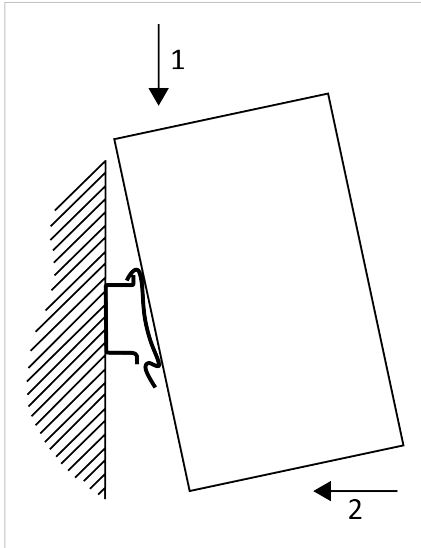


Figure 1. Installing on din rail

1. Hook the din rail clip onto the upper lip of the rail and push the device downwards (1).
2. Push the device towards the rail until it snaps into place (2).
3. Make sure, that the venting slots are not covered and ensure adequate air circulation (recommended mounting distance: 2 cm distance to venting slots).

### 5.2. Installing the Adhesive Feet

1. Stick the adhesive feet to the bottom of the device.
2. Place the CANnector on an even surface.
3. Make sure, that the venting slots are not covered and ensure adequate air circulation (recommended mounting distance: 2 cm distance to venting slots).

## 6. Configuration

### 6.1. Creating Configurations for CANnector S, L, SE, LE, LA

The CANnector is a Linux platform that is able to work standalone without any connected PC. For the standalone function a configuration is needed, that can be created and downloaded to the device via a the PC based *Advanced Configuration Tool (ACT)*.

The following licence stages are available:

- Freeware: no license dongle needed, all data logging, CAN/CAN FD/LIN/Generic Ethernet/EtherCAT gateway, and user code functions are available
- Lite: all freeware functions are activated, additionally FDX gateway is enabled, and MATLAB/Simulink models are supported
- Standard: all functions are activated, for example creating residual bus simulations and configuring signal manipulation configurations is possible



#### NOTE

With the CANnector an optional RBS license is needed for residential bus simulations and for signal manipulation configurations.

Via the USB dongle a single ACT user license can be enabled.

For a detailed list of the functions of the different license stages see [www.ixxat.com/products/automotive-products](http://www.ixxat.com/products/automotive-products).

The ACT tool can be downloaded on [www.ixxat.com/support](http://www.ixxat.com/support).

1. Plug in the USB dongle in the PC that is used for the configuration.
2. On [www.ixxat.com/technical-support/support](http://www.ixxat.com/technical-support/support) select **Advanced Configuration Tool** and open **Secured Downloads**
3. Download the ACT tool ZIP container from the support area.



#### IMPORTANT

To be able to download the ACT, a valid e-mail address must be submitted.

4. Unpack the ZIP container in a user defined folder on the local drive.
5. Execute the included installation file `ixxat ACT Setup w.x.yyy.z CM.exe`.
  - ACT setup assistant is started.
6. Follow instructions in ACT setup assistant.
7. When ACT is installed, start ACT.
8. Configure the desired configuration in ACT and download the configuration to the device.
9. For more information, select **Help** in the main menu to open the online help.



#### NOTE

HMS provides basic configuration for a data logger, Bridge, and Range. To use pre-configured configurations download the desired configuration from [www.ixxat.com](http://www.ixxat.com) and observe the respective user manual of CANnector Log, Bridge or Range.

## 6.2. Selecting Pre-Configured Configurations for CANnector Log, Bridge, Range

To connect the CANnector to a PC via USB a driver is needed. With installation of the configuration tool ACT the driver is automatically installed (see [Installing the Software, p. 11](#)). When the device is correctly connected the default configuration of the respective product variant is running (see [Connecting the Device, p. 11](#)) and other pre-configured configurations can be selected (see [Selecting a Pre-Configured Configuration, p. 12](#)). For information how to create individual configurations see user manual of the respective device.

### 6.2.1. Installing the Software

The ACT tool can be downloaded on [www.ixxat.com/support](http://www.ixxat.com/support).

1. On [www.ixxat.com/technical-support/support](http://www.ixxat.com/technical-support/support) select **Advanced Configuration Tool** and open **Secured Downloads**
2. Download the ACT tool ZIP container from the support area.



#### IMPORTANT

To be able to download the ACT, a valid e-mail address must be submitted.

3. Unpack the ZIP container in a user defined folder on the local drive.
4. Execute the included installation file Ixxat ACT Setup w.x.yyy.z CM.exe.
  - ACT setup assistant is started.
5. Follow instructions in ACT setup assistant.
  - a. When installation is finished, ACT and IxAdmin are installed.
  - b. Required USB driver for configuration is installed.

### 6.2.2. Connecting the Device



#### NOTE

For information about the interfaces see [Connectors, p. 14](#).

1. Make sure, that the required software is installed (see [Installing the Software, p. 11](#)).
2. Connect the three pins of the power supply connector (**W**, **P**, and **G**) with the power supply. A ready to use power cable is available as accessory from HMS Industrial Network (see [Additional Components, p. 21](#)).
 

**If using CANnector Range with Master and Slave device:**

  - a. Connect the power supply of both devices.
  - b. Use a direct Ethernet cable to connect both devices via the **LAN** connector.
3. Connect the CAN interfaces X1 to X4 to be used.
4. If required, integrate a bus termination in the CAN connection.
5. Connect the bus termination to the cable and to the connector.
6. Use suitable cable assemblies for the CANnector, available from Ixxat.
 

**If using the CANnector Log:**

  - a. Plug in the USB memory storage device.
  - b. Use only FAT32 or NTFS formatted USB memory storage devices.
7. Switch on the power supply.
  - The default configuration with 250 Kbit/s is started automatically.
  - With CANnector Range the Master configuration is started.

- If using CANnector Range with Master and Slave device, the slave application must be activated on the Slave device (see [Selecting a Pre-Configured Configuration](#), p. 12).



### IMPORTANT

If using the CANnector Log, the logging only starts if the USB memory storage device is plugged in correctly.

## 6.2.3. Selecting a Pre-Configured Configuration

When the device is correctly connected the default configuration of the respective product variant is running (see [Connecting the Device](#), p. 11). With the dashboard, that is accessible via the IP address and a web browser, different pre-configured configurations can be selected and activated on the device.

- Make sure, that the required software is installed (see [Installing the Software](#), p. 11) and that the CANnector is connected (see [Connecting the Device](#), p. 11).
- Use the USB cable (included in the scope of delivery) to connect the Mini USB connector of the CANnector to the PC.
- Open a web browser on the PC.
- Enter the IP address 169.254.254.254 as URL.
  - CANnector dashboard is opened.

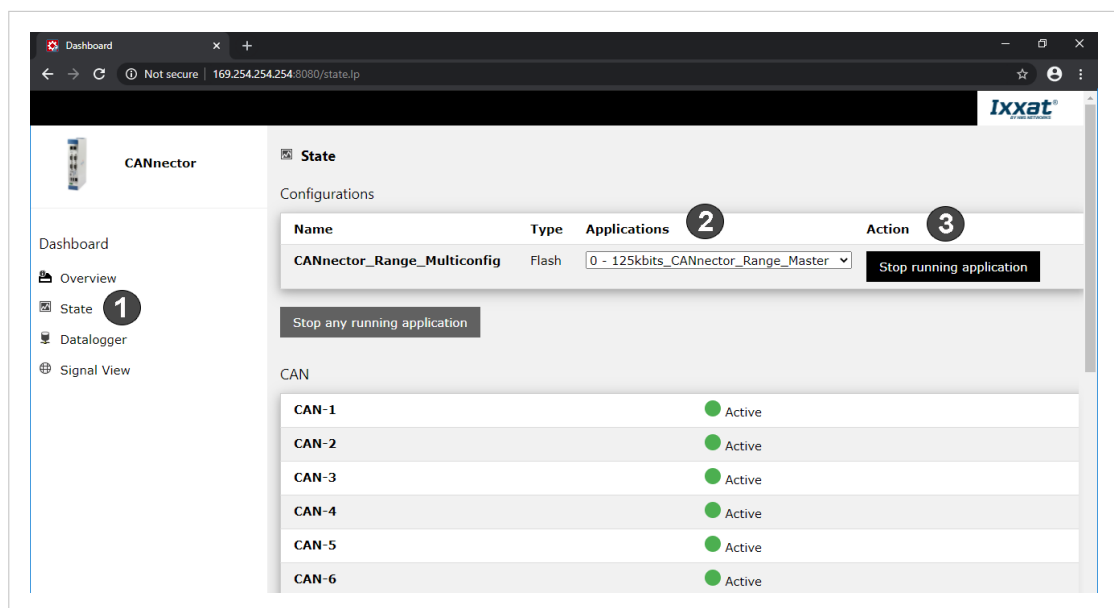


Figure 2. CANnector dashboard

- Select **State (1)** in the configuration tree.
  - State of configuration and CAN ports is shown.
- Click button **Stop running application** in column **Action (3)**.
- In drop-down menu in column **Application (2)** select the application with the desired baud rate.
- For the slave device of a CANnector Range select the Slave application with the same baud rate as used on the Master device.
- Click button **Start selected application** in column **Action (3)**.
  - Selected pre-configured basic application is running.



### NOTE

After a power cycle the last selected configuration is automatically started.

10. For more information about configuration possibilities of the product variants Log, Bridge and Range see respective User Manual on [www.ixxat.com](http://www.ixxat.com).

## 7. Connectors

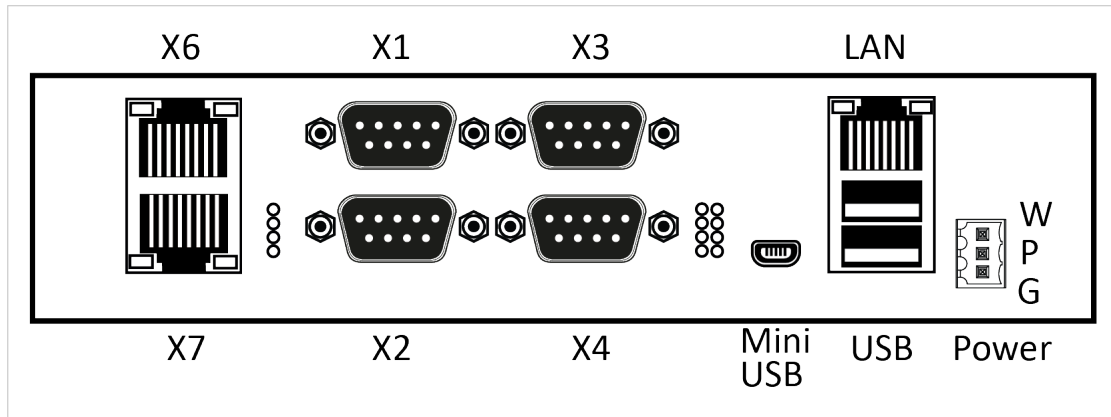


Figure 3. CANnector front connectors

### 7.1. Power Connector

The device is supplied with a DC voltage from 6 V to 36 V. The power supply input is protected against overvoltage and against polarity reversal. The CANnector provides a 3-pin Phoenix connector.

Table 1. Pin Allocation

Pin	Signal	Description
1	G	Ground
2	P	Permanent power supply to provide power in standby mode
3	W	Input to switch on the device (wake up)

A ready to use power cable is available as accessory from HMS Industrial Network (see [Additional Components](#), p. 21).



#### NOTE

To switch on the device permanently, both inputs **P** and **W** must be connected to supply voltage (see [Self Switch-Off](#), p. 14).

#### 7.1.1. Switch-on on CAN

The device can be configured to be switched on if a CAN message is received.

If Switch-on on CAN is configured, by default the device is switched on if any CAN message is received on CAN 1 or if any CAN FD message is received on CAN 7. With the device variant CANnector LA it is possible to configure one specific CAN message ID or CAN FD message ID that switches on the device. For more information how to configure the Switch-on on CAN and the specific message see user manual IxAdmin.

#### 7.1.2. Self Switch-Off

If inputs **P** and **W** are connected to supply voltage, the device stays switched on permanently. If input **P** is connected and input **W** only gets a short impulse (e.g. if the device is switched-on on CAN, but the CAN activity is a spike only) the device switches off after 10 seconds again. With the ACT configuration tool the device can be configured to stay switched on even if the wakeup reason is gone. In that case the configuration that is running on the CANnector decides when to switch off. For more information see user manual ACT Configuration Tool.

### 7.2. Ethernet Connector (LAN)

The standard Ethernet RJ45 connector is galvanically isolated from the other connectors.

## 7.3. EtherCAT



### NOTE

EtherCAT function is only provided by the device variants SE and LE.

### Connectors (X6 and X7)

If connected to a EtherCAT network, the CANnector represents a EtherCAT Slave. The connector X6 provides the EtherCAT-Slave-OUT function and X7 provides the EtherCAT-Slave-IN function. If the CANnector is connected to a EtherCAT Master solely, only X7 (IN) is used and X6 remains unconnected. The EtherCAT interfaces are galvanically isolated from the other interfaces.

### LEDs (S1, S2, S3, and S4)

LEDs S1 and S2 indicate the EtherCAT status.

LED S1 state	LED S2 state	Description	Comment
Off	Off	INIT	CANnector (EtherCAT Slave) in state INIT or no power
Green	Off	OPERATIONAL	CANnector (EtherCAT Slave) in state OPERATIONAL
Green blinking	Off	PRE-OPERATIONAL	CANnector (EtherCAT Slave) in state PRE-OPERATIONAL
Green single flash	Off	SAFE-OPERATIONAL	CANnector (EtherCAT Slave) in state SAFE-OPERATIONAL
Green, flickering	Off	BOOT	CANnector (EtherCAT Slave) in state BOOT
Off	Red	If LED S4 also red: fatal error	Internal error forces device to passive state. If LED S2 and LED S4 are red, contact HMS Industrial Networks technical support.

LEDs S3 and S4 indicate EtherCAT communication errors.

LED S3 state	LED S4 state	Description	Comment
Off	Off	No error, or not initialized	No error, no power, or CANnector (EtherCAT Slave) in state SETUP or NW_INIT
Off	Red blinking	Invalid configuration	State change received from Master not possible due to invalid register of object settings
Off	Red single flash	Unsolicited state change	Slave device application has changed the EtherCAT state autonomously
Off	Red double flash	Application watchdog timeout	Sync manager watchdog timeout
Off	Red	Application controller error	CANnector (EtherCAT Slave) in state EXCEPTION
		If LED S2 also red: fatal error	Internal error forces device to passive state. If LED S2 and LED S4 are red, contact HMS Industrial Networks technical support.
Off	Flickering	Bootling error	E.g. due to firmware download failure

## 7.4. USB Slave Connector (PC)

The standard Mini USB connector is used as USB Slave interface to a PC.

**IMPORTANT**

Damaged PC because of compensation current between test object and PC through the USB connection.

Provide a grounded connection between the test object and the CANnector, before connecting the PC to the CANnector via USB.

1. Provide a grounded connection between the test object and the CANnector.
2. Connect the PC via USB to the CANnector.

## 7.5. USB Host Connectors (USB-A)

The two standard USB A type connectors are used as USB host interface to another USB device, for example a USB memory storage device or the WiFi extension.

**IMPORTANT**

Damaged USB device because of compensation current between test object and USB device through the USB connection.

When the CANnector is connected to test object, provide a grounded connection between the test object and the CANnector, before connecting a USB device to the CANnector (for example a USB based analog input extension).

1. When the CANnector is connected to test object, provide a grounded connection between the test object and the CANnector.
2. Connect the USB device to the CANnector.
3. Use only FAT32 or NTFS formatted mass storage devices.

## 7.6. LED Array

### Power LED (LED 1)

LED 1 indicates the device status.

LED state	Description
Off	No power supply (pin 1 power connector) or reverse polarity
Red	Boot mode, operating system is starting.
Green	Boot mode is finished, applications are started or can be started.
Green flashing	Device is in self switch-off

### Ready LED (LED 2)

LED 2 indicates the status of the application.

LED state	Description
Green flashing	No application loaded
Green flashing twice	Application started and running
Red flashing twice	Application started and error detected, if possible error message is sent

## USB memory storage device LED (LED 3)

LED state	Description
Off	No USB memory storage device plugged in
Green	USB memory storage device plugged in
Green flashing	Access

## LED 4

Reserved for future use.

## CAN LEDs (LED 5 to LED 8)

LEDs 5 to 8 indicate the status of the following CAN connections:

- LED 5: CAN 1 and CAN 5
- LED 6: CAN 2 and CAN 6
- LED 7: CAN 3 and CAN 7
- LED 8: CAN 4 and CAN 8

LEDs 5 to 8 are each used for two CAN connections. An error status of one of the two CAN connections has a higher priority and is overlaying the other CAN without an issue.

LED state	Description
Off	Initialized but no data or not initialized
Green	Data traffic
Red	Bus off
Red flashing	Transmit error (e.g. Tx pending)

## Rescue Kernel

If LEDs 2-8 are flashing red, the Rescue Kernel is executed.

1. Connect IxAdmin via Ethernet.
2. To repair the device see information in online help IxAdmin.
3. Restart the device.

For more information see [Rescue Kernel, p. 19](#).

## 7.7. Field Bus Connectors X1, X2, X3, and X4

X1, X2, X3, and X4 are D-Sub 9 male connectors, that provide CAN high-speed, CAN FD, LIN interfaces, and digital I/Os.



### IMPORTANT

Observe the different pin allocation for CAN HS and CAN FD on connectors X1 and X2 compared to X3 and X4.

Table 2. Pin Allocation X1

Pin	Signal	Description
1	CAN-FD L	CAN FD 7 low signal (only for CANnector L, LA, LE)
2	CAN-HS L	High-speed CAN 1 low signal
3	GND	Common ground

Pin	Signal	Description
4	CAN-FD H	CAN FD 7 high signal (only for CANnector L, LA, LE)
5	CAN-TX Disable	RX only mode: when connected to GND, TX is disabled by hardware
6	RK Enable	When connected to pin 5 during power on, Rescue Kernel is activated.
7	CAN-HS H	High-speed CAN 1 high signal
8	LIN	LIN signal 1
9	V-LIN	Power supply for LIN

Table 3. Pin Allocation X2

Pin	Signal	Description
1	CAN-FD L	CAN-FD 8 low signal (only for CANnector L, LA, LE)
2	CAN-HS L	High-speed CAN 2 low signal
3	GND	Common ground
4	CAN-FD H	CAN-FD 8 high signal (only for CANnector L, LA, LE)
5	CAN-TX Disable	RX only mode: when connected to GND, TX is disabled by hardware
6	—	Not used
7	CAN-HS H	High-speed CAN 2 high signal
8	DIO	Digital I/O 1
9	V-DIO	Power supply for digital I/O

Table 4. Pin Allocation X3

Pin	Signal	Description
1	CAN-HS L	High-speed CAN 3 low signal
2	CAN-FD L	CAN-FD 5 low signal
3	GND	Common ground
4	CAN-HS H	High-speed CAN 3 high signal
5	CAN-TX Disable	RX only mode: when connected to GND, TX is disabled by hardware
6	—	Not used
7	CAN-FD H	CAN-FD 5 high signal
8	LIN	LIN signal 2
9	V-LIN	Power supply for LIN

Table 5. Pin Allocation X4

Pin	Signal	Description
1	CAN-HS L	High-speed CAN 4 low signal
2	CAN-FD L	CAN-FD 6 low signal
3	GND	Common ground
4	CAN-HS H	High-speed CAN 4 high signal
5	CAN-TX Disable	RX only mode: when connected to GND, TX is disabled by hardware
6	—	Not used
7	CAN-FD H	CAN-FD 6 high signal
8	DIO	Digital I/O 2
9	V-DIO	Power supply for digital I/O

### 7.7.1. Galvanic Isolation

The CANnector has four interface islands on the D-Sub connectors X1, X2, X3 and X4. Each of the four islands is galvanically isolated from the other islands. Within an island the interfaces for CAN-FD, CAN high-speed, digital I/O, and LIN are galvanically connected to one another. The shielding of the cable and/or the metal collar of a D-Sub connector is directly connected to the housing.

For connectors X2 and X4 the isolation voltage is 1 kV. For connectors X1 and X3 the isolation voltage is 4 kV for 1 seconds.

### 7.7.2. Rescue Kernel

Pin 6 *RK Enable* of connector X1 is checked when the device is switched on or booted and identifies whether the system starts up normal or the rescue kernel is activated. If an active user configuration in the flash storage obstructs external access to the device or if the operating system is corrupted, the Rescue Kernel can be used to fix this situation.

1. To force the device into Rescue Kernel, connect pin 6 and pin 5 of X1.
2. Switch on the device.
  - Device checks the input on pin 6 during start-up and starts the Rescue Kernel.
  - LEDs 2-8 are flashing red.
3. Connect IxAdmin via Ethernet (check default IP address on the device label).
4. To repair the device see information in online help IxAdmin.
5. Restart the device.

### 7.7.3. CAN High-Speed/CAN-FD

CAN interfaces 1 to 4 only support physical bus connection as defined in ISO 11898-2. The differential signal pair (CAN-low and CAN-high) and ground are connected at the CAN connector.

For ISO 11898-2 high-speed CAN and CAN-FD no bus termination resistor is integrated in the device.

1. If a bus termination is required:
2. Connect the bus termination to the cable and/or to the connector.
3. Use suitable cable assemblies for the CANnector, available from Ixxat.

### 7.7.4. LIN

The LIN interfaces can be used either as Master or Slave. In Master mode a 1 kOhm resistor is used on V-LIN. In Slave mode the resistor is not connected.

- If LIN is used, apply voltage of 12-24 V to the V-LIN connection.

### 7.7.5. Digital I/O

The CANnector provides two digital I/O channels:

- Each digital I/O channel has an output with a high-side switch (FET) and a comparator input with a Schmitt trigger function.
- For each digital I/O an own V-DIO is provided.
- The power input 6-36 VDC on the power connector and voltage V-DIO for digital I/O are internally not connected and can be operated independently of one another.
- The maximum voltage on V-DIO is 34 V.

Observe the following regarding the outputs:

- The output voltage range is between 0 and V-DIO, because the high-side switch on the outputs is supplied with V-DIO. For example, if a TTL level must be generated, a voltage of 5 V must be connected to V-DIO.
- The output power per channel is limited to 1 A.
- Make sure, that the outputs are always operated with a load against ground.
- The GND connection cannot be used as the return for this ground. The return for the digital loads must be a separate line for power supply.

Observe the following regarding the inputs:

- Each input is equipped with a comparator with a Schmitt trigger function.
- The switching threshold is half the voltage on V-DIO. For example, if a voltage of 12 V is connected to V-DIO, then voltages can be monitored directly and the switching threshold is about 6 V.
- The ground connection GNDIO serves as the reference.
- Make sure that GNDIO is always connected to the test object.

## 8. Additional Components

HMS Networks offers the following additional components.

Connector	Description	Article number
POWER	Cable with 3 banana plugs, 2.0 m (see <a href="#">Power Supply Cable, p. 21</a> )	1.04.0089.00002
X1-X4	Dual CAN cable with D-Sub 9 and 2 x D-Sub 9, 1.5 m (see <a href="#">Dual-CAN Cable, p. 21</a> )	1.04.0089.00201
X1-X4	CAN and LIN breakout cable with D-Sub 9, 1.5 m (see <a href="#">Breakout Cable for X1 to X4, p. 23</a> )	1.04.0089.00200
X1-X4	CAN and LIN breakout cable with D-Sub 9, 0.5 m (see <a href="#">Breakout Cable for X1 to X4, p. 23</a> )	1.04.0089.00203
X1-X4	CAN, and LIN breakout box with D-Sub 9 and 3 x D-Sub 9, 0.5 m (see <a href="#">Breakout Box for X1 to X4, p. 22</a> )	1.01.0081.00100

### 8.1. Power Supply Cable

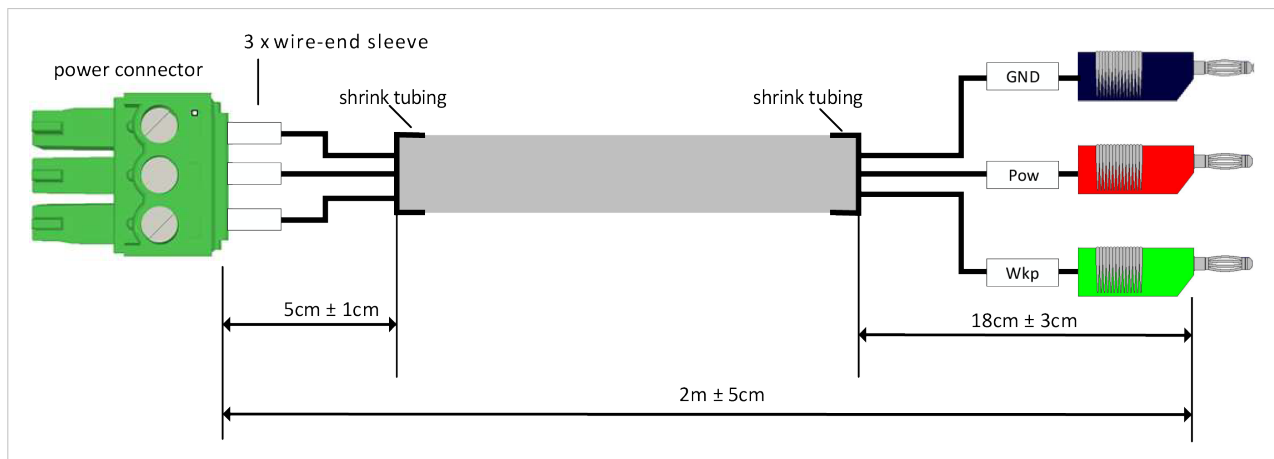


Figure 4. Power supply cable

Table 6. Individual Lines of Power Supply Cable

Pin CANnector	Signal	Description
1 (G)	GND	Power supply ground with black laboratory plug
2 (P)	Power (Pow)	Power supply +6 to +36 V DC with red laboratory plug
2 (W)	Wake up (Wkp)	Digital input to switch on the device with green laboratory plug

### 8.2. Dual-CAN Cable

The ready-made cable can be used to separate two different CAN interfaces. Depending on the device variant different interfaces are provided at the connectors of the dual-CAN cable.

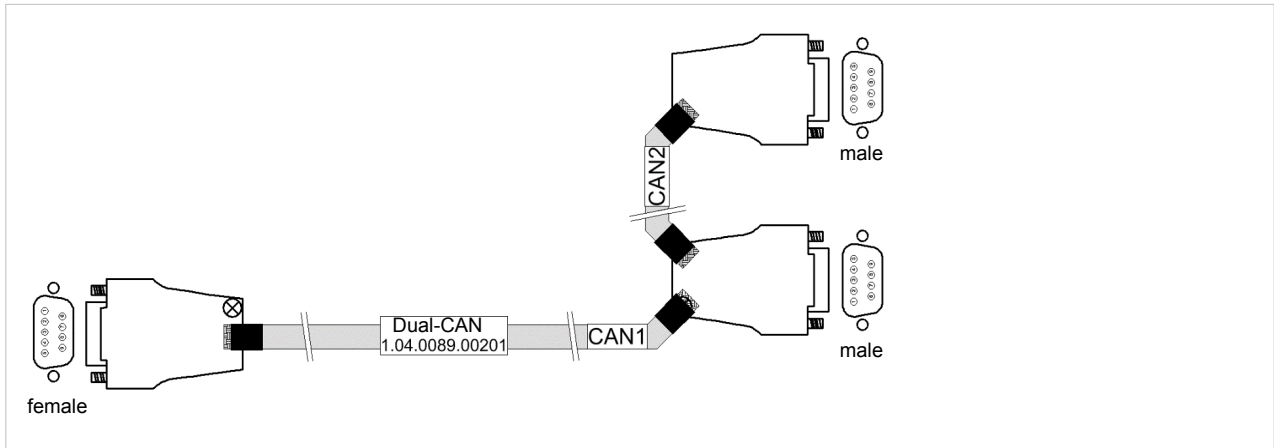


Figure 5. Dual-CAN cable

Table 7. Pin Allocation Cable Connector on the CANnector

Connector CANnector	Cable connectors CAN 1	Cable connectors CAN 2
X1	HS-CAN 1	CAN-FD 7
X2	HS-CAN 2	CAN-FD 8
X3	CAN-FD 5	HS-CAN 3
X4	CAN-FD 6	HS-CAN 4

Table 8. Pin Allocation Cable Connector on the CAN Cable

Pin	CAN 1	CAN 2
2	CAN HS/FD L	CAN HS/FD L
7	CAN HS/FD H	CAN HS/FD H
3	GND	GND
9	—	—

### 8.3. Breakout Box for X1 to X4

Depending on the device variant several interfaces are connected to the connectors X1 to X4. HMS Networks offers a breakout box to provide each of the interfaces on one connector.



Figure 6. Breakout box for X1 to X4

Table 9. Breakout Box Connectors

Connector CANnector	BOB connector Y1	BOB connector Y2	BOB connector Y3
X1, X2	HS-CAN1/2	CAN-FD 7/8	LIN1/DIO1
X3, X4	CAN-FD 4/6	HS-CAN 3/4	LIN2/DIO2

Table 10. Pin Allocation Breakout Box

BOB connector	Pin allocation D-Sub 9	
	Pin	Signal
Y1	2	CAN HS/CAN-FD low
	7	CAN HS/CAN-FD low
	3	GND
Y2		see Y1
Y3	8	LIN/DIO
	9	V-LIN/V-DIO
	3	GND

## 8.4. Breakout Cable for X1 to X4

Depending on the device variant several interfaces are connected to the connectors X1 to X4. HMS Networks offers breakout cables in different lengths to allow the creation of specific adapters.

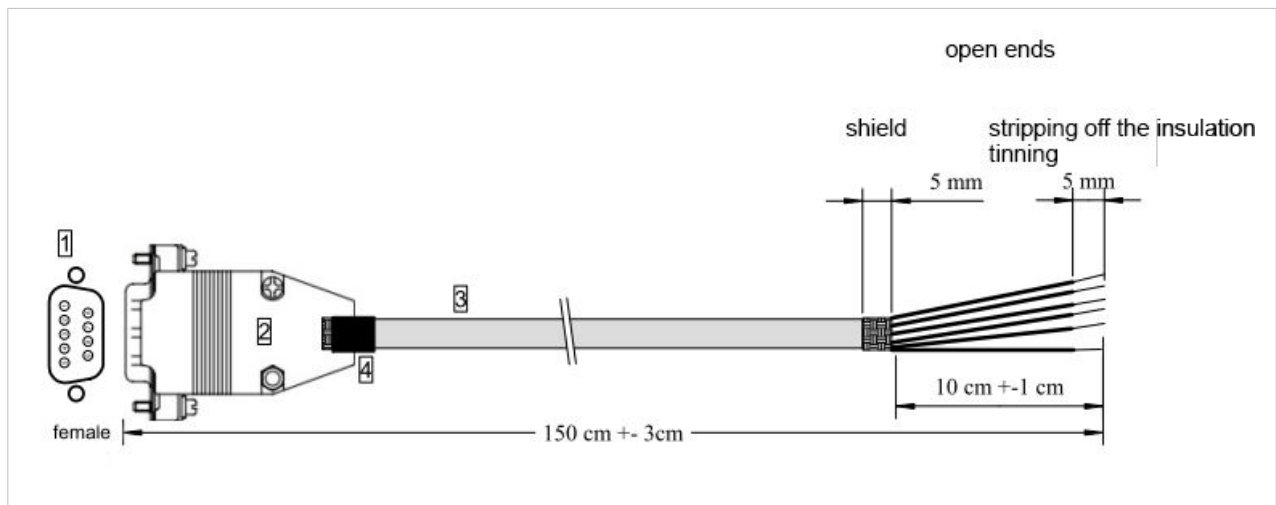


Figure 7. Breakout cable

Table 11. Pin Allocation

Pin	Color	Pin	Color
1	WT	6	PK
2	GN	7	YE
3	BU	8	GY
4	BN	9	RD
5			

## 9. Technical Data

Table 12. Basic Unit

Dimensions (L x W x H)	196 x 113 x 43 mm (without DIN rail bracket and device feet)
Weight	790 g
Operating temperature	-40 °C to +80 °C
Storage temperature	-40 °C to +85 °C
Power supply	6-36 V DC
Current consumption	Typ. 420 mA at 12 V
Housing material	Aluminium, stainless steel
Relative humidity	10-95 %, non-condensing
Host system	Power PC, 256 MByte RAM, 256 MByte Flash
Ethernet	10/100 MBit/s, RJ45
USB	2.0 high-speed device, mini-USB 2.0 high-speed host, USB-A
CAN transceiver high-speed	Texas Instruments SN65HVD251
CAN-FD transceiver	Microchip MCP2562FD
CAN bus termination resistor	None
CAN signal delay with galvanic isolation:	Typ. 27 ns
LIN transceiver	Microchip MCP2003B
System startup time	< 5 sec from power-on

## 10. Support/Return Hardware

### Support

1. To contact support, go to [www.ixxat.com/technical-support/contact-technical-support](http://www.ixxat.com/technical-support/contact-technical-support).
2. Scroll down and click button **mysupport.hms.se** to register a support case.

### Return Hardware

1. On [www.ixxat.com/support/product-returns](http://www.ixxat.com/support/product-returns) click button **Portal** to access the support portal.
2. In the support portal select **Submit Product Return (RMA)**.
3. Read the information and click **Create RMA Case**.
4. Register a support account and sign in.
5. Fill in the form for warranty claims and repair.
6. Print out the Product Return Number (PRN resp. RMA).
7. Pack product in a physically- and ESD-safe way, use original packaging if possible.
8. Enclose PRN number.
9. Observe further notes on [www.ixxat.com](http://www.ixxat.com).
10. Return hardware.

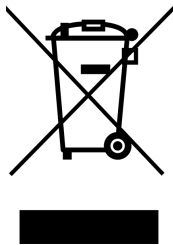
## 11. Regulatory Compliance

### 11.1. EMC Compliance (CE)



The product is in compliance with the Electromagnetic Compatibility Directive. More information and the Declaration of Conformity is found at [www.ixxat.com](http://www.ixxat.com).

### 11.2. Disposal and Recycling



You must dispose of this product properly according to local laws and regulations. Because this product contains electronic components, it must be disposed of separately from household waste. When this product reaches its end of life, contact local authorities to learn about disposal and recycling options, or simply drop it off at your local HMS office or return it to HMS.

For more information, see [www.hms-networks.com](http://www.hms-networks.com).

## 12. Open Source Software

The software of the device contains software components that are licensed as Free Software or Open Source Software by the rights holders. The corresponding licenses are available on the support area of the device on [www.ixxat.com](http://www.ixxat.com). (Included in Firmware Download Package as well as included in Offline Help Package). You may obtain the complete corresponding source code of the software components from us on a data carrier and within three years as of the distribution of the software by us or at least for as long as we offer support and spare parts for the software, if you make a request to HMS Industrial Networks AB at the following address:

HMS Industrial Networks AB  
Box 4126  
SE-300 04 Halmstad  
Sweden

The source code is also available at the support area of the device on [www.ixxat.com](http://www.ixxat.com).