Ixxat® BY HMS NETWORKS

CANnector Range

USER MANUAL

4.01.0091.22000 1.1 en-US ENGLISH

HMS Connecting Devices™

Important User Information

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Table of Contents

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1 User Guide

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

1.1 Target Audience

This manual addresses trained personnel who are familiar with CAN, CAN FD and the applicable national standards. The contents of the manual must be made available to any person authorized to use or operate the product.

1.2 Related Documents

Document	Author
IxAdmin Online Help	HMS
ACT Installation Manual	HMS
Installation Guide *CANnector*	HMS

1.3 Document History

Version	Date	Description
1.0	October 2020	First release
1.1	November 2020	Minor corrections, added pin allocation power connector

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 and results are structured as follows:

- ► instruction 1
- ► instruction 2
  - → result 1
  - → result 2

Lists are structured as follows:

- item 1
- item 2

Bold typeface indicates interactive parts such as connectors and switches on the hardware, or menus and buttons in a graphical user interface.

```
This font is used to indicate program code and other
kinds of data input/output such as configuration scripts.
```

This is a cross-reference within this document: *Conventions, p. 4*

This is an external link (URL): www.hms-networks.com

Safety advice is structured as follows:

> **!** Cause of the hazard!
>
> Consequences of not taking remediate action.
>
> How to avoid the hazard.

Safety signs and signalwords are used dependent on the level of the hazard.

This is additional information which may facilitate installation and/or operation.

> **!** This instruction must be followed to avoid a risk of reduced functionality and/or damage to the equipment, or to avoid a network security risk.

> **Caution**
> This instruction must be followed to avoid a risk of personal injury.

> **WARNING**
> This instruction must be followed to avoid a risk of death or serious injury.

2 Safety Instructions

2.1 Information on EMC

> **!** 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.

2.2 General Safety Instructions

- Protect product from moisture and humidity.
- Protect product from too high or too low temperature (see *Technical Data, p. 26*).
- 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.

2.3 Intended Use

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:

- CANnector Range
- adhesive device feet
- Installation Guide *CANnector*
- power supply connector

4 Product Description

With the CANnector Range the connected busses can be transferred over a long distance via Ethernet. To extend the transmission range of the interfaces two CANnector Range devices (Master and Slave) are required. The Master device establishes a connection to the Slave device via Ethernet and transparently extends the CAN busses.

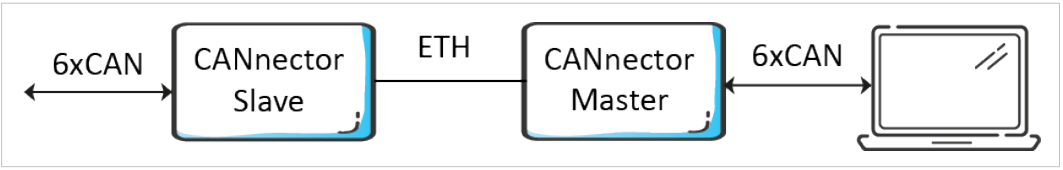

Fig. 1 CANnector Master and Slave

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.

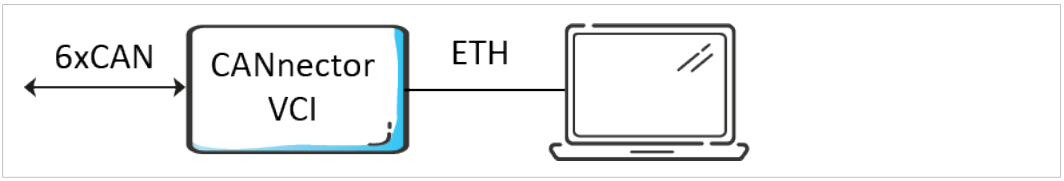

Fig. 2 CANnector VCI

The provided ready-to-use basic configurations for Master and Slave devices allow to extend the six available CAN busses via Ethernet for the baud rates 125 Kbit/s, 250 Kbit/s, 500 Kbit/s, or 1000 Kbit/s. By default the Master configuration with 250 Kbit/s is loaded. The ACT tool provides further configuration possibilities.

4.1 Features

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

4.2 Software for Configuration and Visualization

The CANnector Range provides various possibilities to manage configurations.

Web Browser

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

ACT Tool

The ACT is Windows based and allows the easy creation of configurations via drag and drop. The ACT tool provides further configuration possibilities (e.g. setting a specific IP address).

IxAdmin

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

5 Installation

5.1 Installing the Software

To connect the CANnector Range to a PC via USB a driver is needed. With installation of the configuration tool ACT the driver is automatically installed.

The ACT tool can be downloaded on www.ixxat.com.

- On www.ixxat.com/technical-support/support select **Advanced Configuration Tool** and open **Secured Downloads**
- Download the ACT tool ZIP container from the support area.

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

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

5.2 Installing the Hardware

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

5.2.1 Installing on DIN Rail

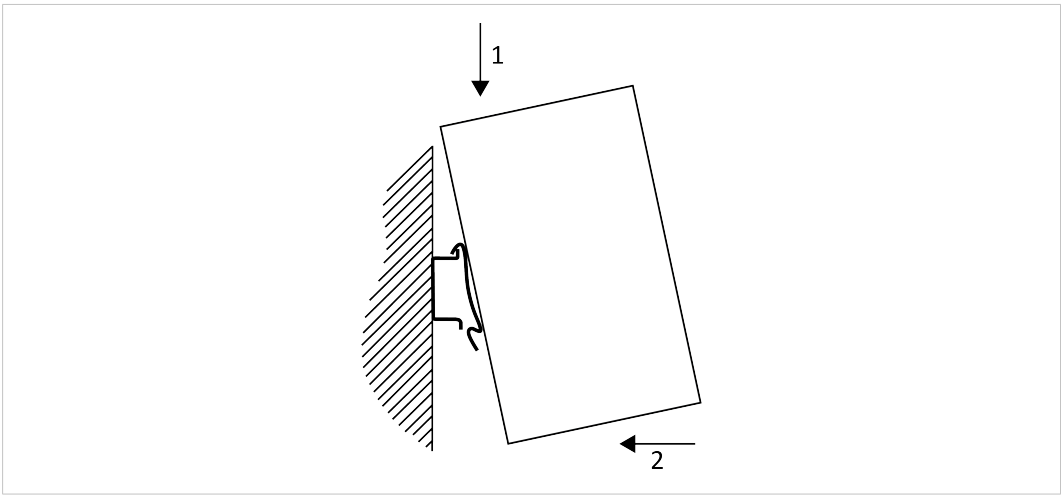

Fig. 3 Installing on din rail

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

5.2.2 Installing the Adhesive Feet

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

5.3 Connecting Master and Slave Device

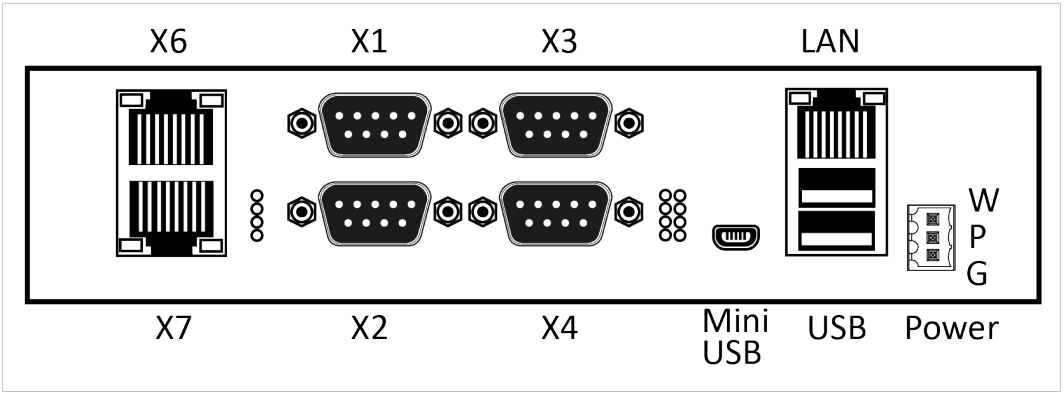

Fig. 4 CANnector front connectors

Pin Allocation Power Connector		
Pin	**Signal**	**Description**
1	G	Ground
2	P	Permanent power supply to provide power in standby mode (+6 to +36 V DC)
3	W	Input to switch on the device (wake up)

For more information about the interfaces, the detailed pin allocations, available accessories, and the LEDs see Installation Guide *CANnector*.

- Make sure, that the software is installed (see *Installing the Software, p. 8*).
- 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.
- Connect the power supply of both devices.
- Use a direct Ethernet cable to connect both devices via the LAN connector.
- Connect the CAN interfaces X1 to X4 to be used.
- If required, integrate a bus termination in the CAN connection.
- Connect the bus termination to the cable and/or to the connector.
- Use suitable cable assemblies for the CANnector Range, available from Ixxat.
- Switch on the power supply.

By default the Master configuration (250 Kbit/s) is loaded to the device, therefore the Slave application must be selected on the Slave device:

- Use the USB cable (included in the scope of delivery) to connect the Mini USB connector of the CANnector Slave to the PC.
- Open a web browser on the PC.

► Enter the IP address 169.254.254.254 as URL.

→ CANnector Range dashboard is opened.

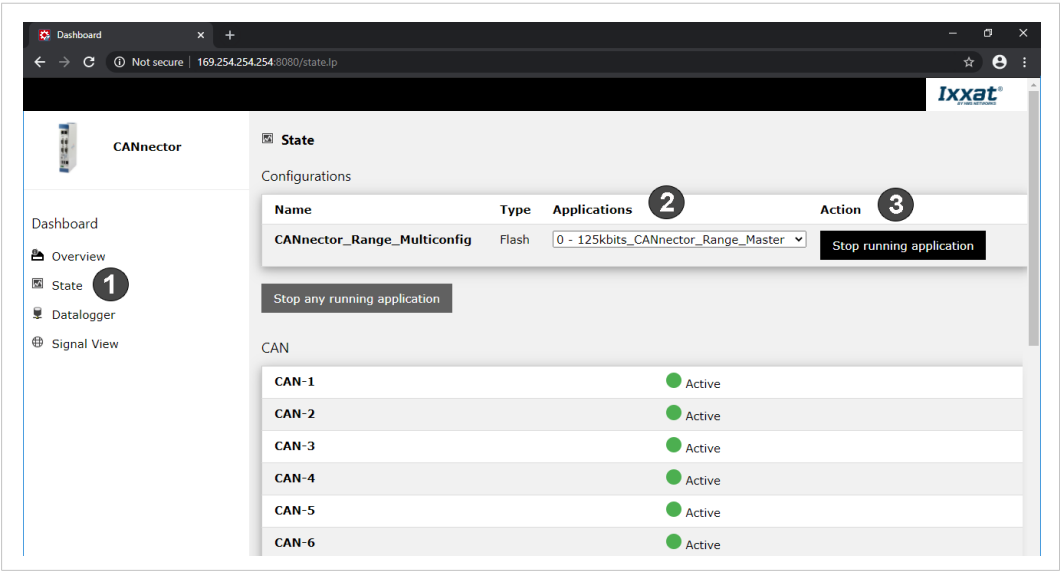

Fig. 5 CANnector dashboard

► Select **State** (**1**) in the configuration tree.

→ State of configuration and CAN ports is shown.

► Click button **Stop running application** in column **Action** (**1**).

► In drop-down menu in column **Application** (**2**) select the Slave application with the desired baud rate.

► Click button **Start selected application** in column **Action** (**3**).

→ Selected configuration is running.

→ All connected CAN busses are extended one to one.

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

5.4 Connecting Directly to a PC (VCI)

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 and acts as remote PC interface connected via Ethernet. In that case the baud rates can be set individually from the PC and lower latencies can be achieved.

The VCI driver is constantly improved and expanded! Check if a newer version is available within the support area on www.ixxat.com.

- Make sure that the software is installed (see *Installing the Software, p. 8*).
- Install the latest VCI driver on a Windows computer.
- Make sure, that the driver components for the FRC-EP190 are installed (see Installation Guide *VCI Driver*).
- Use a direct Ethernet cable to connect the CANnector Range to the PC via the LAN connector.

  or

  Use the USB cable (included in the scope of delivery) to connect the Mini USB connector of the CANnector Slave to the PC (for configuration only).

  or

  Use the WiFi option to wireless connect the CANnector Range to the PC (for more information see *ACT Help*).
- When VCI driver for FRC-EP190 is installed, go to **Start menu — HMS — Ixxat® VCI 4.0** and open the **VCI Device Server Control**.

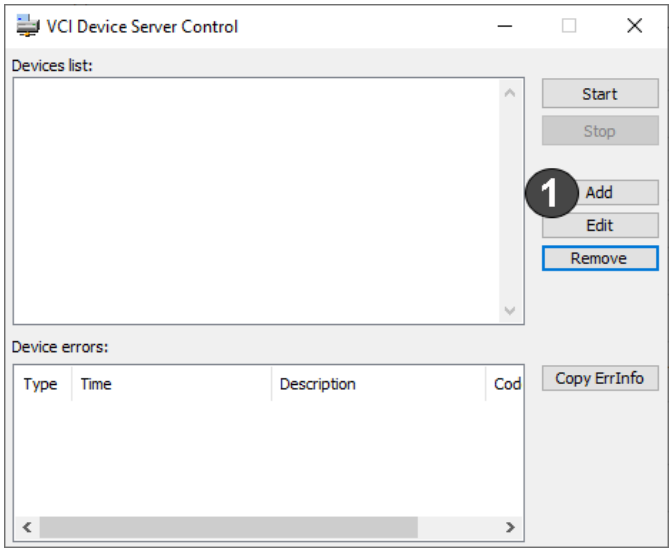

Fig. 6 VCI Device Server Control

- Click button **Add** (**1**).

  → Window **Add Device** is opened.

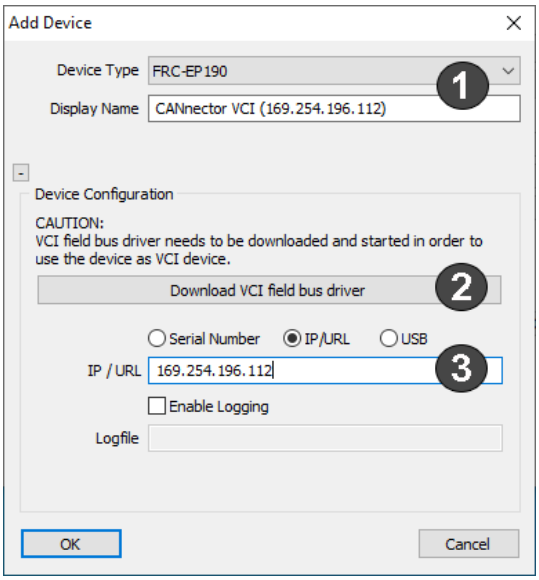

Fig. 7 Add Device

► In field **Device Type** (**1**) select **FRC-EP190**.

The CANnector is part of the FRC-EP device family.

► In field **Display Name** (**1**) enter a name for the device to be connected.

The name of the device is displayed in the VCI Device Server Control.

► Select **IP/URL** and enter IP of device in use in field **IP/URL** (**3**) Check default IP address on the device label.

In case of WiFi connect the PC to the CANnector WiFi access point (IP address: 192.168.0.1).

► If using a device connected via USB, select **USB** (**3**). With USB only one CANnector can be connected to the PC.

► To download the VCI application to the CANnector (only in first configuration), click button **Download VCI field bus driver** (**2**).

→ IxAdmin window **Connect Device** is opened.

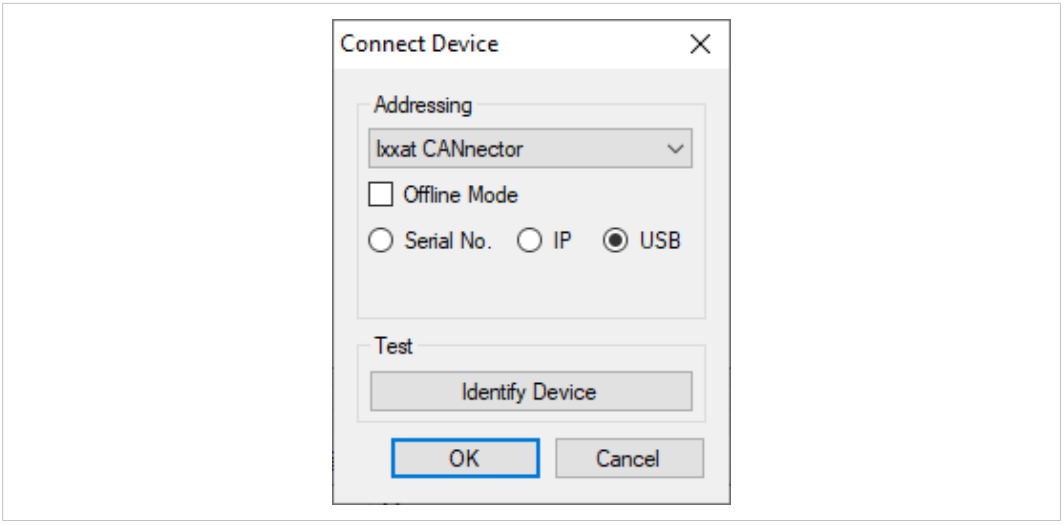

Fig. 8 IxAdmin

- Select **Ixxat CANnector.**.
- Select IP or USB depending how the CANnector Range is connected.
- If connected via IP, enter the IP address of the device.
- Click button **OK**

  → Connection to CANnector is established.

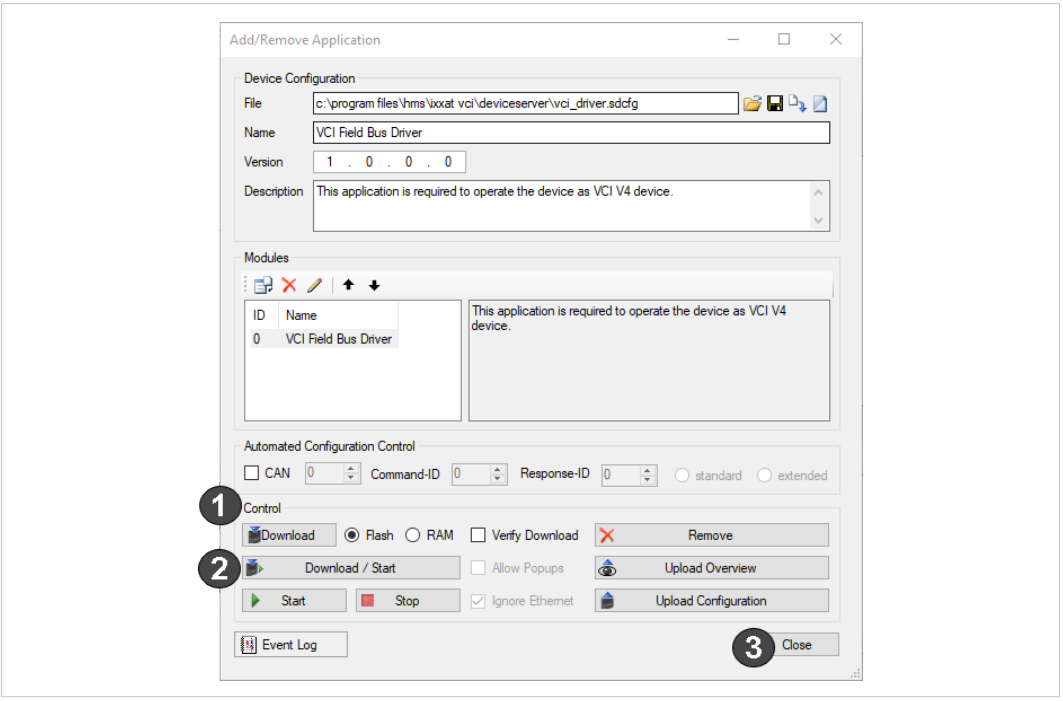

Fig. 9 IxAdmin

- In field **Control** (**1**) define the memory the configuration is downloaded to:
  - Select Flash for the non-volatile memory of the target device. Configurations which are downloaded to the Flash memory, are automatically started at the next power-on of the device.
  - Select RAM for the volatile memory of the target device. Configurations which are installed in the RAM memory are lost when the device is switched off.

- ► To start the configuration on the CANnector Range, click button **Download/Start** (**2**).
- ► Click button **Close** (**3**).
- ► In the **VCI Device Server Control** window **Add Device** click button **OK** (**1**).

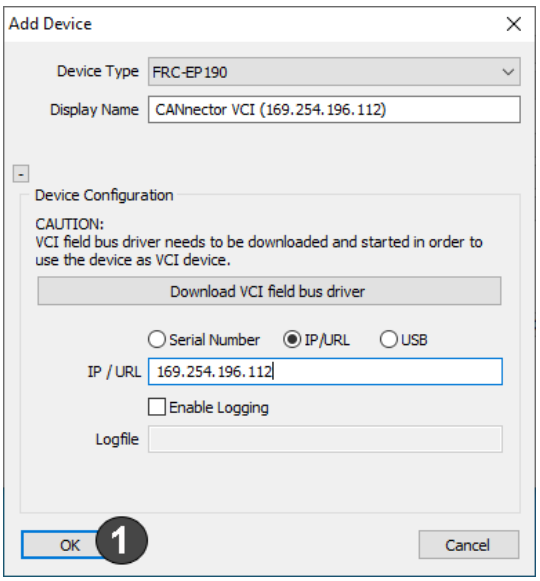

Fig. 10 VCI Add Device

- ► In the **VCI Device Server Control** select the CANnector in the device list and click button **Start**.

  → When the CANnector is ready to use with the VCI application, symbol ✓ is shown.

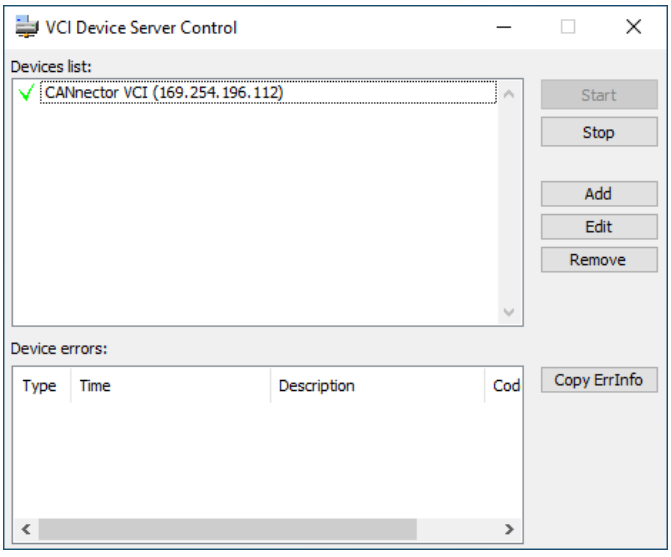

Fig. 11 Connected device

► To access the six CAN interfaces of the CANnector open for example the canAnalyser 3 Mini (included in the VCI download).

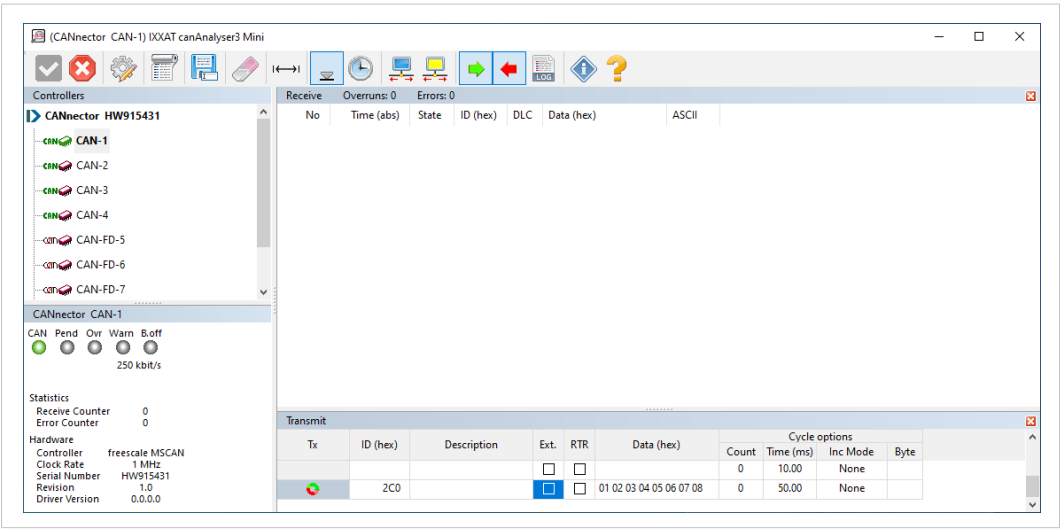

Fig. 12 can Analyser 3 Mini

To change back to the pre-configured basic configuration (Master and Slave) load the desired configuration to the device with IxAdmin.

6 Configuration

By default the CANnector Range Master configuration that initializes all six CAN interfaces with 250 Kbit/s is loaded and the respective Slave configuration must be loaded to the Slave device when connecting the device (see *Connecting Master and Slave Device, p. 9*). To change the baud rate of all CAN interfaces to 125Kbit/s, 500 Kbit/s, or 1000 Kbit/s other pre-configured Master and Slave configurations can be selected with the dashboard (see *Selecting a Configuration with Different Baud Rate, p. 16*). With IxAdmin, it is possible to set specific baud rates for individual interfaces in the pre-configured configuration (see *Setting a Specific Baud Rate, p. 17*), or to set a specific IP address for the Slave (see *Setting a Specific IP Address, p. 21*).

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 (see *Connecting Directly to a PC (VCI), p. 11*).

6.1 Pre-Configured Configurations

6.1.1 Selecting a Configuration with Different Baud Rate

By default the configuration with 250 Kbit/s is loaded. To use another pre-configured configuration with another baud rate for all CAN interfaces, the configuration can be selected in the dashboard via a web browser. The configurations must be selected for both Master device and Slave device.

- Connect the CANnector Range devices (see *Connecting Master and Slave Device, p. 9*).
- Make sure, that the required software is installed (see *Installing the Software, p. 8*).
- Use the USB cable (included in the scope of delivery) to connect the Mini USB connector of the CANnector Range Master to the PC.
- Open a web browser on the PC.
- Enter the IP address 169.254.254.254 as URL.

  → CANnector Range dashboard is opened.

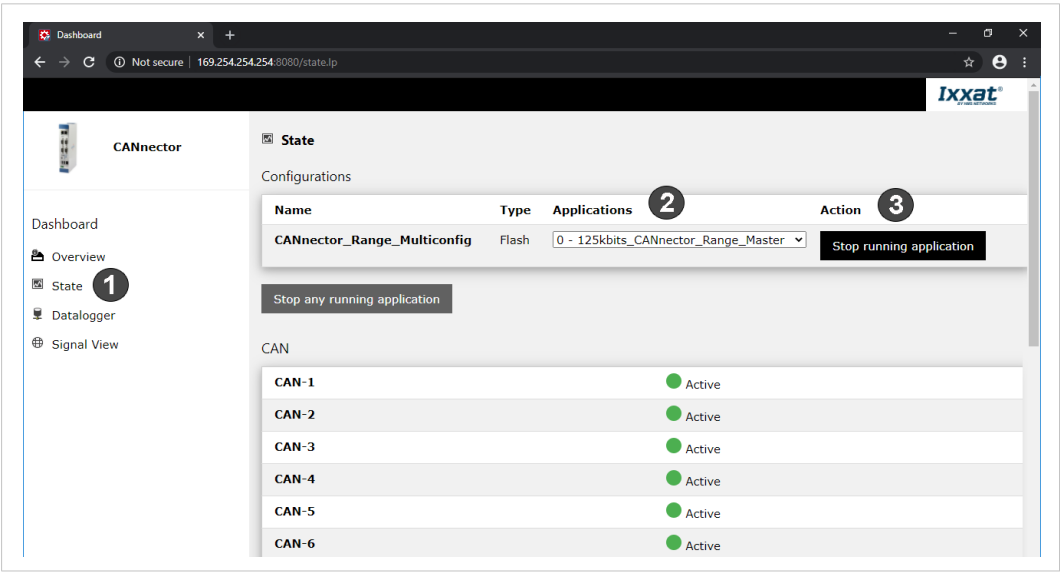

Fig. 13 Dashboard

- 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 Master configuration with the desired baud rate.
- Click button **Start selected application** in column **Action** (**3**).
  → Application with selected baud rate is running.
  → Configuration starts automatically for the selected baud rate.
- Connect the CANnector Range Slave device (see *Connecting Master and Slave Device, p. 9*).
- Repeat the connecting and configuration steps as done for the Master.
- Select the Slave configuration with the same baud rate as the configuration selected for the Master.
- Click button **Start selected application** in column **Action** (**3**).
  → Application with selected baud rate is running.
  → Configuration starts automatically for the selected baud rate.

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

6.1.2 Setting a Specific Baud Rate

With IxAdmin it is possible to set an individual baud rate for each CAN bus or a specific baud rate (e.g. 666 kBit/s) without creating a new configuration.

- Connect the CANnector Range (see *Connecting Master and Slave Device, p. 9*).
- Make sure, that the required software is installed (see *Installing the Software, p. 8*).
- Use the USB cable (included in the scope of delivery) to connect the Mini USB connector of the CANnector Range to the PC.
- Start IxAdmin on the PC.
  → Window **Connect Device** is opened.

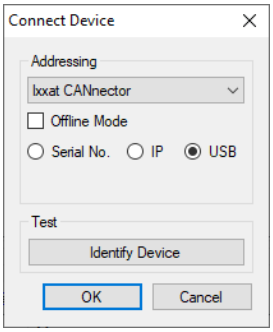

Fig. 14 IxAdmin

- Select **Ixxat CANnector** and **USB**.
- Click button **OK**.
  → Connection to CANnector is established.

► Open menu **Device** and select **Add/Remove Application**.

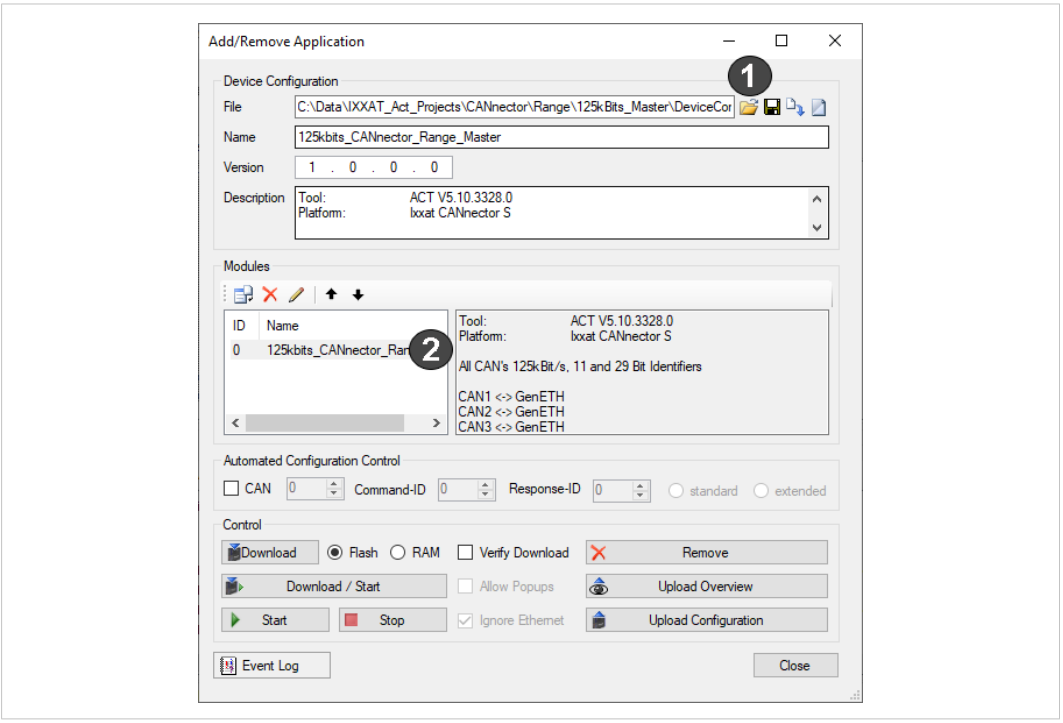

Fig. 15 IxAdmin CANnector configuration

► Click button **Open folder** (**1**).

► Select one basic configuration (sdcfg file) and click button **Open**.

The sdcfg file is the download project file of a configuration, that contains all links to all files that are required for one configuration.

→ Selected basic configuration is opened.

► Double-click on the configuration in window **Modules** (**2**).

→ Window to configure the application is opened.

→ Available CAN controllers are listed in field **Bus controllers**.

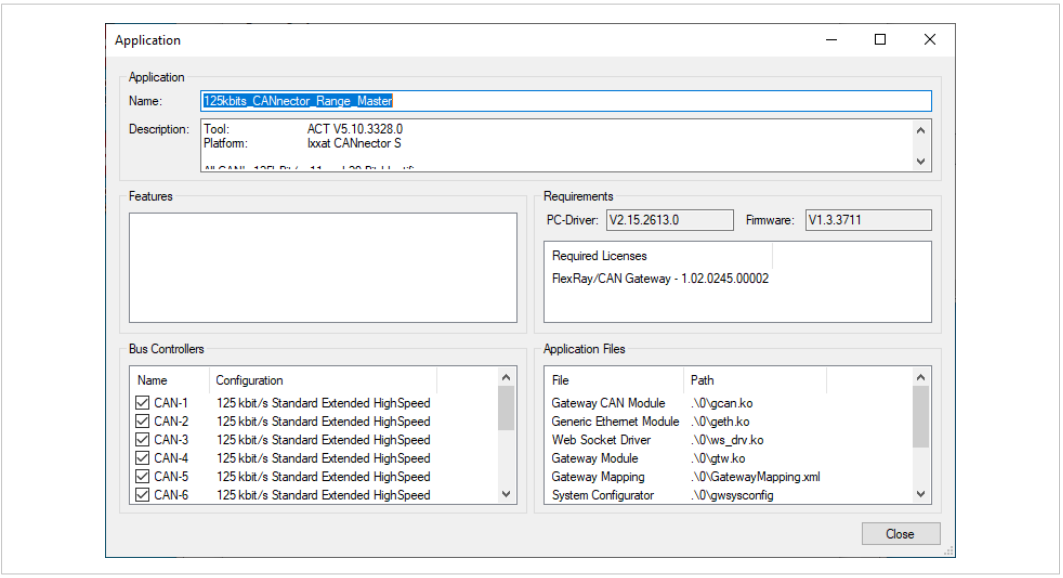

Fig. 16 IxAdmin CANnector application

► In field **Bus Controllers** select the desired CAN controller and right-click on the desired controller.

→ Window to edit the controller is opened.

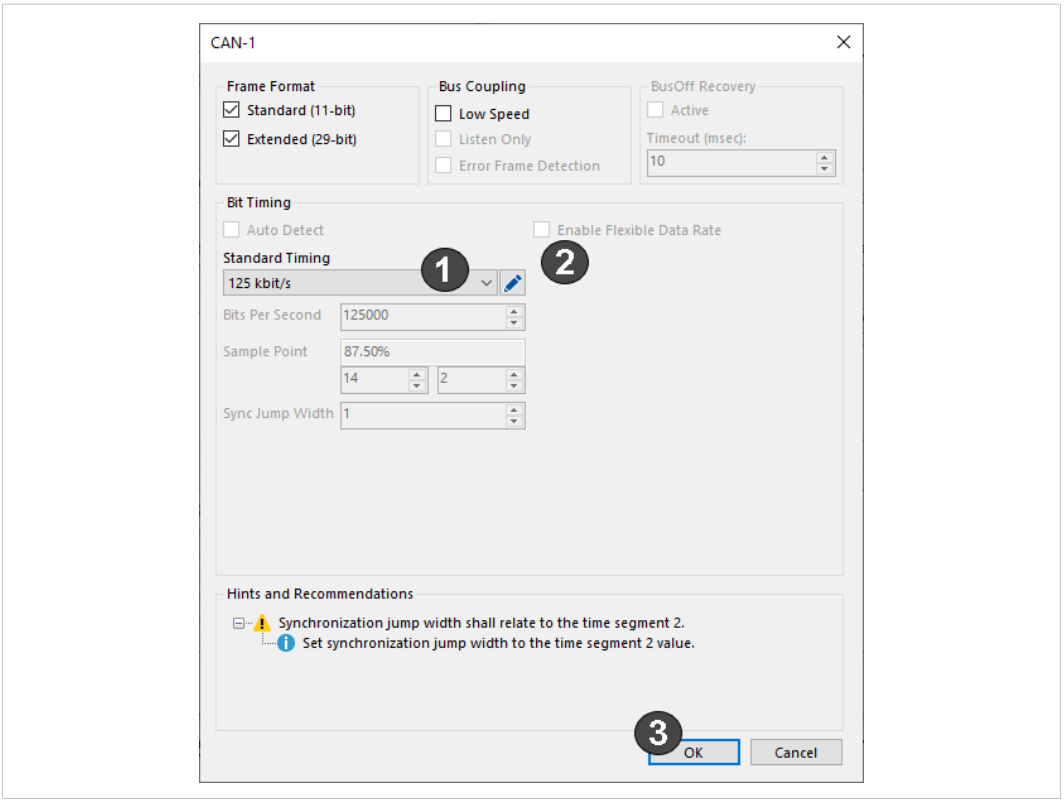

Fig. 17 IxAdmin Edit Baud rate of CAN controller

► Select the desired baud rate in drop-down menu **Standard Timing** (**1**).

► To enable CAN FD with CAN 5 and CAN 6, activate **Enable Flexible Data Rate** (**2**) to be able to set the Standard baud rate and the Fast Timing baud rate for CAN FD.

► To assign the selected baud rate to the controller, click button **OK** (**3**).

► To close the window, click button **Close**.

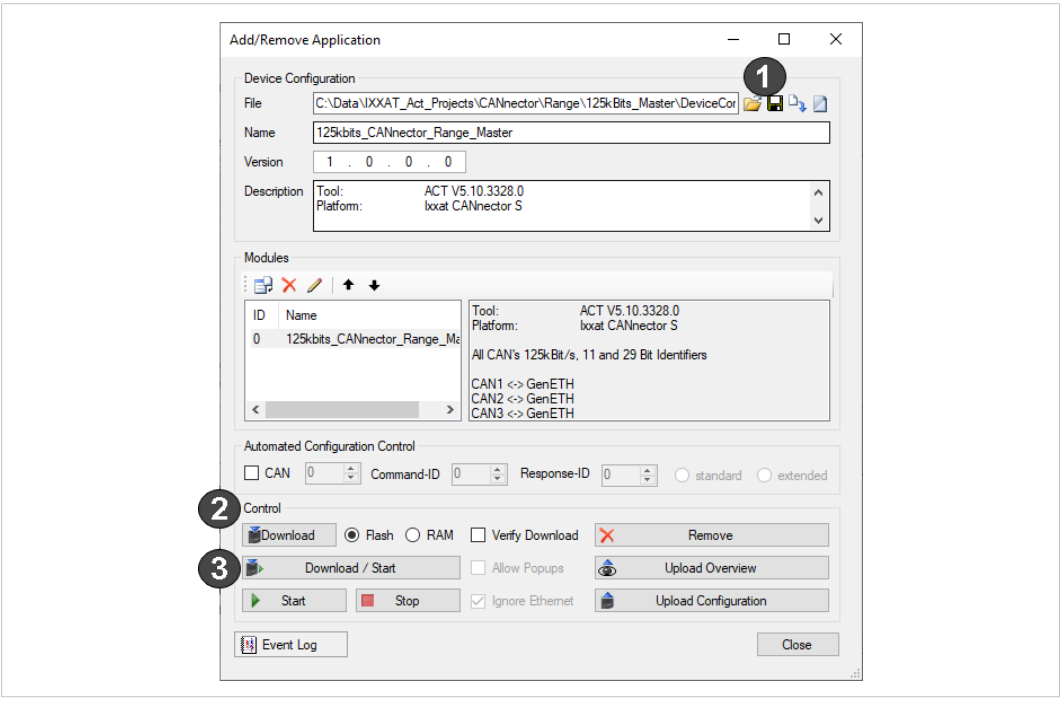

Fig. 18 Save application

► In window **Add/Remove application** save the configuration with button **Save** (**1**).

► In field **Control** (**2**) define the memory the configuration is downloaded to:

– Select Flash for the non-volatile memory of the target device. Configurations which are downloaded to the Flash memory, are automatically started at the next power-on of the device.

– Select RAM for the volatile memory of the target device. Configurations which are installed in the RAM memory are lost when the device is switched off.

► To start the configuration on the CANnector, click button **Download/Start** (**3**).

6.1.3 Setting a Specific IP Address

In the provided basic Master configurations an IP address for the Slave device is defined. To connect a Master with another Slave, the Master has to know the IP address of the new Slave. The Slave address can be communicated to the Master device with IxAdmin in the pre-configured basic configuration of the Master.

- Make sure, that the required software is installed (see *Installing the Software, p. 8*) and that the CANnector Range is connected (see *Connecting Master and Slave Device, p. 9*).
- Use the USB cable (included in the scope of delivery) to connect the Mini USB connector of the CANnector Range to the PC.
- Start IxAdmin on the PC.

  → Window **Connect Device** is opened.

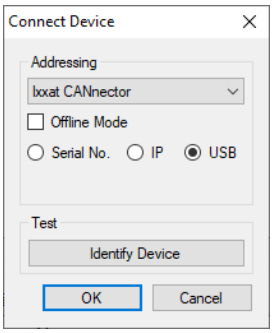

Fig. 19 IxAdmin

- Select **Ixxat CANnector** and **USB**.
- Click button **OK**.

  → Connection to CANnector is established.
- Open menu **Device** and select **Add/Remove Application**.

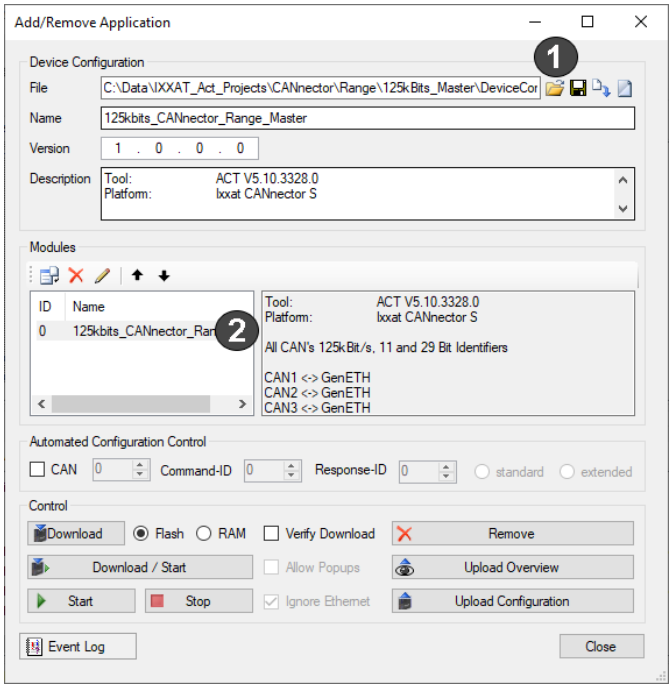

Fig. 20 IxAdmin CANnector configuration

- ► Click button **Open folder** (**1**).
- ► Select one basic configuration (sdcfg file) and click button **Open**.

The sdcfg file is the download project file of a configuration, that contains all links to all files that are required for one configuration.

→ Selected basic configuration is opened.

- ► Double-click on the configuration in window **Modules** (**2**).

→ Window to configure the application is opened.

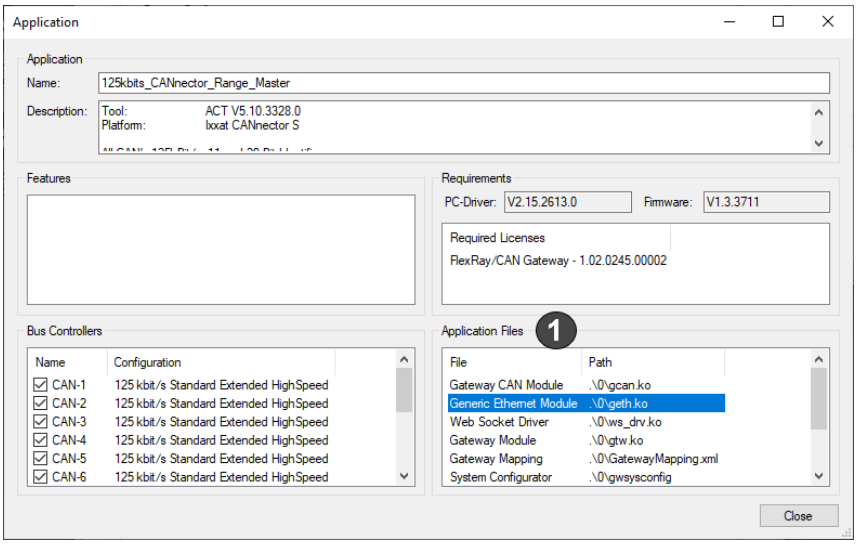

Fig. 21 IxAdmin CANnector application

- ► In field **Application Files** (**1**) select and right-click list entry **Generic Ethernet Module** and select **Edit**.

→ Window to edit the IP settings is opened.

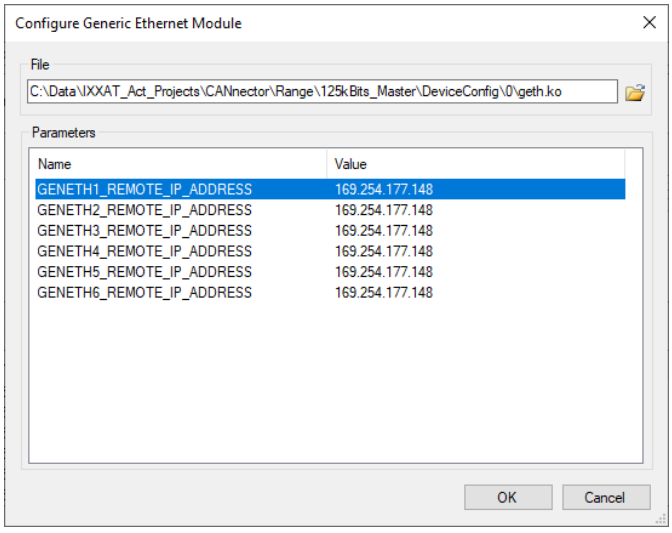

Fig. 22 Select IP Stream

► Select and right-click the first IP address line and select **Edit**.

→ Window to edit the IP address is opened.

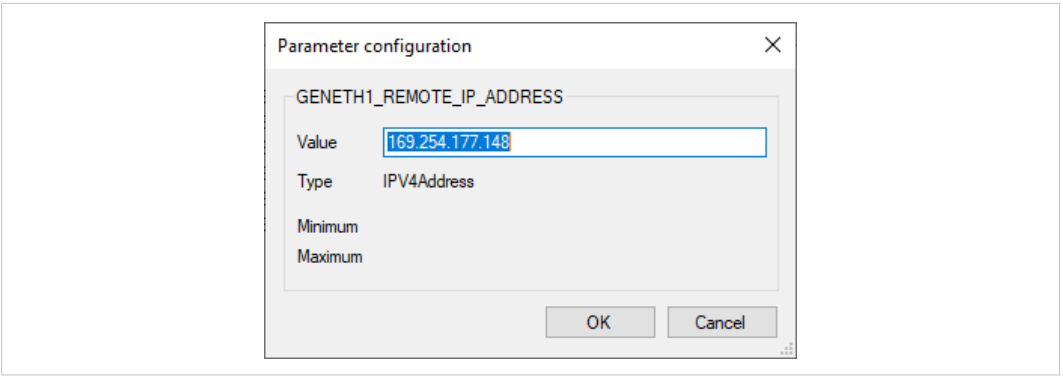

Fig. 23 Edit IP address

► Enter the IP address of the Slave device and click button **OK**.

→ The entered IP address is assigned to the virtual bus.

► Repeat the assigning of the IP address for each IP address line.

> **!** Each of the six CAN busses is transmitted in one IP stream. Since all IP streams are transmitted to the destination Slave device, the new IP address must be set six times, once for each IP stream.
>
> If combining a Master device with several Slave devices, it is possible to distribute the CAN busses to different IP addresses. In this case the IP address of the desired Slave must be set for the respective stream.

► To close the window, click button **Close**.

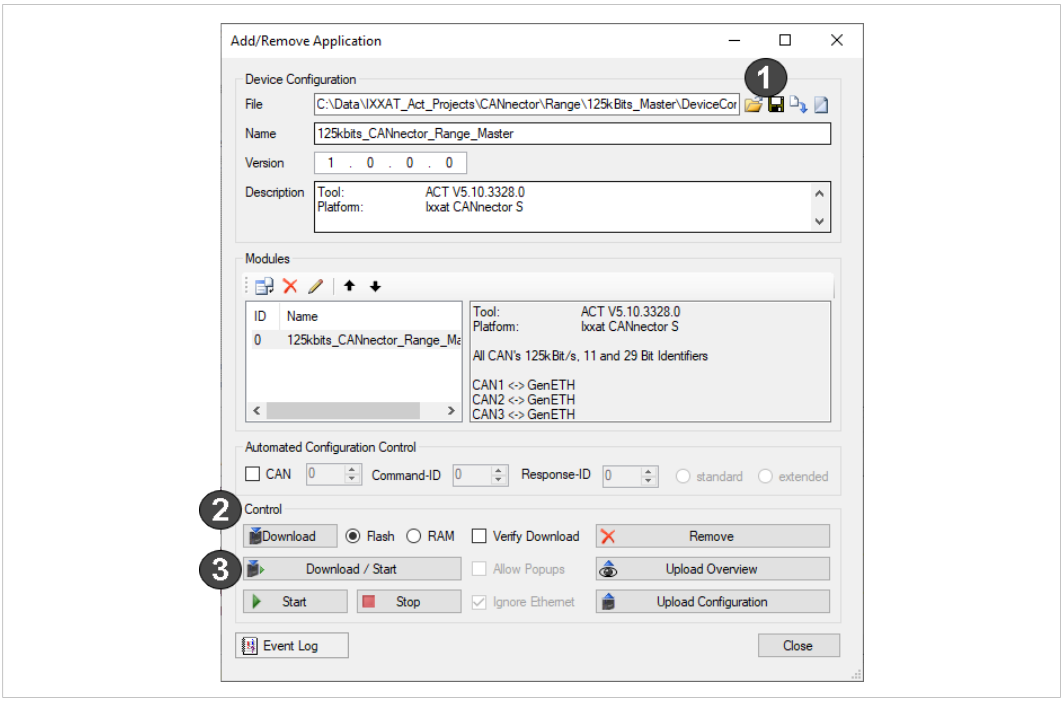

Fig. 24 Save application

► Save the configuration with button **Save** (**1**).

- In field **Control** (**2**) define the memory the configuration is downloaded to:
  - Select Flash for the non-volatile memory of the target device. Configurations which are downloaded to the Flash memory, are automatically started at the next power-on of the device.
  - Select RAM for the volatile memory of the target device. Configurations which are installed in the RAM memory are lost when the device is switched off.
- To start the configuration on the CANnector, click button **Download/Start** (**3**).

6.2 Configuring Further Functions

The CANnector Range can additionally be used as Logger or Gateway/Bridge, to manipulate data and to visualize data. When combined with a WiFi or LTE extensions it is possible to access the device wireless from the cloud or to configure the device to send logging data to a server in the cloud.

The following functions are possible:

FDX	Fast Data Exchange	Standardized protocol to exchange data via Ethernet
GenEthernet	Virtual CAN interfaces on Ehternet	Ixxat protocol to transmit CAN busses via Ethernet, allows to represent Range Extender applications (see *User Manual CANnector Range*)
IO	Digital I/Os	Allows to use the Digital I/Os of the CANnector Range (e.g. to trigger the logger or to switch on a light)
MatLab	MatLab/Simulink models	Possibility to calculate signals with a Simulink model that runs on the CANnector Range
OPC	OPC-UA	Standardized protocol for data exchange with a cloud
System	System bus	Contains all status signals of all used bus systems, e.g. CAN bus status
Logger	Data logger	Possibility to extend the configurations with data loggers, e.g. to log signals and messages parallel to the Bridge/Gateway (see *User Manual CANnector Log*)
Trigger	Trigger module	Possibility to trigger on messages or signal values and for example start logging with the trigger. Possibility to trigger the transmission of a message or to switch a digital I/O (see *User Manual CANnector Log*)
Virtual	Define own signals	Possibility to define signals, e.g. to count via usercode how often a certain event happens
WebSock	Data visualization/stimulation	Signals that are mapped to this bus, can be visualized and stimulated with the web browser
XCP	XCPonEthernet	Standardized protocol to exchange data via Ethernet

► To additional functions to the configuration, in the ACT tool open menu **Project — Bus configuration**.

→ Window **Bus Configuration** is opened.

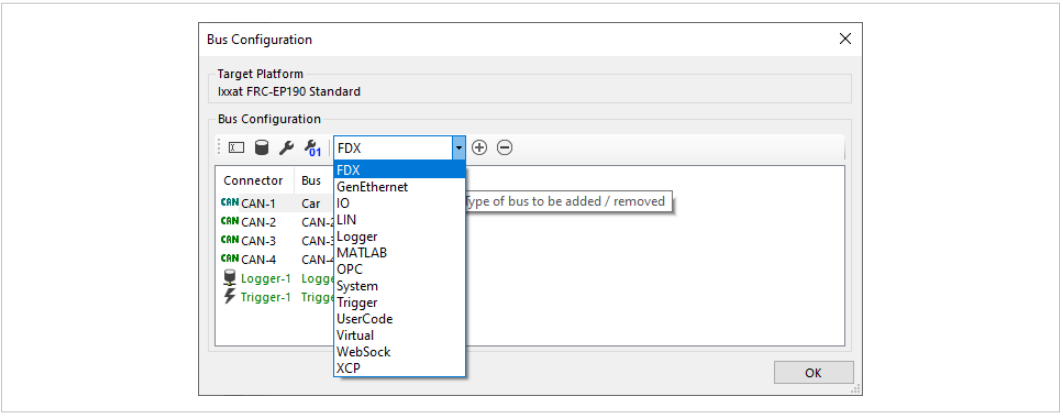

Fig. 25 Bus Configuration

► Open drop-down menu and select the desired function.

► Click button **Add (+)** to add the selected function.

→ Module is added to the configuration.

► For information about the configuration of the additional functions see *ACT Help*.

7 Technical Data

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, USB-B 2.0 high-speed device, 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

8 Support/Return Hardware

8.1 Support

- For problems or support with the product request support at www.ixxat.com/support.
- If required use support phone contacts on www.ixxat.com.

8.2 Return Hardware

- Fill in the form for warranty claims and repair on www.ixxat.com/support/product-returns.
- Print out the Product Return Number (PRN resp. RMA).
- Pack product in a physically- and ESD-safe way, use original packaging if possible.
- Enclose PRN number.
- Observe further notes on www.ixxat.com.
- Return hardware.

9 Disposal

- Dispose of product according to national laws and regulations.
- Observe further notes about disposal of products on www.ixxat.com.

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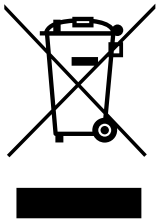
A Regulatory Compliance

A.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.

A.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.

B Open Source Software

The software of the Ixxat CANnector Range 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 CANnector Range on 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 CANnector Range on www.ixxat.com.

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