# Kvaser DIN Rail SE410S-X10 User's Guide

(This page is intentionally left blank.)

# Contents

# 1 About this manual

This manual is intended for Kvaser DIN Rail SE410S-X10 users. This manual contains a description of the hardware properties and general instructions for connecting the device to a computer.

# 2 Introduction

This section will describe the functions and features of the Kvaser DIN Rail SE410S-X10.

## 2.1 Welcome to Kvaser DIN Rail SE410S-X10



Figure 1: Kvaser DIN Rail SE410S-X10

Kvaser DIN Rail SE410S-X10 is a powerful Ethernet to CAN/CAN FD interface with support for Kvaser t programs. It has 4 CAN/CAN FD channels, support for I/O via add-on modules and 16GB flash storage. Kvaser DIN Rail SE410S-X10 acts as a master for the add-ons. The housing has a smart mounting clip that attaches to a DIN rail for easy installation. The communication between the I/O modules and the Kvaser DIN Rail SE410S-X10 uses an optical bus, thus there is no need for cables in between. The I/O modules can be controlled either from Kvaser's CANlib SDK (over Ethernet) or directly on the unit using Kvaser t programs. The different I/O modules are listed in Table 3 on Page 8. The Kvaser DIN Rail SE410S-X10 is compatible with applications that use Kvaser's CANlib SDK.

This guide is applicable to the Kvaser DIN Rail SE410S-X10 devices listed in Table 1.

| Device | Description | Product Number |
|---|---|---|
| Kvaser DIN-Rail SE410S-X10 | Base module | 73-30130-01118-2 |
| Kvaser DIN Rail S010-X10 | Digital add-on | 73-30130-01065-9 |
| Kvaser DIN Rail S020-X10 | Analog add-on | 73-30130-01066-6 |
| Kvaser DIN Rail S030-X11 | Relay add-on | 73-30130-01067-3 |

Table 1: Kvaser DIN Rail SE410S-X10 device family and their product numbers.

## 2.2 Major features

- Quick and easy installation.

- Multi channel CAN to Ethernet interface.

- Supports CAN FD, up to 8 Mbit/s (with correct physical layer implementation).

- Capable of sending up to 20000 messages per second, per CAN channel.

- Ethernet connection with auto-MDIX using a standard shielded RJ45 socket.

- Galvanically isolated CAN channels.

- Fully compatible with J1939, CANopen, NMEA 2000 and DeviceNet.

- Lightweight plastic housing for easy mounting on DIN Rail, no tools needed.

- Can use up to four add-on modules for digital and/or analog inputs and outputs, controllable through Kvaser CANlib.

- Supports programs written in the Kvaser t programming language, enables e.g. gateway functionality.

- Allows users to develop I/O functionality written in the Kvaser t programming language.

- Compatible with all applications written for Kvaser hardware, such as PCIcan and USBcan, using Kvaser CANlib.

- Allows users to save programs written in Kvaser t programming language to flash storage.

- Automatically start t programs at power on.

## 2.3 Interface

Kvaser DIN Rail SE410S-X10 provides a CAN bus interface through a standard RJ-45 connector.

## 2.4 The t programming language

The Kvaser t programming language is event oriented and modelled after C. It can be used to customize the behavior of the Kvaser DIN Rail SE410S-X10 and other Kvaser t capable devices.

A t program is invoked via hooks, which are entry points that are executed at the occurrence of certain events. These events can be, for example, the arrival of specific CAN messages or a timer expiration.

Like any Kvaser CAN interface, the Kvaser DIN Rail SE410S-X10 can be used via CANlib on a PC. The addition of t programs running directly on the Kvaser DIN Rail SE410S-X10 makes it possible to react much quicker to CAN bus events (for example to speed up file transfer protocols or to simulate missing hardware).

For more information, see the Kvaser t Programming Language guide that can be downloaded at www.kvaser.com/download.

### 2.4.1 Restrictions in t functionality

The Kvaser DIN Rail SE410S-X10 has no logging functionality, no real-time clock (RTC). This means that the t functions listed in Table 2 on Page 7 are not available in Kvaser DIN Rail SE410S-X10.

| Group | Function name |
|---|---|
| Predefined Logger Related Functions | `filterDropMessage` |
| | `loggerStatus` |
| | `loggerStart` |
| | `loggerStop` |
| Other Predefined Functions | `timeGetDate` |

Table 2: Functionality in the t language that is not supported by Kvaser DIN Rail SE410S-X10.

## 2.5 Additional software and documentation

The Kvaser CANlib SDK includes everything you need in order to develop software applications interacting with Kvaser CAN hardware. The SDK contains full documentation and many sample programs, written in C, C++, C#, Delphi, Python and Visual Basic. Kvaser CAN hardware is built around the same common software API. Applications developed using one device type will run without modification on other device types.

The latest versions of documentation, software and drivers can be downloaded for free at www.kvaser.com/download.

# 3   Kvaser DIN Rail SE410S-X10 hardware

In this section you can read more about the CAN channels, power supply and LED indicators.

## 3.1   Modules

The Kvaser DIN Rail SE410S-X10 is a base module which controls up to four, optional, add-on modules attached to the right side of the base module. Only the Kvaser DIN Rail SE410S-X10 can act as a single unit.

The communication between the Kvaser DIN Rail SE410S-X10 and the add-on modules uses an internally integrated optical bus, so no cable connections are needed between them.

All modules use the same connector type for CAN (see Section 3.6, CAN connector, on Page 16), IOs (see Section 3.5, IO connectors, on Page 14) and power (see Section 3.7, Power supply, on Page 17).

The following types of IO modules can be connected:

| Add-on Name | Description | Product Number | I/O ports |
|---|---|---|---|
| Kvaser DIN Rail S010-X10 | Digital add-on | 73-30130-01065-9 | 16 inputs and 16 outputs |
| Kvaser DIN Rail S020-X10 | Analog add-on | 73-30130-01066-6 | 4 inputs and 4 outputs |
| Kvaser DIN Rail S030-X11 | Relay add-on | 73-30130-01067-3 | 8 relay outputs and 8 digital inputs |

Table 3: Add-on modules currently available for the Kvaser DIN Rail SE410S-X10.

## 3.2   Hardware installation

The DIN rail mounting for the Kvaser DIN Rail SE410S-X10 and its add-on modules has been designed to occupy very little extra space, thus enabling a compact system design, in particular when several units are assembled next to each other.

The Kvaser DIN Rail SE410S-X10 and its add-on modules are easy to mount and dismount from a DIN rail. The system uses a mounting clip that will attach to the DIN Rail in a manner that ensures a rigid fixation to the rail and allows the Kvaser DIN Rail SE410S-X10 and its add-on modules to be snapped into the mounting clip.

Mounting the Kvaser DIN Rail SE410S-X10 to the DIN Rail:
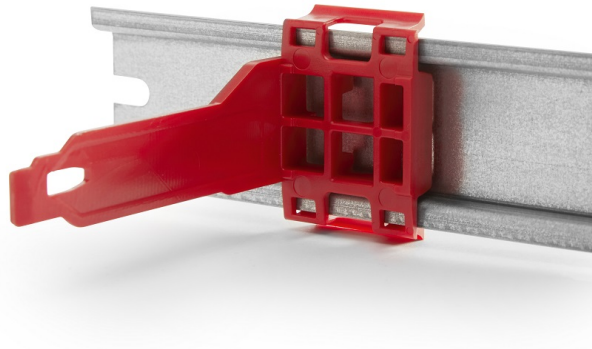
Figure 2: The mounting clip mounted on a DIN Rail.
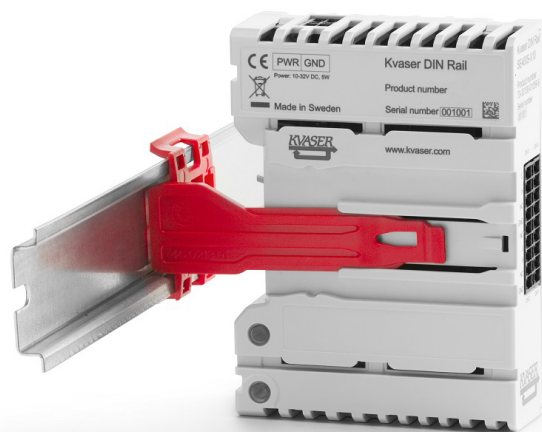


Figure 3: Inserting module into clip mounted on a DIN Rail.
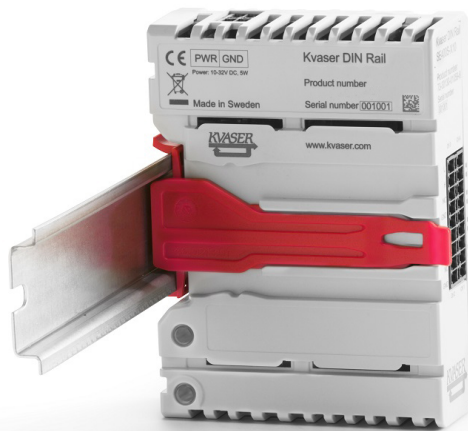
Figure 4: Module securely mounted on a DIN Rail.

1. Mount the mounting clip onto the DIN Rail by firmly snapping it into place, see Figure 2 on Page 9.

2. Mount the Kvaser DIN Rail SE410S-X10 module by inserting the module so that the mounting clip fits into the guiding rail of the module. Apply slight pressure of the module against the DIN Rail so that the module locks into place, see Figure 3 on Page 9 and Figure 4 on Page 10.



Figure 5: Mounting add-on modules to the DIN Rail.

Mounting an add-on module to the DIN Rail is done by:

1. Mount the mounting clip into the DIN Rail to the right of the already mounted module(s).

2. Mount the add-on module by inserting the module so that the mounting clip fits into the guiding rail of the module, and applying slight pressure of the module against the DIN Rail so that the module locks into place, see Figure 5 on Page 10. Make sure that the add-on module also fits into the guide rails of the previous module.

Repeat the procedure for all add-on modules. See Section 4.4, Initial I/O Module Configuration, on Page 24 for information on how I/O are numbered.

When the Kvaser DIN Rail SE410S-X10 and it's add-on modules have been attached to the mounting clip, a robust and rigid mounting to the DIN Rail has been established.

To remove a module:

1. Press the top of the mounting clip to the left, see Figure 6.

2. Pull the module out from the DIN Rail, see Figure 7 on Page 12.

3. Remove the mounting clip from the DIN Rail by use of a screw driver, see Figure 8 on Page 12.



Figure 6: Press the top of mounting clip before removing a module from the DIN Rail.

.

> ⚠️ Note that it is important that all modules have been properly attached, both to the DIN Rail as well as against any neighboring module using the guiding rail, in order for the internal optical link to work properly.

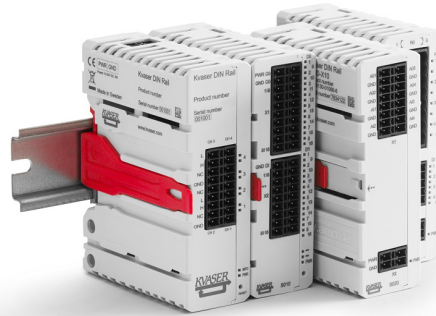Power must be supplied via the power connector, see Section 3.7, Power supply, on Page 17.

Figure 7: Pull the module out from the DIN Rail.
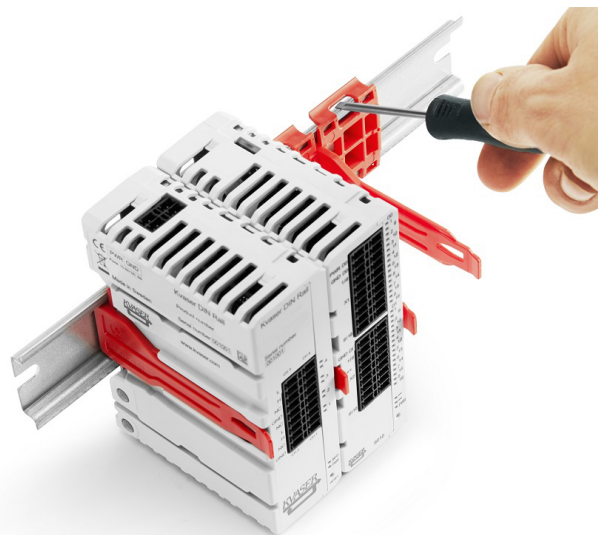


Figure 8: Removing the mounting clip from the DIN Rail.

## 3.3 The delivery package contains

### 3.3.1 Kvaser DIN Rail SE410S-X10

- Kvaser DIN Rail SE410S-X10

- Mounting clip for mounting

- Four connectors for CAN. Phoenix connector type: FMC 1.5/4-ST-3.5

- One connector for power. Phoenix connector type: FMCD 1.5/2-ST-3.5

See Figure 1 on Page 5 for included parts. Cables are not included.

### 3.3.2 Kvaser DIN Rail S010-X10

- Kvaser DIN Rail S010-X10

- Mounting clip for mounting

### 3.3.3 Kvaser DIN Rail S020-X10

- Kvaser DIN Rail S020-X10

- Mounting clip for mounting

### 3.3.4 Kvaser DIN Rail S030-X11

- Kvaser DIN Rail S030-X11

- Mounting clip for mounting

## 3.4 Network connector

The Kvaser DIN Rail SE410S-X10 has a standard shielded RJ45 socket Ethernet connector, see Figure 9 on Page 14.

Connect the Kvaser DIN Rail SE410S-X10 to your network or directly to your PC for first time configuration. For more information on how to configure the Kvaser DIN Rail SE410S-X10 see Section 4, How to use the Kvaser DIN Rail SE410S-X10, on Page 20.

Figure 9: Network connector on the Kvaser DIN Rail SE410S-X10.

## 3.5 IO connectors

The modules use the Phoenix mating connectors type FMCD 1.5/X-ST-3.5, where X is number of pins. Single row connectors of type FMC 1.5/X-ST-3.5 can also be used. The relay module uses FKCN 2.5/X-ST, where X is number of pins. See Section 5.2, Combicon header connectors, on Page 31 for details about the pin out.

Recommended connectors for the add-on modules are shown in Table 4.

| Quantity | Name | Phoenix's part number | Add-on module | Usage |
|----------|------|----------------------|---------------|-------|
| 2 | FMC 1.5/10-ST-3.5 | 1952348 | Digital add-on | Digital out |
| 2 | FMC 1.5/9-ST-3.5 | 1952335 | Digital add-on | Digital in |
| 2 | FMC 1.5/8-ST-3.5 | 1952322 | Analog add-on | Analog in and out |
| 1 | FMCD 1.5/2-ST-3.5 | 1707854 | Analog add-on | Power |
| 2 | FKCN 2.5/8-ST | 1732807 | Relay add-on | Relay out |
| 2 | FMC 1.5/5-ST-3.5 | 1952296 | Relay add-on | Digital in |
| 1 | FMCD 1.5/2-ST-3.5 | 1707854 | Relay add-on | Power |

Table 4: Connector recommendation for the IO modules.

Regarding ground (GND) and isolation:

- On the Digital add-on module, the GND and Power is isolated between the digital input section and digital output section.

- On the Analog add-on module, all GND pins, including the power, are internally connected.

- On the Relay add-on module, the GND and Power is isolated from both the relay section and the digital out section. The GND in the digital out section is also isolated from the relay section.
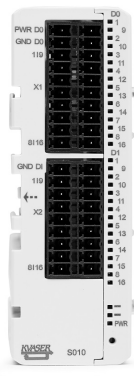


Figure 10: Digital add-on with 16 inputs and 16 outputs (01065-9).
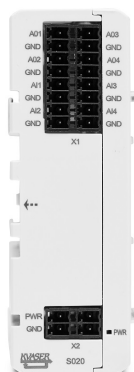


Figure 11: Analog add-on with 4 inputs and 4 outputs (01066-6).
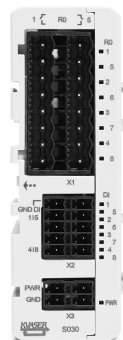
Figure 12: Relay add-on with 8 relay out and 8 digital inputs (01067-3).

## 3.6 CAN connector

The Kvaser DIN Rail SE410S-X10 has four galvanically isolated CAN channels in one 18-pin "Phoenix Contact mini combicon headers" connector. See Section 5.2, Combicon header connectors, on Page 31 for details about the pin out.

Recommended connectors for the base modules are shown in Table 5.

| Quantity | Name | Phoenix's part number | Usage |
|---|---|---|---|
| 4 | FMC 1.5/4 ST-3.5 | 1952283 | CAN |

Table 5: Connector recommendation for the base module.
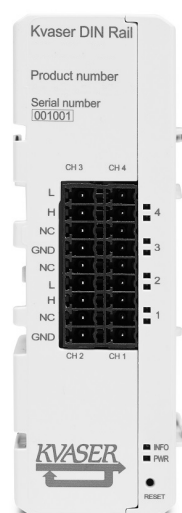


Figure 13: CAN connectors on Base module.

## 3.7 Power supply

The Kvaser DIN Rail SE410S-X10 is powered from the "Phoenix Contact mini combicon headers" connector. All modules have two pins for power in and two pins for ground, so you can easily daisy-chain power to the modules from one power source. Note that daisy-chaining power between modules will break the galvanic isolation between the modules.

The Kvaser DIN Rail SE410S-X10 contains a battery that needs to be fully charged before using the device for the first time. Connect the Kvaser DIN Rail SE410S-X10 to its power and let the battery charge fully by letting it charge overnight. The battery inside the Kvaser DIN Rail SE410S-X10 is used for ensuring a safe shutdown of the device when disconnected from power.

To maintain a healthy battery you need to:

- let it stay connected

- TODO: Fix this do we even need a list here?

When the modules are supplied with separated power, the maximum DC level between them must never exceed 100 VDC.

|  | In order to comply with CE, add-on modules should be supplied from Class 2 or SELV power supply. |
| --- | --- |

Recommended connectors for power is shown in Table 6.

| Quantity | Name | Phoenix's part number | Usage |
| --- | --- | --- | --- |
| 1 | FMCD 1.5/2-ST-3.5 | 1707854 | Power |

Table 6: Connector recommendation for power.

|  | Daisy-chaining power will break the galvanic isolation between modules. |
| --- | --- |

The power connector on the Base module is isolated from the CAN connector.
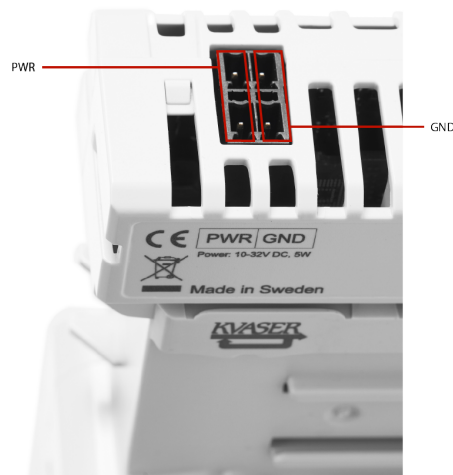
Figure 14: Power connectors on Base module.

## 3.8 LED indicators

The Kvaser DIN Rail SE410S-X10 has ten LEDs as shown in Figure 15.
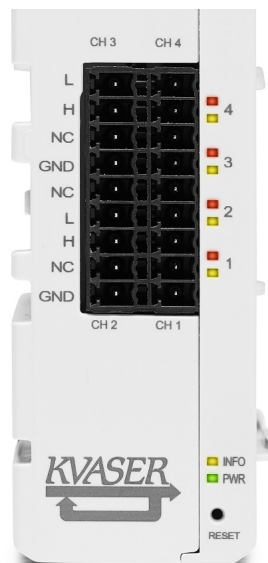


Figure 15: LEDs on the Kvaser DIN Rail SE410S-X10.

| LED | General meaning |
|---|---|
| PWR (Green) | Steady light when unit is powered and working. |
| INFO (Yellow) | LAN connection status. |
| | Fast flashing when waiting for DHCP lease. |
| | Slow flashing when ready for connection as remote device. |
| | Steady light when device is connected as a remote device. |
| CAN 1..4 (Yellow/Red) | CAN channel status. |

Table 7: LEDs on the Kvaser DIN Rail SE410S-X10.

The ERROR LED indicator can provide more information about the cause of failure, see Table 8.

| CAN (Red) | CAN (Yellow) | General Meaning |
|---|---|---|
| Blink | Blinks | CAN channel is in error passive mode |
| Slower blink | Blinks | CAN channel is bus off |
| Short flash | - | Error frame detected |

Table 8: ERROR LED Indicator Signals

Each add-on module has its own PWR LED:

| LED | General meaning |
|---|---|
| PWR (Green) | Steady light when unit is powered and communicating with Kvaser DIN Rail SE410S-X10. |
| | Flashing light when unit is powered but has no communication with Kvaser DIN Rail SE410S-X10. |

Table 9: LED on the add-on modules.

# 4 How to use the Kvaser DIN Rail SE410S-X10

## 4.1 Driver installation

For the Kvaser DIN Rail SE410S-X10 to communicate with the host computer, a compatible version of the Kvaser driver and firmware must be installed.

After the driver has been installed on the host computer, the firmware may then be downloaded and installed on the Kvaser DIN Rail SE410S-X10.

The latest version of the driver and firmware can be downloaded from www.kvaser.com/download.

The driver is installed by running the file `kvaser_drivers_setup.exe`.

## 4.2 Initial setup on network with DHCP

Connect the Kvaser DIN Rail SE410S-X10 to the network and start Kvaser Network Device Selector found in Kvaser Device Guide, see Figure 16.
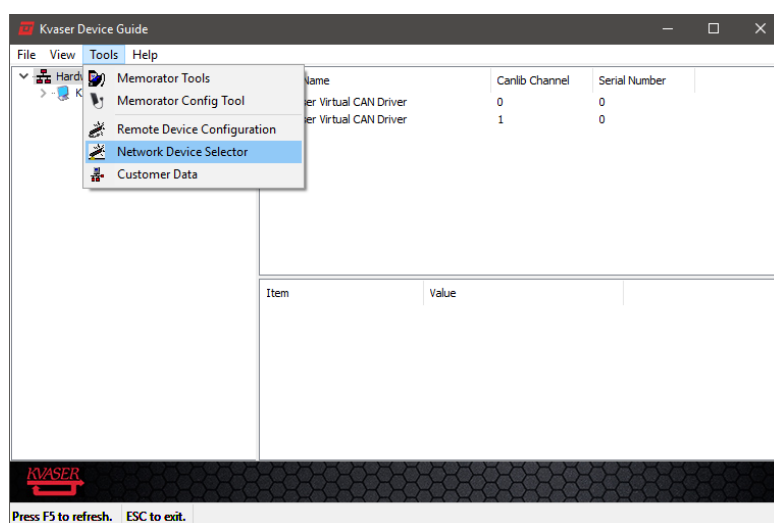


Figure 16: Kvaser Network Device Selector is found in Kvaser Device Guide

The new device will be available in the Kvaser Network Device Selector, see Figure 17 on Page 21.
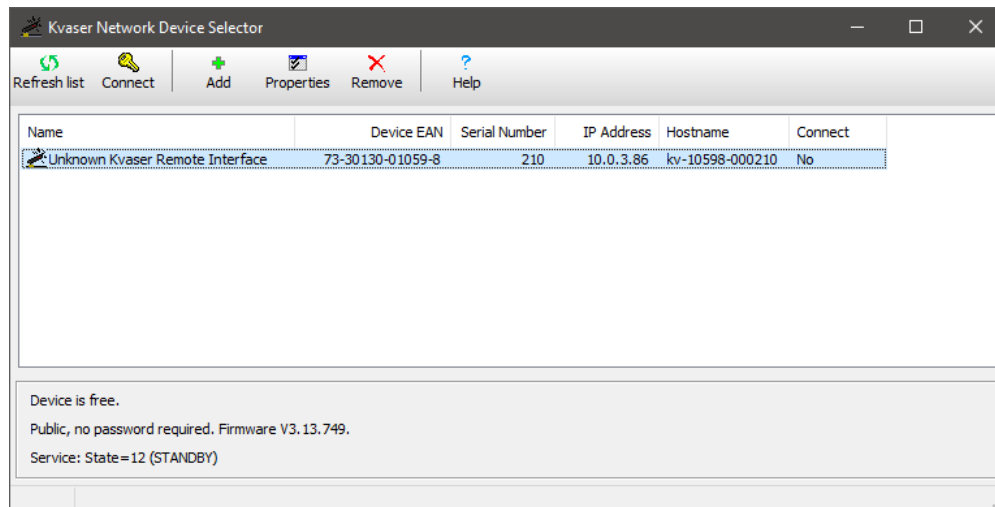
Figure 17: The new device is found in Kvaser Network Device Selector

## 4.3 Initial setup on network with static IP

The factory setting uses Windows APIPA[1]. To initially configure the Kvaser DIN Rail SE410S-X10 for a static IP, connect the device directly to your computer's network connector and the new device will be available in the Kvaser Network Device Selector (using an IP in the range 169.254.0.1 to 169.254.255.254), see Figure 18.
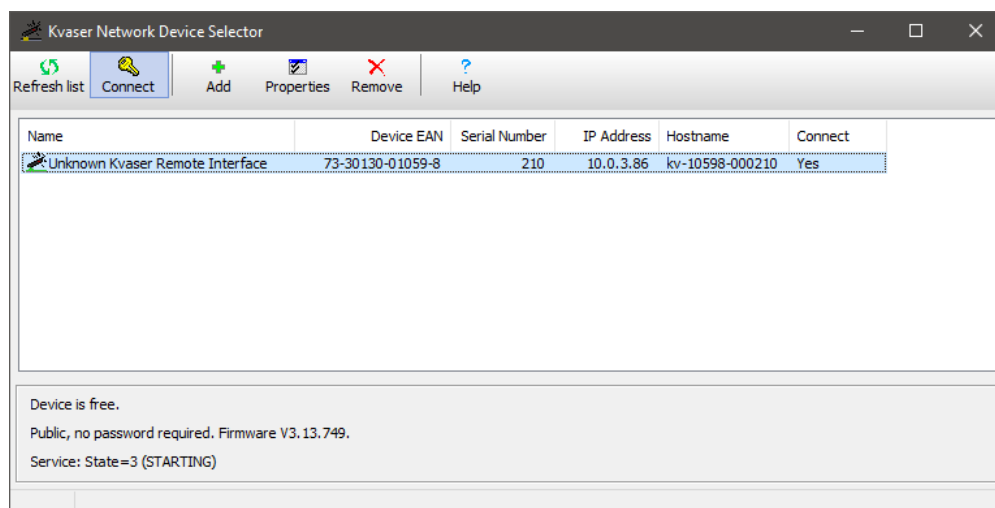


Figure 18: The new device is found in Kvaser Network Device Selector

You can now connect to the device by clicking the Connect button. Once connected, the device should be installed on your system and show up in Kvaser Device Guide. The next step is to start Kvaser Remote Device Configuration

---

[1]APIPA (Automatic Private IP Addressing) is a DHCP failover mechanism for local networks. When a DHCP server fails, APIPA allocates IP addresses in the private range 169.254.0.1 to 169.254.255.254

(found in Kvaser Device Guide), see Figure 19 on Page 22.
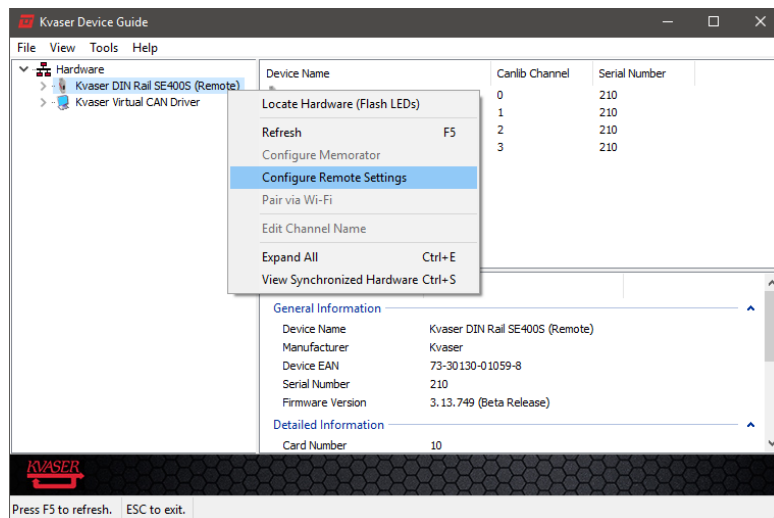


Figure 19: Select device in Kvaser Remote Device Configuration

You will be informed that the parameter area is blank, which is a normal condition for new devices, see Figure 20 on Page 23.

Change the Network Settings to the preferred settings and click OK, see Figure 21 on Page 23.
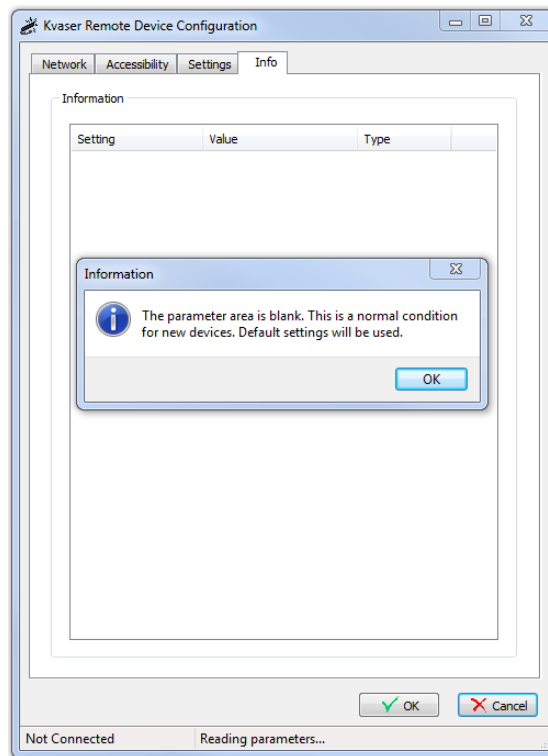
Figure 20: Kvaser Remote Device Configuration starting up
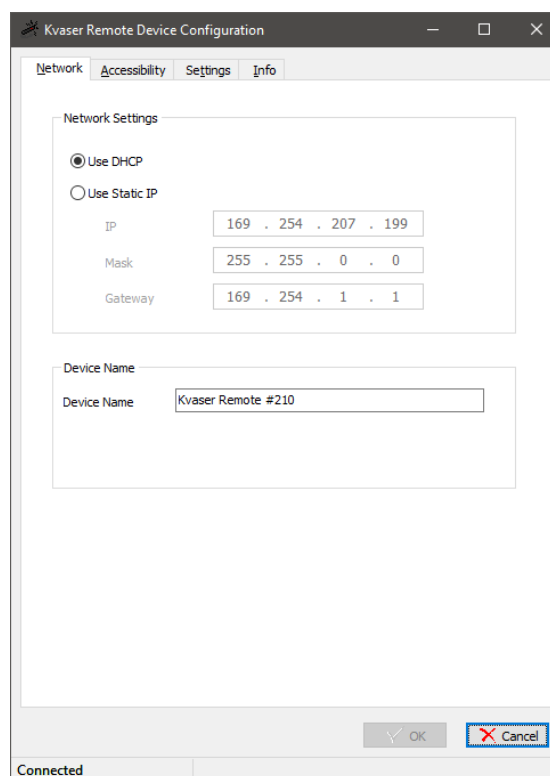


Figure 21: Kvaser Remote Device Configuration network settings

## 4.4 Initial I/O Module Configuration

The base module supports up to four add-on modules. The base module enumerates the I/O pins on the add-on modules with consecutive integer pin numbers starting with 0 for the first pin on the first module, 1 for the second pin on the first module, and so on until the last pin on the last module.

Removing, adding or changing the order of the add-on modules will cause the base module to re-enumerate all I/O pins to match the new configuration and set all output I/O pins to zero.

### 4.4.1 Example

Consider the case where only one analog add-on module is attached to the base module. The first analog output pin will now have pin number 0 and the last analog input pin will be number 7. Consider now that we do some changes by:

1. **Adding** a digital add-on to the right of the analog add-on will force the base module to re-enumerate all add-ons. The analog add-on is the leftmost add-on and starts on 0. The first analog output pin will be 0 and last analog input pin will be 7 just as before.

   The digital add-on pin numbers will start on 8, since the analog add-on to the left got the pin numbers from 0 to 7. The first digital out will be 8+0=8 and the last digital in will be 8+31=39, see Figure 24 on Page 32.

2. **Removing** the analog add-on will force the base module to re-enumerate all add-ons. The digital add-on is now the leftmost add-on and starts on 0. The first digital out will be 0 and the last digital in will be 31.

3. **Changing order** by adding a new analog add-on to the right of the digital add-on creates the opposite configuration from the case above where a digital add-on was added.

   The digital add-on is the leftmost add-on and starts on 0. The first digital out will be 0 and the last digital in will be 31 just as before.

   The analog add-on pin numbers will start on 32, since the digital add-on to the left got the pin numbers from 0 to 31. The first analog out will be 32+0=32 and the last analog in will be 32+7=39.

## 4.5 Using flash storage

The base module contains 16GB flash storage. The storage can be accessed from Kvaser's CANlib SDK or from Kvaser tprogramming language in read/write mode. The FAT32 file system only supports short (8.3) filenames.

> Do not turn off the power while writing to flash storage, since this will corrupt the storage. A corrupted flash storage must be formatted before it can be used again.

### 4.5.1 Autostart t programs

Kvaser DIN Rail SE410S-X10 can automatically load and run up to four t programs from flash storage at power on. This is done by entering the names of the t programs into a special file, `autoexec.txt`, and copying the compiled t programs and `autoexec.txt` to flash storage using CANlib SDK.

To stop the t programs from being started at power on, simply delete `autoexec.txt` from flash storage.

**autoexec.txt**

This a special text file that Kvaser DIN Rail SE410S-X10 tries to read from flash storage at power on. Each line must have the following format:

```
filename, channel, slot
```

where `filename` is the name of the compiled t program and `channel` is the CAN channel that the t program will use by default, see Kvaser t Programming Language guide for further details. `slot` is one of four slots numbered `0` to `3` that are available for t programs in Kvaser DIN Rail SE410S-X10.

**Example**

Starting `program1.txe` on CAN channel `2` and `program2.txe` on CAN channel `0` can be done with the `autoexec.txt` file below:

```
program1.txe, 2, 0
program2.txe, 0, 1
```

## 4.6 Reset device to factory settings

In some cases the device might have to be reset to factory settings. For example when the device is moved between networks with different settings or if the device is configured wrongly. The next section describes the procedure.

### 4.6.1 Resetting

| Time in seconds | LED Pattern | Reset type |
|---|---|---|
| 0..3 | CAN 1 RED | All modules will be reset. |
| 3 and above | CAN 1 and 2 RED | Network factory reset and all modules reset |

Table 10: Reset types

1. Apply power to the Kvaser DIN Rail SE410S-X10.
2. Let the device boot up and the PWR LED will have a steady light.
3. Gently press and hold down the reset button using a bent paperclip or similar.
4. The CAN 1 led will be lit directly.
5. Release the reset button when the desired reset type has been achieved.

Figure 22: Press and hold reset button to reset the base module.

## 4.7 Troubleshooting

Use "Kvaser Device Guide" in the Control Panel to verify that the computer can communicate with the Kvaser DIN Rail SE410S-X10. If the firmware version shown is all zeros, there are communication problems. If the LEDs are not flashing or do not light up at all, check the power supply.

# 5 Appendices

In this section you will find technical information about Kvaser DIN Rail SE410S-X10 and the device's connectors.

## 5.1 Technical data

Specifications for the Kvaser DIN Rail SE410S-X10 and the add-on modules can be found in this section.

### 5.1.1 Kvaser DIN Rail SE410S-X10

In Table 11 below you will find the Kvaser DIN Rail SE410S-X10 technical specifications.

| | |
|---|---|
| CAN Channels | 4 |
| CAN Transceivers | MCP2561FD (Compliant with ISO 11898-2) |
| CAN Controller | Kvaser CAN IP in FPGA |
| CAN Bit Rate | 50 kbit/s to 1 Mbit/s |
| CAN FD Bit Rate | Up to 8 Mbit/s (with correct physical layer implementation) |
| Time stamp resolution | 100 µs |
| Max message rate | 20000 msg/s |
| Error Frame Detection | Yes |
| Error Frame Generation | Yes |
| Silent mode | Yes |
| Kvaser CANtegrity | No |
| PC interface | Ethernet |
| Ethernet interface | Ethernet IEEE 802.3u 100BASE-TX |
| Ethernet connector | Shielded RJ45 socket STP |
| Galvanic isolation | Yes |
| Power Supply | +9 V to +35 V DC |
| Power consumption | Idle 2.0 W, load 3.2 W |
| Software requirements | Windows (7 or later)[1] |
| Hardware configuration | Done by software |
| DIN rail type | 35 mm Top Hat rail IEC/EN 60715 |
| Dimensions | 36.3 x 75 x 101 mm |
| Weight | 120 g |
| Operating temperature | 5 °C to +65 °C |
| Storage temperature | −40 °C to +70 °C |
| Relative Humidity | 10 % to 95 % (non-condensing) |

Table 11: Technical specifications for Kvaser DIN Rail SE410S-X10.

---

[1] For other operating systems, contact Kvaser support.

### 5.1.2   Kvaser DIN Rail S010-X10

In Table 12, you will find the Digital add-on Kvaser DIN Rail S010-X10 technical specifications.

| | |
|---|---|
| Power Supply Voltage, CLASS 2 | 24 V DC (-15 %/+20 %) |
| Input Current | 8 A |
| Plug in current | < 2 A @ 1 ms |
| Surge protected power supply | Yes |
| Reversed polarity protected | Yes |
| Power dissipation | typical 2.1 W, max 4.6 W |
| DIN rail type | 35 mm Top Hat rail IEC/EN 60715 |
| Dimensions | 36.3 x 75 x 101 mm |
| Weight | 105 g |
| | |
| **Digital out (16 channels):** | |
| Output type | Single-ended High-Side-Switch |
| Power Supply digital outputs | PWR DO |
| Rated operational voltage | $U_e$=24 V DC (-15 %/+20 %) |
| Max operational voltage, including ripple | $U_e$max=30 V DC |
| Rated output current | $I_{out}$=0.5 A |
| Max output current | $I_{out}$max=0.6 A |
| Voltage drop @ 0.5 A | $U_d$=0.5 V |
| Output voltage | $U_o$=$U_e$-$U_d$ |
| Max inductive loads (max switching repetition rate: 10s) | 1000 mH |
| Max capacitive load | 10 mF |
| Short circuit proof acc EN611131-2 | Yes |
| Typical short circuit current | 1.2 A |
| Thermal protected | Yes |
| Reversed polarity protected | Yes |
| Surge protected | Yes |
| | |
| **Digital in (16 channels):** | |
| Input type | Current sinking type 1 IEC 61131-2 |
| Input voltage | $U_e$=24 V DC |
| Max input voltage | $U_e$max=30 V DC |
| Signal level High (type switch voltage +10V) | +15 V min |
| Current level High | > 2 mA, typical 4 mA |
| Signal level Low | +5 V max |
| Signal current Low | < 0.5 mA |
| Reversed polarity protected | Yes |
| Surge protected | Yes |
| Input filter time | 0 - 65 ms (default 5 ms) |

Table 12: Technical specifications for Digital add-on S010-X10.

### 5.1.3   Kvaser DIN Rail S020-X10

In Table 13, you will find the analog add-on Kvaser DIN Rail S020-X10 technical specifications.

| | |
|---|---|
| Power Supply Voltage, CLASS 2 | 24 V DC (-15 %/+20 %) |
| Input Current | 150 mA |
| Plug in current | < 2 A @ 1 ms |
| Surge protected power supply | Yes |
| Reversed polarity protected | Yes |
| Power dissipation | typical 2.1 W, max 3.0 W |
| DIN rail type | 35 mm Top Hat rail IEC/EN 60715 |
| Dimensions | 36.3 x 75 x 101 mm |
| Weight | 95 g |
| | |
| **Analog out (4 channels):** | |
| Output type | Voltage output |
| Output voltage range | 0 - 10 V |
| Output method | Single ended |
| Resolution | 12 bits, 2.44 mV |
| Accuracy | 0.5 % + 25 mV |
| Load impedance, min | 1 k$\Omega$ |
| Max load capacitance | 500 nF |
| Reversed polarity protected | Yes |
| Surge protected | Yes |
| | |
| **Analog in (4 channels):** | |
| Input type | Voltage input |
| Input voltage range | 0 - 10 V |
| Absolute max rating | $\pm$ 30 V |
| Input method | Single ended |
| Resolution | 12 bits, 2.44 mV |
| Accuracy | 0.5 % + 25 mV |
| Input Impedance | typical 100 k$\Omega$ |
| Reversed polarity protected | Yes |
| Surge protected | Yes |

Table 13: Technical specifications for Analog add-on S020-X10.

### 5.1.4    Kvaser DIN Rail S030-X11

In Table 14, you will find the relay add-on Kvaser DIN Rail S030-X11 technical specifications.

| | |
|---|---|
| Power Supply Voltage, CLASS 2 | 24 V DC (-15 %/+20 %) |
| Input Current | 150 mA |
| Plug in current | < 2 A @ 1 ms |
| Surge protected power supply | Yes |
| Reversed polarity protected | Yes |
| Power dissipation | typical 2.5 W, max 4.3 W |
| DIN rail type | 35 mm Top Hat rail IEC/EN 60715 |
| Dimensions | 36.3 x 75 x 101 mm |
| Weight | 133 g |
| | |
| **Relay out (8 channels):** | |
| Output type | N.O. contact |
| Interface | 2 points, independent contacts |
| Switching Voltage, max | 230 V AC |
| Switching Current, max | 2 A |
| ON / OFF response time | 10 ms max |
| Dielectric strength, open contacts | 1000 Vrms |
| Dielectric strength, contacts - internal circuits | 3000 VAC during 1 min |
| Mechanical endurance | > 30 x $10^6$ ops |
| | |
| **Digital in (8 channels):** | |
| Input type | Current sinking type 1 IEC 61131-2 |
| Input voltage | $U_e$=24 V DC |
| Max input voltage | $U_e$max=30 V DC |
| Signal level High (type switch voltage +10V) | +15 V min |
| Current level High | > 2 mA, typical 4 mA |
| Signal level Low | +5 V max |
| Signal current Low | < 0.5 mA |
| Reversed polarity protected | Yes |
| Surge protected | Yes |
| Input filter time | 0 - 65 ms (default 5 ms) |

Table 14: Technical specifications for Relay add-on S030-X11.

## 5.2 Combicon header connectors
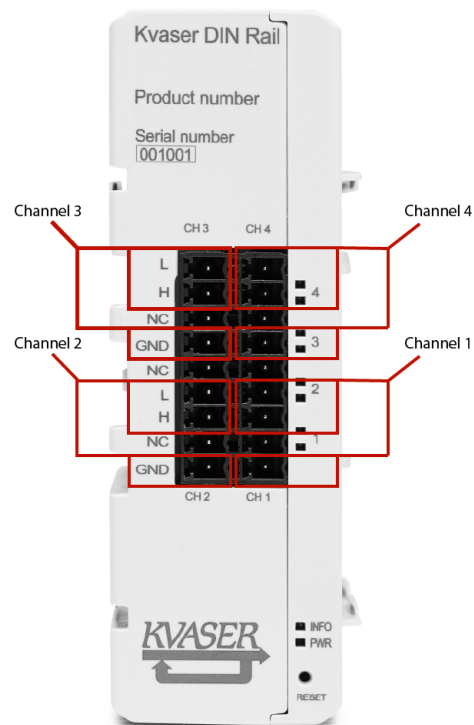
### 5.2.1 Kvaser DIN Rail SE410S-X10



Figure 23: Kvaser DIN Rail SE410S-X10 connectors

The base module has four CAN channels, see Figure 23.

The CAN pins are shown in Table 15. Use the table together with Figure 23 for better understanding.

| Label | Pin function | Pin function |
|-------|--------------|--------------|
| L | Channel 3 CAN low | Channel 4 CAN low |
| H | Channel 3 CAN high | Channel 4 CAN high |
| NC | Not connected | Not connected |
| GND | Channel 3 Signal ground | Channel 4 Signal ground |
| NC | Not connected | Not connected |
| L | Channel 2 CAN low | Channel 1 CAN low |
| H | Channel 2 CAN high | Channel 1 CAN high |
| NC | Not connected | Not connected |
| GND | Channel 3 Signal ground | Channel 1 Signal ground |

Table 15: Digital add-on pin enumeration

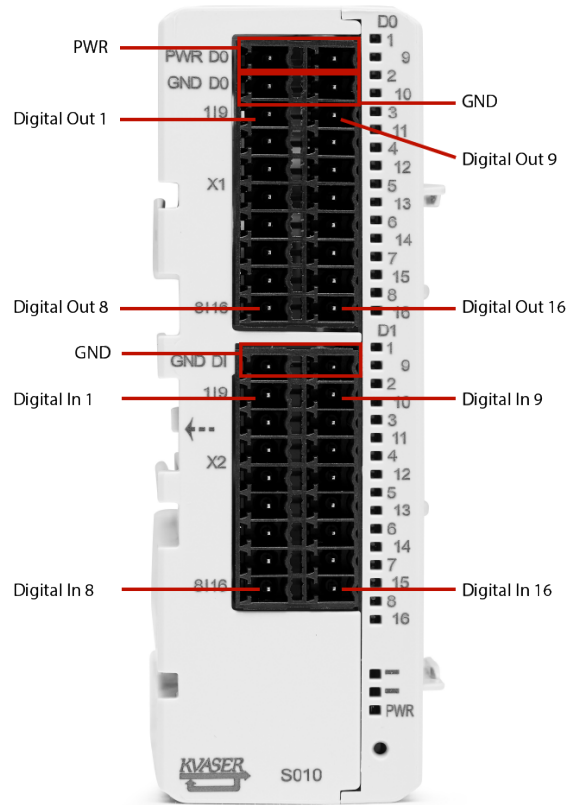### 5.2.2 Digital add-on S010-X10



Figure 24: Digital add-on connectors

The digital add-on module has 16 digital outputs and 16 digital inputs, see Figure 24.

The I/O pins are enumerated as shown in Table 16 on Page 33.

| Name | Label | Pin number | Name | Label | Pin number |
|------|-------|-----------|------|-------|-----------|
| Digital Out 1 | DO1 | 0 | Digital In 1 | DI1 | 16 |
| Digital Out 2 | DO2 | 1 | Digital In 2 | DI2 | 17 |
| Digital Out 3 | DO3 | 2 | Digital In 3 | DI3 | 18 |
| Digital Out 4 | DO4 | 3 | Digital In 4 | DI4 | 19 |
| Digital Out 5 | DO5 | 4 | Digital In 5 | DI5 | 20 |
| Digital Out 6 | DO6 | 5 | Digital In 6 | DI6 | 21 |
| Digital Out 7 | DO7 | 6 | Digital In 7 | DI7 | 22 |
| Digital Out 8 | DO8 | 7 | Digital In 8 | DI8 | 23 |
| Digital Out 9 | DO9 | 8 | Digital In 9 | DI9 | 24 |
| Digital Out 10 | DO10 | 9 | Digital In 10 | DI10 | 25 |
| Digital Out 11 | DO11 | 10 | Digital In 11 | DI11 | 26 |
| Digital Out 12 | DO12 | 11 | Digital In 12 | DI12 | 27 |
| Digital Out 13 | DO13 | 12 | Digital In 13 | DI13 | 28 |
| Digital Out 14 | DO14 | 13 | Digital In 14 | DI14 | 29 |
| Digital Out 15 | DO15 | 14 | Digital In 15 | DI15 | 30 |
| Digital Out 16 | DO16 | 15 | Digital In 16 | DI16 | 31 |

Table 16: Digital add-on pin enumeration

The pin number is only valid if this is the leftmost add-on. Any add-ons to the left of this module will add their offsets to the pin number.

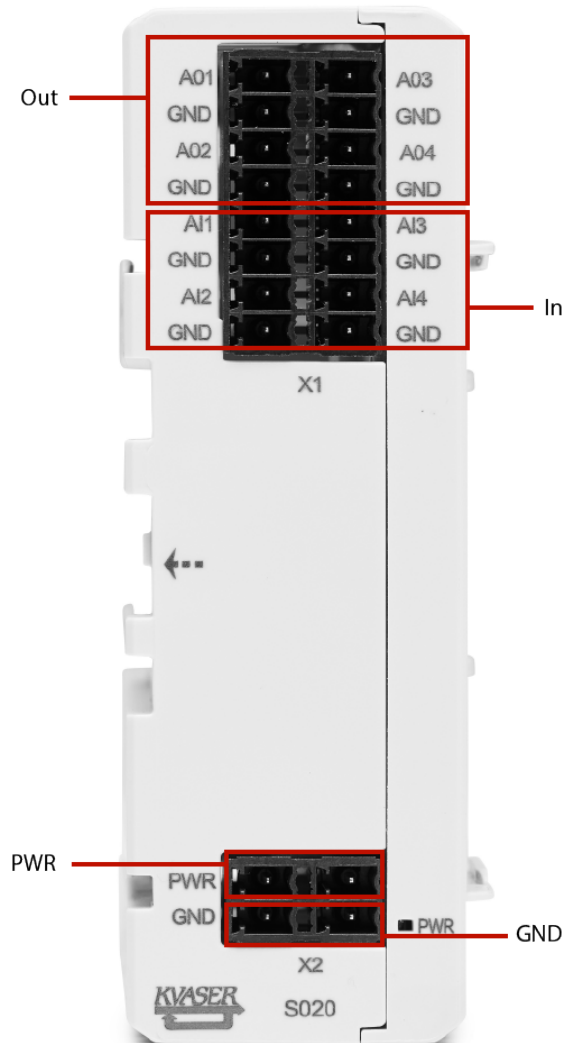### 5.2.3   Analog add-on S020-X10



Figure 25: Analog add-on connectors

The analog add-on module has 4 analog outputs and 4 analog inputs, see Figure 25.

The I/O pins are enumerated as shown in Table 17 on Page 35.

| Name | Label | Pin number | Name | Label | Pin number |
|------|-------|------------|------|-------|------------|
| Analog Out 1 | AO1 | 0 | Analog In 1 | AI1 | 4 |
| Analog Out 2 | AO2 | 1 | Analog In 2 | AI2 | 5 |
| Analog Out 3 | AO3 | 2 | Analog In 3 | AI3 | 6 |
| Analog Out 4 | AO4 | 3 | Analog In 4 | AI4 | 7 |

Table 17: Analog add-on pin enumeration

The pin number is only valid if this is the leftmost add-on. Any add-ons to the left of this module will add their offsets to the pin number.
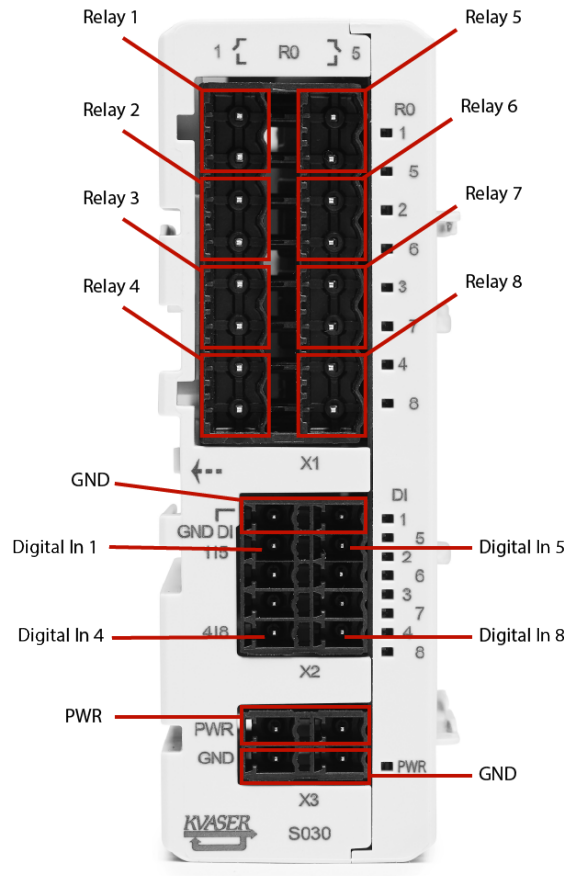
### 5.2.4 Relay add-on S030-X11



Figure 26: Relay add-on connectors

The relay add-on module has 8 relay outputs and 8 digital inputs, see Figure 26.

The I/O pins are enumerated as shown in Table 18.

| Name | Label | Pin number | Name | Label | Pin number |
|------|-------|-----------|------|-------|-----------|
| Relay 1 | RO1 | 0 | Digital In 1 | DI1 | 8 |
| Relay 2 | RO2 | 1 | Digital In 2 | DI2 | 9 |
| Relay 3 | RO3 | 2 | Digital In 3 | DI3 | 10 |
| Relay 4 | RO4 | 3 | Digital In 4 | DI4 | 11 |
| Relay 5 | RO5 | 4 | Digital In 5 | DI5 | 12 |
| Relay 6 | RO6 | 5 | Digital In 6 | DI6 | 13 |
| Relay 7 | RO7 | 6 | Digital In 7 | DI7 | 14 |
| Relay 8 | RO8 | 7 | Digital In 8 | DI8 | 15 |

Table 18: Relay add-on pin enumeration

The pin number is only valid if this is the leftmost add-on. Any add-ons to the left of this module will add their offsets to the pin number.

## 5.3 Lowpass Filter

The analog input pins have their own lowpass filter and hysteresis handling. The filter acts on the applied signal before the hysteresis. The hysteresis function is described in the next section.

The lowpass filter follows the formula below, where N is configurable via the LowPassFilterOrder variable. The variable has a range from 0 to 16 and has a default value of 3.

$$y_n = \frac{(N-1)y_{n-1} + x_n}{N}$$

$$N = 2^{LowPassFilterOrder}$$

Below are three plot examples of different lowpass filter orders. The first plot has an order of 3 where the next two have an order of 7 and 15 respectively.
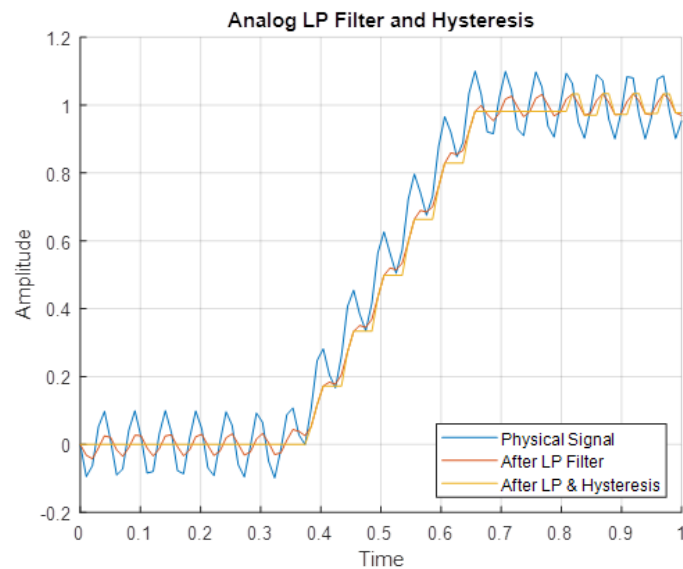


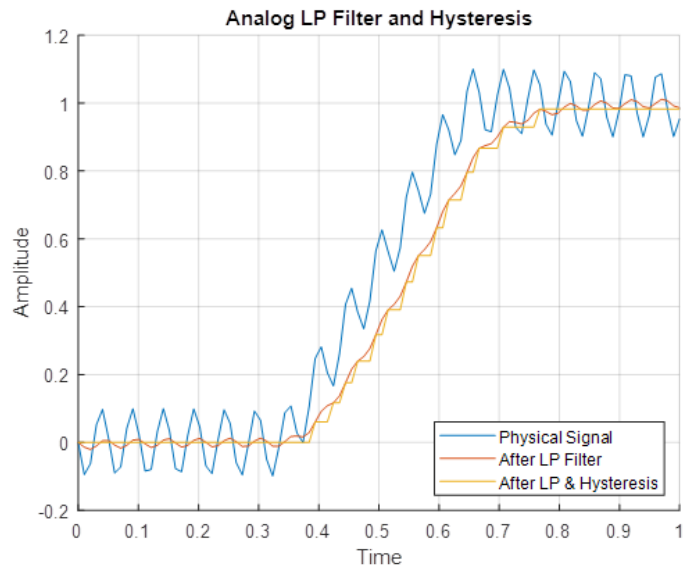Figure 27: Lowpass filter order set to 3
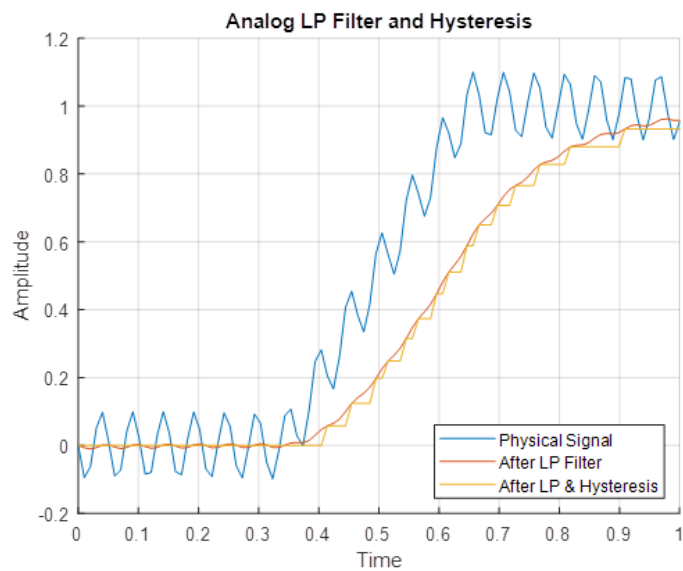
Figure 28: Lowpass filter order set to 7



Figure 29: Lowpass filter order set to 15

## 5.4   Hysteresis

The analog input samples the values of the connected continuous signal. The signal can be noisy and depending on the hysteresis setting of DIN-Rail, the signal will be more/less clean as the figures below show.

Hysteresis function works by ignoring samples that are inside the window specified by +/- of the value of Hysteresis and using the last sample that was not ignored as a reference. Hysteresis can be set between 0 to 10 volt and has a default value of 0.01 volt.

The images below are examples of different hysteresis values on an random signal. In the first image, the hysteresis function decides against the last active value if it is outside +/-0.5V. If the sample are outside then it will be the new active value. The next two images has a hysteresis window of +/-1V and +/-2V respectively.
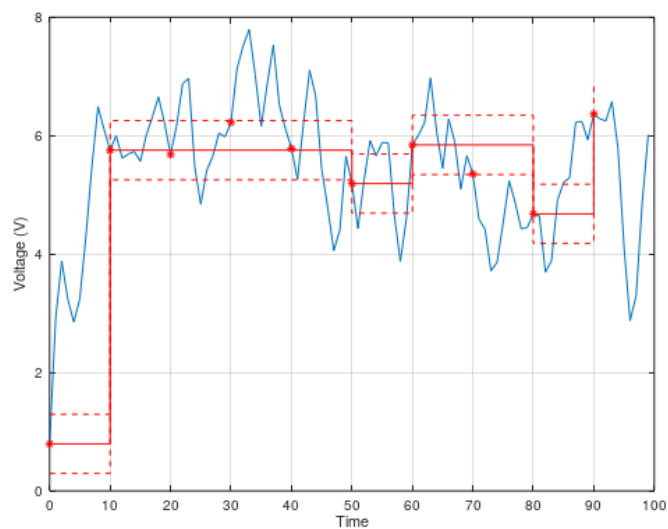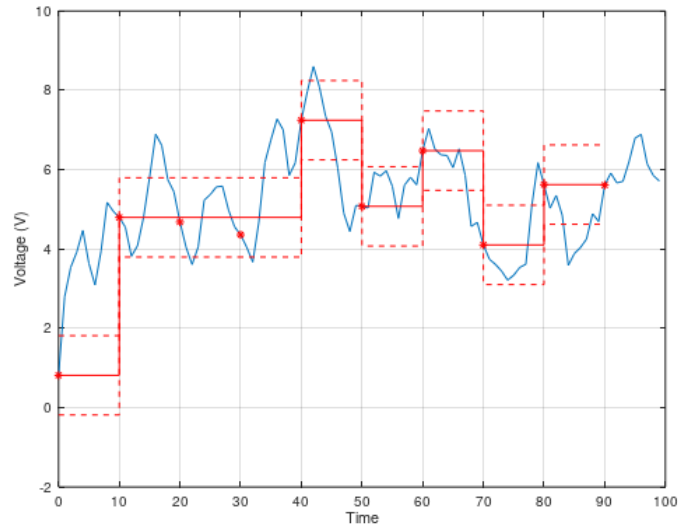


Figure 30: Hysteresis set to 0.5V
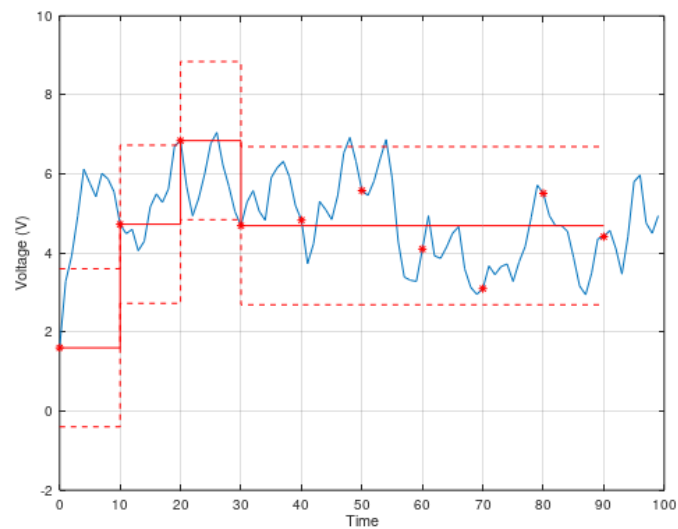
Figure 31: Hysteresis set to 1V



Figure 32: Hysteresis set to 2V

## 5.5 Updating the firmware

For the Kvaser DIN Rail SE410S-X10 to communicate with the host computer, compatible versions of the Kvaser CANlib (including driver) and firmware must be installed.

The latest versions of firmware and drivers can be downloaded for free at www.kvaser.com/download. Read the Release Notes carefully.

During the whole firmware upgrade session, all the yellow CAN leds will blink to warn the user not turn off the power during upgrade. The total upgrade turnaround time will vary depending on how many or which type of submodules. The table below states the turnaround time for each module type. The worst case is when all four submodules are analog, this takes around 4 minutes.

| Module | Upgrade Time | PWR LED Indication | CAN LED Indication (Base Module) |
|---|---|---|---|
| Base Module | 25 seconds | No Indication | Flashing (Yellow) |
| Relay Module | 20 seconds | Flashing (Red) | Flashing (Yellow) |
| Digital Module | 20 seconds | Flashing (Red) | Flashing (Yellow) |
| Analog Module | 60 seconds | Flashing (Red) | Flashing (Yellow) |

Table 19: Upgrade Turnaround Time and Indications

Next table, states faulty firmware indications for different modules. A module will get its firmware corrupted if the power is disconnected during firmware upgrade. The firmware might recover from a failed upgrade by rerunning the upgrade.

| Module | PWR LED Indication | CAN ERR LED Indication (Base Module) |
|---|---|---|
| Base Module | No Indication | Flashing (Red) |
| Relay Module | Flashing (Red) | No Indication |
| Digital Module | Flashing (Red) | No Indication |
| Analog Module | Flashing (Red) | No Indication |

Table 20: Faulty Firmware Indications

## 5.6 I/O pin readout time

The typical I/O pin readout time is less than 5ms depending on CAN busload. While running Kvaser t programs, typical readout time can be as high as 40ms. It is recommended to use a maximum readout/update frequency of 10Hz (this means that you should wait at least 100ms after setting an output before reading any affected inputs).

# 6 Disposal and Recycling Information

When this product reaches its end of life, please dispose of it according to your local environmental laws and guidelines.

For information about Kvaser's recycling programs, visit:
https://www.kvaser.com/en/kvaser/recycling-policy.html

# 7 Legal acknowledgements

## 7.1 Usage warning

**WARNING FOR ALL USERS**

WARNING! - YOUR USE OF THIS DEVICE MUST BE DONE WITH CAUTION AND A FULL UNDERSTANDING OF THE RISKS!

THIS WARNING IS PRESENTED TO INFORM YOU THAT THE OPERATION OF THIS DEVICE MAY BE DANGEROUS. YOUR ACTIONS CAN INFLUENCE THE BEHAVIOR OF A CAN-BASED DISTRIBUTED EMBEDDED SYSTEM, AND DEPENDING ON THE APPLICATION, THE CONSEQUENCES OF YOUR IMPROPER ACTIONS COULD CAUSE SERIOUS OPERATIONAL MALFUNCTION, LOSS OF INFORMATION, DAMAGE TO EQUIPMENT, AND PHYSICAL INJURY TO YOURSELF AND OTHERS. A POTENTIALLY HAZARDOUS OPERATING CONDITION IS PRESENT WHEN THE FOLLOWING TWO CONDITIONS ARE CONCURRENTLY TRUE: THE PRODUCT IS PHYSICALLY INTERCONNECTED TO A REAL DISTRIBUTED EMBEDDED SYSTEM; AND THE FUNCTIONS AND OPERATIONS OF THE REAL DISTRIBUTED EMBEDDED SYSTEM ARE CONTROLLABLE OR INFLUENCED BY THE USE OF THE CAN NETWORK. A POTENTIALLY HAZARDOUS OPERATING CONDITION MAY RESULT FROM THE ACTIVITY OR NON-ACTIVITY OF SOME DISTRIBUTED EMBEDDED SYSTEM FUNCTIONS AND OPERATIONS, WHICH MAY RESULT IN SERIOUS PHYSICAL HARM OR DEATH OR CAUSE DAMAGE TO EQUIPMENT, DEVICES, OR THE SURROUNDING ENVIRONMENT.

WITH THIS DEVICE, YOU MAY POTENTIALLY:

- CAUSE A CHANGE IN THE OPERATION OF THE SYSTEM, MODULE, DEVICE, CIRCUIT, OR OUTPUT.
- TURN ON OR ACTIVATE A MODULE, DEVICE, CIRCUIT, OUTPUT, OR FUNCTION.
- TURN OFF OR DEACTIVATE A MODULE, DEVICE, CIRCUIT, OUTPUT, OR FUNCTION.
- INHIBIT, TURN OFF, OR DEACTIVATE NORMAL OPERATION.
- MODIFY THE BEHAVIOR OF A DISTRIBUTED PRODUCT.
- ACTIVATE AN UNINTENDED OPERATION.
- PLACE THE SYSTEM, MODULE, DEVICE, CIRCUIT, OR OUTPUT INTO AN UNINTENDED MODE.

ONLY THOSE PERSONS WHO:

(A) ARE PROPERLY TRAINED AND QUALIFIED WITH RESPECT TO THE USE OF THE DEVICE,

(B) UNDERSTAND THE WARNINGS ABOVE, AND

(C) UNDERSTAND HOW THIS DEVICE INTERACTS WITH AND IMPACTS THE FUNCTION AND SAFETY OF OTHER PRODUCTS IN A DISTRIBUTED SYSTEM AND THE APPLICATION FOR WHICH THIS DEVICE WILL BE APPLIED, MAY USE THE DEVICE.

PLEASE NOTE THAT YOU CAN INTEGRATE THIS PRODUCT AS A SUBSYSTEM INTO HIGHER-LEVEL SYSTEMS. IN CASE YOU DO SO, KVASER AB HEREBY DECLARES THAT KVASER AB'S WARRANTY SHALL BE LIMITED TO THE CORRECTION OF DEFECTS, AND KVASER AB HEREBY EXPRESSLY DISCLAIMS ANY LIABILITY OVER AND ABOVE THE REFUNDING OF THE PRICE PAID FOR THIS DEVICE, SINCE KVASER AB DOES NOT HAVE ANY INFLUENCE ON THE IMPLEMENTATIONS OF THE HIGHER-LEVEL SYSTEM, WHICH MAY BE DEFECTIVE.

## 7.2 EU Regulatory Compliance

**EU Declaration of Conformity (DoC)**

**We**

| | | | |
|---|---|---|---|
| Company Name: | Kvaser AB | City: | Mölndal |
| Postal address: | Aminogatan 25 | Telephone number: | +46 31 886344 |
| Postcode: | 431 53 | E-mail address: | sales@kvaser.com |

**declare that the DoC is issued under our sole responsibility and belongs to the following product:**

Product: Kvaser DIN Rail SE410S-X10

**Object of the declaration** (identification of apparatus allowing traceability):
Product: Kvaser DIN Rail SE410S-X10
Type: 73-30130-01118-2

**The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:**
Electromagnetic Compatibility (EMC) Directive 2014/30/EU (Art. 6)

RoHS recast Directive 2011/65/EU (Art. 4.1)

**The following harmonised standards and technical specifications have been applied**
(title, date of standard/specification):

| | |
|---|---|
| EN 55024 (2010) | EN 55032 (2012 + AC:2013) |
| EN 61000-6-2 (2005) | EN 61000-6-3 (2007 + A1:2011) |
| EN 61131-2 (2007) | EN 50581 (2012) |

**Signed for and on behalf of:**

| | | |
|---|---|---|
| Mölndal | 2021-10-08 | |
| Place of issue | Date of issue | Claes Haglund, Supply Chain and Quality director |

**EU Declaration of Conformity (DoC)**

**We**

| | | | |
|---|---|---|---|
| Company Name: | Kvaser AB | City: | Mölndal |
| Postal address: | Aminogatan 25 | Telephone number: | +46 31 886344 |
| Postcode: | 431 53 | E-mail address: | sales@kvaser.com |

**declare that the DoC is issued under our sole responsibility and belongs to the following product:**

Product:       Kvaser DIN Rail S010-X10

**Object of the declaration** (identification of apparatus allowing traceability):
Product: Kvaser DIN Rail S010-X10
Type: 73-30130-01065-9

**The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:**
Electromagnetic Compatibility (EMC) Directive 2014/30/EU (Art. 6)

RoHS recast Directive 2011/65/EU (Art. 4.1)

**The following harmonised standards and technical specifications have been applied**
(title, date of standard/specification):

EN 61000-6-2 (2005)                    EN 61000-6-4 (2007 + A1:2011)

EN 61131-2 (2007)                    EN 50581 (2012)

**Signed for and on behalf of:**

Mölndal                    2021-10-08

Place of issue                    Date of issue          Claes Haglund, Supply Chain and Quality director

**EU Declaration of Conformity (DoC)**

**We**

| | | | |
|---|---|---|---|
| Company Name: | Kvaser AB | City: | Mölndal |
| Postal address: | Aminogatan 25 | Telephone number: | +46 31 886344 |
| Postcode: | 431 53 | E-mail address: | sales@kvaser.com |

**declare that the DoC is issued under our sole responsibility and belongs to the following product:**

Product: Kvaser DIN Rail S020-X10

**Object of the declaration** (identification of apparatus allowing traceability):
Product: Kvaser DIN Rail S020-X10
Type: 73-30130-01066-6

**The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:**
Electromagnetic Compatibility (EMC) Directive 2014/30/EU (Art. 6)

RoHS recast Directive 2011/65/EU (Art. 4.1)

**The following harmonised standards and technical specifications have been applied**
(title, date of standard/specification):

EN 61000-6-2 (2005)        EN 61000-6-4 (2007 + A1:2011)

EN 61131-2 (2007)        EN 50581 (2012)

**Signed for and on behalf of:**

| Mölndal | 2021-10-08 | |
|---|---|---|
| Place of issue | Date of issue | Claes Haglund, Supply Chain and Quality director |

## EU Declaration of Conformity (DoC)

**We**

| | | | |
|---|---|---|---|
| Company Name: | Kvaser AB | City: | Mölndal |
| Postal address: | Aminogatan 25 | Telephone number: | +46 31 886344 |
| Postcode: | 431 53 | E-mail address: | sales@kvaser.com |

**declare that the DoC is issued under our sole responsibility and belongs to the following product:**

Product: Kvaser DIN Rail S030-X11

**Object of the declaration** (identification of apparatus allowing traceability):
Product: Kvaser DIN Rail S030-X11
Type: 73-30130-01067-3

**The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:**

Electromagnetic Compatibility (EMC) Directive 2014/30/EU (Art. 6)

Low voltage Directive (LVD) 2014/35/EU (Art. 1)

RoHS recast Directive 2011/65/EU (Art. 4.1)

**The following harmonised standards and technical specifications have been applied**
(title, date of standard/specification):

| | |
|---|---|
| EN 61000-6-2 (2005) | EN 61000-6-4 (2007 + A1:2011) |
| EN 61010-2-201 (2013) | EN 61131-2 (2007) |
| EN 50581 (2012) | |

**Signed for and on behalf of:**

| Mölndal | 2021-10-08 | |
|---|---|---|
| Place of issue | Date of issue | Claes Haglund, Supply Chain and Quality director |

**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

## 7.3 Patents, copyrights and trademarks

All trademarks are the property of their respective owner. Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

Adobe, the Adobe logo, and Reader are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries.

DeviceNet is a trademark of Open DeviceNet Vendor Association, Inc.

NMEA 2000 is the registered trademark of the National Marine Electronics Association, Inc.

For information about Kvaser related CAN patents, see www.kvaser.com/patent.

# 8 Version history

Version history for document UG_98218_din_rail_se410s-x10:

| Revision | Date | Changes |
|----------|------|---------|
| 1.0 | 2019-08-22 | Initial version |
| 1.0 | 2019-05-08 | First version |
| 1.1 | 2020-02-21 | Fixed typo |
| 1.2 | 2020-08-19 | Windows 7 or later supported |
| 1.3 | 2021-10-08 | DoC updated |