Kvaser DIN Rail SE410S-X10 User's Guide



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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 scripts. 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 scripts. The different I/O modules are listed in Table 3 on Page 9. 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.
- 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 Script language, enables e.g. gateway functionality.
- Allows users to develop I/O functionality written in the Kvaser t Script language.
- Compatible with all applications written for Kvaser hardware, such as PCIcan and USBcan, using Kvaser CANlib.
- Allows users to save scripts written in Kvaser t Script language to flash storage.
- Automatically start t scripts 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 Script language

The Kvaser t Script 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 script 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 host computer. The addition of t scripts 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 Script 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 8 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 and LIN hardware. The SDK contains full documentation and many sample programs, written in C, C++, C#, Delphi, Python and Visual Basic. Kvaser CAN and LIN 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 17), IOs (see Section 3.5, IO connectors, on Page 15) and power (see Section 3.7, Power supply, on Page 18).

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:

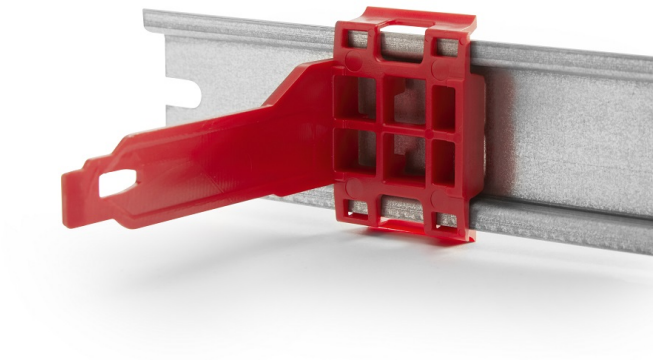

Figure 2: The mounting clip mounted on a DIN Rail.



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 10.
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 10 and Figure 4 on Page 11.



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 11. 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 25 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 13.
3. Remove the mounting clip from the DIN Rail by use of a screw driver, see Figure 8 on Page 13.

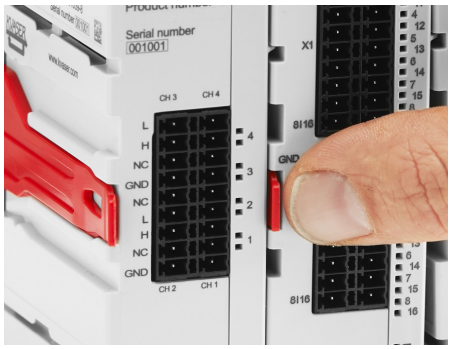

Figure 6: Press the top of mounting clip before removing a module from the DIN Rail.

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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 18.



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

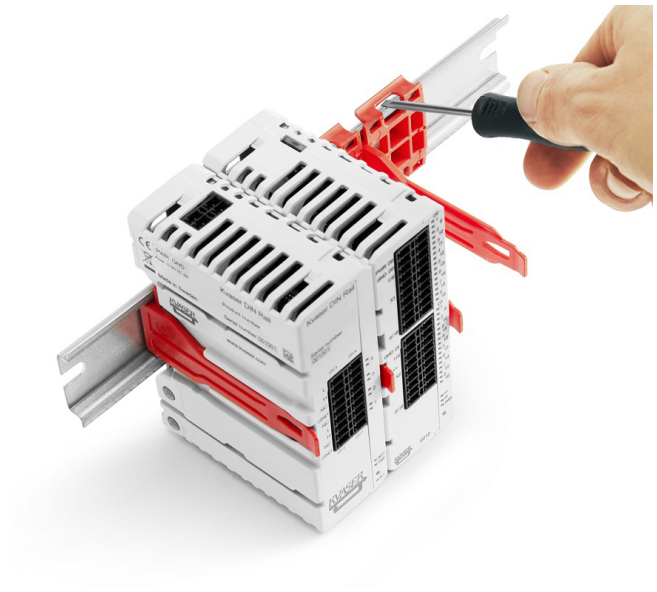

Figure 8: Removing the mounting clip from the DIN Rail.

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 6 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 15.

Connect the Kvaser DIN Rail SE410S-X10 to your network or directly to your host computer 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 21.



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 5.3, Combicon header connectors, on Page 33 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.

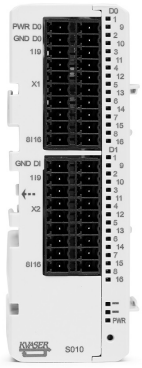

Figure 10: Digital add-on with 16 inputs and 16 outputs (01065-9).



Figure 11: Analog add-on with 4 inputs and 4 outputs (01066-6).

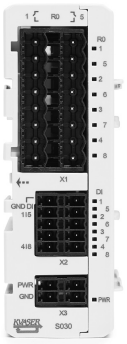

Figure 12: Relay add-on with 8 relay out and 8 digital inputs (01067-3).

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 5.3, Combicon header connectors, on Page 33 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.

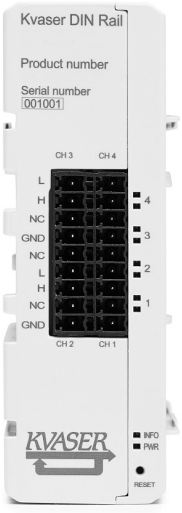

Figure 13: CAN connectors on Base module.

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.

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.

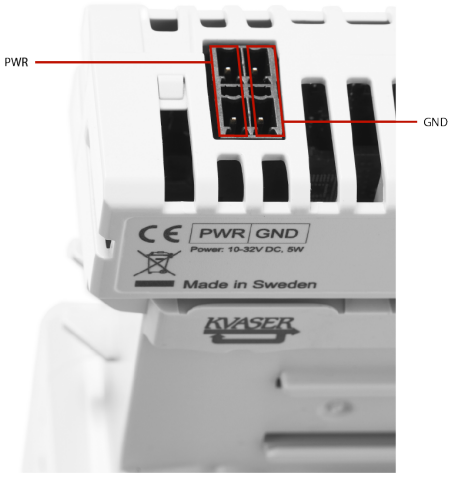

Figure 14: Power connectors on Base module.

3.8 LED indicators

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

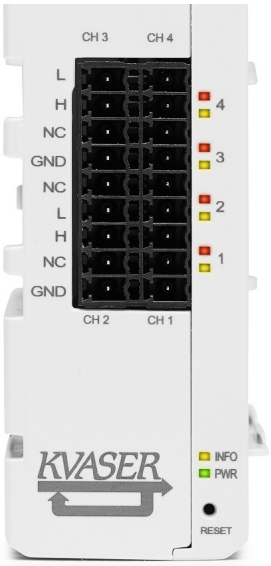

Figure 15: LEDs on the Kvaser DIN Rail SE410S-X10.

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.

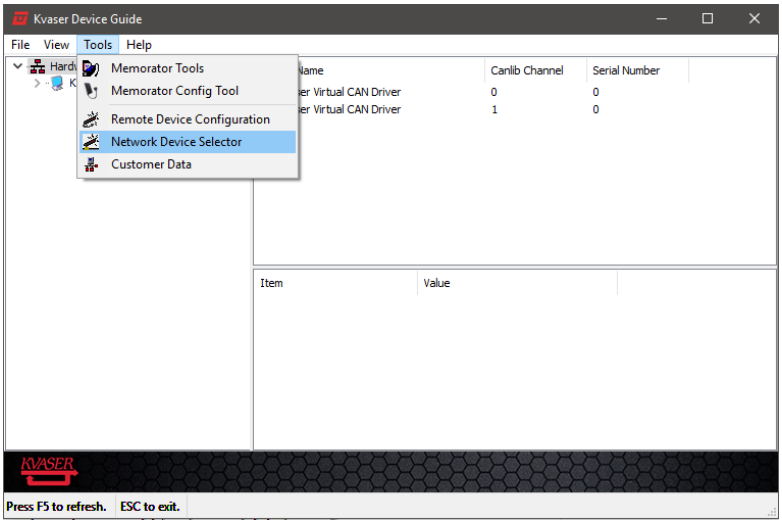

Figure 16: Kvaser Network Device Selector is found in Kvaser Device Guide

The new device will be available in the Kvaser Network Device Selector, see Figure 17 on Page 22.

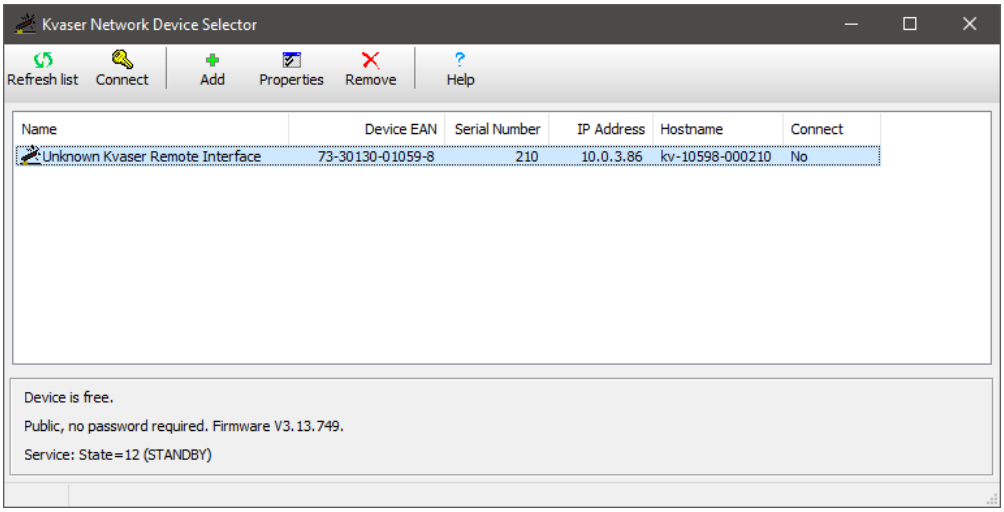

Figure 17: The new device is found in Kvaser Network Device Selector

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.

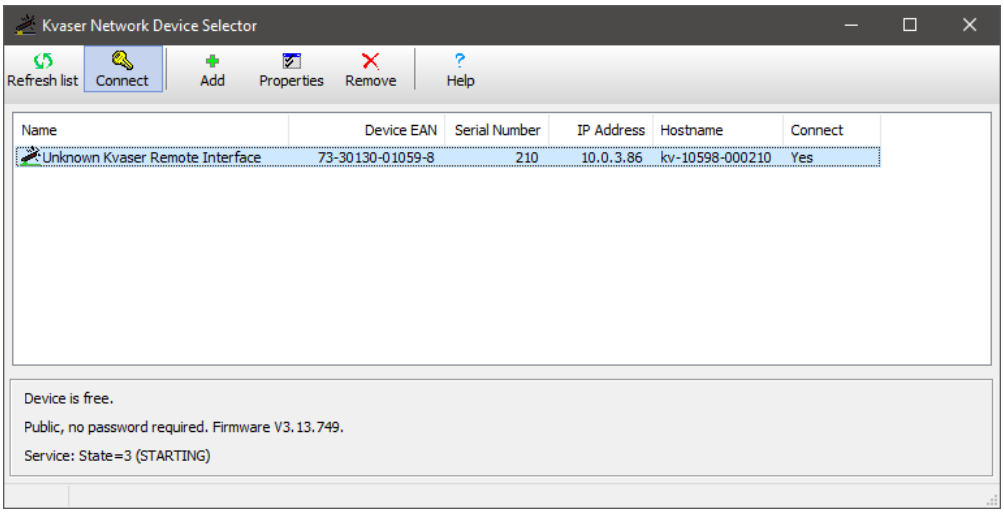

Figure 18: The new device is found in Kvaser Network Device Selector

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 23.

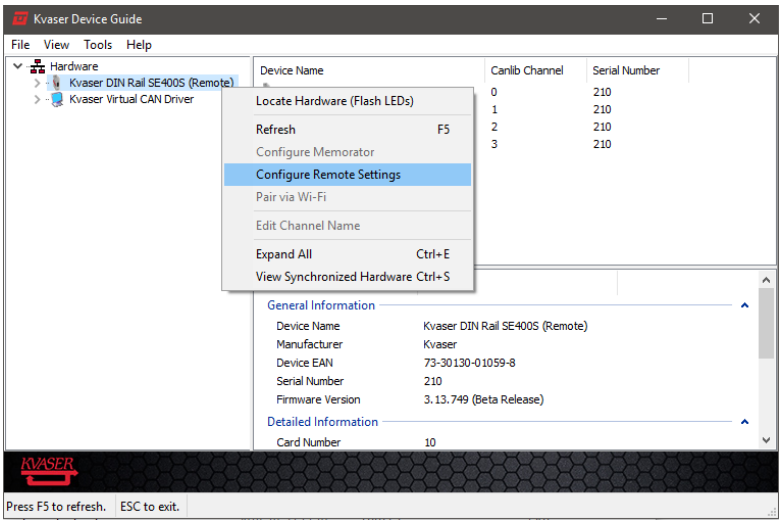

Figure 19: Select device in Kvaser Remote Device Configuration

You will be informed that the parameter area is blank, which is a normal condition for new devices, see Figure 20 on Page 24. The Info tab in the Kvaser Remote Device Configuration tool will then show general information about the device such as MAC address, hostname, and used IP address.

Change the Network Settings to the preferred settings and click OK, see Figure 21 on Page 24.

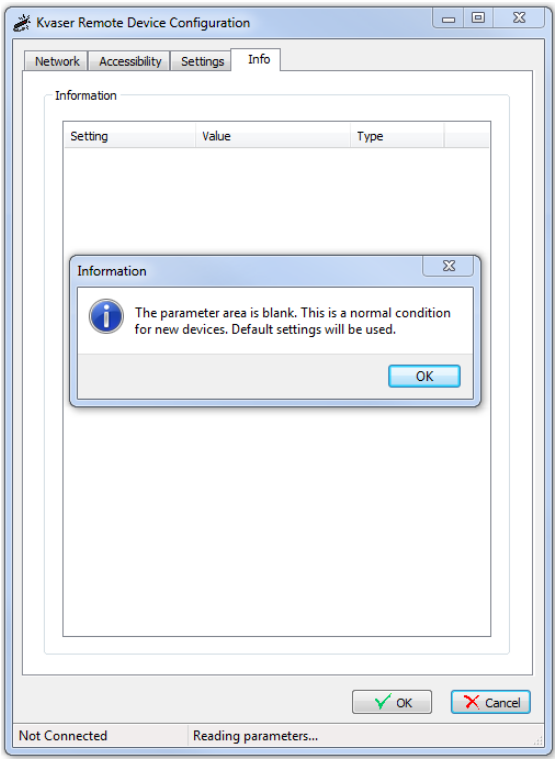

Figure 20: Kvaser Remote Device Configuration starting up



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 34.

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 t Script 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 scripts

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

To stop the t scripts 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 script and `channel` is the CAN channel that the t script will use by default, see Kvaser t Script Language guide for further details. `slot` is one of four slots numbered `0` to `3` that are available for t scripts 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..10	CAN 1 and 2 RED	Network factory reset and reset of all modules
After 10	CAN 1, 2 and 3 RED	Flash storage will be cleared, network factory reset and reset of all modules

Table 10: Reset types



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

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.

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.

4.7.1 Check your firewall

The default port number used by the Kvaser DIN Rail SE410S-X10 is 11416. This port is used for both UDP and TCP and should be open for both incoming and outgoing traffic (both TCP and UDP) on your firewall. The Kvaser Network Device Selector tool might also need authorization from you. Consult your firewall software documentation for how to do this.

5 Appendices

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

5.1 Start and stop of t scripts

All events that a t script will react to are specified using various event hooks. In effect, these are functions which are called when the specific events occur. Among other events, the script can react to starting and stopping itself which this section describes. Read the Kvaser t Script Language guide that can be downloaded at www.kvaser.com/download for more information.

The "on start" event will be triggered in the Kvaser DIN Rail SE410S-X10 when any of the following occurs:

- When a t script is started using the CANlib API (`kvScriptStart()`).
- When a t script is started from another t script.

The "on stop" event will be triggered for running t scripts during the corresponding cases:

- When a t script is stopped using the CANlib API (`kvScriptStop()`).
- When a t script is stopped from another t script.

5.2 Technical data

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

5.2.1 Kvaser DIN Rail SE410S-X10

In Table 11 on Page 29 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	20 kbit/s to 1 Mbit/s
CAN FD Bit Rate	Up to 8 Mbit/s
Time stamp resolution	100 µs
Max message rate	20000 msg/s
Error Frame Detection	Yes
Error Frame Generation	Yes
Silent mode	Yes
Kvaser t Script	Yes
Kvaser CANtegrity	No
Host interface	Ethernet
Host OS	Windows (7 or later)[1]
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
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.

5.2.2 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.

5.2.3 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 kΩ
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	± 30 V
Input method	Single ended
Resolution	12 bits, 2.44 mV
Accuracy	0.5 % + 25 mV
Input Impedance	typical 100 kΩ
Reversed polarity protected	Yes
Surge protected	Yes

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

5.2.4 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.

5.3 Combicon header connectors

5.3.1 Kvaser DIN Rail SE410S-X10

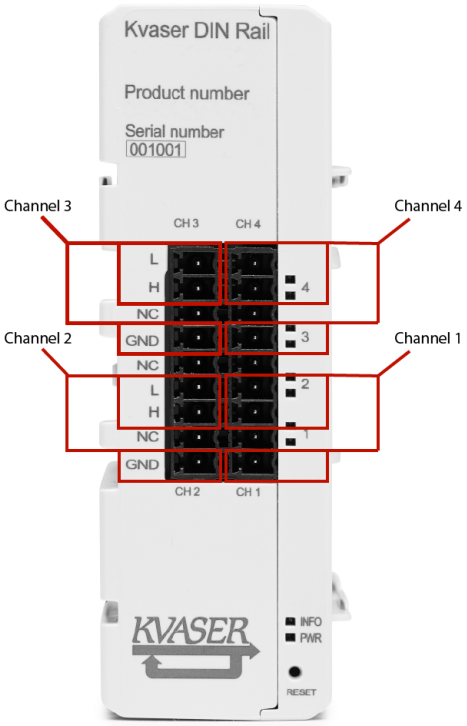

Figure 23: Kvaser DIN Rail SE410S-X10 connectors

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

5.3.2 Digital add-on S010-X10

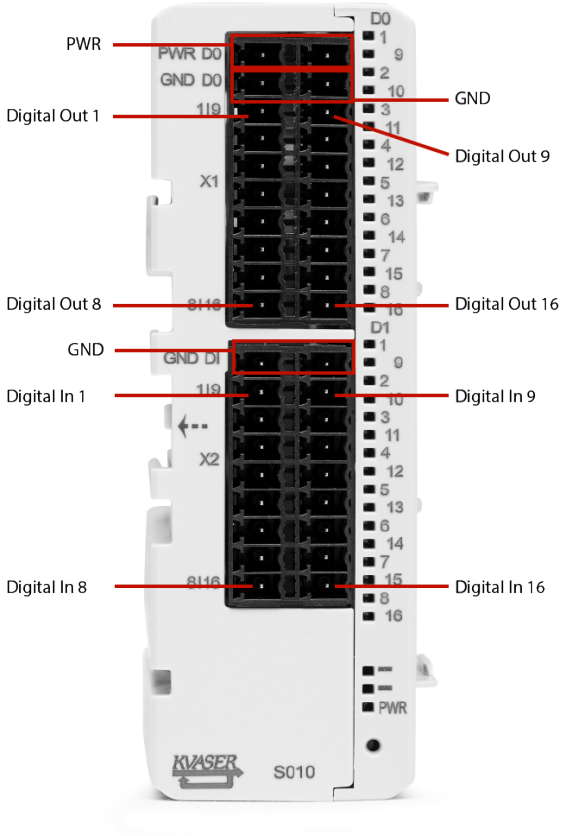

Figure 24: Digital add-on connectors

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 35.

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.

5.3.3 Analog add-on S020-X10

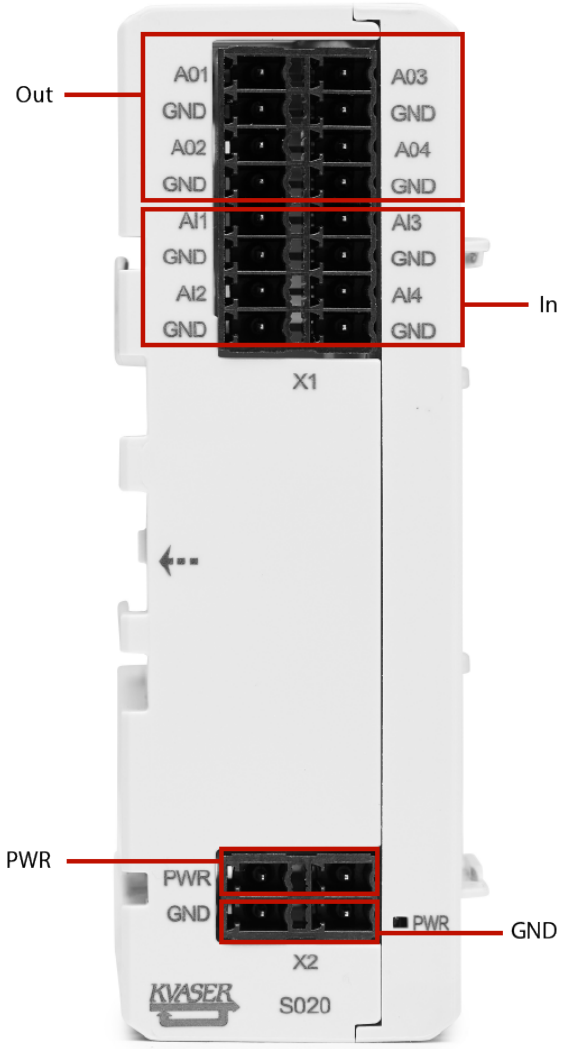

Figure 25: Analog add-on connectors

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 37.

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.

5.3.4 Relay add-on S030-X11

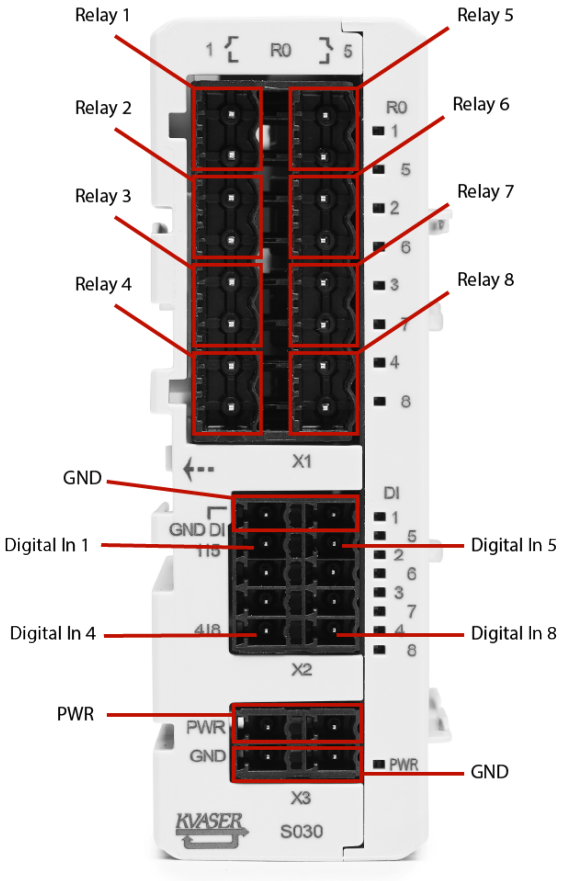

Figure 26: Relay add-on connectors

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.

5.4 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.

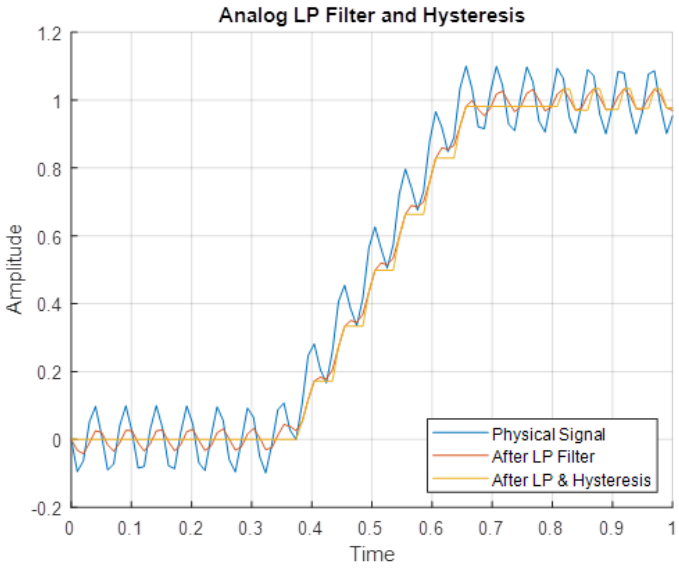

Figure 27: Lowpass filter order set to 3

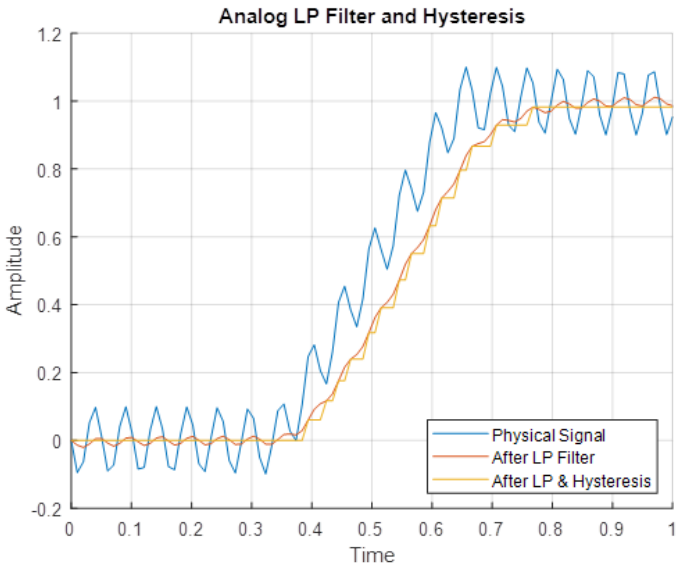

Figure 28: Lowpass filter order set to 7

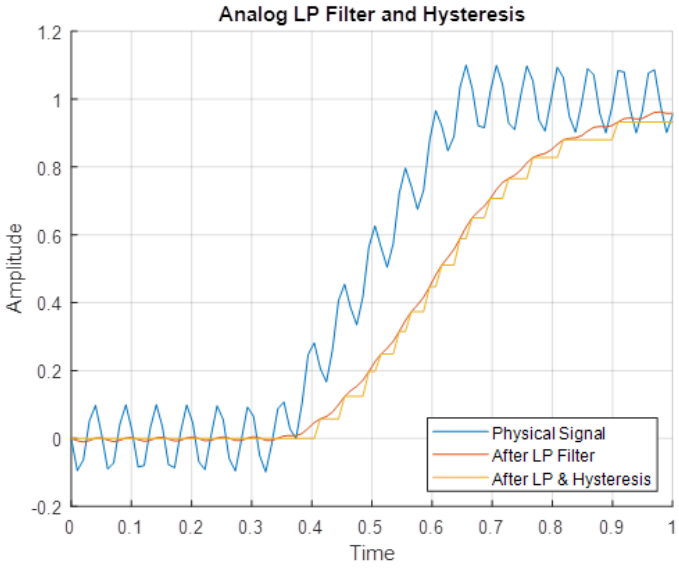

Figure 29: Lowpass filter order set to 15

5.5 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.

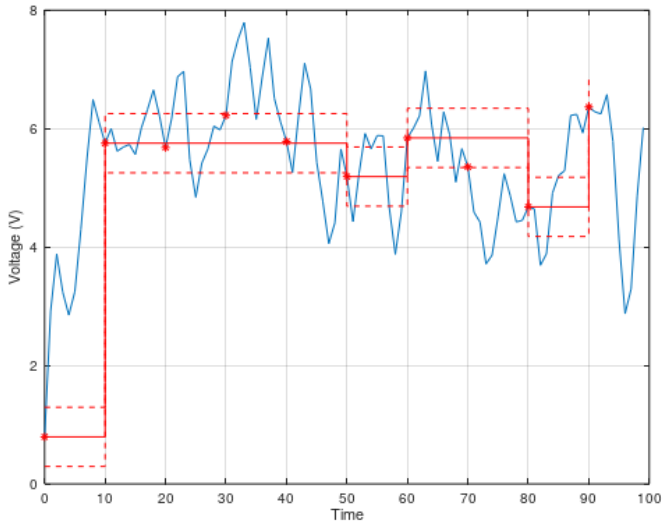

Figure 30: Hysteresis set to 0.5V

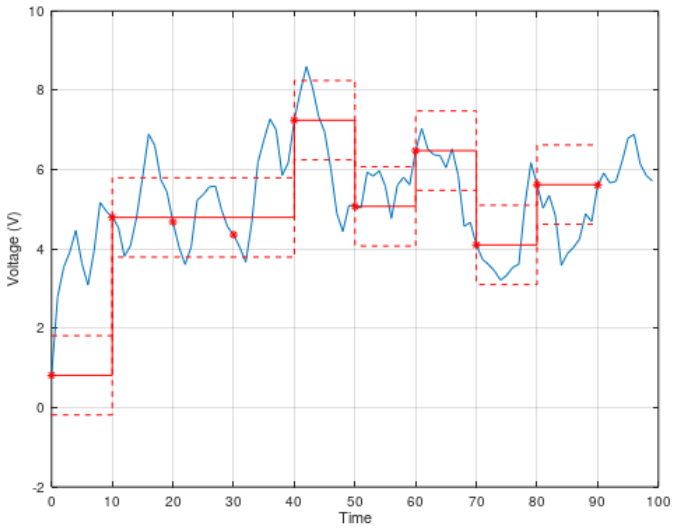

Figure 31: Hysteresis set to 1V

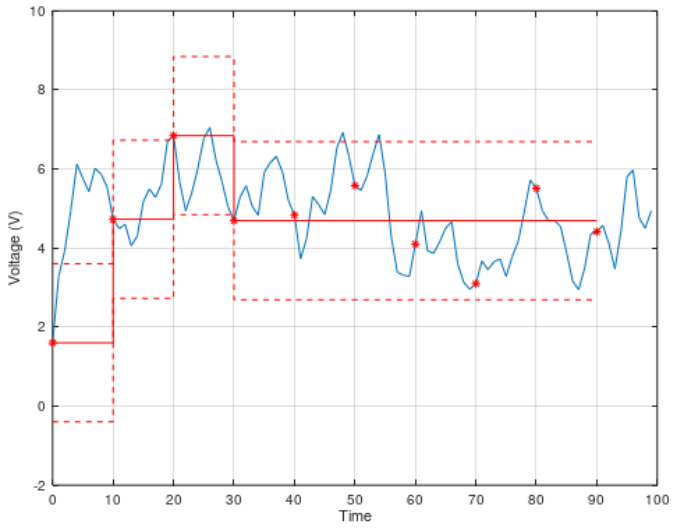

Figure 32: Hysteresis set to 2V

5.6 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

5.7 I/O pin readout time

The typical I/O pin readout time is less than 5ms depending on CAN busload. While running Kvaser t scripts, 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 Safety Instructions

6.1 Intended Use

Kvaser interfaces are used to connect computer systems to CAN buses. The Kvaser DIN Rail SE410S-X10 is intended for connection to a computer via an available Ethernet socket.

6.2 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 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

8 Legal acknowledgements

8.1 EU Regulatory Compliance

KVASER **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

KVASER **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

KVASER **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.

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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.

9 Document Revision 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.
1.4	2022-03-02	Minor textual changes.
1.5	2023-02-20	Added more information about Kvaser t programming. Updated the Technical data table. Added section about intended use.
1.6	2023-08-10	Updated the Reset types table. Minor textual changes.
1.7	2024-04-25	Updated Kvaser logo and the section for troubleshooting.
1.8	2025-01-13	Minor textual changes.
1.9	2026-08-17	Changed terminology from t programming to t script.