

# Kvaser Memorator Pro 5xHS User's Guide



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<http://www.kvaser.com>

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## **1 About this manual**

This manual is intended for Kvaser Memorator Pro 5xHS users. This document contains a description of the hardware's properties and general instructions for connecting the device to a computer.

## 2 Introduction

This section will describe the functions and features of the Kvaser Memorator Pro 5xHS.



You must charge the battery before using your Kvaser Memorator Pro 5xHS for the first time. See Section 3.5, Power supply, on Page 11 for more information.

### 2.1 Welcome to Kvaser Memorator Pro 5xHS



Figure 1: Kvaser Memorator Pro 5xHS

Kvaser Memorator Pro 5xHS is a small, yet advanced, portable CAN data logger that handles transmission and reception of standard and extended CAN messages on the bus with a high time stamp precision. Kvaser Memorator Pro 5xHS can also be used as a powerful real time CAN to USB interface. It is compatible with applications that use Kvaser's CANlib.

This guide applies to Kvaser Memorator Pro 5xHS devices listed in Table 1 on Page 6.

Device	Product Number (EAN)	Firmware
Kvaser Memorator Pro 5xHS	73-30130-00778-9	v3.3

Table 1: Kvaser Memorator Pro 5xHS devices and their product numbers.

## 2.2 Major features

- Data logger.
- USB CAN interface.
- Supports CAN FD, up to 8 Mbit/s (with correct physical layer implementation).
- Quick and easy plug-and-play installation.
- Supports both 11-bit (CAN 2.0A) and 29-bit (CAN 2.0B active) identifiers.
- 100% compatible with applications written for other Kvaser CAN hardware with Kvaser CANlib.
- High-speed CAN connection (compliant with ISO 11898-2), up to 1 Mbit/s.
- Fully compatible with J1939, CANopen, NMEA 2000<sup>®</sup> and DeviceNet.
- Simultaneous operation of multiple devices.
- Can use the Kvaser *t* language for even more advanced setups.
- One SD card slot for logging.
- Logger status is indicated with externally visible LEDs.
- Kvaser MagiSync – automatic time synchronization (see Section 4.10, Kvaser MagiSync, on Page 24 for more details).
- Includes 5 channel breakout cable.

## 2.3 Interface and logger

Kvaser Memorator Pro 5xHS provides a CAN bus interface through a standard USB interface or logs data from a CAN bus to a standard SD card. The device is in Interface mode when connected to the PC via USB, and in Logger mode when only connected to CAN power.

Kvaser Memorator Pro 5xHS can log continuously, or logging can be triggered by external triggers (rising or falling edge) and/or by messages on the CAN bus (triggered by identifier, data contents or error frames.) Pre- and post-trigger times can be set.

To enhance logging performance, Kvaser Memorator Pro 5xHS can filter out messages to be logged. The identifiers can be picked from a database file, or all messages can be logged.

### 2.3.1 Auto transmit messages

CANlib supports object buffers for special purposes in Interface mode. The object buffers allows you to define:

- Auto response messages; that is, when a message meeting a certain condition is received, CANlib will respond automatically with a message you define.
- Auto transmit messages; that is, messages that are transmitted periodically.

Kvaser Memorator Pro 5xHS supports setting up auto transmit messages in the device in order to offload the computer and getting increased performance.

### 2.3.2 Advanced triggers

Triggers are useful if you want the Kvaser Memorator Pro 5xHS to start logging when something special happens. An example of a trigger is a specific incoming CAN message.

The triggers are combined using logical operators into expressions. More than one trigger may be used in an expression.

An action is then associated with the expression, where the action describes what should happen when the expression is true, e.g. start logging.

Kvaser Memorator Pro 5xHS supports setting up auto transmit messages in the device to increase performance by reducing the computer workload.

### 2.3.3 Transmit lists

A transmit list is a list of messages that can be sent in Logger mode when a specific expression is fulfilled. Up to 8 transmit lists can be added and sent either continuously or only once. Configuration of a delay time between every message in the list and an idle time between continuous list transmissions is supported.

## 2.4 Configuration software in the PC

To be able to configure Kvaser Memorator Pro 5xHS, you need to install Kvaser Memorator Config Tool which can be downloaded at [www.kvaser.com/download](http://www.kvaser.com/download). The Kvaser Memorator Config Tool will assist in:

- Configuration of the CAN controller (e.g. bit rate and filters).
- Configuration of the trigger conditions (including up to 32 bit signals from databases).
- Configuration of message filters.
- Configuration of programs to be started.
- Downloading configuration via USB or SD card reader.

- Extracting logged messages via USB or SD card.
- Converting files logged in Kvaser Memorator Pro 5xHS to several different formats.

For a detailed description, and how to get started, see the on-line help available inside Kvaser Memorator Config Tool.

## 2.5 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 Memorator Pro 5xHS 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, external input or a timer expiration.

Like any Kvaser CAN interface, the Kvaser Memorator Pro 5xHS can be used via CANlib on a PC. The addition of t programs running directly on the Kvaser Memorator Pro 5xHS makes it possible to react much quicker to CAN bus events (for example to speed up file transfer protocols or to simulate missing hardware). The Kvaser Memorator Pro 5xHS can also operate completely autonomously.

For more information, see the Kvaser t Programming Language guide that can be downloaded at [www.kvaser.com/download](http://www.kvaser.com/download).

## 2.6 Restrictions in t functionality

The Kvaser Memorator Pro 5xHS does not include dedicated I/O pins which means that the t functionality listed in Table 2 is not available on Kvaser Memorator Pro 5xHS (the table shows version 3.10 of the t language compiler).

Group	Function name
Hooks	on IoEvent
Predefined I/O Functions	kvIoGetNumberOfPins
	kvIoPinGetInfo
	kvIoPinSetInfo
	kvIoConfirmConfig
	kvIoPinSetDigital
	kvIoPinGetDigital
	kvIoPinGetOutputDigital
	kvIoPinSetRelay
	kvIoPinGetOutputRelay
	kvIoPinSetAnalog
	kvIoPinGetAnalog
	kvIoPinGetOutputAnalog

Table 2: Functionality in the t language (v3.10) that is not supported by Kvaser Memorator Pro 5xHS.



## 2.7 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](http://www.kvaser.com/download).

## 3 Kvaser Memorator Pro 5xHS hardware

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

### 3.1 Hardware installation

For the Kvaser Memorator Pro 5xHS 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 Memorator Pro 5xHS.

The latest version of the driver and firmware can be downloaded from [www.kvaser.com/download](http://www.kvaser.com/download).

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

The Kvaser Memorator Pro 5xHS may be inserted in any free USB socket on the host computer. You do not need to switch the power off before inserting or removing the device.

For information on how to upgrade the firmware, see Section 4.9, Updating the firmware, on Page 24.

### 3.2 USB connector

The Kvaser Memorator Pro 5xHS has a standard USB type “Micro-B” female connector.



Figure 2: Micro USB cable connected to the Kvaser Memorator Pro 5xHS.

Connect the device to your computer using any high quality USB 2.0 certified cable. The maximum USB cable length is 5 m (~ 16 ft). If you need a longer cable, you can use USB hubs or USB extension cables with a built-in hub. By chaining up to 5 hubs, you can achieve an effective cable length of up to 25 m (~ 82 ft).



As USB cables become longer they are more sensitive to EMI, because they make a longer antenna that can pick up more noise. These issues can be mitigated by using higher quality cables with better shielding. Thicker cables tend to be better than thin ones, and braided shielding tends to be more reliable than only foil. Furthermore, longer cables may introduce signal degradation and timing issues that, if necessary, can be mitigated using shorter cable segments combined with hubs that amplify the signal and handle delays on a per-cable basis.

### 3.3 CAN channels

The Kvaser Memorator Pro 5xHS has five CAN Hi-Speed channels in a single 26-pin HD D-SUB CAN connector (see Figure 3). See Section 4.4, CAN connectors, on Page 19 for pinout information.



Figure 3: CAN connector on Kvaser Memorator Pro 5xHS

### 3.4 External trigger

The Kvaser Memorator Pro 5xHS can be set up to trigger on an external input signal, where the edge can be configured for rising or falling. It is also possible to configure the Kvaser Memorator Pro 5xHS to send an external pulse, of configurable length, as an action for a trigger event. See also Section 4.6, External trigger input, on Page 21 and Section 4.7, External trigger output, on Page 23.

### 3.5 Power supply

The Kvaser Memorator Pro 5xHS can be powered through the CAN connector or through the USB connector.

To operate the Kvaser Memorator Pro 5xHS in logger mode, you **must** supply power through the CAN connector. To use the device as a USB CAN interface or to configure the device, power on the USB side is sufficient.

The Kvaser Memorator Pro 5xHS contains a battery that needs to be fully charged before using the device for the first time. Connect the Kvaser Memorator Pro 5xHS to either a powered USB port or supply power through the CAN connector and let the battery charge overnight.

The battery inside the Kvaser Memorator Pro 5xHS is used for powering the real time clock and ensuring a safe shutdown of the device when disconnected. When in logger mode, the Kvaser Memorator Pro 5xHS can also use the battery to extend the logging time by a number of seconds (accessible from the Power Settings in Kvaser Memorator Config Tool).

To maintain a healthy battery you need to:

- Always connect the Kvaser Memorator Pro 5xHS to a properly powered USB hub, using the supplied cable, when connected to a computer.
- When using the feature to extend time to live after CAN power is disconnected, always make sure to recharge the device between each use. To fully recharge the device, connect to power for up to 20x “live time” (e.g. 15s battery use might require up to 5 min of recharging).
- If the Kvaser Memorator Pro 5xHS is not used regularly, ensure the device is recharged at least twice a year overnight at room temperature.



All charging times are given at temperatures between  $-10^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ . In warmer and colder temperatures the charging time will increase.

See Section 4.4, CAN connectors, on Page 19 for information on how to connect power to the connector. The supply power should be in the range specified in Section 4.3, Technical data, on Page 18.

### 3.6 SD Card

You can use SD, SDHC and SDXC cards with your Kvaser Memorator Pro 5xHS for logging. The Kvaser Memorator Pro 5xHS is built with industrial environments in mind, but please note that the SD card used can be a limiting factor. By using a quality card that matches the specifications of the Kvaser unit, you minimize the risk for data corruption or lost data.

Insert the SD card upside down into your Kvaser Memorator Pro 5xHS (see Figure 4 on Page 13). Do not apply excessive force.

To remove the SD card, open the access door and using a finger or a small coin, gently press on the edge of the SD card until a click is heard. Release the card and it will partially eject. Remove the SD card completely.



Figure 4: Inserting SD card into the Kvaser Memorator Pro 5xHS.



The setting of the write protection switch on SD cards is disregarded by design. The Kvaser Memorator Pro 5xHS will write to the disk even if the write protection switch is set.

### 3.7 LED Indicators

The Kvaser Memorator Pro 5xHS has one power LED and one traffic LED for each CAN channel as shown in Figure 5. Their functions are described in Section 4.1, Definitions of LED states and colors, on Page 15.



Figure 5: LEDs on the Kvaser Memorator Pro 5xHS.

### 3.8 Troubleshooting

Use “Kvaser Device Guide” in the Control Panel to verify that the computer can communicate with the Kvaser Memorator Pro 5xHS. 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. If the battery has been depleted, no LEDs will light up. Connect the Kvaser Memorator Pro 5xHS to either a properly

powered USB port or supply power through the CAN connector and let the battery charge overnight.

## 4 Appendices

In this section you will find technical information about the Kvaser Memorator Pro 5xHS and its connectors.

### 4.1 Definitions of LED states and colors

A Kvaser device has two basic types of LEDs; Power and Traffic. These are dual colored as shown in Table 3. A device with multiple CAN channels has one Traffic LED for each CAN channel. When the device has more than one channel a space and digit is added on the label, CAN 1, CAN 2 etc. The red Traffic LEDs are also used to indicate errors by using all red Traffic LEDs simultaneously.

LED	Label	Color
Power	PWR	Green/Yellow
Traffic	CAN	Yellow/Red

Table 3: The different type of LEDs.

The following definitions is used to describe the state of an LED:

**Off** The LED is off and no light is emitted.

**Flash** The LED is lit up for a very short time. A single flash may be hard to see and a continuous set of flashes will look the same as On.

**Slow Blink** The LED is repeatedly turned On and Off. The On and Off phase is equal in time.

**Fast Blink** The LED is repeatedly turned On and Off but with a higher frequency than Slow Blink. The On and Off time is still equal.

**On** The LED is constantly emitting light.

**Slow Waver** This is a variant of Slow Blink but instead of being Off, a second color is On. This is only possible with a dual colored LED.

**Fast Waver** The LED is alternating between two colors as in Slow Waver but using a higher frequency.

**Running** This means that all LEDs are lit, one at the time, in sequence with every color available i.e. "Power green->Power yellow->Traffic 1 yellow->Traffic 1 red->Traffic 2 yellow->Traffic 2 red->..."

As an example, "Slow Waver (Green/Yellow)" means that the LED is slowly blinking by alternating between green and yellow.

### 4.1.1 Interface mode

The device is in Interface mode when connected to the PC via USB. If the Power LED is showing a steady green light, the device is in Interface mode and working correctly. When connected to the computer for the first time, the Power LED will blink slowly in yellow until the driver is installed and the device has received a USB configuration.

When in Interface mode, if the Power LED is yellow for an extended period, something is wrong. Please see Table 4.

When the device is connected to Kvaser Memorator Configuration Tool (in Interface mode), the LED will be showing any of the states shown in Table 6.



The power should never be removed during disk activity or when firmware update is in progress.

Power LED	Traffic LED	Description
Slow Blink (Yellow)	All off (-)	Waiting for USB configuration
Slow Waver (Green/Yellow)	Slow Waver (Yellow/Red)	Firmware configuration error <sup>1</sup>
Slow Waver (Green/Yellow)	All Slow Blink (Yellow)	Power problem <sup>2</sup>

Table 4: Yellow Power LED shows problems in Interface mode.

Traffic LED	Description
Off (-)	Idle, no CAN traffic
Flash (Yellow)	CAN message received or sent
Flash (Red)	Error frame received
All Fast Blink (Yellow)	Firmware update is in progress
Fast Blink (Red)	CAN channel is error passive
On (Red) <sup>3</sup>	CAN overrun

Table 5: Traffic LED shows CAN bus status in Interface mode and Logger mode.

Power LED	Traffic LED	Description
Running	Running	Device is communicating with Memorator Tools
On (Green)	All Fast Blink (Yellow)	Disk activity such as formatting or firmware update is in progress

Table 6: LED indications when connected to Kvaser Memorator Configuration Tools.

<sup>1</sup>This should not normally happen. If it does, please contact Kvaser support.

<sup>2</sup>This indicates low power supply, such as using an unpowered USB hub.

<sup>3</sup>The red Traffic LED indicating overrun will stay on until the device goes bus off.



### 4.1.2 Logger mode

The device is in Logger mode when only connected to CAN power. If all the Traffic LEDs are showing the same pattern (most likely including red) there is some problem and the Power LED will indicate what type of problem according to Table 7 on Page 17.

When in operational mode, the green Power LED shows what state the device is in (armed, active or stopped), see Table 8, and the Traffic LEDs are showing the status of the CAN bus in the same way as in Interface mode, see Table 5 on Page 16.

Power LED	Traffic LED	Description
Fast Waver (Green/Yellow)	All Fast Waver (Yellow/Red)	Firmware or Hardware error <sup>4</sup>
Fast Waver (Green/Yellow)	All Slow Waver (Yellow/Red)	Battery fault
Yellow On	All Slow Blink (Red)	Disk full or Disk error
Yellow On	All Fast Blink (Red)	Configuration file missing or corrupt <sup>5</sup>

Table 7: When all Traffic LEDs are showing the same pattern, the Power LED indicates the problems in Logger mode.

Power LED	Description
On (Green)	Device Armed
Fast Blink (Green)	Logging active
Slow Blink (Green)	Logging stopped due to trigger

Table 8: The green Power LED indicates that the device is in a valid state.

### 4.1.3 Status of scripts

There are by default no LED indications showing the state of a t program. Instead, the developer of a script can override any of the existing LEDs and create notifications as needed when the t program is running, including program exceptions.

An action that cannot be handled by the script developer is when a t program fails to load and does not start up. If this happens, the "Configuration file missing or corrupt" pattern in Table 7 will be used.

## 4.2 Start and stop of t programs

All events that a t program will react to are specified using various event hooks. In effect, these are functions which are called when the specific events occur. Among

<sup>4</sup>This should not normally happen. If it does, please contact Kvaser support.

<sup>5</sup>This also includes the case where a t program failed to load and start as configured.

other events, the program can react to starting and stopping itself which this section describes. Read the Kvaser t Programming Language guide that can be downloaded at [www.kvaser.com/download](http://www.kvaser.com/download) for more information.

The “on start” event will be triggered in the Kvaser Memorator Pro 5xHS when any of the following occurs:

- When a t program is started using the CANlib API (`kvScriptStart()`).
- When a t program is started from another t program.
- When Kvaser Memorator Pro 5xHS is powered on into Logger mode.
- When using CANlib API (`kvDeviceSetMode(kvDEVICE_MODE_LOGGER)`).

The “on stop” event will be triggered for running t programs during the corresponding cases:

- When a t program is stopped using the CANlib API (`kvScriptStop()`).
- When a t program is stopped from another t program.
- When Kvaser Memorator Pro 5xHS is powered off in Logger mode, after configured afterburner expires.
- When using CANlib API (`kvDeviceSetMode(kvDEVICE_MODE_INTERFACE)`).
- When USB power is connected or removed (CAN power is applied).

### 4.3 Technical data

In Table 9 on Page 19 below you will find the Kvaser Memorator Pro 5xHS's technical specifications.

CAN Channels	5
CAN Transceivers	MCP2561FD (Compliant with ISO 11898-2)
CAN Controller	Kvaser CAN IP in FPGA
Galvanic isolation	Yes
CAN Bit Rate	40 kbit/s to 1 Mbit/s
CAN FD Bit Rate	Up to 8 Mbit/s (with correct physical layer implementation)
Time stamp resolution	1 $\mu$ s
Max message rate	20000 msg/s per channel
Error Frame Detection	Yes
Error Frame Generation	Yes
Silent mode	Yes
Kvaser MagiSync	Yes
PC interface	USB Hi-Speed
External power	9–40 V
Power consumption	Up to 3W
Hardware configuration	Done by software (Plug & Play).
Software requirements	Windows Vista or later. (For other operating systems, contact Kvaser support.)
Dimensions	68 x 155 x 23 mm for body incl. strain relief
Weight	150 g (320g including HD26-5DS9 Splitter)
Operating temperature	–40 °C to +85 °C
Storage temperature	–40 °C to +85 °C
Relative humidity	0 % to 85 % (non-condensing.)

Table 9: Technical Specifications.

#### 4.4 CAN connectors

Kvaser Memorator Pro 5xHS devices that use the 26-pin HD D-SUB connector (see Figure 6) have the pinning described in Table 10 on Page 20. This table also describes how the HD26-5xDS9 splitter (see Figure 8 on Page 21) connects to five separate 9-pin D-SUB connectors, CAN 1 to CAN 5.

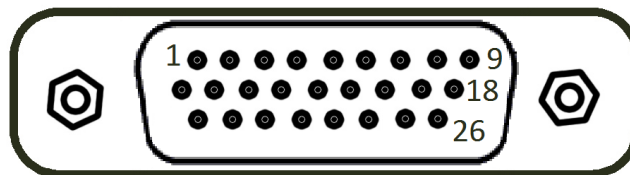


Figure 6: The male 26 pin HD D-SUB connector pin numbers

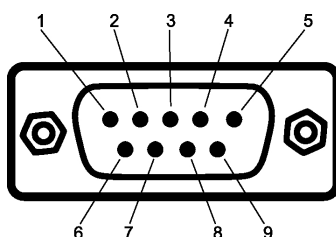


Figure 7: The male D-SUB 9 connector pin numbers

HD D-SUB	CAN 1	CAN 2	CAN 3	CAN 4	CAN 5	Function
1	2					CAN_L channel 1
2		2				CAN_L channel 2
3			2			CAN_L channel 3
4				2		CAN_L channel 4
5					2	CAN_L channel 5
6						Not connected
7						Not connected
8	4					External trigger input
9						Not connected
10	9					Power supply to the device
11	7					CAN_H channel 1
12		7				CAN_H channel 2
13			7			CAN_H channel 3
14				7		CAN_H channel 4
15					7	CAN_H channel 5
16						Not connected
17						Not connected
18		4				External trigger output
19	3					GND channel 1
20		3				GND channel 2
21			3			GND channel 3
22				3		GND channel 4
23					3	GND channel 5
24						Not connected
25						Not connected
26						Not connected

Table 10: Pin configuration of the 26-pin HD D-SUB (and HD26-5xDS9 splitter)



Figure 8: The HD26-5xDS9 Splitter

## 4.5 CAN bus termination

Every CAN bus must be terminated with a 120 Ohm resistor at each end of the bus. The Kvaser Memorator Pro 5xHS does not contain any CAN bus termination, because their inclusion could cause severe disturbance in a system which is already correctly terminated.

For laboratory or testing use, the exact value of the termination resistors is not always critical. Sometimes a single terminator is sufficient. For production, proper termination is essential. If you see error frames on the bus, you should check the termination.



**To save yourself a lot of trouble, always terminate the CAN bus properly.**

## 4.6 External trigger input

The Kvaser Memorator Pro 5xHS can be set up to trigger on an external signal and can be configured to react on both falling and rising edges.

- If it is set to trigger on a falling edge, the trigger is activated when the External trigger is connected to ground.
- If it is set to trigger on a rising edge, the trigger is activated when the External trigger is disconnected from ground.

There are two ways to create such an external signal, either connect a switch from the External trigger input on CAN channel 1 to ground or connect a signal between 0 and 5 V to the External trigger input. See Section 4.4, CAN connectors, on Page 19 for pin numbering.

The trigger input is debounced by the firmware so that a pulse of shorter length than approximately 30 ms will not be detected.

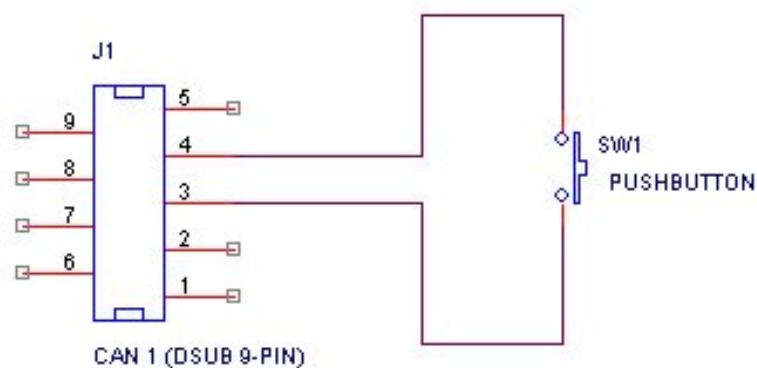


Figure 9: Example of how to connect a button to the External trigger input.

Internally, the External trigger input has a pull-up to +5 V, see Figure 10

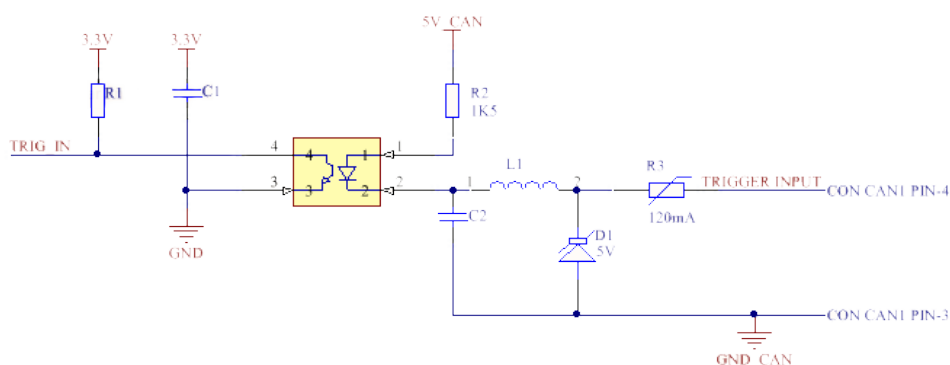


Figure 10: The External trigger input inside the Kvaser Memorator Pro 5xHS.

### 4.7 External trigger output

The Kvaser Memorator Pro 5xHS can be set up to send an external pulse through the External trigger output pin. See Section 4.4, CAN connectors, on Page 19 for pin numbering.

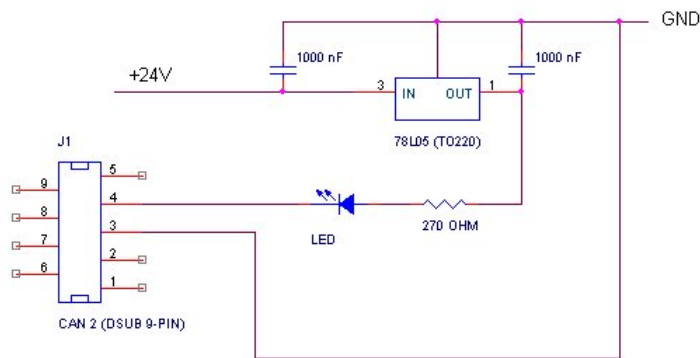


Figure 11: Sample circuit for connecting a LED to the External trigger output.

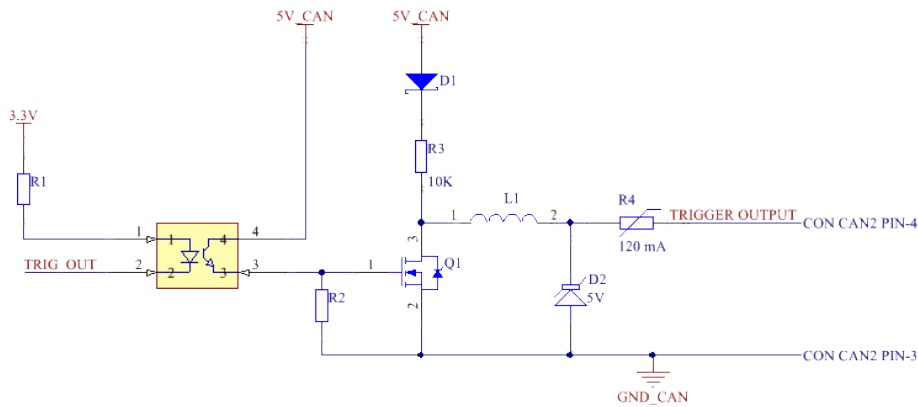


Figure 12: The External trigger output inside the Kvaser Memorator Pro 5xHS.

### 4.8 Daisy Chain Several Devices

You can daisy chain several Kvaser Memorator Pro 5xHS to gain additional logging capacity. To do this, connect the trigger output of one device to the trigger input of the next device. Using the Kvaser Memorator Config Tool, configure the trigger output of the first device to emit a pulse when the disk becomes full. Configure the trigger input of the second device to start logging when a falling edge is detected. Set the post-trigger time to 0 (infinite) and the pre-trigger time to 1 s. You now have a setup where the second unit starts logging when the first one becomes full.

## 4.9 Updating the firmware

For the Kvaser Memorator Pro 5xHS 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](http://www.kvaser.com/download).

Connect the Kvaser Memorator Pro 5xHS to your PC with the USB cable and start the update.exe application. A window opens showing the Firmware Update Instructions, read and follow those carefully.

To check the current firmware version, open "Kvaser Device Guide" which can be found in the Control Panel. Select "Kvaser Memorator Pro 5xHS" in the tree view to the left, and click on the channel. The firmware revision information now appears in the right half of the window.

## 4.10 Kvaser MagiSync

Time synchronization is needed to achieve accurate and precise time stamping between several PC-to-bus interfaces connected to one PC. Since each PC-to-bus interface uses its on-board clock to set the time stamps.

Kvaser MagiSync is an innovative way to synchronize several different Kvaser USB interfaces. You do not need external cables - you get instant synchronisation when you connect the MagiSync enabled Kvaser USB device.

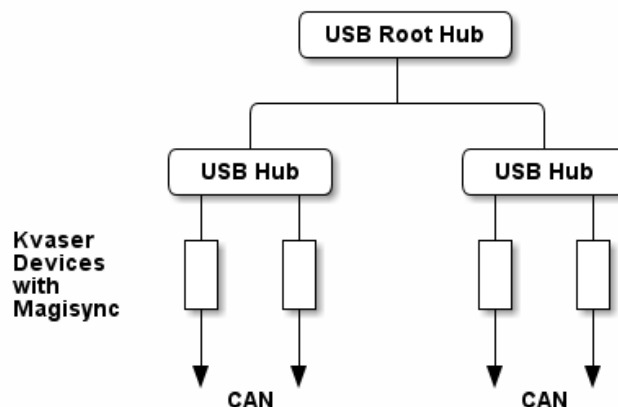


Figure 13: An example setup where all devices are synchronized via MagiSync.

For this to work the Kvaser USB interfaces must reside on the same USB root hub. If they do not they will not be synchronized, see Figure 13 and Figure 14 on Page 25.



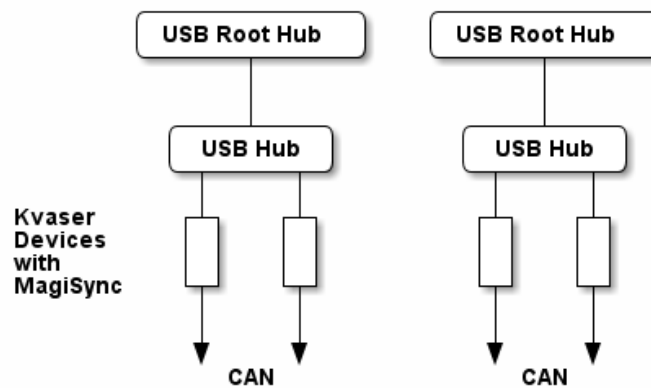


Figure 14: Not all devices are synchronized via MagiSync in this setup.

Usually, a computer has a USB controller with one root hub in a computer. If you use that one, you do not need an external USB hub to get your Kvaser Devices synchronized. The easiest way to verify the setup is to view Synchronized Hardware in the Device Tree of “Kvaser Device Guide” in your computer’s control panel. If all your hardware is placed in one Kvaser MagiSync Group, then you are ready to go.

When connected correctly, all units are synchronized achieving a high precision virtual clock accurate to the microsecond.

## 5 Disposal and Recycling Information



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

Dispose of batteries according to your local environmental laws and guidelines.

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

## 6 Legal acknowledgements

### 6.1 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.



THIS PRODUCT CONTAINS A RECHARGEABLE LI-POL BATTERY THAT MUST BE DISPOSED OF PROPERLY. IT MAY EXPLODE IF DAMAGED OR DISPOSED OF IN FIRE. DO NOT SHORT CIRCUIT.

## 6.2 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 Memorator Pro 5xHS

**Object of the declaration** (identification of apparatus allowing traceability):

Product: Kvaser Memorator Pro 5xHS

Type: 73-30130-00778-9

**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 55024 (2010)

EN 55032 (2012)

EN 61000-6-3 (2007 + A1:2011)

EN 50581 (2012)


**Signed for and on behalf of:**

Mölndal

2018-10-04

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.

### 6.3 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.

MagiSync is a trademark of Kvaser AB.

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](http://www.kvaser.com/patent).

## 7 Document Revision History

Version history for document UG\_98165\_memo\_pro\_5hs:

Revision	Date	Changes
1.0	2015-01-30	Initial version
1.1	2015-02-16	Added note on handling of write protected SD cards and info about trigger on 32 bit signals.
1.2	2015-04-23	Added MagiSync chapter, added new led pattern power problem, changed color of disk activity led, updated compliance text, updated layout, minor updates.
1.3	2015-08-11	Minor textual changes
1.4	2015-11-19	Added info about charging battery, minor textual changes.
1.5	2016-02-04	Minor textual changes
1.6	2016-06-17	Added charging information under troubleshooting section
2.0	2017-01-09	Added chapter Daisy Chain, updated compliance text, added link to patents
3.0	2017-08-25	Updated EU Declaration of Conformity
3.1	2018-01-29	"Kvaser Device Guide" has replaced "Kvaser Hardware"
3.2	2018-05-07	Minor textual changes
3.3	2018-08-28	Minor textual changes
4.0	2018-11-13	Updated EU Regulatory Compliance, added restrictions in t
4.1	2019-02-07	Minor textual changes