

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.

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 multi channel 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)
Kvaser Memorator Pro 5xHS	73-30130-00778-9

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

2.2 Major features

- USB CAN interface.
- 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[®] and DeviceNet.
- Simultaneous operation of multiple devices.
- One SD card slot for logging.
- Logger status is indicated with externally visible LEDs.

2.3 Interface and logger

Kvaser Memorator Pro 5xHS provides a CAN bus interface through a standard USB interface, it also makes it possible to log data from a CAN bus to a standard SD card.

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.

2.4 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 <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.
- Configuration of filter for messages to be stored.
- Configuration of t programs to be started.
- Downloading configuration via USB.
- 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 modeled 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, timer expiration, or external input.

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 <http://www.kvaser.com/download/>.

2.6 Additional software and documentation

The Kvaser CANlib SDK includes everything you need in order to develop software for the Kvaser CAN hardware. It contains full documentation and many sample programs, written in C, C++, C#, Delphi, Python and Visual Basic. All Kvaser CAN interface hardware share a common software API. Programs written for 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 <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

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 the Kvaser Memorator Pro 5xHS to communicate with the host computer, the correct version of the Kvaser driver and firmware must be installed. The firmware is downloaded and installed directly on the Kvaser Memorator Pro 5xHS and the driver is installed on the host computer. The latest version of the driver and firmware can be downloaded from <http://www.kvaser.com/download/>.

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

For information on how to upgrade the firmware, see Section 4.8, Updating the firmware, on Page 20.

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.

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 on Page 9). See Section 4.4, CAN

connectors, on Page 16 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 18 and Section 4.7, External trigger output, on Page 20.

3.5 Power supply

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

See Section 4.4, CAN connectors, on Page 16 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 15.

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 10). 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.

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 12.



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

3.8 Troubleshooting

Use “Kvaser Hardware” in the Control Panel to verify that the computer can communicate with the Kvaser Memorator Pro 5xHS, if the firmware version shown is all zeroes, there are communication problems.

If the LEDs are not flashing or not light up at all, check the power supply.

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 2. 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 2: 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 during a very short time. A single flash may be hard to see and a continuous set of flashes will be 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 it is 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 it has received a USB configuration. If the Power LED is showing yellow in the Interface mode for an extended period something is wrong, see Table 3 on Page 13.

When the device is connected to Kvaser Memorator Tools (in Interface mode), the LED will be showing any of the states shown in Table 5.



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 ¹

Table 3: 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
Fast Blink (Red)	CAN channel is error passive
On (Red) ²	CAN overrun

Table 4: 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 (Red)	Disk activity such as formatting or firmware update is in progress

Table 5: LED indications when connected to Kvaser Memorator Tools.

4.1.2 Logger mode

The device is in Logger mode when it is connected only to CAN power. If all the Traffic LEDs are showing the same pattern (most likely including red) there is some

¹This should not normally happen.

²The red Traffic LED indicating overrun will stay on until the device goes bus off.

problem and the Power LED will indicate what type of problem according to Table 6 on Page 14.

When in operational mode, the green Power LED shows what state the device is in (armed, active or stopped), see Table 7, and the Traffic LEDs are showing the status of the CAN bus in the same way as in Interface mode, see Table 4 on Page 13.

Power LED	Traffic LED	Description
Fast Waver (Green/Yellow)	All Fast Waver (Yellow/Red)	Firmware or Hardware error ³
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 ⁴

Table 6: 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 7: 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.

One action can not be handled by the script developer, and that is when a t program has failed to load and never started. This is instead included in the indication of "Configuration file missing or corrupt", see Table 6.

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 other events, the program can react to starting and stopping itself which this

³This should not normally happen.

⁴This also includes the case where a t program failed to load and start as configured.

section describes. Read the Kvaser t Programming Language guide that can be downloaded at <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 started 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 8 on Page 16 below you will find the Kvaser Memorator Pro 5xHS's technical specifications.

CAN Channels	5
CAN Transceivers	TJA1051T (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
Time stamp resolution	1 μ s
Max message rate	20000 per channel
Error Frame Detection	Yes
Error Frame Generation	Yes
Silent mode	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 XP 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 8: Technical Specifications.

4.4 CAN connectors

Kvaser Memorator Pro 5xHS devices that uses the 26-pin HD D-SUB connector (see Figure 6) has the pinning described in Table 9 on Page 17. This table also describes how the HD26-5xDS9 Splitter (see Figure 7 on Page 18) connects to five separate 9-pin DSUB connectors, CAN 1 to CAN 5.

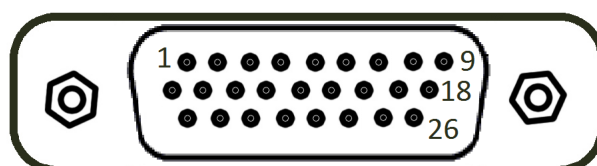


Figure 6: The 26 pin HD D-SUB connector pin numbers

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



Figure 7: 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 16 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.

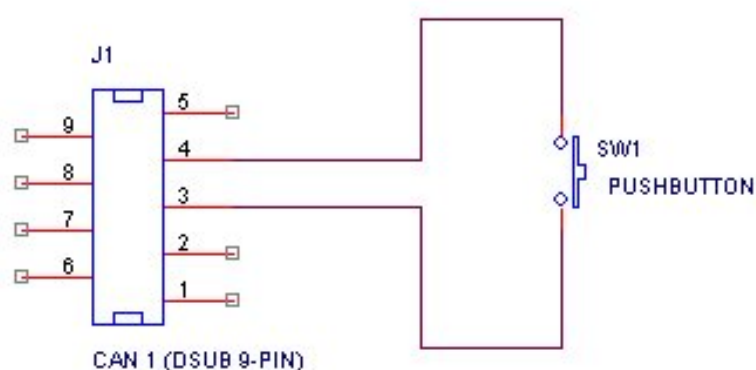


Figure 8: Example of how to connect a button to the External trigger input.

Internally, the External trigger input has a pull-up to +5 V, see Figure 9

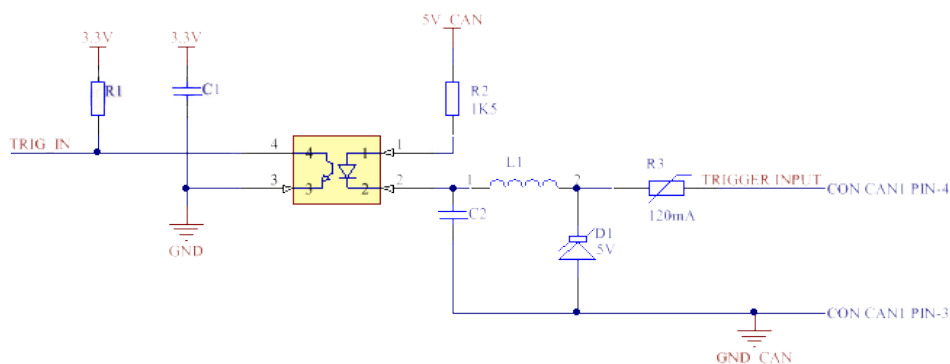


Figure 9: The External trigger input inside the Kvaser Memorator Pro 5xHS.

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 16 for pin numbering.

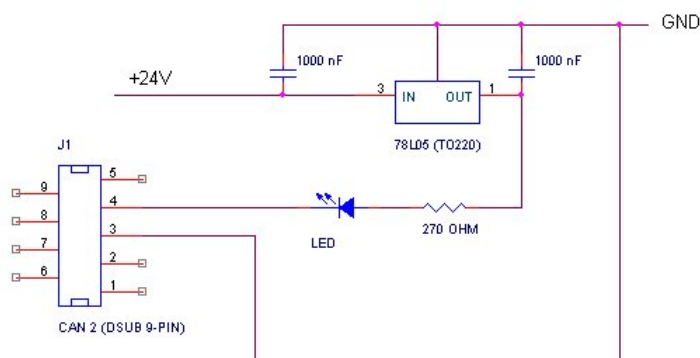


Figure 10: Sample circuit for connecting a LED to the External trigger output.

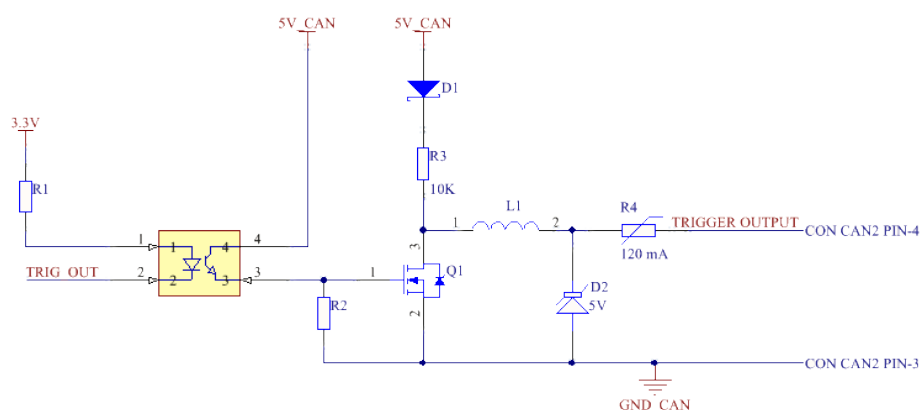


Figure 11: The External trigger output inside the Kvaser Memorator Pro 5xHS.

4.8 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 <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 Hardware” 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.

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 EC Regulatory Compliance

The product(s); 73-30130-00778-9, is in conformity with the essential requirements of the following regulations and directives:

- DIRECTIVE 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 (WEEE)
- REGULATION (EC) No. 1907/2006 (REACH), Annex XIV (the 'Candidate list') and Annex XVII ('Restriction of Substances')

The products listed above also complies with DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 (RoHS) and is in conformity with the following standards and/or other normative documents:

Standard	Description
EN 50 581 (2012)	Assessment with respect to restriction of hazardous substances

Table 10: Standards and normative documents for RoHS 2011

The products listed above also complies with DIRECTIVE 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 December 2004 (EMC-directive) and is in conformity with the following standards and/or other normative documents:

Standard	Description
EN 55 022 (2010)	Class B, radiated. IT equipment, commercial emission
EN 55 024 (2010)	IT equipment, commercial immunity
EN 61 000-6-2 (2005)	Generic, industrial immunity

Table 11: Standards and normative documents for EMC 2004

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.

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

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

7 Document Revision History

Version history for document UG_98165_memorator_pro_uvp:

Revision	Date	Changes
1.0	2015-01-30	Initial version