Kvaser Memorator Light User's Guide



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https://www.kvaser.com

Printed Wednesday 18th February, 2026

We believe that the information contained herein was accurate in all respects at the time of printing. Kvaser AB cannot, however, assume any responsibility for errors or omissions in this text. Also note that the information in this document is subject to change without notice and should not be construed as a commitment by Kvaser AB.

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1 About this manual

This manual is intended for the Kvaser Memorator Light users. This manual contains a description of the hardware's properties and general instructions for connecting the device to a computer. The file extraction software for the Kvaser Memorator Light is called the **Kvaser Memorator Tools** and is described in detail and available in the software's online help.

2 Introduction

This section will describe the functions and features of the Kvaser Memorator Light.

2.1 Welcome to Kvaser Memorator Light



Figure 1: Kvaser Memorator Light

The Kvaser Memorator Light is an advanced portable CAN data logger. The device features two CAN message buffers that are used as ring (FIFO) buffers. One buffer logs all messages on the bus. The other buffer logs approximately 1000 messages before and 1000 messages after any error frame.

When a ring buffer is full, it is automatically overwritten from the beginning. An external LED indicates when either of the ring buffers is being overwritten.

The Kvaser Memorator Light automatically determines the correct CAN bus bit rate, removing the need for configuration – just plug and play.

Also, the Kvaser Memorator Light has a built-in flash disk that cannot be accidentally lost, misplaced, or mixed up with other disks.

Device	Product Number
Kvaser Memorator Light HS	73-30130-00513-6

Table 1: The Kvaser Memorator Light device described in this manual

Throughout this document, we use the name Kvaser Memorator Light to mean any one of the different Kvaser Memorator Light products listed in Table 1, unless otherwise noted.

2.2 Major features of Kvaser Memorator Light

- Fully compatible with J1939, CANopen, NMEA 2000 and DeviceNet.
- Quick and easy plug-and-play installation.
- Pre-configured data logging.
- Data logger with two fixed-size ring buffers – one for all messages, and one for error frames with pre- and post-trigger buffers.
- Supports both 11-bit (CAN 2.0A) and 29-bit (CAN 2.0B active) identifiers.
- Each CAN message time-stamped with a 2 µs resolution.
- Runs in silent mode – logs bus traffic without interference.
- One high-speed CAN channel fully compliant with ISO 11898-2:2003 for signaling rates of 10 kbit/s to 1 Mbit/s.
- Automatically adjusts to the CAN bus signaling rate (autobaud feature).
- Fixed internal disk size of 1 GB.
- One Hi-Speed USB 2.0 connection with signaling rates up to 480 Mbps. The device automatically adjusts to USB 1.1 slots with signaling rates to 12 Mbit/s.
- Power supplied through the CAN bus or the USB bus.
- Small, light plastic housing that is easy to tuck away (e.g. in a vehicle during a test drive).
- Built-in real time clock (calendar) with battery backup.
- Logger status indicated with four externally visible LEDs.
- Boots up in 250 ms or less.

2.3 Kvaser Memorator Tools

- Easy to use data extraction tool.
- Also used for optional configuration of Kvaser Memorator Light.
- File manager for organizing and converting log files to a variety of formats, including CSV, ASCII, MDF and Matlab formats.

3 Kvaser Memorator Light Hardware

This section describes the CAN channel, power supply, LED indicators, and other aspects of the hardware.

3.1 Hardware installation

For the Kvaser Memorator Light 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 Light.

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`.

The Kvaser Memorator Light 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.

See also Section 5.5, Updating the firmware, on Page 14 for more information.

The Kvaser Memorator Light delivery package contains:

- Kvaser Memorator Light
- USB cable

For more driver installation information, see the driver and hardware installation guide at www.kvaser.com/download.

3.2 USB connector

The Kvaser Memorator Light has a standard USB type "B" receptacle connector. Connect the device to your computer using any high quality USB 2.0 certified cable. The maximum total USB cable length is 5 m (∼ 16 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 channel

The standard Kvaser Memorator Light has one CAN channel as shown in Figure 2 on Page 8.

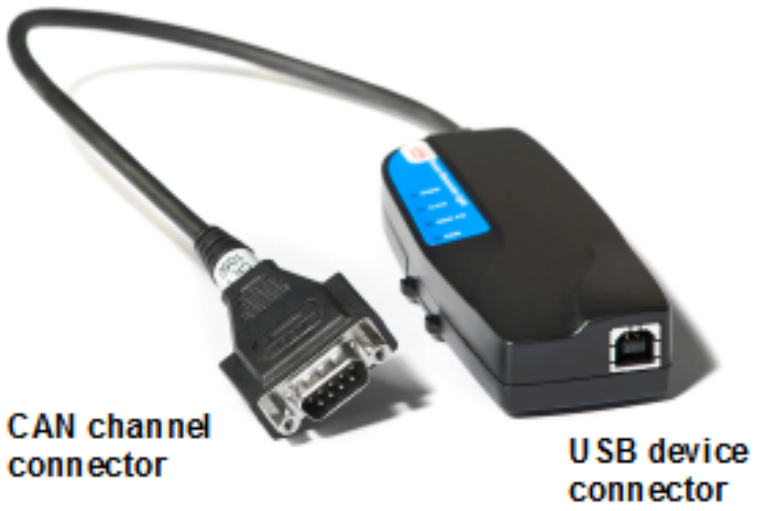

Figure 2: CAN Channel Connector of the Kvaser Memorator Light

3.4 Power supply

The Kvaser Memorator Light can be powered from the CAN side and from the USB side.

The device does not have internal galvanic isolation, therefore supplying power on both sides at the same time may damage the device unless both power sources have the same electric ground potential.

Operating the Kvaser Memorator Light in logger mode requires power to be supplied from the CAN side. The device does not function as a logger when powered from the USB connection.

When power is supplied on the CAN side, use pin 9 for V+ and pin 3 for ground as shown in Figure 4. The recommended supply power should be in the range of 6 V to 35 V DC although the device can tolerate an input voltage up to 48 V DC. The power requirement is approximately 1 W (maximum).

When extracting data from the device or when performing flash disk maintenance, power should only be supplied through the USB side.

3.5 Flash disk

The disk in the Kvaser Memorator Light is permanently installed inside the device and cannot be replaced by the user.

3.6 LED indicators

The Kvaser Memorator Light is equipped with four LED indicators. The following tables describe the status functions of the LEDs.



Figure 3: LEDs on the Kvaser Memorator Light

LED	General meaning
PWR (Green)	Power and general status
CAN (Yellow)	Status for CAN channel
ERR FR (Amber)	Error frames, and FIFO status
ERR (Red)	Indicates temporary or permanent errors

Table 2: LED indicators overview

PWR (Green)	CAN (Yellow)	ERR FR (Amber)	ERR (Red)	Meaning
	short flash			Receiving CAN messages on the CAN channel
	blink		blink	The CAN channel is error passive
	slow flash		slow flash	The CAN channel is bus off
		short flash		Receiving Error frames on the CAN channel
steady				Autobaud successfully completed. The device is logging to disk.
slow blink (1 Hz)				Autobaud in progress
flash			steady	Error. Using the device as a CAN interface is not supported by the hardware.

Table 3: LED indicators: CAN bus status

ERR FR (Amber)	Meaning
steady	One or both of the FIFOs (ring buffers) are full and are being overwritten

Table 4: LED Indicators: FIFO status

ERR	Meaning
constant red, one yellow flash	CAN overrun
constant red, two yellow flashes	(this error code is not used)
constant red, three yellow flashes	Configuration file missing or corrupt
constant red, four yellow flashes	Disk error
constant red, five yellow flashes	Internal error; please contact support

Table 5: LED indicators: Error conditions

PWR (Green)	Meaning
steady	Autobaud successfully completed. The device is logging to disk.

Table 6: LED indicators: Logging status

PWR (Green)	CAN (Yellow)	ERR FR (Amber)	ERR (Red)	Meaning
"Running lights" on all LEDs				The device is communicating with the tool
		blink		Disk activity such as formatting

Table 7: LED indicators: When connected to Kvaser Memorator Tools

PWR (Green)	ERR (Red)	Meaning
flash every few seconds		No USB communication. Check USB cables and communication. Unplug the device and reconnect it after a few seconds. Check that the device driver is installed correctly.
flash	steady	Firmware configuration error. This should not normally happen. Please contact the support.

Table 8: LED indicators: Other light patterns

4 How to use the Kvaser Memorator Light

The Kvaser Memorator Light is preconfigured at the factory and needs no further configuration. The Kvaser Memorator Tools may be used to reinitialize the disk if necessary.

4.1 Use as a logger

When using the Kvaser Memorator Light as a CAN data logger, power is supplied through the CAN connector while connected to the CAN bus as shown in Figure 4 on Page 14.

Logging begins immediately after the autobaud process has completed.



If everything is OK, the green PWR LED is constantly illuminated. When CAN traffic is detected, the CAN LED flashes.

4.2 Kvaser Memorator Tools

The tool is required for two tasks:

1. To extract logged data
2. To clear or reinitialize the built-in disk

For further information about the Kvaser Memorator Tools, please refer to the program's online help.

4.3 Troubleshooting

Use "Kvaser Device Guide" in the Control Panel to verify that the computer can communicate with the Kvaser Memorator Light. 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.

Verify that the disk is formatted. If in doubt, reformat it using the Kvaser Memorator Tools.

If configuration fails, verify that the Kvaser Memorator Light is in configuration mode when you are using the Kvaser Memorator Tools. You can see this by looking at the LEDs – they should flash in "running light" fashion.

5 Appendices

In this section you will find technical information about Kvaser Memorator Light and its connectors.

5.1 System requirements

A USB interface. Use USB 2.0 HiSpeed for optimum results, although the device will work with a USB 1.1 interface too.

5.2 Technical data

In Table 9 you will find the technical specifications of Kvaser Memorator Light.

CAN Channels	1 (CAN 2.0A and 2.0B active).
CAN transceivers (HS)	SN 65HVD251 (Compliant with ISO 11898-2:2003)
Galvanic isolation	No
CAN signaling rate	10 kbit/s to 1 Mbit/s
Timestamp resolution	2 µs
Error frame detection	Yes
Kvaser t programming	No
Autobaud	Yes
Host interface	USB 2.0. Supports HiSpeed (HS) at 480 Mbit/s. Compatible with USB 1.1 at 12 Mbit/s.
Host OS	Windows (7 or later) [1].
Power consumption	~5 V and 130 mA if powered from the USB and ~850 mW if powered from the CAN bus.
External power	Pin 9 (V+) and pin 3 (GND) on CAN channel 1.
Minimum operating voltage	6.2 V DC (cold start) and 5.6 V DC (during operation).
Maximum operating voltage	35 V DC.
Absolute maximum input voltage	48 V DC.
Hardware configuration	Done by software (Plug & Play).
Dimensions (W x L x H)	46 x 115 x 22 mm (1.8 x 4.5 x 0.9 inch)
Operating temperature	−40 °C to +85 °C
Weight	142 g including cables and connectors.
Storage temperature	−40 °C to +85 °C
Relative Humidity	0% to 85% (non-condensing.)

Table 9: Kvaser Memorator Light Technical specifications

5.3 Disk capacity

Each logged CAN message occupies 24 bytes on the disk. The disk is divided into two equal-sized parts: one for the error frames with pre- and post-trigger buffers

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

and one that logs all CAN messages.

The disk size is 1 GB, so the "log all" portion of the disk accommodates approximately 20,000,000 messages. At 500 messages per second, this means that slightly more than 11 hours are recorded before the FIFO buffer wraps and begins overwriting the beginning data.

5.4 CAN connector

The Kvaser Memorator Light has one CAN channel. The CAN channel connector is the 9-pin male D-SUB connector shown in Figure 4 with the pin-out described below in Table 10.

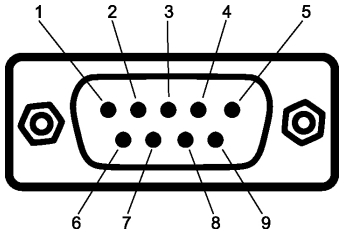

Figure 4: The D-SUB connector pin numbers of the CAN connector.

D-SUB pin number	Color code	Function HS
1	N/A	Not connected
2	Green	CAN_L
3	Brown	GND
4	Orange	Not connected
5	Black	Shield
6	N/A	Not connected
7	Red	CAN_H
8	N/A	Not connected
9	Yellow	Power supply **to** the device
Auto-reset fuses protect Pins 2, 3, 4, 7 and 9.		

Table 10: D-SUB pin configuration of the CAN channel 1



Note: Always connect the ground pin on the D-SUB to the ground of your CAN bus.

5.5 Updating the firmware

Connect the Kvaser Memorator Light to your host computer with the USB cable. Double-click on the file "update.exe". The Kvaser Memorator Tools can also update

the Kvaser Memorator Light firmware directly (see the online help for more information). A small application opens where you should see the device listed if correctly connected to your host computer (see Figure 5 on Page 15). Select the device to program and click the *Next* button

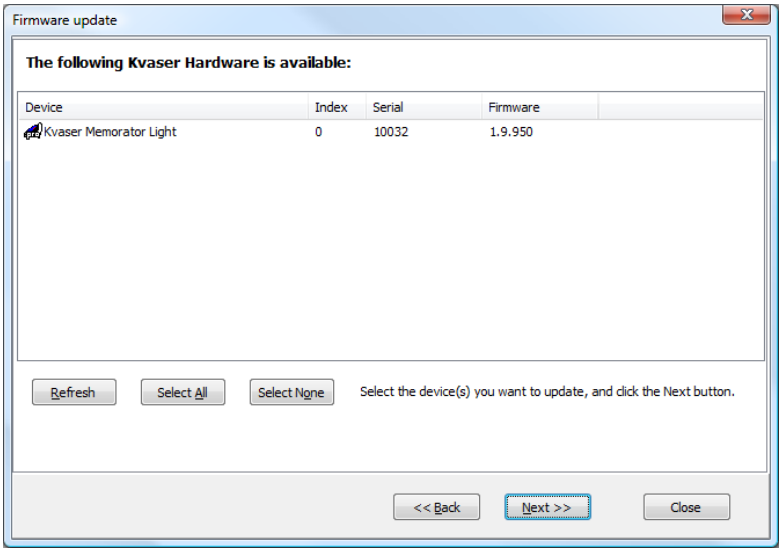

Figure 5: Firmware update, select device.

Click on the *Start Upgrade* button to start programming. The programming takes approximately 20 seconds. The progress is printed on the screen, and typically looks like in Figure 6.

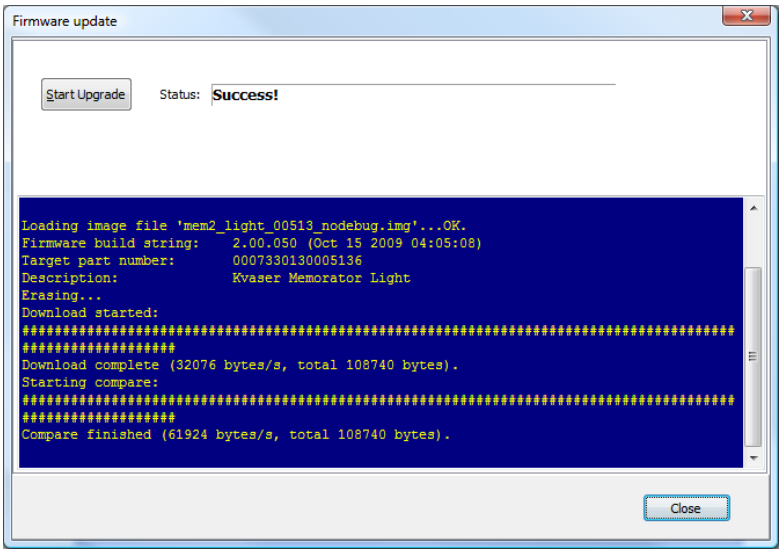

Figure 6: Firmware update, screenshot



No error messages should appear. If you see error messages, try to disconnect and reconnect the device, and then perform the operation again.

To verify that the firmware is updated, double-click on "Kvaser Device Guide" in the Control Panel. Select "Kvaser Memorator Light" in the tree view to the left, and click on either channel. The firmware revision information appears in the right half of the window.

5.6 Required driver version

Driver (CANLIB) version 4.1 or later is required to use the Kvaser Memorator Light.

5.7 CAN bus termination

Every CAN bus must be terminated with a 120 Ω resistor at each end of the bus. The Kvaser Memorator Light does not contain any CAN bus terminators, 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

5.8 CAN bus silent mode

The Kvaser Memorator Light is always in silent mode on the CAN bus.

The Kvaser Memorator Light never transmits CAN messages, error frames, or acknowledgement bits on the bus. Therefore, two other nodes must exist on the CAN bus that are actively sending and receiving messages and are not in silent mode.



There must be at least two active nodes on the CAN bus, other than the Kvaser Memorator Light.

5.9 CAN bus autobaud

The Kvaser Memorator Light features autobaud on the CAN bus. This means the device listens to CAN bus traffic and automatically adapts to the signaling rate being used. The signaling rate cannot be set manually since autobaud is always active.

If the Kvaser Memorator Light fails to adapt to the signaling rate, use the Kvaser Memorator Tools to adjust the autobaud process. The tool provides standard signaling rate tables for various higher layer protocols. Select the appropriate table for the higher layer protocol being used.

The autobaud process requires CAN bus traffic to work and does not work on a quiescent CAN bus. When adjusting the signaling rate, a number of CAN messages are always missed. As soon as the correct signaling rate is detected, which typically takes around 20 ms, the Kvaser Memorator Light begins logging.

The status of the autobaud process is displayed by the LED indicators as shown in Table 3 on Page 10 and Table 6 on Page 10.

5.10 CAN bus overrun

Under extremely heavy load with high signaling rates and long bursts of messages, the Kvaser Memorator Light may lose messages. This loss is a rare occasion, and if such a loss occurs the setup displays a notification message when the file is extracted. Several of the file formats that support this feature also indicate when the overrun occurred. (See the help section in Kvaser Memorator Tools for details about file formats.)

6 Safety Instructions

6.1 Intended Use

Kvaser interfaces are used to connect computer systems to CAN buses. The Kvaser Memorator Light is intended for connection to a computer via the USB port.

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.

Dispose of batteries 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 EC 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 Memorator Light HS

Object of the declaration (identification of apparatus allowing traceability):
Product: Kvaser Memorator Light HS
Type: 73-30130-00513-6

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:
COMMISSION DIRECTIVE 2004/104/EC of 14 October 2004 (The Automotive EMC Directive)

DIRECTIVE 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 December 2004 (EMC-directive)

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 50581 (2012)

Signed for and on behalf of:

Mölndal	2019-12-05	
Place of issue	Date of issue	Claes Haglund, Supply Chain and Quality Director

8.2 FCC Regulatory Compliance

KVASER

Federal Communications Commission (FCC) Compliance Information Statement

IDENTIFICATION OBJECT:
Product: Kvaser Memorator Light HS
Type: 73-30130-00513-6

APPLICABLE COMPLIANCE STATEMENTS:
CFR Title 47 Part 15 §15.107, §15.109
This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received,
including interference that may cause undesired operation.

RESPONSIBLE PARTY (IN USA) NAME:
Kvaser Inc.
23881 Via Fabricante, Suite 503
Mission Viejo, CA 92691

Internet contact: support@kvaser.com

8.3 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.

The products described in this document are protected by U.S. patent 5,696,911.

9 Document revision history

Version history for document UG_98037_kvaser_memorator_light:

Revision	Date	Changes
1	2006-02	Initial version.
2	2009-02-26	Final updates for release.
3	2009-02-26	Language and minor technical adjustments (CPU information removed).
4	2009-09-25	*Kvaser Memorator Light Setup Tool* is now known as *Kvaser Memorator Tools*. Changed battery type to Li-Pol.
5	2009-10-19	Updated pictures of firmware update.
6	2011-01-14	Updated supported OS list.
7	2011-09-12	Updated disposal information.
8	2014-04-28	Minor updates. Changed layout of references, figures. Hardware installation chapter updated. Updated layout of battery warning box.
9	2015-03-30	Updated layout.
10	2016-02-05	Minor updates.
11	2017-01-09	Updated compliance text, added link to patents.
11.1	2018-01-29	"Kvaser Device Guide" has replaced "Kvaser Hardware".
11.2	2018-05-07	Minor textual changes.
11.3	2018-08-28	Minor textual changes.
12.0	2019-02-11	Windows Vista or later supported, minor textual changes.
12.1	2019-08-09	Url protocol updated.
12.2	2020-01-27	Added DoC and sdoc.
12.3	2020-08-19	Updated supported OS. Updated content in delivery package.
12.4	2022-04-01	Minor textual changes, added galvanic isolation info to Technical data table.
12.5	2023-02-13	Stated in the Technical data table that Kvaser t programming is not supported. Added section about intended use.
12.6	2024-03-15	Updated Kvaser logo.