

Kvaser USBcan Professional User's Guide



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<http://www.kvaser.com>

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2 About this manual

This manual is intended for the Kvaser USBcan Professional users. This manual contains a description of the properties of the hardware and general instructions for connecting the device to a computer.

3 Introduction

This section will describe the functions and features of the Kvaser USBcan Professional.

3.1 Welcome to Kvaser USBcan Professional



Figure 1. Kvaser USBcan Professional.

Kvaser USBcan Professional is a powerful two channel real time CAN to USB interface.

The Kvaser USBcan Professional supports Kvaser's MagiSync™ technology to synchronize time stamps across multiple units without extra wires providing flexibility for multi-channel applications. With quick reaction times and high data throughput, the Kvaser USBcan Professional is perfect for rapid ECU re-flashing, advanced bus analyzers, and efficient development work.

This guide is applicable to the Kvaser USBcan Professional devices listed in Table 1.

Table 1: The Kvaser USBcan Professional device and its EAN number.

| Device | Product Number |
|----------------------------------|------------------|
| Kvaser USBcan Professional HS/HS | 733-0130-00357-6 |

3.2 Major features of Kvaser USBcan Professional

- Quick and easy plug-and-play installation.
- Supports both 11-bit (CAN 2.0A) and 29-bit (CAN 2.0B active) identifiers.
- CAN messages are time-stamped with 2 microseconds accuracy.
- Large on-board RAM buffer for CAN messages.
- Supports silent (listen-only) mode for analyzing tools and data logging.
- 100% compatible with applications written for Kvaser hardware such as LAPcan, PCICan, and USBcan with Kvaser CANLIB.
- Two high-speed CAN connections (compliant with ISO 11898-2), 5 kbit/s up to 1 Mbit/s.
- Fully compatible with J1939, CANopen, NMEA 2000® and DeviceNet.
- One USB 2.0 HiSpeed connection with data rates up to 480 Mbit/s. The device can also be used in USB 1.1 slots (with up to 12 Mbit/s).
- Power is taken from the USB bus.
- Small, light plastic housing with dimensions (W x L x H) approximately 46 x 115 x 22 mm (1.8 x 4.5 x 0.9 inch) – easy to tuck away (e.g. in a vehicle during a test drive)
- Supports extreme data throughput, quick reaction times and precise time stamping – removing any bottlenecks. Handles up to 40 000 messages per second.
- Kvaser MagiSync™ - automatic time synchronization between all Kvaser products that uses the Kvaser MagiSync™ feature.
- Simultaneous operation of multiple devices.

3.3 Additional software and documentation

- Kvaser CANLIB SDK, which includes everything you need to develop software for the Kvaser CAN hardware. Includes full documentation and many sample programs, written in C, C++, C#, Delphi, and Visual Basic. All Kvaser CAN interface hardware shares a common software API. Programs written for one board type will run without modifications on the other board types!
- On-line documentation in Windows® HTML Help and Adobe Acrobat format.
- Documentation, software and drivers can be downloaded for free at www.kvaser.com or purchased separately on CD if preferred.

4 Kvaser USBcan Professional hardware

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

4.1 Hardware installation

The Kvaser USBcan Professional 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 USBcan Professional 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 USBcan Professional and the driver is installed on the host computer. For additional information on how to upgrade the firmware, read section 6.5, Updating the firmware.

The delivery package of Kvaser USBcan Professional contains:

- Kvaser USBcan Professional.
- Software and Driver CD, containing drivers for Windows; Kvaser CANKing, an easy to use CAN bus monitor; Drivers for RP1210A, LabView and DIAdem; and Kvaser CANlib Software Development Kit.
- Kvaser USBcan Professional User's Guide (also on the CD.)
- A USB cable.

For driver installation information, see the driver and hardware installation guide which can be found at <http://www.kvaser.com>.

4.2 USB connector

The Kvaser USBcan Professional has a standard USB type "B" receptacle connector. Connect it to your PC using any high quality, USB 2.0 certified cable. The maximum USB cable length is 5 meters (approx. 16.5 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 a cable length of up to 25 meters (approx. 83 ft.)

4.3 CAN channels

The standard Kvaser USBcan Professional has two independent CAN channels that are seen in Figure 2. The first CAN channel is marked on the housing with the symbol '1', where as the second channel (number 2) is not marked. See Figure 3. The CAN connectors are also labeled for easy identification.

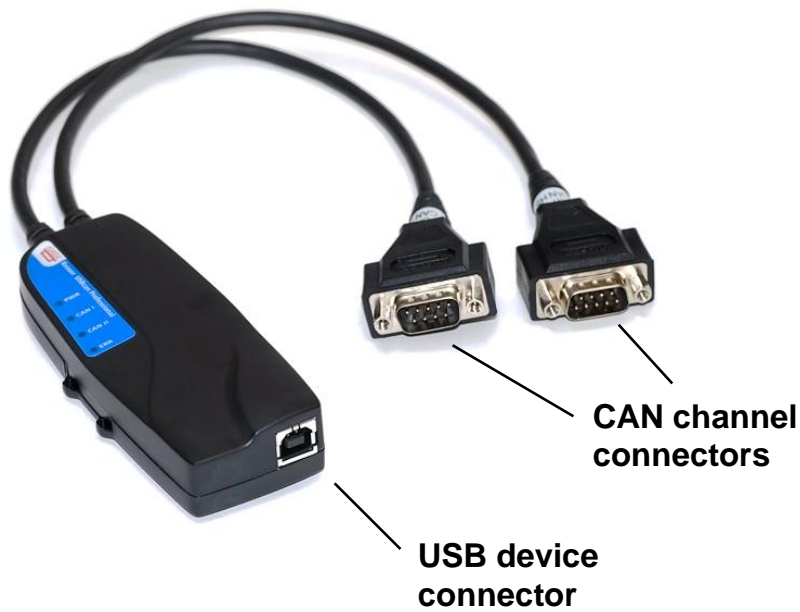


Figure 2: Connections on the Kvaser USBcan Professional. The two CAN channels are on top of the picture and the USB device connector is on the bottom of the picture.



Figure 3: The CAN channels on Kvaser USBcan Professional.

4.4 LED indicators

Table 2: LED indicators overview.

| Lamp | General meaning |
|----------------|--------------------------------------|
| PWR (Green) | Power and general status. |
| CAN 1 (Yellow) | Status for CAN channel 1. |
| CAN 2 (Yellow) | Status for CAN channel 2. |
| ERR (Red) | Indicates different types of errors. |



Figure 4. LEDs on the Kvaser USBcan Professional.

Table 3: LED indicators, detailed meaning.

| PWR (Green) | CAN 1 (Yellow) | CAN 2 (Yellow) | ERR (Red) | Meaning |
|----------------|-------------------|-------------------|--------------|---|
| Slow flash | | | | Waiting for USB connection with the PC. |
| Steady | | | | Power ON (The device is connected to the computer). |
| | Short flash | | | CAN traffic on channel 1. |
| | | Short flash | | CAN traffic on channel 2. |
| | | | Short flash | Error frame on either channel. |
| | | | Steady | Self-test failed, wrong bit rate, CAN bus transceiver failure. |
| Fast flash | | | | Firmware configuration error (should not normally happen, so please contact the support). |

5 How to use the Kvaser USBcan Professional

To use the Kvaser USBcan Professional as a CAN interface; connect the unit to a free USB socket on your PC or USB hub.



When used as a CAN interface, the green lamp will be illuminated and the yellow lamps will emit short flashes when CAN messages are transmitted and received.

5.1 Troubleshooting



- Use “Kvaser Hardware” in the Control Panel to verify that the computer really can talk to the Kvaser USBcan Professional. Read out the firmware version. If it's all zeroes, there are communication problems.
- If the LEDs are flashing or glowing, compare the pattern with the specified LED indicators in Table 2 and Table 3.
- If the LEDs are not flashing or glowing at all, check the power supply.

6 Appendices

In this section you will find technical information about Kvaser USBcan Professional and its connectors.

6.1 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.

6.2 Technical data

In Table 4 below you will find the Kvaser USBcan Professional's technical specifications.

Table 4: Kvaser USBcan Professional Technical specifications.

| | |
|------------------------|---|
| CAN Channels | 2 (CAN 2.0A and 2.0B active). |
| CAN Transceivers | SN 65251 (Compliant with ISO 11898-2) |
| CAN Controller | Built into the M32C |
| Microcontroller | Renesas M32C |
| CAN Bit Rate | 5 kbit/s to 1 Mbit/s |
| Timestamp accuracy | 2 μ s |
| Error Frame Detection | Yes, both channels. |
| Error Frame Generation | Yes, when used as a USB-CAN interface. |
| PC interface | USB 2.0. Supports HiSpeed (HS) at 480 Mbit/s. Compatible with USB 1.1 at 12 Mbit/s. |
| Power consumption | ~ 5V and 130mA when powered from the USB. |
| Software requirements | Windows XP or later. (For other operating systems, see Kvaser web or contact Kvaser support.) |
| 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 ... +85 °C |
| Weight | 142 g including cables and connectors. |

| | |
|---------------------|------------------------------|
| Storage temperature | -40 °C ... +85 °C |
| Relative Humidity | 0% ... 85% (non-condensing.) |

6.3 Performance

In Table 5 below some approximate performance numbers of the Kvaser USBcan Professional are listed.

Table 5: Performance.

| | Kvaser USBcan Professional |
|-----------------------------|----------------------------|
| RX performance per channel. | 20000 messages/s |
| TX performance per channel | 20000 messages/s |
| Time stamp accuracy. | 2 μ s |
| Galvanic isolation. | Yes |

6.4 CAN connectors

The Kvaser USBcan Professional has two high-speed CAN channels which are equipped with either D-SUB connectors or RJ45 connectors.

6.4.1 D-SUB

Both CAN channels have 9-pin D-SUB connectors (see Figure 5) with the pinning described below (see Table 6 and Table 7).

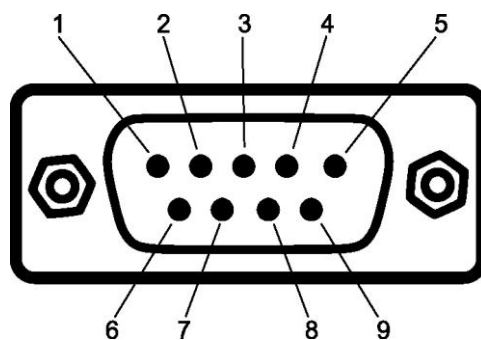


Figure 5: The D-SUB connector pin numbers on a CAN channel.

Table 6: D-SUB pin configuration of the CAN channel 1.

The CAN channel 1 has the following pin configuration.
(Auto-reset fuses protect Pins 2, 3, 4, 7 and 9.)

| D-SUB pin number | Color code | Function |
|------------------|------------|--------------------------|
| 1 | N/A | Not connected. |
| 2 | Green | CAN_L |
| 3 | Brown | GND |
| 4 | Orange | Reserved; do not connect |
| 5 | Black | Shield |
| 6 | N/A | Not connected. |
| 7 | Red | CAN_H |
| 8 | N/A | Not connected. |
| 9 | Yellow | Not connected. |

Table 7: D-SUB pin configuration of the CAN channel 2.

The CAN 2 channel has the following pin configuration.
(Auto-reset fuses protect Pins 2, 3, 4, 7 and 9.)

| D-SUB pin number | Color code | Function |
|------------------|------------|--------------------------|
| 1 | N/A | Not connected. |
| 2 | Green | CAN_L |
| 3 | Brown | GND |
| 4 | Orange | Reserved; do not connect |
| 5 | Black | Shield |
| 6 | N/A | Not connected. |
| 7 | Red | CAN_H |
| 8 | N/A | Not connected. |
| 9 | Yellow | Not connected. |



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

6.4.2 RJ45

Both CAN channels have 8-pin RJ45 connectors (see Figure 6) with the pinning described below (see Table 8 and Table 9).

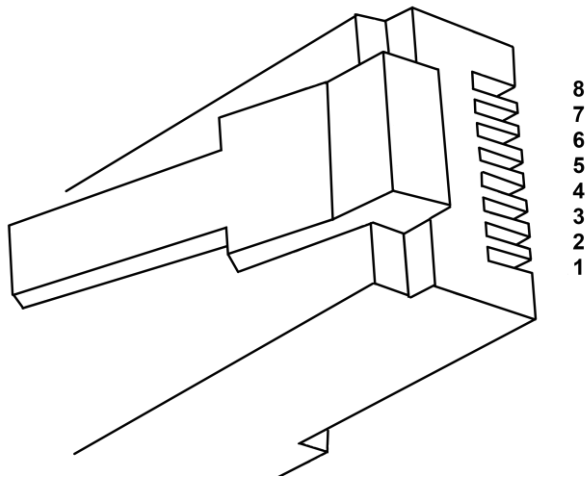


Figure 6: The RJ45 connector pin numbers on a CAN channel.

Table 8: RJ45 pin configuration of the CAN channel 1.

The CAN channel 1 has the following pin configuration.
(Auto-reset fuses protect Pins 1, 2, 3, 4 and 8.)

| RJ45 pin number | Function |
|-----------------|---------------------------|
| 1 | CAN_H |
| 2 | CAN_L |
| 3 | GND |
| 4 | Reserved; do not connect. |
| 5 | Not connected. |
| 6 | Shield. |
| 7 | GND |
| 8 | Not connected. |

Table 9: RJ45 pin configuration of the CAN channel 2.

The CAN 2 channel has the following pin configuration.
(Auto-reset fuses protect Pins 1, 2, 3, 4 and 8.)

| RJ45 pin number | Function |
|-----------------|---------------------------|
| 1 | CAN_H |
| 2 | CAN_L |
| 3 | GND |
| 4 | Reserved; do not connect. |
| 5 | Not connected. |
| 6 | Shield. |
| 7 | GND |
| 8 | Not connected. |



Note: Always connect at least one of the ground pins on the RJ45 to the ground of your CAN bus. Preferably use ground on pin 3.

6.5 Updating the firmware

Connect the Kvaser USBcan Professional to your PC with the USB cable. Double-click on the file "update.exe". A small application opens where you should see the device listed if correctly connected to your PC (see Figure 7). Select the device to program and click the *Next* button.

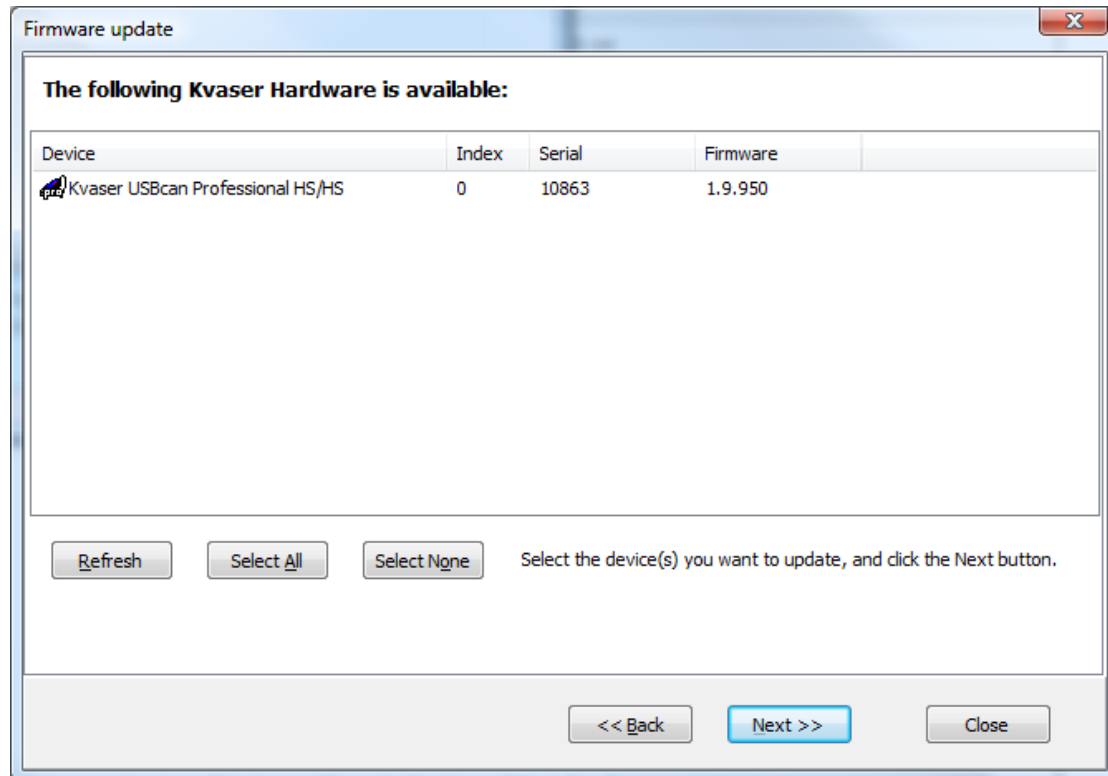


Figure 7: Firmware update, select device.

Click on the *Start Upgrade* button to start programming (see Figure 8). The programming takes approximately 20 seconds. The progress is printed on the screen, and typically looks like this:

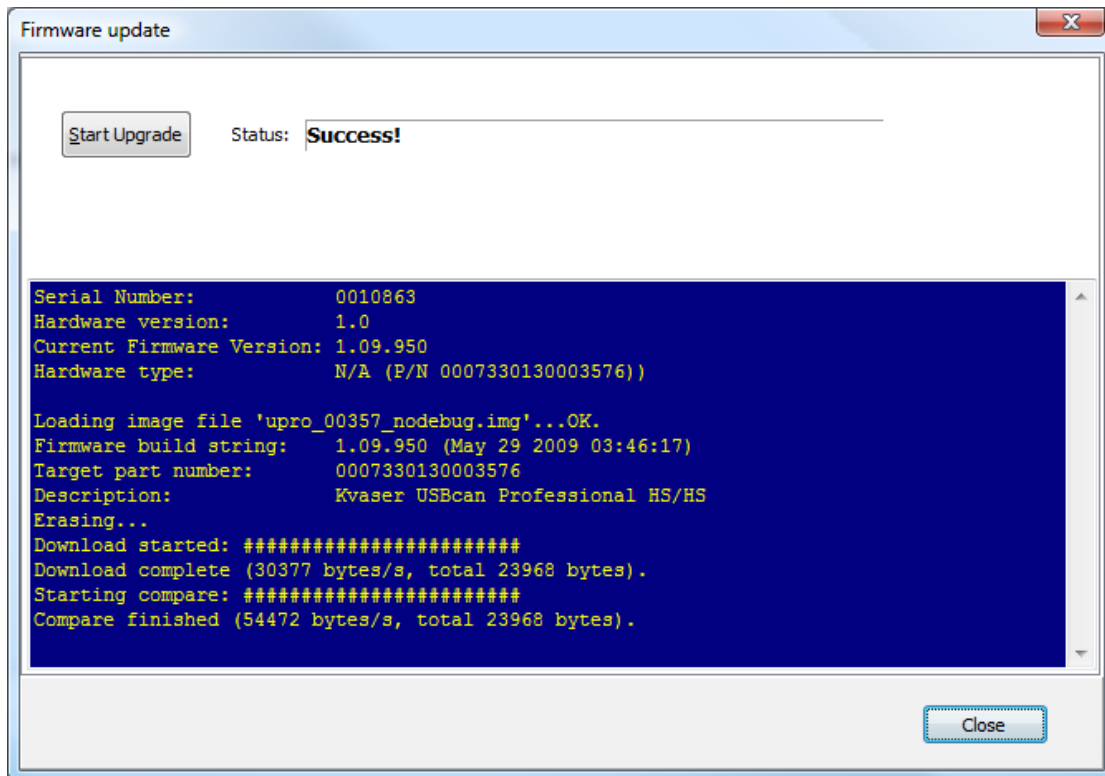


Figure 8: Firmware update, start upgrade.



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 Hardware” in the Control Panel. Select “Kvaser USBcan Professional” in the tree view to the left, and click on either channel. The firmware revision information appears in the right half of the window.

6.6 Required driver version

You need at least driver (CANLIB) version 3.9 to use your Kvaser USBcan Professional.

6.7 CAN bus termination

Every CAN bus must be terminated with a 120 Ohm resistor at each end of the bus. The Kvaser USBcan Professional 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.

7 Frequently Asked Questions

Q: I want to read the messages sent on the CAN bus without interfering with the system, how can I do that?

A: You should put the Kvaser USBcan Professional in Silent mode; that is, it doesn't send anything, not even ACK bits, on the bus. Reception works as usual.

Q: I am trying to send CAN messages but I can't see any messages on the bus.

A: Make sure the CAN channel isn't in Silent mode.

Q: Could I use several Kvaser USBcan Professional?

A: Yes, no problem. For MagiSync™ to work make sure you connect them to the same root hub.

Q: If I reboot my computer, will the Kvaser USBcan Professional and other products have the same channel numbers as before?

A: Yes, they will try to reuse the old channel numbers.

Q: How can I identify which Kvaser USBcan Professional has a certain channel number?

A: Use "Kvaser Hardware" to flash the LEDs on the Kvaser USBcan Professional.

Q: How do I know which Kvaser USBcan Professionals are synchronized?

A: Use "Kvaser Hardware" to flash the LEDs on an entire MagiSync™ group.

Q: Do I have to use an external hub to keep the USBcan Professionals synchronized?

A: No, you don't. Just make sure they are on the same root hub.

8 Legal acknowledgements

8.1 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.

8.2 EMC compliance statement

EMC Tests

The equipment has been tested for compliance with the EN 50 081-2:1993 (emission) and the EN 61000-6-2:1999 (immunity) standards.

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.

8.3 WEEE compliance statement



This product is sold in compliance with the directive 2002/96/EC of the European Parliament on Waste Electrical and Electronic Equipment (WEEE.)

8.4 RoHS compliance statement

This product is manufactured in accordance with directive 2002/95/EC on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS.)

8.5 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.

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.

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

9 Document revision history

| Revision | Date | Changes |
|----------|------------|---|
| 1 | 2007-01-17 | Original revision |
| 2 | 2007-01-30 | Updates photos. |
| 3 | 2008-12-03 | <ul style="list-style-type: none">• Correction: USBcan Professional can not be powered from the CAN bus side, only from the USB side.• Added proper WEEE symbol. |
| 4 | 2009-09-25 | The ERR LED is only red and not bi-colored. Removed section 4.4 because the device is galvanically isolated and can not be powered from the CAN bus side. Various editorial changes. |
| 5 | 2009-10-19 | Changed pictures for firmware update. |
| 6 | 2011-01-14 | Updated supported OS list |
| 7 | 2011-04-15 | Added description of RJ45 connector. |