Kvaser BlackBird User's Guide

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2   About this manual

This manual is intended for Kvaser BlackBird users. This document contains a description of the hardware's properties and general instructions for connecting the device to a computer. The Kvaser BlackBird setup software is started from the Kvaser Hardware program in the control panel. The Kvaser Hardware program's online help also contains a detailed description of the Kvaser BlackBird setup software.

For information about how to set up a WLAN connection to the Kvaser BlackBird, see the Kvaser BlackBird Getting Started Guide.

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

3 Introduction

This section will describe the functions and features of the Kvaser BlackBird.

3.1 Welcome to Kvaser BlackBird

Figure 1. Kvaser BlackBird.

The Kvaser BlackBird is a small, yet advanced, wireless CAN interface. Configured via the USB interface, the Kvaser BlackBird can be used as a wireless CAN interface or as a USB CAN interface.

This guide applies to Kvaser BlackBird devices listed in Table 1.

Table 1: Kvaser BlackBird Devices and EAN Numbers.

Device	Product Number
Kvaser BlackBird SemiPro HS	733-0130-00441-2
Kvaser BlackBird SemiPro HS/HS	733-0130-00453-5
Kvaser BlackBird SemiPro 3xHS	733-0130-00446-7

3.2   Major features

- Wireless CAN interface
- Supports 802.11b/g
- Infrastructure and Ad-hoc mode
- Supports WPA2/WPA/WEP128/WEP64 encryption
- Can be either public or private.
- 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.
- Large on-board RAM buffer for CAN messages
- Supports silent (listen-only) mode for analysis tools and data logging.
- 100% compatible with applications written for other Kvaser CAN hardware with Kvaser CANLib.
- 1-3 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 (data rates up to 12 Mbit/s).
- Power is taken from the CAN bus or the USB bus. The device automatically switches between the CAN (primary) and the USB (secondary) power supply, reducing the power drain on a laptop's battery.
- Rugged aluminum housing with the approximate dimensions
    - Kvaser BlackBird HS - 30 x 190 x 20 mm
    - Kvaser BlackBird HS/HS and 3xHS - 30 x 220 x 20 mm

3.3   Real time CAN-USB interface

- Uses USB 2.0 HiSpeed while being compatible with USB 1.x and USB 3.0.
- Supports extreme data throughput and prevents bottlenecks with quick reaction times and precise time stamping.
- Kvaser MagiSync™ - automatic time synchronization between all Kvaser products that use the Kvaser MagiSync™ feature (only when connected via USB).
- Supports silent mode for analysis tools – listen to the bus without interfering.
- Simultaneous operation of multiple devices.
- Power supplied through the CAN bus interface or the USB interface.

3.4   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 device type will run without modification on other device types!

- On-line documentation in Windows® HTML Help and Adobe Acrobat format.

- The latest versions of documentation, software and drivers can be downloaded for free at www.kvaser.com or purchased separately on CD.

4   Kvaser BlackBird hardware

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

4.1   Hardware installation

The Kvaser BlackBird 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 BlackBird to communicate with the host computer, compatible versions of the Kvaser driver and firmware must be installed. The firmware is downloaded and installed directly on the Kvaser BlackBird. The driver is installed on the host computer.

For additional information on how to upgrade the firmware, read section 5.3 of this document.

The Kvaser BlackBird delivery package contains:

- Kvaser BlackBird.
- Software and Driver media containing drivers for Windows; Kvaser BlackBird Setup Tool; Kvaser CANKing, an easy to use CAN bus monitor; Drivers for RP1210A, LabView, and DIAdem; and Kvaser CANlib Software Development Kit.
- Kvaser Quick Start Instruction.

4.2   USB connector

The Kvaser BlackBird has a standard USB type "A" connector.

4.3   CAN channels

The standard Kvaser BlackBird has 1-3 independent CAN channels. The Kvaser BlackBird HS has a 9-pin DSUB (see Figure 2). The Kvaser BlackBird HS/HS and Kvaser BlackBird 3xHS have a 15-pin DSUB (see Figure 3).

4.4   Power supply

The Kvaser BlackBird can be powered from the CAN side and from the USB side. To operate the Kvaser BlackBird as wireless CAN interface, you **must** supply power on the CAN side. To use the device as a USB CAN interface or to configure the device, power on the USB side is sufficient.

When you supply power on the CAN side, provide power on the channel 1 connector. See Figure 2 for the Kvaser BlackBird HS. See Figure 3 for the Kvaser BlackBird HS/HS and 3xHS. It is safe, but pointless, to supply power on channel 2 or 3.

4.5   LED indicators

The LED indicators have somewhat different meaning depending on how your Kvaser BlackBird is being used – as a CAN interface or a wireless interface. Table 2 describes the general purpose of each LED. The following sections describe how the LEDs behave in each case.

Table 2: LED Indicators Overview.

LED	General meaning
PWR (Green)	Power and general status.
WLAN (Blue)	WLAN status.
ERR (Red)	Indicates temporary or permanent errors.
INFO (Orange)	General Information.
CAN 1 (Yellow)	Status for CAN channel 1.
CAN 2 (Yellow)	Status for CAN channel 2.
CAN 3 (Yellow)	Status for CAN channel 3.

4.6   Use as a USB CAN interface

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

> When used as a USB CAN interface, the PWR LED will be illuminated and the CAN LEDs will emit short flashes when CAN messages are transmitted and received.

4.7   Use as a Wireless CAN Interface

To use the Kvaser BlackBird as a Wireless CAN interface, supply power on the CAN channel 1 connector and ensure that the unit is up and running on the wireless network.

> When used as a Wireless CAN interface, the PWR LED will be illuminated and the CAN LEDs will emit short flashes when CAN messages are transmitted and received. When the WLAN LED is constantly illuminated, the BlackBird is connected as a CAN interface and the wireless communication is stable. When the WLAN LED is flashing, the BlackBird is not connected as a CAN interface, or the wireless communication is having issues with configuration, range, or interference.

4.8   Troubleshooting

> - Use "Kvaser Hardware" in the Control Panel to verify that the computer really can talk to the Kvaser BlackBird. If the firmware version shown is all zeroes, there are communication problems.
>
> - If the LEDs are not flashing or illuminated at all, check the power supply.
>
> - For further troubleshooting, see the trouble shooting section in the Kvaser BlackBird Getting Started Guide.

5 Appendices

In this section you will find technical information about the Kvaser BlackBird and its connectors.

5.1 *Technical data*

In Table 3 below you will find the Kvaser BlackBird's technical specifications.

Table 3: Kvaser BlackBird Technical Specifications.

CAN Channels	1, 2 or 3 (CAN 2.0A and 2.0B active).
CAN Transceivers	SN 65251 (Compliant with ISO 11898-2)
CAN Controller	Built into the M32C, 3rd channel using MCP2515
CAN Bit Rate	5 kbit/s to 1 Mbit/s
Time stamp resolution	25 µs
Error Frame Detection	Yes
Error Frame Generation	Yes
PC interface	USB 2.0. Supports HiSpeed (HS) at 480 Mbit/s. Compatible with USB 1.1 at 12 Mbit/s and with USB 3.0 at 480 Mbit/s.
Wireless communication	WLAN 802.11b/g (infrastructure and ad hoc-mode)
Wireless security	WPA2 / WPA / WEP128 / WEP64
External power	Allowed operating voltage 7 – 36 V DC. Maximum input voltage 48 V DC.
Power consumption	Typical values are: 400mA if powered from the USB (~5V). 1.4 W for single channel powered from the CAN bus. 1.8 W for dual channel powered from the CAN bus. 2.2 W for three channel powered from the CAN bus.
Hardware configuration	Done by software (Plug & Play).
Software requirements	Windows XP or later. (For other operating systems, see Kvaser web or contact Kvaser support.)
Weight	150 g including cables and connectors.
Operating temperature	-30 ºC ... +85 ºC
Storage temperature	-30 ºC ... +85 ºC
Relative Humidity	0% ... 85% (non-condensing.)

5.2 CAN connectors

The Kvaser BlackBird has 1-3 high-speed CAN channels. The Kvaser BlackBird HS has a 9-pin D-SUB connector (see Figure 2) with the pinning described below (see Table 4). The Kvaser BlackBird HS/HS and 3xHS has a 15-pin DSUB (see Figure 3) with the pinning described in Table 5.
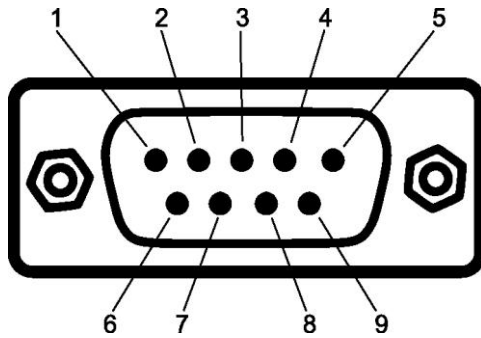
Figure 2: 9-pin DSUB.

Table 4: Configuration of the 9-pin DSUB.

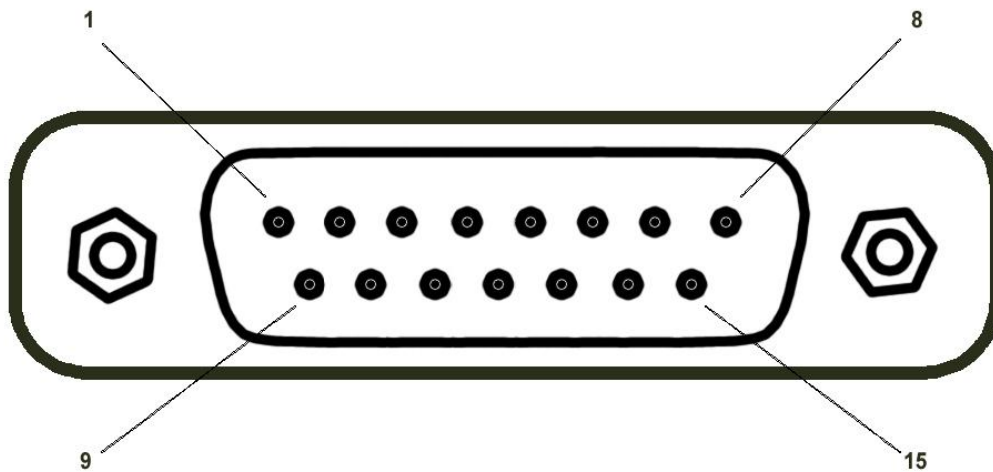| D-SUB pin number	Function
1	Not connected
2	CAN_L
3	GND
4	Not connected
5	Shield
6	Not connected.
7	CAN_H
8	Not connected.
9	Power supply to the device

Figure 3: 15-pin DSUB.

Table 5: Configuration of the 15-pin DSUB.

D-SUB pin number	Function
1	Power supply to the device (channel 1)
2	CAN_L channel 1
3	Not connected
4	CAN_L channel 2
5	Not connected.
6	CAN_L channel 3 (only connected on 3-channel devices)
7	Not Connected
8	Shield channel 3 (only connected on 3-channel devices)
9	GND channel 1
10	CAN_H channel 1
11	GND channel 2
12	CAN_H channel 2
13	GND channel 3 (only connected on 3-channel devices)
14	CAN_H channel 3 (only connected on 3-channel devices)
15	Shield channel 2
Shell	Shield channel 1

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

5.3 Updating the firmware

Connect the Kvaser BlackBird to your PC with the USB cable. Start the **update.exe** application. A window opens where you should see the device listed if correctly connected to your PC (see Figure 4). Select the device to program and click the *Next* button.
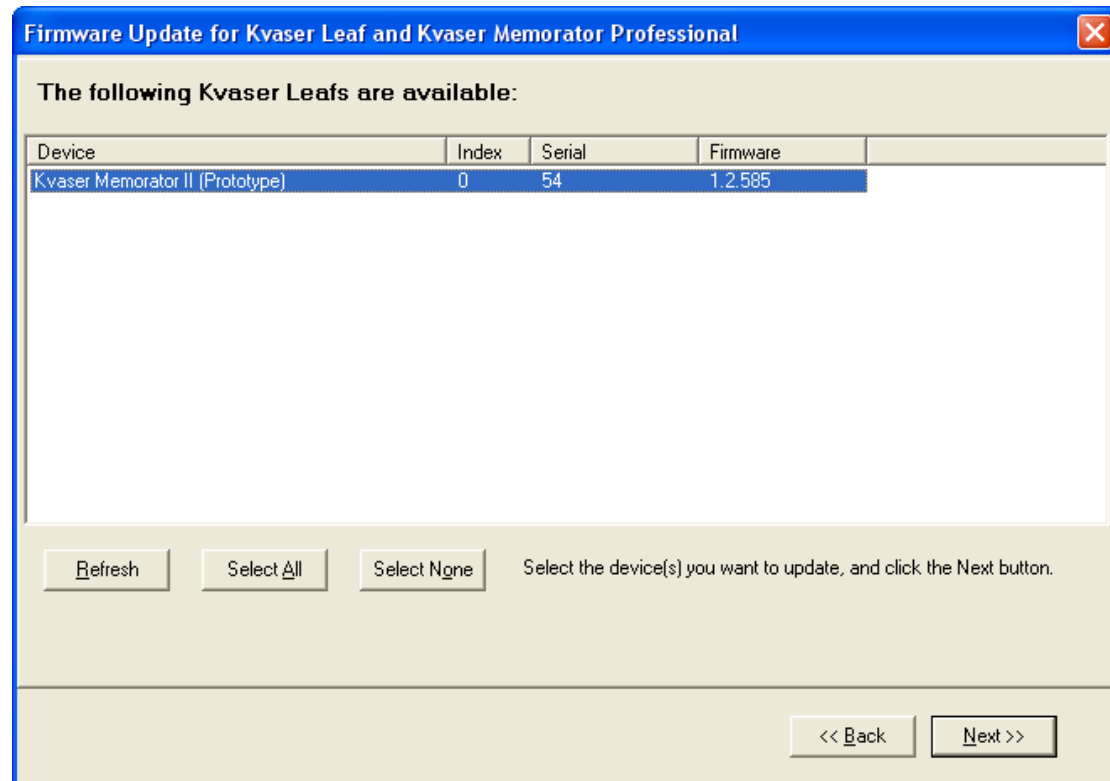

Figure 4: Firmware Update, Select Device.

Click on the *Start Upgrade* button to start programming (see Figure 5). The programming takes approximately 30 seconds. The progress is displayed on the screen.
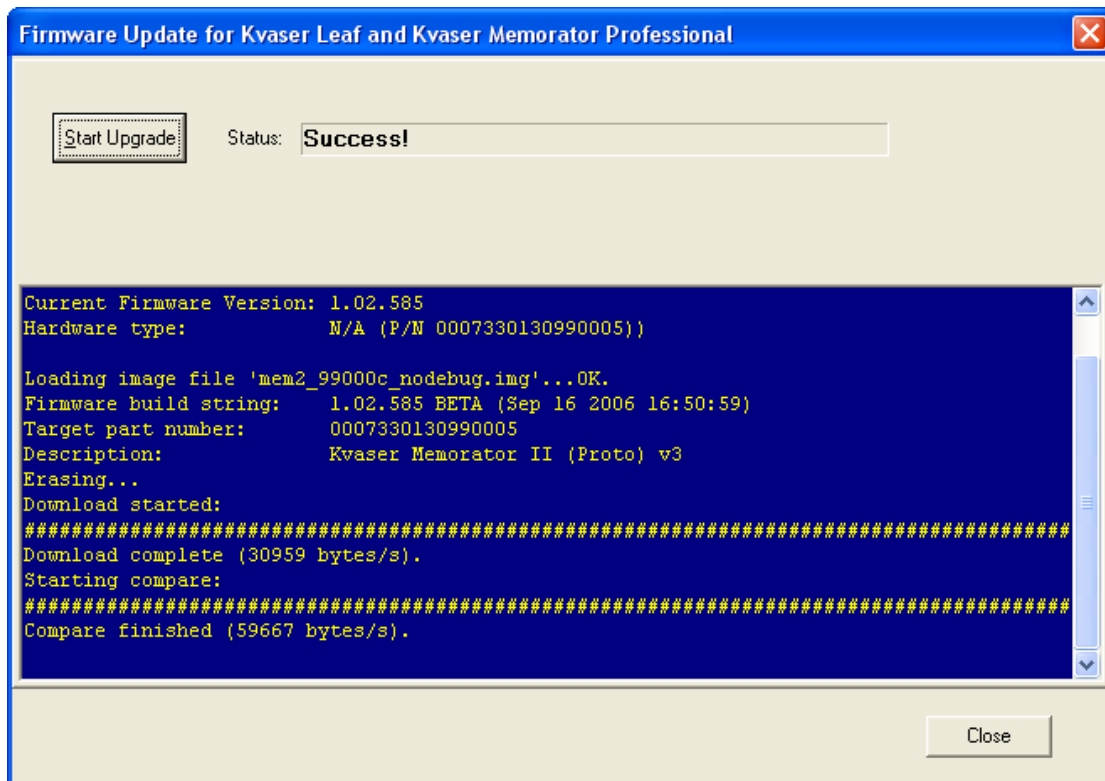
Figure 5: Firmware Update, Start Upgrade.

⚠️ **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,

- Open "Kvaser Hardware" in the Control Panel. Select "Kvaser BlackBird" in the tree view to the left, and click on either channel. The firmware revision information appears in the right half of the window.

5.4 CAN bus termination

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

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-LEVER SYSTEM, WHICH MAY BE DEFECTIVE.

THIS PRODUCT CONTAINS A RECHARGEABLE LI-ION BATTERY. MUST BE DISPOSED OF PROPERLY. MAY EXPLODE IF DAMAGED OR DISPOSED OF IN FIRE. DO NOT SHORTCUT.

6.2 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.

FCC Compliance
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.

This device contains
FCC ID: PVH090901
IC: 5325A-090901

When using the Kvaser Blackbird device, you will be exposed to some of the transmitted RF energy. This exposure is well below the prescribed limits in all national and international RF safety standards and regulations. For security reasons: This modular transmitter MUST have a separation distance of at least 20 cm between the antenna and the body of the user or nearby persons.

6.3 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.)

6.4 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.)

6.5 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 and 7,100,042.

7   Document revision history

Revision	Date	Changes
1	2008-04	Original revision
2	2008-04	Corrected a typo
3	2008-04-25	Corrected language. Changed: • Operating voltage is 6 – 40 V DC (max voltage 48 V DC) • Power consumption is 2.2W • Removed Windows 98 and Windows ME from list of supported OSes
4	2009-09-25	Editorial changes.
5	2011-01-17	Updated values supply voltages and power consumption. Extended D-SUB pin description. Corrected values of physical dimensions. Added WLAN information to specifications. New text regarding operating systems supported. Editorial changes.