Kvaser USBcan Pro 4xCAN Silent User's Guide

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https://www.kvaser.com

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1 About this manual

This manual is intended for Kvaser USBcan Pro 4xCAN Silent 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 USBcan Pro 4xCAN Silent.

2.1 Welcome to Kvaser USBcan Pro 4xCAN Silent

Figure 1: Kvaser USBcan Pro 4xCAN Silent

Kvaser USBcan Pro 4xCAN Silent is a small, yet advanced, portable multi channel CAN to USB real time interface that handles reception of standard and extended CAN messages on the CAN bus with a high time stamp precision. The Kvaser USBcan Pro 4xCAN Silent is compatible with applications that use Kvaser's CANlib.

The Kvaser USBcan Pro 4xCAN Silent is always in silent mode, meaning it cannot affect the bus.

This guide applies to Kvaser USBcan Pro 4xCAN Silent devices using at least Firmware and Driver versions listed in Table 1 on Page 6. For minimum compatible

firmware and driver versions of Kvaser USBcan Pro 4xCAN Silent see Table 8 on Page 19.

Device	Product Number	Firmware	Driver (Windows/Linux)
Kvaser USBcan Pro 4xCAN Silent	73-30130-01411-4	v3.29	v5.41 (kcany/mhydra)

Table 1: Firmware and driver versions for Kvaser USBcan Pro 4xCAN Silent devices needed to support all functionality present in this guide.

2.2 Major features

- USB CAN interface with Kvaser *t* programmability.
- Always in silent mode – listens to the bus without interfering it.
- Supports CAN FD, up to 8 Mbit/s.
- Quick and easy plug-and-play installation.
- Supports both 11-bit (CAN 2.0A) and 29-bit (CAN 2.0B active) identifiers.
- Power is taken from the USB port.
- 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.
- Kvaser MagiSync – automatic time synchronization (see Section 4.7, Kvaser MagiSync, on Page 19 for more details).
- Supports simultaneous usage of multiple Kvaser interfaces.
- Includes 4 channel breakout cable.

2.3 Interface

Kvaser USBcan Pro 4xCAN Silent provides a CAN bus interface through a standard USB interface.

2.4 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 USBcan Pro 4xCAN Silent 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 or a timer expiration.

Like any Kvaser CAN interface, the Kvaser USBcan Pro 4xCAN Silent can be used via CANlib on a host computer. The addition of t programs running directly on the Kvaser USBcan Pro 4xCAN Silent makes it possible to react much quicker to CAN bus events.

For more information, see the Kvaser t Programming Language guide that can be downloaded at www.kvaser.com/download.

2.5 Restrictions in t functionality

The Kvaser USBcan Pro 4xCAN Silent is a dedicated CAN interface, and as such does not contain real-time clock (RTC), logger or SD card functionality, neither does the Kvaser USBcan Pro 4xCAN Silent include dedicated I/O pins. This means that the t functionality listed in Table 2 on Page 8 is not available on Kvaser USBcan Pro 4xCAN Silent (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`
Predefined File I/O Functions	`fileOpen`
	`fileClose`
	`fileGets`
	`fileReadBlock`
	`filePuts`
	`fileWriteBlock`
	`fileSeek`
	`fileDelete`
Predefined XML Functions	`xmlOpen`
	`xmlClose`
	`xmlGet`
Predefined t Program Related Functions	`scriptLoad`
Predefined Logger Related Functions	`filterDropMessage`
	`loggerStatus`
	`loggerStart`
	`loggerStop`
Predefined CAN Related Functions	`canWrite`
	`canSetBusOutputControl`
Other Predefined Functions	`timeGetDate`

Table 2: Functionality in the t language (v3.10) that is not supported by Kvaser USBcan Pro 4xCAN Silent.

2.6 Additional software and documentation

The Kvaser CANlib SDK includes everything you need in order to develop software applications interacting with Kvaser CAN and LIN hardware. The SDK contains full documentation and many sample programs, written in C, C++, C#, Delphi, Python and Visual Basic. Kvaser CAN and LIN 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.

3 Kvaser USBcan Pro 4xCAN Silent hardware

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

3.1 Hardware installation

For the Kvaser USBcan Pro 4xCAN Silent 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 USBcan Pro 4xCAN Silent.

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 USBcan Pro 4xCAN Silent 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 4.6, Updating the firmware, on Page 18.

3.2 USB connector

The Kvaser USBcan Pro 4xCAN Silent has a standard USB type "A" connector.

Figure 2: A standard USB type "A" 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 channels

The Kvaser USBcan Pro 4xCAN Silent has four CAN channels in a single 26-pin HD D-SUB CAN connector (see Figure 3). See Section 4.4, CAN connectors, on Page 16 for pinout information.

Figure 3: CAN connector on Kvaser USBcan Pro 4xCAN Silent

3.4 Power supply

The Kvaser USBcan Pro 4xCAN Silent is powered from the USB port.

3.5 LED Indicators

The Kvaser USBcan Pro 4xCAN Silent has one power LED and one traffic LED for each CAN channel as shown in Figure 4 on Page 12. Their functions are described in Section 4.1, Definitions of LED states and colors, on Page 13.

Figure 4: LEDs on the Kvaser USBcan Pro 4xCAN Silent.

3.6 Troubleshooting

Use "Kvaser Device Guide" in the Control Panel to verify that the computer can communicate with the Kvaser USBcan Pro 4xCAN Silent. 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.

4 Appendices

In this section you will find technical information about the Kvaser USBcan Pro 4xCAN Silent 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 host computer 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.

The power should never be removed 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]
Slow Waver (Green/Yellow)	All Slow Blink (Yellow)	Power problem[2]

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

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

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

4.1.2 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.

[1] This should not normally happen. If it does, please contact Kvaser support.
[2] This indicates low power supply, such as using an unpowered USB hub.
[3] The red Traffic LED indicating overrun will stay on until the device goes bus off.

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 section describes. Read the Kvaser t Programming Language guide that can be downloaded at www.kvaser.com/download for more information.

The "on start" event will be triggered in the Kvaser USBcan Pro 4xCAN Silent 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.

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.

4.3 Technical data

In Table 6 on Page 16 you will find the technical specifications of Kvaser USBcan Pro 4xCAN Silent.

CAN Channels	4
CAN Transceivers	TJA1051T (Compliant with ISO 11898-2)
CAN Controller	Kvaser CAN IP in FPGA
Galvanic isolation	Yes
CAN Bit Rate	20 kbit/s to 1 Mbit/s
CAN FD Bit Rate	Up to 8 Mbit/s
Time stamp resolution	1 µs
Max message rate	20000 msg/s per channel
Error Frame Detection	Yes
Error Frame Generation	No
Silent mode	Always
Kvaser MagiSync	Yes
Kvaser t programming	Yes
Kvaser CANtegrity	No
Host interface	USB Hi-Speed
Host OS	Windows (7 or later), Linux.
Power consumption	Typical 150 mA
Hardware configuration	Done by software (Plug & Play).
Dimensions	50 x 170 x 20 mm for body incl. strain relief
Weight	150 g (300g including HD26-4DS9 Splitter)
Operating temperature	−40 °C to +85 °C
Storage temperature	−40 °C to +85 °C
Relative humidity	0 % to 85 % (non-condensing.)

Table 6: Technical Specifications.

4.4 CAN connectors

Kvaser USBcan Pro 4xCAN Silent devices that use the 26-pin HD D-SUB connector (see Figure 5) have the pinning described in Table 7 on Page 17. This table also describes how the HD26-4xDS9 splitter (see Figure 7 on Page 18) connects to four separate 9-pin D-SUB connectors, CAN 1 to CAN 4.

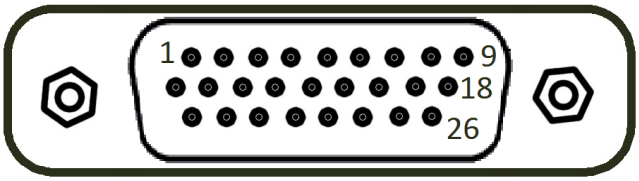

Figure 5: The male 26 pin HD D-SUB connector pin numbers

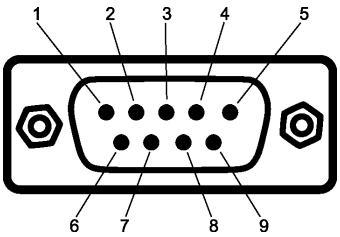

Figure 6: The male D-SUB 9 connector pin numbers

HD D-SUB	CAN 1	CAN 2	CAN 3	CAN 4	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					Not connected
6					Not connected
7					Not connected
8	4				Not used
9					Not connected
10	9				Not used
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					Not connected
16					Not connected
17					Not connected
18		4			Not used
19	3				GND channel 1
20		3			GND channel 2
21			3		GND channel 3
22				3	GND channel 4
23					Not connected
24					Not connected
25					Not connected
26					Not connected

Table 7: Pin configuration of the 26-pin HD D-SUB (and HD26-4xDS9 splitter)

Figure 7: The HD26-4xDS9 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 USBcan Pro 4xCAN Silent 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 Updating the firmware

For the Kvaser USBcan Pro 4xCAN Silent 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.

Connect the Kvaser USBcan Pro 4xCAN Silent to your host computer 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 USBcan Pro 4xCAN Silent" 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.

The absolute minimum firmware and driver versions needed in order to use Kvaser USBcan Pro 4xCAN Silent are listed in Table 8.

Device	Min. Firmware Version	Min. Driver Version
Kvaser USBcan Pro 4xCAN Silent	v3.28	v5.40

Table 8: Minimum compatible driver and firmware versions of Kvaser USBcan Pro 4xCAN Silent.

4.7 Kvaser MagiSync

Time synchronization is needed to achieve accurate and precise time stamping between several host computer-to-bus interfaces connected to one host computer. Since each host computer-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.

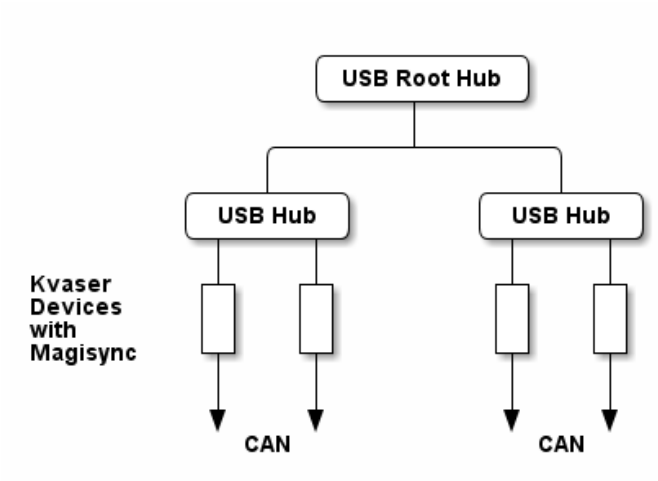

Figure 8: An example setup where all devices are synchronized via MagiSync.

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 8 and Figure 9 on Page 20.

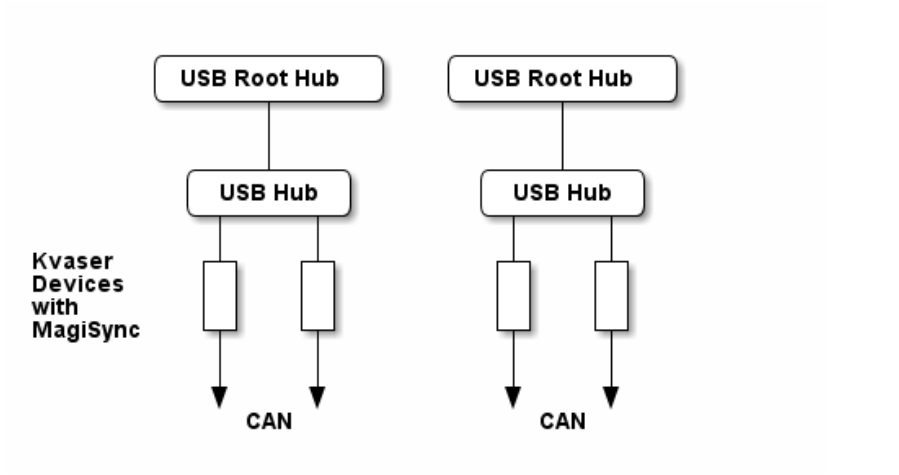

Figure 9: Not all devices are synchronized via MagiSync in this setup.

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 Safety Instructions

5.1 Intended Use

Kvaser interfaces are used to connect computer systems to CAN buses. The Kvaser USBcan Pro 4xCAN Silent is intended for connection to a computer via the USB port.

5.2 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.

6 Disposal and Recycling Information

When this product reaches its end of life, please dispose of it 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

7 Legal acknowledgements

7.1 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 USBcan Pro 4xCAN Silent

Object of the declaration (identification of apparatus allowing traceability):
Product: Kvaser USBcan Pro 4xCAN Silent
Type: 73-30130-01411-4

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 55032 (2015 + A11:2020) EN 55035 (2017 + A11:2020)

EN 61000-6-3 (2007 + A1:2011) EN IEC 63000 (2018)

Signed for and on behalf of:

Mölndal	2022-10-31	
Place of issue	Date of issue	Kent Lennartsson, Research Manager

7.2 FCC Regulatory Compliance

Federal Communications Commission (FCC) Compliance Information Statement

IDENTIFICATION OBJECT:
Product: Kvaser USBcan Pro 4xCAN Silent
Type: 73-30130-01411-4

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

7.3 Patents, Copyrights and Trademarks

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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.

8 Document Revision History

Version history for document UG_98248_usbcan_pro_4xcan_silent:

Revision	Date	Changes
1.0	2022-11-11	Initial version