Kvaser U100 User's Guide

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Contents

1 About this manual

This manual is intended for Kvaser U100 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 U100.

2.1 Welcome to Kvaser U100

Figure 1: Kvaser U100 with D-SUB CAN connector

Kvaser U100 is a small, yet powerful, CAN to USB interface. It provides real-time transmission and reception of standard and extended CAN messages on the bus with a high timestamp precision, and is compatible with applications that use Kvaser's CANlib.

This guide applies to Kvaser U100 devices listed in Table 1.

Device	Product Number
Kvaser U100	73-30130-01173-1

Table 1: Kvaser U100 devices, with Product numbers.

2.2 Major features

- USB CAN interface.
- Powered through the USB connector.
- Supports CAN FD, up to 8 Mbit/s (with correct physical layer implementation).
- Supports both 11-bit (CAN 2.0A) and 29-bit (CAN 2.0B active) identifiers.
- Lightweight robust housing made of glass fibre reinforced polyamide overmolded with TPE.
- Intuitive LED UI.
- Reinforced galvanic isolation, design validated with 5000 VAC rms applied for 60 s.
- Industrial grade temperature range, −40 °C to +85 °C.
- 20 000 msg/s, each timestamped with a resolution of 100 µs.
- Fully compatible with applications written for other Kvaser CAN hardware with Kvaser CANlib.
- Support for SocketCAN.
- Fully compatible with J1939, CANopen, NMEA 2000® and DeviceNet.
- IP67 rating.
- A selection of different cables/connectors for the CAN connection.

2.3 Interface

Kvaser U100 provides a CAN bus interface through a standard USB interface.

2.4 Additional software and documentation

The Kvaser CANlib SDK includes everything you need in order to develop software applications interacting with Kvaser CAN hardware. The SDK contains full documentation and many sample programs, written in C, C++, C#, Delphi, Python and Visual Basic. Kvaser CAN 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 U100 hardware

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

3.1 Hardware installation

The Kvaser U100 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 U100 to communicate with the host computer, a compatible version of the Kvaser driver and firmware must be installed.

The driver is installed by running the file `kvaser_drivers_setup.exe`. For instructions on how to update the firmware, see Section 4.8, Updating the firmware, on Page 15. The latest version of the driver and firmware can be downloaded from www.kvaser.com/download.

The firmware is downloaded and installed directly on the Kvaser U100 and the driver is installed on the host computer. After the driver has been installed on the host computer, the firmware may then be downloaded and installed on the Kvaser U100.

Device	Firmware	Windows driver	Linux driver
Kvaser U100	v3.22.578	v5.34 (kcany)	v5.34 (mhydra)

Table 2: Kvaser U100 devices and requirements on minimal version of firmware and drivers.

3.2 USB connection

The Kvaser U100 is connected to a PC using USB. See Section 4.5, USB connector options, on Page 13 for more information.

Connect the device to your computer using any high quality USB 2.0 certified cable. The maximum USB cable length is 5 m (∼ 16 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 an effective cable length of up to 25 m (∼ 82 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 U100 has one CAN Hi-Speed channel. See Section 4.6, CAN connector options, on Page 14 for more information.

3.4 Power supply

The Kvaser U100 is powered through the USB connector.

3.5 LED Indicators

The Kvaser U100 has one Tx LED Bar and one Rx LED Bar as shown in Figure 2 on Page 9, Figure 3 on Page 10. Their functions are described in Section 4.2, Definitions of Information types and States, on Page 11.

3.6 Troubleshooting

Use "Kvaser Device Guide" in the Control Panel to verify that the computer can communicate with the Kvaser U100. If the firmware version shown is all zeros, there are communication problems. If the LED Bar or the status indication is not flashing or does not light up at all, check the power supply.

4 Appendices

In this section you will find technical information about the Kvaser U100 and its connectors.

4.1 Definitions of LED states and colors

The Kvaser U100 has one Tx LED Bar and one Rx LED Bar. Each LED Bar has a status area, the Tx LED Bar has a status area towards the USB end of the bar, and the Rx LED bar has a status area towards the CAN end of the bar. This is shown in Figure 2.

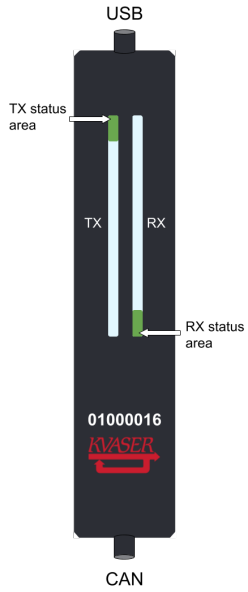

Figure 2: The Tx and Rx LED bars on the Kvaser U100 includes status areas.

The Tx LED bar lit area grows from the USB end of the LED bar towards the CAN end of the bar as CAN Tx traffic is increased. Likewise, the Rx LED bar lit area grows from the CAN end of the LED bar towards the USB end of the bar as the message rate of the received traffic is increased, see Figure 3 on Page 10. In this example the unit is transmitting data, which shows a yellow Tx status area. No CAN traffic is received and as such the Rx status area is green.

The total size of the LED bars are indicating the current bus load, e.g. Figure 3 on Page 10 shows only receiving CAN messages at 50% bus load. Figure 4 on Page 10 shows two different bus load conditions. The image on the left shows the unit transmitting and receiving data corresponding to 50% bus load in each direction for a total of 100% bus load. The image on the right shows the unit transmitting data corresponding to 100% bus load.

Figure 3: The Tx LED bar lights up from the USB side to the CAN side of the unit, while the Rx LED bar lights up from the CAN side to the USB side of the unit.

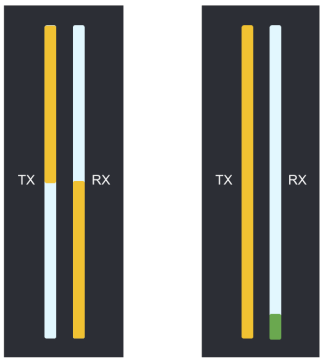

Figure 4: The total size of the LED Bars is proportional to the bus load. Both images indicate a bus load of 100%.

4.2 Definitions of Information types and States

A Kvaser U100 device has two traffic LED bars where part of each LED bar is also used as a status area. Different colors are used for different types of information and different blink patterns define the current state, see Table 3 and Table 4.

Color	Information type
Yellow	Traffic
Green	Power
Red	Error
White	Alert
Blue	System

Table 3: Different types of information.

State	Definition
Off	The indicator is off and no light is emitted.
Slow Blink	The indicator is repeatedly turned on and off. The on and off phases are equal in time.
Fast Blink	The indicator is repeatedly turned on and off but with a higher frequency than Slow Blink. The on and off times are still equal.
On	The indicator is constantly emitting light.
Dynamic	The indicator is moving and/or increasing/decreasing in size.

Table 4: Definitions of the indicator states.

4.3 Interface mode

The device is in interface mode when connected to the PC via USB. If the status area is presenting a steady green light, the device is in interface mode and is working correctly. When connected to the computer for the first time, the status area will Fast Blink with blue light until the Kvaser Driver is installed and the device has automatically received a USB configuration. Table 5 summarises the information shown in interface mode.

Description	Status area	LED bar
Power is on	On (Green)	-
CAN overrun	On (Red)	-
CAN channel is error passive	Fast Blink (Red)	-
Firmware update	Slow Blink (Blue)	-
Waiting for USB configuration	Fast Blink (Blue)	-
Error frame	On (Red)	On (Red)
CAN channel traffic	On (Yellow)	Dynamic (Yellow)
Locate hardware	Slow Blink (White)	Slow Blink (White)

Table 5: LED inidications in interface mode.

4.4 Technical data

In Table 6 on Page 12 below you will find the Kvaser U100's technical specifications.

CAN Channels	1
CAN Transceivers	ADM3055E (Compliant with ISO 11898-2)
CAN Controller	Built into the processor.
Galvanic isolation	Yes, reinforced. Design validated with 5000 VAC rms applied for 60 s.
CAN Bit Rate	10 kbit/s to 1 Mbit/s
CAN FD Bit Rate	Up to 8 Mbit/s (with correct physical layer implementation).
Time stamp resolution	100 µs
Max message rate	20 000 msg/s per channel
Error Frame Detection	Yes
Error Frame Generation	No
Silent mode	No
Kvaser MagiSync	No
PC interface	USB 2.0
Power consumption	Typical 250 mA
Hardware configuration	Done by software (Plug & Play)
Software requirements	Windows (7 or later), Linux
Dimensions	38 x 128 x 26 mm for body
Cable length	USB 1.0 m, CAN 0.3 m
Weight	167 g with default connectors
Operating temperature	−40 °C to +85 °C
Storage temperature	−40 °C to +85 °C
Relative humidity	0 % to 85 % (non-condensing)
IP Rating	IP67

Table 6: Technical Specifications

4.5 USB connector options

This section describes the PC connector options available for Kvaser U100.

4.5.1 USB-A connector (Default)

The default option for the Kvaser U100 is a standard USB type "A" connector.

Figure 5: A standard USB type "A" connector.

4.6 CAN connector options

This section describes the CAN connector options available for Kvaser U100.

4.6.1 9-pin D-SUB connector (Default)

The default option for the Kvaser U100 is the 9-pin D-SUB connector (see Figure 7) which has the pinout described in Table 7.

Figure 6: 9-pin D-SUB CAN connector.

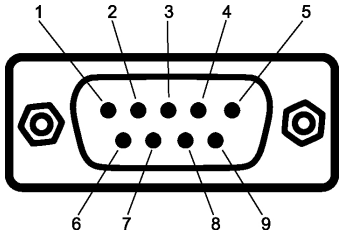

Figure 7: The D-SUB 9 connector pinout.

D-SUB pin	Function
1	Not connected
2	CAN_L
3	GND
4	Not connected
5	Shield
6	Not connected
7	CAN_H
8	Not connected
9	Not connected

Table 7: Configuration of the 9-pin D-SUB

4.7 CAN bus termination

Every CAN bus must be terminated with a 120 Ohm resistor at each end of the bus. The Kvaser U100 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.

4.8 Updating the firmware

For the Kvaser U100 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 U100 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 Device Guide" which can be found in the Control Panel. Select "Kvaser U100" 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 Safety Instructions

5.1 Intended Use

Kvaser CAN Interfaces are used to connect computer systems to CAN and LIN networks. The Kvaser U100 is inteded for connection to a computer via the USB interface.

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

KVASER
Advanced CAN Solutions

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 U100

Object of the declaration (identification of apparatus allowing traceability):
Product: Kvaser U100
Type: 73-30130-01173-1

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 (2012)

EN 55035 (2017)

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

EN 50581 (2012)

Signed for and on behalf of:

Mölndal	2020-05-05	
Place of issue	Date of issue	Claes Haglund, Supply Chain and Quality director

7.2 FCC Regulatory Compliance

Federal Communications Commission (FCC) Compliance Information Statement

IDENTIFICATION OBJECT:
Product: Kvaser U100
Type: 73-30130-01173-1

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

For information about Kvaser related CAN patents, see www.kvaser.com/patent.

8 Document Revision History

Version history for document UG_98223_U100:

Revision	Date	Changes
1.0	2021-01-11	Initial version