



User Manual

CANtouch®



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CANtouch[®]

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Version Overview¹

Date	Version	Change(s)
19.03.14	1.0	First version
2014-06-04	1.1	Various changes and error correction
2014-10-06	1.2	Bit timing settings appended
2014-11-06	1.3	Measurement "Common-Mode Voltage" enhanced
2015-05-13	1.4	Protocol Monitor: Symbolic decoding , Enhanced measurement of the Disturbance-free voltage range, Ordering Information enhanced
2015-11-05	1.5	Minor changes in measurement CAN Levels and Protocol Monitor
2016-01-28	1.6	Documentation of calibration; Ranges, resolutions and accuracies complemented in technical data
2016-06-03	1.7	App Protocol monitor: Trace module added
2016-08-29	1.8	Supplements: Maximum voltages in tech. specification and "Delete user data" in settings dialog
2016-12-12	1.9	Frame detection in App "Bus Status", revised App "Node Measure", updated Logos / Declaration of Conformity
2017-06-09	1.10	Description of the new functions "Automatic Quick Test" and Control Center
2017-08-08	1.11	New App "Online Trigger"
2017-10-26	1.12	App "Protocol Monitor" - Transmit of sequences (multiple CAN messages), Ordering information
2018-02-01	1.13	Project management
2018-03-26	1.14	New function: "Restore archive"
2018-07-17	1.15	Changes in Declaration of Conformity
2018-08-13	1.16	Minor improvements
2019-09-13	1.17	New value "Level Ratio" within the measurement "CAN Levels Absolute"
2019-05-11	1.18	Rating limits now available for all measured values
2020-01-17	1.19	Changes in "Maintenance and Customer Service"
2020-01-23	1.20	Minor corrections
2020-12-10	1.21	Changes in Measurement Bus status
2022-01-18	1.22	Change of declaration of conformity and CE information due to outdated standards

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Note:

Use of the CANtouch® device and proper understanding of this Manual require general knowledge of the CAN-Bus, CANopen, DeviceNet and/or SAE J1939 fieldbus systems.

¹ With publication of this document all previous versions lose their validity.

Table of Contents

1 Introduction.....	1
2 Start-up.....	2
2.1 Receiving inspection.....	2
2.2 Handling.....	2
2.3 Safety notes / Battery.....	2
3 Overview of the CANtouch®	3
3.1 Connections.....	3
3.2 Buttons.....	5
4 Operation.....	6
4.1 Lock screen.....	6
4.2 Home screen.....	6
4.3 Icons in the status bar.....	6
5 License Management.....	7
5.1 License model.....	7
5.2 Trial versions.....	7
6 Project management.....	8
7 Bus Status Measurement.....	9
7.1 Bus status.....	9
7.2 Bus traffic load.....	9
8 Bus Error Measurement.....	10
8.1 Error frames.....	10
9 Bus Voltage Measurement.....	11
9.1 CAN Supply Voltage.....	11
9.2 Shield Voltage.....	11
10 Common-Mode Voltage Measurement.....	12
11 CAN Level Difference Measurement.....	13
11.1 CAN level difference, recessive.....	13
11.2 CAN level difference, dominant.....	13
12 CAN Levels Absolute Measurement.....	14
13 Bus Wiring.....	15
14 Node Measurement.....	16
14.1 General.....	16
14.2 Bus system.....	16
14.3 List of nodes.....	17
14.4 Measurement of all nodes.....	17
14.5 Measurement of one node.....	18
15 Online Trigger Measurement.....	19
15.1 General.....	19

15.2 Trigger function.....	20
15.3 Alarm function.....	20
15.4 Evaluation.....	20
16 Protocol Monitor.....	21
16.1 Creating messages / sequences.....	21
16.2 Edit of messages.....	21
16.3 Edit of sequences.....	22
16.4 Transmit messages / sequences.....	22
16.5 Receive messages.....	23
16.6 Receipt of messages with symbolic decoding.....	24
16.7 Recording of messages (Trace).....	25
17 Automatic Quick Test.....	26
18 Settings.....	27
18.1 Device.....	27
18.2 Project.....	28
18.3 Reset.....	30
18.4 Alternative Home screen background.....	30
18.5 Control Center.....	30
19 Meas. the Physical Bus Characteristics per Node.....	31
19.1 Disturbance-free voltage range.....	32
19.2 Edge steepness.....	32
19.3 General quality level.....	33
19.4 Oscilloscope display with message frame analysis.....	33
20 Technical Specifications.....	34
21 Maintenance and Customer Service.....	36
21.1 Maintenance.....	36
21.2 Customer service.....	36
22 Ordering Information.....	37
23 Notes.....	38

1 Introduction

Thank you for purchasing CANTouch®. You have acquired a tool supporting you in the start-up, analysis, monitoring and servicing/maintenance of your CAN bus system.

Thanks to its wide range of applications, its high data transfer rate and above all through its high tolerance against interference in the field of plant automation, the CAN bus has been well established for the last few years. Nonetheless, even when starting up new plants, but also during operation, a large number of problems occur, resulting quickly in undesired and often expensive failures.

CANTouch® is a battery-operated handheld diagnostic device for the physical and logical analysis of CAN bus systems. Its state-of-the-art operation via touch screen provides intuitive and efficient handling without additional PC. As a further development of the CAN-Bus Tester 2, it possesses not only its functionality, but, in addition, provides new measuring functions. A simplified evaluation method based on a combination of traffic lights and smilies will assist you in quick assessment of the measurement results. Thanks to the integrated update option, you are already prepared for future extensions today. New functions can be enabled by purchasing additional licenses at any time.

2 Start-up

2.1 Receiving inspection

Carefully unpack and check the device and completeness of the delivery immediately after receipt. If transport damage is suspected, inform the delivery agent within 72 hours and keep the packaging for inspection. The device must only be transported in its original or equivalent packaging.

2.2 Handling

Always handle the CANtouch® with the required care. Its display is made of glass and thus may break if the device falls on a hard surface or is subjected to hard impact. Before turning on the CANtouch®, allow the device to warm up to room temperature. When operating the device, it is imperative to observe the general accident prevention regulations relating to the use of measuring instruments. The device must only be used in dry rooms.

2.3 Safety notes / Battery

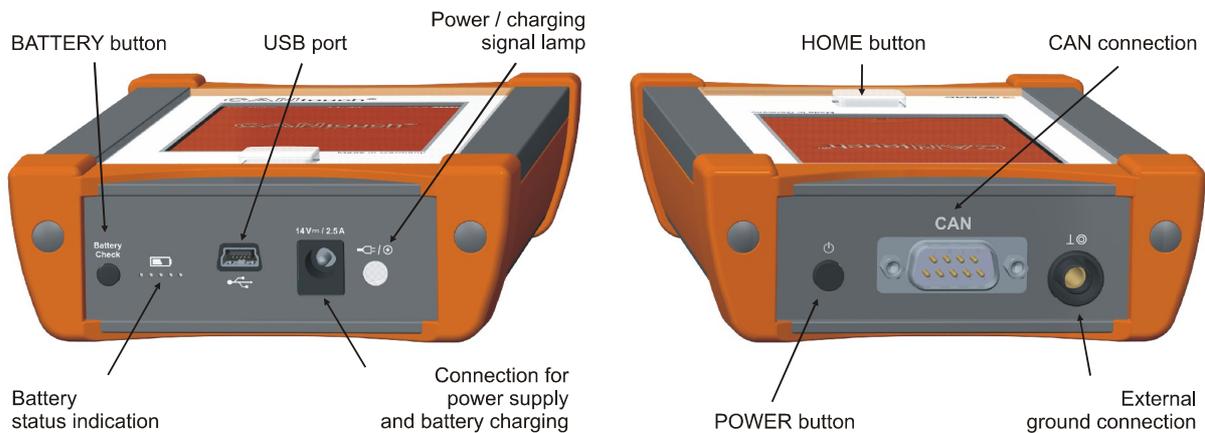
 The CANtouch® is fitted with an integrated, rechargeable lithium-ion battery. Only the supplied power supply unit must be used for power supply and charging of the integrated battery via the extra-low voltage socket. Failure to do so will invalidate your warranty.

For safety reasons the CANtouch® must not be opened in any case. Inappropriate handling of the battery might lead to explosion. Battery maintenance or change, replacement of the integrated 2.5 A fuse as well as repairs of the device must only be done by the manufacturer. For repair requests contact the customer service at the address specified in section 21.2 "Customer service".

The battery should be "recalibrated" every few months to ensure that the charge condition and the remaining battery life displayed on the screen remain exact. To this end, it is sufficient to fully charge and subsequently discharge the battery.

3 Overview of the CANtouch®

3.1 Connections



3.1.1 Power supply / charging

Only the supplied power supply unit must be used for power supply and charging of the integrated battery via the extra-low voltage socket. It possesses a wide-range input designed for connection to mains voltages from 115 V to 230 V with 50/60 Hz. While the battery is being charged, the signal lamp "Power/charging" is lit yellow alongside the extra-low voltage socket. A green LED means that the battery is fully charged. If the LED is not lit, check that the power supply unit is connected to the mains and the plug connector is connected correctly.

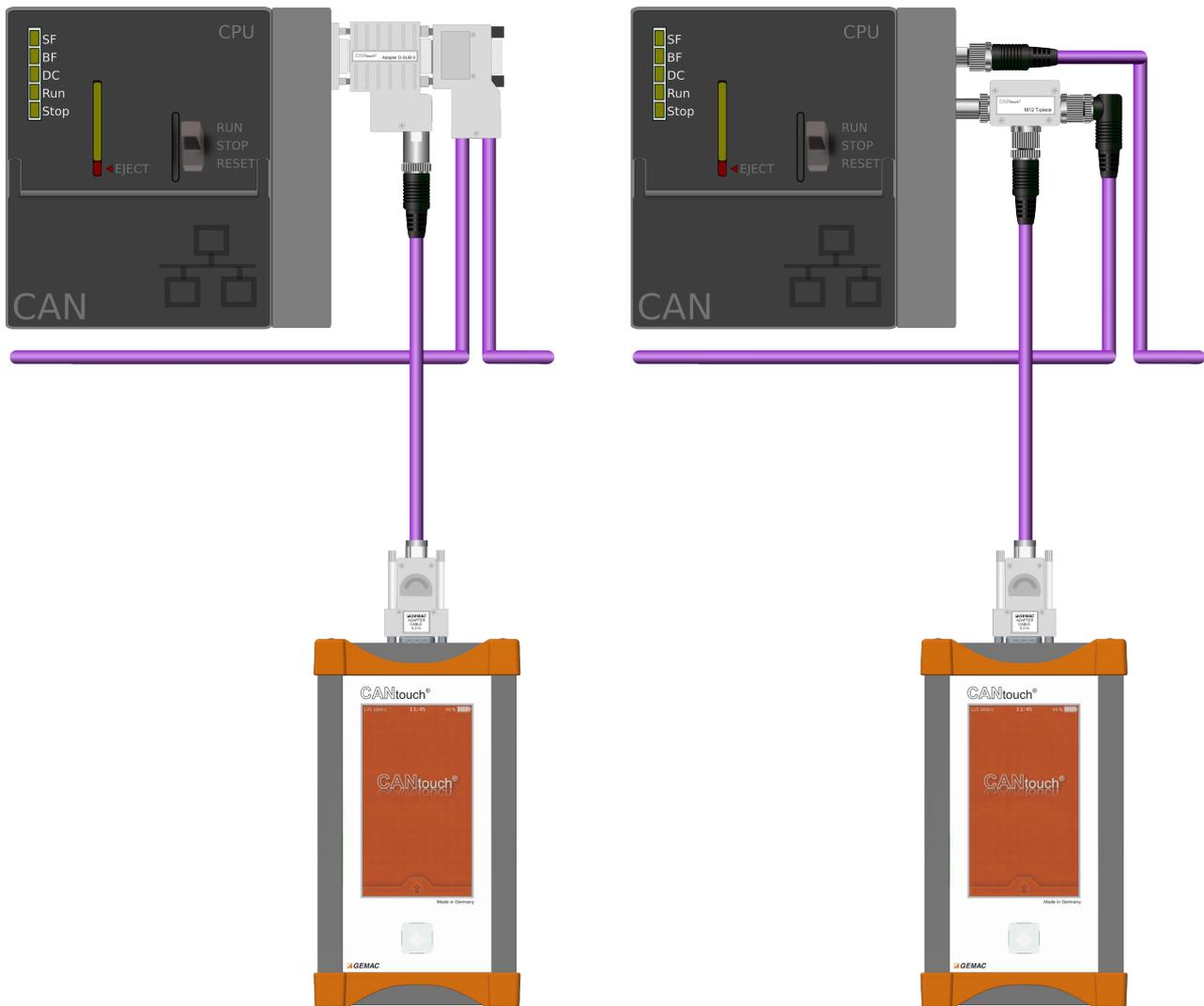
3.1.2 Connection to the CAN bus

The CANtouch® is connected to the CAN bus system by way of a 9-pin D-sub connector.

Pin	Signal	Connector Pin Assignment
1	-	-
2	CAN_L	CAN_L bus line
3	CAN_GND	-
4	-	-
5	CAN_SHLD	Shield
6	CAN_V- / GND	GND / 0 V / V-
7	CAN_H	CAN_H bus line
8	-	-
9	CAN_V+	Optional external supply voltage (+24 V)

3.1.3 Using the adapter set

An adapter set is available as an option to connect the CANTouch® to networks by way of 9-pin subminiature D connectors or M12 plug connectors (see also Section 22 "Ordering Information").



3.1.4 USB connection

The CANTouch® can be connected to a PC or notebook by way of a USB cable; it appears there as a mass storage device with a drive letter. The USB connection is electrically isolated.

3.1.4.1 Data exchange

All measurement results are made available via the shared drive as a document in XML or binary format for further evaluation. Especially more comprehensive CAN message frame lists can be easily processed on the PC and transmitted back to the CANTouch®.

3.1.4.2 Firmware update / license files

Simply copy the license files and the package file for the firmware update to the connected drive. These files will then be integrated into the appropriate set-up pages.

3.1.5 External ground connection

In addition to measuring of the CAN_H - CAN_L difference signal, CANTouch® can also be used to perform absolute measurements of various CAN signals. Absolute measurements include measuring of the shield voltage and common-mode voltage (CMV). Normally, these measurements are performed against CAN_V- (pin 6) of the 9-pin sub D socket. In the "Settings" menu, it is also possible to switch to the external ground connection. This is necessary whenever CAN_V- is not present in the cable and you must make a ground connection to the measurement object.

3.2 Buttons

3.2.1 Power button

The CANTouch® is turned on by pressing and holding down the POWER button until the start logo is displayed. If you are not using the device for a short period of time, you can switch it to the standby mode, which turns off the screen and saves the battery. Pressing the POWER or HOME button once more quits the standby mode. To turn off the device, press and hold down the POWER button until the shutdown query is displayed, and confirm.

In the standby mode, the device is shut down automatically after a settable time (Settings → Device → Auto shutdown).

Note:

If the device no longer responds to inputs, a forced shutdown is necessary. To this end, press and hold down the POWER button for 5 s. All measurement results and settings, however, will be lost.

3.2.2 Home button

The HOME button always allows you to return to the HOME screen, irrespectively of running measurements. Holding down the HOME button starts the automatic baud rate scan.

3.2.3 Battery button

Use the BATTERY button to activate the battery status indication allowing you to read the remaining battery charge. This function is also available when the device is turned off.

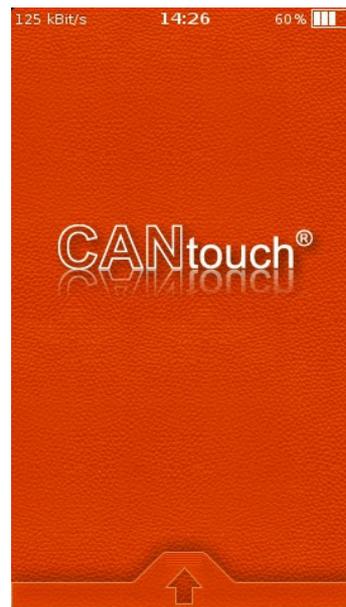
4 Operation

4.1 Lock screen

The lock screen serves as a protection from unintended operation of the device and is active whenever the standby mode is deactivated or the device is turned on.

To unlock the screen, touch the arrow and swipe the lock screen upwards.

You may reactivate the lock at any time by pulling the lock screen down from the top margin.



4.2 Home screen

Thanks to the sophisticated touch screen operation of CANtouch®, it can be handled intuitively and efficiently, in a similar manner to state-of-the-art smartphones. To interact with CANtouch®, use your fingers to activate functions by tapping and swiping on the screen.

All measuring functions are realized as applications ("**Apps**"). To open an **app**, tap it. To close, press the  button in the toolbar of each app or use the Home button to return to the Home screen.

The "Settings" application can be found on the right-hand side of the control center  in the toolbar of the Home screen (see also Section 18 "Settings").



4.3 Icons in the status bar

The icons in the status bar at the top of the screen display information about the CANtouch®:

Icon		Meaning
125 kbit/s	Baud rate	Displays the currently set baud rate
11:34	Time	Displays the current time
66 % 	Battery	Displays the battery status or the status of the charging process.
	User-def. bit timing	Baud rate with non-standard bit timing adjusted
	Ext. Ref. ground	Displays that the external ground connection was selected as the reference ground.
	Listen only	Displays that the "Listen only" mode of the CAN controller is active. In this mode, no acknowledgment is sent by the CAN controller.

5 License Management

5.1 License model

The CANtouch® basic variant can be used for the following measurements:



Bus Status



Bus Errors



Bus Voltages



Com. Mode Voltage



CAN Levels Difference



CAN Levels Absolute

The following optional measurements can be enabled as required by purchasing additional licenses.



Bus Wiring



Node Measurement



Online Trigger



Protocol Monitor

To be able to use the optional measurements, you must purchase the appropriate license. Then, a license file (*.cbthlic) is made available to you. Copy this file to the drive of the CANtouch® after connecting it to the PC via USB.

5.2 Trial versions

After purchasing the CANtouch®, it is possible to test all optional measurements once for a period of 30 days. This period starts with activation of the trial version by the user.

After expiry of the trial period, the optional measurements are disabled again, and you will need an appropriate license to use them permanently.

You can view the license status or the remaining runtime of the trial versions by way of the icon of the application.



No license present (measurement locked)



Trial version with a remaining test period of 30 days activated (measurement can be used temporarily)



License present (measurement can be used permanently)



6 Project management

With the help of projects your CANtouch® can be quickly adapted to different purposes. At least one project is active on each device, by default with the name "Default". If there is more than one project or the name of the currently active project is not "Default", it will be displayed in the lock screen and the Control Center.

Projects are realized on the drive of the CANtouch® as a sub folder with a corresponding name in the folder "CANtouch:\Projects\" and can be managed via the app *Settings:Project*. Also, a manual management with the file manager at the PC-connected device is possible.

A project contains the following elements:

<ul style="list-style-type: none"> ■ All CAN specific settings <small>(baud rate, bit timing, timeouts, reference ground, listen only, ...)</small> 	<Projektname>\cantouch.config.project.xml
<ul style="list-style-type: none"> ■ Measuring data of all apps 	<Projektname>\cantouch.document.app.*.xml
<ul style="list-style-type: none"> ■ Archive files 	<Projektname>\Archive\cantouch.document.app.*_xxx.xml
<ul style="list-style-type: none"> ■ Trace files 	<Projektname>\TraceFiles*.trc
<ul style="list-style-type: none"> ■ Symbol files 	<Projektname>\SymbolFiles*.symx
<ul style="list-style-type: none"> ■ Screenshots 	<Projektname>\Screenshots*.png
<ul style="list-style-type: none"> ■ Ratings (Smileys) 	<Projektname>\cantouch.property.rating.xml
<ul style="list-style-type: none"> ■ Additional Settings 	<Projektname>\cantouch.property.options.xml
<ul style="list-style-type: none"> ■ Additional baud rates 	<Projektname>\cantouch.property.additionalbaudrates.xml
<ul style="list-style-type: none"> ■ Alternative Home screen background 	<Projektname>\Background.png

The integrated project management is currently limited to 100 projects and is accessed via the app *Settings:Project* (see also section 18.2.1 "Project: Selection / management").

7 Bus Status Measurement



The "Bus Status" measurement is started immediately when the app is opened and is only quit when the app is closed. The results of the measurement are not saved.

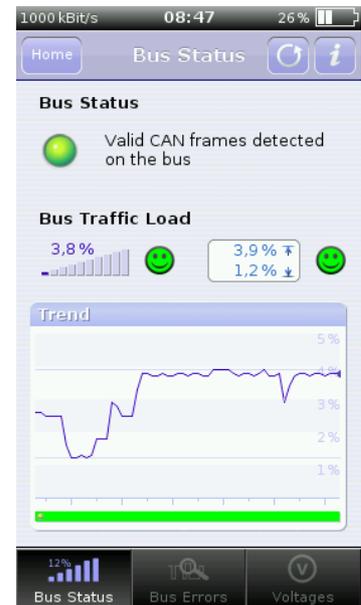
Press , to restart the measurement.

Press  for more information about the measurement.

7.1 Bus status

The bus status provides a quick overview of the status of your CAN bus system. A cyclic measurement over one second indicates whether or not data traffic is present and whether or not the CANTouch® is connected correctly to the bus. If the system is stopped (no data traffic), the idle level of the bus is measured and evaluated. If this value lies in an impermissible range, this will be indicated. Conclusions regarding errors in the bus cabling can be drawn from the value of this difference voltage.

-  Differential voltage in the forbidden range 0.5 V ... 0.9 V.
-  Bus static dominant (no level change detected on the bus within the measuring time of one second); diff. voltage greater than 0.9 V)
-  CAN_H & CAN_L swapped or misconnected.
Negative level change or a static negative voltage were detected.
-  Bus static recessive (no level change detected on the bus within the measuring time of one second); diff. voltage less than 0.5 V, bus idle)
-  Level change but no CAN telegrams detected on the bus.
Make sure that the baud rate is set correctly.
-  Valid CAN frames detected on the bus



7.2 Bus traffic load

Not only configuration problems, but also diagnostic and alarm messages, as well as poor transmission properties and the resulting sporadic frame repetitions can extend the bus traffic load. Problems of this kind can be avoided by measuring the bus traffic load at regular intervals and saving the measured minimum and maximum values.

8 Bus Error Measurement



The "Bus Error" measurement is started immediately when the app is opened and quits only when the app is closed. The results of the measurement are not saved.

Press , to restart the measurement.

Press  for more information about the measurement.

8.1 Error frames

Error frames belong to the error management functionality implemented in the data link layer in all CAN controllers. They permit detection of the following error types:

- Bit errors
- Bit stuffing errors
- CRC errors
- Format errors
- Acknowledgment errors

Each error detected by the error management is notified to all other bus nodes by way of an error frame. This is achieved with a deliberate coding violation. All CAN controllers then discard this frame disturbed by an error frame, and the CAN controller sending the frame repeats it once more.

If an active or passive error frame is detected, the corresponding counter is incremented. As a rule, the count of this display should always show "0". If sporadic, or even frequent errors occur, this is generally attributable to problems with the physical bus characteristics and the corresponding transmission problems.

The errors are displayed either per second or as a total count. You may switch between minimum, current, maximum and total count values.



What can I do when or are displayed?

Bus Error

- Remove individual modules temporarily and check whether the error rate changes
- Replace individual modules or cable segments
- Perform further, nodes-specific measurement to localize the error

9 Bus Voltage Measurement



The "Bus Voltage" measurement is started immediately when the app is opened and is only quit when the app is closed. The results of the measurement are not saved.

Press , to restart the measurement.

Press  for more information about the measurement.

9.1 CAN Supply Voltage

The CAN supply voltage, which is present optionally in the case of CAN/CANopen/SAE J1939 or always in the case of DeviceNet, is measured and displayed cyclically.

9.2 Shield Voltage

Normally, the shield of all connected CAN devices should be connected to the protective earth together with the CAN_V- on the power supply. This means that no current flows through a correctly connected shield and the shield has the same power level as the protective earth. A current flow in the "CAN_V-" line (current consumption of the CAN devices) increases their voltage level and results in a negative voltage offset of the shield voltage measured against CAN_V.

CANtouch® measures the shield voltage between the shield connection CAN_SHLD and CAN_V- continuously.



What can I do when or are displayed?

Shield voltage

- Make sure that the shield and CAN_V- are connected both to each other and to the protective earth.
- Check the shield for short-circuits and interruptions.
- Check the shield for correct earthing.

The shield voltage measurement need not be performed if you use own shield wiring technologies deviating from those as recommended.

10 Common-Mode Voltage Measurement

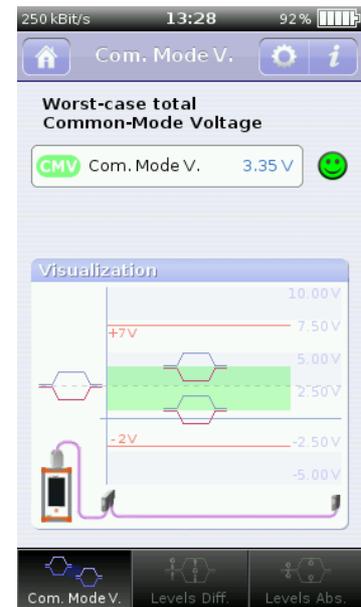


The "Common-Mode Voltage Measurement" is started immediately when the app is opened and is only quit when the app is closed. The results of the measurement are not saved.

Press  , to setup the measurement (Acquisition time, Reference ground).

Press  for more information about the measurement.

In a differentially operating transfer system, such as CAN, the term 'common-mode voltage' is used for the voltage of both signals relative to a common reference potential. This is normally CAN_GND which in every device is connected to CAN_V-. On CAN, both signal lines (CAN_H and CAN_L) should display a common-mode voltage of 2.5 V in the recessive condition. In case of incorrectly performed common grounding of all nodes, the common-mode voltages may be offset relative to each other due to a voltage drop between the modules. The voltage drop on the "V-" line will also result in an offset of the signal voltages when all CAN modules are supplied commonly via the CAN cable. This offset will be seen individually by each module. With CAN, this offset is only permissible in the range between -2 V and +7 V. Even if state-of-the-art CAN transceivers permit higher values as those of the specified range, higher common-mode voltages can result in errors in the communication and finally in destruction of the transceivers.



On bus traffic the CANTouch® continuously measures the absolute signal levels of all CAN modules relative to the position of the tester and determines highest difference of their signal levels – the **worst-case total common-mode voltage**.

What can I do when 😊 or 😞 are displayed?

Common-mode voltage

- Check your bus with reference to the cables used and their length.
- Check the current consumption of the installed modules supplied via the bus.
- The power supply unit should be installed either in the middle of the bus or in the vicinity of the modules with the highest current consumption.
- Consider the use of additional power supply units to reduce the voltage drop over the "CAN_V-" line.

11 CAN Level Difference Measurement



The "CAN Level Difference" measurement is started immediately when the app is opened and is only quit when the app is closed. The results of the measurement are not saved.

Press , to setup the measurement (Acquisition time, Reference ground).

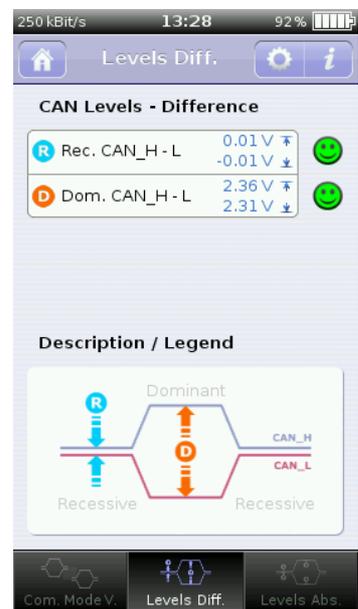
Press for more information about the measurement.

11.1 CAN level difference, recessive

CANtouch® continuously measures the differential voltage between CAN_H and CAN_L, which should ideally be 0 V in the recessive state, but typically lies in the range of some millivolts around zero. A recessive level which deviates excessively from 0 V can result in misinterpretation by the CAN transceivers and thus in communication faults.

11.2 CAN level difference, dominant

In the dominant state, the differential voltage between CAN_H and CAN_L should display a value around 2 V. Smaller voltages could result in misinterpretation by the CAN transceivers and thus in communication faults. Voltages higher than 3 V are an indication of problems at the CAN bus. This value can only be measured if bus traffic is available.



What can I do when 😊 or 😞 are displayed? **CAN level difference**

- Check the cable for short-circuited or interrupted CAN_H or CAN_L signal lines. – To this end, use the "Bus Wiring" measurement.
- Check that the bus is correctly terminated - the resistance at both ends must be 120 Ω.
- Remove individual modules temporarily to rule out faulty CAN transceivers.

12 CAN Levels Absolute Measurement



The "CAN Levels Absolute" measurement is started immediately when the app is opened and is only quit when the app is closed. The results of the measurement are not saved.

Press  , to setup the measurement (Acquisition time, Reference ground).

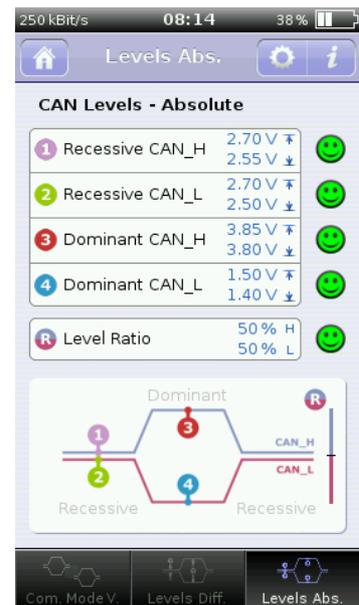
Press  for more information about the measurement.

CANtouch® continuously measures the absolute levels of the CAN_H and CAN_L signals with reference to the "CAN_V-" line. If these levels are too low or too high, misinterpretations by the CAN transceivers and thus communication faults may result.

Any deviations from the voltage levels to be expected are acquired and displayed as a warning or error.

The recessive levels are measured continuously – the dominant levels can only be measured if bus traffic is available.

The "Level Ratio" describes the percentage parts of CAN_H and CAN_L of the difference signal for the dominant bus state. Reduced parts can indicate static shorts of the corresponding line to ground or supply voltage.



What can I do when 😊 or 😞 are displayed?

CAN Levels - Absolute

- Check the cable for short-circuited or interrupted CAN_H or CAN_L signal lines. – To this end, use the "Bus Wiring" measurement.
- Check that the bus is correctly terminated - the resistance at both ends must be 120 Ω.
- Remove individual modules temporarily to rule out faulty CAN transceivers.
- If the Level Ratio of CAN_H is low, check for shorting of this signal line against a supply voltage.
- If the Level Ratio of CAN_L is low, check if this signal line is shorted against ground.

13 Bus Wiring



License required

Press  for more information about the measurement.

Press  longer, to archive the current measurement and press shortly to restore a measurement.

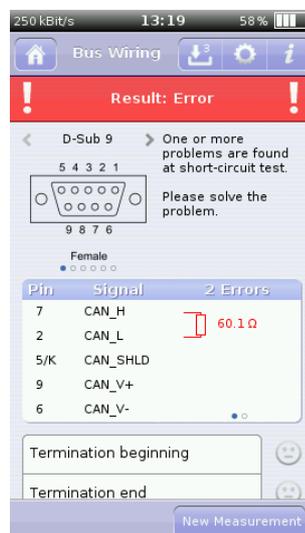
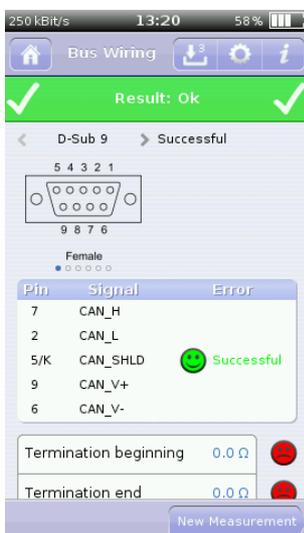
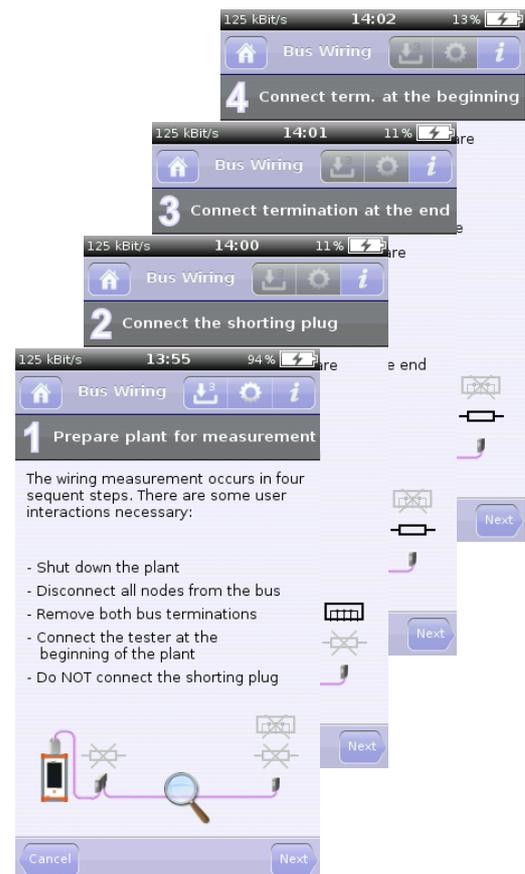
The results of this measurement are saved as a document (XML file) and are also available after restarting the application.

With the wiring test, it is possible to determine line short-circuits, line breaks, the bus termination, the loop resistances of the CAN line and the CAN power supply line, and the overall line length. To ensure correct bus cabling, it is recommended to perform the wiring test at the beginning of any system measurements.

The wiring test is performed as a sequence of four steps. The test requires certain interactions from you, such as activation/deactivation of the terminators and connecting of a shorting plug. A wizard guides you through the process.

Select the plug connector used in your system to display an assignment of the signals to the pins in the plug connector.

The values of the terminators are evaluated by CANTouch®. The measured loop resistance values should coincide with the measurement values of the cable of appropriate line



length used. Higher values than expected are an indication of transition resistances in plug and terminal connections.

14 Node Measurement



License required

Press  for more information about the measurement.

Press  longer, to archive the current measurement and press shortly to restore a measurement.

The results of this measurement are saved as a document (binary file) and are also available after restarting the application. The document can be transferred to other CANtouch® or imported in the CAN-Bus Tester 2 software for further processing like printing or creation of test reports.

To perform several successive measurements, it is possible to archive the current node measurement. Through this a copy of the current document is stored in the "Archive" folder of the selected project with ascending numbering.

14.1 General

The "Node Measurement" realizes the most important measuring function of CANtouch® - the node-related physical measurement of the physical bus characteristics. For a detailed description, refer to Section 19 "Meas. the Physical Bus Characteristics per Node".

Correct assignment of the measured signal levels to the individual nodes requires correct setting of the bus system used (CAN, CANopen, DeviceNet, SAE J1939). The selection can be made via the Settings app, or directly by tapping on the icon of the bus system. When changing the bus system, the list of nodes with all measurements will be deleted.

14.2 Bus system

During a measurement, CANtouch® must detect the message frames of the CAN bus node to be measured to be able to evaluate its physical bus signal. The assignment of a signal to a node is determined by the ID contained in each CAN bus message frame. With the settings CANopen, DeviceNet and SAE J1939, the Node ID, MAC ID or source address is decoded from the CAN ID of the message frame and used for assignment of the node. As soon as this ID or the source address is detected, and if it is identical to that of the node to be measured, the frame concerned is physically measured. With the selection of SAE J1939, the bus systems ISOBUS and NMEA 2000 based on it are also supported.

14.3 List of nodes

The list of nodes is the basis for further node-related measurements. Depending on the bus system selected, you can choose from several predefined node lists. The definition of these node lists can be made via the file "*cantouch.document.app.nodemeasure.config.xml*". Beside the predefined lists, a user-defined node list is always available, which you can freely configure and edit directly on the CANtouch®. The node scan determines automatically, depending on the bus system selected, all transmitting nodes or IDs transmitted on the bus and enters them into the selected list. Nodes already existing in the list and their measurements will not be deleted.

Tap  to switch into the lists editing mode. After this, you can add nodes manually , or you can use the node scan . Tap a node and subsequently   to move the node within the list. Tapping  removes the selected node from the list. To delete the complete list, tap and hold your finger on . By tapping  you are able to edit the selected node.

14.4 Measurement of all nodes

The measurement "Overview" provides a quick overview of the signal conditions of all nodes at the bus. The measured quality value is displayed clearly in a bar diagram for each node. Any minimum and maximum values are also marked graphically so that variations can be recognized easily. This view also displays minimum and maximum values for the quality level, together with a time stamp.

Tap "Start" to start a new measurement.

Tap a bar in the diagram to select a node. If more than 8 nodes are contained in the list, you may also switch to further nodes by wiping to the left or right over the bars.



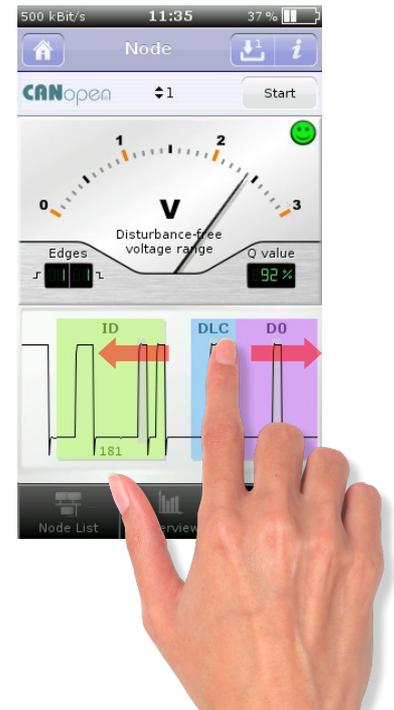
14.5 Measurement of one node

The measurement "Node" serves for the purpose-oriented examination of the signal quality of individual nodes. The view displays the quality level, the disturbance-free voltage range, the worst rising and falling edges, the complete signal waveform and the last measured message frame for the selected node.

Tap "Start" to start a new measurement.

Switch between the individual nodes by tapping the node address in the toolbar and select nodes by swiping up- or downwards.

Swipe up or down on the oscilloscope display to change the zoom factor. Tap and hold your finger to switch between logical and physical representation. The logical representation shows the analog signal characteristic of the measured frame together with an overlaid decoding of the CAN protocol.



What can I do when 😊 or 😞 are displayed? **Quality value, Disturbance-free voltage range, Edge steepness**

- Check the cable for short-circuited or interrupted CAN_H or CAN_L signal lines. – To this end, use the "Bus Wiring" measurement.
- Check that the bus is correctly terminated - the resistance at both ends must be 120 Ω.
- Check your bus with reference to the maximum permissible cable and branch lengths for your baud rate.
- Remove individual modules temporarily to rule out faulty CAN transceivers.
- Replace individual modules or cable segments.

15 Online Trigger Measurement



License required

Press  for more information about the measurement.

Press  longer, to archive the current measurement and press shortly to restore a measurement.

The results of this measurement are saved within two documents (tracks as XML file and oscilloscope as binary file) and are also available after restarting the application. This documents can be transferred to other CANTouch® or imported in the CAN-Bus Tester 2 software for further processing like printing or creation of test reports.

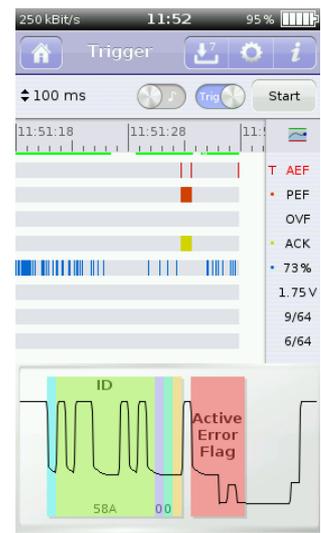
It is possible to archive the current Online Trigger Measurement. Through this a copy of the current document is stored in the "Archive" folder of the selected project with ascending numbering.

15.1 General

The online trigger measurement serves for long-term analysis of the bus system over several days/weeks. In this way, both sporadic bus disturbances (external EMC influences) and a slowly deteriorating signal quality (e.g. due to liquid in the connector) can be detected. For this measurement, **all** message frames on the bus (irrespective of the stations in the List of stations) are subject of the online physical and logical evaluation, and any deviations from a pre-defined threshold value are recorded.

The online trigger measurement can recognize the following trigger events:

- Logical events/ errors
 - Active error frames
 - Passive error frames
 - Overload frames
 - Acknowledge errors
- Physical errors
 - Failure to reach a critical quality level
 - Failure to reach a critical disturbance-free voltage range
 - Exceeding of a critical edge (rising)
 - Exceeding of a critical edge (falling)



Tap  to configure which events / errors are displayed and / or which will trigger the oscilloscope. For the physical errors, the critical threshold values are also set here.

The time axis resolution for the recording of the trigger events is set in the resolution selection box. The shorter the selected time, the greater the amount of measurement data to be assessed. Within the set time

(time slice), each trigger event is recorded in its corresponding channel. Several trigger events (e.g. two faulty frames) within one time slice can no longer be distinguished. In this case, the resolution must be increased. It is not meaningful to set the resolution to a time less than the time required for a message frame at the set baud rate. Each time slice is represented in the display with the width of one pixel.

Tap "Start" to start a new measurement.

The measured values acquired up to this point can be evaluated even while the measurement is still running. (scroll through the tracks).

15.2 Trigger function

Each of the observed trigger events possesses a separate channel, leading to a "trigger" when activated. An oscilloscope of the faulty telegram will be displayed. The trigger function can also be (de)activated during a running measurement.



Measuring does **not** stop when error events occur. The error events are displayed graphically in the corresponding channel.



The measuring stops automatically when the **first** following activated error event occurs.

15.3 Alarm function

The alarm function is a useful function, especially for finding sporadic errors. While you are looking for errors on cables or connectors, you can hear the acoustic feedback from the CANTouch® without having to look at the display.



The alarm function is deactivated.



The alarm function is activated. A sound with a duration of 100 ms is output for every error event.

15.4 Evaluation

The measured values acquired up to this point can be evaluated even while the measurement is still running. A time slice can be marked by tap and hold the finger on the tracks. A tool tip is also displayed with additional information about this time slice. Whilst the measurement is in progress, the current data of the individual channels is displayed on the right hand side. The current, best and worst measured values are recorded for each track since the start of the measurement. The display can be switched between the measured values (current / best / worst) by tapping on it.

The channel in which an error occurred is marked with a "•". In the case of a trigger, the marking changes to a "T". The oscilloscope display then shows the message frame which produced the trigger. All setting and evaluation possibilities correspond to those for the oscilloscope display in the App „Node Measurement“.

16 Protocol Monitor



License required

The send and receive lists are saved as a document (XML file) and are also available after restarting the application. The document can be transferred to other CANTouch® or imported in the CAN-Bus Tester 2 software for further processing.

Use the protocol monitor to record CAN messages or to transmit user-defined CAN messages or multiple CAN messages within message lists (sequences). The reception is optionally possible by means of a symbolic decoding. A long-term recording (trace) supported by trigger conditions is also available.

Press **i** for more information about the protocol monitor.

16.1 Creating messages / sequences

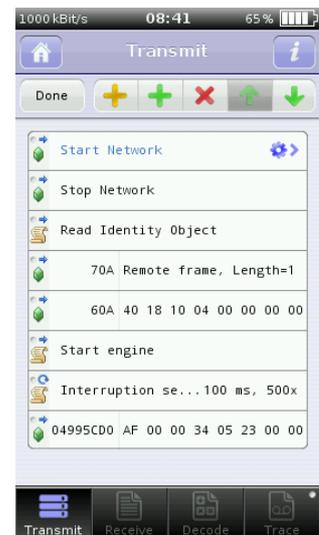
Tap  to switch into the editing mode of the transmit list. Here you can create and modify new messages or sequences.

Tap  for a new  message or tap  to insert a new  sequence into the list. If a message is selected, it can be duplicated by long pressing .

 removes a message or sequence – a long press deletes the complete list.

Use the arrows   to move a message or sequence within the list.

Exit the editing mode by pressing the "Done" button.



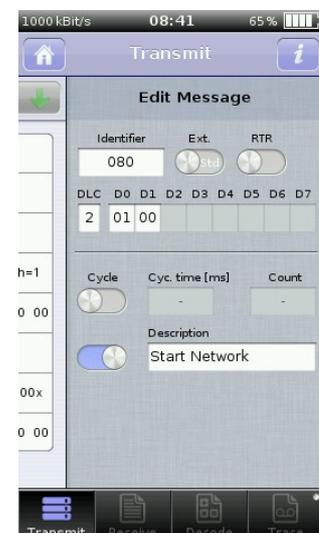
16.2 Edit of messages

Tap  , to edit a message:

Activate "Cycle" to send a message repeatedly with a set cycle time. The "Count" field specifies how often it is sent. If you enter "0", the number of message sending cycles is unlimited.

You can assign a name for each message, which is displayed in the transmit list instead of the ID + data field.

Tap outside the configuration area, or press the Home button to complete the entry and return to the transmit list.



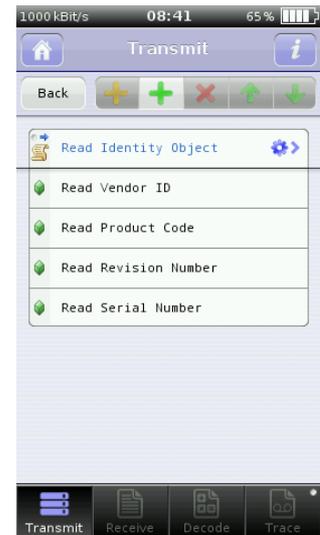
16.3 Edit of sequences

Tap  , to open the message list of a sequence.

Use the ,  and  keys to insert, duplicate and sort messages within the sequence.

Tap  , to edit a message as described above in section "Edit of messages".

Tap  , to edit a sequence. You can assign a name for each sequence, as for messages, and set the cycle time and cycle count.



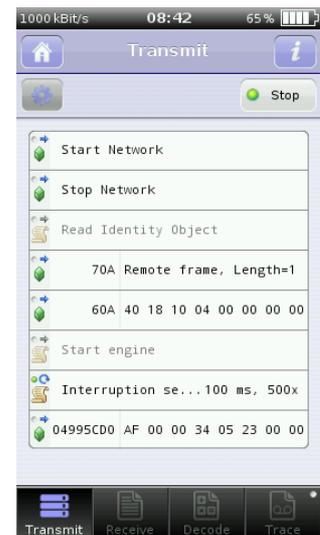
16.4 Transmit messages / sequences

Tap "Start" to activate the CAN controller and to switch to the sending mode. The LED in the top right corner indicates the status of the CAN controller. Tap "Stop" to deactivated the CAN controller.

-  CAN controller active; transmit and receive possible
-  CAN controller has reached or exceeded its warning limit
-  CAN controller has been turned off automatically (Bus off state)
-  CAN controller deactivated

To send a message or sequence, tap it once. Repeated sending of messages and sequences is started in the same way. Sending is quit by tapping them again.

Note: Up to 16 cyclic messages and a sequence can be sent simultaneously.



16.5 Receive messages

The buttons in the toolbar are also active when CAN messages are received and have the following meanings:



Switch between the modes:

Scroll: CAN messages in the order in which they were received

Overwrite: CAN messages sorted by their CAN ID.



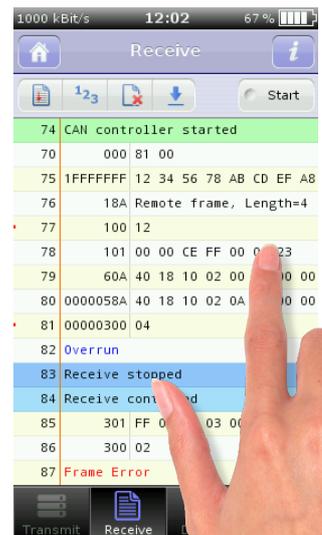
Switches between display of a consecutive number and the time lapse since the previous message



Deletes the complete reception list



Scrolls to the end of the reception list (only available in the "Scrolling" mode)



Tap "Start" to receive CAN messages. Tap "Stop" to stop the reception.

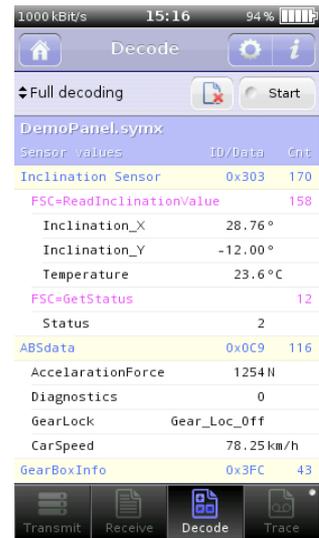
16.6 Receipt of messages with symbolic decoding

CAN messages can be displayed as a symbol to relieve their interpretation. Their representation is adapted via a symbol file.

Multiple symbol files can be available on the device. For decoding the messages, the CANTouch® always uses one symbol file only.

Tap  to display a list of all symbol files available on the device. Select one symbol file to be used for the representation.

Choose a watch list in the left selection box on top to switch between complete and adapted decoding.

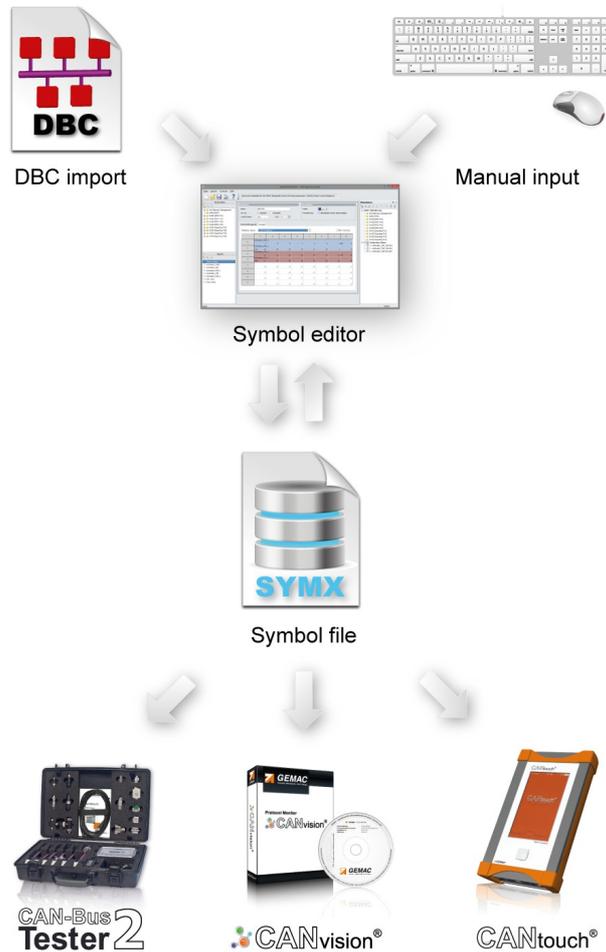


If symbolic representation is selected, the CAN IDs are displayed by their symbolic names. The sequences of bits of a CAN message are marked as signals with names. These signals can display the raw data transmitted by CAN either in decimal or hexadecimal format or – if requested – convert them automatically and show them as a physical value with its unit. With the descriptions of the values (Enums) certain variables can be displayed alphanumerically. Different definitions of the data can be determined in a CAN ID by multiplexers.

Symbol files can be created by using the free of charge symbol editor **CANsymEdit**. This symbol editor is available on GEMAC's website. All created symbol files have to be stored in the folder „SymbolFiles“ on the drive of the CANTouch®.

A detailed description of the creation of symbol files is available in the user manual of the symbol editor.

Tap „Start“ to start the symbolic receipt. Tap „Stop“ to stop the receipt.



16.7 Recording of messages (Trace)

The trace module is used to record all received CAN messages on the bus. It has no visualization, unlike the receiving module in section 16.5 „Receive messages“. By using different trigger conditions the trace can be automatically started and stopped again. Thus, the recording can be limited to specific data.

Start conditions:

- Manual via button
- Start upon receipt of an adjustable CAN identifier

Stop conditions:

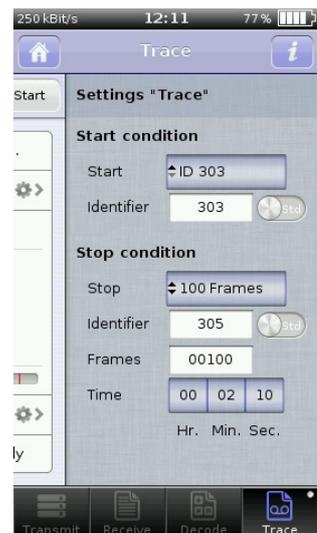
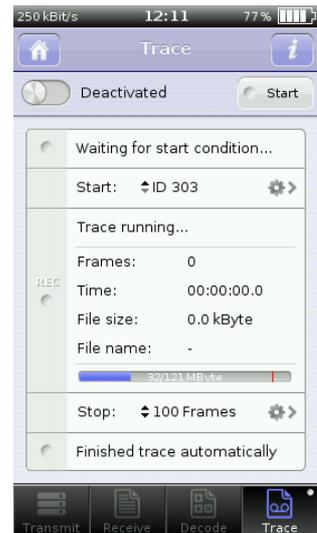
- Manual via button
- Stop upon receipt of an adjustable CAN identifier
- Stop after a configurable number of messages
- Stop after a configurable time

Configuration:

Tap   , to configure start and stop conditions. Tap outside the configuration area or press the Home button to complete the configuration.

The requirements for the recording are an activated CAN controller (start button) and an activated trace module. An ongoing recording is additionally visualized by an LED in the toolbar.

- Recording is inactive (disabled)
- Recording is active: Waiting for start condition
- Recording is active: Recording in progress (start condition has occurred)
- Recording is active: Recording was automatically stopped (stop condition has occurred)



By starting the trace module a new file in the format “can00000.trc” with ascending number is stored in the folder “Tracefiles” on the drive of the CANtouch®. The already used space is visualized by means of a progress bar. Upon reaching the reserve capacity (red line), the recording will stop automatically.

The evaluation of trace files can be done using the CANvision software with version v1.2 This program can also be used to convert the recorded CAN messages into other formats.

17 Automatic Quick Test

The Automatic Quick Test is used to provide an immediate overview of the status of all measured values that the CANtouch® can detect on the CAN bus. The baud rate is determined automatically and a continuous measurement is started. The evaluation of all results of the six free apps is done by a smiley. Also an assessment of the quality values of all bus nodes is running, even if no license for the Node Measurement was acquired. The Smiley represents the worst measurement result of the last measuring cycle.

Enable the automatic quick test by wiping left on the Home screen. It is terminated by pressing the Home button, and by swiping to the right.



18 Settings



Basically, CANtouch® differentiates between device-specific and project-specific settings. While the device-specific settings apply to the entire device, project-specific settings are only valid for the currently active project. Switching to another project then applies its settings.



18.1 Device

18.1.1 Device: Information

 **Versions / update:** This menu item can be used to display the serial number and information about the software version of your CANtouch® and to update the software.

 **Battery:** This menu item can be used to display charge information, the time-to-empty and further parameters in respect of the battery. To calculate the time-to-empty / time-to-full, the current is evaluated over a longer period of time.

 **Memory usage:** You can see the current usage of the integrated memory here. The list is based on file types and projects.

 **Licenses:** This menu item displays the licenses for the optional measurements on your CANtouch®. Tap "Activate Licenses" to enable further measuring functions (see also Section 5.1 "License model").

 **Calibration:** Use this menu item to display the "Certificate of Calibration" (see also Section 21.1 "Maintenance").

 **Manufacturer:** On this page, you will find contact information, such as the address, telephone number, e-mail address and website of the manufacturer of the CANtouch®.



18.1.2 Device: Settings

Language: Use this menu item to set your preferred language for the device. Currently, German and English are available. German is set as the default language.

Brightness: The brightness has great influence on the battery charge. It is recommended to reduce the brightness using the slide controller so that the battery of CANtouch® need not be charged so often or to use the "Auto-Brightness". If this menu item is selected, CANtouch® will use its integrated brightness sensor to adapt the brightness of the screen to the brightness of the environment automatically.

Auto shutdown: Use this menu item to specify after which time the CANtouch® is shutdown in the standby mode automatically.

Button sound: Use this menu item to specify that the CANtouch® plays a sound when a button is pressed. To this end, activate this menu item.

Battery display: Use this menu item to specify whether the battery charge level as a percentage or the estimated time-to-empty / time-to-full of the CANtouch® is displayed in the status bar.

Date & Time: Use this menu item to set the date and the current time for your device. These settings are used for the time stamp of various measurements.



18.2 Project

18.2.1 Project: Selection / management

With the project management, new projects can be created, renamed or deleted. When deleting a project, all data created or stored in this project are also removed.

Tap **gear icon** to get more detailed information about the project and its measuring data, archive files, trace files, symbol files, and screenshots. You can rename the project as well as delete the data individually.

The currently active project is marked accordingly. Tap another project and then select **checkmark icon**, to activate it. The currently active project is saved and the new project will be loaded. The basics of dealing with projects can be found in section 6 "Project management".

18.2.2 Project: CAN bus

 **Baud rate:** Use this menu item to specify the baud rate for the CAN network to be measured or let the CANTouch® determine the rate automatically by pressing and holding down the HOME button.

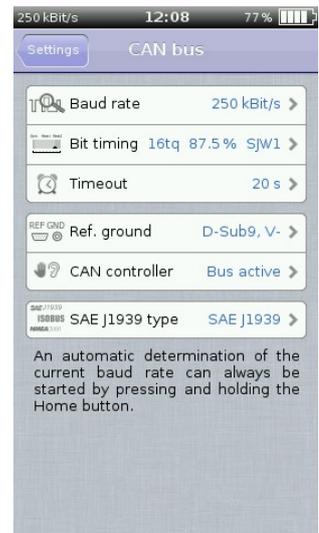
 **Bit timing:** Use this menu to set the bit timing of the CAN controller for the selected baud rate. Adjustable are the number of BTL cycles² (tq), the sample point in percent and the resynchronization jump width (SJW).

 **Timeout:** If no message frame of the node to be detected is measured within the time specified under "Timeout", the currently running measurement is interrupted, and "Timeout" is displayed.

 **Ref. ground:** To be able to determine the absolute signal levels in the measurements "Common-Mode Voltage", "CAN Level Difference" and "CAN Level Absolute", as well as to be able to measure the shield voltage, the reference ground against which these levels were measured must be set. Measurement against CAN_V- (pin 6) of the 9-pin D-Sub CAN socket is set here. If the "CAN_V-" line is not connected in the connector of the cable you are using, then switch the reference ground to the external ground connection and connect it to the ground of the node to be measured.

 **CAN controller:** This setting is only important for the "Protocol Monitor". By default, "Bus Active" is set. If you do not want the CAN controller to generate an "Acknowledge" at the bus, activate the "Listen Only" option. Then, no CAN messages can be sent.

 **SAE J1939 Type:** ISOBUS and NMEA 2000 are based on SAE J1939. The CANTouch® is able to physically measure all three bus systems, since the addressing is identical in each case. You can select the logo of your preferred bus system. The selection has no influence on the method of operation of the CANTouch®.



18.2.3 Project: Screenshots

Briefly press the POWER and the HOME buttons simultaneously to take and save a screenshot. Up to 10 screenshots are taken and saved in the "Screenshots" folder. If more than 10 screenshots are taken, the oldest ones are deleted. The files are saved in the PNG format.

18.2.4 Project: Rating

CANTouch® can perform an automatic evaluation for all of the measured parameters of the CAN network; warnings or errors are represented using the traffic-light principle and smilies. The appropriate limit values are listed in this area for all parameters.

These limits can be adjusted in the file „cantouch.property.rating.xml“ according to the project.

² The number of BTL cycles applies only to the CAN controller. The bit sampling for the physical measurements is always 64 times.

18.3 Reset

18.3.1 Reset: Restore factory settings

Select this menu item to **completely** reset the CANtouch® to factory settings. All settings and all projects including all measurement data as well as all user data are deleted. Apart from the data at the time of delivery, only an additionally installed license file is retained. If necessary, backup your personal data before calling this function!

18.4 Alternative Home screen background

For a better differentiation of the projects or for personalization, an alternative background for the Home screen can be set up for the CANtouch®. At first the device searches for an image file in PNG format named "Background.png" with the dimensions 272x480px or 272x420px in the project folder and then alternatively in the main directory. Thus it is possible to use a different background per project. Newly created projects will use then, if available, the background file from the main directory, otherwise the default background.

18.5 Control Center

The Control Center is a setting panel for the frequently used settings, which is available everywhere. Open the control center by swiping up from the bottom edge of any screen. To close, you can swipe down, tap outside the Control Center, or press the Home button.



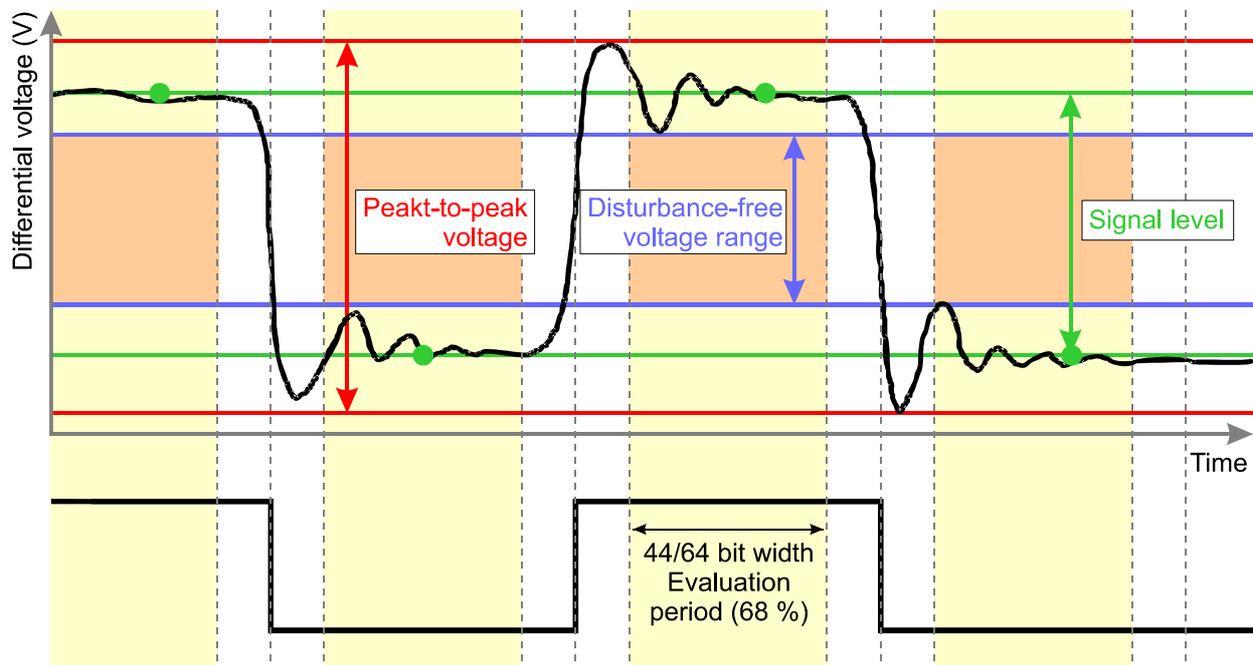
19 Meas. the Physical Bus Characteristics per Node

CANtouch® allows to measure and display the signal conditions of each CAN bus node. Any problems with the appropriate node or with the bus cabling can be inferred from the results of the signal quality. CANtouch® displays the following physical bus characteristics for each CAN bus node separately:

- General quality level (0 ... 100%)
- Disturbance-free voltage range (minimum, interference-free differential voltage)
- Edge steepness (worst rising and falling edges of the message frame)
- Oscilloscope display with frame analysis for the complete message frame

The CAN bus uses a difference signal, i.e. the actual data signal is transferred via two lines inverted to each other (CAN_H and CAN_L). The difference between these two lines generates the signal digitized by each CAN bus transceiver. Any faults occurring there can endanger the correct detection of the bit stream. CANtouch® provides an evaluation of the difference signal in the form of a general quality value, the disturbance-free voltage range and the edge steepness, as well as using the oscilloscope display. All these measurements are determined within a message frame.

Contrary to the quality level providing a general evaluation of the signal quality for the bus, the determination of the disturbance-free voltage range and of the edges, as well as the oscilloscope display are useful aids for targeted troubleshooting.



Definition of disturbance-free voltage range, peak-to-peak voltage and signal level

19.1 Disturbance-free voltage range

The disturbance-free voltage range is understood as the disturbance-free range of the differential voltage, which is determined over a certain part of each bit¹ of the message frames of the node to be measured. This part is called evaluation period.

Each bit is sampled 64 times. The disturbance-free voltage range is evaluated over 44/64 of the bit width (68% of the evaluation period). At the beginning and the end of each bit, 10/64 each of the bit width are excluded from the determination of the disturbance-free voltage range. Signal overshoot and settling processes are excluded from the interference voltage measurement, if they lie outside the evaluation period. A voltage drop of less than 1/64 of the bit time during the evaluation period cannot be detected reliably any more and in this case also has no influence on the determination of the disturbance-free voltage range.

Note: Enhanced Measurement of the Disturbance-free voltage range



By using the existing process to measure the disturbance-free voltage range, sometimes drops in recessive bits could not be identified securely. Thus, the CANTouch firmware version v1.80 and the CAN-Bus Tester 2 PC software v4.4.0.0 and newer versions of them offer an enhanced measurement process by default. The manufacturer highly recommends to use this enhanced process for new measurements. As the disturbance-free voltage range also influences the calculation of the quality level, this value changes as well.

The old process is further available in Legacy Mode for compatibility intentions with existing measurements. That old process can be activated by entering **LegacyMode="1"** into the file „cantouch.property.options.xml“ on the drive of the CANTouch®.

19.2 Edge steepness

To evaluate the transmission properties of the bus cabling and of the individual CAN bus nodes completely, in addition to the disturbance-free voltage range, the edges must also be studied; shallow edges can also prevent the correct decoding of the transmission signal.

CANTouch® determines the edge steepness for rising and falling edges separately. To this end, two thresholds are set at 10% and 90% of the signal level determined (determined differential voltage at sample point). The time required by the difference signal to change between these voltage threshold values is measured both for falling and rising edges. The rise and fall times are determined with a resolution of 1/64 of the baud rate used and displayed as a value between 0/64 and 64/64. This value always specifies the slowest rising and falling edge of the measured frame. A measured value of 0/64 means that the level change takes place in less than 1/64 of the bit width.

19.3 General quality level

The quality level is a generally valid expression of the signal quality on the bus. It represents the most important physical properties of the bus and summarizes these in a single value. The quality level is specified as a percentage value. The value range is 0...100%.

The value is determined from the following three components important for the signal quality:

- Edge steepness

The edge steepness is measured as $x/64$. A steepness of $0/64$ represents an ideal edge steepness and is valued as 100%. The worst flank is defined as $32/64$ and equates to 0%.

$$\text{Edge steepness}[\%] = \frac{32-x}{32} \cdot 100\% \rightarrow x=0 \dots 32$$

- Disturbance-free voltage range

A disturbance-free voltage range of 1.0 V is defined as 0% – a value of 2.2 V as 100%.

$$\text{Disturbance-free voltage range}[\%] = \frac{U_{\text{disturb}} - 1.0V}{2.2V - 1.0V} \cdot 100\% \rightarrow U_{\text{disturb}} = 1.0V \dots 2.2V$$

- Reflection

Reflection is the relationship of the disturbance-free voltage range to the peak-to-peak voltage. If the peak-to-peak voltage is identical to the disturbance-free voltage range, this is the ideal case and represents 100%. If the peak-to-peak voltage is twice the value of the disturbance-free voltage range, this is defined as 0%.

$$\text{Reflection}[\%] = \left(2 - \frac{U_{SS}}{U_{\text{disturb}}}\right) \cdot 100\% \rightarrow U_{SS}/U_{\text{disturb}} = 0.0V \dots 3.0V$$

All three components contribute equally to the calculation of the quality level.

$$\text{Quality level}[\%] = \frac{\text{Edge steepness}[\%]}{3} + \frac{\text{Dist. - free voltage range}[\%]}{3} + \frac{\text{Reflecons}[\%]}{3}$$

19.4 Oscilloscope display with message frame analysis

To be able to evaluate signal transitions and measure reflections, CANtouch® records the signal characteristic of the measured message frame and represents it on the oscilloscope display of the "Node Measurement". Sampling is performed at 64 times the set baud rate over a total of 160 bits (64 x 160 = 10,240 points). The trigger point for the recording always lies on the first edge of the relevant message frame with an advance of 3 bits.

20 Technical Specifications

General parameters and overview of functions			
Languages	German, English		
Bus systems	CAN (ISO11898-2), CANopen, DeviceNet, SAE J1939 (ISOBUS, NMEA 2000)		
Bit sampling	64-fold, 10240 sampling points		
Bit timing	Adjustable BTL cycles (tq), sample point and resynchronization jump width (SJW)		
Supported baud rates	Default baud rates: 10; 20; 50; 100; 125; 250; 500; 800; 1000 kbit/s Additionally user-defined: 5; 33.3; 62.5; 75; 83.3; 200 kbit/s, additional on request Automatic detection via baud rate scan, bit timing adjustable		
Bus status	Bus traffic detection (display: undefined, dominant, recessive, bus traffic) Display of the Bus traffic load (0 ... 100 %), characteristic, min. and max. value saving		
Bus errors	Display of detected frame errors Distinction between active and passive error frames (0 ... >50,000), trend chart		
Bus voltages	Display of the optional CAN supply voltage and shield voltage Characteristic, minimum and maximum value saving		
Common-mode voltage	Acquisition of the maximum voltage offset between the individual bus nodes		
CAN level (absolute / differential)	Acquisition and evaluation of the differential and absolute CAN levels of all bus nodes during operation		
Node measurement	Node related measurements Quality value (signal quality), Disturbance-free voltage range, Edge steepness (falling and rising) and Oscilloscope display with message frame analysis		
Online Trigger measurement	Resolutions : 10 ms, 100 ms, 1 s, 30 s, 1 min Time slots : max. 10,000 (regardless of the selected resolution)		
Protocol monitor	Send / receive of CAN messages, symbolic decoding, recording with trigger conditions		
Electrical parameters			
Power supply and battery*	Integrated, rechargeable lithium-ion battery External power input: SELV d. c. voltage 14 V, internal fused with 2.5 A Operating with the supplied 35 W wide-range power supply unit only (SAW-14.0-2500)		
	Times-to-empty:	Standby:	up to 500 hours
		Use:	up to 36 hours
		Measuring:	up to 6 hours
	Charge times:	Quick charge to 80% in approx. 1 h	
		Full charge in approx. 2 h	
Potential difference between the CAN bus and USB connections	< 500 V AC		
Voltage between any two terminals of the CAN connection or external ground, resp.	< ±30 V DC		
Measurements	Range	Resolution	Accuracy (typ.)
Quality value	0.0 % ... 100.0 %	0.1 %	-
Edge steepness	0/64 ... 64/64	1/64	-
Disturbance-free voltage range	-0.75 V ... +3.25 V	0.05 V	1.90 % ±100 mV
Measuring of the differential voltage	-0.75 V ... +3.25 V	0.01 V	0.50 % ±10 mV (calibrated)
Measuring of the absolute voltage	-5.00 V ... +10.00 V	0.05 V	0.50 % ±50 mV (calibrated)
Measuring of the shield voltage	-10.0 V ... +1.0 V	0.1 V	0.25 % ±100 mV (calibrated)
Measuring of the CAN supply voltage	0.0 V ... 32.0 V	0.1 V	0.25 % ±100 mV (calibrated)
Measuring of the loop resistances	0 Ω ... 100 Ω 100 Ω ... 1000 Ω	0.1 Ω 1.0 Ω	0.85 % ±0,2 Ω 0.85 % ±2,0 Ω
Measuring of the cable length	2 m ... 1000 m	1 m	5 % ± 2 m (signal propagation delay: 4.5 ns/m)

* Rechargeable batteries have a limited number of charging cycles and must eventually be replaced. Over time the charge capacity of the battery will be reduced. This is not considered a fault nor covered by the guarantee. The time-to-empty of the battery and the actual number of charge cycles are dependent on its use and the selected settings.

Mechanical parameters	
Power supply unit connection	Extra-low voltage socket
CAN connection	9-pin D-Sub connector
PC connection	Self-powered device to USB Specification 2.0, full speed, in addition, electrically isolated Connection of a drive for exchange of measuring data (USB mass storage device)
Housing	Aluminum housing, cover glass
Ambient conditions	Operation temperature: 5 °C ... 40 °C Storage temperature: -20 °C ... 60 °C Atmospheric humidity: 20 % ... 85 %, non-condensing
Degree of protection of the housing	IP20 to EN 60529
Dimensions	186 mm x 102 mm x 37 mm
Weight	Approx. 860 g

21 Maintenance and Customer Service

21.1 Maintenance

The CANtouch® is maintenance-free. For some measured values (Technical Specifications), calibration including adjustment is performed during manufacture of the device. The calibration certificate is stored electronically on the device.

A regular calibration is not necessary. In case of customer-specific requirements, a new calibration with adjustment can be carried out by the manufacturer. Therefore a printable calibration certificate (PDF) is optionally available.

21.2 Customer service

21.2.1 Return

If you send the CANtouch® for calibration or repair, use only the original or equivalent packaging. Please give a brief description of the problem and your telephone number in case we have any questions.

21.2.2 Support

Further information about our CAN product family and newer product versions and updates for your device can be found on our website. If you have any technical questions, please specify the serial number of your device and its firmware version.

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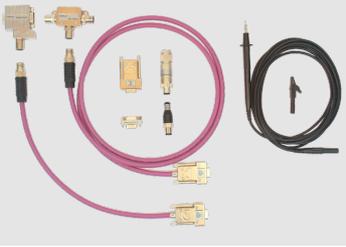
21.2.3 Warranty and limitation of liability

We will assume a warranty of 24 months for the CANtouch®, commencing from the date of delivery. Any repairs which are required during this time and fall under the manufacturer's obligation to give a warranty will be performed free of charge. Any damage resulting from improper use of the device or from exceeding of the specified technical parameters is not covered by the manufacturer's obligation to give a warranty.

GEMAC Chemnitz GmbH will only be liable for consequential damage resulting from use of the product in case of deliberate action or gross negligence on its own part.

The General Terms and Conditions of GEMAC Chemnitz GmbH will apply.

22 Ordering Information

Product	Description	Article number		
CANtouch® Complete Set				
	Complete set containing: <ul style="list-style-type: none"> CANtouch® - Basic Set (PR-22580-00) Adapter Set (PR-22580-10) Service Case (PR-22580-50) 	PR-22580-81		
CANtouch® Basic Set				
	CANtouch® incl. power supply (type: SAW-14.0-2500), power supply cord, USB cable, 2 manuals (German / English)	PR-22580-00		
Adapter Set				
	CAN connection cable 0.3 m CAN connection cable 1.5 m Adapter 2x 9-pin D-Sub / 1x M12 full metal M12 T-piece full metal Shorting plug M12 Shorting plug 9-pin D-Sub Termination resistor M12 Termination resistor 9-pin D-Sub 4 mm safety testing wire 3 m length 4 mm safety crocodile clip	PR-22580-10		
Service Case				
	Robust case with foam inserts for the CANtouch® basic set and adapter set	PR-22580-50		
*Figure shows service case with CANtouch®				
Licenses for optional Software Modules				
License "Node Measurement"	CAN	License key for the Application: "Node Measurement"	CAN	SW-22580-00
	CANopen		CANopen	SW-22580-01
	DeviceNet		DeviceNet	SW-22580-02
	SAE J1939		SAE J1939	SW-22580-03
License "Bus Wiring"	License key for measuring of the bus wiring		SW-22580-10	
License "Protocol Monitor"	License key for the CAN Protocol Monitor (Transmit / Receive)		SW-22580-11	
License "Online Trigger"	License key for the Online Trigger measurement		SW-22580-15	
Maintenance				
Battery change service	Replacement of the integrated battery		PR-22580-90	
Calibration service	Calibration including adjustment of the CAN input circuit		PR-22580-92	

Ordering Information

