



# GEMAC

Sensorik. Messtechnik. ASIC-Design.

## User manual

### CANobserver<sup>®</sup>

Version: 1.3

Date: 2013-11-15



GEMAC - Gesellschaft für  
Mikroelektronikanwendung Chemnitz mbH  
Zwickauer Straße 227  
09116 Chemnitz  
Germany

Phone: +49 371 3377 - 0  
Fax: +49 371 3377 - 272  
E-mail: [info@gemac-chemnitz.de](mailto:info@gemac-chemnitz.de)  
Web: [www.gemac-chemnitz.de](http://www.gemac-chemnitz.de)

## Revision Overview

Date	Revision	Change(s)
2007-06-12	0	First version
2010-04-01	1	Changes to new CI, new Functions, e-mail notification, etc...
2011-02-21	2	Changing behavior of reset button, technical data
2013-11-15	3	Replacement of Java-Applets with HTML5

© Copyright 2013 GEMAC - Gesellschaft für Mikroelektronikanwendung Chemnitz mbH

Subject to change without prior notice.

Our policy is one of continuous improvement, and consequently the equipment may vary slightly from the description and specifications in this publication. The specifications, illustrations and descriptions provided in this documentation are not binding in detail.

No part of this publication may be reproduced in any form, or by any means, without the prior written permission of GEMAC mbH.

All rights according to copyright law expressly reserved to GEMAC mbH.

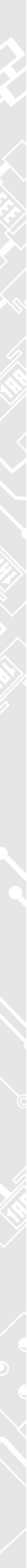
**Note:**

To use the CANobserver®, and for proper understanding of this manual, general knowledge of the field bus systems CAN, CANopen, DeviceNet and/or SAE J1939 are required.

# Table of Contents

1 Introduction.....	1
2 Start-up.....	3
2.1 Receiving inspection and testing.....	3
2.2 Acclimatizing the device.....	3
2.3 Prevention of accidents.....	3
2.4 Connecting the device.....	3
2.4.1 Design.....	3
2.4.2 Power supply.....	4
2.4.3 Connection to the CAN bus.....	4
2.4.4 Connection to the network.....	4
2.4.5 START/STOP button.....	4
2.4.6 BUS STATUS LED.....	4
2.4.7 Error LEDs.....	4
2.4.8 Isolated error output.....	5
2.4.9 Resetting the device.....	5
3 Functions and Measuring Principle.....	6
3.1 The most important measuring functions.....	6
3.2 Measuring the physical bus characteristics.....	6
3.2.1 Disturbance-free voltage range.....	7
3.2.2 Edge steepness.....	7
3.2.3 General quality level.....	8
3.3 Bus condition.....	9
3.3.1 Bus status.....	9
3.3.2 Bus traffic load.....	9
3.3.3 Optional CAN supply voltage.....	9
4 General - TCP/IP Communication.....	10
5 Connection to the Network.....	10
6 Working with the Web Interface.....	11
6.1 Language selection.....	11
6.2 Menu structure.....	11
6.3 Status display.....	11
6.3.1 Device status.....	12
6.3.2 Bus status.....	12
6.3.3 Bus traffic load.....	13
6.3.4 CAN-supply voltage.....	13
6.4 Device.....	14
6.4.1 Status.....	14
6.4.2 Date/Time.....	14

6.4.3 Network.....	15
6.4.4 HTTP.....	15
6.4.5 SMTP.....	15
6.4.6 SNMP.....	15
6.4.7 Reset.....	15
6.4.7.1 Reset configuration.....	15
6.4.7.2 Delete data records.....	15
6.4.8 Restart.....	15
6.5 Online monitoring.....	16
6.5.1 Configuration: bus system.....	16
6.5.1.1 Segment name.....	16
6.5.1.2 CAN type.....	16
6.5.1.3 Baud rate.....	16
6.5.1.4 Baud rate scan.....	17
6.5.1.5 Create Overview.....	17
6.5.2 Configuration: notification.....	18
6.5.2.1 Device notification.....	18
6.5.2.2 Status notification.....	18
6.5.2.3 Error notification.....	18
6.5.3 Configuration: error output.....	20
6.5.4 Configuration: monitoring.....	21
6.5.4.1 Configuring the threshold values.....	21
6.5.4.2 Configuring Resolution and runtime.....	22
6.5.5 Display: monitoring.....	23
6.6 Help.....	24
6.6.1 Contact.....	24
6.6.2 Manual.....	24
6.6.3 Quick start guide.....	24
6.7 Default device parameters.....	25
7 Technical Specifications.....	26
8 Scope of Supply.....	27
9 Maintenance and Customer Service.....	28
9.1 Maintenance.....	28
9.2 Customer service.....	28
9.2.1 Return.....	28
9.2.2 Support.....	28
9.2.3 Warranty and limitation of liability.....	28
10 Ordering Information.....	29
11 Problem Solutions.....	30
11.1 Problems with the connection to CANobserver®.....	30
11.2 Problems with the web interface.....	30



11.3 Problems when measuring.....	31
12 Notes.....	32

## List of Tables

Table 1: CAN-bus connector pin assignment.....	4
Table 2: Designation of the error LEDs on the device.....	5
Table 3: Recording time depending on the resolution.....	22
Table 4: Default device parameters.....	25
Table 5: Technical specifications.....	26
Table 6: Ordering information.....	29

## List of Figures

Figure 1: Using CANobserver®.....	1
Figure 2: Connections and controls elements of CANobserver®.....	3
Figure 3: CAN bus connector.....	4
Figure 4: Definition of disturbance-free voltage range, peak-to-peak voltage and signal level.....	7
Figure 5: Overview Web interface.....	11
Figure 6: Status display.....	12
Figure 7: Device - Status.....	14
Figure 8: Configuration: bus system.....	16
Figure 9: Configuration: notification.....	18
Figure 10: Configuration: error output.....	20
Figure 11: Configuration: monitoring.....	21

# 1 Introduction

Thank you for purchasing CANobserver®. You have acquired a valuable tool which will support you in the monitoring and servicing/maintenance of your CAN bus system.

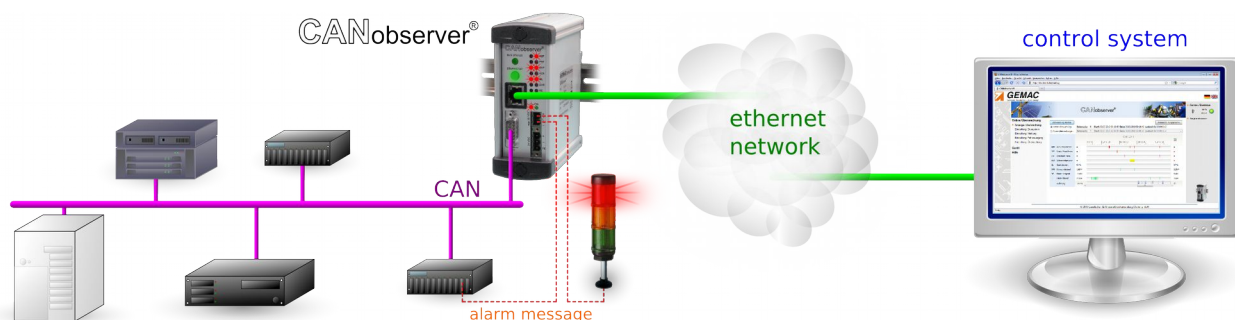
If a system is at standstill, it is already too late in most cases. To be able to initiate countermeasures in good time, it is recommended to perform maintenance both for the system components and for the bus system as a whole at regular intervals. The operating parameters of the bus system deteriorate over the time due to wear. CANobserver® from GEMAC diagnoses such changes during operation and reports them to the system operator.



This necessity has also been recognized by the VDI/VDE. In 2007, the new guideline 2184 was issued, outlining how system operators can guarantee reliable operation and maintenance of their field bus systems.

CANobserver® is a diagnostic tool for physical and logical long-term monitoring of CAN-bus systems and is designed as a locally installed supplement to the CAN-Bus Tester 2. It is integrated permanently into the network, monitors the data transfer continuously and records the deviation from a predefined threshold automatically for a period of up to ten years. Thanks to CANobserver®, sporadic bus interference, such as external EMC interference or a slowly deteriorating signal quality attributable to worn plug connections, can be detected in good time. Such interference is reported to the system operator who can then draw the corresponding conclusions for preventive maintenance intervals in the future. This is the only way to ensure a status-oriented maintenance.

To this end, the signal conditions of each CAN bus node are subjected to a physical and logical evaluation, and any deviations from a predefined threshold value are recorded. The weaker the signal quality of a message frame, the higher its error potential. If errors can be rectified, the signal quality will be better, the bus will work reliably, the system will be less susceptible to EMC interference, and system standstill can be avoided. In this context, the physical layer diagnosis offers decisive advantages: It reveals error sources in the physical set-up of CAN, CANopen, DeviceNet and SAE J1939 systems at an early stage. Thus, CANobserver® is already able to inform the system operator before any communication error occurs. Other monitoring tools do not react until the error occurs, as they only monitor the logical data transfer. The present and past status of the system can be visualized centrally through the control center software, either via a web interface or automatically via SNMP polling. With both variants, the system operator can make in-



**Figure 1: Using CANobserver®**  
 Document: 22550-HB-1-3-E-CANobserver



dividual use of the resulting data records. The information output via web interface offers a graphically prepared representation for the user and provides ideal configuration and start-up possibilities. Further use of these data by a control center, however, calls for measuring data to be provided in numeric form. Therefore, in addition to the web interface, CANobserver® provides an SNMP interface. The Simple Network Management Protocol is an IETF-standardized protocol to transfer diagnosis information. In addition, all OPC-capable applications in automation technology benefit from the measuring functions of CANobserver® thanks to the SNMP/OPC gateway. The common general feature of all variants is that they provide remote maintenance and configuration. In this way, it is neither necessary to connect a computer locally, nor must the system operator be present on the site.

As already mentioned, CANobserver® is designed as a locally installed supplement to CAN-Bus Tester 2 (CBT2): We recommend use of the CBT2 to perform initial measurements on the system to be monitored. The CBT2 operates according to the same measuring principle as CANobserver® and supports the system operator in starting up the system. The monitoring of the signal quality determined on the basis of these measurements can then be ensured with CANobserver®. If CANobserver® detects any errors in the system, CBT2 will help you in further troubleshooting with additional node-specific diagnostic functions.

## 2 Start-up

### 2.1 Receiving inspection and testing

Carefully unpack and check the device 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. Check the completeness of the delivery against Chapter 8 "Scope of Supply".

### 2.2 Acclimatizing the device

Before turning on the device, make sure that it has acclimatized to room temperature. This should take max. 60 minutes.

### 2.3 Prevention of accidents

When operating this test device, it is imperative to observe the general accident prevention regulations for the use of measuring instruments. The device must only be used in dry rooms. This device contains a lithium battery. This battery should never be removed or changed by the user. If an exchange becomes necessary please contact the support address mentioned in section 9.2 of this manual.

**ATTENTION:** Wrong handling of lithium batteries can lead to explosion. These batteries must not be re-charged, disassembled or burned. Disregard can cause injury to persons and damage to the device.

### 2.4 Connecting the device

#### 2.4.1 Design

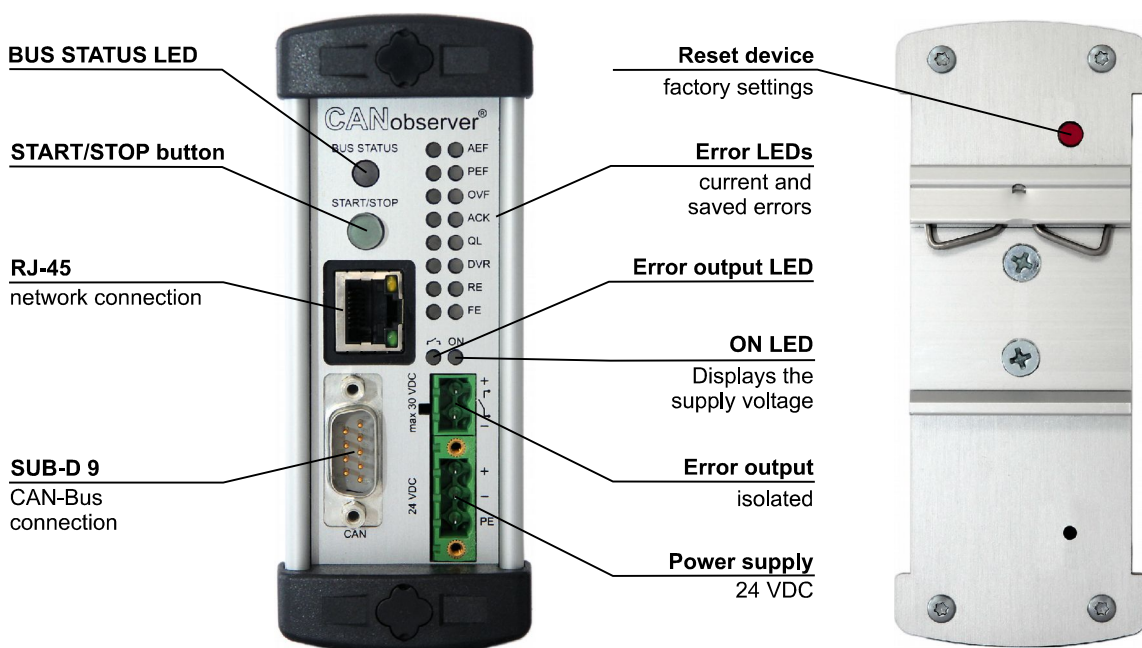


Figure 2: Connections and controls elements of CANobserver®

Figure 2 shows all connections and control elements of CANobserver®.

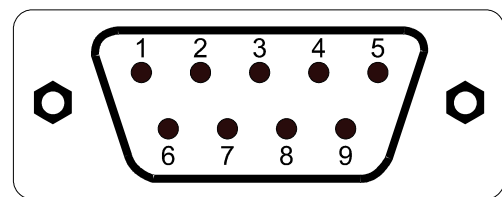
### 2.4.2 Power supply

CANobserver® requires a 24 V DC power supply to be connected to the device using the supplied connectors (observe the polarity). The pin with the designation "PE" can be used as the protective earth. The green ON LED is lit when the operating voltage is present.

### 2.4.3 Connection to the CAN bus

Connect the system to be tested to the CAN D-SUB 9 connector on CANobserver®. An appropriate D-SUB 9 conduit thread connector is available as a self-assembled accessory (see Section 10 "Ordering Information") for connection to CAN-based field bus systems which possess other connectors (M12, 7/8", open style). The pin assignment of the CAN D-SUB 9 connector of CANobserver® is as follows:

Pin	Signal	Belegung
1	-	-
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	Shield
4	-	-
5	CAN_SHLD	Shield
6	OPT_GND	Ground for CAN supply voltage (V- / 0 V)
7	CAN_H	CAN_H bus line (dominant high)
8	-	-
9	CAN_V+	Positive CAN supply voltage (V+ / 24 V)
-	Metal protective collar	Shield



**Table 1: CAN-bus connector pin assignment**

**Figure 3: CAN bus connector**

### 2.4.4 Connection to the network

CANobserver® is connected to a PC, notebook or control center via an Ethernet interface. It is possible to use crossover or patch cables.

### 2.4.5 START/STOP button

The START/STOP button is used to start or stop the monitoring of the connected CAN bus. When the monitoring is running, the button is lit green.

### 2.4.6 BUS STATUS LED

During operation, the **BUS STATUS** LED indicates whether or not there is data traffic on the CAN bus. The colors correspond to those of the bus status LED in the web interface (see Section 6.3.2 : "Bus status").

### 2.4.7 Error LEDs

Two error LEDs are provided on the front of the device to indicate events and errors recorded by CANobserver®. The left LED shows the current status and the LED on the right the stored status of the event or error.

Logical Events / Errors		
<b>AEF</b>	<b>Active-Error Frame</b>	
<b>PEF</b>	<b>Passive-Error Frame</b>	
<b>OVF</b>	<b>OVERload Frame</b>	
<b>ACK</b>	<b>ACKnowledge Error</b>	
Physical Errors		
<b>QL</b>	<b>Quality Level</b>	- the signal level has fallen below the critical quality level
<b>DVR</b>	<b>Disturbance-free Voltage Range</b>	- the disturbance-free voltage has fallen below the permissible range
<b>RE</b>	<b>Rising Edge</b>	- the critical edge (rising) was exceeded
<b>FE</b>	<b>Falling Edge</b>	- the critical edge (falling) was exceeded

**Table 2: Designation of the error LEDs on the device**

When the monitoring is started, all error LEDs are off. The LEDs on the left-hand side, which display the currently present errors, are lit as long as the corresponding error is present and the monitoring is active. The LEDs on the right, which display the stored errors, remain lit permanently from the time when the first error occurs until a new monitoring is started.

#### 2.4.8 Isolated error output

To be able to report any errors detected by CANobserver® back to the system or on to any other device, each error LED can be associated with an isolated error output.

#### 2.4.9 Resetting the device

To restore the factory settings, hold down the red button on the rear of the device for ten seconds. After the following restart, the device will start up with the "Default device parameters" specified in Section 6.7 .

## 3 Functions and Measuring Principle

### 3.1 The most important measuring functions

The CANobserver® can measure and display the signal conditions of each CAN bus station. Problems with the appropriate station or with the bus cabling can be inferred from the results of the signal quality measurement.

CANobserver® can detect the following logical events / errors:

- Active error / passive error frames

Error frames are part of the error management in the data link layer implemented in all CAN controllers. The error management can detect bit, bit stuffing, CRC, format and acknowledgment errors. Each error detected by the error management is notified to all other bus stations by way of an error frame. This is achieved with a deliberate coding violation. If sporadic, or even frequent errors occur, this is generally attributable to problems with the physical bus characteristics and the corresponding transmission problems.

- Overload frames

Another special case is that of the overload frames. Their design is identical to the error frames, with the difference that error frames are issued within a message, and overload frames between messages. With these frames, a CAN controller informs the others that it is currently not in a position to process a new message frame. As a result, the start of the subsequent message is delayed.

- Acknowledge error

All bus nodes which have recognized an issued message correctly acknowledge this by sending a dominant bit in the ACK slot of the message. The valid recognition of this acknowledgment, however, only specifies that at least one node at the bus has recognized the message frame as valid. If the message is not acknowledged, the CAN controller will immediately put it to the bus again.

In addition to the logical events and errors, CANobserver® can determine and monitor the following physical properties of the CAN bus:

- 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)

In addition to the logical and physical measurements, CANobserver® continuously checks the bus load, the bus status and the optional CAN supply voltages.

The individual measuring functions are described in detail in the following subsections.

### 3.2 Measuring the physical bus characteristics

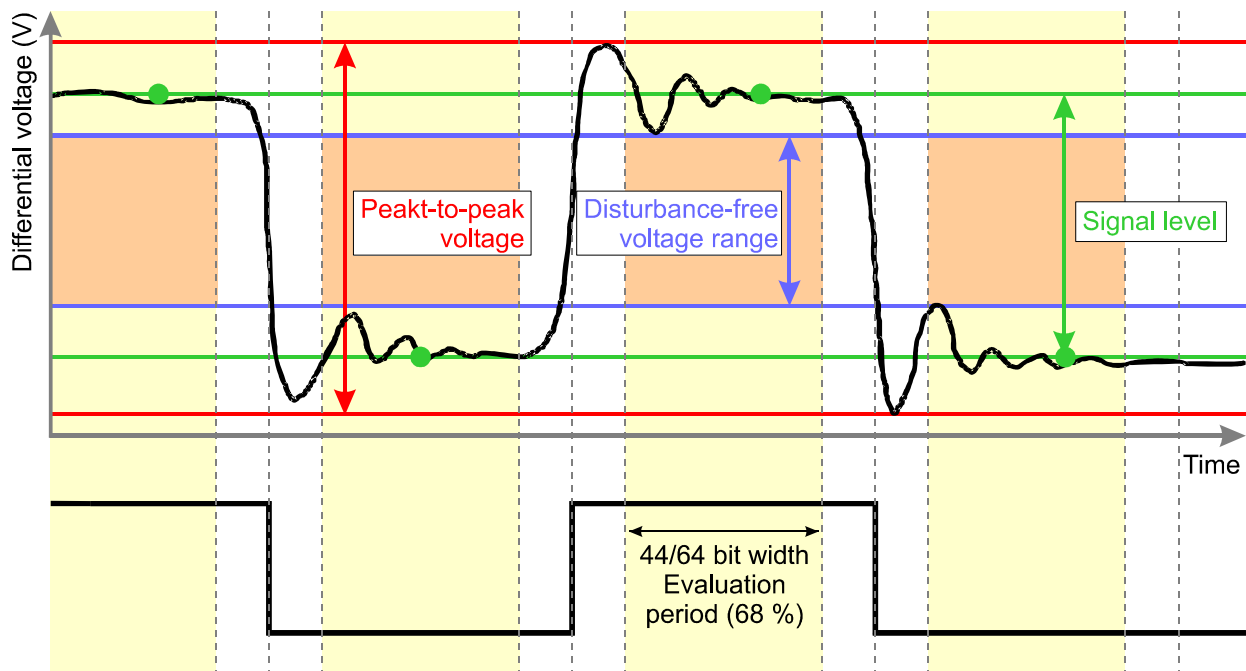
The CAN bus uses a difference signal, i.e. the actual data signal is transferred via two lines inverted to each other (CAN\_H and CAN\_L). The difference between these two lines generates the signal digitized by each CAN bus transceiver. Any faults occurring there can endanger the correct detection of the bit stream. CANobserver® provides an evaluation of the difference signal in the form of a general quality value, the dis-

turbance-free voltage range and the edge steepness. All these measurements are determined within a message frame.

Alongside the quality level, which provides a general evaluation of the signal quality for the bus, the determination of the disturbance-free voltage range and of the edges is a useful aid for targeted troubleshooting.

### 3.2.1 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 bit<sup>1</sup> of the message frames of the station to be measured. This part is called evaluation period.



**Figure 4: Definition of disturbance-free voltage range, peak-to-peak voltage and signal level**

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 (see Figure 4). 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.

### 3.2.2 Edge steepness

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

<sup>1</sup> During the arbitration phase (start bit + ID + RTR), as well as during the acknowledge phase, there is no evaluation of the physical properties of the message frame, as several bus stations could be driving the signal during these phases.

The CANobserver® determines the edge steepness separately for rising and falling edges. To this end, two thresholds are set at 10% and 90% of the signal level determined (determined differential voltage at  $42/64 = 2/3 = 66\%$ , see Figure 4). 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.

### 3.2.3 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  $0 \dots 100\%$ .

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  $1.0 \text{ V}$  is defined as  $0\%$  – a value of  $2.2 \text{ V}$  as  $100\%$ .

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

- 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  $0\%$ .

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

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

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

### **3.3 Bus condition**

The bus condition consists of three parts: Bus status, Bus traffic load and optional CAN supply voltage. Independently of the running monitoring, the bus condition is measured continuously and displayed in the web view.

#### **3.3.1 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 (level change) is present and whether or not the CANobserver® 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 outside a permissible range, this will be indicated. Conclusions regarding errors in the bus cabling can be drawn from the value of this difference voltage. A precise description of the individual states is to be found in Section 6.3.2 “Bus status“.

#### **3.3.2 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.

For this measurement to function correctly, it is sufficient to set the baud rate of the CAN bus segment and to connect the CANobserver® to the system. The device then determines the bus traffic load cyclically over durations of one second each.

#### **3.3.3 Optional CAN supply voltage**

The 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.



## 4 General - TCP/IP Communication

CANobserver® possesses a 10/100 Base-T Ethernet connection with a TCP/IP protocol stack and provides access to a web site for operation. This renders CANobserver® independent of the operating system installed. The system requirements for access to the web interface is a browser with JavaScript enabled and the following minimum versions:

- Firefox 6
- Chrome 8
- Opera 12.1
- Safari 6
- Internet Explorer 10

## 5 Connection to the Network

Before integrating CANobserver® into a network, clarify your intended approach with the network administrator. CANobserver® is delivered factory-made with the following static network configuration:

- NetBIOS Name:           CANobserver
- IP address:               192.168.0.254
- Subnet Mask:            255.255.255.0

To change these and other settings, you will need access to the web interface of the device. To this end, proceed as follows:

- Connect the device directly to the PC using an appropriate network cable (both crossover and patch cable possible).
- Change the network settings of the PC such that the PC and the CANobserver® are in the same subnet (e.g.: PC IP address 192.168.0.10, PC subnet mask: 255.255.255.0).
- Subsequently, open your web browser and type the following URL in the address line: <http://192.168.0.254> or <http://CANobserver>. The CANobserver® start page is then displayed. Make sure that JavaScript is activated in your web browser.
- Now you can change the network settings of your device as described under 6.4.3 “Network“  
Attention:
  - The changed network settings only become effective after restarting the device.
  - Modify also the network settings of your PC correspondingly to be able to obtain access to the device again after the restart.

### Note:

If you do not know the current network settings of the CANobserver®, you can reset the device to the factory settings as described in Section 2.4.9 “Resetting the device“. Thereafter, you should be granted access to the device with the above “Default device parameters“.

## 6 Working with the Web Interface

As can be seen in Figure 5, the web interface is divided into various areas.

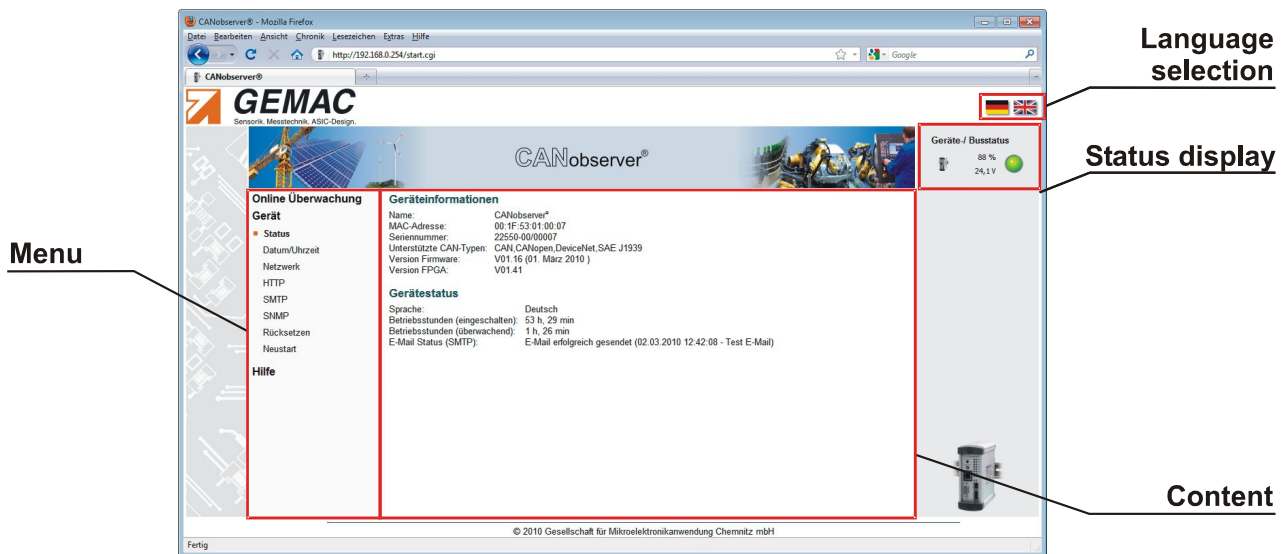


Figure 5: Overview Web interface

### 6.1 Language selection

The "Language selection" icons can be used to select the display language for the web interface. This setting is then saved to the device so that the interface pages are displayed in the selected language when next called.

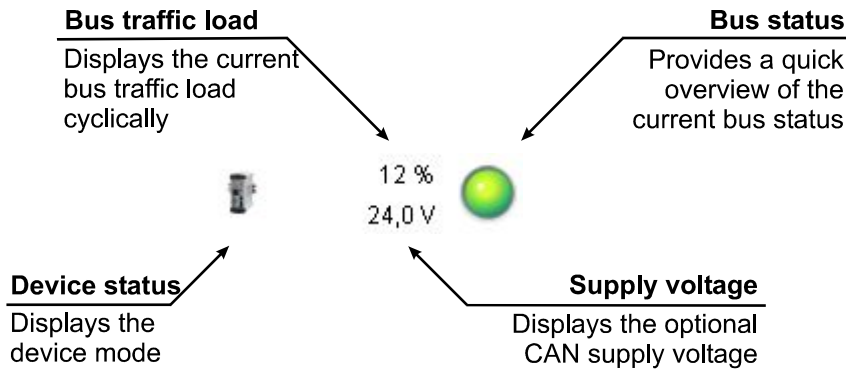
### 6.2 Menu structure

The menu with the menu items "Online monitoring", "Device" and "Help" is located on the left side of the web interface. The "Online monitoring" menu is used to set, perform and evaluate the measurement. The device status can be called via "Device", where all device-specific settings can be made. "Help", finally, calls up the user manual in electronic form and various other files required for the operation of the device.

A corresponding submenu with further subsections is displayed for each main menu item. Appropriate contents are displayed in the main frame, depending on the selected main menu/submenu.

### 6.3 Status display

The status display can be found on the right side of the web interface and is always visible. It informs the user permanently on the bus status and displays a currently running monitoring. Figure 6 is a screen-shot of the status display and its elements.



**Figure 6: Status display**

### 6.3.1 Device status



CANObserver® not connected to the power supply and/or to the network



Connection to CANObserver® present;  
monitoring (measurement) not running.



Connection to CANObserver® present;  
monitoring (measurement) currently running.

### 6.3.2 Bus status

The bus status display comprises a multicolor LED graphic. The LED changes its color depending on the bus status. If the mouse pointer dwells on the LED, a tool tip with a description text is displayed. For a detailed description of the bus status measurement, refer to Section 3.3.1 “Bus status“. The following states can occur:



LED = gray: CANObserver® not connected to the power supply and/or network, or differential voltage in the impermissible range 0.5 V ... 0.9 V.



LED = yellow: Bus static (no level change detected on the bus within the measuring time of one second); difference voltage less than 0.5 V, bus idle)



LED = red: Bus static (no level change detected on the bus within the measuring time of one second); difference voltage greater than 0.9 V)



LED = green: Level change detected on the bus

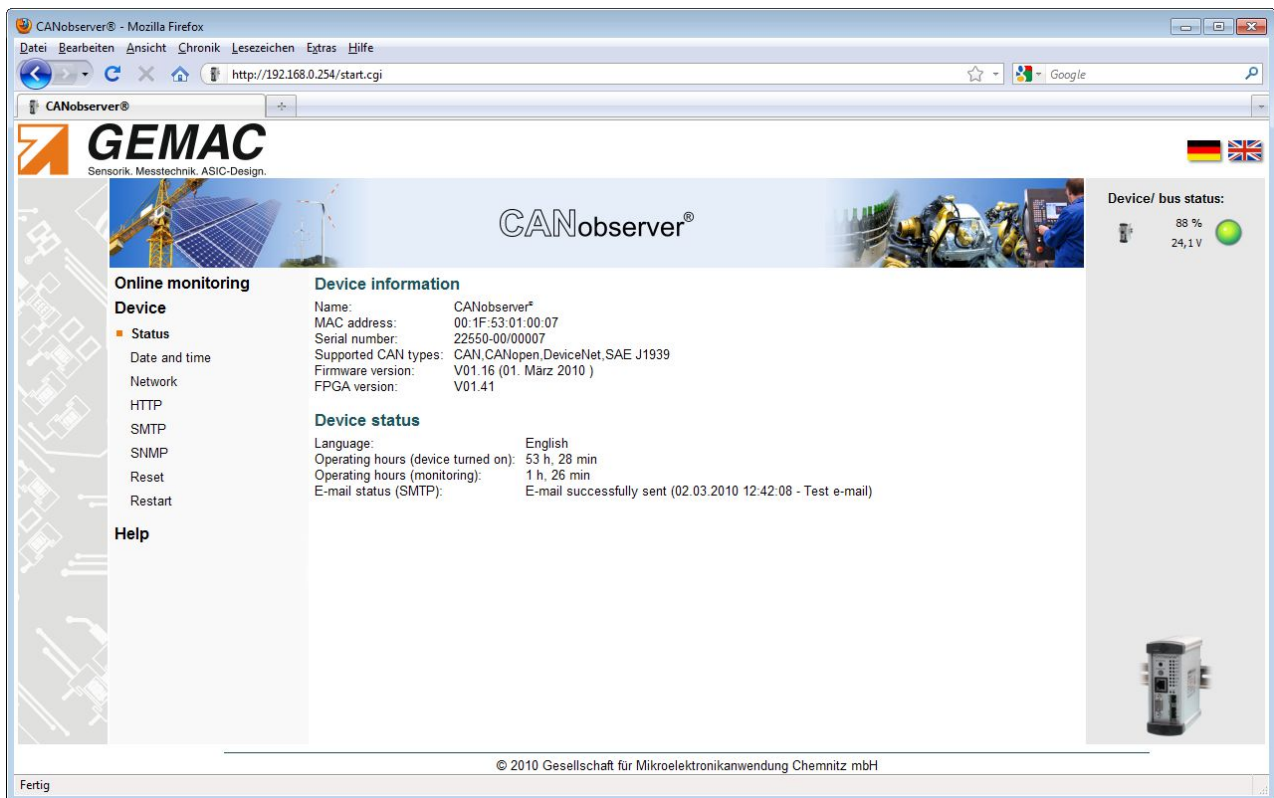
### **6.3.3 Bus traffic load**

The bus traffic load is determined continuously and independently of other measurements. As already described in detail in Section 3.3.2 “Bus traffic load“, the bus traffic load is measured and updated constantly at intervals of one second.

### **6.3.4 CAN-supply voltage**

The 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.

## 6.4 Device



**Figure 7: Device - Status**

### 6.4.1 Status

The “Status” area displays all device-specific data. This includes the unique serial number and MAC address, as well as the supported CAN types and the version numbers. The operating hours are counted separately for the device states "Monitoring" and "Device turned on". The “E-mail status” informs about successfully delivered / undelivered mails.

The device is ideally prepared for future extensions thanks to the possibility of firmware updates. You can only use updates released for your device. Attention: A firmware update will delete all your measuring data.

### 6.4.2 Date/Time

This screen can be used to set the time and date. Please note that "UTC" (**U**niversal **T**ime **C**oordinated) is to be used. This is the only way to be able to compare different measurements from different locations in the world with each other. The exporting of the measurement data for use in other programs (CAN Bus Tester 2 software) is thus also possible.

In addition to setting the time manually, the time setting can also be received automatically from a time server. The IP address and the host name of the time server can be entered in the "NTP time server" field. If the time server is not integrated into the local network (e. g. "pool.ntp.org"), a gateway must be specified under “Network“. If the host name of the time server is used instead of the IP address, in addition, the DNS server must be specified under “Network“.

### 6.4.3 Network

It is possible to assign a unique NetBIOS name to address the device by its name. For connection to the network, you can have the IP data assigned automatically by a DHCP server in the network or choose manual setting. In the case of manual setting, you will need to specify at least the IP address and the subnet mask. Gateway and DNS server are only required if the time and date are set automatically via NTP time server, see also Section 6.4.2 "Date/Time".

### 6.4.4 HTTP

To restrict access to the web interface to selected persons only, it is optionally possible to activate authentication with user name and password.

### 6.4.5 SMTP

To enable the automatic sending of e-mail notifications (also see section 6.5.2 „Configuration: notification“) the outgoing mail server needs to be configured. If the server requires an authentication, a user name and password can be activated. Currently the CANobserver® exclusively supports the SMTP authentication processes „PLAIN“ and „LOGIN“. To check the configuration a test e-mail can be sent.

### 6.4.6 SNMP

The read and write community strings can be modified for access control. The name, location and contact correspond to the MIB variables sysName, sysLocation and sysContact in SNMPv2 MIB and serve to differentiate several CANobserver® devices installed in the network. The MIB files are archived as "MIB\_Files.zip" and available here for downloading.

### 6.4.7 Reset

#### 6.4.7.1 *Reset configuration*

The device configuration can be reset to the factory settings. This pertains to all settings both of the online monitoring and of the device itself. Since the network settings are also reset during this process, the device can then only be accessed with the Default device parameters as described in Section 6.7 . The new configuration only becomes effective after the next restart of the device, see also Section 6.4.8 "Restart".

#### 6.4.7.2 *Delete data records*

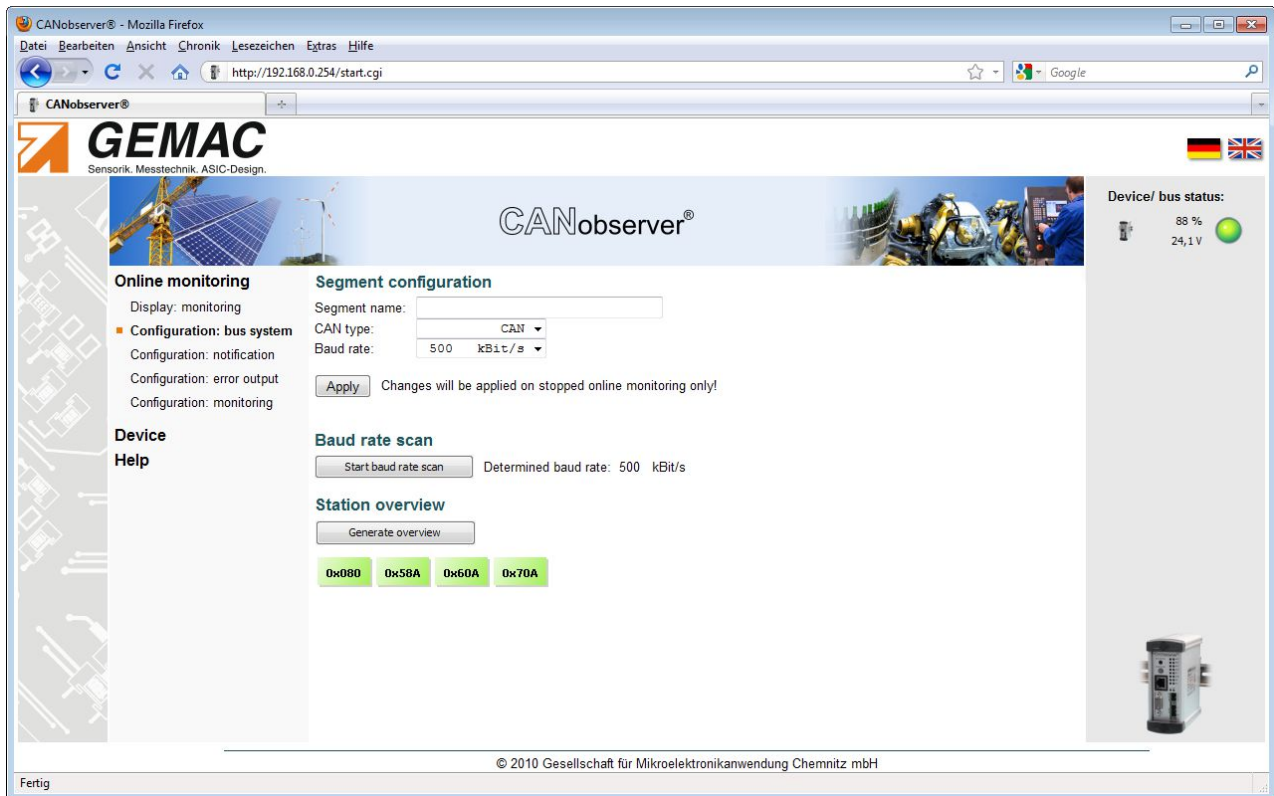
If you select this option, all data records saved in the device are deleted. This pertains to all 20 data records from the online monitoring. Important data records should be exported beforehand. The deletion of data records is only possible if the online monitoring is stopped.

### 6.4.8 Restart

This menu item can be used to restart the device. After restart, you will automatically be forwarded to the devices start page.

## 6.5 Online monitoring

### 6.5.1 Configuration: bus system



**Figure 8: Configuration: bus system**

#### 6.5.1.1 Segment name

If your CAN bus system comprises several segments (bus segments separated by a repeater), you can optionally specify a name for the segment (max. 30 characters) in the “Segment name” field for differentiation. The name will then be displayed for differentiation in the „Status display“ of the web interface if several CANobserver® are installed.

#### 6.5.1.2 CAN type

Selection of the bus system type (CAN / CANopen / DeviceNet / SAE J1939): To be able to create an overview of all nodes, CANobserver® must detect the message frames issued by the CAN bus nodes. The assignment of a signal to a station is determined by the ID contained in each CAN bus message frame. With the settings “CANopen” the node ID, with “DeviceNet” the MAC ID and with “SAE J1939” the source address is decoded from the CAN ID of the message frame and used for assignment of the station.

#### 6.5.1.3 Baud rate

The data transfer rate you wish to use for the CAN bus segment to be measured can be set under “Baud rate”. You can also use the “Baud rate scan” function to have CANobserver® determine the baud rate automatically.

### 6.5.1.4 *Baud rate scan*

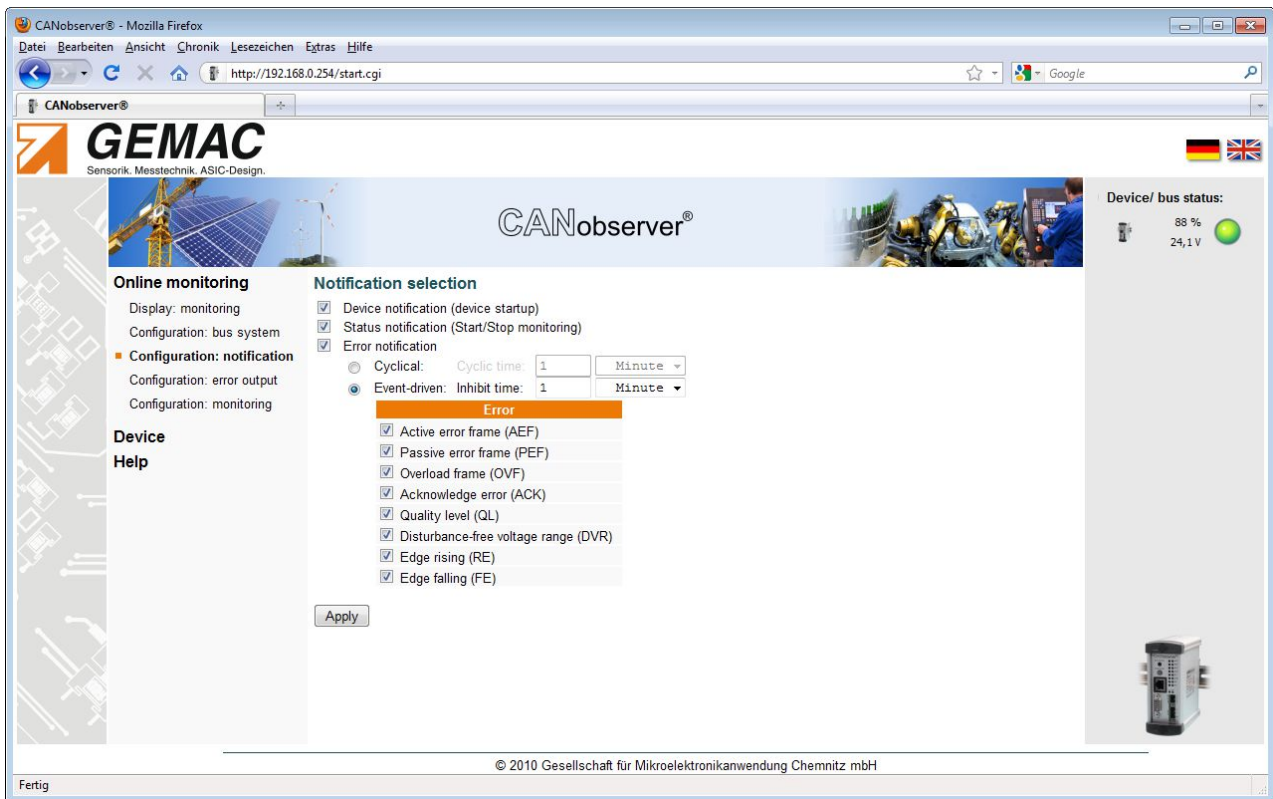
CANobserver® can determine the baud rate for a segment automatically, provided that the CAN bus system is functioning correctly (data traffic present, bus status LED = green). The determination of the baud rate is started with a mouse click on "Baud rate scan". The baud rate determined by the system is displayed and can be accepted into "Baud rate".

### 6.5.1.5 *Create Overview*

"Create Overview" determines all transmitting nodes or IDs transmitted on the bus automatically, depending on the bus system selected, (CAN type) and displays them graphically.



## 6.5.2 Configuration: notification



**Figure 9: Configuration: notification**

The CANobserver® is able to send notifications by e-mail when different events occur. To operate correctly the device needs to be configured as described in section 6.4.5 „SMTP“. Events relevant to the user need to be selected.

### 6.5.2.1 Device notification

When activated an e-mail will be sent whenever the device is started. This can be used to recognize a power-off device failure.

### 6.5.2.2 Status notification

When activated an e-mail will be sent upon each start and stop of an monitoring. After completion of the recording period mentioned in Table 3, a new data record will be created and therefore an e-mail with the information “Stop monitoring” will be sent. After that an e-mail informing of “Start monitoring” will be sent.

### 6.5.2.3 Error notification

Two operating modes are available to send error notifications.

When **cyclical** error notification is chosen a message informing about errors that occurred in the last time interval will be sent at a configurable interval (cyclic time). In this operating mode no information about any errors that occurred will be lost – however messages will be sent at regular intervals even if no errors occur, respectively if an error occurs the relevant notification will be given after the time interval is completed.

When **event-driven** error notification is chosen a message will be sent immediately when an error occurs. To avoid an overload of notifications a configurable inhibition time is set. During this inhibition time a change of the event will not be reported. After the inhibition time has expired a notification will be sent once the error status changes in the observed bus system. However changes in the error that occurred cannot be notified if the inhibition time is still running. The tester will report these immediately after the inhibition time has passed. The errors that need to be reported can be preselected.

### 6.5.3 Configuration: error output

To signal errors detected by CANobserver®, each error LED can be connected to the isolated error output. In this way, it is possible to realize a checkback signal into the CAN system to be monitored via a free input. It is possible to connect either the current or the saved error LED to the error output. All errors are linked with an OR function.

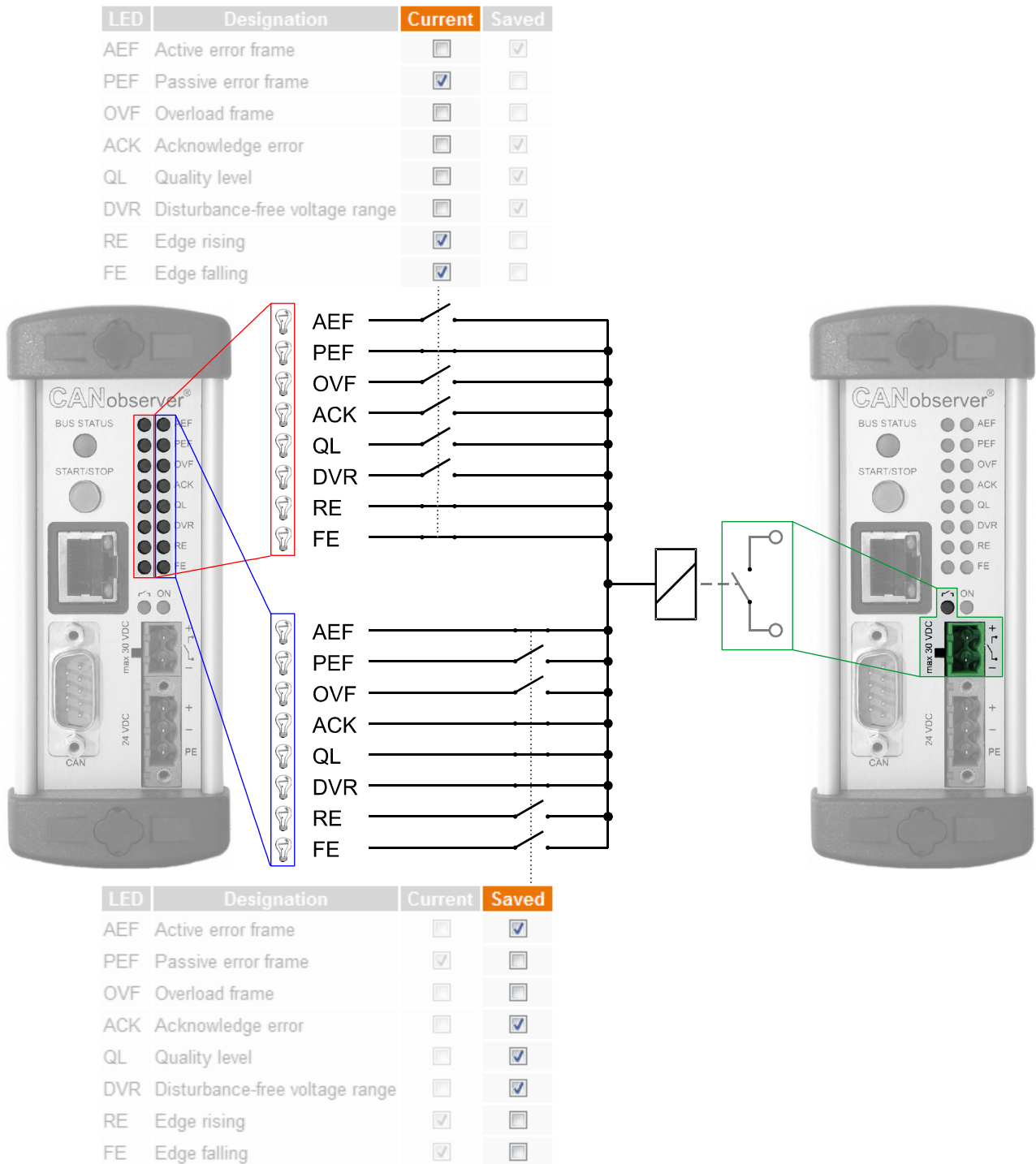
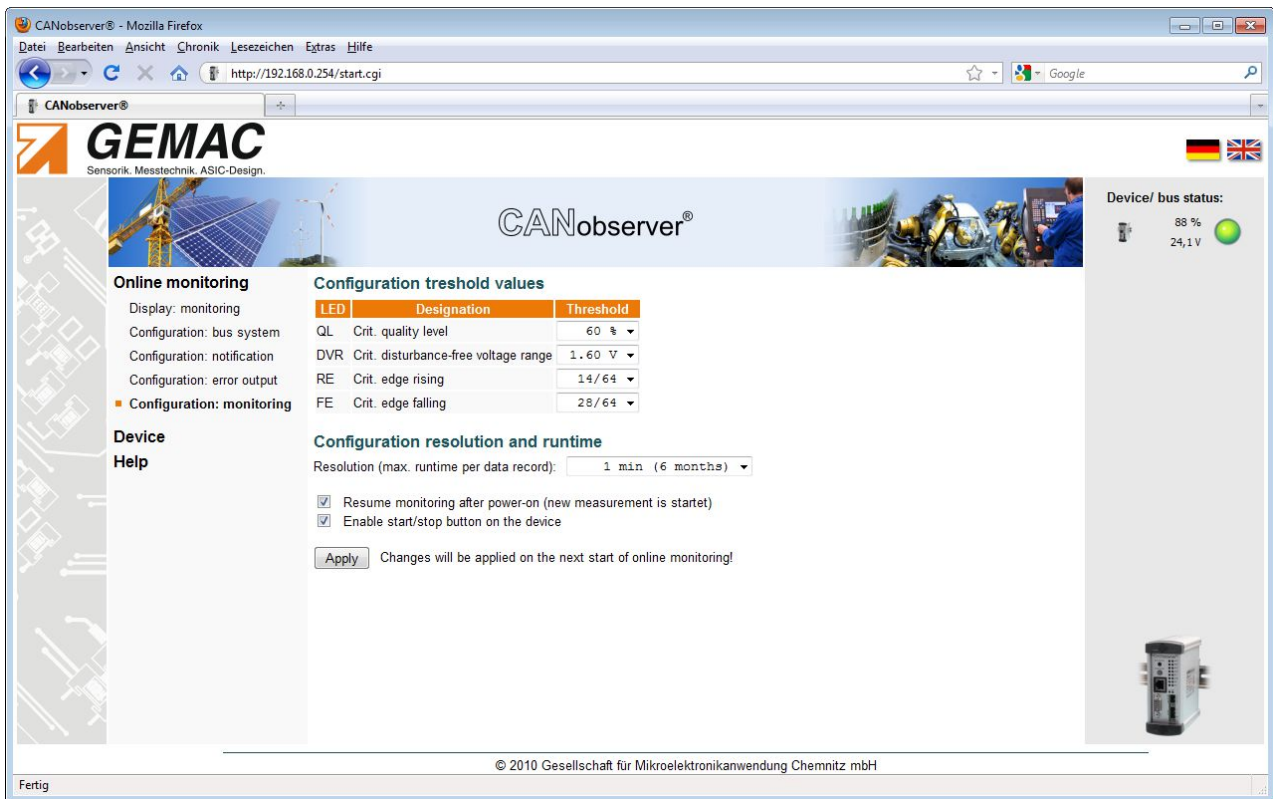


Figure 10: Configuration: error output

## 6.5.4 Configuration: monitoring



**Figure 11: Configuration: monitoring**

### 6.5.4.1 Configuring the threshold values

The following bus parameters are recorded continuously:

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

The logical events/errors are recorded in the track in which they occur. To be able to record the physical errors, a threshold value must be configured for each track, permitting marking of the corresponding track if the threshold is violated. The displays of the current physical values can be used to define the threshold values when the system is functioning correctly. It is also recommended to perform an initial measurement for the corresponding system using the CAN Bus Tester 2. It uses the same measuring principle and will help in starting up the system and troubleshooting. The following setting ranges are possible:

- Critical quality level (30 ... 90%; critical measured value if not reached)

- Critical disturbance-free voltage range (1.0 ... 3.0 V; critical measured value if not reached)
- Critical rising edge (recessive - dominant) (1/64 ... 48/64, critical measured value if exceeded)
- Critical falling edge (dominant - recessive) (1/64 ... 48/64, critical measured value if exceeded)

Each track can be activated separately. Tracks not activated are not displayed, but will still be recorded. Deactivated tracks can be displayed again at any time by clicking with the right mouse button on the track display.

#### 6.5.4.2 Configuring Resolution and runtime

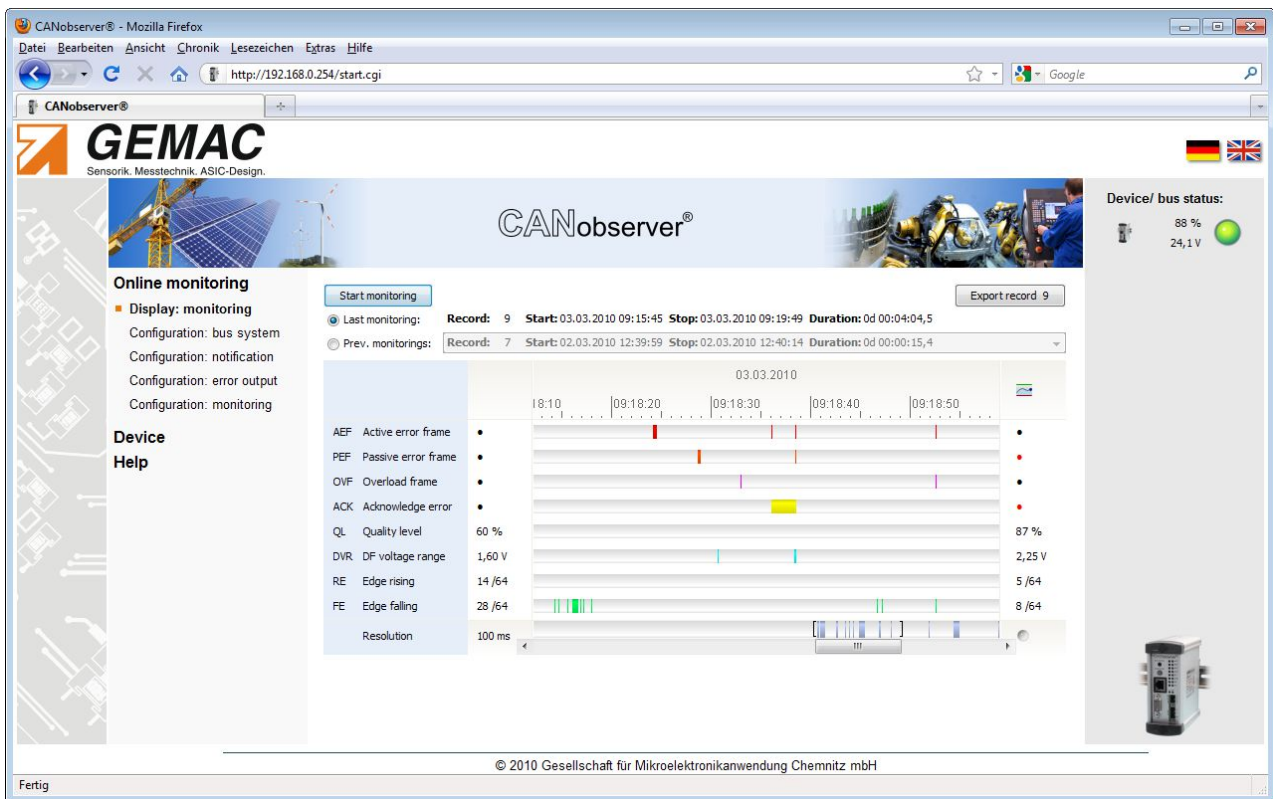
The time-based resolution for the data recording is set with the “Configuring Resolution and runtime“ list box. The shorter the selected time, the greater the amount of measurement data to be assessed. Any logical errors within this time and all values exceeding or falling below the appropriate threshold minimum or maximum value within the set time (time slice) are recorded for the corresponding track. Several events (e. g. two faulty message 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. The max. recording time per data record is limited depending on the selected resolution.

Resolution	max. Recording Time per Data Record
100 ms	6 hours
1 s	3 days
10 s	1 month
30 s	3 months
1 min	6 months

**Table 3: Recording time depending on the resolution**

It is a standard setting that a running observation is automatically continued after the restart of the device. A new measurement will be started every time. This behavior can be deactivated. Once this has been done the observation will not be continued after the restart of the CANobserver®.

### 6.5.5 Display: monitoring



**Figure 11: Online monitoring - Display: monitoring**

Clicking on the "Start/stop monitoring" button starts or stops a new monitoring. This button has the same function as the START/STOP button on the device. During an active monitoring, the START/STOP button on the device is lit and two arrows in the "Status display" of the web interface rotate around the symbol of the CANobserver®.

Each time a monitoring is started and after expiry of the recording time specified in Table 3 for an active measurement, a new data record is created automatically. CANobserver® records a maximum of 20 data records (max. total runtime 10 years). Thereafter, the oldest data record is overwritten.

The measured values accumulated up to any given point can already be evaluated while the monitoring is still running. A time slice can be marked with the left mouse button. A tool tip is also displayed with additional information about this time slice. The time is displayed above the recorded tracks, and a summation track permitting orientation within the overall measurement is displayed beneath the tracks. In this way, it is also possible to quickly localize error events not displayed on the screen. To the left of the tracks, the critical threshold set for evaluation at the start time is displayed. The current physical value of the track is displayed continuously on the right-hand side. This display can be switched from showing the current measurement value to showing the worst / best value since the measurement was started via right click.

The currently selected data record can be exported to an XML file for archiving, and can then be read in using the CAN-Bus Tester 2 software. Thus it is possible to display and print the data records of the measured data and to use them in other programs.

## **6.6 Help**

### **6.6.1 Contact**

This menu informs about the contact information of the manufacturer.

### **6.6.2 Manual**

The German and English device manuals can be downloaded via this menu item as PDF files.

### **6.6.3 Quick start guide**

The quick start guide (German/English) describing how to install the device can be downloaded via this menu item as a PDF file.

## 6.7 Default device parameters

Parameter		Default Value
Device settings		
Date/time	NTP time server	-
Network	NetBIOS name	CANobserver
	IP assignment	Use the following IP address
	IP address	192.168.0.254
	Subnet mask	255.255.255.0
	Gateway	-
	Primary DNS	-
	Secondary DNS	-
HTTP	Web interface authentication	OFF
	User name	-
	Password	-
SMTP	Server host name	-
	Authenticate with user name and password	OFF
	User name	-
	Password	-
	Address sender:	-
	Address recipient:	-
	Subject:	-
SNMP	SNMP Read Community	public
	SNMP Write Community	private
	Name (sysName)	CANobserver
	Location (sysLocation)	-
	Contact (sysContact)	-
HTTP	Web interface authentication	OFF
	User name	-
	Password	-
Online monitoring		
Bus system	Segment name	-
	CAN type	CAN
	Baud rate	500 kBit/s
Notification	Device notification	OFF
	Status notification	OFF
	Error notification	OFF
Error output	all errors	current error mapped to error output
Monitoring	Critical quality level	60 %
	Critical disturbance-free voltage range	1,60 V
	Critical rising edge	14/64
	Critical falling edge	28/64
	Resolution / runtime	1 s / 3 days

**Table 4: Default device parameters**



## 7 Technical Specifications

### General Parameters and Overview of Functions

Use (CAN type)	CAN (ISO11898-2), CANopen, DeviceNet (EN 50325-2), SAE J1939
Supported baud rates	Depending on CAN type: 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
Node overview	Automatically, depending on the CAN type
Bit sampling	64-fold
Quality level	Signal quality level (0 ... 100 %)
Disturbance-free voltage range	Disturbance-free voltage range (0...4 V, resolution 50 mV)
Edges	Edge steepness (falling and rising, specified in 1/64th of the bit width)
Bus status	Bus traffic detection (display: dominant, recessive, not defined, bus traffic)
Bus traffic load	Permanent display of the bus traffic load (0 ... 100 %)
Monitoring	Real-time monitoring of the bus for logical and physical errors Definable resolution (10 ms ... 1 min)
Error recording	Active error frames Passive error frames Overload frames Acknowledge errors Signal quality below the critical quality level (can be defined) Signal quality below the critical disturbance-free voltage range (can be defined) Exceeding of the critical rising edge (can be defined) Exceeding of the critical falling edge (can be defined)
Error display	All recorded errors (current/saved) by way of LEDs
Error output	Freely programmable
Export	Recorded data records in the XML format for use in CAN-Bus Tester 2 software
Firmware and FPGA configuration	Can be updated

### Electrical parameters

Power supply	9 ... 36 V SELV - safety extra-low voltage (internal grounding conductor: 0.75 mm <sup>2</sup> )
Current consumption	0.55 ... 0.15 A
Measuring of the differential voltage	Typ. -0.75 V ... 3.00 V
Measuring of the CAN supply voltage	0 ... 36 V
Error output	Isolated, max. 30 V DC

### Mechanical parameters

CAN connection	9-pol. D-SUB connector
Network connection	10/100 MBit Ethernet IEE 802.3u, RJ-45 (8P8C) LAN connection
Housing	Aluminum plate housing for top-hat rail (35 mm)
Degree of protection of the housing	IP20 to EN 60529
Temperature range	Operation: 5 °C ... 40 °C Storage: -20 °C ... 60 °C
Humidity	Operation: 20 % ... 80 % (non-condensing) Storage: 20 % ... 80 % (non-condensing)
Dimensions	50 mm x 125 mm x 124 mm
Weight	Approx. 550 g

### CE conformity

Equipment safety	EN 60950-1: 2003-03
EMC	EN 61000-3-2: 2000, +A1: 2001, +A2: 2004 EN 55022: 1998, +A1:2000, +A2:2003 EN 61000-6-2: 2001

**Table 5: Technical specifications**

## 8 Scope of Supply

The following components are included in the scope of supply of the CANobserver® for the bus systems CAN, CANopen, DeviceNet and SAE J1939:

- CANobserver® basic unit
- Connectors:
  - Connector for the power supply
  - Connector for the error output
- Quick start guide
- Packaging

## 9 Maintenance and Customer Service

### 9.1 Maintenance

The CANobserver® is maintenance-free. Calibration is not necessary. Any repairs must be entrusted exclusively to the manufacturer.

### 9.2 Customer service

#### 9.2.1 Return

If you send the CANobserver® for repair, use only the original or equivalent packaging. Furthermore, you should request an RMA number from the manufacturer. Please give a brief description of the problem and your telephone number in case we have any questions. Please note that devices sent in for repair are reset to their default factory settings. Therefore, save your measuring data and make a note of the configuration of your device.

#### 9.2.2 Support

If you have any technical questions, please specify the serial number of your device, its firmware and hardware configuration version. Please direct questions to your supplier or else contact the hotline of the CANobserver®.

**Manufacturer:** GEMAC - Gesellschaft für Mikroelektronikanwendung Chemnitz mbH  
Zwickauer Str. 227  
09116 Chemnitz  
Tel. +49 371 3377 - 0  
Fax +49 371 3377 - 272  
Web: <http://www.gemac-chemnitz.de>  
E-Mail: [info@gemac-chemnitz.de](mailto:info@gemac-chemnitz.de)

#### 9.2.3 Warranty and limitation of liability

We will assume a warranty of 24 months for the CANobserver®, 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 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 - Gesellschaft für Mikroelektronikanwendung Chemnitz mbH will apply.

## 10 Ordering Information

Product	Description	Article number
<b>Basic unit</b>		
CANobserver®	CANobserver® bus systems: CAN, CANopen, DeviceNet, SAE J1939	PR-22550-00
<b>Optional accessories</b>		
D-SUB 9 conduit-thread connector	Erni, ERBIC CAN node with conduit-thread connector	BU-03050-00
<b>Spare parts</b>		
Connector for the power supply	Phoenix Contact, MSTB 2,5/3-STF	X-03828-00
Screw-clamping connector for the error output	Phoenix Contact, MSTB 2,5/2-ST	X-03829-00

**Table 6: Ordering information**

## 11 Problem Solutions

The following chapter will help you if you have problems with your CANobserver®. This chapter lists typical errors and problem situations, indicates possible causes and offers possible solutions.

If you encounter a problem with your CANobserver® and/or the web interface which is not listed here or cannot be solved by the solutions specified here, please contact the manufacturer (see Section 9.2.2 "Support").

### 11.1 Problems with the connection to CANobserver®

Problem	Questions, Causes & Problem Recovery
No connection to CANobserver®	<p><b>Questions:</b></p> <ul style="list-style-type: none"> <li>• Is the power supply present for CANobserver® (<b>ON</b> LED lit)?</li> <li>• Is the yellow link LED on the Ethernet socket lit?</li> <li>• Do the CANobserver® network settings match those of the network?</li> </ul> <p><b>How to solve this problem:</b></p> <ul style="list-style-type: none"> <li>• Connect and turn on the power supply (see Section 2.4.2 "Power supply")</li> <li>• Connect the network cable (crossover or patch) to the device and then to the network (10/100 MBit/s, full/half-duplex).</li> <li>• Adapt the network settings accordingly (see Section 6.4.3 "Network")</li> </ul>

### 11.2 Problems with the web interface

Problem	Questions, Causes & Problem Recovery
The web interface is not displayed correctly	<p><b>Questions:</b></p> <ul style="list-style-type: none"> <li>• Are the forms displayed correctly?</li> </ul> <p><b>How to solve this problem:</b></p> <ul style="list-style-type: none"> <li>• Activate Javascript.</li> <li>• Update your browser to the newest version</li> </ul>

### 11.3 Problems when measuring

Problem	Questions, Causes & Problem Recovery
<b>Baud rate scan</b>	
<b>Button is disabled (hidden)</b>	<p><b>Questions:</b></p> <ul style="list-style-type: none"> <li>• Connection to CANobserver® available?</li> <li>• Is the measurement "Create overview" currently running?</li> <li>• Is the measurement "Online monitoring" currently running?</li> </ul> <p><b>How to solve this problem:</b></p> <ul style="list-style-type: none"> <li>• Stop the measurement "Create overview".</li> <li>• Stop the measurement "Online monitoring".</li> </ul>
<b>No baud rate detected</b>	<p><b>Possible causes:</b></p> <ul style="list-style-type: none"> <li>• Incorrect bus installation (→ excessive reflections)</li> <li>• Excessive interference affecting the line</li> <li>• Defective CAN bus driver</li> <li>• Line short-circuits</li> <li>• Unsupported baud rate selected</li> </ul> <p><b>How to solve this problem:</b></p> <ul style="list-style-type: none"> <li>• Provide for transmission activity on the CAN bus.</li> <li>• Correct the baud rate manually or try a different baud rate.</li> </ul>
<b>Node list ("Create overview")</b>	
<b>Button is disabled (hidden)</b>	<p><b>Questions:</b></p> <ul style="list-style-type: none"> <li>• Connection to CANobserver® available?</li> <li>• Is the measurement "Baud rate scan" currently running?</li> <li>• Is the measurement "Online monitoring" currently running?</li> </ul> <p><b>How to solve this problem:</b></p> <ul style="list-style-type: none"> <li>• Stop the measurement "Baud rate scan".</li> <li>• Stop the measurement "Online monitoring".</li> </ul>
<b>No nodes found</b>	<p><b>Questions:</b></p> <ul style="list-style-type: none"> <li>• Baud rate selected correctly?</li> <li>• Connection to CAN bus established?</li> <li>• Are the nodes on the bus transmitting (bus status LED: green)?</li> </ul> <p><b>How to solve this problem:</b></p> <ul style="list-style-type: none"> <li>• Set the baud rate for the bus system.</li> <li>• Establish connection to CAN bus.</li> <li>• Provide for transmission activity of the nodes.</li> </ul>
<b>Wrong nodes found</b>	<p><b>Cause:</b></p> <ul style="list-style-type: none"> <li>• Baud rate or CAN type (bus system) not correctly selected.</li> </ul>



