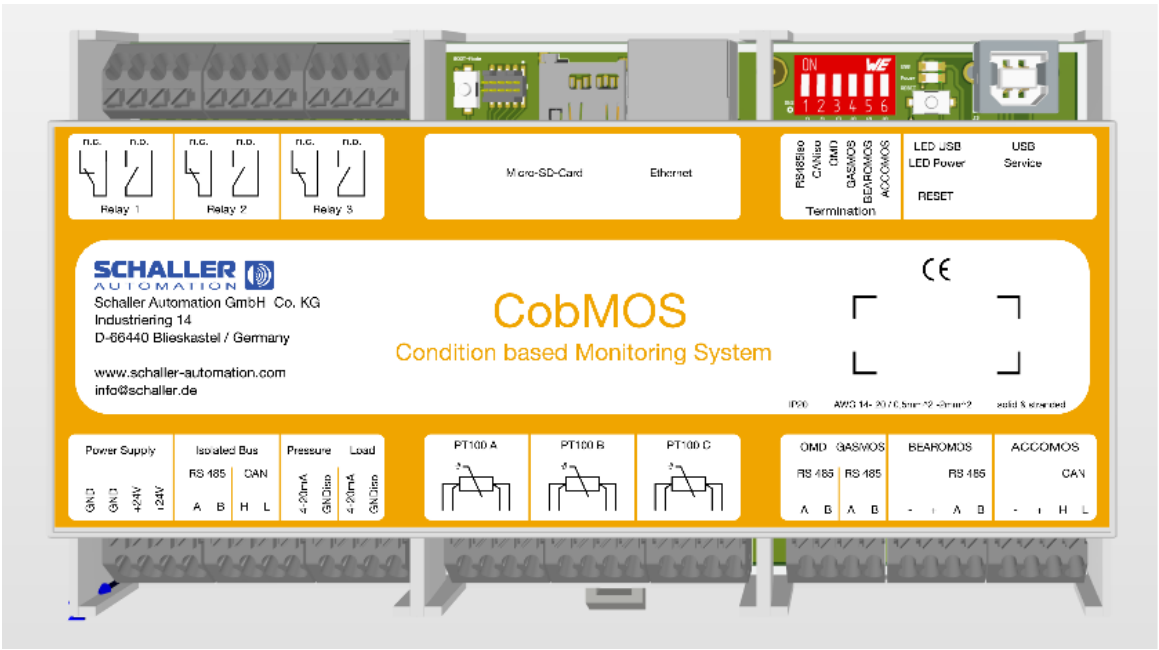
INSTRUCTIONS FOR USE

CobMOS (153214)



Version: Version 1.1

Document No.: Part number 180515

The original operating manual is written in German.
Any translations are based on the original operating manual.

LEGAL NOTICE

Copyright

We reserve the right to make technical changes to the hardware and software of our products without prior notice. We do not assume any liability a currently delivered device having all the features described in this operating manual.

 Specifications of nominal conditions, technical changes, improvements and errors are excepted.

Schaller Automation Industrielle Automationstechnik GmbH & Co. KG
Industriering 14

66440 Blieskastel Saarland
Germany

Phone: +49 6842-508-0
Fax: +49 6842-508-260

Email: info@schaller.de
www.schaller-automation.com

Version	Change	Date	Author
1.0	Creation/release	**22/06/2023**	M. Flemmer
1.1	Ethernet data access (8.6.1/8.6.2/8.6.3/8.6.4/8.7)	**25/09/2023**	M. Flemmer

Table 1: Version history and change notes

Table of contents

1 Information about the operating manual

1.1 Validity of the operating manual

This operating manual applies exclusively to the following products:

- **CobMOS**

hereafter referred to as the “device”.

Firmware version at time of publication: **V1.1**

Last updated: **25/09/2023**

1.2 Use and purpose of the operating manual

The operating manual is intended for:

- the operator of the device; and
- the qualified personnel responsible for installing, starting up, operating and servicing the device.

This operating manual will support you to:

- carry out initial assembly and installation as intended;
- operate the device safely and in accordance with its intended use;
- avoid hazards;
- carry out maintenance and repair work as intended and thereby reduce repair costs and long downtimes;
- guarantee or increase the reliability and service life of the device;
- select and order spare parts and accessories; and
- find authorised service partners local to you

Hazard warnings, safety regulations and the information in this operating manual must be observed without exception. You must read, understand and apply the operating manual in order to operate and work on the device properly and safely.

This operating manual must be read and applied by the fitter and the responsible qualified personnel/operator before transport, installation/removal, starting up, operation and maintenance.

1.3 Document storage

- These instructions, as well as all other applicable documents, must be kept safely so that they are always available to the qualified personnel at the place of use.
- The documents must be handed over in full to subsequent owners.

1.4 Symbols in this operating manual

Various types of notation and symbols are used in the text of these instructions. These are explained below:

Numbered steps:

- Required action
  - ☑ Result of the sequence of actions
- Symbol for a list
  1. Points of the list

⇨ *Reference to a section or figure*

`Display text`

Additional information and instructions

Environmental and energy-saving tips

Different warning symbols are used for warnings. Please see the descriptions and instructions in ⇨ *Section 2°Safety instructions*

1.5 Applicable documents and regulations

Further documents apply in conjunction with this operating manual.

- For added components, follow the instructions supplied with those components.
- When using the device and for all service work, also follow:
  - the recognised technical rules for working safely and correctly;
  - the statutory accident prevention regulations;
  - the statutory environmental protection regulations;
  - the provisions of the employers' liability insurance association;
  - the regulations applicable in other countries and the requirements for the state of the art; and
  - the rules and instructions of the operator.

1.6 Qualifications of personnel

Installation, starting up, operation and maintenance of the device may only be carried out by appropriately qualified personnel.

The operator must therefore ensure that the personnel for the work/activities defined in this operating manual have the appropriate qualifications and/or are trained and fully understand the contents of this operating manual.

The following operator qualifications are required for this device:

- completed technical training as an electronics technician or mechatronics technician, or industrial mechanic;
- instruction by the operator on the instructions for the entire installation on site.

Certain maintenance work may only be carried out by authorised qualified personnel. The operator must precisely define and provide rules for the area of responsibility, the authority and the supervision of personnel for such work.

1.7 Operator's obligations

- Only employed qualified and instructed maintenance and installation personnel.
- Define rules for the authority and supervision of personnel.
- Check all safety devices regularly to ensure they are functioning and complete.
- Ensure that scheduled maintenance is carried out as planned.
- Inform the manufacturer of any damage that is identified.
- Provide personnel with the necessary protective equipment.
- Replace damaged parts.
- Keep the work areas and escape routes clear and in good condition.
- Inform yourself of the health and safety regulations applicable at the place of use.
- In a risk assessment, also identify hazards that arise from the specific working conditions at the place of use.
- Implement the knowledge gained from the risk assessment in the form of instructions.

1.8 Liability for defects

The terms in the order confirmation from Schaller Automation Industrielle Automationstechnik GmbH & Co. KG or the terms agreed in the contract apply.

Claims for personal injury and damage are excluded if they are due to one or more of the following causes:

- use not as intended ⇨ *Section 4.4 Foreseeable misuse*
- foreseeable misuse ⇨ *Section 4.4 Foreseeable misuse*
- technical data ⇨ *Section 3.3 Technical data*
- technical description ⇨ *Section 4.2 Technical description and technical data*

1.9 Terms of warranty

The extent of warranty is defined in the “General Terms and Conditions”.

The warranty is invalidated by the following:

- insufficiently qualified personnel;
- operating the device with safety devices that are not properly attached or are not functioning;
- failure to observe the instructions, commands and prohibitions in the operating manual;
- unauthorised structural changes to the device;
- inadequate monitoring of wear parts;
- maintenance work not carried out correctly and not carried out in good time;
- modifications to the device may invalidate the warranty;
- retrofitting and modifications are only allowed after consulting Schaller Automation Industrielle Automationstechnik GmbH & Co. KG;
- transport damage as a result of incorrect handling.

The following also applies in addition:

- ▶ Comply with statutory requirements.
- ▶ Do not make any unauthorised changes or manipulate the device.
- ▶ Only use correct and approved materials.
- ▶ Only use approved and suitable spare parts.
- ▶ Normal wear and tear is not a malfunction for the purpose of the terms of warranty.

1.10 Version of the operating manual

This document has been prepared to the best of our knowledge and belief. It matches the technical version of the device as delivered.

Schaller Automation Industrielle Automationstechnik GmbH & Co. KG reserves the right to amend and revise this document, if necessary. Schaller Automation's products have are customised products with a long service life and state-of-the-art design. There is therefore a range of factors that may require revision of this document, such as:

- knowledge gained during starting up;
- knowledge gained during maintenance and repairs;
- additional requirements from customers and authorities;
- changes to standards and regulations;
- modernisation and overhaul of plant;
- extensions to the scope of the order by the customer;
- knowledge gained by the operator regarding plant safety and plant operation.

The version of the document is indicated by the version date and the version number on the title page and in the footer. The operator must check that the document is up-to-date.

1.11 Variables and units of measurement that are used

The following table lists the variables and units of measurement that are currently used in the operating manual. We reserve the right to add to or change the table, as necessary.

Variable	Unit
Lengths	mm, m
Mass	g, kg
Temperature	°C
Frequency	Hz
Relative humidity	%
Vibration	m/s^2, mG
Voltage	V
Current	A
DC voltage	DC
Pressure	mbar

Table 2: Variables and units of measurement that are used

2 Safety instructions

This operating manual contains safety instructions.

2.1 Safety devices and guards

These instructions for use contain instructions for your safety. The following basic safety instructions are instructions that always apply in order to operate the machine safely and keep the machine in a safe condition.

The warnings that relate to specific actions warn you about residual hazards and are provided before any hazardous step.

- All instructions must be followed to prevent personal injury, environmental damage or property damage.

2.2 Warnings

Warnings indicate potential residual hazards before an action.

2.2.1 Structure of warnings

Warnings are provided before hazardous steps. Warnings have the following structure:

SIGNAL WORD

Nature and source of the hazard!

Description of the nature and source of the hazard.

- Measures to prevent the hazard.

2.2.2 Hazard levels in warnings

The warnings have different levels according to the severity of the hazard. The hazard levels with the corresponding signal words and warning symbols are described below.

DANGER

Immediate risk of death or serious injury.

- Indicates a high-risk hazard which, if not avoided, will result in death or serious injury.

WARNING

Potential risk of death or serious injury.

- Indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.

CAUTION

Potential risk of minor injury.

- Indicates a low-risk hazard that, if not avoided, may result in minor or moderate injury.

NOTE

Potential damage to the device or the surroundings.

- Indicates a potential hazard, with the aim of preventing damage.

2.3 Information, warning and mandatory signs that are used

The following symbols and signs according to DIN EN ISO 7010 and DIN 4844-2 are used in this operating manual:

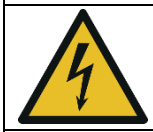
Symbol	Explanation
	General warning sign
	Warning; electricity
	Disconnect before carrying out maintenance or repair
	Refer to operating manual/instructions
	Note: Important information!
	Note: A qualified electrician is required for installation!
	Note: Action required!

Table 3: Information, warning and mandatory signs

2.4 Basic safety instructions

The basic safety instructions are instructions that always apply in order to operate the machine safely and keep the device in a safe condition.

If the following safety instructions are not observed, the following may occur:

- there may be personal injury, environmental damage or damage to property;
- important functions of the device may fail;
- specified methods of maintenance and servicing may fail;
- any claims may fail.

▶ Observe the following instructions for your own protection and for the protection of your surroundings.

▶ If necessary, draw people's attention to the safety instructions and warnings.

⚠ CAUTION

Safe and proper use of the device

▶ Read the operating manual and other documents that accompany the product carefully and keep them in a suitable place for later use.

▶ For repair and service work, you must follow the instructions in the operating manual.

⚠ DANGER

Malfunction

Operating the device with a malfunction may cause environmental damage and/or damage to the device.

▶ The device must be taken out of operation immediately in the event of a malfunction.

⚠ DANGER

Electrical hazards

Electrical damage to the device from welding work on the engine as a result of overvoltage.

▶ Disconnect the device from the power supply before starting work.

Repair work on the device

▶ Disconnect the device from the power supply before starting work.

3 Identification

3.1 Manufacturer's details

Schaller Automation Industrielle Automationstechnik GmbH & Co. KG
Industriering 14

66440 Blieskastel Saarland
Germany

Phone: +49 6842-508-0
Fax: +49 6842-508-260

Email: info@schaller.de
www.schaller-automation.com

3.2 Type plate

The product is identified by a type plate on the top of the device.

The sticker with the serial number is attached to the right-hand side, as shown in the figure below.

Fig.: 1 : Type plate

The following information is provided on the type plate:

1: Manufacturer/company logo
2: Part designation
3: Serial number field with barcode
4: CE marking

3.3 Technical data

3.3.1 Mechanical and electrical interfaces

Mechanical data	
Dimensions (L x W x H)	160 mm x 90 mm x 33 mm
Weight	Approx. 210 g
Attachment	DIN top-hat rail (TH 35); keyhole slots
Connections	Spring-loaded terminals American Wire Gauge (AWG) 14-20/0.5 mm^2 – 2 mm^2

Electrical data	
Power supply	9 V to 32 V (DC)
Nominal voltage	24 V DC
Current consumption	Max. 1.85 A
Relay outputs	No function implemented yet (max. 60 V DC/45 V AC, 60 W, 45 V A, 1 A)
Digital interfaces for external communication	Ethernet
	RS485, electrically isolated, Modbus RTU
	CAN, electrically isolated, CANopen
	USB1.1 – changing parameters and log access
Digital interfaces for Schaller sensors	RS485 – OMD (VN2020 or VN301plus)
	RS485 – GASMOS
	RS485 – BEAROMOS including power supply
	CAN - ACCOMOS including power supply
Analogue sensor connections	3x 4-wire PT100
	4-20 mA – load sensor
	4-20 mA – pressure sensor

Table 4: Mechanical and electrical interfaces

3.3.2 Environmental conditions

Environmental conditions	
Operating temperature	+0°C to +55°C
Storage temperature	-20°C to +50°C
Max. vibrations	5 Hz to 13.2 Hz: 1 mm peak 13.2 Hz to 100 Hz: 7 m/s² peak (The given values describe the test conditions; there is no experience of operating outside this frequency range)
Relative humidity	up to 95%
IP protection rating	IP 20

Table 5: Ambient conditions and physical characteristics

4 Product overview

4.1 Component overview

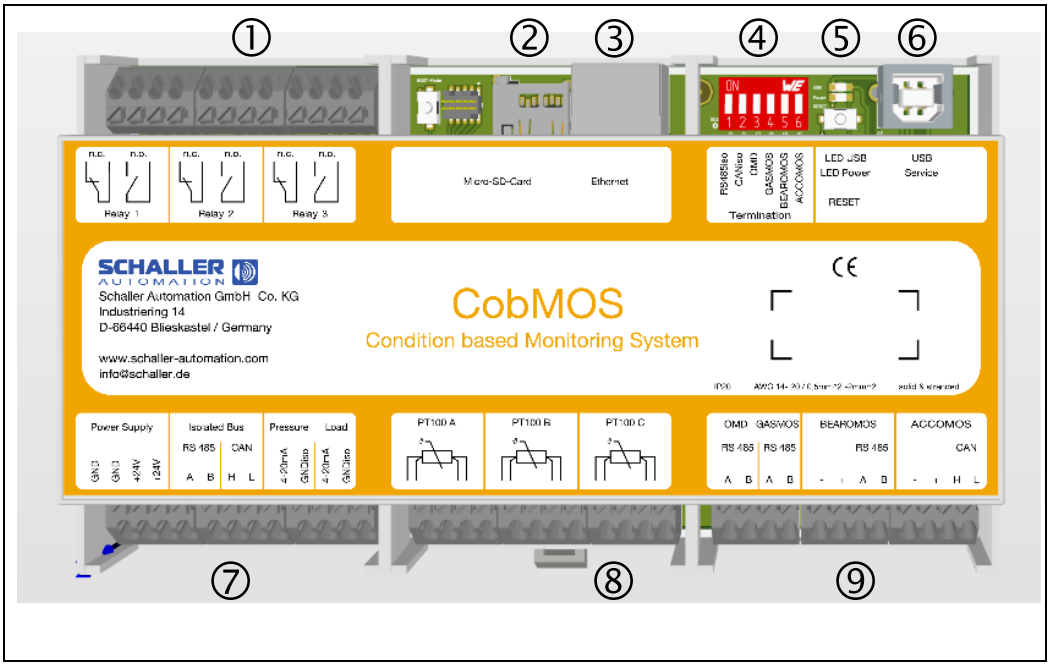


Fig.: 2 : Component overview, CobMOS

1: Relay contacts
2: Micro SD card holder
3: Ethernet connection (RJ45)
4: DIP switch for BUS terminations
5: LEDs (USB: yellow, power: blue) & RESET
6: USB-B service connection
7: Connections for voltage, external BUS and 4-20 mA interfaces
8: PT100 connections
9: Connections for Schaller sensors

4.2 Technical description and technical data

NOTE

The figures below are for descriptive purposes only.

We reserve the right to vary the size and design of the device and accessories at any time.

4.2.1 Functional principle of the CobMOS

The CobMOS module acts an edge gateway and data logger for Schaller sensors.

As not all Schaller sensors are directly provided with a standardised protocol, the data from ACCOMOS, BEAROMOS, GASMOS and the VN2020 or VN301plus are combined, analysed and made available on a standardised interface, using CobMOS. CANopen, Modbus RTU (RS485) or MQTT (Ethernet) are available for this.

In addition to providing the sensor signals on standardised interfaces, CobMOS can be integrated into a local network via Ethernet to visualise the sensor signals from ACCOMOS, BEAROMOS, GASMOS and the VN2020 or VN301plus on any end device via a web interface.

CobMOS also provides a data logger function, which allows you to store the sensor data on an SD card for a configurable number of days and to record when limit values are exceeded in a separate log file.

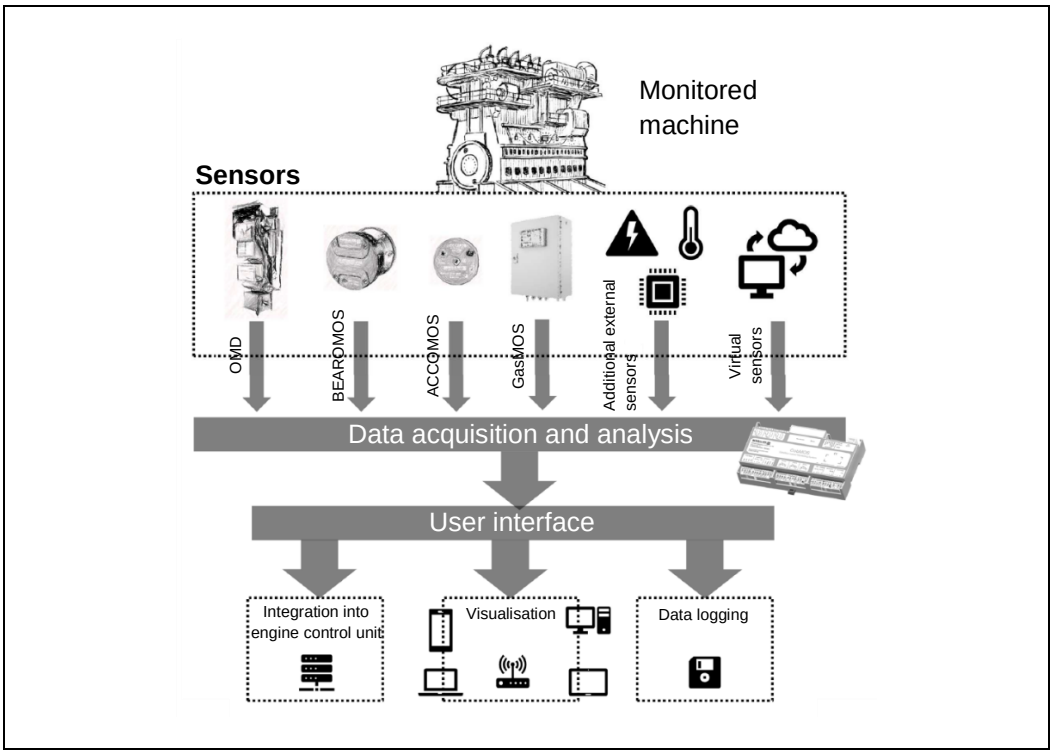


Fig.: 3 : Principle of the CobMOS

4.3 Intended use

The task of the CobMOS is to integrate Schaller sensors into customer control systems or to visualise them on web-based end devices. The CobMOS Edge Gateway is only used as a Condition Monitoring System and it must not be integrated into a safety system.

4.4 Foreseeable misuse

NOTE

Applications and methods not referred to or described in these instructions are not allowed!

Unauthorised persons must not carry out installation or maintenance.

It must not be used in potentially explosive atmospheres.

5 Transport and storage

5.1 Unpacking and items included in delivery

When you receive the device, check the whole delivery to ensure that it contains all the components.

NOTE

Dispose of the packaging materials in accordance with your local disposal regulations in the containers provided for this purpose.

5.2 Transport

The delivery is ex works in a ready-to-use condition. Delivery is made in accordance with the terms of the contract.

Check the delivery immediately on receipt for any transport damage.

CAUTION

Damaged components can cause damage to electrical systems.

- Make sure immediately that the delivery is correct, complete and undamaged. Report any visible transport damage to the responsible transport company immediately.

CAUTION

Damage to the device from improper transport

- Avoid shocks, vibrations and collisions with other objects by handling the device slowly and in a controlled manner.
- A collision or falling of the device may cause damage to the internal high-precision components. In such cases, we recommend no longer using the device.

5.3 Storage conditions before starting up

The maximum storage period for the device is 12 months after receipt of goods in the original packaging.

- Store the device in a place that meets the following conditions:
  - The room is covered (dry and free from frost and dust)
  - There is no exposure to wind or rain
  - There is no exposure to flammable, volatile or corrosive gases or dust
  - There is no exposure to vibrations
  - The place is stable and free of hazards

Storage temperature range	-25°C to max. 50°C
Relative humidity [RH]	< 85% and avoiding condensation

Table 6: Storage conditions before starting up

CAUTION

Incorrect storage can damage the device.

- Keep the storage period for the device to a minimum.
- Keep the device in its original packaging.
- If stored for a longer period, check the condition of the device regularly.
- Note the warranty period under the General Terms & Conditions

6 Assembly and installation

WARNING

- Failure to comply with the safety instructions may result in serious damage to property or the environment.
- Familiarise yourself with the basic safety instructions before starting assembly.
  ⇨ Section 2.4 Basic safety instructions

NOTE

- Observe the environmental conditions for assembling the device
- *⇨ Section 3.3.2*
  Environmental conditions

6.1 Preparatory steps by the customer

NOTE

- For installation and operation of the device, the following must be provided by the customer at the installation site:
  - ☑ a suitable space in a switch cabinet;
  - ☑ a supply line for the electrical power supply;
  - ☑ supply lines to transfer the signals.

  ⇨ For details, see Section 3.3.1. Mechanical and electrical interfaces

6.1.1 Establishing the electrical power supply

The electrical power supply must be provided by the customer:

- Power supply: 9 Volt to 32 Volt DC, max. 1.85 A
- Nominal voltage: 24 Volt DC

DANGER

Electrical hazards

- Before connecting the electrical supply lines, they first have to be disconnected from the power supply.

6.2 Setting up

NOTE

Observe the ambient conditions when setting up.
(E.g. humidity, vibration, etc.) ⇨ *Section 3.3.2*
Environmental conditions

- The device may only be installed by qualified or trained personnel!
- Suitable electrical supply connections must be available at the site.
  ⇨ *Section 6.1 Preparatory steps by the customer*
- Do not operate the device in an elevated electromagnetic environment.
  (Outside standardised limit values)
- Do not operate the device with increased vibrations or outside the permissible limit values (see ⇨ *Section 3.3.2*).
- Environmental conditions

6.3 Assembling the system components

CAUTION

Safe and correct assembly of the device

- For assembly, read the operating manual and other documents accompanying the product with care and keep them in a suitable place for later use.

The sensor unit is assembled in 2 steps:

Step 1: Assemble the top-hat rail housing

Step 2: Establish the electrical power supply

6.3.1 Assemble the top-hat rail housing

The CobMOS module is installed in a suitable switch cabinet either on a DIN top-hat rail (TH 35) or using the keyhole slots on the back of the housing.

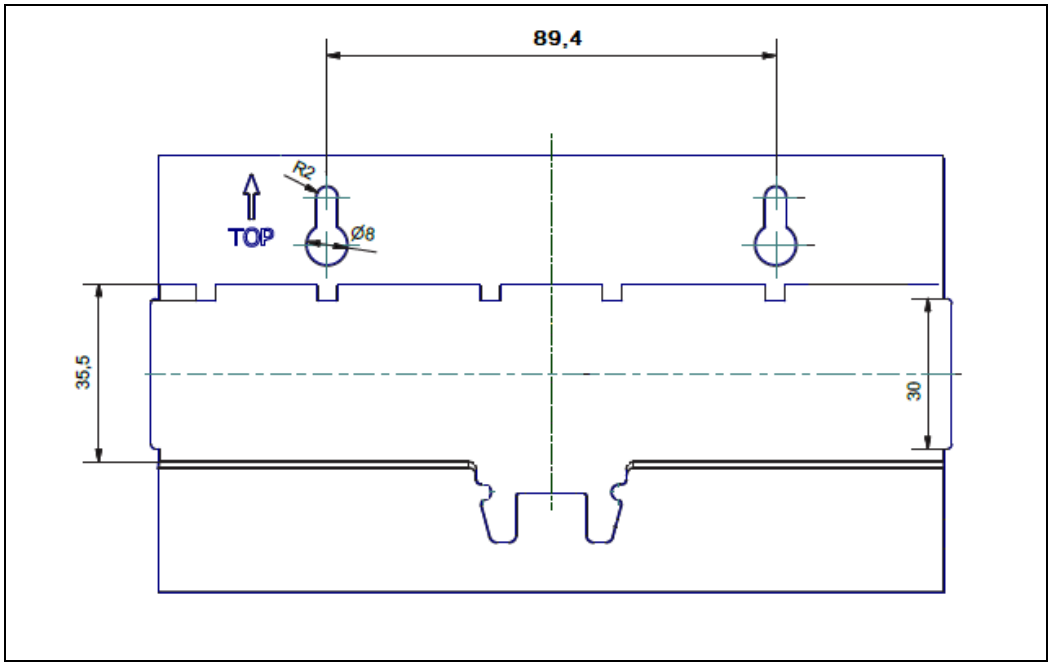


Fig.: 4 : Mechanical dimensions

6.3.2 Electrical connection

With the exception of Ethernet and USB, the module is connected using spring-loaded terminals. A flexible or rigid cable with a conductor cross-section of 0.5 - 2 mm² or 20 - 14 AWG must be used for the spring-loaded terminals. An RJ45 connection is available for the Ethernet connection. A CAT.6 cable as a minimum should be used for the Ethernet connection.

To connect the spring-loaded terminals, strip the cable by 7.5 mm to 8.5 mm, press down the release for the loaded spring with a screwdriver, insert the cable and take the screwdriver out again:

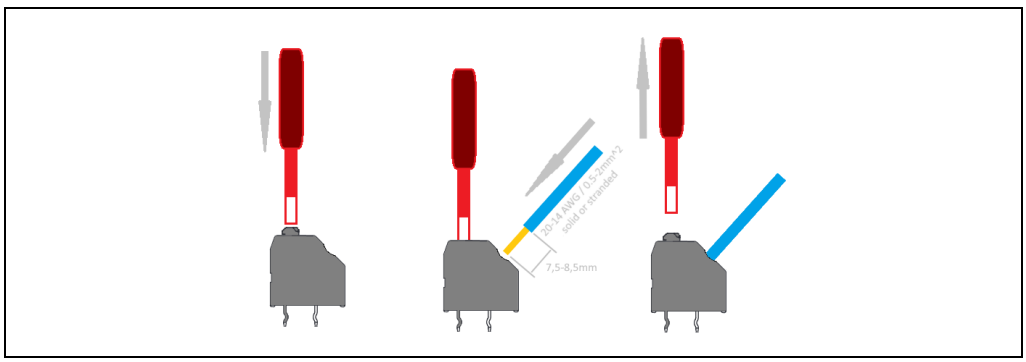


Fig.: 5 : Connecting the spring-loaded terminals

Shielded cables must be used to connect the sensors (ACCOMOS, BEAROMOS, GASMOS and OMD) (see sensor manual). The ACCOMOS and BEAROMOS sensors

can be supplied with power via the module; the GASMOS and OMD must be connected to a power supply separately.

The PT100 temperature sensors are connected by 4-wire connection. If sensors that use a 2-wire connection are to be used for this (not recommended), the two outer connections must be connected.

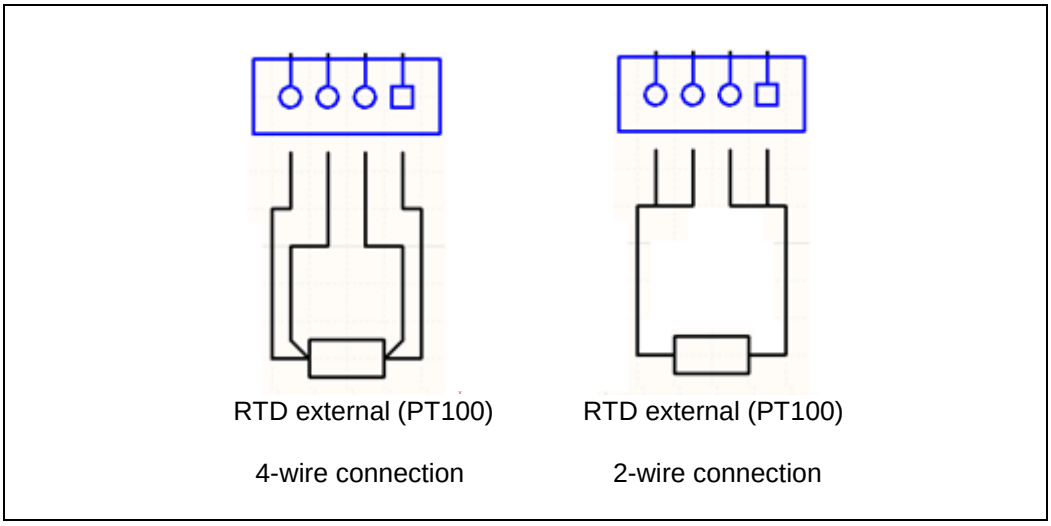


Fig.: 6 : Connecting PT100 sensors

The 4-20 mA interface for load and pressure is connected according to the following diagram:

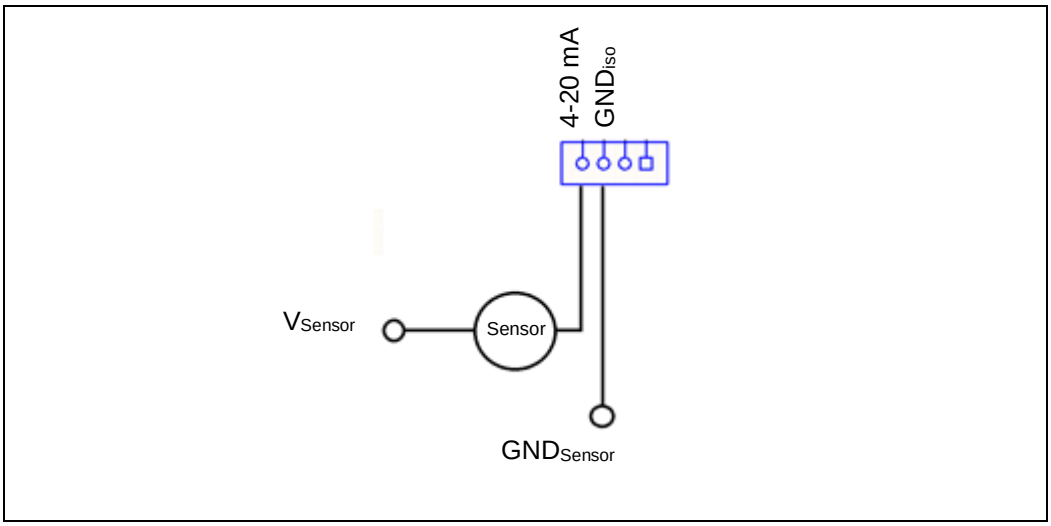


Fig.: 7 : Connecting 4-20 mA interfaces

It is important to ensure that the power supply for the 4-20 mA sensors is electrically isolated from the CobMOS module supply, as otherwise there is no isolation between the 4-20 mA interface and the RS485/CAN bus.

The isolated interfaces (CAN and RS485) are used for communication with external control systems. As for the sensors, shielded cables must be used for this.

You must observe the wiring diagram on the housing when connecting the sensors, the BUS cables and the power supply.

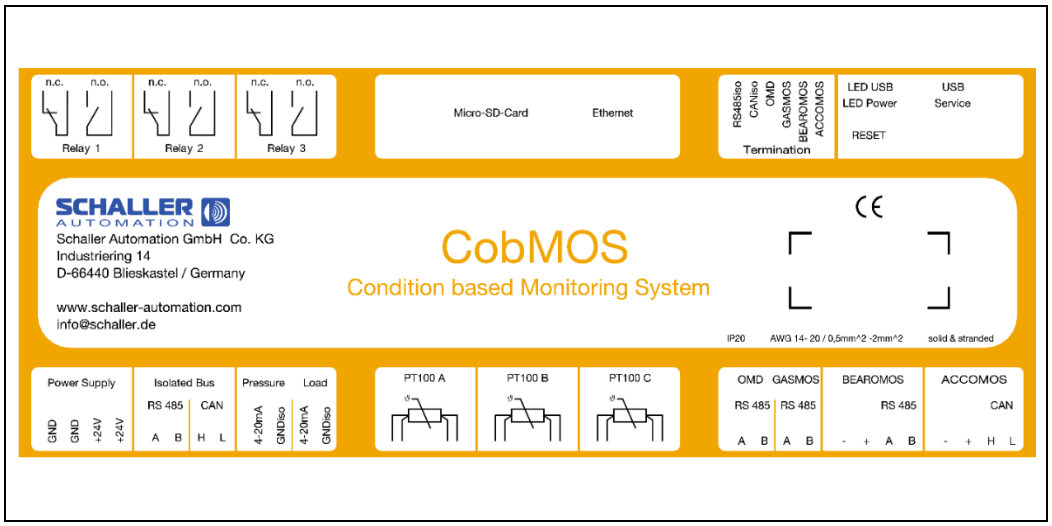


Fig.: 8 : Connecting 4-20 mA interfaces

The following applies to all BUS connections: the last device on the BUS has to be terminated. If CobMOS is the last device on the applicable BUS, the DIP switches can be used for this (line termination/terminator activated: DIP switch ON).

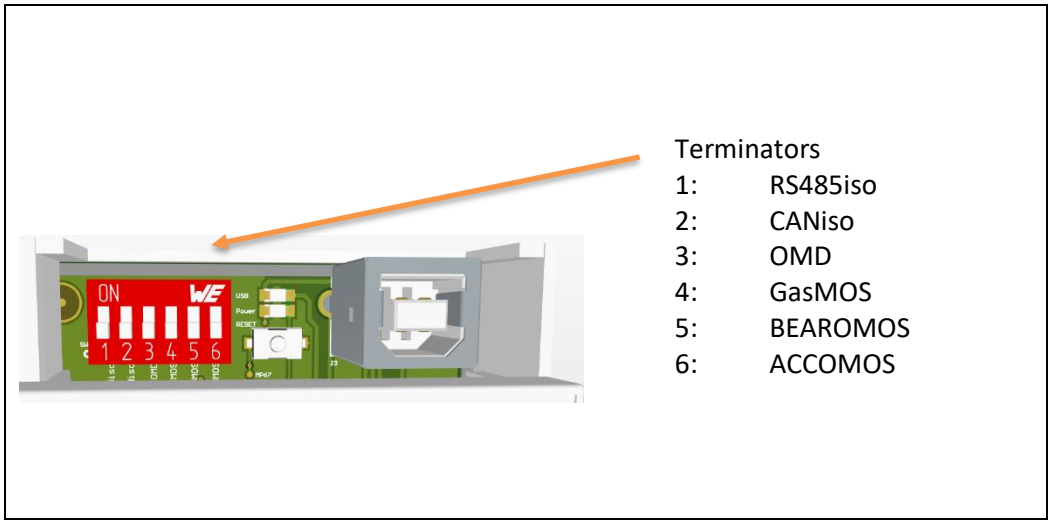


Fig.: 9 : Terminators for BUS interfaces

6.4 Starting up for the first time

CAUTION

Safe and proper use of the device

- Read the operating manual and other documents that accompany the product carefully and keep them in a suitable place for later use.
- For repair and service work, you must follow the instructions in the operating manual.

6.4.1 Checklist for starting up for the first time

Once assembly (⇨ *Section 6.3 Assembling the system components)* and the electrical connection have been completed successfully, we recommend working through the following checklist **before** starting up for the first time:

Item No.	Description	☑
1	Are the sensor units connected according to the description of connection?	
4	Are all the electrical lines and cables safely routed or tucked away?	
6	Have the correct terminators been set?	
9	Is the power supply correctly connected and is the voltage within the specified range?	
13	After the visual inspection, close all the covers that are still open.	

Table 7: Checklist for startup

6.4.2 Connecting the power supply

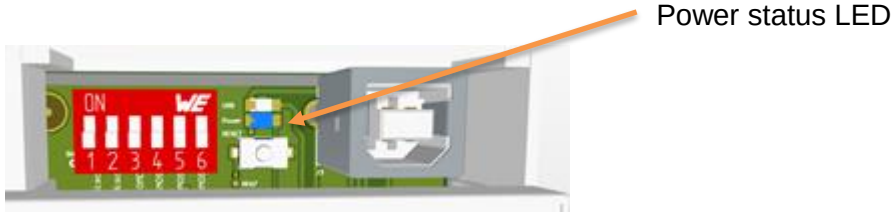
The power supply has been made available in advance by the operator and installed according to Section 6.4.2. ⇨ *Section 6.4.2 Connecting the power supply*

1. Switch on the power supply.

NOTE

Indicator when ready for operation

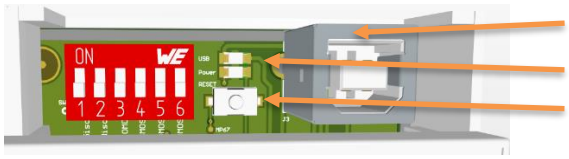
- After starting up/switching on the power supply, the blue power status LED comes on



7 Manufacturer settings

NOTE

- A RESET must be performed every time the parameters are changed



CAUTION

Safe and proper use of the device

- If the SD card has to be removed to change the parameters, you must disconnect the power supply first.
- To ensure the device functions correctly, all the values that are not described must not be changed and must be left as the default value!
- When changing parameters, note the commas after each parameter, except for the last parameter, inside the curly brackets!

The parameter files can be accessed either using the USB-B cable to the CobMOS connection (please note that CobMOS stops data logging as soon as a USB connection to a PC is established) or by removing the micro SD card from the SD card slot (⇨ *Section 8.8 Removing the SD card*). (To do this, however, CobMOS must **first be disconnected from the power supply** and then you have to remove the card with the PUSH-PULL method).After changing parameters on a PC, reinsert the micro SD card and you can power up the module again.

The parameter files are available in *.json format and can be edited using e.g. the Windows text editor.

Before disconnecting USB, the drive has to be safely “ejected” via the PC's operating system. To do this in Windows Explorer, right-click on the drive icon and select the “Eject” option.A RESET must be performed after disconnecting USB. The RESET button is on the left of the USB port. It may also be necessary to perform a RESET after establishing the connection, so that the mass storage device is properly recognised by the PC operating system.

7.1 ACCOMOS parameters

Directory on the SD card: ***Drive*:\COBMOS\CONFIG\accomos.json**


```
{
  "device": "ACCOMOS",
  "isActive": true,
  "offsetX": 0,
  "offsetY": 0,
  "offsetZ": 0,
  "limit1Value": 4000,
  "limit1Min": 0,
  "limit1Max": 16000,
  "limit2Value": 8000,
  "limit2Min": 0,
  "limit2Max": 16000
}
```


When operating the ACCOMOS, make sure that its DEFAULT address is set in the sensor. For more information, see the ACCOMOS operating manual.

Values that can be configured

isActive true / false
Activate/deactivate the interface

offset 0-16000
Offset to be subtracted from the sensor value. Can be used to suppress static acceleration (e.g. acceleration due to gravity). For more information, see the ACCOMOS operating manual.

limit1Value / limit2Value
Limit values for recording an event.

7.2 BEAROMOS parameters

Directory on the SD card: ***Drive*:\COBMOS\CONFIG\bearomos.json**


```
{
  "device": "BEAROMOS",
  "isActive": true,
  "mixedfrictionValue": 10,
  "mixedfrictionMin": 10,
  "mixedfrictionMax": 25,
  "regression1Value": 20,
  "regression1Min": 0,
  "regression1Max": 30,
  "regression2Value": 8,
  "regression2Min": 0,
  "regression2Max": 30,
  "motorstartdelayValue": 140,
  "motorstartdelayMin": 0,
  "motorstartdelayMax": 600,
  "evaluationdelayValue": 30,
  "evaluationdelayMin": 0,
  "evaluationdelayMax": 600,
  "rotationSpeedValue": 100,
```

```
  "rotationSpeedMin": 0,
  "rotationSpeedMax": 3600,
  "predictandIndex": 4
}
```


Values that can be configured

isActive true / false
Activate/deactivate the interface

mixedfrictionValue 10-25
Limit value range (sensitivity)

motorstartdelayValue
Start time of the engine to delay analysis until the operating status is reached.

rotationSpeedValue
Minimum rotation speed until the start of the analysis

7.3 CobMOS basic parameters

Directory on the SD card: ***Drive*:\COBMOS\CONFIG\cobmos.json**


```
{
  "device": "CobMOS",
  "motor": "Monitored Device Name",
  "serialnumber": MMJJ0xxx,
  "modbus": {
    "isActive": true,
    "address": 1
  },
  "canopen": {
    "isActive": true
  },
  "ethernet": {
    "ipaddress": "192.168.0.26",
    "subnetmask": "255.255.255.0",
    "gateway": "0.0.0.0",
    "refresh": 5
  },
  "sdcard": {
    "numHistoryFiles": 1096,
    "numEventsFiles": 1096,
    "numFftFiles": 24
  },
  "mqtt": {
    "broker_ip": "192.168.178.12",
    "qos": 1
  }
}
```


Values that can be configured

motor
Description of the installation location. Is also used on the web display to name tabs.

modbus
isactive true / false
Activate/deactivate the interface
Address Modbus RTU address for CobMOS

canopen
isactive true / false
Activate/deactivate the interface
The other CAN parameters are configured via a separate file (described below).

ethernet
ipadress
subnetmask
gateway
Settings/parameters of the network connection for CobMOS on the local network
refresh
Refresh rate for the web interface in s

sdcard
numHistoryFiles 0 - 1096
Number of history files (1 file per day)
numEventFiles 0-1096
Number of event files (1 file per day)
numFftFiles 0-24
Number of FFT files (1 file per h)

mqtt
broker_ip
IP address of the MQTT broker
qos 0 - 2
Quality Of Service:
0: at most once
1: at least once (DEFAULT)
2: exactly once

7.4 GASMOS parameters

Directory on the SD card: ***Drive*:\COBMOS\CONFIG\gasmos.json**

```
{
  "device": "GasMOS",
  "isActive": true,
  "modbusAddress": 2
}
```

isactive true / false
Activate/deactivate the interface

modbusAddress 1 - 247
Modbus address of the GASMOS sensor

7.5 Load sensor parameters

***Drive*:\COBMOS\CONFIG\load.json**

```
{
  "device": "Load",
  "isActive": true,
  "samples": 1,
  "load4mA": 0,
  "load20mA": 1000
}
```

isactive true / false
Activate/deactivate the interface

samples 1, 2, 5, 10, 20
Number of samples from which a mean is calculated

load4mA
Lower measuring range end value (-20000 to 20000)

load20mA
Upper measuring range end value (-20000 to 20000)

7.6 OMD parameters

Directory on the SD card: ***Drive*:\COBMOS\CONFIG\omd.json**

```
{
  "device": "OMD",
  "isActive": true,
  "type": 1,
  "modbusAddress1": 80,
  "modbusAddress2": 82
}
```

isactive true / false
Activate/deactivate the interface

Type 1-3
1: VN2020
2: VN301plus
3: VN301plus with VN301plus Partner CU*

modbusAddress1 1 - 247
Modbus address of the OMD sensor

modbusAddress2 1 - 247
Modbus address of the partner CU of the VN301plus with more than 10 compartments.

*Even if both VN301plus central units are connected to each other as partner CU (CAN-DIEMOS), both central units also have to be connected to the associated CobMOS BUS connection with Modbus, in parallel to each other. Attention must be paid in this case to the correct configuration (Modbus RTU) and addresses of the central units (see VN301plus operating manual).

7.7 Pressure sensor parameters

Directory on the SD card: ***Drive*:\COBMOS\CONFIG\pressure.json**

```
{
  "device": "Pressure",
  "isActive": true,
  "samples": 1,
  "pressure4mA": -1000,
  "pressure20mA": 600
}
```

isactive true / false

Activate/deactivate the interface

samples 1, 2, 5, 10, 20
Number of samples from which a mean is calculated

pressure4mA
Lower measuring range end value (-20000 to 20000)

pressure20mA
Upper measuring range end value (-20000 to 20000)

7.8 PT100/temperature sensor parameters

***Drive*:\COBMOS\CONFIG\pt100.json**

```
{
  "device": "PT100",
  "isActiveA": true,
  "isActiveB": true,
  "isActiveC": true,
  "filterTypeA": 0,
  "filterTypeB": 0,
  "filterTypeC": 0
}
```

isactive true / false
Activate/deactivate the interface

filterType 0 – 1
Filter to suppress the mains frequency when using AC/DC converters.
0: 50Hz filter
1: 60Hz filter

7.9 CANOpen parameters

***Directory on the SD card:Drive*:\COBMOS\CONFIG\CANopen\CANopen.json**

```
{
   "NodeID": 4,
   "Baud_kbit": 500,
   "P05_active": 0,
   "P05_ID": 0x685,
   "P06_active": 0,
   "P06_ID": 0x686,
   "P07_active": 0,
   "P07_ID": 0x687,
   "P08_active": 0,
   "P08_ID": 0x688,
   "P09_active": 0,
   "P09_ID": 0x689,
   "P10_active": 0,
   "P10_ID": 0x68A,
   "P11_active": 0,
   "P11_ID": 0x68B,
   "P12_active": 0,
   "P12_ID": 0x68C
}
```

NodeID
CobMOS address on the CAN network.

Baud_kbit 100, 125, 250, 500, 1000
CAN network transfer rate

As CobMOS provides more sensor values via CANopen than can be accommodated in a standard CANopen PDO frame, additional address ranges have to be defined for the extra PDOs. These can be defined and activated/deactivated using the following parameters. The extra PDOs are deactivated by default so that other devices that may be within this address range are not disrupted.

P*xx*_active 0-1
0: Deactivate PDO
1: Activate PDO

P*xx*_ID
ID for the applicable PDO

8 Operation and use

CAUTION

Safe and proper use of the device

- Read this operating manual and other documents that accompany the product carefully and keep them in a suitable place for later use.

8.1 Check every time before operation

The device must be checked according to the checklist in Section 6.5.1 every time before it is started up. ⇨ *Section 6.4.1 Checklist for starting up for the first time*

For further information, please see Section 10 of these instructions. ⇨ *Section 10 Error diagnosis and troubleshooting*

8.2 Operation under correct conditions

The CobMOS is a built-in device with two LED status indicators and several BUS connections. The LEDs are used to check that the module is working:

- Blue: Power supply is working
- Orange: USB device connected

The following interfaces are used to monitor and analyse the connected sensors:

- CAN - CANopen
- RS485 - Modbus RTU
- Ethernet
  - MQTT
  - Web visualisation
- Data log on micro SD card

All Schaller sensors can be integrated into higher-level control systems using the CobMOS. The protocols required for this purpose are described below. An Electronic Data Sheet (EDS) file is also available for CANopen.

CobMOS provides the option of logging sensor data and time when limit values are exceeded. The log data can be accessed either via the built-in USB port or directly from the micro SD card and a PC with a suitable reader.

The 4 main sensors (OMD, ACCOMOS, BEAROMOS and GASMOS) can be visualised on any end device via a web browser with an Ethernet connection to the local network.

8.3 Switching the device on and off

The device is switched on and off by switching on and off the power supply, which is provided by the operator. The other steps for starting up are described in detail in Section 6.5.3.

⇨ *Section 6.4.2 Connecting the power supply*

8.4 Normal operation

When the power supply is established, the module starts recording data and makes all the data available on request on the BUS interfaces, provided they have been activated in the relevant parameter files.

NOTE

Exception

- As soon as USB is connected to a PC, the module stops recording and transferring data and is treated as a mass storage device by the connected PC.

8.5 Data log

The CobMOS saves all the sensor data every second to a data log, which is stored on the internal SD card. The data can be accessed either using the USB-B cable to the CobMOS connection (please note that CobMOS stops data logging as soon as a USB connection to a PC is established) or by removing the SD card from the SD card slot (⇨ *Section 8.8 Removing the SD card*). (To do this, however, CobMOS must **first be disconnected from the power supply** and then you have to remove the card with the PUSH-PULL method). Once the micro SD card has been reinserted, the module can be powered on again.

Before disconnecting USB, the drive has to be safely “ejected” via the PC's operating system. To do this in Windows Explorer, right-click on the drive icon and select the “Eject” option.A RESET must be performed after disconnecting USB. The RESET button is on the left of the USB port. It may also be necessary to perform a RESET after establishing the connection, so that the mass storage device is properly recognised by the PC operating system.

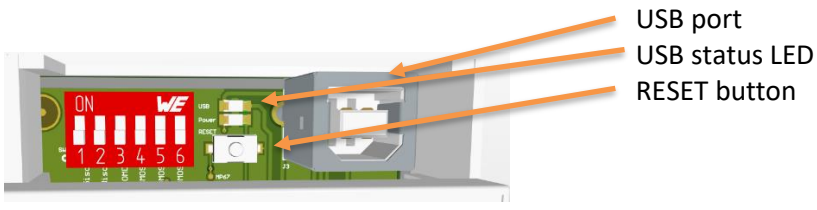


Fig.: 10 : Position of the RESET button

8.5.1 History data

Directory on the SD card: ***Drive*:\COBMOS\DATA\HISTORY**

A log file in *.csv format is created per day. This is FIFO memory with a configurable number of files (max. 3 years). The files have the following structure:

YYYY-MM-DDTHH:MM:SS	AS_RMS_X	AS_RMS_Y	AS_RMS_Z	AS_MAX_X	AS_MAX_Y	AS_MAX_Z	BS_MEAN	BS_LOWER_LIMIT	BS_UPPER_LIMIT	BS_REVOLUTION_SPEED	GS_METHANE	GS_HUMIDITY	OMD_1	...	OMD_20	PT100_1	PT100_2	PT100_3	PRESSURE	LOAD
2021-11-18T00-00-00	36	50	56	106	151	168	144	2147483647	2147483647	6	2	3695	0		0	27	883	883	-1000	0
2021-11-18T00-00-01	36	49	55	106	135	184	145	2147483647	2147483647	6	2	3700	0		0	27	883	883	-1000	0
2021-11-18T00-00-02	35	49	55	106	135	168	145	2147483647	2147483647	6	2	3700	0		0	27	883	883	-1000	0
2021-11-18T00-00-03	36	49	55	106	135	168	145	2147483647	2147483647	6	2	3701	0		0	27	883	883	-1000	0
2021-11-18T00-00-04	36	49	55	106	135	168	145	2147483647	2147483647	6	2	3701	0		0	27	883	883	-1000	0
2021-11-18T00-00-05	36	50	55	106	127	176	144	2147483647	2147483647	6	2	3714	0		0	27	883	883	-1000	0
2021-11-18T00-00-06	36	50	55	106	135	199	144	2147483647	2147483647	6	2	3714	0		0	27	883	883	-1000	0
2021-11-18T00-00-07	36	50	55	106	135	199	145	2147483647	2147483647	6	2	3704	0		0	27	883	883	-1000	0
2021-11-18T00-00-08	36	50	55	106	151	176	145	2147483647	2147483647	6	2	3704	0		0	27	883	883	-1000	0
2021-11-18T00-00-09	36	50	55	106	151	168	145	2147483647	2147483647	6	2	3705	0		0	27	883	883	-1000	0

Table 8: Example of a history log

Units for the sensor values:

ACCOMOS RMS & Peak:	mG
BEAROMOS (MEAN, Limit):	uV
Revolution Speed:	RPM
Methane:	0.01 %
Humidity:	0.01 %
OMD:	%
PT100:	°C
Pressure:	mbar
Load:	0.1%

8.5.2 Event data

Times when the configured threshold values are exceeded are stored in a separate log file:

Directory on the SD card: ***Drive*:\COBMOS\DATA\EVENTS**

A log file in *.csv format is created per day. This is FIFO memory with a configurable number of files (max. 3 years). The files have the following structure:

YYYY-MM-DDTHH:MM:SS	DEVICE	EVENT
2021-11-15T01-32-44	GasMOS	limit exceeded
2021-11-15T01-32-45	GasMOS	Operation
2021-11-15T01-32-52	OMD	not ready
2021-11-15T01-33-40	ACCOMOS	limit 1 exceeded
2021-11-15T01-33-43	ACCOMOS	below limit 1

Table 9: Example of an event log

8.5.3 ACCOMOS FFT data

For ACCOMOS, a frequency analysis (FFT) is run every second in addition to the sensor values and is stored in another log file:

Directory on the SD card: ***Drive*:\COBMOS\DATA\FFT**

A log file in *.csv format is created per hour. This is FIFO memory with a configurable number of files (max. 24 hours). The files have the following structure:

YYYY-MM-DDTHH:MM:SS	AS_FFT_AXIS0_0	...	AS_FFT_AXIS0_2047	AS_FFT_AXIS1_0	...	AS_FFT_AXIS1_2047	AS_FFT_AXIS2_0	...	AS_FFT_AXIS2_2047
2021-11-17T23-00-00	1		0	1		0	1		0
2021-11-17T23-00-01	1		0	1		0	1		0
2021-11-17T23-00-02	0		0	0		0	0		0
2021-11-17T23-00-03	0		0	0		0	0		0
2021-11-17T23-00-04	0		0	0		0	0		0
2021-11-17T23-00-05	1		0	0		0	0		0
2021-11-17T23-00-06	0		0	0		0	0		0
2021-11-17T23-00-07	0		0	0		0	0		0

Table 10: Checklist for startup

AXIS0 is the x-axis of the ACCOMOS; AXIS1 is the y-axis; and AXIS2 is the z-axis. The values are stated as RMS values in mG.

A total of 2048 values are stored per axis; the values are in increments of 0.732 Hz.

8.6 Visualisation via web interface

To use the visualisation on the web interface, you can open the interface in a web browser on any device by going to the configured IP address of the CobMOS module. This requires an Ethernet connection to an existing network. If the network cable was only connected after starting up (hotplug), it may not be possible to reach the CobMOS web server. In this case, you have to perform a RESET or briefly disconnect the power supply.

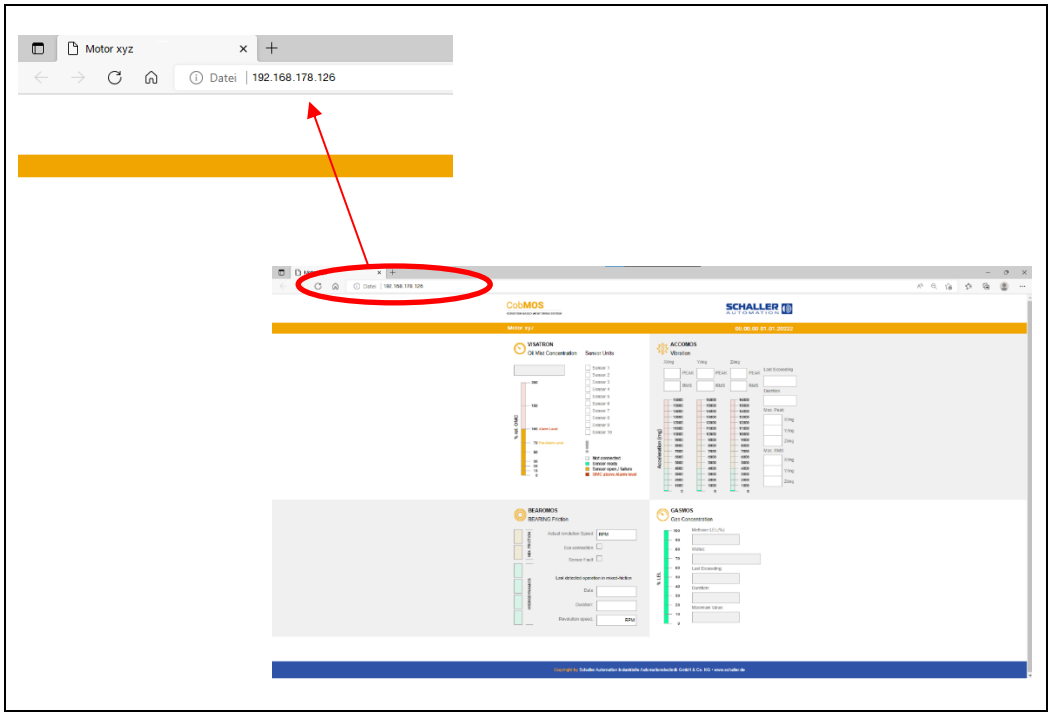


Fig.: 11 :Web interface

For best presentation, use the web visualisation in full-screen mode. Press F11 while the web browser is open to enter full-screen mode. You can change the window size using Ctrl +/-.

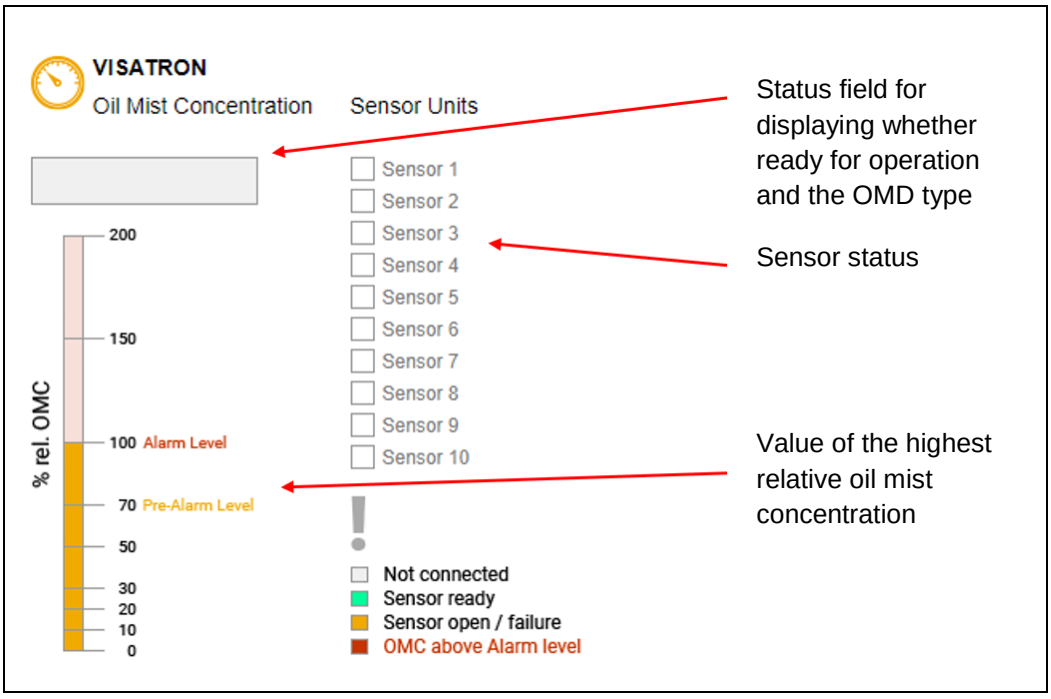


Fig.: 12 :Web interface – VISATRON display

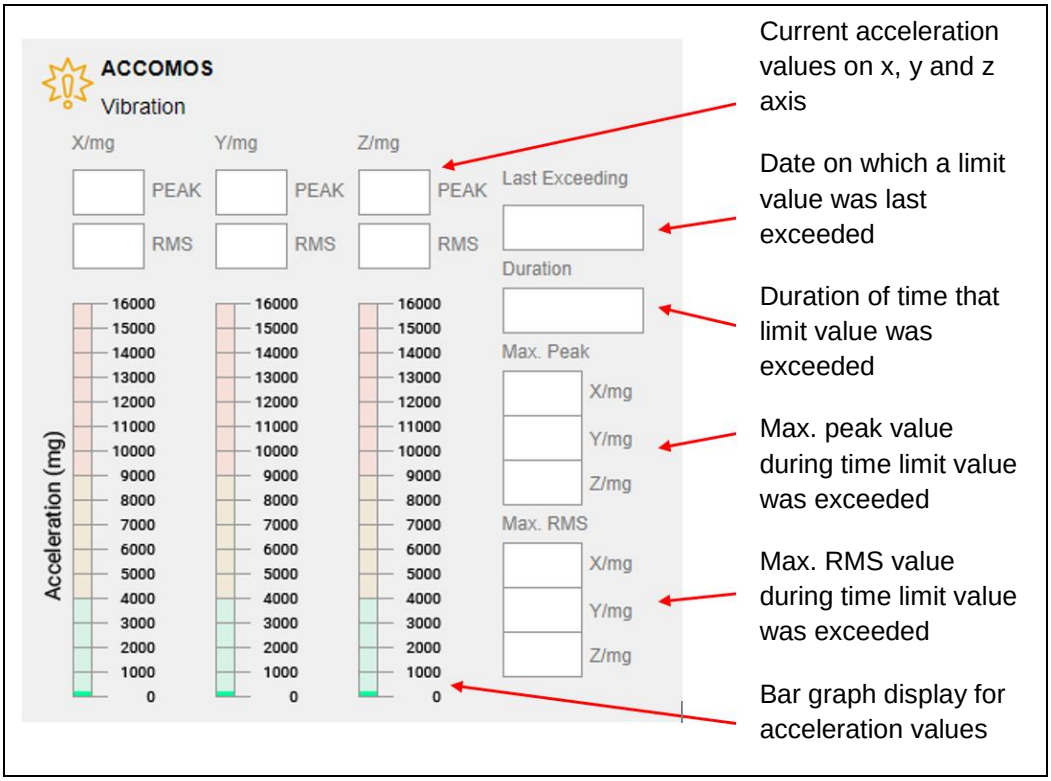


Fig.: 13 :Web interface – ACCOMOS display

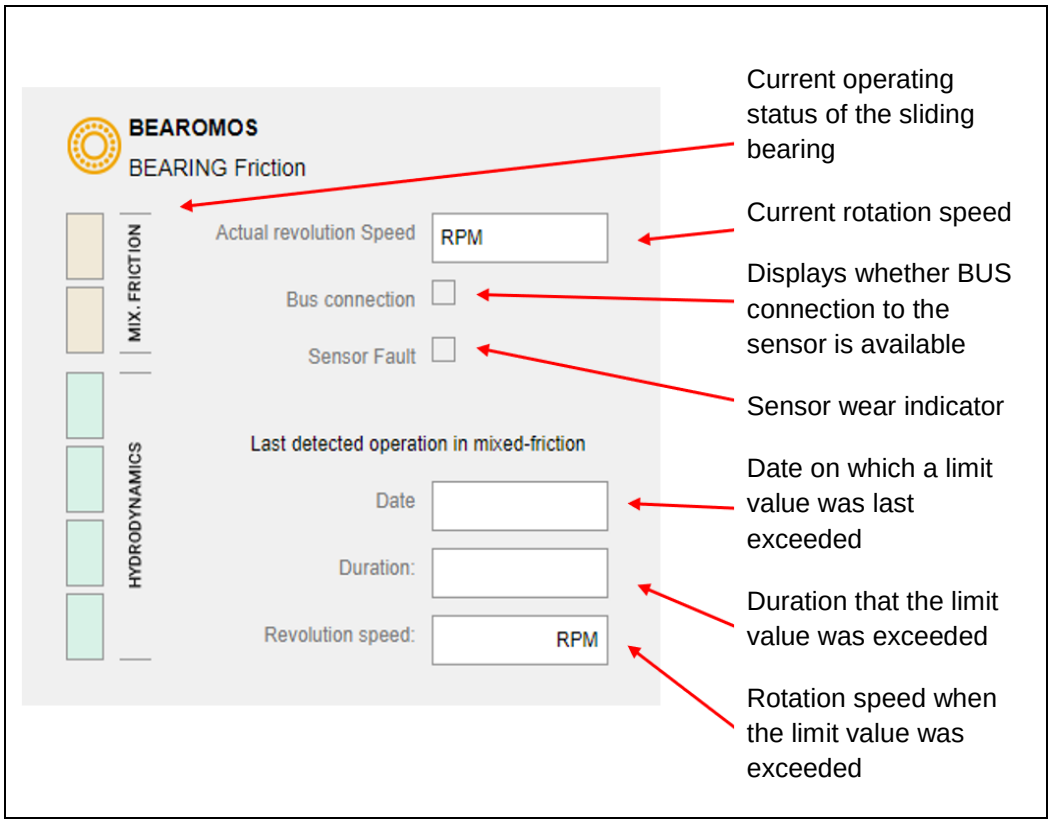


Fig.: 14 :Web interface – BEAROMOS display

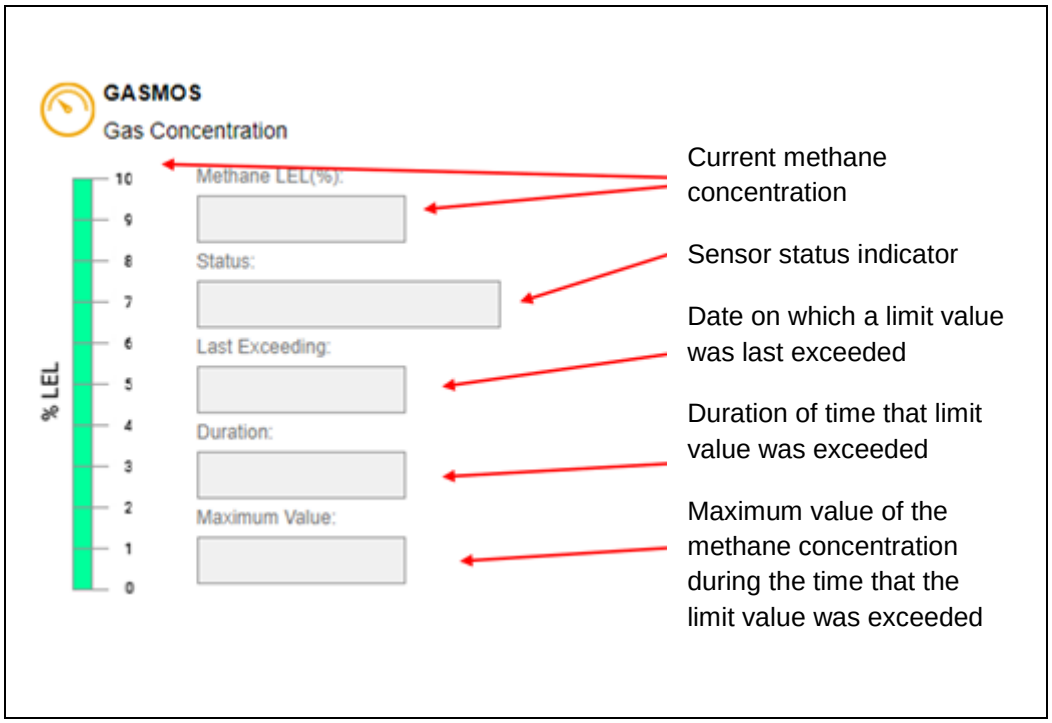


Fig.: 15 :Web interface – GASMOS display

In addition to simple visualisation, the internal web server has the option of making the data log and the FFT data available via a web interface.

CobMOS also has the option of setting the time via the web interface and performing a RESET.

These functions are described in more detail in the sections below.

Fig.: 16 :Web interface – ACCOMOS display

The footer of the website has links to the relevant functions.

NOTE

Data download

- The CobMOS web visualisation must not be active during the download process, as the download is aborted when this page is updated for the first time and the file that is produced is incomplete.
- When downloading the data via the web interface, the CobMOS stops recording data until the transfer of data is complete.
- The file download can take several minutes.

8.6.1 Data log download (Measurements)

The “Measurements” link opens a dialogue box where you can download the log files for one calendar day at a time:

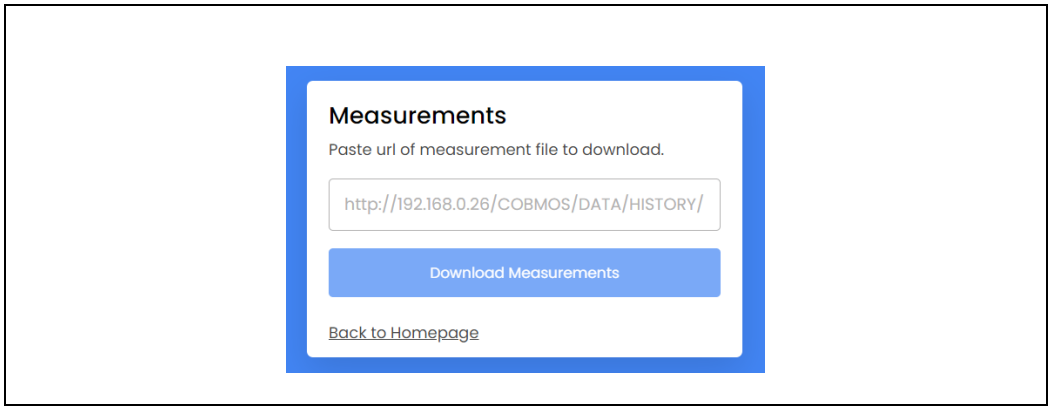


Fig.: 17 : Measurements dialogue box

Enter the address in the following format:

http://xxx.xxx.xxx.xxx/COBMOS/DATA/HISTORY/*jjjjmmdd*.csv

xxx.xxx.xxx.xxx	IP address of the relevant CobMOS module
jjjj	Year of the log file
mm	Month of the log file (for single-digit month, with leading 0)
dd	Day of the log file (for single-digit day, with leading 0)

If the requested file does not exist, an error message “404: The requested file cannot be found.” is displayed.

8.6.2 FFT download (FFT)

The “FFT” link opens a dialogue box where you can download the ACCOMOS FFT log files for one hour at a time:

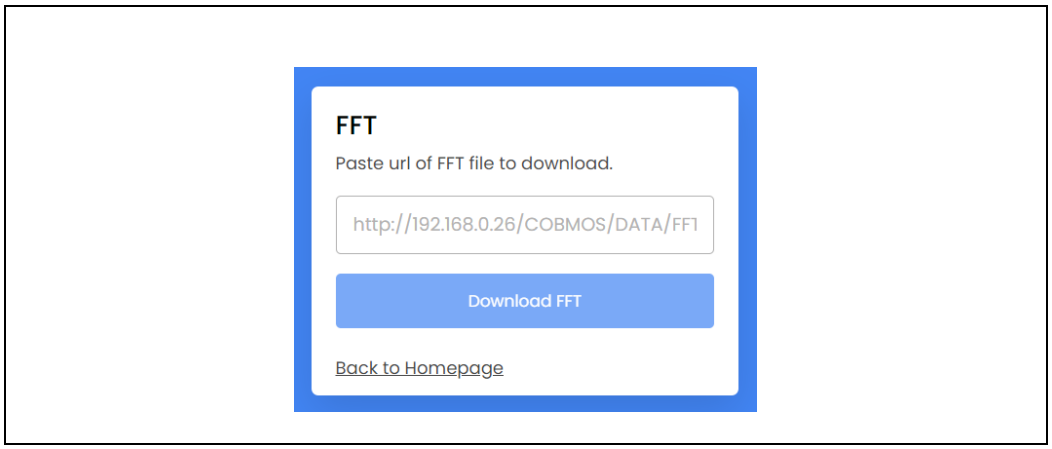


Fig.: 18 :. FFT dialogue box

Enter the address in the following format:

http://*xxx.xxx.xxx.xxx*/COBMOS/DATA/FFT/*jjjjmmddhh*.csv

xxx.xxx.xxx.xxx	IP address of the relevant CobMOS module
jjjj	Year of the log file
mm	Month of the log file (for single-digit month, with leading 0)
dd	Day of the log file (for single-digit day, with leading 0)
hh	Hour of the log file

If the requested file does not exist, an error message “404: The requested file cannot be found.” is displayed.

8.6.3 Set the time (Date and Time)

The “Date and Time” link opens a dialogue box where you can set the system time for the CobMOS module.

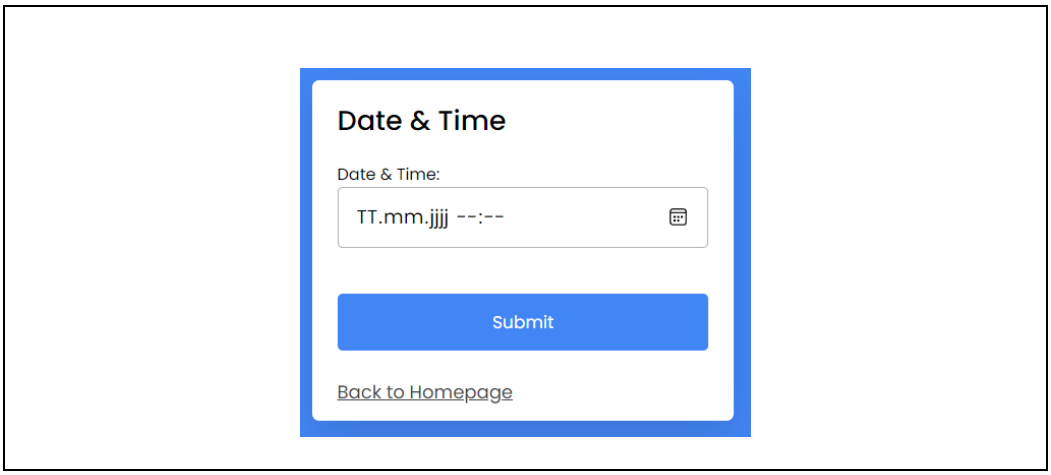


Fig.: 19 : Date and Time dialogue box

Enter the address in the following format:

jjjj	Year
mm	Month (for single-digit month, with leading 0)
dd	Day (for single-digit day, with leading 0)
--:--	Hour and minutes

8.6.4 System Reset

The “System Reset” link opens a RESET button, which resets/restarts the CobMOS. This is required e.g. for an update.

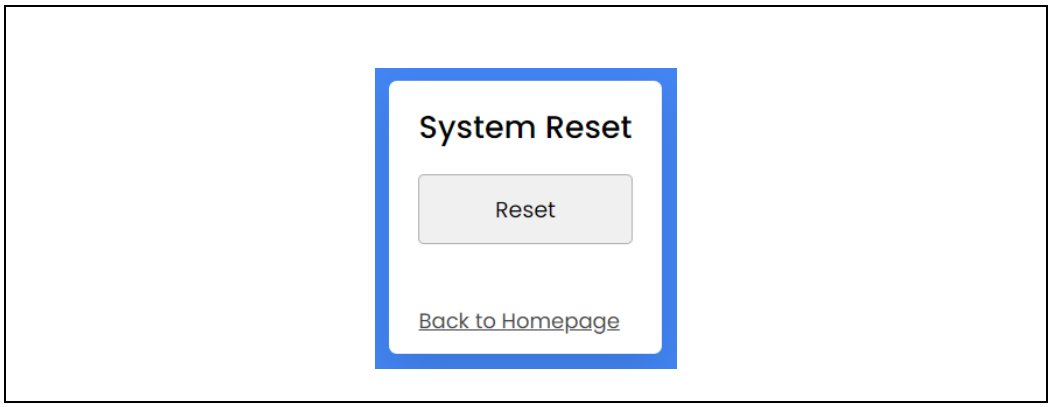


Fig.: 20 : Reset button

NOTE

Depending on your browser, it is possible for the RESET to run in a loop after clicking the RESET button; this is when the browser automatically activates the RESET repeatedly.

- To stop or prevent this, close the browser tab.

8.7 TFTP server

In addition to the web interface, the log files can also be downloaded using a TFTP client. How to download the files in this way is described below using the Microsoft TFTP client on the command line (CMD).

The firmware can also be updated via TFTP upload.

NOTE

Data download

- The file download can take several minutes.

8.7.1 Data log download

Enter the following command on the CMD line:

tftp -i *xxx.xxx.xxx.xxx* GET /COBMOS/DATA/HISTORY/*jjjjmmdd*.csv

xxx.xxx.xxx.xxx	IP address of the relevant CobMOS module
jjjj	Year of the log file
mm	Month of the log file (for single-digit month, with leading 0)
dd	Day of the log file (for single-digit day, with leading 0)

8.7.2 FFT download

Enter the following command on the CMD line:

tftp -i *xxx.xxx.xxx.xxx* GET /COBMOS/DATA/FFT/*jjjjmmddhh*.csv

xxx.xxx.xxx.xxx	IP address of the relevant CobMOS module
jjjj	Year of the log file
mm	Month of the log file (for single-digit month, with leading 0)
dd	Day of the log file (for single-digit day, with leading 0)
hh	Hour of the log file

8.7.3 Firmware update

Enter the following command on the CMD line:

tftp -i xxx.xxx.xxx.xxx PUT *UPDATE-File*.bin /COBMOS/UPDATE/firmware.bin

xxx.xxx.xxx.xxx	IP address of the relevant CobMOS module
Update-File:BIN	The “***UPDATE-File*.bin**” update file must be in the currently activated folder of the CMD line window

NOTE

After uploading the *.bin firmware file, you must perform a RESET to start the update process.

- ▶ The file download can take several minutes.

8.8 Transfer protocols

8.8.1 CANopen (CiA 401)

Possible baud rates:	100 kBit, 125 kBit, 250 kBit, 500 kBit, 1000 kBit
Refresh rate:	1 s
The following applies to all values:	LSW (least significant word/byte) first

An EDS file is available to integrate the CANopen protocol.

8.8.1.1 PDO mapping

Object register data:

Index:	0x2000		
SubID	ACCOMOS	PDO Mapping	
0	NumOfChannels		
1	X Peak	PDO1	mG, 16 bit
2	Y Peak		mG, 16 bit
3	Z Peak		mG, 16 bit
4	X RMS	PDO2	mG, 16 bit
5	Y RMS		mG, 16 bit
6	Z RMS		mG, 16 bit

Index:	0x2020		
SubID	BEAROMOS		
0	NumOfChannels		
1	Mean	PDO3	uV, signed, 32 bit
2	Rotation speed		RPM, 16 bit
3	Limit +	PDO4	uV, signed, 32 bit
4	Limit –		uV, signed, 32 bit

Index:	0x2040		
SubID	GASMOS		
0	NumOfChannels		
1	Methane	PDO5	0.01 %, signed,16 bit
2	Limit value		0.01 %, 16 bit
3	Humidity		0.01 %, 16 bit

Index:	0x2060		
SubID	OMD rel OMC		
0	NumOfChannels		
1	Sensor 1	PDO6	%, 16 bit
2	Sensor 2		%, 16 bit
3	Sensor 3		%, 16 bit
4	Sensor 4		%, 16 bit
5	Sensor 5	PDO7	%, 16 bit
6	Sensor 6		%, 16 bit
7	Sensor 7		%, 16 bit
8	Sensor 8		%, 16 bit
9	Sensor 9	PDO8	%, 16 bit
10	Sensor 10		%, 16 bit
11	Sensor 11		%, 16 bit
12	Sensor 12		%, 16 bit
13	Sensor 13	PDO9	%, 16 bit
14	Sensor 14		%, 16 bit
15	Sensor 15		%, 16 bit
16	Sensor 16		%, 16 bit

17	Sensor 17	PDO10	%, 16 bit
18	Sensor 18		%, 16 bit
19	Sensor 19		%, 16 bit
20	Sensor 20		%, 16 bit
Index: 0x2080			
SubID	Temperature		
0	NumOfChannels		
1	PT100A	PDO11	°C, signed, 16 bit
2	PT100B		°C, signed, 16 bit
3	PT100C		°C, signed, 16 bit
Index: 0x20A0			
SubID	4-20mA		
0	NumOfChannels		
1	Pressure	PDO12	mbar, signed, 16 bit
2	Load		0-1000, 16 bit

8.8.1.2 Cyclic transfer of all data

Cyclic transfer (1 s) can be started using the “LSS – Start Node”:

Example for CobMOS address (Node ID) 4: 000 2 01 *04*

- Frame ID: 0x000
- Data Length: 2
- Start Node: 0x01
- Node ID: 0x04

Other possible commands:

- Start Node: 0x01
- Stop Node: 0x02
- Pre-Operational State: 0x80
- Reset Node: 0x81
- Reset Communication: 0x82

Example 1:

ID ...	DLC...	Data Byte(s)	
0x000	2	01 04	“Start Node” start message
0x184	8	78 00 52 01 81 00 00 00	ACCOMOS Peak: 120 mG, 293 mG, 129 mG
0x284	8	30 00 1A 01 3A 00 00 00	ACCOMOS RMS: 48 mG, 282 mG, 58 mG
0x384	8	24 00 00 00 00 00 00 00	BEAROMOS: MW: 36 uV, RPM: 0
0x484	8	FF FF FF 7F FF FF FF 7F	BEAROMOS Limits: Full-Scale
0x685	8	00 00 00 00 00 00 00 00	GASMOS: not connected
0x686	8	0A 00 00 00 00 00 00 00	OMD1: 10 %
0x687	8	00 00 00 00 00 00 00 00	
0x688	8	00 00 00 00 00 00 00 00	
0x689	8	00 00 00 00 00 00 00 00	
0x68A	8	00 00 00 00 00 00 00 00	
0x68B	8	1A 00 0E FF 0E FF 00 00	PT100: A: 26 °C, B/C: not connected ➔Full-Scale
0x68C	8	18 FC 00 00 00 00 00 00	Pressure/load: not connected

Example 2:

1	184	6A 00 78 00 98 00 00.
2	284	22 00 27 00 35 00 00.
3	384	92 00 00 00 06 00 00.
4	484	FF FF FF 7F FF FF FF.
5	685	42 01 2C 01 6D 08 00.
6	686	00 00 00 00 00 00 00.
7	687	00 00 00 00 00 00 00.
8	688	00 00 00 00 00 00 00.
9	689	00 00 00 00 00 00 00.
10	68A	00 00 00 00 00 00 00.
11	68B	1D 00 73 03 73 03 00.
12	68C	18 FC 00 00 00 00 00.

ACCOMOS Peak: 106 mG, 120 mG, 98 mG
ACCOMOS RMS: 34 mG, 39 mG, 53 mG
BEAROMOS: MW: 146 uV, RPM: 6 (Values <10 must be interpreted as 0!)
BEAROMOS Limits: Full-Scale
GASMOS: Methane: 3.22 %, Limit: 3 %, Humidity: 21.57%
OMD: 0 %

PT100: A: 29 °C, B/C: not connected ➔Full-Scale
Pressure/load: not connected

8.8.1.3 Single data request

Single requests can be made using the “Request Identifier” 0x600 + node address. CobMOS then responds with the “Confirm Identifier” 0x580 + node address.

Example of ACCOMOS x-Peak Value with CobMOS address 0x04:

Request to CobMOS: 604 8 40 00 20 01 EE EE EE EE

- Frame ID: 0x604
- Data Length: 8
- Client Request: 0x40 (Read data)
- Index: 0x2000
- SubIndex (SI): 0x01
- Data: -

Example response: 584 8 43 00 20 01 6A 00 00 00

- Frame ID: 0x584
- Data Length: 8
- Client Request: 0x43 (4 bytes valid response)
- Index: 0x2000
- SubIndex (SI): 0x01
- Data: 0x006A (106 mG)

The following requests with the corresponding responses are possible:

Request	CobMOS Response	Comment
0x23	0x60	Write data, size: 4 bytes
0x40	0x43	Read data, 4 bytes valid response
0x40	0x4B	Read data, 2 bytes valid response

8.8.1.4 Layer Setting Service (LSS) instruction set

Below is a list of the entire LSS (Layer Setting Service) instruction set for the CANopen interface (here: Node ID *0x04*):

```
;+Bus
;|  +Message ID
;|  |       +Reserved
;|  |       |  +Cycle time in ms (0=manual)
;|  |       |  |    +Length of message
;|  |       |  |    |   +Frame type: Data or Remote request
;|  |       |  |    |   | +Message data
;|  |       |  |    |   | |
 1  000h    -  0    2   D 01h 04h ; Start Node 4
 1  000h    -  0    2   D 80h 04h ; Go back to pre-Operational - Node 4
 1  080h    -  0    0   D ; SYNC
 1  000h    -  0    2   D 01h 04h ; ------------------------
 1  604h    -  0    8   D 40h 00h 20h 01h EEh EEh EEh EEh ; Read 0x2000 Channel 1
 1  604h    -  0    8   D 40h 00h 20h 02h EEh EEh EEh EEh ; Read 0x2000 Channel 2
 1  604h    -  0    8   D 40h 00h 20h 03h EEh EEh EEh EEh ; Read 0x2000 Channel 3
 1  604h    -  0    8   D 40h 00h 20h 04h EEh EEh EEh EEh ; Read 0x2000 Channel 4
 1  604h    -  0    8   D 40h 00h 20h 05h EEh EEh EEh EEh ; Read 0x2000 Channel 5
 1  604h    -  0    8   D 40h 00h 20h 06h EEh EEh EEh EEh ; Read 0x2000 Channel 6
 1  000h    -  0    2   D 01h 04h ; ------------------------
 1  604h    -  0    8   D 40h 20h 20h 01h EEh EEh EEh EEh ; Read 0x2020 Channel 1
 1  604h    -  0    8   D 40h 20h 20h 02h EEh EEh EEh EEh ; Read 0x2020 Channel 2
 1  604h    -  0    8   D 40h 20h 20h 03h EEh EEh EEh EEh ; Read 0x2020 Channel 3
 1  604h    -  0    8   D 40h 20h 20h 04h EEh EEh EEh EEh ; Read 0x2020 Channel 4
 1  000h    -  0    2   D 01h 04h ; ------------------------
 1  604h    -  0    8   D 40h 40h 20h 01h EEh EEh EEh EEh ; Read 0x2040 Channel 1
 1  604h    -  0    8   D 40h 40h 20h 02h EEh EEh EEh EEh ; Read 0x2040 Channel 2
 1  604h    -  0    8   D 40h 40h 20h 03h EEh EEh EEh EEh ; Read 0x2040 Channel 3
 1  000h    -  0    2   D 01h 04h ; ------------------------
 1  604h    -  0    8   D 40h 60h 20h 01h EEh EEh EEh EEh ; Read 0x2060 Channel 1
 1  604h    -  0    8   D 40h 60h 20h 02h EEh EEh EEh EEh ; Read 0x2060 Channel 2
 1  604h    -  0    8   D 40h 60h 20h 03h EEh EEh EEh EEh ; Read 0x2060 Channel 3
 1  604h    -  0    8   D 40h 60h 20h 04h EEh EEh EEh EEh ; Read 0x2060 Channel 4
 1  604h    -  0    8   D 40h 60h 20h 05h EEh EEh EEh EEh ; Read 0x2060 Channel 5
 1  604h    -  0    8   D 40h 60h 20h 06h EEh EEh EEh EEh ; Read 0x2060 Channel 6
 1  604h    -  0    8   D 40h 60h 20h 07h EEh EEh EEh EEh ; Read 0x2060 Channel 7
 1  604h    -  0    8   D 40h 60h 20h 08h EEh EEh EEh EEh ; Read 0x2060 Channel 8
 1  604h    -  0    8   D 40h 60h 20h 09h EEh EEh EEh EEh ; Read 0x2060 Channel 9
 1  604h    -  0    8   D 40h 60h 20h 0Ah EEh EEh EEh EEh ; Read 0x2060 Channel 10
 1  604h    -  0    8   D 40h 60h 20h 0Bh EEh EEh EEh EEh ; Read 0x2060 Channel 11
 1  604h    -  0    8   D 40h 60h 20h 0Ch EEh EEh EEh EEh ; Read 0x2060 Channel 12
 1  604h    -  0    8   D 40h 60h 20h 0Dh EEh EEh EEh EEh ; Read 0x2060 Channel 13
 1  604h    -  0    8   D 40h 60h 20h 0Eh EEh EEh EEh EEh ; Read 0x2060 Channel 14
 1  604h    -  0    8   D 40h 60h 20h 0Fh EEh EEh EEh EEh ; Read 0x2060 Channel 15
 1  604h    -  0    8   D 40h 60h 20h 10h EEh EEh EEh EEh ; Read 0x2060 Channel 16
 1  604h    -  0    8   D 40h 60h 20h 11h EEh EEh EEh EEh ; Read 0x2060 Channel 17
 1  604h    -  0    8   D 40h 60h 20h 12h EEh EEh EEh EEh ; Read 0x2060 Channel 18
 1  604h    -  0    8   D 40h 60h 20h 13h EEh EEh EEh EEh ; Read 0x2060 Channel 19
 1  604h    -  0    8   D 40h 60h 20h 14h EEh EEh EEh EEh ; Read 0x2060 Channel 20
 1  000h    -  0    2   D 01h 04h ; ------------------------
 1  604h    -  0    8   D 40h 80h 20h 01h EEh EEh EEh EEh ; Read 0x2080 Channel 1
 1  604h    -  0    8   D 40h 80h 20h 02h EEh EEh EEh EEh ; Read 0x2080 Channel 2
 1  604h    -  0    8   D 40h 80h 20h 03h EEh EEh EEh EEh ; Read 0x2080 Channel 3
 1  000h    -  0    2   D 01h 04h ; ------------------------
 1  604h    -  0    8   D 40h A0h 20h 01h EEh EEh EEh EEh ; Read 0x20A0 Channel 1
 1  604h    -  0    8   D 40h A0h 20h 02h EEh EEh EEh EEh ; Read 0x20A0 Channel 2
 1  000h    -  0    2   D 01h 04h ; ------------------------
 1  604h    -  0    8   D 40h 00h 18h 01h EEh EEh EEh EEh ; Read 0x1800-01: PDO1 COB-ID
 1  604h    -  0    8   D 40h 00h 18h 02h EEh EEh EEh EEh ; Read 0x1800-02: PDO1 transmission-sync-type
 1  604h    -  0    8   D 40h 00h 18h 05h EEh EEh EEh EEh ; Read 0x1800-05: PDO1 Event timer
 1  604h    -  0    8   D 40h 01h 18h 01h EEh EEh EEh EEh ; Read 0x1801-01: PDO2 COB-ID
 1  604h    -  0    8   D 40h 01h 18h 02h EEh EEh EEh EEh ; Read 0x1801-02: PDO2 transmission-sync-type
 1  604h    -  0    8   D 40h 01h 18h 05h EEh EEh EEh EEh ; Read 0x1801-05: PDO2 Event timer
 1  604h    -  0    8   D 40h 02h 18h 01h EEh EEh EEh EEh ; Read 0x1802-01: PDO3 COB-ID
 1  604h    -  0    8   D 40h 02h 18h 02h EEh EEh EEh EEh ; Read 0x1802-02: PDO3 transmission-sync-type
 1  604h    -  0    8   D 40h 02h 18h 05h EEh EEh EEh EEh ; Read 0x1802-05: PDO3 Event timer
 1  604h    -  0    8   D 40h 03h 18h 01h EEh EEh EEh EEh ; Read 0x1803-01: PDO4 COB-ID
 1  604h    -  0    8   D 40h 03h 18h 02h EEh EEh EEh EEh ; Read 0x1803-02: PDO4 transmission-sync-type
 1  604h    -  0    8   D 40h 03h 18h 05h EEh EEh EEh EEh ; Read 0x1803-05: PDO4 Event timer
```

```
1  000h    - 0   2   D 01h 04h ; ------------------------
1  604h    - 0   8   D 40h 04h 18h 01h EEh EEh EEh EEh ; Read 0x1804-01:  PDO5 COB-ID
1  604h    - 0   8   D 23h 04h 18h 01h 85h 06h 00h 40h ; Write 0x1804-01: PDO5 COB-ID to 0x685, default (enabled, no RTR)
1  604h    - 0   8   D 23h 04h 18h 01h 35h 05h 00h 40h ; Write 0x1804-01: PDO5 COB-ID to 0x535 (enabled, no RTR)
1  604h    - 0   8   D 40h 04h 18h 02h EEh EEh EEh EEh ; Read 0x1804-02:  PDO5 transmission-sync-type
1  604h    - 0   8   D 40h 04h 18h 05h EEh EEh EEh EEh ; Read 0x1804-05:  PDO5 Event timer
1  000h    - 0   2   D 01h 04h ; ------------------------
1  604h    - 0   8   D 40h 05h 18h 01h EEh EEh EEh EEh ; Read  0x1805-01: PDO6 COB-ID
1  604h    - 0   8   D 23h 05h 18h 01h 86h 06h 00h 40h ; Write 0x1805-01: PDO6 COB-ID to 0x686, default (enabled, no RTR)
1  604h    - 0   8   D 23h 05h 18h 01h 36h 05h 00h 40h ; Write 0x1805-01: PDO6 COB-ID to 0x536 (enabled, no RTR)
1  604h    - 0   8   D 40h 05h 18h 02h EEh EEh EEh EEh ; Read  0x1805-02: PDO6 transmission-sync-type
1  604h    - 0   8   D 40h 05h 18h 05h EEh EEh EEh EEh ; Read  0x1805-05: PDO6 Event timer
1  000h    - 0   2   D 01h 04h ; ------------------------
1  604h    - 0   8   D 40h 06h 18h 01h EEh EEh EEh EEh ; Read  0x1806-01: PDO7 COB-ID
1  604h    - 0   8   D 23h 06h 18h 01h 87h 06h 00h 40h ; Write 0x1806-01: PDO7 COB-ID to 0x687, default (enabled, no RTR)
1  604h    - 0   8   D 23h 06h 18h 01h 37h 05h 00h 40h ; Write 0x1806-01: PDO7 COB-ID to 0x537 (enabled, no RTR)
1  604h    - 0   8   D 40h 06h 18h 02h EEh EEh EEh EEh ; Read  0x1806-02: PDO7 transmission-sync-type
1  604h    - 0   8   D 40h 06h 18h 05h EEh EEh EEh EEh ; Read  0x1806-05: PDO7 Event timer
1  000h    - 0   2   D 01h 04h ; ------------------------
1  604h    - 0   8   D 40h 07h 18h 01h EEh EEh EEh EEh ; Read  0x1807-01: PDO8 COB-ID
1  604h    - 0   8   D 23h 07h 18h 01h 88h 06h 00h 40h ; Write 0x1807-01: PDO8 COB-ID to 0x688, default (enabled, no RTR)
1  604h    - 0   8   D 23h 07h 18h 01h 38h 05h 00h 40h ; Write 0x1807-01: PDO8 COB-ID to 0x538 (enabled, no RTR)
1  604h    - 0   8   D 40h 07h 18h 02h EEh EEh EEh EEh ; Read  0x1807-02: PDO8 transmission-sync-type
1  604h    - 0   8   D 40h 07h 18h 05h EEh EEh EEh EEh ; Read  0x1807-05: PDO8 Event timer
1  000h    - 0   2   D 01h 04h ; ------------------------
1  604h    - 0   8   D 40h 08h 18h 01h EEh EEh EEh EEh ; Read  0x1808-01: PDO9 COB-ID
1  604h    - 0   8   D 23h 08h 18h 01h 89h 06h 00h 40h ; Write 0x1808-01: PDO9 COB-ID to 0x689, default (enabled, no RTR)
1  604h    - 0   8   D 23h 08h 18h 01h 39h 05h 00h 40h ; Write 0x1808-01: PDO9 COB-ID to 0x539 (enabled, no RTR)
1  604h    - 0   8   D 40h 08h 18h 02h EEh EEh EEh EEh ; Read  0x1808-02: PDO9 transmission-sync-type
1  604h    - 0   8   D 40h 08h 18h 05h EEh EEh EEh EEh ; Read  0x1808-05: PDO9 Event timer
1  000h    - 0   2   D 01h 04h ; ------------------------
1  604h    - 0   8   D 40h 09h 18h 01h EEh EEh EEh EEh ; Read  0x1809-01: PDO10 COB-ID
1  604h    - 0   8   D 23h 09h 18h 01h 8Ah 06h 00h 40h ; Write 0x1809-01: PDO10 COB-ID to 0x68A, default (enabled, no RTR)
1  604h    - 0   8   D 23h 09h 18h 01h 3Ah 05h 00h 40h ; Write 0x1809-01: PDO10 COB-ID to 0x53A (enabled, no RTR)
1  604h    - 0   8   D 40h 09h 18h 02h EEh EEh EEh EEh ; Read  0x1809-02: PDO10 transmission-sync-type
1  604h    - 0   8   D 40h 09h 18h 05h EEh EEh EEh EEh ; Read  0x1809-05: PDO10 Event timer
1  000h    - 0   2   D 01h 04h ; ------------------------
1  604h    - 0   8   D 40h 0Ah 18h 01h EEh EEh EEh EEh ; Read  0x180A-01: PDO11 COB-ID
1  604h    - 0   8   D 23h 0Ah 18h 01h 8Bh 06h 00h 40h ; Write 0x180A-01: PDO11 COB-ID to 0x68B, default (enabled, no RTR)
1  604h    - 0   8   D 23h 0Ah 18h 01h 3Bh 05h 00h 40h ; Write 0x180A-01: PDO11 COB-ID to 0x53B (enabled, no RTR)
1  604h    - 0   8   D 40h 0Ah 18h 02h EEh EEh EEh EEh ; Read  0x180A-02: PDO11 transmission-sync-type
1  604h    - 0   8   D 40h 0Ah 18h 05h EEh EEh EEh EEh ; Read  0x180A-05: PDO11 Event timer
1  000h    - 0   2   D 01h 04h ; ------------------------
1  604h    - 0   8   D 40h 0Bh 18h 01h EEh EEh EEh EEh ; Read  0x180B-01: PDO12 COB-ID
1  604h    - 0   8   D 23h 0Bh 18h 01h 8Ch 06h 00h 40h ; Write 0x180B-01: PDO12 COB-ID to 0x68C, default (enabled, no RTR)
1  604h    - 0   8   D 23h 0Bh 18h 01h 3Ch 05h 00h 40h ; Write 0x180B-01: PDO12 COB-ID to 0x53C (enabled, no RTR)
1  604h    - 0   8   D 40h 0Bh 18h 02h EEh EEh EEh EEh ; Read  0x180B-02: PDO12 transmission-sync-type
1  604h    - 0   8   D 40h 0Bh 18h 05h EEh EEh EEh EEh ; Read  0x180B-05: PDO12 Event timer
1  000h    - 0   2   D 01h 04h ; ------------------------
1  604h    - 0   8   D 40h 00h 1Ah 00h EEh EEh EEh EEh ; Read  0x1A00: PDO1 numof mapped Values
1  604h    - 0   8   D 40h 00h 1Ah 01h EEh EEh EEh EEh ; Read  0x1A00: PDO1 value1 specification
1  604h    - 0   8   D 40h 00h 1Ah 02h EEh EEh EEh EEh ; Read  0x1A00: PDO1 value2 specification
1  604h    - 0   8   D 40h 00h 1Ah 03h EEh EEh EEh EEh ; Read  0x1A00: PDO1 value3 specification
1  604h    - 0   8   D 40h 01h 1Ah 00h EEh EEh EEh EEh ; Read  0x1A01: PDO2 numof mapped Values
1  604h    - 0   8   D 40h 01h 1Ah 01h EEh EEh EEh EEh ; Read  0x1A01: PDO2 value1 specification
1  604h    - 0   8   D 40h 01h 1Ah 02h EEh EEh EEh EEh ; Read  0x1A01: PDO2 value2 specification
1  604h    - 0   8   D 40h 01h 1Ah 03h EEh EEh EEh EEh ; Read  0x1A01: PDO2 value3 specification
1  604h    - 0   8   D 40h 02h 1Ah 00h EEh EEh EEh EEh ; Read  0x1A02: PDO3 numof mapped Values
1  604h    - 0   8   D 40h 02h 1Ah 01h EEh EEh EEh EEh ; Read  0x1A02: PDO3 value1 specification
1  604h    - 0   8   D 40h 02h 1Ah 02h EEh EEh EEh EEh ; Read  0x1A02: PDO3 value2 specification
1  604h    - 0   8   D 40h 03h 1Ah 00h EEh EEh EEh EEh ; Read  0x1A03: PDO4 numof mapped Values
1  604h    - 0   8   D 40h 03h 1Ah 01h EEh EEh EEh EEh ; Read  0x1A03: PDO4 value1 specification
1  604h    - 0   8   D 40h 03h 1Ah 02h EEh EEh EEh EEh ; Read  0x1A03: PDO4 value2 specification
1  604h    - 0   8   D 40h 04h 1Ah 00h EEh EEh EEh EEh ; Read  0x1A04: PDO5 numof mapped Values
1  604h    - 0   8   D 40h 04h 1Ah 01h EEh EEh EEh EEh ; Read  0x1A04: PDO5 value1 specification
1  604h    - 0   8   D 40h 04h 1Ah 02h EEh EEh EEh EEh ; Read  0x1A04: PDO5 value2 specification
1  604h    - 0   8   D 40h 04h 1Ah 03h EEh EEh EEh EEh ; Read  0x1A04: PDO5 value3 specification
1  604h    - 0   8   D 40h 05h 1Ah 00h EEh EEh EEh EEh ; Read  0x1A05: PDO6 numof mapped Values
1  604h    - 0   8   D 40h 05h 1Ah 01h EEh EEh EEh EEh ; Read  0x1A05: PDO6 value1 specification
1  604h    - 0   8   D 40h 05h 1Ah 02h EEh EEh EEh EEh ; Read  0x1A05: PDO6 value2 specification
1  604h    - 0   8   D 40h 05h 1Ah 03h EEh EEh EEh EEh ; Read  0x1A05: PDO6 value3 specification
1  604h    - 0   8   D 40h 05h 1Ah 04h EEh EEh EEh EEh ; Read  0x1A05: PDO6 value4 specification
1  604h    - 0   8   D 40h 06h 1Ah 00h EEh EEh EEh EEh ; Read  0x1A06: PDO7 numof mapped Values
1  604h    - 0   8   D 40h 06h 1Ah 01h EEh EEh EEh EEh ; Read  0x1A06: PDO7 value1 specification
1  604h    - 0   8   D 40h 06h 1Ah 02h EEh EEh EEh EEh ; Read  0x1A06: PDO7 value2 specification
```

```
1 604h    - 0   8   D 40h 06h 1Ah 03h EEh EEh EEh EEh ; Read  0x1A06: PDO7 value3 specification
1 604h    - 0   8   D 40h 06h 1Ah 04h EEh EEh EEh EEh ; Read  0x1A06: PDO7 value4 specification
1 604h    - 0   8   D 40h 07h 1Ah 00h EEh EEh EEh EEh ; Read  0x1A07: PDO8 numof mapped Values
1 604h    - 0   8   D 40h 07h 1Ah 01h EEh EEh EEh EEh ; Read  0x1A07: PDO8 value1 specification
1 604h    - 0   8   D 40h 07h 1Ah 02h EEh EEh EEh EEh ; Read  0x1A07: PDO8 value2 specification
1 604h    - 0   8   D 40h 07h 1Ah 03h EEh EEh EEh EEh ; Read  0x1A07: PDO8 value3 specification
1 604h    - 0   8   D 40h 07h 1Ah 04h EEh EEh EEh EEh ; Read  0x1A07: PDO8 value4 specification
1 604h    - 0   8   D 40h 08h 1Ah 00h EEh EEh EEh EEh ; Read  0x1A08: PDO9 numof mapped Values
1 604h    - 0   8   D 40h 08h 1Ah 01h EEh EEh EEh EEh ; Read  0x1A08: PDO9 value1 specification
1 604h    - 0   8   D 40h 08h 1Ah 02h EEh EEh EEh EEh ; Read  0x1A08: PDO9 value2 specification
1 604h    - 0   8   D 40h 08h 1Ah 03h EEh EEh EEh EEh ; Read  0x1A08: PDO9 value3 specification
1 604h    - 0   8   D 40h 08h 1Ah 04h EEh EEh EEh EEh ; Read  0x1A08: PDO9 value4 specification
1 604h    - 0   8   D 40h 09h 1Ah 00h EEh EEh EEh EEh ; Read  0x1A09: PDO10 numof mapped Values
1 604h    - 0   8   D 40h 09h 1Ah 01h EEh EEh EEh EEh ; Read  0x1A09: PDO10 value1 specification
1 604h    - 0   8   D 40h 09h 1Ah 02h EEh EEh EEh EEh ; Read  0x1A09: PDO10 value2 specification
1 604h    - 0   8   D 40h 09h 1Ah 03h EEh EEh EEh EEh ; Read  0x1A09: PDO10 value3 specification
1 604h    - 0   8   D 40h 09h 1Ah 04h EEh EEh EEh EEh ; Read  0x1A0A: PDO10 value4 specification
1 604h    - 0   8   D 40h 0Ah 1Ah 00h EEh EEh EEh EEh ; Read  0x1A0A: PDO11 numof mapped Values
1 604h    - 0   8   D 40h 0Ah 1Ah 01h EEh EEh EEh EEh ; Read  0x1A0A: PDO11 value1 specification
1 604h    - 0   8   D 40h 0Ah 1Ah 02h EEh EEh EEh EEh ; Read  0x1A0A: PDO11 value2 specification
1 604h    - 0   8   D 40h 0Ah 1Ah 03h EEh EEh EEh EEh ; Read  0x1A0A: PDO11 value3 specification
1 604h    - 0   8   D 40h 0Bh 1Ah 00h EEh EEh EEh EEh ; Read  0x1A0B: PDO12 numof mapped Values
1 604h    - 0   8   D 40h 0Bh 1Ah 01h EEh EEh EEh EEh ; Read  0x1A0B: PDO12 value1 specification
1 604h    - 0   8   D 40h 0Bh 1Ah 02h EEh EEh EEh EEh ; Read  0x1A0B: PDO12 value2 specification
1 000h    - 0   2   D 01h 04h ; ------------------------
1 7E5h    - 0   8   D 04h 01h 00h 00h 00h 00h 00h 00h ; LSS: switch mode global to config
1 7E5h    - 0   8   D 11h 02h 00h 00h 00h 00h 00h 00h ; LSS: Set Node-ID to 2 (CMD17)
1 7E5h    - 0   8   D 11h 04h 00h 00h 00h 00h 00h 00h ; LSS: Set Node-ID to 4 (CMD17)
1 7E5h    - 0   8   D 17h 00h 00h 00h 00h 00h 00h 00h ; LSS: Store (CMD23)
1 000h    - 0   2   D 01h 04h ; ------------------------
1 000h    - 0   2   D 01h 04h ; ------------------------
1 000h    - 0   2   D 01h 04h ; ------------------------
1 604h    - 0   8   D 23h 10h 10h 01h 73h 61h 76h 65h ; Save ALL parameters
1 604h    - 0   8   D 23h 11h 10h 01h 6Ch 6Fh 61h 64h ; Restore ALL parameters
1 000h    - 0   2   D 01h 04h ; ------------------------
1 604h    - 0   8   D 40h 00h 10h 00h EEh EEh EEh EEh ; Read 0x1000-00: DeviceType
1 604h    - 0   8   D 40h 00h 10h 00h EEh EEh EEh EEh ; Read 0x1000-00: DeviceType
1 604h    - 0   8   D 40h 02h 10h 00h EEh EEh EEh EEh ; Read 0x1002-00: ManufacturerStatusReg
1 604h    - 0   8   D 40h 02h 10h 00h EEh EEh EEh EEh ; Read 0x1002-00: ManufacturerStatusReg
1 604h    - 0   8   D 40h 0Ah 10h 00h EEh EEh EEh EEh ; Read 0x100A-00: SoftwareVersion
1 604h    - 0   8   D 40h 0Ah 10h 01h EEh EEh EEh EEh ; Read 0x100A-01: SoftwareVersion
1 604h    - 0   8   D 40h 18h 10h 01h EEh EEh EEh EEh ; Read 0x1018-01: VendorID
1 604h    - 0   8   D 40h 18h 10h 02h EEh EEh EEh EEh ; Read 0x1018-02: ProductCode
1 604h    - 0   8   D 40h 18h 10h 03h EEh EEh EEh EEh ; Read 0x1018-03: RevisionNumber
1 604h    - 0   8   D 40h 18h 10h 04h EEh EEh EEh EEh ; Read 0x1018-04: Serial-Number
```

8.8.2 Modbus RTU

Baud rate:	19,200 bits
Data bits:	8
Parity bit:	1 (even)
Stop bit:	1
Flow control	none
Refresh rate:	1 s
The following applies to all values:	MSW (most significant word/byte) first

The following registers can be read out via function code 0x04:

Address	Description	
0x2001	ACCOMOS – X-Peak	mg, 16 bit
0x2002	ACCOMOS – Y-Peak	mg, 16 bit
0x2003	ACCOMOS – Z-Peak	mg, 16 bit
0x2004	ACCOMOS – X-RMS	mg, 16 bit
0x2005	ACCOMOS – Y-RMS	mg, 16 bit
0x2006	ACCOMOS – Z-RMS	mg, 16 bit
0x2021	BEAROMOS - Mean	uV, signed 32 bit, MSW
0x2022	BEAROMOS - Mean	uV, signed 32 bit, LSW
0x2023	BEAROMOS - Rotation speed	RPM, 16bit
0x2024	BEAROMOS - Upper limit	uV, signed, 32 bit, MSW
0x2025	BEAROMOS - Upper limit	uV, signed, 32 bit, LSW
0x2026	BEAROMOS - Lower limit	uV, signed, 32 bit, MSW
0x2027	BEAROMOS - Lower limit	uV, signed, 32 bit, LSW
0x2041	GASMOS - Methane concentration	0.01 %, signed, 16 bit
0x2042	GASMOS - Methane warning limit	0.01 %, 16 bit
0x2043	GASMOS - Humidity	0.01 %, 16 bit
0x2061	OMD Sensor 01 – Oil mist concentration	%, 16 bit
0x2062	OMD Sensor 02 – Oil mist concentration	%, 16 bit
0x2063	OMD Sensor 03 – Oil mist concentration	%, 16 bit
0x2064	OMD Sensor 04 – Oil mist concentration	%, 16 bit
0x2065	OMD Sensor 05 – Oil mist concentration	%, 16 bit
0x2066	OMD Sensor 06 – Oil mist concentration	%, 16 bit
0x2067	OMD Sensor 07 – Oil mist concentration	%, 16 bit
0x2068	OMD Sensor 08 – Oil mist concentration	%, 16 bit
0x2069	OMD Sensor 09 – Oil mist concentration	%, 16 bit
0x206A	OMD Sensor 10 – Oil mist concentration	%, 16 bit
0x206B	OMD Sensor 11 – Oil mist concentration	%, 16 bit
0x206C	OMD Sensor 12 – Oil mist concentration	%, 16 bit
0x206D	OMD Sensor 13 – Oil mist concentration	%, 16 bit
0x206E	OMD Sensor 14 – Oil mist concentration	%, 16 bit
0x206F	OMD Sensor 15 – Oil mist concentration	%, 16 bit
0x2070	OMD Sensor 16 – Oil mist concentration	%, 16 bit
0x2071	OMD Sensor 17 – Oil mist concentration	%, 16 bit
0x2072	OMD Sensor 18 – Oil mist concentration	%, 16 bit
0x2073	OMD Sensor 19 – Oil mist concentration	%, 16 bit
0x2074	OMD Sensor 20 – Oil mist concentration	%, 16 bit
0x2081	PT100A	°C, signed, 16 bit
0x2082	PT100B	°C, signed, 16 bit
0x2083	PT100C	°C, signed, 16 bit
0x20A1	Pressure	mbar, signed, 16 bit
0x20A2	Load	0-1000, 16 bit

Note that related values (MSW & LSW) must always be read out together, otherwise there may be inconsistent values.

8.8.2.1 Requesting sensor values

Requesting ACCOMOS values

Request to CobMOS: **01 04 20 01 00 06 2A 08**
- CobMOS address: 0x01
- Function code: 0x04
- Register start: 0x2001
- Number of registers: 0x06
- CRC: 0x082A

Example response: **01 04 0C 00 B6 04 7F 04 9F 00 65 04 26 04 0D B9 16**
- CobMOS address: 0x01
- Function code: 0x04
- Number of bytes: 0x06
- Data: 0x00B6 (x-RMS: 182 mG)
  0x047F (y-RMS: 1.151 mG)
  0x049F (z-Peak: 1.183 mG)
  0x0065 (x-Peak: 101 mG)
  0x0426 (y-Peak: 1.062 mG)
  0x040D (z-Peak: 1.037 mG)
- CRC: 0x16B9

Requesting BEAROMOS values

Request to CobMOS: **01 04 20 21 00 07 EA 02**
- CobMOS address: 0x01
- Function code: 0x04
- Register start: 0x2021
- Number of registers: 0x07
- CRC: 0x02EA

Example response: **01 04 0E 00 00 00 91 00 00 7F FF FF FF 7F FF FF FF 34 FD**
- CobMOS address: 0x01
- Function code: 0x04
- Number of bytes: 0x0E
- Data: 0x00000091 (Mean: 145 uV)
  0x0000 (Rotation Speed: 0 RPM))
  0x7FFFFFFF (Upper limit: Full-Scale)
  0x7FFFFFFF (Lower limit: Full-Scale)
- CRC: 0xFD34

Requesting GASMOS values

Request to CobMOS: **01 04 20 41 00 03 EB DF**
- CobMOS address: 0x01
- Function code: 0x04
- Register start: 0x2041
- Number of registers: 0x03
- CRC: 0xDFEB

Example response: **01 04 06 00 00 00 00 00 00 60 93**
- CobMOS address: 0x01
- Function code: 0x04
- Number of bytes: 0x06

- Data: 0x0000 (Methane concentration: 0,00 %)
  0x0000 (Warning Limit: 0,00 %)
  0x0000 (Humidity: 0,00 %)
- CRC: 0x9360

Requesting OMD values

Request to CobMOS for VN2020: **01 04 20 61 00 01 6B D4**
Request to CobMOS for VN301plus: **01 04 20 61 00 0A 2A 13**
Request to CobMOS for VN301plus with partner CU: **01 04 20 61 00 14 AA 1B**

- CobMOS address: 0x01
- Function code: 0x04
- Register start: 0x2061
- Number of registers: 0x01; 0x0A; 0x14
- CRC: 0xD46B, 0x132A; 0x1BAA

Example of VN2020 values: **01 04 02 00 00 B9 30**

- CobMOS address: 0x01
- Function code: 0x04
- Number of bytes: 0x02
- Data: 0x0000 (Oil mist concentration: 0 %)
- CRC: 0x30B9

Example of VN301plus values: **01 04 14 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 95 81**

- CobMOS address: 0x01
- Function code: 0x04
- Number of bytes: 0x14
- Data: 0x0000 (Oil mist concentration 1: 0 %)
  …
  0x0000 (Oil mist concentration 10: 0 %)
- CRC: 0x8195

Example of VN301plus with partner CU: **01 04 28 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 95 56**

- CobMOS address: 0x01
- Function code: 0x04
- Number of bytes: 0x28
- Data: 0x0000 (Oil mist concentration 1: 0 %)
  …
  0x0000 (Oil mist concentration 20: 0 %)
- CRC: 0x5695

Requesting PT100 values

Request to CobMOS: **01 04 20 81 00 03 EB E3**

- CobMOS address: 0x01
- Function code: 0x04
- Register start: 0x2081
- Number of registers: 0x03
- CRC: 0xE3EB

Example response: **01 04 06 00 15 FF 0E 00 17 7C 89**

- CobMOS address: 0x01
- Function code: 0x04

- Number of bytes: 0x06
- Data: 0x0015 (PT100A: 21 °C)
  0xFF0E (PT100B: -242 °C)
  0x0017 (PT100C: 23 °C)
- CRC: 0x897C

Requesting pressure value (4-20 mA)

Request to CobMOS: **01 04 20 A1 00 01 6B E8**

- CobMOS address: 0x01
- Function code: 0x04
- Register start: 0x20A1
- Number of registers: 0x01
- CRC: 0xE86B

Example response: **01 04 02 00 40 B8 C0**

- CobMOS address: 0x01
- Function code: 0x04
- Number of bytes: 0x02
- Data: 0x0040 (Pressure: 64 mBar)
- CRC: 0xC0B8

Requesting load value (4-20 mA)

Request to CobMOS: **01 04 20 A2 00 01 9B E8**

- CobMOS address: 0x01
- Function code: 0x04
- Register start: 0x20A2
- Number of registers: 0x01
- CRC: 0xE89B

Example response: **01 04 02 00 00 B9 30**

- CobMOS address: 0x01
- Function code: 0x04
- Number of bytes: 0x02
- Data: 0x0000 (Load: 0 %)
- CRC: 0x20B9

8.8.2.2 Date and Time

The date and time must be retrieved/written in one request.

Address	Description	
0x2201	Year	[0 – 99]
0x2202	Month	[1 – 12] 1=January, etc.
0x2203	Day	[0 – 31]
0x2204	Hours	[0 – 23]
0x2205	Minutes	[0 – 59]
0x2206	Seconds	[0 – 59]

The date and time can be read using function code 0x03 and written using 0x10.

Write date and time (this example: 19 August 2022, 11:55:00):

- CobMOS address: 0x01
- Function code: 0x10
- Register start: 0x2201
- Number of registers: 0x06
- Number of bytes to be written: 0x0C
- Year: 0x16 (year: 22)
- Month: 0x08 (month: 08)
- Day: 0x13 (day: 19)
- Hours: 0x0B (hours: 11)
- Minutes: 0x37 (minutes: 55)
- Seconds: 0x00 (seconds: 00)
- CRC: 0xAB68

Message to be sent:
01 10 22 01 00 06 0C 00 16 00 08 00 13 00 0B 00 37 00 00 68 AB

Read date and time: **01 03 22 01 00 06 9E 70**

- CobMOS address: 0x01
- Function code: 0x03
- Register start: 0x2201
- Number of registers: 0x06
- CRC: 0x709E

Example response: **01 03 0C 00 17 00 03 00 1B 00 0E 00 04 00 38 4B E7**

- CobMOS address: 0x01
- Function code: 0x04
- Number of bytes: 0x0C
- Data: 0x0017 (year: 22)
  0x0003 (month: 03)
  0x001B (day: 27)
  0x000E (hours: 14)
  0x0004 (minutes: 04)
  0x0038 (seconds: 56)
- CRC: 0xE74B

8.8.3 MQTT

An Ethernet connection to an existing network with an MQTT broker is required to provide the data with the MQTT protocol. If the network cable was only connected after starting up (hotplug), it may not be possible to reach the CobMOS MQTT client. In this case, you have to perform a RESET or briefly disconnect the power supply.

MQTT Version:	V3.1.1
CobMOS:	MQTT client
Port:	1883
Refresh rate:	1s
Quality of Service:	0: at most once 1: at least once (DEFAULT) 2: exactly once

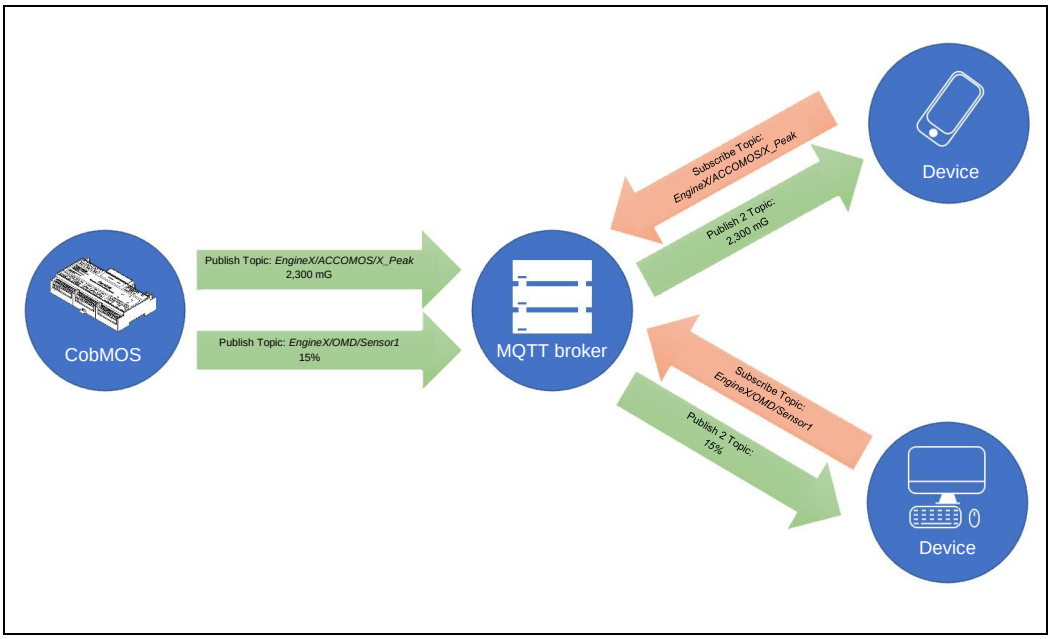


Fig.: 21 : MQTT – basic structure of the topology

Subscribable topics:

MotorX/ACCOMOS/X_Peak	mG, 16 bit
MotorX/ACCOMOS/Y_Peak	mG, 16 bit
MotorX/ACCOMOS/Z_Peak	mG, 16 bit
MotorX/ACCOMOS/X_RMS	mG, 16 bit
MotorX/ACCOMOS/Y_RMS	mG, 16 bit
MotorX/ACCOMOS/Z_RMS	mG, 16 bit
MotorX/BEAROMOS/Mean	uV, signed, 32 bit
MotorX/BEAROMOS/RPM	RPM, 16 bit
MotorX/BEAROMOS/UpperLimit	uV, signed, 32 bit
MotorX/BEAROMOS/LowerLimit	uV, signed, 32 bit
MotorX/GASMOS/Methan	0.01 %, signed, 16 bit
MotorX/GASMOS/MethanWarningLimit	0.01 %, 16 bit
MotorX/GASMOS/Humidity	0.01 %, 16 bit
MotorX/OMD/Sensor1	%, 16 bit
MotorX/OMD/Sensor2	%, 16 bit
MotorX/OMD/Sensor3	%, 16 bit
MotorX/OMD/Sensor4	%, 16 bit

MotorX/OMD/Sensor5	%, 16 bit
MotorX/OMD/Sensor6	%, 16 bit
MotorX/OMD/Sensor7	%, 16 bit
MotorX/OMD/Sensor8	%, 16 bit
MotorX/OMD/Sensor9	%, 16 bit
MotorX/OMD/Sensor10	%, 16 bit
MotorX/OMD/Sensor11	%, 16 bit
MotorX/OMD/Sensor12	%, 16 bit
MotorX/OMD/Sensor13	%, 16 bit
MotorX/OMD/Sensor14	%, 16 bit
MotorX/OMD/Sensor15	%, 16 bit
MotorX/OMD/Sensor16	%, 16 bit
MotorX/OMD/Sensor17	%, 16 bit
MotorX/OMD/Sensor18	%, 16 bit
MotorX/OMD/Sensor19	%, 16 bit
MotorX/OMD/Sensor20	%, 16 bit
MotorX/PT100/A	°C, signed, 16 bit
MotorX/PT100/B	°C, signed, 16 bit
MotorX/PT100/C	°C, signed, 16 bit
MotorX/Pressure	mbar, signed, 16 bit
MotorX/Load	0-1000, 16bit

In this case, *EngineX* represents the configurable content of the “motor” field in the cobmos.json parameter file (see Section 7 Manufacturer settings).

8.9 Removing the SD card

If you need to remove the SD card to access it on a PC with card reader (e.g. to change parameters or to access the data log), it is under a plastic cover next to the Ethernet connection at the top middle of the housing.

To remove the SD card, start by taking off the plastic cover. To do this, insert a suitable screwdriver into the opening and lever the cover up by pressing the screwdriver down.

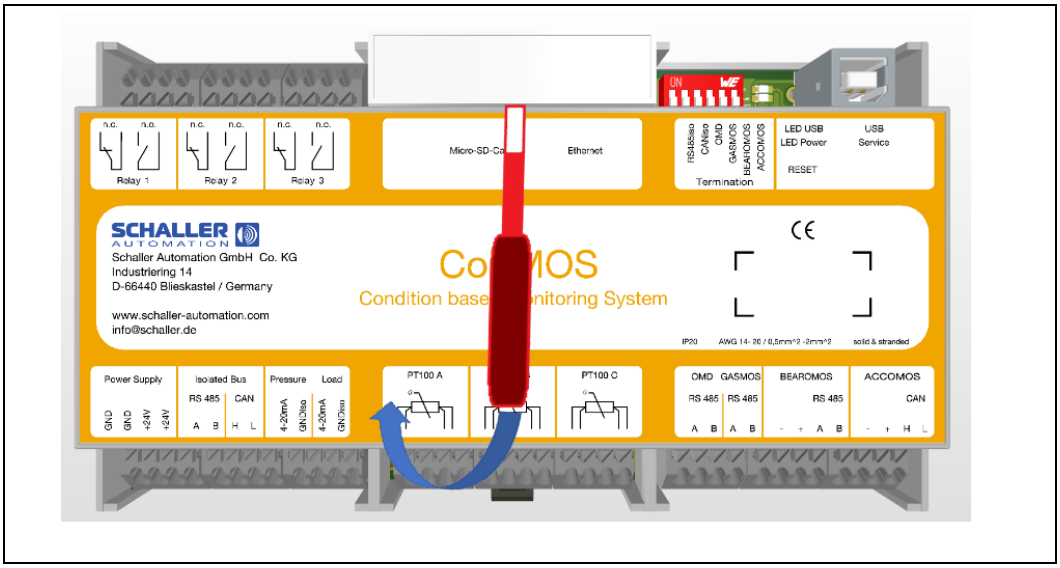


Fig.: 22 : Opening the plastic cover

You can then remove the SD card using the PUSH-PULL mechanism. To do this, press the SD card towards the middle of the housing until you hear a click. The SD card is then pushed out by a spring. You can remove it by pulling it out.

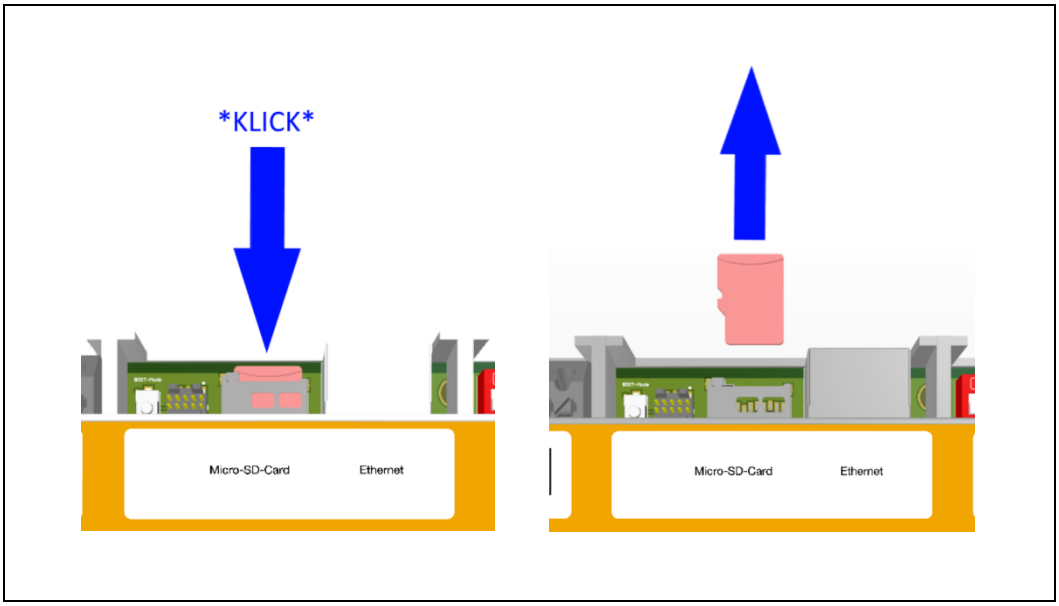


Fig.: 23 :Removing the SD card

You can reinsert the SD card in the same way. Push the SD card into the SD card holder until you hear a click, then let it go.

After reinserting, put the cover back on and click it back into place.

NOTE

Replacing the SD card

- If you need to replace the SD card, make sure that the folder structure and parameter files are copied to the new SD card.

9 Maintenance

CAUTION

Safe and correct maintenance of the device

- Read this operating manual and other documents that accompany the product carefully first and keep them in a suitable place for later use.

9.1 Software update

Two methods for updating the firmware are described below.

9.1.1 Software update by removing the SD card

Update via PC and using a suitable SD card reader (to do this, however, the CobMOS **must first be disconnected from the power supply** and then the card has to be removed with the PUSH-PULL method):

- Disconnect the CobMOS from the power supply
- Remove the SD card ⇨ *Section 8.8 Removing the SD card*
- Insert the SD card into a PC or card reader
- Copy the software image to the correct folder on the SD card:
  - *x*:\COBMOS\UPDATE\FIRMWARE.BIN
- Insert the SD card back into CobMOS ⇨ *Section 8.8 Removing the SD card*
- Connect the CobMOS to the power supply (USB must not be connected during the boot process!)
  - Bootloader recognises the FW image file
  - Bootloader flashes the new FW (takes approx. 45 s)
  - Bootloader starts the new FW
- After the update, press the RESET button for approx. 10 s

After updating successfully, the “FIRMWARE.BIN” file is automatically deleted from the SD card.

9.1.2 Software update via USB connection

Update via USB connection to a PC (note that CobMOS stops logging data as soon as a USB connection to a PC is established):

- Connect USB cable to CobMOS and PC
  - CobMOS is recognised as a mass storage device (it may be necessary to perform a RESET after establishing the connection, so that the mass storage device is properly recognised by the PC operating system)
- Copy the software image to the correct folder on the SD card:
  - *x*:\COBMOS\UPDATE\FIRMWARE.BIN
- Disconnect the USB cable (USB must not be connected during the boot process!)
  - Bootloader recognises the FW image file
  - Bootloader flashes the new FW (takes approx. 45 s)
  - Bootloader starts the new FW
- After the update, press the RESET button for approx. 10 s

After updating successfully, the “FIRMWARE.BIN” file is automatically deleted from the SD card and the USB cable can be reconnected if required.

9.2 Replacing the battery

NOTE

Date and time

- The date and time are not kept when the battery is changed
- For the module to display the correct date and time again, these values have to be configured via Modbus RTU. ⇨ *Section 8.7.2 Modbus RTU*

The module has a CR2032 coin cell battery, which is needed to power the real-time clock. If the coin cell battery is dead, the module no longer works properly and the battery has to be replaced.

To replace the battery, remove all the connection cables and open the module as follows:

Open the module using a screwdriver at the points provided on the back. To do this, insert the screwdriver into the slot provided and lever the cover off.

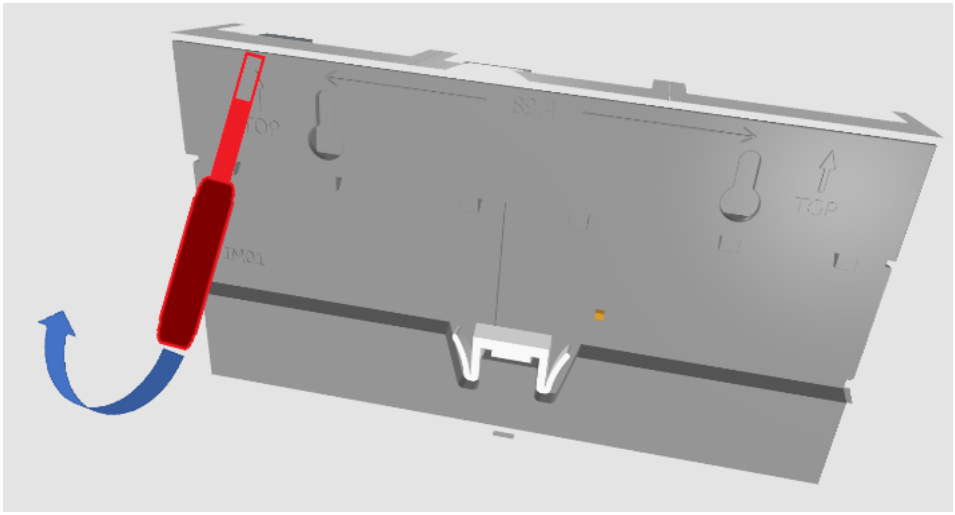


Fig.: 24 : Opening the plastic housing

Then remove the PCB from the housing. The battery is on the front of the PCB in a battery holder. Push back the metal spring on the holder to push out the battery.

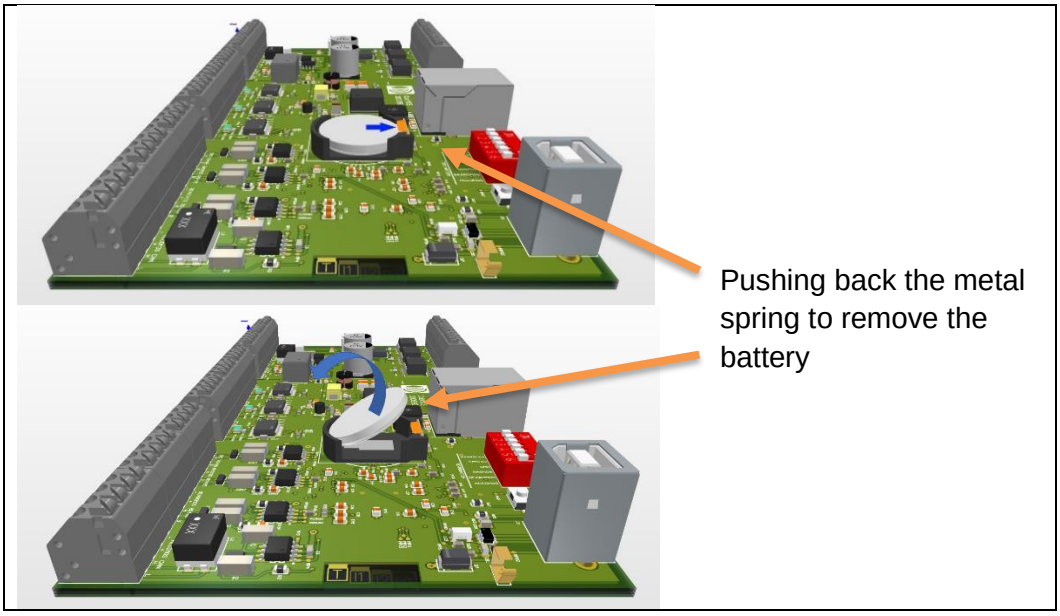


Fig.: 25 : Removing the battery

Start by pushing the new battery under the metal spring, then press it down until it clicks into place. **ATTENTION! The battery is inserted starting on the opposite side to the side where you start to remove it.If start to insert it on the same side as you started to remove it, you will damage the battery holder.** Make sure that the polarity of the battery is correct (+ sign is pointing upwards).

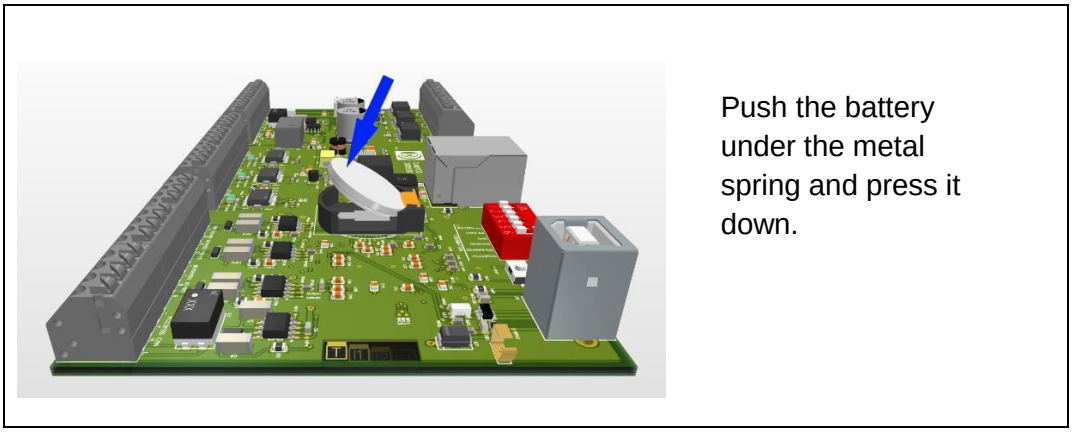


Fig.: 26 : Inserting the battery

You must dispose of the used battery of properly after removing it ⇨ *Section 12 Disposal*

10 Error diagnosis and troubleshooting

CAUTION

Working safely and correctly

- Read this operating manual and other documents that accompany the product carefully and keep them in a suitable place for later use.

10.1 Troubleshooting

The displayed errors can be corrected by the customer or alternatively by an authorised Schaller service partner. In this case, contact service at Schaller Automation Industrielle Automationstechnik GmbH & Co KG. ⇨ *Section 12 Contact*

The error statuses and troubleshooting steps are listed below.

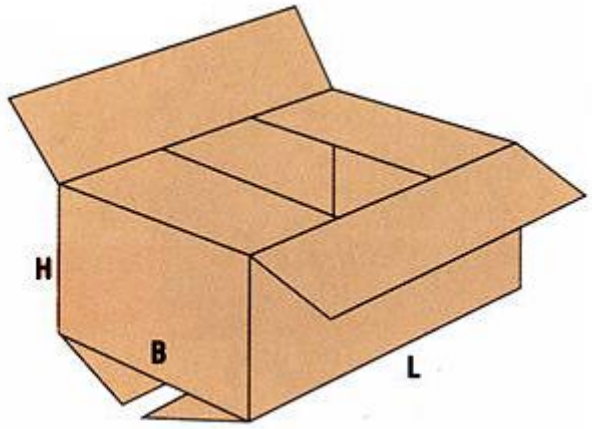
Error	Solution
The blue power status LED does not come on	Check the supply voltage. The terminal voltage must be 9 V to 36 V.
Module does not start, blue LED comes on	1. Check whether an SD card is inserted ⇨ *Section 8.8 Removing the SD card* 2. Battery voltage too low (check in log file) ➔ Replace battery ⇨ *Section 9.2 Replacing the battery*
Cannot connect to BUS (RS485 or CAN)	Check the following: 1. whether the cables are connected correctly; 2. whether the address/parameters have been configured correctly; ⇨ *Section 7 Manufacturer settings* 3. whether the correct connection has been used for the applicable BUS; 4. whether the resistance in the BUS circuit has a value of 50 Ω < R < 1500Ω. The terminal voltage must be < 2 V when the module is connected; 5. the polarity of the BUS circuit (A and B or H and L wires the wrong way round?); 6. the terminating resistors of the BUS system.
Cannot connect to BUS (Ethernet)	Check the following: 1. whether the cable is plugged in correctly; 2. whether the green “Link” LED on the RJ45 connector is coming on – if not, check the network connection; 3. whether the yellow “Traffic” LED on the RJ45 connector is flashing – if not, check the network parameters.

Error	Solution
Cannot connect to BUS (USB)	Check the following: 1. whether the orange USB LED next to the connector is coming on; 2. whether the cable is plugged in correctly; 3. whether the CobMOS has been recognised by the PC and the driver has been loaded (CobMOS connects as a plug & play USB drive/mass storage device); 4. if the CobMOS has not been correctly recognised by the system, perform a RESET with the connection plugged in.
Specific sensor values are not available	RS485 or CAN: Check the following: 1. whether the cables are connected correctly; 2. whether the correct connection has been used for the applicable BUS; ⇨ *Section 6.3.2 Electrical connection* 3. whether the address/parameters have been configured correctly; ⇨ *Section 7 Manufacturer settings* 4. whether the resistance in the BUS circuit has a value of 50 Ω < R < 1500Ω. The terminal voltage must be < 2 V when the module is connected; 5. the polarity of the BUS circuit (A and B or H and L wires the wrong way round?); 6. the terminating resistors of the BUS system; ⇨ *Section 6.3.2 Electrical connection* 7. whether the applicable sensor is operating – check the sensor's status indicator.
Windows reports an error: “There's a problem with this drive”	Follow the instructions of your operating system to check and, if necessary, repair the file system. To avoid the error, you have to safely “eject” the SD card from the system. To do this in Windows Explorer, right-click on the drive icon and select the “Eject” option.

Table 11: Error diagnosis and troubleshooting

If the error cannot be resolved, replace the device. When you return the device for repair, please include a description of the malfunction that has occurred. Repairing the device on site is not appropriate and is therefore not intended.

11 Packaging



H	95 mm
B	156 mm
L	216 mm
Weight	Approx. 500 g

Fig.: 27 : Packaging dimensions

12 Disposal

Observe local and national laws, guidelines and regulations on the disposal of materials and products.

Please return defective devices or devices that are no longer required to us for proper disposal.

Batteries must not be disposed of with normal household waste. Dispose of them at your local battery collection centres or send them back to us.

14 Spare parts

WARNING

Using unapproved spare parts may affect the safety of the device. Original spare parts are necessary for the device to operate correctly and are designed for your safety. Using other parts may exclude liability for the consequences.

- Only use original spare parts from Schaller Automation!

14.1 Spare parts list

Part number	Description	Unit	Quantity
153214	CobMOS module (including battery and SD card)	Pcs	1
435019	Replacement battery – CR2032 coin cell	Pcs	1
311326	Replacement SD card, 16GB	Pcs	1

Table 12: Spare parts list

15 List of figures

16 List of tables

17 EC Declaration of Conformity

EC Declaration of Conformity

We, the manufacturer:

SCHALLER AUTOMATION
Industrielle Automationstechnik GmbH & Co. KG
Industriering 14
66440 Blieskastel
Germany
Phone: +49 6842 5080
Fax: +49 6842 508260

declare on our sole responsibility that the product:

Type of device:	Edge Gateway
Type designation:	CobMOS
Intended use:	Visualisation and implementation of sensor data, and the storage of sensor data

We declare that the product is in conformity with the directives that apply to the product:

- EC Directive 2014/30/EU (EMC Directive)
- EC Directive 2011/65/EU (RoHS Directive)

Applied harmonised standards:

IEC 60068-1, IEC 60068-2-6, IEC 60068-2-1, IEC 60068-2-2, IEC 61000-4-4, IEC 61000-4-5, IEC 60068-2-78, IEC 61000-4-6, IEC 61000-4-3

Applied national standards and technical specifications: DNVGL-CG-0339:Nov2016

The original version of the operating manual for the CobMOS is provided.

This EC declaration of conformity shall no longer be valid if:

- The device is retrofitted, modified or used for purposes other than those for which it is intended without our written consent.
- The instructions in the operating manual are not followed.

66440 Blieskastel, 2023-02-23

Stephan Schaller
- Managing Director -

Notes

Notes

18 Index