COMTRAXX® CP9…-I Series

Condition Monitor with display and integrated gateway

Software version: V4.3.x

Photos: Bender Archive

Table of Contents

1. Important information

1.1 How to use this manual

*This manual is intended for **qualified personnel** working in electrical engineering and electronics.*

Before using the devices please read:
- This manual. It describes:
    - The properties of the devices
    - The connection of the devices
    - The functions of the web user interface for Bender gateways
- The sheet "Important safety instructions for Bender products"
- The manuals of the system components

As well as, if the related interface is used:
- The "BCOM" manual
- The "BMS bus" manual

COMTRAXX® is a registered trademark of Bender GmbH & Co. KG.

Terms used

This manual explains Bender-specific terms and functions in detail. Familiarisation with general specialist IT and network terminology is considered a prerequisite. These terms are therefore only explained briefly in this manual. You will find more detailed explanations in the related specialist literature and on the Internet.

BCOM Protocol for communication of Bender devices via an IP-based network
BMS   Bender measuring device interface (RS-485 interface with BMS protocol)

Always keep this manual within easy reach for future reference.
To make it easier for you to understand and revisit certain sections in this manual, we have used symbols to identify important instructions and information. The meaning of these symbols is explained below:

DANGER
*This signal word indicates that there is a **high** risk of danger, that **will** result in **death** or **serious injury** if not avoided.*

WARNING
*This signal word indicates a **medium** risk of danger that **can** lead to **death** or **serious injury** if not avoided.*

> ⚠ **CAUTION**
>
> *This signal word indicates a **low** level risk, that **can** result in minor or **moderate injury** or **damage to property** if not avoided.*

> ⓘ
>
> *This symbol denotes information intended to assist the user in making optimum use of the product.*

This manual has been compiled with great care. It may nevertheless contain errors and mistakes. Bender cannot accept any liability for injury to persons or damage to property resulting from errors or mistakes in this manual.

1.2 Technical support: service and support

For commissioning and troubleshooting, Bender offers:

1.2.1 First level support

Technical support by phone or e-mail for all
Bender products

- Questions concerning specific customer applications
- Commissioning
- Troubleshooting

Telephone	+49 6401 807-760*
Fax	+49 6401 807-259
In Germany only	0700BenderHelp (Telephone and Fax)
E-mail	support@bender-service.de

1.2.2 Repair service

Repair, calibration, update and replacement service for Bender products

- Repair, calibration, testing and analysis of Bender products
- Hardware and software update for Bender devices
- Delivery of replacement devices in the event of faulty or incorrectly delivered Bender devices
- Extended warranty for Bender devices with in-house repair service or replacement devices at no extra cost

Telephone	+49 6401 807-780** (technical issues)/
	+49 6401 807-784**, -785** (sales)
Fax	+49 6401 807-789
E-mail	repair@bender-service.de

Please send the devices for **repair** to the following address:

Bender GmbH, Repair-Service,
Londorfer Straße 65,
35305 Grünberg

1.2.3 Field service

On-site service for all Bender products

- Commissioning, parameter setting, maintenance, troubleshooting for Bender products
- Analysis of the electrical installation in the building (power quality test, EMC test, thermography)
- Training courses for customers

Telephone	+49 6401 807-752**, -762 **(technical issues)/
	+49 6401 807-753** (sales)
Fax	+49 6401 807-759
E-mail	fieldservice@bender-service.de
Internet	**www.bender.de**

*Available from 7.00 am to 8.00 pm 365 days a year (CET/UTC+1)
**Mo-Thu 7.00 am - 8.00 pm, Fr 7.00 am - 13.00 pm

1.3 Training courses

Bender is happy to provide training regarding the use of test equipment. The dates of training courses and workshops can be found on the Internet at **www.bender.de > Know-how > Seminars**.

1.4 Delivery conditions

The conditions of sale and delivery set out by Bender apply.
For software products the "Softwareklausel zur Überlassung von Standard-Software als Teil von Lieferungen, Ergänzung und Änderung der Allgemeinen Lieferbedingungen für Erzeugnisse und Leistungen der Elektroindustrie" (software clause in respect of the licensing of standard software as part of deliveries, modifications and changes to general delivery conditions for products and services in the electrical industry) set out by the ZVEI (Zentralverband Elektrotechnik- und Elektronikindustrie e. V.) (German Electrical and Electronic Manufacturer's Association) also applies.
The delivery and payment conditions can be obtained from Bender in printed or electronic format.

1.5 Inspection, transport and storage

Inspect the dispatch and equipment packaging for damage, and compare the contents of the package with the delivery documents. In the event of damage in transit, please contact Bender immediately.
The devices must only be stored in areas where they are protected from dust, damp, and spray and dripping water, and in which the specified storage temperatures can be ensured.

1.6 Warranty and liability

Warranty and liability claims in the event of injury to persons or damage to property are excluded if they can be attributed to one or more of the following causes:

- Improper use of the device.

- Incorrect mounting, commissioning, operation and maintenance of the device.

- Failure to observe the instructions in this operating manual regarding transport, commissioning, operation and maintenance of the device.

- Unauthorised changes to the device made by parties other than the manufacturer.

- Non-observance of technical data.

- Repairs carried out incorrectly and the use of replacement parts or accessories not approved by the manufacturer.

- Catastrophes caused by external influences and force majeure.

- Mounting and installation with device combinations not recommended by the manufacturer.

This operating manual, especially the safety instructions, must be observed by all personnel working on the device. Furthermore, the rules and regulations that apply for accident prevention at the place of use must be observed.

1.7 Disposal

Abide by the national regulations and laws governing the disposal of this device. Ask your supplier if you are not sure how to dispose of the old equipment.
The directive on waste electrical and electronic equipment (WEEE directive) and the directive on the restriction of certain hazardous substances in electrical and electronic equipment (RoHS directive) apply in the European Community. In Germany, these policies are implemented through the "Electrical and Electronic Equipment Act" (ElektroG). According to this, the following applies:

- Electric and electronic equipment are not to be included in household waste.

- Batteries and accumulators are not to be included in household waste but must be disposed of in accordance with the regulations.

- Old electrical and electronic equipment from users other than private households which was introduced to the market after 13th August 2005 must be taken back by the manufacturer and disposed of properly.

For more information on the disposal of Bender devices, refer to our homepage at

www.bender.de > Service & support.

2. Safety instructions

2.1   General safety instructions

Part of the device documentation in addition to this manual are the enclosed "Safety instructions for Bender products".

2.2   Working on electrical installations

*Only **qualified personnel** are permitted to carry out the work necessary to mount, commission and run a device or system.*

DANGER

Risk of fatal injury due to electric shock!
Touching live parts of the system carries the risk of:
- *An electric shock*
- *Damage to the electrical installation*
- *Destruction of the device*

Before installing and connecting the device, *make **sure** that **the installation has been de-energised**. Observe the rules for working on electrical installations.*

If the device is being used in a location outside the Federal Republic of Germany, the applicable local standards and regulations must be complied with. The European standard EN 50110 can be used as a guide.

2.3   Intended use

CP9…-I show alarms, measured values and states of devices.
These include, for example:

- All Bender devices with BMS bus or BCOM interface

- Bender devices (PEM, energy meters,…) with Modbus RTU or Modbus TCP interface

- Other devices with Modbus RTU or Modbus TCP interface

In addition, the data is available via the Modbus TCP protocol. This allows coupling to a higher-level building control system as well as visualisation and evaluation using standard web browsers.
Operation and settings are made via the COMTRAXX® user interface integrated in the device.
Any other use than that described in this manual is regarded as improper.

3. Product description

This manual describes:

- The COMTRAXX® **CP907-I** condition monitor with display and an integrated gateway
- The COMTRAXX® **CP915-I** condition monitor with display and an integrated gateway

3.1   Scope of delivery

Included within the scope of delivery:

- A CP9…-I condition monitor with display
- A printed quick-start guide
- The manuals "COMTRAXX® CP9…-I" and "BCOM" are available as PDF files for download at **https://www.bender.de/en > Service & support > Downloads**
- For CP915-I: connecting cable (DVI cable, Ethernet-Keystone coupler, USB cable, RJ45 flat patch cable)

3.2   Device features

- Display size 7" and 15.6" with tempered and anti-reflective glass
- Easy to clean and disinfect, degree of protection IP54
- Screwless mounted front plate
- Condition monitor for Bender systems
- Integrated modular gateway between Bender systems and TCP/IP
- Remote access via LAN, WAN or Internet
- Support of devices that are connected to the internal BMS bus, via BCOM, Modbus RTU or Modbus TCP
- Individual visualisation can be generated, which can be viewed via the web browser or on the display
- Silent due to operation without fan
- High-quality display with excellent contrast, high resolution and wide viewing angle
- Possibility of graphical integration of building plans or status displays in photo quality
- Visual and acoustic notification in the event of an alarm

3.2.1   Scope of functions CP9…-I

- Condition monitor with web interface and display
- Interfaces for the integration of devices
  - Internal BMS bus (max. 150 devices)
  - BCOM (max. 255 devices)
  - Modbus RTU and Modbus TCP (max. 247 devices each)

- Selectable display content
  - System overview with all devices, measured values, parameters and alarms
  - Individually configurable visualisation
- Ethernet interface with 10/100 Mbit/s for remote access via LAN, WAN or Internet
- Time synchronisation for all assigned devices
- History memory (20,000 entries)
- Data logger, freely configurable (30 x 10,000 entries)
- Assignment of individual texts for devices, channels (measuring points) and alarms
- Device failure monitoring
- E-mail notifications to different users in the event of alarms and system errors
- Device documentation** can be created for any device in the system
- System documentation can be created. It documents all devices in the system at once
- Support of external applications (e.g. visualisation programs or PLCs) via the Modbus TCP and Modbus RTU protocol
- Reading the latest measured values, operating and alarms messages from all assigned devices. Uniform access to all assigned devices via Modbus TCP over an integrated server
- Control commands: From an external application (e.g. visualisation software or PLC), commands can be sent to devices via Modbus TCP or Modbus RTU
- Access to alarms and measured values via SNMP protocol (V1, V2c or V3). SNMP traps are supported
- Fast and easy parameter setting of all devices assigned to the gateway via web browser
- Device backups can be created and restored for all devices in the system
- Quick and easy-to-create visualisation of the system. Integrated editor provides access to a variety of widgets and functions.
  - Display on up to 50 overview pages, where e.g. room plans can be stored. It is possible to navigate within these pages
  - Access to all measured values that are available in the system
  - Buttons and sliders can be used to send BMS test and reset commands, as well as to control external devices via Modbus TCP
- 100 virtual devices with 16 channels each can be created. There, for example, calculations of several measured values can be carried out and the result can be used in the system as a new measured value
- 1,600 data points from third-party devices (via Modbus RTU or Modbus TCP) can be integrated into the system

**   It contains all parameters and measured values belonging to the device, as well as device information such as serial number and software version.

3.3 Applications

- Monitoring and parameter setting of all Bender products that support communication
- Mounting in the control cabinet door so that all information is immediately visible
- Commissioning and diagnosis of Bender systems
- Remote diagnosis and remote maintenance
- Control stations in all areas
- Monitoring and analysis of data centres

3.4 Function

CP9…-I are integrated into the existing EDP structure like PCs. After connection to the network and compatible Bender products, all system devices can be accessed from any PC using a web browser. In this way, all important system information is directly available. Verified web browsers: Microsoft IE, Mozilla Firefox, Google Chrome.

3.5 BMS interface

The majority of Bender devices communicate via the internal BMS bus. CP9…-I can be operated as a master or as a slave.

> **CP9…-I is to be operated as a master** if:
> - Parameters are queried or changed
> - Certain control commands are issued
> Note that not all BMS masters can surrender their master function!

3.6 Address configuration and termination

To ensure proper functioning of the CP9…-I, correct address assignment and termination is of utmost importance.

> **Multiple assignment of addresses**
> The factory setting for the system name on all Bender BCOM devices is "SYSTEM". If several systems with the same system name are integrated into the same network, addresses are assigned twice. This leads to transmission errors. Always enter a unique BCOM system name during initial configuration.

3.7 Functional description

3.7.1 Interfaces

CP9…-I communicate with the devices and systems assigned via various interfaces:

- Internal BMS bus (RS-485) for Bender systems such as EDS46x/49x, RCMS46x/49x and MEDICS. CP9…-I can be operated as a master or as a slave. When operated as a master, requests are answered more quickly. The devices can only be operated on the internal BMS bus.

- BCOM (Ethernet) for new and future Bender systems, such as ISOMETER® iso685-D.

- Modbus RTU (RS-485) CP9…-I when operated as a master for Bender devices PEM… with restricted functionality (full functionality of PEM…**5** only via Modbus TCP).

- Modbus TCP (Ethernet) for Bender devices PEM…**5**
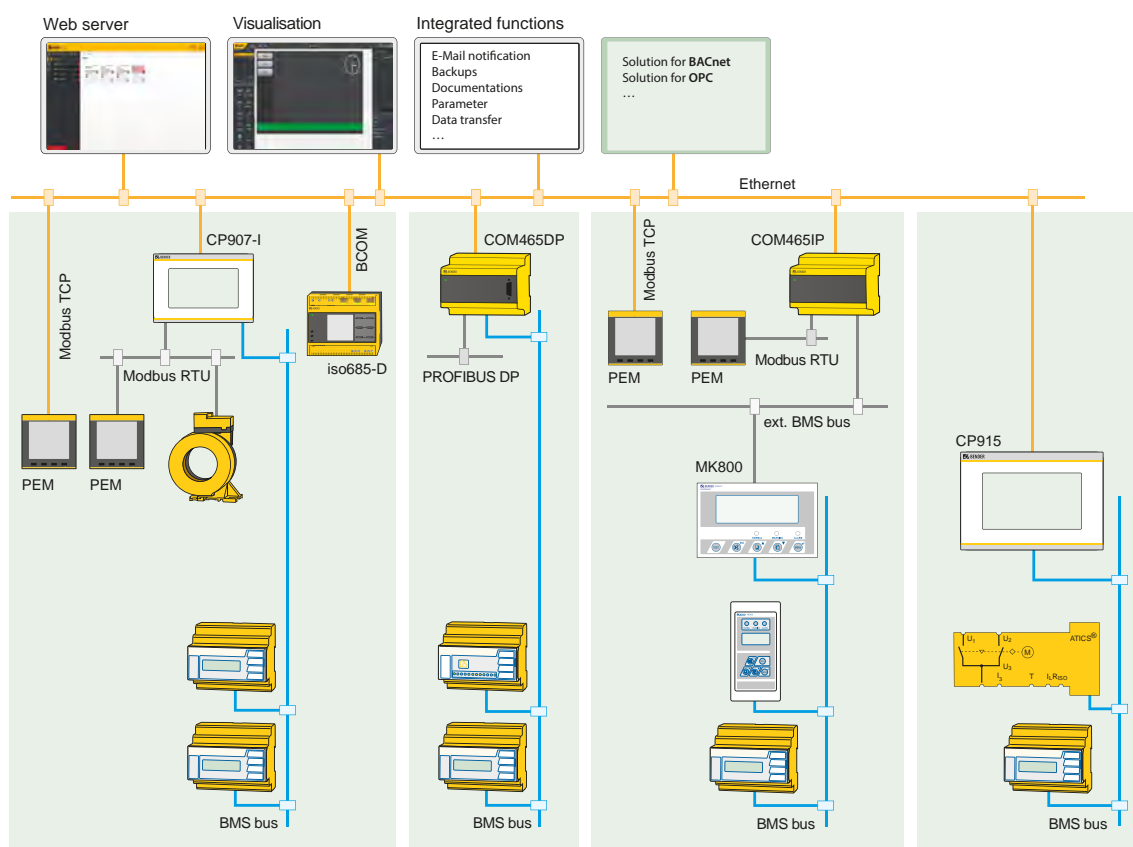
Fig. 3.1: System overview interfaces CP9…-I

3.7.2 Process image

The CP9…-I prepares and saves a process image from the communication with the devices assigned. This process image contains alarms, status information and measured values from the devices assigned.

The CP9…-I combines the information from the different interfaces and makes it available for:

- Display and configuration via the system overview on the display or web interface
- Display and operation via the visualisation on the display or web interface
- Transmission to external systems via Modbus TCP or SNMP

The CP9…-I provides a common user interface for the devices assigned via different interfaces. On this user interface, each device is given an individual address by which it can be identified. BMS, BCOM and Modbus RTU devices receive the appropriate address for their interface. A virtual address is assigned to Modbus TCP devices so that they can be addressed correctly in the system.

4. Mounting, connection and commissioning

*Only **qualified personnel** are permitted to carry out the work necessary to install, commission and run a device or system.*

CAUTION

Functional ground
The device must be earthed. Without connection of the functional earth, the device function is not guaranteed.

Electrostatic sensitive devices
Observe precautions for handling electrostatic sensitive devices.

Damage to components
Do not remove the device from the enclosure during ongoing operation. First, disconnect the device from the supply voltage and from the network (Ethernet).

Damage to the device due to incorrect connector plug
A connector plug of another device may have a different polarity.
Make sure to use the supplied connector plug!

Safe separation
The supply shall be properly separated from hazardous voltages and meet the limits of UL/CSA 61010-1, Clause 6.3.

4.1   Mounting of the CP9…-I device

The COMTRAXX® CP9…-I devices are installed either in the supplied and professionally pre-assembled flush-mounting enclosures or with the optionally available control cabinet door mounting (CP907-I only).

4.1.1   Dimension diagram
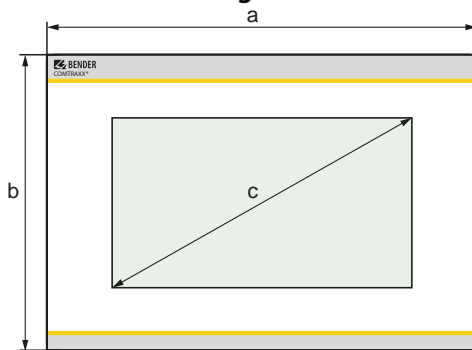
Glass thickness: 3 mm

Device dimensions

Type	Dimensions (mm) ±1		
	a	b	c
CP 907-I	226	144	176 (7")
CP 915-I	505	350	386 (15.6")

Installation dimensions enclosure

Type	Enclosure	Dimensions (mm)		Required installation depth
		a	b	
CP 907-I	UP	212	124	75
	Door	215	124	65
CP 915-I	UP	461	306	92

4.1.2   Flush-mounting enclosure CP907-I

> ℹ️ **Mounting of flush-mounting enclosures**
> The supplied flush-mounting enclosures are only suitable for mounting in cavity walls. In drywall and stud frame constructions, the enclosures must be screwed at right angles to battens or to the stud frame structure. The enclosure must not warp during mounting. The wall surface must be even.
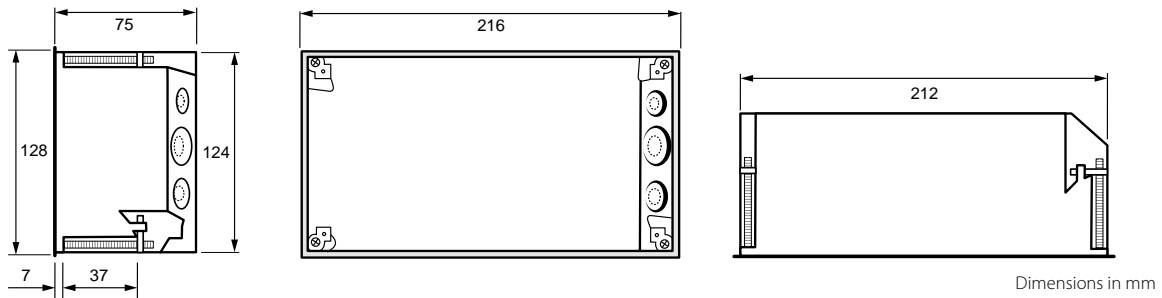
Dimensions in mm

Fig. 4.1: Basic enclosure shape and dimensions CP907

> ℹ️ **Tightening torque**
> The tightening torque for the mounting screws may be in a range between 0.8 … 1 Nm.

4.1.3   Door mounting CP907-I

Dimensions in mm
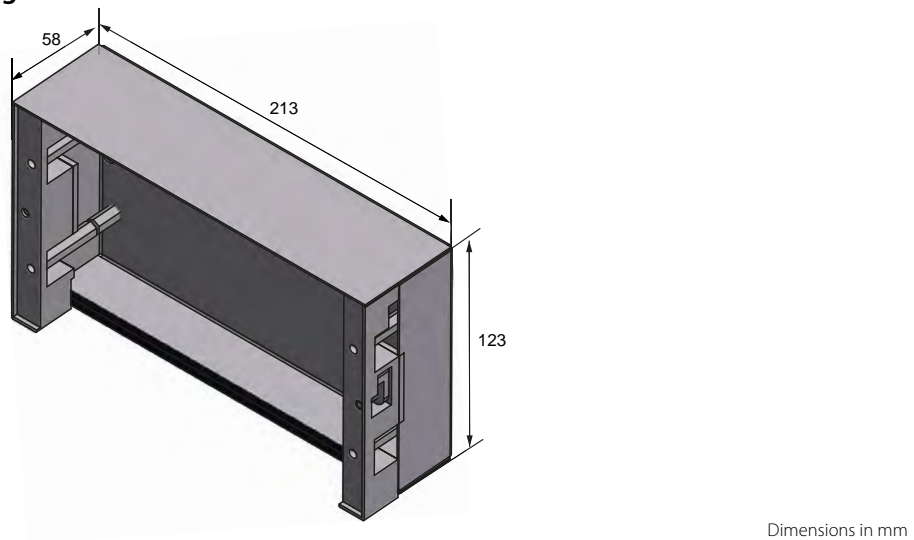
Fig. 4.2: Enclosure for control cabinet door

> ℹ️ **Tightening torque**
> The tightening torque for the mounting screws may be in a range between 0.8 … 1 Nm.
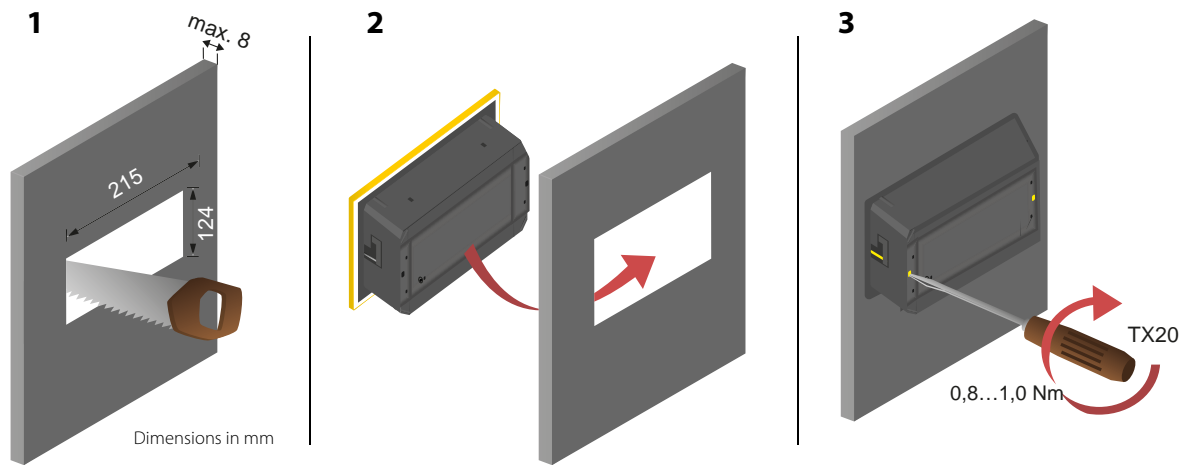
Fig. 4.3: Door mounting

4.1.4   Flush-mounting enclosure CP915

> **ⓘ** ***Mounting of flush-mounting enclosures***
> *The supplied flush-mounting enclosures are only suitable for mounting in cavity walls. In drywall and stud frame constructions, the enclosures must be screwed at right angles to battens or to the stud frame structure. The enclosure must not warp during mounting. The wall surface must be even.*
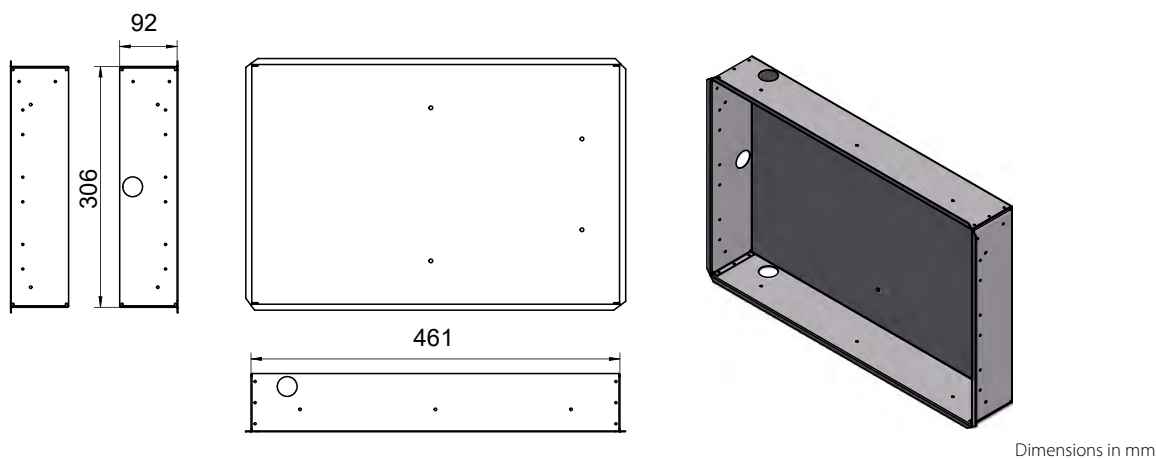
Dimensions in mm

Fig. 4.4: Basic enclosure shape and dimensions CP915-I

Removing the CP915 front plate

The front plate is removed from the enclosures of the CP915-I devices using a suction lifter. For this purpose, the suction lifter must be placed on the points marked below one after the other and the front plate must be removed until it clicks into place for the first time. If the front plate is detached on both sides, the plate can be lifted off the enclosure.

⚠ CAUTION	***Damage to the display front*** *Placing the suction lifter in the middle and pulling only at this point may damage the front plate.* *Always place the suction lifter on the edges of the display.*
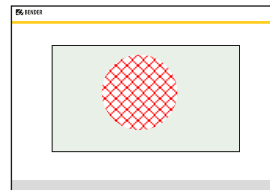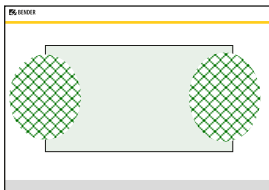
4.2   Connection of the CP9…-I device

The CP9…-I is integrated into existing LAN structures, but can also be operated via a single PC.

> ℹ️ ***Configuration of computer networks***
> *If you are familiar with the configuration of computer networks, you can carry out the connection of the CP9…-I yourself.* **Otherwise please contact your EDP administrator!**

Remove the device from the built-in flush-mounting enclosure.
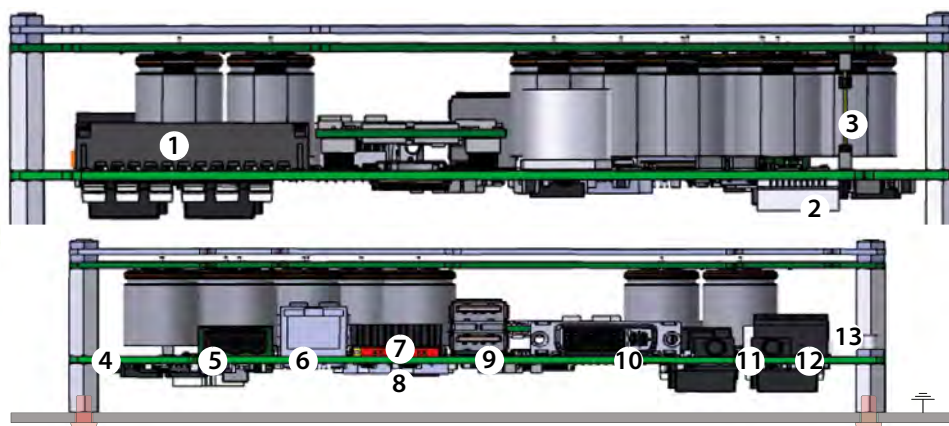
Fig. 4.5: Mainboard and connections of the CP9…-I devices

No.	Connection	CP907-I	CP915-I
1	Plug connector digital inputs		
2	I²C interface		
3	Plug connector to energy storage board		
4	Backbone bus (deactivated)	not included	not included
5	Voltage supply A1/+, A2/−, PE		
6	Ethernet (RJ45/CAT5); HTTP, Modbus TCP, BCOM	with PoE	
7	X1 plug connector for Modbus RTU, BMS bus		
8	Termination of Modbus RTU and BMS bus		
9	USB ports (for touch sensor)	not included	
10	DVI output	not included	
11	Audio output	not included	
12	Audio input	not included	
13	Connection to control relay		

4.2.1   Connect the CP9…-I device as follows:

1. Modbus RTU connection (7):
   Connect terminals **A**MB and **B**MB to the Modbus RTU (A to A, B to B).

2. BMS bus connection (7):
   Connect terminals **A**BMS and **B**BMS to the BMS bus (A to A, B to B).
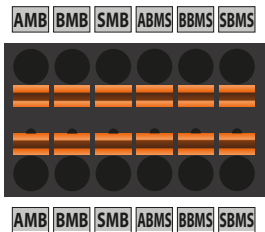
3. If the CP9…-I is located at the beginning or end of the respective bus (Modbus RTU and BMS), the respective terminating switch of the device (**8**) must be switched to "ON".

Termination
Modbus RTU
BMS bus

Modbus RTU   BMS
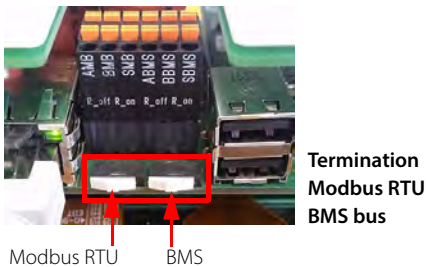
4. Establish connection with PC and BCOM:
   Connect the CP9…-I device to the PC network using an Ethernet cable (**6**).

5. Link digital inputs and outputs.
   See Chapter "4.3 Digital inputs".

6. Connect relay (if necessary).
   See Chapter "4.4 Relay"

7. Connect power supply

| ⚠️ **CAUTION**	***Functional ground*** *The device must be earthed. Without connection of the functional earth, the device function is not guaranteed.* ***Electrostatic sensitive devices*** *Observe precautions for handling electrostatic sensitive devices.* ***Damage to components*** *Do not remove the device from the enclosure during ongoing operation. First, disconnect the device from the supply voltage and from the network (Ethernet).* ***Damage to the device due to incorrect connector plug*** *A connector plug of another device may have a different polarity.* *Make sure to use the supplied connector plug!* ***Safe separation*** *The supply shall be properly separated from hazardous voltages and meet the limits of UL/CSA 61010-1, Clause 6.3.*

Connect terminals A1/+ and A2/- (**5**) to the power source. Connect PE to earth.
The CP907-I can also be supplied via Power-over-Ethernet (PoE). **In this case the PoE switch must be earthed**. For further details, see technical data.

8. Attach the front plate to the built-in flush-mounting enclosure.

CP907-I is mounted. The following steps apply to CP915-I only

9. Connect the front plate to the control board and the power supply unit:
   Connect a USB port **(9)** to the board for the touch sensor connection on the front plate. Appropriate connecting cable included in scope of delivery.

USB connection control board   **Touch sensor connection Front plate**
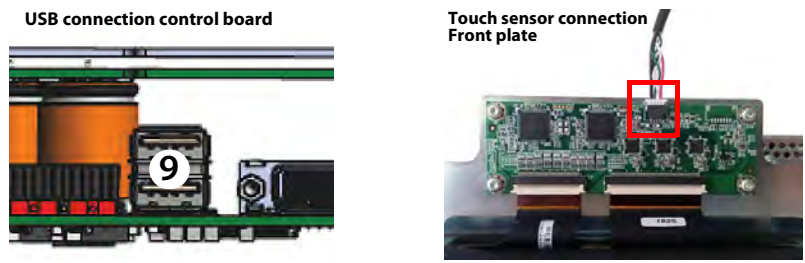
10. Connect the screen output DVI **(10)** to the front plate. The appropriate DVI-D connecting cable is included in the scope of delivery.

DVI-D connection control board
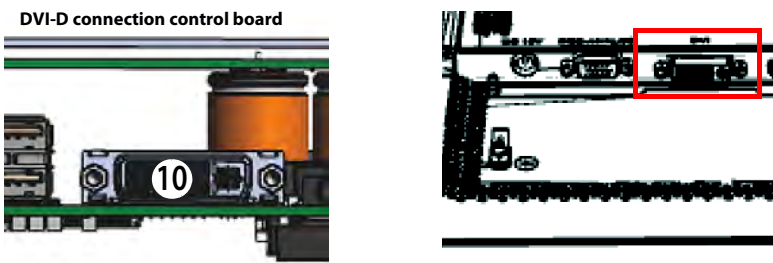
11. Connect the voltage supply to the power supply unit via the pre-assembled wiring. Connect the earthing to the front plate.

Pre-assembled voltage supply
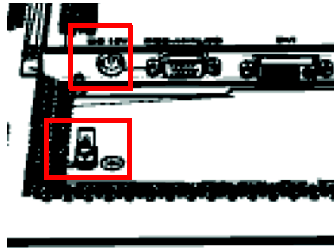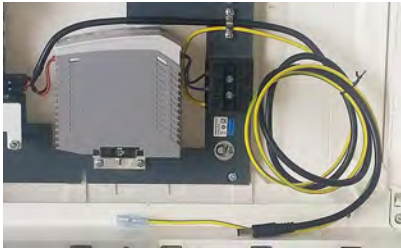
12. Attach the front plate to the built-in flush-mounting enclosure.
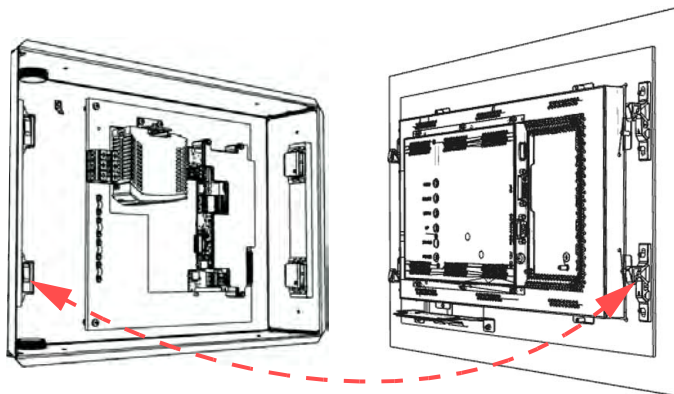
4.3   Digital inputs

CP9…-I devices feature 12 configurable digital inputs. Settings are made via the COMTRAXX® user interface in a browser (see Chapter 5.5.1).
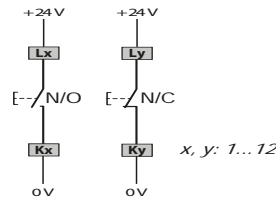
4.4   Relay

The relay parameters are set in the device menu (see Chapter 5.5.2).

Connection

11	12	14		N/C
				N/O
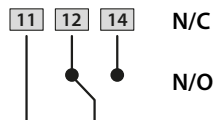
N/C operation contacts **11-12**
(the alarm relay is energised during normal operation).

N/O operation contacts **11-14**
(the alarm relay is de-energised during normal operation).

4.5 Commissioning of the CP9…-I device

1. Switch on the supply voltage:
   After switching on, the device performs a start routine. It is completed when the commissioning page appears n the display.
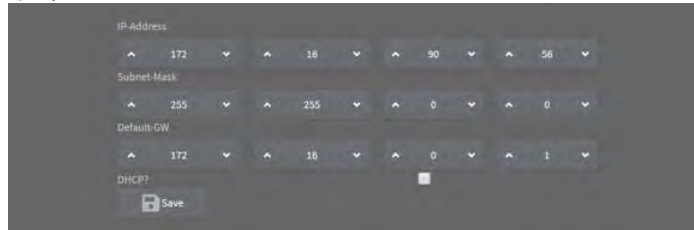
2. Enter the desired IP address in the 1st line

3. Enter the subnet mask in the 2nd line

4. Enter the address of the default gateway.

5. Press the "Save" button to store the entries.

6. Wait 8…10 seconds. The COMTRAXX® system overview starts.

7. If there is a DHCP server in the network, select only the check box to the right of the "DHCP?" label in line 4. Confirm your selection by pressing the "Save" button. The network settings transmitted from the server are shown on the display after 8…10 seconds.

> ⓘ *After this, the commissioning must be continued via the COMTRAXX® user interface.*

Factory settings communication addresses

Parameter	Factory setting
IP address	
IP address for 1:1 ETH conn.)	169.254.0.1
Net mask	255.255.0.0
Standard gateway	192.168.0.1
DNS	-
DHCP	off

Parameter	Factory setting
t_{off} Timeout for DCHP address assign-ment	30 s
BMS address	1
BMS protocol	BMS i
BCOM system name	SYSTEM
Subsystem address	1
BCOM device address	0

The settings can be changed during commissioning via the display or the web user interface.

- From an external application (e.g. visualisation software), commands can be sent to BMS devices. The "Modbus control commands" menu provides Modbus control commands for selected BMS commands. These commands can be copied to the clipboard of the PC and then included in the programming of the external application.

- Graphical display with scaling of the time axis for the data loggers of the gateway and compatible Bender devices.

4.6 Software products used

Select **Tools > Information > Copyright** to display the used software products.

4.7 Browser configuration

As browser, the latest version of Windows© Internet Explorer, Google Chrome and Mozilla Firefox are recommended.

5. Web user interface

The web user interface of the device enables access via LAN, WLAN or the Internet. It provides a uniform display of Bender devices that are connected to:

- The internal BMS bus
- BCOM
- Modbus RTU
- Modbus TCP

Each interface has its own address range. Each device is given its own individual address by which it can be identified.

5.1   Functions of the web user interface

- Bus overview of the associated devices
  - Indicating alarms and measured values
  - Display by interface or subsystem
  - Setting, displaying and evaluating the history memory and data loggers
  - Graphical display of measured values (bar graph, phasor diagram, power triangle) and waveform recorders; In case of universal measuring devices, additional display of the harmonics as table or bar graph
  - Setting device parameters
  - Device failure monitoring
  - Saving settings as "backup" and restoring values again
  - Documenting settings and measured values
  - Assigning individual texts for devices, measuring points (channels) and alarms
  - E-mail notifications to different user groups according to a time-controlled schedule in the event of alarms and system errors. The sender's e-mail address can be entered.
  - Display of virtual devices. A virtual "measuring point" is obtained by logically or numerically evaluating measured values of "real" devices connected to the gateway.
- Management of Modbus devices
  - Adding/deleting devices to/from the bus overview
  - Creating a template with selected measured values
- Visualisation
  - Fast, simple visualisation can be configured in its own editor without programming knowledge
  - Measured values, alarms, buttons, etc. can be arranged and displayed in front of a graphic (system diagram, room plan) using various widgets
  - Displaying an overview page; jumping to another view page and back to the overview page is possible

- From an external application (e.g. visualisation software), commands can be sent to BMS devices. The "Modbus control commands" menu provides Modbus control commands for selected BMS commands. These commands can be copied to the clipboard of the PC and then included in the programming of the external application.

- Graphical display with scaling of the time axis for the data loggers of the gateway and compatible Bender devices.

5.2   Software products used

Select **Tools > Information > Copyright** to display the used software products.

5.3   Browser configuration

As browser, the latest version of Windows© Internet Explorer, Google Chrome and Mozilla Firefox are recommended.
To use the functions of the web user interface, JavaScript has to be activated. The pop-up blocker should be deactivated for the IP address of the COMTRAXX® device.

> *For Windows© Internet Explorer, the compatibility view has to be disabled.*
> *Select **Extras > Configuration of compatibility view**.*
> ***Deactivate** the button **Display Intranet sites in compatibility view**..*

5.4   Home page COMTRAXX® user interface

1. Open an Internet browser.

2. Enter the IP address of the gateway in the address line (example: http://172.16.60.72).
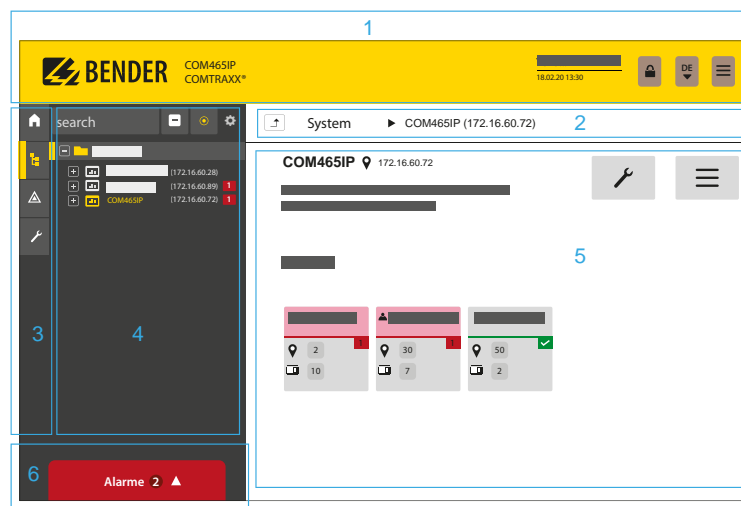
Legend

1	Headline
2	Path display
3	Navigation
4	Subnavigation
5	Content area
6	Alarm overview

5.4.1 Headline

Legend

1	Clicking the logo: Return to home page
2	Used device: Device type
3	Used device: **System name > Subsystem > Device address**
	Date and time of the device
4	The symbol indicates that the web user interface is protected by a password. Click the symbol and then click **Login** to enter the user name and password
5	Language selection
6	Open/close navigation (button only available in small browser window)

5.4.2 Path display (breadcrumb navigation)

Example
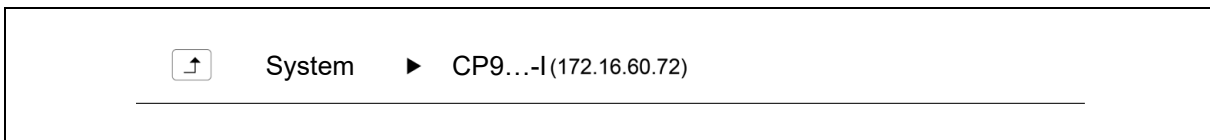
The path display shows at any time on which device and in which bus you are currently located in the content window.

5.4.3 Navigation

	Menu	Description
	Start	Display of information about the device and the software. Please have this information to hand if you need to contact us for assistance by telephone.
	System overview	The system overview shows all devices in the system either by subsystem or by interface. Pending alarms and operating messages are displayed and the respective devices can also be configured.
	Alarms	Display of all pending alarms and data of the devices sending an alarm
	Tools	Functions that affect the entire system

The navigation symbols are permanently visible on the left side.
Even if a random submenu of the web user interface is open, you can navigate to one of the four areas by clicking the respective symbol.

5.4.4 Subnavigation

The system overview is displayed in the subnavigation.
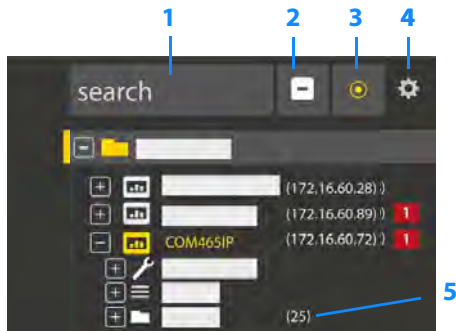
Legend

1 Full text search in the system for device names or menu entries. Matches are highlighted in yellow.

2 Close unfolded tree in the subnavigation

3 Fold out automatically:

When enabled (= yellow), the displayed contents of the content area are shown in the subnavigation with automatically unfolding device tree in addition to the path display. Path display and content area are always synchronous.

When disabled (= white), the subnavigation is not adapted to the path display or the current content area.

4 - Select **display** by subsystems or by interfaces. The interface display is only available for COMTRAXX® V4.xx and higher.

- Configure the **line height** of the entries.

5 The number in brackets (here: 25) indicates the set bus address.

> ℹ️ *The display by subsystem or interface is possible independently of the configured Modbus image V1 or V2.*

5.4.5 Content area

Display of the system, alarms and entries for the tools 🔧.
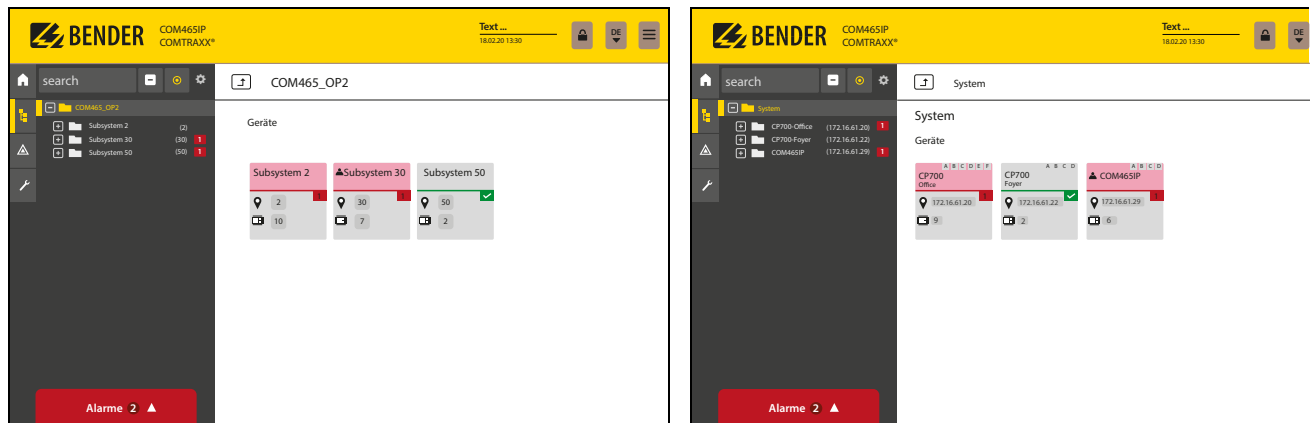
Fig. 5.1: Content area of the system display by subsystem (left) and by interface (right)

5.4.6 Overview of pending alarms

Alarme ② ▲

ℹ | *Clicking the alarm overview* | *List of pending alarms*
Clicking on the list | *Details about the alarms in the content area*

5.5 Making settings on the device

Changes must be saved before leaving the respective mask. Otherwise they are discarded.

5.5.1 Digital input
Menu > Settings > Digital input 1 - 12
For each of the 12 digital inputs DI1...12, the following can be defined:

Parameter	Options/Setting range	
Mode	Active high Active low Imp. (active high) Imp. (active low)	
Measurement type	Operating message Alarm Error(s)	
t_{on}	Response delay	0 s…10 minutes
t_{off}	Switch-off delay	

An event is executed when the digital input experiences an edge change. The edge change must be present at least for the set response delay t_{on}, otherwise it is ignored.
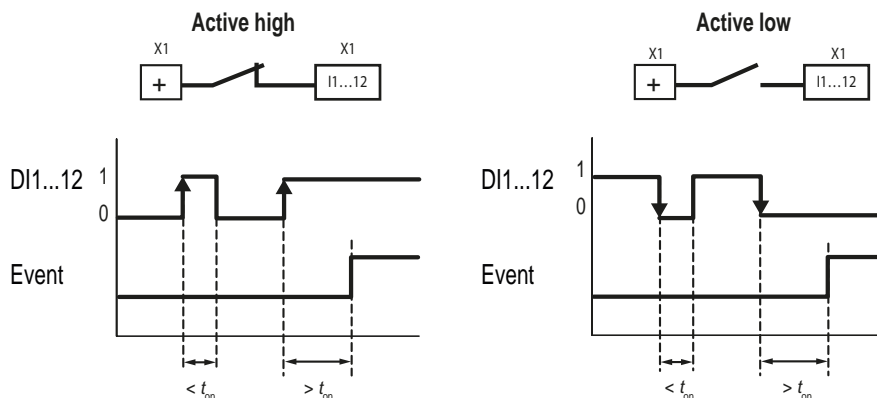
5.5.2 Relay
Menu > Settings > Relay

Setting options	Options	Explanation
Relay mode	N/O	Normally Open
	N/C	Normally Closed
Mode	Cont.	Relay remains permanently energised.
	Imp.	Relay is energised for one pulse.
	Flash	Relay switches several times between active and inactive.
Timer	100 ms…2 s	"Imp." mode: impulse time "Flash" mode: cycle time
PowerOn	off	Relay is deenergised during device start.
	on	Relay is energised during device start.
	PowerOff	During device start the relay takes on the same state it had when the supply voltage was switched off.

5.5.3 Interface
Menu > Settings > Interface
The required parameters for each connected interface are set here:

- BCOM
- Ethernet
- BMS
- Modbus
- SNMP
- POWERSCOUT®

5.5.4 Edit texts
Menu > Settings > Edit texts
The individual device and channel texts of the COMTRAXX® device are configured here. The data logger texts can also be edited.

Setting options	Setting for…/Description	
Channels	DI1…12	Descriptive text and alarm text
	DO1	Descriptive text and alarm text
	Timer 1…12	Descriptive text
Device	Device name	
	Message in case of device failure	
Data logger	Data logger 1…30	Descriptive text

5.5.5 E-mail

Menu > Settings > E-mail > Profile

The following is set for 5 different profiles:

Setting options	Setting for…/Description
Settings	Profile Active Server Timeout Port Encryption Check certificate User Password
E-mail	Language Sender To (= addressee) Subject Messager header Message footer E-mail in the event of prewarning E-mail in the event of test alarm System monitoring
Test	Send test e-mail to check all settings

5.5.6 History/Logger

Menu > Settings > History/logger

Setting options	Setting for…/Description	
History	History content	Complete system
		Own device and all subdevices
	Delete	
Data logger 1…30	Name	
	Path	
	Status	on, off
	Percentage change (	off, 1…99 %
	Trigger	off, 15 minutes …7 days
	Absolute change	off or precise limit value
	Overwrite	yes, no
	Delete	
BMS recording		off, 1…7 days

5.5.7 Clock
Menu > Settings > Clock

Setting options	Setting for…/Description
Summer time	off, on, CEST, DST
UTC offset	
NTP	off, on
NTP server	

5.5.8 Display
Menu > Settings > Display

Setting options	Setting for…/Description	
Display	Resolution	
	Rotation	Observe mounting direction of display
Standard view	Standard view	System overview [1], visualisation, IP address
	Return to standard view	off, 1…30 min
	Allow switching from system overview to visualisation [2]	on, off

[1] The system overview known from the web application can also be shown on the display. This allows alarms and details to be displayed or settings to be made directly on the device. The system overview is configured as the default display at the factory and is shown during device start.

[2] *Prerequisite: A visualisation has been created.*
If "Allow switching from system overview to visualisation" is enabled in the settings, a button for switching to the visualisation appears on the display. To return from the visualisation to the system overview, the widget ⬜➡⬛ must be placed and configured in the visualisation. This allows you to switch between the visualisation and the system overview at any time.

5.5.9 Password
Menu > Settings > Password
The password protection is configured in the device menu of the respective COMTRAXX® device. Password protection can be configured for the roles **User** and **Administrator**. This allows regulating the access to the web user interface.   .

⚠️ **CAUTION**

Risk of damage to equipment due to unauthorised access
The password protection for the gateway protects against unauthorised access to a limited extent only. Attackers from the Internet may still be able to read data and change settings.
It is absolutely necessary that:
- The network is separated from the Internet
- Common security mechanisms are applied (firewall, VPN access)

The default user names and authorisations ("admin, read and write" and "user, read only") cannot be changed.

Setting options for role	Setting for…/Description
Status	enabled, disabled
Password	A…Z a…z 0…9 - _

5.5.10 Buzzer
Menu > Settings > Buzzer

- Volume (High, Normal, Low)

5.5.11 Factory settings
Menu > Settings > Factory setting
When resetting to factory settings, all settings, parameters, data logger and history memory are reset. It can be specified that Ethernet settings are not affected.

6. Visualisation

The data from the Bender system can be displayed in a separate visualisation. It provides access to all measuring channel information, alarms and other data. The application is shown in a separate browser tab of the connected device and does not require any further plug-ins. The visualisation is configured in an editor. The editor is accessed via the menu item

Tools > Visualisation > Edit in the COMTRAXX® application. The user interface is illustrated schematically in the graphic below.

Browser tab		
Headline		
Dashboards	**"Work area"**	**Settings**
Widget library		
		Used widgets
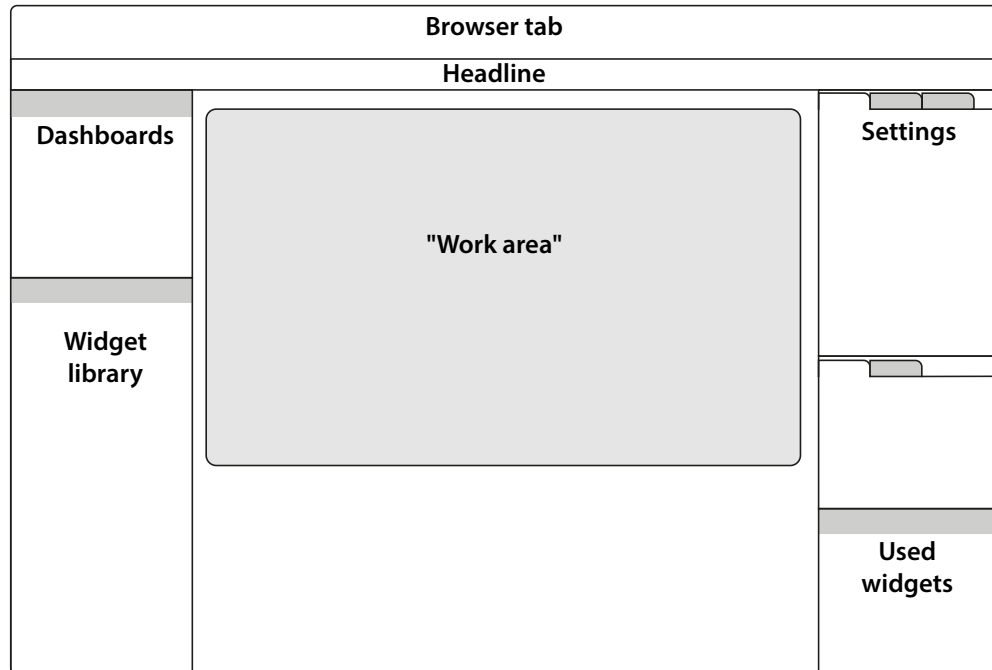
The "work area" represents the visible area in the browser tab. Individual elements with different functions, so-called **widgets**, are placed on it to form a "picture" called "Dashboard". Up to 50 different dashboards can be created and linked to each other. All the dashboards organised in an interconnection are grouped together as a "project" and can be saved on the PC or transferred to the device.

The created visualisation can then be started in a separate browser tab in the COMTRAXX® application via the menu items **Tools > Visualisation > Displays**.

The following section describes the buttons, tools and elements available in the editor.

6.1 The headline

| File ▼ | ⬚ ⬚ | Project name | German ▼ | 🖥 |

6.1.1 Drop-down menu "File"

| File ▼ |

New project		Create a new project
New dashboard		Create a new dashboard
Import project from PC	Ctrl+O	Import existing project from PC
Import active project from device	Ctrl+L	Import current project from the device to PC
Export project to PC	Ctrl+Shift+S	Export created project to PC
Save and export to device	Ctrl+S	Save changes and export to deviceI
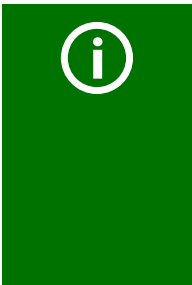
ⓘ **Saving and exporting projects**
Please note that only the visualisation is saved! The configuration of interfaces, link variables and links is stored in a separate backup file. This is done in the COMTRAXX® application.
Select the used device in the bus overview:
Device settings > Export backup.
This backup contains all configurations made in the COMTRAXX® application, such as link variables, alarm addresses, etc.

6.1.2 Grouping functions

⬚	No widgets selected
⬚	Group selected widgets. Individual widgets can then only be moved in groups.
⬚	No group selected
⬛	Selected group is ungrouped. The widgets can then be edited individually.

6.1.3 Project name

Display of the project name.

6.1.4   Language selection

English   ▼

Select the operating language of the editor. This is not necessarily the language of the automatically generated messages displayed on the device (= export language)

Czech	German	Greek	English GB	English US
Spanish	Finnish	French	Hebrew	Croatian
Hungarian	Indonesian	Italian	Japanese	Sanskrit
Dutch	Norwegian	Polish	Portuguese PO	Portuguese BR
Russian	Slovenian	Serbian	Swedish	Chinese
Turkish				

6.1.5   Simulating visualisation

Simulate the project in a browser tab to test the appearance and functionality of the buttons in advance.

6.2   The "work area"

The "work area" represents the display of the visualisation. The widgets can be moved from the widget library to the work area using drag & drop. It only represents a preview of the expected display. The functionality (e.g. navigation) can be tested in the browser after saving the project.

6.3   Dashboards
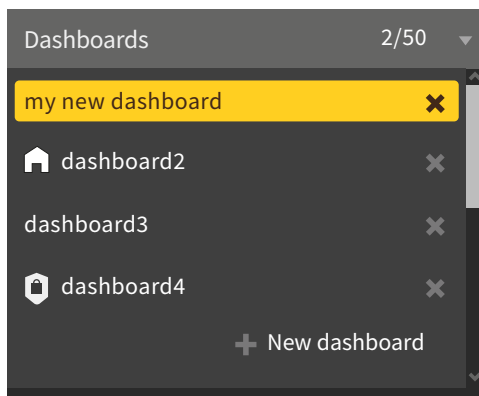
2/50	Number of created dashboards
🏠	Home page
✖	Delete dashboard
🛡	Password-protected dashboard
➕ New dashboard	Create a new dashboard

Function

Display and manage existing dashboards and add new dashboards.

A dashboard is a page that can be displayed in the visualisation. Up to 50 different pages (dashboards) can be created. To link the individual dashboards, navigation elements must be placed on the pages.

If several dashboards have been defined, one of the dashboards acts as home page. It is marked with a house icon. This dashboard appears as the starting point after executing the visualisation. The home page assignment is described in the project settings in Chapter 7..

The active dashboard is highlighted in YELLOW.
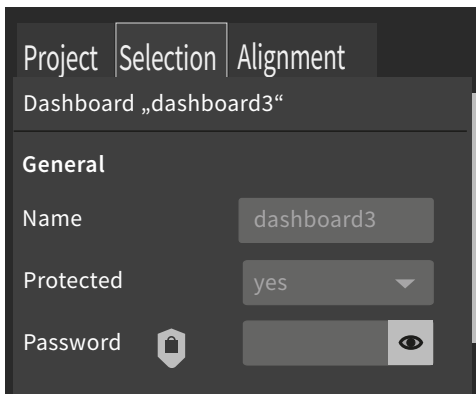
In the "Selection" tab (right side) the dashboard can be named and also password protected ("Protected" yes/no).

Password-protected dashboards are marked with a lock symbol in the dashboard list.

6.4   Widget library
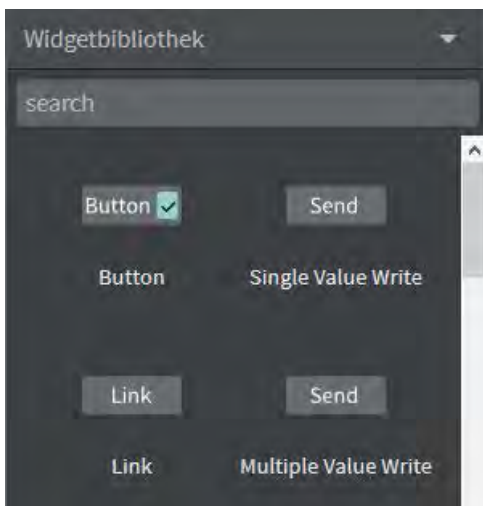
All available widgets are included in a library.

> ⓘ   *Use the scroll bar (right) to navigate to further widgets.*

A widget is a template for a defined function to which various values (parameters) can be assigned. This allows both specific values to be transmitted to specific addresses and values from linked systems to be evaluated and displayed.

When moving the mouse pointer over a widget in the widget library (mouseover), the icons (**i** and **+**) with two functions appear at the bottom of the widget.
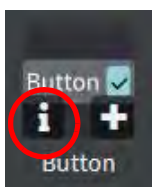
    Information on the selected widget
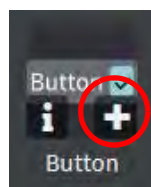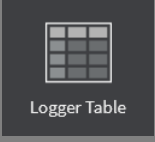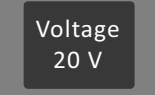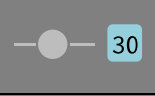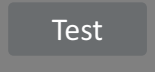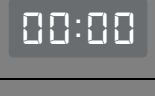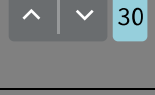
    Place selected widget on the top left of the work area

To place a widget on the work area, it can also be dragged there with the mouse. (Chapter 6.4.2)

The widget settings are made on the right side in the "Settings" area.
The assignment of values to a widget is described in Chapter 6.5.2.

6.4.1 Widget list

Icon	Labelling	Explanation
Syst. OK	**Alarm Bar**	*Alarm overview* Display alarm messages in an alarm line. Settings are made at "Alarm addresses" in the COMTRAXX® user interface in the browser. If several alarm messages are pending, the alarms are displayed one after another. The alarm is always displayed with the background colour set for the most important alarm.
	Background area	*Display frame* Display a frame with a background colour (optionally with shading).
Button ☑	**Button**	*Switch with state display* The current state can be displayed additionally (optional).
	Cleaning Mode	*Lock display operation for a short time* Screen lock for cleaning purposes.
	Clock	*Display time* Display a digital or analogue clock.
20° 23°	**CurrentState/ TargetState**	*Display current value and target value* The target value can be adjusted via the buttons. Control devices that trigger certain events when a target value is reached.
	Dashboard Link	*Navigation between existing dashboards* Enable switching between dashboards
ON	**Feedback**	*Display state* Colour indication of a value (True or False; ON or OFF).
Label	**Group**	*Group elements in a frame* Display a frame with heading.
</>	**iFrame**	*Display another website* Display the content of a URL in a frame of a freely definable size.
	Image	*Display a graphic* Place image contents from files. Set level = 0 for background images. Higher levels may overlap other widgets.
i	**Info**	*Device information* Tabular display of address information
Label	**Label**	*Create label* Display a text field
Link	**Link**	*Link to another dashboard* Link dashboards. The target is the dashboard to which the user wants to switch.

Icon	Labelling	Explanation
	Logger Table	*History memory* Display the history memory content of the device. The content to be displayed can be configured.
Voltage 20 V	**Measurement**	*Display measured value* Display the measured value of a channel of a connected device.
	Multiple Images	*Display multiple graphics* Display different pictures, which are shown depending on the current input value.
	Multiple Labels	*Display multiple labels* Display different labels, which are shown depending on the current input value.
Send	**Multiple Value Write**	*Write multiple predefined values* Defined values are sent to a defined address.
	RGB Color Picker	*Colour picker window* Range of 16.7 million colours. Provides an RGB colour value.
	RGB display	*Display frame* Display a frame with a background colour (optionally with shading).
Send	**Single Value Write**	*Write a predefined value* Send a set value to a defined address.
30	**Slider**	*Slider with state display* Slider with optionally available state display.
Test	**Start Test**	*Start device test* Device tests can be started.
	Switch to System overview	*Switch to system overview* Switch directly to the system overview from any page.
00:00	**Timer**	*Timer function* Display of a configurable timer.
∧ | ∨ 30	**Up/Down Button**	*Button with two programmable functions and status display* Control of equipment (lamp, temperature, shutter…). The current value can optionally be displayed.
URL ⧉	**URL Link**	*Enter link* Link to a URL page, which is then opened in a new browser tab Note: This widget is only available for COM465…P.

6.4.2 Placing widgets in the work area
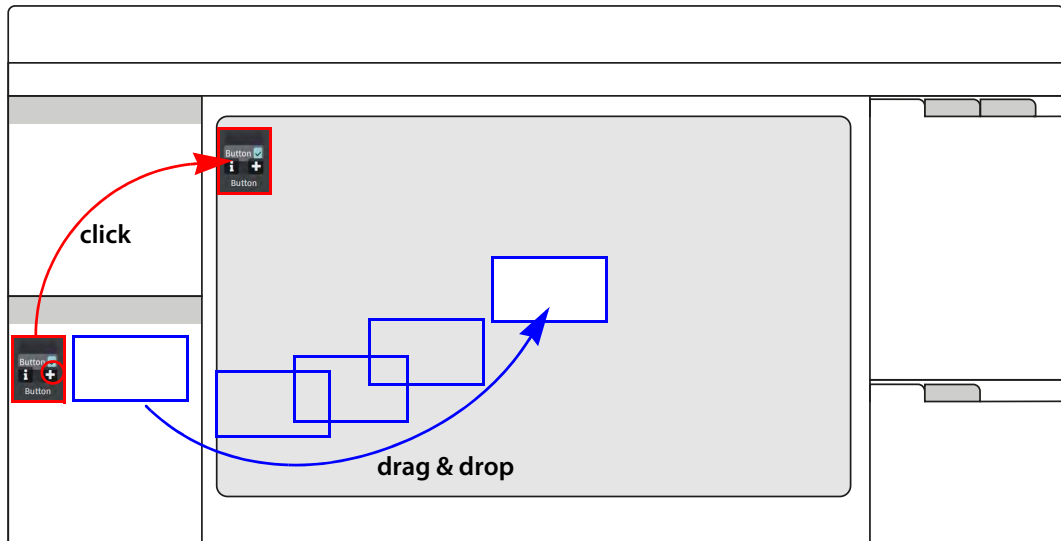
Clicking on the ✚ icon of an active widget in the widget library inserts it into the upper left corner of the work area.

The widget can also be placed directly and freely on the work area with the mouse using "drag & drop".

6.5 Settings
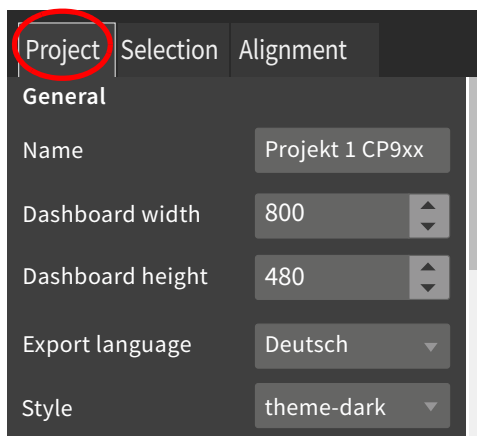
Project settings
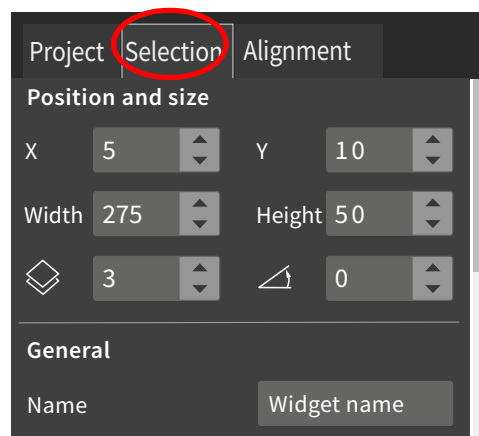
Widget(s) settings

All value-based settings are made in the settings area. The values displayed there always represent the values of the currently active element. Elements can be both dashboards and widgets. If multiple widgets are selected, value changes always affect **all** of them. This also applies to grouped widgets. Number and type of parameters vary depending on the widget.

> ℹ️ *Use the scroll bar (right) to navigate to the setting options hidden in the monitor view.*

6.5.1 Project settings

Make individual project settings here.

Project	Selection	Alignment		Set home page (dashboard list house icon)

Miscellaneous

Start	Home ▾	Time after which the system jumps back in case of inactivity
Return to start page after time (min)	5 ▲▼	only relevant if return to home page is enabled
Jump to start page	☐	Automatic return to home page ON/OFF

General

Name	Projekt 1 CP9xx	Project name in the title bar
Dashboard width (px)	800 ▲▼	Dashboard dimensions in pixels (the dimensions should be based on the size of the visualisation to be configured)
Dashboard height (px)	480 ▲▼	
Export language	Deutsch ▾	Language of the channel descriptions (may differ from editor language)
Style	theme-dark ▾	Appearance of the operating elements (buttons)
relative export	☐	Scaling of the work area to the size of the target medium

Font

Font colour	#000000	Font colour #RRGGBB with numerical and interactive colour selection
regular ▾	normal ▾	100 ▲▼	Font settings (weight, slant and size)

ⓘ **Font colour selection**
Numerical input using 6-digit hexadecimal value with leading number sign (hashtag). Colour values are formed as follows: # RR GG BB
R = red value; G = green value; B = blue value

6.5.2 Widget settings

Individual widget settings can be made here. Depending on the selected widget, the corresponding setting options are available. The number and type of parameters displayed vary depending on the active widget. In the following, the possible parameter areas are described independently.

6.5.2.1 Predefined icon symbols and units

Icon symbols

One of 45 predefined icons can be selected from a selection menu. After selection, it is displayed on the left side of the respective widget.

	BPS		Radiation		Attention		Settings
	Temperature		OT light		Ventilation		ON/OFF
	IPS		OT light		Humidity		System
	Gas		LED		Shutter		Cleaning
	History		PLC		UPS		Emergency light
	In use		Warning		Room		Half-bright
	Laser		Intercom		Overview		Bright
	Save set		Plus		Minus		Field size
	Freeze		Half brightness		Field		Brightness
	Synchronisation		Load set				

Tab. 6.1: Overview icon symbols

It is possible to add custom icons at **File > Manage icon library**.
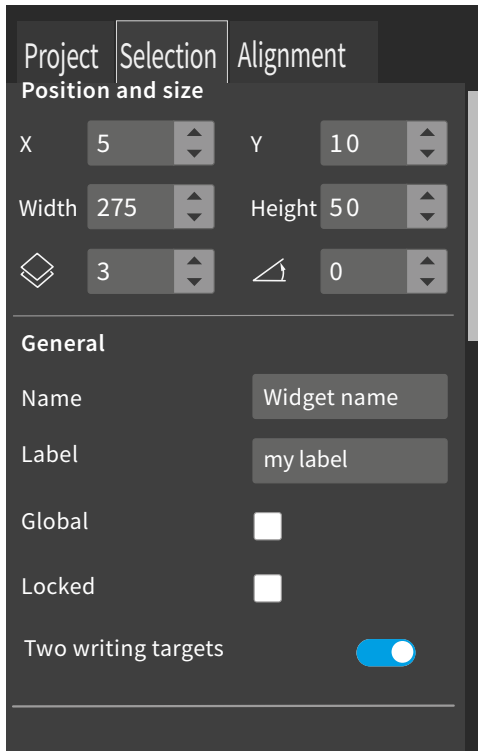
Units

Ω	Ohm	A	Ampere	V	Volt	%	Percent
Hz	Hertz	Baud	Baud (data rate)	F	Farad	H	Henry
°C	Degree Celsius	°F	Degree Fahrenheit	s	Second	min	Minute
h	Hour	d	Day	mo	Month	W	Watt
var	Volt-ampere react.	VA	Volt-ampere	Wh	Watt-hours	varh	Volt-ampere-hours react.
VAh	Volt-ampere-hours	°	Degree	Hz/s	Hertz/second	bar	Bar

Tab. 6.2: Overview units (predefined)

6.5.2.2 "General" area

The "General" area contains parameters which apply to all widgets.
Labelled widgets have the additional parameter "Label".

	Position on the work area (in pixels) Default position in the work area is top/left
	Widget dimensions (in pixels)
	Position on the z level and angle of rotation
Name	Assigned automatically or by user
Label	Labelling widgets in the work area
Global	Placing the widgets on all dashboards ON/OFF
Locked	Locking the widget ON/OFF
Two writing targets	Enable value transfer to two digital outputs (for "Up/Down Button" widget)
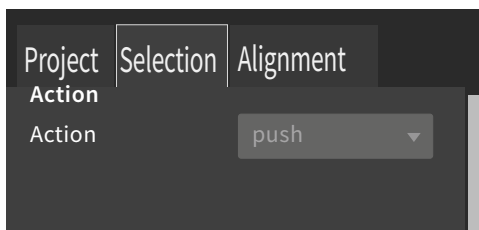
6.5.2.3 "Action" area

For "Button" widget

6.5.2.4 "Miscellaneous" area

| Project | Selection | Alignment |

Miscellaneous
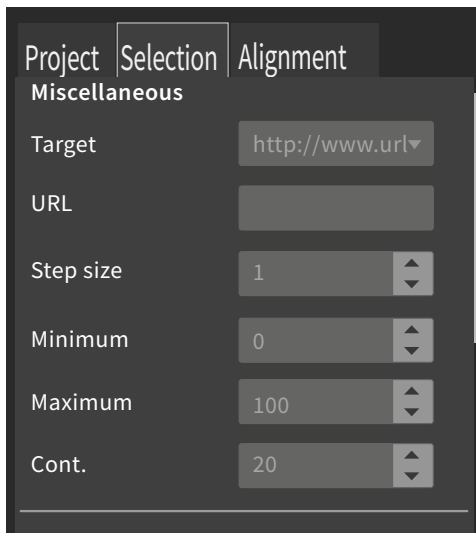
Target	http://www.url ▾	Select link destination from existing dashboards
URL		For "iFrame" widget
Step size	1 ▲▼	Only for "Current state/Target state" and "Up/Down Button" widgets:
Minimum	0 ▲▼	
Maximum	100 ▲▼	Set limits and step size
Cont.	20 ▲▼	For "Cleaning Mode" widget in s

6.5.2.5 "Communication" area

| Project | Selection | Alignment |

Communication

Endpoint to deactivate

Select none ✏️
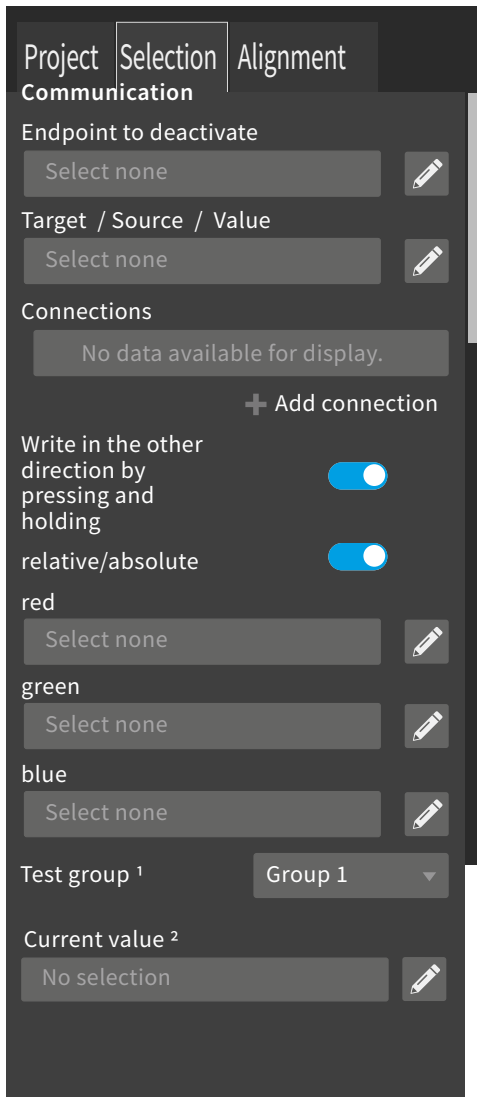
This function can be disabled. The source that does this is assigned here.

Target / Source / Value

Select none ✏️

Setting options depend on the widget

Connections

No data available for display.

➕ Add connection

Add new link

Write in the other direction by pressing and holding ⬤

When enabled, values can also be written back to a source by pressing and holding the button.

relative/absolute ⬤

red

Select none ✏️

Widgets RGB Color Picker and RGB Display:
relative: 0…100 %
absolute: 0…255

green

Select none ✏️

blue

Select none ✏️

[1] For "Start Test" widget

Test group [1]   Group 1 ▼

[2] For "Current State/Target State" widget

Current value [2]

No selection ✏️

ⓘ **Colour selection**
Numerical input using 8-digit hexadecimal value with leading number sign (hashtag). Colour values are formed as follows: # RR GG BB TT
R = red value; G = green value; B = blue value; T = transparency

---

6.5.2.6   "Appearance" area
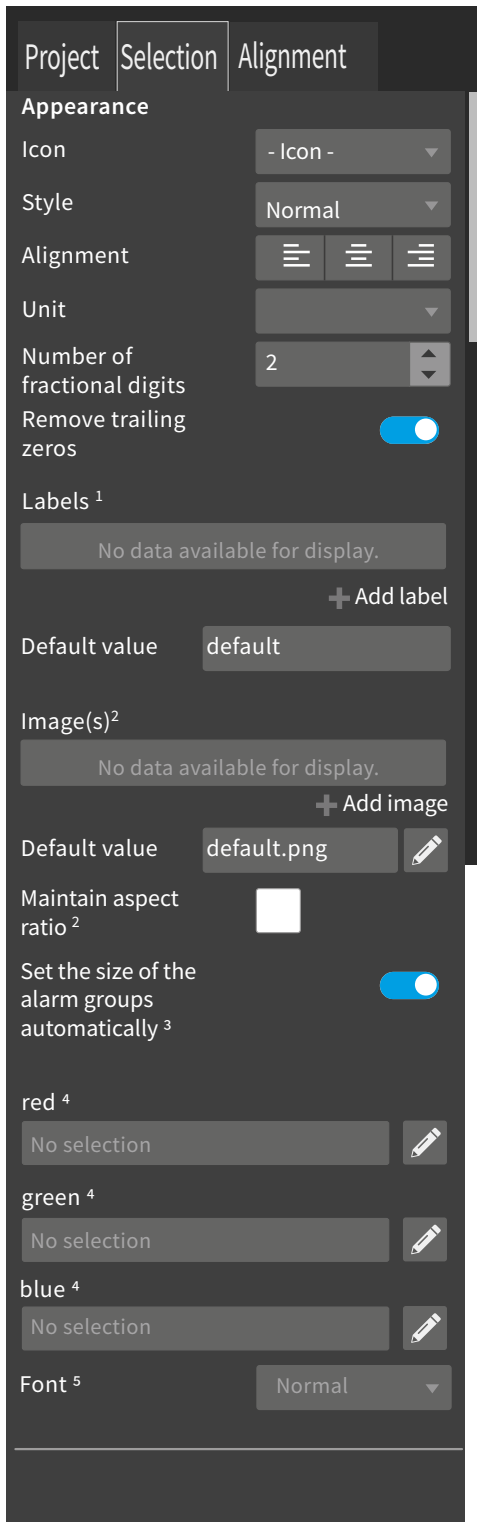
Project | **Selection** | **Alignment**	
Appearance	
Icon — - Icon - ▼	For selection options, see Table 6.1
Style — Normal ▼	Normal, Dashboard, Transparent, Tab Menu
Alignment — ☰ ☰ ☰	Alignment of the labelling on the element
Unit — ▼	For selection options, see Table 6.2
Number of fractional digits — 2 ▲▼	Set indication accuracy
Remove trailing zeros — 🔵	2.70000 is displayed as 2.7
Labels [1] — No data available for display. — ➕ Add label	[1] For the "Label" and "Multiple Labels" widgets Add an additional line
Default value — default	Standard labelling
Image(s)[2] — No data available for display. — ➕ Add image	[2] For the "Image", "Multiple Images" and "RGB Color Picker" widgets Select an image source
Default value — default.png 🖉	Standard image
Maintain aspect ratio [2] — ☐	Maintain aspect ratio YES/NO
Set the size of the alarm groups automatically [3] — 🔵	[3] For the "Alarm Bar" widget
red [4] — No selection 🖉	[4] For the "RGB Display" widget
green [4] — No selection 🖉	
blue [4] — No selection 🖉	
Font [5] — Normal ▼	[5] For the "Timer" widget

"Logger Table appearance" area

Project	Selection	Alignment	
Appearance			
Column name/Width/Visibility			
No.	70	✓	Number of the record
Timestamp	150	✓	Timestamp of the record
Path	250	✓	Path of the measuring point
Type	150	✓	Type of record (Alarm start, Alarm end, Device restart, Acknowledge, …)
Start/Min.	150	✓	Value at occurrence of the alarm
Max.	150	✓	Maximum value for the duration of an alarm (only for "Alarm end")
Description	150	✓	Description of the measuring point
Alarm	70	✓	Type of alarm
Test	150	✓	Entry initiated by test

The order of the columns cannot be changed.

The width (pixels) of the displayed columns can be changed to any value using the arrow buttons in steps of 10 or in the number field. If a column is not needed, it can be hidden by unchecking the box. If the path specification is longer than the space available in the column, the text is always cut off on the left. This way, the relevant information remains visible.

"Clock appearance" area

Appearance		Numerical or interactive colour specification
Mode	Analogue[1/2] ▼	Mode
Colour	#000000ff ■	Hour marker ON/OFF
Show hour marker [1]	☐	Seconds ON/OFF
Show seconds [1]	☐	Display date ON/OFF
Show date [2]	☐	Display time ON/OFF
Show time [2]	☐	Display seconds ON/OFF
Show seconds [2]	☐	

[1] Analogue mode	[2] Digital mode

"Background appearance" area

Appearance		
Colour	#000000ff ■	Colour specification filling colour (numerical or interactive)
Frame colour	#000000ff ■	Colour specification frame (numerical or interactive)
Frame size	1 ▲▼	Frame thickness (in pixels)
Shadow	⬤━	Shadow ON/OFF
Shadow colour [1]	#00000080 ■	Colour specification shadow (numerical or interactive)
Shadow x [1]	0 ▲▼	Shadow direction horizontal
Shadow y [1]	0 ▲▼	Shadow direction vertical
Shadow blur [1]	5 ▲▼	Shadow gradient (intensity)
Shadow width [1]	0 ▲▼	Shadow size
Internal frame [1]	☐	Inner frame ON/OFF

[1] Additional parameters are **shown** when "Shadow" option is enabled.

> ⓘ **Colour selection**
> *Numerical input using 8-digit hexadecimal value with leading number sign (hashtag). Colour values are formed as follows: # RR GG BB TT*
> *R = red value; G = green value; B = blue value; T = transparency*

6.5.2.7 "Value display" area

Value display	
Show state ⬤	Display state ON/OFF
State	
Select none ✎	Source, whose state is to be displayed
Colour if condition true #98cfdc ▢	Colour specification TRUE
Colour if condition wrong #808284 ▢	Colour specification FALSE
Value	
Select none ✎	Text to be displayed
Show text ⬤	Display text
Text if condition true ON	Text for TRUE
Text if condition false OFF	Text for FALSE

Additional parameters are **shown** when the option is activated.

> ⓘ **Colour selection**
> *Numerical input using 8-digit hexadecimal value with leading number sign (hashtag). Colour values are formed as follows: # RR GG BB TT*
> *R = red value; G = green value; B = blue value; T = transparency*

6.5.2.8 "Font" area

Additional parameters are **hidden** when the option "Use global text settings" is activated. For information on colour value selection for font colours,.

6.6 Widget alignment

This section provides help for easy arrangement and alignment of the widgets on the display of the device.
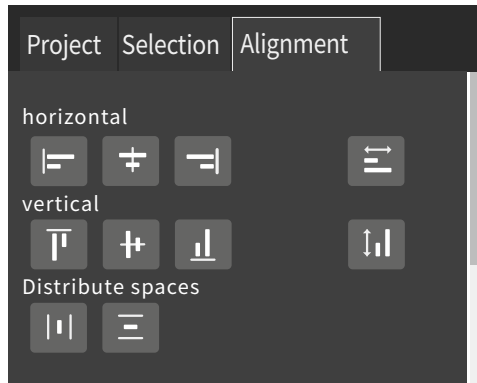
Horizontal options:
left-aligned, centred, right-aligned.
The fourth button formats selected widgets to the largest common width.
Vertical options:
align to top, centre, bottom
The fourth button formats selected widgets to the largest common height.
Distance distribution options:
The space between several selected widgets can automatically be distributed evenly in horizontal and vertical direction.

6.7 Guides and grid

6.7.1 Guides
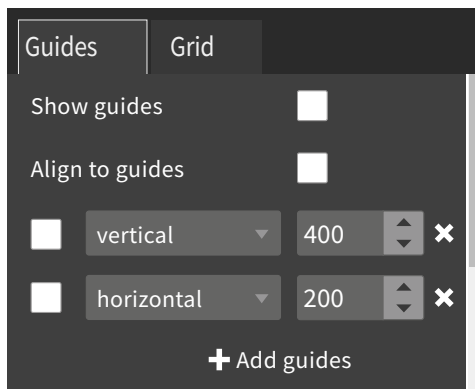
Guides ON/OFF

Align widgets to guides ON/OFF

Display a configured vertical guide

Display a configured horizontal guide

Add a guide

6.7.2 Grid
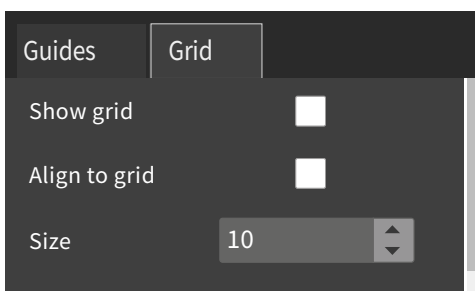
Grid ON/OFF

Align widgets to grid ON/OFF

Setting grid size

6.8 Used widgets
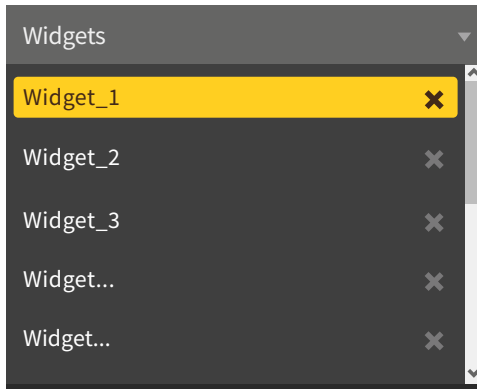
The list shows all widgets of the displayed dashboard. By clicking on an entry, the corresponding element is highlighted in yellow and can be edited. It can be deleted by clicking on the ✖ in the respective widget.

> ℹ️ *Use the scroll bar (right) to navigate to hidden widgets.*

7. Virtual devices

The concept of virtual devices involves combining existing measurements with other measurements in such a way that additional values, operating or alarm states can be displayed. Combine up to 26 measurements with numerical and logical operators to create a new "virtual" measuring point. Each of these measuring points uses one channel. A virtual device consists of a maximum of 16 channels. Virtual devices are treated like real devices and are fully integrated into the Bender system: All calculated values

- can be stored in a data logger,
- are available via Modbus,
- can be displayed in a visualisation.

7.1 Application possibilities

Warnings

Alarms and warnings can be configured for Modbus devices. Through virtual devices, user-defined warning limits can be set for devices that do not offer this option (e.g. PEMs). Each generated warning appears in the warning history and can be used to send an e-mail notification.

Device failure monitoring

In large buildings with many devices installed in a production hall, department or floor, virtual devices simplify simultaneous monitoring for device failure. It allows narrowing down the location of the failure and enables fast intervention.

Converting to BMS bus (mirroring)

Operating states of the virtual devices can be transmitted via BMS bus even if the real devices have no BMS interface. For this purpose, the virtual devices are "mirrored" to the BMS bus. The states of the measuring points (channels 1...12) are transmitted during the channel query of the BMS master.

> (i) *Only **operating states** are transmitted via the BMS bus (No alarm, Prewarning, Alarm). Specific measured values cannot be transmitted.*

7.2   Managing virtual devices

Path: Tools > Device management > Virtual devices

7.2.1   Virtual devices: Overview list/Main page

Address

Device addresses: 1…255

Alarm

Current operating state of the virtual device (prewarnings are displayed as alarms)

✅ No alarm   ❗ Alarm

Device name

ⓘ *Virtual devices are always named "VD700…".*

Mirrored

When enabled, the operating states of channels 1…12 of the virtual device are transmitted via BMS bus.

7.2.2   Editing a virtual device

✎

Device address, device name and BMS mirroring can be edited.

7.2.3   Editing channels

⚙

In the channel overview, the 16 possible channels are displayed with the following information:

- Current operating state (✅ No alarm   ⚠ Prewarning   ❗ Alarm)
- Individual text for prewarning or alarm
- General and individual channel description
- Current measured value
- Defined formula

In the overview, channels can be created or edited via ⚙ .
Channels can be deleted via 🗑.

ⓘ *Refer to the "Legend and examples" tab for assistance.*

7.2.4   Deleting a device

🗑

A device can be deleted via the bin.

7.2.5 Adding a virtual device
Use the button in the footer to add virtual devices.

> ⓘ *The number of virtual devices that can be created depends on the COMTRAXX device used or its active function modules.*

Device address
Select a free bus address from the drop-down menu.

> ⓘ *Virtual devices are treated like real devices. Therefore, addresses must not be assigned twice!*

Device name
Assign a name to the virtual device.

> ⓘ *Virtual devices are always named "VD700…". In addition, an individual name can be assigned.*

Mirroring to BMS
If operating states are to be transmitted via BMS, this can bet set here.

> ⓘ *Virtual devices are treated like real devices. Therefore, addresses must not be assigned twice!*

8. Modbus TCP server

> *Support tools that provide comprehensive information about Modbus can be found in the web user interface at*
>
> 🔧 **Tools > Service > Modbus**
>
> - *Generate control commands for BMS*
> - *Display information on all available Modbus registers*
> - *Generate Modbus documentation of all available Modbus registers of the connected devices*

The Modbus TCP server supports the following function codes:

- Function code **0x03** (Read Holding Registers)
- Function code **0x04** (Read Input Registers)
- Function code **0x10** (Preset Multiple Registers)

The Modbus TCP server generates a function-related response to requests and sends it back to the Modbus TCP client.

For details on the Bender Modbus images, see Chapter 8.3. Similarities and differences for read and write operations are explained in the following examples.

8.1 Modbus requests

The required data of the system image are read from the COMTRAXX® device using the function codes **0x03** and **0x04**. For this purpose, the start address and the number of the registers to be read have to be entered. In addition, registers can also be written using function code **0x10**.

Example for function code 0x03

Configuration   COMTRAXX® device in subsystem 1 with BCOM and BMS address 1;
                           BMS device on BMS interface with address 2

Task   Read register 0x05 10 of the BMS device

Byte	Name	Bender Modbus image V1	Bender Modbus image V2
Byte 0, 1	Transaction identifier	0x00 00	0x00 00
Byte 2, 3	Protocol identifier	0x00 00	0x00 00
Byte 4, 5	Length field	0x00 06	0x00 06
Byte 6	Unit ID	0x02 Device address assignment (0x02 corresponds to the device address 2 of the **subsystem**)	0x05 (address assignment via device assignment (0x05 = unit ID assigned by way of example for the device in the **Modbus device assignment**, see Chapter 8.5)
Byte 7	Modbus function code	0x03	0x03
Byte 8, 9	Register start address	0x05 10	0x05 10
Byte 10, 11	Number of words	0x00 01	0x00 01

Example for function code 0x04

	Configuration	COMTRAXX® device in subsystem 1 with BCOM and BMS address 1;
		BMS device on BMS interface with address 2
	Task	Read measured value from channel 1 of the BMS device

Byte	Name	Example Bender Modbus image V1	Example Bender Modbus image V2
Byte 0, 1	Transaction identifier	0x00 00	0x00 00
Byte 2, 3	Protocol identifier	0x00 00	0x00 00
Byte 4, 5	Length field	0x00 06	0x00 06
Byte 6	Unit ID	0x01 Address assignment of the **sub-system** (0x01 corresponds to subsystem address 1)	0x0A Address assignment of the **interface** 0x0A = interface internal BMS (see Chapter 8.5)
Byte 7	Modbus function code	0x04	0x04
Byte 8, 9	Register start address	0x02 10 Start register (0x02 = device address 2; 0x10 = start register for channel 1. (see Chapter 8.4.5)	0x01 62 Start register (measured value channel 1) (see Chapter 8.5)
Byte 10, 11	Number of words	0x00 02	0x00 02

Example for function code 0x10

	Configuration	COMTRAXX® device in subsystem 1 with BCOM and BMS address 1;
		BMS device on BMS interface with address 2
	Task	Write value = 100 to register 0x05 10 of the BMS device

Byte	Name	Bender Modbus image V1	Bender Modbus image V2
Byte 0, 1	Transaction identifier	0x00 00	0x00 00
Byte 2, 3	Protocol identifier	0x00 00	0x00 00
Byte 4, 5	Length field	0x00 06	0x00 06
Byte 6	Unit ID	0x01 Address assignment of the **sub-system** (0x01 corresponds to subsystem address 1)	0x0A Address assignment of the **interface** (0x0A = interface internal BMS) (see Chapter 8.5)
Byte 7	Modbus function code	0x10	0x10
Byte 8, 9	Register start address	0x05 10	0x05 10
Byte 10, 11	Number of registers	0x00 01	0x00 01
Byte 12	Number of registers x2	0x02	0x02
Byte 13 - xx	Values	0x64	0x64

8.2 Modbus responses

The responses consist of 2 bytes per register. The byte sequence is MSB (Most Significant Bit, Big Endian) first.

8.2.1 Responses for function code 0x03 and 0x04

Byte	Name	Example
Byte 1…6	Identical with request	
Byte 7	Modbus function code	0x03 or 0x04
Byte 8	Byte count	0x04
Byte 9, 10	Value register 0	0x12 34 (fictitious value)
Byte 11, 12	Value register 1	0x23 45 (fictitious value)

8.2.2 Responses for function code 0x10

Byte	Name	Example
Byte 1…6	Identical with request	
Byte 7	Modbus function code	0x10
Byte 8, 9	Register start address	0x12 34 (fictitious value)
Byte 10, 11	Number of registers	0x00 12 (fictitious value)

8.2.3 Exception code

If a request cannot be answered for whatever reason, the Modbus TCP server sends an exception code with which possible faults can be narrowed down.

Exception code	Description
0x01	Impermissible function
0x02	Impermissible data access
0x03	Impermissible data value
0x04	Slave device error
0x05	Acknowledgement of receipt (response delayed)
0x06	Request not accepted (repeat request if necessary)
0x08	Memory: Parity Error
0x0A	Gateway path not available
0x0B	Gateway error

Tab. 8.1: Overview of exception codes

Byte	Name	Example
Byte 1…6	Identical with request	
Byte 7	Modbus function code	0x84
Byte 8	Exception code	

Tab. 8.2: Structure of the exception code

8.3　Modbus system image

The COMTRAXX® device stores a system image in the internal memory. This shows the present values and states of all devices that are connected via the device.

The system image depends on which Bender Modbus image (V1 or V2) is active on the COMTRAXX® device.

Starting from COMTRAXX® version V4.00, address assignment by interfaces is introduced. Each interface now has its own address range. This means that there can be several devices with the same device address in the system if they are connected via different interfaces.
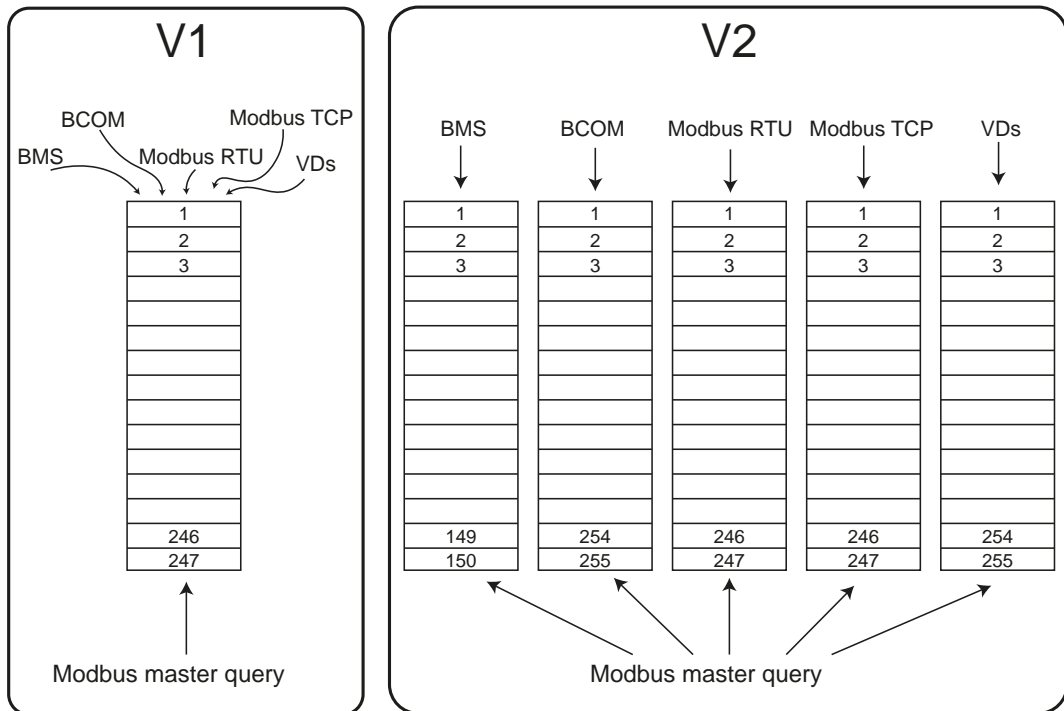
Fig. 8.1: Differences between Bender Modbus images V1 and V2

In the **Bender Modbus image V1**, all interfaces share a common address range; in the **Bender Modbus image V2**, each interface has its own address range. The Bender Modbus image V2 guarantees a unique and collision-free access to the device data.

> *After updating an existing device to V4.0, the Bender Modbus image is still set to V1.*
> *On newly delivered devices, V2 is active by default.*
> *The Bender Modbus image is configured in the device menu of the COMTRAXX® device at*
> **Settings > Interface > Modbus**

8.4   Bender Modbus image V1
(one address range for all interfaces)

If the Bender Modbus image is set to V1, the Modbus data are provided as follows:

8.4.1   Querying data with Modbus function code 0x03

The parameters and measured values of all devices in the subsystem can be read using the Modbus function code **0x03** (Read Holding Registers). This is only possible on the subsystem level, not in the entire system. The unit ID refers to the respective device address.

8.4.2   Querying data with Modbus function code 0x04

The system image in the memory of the COMTRAXX® device can be read using the Modbus function code **0x04** (Read Input Registers). The following information is available for all devices in the system:

- Device name
- Channel states
- Alarm and operating messages

The unit ID refers to the subsystem address.

The volume of the queried data depends on the number of bytes selected in the Modbus client used. Up to 125 words (0x7D) can be read with a single query.
An individual word can also be read, for example, to detect the set bit for a saved common alarm.

8.4.3   Writing data with Modbus function code 0x10

The parameters of all devices located in the same subsystem can be written using the Modbus function code **0x10** (Preset Multiple Registers). This is only possible at subsystem level, but not in the whole system. The unit ID refers to the respective device address.
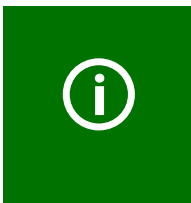
> (i)   *To make it easier to configure device parameters via Modbus TCP, the register addresses for each parameter can be displayed in the device menus. Activate this function at the menu item*
>
> 🔧 **Tools > Service > Parameter addresses**

8.4.4   Distribution of the memory areas

Memory utilisation	Start address	End of memory area	Size of memory area
Reference values for test purposes	0x0000	0x00FF	0x0100
System image	0x0100	0x95FF	0x9500
Not used	0x96FF	0xFFFF	0x6900

> (i)   *For some Modbus clients an offset of 1 must be added to the register addresses. Example: process image start address = 0x0101.*

The assignment of the memory addresses and the associated memory content for one subsystem is described below. Please refer also to the "BCOM" manual, which provides information about the entire addressable system.

8.4.5 Memory scheme of the system image

8.4.5.1 Structure of the system image

As illustrated in the table, the Modbus start address for the respective system image is derived from the **device address**.

256 (0x100) words or 512 bytes are reserved for each device. They contain all information requested and transmitted on the interface. .

Device address	Modbus address ranges of the process images in the memory			
	Word			
	HiByte	LoByte		
		00	**…**	**FF**
1	0x**01**	Device 1		
2	0x**02**	Device 2		
3	0x**03**	Device 3		
…	…	…		
32	0x**20**	Device 32		
…	…	…		
255	0x**FF**	Device 255		

Tab. 8.3: Modbus start addresses for each device for which a request can be sent (V1)

8.4.5.2 Memory scheme of an individual device

Devices can feature various types of analogue and/or digital channels. Please note the device-specific differences:

- BMS devices usually feature 12 channels
- MK800/TM800 supports up to 64 digital channels in the master mode

Use Table 8.3 and Table 8.4 to determine the start address to query the following device parameters:

- Device type
- Timestamp
- Common alarm
- Device error
- Channel information

8.4.5.3   Example: Determine start address

Channel 2 of the device with address 3 is to be queried. How is the start address determined to send the query for the channel? In our example, the relevant cells in the table are marked in bold.

1. For device address 3, the first address part 0x03 (HiByte) is taken from Table 8.3.

2. For channel 2, the second address part 0x14 (LoByte) is taken from Table 8.4. For the number of words to be queried, the number 4 is taken from the same table:
   (0x14 to 0x17 = 0x04).

3. The start address 0x0314 is formed by HiByte and LoByte.

Memory image of a device															
LoByte	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**A**	**B**	**C**	**D**	**E**	**F**
0x**0**0	-------------------------- Device type --------------------------									------ Timestamp ------				C	D	R.
0x**1**0	Channel 1				Channel 2				Channel 3				Channel 4			
0x**2**0	Channel 5				Channel 6				Channel 7				Channel 8			
0x**3**0	Channel 9				Channel 10				Channel 11				Channel 12			
0x**4**0	Channel 13				Channel 14				Channel 15				Channel 16			
0x**5**0	Channel 17				Channel 18				Channel 19				Channel 20			
0x**6**0	Channel 21				Channel 22				Channel 23				Channel 24			
0x**7**0	Channel 25				Channel 26				Channel 27				Channel 28			
0x**8**0	Channel 29				Channel 30				Channel 31				Channel 32			
0x**9**0	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
0x**A**0	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.
0x**B**0	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.
0x**C**0	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.
0x**D**0	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.
0x**E**0	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.
0x**F**0	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.

Tab. 8.4: Modbus address assignment of the channels in a device (V1)

Hex representation: horizontal = units
                             vertical = sixteens

Abbreviations for memory contents:
C = Common alarm
D = Device lost (device failure)
R = Reserved

8.4.6   Data formats

8.4.6.1   Device type

The device type is set using a bus scan.

Word 0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09
ASCII text, 10 words/20 bytes									

Tab. 8.5: Data format device type

8.4.6.2   Timestamp

The timestamp is set according to a datagram received from a transmitting device.

Word 0x0A		0x0B		0x0C		0x0D	
HiByte	LoByte	HiByte	LoByte	HiByte	LoByte	HiByte	LoByte
Year YY		Month MM	Day DD	Hour hh	Minute mm	Second ss	Reserved

Tab. 8.6: Data format time stamp

8.4.6.3   C = Common alarm and D = Device lost (device failure)

Word 0x0E	
HiByte	LoByte
C	D
Common alarm, 1 byte: LSB = 0 or 1	Device error, 1 byte: LSB = 0 or 1

Tab. 8.7: Data format common alarm and device failure

The common alarm bit is set as soon as an alarm status from the respective device is detected.
The device error bit is set when the communication with the respective device is no longer possible.

8.4.6.4   Channels 1 to 32 with analogue and/or digital values

Every analogue device channel can contain alarm messages, operating messages, measured values, test messages and descriptive text.
Both analogue and digital information can be transmitted.
AT&T   Alarm type and test type (internal/external)
R&U   Range and unit
For details on the channel description refer to Chapter 8.6.

Word 0x00		0x01		0x02		0x03	
HiByte	LoByte	HiByte	LoByte	HiByte	LoByte	HiByte	LoByte
Floating point value (Float)				AT&T	R&U	Channel description	

Tab. 8.8: Channels 1…32: data format analogue/digital values

8.4.6.5 Float = Floating point value of the channels

Word	0x00				0x01			
Byte	HiByte		LoByte		HiByte		LoByte	
Bit	3 3 1 0	2 4	2 2 3 2	1 6	1 5	8	7	0
	S E E E E E E E E		M M M M M M M M		M M M M M M M M		M M M M M M M M	

Tab. 8.9: Channels 1…32: data format floating point values

Representation of the bit order for processing analogue measured values according to IEEE 754
S = Sign
E = Exponent
M = Mantissa

8.4.6.6 A&T = Alarm type and test type (internal/external)
The alarm type is coded by the bits 0 to 2.
The bits 3 and 4 are reserved and always have the value 0.
Bit 5 usually has the value 0 and represents the digital value of the status (this column is only relevant for the SMI472).
Bit 6 or 7 are usually set when an internal or external test has been completed.
Other values are reserved.
The complete byte is calculated from the sum of the alarm type and the test type.

Bit	7	6	5	4	3	2	1	0	Description
	External test	Internal test	Status	Reserved	Reserved	Alarm	Error		
Alarm type	X	X	X	X	X	0	0	0	No alarm
	X	X	X	X	X	0	0	1	Prewarning
	0	0	X	X	X	0	1	0	Device error
	X	X	X	X	X	0	1	1	Reserved
	X	X	X	X	X	1	0	0	Alarm (yellow LED), e.g. insulation fault
	X	X	X	X	X	1	0	1	Alarm (red LED)
	X	X	X	X	X	1	1	0	Reserved
	X	X	X	X	X	…	…	…	Reserved
	X	X	X	X	X	1	1	1	Reserved
Test	0	0	X	X	X	X	X	X	No test
	0	1	X	X	X	X	X	X	Internal test
	1	0	X	X	X	X	X	X	External test

Tab. 8.10: Channels 1…32: data format A&T

8.4.6.7 R&U = Range and unit

The unit is coded in the bits 0 to 4.
The bits 6 and 7 describe the range of validity of a value. Bit 5 is reserved.
The complete byte is calculated from the sum of the unit and the range of validity.

Bit	7	6	5	4	3	2	1	0	Description
Unit	X	X	X	0	0	0	0	0	Invalid (init)
	X	X	X	0	0	0	0	1	No unit
	X	X	X	0	0	0	1	0	Ω
	X	X	X	0	0	0	1	1	A
	X	X	X	0	0	1	0	0	V
	X	X	X	0	0	1	0	1	%
	X	X	X	0	0	1	1	0	Hz
	X	X	X	0	0	1	1	1	Baud
	X	X	X	0	1	0	0	0	F
	X	X	X	0	1	0	0	1	H
	X	X	X	0	1	0	1	0	°C
	X	X	X	0	1	0	1	1	°F
	X	X	X	0	1	1	0	0	Second
	X	X	X	0	1	1	0	1	Minute
	X	X	X	0	1	1	1	0	Hour
	X	X	X	0	1	1	1	1	Day
	X	X	X	1	0	0	0	0	Month
	X	X	X	…	…	…	…	…	Reserved
	X	X	X	1	1	1	1	0	CODE
	X	X	X	1	1	1	1	1	Reserved
	X	X	X	…	…	…	…	…	Reserved
	X	X	X	1	1	1	1	1	Reserved
Range of validity	0	0	X	X	X	X	X	X	Actual value
	0	1	X	X	X	X	X	X	The actual value is lower
	1	0	X	X	X	X	X	X	The actual value is higher
	1	1	X	X	X	X	X	X	Invalid value

Tab. 8.11: Channels 1…32: data format R&U

> ⓘ *If the unit byte (0…4) refers to CODE, the recorded value or status will result in a text message.*

The content of this text message is listed in the table on Page 76.
The floating point value contains an internal CODE but no valid measured value.

8.4.6.8 Channel description

A code with the associated descriptive text is available for each channel. For a complete list of the available codes or texts refer to Page 76.

Channel 33 to 64

The channels 33 to 64 only provide digital information. The information is coded as alarm or message type as well as test type (internal/external). The coding is similar to the AT&T data format for channels 1 to 32 except for the additional bit 4,
which is used for coding device errors, e.g. connection faults or internal device errors.

Bit	7	6	5	4	3	2	1	0	Description
	External	Internal	Status	Reserved	Reserved	Alarm	Error		
	X	X	X	X	X	0	0	0	No alarm
	X	X	X	X	X	0	0	1	Prewarning
	0	0	0	X	X	0	1	0	Device error
Alarm type	X	X	X	X	X	0	1	1	Reserved
	X	X	X	X	X	1	0	0	Alarm (yellow LED), e.g. insulation fault
	X	X	X	X	X	1	0	1	Alarm (red LED)
	X	X	X	X	X	1	1	0	Reserved
	X	X	X	X	X	…	…	…	Reserved
	X	X	X	X	X	1	1	1	Reserved
Test	0	0	X	X	X	X	X	X	No test
	0	1	X	X	X	X	X	X	Internal test
	1	0	X	X	X	X	X	X	External test

Tab. 8.12: Data format channel 33…64

8.4.7   Modbus example for reading data (V1)

Example: Reading out from ATICS channel 1 (voltage line 1)
> The COMTRAXX® device has address 1 in subsystem 1. ATICS channel 1 of internal address 3 is to be read out. The content is the voltage of line 1 as floating point value.

Modbus request
00 01 00 00 00 06 01 04 03 10 00 02

00 01	Transaction ID (is generated automatically)
00 00	Protocol ID
00 06	Length
01	Unit ID (subsystem 1)
04	Modbus Function Code 0x 04 (read input registers)
03 10	Start register
	(register address at which the value appears in the memory image: 784 = 0x 03 10)
00 02	Length of the data (words)

Modbus response
00 01 00 00 00 06 01 04 04 01 00 43 63 00 00

00 01	Transaction ID (is generated automatically)
00 00	Protocol ID
00 05	Length
01	Unit ID (device address of the COMTRAXX® device)
04	Modbus Function Code 0x 04 (read input registers)
04	Length of the data (bytes)
01 00 43 63	Data floating point value (0x 43 63 01 00 (words swapped) = 227.0039)
00 04	Alarm and test type (00 = no alarm), range and unit (04 = volts)

8.4.8   Reference data records of the process image
To make it easier to check the configuration and the Modbus TCP data access to devices, the COM-TRAXX® device provides a reference data record at the **virtual** address 0.

> ⓘ
> *No real device can have address 0!*
> *Address 0 only serves to simulate data access.*

Special features of the Modbus communication are the byte offset and the word and byte order in the memory (Big Endian, MSB). At the end of this chapter, a few examples of correct configuration are given, which might be helpful.

8.4.9 Address assignment of the reference data record

As shown in the following table, the Modbus start address for access to the reference data record is derived from device address 0.

Virtual device address	HiByte	Word			
		LoByte			
		00	0E	10	14
0	0x**00**	Device type	Common alarm	Channel 1	Channel 2

Tab. 8.13: Start addresses for the reference data record query

The start addresses provide the following reference values

- 0x0000: TEST (device type)
- 0x000E: 1 (common alarm, LSB of the HiByte is set)
- 0x0010: 230 V undervoltage (reference value on channel 1)
- 0x0014: 12.34 A overcurrent (reference value on channel 2)

8.4.10 Reference value on channel 1

The following reference value is stored in this channel: 230.0 V undervoltage

Word 0x10		0x11		0x12		0x13	
HiByte	LoByte	HiByte	LoByte	HiByte	LoByte	HiByte	LoByte
0x43	0x66	0x00	0x00	0x00	0x04	0x00	0x4D
Floating point value (Float)				AT&T	R&U	Description	
230,0				No/No	Volt	Undervoltage	

Tab. 8.14: Stored reference data (channel 1)

8.4.11 Reference value on channel 2

The following reference value is stored in this channel:12.34 A

Word 0x14		0x15		0x16		0x17	
HiByte	LoByte	HiByte	LoByte	HiByte	LoByte	HiByte	LoByte
0x41	0x45	0x70	0xA4	0x00	0x03	0x00	0x4A
Floating point value (Float)				AT&T	R&U	Description	
12,34				No/No	Ampere	Overcurrent	

Tab. 8.15: Stored reference data (channel 2)

8.4.12 Explanation of how to access floating point values

The test value 12.34 can be read out via Modbus TCP using the Modbus function code **0x04** at the address 0x0014. The test value has a size of 2 words.

Proceed as follows:

1. Determine the correct byte offset
   Interpreting both words as unsigned integer values should result in the following values:
   Word 1 with address 0x14: unsigned integer value => 16709 (0x4145)
   Word 2 with address 0x15: unsigned integer value => 28836 (0x70A4)

2. Determine the correct byte or word swap
   There are four different combinations of swapping. The only correct value is 12.34.
   All swapping combinations are represented in the following table.

Hex value sequence	Word 1		Word 2		Floating point value
	Byte 1	Byte 2	Byte 3	Byte 4	
CORRECT	**A** **41**	**B** **45**	**C** **70**	**D** **A4**	**12,34**
Word swapping	C 70	D A4	A 41	B 45	4.066E+29
Byte swapping	B 45	A 41	D A4	C 70	3098,27
Word and byte swapping	D A4	C 70	B 45	A 41	-5.21E-17

8.5 Bender Modbus image V2 (one address range for each interface)

If the Bender Modbus image is set to V2, the Modbus data are provided as follows.

Function code 0x03 (Read Holding Registers):

Querying data from the Modbus device assignment table

- **Reading** the parameters and measured values of all devices in the system

- Modbus device assignment must be performed before use, because the unit ID in the Modbus request refers to the respective unit ID assigned in the Modbus device assignment.

- The device assignment determines which devices are accessible via **0x03**.

- 255 addresses are available, which can be configured freely.

- The device assignment takes place in the area 🔧 of the COMTRAXX® device at **Device management > Device assignment > Modbus.**

Function code 0x10 (Write Multiple Registers):

Writing data

- **Writing** the parameters of all devices in the subsystem

For the Modbus request, the unit ID refers to the interface via which the corresponding device is integrated. (see Table 8.2)

> (i) *To set parameters for devices via Modbus TCP, a device assignment must first be made in order to obtain unique unit IDs:*
>
> 🔧 **Tools > Device management > Device assignment > Modbus.**
>
> *Note that there may be a time delay of up to 3 minutes in BMS bus operations before changes become visible.*

> (i) *To make it easier to configure device parameters via Modbus TCP, the register addresses for each parameter can be displayed in the device menus. Activate this function at the menu item*
>
> 🔧 **Tools > Service > Parameter addresses**

Function code 0x04 (Read Input Registers):

Querying data from the system image

- **Reading** the system image from the COMTRAXX® device memory
- Querying device names, channel states, alarm and operating messages from all devices connected via the COMTRAXX® device
- Here, the unit ID refers to the interface via which the corresponding device is connected.
- The volume of the queried data depends on the number of bytes selected in the Modbus client used.
- Up to 125 words (0x7D) can be read with a single query.

Distribution of the memory areas (V2)

Unit ID	Interface	Maximum No. of devices	Measuring points per device	Register per device	Device/Register per unit ID	Device/Register last unit ID	Start address	End address
1	COMTRAXX® device information	1	550	8880	1 / 8880	-	0	8879
10	Internal BMS	150	12	272	150 / 40800	-	0	40799
20…28	Modbus RTU	247	128	2128	30 / 63840	7 / 14896	0 (per unit ID)	14895 (unit ID 28)
40…48	Modbus TCP	247	128	2128	30 / 63840	7 / 14896	0 (per unit ID)	14895 (unit ID 48)
60…68	BCOM	255	128	2128	30 / 63840	15 / 31920	0 (per unit ID)	31919 (unit ID 68)
90…91	Virtual devices	255	16	336	195 / 65520	60 / 20160	0 (per unit ID)	20159 (unit ID 91)
95	I²C	127	16	336	127 / 42672	-	0	42671
101…199 [1]	External BMS: Here, the unit ID represents an external BMS address. BMSe Addr. 10 = unit ID 110	150 per unit ID	12	272	150 / 40800	-	0 (per unit ID)	40799 (unit ID 199)

Fig. 8.2: Distribution of the memory areas (V2)

[1]   Only for devices with the corresponding interface; otherwise: reserved

> ⓘ   *For some Modbus clients an offset of 1 must be added to the register addresses. Example: process image start address = 0x0101.*

8.5.1 Memory scheme of the system image (V2)

Structure of the system image

As illustrated in the table, the Modbus start address for the respective system image is derived from the device address. It contains all information requested and transmitted on the interface.

Example: Internal BMS

Unit ID	Device address	Modbus address ranges of the data in the memory	
		Start register	End register
10	1	0 (272 * 0)	271 (272 * 1 - 1)
10	2	272 (272 * 1)	543 (272 * 2 - 1)
10	3	544 (272 * 2)	815 (272 * 3 - 1)
…	…	…	…
10	30	7888 (272 * 29)	8159 (272 * 30 - 1)
10	31	8160 (272 * 30)	8431 (272 * 31 - 1)
…	…	…	…
10	150	40528 (272 * 149)	40799 (272 * 150 - 1)

Example: Modbus TCP

Unit ID	Device address	Modbus address ranges of the data in the memory	
		Start register	End register
40	1	0 (2128 * 0)	2127 (2128 * 1 - 1)
40	2	2128 (2128 * 1)	4255 (2128 * 2 - 1)
40	3	4256 (2128 *2)	6383 (2128 * 3 - 1)
…	…	…	…
40	30	61712 (2128 * 29)	63.839 (2128 * 30 -1)
41	31	0 (2128 * 0)	2127 (2128 * 1 - 1)
…	…	…	…
48	247	12768 (2128 *6)	14.895 (2128 * 7 - 1)

8.5.2 Memory scheme of a device (V2)

Each device is managed via an individual device image in the memory. Its first block provides the device information.
Afterwards, the individual measured value/channel information is displayed.
The size of the block depends on how many measured values a device provides.

Device (V2)

Default values in case no values are available for the requested register:

- UINT16: 65.535 (all bits are set)

- UINT32: 4.294.967.295 (all bits are set)

- String: empty string (value 0)

- Float: NaN (all bits are set)

Offset	Hex	Type	Length in words	Extended description
0	0	String	10	Device name
10	A	String	10	Serial number of the device
20	14	UINT32	2	Last contact (time stamp in seconds since 01.01.1970)
22	16	UINT16	1	Device status 2 = Inactive (Device is not active. However, devices connected to this device are monitored for failure) 3 = Active (Device is active) 4 = Lost (Device is not active but is monitored for failure)
23	17	UINT16	1	Sum of all messages (alarm, warning, prewarning, device error)
24	18	UINT16	1	Number of alarms
25	19	UINT16	1	Number of warnings
26	1A	UINT16	1	Number of prewarnings
27	1B	UINT16	1	Number of device errors
28	1C	UINT16	52	Individual device range, the content depends on the respective device
			Sum = 80	

Example: Memory scheme V2: Device internal BMS

Description	Words
Device information	80
Measured values	192 (12 channels * 16 words per channel)
Total	272

Measured value (V2)

Offset	Hex	Type	Length in words	Extended description
0	0	UINT32	2	Time stamp in seconds since 01.01.1970
2	2	Float	2	Measured value (NAN if not valid)
4	4	Float	2	Response value (not available for every device; if not available, NAN)
6	6	Float	2	Response value for prewarning (not available for every device; if not available, NAN)
8	8	UINT16	1	Alarm type 0 = None 1 = Prewarning 2 = Fault 4 = Warning 5 = Alarm
9	9	UINT16	1	Unit 1 = None 15 = Day 2 = Ohm 16 = Month 3 = Ampere 17 = Watt 4 = Volt 18 = var 5 = Percent 19 = VA 6 = Hertz 20 = Wh 7 = Baud 21 = varh 8 = Farad 22 = VAh 9 = Henry 23 = Grad 10 = °Celsius 24 = HertzPerSecond 11 = °Fahrenheit 25 = NonewithConvert 12 = Second 26 = Bar 13 = Minute 30 = Textcode 14 = Hour
10	A	UINT16	1	Validity
11	B	UINT16	1	Test 0 = None 1 = Internal 2 = External
12	C	UINT16	1	Description
13	D	UINT16	1	Special text code (if the unit is set to text code (30), NAN is output on the measured value)
14	E	UINT16	1	Compressed channel state Bit coded 1 = Message present 2 = Prewarning 4 = Fault/Alarm/Warning 8 = Internal test 16 = External test
15	F		1	Reserved
			Sum = 16	

8.5.3   Modbus example for reading data (V2)

Example: Reading out from ATICS channel 1 (voltage line 1)
The COMTRAXX® device has address 1 in subsystem 1.
Channel 1 of an ATICS is to be read out at the internal BMS with address 3.
The content is the voltage of line 1 as floating point value.
Modbus request
00 01 00 00 00 06 01 04 03 10 00 02

00 01	Transaction ID (is generated automatically)
00 00	Protocol ID
00 06	Length
0A	Unit ID (internal BMS)
04	Modbus Function Code 0x 04 (read input registers)
02 72	Start register (272 [words per device] * 2 [address 3] + 82 [Start register measured value channel 1])
00 02	Length of the data (words)

Modbus response
00 01 00 00 00 06 01 04 04 01 00 43 63 00 00

00 01	Transaction ID (is generated automatically)
00 00	Protocol ID
00 05	Length
0A	Unit ID (internal BMS)
04	Modbus Function Code 0x 04 (read input registers)
04	Length of the data (bytes)
01 00 43 63	Data floating point value (0x 43 63 01 00 (words swapped) = 227.0039)
00 04	Alarm and test type (00 = no alarm), range and unit (04 = volts)

8.5.4   Reference data records of the system image (V2)

To check the configuration and the Modbus TCP data access, internal registers of the COMTRAXX® device can be retrieved with function code **0x04**.

Address assignment of the reference data record

Information on the COMTRAXX® device can be retrieved in the following registers.
This can be used to check the configuration and the Modbus TCP data access to the device.

Modbus address ranges of the data in the memory						
Content	Unit ID	Device address	Start register	End register	Type	Length
Device name	1	1	0x00 00	0x00 09	String	10 words
Serial number	1	1	0x00 0A	0x00 13	String	10 words

8.6   Channel descriptions for the process image (V1 and V2)

Value	Measured value description Alarm message Operating message	Description
0		
1 (0x01)	Insulation fault	
2 (0x02)	Overload	
3 (0x03)	Overtemperature	
4 (0x04)	Failure line 1	
5 (0x05)	Failure line 2	
6 (0x06)	Insul. OT light	Insulation fault operating theatre light
7 (0x07)		
8 (0x08)	Distribution board failure	
9 (0x09)	Failure oxygen	
10 (0x0A)	Failure vacuum	
11 (0x0B)	Anaesthetic gas	
12 (0x0C)	Compressed air 5 bar	
13 (0x0D)	Compressed air 10 bar	
14 (0x0E)	Failure nitrogen	
15 (0x0F)	Failure CO2	
16 (0x10)	Insulation UPS	Insulation fault UPS
17 (0x11)	Overload UPS	
18 (0x12)	Converter UPS	
19 (0x13)	UPS fault	
20 (0x14)	UPS emergency operation	
21 (0x15)	UPS test run	
22 (0x16)	Failure air conditioning	
23 (0x17)	Batt.op. OT-L	Battery-operated operating theatre light
24 (0x18)	Batt.op. OT-S	Battery-operated Sat operating theatre light
25 (0x19)	Fail.norm.supply	Line normal power supply
26 (0x1A)	Fail.safet.supply	Line safety power supply
27 (0x1B)	Failure UPS	Line additional safety power supply
28 (0x1C)	Ins.safety supply	
29 (0x1D)	Fail.N conductor	
30 (0x1E)	Short dist. panel	Distribution panel short circuit
31 (0x1F)		
32 (0x20)		Reserved
33 (0x21)		
34 (0x22)		
35 (0x23)	Standby function	(Measuring function switched off (standby))
36 (0x24)		
37 (0x25)		
38 (0x26)	Batt.op. UPS	Battery operation, special safety power supply
39 (0x27)	Phase sequ. left	
40 (0x28)	Failure line BPS	Battery-supported safety power supply

Value	Measured value description Alarm message Operating message	Description
41 (0x29)		
…		Reserved
66 (0x42)		
67 (0x43)	Function test until:	Date
68 (0x44)	Service until:	Date
69 (0x45)	Ins.fault locat	Insulation fault location
70 (0x46)	Peak	Fault EDS system
71 (0x47)	Insulation fault	Insulation resistance in Ω
72 (0x48)	Current	Measured value in A
73 (0x49)	Undercurrent	
74 (0x4A)	Overcurrent	
75 (0x4B)	Residual current	Measured value in A
76 (0x4C)	Voltage	Measured value in V
77 (0x4D)	Undervoltage	
78 (0x4E)	Overvoltage	
79 (0x4F)	Frequency	Measured value in Hz
80 (0x50)	Reserved	
81 (0x51)	Unbalance	
82 (0x52)	Capacitance	Measured value in F
83 (0x53)	Temperature	Measured value in °C
84 (0x54)	Overload	Measured value in %
85 (0x55)	Digital input	State 0 or 1
86 (0x56)	Insulation fault	Impedance
87 (0x57)	Insulation fault	Alarm from an insulation fault locator
88 (0x58)	Load	Measured value in %
89 (0x59)	Total Hazard Current	THC
90 (0x5A)	Inductance	Measured value in H
…	Reserved	
97 (0x61)	Service code	Information about service intervals
…	Reserved	
101 (0x65)	Mains power connection	
102 (0x66)	Earth connection	
103 (0x67)	Short-circuit transformer	CT short circuit
104 (0x68)	No CT connected	
105 (0x69)	Short temp.sensor	Temperature sensor short circuit
106 (0x6A)	Temp.sensor open.	Connection temperature sensor
107 (0x6B)	K1	Fault contactor K1
108 (0x6C)	K2	Fault contactor K2
109 (0x6D)		
110 (0x6E)	Reserved	
111 (0x6F)	No address:	Failure BMS device
112 (0x70)	Reserved	
113 (0x71)	Failure K1/Q1	Failure contactor K1/Q1
114 (0x72)	Failure K2/Q2	Failure contactor K2/Q2

Value	Measured value description Alarm message Operating message	Description
115 (0x73)	Device error	Fault ISOMETER
116 (0x74)	Manual mode	K1/2 manual mode
117 (0x75)	Open circuit K1on	Line to K1 interrupted on
118 (0x76)	Open circ. K1off	Line to K1 interrupted off
119 (0x77)	Open circuit K2 on	Line to K2 interrupted on
120 (0x78)	Open circ. K2 off	Line to K2 interrupted off
121 (0x79)	K/Q1on	Fault
122 (0x7A)	K/Q1off	Fault
123 (0x7B)	K/Q2on	Fault
124 (0x7C)	K/Q2off	Fault
125 (0x7D)	Failure K3	
126 (0x7E)	Q1	Fault
127 (0x7F)	Q2	Fault
128 (0x80)	No master	
129 (0x81)	Device error	
130 (0x82)	Reserved	
131 (0x83)	Fault RS485	
132 (0x84)	Reserved	
133 (0x85)		
134 (0x86)		
135 (0x87)		
136 (0x88)		
137 (0x89)	Short circuit Q1	
138 (0x8A)	Short circuit Q2	
139 (0x8B)	CV460	CV460 fault
140 (0x8C)	RK4xx	Fault RK4xx
141 (0x8D)	Address collision	BMS address has been assigned several times
142 (0x8E)	Invalid address	
143 (0x8F)	Several masters	
144 (0x90)	No menu access	
145 (0x91)	Own address	
…	Reserved	
201 (0xC9)	Line 1 normal op	
202 (0xCA)	Line 2 normal op	
203 (0xCB)	Switch. el. 1 on	
204 (0xCC)	Switch. el. 2 on	
205 (0xCD)	Reserved	
206 (0xCE)	Auto mode	
207 (0xCF)	Manual mode	
208 (0xD0)	Reserved	
209 (0xD1)		
210 (0xD2)	Line AV on	
211 (0xD3)	Line SV on	
212 (0xD4)	Line UPS on	

Value	Measured value description Alarm message Operating message	Description
213 (0xD5)	Channel disabled	
214 (0xD6)	Switch-back lock	Switch-back lock enabled
215 (0xD7)	Phase sequ. right	
216 (0xD8)	Switch. el. pos.0	
217 (0xD9)	Line BPS on	
218 (0xDA)	On	SMO48x: Alarm, relay

Tab. 8.16: Channel descriptions for the process image

To convert parameter data, data type descriptions are required. Text representation is not necessary in this case.

Value	Description of parameters:
1023 (0x3FF)	Parameter/measured value invalid. The menu item for this parameter is not displayed
1022 (0x3FE)	No measured value/no message
1021 (0x3FD)	Measured value/parameter inactive
1020 (0x3FC)	Measured value/parameter only temporarily inactive (e.g. during the transfer of a new parameter.) Display in the menu "…".
1019 (0x3FB)	Parameter/measured value (value) unit not displayed
1018 (0x3FA)	Parameter (code selection menu) unit not displayed
1017 (0x3F9)	String max. 18 characters (e.g. device type, device variant, …)
1016 (0x3F8)	Reserved
1015 (0x3F7)	Time
1014 (0x3F6)	Date day
1013 (0x3F5)	Date month
1012 (0x3F4)	Date year
1011 (0x3F3)	Register address (unit not displayed)
1010 (0x3F2)	Time
1009 (0x3F1)	Multiplication [*]
1008 (0x3F0)	Division [/]
1007 (0x3EF)	Baud rate

Tab. 8.17: Data type descriptions

8.7   Modbus control commands

Commands can be sent to BMS devices by an external application (e.g. a visualisation software).

This functionality can be activated or deactivated via the web user interface.

Command structure

Write				Read
Word 0xFC00	0xFC01	0xFC02	0xFC03	0xFC04
External BMS bus address [1]	Internal BMS bus address	BMS channel	Command	Status

[1]   Only for devices with the corresponding interface; otherwise: reserved.

8.7.1   Writing to registers

- Use function code **0x10** (Preset Multiple Registers) for writing.

- Start address: 0xFC00

- Number: 4 registers

- Always set all four registers (word 0xFC00…0xFC03) at the same time. This statement also applies if individual registers remain unchanged.

- If no other subsystem is available, enter value"1" in this register.

- If a BMS channel number is not required, enter value "0" (zero) in this register.

> ⓘ   *Control commands can also be generated in the menu*
> **Service > Modbus > Modbus control commands** .

8.7.2   Reading registers

Use function code **0x04** "Read Input Registers" to read.

Possible response in "Status" register:

0	Busy	Processing command.
1	Error	An error has occurred.
2	Ready	Command has been processed successfully.

8.7.3 Control commands for the (internal/external) BMS bus

int/ext BMS bus	Register Ext	Register Int	Register Channel	Register Command	Menu text/ Function
INT	1	1-150	0	1	Test Isometer
EXT	1-99				
INT	1	1-150	0	2	Test change over unit (PRC487) / Test Umschalteinrichtung PRC
EXT	1-99		0		
INT	1	1-150	0	3	Test changeover unit (ATICS)/ Start automatic test changeover 1->2 End after time T(test)
EXT	--	--	--	--	
INT	1	1-150	0	4	Start test generator without changeover (ATICS) / Start test generator without changeover
EXT	--	--	--	--	
INT	1	1-150	0	5	Changeover to line 1 (ATICS) / Umschaltung auf Leitung 1
EXT	--	--	--	--	
INT	1	1-150	0	6	Changeover to line 2 (ATICS) / Umschaltung auf Leitung 2
EXT	--	--	--	--	
INT	1	0	0	7	Reset alarm (all devices) / RESET Alarm (Broadcast)
EXT	1-99				
INT	1	0	0	8	Clear EDS insulation alarm (EDS) / RESET Alarm EDS (Broadcast)
EXT	--	--	--	--	
INT	1	1-150	0	9	Mute buzzer (MK, TM, LIM) / Summer aus [für Alarmadresse] (BC)
EXT	1-99		1-192		
INT	1	1-150	1-12	10	Switch channel on (SMO481; PRC487): channel 1: Changeover to line 1; channel 2: Changeover to line 2 / Relais/Schalter einschalten
EXT	--	--	--	--	
INT	1	1-150	1-12	11	Switch channel off (SMO481) / Relais/Schalter ausschalten
EXT	--	--	--	--	
INT	1	1-150	1-12	12	Test (EDS, RCMS)
EXT	--	--	--	--	

Tab. 8.18: BMS bus control commands

8.7.4 Modbus example for control commands

Example: Changeover of ATICS to line 1

The COMTRAXX® device has address 1 in subsystem 1. An ATICS of internal address 3 is to be changed over to line 1.

Modbus control command
00 02 00 00 00 0F 01 10 FC 00 00 04 08 00 01 00 03 00 00 00 05

00 02   Transaction ID (is generated automatically)
00 00   Protocol ID
00 0F   Length
01   Unit ID (device address of the COMTRAXX® device)
10   Modbus function code 0x10 (write multiple registers)
FC 00   Start register
00 04   Number of registers
08   Length of the data
00 01   value 1 (subsystem address: subsystem 1)
00 03   value 2 (internal address: ATICS address 3)
00 00   value 3 (channel address: always has to be 0)
00 05   value 4 (command)

Modbus response
00 02 00 00 00 06 01 10 FC 00 00 04

00 02   Transaction ID (is generated automatically)
00 00   Protocol ID
00 06   Length
01   Unit ID (device address of the COMTRAXX® device)
10   Modbus function code 0x10 (write multiple registers)
FC 00   Start register
00 04   Number of registers

9. SNMP

9.1 Data access using SNMP

The COMTRAXX® device makes all measured values of the Bender system available via the SNMP interface. The SNMP versions V1, V2c and V3 are supported. The trap function can also be used. When an event occurs in the system, a message is automatically generated and sent to the SNMP manager. Up to 3 receivers can be configured.

9.2 Device assignment for SNMP

To use the SNMP function "Traps" or the individual texts from the COMTRAXX® application, the Bender MIB V2 must be used. It provides these functions. In addition, it is necessary to generate a device assignment for the SNMP image. There, the address of the device on the SNMP side is defined. This can be done automatically or configured individually.

The configuration is done at **> Device management > Device assignment >SNMP**. There, the MIB files are also available for download.

10. Troubleshooting

10.1 Malfunctions

If the CP9…-I causes malfunctions in the connected networks, please refer to this manual.

10.1.1 What should be checked?

For the CP9…-I, check whether

- the device is supplied with the correct supply voltage U_S.

- the BMS bus cable is correctly connected and terminated (120 Ω).

- the BMS address is set correctly.

- the BCOM address settings are correct.

10.1.2 Frequently asked questions

How do I access the device if the address data are unknown?

1. Connect the device directly to a Windows PC using a patch cable

2. Activate the DHCP function on the PC.

3. Wait around one minute.

4. Access is now possible using the following pre-defined IP address: 169.254.0.1.

5. Now set the new address data.

> *Document the new settings as PDF file.*
> *Use the backup function to save all settings of the device (see Chapter "3.2 Device features").*

Frequently asked questions on the Internet

You will find FAQs on many Bender devices at:
https://www.bender.de > Service & support > Rapid assistance > FAQ

10.2 Maintenance

The device does not contain any parts that must be maintained.

10.3 Cleaning

The device is only allowed to be cleaned using a clean, dry, soft, antistatic cloth.

11. Technical data

11.1   Tabular data

Insulation coordination acc. to IEC 60664-1
CP907-I
    Rated voltage ....50 V
    Overvoltage category... III
    Pollution degree.. 2
    Rated impulse voltage ....800 V
CP915-I
    Rated voltage .... AC 250 V
    Overvoltage category... III
    Pollution degree.. 2
    Rated impulse voltage .... 4 kV

Supply
CP907-I via plug-in terminal (A1/+;A2/-)
    Nominal voltage... DC 24 V SELV/PELV
    Nominal voltage tolerance ....±20 %
    Typical power consumption at DC 24 V .... < 15 W
    Connection plug-in terminal (A1/+;A2/-)
    Maximum cable length when supplied via B95061210 (24-V DC power supply unit 1.75 A):
        $0.28\ mm^2$ ....75 m
        $0.5\ mm^2$ .... 130 m
        $0.75\ mm^2$ ....200 m
        $1.5\ mm^2$ ....400 m
        $2.5\ mm^2$ ....650 m
CP907-I via Power-over-Ethernet (PoE)8
    Nominal voltage... DC 48 V SELV/PELV
    Nominal voltage tolerance .... -25…+15 %
    Typical power consumption for PoE.. < 15 W
    Maximum cable length when supplied via AWG 26/7; $0.14\ mm^2$ ....100 m
CP915-I via terminal block (L1; N)
    Nominal voltage via external power supply unit.. AC 100…240 V
    Nominal voltage tolerance .... -15…+10 %
    Frequency range U_S ....50…60 Hz
    Typical power consumption at AC 230 V .... < 30 W
    Connection .... terminal block (L1; N)

Stored energy time in the event of voltage failure
Time, date .... min. 3 days

Displays, memory
Display CP907-I ....7" TFT touch display
Display CP915-I ....15.6" TFT touch display
E-mail configuration and device failure monitoring .... max. 250 entries
Individual texts .... unlimited number of texts with 100 characters each
Number of data points for "third-party devices" to Modbus TCP and Modbus RTU 1600
Number of data loggers 30
Number of data points per data logger 10,000
Number of entries in the history memory 20,000

Visualisation

Number of pages 50
Background image size .... max. 3 MB

Interfaces

Ethernet

    Connection RJ45
    Data rate .... 10/100 Mbit/s, autodetect
    HTTP mode .... HTTP/HTTPS (HTTP)*
    DHCP .... on/off (off)*
    t_{off} (DHCP) .... 5...60 s (30 s)*
    IP address ....
        nnn.nnn.nnn.nnn .... (192.168.0.254)*
        can always be reached via 169.254.0.1
    Net mask .... nnn.nnn.nnn.nnn (255.255.0.0)*
    Protocols .... TCP/IP, Modbus TCP, Modbus RTU, DHCP, SNMP, SMTP, NTP

BMS bus

    Interface/protocol .... RS-485/BMS internal
    Operating mode .... master/slave (master)*
    Baud rate .... 9.6 kbit/s
    Cable length .... < 1200 m
    Cable .... shielded, one end of shield connected to PE
        recommended .... CAT6/CAT7 min. AWG23
        alternatively .... twisted pair, J-Y(St)Y min. 2x0.8
    Connection .... "ABMS", "BBMS" (see plug-in terminal)
    Terminating resistor .... 120 Ω (0.25 W), can be connected internally (see plug-in terminal)
    Device address .... 1...150 (1)*

BCOM

    Interface/protocol .... Ethernet/BCOM
    BCOM system name .... (SYSTEM)*
    BCOM subsystem address .... 1...255 (1)*
    BCOM device address .... 0...255 (0)*

Modbus

    Bender Modbus image .... V1, V2 (V2)*

Modbus TCP

    Interface/protocol .... Ethernet/Modbus TCP
    Operating mode .... client for Bender Modbus TCP devices and "third-party devices"
    Operating mode .... Server for access to process image and for Modbus control commands
    Parallel data access from different clients .... max. 8

Modbus RTU

    Interface/protocol .... RS-485/Modbus RTU
    Operating mode .... master/slave (master)*
    Baud rate .... 9.6...57.6 kbit/s
    Cable length .... < 1200 m
    Cable .... shielded, one end of shield connected to PE
        recommended .... CAT6/CAT7 min. AWG23
        alternatively .... twisted pair, J-Y(St)Y min. 2x0.8
    Connection .... "AMB", "BMB" (see plug-in terminal)
    Terminating resistor .... 120 Ω (0.25 W), can be connected internally (see plug-in terminal)
    Supported Modbus RTU slave addresses .... 2...247

SNMP

    Versions 1, 2c, 3
    Supported devices .... query of all devices (channels) possible
    Trap support .... yes

USB

Number 2
Operating mode .... USB 2.0 host (5 V, 500 mA)
Data rate .... 480 Mbit/s
Connection type .... USB 2 Standard-A

Used ports

53 ....DNS (UDP/TCP)
67, 68 .... DHCP (UDP)
80... HTTP (TCP)
123 ....NTP (UDP)
161 .... SNMP (UDP)
162 ....SNMP TRAPS (UDP)
443 ....HTTPS (TCP)
502 .... MODBUS (TCP)
4840 ....OPCUA (TCP)
5353 .... MDNS (UDP)
48862 .... BCOM (UDP)

Digital inputs (1-12)

Number.. 12
Galvanic separation .... yes
Operating mode ....selectable for each input: active-high or active-low
Factory setting ....active-high
Voltage range (high) .... AC/DC 10. . .30 V
Voltage range (low) .... AC/DC 0. . .2 V
Max. current per channel (at AC/DC 30 V) ....8 mA
Connection push-in terminal .... (1-1) (2-2) (3-3) . . . (12-12)
Maximum cable length .... < 1000 m

Switching elements

Number... 1 relay
Operating mode .... N/C operation or N/O operation
Function ....programmable
Electrical endurance under rated operating conditions, number of cycles 10,000
Contact data acc. to IEC 60947-5-1

Utilisation category .... AC-13 .... AC-14 ....DC-12
    Rated operational voltage.. 24 V .... 24 V ....24 V
    Rated operational current .... 2 A .... 2 A ....2 A
    Minimum contact rating .... 1 mA at AC/DC > 10 V
Minimum contact load (relay manufacturer's reference)..10 µA / 10 mV DC
Connection .... plug-in terminal (11;12;14)

Buzzer

Buzzer message .... can be acknowledged, adoption of characteristics of new value
Buzzer interval ....configurable
Buzzer frequency ....configurable
Buzzer repetition ....configurable

Audio (for CP915-I only)

Line IN .... STEREO signal input via 3.5 mm jack plug
Line OUT.. Output to a STEREO playback device via 3.5 mm jack plug

Device connections

Terminal block (L1; N; PE) (for CP915-I only)

Conductor sizes .... AWG 20-12
Stripping length .... 10…11 mm
rigid/flexible ....0.5…4 mm²
flexible with ferrule with/without plastic sleeve ....0.5…4 mm²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve....................................0.5…4 mm²

Plug-in terminal (A1/+;A2/) (11;12;14)

Conductor sizes .... AWG 24-12
Stripping length .... 10 mm
rigid/flexible .... 0.2…2.5 mm²
flexible with ferrule with/without plastic sleeve .... 0.25…2.5 mm²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve.............................0.5…1.5 mm²

Plug-in terminal (I1…12), (k1…k12), (…MB), (…BMS)

Conductor sizes .... AWG 24-16
Stripping length .... 10 mm
rigid/flexible .... 0.2…1.5 mm²
flexible with ferrule without plastic sleeve... 0.25…1.5 mm²
flexible with ferrule with plastic sleeve .... 0.25…0.75 mm²

Environment/EMC

EMC ....IEC 61326-1

Operating temperature

CP907-I ....-10…+55 ℃
CP915-I .... -5…+40 ℃

Operating altitude .... ≤ 2000 m AMSL
Rel. humidity ....≤ 98 %

Classification of climatic conditions acc. to IEC 60721

Stationary use (IEC 60721-3-3) .... 3K23 (except condensation and formation of ice)
Transport (IEC 60721-3-2).. 2K11
Long-term storage (IEC 60721-3-1) 1K22

Classification of mechanical conditions acc. to IEC 60721

Stationary use (IEC 60721-3-3) CP907-I only 3M11
Stationary use (IEC 60721-3-3) CP915-I only 3M10
Transport (IEC 60721-3-2).. 2M4
Long-term storage (IEC 60721-3-1) 1M12

Other

Operating mode...continuous operation
Mounting ....display-oriented
Degree of protection, front IP54
Degree of protection, enclosure IP20
Flammability class .... UL 94V-0

Dimensions

CP907-I (W x H x D) .... 226 x 144 x 78 mm
CP915-I (W x H x D) .... 505 x 350 x 95 mm

Weight

CP907-I .... < 1.1 kg
CP915-I .... < 6.1 kg

( )* = factory setting

11.2 Standards, approvals and certifications

CE   UKCA   c(UL)us LISTED

only CP907-I
B95061031

11.3 Ordering information

Complete devices

Type	Display size	Supply	Device dimensions (W x H x D), mm	Weight	Enclosure	Display unit	Art. No.
CP907-I	7" (17.6 cm)	DC 24 V, < 15 W	226 x 144 x 78	1.1 kg	Flush-mounting enclosure	Glass, tempered, white	B95061031
			226 x 144 x 65	1.0 kg	Control cabinet door mounting		B95061032
CP915-I	15.6" (38.6 cm)	AC 100…240 V < 30 W	505 x 350 x 92	6.1 kg	Flush-mounting enclosure		B95061033
						Glass, tempered, grey	B95061034

Scope of delivery:

- Display unit
- Control cabinet door mounting or flush-mounting enclosure incl. mounting plate with electronics
- CP9…-I connecting cable
- Plug kit

Individual components

Device series	Type	Art. No.
CP907-I	Flush-mounting enclosure	B95100140
CP915-I	Display unit white	B95061090
	Display unit grey	B95061110
	Flush-mounting enclosure incl. mounting plate with electronics	B95061092

Accessories

Description	Art. No.
CP9…-I replacement plug kit	B95061910
CP9…-I suction lifter [1]	B95061911

[1] The suction lifter is required to remove the display of the CP915-I.

11.4   Document revision history

Date	Document version	Valid from software version	State/Changes
10.2020	00		First edition
11.2020	01	V4.1.x	*Editorial revision* Chapter 4.: Notes for connection PoE; Enclosure for control cabinet door *Added* Chapter 11.2: UKCA logo
04.2021	02	V4.3.x	*Editorial revision* Chapter 11.1: Cable recommendations and lengths; Modbus RTU switchable Master/Slave *Added* Chapter 6.: Show parameter addresses; new widget Loggertable

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