



COMTRAXX® CP9xx – Touch Control Panel Series



Remote alarm indicator and operator panel
for medical locations and other areas

Softwareversion: V3.xx



Bender GmbH & Co. KG

P.O.Box 1161 • 35301 Gruenberg • Germany
Londorfer Straße 65 • 35305 Gruenberg • Germany
Tel.: +49 6401 807-0 • Fax: +49 6401 807-259
E-mail: info@bender.de • www.bender.de

Photos: Bender Archive

© Bender GmbH & Co. KG
All rights reserved.
Reprinting only with permission
of the publisher.
Subject to change!

Table of Content

1. Important information	7
1.1 How to use this manual	7
1.2 Technical support: service and support	8
1.2.1 End customer support and consulting	8
1.2.2 Repair	8
1.2.3 Customer service	8
1.3 Training courses	8
1.4 Delivery conditions	9
1.5 Inspection, transport and storage	9
1.6 Warranty and liability	9
1.7 Disposal	9
2. Safety instructions	11
2.1 General safety instructions	11
2.2 Work activities on electrical installations	11
2.3 Intended use	11
3. Product description	13
3.1 Scope of delivery	13
3.2 Device features	13
3.3 Range of functions of the CP9... display and operator panel	13
3.4 Applications	13
3.5 Function	14
3.6 Software products used	14
3.7 Functional description	14
3.7.1 Interfaces	14
3.7.2 Process image	15
3.7.3 List of compatible BMS devices	15
3.8 BMS side of the CP9... display an operator panel	15
3.9 Address configuration and termination	15
4. Installation, connection and commissioning of the CP9...	17
4.1 Installation of the CP9... device	17
4.1.1 Dimension diagram	17
4.1.2 Flush-mounting box CP907	18
4.1.3 Flush-mounting box CP915	18

4.2	Connection of the CP9... device	19
4.3	Commissioning of the CP9... device	21
4.4	COMTRAXX® user interface of the CP9...	22
4.4.1	Factory settings communication addresses	23
5.	Modbus TCP server	25
5.1	Data access using Modbus TCP protocol	25
5.1.1	Exception code	25
5.1.2	Modbus requests	25
5.1.3	Modbus responses	25
5.1.4	Structure of the exception code	26
5.1.5	Modbus address structure for BMS devices	26
5.2	Modbus process image in the memory of the CP9...	26
5.2.1	Querying data	26
5.2.1.1	Modbus function code FC03	26
5.2.1.2	Modbus function code FC04	26
5.2.1.3	How are the memory areas organised?	26
5.2.2	Memory scheme of the process image	27
5.2.2.1	Structure of the process image	27
5.2.2.2	Memory scheme of an individual device	27
5.2.2.3	Device type	28
5.2.2.4	Timestamp	28
5.2.2.5	C = Common alarm and D = Device lost (device failure)	29
5.2.2.6	Channels 1 to 32 with analogue and/or digital values	29
5.2.2.7	Float = Floating point value of the channels	29
5.2.2.8	A&T = Alarm type and test type (internal/external)	30
5.2.2.9	R&U = Range and unit	31
5.2.2.10	Channel description	32
5.2.2.11	Channel 33 to 64	32
5.2.3	Modbus examples to read out data	33
5.2.4	Reference data records of the process image	33
5.2.4.1	Address assignment of the reference data record	33
5.2.4.2	Reference value on channel 1	34
5.2.4.3	Reference value on channel 2	34
5.2.4.4	Explanation of how to access floating point values	34
5.2.5	Channel descriptions for the process image	34
5.2.6	Modbus control commands	38
5.2.6.1	Modbus example for control commands	40
6.	Troubleshooting	41
6.1	Malfunctions	41
6.1.1	What should be checked?	41

6.1.2	Frequently asked questions	41
6.2	Maintenance	41
6.3	Cleaning	41
7.	Technical data	43
7.1	Standards, approvals and certifications	46
7.2	Ordering details	46
7.3	Replacement parts	46
7.4	Optional accessories	46
Index	.....	62

1. Important information

1.1 How to use this manual



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

This manual describes the 7", 15" and 24" variants of the CP9... display and operator panel. Before using the devices please read:

- This manual. It describes the installation, commissioning and use of the display and operator panels CP907, CP915 and CP924.
- The "COMTRAXX®" manual. It describes the functions of the web user interface.
- The supplement "Important safety instructions for BENDER products".
- The manuals for the system components.

And the separate manuals which describe the interfaces:

- The "BCOM" manual
- The "BMS bus" package slip

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

Always keep this manual within easy reach for future reference.

We have used symbols to identify important instructions and information:



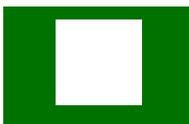
This signal word indicates that there is a **high** risk of danger, that **will** result in **death** or **serious injury** if not avoided.



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



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.

1.2 Technical support: service and support

For commissioning and troubleshooting Bender offers:

1.2.1 End customer support and consulting

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

- Questions about 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

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 for 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** (commercial issues)
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 Customer 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)
- Practical training courses for customers

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

*Available from 7.00 a.m. to 8.00 p.m. on 365 days of the year (CET/UTC +1)

**Mo-Thu 7.00 a.m. - 4.00 p.m., Fr 7.00 a.m. - 1.00 p.m

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. These can be obtained from Bender in printed or electronic format.

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 Zentralverband Elektrotechnik- und Elektronikindustrie e.V. (German Electrical and Electronic Manufacturers' Association) applies.

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, humidity and spray or dripping water, and in which the specified storage temperatures are not exceeded.

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, refer to our website at www.bender.de -> Service & support.

2. Safety instructions

2.1 General safety instructions

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

2.2 Work activities on electrical installations



Only **qualified personnel** are permitted to carry out the work necessary to install, 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... display and operator panels 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

3.1 Scope of delivery

You will receive:

- The CP9... display and operator panel
- A printed quick reference guide
- The sheet "Safety instructions for Bender products"
- The "COMTRAXX® CP9... - Touch Control Panel Series", "COMTRAXX®" and "BCOM" manuals as PDF files. You can obtain the manuals at:
<http://www.bender.de> > Service & support > Download > Operating manuals
- **for CP915**
Manufacturer's instructions for installing the flush-mounting box incl. accessories; Connecting cable (DVI cable, Ethernet-Keystone coupler, USB cable, RJ45 flat patch cable)

3.2 Device features

Universal display and operator panel for Bender systems:

- User-friendly touch-sensitive monitoring system for medical installations and other applications
- Clear menu structure and intuitive operation
- Silent due to operation without fan
- High display resolution, high contrast, wide viewing angle
- Visualised integration of building plans or status displays in photo quality
- Integration of external subsections like charging stations for operating theatre table controls and inter-com systems with front foil
- Screwless mounted front plate. Glass or antibacterial foil surface
- Simple conversion and expansion with minimal service interruptions

3.3 Range of functions of the CP9... display and operator panel

Main functions:

- Indication and visualisation of system conditions, warning and alarm messages
- Centralised monitoring, control and parameter setting
- Output of visual and acoustic messages
- Indication of present measured values and parameterisation of setpoints

Application examples: IT systems, supply systems for medical gases, air conditioning and ventilation systems, room lighting, communication systems, operating theatre lights, special power supply systems

3.4 Applications

- Optimal visualisation on the display tailored to the user
- Integration of all compatible Bender products (ISOMETER®, ATICS®, RCMS, EDS, Linetraxx® and MEDICS® systems, universal measuring devices and energy meters)
- Individual instructions in case of alarms
- Selective notification to various users in case of alarms
- Control and regulation of systems such as air conditioning or blinds control.

3.5 Function

CP9... display and operator panels 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

The possibility of integrating all technical equipment into a single panel creates a "technical monitoring centre" in the respective room. Each panel is individually manufactured and tailored to the requirements of the user.

3.6 Software products used

CP9... devices are equipped with the COMTRAXX® user interface. It is described separately in the "COMTRAXX" manual.

3.7 Functional description

3.7.1 Interfaces

CP9... devices 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... devices 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 for new and future Bender systems, such as ISOMETER® iso685-D.
- Modbus RTU (RS-485) when operated as a master for Bender universal measuring devices PEM..3 and also PEM..5 with restricted functionality (full functionality of PEM..5 only via Modbus TCP).
- Modbus TCP (Ethernet) for Bender universal measuring devices PEM..5

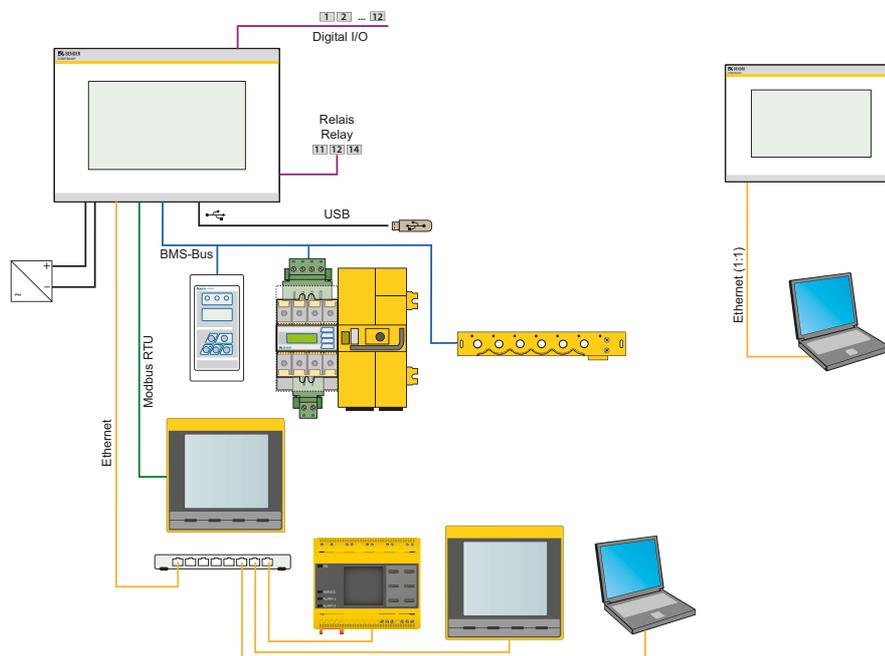


Abb. 3.1: System overview CP9xx interfaces

3.7.2 Process image

The CP9... display and operator panel combines the information from the different interfaces and makes it available for operation and visualisation via the web user interface of a PC.

It acts as a central user interface. In order to be able to identify them, one individual address is available for each device on this interface. BMS, BCOM and Modbus RTU devices receive the appropriate address for their interface. A virtual address is assigned to Modbus TCP devices.

3.7.3 List of compatible BMS devices

An updated list of parametrisable devices can be found on our homepage <http://www.bender.de>. Enter the term "Compatibility list" in the search field.

3.8 BMS side of the CP9... display an operator panel

The majority of Bender devices communicate via the internal BMS bus.

The CP9... display and operator panel can be operated as a master or as a slave.



The CP9... display and operator panel is to be operated as a master if

- Parameters are queried or changed
- Certain control commands are issued



Please note that not all BMS masters can surrender their master function!

3.9 Address configuration and termination

To ensure proper functioning of the CP9... display and operator panel, 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.

4. Installation, connection and commissioning of the CP9...

The CP9... touch panel is integrated into existing LAN structures, but can also be operated via a single PC.

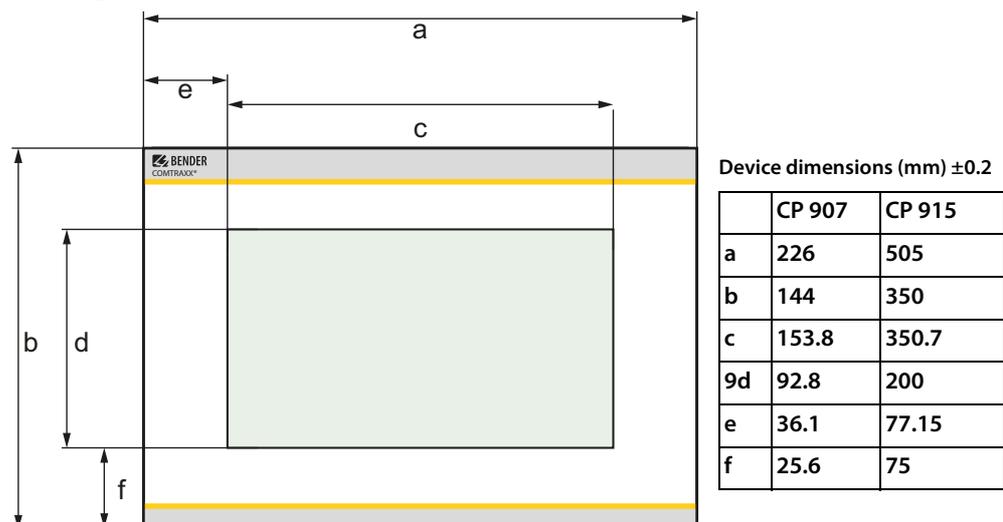


*If you are familiar with the configuration of computer networks, you can carry out the connection of the CP9... display and operator panel yourself. **Otherwise please contact your EDP administrator!***

4.1 Installation of the CP9... device

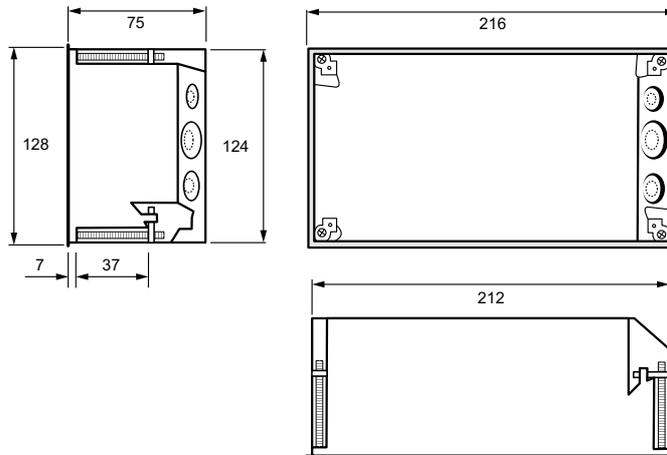
The COMTRAXX® CP9... devices are installed exclusively in the supplied and professionally pre-assembled flush-mounting boxes. Instructions for installing the flush-mounting boxes are provided and enclosed by the manufacturer.

4.1.1 Dimension diagram



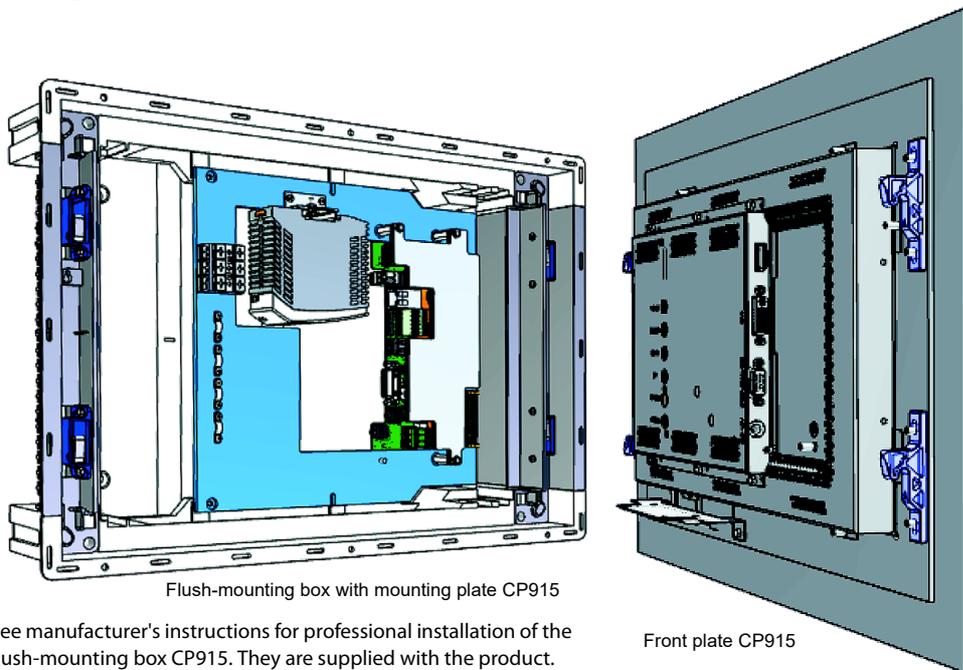
*Only **qualified personnel** are permitted to carry out the work necessary to install, commission and run a device or system.*

4.1.2 Flush-mounting box CP907



Cut out (mm)
212 x 124, depth min. 75

4.1.3 Flush-mounting box CP915



Flush-mounting box with mounting plate CP915

See manufacturer's instructions for professional installation of the flush-mounting box CP915. They are supplied with the product.

Front plate CP915

Cut out (mm)
471 x 314, depth min. 87

4.2 Connection of the CP9... device

Remove the device from the built-in flush-mounting box.

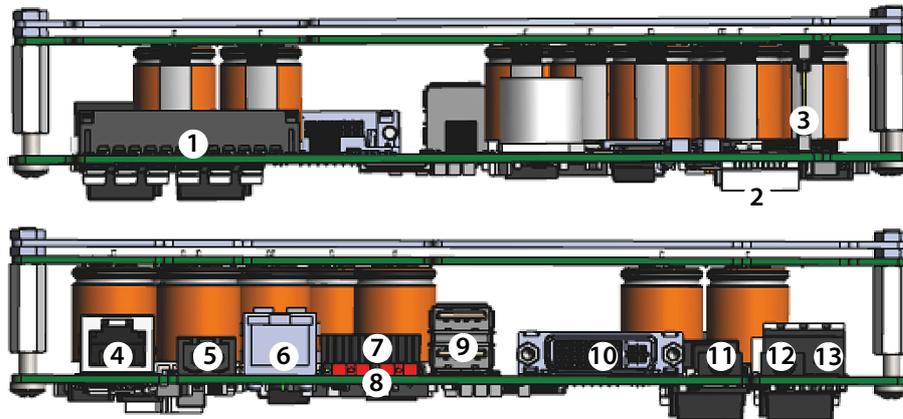


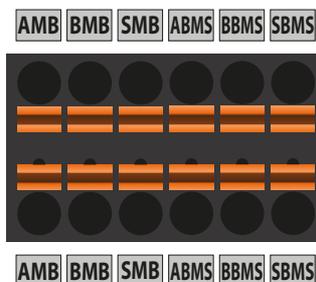
Abb. 4.1: Mainboard and connections of the CP9xx devices

No.	Connection	CP907	CP915
1	Plug connector digital inputs		
2	I ² C interface		
3	Plug connector to energy storage board		
4	Backbone bus (deactivated)		
5	Voltage supply A1/+ A2/-		
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		

Connect the CP9... as follows:

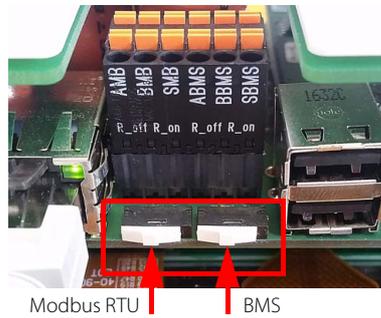
1. Modbus RTU connection:
Connect terminals **AMB** and **BMB** (7) to the Modbus RTU (A to A, B to B).
2. BMS bus connection:
Connect terminals **ABMS** and **BBMS** (7) to the BMS bus (A to A, B to B).

X1 plug assignment (7)



- If the CP9... 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



- Establish connection with PC and BCOM:
Connect the CP9... device to the PC network using an Ethernet cable (**6**).
- Connect voltage supply:



Damage to the device by using an incorrect connector plug
An existing connector plug of another device may have a different polarity. **It is necessary that you use the supplied connector plug (A1+/A2-).**

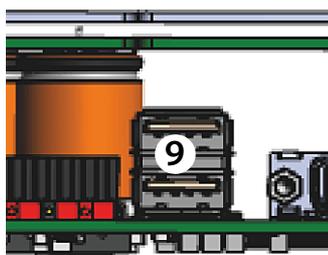
Connect terminals A1/+ and A2/- (**5**) to the voltage source. The CP907 can also be supplied via Ethernet (PoE). For further information, please refer to the technical data.

- Attach the front plate to the built-in flush-mounting box.

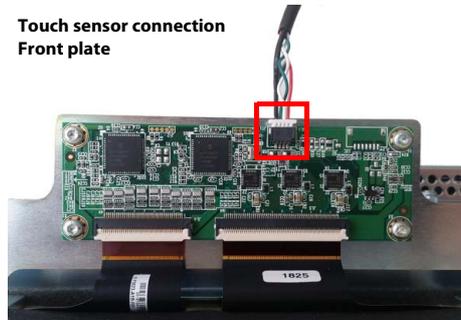
For CP915 only

- 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

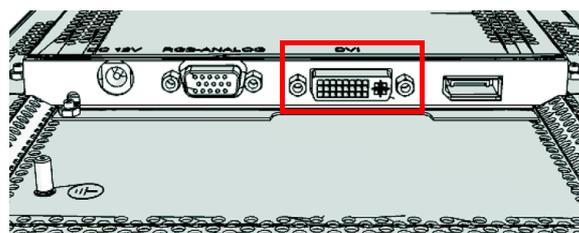
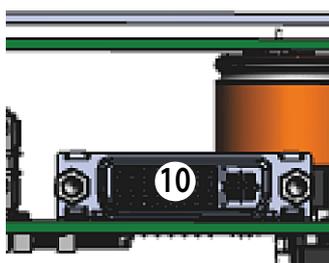


Touch sensor connection
Front plate



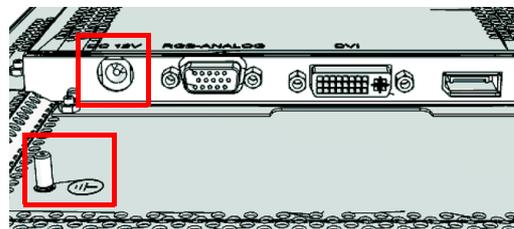
- Connect the screen output DVI (**10**) to the front plate. Appropriate DVI-D connecting cable included in scope of delivery.

DVI-D connection control board

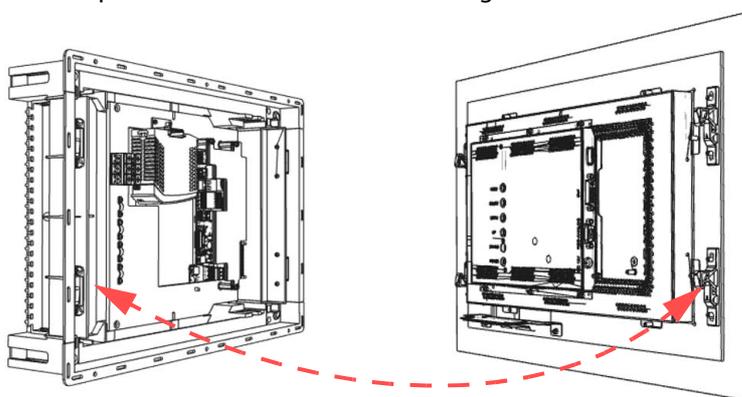


9. Connect the voltage supply to the power supply unit via the pre-assembled wiring. Connect the earthing to the front plate.

Pre-assembled voltage supply



10. Attach the front plate to the built-in flush-mounting box.



4.3 Commissioning of the CP9... device

1. Switch on the supply voltage: After switching on, the device performs a start routine. It is completed when the commissioning page appears in the display.



Abb. 4.2: Commissioning page CP9xx device

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.
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 displayed on the display after 8-10 seconds.

4.4 COMTRAXX® user interface of the CP9...

The device has a web user interface for setting and operation.

How to start the web interface:

- Open an Internet browser from any network device.
- Enter the address of the CP9... device into the address line of the browser.

It is possible to connect the CP9... directly to a computer/laptop. In this case, the CP9... can be controlled with a second fixed IP address.

- Open the browser on the connected device
- Enter the following IP address: 169.254.0.1

The start screen of the COMTRAXX® user interface appears in the browser window.

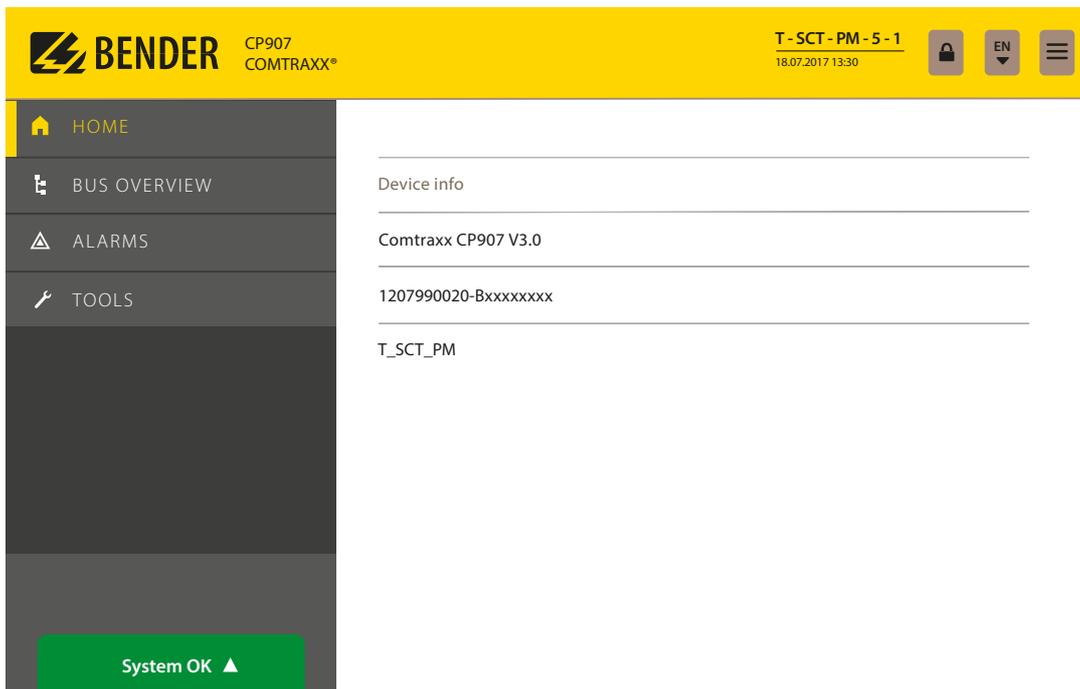


Abb. 4.3: Start window CP907 in the COMTRAXX® user interface

LOGIN to the device	
LANGUAGE selection	
SHOW MENU/HIDE MENU	
SYSTEMS without faults	
ALARMS with number of faults	



COMTRAXX® manual

Further information about functionality and configuration of the CP9... can be found in the COMTRAXX® manual.

4.4.1 Factory settings communication addresses

CP9... devices are delivered with the following factory settings:

Parameter	Factory setting
IP address	
Connection can always be made via the pre-defined IP address (e.g. for commissioning or for direct 1:1 ETH connection)	169.254.0.1
Net mask	255.255.0.0
Standard gateway	192.168.0.1
DNS	-
DHCP	off
t_{off} Timeout for DCHP address assignment	30 s
BMS address	1
BMS protocol	BMS i
BCOM system name	SYSTEM
Subsystem address	1
BCOM device address	1

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

5. Modbus TCP server

5.1 Data access using Modbus TCP protocol

Requests are sent to the Modbus TCP server of the CP9... using function code FC4 (read input register). The server generates a function-related response and sends it to the Modbus client.

5.1.1 Exception code

If a request cannot be answered for whatever reason, the server sends a so-called 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 (answer will be time-delayed)
0x06	Request not accepted (repeat request, if necessary)
0x08	Memory: Parity Error
0x0A	Gateway path not available
0x0B	Gateway error

5.1.2 Modbus requests

The required words of the process image can be read from the input registers of the CP9... using the function code FC4. For this purpose, the start address and the number of the registers to be read out have to be entered.

Example:

The words 0 and 1 are to be read from the input registers 0x100 and 0x101.

Byte	Name	Example
Byte 0, 1	Transaction identifier	0x0000
Byte 2, 3	Protocol identifier	0x0000
Byte 4, 5	Length field	0x0006
Byte 6	Unit identifier	Subsystem address assignment. 0x01 (corresponds to the subsystem address 1)
Byte 7	Modbus function code	0x04
Byte 8, 9	Device address (BMS int * 0x100)	Device address assignment. 0x0100 (corresponds to the device address 1)
Byte 10, 11	Number of words	0x0002

5.1.3 Modbus responses

The responses consist of 2 bytes per register. The MSB is the first byte.

Byte	Name	Example
...
Byte 7	MODBUS function code	0x04
Byte 8	Byte count	0x04
Byte 9, 10	Value register 0	0x1234 (fictitious value)
Byte 11, 12	Value register 1	0x2345 (fictitious value)

5.1.4 Structure of the exception code

Byte	Name	Example
...
Byte 7	MODBUS function code	0x84
Byte 8	Exception code	0x01 or 0x02

5.1.5 Modbus address structure for BMS devices

Function	Address range	Number of bytes	Number of words
Device type	0x00...0x09	20 bytes	10 words
Timestamp	0x0A...0x0D	8 bytes	4 words
Common alarm	0x0E (high byte)	1 byte	0.5 words
No BMS bus connection	0x0E (low byte)	1 byte	0.5 words
Unused	0x0F	2 bytes	1 word
Channel 1...32	0x10...0x8F	32 x 8 bytes	128 words
Alarm and test Channel 33...64	0x90...0xFC	218 x 8 bytes	109 words

5.2 Modbus process image in the memory of the CP9...

The device holds a process image in memory. This image represents the current states and values of all devices that are in the same system as the CP9...

5.2.1 Querying data

5.2.1.1 Modbus function code FC03

The parameters and measured values of all devices in the subsystem can be read using the Modbus function 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.

5.2.1.2 Modbus function code FC04

The process image in the memory of the CP9... can be read using the Modbus function 4 "Read Input Registers". Device name, device channel states and alarm and operating messages can be accessed via this function. This is possible for all devices in the system. Here, 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.

5.2.1.3 How are the memory areas organised?

Memory utilisation	Start address	End of memory area	Size of memory area
Reference values for test purposes	0x0000	0x00FF	0x0100
Process image	0x0100	0x95FF	0x9500
Unused	0x96FF	0xFFFF	0x6900



*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.

5.2.2 Memory scheme of the process image

5.2.2.1 Structure of the process image

As illustrated in the table, the Modbus start address for the respective process image is derived from the device address. 256 (0x100) words or 512 bytes are reserved for each device. They contain all the information requested and transmitted from the bus.

Modbus address ranges of the process images in the memory			
Device address	Word		
	HiByte	LoByte	
		00	...	FF
1	0x01	Device 1	
2	0x02	Device 2	
3	0x03	Device 3	
...	
32	0x20	Device 32	
...	
255	0xFF	Device 255	

Tab. 5.1: Modbus start address for each device for which a request can be sent.

5.2.2.2 Memory scheme of an individual device

Devices can feature various types of analogue and/or digital channels. Please take into consideration that there are device-specific differences:

- BMS devices usually feature 12 channels
- MK800/TM800 supports up to 64 digital channels in the master mode
- The channels 33 to 64 transmit digital messages only

Use the tables on Seite 27 and Seite 28 to determine the start address to request the following device parameters:

- Device type
- Timestamp
- Common alarm
- Device error
- BMS channel

Example:

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

1. For device address 3 the first part of the address, 0x03 (high byte), is taken from Tabelle 5.1.
2. For channel 2 the second part of the address, 0x14 (low byte), is taken from Tabelle 5.2. For the number of words to be requested the number 4 is taken from the same table: (0x14 to 0x17 = 0x04).
3. The start address 0x0314 is formed from the high byte and low byte.

Memory image of a device																																	
LoByte	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F																	
0x0	----- Device type -----										----- Timestamp -----			C	D	R.																	
0x1	Channel 1				Channel 2				Channel 3				Channel 4																				
0x2	Channel 5				Channel 6				Channel 7				Channel 8																				
0x3	Channel 9				Channel 10				Channel 11				Channel 12																				
0x4	Channel 13				Channel 14				Channel 15				Channel 16																				
0x5	Channel 17				Channel 18				Channel 19				Channel 20																				
0x6	Channel 21				Channel 22				Channel 23				Channel 24																				
0x7	Channel 25				Channel 26				Channel 27				Channel 28																				
0x8	Channel 29				Channel 30				Channel 31				Channel 32																				
0x9	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6
0xA	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
0xB	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
0xC0	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
0xD	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
0xE	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
0xF	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	

Tab. 5.2: Modbus address assignment of the channels in a device;
Hex representation: horizontal = units, vertical = sixteens

Abbreviations for memory contents: C = Common alarm D = Device lost (device failure) R = Reserved
A detailed description of the data formats for the device type, timestamp etc. is given below.

5.2.2.3 Device type

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

The device type is set using a bus scan.

5.2.2.4 Timestamp

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

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

5.2.2.5 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

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 communication with the respective device is no longer possible.

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

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

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 Kapitel 5.2.5.

5.2.2.7 Float = Floating point value of the channels

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

Representation of the bit order for processing analogue measured values according to IEEE 754

S = Sign E = Exponent M = Mantissa

5.2.2.8 A&T = Alarm type and test type (internal/external)

Bit	7	6	5	4	3	2	1	0	Meaning
	Test external	Test internal	Status	Reserved	Reserved	Alarm	Fault		
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

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 SMI472 and represents the digital value of the status
This column is relevant for the SMI472 only.

Bit 6 or 7 is 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.

5.2.2.9 R&U = Range and unit

Bit	7	6	5	4	3	2	1	0	Meaning
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	1	°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

The units of the bits 0 to 4 are coded.

Bits 6 and 7 describe the validity range of a value. Bit 5 is reserved.

The complete byte is calculated from the sum of the unit and the range of validity.

Attention!

If the unit byte 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 Seite 32 or Seite 34. The floating point value contains an internal CODE but no valid measured value.

5.2.2.10 Channel description

Word	0x03															decimal	Meaning	
Byte	HiByte							LoByte										
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
Alarms and warnings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Reserved
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	Insulation fault
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	Overload
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	Overtemperature
	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	Failure line 1
	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	5	Failure line 2
	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	6	Insulation OT light
	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	7	Reserved
	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	8	Failure distribution board
	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	9	Oxygen
	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	10	Vacuum
	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	11	Anaesthetic gas
	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	12	Compressed air 5 bar
...	

A code with the associated descriptive text is available for each channel. The table above only shows an extract from the texts. For a complete list of the available codes or texts refer to Seite 34.

5.2.2.11 Channel 33 to 64

Bit	7	6	5	4	3	2	1	0	Meaning
	Test external	Test internal	Status	Reserved	Reserved	Alarm	Fault		
Alarm type	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
	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

Channels 33 to 64 only provide digital information. The information is coded as an alarm or message type or test type (internal, external).

The coding is similar to the data format AT&T for the channels 1 to 32, with the exception of the additional bit 4, which is used for coding device errors, e.g. connection faults or internal device errors.

5.2.3 Modbus examples to read out data

Example: Reading out from ATICS channel 1 (voltage line 1)

CP9... 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 in the memory image appears: 784 = 0x 03 10)
 00 02 Length of the data (words)

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 CP9...)
 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)

5.2.4 Reference data records of the process image

To make it easier to check the configuration and the Modbus TCP data access to devices, the CP9... provides a reference data record at the **virtual** address 0.



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). At the end of this chapter, a few examples of correct configuration are given, which might be helpful.

5.2.4.1 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	Word				
	HiByte	LoByte			
		00	0E	10	14
0	HiByte 0x00	Device type	Common alarm	Channel 1	Channel 2

Tab. 5.3: 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 high byte is set)
- 0x0010: 230 V undervoltage (reference value on channel 1)
- 0x0014: 12.34 A overcurrent (reference value on channel 2)

5.2.4.2 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. 5.4: Reference data stored in channel 1

5.2.4.3 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. 5.5: Reference data stored in channel 2

5.2.4.4 Explanation of how to access floating point values

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

Proceed as follows:

- 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)
- 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

5.2.5 Channel descriptions for the process image

Value	Measured value description alarm message operating	Note
0		
1 (0x01)	Insulation fault	
2 (0x02)	Overload	
3 (0x03)	Overtemperature	
4 (0x04)	Failure line 1	

Value	Measured value description alarm message operating	Note
5 (0x05)	Failure line 2	
6 (0x06)	Insul. OT light	Insulation fault operating theatre light
7 (0x07)		
8 (0x08)	Failure distribution board	
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	Short circuit distribution board
31 (0x1F)		
32 (0x20)		
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 UPS	Battery-supported safety power supply
41 (0x29)		
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

Value	Measured value description alarm message operating	Note
77 (0x4D)	Undervoltage	
78 (0x4E)	Overvoltage	
79 (0x4F)	Frequency	Measured value in Hz
80 (0x50)		
81 (0x51)	Asymmetry	
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
97 (0x61)	Service code	Information about service intervals
101 (0x65)	Connection system	
102 (0x66)	Connection earth	
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)		
111 (0x6F)	No address:	Failure BMS device
112 (0x70)		
113 (0x71)	Failure K1/Q1	Failure contactor K1/Q1
114 (0x72)	Failure K2/Q2	Failure contactor K2/Q2
115 (0x73)	Device error	Fault ISOMETER
116 (0x74)	Manual mode	K1/2 manual mode
117 (0x75)	Open circuit K1on	Line to K1 on interrupted
118 (0x76)	Open circ. K1off	Line to K1 off interrupted
119 (0x77)	Open circuit K2 on	Line to K2 on interrupted
120 (0x78)	Open circ. K2 off	Line to K2 off interrupted
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)		
131 (0x83)	Fault RS485	
132 (0x84)		
133 (0x85)		

Value	Measured value description alarm message operating	Note
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	
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)		
206 (0xCE)	Auto mode	
207 (0xCF)	Manual mode	
208 (0xD0)		
209 (0xD1)		
210 (0xD2)	Line AV on	
211 (0xD3)	Line SV on	
212 (0xD4)	Line UPS on	
213 (0xD5)	Channel disabled	
214 (0xD6)	Switching back interlocking function	Switching back interlocking function enabled
215 (0xD7)	Phase sequ. right	
216 (0xD8)	Switch. el. pos.0	
217 (0xD9)	Line BSV on	
218 (0xDA)	On	SMO48x: Alarm, relay

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, variant, ...)
1016 (0x3F8)	
1015 (0x3F7)	Time
1014 (0x3F6)	Date day
1013 (0x3F5)	Date month
1012 (0x3F4)	Date year

Value	Description of parameters:
1011 (0x3F3)	Register address (unit not displayed)
1010 (0x3F2)	Time
1009 (0x3F1)	Factor multiplication [*]
1008 (0x3F0)	Factor division [/]
1007 (0x3EF)	Baud rate

5.2.6 Modbus control commands

Commands can be sent to BMS devices by an external application (e.g. 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	Internal BMS bus address	BMS channel	Command	Status

Writing to register:

- To write use function code 0x10 "Write Multiple registers".
- 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.



You can also generate control commands in the menu "Tools" > "Modbus" > "Modbus control commands".

Reading out register:

- 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.

Control commands for the internal and 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 changeover unit (PRC487)/ Test PRC changeover unit
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 chan- geover (ATICS) / Start test generator without changeover
EXT	--	--	--	--	
INT	1	1-150	0	5	Changeover to line 1 (ATICS)/Chan- geover to line 1
EXT	--	--	--	--	
INT	1	1-150	0	6	Changeover to line 2 (ATICS)/Chan- geover to line 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)/Mute buzzer [for alarm address] (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 / Relay/Turn switch on
EXT	--	--	--	--	
INT	1	1-150	1-12	11	Switch channel off (SMO481) / Relay/Turn switch off
EXT9	--	--	--	--	
INT	1	1-150	1-12	12	Test (EDS, RCMS)
EXT	--	--	--	--	

5.2.6.1 Modbus example for control commands

Example: Changeover of ATICS to line 1

CP9... 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 CP9...)
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)

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 CP9...)
10	Modbus function code 0x10 (write multiple registers)
FC 00	Start register
00 04	Number of registers

6. Troubleshooting

6.1 Malfunctions

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

6.1.1 What should be checked?

For the CP9..., 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.

6.1.2 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 a PDF file

Use the backup function to save all settings of the device (see Kapitel „3.2 Device features“ as well as the COMTRAXX® manual).

Frequently asked questions on the Internet

You will find FAQs on many Bender devices at:

<http://www.bender.de> > Service & support > Rapid assistance > FAQ

6.2 Maintenance

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

6.3 Cleaning

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

7. Technical data

Insulation coordination CP907 acc. to IEC 60664-1

Rated voltage.....	50 V
Overtoltage category	III
Pollution degree	2
Rated impulse voltage.....	800 V

Insulation coordination CP915 acc. to IEC 60664-1

Rated insulation voltage.....	AC 250 V
Overtoltage category	III
Pollution degree	2
Rated impulse voltage.....	4 kV

Supply CP907 via plug-in terminal (A1/+;A2/-)

Nominal voltage CP907.....	DC 24 V
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 (DC 24 V 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

Supply via PoE

Nominal voltage.....	DC 48 V
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

Supply CP915 via terminal block (L1; N)

Nominal voltage CP915 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
Restart after voltage interruption.....	min. 15 seconds

Displays, memory

Display CP907	7" TFT touch display
Display CP915	15.6" TFT touch display
E-mail configuration and device failure monitoring	max. 250 entries
Individual texts	1200 texts with 100 characters each
Displayable devices	247
Number of data points for "third-party devices" to Modbus TCP and Modbus RTU	50
Number of data loggers	30
Number of data points per data logger	10,000
Number of entries in the history memory	1,000

Visualisation

Number of pages	20
Background image size	max. 3 MB/image; max. 50 MB total memory

Interfaces
Ethernet

Connection	RJ45
Data rate	10/100 Mbit/s, autodetect
DHCP	on/off (off)*
Toff (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 (depending on function module selected)	TCP/IP, Modbus RTU, DHCP, SMTP, NTP

BCOM

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

Modbus TCP

Interface/protocol	Ethernet/Modbus TCP
Operating mode	Client for PEM and "third-party devices" assigned
Operating mode	Server for access to process image and for Modbus control commands

SNMP

Versions	1, 2c, 3
Devices supported	Queries to all devices (channels) possible (no trap functionality)

BMS bus

Interface/protocol	RS-485/BMS internal
Operating mode	master/slave (master)*
Baud rate	9.6 kbit/s
Cable length	< 1200 m
Cable: twisted pair, shielded, one end of shield connected to PE	recommended: J-Y(St)Y min. 2x0.8
Connection	"ABMS", "BBMS" (see plug-in terminal)
Terminating resistor	120 Ω (0.25 W), can be switched on internally (see plug-in terminal)
Device address	1 . . . 99 (1)*

Modbus RTU

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

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
Connection	plug-in terminal: (1;1;2; . . . 12;12)
Maximum cable length	< 1000 m

Switching elements

Number	1 changeover contact
Operating mode	N/C operation / 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
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 CP015 and CP924 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 CP015 and CP924 only)

Conductor sizes	AWG 20-12
Stripping length.....	10 . . . 11 mm
rigid/flexible	0.5 . . . 4 mm ²
flexible with ferrule with/without plastic sleeve	0.5 . . . 4 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve.....	0.5 . . . 4 mm ²

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

Conductor sizes	AWG 24-12
Stripping length.....	10 mm
rigid/flexible	0.2 . . . 2.5 mm ²
flexible with ferrule with/without plastic sleeve	0.25 . . . 2.5 mm ²
Multiple conductor, flexible with TWIN ferrule with plastic sleeve.....	0.5 . . . 1.5 mm ²

Plug-in terminal (I1;k1;l2;k2...I12;k12) (AMB;BMB;SMB;ABMS;BBMS;SBMS)

Conductor sizes	AWG 24-16
Stripping length.....	10 mm
rigid/flexible	0.2 . . . 1.5 mm ²
flexible with ferrule without plastic sleeve.....	0.25 . . . 1.5 mm ²
flexible with ferrule with plastic sleeve	0.25 . . . 0.75 mm ²

Environment/EMC

EMC	IEC 61326-1
Operating temperature	-10 . . . +55 °C

Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3
Long-term storage (IEC 60721-3-1)	1K4

Classification of mechanical conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-term storage (IEC 60721-3-1)	1M3
Range of use	< 2000 m AMSL

Other

Operating mode	continuous operation
Mounting	display-oriented
Degree of protection, front	IP50
Degree of protection, enclosure	IP20
Flammability class	UL 94V-0
Dimensions CP907 (W x H x D)	226 x 144 x 78 mm
Dimensions CP915 (W x H x D)	505 x 350 x 92 mm
Documentation number	D00349
Weight CP907	approx. 1.1 kg
Weight CP915	approx. 6.1 kg

7.1 Standards, approvals and certifications



7.2 Ordering details

Type	Display size	Front	Supply	Device dimensions (W x H x D)	Weight	Art. No.
CP907	7" (17.6 cm)	Glass, tempered	DC 24 V, < 15 W; PoE	226 x 144 x 78 mm	1.1 kg	B95061080
CP915	15.6" (39.6 cm)	Glass, tempered	AC 100... 240 V, < 30 W	505 x 350 x 92 mm	6.1 kg	B95061081
CP924	24" (61 cm)	Glass, tempered	–	–	–	Shortly

7.3 Replacement parts

Device	Accessories	Order number
CP907	Suitable flush-mounting enclosure	B95100140
CP915	Front/display	B95061090
	Flush-mounting box	B95061091
	Mounting plate with electronics	B95061095
	Flush-mounting box with electronics	B95061092
CP924	Front/display	Shortly
	Mounting box	Shortly
	Mounting plate with electronics	Shortly
	Mounting box with electronics	Shortly
All	CP9... replacement plug connector kit	B95061910

7.4 Optional accessories

Type	Description	Art. No.
	CP9... suction lifter	B95061911
BI800S	Backlit keypad with five buttons	On request
	Audio output	On request
BM18/8	8 digital inputs, 8 digital outputs	B95100119
BM18/4	8 digital inputs, 4 relays	B95100120
BM10/4	4 relays	B95100121
IOM750-08D	8 digital inputs, 8 digital outputs, Modbus TCP	B95061150
IOM750-16D	16 digital inputs, 16 digital outputs, Modbus TCP	B95061151
IOM750-20D4A	16 digital inputs, 4 galv. isolated digital inputs, 16 digital outputs, 4 analogue inputs, 4 analogue outputs, Modbus TCP	B95061152
IOM750-20D4P	16 digital inputs, 4 galv. isolated digital inputs, 16 digital outputs, 4 analogue inputs, 4 analogue outputs, 1 programmable controller, Modbus TCP	B95061153
	Data coupling to third-party systems	On request

A

Address 23

B

BMS device address assignment on the
Modbus 27

Byte offset 34

Byte or word swapping 34

C

Claims under the warranty 41

Connection

- BMS 19

- PROFIBUS DP 20

D

de-energised 11

Display and operating elements 15

Disposal 9

E

Exception code 25

F

Factory settings 23

G

GSD file 23

I

Installation and connection 17

Intended use 11

M

Malfunctions 41

Manual 7

Measured value descriptions for the pro-
cess image, list 34

Memory image of a BMS device 28

Memory scheme of the process image 27

Modbus

- Address structure for BMS devices
26

- control commands 38

- Function code 26

- Process image 26

- requests 25

- responses 25

P

Process image 27

Q

Qualified personnel 7, 11, 17

R

Reference data records of the process
image 33

Repair 8

S

Service 8

Sketch with dimensions 46

Storage 9

Support 8

T

Training courses 8

U

UL applications 19

Update 8

W

WEEE directive 9

Workshops 8



Bender GmbH & Co. KG

Postfach 1161 • 35301 Grünberg • Germany
Londorfer Straße 65 • 35305 Grünberg • Germany
Tel.: +49 6401 807-0 • Fax: +49 6401 807-259
E-Mail: info@bender.de • www.bender.de

Fotos: Bender Archiv.



BENDER Group