



# COMTRAXX® COM465IP/COM465DP



**Condition Monitor with integrated Gateway  
for the connection of Bender devices  
to PROFIBUS DP and Ethernet-TCP/IP networks  
Software version: D472 V2.0x**



**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](mailto:info@bender.de) • [www.bender.de](http://www.bender.de)

Photos: Bender archives.

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

# Table of Contents

<b>1. Important information</b>	<b>7</b>
1.1 How to use this manual	7
1.2 Technical support: service and support	8
1.2.1 First level support	8
1.2.2 Repair service	8
1.2.3 Field service	9
1.3 Training courses	9
1.4 Delivery conditions	9
1.5 Inspection, transport and storage	10
1.6 Warranty and liability	10
1.7 Disposal	10
<b>2. Safety instructions</b>	<b>11</b>
2.1 General safety instructions	11
2.2 Work on electrical installations	11
2.3 Intended use	11
2.4 Address configuration and termination	12
<b>3. Product description</b>	<b>13</b>
3.1 Scope of delivery	13
3.2 Device features	13
3.2.1 Functional scope of COM465IP and COM465DP basic device (without function modules)	13
3.2.2 Function module A	14
3.2.3 Function module B	14
3.2.4 Function module C	15
3.2.5 Function module D*	15
3.2.6 Function module E	15
3.2.7 Function module F	15
3.3 Applications	15
3.4 Function	16
3.5 Software products used	16
3.6 Description of function	17
3.6.1 Interfaces	17

3.6.2	Process image .....	18
3.6.3	List of BMS devices compatible with the COM465... ..	18
3.7	BMS side of the COM465... ..	18
<b>4.</b>	<b>Installation, connection and commissioning .....</b>	<b>19</b>
4.1	Preliminary considerations .....	19
4.2	Installation and connection .....	20
4.3	Installing device .....	20
4.3.1	Outline drawing .....	20
4.4	Connecting device .....	21
4.5	Displays and controls .....	22
4.6	COM465... web user interface .....	22
4.7	Placing device in operation .....	23
4.7.1	Addresses and their factory settings .....	24
4.7.2	Installing GSD file for PROFIBUS DP master (COM465DP only) .....	24
<b>5.</b>	<b>PROFIBUS DP (COM465DP only) .....</b>	<b>25</b>
5.1	PROFIBUS DP side of the COMTRAXX® COM465DP .....	25
5.1.1	Cyclic data exchange .....	25
5.1.2	Correct control of the timing on the COM465DP using PROFIBUS commands is necessary. ....	26
5.1.3	The COM465DP communicates as "BMS master" with the PROFIBUS DP master 26	
5.1.4	Formats of the output and input data .....	26
5.1.5	Data access using PROFIBUS DP .....	27
5.1.5.1	Type 1: Querying measured data from devices on the bus .....	27
5.1.5.2	Type 2: Querying registers in devices on the bus .....	28
5.1.5.3	Type 3: Writing to registers on devices on the bus .....	29
5.2	Programming examples .....	31
5.2.1	Type 1: Querying measured data from devices on the bus .....	31
5.2.1.1	Example 1: Querying measured value from the RCMS490-D .....	31
5.2.1.2	Example 2: Querying measured value in the event of an IRDH375 alarm .	33
5.2.1.3	Example 3: Querying IRDH375 device fault .....	35
5.2.2	Type 2: Querying registers in devices on the bus .....	37
5.2.2.1	Example: Querying a register on the RCMS490-D .....	37
5.2.3	Type 3: Writing to registers on devices on the bus .....	38
5.2.3.1	Example: Writing to a register on the RCMS490-D .....	38
<b>6.</b>	<b>Modbus TCP server .....</b>	<b>39</b>
6.1	Data access using Modbus TCP protocol .....	39

6.1.1	Exception code .....	39
6.1.2	Modbus requests .....	39
6.1.3	Modbus responses .....	40
6.1.4	Structure of the exception code .....	40
6.1.5	Modbus address structure for BMS devices .....	40
6.2	Modbus process image in the memory of the COM465... ..	41
6.2.1	Querying data .....	41
6.2.1.1	Modbus function code FC03 .....	41
6.2.1.2	Modbus function code FC04 .....	41
6.2.1.3	How are the memory areas organised? .....	41
6.2.2	Memory scheme of the process image .....	42
6.2.2.1	Structure of the process image .....	42
6.2.2.2	Memory scheme of an individual device .....	42
6.2.2.3	Device type .....	44
6.2.2.4	Timestamp .....	44
6.2.2.5	C = Common alarm and D = Device lost (device failure) .....	44
6.2.2.6	Channels 1 to 32 with analogue and/or digital values .....	44
6.2.2.7	Float = Floating point value of the channels .....	45
6.2.2.8	A&T = Alarm type and test type (internal/external) .....	45
6.2.2.9	R&U = Range and unit .....	46
6.2.2.10	Channel description .....	47
6.2.2.11	Channel 33 to 64 .....	48
6.2.3	Modbus examples to read out data .....	49
6.2.4	Reference data records of the process image .....	50
6.2.4.1	Address assignment of the reference data record .....	50
6.2.4.2	Reference value on channel 1 .....	50
6.2.4.3	Reference value on channel 2 .....	51
6.2.4.4	Explanation of how to access floating point values .....	51
6.2.5	Channel descriptions for the process image .....	52
6.2.6	Modbus control commands .....	56
6.2.6.1	Modbus example for control commands .....	58
<b>7.</b>	<b>Troubleshooting .....</b>	<b>59</b>
7.1	Malfunctions .....	59
7.1.1	What should be checked? .....	59
7.1.2	Frequently asked questions .....	59
7.2	Maintenance .....	60
7.3	Cleaning .....	60
<b>8.</b>	<b>Technical specifications .....</b>	<b>61</b>

8.1	Tabular data .....	61
8.2	Standards, approvals and certificates .....	63
8.3	Ordering data .....	64
<b>INDEX</b>	.....	<b>65</b>

# 1. Important information

## 1.1 How to use this manual

This manual describes

- The condition monitor with an integrated gateway COMTRAXX® COM465IP and
- The condition monitor with an integrated gateway COMTRAXX® COM465DP



---

*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 gateways COMTRAXX® COM465IP and COMTRAXX® COM465DP,
  - the connection of the devices
  - and the PROFIBUS DP interface of the COMTRAXX® COM465DP.
- The "COMTRAXX" manual. It describes the functions of the web user interface for Bender gateways.
- The sheet "Important safety instructions for BENDER products".
- The manuals for the system components.

As well as, if the related interface is used:

- The "BCOM" manual. It describes the new Bender interface.
- The "BMS bus" package slip.

COMTRAXX® COM465IP is also referred to in this manual as "COM465IP" for short.  
COMTRAXX® COM465DP is also referred to in this manual as "COM465DP" for short.  
The devices are called "COM465..." or "gateway" in texts that apply to both.

COMTRAXX® is 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 in the Internet.

BCOM	protocol for the communication between 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:

 <p><b>DANGER</b></p>	<p><i>This signal word refers to a hazard with a <b>high</b> level of risk that, if it is not avoided, <b>will</b> result in <b>death</b> or <b>serious injury</b>.</i></p>
 <p><b>WARNING</b></p>	<p><i>This signal word refers to a hazard with a <b>medium</b> level of risk that, if it is not avoided, <b>may</b> result in <b>death</b> or <b>serious injury</b>.</i></p>
 <p><b>CAUTION</b></p>	<p><i>This signal word refers to a hazard with a <b>low</b> level of risk that, if it is not avoided, <b>may</b> result in <b>minor injury</b> or <b>damage</b>.</i></p>
	<p><i>This symbol refers to information that is designed to help you make the best use of the product.</i></p>

Although great care has been taken in drafting this manual, 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 you:

### 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 (Tel. and Fax)  
**E-mail:** support@bender-service.de

### 1.2.2 Repair service

Repair, calibration, update and replacement service for Bender products

- Repairing, calibrating, testing and analysing Bender products
- Hardware and software update for Bender devices



- Delivery of replacement devices in the event of faulty or incorrectly delivered Bender devices
- Extended guarantee for Bender devices, which includes an 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 a.m. to 8.00 p.m. 365 days a year (CET/UTC+1)

\*\*Mo-Thu 7.00 a.m. - 8.00 p.m., Fr 7.00 a.m. - 13.00 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.com](http://www.bender-de.com) -> Know-how -> Seminars.

## 1.4 Delivery conditions

The delivery and payment conditions 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 law, the following applies:

- Electrical and electronic equipment are not to be placed in household waste.
- Batteries and accumulators are not to be placed 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 13 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](http://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 "Safety instructions for Bender products".

### 2.2 Work on electrical installations



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



#### **Mortal danger 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 used in a location outside the Federal Republic of Germany, the applicable local standards and regulations must be observed. European standard EN 50110 can be used as a guide.

### 2.3 Intended use

The gateway connects the following devices to Ethernet TCP/IP and PROFIBUS DP networks:

- Bender devices with BMS bus or BCOM interface
- Bender universal measuring devices PEM... with Modbus RTU or Modbus TCP.

The COM465... converts alarms, measured values and statuses from the devices to the Modbus TCP and HTTP protocols. This conversion permits coupling to Modbus TCP networks as well as data display and evaluation using standard web browsers.

COM465DP only: The gateway transfers information from the BMS bus and BCOM interface to the PROFIBUS DP and vice versa.

It is operated and configured using the web user interface integrated into the device.

## 2.4 Address configuration and termination

To ensure the correct function of the COM465..., correct address assignment and termination is of utmost importance.



**CAUTION**

---

**Malfunction due to duplicated addresses!**

*The duplicate assignment of addresses can cause serious malfunctions in the bus systems affected.*

? *Make sure the COM465... is correctly addressed and terminated*

---

## 3. Product description

### 3.1 Scope of delivery

You will receive:

- the gateway COM465...
- A printed quick reference guide
- the manual "COMTRAXX® COM465IP/COM465DP", "COMTRAXX" and "BCOM" as pdf files. You can obtain the manuals at:  
<http://www.bender.de> > Service & support > Download > Operating manuals
- The configuration file for PROFIBUS DP: "BEND0F27.gsd" (COM465DP only)  
You can obtain the latest version of the file at:  
<http://www.bender.de> > Service & support > Download > Software  
Only registered users can download software. Please register with your e-mail address.

### 3.2 Device features

Condition Monitor for Bender systems:

- An integrated modular gateway between the Bender system and TCP/IP allows remote access via LAN, WAN or Internet.
- Features adaptable by means of the function modules.
- Ethernet (10/100 MBit/s) for remote access via LAN, WAN or Internet.
- Support for devices that are connected to the internal BMS bus via BCOM, Modbus RTU or Modbus TCP.
- Additional to COM465DP only: An integrated gateway between the Bender system and PROFIBUS DP.

#### 3.2.1 Functional scope of COM465IP and COM465DP basic device (without function modules)

- Condition Monitor with a web interface for use with Bender BMS and BCOM devices and universal measuring instruments.
- Support for devices that are connected to
  - to the internal (max. 139 devices) or external\* BMS bus (max. 98 \* 139 devices)
  - via the BCOM interface (see the BCOM operating manual)
  - via Modbus RTU or via Modbus TCP (max. 247 devices).
- Remote display of the latest measured values, status and alarms messages, and parameters\*.
- COM465DP only: Coupling gateway for PROFIBUS DP devices.
- Gateway to Modbus TCP: Reading the latest subsystem measured values, status and alarm messages from addresses 1 ... 10 via Modbus TCP.
- Ethernet interface with 10/100 MBit/s for remote access via LAN, WAN or Internet.

- Setting internal parameters and the configuration of Bender Universal measuring instruments and energy meters.\*\*
- Time synchronisation for all assigned devices
- History memory (1,000 entries)
- Data logger, freely configurable (30 \* 10,000 entries)
- Documenting the device: A PDF file to document the settings of the used COMTRAXX device can be generated.
- A backup file with all settings of the used COMTRAXX device can be generated and imported.
- 50 data points from third-party devices (via Modbus RTU or Modbus TCP) can be integrated into the system.
- A virtual device with 16 channels can be created.

\*) *Displaying the parameters of BMS bus devices is only possible if the gateway is connected to the internal BMS bus.*

\*\*) *Individual parameters can be set via a web-based application and externally (via BMS/ICOM/BCOM), but NOT via Modbus or PROFIBUS. Only parameter assigned devices can be read; in order to change settings, function module C is required!*

#### Additional to COM465DP only:

- Support for external applications (e.g. visualisation programs or PLCs) by means of the PROFIBUS DP protocol.
- Reading the latest measured values, status and alarms messages from all assigned devices. Uniform access to all assigned devices by means of PROFIBUS DP via integrated servers.
- Control commands: From an external application (e.g. visualisation software or PLC), commands can be sent to devices by means of PROFIBUS DP.

#### 3.2.2 Function module A

- Allocation of individual texts for devices, channels (measuring points) and alarms.
- Device failure monitoring
- E-mail notification in the event of alarms or system faults to different users.
- Configuration of e-mail notifications.
- Documenting the device: A PDF file to document the settings of **any** device in the system can be generated.
- Documenting the system: A PDF file to document the settings of **all** devices in the system can be generated.

#### 3.2.3 Function module B

- Supports external applications (e.g. visualisation programs or PLCs) by means of the Modbus TCP protocol
- Reading the latest measured values, status and alarms messages from all assigned devices. Uniform access to all assigned devices by means of Modbus TCP via integrated servers.
- Control commands: From an external application (e.g. visualisation software or PLC), commands can be sent to devices by means of Modbus TCP.
- Access to alarms and measurement values via SNMP protocol (V1, V2c or V3).

### 3.2.4 Function module C

- Quick and easy parameterisation of all assigned gateway devices\* by means of a web browser
- A backup file containing the settings of all devices in the system can be generated and imported.

\*) *The parameterisation of BMS bus devices is only possible if the gateway is connected to the internal BMS bus.*

### 3.2.5 Function module D\*

- Fast, simple visualisation without programming. Device statuses, alarms or readings can be arranged and displayed (e.g. a spatial plan) in front of a background image.
  - Display of an overview covering several pages. Jump to another view page and back to the overview page.
  - Graphical display of the data logger with scaling of the time axis.
  - System data display: Several Gateways (COM460IP, COM465IP, COM465DP, CP700) are displayed on a web page. Display of collective gateway alarms. By clicking on the depicted Gateway opens its web user interface.

\*) *Currently the Silverlight web interface is still required.*

### 3.2.6 Function module E

- 100 virtual devices with 16 channels each can be created.

### 3.2.7 Function module F

- 1600 data points from third-party devices (via Modbus RTU or Modbus TCP) can be integrated into the system.

#### Example:

- To write parameters via Modbus, function modules B and C are required.
- To read parameters via Modbus, function module B is required.
- Parameterisation via PROFIBUS is only possible with COM465DP and function module C.

## 3.3 Applications

- Optimum display and visualisation of device and plant statuses in the web browser
- Observing and analysing compatible BENDER products (ISOMETER®, ATICS®, RCMS, EDS, Linetraxx® and MEDICS systems, universal measuring devices and energy meters)
- Specific system overview according to individual installation description
- Notifying different users in the event of alarms
- Using professional visualisation programs, which are implemented on the Modbus TCP or PROFIBUS DP protocol
- Clear setting of parameters for devices, saving, documenting and restoring parameters
- Commissioning and diagnosis of Bender systems
- Remote diagnosis, remote maintenance

### 3.4 Function

The COM465... are integrated into the existing EDP structure like PCs. After connecting to the network and compatible Bender products, all system devices can be accessed from any PC using a standard web browser (e.g. Google Chrome, Mozilla Firefox, Internet Explorer). In this way, all important system information is directly available.

The COM465DP has an additional connection that enables it to be integrated as a slave in PROFIBUS DP systems. The PROFIBUS master, for example a PC with a PROFIBUS card or a PLC, must be programmed so that the appropriate reactions are triggered via the COM465DP and responses are received. To achieve this, a good knowledge of PROFIBUS is required. The necessary documentation with the complete command syntax can be found in the chapter "PROFIBUS DP (COM465DP only)" on page 25.

### 3.5 Software products used

You will find this chapter in the manual "COMTRAXX".

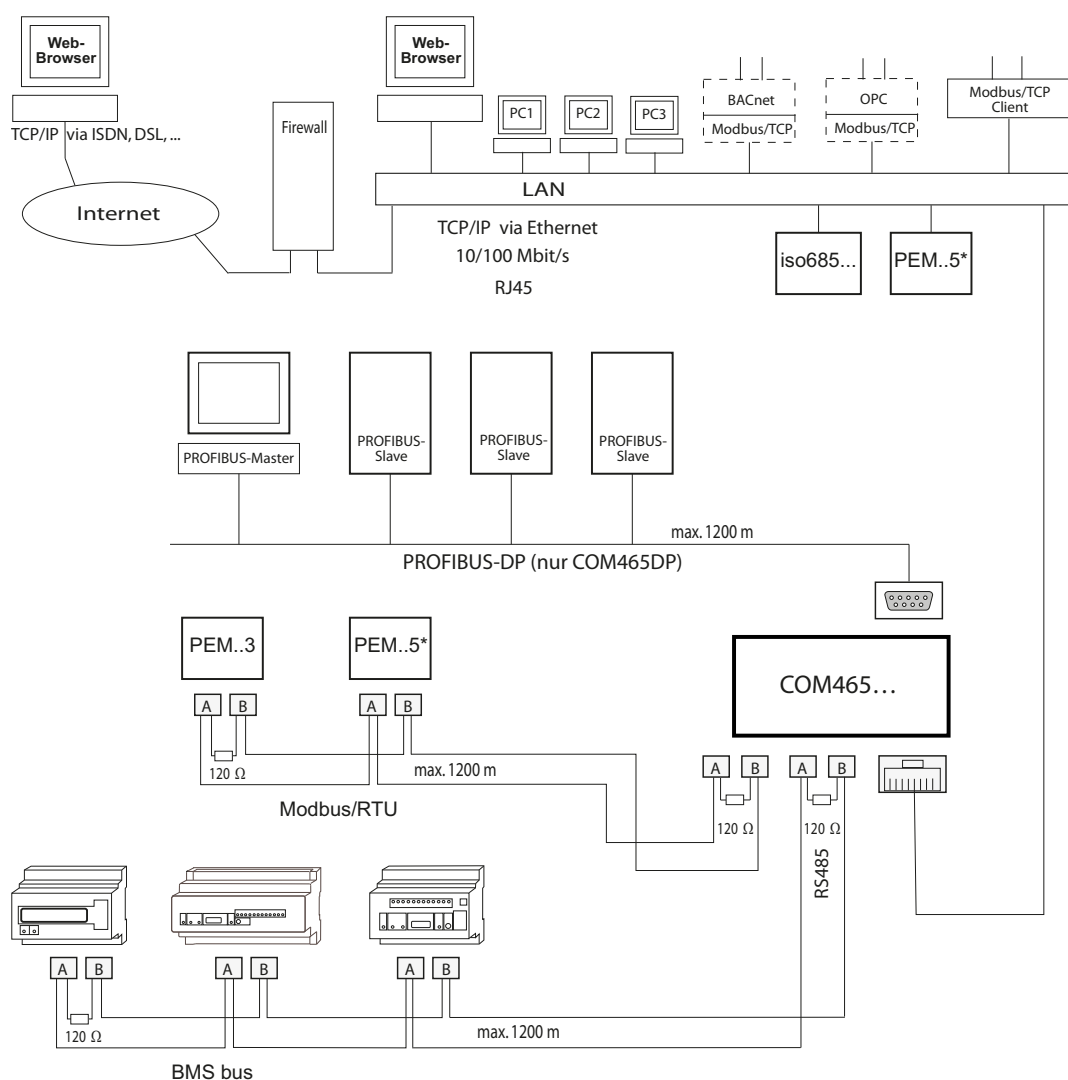


## 3.6 Description of function

### 3.6.1 Interfaces

COM465... communicates with the devices and systems assigned via various interfaces:

- BMS (RS-485) for Bender systems such as EDS46x/49x, RCMS46x/49x and MEDICS. COM465... can be operated as a master or as a slave. Requests are answered more quickly on operation of the COM465... as a master. The COM465... can be operated on the internal and external BMS bus.
- BCOM for new and future Bender systems, e.g. ISOMETER® iso685-D.
- Modbus RTU (RS-485) COM465... on operation 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
- COM465DP only: coupling with PROFIBUS DP. For this purpose the gateway is connected to the PROFIBUS DP network as a PROFIBUS DP slave.



### 3.6.2 Process image

The gateway 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 gateway combines the information from the different interfaces and makes it available for:

- Operation and data display via the web user interface on a PC
- Transfer to external data display programs or PLCs using Modbus TCP or PROFIBUS DP.

The COM465... provides a common user interface for the devices assigned via different interfaces. On this user interface each device is given an individual address using which it can be identified. BMS, BCOM and Modbus RTU devices (PROFIBUS DP devices with the COM465DP) receive the address necessary for their interface. Modbus TCP devices are assigned a virtual address.

COM465DP only: The gateway is a slave on the PROFIBUS DP. For this reason only the gateway can be represented as a PROFIBUS device.

### 3.6.3 List of BMS devices compatible with the COM465...

You will find an updated list of devices on which parameters can be set on our homepage

<http://www.bender.de>

Enter the term "Compatibility list" in the search field.

## 3.7 BMS side of the COM465...

### Internal and external BMS bus

The majority of Bender devices communicate via the internal BMS bus. Individual devices, such as MK800, TM 800 or Bender panels can communicate via both the internal BMS bus (BMS i) and the external BMS bus (BMS e).

The COM465... is capable of communicating either via the internal BMS bus (BMS i) or the external BMS bus (BMS e). The related protocol must be set on the menu "Interface" > "BMS".

If the COM465... is operated on the external bus, it is not possible to set the parameters on any other bus devices. The parameters on the COM460IP itself can, however, be set via the LAN connected.

COM465... can be operated as a master or as a slave.



*COM465... is to be operated as a master if*  
*- Parameters are queried or changed*  
*- Or certain control commands are issued*



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

## 4. Installation, connection and commissioning

The BMS-Ethernet gateway is normally integrated into existing LAN structures, but can also be operated via a single PC on the Ethernet side.



*If you are familiar with the configuration of computer networks, you can carry out the connection of the COM465... yourself. **Otherwise please contact your IT administrator!***

### 4.1 Preliminary considerations

1. Have all the questions as regards the installation been answered by the technician responsible for the installation?
2. Will the device be operated on the internal or external BMS bus?  
Do you know the BMS address to be set?  
Can COM465... be operated as the master (BMS address 1)? If, apart from the COM465..., an alarm indicator and test combination MK800 is connected to the internal bus, the COM465... must **not** have the address 1 (master).  
You will find more detailed information on the topic of BMS, in particular about the wiring of bus devices, in the separate document "BMS bus". You can obtain this document at: <http://www.bender.de> > Service & support > Download > Operating manuals.
3. Does the computer network have a DHCP server?  
Otherwise, the network data allocated by the person responsible for the installation such as the IP address and subnet mask must be set manually.
4. Ask for the IP address of the NTP server; this is required for setting the time automatically.
5. Are suitable PC hardware and software available for commissioning? -  
System requirements (minimum): 1.6 GHz processor/512 MB RAM /  
Windows XP/Vista/7/10/web browser.
6. COM465DP only: Is the PROFIBUS DP address to be set known? Is a terminating resistor required?



*For initial connection, the basic configuration of the COM465... is to be undertaken outside the installation, depending on the specific situation.*

## 4.2 Installation and connection



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



**DANGER**

### **Mortal danger 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 the device** and prior to working on the device connections, make **sure** that **the installation has been de-energised**. Observe the rules for working on electrical installations.



**DANGER**

### **Mortal danger and risk of irreparable damage due to moisture!**

? Install device such that it is protected against moisture.



**CAUTION**

### **Pay attention to installation location**

On installing the device, please take into consideration that the device is only to be used in locations that are protected from unauthorised entry! This can be installation in a switch cabinet, for example.

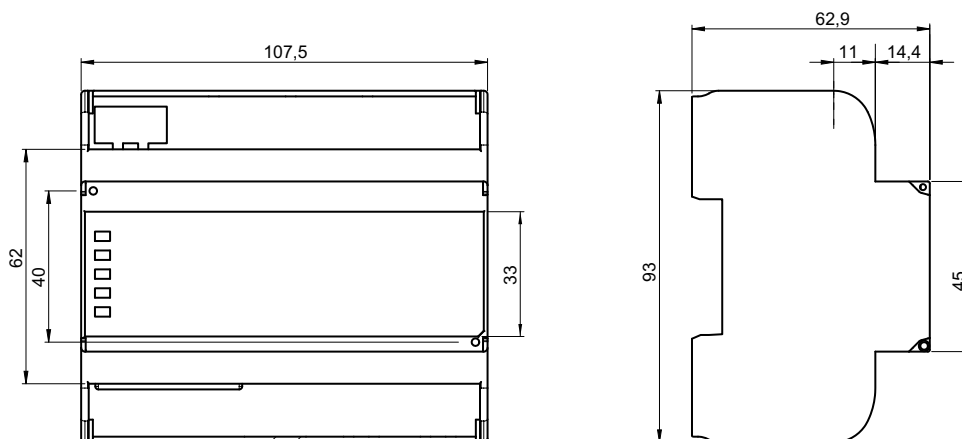
## 4.3 Installing device

The device is suitable for the following types of installation:

- Snap-on mounting on a DIN rail according to IEC 60715 or
- Screw mounting using 2 x M4

### 4.3.1 Outline drawing

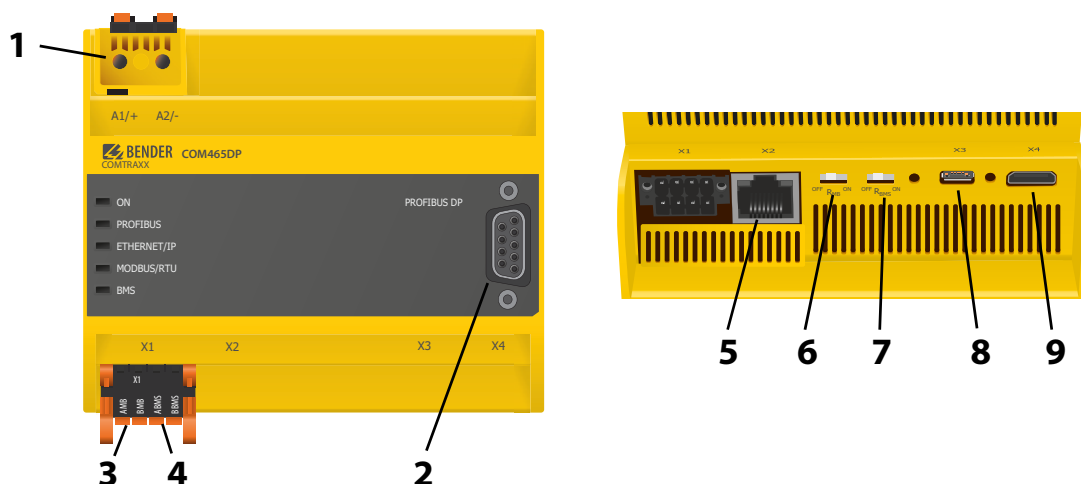
COM465... is in a series J460 enclosure.



## 4.4 Connecting device

For UL applications, the following must be observed:

- Maximum ambient temperature: 55 °C
- Use 60/70°C copper lines only



1	Power supply: see nameplate and chapter "8.3 Ordering data"	
2	PROFIBUS DP connection (COM465DP only)	
3	Modbus/RTU interface: Terminals <b>AMB</b> and <b>BMB</b>	Plug X1
4	BMS bus (Bender measuring device interface): Terminals <b>ABMS</b> and <b>BBMS</b>	
5	Ethernet connection (RJ45) for the connection to the PC network as well as to BCOM	Plug X2
6	Modbus RTU terminating resistor switch	
7	BMU bus terminating resistor switch	
8	Micro-USB interface (currently has no function)	Plug X3
9	Mini-HDMI interface (currently has no function)	Plug X4

Make the connection as follows:

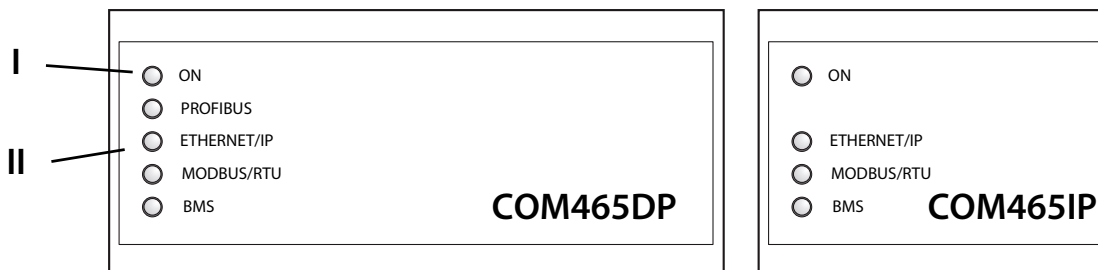
1. Remove terminal covers of the device
2. BMS bus connection:  
Connect the terminals **ABMS** and **BBMS** (4) to the BMS bus (A to A, B to B). If the COM465... is at the end of the BMS bus, you must switch the terminating switch on the device (7) to "ON".
3. Modbus RTU connection:  
Connect the terminals **AMB** and **BMB** (3) to the Modbus RTU (A to A, B to B). If the COM465... is at the end of the bus, you must switch the terminating switch on the device (6) to "ON".
4. Establish connection with PC and BCOM:  
Connect Ethernet cable (RJ45) to the COM465... (5) and connect to the PC network. It is recommended to use at least on Ethernet cable of category 5 (Cat. 5).

5. PROFIBUS DP connection (COM465DP only):  
Connect the corresponding connector on the PROFIBUS cable to the 9-pin Sub-D socket (2). If the COM465DP is at the end of the PROFIBUS DP network, you must switch the terminating switch on the PROFIBUS connector to "ON".
6. Connect power supply:  
Connect terminals A1/+ and A2/- (1) to a power supply (see nameplate and chapter "8.3 Ordering data").  
The power supply must be protected using a 6 A fuse.

COM465DP-24V, COM465IP-24V	Pay attention to the connection polarity! Use power supply units with safe separation only!
COM465DP-230V, COM465IP-230V	Connection polarity is irrelevant.

7. Position the terminal covers and click it into place.

## 4.5 Displays and controls



Item	Function
I	"ON" LED: Flashes during the start process. The LED illuminates continuously as soon as the device is ready for operation.
II	LEDs indicate activity on the various interfaces. The LED "PROFIBUS" exists only in the COM465DP.

## 4.6 COM465... web user interface

The device has a web user interface for configuring and operating the device. The many features of the web user interface are described in the manual "COMTRAXX".

## 4.7 Placing device in operation

### 1. Switch on the supply voltage:

When the device is supplied with power, all LEDs initially illuminate briefly. During the start process the "ON" LED flashes. After a successful start, the "ON" LED then illuminates continuously. The device is now ready for operation.

### 2. Start web user interface:

– Open a web browser.

– Type the following IP address to open the web interface for the gateway:

–> If your PC is in a 192.168.0.0 IT subnet, you can connect to the gateway using the IP address set in the factory, 192.168.0.254.

–> If your PC is in different subnet, you must disconnect the PC from your network. Connect the gateway directly to your PC. You can open the web user interface using the **second pre-defined** IP address: 169.254.0.1.  
For this purpose, DHCP must be enabled on the PC.

You can configure the IP address for the gateway as required in the web user interface.

### 3. Configure:

As a minimum configure all the address data for the gateway. Always configure the BCOM interface (system name, subsystem, device address). The BCOM device address is, at the same time, the address on the internal BMS bus.



#### **Risk of duplicate addresses if BCOM system name is not changed.**

*The factory setting for the system name on all Bender BCOM devices is "SYSTEM". If several systems are established in the same network, there is a risk that addresses will be assigned more than once.*

*? Therefore always assign a new BCOM system name.*

### 4. Integrate devices into the system:

– BMS devices are detected automatically

– BCOM devices are detected automatically

– Modbus devices need to be configured. Start the alternative Web user interface (with Silverlight).

Then select "Tools" > "Modbus" > "Manage devices".

### 5. Check connection

Connect the gateway to your PC network again. Start the web user interface. You can now make all other settings (specific texts, e-mail notifications etc.).

#### 4.7.1 Addresses and their factory settings

The COM465... is supplied with the following factory settings:

Parameter	Factory setting
IP address	192.168.0.254
Connection can always be made using the pre-defined IP address (e.g. for commissioning)	169.254.0.1
Net mask	255.255.0.0
Standard gateway	192.168.0.1
DNS	194.25.2.129
DHCP	off
$t_{\text{off}}$ Timeout for DHCP address assignment	30 s
BMS address	1
BMS protocol	BMS i
BCOM system name	SYSTEM
Subsystem address	1
BCOM device address	1
PROFIBUS DP address	3

The settings can be changed using the web user interface.

#### 4.7.2 Installing GSD file for PROFIBUS DP master (COM465DP only)

A PROFIBUS DP master requires the device master data (Geräte-Stamm-Daten - GSD) for its slave components distributed in the automation system. Accordingly, you must install the GSD file on the master. It describes in a standardised format the properties of the COM465DP. You can obtain the latest GSD file at:

<http://www.bender.de> > Service & support > Download > Software

1. Select the destination folder to which the GSD file is to be copied. For the exact destination please see the documentation for the program you want to use to program the PROFIBUS master.
2. Also copy the file BEND0F27.gsd to the folder created for the device master data.



## 5. PROFIBUS DP (COM465DP only)

### 5.1 PROFIBUS DP side of the COMTRAXX® COM465DP



*COM465DP is always operated as a slave in the PROFIBUS DP side.*

The gateway and its PROFIBUS address are to be made known to the PROFIBUS master. For this purpose you will need the file `BEND0F27.gsd` (see "Scope of delivery" on page 13)

A connection from Bender systems with BMS bus and BCOM to PROFIBUS DP using COM465DP can be necessary for various reasons:

- A PROFIBUS DP device is to react to an event in the BMS world
- A BMS bus device is to react to an event in the PROFIBUS DP world
- The data on the BMS bus are to be displayed, evaluated or depicted together with PROFIBUS DP data on a PC with PROFIBUS DP software
- The data on the BMS bus are to be displayed in the software for a building services management system that has a PROFIBUS DP interface
- The devices on the BMS side are to be configured via a PC with PROFIBUS DP interface
- Certain actions on the BMS side are to be controlled via PROFIBUS DP.

The COM465DP is a PROFIBUS DP slave as per IEC 61158/IEC 61784. This means that there must always be at least one master on the PROFIBUS side.

- COM465DP = PROFIBUS DP V0 slave
- PROFIBUS DP address = 1...125 (factory setting: 3)
- Data transmission rate = 9.6 kbit/s to 1.5 Mbit/s, the baud rate is detected automatically

#### 5.1.1 Cyclic data exchange

In this manual the Profibus is considered in principle from the point of view of a PROFIBUS DP master. The communication on the PROFIBUS DP is cyclic. During this process the PROFIBUS master polls all PROFIBUS slaves in sequence using a query-and-response sequence.

A query is represented by the output data from the master. The COM465DP then responds to the master. The response is represented by the input data to the master.

Due to the large amount of data on the BMS side, all these data cannot be transferred simultaneously during the cyclic exchange of data. The PROFIBUS master must therefore define precisely which data it wants to receive from the BMS device.

The assignment between input data and output data, that is between request and response, is defined via an ID no. The PROFIBUS DP programmer must ensure the next ID no. is output as soon as the previous request has been answered.

### 5.1.2 Correct control of the timing on the COM465DP using PROFIBUS commands is necessary.

Due to the different times the various devices take to respond to the commands, it may occur that responses from previous queries arrive between a query from the PROFIBUS DP master and the related response from the slave, (COM465DP). For this reason it is very important to compare the ID numbers of the query and response.



*The PROFIBUS programmer is responsible for incrementing the ID no. in compliance with system requirements. Incorrect control of the timing will result in the misinterpretation of the responses (PROFIBUS input data)!  
Take into account the time required to execute the related commands!*

### 5.1.3 The COM465DP communicates as "BMS master" with the PROFIBUS DP master

If you have given the COM465DP the BMS address 1, the device operates as a BMS master. In this way it can be used as a master for all BMS systems. Along with querying alarm and operating messages, it is also possible to issue switching commands and parameter settings directly.

### 5.1.4 Formats of the output and input data

The communication is to be considered from the point of view of the PROFIBUS DP. The PROFIBUS DP master sends to the COM465DP (the PROFIBUS slave) a byte sequence, the **output data**.

As a response the PROFIBUS DP master receives back a byte sequence, the **input data**. The assignment between input bytes and output bytes, that is between request and response, is defined via an ID no. The PROFIBUS DP programmer must ensure the next ID no. is output as soon as the previous request has been answered.

For the output data a length of 11 bytes is defined and for the input data a length of 10 bytes.

### 5.1.5 Data access using PROFIBUS DP

PROFIBUS DP offers three methods for reading or writing data:

- Type 1: Querying measured data from devices on the bus
- Type 2: Querying registers in devices on the bus
- Type 3: Writing to registers on devices on the bus

#### 5.1.5.1 Type 1: Querying measured data from devices on the bus

Request to the gateway:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
ID	Msg type	System	Device	Channel	0x00	0x00	0x00	0x00	0x00	0x00

- Byte 0: Sequential ID no.: Must be set by the person programming the PROFIBUS DP master. The ID no. must be incremented for the next request as soon as a response has been received to the previous request.
- Byte 1: Message type: For this request always 0x01
- Byte 2: Subsystem address: Depending on how the device is operated, either the BCOM or the external BMS bus address (default for usage on the internal BMS bus: 2)
- Byte 3: Device address: The internal BMS or BCOM address. Depends on which interface is used to integrate the device.
- Byte 4: Channel: The channel that is to be queried.
- Byte 5-10: Always 0x00

Response from the gateway:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ID	Data value high high	Data value high low	Data value low high	Data value low low	Alarm & test	Range & unit	Description high	Description low	0xFF

- Byte 0: Sequential ID no.
- Byte 1-4: Measured values: The data are output as a floating point value.
- Byte 5: Alarm type and test type  
For details see "A&T = Alarm type and test type (internal/external)" on page 45.

Alarm type & test	Test ext.	7
	Test int.	6
	State	5
	Res.	4
	Res.	3
	Alarm	2 1 0

Byte 6: Structure of the byte: Range and unit.  
For details see "R&U = Range and unit" on page 46.

Range & unit	Range validity	7
		6
	State	5
	Unit	4 3 2 1 0

Byte 7: Description high: The high byte of the measured value description.  
For details see "Channel descriptions for the process image" on page 52.

Byte 8: Description low: The low byte of the measured value description.  
For details see "Channel descriptions for the process image" on page 52.

Byte 9: Always 0xFF

#### Response from the gateway in the event of an error:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ID	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF

#### 5.1.5.2 Type 2: Querying registers in devices on the bus

A register has a size of one word.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
ID	Msg type	System	Device	Number of registers	Address high	Address low	0x00	0x00	0x00	0x00

Byte 0: Sequential ID no.: Must be set by the person programming the PROFIBUS DP master. The ID no. must be incremented for the next request as soon as a response has been received to the previous request.

Byte 1: Message type: For this request always 0x02

Byte 2: Subsystem address: Depending on how the device is operated, either the BCOM or the external BMS bus address (default for usage on the internal BMS bus: 2)

Byte 3: Device address: The internal BMS address

Byte 4: Number of registers: Number of registers to be read (min: 1, max: 4)

Byte 5: Register start address high byte: Start register starting from which the data are read

Byte 6: Register start address low byte: Start register starting from which the data are read

Byte 7-10: Always 0x00

**Response from the gateway:**

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ID	Number of registers	Reg. 0 high	Reg. 0 low	Reg. 1 high	Reg. 1 low	Reg. 2 high	Reg. 2 low	Reg. 3 high	Reg. 3 low

Byte 0: Sequential ID no.

Byte 1: Number of registers: Number of registers read (min: 1, max: 4)

Byte 2-9: Register values: The data from the registers read. Bytes not requested are filled with 0xFF.

**Response from the gateway in the event of an error:**

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ID	0	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF

**5.1.5.3 Type 3: Writing to registers on devices on the bus**

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
ID	Msg type	System	Device	Number of registers	Address high	Address low	Reg. 0 high	Reg. 0 low	Reg. 1 high	Reg. 1 low

Byte 0: Sequential ID no.: Must be set by the person programming the PROFIBUS DP master. The ID no. must be incremented for the next request as soon as a response has been received to the previous request.

Byte 1: Message type: For this request always 0x03

Byte 2: Subsystem address: Depending on how the device is operated, either the BCOM or the external BMS bus address (default for usage on the internal BMS bus: 2)

Byte 3: Device address: The internal BMS address

Byte 4: Number of registers: Number of registers to be written (min: 1, max: 2)

Byte 5: Register start address high byte: Start register starting from which the data are written.

Byte 6: Register start address low byte: Start register starting from which the data are written.

Byte 7-10: Number of register values to be written: Contents that are to be written to the register. If only one register is written, 0xFF must be entered in the bytes 9 and 10.

**Response from the gateway:**

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ID	Number of registers	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF

Byte 0: Sequential ID no.

Byte 1: Number of registers: Number of registers written (min: 1, max: 2)

Byte 2...9: Always 0xFF

**Response from the gateway in the event of an error:**

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ID	0	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF

## 5.2 Programming examples

The PROFIBUS master is to be informed of the necessary configuration data for the PROFIBUS DP using the device master data file BEND0F27.gsd before executing the program. You can download the latest gsd file from the following address on our web site:

<http://www.bender.de> > Service & support > Download > Software

### 5.2.1 Type 1: Querying measured data from devices on the bus

#### 5.2.1.1 Example 1: Querying measured value from the RCMS490-D

The RCMS490-D has the BMS address 2, channel 1 is queried. It has the measured value 200.13 mA.

##### Request to the gateway

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
ID	Msg type	System	Device	Channel	0x00	0x00	0x00	0x00	0x00	0x00
0x01	0x01	0x02	0x02	0x01	0x00	0x00	0x00	0x00	0x00	0x00

For an explanation of the protocol structure see "Type 1: Querying measured data from devices on the bus" on page 27.

- Byte 0: Sequential ID no.
- Byte 1: Message type: For this request always 0x01
- Byte 2: Subsystem address: 2
- Byte 3: BMS device address: 2
- Byte 4: Channel: 1
- Byte 5-10: Always 0x00

**Response from the gateway:**

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ID	Data value high high	Data value high low	Data value low high	Data value low low	Alarm & test	Range & unit	Description high	Description low	0xFF
0x01	0x3E	0x4C	0xEE	0xE1	0x00	0x03	0x00	0x4B	0xFF

For an explanation of the protocol structure see "Type 1: Querying measured data from devices on the bus" on page 27.

Byte 0: Sequential ID no.

Byte 1-4: Floating point value = 0.20013

Byte 5: Alarm type and test type = 0x00 (no alarm)

Alarm type & test	Test ext.	0	7
	Test int.	0	6
	State	0	5
	Res.	0	4
	Res.	0	3
	Alarm	0 0 0	2 1 <b>0</b>

Byte 6: Structure of the byte: Range and unit = 0x03 (Ampere)

Range & unit	Range validity	0	7
		0	6
	State	0	5
	Unit	0	4
		0	3
		0	2
1		<b>1</b>	
1		<b>0</b>	

Byte 7-8: 0x4B = Residual current

Byte 9: 0xFF



**5.2.1.2 Example 2: Querying measured value in the event of an IRDH375 alarm**

The IRDH375 has the BMS address 3, channel 1 is queried.

An insulation fault with the measured value 5 kΩ has occurred (alarm).

**Request to the gateway**

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
ID	Msg type	System	Device	Channel	0x00	0x00	0x00	0x00	0x00	0x00
0x02	0x01	0x02	0x03	0x01	0x00	0x00	0x00	0x00	0x00	0x00

For an explanation of the protocol structure see "Type 1: Querying measured data from devices on the bus" on page 27.

- Byte 0: Sequential ID no.
- Byte 1: Message type: For this request always 0x01
- Byte 2: Subsystem address: 2
- Byte 3: BMS device address: 3
- Byte 4: Channel: 1
- Byte 5-10: Always 0x00

**Response from the gateway:**

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ID	Data value high high	Data value high low	Data value low high	Data value low low	Alarm & test	Range & unit	Description high	Description low	0xFF
0x02	0x45	0x9C	0x40	0x00	0x04	0x02	0x00	0x47	0xFF

For an explanation of the protocol structure see "Type 1: Querying measured data from devices on the bus" on page 27.

Byte 0: Sequential ID no.

Byte 1-4: Floating point value = 5000

Byte 5: Alarm type and test type = 0x04 (alarm)

Alarm type & test	Test ext.	0	7
	Test int.	0	6
	State	0	5
	Res.	0	4
	Res.	0	3
	Alarm	1 0 0	<b>2</b> 1 0

Byte 6: Structure of the byte: Range and unit = 0x02 ( $\Omega$ )

Range & unit	Range validity	0	7
		0	6
	State	0	5
	Unit	0	4
		0	3
		0	2
1 0		<b>1</b> 0	

Byte 7-8: 0x47 = Insulation fault

Byte 9: 0xFF

**5.2.1.3 Example 3: Querying IRDH375 device fault**

The IRDH375 has the BMS address 3, channel 4 is queried.

There is an "earth connection" device fault.

**Request to the gateway**

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
ID	Msg type	System	Device	Channel	0x00	0x00	0x00	0x00	0x00	0x00
0x03	0x01	0x02	0x03	0x04	0x00	0x00	0x00	0x00	0x00	0x00

For an explanation of the protocol structure see "Type 1: Querying measured data from devices on the bus" on page 27.

- Byte 0: Sequential ID no.
- Byte 1: Message type: For this request always 0x01
- Byte 2: Subsystem address: 2
- Byte 3: BMS device address: 3
- Byte 4: Channel: 4
- Byte 5-10: Always 0x00

**Response from the gateway:**

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ID	Data value high high	Data value high low	Data value low high	Data value low low	Alarm & test	Range & unit	Description high	Description low	0xFF
0x03	0x42	0xCC	0x00	0x00	0x02	0x1E	0x00	0x66	0xFF

For an explanation of the protocol structure see "Type 1: Querying measured data from devices on the bus" on page 27.

Byte 0: Sequential ID no.

Byte 1-4: Floating point value = 102 (earth connection)

Byte 5: Alarm type and test type = 0x02 (device fault)

Alarm type & test	Test ext.	0	7
	Test int.	0	6
	State	0	5
	Res.	0	4
	Res.	0	3
	Alarm	0 1 0	2 <b>1</b> 0

Byte 6: Structure of the byte: Range and unit = 0x1E (code)

Range & unit	Range validity	0	7
		0	6
	State	0	5
	Unit	1	<b>4</b>
		1	<b>3</b>
		1	<b>2</b>
0		<b>1</b>	
	0	0	

Byte 7-8: 0x66 = Earth connection

Byte 9: 0xFF

## 5.2.2 Type 2: Querying registers in devices on the bus

### 5.2.2.1 Example: Querying a register on the RCMS490-D

The RCMS490-D has the BMS address 2. The "Prewarning" menu item is queried. It has the value "50 %". A register has a size of one word.

Request to the gateway:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
ID	Msg type	System	Device	Number of registers	Address high	Address low	0x00	0x00	0x00	0x00
0x04	0x02	0x02	0x02	0x02	0x22	0x06	0x00	0x00	0x00	0x00

- Byte 0: Sequential ID no.
- Byte 1: Message type: For this request always 0x02
- Byte 2: Subsystem address: 2
- Byte 3: BMS device address: 2
- Byte 4: Number of registers: 2
- Byte 5: Register start address high byte: 0x22
- Byte 6: Register start address low byte: 0x06
- Byte 7-10: Always 0x00

Response from the gateway:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ID	Number of registers	Reg. 0 high	Reg. 0 low	Reg. 1 high	Reg. 1 low	Reg. 2 high	Reg. 2 low	Reg. 3 high	Reg. 3 low
0x04	0x02	0x42	0x48	0x00	0x00	0xFF	0xFF	0xFF	0xFF

- Byte 0: Sequential ID no.
- Byte 1: Number of registers: 2

Byte 2	Register 0 high byte: 0x42	Floating point value 50 = Prewarning 50 %
Byte 3	Register 0 low byte: 0x48	
Byte 4	Register 1 high byte: 0x00	
Byte 5	Register 1 low byte: 0x00	

- Byte 6-9: 0xFF

### 5.2.3 Type 3: Writing to registers on devices on the bus

#### 5.2.3.1 Example: Writing to a register on the RCMS490-D

The RCMS490-D has the BMS address 2. The "Prewarning" menu item is written. It has the value "50 %". The value is changed to "60 %". A register has a size of one word.

Request to the gateway:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
ID	Msg type	System	Device	Number of registers	Address high	Address low	Reg. 0 High	Reg. 0 Low	Reg. 1 High	Reg. 1 Low
0x05	0x03	0x02	0x02	0x02	0x22	0x06	0x42	0x70	0x00	0x00

- Byte 0: Sequential ID no.
- Byte 1: Message type: For this request always 0x03
- Byte 2: Subsystem address: 2
- Byte 3: BMS device address: 2
- Byte 4: Number of registers: 2
- Byte 5: Register start address high byte: 0x22
- Byte 6: Register start address low byte: 0x06

Byte 7	Register 0 high byte: 0x42	Floating point value 60 = Prewarning 60 %
Byte 8	Register 0 low byte: 0x70	
Byte 9	Register 1 high byte: 0x00	
Byte 10	Register 1 low byte: 0x00	

Response from the gateway:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ID	Number of registers	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF
0x05	0x02	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF

- Byte 0: Sequential ID no.
- Byte 1: Number of registers: 2
- Byte 2-9: 0xFF

## 6. Modbus TCP server

### 6.1 Data access using Modbus TCP protocol

Requests are sent to the Modbus TCP server in the COM465... using function code FC4 (read input register). The server generates a function-related response and sends it to the Modbus client.

#### 6.1.1 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 (response delayed)
0x06	Request not accepted (repeat request, if necessary)
0x08	Memory: parity error
0x0A	Gateway path not available
0x0B	Gateway error

#### 6.1.2 Modbus requests

The required words of the process image can be read from the input registers in the COM465... using the function code FC4. For this purpose, the start address and the number of registers to be read need 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

### 6.1.3 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)

### 6.1.4 Structure of the exception code

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

### 6.1.5 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
Not used	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



## 6.2 Modbus process image in the memory of the COM465...

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 COM465...

### 6.2.1 Querying data

#### 6.2.1.1 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.

#### 6.2.1.2 Modbus function code FC04

The process image in the memory of the COM465... 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.

#### 6.2.1.3 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
Not used	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.

## 6.2.2 Memory scheme of the process image

### 6.2.2.1 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	...
1	0x01	Device 1	
2	0x02	Device 2	
3	0x03	Device 3	
...	...	...	
32	0x20	Device 32	
...	...	...	
255	0xFF	Device 255	

Tab. 6.1: Modbus start address for each device for which a request can be sent.

### 6.2.2.2 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 page 42 and page 43 to determine the start address to query 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 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 part of the address, 0x03 (high byte), is taken from table 6.1.
2. For channel 2 the second part of the address, 0x14 (low byte), is taken from table 6.2. 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	<b>4</b>	5	6	7	8	9	A	B	C	D	E	F																			
0x00	----- Device type -----										----- Time stamp -----						C	D	R.																
<b>0x10</b>	Channel 1				<b>Channel 2</b>				Channel 3				Channel 4																						
0x20	Channel 5				Channel 6				Channel 7				Channel 8																						
0x30	Channel 9				Channel 10				Channel 11				Channel 12																						
0x40	Channel 13				Channel 14				Channel 15				Channel 16																						
0x50	Channel 17				Channel 18				Channel 19				Channel 20																						
0x60	Channel 21				Channel 22				Channel 23				Channel 24																						
0x70	Channel 25				Channel 26				Channel 27				Channel 28																						
0x80	Channel 29				Channel 30				Channel 31				Channel 32																						
0x90	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			
0xA0	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.			
0xB0	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.			
0xD0	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.			
0xE0	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.			
0xF0	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. 6.2: 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.

### 6.2.2.3 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.

### 6.2.2.4 Timestamp

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

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

### 6.2.2.5 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.

### 6.2.2.6 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				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 chapter "6.2.5".

6.2.2.7 Float = Floating point value of the channels

Word	0x00																0x01															
Byte	HiByte								LoByte								HiByte								LoByte							
Bit	31	30					24	23	22					16	15				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				

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

S = Sign

E = Exponent

M = Mantissa

6.2.2.8 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	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

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 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.

## 6.2.2.9 R&amp;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	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	True value
	0	1	X	X	X	X	X	X	True value is smaller
	1	0	X	X	X	X	X	X	True value is larger
	1	1	X	X	X	X	X	X	Invalid value

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

**Caution!**

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 page 47 or page 52. The floating point value contains an internal CODE but no valid measured value.

6.2.2.10 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 OP 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	Distribution board failure
	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 page 52.

## 6.2.2.11 Channel 33 to 64

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

The 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. This is used for coding device errors, e.g. connection faults or internal device errors.



### 6.2.3 Modbus examples to read out data

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

COM465... 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 COM465...)  
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)

### 6.2.4 Reference data records of the process image

To make it easier to check the configuration and the Modbus TCP data access to devices, the COM465... 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). At the end of this chapter, a few examples of correct configuration are given, which might be helpful.

#### 6.2.4.1 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. 6.3: 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)

#### 6.2.4.2 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				AT&T	R&U	Description	
230.0				No/No	Volt	Undervoltage	

Tab. 6.4: Reference data stored in channel 1

### 6.2.4.3 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				AT&T	R&U	Description	
12.34				No/No	Ampere	Overcurrent	

Tab. 6.5: Reference data stored in channel 2

### 6.2.4.4 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:

- 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	
<b>CORRECT</b>	<b>A 41</b>	<b>B 45</b>	<b>C 70</b>	<b>D A4</b>	<b>12.34</b>
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

### 6.2.5 Channel descriptions for the process image

Value	Measured value description alarm message operating message	Note
0		
1 (0x01)	Insulation fault	
2 (0x02)	Overload	
3 (0x03)	Overtemperature	
4 (0x04)	Failure line 1	
5 (0x05)	Failure line 2	
6 (0x06)	Insul. OP 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. OP-L	Battery-operated operating theatre light
24 (0x18)	Batt.op. OP-S	Battery-operated Sat OP 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 board short-circuit
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	

Value	Measured value description alarm message operating message	Note
40 (0x28)	Failure UPS	Battery-supported safety power supply
41 (0x29)		
66 (0x42)		
67 (0x43)	Function test till:	Date
68 (0x44)	Service till:	Date
69 (0x45)	Ins.fault locat	Insulation fault location
70 (0x46)	Peak	Fault EDS system
71 (0x47)	Insulation fault	Insulation resistance in $\Omega$
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)		
81 (0x51)	Asymmetry	
82 (0x52)	Capacitance	Measured value in F
83 (0x53)	Temperature	Measured value in $^{\circ}\text{C}$
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)	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

Value	Measured value description alarm message operating message	Note
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)		
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	

Value	Measured value description alarm message operating message	Note
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)	SwitchBackLock	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 the data of parameters, you will need data type descriptions.  
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 (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 of day
1014 (0x3F6)	Date day
1013 (0x3F5)	Date month
1012 (0x3F4)	Date year
1011 (0x3F3)	Register address (unit not displayed)
1010 (0x3F2)	Time
1009 (0x3F1)	Factor multiplication [*]

Value	Description of parameters:
1008 (0x3F0)	Factor division [/]
1007 (0x3EF)	Baud rate

**6.2.6 Modbus control commands**

Commands can be sent to BMS devices by an external application (e.g. data display 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 Umschaltseinrichtung PRC
Ext	1-99		0		
INT	1	1-150	0	3	Test changeover unit (ATICS) / Start automatischer Test Umschaltung 1->2 Ende nach der Zeit T(Test)
Ext	--	--	--	--	
INT	1	1-150	0	4	Start test generator without changeover (ATICS) / Start Test- generator ohne Umschaltung
Ext	--	--	--	--	
INT	1	1-150	0	5	Change over to line 1 (ATICS) / Umschaltung auf Leitung 1
Ext	--	--	--	--	
INT	1	1-150	0	6	Change over 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) / Sum- mer aus [für Alarmadresse] (BC)
Ext	1-99		1-192		
INT	1	1-150	1-12	10	Switch channel on (SMO481; PRC487): channel 1: Change over to line 1; channel 2: Change over 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	--	--	--	--	

### 6.2.6.1 Modbus example for control commands

#### Example: Changeover of ATICS to line 1

COM465... 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 COM465...)
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 COM465...)
10	Modbus function code 0x10 (write multiple registers)
FC 00	Start register
00 04	Number of registers

## 7. Troubleshooting

### 7.1 Malfunctions

If the COM465... causes malfunctions in the connected networks, please refer to this manual.

#### 7.1.1 What should be checked?

Check whether the COM465...

- The device is supplied with the correct supply voltage  $U_S$
- The BMS bus cable is correctly connected and terminated (120  $\Omega$ )
- The BMS address is correctly configured

Check also for the COM465DP whether

- The PROFIBUS DP cable is connected correctly and terminated (DIP switch)
- The PROFIBUS DP address is correctly configured
- The GSD file has been transferred to the PROFIBUS DP master
- The PROFIBUS DP command "Device type" to COM465DP:  
ID no., 0, BMS address of the COM465DP, 0, 20, 0, 0, 0  
produces the following correct result:  
ID no., 0, BMS address of the COM465DP, 0, 20, 201, 0, 0  
Otherwise the COM465DP is already operating incorrectly
- The PROFIBUS DP commands for COM465DP have the correct syntax

#### 7.1.2 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 chapter "3.2 Device features" as well as the COMTRAXX® manual).*

#### Frequently asked questions in the Internet

You will find FAQs on many Bender devices at:

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

## 7.2 Maintenance

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

## 7.3 Cleaning

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

## 8. Technical specifications

### 8.1 Tabular data

(\*) = Factory setting

#### Insulation coordination in acc. with IEC 60664-1/IEC 60664-3 (For 230 V variants B95061060)

Rated voltage.....	AC 250 V
Rated impulse withstand voltage/overvoltage category .....	4 kV / III
Pollution degree .....	3
Safe isolation (reinforced insulation) between .....	(A1/+, A2/-) - [(AMB, BMB), (ABMS, BBMS), (X2), (X3, X4), (PROFIBUS DP)]

#### Insulation coordination in acc. with IEC 60664-1/IEC 60664-3 (For 24 V variants B95061061)

Rated voltage.....	AC 50 V
Rated impulse withstand voltage/overvoltage category .....	0.5 kV / III
Pollution degree .....	3

#### Supply voltage

Supply voltage $U_s$ .....	See ordering data
Tolerance of $U_s$ .....	-20 . . . +15 %
Frequency range $U_s$ .....	See ordering data
Power consumption .....	See ordering data

#### Indications

LEDs:	
ON .....	Operation indicator
PROFIBUS .....	PROFIBUS DP data traffic
BCOM .....	BCOM data traffic
MODBUS .....	Modbus TCP/Modbus RTU data traffic
BMS .....	BMS data traffic
Ethernet (terminal X2) .....	Illuminates if connected to the network, flashes during data transmission

#### Memory

E-mail configurations (function module A only) and device failure monitoring .....	max. 250 entries
Individual texts (function module A only) .....	unlimited number of texts each with 100 characters
Number of data points for "third-party devices" on the 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

#### Data display

Number of pages .....	20
Background image size .....	50 kByte (scaled down if larger)
Data points (per page) .....	50 devices or channels, 150 text elements

#### 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, can always be reached via (192.168.0.254\*, 169.254.0.1)  
 Netmask ..... nnn.nnn.nnn.nnn (255.255.0.0)\*  
 Protocols (depending on function module selected) ..... TCP IP, Modbus TCP, Modbus RTU, DHCP, SMTP, NTP

**SNMP**

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

**BMS bus (internal/external)**

Interface/protocol ..... RS-485/BMS internal or BMS external (BMS internal)\*  
 Operating mode ..... master/slave (master)\*  
 Baud rate BMS ..... Internal 9.6 kbit/s  
 ..... external 19.2; 38,4; 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 ..... X1 (ABMS, BBMS)  
 Connection type ..... See connection "Push-wire terminal X1"  
 Terminating resistor ..... 120 Ω (0.25 W), can be switched on internally  
 Device address, BMS bus internal/external ..... 1 . . . 99 (1)\*

**BCOM**

Interface/protocol ..... Ethernet/BCOM  
 BCOM system name ..... (BENDER)\*  
 BCOM subsystem address ..... 1 . . . 99 (1)\*  
 BCOM device address ..... 1 . . . 99 (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

**Modbus RTU**

Interface/protocol ..... RS485/Modbus RTU  
 Operating mode ..... Master  
 Baud rate ..... 9.6 . . . 57.6 kbit/s  
 Cable length ..... ≤ 1200 m  
 Connection ..... X1 (AMB, BMB)  
 Connection type ..... See connection "Push-wire terminal X1"  
 Terminating resistor ..... 120 Ω (0.25 W), can be switched on internally  
 Supported Modbus RTU slave addresses ..... 2 . . . 247

**PROFIBUS DP (COM465DP only)**

Interface/protocol RS-485 ..... electrically isolated/PROFIBUS DP  
 Operating mode ..... Slave  
 Baud rate ..... Automatic baud rate detection: 9.6 kbit/s . . . 1.5 Mbit/s  
 ..... 9.6 / 19.2 / 93.75 / 187.5 / 500 kbit/s, 1.5 Mbit/s  
 Connection ..... Sub D 9-pin  
 Device address, PROFIBUS DP ..... 1 . . . 125 (3)\*

**Environment / EMC**

EMC ..... EN 61326-1  
 Ambient temperatures:  
 Operating temperature ..... -25 . . . +55 °C  
 Transport ..... -40 . . . +85 °C  
 Long-term storage ..... -25 . . . +70 °C

Climate classes 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
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

**Connection**

Connection type..... pluggable push-wire terminals

**Push-wire terminals**

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

**Push-wire terminal X1**

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

**Miscellaneous**

Operating mode .....	Continuous operation
Mounting position .....	Front-orientated, air must pass through cooling slots vertically
Degree of protection, internal components (IEC 60529) .....	IP30
Degree of protection, terminals (IEC 60529) .....	IP20
Snap-on mounting on a DIN rail .....	IEC 60715
Screw mounting .....	2 x M4
Type of enclosure .....	J460
Enclosure material .....	Polycarbonate
Flammability class .....	UL94V-0
Dimensions (W x H x D) .....	107.5 x 93 x 62.9 mm
Software version .....	D472
Documentation number.....	D00216
Weight .....	≤ 240 g



( )\* = Factory setting

**8.2 Standards, approvals and certificates**

Certification by the PROFIBUS Nutzerorganisation e.V. (PNO) is available.  
 PROFIBUS conformity: Z02007



### 8.3 Ordering data

Type	Application	Supply voltage/ Frequency range $U_S$	Power consumption	 	Art. no.
COM465DP-230V	Condition Monitor with an integrated gateway: Bender system / PROFIBUS DP / Ethernet	AC/DC 24...240 V 50...60 Hz	$\leq 9.6 \text{ VA} / \leq 4 \text{ W}$	Approval available	B 9506 1060
COM465DP-24V		DC 24 V	$\leq 3 \text{ W}$		B 9506 1061
COM465IP-230V	Condition Monitor with an integrated gateway: Bender system / Ethernet	AC/DC 24...240 V 50...60 Hz	$\leq 9.6 \text{ VA} / \leq 4 \text{ W}$		B 9506 1065
COM465IP-24V		DC 24 V	$\leq 3 \text{ W}$		B 9506 1066

#### Function modules

Function module (software licence)	Application	Art. no.
Function module A	Individual texts for devices/channels, device failure monitoring, e-mail in the event of an alarm, documenting the device, documenting the system	B 7506 1011
Function module B	Modbus TCP server for max. 98 * 139 BMS nodes as well as BCOM devices and universal measuring devices, SNMP server	B 7506 1012
Function module C	Parameter setting for BMS devices as well as BCOM and universal measuring devices, generating and importing backup files	B 7506 1013
Function module D	Visualisation of Bender systems, system visualisation	B 7506 1014
Function module E	Virtual devices	B 7506 1015
Function module F	Integrating third-party devices	B 7506 1016



# INDEX

## A

Address 24

## B

BMS device address assignment on the  
Modbus 42  
Byte offset 51  
Byte or word swapping 51

## C

Claims under the warranty 60  
Connection 20  
- BMS 21  
- PROFIBUS DP 22  
Connection, preliminary considerations  
19

## D

de-energised 11  
Displays and controls 18  
Disposal 10

## E

Exception code 39

## F

Factory settings 24  
FTC470XDP  
- as BMS master 26

## G

GSD file 24

## I

Installation and connection 19  
Installation, preliminary considerations  
19  
Intended use 11

## L

Loading GSD file from the web site 13

## M

Malfunctions 59  
Manual 7  
Measured value descriptions for the pro-  
cess image, list 52  
Memory image of a BMS device 43  
Memory scheme of the process image 42  
Modbus  
- address structure for BMS devices  
40  
- control commands 56  
- function code 41  
- Process image 41  
- requests 39  
- responses 40

## P

Process image 42  
Programming examples 31

## Q

Qualified personnel 7, 11, 20

## R

Reference data records of the process im-  
age 50  
Repair 8

## S

Service 8  
Sketch with dimensions 64  
Storage 10  
Support 8

## T

Training courses 9

## U

UL applications 21  
Update 8

## W

WEEE directive 10

Workshops 9







**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](mailto:info@bender.de) • [www.bender.de](http://www.bender.de)

Fotos: Bender Archiv.



**BENDER Group**