**BENDER**
The Power in Electrical Safety©

**Operating Manual**



# COM461MT

BMS Ethernet gateway for the connection
of Bender devices with BMS support
to Ethernet (TCP/IP)
using the Modbus/TCP protocol
Software version: D402 V1.0x

# Table of Contents

# 1. Making effective use of this document

## 1.1 How to use this manual

**This operating manual is aimed at qualified experts in electrical engineering and communications technology!**

To make it easier for you to understand and revisit certain sections of text and instructions in the manual, we have used symbols to identify important instructions and information. The meaning of these symbols is explained below:

*Information calling attention to hazards are marked with this warning symbol.*

*Information intended to assist the user to make optimum use of the product are marked with the Info symbol.*

## 1.2 Overview of chapters

- Making effective use of this document:
  This chapter gives you instructions on how to use this documentation
- Safety instructions:
  This chapter describes the dangers during installation and when operating the device
- Product description:
  This chapter describes the scope of delivery and features of the product

- Installation, connection and commissioning:
  This chapter shows the steps to take up to commissioning
- The BMS-Ethernet gateway COM461MT:
  This chapter describes the display and operating elements
- Data access using Modbus/TCP protocol:
  Describes how to send requests to the Modbus/TCP server in the
  COM461MT and how the responses are to be interpreted
- Modbus process image in the COM461MT's memory:
  In this chapter, the representation of BMS data on Modbus/TCP struc-
  tures is described in detail
- Technical data:
  In addition to the technical data you will find here ordering data
- Troubleshooting:
  This chapter offers service and support in case of malfunction. In addi-
  tion you will also find here information on our Technical Service
  department
- Index:
  The key word index assists you in finding the term you are searching
  for.

## 1.3   Quick reference guide

### Connection of the COM461MT

If you are familiar with the installation and connection of electrical devices as
well as networking, particularly with Ethernet, you can start right away with
the wiring diagram on page 17.

It may also be helpful to refer to block diagrams representing an application
example with an internal bus on page 14.

### Using the Modbus/TCP functions

Information about this complex field can be found from page 25.

# 2. Safety instructions

## 2.1 Work activities on electrical installations

- Only skilled persons are permitted to carry out the work necessary to install, commission and run a device or system.
- Compliance with applicable regulations governing work on electrical installations, and with the regulations derived from and associated with them, is mandatory. EN 50110 is of particular importance in this regard.

> ⚠ *Any work on electrical installations which is not carried out properly can lead to death and injury!*

- 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. European standard EN 50110 can be used as a guide.

## 2.2 Intended use

The BMS-Ethernet gateway COM461MT connects the serial BMS bus to Ethernet TCP/IP networks. The gateway converts alarms, measured values and statuses from the BMS bus to the Modbus/TCP protocol. This allows connection to Modbus networks.

The gateway is operated on the **internal** BMS bus.

## 2.3   Address setting and termination

In order to ensure proper functioning of the BMS-Ethernet gateway COM461MT, correct address assignment and termination of the BMS bus is of utmost importance.

> ⚠️ *Assigning addresses that are already used by existing devices in the BMS or TCP/IP networks concerned may cause serious malfunctions.*

Ensure correct address setting and termination of the COM461MT.
For details refer to the chapter basic configuration from page 19.

## 2.4   Protection against  unauthorized access

> ⚠️ **Risk of damage to equipment due to unauthorized access.**
> *Attackers from the Internet may be able to read data and to change settings.*
> *It is absolutely necessary to ensure that*
> *- the network is separated from the Internet*
> *- common security mechanisms are applied*
>   *(firewall, VPN access)*

# 3. Product description

## 3.1 Scope of supply

You will receive:
- the COM461MT
- an operating manual

## 3.2 A short description

The BMS-Ethernet gateway COM461MT contains a Modbus/TCP server that converts the BMS data for a Modbus client.
A web server makes it possible to configure the COM461MT (see "Commissioning" on page 19).

**Ethernet-TCP/IP interface:**
The coupling is performed via the internal Layer-2 switch. Two Ethernet ports are available.

**Interface on the BMS side:**
COM461MT can be operated as a master or slave.

## 3.3 Properties

- Setting of the IP address, BMS address and time/date using standard web browser
- Time synchronisation for all BMS bus devices
- Integrated Ethernet switch: 2 x RJ45, 10/100 Mbit/s
- Operation on the internal BMS bus
- Modbus/TCP data access to the internal BMS bus, max. 150 BMS devices
- Commands can be sent from an external application (e.g. data display software) to BMS devices and measured values read.

## 3.4   Possible applications

- Usage of professional data display programs by converting the BMS data to the Modbus/TCP protocol
- Observing and analysing Bender products that support communication, such as RCMS, EDS and MEDICS® systems

# 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 COM461MT yourself.* ***Otherwise please contact your EDP administrator!***

## 4.1 Preliminary considerations

1. Have all the questions as regards the installation been answered by the technician responsible for the installation?
2. The device is operated on the internal BMS bus. Is the BMS address to be set known?
   If, apart from the COM461MT, an alarm indicator and test combination MK800 is connected to the internal bus, the COM461MT must **not** have the address 1 (master).
   You will find more detailed information on the BMS topic, in particular about the wiring of bus devices, in the separate document "BMS bus". You can download the document from the download area of the website `www.bender.de`.
3. Request network data from the technician responsible for the installation. The IP address and subnet mask are to be set manually.
4. Ask for the IP address of the NTP server, which is required for automatic time setting.
5. Are suitable PC hardware and software available for commissioning? - Minimum system requirements: 1.6-GHz processor/512 MB RAM / Windows XP/Vista/7/Web browser.

For initial connection, the basic configuration of the COM461MT is to be undertaken outside the installation, depending on the specific situation.

## 4.2  COM461MT on the internal BMS bus

Bender systems such as EDS46x/49x, RCMS46x/49x and MEDICS® communicate with each other via the Bender measuring device interface BMS. The BMS-Ethernet gateway COM461MT provides the coupling between the BMS bus and TCP/IP networks. The internal Modbus/TCP server in the COM461MT communicates with the Modbus/TCP client via these networks. The following block diagram illustrates the operation of the gateway on the internal BMS bus.

> *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 BMS-Ethernet gateway COM461MT can only communicate via the internal BMS bus (BMS i).*
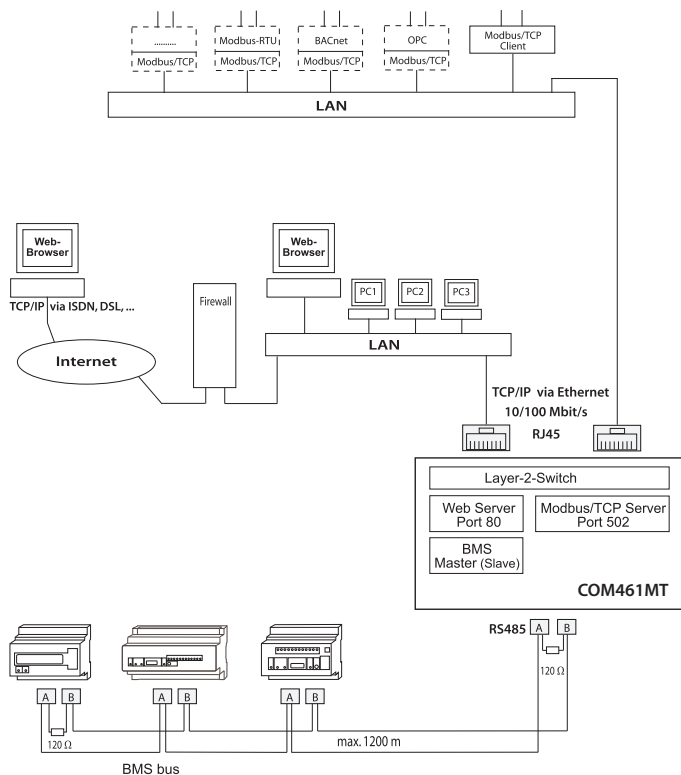
Fig. 4.1: Block diagram of a coupling between an **internal** BMS bus and TCP/IP networks

## 4.3   Installing the device

Possible methods of mounting:
- DIN rail mounting
- Screw mounting with 2 x M4 (dimension diagram on page 61)

*When 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.*

## 4.4 Connecting the device

For UL applications, the following is to be observed:

- – Supply voltage $U_s$ see nameplate and ordering data
- – Maximum ambient temperature 55 °C
- – For use in pollution degree 2 environments
- – Only 60/75 °C copper wires are to be used
- – Tightening torque for terminals 0.5…0.6 Nm

Connect the terminals and sockets on the COM461MT according to the wiring diagram.
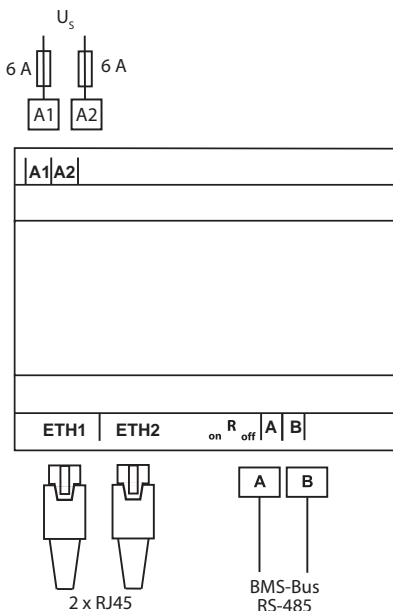
| Terminal | Description |
|---|---|
| **A1, A2** | Connection to the supply voltage, 6 A fuse recommended, two-pole fuses should be used on IT systems.<br>For UL and CSA applications, it is mandatory to use 5 A fuses |
| **ETH1, ETH2** | Two connections for connection to a personal computer or to the local network (hub, switch, router);<br>Connection using a CAT5 cable; internal Layer-2 switch with cable autodetect. |
| **A, B** | Connection to the internal BMS bus with shielded cable (e.g. J-Y(St)Y 2x0.8) |
| **$R_{on/off}$ (A,B)** | Switch for BMS bus termination. When the device is installed at the end of the bus, set the terminating switch to "on". |

## 4.5   Commissioning

1. Apply the supply voltage to the COM461MT. The green "ON" LED illuminates.
2. Connect the COM461MT to a PC and open a web browser.
3. Enter the IP address for the COM461MT (factory setting 192.168.0.254). The page for the device settings appears:

⚠️ *Without address data it is not possible to access the device.*

*If the IP address and subnet mask are not known, this information can only be found with a large amount of effort (see "Determining address data" on page 22).*

*If the factory settings are changed, **always** note the modified address data in the following table.*

4. Make the necessary settings. Make a note of the modified settings:

| Para-meter | Meaning | Factory setting | Modified setting |
|---|---|---|---|
| IP address | IP address of the COM461MT | 192.168.0.254 | |
| Subnet | Subnet mask of the COM461MT | 255.255.0.0 | |
| Bms address | Address on the internal BMS bus | 2 | |
| Modbus control | Enable or disable control via Modbus | On | |
| Ntp-Server address | IP address of the NTP server, is required for automatically setting the time | 192.168.0.123 | |
| UTC | Time zones setting (-12…+13):<br>UTC + 1 h = CET<br>UTC + 2 h = …<br>UTC + 3 h = … | +1 | |

| Para-meter | Meaning | Factory setting | Modified setting |
|---|---|---|---|
| Summer-time | Select summer time set-ting:<br>Off = Function disabled<br>DST = Automatic switchover, USA, CDN<br>CEST = Automat. switcho-ver, Central Europe<br>On = Set time zone + 1 h | Off | |
| Date | Date | | |
| Time | Time of day | | |
| skip time | Skip time setting. The time remains unchanged. | ☑ | |

5. Click "Change" to save the modified settings. Or click "Undo" to undo the changes made.

### 4.5.1   Determining address data

The IP address and subnet mask set must be known for the operation of the COM461MT. If these data have been changed without making a note of the modified address data, the following options are available:

- Enter NetBIOS name in the web browser: "http://com461mt" or "com461mt" (dependent on the browser). Requirement: COM461MT and PC must lie in the same address range.
- Connect a COM460IP with option C to the network. Set address data again using COM460IP.
- Connect a COM460IP with option A to the network. Read address data using COM460IP.
- Install an IP scanner on a PC in the network and find address.
- Have COM461MT reset to the factory setting by Bender.

# 5. The BMS-Ethernet gateway COM461MT

## 5.1 Display and operating elements
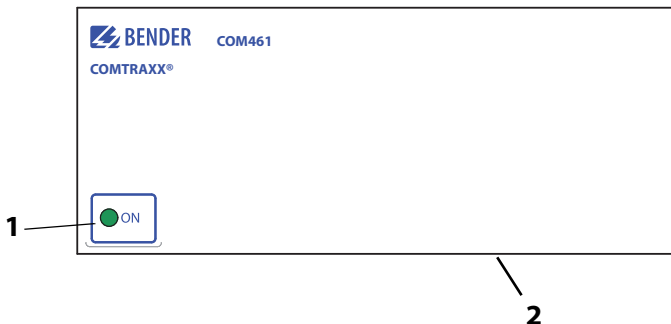


*Fig. 5.1: COM461MT front panel*

| Key | |
|---|---|
| **1** | "ON" LED lights when supply voltage is applied |
| **2** | Ron/off (beside terminals A, B)<br>Switch for terminating the BMS bus. When the device is installed at the end of the bus, set the terminating switch to "on". |

# 6. Data access using Modbus/TCP protocol

Requests are sent to the Modbus/TCP server in the COM461MT using function code FC4 (read input register). The server generates a function-related response and sends it to the Modbus client.

## 6.1 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 |

## 6.2   Modbus requests

The required words of the process image can be read from the input registers in the COM461MT 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 | 0x01 |
| Byte 7 | MODBUS function code | 0x04 |
| Byte 8, 9 | Device address (BMS int * 0x100) | 0x0100 (corresponds to the internal BMS address 1), internal BMS bus address assignment |
| Byte 10, 11 | Number of words | 0x0002 |

## 6.3   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 | Name | Example |
|------|------|---------|
| Byte 9, 10 | Value register 0 | 0x1234 (fictitious value) |
| Byte 11, 12 | Value register 1 | 0x2345 (fictitious value) |

## 6.4 Structure of the exception code

| Byte | Name | Example |
|------|------|---------|
| … | … | … |
| Byte 7 | MODBUS function code | 0x84 |
| Byte 8 | Exception code | 0x01 or 0x02 |

## 6.5 Modbus address structure for BMS devices

| Function | Address range | Number of bytes | Number of words |
|----------|---------------|-----------------|-----------------|
| Device name | 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 |

# 7. Modbus process image in the memory of the COM461MT

The device holds a process image in the memory. This image represents the current statuses and values of up to 150 BMS devices for each monitored internal BMS bus.

## 7.1 Requesting data

### 7.1.1 Modbus function code

The memory in the COM461MT can be read using the Modbus function 4 "Read input registers". The volume of the data requested depends on the number of bytes selected in the Modbus client used. Up to 125 words (0x7D) can be read with a single request. An individual addressable byte, such as the set bit for a stored common alarm, can also be read.

### 7.1.2 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 is described below.

## 7.2    Memory scheme of the process image

### 7.2.1    BMS device address assignment on the Modbus

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

| BMS device address | Modbus address ranges of the process images in the memory | | | |
|---|---|---|---|---|
| | **Word** | | | |
| | **HiByte** | **LoByte** | | |
| | | **00** | **…** | **FF** |
| 1 | 0x**01** | Device 1 | | |
| 2 | 0x**02** | Device 2 | | |
| 3 | 0x**03** | Device 3 | | |
| … | … | … | | |
| 32 | 0x**20** | Device 32 | | |
| … | … | … | | |
| 150 | 0x**96** | Device 150 | | |

*Tab. 7.1: Modbus start address for each BMS device for which a request can be sent.*

## 7.2.2 Memory scheme of an individual BMS device

BMS 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 30 and page 33 to determine the start address to request the following device parameters:

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

Example:

In our example, data is to be requested from channel 2 of the device with BMS address 3. How is the start address determined to send the request for the channel? In our example, the relevant cells in the table are marked bold.

1. For BMS device address 3 the first part of the address, 0x03 (high byte), is taken from Table 7.1.
2. For channel 2 the second part of the address, 0x14 (low byte), is taken from Table 7.2. 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 BMS device** | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LoByte** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **A** | **B** | **C** | **D** | **E** | **F** |

| LoByte | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0x00 | ------------------------- Device type ------------------------- | | | | | | | | | | ---- Timestamp ---- | | | | C D | R. |
| 0x10 | Channel 1 | | | | Channel 2 | | | | 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. |
| 0xB0 | 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. |

| 0x**D0** | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0x**E0** | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. |
| 0x**F0** | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. | R. |

*Tab. 7.2: Modbus address assignment of the channels in a BMS 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 name, timestamp etc.
is given below.

### 7.2.3    Device name

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

The device name is set using a BMS bus scan.

### 7.2.4 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 | Re-served |

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

### 7.2.5 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 BMS device is detected.
The device error bit is set when communication with the respective BMS device is no longer possible.

### 7.2.6 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 BMS 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 7.4.

### 7.2.6.1 Float = Floating point value of the BMS 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 M M M M | |

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

S = Sign

E = Exponent

M = Mantissa

### 7.2.6.2 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 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.

### 7.2.6.3    R&U = Range and unit

| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Meaning |
|-----|---|---|---|---|---|---|---|---|---------|
| | 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 |
| Unit | 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 |

| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Meaning |
|---|---|---|---|---|---|---|---|---|---|
| **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 39 or page 45. The floating point value contains an internal CODE but no valid measured value.

### 7.2.6.4 Channel description

Word: 0x03

| Meaning | decimal | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | LoByte | | | | | | | | HiByte | | | | | |
| Reserved | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Insulation fault | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Overload | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Overtemperature | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Failure line 1 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Failure line 2 | 5 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Insulation OP light | 6 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reserved | 7 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Failure distribution board | 8 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oxygen | 9 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vacuum | 10 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Anaesthetic gas | 11 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Compressed air 5 bar | 12 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

Bit (bottom-left label): Alarms and warnings

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 45.

### 7.2.6.5    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 BMS 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.

## 7.3 Reference data records of the process image

To make it easier to check the configuration and the Modbus/TCP data access to BMS devices, COM461MT provides a reference data record at the **virtual** BMS address 0.

> *A real BMS device cannot have BMS 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.

### 7.3.1 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 BMS device address 0.

| Virtual BMS device address | **Modbus addresses for reference data record** | | | | |
|---|---|---|---|---|---|
| | **Word** | LoByte | | | |
| | | **00** | **0E** | **10** | **14** |
| 0 | HiByte 0x**00** | Device type | Common alarm | Channel 1 | Channel 2 |

*Tab. 7.3: Start addresses for the reference data record request*

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)

### 7.3.2 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. 7.4: Reference data stored in channel 1*

### 7.3.3 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. 7.5: Reference data stored in channel 2*

### 7.3.4 Explanation of how to access floating point values

The test value 12.34 can be read out via Modbus/TCP using Modbus function 4 at the address 0x0014. The test value has a size of 2 words.

Proceed as follows:

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

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

| Hex value sequence | Word 1 | | Word 2 | | Floating point value |
|---|---|---|---|---|---|
| | Byte 1 | Byte 2 | Byte 3 | Byte 4 | |
| **CORRECT** | **A**<br>**41** | **B**<br>**45** | **C**<br>**70** | **D**<br>**A4** | **12.34** |
| Word swap-ping | C<br>70 | D<br>A4 | A<br>41 | B<br>45 | 4.066E+29 |
| Byte swapping | B<br>45 | A<br>41 | D<br>A4 | C<br>70 | 3098.27 |
| Word and byte swapping | D<br>A4 | C<br>70 | B<br>45 | A<br>41 | -5.21E-17 |

## 7.4   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. fault OP 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 | |

| Value | Measured value, description alarm message, operating message | Note |
|---|---|---|
| 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 | Failure normal power supply |
| 26 (0x1A) | Fail.safet.supply | Failure safety power supply |

| Value | Measured value, description alarm message, operating message | Note |
|---|---|---|
| 27 (0x1B) | Failure UPS | Failure additional power supply |
| 28 (0x1C) | Ins.safety supply | |
| 29 (0x1D) | Fail.N conductor | |
| 30 (0x1E) | Short distr.panel | Short-circuit distribution panel |
| 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 by: | Date |
| 68 (0x44) | Service by: | 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 |

| Value | Measured value, description alarm message, operating message | 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 |
| | | |

| Value | Measured value, description alarm message, operating message | Note |
|---|---|---|
|  |  |  |
| 97 (0x61) | Service code | Information about service intervals |
|  |  |  |
|  |  |  |
| 101 (0x65) | Mains power connection |  |
| 102 (0x66) | Earth connection |  |
| 103 (0x67) | Short CT | CT short-circuit |
| 104 (0x68) | No CT connected |  |
| 105 (0x69) | Short temp.sensor | Short-circuit temperature sensor |
| 106 (0x6A) | Temp.sensor open. | Connection temperature sensor |
| 107 (0x6B) | K1 | Fault contactor K1 |
| 108 (0x6C) | K2 | Fault contactor K2 |
| 109 (0x6D) |  |  |

| Value | Measured value, description alarm message, operating message | Note |
|-------|-------------------------------------------------------------|------|
| 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 | |

| Value | Measured value, description alarm message, operating message | Note |
|---|---|---|
| 126 (0x7E) | Q1 | Fault |
| 127 (0x7F) | Q2 | Fault |
| 128 (0x80) | No Master | |
| 129 (0x81) | Device error | |
| 130 (0x82) | | |
| 131 (0x83) | Fault RS-485 | |
| 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 |

| Value | Measured value, description alarm message, operating message | Note |
|---|---|---|
| 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) | | |

| Value | Measured value, description alarm message, operating message | Note |
|---|---|---|
| 209 (0xD1) | | |
| 210 (0xD2) | Line AV on | |
| 211 (0xD3) | Line SV on | |
| 212 (0xD4) | Line UPS on | |
| 213 (0xD5) | Channel disabled | |
| 214 (0xD6) | SwitchBackLock | Switching back interlocking function active |
| 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.<br>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 |
| 1014 (0x3F6) | Date day |
| 1013 (0x3F5) | Date month |
| 1012 (0x3F4) | Date year |
| 1011 (0x3F3) | Register address (unit not displayed) |
| 1010 (0x3F2) | Time |

| Value | Description of parameters: |
|---|---|
| 1009 (0x3F1) | Factor multiplication [*] |
| 1008 (0x3F0) | Factor division [/] |
| 1007 (0x3EF) | Baud rate |

## 7.5 Modbus control commands

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

Control via Modbus can be enabled or disabled on the "Settings" browser menu.

**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 there is no external BMS bus, enter value "1" in this register.
- If a BMS channel number is not required, enter value "0" (zero) in this register.

Reading register:
- To read use function code 0x04 "Read Input Registers".

Possible response in register "Status":

| 0 | Busy | Command is being processed. |
|---|---|---|
| 1 | Error | An error has occurred. |
| 2 | Ready | Command has been processed successfully. |

Control commands for the internal BMS bus

| Register Ext | Register Int | Register Channel | Register Command | Function |
|---|---|---|---|---|
| 1 | 1-150 | 0 | 1 | Test Isometer |
| 1 | 1-150 | 0 | 2 | Test changeover device PRC |
| 1 | 1-150 | 0 | 3 | Start automatic test changeover 1->2, end after time T(test) |
| 1 | 1-150 | 0 | 4 | Start test generator without changeover |
| 1 | 1-150 | 0 | 5 | Switchover to line 1 |
| 1 | 1-150 | 0 | 6 | Switchover to line 2 |
| 1 | 0 | 0 | 7 | RESET alarm (broadcast) |
| 1 | 0 | 0 | 8 | RESET alarm EDS (broadcast) |
| 1 | 1-150 | 0 | 9 | Buzzer off [for alarm address] (BC) |
| 1 | 1-150 | 1-12 | 10 | Switch on relay/ switch |
| 1 | 1-150 | 1-12 | 11 | Switch off relay/ switch |

# 8. Technical data

( )* = Factory setting

## 8.1 Tabular data

**Insulation co-ordination according to IEC 60664-1**

Rated voltage ................................................................................................................................ AC 250 V

Rated impulse voltage/pollution degree ........................................................................................ 4 kV/3

**Supply voltage**

Supply voltage $U_s$ ................................................................................................. See ordering data

Frequency range $U_s$ ........................................................................................... See ordering data

Power consumption ........................................................................................................ See ordering data

**LED indicators**

2 x Ethernet ETH1, ETH2 act/link...... Illuminates when connected to the network, flashes during data transmission

ON .................................................................................................................................. Operation indicator

**Interfaces**

BMS bus internal:

Interface/protocol ..................................................................................... RS-485/BMS bus internal

Operating mode ........................................................................................... Master/slave (slave)*

Baudrate BMS internal ............................................................................................................ 9.6 kBit/s

Cable length ..................................................................................................................... ≤ 1200 m

Cable, twisted pair, shielded, shield connected to PE ........................................................ J-Y(St)Y 2x0.8

Connection, BMS internal ............................................................................................... Terminals A, B

Terminating resistor ............................................................................................... 120 $\Omega$ (0.25 W)

Device address, BMS bus internal ......................................................................... 1...99 (2)*

Ethernet:

Connection ..................................................................................................................... 2 x RJ45

Data rate .......................................................................................... 10/100 Mbit/s, autodetect

IP address .................................................................. nnn.nnn.nnn.nnn (192.168.0.254)*

Subnet mask .................................................................. nnn.nnn.nnn.nnn (255.255.0.0)*

Protocols ................................................................................. TCP/ IP, Modbus/TCP, NTP

**General data**

EMC ............................................................................................................................ EN 61326-1

Climate classes acc. to IEC 60721:

Stationary use .............................................................................................................. 3K23

Transport ..................................................................................................................... 2K11

Long-term storage ......................................................................................................... 1K22

Operating temperature ........................................................................................ -10 . . . +55 ℃

Mechanical conditions acc. to IEC 60721:

Stationary use .............................................................................................................. 3M11

Transport ....................................................................................................................... 2M4

Long-term storage ......................................................................................................... 1M12

Operating mode ............................................................................................... Continuous duty

Mounting position ............................................................................................ Display oriented

**Connection**

Connection type ............................................................................................... Screw terminals

Connection properties:

Rigid/flexible ........................................................ 0.2 . . . 4/0.2 . . . 2.5 mm$^2$ (AWG 24 . . . 12)

Multi-conductor connection (2 conductors with the same cross-section):

Rigid/flexible ......................................................................... 0.2 . . . 1.5/0.2 . . . 1.5 mm$^2$

Stripped length ......................................................................................................... 8 . . . 9 mm

Tightening torque ................................................................................................. 0.5 . . . 0.6 Nm

Degree of protection, internal components (IEC 60529) ...................................................... IP30

Degree of protection, terminals (IEC 60529) .................................................................... IP20

Type of enclosure .......................................................................................................... X460

Screw fixing.............................................................................................................. 2 x M4

Snap-on mounting on a DIN rail .............................................................................. IEC 60715

Flammability class ..................................................................................................... UL94V-0

Software version ................................................................................................. D402 V1.0x

Weight ................................................................................................................... ≤ 310 g

( )* = Factory setting

## 8.2   Dimension diagram
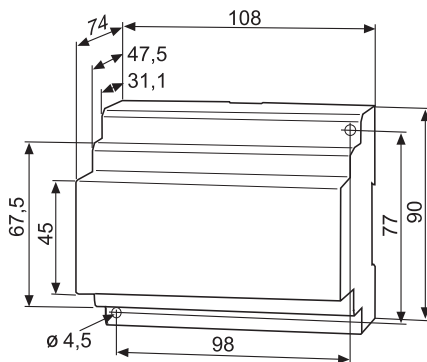


## 8.3   Standards, approvals, certifications



For information on UL applications refer to page 17.

**Other interface protocols**
Connection to control system and/or PLC via OPC, BACnet or other protocols on request.

## 8.4   Ordering data

| Type | Supply voltage/ frequency range $U_S$ | Power con-sumption | Lloyd's Register TYPE APPROVED / c UL us LISTED | Item no. |
|---|---|---|---|---|
| COM461MT BMS-Ethernet gateway | AC/DC 76…276 V */ AC 42…460 Hz/DC<br><br>For UL applications:<br>$U_S$ AC=76…250V, 40…150 mA, 42…460 Hz<br>$U_S$ DC = 76…250 V, 10…35 mA | 3.5…40 VA/ 2.4 W | UL listed: Approval available<br><br>Lloyds register: Approval available | B 9506 1021 |

*Absolute values

# 9. Troubleshooting

## 9.1 Damage in transit

If you find transport damage on receipt of the delivery, have this damage confirmed by the delivery agent on handover. In case of doubt, please contact:
Bender GmbH & Co.KG
Londorfer Strasse 65
35305 Gruenberg, Germany
+49 6401 807-0

## 9.2 Malfunctions

If the COM461MT causes malfunctions in the connected networks, please refer to this operating manual.

### 9.2.1 What should be checked?

Check whether …

- The device is supplied with the correct supply voltage
- The BMS bus cable is correctly connected and terminated (120 Ω)
- The appropriate Ethernet cable (RJ45) is correctly connected
- The BMS address is correctly set
- The IP address is correctly set
- The "Settings" page on the COM461MT web server can be opened using a web browser
- The network parameters are correctly set, as a minimum the IP address and subnet mask

### 9.2.2   Where do you go to get help?

If, despite thorough study of the technical manual and intensive trouble-shooting in your installation, you cannot rectify the fault related to the BMS-Ethernet gateway COM461MT, please contact our Service department:

**Tel.:**         **+49 6401 807-760 or 0700BENDERHELP**
**Fax:**         **+49 6401 807-259**
**E-mail:**    **support@bender.de**

# INDEX

**BENDER**