# Manual


CONFIGURATION

INSTALLATION

SETUP

COMMUNICATION

TECHNICAL DATA

# Manual

**Zone 1/21**

- **BEx1-PNIO 8AI-8AO-8DI-8DO** **Type: 14200100**
- **BEx1-PNIO 16DI-16DO** **Type: 14200101**
- **BEx1-PNIO 32DI** **Type: 14200102**

**Zone 2 /22**

- **BEx2-PNIO 8AI-8AO-8DI-8DO** **Type: 24200100**
- **BEx2-PNIO 16DI-16DO** **Type: 24200101**
- **BEx2-PNIO 32DI** **Type: 24200102**

**Zone 1/21**

- **BEx1-Modbus 8AI-8AO-8DI-8DO** **Type: 14200300**
- **BEx1-Modbus 16DI-16DO** **Type: 14200301**
- **BEx1-Modbus 32DI** **Type: 14200302**

**Zone 2 /22**

- **BEx2-Modbus 8AI-8AO-8DI-8DO** **Type: 24200300**
- **BEx2-Modbus 16DI-16DO** **Type: 24200301**
- **BEx2-Modbus 32DI** **Type: 24200302**

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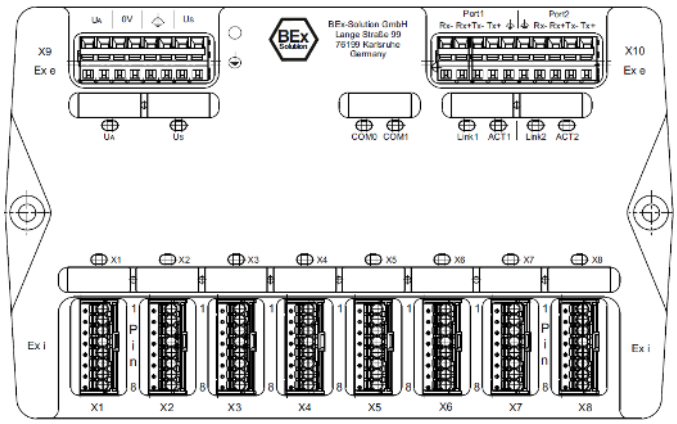


The original manual is written in German. All other available languages are translations of the original manual. Note: The image picture on the title page is an example of the BEx1

Reservation: We reserve the right to make technical changes. Changes, errors or misprints do not constitute a claim for damages.

# Content

# 1 Important Notes

## 1.1 Designated Use

BEx1 module can be installed in hazardous areas of Zone 1/21 and the BEx2 module can be installed in hazardous areas of Zone 2/22.

For special conditions see chapter 13.

Read this manual carefully before starting the equipment and keep it in a place that is accessible at any time for all users. The products described in this manual were developed, manufactured, tested, and documented under strict compliance with safety standards. The equipment poses no danger to operating personnel or material if the handling instructions are complied with. The EU Declaration of Conformity contains the requirements and guidelines that the module fulfills. Trouble-free and safe functioning of the product can only be assured through proper transportation, storage, installation, assembly, and operation with proper care and attention.

## 1.2 Safety Instructions

BEx module may only be operated in a clean, undamaged condition and may only be deployed within the specified temperature class and the temperature range indicated for it (see type label). The assembly/dismantling of the regulating and control components must be conducted by qualified personnel authorised and trained to install electrical components in potentially explosive areas. The use in areas other than those specified or alteration of the product releases BEx-Solution from liability for defects and further liability. Modifications and changes to the module are not permitted. The generally applicable statutory regulations and other binding guidelines on occupational health and safety, on accident prevention and on environmental protection must be complied with.

## 1.3 Danger, Warning and Note Symbols

This manual contains important information that has to be observed in order to guarantee safety and avoid material damage. This information is specially marked and illustrated as follows:

**CAUTION**

The hazard warning symbol refers to instructions that if not observed, may cause damage to equipment and other objects or, if appropriate precautions are not taken, may result in danger to the user's health or life.

**REMARK**

This symbol refers to important technical information


**RECOMMENDATION**

Notes with this symbol are recommendations of BEx-Solution GmbH

# 2 Configuration

## 2.1 Power Supply

The max. power consumption is 450 mA for the module and sensors supply and 300 mA for the actuators supply at 24V. The power supply is connected to the module via Ex e input terminal X9. The module is provided with safe galvanic isolation so that intrinsically safe sensors/actuators can be connected to the IO terminals X1-X8.

**Two independent voltages can be connected (sensor and actuator voltage are separated, with common ground). Thus, a central shutdown of the actuators take place**

**It must be ensured that the supply voltage - measured at the farthest module does not fall below 18 V DC. At a voltage below 18 V DC, the module switches off**

## 2.2 Cable Cross Sections

All terminals on the module are cage clamp terminals (CAGE CLAMP®). The max. Cable cross-section at X9 (supply) and X10 (bus) is 2.5 mm² and for X1-X8 (sensors and actuators) 1.5 mm².

## 2.3 Cable Selection

### 2.3.1 Power Supply

Regarding voltage drop the max cable length and cable cross-section must be taken for the power supply cable. A core-cable for fixed installation (max 2.5 mm²) is required.

### 2.3.2 Ethernet

The maximum segment length for electrical data transmission with copper lines between two nodes (field devices or switches) is 100 m. The copper cables should be made uniform in AWG 22. The cable type A should be used. Standard fixed, no movement after installation.

### 2.3.3 Sensors and Actuators

Due to intrinsic safety, connecting cables should have the color light blue. A two core-cable for fixed installation (max 1.5 mm²) is required. Shielded cable should be used for the analog signals.

## 2.4 Electromagnetic Compatibility (EMC)

CE

The EU Declaration of Conformity contains the requirements and guidelines that the module fulfills.

The devices described in this manual each meet the relevant standards for electromagnetic compatibility. However, this does not mean that their electromagnetic compatibility is still guaranteed when installed in a plant or machine.
For this reason, we urgently advise you to comply with the instructions on installation in accordance with EMC requirements below. Only then can you assume that the overall system complies with EMC requirements, provided CE-marked components are used exclusively.

**The device is Class A equipment. It may cause radio-frequency interferences in residential areas. In this case, the operator may be required to implement adequate countermeasures.**

## 2.5 Grounding

The equipotential bonding connection point ⏚ at the module must be connected to the equipotential bonding conductor in the hazardous area. Cable cross-section at least 4mm².

## 2.6 Voltage Drops

Short-term voltage drops normally do not pose operational problems as the electronics are protected by capacitors integrated in the power circuits. This does not apply to the power supply of the sensors and actuators connected to the module. Their high-power requirement cannot be covered by the capacitors integrated in the device. For this reason, even transient interruptions of the actuator supply can result in undesirable switching operations. Longer interruptions of the sensor supply may cause changes of the input signal.

# 3 Description

The BEx module is a Remote IO system that is installed as an interface in zone 1/2 or 21/22 in the hazardous area between the intrinsically safe signals from zone 0/20 (sensors/actuators) and the external PLC in the safe area. The system is used to transmit input-output signals via a bus system. With BEx module it is possible to connect up to 32 intrinsically safe signals via short cable routes directly to the integrated input/output (IO) module. All signals are combined in the BEx module and digitized via the integrated bus coupler. The data transfer takes place via a four-wire bus cable to the controller.

Isolating amplifier as well as analog and digital IO modules are no longer necessary in the safe area.

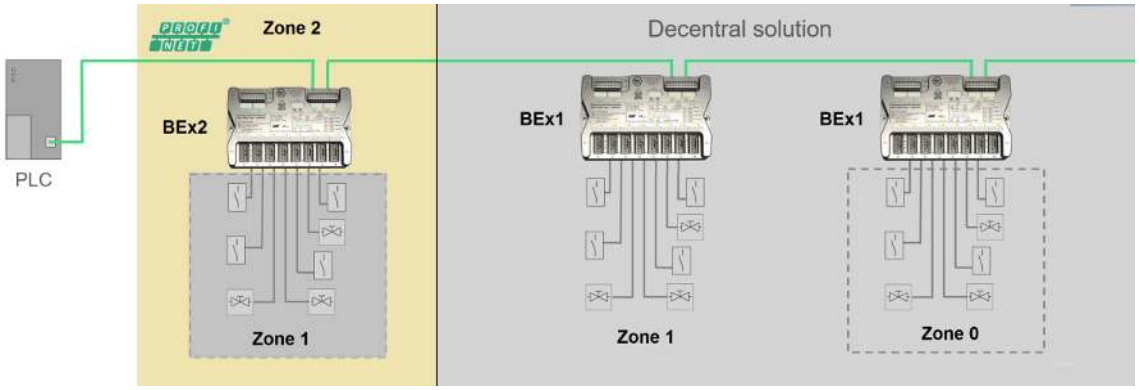



**Figure 1** Simplified display: System and installation with BEx Remote IO module

## 3.1 Function

The module has 32 intrinsically safe channels

| | | |
|---|---|---|
| 8xDI / 8xDO / 8xAI / 8xAO<br>8xDI / 16xDO / 8xAI<br>8xDI / 8xDO / 8xSwitch Mode<br><br>Zone 1 Type : **14200*00**<br>Zone 2 Type : **24200*00** | 16DI / 16DO<br>16DI / 8DO / 8AIO<br>16xDI / 8xDO/ 8xSwitch Mode<br><br>Zone 1 Type : **14200*01**<br>Zone 2 Type : **24200*01** | 32DI<br><br>Zone 1 Type : **14200*02**<br>Zone 2 Type : **24200*02** |

# 4 Installation

**Danger of explosion**
**Improperly wired cables/wires can lead to dangerous mix-ups between intrinsically safe and non-intrinsically safe circuits, which can ignite an explosive mixture. Observe the installation instructions acc. IEC/EN 60079-14**

## 4.1 Mounting

BEx1 IP 20 module is designed for use in Zone 1/21 and Zone 2/22 hazardous areas and is intended for connection to a fixed installation in certified enclosures/control-stations that conform to equipment protection level Gb or Db. Enclosure type min. IP 54.

The BEx2 module have to be installed in a suitable housing according the EN 60079-7:2018 in such a way, that a degree of protection of at least IP 54 is reached.

For special conditions see chapter 13.

**Danger of exlosion**
**By incorrect installation, there is a risk of explosion.**

BEx modules can be mounted side by side. The installation position is arbitrary

**Figure 2** Example certified Ex e enclosure made of stainless steel with cable glands and shield rail

**RECOMMENDATION: We offer individual certified control stations from our system partner.**

## 4.2 Dimension and Mounting

Easy DIN rail mounting according to DIN 60718 TH35 or via two mounting holes diameter 5.2 mm for M5 screws. Distance mounting holes 200 mm.

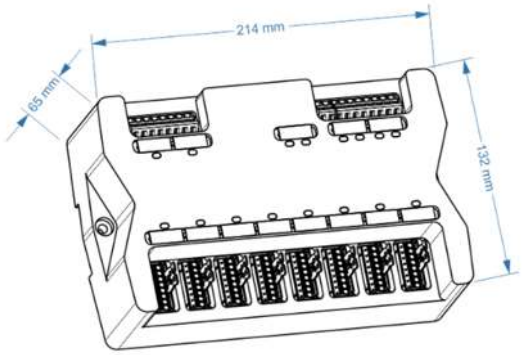



**Figure 3** Dimensions and mounting BEx module

## 4.3 Connection

All terminals are in spring clamp type (CAGE CLAMP®).

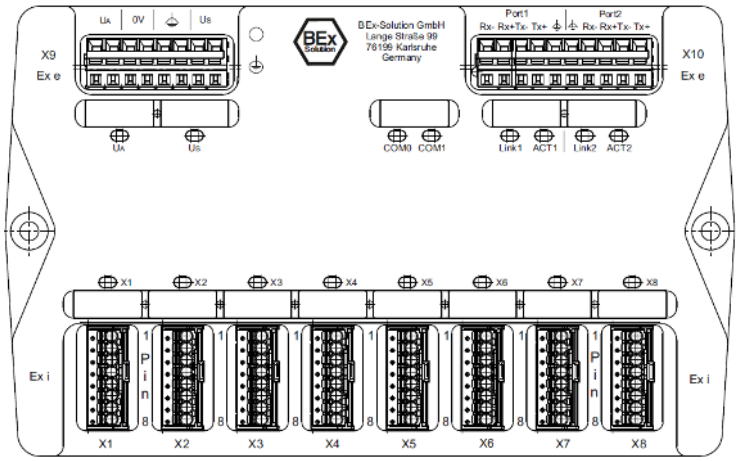



**Figure 4** Front view BEx

| | |
|---|---|
| ⏚ | **Ground connection / equipotential bonding** via M4 screw and eyelet |
| **X9** | **Power supply of actuators, sensors and module**<br>Ex e terminals (increased safety) |
| **X10** | **Ethernet**<br>Ex e terminals (increased safety) |
| **X1-X8** | **Intrinsically safe sensors and actuators**<br>Ex i terminals pluggable (intrinsically safe) |

### 4.3.1 Power Supply

Power supply of actuators, sensors and module (Ex e terminals)

**Marking terminals:**

UA = Power supply of actuators
0V = Ground
⏚ = Functional grounding
US = Power supply sensors and module

Separate power supply for sensor and actuator.

**The power supply US must not be switchable. It supplies the module electronics.**

The input voltages US and UA are internally protected against reverse polarity.

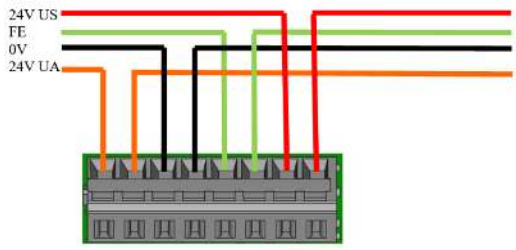



**Figure 5** Terminal X9

### 4.3.2 Ethernet

Ethernet-based fieldbus connection. (Ex e terminals) The integrated switch allows the connection of further bus participants.

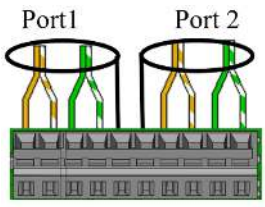



**Abbildung 6** Klemmenblock X10

| | |
|---|---|
| Rx- | Receive data negative line |
| Rx+ | Receive data positive line |
| Tx- | Transmit data negative line |
| Tx+ | Transmit data positive line |
| ⏚ | Shield |

**In the safe area no isolating amplifier for the Ethernet connection is required!**

**Autonegotiation for Ethernet (Layer 1 - OSI-Model) conform with IEEE 802.3u**

**Auto-crossover conform with IEEE 803.2ab**

### 4.3.3 Sensors and Actuators

Connection of intrinsically safe sensors and actuators (Ex i terminals)

**Marking terminals:**

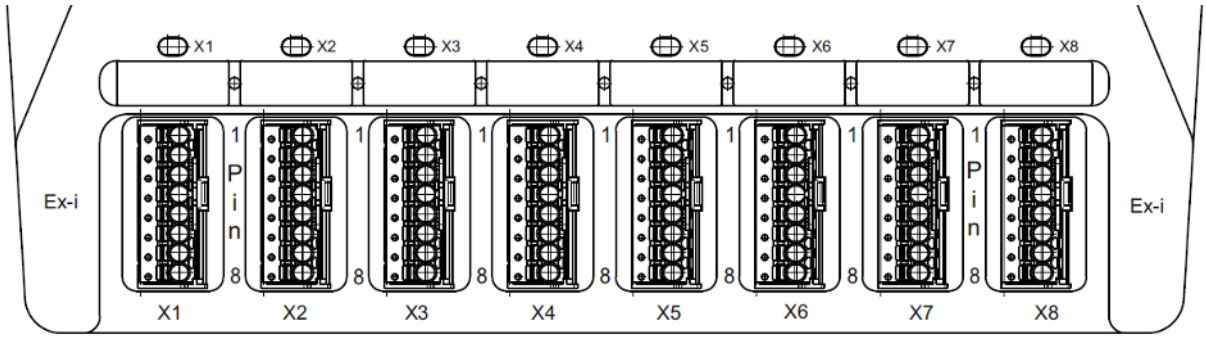



**Figure 7** Terminal X1-X8

| | 8xDI / 8xDO / 8xAI / 8xAO<br>8xDI / 16xDO / 8xAI<br>8xDI / 8xDO / 8xSwitch Mode<br><br>Zone 1 Type : **14200*00**<br>Zone 2 Type : **24200*00** | 16DI / 16DO<br>16DI / 8DO / 8AIO<br>16xDI / 8xDO/ 8xSwitch Mode<br><br>Zone 1 Type : **14200*01**<br>Zone 2 Type : **24200*01** | 32DI<br><br>Zone 1 Type : **14200*02**<br>Zone 2 Type : **24200*02** |
|---|---|---|---|
| 1 | AI / Switch Mode(-) | DO / AO / AI / Switch Mode(+) | *DI* |
| 2 | GND | GND / Switch Mode(-) | GND |
| 3 | AO / DO / Switch Mode(+) | *DI* | *DI* |
| 4 | GND | GND | GND |
| 5 | *DI* | *DI* | *DI* |
| 6 | GND | GND | GND |
| 7 | DO | DO | *DI* |
| 8 | GND | GND | GND |

**Figure 8** Terminal X1-X8

**The intrinsically safe Namur-Sensors may only be connected to the DI function. Connection to other pins can destroy the sensor!**

**Type *00 Pin 1 passive (only Ex i sources at the modul can be used)**
See Annex 3 Connection examples Type *00

**Type *01 Pin 1 active current source**

## 4.4 Cover caps

When using the cover caps (accessory), the Ex e enclosure may be opened while energized, provided that there are no other open Ex e connections in the enclosure.

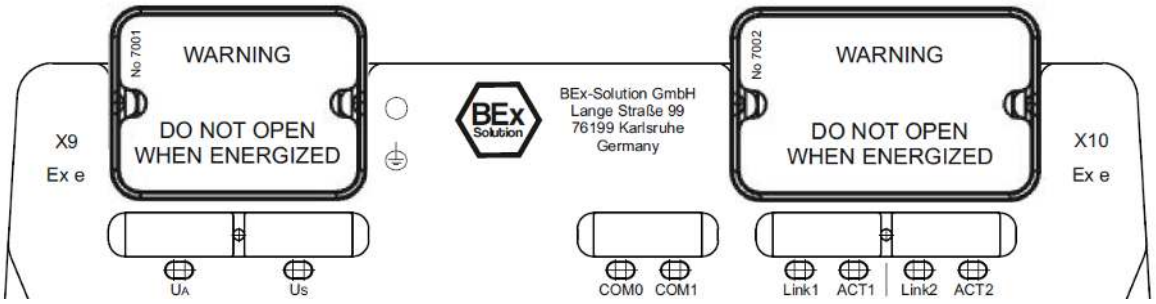



**Figure 9** cover caps

Tightening torque of screws: 1 Nm

Please note among others EN or IEC 60079-7 paragraph 4.10.3

# 5 LED Display

The module is equipped with different LEDs.

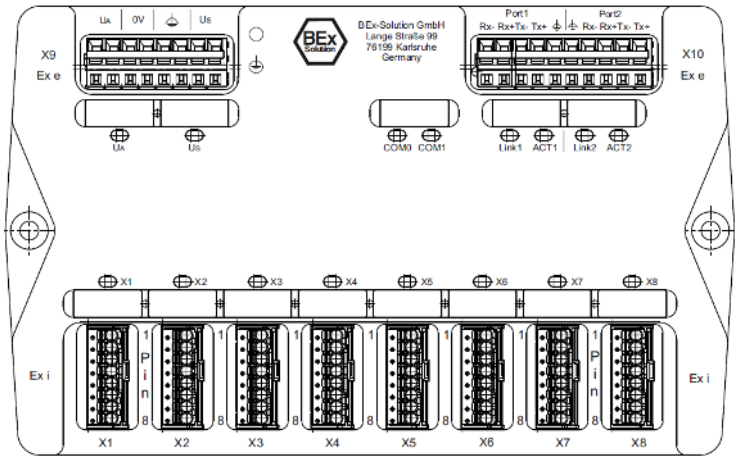
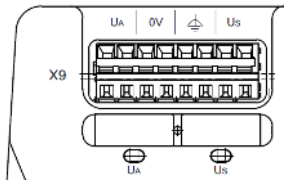
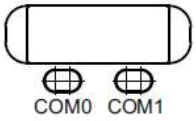
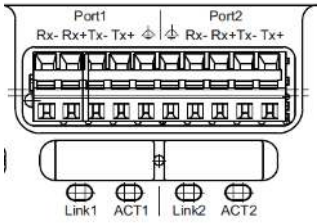
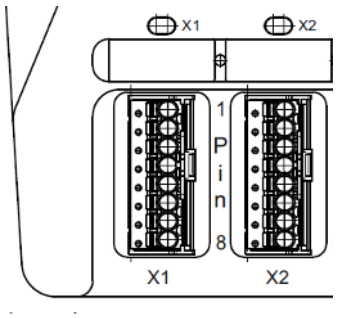



**Figure 10** Front view BEx1

| LED | Function | Color |
|---|---|---|
| UA | Display of actuator power supply | Green / Red |
| UA | Display of sensor and module power supply | Green / Red |
| COM0 | Communication LED - 0 | Green / Red |
| COM1 | Communication LED - 1 | Green / Red |
| Link1 | Ethernet connection LED Port 1 | Green |
| ACT1 | Ethernet activity LED Port 1 | Yellow |
| Link2 | Ethernet connection LED Port 2 | Green |
| ACT2 | Ethernet activity LED Port 2 | Yellow |
| X1-X8 | Status display of the associated terminals | Green / Yellow |

| | | | | Default |
|---|---|---|---|---|
| UA / US   | LED off | No voltage on module | | |
| | LED red | Voltage too low < 18V | | |
| | LED green | Voltage ok U > 18V | | ← |
| | | | | |
| COM0 / COM1   | LED off | Module works proper | | ← |
| | COM0 LED red | System error | | |
| | COM1 LED red | Bus error | | |
| | | | | |
| Link / ACT Each for Port 1 and Port 2   | Link / ACT LED off | No connection and no communication | | |
| | Link LED on ACT LED off | Connection exist but no communication | | |
| | Link LED on ACT LED flash | Connection exist Communication in start up | flash | |
| | Link LED on ACT LED blink ca. 0.5 Hz | Connection exist and communication in operation | blink | ← |
| | | | | |
| X1 to X8   | LED off | Output is off and there is no error at the respective terminal | | |
| | LED yellow | Output (pin 7) is switched and there is no error at the respective terminal | | |
| | LED red | There is an error at the respective terminal, regardless of the output | | |

# 6 Setup

No configuration is required to commission the BEx module.

**Danger of explosion**
**Prior to commissioning proper installation must be ensured. See also chapter 1 IMPORTANT NOTES and chapter 4 INSTALLATION!**

# 7 Diagnostic

Open load detection for each channel

Prefault detection for each channel

Short circuit detection for each channel

The corresponding LED-display X1-X8 on the module takes place

The individual messages are available in the communication data

# 8 Communication Protocols

Autonegotiation for Ethernet (Layer 1 - OSI-Model) conform with IEEE 802.3u

Auto-crossover conform with IEEE 803.2ab

## 8.1 Profinet

For operating of Profinet module described in this manual a GSDML-file is required.

GSDML-File *.xml English

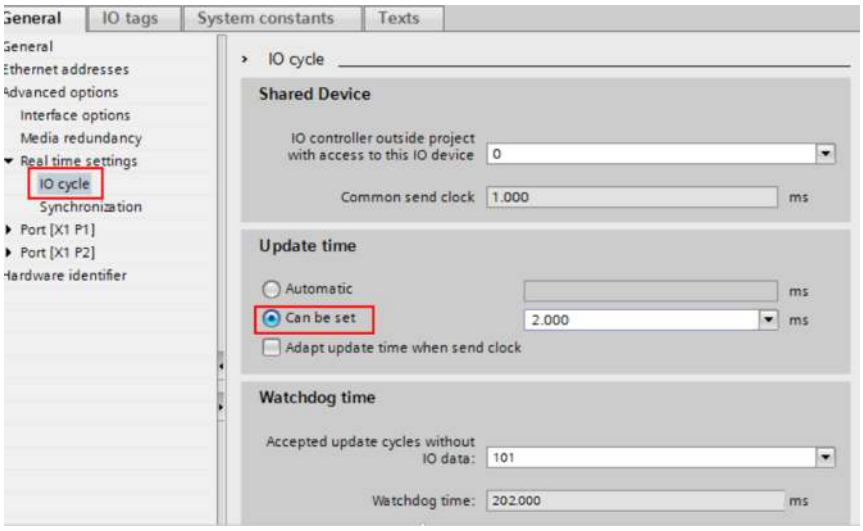
The GSDML file can be downloaded from the website of BEx-Solution:

www.bex-solution.com/downloads

### 8.1.1 MRP - Media Redundancy Protocol

Please read the complete documentation from Siemens about MRP, here only a small section for the Remote IO module is described, these settings have to be made for every module individually.

The reconfiguration time for MRP is 200ms (for 50 nodes), so the response monitoring time > 200ms must be selected for PROFINET communication. The response monitoring time is not configured directly but as a number of accepted update cycles without IO data. Select IO cycle “can be set”; and enter the desired time. The response monitoring time must be greater than 200ms in total. To achieve this, you can either increase the update time or the number of cycles without PNIO Traffic.




### 8.1.2 LLDP - Link Layer Discovery Protocol

To use the automatic addressing function (LLDP - conform with IEEE standard 802. 1AB) it is necessary to:

- The topology recognition in PLC must turn on.
- If there is a switch in the plant, a managed switch must be used.

## 8.2 Modbus TCP/IP

The module has 32 registers (module ➔ PLC) and 35 registers (PLC ➔ module).

Registers 1-32 correspond to the 64 byte input/output data (see chapter 9)

For a Modbus client whose register numbering begins at 0, the register numbers specified in this manual must be decremented by 1.

Registers 33 to 35 are for addressing the module.

**The NetMask value are fix 255.255.255.0**

Supported MODBUS function codes

| Function Code | Register Type |
|---|---|
| FC2 | Read Discrete Input |
| FC4 | Read Input Registers |
| FC5 | Write Single Coil |
| FC6 | Write Single Holding Register |
| FC15 | Write Multiple Coils |
| FC16 | Write Multiple Holding Registers |

### 8.2.1 IO Register

32 Register (Modul ➔ SPS)

| Register 1 | | Register 2 | | Register 3 | | Register 4 | | Register 5 | | Register 6 | | Register 7 | | Register 8 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low |
| AI X1 Pin1 | | AI X2 Pin1 | | AI X3 Pin1 | | AI X4 Pin1 | | AI X5 Pin1 | | AI X6 Pin1 | | AI X7 Pin1 | | AI X8 Pin1 | |

| Register 9 | | Register 10 | | Register 11 | | Register 12 | | Register 13 | | Register 14 | | Register 15 | | Register 16 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low |
| DI X1-X8 Pin1 | DI X1-X8 Pin3 | DI X1-X8 Pin5 | DI X1-X8 Pin7 | Res | Res | Res | Res | Internal voltage | | | Internal temperature | | Operating hour counter | | |
| | | | | | | | | $U_S$ | $U_A$ | 8V2 | sign | value | | | |

| Register 17 | | Register 18 | | Register 19 | | Register 20 | | Register 21 | | Register 22 | | Register 23 | | Register 24 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low |
| Current flow | | | | | | | | Current flow | | | | | | | |
| X1 Pin5 | X2 Pin5 | X3 Pin5 | X4 Pin5 | X5 Pin5 | X6 Pin5 | X7 Pin5 | X8 Pin5 | X1 Pin7 | X2 Pin7 | X3 Pin7 | X4 Pin7 | X5 Pin7 | X6 Pin7 | X7 Pin7 | X8 Pin7 |

| Register 25 | | Register 26 | | Register 27 | | Register 28 | | Register 29 | | Register 30 | | Register 31 | | Register 32 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low |
| Modul Diag | Open load | | | | Prefault | | | Short circuit | | | | High Serial number Low | | | |
| | X1-X8 Pin1 | X1-X8 Pin3 | X1-X8 Pin5 | X1-X8 Pin7 | X1-X8 Pin1 | X1-X8 Pin3 | X1-X8 Pin5 | X1-X8 Pin7 | X1-X8 Pin1 | X1-X8 Pin3 | X1-X8 Pin5 | X1-X8 Pin7 | | | |

32 Register (SPS ➔ Modul)

| Register 1 | | Register 2 | | Register 3 | | Register 4 | | Register 5 | | Register 6 | | Register 7 | | Register 8 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low |
| High AO X1 Low | | AO X2 | | AO X3 | | AO X4 | | AO X5 | | AO X6 | | AO X7 | | AO X8 | |

| Register 9 | | Register 10 | | Register 11 | | Register 12 | | Register 13 | | Register 14 | | Register 15 | | Register 16 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low |
| ON/OFF X1-X8 Pin 1 | ON/OFF X1-X8 Pin 3 | ON/OFF X1-X8 Pin 5 | ON/OFF X1-X8 Pin 7 | Res | Switch mode X1-X8 | AO->DO Type *00 X1-X8 Pin 3 | DO->AO Type *01 X1-X8 Pin 1 | DO->AI Type *01 X1-X8 Pin 1 | Res | Res | Res | Res | Res | Res | Res |

| Register 17 | | Register 18 | | Register 19 | | Register 20 | | Register 21 | | Register 22 | | Register 23 | | Register 24 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low |
| Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res |

| Register 25 | | Register 26 | | Register 27 | | Register 28 | | Register 29 | | Register 30 | | Register 31 | | Register 32 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High | Low |
| Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res |

All „Res“ Bytes must be „0“ The channels can be switched on via bytes 16 to byte 19!

### 8.2.2 Change the IP Address

Register 33 : IP-Address_Byte1 and IP-Address_Byte0
Register 34 : IP-Address_Byte3 and IP-Address_Byte2
Register 35 : Flag for writing or DHCP

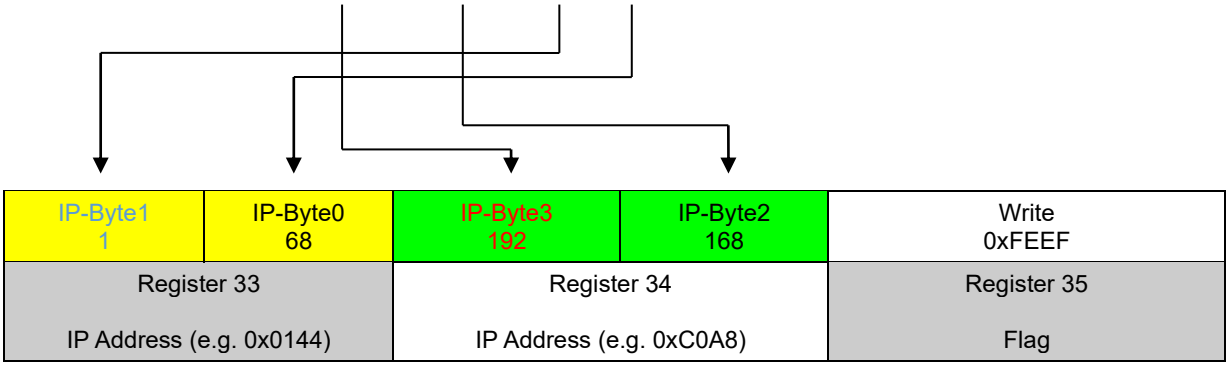
| IP-Byte1 | IP-Byte0 | IP-Byte3 | IP-Byte2 | Flag (Write or DHCP) |
|---|---|---|---|---|
| Register 33<br>IP Address | | Register 34<br>IP Address | | Register 35<br>Flag |

Writing 0xFEEF to the register „Flag“, the values in register 33 and 34 will be stored in the module.

Writing 0xA55A to the register "Flag", will delete the stored IP Address and activate DHCP.

After storing the IP-Address the module do a reset.

Example for IP Address: 192.168.1.68



| IP-Byte1<br>1 | IP-Byte0<br>68 | IP-Byte3<br>192 | IP-Byte2<br>168 | Write<br>0xFEEF |
|---|---|---|---|---|
| Register 33<br>IP Address (e.g. 0x0144) | | Register 34<br>IP Address (e.g. 0xC0A8) | | Register 35<br>Flag |

Register 33 : 0x0144 -> (IP_B0 : 68 = hex 44 ; IPB1 : 1 = hex 01)
Register 34 : 0xC0A8 -> (IP_B2 : 168 = hex A8 ; IPB3 : 192 = hex C0)
Register 35 : 0xFEEF (write)

# 9 IO Data Profinet

64 Input byte – from Remote IO to SPS

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High AI X1 Pin1 | Low | AI X2 Pin1 | | AI X3 Pin1 | | AI X4 Pin1 | | AI X5 Pin1 | | AI X6 Pin1 | | AI X7 Pin1 | | AI X8 Pin1 | |

| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DI X1-X8 Pin1 | DI X1-X8 Pin3 | DI X1-X8 Pin5 | DI X1-X8 Pin7 | Res | Res | Res | Res | Internal voltage | | | Internal temperature | | High Operating hour counter | | Low |
| | | | | | | | | $U_S$ | $U_A$ | 8V2 | sign | value | | | |

| 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Current flow | | | | | | | | Current flow | | | | | | | |
| X1 Pin5 | X2 Pin5 | X3 Pin5 | X4 Pin5 | X5 Pin5 | X6 Pin5 | X7 Pin5 | X8 Pin5 | X1 Pin7 | X2 Pin7 | X3 Pin7 | X4 Pin7 | X5 Pin7 | X6 Pin7 | X7 Pin7 | X8 Pin7 |

| 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Modul Diag | Open load | | | | Prefault | | | | Short circuit | | | | High Serial number | | Low |
| | X1-X8 Pin1 | X1-X8 Pin3 | X1-X8 Pin5 | X1-X8 Pin7 | X1-X8 Pin1 | X1-X8 Pin3 | X1-X8 Pin5 | X1-X8 Pin7 | X1-X8 Pin1 | X1-X8 Pin3 | X1-X8 Pin5 | X1-X8 Pin7 | | | |

64Output byte – from SPS to Remote IO

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High AO X1 | Low | AO X2 | | AO X3 | | AO X4 | | AO X5 | | AO X6 | | AO X7 | | AO X8 | |

| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ON/OFF X1-X8 Pin 1 | ON/OFF X1-X8 Pin 3 | ON/OFF X1-X8 Pin 5 | ON/OFF X1-X8 Pin 7 | Res | Switch mode X1-X8 | AO->DO Type *00 X1-X8 Pin 3 | DO->AO Type *01 X1-X8 Pin 1 | DO->AI Type *01 X1-X8 Pin 1 | Res | Res | Res | Res | Res | Res | Res |

| 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res |

| 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res | Res |

All „Res“ Bytes must be „0“ The channels can be switched on via bytes 16 to byte 19!

**Explanation:**

AI = Analog Input

AO = Analog Output

DI = Digital Input

DO = Digital Output

Res = Reseved (do not use)

Diag = Diagnoses

## 9.1 Input Byte 0...15 ⇨ Analog Input

Value :1000 = analog Value in mA (z.B. 9987 : 1000 = 9,987mA)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High AI Low X1-Pin1 | | AI X2-Pin1 | | AI X3-Pin1 | | AI X4-Pin1 | | AI X5-Pin1 | | AI X6-Pin1 | | AI X7-Pin1 | | AI X8-Pin1 | |
| MSB | | | | | | | LSB | MSB | | | | | | | LSB |
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| $2^{15}$ | $2^{14}$ | $2^{13}$ | $2^{12}$ | $2^{11}$ | $2^{10}$ | $2^{9}$ | $2^{8}$ | $2^{7}$ | $2^{6}$ | $2^{5}$ | $2^{4}$ | $2^{3}$ | $2^{2}$ | $2^{1}$ | $2^{0}$ |
| Byte 0 | | | | | | | | Byte 1 | | | | | | | |

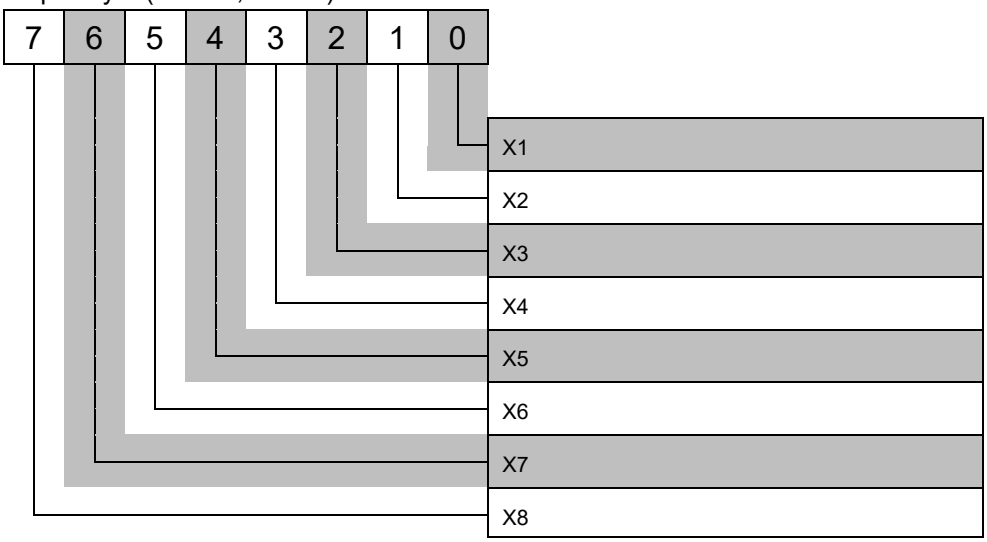
z.B.

| Value[mA] | hex | | | dex | |
|---|---|---|---|---|---|
| 4,000 | 0F | A0 | | 15 | 160 |
| 10,000 | 27 | 10 | | 39 | 16 |
| 15,000 | 3A | 98 | | 58 | 152 |
| 20,000 | 4E | 20 | | 78 | 32 |
| 25,000 | 61 | A8 | | 97 | 168 |
| | Byte 0 | Byte 1 | | Byte 0 | Byte 1 |

## 9.2 Input Byte 16...19 ⇨ Digital Input

Input Byte 16 ⇨ X1…X8 - Pin 1
Input Byte 17 ⇨ X1…X8 - Pin 3
Input Byte 18 ⇨ X1…X8 - Pin 5
Input Byte 19 ⇨ X1…X8 - Pin 7

Input Byte (0 = off ; 1 = on)




For Namur sensors

| Type *00 | Type *01 |
|---|---|
| „1“ if current is < 1,2 mA | „0“ if current is < 1,2 mA |
| „0“ if current is > 2,1 mA | „1“ if current is > 2,1 mA |

| | |
|---|---|
| Current < 0,2 mA | ⇒ Open load |
| Current < 1,2 mA | ⇒ Sensor ready, damped |
| Current > 2,1 mA | ⇒ Sensor ready, undamped |
| Current from max. value | ⇒ Short circuit, max. current |

## 9.3 Input Byte 20…23 ⇨ Reserve

Do not use

## 9.4 Input Byte 24…26 ⇨ Internal voltage

| | |
|---|---|
| Input Byte 24 ⇨ $U_S$ | Internal Sensor supply voltage |
| Input Byte 25 ⇨ $U_A$ | Internal Actuator supply voltage |
| Input Byte 26 ⇨ 8V2 | Internal Namur supply voltage |

Value :10 = Voltage value in V

e.g. 243 : 10 = 24,3V

e.g. 82 : 10 = 8,2V

The voltage is measured with a tolerance of ± 10%.

## 9.5 Input Byte 27, 28 ⇨ Internal temperature

Input Byte 27 ⇨ Sign of temperature

Input Byte 28 ⇨ Temperature value

Byte 27 = Sign of temperature value in Byte 28

(0 = positive temperature value; 1 = negative temperature value)

Byte 28 = Temperature value in °C (e.g. 24 = 24°C)

if Byte 27 = 1 then e.g. -24°C

The temperature is measured with a tolerance of ± 5K.

If the temperature rises internally above 75 ° C (or < 45 ° C), an error message is output on byte 48.

## 9.6 Input Byte 29…31 ⇨ Operating hour counter

Input Byte 29 ⇨ High value
Input Byte 30 ⇨ Mid value
Input Byte 31 ⇨ Low value

Value = operating hour in h

e.g. 7488 : 24 = 312 days

## 9.7 Input Byte 32...47 ⇨ Actual current flow through the pin

Input Byte 32 ⇨ X1 – Pin5

Input Byte 33 ⇨ X2 – Pin5

Input Byte 34 ⇨ X3 – Pin5

Input Byte 35 ⇨ X4 – Pin5

Input Byte 36 ⇨ X5 – Pin5

Input Byte 37 ⇨ X6 – Pin5

Input Byte 38 ⇨ X7 – Pin5

Input Byte 39 ⇨ X8 – Pin5

Input Byte 40 ⇨ X1 – Pin7

Input Byte 41 ⇨ X2 – Pin7

Input Byte 42 ⇨ X3 – Pin7

Input Byte 43 ⇨ X4 – Pin7

Input Byte 44 ⇨ X5 – Pin7

Input Byte 45 ⇨ X6 – Pin7

Input Byte 46 ⇨ X7 – Pin7

Input Byte 47 ⇨ X8 – Pin7

Value :10 = current in mA

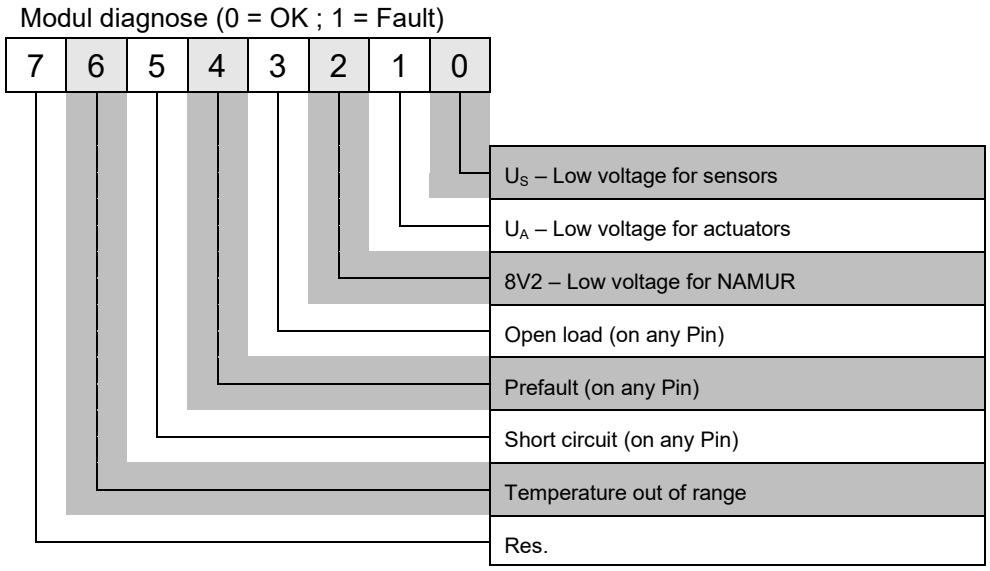
e.g. 193 : 10 = 19,3mA

max. current 255:10 = 25,5mA

The current is measured with a tolerance of ± 1mA.

## 9.8 Input Byte 48 ⇨ Module diagnoses

Input Byte 48 ⇨ Any module diagnoses appear in this byte

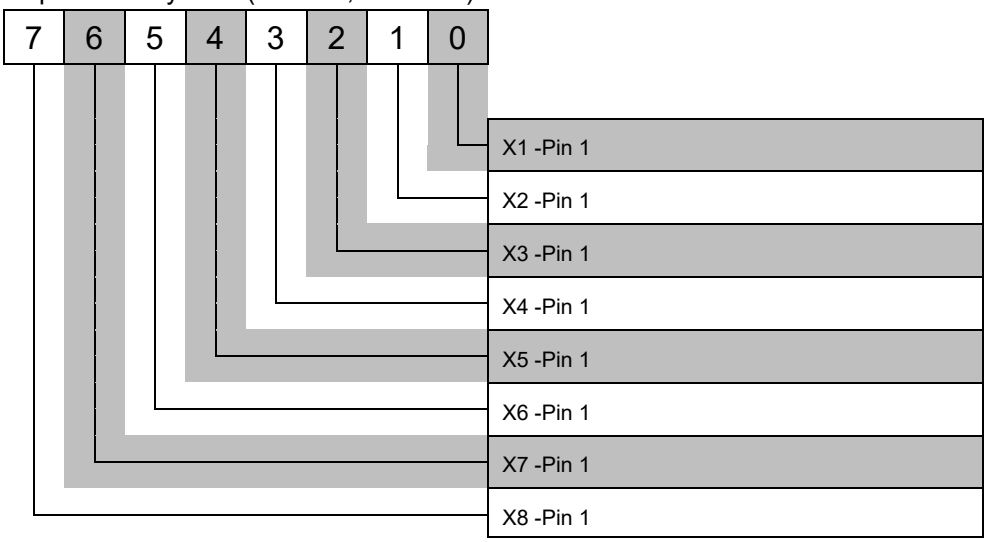



**RECOMMENDATION:**
**All errors are displayed in this byte and should be evaluated in the PLC.**

## 9.9 Input Byte 49…52 ⇨ Open load

Input Byte 49 ⇨ Open load Pin 1
Input Byte 50 ⇨ Open load Pin 3
Input Byte 51 ⇨ Open load Pin 5
Input Byte 52 ⇨ Open load Pin 7

Open load Byte 49 (0 = OK ; 1 = Fault)

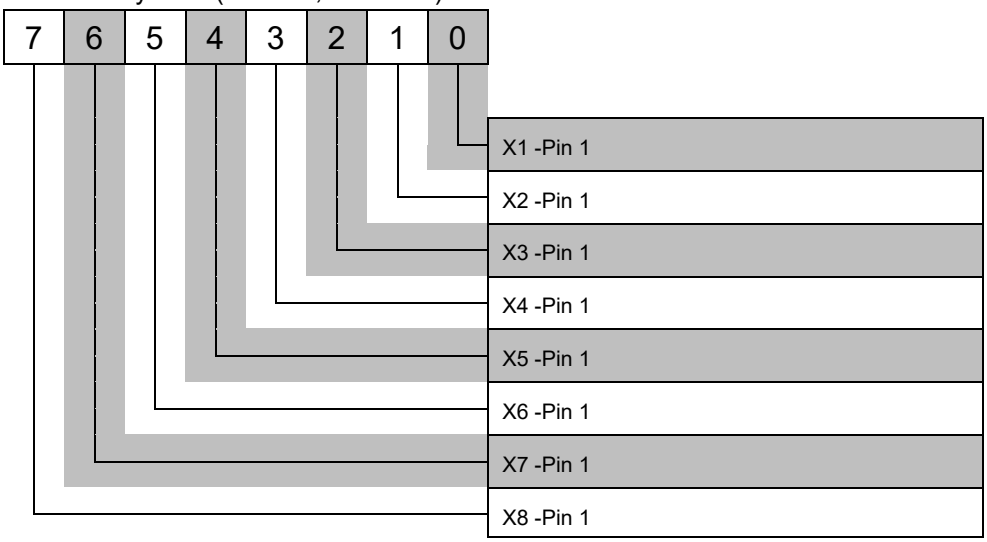



Open load is detected at a current < 0.5mA

## 9.10 Input Byte 53…56 ⇨ Prefault

Input Byte 53 ⇨ Prefault Pin 1
Input Byte 54 ⇨ Prefault Pin 3
Input Byte 55 ⇨ Prefault Pin 5
Input Byte 56 ⇨ Prefault Pin 7

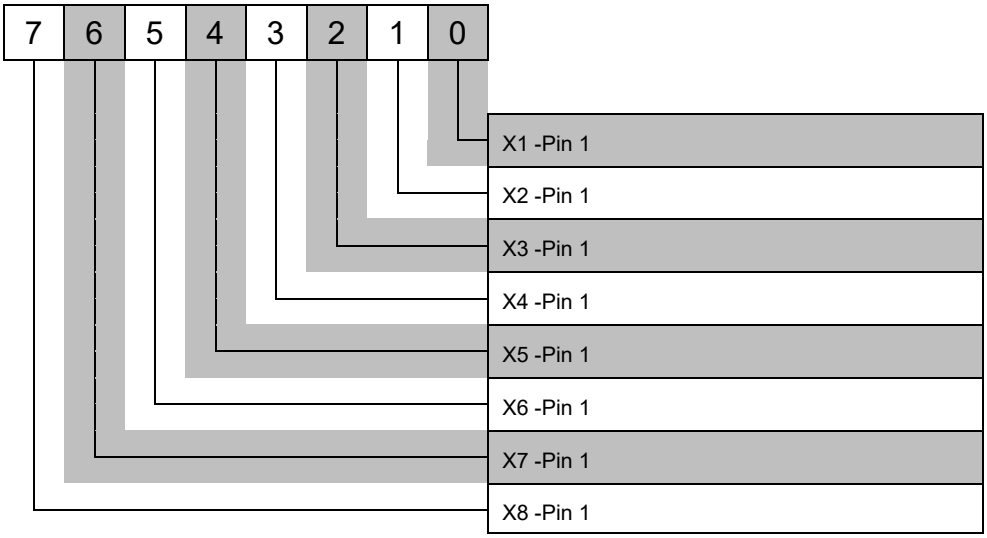
Prefault Byte 53 (0 = OK ; 1 = Fault)



## 9.11 Input Byte 57…60 ⇨ Short circuit

Input byte 57 ⇨ Short circuit Pin 1
Input byte 58 ⇨ Short circuit Pin 3
Input byte 59 ⇨ Short circuit Pin 5
Input byte 60 ⇨ Short circuit Pin 7

Short circuit Byte 57 (0 = OK ; 1 = Fault)




## 9.12 Input Byte 61…63 ⇨ Serialnumber

Input Byte 61 ⇨ High value

Input Byte 62 ⇨ value

Input Byte 63 ⇨ Low value

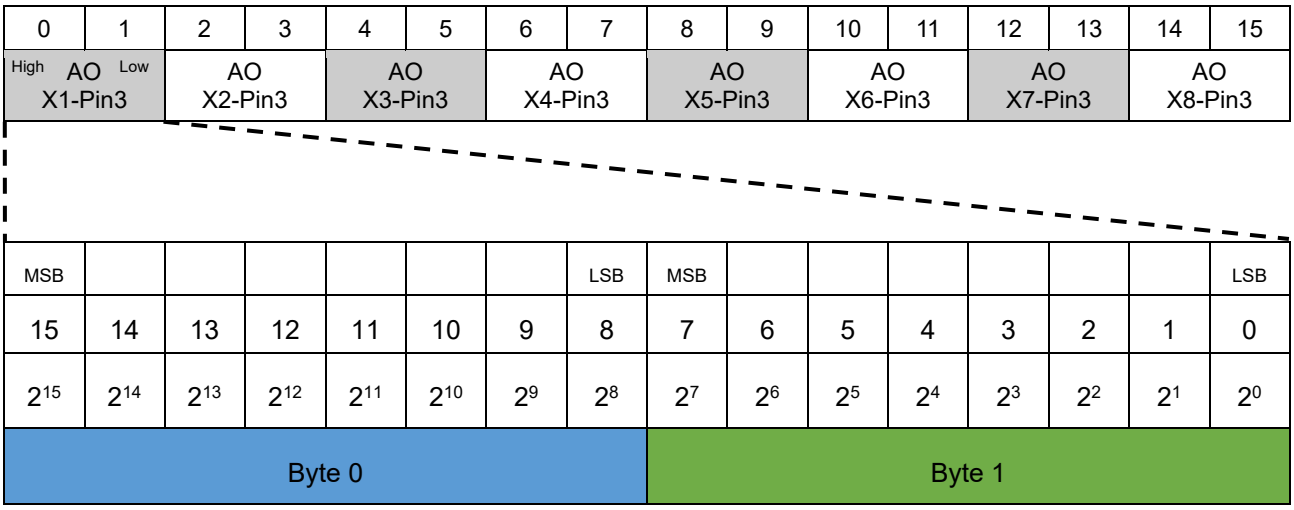
Value = Serialnumber

Value > 100000

## 9.13 Output Byte 0…15 ⇨ Analog Output at Pin 3

Output Byte 0, 1 ⇨ analog Output 0
Output Byte 2, 3 ⇨ analog Output 1
Output Byte 4, 5 ⇨ analog Output 2
Output Byte 6, 7 ⇨ analog Output 3
Output Byte 8, 9 ⇨ analog Output 4
Output Byte 10, 11 ⇨ analog Output 5
Output Byte 12, 13 ⇨ analog Output 6
Output Byte 14, 15 ⇨ analog Output 7

Value :1000 = analog value in mA (z.B. 9987 : 1000 = 9,987mA)



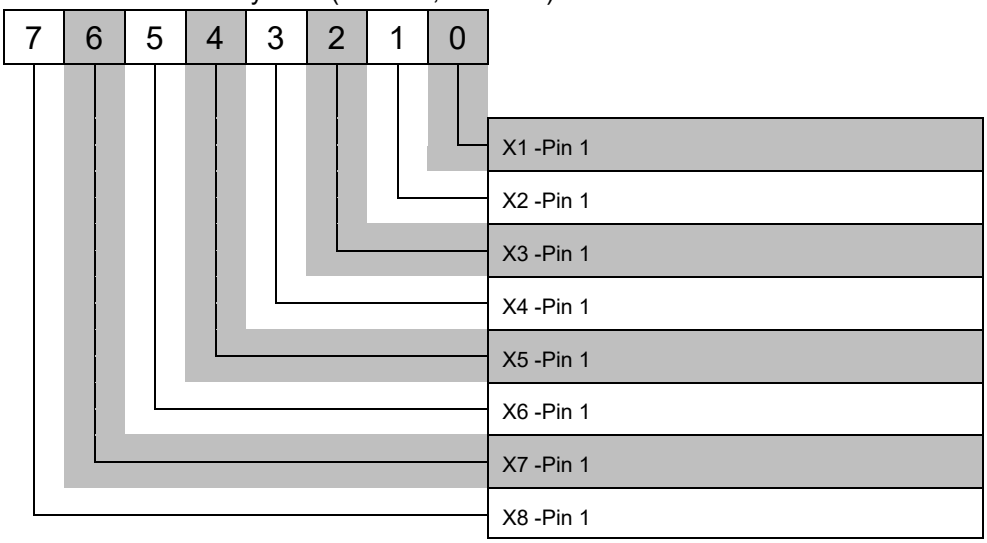

e.g.

| Value[mA] | hex | | | dex | |
|---|---|---|---|---|---|
| 4,000 | 0F | A0 | | 15 | 160 |
| 10,000 | 27 | 10 | | 39 | 16 |
| 15,000 | 3A | 98 | | 58 | 152 |
| 20,000 | 4E | 20 | | 78 | 32 |
| 25,000 | 61 | A8 | | 97 | 168 |
| | Byte 0 | Byte 1 | | Byte 0 | Byte 1 |

## 9.14 Output Byte 16…19 ⇨ Channel ON / OFF

Output Byte 16 ⇨ Channel ON / OFF on Pin 1
Output Byte 17 ⇨ Channel ON / OFF on Pin 3
Output Byte 18 ⇨ Channel ON / OFF on Pin 5
Output Byte 19 ⇨ Channel ON / OFF on Pin 7

Channel ON/OFF Byte 16 (0 = ON ; 1 = OFF)




The channels can be switched on via bytes 16 to byte 19!

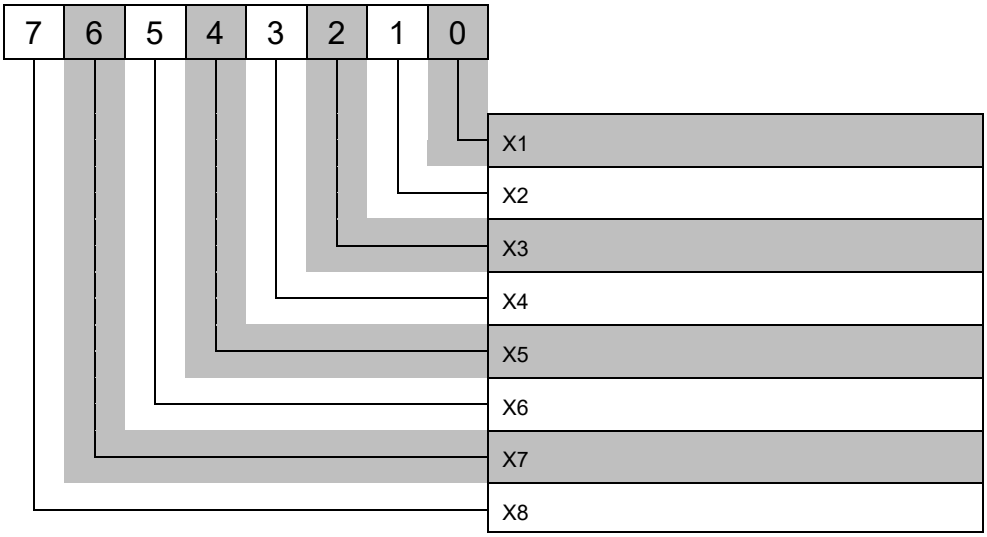
**To turn on the function of Pin 1, 3, 5, 7 the bytes 16 to 18 are always set to "1". The DO function can be turn on and off via this Bytes.**

A short circuit at DO or at DI leads to the immediate shutdown of the affected pin. Every 5 seconds, it is checked whether the short circuit is still present. Only when the error has been corrected, the pin automatic switch on.

## 9.15 Output Byte 21 ⇨ SwitchMode

Output Byte 21 ⇨ SwitchMode ON / OFF

SwitchMode ON/OFF Byte 21 (1 = ON ; 0 = OFF)




A mechanical switch can be connected to the module through the SwitchMode.

| | 8xDI / 8xDO / 8xAI / 8xAO<br>8xDI / 16xDO / 8xAI<br>8xDI / 8xDO / 8xSwitch Mode<br><br>Zone 1 Type : **14200*00**<br>Zone 2 Type : **24200*00** | 16DI / 16DO<br>16DI / 8DO / 8AIO<br>16xDI / 8xDO/ 8xSwitch Mode<br><br>Zone 1 Type : **14200*01**<br>Zone 2 Type : **24200*01** | 32DI<br><br>Zone 1 Type : **14200*02**<br>Zone 2 Type : **24200*02** |
|---|---|---|---|
| 1 | Switch Mode(-) | Switch Mode(+) | *DI* |
| 2 | GND | GND / Switch Mode(-) | GND |
| 3 | Switch Mode(+) | *DI* | *DI* |
| 4 | GND | GND | GND |
| 5 | *DI* | *DI* | *DI* |
| 6 | GND | GND | GND |
| 7 | DO | DO | *DI* |
| 8 | GND | GND | GND |

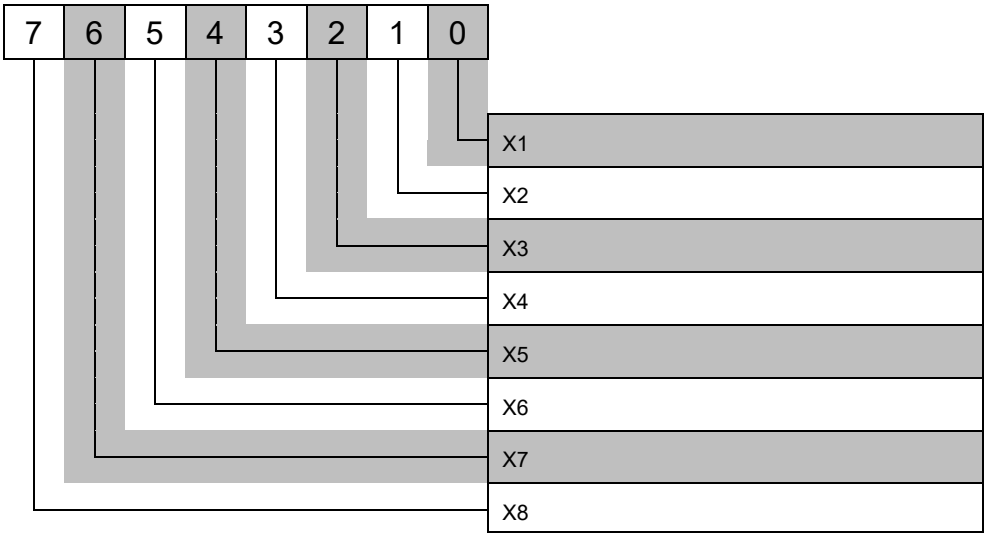
In SwitchMode, the module will output 4 mA at the analog output and read back the 4 mA at the analog input when the switch is closed. Then a "1" is reported on the input byte 16. If the switch is open, no current flows into the analog input and the corresponding bit is "0".

➔ The corresponding analog channels must also be activated.

## 9.16 Output Byte 22 ⇨ AO to DO (Type *00)

Output Byte 22 ⇨ AO to DO ON / OFF (default = 0 = AO)

Digital Mode ON/OFF Byte 22 (1 = ON ; 0 = OFF)




The analogue output can be used as a digital output (Imax = 25mA).

Thus, the analog output at pin 3 behaves like a digital output.
Switching on and off takes place via the Output Byte 17.

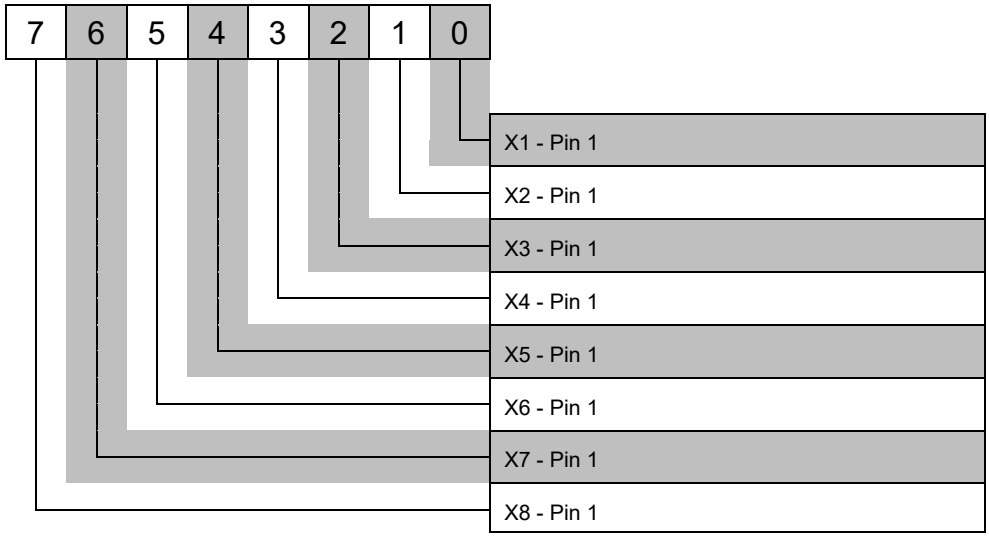
| | 8xDI / 8xDO / 8xAI / 8xAO<br>8xDI / 16xDO / 8xAI<br>8xDI / 8xDO / 8xSwitch Mode<br><br>Zone 1 Type : **14200*00**<br>Zone 2 Type : **24200*00** | 16DI / 16DO<br>16DI / 8DO / 8AIO<br>16xDI / 8xDO/ 8xSwitch Mode<br><br>Zone 1 Type : **14200*01**<br>Zone 2 Type : **24200*01** | 32DI<br><br>Zone 1 Type : **14200*02**<br>Zone 2 Type : **24200*02** |
|---|---|---|---|
| 1 | AI / Switch Mode(-) | DO / AO / AI / Switch Mode(+) | *DI* |
| 2 | GND | GND / Switch Mode(-) | GND |
| 3 | AO / DO | *DI* | *DI* |
| 4 | GND | GND | GND |
| 5 | *DI* | *DI* | *DI* |
| 6 | GND | GND | GND |
| 7 | DO | DO | *DI* |
| 8 | GND | GND | GND |

Openload and short circuit detection is not active on these channels.

## 9.17 Output Byte 23 ⇨ DO to AO (Type *01)

Output Byte 23 ⇨ DO -> AO ON / OFF (default = 0 = DO)

Digital Mode ON/OFF Byte 23 (1 = ON ; 0 = OFF)



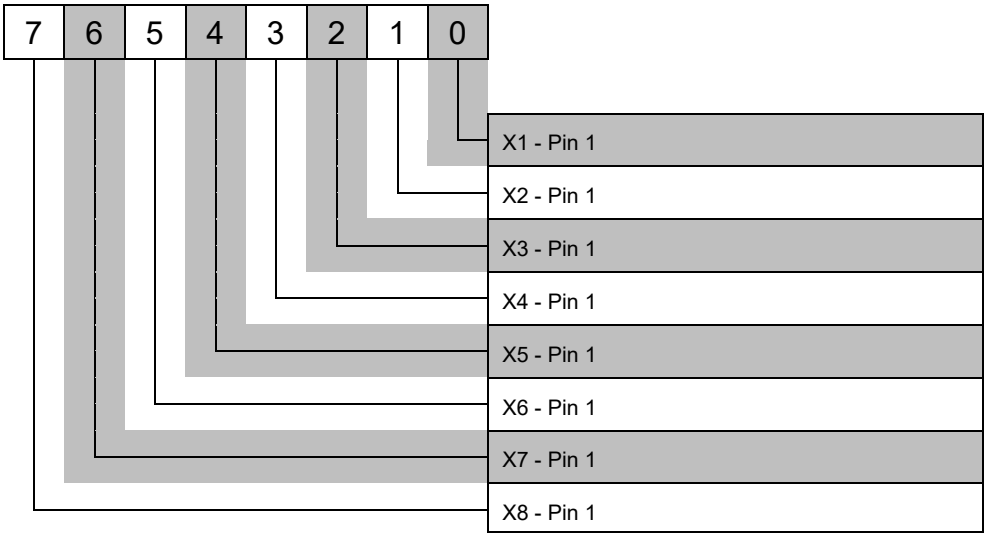

Thus Pin on 14200*01 and 24200*01 can be used as DO, AO oder AI (Imax = 25mA).

| | 8xDI / 8xDO / 8xAI / 8xAO<br>8xDI / 16xDO / 8xAI<br>8xDI / 8xDO / 8xSwitch Mode<br><br>Zone 1 Type : **14200*00**<br>Zone 2 Type : **24200*00** | 16DI / 16DO<br>16DI / 8DO / 8AIO<br>16xDI / 8xDO/ 8xSwitch Mode<br><br>Zone 1 Type : **14200*01**<br>Zone 2 Type : **24200*01** | 32DI<br><br>Zone 1 Type : **14200*02**<br>Zone 2 Type : **24200*02** |
|---|---|---|---|
| 1 | AI / Switch Mode(-) | DO / AO | *DI* |
| 2 | GND | GND / Switch Mode(-) | GND |
| 3 | AO / DO / Switch Mode(+) | *DI* | *DI* |
| 4 | GND | GND | GND |
| 5 | *DI* | *DI* | *DI* |
| 6 | GND | GND | GND |
| 7 | DO | DO | *DI* |
| 8 | GND | GND | GND |

## 9.18 Output Byte 24 ⇨ DO to AI (Type *01)

Output Byte 23 ⇨ DO -> AI ON / OFF (default = 0 = DO)

Digital Mode ON/OFF Byte 24 (1 = ON ; 0 = OFF)




Thus Pin on 14200*01 and 24200*01 can be used as DO, AO oder AI (Imax = 25mA).

| | 8xDI / 8xDO / 8xAI / 8xAO<br>8xDI / 16xDO / 8xAI<br>8xDI / 8xDO / 8xSwitch Mode<br><br>Zone 1 Type : **14200*00**<br>Zone 2 Type : **24200*00** | 16DI / 16DO<br>16DI / 8DO / 8AIO<br>16xDI / 8xDO/ 8xSwitch Mode<br><br>Zone 1 Type : **14200*01**<br>Zone 2 Type : **24200*01** | 32DI<br><br>Zone 1 Type : **14200*02**<br>Zone 2 Type : **24200*02** |
|---|---|---|---|
| 1 | AI / Switch Mode(-) | DO / AI | *DI* |
| 2 | GND | GND / Switch Mode(-) | GND |
| 3 | AO / DO / Switch Mode(+) | *DI* | *DI* |
| 4 | GND | GND | GND |
| 5 | *DI* | *DI* | *DI* |
| 6 | GND | GND | GND |
| 7 | DO | DO | *DI* |
| 8 | GND | GND | GND |

## 9.17 Output Byte 20, 23…63 ⇨ Reserve

All "Res" bytes must be set to "0"

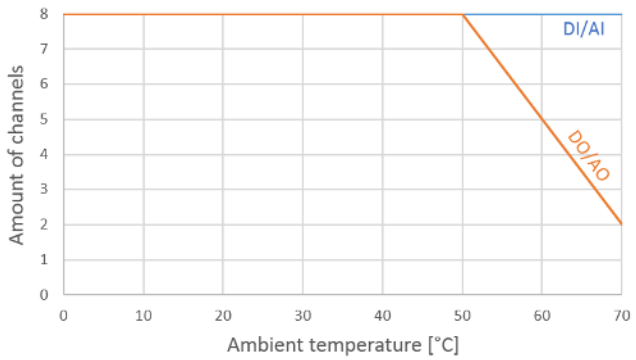
# 10 Temperature Derating

Number of simultaneously usable channels.

Not all channels may be used at the same time, if the service temperature will rise > 50°C.

The actual temperature value are transferred via the communication data.

| | 40°C | 50°C | 60°C | 70°C |
|---|---|---|---|---|
| AI | 8 | 8 | 8 | 8 |
| AO | 8 | 8 | 5 | 2 |
| DI | 8 | 8 | 8 | 8 |
| DO | 8 | 8 | 5 | 2 |




The device is equipped with a temperature monitoring and measures permanently the operating temperature. If the operating temperature of module exceeds 75°C, an error message is displayed in the communication data and at 85°C all output channels and the communication are switched off.

**The module automatically does switch back to operating mode, as soon as the operating temperature has reached a value < 75°C.**

## 10.1 Power Dissipation

Type *00

Power Dissipation max. 15 W

Calculation Power Dissipation:

Idling: 5 W

AI = 150 mW per channel (8x = 1,2 W) ; AO = 600 mW per channel (8x = 4,8 W)

DI = 100 mW per channel (8x = 0,8 W) ; DO = 400 mW per channel (8x = 3,2 W)

| e.g. | Idling | | 2 AI | | 1 AO | | 4 DI | | 4 DO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 W | + | 0,3 W | + | 0,6 W | + | 0,4 W | + | 1,6 W | = | 7,9 W |

Type *01

Power Dissipation max. 14,6 W

Calculation Power Dissipation:

Idling: 5 W

DO (AO / AI) = 600 mW per channel (8x = 4,8 W)

DI = 100 mW per channel (16x = 1,6 W) ; DO = 400 mW per channel (8x = 3,2 W)

Type *02

Power Dissipation max. 8,2 W

Calculation Power Dissipation:

Idling: 5 W

DI = 100 mW per channel (32x = 3,2 W)

# 11 Technical Data

## Power supply

| | |
|---|---|
| Operating voltage $U_A/U_S$ | DC 18...30V |
| Current module and sensor supply $I_S$ | DC 450 mA |
| Current actuator supply $I_A$ | DC 300 mA |
| Power dissipation | max. 15 W |
| Reverse polarity protection | Yes |
| LED Voltage > 18V | Green |
| LED Undervoltage | Red |

## Fieldbus data

| | |
|---|---|
| Transfer Rate | 10/100 MBit/s |
| Addressing (Profinet) | via DCP |
| Addressing (Modbus TCP/IP) | DHCP or fix |
| Delay time for signal change | < 10ms |
| LED Ethernet Status LINK | Green |
| LED Ethernet Status ACT | Yellow |
| LED Module Status | Green / Red |
| LED channel on | Yellow |
| LED error detection | Red |

## Ambient conditions

| | |
|---|---|
| Permitted range of the service temperature after installation inside the additional enclosure | -40°C ... +70°C |
| Storage temperature | -40°C ... +80°C |
| Enclosure type of module (EN 60529) | IP 20 |
| Relative humidity | 5 % bis 95 % not condensing |
| Max. operating altitude | 2000m |
| Overvoltage category | 2 |
| Degree of pollution | 2 |
| Protection class (ambient) | IP 54 |

## Mechanical data

| | |
|---|---|
| Dimensions (LxWxH) | 214 x 132 x 65 mm |
| Mounting holes | ∅ 5,2 |
| Mounting space | 200 mm |
| Mounting position | any position |
| Weight | ca. 2700 g |
| Housing material | Aluminium (electroplated) |
| Housing marking | laser engraving |

## IO - Function

| | 8xDI / 8xDO / 8xAI / 8xAO<br>8xDI / 16xDO / 8xAI<br>8xDI / 8xDO / 8xSwitch Mode<br><br>Zone 1 Type : **14200*00**<br>Zone 2 Type : **24200*00** | 16DI / 16DO<br>16DI / 8DO / 8AIO<br>16xDI / 8xDO/ 8xSwitch Mode<br><br>Zone 1 Type : **14200*01**<br>Zone 2 Type : **24200*01** | 32DI<br><br>Zone 1 Type : **14200*02**<br>Zone 2 Type : **24200*02** |
|---|---|---|---|
| 1 | AI / Switch Mode(-) | DO / AO / AI / Switch Mode(+) | *DI* |
| 2 | GND | GND / Switch Mode(-) | GND |
| 3 | AO / DO / Switch Mode(+) | *DI* | *DI* |
| 4 | GND | GND | GND |
| 5 | *DI* | *DI* | *DI* |
| 6 | GND | GND | GND |
| 7 | DO | DO | *DI* |
| 8 | GND | GND | GND |

DI Namur ..... 8,2V
(I<1,2mA = on)
(I>2,1mA = off)

DO (can also be used as power supply) ..... 24V ($I_{max}$ = 25mA)

AI and AO ..... 24V
4..20mA (0..25mA)

Resolution AI and AO ..... 16 Bit
Measurement deviation (at +25°C) ..... ± 0,1% in range 4 ... 20mA
Ambient temperature influence ..... ± 0,01%/K

AO to DO, DO to AO, DO to AI ..... 24V ($I_{max}$ = 25mA)
Switch Mode ..... 24V($I_{max}$ = 4mA)

## Diagnoses

Open load detection ..... Yes, per pin
Prefault detection ..... Yes, per pin
Short circuit detection ..... Yes, per pin

Operating hour counter ..... 24 Bit

## Electrical connection

Earthing / Equipotential bonding via M4 screw and eyelet
Cable cross-section ..... min. 4,0 mm²

CAGE CLAMP® connection technology
X1-X8 (pluggable) Inputs / Outputs (Ex i)
Cable cross-section ..... max. 1,5 mm²

X9 Power supply (Ex e)
Cable cross-section ..... max. 2,5 mm²

X10 Bus (Ex e)
Cable cross-section ..... max. 2,5 mm²

## Commercial data

Zone 1/21

| | |
|---|---|
| BEx1(8AI/8AO/8DI/8DO) | |
| Profinet Order No. | 14200100 |
| Modbus Order No. | 14200300 |
| BEx1(16DI/16DO) | |
| Profinet Order No. | 14200101 |
| Modbus Order No. | 14200301 |
| BEx1(32DI) | |
| Profinet Order No. | 14200102 |
| Modbus Order No. | 14200302 |

Zone 2 /22

| | |
|---|---|
| BEx2(8AI/8AO/8DI/8DO) | |
| Profinet Order No. | 24200100 |
| Modbus Order No. | 24200300 |
| BEx2(16DI/16DO) | |
| Profinet Order No. | 24200101 |
| Modbus Order No. | 24200301 |
| BEx2(32DI) | |
| Profinet Order No. | 24200102 |
| Modbus Order No. | 24200302 |

Country of origin ..... DE
Packaging unit ..... 1
Customs tariff number ..... 85176200

# 12 Approval safety data

Max. $U_m$ X9 / X10 DC 30 V

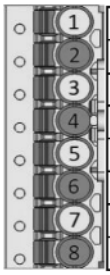
| Terminals | Parameter |
|---|---|
| Terminal block X1 to X8 | (Output parameters of each clamp, clamps are not allowed to be combined) |
| $Clamp_{26V}$ ..... | $U_0$ = 26 V d.c.<br>$I_0$ = 82 mA<br>$P_0$ = 533 mW |

| | IIC | | | |
|---|---|---|---|---|
| $L_0$ | 3 mH | 1 mH | 0,5 mH | 0 mH |
| $C_0$ | 42 nF | 62 nF | 78 nF | 99 nF |
| | Group IIB / III | | | |
| $L_0$ | 20 mH | 2 mH | 0,5 mH | 0 mH |
| $C_0$ | 350 nF | 350 nF | 490 nF | 770 nF |

$Clamp_{9,6V}$ ..... $U_0$ = 9,6 V d.c.
$I_0$ = 31 mA
$P_0$ = 75 mW

| | IIC | | | |
|---|---|---|---|---|
| $L_0$ | 49 mH | 10 mH | 1 mH | 0 mH |
| $C_0$ | 310 nF | 640 nF | 1.1 µF | 3.6 µF |
| | Group IIB / III | | | |
| $L_0$ | 100 mH | 10 mH | 1 mH | 0 mH |
| $C_0$ | 2 µF | 3.6 µF | 6.1 µF | 26 µF |

$Clamp_{GND}$ ..... galvanically separated from input GND




| | Type : **14200*00**<br>Type : **24200*00** | Type : **14200*01**<br>Type : **24200*01** | Type : **14200*02**<br>Type : **24200*02** |
|---|---|---|---|
| Clamp 1 | $U_0$ = 26 V d.c. | $U_0$ = 26 V d.c. | *$U_0$ = 9,6 V d.c.* |
| Clamp 2 | GND | GND | GND |
| Clamp 3 | $U_0$ = 26 V d.c. | *$U_0$ = 9,6 V d.c.* | *$U_0$ = 9,6 V d.c.* |
| Clamp 4 | GND | GND | GND |
| Clamp 5 | *$U_0$ = 9,6 V d.c.* | *$U_0$ = 9,6 V d.c.* | *$U_0$ = 9,6 V d.c.* |
| Clamp 6 | GND | GND | GND |
| Clamp 7 | $U_0$ = 26 V d.c. | $U_0$ = 26 V d.c. | *$U_0$ = 9,6 V d.c.* |
| Clamp 8 | GND | GND | GND |

# 13 Explosion Protection

**BEx1**

EPS 19 ATEX 1 219 X

II 2(1) G Ex eb mb [ia Ga] IIC T4 Gb

II (1) D [Ex ia Da] IIIC

IECEx EPS 19.0093X

Ex eb mb [ia Ga] IIC T4 Gb

[Ex ia Da] IIIC

**BEx2**

EPS 19 ATEX 1 248 X

II 3(1) G Ex ec mc [ia Ga] IIC T4 Gc

II (1) D [Ex ia Da] IIIC

IECEx EPS 19.0111X

Ex ec mc [ia Ga] IIC T4 Gc

[Ex ia Da] IIIC

## 13.1 Specific Conditions of use for BEx1

- The BEx1-Remote IO of the types 14200100, 14200200, 14200300, 14200400, 14200500 and 14200600 shall be mounted in an enclosure which is fully certified according to the directive 2014/34/EU and the IECEx-Scheme. The installation of the IO modules of the types mentioned above shall be acknowledged by the certification of the enclosure.
- The permitted range of the service temperature after installation inside the additional enclosure is -40 °C to +70 °C.
- The non-intrinsically safe terminals of the equipment (terminals X9 and X10) shall be supplied by a source providing SELV output circuit or conforming to IEC 61010 or IEC 60950 (Um=30V DC).

## 13.2 Specific Conditions of use for BEx2

- The BEx2 module have to be installed in a suitable housing according the EN 60079-7:2018 in such a way, that a degree of protection of at least IP 54 is reached.
- The non-intrinsically safe terminals of the equipment (terminals X9 and X10) shall be supplied by a source providing SELV output circuit or conforming to IEC 61010 or IEC 60950 (Um=30V DC).

# 14 Service, Maintenance

The module is maintenance-free.

Observe the intended function.

Follow the guidelines of IEC / EN 60079-17.

According to EN / IEC 60079-17 and EN / IEC 60079-19, the operator of electrical installations in potentially explosive atmospheres is obliged to have these systems checked by a qualified electrician to ensure that they are in a proper condition.

# 15 Repair

The device is potted. It can not be repaired. If you have any questions, please contact BEx-Solution GmbH.

# 16 Disposal

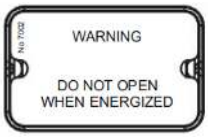
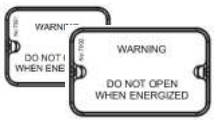
Observe the national waste disposal regulations!

# 17 Transport and Storage

Transport and storage are only allowed in original packaging.

# 18 Accessories / Spare parts

On request

| | |
|---|---|
|  | Spring strip with gripping plate; Cable bundling function and unlocking aid<br>8-pole<br>Use for terminal strip X1-X8<br>Source of supply: Wago<br>Article number: 2091-1108 / 002-000 |
|  | Snap-on tag color white - UTC-EM (20 * 8)<br>Use labeling terminal strips<br>Source of supply: Phoenix Contact<br>Article number: 0801477 |
|  | Coding key carrier; suitable for pitch 3.5 mm<br>Use for terminal strip X1-X8<br>Source of supply: Wago<br>Article number: 2091-1610 |
|  | Operating tool; plastic<br>Use for terminal block X9 - X10<br>Source of supply: Wago<br>Article number: 236-332 |
|  | Cover cap<br><br>For X9<br>Article number: 7001 |
|  | Cover cap<br><br>For X10<br>Article number: 7001 |
|  | Cover cap set<br><br>For X9 and X10<br>Article number: 7000 |

# 19 Troubleshooting

| Malfunction | Possible causes | Action |
|---|---|---|
| The channels do not react | Each channel must be switched on individually | Output Bytes 16 to 19 are set to 0xFF, so all channels are switched on and the outputs are set. |
| Digital output does not switch anymore | If there is an overload or a short circuit at an output, it will be switched off. The output remains switched off even after removing the error. | To reset the short-circuit memory, the output must be switched off via the PLC. |
| Error message to unused pins. | No sensors or actuators connected to these pins | The pins can be switched off individually via the Output Bytes 16 to 19. |
| | | |
| | | |
| | | |

# EU Declaration of Conformity

## BEx EU - Konformitätserklärung

**EU - Declaration of conformity / UE – Déclaration de conformité**

*Wir / We / Nous*

**BEx-Solution GmbH**
Lange Str. 99
76199 Karlsruhe
Germany

*erklären in alleiniger Verantwortung, dass das hier genannte Produkt den aufgeführten Richtlinien (RL) entspricht:*
*declare in sole responsibility that the product complies with the listed directives:*
*déclarons sous la seule responsabilité que le produit est conforme aux directives énumérées:*

**BEx1 Remote IO Modul**
Type 14200*00 / 14200*01 / 14200*02

| ***Richtlinien / directives / directives*** | ***Normen / Standards / Normes*** |
|---|---|
| ATEX<br>2014/34/EU | EN IEC 60079-0:2018<br>EN 60079-7:2018<br>EN 60079-11:2012<br>EN 60079-18/AC:2018 |
| EMV / EMC / CEM<br>2014/30/EU | EN 61000-6-2:2019-11<br>EN 61000-6-4:2020-09 |
| RoHS<br>2011/65/EU<br>2015/863/EU | |

***Kennzeichnung / Marking / Marquage***

Ex II 2(1) G Ex eb mb [ia Ga] IIC T4 Gb
II (1) D [Ex ia Da] IIIC

CE 2813

***EU-Baumusterprüfbescheinigung / EU-Type Examination / Examen de type UE***

EPS 19 ATEX 1 219 X
Bureau Veritas Consumer Products Services Germany GmbH
Notified body No. 2004
Wilhelm-Hennemann-Straße 8, 19061 Schwerin, Germany

***Qualitätsmanagement System / Quality Management System / Système de gestion de qualité***

ISO 9001:2015

Karlsruhe, 2021 / 03 / 26

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Ralf Bauermeister - CEO

9003_EU-Konf_BEx1_2021-03-26

# BEx EU - Konformitätserklärung

## EU - Declaration of conformity / UE – Déclaration de conformité

*Wir / We / Nous*

**BEx-Solution GmbH**
Lange Str. 99
76199 Karlsruhe
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*erklären in alleiniger Verantwortung, dass das hier genannte Produkt den aufgeführten Richtlinien (RL) entspricht:*
*declare in sole responsibility that the product complies with the listed directives:*
*déclarons sous la seule responsabilité que le produit est conforme aux directives énumérées:*

**BEx2 Remote IO Modul**
Type 24200*00 / 24200*01 / 24200*02

| ***Richtlinien / directives / directives*** | ***Normen / Standards / Normes*** |
|---|---|
| ATEX<br>2014/34/EU | EN IEC 60079-0:2018<br>EN 60079-7:2018<br>EN 60079-11:2012<br>EN 60079-18/AC:2018 |
| EMV / EMC / CEM<br>2014/30/EU | EN 61000-6-2:2019-11<br>EN 61000-6-4:2020-09 |
| RoHS<br>2011/65/EU<br>2015/863/EU | |

***Kennzeichnung / Marking / Marquage***

Ⓔx II 3(1) G Ex ec mc [ia Ga] IIC T4 Gc
II (1) D [Ex ia Da] IIIC

CE

***EU-Baumusterprüfbescheinigung / EU-Type Examination / Examen de type UE***

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***Qualitätsmanagement System / Quality Management System / Système de gestion de qualité***

ISO 9001:2015

Karlsruhe, 2021 / 03 / 26

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Ralf Bauermeister - CEO

9203_EU-Konf_BEx2_2021-03-26

# List of Abbreviations

| | |
|---|---|
| ATEX | **AT**mosphères **Ex**plosibles |
| AI | Analog Input |
| AO | Analog Output |
| BEx1 | Product name |
| CE | Communauté Européenne |
| DI | Digital Input |
| DO | Digital Output |
| Diag | Diagnoses |
| EMC | Electromagnetic Compatibility |
| EU | European Union |
| IEC | International Electrotechnical Commission |
| IP | International Protection (code) |
| IO | Input-Output |
| LED | Light-Emitting Diode |
| Pin | Terminal |
| Res | Reserve |

# Annex 1 Byte allocation of the different modules

| | 8xDI / 8xDO / 8xAI / 8xAO<br>8xDI / 16xDO / 8xAI<br>8xDI / 8xDO / 8xSwitch Mode<br><br>Zone 1 Type : **14200*00**<br>Zone 2 Type : **24200*00** | 16DI / 16DO<br>16DI / 8DO / 8AIO<br>16xDI / 8xDO/ 8xSwitch Mode<br><br>Zone 1 Type : **14200*01**<br>Zone 2 Type : **24200*01** | 32DI<br><br>Zone 1 Type : **14200*02**<br>Zone 2 Type : **24200*02** |
|---|---|---|---|
|  | | | |
| 1 | AI / Switch Mode(-) | DO / AO / AI / Switch Mode(+) | *DI* |
| 2 | GND | GND / Switch Mode(-) | GND |
| 3 | AO / DO / Switch Mode(+) | *DI* | *DI* |
| 4 | GND | GND | GND |
| 5 | *DI* | *DI* | *DI* |
| 6 | GND | GND | GND |
| 7 | DO | DO | *DI* |
| 8 | GND | GND | GND |

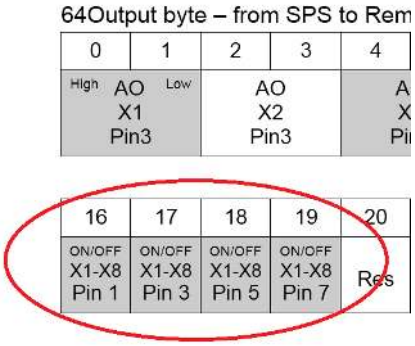
IB = Input byte (Modul ➔ SPS)
OB = Output byte (SPS ➔ Modul)

| | 8xDI / 8xDO / 8xAI / 8xAO<br>8xDI / 16xDO / 8xAI<br>8xDI / 8xDO / 8xSwitch Mode<br><br>Zone 1 Type : **14200*00**<br>Zone 2 Type : **24200*00** | | | 16DI / 16DO<br>16DI / 8DO / 8AIO<br>16xDI/ 8xDO/ 8xSwitch Mode<br><br>Zone 1 Type : **14200*01**<br>Zone 2 Type : **24200*01** | | | 32DI<br><br>Zone 1 Type : **14200*02**<br>Zone 2 Type : **24200*02** | | |
|---|---|---|---|---|---|---|---|---|---|
| PIN | Function | activated | IO Data | Function | activated | IO Data | Function | activated | IO Data |
| 1 | AI | OB 16 | IB 0..15 | DO | OB 16 | OB 16 | DI | OB 16 | IB 16 |
| | Switch Mode (-) | OB 16<br>OB 21 | IB 16 | AO | OB 16<br>OB 23 | OB 0..15 | | | |
| | | | | AI | OB 16<br>OB 24 | IB 0..15 | | | |
| | | | | Switch Mode (+) | OB 16<br>OB 21 | IB 16 | | | |
| 2 | GND | | | GND / SwitchMode (-) | | | GND | | |
| 3 | AO | OB 17 | OB 0..15 | DI | OB 17 | IB 17 | DI | OB 17 | IB 17 |
| | DO | OB 17<br>OB 22 | OB 17 | | | | | | |
| | Switch Mode (+) | OB 17<br>OB 21 | IB 16 | | | | | | |
| 4 | GND | | | GND | | | GND | | |
| 5 | DI | OB 18 | IB 18 | DI | OB 18 | IB 18 | DI | OB 18 | IB 18 |
| 6 | GND | | | GND | | | GND | | |
| 7 | DO | OB 19 | OB 19 | DO | OB 19 | OB 19 | DI | OB 19 | IB 19 |
| 8 | GND | | | GND | | | GND | | |

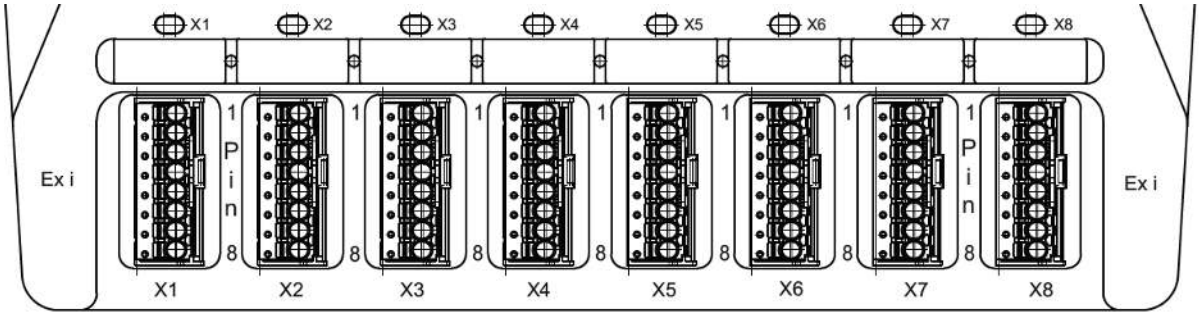
# Annex 2 How to start data exchange with PLC

All values will be shown as decimal and in brackets in hexadecimal

- ⇨ To activate all function (AI, AO, DI, DO) for all channels you have to set the Byte 16 to 19 to **255** (0xFF) continuously (in each cycle).
- ⇨ If you don't use a channel, set the corresponding bit to **0** (0x00).




If you only use a part of this function, here is some example how to set the bytes 16 to 19




- ⇨ Byte 16 for the analog input (Type *00)

If you have three AI Sensors connected on X1, X4 and X8

| Clamp | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 |
|---|---|---|---|---|---|---|---|---|
| Value | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 |
| Connected | yes | - | - | yes | - | - | - | yes |

Just add the values : 1 + 8 + 128 = 137 Binär : 10001001 = 137

**Byte 16 = 137 (0x89)**

⇨ Byte 17 for the analog output (Type *00)

If you have five AO Actuators connected on X3, X4,X6 and X8

| Clamp | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 |
|---|---|---|---|---|---|---|---|---|
| Value | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 |
| Connected | - | - | yes | yes | - | yes | - | yes |

Just add the values : 4 + 8 + 32 + 128 = 172 Binär : 10101100 = 172

**Byte 17 = 172 (0xAC)**

⇨ Byte 18 for the digital input (Type *00, *01 and *02)

If you have seven DI Namur sensors connected on X1, X2, X4, X6, X7 and X8

| Clamp | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 |
|---|---|---|---|---|---|---|---|---|
| Value | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 |
| Connected | yes | yes | - | yes | - | yes | yes | yes |

Just add the values : 1 + 2 + 8 + 32 + 64 + 128 = 235 Binär : 11101011 = 235

**Byte 18 = 235 (0xEB)**

⇨ Byte 19 for the digital output (Type *00 and *01)

If you have four DO Actuators connected on X3, X5, X6 and X7

| Clamp | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 |
|---|---|---|---|---|---|---|---|---|
| Value | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 |
| Connected | - | - | yes | - | yes | yes | yes | - |

Just add the values : 4 + 16 + 32 + 64 = 116 Binär : 01110100 = 116

**Byte 19 = 116 (0x74)**

You can set and reset this value in your PLC program to turn on and off the DO channels

⇨ Byte 21 for the switch mode (Type *00 and *01)

If you use this mode you also have to turn on the equivalent bit in byte 16 and 17 (Type *00) according Byte 16 (Type *01)

Three switches on clamp X4, X6, X8

| Clamp | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 |
|---|---|---|---|---|---|---|---|---|
| Value | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 |
| Connected | - | - | - | yes | - | yes | - | yes |

Just add the values : 8 + 32 + 128 = 168 Binär : 10101000 = 168 dez

**Byte 21 = 168 (0xA8)**

⇨ Byte 22 mode “AO to DO“ (Type *00)

If you use this mode you also have to turn on the equivalent bit in byte 17.

If you have four DO Actuators connected on X1, X3, X4, X6 and X8.

| Clamp | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 |
|---|---|---|---|---|---|---|---|---|
| Value | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 |
| Connected | yes | - | yes | yes | - | yes | - | yes |
| Byte 17 | 1 | | 1 | 1 | | 1 | | 1 |
| Byte 22 | 1 | | 1 | 1 | | 1 | | 1 |

Just add the values: 1 + 4 + 8 + 32 + 128 = 173 Binär: 10101101= 173 dez

**Byte 17 = 173 (0xAD) ; Byte 22 = 173 (0xAD)**

The output can be turn on and off via the Byte 17.

⇨ Byte 23 mode “DO to AO“ (Type *01)

If you use this mode you also have to turn on the equivalent bit in byte 16.

If you have four AO Actuators connected on X2, X5, X6 and X7.

| Clamp | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 |
|---|---|---|---|---|---|---|---|---|
| Value | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 |
| Connected | - | yes | - | - | yes | yes | yes | - |
| Byte 16 | | 1 | | | 1 | 1 | 1 | |
| Byte 23 | | 1 | | | 1 | 1 | 1 | |

Just add the values: 2 + 16 + 32 + 64 = 114 Binär: 1110010 = 114 dez

**Byte16 = Byte 22 = 114 (0x72)**

The analog Values can be set via output Byte 0..15.

⇨ Byte 24 mode “DO to AI“ (Type *01)

If you use this mode you also have to turn on the equivalent bit in byte 16.

If you have three AI Sensors connected on X3, X5 and X6.

| Clamp | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 |
|---|---|---|---|---|---|---|---|---|
| Value | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 |
| Connected | - | - | yes | - | yes | yes | | - |
| Byte 16 | | | 1 | | 1 | 1 | | |
| Byte 24 | | | 1 | | 1 | 1 | | |

Just add the values: 4 + 16 + 32 = 52 Binär: 0110100= 52 dez

**Byte 16 = Byte 22 = 52 (0x34)**

The analog Values are on the input Byte 0..15.

Some complex sample (Type *00)

| | |
|---|---|
| 3x AI X2, X7, X8 | (AI + and AI -) |
| 4x AO X1, X2, X3, X5 | (AO + and GND) |
| 6x DI X2, X3, X4, X6, X7, X8 | (DI + and GND) |
| 7x DO X1, X3, X4, X5, X6, X7, X8 | (DO + and GND) |
| | |
| 2x switch mode X4, X6 | (SW + and SW -) |
| 2x AO to DO mode X7, X8 | (Power supply for AI +) |

| Clamp | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | Result |
|---|---|---|---|---|---|---|---|---|---|
| Value | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | |
| Pin 1 (Byte 16) | - | AI - | - | SW - | - | SW - | AI - | AI - | 234 |
| Pin 2 - GND | | | | | | | | | |
| Pin 3 (Byte 17) | AO + | AO + | AO + | SW+ | AO + | SW+ | AI + | AI + | 255 |
| Pin 4 - GND | | | | | | | | | |
| Pin 5 (Byte 18) | - | DI + | DI + | DI + | - | DI + | DI + | DI + | 238 |
| Pin 6 – GND | | | | | | | | | |
| Pin 7 (Byte 19) | DO + | AI + | DO + | DO + | DO + | DO + | DO + | DO + | 255 |
| Pin 8 - GND | | | | | | | | | |
| | | | | | | | | | |
| Switch (Byte 21) | - | - | - | yes | - | yes | - | - | 40 |
| AOtoDO (Byte 22) | - | - | - | - | - | - | yes | yes | 192 |

For this example output bytes has to be written with this values.

These values must be transferred each cycle (continuous).

| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|
| ON/OFF X1-X8 Pin 1 | ON/OFF X1-X8 Pin 3 | ON/OFF X1-X8 Pin 5 | ON/OFF X1-X8 Pin 7 | Res | Switch X1-X8 1 - 3 | AO to DO X1-X8 Pin 3 |
| **234** | **255** | **238** | **255** | **0** | **40** | **192** |
| **0xEA** | **0xFF** | **0xEE** | **0xFF** | **0x00** | **0x28** | **0xC0** |

Free for your use

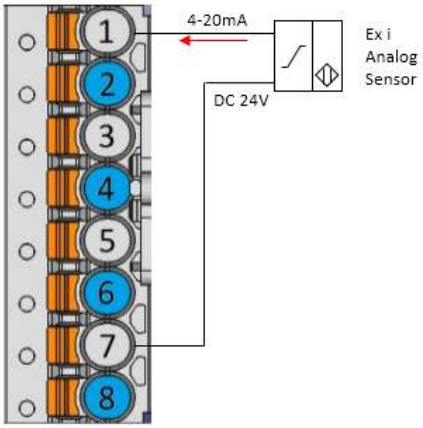
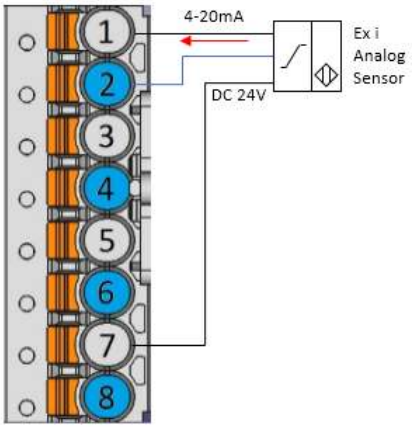
| Clamp | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | result |
|---|---|---|---|---|---|---|---|---|---|
| Value | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | |
| Pin 1 (Byte 16) | | | | | | | | | |
| Pin 2 - GND | | | | | | | | | |
| Pin 3 (Byte 17) | | | | | | | | | |
| Pin 4 - GND | | | | | | | | | |
| Pin 5 (Byte 18) | | | | | | | | | |
| Pin 6 – GND | | | | | | | | | |
| Pin 7 (Byte 19) | | | | | | | | | |
| Pin 8 - GND | | | | | | | | | |
| | | | | | | | | | |
| SwitchMode (Byte 21) | | | | | | | | | |
| AOtoDO(Byte 22) | | | | | | | | | |
| DOtoAO(Byte 23) | | | | | | | | | |
| DOtoAI(Byte 24) | | | | | | | | | |

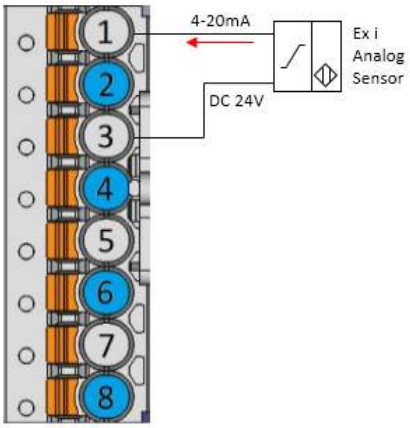
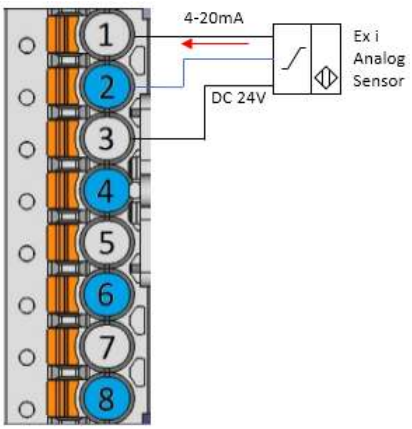
Free for your use

| Clamp | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | result |
|---|---|---|---|---|---|---|---|---|---|
| Value | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | |
| Pin 1 (Byte 16) | | | | | | | | | |
| Pin 2 - GND | | | | | | | | | |
| Pin 3 (Byte 17) | | | | | | | | | |
| Pin 4 - GND | | | | | | | | | |
| Pin 5 (Byte 18) | | | | | | | | | |
| Pin 6 – GND | | | | | | | | | |
| Pin 7 (Byte 19) | | | | | | | | | |
| Pin 8 - GND | | | | | | | | | |
| | | | | | | | | | |
| SwitchMode (Byte 21) | | | | | | | | | |
| AOtoDO(Byte 22) | | | | | | | | | |
| DOtoAO(Byte 23) | | | | | | | | | |
| DOtoAI(Byte 24) | | | | | | | | | |

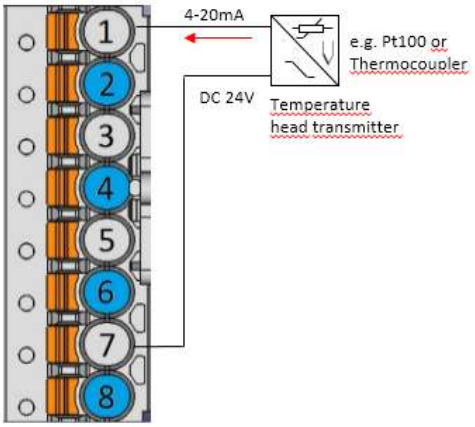
# Annex 3 Connection examples Type *00

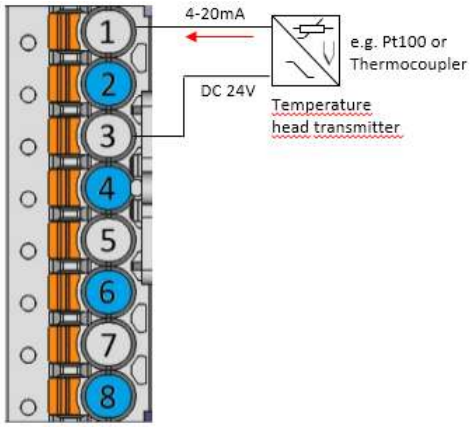
**AI - Analog input**

| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  |  |
| App No | 10 | 11 |
| Mode | Non | Non |
| Open load | yes | yes |
| short circuit | yes | yes |

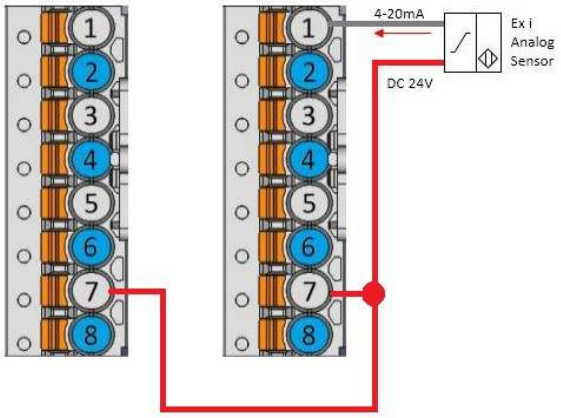
| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  |  |
| App No | 12 | 13 |
| Mode | AO to DO | AO to DO |
| Open load | yes | yes |
| short circuit | yes | yes |

**AI - Analog input (PT100 or TH)**

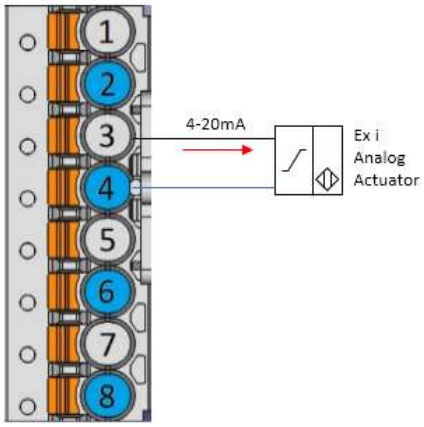
| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 14 | |
| Mode | Non | |
| Open load | yes | |
| short circuit | yes | |
| External | Temperature head transmitter | |

| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 15 | |
| Mode | AO to DO | |
| Open load | yes | |
| short circuit | yes | |
| External | Temperature head transmitter | |

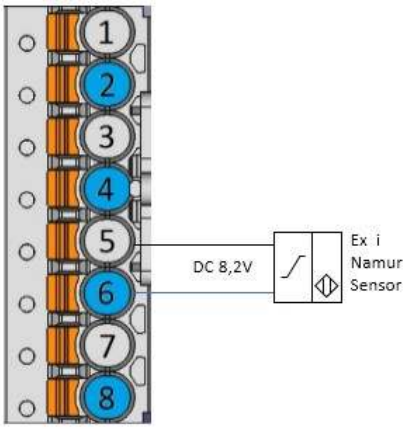
**Special condition, if more voltage is required at the sensor :**

| | 2 Draht Verbindung |
|---|---|
| wiring diagram |  |
| App No | 16 |
| Mode | non |
| Open load | No |
| short circuit | no |
| Caution  | **Connection of two DO (PIN 7) channels is only allowed,**<br>**if the return wire leads to the analog input PIN 1.** |

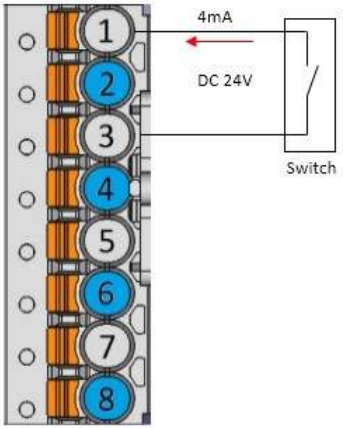
### AO - Analog output

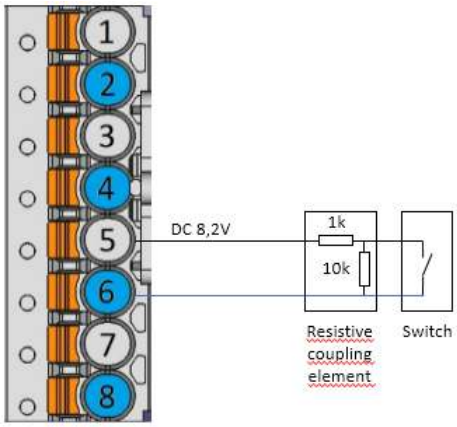
| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 30 | |
| Mode | Non | |
| Open load | yes | |
| short circuit | no | |

### DI – Digital input

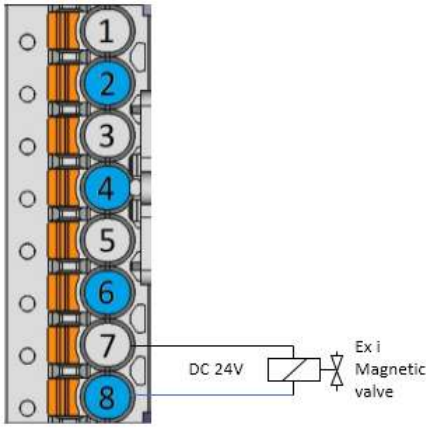
| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 50 | |
| Mode | Non | |
| Open load | yes | |
| short circuit | yes | |

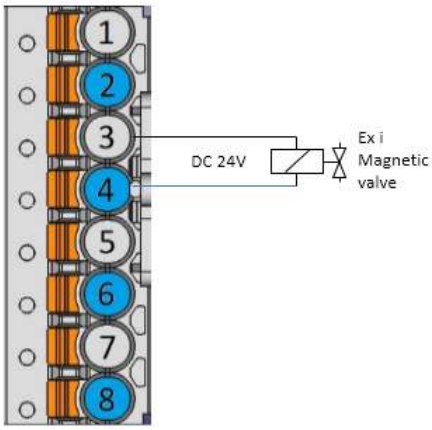
**DI – Digital input (mechanical switch)**

| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 51 | |
| Mode | Switch mode | |
| Open load | no | |
| short circuit | no | |

| | | |
|---|---|---|
| wiring diagram |  | |
| App No | 52 | |
| Mode | non | |
| Open load | yes | |
| short circuit | yes | |
| External | Resistive coupling element | |

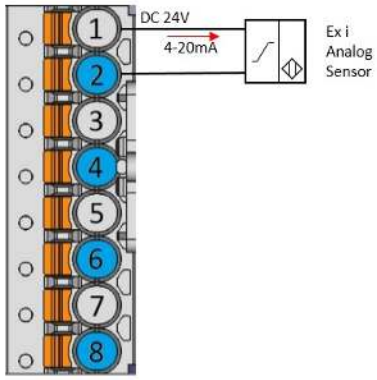
**DO – Digital output**

| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 70 | |
| Mode | Non | |
| Open load | yes | |
| short circuit | yes | |

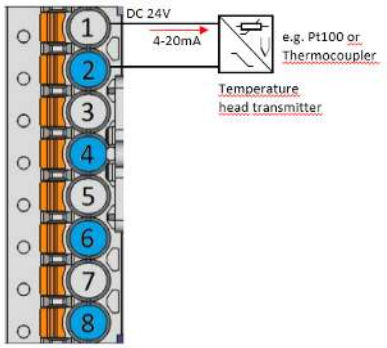
| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 71 | |
| Mode | AO to DO | |
| Open load | yes | |
| short circuit | no | |

# Annex 4 Connection examples Type *01

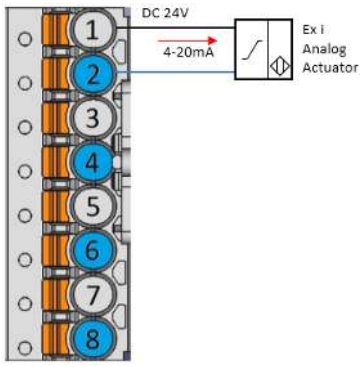
**AI - Analog input**

| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 110 | |
| Mode | DO to AI | |
| Open load | yes | |
| short circuit | yes | |

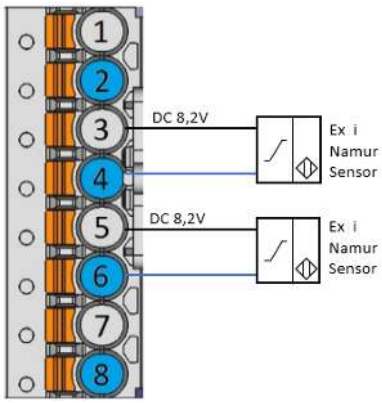
**AI - Analog input (PT100 or TH)**

| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 114 | |
| Mode | DO to AI | |
| Open load | yes | |
| short circuit | yes | |
| External | Temperature head transmitter | |

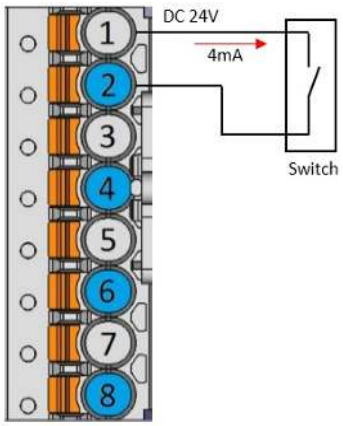
### AO - Analog output

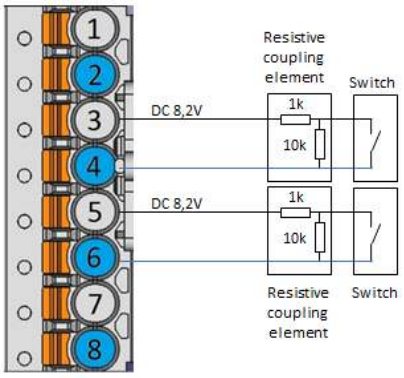
| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 130 | |
| Mode | DO to AO | |
| Open load | yes | |
| short circuit | no | |

### DI – Digital Eingang

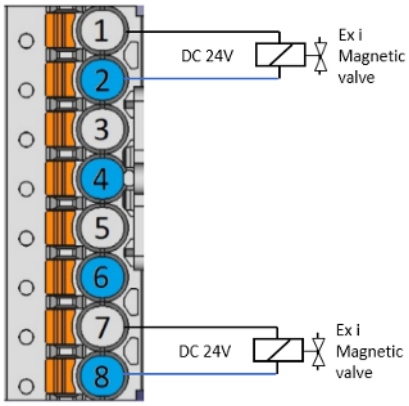
| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 150 | |
| Mode | Non | |
| Open load | yes | |
| short circuit | yes | |

**DI – Digital input (mechanical switch)**

| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 151 | |
| Mode | SwitchMode | |
| Open load | no | |
| short circuit | no | |

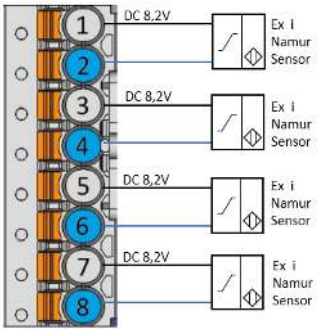
| | | |
|---|---|---|
| wiring diagram |  | |
| App No | 152 | |
| Mode | Non | |
| Open load | yes | |
| short circuit | yes | |
| External | Resistive coupling element | |

**DO – Digital output**

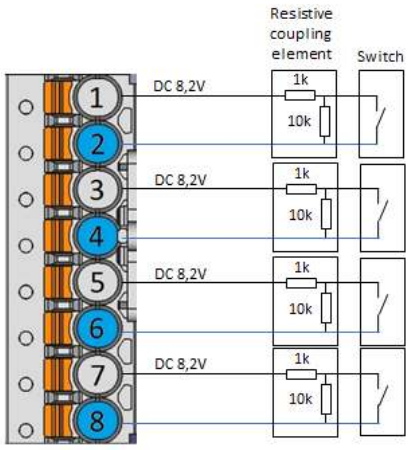
| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 170 | |
| Mode | Non | |
| Open load | yes | |
| short circuit | yes | |

# Annex 5 Connection examples Type *02

**DI – Digital input**

| | 2 wire connection | 3 wire connection |
|---|---|---|
| wiring diagram |  | |
| App No | 250 | |
| Mode | Non | |
| Open load | yes | |
| short circuit | yes | |

**DI – Digital input (mechanical switch)**

| | | |
|---|---|---|
| wiring diagram |  | |
| App No | 252 | |
| Mode | Non | |
| Open load | yes | |
| short circuit | yes | |
| External | Resistive coupling element | |

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