1. Description

The Modbus module with 4 analog outputs is designed for local switching operations. It is suitable as variable encoder, for example ventilation or mixing valves, valve positions etc. The outputs can be adjusted via a Modbus-Master. Setting of the slave address, bit rate and parity is done with the two address terminals. The device does not participate in bus communication if the address, bit rate and parity is not set correctly.

2. Declaration of Conformity

The device was tested according to the applicable standards. Conformity was proved. The declaration of conformity is available at the manufacturer BTR NETCOM GmbH.

Notes Regarding Device Description

These instructions include indications for use and mounting of the device. In case of questions that cannot be answered with these instructions please consult supplier or manufacturer. The indicated installation directions or rules are applicable to the Federal Republic of Germany. If the device is used in other countries it applies to the equipment installer or the user to meet the national directions.

Safety Instructions

Keep the applicable directions for industrial safety and prevention of accidents as well as the VDE rules. Technicians and/or installers are informed that they have to electrically discharge themselves before installation or maintenance of the devices. Only qualified personnel shall do mounting and installation work with the devices, see section “qualified personnel”. The information of these instructions have to be read and understood by every person using this device.

Symbols

Warning of dangerous electrical voltage

Meaning of symbols

3. Technical Data

Modbus Interface

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Modbus RTU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission rate</td>
<td>1200 ... 115200 Bd (factory setting 19200 Bd Even)</td>
</tr>
<tr>
<td>Cabling</td>
<td>RS485 two wire bus with voltage equalizing cable in bus / line topology</td>
</tr>
</tbody>
</table>

Supply

| Operating voltage range | 20 ... 28 V AC/DC (SELV) |
| Current consumption | 50 mA (AC) / 20 mA (DC) |
| Relative duty cycle | 100 % |

Output

| Output voltage | 4 x 0 ... 10 V DC |
| Output current | 5 mA at 10 V DC |
| Resolution | 0.625 mV / Digit |
| Error | 100 mV |

Housing

| Dimensions WxDxH | 1.4 x 2.8 x 2.6 in. (35 x 70 x 65 mm) |
| Weight | 72 g |
| Mounting position | any |

Mounting

| Mounting standard rail TH35 per IEC 60715 |
| Mounting in series | the maximum quantity of modules connected in line is limited to 15 or to a maximum power consumption of 2 Amps (AC or DC) per connection to the power supply. For any similar block of additional modules a separate connection to the power supply is mandatory. |

Continuation Technical Data

| Material | Polyamide 6.6 V0 |
| Housing | Polycarbonate |
| Terminal blocks | Polyamide 6.6 V0 |
| Cover plate | Polycarbonate |
| Type of protection | IEC 60529 |
| Housing | IP40 |
| Terminal blocks | IP20 |

Terminal blocks

| Supply and bus | max. AWG 16 (1.5 mm²) solid wire |
| 4 pole terminal block | max. AWG 18 (1.0 mm²) stranded wire |
| Wire diameter | min. 0.3 mm up to max. 1.4 mm |
| (terminal block and jumper plug are included to each packing unit) |

Module connection

| Input/Output | max. AWG 12 (4.0 mm²) solid wire |
| Wire diameter | max. AWG 14 (2.5 mm²) stranded wire |
| min. 0.3 mm up to max. 2.7 mm |

Temperature range

| Operation | -5 ° C ... +55 ° C |
| Storage | -20 ° C ... +70 ° C |
| Protective circuitry | polarity reversal protection of operating voltage |
| Operating and bus activity green LED |
| Error indication | red LED |

4. Wiring Diagram

5. Connection Diagram
6. Mounting

Power down the equipment
Mount the module on standard rail (TH35 per IEC 60715 in junction boxes and/or on distribution panels).

Installation
Electric installation and device termination shall be done by qualified persons only. Respecting all applicable specifications and regulations.

Plug in the terminal block for bus connection

7. Bit rate and Parity setting

The bit rate and parity can be set in the programming mode when jumper is plugged behind the front cover of the module. This jumper is removed in normal mode. A connection to the bus is not required during bit rate setting.

The bit rate of the modules can be set in the following way:
1. remove the front cover of the module;
2. plug a jumper to the two middle pins of the 4 pole header between the red and green LED (3);
3. set the desired parity and bit rate with the address switches (3) in accordance to the chart below.

4. switch on the supply voltage of the module; it is now permanently saving the bit rate in an EEPROM;
5. switch off the supply voltage of the module;
6. remove the jumper from the header and place the front cover.

The module can be aligned without interspace. Use the jumper plug to connect bus and supply voltage when the modules are mounted in series.

The maximum quantity of modules connected in line is limited to 15 or to a maximum power consumption of 2 Amps (AC or DC) per connection to the power supply. For any similar block of additional modules a separate connection to the power supply is mandatory.

8. Software description

9.1 I/O Commands

“03 (0x03) Read Holding Registers”

Holding Register 0-3: Output values of the outputs
Signed Integer16,

Holding Register 4-7: Basic settings of the output values

Request

Valid Register Starting Address 0.7 or 66
Valid Quantity of Registers 1..8 or 1

Response

Byte Count 2 x Quantity of Registers
Values Register 0..7
0x0000 to 0xFFF
(0x7FFF = 10,24 Volt )

Einheit = 10,24V / 215 = 1V / 3200 = 0,3125 mV

Value Register 66
Time constant for communication monitoring.
Register Value = 0 (0x0000) there is no communication monitoring, all other values are for communication monitoring with a solution of 10 ms.
0x0000 to 0xFFF -> 0 to 655,35 seconds = 10,9 minutes

“06 (0x06) Write Single Register”

Request

Valid Register Address 0.7 or 66
Valid Value Register 0..7
0x0000 to 0xFFF
(0x7FFF = 10,24 Volt )

Valid Value Register 66
0x0000 to 0xFFF
(0 to 655,35 seconds )

Response

Echo of the request

“16 (0x10) Write Multiple Registers”

Request

Valid Register Starting Address 0.7
Valid Quantity of Registers 1..8
Valid Byte Count 2 x Quantity of Registers (QoR)
Valid Value Register 0..7
QoR x 0x0000 to 0xFFF

Response

Echo of the request

Function Code, Register Starting Address, Quantity of Registers

9.2 Bit rate setting with Modbus command

Parity and bit rate have the same value as when setting them by address switch.

If Parity or Bit has the value 0, no setting or storage is carried out.

The register content is stored in the EEPROM.
Continuation Software description

9.3 General Commands

“08 (0x08) Diagnostics”

Subfunction “0 (0x0000) Return Query Data”
- Data Field Any
- Response: Echo of Request

Subfunction “1 (0x0001) Restart Communication Option”
- Data Field 0x0000 oder 0xFF00
- Response: Echo of Request
- Action: Clears all Error Counters, Restarts node

Subfunction “4 (0x0004) Force Listen Only Mode”
- Data Field 0x0000
- No Response
- Action: Clears all Error Counters

Subfunction “10 (0x000A) Clear Counters”
- Data Field 0x0000
- Response: Echo of Request
- Action: Clears all Error Counters

Subfunction “11 (0x000B) Return Bus Message Count”
- Data Field 0x0000
- Response: Quantity of messages that the remote device has detected on the communications system since its last restart, clear counters operation, or power-up.

Subfunction “12 (0x000C) Return Bus Communication Error Count”
- Data Field 0x0000
- Response: Quantity of errors encountered by the remote device since its last restart, clear counters operation, or power-up. (CRC, Length <3, Parity, Framing)

Subfunction “13 (0x000D) Return Bus Exception Error Count”
- Data Field 0x0000
- Response: Quantity of MODBUS exception responses returned by the remote device since its last restart, clear counters operation, or power-up.

Subfunction “14 (0x000E) Return Slave Message Count”
- Data Field 0x0000
- Response: Quantity of messages addressed to the remote device or broadcast, that the remote device has processed since its last restart, clear counters operation, or power-up.

Subfunction “15 (0x000F) Return Slave No Response Count”
- Data Field 0x0000
- Response: Quantity of messages addressed to the remote device for which it has returned no response (neither a normal response nor an exception response), since its last restart, clear counters operation, or power-up.

Continuation Software description

“43 /14 (0x2B / 0x0E) Read Device Identification”

Request

<table>
<thead>
<tr>
<th>Read Device ID code:</th>
<th>0x01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object ID 0x00</td>
<td></td>
</tr>
</tbody>
</table>

Response:

- Device ID code 0x01
- Conformity level 0x01
- More follows 0x00
- Next object ID 0x00
- Number of objects 0x03
- Object ID 0x00
- Object Length 0x03
- Object Value “BTR”
- Object ID 0x01
- Object Length 0x06
- Object Value “MR-AO4”
- Object ID 0x02
- Object Length 0x04
- Object Value “V1.0”