1. Description
The Modbus module with 4 digital inputs is designed for local switching operations. It is suitable to record potential-free switching states as well as electrical limit switches of ventilation valves or auxiliary contacts of power contactors. The inputs can be operated by potential-free switches or contacts and as voltage inputs. The inputs can be scanned via a Modbus-Master. Setting of the slave address, bit rate and parity is done with the two address inputs. The inputs can be used for the connection of the device to the bus. It is suitable to connect the device according to the VDE 0664. It also includes indications for use and mounting of such devices and whose professional qualification meets the requirements of their work.

This includes for example:
- Qualification to connect the device according to the VDE specifications and the local regulations and a qualification to put this device into operation, to power it down or to activate it by respecting the internal directions.
- Knowledge of safety rules.
- Knowledge about application and use of the device within the equipment system etc.

2. Declaration of Conformity
The device was tested according to the applicable standards. Conformity was proofed. 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.

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 as prescribed 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
- Means that non-observance may cause risk of life, grievous bodily harm or heavy material damage.

Qualified Personnel
Qualified personnel in the sense of these instructions are persons who are well versed in the use and installation of such devices and whose professional qualification meets the requirements of their work.

This includes for example:
- Qualification to connect the device according to the VDE specifications and the local regulations and a qualification to put this device into operation, to power it down or to activate it by respecting the internal directions.
- Knowledge of safety rules.
- Knowledge about application and use of the device within the equipment system etc.

3. Technical Data

<table>
<thead>
<tr>
<th>Modbus Interface</th>
<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>
<td></td>
</tr>
<tr>
<td>Cabling</td>
<td>RS485 two wire bus with voltage equalizing cable in bus / line topology terminate with 120 Ohms</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supply</th>
<th>Operating voltage range</th>
<th>20 ... 28 V AC/DC (SELV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current consumption</td>
<td>50 mA (AC) / 20 mA (DC)</td>
<td></td>
</tr>
<tr>
<td>Relative duty cycle</td>
<td>100 %</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input</th>
<th>Voltage input</th>
<th>30 V AC/DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-signal recognition</td>
<td>&gt; 10 V AC/DC</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Housing</th>
<th>Dimensions WxHxD</th>
<th>1.4 x 2.8 x 3.0 in. (35 x 70 x 65 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>95 g</td>
<td></td>
</tr>
<tr>
<td>Mounting position</td>
<td>any</td>
<td></td>
</tr>
<tr>
<td>Mounting in series</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminal blocks</th>
<th>Supply and bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 pole terminal block</td>
<td>max. AWG 16 (1.5 mm²) solid wire</td>
</tr>
<tr>
<td>Wire</td>
<td>max. AWG 18 (1.0 mm²) stranded wire</td>
</tr>
<tr>
<td>Wire diameter</td>
<td>min. 0.3 mm up to max. 1.4 mm (terminal block and jumper plug are included to each packing unit)</td>
</tr>
<tr>
<td>Module connection</td>
<td>max. AWG 12 (4.0 mm²) solid wire</td>
</tr>
<tr>
<td>Input/Output</td>
<td>max. AWG 14 (2.5 mm²) stranded wire</td>
</tr>
<tr>
<td>Wire diameter</td>
<td>min. 0.3 mm up to max. 2.7 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature range</th>
<th>Operation</th>
<th>-5 °C ... +55 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage</td>
<td>-20 °C ... +70 °C</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protective circuitry</th>
<th>polarity reversal protection of operating voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>polarity reversal protection of supply and bus</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display activity</th>
<th>green LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error indication</td>
<td>red LED</td>
</tr>
<tr>
<td>Status of the inputs</td>
<td>yellow LED</td>
</tr>
</tbody>
</table>

4. Wiring Diagram

5. Connection Diagram

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Digital Input Module MR-DI4
1108341319
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, by respecting all applicable specifications and regulations.

Plug in the terminal block for bus connection

Mounting instruction see www.metz-connect.com

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 (J);
3. set the desired parity and bit rate with the address switches (A) 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.

If the settings differ from the settings specified in the chart the factory setting applies.

Factory setting: 19200 Bd Even

8. Connection examples

Connection example 1

Connection example 2

9. Software description

9.1 I/O Commands

"02 (0x02) Read Discrete Inputs"

Request
Valid Input Starting Address 0 .. 3
Valid Quantity of Inputs 1 .. 4

Response
Byte Count 1
Input Status Bit0 ... Bit3 ( Bit 4 .. 7 = 0 )

Information
1 = Status input closed
0 = Status input open

“04 (0x04) Read Input Registers”

Request
Valid Register Starting Address 0
Valid Quantity of Registers 1

Response
Byte Count 2
Values Register
Input Status Bit 0 .. 3

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.

"06 (0x06) Write Single Register"

Request
Valid Register Address 0x41 (65)
Valid Register Value 2 Bytes
Bit 15-8: Magic-Number 0x53 = 83 as protection against accidental writing.

The command will be further analysed only with this number.

Response
Echo of Request
Example for a frame:

Slave address 0x12 Setting of rotary switch (18)
Function 0x06 Write Single Register
Register address Hi 0x00
Register address Lo 0x41 Bit rate and parity (65)
Register contents Hi 0x53 Magic-Number
Register contents Lo 0x15 Parity Even, 19200 Baud

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Distributed by RIA CONNECT GmbH and BTR NETCOM GmbH
Mounting instruction see www.metz-connect.com
Continuation Software Description

All devices can be switched simultaneously with a Broadcast command (Slave address 0x00). However, it is advised not to do so as this can cause problems:

- Devices from other manufacturers may have under this address a register for a different purpose that will then be operated in the wrong way.
- There is no feedback from the individual devices. Consequently the control cannot immediately recognize if the command was correctly received.

It is safer to address and switch each device individually. The device will then answer with the old settings of parity and bit rate. Switching will take place only afterwards. However, the answer can get lost if the bus is disturbed.

When all devices are switched, it is advised to check communication. Any function of the device providing a feedback is suitable. If a single function is to be used being independent from the process periphery then the function „Diagnostic“ sub-function „Return Query Data“ is suitable, it returns the transferred data.

If bit rate and parity setting of a device are unknown it is possible to address the device successively with all combinations of bit rate and parity until the device answers. Try the most likely combinations first. Try the lower bit rates last as they take longer.

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: No response until Node Reset or Function Code 08 Subcode 01
Subfunction “10 (0x000A) Return Bus Message Count”
Data Field 0x0000
Response: Quantity of messages that the remote device has processed 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.

“43 / 14 (0x2B / 0x0E) Read Device Identification”
Request
Read Device ID code: 0x01
Object ID 0x00
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-DI4”
Object ID 0x02
Object Length 0x04
Object Value “V1.0”