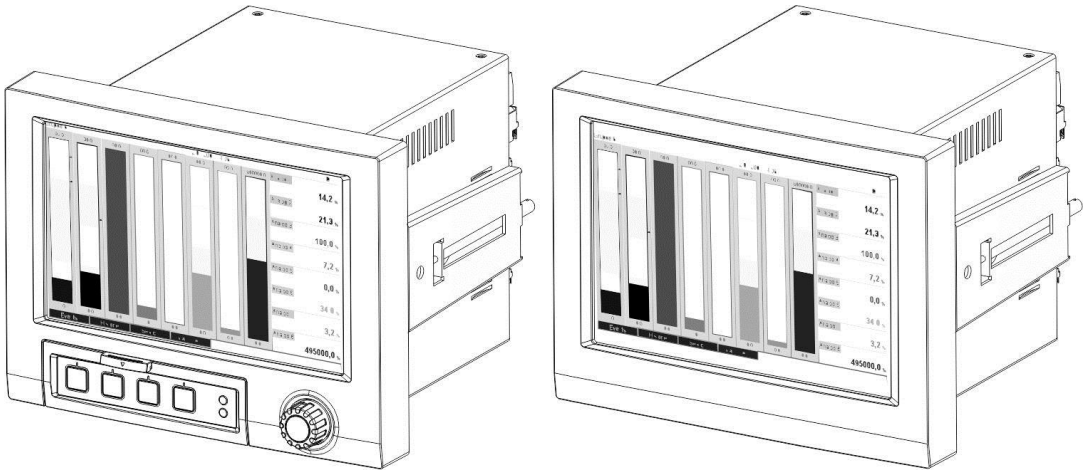
Additional instructions

Videographic recorder LINAX DR3000

Modbus RTU/TCP Master



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1 General information

Symbols and icons:

NOTICE **Note**
Failure to observe these instructions can lead to device damage or malfunction!

Tip
Indicates additional information.

All of the descriptions below that are relevant to device settings refer to **"Setup/Advanced setup"** unless otherwise specified.

1.1 Scope of delivery

These instructions represent an additional description for a particular software option.

This supplementary description is **not intended to replace** the accompanying Operating Instructions!
Please refer to the Operating Instructions and other documentation for detailed information.

1.2 Firmware history

Overview of unit software history:

Unit software version / date	Software modification	Modbus Master Operating Instructions
V2.00.06 / 12.2015	Original software	BA01629O/09/01.16

1.3 Requirements

The Modbus Master function can be used in parallel with the Fieldbus slave options (Modbus TCP, Profibus DP, etc.). The device can thus be master of a Modbus bus and can be scanned as a slave by a control system.

Modbus Master RTU and Modbus Slave RTU cannot be used simultaneously because the same interface is used.

Modbus Master RTU and Modbus Master TCP cannot be used simultaneously.

The combination of Modbus Master RTU and tele-alarm software option is possible. However, the device's RS485/232 interface is used by the Modbus master wiring. The Internet/email functionality of the tele-alarm software can thus be used but modem connection is not possible via RS232.

1.4 Required settings

As Modbus master, the device can scan other Modbus slaves via RS485 or Ethernet.
The following settings are required for this purpose:

1.4.1 Modbus Master RTU

"Setup/Advanced setup/Communication/Modbus Master"

- Modbus RS485
- Scan cycle 1, 2, 5, 10, 30s, 1, 2, 5, 10min
- Timeout for response 1, 2, 5, 10s, 30s, 1min
- Serial interface

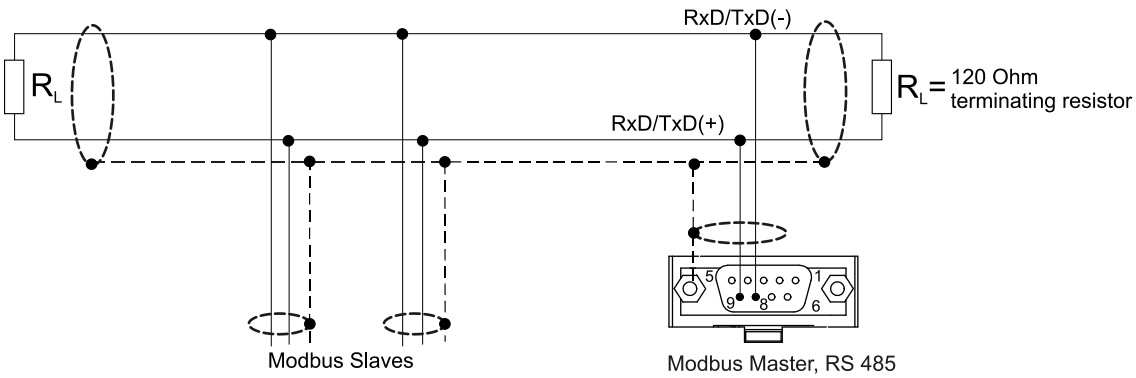
- Baud rate 9600, 19200, 38400, 57600, 115200
- Parity (none, odd, even)
- Stop bits 1, 2

- Expert mode
  - Register per command 3..125
  - Connection attempts 1..10
  - Command distribution Distributed over scan cycle
    At the start of the scan cycle
    Continuously
  - Pause between commands 5..600000 ms

"Setup/Advanced setup/Inputs/Universal inputs/Universal input x"

- Universal input (max. 40)
  - Signal Modbus Master
  - Measured value type Instantaneous value, counter
  - Slave address 1..255
  - Readout function Read Input Register, Read Holding Register
  - Register address 1..65535
  - Data type INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, FLOAT_L, DOUBLE_B, DOUBLE_L
  - Calc. factor (If "Counter" is selected)
  - Start value range
    End value range
    Range start
    Meas. range end (Scaling for measured value type *Instantaneous value* and data type ..INT..)

Electrical connection:



Initial setting:
The commands used are evenly distributed over the scan cycle.
If a response timeout occurs, the request is made once more at the next scan cycle.
If there is still no response, all of the values of the slave are declared as invalid. (Counting stops if "Counter" is selected).
The counter read in is interpreted as overall counter.

1.4.2 Modbus Master TCP

"Setup/Advanced setup/Communication/Modbus Master"

- Modbus Ethernet
- Expert mode
  - Register per command 3..125

"Setup/Advanced setup/Inputs/Universal inputs/Universal input x"

- Universal input (max. 40)
  - Signal — Modbus Master
  - Measured value type — Instantaneous value, counter
  - Transmission protocol — Modbus TCP, Modbus TCP with slave address, Modbus RTU or TCP
  - IP address — x.x.x.x
  - Port — 502
  - Slave address — 1..255 (for Modbus TCP with slave address)
  - Readout function — Read Input Register, Read Holding Register
  - Register address — 1..65535
  - Data type — INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, FLOAT_L, DOUBLE_B, DOUBLE_L
  - Calc. factor — (If "Counter" is selected)
  - Start value range
    End value range
    Range start
    Meas. range end — (Scaling for measured value type *Instantaneous value* and data type ..INT..*)*

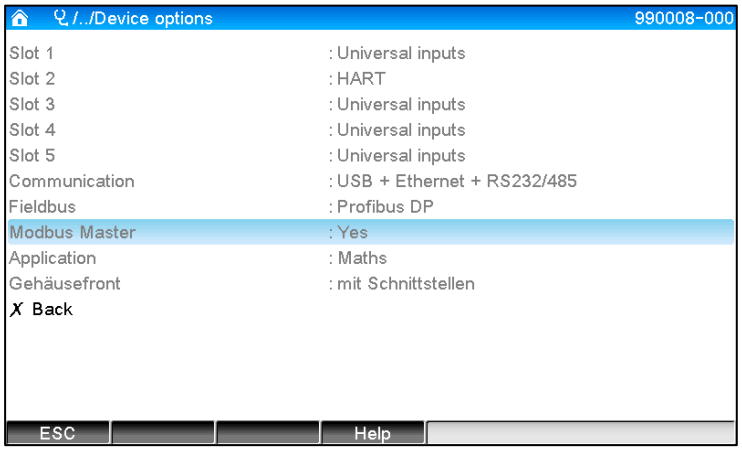
Initial setting:
The requests are combined as follows:
- A separate connection is established for every different IP address combined with the port
- If the IP address and port are the same, the same transmission protocols are combined with the slave address into one connection

The commands used are evenly distributed over the time period of 0.5 s and sent in one connection.
Slaves with different IP addresses or transmission protocols are scanned in parallel.

If a response timeout occurs, the request is made once more at the next scan cycle.
If there is still no response, all of the values of the slave are declared as invalid. (Counting stops if "Counter" is selected).
The counter read in is interpreted as overall counter.

1.5 Checking if the Modbus Master option exists

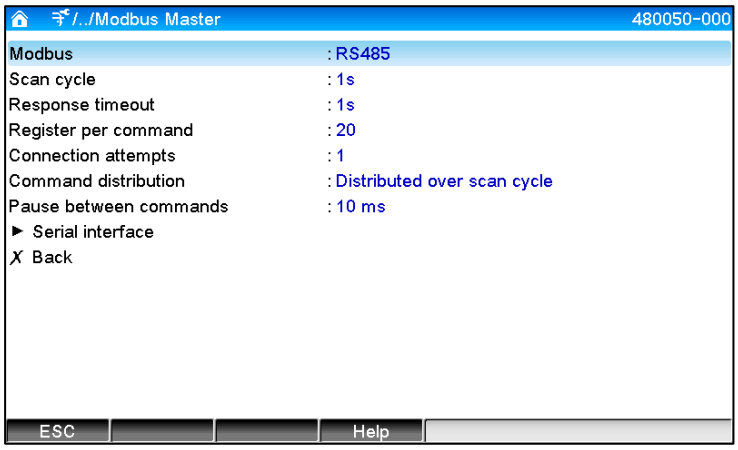
To establish if the "Modbus Master" option exists, check in the main menu under **"Diagnostics/Device information/Device options**.

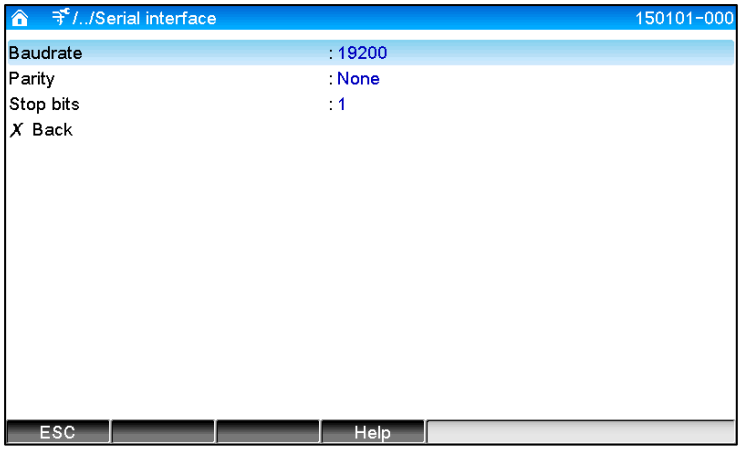


2 Basic settings

2.1 Activating Modbus Master RTU (RS485)

The Modbus Master RTU functionality must first be activated in the main menu under **"Expert/Communication/ Modbus Master"** in order to use it.





2.1.1 Register per command

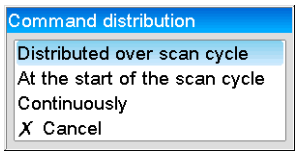
Initial setting: 20 (3..125)
This option is used to set the maximum number of registers combined in one command if several registers are read by one slave, e.g. registers 1-3 and registers 10-12 should be read so registers 1-12 are read with one command.
If this parameter was set to 6 for example, two individual commands are sent.

2.1.2 Connection attempts

Initial setting: 1 (1 to 10)
If a slave does not respond within the configured time, an attempt is once again made to build a connection at the next scan cycle. The number of attempts can be set. The last value configured is reused during the attempts. The value is then flagged as invalid.

2.1.3 Command distribution

Initial setting: Distributed over scan cycle



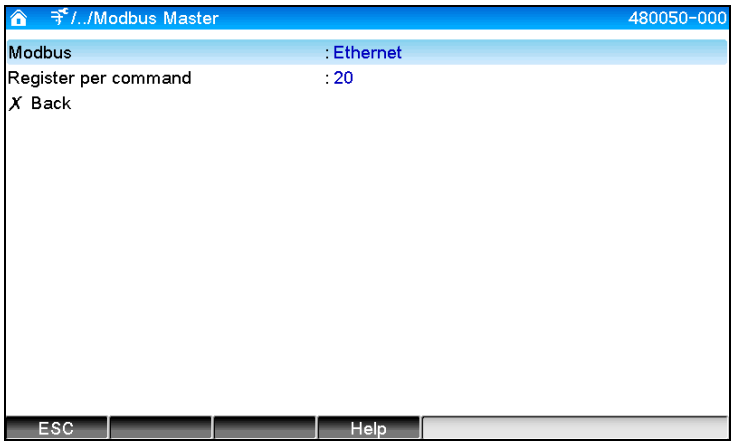
Distributed over scan cycle:	The commands are evenly distributed over the scan cycle.
At the start of the scan cycle:	The commands are sent at intervals (pause) at the start of the scan cycle. A new request starts after the scan cycle is completed.
Continuously:	The commands are continuously sent at intervals (pause) irrespective of the scan cycle.

2.1.4 Pause between commands

Initial setting 10 ms (5 to 600000)
The minimum duration of the pause between the commands to be sent.

2.2 Activating Modbus Master TCP (Ethernet)

The Modbus Master TCP functionality must first be activated in the main menu under **"Expert/Communication/Modbus Master"** in order to use it.



2.2.1 Register per command

Initial setting: 20 (3..125)
This option is used to set the maximum number of registers combined in one command if several registers are read by one slave, e.g. registers 1-3 and registers 10-12 should be read so registers 1-12 are read with one command.
If this parameter was set to 6 for example, two individual commands are sent.

2.2.2 Transmission behaviour

Transmission follows an established pattern that includes the following key data:

- Connection timeout 5 s
- Resumption of connection after 2 s
- Response timeout 2 s
- Pause between the individual commands in a connection 500ms/number of commands in the connection

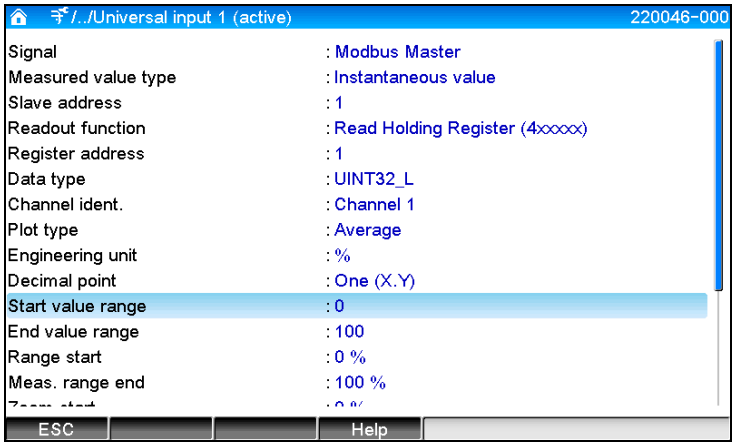
- If the following properties are (see 3.2) identical, the same connection is used:
  - IP address
  - Port
  - Transmission protocol
  - Slave address

3 Selecting the Modbus slaves

The Modbus slaves are allocated in the main menu under "**Expert/Inputs/Universal inputs**".

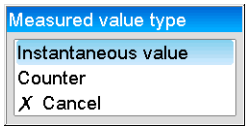
3.1 Setting the universal input for Modbus RTU

The Modbus Master RTU (RS485) must first be activated!



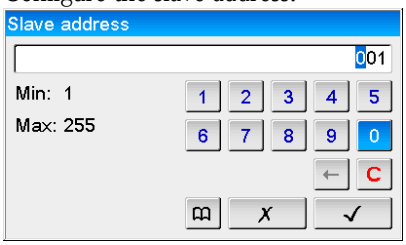
3.1.1 Measured value type

Select how the read measured value should be used.



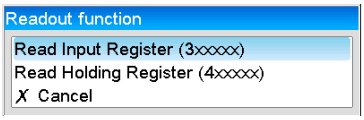
3.1.2 Slave address

Configure the slave address.



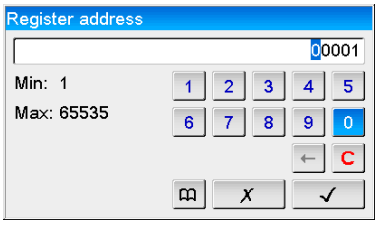
3.1.3 Readout function

Select the function with which the values should be read out.



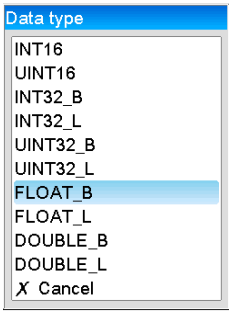
3.1.4 Register address

Enter the register address. Start at 1, which corresponds to address 0 in the transmission protocol.



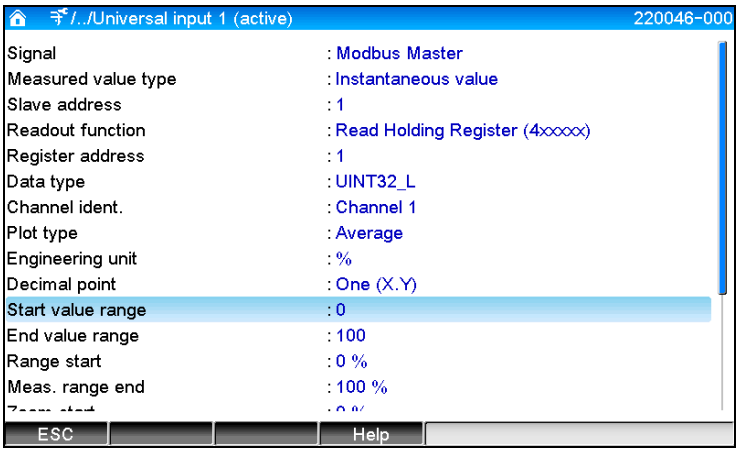
3.1.5 Data type

Select the data type that should interpret the read byte sequences (see also 3.3 Data types).

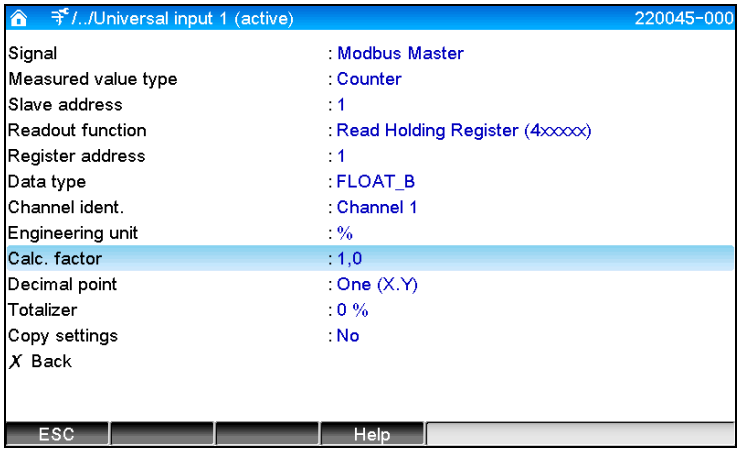


3.1.6 Scaling or calculation factor

The value can be scaled if the data type was set to ..**INT**.. and measured value type to **Instantaneous value**.

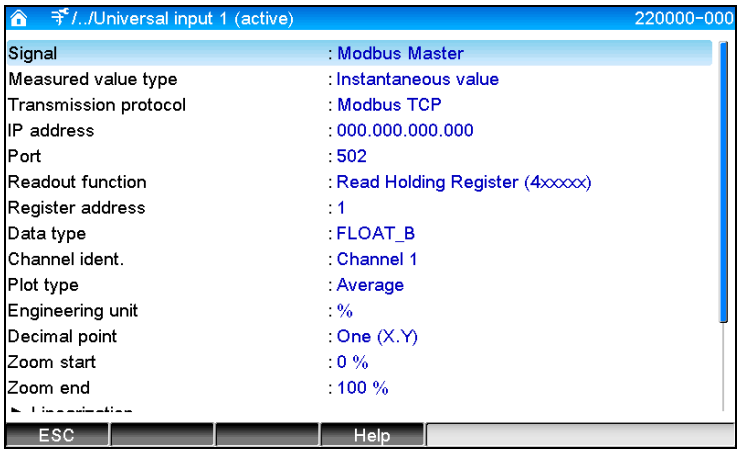


If **Counter** is selected as measured value type, a calculation factor can be specified.



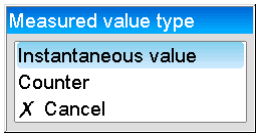
3.2 Setting the universal input for Modbus TCP

The Modbus Master TCP (Ethernet) must first be activated!



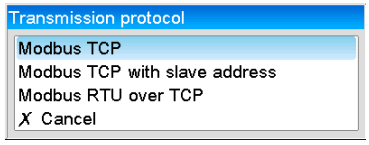
3.2.1 Measured value type

Select how the read measured value should be used.



3.2.2 Transmission protocol

Select the transmission protocol with which the data are transferred.

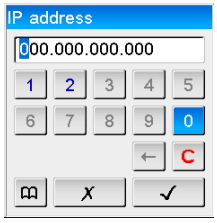


Modbus TCP:	Communicate with Modbus TCP slaves.
Modbus TCP with slave address:	Communicate with gateways that convert the address to the correct slave using a table.

Modbus RTU over TCP:	Transfer the basic Modbus RTU protocol with CRC sum. Used in Ethernet signal converters -> RS485.

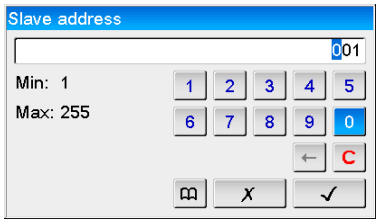
3.2.3 IP address

IP address of the slave or gateway.



3.2.4 Slave address

A slave address must be entered for the **Modbus TCP with slave address** and **Modbus RTU over TCP** transmission protocols.

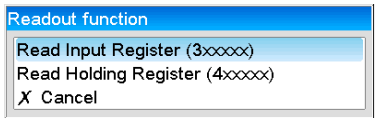


3.2.5 Port

Port for the connection.

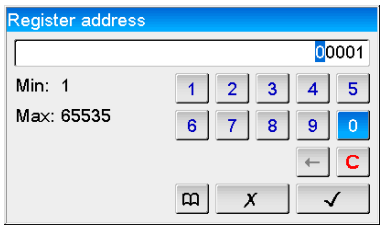
3.2.6 Readout function

Select the function with which the values should be read out.



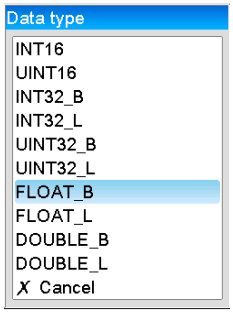
3.2.7 Register address

Enter the register address. Start at 1, which corresponds to register address 0 in the transmission protocol.



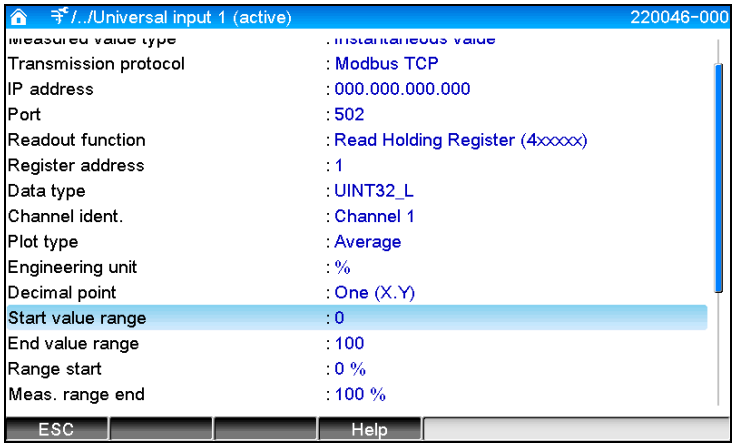
3.2.8 Data type

Select the data type that should interpret the read byte sequences (see also 3.3 Data types).

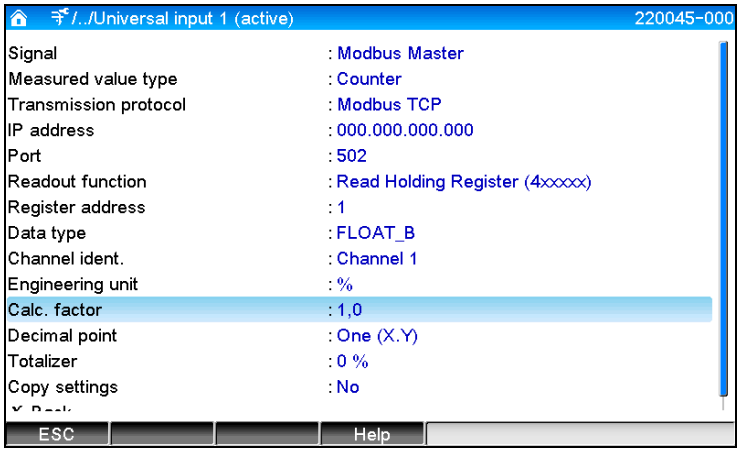


3.2.9 Scaling or calculation factor

The value can be scaled if the data type was set to ..**INT**.. and measured value type to **Instantaneous value**.



If **Counter** is selected as measured value type, a calculation factor can be specified.



3.3 Data types

The addressing of the bytes, i.e. the order in which they are transmitted, is not defined in the MODBUS specification. It is therefore important to agree or adjust the addressing mode between the master and slave at commissioning.

The following data types are supported by the device:

FLOAT (floating-point number IEEE 754)
Data length = 4 bytes (2 registers)

Byte 0	Byte 1	Byte 2	Byte 3
SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM

S = Sign
E = Exponent
M = Mantissa

Option	Order			
	1.	2.	3.	4.
FLOAT_L	Byte 2 (MMMMMMMM)	Byte 3 (MMMMMMMM)	Byte 0 (SEEEEEEE)	Byte 1 (EMMMMMMM)
FLOAT_B	Byte 0 (SEEEEEEE)	Byte 1 (EMMMMMMM)	Byte 2 (MMMMMMMM)	Byte 3 (MMMMMMMM)

DOUBLE (floating-point number IEEE 754)
Data length = 8 bytes (4 registers)

Byte 0	Byte 1	Byte 2	Byte 3
SEEEEEEE	EEEEMMMM	MMMMMMMM	MMMMMMMM
Byte 4	**Byte 5**	**Byte 6**	**Byte 7**
MMMMMMMM	MMMMMMMM	MMMMMMMM	MMMMMMMM

S = Sign
E = Exponent
M = Mantissa

Option	Order			
	1. 5.	2. 6.	3. 7.	4. 8.
DOUBLE_L	Byte 6 (MMMMMMMM)	Byte 7 (MMMMMMMM)	Byte 4 (EMMMMMMM)	Byte 5 (MMMMMMMM)
	Byte 2 (MMMMMMMM)	Byte 3 (MMMMMMMM)	Byte 0 (SEEEEEEE)	Byte 1 (EEEEMMMM)
DOUBLE_B	Byte 0 (SEEEEEEE)	Byte 1 (EEEEMMMM)	Byte 2 (MMMMMMMM)	Byte 3 (MMMMMMMM)
	Byte 4 (MMMMMMMM)	Byte 5 (MMMMMMMM)	Byte 6 (MMMMMMMM)	Byte 7 (MMMMMMMM)

UINT32 (unsigned) , INT32 (signed):
Data length = 4 bytes (2 registers)

Byte 0	Byte 1	Byte 2	Byte 3
Most significant byte (MSB)			Least significant byte (LSB)

Option	Order			
	1.	2.	3.	4.
UINT32_L INT32_L	Byte 2	Byte 3 (LSB)	Byte 0 (MSB)	Byte 1
UINT32_B INT32_B	Byte 0 (MSB)	Byte 1	Byte 2	Byte 3 (LSB)

UINT16 (unsigned) , INT16 (signed):
Data length = 2 bytes (1 register)

Byte 1	Byte 2
Most significant byte (MSB)	Least significant byte (LSB)

Option	Order	
	1.	2.
UINT16 INT16	Byte 1 (MSB)	Byte 0 (LSB)

4 Troubleshooting

4.1 Troubleshooting Modbus TCP

- Is the Ethernet connection between device and master OK?
- Does the IP address sent by the master correspond to that configured at the device?
- Does the port configured at the master correspond to that configured at the device?

4.2 Troubleshooting Modbus RTU

- Does the device have the same baud rate and parity as the master?
- Is the interface wiring OK?
- Does the device address sent by the master correspond to the configured device address of the device?
- Have all slaves on the Modbus different device addresses?