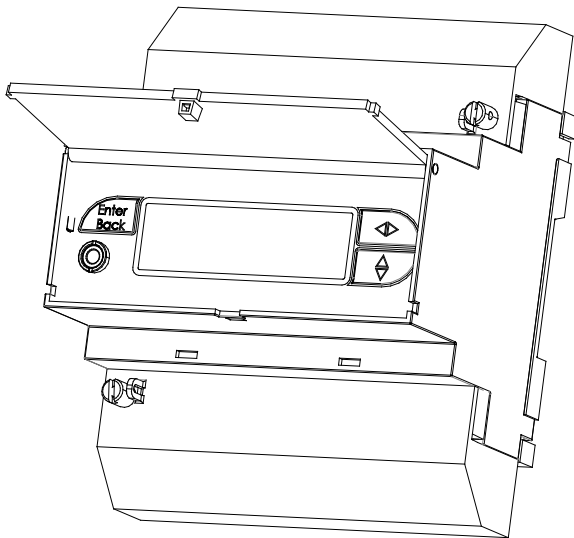




OPERATING MANUAL

MODBUS PROTOCOL for ML 311



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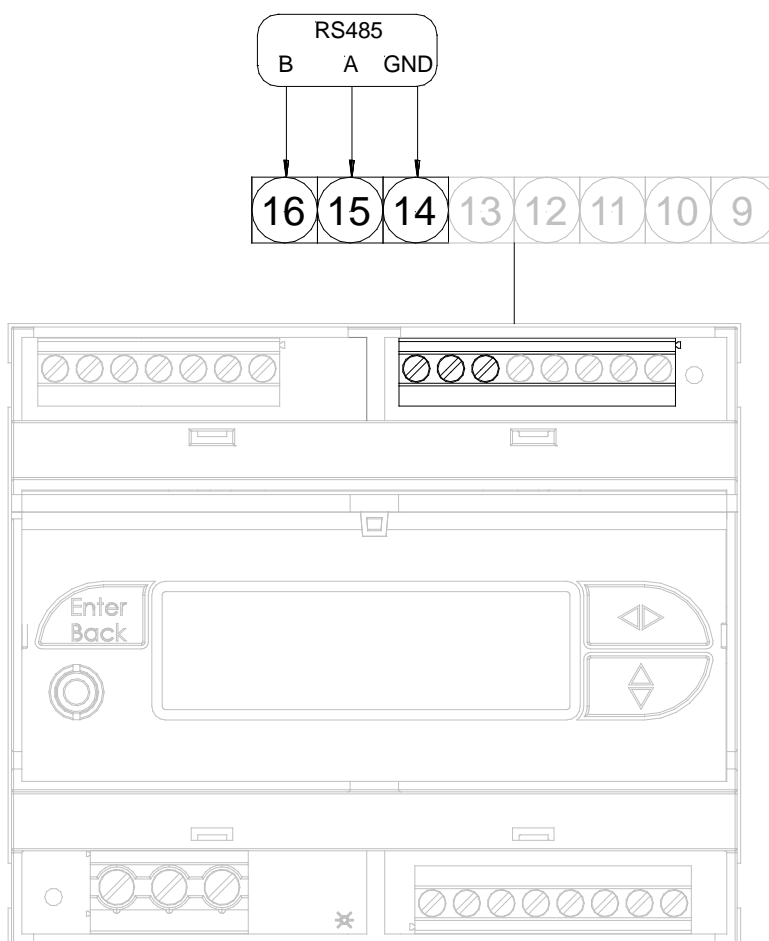
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INTRODUCTION

In this manual section there is the description of the Modbus field bus implemented in the converter.

The Modbus field bus is available in the RS485 serial port of the converter and it is RTU type.

RS485 HARDWARE CONNECTION



DATA WORD FORMAT

The data bytes travelling in serial form on the communication line are enclosed in **words** which have a fixed length of 10 bits:

- 1 START BIT
- 8 DATA BITS = 1 BYTE DI DATI
- 1 STOP BIT

Each word contains one data byte plus additional bits which serve to synchronize and make the communication safer. These extra bits are added automatically in the transmission phase by the transmitter integrated circuit. In the reception phase, the reverse operation is executed by the receiver integrated circuit: the eight data bits are extracted and the others are eliminated. These operations are executed entirely on a hardware level.

The 8 data bits must be serialized starting from bit 0 (the least significant one).

COMMUNICATION SPEEDS

The instrument has 4 communication speeds:

- 4800 bps
- 9600 bps
- 19200 bps
- 38400 bps

SERIAL PORT SETTINGS Sial port settings:

- Data bits: 8
- Parity: Menu «**6-Communication**», function - «**Parity**»
- Stop bits: 1
- Flow control: none (no control lines no xon/xoff characters used)

PARAMETERS SETTING

MODBUS PARAMETERS SETTING FOR THE CONVERTER:

- Menu «**6-Communication**», function - «**Parity**»: set the parity control for the byte frame in MODBUS communication. This function affect all the serial port communicating with MODBUS protocol. The possible values are: EVEN (default), NONE and ODD.

- Menu «**6-Communication**», function - «**Protocol**»: the function select protocol type for the RS 485 serial port. Select the MODBUS value.

Refer to the relative section of the serial port selected for the other parameter type, like port speed etc.

STANDARD FUNCTIONS

For the MODBUS protocol, the converter has the function of SLAVE device. The MASTER of the MODBUS network see the Converter as a register set of 1 bit or 16 bit. The data are supplied with list of fixed address grouped in tables with different length.

- **FUNCTION 03**

Send process data, data logger data and data logger events.

This command return 16 bit variables that are linked to form floating-point (float) or 32 bit long-integer (long) variables type. The most significant word (MSW) is on even address, the least significant word (LSW) is in the immediately following address. The addresses are in HEX format.

NOTE: when the request is for the data of the data logger or the event logger that is not valid (data not still collected), the returned value are = FFFFFFFF (hex).

Addresses table:

Addresses (Hex format)	Description
0000-002A	Process data
0064-010B	Hourly data logger value, grouped in 24 blocks contiguous from 7 registries of memory to 16 bit for every block
0190-0303	Daily data logger value, grouped in 31 blocks contiguous from 12 registries of memory to 16 bit for every block
044C-04DB	Monthly data logger value, grouped in 12 blocks contiguous from 12 registries of memory to 16 bit for every block
0578-05D7	Event data logger value, grouped in 32 blocks contiguous from 3 registries of memory to 16 bit for every block

Process Data:

Addresses (Hex format)	Description
0000-0001	Flow rate in % (float)
0002-0003	Flow rate in technical unit (float)
0004-0005	Thermal power in % (float)
0006-0007	Thermal power in technical unit (float)
0008-0009	Delta T value in % (float)
000A-000B	Delta T value in technical unit (float)
000C-000D	Temperature T1 value in % (float)
000E-000F	Temperature T1 value in technical unit (float)
0010-0011	Temperature T2 value in % (float)
0012-0013	Temperature T2 value in technical unit (float)
0014-0015	Totalizer for total volume flow rate (long)
0016-0017	Totalizer for partial volume flow rate (long)
0018-0019	Totalizer for total volume hot water (long)
001A-001B	Totalizer for partial volume hot water (long)
001C-001D	Totalizer for total volume cold water (long)
001E-001F	Totalizer for partial volume cold water (long)
0020-0021	Totalizer for total heat energy (long)
0022-0023	Totalizer for partial heat energy (long)
0024-0025	Totalizer for total cool energy (long)
0026-0027	Totalizer for partial cool energy (long)
0028-0029	Clock value in seconds (long)
002A	<p>Through the device that reads data on the Modbus protocol, may be the two following meanings:</p> <p>Meaning 1:</p> <ul style="list-style-type: none"> Bit 0 (LSB) = max alarm flow rate Bit 1 = min alarm flow rate Bit 2 = overflow measures Bit 3 = overflow pulses Bit 4 = analog input 4-20 out range Bit 5 = IN4 <> power sign Bit 6 = rtd sensor error Bit 7 = power supply error <p>Bit 8 (LSB) = max alarm thermal power</p> <ul style="list-style-type: none"> Bit 9 = min alarm thermal power Bit 10 = max alarm delta T Bit 11 = min alarm delta T Bit 12 = max alarm temp. T1 Bit 13 = min alarm temp. T1 Bit 14 = max alarm temp. T2 Bit 15 = min alarm temp. T2 <p>Meaning 2:</p>

Bit 0 (LSB) = max alarm thermal power
 Bit 1 = min alarm thermal power
 Bit 2 = max alarm delta T
 Bit 3 = min alarm delta T
 Bit 4 = max alarm temp. T1
 Bit 5 = min alarm temp. T1
 Bit 6 = max alarm temp. T2
 Bit 7 = min alarm temp. T2

Bit 8 (LSB) = max alarm flow rate
 Bit 9 = min alarm flow rate
 Bit 10 = overflow measures
 Bit 11 = overflow pulses
 Bit 12 = analog input 4..20 out range
 Bit 13 = IN4 <> power sign
 Bit 14 = rtd sensor error
 Bit 15 = power supply error

Hourly Data Logger values:

Addresses (Hex format)	Description
0064-006A	Data block record n.1 of the Hourly Data logger
006B-0071	Data block record n.2 of the Hourly Data logger
0072-0086	Data block record n.3 of the Hourly Data logger
...	...
...	...
...	...
0105-010B	Data block record n.24 of the Hourly Data logger

In the following table there is the description of the structure of data of the first record of the Hourly Data Logger, the next records are the same but in different addresses.

Addresses (Hex format)	Description of the record
0064-0065	Date and time of the record in second (long)
0066	Incremental value of the total flow rate totalizer (LSW unsigned integer)
0067	Incremental value of the total hot water totalizer (LSW unsigned integer)
0068	Incremental value of the total cold water totalizer (LSW unsigned integer)
0069	Incremental value of the total heat energy totalizer (LSW unsigned integer)
006A	Incremental value of the total cool energy totalizer (LSW unsigned integer)

The returned values are at FFFFFFFF (hex) when the request data is not valid in the data logger (data not still collected).

Daily Data Logger values:

Addresses (Hex format)	Description
0190-019B	Data block record n.1 of the Daily Data logger
019C-01A7	Data block record n.2 of the Daily Data logger
01A8-01B3	Data block record n.3 of the Daily Data logger
...	...
...	...
...	...
02F8-0303	Data block record n.31 of the Daily Data logger

In the following table there is the description of the structure of data of the first record of the Daily Data Logger, the next records are the same but in different addresses.

Addresses (Hex format)	Description of the record
0190-0191	Date and time of the record in second (long)
0192-0193	Incremental value of the total flow rate totalizer (long)
0194-0195	Incremental value of the total hot water totalizer (long)
0196-0197	Incremental value of the total cold water totalizer (long)
0198-0199	Incremental value of the total heat energy totalizer (long)
019A-019B	Incremental value of the total cool energy totalizer (long)

The returned values are at FFFFFFFF (hex) when the request data is not valid in the data logger (data not still collected).

Monthly Data Logger values:

Addresses (Hex format)	Description
044C-0457	Data block record n.1 of the Monthly Data logger
0458-0463	Data block record n.2 of the Monthly Data logger
0464-046F	Data block record n.3 of the Monthly Data logger
...	...
...	...
04D0-04DB	Data block record n.12 of the Monthly Data logger

The following table describes the data structure of the first record of the Monthly Data Logger, the next ones are the same but in different addresses.

Addresses (Hex format)	Description of the record
044C-044D	Date and time of the record in second (long)
044E-044F	Incremental value of the total flow rate totalizer (long)
0450-0451	Incremental value of the total hot water totalizer (long)
0452-0453	Incremental value of the total cold water totalizer (long)
0454-0455	Incremental value of the total heat energy totalizer (long)
0456-0457	Incremental value of the total cool energy totalizer (long)

The returned values are at FFFFFFFF (hex) when the request data is not valid in the data logger (data not still collected).

Event Data Logger

Addresses (Hex format)	Description
0578-057A	Data block record n.1 of the Event Data logger
057B-057D	Data block record n.2 of the Event Data logger
057E-0580	Data block record n.3 of the Event Data logger
...	...
...	...
...	...
05D5-05D7	Data block record n.32 of the Event logger

The following table illustrates the data structure of the first record of the Event Data Logger, the following records are the same but in different addresses.

Addresses (Hex format)	Description
0578-0579	Date/Time of the record in seconds (long)
057A	<p>Events (unsigned integer):</p> <ul style="list-style-type: none"> Bit 0 (LSB) = max alarm flow rate Bit 1 = min alarm flow rate Bit 2 = overflow measures Bit 3 = overflow pulses Bit 4 = analog input 4..20 out range Bit 5 = IN4 <> power sign Bit 6 = rtd sensor error Bit 7 = power supply error <ul style="list-style-type: none"> Bit 8 (LSB) = max alarm thermal power Bit 9 = min alarm thermal power Bit 10 = max alarm delta T Bit 11 = min alarm delta T Bit 12 = max alarm temp. T1 Bit 13 = min alarm temp. T1 Bit 14 = max alarm temp. T2 Bit 15 = min alarm temp. T2

The returned values are at FFFFFFFF (hex) when the request data is not valid in the data logger (data not still collected).

- **FUNCTION 05**, execution of command of type on/off. For the standard MODBUS, this function is used only for set the state of variable type "coil" or bit, in this context the function of the variable is for change the activation state of a specific function. The two 16 bit words that follow the command are used for indicate the function type (address) and action (on or off). The "off" action do not have practical effect. To every address a various function corresponds. The code number for "on" is FF00 (hex), for "off" is 0000. Others values product the exception n.3.

Addresses(Hex format)	Function Description
0000	reset all partial totalizers
0001	reset events logger

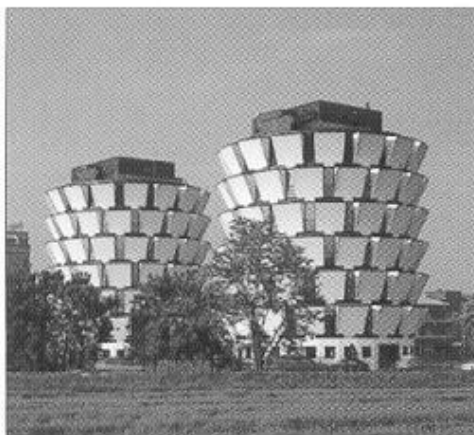
- **FUNCTION 08**, standard diagnosis function of the MODBUS protocol. The following table lists the sub-commands:

Addresses (Hex format)	Function Description
0000	return query data
0001	restart communications
0004	listen mode only
000A	clear counters
000B-0012	return counters value

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