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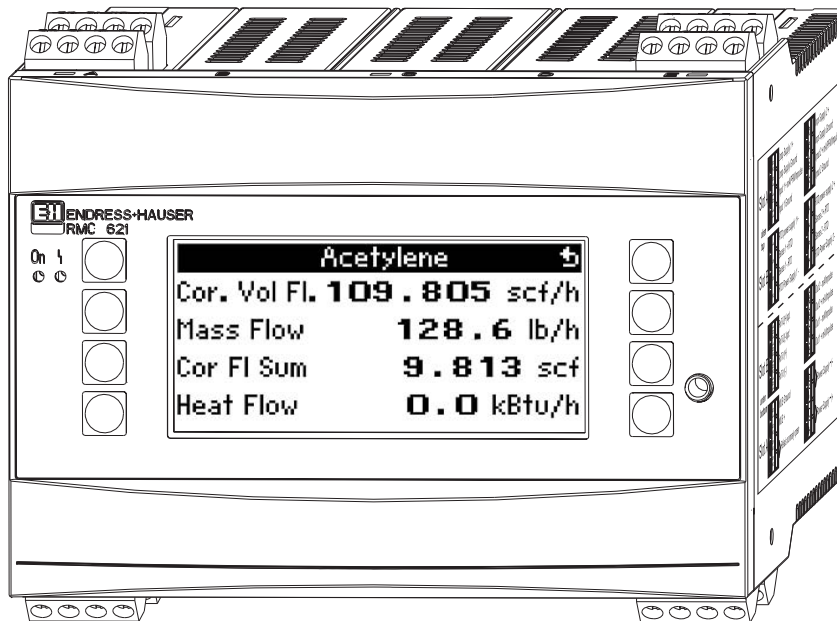
Solutions

## Operating Instructions

# Appendix to the Operating Instructions

RMx621 with ModBus Interface V3.03.00

Connection to ModBus-IDA System





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# 1 General

## 1.1 Transport damage

Please inform both your supplier and transport company.

## 1.2 Scope of delivery

- These Operating Instructions
- Energy Manager / Application Manager RMx621 with ModBus option
- Operating Instructions for the RMx621

If anything is missing, please ask your supplier!

Please note the following pictograms:



**Note:** Information about commissioning and operation



**Caution:** Failure to observe instructions can cause damage to the device or lead to malfunction!

## 1.3 Basics

- RMx621 uses ModBus RTU (Remote Terminal Unit) in accordance with ModBus-IDA Protocol Specification V 1.1a (June 2004)
- For RMS621 and RMC621, ModBus can be set for all RS232/RS485 interfaces available. For RMM621, only the 2<sup>nd</sup> RS485 interface can be used.
- Configuration of the ModBus at the Energy Manager RMS/RMC621 via Setup – Communication – RS485 / MODBUS(1) or RS232/485 / MODBUS(2)
- Configuration of the ModBus at the Application Manager RMM621 via Setup – Communication – RS485 (2) / MODBUS



**Note**

Configuration (1) is recommended for RMS621 and the non-Ex version of RMC621 as communication via the RS232 interface (jack socket) would otherwise not be possible if the ModBus interface is activated. The bus interface has to be switched to RS232 at the device if data are transmitted or read out with the PC configuration software.

## 2 Installation

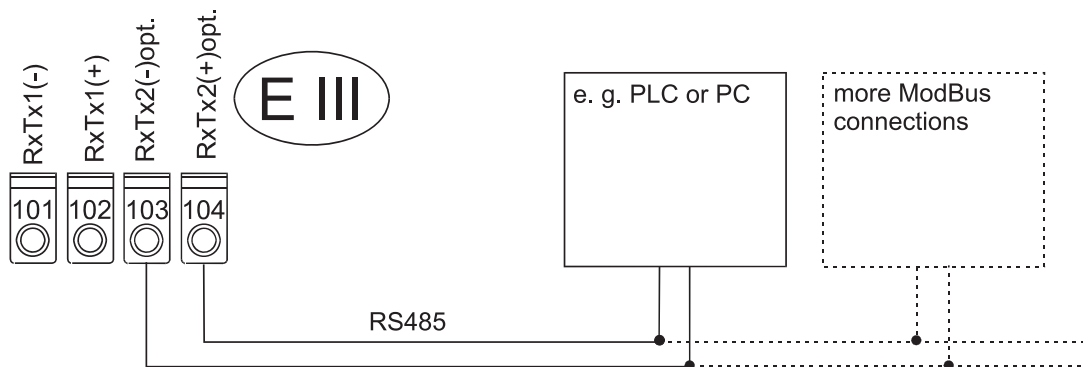
Refer to the installation instructions provided for the Energy Manager/Application Manager RMx621 in the associated Operating Instructions.

### 2.1 Prerequisites

The ModBus option is available as of firmware version V3.03.00 of the Energy Manager RMx621 and as of firmware version V01.01.00 of the Application Manager RMM621.

### 2.2 Connections and terminal diagram

Connecting the RMx621 to a ModBus system.



## 3 Commissioning

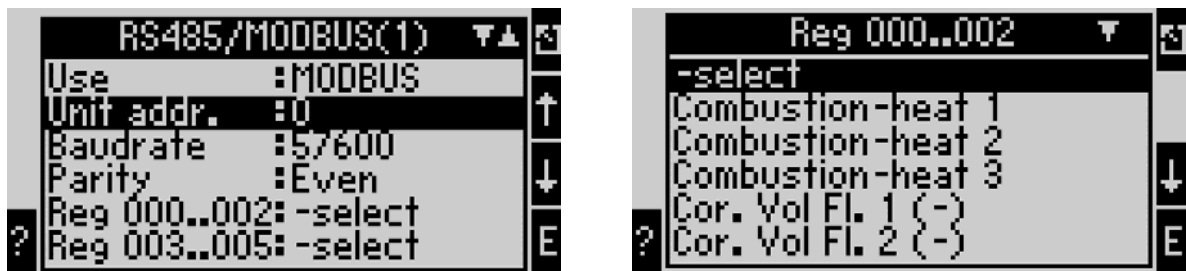
### 3.1 Configuring the ModBus interface on RMx621

All the parameters relevant for the ModBus interface can be found in the menu

- "Setup – Communication - RS485/MODBUS (1)" or
- "Setup – Communication - RS232/RS485/MODBUS (2)" for Energy Managers RMS/RMC621.

In the case of the Application Manager RMM621, the relevant parameters can be found in the following menu:

- "Setup – Communication - RS485(2)/MODBUS"



If you are commissioning the device for the first time, please set the "Use" parameter to "ModBus". This makes the following parameters visible:

- Unit address
- Baud rate
- Parity
- Register

Function (menu item)	Parameter setting	Description
Use	<ul style="list-style-type: none"> <li>• RS485</li> <li>• RS232/RS485</li> <li>• ModBus</li> </ul>	Defines the operating mode of the optional interface
Unit adr.	000	Input 1 to 247 The RMx621 always responds to the address 0.
Baud rate	9600 19200 38400 57600	Setting for the transmission rate on the ModBus
Parity	Even Odd None	
Register	Reg 000 to 002 Reg 003 to 005	Allocation of the values in the Energy Manager to the ModBus

## 4 Data transmission

### 4.1 ModBus telegram

RMx621 supports the function 03: Read Holding Register.

This allows for up to 36 current measured values with status to be transmitted.

Each measured value occupies 3 registers (6 bytes). The measured values are assigned to the registers in the ModBus settings in the RMx621.

Register 000	: Status of the first measured value (16-bit integer, high byte first)
Register 001 to 002	: First measured value (32-bit float, high byte first)
Register 003	: Status of the second measured value (16-bit integer, high byte first)
Register 004 to 005	: Second measured value (32-bit float, high byte first)
.	.
Register 105	: Status of the 36th measured value (16-bit integer, high byte first)
Register 106 to 107	: 36th measured value (32-bit float, high byte first)

#### 4.1.1 Units for the transmission of measured values

The units for the transmission of measured values are specified in the Setup menu of the RMx621.

#### Menu Setup → Communication → ModBus → Units

Choose **Display units** in order to use the units configured for display also for the transmission via ModBus.

Choose **Default units** in order to use the following default units:

Volume flow	m <sup>3</sup> /h
Temperature	°C
Pressure	bar
Heat flow (performance)	kW
Mass flow	t/h
Standard volume	(N)m <sup>3</sup> /h
Total volume	m <sup>3</sup>
Total mass	kg
Total heat quantity	kWh
Total standard volume	(N)m <sup>3</sup>
Density	kg/m <sup>3</sup>
Enthalpy	kJ/kg

The number of process values sent is specified in the configuration of the Energy Manager, see Section 3.1. The minimum is 1 process value (5 byte) and the maximum is 36 process values.

## 4.2 Measured value status

0	:	Invalid value
1	:	Measured value valid
2	:	Overflow warning
3	:	Overflow error
4	:	Underflow warning
5	:	Underflow error
6	:	Saturated steam alarm
7	:	Error in differential pressure calculation
8	:	Wrong medium for DP calculation
9	:	Wrong value range → DP calculation inaccurate
10	:	Differential pressure → general error
11	:	Range overshoot (T <sub>sat</sub> > 350 etc.) on
12	:	Change in state of aggregation
26	:	Differential pressure → general error
99	:	No measured value is assigned to the register in the setup of the ModBus

When a request is made by the master, the desired start register and the number of registers that are to be read are sent to the RMx621.

## 4.3 Request procedure

### 4.3.1 From master to RMx621

ga fk r1 r0 a1 a0 c1 c2

ga	Unit address (1 to 247)
fk	Function, always 03
r1 r0	Start register (high byte first)
a1 a0	Number of registers (high byte first)
c0 c1	CRC checksum (low byte first)



### 4.3.2 Response from RMx621 in event of successful request

ga fk az s1 s0 w3 w2 w1 w0 . . . . s1 s0 w3 w2 w1 w0 c1 c0

ga	Unit address
fk	Function, always 03
az	Number of bytes of all subsequent measured values
s1 s0	Status of the first measured value (16-bit integer, high byte first)
w3 w2 w1 w0	First measured value in 32-bit float format, high byte first
s1 s0	Status of the second measured value (16-bit integer, high byte first)
w3 w2 w1 w0	Second measured value (32-bit float, high byte first)
.	.
.	.
s1 s0	Status of the last measured value (16-bit integer, high byte first)
w3 w2 w1 w0	Last measured value (32-bit float, high byte first)
c0 c1	Checksum CRC 16-bit (low byte first)

### 4.3.3 Response from RMx621 in event of unsuccessful request

ga fk fc c0 c1

ga	Unit address
fk	Requested function + 80hex
fc	Error code
c0 c1	Checksum CRC 16-bit (low byte first)

### 4.3.4 Error code

- 01 : Function not known
- 02 : Start register invalid
- 03 : Number of registers to be read invalid



**Note:**

If there are checksum or parity errors in the request from the master, the RMx621 does not respond.

## 5 Troubleshooting

### 5.1 No communication with RMx621

If communication with the RMx621 does not materialize via the ModBus, please check the following possibilities:

- Was setup in the RMx621 completed correctly?
- Are the RMx621 and the master using the same baud rate and parity?
- Is the wiring of the interface OK?
- Does the unit address sent by the master match the specified unit address of the RMx621?
- Do all slaves at the ModBus have different unit addresses?
- Is the RS232 jack plug unplugged? (only necessary for RMS621 and RMC621 non-Ex devices when using the second RS485 interface for ModBus)



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