Operating instructions

Supplement to Mounting and operating instructions CALEC® ST - Art. No. 11741

CALEC® ST
RS 485 Modbus RTU Interface

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General information

Content

In this operating manual are only Modbus specific information on CALEC® ST, for more details, the technical documentation of CALEC® ST is necessary.
Under www.modbus.org general information to Modbus are available.

Ordering process

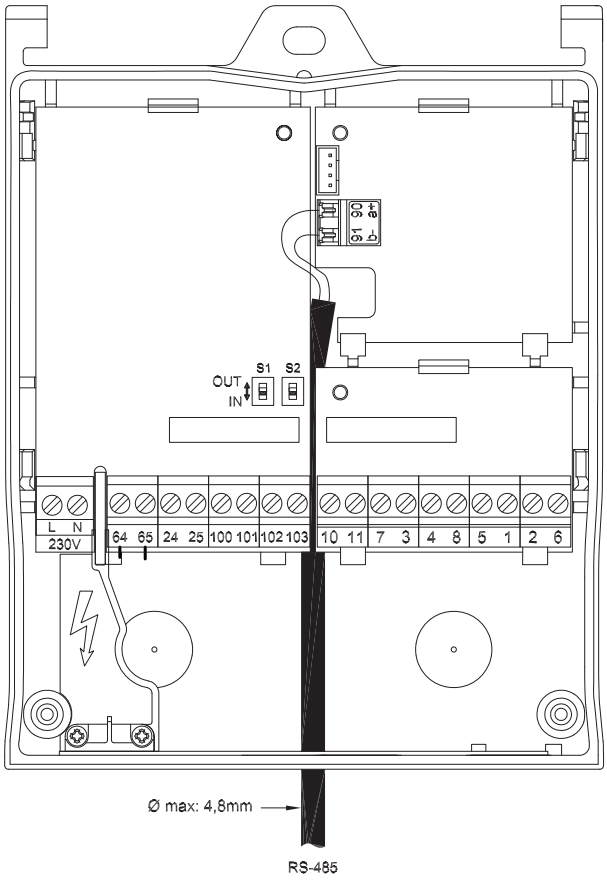
The CALEC® ST (Power version - 230 VAC) for RS 485 Modbus RTU interface and Pt100 is available under the article no. 94480.
In case of spare part orders, the main article no. 94480 of the calculator module included the necessary spare parts has to be mentioned.

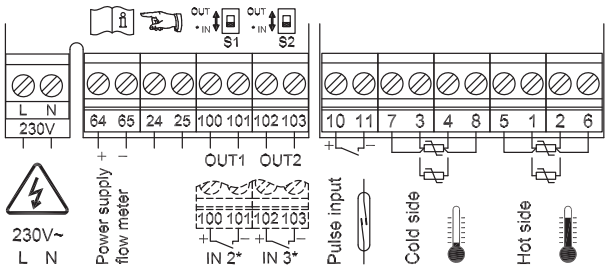
CALEC® ST: Overview of supported functions

Function	Parameter	Description	More information
Addressing range	Slave: 1-247	Factory setting: 1	See chapter: Configuration of the Modbus interface on CALEC® ST
Baud rate	300, 2400, 9600, 19200, 38400	Factory setting: 19200	See chapter: Configuration of the Modbus interface on CALEC® ST
Broadcast	Yes	Address 0	
Parity	Even, Odd or None	Factory setting: Even	See chapter Configuration of the Modbus interface on CALEC® ST
Function code	03	Read Holding Register Reads one or more registers of the Modbus slave. 1 to a maximum of 125 consecutive registers (1 register = 2 byte) can be read with a telegram.	
Modbus Unit Codes		All the values are always transmitted via Modbus in the basic units.	See chapter: Modbus registers

Installation of CALEC® ST: Electrical connection

For using the Modbus interface, please connect the cable to clamp 90 (a +) and 91 (b -).





Remarks:
- Clamp 64 / 65: Only for Use sensor supply
- Clamp 24 / 25: No functionality
- Clamp 90 / 91: RS 485 connection

Power Supply:
- 230 VAC

Commissioning

Configuration of the Modbus interface on CALEC® ST

For using the CALEC® ST with a Modbus interface, please set the necessary Modbus parameter in the CALEC® ST operating menu, e.g. bus address from 1 to a valid address.

The parameters

- Bus address
- Baud rate
- Parity

are changeable in the menu structure under

Bus ➪ Modbus ➪ Adr.
➪ Baud
➪ Parity

RS 485 Modbus RTU technology

Modbus is an open, standardized field bus system which is used in the areas of manufacturing automation, process automation and building automation. RS 485 Modbus RTU (Remote Terminal Unit) allows the heat calculator CALEC® ST to be easily integrate to DDC, BMS, PLC or SCADA systems.

The Modbus RS 485 distinguishes between master and slave devices. The CALEC® ST of Aquametro AG works as a slave station.

- **Master devices:**
  Master devices determine the data traffic on the field bus system. They can send request telegram to one (Standard) or all (only Broadcast Address = 0) slaves.

- **Slave devices:**
  Slave devices are able to send their data only in response to a request of a master.

Modbus protocol

The protocol defines the way in which messages will be transmitted between CALEC® ST and a Modbus master.

Modbus telegram

The data is transferred between the master and slave by means of a telegram. A request telegram from the master contains the following telegram fields.

- **Slave Address:**
  The bus address of the CALEC® ST has to be in an address range from 1 to 247. The master talks to all the slaves simultaneously by means of the slave address 0 (Broadcast Message).

- **Function Code:**
  The function code determines which read, write and test operations should be executed by means of the Modbus protocol.

- **Data:**
  Depending of the function code, the following values are transmitted in this data field:
  - Register start address (from which data are transmitted)
  - Number of registers
  - Read Data
  - Data length

- **Check sum:**
  The telegram check sum forms the end of the telegram.

If an error occurs during data transfer or if the slave cannot execute the command from the master, the slave returns an error telegram to the master.

Modbus register

In general a device parameter has its own register address. The master uses follow register addresses to access the data of CALEC® ST.

Register no.	Register Name	Description	R / W	Data Type
General device parameters				
0	Device	0xC0 = CALEC® ST 0xC1 = CALEC® ST MASS 0xC2 = CALEC® ST Flow 0xC4 = CALEC® ST BDE	Read Only	16 Bit Integer
1	Status	OK = 0 ERROR = 1 ALARM = 2	Read Only	16 Bit Integer
2	Medium (mounting-side)	cold = 0x04 hot = 0x0C	Read Only	16 Bit Integer
4, 5	Serial Number	0…99999999	Read Only	32 Bit Integer
6, 7	Operating hours		Read Only	IEEE754 Float
8, 9	Error Operating hours		Read Only	IEEE754 Float
10, 11	Firmware Version	e.g. 10500	Read Only	32 Bit Integer
12, 13	Hardware Version	e.g. 1011010	Read Only	32 Bit Integer
Energy Counter				
100, 101	Value Energy		Read Only	IEEE754 Float
102, 103	Value Cooling Energy (BDE)		Read Only	IEEE754 Float
104	Unit Energy	0 = [KWh]	Read Only	16 Bit Integer
Volume Counter				
200, 201	Value Volume		Read Only	IEEE754 Float
202, 203	Value Cooling Volume (BDE)		Read Only	16 Bit Integer
204	Unit Volume	1 = [m^3]	Read Only	IEEE754 Float
Mass Counter				
300, 301	Value Mass		Read Only	IEEE754 Float
302	Unit Mass	1 = [t]	Read Only	16 Bit Integer
Auxiliary Counter				
Counter **1**				
400, 401	Value auxiliary		Read Only	IEEE754 Float
402	Unit auxiliary	0 = [1]	Read Only	16 Bit Integer
Counter **2**				
430, 431	Value auxiliary		Read Only	IEEE754 Float
432	Unit auxiliary	0 = [1]	Read Only	16 Bit Integer
Counter **3**				
460, 461	Value auxiliary		Read Only	IEEE754 Float
462	Unit auxiliary	0 = [1]	Read Only	16 Bit Integer
Power Values				
500, 501	Value Power		Read Only	IEEE754 Float
502	Unit Power	1 = [KW]	Read Only	16 Bit Integer
(Volume-) Flow Values				
600, 601	Value Flow		Read Only	IEEE754 Float
602	Unit Flow	2 = [m3/h]	Read Only	16 Bit Integer
Mass flow Values				
700, 701	Value Mass flow		Read Only	IEEE754 Float
702	Unit Mass flow	2 = [t/h]	Read Only	16 Bit Integer
Temperature Values				
800, 801	Value Temperature Hot		Read Only	IEEE754 Float
802	Unit Temperature Hot	0 = [°C]	Read Only	16 Bit Integer
810, 811	Value Temperature Cold		Read Only	IEEE754 Float
812	Unit Temperature Cold	0 = [°C]	Read Only	16 Bit Integer
820, 821	Value Temperature difference		Read Only	IEEE754 Float
822	Unit Temperature difference	2 = [K]	Read Only	16 Bit Integer

Modbus status messages

Also the status messages are linked to Modbus registers. Aquametro AG will differentiate between follow types of status messages:

- **Device status “Error”:**
  All important device errors have to be monitored, like ”System Error”

- **Measurement value status “Alarm”:**
  Specific messages like “dt Alarm” have to be monitored
  (for more information please see error messages in the operating manual of CALEC® ST)

Troubleshooting

No communication

If no communication via Modbus possible, please check the following possibilities:

- Are the connections to clamp 90 and 91 O.K.?
- Is the Modbus setup at CALEC® ST (Address, Baud rate and Parity) O.K.?
- Please check the address and baud rate of all Modbus slaves in the network.

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