ALSONIC

Modbus Specifications v1.25

Contents

1 Physical Layer

The Sensors can be configured to be compatible with any UART based physical protocols: UART, RS-232, RS-485. The RS485 is implemented with 5V levels.

2 Data Layer

2.1 Transmission Mode

The transmission mode is RTU (Remote Terminal Unit). The transmission of data is in binary format (hexadecimal) with 8 bits.

The LSB (least significant bit) is the first to be transmitted.

2.2 Data Blocks

All data blocks have the same structure.

Slave Address	Function Code	Data Field	Checksum CRC16
1 Byte	1 Byte	x Bytes	2 Bytes

Each data block contains 4 fields:

- Slave Address - Device address of a specific slave
- Function code - Function selection (read, write words)
- Data field - Contains the information:
  - Word address (2 bytes)
  - Number of words (2 bytes)
  - Word value
- Checksum

2.3 Checksum (CRC16)

The checksum (CRC16) transmission errors are detected. If an error is identified during evaluation, the corresponding device does not respond.

Checksum parameters:

- Type: CRC-16 (Modbus)
- Initial value: FFFF (hex)
- Polynomial: x16 + x15 + x2 + 1 = 8005 (hex)
- XOR Out: 0
- Reflection In: ON
- Reflection Out: ON

2.4 Examples

Data Request: Reading 2 words from address 1 (CRC16 = 0x0B20)

01	04	00	01	00	02	20	0B
Dev ID	Read Command	Register Address		Number of words		CRC16	

Answer: (CRC16 = 0xF789)

01	04	04	09	9B	00	00	89	F7
Dev ID	Read Command	Number of Data Bytes	Word 1		Word 2		CRC16	

2.5 Implemented Modbus Functions

04	Read n words
06	Write single register
16	Write n words

2.6 BAUD Rate

BAUD rates between 9600 and 1000000 are supported. BAUD rate can be limited by the selected MCU for a specific configuration or power consumption requirements.

Default BAUD rate is 115200.

Baud rate can be changed by writing the new BAUD rate to address 321-322 in UInt32 format. See section 3.2.

2.7 Device Address

Default device address is 0x01. Supported addresses are between 1 and 247.

Device address can be changed by writing the new address to address 320. See section 3.2.

2.8 Parity

Parity is EVEN.

Parity can be changed by writing the new address to address 324. See section 3.2.

2.9 Stop bit

Stop bit is 1.

Stop bit can be changed by writing the new address to address 325. See section 3.2.

2.10 Recovery Mode

If the device id, baudrate, parity and stopbits have been changed from default and is no longer possible to communicate with the device it is possible to recover / change the configuration by entering in recovery mode.

Default settings:

- Device id: 1
- Baudrate: 115200
- Parity: Even
- Stopbits: 1

Recovery mode access:

If an valid modbus command with default configuration (id, baud, parity, stopbit) is sent to the sensor during power-up the sensor will maintain the default configuration until the next restart.

3 Register map

This section describes the register access type and addresses.

3.1 Periodically updated values

Values that are updated after every measurement can be read using 04 function. These registers are read-only.

Register details are presented in the table below:

Address	Register name	Range	Resolution	Unit	Comments
0	Flow	Int32	0.1	l/h	
2	Temp Internal	Int16	0.01	°C	
3	Temp Remote	Int16	0.01	°C	(Optional)
4	Temp Difference	Int16	0.01	°C	(Optional)
5	Pressure	Int16	0.001	Bar	(Optional)
6	Power	Int32	0.01	kW	(Optional)
8	Error	UInt16		n/a	Not yet implemented
9	Warning	UInt16		n/a	Not yet implemented

Address	Register name	Range	Resolution	Unit	Comments
10	Air Bubble signal	UInt16			0 – No air 1 – Air detected
11	Bubble detection level	UInt16			0 – No air 1 – Small amount of air 2 – Medium amount of air 3 – High amount of air 4 – Severe / completely air
12	Glycol concentration	Int16	0.01	%	Activation via address 327 necessary
13	Reserved	Int16			
14	Freezing Point	Int16	0.01	°C	Activation via address 327 necessary
15	Reserved	Int16			
277	Firmware version	Int32			Read only
500	Totalizer 1 Sum water volume	Int32	1	l	
502	Totalizer 2 Power on time	Int32	1	s	
504	Totalizer 3 Power on time with flow	Int32	1	s	Power on time with flow ≠ 0
506	Energy sum	Int32	0.01	kWh	
508	Reserved	Int32			
1000	Flow	Float	1	gal/h	
1002	Temp Internal	Float	1	°F	
1004	Temp Remote	Float	1	°F	(Optional)
1006	Temp Difference	Float	1	°F	(Optional)
1008	Pressure	Float	1	PSI	(Optional)

3.2 Configuration Parameters with Read/Write access

The following values can be written to memory. Values are updated after the memory write command is executed.

Register details are presented in the table below:

Address	Register name	Range	Resolution	Unit	Comments
320	Device ID	Int8	1		1 to 247 Default: 1
321	BAUD Rate	UInt32	1	bps	9600 to 115200 Default: 115200
323	Reserved	Int8			
324	Parity	Int8			0 – None 1 – Even 2 – Odd Default: Even
325	Stop bit	Int8			0 – stopbit 1 1 – stopbit 2 Default: stopbit 1
326	Reserved	Int8			
327	Glycol detection configuration	Int8			0 – Deactivated 1 – Activated for Ethylene Glycol 2 – Activated for Propylene Glycol
328	Energy measurement configuration	Int8			0 – No Energy measurement 1 – Energy meas. $T_{Remote} > T_{Local}$ 2 – Energy meas. $T_{Local} > T_{Remote}$ 3 – Energy meas. $Abs(T_{Remote} - T_{Local})$ 4 – Energy meas. $T_{Remote} > T_{Local}$ (Heating + Cooling) 5 – Energy meas. $T_{Local} > T_{Remote}$ (Heating + Cooling) Default: 0 / 1 (with / without external temperature probe)

4 Changelog

Date	Version	Description
2023-04-19	V1.22	• Function code 6 (write single register) implemented • After change of the modbus ID the acknowledgement reply is made with the old ID instead of the new one • Added register for firmware version tracking • Implemented change of parity and stopbits and energy meas. Configuration • Implemented recovery mode
2024-02-07	V1.23	• Glycol detection added • Transferred to new layout
2024-05-17	V1.24	• Implemented Imperial units
2024-05-28	V1.25	• Glycol detection for propylene glycol (valid only for newer software values)

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