

Hydrogen Flow Meter

Modbus Specifications v0.3



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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: $x^{16} + x^{15} + x^2 + 1 = 8005$ (hex)
- XOR Out: 0
- Reflection In: ON
- Reflection Out: ON

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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.

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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	Temperature	Int16	0.01	°C	
5	Absolute Pressure	Int16	1	mbar	
16	Mass Flow	Int32	0.001	kg/h	
18	Standard Volume Flow	Int32	0,001	l _s /min	Reference conditions 1 atm, 0 °C
502	Totalizer 2 Power on time	Int32	1	s	
2536	Humidity	Int16	0.01	% RH	
2538	Vapor Pressure	Int16	0.1	mbar	
2780	Density	Float	1	kg/m ³	

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Address	Register name	Range	Resolution	Unit	Comments
2790	Mixing Ratio H ₂	Int16	0.01	% vol	
2791	Mixing Ratio N ₂	Int16	0.01	% vol	
2792	Mixing Ratio H ₂ O	Int16	0.01	% vol	

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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

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Allengra GmbH, with headquarters in Germany and Romania, was established in 2005 and specializes in the design and production of standard or OEM ultrasonic flow sensors and control valves for liquids and gases, tailored to meet the specific needs of each end client application. Our company manages the entire development process, from concept to serial production, with various engineering departments and prototyping skills at our disposal.

Allengras core technology, ultrasonic metering, has been refined over the years to a level where both high-end device integration and cost-effective applications are achievable. Allengra provides metering and regulating solutions for various industries, including gas heating boilers, automatic coffee machines, robotic scrubbers, and industrial automation, among others.

Über Uns

Die 2005 gegründete Allengra GmbH mit Sitz in Deutschland und Rumänien entwickelt und produziert sowohl Standard- als auch maßgeschneiderte Ultraschall-Durchflusssensoren und Regelventile für Flüssigkeiten und Gase. Allengra vereint alle notwendigen Engineering und Prototyping Fähigkeiten, um die Produkte interdisziplinär und ganzheitlich zu entwickeln. So können auch neue und innovative Ideen schnell und flexibel in robuste Serienprodukte überführt werden.

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