Micro flow sensor

Modbus Specifications v1.00

Contents

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ALLENGRA Flowmeters

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 3.3V 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 a 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 rate	Int32	0.01	l/h	
2	Temperature PT1000	Int16	0.01	°C	Physical measured temperature with PT1000
3	Reserved	Int16			
4	Reserved	Int16			
5	Reserved	Int16			
6	Reserved	Int32			
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	Reserved	Int16			
13	Reserved	Int16			
14	Reserved	Int16			
15	Reserved	Int16			
16	Speed of sound	Int16	0.1	m/s	
17	Temperature SoS	Int16	0.01	°C	Instant temperature measured out of speed sound
277	Firmware version	Int32			Read only
500	Totalizer 1 Sum volume	Int32	0.1	ml	Long term volume counter
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
516	Totalizer 8 Sum short volume	Int32	0.01	ml	Short term volume counter that automatically starts from 0ml when flow ≠ 0 L/h
518	Totalizer 9 Sum short time	Int32	0.01	s	Short term time counter that automatically starts from 0s when flow ≠ 0 L/h

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	Reserved	Int8			
328	Reserved	Int8			

4 Changelog

Date	Version	Description
2024-05-10	V1.00	• Initial release

About Us

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.

Allengras Kernkompetenz, die Ultraschall-Durchflussmessung, kann durch die umfangreiche und langjährige Erfahrung mit der Technologie problemlos sowohl in High-End-Produkte als auch in robuste und kostengünstige Serienlösungen integriert werden. Allengra bietet Mess- und Regelungslösungen für Anwendungen in Gasheizkesseln, Kaffeevollautomaten, Bodenreinigungsmaschinen, dem Motorsport, der industriellen Automatisierung und vieles mehr.