# Modbus Interface Description

## Flow Sensor 22PF-.. / V4.3.0

Edition 2026-05

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# General notes

## General information

| | |
|---|---|
| Date | 28.05.2026 |
| Product Name | Flow Sensor |
| Product Model Number | 22PF-... |
| Protocol | Modbus RTU over RS-485 |

## Modbus RTU

| | |
|---|---|
| Transmission Formats | 1-8-N-2, 1-8-N-1, 1-8-E-1, 1-8-O-1 (Default: 1-8-N-2) |
| Baud Rates | 9'600, 19'200, 38'400, 76'800, 115'200 Bd (Default: 38'400) |
| Address | 1...247 (Default: 1) |
| Number of Nodes | Max. 32 (without repeater) |
| Terminating Resistor | 120 Ω |

## Parametrisation

| | |
|---|---|
| Tool | Belimo Assistant 2 |

## Register implementation

All data is arranged in a table and addressed by 1..n (Register No.) or 0..n-1 (Address). No distinction is made between data types (Discrete Inputs, Coils, Input Registers and Holding Registers). As a consequence, all data can be accessed with the two commands for Holding Register. The commands for Discrete Inputs and Input Registers can be used as an alternative.

## Standard commands

Read Holding Registers [3]
Write Single Register [6]
Read Discrete Inputs [2]
Read Input Registers [4]
Write Multiple Registers [16]

## Command “Read Discrete Inputs”

The command reads one or more bits and can alternatively be used for Register No. 105 (Malfunction and Service Information).

Example:

The start address to be used is 1664 -> **104** (Register No.) *** 16** (Bit) = **1664**

## Interpret values in the registers

All values in the register are unsigned integer data types.
Exeptions are marked with **). Signed integers are represented as two´s complement.

| Example unsigned integer: | Example signed integer: |
|---|---|
| Read (Function 03, 1 Register)<br>Value Register No. x<br>= 0001 1010 1100 $1000_2$<br>= $6{,}856_{10}$ | Read (Function 03, 1 Register)<br>Value Register No. x<br>= 1111 1101 1111 $0010_2$<br>= $-526_{10}$ |
| Actual value<br>= value * scaling factor * unit<br>= 6,856 * 0.01 * unit<br>= **68.56 unit** | Actual value<br>= value * scaling factor * unit<br>= -526 * 0.01 * unit<br>= **-5.26 unit** |

## 32-bit values in two registers

Values that exceed 65,535 are stored in two Consecutive Registers and have to be interpreted as “little endian byte swap” / LSW (Least Significant Word) first.

**Note:** While the regular "little endian" interpretation refers to each byte (8-bit word) per register, the additional "byte swap" interpretation leads to where "little endian" refers to the 16-bit word of one register.

Both registers have to be written at once with function "Write Multiple Registers [16]". It cannot be written together with other registers.

Example:

| Register No. x (Value LowWord) | Register No. x + 1 (Value HighWord) |
|---|---|
| = $14{,}551_{10}$ | = $19_{10}$ |
| = $0011\ 1000\ 1101\ 0111_2$ | = $0000\ 0000\ 0001\ 0011_2$ |

| **Value LowWord** | **Value HighWord** |
|---|---|
| = 14,551 | = 19 |
| = $0011\ 1000\ 1101\ 0111_2$ | = $0000\ 0000\ 0001\ 0011_2$ |

32-bit value
= $0000\ 0000\ 0001\ 0011\ 0011\ 1000\ 1101\ 0111_2$
= $1{,}259{,}735_{10}$
= **1,259.735 unit**

Math formula:

32-bit value = (Value HighWord * 65,536) + Value LowWord
32-bit value = (19 * 65,536) + 14,551
= 1,259,735
= **1,259.735 unit**

## Deactivated registers

If a register is not supported by a device or by a device setting, this is indicated by 65,535 ($1111\ 1111\ 1111\ 1111_2$).

# Register overview

## Operation

| No. | Address | Register | | Access |
|---|---|---|---|---|
| 7 | 6 | Relative Volumetric Flow [%] | | R |
| 8 | 7 | Absolute Volumetric Flow [l/s] | | R |
| 9 | 8 | Absolute Volumetric Flow [gpm] | | R |
| 10 | 9 | Absolute Volumetric Flow [selected unit] | LowWord | R |
| 11 | 10 | | HighWord | |
| 13 | 12 | Sensor 1 Value [mV] [-] | | R |
| 22 | 21 | Temperature (flow body) [°C] **) | | R |
| 23 | 22 | Temperature (flow body) [°C] **) | | R |
| 26 | 25 | Glycol Concentration [%] | | R |
| 60 | 59 | Accumulated Volume [$m^3$] | LowWord | R |
| 61 | 60 | | HighWord | |
| 62 | 61 | Accumulated Volume [gal] | LowWord | R |
| 63 | 62 | | HighWord | |
| 64 | 63 | Accumulated Volume [selected unit] | LowWord | R |
| 65 | 64 | | HighWord | |

**) signed integer

## Configuration

| No. | Address | Register | | Access |
|---|---|---|---|---|
| 100 | 99 | Bus Termination | | R |
| 101 | 100 | Series Number 1st part | | R |
| 102 | 101 | Series Number 2nd part | | |
| 103 | 102 | Series Number 4th part | | |
| 104 | 103 | Firmware Version | | R |
| 105 | 104 | Malfunction and Service Information | | R |
| 111 | 110 | FS (full scale) [l/s] | | R |
| 112 | 111 | FS (full scale) [gpm] | | R |
| 113 | 112 | FS (full scale) [selected unit] | LowWord | R |
| 114 | 113 | | HighWord | |
| 121 | 120 | Sensor 1 Type | | R / W |
| 148 | 147 | Unit Selection Flow | | R / W |
| 150 | 149 | Unit Selection Volume | | R / W |
| 201 | 200 | Flow Meter Serial Number First Digits | LowWord | R |
| 202 | 201 | | HighWord | |
| 203 | 202 | Flow Meter Serial Number Last Digits | LowWord | R |
| 204 | 203 | | HighWord | |

All writeable registers >100 are persistent and are **not** supposed to be written on a regular basis. Designated registers are highlighted in colour in the document.

# Register descriptions

## Control and general settings

These registers can be used to read values related to the Flow Sensor.

| No. | Address | Description<br>Comment | Range, enumeration | Unit | Scaling | Access |
|---|---|---|---|---|---|---|
| 100 | 99 | **Bus termination**<br>Indicates if bus termination (120 Ω) is enabled.<br>Bus termination can be set with Belimo Assistant 2. | 0: Disabled<br>1: Enabled<br>Default: 0 | – | 1 | R |
| 101 | 100 | **Series number 1st part**<br>Each device has an unambiguous series number, which is either impressed on or glued to the housing. The series number consists of 4 segments, although only parts 1, 2 and 4 are displayed on Modbus.<br><br>Example 00839-31324-064-008<br>1st part: 00839<br>2nd part: 31324<br>4th part: 008 | – | – | 1 | R |
| 102 | 101 | **Series number 2nd part** | – | – | 1 | R |
| 103 | 102 | **Series number 4th part** | – | – | 1 | R |
| 104 | 103 | **Firmware version**<br>Firmware version of communication module.<br>Example: 400, version 4.00. For details, see release notes. | – | – | 1 | R |

Access: R = Read, W = Write

**Note:** According to the present configuration settings of the product (e.g. DN size) the HVAC application may perform a size limitation within the indicated Modbus value range. Each product may have different HVAC value size limitations

# Flow

These registers can be used to configure and read values related to Flow control.

| No. | Address | Description<br>Comment | Range,<br>enumeration | Unit | Scaling | Access |
|---|---|---|---|---|---|---|
| 7 | 6 | **Relative volumetric flow**<br>Related to FS (full scale)<br>Register No. 111: FS (full scale) [l/s]<br>Register No. 112: FS (full scale) [gpm]<br>Register No. 113: FS (full scale) | 0...15'000 | % | 0.01 | R |
| 8 | 7 | **Absolute volumetric flow**<br>Actual measuring range depends on device type (see data sheet). | 0...10’416.7 | l/s | 0.01 | R |
| 9 | 8 | **Absolute volumetric flow**<br>Actual measuring range depends on device type (see data sheet). | 0...16’510.0 | gpm | 0.1 | R |
| 10<br>11 | 9<br>10 | **Absolute volumetric flow in selected unit**<br>Actual measuring range depends on device type (see data sheet).<br>→ Unit can be selected by Register No. 148: Unit selection flow | 0..104.167<br>0..375'000<br>0...104’167<br>0...6’250’000<br>0..375’000’000<br>0..1’651’075<br>0..220’716 | $m^3/s$<br>$m^3/h$<br>l/s<br>l/min<br>l/h<br>gpm<br>cfm | 0.001 | R |
| 111 | 110 | **FS (full scale)**<br>Nominal volumetric flow | 0...6’250 | l/s | 0.01 | R |
| 112 | 111 | **FS (full scale)**<br>Nominal volumetric flow | 0...8’248 | gpm | 0.1 | R |
| 113<br>114 | 112<br>113 | **FS (full scale)**<br>Nominal volumetric flow<br>→ Unit can be selected by Register N. 148: Unit selection flow | 0...62.5<br>0..225'000<br>0...62'500<br>0...3'750'000<br>0..225'000'000<br>0...824’800<br>0...132’400 | $m^3/s$<br>$m^3/h$<br>l/s<br>l/min<br>l/h<br>gpm<br>cfm | 0.001 | R |
| 148 | 147 | **Unit selection flow**<br>The selected unit is valid for<br>Register No. 10: Absolute volumetric flow in selected unit<br>Register No. 113: FS (full scale) | 0: $m^3/s$<br>1: $m^3/h$<br>2: l/s<br>3: l/min<br>4: l/h<br>5: gpm<br>6: cfm<br>Default: 4 | – | – | R / W |
| 60<br>61 | 59<br>60 | **Accumulated volume**<br>(cannot be reset) | 0...2'147'483'600 | $m^3$ | 0.01 | R |
| 62<br>63 | 61<br>62 | **Accumulated volume**<br>(cannot be reset) | 0...2'147'483'647 | gal | 1 | R |
| 64<br>65 | 63<br>64 | **Accumulated volume in selected unit**<br>(cannot be reset)<br>→ Unit can be selected by Register No. 150: Unit selection volume | 0...42'000'000<br>0...42'000'000'000<br>0...11'095'226'199<br>0...1'483'216'002.3 | $m^3$<br>l<br>gal<br>cf | 1 | R |

| No. | Address | Description<br>Comment | Range,<br>enumeration | Unit | Scaling | Access |
|---|---|---|---|---|---|---|
| 150 | 149 | **Unit selection volume**<br>The selected unit is valid for Register No. 64: Accumulated volume in selected unit. | 0: $m^3$<br>1: Litre<br>2: Gallon<br>3: cf<br>Default: 0 | – | – | R / W |
| 26 | 25 | **Glycol concentration**<br>Effective measuring range depends on device type (see data sheet). | 0...6'000 | % | 0.01 | R |
| 201 | 200 | **Flow Meter serial number first digits**<br>ProductionOrderNumber | – | – | 1 | R |
| 202 | 201 | | | | | |
| 203 | 202 | **Flow Meter serial number last digits**<br>ProductionSequenceNumber | – | – | 1 | R |
| 204 | 203 | | | | | |

## Temperature

The measured temperature value can be read out via the Modbus Registers below.

| No. | Address | Description<br>Comment | Range,<br>enumeration | Unit | Scaling | Access |
|---|---|---|---|---|---|---|
| 22 | 21 | **Temperature (flow body)** | -2'000...12'000 | °C | 0.01 | R |
| 23 | 22 | **Temperature (flow body)** | -400...24'800 | °F | 0.01 | R |

## Conversion of sensor signals

These registers can be used to configure the additional Sensor 1 Input on Y3 and related values.

| No. | Address | Description<br>Comment | Range,<br>enumeration | Unit | Scaling | Access |
|---|---|---|---|---|---|---|
| 13 | 12 | **Sensor 1 value**<br>Current value of sensor 1, depending on Register No 121: Sensor 1 Type. | 0...65'535 | mV<br>– | 1 | R |
| 121 | 120 | **Sensor 1 type**<br>Additional sensor input | 0: None<br>1: Active<br>2: -<br>3: -<br>4: Switch<br>Default: 0 | – | – | R / W |

Access: R = Read, W = Write

**Note:** According to the present configuration settings of the product (e.g. DN size) the HVAC application may perform a size limitation within the indicated Modbus value range. Each product may have different HVAC value size limitations

# Health state

This register allows to determine malfunctions, service information and error states of the Flow Sensor.

| No. | Address | Description<br>Comment | Range, enumeration | Unit | Scaling | Access |
|---|---|---|---|---|---|---|
| 105 | 104 | **Malfunction and service information**<br>Value is bit-coded. More than one bit can be set to 1.<br>Not all bits mentioned in the enumeration are used for this product range.<br><br>3: Reverse flow is detected. Pump pressure too low; high resistance in the flow circuit; flushing bypass open; V'max setting too high.<br>6: Actual flow exceeds the designed nominal flow.<br>7: Air in the system, error occurred during flow measurement. Water contamination, not specified fluid used.<br>9: Error with embedded temperature sensor.<br><br>11: Measured temperature and glycol concentration indicate that grease ice can build up.<br>12: Medium contains glycol. | Bitmask =<br>0: –<br>1: –<br>2: –<br>3: Reverse flow<br>4: –<br>5: –<br><br>6: Flow actual exceeds flow nominal<br>7: Flow measurement error<br>8: –<br><br>9: Flowbody temperature error<br>10: –<br>11: Freeze warning<br><br>12: Glycol detected<br>13: –<br>14: –<br>15: – | – | 1 | R |

Access: R = Read, W = Write

**Note:** According to the present configuration settings of the product (e.g. DN size) the HVAC application may perform a size limitation within the indicated Modbus value range. Each product may have different HVAC value size limitations

# All inclusive.

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- On site around the globe
- Complete product range
- Tested quality
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EN – 2026-05 – Subject to technical modifications

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