



Modbus Interface Description



Flow Sensor 22PF-1U..

Edition 2025-10 / V4.2

Table of contents

General notes

General information	
Modbus RTU	
Parametrisation	
Register implementation	4
Standard commands	
Command "Read Discrete Inputs"	
Interpret values in the registers	
32-bit values in two registers	5

Register overview

Operation	6
Service	7

Register descriptions

Control and general settings	8
Flow	9
Temperature	10
Conversion of sensor signals	
Health state	11

General notes

General information

Date	15.12.2022
Product Name	Flow Sensor
Product Model Number	22PF-x1(X)Ux2(x3(x4))-(SG) X1: 1, 5 x2: C, D, E, F, G, H, H x3: H, N, K x4: H, T
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
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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. Exceptions are marked with **. Signed integers are represented as two's complement.

Example unsigned integer:	Example signed integer:
Read (Function 03, 1 Register) Value Register No. x = 0001 1010 1100 1000 ₂ = 6,856 ₁₀	Read (Function 03, 1 Register) Value Register No. x = 1111 1101 1111 0010 ₂ = -526 ₁₀
Actual value = value * scaling factor * unit = 6,856 * 0.01 * unit = 68.56 unit	Actual value = value * scaling factor * unit = -526 * 0.01 * unit = -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 = 14,551 = 0011 1000 1101 0111 ₂	Value HighWord = 19 = 0000 0000 0001 0011 ₂
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32-bit value
 = 0000 0000 0001 0011 0011 1000 1101 0111₂
 = 1,259,735₁₀
 = **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 1111₂).

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
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
61	60		LowWord
62	61	Accumulated Volume [gal]	LowWord
63	62		LowWord
64	63	Accumulated Volume [selected unit]	LowWord
65	64		LowWord

**) signed integer

Service

No.	Address	Register	Access
100	99	Bus Termination	R
101	100	Series Number 1 st part	
102	101	Series Number 2 nd part	R
103	102	Series Number 4 th 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
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
202	201		HighWord
203	202	Flow Meter Serial Number Last Digits	LowWord
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 Comment	Range, enumeration	Unit	Scaling	Access
100	99	Bus termination Indicates if bus termination (120 Ω) is enabled. Bus termination can be set with Belimo Assistant 2.	0: Disabled 1: Enabled Default: 0	–	1	R
101	100	Series number 1st part 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. Example 00839-31324-064-008 1 st part: 00839 2 nd part: 31324 4 th part: 008	–	–	1	R
102	101	Series number 2nd part	–	–	1	R
103	102	Series number 4th part	–	–	1	R
104	103	Firmware version Firmware version of communication module. 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 Comment	Range, enumeration	Unit	Scaling	Access
7	6	Relative volumetric flow Related to V'nom Register No. 111: Nominal volumetric flow [l/s] Register No. 112: Nominal volumetric flow [gpm] Register No. 113: FS (full scale)	0...15'000	%	0.01	R
8	7	Absolute volumetric flow Sensor reading up to 2.5*V'nom possible. Actual measuring range depends on device type (see data sheet).	0...10'000	l/s	0.01	R
9	8	Absolute volumetric flow Sensor reading up to 2.5*V'nom possible. Actual measuring range depends on device type (see data sheet).	0...16'000	gpm	0.1	R
10	9	Absolute volumetric flow in selected unit Sensor reading up to 2.5*V'nom possible. Actual measuring range depends on device type (see data sheet).	0...15 0...56'750 0...15'762 0...945'832	m ³ /s m ³ /h l/s	0.001	R
11	10	→ Unit can be selected by Register No. 148: Unit selection flow	0...56'750'000 0...249'862 0...33'400	l/h gpm cfm		
111	110	FS (full scale) Nominal volumetric flow	0...10'000	l/s	0.01	R
112	111	FS (full scale) Nominal volumetric flow	0...16'000	gpm	0.1	R
113	112	FS (full scale) Nominal volumetric flow	0...0.097 0...3'500 0...972 0...58'333	m ³ /s m ³ /h l/s l/min	0.001	R
114	113	→ Unit can be selected by Register N. 148: Unit selection flow	0...3'500'000 0...15'410 0...2'060	l/h gpm cfm		
148	147	Unit selection flow The selected unit is valid for Register No. 10: Absolute volumetric flow in selected unit Register No. 113: FS (full scale)	0: m ³ /s 1: m ³ /h 2: l/s 3: l/min	4: l/h 5: gpm 6: cfm Default: 4	-	R / W
60	59	Accumulated volume (cannot be reset)	0...2'147'483'600	m ³	0.01	R
61	60					
62	61	Accumulated volume (cannot be reset)	0...2'147'483'647	gal	1	R
63	62					
64	63	Accumulated volume in selected unit (cannot be reset)	0...42'000'000 0...42'000'000'000	m ³ l	1	R
65	64	→ Unit can be selected by Register No. 150: Unit selection volume	0...11'095'226'199 0...1'483'216'002.3	gal cf		

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

Temperature

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

No.	Address	Description Comment	Range, 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 Comment	Range, enumeration	Unit	Scaling	Access
13	12	Sensor 1 value Current value of sensor 1, depending on Register No 121: Sensor 1 Type.	0...65'535	mV -	1	R
121	120	Sensor 1 type Additional sensor input	0: None 1: Active 2: - 3: - 4: Switch 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 Comment	Range, enumeration	Unit	Scaling	Access
105	104	<p>Malfunction and service information</p> <p>Value is bit-coded. More than one bit can be set to 1.</p> <p>Not all bits mentioned in the enumeration are used for this product range.</p> <p>3: Reverse flow is detected. Pump pressure too low; high resistance in the flow circuit; flushing bypass open; V'max setting too high.</p> <p>6: Actual flow exceeds the designed nominal flow.</p> <p>7: Air in the system, error occurred during flow measurement. Water contamination, not specified fluid used.</p> <p>9: Error with embedded temperature sensor.</p> <p>11: Measured temperature and glycol concentration indicate that grease ice can build up.</p> <p>12: Medium contains glycol.</p>	<p>Bitmask =</p> <p>0: –</p> <p>1: –</p> <p>2: –</p> <p>3: Reverse flow</p> <p>4: –</p> <p>5: –</p> <p>6: Flow actual exceeds flow nominal</p> <p>7: Flow measurement error</p> <p>8: –</p> <p>9: Flowbody temperature error</p> <p>10: –</p> <p>11: Freeze warning</p> <p>12: Glycol detected</p> <p>13: –</p> <p>14: –</p> <p>15: –</p>	–	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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Always focusing on customer value, we deliver more than only products. We offer you the complete product range for the regulation and control of HVAC systems from a single source. At the same time, we rely on tested Swiss quality with a five-year warranty. Our worldwide representatives in over 80 countries guarantee short delivery times and comprehensive support through the entire product life. Belimo does indeed include everything.

The “small” Belimo devices have a big impact on comfort, energy efficiency, safety, installation and maintenance.

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5-year warranty



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Complete product range



Tested quality



Short delivery times



Comprehensive support



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