



Modbus Interface Description



Flow Sensor 22PF-1U..

Edition 2023-05 / V4.0

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Modbus 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 App
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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.

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
------------------------------------------------------------------------	---------------------------------------------------------------------

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).



All writeable registers >100 are persistent and are not supposed to be written on a regular basis.

Modbus 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 in unit selected	LowWord
11	10		HighWord
..	..	-	-
13	12	Sensor Value [mV] [-]	R
..	..	-	-
22	21	T_C **)	R
23	22	T_F **)	R
26	25	Glycol Concentration [%]	R

**) signed integer

Accumulation

No.	Address	Register	Access
60	59	Total Volume m ³	LowWord
61	60		HighWord
62	61	Total Volume gal	LowWord
63	62		HighWord
64	63	Total Volume in selected units	LowWord
65	64		HighWord

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	-
105	104	Malfunction and Service Information	R
..	..	-	-
111	110	FS (full scale, max. flow) in l/s	R
112	111	FS (full scale, max. flow) in gpm	R
113	112	FS (full scale, max. flow) in selected units	LowWord
114	113		HighWord
..	..	-	-
121	120	Sensor 1 Type	R / W
..	..	-	-
148	147	Unit Selected Flow	R / W
150	149	Unit Selected Volume	R / W
..	..	-	-
201	200	Meter_Serial_No First Part	LowWord
202	201		HighWord
203	202	Meter_Serial_No_Second Part	LowWord
204	203		HighWord

Modbus register description

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
7	6	Relative Volumetric Flow Relative to FS	0...15'000	%	0.01	R
8	7	Absolute Volumetric Flow	0...10'000	l/s	0.01	R
9	8	Absolute Volumetric Flow	0...16'000	gpm	0.1	R
10	9	Absolute Volumetric Flow in selected units -> based on selection in Register No. 148	0...360'000'000	UnitSel	0.001	R
11	10		Actual range determined			
13	12	Sensor Value 1	0...65'535	mV	1 0/1	R
..	..	-	-	-	-	-
22	21	T_C	-2'000...12'000	°C	0.01	R
23	22	T_F	-400...24'800	°F	0.01	R
26	25	Glycol Concentration	0...10'000	%	0.01	R
..	..	-	-	-	-	-
60	59	Total Volume	0...2'147'483'600	m ³	0.01	R
61	60					
62	61	Total Volume	0...2'147'483'647	gal	1	R
63	62					
64	63	Total Volume in selected units -> based on selection in Register No. 150	0...2'147'483'647	UnitSel	1	R
65	64		Actual range determined by selected unit			

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
100	99	Bus Termination Indicates if bus termination (120Ω) is enabled. Bus termination can be set by configuration tools.	0: Disabled 1: Enabled Default: 0	-	-	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 1st part: 00839 2nd part: 31324 4th part: 008	-	-	-	R
102	101	Series Number 2nd part	-	-	-	R
103	102	Series Number 4th part	-	-	-	R
104	103	Firmware Version	-	-	-	R
105	104	Malfunction and Service Information Value ist bit-coded. More than one bit can be set to 1. All bits not mentioned in the enumeration are not used for this actuator range.	Bitmask = 0: - 1: - 2: - 3: Reverse flow 4: - 5: - 6: Flow actual exceeds FS 7: Flow measurement error 8: - 9: Flowbody temperature error 10: Communication to sensor interrupted 11: Freeze warning 12: Glycol detected	-	-	R
..	..	-	-	-	-	-
111	110	FS (full scale, max. flow)	0...10'000	l/s	0.01	R
112	111	FS (full scale, max. flow)	0...16'000	gpm	0.1	R
113	112	FS (full scale, max. flow) in selected units	0...360'000'000	UnitSel	0.001	R
114	113	-> based on selection in Register No. 148	Actual range determined by selected unit			
..	..	-	-	-	-	-
121	120	Sensor 1 Type Additional sensor input	0: None 1: Active 2: - 3: - 4: Switch Default: 0	-	-	R / W
..	..	-	-	-	-	-

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
148	147	Unit Selection Flow	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
..	..	-	-	-	-	-
150	149	Unit Selection Volume	0: m ³ 1: Litre 2: Gallon 3: cf Default: 0	-	-	R / W
..	..	-	-	-	-	-
201	200	Meter Serial Number First Part	-	-	1	R
202	201	ProductionOrderNumber	-	-	1	R
203	202	Meter Serial Number Second Part	-	-	1	R
204	203	ProductionSequenceNumber	-	-	1	R

All inclusive.

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