Modbus Interface Description

Flow Sensor 22PF-1U..

Edition 2023-05 / V4.0

Contents

BELIMO

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

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) 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	**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 ($1111\ 1111\ 1111\ 1111_2$).

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	R
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	R
61	60		HighWord	
62	61	Total Volume gal	LowWord	R
63	62		HighWord	
64	63	Total Volume in selected units	LowWord	R
65	64		HighWord	

Service

No.	Address	Register		Access
100	99	Bus Termination		R
101	100	Series Number 1st part		
102	101	Series Number 2nd part		R
103	102	Series Number 4th 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	R
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	R
202	201		HighWord	
203	202	Meter_Serial_No_Second Part	LowWord	R
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 11	9 10	**Absolute Volumetric Flow in selected units** -> based on selection in Register No. 148	0...360'000´000 Actual range determined	UnitSel	0.001	R
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 61	59 60	**Total Volume**	0...2'147'483'600	m^3	0.01	R
62 63	61 62	**Total Volume**	0...2'147'483'647	gal	1	R
64 65	63 64	**Total Volume in selected units** -> based on selection in Register No. 150	0...2'147'483'647 Actual range determined by selected unit	UnitSel	1	R

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
113 114	112 113	**FS (full scale, max. flow) in selected units** -> based on selection in Register No. 148	0...360'000´000 Actual range determined by selected unit	UnitSel	0.001	R
..	..	-	-	-	-	-
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** ProductionOrderNumber	-		-	1	R
202	201						
203	202	**Meter Serial Number Second Part** ProductionSequenceNumber	-		-	1	R
204	203						

All inclusive.

Belimo as a global market leader develops innovative solutions for the controlling of heating, ventilation and air-conditioning systems. Damper actuators, control valves, sensors and meters represent our core business.

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.

In short: Small devices, big impact.

- 5-year warranty
- On site around the globe
- Complete product range
- Tested quality
- Short delivery times
- Comprehensive support

EN – 2023-05 – Subject to technical modifications

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