Endress+Hauser
People for Process Automation

FLOWSIC900, FLOWSIC610
Technical Bulletin

MODBUS interface V1.4.0

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Version history

Version	Modifications	Date	Editor
1.0.0	Initial	2024-04	Kirmse
1.1.0	- Format of date changed to YYYYMMDD - Separation of internal and external pressure and temperature removed	2024-05	Kirmse
1.2.0	- Section ISO17089 Modbus communication added - Support for device FLOWSIC610 added	2024-06	Kirmse
1.4.0	- Live density as device input added - Metrological firmware version added - Device variant overview added - Quality diagnostics added	2025-03	Kirmse

1 Introduction

This document specifies the serial communication protocols for IACS field communication based on Modbus RTU/-ASCII.

1.1 Reference

Modbus over serial line specification and implementation guide V1.02; 2006; MODBUS Organization; http://www.modbus.org/docs/Modbus_over_serial_line_V1_02.pdf

Modbus Application Protocol Specification V1.1b3; 2012; MODBUS Organization; http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf

1.2 Abbreviations / Nomenclature

IACS	Integrated automation and control system
INT8	8-bit, signed integer value
UINT8	8-bit, unsigned integer value
INT16	16-bit, signed integer value
UINT16	16-bit, unsigned integer value
INT32	32-bit, signed integer value
UINT32	32-bit, unsigned integer value
INT64	64-bit, signed integer value
FLOAT	32-bit IEEE floating point value
DOUBLE	64-bit IEEE floating point value
CHAR8[N]	Array of ANSI chars, representing N chars in N/2 16-bit values
UTF8[N]	Array of UTF8 chars, representing N chars in N/2 16-bit values
UTF16[N]	Array of UTF16 chars, representing N chars in N 16-bit values (M ⇐ N)
UINT8[N]	Array of UINT8 values
UINT16[N]	Array of UINT16 values
EVC	Electronic Volume Conversion
MSB	Most significant bit
RTC	Real time clock
SOS	Speed of sound

VOF	Velocity of fluid
VOG	Velocity of gas
UTC	Universal Time Coordinated
a.c.	Value at actual conditions
s.c.	Value at standard conditions
Path 1-1	refers to path 1 according ISO 17089:2019
Path 1-2	refers to path 2 according ISO 17089:2019
Path 1-3	refers to path 3 according ISO 17089:2019
Path 1-4	refers to path 4 according ISO 17089:2019
Path 2-1	refers to path 5 according ISO 17089:2019
Path 2-2	refers to path 6 according ISO 17089:2019
Path 2-3	refers to path 7 according ISO 17089:2019
Path 2-4	refers to path 8 according ISO 17089:2019

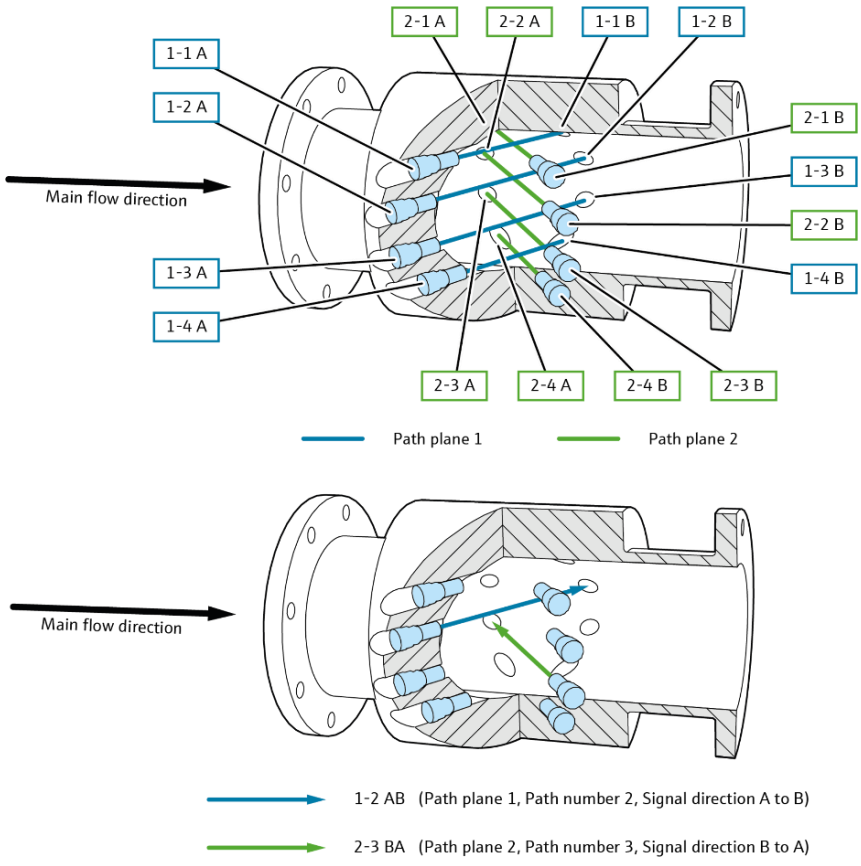

Figure 1: Ultrasonic Path Nomenclature

1.3 Device feature overview

This document is valid for multiple devices with slightly different functionalities: FLOWSIC900 and FLOWSIC610. The functions in the following sections are not present in all devices. If a data element is not present, it reads as zero and a write action has no effect. The following table gives an overview:

Function	FLOWSIC900	FLOWSIC610
Liquid flow measurement	X	-
Gas flow measurement	-	X
Volume at base conditions	-	-
Energy	X	-
Mass	X	-
Temperature measurement	X	X
Pressure measurement	-	X
Batching and batching archive	X	-
Data archives	X	X
ISO17089-1 communication protocol	X	X

2 Process interface Modbus communication

2.1 General information

The protocol is intended for device integration into customer automation systems (IACS) with cyclic requesting measured data. The protocol defines a vendor specific Modbus template that is integrated in all future devices. Data elements will not change for different devices implementing this protocol. If data elements are not supported, the access will read 0.

The framing is according to Modbus ("modbus.org") and supports the functions for read-multiple registers (03h) and write-multiple-registers (10h). The protocol can be switched between RTU and ASCII mode.

The slave address can be in range from 1 to 247. The device also responds to the fixed address 253. The maximum number of data elements accessible in one read request is 125 (250 Byte). The maximum number of data elements accessible in one write request is 123 (246 Byte) It is not allowed to read or write addresses outside the specified range in the register table. According to Modbus, the starting register address is always the specified data element address minus 1. So, if data element at address 3000 is required, the starting register address must be 2999. The request of undefined addresses is not allowed, and an error response is generated.

The template supports a fixed list of data items with different base offsets to select the desired communication unit:

Data item base offset	Units
3000	Metric units
5000	Imperial units
7000	Customized units

Example:

The measured actual flowrate can be accessed in metric units with register #3123 and in imperial units with register #5123.

The template defines multiple data regions:

Data item offset	Data region
0..99	Device Information
100..199	Status and flow measurement values
200..299	Totalizer data
300..399	External live process data
400..599	Path diagnostic data
600..1999	Reserved for future use

2.2 Data encoding

Access to data elements must exactly use the specified length as one data element defines one "variable". Partial access to data elements is not permitted. Data elements with data length of more than 16 bits define an area forming a gap in register numbers (example: data item #3020 "AMetricValue" with 32bit data length is followed by data item #3022 "AnotherMetricValue", a register #3021 does not exist).

Data is transferred within Modbus always MS-Byte first. The documentation in "modbus.org" only specifies the encoding of uint16, uint32 and float data types. The following table gives examples for other data types (8-bit types to 64-bit types, strings and arrays).

Example	Test values	Number of 16bit registers	Test data sequence (hex)
UINT8	170	1	AA 00
UINT8[3]	170 187 204	2	AA BB CC 00
UINT8[6]	1 2 3 4 5 6	3	01 02 03 04 05 06
CHAR8[4]	"TEST"	2	84 69 83 84
INT8	-18	1	FE 00
UINT16	465	1	01 D1
UINT16[2]	465 466	2	01 D1 01 D2
INT16	-2	1	FF FE
UTF16[4]	"TEST"	4	00 84 00 69 00 83 00 84
UINT32	123456789	2	07 5B CD 15
FLOAT	0,7302504	2	3F 3A F1 B1
DOUBLE	9,87654321	4	40 23 C0 CA 45 88 F6 33
DOUBLE[2]	181,124558462 181,123077917	8	40 66 A3 FC 62 07 17 5D 40 66 A3 F0 41 19 8B FF

INT64	-120000	4	FF FF FF FF FF FE 2B 40

2.3 Data element description

Some data items are used as bit lists, they collect independent (changeable) bits. Description of bit list content is given as follows (please note the column label “Bit”):

#XXXX Bit data item name:

Bit	Description
0	Description of Bit 0
1	Description of Bit 1
2	Description of Bit 2

Description of unused bits are either omitted or in case of a gap between bits declared as <reserved>.

Caution:

Trying to change bits declared as unused or <reserved> could lead to unpredictable device behavior and is not allowed.

Some other data items are restricted to certain values (from a selection list) or limited in range. Description of selected / restricted content is given as follows (only as example, please note the label “Value” of the first column):

#YYYY Value data item name:

Value	Description
0	Value 1
1	Value 2
2	Value 3

2.4 Register Reference

The following values are accessible via process interface Modbus:

Device information register table

Address	Access	Description	Data type	Metric unit	Imperial unit	Custom unit
0	R	Device serial number	CHAR8[9]	-		
5	R	Device part number	CHAR8[7]	-		
9	R	Device TAG	UTF16[20]	-		
29	R	Production date	UINT32	YYYYMMDD		
31	R	Firmware version	CHAR8[14]	xxX.yyY.zzZ		
38	R	Firmware date	UINT32	YYYYMMDD		
40	R	Firmware CRC	UINT32	-		
42	R	Firmware metrology CRC	UINT32	-		
44	R	Parameter metrology CRC	UINT16	-		
45	R	Path number	UINT16	-		
46	R	Qmax	FLOAT	m^3/h	ft^3/h	see (1)
48	R	Qmin	FLOAT	m^3/h	ft^3/h	see (1)
50	R	Qt	FLOAT	m^3/h	ft^3/h	see (1)
52	R	Firmware metrology version	CHAR8[14]	xxX.yyY.zzZ		

(1) Detailed information in chapter regional settings

Device status and flow measurement register table

Address	Access	Description	Data type	Metric unit	Imperial unit	Custom unit
100	R	Global status	UINT16	-		
101	R	Detail status #1	UINT32	-		
103	R	Detail status #2	UINT32	-		
105	R	<reserved>	UINT32	-		
107	R	<reserved>	UINT32	-		
109	R	History status #1	UINT32	-		
111	R	History status #2	UINT32	-		
113	R	<reserved>	UINT32	-		
115	R	<reserved>	UINT32	-		
117	R	Device date	UINT32	YYYYMMDD		
119	R	Device time	UINT32	HHMMSS		
121	R	Device time stamp (UTC)	UINT32	-		
123	R	Flowrate a.c.	FLOAT	m³/h	ft³/h	see (1)
125	R	Flowrate s.c.	FLOAT	m³/h	ft³/h	see (1)
127	R	Energy flowrate	FLOAT	MJ/h	BTU/h	see (1)
129	R	Mass flowrate	FLOAT	ton/h	short ton/h	see (1)
131	R	Velocity of fluid/gas (pipe)	FLOAT	m/s	ft/s	see (1)
133	R	Speed of sound	FLOAT	m/s	ft/s	see (1)
135	R	Atmospheric pressure	FLOAT	bar	psi	see (1)
137	R	Pressure (2) (3)	FLOAT	bar(a)	psi(g)	see (1)
139	R	Temperature (2) (3)	FLOAT	°C	°F	see (1)
141	R	Diagnostic status #1	FLOAT	-		
143	R	Diagnostic status #2	FLOAT	-		
145	R	Conversion factor (3)	FLOAT	-		
147	R	Gross calorific value a.c. (3)	FLOAT	MJ/m³	BTU/ft³	see (1)
149	R	Density a.c. (3)	FLOAT	kg/m³	lb/ft³	see (1)

(1) Detailed information in chapter regional settings

(2) The values are used internally for Reynolds and meter body correction

(3) The values are used for the calculation of additional process data (e. g. volume conversion or energy conversion)

Totalizer register table

Address	Access	Description	Data type	Metric unit	Imperial unit	Custom unit
200	R	Volume a.c. resolution	INT16	Power of ten		
201	R	Forward volume a.c. (valid)	UINT32	counts		
203	R	Reverse volume a.c. (valid)	UINT32	counts		
205	R	Forward volume a.c. (error)	UINT32	counts		
207	R	Reverse volume a.c. (error)	UINT32	counts		
209	R	Forward volume a.c. (total)	UINT32	counts		
211	R	Reverse volume a.c. (total)	UINT32	counts		
213	R	Volume s.c. resolution	INT16	Power of ten		
214	R	Forward volume s.c. (valid)	UINT32	counts		
216	R	Reverse volume s.c. (valid)	UINT32	counts		
218	R	Forward volume s.c. (error)	UINT32	counts		
220	R	Reverse volume s.c. (error)	UINT32	counts		
222	R	Forward volume s.c. (total)	UINT32	counts		
224	R	Reverse volume s.c. (total)	UINT32	counts		
226	R	Energy resolution	INT16	Power of ten		
227	R	Forward energy (valid)	UINT32	counts		
229	R	Reverse energy (valid)	UINT32	counts		
231	R	Forward energy (error)	UINT32	counts		
233	R	Reverse energy (error)	UINT32	counts		
235	R	Forward energy (total)	UINT32	counts		
237	R	Reverse energy (total)	UINT32	counts		
239	R	Mass resolution	INT16	Power of ten		
240	R	Forward mass (valid)	UINT32	counts		
242	R	Reverse mass (valid)	UINT32	counts		
244	R	Forward mass (error)	UINT32	counts		
246	R	Reverse mass (error)	UINT32	counts		
248	R	Forward mass (total)	UINT32	counts		
250	R	Reverse mass (total)	UINT32	counts		
252	R	Batch volume a.c.	FLOAT	m^3	ft^3	see (1)
254	R	Batch volume s.c.	FLOAT	m^3	ft^3	see (1)
256	R	Batch energy	FLOAT	MJ	BTU	see (1)

258	R	Batch mass	FLOAT	metric ton	short ton us	see [1]
260	R	Batch time interval	FLOAT	s		

[1] Detailed information in chapter regional settings

External process data register table

Address	Access	Description	Data type	Metric unit	Imperial unit	Custom unit
300	R/W	Live pressure	FLOAT	bar [1]	psi [1]	see [1][2]
302	R/W	Live temperature	FLOAT	°C	°F	see [1]
304	R/W	Theoretic speed of sound	FLOAT	m/s	ft/s	see [1]
306	W	Batch control	UINT16	-		
308	R/W	Live density a. c.	FLOAT	kg/m³	lb/ft3	see [1]

[1] Detailed information in chapter regional settings

[2] Absolute and gauge pressure can be configured during commissioning via user software FLOWgate™ via setting the pressure sensor type parameter

Path diagnostic register tables

For Nomenclature of ultrasonic path plane, path number and signal direction see Figure 1.

Path Plane 1

Address	Access	Description	Data type	Metric unit	Imperial unit	Custom unit
400	R	Velocity 1-1	FLOAT	m/s	ft/s	see [1]
402	R	SOS 1-1	FLOAT	m/s	ft/s	see [1]
404	R	AcceptanceRate 1-1	UINT16	%		
405	R	PathStatus 1-1	UINT16	-		
406	R	SNR 1-1 AB	FLOAT	dB		
408	R	SNR 1-1 BA	FLOAT	dB		
410	R	AGC 1-1 AB	FLOAT	dB		
412	R	AGC 1-1 BA	FLOAT	dB		
414	R	Velocity 1-2	FLOAT	m/s	ft/s	see [1]
416	R	SOS 1-2	FLOAT	m/s	ft/s	see [1]
418	R	AcceptanceRate 1-2	UINT16	%		

419	R	PathStatus 1-2	UINT16	-		
420	R	SNR 1-2 AB	FLOAT	dB		
422	R	SNR 1-2 BA	FLOAT	dB		
424	R	AGC 1-2 AB	FLOAT	dB		
426	R	AGC 1-2 BA	FLOAT	dB		
428	R	Velocity 1-3	FLOAT	m/s	ft/s	see (1)
430	R	SOS 1-3	FLOAT	m/s	ft/s	see (1)
432	R	AcceptanceRate 1-3	UINT16	%		
433	R	PathStatus 1-3	UINT16	-		
434	R	SNR 1-3 AB	FLOAT	dB		
436	R	SNR 1-3 BA	FLOAT	dB		
438	R	AGC 1-3 AB	FLOAT	dB		
440	R	AGC 1-3 BA	FLOAT	dB		
442	R	Velocity 1-4	FLOAT	m/s	ft/s	see (1)
444	R	SOS 1-4	FLOAT	m/s	ft/s	see (1)
446	R	AcceptanceRate 1-4	UINT16	%		
447	R	PathStatus 1-4	UINT16	-		
448	R	SNR 1-4 AB	FLOAT	dB		
450	R	SNR 1-4 BA	FLOAT	dB		
452	R	AGC 1-4 AB	FLOAT	dB		
454	R	AGC 1-4 BA	FLOAT	dB		

(1) Detailed information in chapter regional settings

Path plane 2

Address	Access	Description	Data type	Metric unit	Imperial unit	Custom unit
456	R	Velocity 2-1	FLOAT	m/s	ft/s	see (1)
458	R	SOS 2-1	FLOAT	m/s	ft/s	see (1)
460	R	AcceptanceRate 2-1	UINT16	%		
461	**R**	PathStatus 2-1	uint16	-		
462	R	SNR 2-1 AB	FLOAT	dB		
464	R	SNR 2-1 BA	FLOAT	dB		
466	R	AGC 2-1 AB	FLOAT	dB		
468	R	AGC 2-1 BA	FLOAT	dB		
470	R	Velocity 2-2	FLOAT	m/s	ft/s	see (1)

472	R	SOS 2-2	FLOAT	m/s	ft/s	see [1]
474	R	AcceptanceRate 2-2	UINT16	%		
475	R	PathStatus 2-2	UINT16	-		
476	R	SNR 2-2 AB	FLOAT	dB		
478	R	SNR 2-2 BA	FLOAT	dB		
480	R	AGC 2-2 AB	FLOAT	dB		
482	R	AGC 2-2 BA	FLOAT	dB		
484	R	Velocity 2-3	FLOAT	m/s	ft/s	see [1]
486	R	SOS 2-3	FLOAT	m/s	ft/s	see [1]
488	R	AcceptanceRate 2-3	UINT16	%		
489	R	PathStatus 2-3	UINT16	-		
490	R	SNR 2-3 AB	FLOAT	dB		
492	R	SNR 2-3 BA	FLOAT	dB		
494	R	AGC 2-3 AB	FLOAT	dB		
496	R	AGC 2-3 BA	FLOAT	dB		
498	R	Velocity 2-4	FLOAT	m/s	ft/s	see [1]
500	R	SOS 2-4	FLOAT	m/s	ft/s	see [1]
502	R	AcceptanceRate 2-4	UINT16	%		
503	R	PathStatus 2-4	UINT16	-		
504	R	SNR 2-4 AB	FLOAT	dB		
506	R	SNR 2-4 BA	FLOAT	dB		
508	R	AGC 2-4 AB	FLOAT	dB		
510	R	AGC 2-4 BA	FLOAT	dB		

[1] Detailed information in chapter regional settings

2.5 Detailed register descriptions

#31 - Firmware version

#52 - Firmware metrology version

The returned string format is major.minor.patch. In case of test versions, a minus with dedicated test qualifier is added. A change in major version indicates incompatible changes. A change in minor version indicates functional changes or enhancement. A change in patch version indicates bug fixes.

#306 - Batch control

Value	Description
1	Batch start
2	Batch stop

#100 - Global status

Bit	Bit description (bit activated)
0	The device operates in valid conditions
1	Flow measurement is in initialization mode
2	Device operates in error condition, measurement is invalid
3	Device warning is active
4	User diagnostics warning active
5	The configuration mode is active, measurement invalid if metrological lock switch is open

#101 - Detailed status #1

#109 - Historical status #1

Bit	Bit description (bit activated)
0	The device was restarted
1	New logbook entries available
2	The metrological lock switch is open
3	The remote software download lock switch is open
4	-
5	The configuration mode is active
6	The system test mode is active

7	Firmware checksum error
8	Real time clock hardware error
9	Date and time invalid
10	Real time clock battery is below 10% lifetime
11	Totalizer checksum error
12	Limit reverse flow
13	Parameter invalid
14	Pressure sensor failure
15	Pressure lower user limit exceeded
16	Pressure upper user limit exceeded
17	Temperature sensor failure
18	Temperature lower user limit exceeded
19	Temperature upper user limit exceeded
20	Impulse#1 warning
21	Impulse#2 warning
22	Flow-hardware error
23	Flow-parameter implausible
24	Path failure (error)
25	Path failure (warning)
26	Flow test active
27	Flow adjust range exceeded
28	Calculation error energy
29	Calibration mode
30	Logbook failure
31	Logbook warning

#103 - Detailed status #2

#111 - Historical status #2

Bit	Bit description (bit activated)
0	Display module failure
1	Bundle firmware invalid
2	Batch mode active, Batch stopped
3	User warning active

4	Diagnostic archive warning active
5	Batch or data archive warning active
6	Pressure outside device operation range
7	Temperature outside device operation range

#145 - Diagnostic status #1

Bit	Bit description (bit activated)
0	The configuration mode is active
1	Limit supply voltage
2	Logbook contains unacknowledged entries
3	Logbook is full of unacknowledged entries
4	Limit flow velocity exceeded
5	Limit path acceptance rate exceeded
6	Limit theoretical SOS deviation exceeded
7	Limit SOS path difference exceeded
8	Limit turbulence exceeded
9	Limit AGC exceeded
10	Limit AGC AB/BA exceeded
11	Limit AGC difference exceeded
12	Limit SNR exceeded
13	Limit profile factor exceeded
14	Limit symmetry exceeded
15	Limit swirl exceeded
16	Limit CBI exceeded (cross beam indicator)
17	Limit quality indicator exceeded

#405 - Path Status 1-1

#419 - Path Status 1-2

#433 - Path Status 1-3

#447 - Path Status 1-4

#461 - Path Status 2-1

#475 - Path Status 2-2

#489 - Path Status 2-3

#504 - Path Status 2-4

Bit	Bit description (bit activated)
0	Signal too big in measuring window
1	Signal too small in measuring window
2	Signal too early in measuring window
3	Signal too late in measuring window
4	SNR limit exceeded
5	Limit signal slope exceeded
6	Run time implausible
7	Limit phase shift
8-14	<reserved>
15	Path failed

3 ISO17089-1 (“Instance-F DSFG”) Modbus communication

3.1 General information

The ISO17089-1 Modbus communication protocol is published in the ISO17089 appendix and intended for device integration into IACS with cyclic requesting measured data. The framing is according to Modbus ("modbus.org") and supports the functions for read-multiple registers (03h) and write-multiple-registers (10h). The protocol can be switched between RTU and ASCII mode. The protocol supports a fixed list of data items according to ISO17089-1.

The slave address can be in range 1...247. The device also responds to the fixed address 253. The maximum number of registers accessible in one read request is 125 (250 Byte). The maximum number of registers accessible in one write request is 123 (246 Byte) It is not allowed to read or write addresses outside the specified range in the register table. According to Modbus, the starting address is always the specified address in the register tables minus 1. So, if data item at address 32768 is required, the starting address must be 32767. The request of undefined addresses is not allowed, and an error response is generated. The byte order of data elements is always MS-Word first, MS-Byte first. Strings are transmitted left aligned (leading character first).

For path nomenclature, the nomenclature of ISO17089-1 is used. The assignment to the exact path position is explained in chapter 1.2 Abbreviations / Nomenclature on page 4.

3.2 Unit settings

There exist 3 possible unit settings in the ISO17089:

Description	Units
Metric units	bar, °C, m³, m³/h, m/s
Imperial units	psi, °F, ft³, ft³/m, ft/s
Modified metric units	MPa, K, m³, m³/h, m/s

The setting of the unit system switches between the metric and the imperial unit setting. If the pressure unit is set to Megapascal and the temperature unit is set to Kelvin, the modified metric unit setting will be used. See unit settings for a detailed description.

Attention:

The unit for measured volume must be set its default value. Otherwise, the unit of the transmitted volume counters is not as expected!

3.3 Setting of process data

The ISO17089-1 Modbus communication protocol features the setting of process variables in the meter. Currently, only pressure and temperature are supported. The feature can be individually enabled by selecting the correct sensor type for pressure resp. temperature using FLOWgate.

3.4 Register tables

The following values are accessible via ISO17089 Modbus communication:

Path independent data values

Address	Data type	Description	Units and details
32768	FLOAT	Flow rate	[m3/h] or [ft3/h]
32770	FLOAT	Velocity of Gas	[m/s] or [ft/s]
32772	FLOAT	Speed of Sound	[m/s] or [ft/s]
32774	UINT32	Volume counter total (forward)	register count (9 digits)
32776	UINT32	Volume counter total (reverse)	register count (9 digits)
32778	UINT32	Volume counter (forward)	register count (9 digits)
32780	UINT32	Volume counter (reverse)	register count (9 digits)
32782	UINT32	Error volume counter (forward)	register count (9 digits)
32784	UINT32	Error volume counter (reverse)	register count (9 digits)
32786	UINT32	Counter resolution	power of ten (-3..3)
32788	UINT32	Flow rate greater than Qt	0 = no, 1 = yes
32790	UINT32	Signal acceptance rate	"traffic light" concept: 0% = All paths failed or system error (red) 33% = Not compensated path failure (red) 66% = Compensated path failure (yellow) 100% = Flow measurement ok (green)
32792	UINT32	Error status	0 = no error(s), 1 = error(s) present
32794	UINT32	Number of paths	-
32796	FLOAT	deviation speed of sound path 1	[%] c1_dev = (c1 – cavg)/cavg ・ 100
32798	FLOAT	deviation speed of sound path 2	[%] c2_dev = (c2 – cavg)/cavg ・ 100
32800	FLOAT	deviation speed of sound path 3	[%] c3_dev = (c3 – cavg)/cavg ・ 100
32802	FLOAT	deviation speed of sound path 4	[%] c4_dev = (c4 – cavg)/cavg ・ 100
32804	FLOAT	deviation speed of sound path 5	[%] c5_dev = (c5 – cavg)/cavg ・ 100

32806	FLOAT	deviation speed of sound path 6	[%] c6_dev = (c6 – cavg)/cavg ・ 100
32808	FLOAT	deviation speed of sound path 7	[%] c7_dev = (c7 – cavg)/cavg · 100
32810	FLOAT	deviation speed of sound path 8	[%] c8_dev = (c8 – cavg)/cavg · 100
32812.. 32894	-	Reserved, always 0	-

Path related data values

Address	Data type	Description	Units and details
32896	FLOAT	Velocity of the acoustic path 1	[m/h] or [ft/h]
32898	FLOAT	Speed of sound path 1	[m/h] or [ft/h]
32900	FLOAT	Signal acceptance rate path 1	[%]
32902	FLOAT	SNR AB path 1	[dB]
32904	FLOAT	SNR BA path 1	[dB]
32906	FLOAT	AGC AB path 1	[dB]
32908	FLOAT	AGC BA path 1	[dB]
32910	FLOAT	reserved, always 0	-
32912..32926	FLOAT	path 2 (content see path 1)	-
32928..32942	FLOAT	path 3 (content see path 1)	
32944..32958	FLOAT	path 4 (content see path 1)	
32960..32974	FLOAT	path 5 (content see path 1)	
32976..32990	FLOAT	path 6 (content see path 1)	
32992..33006	FLOAT	path 7 (content see path 1)	
33008..33022	FLOAT	path 8 (content see path 1)	

Virtual meter type plate

Address	Data type	Description	Units and details
33792	CHAR8[16]	Manufacturer	“EHS”
33800	CHAR8[16]	Device type/model number	First part of <ModelName>
33808	CHAR8[16]	Serial number	Device serial number
33816	CHAR8[16]	Year of production	-
33824	CHAR8[16]	Software version	Major.Minor.Patch-Qualifier
33832	CHAR8[32]	Software checksum	8 byte hexadecimal
33848	UINT32	Unit system identifier	Unit system

			0: bar, °C, m3, m3/h, m/s 1: psi, °F, ft3, ft3/h, ft/s 2: MPa, K, m3, m3/h, m/s
33850	UINT32	Meter functionality identifier	Meter functionality Bit 0: pressure/temperature data accepted Bit 1..31: reserved
33852	FLOAT	Minimum actual flow rate	[m3/h] or [ft3/h]
33854	FLOAT	Maximum actual flow rate	[m3/h] or [ft3/h]
33856	FLOAT	Minimum operating pressure	[bar], [psi] or [MPa]
33858	FLOAT	Maximum operating pressure	[bar], [psi] or [MPa]
33860	FLOAT	Minimum operating temperature	[°C], [°F] or [K]
33862	FLOAT	Maximum operating temperature	[°C], [°F] or [K]
33864..34047	-	reserved, always 0	-

Process data values

Address	Data type	Description	Units and details
34048	UINT32	Process value status	Status (0=invalid or unused, 1=valid) Bit 0: Pressure valid Bit 1: Temperature valid Bit 2..31: reserved, always 0
34050	FLOAT	Actual working pressure (absolute)	[bar], [psi] or [MPa]
34052	FLOAT	Actual working temperature	[°C], [°F] or [K]
34054..34112	FLOAT	reserved	-

4 Regional settings

The device offers settings to adjust its behavior to regional requirements that can be modified via FLOWgate communication tool.

In general, the calculation and storage of measurement data in the device is internally based on metric units. As an exception the totalizer counts are always stored and visualized/communicated in the selected unit. All other values are converted to the selected unit at visualization or communication time directly.

The most important setting is the device unit system parameter to select between metric or imperial units. A change of the unit system or the totalizer unit will clear the totalizers and data archives. Some device units can be set individually via dedicated parameters. With an extra parameter setting, the pressure values can be represented as absolute or gauge (over pressure, relative to ambient air). The following unit settings are possible:

Value type	Standard metric	Standard imperial	Additional customer settings
Flowrate a.c.	m^3/h	ft^3/h	m3/d, liter/min, ft3/d, us liquid gallon/min
Volume a.c.	m^3	ft^3	liter, us liquid gallon
Flowrate s.c.	m^3/h	ft^3/h	m3/d, liter/min, ft3/d, us liquid gallon/min
Volume s.c.	m^3	ft^3	liter, us liquid gallon
Energyflowrate	MJ/h	BTU/h	kWh/h, MWh/h, GWh/h, GJ/h, MMBTU/h
Energy	MJ	BTU	kWh, MWh, GWh, GJ, TJ, MMBTU
Massflowrate	metric ton/h	short ton us/h	kg/h, lb/h
Mass	metric ton	short ton us	kg, lb
Speed	m/s	ft/s	-
Molar mass	g/mol	lb/mol	-
Density	kg/m^3	lb/ft^3	-
Heating value	MJ/m^3	BTU/ft^3	kWh/m3, MWh/m3, GJ/m3
Length	M	In	-
Temperature	°C	°F	K, R
Pressure	bar	Psi	kPa, MPa, kg/cm2
Pressure type	absolute	relative	-