

Special Documentation

Teqwave H

Modbus TCP

System integration



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1 About this document

1.1 Document function

This manual is special documentation; it does not replace the Operating Instructions and device parameters pertaining to the device. It serves as a reference manual and a complementary source of information for the integration of field devices with a Modbus interface into process control systems and controllers.

This supplementary documentation is only available in conjunction with a measuring instrument with Modbus TCP interface must be used.

1.2 Target group

This document is aimed at individuals who are incorporating the device into a Modbus network. It is a requirement that the reader has basic knowledge of Modbus technology.

More detailed information on Modbus technology can be found at www.modbus.org

1.3 Abbreviations

ADU	Application Data Unit
APL	Advanced Physical Layer
ASCII	American Standard Code for Information Interchange
CRC	Cyclic redundancy check
DHCP	Dynamic Host Configuration Protocol
ENP	Electronic nameplate
HTTP	Hypertext Transfer Protocol
ICMP	Internet Control Message Protocol
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet protocol
LSB	Least Significant Byte
MAC	Media access control
MBAP	Modbus application protocol header
MSB	Most Significant Byte
n/a	Not available
NaN	Not a Number (IEEE-754, 7Fh A0h 00h 00h)
ro	Read only
rw	Read and write
RS485	Recommended Standard 485
RTU	Remote terminal unit
TCP	Transmission control protocol

1.4 Symbols

1.4.1 Safety symbols

DANGER

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

WARNING

This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

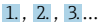
CAUTION

This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE

This symbol alerts you to a potentially harmful situation. Failure to avoid this situation can result in damage to the product or something in its vicinity.

1.4.2 Symbols for certain types of information

Symbol	Meaning
	Permitted Procedures, processes or actions that are permitted.
	Forbidden Procedures, processes or actions that are forbidden.
	Tip Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Notice or individual step to be observed
	Series of steps
	Result of a step

1.4.3 Symbols in graphics

Symbol	Meaning
1, 2, 3, ...	Item numbers
	Series of steps

1.5 Documentation

-  For an overview of the scope of the associated Technical Documentation, refer to the following:
 - *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
 - *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

 This Special Documentation and other documentation are available:
In the Download Area of the Endress+Hauser website: www.endress.com → Downloads

This documentation is an integral part of the following Operating Instructions and device parameters:

Measuring instrument	Documentation code Modbus TCP
Teqwave H	BA02574D

1.6 Registered trademarks

Modbus®
Registered trademark of SCHNEIDER AUTOMATION, INC.

2 Modbus protocol

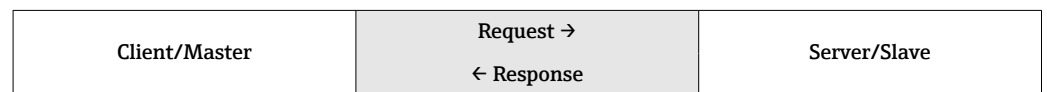
Modbus is an open, standardized communication protocol that is used in the areas of manufacturing automation, process automation and building automation.

The Modbus protocol is used to exchange data with intelligent field devices via master/slave (client/server) connections. The Modbus protocol can be used here on different transmission media and embedded in other communication protocols.

The specifications for the Modbus protocol are freely available on the Modbus organization website: <https://modbus.org/>

2.1 Operating principle

Modbus communication uses a simple request-response mechanism.



A distinction is made between three cases:

- If the device receives a valid telegram with a valid request and can respond to this, then it responds with a response telegram with the function code of the request.
- If the device receives an invalid telegram (e.g. CRC error), it does not respond. The application must carry out troubleshooting after a defined time (time-out) has elapsed.
- If the device receives a valid telegram with an invalid request, then it responds with a Modbus exception. The application must carry out troubleshooting.

2.2 Modbus exception codes

If the Modbus slave detects an error in the request telegram from the master, it sends an error message to the master as a response, consisting of the slave address, function code, error code (exception code) and checksum. To indicate that this is an error message, the leading bit of the returned function code is set. The cause of the error is transmitted to the master via the error code (exception code).

Exception code	Description
01	ILLEGAL_FUNCTION The function code sent by the master is not supported by the measuring instrument (slave).
02	ILLEGAL_DATA_ADDRESS The register addressed by the master is not assigned (i.e. it does not exist) or the length of the data queried is too large.
03	ILLEGAL_DATA_VALUE The master attempts to write to a register which allows only read access. The value that appears in the data field is not permitted, e.g. span limits exceeded or incorrect data format.
04	SLAVE_DEVICE_FAILURE The slave did not respond to the request telegram from the master or an error occurred while processing the request telegram.

2.3 Modes of operation

2.3.1 Modbus TCP

The data is transmitted in binary form as for RTU. Address and checksum used in RTU mode are dispensed with. The Modbus ADU is embedded in the TCP/IP telegram.

Modbus TCP/IP ADU					
MBAP header				Modbus	
Transaction number	Protocol character	Number of bytes still to follow	Address	Function	Data
2 bytes	2 bytes	2 bytes	1 byte	1 byte	n bytes
	= 0x0000	= n+2	= 0		

Field	Length	Description	Client	Server
Transaction number	2 bytes	Identifies the transaction.	Set by client.	Copied from the request to the response.
Protocol character	2 bytes		Set by client.	Copied from the request to the response.
Number of bytes still to follow	2 bytes	Number of following bytes.	Set by client.	Set by server.
Unit identifier	1 byte	Identifies a slave which is connected to a serial bus located downstream.	Set by client.	Copied from the request to the response.

 Up to four parallel TCP connections can be simultaneously supported with the device via TCP port 502. Please observe the correct structure of the MBAP header here.

2.4 Interface configuration

2.4.1 Modbus TCP

The network settings (IP address, subnet mask and gateway) of the device must first be configured before a Modbus TCP connection with the device can be established. The settings depend on the network into which the device is being integrated.

Settings

Port 1: Modbus TCP over Ethernet

Setting	Factory setting	Options
DHCP	On	Off, On
IP address	192.168.1.212	Valid IPv4 address
Netmask	255.255.255.0	Valid subnet mask
Gateway	0.0.0.0	Valid IPv4 address
MAC address	See menu	
TCP port (Modbus TCP)	502	None

MAC address

The MAC address can be read out via the menu. The MAC address of the device is used for identification purposes and is permanently assigned at the factory as a one-off.

DHCP (automatic setting)

If a DHCP server is used in the TCP/IP network, then the IP address, gateway and subnet mask are set automatically as soon as the DHCP client function is enabled. The DHCP client function is disabled upon delivery of the device and can be enabled via the Network settings submenu.

Settings menu → Network settings → DHCP

Setting the static IP address

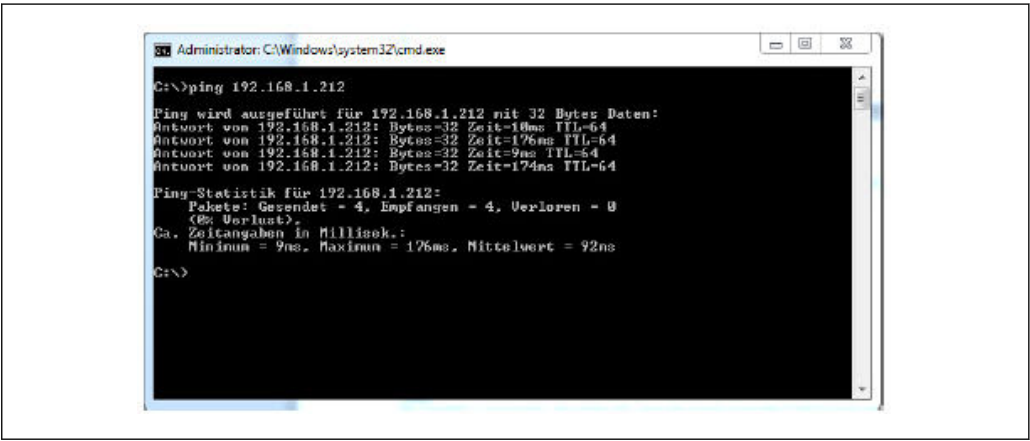
Requirement

Off option selected in **DHCP client** parameter.

Settings menu → Network settings → DHCP

Checking the connection

The Internet Control Message Protocol (ICMP) is implemented in the device. The “ping” command can be used to check whether the device can be reached via the network.



1 Checking the connection

2.5 Data types

The measuring instrument supports the following data types:

FLOAT (floating point number IEEE 754) Data length = 4 bytes (2 registers)			
Byte 3	Byte 2	Byte 1	Byte 0
SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM
S = sign, E = exponent, M = mantissa			

INTEGER Data length = 2 bytes (1 register)	
Byte 1	Byte 0
Most Significant Byte (MSB)	Least Significant Byte (LSB)

STRING Data length = depends on the device parameter, e.g. presentation of a device parameter with a data length = 18 bytes (9 registers)				
Byte 17	Byte 16	...	Byte 1	Byte 0
Most Significant Byte (MSB)		...		Least Significant Byte (LSB)

2.6 Byte transmission sequence

Byte addressing, i.e. the transmission sequence of the bytes, is not set in the Modbus specification. It is therefore important to agree or adjust the addressing mode between the master and slave or client and server when commissioning.

FLOAT				
	Sequence			
Options	1.	2.	3.	4.
3 - 2 - 1 - 0	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMM)	Byte 1 (MMMMMMMM)	Byte 0 (MMMMMMMM)

INTEGER		
	Sequence	
Options	1.	2.
3 - 2 - 1 - 0	Byte 1 (MSB)	Byte 0 (LSB)

2.7 Register addressing

Holding register starting from address 00001.

 It is also customary to use a notation in Modbus applications which counts the register addresses starting from a value of 1. In this case, the (register address - 1) is transmitted in the Modbus telegram.

3 Description of functions

3.1 Modbus function codes

Function codes are used to define which read or write action is carried out via the Modbus protocol. The measuring instrument supports the following function codes:

Code	Name	Description	Application
04	Read input register	Controller reads one or more Modbus registers of the measuring instrument. A maximum of 125 consecutive registers can be read with one telegram: 1 register = 2 bytes  The measuring instrument does not make a distinction between function codes 03 and 04; these codes therefore yield the same result.	Read device parameters with read and write access Example: Read temperature value
16	Write multiple registers	Controller writes a new value to several Modbus registers of the measuring instrument. A maximum of 120 consecutive registers can be written with one telegram.  If the required device parameters are not available as a group, yet must nevertheless be addressed with a single telegram, use Modbus data map	Write multiple device parameters Example: Lower and upper range limit of the temperature unit
Modbus TCP only			
43/14	Read device identification	Controller reads device identification	Read multiple device parameters

 Broadcast messages are only allowed with function code 16.

3.2 Response time

Response time of the measuring instrument to the request telegram of the Modbus master: Typically 3 to 5 ms

4 Appendix

4.1 Data types

4.1.1 Floating point numbers (IEEE-754)

Byte 3	Byte 2	Byte 1	Byte 0
SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM
S = sign, E = power of ten, M = mantissa			

4.1.2 Integer

Byte 1	Byte 0
Most Significant Byte (MSB)	Least Significant Byte (LSB)

4.1.3 Character string

Byte n	Byte n-1	...	Byte 1	Byte 0
Most Significant Byte (MSB)		...		Least Significant Byte (LSB)

Example

Register	Hex	Character
6403	0x0054	T
6404	0x0065	e
6405	0x0071	q
6406	0x0077	w
6407	0x0054	a
6408	0x0061	v
6409	0x0076	e
6410	0x0065	0
6411	0x0000	0
6412	0x0000	0
6413	0x0000	0
6414	0x0000	0

4.1.4 Other data types

Other data types with a data length of more than two are treated like character strings.

5 Register information

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Measured values / Process variables	Analysis Parameter 1	1	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Process variables	Analysis Parameter 2	3	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Process variables	Analysis Parameter 3	5	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Process variables	Analysis Parameter 4	7	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Process variables	Analysis Parameter 5	9	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Process variables	Analysis Parameter 6	11	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Process variables	Analysis Parameter 7	13	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Process variables	Analysis Parameter 8	15	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Process variables	Temperature	17	Float	4	ro	-3.4E+38...+3.4E+38 K
Measured values / Process variables	Speed of sound	19	Float	4	ro	-3.4E+38...+3.4E+38 m/s
Measured values / Process variables	Density	21	Float	4	ro	-3.4E+38...+3.4E+38 kg/m ³
Measured values / Process variables	Dispersion	27	Float	4	ro	-3.4E+38...+3.4E+38
Measured values / Process variables	Delta cF H2O	39	Float	4	ro	-3.4E+38...+3.4E+38 m/s
Measured values / Compensation variables	Compensation value 1	49	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Compensation variables	Compensation value 2	51	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Compensation variables	Compensation value 3	53	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Compensation variables	Compensation value 4	55	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Diagnostics	System status	81	UInt32	4	ro	Bitwise, combination possible: 1 : No sensor connected 2 : No fluid detected 4 : System failure 8 : System failure 16 : System failure 128 : System is initializing 256 : Bubbles detected 512 : Process disturbance 1,024 : System failure 2,048 : System failure 4,096 : System failure 16,384 : Modbus communication faulty, measurement not available 32,768 : Modbus communication faulty, compensation not available 65,536 : System failure 262,144 : System failure 4,194,304 : System failure 134,217,728 : System failure

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Diagnostics / Measured values	Analysis Parameter 1	97	Uint16	2	ro	Bitwise, combination possible: 1 : Value below the configured measuring range 2 : Value above the configured measuring range 4 : Value below the specified calibration range 8 : Value above the specified calibration range 16 : Value changes faster than the set value for the maximum permissible slew rate 32 : Value changes too fast and does not fulfill the noise criteria 64 : Value changes too fast and does not fulfill the stationarity criteria
Diagnostics / Measured values	Analysis Parameter 2	98	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Measured values	Analysis Parameter 3	99	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Measured values	Analysis Parameter 4	100	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Measured values	Analysis Parameter 5	101	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Measured values	Analysis Parameter 6	102	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Measured values	Analysis Parameter 7	103	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Measured values	Analysis Parameter 8	104	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Measured values	Temperature	105	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Measured values	Speed of sound	106	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Measured values	Density	107	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Measured values	Dispersion	110	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Measured values	Delta cF H2O	116	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Compensation values	Compensation value 1	121	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Compensation values	Compensation value 2	122	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Compensation values	Compensation value 3	123	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Compensation values	Compensation value 4	124	Uint16	2	ro	See Diagnostics / Measured values / Analysis Parameter 1 for details.
Diagnostics / Device information	Cable length	768	Float32	4	ro	0 to 100 m

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / System units	Analysis Parameter 1	5121	Enum16	2	rw	0 : Base unit* 1 : Alternative unit 1* 2 : Alternative unit 2* 3 : Alternative unit 3* 4 : Alternative unit 4* Note: This setting only changes the representation of the measured value on the display! * Depends on the active fluid profile
Setup / System units	Analysis Parameter 2	5122	Enum16	2	rw	See Setup / System units / Analysis Parameter 1 for details.
Setup / System units	Analysis Parameter 3	5123	Enum16	2	rw	See Setup / System units / Analysis Parameter 1 for details.
Setup / System units	Analysis Parameter 4	5124	Enum16	2	rw	See Setup / System units / Analysis Parameter 1 for details.
Setup / System units	Analysis Parameter 5	5125	Enum16	2	rw	See Setup / System units / Analysis Parameter 1 for details.
Setup / System units	Analysis Parameter 6	5126	Enum16	2	rw	See Setup / System units / Analysis Parameter 1 for details.
Setup / System units	Analysis Parameter 7	5127	Enum16	2	rw	See Setup / System units / Analysis Parameter 1 for details.
Setup / System units	Analysis Parameter 8	5128	Enum16	2	rw	See Setup / System units / Analysis Parameter 1 for details.
Setup / System units	Temperature	5129	Enum16	2	rw	0 : K 1 : °C 2 : °F Note: This setting only changes the representation of the measured value on the display!
Setup / System units	Speed of sound	5130	Enum16	2	rw	0 : m/s Note: This setting only changes the representation of the measured value on the display!
Setup / System units	Density	5131	Enum16	2	rw	0 : kg/m ³ 1 : g/cm ³ 2 : g/l Note: This setting only changes the representation of the measured value on the display!
Setup / System units	Dispersion	5134	Enum16	2	rw	0 : no unit Note: This setting only changes the representation of the measured value on the display!
Setup / System units	Delta cF H2O	5140	Enum16	2	rw	0 : m/s Note: This setting only changes the representation of the measured value on the display!
Setup / System units	Compensation value 1	5145	Enum16	2	rw	0 : Base unit* Note: This setting only changes the representation of the measured value on the display! * Depends on the active fluid profile
Setup / System units	Compensation value 2	5146	Enum16	2	rw	See Setup / System units / Compensation value 1 for details.
Setup / System units	Compensation value 3	5147	Enum16	2	rw	See Setup / System units / Compensation value 1 for details.
Setup / System units	Compensation value 4	5148	Enum16	2	rw	See Setup / System units / Compensation value 1 for details.

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Measured values / Visibility	Analysis Parameter 1	5153	Enum16	2	rw	0 : Measured value is not visible 1 : Measured value is visible
Setup / Measured values / Visibility	Analysis Parameter 2	5154	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Analysis Parameter 3	5155	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Analysis Parameter 4	5156	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Analysis Parameter 5	5157	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Analysis Parameter 6	5158	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Analysis Parameter 7	5159	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Analysis Parameter 8	5160	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Temperature	5161	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Speed of sound	5162	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Density	5163	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Dispersion	5166	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Delta cF H2O	5172	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Compensation value 1	5177	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Compensation value 2	5178	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Compensation value 3	5179	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.
Setup / Measured values / Visibility	Compensation value 4	5180	Enum16	2	rw	See Setup / Measured values / Visibility / Analysis Parameter 1 for details.

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Measured values / Decimal places	Analysis Parameter 1	5217	Enum16	2	rw	0 : No decimal places, e.g. 15 1 : 1 digit after the decimal point, e.g. 15.2 15 : 1 digit after the decimal point, but rounded to 0.5, e.g. 15.0 2 : 2 digits after the decimal point, e.g. 15.23 25 : 2 digits after the decimal point, but rounded to 0.05, e.g. 15.25 3 : 3 digits after the decimal point, e.g. 15.237 35 : 3 digits after the decimal point, but rounded to 0.05, e.g. 15.240 4 : 4 digits after the decimal point, e.g. 15.2378 Note: This setting only changes the representation of the measured value on the display!
Setup / Measured values / Decimal places	Analysis Parameter 2	5218	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Analysis Parameter 3	5219	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Analysis Parameter 4	5220	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Analysis Parameter 5	5221	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Analysis Parameter 6	5222	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Analysis Parameter 7	5223	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Analysis Parameter 8	5224	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Temperature	5225	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Speed of sound	5226	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Density	5227	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Dispersion	5230	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Delta cF H2O	5236	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Compensation value 1	5241	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Measured values / Decimal places	Compensation value 2	5242	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Compensation value 3	5243	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Measured values / Decimal places	Compensation value 4	5244	Enum16	2	rw	See Setup / Measured values / Decimal places / Analysis Parameter 1 for details.
Setup / Diagnostics / Measuring range lower limit	Analysis Parameter 1	5249	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Analysis Parameter 2	5251	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Analysis Parameter 3	5253	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Analysis Parameter 4	5255	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Analysis Parameter 5	5257	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Analysis Parameter 6	5259	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Analysis Parameter 7	5261	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Analysis Parameter 8	5263	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Temperature	5265	Float	4	rw	-3.4E+38...+3.4E+38 K Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Speed of sound	5267	Float	4	rw	-3.4E+38...+3.4E+38 m/s Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Density	5269	Float	4	rw	-3.4E+38...+3.4E+38 kg/m ³ Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Dispersion	5275	Float	4	rw	-3.4E+38...+3.4E+38 Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Delta cF H2O	5287	Float	4	rw	-3.4E+38...+3.4E+38 m/s Note: Changing this value also affects the analog output!

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Diagnostics / Measuring range lower limit	Compensation value 1	5297	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Compensation value 2	5299	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Compensation value 3	5301	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range lower limit	Compensation value 4	5303	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Analysis Parameter 1	5313	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Analysis Parameter 2	5315	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Analysis Parameter 3	5317	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Analysis Parameter 4	5319	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Analysis Parameter 5	5321	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Analysis Parameter 6	5323	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Analysis Parameter 7	5325	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Analysis Parameter 8	5327	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Temperature	5329	Float	4	rw	-3.4E+38...+3.4E+38 K Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Speed of sound	5331	Float	4	rw	-3.4E+38...+3.4E+38 m/s Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Density	5333	Float	4	rw	-3.4E+38...+3.4E+38 kg/m ³ Note: Changing this value also affects the analog output!

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Diagnostics / Measuring range upper limit	Dispersion	5339	Float	4	rw	-3.4E+38...+3.4E+38 Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Delta cF H2O	5351	Float	4	rw	-3.4E+38...+3.4E+38 m/s Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Compensation value 1	5361	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Compensation value 2	5363	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Compensation value 3	5365	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Diagnostics / Measuring range upper limit	Compensation value 4	5367	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit Note: Changing this value also affects the analog output!
Setup / Measured values / Averaging	Analysis Parameter 1	5377	Uint16	2	rw	1...65535
Setup / Measured values / Averaging	Analysis Parameter 2	5378	Uint16	2	rw	1...65535
Setup / Measured values / Averaging	Analysis Parameter 3	5379	Uint16	2	rw	1...65535
Setup / Measured values / Averaging	Analysis Parameter 4	5380	Uint16	2	rw	1...65535
Setup / Measured values / Averaging	Analysis Parameter 5	5381	Uint16	2	rw	1...65535
Setup / Measured values / Averaging	Analysis Parameter 6	5382	Uint16	2	rw	1...65535
Setup / Measured values / Averaging	Analysis Parameter 7	5383	Uint16	2	rw	1...65535
Setup / Measured values / Averaging	Analysis Parameter 8	5384	Uint16	2	rw	1...65535
Setup / Measured values / Averaging	Temperature	5385	Uint16	2	rw	1...65535
Setup / Measured values / Averaging	Speed of sound	5386	Uint16	2	rw	1...65535
Setup / Measured values / Averaging	Density	5387	Uint16	2	rw	1...65535
Setup / Measured values / Averaging	Dispersion	5390	Uint16	2	rw	1...65535
Setup / Measured values / Averaging	Delta cF H2O	5396	Uint16	2	rw	1...65535
Setup / Diagnostics / Slew rate monitoring	Analysis Parameter 1	5409	Enum16	2	rw	0: Changes of the measured value regarding the slew rate will be ignored 1: Changes of the measured value regarding the slew rate will be monitored and may produce a warning

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Diagnostics / Slew rate monitoring	Analysis Parameter 2	5410	Enum16	2	rw	See Setup / Diagnostics / Slew rate monitoring / Analysis Parameter 1 for details.
Setup / Diagnostics / Slew rate monitoring	Analysis Parameter 3	5411	Enum16	2	rw	See Setup / Diagnostics / Slew rate monitoring / Analysis Parameter 1 for details.
Setup / Diagnostics / Slew rate monitoring	Analysis Parameter 4	5412	Enum16	2	rw	See Setup / Diagnostics / Slew rate monitoring / Analysis Parameter 1 for details.
Setup / Diagnostics / Slew rate monitoring	Analysis Parameter 5	5413	Enum16	2	rw	See Setup / Diagnostics / Slew rate monitoring / Analysis Parameter 1 for details.
Setup / Diagnostics / Slew rate monitoring	Analysis Parameter 6	5414	Enum16	2	rw	See Setup / Diagnostics / Slew rate monitoring / Analysis Parameter 1 for details.
Setup / Diagnostics / Slew rate monitoring	Analysis Parameter 7	5415	Enum16	2	rw	See Setup / Diagnostics / Slew rate monitoring / Analysis Parameter 1 for details.
Setup / Diagnostics / Slew rate monitoring	Analysis Parameter 8	5416	Enum16	2	rw	See Setup / Diagnostics / Slew rate monitoring / Analysis Parameter 1 for details.
Setup / Diagnostics / Slew rate monitoring	Temperature	5417	Enum16	2	rw	See Setup / Diagnostics / Slew rate monitoring / Analysis Parameter 1 for details.
Setup / Diagnostics / Slew rate monitoring	Speed of sound	5418	Enum16	2	rw	See Setup / Diagnostics / Slew rate monitoring / Analysis Parameter 1 for details.
Setup / Diagnostics / Slew rate monitoring	Density	5419	Enum16	2	rw	See Setup / Diagnostics / Slew rate monitoring / Analysis Parameter 1 for details.
Setup / Diagnostics / Slew rate monitoring	Dispersion	5422	Enum16	2	rw	See Setup / Diagnostics / Slew rate monitoring / Analysis Parameter 1 for details.
Setup / Diagnostics / Slew rate monitoring	Delta cF H2O	5428	Enum16	2	rw	See Setup / Diagnostics / Slew rate monitoring / Analysis Parameter 1 for details.
Setup / Diagnostics / Slew rate threshold	Analysis Parameter 1	5441	Float	4	rw	0.01...+3.4E+38
Setup / Diagnostics / Slew rate threshold	Analysis Parameter 2	5443	Float	4	rw	0.01...+3.4E+38
Setup / Diagnostics / Slew rate threshold	Analysis Parameter 3	5445	Float	4	rw	0.01...+3.4E+38
Setup / Diagnostics / Slew rate threshold	Analysis Parameter 4	5447	Float	4	rw	0.01...+3.4E+38
Setup / Diagnostics / Slew rate threshold	Analysis Parameter 5	5449	Float	4	rw	0.01...+3.4E+38
Setup / Diagnostics / Slew rate threshold	Analysis Parameter 6	5451	Float	4	rw	0.01...+3.4E+38
Setup / Diagnostics / Slew rate threshold	Analysis Parameter 7	5453	Float	4	rw	0.01...+3.4E+38
Setup / Diagnostics / Slew rate threshold	Analysis Parameter 8	5455	Float	4	rw	0.01...+3.4E+38
Setup / Diagnostics / Slew rate threshold	Temperature	5457	Float	4	rw	0.01...100

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Diagnostics / Slew rate threshold	Speed of sound	5459	Float	4	rw	0.01...100
Setup / Diagnostics / Slew rate threshold	Density	5461	Float	4	rw	0.01...100
Setup / Diagnostics / Slew rate threshold	Dispersion	5467	Float	4	rw	0.01...100
Setup / Diagnostics / Slew rate threshold	Delta cF H2O	5479	Float	4	rw	0.01...+3.4E+38
Setup / Interfaces / Relay / Lower switch point (section mode)	Analysis Parameter 1	5665	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Lower switch point (section mode)	Analysis Parameter 2	5667	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Lower switch point (section mode)	Analysis Parameter 3	5669	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Lower switch point (section mode)	Analysis Parameter 4	5671	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Lower switch point (section mode)	Analysis Parameter 5	5673	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Lower switch point (section mode)	Analysis Parameter 6	5675	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Lower switch point (section mode)	Analysis Parameter 7	5677	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Lower switch point (section mode)	Analysis Parameter 8	5679	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Lower switch point (section mode)	Temperature	5681	Float	4	rw	-3.4E+38...+3.4E+38 K
Setup / Interfaces / Relay / Lower switch point (section mode)	Speed of sound	5683	Float	4	rw	-3.4E+38...+3.4E+38 m/s
Setup / Interfaces / Relay / Lower switch point (section mode)	Density	5685	Float	4	rw	-3.4E+38...+3.4E+38 kg/m ³
Setup / Interfaces / Relay / Lower switch point (section mode)	Dispersion	5691	Float	4	rw	-3.4E+38...+3.4E+38
Setup / Interfaces / Relay / Lower switch point (section mode)	Delta cF H2O	5703	Float	4	rw	-3.4E+38...+3.4E+38 m/s
Setup / Interfaces / Relay / Upper switch point (section mode)	Analysis Parameter 1	5729	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Upper switch point (section mode)	Analysis Parameter 2	5731	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Upper switch point (section mode)	Analysis Parameter 3	5733	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Upper switch point (section mode)	Analysis Parameter 4	5735	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Upper switch point (section mode)	Analysis Parameter 5	5737	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Upper switch point (section mode)	Analysis Parameter 6	5739	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Upper switch point (section mode)	Analysis Parameter 7	5741	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Upper switch point (section mode)	Analysis Parameter 8	5743	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Upper switch point (section mode)	Temperature	5745	Float	4	rw	-3.4E+38...+3.4E+38 K

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Interfaces / Relay / Upper switch point (section mode)	Speed of sound	5747	Float	4	rw	-3.4E+38...+3.4E+38 m/s
Setup / Interfaces / Relay / Upper switch point (section mode)	Density	5749	Float	4	rw	-3.4E+38...+3.4E+38 kg/m ³
Setup / Interfaces / Relay / Upper switch point (section mode)	Dispersion	5755	Float	4	rw	-3.4E+38...+3.4E+38
Setup / Interfaces / Relay / Upper switch point (section mode)	Delta cF H2O	5767	Float	4	rw	-3.4E+38...+3.4E+38 m/s
Setup / Interfaces / Relay / Hysteresis (section mode)	Analysis Parameter 1	5793	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (section mode)	Analysis Parameter 2	5795	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (section mode)	Analysis Parameter 3	5797	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (section mode)	Analysis Parameter 4	5799	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (section mode)	Analysis Parameter 5	5801	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (section mode)	Analysis Parameter 6	5803	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (section mode)	Analysis Parameter 7	5805	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (section mode)	Analysis Parameter 8	5807	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (section mode)	Temperature	5809	Float	4	rw	-3.4E+38...+3.4E+38 K
Setup / Interfaces / Relay / Hysteresis (section mode)	Speed of sound	5811	Float	4	rw	-3.4E+38...+3.4E+38 m/s
Setup / Interfaces / Relay / Hysteresis (section mode)	Density	5813	Float	4	rw	-3.4E+38...+3.4E+38 kg/m ³
Setup / Interfaces / Relay / Hysteresis (section mode)	Dispersion	5819	Float	4	rw	-3.4E+38...+3.4E+38
Setup / Interfaces / Relay / Hysteresis (section mode)	Delta cF H2O	5831	Float	4	rw	-3.4E+38...+3.4E+38 m/s
Setup / Interfaces / Relay / Default state (section mode)	Analysis Parameter 1	5857	Enum16	2	rw	0 : Normally closed 1 : Normally opened
Setup / Interfaces / Relay / Default state (section mode)	Analysis Parameter 2	5858	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (section mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (section mode)	Analysis Parameter 3	5859	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (section mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (section mode)	Analysis Parameter 4	5860	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (section mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (section mode)	Analysis Parameter 5	5861	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (section mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (section mode)	Analysis Parameter 6	5862	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (section mode) / Analysis Parameter 1 for details.

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Interfaces / Relay / Default state (section mode)	Analysis Parameter 7	5863	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (section mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (section mode)	Analysis Parameter 8	5864	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (section mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (section mode)	Temperature	5865	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (section mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (section mode)	Speed of sound	5866	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (section mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (section mode)	Density	5867	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (section mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (section mode)	Dispersion	5870	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (section mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (section mode)	Delta cF H2O	5876	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (section mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Switch point (threshold mode)	Analysis Parameter 1	5889	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Switch point (threshold mode)	Analysis Parameter 2	5891	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Switch point (threshold mode)	Analysis Parameter 3	5893	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Switch point (threshold mode)	Analysis Parameter 4	5895	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Switch point (threshold mode)	Analysis Parameter 5	5897	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Switch point (threshold mode)	Analysis Parameter 6	5899	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Switch point (threshold mode)	Analysis Parameter 7	5901	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Switch point (threshold mode)	Analysis Parameter 8	5903	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Switch point (threshold mode)	Temperature	5905	Float	4	rw	-3.4E+38...+3.4E+38 K
Setup / Interfaces / Relay / Switch point (threshold mode)	Speed of sound	5907	Float	4	rw	-3.4E+38...+3.4E+38 m/s
Setup / Interfaces / Relay / Switch point (threshold mode)	Density	5909	Float	4	rw	-3.4E+38...+3.4E+38 kg/m ³
Setup / Interfaces / Relay / Switch point (threshold mode)	Dispersion	5915	Float	4	rw	-3.4E+38...+3.4E+38
Setup / Interfaces / Relay / Switch point (threshold mode)	Delta cF H2O	5927	Float	4	rw	-3.4E+38...+3.4E+38 m/s
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Analysis Parameter 1	5953	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Analysis Parameter 2	5955	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Analysis Parameter 3	5957	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Analysis Parameter 4	5959	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Analysis Parameter 5	5961	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Analysis Parameter 6	5963	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Analysis Parameter 7	5965	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Analysis Parameter 8	5967	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Temperature	5969	Float	4	rw	-3.4E+38...+3.4E+38 K
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Speed of sound	5971	Float	4	rw	-3.4E+38...+3.4E+38 m/s
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Density	5973	Float	4	rw	-3.4E+38...+3.4E+38 kg/m ³
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Dispersion	5979	Float	4	rw	-3.4E+38...+3.4E+38
Setup / Interfaces / Relay / Hysteresis (threshold mode)	Delta cF H2O	5991	Float	4	rw	-3.4E+38...+3.4E+38 m/s
Setup / Interfaces / Relay / Default state (threshold mode)	Analysis Parameter 1	6017	Enum16	2	rw	0 : Normally closed 1 : Normally opened
Setup / Interfaces / Relay / Default state (threshold mode)	Analysis Parameter 2	6018	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (threshold mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (threshold mode)	Analysis Parameter 3	6019	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (threshold mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (threshold mode)	Analysis Parameter 4	6020	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (threshold mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (threshold mode)	Analysis Parameter 5	6021	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (threshold mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (threshold mode)	Analysis Parameter 6	6022	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (threshold mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (threshold mode)	Analysis Parameter 7	6023	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (threshold mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (threshold mode)	Analysis Parameter 8	6024	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (threshold mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (threshold mode)	Temperature	6025	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (threshold mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (threshold mode)	Speed of sound	6026	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (threshold mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (threshold mode)	Density	6027	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (threshold mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Default state (threshold mode)	Dispersion	6030	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (threshold mode) / Analysis Parameter 1 for details.

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Interfaces / Relay / Default state (threshold mode)	Delta cF H2O	6036	Enum16	2	rw	See Setup / Interfaces / Relay / Default state (threshold mode) / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Mode	Analysis Parameter 1	6049	Enum16	2	rw	0 : Section mode 1 : Threshold mode
Setup / Interfaces / Relay / Mode	Analysis Parameter 2	6050	Enum16	2	rw	See Setup / Interfaces / Relay / Mode / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Mode	Analysis Parameter 3	6051	Enum16	2	rw	See Setup / Interfaces / Relay / Mode / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Mode	Analysis Parameter 4	6052	Enum16	2	rw	See Setup / Interfaces / Relay / Mode / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Mode	Analysis Parameter 5	6053	Enum16	2	rw	See Setup / Interfaces / Relay / Mode / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Mode	Analysis Parameter 6	6054	Enum16	2	rw	See Setup / Interfaces / Relay / Mode / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Mode	Analysis Parameter 7	6055	Enum16	2	rw	See Setup / Interfaces / Relay / Mode / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Mode	Analysis Parameter 8	6056	Enum16	2	rw	See Setup / Interfaces / Relay / Mode / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Mode	Temperature	6057	Enum16	2	rw	See Setup / Interfaces / Relay / Mode / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Mode	Speed of sound	6058	Enum16	2	rw	See Setup / Interfaces / Relay / Mode / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Mode	Density	6059	Enum16	2	rw	See Setup / Interfaces / Relay / Mode / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Mode	Dispersion	6062	Enum16	2	rw	See Setup / Interfaces / Relay / Mode / Analysis Parameter 1 for details.
Setup / Interfaces / Relay / Mode	Delta cF H2O	6068	Enum16	2	rw	See Setup / Interfaces / Relay / Mode / Analysis Parameter 1 for details.
Setup / Diagnostics	Dispersion threshold	6205	Float	4	rw	0.01...3
Setup / Diagnostics	Dispersion monitoring	6207	Enum16	2	rw	0 : Monitoring disabled 1 : Monitoring enabled
Setup / Offset	Analysis Parameter 1	6209	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Offset	Analysis Parameter 2	6211	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Offset	Analysis Parameter 3	6213	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Offset	Analysis Parameter 4	6215	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Offset	Analysis Parameter 5	6217	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Offset	Analysis Parameter 6	6219	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Offset	Analysis Parameter 7	6221	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup / Offset	Analysis Parameter 8	6223	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Compensation variables	Compensation value 1	6227	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Compensation variables	Compensation value 2	6229	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Compensation variables	Compensation value 3	6231	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Measured values / Compensation variables	Compensation value 4	6233	Float	4	rw	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Setup	Language	6401	Enum16	2	rw	0 : German 1 : English 2 : French 3 : Italian 4 : Spanish
Setup / Interfaces / Ethernet	DHCP	6402	Enum16	2	rw	0 : DHCP deactivated 1 : DHCP activated
Setup / Interfaces / Ethernet	System name	6403	String	30	rw	
Setup / Interfaces / Ethernet	IPv4 address	6424	UInt32	4	rw	Note: The first register corresponds to the first two parts of the address, i.e. XXX.XXX.000.000. The second register to the last two parts of the address, i.e. 000.000.XXX.XXX. Note: When reading the register, the currently active IPv4 address is returned, i.e. when DHCP is active, the assigned IPv4 address will be returned. When writing the register, the IPv4 address is set for the static configuration, even if DHCP is active!
Setup / Interfaces / Ethernet	Subnet mask	6426	UInt32	4	rw	Note: The first register corresponds to the first two parts of the mask, i.e. XXX.XXX.000.000. The second register to the last two parts of the address, i.e. 000.000.XXX.XXX. Note: When reading the register, the currently active subnet mask is returned, i.e. when DHCP is active, the assigned subnet mask will be returned. When writing the register, the subnet mask is set for the static configuration, even if DHCP is active!

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Interfaces / Ethernet	Gateway IPv4 address	6428	Uint32	4	rw	Note: The first register corresponds to the first two parts of the address, i.e. XXX.XXX.000.000. The second register to the last two parts of the address, i.e. 000.000.XXX.XXX. Note: When reading the register, the currently active gateway IPv4 address is returned, i.e. when DHCP is active, the assigned gateway IPv4 address will be returned. When writing the register, the gateway IPv4 address is set for the static configuration, even if DHCP is active!
Diagnostics / Firmware version	Main	6522	Uint16	2	ro	
Diagnostics / Firmware version	Major	6523	Uint16	2	ro	
Diagnostics / Firmware version	Minor	6524	Uint16	2	ro	
Diagnostics / Firmware version	Build	6525	Uint16	2	ro	
Diagnostics / Hardware revision	Main	6538	Uint16	2	ro	
Diagnostics / Hardware revision	Major	6539	Uint16	2	ro	
Diagnostics / Hardware revision	Minor	6540	Uint16	2	ro	
Setup / Time	Milliseconds	6544	Uint16	2	rw	0...999
Setup / Time	Second	6545	Uint16	2	rw	0...59
Setup / Time	Minute	6546	Uint16	2	rw	0...59
Setup / Time	Hour	6547	Uint16	2	rw	0...23
Setup / Time	Year	6548	Uint16	2	rw	0...99
Setup / Time	Month	6549	Uint16	2	rw	1...12
Setup / Time	Day	6550	Uint16	2	rw	1...31
Diagnostics	System reset	6558	Uint16	2	wo	21.589
Diagnostics	Restore factory settings	6560	Uint16	2	wo	21.589
Diagnostics	Serial number	6587	String	30	ro	
Diagnostics	Free disk space	6603	Uint32	4	ro	0 to 4,000,000,000 bytes
Setup / Memory	Logging interval	6913	Float	4	rw	10.0 to 7200.0 s

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Diagnostics	Configuration	6915	Enum32	4	rw	Bitwise, combination possible: 1 : Hide affected values. If a measured value generates a warning, its value is hidden in the display ('---'). Note: This option cannot be combined with "Hold affected values". 2 : Mark affected values. If a measured value generates a warning, its value is marked in the display, i.e. it will be displayed with a yellow background. Note: This option cannot be combined with "Hold affected values". 4 : Check measurement range. Only if this option is set are the measured values checked with regard to their respective measuring range. 8 : Check calibration range. Only if this option is set are the measured values checked with regard to their respective calibration range. 16 : Hold affected values. As soon as a measured value generates a warning, its last valid value will be retained in the display. In addition, the value is displayed with an orange background and the time stamp of the last update. Note: This option cannot be combined with "Hide affected values" and "Mark affected values". 32 : Check stationarity criteria. If this option is set measured values will be checked with regard to the stationarity criteria, e.g. whether the liquid is mixed evenly.
Setup / Interfaces / Relay	Output	6917	Enum16	2	rw	0 : Analysis Parameter 1 1 : Analysis Parameter 2 2 : Analysis Parameter 3 3 : Analysis Parameter 4 4 : Analysis Parameter 5 5 : Analysis Parameter 6 6 : Analysis Parameter 7 7 : Analysis Parameter 8 8 : Temperature 9 : Speed of sound 10 : Density 13 : Dispersion 19 : Delta cF H2O 32 : Disable relay, i.e. set a defined state

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Interfaces / Input	Channel 1 configuration	6918	Enum16	2	rw	0 : Analysis Parameter 1 1 : Analysis Parameter 2 2 : Analysis Parameter 3 3 : Analysis Parameter 4 4 : Analysis Parameter 5 5 : Analysis Parameter 6 6 : Analysis Parameter 7 7 : Analysis Parameter 8 8 : Temperature 9 : Speed of sound 10 : Density 13 : Dispersion 19 : Delta cF H2O 32 : Disable analog output, i.e. set a defined state 33 : Freeze the system status, i.e. don't update values and interface states Note: Selecting a measured value that is not available will always default to the disable analog output option
Setup / Interfaces / Input	Channel 2 configuration	6919	Enum16	2	rw	See Setup / Interfaces / Input / Channel 1 configuration for details.
Setup / Interfaces / Input	Channel 3 configuration	6920	Enum16	2	rw	See Setup / Interfaces / Input / Channel 1 configuration for details.
Setup / Interfaces / Input	Channel 4 configuration	6921	Enum16	2	rw	See Setup / Interfaces / Input / Channel 1 configuration for details.
Setup / Interfaces / Analog output	Mode	6922	Enum16	2	rw	0 : Current mode, 4 - 20 mA 1 : Voltage mode, 0 - 10 V
Setup / Interfaces / Analog output	Boundary handling	6926	Enum16	2	rw	0 : Error mode, i.e. 2 mA / 0 V are output when leaving the configured range. 1 : Limit mode, i.e. 4 mA / 0 V are output if the value falls below the range, 20 mA / 10 V are output if the value is above the range.
Advanced Setup	System freeze delay	6927	UInt16	2	rw	0 to 10,000 s
Setup / Application	Fluid profile / recipe	6928	UInt32	4	rw	Note: Use either the recipe number generated by the viewer recipe generator or the article number specified in the data sheet of the fluid profile. Note: A system reset is required before the new app/recipe can be fully used. See register 6558 system reset.
Application	Fluid profile index	6939	UInt16	2	rw	0...65535 This index can be used to cycle through and select the different fluid profiles that are available on the system without activating them. As soon as an index value is set, the registers in the "Application / Information" group are updated accordingly.
Application	Analysis parameter index	7372	UInt16	2	rw	0...7
Application	Unit index	7373	UInt16	2	rw	0...4

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Application	Fluid profile language index	7495	Enum16	2	rw	0 : German 1 : English 2 : French 3 : Italian 4 : Spanish This index can be used to cycle through and select the different languages that are available on the system without setting them. As soon as an index value is set, the registers in the "Application / Information" group are updated accordingly.
Application	Number of fluid profiles	7371	Uint16	2	ro	0...65535
Application / Information	Unit	7375	String	32	ro	Note: Use Application / Fluid profile index, Analysis parameter index and Unit index to select the content for this register
Application / Information	Fluid profile name	7403	String	128	ro	Note: Use Application / Fluid profile index and Fluid profile language index to select the content for this register
Application / Information / Name	Analysis Parameter 1	6943	String	32	ro	
Application / Information / Name	Analysis Parameter 2	6959	String	32	ro	
Application / Information / Name	Analysis Parameter 3	6975	String	32	ro	
Application / Information / Name	Analysis Parameter 4	6991	String	32	ro	
Application / Information / Name	Analysis Parameter 5	7007	String	32	ro	
Application / Information / Name	Analysis Parameter 6	7023	String	32	ro	
Application / Information / Name	Analysis Parameter 7	7039	String	32	ro	
Application / Information / Name	Analysis Parameter 8	7055	String	32	ro	
Application / Information / Calibration range	Temperature lower limit	7271	Float	4	ro	-3.4E+38...+3.4E+38 K
Application / Information / Calibration range	Temperature upper limit	7273	Float	4	ro	-3.4E+38...+3.4E+38 K
Application / Information / Calibration range	Speed of sound lower limit	7275	Float	4	ro	-3.4E+38...+3.4E+38 m/s
Application / Information / Calibration range	Speed of sound upper limit	7277	Float	4	ro	-3.4E+38...+3.4E+38 m/s
Application / Information / Calibration range	Density lower limit	7279	Float	4	ro	-3.4E+38...+3.4E+38 kg/m ³
Application / Information / Calibration range	Density upper limit	7281	Float	4	ro	-3.4E+38...+3.4E+38 kg/m ³
Application / Information / Calibration range	Analysis Parameter 1 lower limit	7335	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 1 upper limit	7337	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 2 lower limit	7339	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 2 upper limit	7341	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 3 lower limit	7343	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Application / Information / Calibration range	Analysis Parameter 3 upper limit	7345	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 4 lower limit	7347	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 4 upper limit	7349	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 5 lower limit	7351	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 5 upper limit	7353	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 6 lower limit	7355	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 6 upper limit	7357	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 7 lower limit	7359	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 7 upper limit	7361	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 8 lower limit	7363	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information / Calibration range	Analysis Parameter 8 upper limit	7365	Float	4	ro	-3.4E+38...+3.4E+38 active fluid profile dependent base unit
Application / Information	Article number	7367	UInt32	4	ro	0...99,999
Application / Information / Name	Compensation value 1	7506	String	32	ro	
Application / Information / Name	Compensation value 2	7533	String	32	ro	
Application / Information / Name	Compensation value 3	7560	String	32	ro	
Application / Information / Name	Compensation value 4	7587	String	32	ro	
Application / Information / Unit	Compensation value 1	7522	String	20	ro	
Application / Information / Unit	Compensation value 2	7549	String	20	ro	
Application / Information / Unit	Compensation value 3	7576	String	20	ro	
Application / Information / Unit	Compensation value 4	7603	String	20	ro	
Setup / Compensation variables	Compensation value 1	7532	Enum16	2	rw	0 : Disabled. The value will be initialized to NaN and is not used for compensation. 1 : Static value. The currently configured value will be used for compensation. 2 : Dynamic value. The value will be initialized to NaN after a system reset and needs to be updated using the corresponding Modbus register 6227.
Setup / Compensation variables	Compensation value 2	7559	Enum16	2	rw	0 : Disabled. The value will be initialized to NaN and is not used for compensation. 1 : Static value. The currently configured value will be used for compensation. 2 : Dynamic value. The value will be initialized to NaN after a system reset and needs to be updated using the corresponding Modbus register 6229.

Parameter group	Parameter label	Register (1-based)	Data type	Size (Bytes)	Access	Range
Setup / Compensation variables	Compensation value 3	7586	Enum16	2	rw	0 : Disabled. The value will be initialized to NaN and is not used for compensation. 1 : Static value. The currently configured value will be used for compensation. 2 : Dynamic value. The value will be initialized to NaN after a system reset and needs to be updated using the corresponding Modbus register 6231.
Setup / Compensation variables	Compensation value 4	7613	Enum16	2	rw	0 : Disabled. The value will be initialized to NaN and is not used for compensation. 1 : Static value. The currently configured value will be used for compensation. 2 : Dynamic value. The value will be initialized to NaN after a system reset and needs to be updated using the corresponding Modbus register 6233.



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