

Liquistation CSFxx - Revision 2

HART Field Device Specification

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1. Introduction

1.1. Scope

The Endress+Hauser sampler, model Liquistation CSFxx complies with HART protocol revision 7. This document specifies all the device specific features and documents HART protocol implementation details. The functionality of this field device is described sufficiently to allow its proper application in a process and its complete support in HART capable host applications.

1.2. Purpose

This specification is designed to complement the operating instructions (BA00443C and BA00486C) by providing a complete, unambiguous description of this field device from a HART communication perspective.

1.3. Who should use this document?

The specification is designed to be a technical reference for HART capable host application developers, system integrators and experienced end users. It also provides functional specifications (e.g., commands, enumerations and performance requirements) used during field device development, maintenance and testing. This document assumes the reader is familiar with HART protocol requirements and terminology.

1.4. Abbreviations and definitions

FSK: Frequency shift keying
FCG: Fieldcomm Group
n. A.: Not applicable
NaN: Not a number (an IEEE-754 floating point value representing no number, 7F A0 00 00_h)
ENP: Electronic nameplate

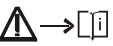
1.5. References

HCF_SPEC-12: HART Smart Communications Protocol Specification. Available from the FCG.
BA00443C: Liquistation CSFxx Operating instructions.
BA00486C: Liquistation CSFxx Operating instructions (Communication via the HART protocol).

2. Device identification

Manufacturer name:	Endress+Hauser
Model name:	Liquistation CSFxx
Manufacturer ID code:	17 (11 _h)
Device type code:	157 (9D _h)
Expanded device type code:	4509 (119D _h)
HART protocol revision:	7
Device revision:	2
Number of device variables:	32
Physical layers supported:	FSK
Physical device category:	Transmitter, DC isolated bus device

The nameplate is located on the right side of the housing and indicates the model name, order codes, serial number and software version. The device revision and unique and polling addresses are shown in the diagnostics menu.

Endress+Hauser 	
Liquistation CSF48 Made in Germany, 70839 Gerlingen	
Order code:	CSF48-1009/0
Order code ext.:	CSF48-4LMO4C2R4D4ABCD
Ser. No.:	61000105G00
Firmware version:	01.01.05 - [1...5]
Mains:	100-120VAC/200-240VAC 50/60 Hz 290 VA
Input analog:	0/4...20 mA / max. 30 V DC
Input binary:	10...30 V DC / max. 10 mA
Input digital:	Memosens Sensor
Output binary:	10...30V DC / max. 100mA
Output relay:	250 V AC / max. 5A
Output analog:	0/4...20 mA
Wire communication:	HART
Function code:	123456 . 123456 . 123456 . 123456 . 123456 . 123456 . 123456 . 123456 . 123456 . 123456 . 123456 . 123456
Ambient Temperature:	-20°C...40°C
 	
 	



Liquistation

A nameplate example

3. Product overview

Liquistation is a stationary sampler for liquid media. Current outputs and HART communication are optional. Only current output one is HART capable. Different plug and play sensors (Memosens) can be connected for different use cases.

Product interfaces

4. Product interfaces

4.1. Process interface

4.1.1. Sensor input channels

Depending on the Liquistation version different sensors can be connected to different terminals. Please refer to the operating instructions shipped with your Liquistation.

4.2. Host interface

Depending on the Liquistation version different current outputs can be connected to different terminals. Please refer to the operating instructions shipped with your Liquistation.

4.2.1. Analog output 1

HART can only be used if this output is present. It represents a value selected by the user. The user can choose this value from a list of values depending on the number and types of the connected sensors. Even mathematical functions or controllers can be set as source for current output. Depending on the selection the output is scaled according to the configured range of the instrument. The selected value unit may furthermore depend on the operating mode (e.g. saturation or concentration measurement).

Analog output 1 corresponds to the HART primary variable. HART communication is supported on this loop, only.

Linear overrange is possible from 3.8 mA to 20.5 mA. Device malfunction can be indicated by error current if selected. Current values are shown in the table below:

Downwards linear overrange:	3.8 mA
Upwards linear overrange:	20.5 mA
Device malfunction indication:	user selectable
Minimum current:	2.4 mA
Maximum current:	23.0 mA
Multidrop current draw:	4.0 mA (during boot: 0.0 mA)
Lift-off voltage:	n. A.

Current outputs can be set to 0..20 mA or 4..20 mA range. If 0..20 mA is selected HART communication is switched off.

4.2.2. Other analog outputs

Up to 8 current outputs can be present. The outputs 2..8 are not HART capable. The sources of all current outputs can be selected by the user.

Linear overrange is possible from 3.8 mA to 20.5 mA. Current values are shown in the table below:

Downwards linear overrange:	3.8 mA
Upwards linear overrange:	20.5 mA
Device malfunction indication:	user selectable
Minimum current:	2.4 mA
Maximum current:	23.0 mA
Multidrop current draw:	n. A.
Lift-off voltage:	n. A.

4.3. Local interfaces, jumpers and switches

4.3.1. Local controls and displays

Liquistation has four buttons, one navigator and a large dot matrix LC display for user interaction. All buttons and the navigator are software controlled. For detailed information refer to the operating instructions.

4.3.2. Internal jumpers and switches

There are no controls inside of the electronics housing.

5. Device variables

5.1. Overview

Liquistation is a plug and play device. That means any available digital sensor (“Memosens”) can be connected to any input. Because of this variable configuration the device variables are variable, too. There are 4 different groups of device variables:

- 0..15: These device variables can be selected by the user
- 16..23: These device variables represent measurement values assigned to current outputs 1..8
- 24..31: These device variables represent currents of current outputs 1..8
- 243..249: Standardized device variables

5.2. User selectable device variables

Device variables in the range from 0 to 15 have to be set up in the Liquistation setup menu. Every of these device variables can be mapped to any present measurement value. The following subchapters describe the possible measurement values for each sensor or module.

5.2.1. Limits

Device variable lower and upper limits shown in the following chapters are absolute maximum limits for the according device variable class. The actual connected sensor might have narrower limits. Upper and lower transducer limits reflect the measuring range supported by the actual sensor. Actual sensor limits can be found in the sensor calibration certificate.

5.2.2. pH glass sensor values

Raw value mV

This value returns the damped raw voltage measured by the electrode.

Device variable classification:	EMF/Voltage	83 (53 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mV, V	36, 58 (24 _h , 3A _h)
Device variable lower limit:	-5000 mV	
Device variable upper limit:	25000 mV	
Device variable damping possible:	Yes	

Temperature

This value returns the damped temperature measured by the electrode.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

pH

This value returns the damped temperature compensated pH value.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	pH	59 (3B _h)
Device variable lower limit:	-2 pH	
Device variable upper limit:	16 pH	
Device variable damping possible:	Yes	

Glass impedance

This value returns the glass impedance of the electrode.

Device variable classification:	Resistance	85 (55 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	kΩ, MΩ	163, 170 (A3 _h , AA _h)
Device variable lower limit:	0 MΩ	
Device variable upper limit:	2e7 MΩ	
Device variable damping possible:	No	

5.2.3. pH isfet sensor values

Raw value mV

This value returns the damped raw voltage measured by the electrode.

Device variable classification:	EMF/Voltage	83 (53 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mV, V	36, 58 (24 _h , 3A _h)
Device variable lower limit:	-5000 mV	
Device variable upper limit:	25000 mV	
Device variable damping possible:	Yes	

Temperature

This value returns the damped temperature measured by the electrode.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

pH

This value returns the damped temperature compensated pH value.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	pH	59 (3B _h)
Device variable lower limit:	-2 pH	
Device variable upper limit:	16 pH	
Device variable damping possible:	Yes	

5.2.4. Redox/ORP sensor values

ORP mV

This value returns the damped raw voltage measured by the electrode.

Device variable classification:	EMF/Voltage	83 (53 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mV, V	36, 58 (24 _h , 3A _h)
Device variable lower limit:	-5000 mV	
Device variable upper limit:	25000 mV	
Device variable damping possible:	Yes	

ORP %

This value returns the ORP % value.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-100 %	
Device variable upper limit:	1000 %	
Device variable damping possible:	Yes	

Temperature

This value returns the damped temperature measured by the electrode.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

Reference impedance

This value returns the reference impedance of the electrode if supported by electrode.

Device variable classification:	Resistance	85 (55 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	kΩ, MΩ	163, 170 (A3 _h , AA _h)
Device variable lower limit:	0 MΩ	
Device variable upper limit:	2e7 MΩ	
Device variable damping possible:	No	

5.2.5. pH/ORP sensor values

rH

This value returns the damped temperature compensated pH value.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	rH	247 (F7 _h)
Device variable lower limit:	0 rH	
Device variable upper limit:	100 rH	
Device variable damping possible:	No	

ORP mV

This value returns the damped raw voltage measured by the electrode.

Device variable classification:	EMF/Voltage	83 (53 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mV, V	36, 58 (24 _h , 3A _h)
Device variable lower limit:	-5000 mV	
Device variable upper limit:	25000 mV	
Device variable damping possible:	Yes	

ORP %

This value returns the ORP % value.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-100 %	
Device variable upper limit:	1000 %	
Device variable damping possible:	Yes	

Raw value mV

This value returns the damped raw voltage measured by the electrode.

Device variable classification:	EMF/Voltage	83 (53 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mV, V	36, 58 (24 _h , 3A _h)
Device variable lower limit:	-5000 mV	
Device variable upper limit:	25000 mV	
Device variable damping possible:	Yes	

Temperature

This value returns the damped temperature measured by the electrode.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

pH

This value returns the damped temperature compensated pH value.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	pH	59 (3B _h)
Device variable lower limit:	-2 pH	
Device variable upper limit:	16 pH	
Device variable damping possible:	Yes	

Glass impedance

This value returns the glass impedance of the electrode.

Device variable classification:	Resistance	85 (55 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	kΩ, MΩ	163, 170 (A3 _h , AA _h)
Device variable lower limit:	0 MΩ	
Device variable upper limit:	2e7 MΩ	
Device variable damping possible:	No	

Reference impedance

This value returns the reference impedance of the electrode.

Device variable classification:	Resistance	85 (55 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	kΩ, MΩ	163, 170 (A3 _h , AA _h)
Device variable lower limit:	0 MΩ	
Device variable upper limit:	2e7 MΩ	
Device variable damping possible:	No	

5.2.6. ISE multi sensor values

Raw value

This value returns the raw voltage value of the corresponding electrode.

Device variable classification:	EMF/Voltage	83 (53 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mV, V	36, 58 (24 _h , 3A _h)
Device variable lower limit:	-5000 mV	
Device variable upper limit:	25000 mV	
Device variable damping possible:	No	

Temperature

This value returns the damped temperature measured by the electrode.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

Concentration

This value returns the damped concentration of nitrate, ammonium, potassium or chloride, depending on the electrode type.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 µg/l	
Device variable upper limit:	2e9 µg/l	
Device variable damping possible:	Yes	

pH

This value returns the damped temperature compensated pH value.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	pH	59 (3B _h)
Device variable lower limit:	-2 pH	
Device variable upper limit:	16 pH	
Device variable damping possible:	Yes	

ORP mV

This value returns the ORP voltage of the electrode.

Device variable classification:	EMF/Voltage	83 (53 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mV, V	36, 58 (24 _h , 3A _h)
Device variable lower limit:	-5000 mV	
Device variable upper limit:	25000 mV	
Device variable damping possible:	Yes	

5.2.7. Conductivity sensor values (conductive)

Temperature

This value returns the damped temperature measured by the electrode.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

Conductivity

This value returns the damped conductivity measured by the electrode.

Device variable classification:	Conductance	87 (57 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	mS/cm, µS/cm	66, 67 (42 _h , 43 _h)
Device variable lower limit:	0 mS/cm	
Device variable upper limit:	5000 mS/cm	
Device variable damping possible:	Yes	

Resistance

This value returns the damped resistivity measured by the electrode.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	MΩcm	242 (F2 _h)
Device variable lower limit:	0 MΩcm	
Device variable upper limit:	400000 MΩcm	
Device variable damping possible:	Yes	

TDS (mg/l)

This value returns the damped TDS (total dissolved solids) value.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 µg/l	
Device variable upper limit:	2e9 µg/l	
Device variable damping possible:	Yes	

TDS (ppm)

This value returns the damped TDS (total dissolved solids) value.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

5.2.8. Conductivity sensor values (conductive 4-electrode and inductive)

Temperature

This value returns the damped temperature measured by the electrode.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

Concentration

This value returns the damped concentration value.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-100 %	
Device variable upper limit:	1000 %	
Device variable damping possible:	Yes	

Conductivity

This value returns the damped conductivity measured by the electrode.

Device variable classification:	Conductance	87 (57 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	mS/cm, µS/cm	66, 67 (42 _h , 43 _h)
Device variable lower limit:	0 mS/cm	
Device variable upper limit:	5000 mS/cm	
Device variable damping possible:	Yes	

TDS (mg/l)

This value returns the damped TDS (total dissolved solids) value.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 µg/l	
Device variable upper limit:	2e9 µg/l	
Device variable damping possible:	Yes	

TDS (ppm)

This value returns the damped TDS (total dissolved solids) value.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

5.2.9. Dissolved oxygen sensor values (amperometrical)

Temperature

This value returns the damped temperature measured by the electrode.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

Raw value nA

This value returns the raw current measured by the electrode.

Device variable classification:	Current	84 (54 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mA	39 (27 _h)
Device variable lower limit:	-1000 mA	
Device variable upper limit:	1000 mA	
Device variable damping possible:	No	

Partial pressure

This value returns the damped partial pressure value.

Device variable classification:	Pressure	65 (41 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	hPa, mBar	174, 8 (AE _h , 8 _h)
Device variable lower limit:	0 hPa	
Device variable upper limit:	5000 hPa	
Device variable damping possible:	Yes	

Concentration liquid (mg/l)

This value returns the damped concentration value.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l g/ml, kg/l, g/l,	146, 170 (92 _h , AA _h) 95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 µg/l	
Device variable upper limit:	2e9 µg/l	
Device variable damping possible:	Yes	

Concentration liquid (ppm)

This value returns the damped concentration value.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

Concentration gaseous (%Vol)

This value returns the damped concentration value.

Device variable classification:	Volume per volume	88 (58 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	%Vol	149 (95 _h)
Device variable lower limit:	-100 %Vol	
Device variable upper limit:	500 %Vol	
Device variable damping possible:	Yes	

Concentration gaseous (ppm)

This value returns the damped concentration value.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm	139 (8B _h)
Device variable lower limit:	-1000000 ppm	
Device variable upper limit:	5000000 ppm	
Device variable damping possible:	Yes	

Saturation

This value returns the damped saturation value.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-100 %	
Device variable upper limit:	1000 %	
Device variable damping possible:	Yes	

5.2.10. Dissolved oxygen sensor values (optical)

Temperature

This value returns the damped temperature measured by the sensor.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

Partial pressure

This value returns the damped partial pressure value.

Device variable classification:	Pressure	65 (41 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	hPa, mBar	174, 8 (AE _h , 8 _h)
Device variable lower limit:	0 hPa	
Device variable upper limit:	5000 hPa	
Device variable damping possible:	Yes	

Concentration liquid (mg/l)

This value returns the damped concentration value.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l,	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 µg/l	
Device variable upper limit:	2e9 µg/l	
Device variable damping possible:	Yes	

Concentration liquid (ppm)

This value returns the damped concentration value.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

Concentration gaseous (%Vol)

This value returns the damped concentration value.

Device variable classification:	Volume per volume	88 (58 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	%Vol	149 (95 _h)
Device variable lower limit:	-100 %Vol	
Device variable upper limit:	500 %Vol	
Device variable damping possible:	Yes	

Concentration gaseous (ppm)

This value returns the damped concentration value.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm	139 (8B _h)
Device variable lower limit:	-1000000 ppm	
Device variable upper limit:	5000000 ppm	
Device variable damping possible:	Yes	

Saturation

This value returns the damped saturation value.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-100 %	
Device variable upper limit:	1000 %	
Device variable damping possible:	Yes	

Raw value μ s

This value returns the raw τ value measured by the sensor.

Device variable classification:	Time	70 (46 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	s	51 (33 _h)
Device variable lower limit:	0 s	
Device variable upper limit:	None (3.4e38)	
Device variable damping possible:	No	

5.2.11. Disinfection sensor values

Temperature

This value returns the damped temperature measured by the electrode.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

Current

This value returns the raw current measured by the electrode.

Device variable classification:	Current	84 (54 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mA	39 (27 _h)
Device variable lower limit:	-1000 mA	
Device variable upper limit:	1000 mA	
Device variable damping possible:	No	

Concentration (mg/l)

This value returns the damped concentration value.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 µg/l	
Device variable upper limit:	2e9 µg/l	
Device variable damping possible:	Yes	

Concentration (ppm)

This value returns the damped concentration value.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

5.2.12. Turbidity sensor values

The validity of measurement values depends on operating mode and sensor type.

Temperature

This value returns the damped temperature measured by the sensor.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

Turbidity FNU

This value returns the turbidity measured by the sensor. It is returned in NTU always, even if the device displays FNU.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	NTU	241 (F1 _h)
Device variable lower limit:	0 NTU	
Device variable upper limit:	20000 NTU	
Device variable damping possible:	Yes	

Turbidity (g/l)

This value returns the turbidity measured by the sensor.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 µg/l	
Device variable upper limit:	2e9 µg/l	
Device variable damping possible:	Yes	

Turbidity (ppm)

This value returns the turbidity measured by the sensor.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

Turbidity (%TS)

This value returns the turbidity measured by the sensor.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-1 %	
Device variable upper limit:	200 %	
Device variable damping possible:	Yes	

5.2.13. Nitrate sensor values

Temperature

This value returns the damped temperature measured by the electrode.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

NO3 (mg/l)

This value returns the damped NO3 (nitrate) value.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 µg/l	
Device variable upper limit:	2e9 µg/l	
Device variable damping possible:	Yes	

NO3-N (mg/l)

This value returns the damped NO3-N (nitrogen portion of NO3 only) value.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 µg/l	
Device variable upper limit:	2e9 µg/l	
Device variable damping possible:	Yes	

NO3 (ppm)

This value returns the damped NO3-N (nitrogen portion of NO3 only) value.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

NO3-N (ppm)

This value returns the damped NO3-N (nitrogen portion of NO3 only) value.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

5.2.14. SAC sensor values

Temperature

This value returns the damped temperature measured by the sensor.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

SAC

This value returns the damped SAC (spectral absorption coefficient) value.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	1/m	243 (F3 _h)
Device variable lower limit:	0 1/m	
Device variable upper limit:	5000 1/m	
Device variable damping possible:	Yes	

Transmission

This value returns the damped transmission value.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-100 %	
Device variable upper limit:	1000 %	
Device variable damping possible:	Yes	

Absorption

This value returns the damped absorption value.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	None	251 (FB _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (3.4e38)	
Device variable damping possible:	Yes	

COD (mg/l)

This value returns the COD (chemical oxygen demand) value measured by the sensor.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 µg/l	
Device variable upper limit:	2e9 µg/l	
Device variable damping possible:	Yes	

COD (ppm)

This value returns the COD (chemical oxygen demand) value measured by the sensor.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

TOC (mg/l)

This value returns the TOC (total organic carbon) value measured by the sensor.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 µg/l	
Device variable upper limit:	2e9 µg/l	
Device variable damping possible:	Yes	

TOC (ppm)

This value returns the TOC (total organic carbon) value measured by the sensor.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

DOC (mg/l)

This value returns the DOC (dissolved organic carbon) value measured by the sensor.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 µg/l	
Device variable upper limit:	2e9 µg/l	
Device variable damping possible:	Yes	

DOC (ppm)

This value returns the DOC (dissolved organic carbon) value measured by the sensor.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

BOD (mg/l)

This value returns the BOD (biochemical oxygen demand) value measured by the sensor.

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	μg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 μg/l	
Device variable upper limit:	2e9 μg/l	
Device variable damping possible:	Yes	

BOD (ppm)

This value returns the BOD (biochemical oxygen demand) value measured by the sensor.

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

Transmission 10mm

This value returns the transmission value normalized to 10mm path length.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-100 %	
Device variable upper limit:	1000 %	
Device variable damping possible:	No	

5.2.15. Ultrasonic interface sensor values

Interface

This value returns the interface level measured by the sensor.

Device variable classification:	Length	69 (45 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	m, ft, in	45, 44, 47 (2D _h , 2C _h , 2F _h)
	cm, mm	48, 49 (30 _h , 31 _h)
Device variable lower limit:	0 m	
Device variable upper limit:	2e6 m	
Device variable damping possible:	No	

Turbidity FNU

This value returns the turbidity measured by the sensor. It is returned in NTU always, even if the device displays FNU.

This value is not present on certain sensor versions.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	NTU	241 (F1 _h)
Device variable lower limit:	0 NTU	
Device variable upper limit:	20000 NTU	
Device variable damping possible:	No	

5.2.16. Inline photometer values

The validity of measurement values depends on operating mode and sensor type.

**Measurement value,
2nd measurement value,
Reference value,
Raw measurement value,
Raw 2nd measurement value,
Raw reference value**

These values return the photometer measurement and their according raw values. They can be calibrated in units the user can define himself. As he can define any unit it's most likely there is no HART unit code for it. To avoid undefined behavior the HART unit is "unknown", always.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	Unknown	252 (FC _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (3.4e38)	
Device variable damping possible:	No	

**Raw measurement current,
2nd measurement current,
Raw reference current**

These values return the raw currents measured by the photometer.

Device variable classification:	Current	84 (54 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mA	39 (27 _h)
Device variable lower limit:	-1000 mA	
Device variable upper limit:	1000 mA	
Device variable damping possible:	No	

Lamp current

This value returns the photometer lamp current.

Device variable classification:	Current	84 (54 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mA	39 (27 _h)
Device variable lower limit:	-1000 mA	
Device variable upper limit:	1000 mA	
Device variable damping possible:	No	

Lamp voltage

This value returns the photometer lamp voltage.

Device variable classification:	EMF/Voltage	83 (53 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mV, V	36, 58 (24 _h , 3A _h)
Device variable lower limit:	-5000 mV	
Device variable upper limit:	25000 mV	
Device variable damping possible:	No	

5.2.17. Spectrometer values

The validity of measurement values depends on operating mode and sensor type.

Temperature

This value returns the damped temperature measured by the sensor.

Device variable classification:	Temperature	64 (40 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	°C, °F, K	32, 33, 35 (20 _h , 21 _h , 23 _h)
Device variable lower limit:	-100 °C	
Device variable upper limit:	500 °C	
Device variable damping possible:	Yes	

Measurement values (user defined name)

These values return the spectrometer measurement values. They can be calibrated in units the user can define himself. As he can define any unit it's most likely there is no HART unit code for it. To avoid undefined behavior the HART unit is "unknown", always.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	Unknown	252 (FC _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (3.4e38)	
Device variable damping possible:	No	

5.2.18. Analyzer values

The validity of measurement values and units depends on operating mode and analyzer type.

Analyzer value (mg/l)

This value returns the damped analyzer value (e.g. Ammonium NH₄-N).

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	μg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	-1e7 μg/l	
Device variable upper limit:	2e9 μg/l	
Device variable damping possible:	Yes	

Analyzer value (ppm)

This value returns the damped analyzer value (e.g. Ammonium NH₄-N).

Device variable classification:	Concentration	90 (5A _h)
Device family:	Not used	250 (FA _h)
Device variable units:	ppm, ppb	139, 169 (8B _h , A9 _h)
Device variable lower limit:	-10000 ppm	
Device variable upper limit:	2000000 ppm	
Device variable damping possible:	Yes	

5.2.19. Current input values

Current

This value returns the current measured by the current input.

Device variable classification:	Current	84 (54 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mA	39 (27 _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (3.4e38)	
Device variable damping possible:	No	

Flow rate

This value returns the flow rate measured by an external flow meter connected to a current input.

Device variable classification:	Volumetric flow	66 (42 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	m ³ /s, (cu ft)/min, gal/min	28, 15, 16 (1C _h , 0F _h , 10 _h)
	l/min, m ³ /h, gal/s	17, 19, 22 (11 _h , 13 _h , 16 _h)
	l/s, (cu ft)/s, (cu ft)/d	24, 26, 27 (18 _h , 1A _h , 1B _h)
	m ³ /d, (cu ft)/h, m ³ /min	29, 130, 131 (1D _h , 82 _h , 83 _h)
	gal/h, l/h, gal/d	136, 138, 235 (88 _h , 8A _h , EB _h)
Device variable lower limit:	-5 m ³ /s	
Device variable upper limit:	2000000 m ³ /s	
Device variable damping possible:	No	

Totalized flow

This value returns the totalized flow calculated by the flow rate measured by an external flow meter connected to a current input.

Device variable classification:	Volume	68 (44 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	l, m ³ , gal	41, 43, 40 (29 _h , 2B _h , 28 _h)
	cu ft	112 (70 _h)
Device variable lower limit:	0 m ³	
Device variable upper limit:	2e10 m ³	
Device variable damping possible:	No	

Parameter

This value returns a user defined parameter represented by a current input. As the user can define any unit it's most likely there is no HART unit code for it. To avoid undefined behavior the HART unit is "unknown", always.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	Unknown	252 (FC _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (-3.4e38)	
Device variable damping possible:	No	

5.2.20. Binary input values

Totalized flow

This value returns the totalized flow calculated by the flow rate measured by an external flow meter connected to a binary input.

Device variable classification:	Volume	68 (44 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	l, m ³ , gal cu ft	41, 43, 40 (29 _h , 2B _h , 28 _h) 112 (70 _h)
Device variable lower limit:	0 m ³	
Device variable upper limit:	2e10 m ³	
Device variable damping possible:	No	

Level

This value returns the logic level (either 0 or 1) on a binary input.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	None	251 (FB _h)
Device variable lower limit:	0	
Device variable upper limit:	1	
Device variable damping possible:	No	

Edge counts

This value returns the overall level changes of the corresponding binary input.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	None	251 (FB _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (-3.4e38)	
Device variable damping possible:	No	

Rainfall per time

This value returns the rainfall per time measured by a sensor connected to a binary input. The default unit mm/min is not mapped to HART unit codes.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	None	251 (FB _h)
Device variable lower limit:	0	
Device variable upper limit:	6000000	
Device variable damping possible:	No	

Totalized rainfall

This value returns the totalized rainfall calculated by the rainfall per time measured by an external sensor connected to a binary input.

Device variable classification:	Length	69 (45 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	m, ft, in cm, mm	45, 44, 47 (2D _h , 2C _h , 2F _h) 48, 49 (30 _h , 31 _h)
Device variable lower limit:	0 m	
Device variable upper limit:	2e6 m	
Device variable damping possible:	No	

5.2.21. Mathematical function values

Difference

This value returns a difference calculated from 2 other measurement values.

Device variable classification:	Depends on source value	
Device family:	Not used	250 (FA _h)
Device variable unit:	Depends on source value	
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (3.4e38)	
Device variable damping possible:	No	

Redundancy

This value returns a redundant value calculated from 2 other measurement values.

Device variable classification:	Depends on source value	
Device family:	Not used	250 (FA _h)
Device variable unit:	Depends on source value	
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (3.4e38)	
Device variable damping possible:	No	

rH calculation

This value returns the rH value calculated from a pH and mV value.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	rH	247 (F7 _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (-3.4e38)	
Device variable damping possible:	No	

Degassed conductivity

This value returns the CO2 concentration (degassed conductivity).

Device variable classification:	Mass per volume	73 (49 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	µg/l, mg/l	146, 170 (92 _h , AA _h)
	g/ml, kg/l, g/l	95, 96, 97 (5F _h , 60 _h , 61 _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (-3.4e38)	
Device variable damping possible:	No	

Dual conductivity

This value returns the difference calculated from 2 conductivity values.

Device variable classification:	Conductance	87 (57 _h)
Device family:	Not used	250 (FA _h)
Device variable units:	mS/cm, µS/cm	66, 67 (42 _h , 43 _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (-3.4e38)	
Device variable damping possible:	No	

Calculated pH

This value returns the pH value calculated from 2 conductivity values.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	pH	59 (3B _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (-3.4e38)	
Device variable damping possible:	No	

Cation exchanger capacity, remaining operation time

This value returns the remaining operation time of a cation exchanger.

Device variable classification:	Time	70 (46 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	s	51 (33 _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (3.4e38)	
Device variable damping possible:	No	

Cation exchanger capacity, remaining capacity

This value returns the remaining capacity of a cation exchanger.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (3.4e38)	
Device variable damping possible:	No	

Cation exchanger capacity, time until warning limit reached

This value returns the remaining operation time of a cation exchanger.

Device variable classification:	Time	70 (46 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	s	51 (33 _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (3.4e38)	
Device variable damping possible:	No	

Formula, result numeric

This value returns the result of a user defined formula with different inputs. As the user can define any unit it's most likely there is no HART unit code for it. To avoid undefined behavior the HART unit is "unknown", always.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	Unknown	252 (FC _h)
Device variable lower limit:	None (-3.4e38)	
Device variable upper limit:	None (-3.4e38)	
Device variable damping possible:	No	

5.2.22. Controller values

Bipolar

This value returns the manipulated variable y.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	None	251 (FB _h)
Device variable lower limit:	-1	
Device variable upper limit:	1	
Device variable damping possible:	No	

Unipolar +

This value returns the manipulated variable y.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	None	251 (FB _h)
Device variable lower limit:	0	
Device variable upper limit:	1	
Device variable damping possible:	No	

Unipolar -

This value returns the manipulated variable y.

Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	None	251 (FB _h)
Device variable lower limit:	0	
Device variable upper limit:	1	
Device variable damping possible:	No	

5.2.23. Heartbeat values

Heartbeat transmitter, status

This value returns the transmitter heartbeat status.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-100 %	
Device variable upper limit:	1000 %	
Device variable damping possible:	No	

Heartbeat transmitter, device health

This value returns the transmitter device health.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-100 %	
Device variable upper limit:	1000 %	
Device variable damping possible:	No	

Heartbeat sensor, status

This value returns the status of a sensor.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-100 %	
Device variable upper limit:	1000 %	
Device variable damping possible:	No	

Heartbeat sensor, health

This value returns the health of a sensor.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-100 %	
Device variable upper limit:	1000 %	
Device variable damping possible:	No	

Heartbeat sensor, maintenance timer

This value returns the remaining interval until next sensor maintenance.

Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-100 %	
Device variable upper limit:	1000 %	
Device variable damping possible:	No	

5.3. Current outputs measurement values

All measurement values listed above can not only be mapped to a device variable, but to all current outputs, too. These mapped values can be read using the device variables 16..23.

Device variable 16 (10 _h):	Value mapped to current output 1
Device variable 17 (11 _h):	Value mapped to current output 2
Device variable 18 (12 _h):	Value mapped to current output 3
Device variable 19 (13 _h):	Value mapped to current output 4
Device variable 20 (14 _h):	Value mapped to current output 5
Device variable 21 (15 _h):	Value mapped to current output 6
Device variable 22 (16 _h):	Value mapped to current output 7
Device variable 23 (17 _h):	Value mapped to current output 8

The number of actual present current outputs depends on the Liquistation version. Not present, inactive or unassigned current outputs will lead to a NaN value being returned.

5.4. Current values

All current values of the outputs can be read using device variables 24..31.

Device variable 24 (18 _h):	Current value output 1
Device variable 25 (19 _h):	Current value output 2
Device variable 26 (1A _h):	Current value output 3
Device variable 27 (1B _h):	Current value output 4
Device variable 28 (1C _h):	Current value output 5
Device variable 29 (1D _h):	Current value output 6
Device variable 30 (1E _h):	Current value output 7
Device variable 31 (1F _h):	Current value output 8

Device variable numbers:	24..31	
Device variable classification:	Current	84 (54 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mA	39 (27 _h)
Device variable lower limit:	0 mA	
Device variable upper limit:	23 mA	

The number of actual present current outputs depends on the Liquistation version. Not present or inactive current outputs will return 0 mA. Unassigned current outputs will return error current (e.g. 21.5 mA).

5.5. Standardized device variables

These device variables have to be present in every HART 7 device.

Standardized device variables cannot be mapped to PV, SV, TV or QV using command 51.

5.5.1. Battery life

This device variable will always return NaN, as Liquistation is not battery powered.

Device variable number:	243 (F3 _h)	
Device variable classification:	None	0 (0 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	Not used	250 (FA _h)
Device variable lower limit:	NaN	
Device variable upper limit:	NaN	

5.5.2. Percent range

This device variable returns the PV percentage corresponding to its user set limits. The value will always follow the PV even if the limits are exceeded, or the device is in an error state.

Device variable number:	244 (F4 _h)	
Device variable classification:	Analytical	81 (51 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	%	57 (39 _h)
Device variable lower limit:	-1000 %	
Device variable upper limit:	1000 %	

5.5.3. Loop current

This device variable returns the loop current on current output 1 even if the device is in an error or simulation state.

Device variable number:	245 (F5 _h)	
Device variable classification:	Current	84 (54 _h)
Device family:	Not used	250 (FA _h)
Device variable unit:	mA	39 (27 _h)
Device variable lower limit:	0 mA	
Device variable upper limit:	23 mA	

5.5.4. Primary variable

This device variable returns the primary variable (PV). As PV is always the value assigned to current output 1, device variable 246 is the same as device variable 16.

Device variable number:	246 (F6 _h)	
Device variable classification:	Depends on PV settings	
Device family:	Not used	250 (FA _h)
Device variable unit:	Depends on PV settings	
Device variable lower limit:	Depends on PV settings	
Device variable upper limit:	Depends on PV settings	

5.5.5. Secondary variable

This device variable returns the secondary variable (SV).

Device variable number:	247 (F7 _h)	
Device variable classification:	Depends on SV settings	
Device family:	Not used	250 (FA _h)
Device variable unit:	Depends on SV settings	
Device variable lower limit:	Depends on SV settings	
Device variable upper limit:	Depends on SV settings	

5.5.6. Tertiary variable

This device variable returns the tertiary variable (TV).

Device variable number:	248 (F8 _h)	
Device variable classification:	Depends on TV settings	
Device family:	Not used	250 (FA _h)
Device variable unit:	Depends on TV settings	
Device variable lower limit:	Depends on TV settings	
Device variable upper limit:	Depends on TV settings	

5.5.7. Quaternary variable

This device variable returns the quaternary variable (QV).

Device variable number:	249 (F9 _h)	
Device variable classification:	Depends on QV settings	
Device family:	Not used	250 (FA _h)
Device variable unit:	Depends on QV settings	
Device variable lower limit:	Depends on QV settings	
Device variable upper limit:	Depends on QV settings	

6. Dynamic variables

All 4 dynamic variables (primary variable PV, secondary variable SV, tertiary variable TV and quaternary variable QV) are implemented in Liquistation devices.

6.1. Fixed dynamic variables

PV is always mapped to device variable 16.

6.2. Dynamic variables with configurable mapping

SV, TV and QV can be mapped to any device variable.

Default mapping:

PV returns device variable 16 (10_n) - Value mapped to current output 1

SV returns device variable 17 (11_n) - Value mapped to current output 2

TV returns device variable 0 - User selected value

QV returns device variable 1 - User selected value

7. Status information

7.1. Device status

Bit 4 (10_h, "More status available") is set whenever a diagnostic message can be found in the diagnostics list.

Bit 7 (80_h, "Device malfunction") is set whenever an error message is present (indicated by an F icon in the upper right corner of the Liquistation display). All other diagnostics messages (M, C and S) will not set this bit.

All other bits are not used.

7.2. Extended device status

Bit 0 (01_h, "Maintenance required") is set whenever a maintenance message is present (indicated by an M icon symbol in the upper right corner of the Liquistation display). All other diagnostics messages (F, C and S) will not set this bit.

Bit 1 (02_h, "Device variable alert") is not implemented.

All other bits are not used.

7.3. Standardized status

Standardized status is not supported.

7.4. Additional device status - command #48

Command 48 will return the following bits and bytes:

Byte	Bit	Bit	Error position
0	0	0	Sensor channel 1 error
0	1	1	Sensor channel 2 error
0	2	2	Sensor channel 3 error
0	3	3	Sensor channel 4 error
0	4	4	Sensor channel 5 error
0	5	5	Sensor channel 6 error
0	6	6	Sensor channel 7 error
0	7	7	Sensor channel 8 error
1	0	8	Global error
1	1	9	Reserved
1	2	10	Reserved
1	3	11	Reserved
1	4	12	Reserved
1	5	13	Reserved
1	6	14	Reserved
1	7	15	Reserved
2	0..7	16..23	Reserved
3	0..7	24..31	Reserved
4	0..7	32..39	Reserved
5	0..7	40..47	Reserved

Byte	Bit	Bit	Meaning	According Liquistation diagnostics code(s)
14	0..7	112..119	Reserved	-
15	0	120	Reserved	-
15	1	121	Initialization or maintenance active, please wait	10, 81, 202, 403, 412, 413
15	2	122	Device failure, service necessary	241, 242, 243, 261, 263, 285, 304, 305, 306, 322, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 335, 347, 348, 349, 350, 351, 352, 359, 370, 375, 502, 503, 903, 960, 978
15	3	123	Device maintenance, service necessary	162, 163, 355, 357, 358, 373
15	4	124	Calibration active, please wait	107
15	5	125	Battery empty, change battery of clock	302
15	6	126	Analog input out of range	970, 972, 973
15	7	127	Analog output out of range	460, 461, 971
16	0	128	Alarm, measurement value failure, check application	142, 144, 552, 553, 554, 555, 558, 559, 560, 561, 841, 842, 843, 906, 910, 961, 962, 963, 964, 965, 966, 967, 968
16	1	129	Warning, measurement value failure, check application	141, 168, 907, 937, 938, 939, 942, 943, 944, 945, 946
16	2	130	Alarm, temperature failure, check application	135, 136, 146, 550, 551, 556, 557, 832, 927, 984
16	3	131	Warning, temperature failure, check application	934, 935
16	4	132	Alarm, process check system, no change of measurement value	904
16	5	133	Logbook memory, check logbook	323, 530, 531, 536, 537, 538
16	6	134	Reserved	-
16	7	135	No sample flow, service necessary	314, 920, 921, 928, 930
17	0	136	No cooling, service necessary	315
17	1	137	No heating, service necessary	316, 334
17	2	138	Replace pump tubing / sealing	337, 338, 922, 923, 924, 925, 926
17	3	139	Present / all bottles full, no further sampling	353, 354, 356
17	4	140	Reserved	-
17	5	141	Reserved	-
17	6	142	Reserved	-
17	7	143	Reserved	-
18	0	144	Alarm, no module communication	262
18	1	145	Reserved	-
18	2	146	Sensor communication / connection check	62, 100, 110, 130, 158, 374, 929, 985
18	3	147	Alarm, sensor failure, service necessary	2, 4, 5, 12, 13, 18, 61, 137, 138, 140, 143, 149, 150, 151, 159, 172, 175, 321, 740, 770, 771, 774
18	4	148	Alarm, replace wear part	101, 106, 147, 148, 153, 155, 161, 173, 174, 318, 320, 773, 909
18	5	149	Warning, replace wear part	108, 109, 126, 157, 534, 535, 720, 734, 908
18	6	150	Alarm, clean or replace sensor	156, 313, 317, 319, 339, 340
18	7	151	Calibration necessary	152, 154, 160, 164, 844
19	0	152	Replace temperature sensor	22, 310, 311, 312

Byte	Bit	Bit	Meaning	According Liquistation diagnostics code(s)
19	1	153	Alarm, calibration timer expired	103, 104
19	2	154	Warning, calibration timer expires soon	102, 105
19	3	155	Warning, temperature calibration expires soon	114, 115, 116, 117
19	4	156	Calibration failure, repeat calibration	131, 132, 500, 501, 505, 507, 509, 511, 513, 515, 517, 518, 520, 522
19	5	157	Warning, operation time	111, 169, 170, 171, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 772
19	6	158	Alarm, sensor glass membrane	118, 122, 124
19	7	159	Warning, sensor glass membrane	119, 123, 125, 127
20	0	160	Alarm, sensor reference	120, 724
20	1	161	Warning, sensor reference	121, 725
20	2	162	Alarm, sensor leak current	128
20	3	163	Warning, sensor leak current	129
20	4	164	Alarm, low sensor signal	133
20	5	165	Warning, low sensor signal	134
20	6	166	Alarm, ISE check	983, 987
20	7	167	Alarm, USP / EP	914
21	0	168	Warning, USP / EP	915
21	1	169	Calculation overflow	455, 991, 992, 993, 994
21	2	170	Redundancy deviation	990
21	3	171	Set default failed	545
21	4	172	File operation fail	540, 542, 543
21	5	173	License error	532
21	6	174	Calibration aborted	408
21	7	175	Power fail	343
22	0	176	Sampler is paused	344
22	1	177	Diagnostics menu selected	529
22	2	178	Hold active	216, 951, 952, 953, 954, 955, 956, 957, 958
22	3	179	Reserved	-
22	4	180	Simulation active	215
22	5	181	Reserved	-
22	6	182	Reserved	-
22	7	183	Reserved	-
23	0..7	184..191	Reserved	-
24	0..7	192..199	Reserved	-

For more information about errors and the corresponding Namur classes (F, M, C, S) refer to the operating instructions.

The command 48 bits are up to date all the time.

8. Universal commands

Liquiline supports all universal commands as described in the HART specification (HCF_SPEC-127 revision 7.1).

8.1. Read unique identifier #0 (00_h)

This command reads fundamental information about the connected device.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0	Unsigned-8	254
1..2	Unsigned-16	Expanded device type
3	Unsigned-8	Minimum request preambles
4	Unsigned-8	Universal command revision
5	Unsigned-8	Device revision
6	Unsigned-8	Software revision
7	Unsigned-8	Hardware revision / Physical signaling code
8	Unsigned-8	Flags
9..11	Unsigned-24	Device ID
12	Unsigned-8	Minimum response preambles
13	Unsigned-8	Maximum number of device variables
14..15	Unsigned-16	Configuration change counter
16	Unsigned-8	Extended field device status
17..18	Unsigned-16	Manufacturer identification code
19..20	Unsigned-16	Private label distributor code
21	Unsigned-8	Device profile

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

8.2. Read primary variable #1 (01_h)

This command reads the primary variable (PV). The primary variable is selected by the source of current output 1.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0	Unsigned-8	Primary variable unit
1..4	Float	Primary variable

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

8.3. Read loop current and percent of range #2 (02_h)

This command reads the loop current and the PV percent of range of current output 1.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0..3	Float	Loop current [mA]
4..7	Float	Percent of range [%]

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

8.4. Read dynamic variables and loop current #3 (03_h)

This command reads the loop current and up to four predefined dynamic variables. Every dynamic variable corresponds to one device variable (see chapter 6). PV is always mapped to device variable 16.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0..3	Float	Loop current [mA]
4	Unsigned-8	Primary variable unit
5..8	Float	Primary variable
9	Unsigned-8	Secondary variable unit
10..13	Float	Secondary variable
14	Unsigned-8	Tertiary variable unit
15..18	Float	Tertiary variable
19	Unsigned-8	Quaternary variable unit
20..23	Float	Quaternary variable

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

8.5. Write polling address #6 (06_h)

This command writes the polling address and the loop current mode. The polling address can be set at the Liqiline operating panel as well.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Polling address
1	Unsigned-8	Loop current mode (optional)

Response data bytes

Byte	Format	Description
0	Unsigned-8	Polling address
1	Unsigned-8	Loop current mode

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid address
5	Error	Too few data bytes received
6	Error	Device specific command error
12	Error	Invalid mode
16	Error	Access restricted

Loop current mode

Disabled: 0
Enabled: 1

8.6. Read loop configuration #7 (07_h)

This command reads the loop current and the polling address.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0	Unsigned-8	Polling address
1	Unsigned-8	Loop current mode

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

8.7. Read dynamic variable classification #8 (08_h)

This command reads the classification associated with the dynamic variables. By this command the correct unit code table can be determined.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0	Unsigned-8	Primary variable classification
1	Unsigned-8	Secondary variable classification
2	Unsigned-8	Tertiary variable classification
3	Unsigned-8	Quaternary variable classification

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

8.8. Read device variables with status #9 (09_h)

This command reads up to 8 device variables with their status.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Slot 0: Device variable code
1	Unsigned-8	Slot 1: Device variable code (optional)
2	Unsigned-8	Slot 2: Device variable code (optional)
3	Unsigned-8	Slot 3: Device variable code (optional)
4	Unsigned-8	Slot 4: Device variable code (optional)
5	Unsigned-8	Slot 5: Device variable code (optional)
6	Unsigned-8	Slot 6: Device variable code (optional)
7	Unsigned-8	Slot 7: Device variable code (optional)

Response data bytes

Byte	Format	Description
0	Unsigned-8	Extended device status
1	Unsigned-8	Slot 0: Device variable code
2	Unsigned-8	Slot 0: Device variable classification
3	Unsigned-8	Slot 0: Device variable unit
4..7	Float	Slot 0: Device variable value
8	Unsigned-8	Slot 0: Device variable status
9	Unsigned-8	Slot 1: Device variable code
10	Unsigned-8	Slot 1: Device variable classification
11	Unsigned-8	Slot 1: Device variable unit
12..15	Float	Slot 1: Device variable value
16	Unsigned-8	Slot 1: Device variable status
17	Unsigned-8	Slot 2: Device variable code
18	Unsigned-8	Slot 2: Device variable classification
19	Unsigned-8	Slot 2: Device variable unit
20..23	Float	Slot 2: Device variable value
24	Unsigned-8	Slot 2: Device variable status
25	Unsigned-8	Slot 3: Device variable code
26	Unsigned-8	Slot 3: Device variable classification
27	Unsigned-8	Slot 3: Device variable unit
28..31	Float	Slot 3: Device variable value
32	Unsigned-8	Slot 3: Device variable status
33	Unsigned-8	Slot 4: Device variable code
34	Unsigned-8	Slot 4: Device variable classification
35	Unsigned-8	Slot 4: Device variable unit
36..39	Float	Slot 4: Device variable value
40	Unsigned-8	Slot 4: Device variable status
41	Unsigned-8	Slot 5: Device variable code
42	Unsigned-8	Slot 5: Device variable classification
43	Unsigned-8	Slot 5: Device variable unit
44..47	Float	Slot 5: Device variable value
48	Unsigned-8	Slot 5: Device variable status
49	Unsigned-8	Slot 6: Device variable code
50	Unsigned-8	Slot 6: Device variable classification
51	Unsigned-8	Slot 6: Device variable unit
52..55	Float	Slot 6: Device variable value
56	Unsigned-8	Slot 6: Device variable status

57	Unsigned-8	Slot 7: Device variable code
58	Unsigned-8	Slot 7: Device variable classification
59	Unsigned-8	Slot 7: Device variable unit
60..63	Float	Slot 7: Device variable value
64	Unsigned-8	Slot 7: Device variable status
65..68(*)	Time	Slot 0: Data time stamp

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received
16	Error	Access restricted

(*) Timestamp is always present, even if less than 8 device variables were requested. Its position is always at the end of the frame. Timestamp is in format 1/32 ms since midnight (Unsigned-32).

8.9. Read unique identifier associated with tag #11 (0B_h)

This command reads fundamental information about the connected device.

The device will not respond to this command unless the short tag matches.

Request data bytes

Byte	Format	Description
0..5	Packed ASCII	Tag

Response data bytes

Byte	Format	Description
0	Unsigned-8	254
1..2	Unsigned-16	Expanded device type
3	Unsigned-8	Minimum request preambles
4	Unsigned-8	Universal command revision
5	Unsigned-8	Device revision
6	Unsigned-8	Software revision
7	Unsigned-8	Hardware revision / Physical signaling code
8	Unsigned-8	Flags
9..11	Unsigned-24	Device ID
12	Unsigned-8	Minimum response preambles
13	Unsigned-8	Maximum number of device variables
14..15	Unsigned-16	Configuration change counter
16	Unsigned-8	Extended field device status
17..18	Unsigned-16	Manufacturer identification code
19..20	Unsigned-16	Private label distributor code
21	Unsigned-8	Device profile

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
6	Error	Device specific command error

8.10. Read message #12 (0C_h)

This command reads the message.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0..23	Packed ASCII	Message

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

8.11. Read tag, descriptor and date #13 (0D_h)

This command reads the short tag, descriptor and the date.

The short HART tag is completely separated from the device tag. The short tag can be read and written via HART only.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0..5	Packed ASCII	Short tag
6..17	Packed ASCII	Descriptor
18..20	Unsigned-24	Date

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

8.12. Read primary variable transducer information #14 (0E_h)

This command reads the serial number, limits and the minimum span for the primary variable. The serial number is always 0.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0..2	Unsigned-24	Transducer serial number
3	Unsigned-8	Transducer limits and span unit
4..7	Float	Upper transducer limit
8..11	Float	Lower transducer limit
12..15	Float	Minimum transducer span

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

8.13. Read device information #15 (0F_h)

This command reads additional information of the device.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0	Unsigned-8	PV alarm selection code
1	Unsigned-8	PV transfer function code
2	Unsigned-8	PV range value unit
3..6	Float	PV upper range value
7..10	Float	PV lower range value
11..14	Float	PV damping value [s]
15	Unsigned-8	Write protect code
16	Unsigned-8	Reserved
17	Unsigned-8	PV analog channel flags

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

8.14. Read final assembly number #16 (10_h)

This command reads the final assembly number of the device.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0..2	Unsigned-24	Final assembly number

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

8.15. Write message #17 (11_h)

This command writes the message.

Request data bytes

Byte	Format	Description
0..23	Packed ASCII	Message

Response data bytes

Byte	Format	Description
0..23	Packed ASCII	Message

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
5	Error	Too few data bytes received
6	Error	Device specific command error
16	Error	Access restricted

8.16. Write tag, descriptor and date #18 (12_h)

This command writes the short tag, descriptor and the date.

The short HART tag is completely separated from the device tag. The short tag can be read and written via HART only.

Request data bytes

Byte	Format	Description
0..5	Packed ASCII	Short tag
6..17	Packed ASCII	Descriptor
18..20	Unsigned-24	Date

Response data bytes

Byte	Format	Description
0..5	Packed ASCII	Short tag
6..17	Packed ASCII	Descriptor
18..20	Unsigned-24	Date

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
5	Error	Too few data bytes received
6	Error	Device specific command error
16	Error	Access restricted

8.17. Write final assembly number #19 (13_h)

This command writes the final assembly number.

Request data bytes

Byte	Format	Description
0..2	Unsigned-24	Final assembly number

Response data bytes

Byte	Format	Description
0..2	Unsigned-24	Final assembly number

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
5	Error	Too few data bytes received
6	Error	Device specific command error
16	Error	Access restricted

8.18. Read long tag #20 (14_h)

This command reads the long tag.

The long HART tag corresponds to the Liquistation tag shown on the display and in the setup menu. This tag can be edited via HART and the local operating panel.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0..31	Latin-1	Long tag

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
16	Error	Access restricted

8.19. Read unique identifier associated with long tag #21 (15_h)

This command reads fundamental information about the connected device.

The device will not respond to this command unless the long tag matches.

Request data bytes

Byte	Format	Description
0..31	Latin-1	Tag

Response data bytes

Byte	Format	Description
0	Unsigned-8	254
1..2	Unsigned-16	Expanded device type
3	Unsigned-8	Minimum request preambles
4	Unsigned-8	Universal command revision
5	Unsigned-8	Device revision
6	Unsigned-8	Software revision
7	Unsigned-8	Hardware revision / Physical signaling code
8	Unsigned-8	Flags
9..11	Unsigned-24	Device ID
12	Unsigned-8	Minimum response preambles
13	Unsigned-8	Maximum number of device variables
14..15	Unsigned-16	Configuration change counter
16	Unsigned-8	Extended field device status
17..18	Unsigned-16	Manufacturer identification code
19..20	Unsigned-16	Private label distributor code
21	Unsigned-8	Device profile

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

8.20. Write long tag #22 (16_h)

This command writes the long tag.

The long HART tag corresponds to the Liquistation tag shown on the display and in the setup menu. This tag can be edited via HART and the local operating panel.

Request data bytes

Byte	Format	Description
0..31	Latin-1	Long tag

Response data bytes

Byte	Format	Description
0..31	Latin-1	Long tag

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
5	Error	Too few data bytes received
6	Error	Device specific command error
16	Error	Access restricted

8.21. Reset configuration changed flag #38 (26_h)

This command will reset one of the configuration changed flags, depending on the sending master. If the configuration change counter value is sent the device will check it versus the current counter value. If both match the configuration changed flag will be reset.

Request data bytes

Byte	Format	Description
0..1	Unsigned-16	Configuration change counter (optional)

Response data bytes

Byte	Format	Description
0..1	Unsigned-16	Configuration change counter

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
6	Error	Device specific command error
9	Error	Configuration change counter mismatch
16	Error	Access restricted

8.22. Read additional status #48 (30_h)

This command returns device status information not included in the response code or device status byte. A description of every single bits meanings can be found in chapter 7.4

If data is included when sending command 48 data is checked versus the current device status. If all data matches the “more status available” flag is reset.

Request data bytes

Byte	Format	Description
0..5	Bits	See chapter 7.4 (optional)
6	Bits	Extended device status (optional)
7	Bits	Device operating mode (optional)
8	Bits	Standardized status 0 (optional)
9	Bits	Standardized status 1 (optional)
10	Bits	Analog channel saturated (optional)
11	Bits	Standardized status 2 (optional)
12	Bits	Standardized status 3 (optional)
13	Bits	Analog channel fixed (optional)
14..24	Bits	See chapter 7.4 (optional)

Response data bytes

Byte	Format	Description
0..5	Bits	See chapter 7.4
6	Bits	Extended device status
7	Bits	Device operating mode
8	Bits	Standardized status 0
9	Bits	Standardized status 1
10	Bits	Analog channel saturated
11	Bits	Standardized status 2
12	Bits	Standardized status 3
13	Bits	Analog channel fixed
14..24	Bits	See chapter 7.4

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

9. Common practice commands

The following chapters show all common practice commands supported by Liquistation.

9.1. Read device variable #33 (21_h)

This command reads up to four device variables.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Slot 0: Device variable code
1	Unsigned-8	Slot 1: Device variable code (optional)
2	Unsigned-8	Slot 2: Device variable code (optional)
3	Unsigned-8	Slot 3: Device variable code (optional)

Response data bytes

Byte	Format	Description
0	Unsigned-8	Slot 0: Device variable code
1	Unsigned-8	Slot 0: Device variable unit
2..5	Float	Slot 0: Device variable value
6	Unsigned-8	Slot 1: Device variable code
7	Unsigned-8	Slot 1: Device variable unit
8..11	Float	Slot 1: Device variable value
12	Unsigned-8	Slot 2: Device variable code
13	Unsigned-8	Slot 2: Device variable unit
14..17	Float	Slot 2: Device variable value
18	Unsigned-8	Slot 3: Device variable code
19	Unsigned-8	Slot 3: Device variable unit
20..23	Float	Slot 3: Device variable value

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received
6	Error	Device specific command error

9.2. Write primary variable damping value #34 (22_h)

This command writes the primary variable damping value.

This value can also be set using the Liquistation operating panel.

The damping value can be set only for certain measurement values. Please refer to chapter 5.2.

Request data bytes

Byte	Format	Description
0..3	Float	Primary variable damping value [s]

Response data bytes

Byte	Format	Description
0..3	Float	Primary variable damping value [s]

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
3	Error	Passed parameter too large
4	Error	Passed parameter too small
5	Error	Too few data bytes received
8	Warning	Set to nearest possible value
16	Error	Access restricted

9.3. Write primary variable range values #35 (23_h)

This command defines the relationship between the loop current and the primary variable.

These values can also be set using the Liquistation operating panel.

The upper limit can be set below the lower limit. The current output will operate in reverse direction then.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Range value unit
1..4	Float	Upper range value (value at 20mA)
5..8	Float	Lower range value (value at 4mA)

Response data bytes

Byte	Format	Description
0	Unsigned-8	Range value unit
1..4	Float	Upper range value (value at 20mA)
5..8	Float	Lower range value (value at 4mA)

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
5	Error	Too few data bytes received
6	Error	Device specific command error
9	Error	Lower range value too high
10	Error	Lower range value too low
11	Error	Upper range value too high
12	Error	Upper range value too low
13	Error	Upper and lower range value out of limits
14	Warning	Span too small
16	Error	Access restricted
18	Error	Invalid units code
29	Error	Invalid span

9.4. Set primary variable upper range value #36 (24_h)

As soon as this command is issued, the present primary variable value is copied into the upper range value. The upper range can be set below the lower range.

Use this command in combination with command 37 to adjust the PV range.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
None		

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
6	Error	Device specific command error
9	Error	Applied process too high
10	Error	Applied process too low
14	Warning	Span too small
16	Error	Access restricted
29	Error	Invalid span

9.5. Set primary variable lower range value #37 (25_h)

As soon as this command is issued, the present primary variable value is copied into the lower range value. At the same time, the upper range will be shifted to keep the span constant. Use this command in combination with command 36 to adjust the PV range.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
None		

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
6	Error	Device specific command error
9	Error	Applied process too high
10	Error	Applied process too low
14	Warning	Span too small
16	Error	Access restricted
29	Error	Invalid span

9.6. Enter/Exit fixed current mode #40 (28_h)

This command sets a certain fixed current on current output 1 (current simulation).

To disable simulation mode a value of 0.0 has to be set.

The simulation mode and the current value can also be set using the Liqiline local operating panel. The simulation mode is cancelled at power loss/reset.

Simulation values in the range from 2.4 to 23 mA are valid.

Request data bytes

Byte	Format	Description
0..3	Float	Fixed current value [mA]

Response data bytes

Byte	Format	Description
0..3	Float	Fixed current value [mA]

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
3	Error	Passed parameter too large
4	Error	Passed parameter too small
5	Error	Too few data bytes received
6	Error	Device specific command error
11	Error	Loop current not active (multidrop mode)
16	Error	Access restricted

9.7. Perform self test #41 (29_h)

This command answers the request, only. It is implemented for compatibility reasons. Issuing command 48 (read additional status) will return up to date data at every time.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
None		

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

9.8. Perform device reset #42 (2A_h)

This command triggers a device reset. Liquistation can take up to 2 minutes to initialize and be back online.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
None		

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
16	Error	Access restricted

9.9. Write primary variable unit #44 (2C_h)

This command selects the unit in which the primary variable and its range will be returned. Possible units depending on different operating modes are listed in chapter 5.2.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Primary variable unit

Response data bytes

Byte	Format	Description
0	Unsigned-8	Primary variable unit

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received
16	Error	Access restricted

9.10. Trim loop current zero #45 (2D_h)

Command 45 and 46 can do a recalibration of the current output 1 loop. These commands will not destroy the factory current output calibration, but do a second user calibration. To restore the original values execute a "Factory default" in the Liquistation diagnostics menu or send a command 45 with value 0.0 mA.

Command 45 recalibrates the lower range of the current output.

Before sending command 45 command 40 with a value of 4 mA has to be sent. The value to be sent with command 45 must be measured with an external ampere meter.

Request data bytes

Byte	Format	Description
0..3	Float	Externally measured loop current [mA]

Response data bytes

Byte	Format	Description
0..3	Float	Loop current [mA]

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
3	Error	Passed parameter too large
4	Error	Passed parameter too small
5	Error	Too few data bytes received
6	Error	Device specific command error
9	Error	Incorrect loop current mode or value
11	Error	Loop current not active (multidrop mode)
16	Error	Access restricted

9.11. Trim loop current gain #46 (2E_h)

Command 45 and 46 can do a recalibration of the current output 1 loop. These commands will not destroy the factory current output calibration, but do a second user calibration. To restore the original values execute a "Factory default" in the Liquistation diagnostics menu or send a command 46 with value 0.0 mA.

Command 46 recalibrates the upper range of the current output.

Before sending command 46 command 40 with a value of 20 mA has to be sent. The value to be sent with command 46 must be measured with an external ampere meter.

Request data bytes

Byte	Format	Description
0..3	Float	Externally measured loop current [mA]

Response data bytes

Byte	Format	Description
0..3	Float	Loop current [mA]

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
3	Error	Passed parameter too large
4	Error	Passed parameter too small
5	Error	Too few data bytes received
6	Error	Device specific command error
9	Error	Incorrect loop current mode or value
11	Error	Loop current not active (multidrop mode)
16	Error	Access restricted

9.12. Read dynamic variable assignments #50 (32_h)

This command returns the mapping between device and dynamic variables (see chapter 6.2).

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0	Unsigned-8	Device variable assigned to primary variable
1	Unsigned-8	Device variable assigned to secondary variable
2	Unsigned-8	Device variable assigned to tertiary variable
3	Unsigned-8	Device variable assigned to quaternary variable

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

9.13. Write dynamic variable assignments #51 (33_h)

This command sets the mapping between device and dynamic variables (see chapter 6.2).
PV is always mapped to device variable 16.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Has to be 16 (10 _h) all the time
1	Unsigned-8	Device variable to assign to secondary variable
2	Unsigned-8	Device variable to assign to tertiary variable
3	Unsigned-8	Device variable to assign to quaternary variable

Response data bytes

Byte	Format	Description
0	Unsigned-8	Device variable assigned to primary variable
1	Unsigned-8	Device variable assigned to secondary variable
2	Unsigned-8	Device variable assigned to tertiary variable
3	Unsigned-8	Device variable assigned to quaternary variable

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received
6	Error	Device specific command error
16	Error	Access restricted

9.14. Write device variable unit #53 (35_h)

This command selects the unit in which a certain device variable and its range will be returned. Possible units depending on different operating modes are listed in chapter 5.2.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Device variable code
1	Unsigned-8	Device variable unit

Response data bytes

Byte	Format	Description
0	Unsigned-8	Device variable code
1	Unsigned-8	Device variable unit

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
5	Error	Too few data bytes received
6	Error	Device specific command error
11	Error	Invalid device variable code
12	Error	Invalid unit code
16	Error	Access restricted

9.15. Read device variable information #54 (36_h)

This command reads more information about a device variable.

Device variable transducer serial number and family classification are not supported and will return 0.

Damping values are present for certain device variables, only.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Device variable code

Response data bytes

Byte	Format	Description
0	Unsigned-8	Device variable code
1..3	Unsigned-24	Transducer serial number
4	Unsigned-8	Transducer limits and span unit
5..8	Float	Upper transducer limit
9..12	Float	Lower transducer limit
13..16	Float	Damping value [s]
17..20	Float	Minimum span
21	Unsigned-8	Device variable classification
22	Unsigned-8	Device variable family
23..26	Time	Update time period
27	Bits	Device variable properties

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received

9.16. Write device variable damping value #55 (37_h)

This command writes the damping value of a certain device variable.

The damping value can be set only for certain measurement values. Please refer to chapter 5.2.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Device variable code
1..4	Float	Primary variable damping value [s]

Response data bytes

Byte	Format	Description
0	Unsigned-8	Device variable code
1..4	Float	Primary variable damping value [s]

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
3	Error	Passed parameter too large
5	Error	Passed parameter too small
5	Error	Too few data bytes received
6	Error	Device specific command error
8	Warning	Set to nearest possible value
16	Error	Access restricted

9.17. Write number of response preambles #59 (3B_h)

This command sets the number of response preambles. The value has to be in the range from 5 to 20.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Number of response preambles

Response data bytes

Byte	Format	Description
0	Unsigned-8	Number of response preambles

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
3	Error	Passed parameter too large
4	Error	Passed parameter too small
5	Error	Too few data bytes received
6	Error	Device specific command error
16	Error	Access restricted

9.18. Lock device #71 (47_h)

This command locks the device to one HART master and prevents changes from the other master and the operating panel.

If the device is locked by this command, the local operating panel does not respond to any user action any more.

A lock symbol appears in upper right corner of the display.

If you set a permanent lock and the device loses power, the lock will be set again as soon as the first HART frame is detected. If you have to cancel a permanent lock, use the HART master the lock was set with. If this is not possible then restart the device without HART communication and do a “Factory default” after reboot.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Lock code

Response data bytes

Byte	Format	Description
0	Unsigned-8	Lock code

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
5	Error	Too few data bytes received
6	Error	Device specific command error
10	Error	Invalid lock code
11	Error	Cannot lock device
16	Error	Access restricted

Lock code

Unlock:	0
Lock temporary:	1
Lock permanent:	2
Lock all:	3

9.19. Read lock device state #76 (4C_h)

This command reads the current state of the device lock.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0	Unsigned-8	Lock code

Command specific response codes

Code	Class	Description
0	Success	No command specific errors

Lock state

Locked:	1
Permanent:	2
Locked by primary master:	4
All locked:	8

9.20. Burst mode

This field device does not support burst mode.

9.21. Catch device variable

This field device does not support the "Catch device variable" mechanism.

10. Device specific commands

It is not recommended to use the device specific commands without a device description (DD) or a device type manager (DTM).

If you have to read or write a special parameter of the Liquistation and cannot use a DD or DTM, please be careful as you might destroy the parameterization.

10.1. Read PEA parameter command #167 (A7_h)

This command is for Endress+Hauser internal use, only.

This command reads the values of one or more parameters.

Request data bytes

Byte	Format	Description
0..1	Unsigned-16	Parameter PEA-ID 0
2..n	Unsigned-16 []	Parameter PEA-ID 1, 2, 3, ... (optional)

Response data bytes

Byte	Format	Description
0..1	Unsigned-16	Parameter PEA-ID 0
2..n	Unsigned-16 []	Parameter PEA-ID 1, 2, 3, ... (optional)
n+1..n+m	Unsigned-8 []	Parameter value 0, 1, 2, 3 ...

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
5	Error	Too few data bytes received
11	Error	Set failed
16	Error	Access restricted

10.2. Write PEA parameter command #168 (A8_h)

This command is for Endress+Hauser internal use, only.

This command writes the value of a parameter.

Request data bytes

Byte	Format	Description
0..1	Unsigned-16	Parameter PEA-ID
2..n	Unsigned-8 []	Parameter value

Response data bytes

Byte	Format	Description
0..1	Unsigned-16	Parameter PEA-ID
2..n	Unsigned-8 []	Parameter value

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
5	Error	Too few data bytes received
11	Error	Set failed
16	Error	Access restricted

10.3. Read HART parameter command #224 (E0_h)

This command reads the value of a parameter.

Request data bytes

Byte	Format	Description
0..1	Unsigned-16	Parameter ID (see chapter 11.1)

Response data bytes

Byte	Format	Description
0..1	Unsigned-16	Parameter ID (see chapter 11.1)
2..n	Unsigned-8 []	Parameter value (see chapter 11.2)

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received
6	Error	Device specific command error
16	Error	Access restricted

10.4. Write HART parameter command #225 (E1_h)

This command writes the value of a parameter.

Request data bytes

Byte	Format	Description
0..1	Unsigned-16	Parameter ID (see chapter 11.1)
2..n	Unsigned-8 []	Parameter value (see chapter 11.2)

Response data bytes

Byte	Format	Description
0..1	Unsigned-16	Parameter ID (see chapter 11.1)
2..n	Unsigned-8 []	Parameter value (see chapter 11.2)

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received
6	Error	Device specific command error
11	Error	Set failed
12	Error	Invalid float
16	Error	Access restricted

10.5. Read firmware version #226 (E2_h)

This command reads the firmware version.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Module index (always 0)

Response data bytes

Byte	Format	Description
0	Unsigned-8	Module index
1..16	Latin-1	Software version string

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received

10.6. Read serial number #227 (E3_h)

This command reads the serial number.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Module index (always 0)

Response data bytes

Byte	Format	Description
0	Unsigned-8	Module index
1..16	Latin-1	Serial number string

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received

10.7. Read extended order code #228 (E4_h)

This command reads the extended order code. Order codes larger than 20 characters can be read by incrementing the index. 0 will return the first 20 characters, 1 the following 20 and so on.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Index

Response data bytes

Byte	Format	Description
0	Unsigned-8	Index
1..20	Latin-1	Order code string

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received

10.8. Check device status #231 (E7_h)

This command returns the device status.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Module index (always 0)

Response data bytes

Byte	Format	Description
0	Unsigned-8	Module index
1	Unsigned-8	Device status
2..3	Unsigned-16	Number of the highest priority error

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received

Device status

OK: 0
 F: 1
 C: 2
 M: 4
 S: 8

10.9. Read order code #233 (E9_h)

This command reads the order code.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Module index (always 0)

Response data bytes

Byte	Format	Description
0	Unsigned-8	Module index
1..20	Latin-1	Order code string

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received

10.10. Read ENP version #234 (EA_h)

This command is for Endress+Hauser internal use, only.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Module index (always 0)

Response data bytes

Byte	Format	Description
0	Unsigned-8	Module index
1..16	Latin-1	ENP version string

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received

10.11. Read startup behavior #236 (EC_h)

This command reads the startup behavior of Liquistation.

Request data bytes

Byte	Format	Description
None		

Response data bytes

Byte	Format	Description
0..3	Float	Minimal startup voltage [V]
4..7	Float	Startup current [mA]
8..9	Unsigned-16	Time until HART communication possible [s]
10..13	Float	Minimal operating voltage [V]
14..17	Float	Multidrop current [mA]
18..19	Unsigned-16	Time until measurement values are present [s]

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
6	Error	Device specific command error

Minimal startup voltage: 0.0 V
 Minimal operating voltage: 0.0 V
 Startup current: 0.0 mA
 Multidrop current: 4.0 mA
 Time till HART communication: 140 s
 Time till measurement values: 140 s

10.12. Upload HART parameter #238 (EE_h)

This command is for Endress+Hauser internal use, only.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Reserved
1..2	Unsigned-16	Parameter ID

Response data bytes

Byte	Format	Description
0	Unsigned-8	Reserved
1..2	Unsigned-16	Parameter ID
2..n	Unsigned-8 []	Parameter value

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received
6	Error	Device specific command error
16	Error	Access restricted

10.13. Download HART parameter #239 (EF_h)

This command is for Endress+Hauser internal use, only.

Request data bytes

Byte	Format	Description
0	Unsigned-8	Reserved
1..2	Unsigned-16	Parameter ID
3..n	Unsigned-8 []	Parameter value

Response data bytes

Byte	Format	Description
0	Unsigned-8	Reserved
1..2	Unsigned-16	Parameter ID
3..n	Unsigned-8 []	Parameter value

Command specific response codes

Code	Class	Description
0	Success	No command specific errors
2	Error	Invalid selection
5	Error	Too few data bytes received
6	Error	Device specific command error
11	Error	Set failed
12	Error	Invalid float
16	Error	Access restricted

11. Tables

11.1. Parameter ID's

Menu label	Parameter	Channel	ID	Type	Size	Unit
Diagnostics						
Most important message	Highest priority diagnosis	395	018B _h	String	65	
Past message	Last reset diagnosis	396	018C _h	String	65	
Display						
Language	GUI language	45	002D _h	Enum	1	
Backlight	Backlight state	6	0006 _h	Enum	1	
Contrast	Contrast	8	0008 _h	Float	5	% 7 07 _h
Screensaver	Screen saver state	11	000B _h	Enum	1	
Screen rotation	Screen rotation switch	12	000C _h	Enum	1	
Automatic hold						
Calibration menu	Hold calibration enabled	39	0027 _h	Enum	1	
Hold delay	Hold delay	1	0001 _h	Float	5	s 95 5F _h
Diagnostics menu	Hold diagnostic enabled	37	0025 _h	Enum	1	
Setup menu	Hold setup enabled	35	0023 _h	Enum	1	
General settings						
Error current	Error current	7	0007 _h	Float	5	A 26 1A _h
Alarm delay	Alarm delay	3	0003 _h	Float	5	s 95 5F _h
Temperature unit	Temperature unit	13	000D _h	Enum	1	
Date/Time	Date and time	2007	07D7 _h	Date	7	
Current outputs						
	Connection state	1	2178	0882 _h	Enum	1
	Connection state	2	2179	0883 _h	Enum	1
	Connection state	3	2180	0884 _h	Enum	1
	Connection state	4	2181	0885 _h	Enum	1
	Connection state	5	2184	0888 _h	Enum	1
	Connection state	6	2185	0889 _h	Enum	1
	Connection state	7	2186	088A _h	Enum	1
	Connection state	8	2187	088B _h	Enum	1
Hold behavior	Hold behavior	1	980	03D4 _h	Enum	1
Hold behavior	Hold behavior	2	981	03D5 _h	Enum	1
Hold behavior	Hold behavior	3	982	03D6 _h	Enum	1
Hold behavior	Hold behavior	4	983	03D7 _h	Enum	1
Hold behavior	Hold behavior	5	984	03D8 _h	Enum	1
Hold behavior	Hold behavior	6	985	03D9 _h	Enum	1
Hold behavior	Hold behavior	7	986	03DA _h	Enum	1
Hold behavior	Hold behavior	8	987	03DB _h	Enum	1
Hold current	Hold current	1	1057	0421 _h	Float	5 A 26 1A _h
Hold current	Hold current	2	1058	0422 _h	Float	5 A 26 1A _h
Hold current	Hold current	3	1059	0423 _h	Float	5 A 26 1A _h
Hold current	Hold current	4	1060	0424 _h	Float	5 A 26 1A _h
Hold current	Hold current	5	1061	0425 _h	Float	5 A 26 1A _h
Hold current	Hold current	6	1062	0426 _h	Float	5 A 26 1A _h
Hold current	Hold current	7	1063	0427 _h	Float	5 A 26 1A _h
Hold current	Hold current	8	1064	0428 _h	Float	5 A 26 1A _h
Range lower value	Lower range	1	988	03DC _h	Float	5
Range lower value	Lower range	2	989	03DD _h	Float	5
Range lower value	Lower range	3	990	03DE _h	Float	5
Range lower value	Lower range	4	991	03DF _h	Float	5
Range lower value	Lower range	5	992	03E0 _h	Float	5
Range lower value	Lower range	6	993	03E1 _h	Float	5
Range lower value	Lower range	7	994	03E2 _h	Float	5
Range lower value	Lower range	8	995	03E3 _h	Float	5
Range upper value	Upper range	1	996	03E4 _h	Float	5
Range upper value	Upper range	2	997	03E5 _h	Float	5
Range upper value	Upper range	3	998	03E6 _h	Float	5
Range upper value	Upper range	4	999	03E7 _h	Float	5
Range upper value	Upper range	5	1000	03E8 _h	Float	5
Range upper value	Upper range	6	1001	03E9 _h	Float	5
Range upper value	Upper range	7	1002	03EA _h	Float	5

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Menu label	Parameter	Channel	ID	Type	Size	Unit
Range upper value	Upper range	8	1003	03EB _h	Float	5
	Minimum range	1	1028	0404 _h	Float	5
	Minimum range	2	1029	0405 _h	Float	5
	Minimum range	3	1030	0406 _h	Float	5
	Minimum range	4	1031	0407 _h	Float	5
	Minimum range	5	1032	0408 _h	Float	5
	Minimum range	6	1033	0409 _h	Float	5
	Minimum range	7	1034	040A _h	Float	5
	Minimum range	8	1035	040B _h	Float	5
	Maximum range	1	1036	040C _h	Float	5
	Maximum range	2	1037	040D _h	Float	5
	Maximum range	3	1038	040E _h	Float	5
	Maximum range	4	1039	040F _h	Float	5
	Maximum range	5	1040	0410 _h	Float	5
	Maximum range	6	1041	0411 _h	Float	5
	Maximum range	7	1042	0412 _h	Float	5
	Maximum range	8	1043	0413 _h	Float	5
Current	Simulation value	1	1049	0419 _h	Float	5 A 26 1A _h
Current	Simulation value	2	1050	041A _h	Float	5 A 26 1A _h
Current	Simulation value	3	1051	041B _h	Float	5 A 26 1A _h
Current	Simulation value	4	1052	041C _h	Float	5 A 26 1A _h
Current	Simulation value	5	1053	041D _h	Float	5 A 26 1A _h
Current	Simulation value	6	1054	041E _h	Float	5 A 26 1A _h
Current	Simulation value	7	1055	041F _h	Float	5 A 26 1A _h
Current	Simulation value	8	1056	0420 _h	Float	5 A 26 1A _h
Simulation	Simulation state	1	1012	03F4 _h	Enum	1
Simulation	Simulation state	2	1013	03F5 _h	Enum	1
Simulation	Simulation state	3	1014	03F6 _h	Enum	1
Simulation	Simulation state	4	1015	03F7 _h	Enum	1
Simulation	Simulation state	5	1016	03F8 _h	Enum	1
Simulation	Simulation state	6	1017	03F9 _h	Enum	1
Simulation	Simulation state	7	1018	03FA _h	Enum	1
Simulation	Simulation state	8	1019	03FB _h	Enum	1

Process values

pH values

	pH glass impedance	1	919	0397 _h	Float	5 Ω 64 40 _h
	pH glass impedance	2	920	0398 _h	Float	5 Ω 64 40 _h
	pH glass impedance	3	921	0399 _h	Float	5 Ω 64 40 _h
	pH glass impedance	4	922	039A _h	Float	5 Ω 64 40 _h
	pH glass impedance	5	923	039B _h	Float	5 Ω 64 40 _h
	pH glass impedance	6	924	039C _h	Float	5 Ω 64 40 _h
	pH glass impedance	7	925	039D _h	Float	5 Ω 64 40 _h
	pH glass impedance	8	926	039E _h	Float	5 Ω 64 40 _h
	pH ORP damped	1	270	010E _h	Float	5 V 111 6F _h
	pH ORP damped	2	271	010F _h	Float	5 V 111 6F _h
	pH ORP damped	3	272	0110 _h	Float	5 V 111 6F _h
	pH ORP damped	4	273	0111 _h	Float	5 V 111 6F _h
	pH ORP damped	5	274	0112 _h	Float	5 V 111 6F _h
	pH ORP damped	6	275	0113 _h	Float	5 V 111 6F _h
	pH ORP damped	7	276	0114 _h	Float	5 V 111 6F _h
	pH ORP damped	8	277	0115 _h	Float	5 V 111 6F _h
	pH ORP mV	1	246	00F6 _h	Float	5 V 111 6F _h
	pH ORP mV	2	247	00F7 _h	Float	5 V 111 6F _h
	pH ORP mV	3	248	00F8 _h	Float	5 V 111 6F _h
	pH ORP mV	4	249	00F9 _h	Float	5 V 111 6F _h
	pH ORP mV	5	250	00FA _h	Float	5 V 111 6F _h
	pH ORP mV	6	251	00FB _h	Float	5 V 111 6F _h
	pH ORP mV	7	252	00FC _h	Float	5 V 111 6F _h
	pH ORP mV	8	253	00FD _h	Float	5 V 111 6F _h
	pH ORP percent	1	254	00FE _h	Float	5 % 7 07 _h
	pH ORP percent	2	255	00FF _h	Float	5 % 7 07 _h
	pH ORP percent	3	256	0100 _h	Float	5 % 7 07 _h
	pH ORP percent	4	257	0101 _h	Float	5 % 7 07 _h
	pH ORP percent	5	258	0102 _h	Float	5 % 7 07 _h
	pH ORP percent	6	259	0103 _h	Float	5 % 7 07 _h
	pH ORP percent	7	260	0104 _h	Float	5 % 7 07 _h
	pH ORP percent	8	261	0105 _h	Float	5 % 7 07 _h
	pH ORP raw	1	206	00CE _h	Float	5 V 111 6F _h
	pH ORP raw	2	207	00CF _h	Float	5 V 111 6F _h
	pH ORP raw	3	208	00D0 _h	Float	5 V 111 6F _h
	pH ORP raw	4	209	00D1 _h	Float	5 V 111 6F _h
	pH ORP raw	5	210	00D2 _h	Float	5 V 111 6F _h
	pH ORP raw	6	211	00D3 _h	Float	5 V 111 6F _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	pH ORP raw	7	212	00D4 _h	Float	5	V	111 6F _h
	pH ORP raw	8	213	00D5 _h	Float	5	V	111 6F _h
	pH pH compensated	1	286	011E _h	Float	5	pH	53 35 _h
	pH pH compensated	2	287	011F _h	Float	5	pH	53 35 _h
	pH pH compensated	3	288	0120 _h	Float	5	pH	53 35 _h
	pH pH compensated	4	289	0121 _h	Float	5	pH	53 35 _h
	pH pH compensated	5	290	0122 _h	Float	5	pH	53 35 _h
	pH pH compensated	6	291	0123 _h	Float	5	pH	53 35 _h
	pH pH compensated	7	292	0124 _h	Float	5	pH	53 35 _h
	pH pH compensated	8	293	0125 _h	Float	5	pH	53 35 _h
	pH pH damped	1	262	0106 _h	Float	5	V	111 6F _h
	pH pH damped	2	263	0107 _h	Float	5	V	111 6F _h
	pH pH damped	3	264	0108 _h	Float	5	V	111 6F _h
	pH pH damped	4	265	0109 _h	Float	5	V	111 6F _h
	pH pH damped	5	266	010A _h	Float	5	V	111 6F _h
	pH pH damped	6	267	010B _h	Float	5	V	111 6F _h
	pH pH damped	7	268	010C _h	Float	5	V	111 6F _h
	pH pH damped	8	269	010D _h	Float	5	V	111 6F _h
	pH pH measurement	1	222	00DE _h	Float	5	pH	53 35 _h
	pH pH measurement	2	223	00DF _h	Float	5	pH	53 35 _h
	pH pH measurement	3	224	00E0 _h	Float	5	pH	53 35 _h
	pH pH measurement	4	225	00E1 _h	Float	5	pH	53 35 _h
	pH pH measurement	5	226	00E2 _h	Float	5	pH	53 35 _h
	pH pH measurement	6	227	00E3 _h	Float	5	pH	53 35 _h
	pH pH measurement	7	228	00E4 _h	Float	5	pH	53 35 _h
	pH pH measurement	8	229	00E5 _h	Float	5	pH	53 35 _h
	pH pH raw	1	198	00C6 _h	Float	5	V	111 6F _h
	pH pH raw	2	199	00C7 _h	Float	5	V	111 6F _h
	pH pH raw	3	200	00C8 _h	Float	5	V	111 6F _h
	pH pH raw	4	201	00C9 _h	Float	5	V	111 6F _h
	pH pH raw	5	202	00CA _h	Float	5	V	111 6F _h
	pH pH raw	6	203	00CB _h	Float	5	V	111 6F _h
	pH pH raw	7	204	00CC _h	Float	5	V	111 6F _h
	pH pH raw	8	205	00CD _h	Float	5	V	111 6F _h
	pH rH measurement	1	238	00EE _h	Float	5	rH	68 44 _h
	pH rH measurement	2	239	00EF _h	Float	5	rH	68 44 _h
	pH rH measurement	3	240	00F0 _h	Float	5	rH	68 44 _h
	pH rH measurement	4	241	00F1 _h	Float	5	rH	68 44 _h
	pH rH measurement	5	242	00F2 _h	Float	5	rH	68 44 _h
	pH rH measurement	6	243	00F3 _h	Float	5	rH	68 44 _h
	pH rH measurement	7	244	00F4 _h	Float	5	rH	68 44 _h
	pH rH measurement	8	245	00F5 _h	Float	5	rH	68 44 _h
	pH temperature damped	1	278	0116 _h	Float	5	°C	89 59 _h
	pH temperature damped	2	279	0117 _h	Float	5	°C	89 59 _h
	pH temperature damped	3	280	0118 _h	Float	5	°C	89 59 _h
	pH temperature damped	4	281	0119 _h	Float	5	°C	89 59 _h
	pH temperature damped	5	282	011A _h	Float	5	°C	89 59 _h
	pH temperature damped	6	283	011B _h	Float	5	°C	89 59 _h
	pH temperature damped	7	284	011C _h	Float	5	°C	89 59 _h
	pH temperature damped	8	285	011D _h	Float	5	°C	89 59 _h
	pH temperature measurement	1	230	00E6 _h	Float	5	°C	89 59 _h
	pH temperature measurement	2	231	00E7 _h	Float	5	°C	89 59 _h
	pH temperature measurement	3	232	00E8 _h	Float	5	°C	89 59 _h
	pH temperature measurement	4	233	00E9 _h	Float	5	°C	89 59 _h
	pH temperature measurement	5	234	00EA _h	Float	5	°C	89 59 _h
	pH temperature measurement	6	235	00EB _h	Float	5	°C	89 59 _h
	pH temperature measurement	7	236	00EC _h	Float	5	°C	89 59 _h
	pH temperature measurement	8	237	00ED _h	Float	5	°C	89 59 _h
	pH temperature raw	1	214	00D6 _h	Float	5	°C	89 59 _h
	pH temperature raw	2	215	00D7 _h	Float	5	°C	89 59 _h
	pH temperature raw	3	216	00D8 _h	Float	5	°C	89 59 _h
	pH temperature raw	4	217	00D9 _h	Float	5	°C	89 59 _h
	pH temperature raw	5	218	00DA _h	Float	5	°C	89 59 _h
	pH temperature raw	6	219	00DB _h	Float	5	°C	89 59 _h
	pH temperature raw	7	220	00DC _h	Float	5	°C	89 59 _h
	pH temperature raw	8	221	00DD _h	Float	5	°C	89 59 _h
ISE values								
	ISE concentration CH0	1	760	02F8 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH0	2	761	02F9 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH0	3	762	02FA _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH0	4	763	02FB _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH0	5	764	02FC _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH0	6	765	02FD _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH0	7	766	02FE _h	Float	5	kg/m ³	50 32 _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	ISE concentration CH0	8	767	02FF _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH1	1	768	0300 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH1	2	769	0301 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH1	3	770	0302 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH1	4	771	0303 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH1	5	772	0304 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH1	6	773	0305 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH1	7	774	0306 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH1	8	775	0307 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH2	1	776	0308 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH2	2	777	0309 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH2	3	778	030A _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH2	4	779	030B _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH2	5	780	030C _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH2	6	781	030D _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH2	7	782	030E _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH2	8	783	030F _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH3	1	568	0238 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH3	2	569	0239 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH3	3	570	023A _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH3	4	571	023B _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH3	5	572	023C _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH3	6	573	023D _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH3	7	574	023E _h	Float	5	kg/m ³	50 32 _h
	ISE concentration CH3	8	575	023F _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH0	1	624	0270 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH0	2	625	0271 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH0	3	626	0272 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH0	4	627	0273 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH0	5	628	0274 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH0	6	629	0275 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH0	7	630	0276 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH0	8	631	0277 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH1	1	616	0268 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH1	2	617	0269 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH1	3	618	026A _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH1	4	619	026B _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH1	5	620	026C _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH1	6	621	026D _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH1	7	622	026E _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH1	8	623	026F _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH2	1	640	0280 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH2	2	641	0281 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH2	3	642	0282 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH2	4	643	0283 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH2	5	644	0284 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH2	6	645	0285 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH2	7	646	0286 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH2	8	647	0287 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH3	1	632	0278 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH3	2	633	0279 _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH3	3	634	027A _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH3	4	635	027B _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH3	5	636	027C _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH3	6	637	027D _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH3	7	638	027E _h	Float	5	kg/m ³	50 32 _h
	ISE concentration damped CH3	8	639	027F _h	Float	5	kg/m ³	50 32 _h
	ISE pH CH0	1	576	0240 _h	Float	5	pH	53 35 _h
	ISE pH CH0	2	577	0241 _h	Float	5	pH	53 35 _h
	ISE pH CH0	3	578	0242 _h	Float	5	pH	53 35 _h
	ISE pH CH0	4	579	0243 _h	Float	5	pH	53 35 _h
	ISE pH CH0	5	580	0244 _h	Float	5	pH	53 35 _h
	ISE pH CH0	6	581	0245 _h	Float	5	pH	53 35 _h
	ISE pH CH0	7	582	0246 _h	Float	5	pH	53 35 _h
	ISE pH CH0	8	583	0247 _h	Float	5	pH	53 35 _h
	ISE pH CH1	1	584	0248 _h	Float	5	pH	53 35 _h
	ISE pH CH1	2	585	0249 _h	Float	5	pH	53 35 _h
	ISE pH CH1	3	586	024A _h	Float	5	pH	53 35 _h
	ISE pH CH1	4	587	024B _h	Float	5	pH	53 35 _h
	ISE pH CH1	5	588	024C _h	Float	5	pH	53 35 _h
	ISE pH CH1	6	589	024D _h	Float	5	pH	53 35 _h
	ISE pH CH1	7	590	024E _h	Float	5	pH	53 35 _h
	ISE pH CH1	8	591	024F _h	Float	5	pH	53 35 _h
	ISE pH CH2	1	592	0250 _h	Float	5	pH	53 35 _h
	ISE pH CH2	2	593	0251 _h	Float	5	pH	53 35 _h
	ISE pH CH2	3	594	0252 _h	Float	5	pH	53 35 _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	ISE pH CH2	4	595	0253 _h	Float	5	pH	53 35 _h
	ISE pH CH2	5	596	0254 _h	Float	5	pH	53 35 _h
	ISE pH CH2	6	597	0255 _h	Float	5	pH	53 35 _h
	ISE pH CH2	7	598	0256 _h	Float	5	pH	53 35 _h
	ISE pH CH2	8	599	0257 _h	Float	5	pH	53 35 _h
	ISE pH CH3	1	600	0258 _h	Float	5	pH	53 35 _h
	ISE pH CH3	2	601	0259 _h	Float	5	pH	53 35 _h
	ISE pH CH3	3	602	025A _h	Float	5	pH	53 35 _h
	ISE pH CH3	4	603	025B _h	Float	5	pH	53 35 _h
	ISE pH CH3	5	604	025C _h	Float	5	pH	53 35 _h
	ISE pH CH3	6	605	025D _h	Float	5	pH	53 35 _h
	ISE pH CH3	7	606	025E _h	Float	5	pH	53 35 _h
	ISE pH CH3	8	607	025F _h	Float	5	pH	53 35 _h
	ISE pH damped CH0	1	664	0298 _h	Float	5	pH	53 35 _h
	ISE pH damped CH0	2	665	0299 _h	Float	5	pH	53 35 _h
	ISE pH damped CH0	3	666	029A _h	Float	5	pH	53 35 _h
	ISE pH damped CH0	4	667	029B _h	Float	5	pH	53 35 _h
	ISE pH damped CH0	5	668	029C _h	Float	5	pH	53 35 _h
	ISE pH damped CH0	6	669	029D _h	Float	5	pH	53 35 _h
	ISE pH damped CH0	7	670	029E _h	Float	5	pH	53 35 _h
	ISE pH damped CH0	8	671	029F _h	Float	5	pH	53 35 _h
	ISE pH damped CH1	1	656	0290 _h	Float	5	pH	53 35 _h
	ISE pH damped CH1	2	657	0291 _h	Float	5	pH	53 35 _h
	ISE pH damped CH1	3	658	0292 _h	Float	5	pH	53 35 _h
	ISE pH damped CH1	4	659	0293 _h	Float	5	pH	53 35 _h
	ISE pH damped CH1	5	660	0294 _h	Float	5	pH	53 35 _h
	ISE pH damped CH1	6	661	0295 _h	Float	5	pH	53 35 _h
	ISE pH damped CH1	7	662	0296 _h	Float	5	pH	53 35 _h
	ISE pH damped CH1	8	663	0297 _h	Float	5	pH	53 35 _h
	ISE pH damped CH2	1	680	02A8 _h	Float	5	pH	53 35 _h
	ISE pH damped CH2	2	681	02A9 _h	Float	5	pH	53 35 _h
	ISE pH damped CH2	3	682	02AA _h	Float	5	pH	53 35 _h
	ISE pH damped CH2	4	683	02AB _h	Float	5	pH	53 35 _h
	ISE pH damped CH2	5	684	02AC _h	Float	5	pH	53 35 _h
	ISE pH damped CH2	6	685	02AD _h	Float	5	pH	53 35 _h
	ISE pH damped CH2	7	686	02AE _h	Float	5	pH	53 35 _h
	ISE pH damped CH2	8	687	02AF _h	Float	5	pH	53 35 _h
	ISE pH damped CH3	1	672	02A0 _h	Float	5	pH	53 35 _h
	ISE pH damped CH3	2	673	02A1 _h	Float	5	pH	53 35 _h
	ISE pH damped CH3	3	674	02A2 _h	Float	5	pH	53 35 _h
	ISE pH damped CH3	4	675	02A3 _h	Float	5	pH	53 35 _h
	ISE pH damped CH3	5	676	02A4 _h	Float	5	pH	53 35 _h
	ISE pH damped CH3	6	677	02A5 _h	Float	5	pH	53 35 _h
	ISE pH damped CH3	7	678	02A6 _h	Float	5	pH	53 35 _h
	ISE pH damped CH3	8	679	02A7 _h	Float	5	pH	53 35 _h
	ISE raw voltage CH0	1	720	02D0 _h	Float	5	V	111 6F _h
	ISE raw voltage CH0	2	721	02D1 _h	Float	5	V	111 6F _h
	ISE raw voltage CH0	3	722	02D2 _h	Float	5	V	111 6F _h
	ISE raw voltage CH0	4	723	02D3 _h	Float	5	V	111 6F _h
	ISE raw voltage CH0	5	724	02D4 _h	Float	5	V	111 6F _h
	ISE raw voltage CH0	6	725	02D5 _h	Float	5	V	111 6F _h
	ISE raw voltage CH0	7	726	02D6 _h	Float	5	V	111 6F _h
	ISE raw voltage CH0	8	727	02D7 _h	Float	5	V	111 6F _h
	ISE raw voltage CH1	1	728	02D8 _h	Float	5	V	111 6F _h
	ISE raw voltage CH1	2	729	02D9 _h	Float	5	V	111 6F _h
	ISE raw voltage CH1	3	730	02DA _h	Float	5	V	111 6F _h
	ISE raw voltage CH1	4	731	02DB _h	Float	5	V	111 6F _h
	ISE raw voltage CH1	5	732	02DC _h	Float	5	V	111 6F _h
	ISE raw voltage CH1	6	733	02DD _h	Float	5	V	111 6F _h
	ISE raw voltage CH1	7	734	02DE _h	Float	5	V	111 6F _h
	ISE raw voltage CH1	8	735	02DF _h	Float	5	V	111 6F _h
	ISE raw voltage CH2	1	736	02E0 _h	Float	5	V	111 6F _h
	ISE raw voltage CH2	2	737	02E1 _h	Float	5	V	111 6F _h
	ISE raw voltage CH2	3	738	02E2 _h	Float	5	V	111 6F _h
	ISE raw voltage CH2	4	739	02E3 _h	Float	5	V	111 6F _h
	ISE raw voltage CH2	5	740	02E4 _h	Float	5	V	111 6F _h
	ISE raw voltage CH2	6	741	02E5 _h	Float	5	V	111 6F _h
	ISE raw voltage CH2	7	742	02E6 _h	Float	5	V	111 6F _h
	ISE raw voltage CH2	8	743	02E7 _h	Float	5	V	111 6F _h
	ISE raw voltage CH3	1	744	02E8 _h	Float	5	V	111 6F _h
	ISE raw voltage CH3	2	745	02E9 _h	Float	5	V	111 6F _h
	ISE raw voltage CH3	3	746	02EA _h	Float	5	V	111 6F _h
	ISE raw voltage CH3	4	747	02EB _h	Float	5	V	111 6F _h
	ISE raw voltage CH3	5	748	02EC _h	Float	5	V	111 6F _h
	ISE raw voltage CH3	6	749	02ED _h	Float	5	V	111 6F _h
	ISE raw voltage CH3	7	750	02EE _h	Float	5	V	111 6F _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	ISE raw voltage CH3	8	751	02EF _h	Float	5 V	111	6F _h
	ISE temperature	1	752	02F0 _h	Float	5 °C	89	59 _h
	ISE temperature	2	753	02F1 _h	Float	5 °C	89	59 _h
	ISE temperature	3	754	02F2 _h	Float	5 °C	89	59 _h
	ISE temperature	4	755	02F3 _h	Float	5 °C	89	59 _h
	ISE temperature	5	756	02F4 _h	Float	5 °C	89	59 _h
	ISE temperature	6	757	02F5 _h	Float	5 °C	89	59 _h
	ISE temperature	7	758	02F6 _h	Float	5 °C	89	59 _h
	ISE temperature	8	759	02F7 _h	Float	5 °C	89	59 _h
	ISE temperature damped	1	608	0260 _h	Float	5 °C	89	59 _h
	ISE temperature damped	2	609	0261 _h	Float	5 °C	89	59 _h
	ISE temperature damped	3	610	0262 _h	Float	5 °C	89	59 _h
	ISE temperature damped	4	611	0263 _h	Float	5 °C	89	59 _h
	ISE temperature damped	5	612	0264 _h	Float	5 °C	89	59 _h
	ISE temperature damped	6	613	0265 _h	Float	5 °C	89	59 _h
	ISE temperature damped	7	614	0266 _h	Float	5 °C	89	59 _h
	ISE temperature damped	8	615	0267 _h	Float	5 °C	89	59 _h
	ISE voltage CH0	1	712	02C8 _h	Float	5 V	111	6F _h
	ISE voltage CH0	2	713	02C9 _h	Float	5 V	111	6F _h
	ISE voltage CH0	3	714	02CA _h	Float	5 V	111	6F _h
	ISE voltage CH0	4	715	02CB _h	Float	5 V	111	6F _h
	ISE voltage CH0	5	716	02CC _h	Float	5 V	111	6F _h
	ISE voltage CH0	6	717	02CD _h	Float	5 V	111	6F _h
	ISE voltage CH0	7	718	02CE _h	Float	5 V	111	6F _h
	ISE voltage CH0	8	719	02CF _h	Float	5 V	111	6F _h
	ISE voltage CH1	1	704	02C0 _h	Float	5 V	111	6F _h
	ISE voltage CH1	2	705	02C1 _h	Float	5 V	111	6F _h
	ISE voltage CH1	3	706	02C2 _h	Float	5 V	111	6F _h
	ISE voltage CH1	4	707	02C3 _h	Float	5 V	111	6F _h
	ISE voltage CH1	5	708	02C4 _h	Float	5 V	111	6F _h
	ISE voltage CH1	6	709	02C5 _h	Float	5 V	111	6F _h
	ISE voltage CH1	7	710	02C6 _h	Float	5 V	111	6F _h
	ISE voltage CH1	8	711	02C7 _h	Float	5 V	111	6F _h
	ISE voltage CH2	1	696	02B8 _h	Float	5 V	111	6F _h
	ISE voltage CH2	2	697	02B9 _h	Float	5 V	111	6F _h
	ISE voltage CH2	3	698	02BA _h	Float	5 V	111	6F _h
	ISE voltage CH2	4	699	02BB _h	Float	5 V	111	6F _h
	ISE voltage CH2	5	700	02BC _h	Float	5 V	111	6F _h
	ISE voltage CH2	6	701	02BD _h	Float	5 V	111	6F _h
	ISE voltage CH2	7	702	02BE _h	Float	5 V	111	6F _h
	ISE voltage CH2	8	703	02BF _h	Float	5 V	111	6F _h
	ISE voltage CH3	1	688	02B0 _h	Float	5 V	111	6F _h
	ISE voltage CH3	2	689	02B1 _h	Float	5 V	111	6F _h
	ISE voltage CH3	3	690	02B2 _h	Float	5 V	111	6F _h
	ISE voltage CH3	4	691	02B3 _h	Float	5 V	111	6F _h
	ISE voltage CH3	5	692	02B4 _h	Float	5 V	111	6F _h
	ISE voltage CH3	6	693	02B5 _h	Float	5 V	111	6F _h
	ISE voltage CH3	7	694	02B6 _h	Float	5 V	111	6F _h
	ISE voltage CH3	8	695	02B7 _h	Float	5 V	111	6F _h
	ISE voltage damped CH0	1	544	0220 _h	Float	5 V	111	6F _h
	ISE voltage damped CH0	2	545	0221 _h	Float	5 V	111	6F _h
	ISE voltage damped CH0	3	546	0222 _h	Float	5 V	111	6F _h
	ISE voltage damped CH0	4	547	0223 _h	Float	5 V	111	6F _h
	ISE voltage damped CH0	5	548	0224 _h	Float	5 V	111	6F _h
	ISE voltage damped CH0	6	549	0225 _h	Float	5 V	111	6F _h
	ISE voltage damped CH0	7	550	0226 _h	Float	5 V	111	6F _h
	ISE voltage damped CH0	8	551	0227 _h	Float	5 V	111	6F _h
	ISE voltage damped CH1	1	552	0228 _h	Float	5 V	111	6F _h
	ISE voltage damped CH1	2	553	0229 _h	Float	5 V	111	6F _h
	ISE voltage damped CH1	3	554	022A _h	Float	5 V	111	6F _h
	ISE voltage damped CH1	4	555	022B _h	Float	5 V	111	6F _h
	ISE voltage damped CH1	5	556	022C _h	Float	5 V	111	6F _h
	ISE voltage damped CH1	6	557	022D _h	Float	5 V	111	6F _h
	ISE voltage damped CH1	7	558	022E _h	Float	5 V	111	6F _h
	ISE voltage damped CH1	8	559	022F _h	Float	5 V	111	6F _h
	ISE voltage damped CH2	1	560	0230 _h	Float	5 V	111	6F _h
	ISE voltage damped CH2	2	561	0231 _h	Float	5 V	111	6F _h
	ISE voltage damped CH2	3	562	0232 _h	Float	5 V	111	6F _h
	ISE voltage damped CH2	4	563	0233 _h	Float	5 V	111	6F _h
	ISE voltage damped CH2	5	564	0234 _h	Float	5 V	111	6F _h
	ISE voltage damped CH2	6	565	0235 _h	Float	5 V	111	6F _h
	ISE voltage damped CH2	7	566	0236 _h	Float	5 V	111	6F _h
	ISE voltage damped CH2	8	567	0237 _h	Float	5 V	111	6F _h
	ISE voltage damped CH3	1	648	0288 _h	Float	5 V	111	6F _h
	ISE voltage damped CH3	2	649	0289 _h	Float	5 V	111	6F _h
	ISE voltage damped CH3	3	650	028A _h	Float	5 V	111	6F _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	ISE voltage damped CH3	4	651	028B _h	Float	5 V	111	6F _h
	ISE voltage damped CH3	5	652	028C _h	Float	5 V	111	6F _h
	ISE voltage damped CH3	6	653	028D _h	Float	5 V	111	6F _h
	ISE voltage damped CH3	7	654	028E _h	Float	5 V	111	6F _h
	ISE voltage damped CH3	8	655	028F _h	Float	5 V	111	6F _h

Conductivity values

	Conductivity concentration	1	78	004E _h	Float	5 %	7	07 _h
	Conductivity concentration	2	79	004F _h	Float	5 %	7	07 _h
	Conductivity concentration	3	80	0050 _h	Float	5 %	7	07 _h
	Conductivity concentration	4	81	0051 _h	Float	5 %	7	07 _h
	Conductivity concentration	5	82	0052 _h	Float	5 %	7	07 _h
	Conductivity concentration	6	83	0053 _h	Float	5 %	7	07 _h
	Conductivity concentration	7	84	0054 _h	Float	5 %	7	07 _h
	Conductivity concentration	8	85	0055 _h	Float	5 %	7	07 _h
	Conductivity conductivity	1	62	003E _h	Float	5 S/m	76	4C _h
	Conductivity conductivity	2	63	003F _h	Float	5 S/m	76	4C _h
	Conductivity conductivity	3	64	0040 _h	Float	5 S/m	76	4C _h
	Conductivity conductivity	4	65	0041 _h	Float	5 S/m	76	4C _h
	Conductivity conductivity	5	66	0042 _h	Float	5 S/m	76	4C _h
	Conductivity conductivity	6	67	0043 _h	Float	5 S/m	76	4C _h
	Conductivity conductivity	7	68	0044 _h	Float	5 S/m	76	4C _h
	Conductivity conductivity	8	69	0045 _h	Float	5 S/m	76	4C _h
	Conductivity conductivity damped	1	70	0046 _h	Float	5 S/m	76	4C _h
	Conductivity conductivity damped	2	71	0047 _h	Float	5 S/m	76	4C _h
	Conductivity conductivity damped	3	72	0048 _h	Float	5 S/m	76	4C _h
	Conductivity conductivity damped	4	73	0049 _h	Float	5 S/m	76	4C _h
	Conductivity conductivity damped	5	74	004A _h	Float	5 S/m	76	4C _h
	Conductivity conductivity damped	6	75	004B _h	Float	5 S/m	76	4C _h
	Conductivity conductivity damped	7	76	004C _h	Float	5 S/m	76	4C _h
	Conductivity conductivity damped	8	77	004D _h	Float	5 S/m	76	4C _h
	Conductivity percent limit	1	102	0066 _h	Float	5 %	7	07 _h
	Conductivity percent limit	2	103	0067 _h	Float	5 %	7	07 _h
	Conductivity percent limit	3	104	0068 _h	Float	5 %	7	07 _h
	Conductivity percent limit	4	105	0069 _h	Float	5 %	7	07 _h
	Conductivity percent limit	5	106	006A _h	Float	5 %	7	07 _h
	Conductivity percent limit	6	107	006B _h	Float	5 %	7	07 _h
	Conductivity percent limit	7	108	006C _h	Float	5 %	7	07 _h
	Conductivity percent limit	8	109	006D _h	Float	5 %	7	07 _h
	Conductivity reciprocal conductivity	1	94	005E _h	Float	5 Ωm	82	52 _h
	Conductivity reciprocal conductivity	2	95	005F _h	Float	5 Ωm	82	52 _h
	Conductivity reciprocal conductivity	3	96	0060 _h	Float	5 Ωm	82	52 _h
	Conductivity reciprocal conductivity	4	97	0061 _h	Float	5 Ωm	82	52 _h
	Conductivity reciprocal conductivity	5	98	0062 _h	Float	5 Ωm	82	52 _h
	Conductivity reciprocal conductivity	6	99	0063 _h	Float	5 Ωm	82	52 _h
	Conductivity reciprocal conductivity	7	100	0064 _h	Float	5 Ωm	82	52 _h
	Conductivity reciprocal conductivity	8	101	0065 _h	Float	5 Ωm	82	52 _h
	Conductivity temp. comp. conductivity	1	86	0056 _h	Float	5 S/m	76	4C _h
	Conductivity temp. comp. conductivity	2	87	0057 _h	Float	5 S/m	76	4C _h
	Conductivity temp. comp. conductivity	3	88	0058 _h	Float	5 S/m	76	4C _h
	Conductivity temp. comp. conductivity	4	89	0059 _h	Float	5 S/m	76	4C _h
	Conductivity temp. comp. conductivity	5	90	005A _h	Float	5 S/m	76	4C _h
	Conductivity temp. comp. conductivity	6	91	005B _h	Float	5 S/m	76	4C _h
	Conductivity temp. comp. conductivity	7	92	005C _h	Float	5 S/m	76	4C _h
	Conductivity temp. comp. conductivity	8	93	005D _h	Float	5 S/m	76	4C _h
	Conductivity temperature	1	46	002E _h	Float	5 °C	89	59 _h
	Conductivity temperature	2	47	002F _h	Float	5 °C	89	59 _h
	Conductivity temperature	3	48	0030 _h	Float	5 °C	89	59 _h
	Conductivity temperature	4	49	0031 _h	Float	5 °C	89	59 _h
	Conductivity temperature	5	50	0032 _h	Float	5 °C	89	59 _h
	Conductivity temperature	6	51	0033 _h	Float	5 °C	89	59 _h
	Conductivity temperature	7	52	0034 _h	Float	5 °C	89	59 _h
	Conductivity temperature	8	53	0035 _h	Float	5 °C	89	59 _h
	Conductivity temperature damped	1	54	0036 _h	Float	5 °C	89	59 _h
	Conductivity temperature damped	2	55	0037 _h	Float	5 °C	89	59 _h
	Conductivity temperature damped	3	56	0038 _h	Float	5 °C	89	59 _h
	Conductivity temperature damped	4	57	0039 _h	Float	5 °C	89	59 _h
	Conductivity temperature damped	5	58	003A _h	Float	5 °C	89	59 _h
	Conductivity temperature damped	6	59	003B _h	Float	5 °C	89	59 _h
	Conductivity temperature damped	7	60	003C _h	Float	5 °C	89	59 _h
	Conductivity temperature damped	8	61	003D _h	Float	5 °C	89	59 _h

Dissolved oxygen values

	Diss. oxy. ambient pressure	1	405	0195 _h	Float	5 Pa	58	3A _h
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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	Diss. oxy. ambient pressure	2	406	0196 _h	Float	5	Pa	58 3A _h
	Diss. oxy. ambient pressure	3	407	0197 _h	Float	5	Pa	58 3A _h
	Diss. oxy. ambient pressure	4	408	0198 _h	Float	5	Pa	58 3A _h
	Diss. oxy. ambient pressure	5	409	0199 _h	Float	5	Pa	58 3A _h
	Diss. oxy. ambient pressure	6	410	019A _h	Float	5	Pa	58 3A _h
	Diss. oxy. ambient pressure	7	411	019B _h	Float	5	Pa	58 3A _h
	Diss. oxy. ambient pressure	8	412	019C _h	Float	5	Pa	58 3A _h
	Diss. oxy. concentration gas	1	421	01A5 _h	Float	5	%Vol	14 0E _h
	Diss. oxy. concentration gas	2	422	01A6 _h	Float	5	%Vol	14 0E _h
	Diss. oxy. concentration gas	3	423	01A7 _h	Float	5	%Vol	14 0E _h
	Diss. oxy. concentration gas	4	424	01A8 _h	Float	5	%Vol	14 0E _h
	Diss. oxy. concentration gas	5	425	01A9 _h	Float	5	%Vol	14 0E _h
	Diss. oxy. concentration gas	6	426	01AA _h	Float	5	%Vol	14 0E _h
	Diss. oxy. concentration gas	7	427	01AB _h	Float	5	%Vol	14 0E _h
	Diss. oxy. concentration gas	8	428	01AC _h	Float	5	%Vol	14 0E _h
	Diss. oxy. concentration liquid	1	413	019D _h	Float	5	kg/m ³	50 32 _h
	Diss. oxy. concentration liquid	2	414	019E _h	Float	5	kg/m ³	50 32 _h
	Diss. oxy. concentration liquid	3	415	019F _h	Float	5	kg/m ³	50 32 _h
	Diss. oxy. concentration liquid	4	416	01A0 _h	Float	5	kg/m ³	50 32 _h
	Diss. oxy. concentration liquid	5	417	01A1 _h	Float	5	kg/m ³	50 32 _h
	Diss. oxy. concentration liquid	6	418	01A2 _h	Float	5	kg/m ³	50 32 _h
	Diss. oxy. concentration liquid	7	419	01A3 _h	Float	5	kg/m ³	50 32 _h
	Diss. oxy. concentration liquid	8	420	01A4 _h	Float	5	kg/m ³	50 32 _h
	Diss. oxy. current compensated	1	142	008E _h	Float	5	A	26 1A _h
	Diss. oxy. current compensated	2	143	008F _h	Float	5	A	26 1A _h
	Diss. oxy. current compensated	3	144	0090 _h	Float	5	A	26 1A _h
	Diss. oxy. current compensated	4	145	0091 _h	Float	5	A	26 1A _h
	Diss. oxy. current compensated	5	146	0092 _h	Float	5	A	26 1A _h
	Diss. oxy. current compensated	6	147	0093 _h	Float	5	A	26 1A _h
	Diss. oxy. current compensated	7	148	0094 _h	Float	5	A	26 1A _h
	Diss. oxy. current compensated	8	149	0095 _h	Float	5	A	26 1A _h
	Diss. oxy. current damped	1	397	018D _h	Float	5	A	26 1A _h
	Diss. oxy. current damped	2	398	018E _h	Float	5	A	26 1A _h
	Diss. oxy. current damped	3	399	018F _h	Float	5	A	26 1A _h
	Diss. oxy. current damped	4	400	0190 _h	Float	5	A	26 1A _h
	Diss. oxy. current damped	5	401	0191 _h	Float	5	A	26 1A _h
	Diss. oxy. current damped	6	402	0192 _h	Float	5	A	26 1A _h
	Diss. oxy. current damped	7	403	0193 _h	Float	5	A	26 1A _h
	Diss. oxy. current damped	8	404	0194 _h	Float	5	A	26 1A _h
	Diss. oxy. current raw	1	134	0086 _h	Float	5	A	26 1A _h
	Diss. oxy. current raw	2	135	0087 _h	Float	5	A	26 1A _h
	Diss. oxy. current raw	3	136	0088 _h	Float	5	A	26 1A _h
	Diss. oxy. current raw	4	137	0089 _h	Float	5	A	26 1A _h
	Diss. oxy. current raw	5	138	008A _h	Float	5	A	26 1A _h
	Diss. oxy. current raw	6	139	008B _h	Float	5	A	26 1A _h
	Diss. oxy. current raw	7	140	008C _h	Float	5	A	26 1A _h
	Diss. oxy. current raw	8	141	008D _h	Float	5	A	26 1A _h
	Diss. oxy. partial pressure	1	150	0096 _h	Float	5	Pa	58 3A _h
	Diss. oxy. partial pressure	2	151	0097 _h	Float	5	Pa	58 3A _h
	Diss. oxy. partial pressure	3	152	0098 _h	Float	5	Pa	58 3A _h
	Diss. oxy. partial pressure	4	153	0099 _h	Float	5	Pa	58 3A _h
	Diss. oxy. partial pressure	5	154	009A _h	Float	5	Pa	58 3A _h
	Diss. oxy. partial pressure	6	155	009B _h	Float	5	Pa	58 3A _h
	Diss. oxy. partial pressure	7	156	009C _h	Float	5	Pa	58 3A _h
	Diss. oxy. partial pressure	8	157	009D _h	Float	5	Pa	58 3A _h
	Diss. oxy. saturation	1	158	009E _h	Float	5	%	7 07 _h
	Diss. oxy. saturation	2	159	009F _h	Float	5	%	7 07 _h
	Diss. oxy. saturation	3	160	00A0 _h	Float	5	%	7 07 _h
	Diss. oxy. saturation	4	161	00A1 _h	Float	5	%	7 07 _h
	Diss. oxy. saturation	5	162	00A2 _h	Float	5	%	7 07 _h
	Diss. oxy. saturation	6	163	00A3 _h	Float	5	%	7 07 _h
	Diss. oxy. saturation	7	164	00A4 _h	Float	5	%	7 07 _h
	Diss. oxy. saturation	8	165	00A5 _h	Float	5	%	7 07 _h
	Diss. oxy. tau raw	1	515	0203 _h	Float	5	s	95 5F _h
	Diss. oxy. tau raw	2	516	0204 _h	Float	5	s	95 5F _h
	Diss. oxy. tau raw	3	517	0205 _h	Float	5	s	95 5F _h
	Diss. oxy. tau raw	4	518	0206 _h	Float	5	s	95 5F _h
	Diss. oxy. tau raw	5	519	0207 _h	Float	5	s	95 5F _h
	Diss. oxy. tau raw	6	520	0208 _h	Float	5	s	95 5F _h
	Diss. oxy. tau raw	7	521	0209 _h	Float	5	s	95 5F _h
	Diss. oxy. tau raw	8	522	020A _h	Float	5	s	95 5F _h
	Diss. oxy. temperature adjusted	1	118	0076 _h	Float	5	°C	89 59 _h
	Diss. oxy. temperature adjusted	2	119	0077 _h	Float	5	°C	89 59 _h
	Diss. oxy. temperature adjusted	3	120	0078 _h	Float	5	°C	89 59 _h
	Diss. oxy. temperature adjusted	4	121	0079 _h	Float	5	°C	89 59 _h
	Diss. oxy. temperature adjusted	5	122	007A _h	Float	5	°C	89 59 _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	Diss. oxy. temperature adjusted	6	123	007B _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature adjusted	7	124	007C _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature adjusted	8	125	007D _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature damped	1	126	007E _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature damped	2	127	007F _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature damped	3	128	0080 _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature damped	4	129	0081 _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature damped	5	130	0082 _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature damped	6	131	0083 _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature damped	7	132	0084 _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature damped	8	133	0085 _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature raw	1	110	006E _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature raw	2	111	006F _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature raw	3	112	0070 _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature raw	4	113	0071 _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature raw	5	114	0072 _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature raw	6	115	0073 _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature raw	7	116	0074 _h	Float	5 °C	89	59 _h
	Diss. oxy. temperature raw	8	117	0075 _h	Float	5 °C	89	59 _h

Chlorine values

	Chlorine concentration	1	2147	0863 _h	Float	5 kg/m ³	50	32 _h
	Chlorine concentration	2	2148	0864 _h	Float	5 kg/m ³	50	32 _h
	Chlorine concentration	3	2149	0865 _h	Float	5 kg/m ³	50	32 _h
	Chlorine concentration	4	2150	0866 _h	Float	5 kg/m ³	50	32 _h
	Chlorine concentration	5	2151	0867 _h	Float	5 kg/m ³	50	32 _h
	Chlorine concentration	6	2152	0868 _h	Float	5 kg/m ³	50	32 _h
	Chlorine concentration	7	2153	0869 _h	Float	5 kg/m ³	50	32 _h
	Chlorine concentration	8	2154	086A _h	Float	5 kg/m ³	50	32 _h
	Chlorine conc. pH compensated	1	2123	084B _h	Float	5 kg/m ³	50	32 _h
	Chlorine conc. pH compensated	2	2124	084C _h	Float	5 kg/m ³	50	32 _h
	Chlorine conc. pH compensated	3	2125	084D _h	Float	5 kg/m ³	50	32 _h
	Chlorine conc. pH compensated	4	2126	084E _h	Float	5 kg/m ³	50	32 _h
	Chlorine conc. pH compensated	5	2127	084F _h	Float	5 kg/m ³	50	32 _h
	Chlorine conc. pH compensated	6	2128	0850 _h	Float	5 kg/m ³	50	32 _h
	Chlorine conc. pH compensated	7	2129	0851 _h	Float	5 kg/m ³	50	32 _h
	Chlorine conc. pH compensated	8	2130	0852 _h	Float	5 kg/m ³	50	32 _h
	Chlorine current	1	2115	0843 _h	Float	5 A	26	1A _h
	Chlorine current	2	2116	0844 _h	Float	5 A	26	1A _h
	Chlorine current	3	2117	0845 _h	Float	5 A	26	1A _h
	Chlorine current	4	2118	0846 _h	Float	5 A	26	1A _h
	Chlorine current	5	2119	0847 _h	Float	5 A	26	1A _h
	Chlorine current	6	2120	0848 _h	Float	5 A	26	1A _h
	Chlorine current	7	2121	0849 _h	Float	5 A	26	1A _h
	Chlorine current	8	2122	084A _h	Float	5 A	26	1A _h
	Chlorine just. temperature	1	2155	086B _h	Float	5 °C	89	59 _h
	Chlorine just. temperature	2	2156	086C _h	Float	5 °C	89	59 _h
	Chlorine just. temperature	3	2157	086D _h	Float	5 °C	89	59 _h
	Chlorine just. temperature	4	2158	086E _h	Float	5 °C	89	59 _h
	Chlorine just. temperature	5	2159	086F _h	Float	5 °C	89	59 _h
	Chlorine just. temperature	6	2160	0870 _h	Float	5 °C	89	59 _h
	Chlorine just. temperature	7	2161	0871 _h	Float	5 °C	89	59 _h
	Chlorine just. temperature	8	2162	0872 _h	Float	5 °C	89	59 _h
	Chlorine pH value	1	2163	0873 _h	Float	5 pH	53	35 _h
	Chlorine pH value	2	2164	0874 _h	Float	5 pH	53	35 _h
	Chlorine pH value	3	2165	0875 _h	Float	5 pH	53	35 _h
	Chlorine pH value	4	2166	0876 _h	Float	5 pH	53	35 _h
	Chlorine pH value	5	2167	0877 _h	Float	5 pH	53	35 _h
	Chlorine pH value	6	2168	0878 _h	Float	5 pH	53	35 _h
	Chlorine pH value	7	2169	0879 _h	Float	5 pH	53	35 _h
	Chlorine pH value	8	2170	087A _h	Float	5 pH	53	35 _h
	Chlorine raw temperature	1	2107	083B _h	Float	5 °C	89	59 _h
	Chlorine raw temperature	2	2108	083C _h	Float	5 °C	89	59 _h
	Chlorine raw temperature	3	2109	083D _h	Float	5 °C	89	59 _h
	Chlorine raw temperature	4	2110	083E _h	Float	5 °C	89	59 _h
	Chlorine raw temperature	5	2111	083F _h	Float	5 °C	89	59 _h
	Chlorine raw temperature	6	2112	0840 _h	Float	5 °C	89	59 _h
	Chlorine raw temperature	7	2113	0841 _h	Float	5 °C	89	59 _h
	Chlorine raw temperature	8	2114	0842 _h	Float	5 °C	89	59 _h
	Chlorine temp. comp. current	1	2131	0853 _h	Float	5 A	26	1A _h
	Chlorine temp. comp. current	2	2132	0854 _h	Float	5 A	26	1A _h
	Chlorine temp. comp. current	3	2133	0855 _h	Float	5 A	26	1A _h
	Chlorine temp. comp. current	4	2134	0856 _h	Float	5 A	26	1A _h
	Chlorine temp. comp. current	5	2135	0857 _h	Float	5 A	26	1A _h
	Chlorine temp. comp. current	6	2136	0858 _h	Float	5 A	26	1A _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	Chlorine temp. comp. current	7	2137	0859 _h	Float	5	A	26 1A _h
	Chlorine temp. comp. current	8	2138	085A _h	Float	5	A	26 1A _h
	Chlorine temp. comp. current damped	1	2099	0833 _h	Float	5	A	26 1A _h
	Chlorine temp. comp. current damped	2	2100	0834 _h	Float	5	A	26 1A _h
	Chlorine temp. comp. current damped	3	2101	0835 _h	Float	5	A	26 1A _h
	Chlorine temp. comp. current damped	4	2102	0836 _h	Float	5	A	26 1A _h
	Chlorine temp. comp. current damped	5	2103	0837 _h	Float	5	A	26 1A _h
	Chlorine temp. comp. current damped	6	2104	0838 _h	Float	5	A	26 1A _h
	Chlorine temp. comp. current damped	7	2105	0839 _h	Float	5	A	26 1A _h
	Chlorine temp. comp. current damped	8	2106	083A _h	Float	5	A	26 1A _h
	Chlorine temperature damped	1	2139	085B _h	Float	5	°C	89 59 _h
	Chlorine temperature damped	2	2140	085C _h	Float	5	°C	89 59 _h
	Chlorine temperature damped	3	2141	085D _h	Float	5	°C	89 59 _h
	Chlorine temperature damped	4	2142	085E _h	Float	5	°C	89 59 _h
	Chlorine temperature damped	5	2143	085F _h	Float	5	°C	89 59 _h
	Chlorine temperature damped	6	2144	0860 _h	Float	5	°C	89 59 _h
	Chlorine temperature damped	7	2145	0861 _h	Float	5	°C	89 59 _h
	Chlorine temperature damped	8	2146	0862 _h	Float	5	°C	89 59 _h

Turbidity values

	Turbidity temperature	1	294	0126 _h	Float	5	°C	89 59 _h
	Turbidity temperature	2	295	0127 _h	Float	5	°C	89 59 _h
	Turbidity temperature	3	296	0128 _h	Float	5	°C	89 59 _h
	Turbidity temperature	4	297	0129 _h	Float	5	°C	89 59 _h
	Turbidity temperature	5	298	012A _h	Float	5	°C	89 59 _h
	Turbidity temperature	6	299	012B _h	Float	5	°C	89 59 _h
	Turbidity temperature	7	300	012C _h	Float	5	°C	89 59 _h
	Turbidity temperature	8	301	012D _h	Float	5	°C	89 59 _h
	Turbidity temperature damped	1	302	012E _h	Float	5	°C	89 59 _h
	Turbidity temperature damped	2	303	012F _h	Float	5	°C	89 59 _h
	Turbidity temperature damped	3	304	0130 _h	Float	5	°C	89 59 _h
	Turbidity temperature damped	4	305	0131 _h	Float	5	°C	89 59 _h
	Turbidity temperature damped	5	306	0132 _h	Float	5	°C	89 59 _h
	Turbidity temperature damped	6	307	0133 _h	Float	5	°C	89 59 _h
	Turbidity temperature damped	7	308	0134 _h	Float	5	°C	89 59 _h
	Turbidity temperature damped	8	309	0135 _h	Float	5	°C	89 59 _h
	Turbidity turbidity	1	310	0136 _h	Float	5	FNU	33 21 _h
	Turbidity turbidity	2	311	0137 _h	Float	5	FNU	33 21 _h
	Turbidity turbidity	3	312	0138 _h	Float	5	FNU	33 21 _h
	Turbidity turbidity	4	313	0139 _h	Float	5	FNU	33 21 _h
	Turbidity turbidity	5	314	013A _h	Float	5	FNU	33 21 _h
	Turbidity turbidity	6	315	013B _h	Float	5	FNU	33 21 _h
	Turbidity turbidity	7	316	013C _h	Float	5	FNU	33 21 _h
	Turbidity turbidity	8	317	013D _h	Float	5	FNU	33 21 _h
	Turbidity turbidity cust.	1	379	017B _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust.	2	380	017C _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust.	3	381	017D _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust.	4	382	017E _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust.	5	383	017F _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust.	6	384	0180 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust.	7	385	0181 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust.	8	386	0182 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent	1	447	01BF _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent	2	448	01C0 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent	3	449	01C1 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent	4	450	01C2 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent	5	451	01C3 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent	6	452	01C4 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent	7	453	01C5 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent	8	454	01C6 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm	1	431	01AF _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm	2	432	01B0 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm	3	433	01B1 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm	4	434	01B2 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm	5	435	01B3 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm	6	436	01B4 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm	7	437	01B5 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm	8	438	01B6 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust. damped	1	387	0183 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust. damped	2	388	0184 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust. damped	3	389	0185 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust. damped	4	390	0186 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust. damped	5	391	0187 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust. damped	6	392	0188 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity cust. damped	7	393	0189 _h	Float	5	kg/m ³	50 32 _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	Turbidity turbidity cust. damped	8	394	018A _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity damped	1	318	013E _h	Float	5	FNU	33 21 _h
	Turbidity turbidity damped	2	319	013F _h	Float	5	FNU	33 21 _h
	Turbidity turbidity damped	3	320	0140 _h	Float	5	FNU	33 21 _h
	Turbidity turbidity damped	4	321	0141 _h	Float	5	FNU	33 21 _h
	Turbidity turbidity damped	5	322	0142 _h	Float	5	FNU	33 21 _h
	Turbidity turbidity damped	6	323	0143 _h	Float	5	FNU	33 21 _h
	Turbidity turbidity damped	7	324	0144 _h	Float	5	FNU	33 21 _h
	Turbidity turbidity damped	8	325	0145 _h	Float	5	FNU	33 21 _h
	Turbidity turbidity percent damped	1	455	01C7 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent damped	2	456	01C8 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent damped	3	457	01C9 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent damped	4	458	01CA _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent damped	5	459	01CB _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent damped	6	460	01CC _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent damped	7	461	01CD _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity percent damped	8	462	01CE _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm damped	1	439	01B7 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm damped	2	440	01B8 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm damped	3	441	01B9 _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm damped	4	442	01BA _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm damped	5	443	01BB _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm damped	6	444	01BC _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm damped	7	445	01BD _h	Float	5	kg/m ³	50 32 _h
	Turbidity turbidity ppm damped	8	446	01BE _h	Float	5	kg/m ³	50 32 _h

Nitrate values

	Nitrate	1	182	00B6 _h	Float	5	kg/m ³	50 32 _h
	Nitrate	2	183	00B7 _h	Float	5	kg/m ³	50 32 _h
	Nitrate	3	184	00B8 _h	Float	5	kg/m ³	50 32 _h
	Nitrate	4	185	00B9 _h	Float	5	kg/m ³	50 32 _h
	Nitrate	5	186	00BA _h	Float	5	kg/m ³	50 32 _h
	Nitrate	6	187	00BB _h	Float	5	kg/m ³	50 32 _h
	Nitrate	7	188	00BC _h	Float	5	kg/m ³	50 32 _h
	Nitrate	8	189	00BD _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3	1	363	016B _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3	2	364	016C _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3	3	365	016D _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3	4	366	016E _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3	5	367	016F _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3	6	368	0170 _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3	7	369	0171 _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3	8	370	0172 _h	Float	5	kg/m ³	50 32 _h
	Nitrate damped	1	190	00BE _h	Float	5	kg/m ³	50 32 _h
	Nitrate damped	2	191	00BF _h	Float	5	kg/m ³	50 32 _h
	Nitrate damped	3	192	00C0 _h	Float	5	kg/m ³	50 32 _h
	Nitrate damped	4	193	00C1 _h	Float	5	kg/m ³	50 32 _h
	Nitrate damped	5	194	00C2 _h	Float	5	kg/m ³	50 32 _h
	Nitrate damped	6	195	00C3 _h	Float	5	kg/m ³	50 32 _h
	Nitrate damped	7	196	00C4 _h	Float	5	kg/m ³	50 32 _h
	Nitrate damped	8	197	00C5 _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3 damped	1	371	0173 _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3 damped	2	372	0174 _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3 damped	3	373	0175 _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3 damped	4	374	0176 _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3 damped	5	375	0177 _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3 damped	6	376	0178 _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3 damped	7	377	0179 _h	Float	5	kg/m ³	50 32 _h
	Nitrate NO3 damped	8	378	017A _h	Float	5	kg/m ³	50 32 _h
	Nitrate temperature	1	166	00A6 _h	Float	5	°C	89 59 _h
	Nitrate temperature	2	167	00A7 _h	Float	5	°C	89 59 _h
	Nitrate temperature	3	168	00A8 _h	Float	5	°C	89 59 _h
	Nitrate temperature	4	169	00A9 _h	Float	5	°C	89 59 _h
	Nitrate temperature	5	170	00AA _h	Float	5	°C	89 59 _h
	Nitrate temperature	6	171	00AB _h	Float	5	°C	89 59 _h
	Nitrate temperature	7	172	00AC _h	Float	5	°C	89 59 _h
	Nitrate temperature	8	173	00AD _h	Float	5	°C	89 59 _h
	Nitrate temperature damped	1	174	00AE _h	Float	5	°C	89 59 _h
	Nitrate temperature damped	2	175	00AF _h	Float	5	°C	89 59 _h
	Nitrate temperature damped	3	176	00B0 _h	Float	5	°C	89 59 _h
	Nitrate temperature damped	4	177	00B1 _h	Float	5	°C	89 59 _h
	Nitrate temperature damped	5	178	00B2 _h	Float	5	°C	89 59 _h
	Nitrate temperature damped	6	179	00B3 _h	Float	5	°C	89 59 _h
	Nitrate temperature damped	7	180	00B4 _h	Float	5	°C	89 59 _h
	Nitrate temperature damped	8	181	00B5 _h	Float	5	°C	89 59 _h

Liquistation CSFxx HART Field Device Specification

Menu label	Parameter	Channel	ID	Type	Size	Unit
SAC values						
	SAC absorption	1	880 0370 _h	Float	5	- 0 00 _h
	SAC absorption	2	881 0371 _h	Float	5	- 0 00 _h
	SAC absorption	3	882 0372 _h	Float	5	- 0 00 _h
	SAC absorption	4	883 0373 _h	Float	5	- 0 00 _h
	SAC absorption	5	884 0374 _h	Float	5	- 0 00 _h
	SAC absorption	6	885 0375 _h	Float	5	- 0 00 _h
	SAC absorption	7	886 0376 _h	Float	5	- 0 00 _h
	SAC absorption	8	887 0377 _h	Float	5	- 0 00 _h
	SAC absorption damped	1	904 0388 _h	Float	5	- 0 00 _h
	SAC absorption damped	2	905 0389 _h	Float	5	- 0 00 _h
	SAC absorption damped	3	906 038A _h	Float	5	- 0 00 _h
	SAC absorption damped	4	907 038B _h	Float	5	- 0 00 _h
	SAC absorption damped	5	908 038C _h	Float	5	- 0 00 _h
	SAC absorption damped	6	909 038D _h	Float	5	- 0 00 _h
	SAC absorption damped	7	910 038E _h	Float	5	- 0 00 _h
	SAC absorption damped	8	911 038F _h	Float	5	- 0 00 _h
	SAC BOD	1	864 0360 _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD	2	865 0361 _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD	3	866 0362 _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD	4	867 0363 _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD	5	868 0364 _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD	6	869 0365 _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD	7	870 0366 _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD	8	871 0367 _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD damped	1	840 0348 _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD damped	2	841 0349 _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD damped	3	842 034A _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD damped	4	843 034B _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD damped	5	844 034C _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD damped	6	845 034D _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD damped	7	846 034E _h	Float	5	kg/m ³ 50 32 _h
	SAC BOD damped	8	847 034F _h	Float	5	kg/m ³ 50 32 _h
	SAC COD	1	816 0330 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD	2	817 0331 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD	3	818 0332 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD	4	819 0333 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD	5	820 0334 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD	6	821 0335 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD	7	822 0336 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD	8	823 0337 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD damped	1	784 0310 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD damped	2	785 0311 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD damped	3	786 0312 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD damped	4	787 0313 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD damped	5	788 0314 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD damped	6	789 0315 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD damped	7	790 0316 _h	Float	5	kg/m ³ 50 32 _h
	SAC COD damped	8	791 0317 _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC	1	792 0318 _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC	2	793 0319 _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC	3	794 031A _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC	4	795 031B _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC	5	796 031C _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC	6	797 031D _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC	7	798 031E _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC	8	799 031F _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC damped	1	832 0340 _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC damped	2	833 0341 _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC damped	3	834 0342 _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC damped	4	835 0343 _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC damped	5	836 0344 _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC damped	6	837 0345 _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC damped	7	838 0346 _h	Float	5	kg/m ³ 50 32 _h
	SAC DOC damped	8	839 0347 _h	Float	5	kg/m ³ 50 32 _h
	SAC SAC	1	896 0380 _h	Float	5	1/m 11 0B _h
	SAC SAC	2	897 0381 _h	Float	5	1/m 11 0B _h
	SAC SAC	3	898 0382 _h	Float	5	1/m 11 0B _h
	SAC SAC	4	899 0383 _h	Float	5	1/m 11 0B _h
	SAC SAC	5	900 0384 _h	Float	5	1/m 11 0B _h
	SAC SAC	6	901 0385 _h	Float	5	1/m 11 0B _h
	SAC SAC	7	902 0386 _h	Float	5	1/m 11 0B _h
	SAC SAC	8	903 0387 _h	Float	5	1/m 11 0B _h
	SAC SAC damped	1	824 0338 _h	Float	5	1/m 11 0B _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	SAC SAC damped	2	825	0339 _h	Float	5	1/m	11 0B _h
	SAC SAC damped	3	826	033A _h	Float	5	1/m	11 0B _h
	SAC SAC damped	4	827	033B _h	Float	5	1/m	11 0B _h
	SAC SAC damped	5	828	033C _h	Float	5	1/m	11 0B _h
	SAC SAC damped	6	829	033D _h	Float	5	1/m	11 0B _h
	SAC SAC damped	7	830	033E _h	Float	5	1/m	11 0B _h
	SAC SAC damped	8	831	033F _h	Float	5	1/m	11 0B _h
	SAC temperature	1	872	0368 _h	Float	5	°C	89 59 _h
	SAC temperature	2	873	0369 _h	Float	5	°C	89 59 _h
	SAC temperature	3	874	036A _h	Float	5	°C	89 59 _h
	SAC temperature	4	875	036B _h	Float	5	°C	89 59 _h
	SAC temperature	5	876	036C _h	Float	5	°C	89 59 _h
	SAC temperature	6	877	036D _h	Float	5	°C	89 59 _h
	SAC temperature	7	878	036E _h	Float	5	°C	89 59 _h
	SAC temperature	8	879	036F _h	Float	5	°C	89 59 _h
	SAC temperature damped	1	856	0358 _h	Float	5	°C	89 59 _h
	SAC temperature damped	2	857	0359 _h	Float	5	°C	89 59 _h
	SAC temperature damped	3	858	035A _h	Float	5	°C	89 59 _h
	SAC temperature damped	4	859	035B _h	Float	5	°C	89 59 _h
	SAC temperature damped	5	860	035C _h	Float	5	°C	89 59 _h
	SAC temperature damped	6	861	035D _h	Float	5	°C	89 59 _h
	SAC temperature damped	7	862	035E _h	Float	5	°C	89 59 _h
	SAC temperature damped	8	863	035F _h	Float	5	°C	89 59 _h
	SAC TOC	1	800	0320 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC	2	801	0321 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC	3	802	0322 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC	4	803	0323 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC	5	804	0324 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC	6	805	0325 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC	7	806	0326 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC	8	807	0327 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC damped	1	848	0350 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC damped	2	849	0351 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC damped	3	850	0352 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC damped	4	851	0353 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC damped	5	852	0354 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC damped	6	853	0355 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC damped	7	854	0356 _h	Float	5	kg/m ³	50 32 _h
	SAC TOC damped	8	855	0357 _h	Float	5	kg/m ³	50 32 _h
	SAC transmission	1	808	0328 _h	Float	5	%	7 07 _h
	SAC transmission	2	809	0329 _h	Float	5	%	7 07 _h
	SAC transmission	3	810	032A _h	Float	5	%	7 07 _h
	SAC transmission	4	811	032B _h	Float	5	%	7 07 _h
	SAC transmission	5	812	032C _h	Float	5	%	7 07 _h
	SAC transmission	6	813	032D _h	Float	5	%	7 07 _h
	SAC transmission	7	814	032E _h	Float	5	%	7 07 _h
	SAC transmission	8	815	032F _h	Float	5	%	7 07 _h
	SAC transmission damped	1	888	0378 _h	Float	5	%	7 07 _h
	SAC transmission damped	2	889	0379 _h	Float	5	%	7 07 _h
	SAC transmission damped	3	890	037A _h	Float	5	%	7 07 _h
	SAC transmission damped	4	891	037B _h	Float	5	%	7 07 _h
	SAC transmission damped	5	892	037C _h	Float	5	%	7 07 _h
	SAC transmission damped	6	893	037D _h	Float	5	%	7 07 _h
	SAC transmission damped	7	894	037E _h	Float	5	%	7 07 _h
	SAC transmission damped	8	895	037F _h	Float	5	%	7 07 _h

Ultrasonic interface values

	UIS level	1	2083	0823 _h	Float	5	m	43 2B _h
	UIS level	2	2084	0824 _h	Float	5	m	43 2B _h
	UIS level	3	2085	0825 _h	Float	5	m	43 2B _h
	UIS level	4	2086	0826 _h	Float	5	m	43 2B _h
	UIS level	5	2087	0827 _h	Float	5	m	43 2B _h
	UIS level	6	2088	0828 _h	Float	5	m	43 2B _h
	UIS level	7	2089	0829 _h	Float	5	m	43 2B _h
	UIS level	8	2090	082A _h	Float	5	m	43 2B _h
	UIS turbidity	1	2091	082B _h	Float	5	FNU	33 21 _h
	UIS turbidity	2	2092	082C _h	Float	5	FNU	33 21 _h
	UIS turbidity	3	2093	082D _h	Float	5	FNU	33 21 _h
	UIS turbidity	4	2094	082E _h	Float	5	FNU	33 21 _h
	UIS turbidity	5	2095	082F _h	Float	5	FNU	33 21 _h
	UIS turbidity	6	2096	0830 _h	Float	5	FNU	33 21 _h
	UIS turbidity	7	2097	0831 _h	Float	5	FNU	33 21 _h
	UIS turbidity	8	2098	0832 _h	Float	5	FNU	33 21 _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
Analog input values								
	Input analog	1	335	014F _h	Float	5	°C	89 59 _h
	Input analog	2	336	0150 _h	Float	5	°C	89 59 _h
	Input analog	3	337	0151 _h	Float	5	°C	89 59 _h
Current input values								
	Input current flow rate	1	468	01D4 _h	Float	5	m ³ /s	102 66 _h
	Input current flow rate	2	469	01D5 _h	Float	5	m ³ /s	102 66 _h
	Input current flow rate	3	470	01D6 _h	Float	5	m ³ /s	102 66 _h
	Input current flow rate	4	471	01D7 _h	Float	5	m ³ /s	102 66 _h
	Input current flow rate	5	2201	0899 _h	Float	5	m ³ /s	102 66 _h
	Input current flow rate	6	2202	089A _h	Float	5	m ³ /s	102 66 _h
	Input current parameter	1	476	01DC _h	Float	5	User def.	254 FE _h
	Input current parameter	2	477	01DD _h	Float	5	User def.	254 FE _h
	Input current parameter	3	478	01DE _h	Float	5	User def.	254 FE _h
	Input current parameter	4	479	01DF _h	Float	5	User def.	254 FE _h
	Input current parameter	5	2205	089D _h	Float	5	User def.	254 FE _h
	Input current parameter	6	2206	089E _h	Float	5	User def.	254 FE _h
	Input current totalized flow rate	1	472	01D8 _h	Float	5	m ³	118 76 _h
	Input current totalized flow rate	2	473	01D9 _h	Float	5	m ³	118 76 _h
	Input current totalized flow rate	3	474	01DA _h	Float	5	m ³	118 76 _h
	Input current totalized flow rate	4	475	01DB _h	Float	5	m ³	118 76 _h
	Input current totalized flow rate	5	2203	089B _h	Float	5	m ³	118 76 _h
	Input current totalized flow rate	6	2204	089C _h	Float	5	m ³	118 76 _h
	Input current	1	464	01D0 _h	Float	5	A	26 1A _h
	Input current	2	465	01D1 _h	Float	5	A	26 1A _h
	Input current	3	466	01D2 _h	Float	5	A	26 1A _h
	Input current	4	467	01D3 _h	Float	5	A	26 1A _h
	Input current	5	2199	0897 _h	Float	5	A	26 1A _h
	Input current	6	2200	0898 _h	Float	5	A	26 1A _h
Binary input values								
	Input binary edge counter	1	526	020E _h	Float	5	-	0 00 _h
	Input binary edge counter	2	527	020F _h	Float	5	-	0 00 _h
	Input binary edge counter	3	528	0210 _h	Float	5	-	0 00 _h
	Input binary edge counter	4	529	0211 _h	Float	5	-	0 00 _h
	Input binary edge counter	5	530	0212 _h	Float	5	-	0 00 _h
	Input binary edge counter	6	531	0213 _h	Float	5	-	0 00 _h
	Input binary edges per second	1	532	0214 _h	Float	5	-	0 00 _h
	Input binary edges per second	2	533	0215 _h	Float	5	-	0 00 _h
	Input binary edges per second	3	534	0216 _h	Float	5	-	0 00 _h
	Input binary edges per second	4	535	0217 _h	Float	5	-	0 00 _h
	Input binary edges per second	5	536	0218 _h	Float	5	-	0 00 _h
	Input binary edges per second	6	537	0219 _h	Float	5	-	0 00 _h
	Input binary flow rate per time	1	480	01E0 _h	Float	5	m ³ /s	102 66 _h
	Input binary flow rate per time	2	481	01E1 _h	Float	5	m ³ /s	102 66 _h
	Input binary flow rate per time	3	482	01E2 _h	Float	5	m ³ /s	102 66 _h
	Input binary flow rate per time	4	483	01E3 _h	Float	5	m ³ /s	102 66 _h
	Input binary flow rate per time	5	484	01E4 _h	Float	5	m ³ /s	102 66 _h
	Input binary flow rate per time	6	485	01E5 _h	Float	5	m ³ /s	102 66 _h
	Input binary flow rate totalized	1	486	01E6 _h	Float	5	m ³	118 76 _h
	Input binary flow rate totalized	2	487	01E7 _h	Float	5	m ³	118 76 _h
	Input binary flow rate totalized	3	488	01E8 _h	Float	5	m ³	118 76 _h
	Input binary flow rate totalized	4	489	01E9 _h	Float	5	m ³	118 76 _h
	Input binary flow rate totalized	5	490	01EA _h	Float	5	m ³	118 76 _h
	Input binary flow rate totalized	6	491	01EB _h	Float	5	m ³	118 76 _h
	Input binary rainfall per time	1	492	01EC _h	Float	5	mm/min	55 37 _h
	Input binary rainfall per time	2	493	01ED _h	Float	5	mm/min	55 37 _h
	Input binary rainfall per time	3	494	01EE _h	Float	5	mm/min	55 37 _h
	Input binary rainfall per time	4	495	01EF _h	Float	5	mm/min	55 37 _h
	Input binary rainfall per time	5	496	01F0 _h	Float	5	mm/min	55 37 _h
	Input binary rainfall per time	6	497	01F1 _h	Float	5	mm/min	55 37 _h
	Input binary rainfall totalized	1	498	01F2 _h	Float	5	m	43 2B _h
	Input binary rainfall totalized	2	499	01F3 _h	Float	5	m	43 2B _h
	Input binary rainfall totalized	3	500	01F4 _h	Float	5	m	43 2B _h
	Input binary rainfall totalized	4	501	01F5 _h	Float	5	m	43 2B _h
	Input binary rainfall totalized	5	502	01F6 _h	Float	5	m	43 2B _h
	Input binary rainfall totalized	6	503	01F7 _h	Float	5	m	43 2B _h
	Input binary	1	338	0152 _h	Float	5	-	0 00 _h
	Input binary	2	339	0153 _h	Float	5	-	0 00 _h
	Input binary	3	340	0154 _h	Float	5	-	0 00 _h
	Input binary	4	341	0155 _h	Float	5	-	0 00 _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	Input binary	5	342	0156 _h	Float	5	-	0 00 _h
	Input binary	6	343	0157 _h	Float	5	-	0 00 _h

Mathematical function values

	Degassed conductivity	1	962	03C2 _h	Float	5	kg/m ³	50 32 _h
	Degassed conductivity	2	963	03C3 _h	Float	5	kg/m ³	50 32 _h
	Degassed conductivity	3	964	03C4 _h	Float	5	kg/m ³	50 32 _h
	Degassed conductivity	4	965	03C5 _h	Float	5	kg/m ³	50 32 _h
	Degassed conductivity	5	966	03C6 _h	Float	5	kg/m ³	50 32 _h
	Degassed conductivity	6	967	03C7 _h	Float	5	kg/m ³	50 32 _h
	Difference	1	974	03CE _h	Float	5		
	Difference	2	975	03CF _h	Float	5		
	Difference	3	976	03D0 _h	Float	5		
	Difference	4	977	03D1 _h	Float	5		
	Difference	5	978	03D2 _h	Float	5		
	Difference	6	979	03D3 _h	Float	5		
	Difference conductivity	1	944	03B0 _h	Float	5	S/m	76 4C _h
	Difference conductivity	2	945	03B1 _h	Float	5	S/m	76 4C _h
	Difference conductivity	3	946	03B2 _h	Float	5	S/m	76 4C _h
	Difference conductivity	4	947	03B3 _h	Float	5	S/m	76 4C _h
	Difference conductivity	5	948	03B4 _h	Float	5	S/m	76 4C _h
	Difference conductivity	6	949	03B5 _h	Float	5	S/m	76 4C _h
	pH calculation	1	968	03C8 _h	Float	5	pH	53 35 _h
	pH calculation	2	969	03C9 _h	Float	5	pH	53 35 _h
	pH calculation	3	970	03CA _h	Float	5	pH	53 35 _h
	pH calculation	4	971	03CB _h	Float	5	pH	53 35 _h
	pH calculation	5	972	03CC _h	Float	5	pH	53 35 _h
	pH calculation	6	973	03CD _h	Float	5	pH	53 35 _h
	Redundancy	1	950	03B6 _h	Float	5		
	Redundancy	2	951	03B7 _h	Float	5		
	Redundancy	3	952	03B8 _h	Float	5		
	Redundancy	4	953	03B9 _h	Float	5		
	Redundancy	5	954	03BA _h	Float	5		
	Redundancy	6	955	03BB _h	Float	5		
	rH calculation	1	956	03BC _h	Float	5	rH	68 44 _h
	rH calculation	2	957	03BD _h	Float	5	rH	68 44 _h
	rH calculation	3	958	03BE _h	Float	5	rH	68 44 _h
	rH calculation	4	959	03BF _h	Float	5	rH	68 44 _h
	rH calculation	5	960	03C0 _h	Float	5	rH	68 44 _h
	rH calculation	6	961	03C1 _h	Float	5	rH	68 44 _h

Controller values

	Controller output bipolar	1	429	01AD _h	Float	5	-	0 00 _h
	Controller output bipolar	2	430	01AE _h	Float	5	-	0 00 _h
	Controller output unipolar minus	1	506	01FA _h	Float	5	-	0 00 _h
	Controller output unipolar minus	2	507	01FB _h	Float	5	-	0 00 _h
	Controller output unipolar plus	1	504	01F8 _h	Float	5	-	0 00 _h
	Controller output unipolar plus	2	505	01F9 _h	Float	5	-	0 00 _h

Current output values

	Output current	1	346	015A _h	Float	5	A	26 1A _h
	Output current	2	347	015B _h	Float	5	A	26 1A _h
	Output current	3	348	015C _h	Float	5	A	26 1A _h
	Output current	4	349	015D _h	Float	5	A	26 1A _h
	Output current	5	350	015E _h	Float	5	A	26 1A _h
	Output current	6	351	015F _h	Float	5	A	26 1A _h
	Output current	7	352	0160 _h	Float	5	A	26 1A _h
	Output current	8	353	0161 _h	Float	5	A	26 1A _h

Binary output values

	Output binary	1	344	0158 _h	Float	5	-	0 00 _h
	Output binary	2	345	0159 _h	Float	5	-	0 00 _h

Relay output values

	Output alarm relay		525	020D _h	Float	5	-	0 00 _h
	Output relay	1	354	0162 _h	Float	5	-	0 00 _h
	Output relay	2	355	0163 _h	Float	5	-	0 00 _h
	Output relay	3	356	0164 _h	Float	5	-	0 00 _h
	Output relay	4	357	0165 _h	Float	5	-	0 00 _h
	Output relay	5	358	0166 _h	Float	5	-	0 00 _h
	Output relay	6	359	0167 _h	Float	5	-	0 00 _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	Output relay	7	360	0168 _h	Float	5	-	0 00 _h
	Output relay	8	361	0169 _h	Float	5	-	0 00 _h

Limit switch values

	Limit switch value	1	2191	088F _h	Float	5	-	0 00 _h
	Limit switch value	2	2192	0890 _h	Float	5	-	0 00 _h
	Limit switch value	3	2193	0891 _h	Float	5	-	0 00 _h
	Limit switch value	4	2194	0892 _h	Float	5	-	0 00 _h
	Limit switch value	5	2195	0893 _h	Float	5	-	0 00 _h
	Limit switch value	6	2196	0894 _h	Float	5	-	0 00 _h
	Limit switch value	7	2197	0895 _h	Float	5	-	0 00 _h
	Limit switch value	8	2198	0896 _h	Float	5	-	0 00 _h

Sensor extreme values

	Specification max.	1	1409	0581 _h	Float	5		
	Specification max.	2	1410	0582 _h	Float	5		
	Specification max.	3	1411	0583 _h	Float	5		
	Specification max.	4	1412	0584 _h	Float	5		
	Specification max.	5	1413	0585 _h	Float	5		
	Specification max.	6	1414	0586 _h	Float	5		
	Specification max.	7	1415	0587 _h	Float	5		
	Specification max.	8	1416	0588 _h	Float	5		
	Specification min.	1	1433	0599 _h	Float	5		
	Specification min.	2	1434	059A _h	Float	5		
	Specification min.	3	1435	059B _h	Float	5		
	Specification min.	4	1436	059C _h	Float	5		
	Specification min.	5	1437	059D _h	Float	5		
	Specification min.	6	1438	059E _h	Float	5		
	Specification min.	7	1439	059F _h	Float	5		
	Specification min.	8	1440	05A0 _h	Float	5		
	Temperature max.	1	1233	04D1 _h	Float	5	°C	89 59 _h
	Temperature max.	2	1234	04D2 _h	Float	5	°C	89 59 _h
	Temperature max.	3	1235	04D3 _h	Float	5	°C	89 59 _h
	Temperature max.	4	1236	04D4 _h	Float	5	°C	89 59 _h
	Temperature max.	5	1237	04D5 _h	Float	5	°C	89 59 _h
	Temperature max.	6	1238	04D6 _h	Float	5	°C	89 59 _h
	Temperature max.	7	1239	04D7 _h	Float	5	°C	89 59 _h
	Temperature max.	8	1240	04D8 _h	Float	5	°C	89 59 _h
	Temperature min.	1	1089	0441 _h	Float	5	°C	89 59 _h
	Temperature min.	2	1090	0442 _h	Float	5	°C	89 59 _h
	Temperature min.	3	1091	0443 _h	Float	5	°C	89 59 _h
	Temperature min.	4	1092	0444 _h	Float	5	°C	89 59 _h
	Temperature min.	5	1093	0445 _h	Float	5	°C	89 59 _h
	Temperature min.	6	1094	0446 _h	Float	5	°C	89 59 _h
	Temperature min.	7	1095	0447 _h	Float	5	°C	89 59 _h
	Temperature min.	8	1096	0448 _h	Float	5	°C	89 59 _h

Sensor general information

	Hardware version	1	1097	0449 _h	String	17		
	Hardware version	2	1098	044A _h	String	17		
	Hardware version	3	1099	044B _h	String	17		
	Hardware version	4	1100	044C _h	String	17		
	Hardware version	5	1101	044D _h	String	17		
	Hardware version	6	1102	044E _h	String	17		
	Hardware version	7	1103	044F _h	String	17		
	Hardware version	8	1104	0450 _h	String	17		
	Initial operation date	1	1169	0491 _h	Date	7		
	Initial operation date	2	1170	0492 _h	Date	7		
	Initial operation date	3	1171	0493 _h	Date	7		
	Initial operation date	4	1172	0494 _h	Date	7		
	Initial operation date	5	1173	0495 _h	Date	7		
	Initial operation date	6	1174	0496 _h	Date	7		
	Initial operation date	7	1175	0497 _h	Date	7		
	Initial operation date	8	1176	0498 _h	Date	7		
	Manufacturer	1	1073	0431 _h	String	33		
	Manufacturer	2	1074	0432 _h	String	33		
	Manufacturer	3	1075	0433 _h	String	33		
	Manufacturer	4	1076	0434 _h	String	33		
	Manufacturer	5	1077	0435 _h	String	33		
	Manufacturer	6	1078	0436 _h	String	33		
	Manufacturer	7	1079	0437 _h	String	33		
	Manufacturer	8	1080	0438 _h	String	33		
	Manufacturing date	1	1105	0451 _h	Date	7		

Menu label	Parameter	Channel	ID	Type	Size	Unit
	Manufacturing date	2	1106	0452 _h	Date	7
	Manufacturing date	3	1107	0453 _h	Date	7
	Manufacturing date	4	1108	0454 _h	Date	7
	Manufacturing date	5	1109	0455 _h	Date	7
	Manufacturing date	6	1110	0456 _h	Date	7
	Manufacturing date	7	1111	0457 _h	Date	7
	Manufacturing date	8	1112	0458 _h	Date	7
	Order code	1	1185	04A1 _h	String	33
	Order code	2	1186	04A2 _h	String	33
	Order code	3	1187	04A3 _h	String	33
	Order code	4	1188	04A4 _h	String	33
	Order code	5	1189	04A5 _h	String	33
	Order code	6	1190	04A6 _h	String	33
	Order code	7	1191	04A7 _h	String	33
	Order code	8	1192	04A8 _h	String	33
	Serial number	1	1193	04A9 _h	String	17
	Serial number	2	1194	04AA _h	String	17
	Serial number	3	1195	04AB _h	String	17
	Serial number	4	1196	04AC _h	String	17
	Serial number	5	1197	04AD _h	String	17
	Serial number	6	1198	04AE _h	String	17
	Serial number	7	1199	04AF _h	String	17
	Serial number	8	1200	04B0 _h	String	17
	Software version	1	1129	0469 _h	String	17
	Software version	2	1130	046A _h	String	17
	Software version	3	1131	046B _h	String	17
	Software version	4	1132	046C _h	String	17
	Software version	5	1133	046D _h	String	17
	Software version	6	1134	046E _h	String	17
	Software version	7	1135	046F _h	String	17
	Software version	8	1136	0470 _h	String	17
	Tag	1	1081	0439 _h	String	33
	Tag	2	1082	043A _h	String	33
	Tag	3	1083	043B _h	String	33
	Tag	4	1084	043C _h	String	33
	Tag	5	1085	043D _h	String	33
	Tag	6	1086	043E _h	String	33
	Tag	7	1087	043F _h	String	33
	Tag	8	1088	0440 _h	String	33
	Tag group	1	1177	0499 _h	Unsigned 16	2
	Tag group	2	1178	049A _h	Unsigned 16	2
	Tag group	3	1179	049B _h	Unsigned 16	2
	Tag group	4	1180	049C _h	Unsigned 16	2
	Tag group	5	1181	049D _h	Unsigned 16	2
	Tag group	6	1182	049E _h	Unsigned 16	2
	Tag group	7	1183	049F _h	Unsigned 16	2
	Tag group	8	1184	04A0 _h	Unsigned 16	2

Sensor operating times

	Above spec. temp. max.	1	1385	0569 _h	Float	5	s	95	5F _h
	Above spec. temp. max.	2	1386	056A _h	Float	5	s	95	5F _h
	Above spec. temp. max.	3	1387	056B _h	Float	5	s	95	5F _h
	Above spec. temp. max.	4	1388	056C _h	Float	5	s	95	5F _h
	Above spec. temp. max.	5	1389	056D _h	Float	5	s	95	5F _h
	Above spec. temp. max.	6	1390	056E _h	Float	5	s	95	5F _h
	Above spec. temp. max.	7	1391	056F _h	Float	5	s	95	5F _h
	Above spec. temp. max.	8	1392	0570 _h	Float	5	s	95	5F _h
	Below spec. temp. min.	1	1249	04E1 _h	Float	5	s	95	5F _h
	Below spec. temp. min.	2	1250	04E2 _h	Float	5	s	95	5F _h
	Below spec. temp. min.	3	1251	04E3 _h	Float	5	s	95	5F _h
	Below spec. temp. min.	4	1252	04E4 _h	Float	5	s	95	5F _h
	Below spec. temp. min.	5	1253	04E5 _h	Float	5	s	95	5F _h
	Below spec. temp. min.	6	1254	04E6 _h	Float	5	s	95	5F _h
	Below spec. temp. min.	7	1255	04E7 _h	Float	5	s	95	5F _h
	Below spec. temp. min.	8	1256	04E8 _h	Float	5	s	95	5F _h
	Calib. timer	1	1241	04D9 _h	Float	5	s	95	5F _h
	Calib. timer	2	1242	04DA _h	Float	5	s	95	5F _h
	Calib. timer	3	1243	04DB _h	Float	5	s	95	5F _h
	Calib. timer	4	1244	04DC _h	Float	5	s	95	5F _h
	Calib. timer	5	1245	04DD _h	Float	5	s	95	5F _h
	Calib. timer	6	1246	04DE _h	Float	5	s	95	5F _h
	Calib. timer	7	1247	04DF _h	Float	5	s	95	5F _h
	Calib. timer	8	1248	04E0 _h	Float	5	s	95	5F _h
	Cap calibrations	1	1369	0559 _h	Unsigned 16	2			
	Cap calibrations	2	1370	055A _h	Unsigned 16	2			

Liquistation CSFxx HART Field Device Specification

Menu label	Parameter	Channel	ID	Type	Size	Unit
	Cap calibrations	3	1371	055B _h	Unsigned 16	2
	Cap calibrations	4	1372	055C _h	Unsigned 16	2
	Cap calibrations	5	1373	055D _h	Unsigned 16	2
	Cap calibrations	6	1374	055E _h	Unsigned 16	2
	Cap calibrations	7	1375	055F _h	Unsigned 16	2
	Cap calibrations	8	1376	0560 _h	Unsigned 16	2
	Cap sterilizations	1	1345	0541 _h	Unsigned 8	1
	Cap sterilizations	2	1346	0542 _h	Unsigned 8	1
	Cap sterilizations	3	1347	0543 _h	Unsigned 8	1
	Cap sterilizations	4	1348	0544 _h	Unsigned 8	1
	Cap sterilizations	5	1349	0545 _h	Unsigned 8	1
	Cap sterilizations	6	1350	0546 _h	Unsigned 8	1
	Cap sterilizations	7	1351	0547 _h	Unsigned 8	1
	Cap sterilizations	8	1352	0548 _h	Unsigned 8	1
	Charge	1	1353	0549 _h	Float	5 As 4 04 _h
	Charge	2	1354	054A _h	Float	5 As 4 04 _h
	Charge	3	1355	054B _h	Float	5 As 4 04 _h
	Charge	4	1356	054C _h	Float	5 As 4 04 _h
	Charge	5	1357	054D _h	Float	5 As 4 04 _h
	Charge	6	1358	054E _h	Float	5 As 4 04 _h
	Charge	7	1359	054F _h	Float	5 As 4 04 _h
	Charge	8	1360	0550 _h	Float	5 As 4 04 _h
	CIP cycles	1	1401	0579 _h	Unsigned 16	2
	CIP cycles	2	1402	057A _h	Unsigned 16	2
	CIP cycles	3	1403	057B _h	Unsigned 16	2
	CIP cycles	4	1404	057C _h	Unsigned 16	2
	CIP cycles	5	1405	057D _h	Unsigned 16	2
	CIP cycles	6	1406	057E _h	Unsigned 16	2
	CIP cycles	7	1407	057F _h	Unsigned 16	2
	CIP cycles	8	1408	0580 _h	Unsigned 16	2
	Filter changed	1	1361	0551 _h	Float	5 s 95 5F _h
	Filter changed	2	1362	0552 _h	Float	5 s 95 5F _h
	Filter changed	3	1363	0553 _h	Float	5 s 95 5F _h
	Filter changed	4	1364	0554 _h	Float	5 s 95 5F _h
	Filter changed	5	1365	0555 _h	Float	5 s 95 5F _h
	Filter changed	6	1366	0556 _h	Float	5 s 95 5F _h
	Filter changed	7	1367	0557 _h	Float	5 s 95 5F _h
	Filter changed	8	1368	0558 _h	Float	5 s 95 5F _h
	Lamp life	1	1393	0571 _h	Float	5 s 95 5F _h
	Lamp life	2	1394	0572 _h	Float	5 s 95 5F _h
	Lamp life	3	1395	0573 _h	Float	5 s 95 5F _h
	Lamp life	4	1396	0574 _h	Float	5 s 95 5F _h
	Lamp life	5	1397	0575 _h	Float	5 s 95 5F _h
	Lamp life	6	1398	0576 _h	Float	5 s 95 5F _h
	Lamp life	7	1399	0577 _h	Float	5 s 95 5F _h
	Lamp life	8	1400	0578 _h	Float	5 s 95 5F _h
	Specific 0	1	1265	04F1 _h	Float	5 s 95 5F _h
	Specific 0	2	1266	04F2 _h	Float	5 s 95 5F _h
	Specific 0	3	1267	04F3 _h	Float	5 s 95 5F _h
	Specific 0	4	1268	04F4 _h	Float	5 s 95 5F _h
	Specific 0	5	1269	04F5 _h	Float	5 s 95 5F _h
	Specific 0	6	1270	04F6 _h	Float	5 s 95 5F _h
	Specific 0	7	1271	04F7 _h	Float	5 s 95 5F _h
	Specific 0	8	1272	04F8 _h	Float	5 s 95 5F _h
	Specific 1	1	1257	04E9 _h	Float	5 s 95 5F _h
	Specific 1	2	1258	04EA _h	Float	5 s 95 5F _h
	Specific 1	3	1259	04EB _h	Float	5 s 95 5F _h
	Specific 1	4	1260	04EC _h	Float	5 s 95 5F _h
	Specific 1	5	1261	04ED _h	Float	5 s 95 5F _h
	Specific 1	6	1262	04EE _h	Float	5 s 95 5F _h
	Specific 1	7	1263	04EF _h	Float	5 s 95 5F _h
	Specific 1	8	1264	04F0 _h	Float	5 s 95 5F _h
	Specific 2	1	1281	0501 _h	Float	5 s 95 5F _h
	Specific 2	2	1282	0502 _h	Float	5 s 95 5F _h
	Specific 2	3	1283	0503 _h	Float	5 s 95 5F _h
	Specific 2	4	1284	0504 _h	Float	5 s 95 5F _h
	Specific 2	5	1285	0505 _h	Float	5 s 95 5F _h
	Specific 2	6	1286	0506 _h	Float	5 s 95 5F _h
	Specific 2	7	1287	0507 _h	Float	5 s 95 5F _h
	Specific 2	8	1288	0508 _h	Float	5 s 95 5F _h
	Specific 3	1	1273	04F9 _h	Float	5 s 95 5F _h
	Specific 3	2	1274	04FA _h	Float	5 s 95 5F _h
	Specific 3	3	1275	04FB _h	Float	5 s 95 5F _h
	Specific 3	4	1276	04FC _h	Float	5 s 95 5F _h
	Specific 3	5	1277	04FD _h	Float	5 s 95 5F _h
	Specific 3	6	1278	04FE _h	Float	5 s 95 5F _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	Specific 3	7	1279	04FF _h	Float	5 s	95	5F _h
	Specific 3	8	1280	0500 _h	Float	5 s	95	5F _h
	Specific 4	1	1297	0511 _h	Float	5 s	95	5F _h
	Specific 4	2	1298	0512 _h	Float	5 s	95	5F _h
	Specific 4	3	1299	0513 _h	Float	5 s	95	5F _h
	Specific 4	4	1300	0514 _h	Float	5 s	95	5F _h
	Specific 4	5	1301	0515 _h	Float	5 s	95	5F _h
	Specific 4	6	1302	0516 _h	Float	5 s	95	5F _h
	Specific 4	7	1303	0517 _h	Float	5 s	95	5F _h
	Specific 4	8	1304	0518 _h	Float	5 s	95	5F _h
	Specific 5	1	1289	0509 _h	Float	5 s	95	5F _h
	Specific 5	2	1290	050A _h	Float	5 s	95	5F _h
	Specific 5	3	1291	050B _h	Float	5 s	95	5F _h
	Specific 5	4	1292	050C _h	Float	5 s	95	5F _h
	Specific 5	5	1293	050D _h	Float	5 s	95	5F _h
	Specific 5	6	1294	050E _h	Float	5 s	95	5F _h
	Specific 5	7	1295	050F _h	Float	5 s	95	5F _h
	Specific 5	8	1296	0510 _h	Float	5 s	95	5F _h
	Specific 6	1	1313	0521 _h	Float	5 s	95	5F _h
	Specific 6	2	1314	0522 _h	Float	5 s	95	5F _h
	Specific 6	3	1315	0523 _h	Float	5 s	95	5F _h
	Specific 6	4	1316	0524 _h	Float	5 s	95	5F _h
	Specific 6	5	1317	0525 _h	Float	5 s	95	5F _h
	Specific 6	6	1318	0526 _h	Float	5 s	95	5F _h
	Specific 6	7	1319	0527 _h	Float	5 s	95	5F _h
	Specific 6	8	1320	0528 _h	Float	5 s	95	5F _h
	Specific 7	1	1305	0519 _h	Float	5 s	95	5F _h
	Specific 7	2	1306	051A _h	Float	5 s	95	5F _h
	Specific 7	3	1307	051B _h	Float	5 s	95	5F _h
	Specific 7	4	1308	051C _h	Float	5 s	95	5F _h
	Specific 7	5	1309	051D _h	Float	5 s	95	5F _h
	Specific 7	6	1310	051E _h	Float	5 s	95	5F _h
	Specific 7	7	1311	051F _h	Float	5 s	95	5F _h
	Specific 7	8	1312	0520 _h	Float	5 s	95	5F _h
	Specific 8	1	1329	0531 _h	Float	5 s	95	5F _h
	Specific 8	2	1330	0532 _h	Float	5 s	95	5F _h
	Specific 8	3	1331	0533 _h	Float	5 s	95	5F _h
	Specific 8	4	1332	0534 _h	Float	5 s	95	5F _h
	Specific 8	5	1333	0535 _h	Float	5 s	95	5F _h
	Specific 8	6	1334	0536 _h	Float	5 s	95	5F _h
	Specific 8	7	1335	0537 _h	Float	5 s	95	5F _h
	Specific 8	8	1336	0538 _h	Float	5 s	95	5F _h
	Specific 9	1	1321	0529 _h	Float	5 s	95	5F _h
	Specific 9	2	1322	052A _h	Float	5 s	95	5F _h
	Specific 9	3	1323	052B _h	Float	5 s	95	5F _h
	Specific 9	4	1324	052C _h	Float	5 s	95	5F _h
	Specific 9	5	1325	052D _h	Float	5 s	95	5F _h
	Specific 9	6	1326	052E _h	Float	5 s	95	5F _h
	Specific 9	7	1327	052F _h	Float	5 s	95	5F _h
	Specific 9	8	1328	0530 _h	Float	5 s	95	5F _h
	Sterilizations	1	1377	0561 _h	Unsigned 16	2		
	Sterilizations	2	1378	0562 _h	Unsigned 16	2		
	Sterilizations	3	1379	0563 _h	Unsigned 16	2		
	Sterilizations	4	1380	0564 _h	Unsigned 16	2		
	Sterilizations	5	1381	0565 _h	Unsigned 16	2		
	Sterilizations	6	1382	0566 _h	Unsigned 16	2		
	Sterilizations	7	1383	0567 _h	Unsigned 16	2		
	Sterilizations	8	1384	0568 _h	Unsigned 16	2		
	Total	1	1337	0539 _h	Float	5 s	95	5F _h
	Total	2	1338	053A _h	Float	5 s	95	5F _h
	Total	3	1339	053B _h	Float	5 s	95	5F _h
	Total	4	1340	053C _h	Float	5 s	95	5F _h
	Total	5	1341	053D _h	Float	5 s	95	5F _h
	Total	6	1342	053E _h	Float	5 s	95	5F _h
	Total	7	1343	053F _h	Float	5 s	95	5F _h
	Total	8	1344	0540 _h	Float	5 s	95	5F _h
Sensor specifications								
	Cell constant	1	1425	0591 _h	Float	5 1/m	11	0B _h
	Cell constant	2	1426	0592 _h	Float	5 1/m	11	0B _h
	Cell constant	3	1427	0593 _h	Float	5 1/m	11	0B _h
	Cell constant	4	1428	0594 _h	Float	5 1/m	11	0B _h
	Cell constant	5	1429	0595 _h	Float	5 1/m	11	0B _h
	Cell constant	6	1430	0596 _h	Float	5 1/m	11	0B _h
	Cell constant	7	1431	0597 _h	Float	5 1/m	11	0B _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	Cell constant	8	1432	0598 _h	Float	5	1/m	11 0B _h
	Measurement value max. 0	1	1225	04C9 _h	Float	5		
	Measurement value max. 0	2	1226	04CA _h	Float	5		
	Measurement value max. 0	3	1227	04CB _h	Float	5		
	Measurement value max. 0	4	1228	04CC _h	Float	5		
	Measurement value max. 0	5	1229	04CD _h	Float	5		
	Measurement value max. 0	6	1230	04CE _h	Float	5		
	Measurement value max. 0	7	1231	04CF _h	Float	5		
	Measurement value max. 0	8	1232	04D0 _h	Float	5		
	Measurement value max. 1	1	1217	04C1 _h	Float	5		
	Measurement value max. 1	2	1218	04C2 _h	Float	5		
	Measurement value max. 1	3	1219	04C3 _h	Float	5		
	Measurement value max. 1	4	1220	04C4 _h	Float	5		
	Measurement value max. 1	5	1221	04C5 _h	Float	5		
	Measurement value max. 1	6	1222	04C6 _h	Float	5		
	Measurement value max. 1	7	1223	04C7 _h	Float	5		
	Measurement value max. 1	8	1224	04C8 _h	Float	5		
	Measurement value max. 2	1	1209	04B9 _h	Float	5		
	Measurement value max. 2	2	1210	04BA _h	Float	5		
	Measurement value max. 2	3	1211	04BB _h	Float	5		
	Measurement value max. 2	4	1212	04BC _h	Float	5		
	Measurement value max. 2	5	1213	04BD _h	Float	5		
	Measurement value max. 2	6	1214	04BE _h	Float	5		
	Measurement value max. 2	7	1215	04BF _h	Float	5		
	Measurement value max. 2	8	1216	04C0 _h	Float	5		
	Measurement value max. 3	1	1201	04B1 _h	Float	5		
	Measurement value max. 3	2	1202	04B2 _h	Float	5		
	Measurement value max. 3	3	1203	04B3 _h	Float	5		
	Measurement value max. 3	4	1204	04B4 _h	Float	5		
	Measurement value max. 3	5	1205	04B5 _h	Float	5		
	Measurement value max. 3	6	1206	04B6 _h	Float	5		
	Measurement value max. 3	7	1207	04B7 _h	Float	5		
	Measurement value max. 3	8	1208	04B8 _h	Float	5		
	Measurement value min. 0	1	1145	0479 _h	Float	5		
	Measurement value min. 0	2	1146	047A _h	Float	5		
	Measurement value min. 0	3	1147	047B _h	Float	5		
	Measurement value min. 0	4	1148	047C _h	Float	5		
	Measurement value min. 0	5	1149	047D _h	Float	5		
	Measurement value min. 0	6	1150	047E _h	Float	5		
	Measurement value min. 0	7	1151	047F _h	Float	5		
	Measurement value min. 0	8	1152	0480 _h	Float	5		
	Measurement value min. 1	1	1137	0471 _h	Float	5		
	Measurement value min. 1	2	1138	0472 _h	Float	5		
	Measurement value min. 1	3	1139	0473 _h	Float	5		
	Measurement value min. 1	4	1140	0474 _h	Float	5		
	Measurement value min. 1	5	1141	0475 _h	Float	5		
	Measurement value min. 1	6	1142	0476 _h	Float	5		
	Measurement value min. 1	7	1143	0477 _h	Float	5		
	Measurement value min. 1	8	1144	0478 _h	Float	5		
	Measurement value min. 2	1	1161	0489 _h	Float	5		
	Measurement value min. 2	2	1162	048A _h	Float	5		
	Measurement value min. 2	3	1163	048B _h	Float	5		
	Measurement value min. 2	4	1164	048C _h	Float	5		
	Measurement value min. 2	5	1165	048D _h	Float	5		
	Measurement value min. 2	6	1166	048E _h	Float	5		
	Measurement value min. 2	7	1167	048F _h	Float	5		
	Measurement value min. 2	8	1168	0490 _h	Float	5		
	Measurement value min. 3	1	1153	0481 _h	Float	5		
	Measurement value min. 3	2	1154	0482 _h	Float	5		
	Measurement value min. 3	3	1155	0483 _h	Float	5		
	Measurement value min. 3	4	1156	0484 _h	Float	5		
	Measurement value min. 3	5	1157	0485 _h	Float	5		
	Measurement value min. 3	6	1158	0486 _h	Float	5		
	Measurement value min. 3	7	1159	0487 _h	Float	5		
	Measurement value min. 3	8	1160	0488 _h	Float	5		
	Pressure	1	1417	0589 _h	Float	5	Pa	58 3A _h
	Pressure	2	1418	058A _h	Float	5	Pa	58 3A _h
	Pressure	3	1419	058B _h	Float	5	Pa	58 3A _h
	Pressure	4	1420	058C _h	Float	5	Pa	58 3A _h
	Pressure	5	1421	058D _h	Float	5	Pa	58 3A _h
	Pressure	6	1422	058E _h	Float	5	Pa	58 3A _h
	Pressure	7	1423	058F _h	Float	5	Pa	58 3A _h
	Pressure	8	1424	0590 _h	Float	5	Pa	58 3A _h
	Temperature value max.	1	1121	0461 _h	Float	5	°C	89 59 _h
	Temperature value max.	2	1122	0462 _h	Float	5	°C	89 59 _h
	Temperature value max.	3	1123	0463 _h	Float	5	°C	89 59 _h

Liquistation CSFxx HART Field Device Specification

Menu label	Parameter	Channel	ID	Type	Size	Unit		
	Temperature value max.	4	1124	0464 _h	Float	5	°C	89 59 _h
	Temperature value max.	5	1125	0465 _h	Float	5	°C	89 59 _h
	Temperature value max.	6	1126	0466 _h	Float	5	°C	89 59 _h
	Temperature value max.	7	1127	0467 _h	Float	5	°C	89 59 _h
	Temperature value max.	8	1128	0468 _h	Float	5	°C	89 59 _h
	Temperature value min.	1	1113	0459 _h	Float	5	°C	89 59 _h
	Temperature value min.	2	1114	045A _h	Float	5	°C	89 59 _h
	Temperature value min.	3	1115	045B _h	Float	5	°C	89 59 _h
	Temperature value min.	4	1116	045C _h	Float	5	°C	89 59 _h
	Temperature value min.	5	1117	045D _h	Float	5	°C	89 59 _h
	Temperature value min.	6	1118	045E _h	Float	5	°C	89 59 _h
	Temperature value min.	7	1119	045F _h	Float	5	°C	89 59 _h
	Temperature value min.	8	1120	0460 _h	Float	5	°C	89 59 _h

Sensor calibration information

Assay count	1	1801	0709 _h	Unsigned 8	1	
Assay count	2	1802	070A _h	Unsigned 8	1	
Assay count	3	1803	070B _h	Unsigned 8	1	
Assay count	4	1804	070C _h	Unsigned 8	1	
Assay count	5	1805	070D _h	Unsigned 8	1	
Assay count	6	1806	070E _h	Unsigned 8	1	
Assay count	7	1807	070F _h	Unsigned 8	1	
Assay count	8	1808	0710 _h	Unsigned 8	1	
Cell constant	1	1545	0609 _h	Float	5	
Cell constant	2	1546	060A _h	Float	5	
Cell constant	3	1547	060B _h	Float	5	
Cell constant	4	1548	060C _h	Float	5	
Cell constant	5	1549	060D _h	Float	5	
Cell constant	6	1550	060E _h	Float	5	
Cell constant	7	1551	060F _h	Float	5	
Cell constant	8	1552	0610 _h	Float	5	
COD factor	1	1809	0711 _h	Float	5	
COD factor	2	1810	0712 _h	Float	5	
COD factor	3	1811	0713 _h	Float	5	
COD factor	4	1812	0714 _h	Float	5	
COD factor	5	1813	0715 _h	Float	5	
COD factor	6	1814	0716 _h	Float	5	
COD factor	7	1815	0717 _h	Float	5	
COD factor	8	1816	0718 _h	Float	5	
Dataset name	1	1561	0619 _h	String	33	
Dataset name	2	1562	061A _h	String	33	
Dataset name	3	1563	061B _h	String	33	
Dataset name	4	1564	061C _h	String	33	
Dataset name	5	1565	061D _h	String	33	
Dataset name	6	1566	061E _h	String	33	
Dataset name	7	1567	061F _h	String	33	
Dataset name	8	1568	0620 _h	String	33	
Dataset ref. name	1	1633	0661 _h	String	33	
Dataset ref. name	2	1634	0662 _h	String	33	
Dataset ref. name	3	1635	0663 _h	String	33	
Dataset ref. name	4	1636	0664 _h	String	33	
Dataset ref. name	5	1637	0665 _h	String	33	
Dataset ref. name	6	1638	0666 _h	String	33	
Dataset ref. name	7	1639	0667 _h	String	33	
Dataset ref. name	8	1640	0668 _h	String	33	
Dataset unit	1	1617	0651 _h	Enum	1	
Dataset unit	2	1618	0652 _h	Enum	1	
Dataset unit	3	1619	0653 _h	Enum	1	
Dataset unit	4	1620	0654 _h	Enum	1	
Dataset unit	5	1621	0655 _h	Enum	1	
Dataset unit	6	1622	0656 _h	Enum	1	
Dataset unit	7	1623	0657 _h	Enum	1	
Dataset unit	8	1624	0658 _h	Enum	1	
Isothermal mV	1	1625	0659 _h	Float	5	
Isothermal mV	2	1626	065A _h	Float	5	
Isothermal mV	3	1627	065B _h	Float	5	
Isothermal mV	4	1628	065C _h	Float	5	
Isothermal mV	5	1629	065D _h	Float	5	
Isothermal mV	6	1630	065E _h	Float	5	
Isothermal mV	7	1631	065F _h	Float	5	
Isothermal mV	8	1632	0660 _h	Float	5	
Isothermal pH	1	1649	0671 _h	Float	5	
Isothermal pH	2	1650	0672 _h	Float	5	
Isothermal pH	3	1651	0673 _h	Float	5	
Isothermal pH	4	1652	0674 _h	Float	5	

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Menu label	Parameter	Channel	ID	Type	Size	Unit
	Isothermal pH	5	1653	0675 _h	Float	5
	Isothermal pH	6	1654	0676 _h	Float	5
	Isothermal pH	7	1655	0677 _h	Float	5
	Isothermal pH	8	1656	0678 _h	Float	5
	Offset	1	1657	0679 _h	Float	5
	Offset	2	1658	067A _h	Float	5
	Offset	3	1659	067B _h	Float	5
	Offset	4	1660	067C _h	Float	5
	Offset	5	1661	067D _h	Float	5
	Offset	6	1662	067E _h	Float	5
	Offset	7	1663	067F _h	Float	5
	Offset	8	1664	0680 _h	Float	5
	Operation point	1	1521	05F1 _h	Float	5
	Operation point	2	1522	05F2 _h	Float	5
	Operation point	3	1523	05F3 _h	Float	5
	Operation point	4	1524	05F4 _h	Float	5
	Operation point	5	1525	05F5 _h	Float	5
	Operation point	6	1526	05F6 _h	Float	5
	Operation point	7	1527	05F7 _h	Float	5
	Operation point	8	1528	05F8 _h	Float	5
	TOC factor	1	1705	06A9 _h	Float	5
	TOC factor	2	1706	06AA _h	Float	5
	TOC factor	3	1707	06AB _h	Float	5
	TOC factor	4	1708	06AC _h	Float	5
	TOC factor	5	1709	06AD _h	Float	5
	TOC factor	6	1710	06AE _h	Float	5
	TOC factor	7	1711	06AF _h	Float	5
	TOC factor	8	1712	06B0 _h	Float	5
	Transmitter ID	1	1481	05C9 _h	Unsigned 16	2
	Transmitter ID	2	1482	05CA _h	Unsigned 16	2
	Transmitter ID	3	1483	05CB _h	Unsigned 16	2
	Transmitter ID	4	1484	05CC _h	Unsigned 16	2
	Transmitter ID	5	1485	05CD _h	Unsigned 16	2
	Transmitter ID	6	1486	05CE _h	Unsigned 16	2
	Transmitter ID	7	1487	05CF _h	Unsigned 16	2
	Transmitter ID	8	1488	05D0 _h	Unsigned 16	2

Sensor temperature calibration

	Count	1	1681	0691 _h	Unsigned 16	2		
	Count	2	1682	0692 _h	Unsigned 16	2		
	Count	3	1683	0693 _h	Unsigned 16	2		
	Count	4	1684	0694 _h	Unsigned 16	2		
	Count	5	1685	0695 _h	Unsigned 16	2		
	Count	6	1686	0696 _h	Unsigned 16	2		
	Count	7	1687	0697 _h	Unsigned 16	2		
	Count	8	1688	0698 _h	Unsigned 16	2		
	Date Time	1	1641	0669 _h	Date	7		
	Date Time	2	1642	066A _h	Date	7		
	Date Time	3	1643	066B _h	Date	7		
	Date Time	4	1644	066C _h	Date	7		
	Date Time	5	1645	066D _h	Date	7		
	Date Time	6	1646	066E _h	Date	7		
	Date Time	7	1647	066F _h	Date	7		
	Date Time	8	1648	0670 _h	Date	7		
	Method	1	1537	0601 _h	Enum	1		
	Method	2	1538	0602 _h	Enum	1		
	Method	3	1539	0603 _h	Enum	1		
	Method	4	1540	0604 _h	Enum	1		
	Method	5	1541	0605 _h	Enum	1		
	Method	6	1542	0606 _h	Enum	1		
	Method	7	1543	0607 _h	Enum	1		
	Method	8	1544	0608 _h	Enum	1		
	Offset	1	1721	06B9 _h	Float	5	°C	91 5B _h
	Offset	2	1722	06BA _h	Float	5	°C	91 5B _h
	Offset	3	1723	06BB _h	Float	5	°C	91 5B _h
	Offset	4	1724	06BC _h	Float	5	°C	91 5B _h
	Offset	5	1725	06BD _h	Float	5	°C	91 5B _h
	Offset	6	1726	06BE _h	Float	5	°C	91 5B _h
	Offset	7	1727	06BF _h	Float	5	°C	91 5B _h
	Offset	8	1728	06C0 _h	Float	5	°C	91 5B _h
	Ref. value 1	1	1569	0621 _h	Float	5	°C	89 59 _h
	Ref. value 1	2	1570	0622 _h	Float	5	°C	89 59 _h
	Ref. value 1	3	1571	0623 _h	Float	5	°C	89 59 _h
	Ref. value 1	4	1572	0624 _h	Float	5	°C	89 59 _h
	Ref. value 1	5	1573	0625 _h	Float	5	°C	89 59 _h

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Menu label	Parameter	Channel	ID	Type	Size	Unit		
	Ref. value 1	6	1574	0626 _h	Float	5	°C	89 59 _h
	Ref. value 1	7	1575	0627 _h	Float	5	°C	89 59 _h
	Ref. value 1	8	1576	0628 _h	Float	5	°C	89 59 _h
	Ref. value 2	1	1577	0629 _h	Float	5	°C	89 59 _h
	Ref. value 2	2	1578	062A _h	Float	5	°C	89 59 _h
	Ref. value 2	3	1579	062B _h	Float	5	°C	89 59 _h
	Ref. value 2	4	1580	062C _h	Float	5	°C	89 59 _h
	Ref. value 2	5	1581	062D _h	Float	5	°C	89 59 _h
	Ref. value 2	6	1582	062E _h	Float	5	°C	89 59 _h
	Ref. value 2	7	1583	062F _h	Float	5	°C	89 59 _h
	Ref. value 2	8	1584	0630 _h	Float	5	°C	89 59 _h
	Slope	1	1489	05D1 _h	Float	5	-	0 00 _h
	Slope	2	1490	05D2 _h	Float	5	-	0 00 _h
	Slope	3	1491	05D3 _h	Float	5	-	0 00 _h
	Slope	4	1492	05D4 _h	Float	5	-	0 00 _h
	Slope	5	1493	05D5 _h	Float	5	-	0 00 _h
	Slope	6	1494	05D6 _h	Float	5	-	0 00 _h
	Slope	7	1495	05D7 _h	Float	5	-	0 00 _h
	Slope	8	1496	05D8 _h	Float	5	-	0 00 _h
	Transmitter ID	1	1465	05B9 _h	Unsigned 16	2		
	Transmitter ID	2	1466	05BA _h	Unsigned 16	2		
	Transmitter ID	3	1467	05BB _h	Unsigned 16	2		
	Transmitter ID	4	1468	05BC _h	Unsigned 16	2		
	Transmitter ID	5	1469	05BD _h	Unsigned 16	2		
	Transmitter ID	6	1470	05BE _h	Unsigned 16	2		
	Transmitter ID	7	1471	05BF _h	Unsigned 16	2		
	Transmitter ID	8	1472	05C0 _h	Unsigned 16	2		
	Transmitter serial	1	1593	0639 _h	String	33		
	Transmitter serial	2	1594	063A _h	String	33		
	Transmitter serial	3	1595	063B _h	String	33		
	Transmitter serial	4	1596	063C _h	String	33		
	Transmitter serial	5	1597	063D _h	String	33		
	Transmitter serial	6	1598	063E _h	String	33		
	Transmitter serial	7	1599	063F _h	String	33		
	Transmitter serial	8	1600	0640 _h	String	33		

Sensor zero calibration

	Count	1	1729	06C1 _h	Unsigned 16	2		
	Count	2	1730	06C2 _h	Unsigned 16	2		
	Count	3	1731	06C3 _h	Unsigned 16	2		
	Count	4	1732	06C4 _h	Unsigned 16	2		
	Count	5	1733	06C5 _h	Unsigned 16	2		
	Count	6	1734	06C6 _h	Unsigned 16	2		
	Count	7	1735	06C7 _h	Unsigned 16	2		
	Count	8	1736	06C8 _h	Unsigned 16	2		
	Date time	1	1505	05E1 _h	Date	7		
	Date time	2	1506	05E2 _h	Date	7		
	Date time	3	1507	05E3 _h	Date	7		
	Date time	4	1508	05E4 _h	Date	7		
	Date time	5	1509	05E5 _h	Date	7		
	Date time	6	1510	05E6 _h	Date	7		
	Date time	7	1511	05E7 _h	Date	7		
	Date time	8	1512	05E8 _h	Date	7		
	Delta zero	1	1457	05B1 _h	Float	5		
	Delta zero	2	1458	05B2 _h	Float	5		
	Delta zero	3	1459	05B3 _h	Float	5		
	Delta zero	4	1460	05B4 _h	Float	5		
	Delta zero	5	1461	05B5 _h	Float	5		
	Delta zero	6	1462	05B6 _h	Float	5		
	Delta zero	7	1463	05B7 _h	Float	5		
	Delta zero	8	1464	05B8 _h	Float	5		
	Method	1	1585	0631 _h	Enum	1		
	Method	2	1586	0632 _h	Enum	1		
	Method	3	1587	0633 _h	Enum	1		
	Method	4	1588	0634 _h	Enum	1		
	Method	5	1589	0635 _h	Enum	1		
	Method	6	1590	0636 _h	Enum	1		
	Method	7	1591	0637 _h	Enum	1		
	Method	8	1592	0638 _h	Enum	1		
	Tau	1	1697	06A1 _h	Float	5		
	Tau	2	1698	06A2 _h	Float	5		
	Tau	3	1699	06A3 _h	Float	5		
	Tau	4	1700	06A4 _h	Float	5		
	Tau	5	1701	06A5 _h	Float	5		
	Tau	6	1702	06A6 _h	Float	5		

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Menu label	Parameter	Channel	ID	Type	Size	Unit
	Tau	7	1703	06A7 _h	Float	5
	Tau	8	1704	06A8 _h	Float	5
	Transmitter serial	1	1745	06D1 _h	String	33
	Transmitter serial	2	1746	06D2 _h	String	33
	Transmitter serial	3	1747	06D3 _h	String	33
	Transmitter serial	4	1748	06D4 _h	String	33
	Transmitter serial	5	1749	06D5 _h	String	33
	Transmitter serial	6	1750	06D6 _h	String	33
	Transmitter serial	7	1751	06D7 _h	String	33
	Transmitter serial	8	1752	06D8 _h	String	33
	Zero	1	1673	0689 _h	Float	5
	Zero	2	1674	068A _h	Float	5
	Zero	3	1675	068B _h	Float	5
	Zero	4	1676	068C _h	Float	5
	Zero	5	1677	068D _h	Float	5
	Zero	6	1678	068E _h	Float	5
	Zero	7	1679	068F _h	Float	5
	Zero	8	1680	0690 _h	Float	5
	Delta cell constant	1	1473	05C1 _h	Float	5
	Cell constant	2	1474	05C2 _h	Float	5
	Cell constant	3	1475	05C3 _h	Float	5
	Cell constant	4	1476	05C4 _h	Float	5
	Cell constant	5	1477	05C5 _h	Float	5
	Cell constant	6	1478	05C6 _h	Float	5
	Cell constant	7	1479	05C7 _h	Float	5
	Cell constant	8	1480	05C8 _h	Float	5
	Offset	1	1777	06F1 _h	Float	5
	Offset	2	1778	06F2 _h	Float	5
	Offset	3	1779	06F3 _h	Float	5
	Offset	4	1780	06F4 _h	Float	5
	Offset	5	1781	06F5 _h	Float	5
	Offset	6	1782	06F6 _h	Float	5
	Offset	7	1783	06F7 _h	Float	5
	Offset	8	1784	06F8 _h	Float	5
	Setpoint	1	1529	05F9 _h	Float	5
	Setpoint	2	1530	05FA _h	Float	5
	Setpoint	3	1531	05FB _h	Float	5
	Setpoint	4	1532	05FC _h	Float	5
	Setpoint	5	1533	05FD _h	Float	5
	Setpoint	6	1534	05FE _h	Float	5
	Setpoint	7	1535	05FF _h	Float	5
	Setpoint	8	1536	0600 _h	Float	5

Hardware information

	Temperature	1048	0418 _h	Float	5	°C	89	59 _h
	Voltage 12.5V	1047	0417 _h	Float	5	V	111	6F _h
	Voltage 1.2V	1044	0414 _h	Float	5	V	111	6F _h
	Voltage 24V	1046	0416 _h	Float	5	V	111	6F _h
	Voltage 3.3V	1045	0415 _h	Float	5	V	111	6F _h
	Base module description	1920	0780 _h	String	33			
	Base module hardware version	1957	07A5 _h	String	17			
	Base module order code	1878	0756 _h	String	33			
	Base module part number	1939	0793 _h	Unsigned 32	4			
	Base module serial number	1929	0789 _h	String	33			
	Base module software version	1954	07A2 _h	String	17			
	Base module visibility	1918	077E _h	Boolean	1			
	CPU description	1875	0753 _h	String	33			
	CPU hardware version	1886	075E _h	String	17			
	CPU order code	1942	0796 _h	String	33			
	CPU part number	1894	0766 _h	Unsigned 32	4			
	CPU serial number	1871	074F _h	String	33			
	CPU software version	1852	073C _h	String	17			
	CPU visibility	1853	073D _h	Boolean	1			
	Display module description	1945	0799 _h	String	33			
	Display module hardware version	1834	072A _h	String	17			
	Display module order code	1960	07A8 _h	String	33			
	Display module part number	1934	078E _h	Unsigned 32	4			
	Display module serial number	1895	0767 _h	String	33			
	Display module software version	1884	075C _h	String	17			
	Display module visibility	1865	0749 _h	Boolean	1			
	Extension module 1 description	1856	0740 _h	String	33			
	Extension module 1 hardware version	1902	076E _h	String	17			
	Extension module 1 order code	1830	0726 _h	String	33			
	Extension module 1 part number	1817	0719 _h	Unsigned 32	4			
	Extension module 1 serial number	1937	0791 _h	String	33			

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Menu label	Parameter	Channel	ID	Type	Size	Unit
	Extension module 1 software version		1947	079B _h	String	17
	Extension module 1 visibility		1826	0722 _h	Boolean	1
	Extension module 2 description		1821	071D _h	String	33
	Extension module 2 hardware version		1907	0773 _h	String	17
	Extension module 2 order code		1839	072F _h	String	33
	Extension module 2 part number		1950	079E _h	Unsigned 32	4
	Extension module 2 serial number		1858	0742 _h	String	33
	Extension module 2 software version		1835	072B _h	String	17
	Extension module 2 visibility		1958	07A6 _h	Boolean	1
	Extension module 3 description		1819	071B _h	String	33
	Extension module 3 hardware version		1908	0774 _h	String	17
	Extension module 3 order code		1900	076C _h	String	33
	Extension module 3 part number		1904	0770 _h	Unsigned 32	4
	Extension module 3 serial number		1866	074A _h	String	33
	Extension module 3 software version		1861	0745 _h	String	17
	Extension module 3 visibility		1962	07AA _h	Boolean	1
	Extension module 4 description		1828	0724 _h	String	33
	Extension module 4 hardware version		1919	077F _h	String	17
	Extension module 4 order code		1848	0738 _h	String	33
	Extension module 4 part number		1859	0743 _h	Unsigned 32	4
	Extension module 4 serial number		1932	078C _h	String	33
	Extension module 4 software version		1829	0725 _h	String	17
	Extension module 4 visibility		1888	0760 _h	Boolean	1
	Extension module 5 description		1882	075A _h	String	33
	Extension module 5 hardware version		1893	0765 _h	String	17
	Extension module 5 order code		1869	074D _h	String	33
	Extension module 5 part number		1931	078B _h	Unsigned 32	4
	Extension module 5 serial number		1946	079A _h	String	33
	Extension module 5 software version		1860	0744 _h	String	17
	Extension module 5 visibility		1840	0730 _h	Boolean	1
	Extension module 6 description		1940	0794 _h	String	33
	Extension module 6 hardware version		1850	073A _h	String	17
	Extension module 6 order code		1928	0788 _h	String	33
	Extension module 6 part number		1851	073B _h	Unsigned 32	4
	Extension module 6 serial number		1951	079F _h	String	33
	Extension module 6 software version		1857	0741 _h	String	17
	Extension module 6 visibility		1922	0782 _h	Boolean	1
	Extension module 7 description		1911	0777 _h	String	33
	Extension module 7 hardware version		1822	071E _h	String	17
	Extension module 7 order code		1873	0751 _h	String	33
	Extension module 7 part number		1912	0778 _h	Unsigned 32	4
	Extension module 7 serial number		1842	0732 _h	String	33
	Extension module 7 software version		1843	0733 _h	String	17
	Extension module 7 visibility		1837	072D _h	Boolean	1
	Extension module 8 description		1933	078D _h	String	33
	Extension module 8 hardware version		1926	0786 _h	String	17
	Extension module 8 order code		1877	0755 _h	String	33
	Extension module 8 part number		1827	0723 _h	Unsigned 32	4
	Extension module 8 serial number		1846	0736 _h	String	33
	Extension module 8 software version		1838	072E _h	String	17
	Extension module 8 visibility		1923	0783 _h	Boolean	1
	FMSY1 description		1874	0752 _h	String	33
	FMSY1 hardware version		1909	0775 _h	String	17
	FMSY1 order code		1831	0727 _h	String	33
	FMSY1 part number		1892	0764 _h	Unsigned 32	4
	FMSY1 serial number		1944	0798 _h	String	33
	FMSY1 software version		1930	078A _h	String	17
	FMSY1 visibility		1905	0771 _h	Boolean	1
	Power supply description		1825	0721 _h	String	33
	Power supply hardware version		1824	0720 _h	String	17
	Power supply order code		1927	0787 _h	String	33
	Power supply part number		1913	0779 _h	Unsigned 32	4
	Power supply serial number		1917	077D _h	String	33
	Power supply software version		1949	079D _h	String	17
	Power supply visibility		1872	0750 _h	Boolean	1
	Sensor 1 description		1901	076D _h	String	33
	Sensor 1 hardware version		1836	072C _h	String	17
	Sensor 1 order code		1862	0746 _h	String	33
	Sensor 1 part number		1849	0739 _h	Unsigned 32	4
	Sensor 1 serial number		1899	076B _h	String	33
	Sensor 1 software version		1818	071A _h	String	17
	Sensor 1 visibility		1891	0763 _h	Boolean	1
	Sensor 2 description		1953	07A1 _h	String	33
	Sensor 2 hardware version		1936	0790 _h	String	17
	Sensor 2 order code		1924	0784 _h	String	33
	Sensor 2 part number		1833	0729 _h	Unsigned 32	4

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Menu label	Parameter	Channel	ID	Type	Size	Unit
	Sensor 2 serial number		1847	0737 _h	String	33
	Sensor 2 software version		1952	07A0 _h	String	17
	Sensor 2 visibility		1897	0769 _h	Boolean	1
	Sensor 3 description		1921	0781 _h	String	33
	Sensor 3 hardware version		1941	0795 _h	String	17
	Sensor 3 order code		1961	07A9 _h	String	33
	Sensor 3 part number		1854	073E _h	Unsigned 32	4
	Sensor 3 serial number		1868	074C _h	String	33
	Sensor 3 software version		1879	0757 _h	String	17
	Sensor 3 visibility		1948	079C _h	Boolean	1
	Sensor 4 description		1832	0728 _h	String	33
	Sensor 4 hardware version		1896	0768 _h	String	17
	Sensor 4 order code		1963	07AB _h	String	33
	Sensor 4 part number		1870	074E _h	Unsigned 32	4
	Sensor 4 serial number		1898	076A _h	String	33
	Sensor 4 software version		1867	074B _h	String	17
	Sensor 4 visibility		1956	07A4 _h	Boolean	1
	Sensor 5 description		1876	0754 _h	String	33
	Sensor 5 hardware version		1903	076F _h	String	17
	Sensor 5 order code		1959	07A7 _h	String	33
	Sensor 5 part number		1889	0761 _h	Unsigned 32	4
	Sensor 5 serial number		1855	073F _h	String	33
	Sensor 5 software version		1943	0797 _h	String	17
	Sensor 5 visibility		1881	0759 _h	Boolean	1
	Sensor 6 description		1915	077B _h	String	33
	Sensor 6 hardware version		1820	071C _h	String	17
	Sensor 6 order code		1880	0758 _h	String	33
	Sensor 6 part number		1841	0731 _h	Unsigned 32	4
	Sensor 6 serial number		1883	075B _h	String	33
	Sensor 6 software version		1925	0785 _h	String	17
	Sensor 6 visibility		1935	078F _h	Boolean	1
	Sensor 7 description		1910	0776 _h	String	33
	Sensor 7 hardware version		1844	0734 _h	String	17
	Sensor 7 order code		1890	0762 _h	String	33
	Sensor 7 part number		1914	077A _h	Unsigned 32	4
	Sensor 7 serial number		1887	075F _h	String	33
	Sensor 7 software version		1823	071F _h	String	17
	Sensor 7 visibility		1885	075D _h	Boolean	1
	Sensor 8 description		1863	0747 _h	String	33
	Sensor 8 hardware version		1916	077C _h	String	17
	Sensor 8 order code		1845	0735 _h	String	33
	Sensor 8 part number		1906	0772 _h	Unsigned 32	4
	Sensor 8 serial number		1955	07A3 _h	String	33
	Sensor 8 software version		1864	0748 _h	String	17
	Sensor 8 visibility		1938	0792 _h	Boolean	1
	Sampler firmware version		2081	0821 _h	String	17
	Sampler projecting version		2080	0820 _h	Signed 32	4
HART communication statistics						
	BCC errors		2015	07DF _h	Unsigned 32	4
	Busies		2016	07E0 _h	Unsigned 32	4
	Framing errors		2012	07DC _h	Unsigned 32	4
	Parity errors		2011	07DB _h	Unsigned 32	4
	Invalid frames		2014	07DE _h	Unsigned 32	4
	Valid frames		2013	07DD _h	Unsigned 32	4

11.2. Data types for commands #224 and #225

11.2.1. Strings

Strings are transferred in the Latin-1 character set. They have a fixed length depending on the parameter and are zero terminated. Unused characters are filled with 00_h. The leftmost character will be transferred first.

11.2.2. Floating point values

Floating point values are transferred in IEEE 754 - 1985 big endian format with a Liquistation unit code (see chapter 11.3). NaNs and too large or small values will lead to response code 12 'Invalid float'.

Byte	Description
0	CM44 unit code
1	Sign and exponent bits 2..8
2	Exponent bit 1 and fraction bits 17..23
3	Fraction bits 9..16
4	Fraction bits 1..8

11.2.3. Integer values

All integers are transferred in big endian format. The number of transferred bytes and the value range depends on the integer type:

Type	Bytes	Min	Max
Unsigned 8	1	0	255
Unsigned 16	2	0	65,535
Unsigned 32	4	0	4,294,967,295
Signed 8	1	-128	127
Signed 16	2	-32,768	32,767
Signed 32	4	-2,147,483,648	2,147,483,647

Signed integers use the two's complement format.

11.2.4. Enumeration values

Enumeration values are transferred as a single byte. The range depends on the parameter itself but can not exceed 255.

11.2.5. Boolean values

Boolean values are transferred as a single byte. 0 represents a 'false', 1 a 'true'.

11.2.6. Dates

Dates are encoded similar to EN61804-2:

Byte	Description
0..1	Millisecond (0..59999)
2	Minute (0..59)
3	Hour (0..23)
4	Day of month (1..31)
5	Month (1..12)
6	Year (0..255) 0=1900

11.3. Liquistation unit code table

The following unit code table is used by commands 167, 168, 224, 225, 238 and 239. All other commands use the HART standard unit codes.

Code	Hex code	Description	Unit
0	00 _h	None	-
1	01 _h	Conductivity temperature compensation unit	1/K
2	02 _h	Nanoampereseconds	nAs
3	03 _h	Microampereseconds	μAs
4	04 _h	Ampereseconds	As
5	05 _h	Parts per billion	ppb
6	06 _h	Parts per million	ppm
7	07 _h	Percent	%
8	08 _h	Percent saturation	%Sat
9	09 _h	Per millimeter	1/mm
10	0A _h	Per centimeter	1/cm
11	0B _h	Per meter	1/m
12	0C _h	Grams per kilogram	g/kg
13	0D _h	Parts per million volume	ppmVol
14	0E _h	Percent volume	%Vol
15	0F _h	Percent per kelvin	%/K
16	10 _h	Percent per microvolt	%/μV
17	11 _h	Percent per millivolt	%/mV
18	12 _h	Percent per volt	%/V
19	13 _h	Microsiemens	μS
20	14 _h	Millisiemens	mS
21	15 _h	Siemens	S
22	16 _h	Picoamperes	pA
23	17 _h	Nanoamperes	nA
24	18 _h	Microamperes	μA
25	19 _h	Milliamperes	mA
26	1A _h	Amperes	A
27	1B _h	Nanoamperes per milligram per liter	nA/(mg/l)
28	1C _h	Amperes per kilogram per cubic meter	A/(kg/m ³)
29	1D _h	Amperes per pascal	A/Pa
30	1E _h	Picoamperes per hectopascal	pA/hPa
31	1F _h	Amperes per hectopascal	A/hPa
32	20 _h	Degree	°
33	21 _h	Formazine nephelometric units	FNU
34	22 _h	Nephelometric turbidity units	NTU
35	23 _h	Hertz	Hz
36	24 _h	One per minute	1/min
37	25 _h	One per hour	1/h
38	26 _h	One per day	1/d
39	27 _h	Kilobytes	kB
40	28 _h	Millimeters	mm
41	29 _h	Centimeters	cm
42	2A _h	Decimeters	dm
43	2B _h	Meters	m
44	2C _h	Kilometers	km
45	2D _h	Grams per milliliter	g/ml
46	2E _h	Micrograms per liter	μg/l
47	2F _h	Milligrams per liter	mg/l

Code	Hex code	Description	Unit
48	30 _h	Grams per liter	g/l
49	31 _h	Kilogram per liter	kg/l
50	32 _h	Kilograms per cubic meter	kg/m ³
51	33 _h	Parts per billion @ density 1	ppb
52	34 _h	Parts per million @ density 1	ppm
53	35 _h	pH	pH
54	36 _h	Millimeters per second	mm/s
55	37 _h	Millimeters per minute	mm/min
56	38 _h	Millimeters per hour	mm/h
57	39 _h	Millimeters per day	mm/d
58	3A _h	Pascals	Pa
59	3B _h	Hectopascals	hPa
60	3C _h	Millibars	mbar
61	3D _h	Pascals per ampere	Pa/A
62	3E _h	Personal salinity unit	psu
63	3F _h	Milliohms	mΩ
64	40 _h	Ohms	Ω
65	41 _h	Kiloohms	kΩ
66	42 _h	Megaohms	MΩ
67	43 _h	Gigaohms	GΩ
68	44 _h	rH	rH
69	45 _h	Microsiemens per millimeter	μS/mm
70	46 _h	Nanosiemens per centimeter	nS/cm
71	47 _h	Microsiemens per centimeter	μS/cm
72	48 _h	Millisiemens per centimeter	mS/cm
73	49 _h	Siemens per centimeter	S/cm
74	4A _h	Microsiemens per meter	μS/m
75	4B _h	Millisiemens per meter	mS/m
76	4C _h	Siemens per meter	S/m
77	4D _h	Kilosiemens per meter	kS/m
78	4E _h	Megasiemens per meter	MS/m
79	4F _h	Nanoohmmeters	nΩm
80	50 _h	Microohmmeters	μΩm
81	51 _h	Milliohmmeters	mΩm
82	52 _h	Ohmmeters	Ωm
83	53 _h	Kiloohmmeters	kΩm
84	54 _h	Megaohmmeters	MΩm
85	55 _h	Gigaohmmeters	GΩm
86	56 _h	Ohmcentimeters	Ωcm
87	57 _h	Kiloohmcentimeters	kΩcm
88	58 _h	Megaohmcentimeters	MΩcm
89	59 _h	Degrees Celsius	°C
90	5A _h	Kelvins	K
91	5B _h	Delta degrees Celsius	°C
92	5C _h	Delta kelvins	K
93	5D _h	Microseconds	μs
94	5E _h	Milliseconds	ms
95	5F _h	Seconds	s
96	60 _h	Minutes	min
97	61 _h	Hours	h
98	62 _h	Days	d
99	63 _h	Weeks	week
100	64 _h	Month	month

Code	Hex code	Description	Unit
101	65 _h	Liters per second	l/s
102	66 _h	Cubic meters per second	m ³ /s
103	67 _h	Liters per minute	l/min
104	68 _h	Cubic meters per minute	m ³ /min
105	69 _h	Liters per hour	l/h
106	6A _h	Cubic meters per hour	m ³ /h
107	6B _h	Liters per day	l/d
108	6C _h	Cubic meters per day	m ³ /d
109	6D _h	Microvolts	μV
110	6E _h	Millivolts	mV
111	6F _h	Volts	V
112	70 _h	Millivolts per percent	mV/%
113	71 _h	Volts per percent	V/%
114	72 _h	Millivolts per pH	mV/pH
115	73 _h	Volts per pH	V/pH
116	74 _h	Milliliters	ml
117	75 _h	Liters	l
118	76 _h	Cubic meters	m ³
119	77 _h	Inch	in
120	78 _h	Feet	ft
121	79 _h	Yards	yd
122	7A _h	Miles	mi
123	7B _h	Inch per second	in/s
124	7C _h	Inch per minute	in/min
125	7D _h	Inch per hour	in/h
126	7E _h	Inch per day	in/d
127	7F _h	Degrees Fahrenheit	°F
128	80 _h	Delta degrees Fahrenheit	°F
129	81 _h	Gallons per second	gal/s
130	82 _h	Cubic feet per second	(cu ft)/s
131	83 _h	Megagallons per second	Mgal/s
132	84 _h	Gallons per minute	gal/min
133	85 _h	Cubic feet per minute	(cu ft)/min
134	86 _h	Megagallons per minute	Mgal/min
135	87 _h	Gallons per hour	gal/h
136	88 _h	Cubic feet per hour	(cu ft)/h
137	89 _h	Megagallons per hour	Mgal/h
138	8A _h	Gallons per day	gal/d
139	8B _h	Cubic feet per day	(cu ft)/d
140	8C _h	Megagallons per day	Mgal/d
141	8D _h	Gallons	gal
142	8E _h	Cubic feet	cu ft
143	8F _h	Mol per cubic meter	mol/m ³
144	90 _h	Mol per liter	mol/l
145	91 _h	Percent transferrin saturation	%TS
146	92 _h	Bars	bar
147	93 _h	Nanometers	nm
148	94 _h	Meters per second	m/s
149	95 _h	Feet per second	ft/s
150	96 _h	Megabytes	MB
151	97 _h	Bytes	B
152	98 _h	Gigabytes	GB
153	99 _h	Picoamperes per milligram per liter	pA/(mg/l)

Code	Hex code	Description	Unit
154	9A _h	Kilograms per mol	kg/mol
155	9B _h	Grams per mol	g/mol
156	9C _h	Formazine turbidity unit	FTU
157	9D _h	Turbidity formazine unit	TE/F
158	9E _h	American society of brewing chemists unit	ASBC
159	9F _h	European brewing convention unit	EBC
160	A0 _h	Dough	度
161	A1 _h	Milligrams per liter percent	mg/l
162	A2 _h	Absorbance unit	AU
163	A3 _h	Percent transmission	%T
164	A4 _h	Optical density	OD
165	A5 _h	Milliliters per minute	mm/min
166	A6 _h	Equivalent	eq
167	A7 _h	Equivalent per cubic meter	eq/m ³
168	A8 _h	Equivalent per liter	eq/l
169	A9 _h	Equivalent per gallon	eq/gal
170	AA _h	Celsius per second	°C/s
171	AB _h	Celsius per minute	°C/min
172	AC _h	Formazine attenuation unit	FAU
173	AD _h	Ampere hours	Ah
174	AE _h	Meters per hour	m/h
175	AF _h	Per pascal	1/Pa
176	B0 _h	Per hectopascal	1/hPa
177	B1 _h	Per megapascal	1/MPa
254	FE _h	User unit	(String)

11.4. Manufacturer specific unit codes

Code	Hex code	Description	Unit
240	F0 _h	Mol per liter	mol/l
241	F1 _h	Nephelometric turbidity units	NTU
242	F2 _h	Megaohmcentimeters	MΩcm
243	F3 _h	One per meter	1/m
247	F7 _h	rH	rH

12. Performance

12.1. Sampling rates

Typical sampling rates are shown in the following table:

All sensors sample: ≥ 1 per second

All device variables digital value calculation: ≥ 1 per second

All analog outputs update: ≥ 1 per second

12.2. Power up

On power up, the transmitter has to initialize itself, which takes up to 2 minutes. During this period, the device will not respond to HART commands.

As soon as the measurement screen appears on the display Liquistation is ready to communicate via HART, no matter if there are errors present or not.

Fixed current mode is cancelled by power loss.

12.3. Reset

Command 42 ("Device reset") causes the device to reset. The resulting restart is identical to the normal power up sequence. It will take about 2 minutes until Liquistation is back online.

12.4. Self test

This field device does not support a self test.

12.5. Command response times

Minimum: 0ms

Typical: 60ms

Maximum: 250ms

12.6. Busy and delayed response

Busy and delayed responses will not occur.

12.7. Long messages

The largest data field used with universal and common practice commands is in the response to command 9:

71 bytes, including the two status bytes.

The largest data field used with manufacturer specific commands can be theoretically 255 bytes including the two status bytes.

12.8. Non volatile memory

The device's configuration parameters are saved into a flash memory. New data is written to this memory by a special flash handler. Data will not be saved immediately on execution of a write command, but approximately 5 seconds later. Data consistency is always ensured.

12.9. Operating modes

Fixed current mode is implemented, using command 40. This mode is cleared by power loss or reset.

12.10. Write protection

Write protection is not provided.

13. Annex A: Capability checklist

Manufacturer, model and revision:	Endress+Hauser Liquistation CSFxx - Revision 2
Device type:	Transmitter
HART revision:	7.2
Device description available:	Yes
Number and type of sensors:	Up to 8 digital sensors of different type
Number and type of actuators:	0
Number and type of host side signals:	Up to 8 x 4..20 mA analog
Number of device variables:	32
Number of dynamic variables:	4
Mappable dynamic variables:	Yes / 3
Number of common practice commands:	19
Number of device specific commands:	13
Bits of additional device status:	63
Alternative operating modes:	No
Burst mode:	No
Write protection:	No

14. Annex B: Default configuration

Please refer to the operating instructions.

15. Annex C: Revision history

Revision 1, 24-Feb-2012:	Initial revision
Revision 2, 25-Nov-2013:	Added new errors to command 48 error mapping table Added new E+H units
Revision 3, 29-Jul-2019:	Device revision 2

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