Endress+Hauser
People for Process Automation

Liquiline CM44x - Revision 2

HART Field Device Specification

Document: E+H Liquiline CM44x LIT-18, Revision 5

Initial release: 08-Dec-2010
Current release: 29-Jul-2019

SD01187C/07/EN/03.19

Author:

Mark Fuchs
Endress+Hauser
Gesellschaft für Mess- und Regeltechnik mbH+Co. KG
Dieselstr. 24
70839 Gerlingen
Germany

Table of contents

1. Introduction

1.1. Scope

The Endress+Hauser analysis transmitter, model Liquiline CM44x and CM44xR 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 (BA00444C or BA01225C 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

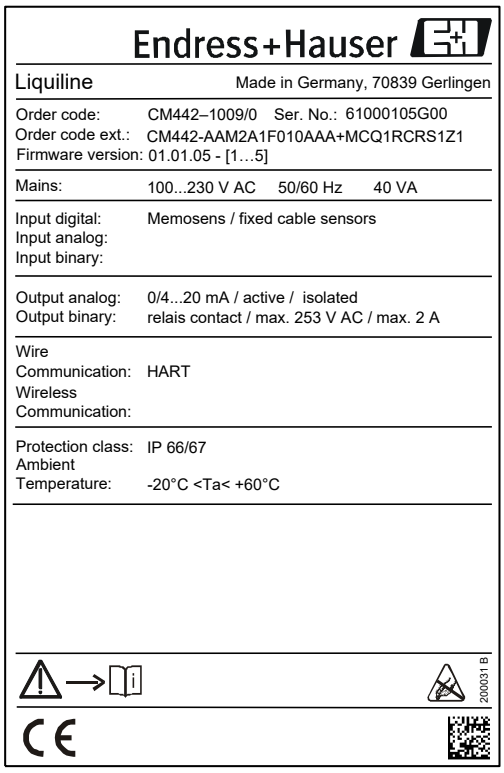
1.5. References

HCF_SPEC-12: HART Smart Communications Protocol Specification. Available from the FCG.
BA00444C: Liquiline CM44x Operating instructions.
BA01225C: Liquiline CM44xR Operating instructions.
BA00486C: Liquiline CM44x Operating instructions (Communication via the HART protocol).

2. Device identification

Manufacturer name:	Endress+Hauser
Model name:	Liquiline CM44x
Manufacturer ID code:	17 (11_h)
Device type code:	156 ($9C_h$)
Expanded device type code:	4508 ($119C_h$)
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

Liquiline — Made in Germany, 70839 Gerlingen

Order code: CM442–1009/0 Ser. No.: 61000105G00
Order code ext.: CM442-AAM2A1F010AAA+MCQ1RCRS1Z1
Firmware version: 01.01.05 - [1…5]

Mains: 100...230 V AC 50/60 Hz 40 VA

Input digital: Memosens / fixed cable sensors
Input analog:
Input binary:

Output analog: 0/4...20 mA / active / isolated
Output binary: relais contact / max. 253 V AC / max. 2 A

Wire Communication: HART
Wireless Communication:

Protection class: IP 66/67
Ambient Temperature: -20°C <Ta< +60°C

200031 B

A nameplate example

Liquiline CM44x


Liquiline CM44xR

3. Product overview

Liquiline is a complex liquid analysis transmitter, with at least one active 4-to-20 mA output (only output 1 is HART capable). Different plug and play sensors (Memosens) can be connected for different use cases.

4. Product interfaces

4.1. Process interface

4.1.1. Sensor input channels

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

4.2. Host interface

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

4.2.1. Analog output 1

This output is present in all Liquiline versions. 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

Liquiline 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 housing.

5. Device variables

5.1. Overview

Liquiline 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 Liquiline 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 µs

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 uits 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	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	

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	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	

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 Liquiline 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 Liquiline 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 Liquiline 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 Liquiline 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_h) - Value mapped to current output 1
SV returns device variable 17 (11_h) - 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 Liquiline 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 Liquiline 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 Liquiline 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, 370, 502, 503, 978
15	3	123	Device maintenance, service necessary	162, 163, 373, 916
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 spec. range	970, 972, 973
15	7	127	Analog output out of spec. 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, 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	530, 531, 536, 537, 538
16	6	134	Reserved	-
16	7	135	Reserved	-
17	0	136	Reserved	-
17	1	137	Reserved	-
17	2	138	Reserved	-
17	3	139	Reserved	-
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, check connection	62, 100, 110, 130, 158, 374, 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, 740, 770, 771, 774
18	4	148	Alarm, replace wear part	101, 106, 147, 148, 153, 155, 161, 173, 174, 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
18	7	151	Calibration necessary	152, 154, 160, 164, 844
19	0	152	Replace temperature sensor	22
19	1	153	Alarm, calibration timer expired	103, 104
19	2	154	Warning, calibration timer expires soon	102, 105

Byte	Bit	Bit	Meaning	According Liquiline diagnostics code(s)
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	Reserved	-
22	0	176	Reserved	-
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

Liqiline 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 Liquiline 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 Liquiline 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 Liquiline.

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 Liquiline operating panel.
The damping value can be set only for certain measurement values. Please refer to chapter5.2.

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 Liquiline 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. Liquiline 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 Liquiline 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 Liquiline 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 looses 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 Liquiline 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 Liquiline.

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			

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	$6F_h$

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

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

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	$6F_h$

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	$6F_h$

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	$3A_h$

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/m³	50	32_h
	Diss. oxy. concentration liquid	2	414	$019E_h$	Float	5	kg/m³	50	32_h
	Diss. oxy. concentration liquid	3	415	$019F_h$	Float	5	kg/m³	50	32_h
	Diss. oxy. concentration liquid	4	416	$01A0_h$	Float	5	kg/m³	50	32_h
	Diss. oxy. concentration liquid	5	417	$01A1_h$	Float	5	kg/m³	50	32_h
	Diss. oxy. concentration liquid	6	418	$01A2_h$	Float	5	kg/m³	50	32_h
	Diss. oxy. concentration liquid	7	419	$01A3_h$	Float	5	kg/m³	50	32_h
	Diss. oxy. concentration liquid	8	420	$01A4_h$	Float	5	kg/m³	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

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/m³	50	32_h
	Chlorine concentration	2	2148	0864_h	Float	5	kg/m³	50	32_h
	Chlorine concentration	3	2149	0865_h	Float	5	kg/m³	50	32_h
	Chlorine concentration	4	2150	0866_h	Float	5	kg/m³	50	32_h
	Chlorine concentration	5	2151	0867_h	Float	5	kg/m³	50	32_h
	Chlorine concentration	6	2152	0868_h	Float	5	kg/m³	50	32_h
	Chlorine concentration	7	2153	0869_h	Float	5	kg/m³	50	32_h
	Chlorine concentration	8	2154	$086A_h$	Float	5	kg/m³	50	32_h
	Chlorine conc. pH compensated	1	2123	$084B_h$	Float	5	kg/m³	50	32_h
	Chlorine conc. pH compensated	2	2124	$084C_h$	Float	5	kg/m³	50	32_h
	Chlorine conc. pH compensated	3	2125	$084D_h$	Float	5	kg/m³	50	32_h
	Chlorine conc. pH compensated	4	2126	$084E_h$	Float	5	kg/m³	50	32_h
	Chlorine conc. pH compensated	5	2127	$084F_h$	Float	5	kg/m³	50	32_h
	Chlorine conc. pH compensated	6	2128	0850_h	Float	5	kg/m³	50	32_h
	Chlorine conc. pH compensated	7	2129	0851_h	Float	5	kg/m³	50	32_h
	Chlorine conc. pH compensated	8	2130	0852_h	Float	5	kg/m³	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	$1A_h$

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

Menu label	Parameter	Channel	ID		Type	Size	Unit		
	Turbidity turbidity cust. damped	8	394	$018A_h$	Float	5	kg/m³	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/m³	50	32_h
	Turbidity turbidity percent damped	2	456	$01C8_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity percent damped	3	457	$01C9_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity percent damped	4	458	$01CA_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity percent damped	5	459	$01CB_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity percent damped	6	460	$01CC_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity percent damped	7	461	$01CD_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity percent damped	8	462	$01CE_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity ppm damped	1	439	$01B7_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity ppm damped	2	440	$01B8_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity ppm damped	3	441	$01B9_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity ppm damped	4	442	$01BA_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity ppm damped	5	443	$01BB_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity ppm damped	6	444	$01BC_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity ppm damped	7	445	$01BD_h$	Float	5	kg/m³	50	32_h
	Turbidity turbidity ppm damped	8	446	$01BE_h$	Float	5	kg/m³	50	32_h
Nitrate values									
	Nitrate	1	182	$00B6_h$	Float	5	kg/m³	50	32_h
	Nitrate	2	183	$00B7_h$	Float	5	kg/m³	50	32_h
	Nitrate	3	184	$00B8_h$	Float	5	kg/m³	50	32_h
	Nitrate	4	185	$00B9_h$	Float	5	kg/m³	50	32_h
	Nitrate	5	186	$00BA_h$	Float	5	kg/m³	50	32_h
	Nitrate	6	187	$00BB_h$	Float	5	kg/m³	50	32_h
	Nitrate	7	188	$00BC_h$	Float	5	kg/m³	50	32_h
	Nitrate	8	189	$00BD_h$	Float	5	kg/m³	50	32_h
	Nitrate NO3	1	363	$016B_h$	Float	5	kg/m³	50	32_h
	Nitrate NO3	2	364	$016C_h$	Float	5	kg/m³	50	32_h
	Nitrate NO3	3	365	$016D_h$	Float	5	kg/m³	50	32_h
	Nitrate NO3	4	366	$016E_h$	Float	5	kg/m³	50	32_h
	Nitrate NO3	5	367	$016F_h$	Float	5	kg/m³	50	32_h
	Nitrate NO3	6	368	0170_h	Float	5	kg/m³	50	32_h
	Nitrate NO3	7	369	0171_h	Float	5	kg/m³	50	32_h
	Nitrate NO3	8	370	0172_h	Float	5	kg/m³	50	32_h
	Nitrate damped	1	190	$00BE_h$	Float	5	kg/m³	50	32_h
	Nitrate damped	2	191	$00BF_h$	Float	5	kg/m³	50	32_h
	Nitrate damped	3	192	$00C0_h$	Float	5	kg/m³	50	32_h
	Nitrate damped	4	193	$00C1_h$	Float	5	kg/m³	50	32_h
	Nitrate damped	5	194	$00C2_h$	Float	5	kg/m³	50	32_h
	Nitrate damped	6	195	$00C3_h$	Float	5	kg/m³	50	32_h
	Nitrate damped	7	196	$00C4_h$	Float	5	kg/m³	50	32_h
	Nitrate damped	8	197	$00C5_h$	Float	5	kg/m³	50	32_h
	Nitrate NO3 damped	1	371	0173_h	Float	5	kg/m³	50	32_h
	Nitrate NO3 damped	2	372	0174_h	Float	5	kg/m³	50	32_h
	Nitrate NO3 damped	3	373	0175_h	Float	5	kg/m³	50	32_h
	Nitrate NO3 damped	4	374	0176_h	Float	5	kg/m³	50	32_h
	Nitrate NO3 damped	5	375	0177_h	Float	5	kg/m³	50	32_h
	Nitrate NO3 damped	6	376	0178_h	Float	5	kg/m³	50	32_h
	Nitrate NO3 damped	7	377	0179_h	Float	5	kg/m³	50	32_h
	Nitrate NO3 damped	8	378	$017A_h$	Float	5	kg/m³	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

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/m³	50	32_h
	SAC BOD	2	865	0361_h	Float	5	kg/m³	50	32_h
	SAC BOD	3	866	0362_h	Float	5	kg/m³	50	32_h
	SAC BOD	4	867	0363_h	Float	5	kg/m³	50	32_h
	SAC BOD	5	868	0364_h	Float	5	kg/m³	50	32_h
	SAC BOD	6	869	0365_h	Float	5	kg/m³	50	32_h
	SAC BOD	7	870	0366_h	Float	5	kg/m³	50	32_h
	SAC BOD	8	871	0367_h	Float	5	kg/m³	50	32_h
	SAC BOD damped	1	840	0348_h	Float	5	kg/m³	50	32_h
	SAC BOD damped	2	841	0349_h	Float	5	kg/m³	50	32_h
	SAC BOD damped	3	842	$034A_h$	Float	5	kg/m³	50	32_h
	SAC BOD damped	4	843	$034B_h$	Float	5	kg/m³	50	32_h
	SAC BOD damped	5	844	$034C_h$	Float	5	kg/m³	50	32_h
	SAC BOD damped	6	845	$034D_h$	Float	5	kg/m³	50	32_h
	SAC BOD damped	7	846	$034E_h$	Float	5	kg/m³	50	32_h
	SAC BOD damped	8	847	$034F_h$	Float	5	kg/m³	50	32_h
	SAC COD	1	816	0330_h	Float	5	kg/m³	50	32_h
	SAC COD	2	817	0331_h	Float	5	kg/m³	50	32_h
	SAC COD	3	818	0332_h	Float	5	kg/m³	50	32_h
	SAC COD	4	819	0333_h	Float	5	kg/m³	50	32_h
	SAC COD	5	820	0334_h	Float	5	kg/m³	50	32_h
	SAC COD	6	821	0335_h	Float	5	kg/m³	50	32_h
	SAC COD	7	822	0336_h	Float	5	kg/m³	50	32_h
	SAC COD	8	823	0337_h	Float	5	kg/m³	50	32_h
	SAC COD damped	1	784	0310_h	Float	5	kg/m³	50	32_h
	SAC COD damped	2	785	0311_h	Float	5	kg/m³	50	32_h
	SAC COD damped	3	786	0312_h	Float	5	kg/m³	50	32_h
	SAC COD damped	4	787	0313_h	Float	5	kg/m³	50	32_h
	SAC COD damped	5	788	0314_h	Float	5	kg/m³	50	32_h
	SAC COD damped	6	789	0315_h	Float	5	kg/m³	50	32_h
	SAC COD damped	7	790	0316_h	Float	5	kg/m³	50	32_h
	SAC COD damped	8	791	0317_h	Float	5	kg/m³	50	32_h
	SAC DOC	1	792	0318_h	Float	5	kg/m³	50	32_h
	SAC DOC	2	793	0319_h	Float	5	kg/m³	50	32_h
	SAC DOC	3	794	$031A_h$	Float	5	kg/m³	50	32_h
	SAC DOC	4	795	$031B_h$	Float	5	kg/m³	50	32_h
	SAC DOC	5	796	$031C_h$	Float	5	kg/m³	50	32_h
	SAC DOC	6	797	$031D_h$	Float	5	kg/m³	50	32_h
	SAC DOC	7	798	$031E_h$	Float	5	kg/m³	50	32_h
	SAC DOC	8	799	$031F_h$	Float	5	kg/m³	50	32_h
	SAC DOC damped	1	832	0340_h	Float	5	kg/m³	50	32_h
	SAC DOC damped	2	833	0341_h	Float	5	kg/m³	50	32_h
	SAC DOC damped	3	834	0342_h	Float	5	kg/m³	50	32_h
	SAC DOC damped	4	835	0343_h	Float	5	kg/m³	50	32_h
	SAC DOC damped	5	836	0344_h	Float	5	kg/m³	50	32_h
	SAC DOC damped	6	837	0345_h	Float	5	kg/m³	50	32_h
	SAC DOC damped	7	838	0346_h	Float	5	kg/m³	50	32_h
	SAC DOC damped	8	839	0347_h	Float	5	kg/m³	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	$0B_h$

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/m³	50	32_h
	SAC TOC	2	801	0321_h	Float	5	kg/m³	50	32_h
	SAC TOC	3	802	0322_h	Float	5	kg/m³	50	32_h
	SAC TOC	4	803	0323_h	Float	5	kg/m³	50	32_h
	SAC TOC	5	804	0324_h	Float	5	kg/m³	50	32_h
	SAC TOC	6	805	0325_h	Float	5	kg/m³	50	32_h
	SAC TOC	7	806	0326_h	Float	5	kg/m³	50	32_h
	SAC TOC	8	807	0327_h	Float	5	kg/m³	50	32_h
	SAC TOC damped	1	848	0350_h	Float	5	kg/m³	50	32_h
	SAC TOC damped	2	849	0351_h	Float	5	kg/m³	50	32_h
	SAC TOC damped	3	850	0352_h	Float	5	kg/m³	50	32_h
	SAC TOC damped	4	851	0353_h	Float	5	kg/m³	50	32_h
	SAC TOC damped	5	852	0354_h	Float	5	kg/m³	50	32_h
	SAC TOC damped	6	853	0355_h	Float	5	kg/m³	50	32_h
	SAC TOC damped	7	854	0356_h	Float	5	kg/m³	50	32_h
	SAC TOC damped	8	855	0357_h	Float	5	kg/m³	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

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

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*

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			

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	$5F_h$

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	$0B_h$

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

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			

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

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			

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				

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	

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 Liquiline 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

Singed 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. Liquiline 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 Liquiline 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 Liquiline 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 Liquiline CM44x - 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, 08-Dec-2010:	Initial revision
Revision 2, 21-Jun-2011:	Command 48 error mapping table corrected Sensor measurement values added
Revision 3, 21-Nov-2011:	Ranges revised Units revised Conductivity sensor values revised
Revision 4, 25-Nov-2013:	Added new errors to command 48 error mapping table Added new E+H units
Revision 5, 29-Jul-2019:	Device revision 2

www.addresses.endress.com

Endress+Hauser

People for Process Automation

Document: E+H Liquiline CM44x LIT-18, Revision 5 – SD01187C/07/EN/03.19