

Liquiline_pHORP – Device Revision 2

FF-H1 Guideline

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Table of contents

1.	Introduction	5
1.1.	Scope	5
1.2.	Purpose	5
1.3.	Who should use this document?	5
1.4.	Notes on safety icons and symbols	5
1.5.	Abbreviations and definitions	6
1.6.	References	7
2.	Device identification	8
3.	Product overview	8
4.	Product interfaces	9
4.1.	Process interface	9
4.2.	FOUNDATION Fieldbus interface	9
4.2.1.	FOUNDATION Fieldbus technology	9
4.2.2.	System architecture	9
4.2.3.	Link Active Scheduler (LAS)	10
4.2.4.	Data transfer	11
4.2.5.	Device ID, addressing	11
4.2.6.	Function Blocks	11
4.2.7.	Fieldbus based process control	11
4.2.8.	Device Description	12
4.2.9.	Configuration of the transmitter and FF functions	12
4.2.10.	Hardware settings	12
4.3.	FOUNDATION Fieldbus cable specification	13
4.3.1.	Cable type	13
4.3.2.	Maximum overall cable length	13
4.3.3.	Maximum spur length	14
4.3.4.	Number of field devices	14
4.3.5.	Shielding and grounding	14
4.3.6.	Bus termination	15
4.3.7.	Further information	15
4.4.	Connecting the measurement unit	16
4.4.1.	Cable glands or entries	16
4.4.2.	Fieldbus connector	16
4.4.3.	Post-connection check	18
5.	Commissioning	19
5.1.	Function check	19
5.2.	Commissioning	19
5.2.1.	Initial commissioning	19
6.	Operation via FOUNDATION Fieldbus	22
6.1.	Block model	22
6.2.	Resource Block (Device Block)	23
6.2.1.	Selecting the operating mode	23
6.2.2.	Block status	23
6.2.3.	Alarm detection and processing	23
6.2.4.	Resource Block FF parameters	25
6.3.	Transducer Blocks	34
6.3.1.	Block output variables	34
6.3.2.	Selecting the operating mode	35
6.3.3.	Alarm detection and processing	35
6.3.4.	Accessing manufacturer-specific parameters	35
6.3.5.	Selecting the units	35
6.3.6.	Accessing logbooks	36

6.3.7. Accessing buffer tables	37
6.3.8. Accessing process medium compensation tables.....	37
6.3.9. Diagnostic codes and maintenance	38
6.3.10. Field Diagnostics.....	40
6.3.11. Transducer Block FF universal parameters	43
6.3.12. PHORP Transducer Block	47
6.3.13. DIAGDI Transducer Block.....	56
6.3.14. SERVICE Transducer Block.....	64
6.3.15. ADVDIAGPHORP Transducer Block	67
6.3.16. DISPLAYPHORP Transducer Block	79
6.3.17. MEMOPHORP Transducer Block.....	80
6.3.18. DIAGPHORP Transducer Block	85
6.4. Function Blocks.....	93
6.4.1. Analog Input	93
6.4.2. Discrete Input.....	93
6.4.3. PID	94
6.4.4. Analog Alarm	94
6.4.5. Signal Characterizer	94
6.4.6. Input Selector	94

1. Introduction

1.1. Scope

The Endress+Hauser analysis transmitter, model Liquiline_pHORP is certified and registered by the Fieldbus FOUNDATION. The device meets all the requirements of the following specifications:

- Certified in accordance with Fieldbus FOUNDATION specification
- Fieldbus FOUNDATION H1 specification
- Interoperability Test Kit (ITK), (device certification number available on request): the device may also be operated using certified devices from other manufacturers
- Physical Layer Conformance Test of the Fieldbus FOUNDATION

This document specifies all the device specific features and documents FF-H1 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 FF-H1 capable host applications.

1.2. Purpose

This specification is designed to complement the operating instructions (BA00381C and BA00382C) by providing a complete, unambiguous description of this field device from a FF-H1 communication perspective.

1.3. Who should use this document?

The specification is designed to be a technical reference for FF-H1 capable host application developers, system integrators and experienced end users. It also provides functional specifications (e.g., methods, enumerations and performance requirements) used during field device development, maintenance and testing. This document assumes the reader is familiar with Fieldbus FOUNDATION protocol requirements and terminology.

1.4. Notes on safety icons and symbols

The structure, signal words and safety colors of the signs comply with the specifications of ANSI Z535.6 ("Product safety information in product manuals, instructions and other collateral materials").

Safety message structure	Meaning
<p>▲ DANGER</p> <p>Cause (/consequences) Consequences if safety message is not heeded</p> <ul style="list-style-type: none"> • Corrective action 	<p>This symbol alerts you to a dangerous situation. Failure to avoid the situation will result in a fatal or serious injury.</p>
<p>▲ WARNING</p> <p>Cause (/consequences) Consequences if safety message is not heeded</p> <ul style="list-style-type: none"> • Corrective action 	<p>This symbol alerts you to a dangerous situation. Failure to avoid the situation can result in a fatal or serious injury.</p>
<p>▲ CAUTION</p> <p>Cause (/consequences) Consequences if safety message is not heeded</p> <ul style="list-style-type: none"> • Corrective action 	<p>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.</p>
<p>NOTICE</p> <p>Cause/situation Consequences if safety message is not heeded</p> <ul style="list-style-type: none"> • Action/note 	<p>This symbol alerts you to situations that can result in damage to property and equipment.</p>

1.5. Abbreviations and definitions

Abbreviation	Description
AI	Analog Input
CiF	Control in the Field
CFF	Common File Format
DCS	Distributed Control System/Digital Control System
DI	Discrete Input
DD	Device Description
DLL	Data Link Layer
EDDL	Electronic Device Description Language
ENP	Electronic Name Plate
FB	Function Block
FF	FOUNDATION Fieldbus
HIST	Host Interoperability Support Testing
HMI	Human Machine Interface
HSE	FOUNDATION High Speed Ethernet
IEC	International Electrotechnical Commission I/O
I/O	Input Output
IS	Intrinsic Safety
ITK	Interoperability Test Kit
LAS	Link Active Schedule
LM	Link Master
n.a.	Not applicable
NaN	Not a Number (IEEE-754, 7Fh A0h 00h 00h)
NM	Network Management
OD	Object Dictionary
PCS	Process Control System

Abbreviation	Description
PID	Proportional/Integral/Derivative Control
PV	Process Variable
RB	Resource Block
SM	System Management
SP	Set Point
TB	Transducer Block
VCR	Virtual Communication Relationship

1.6. References

Standard/Specification	Description
IEC 61158-1	Introductory Guide
IEC 61158-2	Physical Layer specification and Service Definition
IEC 61158-3	Data Link Layer (DLL) Service Definition
IEC 61158-4	Data Link Layer (DLL) Protocol Definition
IEC 61158-5	Application Layer Service Specification
IEC 61158-6	Application Layer Protocol Specification
IEC 61158-7	System Management
IEC 61158-8	Conformance Testing
CEI/IEC 61511	Functional safety – Safety Instrumented Systems for the Process Industry Sector
NAMUR NE81	Requirements for Online Plant Asset Management System
NAMUR NE107	Self-monitoring and Diagnosis of Field Devices
BA00381C	Operating Instructions Liquiline_pHORP Part 1
BA00382C	Operating Instructions Liquiline_pHORP Part 2
BA00062S	Guideline FOUNDATION Fieldbus Function Blocks
BA00013S	FOUNDATION Fieldbus Overview

2. Device identification

Manufacturer name: Endress+Hauser
 Model name: Liquiline_pHORP
 Manufacturer ID code: 452B48_h (4533064)
 Device type code: 10A0_h (4256)
 Device revision: 2
 Stack Communication Profiles: 31PS, 32LT
 H1 Physical Layer Profiles: 511, 113, 115
 H1 ITK Profile: 6.1.1

The name plate is located on the right side of the housing and indicates the model name, order codes, serial number and software version. The device revision, device description revision, physical device tag, node address are shown in the diagnostics menu.

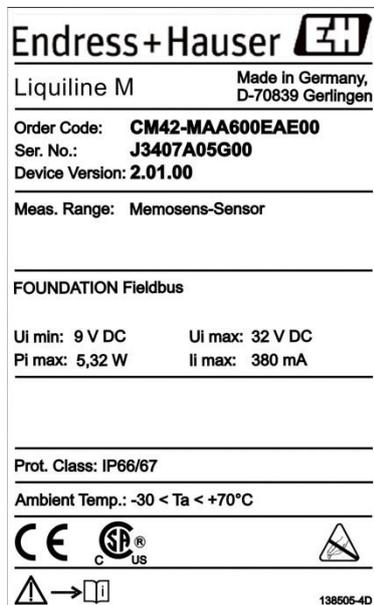


Fig. 3: A name plate example

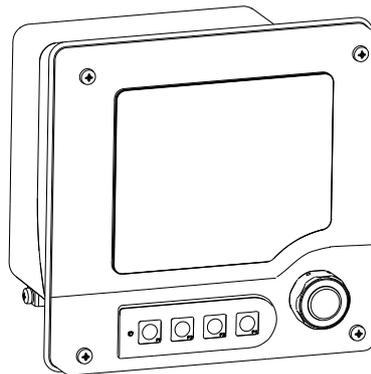


Fig. 2: Stainless steel housing

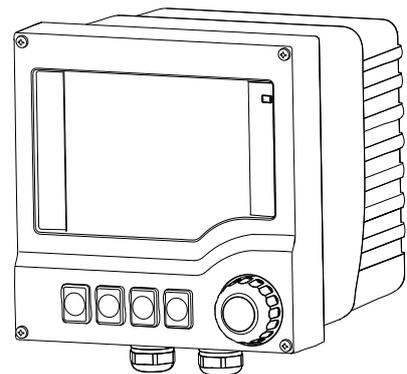


Fig. 1: Plastics (PC) housing

3. Product overview

Liquiline_pHORP is a liquid analysis transmitter for pH/ORP measurement. Different plug and play sensors (Memosens) and analog sensors can be connected for different applications.

4. Product interfaces

4.1. Process interface

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. FOUNDATION Fieldbus interface

4.2.1. FOUNDATION Fieldbus technology

The FOUNDATION Fieldbus (FF) is a purely digital, serial communication system that connects fieldbus devices (sensors, actuators), automation and process control systems with each other. As a local communications network (LAN) for field devices the FF was primarily designed for the requirements of process technology. The FF thus forms the basic network throughout the hierarchy of a communication system.

Please refer to Operating Instructions BA 00013S “FOUNDATION Fieldbus Overview in chapter “Installation and Commissioning Guidelines” for configuration information.

4.2.2. System architecture

The following figure shows an example of a FOUNDATION Fieldbus network with the associated components.

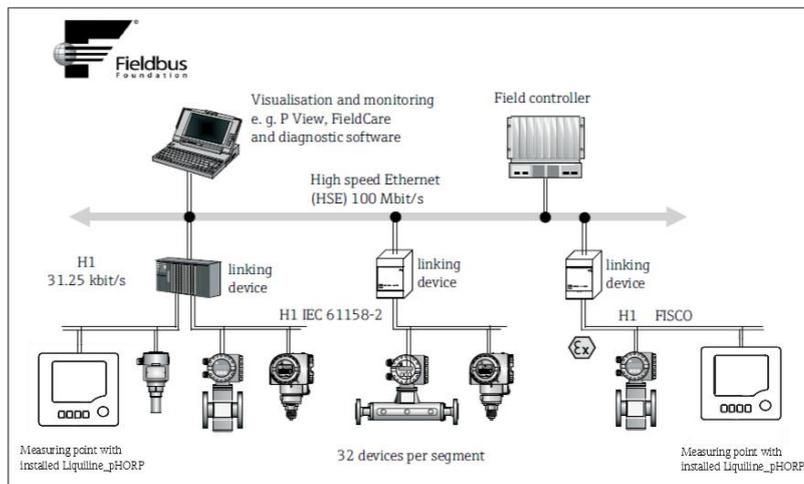


Fig. 4: System integration via FOUNDATION fieldbus

HSE = High Speed Ethernet, H1 = FOUNDATION Fieldbus-H1

The following system connection options are possible:

- A linking device can be used to connect to higher ranking fieldbus protocols (e.g. to the High Speed Ethernet - HSE) (Control Net)
- A H1 card is required for direct connection to a process control system.
- System inputs are available directly for H1 (HSE).

The system architecture of the FOUNDATION Fieldbus can be divided into two sub-networks:

H1 bus system:

In the field, fieldbus devices are connected only via the slower H1 bus system that is specified following IEC 61158-2. The H1 bus system allows simultaneous feed to the field devices and data transfer on the two-wire line.

The following points describe some important characteristics of the H1 bus system:

- All fieldbus devices are powered via the H1 bus. Like the fieldbus devices, the power supply is connected in parallel to the bus line. Devices requiring external power must use a separate power supply.
- One of the most common network structures is the line structure. Star, tree or mixed network structures are also possible using connecting components (junction boxes).
- The bus connection to the individual fieldbus devices is achieved by means of a T connector or via a spur. This has the advantage that individual fieldbus devices can be connected or disconnected without interrupting the bus or the bus communication.
- The number of connected fieldbus devices depends on various factors, such as use in hazardous areas, length of spurs, cable types, current consumption of field devices etc. (see Chapter [FOUNDATION Fieldbus cable specification](#)).
- If using fieldbus devices in a hazardous area, the H1 bus must be equipped with an intrinsically safe barrier before the transition to the hazardous area.
- A bus terminator is required at each end of the bus segment.

High Speed Ethernet (HSE):

The superior bus system is realized via the High Speed Ethernet (HSE) with a transmission rate of max. 100 MBit/s. This serves as the 'backbone' (basic network) between various local sub-networks and/or where there are a large number of network users.

4.2.3. Link Active Scheduler (LAS)

The FOUNDATION Fieldbus works according to the 'producer-consumer' relationship. This provides various advantages.

Data can be directly exchanged between field devices, e.g. a sensor and an actuating valve. Each bus user 'publishes' its data on the bus and all the bus users configured accordingly obtain this data. Publication of this data is carried out by a 'bus administrator' known as the 'Link Active Scheduler', which controls the sequence of bus communication centrally. The LAS organizes all the bus activities and sends appropriate commands to the individual field devices.

Other tasks of the LAS are:

- Recognition and reporting of newly connected devices.
- Reporting the removal of devices no longer communicating with the fieldbus.
- Keeping the 'Live List'. This list, in which all the fieldbus users are recorded, is checked by the LAS regularly. If devices are logged on or logged off, the "Live List" is updated and sent immediately to all the devices.
- Requesting process data from the field devices in accordance with a fixed schedule.
- Allocation of send rights (tokens) to devices between the untimed data transfer.

The LAS can be run redundantly, i.e. it exists both in the process control system and in the field device. If one LAS fails, the other LAS can accurately take over communication. Through precise timing of the bus communication via the LAS, the FF can run exact processes at regular intervals.

Fieldbus devices, such as this analysis transmitter, which can take over the LAS function in the event of failure of the primary master, are called 'Link Masters'. In contrast, 'Basic Devices' can only receive signals and send them to the central process control system. The LAS function is deactivated in this head transmitter when the unit is delivered.

4.2.4. Data transfer

We distinguish between two types of data transfer:

- Scheduled data transfer (cyclic): all time-critical process data (i.e. continuous measurement or actuating signals) are transferred and processed in accordance with a fixed schedule.
- Unscheduled data transfer (acyclic): device parameters that are not time-critical for the process and diagnosis information are only transferred to the fieldbus when needed. This data transfer is always carried out in the intervals between timed communications.

4.2.5. Device ID, addressing

Within the FF network, each fieldbus device is identified by a unique device ID (DEVICE_ID). The fieldbus host system (LAS) automatically gives the network address to the field device. The network address is the address that the fieldbus currently uses to address the device.

The FOUNDATION Fieldbus uses addresses between 0 and 255:

- Groups/DLL: 0 to 15
- Devices in operation: 20 to 35
- Reserve devices: 232 to 247
- Offline/substitute devices: 248 to 251

The field device tag name (PD_TAG) is given to the device during commissioning (see chapter [Initial Commissioning](#)). It remains stored in the device even during a supply voltage failure.

4.2.6. Function Blocks

The FOUNDATION Fieldbus uses predefined function blocks to describe the functions of a device and to specify uniform data access. The function blocks implemented in each fieldbus device provide information on the tasks which a device can accept in the whole of the automation strategy.

In the case of sensors these are typically the following blocks:

- 'Analog Input' or
- 'Discrete Input' (digital input)

Actuating valves normally have the function blocks:

- 'Analog Output' or
- 'Discrete Output' (digital output)

For control tasks there are the blocks:

- PD controller or
- PID controller

More information on this can be found from Section [Operation via FOUNDATION fieldbus](#) onwards.

4.2.7. Fieldbus based process control

With the FOUNDATION Fieldbus field devices can carry out simple process control functions themselves, thereby relieving pressure on the superior process control system. Here the Link Active Scheduler (LAS) coordinates data exchange between the sensor and controller and makes sure that two field devices cannot access the bus at the same time. To do this, configuration software in host systems or workbench tools such as the NI-FBUS Configurator from National Instruments are used to connect the various function blocks to the desired control strategy (see chapter [Initial Commissioning](#)).

4.2.8. Device Description

For commissioning, diagnosis and configuration make sure that process control systems or superior configuration systems can access all device data and that the operating structure is uniform. The device-specific information required for this is stored as so-called device description data in special files (the 'Device Description'- DD). This enables the device data to be interpreted and shown via the configuration program. The DD is thus a kind of 'device driver'. On the other hand, a CFF file (CFF = Common File Format) is required for the network configuration in the OFF-line mode.

These files can be acquired as follows:

- Free of charge via the Internet: www.products.endress.com/fieldbus-dd
- Via the FOUNDATION Fieldbus Organization: www.fieldbus.org

Additional DCS-specific packages are available as well:

- Emerson AMS Device Manager Install Packages: www.products.endress.com/fieldbus-ams
- Yokogawa Plant Resource Manager Device Viewer files: www.products.endress.com/fieldbus-prm

4.2.9. Configuration of the transmitter and FF functions

The FF communication system will only function properly if correctly configured. You can obtain special configuration and operating programs from various manufacturers for the configuration. These can be used for configuring both the FF functions and all of the device-specific parameters. The predefined function blocks allow uniform access to all the network and fieldbus device data. A detailed step-by-step description of the procedure for commissioning the FF functions is given in chapter [Initial Commissioning](#) together with information on configuring device-specific parameters.

System files

You require the following files for commissioning and configuring the network:

- Commissioning → device description (DD: *.sym, *.ffo or EDD: *.sy5, *.ff5)
- Network configuration → CFF file (Common File Format)

4.2.10. Hardware settings

DIP switches on the FMPA3 module are used to enable and disable write protection and the simulation mode (for Analog Input Blocks). When write protection is active, parameters cannot be modified. The current write protection status is displayed in the WRITE_LOCK parameter (see Section [Resource Block FF Parameters](#)). The simulation mode via the hardware setting must be changed before the software setting.

NOTICE

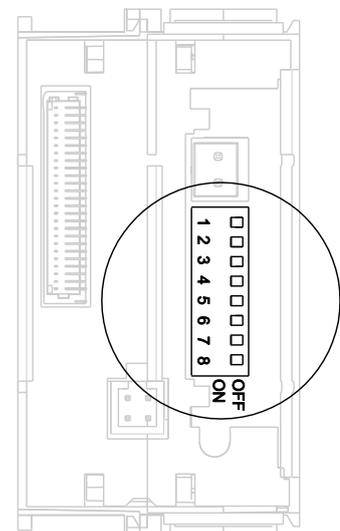
ESD - electrostatic discharge

Failure to observe this may result in destruction or malfunction of parts of the electronics.

- ▶ **Protect the terminals from electrostatic discharge.**

To set the DIP switches, proceed as follows:

1. Open the cover of the transmitter housing.
2. Configure the DIP switch on the FMPA3 module accordingly. Switch to ON = function enabled, switch to OFF = function disabled. (first switch SIM = simulation mode, second switch  = write lock, remaining switches no function)
3. The transmitter accepts the settings within one second.
4. Close the cover and fix it to the housing with the 4 screws.



4.3. FOUNDATION Fieldbus cable specification

4.3.1. Cable type

Twin-core cables are required for connecting the device to the FOUNDATION Fieldbus H1. Following IEC 61158-2 (MBP), four different cable types (A, B, C, D) can be used with the FOUNDATION Fieldbus, only two of which (cable types A and B) are shielded.

- Cable types A or B are particularly preferable for new installations. Only these types have cable shielding that guarantees adequate protection from electromagnetic interference and thus the most reliable data transfer. In the case of cable type B, several field buses (same degree of protection) may be operated in one cable. No other circuits are permissible in the same cable.
- Practical experience has shown that cable types C and D should not be used due to the lack of shielding, since the freedom from interference generally does not meet the requirements described in the standard.

The electrical data of the fieldbus cable have not been specified but determine important characteristics of the design of the fieldbus, such as distances bridged, number of users, electromagnetic compatibility, etc.

	Type A	Type B
Cable structure	Twisted pair, shielded	One or more twisted pairs, fully shielded
Wire size	0.8 mm ² (AWG 18)	0.32 mm ² (AWG 22)
Loop-resistance (direct current)	44 Ω/km	112 Ω/km
Characteristic impedance at 31.25 kHz	100 Ω ± 20%	100 Ω ± 30%
Attenuation constant at 39 kHz	3 dB/km	5 dB/km
Capacitive asymmetry	2 nF/km	2 nF/km
Envelope delay distortion (7.9 to 39 kHz)	1.7 ms/km	*
Shield coverage	90 %	*
Max. cable length (incl. spurs >1m)	1900 m (6233 ft)	1200 m (3937 ft)
* Not specified		

Examples for suitable fieldbus cables (type A) from various manufacturers for non-hazardous areas are listed below:

- Siemens: 6XV1 830-5BH10
- Belden: 3076F
- Leoni Kerpen: FB-v2X(St*)Y-fl or FB-V2X(St*)H

4.3.2. Maximum overall cable length

The maximum network expansion depends on the type of protection and the cable specifications. The overall cable length combines the length of the main cable and the length of all spurs (>1 m/3.3 ft).

Note the following points:

- The maximum permissible overall cable length depends on the cable type used.
- If repeaters are used, the maximum permissible cable length is doubled. A maximum of three repeaters are permitted between field device and master.

4.3.3. Maximum spur length

The line between the distribution box and field device is described as a spur.

In the case of non-Ex applications, the maximum length of a spur depends on the number of spurs (>1 m/3.28 ft):

Number of spurs	1 to 12	13 to 14	15 to 18	19 to 24	25 to 32
Max. length per spur	120 m (393 ft)	90 m (295 ft)	60 m (196 ft)	30 m (98 ft)	1 m (3.28 ft)

4.3.4. Number of field devices

In accordance with IEC 61158-2 (MBP), a maximum of 32 field devices can be connected per fieldbus segment. However, this number is restricted under certain conditions (explosion protection, bus power option, field device current consumption). A maximum of four field devices can be connected to a spur.

4.3.5. Shielding and grounding

Optimum electromagnetic compatibility (EMC) of the fieldbus system can only be guaranteed if the system components and, in particular, the lines are shielded and the shield forms as complete a cover as possible. Shield coverage of 90% is ideal.

- To ensure an EMC protective effect, connect the shield as often as possible to the reference ground.
- For reasons of explosion protection, you should refrain from grounding however.

To comply with both requirements, the FOUNDATION Fieldbus basically allows three different types of shielding:

- Shielding at both ends
- Shielding at one end on the feed side with capacitance connection to the field device
- Shielding at one end on the feed side

Experience shows that the best results with regard to EMC are achieved in most cases in installations with one-sided shielding. Appropriate measures with regard to input wiring must be taken to allow unrestricted operation when EMC interference is present. These measures have been taken into account for this device. Operation in the event of disturbance variables as per NAMUR NE21 is possible with one-sided shielding. Where applicable, national installation regulations and guidelines must be observed during the installation!

Where there are large differences in potential between the individual grounding points, only one point of the shielding is connected directly with the reference ground. In systems without potential equalization, therefore, cable shielding of fieldbus systems should only be grounded on one side, for example at the fieldbus supply unit or at safety barriers.

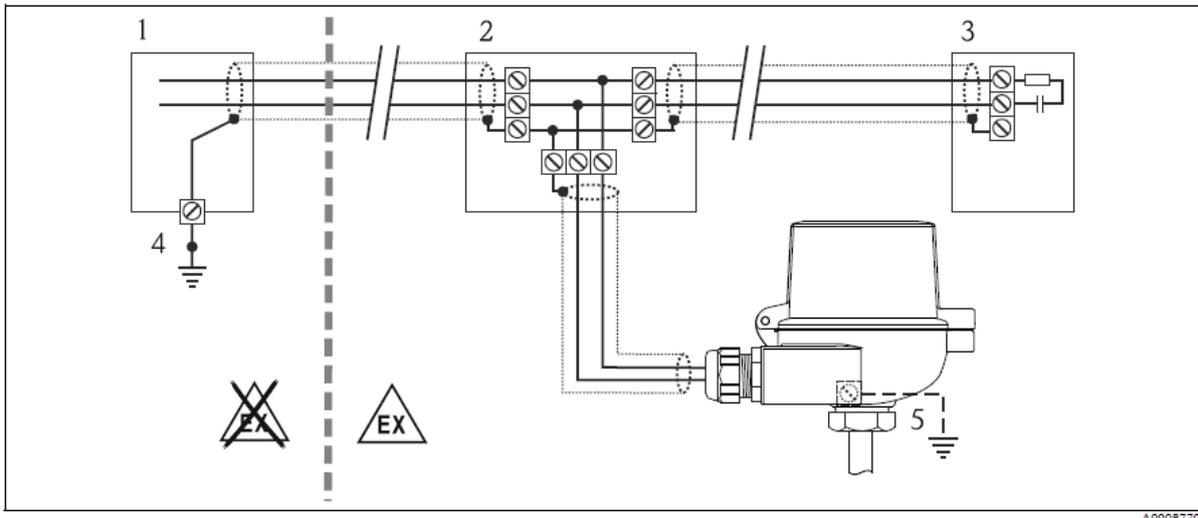


Fig. 5: Shielding and one-sided grounding of the fieldbus cable shielding

- 1 Supply unit
 2 Distribution box (T-box)
 3 Bus terminator
 4 Grounding point for fieldbus cable shielding
 5 Optional grounding of the field device, isolated from cable shielding.

NOTICE

If the shielding of the cable is grounded at more than one point in systems without potential matching, power supply frequency equalizing currents can occur that damage the bus cable or shielding or have serious effect on signal transmission.

- ▶ In such cases the shielding of the fieldbus cable is to be grounded on only one side, i.e. it must not be connected to the ground terminal of the housing (terminal head, field housing).
- ▶ The shield that is not connected should be insulated!

4.3.6. Bus termination

The start and end of each fieldbus segment are always to be terminated with a bus terminator. With various junction boxes (non-Ex), the bus termination can be activated via a switch. If this is not the case, a separate bus terminator must be installed. Note the following points in addition:

- ▶ In the case of a branched bus segment, the device furthest from the segment coupler represents the end of the bus.
- ▶ If the fieldbus is extended with a repeater, then the extension must also be terminated at both ends.

4.3.7. Further information

- General information and further pointers on wiring can be found on www.fieldbus.org, the web site of the FOUNDATION Fieldbus or in the FOUNDATION Fieldbus Overview BA00013S (www.endress.com/cm42 under "Documents").

4.4. Connecting the measurement unit

Devices can be connected to the FOUNDATION Fieldbus in two ways:

- Connection via conventional cable gland → [Chap. 4.4.1](#)
- Connection via fieldbus connector (optional, can be purchased as an accessory) → [Chap. 4.4.2](#)

NOTICE

If the shielding of the fieldbus cable is grounded at more than one point in systems without additional potential matching, power supply frequency equalizing currents can occur that damage the cable or the shielding. In such cases the shielding of the fieldbus cable is to be grounded on only one side, i.e. it must not be connected to the ground terminal of the housing (terminal head, field housing). The shield that is not connected should be insulated.

- ▶ Grounding via one of the grounding screws (terminal head, field housing) is recommended.

4.4.1. Cable glands or entries

Please observe the general procedure described in BA00381C.



- The terminals for the fieldbus connection (997 and 998) are not polarity sensitive.
- A shielded cable must be used for the connection.

4.4.2. Fieldbus connector

Optionally, a fieldbus connector can be screwed into the field housing instead of a cable gland. Fieldbus connectors can be ordered from Endress+Hauser as an accessory (see BA00381C).

The connection technology of FOUNDATION Fieldbus allows measuring devices to be connected to the fieldbus via uniform mechanical connections such as T-boxes, junction boxes, etc. This connection technology using prefabricated distribution modules and plug-in connectors offers substantial advantages over conventional wiring:

- Field devices can be removed, replaced or added at any time during normal operation. Communication is not interrupted.
- Installation and maintenance are significantly easier.
- Existing cable infrastructures can be used and expanded instantly, e.g. when constructing new star distributors using 4-channel or 8-channel distribution modules.

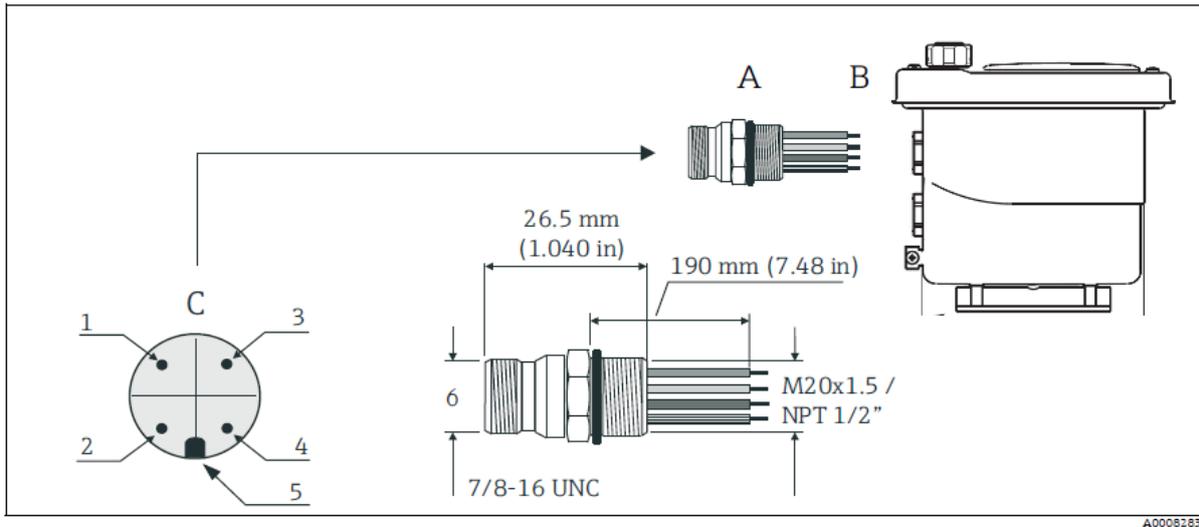


Fig. 6: Connectors for connecting to FOUNDATION Fieldbus

- A *Fieldbus connector (pin assignment/color codes)*
- 1 blue wire: FF- (terminal 998)
 - 2 brown wire: FF+ (terminal 997)
 - 3 gray wire: shielding
 - 4 green/yellow wire: ground
 - 5 positioning tappet
 - 6 7/8" UNC thread
- B *Terminal Liquiline transmitter*
- C *Connector at the housing (male)*

Connector technical data:

Wire cross-section	4 x 0.8 mm ²
Connection thread	M20 x 1.5 / NPT 1/2"
Degree of protection	IP 67 as per DIN 40 050 IEC 529
Contact surface	CuZn, gold-plated
Housing material	1.4401 (316)
Flammability	V - 2 as per UL - 94
Ambient temperature	-40 to +105 °C (-40 to +221 °F)
Current carrying capacity	9 A
Rated voltage	Max. 600 V
Contact resistance	≤5 mΩ
Insulation resistance	≥10 ⁹ Ω



Ground and/or shield connection has to be cut by the customer, if he wants to use "single grounding" in his plant (i.e. because of Ex requirements).

4.4.3. Post-connection check

After the electrical installation of the device, always perform the following final checks:

Device condition and specifications	Notes
Are the measuring device or the cables damaged (visual check)?	-
Electrical connection	Notes
Does the supply voltage match the specifications on the nameplate?	9 to 32 V DC
Do the cables used comply with the specifications?	Fieldbus cable, see Cable type Sensor cable, see BA00381C
Do the cables have adequate strain relief?	-
Power supply and signal cables correctly connected?	→ see BA00381C
Have the connections of the spring terminals been checked?	-
All the cable entries installed, tightened and sealed? Cable run with "water trap"?	→ see BA00381C
Are all the housing covers installed and tightened?	→ see BA00381C
Electrical connection of FOUNDATION Fieldbus	Notes
Are all the connecting components (T-boxes, junction boxes, connectors, etc.) connected with each other correctly?	-
Has each fieldbus segment been terminated at both ends with a bus terminator?	-
Has the max. length of the fieldbus cable been observed in accordance with the FOUNDATION Fieldbus specifications?	→ Maximum Overall Cable Length
Has the max. length of the spurs been observed in accordance with the FOUNDATION Fieldbus specifications?	
Is the fieldbus cable fully shielded (90%) and correctly grounded?	

5. Commissioning

5.1. Function check

Before commissioning the measurement point make sure that all final checks have been carried out:

- Checklist “Post-connection check” → [Post-Connection Check](#)



The FOUNDATION Fieldbus interface's technical data must be maintained in accordance with IEC 61158-2 (MBP).

The bus voltage of 9 ... 32 V (9 ... 17.5 V Ex version) and the current consumption of approx. 22 mA at the measuring device can be checked using a normal multimeter.

5.2. Commissioning

Note the following points:

- The files required for commissioning and network configuration can be obtained as described in chapter [Device Description](#).
- In the case of FOUNDATION Fieldbus, the device is identified in the host or configuration system by means of the device ID (DEVICE_ID). The DEVICE_ID is a combination of the manufacturer ID, device type and device serial number. It is unique and can never be assigned twice. The DEVICE_ID of the device is composed as follows:
 DEVICE_ID = 452B4810A0-XXXXXXXXXXXX
 452B48 = Endress+Hauser
 10A0 = Liquiline_pHORP
 XXXXXXXXXXXX = device serial number (11-digit)
- Please refer to the Operating Instructions of your operating and configuration software.

5.2.1. Initial commissioning

The following description takes you step-by-step through commissioning the device and all the necessary configurations for the FOUNDATION Fieldbus:

1. Open the configuration program.
2. Load the device description files or the CFF file into the host system or the configuration program. Make sure you are using the right system files (see Section [Device Description](#)).
3. Note the DEVICE_ID on the device nameplate for identification in the process control system (see Section [Device Identification](#)).
4. Switch the device on. The first time you establish a connection, a device with factory default settings reacts as follows in the configuration system:

- EH_Liquiline_pHORP_XXXXXXXXXX (tag name PD-TAG)
- 452B4810A0-XXXXXXXXXX (DEVICE_ID)

– Block structure:

Display text (xxx... = serial number)	Base index (decimal)	Description
RS_XXXXXXXXXX	400	Resource Block
PHORP_XXXXXXXXXX	540	pH/ORP Transducer Block
DIAGDI_XXXXXXXXXX	680	DIAGDI Transducer Block
SERVICE_XXXXXXXXXX	820	Service Transducer Block
ADVDIAGPHORP_XXXXXXXXXX	960	Advanced Diagnostics Transducer Block
DISPLAYPHORP_XXXXXXXXXX	1100	Display Transducer Block
MEMOPHORP_XXXXXXXXXX	1240	Memosens Transducer Block
DIAGPHORP_XXXXXXXXXX	1380	Diagnostics Transducer Block
AI_1_XXXXXXXXXX	1520	Analog Input Function Block 1
AI_2_XXXXXXXXXX	1660	Analog Input Function Block 2
AI_3_XXXXXXXXXX	1800	Analog Input Function Block 3
AI_4_XXXXXXXXXX	1940	Analog Input Function Block 4
AI_5_XXXXXXXXXX	2080	Analog Input Function Block 5
AI_6_XXXXXXXXXX	2220	Analog Input Function Block 6
DI_1_XXXXXXXXXX	2360	Discrete Input Function Block 1
DI_2_XXXXXXXXXX	2500	Discrete Input Function Block 2
PID_XXXXXXXXXX	2640	PID Function Block
AALM_1_XXXXXXXXXX	2780	Analog Alarm Function Block 1
AALM_2_XXXXXXXXXX	2920	Analog Alarm Function Block 2
CHAR_XXXXXXXXXX	3060	Signal Characterizer Function Block
ISEL_XXXXXXXXXX	3200	Input Selector Function Block



The device is delivered ex-factory with the bus address “247” and is thus in the address range between 232 and 247 reserved for re-addressing field devices. A lower bus address should be assigned to the device for commissioning.

- Using the DEVICE_ID noted, identify the field device and assign the desired tag name (PD_TAG) to the fieldbus device in question.

Factory setting: EH_Liquiline_pHORP_XXXXXXXXXX (xxx... = serial number).

- Quick Setup in Transducers
 - Check measured value setting (parameter **MEASURED_VALUE_PHORP** in PHORP Transducer Block and, if required, change the indicated value after switching the operating mode of PHORP Transducer to OOS.
 - Check temperature unit setting (parameter **UNIT_MEAS_DAMPED_TEMP_VAL**) and, if required, change the indicated value (writing to this parameter in OOS mode only).
 - Check and change device’s date and time, if required. SERVICE Transducer Block parameters offer this functionality. **DATE_TIME** to read the current device date and time or to change (write) new date and time values to the device. **DATE_FORMAT** and **TIME_FORMAT** allow setting the format for indication on the local device display (DDMMYYYY or MMDDYYYY and HHMMSS24 or HHMMSS12).



Please note that date and time of the device is not synchronized with FF-H1 bus time or host system time.

- Check/Select language for local device display (DISPLAYPHORP Transducer Block parameter **DISPLAY_LANGUAGE**). One can switch between English and a second language which is defined by the order code of the device. The antepenultimate character in the order code identifies the second language. For example CM42-MAA610EBZ00 means that the second language (Z) is set to Chinese.



The order code is indicated on the name plate. Resource Block parameter **ORDER_CODE** indicates the order code of the device as well.

- e. Check that Transducer Block **MODE_BLK** is AUTO or set it back to AUTO.
7. Quick Setup in Analog Input Function Blocks
 - a. Check **MODE_BLK**. If one of the following parameters has to be changed, set it to OOS.
 - b. Select **CHANNEL**. Refer to chapter [Block output variables](#) for more details.
 - c. Select linearization type **L_TYPE**. Choose between linear, indirect and indirect square root.
 - d. Select Transducer Scaling **XD_SCALE**. Refer to chapter [Selecting the units](#) for more details.
 - e. Select output scaling parameter **OUT_SCALE** and set it to desired values.
 - f. Check that Analog Input Block parameter **MODE_BLK** is AUTO or set it back to AUTO.
 8. If a special automatic action within the macrocycle is required in case of a specific event which the device reports, configure the DIAGDI Transducer Block and connect one output or both outputs of this Transducer to discrete inputs of function blocks (for example the Discrete Input Blocks within this device). Refer to chapter [DIAGDI Transducer Block](#) for a description of the available parameters in the DIAGDI Transducer Block.
 9. Configure remaining function blocks in the device, if required. These are Input Selector, Signal Characterizer, Analog Alarm and PID function blocks. A detailed description about how to configure these blocks can be found in in the FOUNDATION Fieldbus Function Blocks manual BA00062S (www.endress.com/cm42 under "Documents").

6. Operation via FOUNDATION Fieldbus

6.1. Block model

In the FOUNDATION Fieldbus all the device parameters are categorized according to their functional properties and task and are generally assigned to three different blocks. A block may be regarded as a container in which parameters and the associated functionalities are contained. A FOUNDATION Fieldbus device has the following block types:

- A Resource Block (device block):
The Resource Block contains all the device-specific features of the unit.
- One or more Transducer Blocks:
The Transducer Blocks contain the measuring and device-specific parameters of the device.
- One or more function blocks: The function blocks contain the device's automation functions. We distinguish between different function blocks, e.g. Analog Input function block, Analog Output function block. Each of these function blocks is used to execute different application functions.

Depending on how the individual function blocks are arranged and connected, various automation tasks can be realized. In addition to these blocks, a field device may have other blocks, e.g. several Analog Input function blocks, if more than one process variable is available from the field device.

Liquiline_pHORP contains the following blocks:

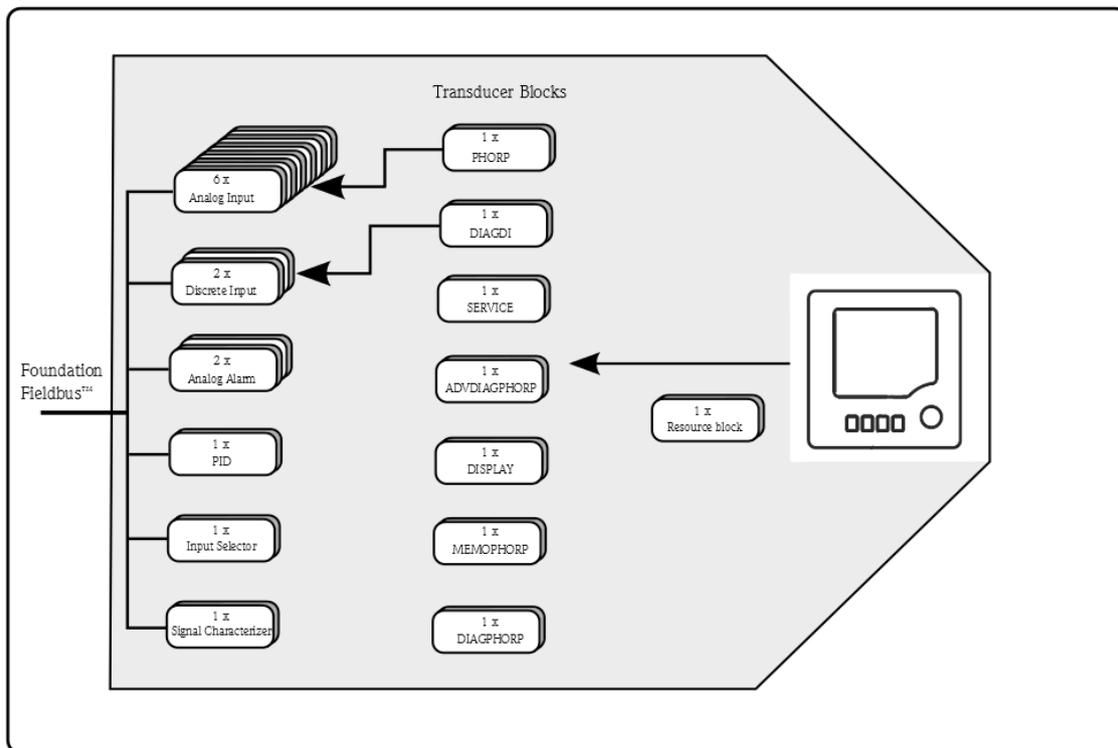


Fig. 7: Block model Liquiline_pHORP

6.2. Resource Block (Device Block)

The Resource Block contains all the data that clearly identify and characterize the field device. It is an electronic version of a nameplate on the field device. In addition to parameters that are needed to operate the device on the fieldbus, the Resource Block makes information such as the order code, device ID, hardware version, firmware version etc. available.

A further task of the Resource Block is the management of overall parameters and functions that have an influence on the execution of the remaining function blocks in the field device. The Resource Block is thus a central unit that also checks the device status and thereby influences or controls the operability of the other function blocks and thus also of the device. As the Resource Block does not have any block input and block output data, it cannot be linked to other blocks.

The most important functions and parameters of the Resource Block are listed below.

6.2.1. Selecting the operating mode

The operating mode is set by means of the MODE_BLK parameter group. The Resource Block supports the following operating modes:

- AUTO (automatic mode)
- OOS (out of service)
- MAN (manual mode)

The 'Out of Service' (OOS) operating mode is also displayed by means of the BLOCK_ERR parameter. In the OOS operating mode, all write parameters can be accessed without restriction if write protection has not been enabled.

6.2.2. Block status

The current operating status of the Resource Block is displayed in the RS_STATE parameter. The Resource Block can enter the following states:

- STANDBY The Resource Block is in the OOS operating mode. It is not possible to execute the remaining function blocks.
- ONLINE LINKING The configured connections between the function blocks have not yet been established.
- ONLINE Normal operating status, the Resource Block is in the AUTO operating mode. The configured connections between the function blocks have been established.

6.2.3. Alarm detection and processing

Process alarms provide information on certain block states and events. The status of the process alarms is communicated to the fieldbus host system by means of the BLOCK_ALM parameter. The current alert status is indicated in parameter ALARM_SUM. The ACK_OPTION parameter allows you to specify whether an alarm has to be acknowledged by means of the fieldbus host system. The following process alarms are generated by the Resource Block:

Block process alarms

The following block process alarms of the Resource Block are displayed by means of the BLOCK_ALM parameter:

- OUT OF SERVICE
- SIMULATE_ACTIVE

Write protection process alarm

If the write protection is disabled, the alarm priority specified in the WRITE_PRI parameter is checked before the status change is relayed to the fieldbus host system. The alarm priority specifies the behavior in the event of an active write protection alarm WRITE_ALM.



If the option of a process alarm was not activated in the ACK_OPTION parameter, this process alarm must only be acknowledged in the BLOCK_ALM parameter.

Field Diagnostic Alarms

Field Diagnostic Fail, Check, Off Spec and Maintenance alarms are enabled by default. Parameters FD_FAIL_MASK, FD_CHECK_MASK, FD_OFFSPEC_MASK and FD_MAINT_MASK allow suppressing alarms for one or more event groups.

Depending on the connected host system please check, if multi-bit alarms are supported. This option can be enabled in the device with setting “Multi-bit Alarm (Bit-Alarm) Support” in Resource Block parameter FEATURE_SEL.

Please refer to BA00381C for a detailed description of FOUNDATION Fieldbus Field diagnostics alarms.

6.2.4. Resource Block FF parameters

Resource Block			
Parameter Index	Parameter	Write access with operating mode	Description
	Local Display Menu Path		
1	Static Revision (ST_REV)	Read only	The revision status of the static data appears on the display. The revision status is incremented on each modification of static data.
2	Tag Description (TAG_DESC)	AUTO - OOS	Entry of a user-specific text for unique identification and assignment of the block.
3	Strategy (STRATEGY)	AUTO - OOS	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. Factory default: 0 This data is neither checked nor processed by the Resource Block.
4	Alert Key (ALERT_KEY)	AUTO - OOS	Use this function to enter the identification number of the plant unit. This information can be used by the fieldbus host system for sorting alarms and events. User input: 1 to 255 Factory default: 0
5	Block Mode (MODE_BLK)	AUTO - OOS	Displays the current (Actual) and desired (Target) operating mode of the Resource Block, the permitted modes (Permitted) supported by the Resource Block and the normal operating mode (Normal). Display: AUTO – OOS The Resource Block supports the following operating modes: <ul style="list-style-type: none">• AUTO (automatic operation) In this mode the execution of the remaining blocks (ISEL, AALM, CHAR, DI, AI and PID function blocks) is permitted.• OOS (out of service): The block is in the “Out of Service” mode. In this mode execution of the remaining blocks (ISEL, AALM, CHAR, DI, AI and PID function blocks) is blocked. These blocks cannot be set to AUTO mode. The current operating status of the Resource Block is also shown via the RS_STATE parameter.
6	Block Error (BLOCK_ERR)	Read only	The active block error is indicated. Display: SIMULATE ACTIVE Simulation is possible in an Analog Input function block via the SIMULATE parameter (refer also to Hardware Write Protection Configuration in Section Hardware Settings). OUT OF SERVICE The block is in the "Out of Service" mode.

Resource Block			
Parameter Index	Parameter	Write access with operating mode	Description
	Local Display Menu Path		
7	Resource State (RS_STATE)	Read only	<p>Displays the current operating status of the Resource Block.</p> <p>Display: STANDBY The Resource Block is in the OOS operating mode. It is not possible to execute the remaining blocks.</p> <p>ONLINE LINKING The configured connections between the function blocks have not yet been made.</p> <p>ONLINE Normal operating status, the Resource Block is in the AUTO operating mode. The configured connections between the function blocks are established.</p>
8	Test Read Write (TEST_RW)	AUTO - OOS	This parameter is required only for interoperability tests and has no meaning in normal operation.
9	DD Resource (DD_RESOURCE)	Read only	<p>Displays the reference source for the device description in the device.</p> <p>Display: (NULL)</p>
10	Manufacturer ID (MANUFAC_ID) DIAG → Device information → Fieldbus module → FF settings → Device ID → Manufacturer ID	Read only	Manufacturer identification number - used by an interface device to locate the DD file for the resource.
11	Device type (DEV_TYPE) DIAG → Device information → Fieldbus module → FF settings → Device ID → Device type	Read only	<p>Displays the device identification number in hexadecimal numerical format.</p> <p>Display: 0x10A0 (hex) for Liquiline_pHORP</p>
12	Device Revision (DEV_REV) DIAG → Device information → Fieldbus module → FF settings → Device revision	Read only	Device revision number associated with the resource - used by an interface device to locate the DD file for the resource.
13	DD Revision (DD_REV) DIAG → Device information → Fieldbus module → FF settings → DD revision	Read only	For an initial release of a device revision, the DD Revision matches that value found in the Resource Block (DD_REV). The DD_REV parameter specifies the minimum DD Revision that should be used for the device. It is possible for a manufacturer to release an updated version of the DD for an existing device. DD Services provides functions for identifying the most recent version of a DD files for a given device revision.
14	Grant Deny (GRANT_DENY)	AUTO - OOS	<p>Enables or restricts the access authorization of a fieldbus host system to the field device.</p> <p>Factory default: 0, 0 (no restrictions)</p>
15	Hard Types (HARD_TYPES)	Read only	Displays the input signal types for the Analog and Discrete Input function blocks

Resource Block			
Parameter Index	Parameter	Write access with operating mode	Description
	Local Display Menu Path		
16	Restart (RESTART)	AUTO - OOS	This parameter is used to reset the device in various ways. Options: <ul style="list-style-type: none"> Restart UNINITIALIZED RUN Restart RESOURCE (restart the Resource Block) Restart with DEFAULTS (restart with the specified default values as per FFSpec - only FF bus parameters) Restart PROCESSOR Reset to Factory settings (all device parameters are reset to default values as set leaving the factory) Reset to Order Configuration settings (unavailable in this device) ENP specific restart (unavailable in this device) Reset to Customer settings (unavailable in this device) Reset to Measurement Application (unavailable in this device)
17	Features (FEATURES)	Read only	Displays the additional options supported by the device. Display: Reports Faultstate Hard W Lock Change Bypass in Auto MVC Report Distribution supported Multi-bit Alarm (Bit-Alarm) Support
18	Feature Selection (FEATURES_SEL)	AUTO - OOS	For selecting the additional functions supported by the device. Factory default: Reports Faultstate Hard W Lock Change Bypass in Auto MVC Report Distribution supp.
19	Cycle Type (CYCLE_TYPE)	Read only	Displays the block execution method supported by the device. Display: SCHEDULED Timed block execution method BLOCK EXECUTION Sequential block execution method MANUF SPECIFIC Manufacturer specified
20	Cycle Selection (CYCLE_SEL)	AUTO - OOS	Displays the block execution method used by the fieldbus host system. The block execution method is selected by the fieldbus host system. Factory default: 0x0001(Scheduled)
21	Minimum Cycle Time (MIN_CYCLE_T)	Read only	Time duration of the shortest cycle interval of which the resource is capable.
22	Memory Size (MEMORY_SIZE)	Read only	Displays the available configuration memory in kilobytes. Since the function blocks of the device are preconfigured, this parameter always displays the value 0.

Resource Block			
Parameter Index	Parameter	Write access with operating mode	Description
	Local Display Menu Path		
23	Nonvolatile Cycle Time (NV_CYCLE_T)	Read only	<p>Displays the time interval for which non-volatile device parameters are stored in the non-volatile memory. The time interval displayed relates to storage of the following non-volatile device parameters:</p> <ul style="list-style-type: none"> • BK_CAL_IN • CAS_IN • FAULT_STATE • FF_VAL • FIELD_VAL • IN • IN_1 • IN_2 • MODE_BLK • OUT • PV • RCAS_IN • ROUT_IN • SP • OUT_D • TRK_VAL <p>These values are stored in the non-volatile memory every 5 seconds. Display: 160000 (1/32 ms).</p>
24	Free Space (FREE_SPACE)	Read only	<p>Displays the free system memory (in percent) available for execution of further function blocks.</p> <p>Since the function blocks of the device are preconfigured, this parameter always displays the value 0.</p>
25	Free Time (FREE_TIME)	Read only	<p>Displays the free system time (in percent) available for execution of further function blocks.</p> <p>Since the function blocks of the device are preconfigured, this parameter always displays the value 0.</p>
26	Shed Remote Cascade (SHED_RCAS)	AUTO - OOS	<p>Specifies the monitoring time for checking the connection between the fieldbus host system and a function block in the RCAS operating mode. When the monitoring time elapses, the function block changes from the RCAS operating mode to the operating mode selected in the SHED_OPT parameter. Factory default: 640000 1/32 ms</p>
27	Shed Remote Out (SHED_ROUT)	AUTO - OOS	<p>Specifies the monitoring time for checking the connection between the fieldbus host system and the PID function block in the ROUT operating mode. When the monitoring time elapses, the PID function block changes from the ROUT operating mode to the operating mode selected in the SHED_OPT parameter. Factory default: 640000 1/32 ms</p>
28	Fault State (FAULT_STATE)	Read only	Current status display of the security behavior of the Analog Output and Discrete Output function blocks.
29	Set Fault State (SET_FSTATE)	AUTO - OOS	<p>This parameter can be used to manually enable the security behavior of the device. Factory default: 1 (Off)</p>
30	Clear Fault State (CLR_FSTATE)	AUTO - OOS	<p>This parameter can be used to manually disable the security behavior of the Analog Output and Discrete Output function blocks. Factory default: 0x01 (Off)</p>

Resource Block			
Parameter Index	Parameter	Write access with operating mode	Description
	Local Display Menu Path		
31	Max Notify (MAX_NOTIFY)	Read only	Displays the maximum number of event reports supported by the device that can exist unconfirmed at the same time. Display: 4
32	Limit Notify (LIM_NOTIFY)	AUTO - OOS	This parameter is used to specify the number of event reports that can exist unconfirmed at the same time. Options: 0 to MAX_NOTIFY (=4) Factory default: 4
33	Confirm Time (CONFIRM_TIME)	AUTO - OOS	Specifies the confirmation time for the event report. If the device does not receive confirmation within this time then the event report is sent to the fieldbus host system again. Factory default: 640000¹/32 ms
34	Write Lock (WRITE_LOCK)	Read only	Display of the current write protection (setting only possible via DIP switch, refer to chapter Hardware Settings for details). Display: LOCKED Device data cannot be modified NOT LOCKED Device data can be modified UNINITIALIZED
35	Update Event (UPDATE_EVT)	Read only	Indicates whether static block data have been altered, including date and time.
36	Block Alarm (BLOCK_ALM)	AUTO - OOS	The current block status is indicated with information on pending configuration, hardware or system errors, including information on the alarm period (Date, time) when the error occurred. The block alarm is triggered in the event of the following block errors: <ul style="list-style-type: none"> ■ SIMULATE ACTIVE ■ OUT OF SERVICE If the option of the alarm has not been enabled in the ACK_OPTION parameter, the alarm can only be acknowledged via this parameter.
37	Alarm Summary (ALARM_SUM)	AUTO - OOS	Displays the current status of the process alarms in the Resource Block. In addition the process alarms can also be disabled in this parameter group.
38	Acknowledge Option (ACK_OPTION)	AUTO - OOS	This parameter is used to specify whether a process alarm must be acknowledged at the time of alarm recognition by the fieldbus host system. If this option is enabled, the process alarm is acknowledged automatically. Factory default: The option is not enabled for any alarm, the alarms must be acknowledged.
39	Write Priority (WRITE_PRI)	AUTO - OOS	Specifies the behavior of a write protected alarm ("WRITE_ALM" parameter). User input: 0 = The write protection alarm is not evaluated. 1 = No report to the fieldbus host system in the event of a write protection alarm. 2 = Reserved for block alarms. 3-7 = The write protection alarm is output with the appropriate priority (3 = low priority, 7 = high priority) to the fieldbus host system as a user notice. 8-15 = The write protection alarm is output with the appropriate priority (8 = low priority, 15 = high priority) to the fieldbus host system as a critical alarm.

Resource Block			
Parameter Index	Parameter	Write access with operating mode	Description
	Local Display Menu Path		
40	Write Alarm (WRITE_ALM)	AUTO - OOS	Displays the status of the write protected alarm. The alarm is triggered if the write protection is disabled.
41	ITK Version (ITK_VER)	Read only	Major revision number of the interoperability test kit used to register this device.
42	ACTUAL_DIAG_STATUS	Read only	Device's FCSM information Supported values: 0x00 : OK, no diagnostics detected 0x01 : F, failure 0x02 : M, maintenance required 0x03 : C, function check 0x04 : S, out of specification 0x05 : NC (Not Categorized)
	DIAG → Most important message		
43	ACTUAL_DIAGNOSTICS	Read only	Current diagnostic code with highest priority Indicated values: 0x0000 to 0x0349(0000 to 0841); details see below in chapter Diagnostic Codes
	DIAG → Most important message		
44	PACKAGE	Read only	Current installed projecting package Range: octet string with size of 16 Factory Setting: PH/ORP
	DIAG → Device information → Projecting		
45	SOFTWARE_FUNCTIONALITY	Read only	Indicates software capability as Standard or Advanced like indicated in order code (i.e. MAA600EAD00 means standard or MAA600EBD00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling Indicated values: 0 - Standard 1 - Advanced
	DIAG → Device information → Order code		
46	Capability Level (CAPABILITY_LEV)	Read only	Indicates the capability level that the device supports.
47	Compatibility Revision (COMPATIBILITY_REV)	Read only	This parameter is optionally used when replacing field devices. The correct usage of this parameter presumes the DEV_REV value of the replaced device is equal or greater than the COMPATIBILITY_REV value of the replacing device.
48	Electronic Name Plate Version (ENP_VERSION)	Read only	Version of the ENP (electronic name plate).
49	Device Tag (DEVICE_TAG)	Read only	Tag name/device TAG.
	DIAG → Device information → TAG		
50	Serial Number (SERIAL_NUMBER)	Read only	Displays the device serial number.
	DIAG → Device information → Serial number		
51	Extended order code (ORDER_CODE_EXT)	Read only	Displays the extended order code of the device
52	Extended order code part2 (ORDER_CODE_EXT_PART2)	Read only	Displays the second part of the extended order code, always empty in this device (therefore sometimes not displayed in host systems)
53	Order Code / Identification (ORDER_CODE)	Read only	Displays the order code for the device.
	DIAG → Device information → Order code		
54	Firmware Version (FIRMWARE_VERSION)	Read only	Displays the version of the device software.
	DIAG → Device information → Device version		

Resource Block			
Parameter Index	Parameter	Write access with operating mode	Description
	Local Display Menu Path		
55	UDL_FEATURE	Read only	Reserved for future use
56	UDL_OP_CODE	AUTO - OOS	Reserved for future use
57	UDL_STATUS	Read only	Reserved for future use
58	UDL_VERI_DELAY	AUTO - OOS	Reserved for future use
59	UDL_REVISION	Read only	Reserved for future use
60	UDL_HEADER	AUTO - OOS	Reserved for future use
61	UDL_CONFIG	AUTO - OOS	Reserved for future use
62	UDL_DATA	AUTO - OOS	Reserved for future use
63	Field device diagnostic version (FD_VER)	Read only	The major version of the Field Diagnostics specification used for the development of this device.
64	Fail Active (FD_FAIL_ACTIVE)	Read only	Reflects the error conditions that are being detected as active as selected for this category.
65	Offspec Active (FD_OFFSPEC_ACTIVE)	Read only	Reflects the error conditions that are being detected as active as selected for this category.
66	Maintenance Active (FD_MAINT_ACTIVE)	Read only	Reflects the error conditions that are being detected as active as selected for this category.
67	Check Active (FD_CHECK_ACTIVE)	Read only	Reflects the error conditions that are being detected as active as selected for this category.
68	Fail Map (FD_FAIL_MAP)	AUTO - OOS	Enable or disable conditions to be detected as active for this alarm category. Factory default: OxF000000 (Highest Process Highest Configuration Highest Electronic Highest Sensor) Details described in BA00381C, chapter 'Configuration of event behaviour according to FOUNDATION Fieldbus Field Diagnostics'.
70	Maintenance Map (FD_MAINT_MAP)	AUTO - OOS	Enable or disable conditions to be detected as active for this alarm category. Factory default: Ox000F0000 (Lowest Process Lowest Configuration Lowest Electronic Lowest Sensor) Details described in BA00381C, chapter 'Configuration of event behaviour according to FOUNDATION Fieldbus Field Diagnostics'.
71	Check Map (FD_CHECK_MAP)	AUTO - OOS	Enable or disable conditions to be detected as active for this alarm category. Factory default: Ox0F000000 (High Process High Configuration High Electronic High Sensor) Details described in BA00381C, chapter 'Configuration of event behaviour according to FOUNDATION Fieldbus Field Diagnostics'.
71	Offspec Map (FD_OFFSPEC_MAP)	AUTO - OOS	Enable or disable conditions to be detected as active for this alarm category. Factory default: Ox00F00000 (Low Process Low Configuration Low Electronic Low Sensor) Details described in BA00381C, chapter 'Configuration of event behaviour according to FOUNDATION Fieldbus Field Diagnostics'.

Resource Block			
Parameter Index	Parameter	Write access with operating mode	Description
	Local Display Menu Path		
72	Fail Mask (FD_FAIL_MASK)	AUTO - OOS	Allow to suppress any single or multiple conditions that are active in this category from being broadcasted to the host through the alarm parameter. Factory default: 0x00000000 (nothing suppressed)
73	Offspec Mask (FD_OFFSPEC_MASK)	AUTO - OOS	Allow to suppress any single or multiple conditions that are active in this category from being broadcasted to the host through the alarm parameter. Factory default: 0x00000000 (nothing suppressed)
74	Maintenance Mask (FD_MAINT_MASK)	AUTO - OOS	Allow to suppress any single or multiple conditions that are active in this category from being broadcasted to the host through the alarm parameter. Factory default: 0x00000000 (nothing suppressed)
75	Check Mask (FD_CHECK_MASK)	AUTO - OOS	Allow to suppress any single or multiple conditions that are active in this category from being broadcasted to the host through the alarm parameter. Factory default: 0x00000000 (nothing suppressed)
76	Fail Diagnostic Alarm (FD_FAIL_ALM)	AUTO - OOS	Used primarily to broadcast a change in the associated active conditions.
77	Offspec Alarm (FD_OFFSPEC_ALM)	AUTO - OOS	Used primarily to broadcast a change in the associated active conditions.
78	Maintenance Alarm (FD_MAINT_ALM)	AUTO - OOS	Used primarily to broadcast a change in the associated active conditions.
79	Check Alarm (FD_CHECK_ALM)	AUTO - OOS	Used primarily to broadcast a change in the associated active conditions.
80	Fail Priority (FD_FAIL_PRI)	AUTO - OOS	Allow to specify the priority of this alarm category. Factory default: 0
81	Offspec Priority (FD_OFFSPEC_PRI)	AUTO - OOS	Allow to specify the priority of this alarm category. Factory default: 0
82	Maintenance Priority (FD_MAINT_PRI)	AUTO - OOS	Allow to specify the priority of this alarm category. Factory default: 0
83	Check Priority (FD_CHECK_PRI)	AUTO - OOS	Allow to specify the priority of this alarm category. Factory default: 0
84	Field Diagnostic Simulate (FD_SIMULATE)	AUTO - OOS	Used as the field diagnostic condition when the simulation is enabled. Factory default: Disabled
85	Recommended Action (FD_RECOMMEN_ACT)	Read only	This parameter is a device enumerated summarization of the most severe condition or conditions detected. The DD help describes by enumerated action, what should be done to alleviate the condition or conditions.
86	Extended Active 1 (FD_EXTENDED_ACTIVE_1)	Read only	Allows finer detail on conditions causing an active condition in FD_*_ACTIVE parameters (details described in chapter Field Diagnostics).
87	Extended Active 2 (FD_EXTENDED_ACTIVE_2)	Read only	Allows finer detail on conditions causing an active condition in FD_*_ACTIVE parameters (details described in chapter Field Diagnostics).
88	Extended Active 3 (FD_EXTENDED_ACTIVE_3)	Read only	Allows finer detail on conditions causing an active condition in FD_*_ACTIVE parameters (details described in chapter Field Diagnostics).
89	Extended MAP 1 (FD_EXTENDED_MAP_1)	AUTO - OOS	Allows finer control on enabling conditions contributing to the conditions in FD_*_ACTIVE parameters (details described in chapter Field Diagnostics). Factory default: 0xFFFFFFFF
90	Extended MAP 2 (FD_EXTENDED_MAP_2)	AUTO - OOS	Allows finer control on enabling conditions contributing to the conditions in FD_*_ACTIVE parameters (details described in chapter Field Diagnostics). Factory default: 0xFFFFFFFF

Resource Block			
Parameter Index	Parameter	Write access with operating mode	Description
	Local Display Menu Path		
91	Extended MAP 3 (FD_EXTENDED_MAP_3)	AUTO - OOS	Allows finer control on enabling conditions contributing to the conditions in FD_*_ACTIVE parameters (details described in chapter Field Diagnostics). Factory default: 0x007FFE7F
92	Restart Enable (RESTART_ENABLE)	AUTO - OOS	This parameter indicates which factory-specific restart levels are actually available. Options: <ul style="list-style-type: none"> Restart Factory (all device parameters are reset to default values as set leaving the factory)
93	Block Error Description 1 (RS_BLOCK_ERR_DESC_1)	Read only	Displays further information for solving block errors: <ul style="list-style-type: none"> Simulation permitted: Simulation is allowed due to activated hardware simulation switch Failsafe active: Failsafe mechanism in an AI block is active
94	Resource Directory (RES_DIRECTORY)	Read only	Displays the resource directory for the electronic name plate (ENP).

6.3. Transducer Blocks

The Transducer Blocks of the Liquiline_pHORP contain all the measuring and device-specific parameters. All the settings directly connected with the application (pH/ORP and temperature measurement) are made here. They form the interface between sensor-specific measured value processing and the Analog Input function blocks required for automation. In addition diagnostics related functions are provided in further manufacturer-specific Transducer Blocks as well.

A Transducer Block allows you to influence the input and output variables of a function block. The parameters of a Transducer Block include information on the sensor configuration, physical units, calibration, damping, error messages, etc. as well as the device-specific parameters.

The device-specific parameters and functions of Liquiline_pHORP are split into several Transducer Blocks, each covering different task areas.

Transducer Block PHORP / base index 400 (dec.):

This block contains all the parameters and functions that have to do with measuring and configuring the input variables (mV values, pH values, ORP values, rH values, temperature, glass impedance, pH slope and zero point).

Transducer Block DIAGDI / base index 540 (dec.):

This block contains parameters for configuration of 2 discrete signals, which reflect the status of the current diagnostics with highest priority or-ed with a configurable mask over all available event numbers.

Transducer Block SERVICE/ base index 680 (dec.):

This block contains parameters which show detailed information about installed modules (i.e. CPU, Fieldbus, Display etc.) and provides the possibility to set date and time in the device which is used for logbook and event message time stamps on the local display.

Transducer Block ADVDIAGPHORP/ base index 820(dec.):

This block comprises parameters for advanced automatic monitoring and field diagnostics including diagnostic list, simulation of diagnostic events, maintenance messages, indicating FF network settings, field diagnostic details, a list with configurable measurement variable status values, logbooks reading.

Transducer Block DISPLAYPHORP/ base index 960 (dec.):

The parameters of this block allow the configuration of the local display.

Transducer Block MEMOPHORP/ base index 1100 (dec.):

The parameters of this block indicate all available Memosens sensor related parameter values.

Transducer Block DIAGPHORP/ base index 1220 (dec.):

The parameters of this block contain the configuration of diagnostic limits for performance data.

6.3.1. Block output variables

The following table shows which output variables (process variables) the Transducer Blocks make available. Only Transducer Blocks "PHORP" and "DIAGDI" do have output variables. The CHANNEL parameters in Analog and Discrete Input function blocks are used to assign which process variable is read and processed in the downstream blocks.

Block	Process variable	Channel parameter	Channel
PHORP	MEAS_MV_VALUE	mV Value	1
PHORP	MEAS_DAMPED_MV_VALUE	damped mV Value	2
PHORP	MEAS_PH_VALUE	pH Value	3
PHORP	MEAS_ORP_MV_VALUE	ORP mV Value	4
PHORP	MEAS_ORP_PERCENT_VALUE	ORP % Value	5
PHORP	MEAS_DAMPED_TEMP_VALUE	Damped Temperature Value	6
PHORP	MEAS_RH_VALUE	rH Value	7
PHORP	MEAS_GLASS_IMPEDANCE	Glass Impedance	8
PHORP	MEAS_SLOPE	pH Slope	9
PHORP	MEAS_ZERO_POINT	pH Zeropoint	10
DIAG_DI	CURRENT_STATE_CH1	Ch1 Codes	15
DIAG_DI	CURRENT_STATE_CH2	Ch2 Codes	16

6.3.2. Selecting the operating mode

The operating mode is set by means of the MODE_BLK parameter group (page 44). A Transducer Block supports the following operating modes:

- AUTO (automatic mode)
- OOS (out of service)
- MAN (manual mode)



The OOS block status is also displayed by means of the BLOCK_ERR parameter (page 44).

6.3.3. Alarm detection and processing

The Transducer Block does not generate any process alarms. The status of the process variables is evaluated in the downstream Analog Input function blocks. If the Analog Input function block receives no input value that can be evaluated from the Transducer Block then a process alarm is generated. This process alarm is displayed in the BLOCK_ERR parameter of the Analog Input function block (BLOCK_ERR = Input Failure).

The BLOCK_ERR parameter of the Transducer Block (page NN) displays the device error that produced the input value that could not be evaluated and thus triggered the process alarm in the Analog Input function block.

6.3.4. Accessing manufacturer-specific parameters

The hardware write protection must be deactivated to access the manufacturer-specific parameters (see Section [Hardware Settings](#)).

6.3.5. Selecting the units

The PHORP Transducer provides 9 Signals with constant units and 1 Signal with configurable units:

Process variable	unit	unit code [hex]	unit code [dec]	configurable unit parameter
MEAS_MV_VALUE	mV	4DB	1243	
MEAS_DAMPED_MV_VALUE	mV	4DB	1243	
MEAS_PH_VALUE	pH	58E	1422	
MEAS_ORP_MV_VALUE	mV	4DB	1243	
MEAS_ORP_PERCENT_VALUE	%	53E	1342	
MEAS_DAMPED_TEMP_VALUE	°C or °F	3E9 or 3EA	1001 or 1002	UNIT_MEAS_DAMPED_TEMP_VAL
MEAS_RH_VALUE	rH	691	1681	
MEAS_GLASS_IMPEDANCE	Ohm	501	1281	
MEAS_SLOPE	mV/pH	631	1585	
MEAS_ZERO_POINT	pH	58E	1422	

The PHORP Transducer delivers a process value to an AI function block. The CHANNEL parameter of an AI function block realizes the association or relationship between transducer and function block.

The unit code of the connected signal should match the unit code of the XD_SCALE parameter in the AI function block with one exception. If the unit code in XD_SCALE is “%” (1342), it is assumed that the unit is the same like in the associated transducer. Please refer to further configuration checks in an AI function block in BA00062S (www.endress.com/cm42 under "Documents").

Both process variable values of the DIAGDI Transducer are Boolean variables without units.

Process variable	unit	unit code [hex]	unit code [dec]	configurable unit parameter
CURRENT_STATE_CH1	n.a.	n.a.	n.a.	n.a.
CURRENT_STATE_CH2	n.a.	n.a.	n.a.	n.a.

6.3.6. Accessing logbooks

A description about how to use Logbooks via local keys of the device is to be found in BA00382C. Logbooks are available via FF-H1 communication as well. A set of methods provides access for reading and deletion of logbook entries.

If a device description with no graphical enhancements is used (*.ffo/*.sym) and the device’s software functionality is ADVANCED, the following methods are available in the ADVDIAGPHORP Transducer Block and provide reading of logbook entries:

- Read_Event_Logbook
- Read_Calib_Logbook
- Read_Param_Logbook
- Read_User_Logbook
- Read_Audit_Logbook

The “Delete_Logbook” method is available to select and delete logbook entries of Event, Calibration, Parameter, User or Audit Logbook.

If a device description with graphical enhancements is used (*.ff5/*.sy5) and the device’s software functionality is ADVANCED, additionally the following methods are available in the ADVDIAGPHORP Transducer Block and provide reading of logbook entries:

Method name	Description
SelectLogbookTypeMethod	The desired logbook type will be selected
GetLogbookStateMethod	Available entries and size will be evaluated
ReadLogbookDataMethod	Logbook Overview data will be read
ReadLogbookDetailDataMethod	Logbook Detail data will be read

Please call these methods first in the following order to get available logbook data:

SelectLogbookTypeMethod → GetLogbookStateMethod → ReadLogbookDataMethod

After these methods have been performed the following menus will indicate overview data of the selected logbook type:

Method/Menu name	Description
ViewLogbookDataMenu1_10	Indicate Logbook entries 1 to 10 in "ring memory"
ViewLogbookDataMenu11_20	Indicate Logbook entries 11 to 20 in "ring memory"
ViewLogbookDataMenu21_30	Indicate Logbook entries 21 to 30 in "ring memory"
ViewLogbookDataMenu31_40	Indicate Logbook entries 31 to 40 in "ring memory"
ViewLogbookDataMenu41_50	Indicate Logbook entries 41 to 50 in "ring memory"
ReadLogbookDetailMenu	Indicate Logbook detail data of a selected entry

Within menu "ReadLogbookDetailMenu" method "ReadLogbookDetailDataMethod" has to be called to read logbook detail data of an entry number which the user has to enter.

6.3.7. Accessing buffer tables

A description about how to edit buffer tables via local keys of the device is to be found in BA00382C. Advanced software functionality allows editing of these tables via FF-H1 communication as well.

Transducer Block PHORP contains a set of parameters which provide this functionality.

If a device description with no graphical enhancements is used (*.ffo/*.sym) and the device's software functionality is ADVANCED, the following method is available in the PHORP Transducer to edit up to 4 Temperature Compensation Tables:

Method name	Description
Edit_Selected_Table_Method	Read selected table, edit and send table to device

If a device description with graphical enhancements is used (*.ff5/*.sy5) and the device's software functionality is ADVANCED, the following methods and menus are available in the PHORP Transducer to edit up to 4 Temperature Compensation Tables:

Method/Menu name	Description
Select_Special_Buffer_Menu_PH	Provide both following methods and a grid to edit table values
Read_Table_Method	Read selected table
Send_Table_Device_Method	Send selected and edited table to device

6.3.8. Accessing process medium compensation tables

A description about how to edit Process Medium Compensation Tables via local keys of the device is to be found in BA00382C. Advanced software functionality allows editing of these tables via FF-H1 communication as well.

Transducer Block PHORP contains a set of parameters which provide this functionality.

If a device description with no graphical enhancements is used (*.ffo/*.sym) and the device's software functionality is ADVANCED, the following method is available in the PHORP Transducer to edit up to 4 Process Medium Compensation Tables:

Method name	Description
Mediums_TC_Table_Method	Read selected table, edit and send table to device

If a device description with graphical enhancements is used (*.ff5/*.sy5) and the device's software functionality is ADVANCED, the following methods and menus are available in the PHORP Transducer to edit up to 4 Process Medium Compensation Tables:

Method/Menu name	Description
Edit_Medium_Comp_Tab_Menu_Window_PH	Provide both following methods and a grid to edit table values
Read_Medium_Comp_Table_Method	Read selected table
Send_Medium_Comp_Table_Device_Method	Send selected and edited table to device

6.3.9. Diagnostic codes and maintenance

A detailed description about diagnostic events and how to find a remedy is to be found in BA00382C, chapter Troubleshooting.

Several parameters within Transducer Blocks and the Resource Block reflect these Diagnostic Codes as well. These are:

Parameter name	Where to find
ACTUAL_DIAGNOSTICS	Resource Block and all Transducer Blocks
PREVIOUS_DIAGNOSTICS	ADVDIAGPHORP and DIAGDI Transducer Block
ACTUAL_DIAG_LIST_1	ADVDIAGPHORP Transducer Block, highest priority
ACTUAL_DIAG_LIST_2	ADVDIAGPHORP Transducer Block
ACTUAL_DIAG_LIST_3	ADVDIAGPHORP Transducer Block
ACTUAL_DIAG_LIST_4	ADVDIAGPHORP Transducer Block
ACTUAL_DIAG_LIST_5	ADVDIAGPHORP Transducer Block
ACTUAL_DIAG_LIST_6	ADVDIAGPHORP Transducer Block
ACTUAL_DIAG_LIST_7	ADVDIAGPHORP Transducer Block
ACTUAL_DIAG_LIST_8	ADVDIAGPHORP Transducer Block
ACTUAL_DIAG_LIST_9	ADVDIAGPHORP Transducer Block
ACTUAL_DIAG_LIST_10	ADVDIAGPHORP Transducer Block, lowest priority
SIMULATED_DIAGNOSTIC_EVENT	ADVDIAGPHORP Transducer Block

Parameters which give instructions how to find a remedy are

Parameter name	Where to find
FD_RECOMMEN_ACT	Resource Block
MAINT_INSTRUCTION_PHORP	ADVDIAGPHORP Transducer Block

The following table describes the relationship between diagnostic codes and maintenance instructions:

Diagnostic Code	Indicated Maintenance Instruction
0 - OK	0 - Not initialized
	1 - No Action Required
003 Temperature sensor failure	3 - Check wiring Change electrode
004 Scanning sensor	4 - Establishing a connection to the sensor
010 Sensor initialization	10 - Wait for sensor initialization to finish
011 Sensor no comm.	11 - Check meas. chain Check sensor settings
012 Sensor failure	12 - Check meas. chain Check sensor settings
013 Wrong sensor type	13 - Check meas. chain Check sensor settings
014 Sensor failure	14 - Change sensor type Change firmware
100 SCS Glass alarm	100 - Check glass electrode Check medium temperature Check electrode plug-in head
101 SCS Ref. alarm	101 - Check reference electrode
102 Limit Switch SCS Glass alarm	102 - Check pH sensor, replace if necessary
103 Limit Switch SCS Ref. alarm	103 - Check reference electrode Replace reference
104 Supply voltage fluctuates	104 - Check connector Replace sensor/cable
106 SCS Glass warning	106 - Check glass electrode Check medium temperature Check electrode plug-in head
107 SCS Ref. warning	107 - Check reference electrode Clean reference electrode
111 Ls SCS Glass warning	111 - Check glass electrode Check medium temperature Check electrode plug-in head
112 Ls SCS Ref. warning	112 - Check reference electrode Clean reference electrode
119 Temp offset too high	119 - Check temp. sensor Replace sensor
120 Temp offset too low	120 - Check temp. sensor Replace sensor
127 Invalid TAG group	127 - Replace sensor Deactivate tag check
128 Invalid TAG	128 - Replace sensor Deactivate tag check
129 Sensor change aborted	129 - Restart the sensor change
130 Calibration active	130 - Wait for the calibration to finish
131 PV not stable	131 - Sensor too old Cable or connector defective
132 Temp. value unstable	132 - Sensor too old Cable/connector defective
134 Upper limit zeropnt. alarm	134 - Sensor too old Diaphragm blocked Buffer solutions too old or contaminated
135 Upper limit zeropnt. warning	135 - Sensor too old Diaphragm blocked Buffer solutions too old or contaminated
136 Lower limit zeropnt. alarm	136 - Sensor too old Diaphragm blocked Buffer solutions too old or contaminated
137 Lower limit zeropnt. warning	137 - Sensor too old Diaphragm blocked Buffer solutions too old or contaminated
138 Lower limit slope alarm	138 - Sensor too old Diaphragm blocked Buffer solutions too old or contaminated
139 Lower limit slope warning	139 - Sensor too old Diaphragm blocked Buffer solutions too old or contaminated
140 Leak current alarm	140 - Replace sensor
142 SCC electrode cond. bad	142 - Replace sensor
140 Leak current warning	145 - Prepare to replace sensor
148 SCC Electrode sufficient	148 - Clean sensor soon Regenerate sensor Replace sensor
153 Upper limit operating point	153 - Sensor old or defective Diaphragm blocked Buffer solutions too old or contaminated
154 Upper limit operating point	154 - Sensor old or defective Diaphragm blocked Buffer solutions too old or contaminated
155 Lower limit operating point	155 - Sensor old or defective Diaphragm blocked Buffer solutions too old or contaminated
156 Lower limit operating point	156 - Sensor old or defective Diaphragm blocked Buffer solutions too old or contaminated
172 Alarm operating time	172 - Replace sensor
173 Usage >80 degC alarm	173 - Replace sensor
174 Usage >100 degC alarm	174 - Replace sensor
175 Usage <300 mV alarm	175 - Replace sensor
176 Usage >300 mV alarm	176 - Replace sensor
177 Delta slope alarm	177 - Replace sensor
178 Delta zero point alarm	178 - Replace sensor
179 Delta op.point alarm	179 - Replace sensor
180 Cal. expired alarm	180 - Perform a calibration
181 No. steril. alarm	181 - Replace sensor
182 Operating time warning	182 - Prepare to replace sensor
183 Usage >80 degC warning	183 - Prepare to replace sensor
184 Usage >100 degC warning	184 - Prepare to replace sensor
185 Usage <300 mV warning	185 - Prepare to replace sensor
186 Usage >300 mV warning	186 - Prepare to replace sensor

Liquiline_pHORP FF-H1 Field Device Specification

Diagnostic Code	Indicated Maintenance Instruction
190 Cal. expired warning	190 - Prepare to replace sensor
191 No. steril. warning	191 - Prepare to replace sensor
203 Wrong transmitter type	203 - Check sensor
215 Simulation active	215 - Active corresponding to your settings
218 Curr.out module defect	218 - Contact the Service Team!
219 Power supply bad	219 - Connect to a clean power supply Check cable
238 Delta slope warning	238 - Replace sensor soon
239 Delta zero point warning	239 - Replace sensor soon
240 Delta op.point warning	240 - Replace sensor soon
318 Glassimp. hi alarm	318 - Check electrode Check medium temperature Check electrode plug-in head
319 Ref.imp. hi alarm	319 - Check reference electrode Clean reference electrode
320 Glassimp. hi warning	320 - Check electrode Check medium temperature Check electrode plug-in head
321 Ref.imp. hi warning	321 - Check reference electrode Clean reference electrode
322 Out of oper. range	322 - Inc. process value Check meas. chain change sensor
380 Comm. module defect	380 - Replace comm. module
381 Comm. module incompatible	381 - Use FBPA3 comm. module
404 Lower limit current output	404 - Check plausibility
405 Upper limit current output	405 - Check plausibility
406 Setup active	406 - End parameter entry
407 Diag. active	407 - End query of device and sensor information
408 Calibration aborted	408 - Renew calib solution repeat calib
409 Sensor change active	409 - Sensor change in progress
501 Device open	501 - Close the housing and tighten the screws
513 Internal device error (nnnnn)	513 - Contact the Service Team
514 Internal device warning (nnnnn)	514 - Contact the Service Team
530 Logbook 20% remaining	530 - Logbook ring memory is almost full
531 Logbook full	531 - New events will overwrite the oldest entries
532 Cal. timer expired	532 - Perform a calibration
802 Process check system alarm	802 - Check sensor and sensor connection Air cushion in assembly Check application
810 PV upper limit alarm	810 - Sensor in air Air cushion in assembly Check measuring chain
811 PV lower limit alarm	811 - Sensor in air Air cushion in assembly Check measuring chain
812 Temperature range exceeded	812 - Sensor in air Air cushion in assembly Check measuring chain
840 PV upper limit warning	840 - Sensor in air Air cushion in assembly Check measuring chain
841 PV lower limit warning	841 - Sensor in air Air cushion in assembly Check measuring chain

6.3.10. Field Diagnostics

This device supports Field Diagnostics as specified in FOUNDATION Fieldbus specification FF-891. The standard functionality is described in BA00381C.

In addition to the grouped diagnostic events for Resource Block parameters FD_FAIL_XXX, FD_CHECK_XXX, FD_OFFSPEC_XXX and FD_MAINT_XXX and the ability to move single events from a group to special bits called Configurable Area in the Manufacturer Specific Conditions there are 3 EXTENDED_MAP and 3 EXTENDED_ACTIVE parameters providing single disabling/enabling of specific events.

Each available event is mapped to one bit of the 3 Extended MAP/ACTIVE parameters. The bit position is set by the manufacturer and cannot be changed. Liquiline_pHORP default settings are as follows.

FD_EXTENDED_MAP_1/FD_EXTENDED_ACTIVE_1:

Bit Position 0-15	Event number	Bit Position 16-31	Event number
0	3	16	119
1	4	17	120
2	10	18	127
3	11	19	128
4	12	20	129
5	13	21	130
6	14	22	131
7	100	23	132
8	101	24	134
9	102	25	135
10	103	26	136
11	104	27	137
12	106	28	138
13	107	29	139
14	111	30	140
15	112	31	142

FD_EXTENDED_MAP_2/FD_EXTENDED_ACTIVE_2:

Bit Position 0-15	Event number	Bit Position 16-31	Event number
0	145	16	182
1	148	17	183
2	153	18	184
3	154	19	185
4	155	20	186
5	156	21	190
6	172	22	191
7	173	23	203
8	174	24	215
9	175	25	218
10	176	26	219
11	177	27	238
12	178	28	239
13	179	29	240
14	180	30	318
15	181	31	319

FD_EXTENDED_MAP_3/FD_EXTENDED_ACTIVE_3:

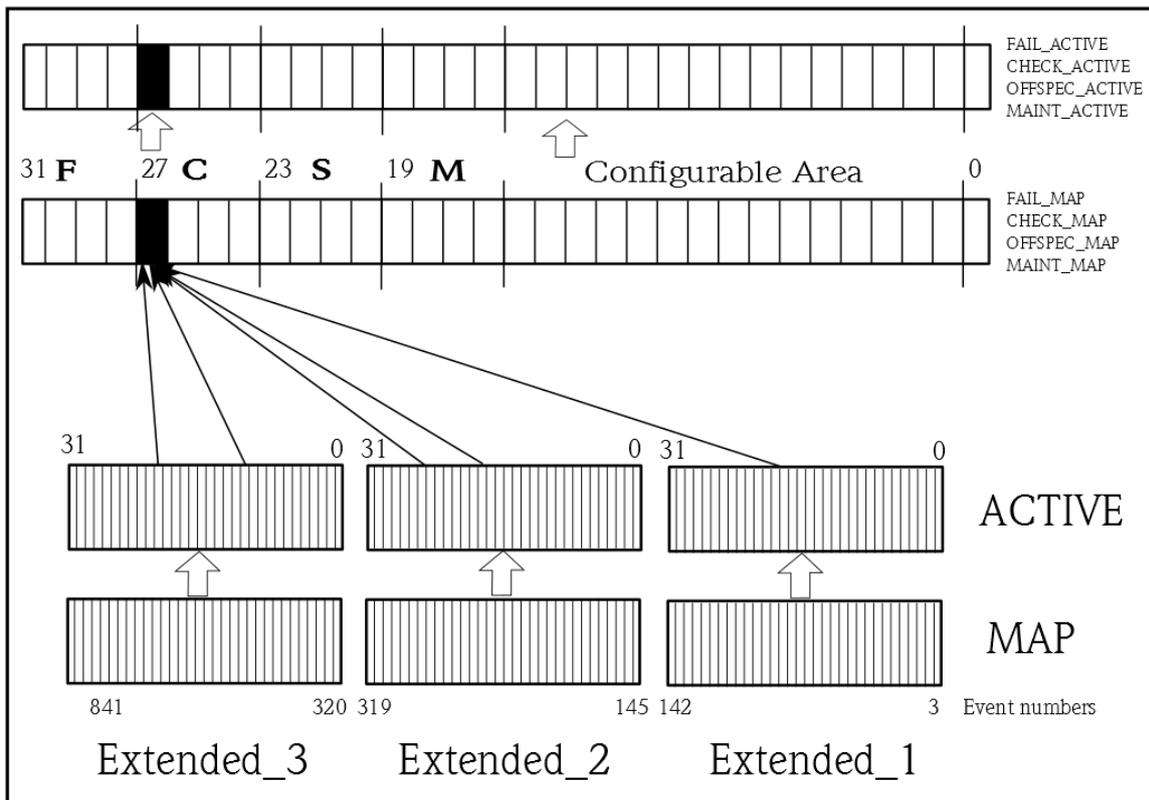
Bit Position 0-15	Event number	Bit Position 16-31	Event number
0	320	16	532
1	321	17	802
2	322	18	810
3	380	19	811
4	381	20	812
5	404	21	840
6	405	22	841
7	406	23	
8	407	24	
9	408	25	
10	409	26	
11	501	27	
12	513	28	
13	514	29	
14	530	30	
15	531	31	

These events are mapped to the fixed area bits 16 to 31 in the Field Diagnostics parameters FD_FAIL_XXX, FD_CHECK_XXX, FD_OFFSPEC_XXX and FD_MAINT_XXX which are also pre-defined by the manufacturer. In the Liquiline_pHORP device these events are grouped as follows.

Bit Position in Manufacturer Specific Conditions	ADVDIAGPHORP Transducer Parameter	Event numbers
31 SensorHiHiSeverity	Fixed_Area_31	3, 11, 12, 13, 100, 101, 102, 103, 104, 119, 120, 127, 128, 140, 203
30 ElectronicHiHiSeverity	Fixed_Area_30	218, 380, 381
29 ConfigHiHiSeverity	Fixed_Area_29	513
28 ProcessHiHiSeverity	Fixed_Area_28	802, 810, 811, 812
27 SensorHiSeverity	Fixed_Area_27	4, 10, 14, 129, 130
26 ElectronicHiSeverity	Fixed_Area_26	215, 219
25 ConfigHiSeverity	Fixed_Area_25	406, 407, 409
24 ProcessHiSeverity	Fixed_Area_24	None
23 SensorLoSeverity	Fixed_Area_23	322
22 ElectronicLoSeverity	Fixed_Area_22	None
21 ConfigLoSeverity	Fixed_Area_21	404, 405, 530, 531
20 ProcessLoSeverity	Fixed_Area_20	None
19 SensorLoLoSeverity	Fixed_Area_19	106, 107, 111, 112, 131, 132, 134, 135, 136, 137, 138, 139, 142, 145, 148, 153, 154, 155, 156, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 190, 191, 238, 239, 240, 318, 319, 320, 321
18 ElectronicLoLoSeverity	Fixed_Area_18	None
17 ConfigLoLoSeverity	Fixed_Area_17	501, 514, 532
16 ProcessLoLoSeverity	Fixed_Area_16	408, 840, 841

The ADVDIAGPHORP Transducer Block provides 16 lists to identify which events are mapped to which group.

The following diagram illustrates the principle of routing an event through the field diagnostics parameter group.



An event is enabled, if the bit representing the event number is set in the FD_EXTENDED_MAP_X parameter. It is disabled by clearing this bit. If an event is disabled, the related bit in the Extended ACTIVE

parameter won't be set any more and will not lead to an active condition in the upper field diagnostics group.

The disabled event number will be replaced with the value "Not categorized" in the matching ADVDIAGPHORP Transducer Block parameter list position. This event will appear without a FCSM mark in the diagnostic list menu on the local display of the device then.

6.3.11. Transducer Block FF universal parameters

The following table lists all the parameters of the Transducer Blocks specified by FOUNDATION Fieldbus. The device-specific parameters are described as of page 47 ff.

Transducer Block (Universal FF parameters)			
Parameter index	Parameter	Write access with operating Mode (MODE_BLK)	Description
1	Static revision (STAT_REV)	Read only	The revision status of the static. The revision status parameter is incremented on each modification of static data. This parameter is reset to 0 in all blocks in the event of a factory reset.
2	Tag description (TAG_DESC)	AUTO - OOS	Use this function to enter a user-specific text of max. 32 characters for unique identification and assignment of the block. Factory setting: (____) no text
3	Strategy (STRATEGY)	AUTO - OOS	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. Factory setting: 0 These data are neither checked nor processed by the Transducer Blocks.
4	Alert key (ALERT_KEY)	AUTO - OOS	Use this function to enter the identification number of the plant unit. This information can be used by the fieldbus host system for sorting alarms and events. User input: 1 to 255 Factory setting: 0

Transducer Block (Universal FF parameters)			
Parameter index	Parameter	Write access with operating Mode (MODE_BLK)	Description
5	Block Mode (MODE_BLK)	AUTO - OOS	<p>Displays the current (Actual) and desired (Target) operating mode of the corresponding Transducer Block, the permitted modes (Permitted) supported by the Resource Block and the normal operating mode (Normal).</p> <p>Supported values: AUTO OOS MAN</p> <p>The Transducer Block supports the following operating modes:</p> <ul style="list-style-type: none"> • AUTO (automatic mode): The block is executed. • OOS (out of service): The block is in the "Out of Service" mode. The process variable is updated, but the status of the process variable changes to BAD. • MAN (manual mode): The block is in the "manual mode". The process variable is updated. This state will be automatically set, if the resource block is "Out of Service".
6	Block Error (BLOCK_ERR)	Read only	<p>Indicates active block errors.</p> <p>Supported values:</p> <ul style="list-style-type: none"> • OUT OF SERVICE The block is in the "out of service" operating mode. • OTHER Further information is available in the Transducer Error parameter and in the Advanced Diagnostic Transducer <p>An error description as well as information on rectifying faults can be found in section Diagnostic Codes and Maintenance.</p>
7	Update Event (UPDATE_EVT)	AUTO - OOS	Indicates whether static block data have been altered, including date and time.

Transducer Block (Universal FF parameters)			
Parameter index	Parameter	Write access with operating Mode (MODE_BLK)	Description
8	Block Alarm (BLOCK_ALM)	AUTO - OOS	<p>The current block status is indicated with information on pending configuration, hardware or system errors, including information on the alarm period (date, time) when the error occurred.</p> <ul style="list-style-type: none"> In addition, the active block alarm can be acknowledged in this parameter group. The device does not use this parameter to display a process alarm since this is generated in the BLOCK_ALM parameter of the Analog Input function block.
9	Transducer Directory	Read only	<p>A directory that specifies the number and starting indices of the transducers in the transducer block. Because no multiple transducers are defined.</p> <p>Display: This value is 0.</p>
10	Transducer Type (TRANSDUCER_TYPE)	Read only	<p>The Transducer Block type is indicated.</p> <p>Supported values:</p> <ul style="list-style-type: none"> PHORP Transducer Block: pH/ORP Measurement, 0xFFF2 DIAGDI Transducer Block: Diagnostic Discrete Input, 0xFFEF SERVICE Transducer Block: Service, 0xFFF0 ADVDIAGPHORP Transducer Block: Advanced Diagnostics pH/ORP, 0xFFEE DISPLAYPHORP Transducer Block: pH/ORP Display CM42, 0xFFEB MEMOPHORP Transducer Block: pH/ORP Memosens Transmitter, 0xFFFB DIAGPHORP Transducer Block: pH/ORP Diagnostics, 0xFFF8
11	Transducer Type Version (TRANSDUCER_TYPE_VER)	Read only	Display of the transducer block type version

Transducer Block (Universal FF parameters)			
Parameter index	Parameter	Write access with operating Mode (MODE_BLK)	Description
12	Transducer Error (XD_ERROR)	Read only	<p>Indication of the active device.</p> <p>Supported values:</p> <ul style="list-style-type: none"> • No Error (normal status) • Electronics failure • Data Integrity Error • Mechanical failure • Configuration Error • Calibration error • General Error <p>Summarized device status/condition, more precise information on the pending error(s) is available by means of the manufacturer-specific error display. This can be read via the ADVDIAGPHORP Transducer Block in the "ACTUAL_DIAG_STATUS" and "ACTUAL_DIAGNOSTICS" parameters and more about previous diagnostics and a list of up to 10 current diagnostic events. How to remedy the error is indicated in the parameter MAINT_INSTRUCTION and in the Resource Block parameter FD_RECOMMEN_ACT.</p>
13	Collection Directory (COLLECTION_DIR)	Read only	Display of the Collection Directory; Not used Display: 0

6.3.12. PHORP Transducer Block

The properties column lists parameter properties:

- W: Parameter is writeable
- OOS: Parameter is writeable in OOS mode only

Since all parameters can be read, this is not explicitly stated.

PHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
14	PHORP_BLOCK_ERR_DESC_1		Block Error Description which indicates problems detected within the block Supported values: 0x01 - Resource Block in OOS
15	ACTUAL_DIAG_STATUS		Device's FCSM information Supported values: 0x00 : OK, no diagnostics detected 0x01 : F, failure 0x02 : M, maintenance required 0x03 : C, function check 0x04 : S, out of specification 0x05 : NC (Not Categorized)
	DIAG → Most important message		
16	ACTUAL_DIAGNOSTICS		Current diagnostic code with highest priority Indicated values: 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance
	DIAG → Most important message		
17	SENSOR_INTERFACE		Connected sensor interface type Indicated values: 0 - Analog 1 - Digital
18	SOFTWARE_FUNCTIONALITY		Indicates software capability as Standard or Advanced like indicated in order code (i.e. MAA600EAD00 means standard or MAA600EBD00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling Indicated values: 0 - Standard 1 - Advanced
	DIAG → Device information → Order code		
19	SIM_JUMPER		Physical position of the simulation jumper (on/off) Indicated values: 1 - Sim disabled 2 - Sim enabled Factory setting: Sim disabled
20	DEVICE_SIM		Icon on local display. If lit, it indicates, that simulate functionality is activated Indicated values: 0 - Off 1 - On
21	HOLD_ON_CALIB	OOS	The last measured value is used constantly on the output, if calibration menu is selected on the local device display Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → General settings → Hold settings → Calibration active		
22	HOLD_ON_SETUP	OOS	The last measured value is used constantly on the output, if parameterization menu is selected on the local device display Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → General settings → Hold settings → SETUP active		

Liquiline_pH/ORP FF-H1 Field Device Specification

PHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
23	HOLD_ON_DIAG	OOS	The last measured value is used constantly on the output, if diagnosis menu is selected on the local device display Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → General settings → Hold settings → DIAG active		
24	HOLD_DELAY	OOS	Defines the time the output will be hold in his fixed signalization status after leaving of calibration, parameterization or diagnosis menu. Available values: 0 to 300 seconds Factory setting: 15 seconds
	SETUP → General settings → Hold settings → Hold delay		
25	TEMP_CAL_TYPE	OOS	Select temperature adjustment type Available values: 0: 1 point 1: 2 point 2: 2 point table Factory setting: 1 point
	CAL → Temp. adjustment → Mode		
26	SENSOR_TYPE	OOS	Select/Indicate sensor type Available values: 0: Glass 1: IsFET 2: ORP 3: IsFET analog 4: ORP analog 5: Pfaudler abs 6: Pfaudler rel 7: Antimony 8: UNUSED 9: Glass analog 10: Pfaudler pH/ORP 11: rH Default value: if sensor interface is digital: automatic, depends on connected sensor if sensor interface is analog: Glass analog
	SETUP → Sensor pH/ORP → Sensor type pH (visible only if analog sensor interface)		
27	MEASURED_VALUE_PHORP	OOS	Select measurement mode Available values: 0 - pH 1 - ORP mV 2 - rH 3 - ORP % Default value: if sensor interface is digital: automatic, depends on connected sensor if sensor interface is analog: pH
	SETUP → Sensor pH/ORP → Measured value		
28	MEASURED_VALUE_ANALOG	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Measured value		
29	MEASURED_VALUE_DIGITAL	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Measured value		
30	MEAS_MV_VALUE		Current measured mV value and status Unit code: 1243 (mV)
	DIAG → Service → Raw values → pH (only visible, if rH measurement is selected)		
31	MEAS_DAMPED_MV_VALUE		Current measured damped mV value and status Unit code: 1243 (mV)
	MEAS → Second and third measurement screen (only visible, if pH measurement is selected)		
32	MEAS_PH_VALUE		Current measured pH value and status Unit code: 1422 (pH)
	MEAS → All measurement screens (only visible, if pH or rH measurement is selected)		
33	MEAS_PH_RAW_VALUE		Current measured pH raw value Unit code: 1422 (pH)
	DIAG → Service → Raw values → pH (only visible for rH sensor type)		

PHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
34	MEAS_ORP_MV_VALUE MEAS → All measurement screens (only visible, if ORP mV measurement is selected)		Current measured ORP mV value and status Unit code: 1243 (mV)
35	MEAS_ORP_PERCENT_VALUE MEAS → All measurement screens (only visible, if ORP % measurement is selected)		Current measured ORP % value and status Unit code: 1342 (%)
36	MEAS_RH_VALUE MEAS → All measurement screens (only visible, if rH measurement is selected)		Current measured rH value and status Unit code: 1681 (rH)
37	MEAS_GLASS_IMPEDANCE MEAS → All measurement screens (only visible, if pH or rH measurement is selected)		Current measured glass impedance value and status Unit code: 11281 (Ohm)
38	MEAS_SLOPE		Current measured pH slope value and status Unit code: 11585 (mV/pH)
39	MEAS_ZERO_POINT		Current measured pH zero point value and status Unit code: 11422 (pH)
40	MEAS_DAMPED_TEMP_VALUE MEAS → All measurement screens		Current measured damped temperature value and status Unit code: depends on setting of parameter UNIT_MEAS_DAMPED_TEMP_VAL 1001 (°C) or 1002 (°F)
41	UNIT_MEAS_DAMPED_TEMP_VAL	OOS	Selected unit for temperature value which is transferred over FF-H1 bus only. Available values: 1001 - Celsius 1002 - Fahrenheit Factory setting: Celsius To select temperature unit which is indicated on the local display only, use parameter DISPLAY_TEMPERATURE_UNIT_PH in DISPLAYPHORP transducer block.
42	POTENTIAL_MATCHING SETUP → Sensor pH/ORP → Potential matching	OOS	Analog sensors only: Indicates symmetric measurement (= with PM, only with a glass electrode, ISFET sensor or Pfaudler electrode) or asymmetric measurement (= without PM) Available values: 0 - Without PM 1 - With PM Factory setting: Without PM
43	OTHER_POTENTIAL_MATCHING SETUP → Sensor pH/ORP → Potential matching	OOS	required for up/download only
44	ANTIMONY_POTENTIAL_MATCHING SETUP → Sensor pH/ORP → Potential matching	OOS	required for up/download only
45	REFERENCE_ELECTRODE SETUP → Sensor pH/ORP → Reference electrode	OOS	Refer to the manufacturer's certificate for the sensor for information on the reference electrode type (Pfaudler sensors only) Available values: 0 - AGAGel 1 - AgAgCl Factory setting: AGAGel
46	INTERNAL_BUFFER SETUP → Sensor pH/ORP → Internal buffer	OOS	Glass electrodes generally have an internal buffer with pH 7. For this reason, a change of the factory setting is useful only, if a special glass electrode with a different internal buffer is used Available values: -2.0 to 16.0 pH Factory setting: 7.0 pH

Liquiline_pH/ORP FF-H1 Field Device Specification

PHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
47	DAMPING_TIME	OOS	The damping causes a floating average curve of the measured values over the time specified (for pH sensors) Available values: 0 to 600 seconds Factory setting: 0 seconds
	SETUP → Sensor pH/ORP → Damping		
48	DAMPING_TIME_ORP	OOS	The damping causes a floating average curve of the measured values over the time specified (for ORP sensors) Available values: 0 to 600 seconds Factory setting: 0 seconds
	SETUP → Sensor pH/ORP → Damping		
49	TEMPERATURE_DAMPING_TIME		The damping causes a floating average curve of the measured values over the time specified (for temperature) Available values: Factory setting:
50	TEMPERATURE_SENSOR_PHORP	OOS	configured temperature sensor for analog sensors Available values: 0 - None 1 - PT100 or PT1000 Factory setting: PT100 or PT1000
	SETUP → Sensor pH/ORP → Temperature sensor		
51	DIGITAL_TEMPERATURE_SENSOR	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Temperature sensor		
52	ANALOG_TEMPERATURE_SENSOR	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Temperature sensor		
53	ANTIMONY_TEMPERATURE_SENSOR	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Temperature sensor		
54	ENABLE_CAL_DATA_INPUT	W	Unblocking manual data entry adjustment method for pH measurement Available values: 0 - Off 1 - On Factory setting: On
	SETUP → Sensor pH/ORP → Cal. Settings → Type of calibration → Numeric input		
55	ENABLE_CAL_2_POINT	W	Unblocking 2-point calibration method for pH measurement Available values: 0 - Off 1 - On Factory setting: On
	SETUP → Sensor pH/ORP → Cal. Settings → Type of calibration → 2 point cal.		
56	ENABLE_CAL_OFFSET	W	Unblocking offset calibration method for pH measurement Available values: 0 - Off 1 - On Factory setting: On
	SETUP → Sensor pH/ORP → Cal. Settings → Type of calibration → 1 point cal.		
57	ENABLE_CAL_PROBE	W	Unblocking grab sample calibration method for pH measurement Available values: 0 - Off 1 - On Factory setting: On
	SETUP → Sensor pH/ORP → Cal. Settings → Type of calibration → Grab sample cal.		
58	ENABLE_CAL_DATA_INPUT_ORPMV	W	Unblocking manual data entry adjustment method for ORP mV measurement Available values: 0 - Off 1 - On Factory setting: On
	SETUP → Sensor pH/ORP → Cal. Settings → Type of calibration → Numeric input		

PHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
59	ENABLE_CAL_1_POINT_ORPMV	W	Unlocking 1-point calibration method for ORP mV measurement Available values: 0 - Off 1 - On Factory setting: On
	SETUP → Sensor pH/ORP → Cal. Settings → Type of calibration → 1 point cal.		
60	ENABLE_CAL_DATA_INPUT_ORPPERC	W	Unlocking manual data entry adjustment method for ORP % measurement Available values: 0 - Off 1 - On Factory setting: On
	SETUP → Sensor pH/ORP → Cal. Settings → Type of calibration → Numeric input		
61	ENABLE_CAL_2_POINT_ORPPERC	W	Unlocking 2-point calibration method for ORP % measurement Available values: 0 - Off 1 - On Factory setting: On
	SETUP → Sensor pH/ORP → Cal. Settings → Type of calibration → 2 point cal.		
62	TEMP_COMP_CALIBRATION	OOS	Temperature Compensation method used for calibration Available values: 0: None 1: ATC (Automatic temperature compensation) 2: MTC (Manual temperature compensation) Factory setting: ATC
	SETUP → Sensor pH/ORP → Cal. Settings → Temp. compensation		
63	MEDIUM_TEMP_CALIBRATION	OOS	Medium (buffer) temperature used for calibration, if MEDIUM_TEMP_CALIBRATION is set to "MTC" Available values: -50 to +250 °C Factory setting: 25 °C
	SETUP → Sensor pH/ORP → Cal. Settings → Medium temp.		
64	BUFFER_RECOGNITION	W	Calibration Buffer Recognition Available values: 0: Automatic 1: Fixed Buffer 2: Manual Automatic: The device recognizes the buffer automatically. The recognition depends on the setting for BUFFER_MANUFACTURER. Fixed: You choose values from a list. This list depends on the setting for BUFFER_MANUFACTURER. Manual: You enter any two buffer values. These must differ in terms of their pH value. Details to temperature tables and calibration see chapter 3.1 Sensor pH/ORP in BA00382C Factory setting: Fixed Buffer
	SETUP → Sensor pH/ORP → Cal. Settings → Buffer recognition		
65	AUTO_BUFFER_RECOGNITION	W	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Buffer recognition		
66	MANUAL_BUFFER_RECOGNITION	W	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Buffer recognition		

PHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
67	BUFFER_MANUFACTURER	W	Calibration Buffer Manufacturer Available values: 0: EH_NIST 1: INGOLD METTLER 2: DIN 19266 3: DIN 19267 4: MERCK RIEDEL 5: Special Buffer 6: Hamilton Details to temperature tables and calibration see chapter 3.1 Sensor pH/ORP in BA00382C You have the possibility of defining four buffers of your own with option "Special Buffer". Factory setting: EH_NIST
	SETUP → Sensor pH/ORP → Cal. Settings → Buffer manufact.		
68	SPECIAL_BUFFER	W	Select one of four available special buffers Available values: 0: User Buffer 1 1: User Buffer 2 2: User Buffer 3 3: User Buffer 4 Factory setting: User Buffer 1
	SETUP → Sensor pH/ORP → Cal. Settings → Special buffer → Special buffer		
69	TAB1_BUFFER_NAME	W	user-defined name for special buffer 1 Available values: up to 10 Ascii characters Factory setting: Buffer 1
	SETUP → Sensor pH/ORP → Cal. Settings → Special buffer → Buffername		
70	TAB2_BUFFER_NAME	W	user-defined name for special buffer 2 Available values: up to 10 Ascii characters Factory setting: Buffer 2
	SETUP → Sensor pH/ORP → Cal. Settings → Special buffer → Buffername		
71	TAB3_BUFFER_NAME	W	user-defined name for special buffer 3 Available values: up to 10 Ascii characters Factory setting: Buffer 3
	SETUP → Sensor pH/ORP → Cal. Settings → Special buffer → Buffername		
72	TAB4_BUFFER_NAME	W	user-defined name for special buffer 4 Available values: up to 10 Ascii characters Factory setting: Buffer 4
	SETUP → Sensor pH/ORP → Cal. Settings → Special buffer → Buffername		
73	TAB_ENTRY	W	Used to read/write special buffer tables by methods
74	TAB_X_VALUE	W	Used to read/write special buffer tables by methods
75	TAB_Y_VALUE	W	Used to read/write special buffer tables by methods
76	TAB_MIN_NUMBER		Used to read/write special buffer tables by methods
77	TAB_MAX_NUMBER		Used to read/write special buffer tables by methods
78	TAB_OP_CODE	W	Used to read/write special buffer tables by methods
79	TAB_STATUS		Used to read/write special buffer tables by methods
80	TAB_ACTUAL_NUMBER	W	Used to read/write special buffer tables by methods
81	MANUAL_1_CAL_BUFFER	OOS	Configuration of the value of calibration buffer 1, which will be used, if BUFFER_RECOGNITION is set to "Manual" Available values: -2.0 to 16.0 pH Factory setting: 7.0 pH
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 1		
82	MANUAL_2_CAL_BUFFER	OOS	Configuration of the value of calibration buffer 2, which will be used, if BUFFER_RECOGNITION is set to "Manual" Available values: -2.0 to 16.0 pH Factory setting: 4.0 pH
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 1		

PHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
83	FIXED_1_CAL_BUFFER	OOS	Configuration of the value of calibration buffer 1, which will be used, if BUFFER_RECOGNITION is set to "Fixed". Indicated values depend on the setting of BUFFER_MANUFACTURER Available values: Details to temperature tables and calibration see chapter 3.1 Sensor pH/ORP in BA00382C Factory setting: E+H 7.00 pH
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 1		
84	E_H_FIXED_1_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 1		
85	INGOLDMETTLER_FIXED_1_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 1		
86	DIN19266_FIXED_1_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 1		
87	DIN19267_FIXED_1_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 1		
88	MERCKRIEDEL_FIXED_1_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 1		
89	SPECIAL_FIXED_1_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 1		
90	HAMILTON_FIXED_1_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 1		
91	FIXED_2_CAL_BUFFER	OOS	Configuration of the value of calibration buffer 2, which will be used, if BUFFER_RECOGNITION is set to "Fixed". Indicated values depend on the setting of BUFFER_MANUFACTURER Available values: Details to temperature tables and calibration see chapter 3.1 Sensor pH/ORP in BA00382C Factory setting: E+H 4.00 pH
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 2		
92	E_H_FIXED_2_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 2		
93	INGOLDMETTLER_FIXED_2_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 2		
94	DIN19266_FIXED_2_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 2		
95	DIN19267_FIXED_2_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 2		
96	MERCKRIEDEL_FIXED_2_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 2		
97	SPECIAL_FIXED_2_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 2		
98	HAMILTON_FIXED_2_CAL_BUFFER	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Calib. Buffer 2		

Liquiline_pH/ORP FF-H1 Field Device Specification

PHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
99	ISOTHERM_PH	OOS	Isotherm intersection The value is identical to that of the internal buffer. Do not change the value. Available values: -2.0 to 16.0 pH Factory setting: 7.0 pH
	SETUP → Sensor pH/ORP → Cal. Settings → Isotherm pnt.		
100	PH_GLASS_ISOTHERM_PH	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Isotherm pnt.		
101	PFAUDLER03_ISOTHERM_PH	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Isotherm pnt.		
102	PFAUDLER18_ISOTHERM_PH	OOS	required for up/download only
	SETUP → Sensor pH/ORP → Cal. Settings → Isotherm pnt.		
103	REFERENCE_BUFFER_ORP_MV	OOS	Reference buffer for ORP mV: Enter the buffer value indicated on the manufacturer's certificate. Available values: -1500 to +1500 mV Factory setting: 0 mV
	SETUP → Sensor pH/ORP → Cal. Settings ORP → Reference buffer		
104	SENSOR_OFFSET_ORP_MV		Calibrated sensor offset Possible values: -100 to +100 mV Default value: 0 mV
	DIAG → Sensor status → Offset		
105	SENSOR_OFFSET_ORP_PERCENT		Calibrated sensor offset Possible values: -100 to +100 mV Default value: 0 mV
	DIAG → Sensor status → Offset		
106	BUFFER_1_PERCENT_ORP	OOS	For ORP % only: First value for two point calibration Available values: 0 to 30 % Factory setting: 20 %
	SETUP → Sensor pH/ORP → Cal. Settings ORP → Buffer 1		
107	BUFFER_2_PERCENT_ORP	OOS	For ORP % only: Second value for two point calibration Available values: 70 to 100 % Factory setting: 80 %
	SETUP → Sensor pH/ORP → Cal. Settings ORP → Buffer 1		
108	TEMP_COMPENSATION	OOS	Current temperature compensation setting Available values: 0: None 1: ATC (Automatic temperature compensation) 2: MTC (Manual temperature compensation) Factory setting: ATC
	SETUP → Sensor pH/ORP → Temp. compensation		
109	MEDIUM_TEMPERATURE	OOS	Medium (buffer) temperatur, if TEMP_COMPENSATION is set to "MTC" Available values: -50 to +250 °C Factory setting: 25.0 °C
	SETUP → Sensor pH/ORP → Medium temp.		
110	COMP_TYPE_PH_MEDIUM	OOS	Select medium compensation type (pH only) Available values: 0:Comp Off 1: 2 point 2: Table Factory setting: Comp off
	SETUP → Sensor pH/ORP → Medium compensation → Type of compensation		
111	REFERENCE_TEMPERATURE	OOS	Temperature to which the compensated pH value refers (pH only) Available values: 50 to +250 °C Factory setting: 25.0 °C
	SETUP → Sensor pH/ORP → Medium compensation → Reference temp.		
112	TEMPERATURE_1	OOS	Medium compensation temperature value 1 for 2-point compensation Available values: 50 to +250 °C Factory setting: 25.0 °C
	SETUP → Sensor pH/ORP → Medium compensation → Temperature 1		

Liquiline_pHORP FF-H1 Field Device Specification

PHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
113	PH_1	OOS	Medium compensation pH value 1 for 2-point compensation Available values: -2.0 to 16.0 pH Factory setting: 7.0 pH
	SETUP → Sensor pH/ORP → Medium compensation → pH 1		
114	TEMPERATURE_2	OOS	Medium compensation temperature value 2 for 2-point compensation Available values: 50 to +250 °C Factory setting: 40.0 °C
	SETUP → Sensor pH/ORP → Medium compensation → Temperature 2		
115	PH_2	OOS	Medium compensation pH value 2 for 2-point compensation Available values: -2.0 to 16.0 pH Factory setting: 7.5 pH
	SETUP → Sensor pH/ORP → Medium compensation → pH 2		
116	MEDIUMS_COMP_TAB_ENTRY	W	Used to read/write medium compensation table by methods
117	MEDIUMS_COMP_TAB_X_VALUE	W	Used to read/write medium compensation table by methods
118	MEDIUMS_COMP_TAB_Y_VALUE	W	Used to read/write medium compensation table by methods
119	MEDIUMS_COMP_TAB_MIN_NUMBER		Used to read/write medium compensation table by methods
120	MEDIUMS_COMP_TAB_MAX_NUMBER		Used to read/write medium compensation table by methods
121	MEDIUMS_COMP_TAB_OP_CODE	W	Used to read/write medium compensation table by methods
122	MEDIUMS_COMP_TAB_STATUS		Used to read/write medium compensation table by methods
123	MEDIUMS_COMP_TAB_ACTUAL_NUMBER	W	Used to read/write medium compensation table by methods
124	PH_OFFSET	OOS	pH offset Available values: -2.0 to 16.0 pH Factory setting: 0.0 pH
	DIAG → Sensor status → Offset		
125	REFERENCE_IMPEDANCE_SENSOR		Current reference impedance (anlog pH or pHORP sensor) unit: Ohm
	DIAG → Service → Raw values → Impedance reference		
126	ISFET_OPERATING_POINT		IsFET sensor only: operating point unit: mV Default value: 0 mV
	DIAG → Sensor status → Operating point		
127	ISFET_LEAKAGE_CURRENT		IsFET sensor only: leakage current unit: nA
128	SLOPE_ORPPERCENT		Slope of mV/percent mapping (ORP% only) Unit: none Default value: 0.03
	DIAG → Sensor status → Slope		
129	ZERO_POINT_ORPPERCENT		Offset of mV/percent mapping (ORP% only) Unit: mV Default value: 0.0 mV
	DIAG → Sensor status → Offset		
130	SENSOR_CAL_VALID		Validity of the displayed calibration parameter for main measurement Available values: FALSE - Invalid TRUE - Valid Factory setting: FALSE
131	SENSOR_CAL_TEMP_VALID		Validity of the displayed calibration parameter for temperature measurement Available values: FALSE - Invalid TRUE - Valid Factory setting: FALSE

6.3.13. DIAGDI Transducer Block

The properties column lists parameter properties:

- W: Parameter is writeable
- OOS: Parameter is writeable in OOS mode only

Since all parameters can be read, this is not explicitly stated.

DIAGDI Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
14	DIAGDI_BLOCK_ERR_DESC_1		Block Error Description which indicates problems detected within the block Supported values: 0x01 - Resource Block in OOS
15	ACTUAL_DIAG_STATUS		Device's FCSM information Supported values: 0x00 : OK, no diagnostics detected 0x01 : F, failure 0x02 : M, maintenance required 0x03 : C, function check 0x04 : S, out of specification 0x05 : NC (Not Categorized)
	DIAG → Most important message		
16	ACTUAL_DIAGNOSTICS		Current diagnostic code with highest priority Indicated values: 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance
	DIAG → Most important message		
17	PREVIOUS_DIAGNOSTICS_DIAGDI		Previous diagnostic code Indicated values: 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance
	DIAG → Past message		
18	CURRENT_STATE_CH1		Current state (value and status) for channel 1 after evaluating parameters ACTUAL_DIAGNOSTICS and CH1_ENB_xxx_yyy_ERR Available values: FALSE - Invalid TRUE - Valid Factory setting: value - FALSE, status - GOOD_NC (0x80)
19	CURRENT_STATE_CH2		Current state (value and status) for channel 2 after evaluating parameters ACTUAL_DIAGNOSTICS and CH2_ENB_xxx_yyy_ERR Available values: FALSE - Invalid TRUE - Valid Factory setting: value - FALSE, status - GOOD_NC (0x80)

DIAGDI Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
20	CH1_ENB_001_032_ERR	W	A list of event numbers from 001 to 032. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00001C04 Activated event numbers: 3, 11, 12, 13
21	CH1_ENB_033_064_ERR	W	A list of event numbers from 033 to 064. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
22	CH1_ENB_065_096_ERR	W	A list of event numbers from 065 to 096. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
23	CH1_ENB_097_128_ERR	W	A list of event numbers from 097 to 128. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0xC0C000F8 Activated event numbers: 100, 101, 102, 103, 104, 119, 120, 127, 128
24	CH1_ENB_129_160_ERR	W	A list of event numbers from 129 to 160. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000800 Activated event number: 140
25	CH1_ENB_161_192_ERR	W	A list of event numbers from 161 to 192. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
26	CH1_ENB_193_224_ERR	W	A list of event numbers from 193 to 224. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x02000400 Activated event numbers: 203, 218
27	CH1_ENB_225_256_ERR	W	A list of event numbers from 225 to 256. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000

DIAGDI Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
28	CH1_ENB_257_288_ERR	W	A list of event numbers from 257 to 288. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
29	CH1_ENB_289_320_ERR	W	A list of event numbers from 289 to 320. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
30	CH1_ENB_321_352_ERR	W	A list of event numbers from 321 to 352. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
31	CH1_ENB_353_384_ERR	W	A list of event numbers from 353 to 384. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x18000000 Activated event numbers: 380, 381
32	CH1_ENB_385_416_ERR	W	A list of event numbers from 385 to 416. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
33	CH1_ENB_417_448_ERR	W	A list of event numbers from 417 to 448. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
34	CH1_ENB_449_480_ERR	W	A list of event numbers from 449 to 480. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
35	CH1_ENB_481_512_ERR	W	A list of event numbers from 481 to 512. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000

DIAGDI Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
36	CH1_ENB_513_544_ERR	W	A list of event numbers from 513 to 544. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000001 Activated event number: 513
37	CH1_ENB_545_576_ERR	W	A list of event numbers from 545 to 576. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
38	CH1_ENB_577_608_ERR	W	A list of event numbers from 577 to 608. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
39	CH1_ENB_609_640_ERR	W	A list of event numbers from 609 to 640. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
40	CH1_ENB_641_672_ERR	W	A list of event numbers from 641 to 672. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
41	CH1_ENB_673_704_ERR	W	A list of event numbers from 673 to 704. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
42	CH1_ENB_705_736_ERR	W	A list of event numbers from 705 to 736. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
43	CH1_ENB_737_768_ERR	W	A list of event numbers from 737 to 768. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
44	CH1_ENB_769_800_ERR	W	A list of event numbers from 769 to 800. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000

DIAGDI Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
45	CH1_ENB_801_832_ERR	W	A list of event numbers from 801 to 832. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000E02 Activated event numbers: 802, 810, 811, 812
46	CH1_ENB_833_864_ERR	W	A list of event numbers from 833 to 864. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
47	CH1_ENB_865_896_ERR	W	A list of event numbers from 865 to 896. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
48	CH1_ENB_897_928_ERR	W	A list of event numbers from 897 to 928. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
49	CH1_ENB_929_960_ERR	W	A list of event numbers from 929 to 960. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
50	CH1_ENB_961_992_ERR	W	A list of event numbers from 961 to 992. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
51	CH1_ENB_993_999_ERR	W	A list of event numbers from 993 to 999. Each set bit will lead to an activated output for channel 1, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
52	CH2_ENB_001_032_ERR	W	A list of event numbers from 001 to 032. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00002208 Activated event numbers: 4, 10, 14
53	CH2_ENB_033_064_ERR	W	A list of event numbers from 033 to 064. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000

DIAGDI Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
54	CH2_ENB_065_096_ERR	W	A list of event numbers from 065 to 096. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
55	CH2_ENB_097_128_ERR	W	A list of event numbers from 097 to 128. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x0000C600 Activated event numbers: 106, 107, 111, 112
56	CH2_ENB_129_160_ERR	W	A list of event numbers from 129 to 160. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x0F0927EF Activated event numbers: 129, 130, 131, 132, 134, 135, 136, 137, 138, 139, 142, 145, 148, 153, 154, 155, 156
57	CH2_ENB_161_192_ERR	W	A list of event numbers from 161 to 192. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x63FFF800 Activated event numbers: 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 190, 191
58	CH2_ENB_193_224_ERR	W	A list of event numbers from 193 to 224. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x04400000 Activated event numbers:215, 219
59	CH2_ENB_225_256_ERR	W	A list of event numbers from 225 to 256. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x0000E000 Activated event numbers:238, 239, 240
60	CH2_ENB_257_288_ERR	W	A list of event numbers from 257 to 288. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
61	CH2_ENB_289_320_ERR	W	A list of event numbers from 289 to 320. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0xE0000000 Activated event numbers:318, 319, 320

DIAGDI Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
62	CH2_ENB_321_352_ERR	W	A list of event numbers from 321 to 352. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000003 Activated event numbers: 321, 322
63	CH2_ENB_353_384_ERR	w	A list of event numbers from 353 to 384. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
64	CH2_ENB_385_416_ERR	W	A list of event numbers from 385 to 416. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x01F80000 Activated event numbers: 404, 405, 406, 407, 408, 409
65	CH2_ENB_417_448_ERR	W	A list of event numbers from 417 to 448. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
66	CH2_ENB_449_480_ERR	W	A list of event numbers from 449 to 480. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
67	CH2_ENB_481_512_ERR	W	A list of event numbers from 481 to 512. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00100000 Activated event number: 501
68	CH2_ENB_513_544_ERR	W	A list of event numbers from 513 to 544. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x000E0002 Activated event numbers: 514, 530, 531, 532
69	CH2_ENB_545_576_ERR	W	A list of event numbers from 545 to 576. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000

DIAGDI Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
70	CH2_ENB_577_608_ERR	W	A list of event numbers from 577 to 608. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
71	CH2_ENB_609_640_ERR	W	A list of event numbers from 609 to 640. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
72	CH2_ENB_641_672_ERR	W	A list of event numbers from 641 to 672. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
73	CH2_ENB_673_704_ERR	W	A list of event numbers from 673 to 704. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
74	CH2_ENB_705_736_ERR	W	A list of event numbers from 705 to 736. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
75	CH2_ENB_737_768_ERR	W	A list of event numbers from 737 to 768. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
76	CH2_ENB_769_800_ERR	W	A list of event numbers from 769 to 800. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
77	CH2_ENB_801_832_ERR	W	A list of event numbers from 801 to 832. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
78	CH2_ENB_833_864_ERR	W	A list of event numbers from 833 to 864. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000180 Activated event numbers: 840, 841

DIAGDI Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
79	CH2_ENB_865_896_ERR	W	A list of event numbers from 865 to 896. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
80	CH2_ENB_897_928_ERR	W	A list of event numbers from 897 to 928. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
81	CH2_ENB_929_960_ERR	W	A list of event numbers from 929 to 960. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
82	CH2_ENB_961_992_ERR	W	A list of event numbers from 961 to 992. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000
83	CH2_ENB_993_999_ERR	W	A list of event numbers from 993 to 999. Each set bit will lead to an activated output for channel 2, if parameter value ACTUAL_DIAGNOSTICS matches. Available values: 0x00000000 to 0xFFFFFFFF Factory setting: 0x00000000

6.3.14. SERVICE Transducer Block

The properties column lists parameter properties:

- W: Parameter is writeable
- OOS: Parameter is writeable in OOS mode only

Since all parameters can be read, this is not explicitly stated.

SERVICE Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
14	SERVICE_BLOCK_ERR_DESC_1		Block Error Description which indicates problems detected within the block Supported values: 0x01 - Resource Block in OOS
15	ACTUAL_DIAG_STATUS		Device's FCSM information Supported values: 0x00 : OK, no diagnostics detected 0x01 : F, failure 0x02 : M, maintenance required 0x03 : C, function check 0x04 : S, out of specification 0x05 : NC (Not Categorized)
	DIAG → Most important message		

SERVICE Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
16	ACTUAL_DIAGNOSTICS		Current diagnostic code with highest priority Indicated values: 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance
	DIAG → Most important message		
17	SENSOR_INTERFACE		Connected sensor interface type Indicated values: 0 - Analog 1 - Digital
18	SOFTWARE_FUNCTIONALITY		Indicates software capability as Standard or Advanced like indicated in order code (i.e. MAA600EAD00 means standard or MAA600EBD00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling Indicated values: 0 - Standard 1 - Advanced
	DIAG → Device information → Order code		
19	SIM_JUMPER		Physical position of the simulation jumper (on/off) Indicated values: 1 - Sim disabled 2 - Sim enabled Factory setting: Sim disabled
20	DEVICE_SIM		Icon on local display. If lit, it indicates, that simulate functionality is activated Indicated values: 0 - Off 1 - On
21	PACKAGE		Current installed projecting package Range: octet string with size of 16 Factory Setting: PH/ORP
	DIAG → Device information → Projecting		
22	DATE_FORMAT	W	Select date format for local device display Available values: 2 - DDMMYYYY 4 - MMDDYYYY Factory setting: DDMMYYYY
	SETUP → General settings → Date/Time → Date format		
23	DATE_TIME	W	Date and time which is indicated on the local device display and used for time stamps in ACTUAL_TIME_STAMP_1..._10, ACTUAL_DIAG_TIMESTAMP and PREVIOUS_DIAG_TIMESTAMP Range: DATE format (size 7) according to FF specification 870
	SETUP → General settings → Date/Time → Set date		
24	TIME_FORMAT	W	Select time format for local device display Available values: 0 - HHMMSS24 2 - HHMMSS12 Factory setting: HHMMSS24
	SETUP → General settings → Date/Time → Time format		
25	HW_ID_INFO_MODUL		Hardware identification number of the device Range: Octet string of size 20
	DIAG → Device information → Hardware identifier		
26	SERIAL_NUMBER_INFO_MODUL		Serial number of the device Range: Octet string of size 20
	DIAG → Device information → Serial number		
27	PROJ_VER_INFO_MODUL		Projecting version of the device Range: Octet string of size 20
	DIAG → Device information → Device version		
28	SW_VERSION_INFO_MODUL		Software version of the device Range: Octet string of size 20
29	ORDER_CODE_INFO_MODUL		Order code of the device Range: Octet string of size 20
	DIAG → Device information → Order code		

Liquiline_pHORP FF-H1 Field Device Specification

SERVICE Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
30	HW_ID_INFO_CPU		Hardware identification number of the CPU module Range: Octet string of size 20
	DIAG → Device information → CPU → Hardware identifier		
31	SERIAL_NUMBER_INFO_CPU		Serial number of the CPU module Range: Octet string of size 20
	DIAG → Device information → CPU → Serial number		
32	ORDER_CODE_INFO_CPU		Order Code for the CPU module Range: Octet string of size 20
	DIAG → Device information → CPU → Order code		
33	HW_VERSION_INFO_CPU		Hardware version of the CPU Range: Octet string of size 20module
	DIAG → Device information → CPU → Hardware version		
34	SW_VERSION_INFO_CPU		Software version of the CPU module Range: Octet string of size 20
	DIAG → Device information → CPU → Software version		
35	HW_ID_INFO_BUS		Hardware identification number of the Fieldbus module Range: Octet string of size 20
	DIAG → Device information → Fieldbus module → Hardware identifier		
36	SERIAL_NUMBER_INFO_BUS		Serial number of the Fieldbus module Range: Octet string of size 20
	DIAG → Device information → Fieldbus module → Serial number		
37	ORDER_CODE_INFO_BUS		Order Code for the Fieldbus module Range: Octet string of size 20
	DIAG → Device information → Fieldbus module → Order code		
38	HW_VERSION_INFO_BUS		Hardware version of the Fieldbus module Range: Octet string of size 20
	DIAG → Device information → Fieldbus module → Hardware version		
39	SW_VERSION_INFO_BUS		Software version of the Fieldbus module Range: Octet string of size 20
	DIAG → Device information → Fieldbus module → Software version		
40	HW_ID_INFO_SAMODUL		Hardware identification number of the Sensor module Range: Octet string of size 20
	DIAG → Device information → Sensor module → Hardware identifier		
41	SERIAL_NUMBER_INFO_SAMODUL		Serial number of the Sensor module Range: Octet string of size 20
	DIAG → Device information → Sensor module → Serial number		
42	ORDER_CODE_INFO_SAMODUL		Order Code for the Sensor module Range: Octet string of size 20
	DIAG → Device information → Sensor module → Order code		
43	HW_VERSION_INFO_SAMODUL		Hardware version of the Sensor module Range: Octet string of size 20
	DIAG → Device information → Sensor module → Hardware version		
44	SW_VERSION_INFO_SAMODUL		Software version of the Sensor module Range: Octet string of size 20
	DIAG → Device information → Sensor module → Software version		
45	HW_ID_INFO_DISPLAY		Hardware identification number of the Display module Range: Octet string of size 20
	DIAG → Device information → Display → Hardware identifier		
46	SERIAL_NUMBER_INFO_DISPLAY		Serial number of the Display module Range: Octet string of size 20
	DIAG → Device information → Display → Serial number		
47	ORDER_CODE_INFO_DISPLAY		Order Code for the Display module Range: Octet string of size 20
	DIAG → Device information → Display → Order code		
48	HW_VERSION_INFO_DISPLAY		Hardware version of the Display module Range: Octet string of size 20
	DIAG → Device information → Display → Hardware version		
49	SW_VERSION_INFO_DISPLAY		Software version of the Display module Range: Octet string of size 20
	DIAG → Device information → Display → Software version		

6.3.15. ADVDIAGPHORP Transducer Block

The properties column lists parameter properties:

- W: Parameter is writeable
- OOS: Parameter is writeable in OOS mode only

Since all parameters can be read, this is not explicitly stated.

ADVDIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
14	ADVDIAG_TRD_BLOCK_ERR_DESC_1		Block Error Description which indicates problems detected within the block Supported values: 0x01 - Resource Block in OOS
15	ACTUAL_DIAG_STATUS		Device's FCSM information Supported values: 0x00 : OK, no diagnostics detected 0x01 : F, failure 0x02 : M, maintenance required 0x03 : C, function check 0x04 : S, out of specification 0x05 : NC (Not Categorized)
	DIAG → Most important message		
16	ACTUAL_DIAGNOSTICS		Current diagnostic code with highest priority Indicated values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance
	DIAG → Most important message		
17	SENSOR_INTERFACE		Connected sensor interface type Indicated values: 0 - Analog 1 - Digital
18	SOFTWARE_FUNCTIONALITY		Indicates software capability as Standard or Advanced like indicated in order code (i.e. MAA600EAD00 means standard or MAA600EBD00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling Indicated values: 0 - Standard 1 - Advanced
	DIAG → Device information → Order code		
19	SIM_JUMPER		Physical position of the simulation jumper (on/off) Indicated values: 1 - Sim disabled 2 - Sim enabled Factory setting: Sim disabled
20	DEVICE_SIM		Icon on local display. If lit, it indicates, that simulate functionality is activated Indicated values: 0 - Off 1 - On
21	DEVICE_HOLD		Icon on local display. If lit, it indicates, that HOLD functionality is activated Indicated values: 0 - Off 1 - On
22	ACTUAL_DIAG_TIMESTAMP		time stamp of current diagnostics Range: DATE format (size 7) according to FF specification 870
23	MAINT_INSTRUCTION_PHORP		maintenance instruction Possible values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance

ADVDIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
24	PREVIOUS_DIAG_STATUS		Previous device's FCSM information Supported values: 0x00 : OK 0x01 : F 0x02 : M 0x03 : C 0x04 : S 0x05 : NC (Not Categorized)
	DIAG → Past message		
25	PREVIOUS_DIAGNOSTICS		Previous diagnostic code Possible values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance
	DIAG → Past message		
26	PREVIOUS_DIAG_TIMESTAMP		time stamp of previous diagnostics Range: DATE format (size 7) according to FF specification 870
27	OPERATING_TIME_FROM_RESTART		Indicates how long the device has been in operation since last restart Range: Octet string of size 14 Format: 0000d00h00m00s
28	ACTUAL_DIAG_LIST_1		First entry in current diagnostics list; matches with first entry of errors/messages view on device's local display Possible values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance
29	ACTUAL_TIMESTAMP_1		time stamp of first diagnostic list entry Range: DATE format (size 7) according to FF specification 870
30	ACTUAL_DIAG_LIST_2		Second entry in current diagnostics list; matches with second entry of errors/messages view on device's local display Possible values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance
31	ACTUAL_TIMESTAMP_2		time stamp of second diagnostic list entry Range: DATE format (size 7) according to FF specification 870
32	ACTUAL_DIAG_LIST_3		Third entry in current diagnostics list; matches with third entry of errors/messages view on device's local display Possible values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance
33	ACTUAL_TIMESTAMP_3		time stamp of third diagnostic list entry Range: DATE format (size 7) according to FF specification 870
34	ACTUAL_DIAG_LIST_4		Fourth entry in current diagnostics list; matches with fourth entry of errors/messages view on device's local display Possible values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance
35	ACTUAL_TIMESTAMP_4		time stamp of fourth diagnostic list entry Range: DATE format (size 7) according to FF specification 870
36	ACTUAL_DIAG_LIST_5		Fifth entry in current diagnostics list; matches with fifth entry of errors/messages view on device's local display Possible values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance
37	ACTUAL_TIMESTAMP_5		time stamp of fifth diagnostic list entry Range: DATE format (size 7) according to FF specification 870
38	ACTUAL_DIAG_LIST_6		Sixth entry in current diagnostics list; matches with sixth entry of errors/messages view on device's local display Possible values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance

ADVDIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
39	ACTUAL_TIMESTAMP_6		time stamp of sixth diagnostic list entry Range: DATE format (size 7) according to FF specification 870
40	ACTUAL_DIAG_LIST_7		Seventh entry in current diagnostics list; matches with seventh entry of errors/messages view on device's local display Possible values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance
41	ACTUAL_TIMESTAMP_7		time stamp of Seventh diagnostic list entry Range: DATE format (size 7) according to FF specification 870
42	ACTUAL_DIAG_LIST_8		Eighth entry in current diagnostics list; matches with eighth entry of errors/messages view on device's local display Possible values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance
43	ACTUAL_TIMESTAMP_8		time stamp of eighth diagnostic list entry Range: DATE format (size 7) according to FF specification 870
44	ACTUAL_DIAG_LIST_9		Ninth entry in current diagnostics list; matches with ninth entry of errors/messages view on device's local display Possible values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance
45	ACTUAL_TIMESTAMP_9		time stamp of ninth diagnostic list entry Range: DATE format (size 7) according to FF specification 870
46	ACTUAL_DIAG_LIST_10		Tenth entry in current diagnostics list; matches with tenth entry of errors/messages view on device's local display Possible values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance
47	ACTUAL_TIMESTAMP_10		time stamp of tenth diagnostic list entry Range: DATE format (size 7) according to FF specification 870
48	DIAGNOSTIC_EVENT_SIMULATION	W	Switch to enable/disable the simulation of diagnostic events.Pre-condition before diagnostic simulation could be set to enabled state: The actual block mode must be OOS.After enabling simulation the SIMU icon on the local display will be lit.The diagnostic event 'Simulation active' will be set as well. Available values: 0 - Off 1 - On Factory setting: Off
49	SIMULATED_DIAGNOSTIC_EVENT	W	Select one of the available enumerations which will be transferred as an active diagnostic event. Possible values: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance
50	LOGBOOKS_RECORDING	W	Switch to enable/disable logbook recording Available values: 0 - Off 1 - On Factory setting: On
	SETUP → General settings → Logbooks → Recording		
51	DATA_LOGBOOK_RECORDING	W	Switch to enable/disable data logbook recording Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → General settings → Logbooks → Data logbook → Recording		
52	SEC_SAMPLE_TIME	W	sample interval for data logbook reading in seconds Range: 0 to 356400 seconds Factory setting: 60 seconds
	SETUP → General settings → Logbooks → Data logbook → Sample time		

ADVDIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
53	MEAS_VALUE_TO_LOG	W	Selection of measurement value which will be logged for data logbook Available values: 0 - raw value 1 - Temperature 2 - Main Value Factory setting: Main Value
	SETUP → General settings → Logbooks → data logbook → Meas. value		
54	LOGBOOK_CMD	W	manufacturer-specific structure used for logbook read methods
55	LOGBOOK_RSP		manufacturer-specific structure used for logbook read methods
56	ENP_VERSION		Electronic name plate version number Range: Octet string(32) Factory setting: 02.02.00
57	DEVICE_TAG		Device TAG Range: Octet string(32) Factory setting: EH_Liquiline_pHORP-<serial number>
	DIAG→Device information→TAG		
58	SERIAL_NUMBER		serial number of the device Range: Octet string(16) Example: J3047B05G00
	DIAG→Device information→ Serial number		
59	ORDER_CODE_EXT		extended order code, part 1; not used Range: Octet string(32) Factory setting: 32 blanks
60	ORDER_CODE_EXT_P2		extended order code, part 2; not used Range: Octet string(32) Factory setting: 32 blanks
61	ORDER_CODE		order code Range: Octet string(32) Example: MAA610EBD00
	DIAG→Device information→ Order code		
62	FIRMWARE_VERSION		firmware version of the device Range: Octet string(32) Example: 02.01.00-0042
	DIAG → Device information → Device version		
63	DEVICE_ID		Device ID Range: Octet string(32) Factory setting: 452B4810A0-<serial number>
	DIAG → Device information → Fieldbusmodule → FF settings→ Device ID		
64	DEVICE_REV		Device Revision Range: 00 to FFh
	DIAG → Device information → Fieldbusmodule → FF settings→ Device revision		
65	DEV_DESCR_REV		initial Device Description Revision Range: 00 to FFh
	DIAG → Device information → Fieldbusmodule → FF settings→ DD revision		
66	DL_DEVICE_CLASS		defines the current operating class of the device Available values: 1 - Basic Field Device 2 - Link Master Factory setting: Basic Field Device
	DIAG → Device information → Fieldbusmodule → FF settings→ DL device class		
67	BOOT_DEVICE_CLASS	W	specifies how the device should function in the network the next time it boots up Available values: 1 - Basic Field Device 2 - Link Master Factory setting: Basic Field Device
	DIAG → Device information → Fieldbusmodule → FF settings→ Boot device class SETUP → General settings → Boot device class		
68	NODE_ADDRESS		node address assigned to the device Range: 10h to FFh, unit in octet time (8 * 1/32 ms = 256 μs) Factory setting: 247 (F7h)
	DIAG → Device information → Fieldbusmodule → FF settings→ Node address		
69	CURRENT_SLOT_TIME		Slot time written by LAS Range: 00h to FFFFh, unit in octet time (8 * 1/32 ms = 256 μs) Factory setting: 4 (1.024 ms)
	DIAG → Device information → Fieldbusmodule → FF settings→ Current slot time		

ADVDIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
70	CURRENT_MIN_INTER_PDU_DELAY		minimum inter PDU (protocol data unit) delay written by LAS Range: 00h to FFh, unit in octet time (8 * 1/32 ms = 256 µs) Factory setting: 10 (2.56 ms)
	DIAG → Device information → Fieldbusmodule → FF settings→ Current MID		
71	CURRENT_MAX_RESPONSE_DELAY		maximum response delay written by LAS Range: 00h to FFh, unit in octet time (8 * 1/32 ms = 256 µs) Factory setting: 8 (2.048 ms)
	DIAG → Device information → Fieldbusmodule → FF settings→ Current MRD		
72	FEASIBLE_SLOT_TIME		slot time provided by device Range: 0000h to FFFFh, unit in octet time (8 * 1/32 ms = 256 µs) Factory setting: 4 (1.024 ms)
	DIAG → Device information → Fieldbusmodule → FF settings→ Feasible slot time		
73	FEASIBLE_MIN_INTER_PDU_DELAY		minimum inter PDU (protocol data unit) delay provided by device Range: 00h to FFh, unit in octet time (8 * 1/32 ms = 256 µs) Factory setting: 10 (2.56 ms)
	DIAG → Device information → Fieldbusmodule → FF settings→ Feasible MID		
74	FEASIBLE_MAX_RESPONSE_DELAY		maximum response delay provided by device Range: 00h to FFh, unit in octet time (8 * 1/32 ms = 256 µs) Factory setting: 8 (1.024 ms)
	DIAG → Device information → Fieldbusmodule → FF settings→ Feasible MRD		
75	CONFIGURABLE_AREA	W	Configurable area mapped from bit 1 to bit 15 of FF-912 manufacturer specific conditions Available values (for each entry of this array): 0 Not used 3 003 Temperature sensor failure 100 100 Glass impedance alarm 101 101 Ref- impedance alarm 102 102 Glass impedance too low 103 103 Ref. impedance too low 104 104 Oper. voltage uncertain 140 140 Leak current alarm 180 180 Cal. expired alarm 181 181 No. steril. alarm 532 532 Cal. timer expired 810 810 PV upper limit 811 811 PV lower limit 812 812 Temp out of range Factory setting: all entries: 0 Not used For further description of the advanced field diagnostics functionality please see chapter 'Configuration of event behaviour according to FOUNDATION Fieldbus Field Diagnostics' of BA000381C
76	FIXED_AREA_31		Current list of diagnostic events in Sensor Highest Severity group (bit 31 of manufacturer specific conditions) Range: Array of Unsigned16 values Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh - Empty Factory setting: 3, 11, 12, 13, 100, 101, 102, 103, 104, 119, 120, 127, 128, 140, 203

ADVDIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
77	FIXED_AREA_30		<p>Current list of diagnostic events in Electronic Highest Severity group (bit 30 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance</p> <p>FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh - Empty</p> <p>Factory setting: 218, 380, 381</p>
78	FIXED_AREA_29		<p>Current list of diagnostic events in Config Highest Severity group (bit 29 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance</p> <p>FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh - Empty</p> <p>Factory setting: 513</p>
79	FIXED_AREA_28		<p>Current list of diagnostic events in Process Highest Severity group (bit 28 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance</p> <p>FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh - Empty</p> <p>Factory setting: 802, 810, 811, 812</p>
80	FIXED_AREA_27		<p>Current list of diagnostic events in Sensor High Severity group (bit 27 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance</p> <p>FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh - Empty</p> <p>Factory setting: 4, 10, 14, 129, 130</p>
81	FIXED_AREA_26		<p>Current list of diagnostic events in Electronic High Severity group (bit 26 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance</p> <p>FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh - Empty</p> <p>Factory setting: 215, 219</p>

ADVDIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
82	FIXED_AREA_25		<p>Current list of diagnostic events in Config High Severity group (bit 25 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh – Empty</p> <p>Factory setting: 406,407,409</p>
83	FIXED_AREA_24		<p>Current list of diagnostic events in Process High Severity group (bit 24 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh – Empty</p> <p>Factory setting: Empty</p>
84	FIXED_AREA_23		<p>Current list of diagnostic events in Sensor Low Severity group (bit 23 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh – Empty</p> <p>Factory setting: 322</p>
85	FIXED_AREA_22		<p>Current list of diagnostic events in Electronic Low Severity group (bit 22 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh – Empty</p> <p>Factory setting: Empty</p>
86	FIXED_AREA_21		<p>Current list of diagnostic events in Config Low Severity group (bit 21 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh – Empty</p> <p>Factory setting: 404, 405, 530, 531</p>

ADVDIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
87	FIXED_AREA_20		<p>Current list of diagnostic events in Process Low Severity group (bit 20 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh - Empty</p> <p>Factory setting: Empty</p>
88	FIXED_AREA_19		<p>Current list of diagnostic events in Sensor Lowest Severity group (bit 19 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh - Empty</p> <p>Factory setting: 106, 107, 111, 112, 131, 132, 134, 135, 136, 137, 138, 139, 142, 145, 148, 153, 154, 155, 156, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 183, 184, 185, 186, 190, 191, 238, 239, 240, 318, 319, 320, 321</p>
89	FIXED_AREA_18		<p>Current list of diagnostic events in Electronic Lowest Severity group (bit 18 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh - Empty</p> <p>Factory setting: Empty</p>
90	FIXED_AREA_17		<p>Current list of diagnostic events in Config Lowest Severity group (bit 17 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh - Empty</p> <p>Factory setting: 501, 514, 532</p>
91	FIXED_AREA_16		<p>Current list of diagnostic events in Process Lowest Severity group (bit 16 of manufacturer specific conditions)</p> <p>Range: Array of Unsigned16 values</p> <p>Available values: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance FFFCh – Not categorized FFFDh – Moved to Configurable Area FFFEh - Empty</p> <p>Factory setting: 182, 408, 840, 841</p>
92	ADVDIAG_DIAG_EXE_BLOCK		For development only
93	ADVDIAG_DIAG_EXE_MAX		For development only

ADVDIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
94	ADVDIAG_DIAG_EXE_MIN		For development only
95	ADVDIAG_DIAG_EXE_CUR		For development only
96	ADVDIAG_DIAG_EXE_RESET		For development only
97	ADVDIAG_DIAG_EXE_CAT		For development only
98	ADVDIAG_DIAG_EXE_COUNT		For development only
99	STATUS_SELECT_003_PHORP	W	<p>optional status setting for diagnostic code 003 (Temperature sensor failure)</p> <p>Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit.</p> <p>Factory setting: GOOD</p>
100	STATUS_SELECT_100_PHORP	W	<p>optional status setting for diagnostic code 100 (Glass impedance alarm) Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit.</p> <p>Factory setting: GOOD</p>
101	STATUS_SELECT_101_PHORP	W	<p>optional status setting for diagnostic code 101 (Reference impedance alarm) Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit.</p> <p>Factory setting: GOOD</p>

Liquiline_pHORP FF-H1 Field Device Specification

ADVDIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
102	STATUS_SELECT_102_PHORP	W	<p>optional status setting for diagnostic code 102 (Glass impedance too low) Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit. Factory setting: GOOD</p>
103	STATUS_SELECT_103_PHORP	W	<p>optional status setting for diagnostic code 103 (Reference impedance too low) Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit. Factory setting: GOOD</p>
104	STATUS_SELECT_104_PHORP	W	<p>optional status setting for diagnostic code 104 (Operating voltage uncertain) Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit. Factory setting: GOOD</p>
105	STATUS_SELECT_140_PHORP	W	<p>optional status setting for diagnostic code 140 (Leakage current alarm) Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit. Factory setting: GOOD</p>

ADVDIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
106	STATUS_SELECT_180_PHORP	W	<p>optional status setting for diagnostic code 180 (Calibration expired alarm) Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit. Factory setting: GOOD</p>
107	STATUS_SELECT_181_PHORP	W	<p>optional status setting for diagnostic code 181 (Number of sterilisations alarm) Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit. Factory setting: GOOD</p>
108	STATUS_SELECT_532_PHORP	W	<p>optional status setting for diagnostic code 532 (Calibration timer expired) Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit. Factory setting: GOOD</p>
109	STATUS_SELECT_810_PHORP	W	<p>optional status setting for diagnostic code 810 (PV upper limit) Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit. Factory setting: GOOD</p>

Liquiline_pHORP FF-H1 Field Device Specification

ADVDIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
110	STATUS_SELECT_811_PHORP	W	<p>optional status setting for diagnostic code 811 (PV lower limit) Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit. Factory setting: GOOD</p>
111	STATUS_SELECT_812_PHORP	W	<p>optional status setting for diagnostic code 812 (Temperature out of range) Available values: 0x00 - BAD 0x01 - UNCERTAIN 0x03 - GOOD 0x10 - BAD_SENSOR_FAILURE 0x40 - UNC_NON_SPECIFIC 0x44 - UNC_LAST_USABLE_VALUE 0x50 - UNC_SENSOR_CONV_NOT_ACCURATE 0x80 - GOOD_NC_NON_SPECIFIC</p> <p>Value GOOD means that the measurement status will NOT be changed and transferred as received from the measurement unit. Factory setting: GOOD</p>

6.3.16. DISPLAYPHORP Transducer Block

The properties column lists parameter properties:

- W: Parameter is writeable
- OOS: Parameter is writeable in OOS mode only

Since all parameters can be read, this is not explicitly stated.

DISPLAYPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
14	DISPLAY_TRD_BLOCK_ERR_DESC_1		Block Error Description which indicates problems detected within the block Supported values: 0x01 - Resource Block in OOS
15	ACTUAL_DIAG_STATUS		Device's FCSM information Supported values: 0x00 : OK, no diagnostics detected 0x01 : F, failure 0x02 : M, maintenance required 0x03 : C, function check 0x04 : S, out of specification 0x05 : NC (Not Categorized)
	DIAG → Most important message		
16	ACTUAL_DIAGNOSTICS		Current diagnostic code with highest priority Indicated values: 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance
	DIAG → Most important message		
17	SENSOR_INTERFACE		Connected sensor interface type Indicated values: 0 - Analog 1 - Digital
18	SOFTWARE_FUNCTIONALITY		Indicates software capability as Standard or Advanced like indicated in order code (i.e. MAA600EAD00 means standard or MAA600EBD00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling Indicated values: 0 - Standard 1 - Advanced
	DIAG → Device information → Order code		
19	SIM_JUMPER		Physical position of the simulation jumper (on/off) Indicated values: 1 - Sim disabled 2 - Sim enabled Factory setting: Sim disabled
20	DEVICE_SIM		Icon on local display. If lit, it indicates, that simulate functionality is activated Indicated values: 0 - Off 1 - On
21	DEVICE_HOLD		Icon on local display. If lit, it indicates, that HOLD functionality is activated Indicated values: 0 - Off 1 - On
22	DISPLAY_LANGUAGE	W	Select language used for local device display Available values: 0 - English 1 - Second Language (Second language is defined by the order code of the device) Factory setting: depends on the order code
	SETUP → Display → Language		
23	LOCAL_OP_ENA	W	Enable/Disable local operations via soft-keys and navigator of the device Available values: 0 - Off 1 - On Factory setting: On

DISPLAYPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
24	DISPLAY_TEMPERATURE_UNIT_PH	W	Select temperature unit used for the local device display only. Available values: 1001 - Celsius 1002 - Fahrenheit Factory setting: Celsius
	SETUP → Display → Temperature unit		
25	MEASURED_VALUE_PHORP		Select measurement mode Available values: 0 - pH 1 - ORP mV 2 - rH 3 - ORP %
	SETUP → Sensor pH/ORP → Measured value		
26	DISPLAY_MAIN_VALUE_FORMAT_PH	W	Select format of the main value used for the local device display Available values: 321 - X.X 338 - X.XX Factory setting: X.XX
	SETUP → Display → Main value format		
27	DISPLAY_TEMP_VALUE_FORMAT_PH	W	Select format of the temperature value used for the local device display Available values: 352 - XXX 353 - XXX.X Factory setting: XXX.X
	SETUP → Display → Temperature format		
28	DISPLAY_RH_VALUE_FORMAT	W	Select format of the rH value used for the local device display Available values: 32 - XX 321 - XX.X Factory setting: XX.X
	SETUP → Display → Main value format		
29	DISPLAY_TEMPERATURE_SENSOR	W	Select temperature sensor, if sensor type is analog Available values: 0 - None 1 - PT100 or PT1000 Factory setting: PT100 or PT1000
	SETUP → Sensor pH/ORP → Temperature sensor		
30	SENSOR_TYPE		Indicate sensor type Available values: 0: Glass 1: IsFET 2: ORP 3: IsFET analog 4: ORP analog 5: Pfaunder abs 6: Pfaunder rel 7: Antimony 8: UNUSED 9: Glass analog 10: Pfaunder pH/ORP 11: rH
	SETUP → Sensor pH/ORP → Sensor type pH (visible only if analog sensor interface)		

6.3.17. MEMOPHORP Transducer Block

The properties column lists parameter properties:

- W: Parameter is writeable
- OOS: Parameter is writeable in OOS mode only

Since all parameters can be read, this is not explicitly stated.

MEMOPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
14	MEMOPHORP_TRD_BLOCK_ERR_DESC_1		Block Error Description which indicates problems detected within the block Supported values: 0x01 - Resource Block in OOS
15	ACTUAL_DIAG_STATUS		Device's FCSM information Supported values: 0x00 : OK, no diagnostics detected 0x01 : F, failure 0x02 : M, maintenance required 0x03 : C, function check 0x04 : S, out of specification 0x05 : NC (Not Categorized)
	DIAG → Most important message		
16	ACTUAL_DIAGNOSTICS		Current diagnostic code with highest priority Indicated values: 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance
	DIAG → Most important message		
17	SENSOR_INTERFACE		Connected sensor interface type Indicated values: 0 - Analog 1 - Digital
18	SOFTWARE_FUNCTIONALITY		Indicates software capability as Standard or Advanced like indicated in order code (i.e. MAA600EAD00 means standard or MAA600EBD00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling Indicated values: 0 - Standard 1 - Advanced
	DIAG → Device information → Order code		
19	SIM_JUMPER		Physical position of the simulation jumper (on/off) Indicated values: 1 - Sim disabled 2 - Sim enabled Factory setting: Sim disabled
20	DEVICE_SIM		Icon on local display. If lit, it indicates, that simulate functionality is activated Indicated values: 0 - Off 1 - On
21	CHECK_SENSOR	W	Switch to enable or disable checking which sensors are accepted at the field device. If enabled, only those sensors are accepted where TAG Number or Group in sensor and transmitter match Available values: 0 - None 1 - Group 2 - Sensor TAG Factory setting: None
	SETUP → General settings → Sensor check		
22	CONFIGURED_TAG_NUMBER		Configured TAG number for the device
	SETUP → General settings → TAG		
23	TAG_NUMBER_SENSOR		TAG number of the sensor
	DIAG → Sensor information → Identification → TAG number		
24	CONFIGURED_TAG_GROUP	W	Configured TAG group for the device Available values: 0 to FFFFh Factory setting: 0
	SETUP → General settings → TAG group		
25	TAG_GROUP_SENSOR		TAG Group of the sensor Possible values: 0 to FFFFh
	DIAG → Sensor information → Identification → TAG group		
26	SERIAL_NUMBER_INFO_SENSOR		Serial number of the sensor Example: E6052605PIO
	DIAG → Sensor information → Identification → Serial number		

Liquiline_pHORP FF-H1 Field Device Specification

MEMOPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
27	ORDER_CODE_INFO_SENSOR		Order code for the sensor Example: CPS11D-AA1B21
	DIAG → Sensor information → Identification → Order code		
28	HW_VERSION_INFO_SENSOR		Sensor hardware version Example: 2
	DIAG → Sensor information → Identification → Hardware version		
29	SW_VERSION_INFO_SENSOR		Sensor software version Example: 10002 (i.e. 01.00.02)
	DIAG → Sensor information → Identification → Software version		
30	TYPE_OF_CALIBRATION		Calibration type Available values: 0 None 1 Numeric Input 2 1 point 3 2 point 4 n point 5 table 6 Grab sample 7 Zero point 8 Slope air (DOxygen) 9 Slope water (DOxygen) 10 Slope variable (DOxygen) 11 Zero point reference (DOxygen) 12 Slope Reference (DOxygen) 13 Offset 14 Slope 15 with temp. comp. 16 without temp. comp. 17 Standard 18 Numeric Input 19 Numeric Input 20 Numeric Input 21 Factory cal. Default value: None
	DIAG → Sensor information → Calibration → Main value → Mode		
31	CAL_S_N_TRANSMITTER		Serial number of the transmitter used for calibration Example: 91094905G00
	DIAG → Sensor information → Calibration → Main value → Serial number		
32	TEMP_CAL_S_N_TRANSMITTER		Serial number of the transmitter used for temperature calibration Example: 91094905G00
	DIAG → Sensor information → Calibration → Temperature → Serial number		
33	TEMP_CAL_DATE_SENSOR		Temperature calibration date and time Range: DATE format (size 7) according to FF specification 870
	DIAG → Sensor information → Calibration → Temperature → Date		
34	SPEC_MAX_TEMPERATURE_SENSOR		Maximum temperature the sensor can be exposed to unit: °C; value depends on sensor type
	DIAG → Sensor information → Max. operating values → Max. temperature		
35	SPEC_MIN_TEMPERATURE_SENSOR		Minimum temperature the sensor can be exposed to unit: °C; value depends on sensor type
	DIAG → Sensor information → Max. operating values → Min. temperature		
36	TEMP_OFFSET_SENSOR		Temperature Offset unit: K
	DIAG → Sensor information → Calibration → Temperature → Temp. offset		
37	MAX_TEMPERATURE_SENSOR		Maximum temperature the sensor has been exposed to unit: °C
	DIAG → Sensor information → Max. operating values → Max. temperature		
38	MIN_TEMPERATURE_SENSOR		Minimum temperature the sensor has been exposed to unit: °C
	DIAG → Sensor information → Max. operating values → Min. temperature		
39	COMMISSIONING_DATE_SENSOR		Sensor commissioning date Range: DATE format (size 7) according to FF specification 870
	DIAG → Sensor information → Identification → Commissioning date		
40	OPERATING_TIME_SENSOR		Total sensor operating time unit: hours
	DIAG → Sensor information → Operating hours → Operating time		

MEMOPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
41	TIME_OVER_80C_SENSOR_PHORP		Total sensor operating time over 80 °C unit: hours
	DIAG → Sensor information → Operating hours → Usage >80°C		
42	NO_OF_STERILISATIONS_SENSOR		Total sterilisation counts of the sensor
	DIAG → Sensor information → Operating hours → No. steril. sensor		
43	CAL_NUMBER_SENSOR		Number of calibrations performed with current sensor
	DIAG → Sensor information → Calibration → Main value → No. cal sensor		
44	CAL_DATE_SENSOR		Sensor calibration date and time Range: DATE format (size 7) according to FF specification 870
	DIAG → Sensor information → Calibration → Main value → Date		
45	TIME_OVER_100C_SENSOR		Total sensor operating time over 100 °C unit: hours
	DIAG → Sensor information → Operating hours → Usage >100°C		
46	TIME_OVER_300MV_SENSOR		Total sensor operating time over 300 mV unit: hours
	DIAG → Sensor information → Operating hours → Usage >-300mV		
47	TIME_LOWER_300MV_SENSOR		Total sensor operating time under -300 mV unit: hours
	DIAG → Sensor information → Operating hours → Usage >300mV		
48	SENSOR_TYPE		Sensor type Available values: 0: Glass 1: IsFET 2: ORP 11: rH
	SETUP → Sensor pH/ORP → Sensor type pH		
49	ZERO_POINT_SENSOR		Calibrated zero point unit: pH
	DIAG → Sensor information → Calibration → Main value → Zero point		
50	OFFSET_SENSOR		Calibrated offset unit: pH
	DIAG → Sensor information → Calibration → Main value → Offset		
51	SLOPE		Calibrated slope for pH unit: mV/pH
	DIAG → Sensor information → Calibration → Main value → Slope		
52	ISFET_OPERATING_POINT_SENSOR		Calibrated IsFET operating point unit: mV
	DIAG → Sensor information → Calibration → Main value → Operating point		
53	ISOTHERM_POINT_PH		pH isotherm point during last calibration unit: pH
	DIAG → Sensor information → Calibration → Main value → Isotherm intersection		
54	ISOTHERM_POINT_MV		ORP mV isotherm point during last calibration unit: mV
55	CAL_BUF_1_SENSOR		pH calibration point 1 unit: pH
	DIAG → Sensor information → Calibration → Main value → Calib. Buffer 1		
56	CAL_BUF_2_SENSOR		pH calibration point 2 unit: pH
	DIAG → Sensor information → Calibration → Main value → Calib. Buffer 2		
57	CAL_REF_1_SENSOR		pH calibration reference point 1 unit: mV
58	CAL_REF_2_SENSOR		pH calibration reference point 2 unit: mV
59	DELTA_ZEROPOINT		Zero point difference between the last two calibrations unit: pH
	DIAG → Sensor information → Calibration → Main value → Delta zeropnt.		
60	DELTA_OFFSET_SENSOR		Offset difference between the last two calibrations unit: mV
	DIAG → Sensor information → Calibration → Main value → Delta offset		
61	DELTA_SLOPE		pH slope difference between the last two calibrations unit: mV/pH
	DIAG → Sensor information → Calibration → Main value → Delta slope		

Liquiline_pH/ORP FF-H1 Field Device Specification

MEMOPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
62	DELTA_OPERATING_POINT_SENSOR		IsFET operating point difference between the last two calibrations unit: mV
	DIAG → Sensor information → Calibration → Main value → Delta operating pnt.		
63	SCS_GLASS_SENSOR		The sensor check system (SCS) monitors the high impedance of the pH glass. unit: Ohm
	DIAG → Service → Raw values → Impedance glass		
64	SPEC_MIN_PH_SENSOR		Specified minimum pH measurement value unit: pH
	DIAG → Sensor information → Specification → Min. main meas. value		
65	SPEC_MAX_PH_SENSOR		Specified maximum pH measurement value unit: pH
	DIAG → Sensor information → Specification → Max. main meas. value		
66	SPEC_MIN_MV_SENSOR		Specified minimum mV measurement value unit: mV
	DIAG → Sensor information → Specification → Min. main meas. value		
67	SPEC_MAX_MV_SENSOR		Specified maximum mV measurement value unit: mV
	DIAG → Sensor information → Specification → Max. main meas. value		
68	DELTA_MEAS_VAL_1_SENSOR_ORP		ORP % calibration reference point 1 unit: mV
	DIAG → Sensor information → Calibration → Main value → Measure value 1		
69	DELTA_MEAS_VAL_2_SENSOR_ORP		ORP % calibration reference point 2 unit: mV
	DIAG → Sensor information → Calibration → Main value → Measure value 2		
70	MEASURED_VALUE_PHORP		Select measurement mode Available values: 0 - pH 1 - ORP mV 2 - rH 3 - ORP %
	SETUP → Sensor pH/ORP → Measured value		

6.3.18. DIAGPHORP Transducer Block

The properties column lists parameter properties:

- W: Parameter is writeable
- OOS: Parameter is writeable in OOS mode only

Since all parameters can be read, this is not explicitly stated.

DIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
14	DIAGPHORP_TRD_BLOCK_ERR_DESC_1		Block Error Description which indicates problems detected within the block Supported values: 0x01 - Resource Block in OOS
15	ACTUAL_DIAG_STATUS		Device's FCSM information Supported values: 0x00 : OK, no diagnostics detected 0x01 : F, failure 0x02 : M, maintenance required 0x03 : C, function check 0x04 : S, out of specification 0x05 : NC (Not Categorized)
	DIAG → Most important message		
16	ACTUAL_DIAGNOSTICS		Current diagnostic code with highest priority Indicated values: 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance
	DIAG → Most important message		
17	SENSOR_INTERFACE		Connected sensor interface type Indicated values: 0 - Analog 1 - Digital
18	SOFTWARE_FUNCTIONALITY		Indicates software capability as Standard or Advanced like indicated in order code (i.e. MAA600EAD00 means standard or MAA600EBD00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling Indicated values: 0 - Standard 1 - Advanced
	DIAG → Device information → Order code		
19	SIM_JUMPER		Physical position of the simulation jumper (on/off) Indicated values: 1 - Sim disabled 2 - Sim enabled Factory setting: Sim disabled
20	DEVICE_SIM		Icon on local display. If lit, it indicates, that simulate functionality is activated Indicated values: 0 - Off 1 - On
21	DIAGNOSTICS_FUNCTION	W	Switch to enable or disable diagnostics functions Available values: 0 - Off 1 - On Factory setting: On
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diag. function		
22	HOUSING_MONITORING	W	Switch to enable or disable monitoring, if the housing is open Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → Sensor pH/ORP → Sensor diagnostics → Housing monitoring		
23	FUNCTION_OPERATING_TIME	W	Switch to enable or disable operating time diagnostic limits Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → Sensor pH/ORP → Sensor diagnostics → Operating hours → Function		

Liquiline_pHORP FF-H1 Field Device Specification

DIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Proper ties	Description
	Local Display Menu Path		
24	WARNING_OP_TIME_LIMIT	W	Warning limit for operating time Range: 1 to ALARM_OP_TIME_LIMIT-1 hours Factory setting: 10000 hours (416 days)
	SETUP → Sensor pH/ORP → Sensor diagnostics → Operating hours → Operating time → Warning level		
25	ALARM_OP_TIME_LIMIT	W	Alarm limit for operating time Range: WARNING_OP_TIME_LIMIT+1 to 50000 hours Factory setting: 15000 hours (625 days)
	SETUP → Sensor pH/ORP → Sensor diagnostics → Operating hours → Operating time → Alarm level		
26	WARNING_OP_TIME_OVER_80C_LIMIT	W	Warning limit for operating time over 80 °C Range: 1 to ALARM_OP_TIME_OVER_80C_LIMIT-1 hours Factory setting: 15000 hours (625 days)
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Usage >80°C → Warning level		
27	ALARM_OP_TIME_OVER_80C_LIMIT	W	Alarm limit for operating time over 80 °C Range: WARNING_OP_TIME_OVER_80C_LIMIT +1 to 50000 hours Factory setting: 15000 hours (625 days)
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Usage >80°C → Alarm level		
28	FUNCTION_STERILISATION_COUNTER	W	Switch to enable or disable sterilisation counter diagnostic limits. This is a customer specific setting how often a sensor can be sterilized Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Sterilization cnt. → Function		
29	WARNING_STERILISATION_CNT_LIMIT	W	Warning limit for sterilisation counter Range: 1 to ALARM_STERILISATION_CNT_LIMIT-1 Factory setting: 30
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Sterilization cnt. → Warning level		
30	ALARM_STERILISATION_CNT_LIMIT	W	Alarm limit for sterilisation counter Range: WARNING_STERILISATION_CNT_LIMIT+1 to 50000 Factory setting: 50
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Sterilization cnt. → Alarm level		
31	OUT_OP_TIME_LIMIT		Current result of operating time check Possible values: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
32	OUT_OP_TIME_OVER_80C_LIMIT		Current result of operating time over 80 °C check Possible values: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
33	OUT_STERILISATION_CNT_LIMIT		Current result of sterilisation counter check Possible values: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
34	CAL_SLOPE		Slope value for last calibration Range: 5 to 100 mV/pH
35	CAL_ZEROPOINT		Zero point value for last calibration Range: -2 to 16 pH
36	UPPER_ALARM_REF_IMPEDANCE	W	Upper alarm value for reference impedance Range: UPPER_WARNING_REF_IMPEDANCE + 0.1 to 1000 kOhm Factory setting: 100 kOhm
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Ref. impedance → Upper alarm value		
37	UPPER_WARNING_REF_IMPEDANCE	W	Upper warning value for reference impedance Range: LOWER_WARNING_REF_IMPEDANCE + 0.1 to UPPER_ALARM_REF_IMPEDANCE - 0.1 kOhm Factory setting: 50 kOhm
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Ref. impedance → Upper warning value		
38	LOWER_WARNING_REF_IMPEDANCE	W	Lower warning value for reference impedance Range: LOWER_ALARM_REF_IMPEDANCE + 0.1 to UPPER_WARNING_REF_IMPEDANCE - 0.1 kOhm Factory setting: 1 kOhm
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Ref. impedance → Lower warning value		

DIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
39	LOWER_ALARM_REF_IMPEDANCE	W	Lower alarm value for reference impedance Range: 0 to LOWER_WARNING_REF_IMPEDANCE - 0.1 kOhm Factory setting: 0 kOhm
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Ref. impedance → Lower alarm value		
40	UPPER_ALARM_GLASS_IMPEDANCE	W	Upper alarm value for glass impedance Range: UPPER_WARNING_GLASS_IMPEDANCE + 0.1 to 1000 MOhm Factory setting: 0 kOhm
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Glass impedance → Upper alarm value		
41	UPPER_WARNING_GLASS_IMPEDANCE	W	Upper warning value for glass impedance Range: LOWER_WARNING_GLASS_IMPEDANCE + 0.1 to UPPER_ALARM_GLASS_IMPEDANCE - 0.1 MOhm Factory setting: 1600 MOhm
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Glass impedance → Upper warning value		
42	LOWER_WARNING_GLASS_IMPEDANCE	W	Lower warning value for glass impedance Range: LOWER_ALARM_GLASS_IMPEDANCE + 0.1 to UPPER_WARNING_GLASS_IMPEDANCE - 0.1 MOhm Factory setting: 0.1 MOhm
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Glass impedance → Lower warning value		
43	LOWER_ALARM_GLASS_IMPEDANCE	W	Lower alarm value for glass impedance Range: 0 to LOWER_WARNING_GLASS_IMPEDANCE - 0.1 MOhm Factory setting: 0 MOhm
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Glass impedance → Lower alarm value		
44	ALARM_PH_SLOPE	W	Alarm limit for pH slope Range: 0.0001 to 55.01 mV/pH Factory setting: 53 mV/pH
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Slope → Alarm value		
45	WARNING_PH_SLOPE	W	Warning limit for pH slope Range: 52.99 to 65 mV/pH Factory setting: 55 mV/pH
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Slope → Maintenance value		
46	UPPER_ALARM_PH_ZEROPOINT	W	Upper alarm value for pH zero point Range: UPPER_WARNING_PH_ZEROPOINT + 0.01 to 16 pH Factory setting: 9 pH
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Zero point → Upper alarm value		
47	UPPER_WARNING_PH_ZEROPOINT	W	Upper warning value for pH zero point Range: LOWER_ALARM_PH_ZEROPOINT + 0.01 to UPPER_WARNING_PH_ZEROPOINT - 0.01 pH Factory setting: 8 pH
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Zero point → Upper warning value		
48	LOWER_WARNING_PH_ZEROPOINT	W	Lower warning value for pH zero point Range: LOWER_ALARM_PH_ZEROPOINT + 0.01 to UPPER_WARNING_PH_ZEROPOINT - 0.01 pH Factory setting: 6 pH
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Zero point → Lower warning value		
49	LOWER_ALARM_PH_ZEROPOINT	W	Lower alarm value for pH zero point Range: 0 to LOWER_WARNING_PH_ZEROPOINT - 0.01 pH Factory setting: 5 pH
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Zero point → Lower alarm value		
50	UPPER_ALARM_OPERATE_POINT	W	Upper alarm value for IsFET operate point Range: UPPER_WARNING_OPERATE_POINT + 1 to 2000 mV Factory setting: 300 mV
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Operating point → Upper alarm value		
51	UPPER_WARNING_OPERATE_POINT	W	Upper warning value for IsFET operate point Range: LOWER_WARNING_OPERATE_POINT + 1 to UPPER_ALARM_OPERATE_POINT - 1 mV Factory setting: 250 mV
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Operating point → Upper warning value		
52	LOWER_WARNING_OPERATE_POINT	W	Lower warning value for IsFET operate point Range: LOWER_ALARM_OPERATE_POINT + 1 to UPPER_WARNING_OPERATE_POINT - 1 mV Factory setting: - 250 mV
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Operating point → Lower warning value		

Liquiline_pH/ORP FF-H1 Field Device Specification

DIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
53	LOWER_ALARM_OPERATE_POINT	W	Lower alarm value for IsFET operate point Range: -2000 to LOWER_WARNING_OPERATE_POINT - 1 mV Factory setting: -300 mV
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Operating point → Lower alarm value		
54	UPPER_ALARM_ORPMV_OFFSET	W	Upper alarm value for ORPmV offset Range: UPPER_WARNING_ORPMV_OFFSET + 1 to 2000 mV Factory setting: 900 mV
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → ORP mV → Upper alarm value		
55	UPPER_WARNING_ORPMV_OFFSET	W	Upper warning value for ORPmV offset Range: LOWER_WARNING_ORPMV_OFFSET + 1 to UPPER_ALARM_OPERATE_POINT - 1 mV Factory setting: 700 mV
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → ORP mV → Upper warning value		
56	LOWER_WARNING_ORPMV_OFFSET	W	Lower warning value for ORPmV offset Range: LOWER_ALARM_ORPMV_OFFSET + 1 to UPPER_WARNING_OPERATE_POINT - 1 mV Factory setting: -700 mV
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → ORP mV → lower warning value		
57	LOWER_ALARM_ORPMV_OFFSET	W	Lower alarm value for ORPmV offset Range: -2000 to LOWER_WARNING_ORPMV_OFFSET - 1 mV Factory setting: -900 mV
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → ORP mV → Lower alarm value		
58	BANDWIDTH_PH_STABLE_CRITERIA	W	Permitted fluctuation in the measuring signal during calibration. With the bandwidth, you define the permitted measured value fluctuation which must not be exceeded in a certain timeframe during calibration Range: 1 to 10 mV Factory setting: 1 mV
	SETUP → Sensor pH/ORP → Cal. Settings → Stable criteria → Bandwidth		
59	TIMEFRAME_PH_STABLE_CRITERIA	W	The permitted measured value fluctuation cannot be exceeded in this timeframe. With the bandwidth, you define the permitted measured value fluctuation which must not be exceeded in a certain timeframe during calibration Range: 5 to 60 seconds Factory setting: 20 seconds
	SETUP → Sensor pH/ORP → Cal. Settings → Stable criteria → Timeframe		
60	FUNCTION_PH_CAL_TIMER	W	Decide whether you want to use the function which checks the calibration interval Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Calibration timer → Function		
61	HOURS_PH_CAL_TIMER	W	Specification for the time after which the timer should have timed out Range: 1 to 9999 hours Factory setting: 1000 hours
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Calibration timer → Time		
62	ELAPSED_CAL_TIME_PH		Elapsed calibration time interval unit: hours
	DIAG → Sensor status → Calibration timer		
63	SCC_FUNCTION	W	Sensor Condition Check (SCC) Decide whether you want to use the function Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → SCC		
64	PCS_FUNCTION	W	Process Check System (PCS) Decide whether you want to use the function Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → PCS → Function		

DIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
65	PCS_OBSERVATION_MINUTES	W	Timeframe in which the measuring signal must have a certain minimum fluctuation so that it is not considered to be stagnant. Range: 1 to 240 minutes Factory setting: 60 minutes
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → PCS → Time		
66	WARNING_OP_TIME_OVER_100C_LIMIT	W	Warning limit for operating time over 100 °C Range: 1 to ALARM_OP_TIME_OVER_100C_LIMIT-1 hours Factory setting: 10000 hours (416 days)
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Usage 100°C → Warning level		
67	ALARM_OP_TIME_OVER_100C_LIMIT	W	Alarm limit for operating time over 100 °C Range: WARNING_OP_TIME_OVER_100C_LIMIT+1 to 50000 hours Factory setting: 15000 hours (625 days)
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Usage 100°C → Alarm level		
68	WARN_OP_TIME_BELOW_M300MV_LIMIT	W	Warning limit for operating time below -300 mV (= pH 12) Range: 1 to ALARM_OP_TIME_BELOW_M300MV_LIMIT-1 hours Factory setting: 10000 hours (416 days)
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Usage < -300mV → Warning level		
69	ALARM_OP_TIME_BELOW_M300MV_LIMIT	W	Alarm limit for operating time below -300 mV Range: WARN_OP_TIME_BELOW_M300MV_LIMIT+1 to 50000 hours Factory setting: 15000 hours (625 days)
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Usage < -300mV → Alarm level		
70	WARNING_OP_TIME_OVER_300MV_LIMIT	W	Warning limit for operating time over 300 mV (= pH2) Range: 1 to ALARM_OP_TIME_OVER_300MV_LIMIT-1 hours Factory setting: 10000 hours (416 days)
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Usage < 300mV → Warning level		
71	ALARM_OP_TIME_OVER_300MV_LIMIT	W	Alarm limit for operating time over 300 mV Range: WARN_OP_TIME_OVER_300MV_LIMIT+1 to 50000 hours Factory setting: 15000 hours (625 days)
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Usage < 300mV → Alarm level		
72	FUNCTION_DELTA_SLOPE_LIMIT	W	The device determines the difference in slope between the last calibration and the penultimate calibration, and issues a warning or an alarm depending on the setting configured. The difference is an indicator for the condition of the sensor. Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Delta slope → Function		
73	WARNING_DELTA_SLOPE_LIMIT	W	Warning limit for delta slope Range: 0.1 to ALARM_DELTA_SLOPE_LIMIT-0.1 mV/pH Factory setting: 5 mV/pH
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Delta slope → Warning level		
74	ALARM_DELTA_SLOPE_LIMIT	W	Alarm limit for delta slope Range: WARNING_DELTA_SLOPE_LIMIT+0.1 to 10 mV/pH Factory setting: 6 mV/pH
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Delta slope → Alarm level		
75	FUNCTION_DELTA_OPERATING_PNT_LIMIT	W	Switch to enable or disable Delta Operating Point diagnostic limits Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Delta operating pnt. → Function		
76	WARNING_DELTA_OPERATING_PNT_LIMIT	W	Warning limit for delta operating point Range: 1.0 to ALARM_DELTA_OPERATING_PNT_LIMIT-0.1 mV Factory setting: 10 mV
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Delta operating pnt. → Warning level		
77	ALARM_DELTA_OPERATING_PNT_LIMIT	W	Alarm limit for delta operating point Range: WARNING_DELTA_OPERATING_PNT_LIMIT+0.1 to 200 mV Factory setting: 15 mV
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Delta operating pnt. → Alarm level		

Liquiline_pH/ORP FF-H1 Field Device Specification

DIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
78	FUNCTION_DELTA_ZERO_PNT_LIMIT	W	The device determines the difference between the last calibration and the penultimate calibration, and issues a warning or an alarm depending on the setting configured. The difference is an indicator for the condition of the sensor. Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Delta zero pnt. → Function		
79	WARNING_DELTA_ZERO_PNT_LIMIT	W	Warning limit for delta zero point Range: 0 to ALARM_DELTA_ZERO_PNT_LIMIT-0.01 pH Factory setting: 0.5 pH
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Delta zero pnt. → Warning level		
80	ALARM_DELTA_ZERO_PNT_LIMIT	W	Alarm limit for delta zero point Range: WARNING_DELTA_ZERO_PNT_LIMIT+0.01 to 2 pH Factory setting: 1 pH
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Delta zero pnt. → Alarm level		
81	FUNCTION_CAL_EXPIRED	W	Decide whether you want to use the function which checks whether the calibration of a sensor is still valid Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Calibration expired → Function		
82	WARNING_CAL_EXPIRED_LIMIT	W	Warning limit for expired calibration Range: 1 to ALARM_CAL_EXPIRED_LIMIT-1 hours Factory setting: 16560 hours (23 months)
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Calibration expired → Warning level		
83	ALARM_CAL_EXPIRED_LIMIT	W	Alarm limit for expired calibration Range: WARNING_CAL_EXPIRED_LIMIT+1 to 17280 hours Factory setting: 17280 hours (24 months)
	SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → Calibration expired → Alarm level		
84	SCS_GLASS_LOWER_CHECK	w	The sensor check system (SCS) monitors the low impedance of the pH glass and Redox sensors. An alarm is issued if a minimum impedance value is undershot. Related limits defined in XXX_GLASS_IMPEDANCE parameters Available values: 0 - Off 1 - On Factory setting: On
	SETUP → Sensor pH/ORP → Sensor diagnostics → SCS glass low		
85	SCS_GLASS_UPPER_CHECK	W	The sensor check system (SCS) monitors the high impedance of the pH glass and Redox sensors. An alarm is issued if a maximum impedance value is overshoot. Related limits defined in XXX_GLASS_IMPEDANCE parameters Available values: 0 - Off 1 - On Factory setting: On
	SETUP → Sensor pH/ORP → Sensor diagnostics → SCS glass high		
86	SCS_REFERENCE	W	Switch to enable or disable Sensor Check System for analog sensors with potential matching enabled and Memosens ORP sensors Available values: 0 - Off 1 - On Factory setting: Off
	SETUP → Sensor pH/ORP → Sensor diagnostics → SCS reference		
87	OUT_PH_ZEROPOINT_LIMIT		Current result of pH zero point check Possible values: 0x00000000: Within Range 0x00000001: Check Config 0x00000002: HiHi Alarm 0x00000003: High Alarm 0x00000004: Low Alarm 0x00000005: LoLo Alarm

DIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
88	OUT_PH_SLOPE_LIMIT		Current result of pH slope check Possible values: 0x00000000: Within Range 0x00000001: Check Config 0x00000002: HiHi Alarm 0x00000003: High Alarm 0x00000004: Low Alarm 0x00000005: LoLo Alarm
89	OUT_OPERATE_POINT_ISFET_LIMIT		Current result of ISFET operate point point check Possible values: 0x00000000: Within Range 0x00000001: Check Config 0x00000002: HiHi Alarm 0x00000003: High Alarm 0x00000004: Low Alarm 0x00000005: LoLo Alarm
90	OUT_ORPMV_LIMIT		Current result of ORPmV limit check Possible values: 0x00000000: Within Range 0x00000001: Check Config 0x00000002: HiHi Alarm 0x00000003: High Alarm 0x00000004: Low Alarm 0x00000005: LoLo Alarm
91	OUT_GLASS_IMPEDANCE_LIMIT		Current result of glass impedance check Possible values: 0x00000000: Within Range 0x00000001: Check Config 0x00000002: HiHi Alarm 0x00000003: High Alarm 0x00000004: Low Alarm 0x00000005: LoLo Alarm
92	OUT_REF_IMPEDANCE_LIMIT		Current result of reference impedance check Possible values: 0x00000000: Within Range 0x00000001: Check Config 0x00000002: HiHi Alarm 0x00000003: High Alarm 0x00000004: Low Alarm 0x00000005: LoLo Alarm
93	OUT_OP_TIME_OVER_100C_LIMIT		Current result of operating time over 100 °C check Possible values: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
94	OUT_OP_TIME_BELOW_M300MV_LIMIT		Current result of operating time below - 300 mV check Possible values: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
95	OUT_OP_TIME_OVER_300MV_LIMIT		Current result of operating time over 300 mV check Possible values: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
96	OUT_CAL_EXPIRED_LIMIT_PHORP		Current result of pH zero point check Possible values: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
97	OUT_DELTA_SLOPE_LIMIT		Current result of pH delta slope check Possible values: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm

Liquiline_pHORP FF-H1 Field Device Specification

DIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
98	OUT_DELTA_ZEROPNT_LIMIT		Current result of pH delta zero point check Possible values: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
99	OUT_CAL_TIMER_LIMIT		Current result of calibration timer check Possible values: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
100	MEASURED_VALUE_PHORP		Select measurement mode Available values: 0 - pH 1 - ORP mV 2 - rH 3 - ORP %
	SETUP → Sensor pH/ORP → Measured value		
101	POTENTIAL_MATCHING		Analog sensors only: Indicates symmetric measurement (= with PM, only with a glass electrode, ISFET sensor or Pfaudler electrode) or asymmetric measurement (= without PM) Available values: 0: Without PM 1: With PM Factory Setting: without PM
	SETUP → Sensor pH/ORP → Potential matching		
102	SENSOR_TYPE		Indicate sensor type Available values: 0: Glass 1: ISFET 2: ORP 3: ISFET analog 4: ORP analog 5: Pfaudler abs 6: Pfaudler rel 7: Antimony 8: UNUSED 9: Glass analog 10: Pfaudler pH/ORP 11: rH Note: Writable in Transducer Block PHORP Default value: if sensor interface is digital: automatic, depends on connected sensor if sensor interface is analog: Glass analog
	SETUP → Sensor pH/ORP → Sensor type pH (visible only if analog sensor interface)		
103	PH_OFFSET		pH offset Available values: -2 to 16 pH Note: Writable in Transducer Block PHORP Factory setting: 0 pH
	DIAG → Sensor status → Offset		
104	SENSOR_OFFSET_ORP_MV		ORP mV offset Available values: -100 to +100 mV Note: Writable in Transducer Block PHORP Factory setting: 0 mV
	DIAG → Sensor status → Offset		

DIAGPHORP Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
	Local Display Menu Path		
105	SLOPE_ORPPERCENT		Slope of mV/percent mapping (ORP% only) unit: % Factory setting: 0.03 %
	DIAG → Sensor status → Slope		
106	SENSOR_OFFSET_ORP_PERCENT		Calibrated sensor offset Available values: -100 to +100 mV Factory setting: 0 mV
	DIAG → Sensor status → Offset		
107	ISFET_OPERATING_POINT		IsFET sensor only: operating point Available values: -2000 to +2000 mV Factory setting: 0 mV
	DIAG → Sensor status → Operating point		
108	MEAS_SLOPE		Current measured pH slope value and status Unit code: 11585 (mV/pH)
109	MEAS_ZERO_POINT		Current measured pH zero point value and status Unit code: 11422 (pH)

6.4. Function Blocks

Several function blocks are available to provide input and output parameters to be linked over the fieldbus. Each device contains the following function blocks:

- Analog Input
- Discrete Input
- PID
- Analog Alarm
- Signal Characterizer
- Input Selector

A short overview is summarized in the following chapters.

A detailed description of the function blocks described below can be found in the FOUNDATION Fieldbus Function Blocks manual BA00062S (www.endress.com/cm42 under "Documents").

6.4.1. Analog Input

In the Analog Input (AI) function block, the process variables of the Transducer Blocks are prepared for subsequent automation functions (e.g. linearization, scaling and limit value processing). The automation function is defined by connecting up the outputs. The AI block in this device is an enhanced version with manufacturer-specific extensions. They contain configuration parameters for 5 additional discrete output alarm signals and a block error description parameter which indicates problems detected within the block like configuration errors.

Liquiline_pH/ORP provides 6 Analog Input Function Blocks. Each block can select a measurement value which is provided by the PHORP Transducer Block. Multiple selection of the same CHANNEL value in several AI blocks is available to support different scaling for one measurement value for example.

6.4.2. Discrete Input

The DI block takes the discrete input data, selected by channel number, and makes it available to other function blocks at its output. A block error description parameter is available which indicates problems detected within the block like configuration errors.

Liquiline_pHORP provides 2 Discrete Input Function Blocks. Each block can select one of two channels to connect the discrete data (CURRENT_STATE_CH1 or CURRENT_STATE_CH2) transfer from the DIAGDI Transducer Block.

6.4.3. PID

A PID function block contains the input channel processing, the proportional integral differential control (PID) and the analog output channel processing. The configuration of the PID function block depends on the automation task. The following can be realized: Basic controls, feedforward control, cascade control, cascade control with limiting. A block error description parameter is available which indicates problems detected within the block like configuration errors.

6.4.4. Analog Alarm

The Analog Alarm Block provides alarm condition reporting on an analog output of any block. Alarm conditions include high, high-high, low, and low-low alarms. A block error description parameter is available which indicates problems detected within the block like configuration errors.

Liquiline_pHORP provides 2 Analog alarm Function Blocks, so that two different measurement values could be evaluated. A possible application could be the pH and temperature values from the OUT signal of an Analog Input Block for example.

6.4.5. Signal Characterizer

The signal characterizer block has two sections, each with an output that is a non-linear function of the respective input. The non-linear function is determined by a single look-up table with 21 arbitrary x-y pairs.

The status of an input is copied to the corresponding output, so the block may be used in the control or process signal path. An option can swap the axes of the function for section 2, so that it can be used in the backward control path. A block error description parameter is available which indicates problems detected within the block like configuration errors.

6.4.6. Input Selector

The signal selector block (Input Selector block = ISEL) provides selection of up to four inputs and generates an output based on the configured action. A block error description parameter is available which indicates problems detected within the block like configuration errors.

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