Liquiline_Oxygen – Device Revision 4

FF-H1 Guideline

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1. Introduction

1.1. Scope

The Endress+Hauser analysis transmitter, model Liquiline_Oxygen 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^{TM} 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
⚠ DANGER Cause (/consequences) Consequences if safety message is not heeded • Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the situation **will** result in a fatal or serious injury.
⚠ WARNING Cause (/consequences) Consequences if safety message is not heeded • Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the situation **can** result in a fatal or serious injury.
⚠ CAUTION Cause (/consequences) Consequences if safety message is not heeded • Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE Cause/situation Consequences if safety message is not heeded • Action/note	This symbol alerts you to situations that can result in damage to property and equipment.

1.5.   Abbreviations and definitions

Abbreviation	Description
AI	Analog Input
CiF	Control in the Field
CIP	Clean in place
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

Abbreviation	Description
PCS	Process Control System
PID	Proportional/Integral/Derivative Control
PV	Process Variable
RB	Resource Block
SIP	Sterilisation in place
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 fort he 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_Oxygen Part 1
BA00382C	Operating Instructions Liquiline_Oxygen Part 2
BA00062S	Guideline FOUNDATION Fieldbus Function Blocks
BA00013S	FOUNDATION Fieldbus Overview

2. Device identification

Manufacturer name: Endress+Hauser
Model name: Liquiline_Oxygen
Manufacturer ID code: $452B48_h$ (4533064)
Device type code: $10A2_h$ (4258)
Device revision: 4
Stack Communication Profiles: 31PS, 32LT
H1 Physical Layer Profiles: 511, 113, 115
H1 ITK Profile: 6.2.0

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. 2: Stainless steel housing   **Fig. 1: Plastics (PC) housing**
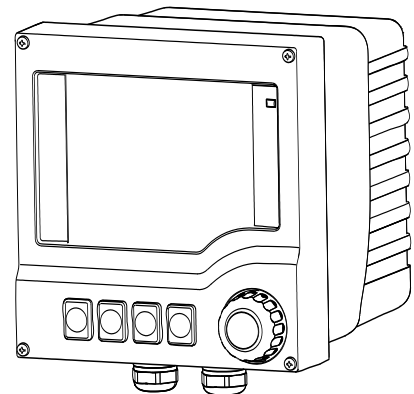
Fig. 3: A name plate example

3. Product overview

Liquiline_Oxygen is a liquid analysis transmitter for liquid and gaseous oxygen measurement. Different plug and play sensors (Memosens) can be connected for different applications.

4. Product interfaces

4.1.   Process interface

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.
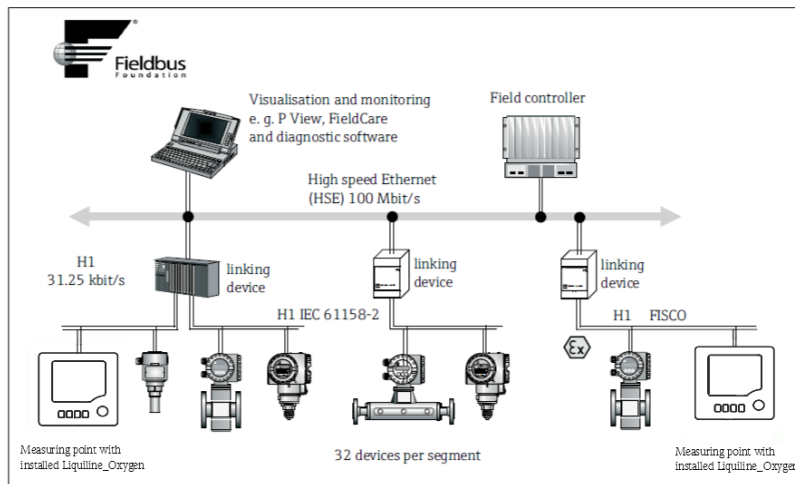
Fig. 4:   System integration via FOUNDATION™ fieldbus™

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 Tconnector 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 is 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 such as the NI-FBUS Configurator from National Instruments is used to connect the various function blocks to the desired control strategy – generally graphically (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 FieldCommGroup Organization: www.fieldcommgroup.org
- Or via www.fieldbus.org

Additional DCS-specific device driver packages are available as well and can be obtained from the download area on the Internet.

4.2.9.   Plant asset management (PAM)

In addition to the device description a FDT/DTM device driver is available.

PAM tools (for example)	Technology	Functionality
FieldCare, FIM (Field Information Manager) PRM (Plant Resource Manager)	FDT/DTM	- Configuration of function and transducer blocks - Indication of available measuring values - Indication of diagnostics and service information - Up-/Download of parameters contained in DTM

The DTM device driver can be acquired via www.endress.com

4.2.10. 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 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)

4.2.11. 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.
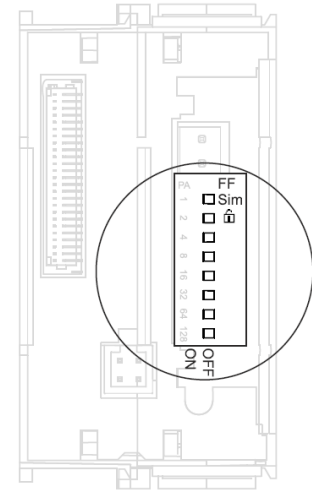
4.3. FOUNDATION Fieldbus cable specification

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 mm2 (AWG 18)	0.32 mm2 (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/3.28 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,.
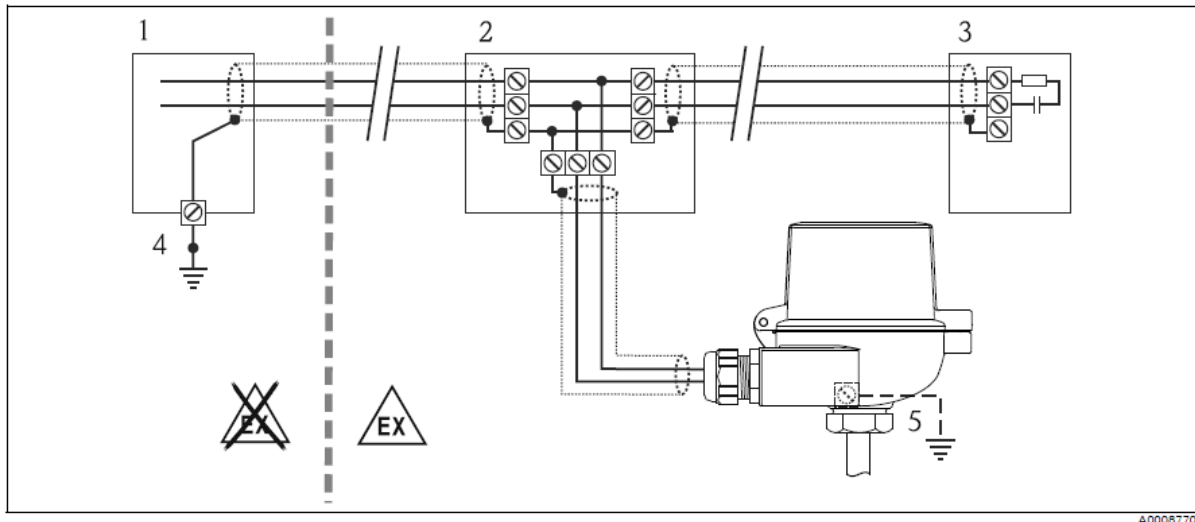
Fig. 5: Shielding and one-sided grounding of the fieldbus cab le shielding

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.

Connector technical data:

Wire cross-section	4 x 0.8 mm^2
Connection thread	M20 x 1.5 / NPT ½"
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 ℃ (−40 to +221 ℉)
Current carrying capacity	9 A
Rated voltage	Max. 600 V
Contact resistance	≤5 mΩ
Insulation resistance	≥10^9 Ω
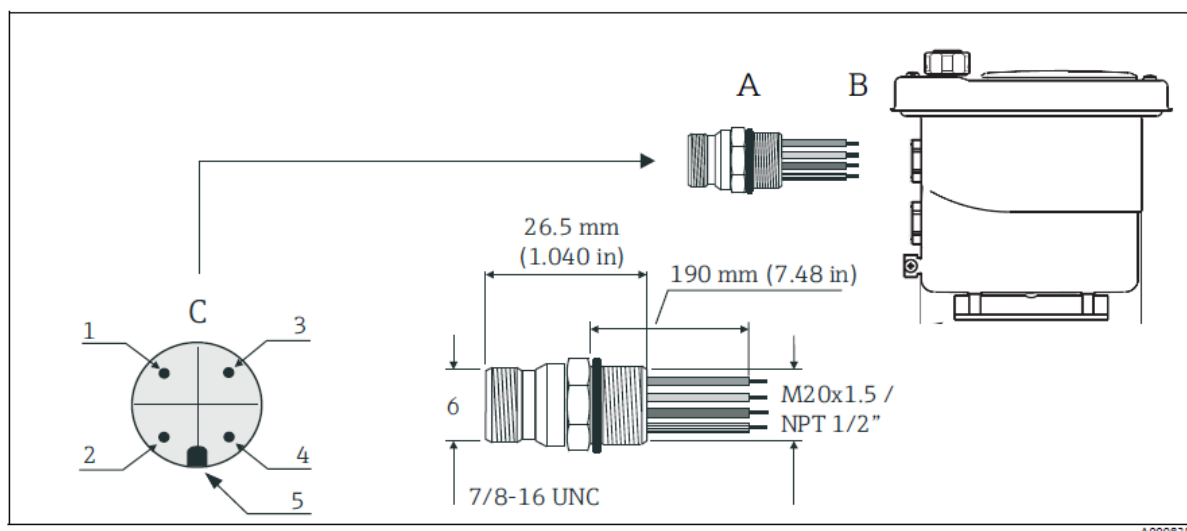
Fig. 6:   Connectors for connecting to FOUNDATION™ Fieldbus

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)

> **i** 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, → 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 multi meter.

5.2.   Commissioning

Note the following points:

- The files required for commissioning and network configuration can be obtained as described in Device Description.
- In the case of the 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 = 452B4810A2-XXXXXXXXXXX
  452B48 = Endress+Hauser
  10A2 = Liquiline_Oxygen
  XXXXXXXXXXX = 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, the device reacts as follows in the configuration system:

   – EH_Liquiline_Oxygen_xxxxxxxxxxx (tag name PD-TAG)
   – 452B4810A2-xxxxxxxxxxx (DEVICE_ID)

– Block structure:

Display text (xxx... = serial number)	Base index (decimal)	Description
RS_xxxxxxxxxxx	0400	Resource Block
DOXYGEN_xxxxxxxxxxx	0570	DOXYGEN Transducer Block
DIAGDI_xxxxxxxxxxx	0740	DIAGDI Transducer Block
SERVICE_xxxxxxxxxxx	0910	Service Transducer Block
ADVDIAGDOXY_xxxxxxxxxxx	1080	Advanced Diagnostics Transducer Block
DISPLAYDOXY_xxxxxxxxxxx	1250	Display Transducer Block
MEMODOXY_xxxxxxxxxxx	1420	Memosens Transducer Block
DIAGDOXY_xxxxxxxxxxx	1590	Diagnostics Transducer Block
AI_1_xxxxxxxxxxx	2100	Analog Input Function Block 1
AI_2_xxxxxxxxxxx	2270	Analog Input Function Block 2
AI_3_xxxxxxxxxxx	2440	Analog Input Function Block 3
AI_4_xxxxxxxxxxx	2610	Analog Input Function Block 4
AI_5_xxxxxxxxxxx	2780	Analog Input Function Block 5
AI_6_xxxxxxxxxxx	2950	Analog Input Function Block 6
DI_1_xxxxxxxxxxx	3120	Discrete Input Function Block 1
DI_2_xxxxxxxxxxx	3290	Discrete Input Function Block 2
PID_xxxxxxxxxxx	3460	PID Function Block
AALM_1_xxxxxxxxxxx	3630	Analog Alarm Function Block 1
AALM_2_xxxxxxxxxxx	3800	Analog Alarm Function Block 2
CHAR_xxxxxxxxxxx	3970	Signal Characterizer Function Block
ISEL_xxxxxxxxxxx	4140	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.

5. 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_Oxygen_xxxxxxxxxxx (xxx... = serial number).
6. Quick Setup in Transducers
   a. Check the measured value setting (parameter **MEASURED_VALUE** in DOXYGEN Transducer Block) and change the indicated value, if required, after switching the operating mode of DOXYGEN Transducer to OOS.
   b. Check concentration unit setting (parameters **LIQ_CONCENTRATION_UNIT** and **GAS_CONCENTRATION_UNIT**), if selected measured value is set to 'Concentration' and change the indicated value (writing to this parameter in OOS mode only), if required.
   c. Check temperature unit setting (parameter **UNIT_TEMPERATURE_VALUE_DOXY**) and change the indicated value, if required (writing to this parameter in OOS mode only).
   d. 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.

e. Check/Select language for local device display (DISPLAYDOXY 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-OAA610EB**Z**00 means that the second language (**Z**) is set to Chinese.

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

f. 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 "6.3.1 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 "6.3.5 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 BA00062SEN.

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_Oxygen contains the following blocks:
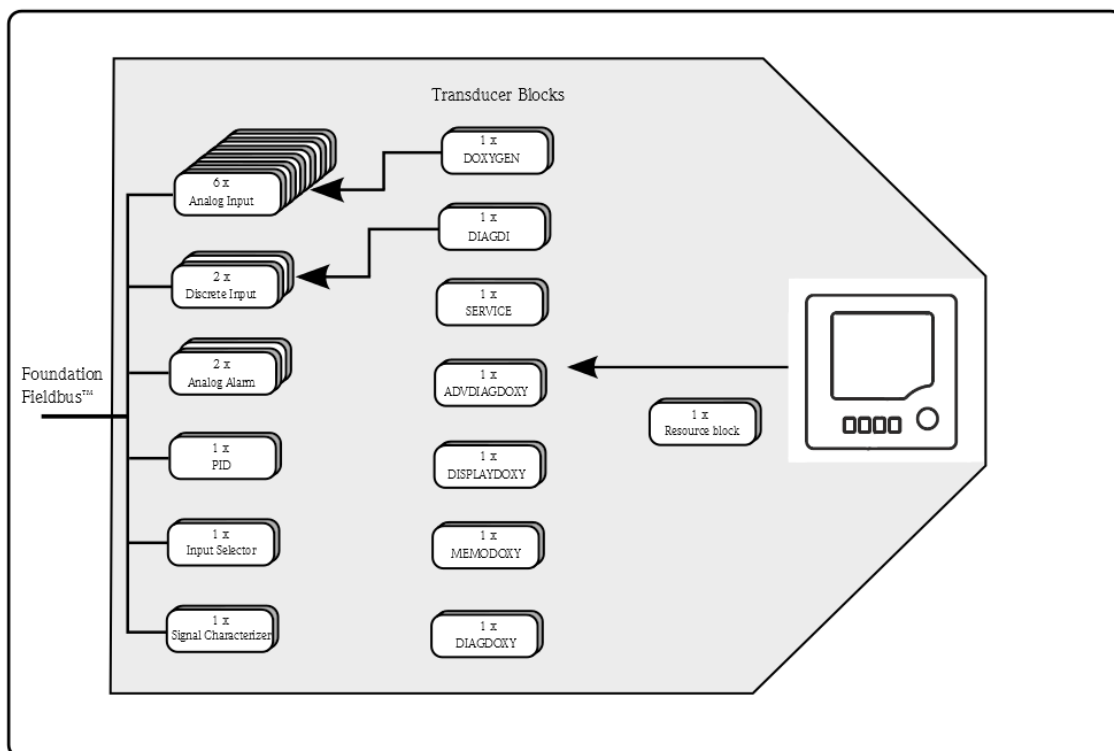
Fig. 7: Block model Liquiline_Oxygen

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)

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 assume 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
- MAINTENANCE_NOW
- MAINTENANCE_SOON
- POWER_UP

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. Reset functions

The device supports several reset functions initiated by a write to Resource block parameter RESTART or SERVICE_RESET.

NOTICE

Resetting the device affects the running process. Before a reset function is executed please ensure yourself that the process is in a safe state.

Available selections are described in the following tables:

Function	RESTART value	Description
Run	1	Setting for normal operation (passive state of RESTART parameter).
Resource	2	Clear up problems like garbage collection and any active reported or unreported alarms.
Defaults	3	Reset all configurable function block application objects to their initial value i.e. their value before any configuration was done by the user. Transducer block parameters are not affected.
Processor	4	Reset processor and initiate execution as though power fail had occurred (provides a way to hit the reset button on the processor associated with the resource).
Factory Default	5	Restart with factory settings without changing MIB entries like PDTag, node address, device class (BFD,LM) etc.
Factory Default Blocks	11	Reset the block set to the factory default, if block instantiation is supported. Block instantiation is not supported in this device. It does nothing but accepts the write to this standard restart level.

Function	SERVICE_RESET value	Description
Factory Reset	5	Restart with initial factory settings. FBVFD and MIB will be reset to factory default values. **NOTICE** Resetting the device to factory affects the running process. MIB parameters like Physical Device Tag, Node Address, Device Class etc. might be affected. The connection to the device needs to be re-established.
ENP	7	ENP specific restart (not supported in this device). It does nothing but accepts the write.

6.2.5. 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: • 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.

Resource Block			
Parameter Index	Parameter Local Display Menu Path	Write access with operating mode	Description
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. MAINTENANCE_NOW At least one diagnostic event of NAMUR class F is active. MAINTENANCE_SOON At least one diagnostic event of NAMUR class C, S or M is active. POWER_UP The device is in start-up phase and RESTART value is set to "Run".
7	Resource State (RS_STATE)	Read only	Displays the current operating status of the Resource Block. Display: STANDBY The Resource Block is in the OOS operating mode. It is not possible to execute the remaining blocks. ONLINE LINKING The configured connections between the function blocks have not yet been made. ONLINE Normal operating status, the Resource Block is in the AUTO operating mode. The configured connections between the function blocks are established.
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	Displays the reference source for the device description in the device. Display: (NULL)
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	Displays the device identification number in hexadecimal numerical format. Display: 0x10A2 (hex) for Liquiline_Oxygen
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.

Resource Block			
Parameter Index	Parameter	Write access with operating mode	Description
	Local Display Menu Path		
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	Enables or restricts the access authorization of a fieldbus host system to the field device. **Factory default: 0, 0 (no restrictions)**
15	Hard Types (HARD_TYPES)	Read only	Displays the input signal types for the Analog and Discrete Input function blocks
16	Restart (RESTART)	AUTO - OOS	This parameter is used to reset the device in various ways. Options: • Restart UNINITIALIZED • RUN • Restart RESOURCE (restart the Resource Block) • Restart with DEFAULTS (restart with the specified default values as per FF Spec - only FF bus parameters) • Restart PROCESSOR • Restart with factory settings without changing MIB entries like PDTag, node address, device class (BFD,LM) • Reset the block set to the factory default. The device will accept the write but will not change any settings, because the device does not support block instantiation.

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 |
			              Defer Inter-Parameter Write Checks

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.

Resource Block			
Parameter Index	Parameter / Local Display Menu Path	Write access with operating mode	Description
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.
24	Free Space (FREE_SPACE)	Read only	Displays the free system memory (in percent) available for execution of further function blocks. Since the function blocks of the device are preconfigured, this parameter always displays the value 0.
25	Free Time (FREE_TIME)	Read only	Displays the free system time (in percent) available for execution of further function blocks. Since the function blocks of the device are preconfigured, this parameter always displays the value 0.
26	Shed Remote Cascade (SHED_RCAS)	AUTO - OOS	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
27	Shed Remote Out (SHED_ROUT)	AUTO - OOS	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
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	This parameter can be used to manually enable the security behavior of the device. **Factory default:** 1 (Off)
30	Clear Fault State (CLR_FSTATE)	AUTO - OOS	This parameter can be used to manually disable the security behavior of the Analog Output and Discrete Output function blocks. **Factory default: 0x01 (Off)**
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: 640000 1/32 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.

Resource Block			
Parameter Index	Parameter	Write access with operating mode	Description
	Local Display Menu Path		
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: ▪ 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.
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 DIAG -> Most important message	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)
43	ACTUAL_DIAGNOSTICS DIAG -> Most important message	Read only	Current diagnostic code with highest priority **Indicated values:** 0x0000 to 0x0349(0000 to 0841); details see below in chapter Diagnostic Codes
44	PACKAGE DIAG -> Device information -> Projecting	Read only	Current installed projecting package **Range**: octet string with size of 16 **Factory Setting**: Oxygen

Resource Block			
Parameter Index	Parameter	Write access with operating mode	Description
	Local Display Menu Path		
45	SOFTWARE_FUNCTIONALITY DIAG -> Device information -> Order code	Read only	Indicates software capability as Standard or Advanced like indicated in order code (i.e. OAA600E**A**D00 means standard or OAA600E**B**D00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling **Indicated values:** 0 - Standard 1 - Advanced
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) DIAG -> Device information -> TAG	Read only	Tag name/device TAG.
50	Serial Number (SERIAL_NUMBER) DIAG -> Device information -> Serial number	Read only	Displays the device 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) DIAG -> Device information -> Order code	Read only	Displays the order code for the device.
54	Firmware Version (FIRMWARE_VERSION) DIAG -> Device information -> Device version	Read only	Displays the version of the device software.
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.

Resource Block			
Parameter Index	Parameter / Local Display Menu Path	Write access with operating mode	Description
68	Fail Map (FD_FAIL_MAP)	AUTO - OOS	Enable or disable conditions to be detected as active for this alarm category. **Factory default:** 0xF0000000 **(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:** 0x000F0000 **(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:** 0x0F000000 **(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:** 0x00F00000 **(Low Process |** **Low Configuration |** **Low Electronic |** **Low Sensor)** Details described in BA00381C, chapter 'Configuration of event behaviour according to FOUNDATION Fieldbus Field Diagnostics'.
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.

Resource Block			
Parameter Index	Parameter / Local Display Menu Path	Write access with operating mode	Description
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 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
88	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).
89	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
90	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).
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:** 0x1FFFFF3F
92	Restart Enable (RESTART_ENABLE)	AUTO - OOS	This parameter indicates which factory-specific restart levels are actually available. Options: • 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: • Simulation permitted: Simulation is allowed due to activated hardware simulation switch • Failsafe active: Failsafe mechanism in an AI block is active
94	Service reset (SERVICE_RESET)	AUTO - OOS	Allows a manual manufacturer-specific device restart to be initiated. Several degrees of restarts are possible. These are 5: Restart with initial default configuration ex-factory. FBVFD and MIB will be reset to factory default values including PD Tag, node address and device class (LM, BFD); 7: Electronic name plate reset. (This procedure is not supported in this device.) **Factory default:** 0x00 (Uninitialized)

6.3.   Transducer Blocks

The Transducer Blocks of the Liquiline_Oxygen contain all the measuring and device-specific parameters. All the settings directly connected with the application (concentration, saturation, partial pressure, ambient pressure, sensor current 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_Oxygen are split into several Transducer Blocks, each covering different task areas.

Transducer Block DOXYGEN / base index 570 (dec.):
This block contains all the parameters and functions that have to do with measuring and configuring the input variables (Concentration, saturation, partial pressure, ambient pressure, sensor current, temperature values).

Transducer Block DIAGDI / base index 740 (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 910 (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 ADVDIAGDOXY/ base index 1080 (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 DISPLAYDOXY/ base index 1250 (dec.):
The parameters of this block allow the configuration of the local display.

Transducer Block MEMODOXY/ base index 1420 (dec.):
The parameters of this block indicate all available Memosens sensor related parameter values.

Transducer Block DIAGDOXY/ base index 1590 (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 "DOXYGEN" 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
DOXYGEN	MEMBRANE_CURRENT_VALUE	Membrane Current	1
DOXYGEN	AMBIENT_PRESSURE_VALUE	Ambient Pressure	2
DOXYGEN	DAMPED_PARTIAL_PRESS_VAL	Damped Partial Pressure	4
DOXYGEN	SATURATION_VALUE	Saturation	5
DOXYGEN	LIQ_CONCENTRATION_VALUE	Liq. Concentration	6
DOXYGEN	MEAS_TEMPERATURE_VALUE	Temperature	7
DOXYGEN	GAS_CONCENTRATION_VALUE	Gas. Concentration	8
DOXYGEN	RAW_VALUE_TAU	Raw tau (us)	9
DOXYGEN	RAW_MEMBRANE_CURRENT_VAL	Raw membrane current	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).). I/O Transducer Blocks OXYGEN and DIAGDI support the following operating modes:
- AUTO (automatic mode)
- OOS (out of service)
- MAN (manual mode)

Remaining transducer blocks are configuration transducers and provide no output signals. Nevertheless OOS, MAN and AUTO are permitted.

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

6.3.3. Alarm detection and processing

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/Sensor Failure or Device Failure).

Parameters BLOCK_ERR and XD_ERROR of the DOxygen Transducer Block (page 44) indicate 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

To access the manufacturer-specific parameters, the hardware write protection must be deactivated (see Section Hardware Settings).

6.3.5. Selecting the units

The DOXYGEN Transducer provides 2 Signals with configurable units:

Process variable	unit	unit code [hex]	unit code [dec]	configurable unit parameter
CONCENTRATION_VALUE	µg/L	FFF1	65521	LIQ_CONCENTRATION_UNIT
	mg/L	648	1608	
	ppm	58F	1423	
	ppb	590	1424	
	Vol.-%	673	1651	GAS_CONCENTRATION_UNIT

	ppmVol	FFF6	65526	
Process variable	unit	unit code [hex]	unit code [dec]	configurable unit parameter
TEMPERATURE_VALUE	℃	3E9	1001	UNIT_TEMPERATURE_VALUE_DOXY
	℉	3EA	1002	

The DOXYGEN 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), the Transducer value will be used without conversion. Please refer to further configuration checks in an AI function block in BA0062EN.

ℹ️ Indicated unit and format on the Liquiline device display may differ from the DOXYGEN Transducer unit settings. The main measurement value on the device's display is selected by DOXYGEN Transducer parameter MAIN_MEASURED_VALUE. The device's firmware calculates the best format for indication then. The DISPLAY_DOXY Transducer provides unit and format parameter options, if a specific indication on the device's display is desired.

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 no graphical enhancements are used in a host system and the device's software functionality is ADVANCED, the following methods are available in the ADVDIAGDOXY 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 ADVDIAGDOXY Transducer Block and provide reading of logbook entries:

Method name	Description
Select logbook type	The desired logbook type will be selected
Get logbook state	Available entries and size will be evaluated
Read logbook data	Logbook Overview data will be read
Read logbook detail	Logbook Detail data will be read

These methods shall be called in the following order to get available logbook data:

"Select logbook type" → "Get logbook state" → "Read logbook data".

These methods shall only be called within menu "Logbooks advanced access" (device level EDD) or "Logbooks adv logging" (block level EDD).

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

Method/Menu name	Description
View logbook data 1-10	Indicate Logbook entries 1 to 10 in "ring memory"
View logbook data 11-20	Indicate Logbook entries 11 to 20 in "ring memory"
View logbook data 21-30	Indicate Logbook entries 21 to 30 in "ring memory"
View logbook data 31-40	Indicate Logbook entries 31 to 40 in "ring memory"
View logbook data 41-50	Indicate Logbook entries 41 to 50 in "ring memory"
Read logbook detail (window menu)	Indicate Logbook detail data of a selected entry

Within menu "Read logbook detail" the method "Read logbook detail" could be called to read logbook detail data of an entry number which the user shall enter.

ℹ️ Indicated logbook data are not updated automatically. It is required to re-run the complete set of methods as described above to read current logbook entries.

6.3.7. Diagnostic codes and maintenance

A detailed description about diagnostic events and how to find a remedy is to be found in 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	ADVDIAGDOXY and DIAGDI Transducer Block
ACTUAL_DIAG_LIST_1	ADVDIAGDOXY Transducer Block
ACTUAL_DIAG_LIST_2	ADVDIAGDOXY Transducer Block
ACTUAL_DIAG_LIST_3	ADVDIAGDOXY Transducer Block
ACTUAL_DIAG_LIST_4	ADVDIAGDOXY Transducer Block
ACTUAL_DIAG_LIST_5	ADVDIAGDOXY Transducer Block
ACTUAL_DIAG_LIST_6	ADVDIAGDOXY Transducer Block
ACTUAL_DIAG_LIST_7	ADVDIAGDOXY Transducer Block
ACTUAL_DIAG_LIST_8	ADVDIAGDOXY Transducer Block
ACTUAL_DIAG_LIST_9	ADVDIAGDOXY Transducer Block
ACTUAL_DIAG_LIST_9	ADVDIAGDOXY Transducer Block
SIMULATED_DIAGNOSTIC_EVENT	ADVDIAGDOXY Transducer Block

Parameters which give instructions to find a remedy are

Parameter name	Where to find
FD_RECOMMEN_ACT	Resource Block
MAINT_INSTRUCTION_DOXY	ADVDIAGDOXY Transducer Block

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

Diagnostic Code	Indicated Maintenance Instruction	CONDCONC Transducer Error (XD_ERROR)
0: No diagnostic message	0: Not initialized	No Error
	1: No Action Required	No Error
003 Temp. sensor failure	3: Check wiring | Change electrode	Electronics Failure
004 Scanning sensor	4: Establishing a connection to the sensor	General Error
010 Sensor initialisation	10: Wait for sensor initialization to finish	General Error
011 Sensor no comm.	11: Check meas. chain | Check sensor settings	General Error
012 Sensor failure	12: Check meas. chain | Check sensor settings	General Error
013 Wrong sensor type	13: Check meas. chain | Check sensor settings	General Error
014 Sensor failure	14: Change sensor type | Change firmware	General Error
104 Sensor supply voltage bad	104: Check connector | Replace sensor/cable	Mechanical Failure
119 Temp offset too high	119: Check temp. sensor | Replace sensor	Calibration Error
120 Temp offset too low	120: Check temp. sensor | Replace sensor	Calibration Error
127 Invalid TAG group	127: Replace sensor | Deactivate tag check	General Error
128 Invalid TAG	128: Replace sensor | Deactivate tag check	General Error
129 Sensor change aborted	129: Restart the sensor change	No Error
130 Calibration active	130: Wait for the calibration to finish	No Error
131 PV not stable	131: Sensor too old | Cable or connector defective	Calibration Error
132 Temperature not stable	132: Sensor too old | Cable/connector defective	Calibration Error
134 Zero pnt. too high alarm	134: Sensor old or defective	Calibration Error
135 Zero pnt. too high warning	135: Sensor old or defective	Calibration Error
136 Zero pnt. too low alarm	136: Sensor old or defective	Calibration Error
137 Zero pnt. too low warning	137: Sensor old or defective	Calibration Error
138 Slope too low alarm	138: Sensor old or defective	Calibration Error
139 Slope too low warning	139: Sensor old or defective	Calibration Error
140 Leakage current alarm	140: Sensor old or defective	Calibration Error
143 Slope too high alarm	143: Sensor old or defective	Calibration Error
144 Slope too high warning	144: Sensor old or defective	Calibration Error
145 Leakage current warn	145: Sensor is becoming unusable. Plan to replace the sensor.	Electronics Failure
162 Usage >40 degC alarm	162: Replace sensor	Unspecified Error
163 Usage >120 degC alarm	163: Replace sensor	Unspecified Error
166 Usage >15 nA alarm	166: Replace sensor	Unspecified Error
167 Usage >50 nA alarm	167: Replace sensor	Unspecified Error
168 Usage >40 degC warning	168: Prepare to replace sensor	Unspecified Error
169 Usage >120 degC warning	169: Prepare to replace sensor	Unspecified Error
170 Cap operating time alarm	170: Replace sensor	Calibration Error
171 Cap operating time warn	171: Prepare to replace sensor	Calibration Error
172 Operating time alarm	172: Replace sensor	Calibration Error
173 Usage >80 degC alarm	173: Replace sensor	Calibration Error
180 Cal. expired alarm	180: Perform a calibration	Calibration Error
181 No. steril. alarm	181: Replace sensor	Calibration Error
182 Operating time warning	182: Prepare to replace sensor	Calibration Error
183 Usage >80 degC warning	183: Prepare to replace sensor	Calibration Error
189 Oper.time <5 degC warn	189: Prepare to replace sensor	Unspecified Error
190 Cal. expired warning	190: Prepare to replace sensor	Calibration Error
191 No. steril. warning	191: Prepare to replace sensor	Calibration Error
192 Usage >15 nA warning	192: Prepare to replace sensor	Unspecified Error
193 Usage >50 nA warning	193: Prepare to replace sensor	Unspecified Error
198 Oper.time <5 degC alarm	198: Replace sensor	Unspecified Error
203 Wrong transmitter type	203: Check sensor	General Error
215 Simulation active	215: Active corresponding to your settings	No Error
218 Curr.out module defect	218: Contact the Service Team!	Electronics Failure
219 Power supply bad	219: Connect to a clean power supply | Check cable	No Error
222 Usage >160 nA warning	222: Prepare to replace sensor	Unspecified Error
223 Usage >160 nA alarm	223: Replace sensor	Unspecified Error
224 Usage >5 degC warning	224: Prepare to replace sensor	Unspecified Error
225 Usage >5 degC alarm	225: Replace sensor	Unspecified Error
226 Usage >30 degC warning	226: Prepare to replace sensor	Unspecified Error
227 Usage >30 degC alarm	227: Replace sensor	Unspecified Error
228 Usage >30 nA warning	228: Prepare to replace sensor	Unspecified Error
229 Usage >30 nA alarm	229: Replace sensor	Unspecified Error

Diagnostic Code	Indicated Maintenance Instruction	CONDCONC Transducer Error (XD_ERROR)
322 Meas. value out of range	322: inc. process value | Check meas. chain | change sensor	General Error
327 Selftest active	327: Please wait for end of selftest	Unspecified Error
328 High sensor electronic temperature	328: Please check ambient temperature and energy consumption	Unspecified Error
329 Low sensor signal amplitude	329: Exchange sensor cap | Contact Service Team	Unspecified Error
330 Low sensor relaxation time	330: Repeat calibration | Exchange sensor cap | Contact Service Team	Unspecified Error
331 High sensor relaxation time	331: Repeat calibration | Exchange sensor cap | Contact Service Team	Unspecified Error
332 Low sensor signal decay	332: Exchange sensor cap | Contact Service Team	Unspecified Error
333 Sensor temperature too high	333: Check application | Check installation	Unspecified Error
380 Comm. module defect	380: Contact the Service Team	Electronics Failure
381 Comm. module incompatible	381: Contact the Service Team	Electronics Failure
404 Lower limit current output	404: Check plausibility	Calibration Error
405 Upper limit current output	405: Check plausibility	Calibration Error
406 Param. active	406: End parameter entry	No Error
407 Diag. active	407: End query of device and sensor information	No Error
408 Calibration aborted	408: Renew calib solution | repeat calib	Calibration Error
409 Sensor change	409: Sensor change in progress	No Error
501 Device open	501: Close the housing and tighten the screws	No Error
513 Device error alarm ([%V%S])	513: Contact the Service Team	Software Error
514 Device error warning ([%V%S])	514: Contact the Service Team	Software Error
530 Logbook 20 % remain	530: Logbook ring memory is almost full	No Error
531 Logbook full	531: New events will overwrite the oldest entries	No Error
532 Cal. timer exceeded	532: Perform a calibration	Calibration Error
802 Process check system alarm	802:Check sensor and sensor connection | Air cushion in assembly | Check application	General Error
810 PV upper limit	810: Sensor in air | Air cushion in assembly | Check measuring chain	No Error
811 PV lower limit	811: Sensor in air | Air cushion in assembly | Check measuring chain	No Error
812 Temp upper limit	812: Sensor in air | Air cushion in assembly | Check measuring chain	No Error
840 PV upper limit	840: Sensor in air | Air cushion in assembly | Check measuring chain	Calibration Error
841 PV lower limit	841: Sensor in air | Air cushion in assembly | Check measuring chain	Calibration Error
902 - Cap SIP, CIP, autoclav alm	902 Replace sensor cap and perform calibration action "change sensor cap"	Calibration Error
903 - Cap SIP, CIP, autoclav warn	903 Replace sensor cap soon	Calibration Error
904 - Cal quality alarm	904 Repeat calibration|Check sensor|replace sensor	Calibration Error
905 - Cal quality warning	905 Repeat calibration|Check sensor|replace sensor	Calibration Error
906 - Number of cap calibrations alarm	906 Replace sensor cap	Calibration Error
907 - Number of cap calibrations warn	907 Replace sensor cap soon	Calibration Error
908 - Reference calibration required	908 Perform a calibration	Calibration Error

6.3.8.   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 connot be changed. Liquiline_Oxygen 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	134
1	4	17	135
2	10	18	136
3	11	19	137
4	12	20	138
5	13	21	139
6	14	22	140
7	104	23	143
8	119	24	144
9	120	25	145
10	127	26	162
11	128	27	163
12	129	28	166
13	130	29	167
14	131	30	168
15	132	31	169

FD_EXTENDED_MAP_2/FD_EXTENDED_ACTIVE_2:

Bit Position 0-15	Event number	Bit Position 16-31	Event number
0	170	16	218
1	171	17	219
2	172	18	222
3	173	19	223
4	180	20	224
5	181	21	225
6	182	22	226
7	183	23	227
8	189	24	228
9	190	25	229
10	191	26	322
11	192	27	327
12	193	28	328
13	198	29	329
14	203	30	330
15	215	31	331

FD_EXTENDED_MAP_3/FD_EXTENDED_ACTIVE_3:

Bit Position 0-15	Event number	Bit Position 16-31	Event number
0	332	16	802
1	333	17	810
2	380	18	811
3	381	19	812
4	404	20	840
5	405	21	841
6	406	22	902
7	407	23	903
8	408	24	904
9	409	25	905
10	501	26	906
11	513	27	907
12	514	28	908
13	530	29	Undefined
14	531	30	Undefined
15	532	31	Undefined

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_Oxygen device these events are grouped as follows.

Bit Position in Manufacturer Specific Conditions	NAMUR class (F, C, S, M)	ADVDIAGDOXY Transducer Parameter	Event numbers
31 SensorHiHiSeverity	F	Fixed_Area_31	3, 11, 12, 13, 104, 119, 120, 127, 128, 140, 203, 332
30 ElectronicHiHiSeverity	F	Fixed_Area_30	218, 380, 381
29 ConfigHiHiSeverity	F	Fixed_Area_29	513
28 ProcessHiHiSeverity	F	Fixed_Area_28	802, 810, 811, 812
27 SensorHiSeverity	C	Fixed_Area_27	4, 10, 14, 129, 130, 328, 329, 330, 331
26 ElectronicHiSeverity	C	Fixed_Area_26	219
25 ConfigHiSeverity	C	Fixed_Area_25	215, 406, 407, 409
24 ProcessHiSeverity	C	Fixed_Area_24	None
23 SensorLoSeverity	S	Fixed_Area_23	322, 333
22 ElectronicLoSeverity	S	Fixed_Area_22	None
21 ConfigLoSeverity	S	Fixed_Area_21	404, 405, 530, 531
20 ProcessLoSeverity	S	Fixed_Area_20	None
19 SensorLoLoSeverity	M	Fixed_Area_19	131, 132, 134, 135, 136, 137, 138, 139, 143, 144, 145, 162, 163, 166, 167, 168, 169, 172, 173, 180, 181, 183, 189, 190, 191, 192, 193, 222, 223, 224, 225, 226, 227, 228, 229
18 ElectronicLoLoSeverity	M	Fixed_Area_18	None
17 ConfigLoLoSeverity	M	Fixed_Area_17	501, 514, 532
16 ProcessLoLoSeverity	M	Fixed_Area_16	182, 408, 840, 841

The ADVDIAGDOXY Transducer Block provides these 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.
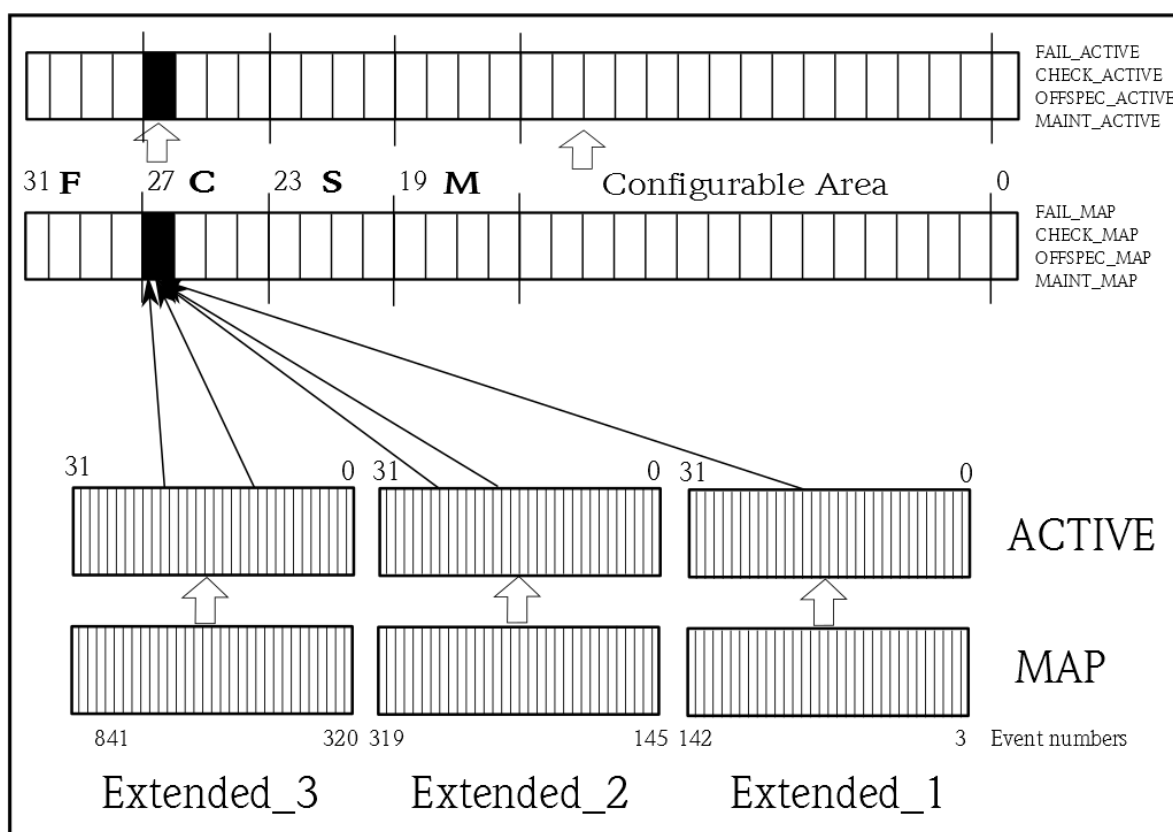
An event is enabled, if the bit representing the event number is set in the FD_EXTENDED_MAP_X parameter. It is disabled by clearing this bit. If an event is disabled, the related bit in the Extended ACTIVE parameter won't be set any more and will not lead to an active condition in the upper field diagnostics group.
The disabled event number will be replaced with the value "Not categorized" in the matching ADVDIAGDOXY 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.

6.3.9.   Discrete diagnostic indication

Liquiline_Oxygen provides 1 Discrete Diagnostic Transducer Block. Two configurable lists with diagnostic event numbers of the device are maintained. The diagnostic message with the highest priority is compared against the configured diagnostic numbers in these lists. If the message number matches an input signal of one of the lists, the system activates the output signal assigned to that list. In the factory setting, the "Ch1 Codes" list is configured with the F-classified events categorized in accordance with NAMUR, the "Ch2 Codes" list is configured with the remaining CSM-classified events.

Therefore the DIAGDI Transducer provides two channels to connect discrete data with status (transducer parameters CURRENT_STATE_CH1 and CURRENT_STATE_CH2) to 2 DI Function Blocks.
CURRENT_STATE_CH1 value will be connected to a DI function block, if CHANNEL value 15 ("Ch1 Codes") is selected.
CURRENT_STATE_CH2 value will be connected to a DI function block, if CHANNEL value 16 ("Ch2 Codes") is selected.

The following methods can be accessed in the DIAGDI Transducer and provide options to modify the ex-factory settings, which diagnostic events will activate "Ch1 Codes or "Ch2 Codes" discrete transducer outputs or both outputs or won't be taken into account for this action.

Method name	Description
Enable diagnostic event	Allows to put a single diagnostic event into "Ch1 Codes" or "Ch2 Codes" list
Disable diagnostic event	Allows deleting a single diagnostic event from "Ch1 Codes" or "Ch2 Codes" list.
Disable all diagnostic events	Allows deleting all diagnostic events from "Ch1 Codes" or "Ch2 Codes" list.
Get enabled diag events for Chn1	Allows indication of all diagnostic events which are belonging to"Ch1 Codes" list
Get enabled diag events for Chn2	Allows indication of all diagnostic events which are belonging to"Ch2 Codes" list

6.3.10. Simulation of measurement values and events

In addition to the standard Analog Input function block simulation feature another possibility is implemented to simulate a measurement value and/or a diagnostic event accessible in the first IO Transducer Block DOXYGEN. This transducer block simulation has no dependencies with the Analog Input SIMULATE parameter.

As well, measurement value simulation is available by selecting the simulation menu for main or temperature measurement value on the local screen of the device. This local operation is described in operating instructions BA00381C/BA00382C.

6.3.10.1. Simulate measurement values

Two simulation paths exist which can be used simultaneously.

There is one section for main measurement value simulation, which contains the following parameters:

Parameter name	Description
MAIN_MEASURED_VALUE_SIMULATION	Switch to enable or disable main measured value simulation.
SIMULATED_MEASURAND_DOXY	Switch to select the desired main measurement parameter which should be simulated. Usable selections depend on the current device's order code which determines the measurement principle.
SIMULATED_MAINMEASURED_VAL_DOXY	Contains the desired main measurement simulation value which is not restricted to sensor specification limits.

There is another section for temperature measurement simulation containing following parameters:

Parameter name	Description
TEMPERATURE_VALUE_SIMULATION	Switch to enable or disable temperature value simulation.
SIMULATED_TEMPERATURE_VALUE	Contains the desired temperature simulation value which is not restricted to sensor specification limits.

NOTICE

It is required to set the transducer block mode to Out-of-Service (OOS) before one of these simulation modes can be activated. Depending on the host system features and the current schedule status a DOXYGEN transducer "OOS" block alarm and an Analog Input "Input Failure" block alarm will be sent, because the measured transducer value status is set to "BAD, Out-of-service".The position of the hardware simulation jumper is not taken into account.

As a consequence of enabling main or temperature measurement simulation the diagnostic event 215 (Simulation active) and the SIMU-Icon will be indicated on the device's local display. If no other events than 215 are active, main measurement and temperature value status will be set to a value defined by the setting of Advanced Diagnostic Transducer parameter "Status select 215". Refer to chapter 6.3.15 for a description of available status values. If option "Unmodified" is selected, the measurement value processing will set the status value to UNCERTAIN SUBSTITUTE VALUE.

If other events are active simultaneously and a target of the simulation will be using a specific status value with a specific measurement value, all events besides 215 should be set to Field Diagnostics state "Not configured". This can be done by de-selecting the desired events in one of the three Resource Block FD_EXTENDED_MAP parameters. Refer to chapter 6.3.8 for a description of these parameters.

⚠ WARNING

Be careful with changing PV status and Resource extended MAP parameter values. Modifications will be persistent whether simulation is active or disabled. If a PV status value other than "Unmodified" is selected

for a specific diagnostic event, all available measurement and temperature status values are set to the configured status when this event will be active. All diagnostic events, which are de-selected in Resource extended MAP parameters are moved to state "Not configured". There is no special notification about a status modification other than the standard static revision update event.

After enabling this simulation mode the Transducer block mode can be set to AUTO again and depending on the current setting of simulated measurand and a simulated main measured/temperature value will be transferred to a connected Analog Input block, if AI MODE_BLK is set to AUTO and CHANNEL and scaling parameters are set correctly.

The unit for main measurement value entered for simulation is fixed and depends on the order code, the selected measurand and the connected sensor type.

Order code	Sensor type	Measurand	Bus unit	Possible AI CHANNEL
CM42-Oxx**6**xxxxx	Memosens digital	Membrane current	nA (unit code 1213)	1 – Membrane current
CM42-Oxx**6**xxxxx	Memosens digital	Damped partial pressure	hPa (unit code 1136)	4 – Damped partial pressure
CM42-Oxx**6**xxxxx	Memosens digital	Saturation	% (unit code 1342)	5 - Saturation
CM42-Oxx**6**xxxxx	Memosens digital	Liq. concentration	LIQ_CONCENTRATION_UNIT mg/l (unit code 1608) µg/l l (unit code 65521) ppm l (unit code 1423) ppb l (unit code 1424)	6 – Liq. concentration
CM42-Oxx**6**xxxxx	Memosens digital	Gas. concentration	GAS_CONCENTRATION_UNIT Vol.-% (unit code 1651) ppmVol (unit code 65526)	8 – Gas. concentration
CM42-Oxx**6**xxxxx	Memosens digital	Raw tau (us)	(unit code 1057)	9 – Raw tau (us)

The unit for simulated temperature value depends on the setting of UNIT_TEMPERATURE_VALUE_DOXY.

Order code	Sensor type	Unit	Possible AI CHANNEL
CM42-xxx**6**xxxxx	All	UNIT_TEMPERATURE_VALUE_DOXY Possible selections are ˚C (unit code 1001) or ˚F (unit code 1002)	7 - Temperature

NOTICE

It is required to set the transducer block mode to Out-of-Service (OOS) again before a simulation mode can be de-activated. As soon as simulation is de-activated the simulated measurement value will be replaced with the un-simulated value. The SIMU-Icon on the device's local display will be switched off, if no other reason for an active simulation exists.

Restarting the device will always de-activate the measurement simulation mode. All entries made in simulation parameters are lost.

6.3.10.2. Simulate diagnostic events

Two parameters in the DOXYGEN Transducer provide a diagnostic event simulation feature.

Parameter name	Description
DIAGNOSTIC_EVENT_SIMULATION	Switch to enable or disable diagnostic event simulation.
SIMULATED_DIAGNOSTIC_EVENT	Contains the desired diagnostic event to be simulated.

NOTICE

It is required to set the transducer block mode to Out-of-Service (OOS) before this simulation mode can be activated. Depending on the host system features and the current schedule status a DOXYGEN transducer "OOS" block alarm and an Analog Input "Input Failure" block alarm will be sent, because the measured transducer value status is set to "BAD, Out-of-service". The position of the hardware simulation jumper is not taken into account.

As a consequence of enabling main or diagnostic event simulation the diagnostic event 215 (Simulation active) will be set. The SIMU-Icon will be indicated on the device's local display as well.

The event being entered to parameter SIMULATED_DIAGNOSTIC_EVENT will be transferred as current device status. The status value of any measurement value will be set to the value specified in Advanced Diagnostics Transducer parameter "Status select 215". Refer to chapter 6.3.15 for a description of available status values. If option "Unmodified" is selected, the measurement value processing will set the status value to UNCERTAIN SUBSTITUTE VALUE in event simulation mode. Refer to chapter 6.3.8 for a description of available status values.

WARNING

Be careful with changing PV status values. Modifications will be persistent whether simulation is active or not. If a value other than "Unmodified" is selected for a specific diagnostic event, all available measurement and temperature status values are set to the configured status when this event will be active. There is no special notification about a status modification other than the standard static revision update event.

After enabling this simulation mode the Transducer block mode can be set to AUTO again and any desired diagnostic event may be entered.

NOTICE

It is required to set the transducer block mode to Out-of-Service (OOS) again before the simulation mode can be de-activated. As soon as simulation is de-activated the simulated event will be replaced with the un-simulated value. The SIMU-Icon on the device's local display will be switched off, if no other reason for an active simulation exists.

Restarting the device will always de-activate the event simulation mode. All entries made in simulation parameters are lost.

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 68 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**

5	Block Mode (MODE_BLK)	AUTO - OOS	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).
			
			Supported values: AUTO
			      OOS
			      MAN
			
			The Transducer Block supports the following operating modes:
			• 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 status is 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	Indicates active block errors.
			
			Supported values:
			• 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
			
			An error description as well as information on rectifying faults can be found in section Diagnostic Codes and Maintenance.

Transducer Block (Universal FF parameters)			
Parameter index	Parameter	Write access with operating Mode (MODE_BLK)	Description
7	Update Event (UPDATE_EVT)	AUTO - OOS	Indicates whether static block data have been altered, including date and time.
8	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. • 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	A directory that specifies the number and starting indicies of the transducers in the transducer block. Because no multiple transducers are defined. **Display**: This value is 0.
10	Transducer Type (TRANSDUCER_TYPE)	Read only	The Transducer Block type is indicated. **Supported values:** • DOXYGEN Transducer Block: Oxygen Measurement, 0xFFF7 • DIAGDI Transducer Block: Diagnostic Discrete Input, 0xFFEF • SERVICE Transducer Block: Service, 0xFFF0 • ADVDIAGDOXY Transducer Block: Advanced Diagnostics Oxygen, 0xFFEC • DISPLAYDOXY Transducer Block: Oxygen Display CM42, 0xFFEA • MEMODOXY Transducer Block: Oxygen Memosens Transmitter, 0xFFFD • DIAGDOXY Transducer Block: Oxygen Diagnostics, 0xFFFA
11	Transducer Type Version (TRANSDUCER_TYPE_VER)	Read only	Display of the transducer block type version
12	Transducer Error (XD_ERROR)	Read only	Indication of the active device. **Supported values:** • 00 - No Error (normal status) • 17 - General Error • 18 - Calibration Error • 19 - Configuration Error • 20 - Electronics Failure • 21 - Mechanical Failure 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 ADVDIAGDOXY 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.
13	Collection Directory (COLLECTION_DIR)	Read only	Display of the Collection Directory; Not used **Display**: 0

6.3.12. DOXYGEN Transducer Block

The properties column lists parameter properties:
- W: Parameter is writable
- OOS: Parameter is writable in OOS mode only

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

Parameter index	Parameter Local Display Menu Path	Proper ties	Description
	DOXYGEN Transducer Block (manufacturer-specific parameters)		
14	IOTRD_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 DIAG → Most important message		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)
16	ACTUAL_DIAGNOSTICS DIAG → Most important message		Current diagnostic code with highest priority **Indicated values:** 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance.
17	SENSOR_INTERFACE		Connected sensor interface type **Indicated values:** 0 - Analog 1 - Digital
18	SOFTWARE_FUNCTIONALITY DIAG → Device information → Order code		Indicates software capability as Standard or Advanced like indicated in order code (i.e. OAA600E**A**D00 means standard or OAA600E**B**D00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling **Indicated values:** 0 - Standard 1 - Advanced
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 SETUP → General settings → Hold settings → Calibration active	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
22	HOLD_ON_SETUP SETUP → General settings → Hold settings → SETUP active	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

Parameter index	Parameter Local Display Menu Path	Properties	Description
	DOXYGEN Transducer Block (manufacturer-specific parameters)		
23	HOLD_ON_DIAG SETUP → General settings → Hold settings → DIAG active	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
24	HOLD_DELAY SETUP → General settings → Hold settings → 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
25	TEMP_CAL_TYPE CAL → Temp. adjustment → Mode	OOS	Select temperature adjustment type **Available values:** 0: 1 point 1: 2 point 2: 2 point table **Factory setting:** 1 point
26	DOXY_SENSOR_TYPE		Indicates sensor type **Possible values**: 0: COS21D A 1: COS21D B 2: COS21D C 3: COS51D 50µm 4: COS51D 25µm 5: COS81D 6: COS22D **Default value**: depends on connected sensor
27	MAIN_MEASURED_VALUE SETUP → Sensor DO → Measured value	OOS	Select main measurement value which will be indicated on the local display of the device. If concentration (liq. or gaseous) is selected, the contents of parameter CONCENTRATION_VALUE is affected as well. **Available values:** 0: Meas. current (nA) 1: Part. Press. (hPa) 2: % saturation 3: Conc. (liquid) 4: Conc. (gaseous) **Default value**: Conc. (liquid)
28	MEMBRANE_CURRENT_VALUE MEAS → Second and third measurement screen MEAS → Fist measurement screen, if MAIN_MEASURED_VALUE is set to "Meas. current"		Current measured compensated sensor current (I_b) value and status Constant unit: nA
29	AMBIENT_PRESSURE_VALUE		Current calculated ambient pressure value and status Constant unit: hPa
30	DAMPED_PARTIAL_PRESS_VAL MEAS → Second and third measurement screen MEAS → Fist measurement screen, if MAIN_MEASURED_VALUE is set to "Part. Press."		Current measured damped partial pressure value and status Constant unit: hPa
31	SATURATION_VALUE MEAS → Second and third measurement screen MEAS → Fist measurement screen, if MAIN_MEASURED_VALUE is set to % saturation"		Current measured saturation value and status Constant unit: %SAT
32	LIQ_CONCENTRATION_VALUE MEAS → Second and third measurement screen MEAS → Fist measurement screen, if MAIN_MEASURED_VALUE is set to "Conc."		Current measured liquid concentration value depending on setting of unit parameter LIQ_CONCENTRATION_UNIT

Parameter index	Parameter Local Display Menu Path	Properties	Description
	DOXYGEN Transducer Block (manufacturer-specific parameters)		
33	GAS_CONCENTRATION_VALUE MEAS → Second and third measurement screen MEAS → Fist measurement screen, if MAIN_MEASURED_VALUE is set to "Conc."		Current measured gaseous concentration value and status depending on setting of unit parameter GAS_CONCENTRATION_UNIT
34	RAW_VALUE_TAU MEAS → Second and third measurement screen MEAS → Fist measurement screen, if MAIN_MEASURED_VALUE is set to "Conc."		Current measured raw value tau value and status Constant unit: µs
35	DAMPED_TEMPERATURE_VALUE MEAS → All measurement screens		Current measured temperature value and status unit setting in UNIT_TEMPERATURE_VALUE_DOXY
36	MEMBRANE_CURRENT_UNIT		Indicated unit for membrane current value which is transferred over FF-H1 bus only. **Constant unit:** 1213: nA
37	AMBIENT_PRESSURE_UNIT		Indicated unit for ambient pressure value which is transferred over FF-H1 bus only. **Constant unit:** 1136: hPa
38	DAMPED_PARTIAL_PRESS_UNIT		Indicated unit for damped partial pressure value which is transferred over FF-H1 bus only. **Constant unit:** 1136: hPa
39	SATURATION_UNIT		Indicated unit for saturation value which is transferred over FF-H1 bus only. **Constant unit:** 1342: %
40	LIQ_CONCENTRATION_UNIT SETUP → Sensor DO → Conc. (liquid)	OOS	Liquid concentration unit **Available values:** 1608: mg/L 65521: µg/L 1423: ppm 1424: ppb **Default value:** mg/L
41	GAS_CONCENTRATION_UNIT SETUP → Sensor DO → Conc. (gaseous)	OOS	Gaseous concentration unit **Available values:** 1651: Vol.-% 65526: ppmVol **Default value:** Vol.-%
42	RAW_VALUE_TAU_UNIT		Indicated unit for membrane current value which is transferred over FF-H1 bus only. **Constant unit:** 1057: µs
43	UNIT_TEMPERATURE_VALUE_DOXY	OOS	Selected unit for temperature value which is transferred over FF-H1 bus only. **Available values:** 1001: ℃ 1002: ℉ **Default value::** ℃ To select temperature unit which is indicated on the local display only, use parameter DISPLAY_TEMPERATURE_UNIT in DISPLAYDOXY transducer block.
44	DAMPING SETUP → Sensor DO → Damping	OOS	Time constant of damping **Available values:** 0 to 600 sec **Default value:** 0 sec.

Parameter index	Parameter / Local Display Menu Path	Properties	Description
	DOXYGEN Transducer Block (manufacturer-specific parameters)		
45	MEDIUM_PRESSURE SETUP → Sensor DO → Medium pressure	OOS	Medium Pressure Compensation Type **Available values**: 0: Process pressure 1: Air pressure 2: Altitude **Default value**:: Process pressure
46	MEDIUM_PRESSURE_COMPENSATION SETUP → Sensor DO → Medium press. Comp.	OOS	The medium pressure must be compensated for the concentration measured value in gas. Specify the medium pressure. The value is needed to calculate the concentration in Vol% or Vol ppm. **Available values:** 500 to 9999 hPa **Default value**: 1013 hPa
47	ALTITUDE_COMPENSATION SETUP → Sensor DO → Altitude	OOS	The air pressure is taken into account when calibrating the sensor. Enter the altitude or the average air pressure (mutually dependent values). If you specify the altitude, the average air pressure is calculated from the barometric altitude formula and vice versa. **Available values:** 0 to 4000 m **Default value**: 0 m
48	AIR_PRESSURE_COMPENSATION SETUP → Sensor DO → Air pressure	OOS	The air pressure is taken into account when calibrating the sensor. Enter the altitude or the average air pressure (mutually dependent values). If you specify the altitude, the average air pressure is calculated from the barometric altitude formula and vice versa. **Available values:** 500 to 9999 hPa **Default value**: 1013 hPa
49	SALINITY SETUP → Sensor DO → Salinity	OOS	The influence of salt content on oxygen measurement is compensated with this function. Example: sea water measurement as per Copenhagen Standard (30 g/kg). **Available values:** 0 to 40 g/kg **Default value**: 0.0 g/kg
50	POL_VOLTAGE_SWITCH_SENSOR SETUP → Sensor DO → Sensor pol. Voltage → Switch	OOS	Internal: The polarization voltage value stored in the sensor is used. External: The value can be adjusted manually. **Available values:** 0: Internal 1: external 2: Off **Default value**: : Internal
51	POL_VOLTAGE_OFFSET_SENSOR SETUP → Sensor DO → Sensor pol. Voltage → adjust	OOS	Polarization voltage of oxygen sensor, normally 650mV. **Available values:** 0 to 750 mV **Default value**: 650mV
52	ENABLE_CAL_SLOPE SETUP → Sensor DO → Cal settings → Type of calibration → Slope	W	Unblocking slope calibration method **Available values:** 0: Off 1: On **Default value**: On
53	ENABLE_CAL_ZEROPOINT SETUP → Sensor DO → Cal settings → Type of calibration →Zero point	W	Unblocking zero point calibration method **Available values:** 0: Off 1: On **Default value**: On
54	ENABLE_CAL_GRAB_SAMPLE_CAL SETUP → Sensor DO → Cal settings → Type of calibration → Grab sample cal.	W	Unblocking grab sample calibration method **Available values:** 0: Off 1: On **Default value**: On

Parameter index	Parameter Local Display Menu Path	Proper ties	Description
55	CAL_MEDIUM_PRESSURE SETUP → Sensor DO → Cal settings → Medium pressure		Medium Pressure Compensation Type during calibration **Available values**: 0: Process pressure 1: Air pressure 2: Altitude **Default value**:: Process pressure
56	CAL_MEDIUM_PRESSURE_COMPENSATION SETUP → Sensor DO → Cal settings →Medium press. Comp.		Medium Pressure Compensation during calibration **Available values**: 500 to 9999 hPa **Default value**: 1013 hPa
57	CAL_AIR_PRESSURE_COMPENSATION SETUP → Sensor DO → Cal settings →Air pressure		During calibration the actual ambient pressure is used to calculate the relevant oxygen partial pressure. This can be done by calculate it with respect to the altitude (results in medium ambient pressure) or by setting the measured absolute ambient pressure. **Available values**: 500 to 9999 hPa **Default value**: 1013 hPa
58	CAL_ALTITUDE_COMPENSATION SETUP → Sensor DO → Cal settings → Altitude		During calibration the actual ambient pressure is used to calculate the relevant oxygen partial pressure. This can be done by calculate it with respect to the altitude (results in medium ambient pressure) or by setting the measured absolute ambient pressure. **Available values**: 0 to 4000 m **Default value**: 0 m
59	CAL_RELATIVE_HUMIDITY SETUP → Sensor DO → Cal settings → Rel. humidity		Relative humidity during calibration **Available values**: 0 to 100 % **Default value**: 50 %
60	SENSOR_CAL_VALID		Validity of the displayed calibration parameter for main measurement **Available values**: 0: FALSE 1: TRUE **Default value**: FALSE
61	SENSOR_CAL_TEMP_VALID		Validity of the displayed calibration parameter for temperature measurement **Available values**: 0: FALSE 1: TRUE **Default value**: FALSE
62	LED_TEMP_MODE SETUP → Sensor DO → LED temp. mode	W	Switch to activate or de-activate temperature-related shutoff for LED of COS81D sensor **Available values**: 0: Off 1: On **Default value**: 1: On
63	LED_TEMP_THRESHOLD SETUP → Sensor DO → LED temp. threshold	W	Temperature threshold for LED-switch-off **Available values**: 30.0 to 130.0 ℃ **Default value**: 80.0 ℃
64	LED_MEAS_INTERVAL SETUP → Sensor DO → LED measuring interval	W	LED measuring cycle **Available values**: 0: 1 second 1: 3 seconde 2: 10 seconds 3: 30 seconds **Default value**: 0: 1 second

Parameter index	Parameter / Local Display Menu Path	Properties	Description
	DOXYGEN Transducer Block (manufacturer-specific parameters)		
65	RAW_MEMBRANE_CURRENT_VAL DIAG→ Service → Raw values → I_a		Current measured uncompensated sensor current (I_a) value and status **Constant unit:** nA
66	RAW_MEMBRANE_CURRENT_UNIT		Indicated uncompensated sensor current (I_a) unit **Available values:** 1213: nA
67	OFFSET_TEMPERATURE		Indicated sensor temperature offset **Constant unit:** Kelvin
68	DOXY_ZERO_POINT		Current zero point at 25 degC (amperometr. sensor) Constant unit: nA
69	DIAGNOSTIC_EVENT_SIMULATION	W	Switch to enable/disable the simulation of diagnostic events. Pre-condition before diagnostic simulation can 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
70	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.
71	MAIN_MEASURED_VALUE_SIMULATION DIAG → Service →Simulation → Measured value → Simulation	W	Switch to enable/disable main measured value simulation. Pre-condition before this simulation type can 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
72	SIMULATED_MEASURAND_DOXY DIAG → Service →Simulation → Measured value → Measured value	W	Select the desired main measurement parameter which should be simulated. **Available values**: 0: Meas. current (nA) 1: Part. Press. (hPa) 2: % saturation 3: Conc. (liquid) 4: Conc. (gaseous) 5: Raw value tau (µs) **Factory setting**: 3: Conc. (liquid)
73	SIMULATED_MAINMEASURED_VAL_DOXY DIAG → Service →Simulation → Measured value → Simulation value	W	Enter desired value to be simulated. The selected measurand unit depends on the measurand setting: Meas. current: MEMBRANE_CURRENT_UNIT Part. Press.: DAMPED_PARTIAL_PRESS_UNIT % saturation: SATURATION_UNIT Conc. (liquid): LIQ_CONCENTRATION_UNIT Conc. (gaseous): GAS_CONCENTRATION_UNIT Raw value tau: RAW_VALUE_TAU_UNIT

DOXYGEN Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
74	TEMPERATURE_VALUE_SIMULATION DIAG → Service →Simulation → Temperature→ Simulation	W	Switch to enable/disable temperature value simulation. Pre-condition before this simulation type can 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
75	SIMULATED_TEMPERATURE_VALUE DIAG → Service →Simulation → Temperature→ Simulation value	W	Enter the desired value to be simulated in the unit which is set in parameter UNIT_TEMPERATURE_VALUE_DOXY. **Possible values**: -50.0 to 250 °C
76	SENSOR_CONNECTED		Indicates current sensor connection state **Available values:** 0 to 29: not connected 30 - connected **Default value:** 0
77	TEMPERATURE_SENSOR	W	configured temperature sensor **Available values:** 0 - None 1 - PT100 or PT1000 **Factory setting:** PT100 or PT1000
78	OFFSET_1PNT_TEMPERATURE	W	Sensor temperature offset for 1-point calibration (required for up/download only)
79	OFFSET_2PNT_TEMPERATURE	W	Sensor temperature offset for 2-point calibration (required for up/download only)
80	OFFSET_TABLE_TEMPERATURE	W	Sensor temperature offset for table calibration (required for up/download only)
81	CIP_SETTINGS_DOXY SETUP → Sensor DO → CIP settings → Function	W	Switch to enable or disable CIP counter function **Available values**: 0 - Off 1 – On **Factory setting**: Off
82	CIP_DURATION_DOXY SETUP → Sensor DO → CIP settings → Duration	W	The duration in min, which have to be reached to count the CIP cycle. The duration starts after falling below the lower temperature threshold value. **Available values**: 1.0 to 250.0 minutes **Factory setting**: 30 minutes
83	CIP_LOWER_TEMP_THRESHOLD_DOXY SETUP → Sensor DO → CIP settings → Lower temp. threshold	W	The lower temperature threshold of CIP criteria. The temperature, measured within the temperature thresholds, is considered as a CIP cycle. **Available values**: 5.0 to (CIP_UPPER_TEMP_THRESHOLD_DOXY - 1.0) **Factory setting**: 85.0 ° C
84	CIP_UPPER_TEMP_THRESHOLD_DOXY SETUP → Sensor DO → CIP settings → Upper temp. threshold	W	The upper temperature threshold of CIP criteria. If the temperature measurement value exceeds this limit, the CIP conditions will be violated and no CIP cycle is counted. A CIP cycle is counted when the lower temperature threshold is exceeded and followed by falling below the lower temperature threshold value again. **Available values**: (CIP_LOWER_TEMP_THRESHOLD_DOXY+1.0) to 90.0 °C **Factory setting**: 90.0 °C

DOXYGEN Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
85	STERILIZATION_DURATION_DOXY SETUP → Sensor DO → Sterilization settings → Duration	W	The duration how long the sterilization temperature has to be reached until the sterilization cycle will be counted. **Available values**: 1 to 250 minutes **Factory setting**: 20 minutes
85	STERIL_TEMP_THRESHOLD_DOXY SETUP → Sensor DO → Sterilization settings → Temp. threshold	W	This temperature limit has to be exceeded so that the time counter will start to count and a sterilization cycle can be considered. **Available values**: Upper limit 150.0 ℃ Lower limit 120 ℃ **Factory setting**: 121.0 ℃
86	OPTICAL_MEAS_FILTER SETUP → Sensor DO → Measurement filter	W	Optical measurement filter **Available values**: 0 - Off 1 - Low 2 - Medium 3 - High 4 - Very high **Factory setting**: 2 - Medium
87	ENABLE_CAL_POINT_AT_OXYGEN SETUP → Sensor DO →Cal. Settings → Type of calibration → Point at oxygen	W	Unblocking point at oxygen calibration method **Available values**: 0: Off 1: On **Factory setting**: 1: On

6.3.13. DIAGDI Transducer Block

The properties column lists parameter properties:
- W: Parameter is writable
- OOS: Parameter is writable in OOS mode only

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

DIAGDI Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
14	IOTRD_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 DIAG → Most important message		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)
16	ACTUAL_DIAGNOSTICS DIAG → Most important message		Current diagnostic code with highest priority **Indicated values**: 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance.

	DIAGDI Transducer Block (manufacturer-specific parameters)		
Parameter index	Parameter Local Display Menu Path	Properties	Description
17	PREVIOUS_DIAGNOSTICS_DIAGDI DIAG → Past message		Previous diagnostic code **Indicated values:** 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance
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)
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:** 0xC0C00080 Activated event numbers: 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 numbers: 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

	DIAGDI Transducer Block (manufacturer-specific parameters)		
Parameter index	Parameter	Properties	Description
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
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:** 0x00000840 Activated event numbers: 327, 332
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

DIAGDI Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
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
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

Parameter index	Parameter	Properties	Description
	DIAGDI Transducer Block (manufacturer-specific parameters)		
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
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

	DIAGDI Transducer Block (manufacturer-specific parameters)		
Parameter index	Parameter	Properties	Description
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
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:** 0x00000000
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:** 0x0001C7EF Activated event numbers 129, 130, 131, 132, 134, 135, 136, 137, 138, 139, 143, 144, 145
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:** 0xF07819E6 Activated event numbers: 162, 166, 167, 168, 170, 171, 172, 173, 180, 181, 182, 183, 190, 191, 192
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:** 0xE4400021 Activated event numbers: 193, 198, 215, 219, 222, 223, 224
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:** 0x0000001F Activated event numbers: 225, 226, 227, 228, 229

DIAGDI Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter	Properties	Description
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:** 0x00000000
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:** 0x00001742 Activated event numbers: 322, 328, 329, 330, 331, 333
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:** 0x01980000 Activated event numbers: 404, 405, 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

	DIAGDI Transducer Block (manufacturer-specific parameters)		
Parameter index	Parameter	Properties	Description
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
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

	DIAGDI Transducer Block (manufacturer-specific parameters)		
Parameter index	Parameter	Properties	Description
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
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**: 0x00000FE0 Activated event numbers: 902, 903, 904, 905, 906, 907, 908
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 writable
- OOS: Parameter is writable in OOS mode only

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

Parameter index	Parameter Local Display Menu Path	Properties	Description
SERVICE Transducer Block (manufacturer-specific parameters)			
14	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 DIAG → Most important message		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)
16	ACTUAL_DIAGNOSTICS DIAG → Most important message		Current diagnostic code with highest priority **Indicated values:** 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance.
17	SENSOR_INTERFACE		Connected sensor interface type **Indicated values:** 0 - Analog 1 - Digital
18	SOFTWARE_FUNCTIONALITY DIAG → Device information → Order code		Indicates software capability as Standard or Advanced like indicated in order code (i.e. OAA600E**A**D00 means standard or OAA600E**B**D00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling **Indicated values:** 0 - Standard 1 - Advanced
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 DIAG → Device information → Projecting		Current installed projecting package **Range**: octet string with size of 16 **Factory Setting**: PH/ORP
22	DATE_FORMAT SETUP → General settings → Date/Time → Date format	W	Select date format for local device display **Available values**: 2 - DDMMYYYY 4 – MMDDYYYY **Factory setting**: DDMMYYYY

Parameter index	Parameter Local Display Menu Path	Properties	Description
	SERVICE Transducer Block (manufacturer-specific parameters)		
23	DATE_TIME SETUP → General settings → Date/Time → Set date	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
24	TIME_FORMAT SETUP → General settings → Date/Time → Time format	W	Select time format for local device display **Available values:** 0 - HHMMSS24 2 - HHMMSS12 **Factory setting**: HHMMSS24
25	HW_ID_INFO_MODUL DIAG → Device information → Hardware identifier		Hardware identification number of the device **Range**: Octet string of size 20
26	SERIAL_NUMBER_INFO_MODUL DIAG → Device information → Serial number		Serial number of the device **Range**: Octet string of size 20
27	PROJ_VER_INFO_MODUL DIAG → Device information → Device version		Projecting version of the device **Range**: Octet string of size 20
28	SW_VERSION_INFO_MODUL		Software version of the device **Range**: Octet string of size 20
29	ORDER_CODE_INFO_MODUL DIAG → Device information → Order code		Order code of the device **Range**: Octet string of size 20
30	HW_ID_INFO_CPU DIAG → Device information → CPU → Hardware identifier		Hardware identification number of the CPU module **Range**: Octet string of size 20
31	SERIAL_NUMBER_INFO_CPU DIAG → Device information → CPU → Serial number		Serial number of the CPU module **Range**: Octet string of size 20
32	ORDER_CODE_INFO_CPU DIAG → Device information → CPU → Order code		Order Code for the CPU module **Range**: Octet string of size 20
33	HW_VERSION_INFO_CPU DIAG → Device information → CPU → Hardware version		Hardware version of the CPU **Range**: Octet string of size 20module
34	SW_VERSION_INFO_CPU DIAG → Device information → CPU → Software version		Software version of the CPU module **Range**: Octet string of size 20
35	HW_ID_INFO_BUS DIAG → Device information → Fieldbus module → Hardware identifier		Hardware identification number of the Fieldbus module **Range**: Octet string of size 20
36	SERIAL_NUMBER_INFO_BUS DIAG → Device information → Fieldbus module → Serial number		Serial number of the Fieldbus module **Range**: Octet string of size 20
37	ORDER_CODE_INFO_BUS DIAG → Device information → Fieldbus module → Order code		Order Code for the Fieldbus module **Range**: Octet string of size 20
38	HW_VERSION_INFO_BUS DIAG → Device information → Fieldbus module → Hardware version		Hardware version of the Fieldbus module **Range**: Octet string of size 20
39	SW_VERSION_INFO_BUS DIAG → Device information → Fieldbus module → Software version		Software version of the Fieldbus module **Range**: Octet string of size 20
40	HW_ID_INFO_SAMODUL DIAG → Device information → Sensor module → Hardware identifier		Hardware identification number of the Sensor module **Range**: Octet string of size 20
41	SERIAL_NUMBER_INFO_SAMODUL DIAG → Device information → Sensor module → Serial number		Serial number of the Sensor module **Range**: Octet string of size 20

SERVICE Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
42	ORDER_CODE_INFO_SAMODUL DIAG → Device information → Sensor module → Order code		Order Code for the Sensor module **Range**: Octet string of size 20
43	HW_VERSION_INFO_SAMODUL DIAG → Device information → Sensor module → Hardware version		Hardware version of the Sensor module **Range**: Octet string of size 20
44	SW_VERSION_INFO_SAMODUL DIAG → Device information → Sensor module → Software version		Software version of the Sensor module **Range**: Octet string of size 20
45	HW_ID_INFO_DISPLAY DIAG → Device information → Display → Hardware identifier		Hardware identification number of the Display module **Range**: Octet string of size 20
46	SERIAL_NUMBER_INFO_DISPLAY DIAG → Device information → Display → Serial number		Serial number of the Display module **Range**: Octet string of size 20
47	ORDER_CODE_INFO_DISPLAY DIAG → Device information → Display → Order code		Order Code for the Display module **Range**: Octet string of size 20
48	HW_VERSION_INFO_DISPLAY DIAG → Device information → Display → Hardware version		Hardware version of the Display module **Range**: Octet string of size 20
49	SW_VERSION_INFO_DISPLAY DIAG → Device information → Display → Software version		Software version of the Display module **Range**: Octet string of size 20

6.3.15. ADVDIAGDOXY Transducer Block

The properties column lists parameter properties:
- W: Parameter is writable
- OOS: Parameter is writable in OOS mode only

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

ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Proper ties	Description
14	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 DIAG → Most important message		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)
16	ACTUAL_DIAGNOSTICS DIAG → Most important message		Current diagnostic code with highest priority **Indicated values**: 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance.
17	SENSOR_INTERFACE		Connected sensor interface type **Indicated values**: 0 - Analog 1 - Digital
18	SOFTWARE_FUNCTIONALITY DIAG → Device information → Order code		Indicates software capability as Standard or Advanced like indicated in order code (i.e. MAA600E**A**D00 means standard or MAA600E**B**D00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling **Indicated values**: 0 - Standard 1 - Advanced
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_DOXY		maintenance instruction **Possible values**: 0x0000 to 0x03C1(0000 to 0961); details see chapter Diagnostic Codes and Maintenance
24	PREVIOUS_DIAG_STATUS DIAG → Past message		Previous device's FCSM information **Supported values**: 0x00 : OK 0x01 : F 0x02 : M 0x03 : C 0x04 : S 0x05 : NC (Not Categorized)
25	PREVIOUS_DIAGNOSTICS DIAG → Past message		Previous diagnostic code **Possible values**: 0x0000 to 0x0349 (0000 to 0841); details see chapter Diagnostic Codes and Maintenance

ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Proper ties	Description
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
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

ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Proper ties	Description
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	LOGBOOKS_RECORDING SETUP → General settings → Logbooks → Recording	W	Switch to enable/disable logbook recording **Available values**: 0 - Off 1 – On **Factory setting**: On
49	DATA_LOGBOOK_RECORDING SETUP → General settings → Logbooks → Data logbook → Recording	W	Switch to enable/disable data logbook recording **Available values**: 0 - Off 1 – On **Factory setting**: Off
50	SEC_SAMPLE_TIME SETUP → General settings → Logbooks → Data logbook → Sample time	W	sample interval for data logbook reading in seconds **Range**: 0 to 356400 seconds **Factory setting**: 60 seconds
51	MEAS_VALUE_TO_LOG SETUP → General settings → Logbooks → data logbook → Meas. value	W	Selection of measurement value which will be logged for data logbook **Avaliable values**: 0 - raw value 1 - Temperature 2 - Main Value **Factory setting**: Main Value
52	LOGBOOK_CMD	W	manufacturer-specific structure used for logbook read methods
53	LOGBOOK_RSP		manufacturer-specific structure used for logbook read methods
54	ENP_VERSION		Electronic name plate version number **Range**: Octet string(32) **Factory setting**: 02.02.00
55	DEVICE_TAG DIAG→Device information→TAG		Device TAG **Range**: Octet string(32) **Factory setting**: EH_Liquiline_Oxygen-<serial number>
56	SERIAL_NUMBER DIAG→Device information→ Serial number		serial number of the device **Range**: Octet string(16) **Example**: J3047B05G00
57	ORDER_CODE_EXT		extended order code, part 1; not used **Range**: Octet string(32) **Factory setting**: 32 blanks
58	ORDER_CODE_EXT_P2		extended order code, part 2; not used **Range**: Octet string(32) **Factory setting**: 32 blanks
59	ORDER_CODE DIAG→Device information→ Order code		order code **Range**: Octet string(32) **Example**: MAA610EBD00
60	FIRMWARE_VERSION DIAG → Device information → Device version		firmware version of the device **Range**: Octet string(32) **Example**: 02.01.00-0042
61	DEVICE_ID DIAG → Device information → Fieldbusmodule → FF settings→ Device ID		Device ID **Range**: Octet string(32) **Factory setting**: 452B4810A0-<serial number>

ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Proper ties	Description
62	DEVICE_REV DIAG → Device information → Fieldbusmodule → FF settings→ Device revision		Device Revision **Range**: 00 to FFh
63	DEV_DESCR_REV DIAG → Device information → Fieldbusmodule → FF settings→ DD revision		initial Device Description Revision **Range**: 00 to FFh
64	DL_DEVICE_CLASS DIAG → Device information → Fieldbusmodule → FF settings→ 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
65	BOOT_DEVICE_CLASS DIAG → Device information → Fieldbusmodule → FF settings→ Boot device class SETUP → General settings → 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
66	NODE_ADDRESS DIAG → Device information → Fieldbusmodule → FF settings→ 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)
67	CURRENT_SLOT_TIME DIAG → Device information → Fieldbusmodule → FF settings→ 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)
68	CURRENT_MIN_INTER_PDU_DELAY DIAG → Device information → Fieldbusmodule → FF settings→ Current MID		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)
69	CURRENT_MAX_RESPONSE_DELAY DIAG → Device information → Fieldbusmodule → FF settings→ Current MRD		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)
70	FEASIBLE_SLOT_TIME DIAG → Device information → Fieldbusmodule → FF settings→ 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)
71	FEASIBLE_MIN_INTER_PDU_DELAY DIAG → Device information → Fieldbusmodule → FF settings→ Feasible MID		minimum inter PDU (protocol data unit) delay provided by device **Range**: 00h to FFh, unit in octet time (8 * 1/32 ms = 256 **Factory setting**: 10 (2.56 ms)
72	FEASIBLE_MAX_RESPONSE_DELAY DIAG → Device information → Fieldbusmodule → FF settings→ Feasible MRD		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)

ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
73	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 104　　　104 Sensor supply voltage bad 140　　　140 Leakage current alarm 145　　　145 Leakage current warning 180　　　180 Cal. expired alarm 181　　　181 Number of. sterilizations alarm 215　　　215 Simulation active 322　　　322 Meas. value out of range 532　　　532 Calibration timer expired 802　　　802 Process check system alarm 810　　　810 PV upper limit 811　　　811 PV lower limit 812　　　812 Temperature 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
74	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 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: 3, 11, 12, 13, 104, 119, 120, 127, 128, 140, 203, 327, 332
75	FIXED_AREA_30		Current list of diagnostic events in Electronic Highest Severity group (bit 30 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: 218, 380, 381
76	FIXED_AREA_29		Current list of diagnostic events in Config Highest Severity group (bit 29 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: 513

ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
77	FIXED_AREA_28		Current list of diagnostic events in Process Highest Severity group (bit 28 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: 802, 810, 811, 812
78	FIXED_AREA_27		Current list of diagnostic events in Sensor High Severity group (bit 27 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: 4, 10, 14, 129, 130, 328, 329, 330, 331
79	FIXED_AREA_26		Current list of diagnostic events in Electronic High Severity group (bit 26 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: 219
80	FIXED_AREA_25		Current list of diagnostic events in Config High Severity group (bit 25 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: 215,406,407,409
81	FIXED_AREA_24		Current list of diagnostic events in Process High Severity group (bit 24 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: Empty

ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
82	FIXED_AREA_23		Current list of diagnostic events in Sensor Low Severity group (bit 23 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: 322, 333
83	FIXED_AREA_22		Current list of diagnostic events in Electronic Low Severity group (bit 22 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: Empty
84	FIXED_AREA_21		Current list of diagnostic events in Config Low Severity group (bit 21 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: 404, 405, 530, 531
85	FIXED_AREA_20		Current list of diagnostic events in Process Low Severity group (bit 20 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: Empty
86	FIXED_AREA_19		Current list of diagnostic events in Sensor Lowest Severity group (bit 19 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: 131, 132, 134, 135, 136, 137, 138, 139, 143, 144, 145, 162, 163, 166, 167, 168, 169, 170, 171, 172, 173, 180, 181, 183, 189, 190, 191, 192, 193, 198, 222, 223, 224, 225, 226, 227, 228, 229, 328, 329, 330, 331, 902, 903, 904, 905, 906, 907, 908

ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
87	FIXED_AREA_18		Current list of diagnostic events in Electronic Lowest Severity group (bit 18 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: Empty
88	FIXED_AREA_17		Current list of diagnostic events in Config Lowest Severity group (bit 17 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: 501, 514, 532
89	FIXED_AREA_16		Current list of diagnostic events in Process Lowest Severity group (bit 16 of manufacturer specific conditions) **Range**: Array of Unsigned16 values **Available values**: 0x0000 to 0x0349 (0000 to 0841) details see chapter Diagnostic Codes and Maintenance 7FFCh – Not categorized 7FFDh – Moved to Configurable Area 7FFEh - Empty **Factory setting**: 182, 408, 840, 841
90	ADVDIAG_DIAG_EXE_BLOCK		For development only
91	ADVDIAG_DIAG_EXE_MAX		For development only
92	ADVDIAG_DIAG_EXE_MIN		For development only
93	ADVDIAG_DIAG_EXE_CUR		For development only
94	ADVDIAG_DIAG_EXE_RESET		For development only
95	ADVDIAG_DIAG_EXE_CAT		For development only
96	ADVDIAG_DIAG_EXE_COUNT		For development only
97	STATUS_SELECT_003_DOXY	W	optional status setting for diagnostic code 003 (Temperature sensor failure) **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 0xFF - UNMODIFIED Value UNMODIFIED _NC_NON_SPECIFIC means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** UNMODIFIED

ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
98	STATUS_SELECT_104_ DOXY	W	optional status setting for diagnostic code 104 (Sensor supply voltage bad) **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 0xFF - UNMODIFIED Value UNMODIFIED means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** UNMODIFIED
99	STATUS_SELECT_140_ DOXY	W	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 0xFF - UNMODIFIED Value UNMODIFIED means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** UNMODIFIED
100	STATUS_SELECT_145_ DOXY	W	optional status setting for diagnostic code 145 (Leakage current warning) **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 0xFF - UNMODIFIED Value UNMODIFIED means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** UNMODIFIED
101	STATUS_SELECT_180_ DOXY	W	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 0xFF - UNMODIFIED Value UNMODIFIED means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** UNMODIFIED

ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
102	STATUS_SELECT_181_ DOXY	W	optional status setting for diagnostic code 181 (Number of sterilizations 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 0xFF - UNMODIFIED Value UNMODIFIED means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** UNMODIFIED
103	STATUS_SELECT_215_ DOXY	W	optional status setting for diagnostic code 1215 (Simulation active) **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 0xFF - UNMODIFIED Value UNMODIFIED means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** UNMODIFIED
104	STATUS_SELECT_322_ DOXY	W	optional status setting for diagnostic code 322 (Meas. value 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 0xFF - UNMODIFIED Value UNMODIFIED means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** UNMODIFIED
105	STATUS_SELECT_532_ DOXY	W	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 0xFF - UNMODIFIED Value UNMODIFIED means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** UNMODIFIED

ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
106	STATUS_SELECT_802_ DOXY	W	optional status setting for diagnostic code 802 (Process check system 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 0xFF - UNMODIFIED Value GOOD_NC_NON_SPECIFIC means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** GOOD_NC_NON_SPECIFIC
107	STATUS_SELECT_810_ DOXY	W	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 0xFF - UNMODIFIED Value UNMODIFIED means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** UNMODIFIED
108	STATUS_SELECT_811_ DOXY	W	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 0xFF - UNMODIFIED Value UNMODIFIED means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** UNMODIFIED
109	STATUS_SELECT_812_ DOXY	W	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 0xFF - UNMODIFIED Value UNMODIFIED means that the measurement status will NOT be changed and transferred as received from the measurement unit. **Factory setting:** UNMODIFIED

Parameter index	Parameter Local Display Menu Path	Properties	Description
	ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)		
110	TOTAL_OPERATING_TIME_DOXY		Total operating time of the device; will be reset by factory default command
111	AVAILABILITY_DOXY		Availability of the device since last counter reset: (Operating time - Time in failure) / Operating time * 100 since last counter reset
112	OPERATING_TIME_DOXY		Operating time of the device since last counter reset
113	TIME_IN_FAILURE_DOXY		Operating time of the device with NAMUR F status signal since last counter reset
114	NUMBER_OF_FAILURES_DOXY		Number of failures since last counter reset
115	MTBF_DOXY		Mean time between failures: (Operating time - Time in failure) / Number of failures
116	MTTR_DOXY		Mean time to repair: Time in failure / Number of failures
117	TIME_IN_CALIBRATION_DOXY		Operating time of the device with calibration status since last counter reset.
118	NO_OF_CALIBRATIONS_DOXY		Number of calibrations since last counter reset
119	MTBC_DOXY		Mean time between calibrations: (Operating time - Time in calibration / No. of calibrations Calibration = one point validation against known standard solution Adjustment = change slope and offset of the sensor
120	RESET_COUNTERS_DOXY	W	This method resets current number of failures and calibrations, time in failure, time in calibration and the operating time value since last reset.
121	ACTUAL_NAMUR_CLASS_1		NAMUR class of first entry in diagnostics list **Available values:** 0x01 : F 0x02 : M 0x03 : C 0x04 : S
122	ACTUAL_NAMUR_CLASS_2		NAMUR class of second entry in diagnostics list **Available values:** 0x01 : F 0x02 : M 0x03 : C 0x04 : S
123	ACTUAL_NAMUR_CLASS_3		NAMUR class of third entry in diagnostics list **Available values:** 0x01 : F 0x02 : M 0x03 : C 0x04 : S
124	ACTUAL_NAMUR_CLASS_4		NAMUR class of fourth entry in diagnostics list **Available values:** 0x01 : F 0x02 : M 0x03 : C 0x04 : S
125	ACTUAL_NAMUR_CLASS_5		NAMUR class of fifth entry in diagnostics list **Available values:** 0x01 : F 0x02 : M 0x03 : C 0x04 : S
126	ACTUAL_NAMUR_CLASS_6		NAMUR class of sixth entry in diagnostics list **Available values:** 0x01 : F 0x02 : M 0x03 : C 0x04 : S
127	ACTUAL_NAMUR_CLASS_7		NAMUR class of seventh entry in diagnostics list **Available values:** 0x01 : F 0x02 : M 0x03 : C 0x04 : S

ADVDIAGDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
128	ACTUAL_NAMUR_CLASS_8		NAMUR class of eighth entry in diagnostics list **Available values**: 0x01 : F 0x02 : M 0x03 : C 0x04 : S
129	ACTUAL_NAMUR_CLASS_9		NAMUR class of ninth entry in diagnostics list **Available values**: 0x01 : F 0x02 : M 0x03 : C 0x04 : S
1340	ACTUAL_NAMUR_CLASS_10		NAMUR class of tenth entry in diagnostics list **Available values**: 0x01 : F 0x02 : M 0x03 : C 0x04 : S
131	ADVDIAG_EXE_TWOTIMEMAX		For development only
132	ADVDIAG_EXE_THREETIMEMAX		For development only
133	DATE_OF_LAST_CALIB_DOXY		Date of last calibration
134	DAYS_SINCE_LAST_CALIB_DOXY		Days since last calibration
135	CAL_DATE_CURRENT_1_DOXY		Current calibration date 1containing DO zero point
136	CAL_DATE_CURRENT_2_DOXY		Current calibration date 2containing DO slope
137	HEARTBEAT_DOXY		Heartbeat diagnostic option Depends on order code. Examples: CM42-OAA600**EHE**00 --> with Heartbeat option CM42-OAA600**EAE**00 or CM42-OAA600**EBE**00 --> without Heartbeat option **Available values**: 0: No 1: Yes

6.3.16. DISPLAYDOXY Transducer Block

The properties column lists parameter properties:
- W: Parameter is writable
- OOS: Parameter is writable in OOS mode only

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

DISPLAYDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
14	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 DIAG → Most important message		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)
16	ACTUAL_DIAGNOSTICS DIAG → Most important message		Current diagnostic code with highest priority **Indicated values:** 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance..

DISPLAYDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
17	SENSOR_INTERFACE		Connected sensor interface type **Indicated values:** 0 - Analog 1 - Digital
18	SOFTWARE_FUNCTIONALITY DIAG → Device information → Order code		Indicates software capability as Standard or Advanced like indicated in order code (i.e. MAA600E**A**D00 means standard or MAA600E**B**D00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling **Indicated values:** 0 - Standard 1 - Advanced
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 SETUP → 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
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
24	DISPLAY_TEMPERATURE_UNIT SETUP → Display → Temperature unit	W	Select temperature unit used for the local device display **Available values:** 1001 - Celsius 1002 – Fahrenheit **Factory setting:** Celsius
25	DISPLAY_TEMP_VALUE_FORMAT_DOXY SETUP → Display → Temperature format	W	Select format of the temperature value used for the local device display **Available values:** 352 - XXX 353 - XXX.X **Factory setting:**XXX.X
26	MAIN_MEASURED_VALUE SETUP → Sensor DO → Measured value		Select measurement mode **Available values:** 0: Meas. current (nA) 1: Part. Press. (hPa) 2: % saturation 3: Conc. (liquid) 4: Conc. (gaseous)

Parameter index	Parameter Local Display Menu Path	Properties	Description
27	DISPLAY_MAIN_VALUE_FORMAT_DOXY SETUP → Display → Main value format	W	Select format of the main value used for the local device display **Available values:** 272 (0x110): XXXXX 273 (0x111): XXX_X 274 (0x112): XX_XX 275 (0x113): X_XXX **Factory setting:** depends on setting of MAIN_MEASURED_VALUE
28	DISPLAY_NA_MAIN_VAL_FORMAT SETUP → Display → Main value format	W	Select format of the temperature value used for the local display of the device **Available values:** 272 (0x110): XXXXX 273 (0x111): XXX_X 274 (0x112): XX_XX 275 (0x113): X_XXX **Factory setting:** XX_XX
29	DISPLAY_HPA_MAIN_VAL_FORMAT SETUP → Display → Main value format	W	Select format of the partial pressure value used for the local display of the device **Available values:** 272 (0x110): XXXXX 273 (0x111): XXX_X 274 (0x112): XX_XX 275 (0x113): X_XXX **Factory setting:** XXX_X
30	DISPLAY_SAT_MAIN_VAL_FORMAT SETUP → Display → Main value format	W	Select format of the saturation value used for the local display of the device **Available values:** 272 (0x110): XXXXX 273 (0x111): XXX_X 274 (0x112): XX_XX 275 (0x113): X_XXX **Factory setting:** XX_XX
31	DISPLAY_LIQ_CONC_MAIN_VAL_FORMAT SETUP → Display → Main value format SETUP → Display → Main value format	W	Select format of the liquid concentration value used for the local display of the device **Available values:** 272 (0x110): XXXXX 273 (0x111): XXX_X 274 (0x112): XX_XX 275 (0x113): X_XXX **Factory setting:** XX_XX
32	DISPLAY_GAS_CONC_MAIN_VAL_FORMAT	W	Select format of the gaseous concentration value used for the local display of the device **Available values:** 272 (0x110): XXXXX 273 (0x111): XXX_X 274 (0x112): XX_XX 275 (0x113): X_XXX **Factory setting:** XX_XX
33	DISPLAY_LIQ_CONCENTRATION_UNIT SETUP → Sensor DO → Conc. (liquid)	W	Selected liquid concentration unit for the local display of the device **Available values:** 1608: mg/L 65521: µg/L 1423: ppm 1424: ppb **Factory setting:** mg/L
34	DISPLAY_GAS_CONCENTRATION_UNIT SETUP → Sensor DO → Conc. (gaseous)	W	Selected gaseous concentration unit for the local display of the device **Available values:** 1651: Vol.-% 65526: Vol-ppm **Factory setting:** Vol.-%

Table title (spanning header): DISPLAYDOXY Transducer Block (manufacturer-specific parameters)

DISPLAYDOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
35	DOXY_SENSOR_TYPE		Indicates sensor type **Available values**: 0: COS21D A 1: COS21D B 2: COS21D C 3: COS51D 50µm 4: COS51D 25µm 5: COS81D 6: COS22D
36	DISPLAY_TAU_MAIN_VAL_FORMAT	W	Select format of the raw value tau value used for the local display of the device **Available values**: 0x110: XXXXX 0x111: XXX_X 0x112: XX_XX 0x113: X_XXX **Factory setting**: 0x111: XXX_X

6.3.17. MEMODOXY Transducer Block

The properties column lists parameter properties:
- W: Parameter is writable
- OOS: Parameter is writable in OOS mode only

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

MEMODOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Proper ties	Description
14	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 DIAG → Most important message		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)
16	ACTUAL_DIAGNOSTICS DIAG → Most important message		Current diagnostic code with highest priority **Indicated values**: 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance.
17	SENSOR_INTERFACE		Connected sensor interface type **Indicated values**: 0 - Analog 1 - Digital
18	SOFTWARE_FUNCTIONALITY DIAG → Device information → Order code		Indicates software capability as Standard or Advanced like indicated in order code (i.e. OAA600E**A**D00 means standard or OAA600E**B**D00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling **Indicated values**: 0 - Standard 1 - Advanced

Parameter index	Parameter Local Display Menu Path	Properties	Description
	MEMODOXY Transducer Block (manufacturer-specific parameters)		
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 SETUP→General settings→Sensor check	W	Switch to enable or disable checking which sensors are accepted at the field device. If enabled, only those sensors are accepted whereTAG Number or Group in sensor and transmitter match **Available values:** 0 - None 1 - Group 2 - Sensor TAG **Factory setting**: None
22	CONFIGURED_TAG_NUMBER SETUP → General settings → TAG		Configured TAG number for the device
23	TAG_NUMBER_SENSOR DIAG → Sensor information → Identification → TAG number		TAG number of the sensor
24	CONFIGURED_TAG_GROUP SETUP → General settings → TAG group	W	Configured TAG group for the device **Available values:** 0 to FFFFh **Factory setting**: 0
25	TAG_GROUP_SENSOR DIAG → Sensor information → Identification → TAG group		TAG Group of the sensor **Possible values:** 0 to FFFFh
26	SERIAL_NUMBER_INFO_SENSOR DIAG→Sensor information→Identification→Serial number		Serial number of the sensor **Example**: E6052605PIO
27	ORDER_CODE_INFO_SENSOR DIAG → Sensor information → Identification → Order code		Order code for the sensor **Example**: COS22D-AA1B21
28	HW_VERSION_INFO_SENSOR DIAG → Sensor information → Identification → Hardware version		Sensor hardware version **Example**: 2
29	SW_VERSION_INFO_SENSOR DIAG → Sensor information → Identification → Software version		Sensor software version **Example**: 10002 (i.e. 01.00.02)
30	TYPE_OF_CALIBRATION DIAG → Sensor information → Calibration → Mode (non-COS81D) ot DIAG → Sensor information → Calibration →Point at oxygen → Mode		Calibration type for non-COS81D sensor types and for Point at oxygen calibration method of COS81D
31	CAL_S_N_TRANSMITTER DIAG → Sensor information → Calibration → Serial number		Serial number of the transmitter used for zero point/slope calibration **Example**: 91094905G00
32	TEMP_CAL_S_N_TRANSMITTER DIAG → Sensor information → Calibration → Temperature → Serial number		Serial number of the transmitter used for temperature calibration **Example**: 91094905G00
33	TEMP_CAL_DATE_SENSOR DIAG → Sensor information → Calibration → Temperature → Date		Temperature calibration date and time **Range**: DATE format (size 7) according to FF specification 870
34	SPEC_MAX_TEMPERATURE_SENSOR DIAG → Sensor information → Max. operating values → Max. temperature		Maximum temperature the sensor can be exposed to unit: °C; value depends on sensor type
35	SPEC_MIN_TEMPERATURE_SENSOR DIAG → Sensor information → Max. operating values → Min. temperature		Minimum temperature the sensor can be exposed to unit: °C; value depends on sensor type

Parameter index	Parameter Local Display Menu Path	Proper ties	Description
36	TEMP_OFFSET_SENSOR DIAG → Sensor information → Calibration → Temperature → Temp. offset		Temperature Offset unit: K
37	MAX_TEMPERATURE_SENSOR DIAG → Sensor information → Max. operating values → Max. temperature		Maximum temperature the sensor has been exposed to unit: ℃
38	MIN_TEMPERATURE_SENSOR DIAG → Sensor information → Max. operating values → Min. temperature		Minimum temperature the sensor has been exposed to unit: ℃
39	COMMISSIONING_DATE_SENSOR DIAG → Sensor information → Identification → Commissioning date		Sensor commissioning date **Range**: DATE format (size 7) according to FF specification 870
40	OPERATING_TIME_SENSOR DIAG → Sensor information → Operating hours → Operating time		Total sensor operating time unit: hours
41	TIME_OVER_80_C_SENSOR DIAG → Sensor information → Operating hours → Usage >80℃		Total sensor operating time over 80 ℃ unit: hours
42	NO_OF_STERILISATIONS_SENSOR DIAG → Sensor information → Operating hours → No. steril. sensor		Total sterilisation counts of the sensor
43	CAL_NUMBER_SENSOR DIAG → Sensor information → Calibration → No. cal sensor		Number of calibrations performed with current sensor
44	CAL_DATE_ZEROPOINT_SENSOR DIAG → Sensor information → Calibration → Zero point → Date		Sensor zero point calibration date and time **Range**: DATE format (size 7) according to FF specification 870
45	CAL_NUMBER_CAP DIAG → Sensor information → Operating time → No. cal cap		Number of cap calibrations
46	NO_OF_STERILISATIONS_CAP DIAG → Sensor information → Operating time → No. steril. cap		Total sterilisation counts of the cap
47	CAL_DATE_SLOPE_SENSOR DIAG → Sensor information → Calibration → Slope → Date		Sensor slope calibration date and time **Range**: DATE format according to FF specification 870
48	DOXY_SENSOR_TYPE		Indicates sensor type **Possible values**: 0: COS21D A 1: COS21D B 2: COS21D C 3: COS51D 50µm 4: COS51D 25µm 5: COS81D 6: COS22D **Default value**: depends on connected sensor
49	SLOPE_SENSOR DIAG → Sensor information → Calibration → Slope → Slope		Calibration value of Sensor Slope unit: pA/hPa
50	ZERO_SENSOR DIAG → Sensor information → Calibration → Zero point → Zero point		Calibration value of Sensor Zeropoint unit: nA
51	DELTA_SLOPE_SENSOR DIAG → Sensor information → Calibration → Slope → Delta slope		Slope difference between the last two calibrations unit: pA/hPa
52	DELTA_ZEROPOINT_SENSOR DIAG → Sensor information → Calibration → Zero point → Delta zeropnt.		Zeropoint difference between the last two calibrations unit: nA
53	TIME_OVER_40C_SENSOR DIAG → Sensor information → Operating time → Usage >40℃		Total sensor operating time over 40 ℃ unit: hrs

Table header: MEMODOXY Transducer Block (manufacturer-specific parameters)

Parameter index	Parameter / Local Display Menu Path	Proper ties	Description
	MEMODOXY Transducer Block (manufacturer-specific parameters)		
54	TIME_OVER_15NA_SENSOR DIAG → Sensor information → Operating time → Usage >15nA		Total sensor operating time over 15 nA unit: hrs
55	TIME_OVER_50NA_SENSOR DIAG → Sensor information → Operating time → Usage >50nA		Total sensor operating time over 50 nA unit: hrs
56	TIME_OVER_5C_SENSOR DIAG → Sensor information → Operating time → Usage >5℃		Total sensor operating time over 5 ℃ unit: hrs
57	TIME_OVER_30C_SENSOR DIAG → Sensor information → Operating time → Usage >30℃		Total sensor operating time over 30 ℃ unit: hrs
58	TIME_OVER_30NA_SENSOR DIAG → Sensor information → Operating time → Usage >30nA		Total sensor operating time over 30 nA unit: hrs
59	TIME_OVER_160NA_SENSOR DIAG → Sensor information → Operating time → Usage >160nA		Total sensor operating time over 160 nA unit: hrs
60	TIME_UNDER_5C_SENSOR DIAG → Sensor information → Operating time → Usage <5℃		Total sensor operating time under 5 ℃ unit: hrs
61	TIME_OVER_120C_SENSOR DIAG → Sensor information → Operating time → Usage >120℃		Total sensor operating time over 120 ℃ unit: hrs
62	POLARISATION_VOLTAGE_SENSOR SETUP → Sensor DO → Sensor pol. Voltage → Adjust		temporary slope after calibration unit: mV
63	CHARGE DIAG → Sensor information → Operating time → Charge		Current charge value unit: nA * sec.
64	MINDOXYGEN_SPECIFICATION DIAG → Sensor information → Specification → Min. main meas. value		Specified minimum oxygen measurement value unit: hPa
65	MAXDOXYGEN_SPECIFICATION DIAG → Sensor information → Specification → Max. main meas. value		Specified maximum oxygen measurement value unit: hPa
66	CAL_ZERO_NORMALIZED_TAU_0 DIAG → Sensor information → Calibration → Zero point → Normalized Tau0		The calculated, normed Tau0 value of the recent zero point calibration. unit: µs
67	CAL_ZERO_VALID		Indicates validity of zero point calibration **Available values:** 0 – FALSE 1 - TRUE
68	SENSOR_CAL_VALID		Validity of the displayed calibration parameter for main measurement **Available values:** 0 – FALSE 1 - TRUE
69	SENSOR_CAL_TEMP_VALID		Validity of the displayed calibration parameter for temperature measurement **Available values:** 0 – FALSE 1 - TRUE
70	SENSOR_CONNECTED		Indicates current Memosens connection state **Available values:** 0 to 29: not connected 30 - connected
71	TYPE_OF_CALIBRATION_COS8X DIAG → Sensor information → Calibration → Zero point →Mode		Calibration type (for COS81D sensor types)

MEMODOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Properties	Description
72	SELECT_CALIB_HISTORY_TYPE_DOXY DIAG → Sensor information → Calibration → Calibration history → Calibration type	W	Select sensor calibration data type. Valid only for COS81D sensor. **Available values:** 0 - Point at oxygen 1 - Zero point
73	AVAILABLE_CALIB_HISTORY_DOXY		Available number of calibration data sets **Available values:** 0 to 9
74	SELECTED_SENSOR_CALDATA_DOXY DIAG → Sensor information → Calibration → Calibration history → Calibration or DIAG → Sensor information → Calibration → Zero point → Calibration or DIAG → Sensor information → Calibration → Point at oxygen → Calibration	W	Choose between available calibration data sets **Available values:** 0 - current data set 1 - recent data set 1 2 - recent data set 2 3 - recent data set 3 4 - recent data set 4 5 - recent data set 5 6 - recent data set 6 7 - recent data set 7 8 - recent data set 8 9 - factory calibration data 10 - reference 11 - Current cal
75	CAL_ZERO_NUMBER_SENSOR DIAG → Sensor information → Calibration → Zero point →No. cal. sensor		Zero point calibration number
76	CAL_PNT_AT_OXYGEN_NUMBER DIAG → Sensor information → Calibration → Point at oxygen →No. cal. sensor		Point at oxygen calibration number
77	CAL_PNT_AT_OXYGEN_CAP_NUMBER DIAG → Sensor information → Calibration → Point at oxygen →No. cal. cap		Point at oxygen cap calibration number
78	CAL_ZERO_CAP_NUMBER DIAG → Sensor information → Calibration → Zero point →No. cal. cap		Zero point cap calibration number
79	CAL_ZERO_S_N_TRANSMITTER DIAG → Sensor information → Calibration → Zero point →Sereil number		Serial number of the transmitter used for zero point calibration example: 91094905G00
80	CAP_NAME DIAG → Sensor information → Identification → Cap name		The name or the ID of the currently used cap
81	AUTOCLAVINGS DIAG → Sensor information →Sensor operation → No. autoclavings		Number of autoclavings. The number of autoclavings will not be increased automatically. It can only be increased manually.
82	CAP_OPERATING_TIME DIAG → Sensor information → Cap operation → Operating time		Cap period of use unit:hours

Parameter index	Parameter Local Display Menu Path	Proper ties	Description
83	CAP_OP_TIME_T1 DIAG → Sensor information →Cap operation → Cap usage T1		Cap period of use at criteria T1 unit:hours
84	CAP_OP_TIME_T1_CRITERIA DIAG → Sensor information →Cap operation → T1		The criteria T1. If the criteria "> 40 ℃ / 104 ℉" is satisfied the corresponding operating time will be increased.
85	CAP_OP_TIME_T2 DIAG → Sensor information → Cap operation → Cap usage T2		Cap period of use at criteria T2 unit:hours
86	CAP_OP_TIME_T2_CRITERIA DIAG → Sensor information → Cap operation → T2		The criteria T2. If the criteria" > 80 ℃ / 176 ℉" is satisfied the corresponding operating time will be increased.
87	CAP_OP_TIME_T3 DIAG → Sensor information → Cap operation → Cap usage T3		Cap period of use at criteria T3 unit:hours
88	CAP_OP_TIME_T3_CRITERIA DIAG → Sensor information → Cap operation → T3		The criteria T3. If the criteria "> 80 ℃ / 176 ℉ "is satisfied the corresponding operating time will be increased.
89	CAP_OP_TIME_T4 DIAG → Sensor information → Cap operation → Cap usage T4		Cap period of use at criteria T4 unit:hours
90	CAP_OP_TIME_T4_CRITERIA DIAG → Sensor information → Cap operation → T4		The criteria T4. If the criteria "< 5 ℃ / 41 ℉" is satisfied the corresponding operating time will be increased.
91	CAP_CIP_CYCLES DIAG → Sensor information → Cap operation →CIP cycles cap		Number of cap CIP cycles. This counter will be reset after a cap change
92	CIP_CYCLES DIAG → Sensor information →Sesnor operation → CIP cycles or DIAF → Sensor status → Operating information → CIP cycles		Number of CIP cycles
93	CAP_AUTOCLAVINGS DIAG → Sensor information → Sensor information → Cap operation →No. cap autoclavings		Number of cap autoclavings. This counter will be reset after a cap change.
94	CAL_ZERO_NORMALIZED_KSV DIAG → Sensor information →Calibration → Zero point →Normalized Ksv		The calculated, normed Ksv value of the recent zero point calibration. unit: 1/MPa

Table title (spanning all columns): MEMODOXY Transducer Block (manufacturer-specific parameters)

	MEMODOXY Transducer Block (manufacturer-specific parameters)		
Parameter index	Parameter Local Display Menu Path	Proper ties	Description
95	CAL_ZERO_QUALITY_INDEX DIAG → Sensor information →Calibration → Zero point → Cal. Quality index		The calibration quality of the recent zero point calibration. unit: percent
96	CAL_PNT_AT_OXY_NORMALIZED_TAU_0 DIAG → Sensor information →Calibration → Point at oxygen → Normalized Tau0		The calculated, normed Tau0 value of the recent point at oxygen calibration. unit: µs
97	CAL_PNT_AT_OXY_NORMALIZED_KSV DIAG → Sensor information → Calibration → Point at oxygen → Normalized Ksv		The calculated, normed Ksv value of the recent point at oxygen calibration. unit: 1/MPa
98	CAL_PNT_AT_OXY_QUALITY_INDEX DIAG → Sensor information → Calibration → Point at oxygen →Cal. Quality index		The calibration quality of the recent point at oxygen calibration. unit: percent
99	CAL_FERMENTER_DATE DIAG → Sensor information →Calibration → Fermenter scaling → Date/Time		Date and time when the recent fermenter scaling had been executed.
100	FERMENTER_SCALING_ACTIVE		Fermenter scaling active state **Available values:** 0 - FALSE 1 - TRUE
101	FERMENTER_SCALING DIAG → Sensor information →Calibration → Fermenter scaling → Scaling factor		The fermenter scaling factor is applied on the saturation value. So it is possible to set the saturation value to a requested start value.
102	CAL_FERMENTER_S_N_TRANSMITTER DIAG → Sensor information → Calibration → Fermenter scaling →Serial number		The transmitter serial number used for the execution of the recent fermenter scaling. example: 91094905G00
103	TEMP_CAL_TYPE_SENSOR_DOXY DIAG → Sensor information →Calibration → Temperature → Mode		Temperature calibration mode
104	OP_HOURS_AT_TEMP_CAL DIAG → Sensor information →Calibration → Temperature → Op. time at cal.		Operation time at temperature calibration unit:hours
105	TEMP_CAL_COUNT_DOXY DIAG → Sensor information →Calibration → temperature → No. cal. sensor		temperature calibration counter of the sensor
106	OP_HOURS_AT_ZERO_CAL DIAG → Sensor information →Calibration → Zero point → Op. time at cal.		Operation time at zero point calibration unit:hours
107	OP_HOURS_AT_CAP_ZERO_CAL DIAG → Sensor information →Calibration → Zero point → Op. time at cal. cap		Operation time at zero pont cap calibration unit:hours

MEMODOXY Transducer Block (manufacturer-specific parameters)			
Parameter index	Parameter Local Display Menu Path	Proper ties	Description
108	OP_HOURS_AT_PNT_AT_OXY_CAL DIAG → Sensor information →Calibration → Point at oxygen → Op. time at cal.		Operation time at point at oxygen calibration unit:hours
109	OP_HRS_AT_CAP_PNT_AT_OXY_CAL DIAG → Sensor information → Calibration → Point at oxygen →Op. time at cal. cap		Operation time at point at oxygen cap calibration unit:hours
110	LATEST_CAL_SELECTION DIAG → Sensor status →Latest cal. Result → Cal. selection		Indication of recent executed calibration type **Available values:** 0 - Point at oxygen 1 - Zero point
111	REFERENCE_CAL_VALID		Validity state of the reference calibration **Available values:** 0 - FALSE 1 - TRUE
112	CURRENT_CAL_VALID		Validity state of the curent calibration **Available values:** 0 - FALSE 1 - TRUE
113	CURRENT_QUALITY_INDEX DIAG → Sensor status →Latest cal. Result → Cal. Quality index		Indication of the current quality index unit: percent
114	CURRENT_TAU_0 DIAG → Sensor status →Latest cal. Result → Normalized Tau0		Indication of the current Tau0 value unit: µs
115	CURRENT_KSV DIAG → Sensor status →Latest cal. Result → Normalized Ksv		Indication of the current Ksv value unit: 1/MPa
116	UNIT_TEMPERATURE_VALUE_DOXY		Indication of the temperature unit **Available values:** 1000 - Celsius 1001 - Fahrenheit
117	NUMBER_OF_CALIBRATIONS DIAG → Sensor information →Sensor operation → No. calibrations		Total number of sensor calibrations

6.3.18. DIAGDOXY Transducer Block

The properties column lists parameter properties:
- W: Parameter is writable
- OOS: Parameter is writable in OOS mode only

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

DIAGDOXY Transducer Block (manufacturer-specific parameters)			
Param eter index	Parameter Local Display Menu Path	Proper ties	Description
14	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 DIAG → Most important message		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)
16	ACTUAL_DIAGNOSTICS DIAG → Most important message		Current diagnostic code with highest priority **Indicated values:** 0x0000 to 0x0349(0000 to 0841); details see chapter Diagnostic Codes and Maintenance.
17	SENSOR_INTERFACE		Connected sensor interface type **Indicated values:** 0 - Analog 1 - Digital
18	SOFTWARE_FUNCTIONALITY DIAG → Device information → Order code		Indicates software capability as Standard or Advanced like indicated in order code (i.e. OAA600E**A**D00 means standard or OAA600E**B**D00 means advanced). Advanced functionality contains functions like additional diagnostics, logbooks, table handling **Indicated values:** 0 - Standard 1 - Advanced
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 SETUP → Sensor DO → Sensor diagnostics → Diag. function	W	Switch to enable or disable diagnostics functions **Available values:** 0 - Off 1 – On **Factory setting**: On
22	HOUSING_MONITORING SETUP → Sensor DO → Sensor diagnostics → Housing monitoring	W	Switch to enable or disable monitoring, if the housing is open **Available values:** 0 - Off 1 – On **Factory setting**: Off
23	FUNCTION_OPERATING_TIME SETUP → Sensor DO → Sensor diagnostics →Operating hours → Function	W	Switch to enable or disable operating time diagnostic limits **Available values:** 0 - Off 1 – On **Factory setting**: Off
24	WARNING_OP_TIME_LIMIT SETUP → Sensor DO → Sensor diagnostics →Operating hours → Operating time → Warning level	W	Warning limit for operating time **Range:** 1 to ALARM_OP_TIME_LIMIT-1 hours **Factory setting**: 10000 hours (416 days)
25	ALARM_OP_TIME_LIMIT SETUP → Sensor DO → Sensor diagnostics →Operating hours → Operating time → Alarm level	W	Alarm limit for operating time **Range:** WARNING_OP_TIME_LIMIT+1 to 50000 hours **Factory setting**: 15000 hours (625 days)

Param eter index	Parameter / Local Display Menu Path	Proper ties	Description
	DIAGDOXY Transducer Block (manufacturer-specific parameters)		
26	WARNING_OP_TIME_OVER_80C_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Usage >80℃ → Warning level	W	Warning limit for operating time over 80 ℃ **Range:** 1 to ALARM_OP_TIME_OVER_80C_LIMIT-1 hours **Factory setting:** 15000 hours (625 days)
27	ALARM_OP_TIME_OVER_80C_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Usage >80℃ → Alarm level	W	Alarm limit for operating time over 80 ℃ **Range:** WARNING_OP_TIME_OVER_80C_LIMIT +1 to 50000 hours **Factory setting:** 15000 hours (625 days)
28	FUNCTION_STERILISATION_COUNTER SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Sterilzation cnt. → Function	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
29	WARNING_STERILISATION_CNT_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Sterilzation cnt. →Warning level	W	Warning limit for sterilisation counter **Range:** 1 to ALARM_STERILISATION_CNT_LIMIT-1 **Factory setting:**) 30
30	ALARM_STERILISATION_CNT_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Sterilzation cnt. → Alarm level	W	Alarm limit for sterilisation counter **Range:** WARNING_STERILISATION_CNT_LIMIT+1 to 50000 **Factory setting:** 50
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 ℃ 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	UPPER_ALARM_SLOPE_DOXYGEN SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Slope → Upper alarm value	W	Sensor slope above expected range, an alarm will be activated. Please check for plausibility. **Range:** UPPER_WARNING_SLOPE_DOXYGEN + 0.1 to 250.0 %
35	UPPER_WARNING_SLOPE_DOXYGEN SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Slope → Upper warning value	W	Sensor slope above expected range, a warning will be activated. Please check for plausibility. **Range:** LOWER_WARNING_SLOPE_DOXYGEN + 0.1 to UPPER_ALARM_SLOPE_DOXYGEN - 0.1 %
36	LOWER_WARNING_SLOPE_DOXYGEN SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Slope → Lower warning value	W	Sensor slope below expected range, a warning will be activated. Please check for plausibility. **Range:** LOWER_ALARM_SLOPE_DOXYGEN + 0.1 to UPPER_WARNING_SLOPE_DOXYGEN - 0.1 %
37	LOWER_ALARM_SLOPE_DOXYGEN SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Slope → Lower alarm value	W	Sensor slope below expected range, an alarm will be activated. Please check for plausibility. **Range:** 0.0 to LOWER_WARNING_SLOPE_DOXYGEN - 0.1 %
38	UPPER_ALARM_ZEROPOINT_DOXYGEN SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Zeropoint → Upper alarm value	W	Sensor zero-point above expected range, an alarm will be activated. Please check for plausibility. **Range:** UPPER_WARNING_ZEROPOINT_DOXYGEN + 0.01 to 10.0 nA

DIAGDOXY Transducer Block (manufacturer-specific parameters)			
Param eter index	Parameter Local Display Menu Path	Proper ties	Description
39	UPPER_WARNING_ZEROPOINT_DOXYGEN SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Zeropoint → Upper warning value	W	Sensor zero-point above expected range, a warning will be activated. Please check for plausibility. **Range**: LOWER_WARNING_ZEROPOINT_DOXYGEN + 0.01 to UPPER_ALARM_ZEROPOINT_DOXYGEN - 0.01 nA
40	LOWER_WARNING_ZEROPOINT_DOXYGEN SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Zeropoint → Lower warning value	W	Sensor zero-point below expected range, a warning will be activated. Please check for plausibility. **Range**: LOWER_ALARM_ZEROPOINT_DOXYGEN + 0.01 to UPPER_WARNING_ZEROPOINT_DOXYGEN - 0.01 nA
41	LOWER_ALARM_ZEROPOINT_DOXYGEN SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Zeropoint →Lower alarm value	W	Sensor zero-point below expected range, an alarm will be activated. Please check for plausibility. **Range**: 0.0 to LOWER_WARNING_ZEROPOINT_DOXYGEN - 0.01 nA
42	DELTA_SIGNAL_STABLE_CRITERIA SETUP → Sensor DO → Cal. Settings → Stable criteria → Delta current	W	Preselection for Calibration: Delta signal and delta temperature are the permitted measured value fluctuations which must not be exceeded in a certain timeframe during calibration. Calibration is not permitted if the permitted difference is exceeded. In this case, calibration is aborted with an error after maximum 60 seconds. **Range**: 0.1 to 2.0 % **Factory default**: 0.2
43	DELTA_TEMP_STABLE_CRITERIA SETUP → Sensor DO → Cal. Settings → Stable criteria → Delta temperature	W	Preselection for Calibration: Delta signal and delta temperature are the permitted measured value fluctuations which must not be exceeded in a certain timeframe during calibration. Calibration is not permitted if the permitted difference is exceeded. In this case, calibration is aborted with an error after maximum 60 seconds. **Range**: 0.1 to 2.0 K **Factory default**: 0.5
44	TIMEFRAME_STABLE_CRITERIA SETUP → Sensor DO → Cal. Settings → Stable criteria → Timeframe	W	Preselection for Calibration: Delta current and delta temperature are the permitted measured value fluctuations which must not be exceeded in a certain timeframe during calibration. Calibration is not permitted if the permitted difference is exceeded. In this case, calibration is aborted with an error after maximum 60 seconds. **Range**: 5.0 to 60.0 sec. **Factory default**: 20.0 sec.
45	FUNCTION_CAL_TIMER SETUP → Sensor DO→ Sensor diagnostics → Diagnostic limits → Calibration timer → Function	W	Decide whether you want to use the function which checks the calibration interval **Available values**: 0 - Off 1 – On **Factory setting**: Off
46	HOURS_CAL_TIMER SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Calibration timer → Time	W	Specification for the time after which the timer should have timed out **Range**: 1 to 9999 hours **Factory setting**: 1000 hours
47	REMAINING_CAL_TIME_PH DIAG → Sensor status → Calibration timer		Remaining calibration time will be initialized with the value of parameterer HOURS_CAL_TIMER after a calibration has been done. REMAINING_CAL_TIME indicates the remaining time until calibration data will be indicated as invalid. If remaining calibration timer value is ZERO, a CAL_TIMER alarm will be set. The sensor should be re-calibrated then. **unit**: hours

Param eter index	Parameter Local Display Menu Path	Proper ties	Description
	DIAGDOXY Transducer Block (manufacturer-specific parameters)		
48	WARNING_OP_TIME_OVER_40C_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >40℃ → Warning level	W	Warning limit for operating time over 40 ℃ **Range:** 1 to ALARM_OP_TIME_OVER_40C_LIMIT-1 hrs **Default value:** 10000 hrs (416 days)
49	ALARM_OP_TIME_OVER_40C_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >40℃ → Alarm level	W	Alarm limit for operating time over 40 ℃ **Range:** WARNING_OP_TIME_OVER_40C_LIMIT+1 to 50000 hrs **Default value:** 15000 hrs (625 days)
50	WARNING_OP_TIME_OVER_15NA_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >15nA → Warning level	W	Warning limit for operating time over15 nA **Range:** 1 to ALARM_OP_TIME_OVER_15NA_LIMIT-1 hrs **Default value:** 10000 hrs (416 days)
51	ALARM_OP_TIME_OVER_15NA_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >15nA → Alarm level	W	Alarm limit for operating time over 15 nA **Range:** WARNING_OP_TIME_OVER_15NA_LIMIT+1 to 50000 hrs **Default value:** 15000 hrs (625 days)
52	WARN_OP_TIME_OVER_50NA_LIM SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >50nA → Warning level	W	Warning limit for operating time over 50 nA **Range:** 1 to ALARM_OP_TIME_OVER_50NA_LIMIT-1 hrs **Default value:** 10000 hrs (416 days)
53	ALM_OP_TIME_OVER_50NA_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >50nA → Alarm level	W	Alarm limit for operating time over 50 nA **Range:** WARNING_OP_TIME_OVER_50NA_LIMIT+1 to 50000 hrs **Default value:** 15000 hrs (625 days)
54	WARNING_OP_TIME_OVER_5C_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >5℃ → Warning level	W	Warning limit for operating time over 5 ℃ **Range:** 1 to ALARM_OP_TIME_OVER_5C_LIMIT-1 hrs **Default value:** 10000 hrs (416 days)
55	ALARM_OP_TIME_OVER_5C_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >5℃ → Alarm level	W	Alarm limit for operating time over 5 ℃ **Range:** WARNING_OP_TIME_OVER_5C_LIMIT+1 to 50000 hrs **Default value:** 15000 hrs (625 days)
56	WARNING_OP_TIME_OVER_30C_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >30℃ → Warning level	W	Warning limit for operating time over 30 ℃ **Range:** 1 to ALARM_OP_TIME_OVER_30C_LIMIT-1 hrs **Default value:** 10000 hrs (416 days)
57	ALARM_OP_TIME_OVER_30C_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >30℃ → Alarm level	W	Alarm limit for operating time over 30 ℃ **Range:** WARNING_OP_TIME_OVER_30C_LIMIT+1 to 50000 hrs **Default value:** 15000 hrs (625 days)
58	WARNING_OP_TIME_OVER_30NA_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >30nA → Warning level	W	Warning limit for operating time over 30 nA **Range:** 1 to ALARM_OP_TIME_OVER_30NA_LIMIT-1 hrs **Default value:** 10000 hrs (416 days)
59	ALARM_OP_TIME_OVER_30NA_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >30nA → Alarm level	W	Alarm limit for operating time over 30 nA **Range:** WARNING_OP_TIME_OVER_30NA_LIMIT+1 to 50000 hrs **Default value:** 15000 hrs (625 days)
60	WARNING_OP_TIME_OVER_160NA_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >160nA → Warning level	W	Warning limit for operating time over 160 nA **Range:** 1 to ALARM_OP_TIME_OVER_160NA_LIMIT-1 hrs **Default value:** 10000 hrs (416 days)

DIAGDOXY Transducer Block (manufacturer-specific parameters)			
Param eter index	Parameter Local Display Menu Path	Proper ties	Description
61	ALARM_OP_TIME_OVER_160NA_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >160nA → Alarm level	W	Alarm limit for operating time over 160 nA **Range:** WARNING_OP_TIME_OVER_160NA_LIMIT+1 to 50000 hrs **Default value:** 15000 hrs (625 days)
62	WARNING_OP_TIME_UNDER_5C_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage <5℃ → Warning level	W	Warning limit for operating time under 5 ℃ **Range:** 1 to ALARM_OP_TIME_UNDER_5C_LIMIT-1 hrs **Default value:** 10000 hrs (416 days)
63	ALARM_OP_TIME_UNDER_5C_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage <5℃ → Alarm level	W	Alarm limit for operating time under 5 ℃ **Range:** WARNING_OP_TIME_UNDER_5C_LIMIT+1 to 50000 hrs **Default value:** 15000 hrs (625 days)
64	WARNING_OP_TIME_OVER_120C_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >120℃ → Warning level	W	Warning limit for operating time over 120 ℃ **Range:** 1 to ALARM_OP_TIME_OVER_120C_LIMIT-1 hrs **Default value:** 10000 hrs (416 days)
65	ALARM_OP_TIME_OVER_120C_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Operating hours → Usage >120℃ → Alarm level	W	Alarm limit for operating time over 120 ℃ **Range:** WARNING_OP_TIME_OVER_120C_LIMIT+1 to 50000 hrs **Default value:** 15000 hrs (625 days)
66	FUNCTION_CAL_EXPIRED SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Calibration expired → Function	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 **Default value:** Off
67	WARNING_CAL_EXPIRED_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Calibration expired → Warning level	W	Warning limit for expired calibration **Range:** 1 to ALARM_CAL_EXPIRED_LIMIT-1 hrs **Default value:** 10000 hrs (416 days)
68	ALARM_CAL_EXPIRED_LIMIT SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → Calibration expired → Alarm level	W	Alarm limit for expired calibration **Range:** WARNING_CAL_EXPIRED_LIMIT+1 to 17280 hrs **Default value:** 15000 hrs (625 days)
69	PCS_FUNCTION SETUP → Sensor pH/ORP → Sensor diagnostics → Diagnostic limits → PCS → Function	W	Process Check System (PCS) Decide whether you want to use the function **Available values:** 0: Off 1: On **Factory setting:** Off
70	PCS_OBSERVATION_MINUTES SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → PCS → Time	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
71	PCS_DELTA_PARTIAL_PRESSURE SETUP → Sensor DO → Sensor diagnostics → Diagnostic limits → PCS → Tolerance width	W	Interval around the measuring signal (raw value) for detecting stagnation. Measured values within the set interval are regarded as stagnating. **Range:** 1.0 to 2000.0 hPa **Factory setting:** 200.0 hPa
72	OUT_SLOPE_LIMIT		Current result of sensor slope check **Possible values:** 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm

Param eter index	Parameter Local Display Menu Path	Proper ties	Description
DIAGDOXY Transducer Block (manufacturer-specific parameters)
73	OUT_ZEROPOINT_LIMIT		Current result of sensor zero point check **Possible values**: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
74	OUT_CALTIMER_LIMIT		Current result ofcalibration timer check **Possible values**: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
75	OUT_CAL_EXPIRED_LIMIT_DOXY		Current result of calibration expired check **Possible values**: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
76	OUT_OP_TIME_OVER_40C_LIMIT		Current result of operating time over 40 ℃ check **Possible values**: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
77	OUT_OP_TIME_OVER_15NA_LIMIT		Current result of operating time over 15 nA check **Possible values**: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
78	OUT_OP_TIME_OVER_50NA_LIMIT		Current result of operating time over 50 nA check **Possible values**: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
79	OUT_OP_TIME_OVER_5C_LIMIT		Current result of operating time over 5 ℃ check **Possible values**: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
80	OUT_OP_TIME_OVER_30C_LIMIT		Current result of operating time over 30 ℃ check **Possible values**: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
81	OUT_OP_TIME_OVER_30NA_LIMIT		Current result of operating time over 30 nA check **Possible values**: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
82	OUT_OP_TIME_OVER_160NA_LIMIT		Current result of operating time over 160 nAC check **Possible values**: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
83	OUT_OP_TIME_UNDER_5C_LIMIT		Current result of operating time under 5 ℃ check **Possible values**: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm
84	OUT_OP_TIME_OVER_120C_LIMIT		Current result of operating time over 120 ℃ check **Possible values**: 0x00000000: Within Range 0x00000001: Warning 0x00000002: Alarm

Param eter index	Parameter Local Display Menu Path	Proper ties	Description
85	DOXY_SENSOR_TYPE		Indicates sensor type **Possible values:** 0: COS21D A 1: COS21D B 2: COS21D C 3: COS51D 50μm 4: COS51D 25μm 5: COS81D 6: COS22D
86	DOXY_SLOPE DIAG → Sensor status → Slope		Current slope at 25 degC Constant unit: %
87	DOXY_ZERO_POINT DIAG → Sensor status →zero point		Current zero point at 25 degC (amperometr. sensor) Constant unit: nA
88	DOXY_ZERO_POINT_TAU		Current zero point at 25 degC (opt. sensor) Constant unit: μs
89	FUNCTION_CAP_OPERATING_TIME SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation → Function	W	Switch to enable or disable cap operating time diagnostic limits **Available values:** 0: Off 1: On **Default value:** Off
90	WARNING_CAP_OP_TIME_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation → Cap operating time → Warning level	W	Warning limit for cap operating time **Range:** 1.0 to (ALARM_CAP_OP_TIME_LIMIT - 1.0) hrs **Default value:** 5000 hrs
91	ALARM_CAP_OP_TIME_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation → Cap operating time → Alarm level	W	Alarm limit for cap operating time **Range:** (WARNINIG_CAP_OP_TIME_LIMIT + 1.0) to 50000 hrs **Default value:** 10000 hrs
92	ALARM_CAP_OP_TIME_T1_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation →Cap usage T1 → Alarm level	W	Alarm limit for operating time of the cap at criteria T1. **Range:** (WARNING_CAP_OP_TIME_T1_LIMIT + 1.0) to 50000 hrs **Default value:** 10000 hrs
93	WARNING_CAP_OP_TIME_T1_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation →Cap usage T1 → Warning level	W	Warning limit for operating time of the cap at criteria T1. **Range:** 1.0 to (ALARM_CAP_OP_TIME_T1_LIMIT - 1.0) hrs **Default value:** 5000 hrs
94	CAP_OP_TIME_T1_CRITERIA SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation →Cap usage T1 →T1		The criteria T1: >40 ℃ / 104 ℉. If the criteria is satisfied, the corresponding operating time will be increased.
95	ALARM_CAP_OP_TIME_T2_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation →Cap usage T2 → Alarm level	W	Alarm limit for operating time of the cap at criteria T2. **Range:** (WARNING_CAP_OP_TIME_T2_LIMIT + 1.0) to 833 hrs **Default value:** 694 hrs
96	WARNING_CAP_OP_TIME_T2_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation →Cap usage T2 → Warning level	W	Warning limit for operating time of the cap at criteria T2. **Range:** 1.0 to (ALARM_CAP_OP_TIME_T2_LIMIT - 1.0) hrs **Default value:** 556 hrs
97	CAP_OP_TIME_T2_CRITERIA SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation →Cap usage T2 →T2		The criteria T2: >80 ℃ / 176 ℉. If the criteria is satisfied, the corresponding operating time will be increased.
98	ALARM_CAP_OP_TIME_T3_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation →Cap usage T3 → Alarm level	W	Alarm limit for operating time of the cap at criteria T3. **Range:** (WARNING_CAP_OP_TIME_T3_LIMIT + 1.0) to 833 hrs **Default value:** 694 hrs

DIAGDOXY Transducer Block (manufacturer-specific parameters)

Param eter index	Parameter Local Display Menu Path	Proper ties	Description
	DIAGDOXY Transducer Block (manufacturer-specific parameters)		
99	WARNING_CAP_OP_TIME_T3_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation →Cap usage T3 → Warning level	W	Warning limit for operating time of the cap at criteria T3. **Range**: 1.0 to (ALARM_CAP_OP_TIME_T3_LIMIT - 1.0) hrs **Default value:** 556 hrs
100	CAP_OP_TIME_T3_CRITERIA SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation →Cap usage T3 →T3		The criteria T3: >120 ℃ / 248 ℉. If the criteria is satisfied, the corresponding operating time will be increased.
101	ALARM_CAP_OP_TIME_T4_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation →Cap usage T4 → Alarm level	W	Alarm limit for operating time of the cap at criteria T4. **Range**: (WARNING_CAP_OP_TIME_T4_LIMIT + 1.0) to 833 hrs **Default value:** 694 hrs
102	WARNING_CAP_OP_TIME_T4_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation →Cap usage T4 → Warning level	W	Warning limit for operating time of the cap at criteria T4. **Range**: 1.0 to (ALARM_CAP_OP_TIME_T4_LIMIT - 1.0) hrs **Default value:** 556 hrs
103	CAP_OP_TIME_T4_CRITERIA SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap operation →Cap usage T4 →T4		The criteria T4: <5 ℃ / 41 ℉. If the criteria is satisfied, the corresponding operating time will be increased.
104	FUNCTION_CAP_STERILIZATION_COUNT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Sterilization cnt. → Function	W	Switch to enable or disable cap sterilization count diagnostic limits **Available values**: 0: Off 1: On **Default value**: Off
105	ALARM_CAP_STERIL_COUNTER_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Sterilization cnt. → Alarm level	W	Alarm limit for cap sterilization counter **Range**: WARNING_CAP_STERILIZATION_CNT_LIMIT+1 to 300 **Default value:** 100
106	WARNING_CAP_STERIL_COUNTER_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Sterilization cnt. → Warning level	W	Warning limit for cap sterilization counter **Range**: 1 to ALARM_CAP_STERILIZATION_CNT_LIMIT-1 **Default value:** 75
107	ALARM_CAL_QUALITY_INDEX SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cal. Quality index →alarm level	W	Alarm limit for calibration quality index **Range**: 50.0 to WARNING_QUALITY_INDEXX - 1.0 % **Default value**: 80 %
108	WARNING_CAL_QUALITY_INDEX SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cal. Quality index →Warninglevel	W	Warning limit for calibration quality index **Range**: (ALARM_QUALITY_INDEX + 1.0) to 100.0 % **Default value:** 85 %
109	CAL_CAP_FUNCTION SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → No. cal. cap → Function	W	Switch to enable or disable cap calibration diagnostic limits **Available values**: 0: Off 1: On **Default value**: Off
110	WARNING_CAL_CAP_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → No. cal. cap →Warning level	W	Number of cap calibrations above this limit will trigger a warning. **Range**: 1.0 to ALARM_CAL_CAP_LIMIT - 1.0 **Default value:** 6.0
111	ALARM_CAL_CAP_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → No. cal. cap → Alarm level	W	Number of cap calibrations above this limit will trigger an alarm. **Range**: (WARNING_CAL_CAP_LIMIT + 1.0) to 1000.0 **Default value:** 75.0
112	NUMBER_CIP_FUNCTION SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → CIP cycles → Function	W	Switch to enable or disable CIP count diagnostic limits **Available values**: 0: Off 1: On **Default value**: Off

Param eter index	Parameter Local Display Menu Path	Proper ties	Description
	DIAGDOXY Transducer Block (manufacturer-specific parameters)		
113	WARNING_CIP_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → CIP cycles →Warning level	W	Number of CIP cycles above this limit will trigger a warning. **Range:** 1.0 to (ALARM_CAP_CIP_LIMIT - 1.0) **Default value:** 500.0
114	ALARM_CIP_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → CIP cycles → Alarm level	W	Number of CIP cycles above this limit will trigger an alarm. **Range:** (WARNING_CAP_CIP_LIMIT + 1.0) to 1000.0 **Default value:** 800.0
115	NUMBER_CAP_CIP_FUNCTION SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → CIP cycles cap → Function	W	Switch to enable or disable cap CIP count diagnostic limits **Available values:** 0: Off 1: On **Default value:** Off
116	WARNING_CAP_CIP_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → CIP cycles cap → Warning level	W	Number of cap CIP cycles above this limit will trigger a warning. **Range:** 1.0 to (ALARM_CAP_CIP_LIMIT - 1.0) **Default value:** 100.0
117	ALARM_CAP_CIP_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → CIP cycles cap →Aalram level	W	Number of cap CIP cycles above this limit will trigger an alarm. **Range:** (WARNING_CAP_CIP_LIMIT + 1.0) to 300.0 **Default value:** 125.0
118	NUMBER_AUTO_CLAV_FUNCTION SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Autoclavings → Function	W	Switch to enable or disable autoclavings diagnostic limits **Available values:** 0: Off 1: On **Default value:** Off
119	WARNING_AUTO_CLAV_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Autoclavings → Warning level	W	Number of autoclavings above this limit will trigger a warning. **Range:** 1.0 to (ALARM_AUTO_CLAV_LIMIT - 1.0) **Default value:** 200.0
120	ALARM_AUTO_CLAV_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Autoclavings →Alarm level	W	Number of autoclavings above this limit will trigger an alarm. **Range:** (WARNING_AUTO_CLAV_LIMIT + 1.0) to 600.0 **Default value:** 300.0
121	NUMBER_CAP_AUTO_CLAV_FUNCTION SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap autoclavings → Function	W	Switch to enable or disable cap autoclavings diagnostic limits **Available values:** 0: Off 1: On **Default value:** Off
122	WARNING_CAP_AUTO_CLAV_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap autoclavings →Warning level	W	Number of cap autoclavings above this limit will trigger a warning. **Range:** 1.0 to (ALARM_CAP_AUTO_CLAV_LIMIT-1.0) **Default value:** 75.0
123	ALARM_CAP_AUTO_CLAV_LIMIT SETUP → Sensor DO → Sensor Diagnostics → Diagnostic limits → Cap autoclavings → Alarm level	W	Number of cap autoclavings above this limit will trigger an alarm. **Range:** (WARNING_CAP_AUTO_CLAV_LIMIT+1.0) to 300.0 **Default value:** 100.0

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_Oxygen provides 6 Analog Input Function Blocks. Each block can select a measurement value which is provided by the DOXYGEN 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_Oxygen 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) coming 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_Oxygen 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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