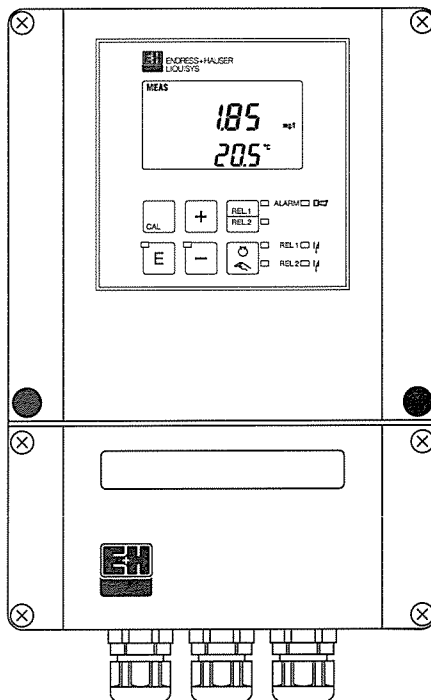
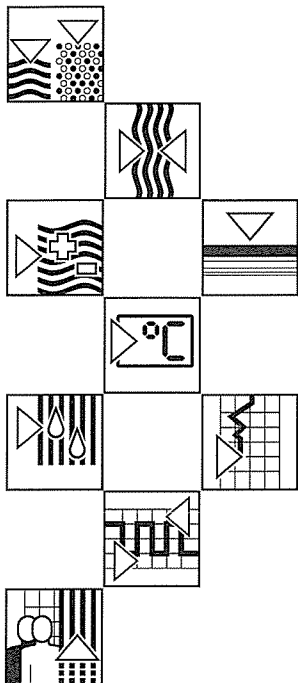


# *liquisys* **COM 252** **Transmitter** **for Dissolved Oxygen** **with Limit Contacter**

## **Operating Instructions**



**Please familiarise yourself with the instrument before you take any other steps:**



**General information**



**Safety**



**Description**

**You wish to install and start up the instrument. The required steps are described in these chapters:**



**Installation**



**First start-up**

**You wish to operate or reconfigure the instrument. The operating concept is explained in these chapters:**



**Operation**



**Instrument configuration**

**Need help with problems or maintenance?**



**Diagnostics**



**Maintenance and service**

**See the back cover for a fold-out overview of the menu structure.**

## Table of contents

<b>1</b>	<b>General information</b>	<b>2</b>
1.1	Symbols used	2
1.2	Conformity statement	2
<b>2</b>	<b>Safety</b>	<b>3</b>
2.1	Intended use	3
2.2	General safety notes	3
2.3	Safety devices	3
<b>3</b>	<b>Description</b>	<b>4</b>
3.1	Areas of application	4
3.2	Measuring system	4
3.3	Important features	5
3.4	Instrument variants	6
3.5	Accessories	7
<b>4</b>	<b>Installation</b>	<b>8</b>
4.1	Storage and transport	8
4.2	Unpacking	8
4.3	Mounting	9
4.4	Connection	11
4.5	Packaging and disposal	13
<b>5</b>	<b>First start-up</b>	<b>14</b>
<b>6</b>	<b>Operation</b>	<b>16</b>
6.1	Operator interface	16
6.2	Display elements	16
6.3	Key functions	18
6.4	Operating concept	19
6.5	Operation example	21
6.6	Relay operating modes auto / manual	24
<b>7</b>	<b>Instrument configuration</b>	<b>25</b>
7.1	Temperature offset entry	25
7.2	Limit contacter configuration	25
7.3	Controller configuration	27
7.4	Measuring range selection	28
7.5	General instrument configuration	29
7.6	Sensor and process monitoring	30
7.7	Calibration of measuring transmitter	34
<b>8</b>	<b>Diagnostics</b>	<b>36</b>
8.1	Limit alarm	36
8.2	Sensor or process alarm	36
8.3	Errors	38
8.4	Possible faults in measuring mode and remedy	39
8.5	Measuring system checks	40
8.6	Measuring transmitter checks	42
<b>9</b>	<b>Maintenance and service</b>	<b>43</b>
9.1	Cleaning	43
9.2	Repair	43
<b>10</b>	<b>Appendix</b>	<b>44</b>
10.1	Technical data	44
10.2	Index	47

# 1 General information

## 1.1 Symbols used

**Warning:**

This symbol alerts to hazards which may cause serious injuries as well as damage to the instrument, measuring system or other equipment if ignored.

**Caution:**

This symbol alerts to possible malfunction due to operator error.

**Note:**

This symbol indicates important items of information.

## 1.2 Conformity statement

The measuring transmitter Liquisys COM 252 has been developed and manufactured in accordance with the applicable European standards and directives.

**Note:**

The corresponding certificate of conformity may be requested from Endress+Hauser.

## 2 Safety

### 2.1 Intended use

The measuring transmitter Liquisys COM 252 is a field-tested and reliable measuring instrument for determining the dissolved oxygen content. It is equipped with two current outputs and two switched outputs for connection to automated process controllers.

### 2.2 General safety notes



**Warning:**

- Operation of the device in a manner other than as described in these operating instructions can lead to unsafe and improper functioning of the measuring system.

#### Installation, start-up, operation

The Liquisys COM 252 instrument has been designed for safe operation according to the state of the art in engineering and in keeping with the applicable regulations and EC directives; see "Technical data". However, if used improperly or other than for the intended purpose, it may pose a hazard, e.g. due to improper connection.

Installation, electrical connection, start-up, operation and maintenance of the measuring system must therefore be performed exclusively by trained specialists authorised by the system operator. This personnel must have read and understood these operating instructions and must adhere to them.

### 2.3 Safety devices

- **Access code:**

Unauthorised access to the calibration and configuration data of the measuring transmitter is effectively prevented by access codes. The instrument settings can be read at any time without entry of an access code.

- **Alarm function:**

Continuous violation of the limit settings or temperature sensor failure will activate an alarm. This condition is indicated by an LED on the control panel and via a switched output. The alarm contact has been designed as a fail-safe switch, i.e. the alarm condition will be immediately signalled in case of a power failure. The alarm contact is also activated by internal system errors (see chapter 8.2).

- **Data protection:**

The instrument configuration is retained even after a power failure.

- **Immunity to interference:**

This instrument is protected against interference, such as pulse-shaped transients, high frequency and electrostatic discharges, according to the applicable European standards. This is only valid, however, for an instrument connected according to the notes in these installation and operating instructions.

## 3 Description

### 3.1 Areas of application

The measuring transmitter Liquisys COM 252 is suitable for measuring tasks in the following areas of application:

- Sewage treatment plants
- Waste water treatment
- Water treatment and water monitoring
- Drinking water
- Surface water (rivers, lakes, sea)
- Fish farming

### 3.2 Measuring system

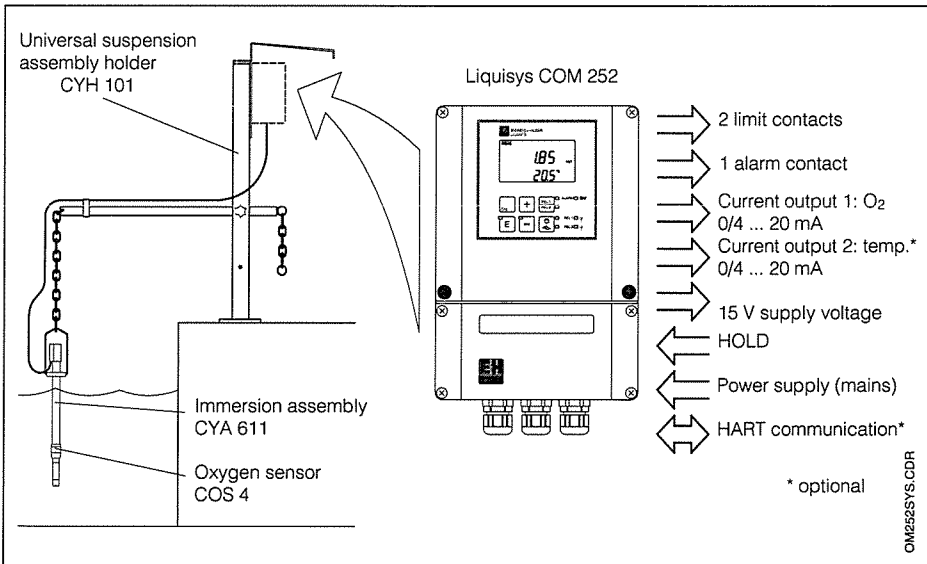


Fig. 3.1 Example of a complete measuring system

**A typical measuring system comprises:**

- an oxygen sensor COS 4 with an integrated NTC temperature sensor
- an immersion, flow or retractable assembly
- a measuring cable extension (type CMK) with junction box VBM where necessary
- the Liquisys COM 252 measuring transmitter

**3.3 Important features**

- Field housing with protection type IP 65
- Measuring range 0 ... 20.00 mg O<sub>2</sub>/l or 0 ... 200.0 % saturation (switchable)
- Temperature measuring range -9.9 ... + 60.0 °C
- Easy to read, two-line display
- Simple configuration with only three keys
- Configuration protected by access code
- Quick calibration using the "CAL" key
- Sensor Check System (SCS) for sensor and process monitoring
- Two switched outputs which can be configured as limit contacters
- One switched output for alarm signalling in cases of limit violation or SCS alarm
- Two current outputs with selectable measurement range, switchable between 0 ... 20 or 4 ... 20 mA proportional (switching affects both outputs)
- Automatic "hold" function to "freeze" the current output and contacts during calibration and configuration
- "Hold" function can be controlled via a galvanically separated input using an external or internal auxiliary voltage

### 3.4 Instrument variants

### Composition of order code

**Version / measuring range**

DX	Field housing, 247 x 170 x 115 mm, protection type IP 65
	Switchable to mg/l or saturation measurement

## Power supply

- 0 Power supply: 230 V AC
- 1 Power supply: 115 V AC
- 2 Power supply: 200 V AC
- 3 Power supply: 24 V AC
- 5 Power supply: 100 V AC
- 8 Power supply: 24 V DC
- 9 Special version to customer specifications

### Measurement output

- 0 Meas. output: oxygen
- 1 Meas. output: oxygen and temperature
- 5 Meas. output: oxygen and HART
- 7 Meas. output: oxygen, temperature and HART
- 9 Special version to customer specifications

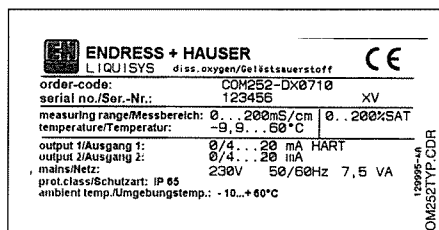
### Additional features

- |    |                                |
|----|--------------------------------|
| 10 | Base version                   |
| 20 | Moisture protection lacquering |

COM 252- 

--	--	--	--

 ⇐ complete order code



You can identify the instrument variant and the mains supply type by the order code on the nameplate of the instrument.

Fig. 3.2 Nameplate of Liquisys COM 252



### 3.5 Accessories

#### Oxygen sensor

Type	Features	Areas of application
COS 4	Amperometric 2-electrode sensor in all-plastic housing with permanently attached cable, optional length 7 or 15 m, ingress protection IP 68, with integrated temperature sensor	Waste water treatment, drinking water, surface water, fish farming

#### Assemblies

Type	Features	Areas of application
CYH 101	Universal suspension assembly holder	Installation for immersed operation, e.g. in activated sludge basins or fish ponds
CYA 611	Immersion assembly	
COA 250	Flow assembly	Installation for flow operation, e.g. in water works or analytical cabinets
COA 461	Retractable assembly	Installation for in-line operation, e.g. in pipes or on basin walls

#### Cleaning systems

Type	Features	Areas of application
Chemoclean CYR 20	Programme sequencer for automatic control of cleaning cycles, user-definable weekly programme	For use in extremely soiled media
Chemoclean CYR 10	Injector with valves for drive water and cleaning agent	
Chemoclean COR 3	Spray head in conjunction with immersion assemblies for 1/2" hose connection, material: PVC	



## 4 Installation

### 4.1 Storage and transport

The packaging material used to store or transport the instrument must provide shock and moisture protection. Optimal protection is provided by the original packaging materials. Conformance with the ambient conditions (see Technical data) must be assured.

### 4.2 Unpacking

Verify that the contents are undamaged. Inform the post office or freight carrier as well as the supplier of any damage.

Check that the delivery is complete and agrees with the shipping documents and your order:

- Quantity delivered
- Instrument type and version according to the nameplate (see chapter 3.4)
- Accessories
- Operating instructions
- Identification card(s)

#### Included in delivery:

- 1 connector set
- 1 x cable gland Pg 7
- 1 x cable gland Pg 16, reduced
- 3 x cable gland Pg 13.5

The post mounting kit is **not** included in the delivery.

Save the original packaging in case the device must be stored or shipped at a later time.

If you have any questions, please consult your supplier or the Endress+Hauser sales office in your area (see back cover of these operating instructions for addresses).

### 4.3 Mounting

#### Wall mounting of Liquisys COM 252 in field housing

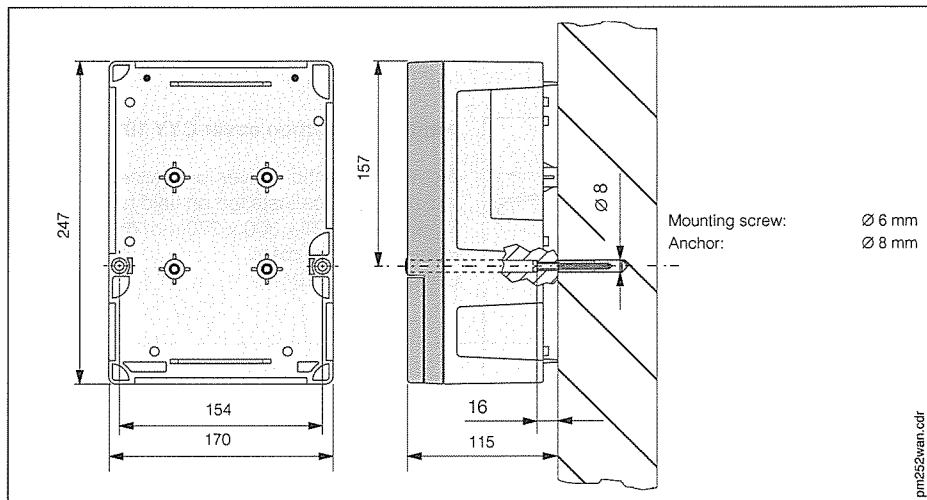


Fig. 4.1 Wall mounting of Liquisys COM 252

#### Post mounting of Liquisys COM 252 in field housing

Additional requirements: post mounting kit (see mounting accessories). Install the post mounting kit on the rear of the instrument. Installation is possible on horizontal or vertical pipes. The maximum pipe diameter is 65 mm (see figure 4.2).

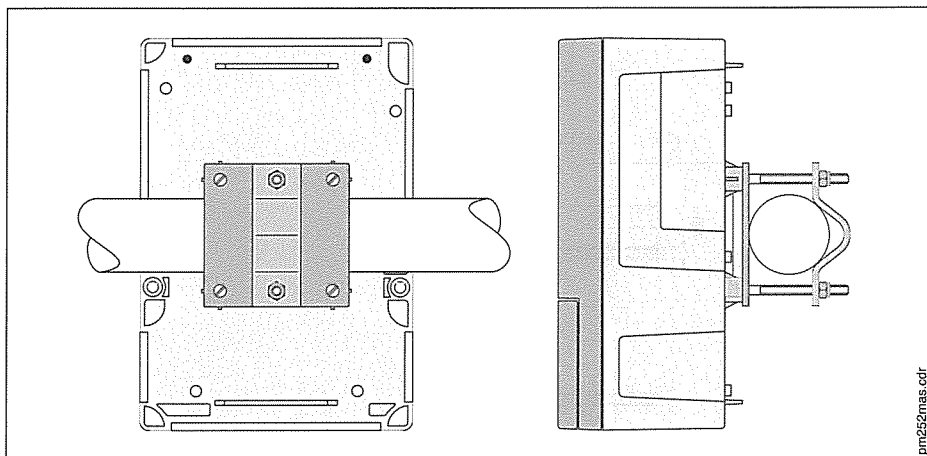


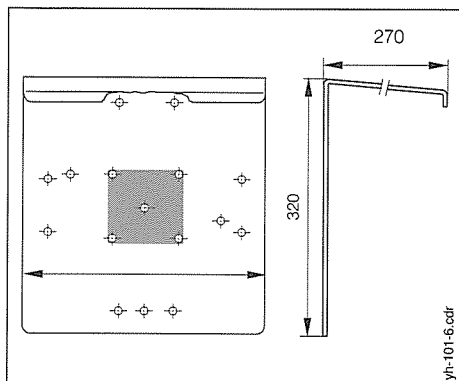
Fig. 4.2 Post mounting of Liquisys COM 252



**Caution:**

Outdoor installation requires weather protection cover VH3 (see Mounting accessories). The protective cover is suitable for wall or post mounting.

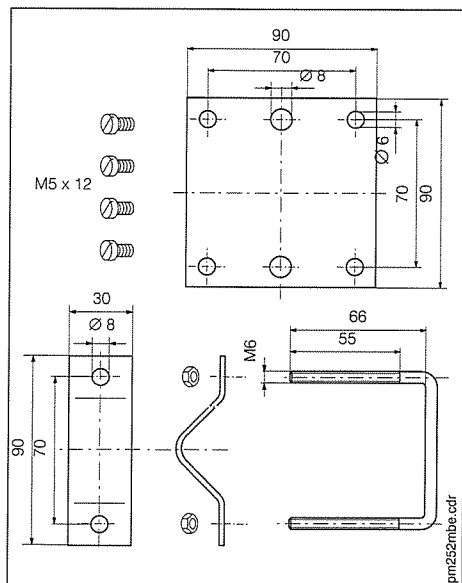
**Mounting accessories**



**Weather protection cover CYY 101**

Weather protection cover for outdoor use of instrument, to be installed on field housing.  
Dimensions: 320 x 300 x 270 mm (H x W x D)  
Material: special steel  
Order no.: CYY101-A

Fig. 4.3 Weather protection cover CYY 101



**Post mounting kit**

Kit for mounting the field housing on horizontal or vertical pipes (max. Ø 60 mm)  
Material: galvanised steel  
Order no. 50086842

Fig. 4.4 Post mounting kit

## 4.4 Connection



### Warning:

- The connection to the mains may only be established by properly trained personnel.
- Do not perform service work on the instrument while the instrument is energised.
- The instrument must be grounded before start-up!
- A clearly identified mains disconnecting device must be installed close to the instrument.
- Before connecting the instrument to the mains, make sure the mains voltage matches the voltage rating on the nameplate.

### Instrument connections

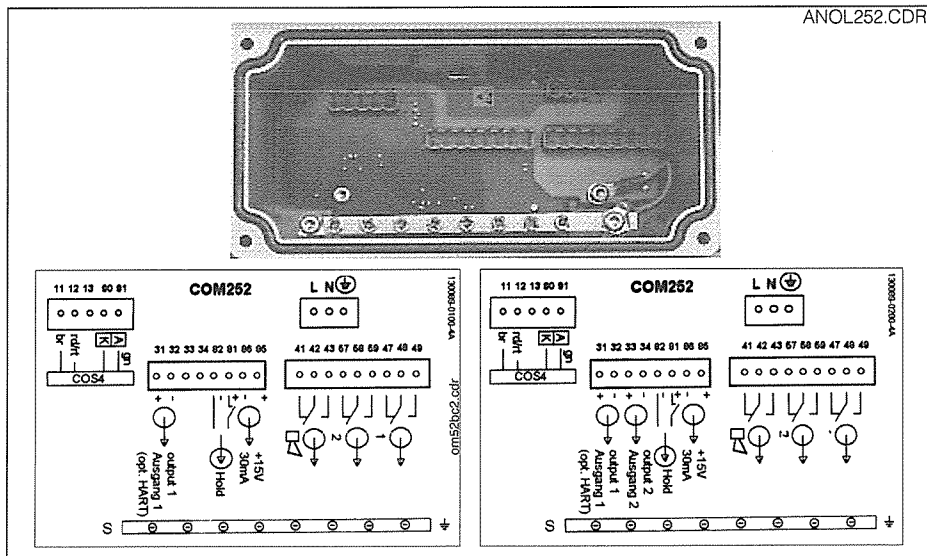


Fig. 4.5 Position and designation of the connections on the rear of instrument; upper: rear; left: instrument with one output; instrument with two outputs

# Connection diagram

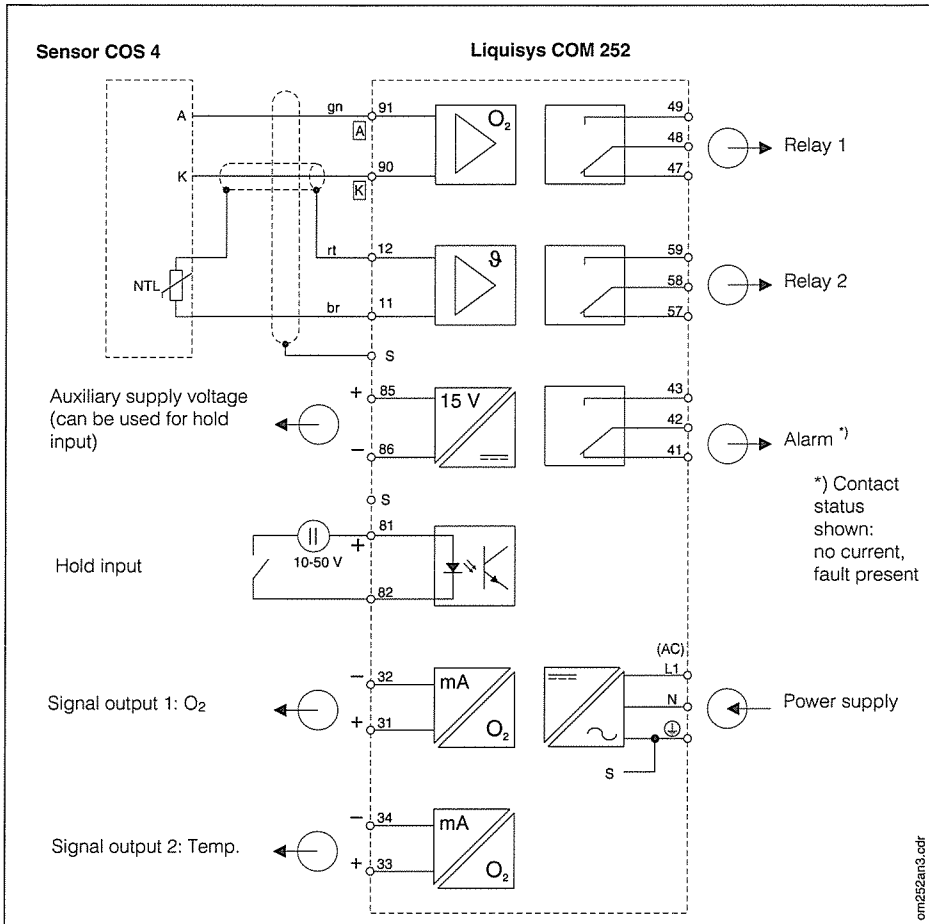


Fig. 4.6 Electrical connection of Liquisys COM 252

Connection of oxygen sensor COS 4

The oxygen sensor is connected via the special multicore measuring cable attached to the sensor. Should it become necessary to extend the measuring cable, use junction box VBM and measuring cable type CMK (not assembled).

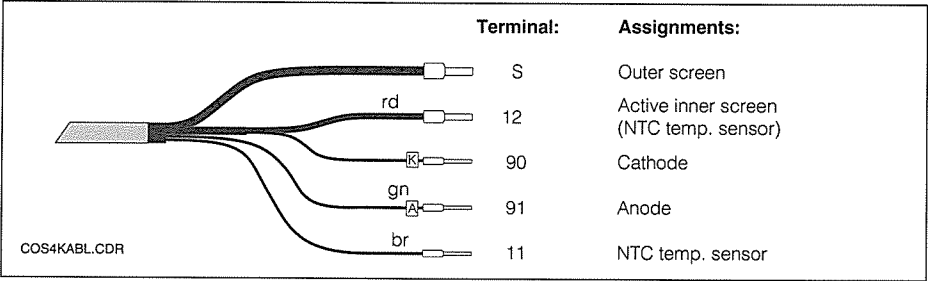


Fig. 4.7 Pre-assembled sensor cable on COS 4



Warning:

Cable end sleeves and terminals must be protected against humidity, otherwise faulty measurements will result!

Connection accessories

Junction box VBM

Junction box for measuring cable extension with 10 high-impedance terminals and Pg 13.5 cable glands for cable entry. Material: painted aluminium; protection class: IP 65  
Order no.: 50003987

Measuring cable CMK

Coaxial cable with two auxiliary cores and an additional outer screen.  
Order no. 50005374

4.5 Packaging and disposal

Packaging

Packaging must provide shock and moisture protection. Optimal protection is provided by the original packaging materials.

Disposal



Note:

Electronic components to be disposed of are considered special waste! Please observe local regulations for disposal!

## 5 First start-up



### Note:

Familiarise yourself with the operation of the measuring instrument before switching it on for the first time!



### Caution:

Before power-up, check that all connections have been properly made!



### Warning:

Before power-up make sure that there is no risk of damage to the system the instrument is a part of; for example, due to valves or pumps that might operate in an uncontrolled manner, etc.

### Power-up, test

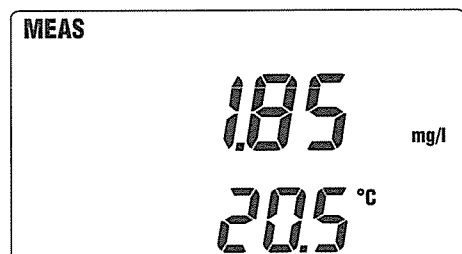


Fig. 5.1 Display after power-up and completion of self-test

After power-up, the instrument performs a self-test and then starts up in the measuring mode.

If the display is similar to figure 5.1, the instrument is functioning properly.

The measured values shown on the display may be different.

In order to check the alarm function as well as any connected alarm signalling device, the current supply can be interrupted for a moment. All configuration data will be retained.

The controller relays can be operated manually for function checks, maintenance work, etc. See chapter 6.6, Auto / manual mode of operation.



## Factory settings

The following factory settings are active when the instrument is powered up for the first time:

<b>Type of measurement</b>	Oxygen concentration in mg/l
<b>Temperature offset</b>	0 °C
<b>Limit 1</b>	2.00 mg/l
<b>Contact function of limit contactor 1</b>	MIN contact without delay (switches when value drops below limit 1)
<b>Limit 2</b>	10.00 mg/l
<b>Contact function of limit contactor 2</b>	MAX contact without delay (switches when limit 2 is exceeded)
<b>Current outputs 1 and 2:</b>	4 ... 20 mA
<b>Current output 1: O<sub>2</sub> value for 4 mA signal current</b>	0.00 mg/l
<b>Current output 1: O<sub>2</sub> value for 20 mA signal current</b>	10.00 mg/l
<b>Current output 2: Temp. value for 4 mA signal current*</b>	0 °C
<b>Current output 2: Temp. value for 20 mA signal current*</b>	40°C
<b>Altitude</b>	0 m above sea level
<b>Salinity</b>	0.0 % salt content
<b>HART communication (optional)</b>	Superimposed on current output 1

\* for instruments with two current outputs



### Note:

When the factory defaults are active, both limit contactors are switched on. There are three ways to prevent a limit alarm from being issued when the instrument is switched on for the first time:

- Switch off the controller function ("Cntr" menu), or
- increase / decrease limit 1 and / or limit 2, or
- enter a limit alarm delay ("ConF" menu).

## 6 Operation

### 6.1 Operator interface

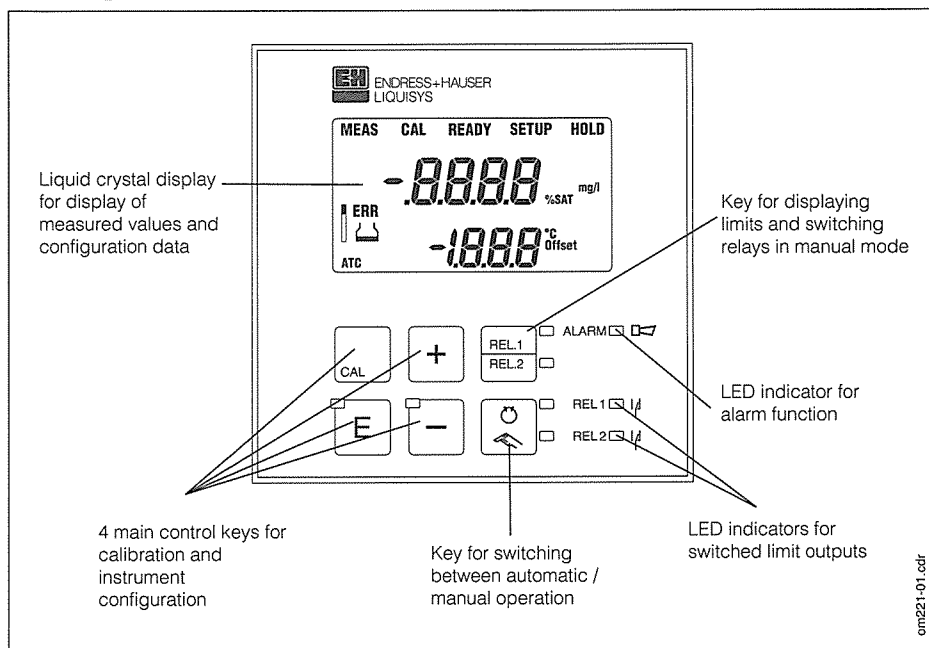


Fig. 6.1 Operating elements of Liquisys COM 252

### 6.2 Display elements

#### LED indicators

☐ Indication for relay controlled in "manual" mode (red LED).



☐ Indication for "auto" (green LED) or "manual" (yellow LED) mode.



REL.1 ☐ Indicates the status of relays 1 and 2.

LED green: measured value is within permissible limits, relay is inactive

REL.2 ☐ LED red: measured value is outside of permissible limits, relay is active.

☐ Alarm indication for continuous limit violation, sensor / process alarm, temperature sensor failure, AD converter overflow or system errors.

Liquid crystal display

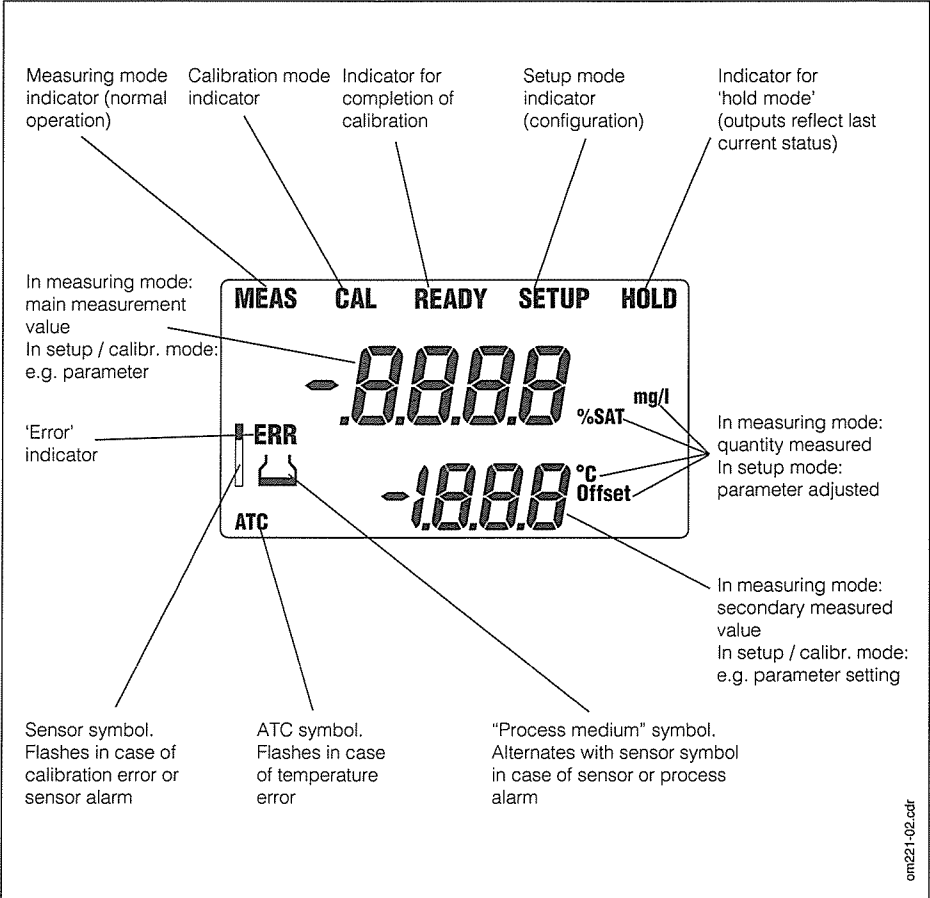


Fig. 6.2 Liquid crystal display of Liquisys COM 252

## 6.3 Key functions



### Quick calibration

Press the CAL key and enter the access code for quick calibration (11) to directly access the calibration mode.



### Setup

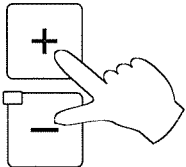
After pressing the E key and entering the setup code (22), the instrument switches to the setup mode. The E key is further used for:

- selecting the individual functions in setup mode
- saving the data entered in setup mode
- starting calibration



In measuring mode: Relay operation in „manual“ mode.

In setup mode: Function group selection, setting of parameters and numerical values (the setting speed increases when the key is held down).



### Note:

Press both keys simultaneously to jump back to the measuring mode.



- ☐ Displays the limits set for the relays in „auto“ mode,
- ☐ switches between relay 1 and relay 2 in „manual“ mode.



- ☐ Toggles the relays between the „auto“ and „manual“ modes.

## 6.4 Operating concept

### Operating modes

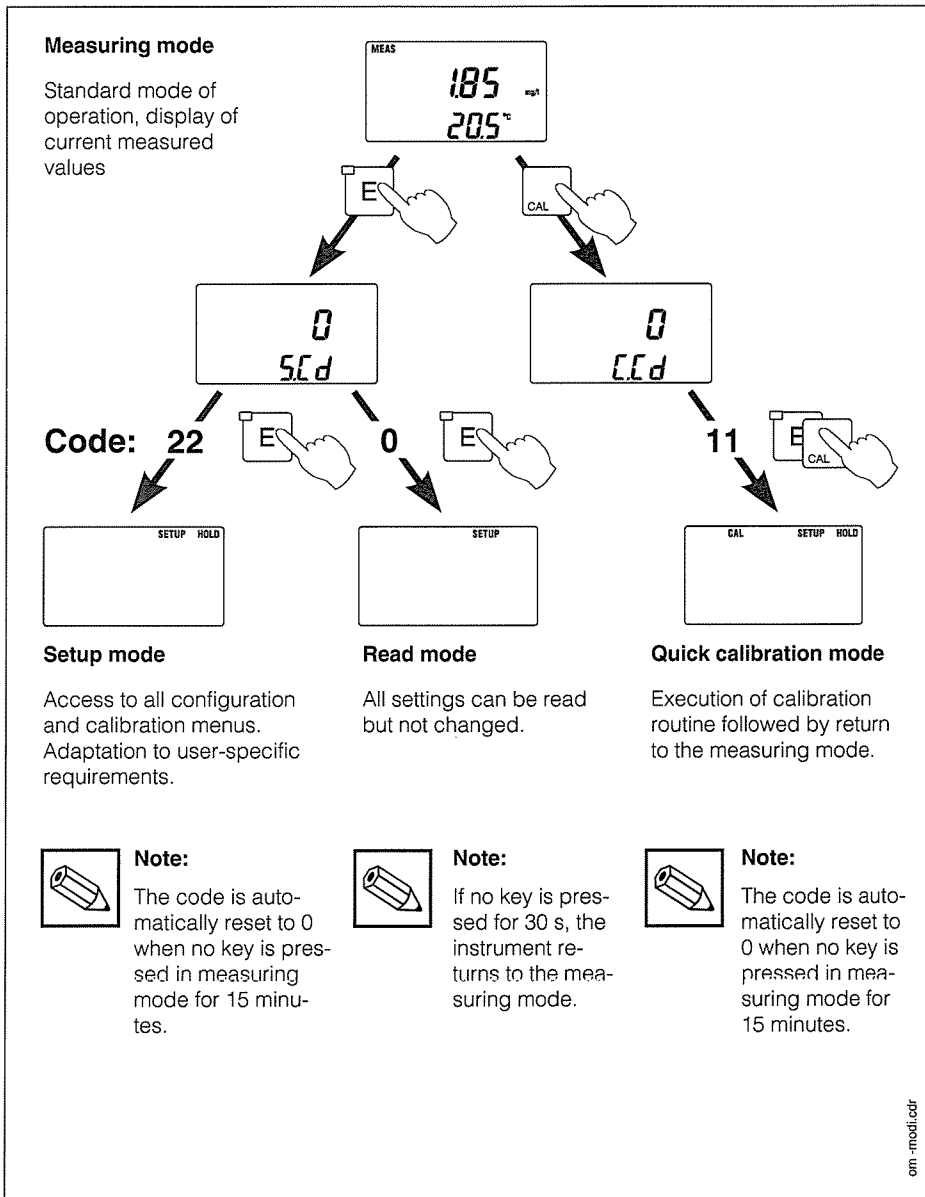


Fig. 6.3 Description of the four operating modes

## Menu structure

The configuration and calibration functions are arranged in a menu structure by function groups.



### Note:

**See the fold-out back page of these operating instructions for an overview of the Liquisys menu structure.**

- The function groups are selected in the setup mode with the '+' and '-' keys.
- The 'E' key is used to move from one function to the next within a function group.
- The '+' and '-' keys are used for option selection and editing. Selections must be confirmed by pressing the 'E' key.
- Pressing the '+' and '-' keys at the same time terminates programming and accepts the changes made.



### Note:

If a change is made but not confirmed by pressing the 'E' key, the previous setting is retained.  
Settings that are outside the permissible adjusting range are rejected.

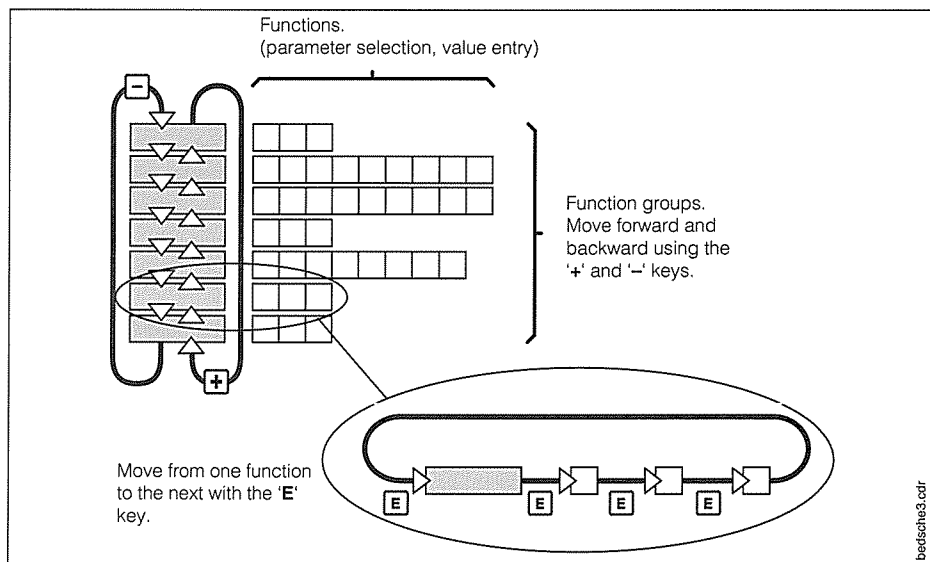


Fig. 6.4 Schematic representation of Liquisys menu structure

### Hold function: "freezing" of outputs

The current output is „frozen“ in the setup mode and during quick calibration, i.e. the last current value is constantly output. The display shows the „HOLD“ message. During automatic operation, all contacts will go to their normal positions. Any alarm delay accumulated will be reset to 0. This function can also be activated externally via a contact input (see chapter 4.4, „Connection“).



#### Note:

If the hold function is to remain active even after a power failure, the hold contact input is to be used.

## 6.5 Operation example



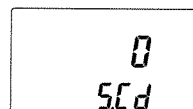
#### Note:

Cf. menu structure on fold-out back page.

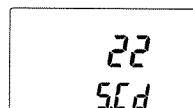
Supposing the limit value for relay 2 were to be set to 6 mg/l as the switching point using the min. function, you would proceed as follows:



Select the "Setup Code" field (S.Cd = Setup Code).

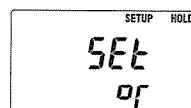


Enter code 22 to access the configuration mode.



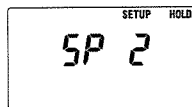
Confirm the code.

The instrument is now in setup mode, and the first function group is selected ("Set °C" = Temperature Offset).  
The hold function is active.





Select function group "Setpoint 2" (SP 2 = Set Point 2).



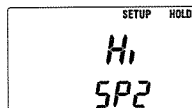
Select the „Set Limit“.



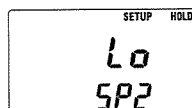
Change the setting, e.g. from 10 mg/l to 6 mg/l.



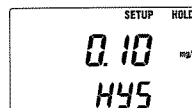
Confirm the entry.  
The instrument advances to the next function.



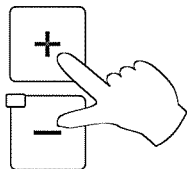
Change the factory setting of  
"Hi" (upper limit = Max Function) to  
"Lo" (lower limit = Min Function).



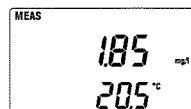
Confirm the setting.  
The instrument advances to the next function  
(HYS = Hysteresis Setting).



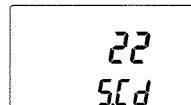




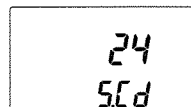
Return to the measuring mode by pressing the '+' and '-' keys at the same time. The hold function is deactivated.



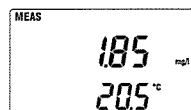
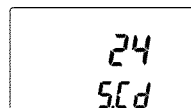
Select the „Setup Code“ field.



Change the code (to any number) to block the access to the configuration function.



Confirm the (blocking) code entry. The instrument returns to the measuring mode.



## 6.6 Relay operating modes auto / manual



### Automatic operation

In this mode of operation, the relays are controlled by the measuring transmitter.



- The limit settings can also be displayed in the measuring mode with the relay toggle key. When this key is pressed, limit 1 is displayed for 2 seconds, then limit 2 for another 2 seconds. Then the display reverts to the current measured value.



### Switching to manual operation

The instrument is switched to the manual mode by pressing the Auto / Manual key. In this mode, the relays are switched on and off manually with the '+' and '-' keys. The relay status is shown on the second line of the display. Press the "REL 1 / REL 2" key to toggle between the relays.

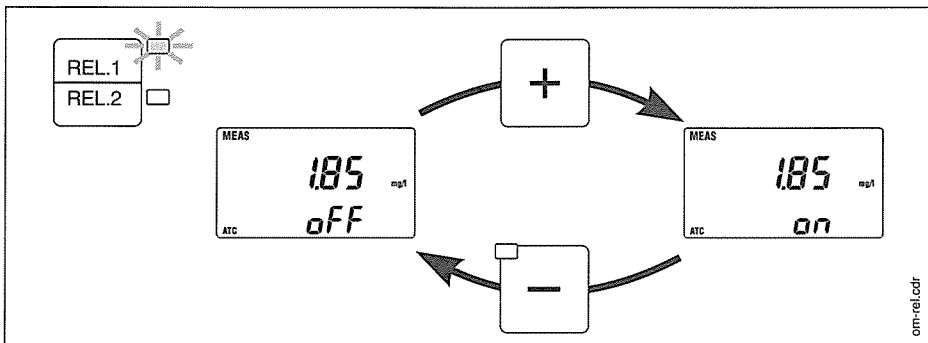




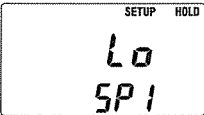
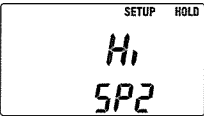



Fig. 6.5 Manual operation of relay 1



### Note:



- The manual mode must be enabled by entering setup code „22“.
- The current operating mode setting is retained even in the event of a power failure.
- The manual mode has precedence over an external hold request.



Field	Selection / range	Display	Info
<p>Entry of limit for controller 1 / 2 in mg/l or %SAT</p> <p>(SP1 = setpoint 1 = limit 1) (SP2 = setpoint 2 = limit 2)</p>	<p>0 ... 20.00 mg/l 0 ... 200.0 %SAT</p> <p><b>Default:</b> Limit 1: 2.00 mg/l 20.0 %SAT Limit 2: 10.00 mg/l 100.0 %SAT</p>	 	
<p>Determines the contact function</p> <p>(Lo = MIN contact, activated when below limit) (Hi = MAX contact, activated when above limit) (SP 1 / 2 = limit 1 / 2)</p>	<p>Lo Hi</p> <p><b>Default:</b> Limit 1: Lo Limit 2: Hi</p>	 	<p>All combinations of the two contacts (Lo/Lo, Lo/Hi, Hi/Lo and Hi/Hi) can be selected</p>
<p>Determines the hysteresis for limit contactor 1 / 2 in mg/l or %SAT.</p> <p>See fig. 7.1 for effect (HYS = hysteresis)</p>	<p>0 ... 5.00 mg/l 0 ... 50.0 %SAT</p> <p><b>Default:</b> 0.10 mg/l 1.0 %SAT</p>		
<p>Adjusts the pickup delay for the limit contactor relay</p> <p>(On.d = ON delay = pickup delay)</p>	<p>0 ... 2000 s</p> <p><b>Default:</b> 0 s</p>		
<p>Adjusts the dropout delay for the limit contactor relay</p> <p>(OF.d = OFF delay = dropout delay)</p>	<p>0 ... 2000 s</p> <p><b>Default:</b> 0 s</p>		

### 7.3 Controller configuration *Enter*

This function group is used to switch the limit contacter function on or off and determine the direction of action of the relays (NC / NO contact). These settings affect both limit contacters.

Field	Selection / range	Display	Info
Switches the limit contacter function on or off  (on = limit contacter on) (oFF = limit contacter off) (L.Ct = limit monitor)	on oFF  <b>Default:</b> on		If oFF is selected here, the next function is not available
Toggles the normally closed / normally open function (rEL = relay function) (dEE n = deenergized, normally closed contact) (En = energized, normally open contact)	dEE n En  <b>Default:</b> dEE n		







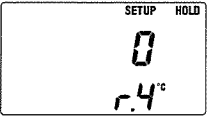

**Note:**

If the limit contacter is switched off in the „Controller“ function group, the function groups „SP1“ and „SP2“ are not displayed.

**Exception:** When the SCS controller monitoring function (“CC”) is enabled, the limit setting function for limit contacter 1 is accessible.

## 7.4 Measuring range selection *rng*

This function group is used to select the measuring function (oxygen content in mg/l or oxygen saturation index %SAT) and determine the measuring range for the current output.

Field	Selection / range	Display	Info
Switches the meas. function: oxygen content in mg/l (ConC) or oxygen saturation index in %SAT (Sat)  (Uni = unit)	ConC SAT  <b>Default:</b> ConC		
Toggles the lower limit of the current output between 0 and 4 mA  (out = current output)	0 – 20 mA 4 – 20 mA  <b>Default:</b> 4 – 20 mA		
<b>Current output 1:</b> Entry of mg/l or %SAT value for 0 or 4 mA (depending on lower limit setting) (r. 0 = value for 0 mA with 0-20 mA) (r. 4 = value for 4 mA with 4-20 mA)	0 ... 20.00 mg/l 0 ... 200.0 %SAT  <b>Default:</b> 0.00 mg/l 0.0 %SAT		The difference between the 0/4 and the 20 mA value must be at least Δ2 mg/l or Δ20 %SAT.
<b>Current output 1:</b> Entry of mg/l or %SAT value for 20 mA  (r.20 = value for 20 mA)	0 ... 20.00 mg/l 0 ... 200.0 %SAT  <b>Default:</b> 10.00 mg/l 100.0 %SAT		
<b>Current output 2 (option):</b> Entry of temperature value for 0 or 4 mA (depending on lower limit setting).	Temp. meas.: -9.9 ... 60 °C  <b>Default:</b> 0 °C		°C symbol on display is on. The difference between the 0/4 and the 20 mA value must be at least 10% of MR or 6 °C.
<b>Current output 2 (option):</b> Entry of temperature value for 20 mA.	Temp. meas.: -9.9 ... 60 °C  <b>Default:</b> 40 °C		



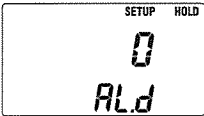
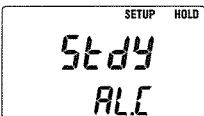
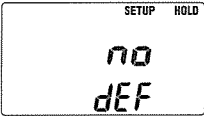
**Note:**

Falling assignments are possible (e.g. 4 mA → 10 mg/l, 20 mA → 5 mg/l); the difference must be at least  $\Delta 2$  mg/l or  $\Delta 20$  %SAT.

If the value falls outside of the display range of 0 ... 20 mg/l or 0 ... 200 %SAT, the message 'Ur' (Underrange) or 'Or' (Overrange) appears.

## 7.5 General instrument configuration *Conf*

This function group is used for general instrument configuration settings.

Field	Selection / range	Display	Info
Entry of local altitude of measuring point in metres above sea level  (Alt = altitude)	0 ... 4000 m  <b>Default:</b> 0 m		
Entry of salt content of medium in per cent by weight  (SAL = salinity)	0 ... 4 %  <b>Default:</b> 0.0 %		For example: sea water 3.5 ... 3.8 %
Determines the alarm delay between the violation of a limit and the activation of the alarm relay. (ALd = alarm delay)	0 ... 2000 min  <b>Default:</b> 0 min		
Defines the alarm relay as a steady or fleeting contact. (StdY = steady contact) (FLEt = fleeting contact) AL.C = alarm contact)	StdY FLEt  <b>Default:</b> StdY		Closing time for fleeting contact is 1 s.
Use this function to restore the factory settings for all functions.  (no = do not restore) (YES = restore) (dEF = defaults = factory settings)	no YES  <b>Default:</b> no		

**Warning:**

**All user settings are lost if the instrument is reset to the factory default settings!**  
**This includes the settings in the other function groups!**

## 7.6 Sensor and process monitoring *SCS Sen*

This function group is used to select and set the monitoring functions.



### Note:

All monitoring functions are disabled when the factory settings are in effect.

The Sensor Check System is adapted to the conditions at hand by enabling and adjusting appropriate functions.

### Alarm threshold monitoring

In oxygen measurement **without** oxygen transfer control (aeration), sensor errors result in incorrect measurement but this does not have any effect on the process medium (examples: measurement in surface waters or in water works for monitoring purposes). Sensor errors usually result in implausibly high or low measured values. Such implausible values can be detected and signalled by means of a user-defined alarm threshold.

### Controller monitoring

In oxygen measurement **with** oxygen transfer control, sensor errors not only result in incorrect measurement but also directly influence the process medium. Particularly in the case of oxygen transfer control in sewage treatment plants, there is a risk that the aeration will not be reactivated at all if the measured value is permanently too high due to the control loop. Inadequate oxygen transfer poses a considerable danger to the microbiology and its clarification performance. Conversely, measured values that are permanently too low can cause an unnecessary increase in costs because the aeration equipment works continuously. These conditions are detected and signalled by means of user-selectable monitoring times for maximum permissible controller ON or OFF times.

### Sensor activity monitoring

The process medium may also affect the sensor, and this in turn may result in incorrect measurement. Braid formation on the sensor from solids floating in the medium or coats on the sensor membrane result in a very sluggish or totally passivated measuring signal. Passivation can be detected and signalled by means of permanent signal activity monitoring.



## Overview of SCS monitoring functions

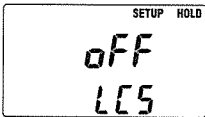
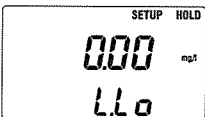


	Function	Settings	Alarm event	Application
<b>Alarm threshold monitoring</b>  <b>(LCS: Limit Check System)</b>	User-selectable lower alarm threshold (AT)	off	–	Applications <b>with</b> or <b>without</b> oxygen transfer control
		lower AT only	Lower AT reached or below lower AT	
	User-selectable upper alarm threshold (AT)	upper AT only	Upper AT reached or exceeded	
		upper and lower AT	Lower AT reached or below lower AT or upper AT reached or exceeded	
<b>Controller monitoring</b>  <b>(PCS: Controller Check)</b>	ON period monitoring OFF period monitoring	off	–	Applications <b>with</b> oxygen transfer control
		on	Maximum setting for permanent ON or OFF period exceeded	
<b>Sensor activity monitoring</b>  <b>(PCS: Alternation Check)</b>	Monitoring for signal change	off	–	Applications <b>with</b> or <b>without</b> oxygen transfer control
		on	Change within one hour less than $\pm 0.1$ mg/l or $\pm 1$ %SAT	

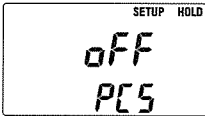


## Fault signalling

Errors detected by sensor and process monitoring are signalled by the symbol "ERR" and the "Sensor" and "Process medium" symbols alternately flashing on the display. They can be displayed by pressing the "+"- or "-" key. When one of these keys is pressed once, all errors (up to the maximum of three) are shown on the display in turn at intervals of approx. 2 s.

## Troubleshooting

Refer to chapter 8.2 for further information on troubleshooting when sensor or process alarms have been detected.

Field	Selection / range	Display	Info
Selection of alarm threshold monitoring (Lo = lower alarm threshold Hi = upper alarm threshold LCS = Limit Check System)	off Lo Hi Lo.Hi *)  <b>Default:</b> off		
Adjustment of lower alarm threshold  (L.Lo = lower alarm threshold)	0 ... 19.00 mg/l *) 0 ... 190 %SAT  <b>Default:</b> 0.00 mg/l 0.0 %SAT		Field is only available if alarm threshold monitoring has been selected
Adjustment of upper alarm threshold  (L.Hi = upper alarm threshold)	1 ... 20.00 mg/l *) 10 ... 200 %SAT  <b>Default:</b> 20.00 mg/l 200.0 %SAT		Field is only available if alarm threshold monitoring has been selected
Adjustment of alarm threshold delay time  (LA.d= alarm threshold delay time)	0 ... 2000 min  <b>Default:</b> 0 min		Can be used to suppress known events that are not supposed to trigger an alarm.  Field is only available if alarm threshold monitoring has been selected.
*) If both the lower and upper alarm thresholds are monitored (setting Lo.Hi), then a minimum distance of 1 mg/l or 10 %SAT between these settings is required. If this is not the case, the "Lo.Hi" mode cannot be selected, and the "ERR" symbol flashes when you press the E key. To re-enable the "Lo.Hi" mode, establish the required minimum difference.			

Field	Selection / range	Display	Info
<p>Selection of process monitoring</p> <p>(AC = Alternation Check CC = Controller Check PCS = process monitoring)</p>	<p>off AC CC AC.CC</p> <p><b>Default:</b> off</p>		<p><b>Controller monitoring always uses the limit set for limit contactor 1. Therefore limit 1 must always be set ("SP1" menu) even if the process is controlled using other devices!</b></p> <p><b>An alarm delay defined in the "ConF" menu is disabled when the Controller Check "CC" is active!</b></p>
<p>Adjusts the maximum permissible period for limit violation (below limit)</p> <p>(Lo.t = maximum time below limit)</p>	<p>0 ... 2000 min</p> <p><b>Default:</b> 480 min</p>		<p>Field can only be accessed when Controller Check "CC" has been selected.</p>
<p>Adjusts the maximum permissible period for limit violation (above limit)</p> <p>(Hi.t = maximum time above limit)</p>	<p>0 ... 2000 min</p> <p><b>Default:</b> 240 min</p>		<p>Field can only be accessed when Controller Check "CC" has been selected.</p>



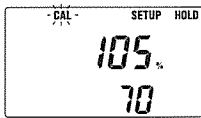
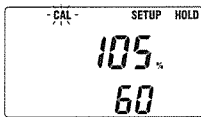


## 7.7 Calibration of measuring transmitter *CAL 02*

This function group is used to calibrate the measuring transmitter.

Please also note the relevant information in the operating instructions of the COS 4 sensor connected.

### Prerequisites for calibration

- Measuring point altitude adjustment in "ConF" menu has been performed.
- Salinity setting is correct ("ConF" menu).
- Sensor is completely polarised (this takes approx. 60 minutes for a new sensor).
- Sensor is clean and dry on the outside.
- Sensor is located in the air, as close to a water surface as possible, and is not exposed to direct solar radiation.
- Sensor has adapted to ambient temperature (approx. 20 min).

Description	Display	Info
Enter field by pressing the "E" or "CAL" key. Instrument is ready for calibration. "Hold" is activated.		Upper field: slope of oxygen sensor in %  Lower field: calibration time display 600 s
Remove sensor from medium and prepare for calibration (refer to sensor operating instructions)		
Press the "E" or "CAL" key once more to initiate the calibration. The "CAL" symbol flashes.		Countdown of calibration time display
After 530 s, the sensor slope is checked for 10 s.		Desired range: sensor slope 75 ... 140 %
<b>If the sensor slope is outside the desired range, the calibration is aborted immediately, and a calibration error is signalled (see below)</b>		
The signal stability is checked during the last 60 s of the calibration		Desired range: deviation < $\pm 1\%$
<b>If the deviation exceeds <math>\pm 1\%</math>, the calibration is aborted immediately, and a calibration error is signalled (see below)</b>		
Successful completion of calibration is signalled by the message "READY".		Return to the measuring mode by pressing the "+"- and "-" keys at the same time
In the event of a calibration error, the "ERR" and sensor symbols flash simultaneously. The calibration time display is reset to 600 s.		Following sensor servicing, the calibration can be restarted by pressing the "E" key.

## 8 Diagnostics



### Warning:

Alarm signalling devices must have an independent power supply to permit alarm signalling in the event of a power failure!

### 8.1 Limit alarm

When sensor and process monitoring are not selected, an alarm is signalled when the measured value

- exceeds the upper limit or
  - stays below the lower limit
- for a period which exceeds the alarm delay set in the "ConF" menu.

Effect:

- Alarm LED is on
- Alarm contact (41 / 42) is closed

### 8.2 Sensor or process alarm

#### SCS alarm "alarm threshold"

Depending on the monitoring function selected ("Lo", "Hi" or "Lo.Hi"), an alarm is triggered:

- when the measured value drops below the lower alarm threshold or
  - when the upper alarm threshold is exceeded
- upon expiration of the delay time defined.

#### SCS alarm "controller"

An alarm is triggered when:

- the maximum permissible ON time is exceeded or
- the maximum permissible OFF time is exceeded.

#### SCS alarm "sensor activity"


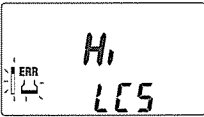

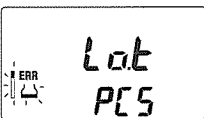
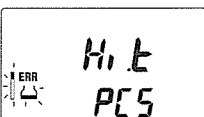
An alarm is triggered when the change in oxygen signal within one hour is less than  $\pm 0.1 \text{ mg/l}$  or  $\pm 1 \% \text{SAT}$ .

Effect:

- Alarm LED is on
- Alarm contact (41 / 42) is closed
- "ERR" symbol is displayed
- "Sensor" and "process medium" symbols alternatingly flash on display

When an SCS alarm condition exists, the "+" or "-" key can be pressed in the measuring mode to display the error conditions that exist (up to 3) in turn for approx. 2 s; see table below:

## Error messages and their meaning

	<p>Alarm threshold monitoring:</p> <p>Lower alarm threshold violation</p>
	<p>Alarm threshold monitoring:</p> <p>Upper alarm threshold violation</p>
	<p>Sensor monitoring:</p> <p>Signal change in one hour less than <math>\pm 0.1</math> mg/l or <math>\pm 1</math> %SAT</p>
	<p>Controller monitoring:</p> <p>Maximum time setting for violation of lower limit exceeded</p>
	<p>Controller monitoring:</p> <p>Maximum time setting for violation of upper limit exceeded</p>

## 8.3 Errors

### Editing error

If values outside of the permissible value range are entered when editing a configuration setting, the "ERR" symbol on the display flashes briefly.

### Temperature error

A temperature error is signalled:

- when the temperature sensor cable is defective, or
- when a temperature is measured that lies outside the measuring or ATC range.

Effect:

- Alarm LED is on
- Alarm contact (41 / 42) is closed
- "ERR" symbol is displayed
- "ATC" symbol flashes on display

### System errors

Internal communication errors lead to the display of a system error. The message "Err." and a one-digit error code flash on the main parameter display field.

EEPROM error: Err 1

Internal communication error: Err 2

Effect:

- Alarm LED is on
- Alarm contact (41 / 42) is closed
- Hold function is activated

If the system error cannot be eliminated by switching the power supply to the instrument off and back on, the instrument must be sent to the competent Endress+Hauser sales agency for servicing.

### Error message in the event of AD converter overflow

This condition is caused by measuring and temperature input overdrive.

Effect:

- "ERR" symbol is displayed
- Alarm LED is on
- Alarm contact (41 / 42) is closed

To eliminate the error:

Check calibration, offset setting and measuring input wiring.



## 8.4 Possible faults in measuring mode and remedy

Test	Remedy
<b>Limit alarm</b>	
<ul style="list-style-type: none"> <li>• Read actual value</li> <li>• Check limit settings</li> <li>• Check limit alarm delay setting</li> </ul>	<ul style="list-style-type: none"> <li>• Move actual value to desired range</li> <li>• Change limits</li> <li>• Increase delay time</li> </ul>
<b>SCS alarm "alarm threshold"</b>	
<b>Lo alarm</b>	
<ul style="list-style-type: none"> <li>• Read actual value</li> <li>• Check lower alarm threshold</li> <li>• Check delay setting</li> </ul>	<ul style="list-style-type: none"> <li>• See chapter 8.5, Measuring system checks "Display value too low"</li> </ul>
<b>Hi alarm</b>	
<ul style="list-style-type: none"> <li>• Read actual value</li> <li>• Check upper alarm threshold</li> <li>• Check delay setting</li> </ul>	<ul style="list-style-type: none"> <li>• See chapter 8.5, Measuring system checks "Display value too high"</li> </ul>
<b>SCS alarm "controller"</b>	
<ul style="list-style-type: none"> <li>• Read actual value</li> <li>• Read limit</li> <li>• Determine whether limit is violated permanently</li> </ul>	<ul style="list-style-type: none"> <li>• Permanently exceeded: See chapter 8.5, Measuring system checks "Display value too high"</li> <li>• Permanently too low: See chapter 8.5, Measuring system checks "Display value too low"</li> </ul>
<b>SCS alarm "sensor activity"</b>	
<ul style="list-style-type: none"> <li>• Visual inspection of sensor</li> </ul>	<ul style="list-style-type: none"> <li>• See chapter 8.5, Measuring system checks "No sensor response"</li> </ul>

## 8.5 Measuring system checks

Test	Remedy
<b>No display, no sensor response</b>	
<ul style="list-style-type: none"> <li>• Transmitter supplied with power?</li> <li>• Sensor connected to transmitter?</li> <li>• Is medium flow sufficient?</li> <li>• Membrane completely soiled?</li> <li>• Measuring chamber filled with electrolyte?</li> </ul>	<ul style="list-style-type: none"> <li>• Apply mains voltage</li> <li>• Connect sensor</li> <li>• Establish required medium flow</li> <li>• Clean sensor</li> <li>• Fill electrolyte into measuring chamber</li> </ul>
<b>Display value too high</b>	
<ul style="list-style-type: none"> <li>• Polarisation completed?</li> <li>• Instrument previously calibrated (with a different sensor)?</li> <li>• Temperature indicated on transmitter obviously too low?</li> <li>• Remove sensor from medium and dry: Correct membrane cap installed on sensor?</li> <li>• Membrane visibly bulged?</li> <li>• Open membrane chamber: Electrolyte soiled?</li> <li>• Dry the electrodes: Does transmitter display go to zero?</li> <li>• Anode coating missing, does electrode have silver coat?</li> <li>• Silver on gold cathode?</li> </ul>	<ul style="list-style-type: none"> <li>• Wait for polarisation to complete</li> <li>• Perform calibration</li> <li>• Return sensor to manufacturer</li> <li>• Cap COY 3-WP for COS 4 (if new = yellow protection cap)</li> <li>• Install new membrane cap</li> <li>• Clean measuring chamber and fill in fresh electrolyte</li> <li>• Check connecting line (also junction box if present) for shunt. If not OK, return sensor to manufacturer</li> <li>• Return sensor to manufacturer for recoating</li> <li>• Clean gold cathode</li> </ul>

Test	Remedy
Display value too low	
<ul style="list-style-type: none"><li>• Has sensor been calibrated?</li><li>• Is medium flow sufficient?</li><li>• Temperature indicated on transmitter obviously too high?</li><li>• Remove sensor from medium and dry: Correct membrane cap on sensor?</li><li>• Membrane visibly soiled?</li><li>• Open measuring chamber: Electrolyte soiled?</li></ul>	<ul style="list-style-type: none"><li>• Perform calibration</li><li>• Establish required medium flow</li><li>• Return sensor to manufacturer</li><li>• Cap COY 3-WP for COS 4 (yellow protection cap, do not use COY3-S-WP!)</li><li>• Clean membrane or replace membrane cap</li><li>• Clean measuring chamber and fill in fresh electrolyte</li></ul>
Considerable fluctuation of display value	
<ul style="list-style-type: none"><li>• Membrane visibly bulged?</li><li>• Open measuring chamber, dry electrodes: Does transmitter display go to zero?</li></ul>	<ul style="list-style-type: none"><li>• Install new membrane cap</li><li>• Check connecting line (also junction box if present) for shunt. If not OK, return sensor to manufacturer</li></ul>

8.6 Measuring transmitter checks



**Caution:**

These transmitter checks require a basic knowledge of electrical engineering. You also need the following equipment:

- Multimeter
- Resistance 37.4 kΩ (different values are possible, e.g. 33 kΩ → 23°C)
- Resistance 2.61 MΩ (2.4 ... 2.7 MΩ possible for test)

Checks are to be carried out in the indicated sequence:	
Measure	Desired value
Voltage check	
<ul style="list-style-type: none"><li>• Disconnect oxygen sensor COS 4</li><li>• Measure polarisation voltage on transmitter between terminals 90 and 91</li></ul>	Reading on multimeter: –750 mV
Zero check	
<ul style="list-style-type: none"><li>• Switch instrument off (power off)</li><li>• Connect 37.4 kΩ resistance between terminals 11 and 12</li><li>• Switch instrument on (power ON)</li></ul>	Display on transmitter: 0.00 mg/l (or 0.0 %SAT) and 20 °C  Current output (terminals 31 and 32): 0 or 4 mA
Slope check	
<ul style="list-style-type: none"><li>• Switch instrument off (power off)</li><li>• Connect 2.61MΩ resistance between terminals 90 and 91</li><li>• Switch instrument on (power ON)</li><li>• Altitude entry ("ConF" menu): 0 m</li><li>• Salinity entry ("ConF" menu): 0.0%</li></ul>	Display before recalibration: 6.00 ... 11.20 mg/l and 20 °C (or 85 ... 157 %SAT)  Display after recalibration: 9.20 ... 9.30 mg/l and 20 °C (or 102 %SAT)



## 9 Maintenance and service

### 9.1 Cleaning

Use a soft cloth and soap solution to clean the front of the field housing and the membrane keypad.

**Caution:**

Even if the instrument becomes very dirty (e.g. from paint or varnish) do not use aggressive cleaning agents such as thinner or acetone!

### 9.2 Repair

#### Replacing a blown fuse

Disconnect the instrument from the power source. Loosen the four screws on the connection space cover and remove the cover. The fuse is located in the upper right corner of the connection space in the black, upright fuse holder. To change the fuse, loosen the fuse holder cap (bayonet lock), replace the fuse and reinstall the cap.

#### Further repairs

Further repairs may only be carried out directly by the manufacturer or through the Endress+Hauser service organisation. An overview of the Endress+Hauser service network can be found on the back cover of these operating instructions.

10 Appendix

10.1 Technical data

<b>O<sub>2</sub> measurement with sensor COS 4</b>	
Display and measuring range	0 ... 20 mg/l or 0 ... 200 %SAT
Measured value resolution	0.01 mg/l, 0.1 %SAT
Measurement deviation <sup>1)</sup> , display	max. 0.5 % of MR
Reproducibility <sup>1)</sup>	max. 0.2 % of MR
Temperature compensation range	0 ... 50 °C
Altitude adjustment range	0 ... 4000 m
Salinity adjustment range	0 ... 4.0 ‰
O <sub>2</sub> signal input	
Signal current	0 ... 3000 nA
Slope adjustment	75 ... 140 % of nominal slope
Nominal slope (sensor in air, 20 °C, 1013 mbar)	290 nA
O <sub>2</sub> signal output	
Current range	0 / 4 ... 20 mA
Measurement deviation	max. 0.75 % of MR
Load	max. 500 Ω
Transmission range	Δ 2 ... Δ 20 mg/l or Δ 20 ... Δ 200 %SAT
<b>Temperature measurement</b>	
Temperature sensor	NTC, 30 kΩ at 25 °C
Display range	-9.9 ... +60 °C
Measured value resolution	0.1 °C
Measurement deviation <sup>1)</sup> , display	1.0 % of MR
Temperature signal output (optional)	
Current range	0 / 4 ... 20 mA, galvanically separated
Measurement deviation <sup>1)</sup>	max. 1.25 % of URV
Load	max. 500 Ω
Transmission range	adjustable, Δ 10 ... Δ 100 % of URV
<b>Limit contactor</b>	
Limit adjustment range	0 ... 20 mg/l or 0 ... 200 %SAT
Switching hysteresis	0 ... 5 mg/l or 0 ... 50 %SAT
Pickup / dropout delay	0 ... 2000 s
Contact type (switchable)	MIN / MAX

<sup>1)</sup> Acc. to DIN IEC 746 part 1, for nominal operating conditions

**Alarm function**

Alarm threshold adjustment range

Lower limit . . . . . 0 ... 19 mg/l or 0 ... 190 %SAT

Upper limit . . . . . 1 ... 20 mg/l or 10 ... 200 %SAT

Alarm delay . . . . . 0 ... 2000 min

MIN monitoring timeout . . . . . 0 ... 2000 min

MAX monitoring timeout . . . . . 0 ... 2000 min

Contact function (switchable) . . . . . steady contact / fleeting contact

**Electrical data and connections**

Voltage supply, AC . . . . . 24 / 100 / 115 / 200 / 230 V AC, +10 / -15 %

Voltage supply, DC . . . . . 24 V DC +20 / -15 %

Frequency . . . . . 48 ... 62 Hz

Power consumption . . . . . max. 7.5 VA

Auxiliary voltage output

Output voltage . . . . . 15 V +/- 0.6 V

Output current . . . . . max. 10 mA

Contact outputs . . . . . potential-free changeover contacts

Switching current

With ohmic load ( $\cos \varphi = 1$ ) . . . . . max. 5 AWith inductive load ( $\cos \varphi = 0.4$ ) . . . . . max. 3 A

Switching voltage . . . . . max. 250 V AC, 30 V DC

Switching power

With ohmic load ( $\cos \varphi = 1$ ) . . . . . max. 1250 VA AC, 150 W DCWith inductive load ( $\cos \varphi = 0.4$ ) . . . . . max. 500 VA AC, 90 W DC

Hold input

Voltage . . . . . 10 ... 50 V

Current consumption . . . . . max. 10 mA

Isolation voltage, signal output . . . . . max. 500 V<sub>RMS</sub>

Connection terminals . . . . . plug-in printed board terminals, 3, 5, 8 and 9 poles

Conductor cross section . . . . . max. 2.5 mm<sup>2</sup>

**General technical data**

Measured value display . . . . .	LCD, 2 lines, 4 and 3½digits, with status symbols
Electromagnetic compatibility (EMC)	
Emission . . . . .	acc. to EN 50081-1, 01.92
Immunity . . . . .	acc. to EN 50082-2, 03.93
Overvoltage (lightning) protection . . . . .	acc. to EN 50142, EN 50082/2
Nominal operating conditions	
Ambient temperature . . . . .	-10 ... +55 °C
Relative humidity . . . . .	10 ... 95 %, non-condensing
Limit operating conditions	
Ambient temperature . . . . .	-20 ... +60 °C
Storage and transport temperature . . . . .	-25 ... +65 °C

**Physical data**

Dimensions of field housing (H x W x D) . . . . .	247 x 170 x 115 mm
Weight . . . . .	max. 1.8 kg
Protection type of field housing . . . . .	IP 65
Materials	
Front membrane . . . . .	polyester, UV-resistant
Field housing . . . . .	ABS PC Fr



## 10.2 Index

### A

Access code	3, 18
Accessories	7
Alarm delay	29
Alarm function	3
Alarm threshold monitoring	30-32
Altitude	29
Areas of application	4
Assemblies	7
Auto / manual operating mode	24
Automatic operation	24

### C

Calibration	34
Chemoclean	7
Cleaning	43
Cleaning agents	43
Cleaning systems	7
Composition of order code	6
Configuration	25-35
Conformity statement	2
Connection	11, 13
Connection accessories	13
Connection diagram	12
Contact function	26
Controller configuration	27
Controller monitoring	30-31
Current output assignment	29
Current output range	28

### D

Data protection	3
Delivery, items included in	8
Description	4-7
Diagnostics	36-42
Display	16-17
Disposal	13
Dropout delay	26

### E

Electrical connection	11-13
Electrical data	45
Elimination of faults	39
Errors	38

### F

Factory settings	15, 29
Faults	39
Features	5
Field housing	9
Function check	14
Fuse	43

### G

General instrument configuration	29
----------------------------------	----

### H

Hold function	21
Hysteresis	25-26

### I

Identification card	8
Immunity to interference	3
Installation	8-13
Instrument configuration	25-35
Instrument connections	11
Instrument variants	6
Intended use	3

### J

Junction box	13
--------------	----

### K

Keys	16, 18
------	--------

<b>L</b>		
LEDs . . . . .	16	
Limit alarm . . . . .	36	
Limit contactor . . . . .	25	
Liquid crystal display . . . . .	17	
<b>M</b>		
Mains disconnecting device . . . . .	11	
Maintenance . . . . .	43	
Manual operation . . . . .	24	
Materials . . . . .	46	
Max contact . . . . .	26	
Measuring function . . . . .	28	
Measuring mode . . . . .	19	
Measuring range . . . . .	28	
Measuring system . . . . .	4-5	
Menu structure . . . . .	20	
Min contact . . . . .	26	
Mounting . . . . .	9	
<b>N</b>		
Nameplate . . . . .	6	
NTC temperature sensor . . . . .	25, 44	
<b>O</b>		
Operating concept . . . . .	19	
Operating elements . . . . .	16	
Operation example . . . . .	21	
Operator interface . . . . .	16	
Order code . . . . .	6	
Oxygen sensor . . . . .	7, 13	
<b>P</b>		
Packaging . . . . .	13	
Pickup delay . . . . .	26	
Post mounting . . . . .	9	
Post mounting kit . . . . .	10	
Power supply . . . . .	6	
Power-up . . . . .	14	
Process monitoring . . . . .	30, 33	
<b>Q</b>		
Quick calibration . . . . .	18-19	
<b>R</b>		
Read mode . . . . .	19	
Relay operating modes . . . . .	24	
Repair . . . . .	43	
<b>S</b>		
Safety devices . . . . .	3	
Safety notes . . . . .	3	
Salinity . . . . .	29	
SCS . . . . .	31-33	
SCS alarm . . . . .	36	
Self-test . . . . .	14	
Sensor activity monitoring . . . . .	30-31	
Sensor cable . . . . .	13	
Sensor monitoring . . . . .	30	
Service . . . . .	43	
Service network . . . . .	43	
Setup mode . . . . .	19-20	
Start-up . . . . .	14-15	
Storage . . . . .	8	
Storage temperature . . . . .	46	
Symbols . . . . .	2	
<b>T</b>		
Technical data . . . . .	44-46	
Temperature error . . . . .	38	
Temperature offset . . . . .	25	
Test . . . . .	14	
Transport . . . . .	8	
<b>U</b>		
Unpacking . . . . .	8	
Use, intended . . . . .	3	
<b>W</b>		
Wall mounting . . . . .	9	
Weather protection cover . . . . .	10	
Weight . . . . .	46	

Display	Abbreviation for	Meaning	Page
<b>AC</b>	alternation check	Sensor activity monitoring	33 , 37
<b>ACCC</b>	alternation check / controller check	Sensor activity and controller monitoring	33
<b>ALT</b>	altitude	Altitude	29
<b>ALC</b>	alarm contact	Alarm contact	29
<b>ALd</b>	alarm delay	Alarm delay	29
<b>CAL</b>	calibration	Function group 'calibration'	34
<b>CC</b>	controller check	Controller monitoring	27
<b>CCd</b>	calibration code	Calibration code	19
<b>Entr</b>	controller	Function group 'controller'	27
<b>Conc</b>	concentration	O <sub>2</sub> measuring range in mg/l	28
<b>Conf</b>	configuration	Function group 'configuration'	29
<b>dEEen</b>	deenergized	Normally closed contact	27
<b>dEF</b>	default	Factory settings (defaults)	29
<b>En</b>	energized	Normally open contact	27
<b>FLEt</b>	fleeting contact	Fleeting contact	29
<b>H<sub>i</sub></b>	high	Max. contact or alarm threshold monitoring with upper threshold	26, 32, 37
<b>H<sub>i</sub>t</b>	high time	Max. time for violation of upper limit	33
<b>HYS</b>	hysteresis	Hysteresis	26

Display	Abbreviation for	Meaning	Page
<b>LAd</b>	limit alarm delay	Alarm delay in case of alarm threshold violation	32
<b>LCS</b>	limit check system	Alarm threshold monitoring	32 , 37
<b>Lct</b>	limit contactor	Limit contactor	27
<b>LH<sub>i</sub></b>	limit high	Upper alarm threshold	32
<b>LLo</b>	limit low	Lower alarm threshold	32
<b>Lo</b>	low	Min contact alarm threshold monitoring with lower threshold	26, 32, 37
<b>LoH<sub>i</sub></b>	low / high	Alarm threshold monitoring with lower und upper thresholds	31
<b>Lot</b>	low time	Max. time for violation of lower limit	33, 37
<b>no</b>	no	Do not restore defaults	29
<b>OFd</b>	off delay	Dropout delay	26
<b>off</b>	off	Controller off or alarm threshold monitoring off, process monitoring off	27
<b>on</b>	on	Controller on	27
<b>On<sub>d</sub></b>	on delay	Pickup delay	26
<b>Or</b>	over range	Display range exceeded	29
<b>out</b>	output	Current output	28
<b>O<sub>2</sub></b>	oxygen	Oxygen	34
<b>PCS</b>	process ckeck system	Process monitoring	33 , 37
<b>r.0</b>	range 0 mA	Display value for 0 mA (0 ... 20 mA)	28
<b>r.4</b>	range 4 mA	Display value for 4 mA (4...20 mA)	28

Display	Abbreviation for	Meaning	Page
<b>r20</b>	range 20 mA	Display value for 20 mA (0/4...20 mA)	28
<b>rEL</b>	relay	Relay function	27
<b>rng</b>	range	Function group 'measuring range'	28
<b>SAL</b>	salinity	Salinity (salt content)	29
<b>SAt</b>	saturation	O <sub>2</sub> measuring range in %SAT	28
<b>SCd</b>	setup code	Setup code	21
<b>SCS</b>	sensor check system	Sensor Check System	30
<b>SEn</b>	sensor	Sensor	30
<b>SEt °C</b>	set temperature °C	Function group 'temperature calibration'	25
<b>SP1</b>	setpoint 1	Limit setpoint 1	25
<b>SP2</b>	setpoint 2	Limit setpoint 2	25
<b>Stdy</b>	steady	Steady contact	29
<b>Un<sub>i</sub></b>	unit	Measuring range unit	28
<b>Ur</b>	under range	Value below display range	29
<b>YES</b>	yes	Restore defaults	29
<b>0-20</b>		Output range selection 0-20 mA	28
<b>4-20</b>		Output range selection 4-20 mA	28

