

# Technical Information

## Liquisys M COM223/253

### Dissolved Oxygen Measurement

#### Transmitter for oxygen sensors



#### Application

- Sewage treatment plants
- Wastewater treatment
- Water treatment
- Drinking water
- Surface water: rivers, lakes, sea
- Fish farming
- Boiler feed water (trace measurement)

#### Your benefits

- Field or panel-mounted housing
- Universal application
- For analogue and digital sensors
- Simple handling
  - Logically arranged menu structure
  - Simple single-point calibration in air, air-saturated water or in the medium is possible
- Safe operation
  - Excellent interference immunity
  - Manual contact control and user-defined alarm configuration

The basic unit can be extended with:

- 2 or 4 additional contacts for use as:
  - Limit contacts (also for temperature)
  - P(ID) controller
  - Timer for simple rinse processes
  - Complete cleaning with Chemoclean
- Plus package:
  - User-defined current output characteristics
  - Automatic cleaning trigger on alarm or limit violation
  - Process monitoring
  - Sensor live check
- HART or PROFIBUS-PA/-DP
- 2nd current output for temperature, main measured value or actuating variable
- Current input for flow rate monitoring with controller shut off or for feedforward control

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## Function and system design

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<b>Features of the basic version</b>	<p><b>Measurement of oxygen content and of partial oxygen pressure</b></p> <p>The oxygen content is displayed in mg/l or in %SAT, the partial oxygen pressure is displayed in hPa. This is selected via the menu. The <b>temperature</b> is displayed at the same time or, if desired, not shown at all.</p> <p><b>Calibration</b></p> <p>The amperometric sensors are zero-current-free and only require a <b>single-point calibration</b>. This takes place in air, air-saturated water or by reference calibration in the medium. The optical sensor will be calibrated before shipment. If necessary it can be calibrated in air and for zero point.</p> <p><b>Configuration</b></p> <p>Different alarms are required depending on application and operator. Therefore the transmitter permits independent <b>configuration of the alarm contact and error current</b> for each individual error. Unnecessary or undesirable alarms can be suppressed in this manner. <b>Up to four contacts Up to two contacts</b> can be used as limit contacts (also for temperature), to implement a P(ID) controller or for cleaning functions.</p> <p>Direct <b>manual operation of the contacts</b> (bypassing the menu) provides quick access to limit, control or cleaning contacts, permitting speedy correction of deviations.</p> <p>The <b>serial numbers</b> of the instrument and modules and the order code can be called up on the display.</p>
<b>Additional functions of version WX/WS/DS</b>	<p><b>Automatic pressure compensation</b></p> <p>Oxygen concentration is not only dependent on altitude but also on weather conditions (pressure). <b>Automatic pressure compensation</b> takes these fluctuations into account.</p>
<b>Additional functions of the Plus package</b>	<p><b>Current output configuration</b></p> <p>In order to output wide measuring ranges while still achieving a high resolution in specific ranges, the <b>current output</b> can be configured as required via a table. This permits <b>bilinear</b> or <b>quasi-logarithmic</b> curves, etc.</p> <p><b>Process Check System (PCS)</b></p> <p>It comprises two independent safety functions:</p> <ul style="list-style-type: none"> <li>▪ Errors in applications <b>without</b> control are detected by monitoring the limit between plausible and implausible measured values, i.e. <b>the alarm threshold</b>.</li> <li>▪ Errors in applications <b>with</b> control are detected by the <b>controller monitor</b> which monitors freely adjustable, maximum permissible time intervals and reference value overshoot or undershoot.</li> </ul> <p><b>Live check, sensor activity monitoring</b></p> <p>The live check issues an alarm when the sensor signal does not change over a defined period of time. This may be caused by blocking, passivation, separation from the process, etc.</p>
<b>Second current output</b>	<p>The second current output can be configured for temperature, main measured value (oxygen content, partial oxygen pressure) or actuating variable.</p>
<b>Current input</b>	<p>The current input of the transmitter allows two different applications: controller shut-down in case of lower flow rate violation or total failure in the main flow as well as feedforward control. Both functions are also combinable.</p>

**Measuring system**

A complete measuring system comprises:

**Variant 1 (DX/DS with COS41)**

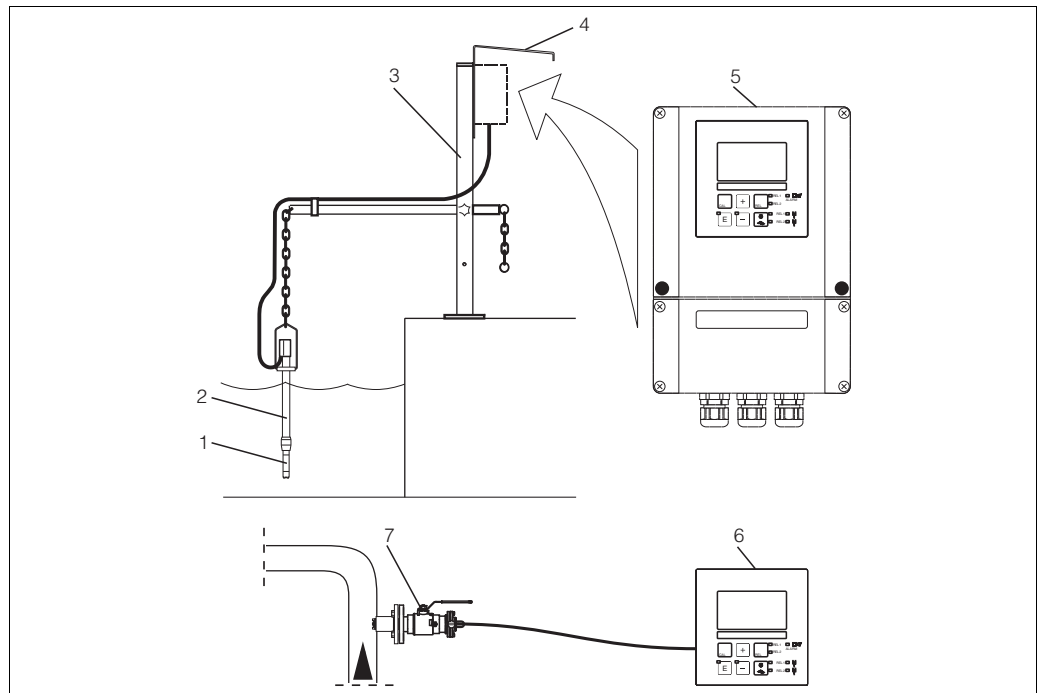
- The transmitter Liquisys M COM223 or COM253 in version DX or DS
- An oxygen sensor COS41
- An immersion, flow or retractable assembly

Options: extension cable CMK, junction box VBM

**Variant 2 (WX/WS with COS31, COS61 or COS71)**

- The transmitter Liquisys M COM223 or COM253 in version WX or WS
- An oxygen sensor COS31, COS61 or COS71
- An immersion, flow or retractable assembly

Options: extension cable OMK, junction box VS



C07-COM2x3xx-14-06-00-xx-002.eps

Complete measuring system Liquisys M COM223/253

- |   |  |   |                             |
|---|--|---|-----------------------------|
| 1 | Oxygen sensor                            | 5 | Liquisys M COM253           |
| 2 | Immersion assembly CYA611                | 6 | Liquisys M COM223           |
| 3 | Universal hanging assembly holder CYH101 | 7 | Retractable assembly COA451 |
| 4 | Weather protection cover CYY101          |   |                             |

## Input

<b>Measured variables</b>	Oxygen Temperature	
<b>Measuring range</b>	COS31: Oxygen concentration Oxygen saturation index Oxygen partial pressure COS41, COS61: Oxygen concentration Oxygen saturation index Oxygen partial pressure COS71: Oxygen concentration Oxygen saturation index Oxygen partial pressure Temperature:	0 to 20 / 0 to 60 mg/l 0 to 200 / 0 to 600 % SAT 0 to 400 / 0 to 1200 hPa 0 to 20 mg/l 0 to 200 % SAT 0 to 400 hPa 0 to 20 mg/l 0 to 200 % SAT 0 to 400 hPa -10 to 60 °C (14 to 140 °F)
<b>Cable specification</b>	Cable length: COS31, COS61, COS71 COS41	max. 100 m (328 ft) max. 50 m (164 ft)
<b>O<sub>2</sub> signal input</b>	Version DX/DS: Version WX/WS:	0 to 3000 nA digital communication or 0 to -7500 mV
<b>Binary inputs</b>	Voltage: Power consumption:	10 to 50 V max. 10 mA
<b>Current input</b>	4 to 20 mA, galvanically separated Load: 260 Ω at 20 mA (voltage drop 5.2 V)	

## Output

**Output signal** 0/4 to 20 mA, galvanically separated, active

HART	
Signal coding	Frequency Shift Keying (FSK) + 0.5 mA via current output signal
Data transfer rate	1200 Baud
Galvanic isolation	yes

PROFIBUS PA	
Signal coding	Manchester Bus Powered (MBP)
Data transfer rate	31.25 kBit/s, voltage mode
Galvanic isolation	yes (IO-Module)

PROFIBUS DP	
Signal coding	RS485
Data transfer rate	9.6 kBd, 19.2 kBd, 93.75 kBd, 187.5 kBd, 500 kBd, 1.5 MBd
Galvanic isolation	yes (IO-Module)

**Signal on alarm** 2.4 or 22 mA in case of an error

**Load** maximum 500  $\Omega$

**Transmission range**

COS31:

Oxygen concentration	$\Delta$ 0.2 to $\Delta$ 20 / $\Delta$ 0.6 to $\Delta$ 60 mg/l
Oxygen saturation index	$\Delta$ 2 to $\Delta$ 200 / $\Delta$ 6 to $\Delta$ 600 % SAT
Oxygen partial pressure	$\Delta$ 4 to $\Delta$ 400 / $\Delta$ 12 to $\Delta$ 1200 hPa

COS41, COS61:

Oxygen concentration	$\Delta$ 0.2 to $\Delta$ 20 mg/l
Oxygen saturation index	$\Delta$ 2 to $\Delta$ 200 % SAT
Oxygen partial pressure	$\Delta$ 4 to $\Delta$ 400 hPa

COS71:

Oxygen concentration	$\Delta$ 0.02 to $\Delta$ 20 mg/l
Oxygen saturation index	$\Delta$ 0.2 to $\Delta$ 200 % SAT
Oxygen partial pressure	$\Delta$ 0.4 to $\Delta$ 400 hPa

Temperature:  $\Delta$  7 to  $\Delta$  70 °C

**Resolution** max. 700 digits/mA

**Isolation voltage** max. 350 V<sub>RMS</sub>/500 V DC

**Overvoltage protection** according to EN 61000-4-5

**Auxiliary voltage output**

Output voltage:	15 V $\pm$ 0.6
Output current:	max. 10 mA

<b>Contact outputs</b>	Switching current with ohmic load ( $\cos \varphi = 1$ ):	max. 2 A
	Switching current with inductive load ( $\cos \varphi = 0.4$ ):	max. 2 A
	Switching voltage:	max. 250 V AC, 30 V DC
	Switching power with ohmic load ( $\cos \varphi = 1$ ):	max. 500 VA AC, 60 W DC
	Switching power with inductive load ( $\cos \varphi = 0.4$ ):	max. 500 VA AC, 60 W DC
<b>Limit contactor</b>	Pickup/dropout delay:	0 to 2000 s
<b>Controller</b>	Function (adjustable):	pulse length/pulse frequency controller
	Controller response:	PID
	Control gain $K_p$ :	0.01 to 20.00
	Integral action time $T_n$ :	0.0 to 999.9 min
	Derivative action time $T_v$ :	0.0 to 999.9 min
	Period for pulse length controller:	0.5 to 999.9 s
	Frequency for pulse frequency controller:	60 to 180 $\text{min}^{-1}$
Basic load:	0 to 40% of max. set value	
<b>Alarm</b>	Function (switchable):	latching/momentary contact
	Alarm threshold adjustment range:	$O_2$ / temperature: entire measuring range, depending on sensor type
	Alarm delay:	0 to 2000 s (min)
	Monitoring time lower limit violation:	0 to 2000 min
	Monitoring time upper limit violation:	0 to 2000 min

## Protocol specific data

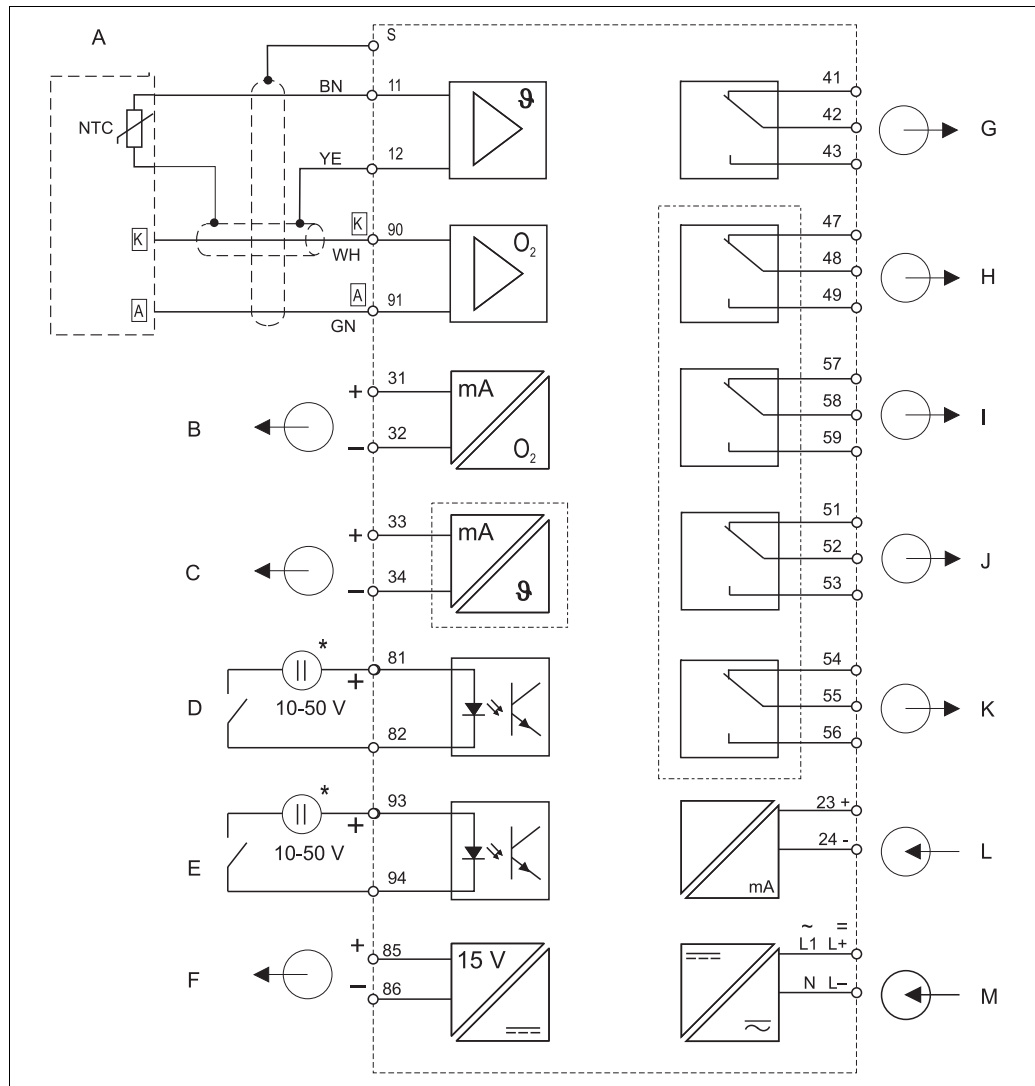
<b>HART</b>	
Manufacturer ID	11 <sub>h</sub>
Device type code	0094 <sub>h</sub>
Transmitter specific revision	0001 <sub>h</sub>
HART specification	5.0
DD files	<a href="http://www.products.endress.com/hart">www.products.endress.com/hart</a>
Load HART	250 Ω
Device variables	None (dynamic variables PV, SV, only)
Features supported	-

<b>PROFIBUS PA</b>	
Manufacturer ID	11 <sub>h</sub>
Ident number	1518 <sub>h</sub>
Device revision	11 <sub>h</sub>
Profile version	2.0
GSD files	<a href="http://www.products.endress.com/profibus">www.products.endress.com/profibus</a>
GSD file version	
Output values	Main value, temperature value
Input values	Display value of PLC
Features supported	Device locking: The device can be locked by hardware or software.

<b>PROFIBUS DP</b>	
Manufacturer ID	11 <sub>h</sub>
Ident number	151E <sub>h</sub>
Profile version	2.0
GSD files	<a href="http://www.products.endress.com/profibus">www.products.endress.com/profibus</a>
GSD file version	
Output values	Main value, temperature value
Input values	Display value of PLC
Features supported	Device locking: The device can be locked by hardware or software.

## Power supply

### Electrical connection COM2x3-DX/DS



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Electrical connection version DX or DS

- A Sensor COS41
- B Signal output 1 oxygen
- C Signal output 2 temperature
- D Binary input 1 (Hold)
- E Binary input 2 (Chemoclean)
- F Aux. voltage output

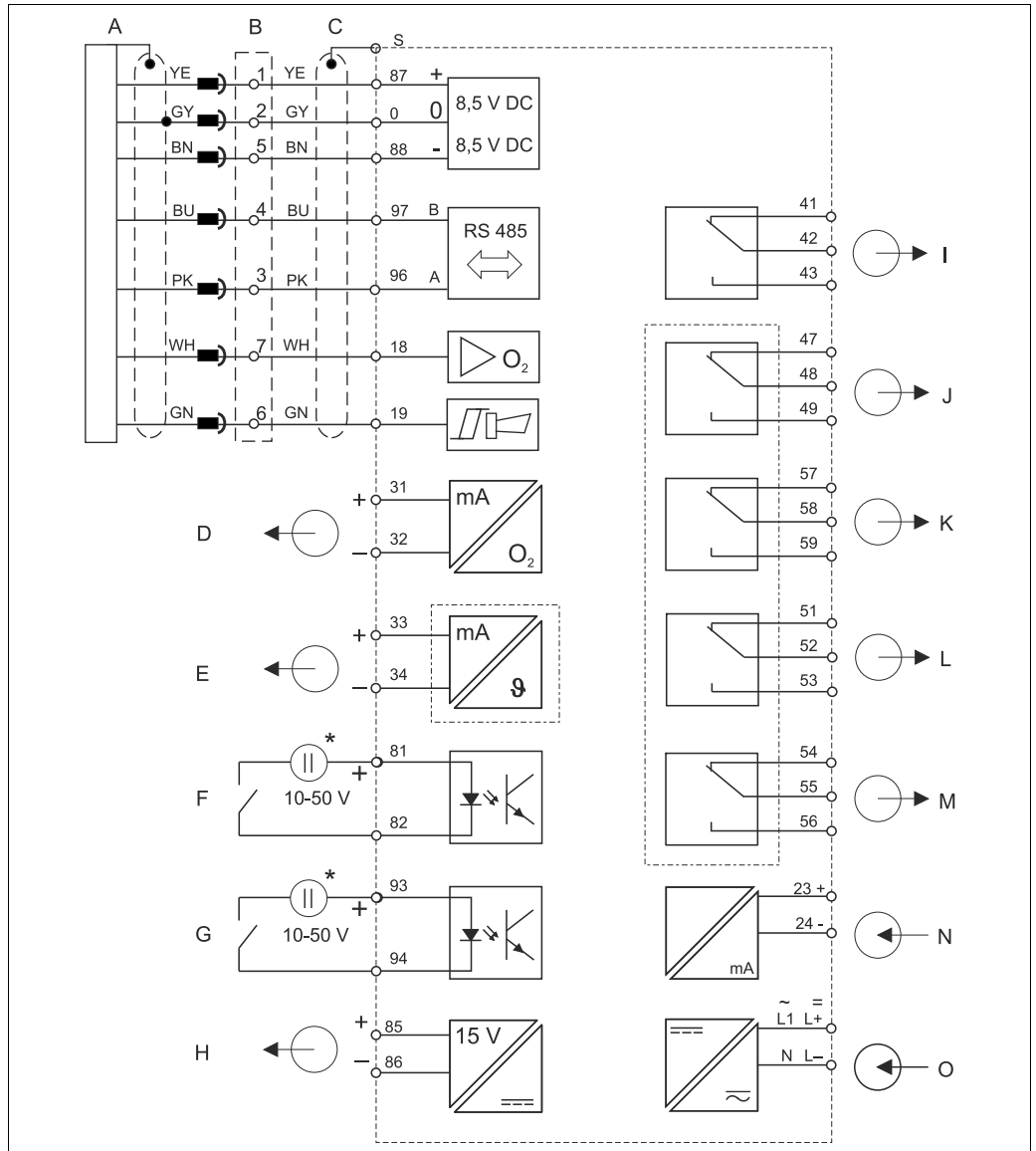
\* Aux. voltage output terminal 85/86 applicable

- G Alarm (current-free contact position)
- H Relay 1 (current-free contact position)
- I Relay 2 (current-free contact position)
- J Relay 3 (current-free contact position)
- K Relay 4 (current-free contact position)
- L Current input 4 to 20 mA
- M Power supply

The device is approved for protection class II and is generally operated without a protective earth connection.



**Electrical connection  
COM2x3-WX/WS<sup>1)</sup>**



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*Electrical connection version WX/WS*

A Oxygen sensor COS31/61/71

B Junction box VS with extension

C COM253: Plug connection for oxygen sensor  
COM223: The sensor cable plug must be removed or L junction box VS used

D Signal output 1 oxygen

E Signal output 2 temperature

F Binary input 1 (Hold)

G Binary input 2 (Chemoclean)

H Aux. voltage output

I Alarm (current-free contact position)

J Relay 1 (current-free contact position)

K Relay 2 (current-free contact position)

L Relay 3 (current-free contact position)

M Relay 4 (current-free contact position)

N Current input 4 to 20 mA

O Power supply

\* Aux. voltage output terminal 85/86 applicable

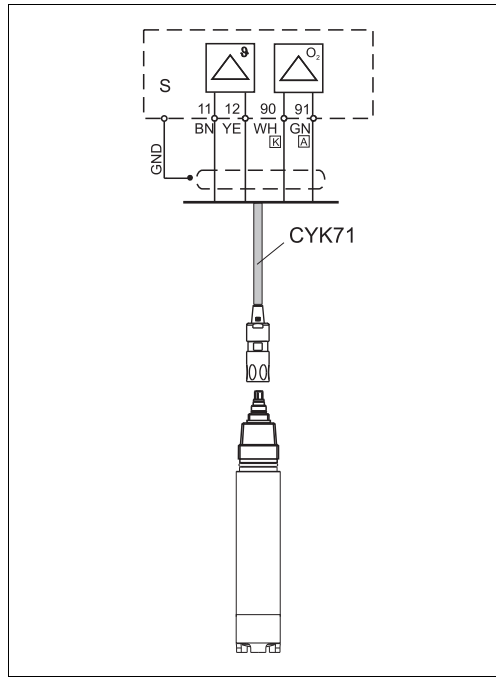
The device is approved for protection class II and is generally operated without a protective earth connection.

The signals "Sensor signal" and "Alarm" are not used by COS61 and the TOP68-versions.

1) COS61 from serial no. 79xxxx

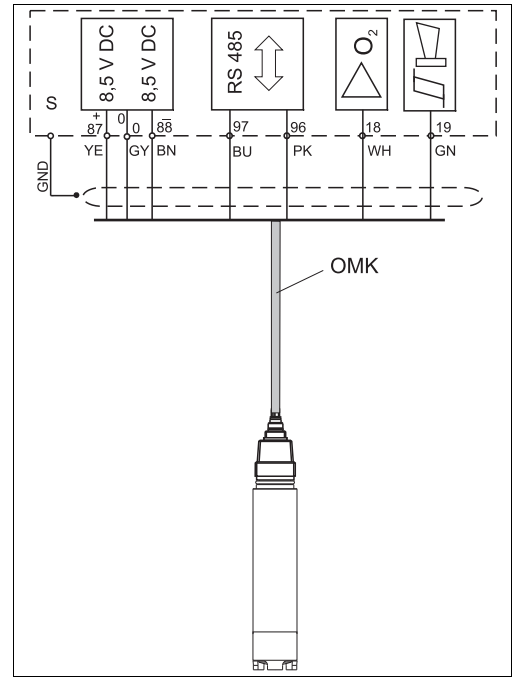
**Connection of sensor**

The oxygen sensors are supplied with the measuring cable. To extend this cable, you have to use a junction box and an extension cable (see "Accessories").



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COS41 to COM2x3-DX/DS with CYK71 cable



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COS31/61<sup>1)</sup>/71 to COM2x3-WX/WS

1) from serial no. 79xxxx

**Supply voltage**

Depending on ordered version:  
 100/115/230 V AC +10/-15 %, 48 to 62 Hz  
 24 V AC/DC +20/-15 %

**Fieldbus connection**

<b>HART</b>	
Supply voltage	n/a, active current outputs
Integrated reverse voltage protection	n/a, active current outputs

<b>PROFIBUS PA</b>	
Supply voltage	9 V to 32 V, max. 35 V
Polarity sensitive	no
FISCO/FNICO compliant acc. to IEC 60079-27	no

<b>PROFIBUS DP</b>	
Supply voltage	9 V to 32 V, max. 35 V
Polarity sensitive	n/a
FISCO/FNICO compliant acc. to IEC 60079-27	no

**Power consumption**

max. 7.5 VA

**Mains protection**

Fine-wire fuse, medium-slow blow 250 V/3.15 A

## Circuit breaker

**NOTICE****The device does not have a power switch**

- ▶ You must provide a protected circuit breaker in the vicinity of the device.
- ▶ This must be a switch or a power-circuit breaker and you must label it as the circuit breaker for the device.
- ▶ At the supply point, the power supply for the 24 V versions must be isolated from dangerous live cables by double or reinforced insulation.

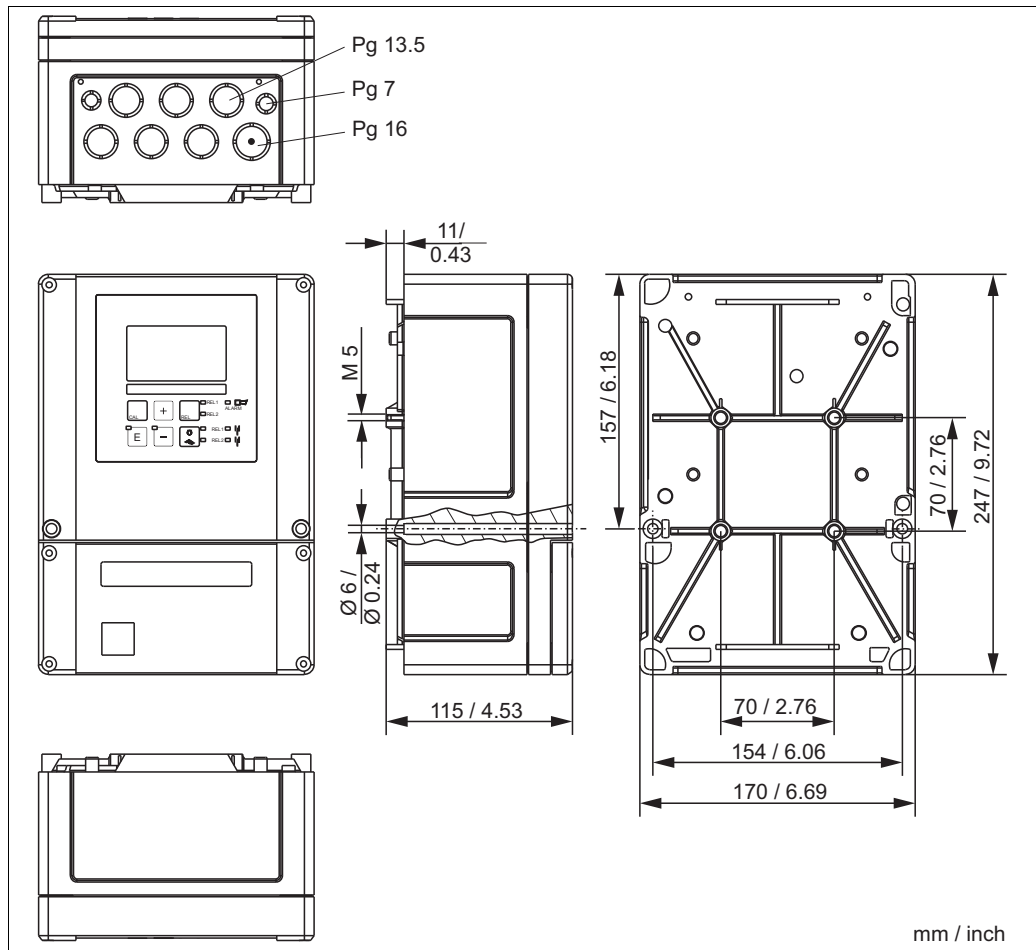
## Performance characteristics

<b>Resolution</b>	Oxygen: COS31, COS41, COS61: COS71: Temperature:	0.01 mg/l / 0.1 % SAT / 1 hPa 0.001 mg/l / 0.1 % SAT / 1 hPa 0.1 °C
<b>Maximum measured error<sup>2)</sup></b>	Display Oxygen: Temperature: Signal output Oxygen: Temperature:	max. 0.5 % of measuring range max. 1.0 % of measuring range  max. 0.75 % of measuring range max. 1.25 % of measuring range
<b>Repeatability<sup>a</sup></b>	max. 0.2 % of measuring range	
<b>Temperature compensation range</b>	0 to 50 °C (32 to 104 °F)	
<b>Pressure compensation range</b>	500 to 1100 hPa	
<b>Altitude adjustment range</b>	0 to 4000 m (0 to 13124 ft)	
<b>Salinity adjustment range</b>	0 to 4 ‰	
<b>Slope adjustment range</b>	COS31: COS41: COS61: COS71:	75 to 140 % (nominal 290 nA, in air, 20 °C, 1013 hPa) 75 to 140 % (nominal 290 nA, in air, 20 °C, 1013 hPa) 75 to 140 % (nominal 1340 nA, in air, 20 °C, 1013 hPa) 50 to 150 % (nominal 8000 nA, in air, 20 °C, 1013 hPa)

2) acc. to IEC 746-1, for nominal operating conditions

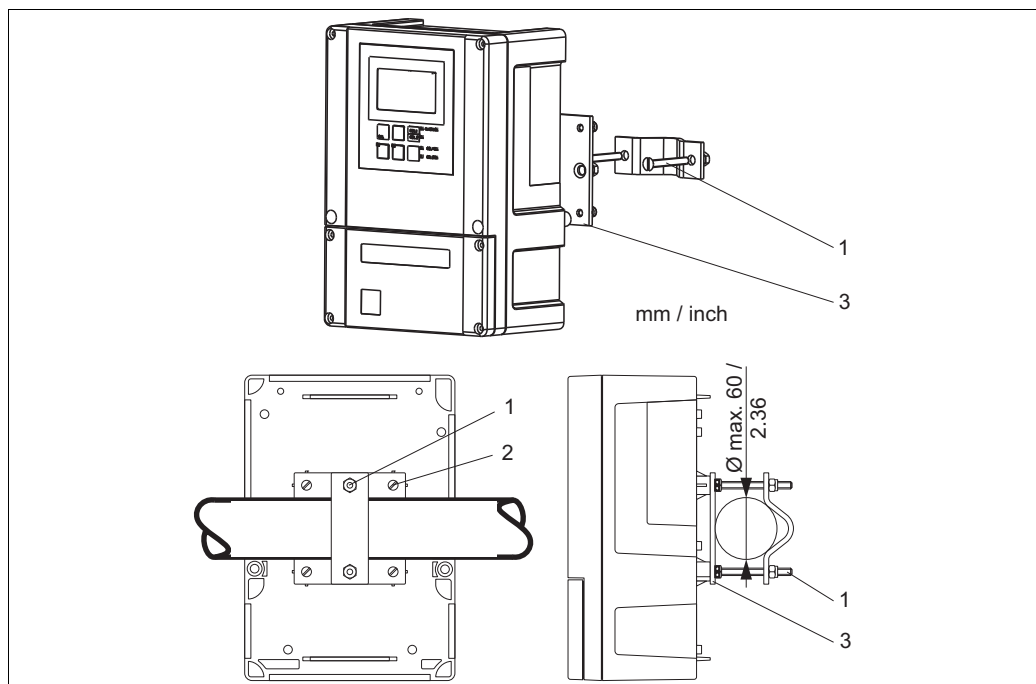
# Installation

## Installation instructions



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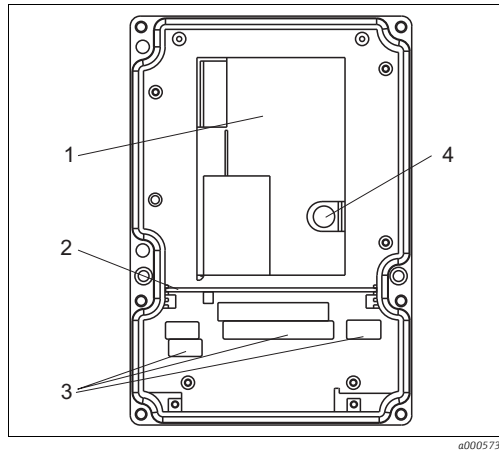
## Field instrument



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## Mounting on pipes

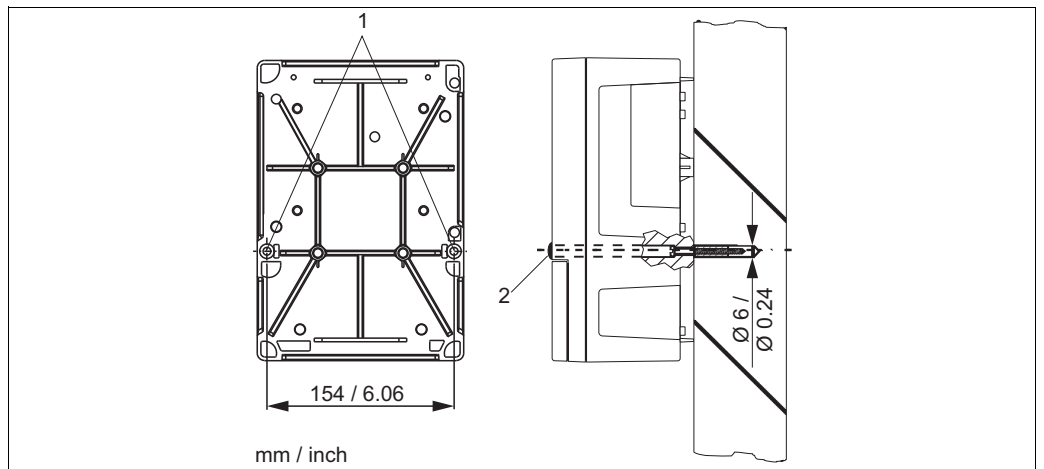
1 - 3 Mounting screws and mounting plate



- 1 Removable electronics box
- 2 Partition plate
- 3 Terminal blocks
- 4 Fuse

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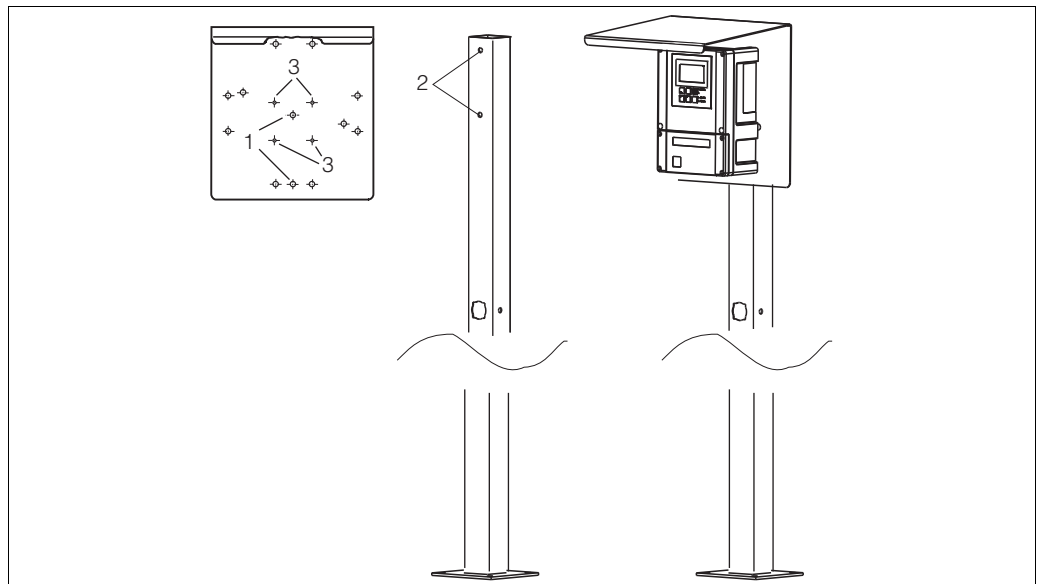
View into the field instrument



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Wall mounting of the field instrument

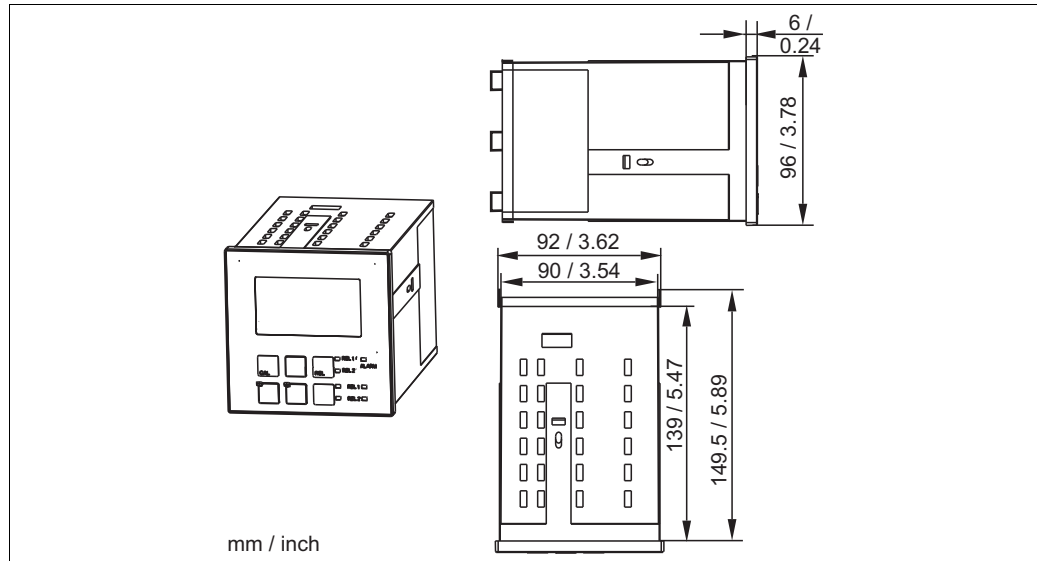
- 1 Mounting holes
- 2 Protecting cap



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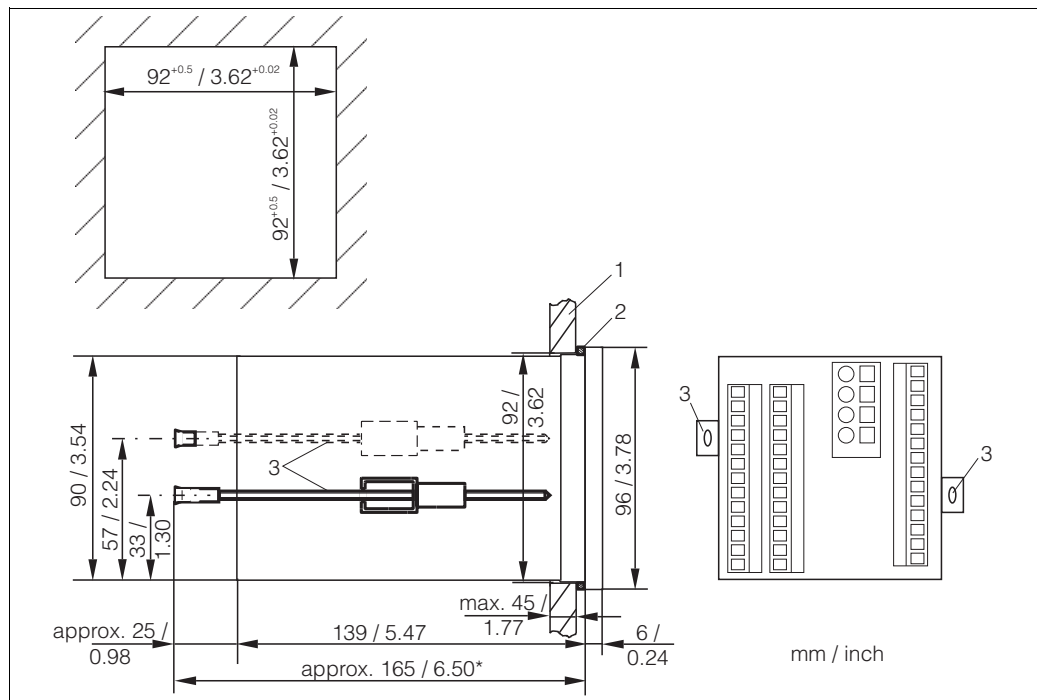
Mounting of the field instrument with mounting post and weather protection cover

- 1 - 3 Mounting holes



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Dimensions panel-mounted instrument



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Installation of the panel-mounted instrument

- 1 Wall of control cabinet
- 2 Gasket
- 3 Tensioning screws
- \* Required installation depth

## Environment

<b>Ambient temperature</b>	-10 to +55 °C (+14 to +131 °F)	
<b>Storage temperature</b>	-25 to +65 °C (-13 to +149 °F)	
<b>Electromagnetic compatibility</b>	Interference emission and interference immunity as per EN 61326-1:2006, EN 61326-2-3:2006	
<b>Ingress protection</b>	Panel mounted instrument: Field instrument:	IP 54 (front), IP 30 (housing) IP 65 / tightness acc. to NEMA 4X
<b>Electrical safety</b>	according EN/IEC 61010-1:2001, Installation Category II, for use up to 2000 m above sea level	
<b>CSA</b>	Apparatus with CSA General Purpose Approval are certified for indoor use.	
<b>Relative humidity</b>	10 to 95%, non-condensing	
<b>Pollution degree</b>	The product is suitable for pollution degree 2.	

## Mechanical construction

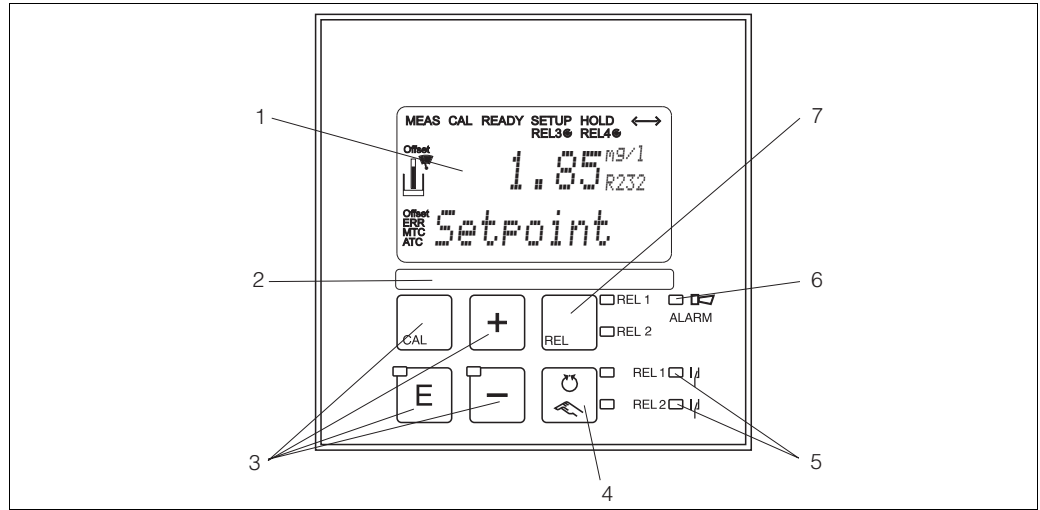
<b>Dimensions</b>	Panel mounted instrument: Field instrument:	96 x 96 x 145 mm (3.78 x 3.78 x 5.71 inches) Installation depth: approx. 165 mm (6.50") 247 x 170 x 115 mm (9.72 x 6.69 x 4.53 inches)
<b>Weight</b>	Panel mounted instrument: Field instrument:	max. 0.7 kg (1.5 lb) max. 2.3 kg (5.1 lb)
<b>Material</b>	Housing of panel mounted instrument: Field housing: Front membrane:	Polycarbonate ABS PC Fr Polyester, UV-resistant
<b>Terminals</b>	Cross section	max. 2.5 mm <sup>2</sup>

## Operability

### Operating concept

All instrument control functions are arranged in a logical menu structure. Following access code entry, the individual parameters can be easily selected and modified as needed.

### Display elements



Operating elements

The display simultaneously shows the current measured value and the temperature - the essential process data. Brief information texts in the configuration menu provide assistance with parameter configuration.



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## Certificates and approvals

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**CE symbol****Declaration of conformity**

The product meets the requirements of the harmonized European standards. It thus complies with the legal requirements of the EC directives.

The manufacturer confirms successful testing of the product by affixing the **CE** symbol.

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**CSA General purpose****CSA General Purpose**

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators "C" and "US":

Version	Approval
COM253-..2... COM253-..3... COM253-..7...	CSA Mark for Canada and USA
COM223-..2... COM223-..3... COM223-..7...	CSA Mark for Canada and USA



**Scope of delivery**

The delivery of the field instrument includes:

- 1 transmitter COM253
- 1 plug-in screw terminal
- 1 cable gland Pg 7
- 1 cable gland Pg 16 reduced
- 2 cable glands Pg 13.5
- 1 Operating Instructions BA00199C/07/EN
- 1 Operating Instructions
- versions with HART communication:
  - 1 Operating Instructions Field Communication with HART, BA00208C/07/EN
- versions with PROFIBUS communication:
  - 1 Operating Instructions Field Communication with PROFIBUS PA/DP, BA00209C/07/EN

The delivery of the panel mounted instrument includes:

- 1 transmitter COM223
- 1 set of plug-in screw terminals
- 2 tensioning screws
- 1 BNC-plug (solder-free)
- 1 Operating Instructions BA00199C/07/EN
- 1 Operating Instructions
- versions with HART communication:
  - 1 Operating Instructions Field Communication with HART, BA00208C/07/EN
- versions with PROFIBUS communication:
  - 1 Operating Instructions Field Communication with PROFIBUS PA/DP, BA00209C/07/EN

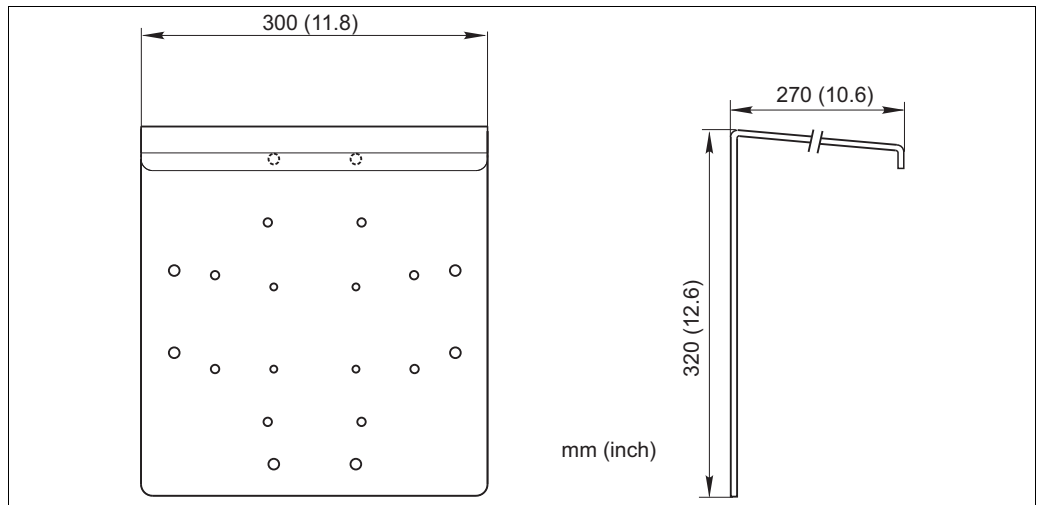
## Accessories

<b>Sensors</b>	<p>Oxymax COS31</p> <ul style="list-style-type: none"> <li>▪ Oxygen sensor for drinking water and wastewater measurements, potentiostatic amperometric principle</li> <li>▪ Material: stainless steel 1.4571 (AISI 316 Ti)</li> <li>▪ Ordering acc. to product structure, see product page: <a href="http://www.products.endress.com/cos31">www.products.endress.com/cos31</a></li> <li>▪ Technical Information TI00285C/07/EN</li> </ul> <p>Oxymax COS41</p> <ul style="list-style-type: none"> <li>▪ Oxygen sensor for drinking water and wastewater measurements, amperometric principle</li> <li>▪ Material: POM</li> <li>▪ Ordering acc. to product structure, see product page: <a href="http://www.products.endress.com/cos41">www.products.endress.com/cos41</a></li> <li>▪ Technical Information TI00284C/07/EN</li> </ul> <p>Oxymax COS71</p> <ul style="list-style-type: none"> <li>▪ Oxygen sensor for trace measurement, potentiostatic amperometric principle</li> <li>▪ Material: stainless steel 1.4571 (AISI 316 Ti)</li> <li>▪ Ordering acc. to product structure, see product page: <a href="http://www.products.endress.com/cos71">www.products.endress.com/cos71</a></li> <li>▪ Technical Information TI00286C/07/EN</li> </ul> <p>Oxymax COS61</p> <ul style="list-style-type: none"> <li>▪ Optical oxygen sensor for drinking water and wastewater measurements, fluorescence quenching principle</li> <li>▪ Material: stainless steel 1.4571 (AISI 316 Ti)</li> <li>▪ Ordering acc. to product structure, see product page: <a href="http://www.products.endress.com/cos61">www.products.endress.com/cos61</a></li> <li>▪ Technical Information TI00387C/07/EN</li> </ul>
<b>Connection accessories</b>	<p>OMK measuring cable</p> <ul style="list-style-type: none"> <li>▪ non-terminated measuring cable for oxygen sensors COS31, COS61 and COS71, for extension between junction box VS and transmitter</li> <li>▪ Sold by the meter, order no. 50004124</li> </ul> <p>CMK measuring cable</p> <ul style="list-style-type: none"> <li>▪ non-terminated measuring cable for oxygen sensor COS41, for extension between junction box VBM and transmitter</li> <li>▪ Sold by the meter, order no. 50005374</li> </ul> <p>VS junction box</p> <ul style="list-style-type: none"> <li>▪ With plug-in socket and 7-pole plug</li> <li>▪ For cable extension from sensor (COS71, COS61, COS31, COS3 with SXP connector) to transmitter, IP 65;</li> <li>▪ Order no. 50001054</li> </ul> <p>Junction box VBM</p> <ul style="list-style-type: none"> <li>▪ for cable extension for sensors COS41, COS4 (fixed cable versions)</li> <li>▪ with 10 terminals, IP 65 / NEMA 4X</li> <li>▪ Order numbers: <ul style="list-style-type: none"> <li>– Cable entry Pg 13.5: 50003987</li> <li>– Cable entry NPT ½": 51500177</li> </ul> </li> </ul>

**Mounting accessories**

CYY101 weather protection cover for field devices, absolutely essential if operating the unit outdoors

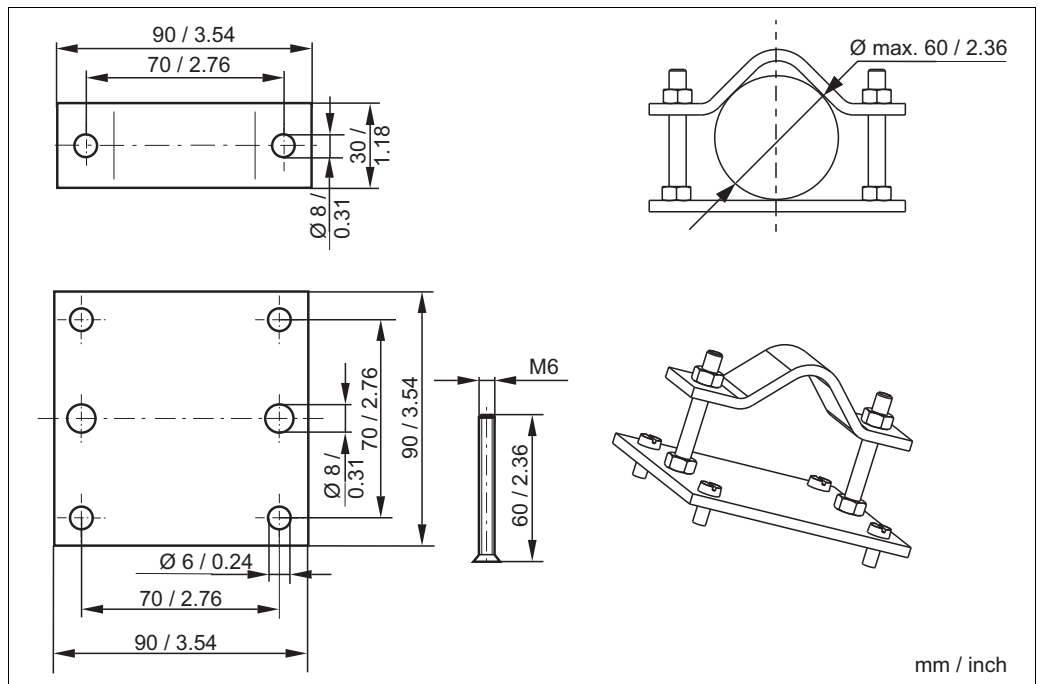
- Material: stainless steel 1.4031 (AISI 304)
- Order No. CYY101-A



Weather protection cover for field devices

**Post mounting kit**

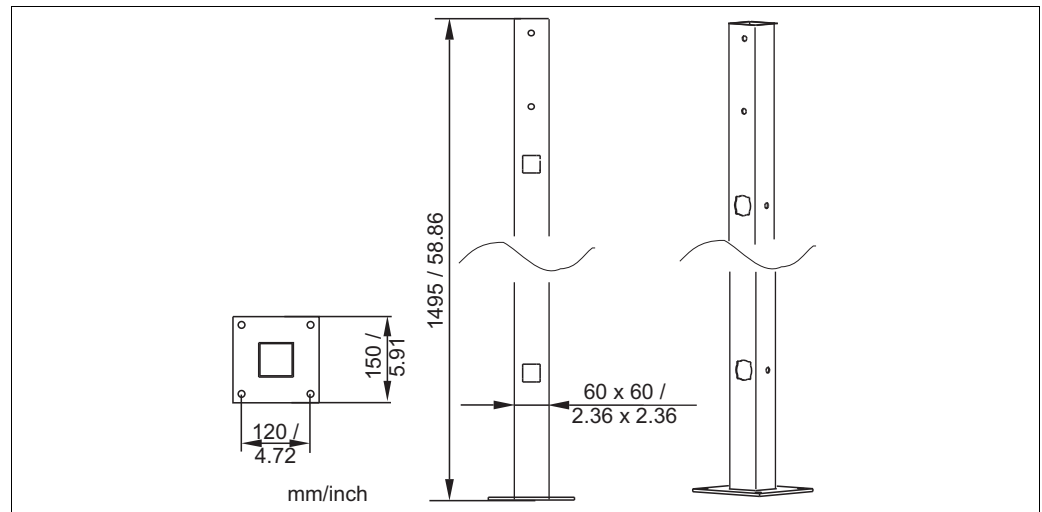
- For mounting of field housing on horizontal or vertical pipes ( $\varnothing$  max. 60 mm (2.36"))
- Material: stainless steel 1.4301
- order no. 50086842



Post mounting kit

## CYY102 universal post

- Square pipe for mounting transmitters
- Material: stainless steel 1.4301 (AISI 304)
- Order No. CYY102-A



Universal post



[www.addresses.endress.com](http://www.addresses.endress.com)

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