



Level



Pressure



Flow



Temperature

Liquid  
Analysis

Registration

Systems  
Components

Services



Solutions

## Technical Information

# Liquisys M COM223/253

## Dissolved Oxygen Measurement Transmitter for oxygen sensors



### Application

The modular design of the transmitter allows easy adaption to a variety of customer requirements. Starting with the basic version for "measurement and alarm generation", the transmitter can be equipped with additional software and hardware modules for special applications. These modules can also be retrofitted as required.

### Areas of 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
  - Direct access for manual contact control
  - 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</b> can be used as limit contacts (also for temperature), to implement a P(ID) controller or for cleaning functions. 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. 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)

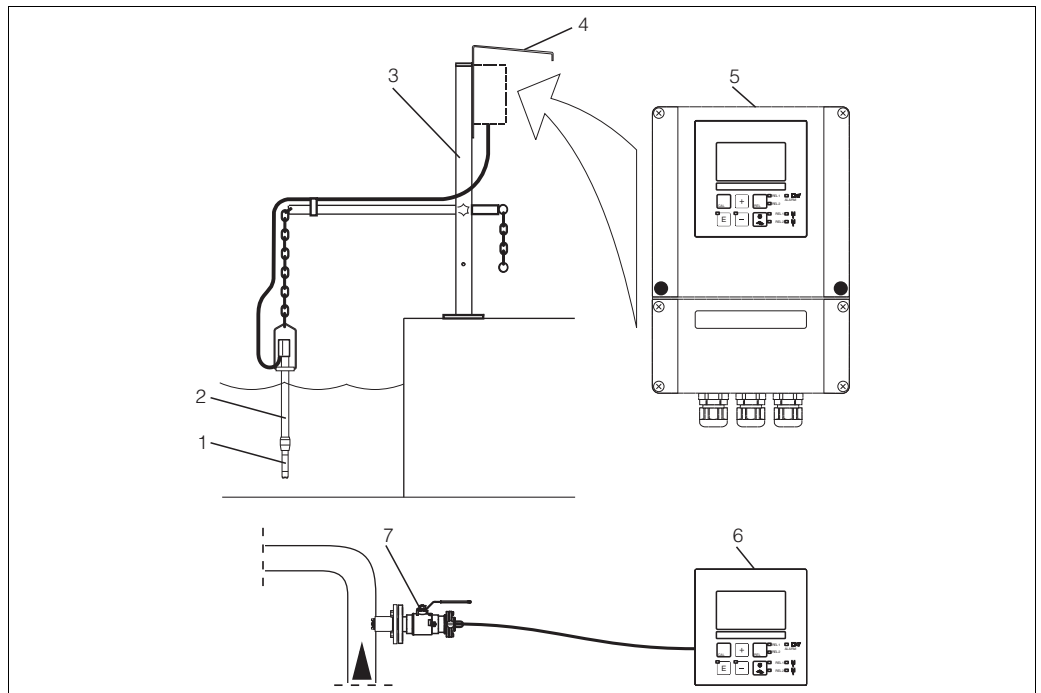
- The transmitter Liquisys M COM223 or COM253 in version DX or DS
- An oxygen sensor COS41
- An immersion, flow or retractable assembly

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



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Complete measuring system Liquisys M COM223/253

- |                                   |                               |
|-----------------------------------|-------------------------------|
| 1 Oxygen sensor                   | 5 Liquisys M COM253           |
| 2 Immersion assembly CYA112       | 6 Liquisys M COM223           |
| 3 Holder CYH112                   | 7 Retractable assembly COA451 |
| 4 Weather protection cover CYY101 |                               |

## Input

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

<b>Signal on alarm</b>	2.4 or 22 mA in case of an error	
<b>Load</b>	maximum 500 $\Omega$	
<b>Transmission range</b>	COS31: Oxygen concentration $\Delta 0.2 \dots \Delta 20 / \Delta 0.6 \dots \Delta 60$ mg/l Oxygen saturation index $\Delta 2 \dots \Delta 200 / \Delta 6 \dots \Delta 600$ % SAT Oxygen partial pressure $\Delta 4 \dots \Delta 400 / \Delta 12 \dots \Delta 1200$ hPa COS41, COS61: Oxygen concentration $\Delta 0.2 \dots \Delta 20$ mg/l Oxygen saturation index $\Delta 2 \dots \Delta 200$ % SAT Oxygen partial pressure $\Delta 4 \dots \Delta 400$ hPa COS71: Oxygen concentration $\Delta 0.02 \dots \Delta 20$ mg/l Oxygen saturation index $\Delta 0.2 \dots \Delta 200$ % SAT Oxygen partial pressure $\Delta 0.4 \dots \Delta 400$ hPa Temperature: $\Delta 7 \dots \Delta 70$ °C	
<b>Resolution</b>	max. 700 digits/mA	
<b>Isolation voltage</b>	max. 350 $V_{RMS}$ /500 V DC	
<b>Overvoltage protection</b>	according to EN 61000-4-5	
<b>Auxiliary voltage output</b>	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 $T_i$ :	0.0 to 999.9 min
	Derivative action time $T_d$ :	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 <sub>2</sub> / temperature: entire measuring range, depending on sensor type
	Alarm delay:	0 ... 2000 s (min)
	Monitoring time lower limit violation:	0 ... 2000 min
	Monitoring time upper limit violation:	0 ... 2000 min

## Protocol specific data

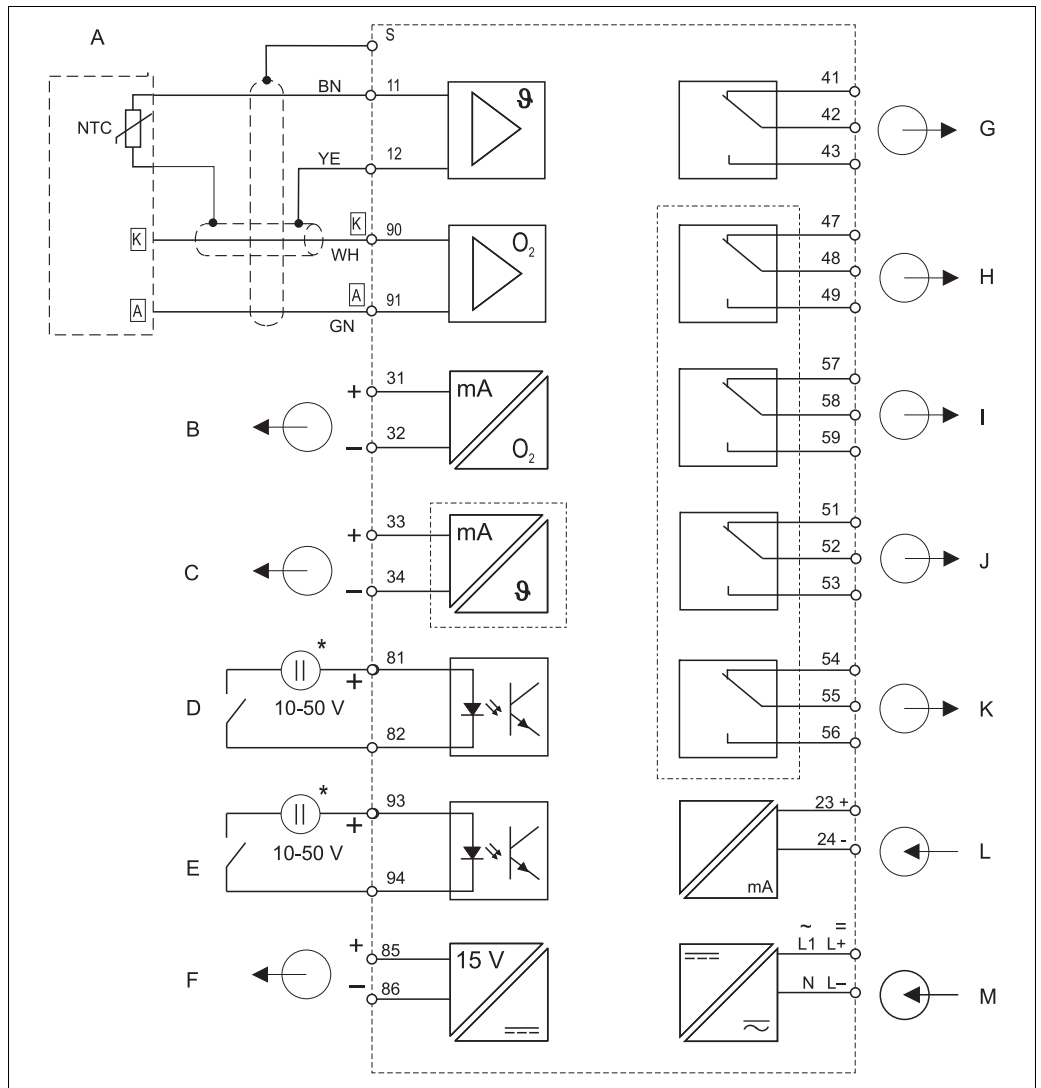
<b>HART</b>	
Manufacturer ID	11 <sub>h</sub>
Device type code	0094 <sub>h</sub>
Transmitter specific revision	0001 <sub>h</sub>
HART specification	5.0
DD files	<a href="http://www.products.endress.com/profibus">www.products.endress.com/profibus</a>
Load HART	250 Ω
Device variables	None (dynamic variables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



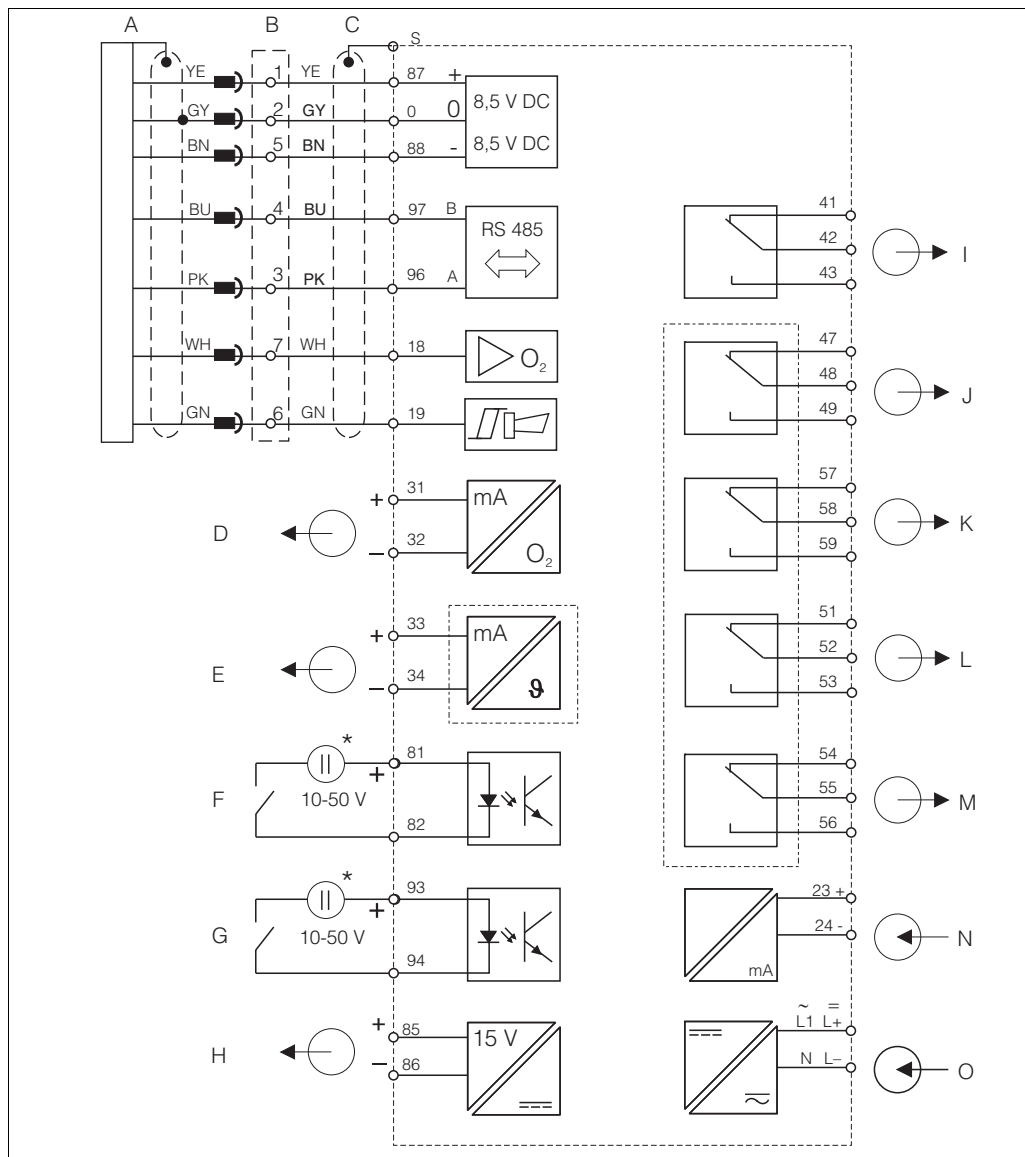
Electrical connection version DX or DS

- 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

- 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 ... 20 mA
- M 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.

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


C07-COM2x3xx-04-06-00-xx-003.eps

**Electrical connection version WX/WS**

- |   |   |   |   |
|---|---|---|---|
| A | Oxygen sensor COS31/61/71   | I | Alarm (current-free contact position)   |
| B | Junction box VS with extension  | J | Relay 1 (current-free contact position) |
| C | COM253: Plug connection for oxygen sensor<br>COM223: The sensor cable plug must be removed or L<br>junction box VS used | K | Relay 2 (current-free contact position) |
| D | Signal output 1 oxygen  | L | Relay 3 (current-free contact position) |
| E | Signal output 2 temperature   | M | Relay 4 (current-free contact position) |
| F | Binary input 1 (Hold)   | N | Current input 4 ... 20 mA               |
| G | Binary input 2 (Chemoclean)   | O | Power supply                            |
| H | Aux. voltage output   |   |   |

\* Aux. voltage output terminal 85/86 applicable

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

**Note!**

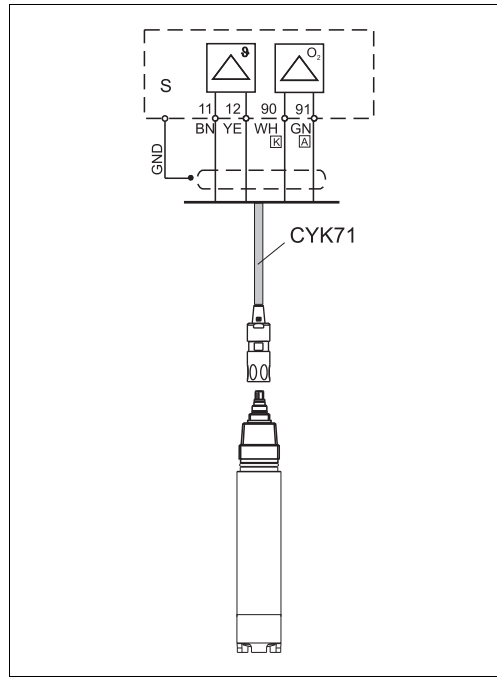
The signals "Sensor signal" and "Alarm" are not used by COS61 and the TOP68-versions.

1) COS61 sensors from serial no. 79xxxx



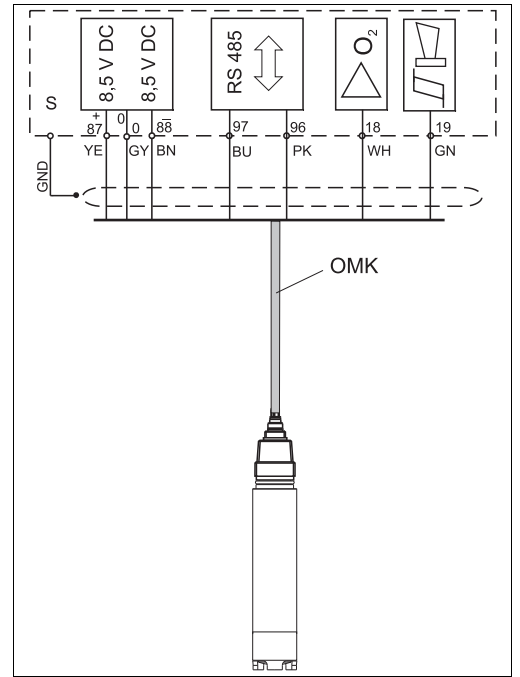
**Sensor cable**

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").



COS41 to COM2x3-DX/DS with CYK71 cable

a0015423



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

a0015424

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

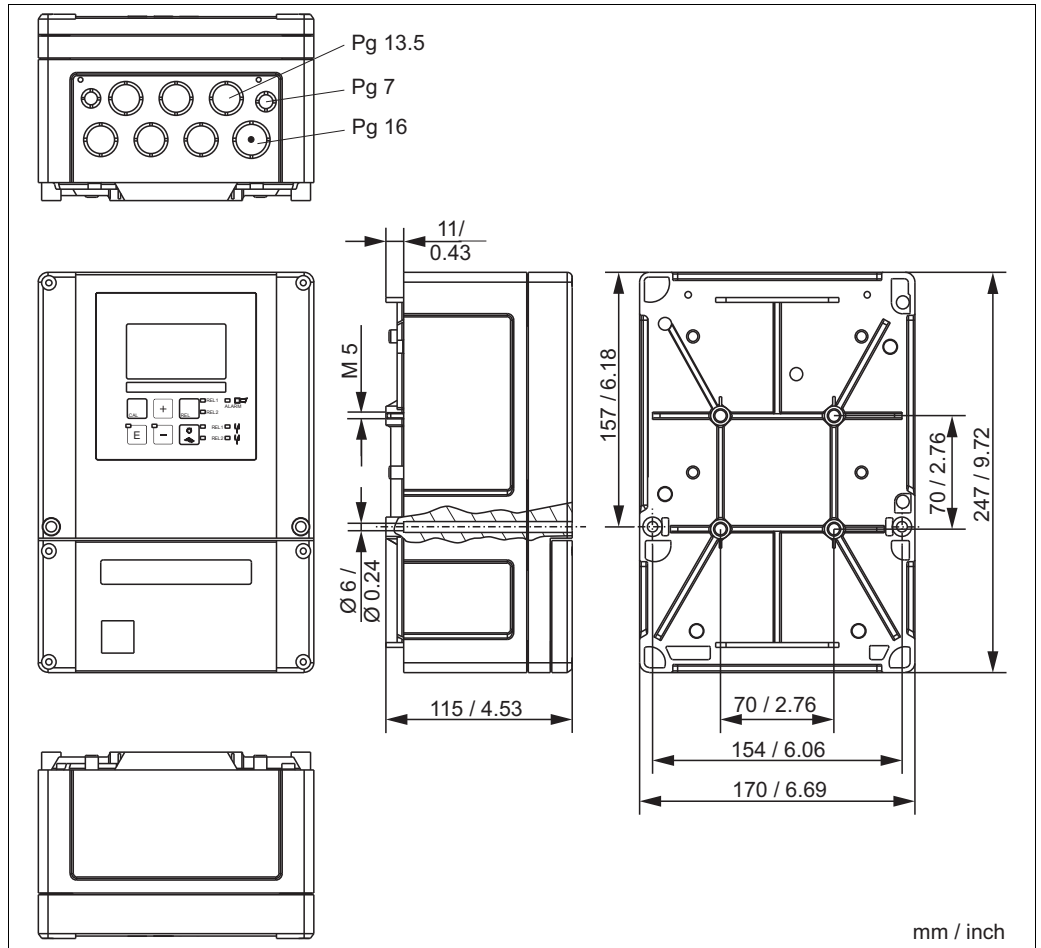
## Performance characteristics

<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 ... 50 °C (32 ... 104 °F)	
<b>Pressure compensation range</b>	500 ... 1100 hPa	
<b>Altitude adjustment range</b>	0 ... 4000 m (0 ... 13124 ft)	
<b>Salinity adjustment range</b>	0 ... 4 ‰	
<b>Slope adjustment range</b>	COS31: COS41: COS61: COS71:	75 ... 140 % (nominal 290 nA, in air, 20 °C (68 °F), 1013 hPa) 75 ... 140 % (nominal 290 nA, in air, 20 °C (68 °F), 1013 hPa) 75 ... 140 % (nominal 1340 nA, in air, 20 °C (68 °F), 1013 hPa) 50 ... 150 % (nominal 8000 nA, in air, 20 °C (68 °F), 1013 hPa)

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

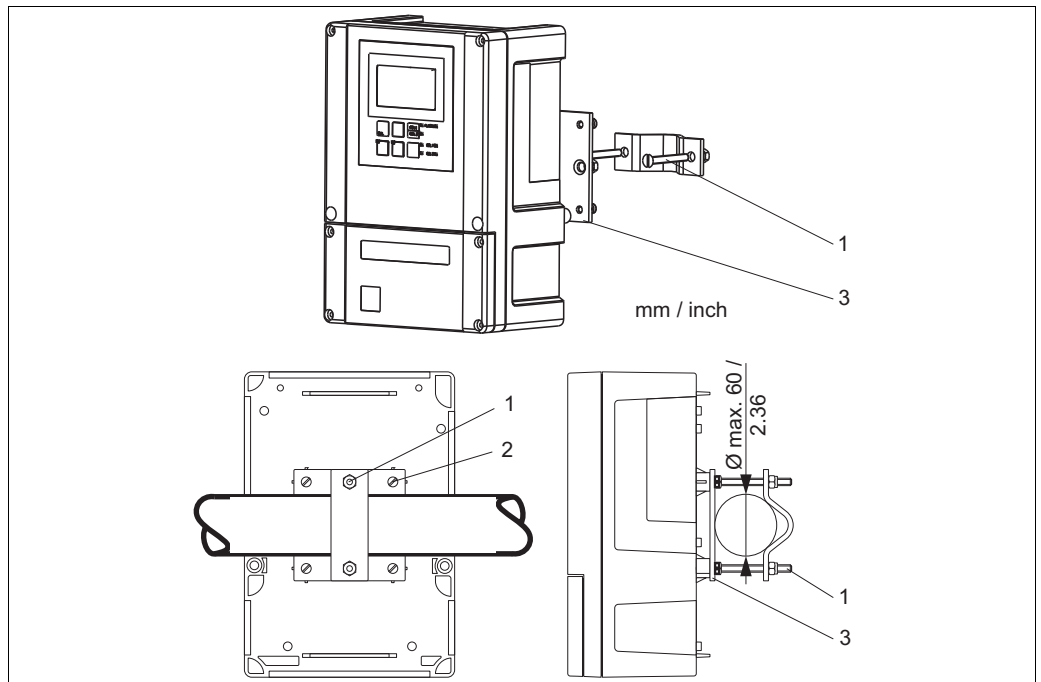
# Installation

## Installation instructions



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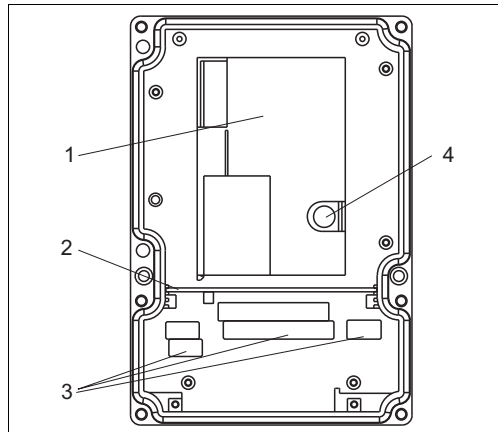
### Field instrument



a0005737

### Mounting on pipes

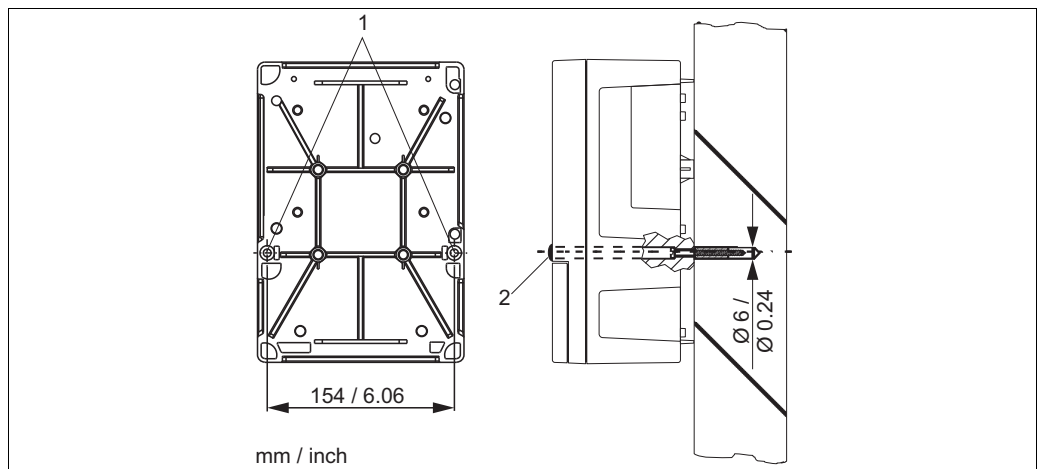
1 - 3 Mounting screws and mounting plate



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

View into the field instrument

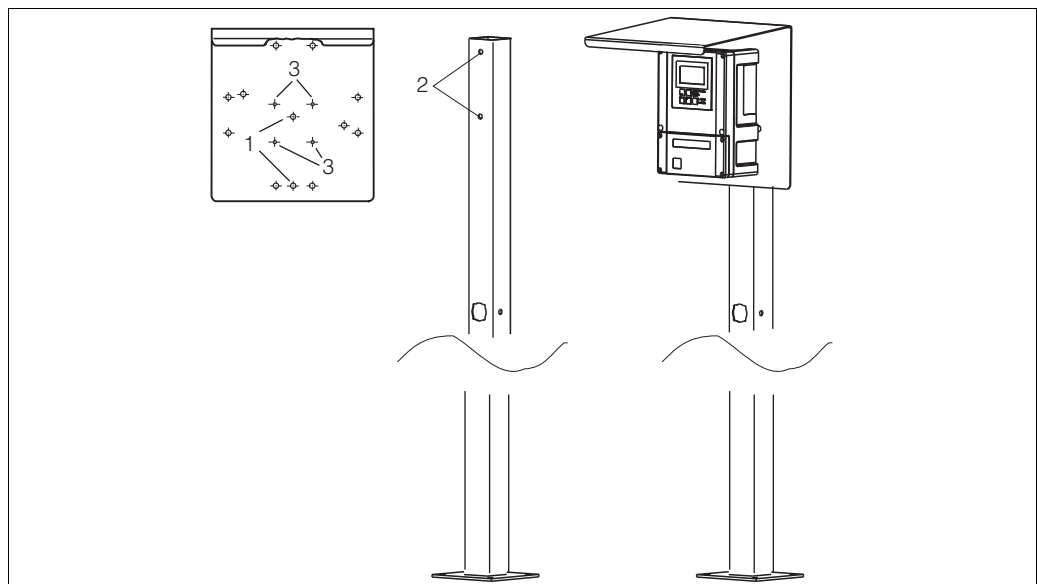
a0005734



Wall mounting of the field instrument

a0005736

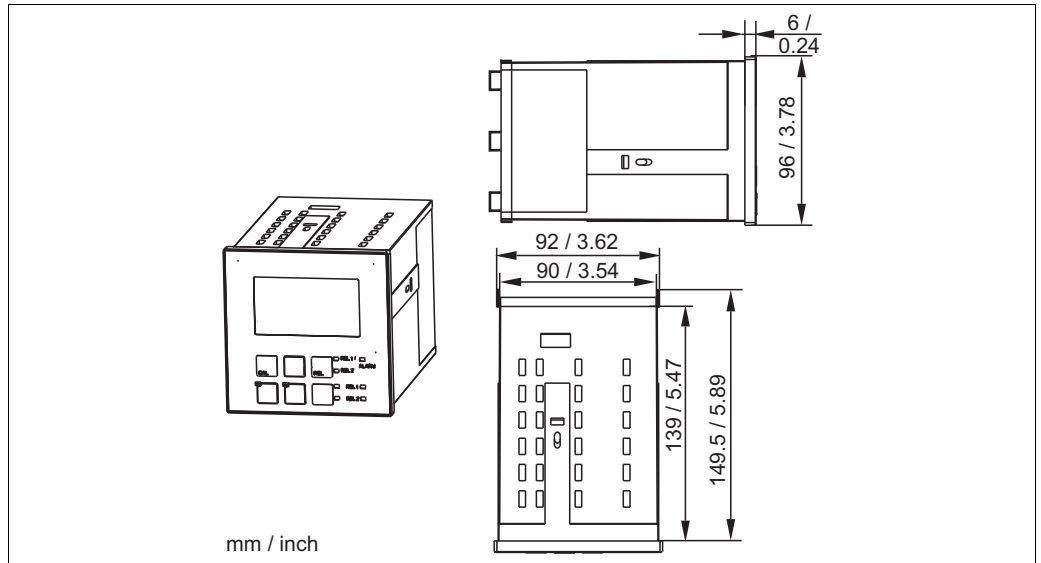
- 1 Mounting holes
- 2 Protecting cap



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

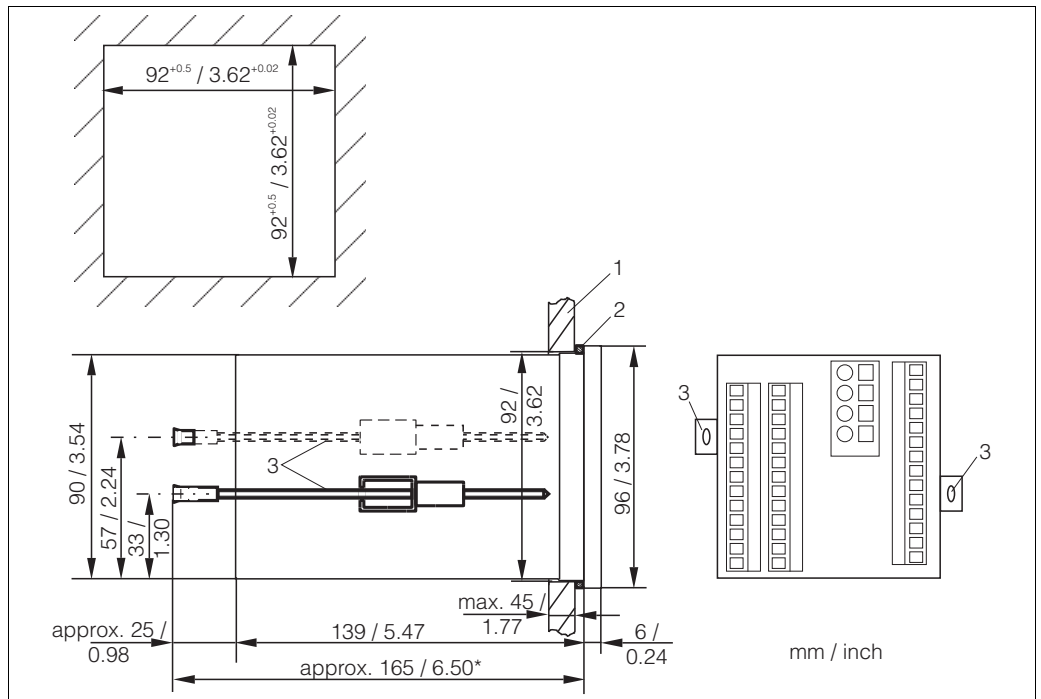
a0005738

- 1 - 3 Mounting holes



Dimensions panel-mounted instrument

#0005735



Installation of the panel-mounted instrument

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

#0005730

## 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

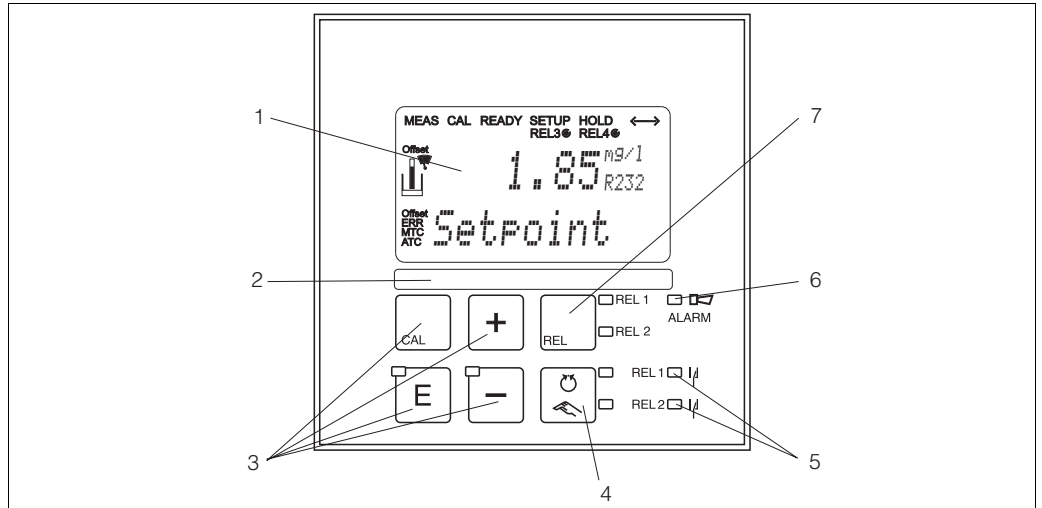
<b>Dimensions</b>	Panel mounted instrument: Field instrument:	96 x 96 x 145 mm (3.78 x 3.78 x 5.71 inches) Installation depth: approx. 165 mm (6.50") 247 x 170 x 115 mm (9.72 x 6.69 x 4.53 inches)
<b>Weight</b>	Panel mounted instrument: Field instrument:	max. 0.7 kg (1.5 lb) max. 2.3 kg (5.1 lb)
<b>Materials</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

C07-COM2x3xx-19-06-00-en-001.eps

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.

## Certificates and approvals

### 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.

### CSA General purpose

C.M2.3-..2...  
C.M2.3-..3...  
C.M2.3-..7...

## Ordering information

### Product structure

Input, software version	
DX	Sensor COS41 / 4 / 4HD, basic functions
DS	Sensor COS41 / 4 / 4HD, with additional functions (Plus package)
WX	Sensor COS31 / 61 / 71 / 3 / 3HD, basic functions
WS	Sensor COS31 / 61 / 71 / 3 / 3HD, with additional functions (Plus package)
Power supply, approval	
0	230 V AC
1	115 V AC
2	230 V AC; CSA Gen. Purp.
3	115 V AC; CSA Gen. Purp.
5	100 V AC
7	24 V AC/DC; CSA Gen. Purp.
8	24 V AC/DC
Output	
0	1 x 20 mA, primary value
1	2 x 20 mA, primary value + secondary value
3	PROFIBUS PA
4	PROFIBUS DP
5	1 x 20 mA, primary value, HART
6	2 x 20 mA, primary value, HART + secondary value
Additional contacts	
05	not selected
10	2 relays (limit/P(ID)/timer)
15	4 relays (limit/P(ID)/Chemoclean) <b>(not with PROFIBUS DP)</b>
16	4 relays (limit/P(ID)/timer) <b>(not with PROFIBUS DP)</b>
20	1 x 4 ... 20 mA input + 2 relays (limit/P(ID)/timer)
25	1 x 4 ... 20 mA input + 4 relays (limit/P(ID)/Chemoclean) <b>(not with PROFIBUS DP)</b>
26	1 x 4 ... 20 mA input + 4 relays (limit/P(ID)/timer) <b>(not with PROFIBUS DP)</b>
Marking	
1	Tagging (Tag), see additional spec.
COM253-	complete order code
COM223-	

### Additional functions of the Plus package

- Current output table to cover large areas with varying resolution, fields O23x
- Process Check System (PCS): live check of the sensor, function group P
- Automatic cleaning function start, field F8
- At version DS: air pressure measurement

### 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 BA199C/07/EN
- versions with HART communication:
  - 1 Operating Instructions Field Communication with HART, BA208C/07/EN
- versions with PROFIBUS communication:
  - 1 Operating Instructions Field Communication with PROFIBUS PA/DP, BA209C/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 BA199C/07/EN
- versions with HART communication:
  - 1 Operating Instructions Field Communication with HART, BA208C/07/EN
- versions with PROFIBUS communication:
  - 1 Operating Instructions Field Communication with PROFIBUS PA/DP, BA209C/07/EN



## Accessories

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### Sensors

#### Oxymax W COS31

- Oxygen sensor for drinking water and wastewater measurements, potentiostatic amperometric principle
- Material: stainless steel 1.4571 (AISI 316 Ti)
- Ordering acc. to product structure, see Technical Information TI285C/07/EN

#### Oxymax W COS41

- Oxygen sensor for drinking water and wastewater measurements, amperometric principle
- Material: POM
- Ordering acc. to product structure, see Technical Information TI284C/07/EN

#### Oxymax W COS71

- Oxygen sensor for trace measurement, potentiostatic amperometric principle
- Material: stainless steel 1.4571 (AISI 316 Ti)
- Ordering acc. to product structure, see Technical Information TI286/07/EN

#### Oxymax W COS61

- Optical oxygen sensor for drinking water and wastewater measurements, fluorescence quenching principle
  - Material: stainless steel 1.4571 (AISI 316 Ti)
  - Ordering acc. to product structure, see Technical Information TI387C/07/EN
- 

### Connection accessories

#### OMK measuring cable

- non-terminated measuring cable for oxygen sensors COS31, COS61 and COS71, for extension between junction box VS and transmitter
- Sold by the meter, order no. 50004124

#### CMK measuring cable

- non-terminated measuring cable for oxygen sensor COS41, for extension between junction box VBM and transmitter
- Sold by the meter, order no. 50005374

#### VS junction box

- With plug-in socket and 7-pole plug
- For cable extension from sensor (COS71, COS61, COS31, COS3 with SXP connector) to transmitter, IP 65;
- Order no. 50001054

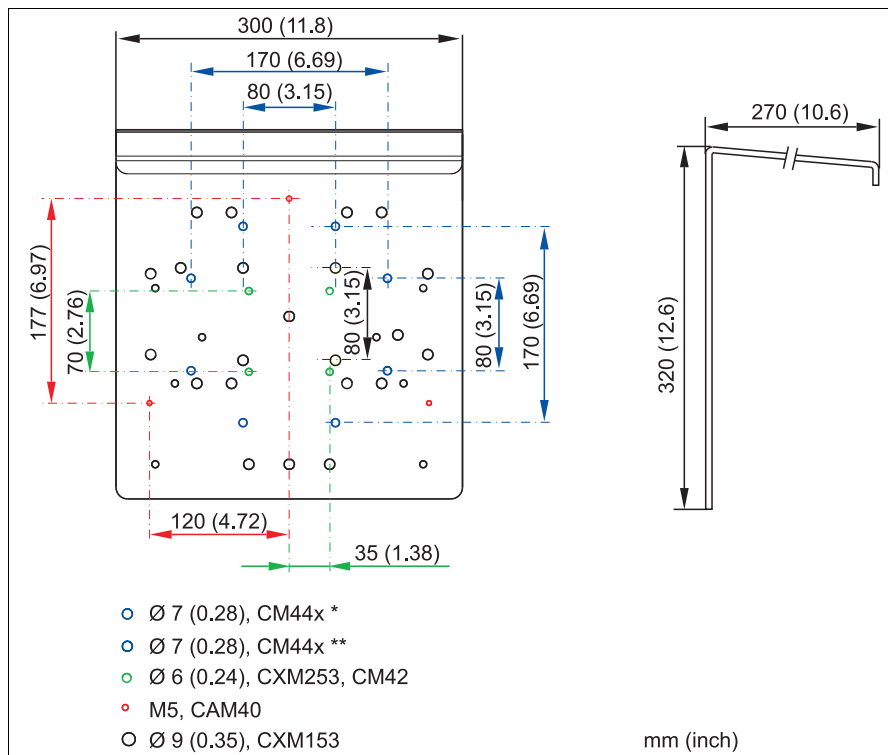
#### Junction box VBM

- for cable extension for sensors COS41, COS4 (fixed cable versions)
- with 10 terminals, IP 65 / NEMA 4X
- Order numbers:
  - Cable entry Pg 13.5: 50003987
  - Cable entry NPT 1/2": 51500177

**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

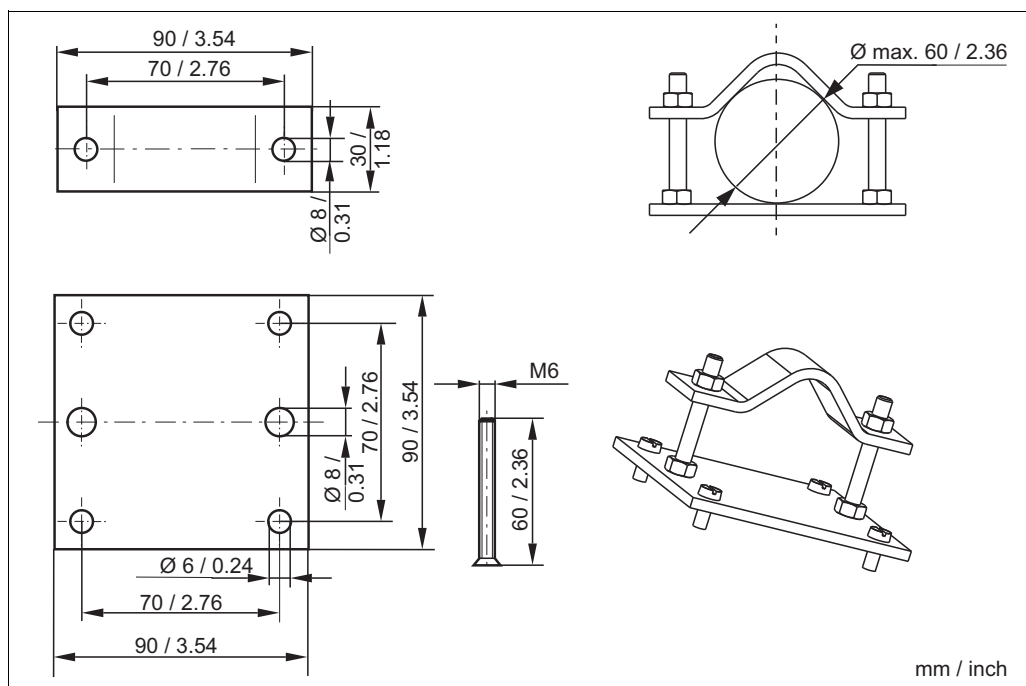


Weather protection cover for field devices

- \* Wall and post mounting
- \*\* Rail mounting

**Post mounting kit**

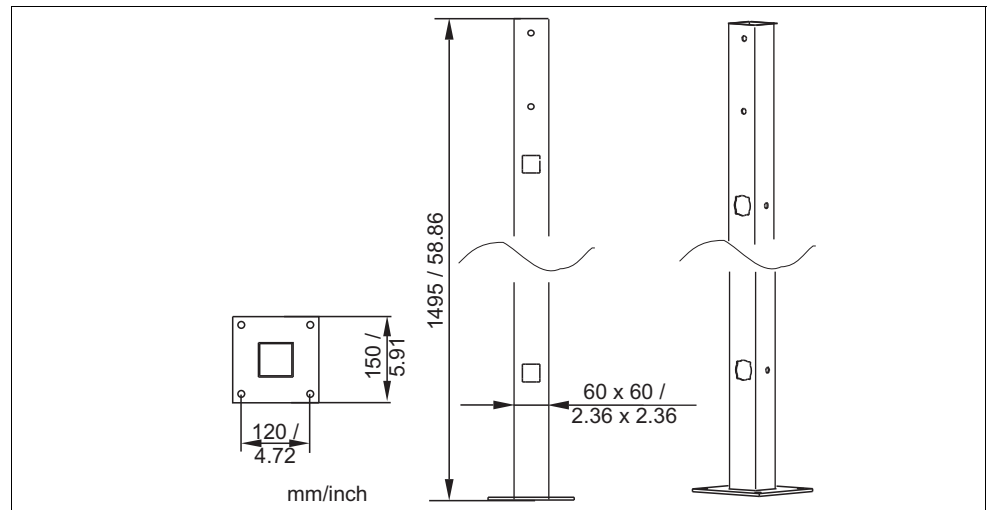
- For mounting of field housing on horizontal or vertical pipes (Ø max. 60 mm (2.36"))
- Material: stainless steel 1.4301
- order no. 50086842



Post mounting kit

## CYY102 universal post

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

*Universal post***Optoscope**

## Optoscope

- Interface between transmitter and PC / laptop for service purposes.
- The Windows software "Scopeware" required for the PC or laptop is supplied with the Optoscope. The Optoscope is supplied in a sturdy plastic case with all the accessories required.
- Order no. 51500650

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## Instruments International

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