



Technical Information

Liquisys M COM223F/253F

Dissolved Oxygen Measurement



Transmitter for oxygen sensors

Application

- Process control in enzyme production
- Control of culture preparation
- Biotechnological production

Your benefits

- Field or panel-mounted housing
- Universal application
- For analog and digital sensors
- Simple handling
 - Logically arranged menu structure
 - Simple single-point calibration in air or in air-saturated water
- 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:
 - Current output via table
 - Automatic cleaning trigger
 - 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

Function and system design

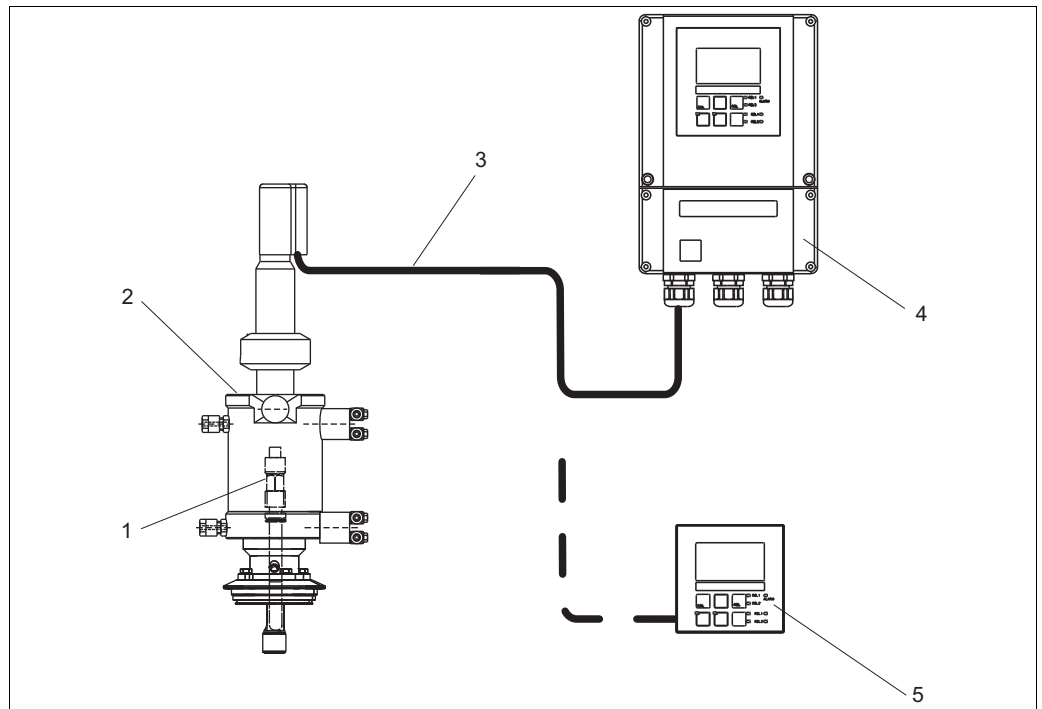
Features of the basic version	Measurement of oxygen content The oxygen content is displayed in mg/l or in %SAT. This is selected via the menu. The temperature is displayed at the same time or, if desired, not shown at all. Calibration The sensor COS21 is zero-current-free and only requires a single-point calibration. This takes place in water-saturated air or in air-saturated water. Configuration Different alarms are required depending on application and operator. Therefore the transmitter permits independent configuration of the alarm contact and error current for each individual error. Unnecessary or undesirable alarms can be suppressed in this manner. Up to four contacts can be used as limit contacts (also for temperature), to implement a P(ID) controller or for cleaning functions. Direct manual operation of the contacts (bypassing the menu) provides quick access to limit, control or cleaning contacts, permitting speedy correction of deviations. The serial numbers of the instrument and modules and the order code can be called up on the display.
Additional functions of version HS	Automatic pressure compensation Oxygen concentration is not only dependent on altitude but also on weather conditions (pressure). Automatic pressure compensation takes these fluctuations into account.
Additional functions of the Plus package	Current output configuration In order to output wide measuring ranges while still achieving a high resolution in specific ranges, the current output can be configured as required via a table. This permits bilinear or quasi-logarithmic curves, etc. Process Check System (PCS) It comprises two independent safety functions: ▪ Errors in applications without control are detected by monitoring the limit between plausible and implausible measured values, i.e. the alarm threshold. ▪ Errors in applications with control are detected by the controller monitor which monitors freely adjustable, maximum permissible time intervals and reference value overshoot or undershoot. Live check 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.
Second current output	The second current output can be configured for temperature, main measured value or actuating variable.
Current input	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.

Measuring system

A complete measuring system comprises:

- The transmitter Liquisys M COM223F or COM253F in version HX or HS
- An oxygen sensor COS22 or COS21 with integrated NTC temperature sensor
- A measuring cable COK21
- An immersion, flow or retractable assembly e.g. CPA442 or CPA475

Options: extension cable CYK71, junction box VBM



Complete measuring system Liquisys M COM223F/253F

1 Oxygen sensor COS22

2 Retractable assembly CPA475

3 Measuring cable COK21

4 Liquisys M COM253F

5 Liquisys M COM223F

Input

Measured variables	Oxygen Temperature	
Measuring range	COS21: Oxygen concentration Oxygen saturation index Temperature:	0.01 to 20 mg/l 0 to 200 % SAT -10 to 60 °C (14 to 140 °F)
Cable specification	Cable length: COS41	max. 50 m (164 ft)
O ₂ signal input	Signal current	0 to 650 nA
Binary inputs	Voltage: Power consumption:	10 to 50 V max. 10 mA
Current input	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 Ω

Transmission range COS21:
 Oxygen concentration Δ 0.2 to Δ 20 mg/l
 Oxygen saturation index Δ 2 to Δ 200 % SAT
 Temperature: Δ 10 to Δ 140 K

Resolution max. 700 digits/mA

Isolation voltage max. 350 V_{eff}/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

Contact outputs
 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

Limit contactor Pickup/dropout delay: 0 to 2000 s

Controller	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 min ⁻¹
	Basic load:	0 to 40% of max. set value

Alarm	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

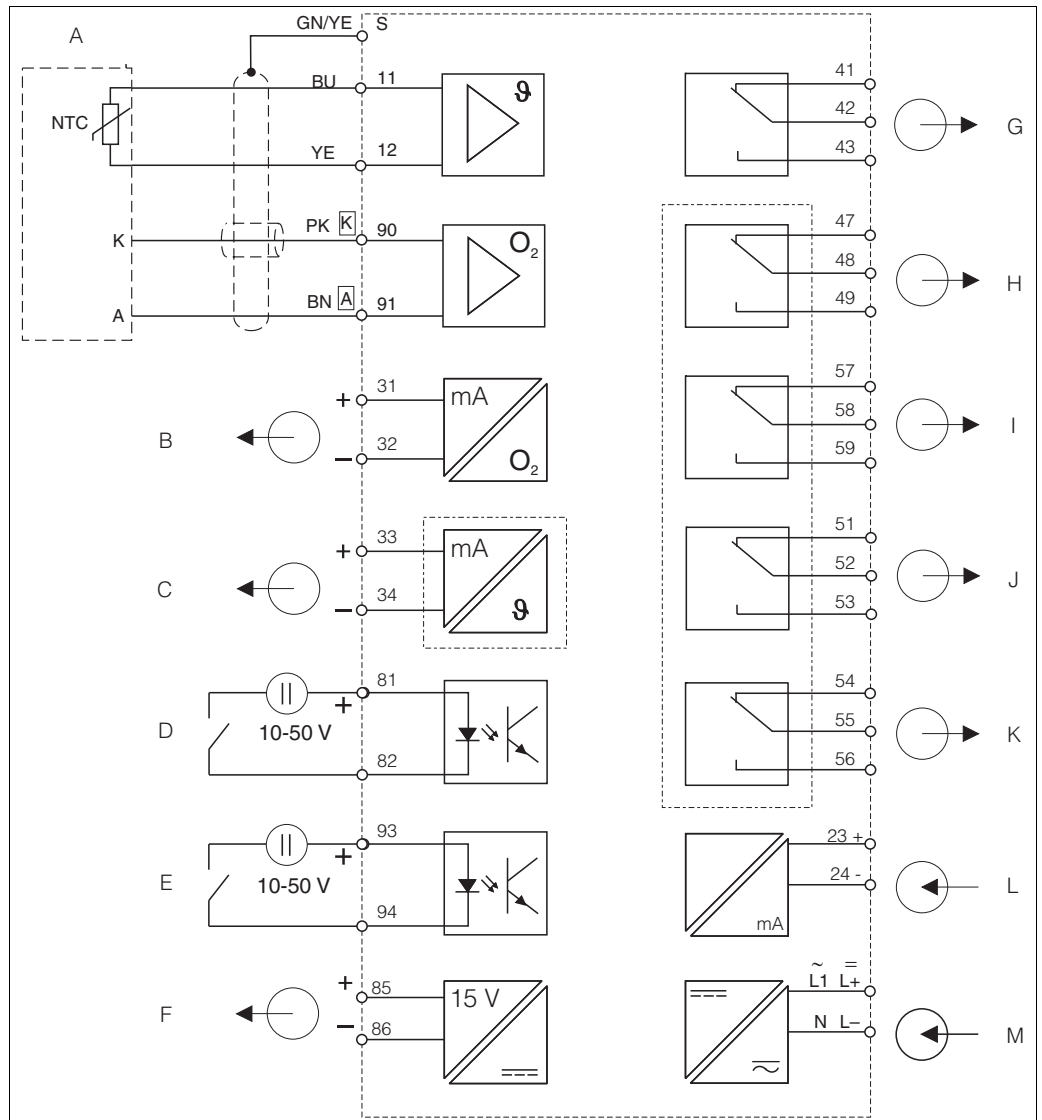
HART	
Manufacturer ID	11 _h
Device type code	0094 _h
Transmitter specific revision	0001 _h
HART specification	5.0
DD files	www.products.endress.com/hart
Load HART	250 Ω
Device variables	None (dynamic variables PV, SV, only)
Features supported	-

PROFIBUS PA	
Manufacturer ID	11 _h
Ident number	1518 _h
Device revision	11 _h
Profile version	2.0
GSD files	www.products.endress.com/profibus
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.

PROFIBUS DP	
Manufacturer ID	11 _h
Ident number	151E _h
Profile version	2.0
GSD files	www.products.endress.com/profibus
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



Electrical connection of the transmitter

- A Oxygen sensor COS2 1
 B Signal output 1 oxygen
 C Signal output 2 temperature/controller
 D Binary input 1 (Hold)
 E Binary input 2 (Chemoclean)
 F Aux. voltage output

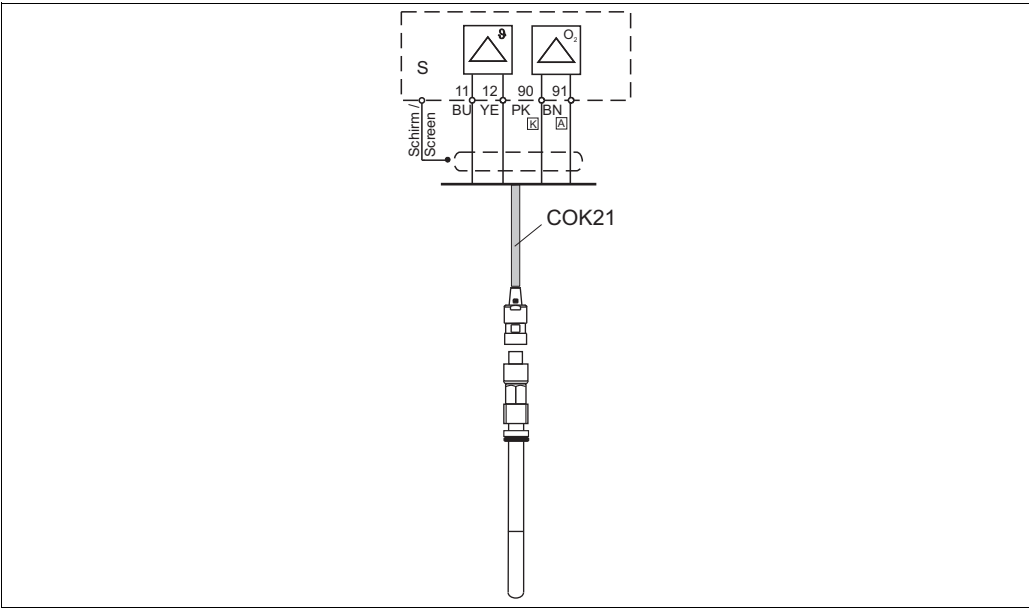
- G Alarm (current-free contact position)
 H Relay 1 (current-free contact position)
 I Relay 2 (current-free contact position)
 J Relay 3 (current-free contact position)
 K Relay 4 (current-free contact position)
 L Current input 4 to 20 mA
 M Power supply

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

The circuits "C" and "F" are not galvanically isolated from each other.

Connection of sensor

The oxygen sensor is connected to the transmitter via the measuring cable COK21.



Connection of COS22 with cable COK21

Supply voltage

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

Supply via fieldbus

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

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

PROFIBUS DP	
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.

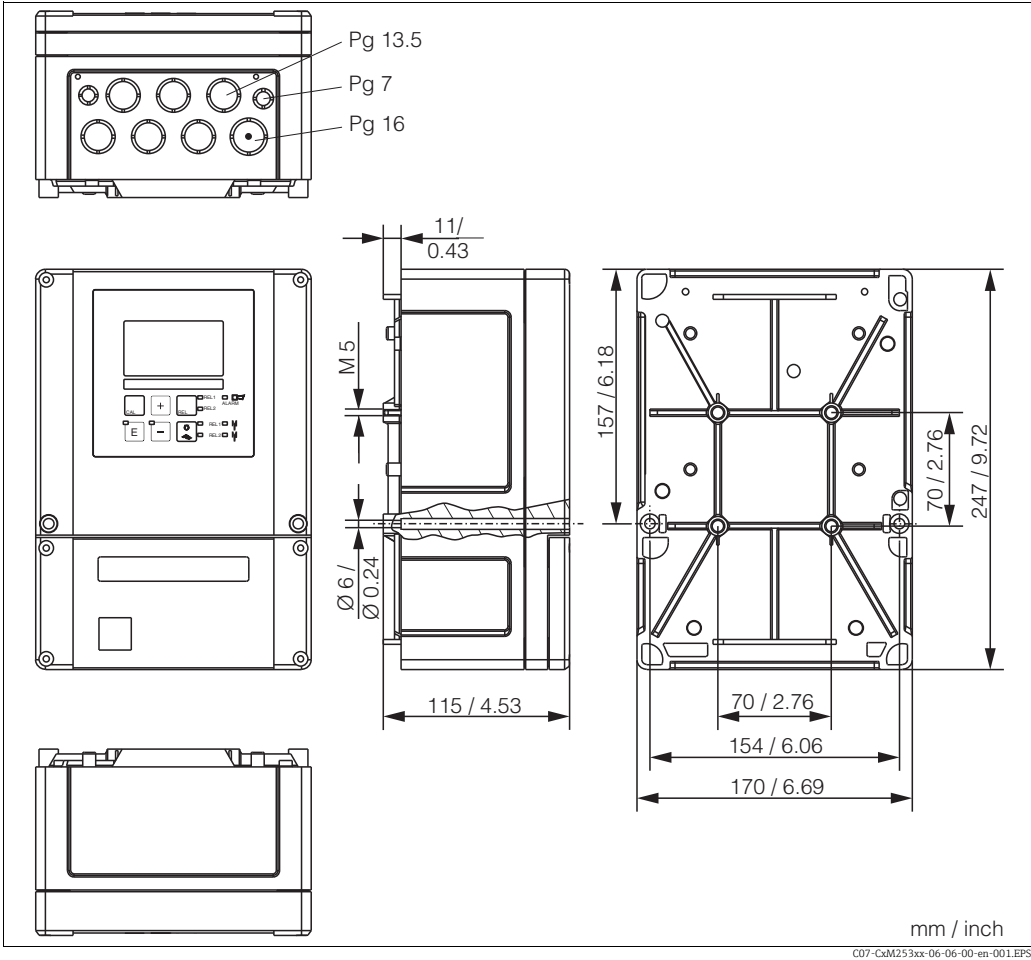
Performance characteristics

Resolution	Oxygen: COS21: Temperature:	0.01 mg/l / 0.1 % SAT 0.1 °C
Maximum measured error¹⁾	Display Oxygen: Temperature: Signal output Oxygen: Temperature:	±0.03 mg/l, ±0.3 % SAT max. 1.0 % in the range of -10 to +60 °C (+14 to 140 °F) max. 0.75 % of measuring range max. 1.25 % of measuring range
Repeatability^a	±0.05 mg/l, ±0.5 % SAT	
Temperature compensation range	0 to 50 °C (32 to 122 °F)	
Pressure compensation range	500 to 1100 hPa	
Altitude adjustment range	0 to 4000 m (0 to 13124 ft)	
Salinity adjustment range	0 to 4 ‰	
Slope adjustment range	COS21:	75 to 140 ‰ (nominal 60 nA, in air, 20 °C (68 °F), 1013 hPa)

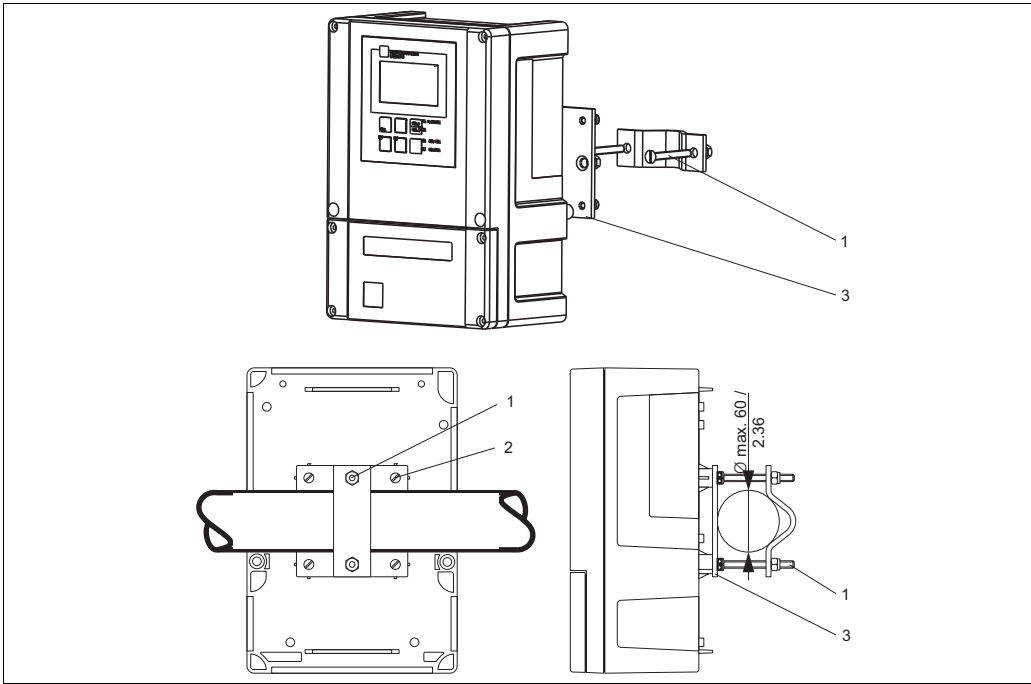
1) acc. to IEC 746-1, for nominal operating conditions

Installation

Installation instructions

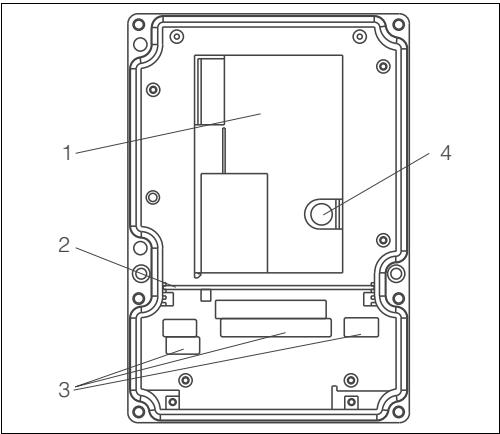


Field instrument



Mounting on pipes

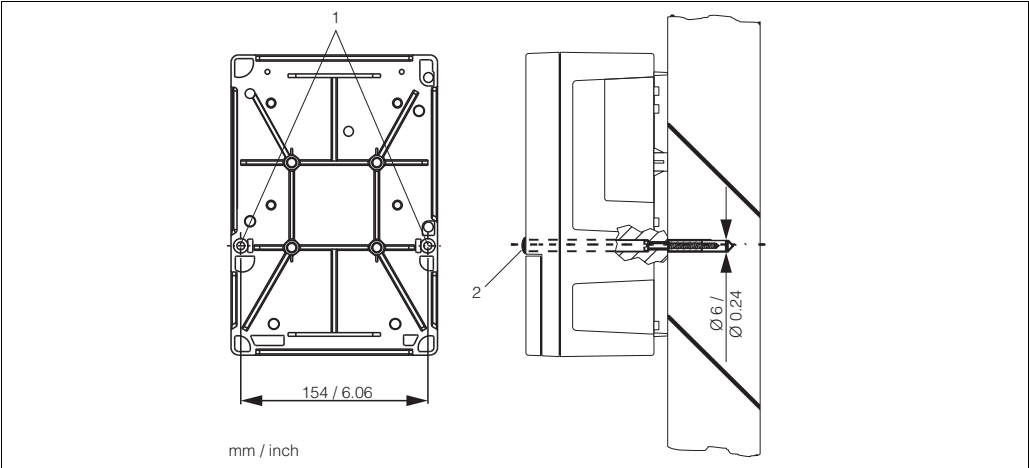
1 - 3 Mounting screws and mounting plate



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

C07-CxM253xx-11-06-00-xx-001.EPS

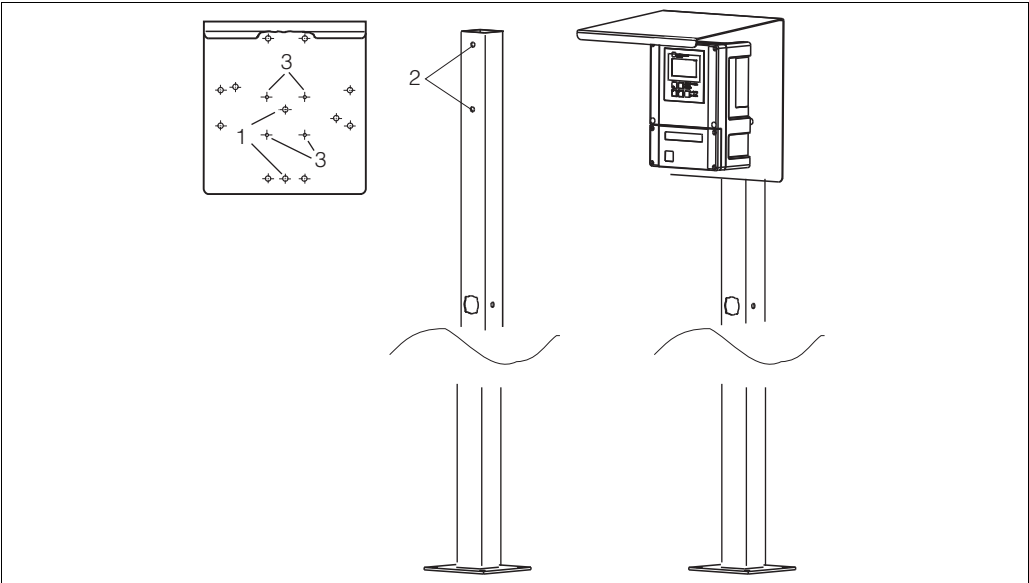
Inside of field instrument



C07-CxM253xx-11-06-00-en-002.EPS

Wall mounting of the field instrument

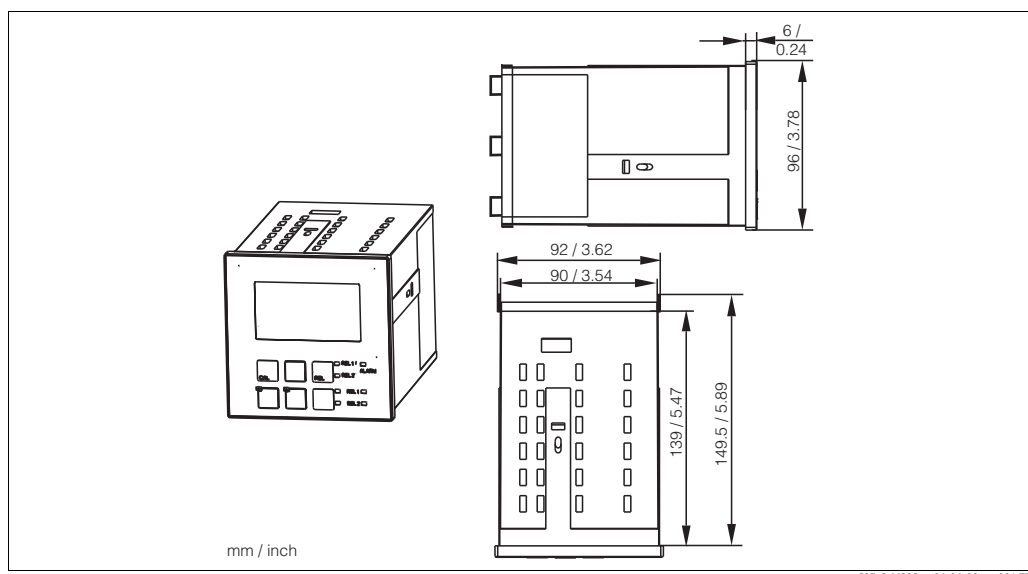
- 1 Mounting holes
- 2 Protecting cap



C07-CxM253xx-11-06-00-xx-004.EPS

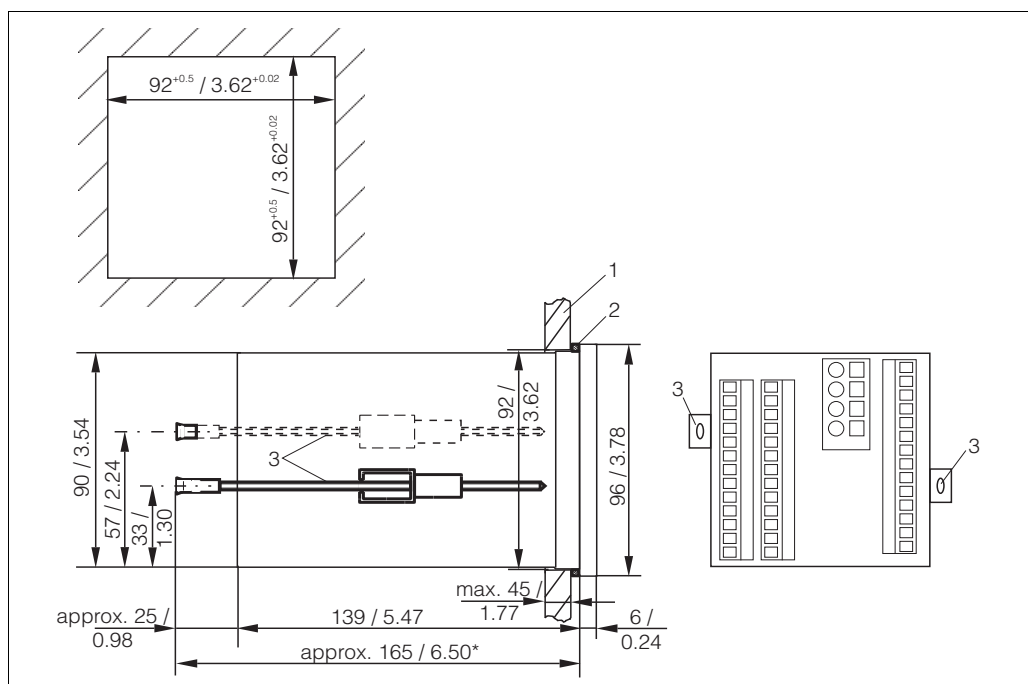
Mounting of the field instrument with mounting post and weather protection cover

- 1 -3 Mounting holes



C07-CxM223xx-06-00-en-001.EPS

Dimensions panel-mounted instrument



C07-CxM223xx-11-06-00-en-001.EPS

Installation of the panel mounted instrument

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

Environment

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

Mechanical construction

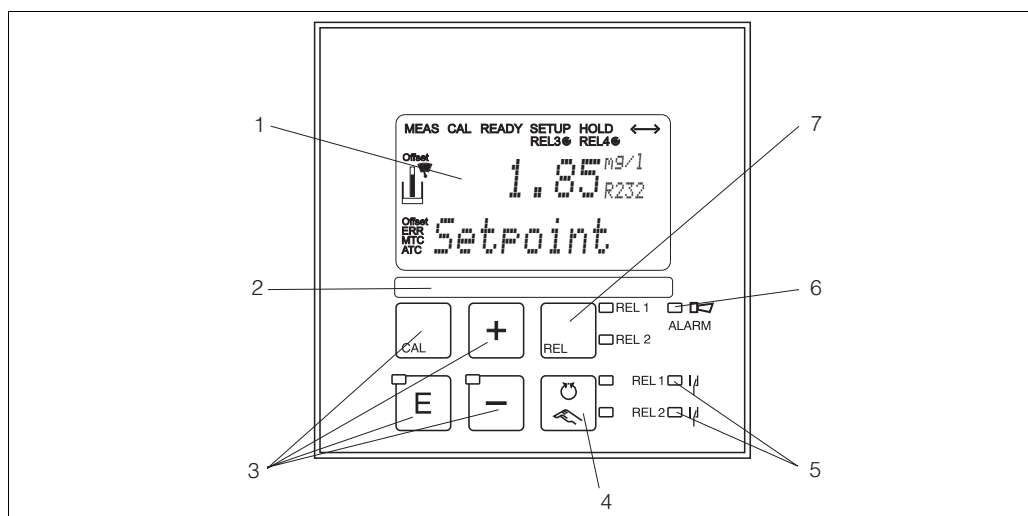
Dimensions	Panel mounted instrument: Field instrument:	96 x 96 x 145 mm (3.78 x 3.78 x 5.71 inches) Installation depth: approx. 165 mm (6.50") 247 x 170 x 115 mm (9.72 x 6.69 x 4.53 inches)
Weight	Panel mounted instrument: Field instrument:	max. 0.7 kg (1.5 lb) max. 2.3 kg (5.1 lb)
Material	Housing of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

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.

Certificates and approvals

CE symbol	Declaration of conformity The product meets the legal requirements of the harmonized European standards. The manufacturer confirms compliance with the standards by affixing the CE symbol.						
CSA General Purpose	CSA General Purpose The products listed below are eligible to bear the CSA Mark shown with adjacent indicators "C" and "US": <table><tr><th>Version</th><th>Approval</th></tr><tr><td>COM253F-..2... COM253F-..3... COM253F-..7...</td><td>CSA Mark for Canada and USA</td></tr><tr><td>COM223F-..2... COM223F-..3... COM223F-..7...</td><td>CSA Mark for Canada and USA</td></tr></table>	Version	Approval	COM253F-..2... COM253F-..3... COM253F-..7...	CSA Mark for Canada and USA	COM223F-..2... COM223F-..3... COM223F-..7...	CSA Mark for Canada and USA
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COM253F-..2... COM253F-..3... COM253F-..7...	CSA Mark for Canada and USA						
COM223F-..2... COM223F-..3... COM223F-..7...	CSA Mark for Canada and USA						

Ordering information

Product structure

Input, software version						
HX	Sensor COS21/COS22; 0.01 to 20 mg/l; basic functions					
HS	Sensor COS21/COS22; 0.01 to 20 mg/l; 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) (not with PROFIBUS DP)					
16	4 relays (limit/P(ID)/timer) (not with PROFIBUS DP)					
20	1 x 4 to 20 mA input + 2 relays (limit/P(ID)/timer)					
25	1 x 4 to 20 mA input + 4 relays (limit/P(ID)/Chemoclean) (not with PROFIBUS DP)					
26	1 x 4 to 20 mA input + 4 relays (limit/P(ID)/timer) (not with PROFIBUS DP)					
Marking						
1	Tagging (Tag), see additional spec.					
COM253F-						complete order code
COM223F-						

Additional functions of the Plus package

- Automatic correction of air pressure with concentration measurement, field A3
- Current output table, fields O33x
- Monitoring for sensor and process, function group P
- Automatic cleaning function start, field F8

Scope of delivery

The delivery of the field instrument includes:

- 1 transmitter COM253F
- 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 BA00246C/07/EN
- 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 COM223F
- 1 set of plug-in screw terminals
- 2 tensioning screws
- 1 BNC-plug (solder-free)
- 1 Operating Instructions BA00246C/07/EN
- 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

Sensors

Oxymax COS22D

- Sterilizable sensor for dissolved oxygen
- Order as per product structure (--> Online configurator, www.products.endress.com/cos22d)
- Technical Information TI446C/07/EN

Connection accessories

Special measuring cable COK21

- Cable length 3 m (9.8 ft)
order no. 51505870
- Cable length 10 m (33 ft)
order no. 51505868

CYK71 measuring cable

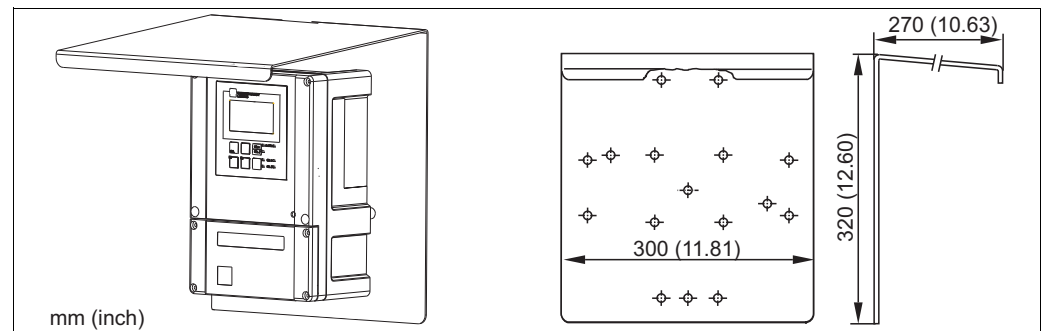
- non-terminated cable for the connection of sensors or the extension of sensor cables
- sold by the meter, order number: 50085333

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 ½": 51500177

Mounting accessories

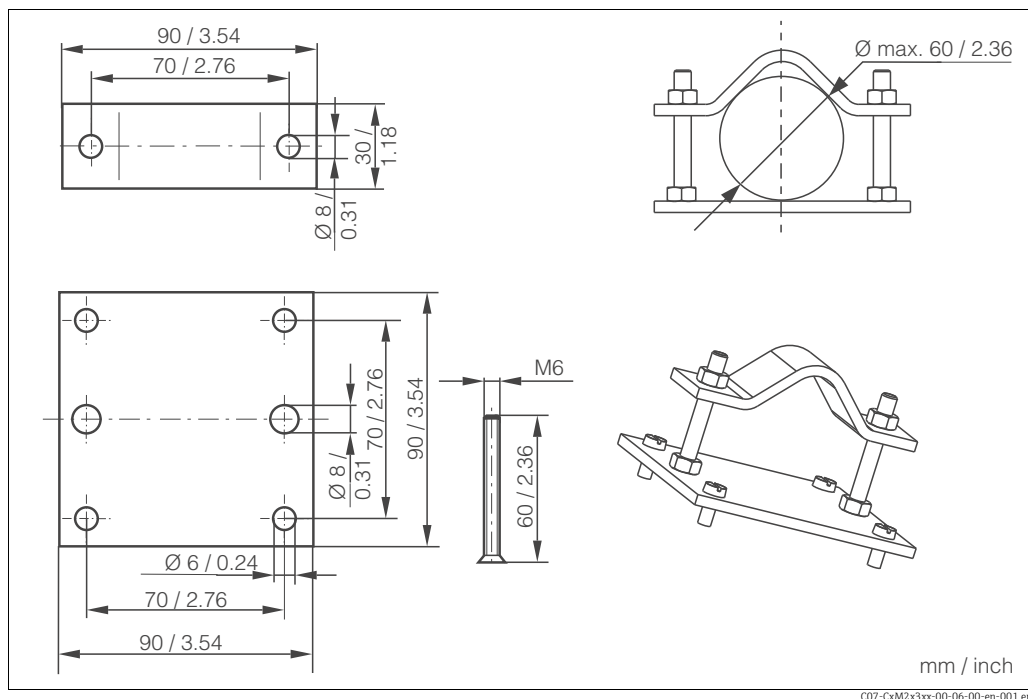
- Weather protection cover CYY101 for mounting of field housing, for outdoor installation
material: stainless steel 1.4031;
order no. CYY101-A



Weather protection cover for field instrument

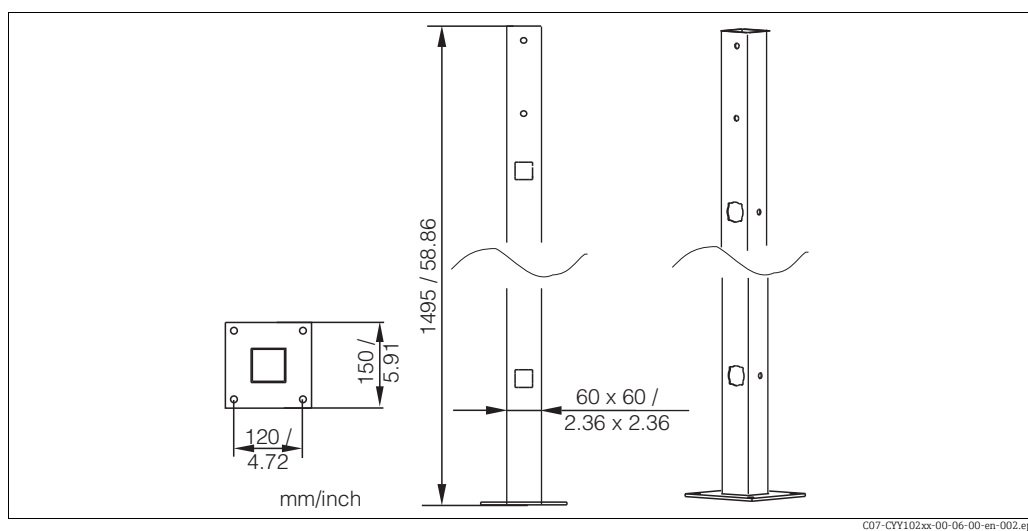
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- Kit for mounting of field housing on horizontal or vertical pipes (Ø max. 60 mm (2.36"))
order no. 50086842



Pipe mounting kit

- Universal upright post CYY102
Square post for mounting of field housing, material: stainless steel 1.4301 (AISI 304);
order no. CYY102-A



Square post CYY102



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