

Technical Information

Liquisys M COM223/253

Dissolved oxygen measurement



Transmitter for oxygen sensors

Application

- Wastewater treatment plants and wastewater treatment
- Water treatment and drinking water monitoring
- Surface water: rivers, lakes, sea
- Fish farming
- Boiler feedwater (trace measurement)

Your benefits

- Field or panel-mounted housing
- Universal application
- Easy to use
 - Simple menu structure
 - Simple calibration in air, air-saturated water or medium
- Manual contact control and user-defined alarm configuration

The basic device can be extended with:

- 2 or 4 contacts for use as
 - Limit contacts (also for temperature)
 - P(ID) controller
 - Timer for simple rinse processes or Chemoclean
- Plus package:
 - Configurable current output characteristic
 - Cleaning started automatically
 - Process monitoring
 - Sensor signal live check
- HART or PROFIBUS-PA/-DP
- 2nd current output: temperature, main measured value, actuating variable
- Current input for flow monitoring or for feedforward control

Function and system design

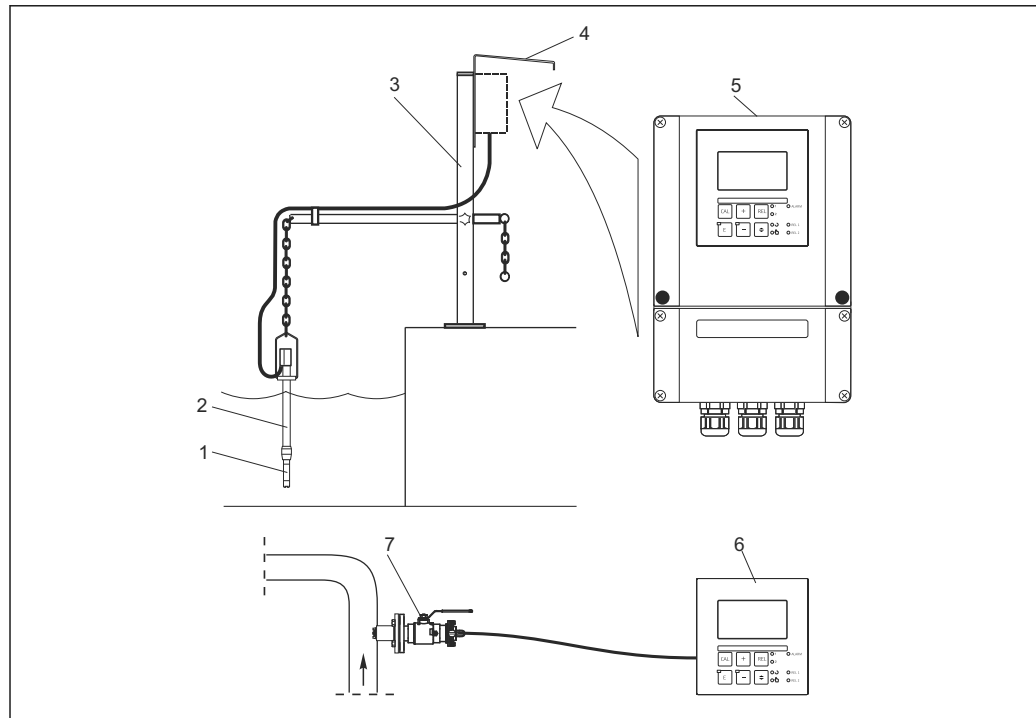
Measuring system

A complete measuring system comprises:

- Transmitter Liquisys M COM223 or COM253
- Oxygen sensor
 - COS41 for Liquisys M COM2x3-DS/DX
 - COS61 for Liquisys M COM2x3-WS/WX

Optionally:

- Extension cable OM, junction box VS
- Weather protection cover CYY101 for field housing



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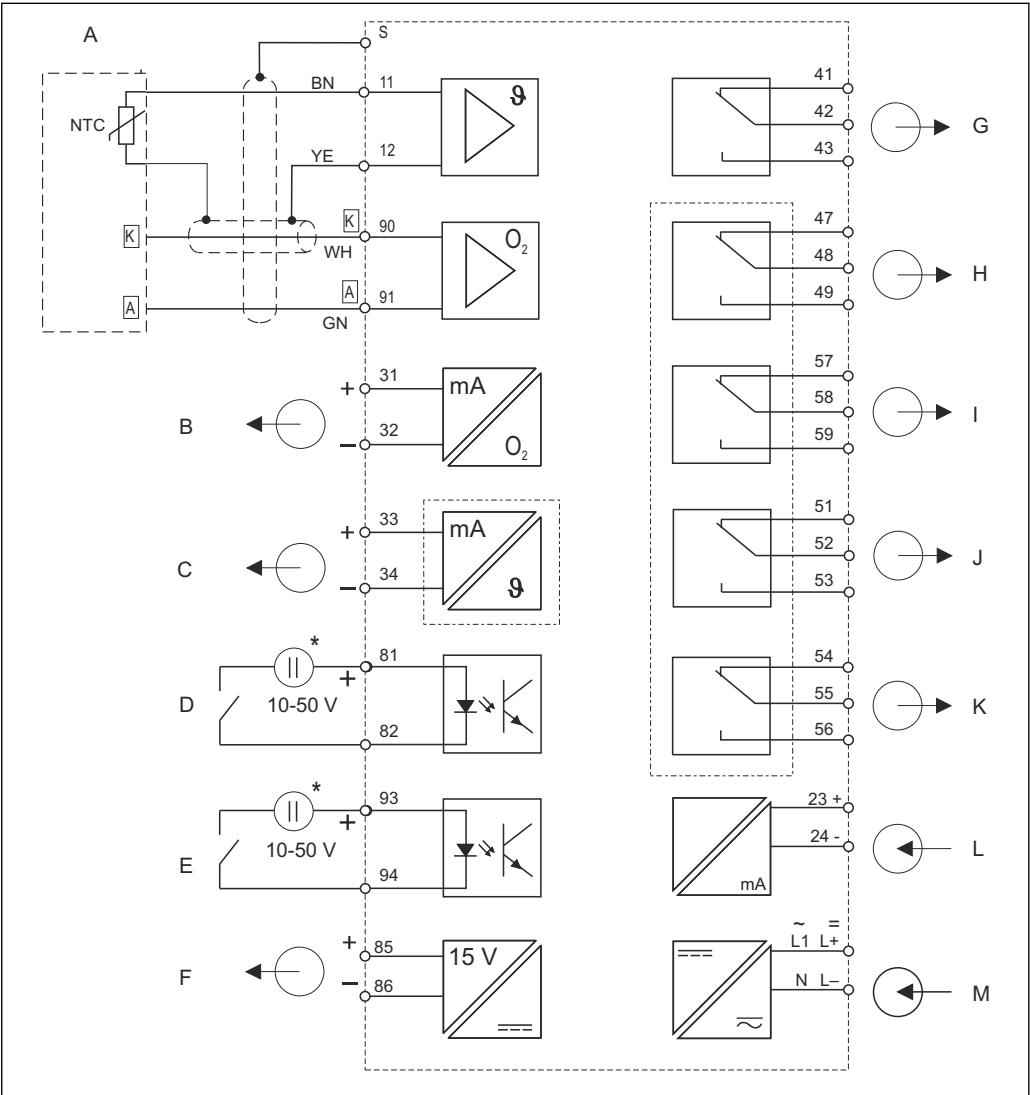
1 Complete measuring systems

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

Equipment architecture

Block diagram

COM2x3-DS/DX (COS41)



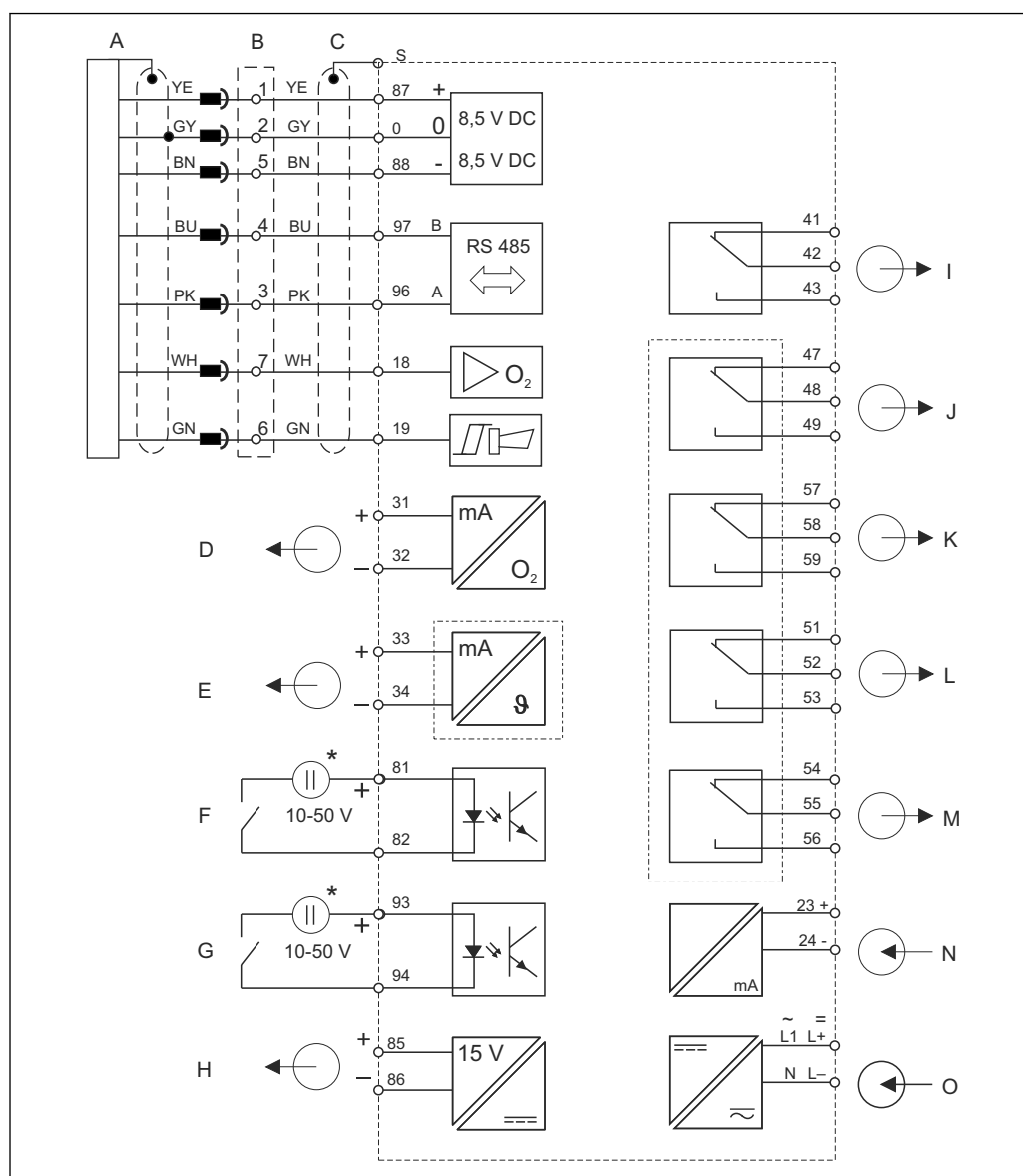
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2 Block circuit diagram COM2x3-DS/DX

- | | | | |
|---|---------------------------------------|---|---|
| A | COS41 sensor | H | Relay 1 (current-free contact position) |
| B | Signal output 1, oxygen | I | Relay 2 (current-free contact position) |
| C | Signal output 2, temperature | J | Relay 3 (current-free contact position) |
| D | Binary input 1 (hold) | K | Relay 4 (current-free contact position) |
| E | Binary input 2 (Chemoclean) | L | Current input 4 to 20 mA |
| F | Auxiliary voltage output | M | Power supply |
| G | Alarm (current-free contact position) | * | Auxiliary voltage, terminal 85/86 can be used |

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

COM2x3-WS/WX (COS61 from serial number 79xxxx)



3 Block circuit diagram COM2x3-WS/WX

A COS61 sensor

B VS box for extension

C COM253: plug-in connection for O₂ connector
COM223: connector of sensor cable must be removed
or VS box must be used

D Signal output 1, oxygen

E Signal output 2, temperature

F Binary input 1 (hold)

G Binary input 2 (Chemoclean)

H Auxiliary 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

* Auxiliary voltage, terminal 85/86 can be used

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

No function is associated with terminals 18 and 19 when a COS61 is connected.

Dependability

Reliability

Calibration

Amperometric sensors have no zero current and therefore only require one-point calibration. This calibration is performed in air, in air-saturated water or by reference calibration in the medium.

The optical sensor is calibrated when delivered and can be calibrated in the air and at the zero point if necessary.

Sensor live check (process check system, PCS (Plus package))

The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a specific period (several measured values).

The main causes of stagnating measured values are:

- Contaminated sensor, or sensor outside of medium
- Sensor defective
- Process error (e.g. through control system)

Current output configuration (Plus package)

In order to display 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** and **quasi-logarithmic** curves etc.

Second current output

The second current output can be flexibly configured to output the temperature, the main measured value (conductivity, resistance, concentration) or the controller actuating variable.

Current input

The transmitter current input permits two different applications:

- Flow monitoring with controller switch-off if flow falls below lower flow level in the main flow
- Feedforward control to the controller

The two functions can also be combined.

Automatic pressure compensation (only DS/WS/WX versions)

The oxygen concentration not only depends on the altitude but also on the weather conditions (pressure). Automatic pressure compensation also takes these fluctuations into consideration.

Safety

Process safety

Different alarms are required depending on the application and operator. The transmitter therefore permits the independent configuration of the fault-signaling contact and the error current for every individual error. Unnecessary or undesired alarms can be suppressed in this way. Up to four contacts can be used as limit contacts (also for temperature), as a P(ID) controller and for cleaning functions. The direct manual operation of the contacts (bypassing the menu) enables quick access to limit value, control or cleaning contacts. Any deviations can be quickly corrected in this way.

Input

Measured values

Oxygen
Temperature

Measuring ranges

Concentration	0 to 20 mg/l
Saturation index	0 to 200 % SAT
Partial pressure	0 to 400 hPa (0 to 6 psi)
Temperature	-10 to 60 °C (can also be displayed in °F)

Signal input

DS/DX version	0 to 3000 nA
WS/WX version	Digital communication or 0 to -7500 mV

Binary inputs	Voltage	10 to 50 V
	Current consumption	Max. 10 mA
Current input	4 to 20 mA, galvanically isolated	
	Load: 260 Ω for 20 mA (voltage drop 5.2 V)	

Output

Output signal	0/4 to 20 mA, galvanically isolated, active	
	HART	
	Signal encoding	Frequency Shift Keying (FSK) + 0.5 mA via current output signal
	Data transmission rate	1200 baud
	Galvanic isolation	Yes
	PROFIBUS PA	
	Signal encoding	Manchester Bus Powered (MBP)
	Data transmission rate	31.25 kBit/s, voltage mode
	Galvanic isolation	Yes (IO modules)
	PROFIBUS DP	
	Signal encoding	RS485
	Data transmission rate	9.6 kBd, 19.2 kBd, 93.75 kBd, 187.5 kBd, 500 kBd, 1.5 MBd
	Galvanic isolation	Yes (IO modules)
Signal on alarm	2.4 or 22 mA in the event of an error	
Load	Max. 500 Ω	
Transmission range	Concentration	Δ 0.2 to Δ 20 mg/l
	Saturation index	Δ 2 to Δ 200 % SAT
	Partial pressure	Δ 4 to Δ 400 hPa
Signal resolution	Max. 700 digits/mA	
Separation voltage	Max. 350 V _{RMS} / 500 V DC	
Auxiliary voltage output	Output voltage	15 V \pm 0.6 V
	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 contactors	Pickup/dropout delay	0 to 2000 s

Controller	Function (configurable)	Pulse length/pulse frequency controller, continuous controller
	Controller behavior	P, PI, PD, PID, basic load dosing
	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 length 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. actuating variable
Alarm	Function (switchable)	Latching/momentary contact
	Alarm threshold adjustment range	O ₂ / temperature: entire measuring range depending on sensor used
	Alarm delay	0 to 2000 s
	Monitoring time for lower limit violation	0 to 2000 min
	Monitoring time for upper limit violation	0 to 2000 min
Protocol-specific data	HART	
	Manufacturer ID	11 _h
	Device type	0094 _h
	Transmitter-specific revision	0001 _h
	HART version	5.0
	Device description files (DD)	www.endress.com/hart
	HART load (communication resistor)	250 Ω
	Device variables	None (only dynamic variables PV and SV)
	Supported features	-
	PROFIBUS PA	
	Manufacturer ID	11 _h
	Device type	1518 _h
	Device revision	0001 _h
	Profile version	2.0
	GSD files	www.endress.com/profibus
	GSD version	
	Output values	Primary value, temperature
	Input variables	PCS display value
	Supported features	Device lock: The device can be locked using the hardware or software.

PROFIBUS DP	
Manufacturer ID	11 _h
Device type	151E _h
Profile version	2.0
GSD files	www.endress.com/profibus
GSD version	
Output values	Primary value, temperature
Input variables	PCS display value
Supported features	Device lock: The device can be locked using the hardware or software.

Power supply

Supply voltage

Depending on order version:

- 100/115/230 V AC +10/-15 %, 48 to 62 Hz
- 24 V AC/DC +20/-15 %

Power supply via fieldbus

HART	
Supply voltage	Not applicable, active current outputs
Reverse polarity protection	Not applicable, active current outputs

PROFIBUS PA	
Supply voltage	9 V to 32 V, max. 35 V
Sensitivity to reverse polarity	No
FISCO/FNICO compliant according to IEC 60079-27	No

PROFIBUS DP	
Supply voltage	9 V to 32 V, max. 35 V
Sensitivity to reverse polarity	Not applicable
FISCO/FNICO compliant according to IEC 60079-27	No

Power consumption

Max. 7.5 VA

Mains fuse

Fine-wire fuse, semi-delay 250 V/3.15 A

Circuit breaker

NOTICE

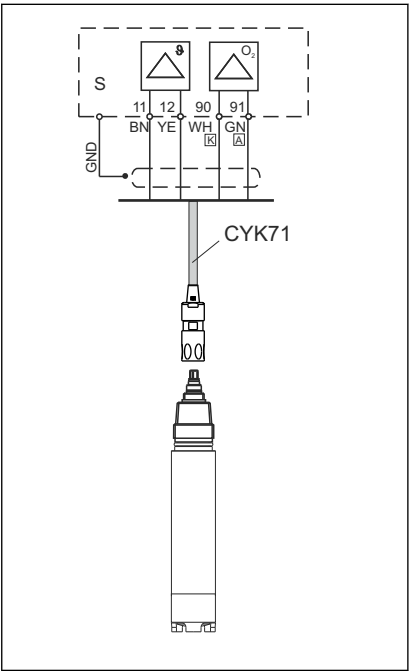
The device does not have a power switch

- ▶ The customer must provide a protected circuit breaker in the vicinity of the device.
- ▶ The circuit breaker must be a switch or power switch, 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.

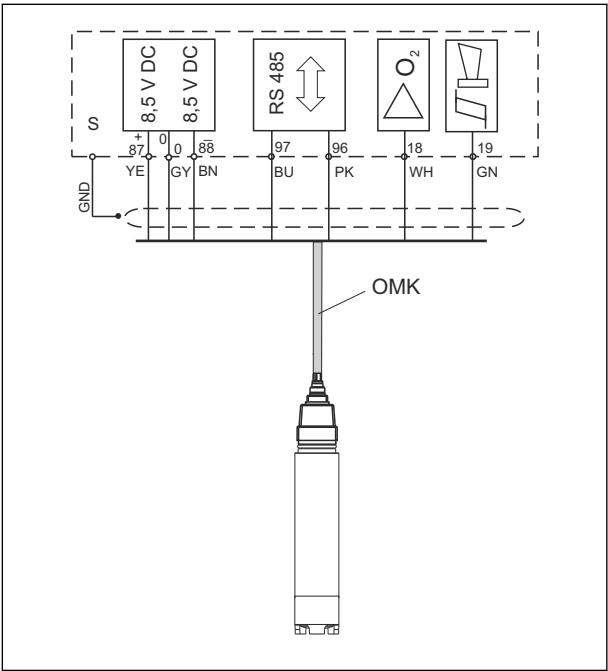
Cable specification

Cable length COS61	Max. 100 m (330 ft)
Cable length COS41	Max. 50 m (160 ft)

Overvoltage protection	According to EN 61000-4-5
Sensor connection	The oxygen sensors are supplied with a measuring cable. Use a junction box and a cable to extend this measuring cable (see Accessories).




4 COS41 to COM2x3-DX/DS



5 COS61 to COM2x3-WX/WS

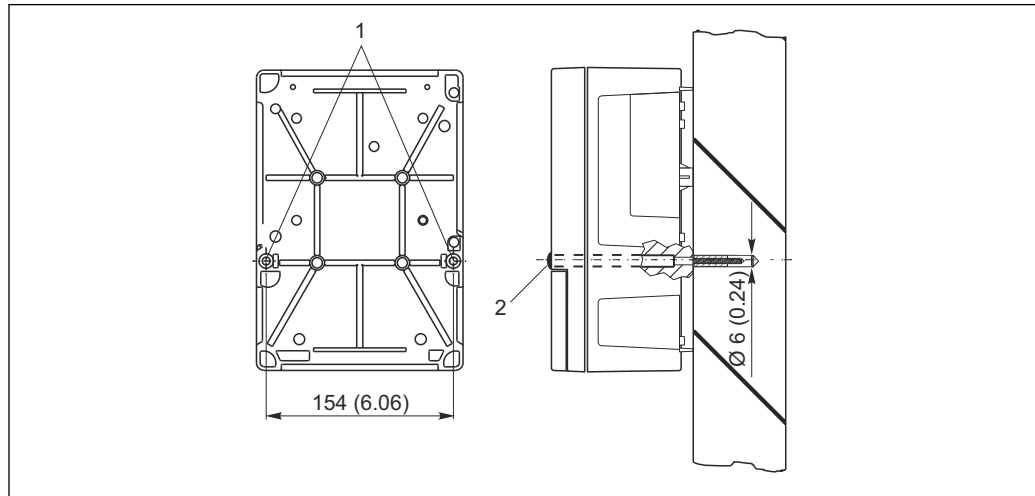
Performance characteristics

Reference operating conditions	Reference temperature:	25 °C (77 °F)
	Reference pressure:	1013 hPa (15 psi)
	Reference application:	Air-saturated water
Measured value resolution	Oxygen	0.01 mg/l / 0.1 % SAT / 1 hPa
	Temperature	0.1 °C
Maximum measured error	Display	
	Oxygen	Max. 0.5 % of measuring range
	Temperature	Max. 1.0 % of measuring range
	Signal output	
	Oxygen	Max. 0.75 % of measuring range
	Temperature	Max. 1.25 % of measuring range
 Measured errors in accordance with DIN IEC 746 Part 1, at rated operating conditions		
Repeatability	Max. 0.2 % of measuring range	
Slope adjustment	COS41	75 to 140 % (nominal 290 nA, in air, 20 °C, 1013 hPa)
	COS61	75 to 140 % (nominal 1340 nA, in air, 20 °C, 1013 hPa)

Installation

Installation instructions

Field device wall mounting

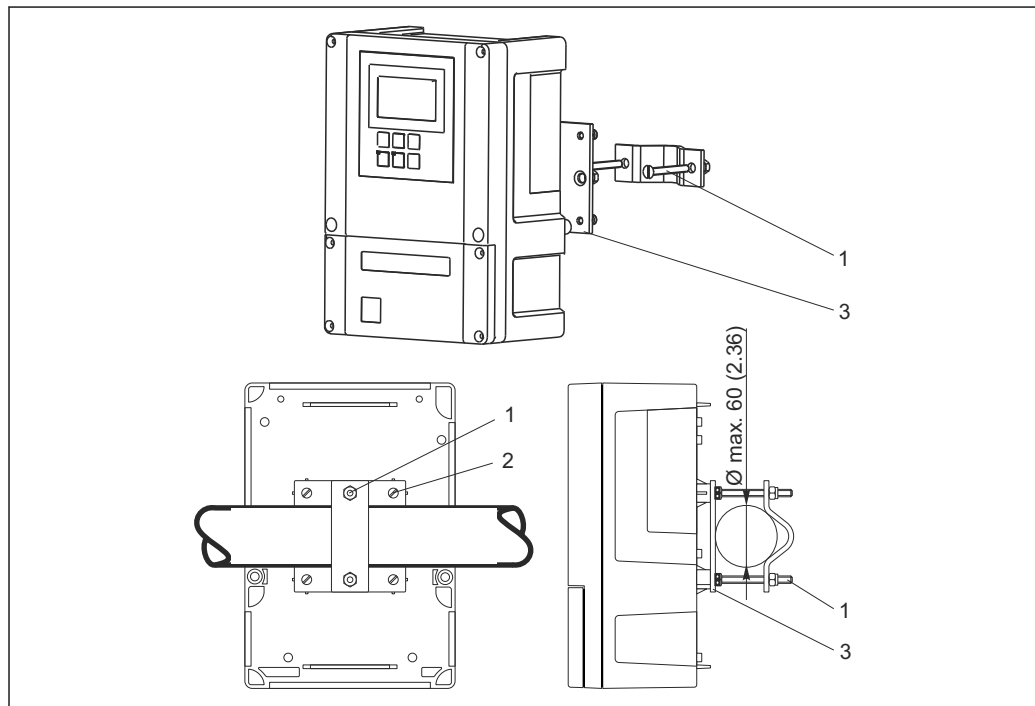


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6 Field device wall mounting

- 1 Fixing bore holes
- 2 Plastic caps

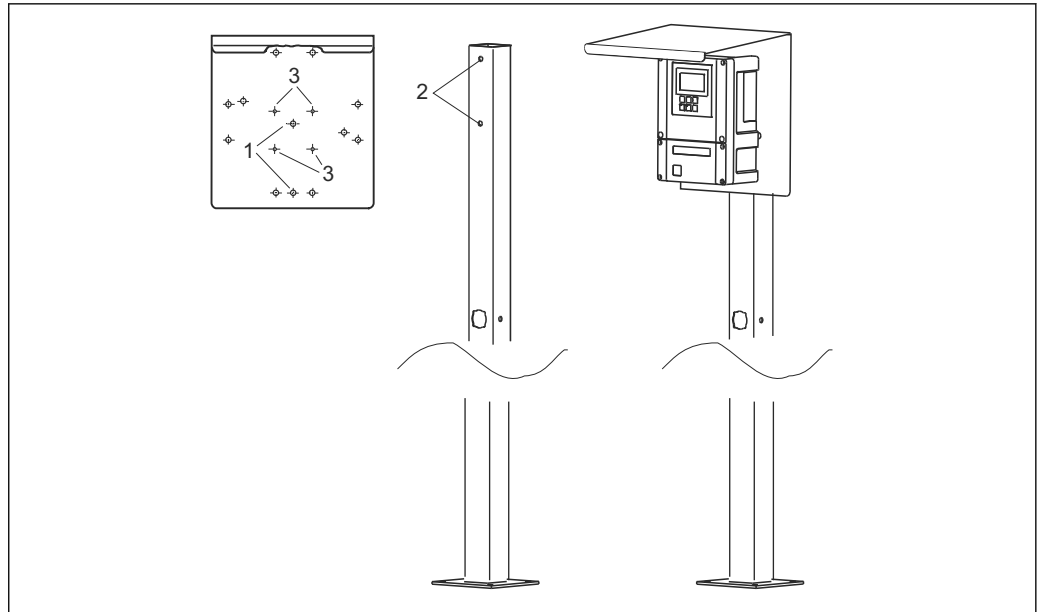
Field device post mounting



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7 Field device on horizontal or vertical pipes

- 1 Securing screws
- 2 Fixing screws
- 3 Securing plate

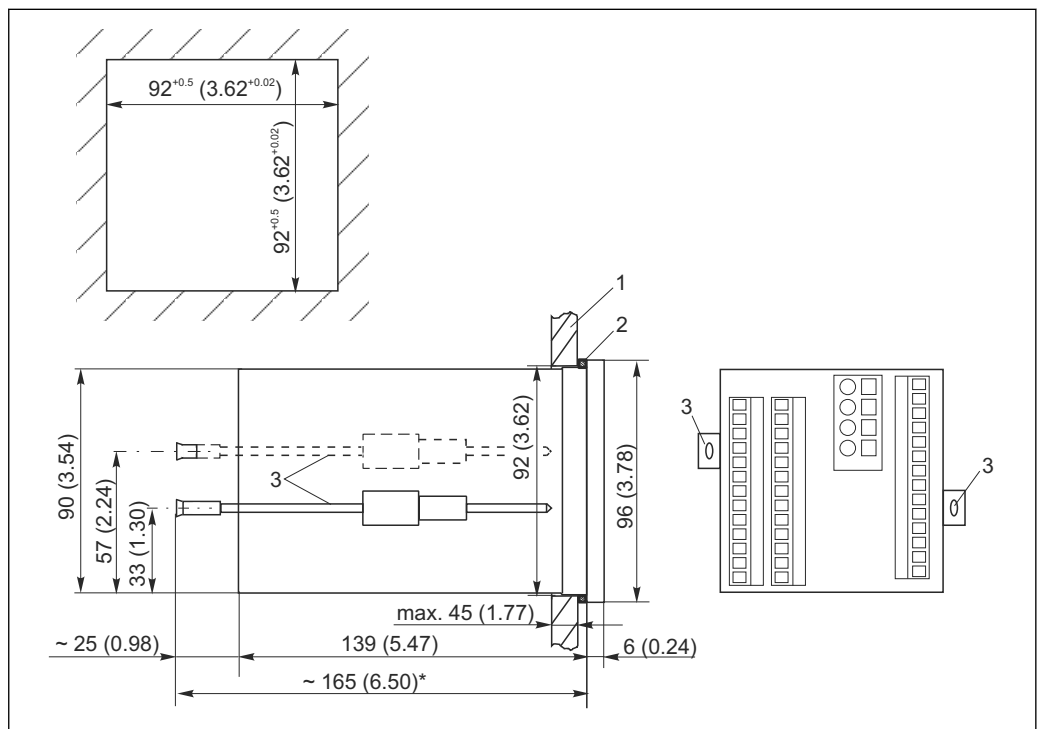


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8 Field device with universal post and weather protection cover

- 1 Bore holes in the weather protection cover to secure to the upright post
- 2 Bore holes in the upright post to secure the weather protection cover
- 3 Bore holes in the weather protection cover to secure the field device

Panel mounting



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9 Dimensions in mm (inch)

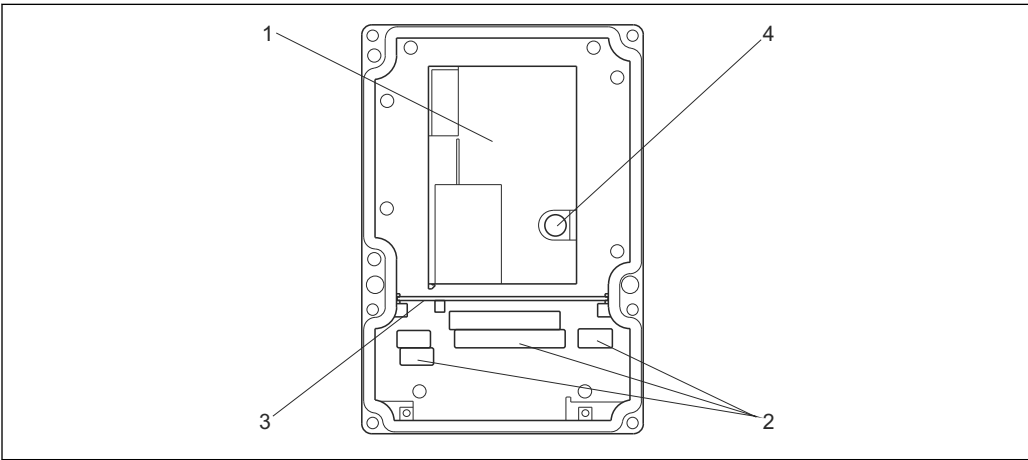
- 1 Mounting plate
- 2 Seal
- 3 Tensioning screws
- * Necessary installation depth

Environment


Ambient temperature range	-10 to +55 °C (+10 to +130 °F)	
Storage temperature	-25 to +65 °C (-10 to +150 °F)	
Electromagnetic compatibility	Interference emission and interference immunity as per EN 61326-1:2006, EN 61326-2-3:2006	
Degree of protection	Field device Panel-mounted device	IP 65 / integrity according to NEMA 4X IP 54 (front), IP 30 (housing)
Electrical safety	As per EN/IEC 61010-1:2010, overvoltage category II for installations up to 2000 m (6500 ft) above MSL	
CSA	Device versions with CSA General Purpose approval are certified for indoor use.	
Relative humidity	10 to 95%, not condensing	
Degree of contamination	The product is suitable for pollution degree 2.	

Mechanical construction

Design

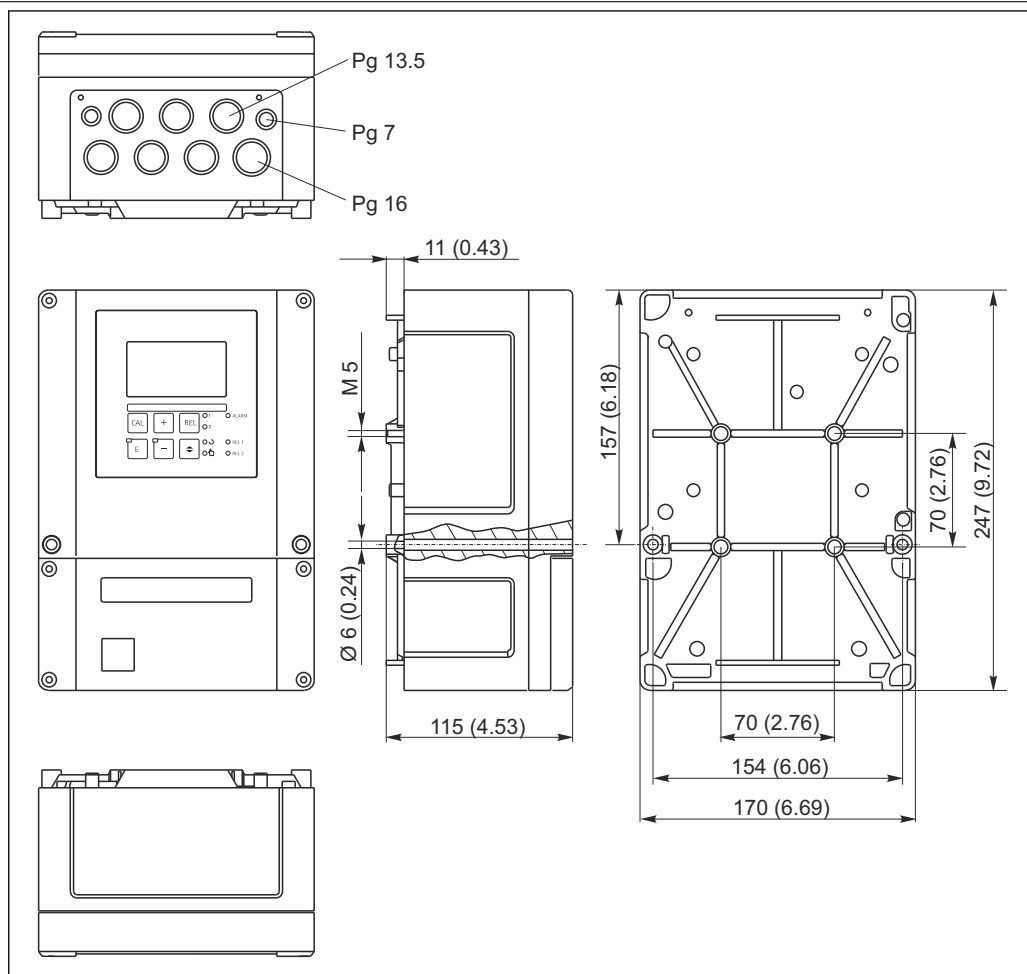


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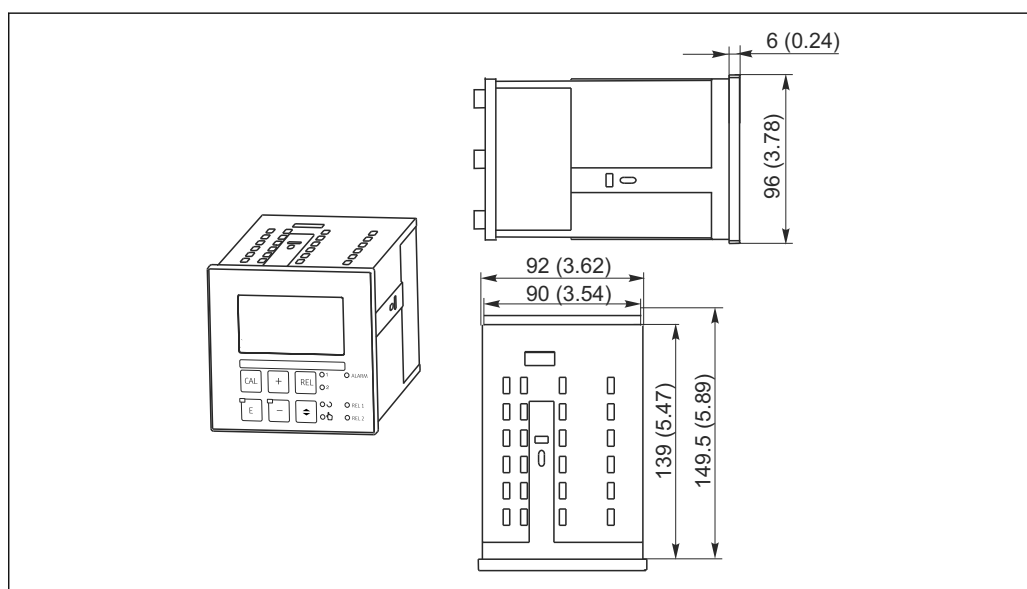
 10 View into the field device housing

- 1 Removable electronics box
- 2 Terminals
- 3 Partition plate
- 4 Fuse

Dimensions



11 Field device: dimensions in mm (inch)



12 Panel-mounted device: dimensions in mm (inch)

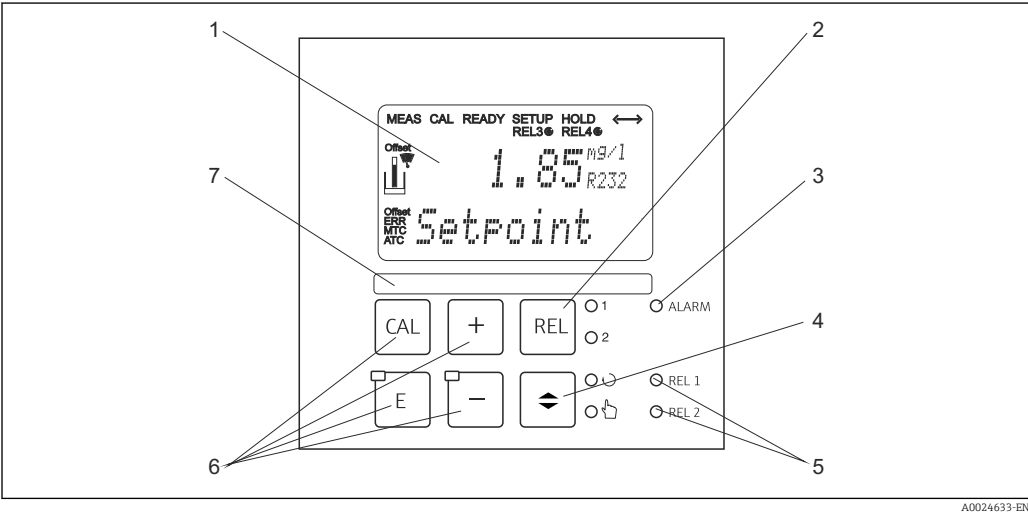
Weight


Panel-mounted device	Max. 0.7 kg (1.54 lbs.)
Field device	Max. 2.3 kg (5.07 lbs.)

Materials	Panel-mounted device housing	Polycarbonate
	Field housing	ABS PC FR
	Front membrane	Polyester, UV-resistant
Terminals	Cable cross-section	Max. 2.5 mm ² (14 AWG)

Operability

Operating concept	All the device's operating functions are arranged in a clear menu structure. The individual parameters can be selected and modified once the access code has been entered.
Display and operating elements	The display shows the current measured value and the temperature simultaneously, which means you have an overview of the most important process data at once. Help text in the configuration menu helps users configure the device parameters.



-  13 Operating elements
- 1 LC display for displaying the measured values and configuration data
 - 2 Key to switch relays in manual mode and to display the active contact
 - 3 LED for alarm function
 - 4 Changeover switch for automatic/manual mode
 - 5 LEDs for limit contactor relay (switch status)
 - 6 Main operating keys for calibration and device configuration
 - 7 Field for user-defined information

Certificates and approvals

CE mark	The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EC directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.
CSA General Purpose	The following device versions meet the requirements of CSA and ANSI/UL for Canada and the US: <ul style="list-style-type: none">■ COM253-**2/3/7***■ COM223-**2/3/7***

Ordering information

Product page	www.endress.com/com223 www.endress.com/com253
Product Configurator	<p>The navigation area is located on the right of the product page.</p> <ol style="list-style-type: none"> 2. Under "Device support" click "Configure your selected product". <ul style="list-style-type: none"> ↳ The Configurator opens in a separate window. 3. Select all the options to configure the device in line with your requirements. <ul style="list-style-type: none"> ↳ In this way, you receive a valid and complete order code for the device. 4. Export the order code as a PDF or Excel file. To do so, click the appropriate button at the top of the screen.
Scope of delivery	<p>The delivery of the field device comprises:</p> <ul style="list-style-type: none"> ■ 1 transmitter COM253 ■ 1 plug-in screw terminal, 3-pin ■ 1 cable gland Pg 7 ■ 1 cable gland Pg 16 reduced ■ 2 cable glands Pg 13.5 ■ 1 set of Operating Instructions ■ For versions with HART communication: <ul style="list-style-type: none"> 1 set of Operating Instructions: Field communication with HART ■ For versions with PROFIBUS interface: <ul style="list-style-type: none"> 1 set of Operating Instructions: Field communication with PROFIBUS PA/DP <p>The delivery of the panel-mounted device comprises:</p> <ul style="list-style-type: none"> ■ 1 transmitter COM223 ■ 1 set of plug-in screw terminals ■ 2 tensioning screws ■ 1 set of Operating Instructions ■ For versions with HART communication: <ul style="list-style-type: none"> 1 set of Operating Instructions: Field communication with HART ■ For versions with PROFIBUS interface: <ul style="list-style-type: none"> 1 set of Operating Instructions: Field communication with PROFIBUS PA/DP

Accessories



The following are the most important accessories available at the time this documentation was issued. For accessories not listed here, please contact your service or sales office.

Sensors

Oxymax COS41

- Oxygen sensor for drinking water and industrial water measurement, amperometric measuring principle
- Material: POM
- Product Configurator on the product page: www.endress.com/cos41



Technical Information TI00248C

Oxymax COS61

- Optical oxygen sensor for drinking water and industrial water measurement
- Measuring principle: quenching
- Material: stainless steel 1.4571 (AISI 316Ti)
- Product Configurator on the product page: www.endress.com/cos61



Technical Information TI00387C

Connection accessories

CMK

- Terminated measuring cable for COS41 oxygen sensors
- For extension between VBM junction box and transmitter
- Sold by meter, Order No.: 50005374

OMK

- Terminated measuring cable for COS61 oxygen sensors
- For extension between VS junction box and transmitter
- Sold by meter, Order No.: 50004124

VBM

- Junction box for cable extension
- 10 terminal strips
- Cable entries: 2 x Pg 13.5 or 2 x NPT 1/2"
- Material: aluminum
- Degree of protection: IP 65
- Order numbers
 - Cable entries Pg 13.5 : 50003987
 - Cable entries NPT 1/2": 51500177

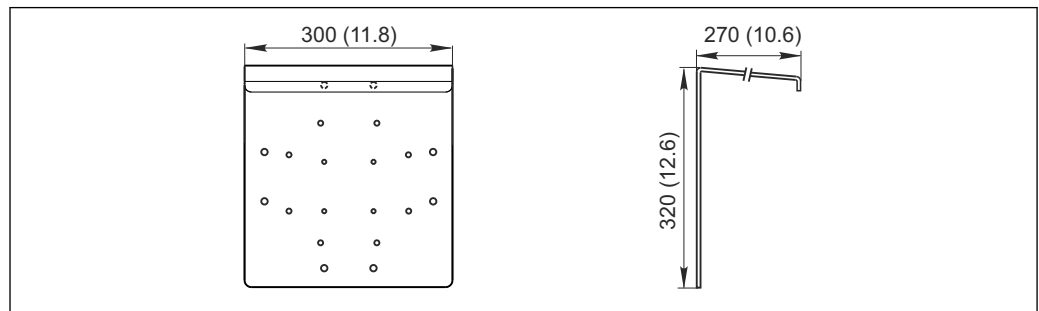
VS

- Junction box for cable extension of COS61 sensor with SXP plug-in connector
- With socket and 7-pin connector
- Degree of protection: IP 65
- Order number: 50001054

Installation accessories

CYY101

- Weather protection cover for field devices
- Absolutely essential for field installation
- Material: stainless steel 1.4301 (AISI 304)
- Order No. CYY101-A

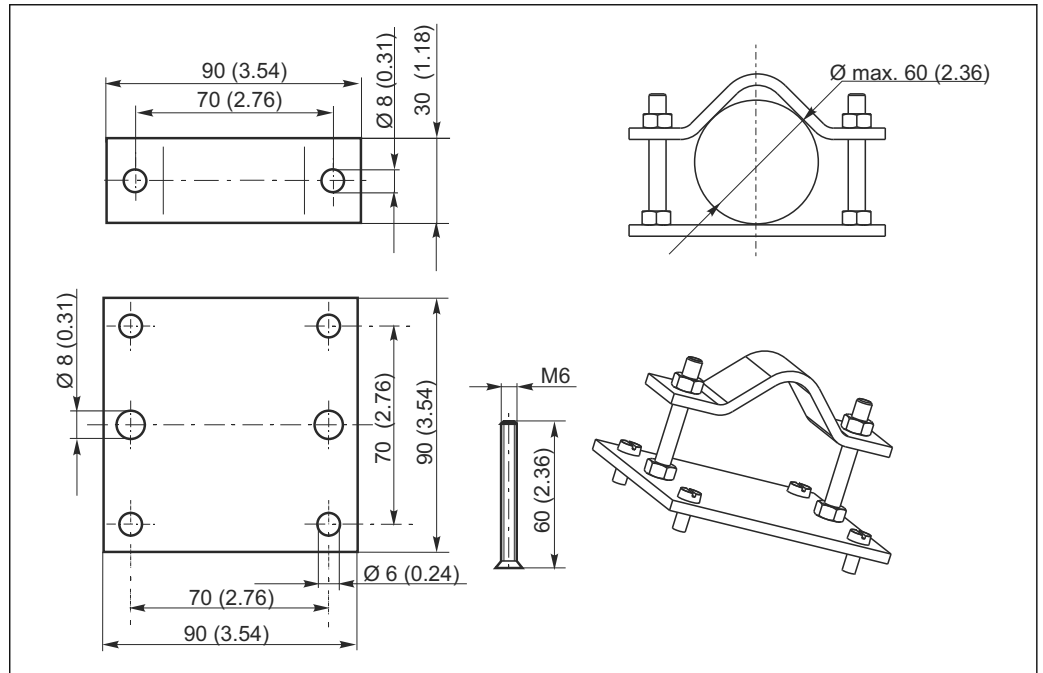


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14 Dimensions in mm (inch)

Post mounting kit

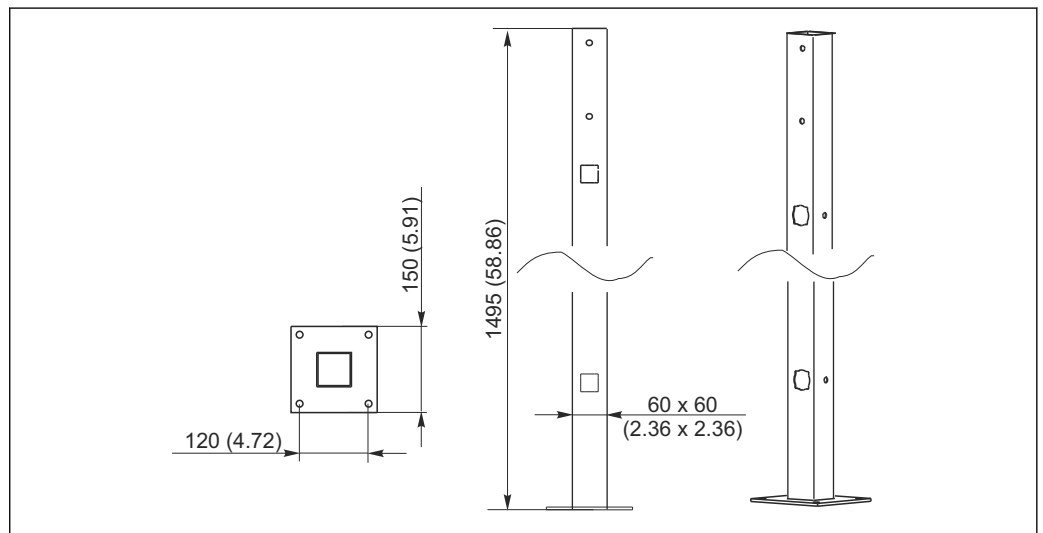
- For securing the field housing to horizontal and vertical posts and pipes
- Material: stainless steel 1.4301 (AISI 304)
- Order No. 50086842



15 Dimensions in mm (inch)

Universal post CYY102

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



16 Dimensions in mm (inch)

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www.addresses.endress.com
