Technical
Information
TI 202C/07/en
No. 51500563

Conductive conductivity measurement *mypro CLM 431 / CLD 431 conductive*

Two-wire transmitter for conductive measurement of conductivity and specific resistance in Ex and non-Ex areas with HART® or Profibus communication

The MyPro CLM 431 and its compact version MyPro CLD 431 are field-tested and reliable analytical transmitters used to determine conductivity or specific resistance in all areas of process control and engineering.
Thanks to its compact dimensions and versatile mounting options, the MyPro can be used in any industrial environment.

Areas of application

- Chemical and petrochemical industries, including Ex areas
- Pharmaceutical industry
- Power plants
- Water processing
- Wastewater treatment

Benefits at a glance

- High reliability and accuracy thanks to:
  - comprehensive self-monitoring functions
  - polarisation detection
  - convenient calibration functions for wet and dry calibration
- Smallest intelligent analytical transmitter currently available
- Extremely simple installation with numerous mounting options; display and housing can be rotated
- Convenient operation via:
  - keypad on instrument
  - hand-held HART® terminal
  - Commuwin II via HART® or Profibus PA

Additional advantages of compact version

- Minimal installation requirements
- Simple handling
- Rugged stainless steel measuring cells

Quality made by
Endress+Hauser

ISO 9001

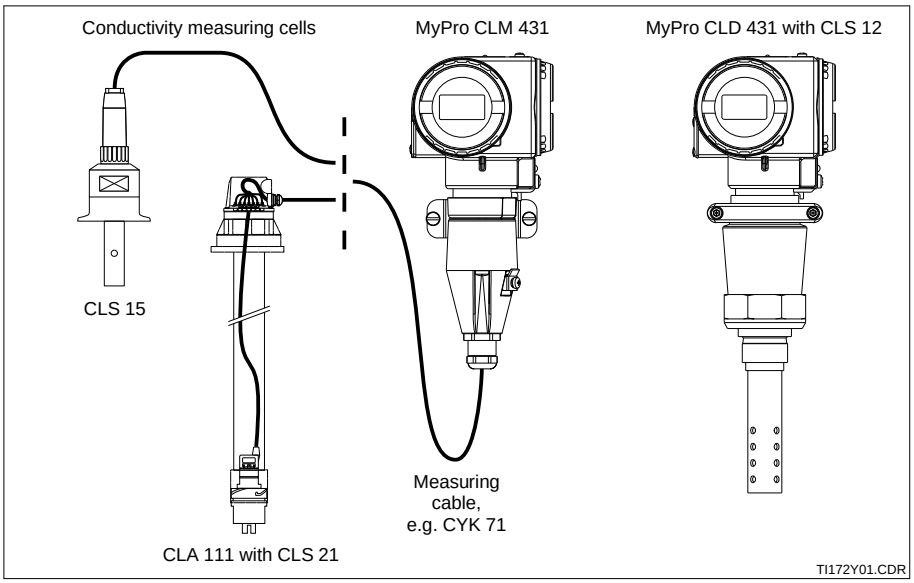
Endress+Hauser

Nothing beats know-how

Measuring system

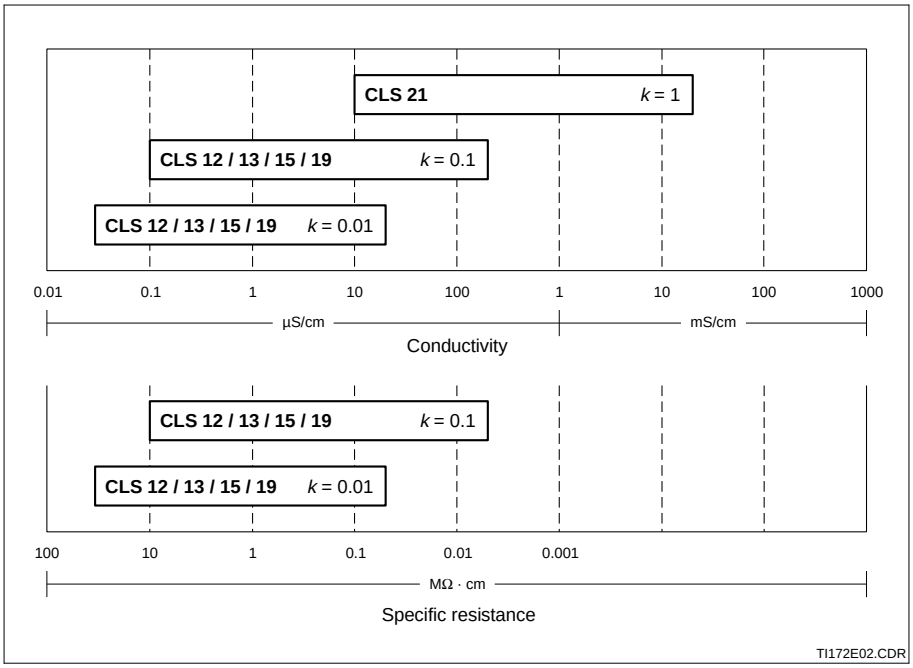
A measuring system generally comprises:

- the MyPro transmitter
- a conductive two-electrode measuring cell with an integrated temperature sensor Pt 100
- a fitting for weld-mounting or an assembly for installation in a pipeline or tank
- an additional measuring cable for the CLM 431 version



Examples of measuring system configurations

Conductivity measuring cells for MyPro CLM 431 conductive



Application ranges of conductive two-electrode measuring cells

The MyPro CLM 431 / CLD 431 transmitter has an overall measuring range of 0 ... 2000 mS/cm which may be spread as required by the application at hand.

Selecting the correct measuring cell for the application is extremely important since the application range of measuring cells is subject to physical limitations.

General information

Measurement
The conductive measuring transmitter MyPro CLM 431 / CLD 431 can be switched from conductivity to specific resistance measurement. Accuracy is the top priority. Continued accuracy is guaranteed by a cyclical adjustment routine.

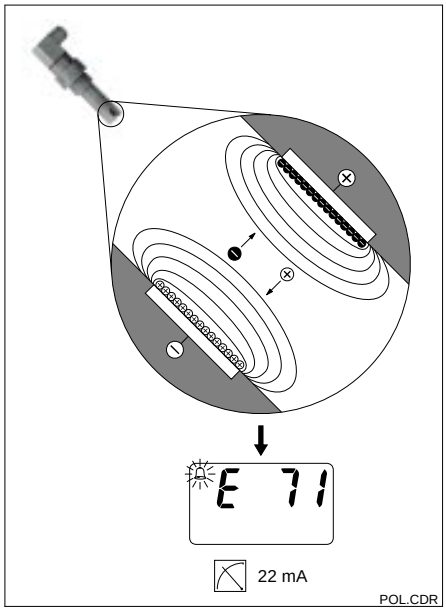
Self-diagnosis
The MyPro permanently monitors the operating condition of the measuring system. 22 possible causes of errors are distinguished. Error conditions are signalled via the field display and the HART® or Profibus interface and, in the case of HART® communication, also via an error current signal (22 mA).

Temperature compensation
The MyPro offers several temperature compensation options:
- Linear compensation: 0 ... 10%/K with the reference temperature selectable by the user
- Compensation according to IEC 746-3 for NaCl
- Temperature compensation for ultrapure water with trace impurities
- Compensation with user-programmable α table containing up to 10 elements

The temperature can either be measured continuously or entered as a fixed value.

Polarisation detection
High ion concentrations at the boundary layer between the electrode and the medium impede free ion movement. These so-called polarisation effects limit the measuring range of conductive measuring cells. Soiling and coatings may also lead to polarisation within the specified measuring range of the measuring cell and produce inaccurate results.

The conductive measuring transmitter MyPro CLM 431 / CLD 431 employs the latest findings in metrology to safely detect polarisation effects. Polarisation detection is available for two-electrode measuring cells in the conductivity measuring range and can be activated by the user.



Polarisation detection

Operation

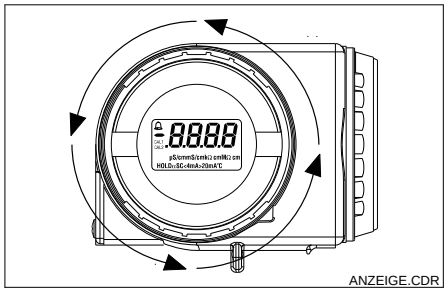
Menu-guided operation
The functions of the MyPro CLM 431 / CLD 431 are arranged at two different levels and can be accessed using four keys:
Operating level 1
- ⊕ Viewing of current settings (secondary parameters)
- ⊖ Error diagnosis (diagnostic parameters)
- Ⓕ Current output settings (parameter settings)
- Ⓒ Calibration

Operating level 2
- All other settings are located at this level, e.g. selection of conductivity or resistance measurement.

The keypad is located underneath a protective cover to prevent unintentional actuation and soiling.

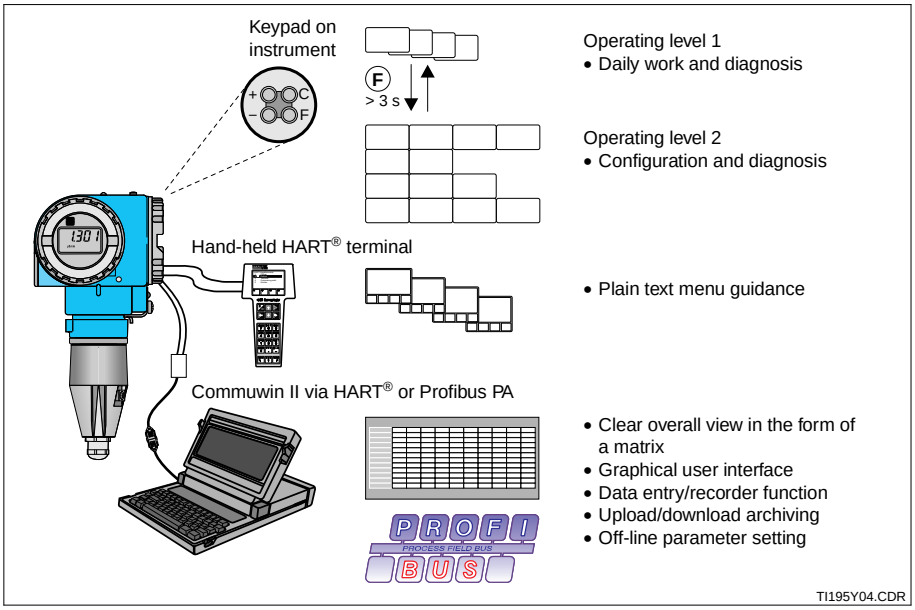
No unauthorised access
Configuration and calibration data are protected against undesirable modification by means of two access codes.

Display
The high-contrast liquid crystal display locks in at 90° angles to guarantee optimal readability in different mounting positions.



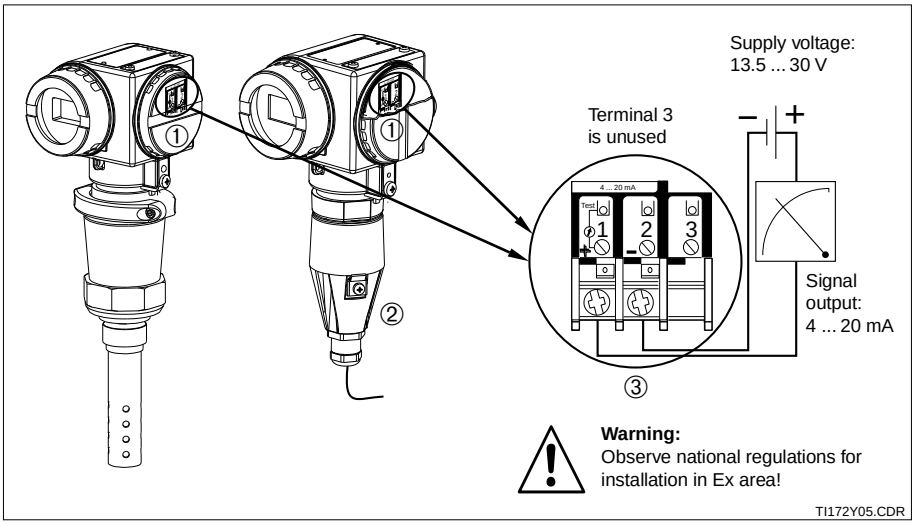
Display

Operation (continued)

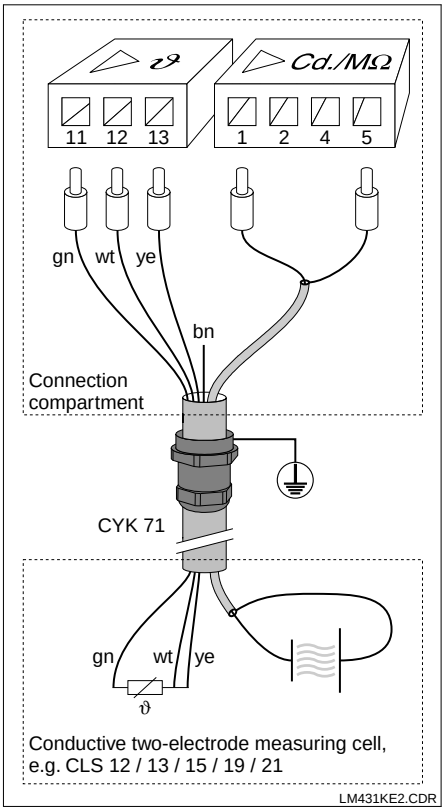


Operation of MyPro CLM 431 / CLD 431 via:
- keys on instrument
- hand-held HART® terminal
- Commuwin II

Electrical connection



Electrical connection of MyPro CLM 431 / CLD 431 (HART® version):
① Connection compartment for two-wire line
② Connection compartment for measuring cell cable
③ Power supply / signal output connection

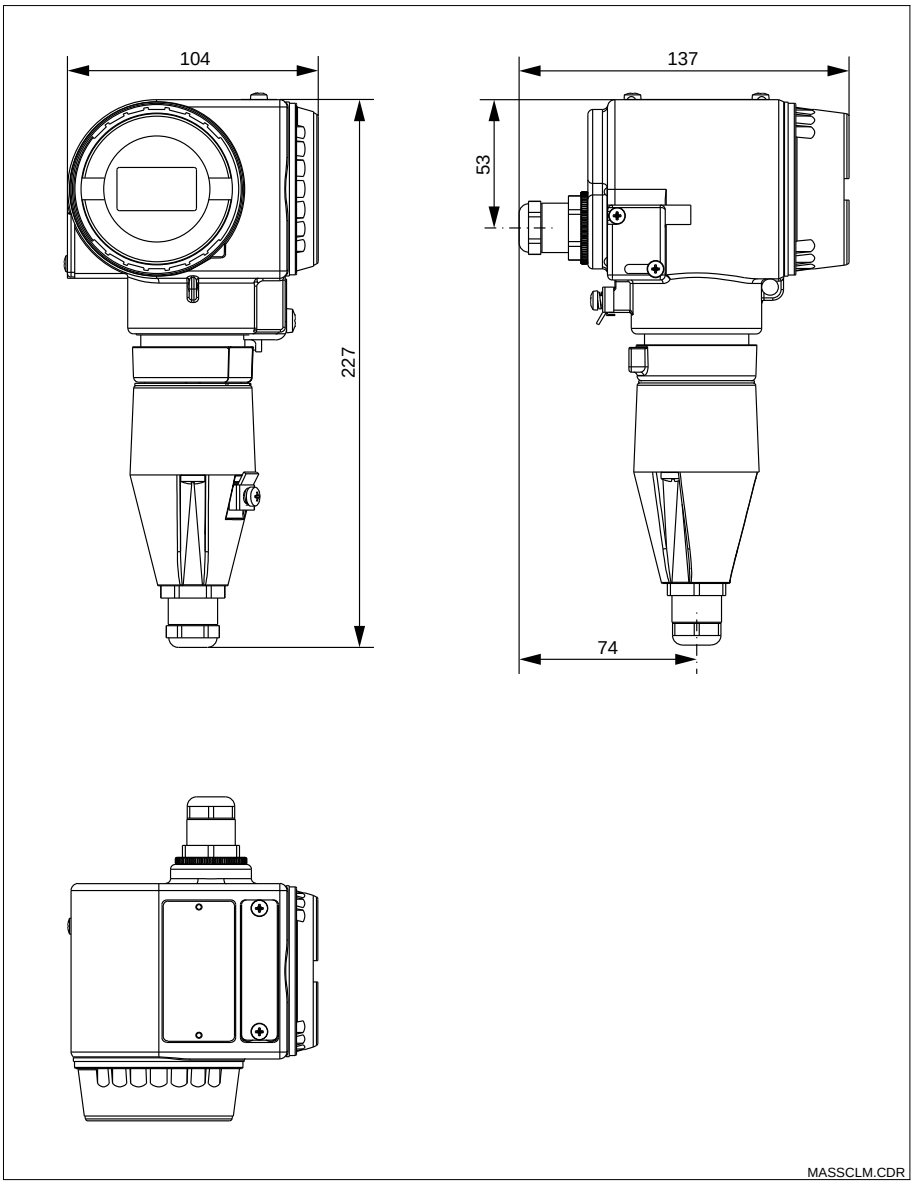


Connection of a conductive two-electrode measuring cell with cable CYK 71

Measuring cable

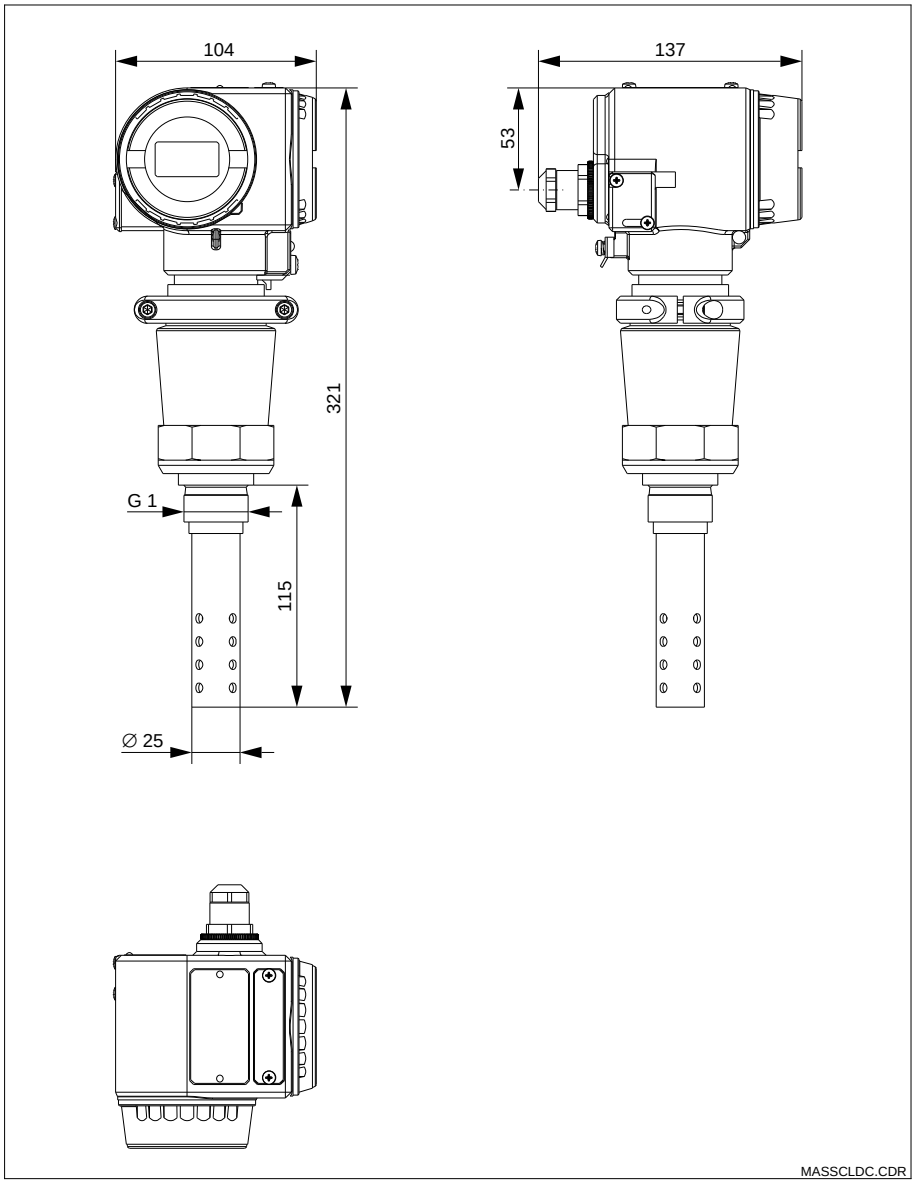
The MyPro CLM 431 transmitter comes with separate connection compartments for the two-wire line and the measuring cell cable. The conductivity measuring cells are connected via standard screened, multi-core measuring cables of the type CYK 71. Junction box VS is to be used for measuring cable extension.

Dimensions of MyPro CLM 431



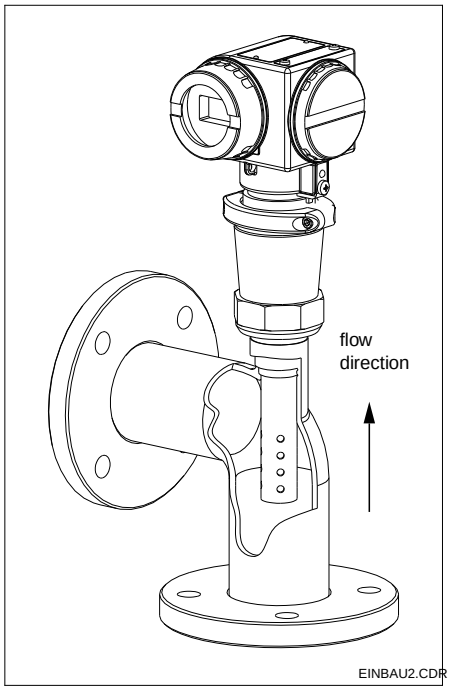
Dimensions of
MyPro CLM 431

Dimensions of MyPro CLD 431 conductive



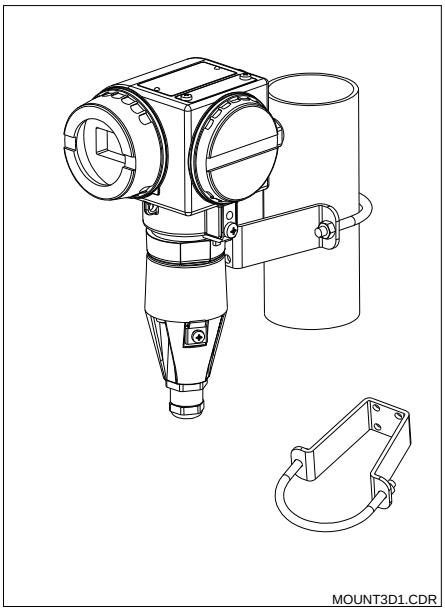
Dimensions of MyPro CLD 431 conductive

Mounting of MyPro CLD 431 conductive

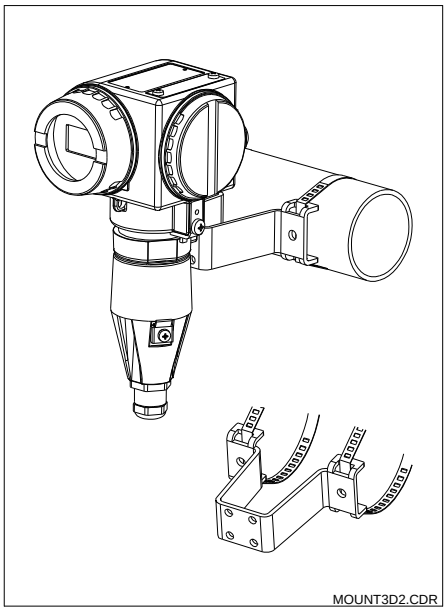


Pipe mounting of MyPro CLD 431 conductive

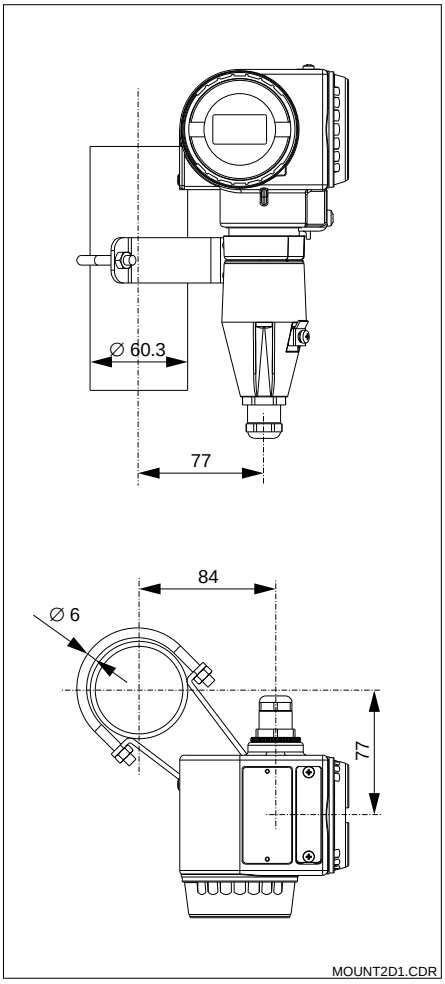
Pipe mounting of MyPro CLM 431



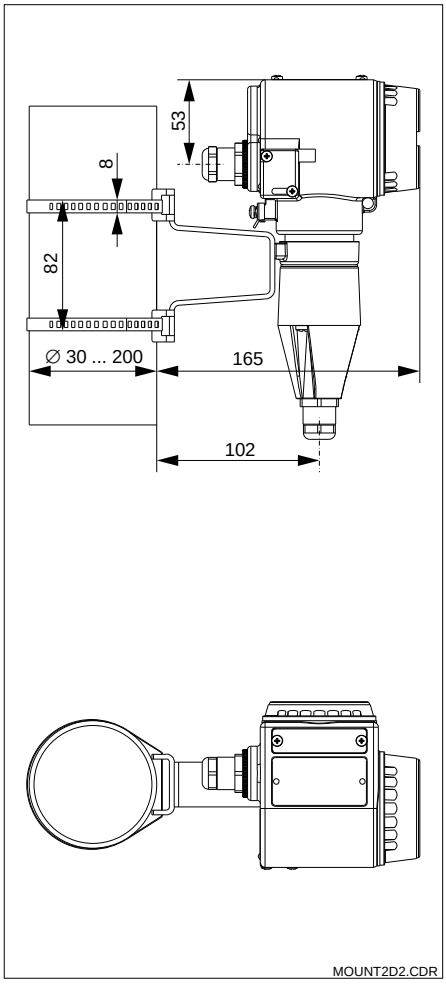
Left:
Pipe mounting DN 60
with mounting bracket



Right:
Pipe mounting
DN 30 ... 200 with
mounting bracket
(horizontal attachment)

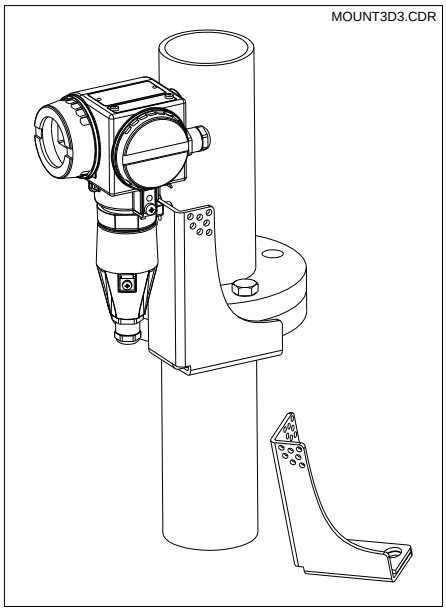


Left:
Pipe mounting DN 60
with mounting bracket

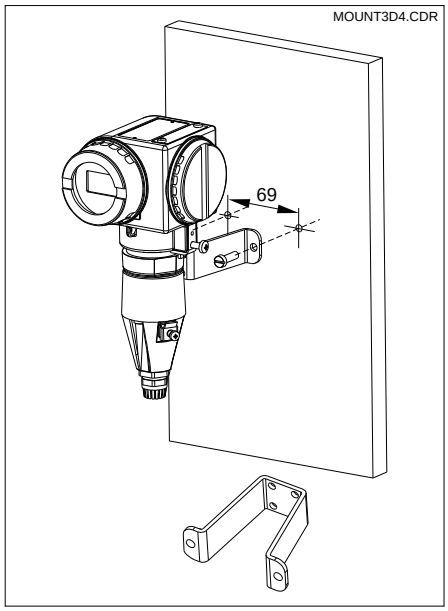


Right:
Pipe mounting
DN 30 ... 200 with
mounting bracket
(vertical attachment)

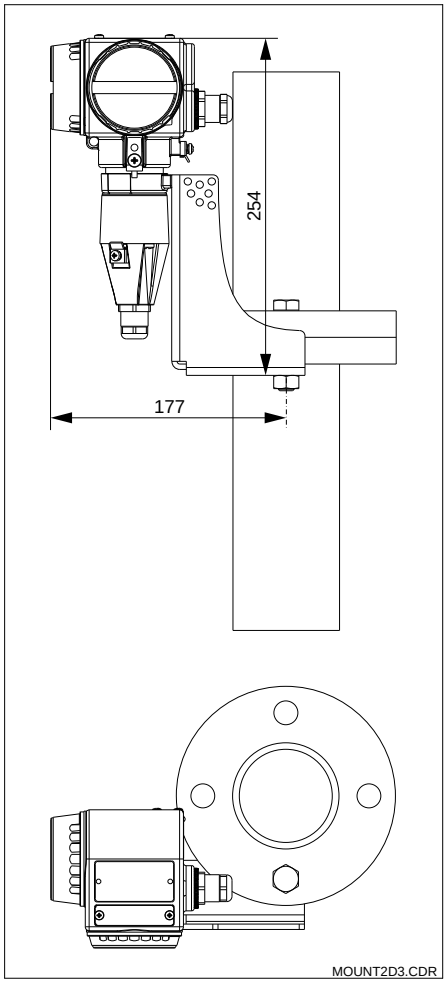
Flange and wall mounting of MyPro CLM 431



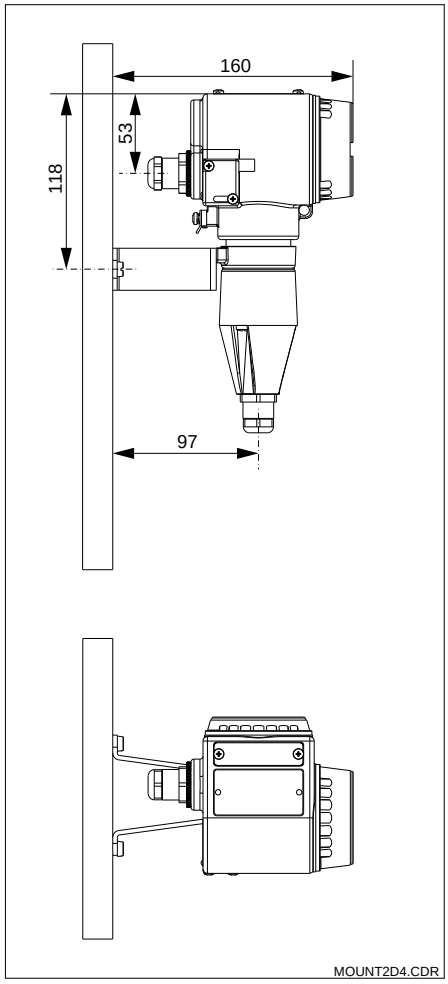
Left:
Flange mounting with angle bracket



Right:
Wall mounting with mounting bracket



Left:
Flange mounting with angle bracket



Right:
Wall mounting with mounting bracket

Technical data

MyPro CLM 431 conductive

General specifications

Manufacturer	Endress+Hauser
Product designation	MyPro CLM 431 conductive

Physical data

Dimensions (H × W × D)	227 × 104 × 137 mm
Weight	max. 1.25 kg
Protection type	IP 65
Housing material	GD-AlSi 10 Mg, plastic-coated
Measured value display	liquid crystal display

Conductivity/resistance measurement

Measuring range	0 ... 2000 mS/cm; 0 ... 86 MΩ·cm
Measurement deviation[1]	±0.5% of measured value ± 4 digits
Reproducibility[1]	±0.1% of measured value ± 2 digits
Usable cell constant	k = 0.0025 ... 99.99 cm^{-1}
Max. measuring cable length (CYK 71)	conductivity: 100 m; resistance: 15 m
Max. resolution (in most sensitive measuring range)	1 nS/cm

Temperature measurement

Temperature sensor to be connected	Pt 100
Measuring range of Pt 100	–20 ... +250 °C
Measurement deviation[1] (entire measuring range)	max. 0.5% of measuring range
Measured value resolution	0.1 °C
Reproducibility[1]	±0.1 K
Adjustable temperature offset	±20 °C

Temperature compensation

Compensation types	linear, NaCl, ultrapure water, table
Range	–20 ... +250 °C
Reference temperature	adjustable; factory setting 25 °C

Signal output

Current range	4 ... 20 mA
Accuracy	± (22 mA + 0.0005 % · I_{real} · ΔT / °C) ΔT = T_a – 25 °C for $T_a \geq$ 25 °C ΔT = 25 °C – T_a for $T_a <$ 25 °C
Load	max. 820 Ω
Resolution	< 6 µA

Electrical data

Supply voltage	12 ... 30 V DC without HART interface 13.5 ... 30 V DC with HART interface
Power consumption	max. 660 mW
Signal output	4 ... 20 mA, potential separated from meas. cell circuit
Error current signal output	22 mA ± 0.02 mA
HART® transfer: load	250 ... 750 Ω
HART® transfer: signal output	0.8 ... 1.2 mA (peak to peak)
Terminals, max. cable cross section	2.5 mm², screen 4 mm²

Ex version

CLM 431-G

Intrinsically safe power supply and signal circuit, protection type EEx ib IIC T4	
Max. input voltage U_i	30 V DC
Max. input current I_i	100 mA
Max. input power P_i	750 mW
Max. internal inductance L_i	200 µH
Max. internal capacitance C_i	≈ 0, to screen = 5.3 nF

Intrinsically safe measuring cell circuit, protection type EEx ia IIC T4	
Max. output voltage U_o	±5.4 (10.8) V DC
Max. output current I_o	320 mA
Max. output power P_o	200 mW
Max. external inductance L_o	100 µH
Max. external capacitance C_o	100 nF

Technical data (continued)

CLM 431-H (Approval acc. to dir. 94/9/EC (ATEX 100a) in preparation)

Intrinsically safe power supply and signal circuit, protection type EEx ib IIC T4	
Max. input voltage U_i	30 V DC
Max. input current I_i	100 mA
Max. input power P_i	750 mW
Max. internal inductance L_i	200 µH
Max. internal capacitance C_i	≈ 0, to screen = 5.3 nF

Intrinsically safe measuring cell circuit, protection type EEx ia IIC T4	
Max. output voltage U_o	±6.3 (12.6) V DC
Max. output current I_o	130 mA
Max. output power P_o	211 mW
Max. external inductance L_o	100 µH
Max. external capacitance C_o	100 nF

Ambient conditions

Electromagnetic compatibility (EMC)	interference emission acc. to EN 50081-1, 1992 interference immunity acc. to EN 50082-2, 1995
Ambient temperature T_a (nom. operating conditions)	–15 ... +55 °C
Relative humidity (nominal operating conditions)	10 ... 95%, non-condensing
Ambient temperature T_a (limit operating conditions)	–20 ... +60 °C (Ex: –20 ... +55 °C)
Storage and transport temperature	–20 ... +70 °C

Vibration stability acc. to IEC 770

Mounting position	pipeline
Vibration frequency	10 ... 60 Hz
Maximum amplitude	0.21 mm

MyPro CLD 431 conductive

General specifications

Manufacturer	Endress+Hauser
Product designation	MyPro CLD 431 conductive

Physical data

Length with CLS 12	321 mm
Process connection	G 1
Weight	approx. 2 kg
Protection type	IP 65
Housing material	GD-AlSi 10 Mg, plastic-coated
Materials in contact with medium	stainless steel 1.4571 (SS 316Ti), Viton, ceramic
Measured value display	liquid crystal display

Conductivity/resistance measurement

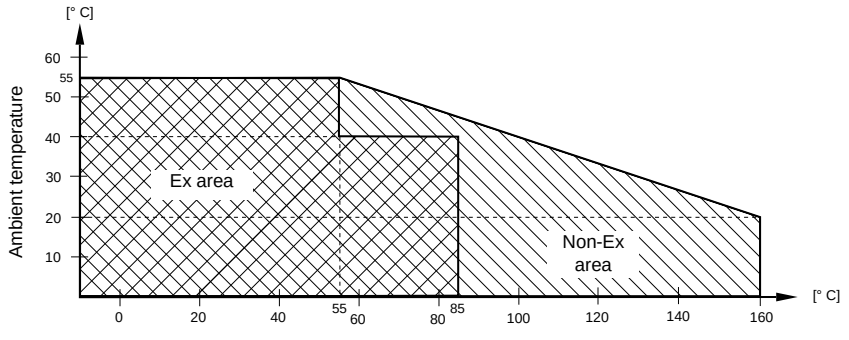
Measuring cell	CLS 12
Conductivity measuring range, version CA / CB	0.04 ... 20 µS/cm / 0.1 ... 200 µS/cm
Resistance measuring range, version CA / CB	0.05 ... 25 MΩ·cm / 0.005 ... 10 MΩ·cm
Cell constant, version CA / CB	k = 0.01 cm^{-1} / 0.1 cm^{-1}

Other data

See MyPro CLM 431 conductive

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

Subject to modifications.



Permissible temperature ranges MyPro CLD 431

Product structure

Conductivity measuring transmitter MyPro CLM 431 conductive

Certificate type

A	Version for non-Ex area
G	Cenelec EEx ia/ib IIC T4
H	Cenelec EEx ia/ib IIC T4 (dir. 76/117/EEC) *

Cable entry for power supply

1	Cable gland Pg 13.5
3	Cable entry M 20 × 1.5
5	Cable entry NPT ½"
7	Cable entry G ½

Electronics, communication, display

A	4 ... 20 mA, HART, without display
B	4 ... 20 mA, HART, LCD
C	Profibus PA, without display
D	Profibus PA, LCD

Accessories

1	No accessories
2	For wall and pipe mounting (DN 60)
3	For wall and pipe mounting (DN 30 ... 200)
4	With flange mounting angle

Preset measuring parameter

C	Conductive, two-electrode measurement
M	Conductive, resistance measurement

Cable, measuring cell connection

A	Cable not included
C	With 1 m CYK 71 cable
E	With 2 m CYK 71 cable

CLM 431-							complete order code

* Approval acc. to dir. 94/9/EC (ATEX 100a) in preparation

Compact conductivity measuring system MyPro CLD 431 conductive

Certificate type

A	Version for non-Ex area
H	Cenelec EEx ib IIC T4 (dir. 76/117/EEC) *

Cable entry for power supply

1	Cable gland Pg 13.5
3	Cable entry M 20 × 1.5
5	Cable entry NPT ½"
7	Cable entry G ½

Electronics, communication, display

A	4 ... 20 mA, HART, without display
B	4 ... 20 mA, HART, LCD
C	Profibus PA, without display
D	Profibus PA, LCD

Accessories

1	No accessories

Measuring cell, process connection, material

CA	CLS 12 / 0.04 ... 20 µS/cm, G 1, SS 316Ti
CB	CLS 12 / 0.1 ... 200 µS/cm, G 1, SS 316Ti

CLD 431-						complete order code

*Approval acc. to dir. 94/9/EC (ATEX 100a) in preparation

Accessories

❏ **Transmitter power supply units**
- RN 221 power separator (non-Ex)
- RN 221 Z power separator (Ex)
- NX 9120 power supply (one channel, non-Ex)
- NX 9121 power supply unit (three channels, Ex)
- One-channel transmitter power supply units with galvanically separated power output

Output voltage:	typ. 24 V DC ± 1 V
Output current:	max. 33 mA
Current limiting:	38 mA ± 5 mA

❏ **Hand-held HART® terminal DXR 275**
The hand-held terminal communicates with any HART®-compatible unit via the 4 ... 20 mA line.
The digital communication signal is superimposed on the 4 ... 20 mA signal without altering it. The simple, straightforward design of the user interface provides convenient access to the entire functionality of the instrument.

❏ **Commuwin II with Commubox**
Commuwin II is a graphical, PC-based operating program for intelligent measuring instruments.
DDE interfaces (DDE = dynamic data exchange, Windows communication standard) are used for communication between Commuwin II and measuring transmitters. One DDE server (driver) per communication channel is available.
Depending on the application, either the serial interface built into the personal computer or a special interface (card to be plugged into the PC) is used. The Commubox serves as the required interface module between the HART® interface and the serial PC interface.

❏ **Measuring cable CYK 71**
For two-electrode measuring cells with a temperature sensor.
Order no. 50085333

❏ **Junction box VS**
Junction box with receptacle and 7-pin connector for extension of measuring cable connection between measuring cell and instrument.
Protection type: IP 65.
Order no. 50001054

❏ **Calibration solutions**
Precision solutions referred to SRM by NIST; error limit 0.5%, reference temperature 25 °C; quantity 500 ml.
See Technical Information CLY 11, order no. 50086574.

Type	Conductivity[1]	Order no.
CLY 11-A	74.0 µS/cm	50081902
CLY 11-B	149.6 µS/cm	50081903
CLY 11-C	1.406 mS/cm	50081904
CLY 11-D	12.64 mS/cm	50081905
CLY 11-E	107.00 mS/cm	50081906

[1] Values may deviate due to manufacturing tolerances. The error limit refers to the value specified on the bottle.

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