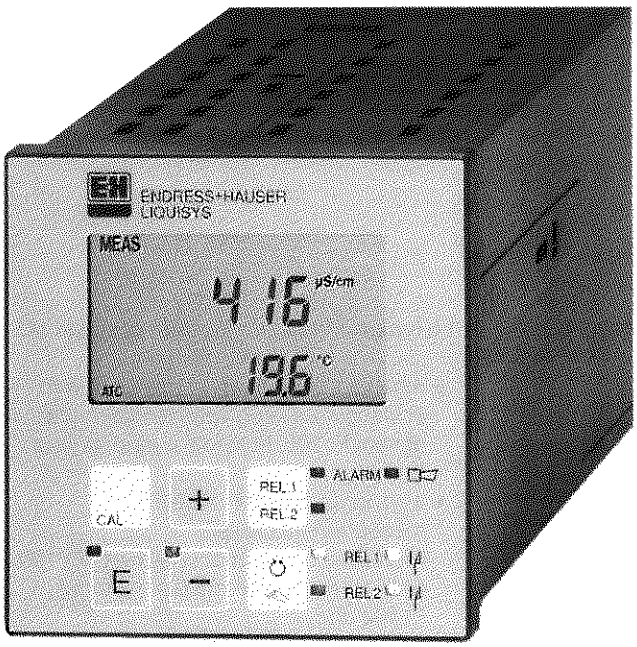
Technical
Information
TI 141C/07/en

Conductivity Measurement
liquisys CLM 221

Measuring transmitter for conductivity and electrical resistance



Safe operation
- Two switching contacts as set point switches with extended delay for cooling water applications
- Alarm contact for error messages
- Galvanically isolated signal output 0/4 ... 20 mA
- High protection against electromagnetic interference
- Pt 100 failure monitoring

Universal use
- Internal re-configuration between specific conductivity and electrical resistance measurement
- Field tested panel mounted housing (96 x 96 mm); ingress protection IP 54 (front)
- Optional, rugged field housing; ingress protection IP 65

Easy operation
- Menu-driven programme simplifies parameter setting.
- Large two line display: measuring value and temperature at a glance
- Full calibration via one CAL button

Areas of application
- High-purity water
- Water treatment
- Ion exchangers
- Reverse osmosis
- Cooling water desalination

Quality made by
Endress+Hauser

ISO 9001

Endress+Hauser

Nothing beats know-how

General information

Maximum measurement accuracy with ATC
Automatic temperature compensation is of central importance for conductivity measurement since the electrical conductance is strongly temperature dependent. The displayed conductivity measurement value is obtained by off-setting to a reference temperature with a specific temperature coefficient for each solution.
In addition to the linear compensation, the devices have a high-purity water compensation which also takes into account the dependence of the temperature coefficient on the purity of the water.
With high-purity water, the temperature coefficient changes from +5.29 %/°C at 25 °C to +2.23 %/°C at 100 °C.

Continuous monitoring
Overflow of the limit value is continuously monitored.
If a limit value is exceeded for a preset time period (0 to 30 minutes), the alarm contact is switched on. This relay also activates if there is a fault in the Pt 100 temperature sensor.
This contact also operates as a fail-safe switch.

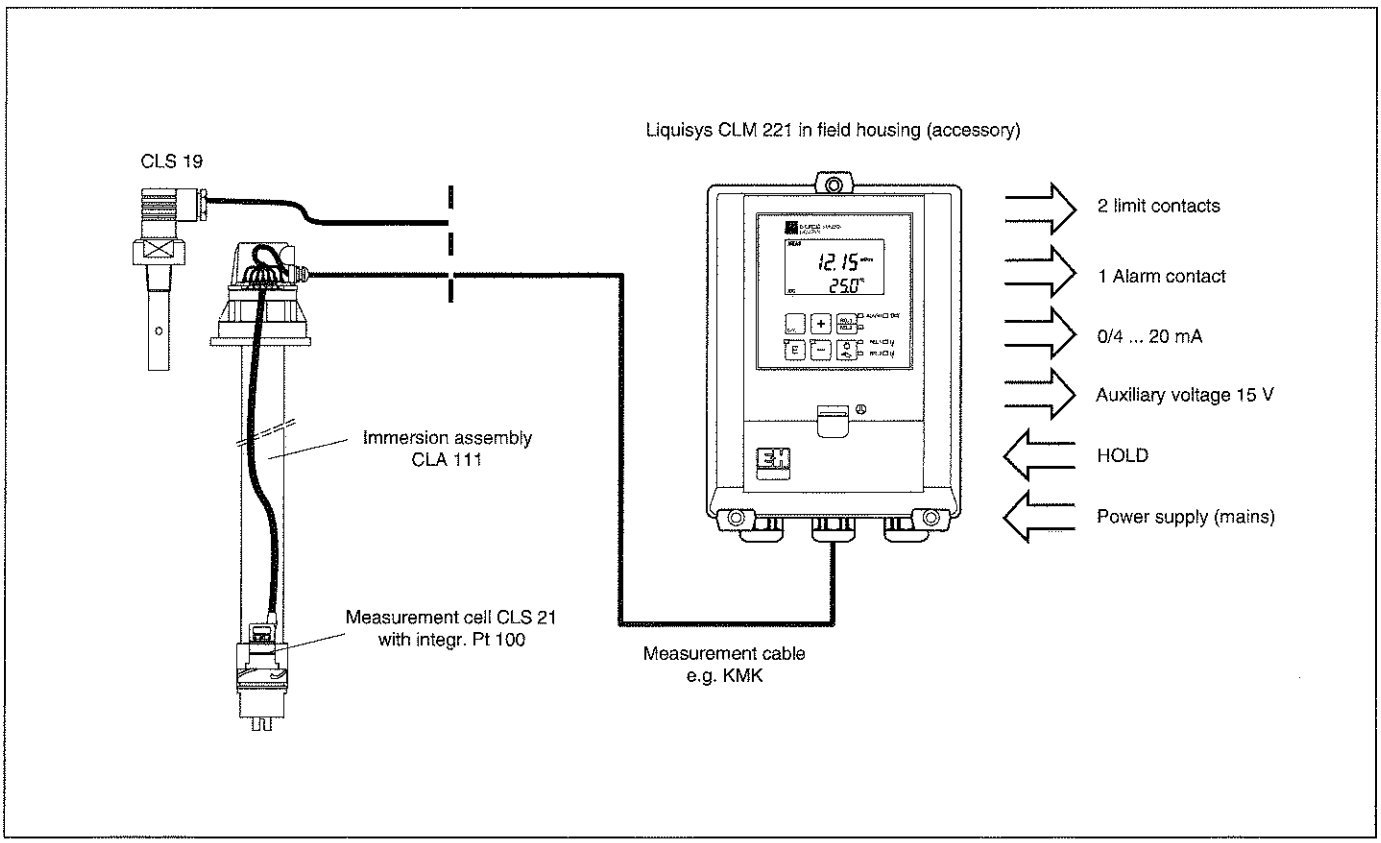
High measurement reliability
All measures have been taken to ensure electromagnetic compatibility for Liquisys.
All requirements for CE certificate are met.
The galvanic isolation of the current output provides additional safety.

Measurement and control system

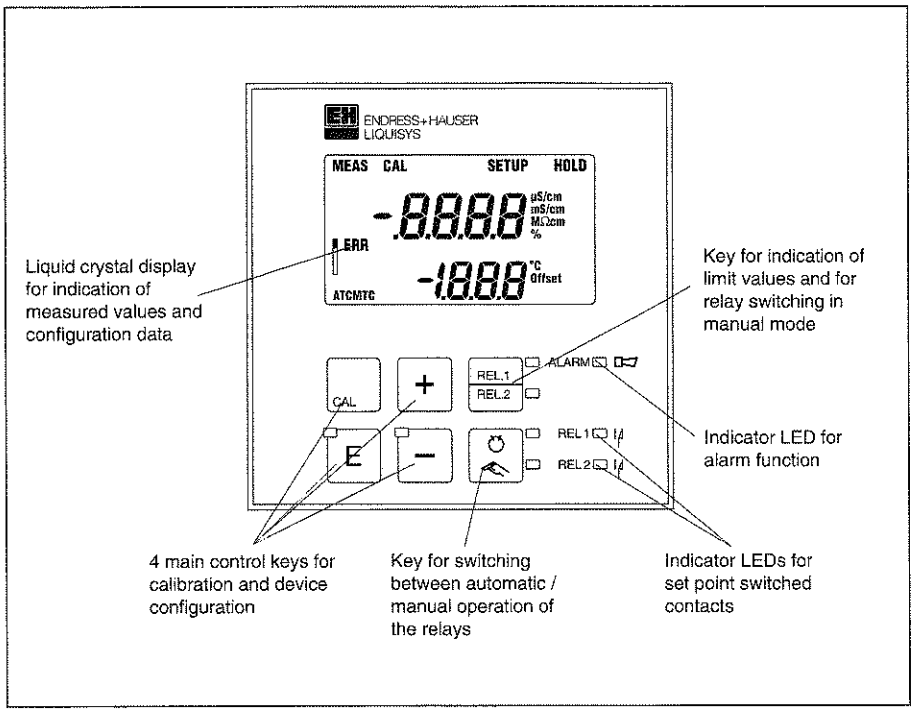
A typical measuring system consists of

- a conductivity measurement cell with or without an integrated temperature sensor Pt 100, built into a pipe, tank or basin,
- an appropriate conductivity measurement cable:
  KMK for measurement cells with Pt 100,
  SMK for measurement cells without Pt 100 und
- the Liquisys CLM 221 as a panel-mounted instrument or in the field housing accessory.

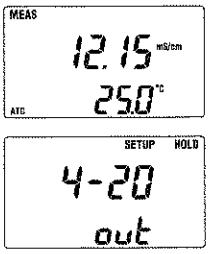
Example for possible measurement systems and system interfaces



Operation



Operating interface:
Display and keys



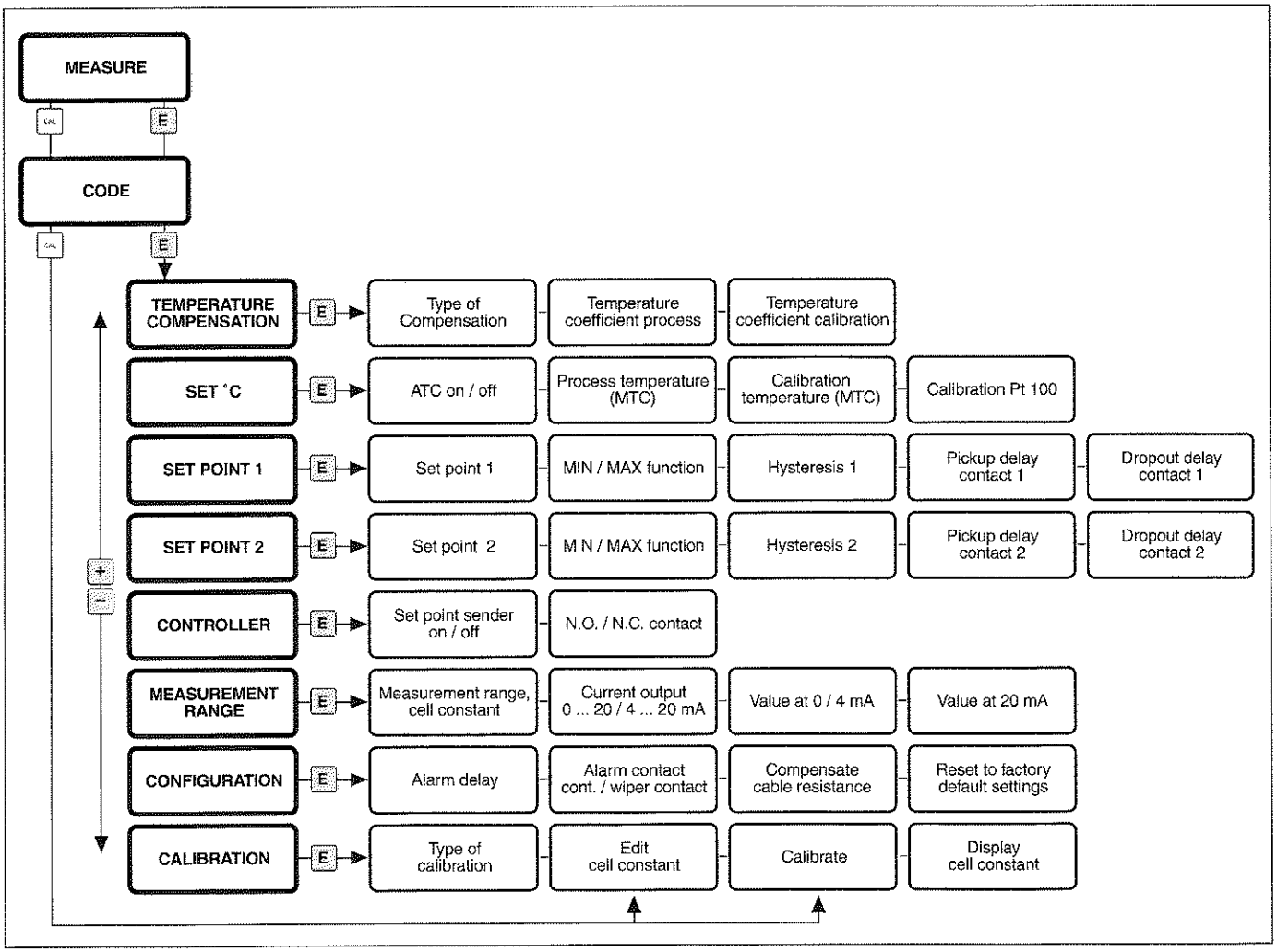
Quick information

The display shows the current measured value and temperature at the same time. All important process data is available at a glance. Brief plain texts displayed in the configuration menu provides guidance in setting the instrument parameters, familiarising users with instrument operation.

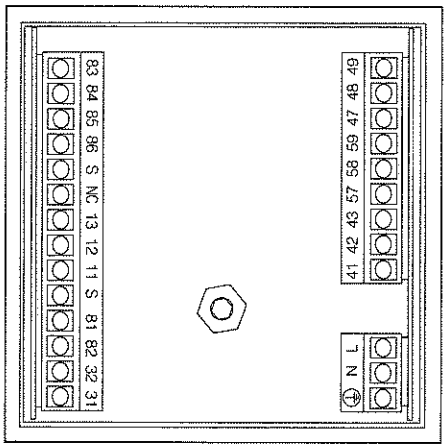
Intelligent and simple

All operating functions of the instrument are clearly arranged in a menu structure. The individual parameters can be easily selected and modified after entering the access code. Calibration is controlled by a single button making it an easy and convenient routine.

Menu structure
Liquisys CLM 221

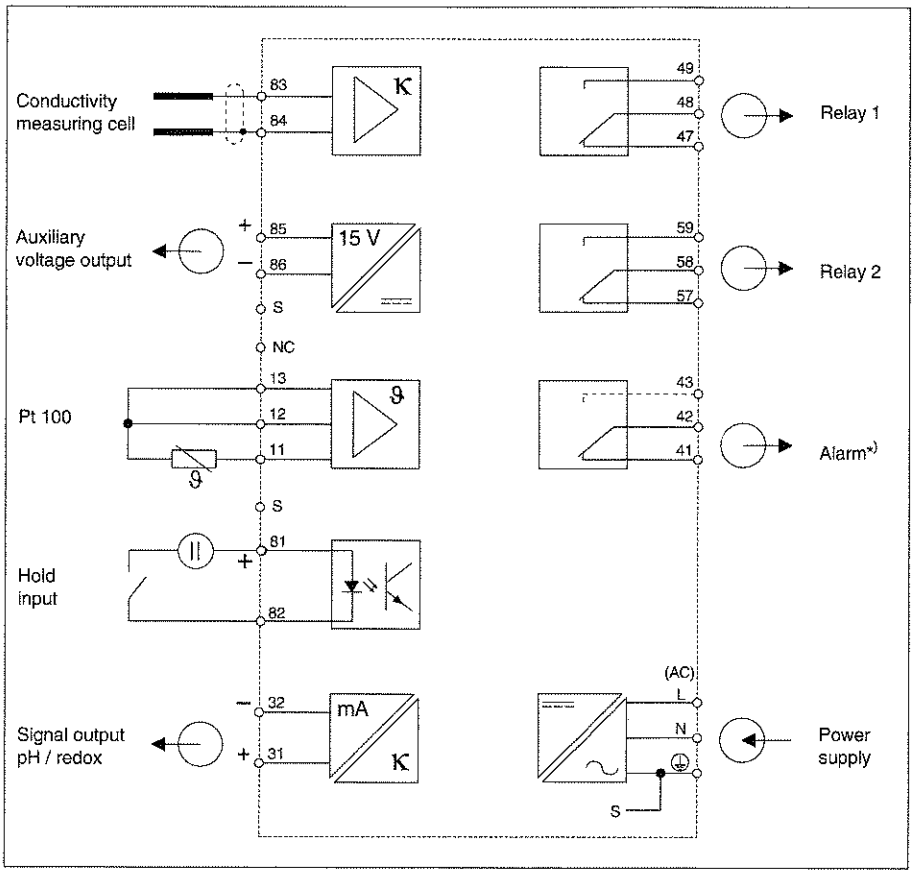


Electrical connection



Liquisys CLM 221
Connections on the rear
of instrument

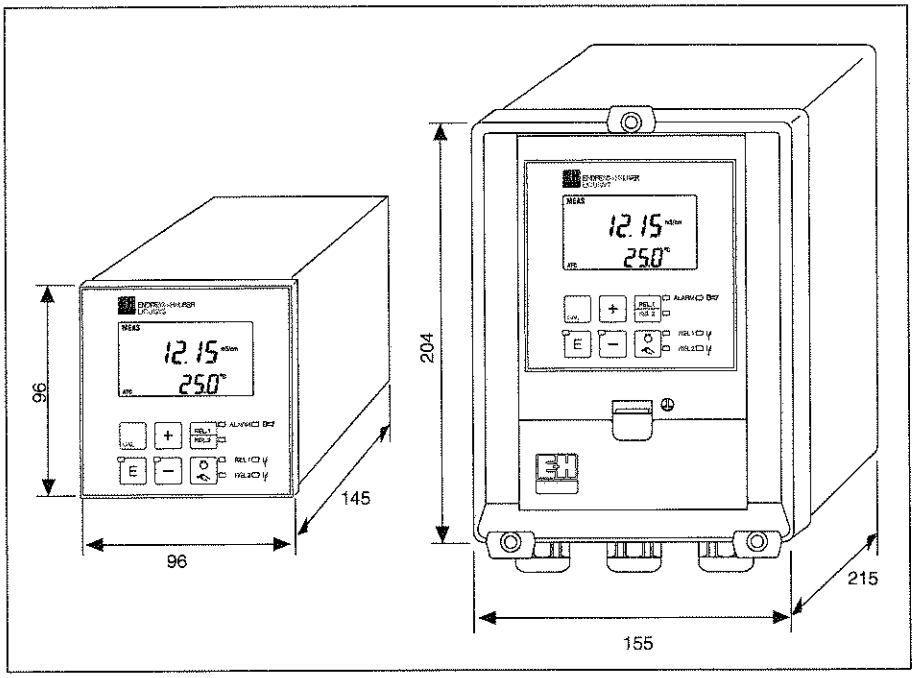
Simple connection
Connecting the device is simple and convenient.
The supplied terminal blocks (3-, 9- and 14-pole) are wired separately and then plugged into the already assembled device.



Connection diagram
Liquisys CLM 221

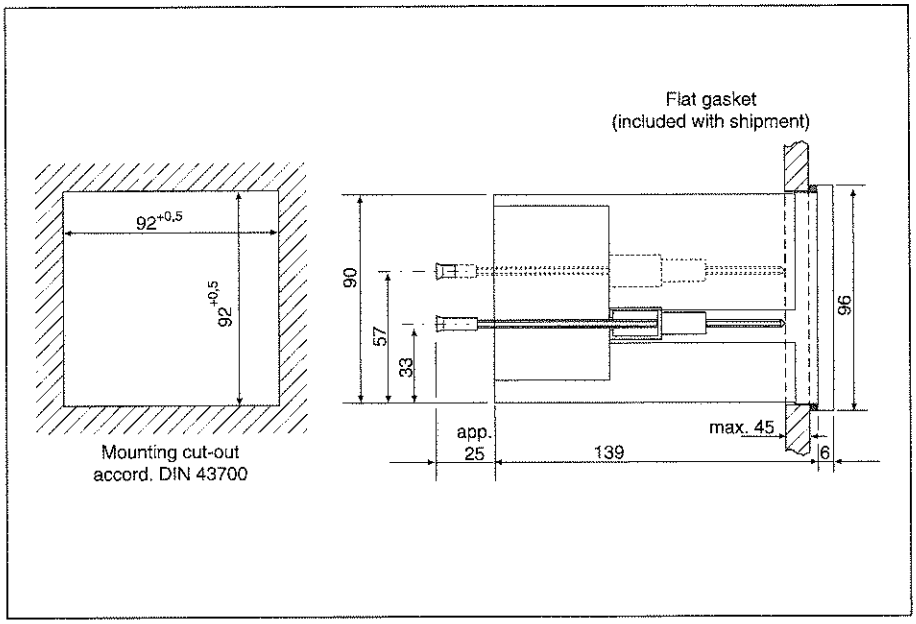
*) indicated contact positions are for currentless or error conditions

Dimensions

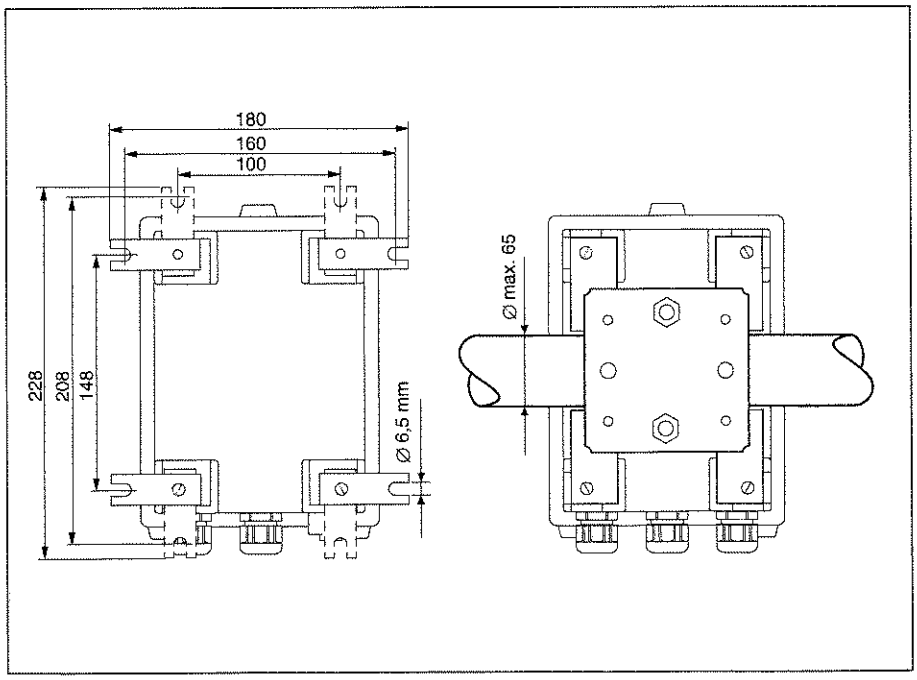


Dimensions
Liquisys CLM 221
in the panel-mounted
housing (left)
and built into the field
housing (right)

Installation



Installing the
control panel housing



Wall mounting (left) and
post mounting (right) of
the field housing
(see accessories)

Technical data

Conductivity measurement

Display and measurement range (MR) (cell constant)

Range 0	0.000 ... 2.000 µS/cm (0,01 cm^{-1})
Range 1	0.00 ... 20.00 µS/cm (0,01 cm^{-1})
Range 2	0.00 ... 20.00 µS/cm (0,1 cm^{-1})
Range 3	0.0 ... 200.0 µS/cm (0,1 cm^{-1})
Range 4	0.0 ... 200.0 µS/cm (1,0 cm^{-1})
Range 5	0 ... 2000 µS/cm (1,0 cm^{-1})
Range 6	0 ... 5000 µS/cm (1,0 cm^{-1})
Range 7	0.00 ... 20.00 mS/cm (1,0 cm^{-1})
Range 8	0.0 ... 200.0 mS/cm (1,0 cm^{-1})
Range 9	0.0 ... 200.0 mS/cm (10 cm^{-1})
Measured value resoution	0.001 µS/cm ... 0.1 mS/cm depending on meas. range
Measurement deviation[1], display	max. 0.5 % of MR final value
Reproducibility[1]	max. 0.2 % of MR final value
Reference temperature	+ 25 °C
Calibration range	80 ... 120 %
Signal output	
Current range	0 / 4 ... 20 mA
Measurement deviation[1]	max. 0.75 % of MR final value
Load	max. 500 Ω
Transmission range	adjustable, Δ20 ... Δ100 % of MR final value

Resistance measurement

Display and measurement range (cell constant)

Range 10	0.10 ... 20.00 MΩ·cm (0.01 cm^{-1})
Range 11	0.010 ... 2.000 MΩ·cm (0.1 cm^{-1})
Measured value resolution (range 10 / 11)	0.01 MΩ·cm / 0.001 MΩ·cm
Measurement deviation[1], display	max. 0.5 % of MR final value
Reproducibility[1]	max. 0.2 % of MR final value
Signal output	
Current range	0 / 4 ... 20 mA
Measurement deviation[1]	max. 0.75 % of MR final value
Load	max. 500 Ω
Transmission range	adjustable, Δ20 ... Δ100 % of MR final value

Temperature measurement

Temperature sensor	Pt 100 (3-wire connection)
Measuring range / ATC range	- 9.9 ... + 125 °C
Measured value resolution	0.1 °C
Measurement deviation[1], display	max. 1.0 % of MR

Limit contactor

Hysteresis	1 ... 10% of MR final value
Pickup / dropout delay	0 ... 2000 s

Alarm function

Function (switchable)	continuous / pulsed contact
Alarm delay	0 ... 2000 s

Electrical data and connections

Voltage supply AC	110 / 230 V AC +10 / –15%
Frequency	48 ... 62 Hz
Current consumption	7.5 VA
Auxiliary voltage output	
Output voltage	15 V ±0.6 V
Output current	max. 10 mA
Contact outputs	potential-free change-over contacts
Switching current	
with ohmic load (cos φ = 1)	max. 5 A
with inductive load (cos φ = 0.4)	max. 3 A
Switching voltage	max. 250 V AC, 30 V DC
Switching power	
with ohmic load (cos φ = 1)	max. 1250 VA AC, 150 W DC
with inductive load (cos φ = 0.4)	max. 500 VA AC, 90 W DC
Isolation voltage, signal output	max. 2500 Veff
Connection terminals	plug-in terminal blocks 3-, 9-, and 14-pole
Conductor cross section	max. 2.5 mm^2
Mains fuse	fine wire fuse, medium 250 V / 1 A

[1] according to DIN IEC 746 part 1, at nominal operating conditions

Technical data

General technical data

Measured value display . LC Display, 2-line, 4- and $3^1/_2$-digits with status symbols
Electromagnetic compatibility
- Emission . . . . . acc. EN 50081-1
- Immunity . . . . . acc. EN 50082-1

Nominal operating conditions
- Ambient temperature . . . . . 0 ... +50 °C
- Relative humidity. . . . . 10 ... 95 %, non-condensing
- Voltage supply AC . . . . . 110 / 230 V AC +10 / –15 %
- Frequency. . . . . 48 ... 62 Hz

Limit operating conditions
- Ambient temperature . . . . . -10 ... + 60 °C

Storage and transport temperature. . . . . -25 ... + 65 °C

Physical data

Dimensions
- Built-in control panel housing (H x W x D) . . . . . 96 x 96 x 145 mm
- Installation depth . . . . . 175 mm
- Field housing (H x W x D). . . . . 204 x 155 x 215 mm

Weight
- Liquisys CLM 221 (control panel housing). . . . . max. 0.7 kg
- Liquisys CLM 221 with field housing . . . . . max. 2.3 kg

Ingress protection
- Liquisys CPM 221 (control panel housing) . . . . . IP 54 (Front), IP 30 (housing)
- Field housing. . . . . IP 65

Materials
- Housing. . . . . polycarbonate
- Front . . . . . polyester, UV-resistant

Subject to modifications.

Accessories

Measuring cells

Type	Description	Areas of application
CLS 19	Universally applicable in pipe or flow vessels, low space requirements, Protection class: IP 65, Process connection: $^1/_2$" NPT	Condensation monitoring
		Monitoring of reverse osmosis and ion exchanger systems
CLS 21	High chemical, thermal and mechanical resistance, easy installation in pipe or flow vessels, Protection class: IP 65, Process connections: G 1", DN 25 and DN 40 pipe connection	Service water
		Boiler water

Cables

Type	Description	Order number
KMK	Special measurement cable for connecting conductivity measurement cells **with Pt 100**	50001419
SMK	Special measurement cable for connecting conductivity measurement cells **without Pt 100**	50000598

Immersion assembly

Type	Description	Fields of appl.
Dipsys CLA 111	Immersion assembly with flange DN 100, bayonet mounting for quick installation and removal of the electrodes, integration of the electrode cleaning Chemoclean possible without modification.	Open basins and tanks
		Flow channels

Accessories

Field housing

Type	Description	Order number
Field housing	For installing the CPM/CLM 221, Dimensions (H x W x D): 204 x 155 x 215 mm Protection class IP 65, wall and post mounting	50054413
Weather protection cover VH 3	For mounting on the field housing, Dimensions (H x W x D): 245 x 200 x 310 mm Material: plastic	50003254
Post mounting kit	Retrofit kit for mounting the field housing on horizontal or vertical pipes (Ø max. 65 mm) Material: steel, galvanised	50003244

How to order

Conductivity and resistance measurement transmitter

Type

221 Built-in control panel device, 96 x 96 x 145 mm, protection class IP 54 (front),
Signal output 0/4 ... 20 mA, HOLD input
2 control contacts, 1 alarm contact

Measurement range

CD Measurement range 0.0 µS/cm ... 200.0 mS/cm
Measurement of the specific **conductivity**
with 2 electrode measurement cells

MM Measurement range 0.00 ... 20.00 MΩcm
Measurement of the specific **resistance**
with two electrode measurement cells

YY Special version

Power supply

0 230 V, 50 / 60 Hz
1 115 V, 50 / 60 Hz
2 200 V, 50 / 60 Hz
3 24 V, 50 / 60 Hz
5 100 V, 50 / 60 Hz
9 Special version

Additional features

10 Base version
20 Moisture protection lacquering
99 Special version

CLM 221 - [ ][ ][ ] ⇐ **complete order code**

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