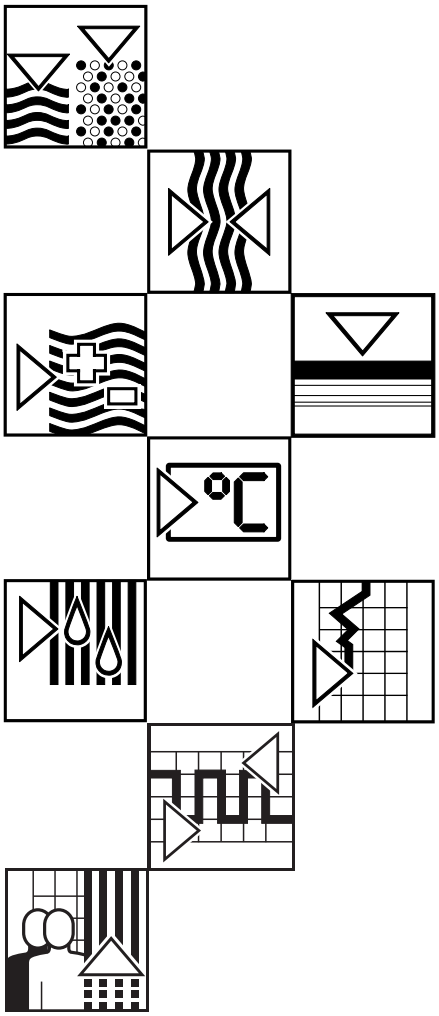
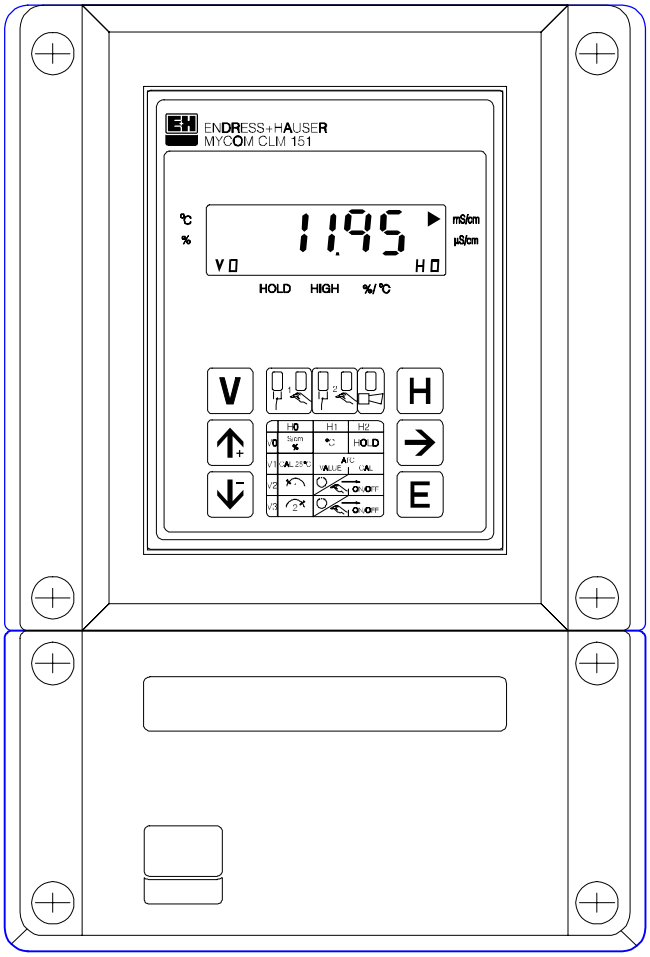
BA 105C/07/en/04.97
No. 50063022
Software version 6.00 or later (CD)
4.00 or later (MM)

mycom
CLM 121 / 151 - CD/MM Transmitter/Controller for Conductivity and Temperature

Operating Instructions





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Endress+Hauser

ISO 9001

Endress+Hauser
Nothing beats know-how

Table of contents

1. General

These operating instructions describe the fully extended conductivity measuring transmitters Mycom CLM 121-CD/MM and CLM 151-CD/MM

Note:

For an instrument with digital interface the separate operating instructions BA 090C "Mycom instrument family serial interface" (order no. 50059856) are required.

1.1 Conformity statement

The Mycom CLM 121 / 151 - CD/MM has been developed and manufactured in accordance with current European standards and directives.

Note:

A conformity statement can be obtained from Endress+Hauser.

1.2 Intended application

Mycom CLM 121 / 151 are microprocessor-based measuring and control instruments used to determine the conductivity value.

Their state-of-the-art engineering allows the instruments to adapt easily to all conductivity measuring tasks.

Typical areas of application are:

- Water treatment
- Effluent treatment
- Sewage treatment plants
- Chemical industry
- Pharmaceutical industry
- Food industry

1.3 General safety instructions

Warning:

Operating this instrument in any way other than described in these instructions may compromise the safety and function of the measuring system and is therefore not allowed.

Installation, start-up, operation

The Mycom CLM 121 / 151 - CD/MM has been designed and manufactured for safe operation according to the state of the art in engineering and conforms to the relevant regulations and EC directives (see „Technical data“). However, if used improperly or other than for the intended purpose, it may be hazardous, e.g. due to improper connection.

Installation, electrical connection, start-up, operation and maintenance of the measuring system must therefore be performed exclusively by trained specialist personnel properly authorised by the system operator for such work. The specialist personnel must be familiar with these operating instructions and must adhere to the instructions contained therein.

1.4 Order code

Mycom CLM 121 / 151

Types
121 Panel-mounted housing, 96 x 96 mm, ingress protection IP 54 (front)
151 Field-mounted housing, 247 x 167 x 111 mm, ingress protection IP 65

Versions
1 With alarm contact
2 With alarm contact and 1 limit contact
3 With alarm contact and 2 limit contacts
9 Special version

Instrument variants
CD Measurement of specific conductivity,
for connection to 2-electrode measuring cells;
measuring ranges freely programmable
MM Measurement of specific resistance,
for connection to measuring cells with cell constant of 0.01 cm^{-1};
Selectable measuring ranges 0 ... 1 µS/cm and 0 ... 20 MΩ × cm
ID Measurement of specific conductivity,
for connection to inductive measuring cells CLS 51;
measuring ranges freely programmable
YY Special version

Power supply
0 230 V, 50 / 60 Hz
1 110 V, 50 / 60 Hz
2 200 V, 50 / 60 Hz
3 24 V, 50 / 60 Hz
4 48 V, 50 / 60 Hz
5 100 V, 50 / 60 Hz
6 127 V, 50 / 60 Hz
7 240 V, 50 / 60 Hz
8 24 V DC

Current output
0 0 / 4 ... 20 mA output for conductivity
1 two 0 / 4 ... 20 mA outputs for conductivity and temperature
3 0 / 4 ... 20 mA output for conductivity with additional RS 232-C interface
4 0 / 4 ... 20 mA output for conductivity with additional RS 485 interface (variant MM only)
6 0 / 4 ... 20 mA output for conductivity with additional RS 485 interface / Rackbus (variants CD and ID only)
9 Special version

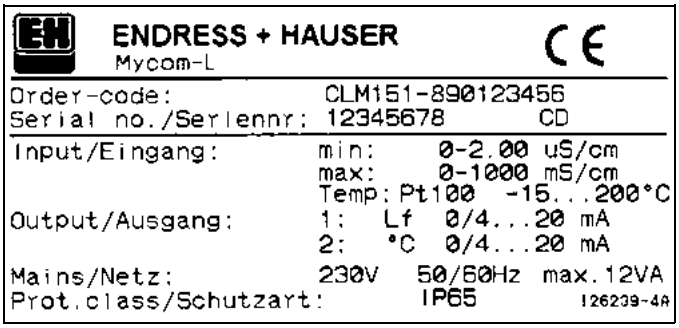


Fig. 1.1: Nameplate

1.5 Unpacking

- Verify that the contents are undamaged! Inform the post office or forwarding agent as well as the supplier of any damage.
- Check that the delivery is complete and agrees with the shipping documents as well as the unit type and version matches the nameplate (see fig. 1.1).

The scope of supply for Mycom CLM 121 (panel-mounted instrument) includes:
- 2 housing mounting kits (order no. 50047795)
- 1 submin D connector (only for instruments with digital interface; order no. 50051998)
- Simulating resistor 3.3 Ω (order no. 50061325)
- Operating instruction(s)
- Instrument identification card(s)
- Simulator for line balancing

The scope of supply for Mycom CLM 151 includes:
- 1 housing mounting kit (order no. 50061357)
- 1 measuring point marking tag (order no. 50061359)
- Operating instruction(s)
- Instrument identification card(s)
- Simulator for line balancing

If you have any questions, consult your supplier or the Endress+Hauser sales agency in your area (see back page of these operating instructions for addresses).

2. Measuring system

The measuring system consists of:

- a 2-electrode conductivity measuring cell, e.g. CLS 12, to be installed into pipe, tank or vessel
- the appropriate conductivity measuring cable, type KMK, SMK or CYK 7
- alternatively
  – the conductivity transmitter Mycom CLM 121 in panel-mounted housing
  – the conductivity transmitter Mycom CLM 151 in field housing

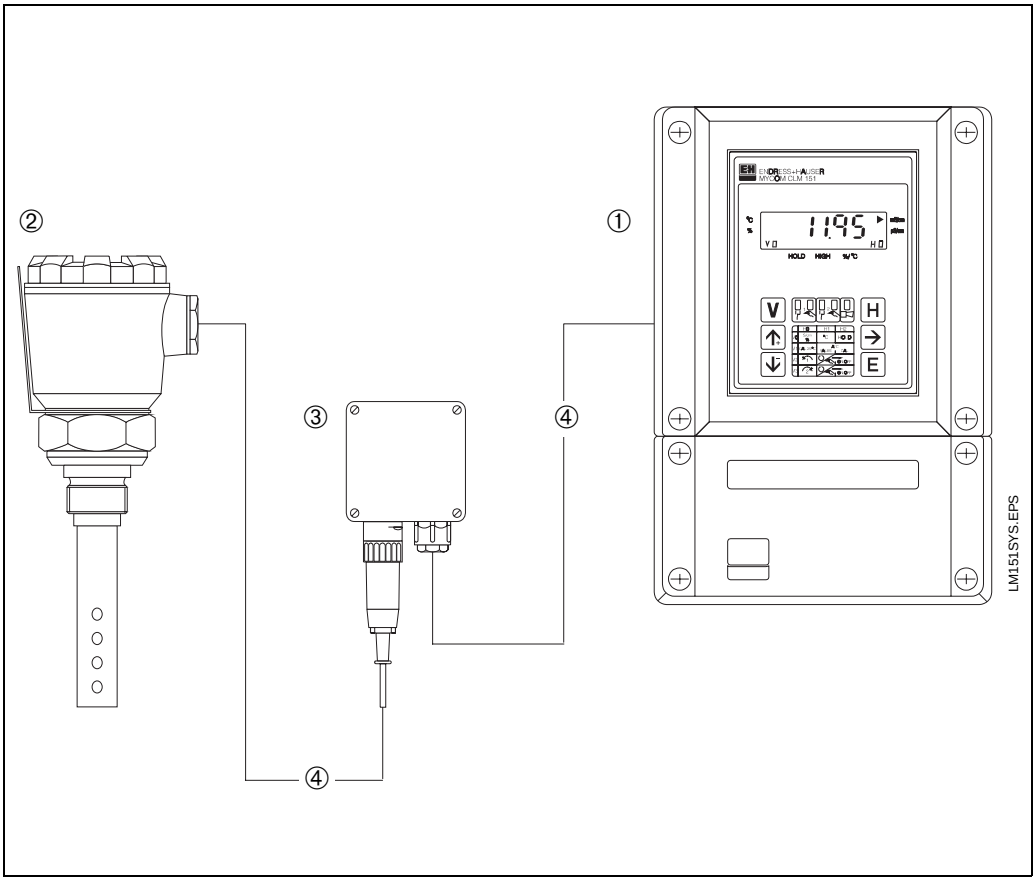


Fig. 2.1: Example of a complete measuring system with:

① Conductivity transmitter Mycom CLM 151
② 2-electrode conductivity-measuring cell. CLS 12 with Pg 16 cable gland
③ Junction box VS (option) with Pg 13.5 - cable gland and SXP-plug, for plug-in connection between Mycom and measuring cell CLS 12
④ Conductivity measuring cable, e.g. SMK or KMK

3. Installation

3.1 Unit dimensions

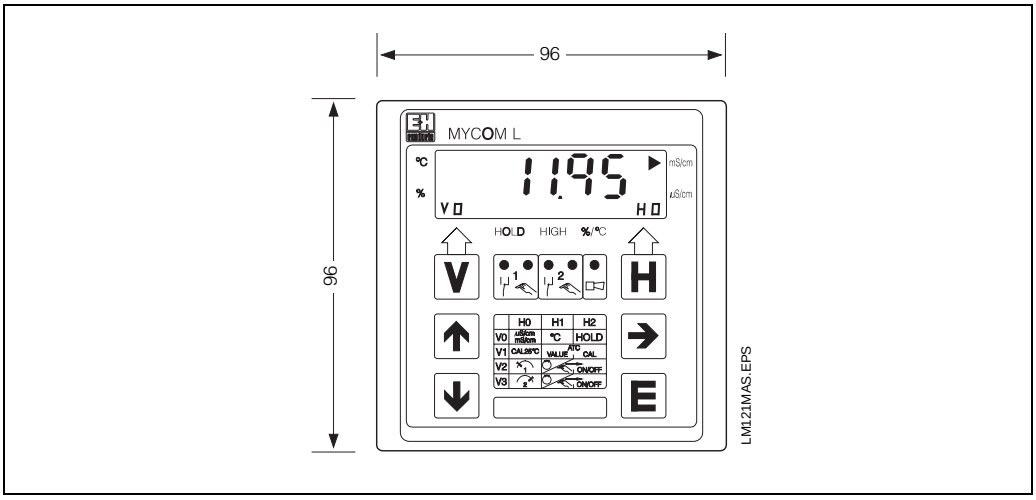


Fig. 3.1: Dimensions of Mycom CLM 121

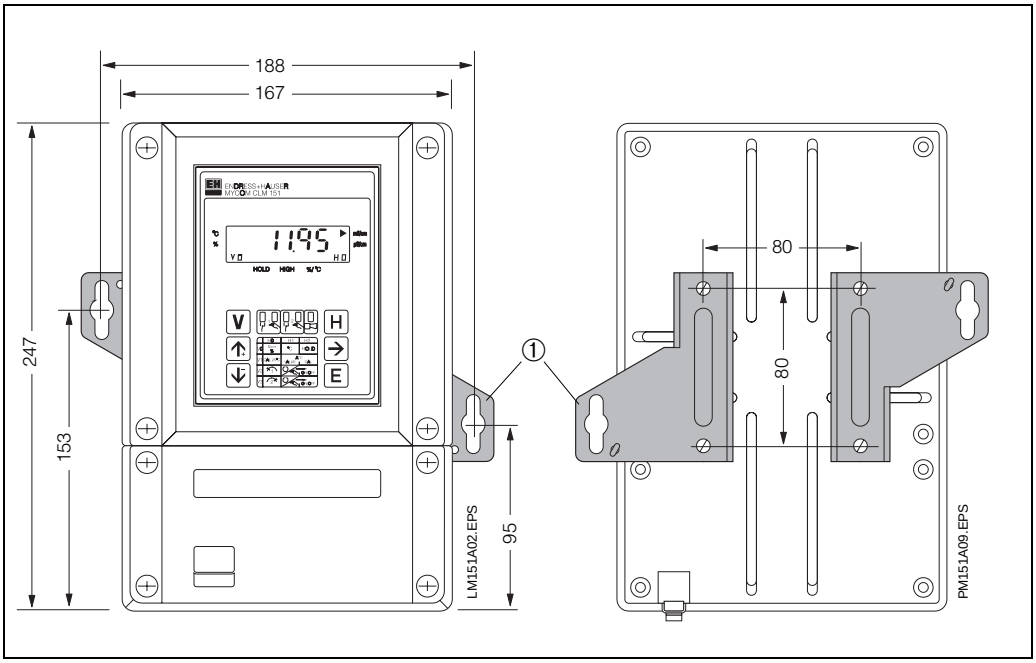


Fig. 3.2: (left) Dimensions of Mycom CLM 151

① Mounting brackets for wall mounting

Fig. 3.3: (right) Rear of field housing with installed mounting brackets

Note:
Mounting brackets and screws are included in the scope of supply as housing mounting kit.

3.2 Types of mounting

3.2.1 Panel mounting of Mycom CLM 121

The required cutout according to DIN 43 700 is $92^{+0,5}$ x $92^{+0,5}$ mm.
The instrument is mounted by means of the supplied housing mounting kit.

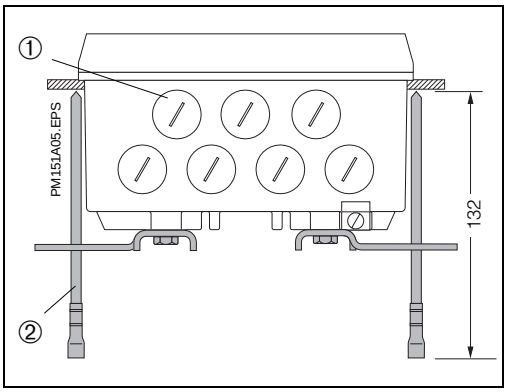


Fig. 3.4: Bottom of field housing with straining screws installed for panel mounting

① Screw plugs for Pg 13,5
② Straining screws

3.2.2 Panel mounting of Mycom CLM 151

The instrument is mounted by means of the supplied housing mounting kit (see fig. 3.4). The sealing of the panel cutout requires a flat packing (see chapter 9.1).

Panel mounting requires a cutout of $161^{+0,5}$ x $241^{+0,5}$ mm (W x H).

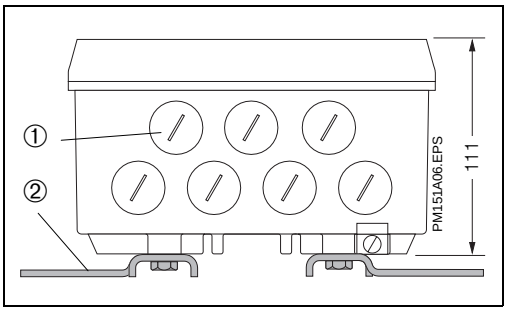


Fig. 3.5: Bottom of field housing with brackets installed for wall mounting

① Screw plugs for Pg 13.5
② Mounting brackets

3.2.3 Wall mounting of Mycom CLM 151

Install mounting brackets on rear of unit according to fig. 3.3.

For housing and mounting dimensions of the field housing see figures 3.2 and 3.5.

3.2.4 Post mounting

The field housing Mycom CLM 151 can be mounted on vertical or horizontal tubing with max. diameter of 70 mm by means of the supplied housing mounting kit.

The parts of the housing mounting kit have to be installed at the rear of the unit in accordance with fig. 3.6 and 3.7.

For further accessories available for Mycom CLM 151 please refer to chapter 9.1.

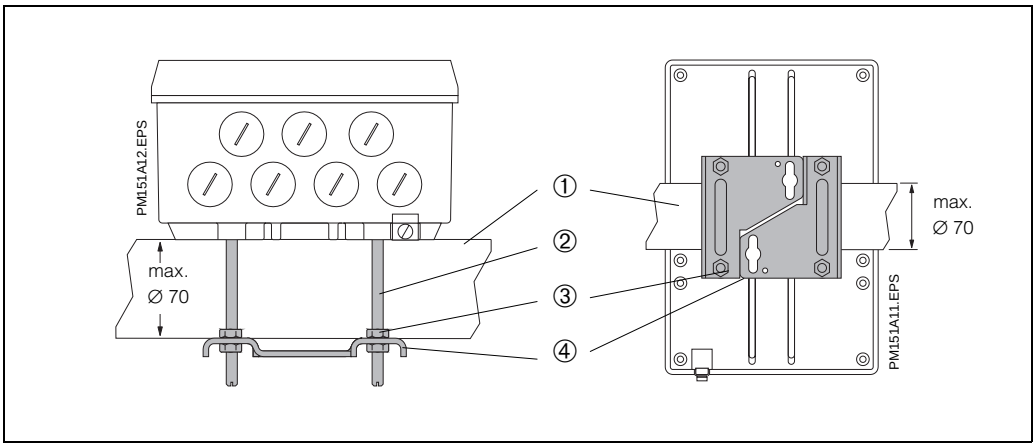


Fig. 3.6: Installation of field housing on horizontal tubing

left: bottom side
right: rear side

① Horizontal tubing
② Threaded rods M6 x 92
③ Mounting screw M6
④ Mounting brackets

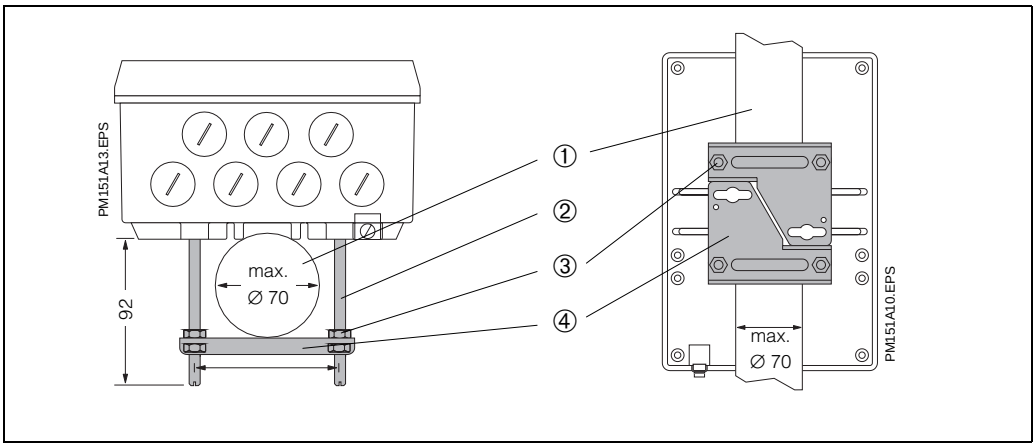


Fig. 3.7: Installation of fied housing on vertical tubing

left: bottom side
right: rear side

① Vertical tubing
② Threaded rods M6 x 92
③ Mounting screws M6
④ Mounting brackets

Warning:

Field mounting

Do not expose the front of the device to direct sunlight.
In this case use the weather protection cover
(see chapter 3.3.1).

3.3 Accessories for installation

3.3.1 Weather protection cover CYY 101

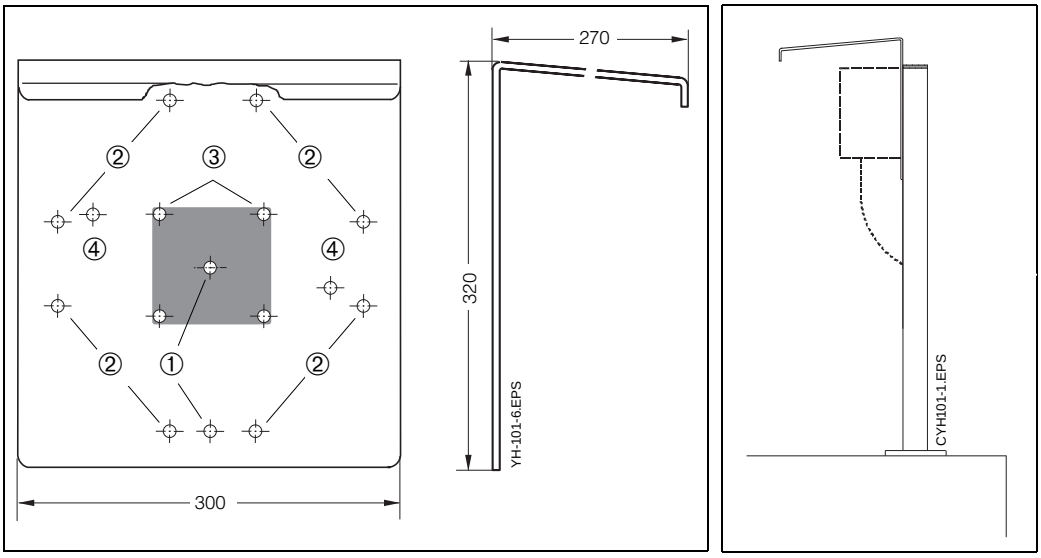


Fig. 3.8: (left) Weather protection cover CYY 101 with dimensions and mounting positions for

① Installation on upright post with 2 screws M8
② Installation on vertical or horizontal pipe with 2 round post mounts
③ Installation of conductivity transmitter Mycom CLM 151
④ Wall mounting of conductivity transmitter Mycom CLM 151

Fig. 3.9 (right) Weather protection cover CYY 101 with Mycom CLM 151 mounted on upright post

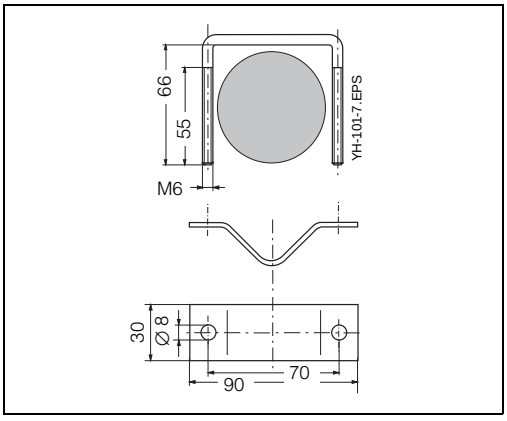


Fig. 3.10: Post mounting kit for weather protection cover CYY 101, if not mounted to assembly holder CYH 101

The weather protection cover CYY 101 can be installed directly on upright post of assembly holder CYH 101 by means of 2 screws (M8), see fig. 3.7, mounting position ① .

Installation on vertical or horizontal tubing and upright posts (max. diameter 70 mm) requires an additional round post mounting kit (see chapter 9.1).

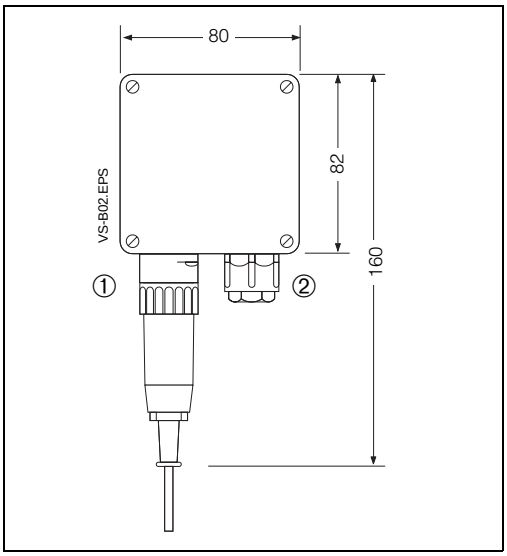


Fig. 3.11: Junction box VS for connection of signal line of 2-electrode conductivity measuring cell with the transmitter

① SXP plug
② Pg 13.5 cable gland

3.3.2 Junction box VS

The installation of junction box VS with plug-in socket is required to connect the signal line of the 2-electrode conductivity measuring cell, e.g. CLS 12 with the transmitter Mycom CLM 151.

The junction box VS has a 7-pole plug (type SXP) for connection of measuring cell to VS junction box.

Ingress protection of junction box VS is IP 65.

4. Electrical connection

4.1 Connection principles

Warning:

- The instrument must be grounded before start-up!
- A mains disconnecting device must be installed close to the instrument and identified as a mains disconnecting device for the CLM 121 / 151-CD/MM (see EN 61010-1).
- If malfunctions can not be remedied, the instrument must be removed from service and secured to prevent accidental start-up.
- Repair work can only be carried out directly by the manufacturer or by the Endress+Hauser service organization.

Caution:

- All lines conducting signals are to be shielded and run separately from other control lines.
- Immunity to interference can only be guaranteed for a properly grounded instrument with a screened measured value output line.
  The grounding of the screen must be kept short. No soldered extensions of the screen!
  This is also valid for connection of junction box VS (see chapter 3.3.2).
- For installation of field housing (CLM 151) the post must be grounded. To increase the immunity to interference cables should be run inside the post.

Note:

- This instrument has been built and tested in accordance with EN 61010-1 and left the manufacturer's works in perfect condition concerning safety regulations.
- Malfunctions of the instrument can be remedied by means of the error list in chapter 7.3 without intervention in the instrument.
- Alterations to the instrument are not allowed and make any guarantee claim invalid.
- After installing and connecting the instrument and sensors the whole measuring system has to be checked for function.

4.2 Connection CLM 121 / 151

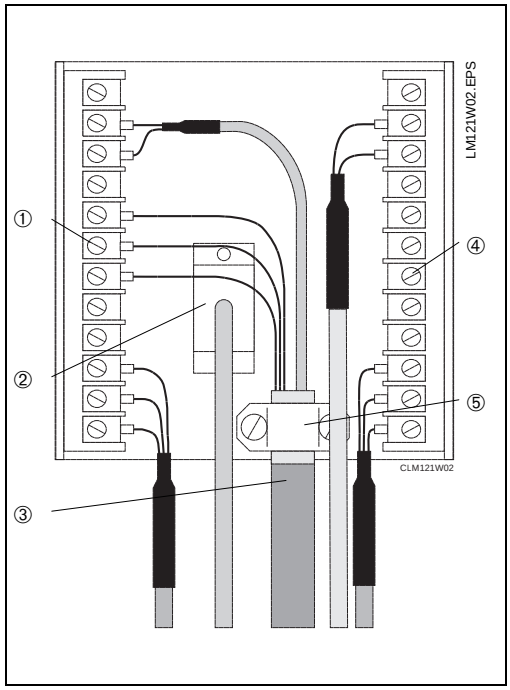


Fig. 4.1: Mycom CLM 121
Rear of unit with connections

① Terminal strip for transmitter and signal lines
② Terminal strip for output 2 or submin D connector (with digital interface)
③ Conductivity measuring cable SMK or KMK
④ Terminal strip for mains connection and switching contacts
⑤ Strain relief clamp for SMK or KMK and additional screen connection for outer measuring cable screen (remove outer insulation below the clamp!)

Note:
The strain relief clamp is directly connected with the grounded wire.

The electrical connections to the instrument for all transmitter and signal lines as well as mains connection and switching contacts are established as follows:

- Mycom CLM 121
  via the removable terminal strips on the rear of the instrument (fig. 4.1)

- Mycom CLM 151
  in the separate terminal connection compartment (fig. 4.2).

  – Replace the screw plugs at the bottom of the instrument with the corresponding number of Pg cable glands.
  – Introduce the connecting cables through the Pg cable glands (see fig. 4.2).
  – Connect the instrument according to the connection diagram (see fig. 4.3). Signal cables must be spatially separated from mains and power cables!
  – Tighten the cable glands.
  – Install cover of separate terminal connection compartment and tighten cover screws.

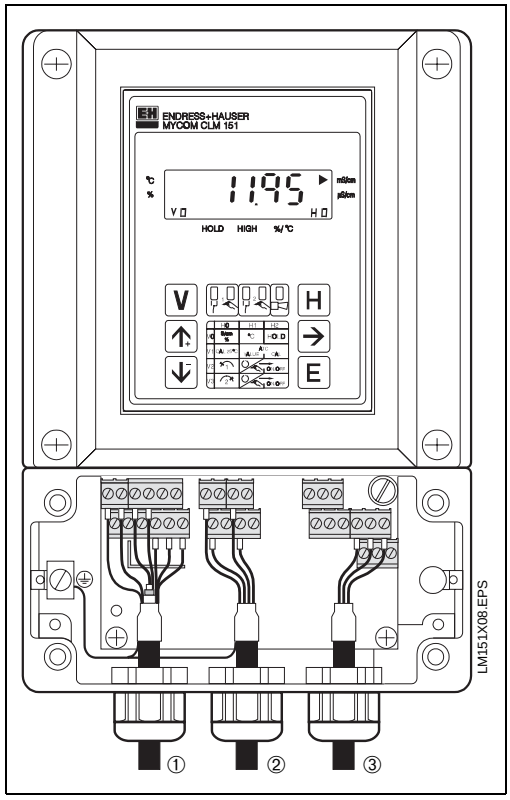


Fig. 4.2: Mycom CLM 151
with instrument connections in separate terminal connection compartment

① Input: Conductivity value
② Outputs: Conductivity, temperature or interface
③ Power supply

Terminals for Mycom CLM 121 / 151	
Cross section:	4.0 mm^2
Optionally connectable:	1 wire with 2.5 mm^2 1 wire with 4.0 mm^2 2 litz wires 1.5 mm^2 each and end sleeves 1 litz wire with 2.5 mm^2 and end sleeve
Terminal designation:	acc. to DIN 45140

BE2LM151.CHP

4.3 Connection diagram

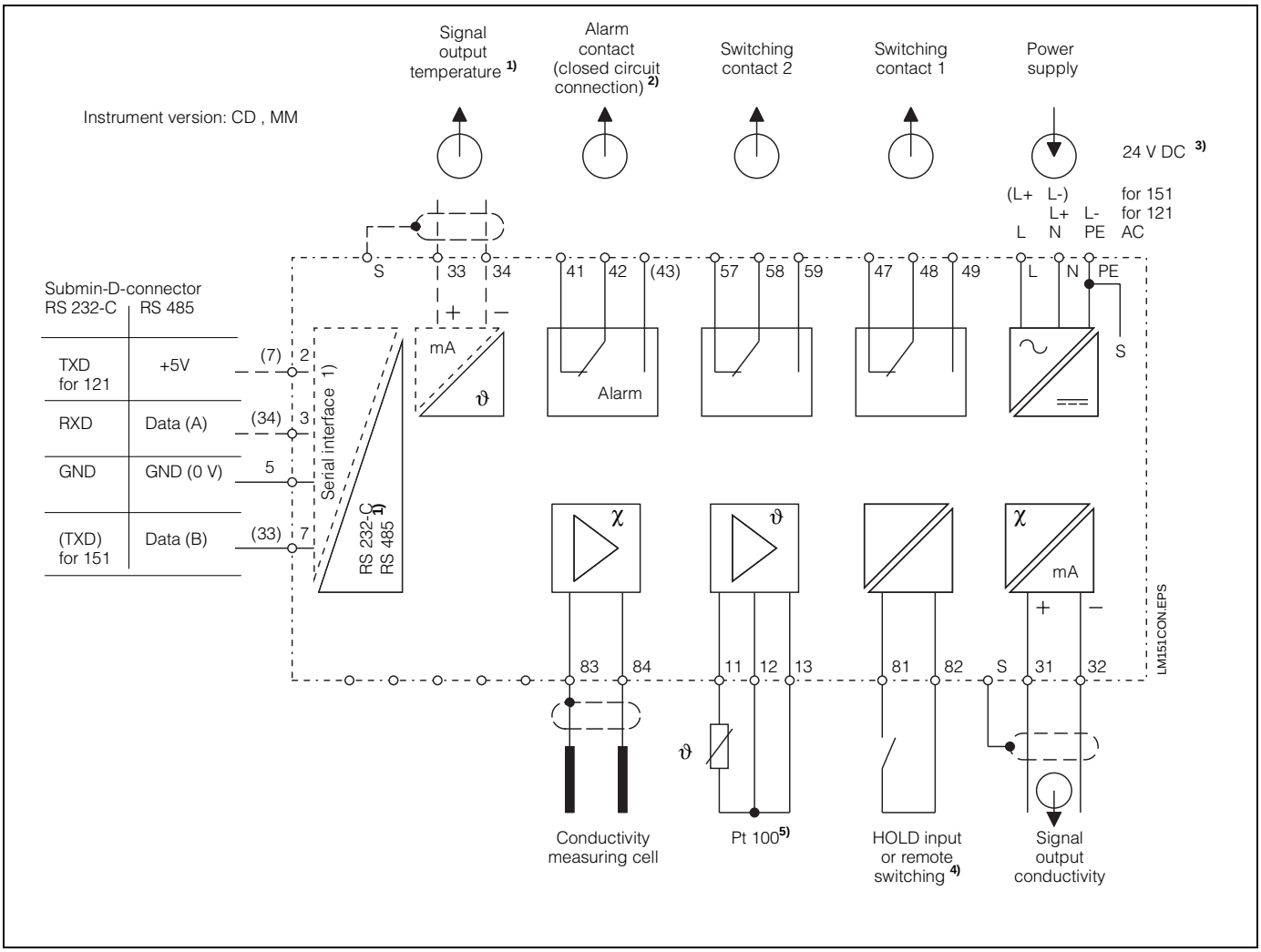


Fig. 4.3: Electrical connection Mycom CLM 121 / 151

Caution:

- The connection diagram shows the fully extended unit!
- Terminal descriptions in brackets are only valid for Mycom CLM 151!

1) Instrument version optionally with temperature signal output or serial digital interface (connection diagram 33 and 34) according to order code (see chapter 1.3).

2) Above described contacts: without current or in case of error

All switching contacts are interference-suppressed by varistors. When required, connected external loads have to be additionally interference-suppressed.

3) 24 V DC: floating or minus pole grounded.

4) In case more than one instrument of the Mycom series are used, every Hold input requires its own potential free contact.

5) In case the substitute resistor is used (for measuring cells without temperature sensor) the temperature coefficient in field V1 / H1 has to be set to 0.0.

4.4 Measuring cable connection

The recommended conductivity measuring cables are:

- CPK 1 (SMK)
  for conductivity measuring cells without Pt 100
- KMK or CYK 7
  for conducitivity measuring cells with Pt 100

The table in chapter 5.5 shows the maximum permitted line lengths depending on the measuring range setting.
In the high conductivity ranges, the maximum permitted line length is determined by cable resistance. In the other ranges it is limited to 100 m to avoid excessive interference.

Caution:

Perform line adjustment!
(matrix field V1 / H8 ; chapter 6.4.1)

Compensation of measuring cable resistance for measurement is only possible after performing line adjustment.

The maximum cable resistance which can be compensated depends on the measuring range. Max. cable lengths see table in chapter 5.5.

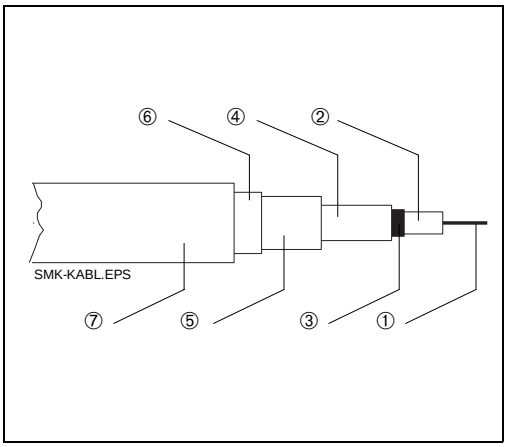


Fig. 4.4: Construction of CPK 1 cable (SMK)

① Inner conductor (measuring signal)
② Inner insulation
③ Black semiconductor layer
Warning:
Must be stripped to inner screen when connecting cables!
④ Inner screen (alternating measuring voltage)
⑤ 2nd insulation
⑥ Outer screen (PE)
⑦ Outer insulation

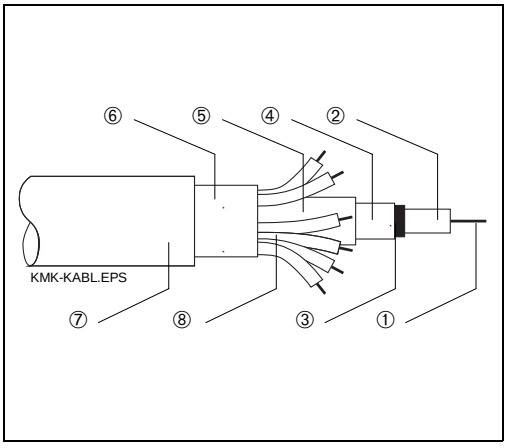


Fig. 4.5: Construction of KMK cable

① Inner conductor (measuring signal)
② Inner insulation
③ Black semiconductor layer
Warning:
Must be stripped to inner screen when connecting cables!
④ Inner screen (alternating measuring voltage)
⑤ 2nd insulation
⑥ Outer screen (PE)
⑦ Outer insulation
⑧ Auxiliary wires Pt100

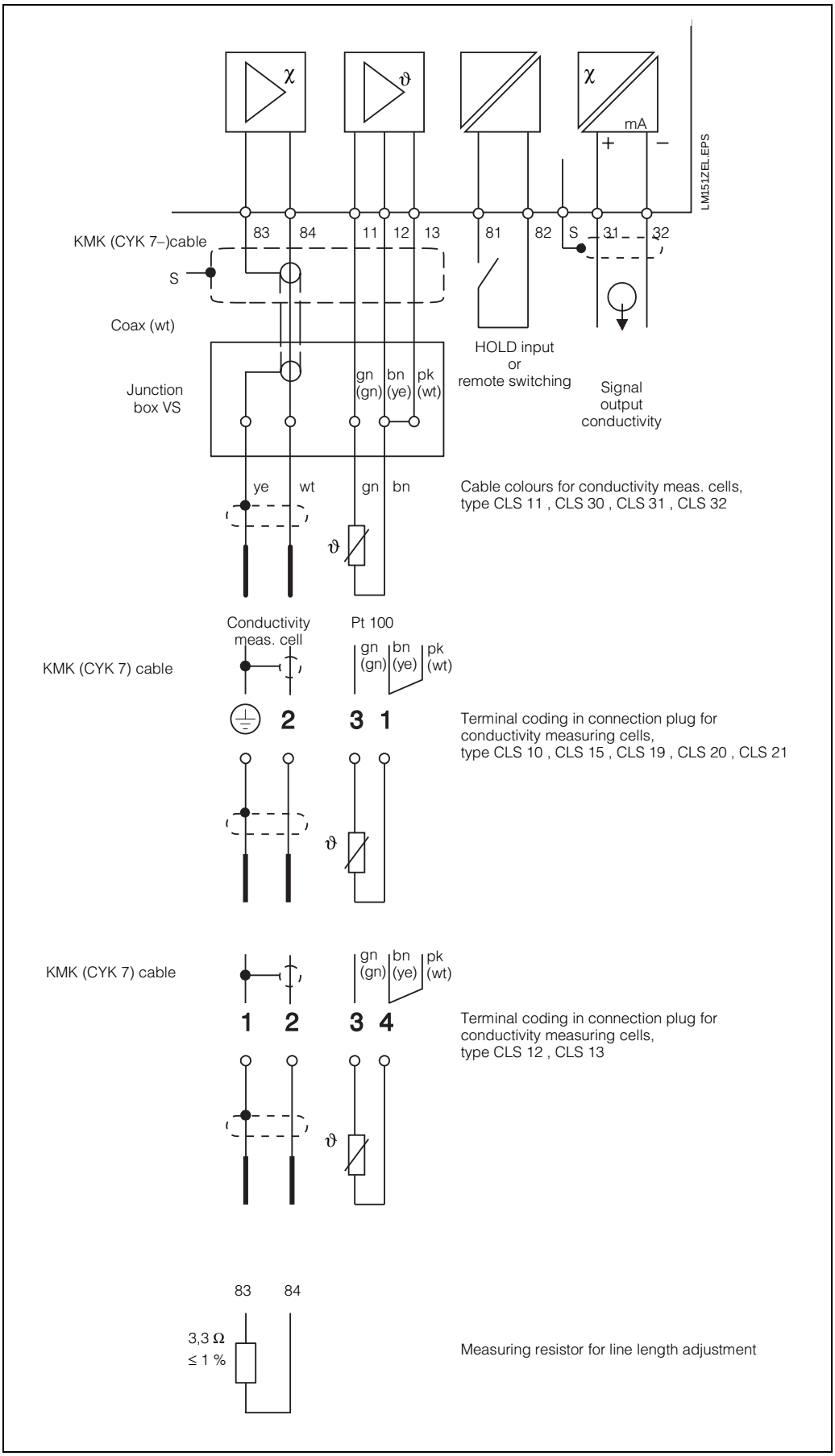


Fig. 4.6: Connection of 2-electrode conductivity measuring cells to Mycom CLM 121 / 151

5. Start-up

5.1 Power-up

Warning:

Before switching on the instrument, make sure that the supply voltage matches the voltage indicated on the nameplate (see fig. 1.1).

Caution:

- The conductivity measuring cell should be located in the medium to be measured.
- After power-up, all LCD segments of the display are shortly activated (approx. 2 s) and all LED's show red.
  Then the unit starts measuring.
  The operating and start-up levels are locked.

5.2 Power failure handling

- At a power failure of max. 20 ms the measuring operation is not interrupted.
- At a power failure of more than 20 ms the measuring operation is interrupted, but the values entered for the parameters are retained.
- When the operating voltage returns, the instrument resumes measuring operation as described in chapter 5.1.

5.3 Minimum settings

The possible inputs for all matrix fields are shown in the operating matrix (see chapter 6.3).

For a detailed functional description of the single matrix fields refer to chapter 6.6. Factory-set parameters are listed in the same chapter.

The initial start-up of the measuring system requires the following minimum settings:

Field	Function
Unlock the start-up level (see chapter 6.2)	
For measurement and calibration	
V1 / H5	Select measuring range (see chapter 5.4)
V1 / H8	Line resistance adjustment (see chapter 6.4.1)
For limit value function and alarm	
V2 / H0 V3 / H0	Adjust setpoints
V2 / H5 V3 / H5	Limit value funciton Set MIN or MAX
V7 / H3	Alarm allocation
V7 / H1	Alarm delay

5.4 Measuring range selection

(Matrix field V1 / H5)

5.4.1 Instrument type with measuring range version CD

Enter the measuring range number (MR no.) to select one of the measuring ranges listed in the table.

The measuring range / cell constant / measuring frequency allocation is fixed and automatically set by the instrument.

The cell constant value of the selected measuring range has to match the cell constant of the measuring cell being used, otherwise incorrect measurement will result!

The external input (terminal 81, 82) is effective as hold input for measuring ranges 0 to 9.
Refer to chapter 6.3 "Operating matrix" and chapter 6.6 "Description of operating functions" for further details.

The external input is effective as remote switching input (RS) for measuring ranges 10 to 15.

Remote or substance switching		
RS input (term. 81 / 82)	**Range**	**Status arrow display**
open	HIGH	points to HIGH
closed	LOW	–

The concentration ranges L and H are freely selectable according to table in chapter 5.6.

MR No.	Range	Measuring range	Cell constant	Frequency	RS / HOLD
0		0 … 2 µS / cm	0.01	300 Hz	HOLD
1		0 … 20 µS / cm	0.01	300 Hz	
2		0 … 200 µS / cm	0.1	300 Hz	
3		0 … 2000 µS / cm	1	1 kHz	
4		0 … 20 mS / cm	1	1 kHz	
5		0 … 20 mS / cm	0.1	5 kHz	
6		0 … 200 mS / cm	1	5 kHz	
7		0 … 200 mS / cm	10	5 kHz	
8		0 … 500 mS / cm	25	5 kHz	
9		0 … 1000 mS / cm	50	5 kHz	
10	LOW HIGH	0 … 2 µS / cm 0 … 20 µS / cm	0.01	300 Hz	RS
11	LOW HIGH	0 … 20 µS / cm 0 … 200 µS / cm	0.1	300 Hz	
12	LOW HIGH	0 … 200 µS / cm 0 … 2000 µS / cm	0.1	1 kHz	
13	LOW HIGH	0 … 2000 µS / cm 0 … 20 mS / cm	1	1 kHz	
14	LOW HIGH	0 … 20 mS / cm 0 … 200 mS / cm	1	5 kHz	
15	L H	Concentration range L Concentration range H	1		

Legend:
MR = Measuring range
RS = Remote swichting
HOLD = External hold input

5.4.2 Instrument type with measuring range version MM

For the measuring ranges 0 ... 1 µS / cm and 0 ... 20 MΩ × cm the cell constant value 0.01 / cm is firmly allocated. The cell constant of the measuring cell being used has to match, otherwise incorrect measurement will result!

MR no.	Range	Measuring range	Cell constant	Frequency	RS / HOLD
0		0 … 20 MΩ cm	0.01	30 Hz	HOLD
1		0 … 1 µS / cm	0.01	30 Hz	HOLD

Legend:
MR = Measuring range
RS = Remote switching
HOLD = External hold input

The minimum required line length is 5 m.
The maximum permitted line lenght is 15 m.

If these cable lengths are observed, the measured value deviation caused by the cable stays within the specifications of the instrument.

5.4.3 Areas of application for measuring cells

Figure 5.1 shows the preferred areas of application for the various conductivity measuring cells.
When performing measurements outside these ranges, increased measuring inaccuracies are to be expected due to polarisation.

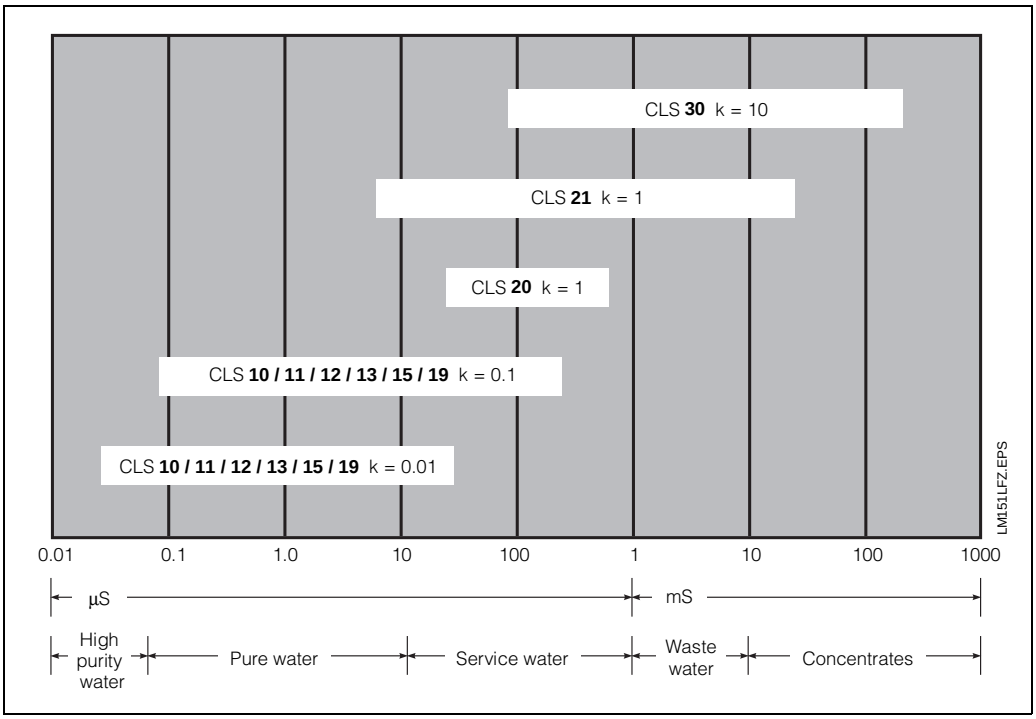


Fig. 5.1: Areas of application for conductivity measuring cells

5.5 Line resistance adjustment

Preparatory measures:
- Connect supplied 3.3 Ω ≤ 1 % simulating resistor to the end of the measuring cable instead of the 2-electrode conductivity measuring cell (see fig. 4.5).
- The line adjustment is automatically performed by selecting matrix field V1 / H8 (see chapter 6.4.1).

See fig. 4.5 for connection of simulating resistor.

Note:

Line adjustment is not required with short line lengths or low-conductivity measuring ranges. Factory setting is 0 Ω.

For the column "without line adjustment" a max. error of 2 % is assumed.
For the column "with line adjustment" the specifications of the instrument are valid.

Cable	Measuring ranges	max. cable length; line adjustment	
		with	without
SMK (0.03 Ω/m)	5, 6, 14	62 m	1 m
	4, 7, 8, 9, 12, 13	100 m	8 m
	0, 1, 2, 3, 10, 11	150 m	80 m
KMK (0.15 Ω/m)	5, 6, 14	15 m	0.25 m
	4, 7, 8, 9, 12, 13	70 m	2 m
	0, 1, 2, 3, 10, 11	100 m	20 m

5.6 Concentration measurement

The data of 4 substances are permanently stored in the unit for the concentration measurement mode.

User-defined data within the permitted value ranges for additional 4 substances can be entered, stored and activated as concentration measuring range.

The concentration ranges can be selected as desired according to the table below.

Note:

With concentration measurement the reference temperature is always 25 °C.

More information concerning concentration measurement you will find in the chapters:

Note:

For concentration measurement use operating matrix on pages 24/25. For description of the specific operation functions please refer to pages 43 with 45.

Subst. no.	Substance	Concentration ranges	Measuring range	Programming
1	NaOH soda lye	0 ... 15 %	0 ... 200.0 mS/cm	–
2	HNO_3 nitric acid	0 ... 20 %	0 ... 200.0 mS/cm	–
3	H_2SO_4 sulphuric acid	0 ... 20 %	0 ... 200.0 mS/cm	–
4	H_3PO_4 phosphoric acid	0 ... 12 %	0 ... 20.00 mS/cm	–
5	free	0 ... 99 %	meas. ranges to choose:	via interface
6	free	0 ... 99 %	MR 3: 0 ... 2000 µS/cm	via interface
7	free	0 ... 99 %	MR 4: 0 ... 20 mS/cm	via keypad
8	free	0 ... 99 %	MR 6: 0 ... 200 mS/cm	via keypad

6. Operation

6.1 General notes regarding operation

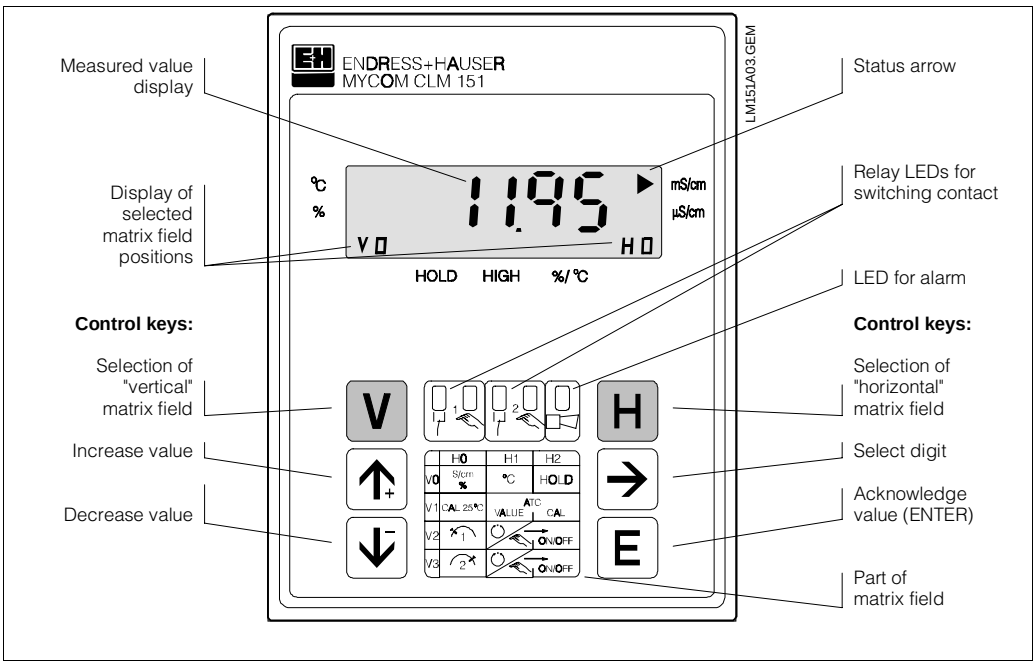


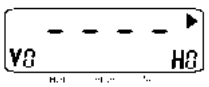
Fig. 6.1: Mycom CLM 121 / 151 Front view of instrument with display and operating elements

The operation is matrix-oriented, i.e. each function type of the instrument is allocated to one position in the 10 x 10 field matrix (fields V0 / H0 to V9 / H9).

The individual operating functions are selected via the V (vertical) and H (horizontal) keys. Hereby the matrix fields are consecutively selected, including those which have not been assigned.
The functions of the matrix fields are grouped into 3 levels, depending on their purpose:

- Level 0: **Indication** (Conductivity, temperature) access code: **none**
- Level 1: **Operation** (Calibration, hold) access code: **1111**
- Level 2: **Start-up** (Current output assignment, damping; limit controller functions) access code: **2222**

Without previous code entry only the content of each matrix field can be displayed.
All matrix fields where the corresponding function has not been activated, display:



Access to level 1 and 2 is secured by means of an access code.
If level 2 is unlocked all functions of level 1 can be accessed, too.

Keys for value entry and function selection:

Value adjustment

Selection of decimal digit, i.e. jump to the highest, second highest etc. decimal digit in cyclic order

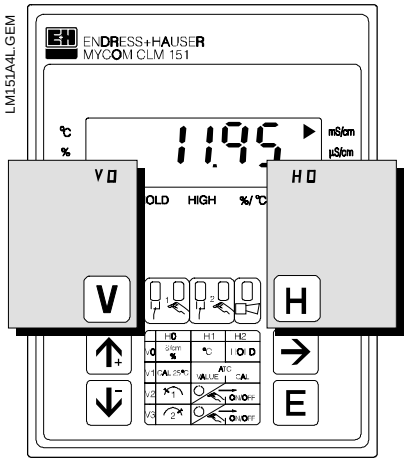
Accept values
control: a value has been accepted when it is displayed continuously

Recall

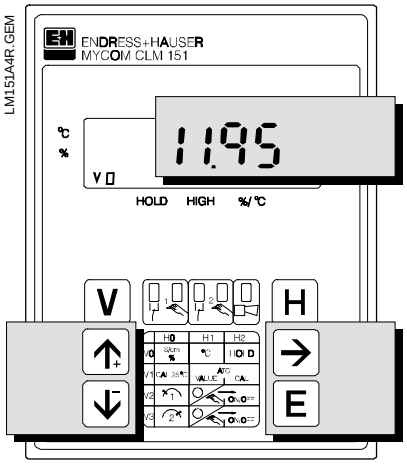
Note:

After each interruption in operation the instrument automatically returns to the indication mode (matrix field V0 / H0).

6.2 Matrix user interface



Matrix position V / H



Value range display or entry

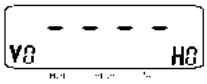
V V key:
Selection of line matrix fields V0 to V9

With each key stroke the display V is increased by one line value.

H H key:
Selection of column matrix fields H0 to H9

With each key stroke the display H is increased by one column value.

Display for locked matrix fields:



Display for changeable matrix fields:
changeable decimal position of display is flashing.

Value entry and function selection by key actuation:

Increase value

Decrease value

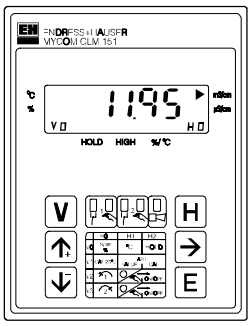
- Selection of decimal digit, i.e. jump to the highest, 2nd highest, etc. decimal digit in cyclic order
- Start editing
- Recall after E

E Acknowledge value

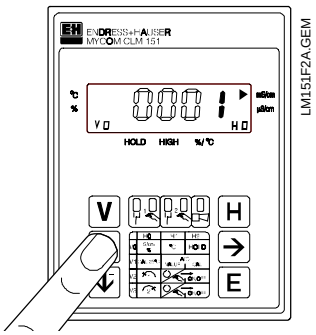
6.2.1 Unlock the levels

- Press the E key (Enter) in matrix field V0 / H0 (**Indication** of measuring value);
  Display jumps to content of matrix field V8 / H9
- Code is shown in matrix field V8 / H9
- Unlock level 1 **Operation** with **Code 1111**
  or
- Unlock level 2 **Start-up** and level 1 **Operation** with **Code 2222**
- Acknowledge with E key
- Return to matrix field V0 / H0
  (indication of measuring value) by pressing the V and H keys simultaneously.

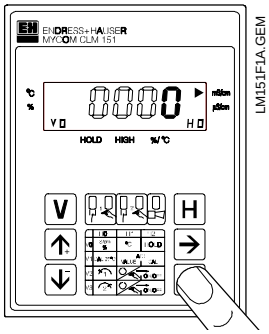
Example for unlocking level 1 (operation)



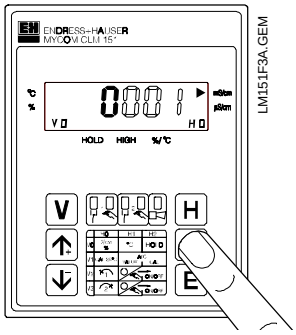
Initial status:
Instrument is in operational mode.
Displayed matrix field position: V0 / H0



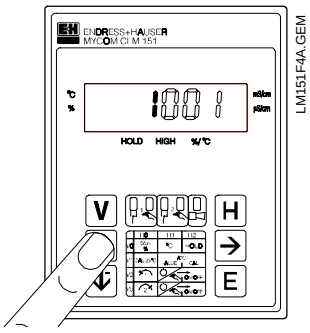
Step 2:
Set value 1 by pressing „ ↑+ “ or „ ↓− “ key.



Step 1:
Press the „ E “ key.
Matrix field V8 / H9 „Unlock / Lock“ is selected.
Digit 4 of display is flashing.

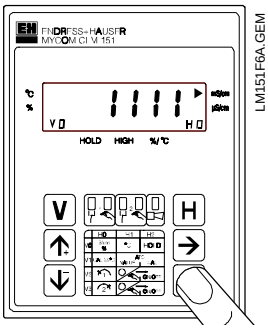


Step 3:
Press the „ → “ key, to go to digit 1.
Digit 1 is flashing.

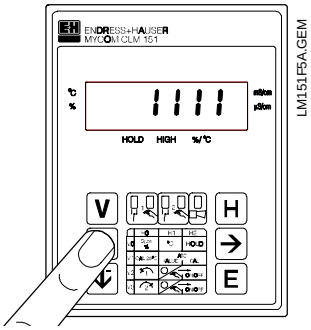


Step 4:
Press „ ↑+ “ or „ ↓− “ key to adjust value **1**.

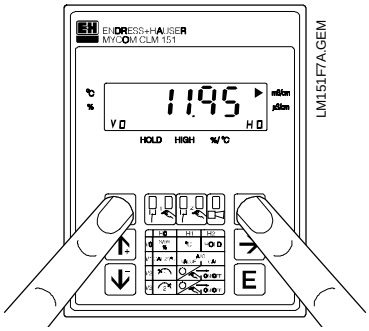
Step 5 and 6:
Same as steps 3 and 4.
Press „ → “ to advance to digit 2 and adjust value **1**.



Step 9:
Press the „ E “ key.
The unlocking code **1111** for the operating level is set.
All matrix fields of the operating level are now unlocked, i.e. changes and inputs by the user are possible.



Step 7 and 8:
As steps 3 and 4.
By pressing the „ → “ key, go to digit 3 and set value **1**.
Now value **1111** is displayed.
If not, steps 2 to 8 can be repeated.



Step 10:
Press the V and H keys simultaneously.
The instrument is now in operational mode.
Displayed matrix field position is V0 / H0.

Unlock level 2 (start-up)

As described in step 1 to 10, however enter code number **2222**.

Lock level 1 and 2

As described in steps 1 to 10, however entering or changing to any number **except** 1111 and 2222.

Note:

1. At initial start-up or after power failure locking value 0000 is displayed.
2. Direct selection of any matrix field with "E" key is only possible for field V8 / H9.
   All other matrix fields are selected by pressing the „ V “ and „ H “ keys separately.
3. The **return** to matrix field **V0 / H0** by pressing the „ V “ and „ H “ keys simultaneously is possible from every matrix field position.

6.3 Operating matrix (Description of operating functions see chapter 6.6.)

6.3.1 Measuring range version CD (Conductivity measurement)

[ ] Level 0 **1111** Level 1 **2222** Level 2

	V \ H	0	1	2	3
Basic functions I	**0**	Measuring	Temperature display	HOLD OFF / ON	Switching 0 … 20 mA / 4 … 20 mA
		0 to 2.0 µS 0 to 1000 mS	–15 to +200 °C	0 = OFF 1 = ON	0 = 0 to 20 mA 1 = 4 to 20 mA
Basic functions II	**1**	Calibration at 25 °C (cell constant)	Entry of temperature coefficient	Determination of temperature coefficient	Switch compensation type
		≥ 0.4 x measuring range	0 to 10.0 % / °K		0 = linear with α (25 °C) 1 = linear α (V1 / H4 °C) 2 = NaCl - compensation
Limit value / contact configuration for limit contacter 1	**2**	Setpoint entry	Switching Auto / Manual	Manual OFF / ON	Pickup delay
		0 to 2.0 µS / cm 0 to 1000 mS / cm	0 = manual 1 = automatic	Measured value	0 to 6000 s
Limit value / contact configuration for limit contacter 2	**3**	Setpoint entry	Switching Auto / Manual	Manual OFF / ON	Pickup delay
		0 to 2.0 µS / cm 0 to 1000 mS / cm	0 = manual 1 = automatic	Measured value	0 to 6000 s
Allocation of substance to concentration ranges 15L and 15H	**4**				
Substance-specific parameters for limit contacters 1 and 2	**5**				
Substance-specific parameters % and α tables	**6**				
Alarm	**7**	Alarm threshold	Alarm delay	Switching steady / fleeting contact	Alarm allocation
		0.01 to 0.6 µS / cm 0.01 to 300 mS / cm	0 to 6000 s	0 = steady contact 1 = fleeting contact	0 = both limit contacts 1 = contact 1 2 = contact 2 3 = no limit contact
Configuration	**8**	Parity	Switching Baud rate		
		0 = none 1 = odd 2 = even	0 = 4800 Bd 1 = 9600 Bd 2 = 19200 Bd		
Service and simulation	**9**	Diagnostic code	Number of auto resets	Order code	Software version
		E— to E255	0 to 255	0000 to 9999	0.00 to 99.99

4	5	6	7	8	9
Rate of rise mA / s	Conductivity at 0 / 4 mA	Conductivity at 20 mA	Temperature at 0 / 4 mA	Temperature at 20 mA	Characteristic switching linear / bilinear
0.2 to 20.0 mA / s	0 to 1.6 µS / cm 0 to 800 mS / cm	0.4 to 2.0 µS / cm 200 to 1000 mS / cm	–15 to +150 °C	+35 to +200 °C	0 = linear 1 = bilinear
Reference temperature	Measuring range switching	Absolute display of meas. range selected	Display of cell constant	Line resistance adjustment	Display / entry of cell constant (percentual)
–15 to +200 °C	0 to 15	2.0 µS / cm to 1000 mS / cm	0.01 to 50	0 to 100 Ω (dependent on meas. range)	80 to 120 %
Dropout delay	Switching MIN / MAX	Switching normally closed/ norm. open contact	Hysteresis		
0 to 6000 s	0 = MIN 1 = MAX	0 = normally closed contact 1 = normally open contact	max. 10% of measuring range		
Dropout delay	Switching MIN / MAX	Switching normally closed norm. open contact	Hysteresis		
0 to 6000 s	0 = MIN 1 = MAX	0 = normally closed contact 1 = normally open contact	max. 10% of measuring range		
					Unlock / lock
					0000 to 9999
Unit address	Preset values (Default)			Simulation ON / OFF	Output current simulation
1 to 32 (RS 232 / 485) 0 to 63 (RS 485 Rackbus)				0 = simulation OFF 1 = simulation ON	0.00 to 20.00 mA

Operating matrix (Description of operating functions see chapter 6.6.)

6.3.2 Measuring range version CD (Concentration measurement)

[ ] Level 0 **1111** Level 1 **2222** Level 2

	V \ H	0	1	2	3
Basic functions I	**0**	Measuring	Temperature display	HOLD OFF / ON	Switching 0 … 20 mA / 4 … 20 mA
		0 to 99.9 %	–15 to +200 °C	0 = OFF 1 = ON	0 = 0 to 20 mA 1 = 4 to 20 mA
Basic functions II	**1**	Calibration at 25 °C (cell constant)			
		≥ 0.4 x measuring range			
Limit value / contact configuration for limit contacter 1	**2**		Switching Auto / Manual	Manual OFF / ON	Pickup delay
			0 = Manual 1 = automatic	Measured value	0 to 6000 s
Limit value / contact configuration for limit contacter 2	**3**		Switching Auto / Manual	Manual OFF / ON	Pickup delay
			0 = Manual 1 = automatic	Measured value	0 to 6000 s
Allocation of substance to concentration ranges 15L and 15H	**4**	Substance allocation 15L (active substance)	Substance allocation 15H (active substance)		
		1 to 8	1 to 8		
Substance-specific parameters for limit contacters 1 und 2	**5**	Selection of substance number for programming	Setpoint 1 (%)	Hysteresis 1 (%)	Setpoint 2 (%)
		1 to 4: fix 5 to 8: freely selectable		max. 1/10 of percentage range	
Substance-specific parameters % and α tables	**6**	Selection measuring range conductivity	%-table: number of supporting values	%-table: Selection of supporting value numbers	%-table: conductivity values
		MR 3 = 2000 µS / cm MR 4 = 20.00 mS / cm MR 6 = 200.0 mS / cm	2 to 10	1 to 10	0 to max. conductivity
Alarm	**7**		Alarm delay	Switching steady / fleeting contact	Alarm allocation
			0 to 6000 s	0 = steady contact 1 = fleeting contact	0 = both limit contacts 1 = contact 1 2 = contact 2 3 = no limit contact
Configuration	**8**	Parity	Switching baud rate		
		0 = none 1 = odd 2 = even	0 = 4800 Bd 1 = 9600 Bd 2 = 19200 Bd		
Service and simulation	**9**	Diagnostic code	Number of auto resets	Order code	Software version
		E— to E255	0 to 255	0000 to 9999	0.00 to 99.99

4	5	6	7	8	9
Rate of rise mA / s			Temperature at 0 / 4 mA	Temperature at 20 mA	
0.2 to 20.0 mA / s			–15 to +150 °C	+35 to +200 °C	
Reference temperature	Switching measuring range	Absolute display of meas. range selected	Display of cell constant	Line resistance adjustment	Display / entry of cell constant (percentual)
25 °C	0 to 15	2.0 µS / cm to 1000 mS / cm	0,01 to 50	0 to 100 Ω (dependent on meas. range)	80 to 120 %
Dropout delay	Switching MIN / MAX	Switching normally closed/ norm. open contact			
0 to 6000 s	0 = MIN 1 = MAX	0 = normally closed contact 1 = normally open contact			
Dropout delay	Switching MIN / MAX	Switching normally closed/ norm. open contact			
0 to 6000 s	0 = MIN 1 = MAX	0 = normally closed contact 1 = normally open contact			
Hysteresis 2 (%)	Alarm threshold (%)	% at 0 / 4 mA	% at 20 mA		
max. $^1/_{10}$ of percentage range					
%-table: concentration value	α-table: selection of supporting numbers	α-table: temperature value	α-table: temperature coefficient α		
0 to 99.99 %	1 to 3	–15 to +200.0 °C	0 to 10 % / °C		
					Unlock / lock
					0000 to 9999
Unit address	Preset values (Default)			Simulation ON / OFF	Output current simulation
1 to 32 (RS 232 / 485) 0 to 63 (RS485 Rackbus)				0 = simulation OFF 1 = simulation ON	0.00 to 20.00 mA

Operating matrix (Description of operating functions see chapter 6.6.)

6.3.3 Measuring range version MM (High purity water measurement, no Rackbus)

[ ] Level 0 **1111** Level 1 **2222** Level 2

	V \ H	0	1	2	3
Basic functions I	**0**	Measuring	Temperature display	HOLD OFF / ON	Switching 0 … 20 mA / 4 … 20 mA
		0 to 20.0 MΩcm 0 to 1.000 µS / cm	–15 to +200 °C	0 = OFF 1 = ON	0 = 0 to 20 mA 1 = 4 to 20 mA
Basic functions II	**1**	Calibration at 25 °C (cell constant)	Entry of temperature coefficient	Switching temperature compensation type	
		≥ 0.4 x measuring range > 0.5 at MM 0.1...0.5 at cond.	0 to 10.0 % / °K	0 = without temp. comp. 1 = linear α (V1/H4 °C) 2 = high purity water comp.	
Limit value / contact configuration for limit contacter 1	**2**	Setpoint entry	Switching Auto / Manual	Manual OFF / ON	Pickup delay
		0 to 20.0 MΩcm 0 to 1,000 µS/cm	0 = Manual 1 = Automatic	Measured value	0 to 6000 s
Limit value / contact configuration for limit contacter 2	**3**	Setpoint entry	Switching Auto / Manual	Manual OFF / ON	Pickup delay
		0 to 20.0 MΩcm 0 to 1,000 µS/cm	0 = Manual 1 = Automatic	Measured value	0 to 6000 s
Allocation of substance to concentration ranges 15L and 15H	**4**				
Substance-specific parameters for limit contacters 1 and 2	**5**				
Substance-specific parameters % and α tables	**6**				
Alarm	**7**	Alarm threshold	Alarm delay	Switching steady / fleeting contact	Alarm allocation
		0 to 6 MΩcm 0 to 0.30 µS/cm	0 to 6000 s	0 = steady contact 1 = fleeting contact	0 = both limit contacts 1 = contact 1 2 = contact 2 3 = no limit contact
Configuration	**8**	Parity	Switching baud rate		
		0 = none 1 = odd 2 = even	0 = 4800 Bd 1 = 9600 Bd		
Service and simulation	**9**	Diagnostic code	Number of auto resets	Order code	Software version
		E— to E255	0 to 255	0000 to 9999	0.00 to 99.99

4	5	6	7	8	9
Rate of rise mA / s	Conductivity at 0 / 4 mA	Conductivity at 20 mA	Temperature at 0 / 4 mA	Temperature at 20 mA	
0.2 to 20.0 mA / s	0 to 0.8 µS / cm 0 to 16 MΩcm	0.2 to 1.0 µS/cm 4 to 20 MΩcm	–15 to +150 °C	+35 to +200 °C	
Reference temperature	Switching measuring range	Absolute display of meas. range selected	Display / entry of cell constant (percentual)		
–15 to +200 °C	0 = 0 to 20 MΩcm 1 = 0 to 1 µS/cm	20 MΩcm 1.0 µS/cm	90 to 110 % (0.01 corresponds to 100 %)		
Dropout delay	Switching MIN / MAX	Switching normally closed/ norm. open contact	Hysteresis		
0 to 6000 s	0 = MIN 1 = MAX	0 = normally closed contact 1 = normally open contact	max. 10% of measuring range		
Dropout delay	Switching MIN / MAX	Switching normally closed/ norm. open contact	Hysteresis		
0 to 6000 s	0 = MIN 1 = MAX	0 = normally closed contact 1 = normally open contact	max. 10% of measuring range		
					Unlock / lock
					0000 to 9999
Unit address	Preset values (Default)			Simulation ON / OFF	Output current simulation
1 to 32				0 = simulation OFF 1 = simulation ON	0.00 to 20.00 mA

6.4 Calibration

Matrix field V1 / H0 ; level 1 (operation)

General

A fixed cell constant is allocated to each conductivity measuring range.
(see table in chapter 5.4).

For absolute value measurement, the measuring range must be calibrated, i.e. adjusted to the actual cell constant value of the conductivity measuring cell.

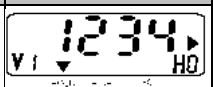
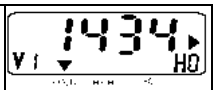
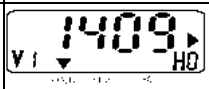
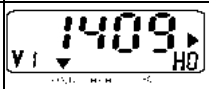
This requires using a measuring solution with a known conductivity value.
See chapter 9.2 for a table of KCl calibration solutions.

The conductivity of the calibration solution must be at least 40 % of the upper measuring range limit and must not exceed three times the upper measuring range limit, e.g.

Measuring range:	2000 µS / cm
KCl-calibr. solution:	CLY 11-C
Conductivity:	1,406 mS / cm at 25 °C

Procedure

- Temper calibration solution to 25 °C or measure the temperature and use the temperature table
- Immerse measuring cell in calibration solution
- Proceed according to the following table

Function	Matrix field command	Display value	Instrument display	Note
Activate calibration function	V1 / H0 →	Conductivity value **(not temperature-compensated)**		Hold function is activated
Immerse measuring cell in calibration solution!				
Start calibration function	→	Conductivity of calibration solution **uncalibrated**		Observe temp. of calibration solution; wait until measured value is stable
Enter calibration value on the display via the keyboard	→ , $\uparrow_+$, $\downarrow^-$	Conductivity of calibration solution **calibrated**		Enter correct conductivity of calibration solution
Store calibration value **or** abort calibration function	E V / H			Calibation is stored, possible error message [1)]

Note:

▽ Status arrow invisible

▼ Status arrow visible

Calibration error

[1)]
- The permissible tolerance range with regard to factory calibration is
  ± 20 % for conductivity measurement
  ± 10 % for resistance measurement.
- Values above or below this tolerance range results in error message 80 to 82 (see chapter 7.3: error list).
- Entries 80 to 82 in the error list are retained even after a power failure.
- A calibration error will set the cell constant value to the minimum or maximum value, depending on the deviation.
- The values are retained until a successful calibration is performed.
- When the calibration function is aborted with the V / H key without pressing the E key, then the original values are retained.

6.4.1 Line adjustment

Matrix field V1 / H8,
Level 2 (start-up)

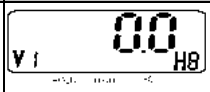
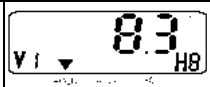
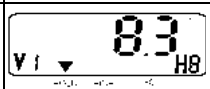
The line resistance is displayed in resistance values. The measuring and display range is –3.3 to +999.9 Ω .
A negative display value means that the simulating resistance is incorrect (resistance value <3,3 Ω).

Instead of the measuring cell a resistor (value 3.3 Ω ≤ 1%) is connected. This value is automatically used by the instrument in determining the line resistance.

The permissible line resistance values are depending on the measuring range selected, see table.

Measuring range	max. line resistance
200 mS / cm , k = 1 20 mS / cm , k = 0.1	2 Ω
20 mS / cm , k = 1 200 mS / cm , k = 10 500 mS / cm , k = 25 1000 mS / cm , k = 50 2000 µS / cm , k = 0.1	10 Ω
20 µS / cm , k = 0.01 200 µS / cm , k = 0.1 2000 µS / cm , k = 1	100 Ω

If value is exceeded or if there is no simulating resistor, error number 89, 90 or 91 is issued.

Function	Matrix field command	Display value	Instrument display	Note
Select line resistance adjustment	V1 / H8	Old line resistance or default value		Display range –3.3 … 999.9 Ω
Determination of line resistance	→	Actual line resistance		Meas. values < 0 Ω or > 100 Ω results in error message
Acknowledge line resistance **or** Return to measuring mode	E V + H			Line adjustment is complete (see chapter 6.6, V1 / H8).

Legend:

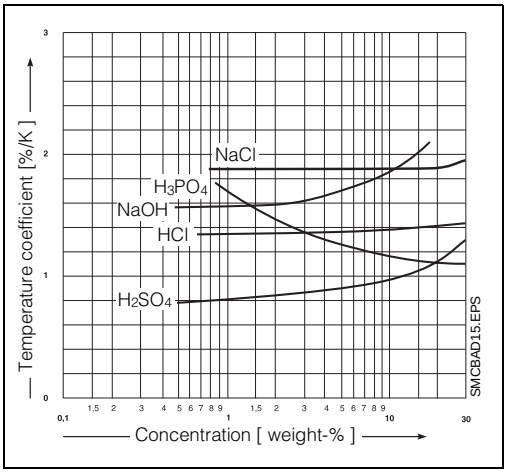
▽ Status arrow invisible

▼ Status arrow visible

6.5 ATC adjustment

The temperature coefficient indicates the change in conductivity per degree of temperature change. It depends on the chemical composition of the solution as well as on its concentration (see fig. 6.2).

Saline solutions have a non-linear temperature coefficient. The NaCl curve is stored in the Mycom instrument.
The NaCl characteristic curve corresponds to DIN IEC 746 for low concentrations.



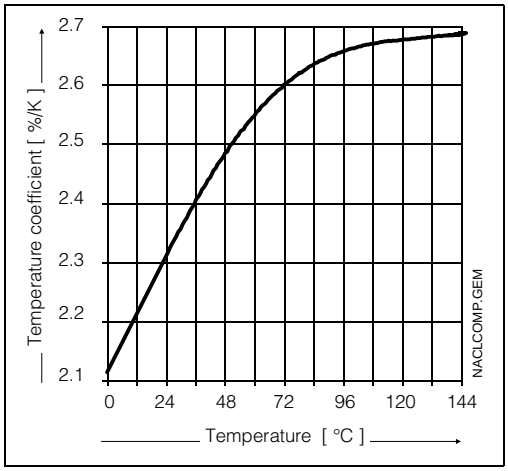


Fig. 6.2: (left) Dependence of the temperature coefficient over the concentration of different electrolyte solutions; reference temperature 25 °C

Fig. 6.3: (right) Dependence of temperature coefficient with NaCl solutions over the temperature

The possible working range of the instrument within which a temperature compensation can be performed over the instrument's entire measuring range is described in the following.

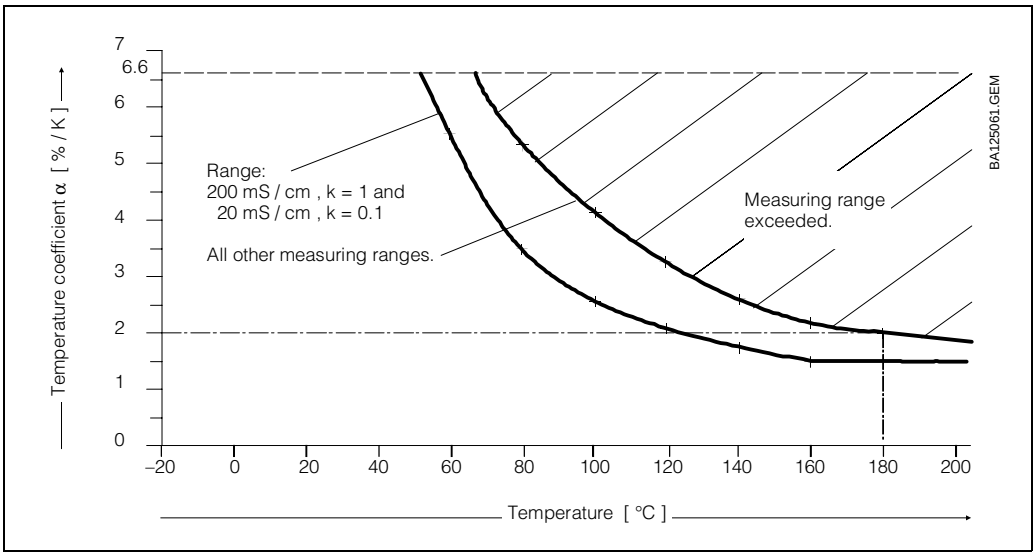


Fig. 6.4: Limit curves for temperature coefficient values;
reference temp. 25 °C

Example:
A temperature coefficient of 2 % / K has been selected.
The automatic temperature compensation is effective at temperatures of up to +180 °C.

Exception:
In the 200 mS / cm, k = 1 measuring range, the automatic temperature compensation is effective at temperatures of up to 120 °C only.

Note:

When the compensation range is exceeded, the display continues to show the maximum value.
Error message 27 is issued, i.e. „measuring range exceeded".

6.5.1 Input and determination of temperature coefficient

Matrix fields V1 / H1 and V1 / H2,
level 1 (operation)

Function	Matrix field	Note
Temperature compensation type	V1 / H3	Explanation see chapter 6.6
Reference temperature	V1 / H4	With NaCl compensation fixed to 25 °C
Temperature coefficient:		
- Input	V1 / H1	With NaCl compensation fixed
- Determination	V1 / H2	Only if temperature coefficient is unknown

Note:
For concentration measurement see chapter 6.5.2 .

Input of temperature coefficient
(matrix field V1 / H1)

- No temperature compensation has to be entered for NaCl compensation.

  The compensation is non-linear according to the temperature curve of the conductivity values of NaCl solutions
  (value according to DIN IEC 746, part 3).
  The reference temperature is 25 °C.

- For linear temperature compensation referred to 25 °C or for freely selectable reference temperature value, the value of the temperature coefficient is entered in matrix field V1 / H1.

- If the temperature coefficient is unknown, it can be determined by measurements. Select matrixfeld V1 / H2. Then the unit automatically calculates the temperature coefficient.

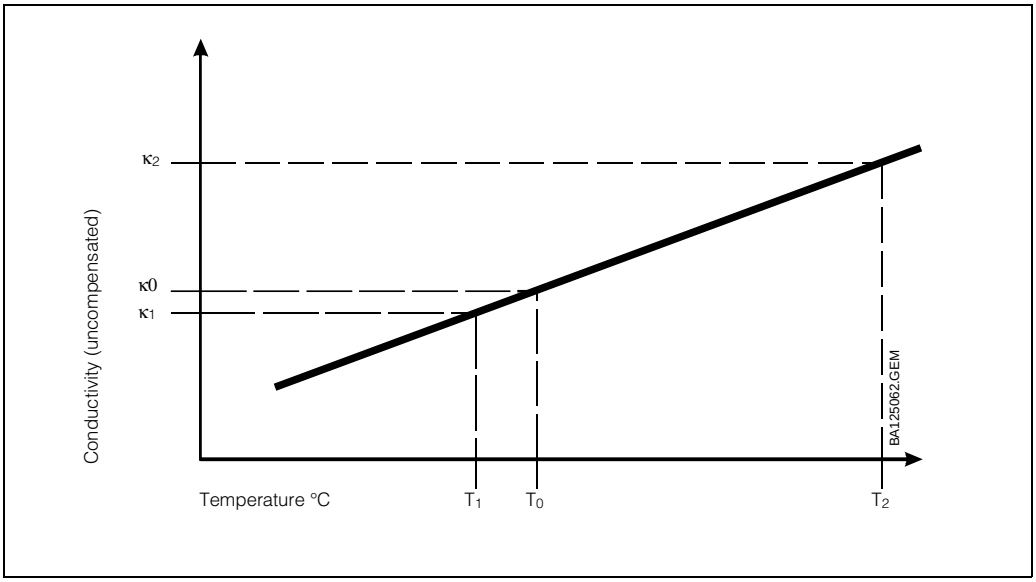


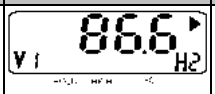
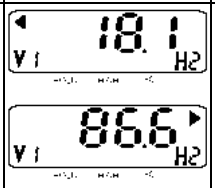
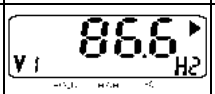
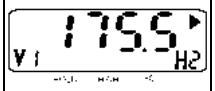
Fig. 6.5: Determination of temperature coefficient α

T_0: Reference temperature (Standard = 25 °C)
χ_0: Conductivity value at T_0
$\chi_{1,2}$: uncompensated conductivity value at T_1, T_2

$$\alpha = \frac{(\frac{\kappa_2}{\kappa_1} - 1) \cdot 100}{(T_2 - T_1)}$$

Determination of temperature coefficient α by measuring method (see fig. 6.5)

- The measuring solution is measured at two temperatures T_1 and T_2 .
- Temperature T_1 should be as close as possible to the reference temperature.
- For obvious reasons, temperature T_2 should lie within the maximum operating temperature range for the measuring solution. (The difference between T_2 and T_1 must be at least 30 K).
  The sequence required to determine the temperature coefficient is shown in the following table.

Function	Matrix-field / command	Display value	Instrument display	Note
Matrix field selection	V1 / H2	Conductivity at temperature T_1		
Temperature display	→ →	Temperature T_1		→ key functions as a shift key between conductivity and temperature display
Store conductivity χ_1 and temperature T_1 value pair	E	Conductivity value at temperature T_1		Stores values only if conductivity and temperature values are stable
Heat measuring solution	→ →	Temperature T_2 (T_2 at least 30 K above T_1)		→ key functions as a shift key between conductivity and temperature display
Store conductivity χ_2 and temperature T_2 value pair	E			Stores values only if conductivity and temperature values are stable. Repeat in case of error*)
Display of temperature coefficient calculated by the instrument				

Note:

***) Error messages are issued if:**

- temperature difference $T_2 - T_1 \leq 30$ K (error 85, see error list in chapter 7.3)
- Conductivity value $\kappa_1 = 0$ (Error 86)
- the temperature coefficient determined is too small or too large (errors 87, 88)

6.5.2 Temperature compensation at concentration measurement

For concentration measurement the ATC values for the chemical substances NaOH, HNO_3, H_2SO_4 and H_3PO_4 have been preset in the instrument.

The following table shows up to which measuring limits the different substances can be measured depending on the medium temperature.

The individual assignment of concentration values to conductivity values also requires the temperature coefficient to be entered or determined as described in chapter 6.5.1.

Note:

The reference temperature at concentration measurement is always 25 °C.

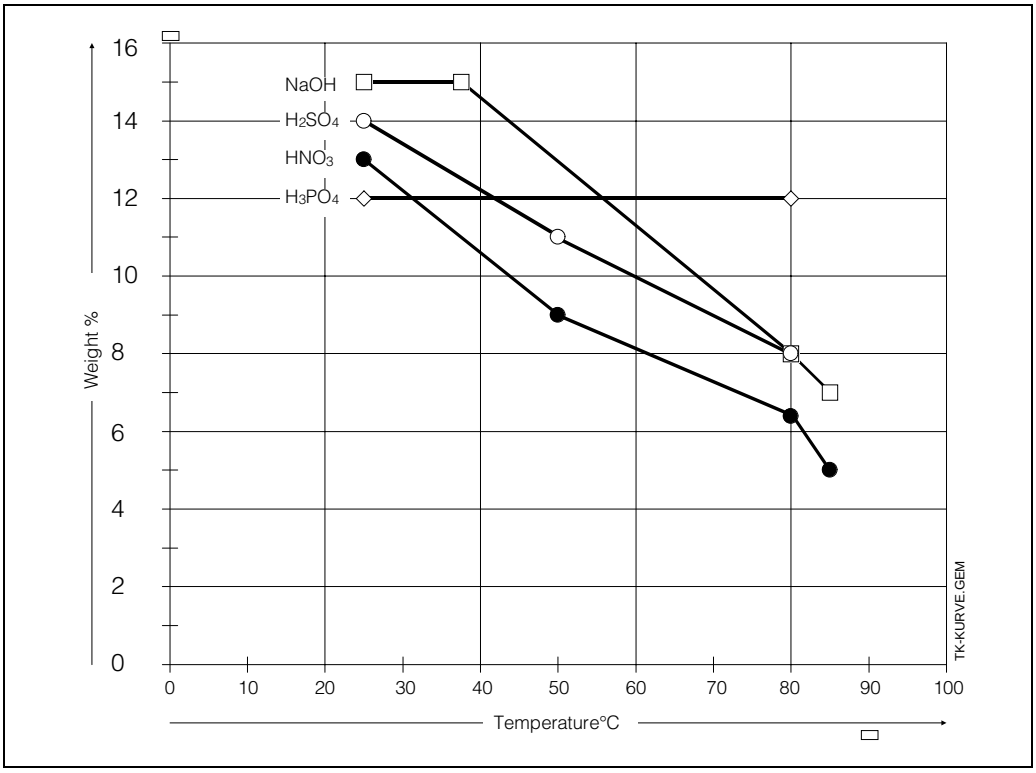


Fig. 6.6: Limit curves for concentation measurement within working temperature range

6.5.3 Input of concentration values

In the concentration measuring mode, the instrument can permanently store the following data of 8 different substances:

- Conductivity range
  MR 3: 0 ... 2000 µS / cm, or
  MR 4: 0 ... 20.00 mS / cm, or
  MR 6: 0 ... 200.0 mS / cm
- Table of concentration as a function of conductivity
- Table of α value as function of temperature
- Independent setpoints and hysteresis values for both limit contacts
- Alarm threshold
- Concentration values for lower and upper output current limits

The concentration and α tables for substances 1 to 4 are fixed.
They can neither be read nor written via the operating matrix or the RS interface.

The concentration and α tables for substances 5 and 6 are available only via the RS interface.

The concentration and α tables for substances 7 and 8 are available via the operating matrix and the RS interface.

Matrix field V5 / H0 (substance number selection) is used to set the substance number to which matrix fields V5 / H1 to V5 / H7 and V6 / H0 to V6 / H7 are referred. When substance parameters are entered via the RS interface, matrix field V5 / H0 must always be written first to permit the subsequent data to be assigned to the correct substance.

Data entered via the RS interface will become visible in the operating matrix only after a successful consistency check.

Sequen.	Function	Matrix field	Note
1	Selection of substance number to be programmed	V5 / H0	Selection ranges: 1 … 4: fixed substances 5 … 8: freely selectable substance parameters (5 and 6 via RS interface only)
2	Selection of conductivity measuring range	V6 / H0	Selection ranges: 0 … 2000 µS / cm 0 … 20 mS / cm 0 … 200 mS / cm
3	Input of value pair number (support values) for concentration	V6 / H1	A minimum of 2 value pairs is required. The maximum is 10 value pairs.
4	Selection of value pair number (support value number) and input of value pair concentration / conductivity	V6 / H2 V6 / H3 V6 / H4	% table: support value number % table: conductivity % table: concentration value
5	Input of corresponding temperature coefficient α	V6 / H5 V6 / H6 V6 / H7	3 temperature / α value pairs must be entered. For linear function the same value pair must be entered three times. α table: number of value pair α table: temperature value α table: temperature coeffiecient α

Note:

See pages 43 to 45 for a detailed description of the individual functions.

6.5.4 Consistency check of concentration value

The instrument automatically performs a consistency check as the value pairs for concentration and conductivity and the corresponding temperature coefficients are entered.
This consistency check is performed following each input or change of a value and is triggered by pressing either the V key or the V and H keys together.

During the consistency check, the instrument checks the following:

- are the conductivity values arranged in an ascending or descending order,
- is the difference between conductivity values min. $^1/_{200}$ of the measuring range,
- is the span min. $^1/_5$ of the measuring range,
- are the temperature values entered in ascending order, and is their minimum difference 10 K.

If an error is detected, the corresponding alarm messages 93 to 96 are issued (see error list in chapter 7.3), and the display changes in matrix field V6 / H0.

If all values entered are valid, the instrument checks the values stored in matrix fields V5 / H1 to V5 / H7 for correct assignment to the substance concentrations.

If the values stored in matrix fields V5 / H1 to V5 / H7 are outside the range limits, the values are automatically adapted to the range limits and overwritten.

Note:

There is no measured value display during this check and adaptation.

6.6 Description of operating functions

Measuring range version CD (conductivity and concentration measurement)

Matrix pos. V / H	Description of functions	Parameter setting	
		Fact.	User
0 / 0	**Measuring** Display of temperature-compensated conductivity or concentration value. Press the E key to jump directly to field V8 / H9 (Unlock / Lock). When measuring range no. 15 (concentration measurement) is active, the instrument switches to conductivity display for approx. 4 seconds when the "→" key is pressed.		
0 / 1	**Temperature display** Display of temperature in °C –15 ... +200 °C		
0 / 2	**HOLD OFF / ON** Activation of HOLD function. 0 = OFF 1 = ON If value 1 is entered, both current outputs are frozen to their current value. With automatic operation, all contacts are set to the normal condition. Any alarm period accumulated is reset to 0.	0	
0 / 3	**Switching between 0 ... 20 mA / 4 ... 20 mA** Switching the lower current output limit to 0 or 4 mA. 0 = 0 ... 20 mA 1 = 4 ... 20 mA The switching affects both current outputs.	1	
0 / 4	**Rate of rise mA / s (damping)** Setting the current rate of rise of the current ouput for measured value. This setting does not affect the temperature output.	20.0	
For the measuring ranges 10 to 15 (remote switching or concentration measurement) the matrix fields V0 / H5 and V0 / H6 are not adjustable (see chapter 5.4).			
0 / 5	**Conductivity at 0 / 4 mA** Input of the conductivity value for 0 or 4 mA between 0 and 80 % of the measuring range selected in absolute values, i.e. min. 0 to 1.6 µS / cm (measuring range 0) max. 0 to 800 mS / cm (measuring range 9) If below a minimum difference of 20 % of measuring range between the upper and lower current values, error message 31 is issued. At the measuring ranges 10 to 14, the current value 0 or 4 mA is assigned to the beginning of the measuring range. At measuring range 15 (concentration measurement), this field is not adjustable (see V5 / H6).	0	

Description of operating functions

Measuring range version CD (conductivity and concentration measurement)

Matrix pos. V / H	Description of functions	Parameter setting Fact.	User
0 / 6	**Conductivity at 20 mA** Input of conductivity value for 20mA current between 20 and 100 % of the measuring range selected in absolute values, i.e. min. 0.4 to 2.0 µS / cm (measuring range 0) max. 200 to 1000 mS / cm (measuring range 9) If below a minimum difference of 20 % of measuring range between the upper and lower current values, error message 31 is issued. For the measuring ranges 10 to 14, the current value 20 mA is assigned to the end of the measuring range of the HIGH range. For measuring range 15 (concentration measurement) this field is not adjustable (see V5 / H7).	FS	
	Temperature output entries are only possible for instruments fitted with a temperature output (see chapter 1.3, order code)!		
0 / 7	**Temperature at 0 / 4 mA** Input of temperature value for 0 or 4 mA of 2nd current output. The minimum difference to the value at 20 mA is 50 K; if below, error message 34 is issued.	0	
0 / 8	**Temperature at 20 mA** Input of temperature value for 20 mA of 2nd current output. The minimum difference to the value at 0 / 4 mA is 50 K; If below, error message 34 is issued.	100	
0 / 9	**Switching of linear / bilinear characteristic curve** Switches the characteristic curve for the 1st current output 0 = linear 1 = bilinear At an input of 0, a linear characteristic curve is assigned to the 1st current output. At an input of 1, a bilinear characteristic curve is assigned to the 1st current output: Meas. range | Current output e.g. 0 ... 10 % | 0 ... 50 % 0 ... 10 mA 10 ... 110 % | 50 ... 100 % 10 ... 20 mA At the measuring ranges 10 to 15, a linear characteristic is assigned and not adjustable.	0	

Note:

FS = Full Scale of measuring range

Measuring range version CD (conductivity and concentration measurement)

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
1 / 0	**Calibration at 25 °C** See separate description: Calibration (chapter 6.4)		
	The matrix fields V1 / H1 to V1 / H3 can not be set for measuring range no. 15.		
1 / 1	**Entry or display of temperature coefficient** (see chapter 6.5.1) Entry of temperature coefficient for temperature compensation in steps of 0.1 or display of temperature coefficient determined with V1 / H2. The display shows "– – – –" , if field V1 / H3 has been switched to NaCl compensation. **Caution:** The temperature coefficient does not change with changes in the measuring range or remote switching!	2.1	
1 / 2	**Determination of temperature coefficient** (see chapter 6.5.1) The value determined for the temperature coefficient is displayed in field V1 / H1 (entry of temperature coefficient). It depends on the type of temperature compensation selected: linear at 25 °C: Reference temperature T_0 is always 25 °C, independent of measured T_0. linear at T_0 : The measured reference temperature T_0 becomes the new reference temperature. NaCl compensation: display shows "– – – –".	100	
1 / 3	**Switching the temperature compensation type** Value range: 0 to 2 0 = Linear temperature compensation Reference temperature = 25 °C 1 = Linear temperature compensation Any reference temperature (temperature entered in field V1 / H4) 2 = Non-linear temperature compensation, NaCl curve A value of 25 °C is displayed in field V1/ H4 for **NaCl compensation**.	2	
1 / 4	**Reference temperature** Entry of reference temperature to determine electrical conductivity in steps of 0.1 °C –15 bis +200 °C (25 °C for concentration measurement) Field V1 / H3 must contain a value of 1.	25	

Description of operating functions

Measuring range version CD (conductivity and concentration measurement)

Matrix pos. V / H	Description of functions	Parameter settings	
		Fact.	User
1 / 5	**Switching measuring ranges 0 to 15** (see chapter 5.4) Determines the measuring range and assigns a measuring range number to the corresponding measuring range If you switch to a measuring range (10 to 15) **with** remote switching, the LOW / HIGH range is adjusted according to the HOLD input setting. If you switch to a measuring range (0 to 9) **without** remote switching, the signal at the HOLD input works as hold function. **Caution:** 1. The time needed for successful execution of a measuring range switching or remote switching command can be between 2 and 3 seconds! 2. At measuring range 15 (concentration measurement), the following matrix fields are **not accessible**: V0 / H5, V0 / H6, V0 / H9 ; V1 / H1 bis V1 / H3 ; V2 / H0, V2 / H7 ; V3 / H0, V3 / H7 ; V7 / H0. The following matrix fields, however, are **accessible**: V4 / H0, V4 / H1 ; V5 / H0 to V5 / H7 ; V6 / H0 to V6 / H7	see name-plate	
1 / 6	**Absolute measuring range display** Displays the maximum conductivity value for the measuring range selected. 2,0 µS / cm to 1000 mS / cm For the measuring ranges **0 to 9** the maximum value is displayed along with the corresponding unit indicator arrow. For the measuring ranges **10 to 15**, the maximum values for the LOW or HIGH range are alternately displayed every 2 seconds, with the unit indicator arrow being alternated.		
1 / 7	**Cell constant display** Displays the uncalibrated cell constant assigned to the measuring range currently selected. 0,01 to 50 The display format depends on the measuring range selected.		
1 / 8	**Line resistance adjustment** (see chapter 5.5 and 6.4.1) Determines the line resistance by connecting a simulating resistor of 3.3 Ω ≤ 1% in place of the sensor. Permitted value ranges are: permitted line resistances see chapter 6.4.1 Monitoring of measured total resistance: – If **< 3.3** Ω (= line resistance display < 0 Ω) (cable short-circuited, incorrect connection) error message 90 is issued. – If **> 100** Ω , absolute maximum resistance value, error message 91 is issued (see chapter 6.4.1).	0	
1 / 9	**Entry of cell constant (percentual)** Cell constant is displayed percentual as (calibration value / nominal value) · 100%, i.e. the entry 100% sets the cell constant to the nominal value which corresponds to the choosen measuring range. Range 80 to 120% **Note:** This value is not reset to factory settings in field (V9/H5).		

Measuring range version CD (conductivity and concentration measurement)

Matrix Pos. V / H	Description of functions	Parameter settings Fact.	User
	Specifications in brackets are valid for setpoint 2.		
2 / 0 (3 / 0)	**Setpoint entry** controller 1 (controller 2) Entry of setpoint for limit contacter 1 (2) in absolute values For measuring ranges **without** remote switching (0 to 9): The value ranges of setpoint, display format and arrow setting match those of the measuring range currently selected. For measuring ranges **with** remote switching (10 to 14): Only one setpoint can be entered for the LOW and HIGH values of the measuring range. The value ranges of the setpoint, display format, arrow setting and step size match those of the HIGH range of the measuring range currently selected. **Note:** At measuring range no. 15 (concentration measurement) this field is not adjustable (see V5 / H1 and V5 / H3).	5 % of FS contr. 1 95 % of FS (contr. 2)	
2 / 1 (3 / 1)	**Switching AUTO / MANUAL** controller 1 (controller 2) 0 = MANUAL 1 = AUTO In the MANUAL mode of operation limit contacter 1 (2) is switched to MANUAL or AUTO), the LED for MANUAL mode is red (see chapter 6.7). The contacts can then be actuated manually using field V2 / H2 (V3 / H2). The contacts drop out when returning from MANUAL to AUTO.	1	
2 / 2 (3 / 2)	**Manual OFF / ON** controller 1 (controller 2) If Manual has been selected in field V2 / H1, this field may be used – to enable contact 1 (2) via the $\uparrow_{+}$ key or – to disable contact 1 (2) via the $\downarrow^{-}$ key. The current measured value is displayed.		
2 / 3 (3 / 3)	**Pickup delay** controller 1 (controller 2) Input of pickup delay for contact 1 or contact 2 of limit contacter in seconds.	0	
2 / 4 (3 / 4)	**Dropout delay** controller 1 (controller 2) Input of dropout delay for contact 1 (contact 2) of limit contacter in seconds.	0	

Note:

FS = Full scale of measuring range

Description of operating functions

Measuring range version CD (conductivity and concentration measurement)

Matrix Pos. V / H	Description of functions	Parameter settings Fact.	Parameter settings User
2 / 5 (3 / 5)	**Switching MIN / MAX** controller 1 (controller 2) Determines the function of contact 1 (contact 2): 0 = MIN 1 = MAX Setting MIN means: Contact is enabled when the value drops below the setpoint. Setting MAX means: Contact is enabled when the value exceeds the setpoint.	 Contr. 1 0=MIN Contr. 2 1=MAX	
2 / 6 (3 / 6)	**Switching normally closed / normally open contact** Controller 1 (controller 2) Determines whether contact 1 (contact 2) is to be used as a normally closed contact or as a normally open contact. 0 = normally closed contact 1 = normally open contact	1	
2 / 7 (3 / 7)	**Hysteresis** Controller 1 (controller 2) Determines the hysteresis for limit contacter 1 (2) in absolute values. The max. hysteresis is 10 % of the measuring range setting, conductivity values are displayed (mS / cm or µS / cm). For measuring ranges **without** remote switching (0 to 9): Display format, arrow setting and step size match those of the measuring range currently selected. For measuring ranges **with** remote switching (10 to 14): Display format, arrow setting and step size match those of the HIGH range of the measuring range currently selected. **Caution:** 1. Measuring range switching sets the hysteresis to the default value while remote switching leaves it unchanged! 2. At measuring range no. 15 (concentration measurement), this field is not adjustable (see V5 / H2 and V5 / H4).	1 % of FS	

Note:

FS = Full Scale of measuring range

Note:

The matrix fields of this page can only be accessed, if measuring range no. 15 (concentration measurement) has been selected.

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
4 / 0	**Substance allocation 15L (active substance)** Allocation of a concentration range to measuring range no. 15 and remote switching range L Value ranges 1 to 8: 1. NaOH concentration: 0 … 15 % max. 2. HNO_3 concentration: 0 … 20 % max. 3. H_2SO_4 concentration: 0 … 20 % max. 4. H_3PO_4 concentration: 0 … 12 % max. 5 to 8: are user defineable		
4 / 1	**Substance allocation 15H (active substance)** Allocation of a concentration range to measuring range no. 15 and remote switching range H Value ranges 1 to 8: see above, V4 / H0		
5 / 0	**Substance number selection for programming** Substance number selection for parametration of matrix field V5 / H1 to V5 / H7 and V6 / H0 to V6 / H7 Substance numbers: 1 = NaOH 2 = HNO_3 3 = H_2SO_4 4 = H_3PO_4 5 to 8 are user defineable		
Note:	In the matrix fields V5 / H1 to V5 / H7 a separate value for each substance can be entered.		
5 / 1	**Setpoint 1 (%)** Entry of a setpoint for limit contacter 1 in % of concentration		
5 / 2	**Hysteresis 1 (%)** Entry of a hysteresis value for limit contacter 1 in % of concentration		
5 / 3	**Setpoint 2 (%)** Entry of setpoint for limit contacter 2 in % of concentration		
5 / 4	**Hysteresis 2 (%)** Entry of a hysteresis value for limit contacter 2 in % of concentration		
5 / 5	**Alarm threshold (%)** This field determines the threshold in % of concentration where an alarm condition starts if a limit is exceeded.		
5 / 6	**% at 0 / 4 mA** Entry of a % of concentration value for 0 / 4 mA current If below a minimum difference of 20 % of the conductivity measuring range between the upper and lower current values, error message 98 is issued.		
5 / 7	**% at 20 mA** Entry of a % of concentration value for 20 mA current If below a minimum difference of 20 % of the conductivity measuring range between the upper and lower current values, error message 98 is issued.		

Note:

The matrix fields of this page can only be accessed, if measuring range no. 15 (concentration measurement) has been selected.

Matrix Pos. V / H	Description of functions	Parameter settings Fact.	User
	Note: For each substance an own value can be entered in matrix fields V6 / H0 to V6 / H4		
6 / 0	**Selection of conductivity measuring range** Selection of conductivity measuring range to be used to determine the concentration of a substance. Conductivity measuring ranges (MR): MR 3 = 2000 µS / cm, cell constant k = 1 MR 4 = 20.00 mS / cm, cell constant k = 1 MR 6 = 200.0 mS / cm, cell constant k = 1 The measuring ranges can be selected with the " $\uparrow_+$ " and " $\downarrow^-$ " keys and acknowledged with the "E" key. The format of subsequent conductivity value pair entries and the editing limits for field V6 / H3 depend on this range selection. **Caution:** – For substance numbers 1 to 6, the display shows "– – – – ". – For substance numbers 5 and 6, this field can only be accessed via interface. – When using the interface, the allocated measuring range numbers 3, 4 and 6 are used instead of plain text entries.		
6 / 1	**% table: Number of value pairs** Determines the number of conductivity / % concentration pairs used for calculating the percentage. Range of value pairs: 2 to 10 A linear interpolation between adjacent value pairs is performed for measured value processing. The entered number defines the upper limit for value pair number selection in matrix field V6 / H2. **Caution:** – For substance numbers 1 to 6, the display shows "– – – – ". – For substance numbers 5 and 6, this field can only be accessed via interface.		
6 / 2	**% table: Selection of value pair number** This parameter selects the conductivity / % value pair number to be read or edited. This number is selectable between 1 and the maximum number of value pairs defined in field V6 / H1. When entering this field from V5 / H2 or V6 / H1, the value pair number 1 is flashing. Another value, however, may be selected. Press the E key to acknowledge the value pair number. The instrument automatically advances to field V6 / H3 to read or enter the corresponding concentration value. **Caution:** – For substance numbers 1 to 6, the display shows "– – – – ". – For substance numbers 5 and 6, this field can only be accessed via the interface.		

Note:

The matrix fields of this page can only be accessed, if measuring range no. 15 (concentration measurement) has been selected.

<table>
<tr><th rowspan="2">Matrix Pos. V / H</th><th rowspan="2">Description of functions</th><th colspan="2">Parameter settings</th></tr>
<tr><th>Fact.</th><th>User</th></tr>
<tr><td>6 / 3</td><td>% table: Conductivity value
Used to read or enter the conductivity value assigned to the value pair in matrix field V6 / H2.
The conductivity value has format and conductivity range specified in matrix field V6 / H0.

The corresponding unit arrow is activated.
Press the E key to acknowledge the conductivity value and automatically advance to matrix field V6 / H4.
Subsequential conductivity values must continuously increase or decrease and must have a minimum difference of $^1/_{200}$ of the conductivity measuring range selected. The conductivity range must be at least $^1/_5$ of the complete measuring range which is selected in V6/H0.

<table><tr><th rowspan="2">No.</th><th colspan="2">Editing range</th><th rowspan="2">Min. difference</th></tr><tr><th>from</th><th>to</th></tr><tr><td>MR 3</td><td>400 µS/cm</td><td>2000 µS/cm</td><td>10 µS/cm</td></tr><tr><td>MR 4</td><td>4.00 mS/cm</td><td>20.00 mS/cm</td><td>0.10 mS/cm</td></tr><tr><td>MR 6</td><td>40.00 mS/cm</td><td>200.0 mS/cm</td><td>1.0 mS/cm</td></tr></table>
Caution:
– For substance numbers 1 to 6 the display shows "– – – – ."
– For substance numbers 5 and 6, this field can only be accessed via the interface.</td><td></td><td></td></tr>
<tr><td>6 / 4</td><td>% table: Concentration value
Used to read or enter the concentration value assigned to the value pair in matrix field V6 / H2.
0 to 99.99 %

Press the "E" key to acknowledge the % value and the instrument automatically advances to field V6 / H2.
When the maximum value pair number has been reached the instrument will remain on the last % value displayed.
Press the "H" key to change to matrix field V6 / H5 for entering the temperature or to the α table.

Caution:
– For substance numbers 1 to 6, the display shows "– – – – ".
– For substance numbers 5 and 6, this field can only be accessed via interface.</td><td></td><td></td></tr>
</table>

Description of operating functions

Measuring range version CD (conductivity and concentration measurement)

Matrix Pos. V / H	Description of functions	Parameter settings	
		Fact.	User
6 / 5	**α table: Selection of value pair number** Entering this field selects a number of the value pair table for the temperature / α pair to be read or edited. Value pairs: 1 to 3 When entering this field from V6 / H4 or V5 / H5 the value pair number 1 is flashing. Another value, however, may be selected. **Caution:** – For substance numbers 1 to 6, the display shows " – – – – ". – For substance numbers 5 and 6, this field can only be accessed via interface.		
6 / 6	**α table: Temperature value** Used to read or to enter the temperature value assigned to the value pair in matrix field V6 / H5. Value range: –15.0 to +200.0 °C Press the "E" key to acknowledge the temperature value and to automatically jump to matrix field V6 / H7. Subsequential temperature values must continously increase and must differ by at least 10 K. The three pairs (temperature and α) define two straight line sections used to interpolate a or temperature between –15 °C und +200 °C. If the current temperature, however, is below the lowerst temperature value or above the highest temperature value in the table, warning 97, "Temperature outside α difinition range", is issued. All 3 value pairs have to be entered. **Caution:** – For substance numbers 1 to 6, the display shows " – – – – ". – For substance numbers 5 and 6, this field can only be accessed via interface.		
6 / 7	**α table: Temperature coefficient α** Used to read or to enter the α temperature coefficient assigned to the current value pair in matrix field V6 / H5. Value range: 0 to 10.0 % / °C Press the "E" key to acknowledge the temperature coefficient value. – If the value pair number is < 3, the instrument automatically returns to matrix field V6 / H5 and raises the value pair by 1. – If the value pair number is = 3, the display remains on the α value displayed last. **Caution:** – For substance numbers 1 to 6, the display shows "– – – –" . – For substance numbers 5 and 6, this field can only be accessed via the interface.		

Measuring range version CD (conductivity and concentration measurement)

Matrix Pos. V / H	Description of functions	Parameter settings	
		Fact.	user
7 / 0	**Alarm threshold** Determines the threshold in mS / cm or µS / cm where an alarm condition starts if a limit is exceeded. 0.01 to 0.6 µS / cm 0.01 to 300 mS / cm **Caution:** – Measuring range switching sets the alarm threshold to the default value while remote switching leaves it unchanged! – For measuring range no. 15 (concentration measurement) this field is not adjustable (see V5 / H5).	5 % of FS	
7 / 1	**Alarm delay** Determines the delay period in seconds after which, following an alarm condition (see V7 / H0) an alarm message is issued (via alarm LED and contact). 0 to 6000 s – If the alarm situation ceases before expiration of the delay period, the timer is reset to 0. – When the HOLD function is activated, the timer is also reset to 0.	0	
7 / 2	**Switching steady / fleeting contact** Defines the alarm relay as a steady or fleeting contact. 0 = steady contact 1 = fleeting contact If defined as fleeting contact, the closing time is 1 s.	0	
7 / 3	**Alarm assignment** Assigns alarm functions to limit values 1 and 2. 0 = both limit contacts issue an alarm 1 = limit value 1 issues an alarm 2 = limit value 2 issues an alarm 3 = no limit contact **Note:** Editing facilities only for instruments with two limit contacts.	0	

Note:

FS = Full Scale of measuring range

Description of operating functions

Measuring range version CD (conductivity and concentration measurement)

Matrix Pos. V / H	Description of functions	Parameter settings	
		Fact.	user
8 / 0	**Parity** Determines the parity bit for the RS interface. 0 = none 1 = odd 2 = even	2	
8 / 1	**Switching Baud rate** For RS 232-C, the transfer rate can be switched between 4800 and 9600 baud. For RS 485, the transfer rate can be switched between 9600 and 19200 baud. For E+H Rackbus the transfer rate is fixed at 19200 baud. 0 = 4800 Bd 1 = 9600 Bd 2 = 19200 Bd	1	
8 / 9	**Unlock / lock** Entry of access code: **Level 0** (indication) **no** code required, read access only. **Level 1** (operation) accessed with Code **1111** **Level 2** (start-up) accessed with Code **2222** **Caution:** – The access code is always 0000 following power-up. – Field V8 / H9 can be selected directly from field V0 / H0 (measuring) by pressing the "E" key. – If level 2 has been unlocked, all functions of level 1 are also accessible to the operator. – Locking affects only the keyboard, not the interface! – Access is always locked after a power failure.	0000	

Measuring range version CD (conductivity and concentration measurement)

Matrix Pos. V / H	Description of functions	Parameter settings	
		Fact.	User
9 / 0	**Diagnostic code** Displays the current diagnostic code according to chapter 7. E- - - to E255 – The error with the highest priority (see chapter 7.1), i.e. the error with the lowest number, is displayed. – Other errors (chapter 7.3) can be displayed "↑+" / "↓¬" key. – Errors are automatically cancelled when the corresponding error condition ceases to exist.		
9 / 1	**Number of auto resets** This function counts the number of automatic resets. 0 to 255 The counter can be put back to zero by the keys "↑+" , "↓¬" and "E". Setting the default values in V9 / H5 has no influence on the counter.		
9 / 2	**Display of instrument configuration** The actual configuration of the instrument is displayed with four digits according to the following code: 0 not used 0 not used 0 without contacts 1 with alarm contact 2 with alarm contact and one limit contact 3 with alarm contact and two limit contacts 4 with alarm contact and 3-point-step controller 0 no additional outputs 1 additional second current output 3 additional RS 232-C interface 4 additional RS 485 interface 6 additional RS 485 interface (RACKBUS) 9 special version		
9 / 3	**Software version** Display of the software version of the instrument according to Endress+Hauser Conducta standards. 0.00 to 99.99		
9 / 4	**Unit address** Determination of the unit address when operated via an RS interface. 1 to 32: RS 232-C / RS 485 0 to 63: RS 485 Rackbus	1	

Description of operating functions

Measuring range version CD (conductivity and concentration measurement)

Matrix Pos. V / H	Description of functions	Parameter settings	
		Fact.	User
9 / 5	**Preset values (default)** Press the "E" key to recall the factory settings for the parameters as indicated for each field. – When you select this field, the text “SET DEFAULT” appears. – After pressing the "E" key, the display flashes. – “End” is displayed once the defaults have been transferred. **Caution:** – All parameter changes made by the user are overwritten. The matrix fields V4 / H0 and V4 / H1 ; V5 / H0 to V5 / H7 ; V6 / H0 to V6 / H7 as well as V8 / H9 (Unlock / lock) are not affected. – This function is not accessible via interface.		
9 / 8	**Simulation ON / OFF** By entering this field, the simulation of the output current can be switched on or switched off. Entry: 0 = Simulation OFF 1 = Simulation ON If you enter 1 (simulation ON) the current value set in matrix field V9 / H9 is applied to both current outputs.	0	
9 / 9	**Output current simulation** Entry of a current value independent of the measurement. This current affects both outputs if "Simulation ON" has been selected in matrix field V9 / H8. The new value is active after pressing the "E" key. **Caution:** If simulation is set to "1" in matrix field V9 / H8 the mA value set in field V9 / H9 is active continously. The signal output no longer responds to changes in conductivity. No error message is issued to alert this condition.	10.00	

Description of operating functions

Measuring range version MM (High purity water measurement)

Note:

The operating functions for all matrix positions not mentioned in the following table are identical with the operating functions of measuring range version CD.

Matrix Pos. V / H	Description of functions	Parameter settings Fact.	User
0 / 0	**Measuring** Display of temperature-compensated conductivity or specific resistance value. 0 to 30.0 MΩ cm 0 to 1.000 mS / cm Press the "E" key to jump directly to matrix field V8 / H9 (Unlock / Lock). – Pressing the SHIFT key switches the display for approx. 3 seconds in an alternative measuring range. Only the display switches, the instrument still works in the set measuring range. At the same time the status arrow (MΩ · cm, µS / cm) switches, too.		
0 / 5	**Conductivity at 0 / 4 mA** Entry of the conductivity value for 0 or 4 mA current from 0 to 0.8 µS / cm 0 to 16 MΩ · cm. If below a minimum difference of 20 % of measuring range between the upper and lower current values, error message 31 is issued.	0	
0 / 6	**Conductivity at 20 mA** Entry of the conductivity value for 20 mA current from 0.2 to 1.0 µS / cm 4 to 20 MΩ · cm. If below a minimum difference of 20 % of measuring range between the upper and lower current values, error message 31 is issued.	FS	
1 / 0	**Calibration at 25 °C (cell constant)** – The deviation of the cell constant from the standard value 0.01 / cm in the range of 90.0 % to 11.0 % is calibrated. – The measued value displayed during calibration and the desired value to be set correspond to the values with disabled temperature compensation, i.e. the calibration must be performed with a calibration solution temperature of exactly 25 °C, or the specific conductivity or specific resistance of the calibration solution at the calibration temperature must be known. – In measuring range 0, the calibration solution must have a specific resistance greater than 10.00 MΩ· cm. Smaller values will not change the cell constant and cause error message E 082 to be issued. – In measuring range 1, the calibration solution must have a specific conductivity above 0.100 µS / cm and below 0.500 µS / cm. Other values will not change the cell constant and cause error message E 081 to be issued. – if a correction value below 90.0 % is determined during calibration, it is set to 90.0 %, and error message E 081 is issued. – If a correction value above 110.0 % is determined during calibration, it is set to 110.0 % and error message E080 is issued. – Error messages E 080 and E 081 are reset if you calibrate with valid values or if a new value is entered in field V1 / H7 "Cell constant entry".		

Note:

FS = Full Scale of measuring range

Description of operating functions

Measuring range version MM (High purity water measurement)

Matrix Pos. V / H	Description of functions	Parameter settings	
		Fact.	User
1 / 1	**Entry or display of temperature coefficient** Entry of temperature coefficient for temperature compensation in steps of 0.1 or display of temperature coefficient determined with V1 / H 2. Display is " – – – – ", if field V1 / H2 has been switched to high purity water compensation.	3.0	
1 / 2	**Switching of temperature compensation type** Value range: 0 to 2 0: Without temperature compensation 1: Linear temperature compensation any reference temperature (temperature entered in field V1 / H4) 2: Non-linear temperature compensation or high purity water temperature compensation with NaCl portion For **high purity water compensation** enter the value 25 in field V1 / H4; this value cannot be altered.	2	
1 / 5	**Switching of measuring range** Determines the measuring range and assigns a measuring range number to the corresponding measuring range 0 = 0 to 20.0 MΩ cm 1 = 0 to 1.000 µS /cm **Note:** The time needed for successful execution of a measuring range switching or remote switching command can be between 2 and 3 seconds.		
1 / 6	**Absolute measuring range display** Displays the maximum conductivity value for the measuring range selected 1.0 µS / cm 10 MΩ cm		

Measuring range version MM (High purity water measurement)

Matrix Pos. V / H	Description of functions	Parameter settings	
		Fact.	User
1 / 7	**Entry of cell constant** Cell constant is displayed percentual as (calibration value / 0.01) · 100%, i.e. k = 0.01 corresponds to 100%. Range: 90 to 110 % Press the Enter key to accept the percantage entered as the new cell constant value. The cell constant ist not affected by any other user operation, exiting the field included. **Note:** If the marginal physical conditions applicable to pure or high-purity water with conductive electrolyte feeding are exceeded (e.g. excessive input resistances, too low conductivity values caused by foaming medium, introduction of air bubbles, organic solvents or other media with a conductivity below high-purity water at measuring temperature), which would cause negative conductivity values. The overcompensation to values smaller than 0 µS resulting in these cases is signalled as follows: – µS indication: the value 0.00 µS is displayed, – MΩ indication: 99.9 MΩ is displayed, **Error 83** is issued in both cases: "Outside compensation range for high-purity water conductivity“.	100.0	

6.7 Limit contacter

6.7.1 Function

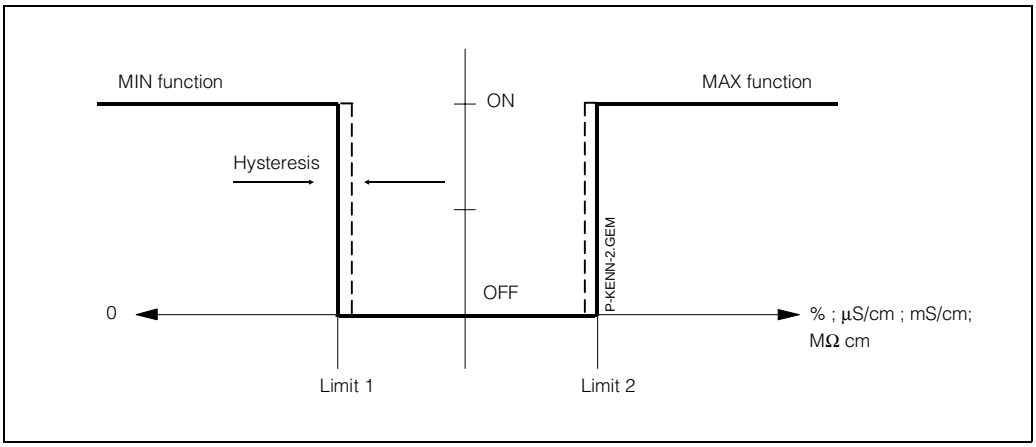


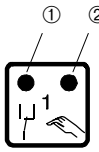
Fig. 6.7: Characteristic curve of limit contacter

Sequence of paramter settings		Matrix position V / H (Contr. 1)	Matrix position V / H (Contr. 2)
Set limit contacter			
1.	Setpoint entry	2 / 0	3 / 0
	Setpoint 1 / 2 (%)	5 / 1	5 / 3
2.	Pickup delay **or** dropout delay	2 / 3 2 / 4	3 / 3 3 / 4
3.	Switching function MIN / MAX	2 / 5	3 / 5
4.	Relay contact closed circuit or open circuit function	2 / 6	3 / 6
5.	Hysteresis	2 / 7	3 / 7
	Hysteresis (%)	5 / 2	5 / 4

Note:

Setpoint (%) and hysteresis (%) refer to concentration measurement.

6.7.2 LED function



① LED red / green for switching status
Set limit contacter:
– green = normal position = OFF
– red = working position = ON

② LED red for manual operation
– Automatic operation: LED OFF
– Manual operation: LED ON

6.7.3 Operating conditions

All operating conditions of the limit contacter function are shown.
The measured or displayed value (actual value) is between approx. 0 % (< setpoint MIN) and approx. 100 % (> setpoint MAX).

Depending on the switching function (MIN / MAX) and the mode of operation of the output contact (closed / open connection) results in different contact positions of the switching contacts.

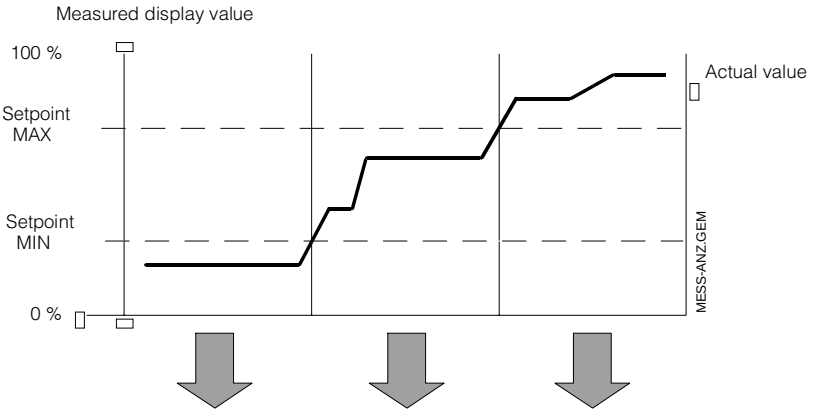


Fig. 6.8: Status diagram for automatic operation of Mycom CLM 151 with limit contacter function

		Switching contacts						
Function V2 / H5 V3 / H5	**Principle V2 / H6 V3 / H6**	**LED**	**Cont.**	**LED**	**Cont.**	**LED**	**Cont.**	**Contact after power failure**
Setpoint MIN	Closed circuit	red	OFF	green	ON	green	ON	OFF
	Open circuit	red	ON	green	ON	green	OFF	OFF
Setpoint MAX	Closed circuit	green	ON	green	ON	red	OFF	OFF
	Open circuit	green	OFF	green	OFF	red	ON	OFF

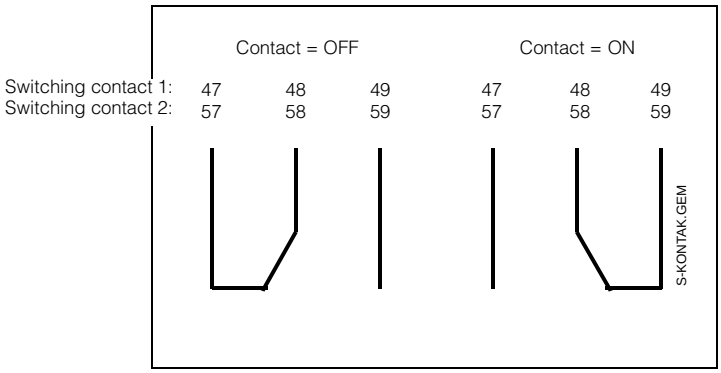


Fig. 6.9: Contact positions for switching contacts with terminal assignments (acc. to fig. 4.2, chapter 4.4)

6.7.4 Alarm function / alarm contact

Sequence of parameter settings		Matrix position V / H
1.	Setpoint controller 1 controller 2 Setpoint 1 (%) Setpoint 2 (%)	2 / 0 3 / 0 5 / 1 5 / 3
2.	Alarm threshold Alarm threshold (%)	7 / 0 5 / 5
3.	Alarm delay	7 / 1
4.	Steady or fleeting contact	7 / 2
5.	Alarm assignment	7 / 3

Note:

Setpoint (%) / alarm threshold (%) refer to concentration measurement.

Alarm situation:

- Alarm LED is flashing red
- Alarm contact active
- Error number is displayed in matrix field V9 / H0 (see error list in chapter 7.3)

Alarm contact:

Operating conditions	LED	Contact 41/42	Contact 41/42 while power failure
Normal	–	OFF	ON
Error	red	ON	ON

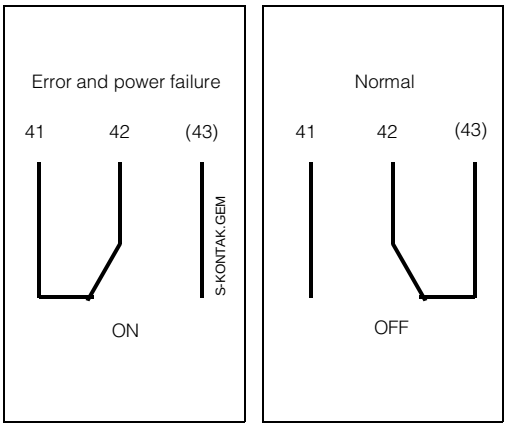


Fig. 6.10: Contact positions of alarm contact with terminal assignments (acc. to fig. 4.2, chapter 4.4)

(Contact 43 only for CLM 151)

7. Error handling and maintenance

7.1 Error classes and error numbers

There are three error classes:

Error classes	Priority	Error no.
No error		- - - -
System error	1 = high	1 ... 9
Disturbances	2 = medium	10 ... 29
Warnings	3 = low	30 ... 255

System errors
are error conditions where proper operation of the entire measuring system is no longer guaranteed (e.g. parameter storage EEPROM cannot be read correctly).
These errors require servicing or exchange of the instrument in the factory since they can not be cleared.

Disturbances
are error conditions where

a) the process parameter to be measured and possibly to be controlled exceeds the limit conditions (process error),
or
b) display and / or current output are outside the specified accuracy range (unit error),
or
c) the measuring transmitter connections receive incorrect signals (connection error).

These errors are cancelled as soon as the error condition ceases to exist.

Warnings
are error conditions where

a) an operator error must be corrected,
or
b) maintenance will be required shortly.

These errors are cancelled as soon as the error condition ceases to exist.

Warning:

If a warning is ignored, a disturbance may result.

7.2 Error display and handling

Errors that occur are entered in an error list which is sorted by error numbers (ascending). The error list (see chapter 7.3) has exactly one space for each error number. Multiple occurrences of an error are therefore not recognized.

Any occurrence of an error activates the alarm LED (flashes at intervals of one second). System errors and disturbances also activate the alarm contact (which may be selected to be a steady or a fleeting contact).

When field V9 / H0 is selected, the display shows the number of the error with the lowest number which has occurred in the format "E001" up to "E255". The error list can be searched for other errors which have occurred using these keys:

 ascending

and

 descending

Disturbances and warnings are deleted from the error list as soon as the error condition ceases to exist. If the error list is empty, "E---" is displayed.

7.3 Error list

No.	Meaning	Field V / H	Measures for maintenance / troubleshooting
	System error		
1	Data exchange error in processor		Return instrument to your Endress+Hauser sales office for repair or request service.
2	Internal configuration error		Return instrument to your Endress+Hauser sales office for repair or request service.
	Disturbances		
10	Limit or setpoint is not reached in preset delay period	7 / 1	Alarm delay timeout. Check actuator, controller function and control parameters.
12	Conductivity measuring range below concentration table	0 / 0	Check absolute conductivity value by using the → key.
13	Conductivity measuring range exceeded	0 / 0	Check conductivity measurement, control and connections; check instrument and measuring cable with conductiity simulator if necessary.
19	Temperature measuring range below limit	0 / 1	Check temperature measurement and connections; check instrument and measuring cable with temperature simulator if necessary.
20	Temperature measuring range exceeded	0 / 1	Check temperature measurement and connections; check instrument and measuring cable with temperature simulator if necessary.
22	Below permitted minimum value of 0 / 4 mA current range (output 1)	0 / 5	Check 0 / 4 mA measuring range assignment and change if necessary. Check measurement and control.
23	Exceeding permitted maximum value of 20 mA current range (output 1)	0 / 6	Check 20 mA measuring range assignment and change if necessary. Check measurement and control.
25	Below permitted minimum value of 0 / 4 mA current range (output 2)	0 / 7	Check 0 / 4 mA measuring range assignment and change if necessary. Check measurement.
26	Exceeding permitted maximum value of 20 mA current range (output 2)	0 / 8	Check 20 mA measuring range assignment and change if necessary. Check measurement and control.
27	Input conductivity value too high	1 / 6 1 / 7	Check measuring range selection and cell constant value; Check temperature and ATC value (see figure 6.4, chapter 6.5).

No.	Meaning	Field V / H	Measures for maintenance / troubleshooting
	Warnings		
30	Current output simulation enabled	9 / 8	Set simulation OFF.
31	Parameter range for current output 1 too small	0 / 5 0 / 6	Increase difference (min. 20 % of of measuring range).
32	Parameter limits for current output 1 interchanged (falling assignment)	0 / 5 0 / 6	Interchange values, i.e. value of V0 / H5 must be smaller than value of V0 / H6, e.g. 4.00 to 20.00 mS/cm.
34	Temperature range for current output 2 too small	0 / 7 0 / 8	Increase difference (min. 50 K)
80	Calibration range exceeded	1 / 0	Repeat calibration; check calibration solution; replace measuring cell or check cell constant if necessary; check measuring cell for short circuit.
81	Below calibration range	1 / 0	Repeat calibration; check instrument with simulator; check measuring cell or measuring cable for interruption.
82	Conductivity measured during calibration too small	1 / 0	Check standard solution and cell constant setting; measuring cell may be soiled.
83	Temperature compensation range exceeded	1 / 1	Check temperature and type of temperature compensation
84	Below ATC range	1 / 1	Check entered values and measured temperature for plausibility.
85	Aborted: Determination of temperature coefficient – temperature difference too small	1 / 2	Minimum temperature difference must be greater than 30 K.
86	Aborted: Determination of temperature coefficient – conductivity measured is zero	1 / 2	Initial conductivity for temeprature coefficient determination must be greater than 0
87	Aborted: Determination of temperature coefficient – below permitted range for temperature coefficient	1 / 2	Repeat temperature coefficient determination; α range may be too small.
88	Aborted: Determination of temperature coefficient – permitted range for temperature coefficient exceeded	1 / 2	Repeat with other temperature values; observe limit curve for ATC range.
89	Line resistance of measuring cable too big for selected measuring range	1 / 8	Switch measuring range to smaller upper limit or use measuring cable with larger line cross section.
90	Aborted: Line resistance adjustment – total resistance too small	1 / 8	Check measuring cable for short circuit or incorrect connection.

No.	Meaning	Field V / H	Measures for maintenance / troubleshooting
	Warnings (continuation)		
91	Aborted: Line resistance adjustment – total resistance too big	1 / 8	Check measuring cable for interruption or use measuring cable with larger line cross section.
92	No valid concentration table defined	4 / 0 4 / 1	Enter new concentration table
93	Conductivity values not steady ascending or descending	6 / 2	Check conductivity values
94	Difference between conductivity values too small	6 / 2	Difference of conductivity values must be min. $^1/_{200}$ of the measuring range
95	Span of conductivity table too small	6 / 2	Measuring span must be min. $^1/_5$ of measuring range
96	Difference between temperature values too small or not steady ascending	6 / 6	Difference of temperature values must be min. 10 K
97	Temperature outside of α definition range	6 / 6	Check temperature range –15 to +200 °C
98	Parameter range for current output 1 of selected substance too small	5 / 6 5 / 7	Check current output assignment

7.4 Maintenance

7.4.1 Cleaning

Use commercial cleansers to clean the instrument front panel.

The front panel is resistant
(test method DIN 42 115) to:
- Alcohol
- Diluted acids
- Diluted bases
- Ester
- Hydrocarbons
- Ketones
- Household cleansers

Note:

We do not guarantee resistance to concentrated mineral acids or concentrated lyes, benzyl alcohol, methylene chloride and high pressure steam.

7.4.2 Notes for maintenance of conductivity measuring cells

Depending on the composition of the measuring solution, the suspended solids in it and the flow rate of the medium, continuous measurement is affected by electrode soiling in the measuring cells and the resulting smaller or greater measuring errors.

Accurate measurement therefore requires the measuring cell to be checked at regular intervals.

- Thus, for example, the carbonate deposits or other non-conductive coatings will result in considerably reduced measured values.

  After some mechanical cleaning, such coatings can be well removed with hydrochloric acid (and a brush).

Warning:

Observe regulations for handling acids!

- Organic soiling should be removed by cleaning with strong oxidising agents and / or grease solvents as required.
- If the measuring cells are used in CIP system for media separation, the risk of electrode soiling is very low since the continuous changes between base and acid prevent formation of coatings.

7.4.3 Notes regarding instrument test

- In an alarm situation, an ohmic resistor can be connected directly to the measuring cell input of the instrument to determine whether the error is caused by the measuring cell, measuring cable or the measuring instrument.
  It is, however, very important to observe the cell constant (see nameplate of the instrument, fig. 1.1, chapter 1)!
- Connect a simulating resistor to terminals 84 and 83 instead of the 2-electrode conductivity measuring cell (see fig. 4.2, chapter 4.4).
- If in addition a calibration is performed with a conductivity simulator or simulating resistor, the appropriate value given in the table below has to be used.
- When a measuring cell with a Pt 100 temperature sensor is disconnected, a 107 Ω simulating resistor must also be connected to the temperature sensor input (terminals 11 and 12 to 13).
- The conductivity measuring range / cell constant / simulating resistor assignments are listed in the table below.

Display / meas. range	at cell constant	Simulating resistor
10 µS	0.01	1 kΩ
	0.1	10 kΩ
	1	100 kΩ
100 µS	0,1	1 kΩ
	1	10 kΩ
1000 µS	1	1 kΩ
10 mS	1	100 Ω
	10	1 kΩ
100 mS	10	100 Ω
15 MΩ	0,01	159 kΩ

8. Technical data

8.1 Electrical data

Conductivity measurement

Conductivity meas. ranges of version CD . . . . . 0 … 2.0 µS / cm ; 0 …1000 mS / cm
Concentration ranges (fixed) . . . . . 0 … max. 15 % NaOH
. . . . . 0 … max. 20 % HNO_3
. . . . . 0 … max. 20 % H_2SO_4
. . . . . 0 ... max. 12 % H_3PO_4
Concentration ranges (user-defined) . . . . . 0 … 99.99 %
Conductivity meas. ranges of version MM. . . . . 0 ... 1 µS / cm , 0 ... 20 MΩ x cm
Measured value display . . . . . LC display, 4 digits, 7 segments, height = 10 mm
Status indication . . . . . LEDs red or red / green
Indication errors of measurement / display / current output (DIN IEC 746) . . . . . 0.2 % / 0.5 %
Cell constants . . . . . 0.01 … 50
Measuring frequency . . . . . CD = 300 Hz … 5 kHz, MM = 30 Hz
Alternating measuring voltage . . . . . ≤ 625 mV
Remote switching of measuring range . . . . . factor 10
Current range of conductivity signal output . . . . . 0 / 4 … 20 mA
Load . . . . . max. 600 Ω
Signal output range
– linear . . . . . 20 … 100 % of meas. range (adjustable in absolute values)
– bilinear. . . . . 0 … 10 % of meas. range $\hat{=}$ 0 …50 % current range (0 / 4 … 10 / 12 mA)
. . . . . 10 … 110 % of meas. range $\hat{=}$ 0 …50 % current range (10 / 12 … 20 mA)

Temperature measurement

Temperature measuring range . . . . . –15 … +200 °C
Temperature signal output (option) . . . . . 0 / 4 … 20 mA
Load . . . . . max. 400 Ω
Temperature output range . . . . . adjustable from Δ 50 … Δ 215 °C
Temperature sensor . . . . . Pt 100 with 3-wire switching
Indication error of measurement (to DIN IEC 746) . . max. 0.5 % of meas. range up to 150 °C
max. 1.0 % of meas. range up to 200 °C

Limit value, controller and alarm functions

Limit contacterr / 2-point controller . . . . . max. 2 limit contacts
Controller function . . . . . limit value
Type of function . . . . . MIN or MAX (direct or inverted)
Setpoint adjustment . . . . . 2 x 0 … 100 % of FS (in absolute values)
Setpoint hysteresis . . . . . 1 … 10 % of FS (in absolute values)
Contact delay . . . . . pickup / dropout
– Delay period. . . . . 0 … 6000 s
Alarm threshold . . . . . 0.5 … 30 % of FS (in absolute values)
– Alarm delay period . . . . . 0 … 6000 s

Electrical data (continued)

Electrical data and connections

Power supply AC	24, 48, 100, 110, 127, 200, 230, 240 V, –15 … +10 %
Frequency	50 … 60 Hz, ± 6 %
Power supply DC	24 V, –20 … +15 %
Power consumption	12 VA
Contact output	CLM 121: 2 change-over contacts, 1 potential-free normally open contact
	CLM 151: 3 change-over contacts
Switching voltage	max. 250 V AC
Switching current	max. 3 A
Switching power	max. 500 VA
Signal outputs	1 or 2 x 0 / 4 … 20 mA, galvanically separated
Insulation voltage	650 V_{RMS}
Digital interface (option)	optionally RS 232-C or RS 485
Terminals	terminal block
– max. conductor cross section	4 mm^2
Fuse	medium, 1.0 A
Electromagnetic compatibility (EMC)	
Interference emission	acc. to EN 50081-1, 01.92
Interference immunity	acc. to EN 50082-1, 03.93

Ambient temperature and relative humidity

Nominal operating range CLM 121	0 ... 50 °C
Nominal operating range CLM 151	–10 … +55 °C
Limit operating range CLM 121 / 151	–20 … +60 °C
Storage and transport CLM 121 / 151	–25 … +85 °C
Relative humidity CLM 121 / 151	10 … 90 %

8.2 Mechanical data

Dimensions / weight / ingress protection

Dimensions CLM 121	96 x 96 x 176.5 mm (HxWxD)
Dimensions CLM 151	247 x 167 x 111 mm (HxWxD)
Weight CLM 121	1.1 kg
Weight CLM 151	3.5 kg
Ingress protection CLM 121 (front)	IP 54
Ingress protection CLM 151	IP 65

Materials

Housing CLM 121	polycarbonate
Housing CLM 151	GD-AlSi12 (Mg-part < 0.05 %)
Coat of lacquer CLM 151	2 constituents PU-lacquer
Front CLM 121	polyester
Front CLM 151	polyester, UV-resistant

9. Appendix

9.1 Accessories

The following accessories for Mycom CLM 121/151 can be ordered separately:

- Weather protection cover CYY 101
  Weather protection cover for installation on Mycom CLM 121/151;
  Dimensions: 320 x 300 x 300 mm (L x W x D)
  Material: stainless steel
  (Order no. CYY 101)

- Post mounting kit
  Retrofit kit for mounting of Mycom CLM 151 to horizontal or vertical tubing
  (max. Ø 70 mm)
  Material: galvanized steel
  (Order no. 50062121)

- Upright post VM3
  For post mounting of Mycom CLM 151
  Material: hot-dip galvanized steel
  (Order no. 50003248)

- Junction box VS
  Junction box with plug-in socket and connector type SXP for pluggable connection between conductivity measuring cell and connecting line to the instrument.
  Suitable for all measuring cells and for connection of special measuring cables SMK, KMK (for cells with automatic temperature compensation) or DMK.
  Dimensions:
  – without SXP connector:
    82 x 80 x 55 mm (L x W x H)
  – with SXP connector:
    160 x 80 x 55 mm (L x W x H)
  Material: plastic
  Ingress protection: IP 65
  (Order no. 50001054)

- Flat packing
  To seal the panel cutout of Mycom CLM 151 for panel mounting
  (Order no. 50064975)

- Conductivity measuring cable KMK
  Combination measuring cable for 2-electrode conductivity measuring cells when instrument is equipped for temperature compensation or temperature measurement; Pt 100 3-wire connection is required.
  Low-noise coaxial cable with 6 auxiliary cores (0.5 mm^2 each) and outer screen in PVC sheath;
  Cable diameter: 10.5 mm
  Length: min. 5 m
  (Order no. 50001419)

- Conductivity measuring cable SMK
  Special measuring cable for connection of 2-electrode conductivity measuring cells to measuring instruments.
  Suitable for all measuring cells without temperature sensor;
  Length: min. 5 m
  (Order no. 50000598)

- Conductivity measuring cable CYK 7
  Special measuring cable for connection of conductivity measuring cells with temperature sensor with the Mycom CLM 151 instrument; consisting of a coaxial line in low-noise quality and 3 auxiliary cores (0.75 mm^2 each) with common screen;
  Outer diameter: 7 mm
  Length: min. 5 m
  (Order no. 50041101)

- 2-electrode conductivity measuring cells CLS 10 to CLS 30
  For detailed information please refer to the separate Technical Information:

– CLS 12	TI 082C/07/e
– CLS 15	TI 109C/07/e
– CLS 19	TI 110C/07/e
– CLS 20	TI 084C/07/e
– CLS 21	TI 085C/07/e
– CLS 30	TI 086C/07/e

Supplementary documentation

☐ Operating instructions
Mycom instrument family serial interface
BA 090C/07/en (order no. 50059856)

9.2 KCl - calibration solutions

Type	Conductivity at 25 °C [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	107.0 mS/cm	50081906

Precision calibration solutions from Endress+Hauser for conductivity accuracy ± 0.5 % at 25 °C, traceable to SRM from NIST. Bottle with 500 ml.

[1)] Values may vary due to manufacturing tolerances. The accuracy is given for the value specified on the bottle.

9.3 Index

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