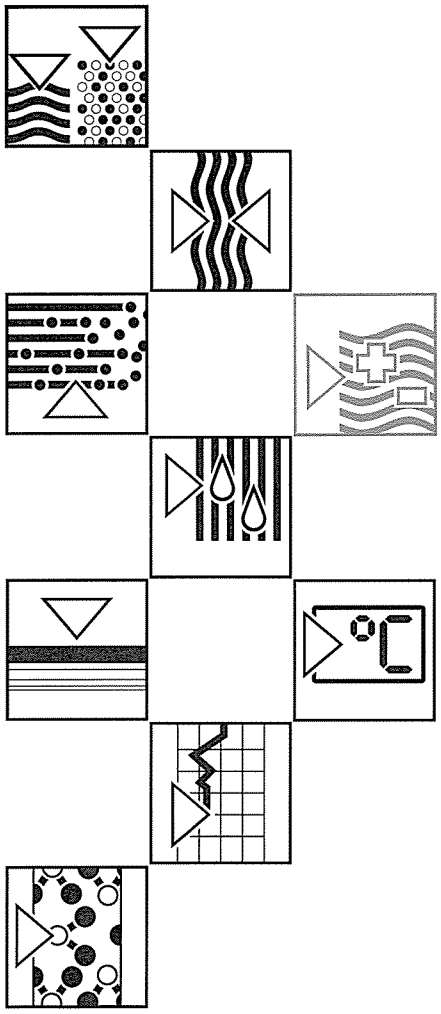
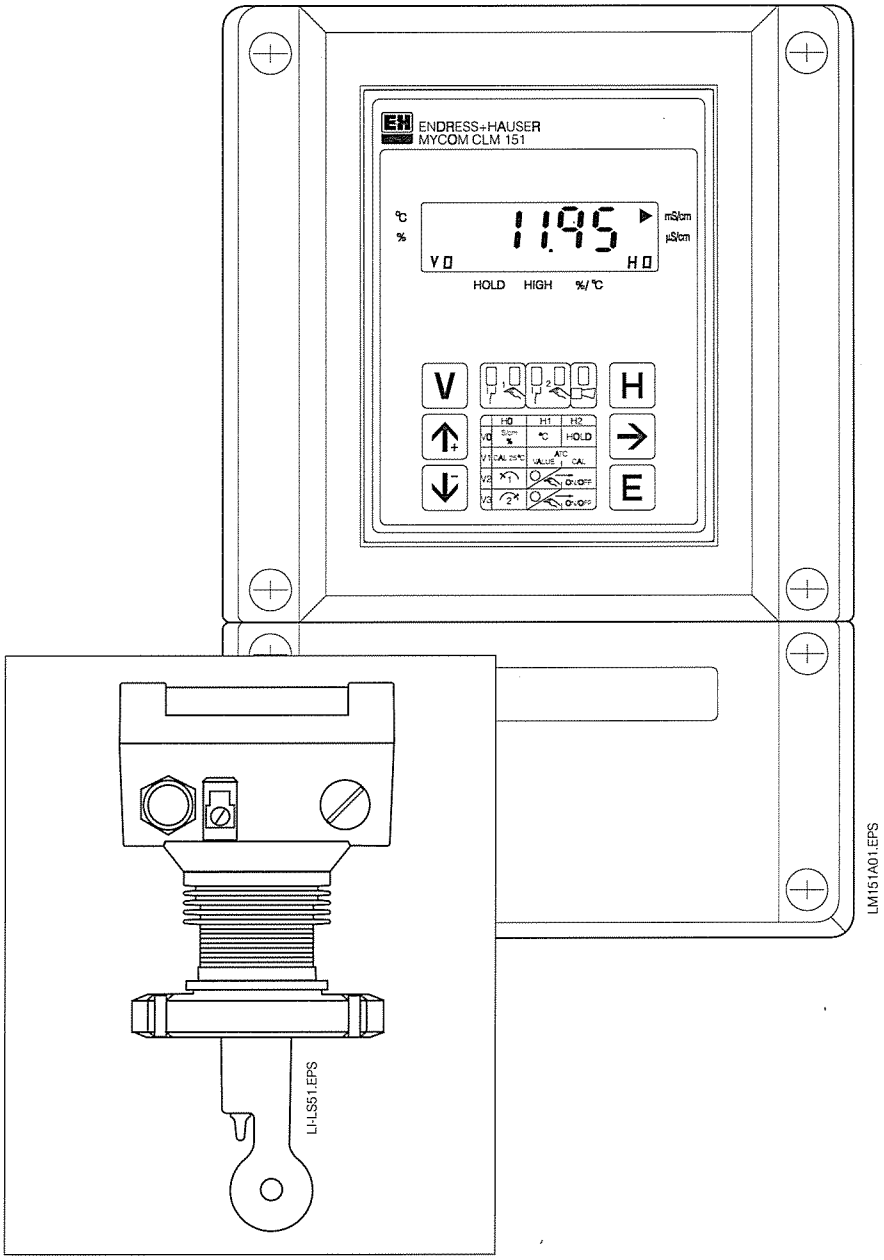
BA 125C/07/e/10.95
Software version 1.00 or later
No. 126 852 - 1000

mycom

CLM 121 / 151 - ID conductivity / temperature transmitter / controller

Installation and operating instructions





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Endress+Hauser

ISO 9001

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Table of contents

1. General

These installation and operating instructions describe the fully equipped conductivity measuring instruments Mycom CLM 121 and CLM 151 in conjunction with the inductive conductivity measuring cell CLS 51.

Note:

Digital interfaces require separate installation and operating instructions from the Mycom family of instruments:
- Mycom serial interface (BA 078C/07/e)

1.1 Unpacking

- Inspect for any damaged packaging! The post office or freight carrier must be informed of any damage. Damaged packaging material must be retained until the matter has been settled.
- Verify that the contents are undamaged! Inform the post office or freight carrier as well as the supplier of any damage.
- Check that the delivery is complete and agrees with the shipping documents and that the unit type and version match the nameplate (see fig. 1.1).

The scope of delivery of the Mycom CLM 121 (panel-mounted unit) includes:
- 2 housing mounting elements (order no. 50047795)
- 1 submin D connector (units with digital interface only; order no. 50051998)
- Installation and operating instructions
- Instrument identification card(s)

The scope of delivery of the Mycom CLM 151 includes:
- 1 housing mounting kit (order no. 50061357)
- 1 measuring point marking tag (order no. 50061359)
- Installation and operating instructions
- Instrument identification card(s)

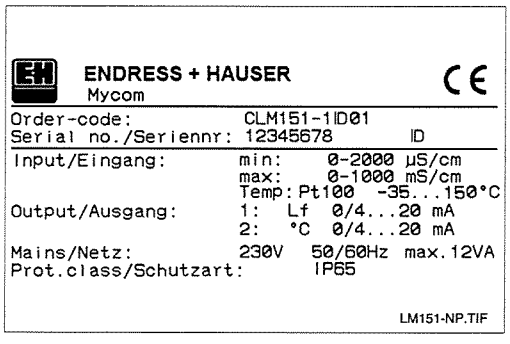
If you have any questions, consult your supplier or your competent Endress+Hauser sales center (see back page of these installation and operating instructions for addresses).

1.2 Application

The Mycom CLM 121 and 151 are microprocessor-based measuring and control instruments used to determine conductivity. State-of-the-art engineering enables these instruments to be adapted to all conductivity measuring tasks in a simple manner.

Typical areas of application are:

- Pharmaceutical industry
- Foodstuffs industry
- Monitoring of CIP systems
- Product monitoring
- Phase separation



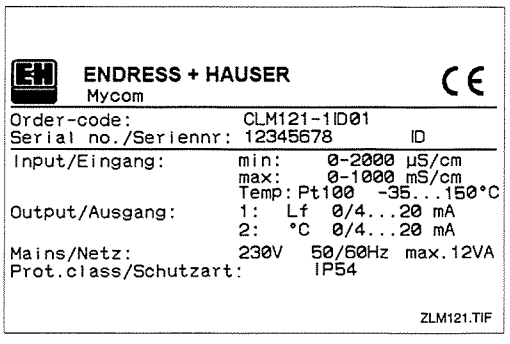


Fig. 1.1: Nameplates
left: Mycom CLM 151
right: Mycom CLM 121

1.3 Order code

Mycom CLM 121 / 151

Housing types
121 Housing for panel installation, 96 x 96 mm, ingress protection IP 54 (front)
151 Field 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 to customer specifications

Instrument variant
CD Measurement of specific conductivity,
for connection to 2-electrode measuring cells;
user-programmable measuring ranges
MM Measurement of specific resistance,
for connection to measuring cells with a cell constant of 0.01 cm^{-1};
measuring range 0 ... 1 µS/cm or 0 ... 20 MΩ x cm selectable
ID Measurement of specific conductivity,
for connection of inductive measuring cells CLS 51;
user-programmable measuring ranges
YY Special version to customer specifications (upon request)

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

Outputs
0 One 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
6 0/4 ... 20 mA output for conductivity with additional RS 485 Rackbus interface
9 Special version to customer specifications

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

Note:

Only instrument variant ID is described in these installation and operating instructions.

2. Measuring system

The measuring system consists of:

- the inductive conductivity measuring cell CLS 51 built into a pipe, tank or vat
- the corresponding conductivity measuring cable, type OMK

- alternatively
  - the conductivity measuring instrument Mycom CLM 121 in the housing for panel mounting, or
  - the conductivity measuring instrument Mycom CLM 151 in the field housing

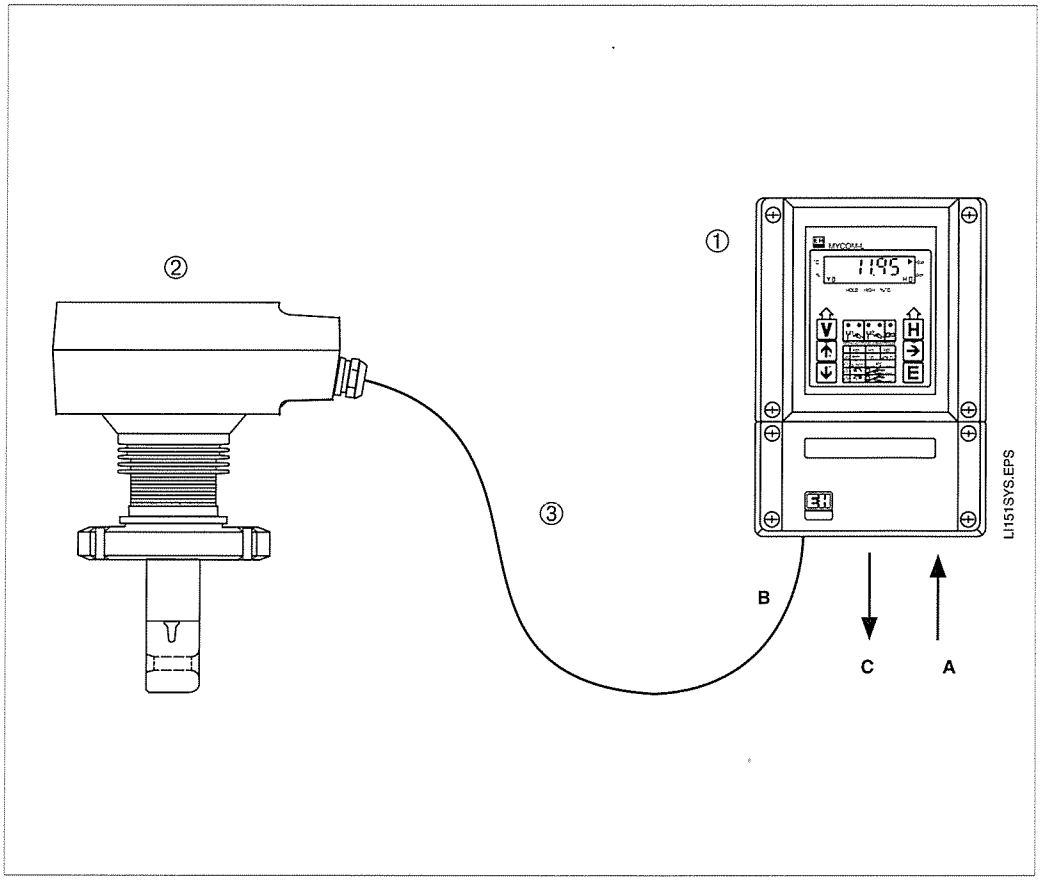


Fig. 2.1: Example of a complete measuring system with:

① Conductivity measuring instrument Mycom CLM 151
A: Power supply (e.g., 230 V AC / 50 Hz)
B: Connector for meas. cable to inductive conductivity measuring cell CLS 51
C: Conductivity output; optionally additional temperature output (0 / 4 ... 20 mA) or digital interface (RS 232-C or RS 485)

② Inductive conductivity measuring cell CLS 51

③ Conductivity meas. cable OMK

3. Installation

3.1 Dimensions

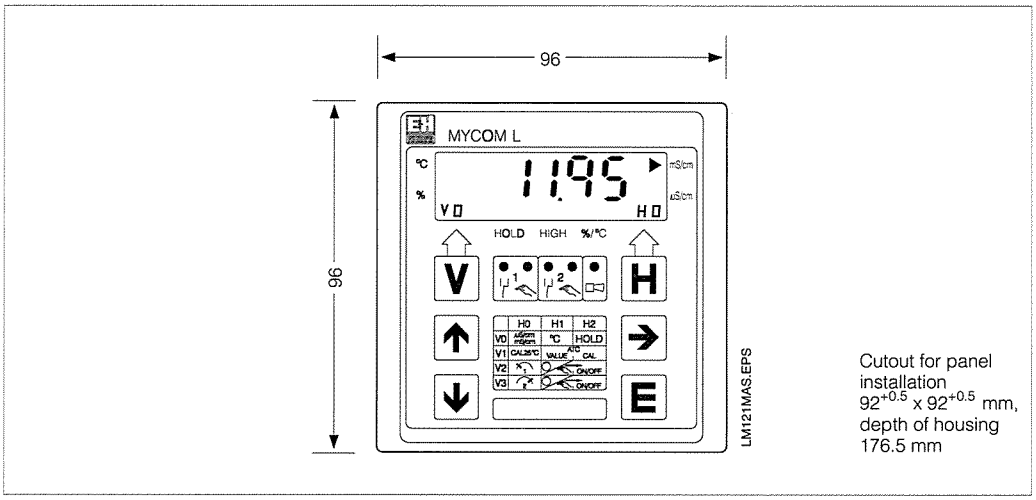


Fig. 3.1: Dimensions of Mycom CLM 121

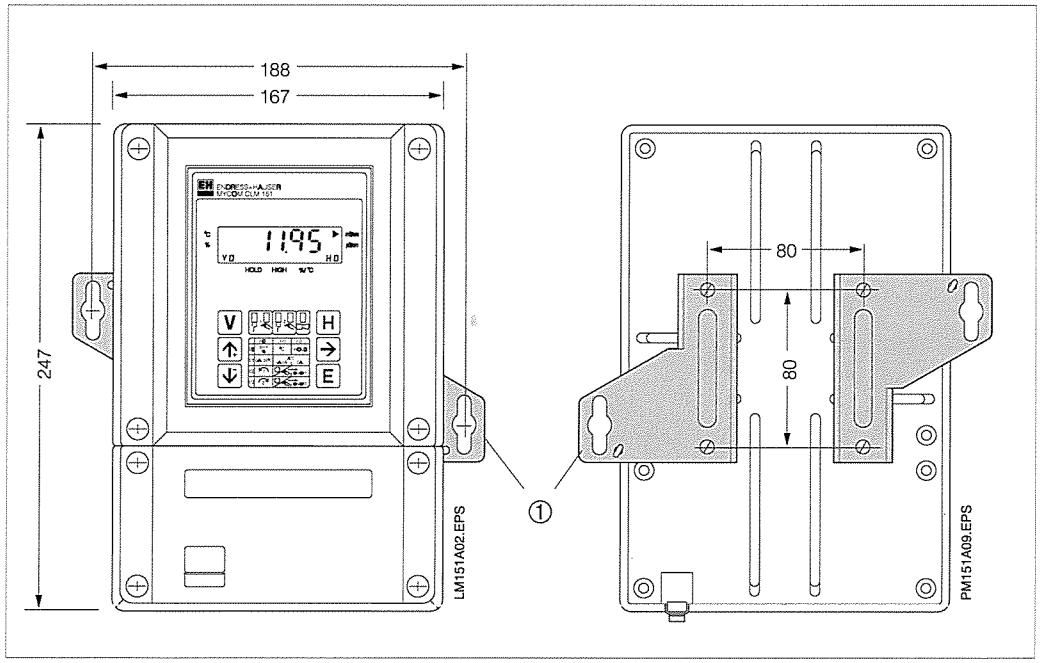


Fig. 3.2: (left) Dimensions of Mycom CLM 151

① Mounting brackets for wall installation (screw Ø 6 mm)

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

Note:
Mounting brackets and straining screws are supplied in the housing mounting kit.

3.2 Mounting types

3.2.1 Panel mounting of Mycom CLM 121

Required cutout for panel mounting in accordance with DIN 43 700:
$92^{+0.5}$ x $92^{+0.5}$ mm.
The instrument is mounted by means of the supplied housing mounting kit.

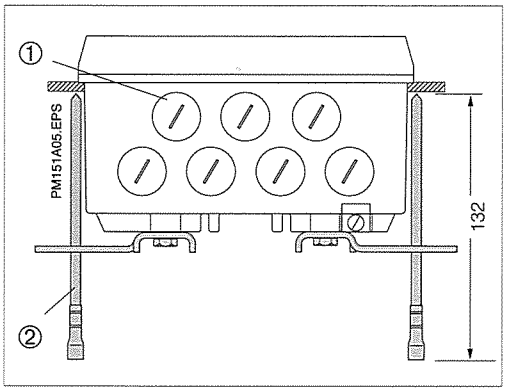


Fig. 3.4: Bottom of field housing with mounting dimensions and straining screws installed for panel mounting

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).

Required cutout for panel mounting:
$161^{+0.5}$ x $241^{+0.5}$ mm (W x H).

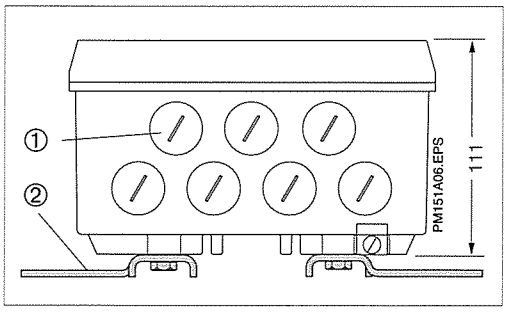


Fig. 3.5: Bottom of field housing with brackets installed for wall mounting

① Screw plugs for Pg 13.5
② Mounting brackets

3.2.3 Wall mounting

Install the mounting brackets on the rear of the instrument according to fig. 3.3.

See figure 3.2 for the housing and mounting dimensions of the field housing.

3.2.4 Post mounting

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

The parts of the housing mounting kit are to be installed on the rear of the unit in accordance with figs. 3.6 and 3.7.

Refer to chapter 9.1 regarding the accessories available for the Mycom CLM 151.

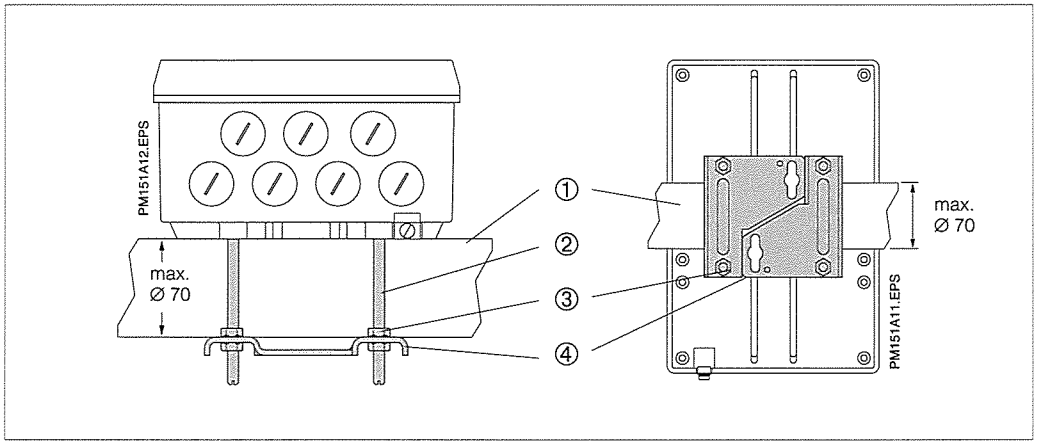


Fig. 3.6: Installation of field housing on horizontal tubing

left: bottom view
right: rear view

① Horizontal tubing
② Threaded rods M6 x 92
③ Fastening nut M6
④ Mounting plate

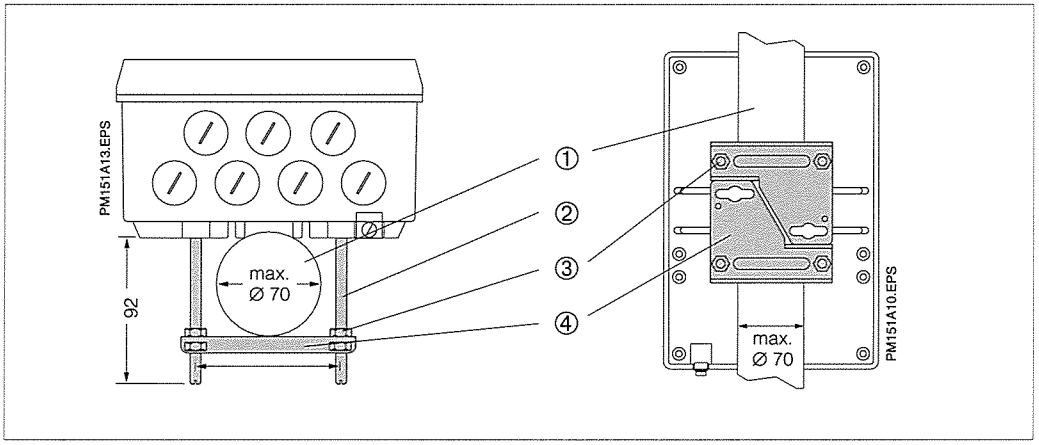


Fig. 3.7: Installation of field housing on vertical tubing

left: bottom view
right: rear view

① Vertical tubing
② Threaded rods M6 x 92
③ Fastening nut M6
④ Mounting plate

3.3 Accessories for installation

3.3.1 Weather protection cover CYY 101

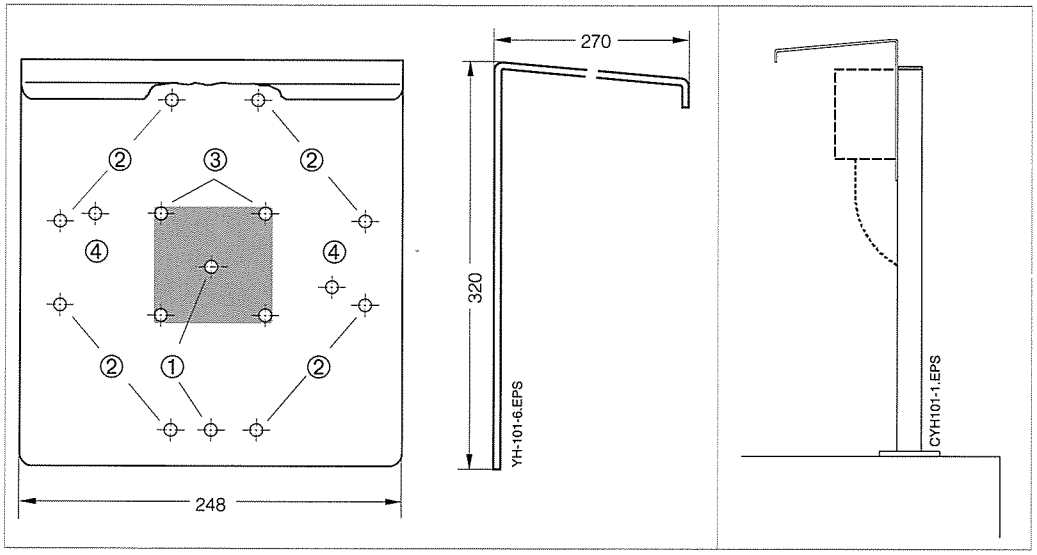


Fig. 3.8: (left) Weather protection cover CYY 101 with dimensions and mounting positions for

① installation on upright post with 2 M8 screws
② installation on vertical or horizontal tubing with 2 round post mounts
③ installation of conductivity measuring instrument Mycom CLM 151
④ wall installation of conductivity measuring instrument Mycom CLM 151

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

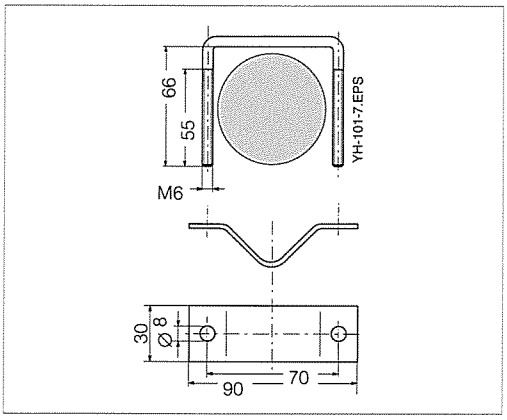


Fig. 3.10: Post mounting kit for weather protection cover CYY 101 not mounted on assembly holder CYH 101

Weather protection cover CYY 101 is required for outdoor installation of Mycom CLM 151.

- Install instrument on weather protection cover.
- Install weather protection cover with instrument
  - on upright post or
  - on round post or
  - on wall.

See fig. 3.8 for position of mounting holes.

The weather protection cover CYY 101 can be installed directly on the upright post of assembly holder CYH 101 by means of 2 screws (M8), see fig. 3.8, mounting position ①).

Installation on vertical or horizontal tubing and upright posts (max. diameter 70 mm) requires an additional post mounting kit (see chapter 9.1 and fig. 3.10).

Warning:

The weather protection cover must be installed in the case of direct exposure to sunlight.

Note:

Following cable connection, the housing cover screws are to be tightened uniformly in order to assure proper sealing. Proceed from one screw to the next in circular fashion. Tighten the Pg cable glands all the way to the stop.

4. Electrical connection

4.1 Basics for connection

Cautions:

- The instrument must be grounded before start-up!
- If faults cannot be remedied, the instrument must be removed from service and secured to prevent accidental start-up.
- Repair work must be carried out directly by the manufacturer or by the Endress+Hauser Service Organization.

Warnings:

- The notes and warnings in these operating instructions must be strictly adhered to!
  Maintenance work may only be carried out by qualified personnel if the instrument remains energized!
- This instrument has been tested for electromagnetic compatibility with industrial areas according to EN 50081-2, 03.94 and prEN 50082-2, 11.94.
  This is only valid, however, for a properly grounded instrument with a screened measured value output line.

Keep the screen ground line as short as possible. Soldered extensions of the screen are impermissible!

Ground the post when installing the field housing (CLM 151) to increase immunity to interference. Running the cable in the post will improve interference suppression.

Notes:

- This instrument has been built and tested in accordance with EN 61010-1, and left the manufacturer's works in perfect condition.
- Any faults in the instrument may be remedied with the aid of the error list in chapter 7.3 without requiring intervention in the instrument itself.

  Interventions in or changes to the instrument are impermissible and will void the warranty.
- After installing and connecting the instrument and sensors, the entire measuring system must be checked for proper function.

4.2 Manufacturer's certificate

This is to certify that the measuring instruments

Mycom CLM 121 / 151 - ID

have been radio interference-suppressed in accordance with the regulations as decreed in BMPT bulletin 243 / 199 with supplement 46 / 1992, EN 55 011.91 = DIN VDE 0875, part 11, k 07.92 and EN 50 081-1.

The German Federal Office for Telecommunication Approvals was advised that these units have been brought into circulation and was granted the right to inspect the series for conformance with the regulations.

Endress+Hauser
Conducta

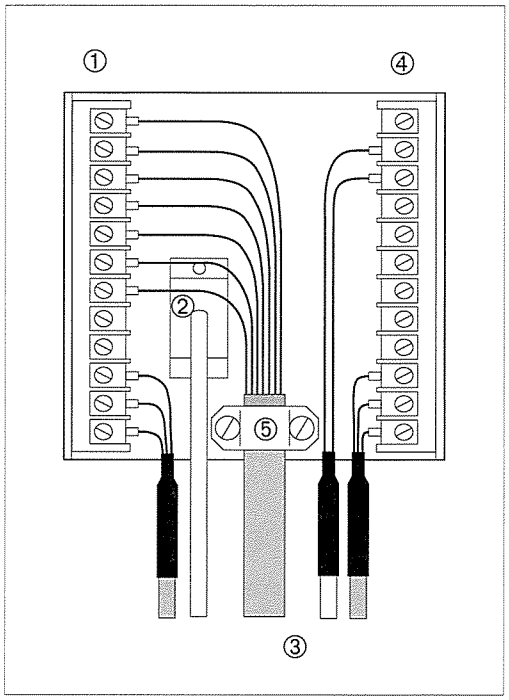


Fig. 4.1: Mycom CLM 121
Rear of instrument with electrical connections

① Terminal strip for transmitter and signal lines
② Terminal for output 2 or submin D connector (digital interface only)
③ Conductivity meas. cable OMK
④ Terminal strip for power supply and switching contacts
⑤ Strain relief clamp for OMK and additional screen connection for outer measuring cable screen
Note:
The strain relief clamp is connected directly to the protective conductor

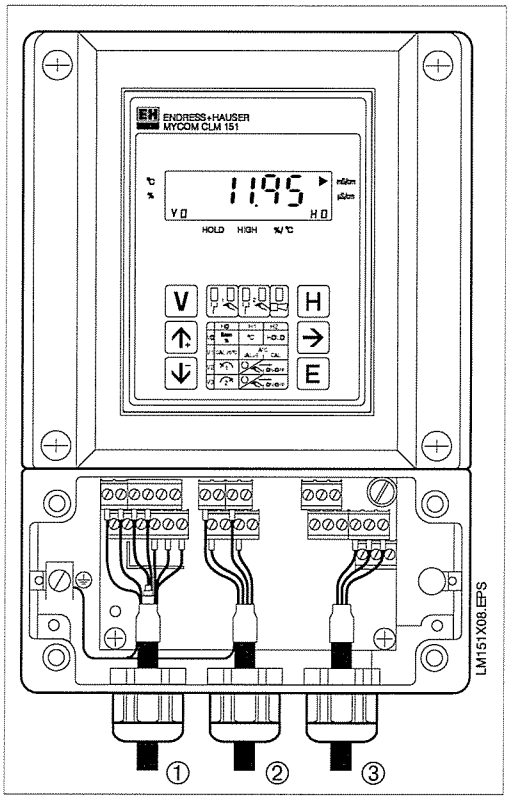


Fig. 4.2: Mycom CLM 151
with instrument connections in separate terminal connection compartment

① Input: Conductivity sensor
② Output: Temperature or interface
③ Power supply

4.3 Connection of CLM 121 / 151

The electrical connections to the unit are established as follows:

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

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

  – Replace the screw plugs underneath the unit with the corresponding number of Pg cable glands.
  – Introduce the connecting cables through the Pg cable glands (see fig. 4.2).
  – Connect the unit according to the connection diagram (see fig. 4.5). Signal cables must be spatially separated from mains and power cables.
  – Tighten the cable glands.
  – Install the cover on the separate terminal connection compartment and tighten the cover screws.

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 with 1.5 mm^2 each and end sleeves 1 litz wire with 2.5 mm^2 and end sleeve
Terminal designations:	acc. to DIN 45140

4.4 Connection diagram

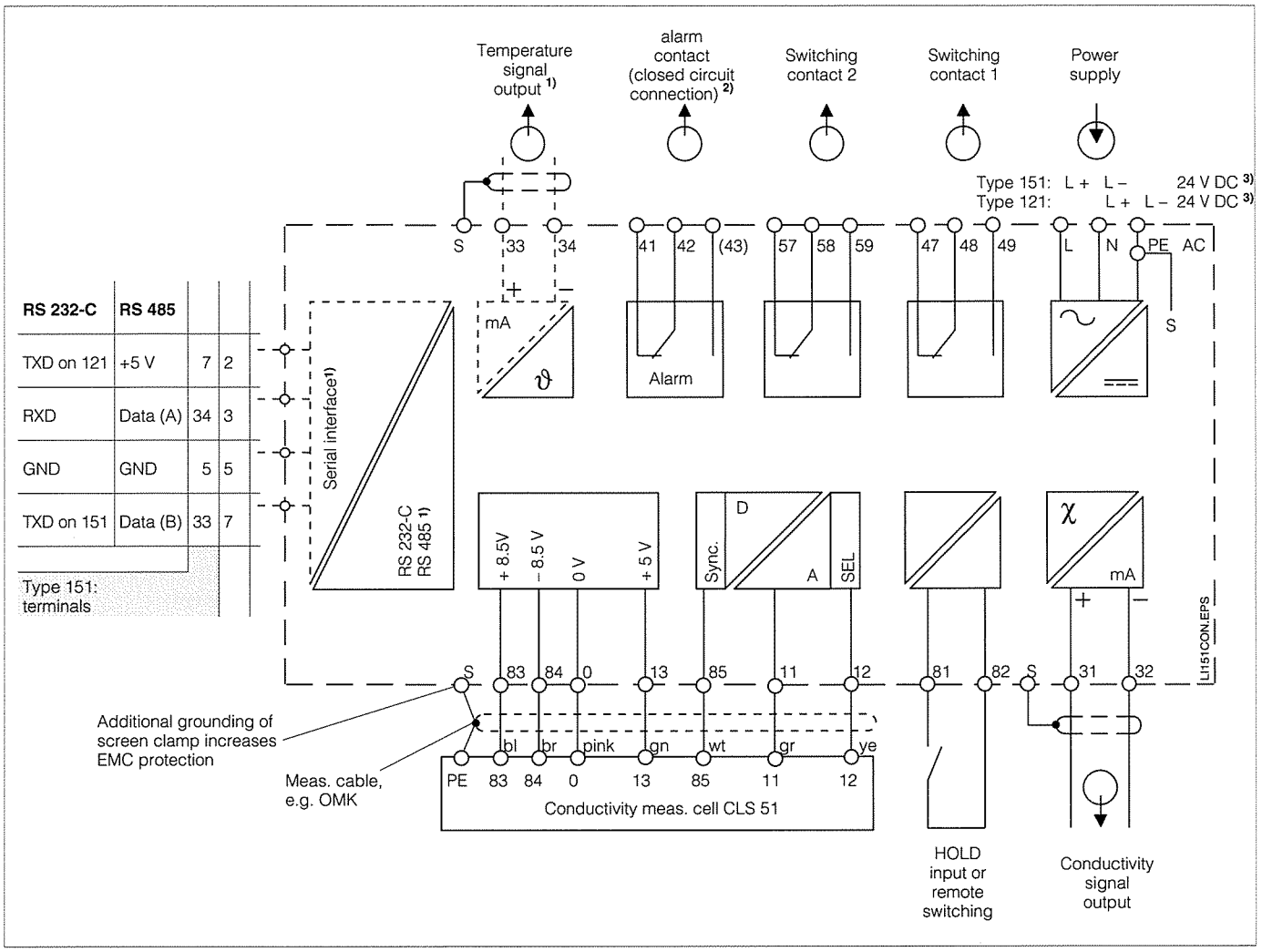


Fig. 4.4: Electrical connection of Mycom CLM 121 / 151

Note:

- The connection diagram shows the fully equipped unit!

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

2) Contact status shown: no current or fault present.

All switching contacts are interference-suppressed by varistors. External loads connected may have to be additionally interference-suppressed.

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

5. Start-up

5.1 Power-up

Caution:

Before switching on the unit, verify if the mains voltage ratings match the specifications on the nameplate (see fig. 1.1).

The Mycom must be electrically connected to the field electronics of the CLS 51 for synchronisation to take place!

Note:

- The conductivity measuring cell should be located in the medium to be measured.
- After power-up, all LCD segments of the display are briefly activated (for approx. 2 seconds) and all LEDs turn red.
  Then the unit starts measuring.
  The operating and start-up levels are locked.

5.2 Power failure

- Measuring operation continues in the event of a power failure with a maximum duration of approx. 20 milliseconds.
- Measuring operation is interrupted if there is a power failure with a duration of more than 20 milliseconds, 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 values which can be entered in the matrix fields are listed in the operating matrix (see chapter 6.3).

A detailed description of the functions of the individual matrix fields follows in chapter 6.6. This chapter also lists the factory settings.

The following minimal settings are required to start up the measuring system:

Field	Function
Unlocking the start-up level (see chapter 6.2)	
Measurement and calibration	
V1 / H7	Sensor adaptation entry (see chapter 6.4)
V4 / H0	Operating mode selection (see chapter 5.4)
Operating mode 0:	
V1 / H5	Measuring range selection (see chapter 5.4)
Operating mode 1:	
V4/ H1	Measuring range assignment L (see chapter 6.7)
V4/ H2	Measuring range assignment H (see chapter 6.7)
Operating mode 2:	
V4/ H1	Substance assignment L (see chapter 6.7)
V4/ H2	Substance assignment H (see chapter 6.7)
Limit function and alarm	
Refer to chapter 6.9 for adjustment sequence.	

5.4 Operating mode and measuring range selection

5.4.1 Operating mode 0

Conductivity measurement

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

MR no.	Measuring range
0	0 ... 2000 µS / cm
1	0 ... 20.00 mS / cm
2	0 ... 200.0 mS / cm
3	0 ... 1000 mS / cm
4	0 ... 1000 mS / cm

In measuring range 4, the instrument automatically switches among measuring ranges 0 to 3. The display format also changes automatically.

A delay of approx. 6 s may occur with automatic measuring range switching. The current output has a fixed 0 to 1000 mS/cm output range assignment. The external hold input is used in operating mode 0.

Hold			
Input (term. 81 / 82)	**Status arrow display**	**Current output**	**Limit contacts**
open	–	active	active
closed	„HOLD“	frozen	normal position

5.4.2 Operating mode 1

Conductivity measurement with remote switching (RSw)

In operating mode 1 „MR switching“, the Mycom can store the data of four measuring ranges:

- user-defined measuring range assignment (0/4 ... 20 mA)
- independent setpoints and hysteresis values for both limit contacts
- individual temperature coefficients
- alarm tolerance

Switching between two preselected measuring ranges is effected via the external remote switching input (RSw).

Remote switching			
RSw input (term. 81 / 82)	**Range**	**Status arrow display**	**Meas. range assignment**
open	H	„HIGH“	V4 / H2
closed	L	–	V4 / H1

The following measuring ranges can be individually assigned to the LOW or HIGH range:

MR no.	Measuring range
0	0 ... 2000 µS / cm
1	0 ... 20.00 mS / cm
2	0 ... 200.0 mS / cm
3	0 ... 1000 mS / cm

5.4.3 Operating mode 2

Concentration measurement with substance switching

The data of four substances is permanently stored in the instrument for the concentration measurement mode of operation. The data of four additional substances can be entered individually within the permissible value ranges. This data is stored and represents concentration measuring ranges that can be activated as required. See chapter 6.7, Concentration measurement, for further information.

Legend:

MR = measuring range
RSw = remote switching
HOLD = external hold input

6. Operation

6.1 General notes on operation

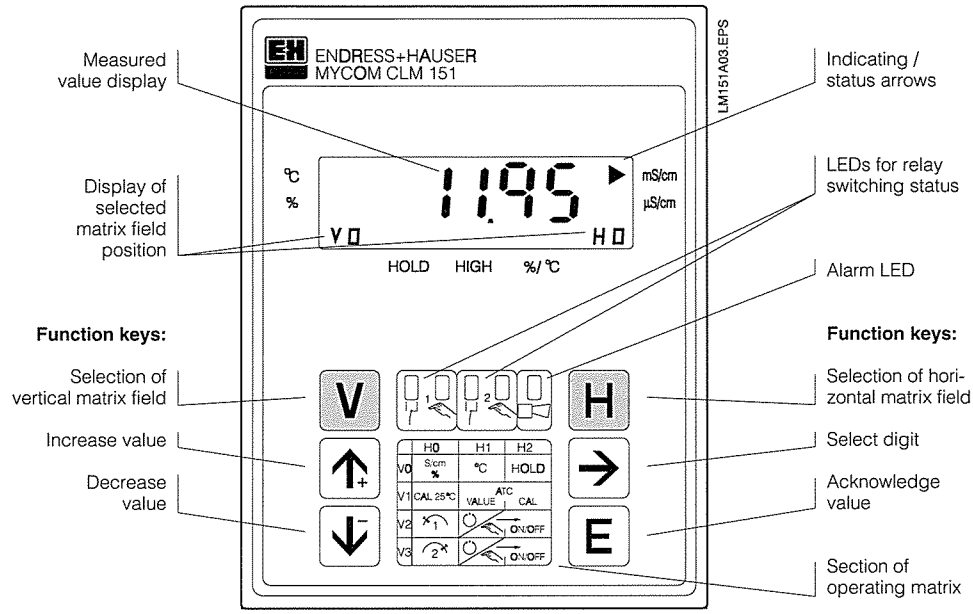


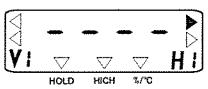
Fig. 6.1: Mycom CLM 121 / 151 Front view of instrument with display and operating elements

The operation of the unit is matrix-oriented. Each function of the unit is assigned a position in a matrix consisting of 10 x 10 fields (fields V0 / H0 to V9 / H9).

The individual operating functions are selected via the V (vertical) and H (horizontal) keys. These keys cycle through the matrix fields one-by-one, including fields that are unused.
The matrix fields can be divided up into 3 groups according to their function:

- 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 contacter functions) Access code: **2222**

Without previous code entry, the contents of the individual matrix fields can only be displayed.
All matrix fields for which the corresponding instrument function has not been enabled display:



Access to levels 1 and 2 is restricted, requiring entry of an access code.
Unlocking level 2 will also make all functions of level 1 accessible to the operator.

Keys for value entry and function selection:

Value adjustment

Selection of digit. Press this key to cycle through the decimal places starting with the 1st decimal place.

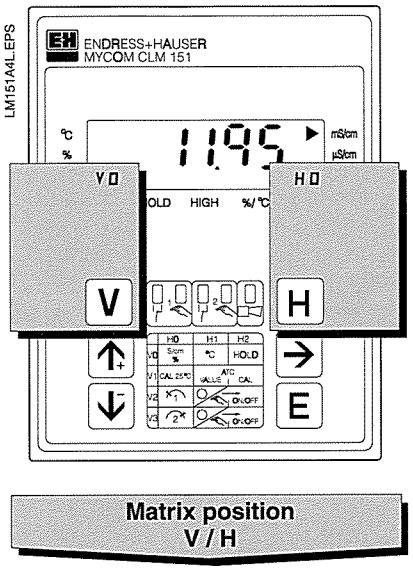
Acknowledge (enter) value

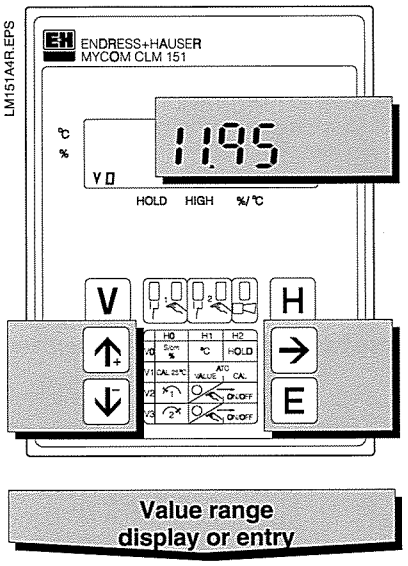
Recall value

Note:

Whenever there has been a power failure, the instrument automatically returns to the measured value display function (matrix field V0 / H0).

6.2 Matrix user interface





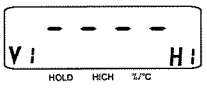
V V key:
Selection of matrix rows (matrix fields V0 to V9)

Each press of this key increases the V (matrix row) display by 1.

H H key:
Selection of matrix columns (matrix fields H0 to H9

Each press of this key increases the H (matrix column) display by 1.

Display for locked matrix fields:



Display for matrix fields that can be changed:
The decimal place that can be edited flashes.

Use the following keys to enter values and select functions:

Increase value

Decrease value

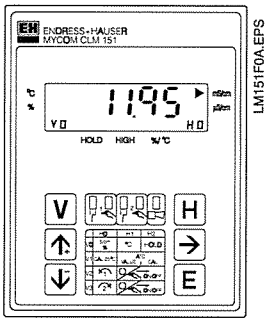
- Selection of decimal place. This key cycles through the digits starting with the first decimal place.
- Start entry
- Recall after E

E Acknowledge (enter) value.
Verification: Continuous display indicates that value has been stored.

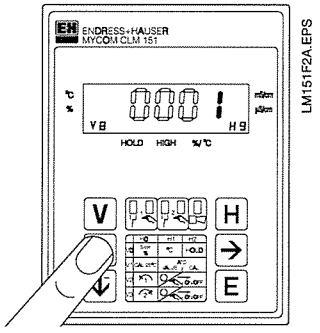
6.2.1 Unlocking the levels

- Press the E key in matrix field V0 / H0 (measured value display) to proceed to matrix field V8 / H9 (access code entry).
- Unlock level 1, **operation**, by entering **code 1111** or
- level 2, **start-up**, and level 1, **operation**, by entering **code 2222**
- Acknowledge by pressing the E key
- Jump back to matrix field V0 / H0 (measured value display) by pressing the V and H keys at the same time

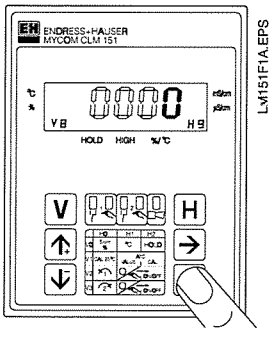
Example for unlocking level 1 (operation)



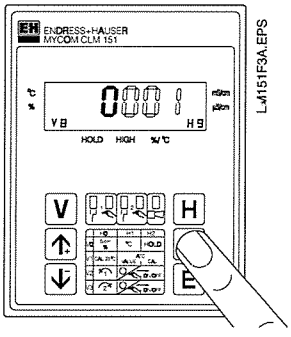
Initial status:
Instrument is in measuring mode.
Matrix field position displayed: V0 / H0



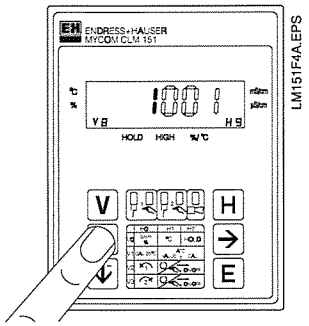
Step 2:
Set value 1 with „ ↑+ “ key.



Step 1:
Press „ E “ key.
Matrix field V8 / H9 „Unlock / Lock“ is selected.
Decimal place 4 flashes on the display.

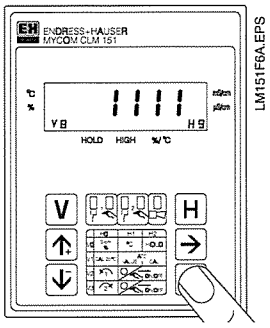


Step 3:
Press the „ → “ key once to cycle to decimal place 1.
Decimal place 1 flashes.

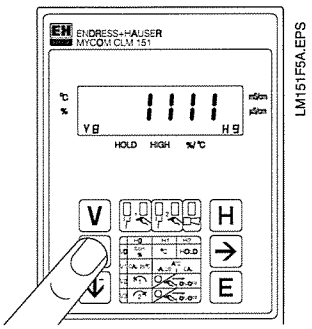


Step 4:
Set value **1** with „ ↑+ “ key.

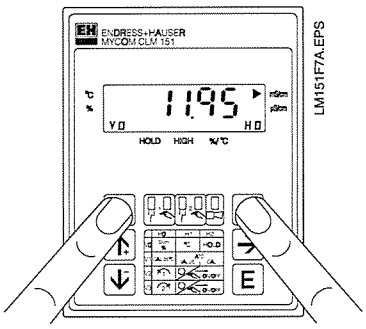
Steps 5 and 6:
Same as steps 3 and 4.
Press the „ → “ key to access decimal place 2 and set value **1**.



Step 9:
Press the „ E “ key.
The code **1111** required to unlock the operation level has now been entered.
All matrix fields of the operation level are now unlocked, i.e. accessible to the operator for changes and entries.



Steps 7 und 8:
Same as steps 3 and 4.
Press the „ → “ key to access decimal place 3 and set value **1**.
The display should now show the value **1111**. If this is not the case, steps 2 to 8 can be repeated as required.



Step 10:
Press the V and H keys at the same time.
The instrument is back in the measuring mode, matrix field position V0 / H0.

Unlocking level 2 (start-up)

Proceed as described for steps 1 to 10 but enter the code **2222**.

Locking levels 1 and 2

Proceed as described for steps 1 to 10 but enter or edit to any numeric value **except** 1111 or 2222.

Note:

- Locking value 0000 is always displayed at the first start-up or after a power failure.
- Only field V8 / H9 can be accessed directly by pressing the „ E “ key.
  All other matrix fields are accessed by individual selection with the „ V “ and „ H “ keys.
- However, you may **jump** to matrix field **V0 / H0** from any field by pressing the „ V “ and „ H “ keys at the same time.

6.3 Operating matrix

6.3.1 Operating mode 0: conductivity measurement

(See chapter 6.6 for description of operating functions.)

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

V \ H	0	1	2	3
Basic functions I **0**	Measurement 0 to 1000 mS / cm	Temperature display -35 to +150 °C	HOLD OFF / ON 0 = OFF 1 = ON	Toggle 0 ... 20 mA / 4 ... 20 mA 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	Entry of temperature coefficient 0 to 10.0 % / °K	Determination of temperature coefficient	Selection of type of temp. compensation 0 = linear with α (25 °C) 1 = linear α (V1 / H4 °C) 2 = NaCl compensation
Limit / contact configuration for limit contacter 1 **2**	Setpoint entry 0 to 2000 µS / cm 0 to 1000 mS / cm	Toggle Auto / Manual 0 = manual 1 = automatic	Manual OFF / ON Measured value	Pickup delay 0 to 6000 s
Limit / contact configuration for limit contacter 2 **3**	Setpoint entry 0 to 2000 µS / cm 0 to 1000 mS / cm	Toggle Auto / Manual 0 = manual 1 = automatic	Manual OFF / ON Measured value	Pickup delay 0 to 6000 s
Measuring mode **4**	Operating mode 0 = cond. with ext. HOLD 1 = cond. with RSw 2 = conc.			
Substance-specific parameters for limit contacters 1 and 2 **5**				
Substance-specific parameters % and α tables **6**				
Alarm **7**	Alarm threshold 1 to 600 µS / cm 1 to 300 mS / cm	Alarm delay 0 to 6000 s	Toggle steady / fleeting contact 0 = steady contact 1 = fleeting contact	Alarm assignment 0 = both limit contacts 1 = contact 1 2 = contact 2 3 = no limit contact
Configuration **8**	Parity 0 = none 1 = odd 2 = even	Toggle baud rate 0 = 4800 Bd 1 = 9600 Bd		
Service and simulation **9**	Diagnostic code E--- to E255		Display instrument configuration 0000 to 9999	Software version 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	Toggle linear / bilinear characteristic
0.2 to 20.0 mA / s	0 to 2000 µS / cm 0 to 1000 mS / cm	0 to 2000 µS / cm 0 to 1000 mS / cm	–35 to +125 °C	–10 to +150 °C	0 = linear 1 = bilinear
Reference temperature	Measuring range selection	Absolute display of measuring range selected	Entry of sensor adaptation see chapter 6.4		Calibration of temperature measurement
–35 to +150 °C	0 to 4	2000 µS / cm to 1000 mS / cm	0.600 to 1.400		– 3.0° C ... + 30° C
Dropout delay	Toggle MIN / MAX	Toggle NC / NO contact	Hysteresis		
0 to 6000 s	0 = MIN 1 = MAX	0 = norm. closed contact 1 = norm. open contact	max. 10% of measuring range		
Dropout delay	Toggle MIN / MAX	Toggle NC / NO contact	Hysteresis		
0 to 6000 s	0 = MIN 1 = MAX	0 = norm. closed contact 1 = norm. open contact	max. 10% of measuring range		
					Unlock / Lock
					0000 to 9999
Device address	Recall factory settings (defaults)			Simulation ON / OFF	Output current simulation
1 to 32				0 = simulation OFF 1 = simulation ON	0.00 to 20.00 mA

6.3.2 Operating mode 1: conductivity measurement with remote switching

(See chapter 6.6 for description of operating functions.)

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

	V \ H	0	1	2	3
Basic functions I	0	Measurement	Temperature display	HOLD OFF / ON	Toggle 0 ... 20 mA / 4 ... 20 mA
		0 to 1000 mS / cm	-35 to +150 °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)			Selection of type of temp. compensation
		≥ 0.4 x measuring range			0 = linear with α (25 °C) 1 = linear α (V1 / H4 °C) 2 = NaCl compensation
Limit / contact configuration for limit contacter 1	2	see V5 / H1	Toggle Auto / Manual	Manual OFF / ON	Pickup delay
			0 = manual 1 = automatic	Measured value	0 to 6000 s
Limit / contact configuration for limit contacter 2	3	see V5 / H3	Toggle Auto / Manual	Manual OFF / ON	Pickup delay
			0 = manual 1 = automatic	Measured value	0 to 6000 s
Measuring mode	4	Operating mode	Meas. range assignment L	Meas. range assignment H	
		0 = cond. with ext. HOLD 1 = cond. with RSw 2 = conc.	0 = 0 to 2000 µS / cm 1 = 0 to 20 mS/cm 2 = 0 to 200 mS/cm 3 = 0 to 1000 mS/cm	0 = 0 to 2000 µS / cm 1 = 0 to 20 mS/cm 2 = 0 to 200 mS/cm 3 = 0 to 1000 mS/cm	
Measuring range-specific parameters for limit contacters 1 and 2	5	Measuring range selection	Setpoint 1	Hysteresis 1	Setpoint 2
		0 to 3	0 to 1000 mS / cm	max. 10% of measuring range	0 to 1000 mS / cm
	6				
Alarm	7		Alarm delay	Toggle steady / fleeting contact	Alarm assignment
			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	Toggle baud rate		
		0 = none 1 = odd 2 = even	0 = 4800 Bd 1 = 9600 Bd		
Service and simulation	9	Diagnostic code		Display instrument configuration	Software version
		E— to E255		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			-35 to +125 °C	-10 to +150 °C	
Reference temperature		Absolute display of measuring range selected	Entry of sensor adaptation see chapter 6.4		Calibration of temperature measurement
-35 to +150 °C		2000 µS / cm to 1000 mS / cm	0.600 to 1.400		- 3.0° C ... + 3.0° C
Dropout delay	Toggle MIN / MAX	Toggle NC / NO contact			
0 to 6000 s	0 = MIN 1 = MAX	0 = norm. closed contact 1 = norm. open contact			
Dropout delay	Toggle MIN / MAX	Toggle NC / NO contact			
0 to 6000 s	0 = MIN 1 = MAX	0 = norm. closed contact 1 = norm. open contact			
Hysteresis 2	Alarm threshold	Conductivity at 0 / 4 mA	Conductivity at 20 mA	Entry of temperature coefficient	
max. 10% of measuring range	max. 30 % of measuring range	0 to 1000 mS / cm	0 to 1000 mS / cm	0 to 10.0 % / °K	
					Unlock / Lock
					0000 to 9999
Device address	Recall factory settings (defaults)			Simulation ON / OFF	Output current simulation
1 to 32				0 = simulation OFF 1 = simulation ON	0.00 to 20.00 mA

6.3.3 Operating mode 2: concentration measurement

(See chapter 6.6 for description of operating functions.)

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

	V \ H	0	1	2	3
Basic functions I	0	Measurement	Temperature display	HOLD OFF / ON	Toggle 0 ... 20 mA / 4 ... 20 mA
		0 to 99.99 %	–35 to +150 °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 / contact configuration for limit contacter 1	2	see V5 / H1	Toggle Auto / Manual	Manual OFF / ON	Pickup delay
			0 = manual 1 = automatic	Measured value	0 to 6000 s
Limit / contact configuration for limit contacter 2	3	see V5 / H3	Toggle Auto / Manual	Manual OFF / ON	Pickup delay
			0 = manual 1 = automatic	Measured value	0 to 6000 s
Measuring mode	4	Operating mode	Substance assignment L	Substance assignment H	
		0 = cond. with ext. HOLD 1 = cond. with RSw 2 = conc.	1 = NaOH 2 = HNO_3 3 = N_2SO_4 4 = H_3PO_4 5 to 8 user-selectable	1 = NaOH 2 = HNO_3 3 = N_2SO_4 4 = H_3PO_4 5 to 8 user-selectable	
Substance-specific parameters for limit contacters 1 and 2	5	Substance number selection	Setpoint 1 (%)	Hysteresis 1 (%)	Setpoint 2 (%)
		1 = NaOH 2 = HNO_3 3 = N_2SO_4 4 = H_3PO_4 5 to 8 user-selectable	0 to upper % range value	0 to upper % range value	0 to upper % range value
Substance-specific parameters % and α tables	6	Selection of conductivity meas. range	% table: number of value pairs	% table: value pair selection	% table: conductivity value
		0 = 2000 µS / cm 1 = 20.00 mS / cm 2 = 200.0 mS / cm 3 = 1000 mS / cm	2 to 10	1 to 10	0 to max. conductivity
Alarm	7		Alarm delay	Toggle steady / fleeting contact	Alarm assignment
			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	Toggle baud rate		
		0 = none 1 = odd 2 = even	0 = 4800 Bd 1 = 9600 Bd		
Service and simulation	9	Diagnostic code		Display instrument configuration	Software version
		E---- to E255		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			–35 to +125 °C	–10 to +150 °C	
Reference temperature		Absolute display of measuring range selected	Entry of sensor adaptation see chapter 6.4		Calibration of temperature measurement
–35 to +150 °C		2000 µS / cm to 1000 mS / cm	0.600 to 1.400		– 3.0° C ... + 3.0° C
Dropout delay	Toggle MIN / MAX	Toggle NC / NO contact			
0 to 6000 s	0 = MIN 1 = MAX	0 = norm. closed contact 1 = norm. open contact			
Dropout delay	Toggle MIN / MAX	Toggle NC / NO contact			
0 to 6000 s	0 = MIN 1 = MAX	0 = norm. closed contact 1 = norm. open contact			
Hysteresis 2 (%)	Alarm threshold (%)	% at 0 / 4 mA	% at 20 mA		
0 to upper % range value	0 to upper % range value	0 to upper % range value	0 to upper % range value		
% table: concentration value	α table: selection of value pair	α table: temperature value	α table: temperature coefficient α		
0 to 99.99 %	1 to 3	–35 to +150 °C	0 to 10.0 % / °C		
					Unlock / Lock
					0000 to 9999
Device address	Recall factory settings (defaults)			Simulation ON / OFF	Output current simulation
1 to 32				0 = simulation OFF 1 = simulation ON	0.00 to 20.00 mA

6.4 Entry of sensor adaptation factor

Matrix field V1 / H7; level 2

Different pipe diameters and the various geometries of the different CLS 51 sensor versions influence measurement in the per cent range depending on the measuring cell and sensor version being used.
These influences can be corrected by entering the appropriate sensor adaptation factor in matrix field V1 / H7.

The adaptation factors for the various pipe cross sections to be used for the different variants of the CLS 51 sensor are listed in the table below.

Version / Pipe diameter	MV 1 Dairy pipe fitting DN 50, DIN 11851	CS 1 Clamp fitting 2"	GE 1 Internal thread G1½„	VA 1 Varivent connection	AP 1 APV connection
DN 40	–	–	–	0.990	0.990
DN 65	1.000	1.000	1.000	1.000	1.000
DN 80	1.000	1.000	1.000	1.000	1.000
DN 100	1.000	1.000	1.000	1.000	1.000
DN 125	1.000	1.000	1.000	1.000	1.000
DN 162	1.000	1.000	1.000	1.000	1.000

Note:

Measuring cell versions MV1, CS1 and GE1 can only be installed in pipes with diameters of DN 65 or larger

6.5 Calibration

6.5.1 Calibration of conductivity measurement

Matrix field V1 / H0; level 1 (operation)

General

The measuring cell may be calibrated for absolute value measurement. This calibration is not mandatory.

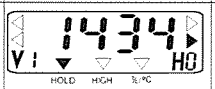
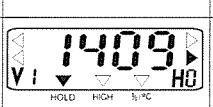
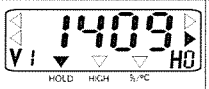
Calibration requires a measuring solution with a known conductivity.
Refer to chapter 9.2 for a table for KCl calibration solutions.

The conductivity of the calibration solution must be at least 40 % of the upper measuring range value and must not exceed 3 times the upper range value, e.g.:

Measuring range:	2000 µS / cm
KCl cal. solution:	0.01 mol / l
Conductivity:	1409 µS / cm at 25 °C

Procedure

- Temper calibration solution to 25 °C.
- Immerse measuring cell in calibration solution.
- Follow procedure outlined in table below.

Funktion	Matrix field command	Display value	Instrument display	Notes
Immerse measuring cell in calibration solution!				
Activate the calibration function	V1 / H0 →	Measured conductivity (not temperature-compensated)		Hold function is activated
Start the calibration function	→	**Uncalibrated** conductivity of calibration solution		Observe temperature of calibration solution; wait until value is stable
Enter the calibration solution value on the display via the keypad	→, ↑+, ↓−	**Calibrated** conductivity of calibration solution		Enter the correct conductivity value of the calibration solution
Store the calibration value **or** abort the calibration function	E V / H			Calibration value is stored; an error message may be displayed [1]

Legend:

▽ Status / indication arrow invisible

▼ Status / indication arrow visible

Calibration errors

[1] – The permissible tolerance band with regard to factory calibration is ± 20 %.
– Values above or below this tolerance range will produce error messages 80 to 82 (see chapter 7.3, Error list).
– Error list entries 80 to 82 are retained in the list even after a power failure.
– A calibration error will set the cell constant to the minimum or maximum value depending on the deviation.
– The values are stored up to the next successful calibration procedure.
– The original values are retained if the calibration function is aborted by pressing the V / H keys without pressing the E key.

6.5.2 Temperature calibration

Matrix field V1 / H9;
Level 1 (operation)

General

For precision temperature measurement, the temperature sensor in the measuring cell can be calibrated independent of the conductivity measurement.

This type of calibration requires a precision temperature sensor for comparison.

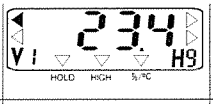
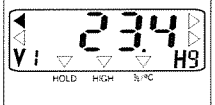
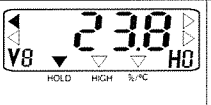
The measuring solution temperature must lie within the specified temperature measuring range of –35 °C ... +150 °C.

This calibration actually shifts the Pt 100 characteristic by the edited offset.

This value can be calibrated in a range of –3.0 °C ... +3.0 °C relative to the current temperature value.

Procedure

- Immerse measuring cell in measuring solution along with precision temperature sensor
- Proceed as outlined in table below

Function	Matrix field command	Display value	Instrument display	Notes
Immerse measuring cell and precision temperature sensor in measuring solution!				
Activate the calibration function	V1 / H9	Measured temperature value		Wait until display value is stable
Start the calibration function	→, ↑+ , ↓–			Enter correct temperature value as measured by precision temperature sensor
Store the calibration value **or** abort the calibration function	E V / H			The temperature corrected by the offset is displayed. Offset is stored

Legend:

▽ Status / indication arrow invisible

▼ Status / indication arrow visible

6.6 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 its concentration (see fig. 6.2).

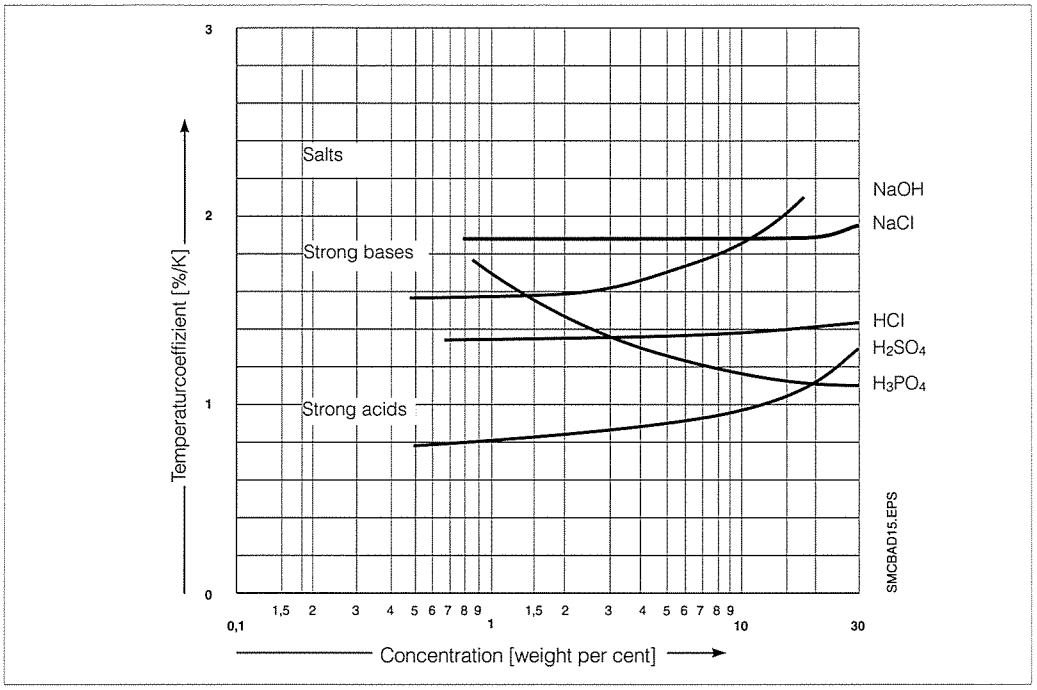


Fig. 6.2: Temperature coefficient of different electrolyte solutions as a function of concentration. Reference temperature T_{ref} = 25° C

Saline solutions have a non-linear temperature coefficient. The NaCl characteristic is stored in the Mycom instrument.

This NaCl characteristic corresponds to DIN IEC 746 for low concentrations.

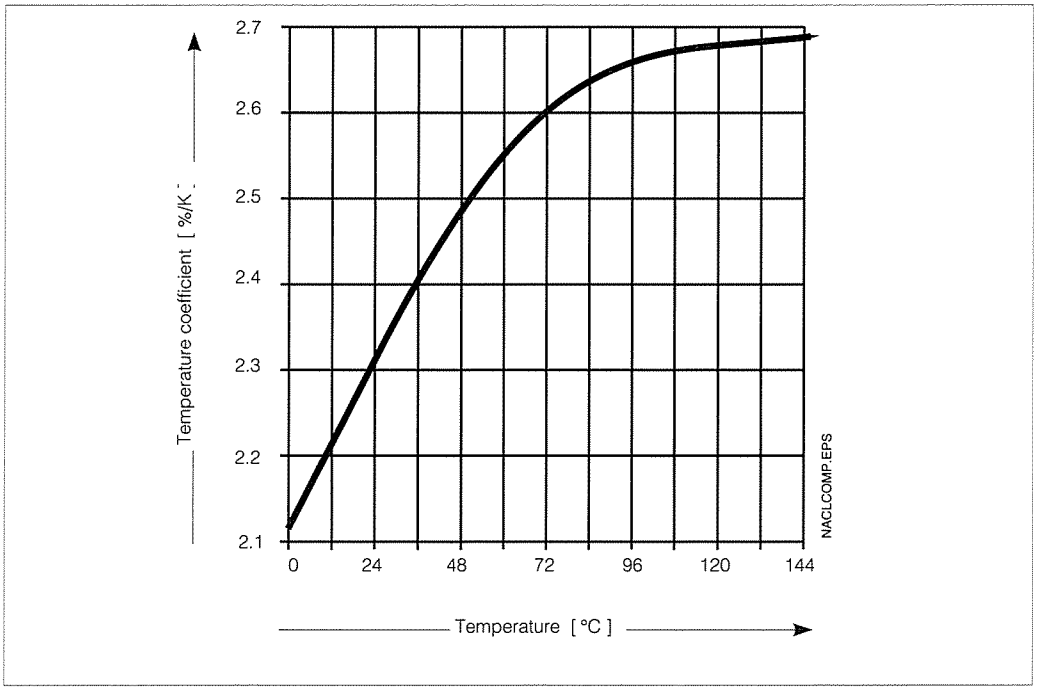


Fig. 6.3: Temperature coefficient of NaCl solutions as a function of temperature

The possible working range of the unit within which a temperature compensation can be performed over the instrument's entire measuring range is shown below.

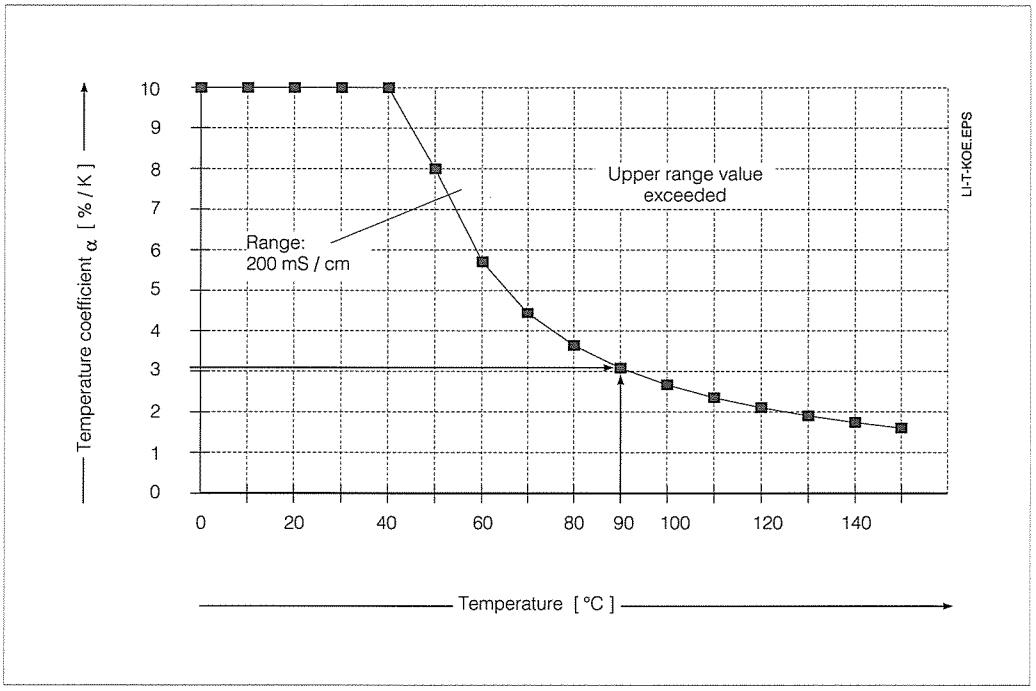


Fig. 6.4: Limit curves for temperature coefficient
Reference temperature 25 °C

Example:
A temperature coefficient of 3 % / K has been selected.
The automatic temperature compensation is effective at temperatures of up to +90 °C.

Note:

When the possible compensation range is exceeded, the display continues to show the maximum value.
Error message 27, „Input conductivity excessive", is signalled.

6.6.1 Entry and determination of temperature coefficient

No.	Function	Matrix field	Notes
1	Temperature compensation type	V1 / H3	See chapter 6.6 for explanation
2	Reference temperature	V1 / H4	Not for NaCl compensation
3	Temperature coefficient:		
	- Entry	V1 / H1	Not for NaCl compensation
		V5 / H8	in operating mode 1
	- Determination	V1 / H2	For unknown temperature coefficients only (operating mode 0)

Note:

Refer to chapter 6.6.2 for concentration measurement.

Entry of temperature coefficient
(matrix field V1 / H1)

- In the case of linear temperature compensation referred to 25 °C or a user-selectable reference temperature value, the value of the temperature coefficient is entered in matrix field V1 / H1.
- If the temperature coefficient value is unknown, it may be determined experimentally. To do this, select matrix field V1 / H2. The instrument then automatically calculates the temperature coefficient.
- No temperature coefficient value can 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 (also see fig. 6.3).

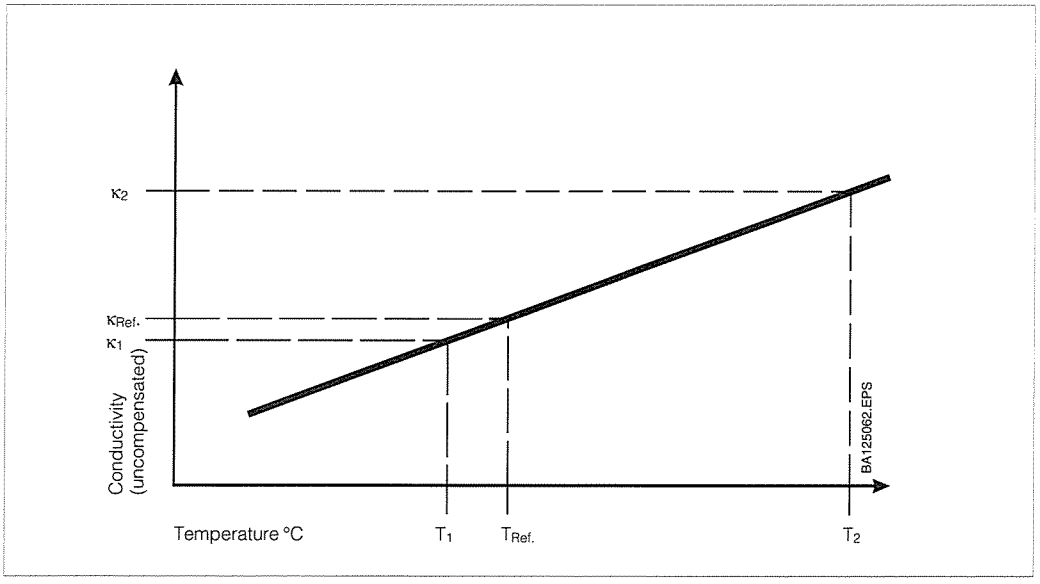


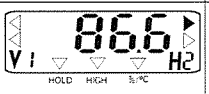
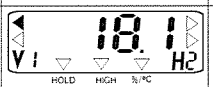
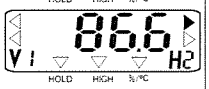
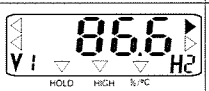
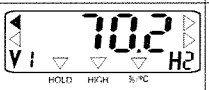
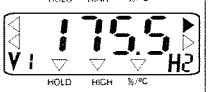
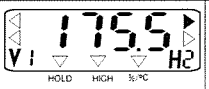
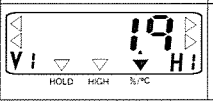
Fig. 6.5: Determination of temperature coefficient α

$T_{Ref.}$: reference temperature (standard = 25 °C)
κ_0: conductivity at T_{Ref}
$\kappa_{1,2}$: uncompensated conductivity value at T_1, T_2

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

Experimental determination of temperature coefficient α (see fig. 6.5)
(only possible in operating mode 0)

- The measuring solution is measured at two temperature values T_1 and T_2.
- Temperature T_1 should be as close to the reference temperature as possible.
- For best results, temperature T_2 should be close to the maximum operating temperature of the measuring solution. (Difference between T_2 and T_1: at least 30 °C).
  The procedure used to determine the temperature coefficient is outlined in the table below.

Function	Cmd. / matrix field	Display value	Instrument display	Notes
Matrix field selection	V1 / H2	Conductivity at temperature T_1		
Temperatur display	→	Temperature T_1		Press → key to toggle between conductivity and temperature display
	→			
Store conductivity χ_1 and temperature T_1 value pair	E	Conductivity at temperature T_1		Wait for conductivity and temperature to stabilize before storage
Warm measuring solution	→	Temperature T_2 (T_2 at least 30 °C above T_1)		Press → key to toggle between conductivity and temperature display
	→			
Store conductivity χ_2 and temperature T_2 value pair	E			Wait for conductivity and temperature to stabilize before storage. Repeat in case of error. *) Temperature T_1 is used as the reference temperature if V1 / H3 = 1.
Display of temperature coefficient computed by instrument	V1 / H1			

Note:

*) Error conditions are signalled if:

- temperature difference $T_2 - T_1 \leq 30$ °C (error 85, see error list in chapter 7.3)
- conductivity $\kappa_1 = 0$ (error 86)
- temperature coefficient determined is to small or too large (error 87, 88)

6.7 Concentration measurement

The data of four substances are permanently stored in the instrument for the concentration measurement mode of operation.

Individual data within the permissible value ranges can be additionally entered, stored and retrieved as concentration measuring ranges when required.

The external substance switching input (RSw) is used to select one of two preselected measuring ranges.

Remote switching			
RSw input (term. 81 / 82)	**Range**	**Status arrow display**	**Meas. range assign-ment**
open	H	„HIGH“	V4 / H2
closed	L	–	V4 / H1

Subst. no.	Subst.	Concentration range	Measuring range	Programming
1	NaOH	0 ... 15.0 %	0 ... 2000 µS / cm	–
2	HNO_3	0 ... 20.0 %	0 ... 20.00 mS / cm	–
3	H_2SO_4	0 ... 20.0 %	0 ... 200.0 mS / cm	–
4	H_3PO_4	0 ... 12.0 %	0 ... 1000 mS / cm	–
5	free	0 ... 99.99 %	MR 0/1/2/3	via interface
6	free	0 ... 99.99 %	MR 0/1/2/3	via interface
7	free	0 ... 99.99 %	MR 0/1/2/3	via keypad
8	free	0 ... 99.99 %	MR 0/1/2/3	via keypad

Range values for measuring ranges:
MR0: 0 to 2000 µS/cm
MR1: 0 to 20.00 mS/cm
MR2: 0 to 200.0 mS/cm
MR3: 0 to 1000 mS/cm

6.7.1 Entry of concentration values

(operating mode 2)

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

- Conductivity range
  2000 µS / cm
  20.00 mS / cm
  200.0 mS / cm
  1000 mS / cm
- Concentration table as a function of conductivity
- α value table as a function of temperature
- Independent setpoint and hysteresis values for both limit contacts
- Alarm threshold
- Concentration values for the lower and upper current output 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 digital RS interface.

The concentration and α tables for substances 5 and 6 can only be read and written via the RS interface.

The concentration and α tables for substances 7 und 8 can be read and written both via the operating matrix and the RS interface.

The substance number is selected in matrix field V5 / H0 (selection of substance number) to which matrix fields V5 / H1 to V5 / H7 and V6 / H0 to V6 / H7 refer.

When supplying substance parameters via the RS interface, you must first write matrix field V5 / H0 to make sure the subsequent data is assigned to the desired substance. Data entered via the RS interface only be comes visible in the operating matrix following a successful consistency check.

Step	Function	Matrix field	Notes
1	Substance assignment to L and H ranges	V4 / H1 V4 / H2	The desired substance numbers are assigned to the L and H ranges. If remote switching is not used, it is only necessary to assign a substance number to the L range.
2	Selection of substance number	V5 / H0	Ranges available for selection: 1 ... 4: fixed 5 ... 8: user-selectable 5 and 6 only through RS interface
3	Selection of conductivity range	V6 / H0	Ranges available for selection: 0 ... 2000 µS / cm 0 ... 20 mS / cm 0 ... 200 mS / cm 0 ... 1000 mS / cm
4	Entry of number of table value pairs for concentration	V6 / H1	A minimum of 2 value pairs is required. The maximum is 10 value pairs.
5	Selection of value pair number and entry of concentration / conductivity value pairs	V6 / H2 V6 / H3 V6 / H4	% table: value pair number % table: conductivity % table: concentration value
6	Entry of corresponding temperature coefficients α	V6 / H5 V6 / H6 V6 / H7	Three temperature / α value pairs must be entered. α table: value pair number α table: temperature value α table: temperature coefficient α

Note:

Chapter 6.7 contains detailed descriptions of the individual functions.

6.7.2 Concentration value consistency check

When the value pairs for concentration and conductivity and the corresponding temperature coefficients are entered, the instrument automatically checks the values entered for consistency.
This consistency check is performed as soon as the V key is pressed or the V and H keys are pressed at the same time following entry or modification of pertinent values.

The instrument tests the following during the consistency check:

- Have the conductivity values been entered in ascending or descending order?
- Is the distance between conductivity values at least $^1/_{200}$ of the measuring range?
- Is the span at least $^1/_5$ of the measuring range?
- Have the temperature values been entered in ascending order and is the distance between temperature values at least 10 °C?

If the check reveals inconsistencies, this is indicated by error messages 93 to 96 (see error list in chapter 7.3), and the display jumps to matrix field V6 / H0.

If all values entered are valid, the Mycom sets the values stored in matrix fields V5 / H1 to V5 / H7 to the default values.

Note:

No measured value is displayed during the check and subsequent adaptation.

6.7.3 Temperature compensation for concentration measurement (operating mode 2)

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

The diagram below shows the limits within which the concentration of these substances can be measured depending on medium temperature.

When assigning concentration values to conductivity values individually (as described in chapter 6.6.3), the temperature coefficient must also be entered.

Note:

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

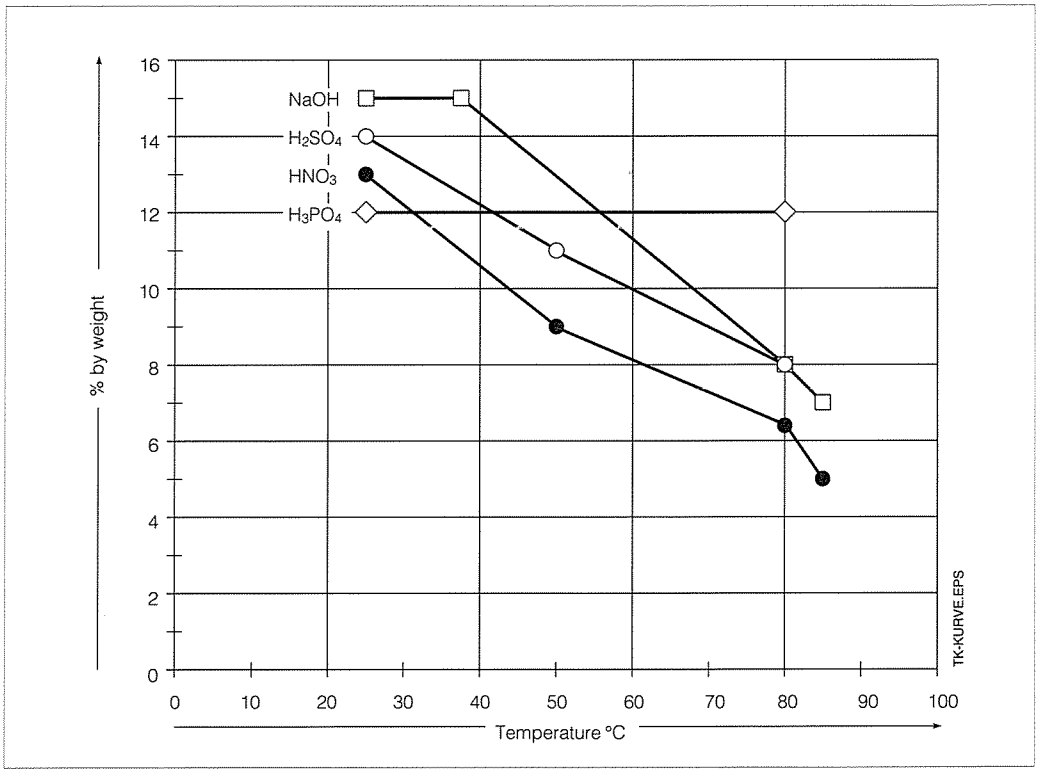


Fig. 6.6: Limit curves for concentration measurement in working temperature range

6.8 Description of operating functions

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
0 / 0	**Measurement** Displays the temperature-compensated conductivity or concentration value. 0 to 2000 µS 0 to 1000 mS 0 to 99.99 %: Note: „ → " key toggles between % and mS (in operating mode 2). Press the E key for direct access to field V8 / H9 (Unlock / Lock).		
0 / 1	**Temperature display** Displays the temperature in °C –35 ... +150 °C		
0 / 2	**HOLD OFF / ON** Activates the HOLD function. 0 = OFF 1 = ON If this field is set to 1, both current outputs are frozen to their current value. In the automatic mode of operation, all contacts are set to the normal position. Any alarm period accumulated is reset to 0.	0	
0 / 3	**Toggle 0 ... 20 mA / 4 ... 20 mA** Toggles the lower current output limit between 0 and 4 mA. 0 = 0 ... 20 mA 1 = 4 ... 20 mA This setting affects both current outputs.	1	
0 / 4	**Rate of rise mA / s (damping)** Sets the rate of rise of the current output for the measured value. 0.2 to 20.0 mA / s This setting does not affect the temperature output.	20.0	
In operating mode 1 or 2 or when a bilinear characteristic has been selected in field V0 / H9, matrix fields V0 / H5 and V0 / H6 cannot be modified (see chapter 5.4).			
0 / 5	**Conductivity at 0 / 4 mA** Entry of conductivity value for 0 or 4 mA as an absolute value. 0 to 2000 µS / cm 0 to 1000 mS / cm Error message 31 is issued if the difference between the upper and lower current values is less than 20 % of the measuring range.	0	
0 / 6	**Conductivity at 20 mA** Entry of conductivity value for 0 or 4 mA as an absolute value. 0 to 2000 µS / cm 0 to 1000 mS / cm Error message 31 is issued if the difference between the upper and lower current values is less than 20 % of the measuring range.	URV	

Note:

URV= upper range value

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
	Temperature output values can only be entered on units equipped with a temperature output (see chapter 1.3, Order code)!		
0 / 7	**Temperature at 0 / 4 mA** Entry of temperature value for 0 or 4 mA of 2nd current output. –35 to +125 °C The minimum difference from the value for 20 mA is 25 K; if below, error message 34 is issued.	0	
0 / 8	**Temperature at 20 mA** Entry of temperature value for 20 mA of 2nd current output. –10 to +150 °C The minimum difference from the value for 0 / 4 mA is 25 K; if below, error message 34 is issued.	100	
0 / 9	**Toggle linear / bilinear characteristic** Toggles the characteristic for the 1st current output. 0 = linear 1 = bilinear If set to 1, the output of the 1st current output is assigned a bilinear characteristic: Measuring range: ~~0 ... 10 %~~ / 10 ... 110 % Current output: ~~0 ... 50 %~~ / 50 ... 100 % e.g.: ~~0 ... 10 mA~~ / 10 ... 20 mA In operating mode 1 or 2, the output assignment is fixed to the linear characteristic, i.e. the assignment cannot be changed.	0	
1 / 0	**Calibration at 25 °C** See separate description: Calibration (chapter 6.5)		
	Matrix fields V1 / H1 and V1 / H2 are irrelevant in operating mode 1 or 2		
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 via V1 / H2. 0 to 10.0 % / °K The display shows – – – – if NaCl compensation has been selected in field V1 / H3. **Note:** The temperature coefficient is set to 2.1 % when the measuring range is switched.	2.1	
1 / 2	**Determination of temperature coefficient** see chapter 6.6.1 The temperature coefficient value determined is shown in field V1 / H1 (entry of temperature coefficient). It depends on the temperature compensation type setting: Linear at 25 °C: Reference temperatur T_{Ref} is always 25 °C. Linear at T_{Ref}: The measured reference temperature T_1 becomes the new reference temperature T_{Ref} NaCl compensation: Display shows – – – –.		

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
	Matrix field V1 / H3 is irrelevant in operating mode 2		
1 / 3	**Selection of temperature compensation type** Value range: 0 to 2 0 = Linear temperature compensation Reference temperature = 25 °C 1 = Linear temperature compensation User-defined reference temperature (enter temperature in field V1 / H4) 2 = Non-linear temperature compensation, NaCl curve For **NaCl compensation**, a value of 25 is entered in field V1 / H4.	2	
1 / 4	**Reference temperature** Entry of reference temperature to determine the electrical conductivity in steps of 0.1 °C –35 to +150 °C Field V1 / H3 must be set to 1.	25.0	
	Matrix field V1 / H5 is irrelevant in operating mode 1 or 2 (see matrix fields V4 / H1, V4 / H2 and V5 / H0)		
1 / 5	**Selection of measuring range 0 to 4** Selects a measuring range. Entry values: 0 to 4 MR no. — Measuring range (MR) 0 — 0 ... 2000 µS / cm 1 — 0 ... 20.00 mS / cm 2 — 0 ... 200.0 mS / cm 3 — 0 ... 1000 mS / cm This field is not accessible in operating modes 1 and 2. See chapter 1.2.1.3, Measuring ranges, for assignment of a measuring range number to the corresponding measuring range. The HOLD function is enabled during meas. range selection. Setpoints, hysteresis, current limits and alarm tolerances are set to the factory defaults. This field cannot be accessed via the interface.	0	
1 / 6	**Absolute measuring range display** Displays the maximum conductivity value for the measuring range selected. 2000 µS / cm to 1000 mS / cm		
1 / 7	**Entry of sensor adaptation factor** Entry of correction factor for the adapter in which the sensor is installed. 0.600 to 1.400 The value entered here compensates for the changes in measured value that are due to the adapter. See chapter 6.4 for entry values.	1.000	
1 / 9	**Calibration of temperature measurement** See chapter 6.5.2 Displays the temperature value in the range –35.0 to +150.0 °C The temperature value may be corrected by a maximum of ± 3 °C.	0.0	

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
	Matrix positions in parentheses apply to setpoint 2.		
2 / 0 (3 / 0)	**Setpoint entry** (controller 1 / controller 2) Entry of setpoint for limit contacter 1 or 2 as an absolute value. 0 to 2000 µS / cm 0 to 1000 mS / cm The value range and display format correspond to the measuring range selected. If a new measuring range is selected, the default value is used. **Note:** – In operating mode 1 or 2, this field is replaced by V5 / H1 (V5 / H3).	5 % of URV contr. 1 95 % of URV contr. 2	
2 / 1 (3 / 1)	**Toggle AUTO / MANUAL** (controller 1 / controller 2) 0 = MANUAL 1 = AUTO In the MANUAL mode of operation (limit contacter 1 or 2 switched to MANUAL or AUTO), the manual operation LED is red (see chapter 6.7). The contacts can now be operated manually via field V2 / H2. The contacts drop out upon return from AUTO to MANUAL.	1	
2 / 2 (3 / 2)	**Manual OFF / ON** (controller 1 / controller 2) If MANUAL has been selected in field V2 / H1, press – $\uparrow_+$ key to enable contact 1 (2) and – $\downarrow^-$ key to disable contact 1 (2). The current measured value is displayed.		
2 / 3 (3 / 3)	**Pickup delay** (controller 1 / controller 2) Entry of pickup delay for contact 1 or contact 2 of the limit contacter in seconds. 0 to 6000 s	0	
2 / 4 (3 / 4)	**Dropout delay** (controller 1 / controller 2) Entry of dropout delay for contact 1 or contact 2 of the limit contacter in seconds. 0 to 6000 s	0	
2 / 5 (3 / 5)	**Toggle MIN / MAX** (controller 1 / controller 2) Determines the function of contact 1 or contact 2: 0 = MIN 1 = MAX Significance of MIN setting: The contact is enabled when the value drops below the setpoint. Significance of MAX setting: The contact is enabled when the value exceeds the setpoint.	Contr. 1 0 = MIN Contr. 2 1 – MAX	
2 / 6 (3 / 6)	**Toggle NC / NO contact** (controller 1 / controller 2) Determines whether contact 1 or contact 2 is to be used as a normally closed (NC) or normally open (NO) contact. 0 = NC contact 1 = NO contact	1	

Note:

URV= upper range value

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
2 / 7 (3 / 7)	**Hysteresis** (controller 1 / controller 2) Sets the hysteresis for limit contacter 1 or 2 in absolute values. The max. hysteresis is 10 % of the measuring range selected. The hysteresis is displayed in conductivity units (mS / cm or µS / cm). The value range and display format correspond to the measuring range selected. If a new measuring range is selected, the default value is used. **Note:** – In operating mode 1 or 2, this field is replaced by V5 / H2 (V5 / H4).	1 % of URV	
4 / 0	**Operating mode** Selection of operating mode. The following modes of operation are available: 0 = conductivity measurement without remote switching 1 = conductivity measurement and remote switching between two defined measuring ranges 2 = concentration measurement and remote switching between two defined substances **Note:** – In operating mode 1 or 2, the following matrix fields are **inoperable**: V0 / H5, V0 / H6, V0 / H9 ; V1 / H1 to V1 / H3, V1 / H5; V2 / H0, V2 / H7; V3 / H0, V3 / H7; V7 / H0. However, the following matrix fields are **operable**: V4 / H1, V4 / H2; V5 / H0 to V5 / H7 (V5 / H 8); V6 / H0 to V6 / H7	0	

Note:

URV= upper range value

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
	Matrix fields V4 / H1, V4 / H2 and V5 / H0 to V5 / H7 can only be accessed in operating modes 1 and 2		
4 / 1	**Measuring range / substance assignment L** Assigns a measuring range or substance to the LOW range of the remote switching input. Operating mode 1: Value range = measuring range no. 0 ... 3 0 0 ... 2000 µS / cm 1 0 ... 20.00 mS / cm 2 0 ... 200.0 mS / cm 3 0 ... 1000 mS / cm Operating mode 2: Value range = substance concentrations 1 to 8: 1 = NaOH concentration: 0 to 15 % max. 2 = HNO_3 concentration: 0 to 20 % max. 3 = H_2SO_4 concentration: 0 to 20 % max. 4 = H_3PO_4 concentration: 0 to 12 % max. 5 ... 8 = user-definable 0 to 99.99 %	0 1	
4 / 2	**Measuring range / substance assignment H** Assigns a measuring range or substance to the HIGH range of the remote switching input. Value ranges: operating modes 1 and 2 see above, V4 / H1	0 operating mode 1 1 operating mode 2	
5 / 0	**Measuring range / substance number selection** Selection of measuring range / substance number for parameter entry in matrix fields V5 / H1 to V5 / H7 (V5 / H8) and V6 / H0 to V6 / H7 Operating mode 1: MR no. Measuring range 0 0 ... 2000 µS / cm 1 0 ... 20.00 mS / cm 2 0 ... 200.0 mS / cm 3 0 ... 1000 mS / cm Operating mode 2: Sub. no. Substance 1 = NaOH 2 = HNO_3 3 = H_2SO_4 4 = H_3PO_4 5 ... 8 = user-definable	0 1	
	Matrix fields V4 / H1, V4 / H2 and V5 / H0 to V5 / H7 can only be accessed in operating mode 1 or 2.		

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
5 / 1	**Setpoint 1** Entry of setpoint for limit contacter 1. Operating mode 1 (entry in absolute values): Value range and display format correspond to the measuring range selected in matrix field V5 / H0. Operating mode 2 (entry as a percentage): Subst. no. 1 ... 4: % range corresponds to concentration range selected 5 ... 8: 0 ... upper range value of concentration range as a percentage	5 % of URV 1: 0.75 % 2: 1.00 % 3: 1.00 % 4: 0.60 % 5...8: 5.00 %	
5 / 2	**Hysteresis 1** Entry of hysteresis value for limit contacter 1 Operating mode 1 (entry in absolute values): Max. 10 % of measuring range Operating mode 2 (entry as a percentage): Subst. no. 1 ... 4: % range corresponds to concentration range selected 5 ... 8: 0 ... upper range value of concentration range as a percentage	1 % of URV 1: 0.15 % 2: 0.20 % 3: 0.20 % 4: 0.12 % 5...8: 1.00 %	
5 / 3	**Setpoint 2** Entry of setpoint for limit contacter 2 Operating mode 1 (entry in absolute values): Value range and display format correspond to the measuring range selected in matrix field V5 / H0. Operating mode 2 (entry as a percentage): Subst. no. 1 ... 4: % range corresponds to concentration range selected 5 ... 8: 0 ... upper range value of concentration range as a percentage	95 % of URV 1: 14.25 % 2: 19.00 3: 19.00 4: 11.40 5...8: 95.00	
5 / 4	**Hysteresis 2** Entry of hysteresis value for limit contacter 2 Operating mode 1 (entry in absolute values): Max. 10 % of measuring range Operating mode 2 (entry as a percentage): Subst. no. 1 ... 8: % range corresponds to concentration range selected	1 % of URV 1: 0.15 % 2: 0.20 % 3: 0.20 % 4: 0.12 % 5...8: 1.00 %	

Note:

URV= upper range value

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
5 / 5	**Alarm threshold** Determines the threshold where an alarm condition starts if a limit is violated. The threshold is specified as a concentration percentage. Operating mode 1: Value range and display format correspond to the measuring range selected in matrix field V5 / H0. Operating mode 2: Subst. no. 1 ... 8: % % range corresponds to concentration range selected	5 % of URV 1: 0.75 % 2: 1.00 % 3: 1.00 % 4: 0.60 % 5...8: 5.00 %	
5 / 6	**Conductivity / % at 0 / 4 mA** Operating mode 1: Entry of conductivity for 0 or 4 mA. Value range and display format correspond to the measuring range selected in matrix field V5 / H0. Operating mode 2: Entry of concentration percentage for 0 / 4 mA Error message 98 is issued if the difference between the upper and lower current values is equivalent to less than 20 % of the conductivity measuring range.	0 0	
5 / 7	**Conductivity / % at 20 mA** Operating mode 1: Entry of conductivity for 20 mA. Value range and display format correspond to the measuring range selected in matrix field V5 / H0. Operating mode 2: Entry of concentration percentage for 20 mA Error message 98 is issued if the difference between the upper and lower current values is equivalent to less than 20 % of the conductivity measuring range.	URV 1: 15.00 % 2: 20.00 % 3: 20.00 % 4: 12.00 % 5...8: 99.99 %	
	Operating mode 1 only		
5 / 8	**Entry of temperature coefficient** Entry of temperature coefficient for temperature compensation in steps of 0.1 % / °K. 0 to 10.0 % / °K The display shows – – – – if field V1 / H3 is set to NaCl compensation. **Note:** A separate temperature coefficient must be entered for each measuring range.	2.1	

Note:

URV= upper range value

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
	Matrix fields V6 / H0 to V6 / H7 can only be accessed in operating mode 2		
6 / 0	**Selection of conductivity measuring range** Selection of the conductivity measuring range to be used to measure a substance concentration. Conductivity measuring ranges (MR): MR 0 = 2000 µS / cm MR 1 = 20.00 mS / cm MR 2 = 200.0 mS / cm MR 3 = 1000 mS / cm The measuring ranges are selected with the ↑+ and ↓- keys and acknowledged with the E key. The format of the subsequent entry of the conductivity value pairs and the editing limits in field V6 / H3 are dependent on this range selection. **Note:** – Display for substance numbers 1 to 6 is – – – – . – This field can only be accessed via the RS interface for substance numbers 5 and 6. – When working with the interface, the assigned measuring range numbers 0, 1, 2 and 3 are used in place of plain text.	1000	
6 / 1	**% table: number of value pairs** Determines the number of conductivity / concentration percentage value pairs used to compute the percentage. Value range for number of value pairs: 2 to 10 The instrument uses linear interpolation between adjacent value pairs in determining the measured value. The number entered here specifies the upper limit for the selection of a value pair number in matrix field V6 / H2. **Note:** – Display for substance numbers 1 to 6 is – – – – . – This field can only be accessed via the RS interface for substance numbers 5 and 6.	10	
6 / 2	**% table: selection of value pair number** This field selects the conductivity / concentration percentage value pair in the value pair table that is to be read or edited. The values that can be selected range from 1 to the maximum number of value pairs specified in field V6 / H1. When this field is accessed from matrix field V5 / H2 or V6 / H1, the display shows a flashing "1". However, another value pair number can be selected. Use the E key to acknowledge the value pair number. The Mycom then automatically jumps to field V6 / H3 where the corresponding conductivity value can be read or entered. **Note:** – Display for substance numbers 1 to 6 is – – – – . – This field can only be accessed via the RS interface for substance numbers 5 and 6.		

<table>
<tr><th>Matrix pos. V / H</th><th>Description of functions</th><th colspan="2">Parameter settings
Fact. | User</th></tr>
<tr><td>6 / 3</td><td>% table: conductivity value
This field is used to read or enter the conductivity value for the value pair in matrix field V6 / H2.
The format and range of the conductivity value are as determined via matrix field V6 / H0.

The corresponding unit indicating arrow is activated.
Press the E key to acknowledge the conductivity value and automatically proceed to field V6 / H4.
The conductivity values in a table of value pairs must be specified in a continuously ascending or descending order and must differ by at least $^1/_{200}$ of the measuring range selected.
The conductivity range must cover at least $^1/_5$ of the entire measuring range defined for the concentration.

<table>
<tr><th>No.</th><th>Cond. range</th><th>Entry range</th><th>Min. distance</th></tr>
<tr><td>MR 0</td><td>2000 µS/cm</td><td>400 ... 2000 µS/cm</td><td>10 µS/cm</td></tr>
<tr><td>MR 1</td><td>20.00 mS/cm</td><td>4.00 ...20.00 mS/cm</td><td>0.10 mS/cm</td></tr>
<tr><td>MR 2</td><td>200.0 mS/cm</td><td>40.0 ...200.0 mS/cm</td><td>1.0 mS/cm</td></tr>
<tr><td>MR 3</td><td>1000 mS/cm</td><td>200 ... 1000 mS/cm</td><td>5 mS/cm</td></tr>
</table>

Note:
– Display for substance numbers 1 to 6 is – – – – .
– This field can only be accessed via the RS interface for substance numbers 5 and 6.</td><td></td><td></td></tr>
<tr><td>6 / 4</td><td>% table: concentration value
This field is used to read or enter the concentration value for the value pair selected in matrix field V6 / H2.
0 to 99.99 %

Press the E key to acknowledge the % value and automatically proceed to field V6 / H2. When the last value pair has been reached, the display continues to show the last % value. Press the H key to proceed to field V6 / H5 in order to enter the temperature / α table.

Note:
– Display for substance numbers 1 to 6 is – – – – .
– This field can only be accessed via the RS interface for substance numbers 5 and 6.</td><td></td><td></td></tr>
<tr><td>6 / 5</td><td>α table: selection of value pair number
This field selects the temperature / α value pair that is to be read or edited in the value pair table.
Value range for value pair numbers:
1 to 3

When this field is accessed from matrix field V6 / H4 or V5 / H5, the display shows a flashing "1". However, another value pair number can be selected.

Note:
– Display for substance numbers 1 to 6 is – – – – .
– This field can only be accessed via the RS interface for substance numbers 5 and 6.</td><td></td><td></td></tr>
</table>

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
6 / 6	**α table: temperature value** This field is used to read or enter the temperature value for the value pair selected in matrix field V6 / H5. Value range: –35.0 to +150.0 °C Press the E key to acknowledge the temperature value and automatically proceed to field V6 / H7. The temperature values in a table of value pairs must be specified in a continuously ascending or descending order and must differ by at least 10 °C. The three pairs (temperature and α) define two linear ranges between –35 °C and +150 °C that are used to interpolate α. If the current temperature is below the lowest or above the highest temperature value defined in the table, error message 97 is issued: "temperature outside of α definition range". **Note:** – Display for substance numbers 1 to 6 is – – – – . – This field can only be accessed via the RS interface for substance numbers 5 and 6.		
6 / 7	**α table: temperature coefficient α** This field is used to read or enter the temperature coefficient α for the value pair selected in matrix field V6 / H5. Value range: 0 to 10.0 % / °C Press the E key to acknowledge the temperature coefficient. – If the value pair number is below 3, matrix field V6 / H5 is automatically selected with the value pair number being incremented by 1. – If the value pair number is 3, the display continues to show the α value last displayed. **Note:** – Display for substance numbers 1 to 6 is – – – – . – This field can only be accessed via the RS interface for substance numbers 5 and 6.		
	This field can only be accessed via the RS interface		
6 / 9	**Trigger consistency check** Enter 1 to start the % consistency check and subsequently return to the measuring mode. Return values: 0: no action 1: check is running 2: check completed, consistency OK 10: consistency not OK		

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
	Operating mode 0 only		
7 / 0	**Alarm threshold** Determines the threshold in mS / cm or µS / cm where an alarm condition starts if a limit is exceeded. MR0: 1 to 600 µS / cm MR1: 0.01 to 6.00 mS / cm MR2: 0.1 to 60.0 mS / cm MR3: 1 to 300 mS / cm MR4: 1 to 300 mS / cm **Note:** – The alarm threshold is set to the default value when the measuring range is switched.	5 % of URV	
7 / 1	**Alarm delay** Determines the delay period in seconds after which, following the occurrence of an alarm situation (see V7 / H0), an alarm is signalled (via the alarm LED and contact). 0 to 6000 s – If the alarm condition ceases to exist before expiration of the delay period, the timer is reset to 0. – When the hold function is enabled, the timer is also reset to 0.	0	
7 / 2	**Toggle steady / fleeting contact** Defines the alarm relay as a steady or fleeting contact 0 = steady contact 1 = fleeting contact Contact closure time is 1 s for the fleeting contact function.	0	
7 / 3	**Alarm assignment** Assigns alarm functions to limits 1 and 2. 0 = both limit contacts trigger an alarm 1 = limit 1 triggers an alarm 2 = limit 2 triggers an alarm 3 = no limit contact	0	
8 / 0	**Parity** Determines the parity bit for the RS interface. 0 = none 1 = odd 2 = even	2	
8 / 1	**Toggle baud rate** For RS 232-C, the transfer rate can be toggled between 4800 and 9600 baud. 0 = 4800 Bd 1 = 9600 Bd The baud rate for RS 485 is fixed to 9600 baud. In this case, a "1" is displayed.	1	

Note:

URV= upper range value

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
8 / 9	**Unlock / lock** Entry of access code: **Level 0** (indication): code entry not required; read access only. **Level 1** (operation) is accessed by entering code 1111. **Level 2** (start-up) is accessed by entering code 2222. **Note:** – The access code in effect after power-up is always 0000. – Field V8 / H9 can be accessed directly from field V0 / H0 (measurement) by pressing the E key. – When level 2 is unlocked, all functions of level 1 are also accessible to the operator. – Locking only affects the keyboard, not the RS interface! – The access status after a power failure is always "locked".	0000	
9 / 0	**Diagnostic code** Displays the current error number according to chapter 7 E- - - to E255 – The error with the highest priority (chapter 7.1), i.e. with the lowest number, is displayed. – Other errors (chapter 7.3) can be displayed by pressing the $\uparrow_+$ / $\downarrow^-$ keys. – Errors are automatically cleared when the corresponding error condition ceases to exist.		
9 / 1	**Number of auto resets** 0 ... 255 Reserved for use by the Endress+Hauser Service Organization for service purposes.		
9 / 2	**Display of instrument configuration** X X X X └ 0 = no option card present 1 = additional 2nd current output 3 = additional serial RS-232-C interface 4 = additional serial RS-485 interface 6 = additional serial RS-485 interface with Rackbus protocol └ 1 = with error signalling contact 2 = with error signalling contact and 1 controller 3 = with error signalling contact and 2 controllers └ 0 = no parameter-specific specialty └ 0 = unused		

Matrix pos. V / H	Description of functions	Parameter settings Fact.	User
9 / 3	**Software version** Displays the software version of the instrument according to the Endress+Hauser Conducta standard. 0.00 to 99.99		
9 / 4	**Device address** Determines the device address when operated via the RS interface. 1 to 32: RS 232-C 1 to 32: RS 485	1	
9 / 5	**Restore factory settings (defaults)** Press the E key to recall the factory settings for the parameters as indicated for each field. – When this field is selected, "SEt d" appears on the display. – The display flashes when the E key is pressed. – "End" is displayed once the defaults have been restored. **Note:** – This function overwrites all parameter settings made by the user. However, matrix fields V4 / H1 and V4 / H2 ; V5 / H0 to V5 / H7 ; V6 / H0 to V6 / H7 and V8 / H9 (unlock / lock) are not affected by this. – This function is not accessible via the interface.		
9 / 8	**Simulation ON / OFF** This field is used to switch the output current simulation on or off. 0 = simulation OFF 1 = simulation ON Enter 1 (simulation ON) to apply the current selected via matrix field V9 / H9 to both current outputs and set warning 30.	0	
9 / 9	**Output current simulation** Entry of a current value independent of the measurement to be applied to both outputs if field V9 / H8 is set to 1 (simulation ON). 0.00 to 20.00 mA A new value entered here becomes effective when the E key is pressed. **Note:** If field V9 / H8 is set to 1 (simulation ON), the mA value entered in field V9 / H9 is output continuously, i.e. the signal output no longer reflects changes in conductivity.	10.00	

6.9 Limit contacter

6.9.1 Function

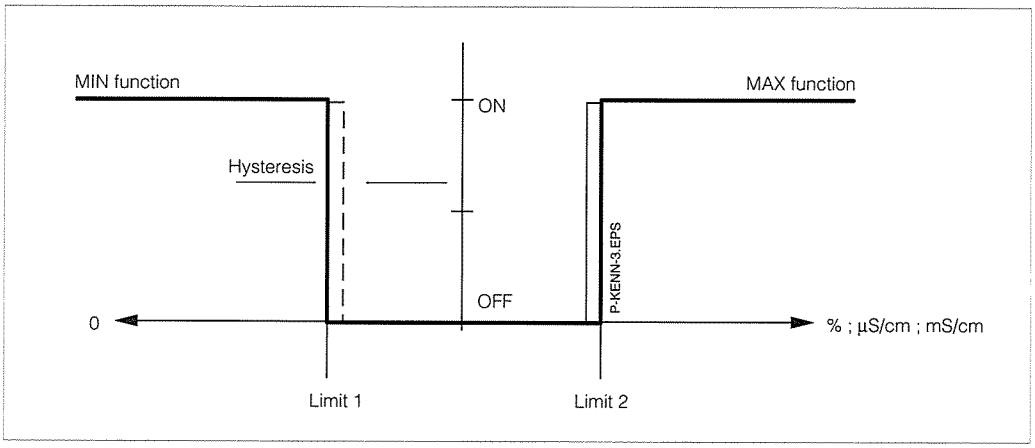
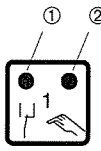


Fig. 6.7: Characteristic of limit contacter

Adjusting sequence		Matrix position V / H (contr. 1)	Matrix position V / H (contr. 2)
Limit contacter adjustment			
1.	Setpoint (operating mode 0)	2 / 0	3 / 0
	Setpoint (%) (operating mode 1 or 2)	5 / 1	5 / 3
2.	Pickup delay **or** dropout delay	2 / 3 2 / 4	3 / 3 3 / 4
3.	MIN / MAX switching function	2 / 5	3 / 5
4.	Relay contact NC or NO function	2 / 6	3 / 6
5.	Hysteresis (operating mode 0)	2 / 7	3 / 7
	Hysteresis (%) (operating mode 1 or 2)	5 / 2	5 / 4

6.9.2 LED function



① Red / green LED for switching status of limit contacter relay:
– green = normal pos. = OFF
– red = working pos. = ON

② Red LED for manual operation:
– automatic operation: LED OFF
– manual operation: LED ON

6.9.3 Operating conditions

All the operating conditions for the limit contacter function of the instrument are shown.
The measured or display value (actual value) lies in the range between approx. 0 % (< MIN setpoint) and approx. 100 % (> MAX setpoint).

Depending on the switching function (MIN / MAX) and mode of operation of the output contact (normally closed / normally open), there will be different switching contact positions.

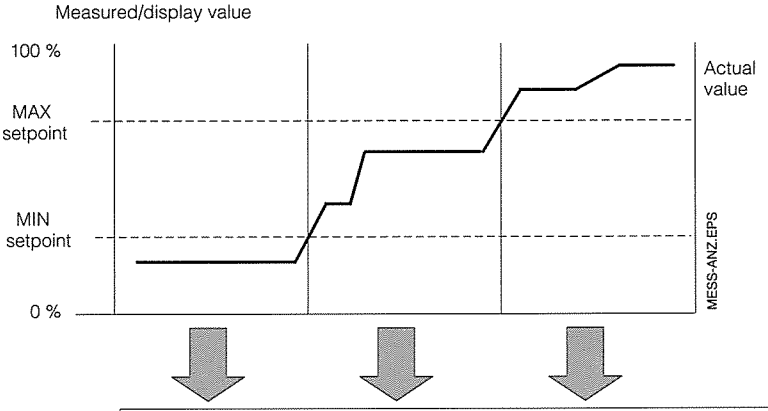


Fig. 6.8: Status diagram for automatic operation of Mycom CLM 121 / 151 with limit contacter function

		Switching contacts						
Function V2 / H5 V3 / H5	**Principle V2 / H6 V3 / H6**	**LED**	**Cont.**	**LED**	**Cont.**	**LED**	**Cont.**	**Contact after power failure**
MIN setpoint	Normally closed	red	OFF	green	ON	green	ON	OFF
	Normally open	red	ON	green	OFF	green	OFF	OFF
MAX setpoint	Normally closed	green	ON	green	ON	red	OFF	OFF
	Normally open	green	OFF	green	OFF	red	ON	OFF

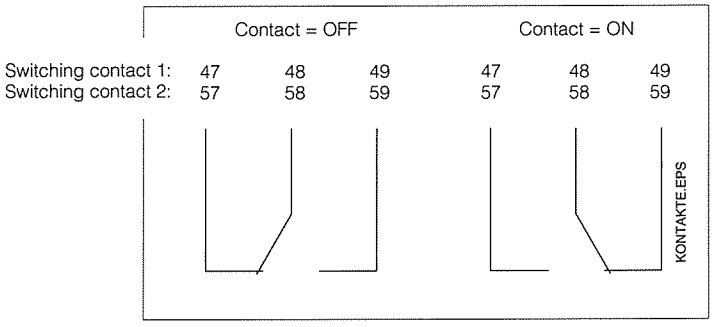


Fig. 6.9: Contact positions of switching contacts with the corresponding terminal assignments (according to fig. 4.4, chapter 4.5)

6.9.4 Alarm function operating conditions

Adjusting sequence		Matrix position V / H
1.	Alarm threshold (operating mode 0) Alarm threshold (oper. mode 1 or 2)	7 / 0 5 / 5
2.	Alarm delay	7 / 1
3.	Steady or fleeting contact	7 / 2
4.	Alarm assignment	7 / 3

Note:

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

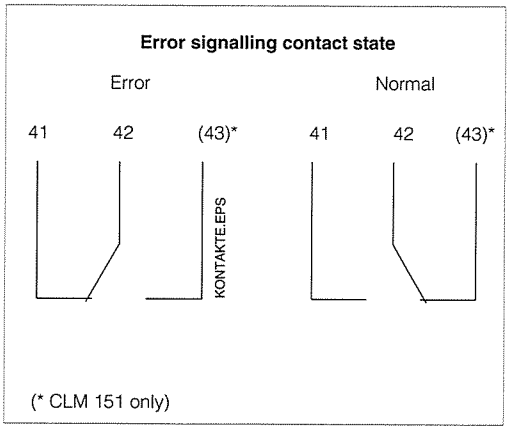


Fig. 6.10: Contact positions of error signalling contact with the corresponding terminal assignments (according to fig. 4.4, chapter 4.5)

In the event of an alarm condition (alarm LED flashes), the error signalling contact is activated and the display shows an error number (see error list in chapter 7.3).

7. Error handling and maintenance

7.1 Error classes and error numbers

There are 3 error classes:

Error class	Priority	Error no.
No error		- - - -
System errors	1 = top	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).
System errors require the instrument to be repaired at the factory or to be replaced since they cannot be cleared.

Disturbances
are error conditions where:

a) the process parameter to be measured and controlled violates the selected limit conditions
or
b) display and / or current output lie outside the specified accuracy range
or
c) the measuring transmitter connections receive incorrect signals

Disturbance messages are cancelled as soon as the corresponding error condition ceases to exist.

Warnings
are error conditions where:

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

Warning messages are cancelled as soon as the corresponding error condition ceases to exist.

Warning:

If a warning is ignored, a disturbance may result.

7.2 Error display and handling

Each one of the errors described below is entered in an error list which is sorted by error numbers (ascending). This 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 enables the alarm LED (flashes at intervals of one second). System errors and disturbances additionally enable the alarm contact (which may be configured as 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" ... "E255".
The error list can be searched for other errors which have occurred using the following keys:

 ascending

and

 descending

These error messages 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 errors		
1	Data exchange error in processor		Return instrument to your Endress+ Hauser sales agency for repair or request service.
2	Internal configuration error		Return instrument to your Endress+ Hauser sales agency for repair or request service.
3	Open sensor line		Check sensor and other connections. Switch Mycom off and back on if necessary.
4	Sensor malfunction		Check sensor and other connections. If necessary, return instrument to your Endress+ Hauser sales agency for repair or request service.
5	Pt 100 in sensor broken		
	Disturbances		
10	Limit or setpoint violated for longer period than delay setting	7 / 1	Alarm delay expired. Check actuator, controller function and control parameters.
12	Conductivity measuring range below substance table	0 / 0	Press → key to check absolute conductivity value.
13	Conductivity measuring range exceeded	0 / 0	Check conductivity measurement, control and connections; test instrument and measuring cable with conductivity simulator if necessary.
19	Below temperature measuring range	0 / 1	Check temperature measurement and connections; test instrument and measuring cable if necessary.
20	Temperature measuring range exceeded	0 / 1	Check temperature measurement and connections; test instrument and measuring cable if necessary.
22	Current below permissible minimum of 0 / 4 mA current range (output 1)	0 / 5	Check 0 / 4 mA measuring range assignment and change if necessary; check measurement.
23	Current exceeds permissible maximum range of 20 mA current output (output 1)	0 / 6	Check 20 mA measuring range assignment and change if necessary; check measurement.
25	Current below permissible minimum of 0 / 4 mA current range (output 2)	0 / 7	Check 0 / 4 mA measuring range assignment and change if necessary; check measurement.
26	Current exceeds permissible maximum range of 20 mA current output (output 2)	0 / 8	Check 20 mA measuring range assignment and change if necessary; check measurement.
27	Input conductivity excessive	1 / 6 1 / 7	Check measuring range selection; check temperature and ATC value (see chapter 6.6, fig. 6.4).

Error list (continued)

No.	Meaning	Field V / H	Measures for maintenance / troubleshooting
	Warnings		
30	Output current simulation enabled	9 / 8	Disable simulation for measuring operation.
31	Parameter range for current output 1 too small	0 / 5 0 / 6	Increase difference (min. 20 % of measuring range).
34	Temperature range for current output 2 too small	0 / 7 0 / 8	Increase difference (min. 25 K).
80	Calibration range exceeded	1 / 0	Repeat calibration, check calibration solution; check measuring cable for short circuit.
81	Below calibration range	1 / 0	Repeat calibration; check sensor with simulation resistor according to chapter 7.4.2; check measuring cable for continuity.
82	Conductivity measured during calibration too small	1 / 0	Check standard solution.
83	Temperature compensation range exceeded	1 / 1	Check temperature and type of temperature compensation.
84	Below ATC range	1 / 1	Check values entered and temperature measured 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 determination of temperature coefficent must be greater than 0.
87	Aborted: Determination of temperature coefficient – below permissible range for temperature coefficient	1 / 2	Repeat determination of temperature coefficient since α range may be too small.
88	Aborted: Determination of temperature coefficient – permissible range for temperature coefficient	1 / 2	Repeat test for other temperature values; note limit curve for ATC range.
89	Line resistance in measuring cable excessive for measuring range selected	1 / 8	Switch measuring range to smaller upper limit or use measuring cable with larger wire cross section.

No.	Meaning	Field V / H	Measures for maintenance / troubleshooting
	Warnings (continued)		
92	No valid concentration table has been defined	4 / 1 4 / 2	Re-enter concentration table.
93	Distance between conductivity values not continuously ascending or descending	6 / 2 to 6 / 4	Check conductivity values.
94	Distance between conductivity values too small	6 / 2 to 6 / 4	Minimum distance between conductivity values must be $^1/_{200}$ of measuring range.
95	Span of conductivity values too small	6 / 2 to 6 / 4	Span must be at least $^1/_5$ of measuring range.
96	Distance between temperature values too small or no continuous increase of values	6 / 6 6 / 7	Minimum distance between temperature values must be 10 °C.
97	Temperature outside of α definition range	6 / 6 6 / 7	Check temperature range of –35 to +150 °C.
98	Parameter range of 1st current output too small for substance selected	5 / 6 5 / 7	Check current output assignment.

7.4 Maintenance

7.4.1 Maintenance notes for conductivity measuring cells

The risk of electrode soiling is very low when the measuring cells are used in CIP applications where the continuous change from alkali to acid prevents formation of coatings.

7.4.2 Notes on instrument testing

For simulation purposes, a wire loop is passed through the centre hole in the sensor. The simulation resistance is connected to this wire loop either in the form of an individual resistor or a decade resistor. The wire loop should be short (max. 400 mm), and the wire cross section should be large (2.5 mm^2). Contact resistance due to improper electrical connections is to be avoided.
The wire loop must not be moved, should be flat and not be twisted.

Refer to the table below for the relationships between conductivity range and simulation resistances.
The simulation resistance for intermediate values is calculated using the following formula:

$$R = \frac{1}{\text{conductivity}} \cdot k$$

Conductivity in S / cm = R in Ω
Conductivity in mS / cm = R in kΩ
Conductivity in µS / cm = R in MΩ
k (cell constant) = 6

Display / measuring range	Simulation resistance
120 µS / cm	50 kΩ
240 µS / cm	25 kΩ
600 µS / cm	10 kΩ
1200 µS / cm	5 kΩ
2400 µS / cm	2.5 kΩ
6 mS / cm	1 kΩ
12 mS / cm	500 Ω
24 mS / cm	250 Ω
60 mS / cm	100 Ω
120 mS / cm	50 Ω
240 mS / cm	25 Ω
600 mS / cm	10 Ω
1200 mS / cm	5 Ω

Note:

The displayed value only matches the simulation value if:
- the temperature is 25 °C or field V1 / H0 is selected for measured value display;
- precision resistors are used for simulation (permissible tolerance 0.1 %);
- the contact resistances of the wire loop and soldered connections are included in the permissible tolerance value.

8. Technical data

8.1. Electrical data

Conductivity measurement

Measuring ranges	0 ... 2000 µS/cm / 20 mS/cm / 200 mS/cm / 1000 mS/cm
Indication error of measurement for ATC = 0 (acc. to DIN IEC 746)	± 0.5 of FS
Lower measuring range limit	100 µS / cm
Remote switching of measuring range	between two user-selectable measuring ranges
Automatic temperature compensation	linear or NaCl
Concentration measurement	
Concentration ranges (fixed)	0 ... max. 15 % NaOH
	0 ... max. 20 % HNO_3
	0 ... max. 20 % H_2SO_4
	0 ... max. 12 % H_3PO_4
Temperature compensation	substance-specific, automatic
Concentration ranges (user-definable)	0 ... 99.99 %
Remote switching of measuring range	between two user-selectable measuring ranges

Temperature measurement

Temperature measuring range	–35 ... +150 °C
Indication error of measurement (acc. to DIN IEC 746)	±0.5 % of FS
Temperature signal output (option)	0 / 4 ... 20 mA
Load	max. 400 Ω
Temperature output range	adjustable from Δ 25 ... Δ 185 °C
Temperature sensor	Pt 100, class B acc. to DIN IEC 751

General technical data
Measured value display and signal evaluation

Measured value display	liquid crystal display, 4 digits, 7 segments, height = 10 mm
Status indication	LEDs, red or red / green
Output summation error/display/current output (DIN IEC 746)	± 0.5 % of FS
Conductivity signal output current range	0 / 4 ... 20 mA
Load	max. 600 Ω
Signal output range	
– linear	20 ... 100 % of MR (adjustable in absolute values)
– bilinear	0 ... 10 % of MR $\hat{=}$ 0 ...50 % of current range (0 / 4 ... 10 / 12 mA)
	10 ... 110 % of MR $\hat{=}$ 0 ...50 % of current range (10 / 12 ... 20 mA)

Limit, controller and alarm functions

Limit contacter / 2-point controller	max. 2 limit contacts
Controller behaviour	limit monitor
Function	MIN or MAX (direct or inverted)
Setpoint settings	2 x 0 ... 100 % of FS (in absolute values)
Setpoint hysteresis	1 ... 10 % of FS (in absolute values)
Contact delay	pickup / dropout
– Delay time	0 ... 6000 s
Alarm threshold	0.5 ... 30 % of FS (in absolute values)
– Alarm delay time	0 ... 6000 s

Electrical data and connections

AC voltage supply	24, 48, 100, 110, 127, 200, 230, 240 V
Frequency	48 ... 62 Hz
DC voltage supply	24 V
Power consumption	12 VA
Contact outputs	CLM 121: 2 changeover contacts, 1 floating NO contact
	CLM 151: 3 changeover 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 Vp-p
Digital interface (variant)	optionally RS 232-C or RS 485
Terminals on CLM 121 (on rear)	terminal block, removable
– Max. conductor cross section	4 mm^2

Electrical data (continued)

Digital interface of CLM 121 (on rear)	female 9-pin submin D connector
Radio interference suppression (acc. to EN 50081-1 [1/92])	limit class B
Immunity to interference (prEN 50082-2 [8/92])	
Burst (IEC 801-4), 2 kV	0.2 % of FS
Electrostatic discharge (IEC 801-2), 10 kV	0.3 % of FS
In electromagnetic field (IEC 801-3), 8 V / m	0.5 % of FS
Ambient temperature and humidity CLM 121	
Nominal operating range	0 ... 50 °C
Limit operating range	–20 ... +60 °C
Storage and transport	–25 ... +85 °C
Relative humidity	10 ... 90 %
Ambient temperature and humidity CLM 151	
Nominal operating range	–10 ... +55 °C
Limit operating range	–20 ... +60 °C
Storage and transport	–25 ... +85 °C
Relative humidity	10 ... 90 %

8.2 Physical data

CLM 121	
Dimensions	96 x 96 x 176.5 mm (HxWxD)
Weight	1.1 kg
Protection class (front)	IP 54
Housing material	polycarbonate
Front of housing	polyester
CLM 151	
Dimensions	247 x 167 x 111 mm (HxWxD)
Weight	3.5 kg
Protection class	IP 65
Housing material	GD-ALSI (Mg component > 0.05 %)
Paintwork	2-component PU varnish
Front of housing	polyester, UV-resistant

9. Appendix

9.1 Accessories

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

- Weather protection cover CYY 101
  Weather protection cover for installation on Mycom CLM 151
  Dimensions: 320 x 300 x 300 mm (L x W x D)
  Material: special steel
  (order no. CYY 101)

- Post mounting kit
  Kit for mounting of Mycom CLM 151 on horizontal or vertical pipes (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)

- Flat packing
  for sealing of panel cutout for panel installation of Mycom CLM 151
  (order no. 50064975)

- Conductivity measuring cable OMK
  Low-noise measuring cable with 7 auxiliary cores (0.5 mm^2 per core) and outer screen, in PVC sheath
  (order no. 50004124)

Supplementary documentation

☐ Installation and operating instructions
Mycom interfaces
BA 078C/07/e

9.2 KCl calibration solutions

Warning:

- Deionised water must be used to prepare calibration solutions because its conductivity is negligible with regard to the conductivity of the solution. Conductivity should be preferably < 2 µS / cm at 25 °C.
- The potassium chloride must be dried at a temperature of 105 °C for a minimum of two hours before preparing the solution.

Calibration solution	Approx. concentration mol x l^{-1}	Preparation	Conductivity in µS / cm or mS / cm at 25°C
A	0.1	Dissolve 7.45 g KCl in water and dilute to obtain 1000 ml.	12.9 mS / cm
	0.05	Dilute 500 ml of solution A to obtain 1000 ml.	6.7 mS / cm
	0.02	Dilute 200 ml of solution A to obtain 1000 ml.	2.77 mS / cm
B	0.01	Dilute 100 ml of solution A to obtain 1000 ml.	1.41 mS / cm
	0.005	Dilute 500 ml of solution B to obtain 1000 ml.	720 µS / cm

Note:

- The KCl calibration solutions and the values listed in the table correspond to DIN ISO 7888.
- Carbon dioxide must be removed from the water by introduction of pure nitrogen or by means of boiling immediately before preparing solution C. Any contact with air must be minimized when working with these solutions.

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