Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions
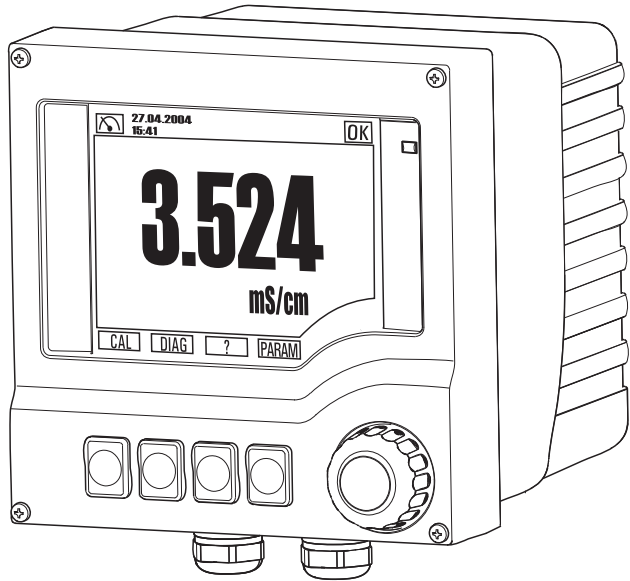
Operating Instructions

Liquiline M CM42

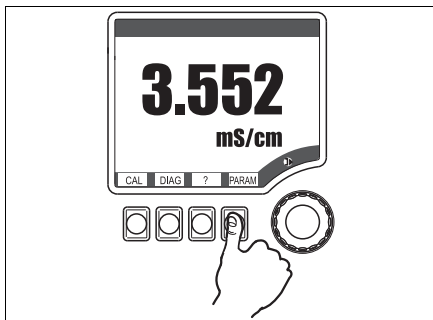Two-wire transmitter for conductivity (digital sensors)

Part 2: Operation

HART
FIELD COMMUNICATION PROTOCOL

Endress+Hauser

People for Process Automation

Operating concept

Fig. 1:   Press soft key: select menu directly

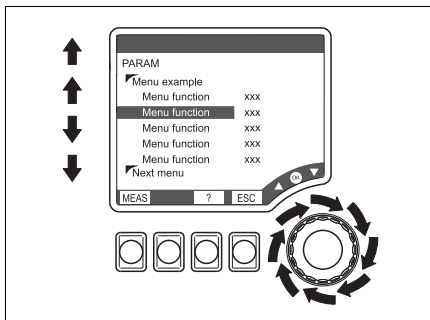*Fig. 2:   Turn navigator: move cursor in the menu*

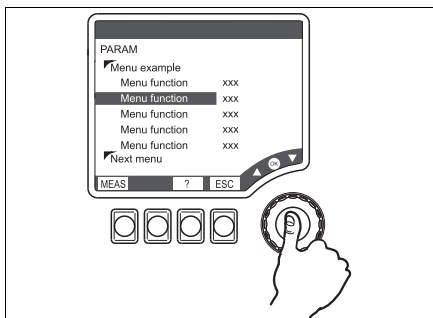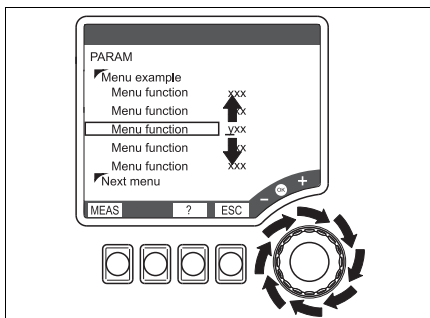*Fig. 3:   Press navigator: select a function*

Fig. 4:   Turn navigator: change value

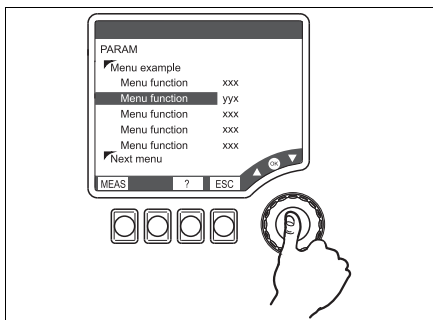*Fig. 5:   Press navigator: accept new value*

Operating concept

1. You select a menu directly by pressing the soft key in question.

2. You move the cursor in the menu by turning the navigator.

3. Press the navigator and select the desired function.

4. Change the value by turning the navigator.

5. Press the navigator to accept the new value.

Table of contents

1 Display

1.1 Overview

Fig. 6: Local display (measuring mode)

a0003630

1   Status line
2   Display and setting field
3   Assignment of the soft keys

1.2 Status messages

(measuring menu symbol)	Symbol for the measuring menu (MEAS)
OK	Device state is OK. No alarms or warnings are present.
(wrench symbol)	Service warning. Maintenance is recommended. The device is operational; the reliability of the measured value may be restricted.
(alarm symbol)	Alarm that points to an error. The device is no longer operational or the measured value is no longer reliable.
17.03.2009 **16:59**	Date and time display in measuring menu
I 3.618 mS/cm **II 5.113 mS/cm**	Measured value display in the status line if a menu other than MEAS is launched. The main values for channel 1 and channel 2 are displayed.
HOLD	Hold is set to "ON", the measured value is "frozen".
SIMU	Symbol for the simulation mode

2   Notes on software description

2.1   Types of setting

- Display fields
  - You can only read the values, not change them.
- Selection fields
  - You receive a list with options.
  - You select one of these options.
- Input fields
  - There are value ranges with upper and lower range limits that depend on the measured value configured and its units.
  - There are also menu functions where you can enter arbitrary text. The number of characters is then limited.
  - Set a value with the navigator:
    Turn to increase/reduce a value/letter/special character
    Press to confirm or to enter the next character for arbitrary text.

2.2   Editing tables

You can set some software functions using a table:
- The number of columns depends on the menu function that is set via the table.
- You can add lines ("Insert") or delete lines ("Del").
- The maximum number of lines also depends on the menu function in question.
- You can press "Esc" at any time to exit the table and stop entering information.
- If the values entered result in a valid table, you receive the message "Table is valid" and the options:
  - Save table
  - Continue edit table
  - Discard table
- If the values entered are invalid, an error message is output with the options:
  - Continue edit table
  - Discard table

2.3   User administration

As a "Specialist" you can assign user authorization for each individual software function.

Below, you will find the factory settings for the "Maintenance" user under "Configuration options" ("AC" column). The possible authorizations are as follows:
- R (=Read), only read access
- R/W (=Read+Write), Read and write access

Note!
The "Specialist" always has read and write access (R/W) and is, therefore, not listed.

3   Measure (MEAS)

✎ Note!
In the measuring menu, you can switch between three different types of display. To do so, simply press the enter button of the navigator.

Function name of local operation (Display)

📁 Meas
  📁 Main value
     📄 Conductivity or Resistivity or Concentration

  📁 Main value and secondary value
     📄 Conductivity or Resistivity or Concentration

     📄 Temperature
  📁 All measured values
     📄 TAG name
     📄 Main value
     📄 Raw value[1]
     📄 Temperature
     📄 Current output 1
     📄 Current output 2

1)   The raw value is the uncompensated conductivity

4   Specifying the parameters (PARAM)

4.1   Menu structure, top hierarchy level

📁 PARAM
  📁 Sensor conductivity
  📁 Operating mode
  📁 Current output
  📁 Temp. comp. tab.
  📁 Conc. table
  📁 General settings
  📁 Display
  📁 Quick Setup

4.2 Sensor

4.2.1 Menu structure

Function name of display (local operation)

📁 PARAM
    📁 Sensor conductivity
        📄 Cell constant
        📄 Damping
        📁 Temp. adjustment
            📄 Mode
            📄 Offset
                (Mode="1-point / 2-point(offset/slope)")
            📄 Slope
                (Mode="2-point(offset/slope)")
            📄 Enter table
                (Mode="2-point (table)")
    📁 Sensor diagnosis
        📄 Diagnosis list

4.2.2 Configuration options

Function	Options	AC	Info
Cell constant	0.0025 to 99.99 cm^{-1} **Factory setting** Depends on the sensor	R/W	The cell constant of the connected sensor is detected. You can change it here.
Damping	0 to 20 s **Factory setting** 0 s	R/W	The damping causes a floating average curve of the measured values over the time specified.
Temp. adjustment			
Mode	Options • 1-point • 2-point (offset/slope) • 2-point (table) **Factory setting** 1-point	R/W	**1-point:** You enter the temperature offset. **2-point (offset/slope):** You enter the offset at 0 °C and a slope. The adjustment takes place by means of the line defined in this way. **2-point (table):** You enter the set point and display value in a table.
Offset	−5.0 to +5.0 °C (−23 to 41 °F) **Factory setting** 0.0 °C	R/W	Only if **"Mode"="1-point"** or **2-point (offset/slope)"**
Slope	0.9000 to 1.1000 **Factory setting** 1.0000	R/W	Only if **"Mode"="2-point (offset/slope)"**

Function	Options	AC	Info
Enter table	Enter table values for: ■ Set point ■ Display	R/W	Only if **"Mode"="2-point (table)"**
Sensor diagnosis			
Diagnosis list	Priority adjustable	R	You can change the priority of the errors by moving them up or down in the list.

4.3 Operating mode

4.3.1 Menu structure

Function name of display (local operation)

📁 PARAM
    📁 Operating mode
        📄 Measured value

        📄 Medium
            (*Measured value*="*Concentration*")
        📄 Temp. compensation
            (*Measured value*="*Conductivity*", "*Resistivity*")
        📄 Coeff. alpha
            (*Temp. compensation*="*Linear*")
        📄 Alpha ref. temp.
            (*Temp. compensation*="*Linear*")
        📄 Temp. source

        📄 Medium temperature
            (*Temp. source*="*Manual input*")

4.3.2 Configuration options

Function	Options	AC	Info
Measured value	Options ■ Conductivity ■ Resistivity ■ Concentration **Factory setting** Conductivity	R/W	

Function	Options	AC	Info
Medium	Options ■ NaOH ■ HNO$_3$ ■ H$_2$SO$_4$ ■ H$_3$PO$_4$ ■ HCl ■ UserTab C1 ■ UserTab C2 ■ UserTab C3 ■ UserTab C4 **Factory setting** NaOH	R/W	Only for **Measured value=Concentration**. The transmitter can convert from conductivity to concentration. Concentrations saved: NaOH: 0 to 15%, 0 to 100 °C HNO$_3$: 0 to 25%, 0 to 90 °C H$_2$SO$_4$: 0 to 30%, 0 to 100 °C H$_3$PO$_4$: 0 to 15%, 0 to 90 °C HCl: 0 to 20%, 0 to 80 °C
Temp. compensation	Options ■ None ■ Linear ■ NaCl (IEC 746-3) ■ Water ISO7888 ■ UPW NaCl ■ UPW HCl ■ UserTab T1 ■ UserTab T2 ■ UserTab T3 ■ UserTab T4 **Factory setting** Linear	R/W	Function only available if you selected **measured value = "Conductivity"** *or* **"Resistivity"**. If you select **"Linear"** you then have to specify the temperature coefficient alpha (0.00 to 20.00 % per °C). The "Ultrapure water HCl" type of compensation is also suitable for ammonia (NH$_3$).
Coeff. alpha	0.00 to 20.00 % / K **Factory setting** 2.10 % / K	R/W	Function only available if you have selected **Temp. compensation = "Linear"**
Alpha ref. temp.	−5 to +100 °C **Factory setting** 25.0 °C	R/W	
Temp. source	Options ■ Temp. sensor ■ Manual input **Factory setting** Temp. sensor	R/W	
Medium temperature	−35.0 to 250.0 °C **Factory setting** 25.0 °C	R/W	Function only available if you have selected **Temp. source="Temp. input"**

4.4   Current output

4.4.1   Menu structure

Function name of display (local operation)

📂 PARAM
    📂 Current output
        📂 Current output 1
            📄 Output source
            📄 Low value (4mA)
            📄 Upper value (20mA)
        📂 Current output 2
            📄 Output source
            📄 Low value (4mA)
            📄 Upper value (20mA)
            📄 Enter table

4.4.2   Configuration options

Function	Options	AC	Info
Current output 1			
Output source	Options ■ Main value ■ Cond.uncomp. **Factory setting** Main value	R/W	
Low value (4mA)	Depends on the measured value **Factory setting** 0.000 µS/cm	R/W	Specify the measured value that should correspond to the 4 mA or 20 mA value.
Upper value (20mA)	Depends on the measured value **Factory setting** 20 mS/cm	R/W	
Current output 2			
Output source	Options ■ Main value ■ Temperature ■ Cond.uncomp. **Factory setting** Temperature	R/W	

Function	Options	AC	Info
Low value (4mA)	−50 to (20 mA value) – 5 °C **Factory setting** -20 °C	R/W	The **smallest possible spread** between 4 mA and 20 mA value is 1 °C.
Upper value (20mA)	(4 mA value) + 5 °C to 250 °C **Factory setting** +100 °C	R/W	

4.5 Temperature compensation table

4.5.1 Menu structure

Function name of display (local operation)

📁 PARAM

   📁 Temp. comp. tab.

      📄 Table selection

      📄 Table name

      📄 Enter table

4.5.2 Configuration options

Function	Options	AC	Info
Table selection	Options ■ UserTab C1 ("Name") ■ UserTab C2 ("Name") ■ UserTab C3 ("Name") ■ UserTab C4 ("Name")	R/W	Select one of the four possible tables and then assign a name for this table. This name then appears in the table selection menu instead of the name that was used previously.
Table name	Enter any text	R/W	Max. 10 characters
Enter table	Column–based entry ■ Temperature ■ Alpha value or ■ Temperature ■ Conductivity ■ Temperature–compensated conductivity	R/W	■ Maximum number of rows: 25

4.6   Concentration table

4.6.1   Menu structure

Function name of display (local operation)

📁 PARAM

    📁 Conc. table

        📄 Table selection

        📄 Table name

        📄 Temp. comp. mode

        📄 Conc. unit

        📄 Enter table

4.6.2   Configuration options

Function	Options	AC	Info
Table selection	Options ■ UserTab C1 ("Name") ■ UserTab C2 ("Name") ■ UserTab C3 ("Name") ■ UserTab C4 ("Name")	R/W	Select one of the four possible tables and then assign a name for this table. This name then appears in the table selection menu instead of the name that was used previously.
Table name	Enter any text	R/W	Max. 10 characters
Temp. comp. mode	Options ■ With temp. comp. ■ Without temp. comp. **Factory setting** With temp. comp.	R/W	Only select "Without temp. comp." in very restricted temperature ranges.
Conc. unit	Options ■ None ■ % ■ ppm ■ mg/l **Factory setting** %	R/W	

Enter table	Column–based entry
	■ Conductivity (uncomp.)
	■ Concentration
	■ Temperature[1]
		R/W	■ Maximum number of rows:
			  – 25 (with Temp. compensation)
			  – 15 (without Temp. compensation)
			■ With Temp. compensation you have to enter at least two curves of constant concentration. The curves must not intersect.
			■ The curves must always be monotone.
			With Temp. compensation, also monotone in the same direction (**all** monotone rising or **all** monotone falling). —> e.g.

1)   Only if you have selected Temp. comp. mode="With temp. comp"

Example of a concentration table:

Conductivity (uncompensated)	Concentration	Temperature
1.000 mS/cm	0.000 mg/l	0.00 °C
2.000 mS/cm	0.000 mg/l	100.00 °C
100.0 mS/cm	3.000 mg/l	0.00 °C
300.0 mS/cm	3.000 mg/l	100.00 °C

4.7 General settings

4.7.1 Menu structure

Function name of display (local operation)

📁 PARAM
    📁 General settings
        📄 TAG number
        📄 Date format
        📄 Set date
        📄 Time format
        📄 Set time
        📁 Alarms
            📁 Alarm message
                📄 Alarm active
                📄 Alarm value *(Alarm active="Set value")*
            📁 Maintenance message
                📄 Maintenance active
                📄 Maint. value *(Maintenance active="Set value")*
    📁 Hold settings
        📄 Calib active
        📄 Calib value *(calib. active ="Set value")*
        📄 Param active
        📄 Param value *(param. active ="Set value")*
        📄 Diag active
        📄 Diag. value *(diag. active="Set value")*
        📄 Hold delay
    📁 Device diagnosis
        📄 Diagnosis list
    📁 User admin.
        📄 Log in
        (not if "Specialist" is already logged on)
        📄 Password protection
        📁 Enter code
        (only if you are logged on as a "Specialist")
            📄 Specialist
            📄 Maintenance
    📄 Bus address

4.7.2 Configuration options

Function	Options	AC	Info
TAG number	Can be edited at random	R/W	Max. 20 characters

Function	Options	AC	Info
Date format	Options ■ DD.MM.YYYY ■ MM.DD.YYYY **Factory setting** DD.MM.YYYY	R/W	Editing mode: DD (day): 1 to 31 MM (month): 1 to 12 YYYY (year): 2005 to 2100
Set date	Depends on the format DD.MM.YYYY	R/W	
Time format	Options ■ hhmmss (24 h) ■ hhmmss (am / pm) **Factory setting** hhmmss (24 h)	R/W	24-hour display or 12-hour display Editing mode: hh (hour): 0 to 23 / 0 am to 12 pm mm (minutes): 0 to 59 ss (seconds): 0 to 59
Set time	Depends on the format hh:mm:ss	R/W	
Alarms			
Alarm message			
Alarm active	Options ■ Off ■ Freeze (I1) ■ Set value (I1) **Factory setting** Set value (I1)	R	
Alarm value	20.5 to 22 mA **Factory setting** 22 mA	R	Only if **Alarm active="Set value (I1)"**
Maintenance message			
Maintenance active	Options ■ Off ■ Freeze (I2) ■ Set value (I2) **Factory setting** Off	R	
Maint. value	20.5 to 22 mA **Factory setting** 22 mA	R	Only if **Maintenance active="Set value (I2)"**
Hold settings			

Calib active	Options
	■ No hold
	■ Freeze
	■ Fixed
	Factory setting
	No hold
		R	■ Freeze:
			  Device keeps the last measured value.
			■ Set value:
			  You define a set display value.

Function	Options	AC	Info
Calib value	20.5 to 22 mA **Factory setting** 21.5 mA	R	Only if **Calib active="Set value"**
Param active	Options ■ No hold ■ Freeze ■ Fixed **Factory setting** No hold	R	■ Freeze: Device keeps the last measured value. ■ Set value: You define a set display value.
Param value	20.5 to 22 mA **Factory setting** 21.5 mA	R	Only if **Param active="Set value"**
Diag active	Options ■ No hold ■ Freeze ■ Fixed **Factory setting** No hold	R	■ Freeze: Device keeps the last measured value. ■ Set value: You define a set display value.
Diag. value	20.5 to 22 mA **Factory setting** 21.5 mA	R	Only if **Diag active="Set value"**
Hold delay	0 to 60 s **Factory setting** 5 s	R	
Device diagnosis			
Diagnosis list	For all messages, you can assign a customer-specific status (alarm/warning/info), see Section "Troubleshooting"/"Diagnosis messages".		
User admin.			
Log in	Options ■ Specialist ■ Maintenance **Factory setting** Maintenance	R	Once the user is selected, you are prompted to enter a code of your choice. **Factory setting** is **empty**. ✎ Note! More information is provided on the user roles under "Commissioning" in the first part of the Operating Instructions.
Password protection	Options ■ None ■ Enter code **Factory setting** None	R/W	👆 Caution! The "Enter code" option is only visible if you are logged on as a "Specialist"!
Enter code	Here, you can enter a code for the user roles "Specialist" and "Maintenance" **(you have to be logged on as a "Specialist"!)**.		

Function	Options	AC	Info
Specialist Maintenance	Options ■ Password **Factory setting** Empty (nothing entered) ■ Store		Once you have specified a password of your choice, go to Store (= Enter). The message "Stored new password" and "OK" is displayed.
Bus address	Entry ■ 0 to 15 **Factory setting** 0	R	

4.8   Display

4.8.1   Menu structure

Function name of display (local operation)

📁 PARAM
　　📁 Display
　　　　📄 Language
　　　　📄 Main meas. unit
　　　　📄 Main value format
　　　　📄 Temperature unit
　　　　📄 Temperature format

4.8.2   Configuration options

Function	Options	AC	Info
Language	Options ■ English ■ Language ordered **Factory setting** Language ordered	R/W	✎ Note! "Language ordered" refers to the language that you selected for your device using the order code ("device language"). If you select the other language in question, all the other settings remain intact.
Main meas. unit	Options ■ Auto ■ µS/cm, mS/cm, S/cm, µS/m, mS/m, S/m ■ kΩcm, MΩcm, kΩm **Factory setting** Auto	R/W	The menu is not available if you selected **Sensor/measured value = "Concentration"**. In this case, you make the setting for the unit in the "Concentration table" menu.

Function	Options	AC	Info
Main value format	Options ■ Auto ■ xxx ■ xxx.x ■ xx.xx ■ xx.xxx **Factory setting** Auto	R/W	You select how many commas should appear after the decimal point in the measured value display.
Temperature unit	Options ■ °C ■ °F **Factory setting** °C	R/W	
Temperature format	Options ■ xxx ■ xxx.x **Factory setting** xxx.x	R/W	You select how many commas should appear after the decimal point in the temperature display.

4.9 Quick Setup

4.9.1 Menu structure

Function name of display (local operation)

📁 PARAM

　　📁 Quick Setup

　　　　📄 Language

　　　　📄 TAG number

　　　　📄 Date format

　　　　📄 Set date

　　　　📄 Time format

　　　　📄 Set time

　　　　📄 Cell constant

　　　　📄 Temperature unit

　　　　📄 Measured value

　　　　📄 Medium *(Measured value="Concentration")*

　　　　📄 Temp. compensation

　　　　📄 Coeff. alpha
　　　　　　(measured value="Conductivity/resistance",
　　　　　　temp. compensation="Linear")

　　　　📄 Temp. source

Function name of display (local operation)

- Medium temperature
  (*Temp. source*="*Manual input*")
- 📁 Current output 1
  - Output source
  - Low value (4mA)
  - Upper value (20mA)
- 📁 Current output 2
  - Output source
  - Low value (4mA)
  - Upper value (20mA)

4.9.2 Configuration options

Function	Options	AC	Info
Language	Options ■ English ■ Language ordered **Factory setting** Language ordered	R/W	✎ Note! "Language ordered" refers to the language that you selected for your device using the order code ("device language"). If you select the other language in question, all the other settings remain intact.
TAG number	Can be edited at random	R/W	Enter the tag name.
Date format	Options ■ DD.MM.YYYY ■ MM.DD.YYYY **Factory setting** DD.MM.YYYY	R/W	Editing mode: DD (day): 1 to 31 MM (month): 1 to 12 YYYY (year): 2005 to 2100
Set date	Depends on the format DD.MM.YYYY	R/W	
Time format	Options ■ hhmmss (24 h) ■ hhmmss (am / pm) **Factory setting** hhmmss (24 h)	R/W	24-hour display or 12-hour display Editing mode: hh (hour): 0 to 23 / 0 am to 12 pm mm (minutes): 0 to 59 ss (seconds): 0 to 59
Set time	Depends on the format hh:mm:ss	R/W	
Temperature unit	Options ■ °C ■ °F **Factory setting** °C	R/W	

Function	Options	AC	Info
Measured value	Options ■ Conductivity ■ Resistivity ■ Concentration **Factory setting** Conductivity	R/W	
Medium	Options ■ NaOH ■ HNO_3 ■ H_2SO_4 ■ H_3PO_4 ■ HCl ■ UserTab C1 ■ UserTab C2 ■ UserTab C3 ■ UserTab C4 **Factory setting** NaOH	R/W	Only for **Measured value=Concentration**. The transmitter can convert from conductivity to concentration. Concentrations saved: NaOH: 0 to 15%, 0 to 100 °C HNO_3: 0 to 25%, 0 to 90 °C H_2SO_4: 0 to 30%, 0 to 100 °C H_3PO_4: 0 to 15%, 0 to 90 °C HCl: 0 to 20%, 0 to 80 °C
Temp. compensation	Options ■ None ■ Linear ■ NaCl (IEC 746–3) ■ Water ISO7888 ■ UPW NaCl ■ UPW HCl ■ UserTab T1 ■ UserTab T2 ■ UserTab T3 ■ UserTab T4	R/W	Function only available if you selected **measured value = "Conductivity"** *or* **"Resistivity"**. If you select **"Linear"** you then have to specify the temperature coefficient alpha (0.00 to 20.00 % per °C). The "Ultrapure water HCl" type of compensation is also suitable for ammonia (NH_3).
Coeff. alpha	0.00 to 20.00 % / K **Factory setting** 2.10 % / K	R/W	Function only available if you have selected **Temp. compensation = "Linear"**
Medium temperature	−50 to + 250 °C (−58 to + 482 °F) **Factory setting** 25 °C (77 °F)	R/W	Function only available if you have selected **Temp. source="Temp. input"**
Current output 1			Main value
Output source	Options ■ Main value ■ Cond.uncomp. **Factory setting** Main value	R	

Function	Options	AC	Info
Low value (4mA)	Depends on the measured value **Factory setting** 0.000 µS/cm	R/W	Specify the measured value that should correspond to the 4 mA or 20 mA value.
Upper value (20mA)	Depends on the measured value **Factory setting** 20 mS/cm	R/W	
Current output 2			Temperature
Output source	Options ■ Main value ■ Temperature ■ Cond.uncomp. **Factory setting** Temperature	R	
Low value (4mA)	−50 to (20 mA value) – 5 °C **Factory setting** -20 °C	R/W	The **smallest possible spread** between 4 mA and 20 mA value is 0.1 °C.
Upper value (20mA)	(4 mA value) + 5 °C to 250 °C **Factory setting** +100 °C	R/W	

5   Device diagnosis (DIAG)

✎ Note!
In the DIAG menu you will find information about the device state, in particular detailed error and maintenance messages.
In addition to this, there are various service functions available[1].
Furthermore, you can configure your optional recorder in the "Datalogger" submenu.

---

1)   Depending on the device version

5.1   Menu structure, top hierarchy level

📁 DIAG
- 📄 Errors/messages
- 📁 Output state
- 📁 Logbooks
- 📁 Sensor information
- 📁 Device information
- 📁 Service

5.2   Errors/messages

Function name of display (local operation)

📁 DIAG
- 📄 Errors/messages

5.3   Output state

Function name of display (local operation)

📁 DIAG
- 📁 Output state
  - **Current settings for:**
  - 📄 Current output 1
  - 📄 Current output 2
  - 📄 Output range

5.4   Logbooks

5.4.1   Menu structure

Function name of display (local operation)

📁 DIAG
- 📁 Logbooks
  - 📄 Recording
  - 📄 Calibration logbook
  - 📄 Event logbook
  - 📄 User logbook
  - 📄 Version logbook
  - 📄 Hardware logbook

Function name of display (local operation)

📁 Data logbook

    📄 Recording

    📄 Sample time

    📄 Measured value

    📄 Show data

📄 Delete entries

5.4.2   Configuration options

Function	Options	AC	Info
Recording	Options ■ On ■ Off **Factory setting** Off	R/W	Activate or deactivate logbook recording. Exception: data logbook. You can activate/deactivate this in its own submenu.
Calibration logbook		R	Log of calibrations and adjustments
Event logbook		R	Log of the warnings and error messages
User logbook		R	Log of logins and logouts
Version logbook		R	Log of the firmware versions
Hardware logbook		R	Log of the installed hardware modules
Data logbook		R	Cyclic recording of measured values
Recording	Options ■ On ■ Off **Factory setting** Off	R/W	
Sample time	0 h 0 min 2 s to 99 h 59 min 59 s **Factory setting** 0 h 0 min 2 s	R/W	Here you can specify the intervals in which measured values are recorded.
Measured value	Options ■ Raw value ■ Temperature ■ Main value **Factory setting** Raw value	R/W	Define the measured value that should be recorded.
Show data		R	Log of the measured values
Delete entries		R	This function deletes all the logbook entries.

5.5   Sensor information

Function name of display (local operation)

📁 DIAG
- 📁 Sensor information
  - 📁 Memosens data
    - 📁 Identification
      - 📄 Hardware identifier
      - 📄 Serial number
      - 📄 Order code
      - 📄 Hardware version
      - 📄 Software version
      - 📄 Cell constant calib.
    - 📁 <Type of calibration> (last used)
      - 📄 Date of calibration
      - 📄 Cell constant
      - 📄 Temperature ref
      - 📄 Conductivity ref
      - 📄 Time of calibration
      - 📄 Number of cal.
      - 📄 Delta cell const
      - 📄 SN transmitter
        (= with which the last calibration was)
    - 📁 Temp. Calibration
      - 📄 Type of calibration
      - 📄 Temperature offset
      - 📄 Temp. cal. date
      - 📄 Temp. cal. time
      - 📄 Slope
      - 📄 Temperature ref 1
      - 📄 Temperature ref 2
    - 📁 Operating hours
      - 📄 Operating time
      - 📄 Number of sterilizations
      - 📄 Commissioning date
      - 📄 Usage >80°C
      - 📄 Usage >120°C
      - 📄 Usage >140°C
      - 📄 Usage > 80 °C, <100n
    - 📁 Max. operating values
      - 📄 Max. temperature
      - 📄 Min. temperature
      - 📄 Max. conductivity
      - 📄 Min. conductivity
      - 📄 CIP cycles

Function name of display (local operation)

📁 Specification

📄 Min. conductivity

📄 Max. conductivity

📄 Min. temperature

📄 Max. temperature

5.6   Device information

Function name of display (local operation)

📁 DIAG

📁 Device information

📄 TAG number

📄 Order code

📄 Serial number

📄 Software version

📄 Bus address

📁 CPU

📄 Hardware identifier

📄 Serial number

📄 Part number

📄 Hardware version

📄 Bootloader version

📁 Sensor module

📄 Hardware identifier

📄 Serial number

📄 Part number

📄 Hardware version

📄 Firmware version

📁 Current output

📄 Hardware identifier

📄 Serial number

📄 Part number

📄 Hardware version

📄 Firmware version

5.7   Service

Function name of display (local operation)

📁 DIAG
    📁 Service
        📁 Simulation
            📁 Current output 1
                📄 Simulation
                📄 Simulation value
            📁 Current output 2
                📄 Simulation
                📄 Simulation value
        📁 Reset
            📄 Confirmation: Abort action
            📄 Confirmation: Reset
    📁 Factory default
        📄 Confirmation: Abort action
        📄 Confirmation: Factory default

✎ Note!
The "Reset" option causes the device to be restarted while maintaining the settings made. If "Factory default" is selected, the device is reset and all the settings are reset to the factory settings.

6   Calibration (CAL)

6.1   Types of calibration

- Cell constant
  - The cell constant can be determined with or without automatic temperature compensation.
  - With "Automatic", compensation takes place using the alpha temperature coefficient. You must enter the value for alpha in the menu.
  - If "Manual" is set, the uncompensated conductivity is used.
  - The accessories kit of the Endress+Hauser calibration solutions and the Technical Information contain the temperature coefficients or the uncompensated conductivities depending on the temperature.
    You can also find these tables on the CD-ROM.
- Temperature adjustment[2]
  - You calibrate and adjust the integrated temperature sensor of the connected sensor.

---

2)   Only conductivity

– You can choose from three adjustment modes: 1-point (offset), 2-point (offset/slope) and 2-point (table)

6.2   Current values

✎ Note!
In this submenu, you can only read the current calibration data but not edit them.

Function name of display (local operation)

📁 CAL
    📁 Current values
        📄 Cell constant
        📄 Offset
        📄 Slope

6.3   Cell constant

6.3.1   Menu structure

Function name of display (local operation)

📁 CAL
    📁 Cell constant
        📄 Current value
        📄 Temp. compensation
        📄 Coeff. alpha
          ("Temp. compensation"="With")
        📄 Alpha ref. temp.
          ("Temp. compensation"="With")
        📄 Temp. source
          ("Temp. compensation"="With")
        📄 Manual temperature
          ("Temperature source"="Manual input")
        📄 Conductivity ref.val.
        📄 Start calibration

6.3.2   Configuration options

Function	Options	Info
Current value	Current value (last calibration value)	"Read only" value
Temp. compensation	Options ■ With ■ Without **Factory setting** With	

Function	Options	Info
Coeff. alpha	0.00 to 10.00 % / K **Factory setting** 2.10 % / K	Only if **temp. compensation ="With"** The temperature tables are available on the CD-ROM for calibration solutions from Endress+Hauser. Specify the alpha value and reference temperature for your calibration solution.
Alpha ref. temp.	−50 to +250 °C **Factory setting** 25 °C	
Temp. source	Options ■ Temperature sensor ■ Manual input **Factory setting** Temperature sensor	
Manual temperature (Temperature of the calibration solution)	−50 to +250 °C **Factory setting** 25 °C	Only if **temp. compensation = "With"** and **temp. source = "Manual input"**. Specify the current temperature of your calibration solution.
Conductivity ref.val.	0.000 µS/cm to 2000 S/cm **Factory setting** 1.000 µS/cm	Specify the conductivity of your calibration solution here.
Start calibration	Calibrate Store value Yes/No **Factory setting** Yes	Follow the instructions in the menu. The cell constant determined is then displayed and you are prompted to accept this value.

6.4   Temperature adjustment

Function name of display (local operation)

📁 CAL
　　📁 Temp. adjustment
　　　　📄 Mode
　　　　📄 Offset
　　　　📄 Slope *(only 2-point)*
　　　　📄 Edit table *(only 2-point (table))*
　　　　📄 Start calibration

1. Select the mode for temperature adjustment:
   − 1-point
   − 2-point (offset/slope)
   − 2-point (table)

2. Depending on the mode selected, you see the current values for the offset and slope.

3.   Depending on the mode selected, proceed as follows:
   a.   1-point (offset)
      – Immerse the sensor into the medium and start the calibration.
      – Once the transmitter has a constant signal from the temperature sensor, you are
        asked to enter the reference temperature.
      – Enter the current medium temperature.
      – The transmitter calculates the new temperature offset and displays it.

   b.   2-point (offset/slope)
      – Immerse the sensor into the medium with reference temperature 1 and start the
        calibration.
      – Once the transmitter has a constant signal from the temperature sensor, you are
        asked to enter the reference temperature 1.
      – Enter the current medium temperature.
      – Immerse the sensor into the medium with reference temperature 2 and start the
        calibration again.
      – Once you have specified the second reference temperature, the transmitter
        determines the new values for the offset and slope and displays them.

   c.   2-point (table)
      – Enter value pairs for the measured temperature and reference temperature.
      – Once you have entered all the data, press "ESC". You then decide whether the table
        should be stored, rejected or processed further.
      – If you select "Store", the validity of the table is checked and calibration is then
        performed using this table.

7   Communication

Parameter entry and measured value interrogation take place by means of HART® protocol.
When doing so, digital communication is performed via the 4 to 20 mA current output.

You have the following options for parameter entry:
- Operation via the universal handheld terminal Communicator DXR375
- Operation via PC using Endress+Hauser operating software, e.g. "Fieldcare", and a HART®
  modem

✎ Note!
Detailed information about HART communication can be found in the document
CM42CCI-LIT-18.pdf (English) on the CD-ROM.

7.1   HART Communicator

If a Liquiline DD (Device Description) is installed on your Communicator, you can make all
settings via the Communicator.
Only restricted configuration or operation is possible with a (pre-installed) universal DD.
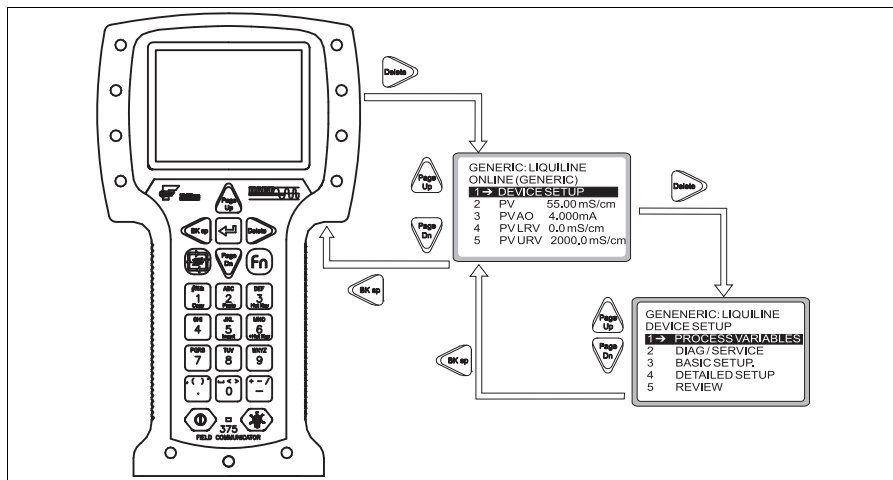
Fig. 7: Operation of the handheld terminal

✎ **Note!**
For information about how to operate the handheld terminal, please refer to the Operating Instructions enclosed with the handheld terminal.

7.2 Fieldcare

"Fieldcare" is a universally applicable service and communication software based on FDT/DTM technology.
The DTMs available for the device can also be used with software from other manufacturers that supports FDT/DTM technology.

✎ **Note!**
Further information can be found in the Installation Instructions from "Fieldcare" supplied with the software, or on our homepage.

7.3 Device identification

Manufacturer name:	Endress+Hauser
Model name:	Liquiline M CM42
Manufacturer ID code:	17 (11_h)
Device type code:	144 (90_h)
HART protocol revision:	5.2
Device revision:	13 ($0D_h$)
Number of device variables:	3
Physical layers supported:	FSK

Physical device category: Transmitter, non–DC-isolated bus device

7.4   Interfaces

Analog output 1: Main value
The main value corresponds to the HART primary variable.
HART communication is **only available at this output** .

Analog output 2
No HART communication is available via this output.

Multidrop mode
If you want to operate Liquiline in the Multidrop mode, you have to turn the Multidrop rotary
switch at the CPU module (→ ⊠● 8, 45 ° counterclockwise).
In Multidrop mode, the current output is fixed at 4.2 mA right from when the device is started.
This allows you achieve the best Multidrop compatibility.
In contrast, Liquiline starts normal operation with 22.5 mA to guarantee SIL conformity.
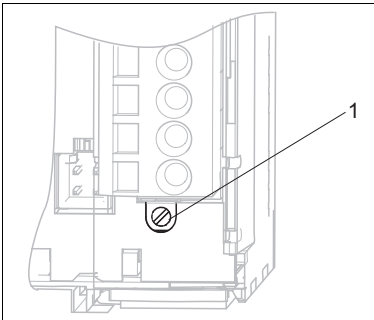
a0005292

Fig. 8:   CPU module (extract)

1   Multidrop screw

✎ Note!
The diagram displays the Multidrop rotary switch in the "Off" position=no Multidrop.

7.5   HART: Universal commands

No.[1]	HART command/ Access type	Command data[1]	Response data[1]
0	Unique device identifier Access type ■ Read	None	Information on device and manufacturer (12 byte): ■ Byte 0: fixed value 254 ■ Byte 1: manufacturer ID 17 (= Endress+Hauser) ■ Byte 3: number of preambles ■ Byte 4: rev. no. universal commands ■ Byte 5: rev. no. device-specific commands ■ Byte 6: software revision ■ Byte 7: hardware revision ■ Byte 8: additional device information ■ Byte 9–11: device identification
1	Main value Access type ■ Read	None	■ Byte 0: HART unit ID of main value ■ Byte 1-4: main value
2	Main value in mA & % of measuring range Access type ■ Read	None	■ Byte 0-3: actual current [mA] at current output 1 ■ Byte 4-7: % of configured measuring range
3	Main value in mA and 4 dynamic process variables Access type ■ Read	None	24-byte response: ■ Byte 0-3: value of current output 1 (main value in mA) ■ Byte 4: HART unit ID of main value ■ Byte 5-8: main value ■ Byte 9: HART unit ID of secondary process variable ■ Byte 10-13: secondary process variable ■ Byte 14: HART unit ID of third process variable ■ Byte 15-18: third process variable ■ Byte 19: HART unit ID of fourth process variable ■ Byte 20-23: fourth process variable **Factory setting** ■ Secondary process variable = temperature
6	HART short-form address Access type ■ Write	■ Byte 0: desired address **Fact. setting** ■ 0	■ Byte 0: active address ✎ Note! If an address >0 (Multidrop mode), current output 1 is permanently set to 4 mA. Any simulation running is terminated. The device boots again with 22 mA. It can be booted with 4 mA by adjusting the Multidrop switch.
11	Unique device identifier using the tag name Access type ■ Read	Byte 0-5: tag name ✎ Note! Setting with command 18	The response consists of a 12-byte ID if the tag name specified matches that of the device. ✎ Note! Settings as for command 0, see above.
12	User message Access type ■ Read	None	■ Byte 0-23: current user message ✎ Note! Write message –> command 17

[1]

No.[1]	HART command/ Access type	Command data[1]	Response data[1]
13	Tag name, description and date Access type ■ Read	None	■ Byte 0–5: tag name ■ Byte 6–17: tag description ■ Byte 18–20: date ✎ Note! Write values —> command 18
14	Sensor info main value Access type ■ Read	None	■ Byte 0–2: sensor serial number ■ Byte 3: unit ID, sensor limits and measuring range of main value ■ Byte 4–7: upper sensor limit ■ Byte 8–11: lower sensor limit ■ Byte 12–15: minimum distance from limits
15	Output info, main value Access type ■ Read	None	■ Byte 0: alarm selection ID ■ Byte 1: ID for transmission function ■ Byte 2: unit ID, main value measuring range ■ Byte 3–6: end of measuring range (20 mA value) ■ Byte 7–10: start of measuring range (4 mA value) ■ Byte 11–14: damping in s ■ Byte 15: ID for write protection ■ Byte 16: ID of OEM dealer (17 = Endress+Hauser)
16	Production number Access type ■ Read	None	■ Byte 0–2: production number ✎ Note! Write production number —> command 19
17	User message Access type ■ Write	Byte 0–23: desired message (max. 32 characters)	■ Byte 0–23: current message
18	Tag name, description and date Access type ■ Write	■ Tag (8 characters) ■ Tag description (16 characters) ■ Date	■ Byte 0–5: tag name ■ Byte 6–17: tag description ■ Byte 18–20: date
19	Production number Access type ■ Write	Enter a number ranging from 0 to 1677715	■ Byte 0–2: production number

1)   Numbers in decimal notation

7.6 HART: Common practice commands

No.	HART command/ Access type	Command data[1]	Response data[1]
33	Device Variables Access type ■ Read	■ Byte 0: Device Variable 1 Code ■ Byte 1: Device Variable 2 Code ■ Byte 2: Device Variable 3 Code ■ Byte 3: Device Variable 4 Code	■ Byte 0: Device Variable 1 Code ■ Byte 1: Device Variable 1 Unit ■ Byte 2–5: Value of Device Variables 1 ■ Byte 6: Device Variable 2 Code ■ Byte 7: Device Variable 2 Unit ■ Byte 8–11: Value of Device Variables 2 ■ Byte 12: Device Variable 3 Code ■ Byte 13: Device Variable 3 Unit ■ Byte 14–17: Value of Device Variables 3 ■ Byte 18: Device Variable 4 Code ■ Byte 19: Device Variable 4 Unit ■ Byte 20–23: Value of Device Variables 4
34	Damping main value Access type ■ Write	■ Byte 0–3: damping in s	■ Byte 0–3: damping in s
35	Main value measuring range Access type ■ Write	■ Byte 0: unit ID ■ Byte 1–4: end of measuring range ■ Byte 5–8: start of measuring range	■ Byte 0: unit ID ■ Byte 1–4: end of measuring range (20 mA value) ■ Byte 5–8: start of measuring range (4 mA value)
36	Adopt measured value as scaling upper limit Access type ■ Write	None	None
37	Adopt measured value as scaling lower limit Access type ■ Write	None	None
38	Reset status "Parameter change" (config changed) Access type ■ Write	None	None
40	Current output simulation, main value Access type ■ Read	■ Byte 0–3: output current in mA ✎ Note! ■ You can simulate values between 2 and 22 mA. ■ You exit simulation by entering 0. ■ Simulation is not possible in Multidrop mode.	■ Byte 0–3: output current in mA
41	Start selftest Access type ■ Read	None	None
42	Device reset Access type ■ Write	None ✎ Note! Communication is not possible during initialization due to the reset.	None

No.	HART command/ Access type	Command data[1]	Response data[1]
44	Main value unit Access type ■ Write	■ Byte 0: unit ID None ✎ Note! Only units that suit the main value are accepted.	■ Byte 0: unit ID None
45	Calibrate the current output lower limit (only possible in 4 mA simulation) Access type ■ Write	■ Byte 0–3: externally measured current value	■ Byte 0–3: measured current value
46	Calibrate the current output upper limit (only possible in 20 mA simulation) Access type ■ Write	■ Byte 0–3: externally measured current value	■ Byte 0–3: measured current value
48	Extended device status Access type ■ Read	None	See Section "Troubleshooting"/"Diagnosis messages"
50	Assignment of the dynamic process variables Access type ■ Read	None	■ Byte 0: Device Variables Code for dynamic process variable 1 ■ Byte 1: Device Variables Code for dynamic process variable 2 ■ Byte 2: Device Variables Code for dynamic process variable 3 ■ Byte 3: Device Variables Code for dynamic process variable 4
51	Assignment of the dynamic process variables Access type ■ Write	■ Byte 0: Device Variables Code for dynamic process variable 1 ■ Byte 1: Device Variables Code for dynamic process variable 2 ■ Byte 2: Device Variables Code for dynamic process variable 3 ■ Byte 3: Device Variables Code for dynamic process variable 4	■ Byte 0: Device Variables Code for dynamic process variable 1 ■ Byte 1: Device Variables Code for dynamic process variable 2 ■ Byte 2: Device Variables Code for dynamic process variable 3 ■ Byte 3: Device Variables Code for dynamic process variable 4
53	Unit of a Device Variable Access type ■ Write	■ Byte 0: Device Variables Code ■ Byte 1: Unit code	■ Byte 0: Device Variables Code ■ Byte 1: Unit code
54	Information on a Device Variable Access type ■ Read	■ Byte 0: Device Variables Code	■ Byte 0: Device Variables Code ■ Byte 1–3: Transmitter serial number ■ Byte 4: Unit code ■ Byte 5–8: Transmitter upper limit ■ Byte 9–12: Transmitter lower limit ■ Byte 13–16: Damping ■ Byte 17–20: Minimum distance from limits ■ Byte 21: Classification ■ Byte 22: Family

No.	HART command/ Access type	Command data[1]	Response data[1]
59	Number of preambles in telegram responses Access type ■ Write	■ Byte 0: number of preambles (2 to 22)	■ Byte 0: number of preambles

1) Numbers in decimal notation

✎ Note!
Code tables and further information can be found in the document .

7.7 Device-specific commands

A detailed description of the device-specific commands can be found in the document on the CD-ROM.

☞ Caution!
The device-specific commands are used by DDs (Device Description) or DTMs (Device Type Manager). Only use these commands "manually" in exceptional cases.

7.8 Status messages

Byte	Bit	Errors/Warnings (group)	Errors/Warnings (local display)
0	0	Temperature sensor failure	F003
0	1	Sensor communication failure	C004, C010, F011
0	2	Sensor failure	F012
0	3	Wrong sensor type	F013
0	4	SCS alarm	F100–F103
0	5	Sensor alarm	F104, F105, M142, F149, F151
0	6	SCS warning	M106, M107, M111, M112
0	7	Sensor warning	M113, M131-M139, M141, M148, M150, M152, M153
1	0	Calibration active	C130
1	1	Internal sensor failure	F170, M171
1	2	Module communication failure	C200, F201
1	3	Module failure	F202, F218
1	4	Module mismatch	F203
1	5	Internal module failure	F212, F218

Byte	Bit	Errors/Warnings (group)	Errors/Warnings (local display)
1	6	Simulation active	C215
1	7	Hold active	C216
2	0	Power bad	M219
2	1	Multidrop active	C221, C220
2	2	Limit alarm	F404, F405
2	3	Limit warning	–
2	4	PARAM menu active	C406
2	5	DIAG menu active	C407
2	6	Software version incompatible	F500
2	7	Internal software failure	F502, M503
3	0	Software configuration failure	F510
3	1	Software framework failure	F513, M514
3	2	Initialization in progress	–
3	3	Initialization failure	F520
3	4	General operation failure	–
3	5	General operation warning	M408
3	6	Internal process value failure	F800, M801
3	7	Measured value limit alarm	F810–F813
4	0	Measured value limit warning	M840–M843
4	1	Process value alarm	–
4	2	Process value warning	–
4	3–7	Not used[1]	–
5, 14–24	0–7	Not used[1]	–

1)   Bits that are not used are set to "0".

✎ Note!
Further information on errors and warnings can be found in the "Troubleshooting" section.

8 Troubleshooting

8.1 Troubleshooting instructions

The transmitter constantly monitors its functions itself.
The red alarm LED lights up if the device detects an error. You can read information on the error in the "DIAG/Error messages" menu → 🖼 9.
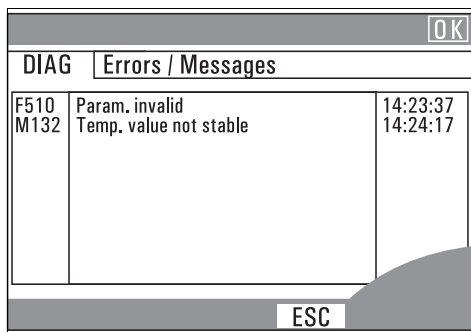
Fig. 9: Error messages (example)

Please refer to the "Diagnosis messages" Section for the possible error numbers and remedial action.

8.2 Diagnosis messages

In the "DIAG/error messages" menu, you can find additional information on the errors currently pending (red alarm LED lights up[3]).

The error messages are characterized by:
- Error class (internal variable, not visible)
- Error status (letter in front of the error number)
  - F = Failure, general error message
  - M = Maintenance required, an action is required (measured value is possibly still valid)
  - C = Device is in service (Check), waiting loop (no error)
  - U = Device status is uncertain, unidentifiable error
- Type of message
  - Alarm
  - Maintenance
  - Service

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3)   Red LED only lights up if the error current is ≥ 20 mA

✎ Note!
You have the option of increasing or decreasing the priority of a pending error. You do this by reorganizing the diagnosis list in the "PARAM/General settings/Devicediagnosis" menu (see Section "PARAM/General settings").
By giving an error currently displayed a lower priority, you can disable an error-related hold and set the device back to the measuring mode.

Example:
Error "M503 Internal C (error number 0815)" is pending. The maintenance icon appears on the device 🛠.
Go to the diagnosis list and move the error M503 down in the service error section (Cxxx).
Go to the measuring mode. The maintenance icon disappears and OK is displayed instead.

Only do this if you are absolutely certain that a critical error is not present and your measuring results still remain plausible. Always inform your Service Team.

The following tables are split by the type of error message.

8.2.1 Alarm messages

No.	Display text	Tests and/or remedial action
F003	Temperature failure	– Check wiring
F011	Sensor no comm.	– Check the measuring chain with a new sensor – Check the settings for the sensor type used.
F012	Sensor failure	
F013	Wrong sensor type	
F108	Cellconst upper limit	
F109	Cellconst lower limit	
F119	Temp offset upper limit	
F120	Temp offset lower limit	
F170	Intern S. (xxxxxxxx)	Contact the Service Team! Quote the error number and the text displayed. The (xxxxxxxx) stands for the text actually displayed.
F201	Transmitter no comm.	Test with a new transmitter module (CPU).
F202	Transmitter failure	
F203	Wrong transmitter type	
F212	Intern E. (xxxxxxxx)	Contact the Service Team! Quote the error number and the text displayed. The (xxxxxxxx) here stands for the text actually displayed.
F218	Curr.out module defect	Contact the Service Team!
F404	Lower limit current output	– Measured value outside the specified current range – Check plausibility – Adjust current output assignment if necessary
F405	Upper limit current output	
F500	Software not valid	Contact the Service Team!

No.	Display text	Tests and/or remedial action
F502	Intern C. (xxxxxxxx)	Contact the Service Team! Quote the error number and the text displayed. The (xxxxxxxx) here stands for the text actually displayed.
F510	Invalid parameters	Check your settings and adjust them.
F513	InternCFW (xxxxxxxx)	Contact the Service Team! Quote the error number and the text displayed. The (xxxxxxxx) here stands for the text actually displayed.
F520	No SA communication	Repeat the initialization. If the error occurs again, please contact the Service Team.
F531	(Logbook): full[1]	Delete the logbook entries.
F800	Intern P. (xxxxxxxx)	Contact the Service Team! Quote the error number and the text displayed. The (xxxxxxxx) here stands for the text actually displayed.
F810	PV upper limit	– Sensor in air
F811	PV lower limit	– Air cushion in assembly
F812	Temp upper limit	– Check the measuring chain
F813	Temp lower limit	✎ Note!
F814	USP645 upper limit exceeded	PV = primary value (main value)
F815	USP645 lower limit exceeded	

1)   Variable text: the logbook in question is named.

8.2.2 Maintenance messages

No.	Display text	Tests and/or remedial action
M110	Cellconst upper limit	
M114	Cellconst lower limit	
M121	Temp offset upper limit	
M122	Temp offset lower limit	
M131	PV not stable	– Sensor too old
M132	Temp. not stable	– Cable or connector defective
M171	Intern S. (xxxxxxxx)	Contact the Service Team! Quote the error number and the text displayed.
M213	Intern E. (xxxxxxxx)	
M219	Power supply bad	Connect the device to a clean power supply.
M408	Calibration aborted	Renew calibration solution, repeat calibration
M501	Device open	Close the housing and tighten the screws.

No.	Display text	Tests and/or remedial action
M503	Intern C. (xxxxxxxx)	Contact the Service Team! Quote the error number and the text displayed.
M514	Intern CFW. (xxxxxxxx)	
M801	Intern P. (xxxxxxxx)	
M530	(Logbook): 20% remaining [1]	
M840	PV upper limit	– Sensor in air – Air cushion in assembly – Check the measuring chain
M841	PV lower limit	
M842	Temp upper limit	
M843	Temp lower limit	
M844	USP645 upper limit exceeded	
M845	USP645 lower limit exceeded	
M950	Conc temp lower limit	
M951	Conc temp upper limit	
M952	Conc kappa lower limit	
M953	Conc kappa upper limit	
M954	Conc lower limit	
M955	Conc upper limit	
M956	Cond temp lower limit	
M957	Cond temp upper limit	
M958	Cond kappa lower limit	
M959	Cond kappa upper limit	
M960	Cond kappa comp lower limit	
M961	Cond kappa comp upper limit	

1)   Variable text: the logbook in question is named.

8.2.3   Service messages

No.	Display text	Tests and/or remedial action
C004	Scanning sensor	
C010	Sensor initialization	Wait for the initialization to finish.
C130	Calibration active	Wait for the calibration to finish.
C200	Transmitter initialization	Wait for the initialization to finish.
C215	Simulation active	Active corresponding to your settings
C216	Hold active	Active corresponding to your settings
C220	Multidrop mode active	
C221	Multidrop switch on	
C406	Param. active	End parameter entry
C407	Diag active	End query of device and sensor information
C519	Init. Software	

8.3   Process errors without messages

Problem	Possible cause	Tests and/or remedial action
Display deviates from comparison measurement	Incorrect calibration	Repeat the calibration. If necessary, check and repeat the calibration with a reference device.
	Sensor contaminated	Clean the sensor.
	Temperature measurement	Check the temperature measured values of both devices.
	Temperature compensation	Check the settings for temperature compensation and adjustment for both devices.
Display deviates from comparison measurement	Polarization error	Use suitable sensor: ▪ Larger cell constant ▪ Graphite instead of stainless steel (note stability)

Problem	Possible cause	Tests and/or remedial action
Implausible measured values: – Measured value constantly 000 – Measured value too low – Measured value too high – Measured value frozen – Current output value does not meet expectations	Short/moisture in sensor	Check sensor.
	Short in cable or box	Check cable and box.
	Interruption in sensor	Check sensor.
	Interruption in cable or box	Check cable and box.
	Cell constant incorrectly set	Check cell constant.
	Incorrect output assignment	Check assignment of measured value to current signal.
	Output function incorrect	Check preselection (0-20/4-20 mA) and curve shape (linear/table).
	Air cushion in assembly	Check assembly and orientation.
	Ground connection at or in device	Measure in isolated device.
	CPU module failure	Check with new module.
	Device has impermissible operating status (no reaction to keys being pressed)	Switch device off and then on again.
Temperature value incorrect	Temperature sensor wired incorrectly	Check connections using wiring diagram; three-wire connection always necessary.
	Measuring cable defective	Check cables for interruptions, short-circuit, shunt.
	Incorrect sensor type set	Configure correct temperature sensor type.
Measured value in process incorrect	No/incorrect temperature compensation	ATC: Select type of compensation. If linear, set suitable coefficient. MTC: Set process temperature.
	Temperature measurement incorrect	Check temperature measured value.
	Bubbles in medium	Suppress bubble formation by: – Using gas bubble trap – Creating counterpressure (orifice plate) – Measuring in bypass
	Flow too high (can result in bubble formation)	Reduce flow or select low-turbulence mounting location.
	Voltage potential in medium (only for conductive)	Ground medium near sensor.
	Sensor contaminated or coated in buildup	Clean sensor (see Section "Cleaning the conductivity sensors").
Measured value fluctuations	Interference on signal output line	Check how line is laid, lay line separately if necessary.
	Interference potential in medium	Remove source of interference or ground medium as close as possible to sensor.
Measured value fluctuations	Interference on measuring cable	Connect cable shielding as per wiring diagram.

Problem	Possible cause	Tests and/or remedial action
No current output signal	Line disconnected or short–circuited	Disconnect line and measure directly at device.
	Output defective	See Section "Device-specific errors".
Fixed current output signal	Current simulation active	Switch off simulation.
Incorrect current output signal	Total load in current loop too high	Disconnect output and measure directly at device.
	EMC (interference coupling)	Disconnect both output lines and measure directly at device.
No HART—communication	Incorrect CPU module	Check nameplate
	- No or incorrect DD - HART interface missing - Device not registered in HART server - Load too low (> 230 Ω) - HART receiver (e.g. FXA191) not connected via load but via power supply - Line problems (too long, cross-section too small, not shielded, shield not grounded, cores not twisted) - Several devices configured on same address	Further information is available on the CD–ROM.

8.3.1 Device–specific errors

Problem	Possible cause	Tests and/or remedial action
Display dark	No supply voltage	Check if available.
	CPU defective	Replace CPU, make sure correct version is used.
Display shows information but – no change in display and/or – device cannot be operated	Module incorrectly wired	Check modules and wiring.
	Operating system has impermissible status	Switch device off and then on again.
Implausible measured values	Sensor module defective	First perform tests and take measures as per "Process-specific errors" Section Test the measuring inputs: – Connect a resistor instead of conductivity sensor – Tables on conductivity and temperature simulation are provided on the CD-ROM.

Problem	Possible cause	Tests and/or remedial action
Current output, current value incorrect	Calibration not correct	Test with integrated current simulation, connect mA meter directly to current output.
	Load too high	
	Shunt/short to ground in current loop	
No current output signal	CPU defective	Test with integrated current simulation, connect mA meter directly to current output.

8.4   Software history

Date	Version	Changes in the software	Documentation: Edition
05/2007	13.04.01	Extension ■ Memosens for conductivity measured conductively	BA381/07/xx/07.05.01 BA382/07/xx/07.05.01

04/2006	13.04.00	Extension
		■ Advanced functionality:
		  – Logbooks
		
		Improvement
		■ Fault elimination:
		  – Simulation, current output 2
		  – Temperature compensation
		  – Temperature adjustment with table and 2 point
		■ Corrections in various editors
		■ Corrections in text catalog
		■ Concentration measurement possible with negative slope (via concentration table)
			BA381/07/xx/06.10.01
			BA382/07/xx/06.10.01

04/2006	13.03.00	Extension
		■ Advanced functionality:
		  – Temperature compensation and conversion of conductivity to concentration via tables
		  – Current outputs can be assigned as required
		■ Standard functionality:
		  – Sensor diagnosis, device diagnosis
		  – Temperature compensation as per ISO7888
		■ Software update via DAT modules
		■ Date and time format selectable
		■ Language extension
			BA381/07/xx/06.07.01
			BA382/07/xx/06.07.01

01/2006	13.02.00	Improvement ■ Selectable data sources for the current outputs ■ Temperature adjustment ■ Invalid resistance values are no longer displayed. An error message appears instead.	BA381/07/xx/05.11.01 BA382/07/xx/05.11.01
09/2005	13.01.00	Extension ■ Compensation integrated in four-electrode sensors ■ Extended error codes ■ Improvement of the update behavior	BA381/07/xx/05.11.01 BA382/07/xx/05.11.01
06/2005	13.00.00	Original software (analog sensors)	BA381/07/xx/05.05.24 BA382/07/xx/05.05.24

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