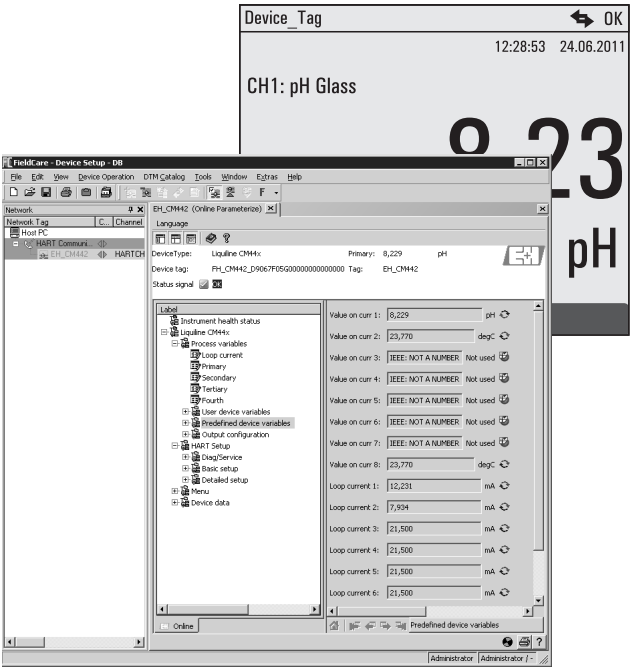
BA00486C/07/EN/02.13
71221127

Supplement to Operating Instructions:
BA00444C, BA00443C, BA00465C, BA00478C, BA01225C

Operating Instructions
Liquiline CM44x/R, Liquistation CSFxx, Liquiport 2010 CSP44

Communication via the HART protocol



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People for Process Automation

Table of contents

1 Documentation

There are several parts to the Operating Instructions on the CD:
- Commissioning
- Operation & configuration
- Calibration
- Maintenance & diagnostics
- HART communication

2 HART protocol

HART (Highway Addressable Remote Transducer) is a standardized communication protocol for industrial fieldbuses.
The HART protocol enables field devices to communicate digitally with a process control system (PCS).

HART is an extension of the widely used 4/20 mA current loops that transmit measured variables by analog communication.
HART transmits data using the Bell 202 Frequency Shift Keying (FSK) standard to superimpose a high-frequency signal (± 0.5 mA) on the low-frequency analog signal (4 to 20 mA).
Two-wire copper cables are usually used for data transmission. Digital communication (HART) can be used independently or in addition to analog data transmission. The maximum transmission distances depend on the network architecture and environmental conditions.
HART only offers a short bandwidth and moderate response times. On the other hand, it can be used in industrial environments and an existing wiring system can be reused.

Applications of HART communication include remote-controlled:
- Process variable interrogation
- Parameter configuration
- Device diagnostics

3 Wiring

3.1 HART connection

3.1.1 Device connection

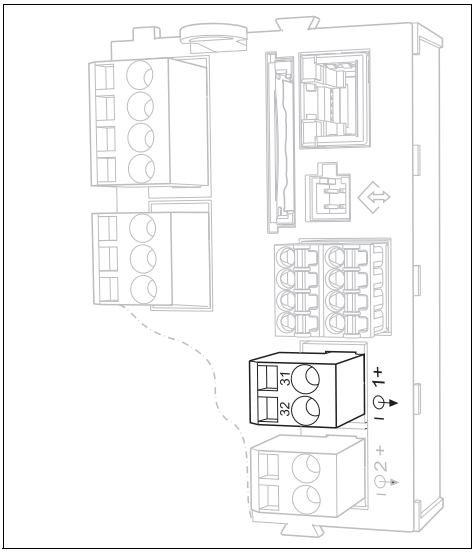

Fig. 1: HART terminals on the base module BASE H, L or E

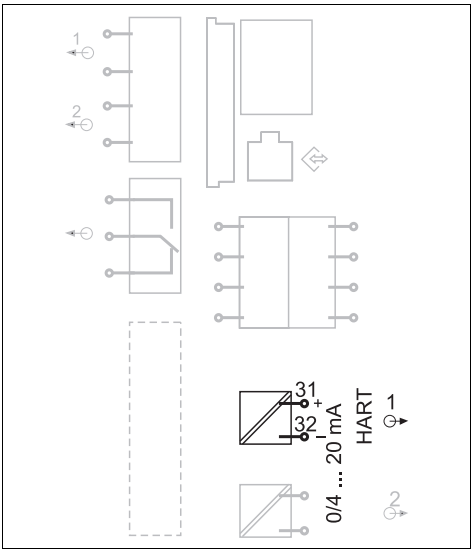

Fig. 2: HART connection on the base module BASE H, L or E

HART communication is **only** possible via the active **current output 1** of the base module. HART is not available via current output 2 of the base module or via another, optional extension module.

You only have HART functionality if you ordered it specifically with the device.
You can also enable the HART functionality after purchasing the device by buying an activation code and entering it via the device software. For this purpose, please read the "Operation and configuration" manual.

It is only possible to have one fieldbus protocol active at any one time. If you had already enabled PROFIBUS or Modbus, these will be disabled when you enable HART.

3.1.2 Connecting to a HART modem

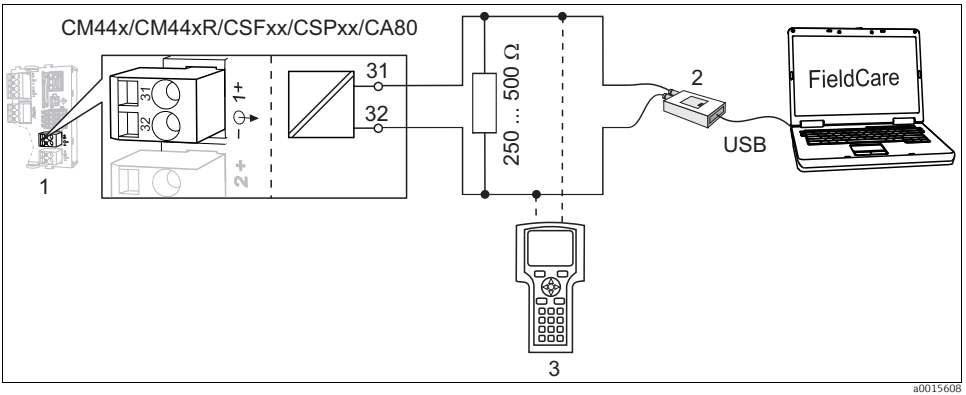

Fig. 3: HART via modem

1 Device module Base L, H or E: current output 1 with HART
2 HART modem for connecting to PC, e.g. Commubox FXA191 (RS232) or FXA195[1)] (USB)
3 HART handheld terminal

3.1.3 Connecting to a HART modem with Bluetooth

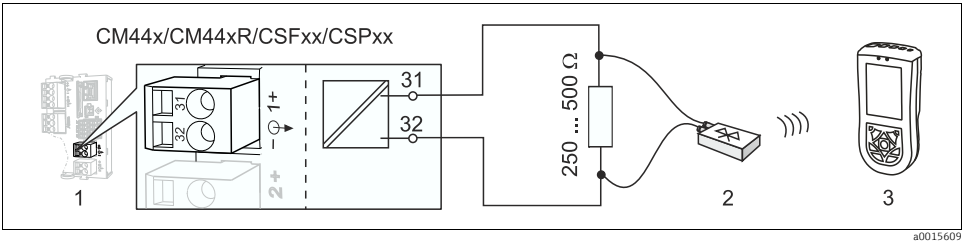

Fig. 4: HART via modem

1 Device module Base L, H or E: current output 1 with HART
2 VIATOR HART Bluetooth modem
3 Field Xpert SFX100 HART handheld terminal

1) Switch position "on" (substitute for resistor)

3.1.4 Connecting to the FXA520 HART gateway

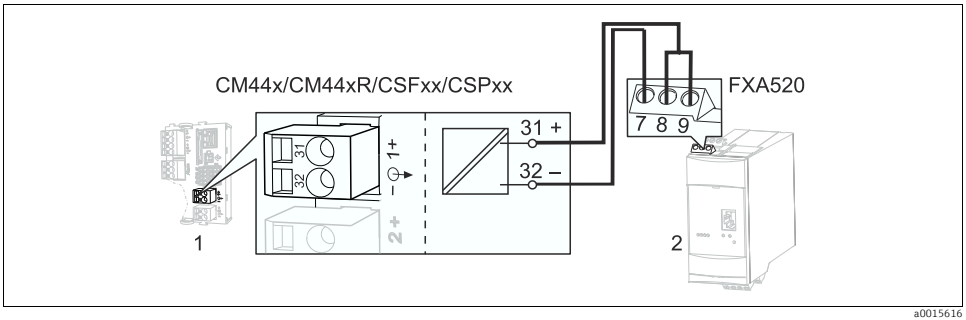

Fig. 5: HART via FXA520 gateway

1 Device module Base L, H or E: current output 1 with HART
2 HART FXA520 gateway

3.1.5 Connecting to the SWA70 WirelessHART adapter

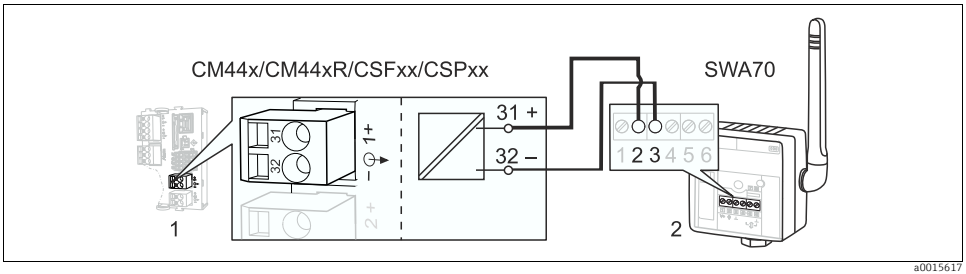

Fig. 6: Via WirelessHART adapter

1 Device module Base L, H or E: current output 1 with HART
2 SWA70 wireless HART adapter

3.2 Multidrop mode

Several HART devices are incorporated into one single current loop in the Multidrop mode. Here, analog signal transmission is disabled and the current output of each of the connected devices is fixed at 4 mA.
Different types of devices from different manufacturers can be incorporated into a multidrop network. However, never mix devices with an active current output (e.g. four-wire devices) and a passive current output (e.g. two-wire devices).
The maximum number of devices that are possible in a multidrop network depends on the device. If only **CM44x/R**-type devices are connected, then the **maximum is 15**.

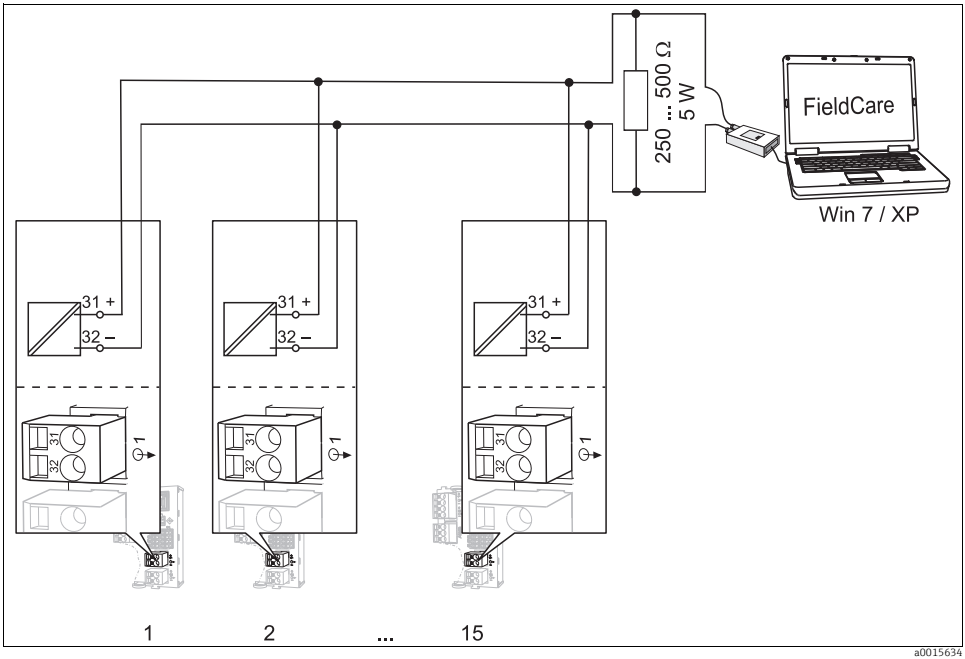

Fig. 7: Multidrop mode for a maximum of 15 devices

1 to 15 Bus address

Each device in the multidrop loop must have a bus address that is different from the bus addresses of the other devices. Ideally, assign addresses from 1 to 15 (it is possible to assign addresses from 1 to 63). Set the bus address either onsite via the device menu or using a HART handheld terminal.
The Multidrop mode is not enabled if the bus address is set to 0.

When the Multidrop mode is enabled, the current output menu is not available for the current output 1:1.

4 Operation

4.1 Configuring the HART output

The device platform is based on a modular multi-channel, plug&play sensor concept. For this reason, there is no general relationship between the sensor measured value and a device variable. The device variable is a kind of placeholder for measured values that can be retrieved through HART communication.

Any device variables that are not assigned a measured value return the value "NaN" (not a number) with the unit "not used" via HART. This corresponds to the factory setting of all the configurable device variables (0 to 15). The same applies for device variables 16 to 23 since the current outputs are not assigned to a measured value at the factory.

4.1.1 User-defined device variables

There are 16 user-defined device variables (0 to 15) which can be configured as the user requires.
Once you have commissioned your device, you should configure at least one device variable via the onsite menu:

Path: Menu/Setup/Outputs/HART/Device variable 0 ... Device variable 15

Function	Options	Info
Source of data	Options ▪ None ▪ User-defined measured variable **Factory setting** None	The sources of data on offer depend on your device version. All the sensors and controllers connected to inputs, along with mathematics functions and current inputs, are available for selection.
Measured value	Options ▪ None ▪ Depends on the Source of data **Factory setting** None	The measured value you can select depends on the option selected under "Source of data".

A complete list of all the measured values that can be configured depending on the data source selected is provided in the SD01187C document, which is available on the CD.

Path: Menu/Setup/Outputs/HART/Device variable 0 ... Device variable 15

Function	Options	Info
Hold behavior	Options ▪ Freeze ▪ None **Factory setting** Freeze	**Freeze** The device retains the last value before the hold and sets the status of the device variables to "good/constant". **None** A hold does not affect the measured value of the device variables. Any changes to the measured value continue to be displayed. The status of the device variables is also set to "good/constant".

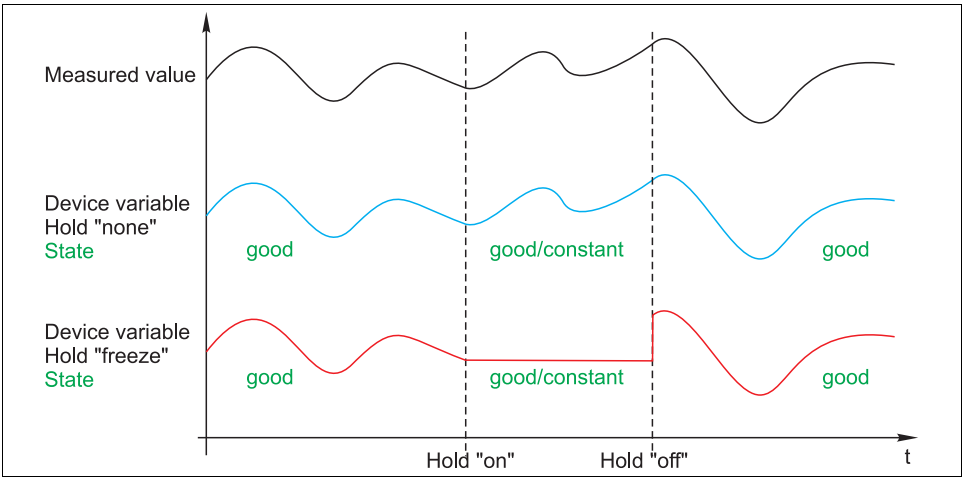

Fig. 8: Hold behavior with HART communication

4.1.2 Predefined device variables

There are also 16 other predefined device variables in addition to the user-defined variables:
- Device variables 16 to 23 are assigned to the measured values of current outputs 1 to 8[2)]
  In the Setup/Outputs/Current output menu, you decide which measured value from which specific data source is output via the current output.
- Device variables 24 to 31 are permanently assigned to the current values [mA] of current outputs 1 to 8.

2) The current output name is based on the following naming convention: "No. of device slot: No. of output", e.g. "1:1"

4.1.3 Dynamic variables

Older control systems (HART 5) might not be able to display device variables. Such systems use "dynamic variables".
Four device variables are assigned to the dynamic variables. The default values are:
- PV = device variable 16 (measured value of current output 1)
- SV = device variable 17 (measured value of current output 2)
- TV = device variable 0
- QV = device variable 1

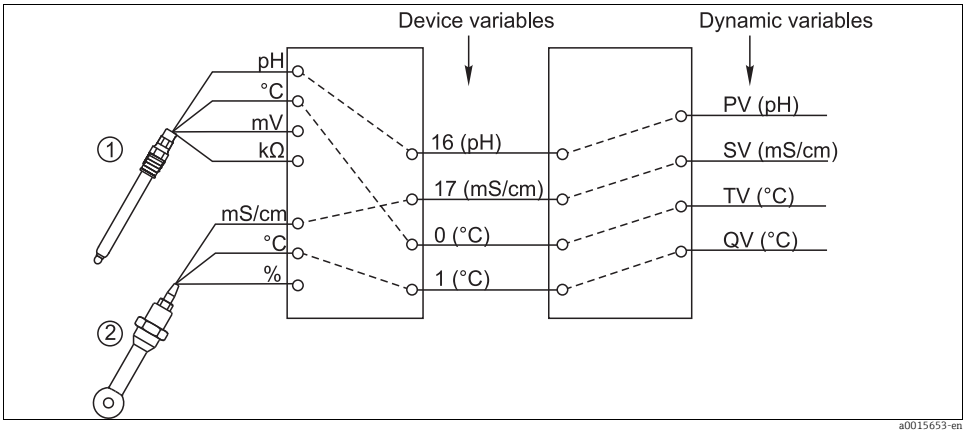

Fig. 9: Possible assignment of dynamic variables to device variables

The assignment of the dynamic variables to device variables can only be changed via HART communication (e.g. with FieldCare).

4.2 Bus address

If Multidrop is active (Bus address > 0), the current at current output 1 is permanently set to 4 mA.
Here, it does not matter what function has been assigned to the output (measured value/controller etc.). Current simulation is no longer possible.

Path: Menu/Setup/General settings/Extended setup/HART

Function	Options	Info
Bus address	0 to 63 **Factory setting** 0	You can change the device address to integrate several HART devices in a single network (Multidrop mode).

If you reset the device to the factory settings (Diagnostics/Systemtest/Reset/Factory default), the bus address is not reset. Your setting is retained.

4.3 Tags

The software offers the user a range of tags (descriptor fields) which can be used to describe the device. Of these tags, only the "long tag" (Device tag) can be changed via onsite operation (Menu/Setup/General settings) and via the bus.

All the other tags can only be accessed via HART communication. In addition, these tags also use a limited character set (packed ASCII, only upper-case letters, numbers and selected special characters):
- "short tag" [3] (8 characters), independent of the "long tag"
- Description (16 characters)
- Message (32 characters)
- Date
- Device number (integer, 0 to 16777215)

All the tags can have a value of some sort. The "short tag" is set to "EH_[product root]" at the factory. The device serial number is also appended for the "long tag".

4.4 Device information

The following information can be retrieved via the "Diagnostics/System information/HART" menu:
- Bus address
- Unique address
  The unique address is linked to the serial number and is used to address devices uniquely in a network.
- Manufacturer ID
- Device type
  Device code for CM44x, CM44xR, CSFxx or CSPxx
- Device revision
- Software revision

The device revision number can change if the base module is replaced. The software revision number can change if the software is updated.

4.5 Communication symbol

The communication symbol ⇆ appears on the display as soon as bus communication is active. It disappears approx. 2 seconds after bus communication has finished.
Many control systems use one HART channel alternately for several devices (e.g. 1 x HART for 8 devices on one common analog input module). In such instances, the symbol can flash instead of being displayed permanently.

3) FieldCare = "Instr. tag"

5 Operation via device drivers

The device cannot be configured entirely via HART communication.
The device drivers available primarily provide a way of making the basic HART settings and displaying measured values and diagnostics information.

The menu structure is similar for all device drivers.
The following section describes the structure of the FC475 HART handheld terminal and provides screenshots for additional tools and drivers.

The handheld terminal is operated in English. For this reason, English software strings and screenshots are used. Other tools, such as FieldCare for example, support other languages and the language can be changed. To ensure comparability, however, the English screenshots are used here.

5.1 Device variables

All the device variables available are displayed in this menu. In addition, you can also change the assignment of user-defined and predefined device variables (→ 10) to dynamic variables (→ 12) and define units for variables 0-23.

Menu structure

Function	Options	Info
Current data	Display only ▪ AI Loop current ▪ PV Primary ▪ SV Secondary ▪ TV Tertiary ▪ 4V Fourth (=QV)	Apart from the current loop current, the system also displays the values of the dynamic variables currently assigned in the set units.
User device variables	Display only ▪ Device variable 0 ▪ ... ▪ Device variable 15	The user-defined device variables are displayed in the corresponding units. Any device variables that are not defined are displayed with "NaN" as the value and "not used" for the unit.
Predefined device variables	Display only ▪ Value on curr 1 ▪ ... ▪ Loop current 8	The predefined device variables are displayed in the corresponding units.
Output configuration	Options ▪ PV is ▪ SV is ▪ TV is ▪ QV is	You can change the assignment of the dynamic variables here. In contrast, you can only change device variables on the device via onsite operation.
Set unit of device variable	Options ▪ Device variable 0 ▪ ... ▪ Value on curr 8	Select a unit that suits the parameter. Otherwise an error message is displayed.

Sample screenshots

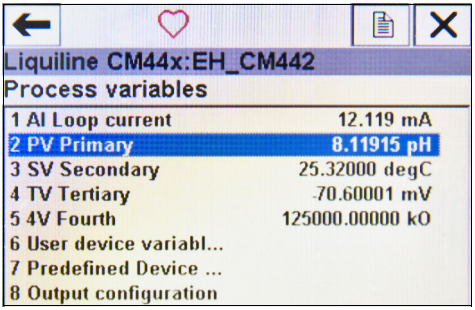

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Fig. 10: Process variables on FC475

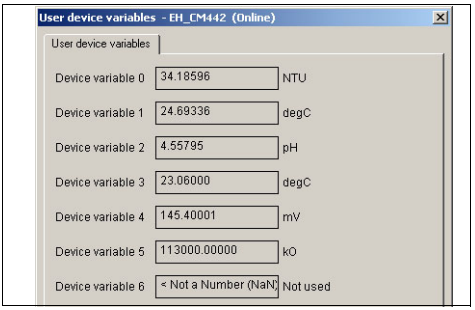

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Fig. 11: User-defined variables with Siemens PDM

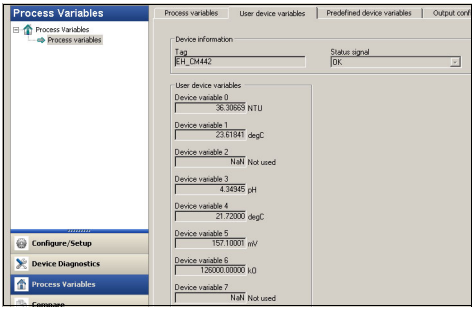

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Fig. 12: Process variables with Emerson AMS

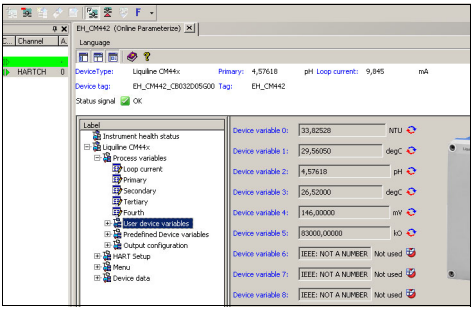

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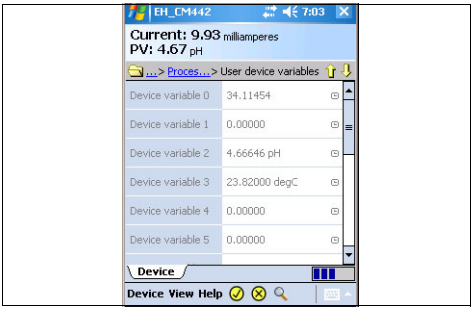
Fig. 13: User-defined variables with FieldCare



a0015672

Fig. 14: User-defined variables with Field Xpert

5.2 HART setup

Menu structure

Function	Options	Info
Diag/Service		
Loop test	Action	When testing the measuring loop, select a target current value for the analog output. The test delivers the bus response.
Device reset	Action	Device restart
Basic setup		
Tag	Customized text (packed ASCII) max. 8 characters	Short tag, can only be edited via the bus
Device tag	Customized text max. 32 characters	Device description, can also be edited locally at the device
PV Unit	Options	Select a unit for the PV (device variable 16).
AI PV Xfer fnctn	Read only	The transfer function is always "linear"
Primary PV Damp	0 to 300 s	The damping causes a floating average curve of the measured values over the time specified.
Device information		
Distributor	Read only	Manufacturer
Model		Device type
Cfg chng count		Counter that indicates how frequently changes were made to the device configuration.
Tag	Same as in the basic setup. You can also edit the descriptor fields here.	
Device tag		
Date	Date format	
Write protect	Read only	You can lock the device keys. This is only possible via onsite operation, however.
Descriptor	Customized text max. 16 characters	
Final asmbly num	0 to 16777215	Unique number to identify the field device
Revision #'s		Revision numbers
Universal rev	Read only	Revision status of the HART protocol used
Fld dev rev		Revision status of the device in general
Software rev		Revision status of the device software
Hardware rev		Revision status of the device electronics

Menu structure

Function	Options	Info
Detailed setup		
Sensors		
Primary	Read only	Measured value of analog output 1
Signal condition		Signal status
Primary PV Damp	0 to 300 s	Same as in the basic setup
AI PV URV	Can be edited, depends on the measured value (PV)	End of measuring range
AI PV LRV		Start of measuring range
AI Rnge unit		Unit of measured variable
AI PV Xfer fnctn	Read only	Same as in the basic setup
AI PV % rnge	Read only	Variable that indicates the PV in relation to the measuring range
Output condition		Status of the output
Analog output		Analog output
Loop current	Read only	Current loop current
AO Alrm typ		Alarm response of the analog output
Channel flags		Characteristics of the analog output
Loop current mode		The loop current would be set to a fixed value of 4 mA in Multidrop mode.
Loop test	Action	Same as in Diag/Service
HART output		HART output
Poll addr	0 to 63	Bus address
Num req preams	Read only	Number of preambles the requesting unit requests from the field device
Num resp preams		Mandatory number of preambles which the field device must send in response

Sample screenshots

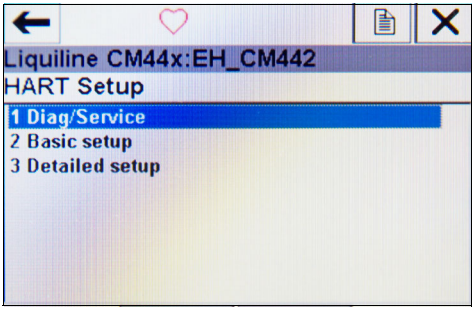


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Fig. 15: HART setup on FC475

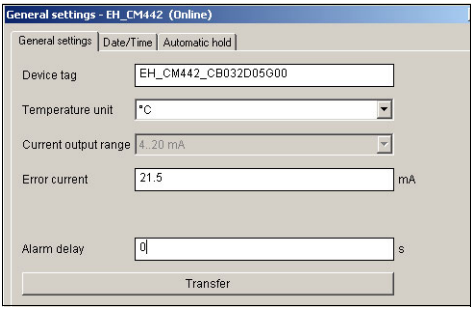

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Fig. 16: HART setup with Siemens PDM

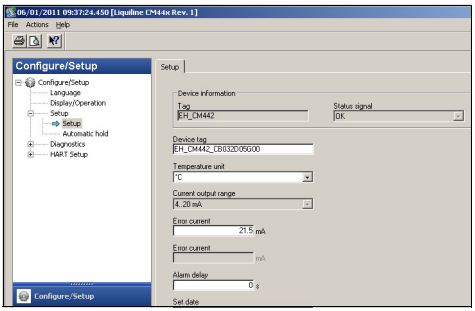

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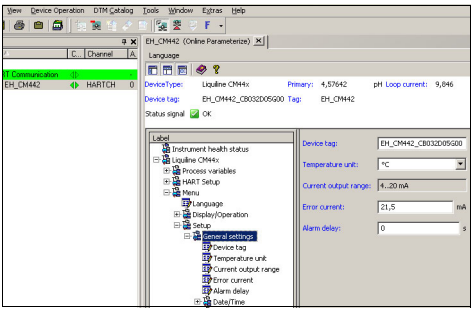
Fig. 17: HART setup with Emerson AMS



a0015698

Fig. 18: HART setup with FieldCare

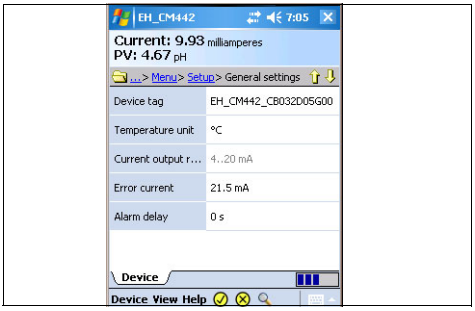


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Fig. 19: HART setup with Field Xpert

5.3 Menu

Menu structure

Function	Options	Info
Language	Choice of all the device languages available	Operating language for onsite operation
Display/Operation		
Contrast	5 to 95 %	Settings for the device display It is advisable to configure these parameters onsite via the device menu.
Backlight	Options ▪ On ▪ Off ▪ Automatic **Factory setting** Automatic	
Screen saver *Only for Liquistation/Liquiport*	Options ▪ Off ▪ Automatic **Factory setting** Off	
Screen rotation	Options ▪ Manual ▪ Automatic **Factory setting** Manual	
Sampling programs		*Only for Liquistation/Liquiport*
Program name	Read only	The name of the sampling program currently selected is displayed.
Program status		Displays the current status of the program.
Program stop	Action	
Start		
Manual sampling		
Program status	Read only	See above
Action message		
Sample volume		Sample volume
Start sampling	Action	
Setup		
General settings	Customized text (packed ASCII) max. 8 characters	Short tag, can only be edited via the bus
Device tag	Customized text, 32 characters	Long tag, see above

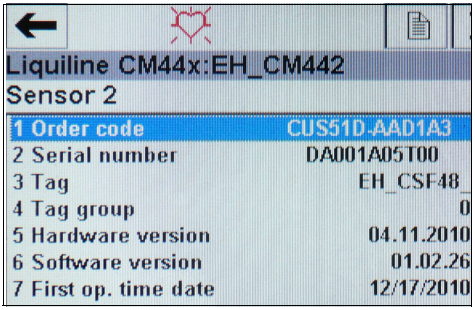
Menu structure

Function	Options	Info
Temperature unit	Options ■ °C ■ °F ■ K	Changes the value displayed on the onsite display
Current output range	4..20 mA	The range must be 4..20 mA for HART.
Error current	2.4 to 23.0 mA	The function meets NAMUR NE43.
Alarm delay	0 to 9999 s	The system only displays the errors that are present longer than the set delay time. This makes it possible to suppress messages that only occur briefly and are caused by normal process-specific fluctuations.
Date/time		
Set date	User entry	Editing mode: Day (two-digit): 01 to 31 Month (two-digit): 01 to 12 Year (four-digit): 1970 to 2106
Set hour	User entry	Time entered in hours and minutes
Set minute	User entry	
Automatic hold		
Device specific hold	Information entered separately for: ■ Setup menu ■ Diagnostics menu ■ Calibration menu	Decide whether a hold should be activated when the particular menu is opened.
Hold delay	0 to 600 s	The hold is maintained for the duration of the delay time when you switch to the measuring mode.
Diagnostics		
Diagnostics list		
Error position	Read only	Input channel where an error occurred
Global error		Error that is independent of a particular channel
Diagnostic bits 121-128		The assignment of the HART diagnostic groups to the diagnostic messages of the onsite display is provided in the "Troubleshooting" section (→ 23). For troubleshooting measures, please refer to Operating Instructions BA445C "Maintenance & diagnostics".
Diagnostic bits 128-135		
Diagnostic bits 136-140		
Diagnostic bits 146-151		
Diagnostic bits 152-159		
Diagnostic bits 160-167		
Diagnostic bits 168-175		
Diagnostic bits 176-180		

Menu structure

Function	Options	Info
Most important message	The error code is displayed	Highest priority message of all the messages currently pending
Past message		Last message to occur
System information		
Device tag	Read only	Device designation, long tag
Order code		Device details: www.products.endress.com/order-ident
Orig. order code ext.		Long order code derived from the product structure
Current order code ext.		If you have made any changes, you can change the order code appropriately via the onsite menu, for example, and check the order code here.
Serial number		You can obtain more information on your device by entering the device serial number at: www.products-endress.com/device-viewer
Software version		
Software version FMSY1		*Only for Liquistation/Liquiport*
FMSY1 proj. version		
System modules		
Backplane	Read only ▪ Description ▪ Serial number ▪ Order code ▪ Hardware version ▪ Firmware version	
Base	Read only ▪ Description ▪ Serial number (2x) ▪ Order code ▪ Hardware version (2x)	
Sensor information		
Sensor 1	Read only ▪ Order code ▪ Serial number ▪ Tag ▪ Tag group ▪ Hardware version ▪ Software version ▪ First op. time date	Information on each of the individual sensors connected. Here you can discover whether a sensor is assigned to a tag group, for example. If you replace the sensor, you can only install a sensor that belongs to the same tag group.
...		
Sensor n		

Sample screenshots



a0015700

Fig. 20: Sensor information on FC475

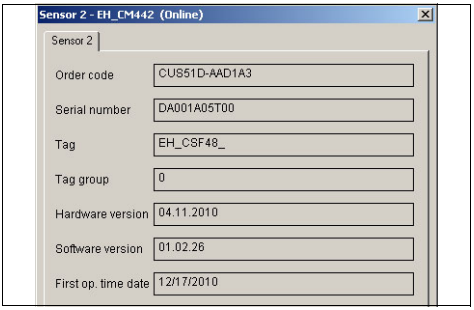


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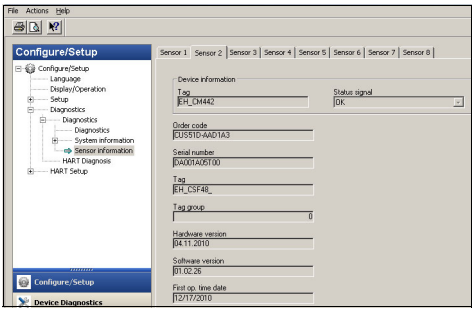
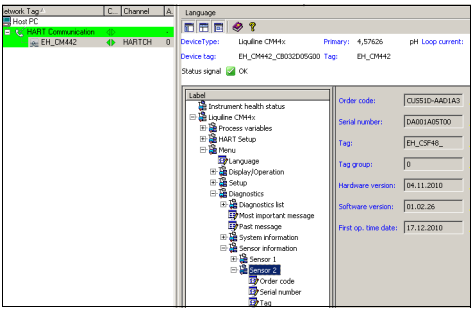
Fig. 21: Sensor information using Siemens PDM



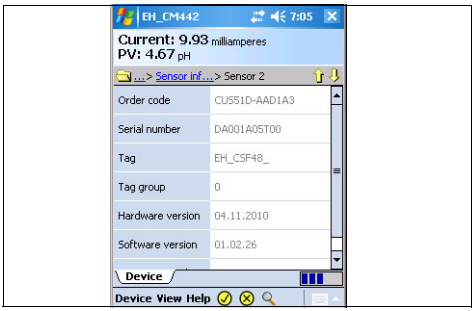
a0015702

Fig. 22: Sensor information using Emerson AMS



a0015703

Fig. 23: Sensor information using FieldCare



a0015705

Fig. 24: Sensor information using Field Xpert

5.4 Device data

This menu contains the device descriptions and revision information.
As with the other menus, it is also possible to edit the descriptor fields in this menu. More information is provided in the previous chapters.

6 Troubleshooting

6.1 Diagnostics messages

The device displays a range of information when an error occurs. Every device driver always displays the error code with the highest priority and the most recent error code.
The errors are either assigned to a sensor channel or marked as "global" if the errors do not apply to one single channel.

Error information is sometimes transmitted as a string. As a result, the device driver might display cryptic characters if the device language configured contains non-Latin script (e.g. Chinese).

It is not possible to display all the possible error codes simultaneously in HART. Therefore, some errors must be put into groups.
Consequently, different reasons have to be taken into account if an error group is displayed. The table indicates which device diagnostic codes belong to a HART diagnostic group.

Bit	Description (long text) in the device driver	Diagnostics messages assigned at the device
121	Initialization or service active, please wait	10, 81, 202, 412, 413
122	Device error, service required	241, 242, 243, 261, 262, 263, 285, 304, 305, 306, 322, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 335, 347, 348, 349, 350, 351, 352, 370, 371, 373, 502, 503, 903
123	Configuration error	162, 163, 355, 358
124	Calibration active, please wait	107
125	Battery empty, replace clock battery	302
126	Current input outside spec. range	972, 973
127	Current output outside spec. range	460, 461
128	Alarm, incorrect measured value, check application	141, 142, 144, 552, 553, 554, 555, 558, 559, 560, 561, 841, 842, 843, 910
129	Warning, incorrect measured value, check application	168, 942, 943
130	Alarm, incorrect temperature, check application	135, 136, 146, 550, 551, 556, 557, 832
131	Warning, incorrect temperature, check application	934, 935
132	Alarm, process check system, no change in measured value	904
133	Logbook memory, check logbook	323, 530, 531
134	No sampling, service required	357, 927
135	No sample flow, service required	314, 920, 921, 928, 930
136	No cooling, service required	315, 336
137	No heating, service required	316, 334

Bit	Description (long text) in the device driver	Diagnostics messages assigned at the device
138	Replace pump hose / process seal	337, 338, 922, 923, 924, 925, 926
139	Current / all sample bottles full, no further sampling	353, 354, 356
146	No sensor communication / check cable connection	62, 100, 130, 158, 374, 929, 985
147	Alarm, sensor defective, service required	2, 4, 5, 12, 13, 18, 61, 137, 138, 140, 143, 149, 150
148	Alarm, sensor worn, replace sensor	101, 106, 147, 148, 153, 155, 157, 161
149	Warning, sensor worn, replace sensor	108, 109, 126, 534, 535
150	Alarm, clean or replace sensor	151, 156, 159, 313, 317, 318, 319, 320, 321, 339, 340
151	Sensor calibration required	152, 154, 160, 164, 844
152	Replace temperature sensor	22, 310, 311, 312, 984
153	Alarm, calibration interval expired	102, 104
154	Warning, calibration interval expires soon	103, 105
155	Warning, temperature calibration expires soon	114, 115, 116, 117
156	Calibration error, repeat calibration	131, 132, 500, 501, 505, 507, 509, 511, 513, 515, 517, 518, 520, 522, 523, 524, 526, 528
157	Warning, operated hours monitoring	71, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199
158	Alarm, sensor glass membrane	118, 122, 124
159	Warning, sensor glass membrane	119, 123, 125, 127
160	Alarm, sensor reference	120
161	Warning, sensor reference	121
162	Alarm, sensor leak current	128
163	Warning, sensor leak current	129
164	Alarm, low sensor signal	133
165	Warning, low sensor signal	134
166	Alarm, ISE check	983, 987
167	Alarm, USP / EP	914
168	Warning, USP / EP	915
169	Overflow calculation	991, 992, 993, 994
170	Redundancy, deviation limit	990
171	Reset failed	545
172	File operation failed	540, 542, 543

Bit	Description (long text) in the device driver	Diagnostics messages assigned at the device
173	License error, service required	532
174	Calib. aborted	408
175	Faulty power supply, service required	343
176	Sampler paused	344
177	Diag menu selected, please wait	407
178	Hold active	216
179	Setup selected, please wait	406
180	Simulation active	215

Refer to the "Maintenance & diagnostics" manual (BA00445C for CM44x, BA01227C for CM44xR, BA00463C for CFS48 and BA00470C for CSP44) for information on the remedial action you can take depending on the error code. Where necessary, you must evaluate all the error codes which are assigned to a group of HART diagnostics messages as indicated in the table.

6.2 Communication-related errors

Problem	Possible cause	Tests and / or remedial action
No communication possible or HART menu not visible	HART is not enabled	Go to the Setup/Outputs menu and check whether the "HART" submenu is displayed. If it is not, HART is not enabled for your device. Purchase an activation code and enter it under "Setup/General settings/Extended setup/Data management/Activation code".
No communication possible	Current output range set to 0 to 20 mA	Change the range to 4 to 20 mA --> Menu/Setup/General settings/Current output range
	HART is connected to the wrong current output	Connect HART to current output 1:1.
	Device is booting	Wait until the device has booted. HART is available as soon as the measuring screen is displayed.
	Current output not enabled	Enable current output 1:1 --> Menu/Setup/Outputs/Current output 1:1/Current output = "On"
	Current output defective	Using an external multimeter, check the output current at output 1:1. You must replace the module if a current cannot be measured in the 2.4 to 23 mA range even though the output is enabled.

Problem	Possible cause	Tests and / or remedial action
No communication possible or communication is unstable	Communication load (resistor) outside the permitted range	Connect HART as indicated in the wiring diagrams (→ 6) an. Ideally, use a 270 Ω resistor.
	The device has been connected to an input of a control system which was not designed for this purpose (e.g. two-wire instead of four-wire).	Connect HART as indicated in the wiring diagrams (→ 6) an. There should not be any external current source in the circuit. The power is supplied by the device.
	USB HART modem	Alternatively use an RS232 modem. Some programs have problems with a USB modem. This has nothing to do with the CM44x/CSXxx device. Use hardware which you are sure works correctly.
No measured value at the process control system (PCS)	No device variable defined	Connect a sensor. Define at least one data source and measured variable for current output 1:1. Also define the device variables in the HART menu. --> Menu/Setup/Outputs/Current output 1:1/Source of data and Measured value --> Menu/Setup/Outputs/HART/Device Variable x
PCS cannot switch on the burst mode	CM44x / CSXxx does not support the burst mode	Use the device without the burst mode.
Unit of the transmitted device variable does not match the unit on the display	Display and HART are independent of one another	▪ Set the unit of the HART device variables with FieldCare, for example. ▪ Not all units are available via HART. In such instances, the PCS displays the message "not defined" or shows Ω instead of MΩ. ▪ Use a DD (device description) for your PCS. You can download DDs and DTMs (device type managers) for common control systems (FieldCare, Pactware, ABB, AMS, PDM, FC475) from the Endress website.
No communication in a multidrop network	Incorrect bus addresses	Each device in the multidrop network must have a unique bus address, preferably in the range from 1 to 15.
	Incorrectly connected	All the devices must be connected in parallel (→ 9).
	Devices in the network do not meet the multidrop requirements	Do not mix devices with active and passive current outputs. Test whether the network works if you have only connected CM44x-type devices.
Measured values tend to "freeze" sometimes	Hold is active	Set the hold to "None" for the device variable in question. --> Menu/Setup/Outputs/HART/Device variable 0 ... Device variable 15/Hold behavior
Measured values change during calibration	Hold is switched off	▪ Activate the hold for the corresponding device variable (Hold behavior = "Freeze"). ▪ Set the automatic hold for the calibration. --> Menu/Setup/General settings/Automatic hold/Calibration menu = "Enabled"
Loop current does not match the value on the display	Loop current has been adjusted by the user	Reset the loop current with FieldCare, for example. If a HART tool is not available, reset the values at the device to the factory default settings. --> Diagnostics/Systemtest/Reset/Factory default

Problem	Possible cause	Tests and / or remedial action
HART tag does not match the device designation on the display	PCS uses the short tag instead of the device designation	Set the short tag to the preferred value (only possible via HART).
PROFIBUS/Modbus etc. no longer work once you have entered a HART activation code	Only one bus protocol can be enabled	Enter the activation code for your previous communication protocol. This disables HART.
Damping cannot be set for PV	Damping is not supported by all the device variables	-
The PV-device variable assignment cannot be altered	PV is always assigned to device variable 16	Change the data source of current output 1:1 via onsite operation
It is not possible to read or write a special parameter or value	Your application	Use device drivers (DD/DTM) if possible. If you are programming your PCS yourself, you can find a complete list of all the supported HART commands and the data content in the "E+H Liquiline CM44x LIT-18.pdf" document, which is available on the CD.

7 Technical data

7.1 Output signal

Signal coding	FSK ± 0.5 mA over current signal
Data transmission rate	1200 Baud
Galvanic isolation	Yes
Load (communication resistor)	250 Ω

7.2 Protocol-specific data

Manufacturer ID	11_h
Device type	$119C_h$ (CM44x/CM44xR), $119D_h$ (CSFxx), $119E_h$ (CSPxx)
Device revision	001_h
HART version	7.2
Device description files (DD/DTM)	www.endress.com Device Integration Manager (DIM)
Device variables	16 user-definable variables and 16 preconfigured, dynamic variables PV, SV, TV, QV
Supported features	PDM DD, AMS DD, DTM

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