

Technical Information

Liquiline System CA80SI

Colorimetric analyzer for silica



Integrated controller with up to 6 measuring channels and digital Memosens technology

Application

The Liquiline System CA80SI is a wet-chemical analyzer for almost continuous determination of the concentration of silica in ultrapure water and boiler feedwater.

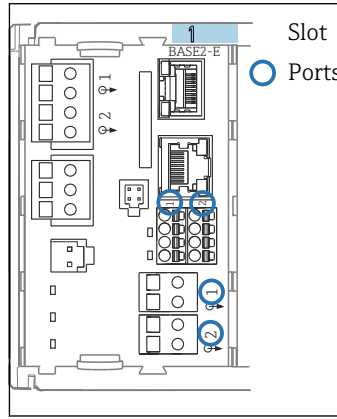
The analyzer is designed for use in the following applications:

- Ultrapure water
- Boiler feedwater
- Steam and condensate analysis
- Reverse osmosis
- Desalination systems

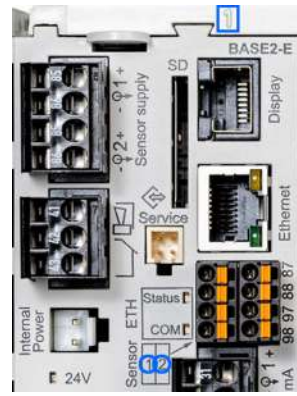
Your benefits

- Easy upgrade to measuring station by connecting up to 4 Memosens sensors
- Digital fieldbuses (e.g. PROFINET, PROFIBUS DP, Modbus TCP, Modbus RS485 and Ethernet IP) and web server
- Simple, tool-free maintenance
- Available with up to 6 measuring channels

Slot and port assignment



5 Slot and port assignment



6 Slot and port assignment

Analyzer_C8024A05G00

▶ Heartbeat diagnostics

SP1 Analyzer	Slot	Port
CH1: 1:1 pH Glass	1	1
CH2: 1:2 Cond c	1	2
Current output 1:1	1	1
Current output 1:2	1	2
Current output 4:1	4	1
Current output 4:2	4	2

ATC 6.95 pH
ATC 131.1 µS/cm
22.5 mA
22.5 mA
22.5 mA

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7 Slots and ports on the display

* Analyzer measured value (parameter-specific)

- Inputs are assigned to measuring channels in the ascending order of the slots and ports. In the example above:
"CH1: 1:1 pH glass" means:
Channel 1 (CH1) is slot 1 (basic module) : Port 1 (input 1), pH glass sensor
- Outputs and relays are named according to their function, e.g. "current output", and are displayed in ascending order with the slot and port numbers
- Display shows SP1: analyzer measuring channel 1 with sampling point SP1 (measured value display is parameter-specific; is not illustrated in the example)

Communication and data processing

Communication protocols:

- Fieldbus systems
 - PROFIBUS DP (Profile 3.02)
 - Modbus TCP or RS485
 - PROFINET
 - EtherNet/IP
- Configuration via Ethernet

Extension module 485 and current outputs

For PROFIBUS DP and Modbus RS485 communication protocols:
A maximum of 2 current outputs can be used in parallel.

Ethernet functionality via Base2 module and current outputs

A maximum of 6 current outputs can be used in parallel.

Bus termination on the device

- Via slide switch at bus module 485
- Displayed via LED "T" on bus module 485

Dependability

Reliability thanks to Memosens technology

Memosens

Memosens makes your measuring point safer and more reliable:

- Non-contact, digital signal transmission enables optimum galvanic isolation
- Completely watertight
- Sensor can be calibrated in a lab, thus increasing the availability of the measuring point in the process
- Intrinsically safe electronics mean operation in hazardous areas is not a problem.
- Predictive maintenance thanks to recording of sensor data, e.g.:
 - Total hours of operation
 - Hours of operation with very high or very low measured values
 - Hours of operation at high temperatures
 - Number of steam sterilizations
 - Sensor condition

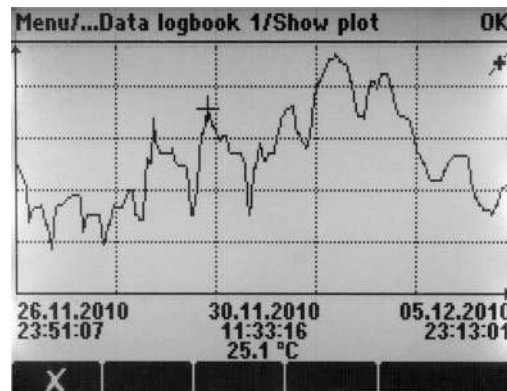
Maintainability**Modular design**


The modular analyzer can be easily adapted to suit your needs:

- Retrofit extension modules for new or extended range of functions, e.g. current outputs, relays and digital communication
- Upgrade to measuring station with digital sensors with Memosens technology
- Optional: M12 sensor connector for connecting any kind of Memosens sensor

Data storage

- Independent, integrated ring memories (FIFO) or stack memories for recording:
 - An analog value (e.g. flow, pH value, conductivity)
 - Events (e.g. power failure)
- Analyzer data logbook
 - Scan time: automatically adjusted to the measuring interval
 - Max. 6 data logbooks
 - 20 000 entries per logbook
 - Graphic display (load curves) or numerical list
 - Factory setting: enabled for all channels, ring memory (FIFO)
- Data logbooks for digital sensors:
 - Adjustable scan time: 1 to 3600 s (1 h)
 - Max. 8 data logbooks
 - 150,000 entries per logbook
 - Graphic display (load curves) or numerical list
- Calibration logbook: max. 75 entries
- Hardware logbook:
 - Hardware configuration and modifications
 - Max. 125 entries
- Version logbook:
 - Software updates among other things
 - Max. 50 entries
- Event logbook
- Analyzer event logbook
 - Analyzer-specific events
 - Max. 19 500 entries, ring memory or fill-up buffer for recording
- Operations logbook: max. 250 entries
- Diagnostic logbook: max. 250 entries



 8 Data logbook: graphic representation on the display

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Mathematical functions (virtual process values)

In addition to "real" process values, which are provided by connected physical sensors or analog inputs, mathematical functions can be used to calculate a maximum of 6 "virtual" process values.

The "virtual" process values can be:

- Output via a current output or a fieldbus
- Used as a controlled variable
- Assigned as a measured variable to a limit switch
- Used as a measured variable to trigger cleaning
- Displayed in user-defined measuring menus

The following mathematical functions are possible:

- Calculation of pH from two conductivity values according to VGB Standard 405, e.g. in boiler feedwater
- Difference between two measured values from different sources, e.g. to monitor membranes
- Differential conductivity, e.g. to monitor the efficiency of ion exchangers
- Degassed conductivity, e.g. for process controls in power plants
- Redundancy to monitor two or three redundant sensors
- rH calculation based on the measured values of a pH and an ORP sensor
- Formula editor as a powerful mathematics tool and for Boolean operations with up to 3 measured values

FieldCare

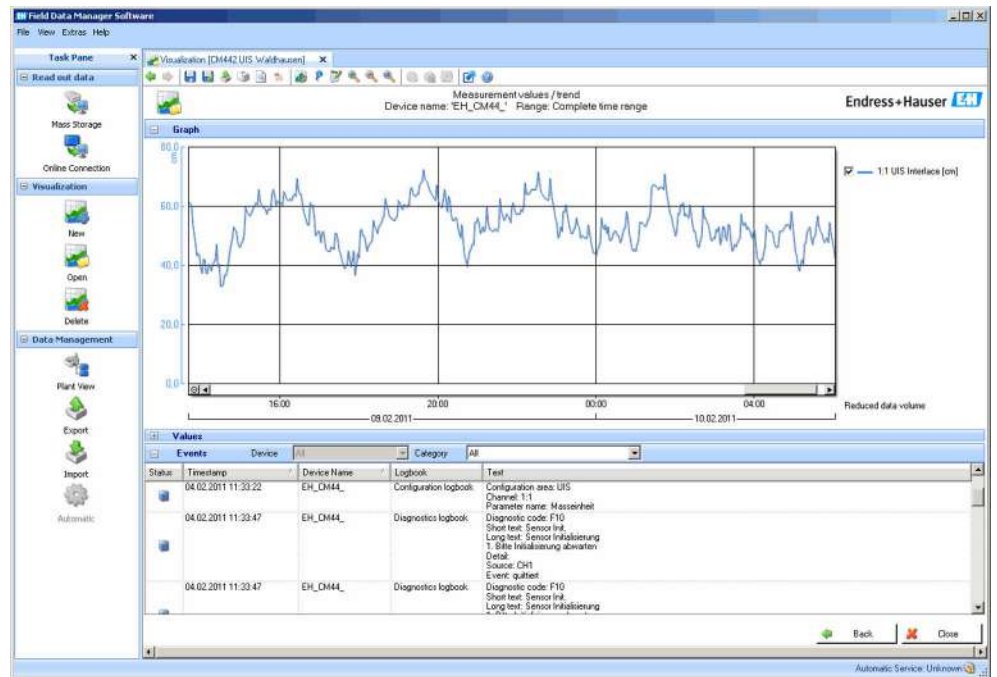
Configuration and asset management software based on FDT/DTM technology

- Complete device configuration when connected via FXA291 and service interface
- Access to a number of configuration parameters and identification, measuring and diagnostic data when connected via HART modem
- Logbooks can be downloaded in CSV format or binary format for "Field Data Manager" software

Field Data Manager

Visualization software and database for measuring, calibration and configuration data

- SQL database which is protected against manipulation
- Functions to import, save and print out logbooks
- Load curves to display measured values



9 Field Data Manager: load curve display

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SD card

The exchangeable storage medium enables:

- Quick and easy software updates and upgrades
- Quick and easy updates and upgrades to measuring parameter lists
- Data storage of internal device memory (e.g. logbooks)
- Transfer of complete configurations to a device with an identical setup (backup function)
- Transfer of configurations without the TAG and bus address to devices with an identical setup (copy function)

Endress+Hauser offers industry-approved SD cards as accessories. These memory cards provide maximum data security and integrity.

Other SD cards can also be used. However, Endress+Hauser does not accept any responsibility for the data security of such cards.

Self-monitoring functions	<p>Electronics</p> <ul style="list-style-type: none"> ▪ Current inputs are deactivated in the event of overcurrent and reactivated once the overcurrent stops. ▪ Board voltages are monitored and the board temperature is also measured. <p>Counter</p> <p>Counters monitor consumables such as reagents or dispensers.</p> <p>Photometer</p> <ul style="list-style-type: none"> ▪ Automatic temperature monitoring ▪ Active monitoring of communication between the photometer module and the analyzer electronics ▪ Leak sensor in the housing ▪ Flow monitoring
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Data security	All settings, logbooks etc. are stored in a non-volatile memory to ensure that the data are retained even in the event of a disruption to the power supply.
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IT security	<p>We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.</p> <p>IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.</p>
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Input

Measured variables	SiO ₂ [mg/l, µg/l, ppm, ppb]	
Measuring range	CA80SI-**AH*:	0 to 500 µg/l (ppb)
	CA80SI-**AJ*:	50 to 5 000 µg/l (ppb)
Types of input	<ul style="list-style-type: none"> ▪ 1, 2, 4 or 6 measuring channels (analyzer main parameter) ▪ 1 to 4 digital sensor inputs for sensors with Memosens protocol (optional) ▪ Analog current inputs (optional) ▪ Binary inputs (optional) 	
Input signal	Depending on version 2 x 0/4 to 20 mA (optional), passive, potentially isolated	
Current input, passive	<p>Span > 0 to 20 mA</p> <p>Signal characteristic Linear</p> <p>Internal resistance Non-linear</p> <p>Test voltage 500 V</p>	
Cable specification (for optional sensors with Memosens technology)	<p>Cable type Memosens data cable CYK10 or sensor fixed cable, each with cable end sleeves or M12 round-pin connector (optional)</p> <p>Cable length Max. 100 m (330 ft)</p>	

Output

Output signal

Depending on version:

- 2 x 0/4 to 20 mA, active, potentially isolated (standard version)
- 4 x 0/4 to 20 mA, active, potentially isolated (version with 2 additional analog outputs)
- 6 x 0/4 to 20 mA, active, potentially isolated (version with 4 additional analog outputs)
- Binary outputs

PROFIBUS DP/RS485	
Signal encoding	EIA/TIA-485, PROFIBUS DP-compliant acc. to IEC 61158
Data transmission rate	9.6 kBd, 19.2 kBd, 45.45kBd, 93.75 kBd, 187.5 kBd, 500 kBd, 1.5 MBd, 6 MBd, 12 MBd
Galvanic isolation	Yes
Connectors	Spring terminal (max. 1.5 mm), bridged internally (T-function), optional M12
Bus termination	Internal slide switch with LED display

Modbus RS485	
Signal encoding	EIA/TIA-485
Data transmission rate	2,400, 4,800, 9,600, 19,200, 38,400, 57,600 and 115,200 baud
Galvanic isolation	Yes
Bus termination	Internal slide switch with LED display

Web server and Modbus TCP	
Signal encoding	IEEE 802.3 (Ethernet)
Data transmission rate	10 / 100 MBd
Galvanic isolation	Yes
Connection	RJ45, M12 optional
IP address	DHCP or configuration using menu

EtherNet/IP	
Signal encoding	IEEE 802.3 (Ethernet)
Data transmission rate	10 / 100 MBd
Galvanic isolation	Yes
Connection	RJ45, M12 optional (D-encoded)
IP address	DHCP (default) or configuration via menu

PROFINET	
Signal encoding	IEEE 802.3 (Ethernet)
Data transmission rate	100 MBd
Galvanic isolation	Yes
Connection	RJ45
Name of station	Via DCP protocol using the configuration tool (e.g. Siemens PRONETA)
IP address	Via DCP protocol using the configuration tool (e.g. Siemens PRONETA)

Signal on alarm	Adjustable, as per NAMUR Recommendation NE 43 <ul style="list-style-type: none"> ▪ In measuring range 0 to 20 mA: Failure current from 0 to 23 mA ▪ In measuring range 4 to 20 mA: Failure current from 2.4 to 23 mA ▪ Factory setting for failure current for both measuring ranges: 21.5 mA
Load	Max. 500 Ω
Transmission behavior	Linear

Current outputs, active

Span	0 to 23 mA
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Signal characteristic	Linear
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Electrical specification	Output voltage Max. 24 V Test voltage 500 V
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Cable specification	Cable type Recommended: shielded cable Cable specification Max. 2.5 mm ² (14 AWG)
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Relay outputs

Electrical specification	Relay types <ul style="list-style-type: none"> ▪ 1 single-pin changeover contact (alarm relay) ▪ 2 or 4 single-pin changeover contacts (optional with extension modules) Maximum load <ul style="list-style-type: none"> ▪ Alarm relay: 0.5 A ▪ All other relays: 2.0 A Relay switching capacity
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Base module (Alarm relay)

Switching voltage	Load (max.)	Switching cycles (min.)
230 V AC, $\cos\Phi = 0.8$ to 1	0.1 A	700,000
	0.5 A	450,000
115 V AC, $\cos\Phi = 0.8$ to 1	0.1 A	1,000,000
	0.5 A	650,000
24 V DC, L/R = 0 to 1 ms	0.1 A	500,000
	0.5 A	350,000

Extension module

Switching voltage	Load (max.)	Switching cycles (min.)
230 V AC, $\cos\Phi = 0.8$ to 1	0.1 A	700,000
	0.5 A	450,000
	2 A	120,000
115 V AC, $\cos\Phi = 0.8$ to 1	0.1 A	1,000,000
	0.5 A	650,000
	2 A	170,000
24 V DC, L/R = 0 to 1 ms	0.1 A	500,000
	0.5 A	350,000
	2 A	150,000

Minimum load (typical)

- Min. 100 mA at 5 V DC
- Min. 1 mA at 24 V DC
- Min. 5 mA at 24 V AC
- Min. 1 mA at 230 V AC

Protocol-specific data

PROFIBUS DP	
Manufacturer ID	11 _h
Device type	155E _h
Profile version	3.02
Device database files (GSD files)	www.endress.com/profibus Device Integration Manager DIM
Output variables	16 AI blocks, 8 DI blocks
Input variables	4 AO blocks, 8 DO blocks
Supported features	<ul style="list-style-type: none"> ▪ 1 MSCY0 connection (cyclical communication, master class 1 to slave) ▪ 1 MSAC1 connection (acyclical communication, master class 1 to slave) ▪ 2 MSAC2 connections (acyclical communication, master class 2 to slave) ▪ Device lock: The device can be locked using the hardware or software. ▪ Addressing using DIL switches or software ▪ GSD, PDM DD, DTM

Modbus RS485	
Protocol	RTU/ASCII
Function codes	03, 04, 06, 08, 16, 23
Broadcast support for function codes	06, 16, 23
Output data	16 measured values (value, unit, status), 8 digital values (value, status)
Input data	4 setpoints (value, unit, status), 8 digital values (value, status), diagnostic information
Supported features	Address can be configured using switch or software

Modbus TCP

TCP port	502
TCP connections	3
Protocol	TCP
Function codes	03, 04, 06, 08, 16, 23
Broadcast support for function codes	06, 16, 23
Output data	16 measured values (value, unit, status), 8 digital values (value, status)
Input data	4 setpoints (value, unit, status), 8 digital values (value, status), diagnostic information
Supported features	Address can be configured using DHCP or software

Web server

The Web server enables full access to the device configuration, measured values, diagnostic messages, logbooks and service data via standard WiFi/WLAN/LAN/GSM or 3G routers with a user-defined IP address.

TCP port	80
Supported features	<ul style="list-style-type: none"> ▪ Remote-controlled device configuration(1 session) ▪ Save/restore device configuration (via SD card) ▪ Logbook export (file formats: CSV, FDM) ▪ Access to Web server via DTM or Internet Explorer ▪ Login ▪ Web server can be switched off

EtherNet/IP

Log	EtherNet/IP	
ODVA certification	Yes	
Device profile	Generic device (product type: 0x2B)	
Manufacturer ID	0x049E _h	
Device type ID	0x109F	
Polarity	Auto-MIDI-X	
Connections	CIP	12
	I/O	6
	Explicit message	6
	Multicast	3 consumers
Minimum RPI	100 ms (default)	
Maximum RPI	10000 ms	
System integration	EtherNet/IP	EDS
	Rockwell	Add-on-Profile Level 3, Faceplate for Factory Talk SE
IO data	Input (T → O)	Device status and diagnostic message with highest priority Measured values: <ul style="list-style-type: none"> ▪ 16 AI (analog input) + Status + Unit ▪ 8 DI (discrete input) + Status
	Output (O → T)	Actuating values: <ul style="list-style-type: none"> ▪ 4 AO (analog output) + status + unit ▪ 8 DO (discrete output) + Status

PROFINET	Protocol	"Application layer protocol for decentral device periphery and distributed automation", PNIO Version 2.34
	Communication type	100 MBit/s
	Conformance Class	Conformance Class B
	Netload Class	Netload Class II
	Baud rate	Automatic 100 Mbps with full-duplex detection
	Cycle times	From 32 ms
	Device profile	Application interface identifier 0xF600 Generic device
	PROFINET interface	1 port, Realtime Class 1 (RT_CLASS_1)
	Manufacturer ID	0x11 _h
	Device type ID	0x859F _h
	Device description files (GSD)	Information and files under: <ul style="list-style-type: none"> ▪ www.endress.com On the product page for the device: Documents/Software → Device drivers ▪ www.profibus.com On the website under Products/Product Finder
	Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
	Supported connections	<ul style="list-style-type: none"> ▪ 1 x AR (IO Controller AR) ▪ 1 x AR (IO-Supervisor Device AR connection allowed) ▪ 1 x Input CR (Communication Relation) ▪ 1 x Output CR (Communication Relation) ▪ 1 x Alarm CR (Communication Relation)
	Configuration options for measuring device	<ul style="list-style-type: none"> ▪ Web browser ▪ Manufacturer-specific software (FieldCare, DeviceCare) ▪ Device master file (GSD), can be read out via the integrated web server of the measuring device
	Configuration of the device name	DCP protocol
Supported functions	<ul style="list-style-type: none"> ▪ Identification & maintenance Simple device identification via: <ul style="list-style-type: none"> ▪ Process control system ▪ Nameplate ▪ Measured value status The process variables are communicated with a measured value status ▪ Blinking feature (FLASH_ONCE) via the local display for simple device identification and assignment ▪ Device operation via operating tools (e.g. FieldCare, DeviceCare) 	
System integration	For information on system integration, see the Operating Instructions <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Overview and description of the modules ▪ Status coding ▪ Startup configuration ▪ Factory setting 	

Power supply

Supply voltage

- 100 to 120 V AC / 200 to 240 V AC
- 50 or 60 Hz

Fieldbus connection Supply voltage: not applicable

Power consumption	For a sample flow rate of 80 ml/min (2.7 fl oz/min), a continuous measuring interval (10 minutes), a sample temperature of 25 °C (77 °F), an ambient temperature of 25 °C (77 °F) and a device with a supply voltage of 230 V: <ul style="list-style-type: none"> ■ Typically 60 VA ■ Max. 1250 VA
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Cable entries	<ul style="list-style-type: none"> ■ 4 x bores for M16, G3/8, NPT3/8", Memosens connection ¹⁾ ■ 4 x bores for M20, G1/2, NPT1/2"
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Cable specification	Cable gland	Permitted cable diameter
	M16x1.5 mm	4 to 8 mm (0.16 to 0.32")
	M12x1.5 mm (for order version M12 socket for Memosens sensors)	2 to 5 mm (0.08 to 0.20")
	M20x1.5 mm	6 to 12 mm (0.24 to 0.48")
	NPT ³ / ₈ "	4 to 8 mm (0.16 to 0.32")
	G ³ / ₈	4 to 8 mm (0.16 to 0.32")
	NPT ¹ / ₂ "	6 to 12 mm (0.24 to 0.48")
	G ¹ / ₂	7 to 12 mm (0.28 to 0.48")

 Cable glands mounted at the factory are tightened with 2 Nm.

Connecting optional modules With extension modules you can purchase additional functions for your device.


NOTICE

Unacceptable hardware combinations (due to conflicts in power supply)

Incorrect measurements or total failure of the measuring point as a result of heat build-up or overloading

- ▶ Find out if the planned upgrade of your device results in a permitted hardware combination (configurator on www.endress.com/CA80SI).
- ▶ A maximum of four sensor inputs is permitted.
- ▶ A maximum of four relay outputs is permitted.
- ▶ A maximum of eight current inputs and six current outputs is permitted.
- ▶ A maximum of two "DIO" modules is permitted.
- ▶ Please contact your Endress+Hauser sales center should you have any questions.

 The number of modules is limited by the number of existing cable entries.

 Cable entries and possible cable diameters

1)