Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Liquisys M CCM223/253

Measurement of free chlorine/chlorine dioxide/total chlorine
Transmitter for chlorine sensors

Application

The modular design of the Liquisys M CCM223/253 allows easy adaption of the transmitter to a variety of customer requirements. Starting with the basic version for "measurement and alarm generation", the transmitter can be equipped with additional software and hardware modules for special applications. These modules can also be retrofitted as required.

Application

- Drinking water
- Water treatment
- Cooling water
- Gas scrubbers
- Reverse osmosis
- Food processing
- Swimming pool water

Your benefits

- Field or panel-mounted housing
- Universal application
- pH compensation for free chlorine
- Simple handling
  - Logically arranged menu structure
  - Calibration via CAL button
- Safe operation
  - Overvoltage (lightning) protection
  - Direct access for manual contact control
  - User-defined alarm configuration

The basic unit can be extended with:

- 2 or 4 additional contacts for use as:
  - Limit contacts (also for temperature)
  - P(ID) controller for chlorine and pH
  - Timer for simple rinse processes
  - Complete cleaning with Chemoclean
- Plus package:
  - Manual pH compensation for Cl_2
  - Any current output configuration via table
  - Automatic cleaning start
  - Process monitoring
  - Live check of sensor
- HART® or PROFIBUS PA / DP
- 2nd current output for temperature, main measured value or actuating variable
- Current input for flow rate monitoring with controller shut off or for feedforward control

TI214C/07/en/07.06
51502336

Endress+Hauser

People for Process Automation

Function and system design

Features of the basic version (EK)

Measurement of free chlorine, chlorine dioxide and total chlorine

The sensor is selected from the menu. The **temperature** is displayed but the reading can also be hidden. The EP version has an alternative feature that allows simeltaneous display of the pH and redox measurements.

Calibration

The CCS140/141 sensors for free chlorine and the CCS240/241 sensors for chlorine dioxide are zero-current-free and therefore require only **single-point calibration**. This is carried out by entering a DPD reference measured value.
The sensor CCS120 is also calibrated by entering a DPD reference measured value. Additionally you can calibrate the zero point of the sensor CCS120 (recommended for measurements below 0.1 mg/l).

Configuration

Different alarms are required depending on application and operator. Therefore the transmitter permits independent **configuration of the alarm contact and error current** for each individual error. Unnecessary or undesirable alarms can be suppressed in this manner. **Up to four contacts** can be used as limit contacts (also for temperature), to implement a P(ID) controller or for cleaning functions.
Direct **manual operation of the contacts** (bypassing the menu) provides quick access to limit, control or cleaning contacts, permitting speedy correction of deviations.
The **serial numbers** of the instrument and modules and the order code can be called up on the display.

Additional functions of the Plus package (ES)

Current output configuration

In order to output wide measuring ranges while still achieving a high resolution in specific ranges, the **current output** can be configured as required via a table. This permits **bilinear** or **quasi-logarithmic** curves, etc.

Manual pH compensation for free chlorine

Measurement of free chlorine with amperometric sensors is pH-dependent while DPD measurement used for calibration is pH-independent. **Manual pH compensation** means the instrument can also be used to measure a variable pH value with a slow rate of change.

Process Check System (PCS)

It comprises two independent safety functions:
- Errors in applications **without** control are detected by monitoring the limit beween plausible and implausible measured values, i.e. **the alarm theshold**.
- Errors in applications **with** control are detected by the **controller monitor** which monitors freely adjustable, maximum permissible time intervals and reference value overshoot or undershoot.

Live check

The live check issues an alarm when the sensor signal does not change over a defined period of time. This may be caused by blocking, passivation, separation from the process, etc.

Additional functions of version EP

Optinonal measurement of pH or ORP

This extension allows additional measurement of pH value or ORP in an instrument. It also allows control of the pH value in the process.
Automatic pH compensation means the instrument can also be used to measure a variable pH value which is subject to frequent changes.

Second current output

The second current output is freely configurable for the output of temperature, of the main measured value (free chlorine, chlorine dioxide, total chlorine) or actuating variable.

Current input

The current input of the transmitter allows two different applications: controller shut-down in case of lower flow rate violation or total failure in the main flow as well as feedforward control. Both functions are also combinable.

Explosion proof versions for zone 2

Application of transmitter and sensor in hazardous area zone 2	Field housing CCM253 with power supply 24 V
Application of transmitter as related electrical equipment in non-hazardous area or in simple pressurized apparatus; application of sensor in hazardous area zone 2	Field housing CCM253 with power supply 230 V or Panel-mounted housing CCM223 with power supply 230 V or 24 V

Measuring system

A complete measuring system comprises:

Version 1 (free chlorine and chlorine dioxide)
- The transmitter Liquisys M CCM223 or CCM253
- A membrane covered sensor CCS140/141 for Cl_2 or CCS240/241 for ClO_2 or an open sensor 963 for Cl_2
- A flow assembly CCA250 (not necessary for sensor 963)

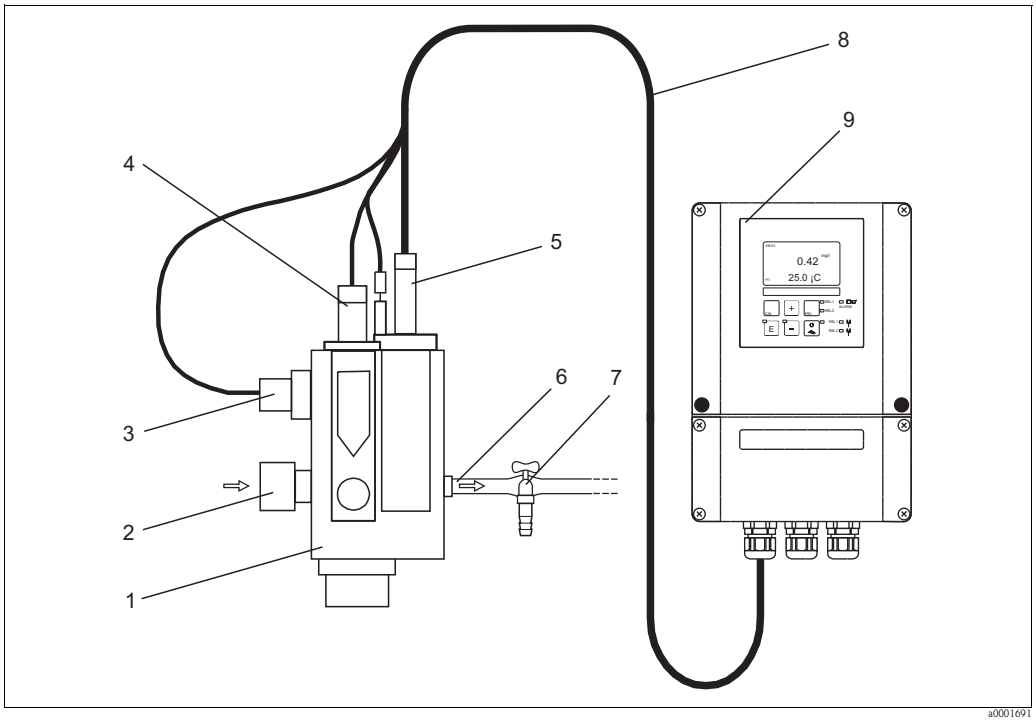
and optional:

- A pH or ORP sensor
- An INS proximity switch for flow monitoring (omitted with 963 sensor)
- CMK extension cable for chlorine measurement if required
- CYK71 extension cable for pH/ORP measurement if required
- MK extension cable for INS proximity switch if required
- VBC junction box

Version 2 (total chlorine)
- The transmitter Liquisys M CCM223 or CCM253
- A sensor for total chlorine CCS120
- A flow assembly CCA250 or immersion assembly CYA611
- A special measuring cable CPK9, PM wire internally

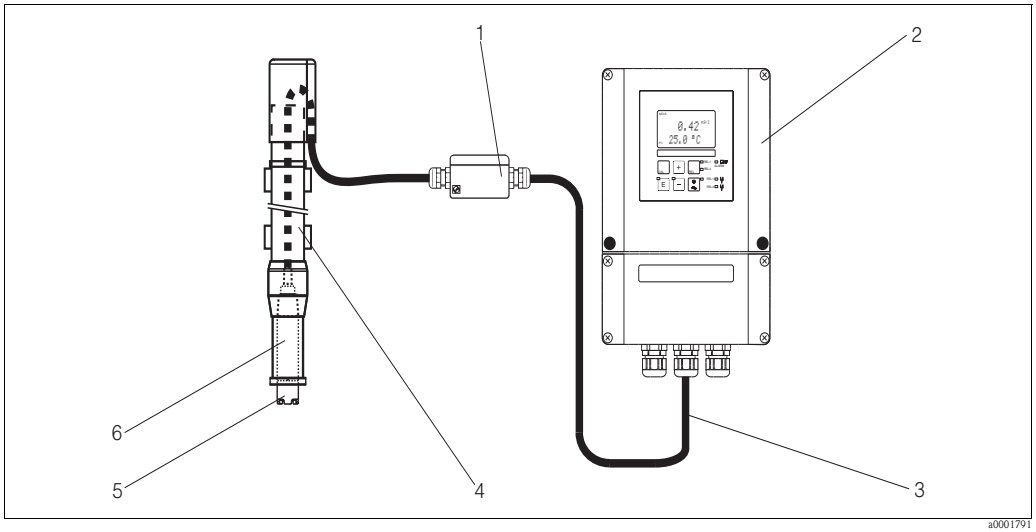
and optional:

- A pH or ORP sensor
- An INS proximity switch for flow monitoring (omitted with immersion assembly)
- CMK extension cable (PM wire internally) for chlorine measurement if required
- CYK71 extension cable for pH/ORP measurement if required
- MK extension cable for INS proximity switch if required
- VBC junction box



Measuring system with flow assembly (example)

1	*Flow assembly CCA250*	*6*	*Medium outlet*
2	*Medium inlet*	*7*	*Sampling tap*
3	*Proximity switch for flow monitoring*	*8*	*Measuring cable*
4	*Mounting place for pH/redox sensor*	*9*	*Transmitter*
5	*Chlorine sensor*		



Measuring system with immersion assembly (example)

1	*Junction box*	*4*	*Immersion assembly CYA611*
2	*Transmitter*	*5*	*Chlorine sensor CCS120*
3	*Measuring cable*	*6*	*Assembly adapter G1*

Input

Measured variables

Total chlorine, free chlorine, chlorine dioxide, temperature
pH or ORP (optional)

Cl_2/ClO_2 measurement

Display and measuring range	0 to 5 / 0 to 20 mg/l
Application measuring range	
CCS120	0.1 to 10 mg/l
CCS140/240	0.05 to 20 mg/l
CCS141/241	0.01 to 5 mg/l
963	0.05 to 5 mg/l
Temperature compensation range	
CCS140/240/141/241 and 963	2 to 45 °C (36 to 113 °F)
CCS120	5 to 45 °C (41 to 113 °F)
pH compensation range for free chlorine	pH 4 to 9
Calibration range	pH 4 to 8
Reference point for nominal slope	25 °C (77 °F) / pH 7.2

Cable specification

Chlorine/chlorine dioxide sensors CCS140/141/240/241:	max. 30 m (98 ft) with CMK cable
Chlorine sensor 963:	max. 30 m (98 ft) with MK cable
Total chlorine sensor CCS120:	max. 15 m (49 ft) with CPK9 cable
pH/ORP measurement:	max. 50 m (164 ft) with CYK71 cable

Cl_2/ClO_2 signal input

CCS120/140/141/240/241:	0 to 5000 nA
Sensor 963:	-100 to 500 µA

Binary inputs

Voltage:	10 ... 50 V
Power consumption:	max. 10 mA

Current input

4 ... 20 mA, galvanically separated

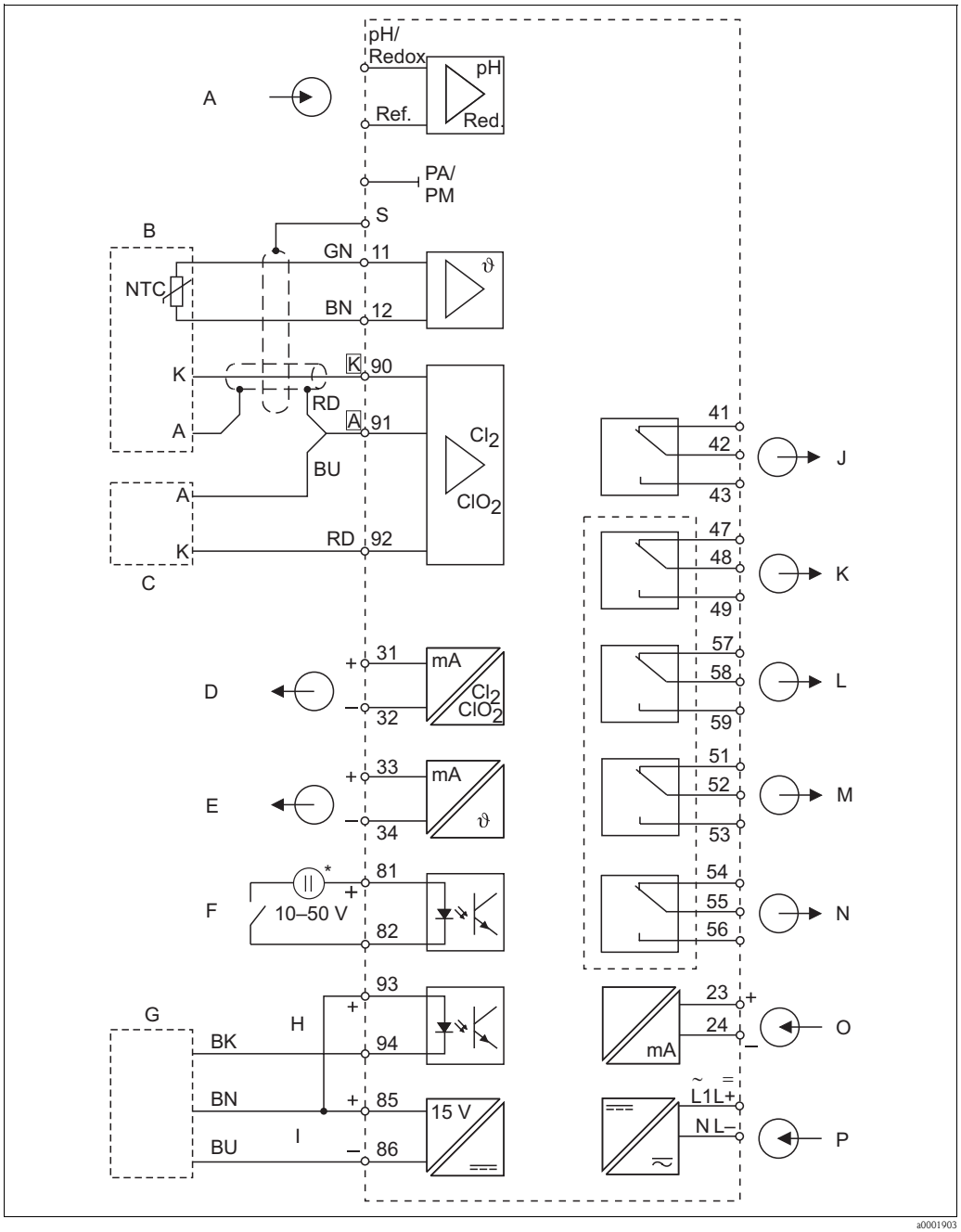
Load: 260 Ω at 20 mA (voltage drop 5.2 V)

Output

Current range	0/4 ... 20 mA, galvanically separated, active	
Error current	2.4 or 22 mA in case of an error	
Load	maximum 500 Ω	
Transmission range	Cl_2/ClO_2:	0 to 10 mg/l for CCS120 0 to 20 mg/l for CCS140/240 0 to 5 mg/l for CCS141/241 and 963
	Temperature:	0 to 50 °C (32 to 122 °F)
	pH:	pH 4 to 9
	ORP:	0 to 1500 mV
Resolution	max. 700 digits/mA	
Isolation voltage	max. 350 V_{RMS}/500 V DC	
Overvoltage protection	according to EN 61000-4-5	
Auxiliary voltage output	Output voltage:	15 V ± 0.6
	Output current:	max. 10 mA
Contact outputs	Switching current with ohmic load (cos φ = 1):	max. 2 A
	Switching current with inductive load (cos φ = 0.4):	max. 2 A
	Switching voltage:	max. 250 V AC, 30 V DC
	Switching power with ohmic load (cos φ = 1):	max. 500 VA AC, 60 W DC
	Switching power with inductive load (cos φ = 0.4):	max. 500 VA AC, 60 W DC
Limit contactor	Pickup/dropout delay:	0 ... 2000 s
Controller	Function (adjustable):	Pulse-length/pulse-frequency controller, three-point step controller for Cl_2/ClO_2
	Controller response:	P, PI, PD, PID, basic load dosing
	Controller gain K_p:	0.01 to 20.00
	Integral action time T_n:	0.0 to 999.9 min
	Derivative action time T_v:	0.0 to 999.9 min
	Period length of pulse-length controller:	0.5 to 999.9 s
	Frequency for pulse-frequency controller:	60 to 180 min^{-1}
	Basic load:	0 to 40% of max. set value
	Motor run time for three-point step controller:	10 to 999 s
	Neutral zone for three-point step controller:	0 to 40 %
Alarm	Function (switchable):	Latching/momentary contact
	Alarm threshold adjustment range:	Cl_2/ClO_2/pH/ORP/temperature: total measuring range
	Alarm delay:	0 to 2000 s (min)
	Monitoring time lower limit violation:	0 to 2000 min
	Monitoring time upper limit violation:	0 to 2000 min

Power supply

Electrical connection variant 1 The wiring diagram shows the connections of the transmitter with all options



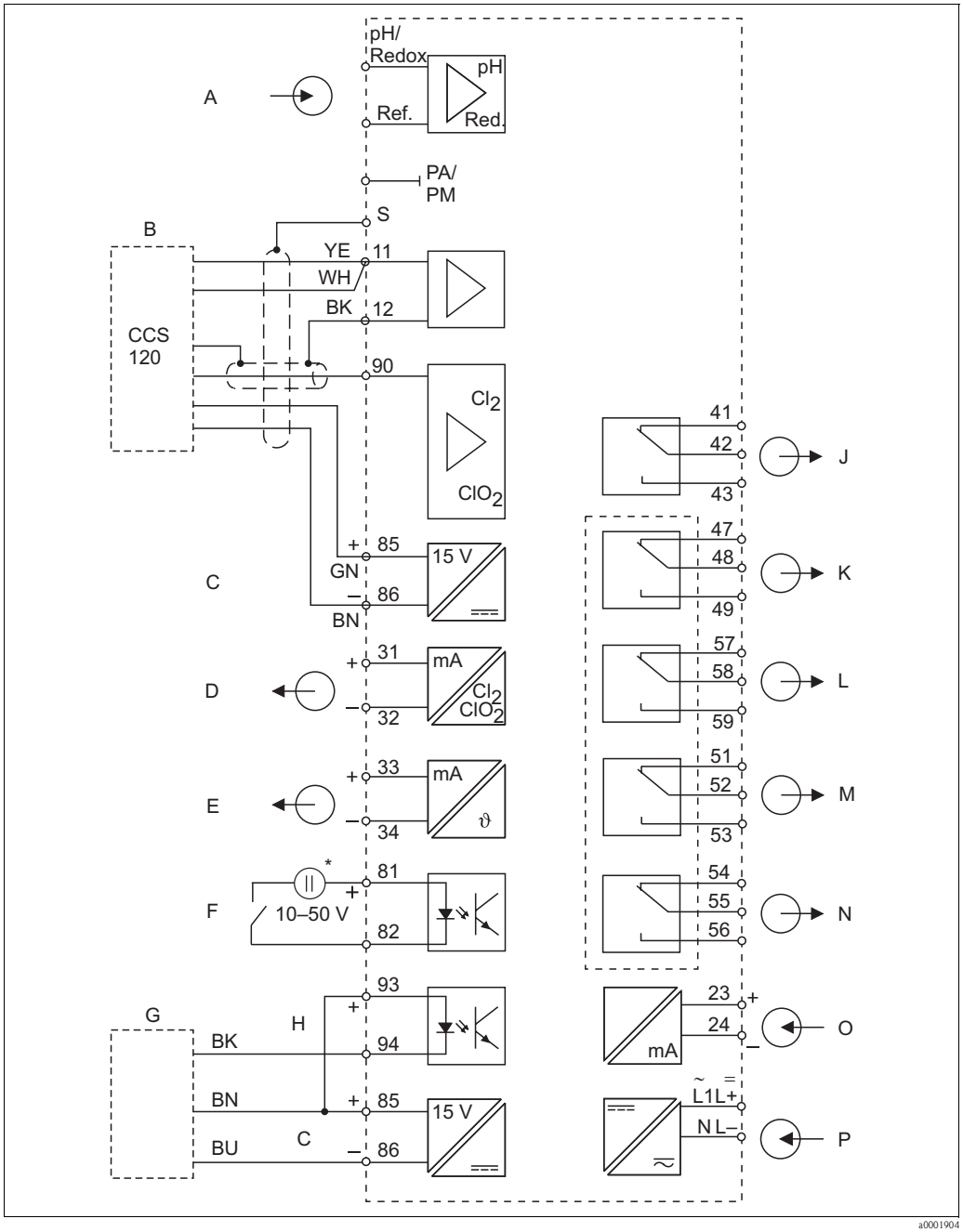
Electrical connection of the transmitter (version 1)

A	*pH / ORP input (optional)*	*I*	*Aux. voltage output*
B	*Sensor CCS140/141/240/241*	*J*	*Alarm (current-free contact position)*
C	*Sensor 963 (alternative)*	*K*	*Relay 1 (current-free contact position)*
D	*Signal output 1 chlorine / chlorine dioxide*	*L*	*Relay 2 (current-free contact position)*
E	*Signal output 2 temperature, pH or ORP*	*M*	*Relay 3 (current-free contact position)*
F	*Binary input 1 (hold / cleaning)*	*N*	*Relay 4 (current-free contact position)*
G	*Proximity switch INS*	*O*	*Current input 4 to 20 mA*
H	*Binary input 2*	*P*	*Power supply*
*	*Aux. voltage output terminal 85/86 applicable*		

Note!
The device is approved for protection class II and is generally operated without protective ground connection. The circuits "E" and "I" are not galvanically separated from each other.

Electrical connection variant 2 (total chlorine)

The wiring diagram shows the connections of the transmitter with all options



Electrical connection of the transmitter (version 2)

A	*pH / ORP input (optional)*	*J*	*Alarm (current-free contact position)*
B	*Sensor CCS120*	*K*	*Relay 1 (current-free contact position)*
C	*Aux. voltage output*	*L*	*Relay 2 (current-free contact position)*
D	*Signal output 1 total chlorine*	*M*	*Relay 3 (current-free contact position)*
E	*Signal output 2 temperature, pH or ORP*	*N*	*Relay 4 (current-free contact position)*
F	*Binary input 1 (hold / cleaning)*	*O*	*Current input 4 to 20 mA*
G	*Proximity switch INS*	*P*	*Power supply*
H	*Binary input 2*		
*	*Aux. voltage output terminal 85/86 applicable*		

Note!
The device is approved for protection class II and is generally operated without protective ground connection. The circuits "E" and "C" are not galvanically separated from each other.

Connection of sensor

Type of sensor	Cable	Extension
Chlorine / chlorine dioxide sensors CCS140 / 141 / 240 / 241	3 m (9.8 ft) CMK, fixed cable	VBC junction box + CMK
Chlorine sensor 963	–	VBC junction box + MK
Temperature sensor for sensor 963	CPK1	
Total chlorine sensor CCS120	CPK9-N*A1B	VBC junction box + CYK71
pH or ORP sensor without temperature sensor	CPK1 for sensors with GSA plug-in head CPK9 for sensors with ESA plug-in head	VBC junction box + CYK71

Power supply

Depending on ordered version:
100/115/230 V AC +10/-15 %, 48 to 62 Hz
24 V AC/DC +20/-15 %

Power consumption

max. 7.5 VA

Mains protection

Fine-wire fuse, medium-slow blow 250 V/3.15 A

Performance characteristic

Cl2/ClO2 measurement

Measured value resolution	
CCS120/140/240 and 963:	0.01 mg/l
CCS141/241:	0.001 mg/l
Measurement deviation[1] display (pH, T = const.)	
CCS140/141/240/241:	max. 0.5 % of measured value ±4 digits
CCS120 and 963:	max. 1 % of measured value ±4 digits
Repeatability:	max. 0.2 % of measuring range
Measurement deviation[1] of signal output	max. 0.75 % of current output range

Temperature measurement

Measured value resolution:	0.1 °C
Measurement deviation[1] of display:	±0.3 K
Measurement deviation[1] signal output:	max. 1.25 % of current output range

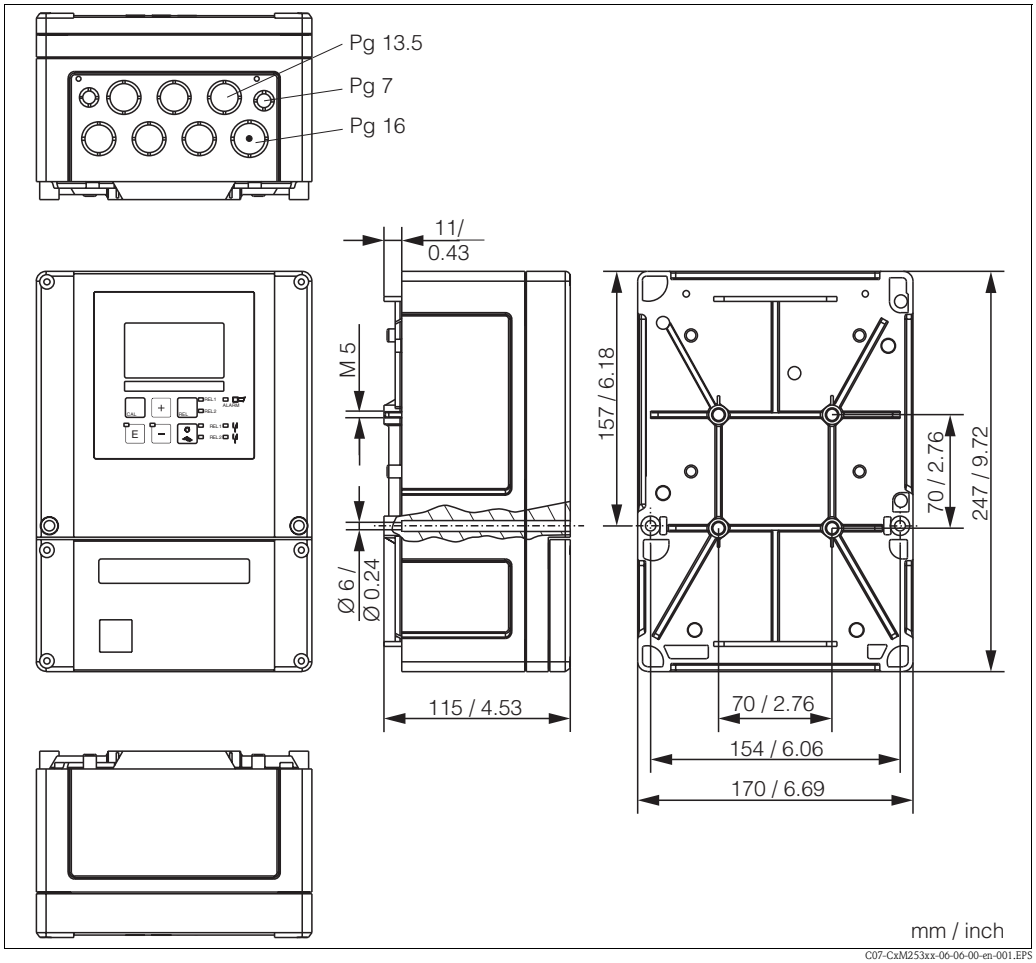
pH and ORP measurement

pH measured value resolution:	pH 0.01
ORP measured value resolution:	1 mV
Measurement deviation[1)] of display pH:	pH 0.03
Measurement deviation[1)] of display ORP:	3 mV
Measurement deviation[1)] of pH signal output:	max. 1.25 % of current output range
Measurement deviation[1)] of ORP signal output:	max. 1.25 % of current output range

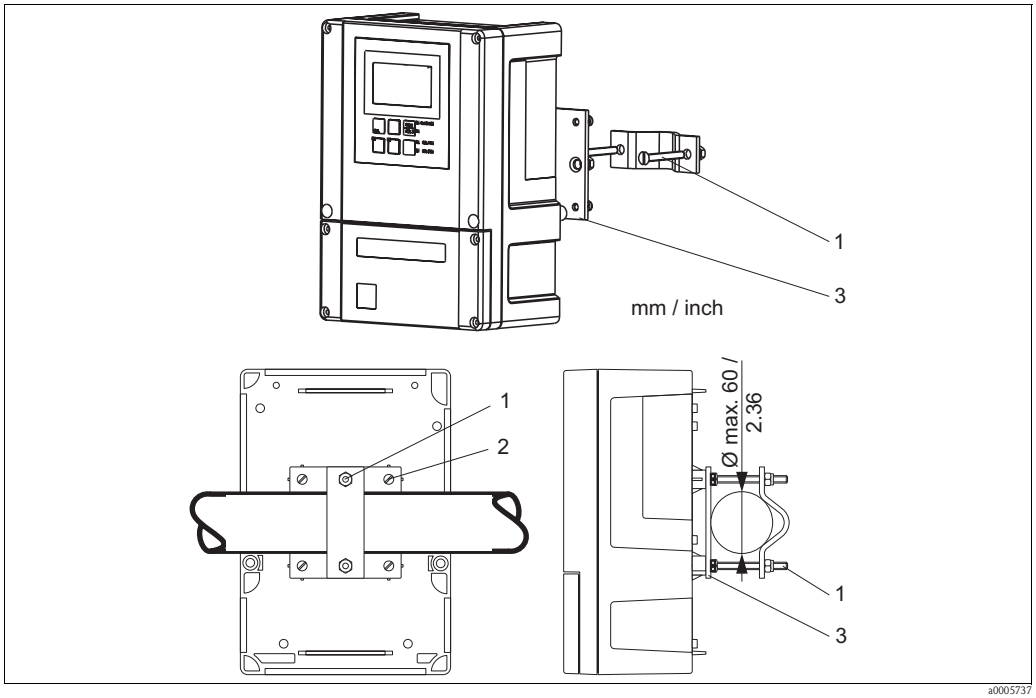
1) acc. to IEC 60746-1, at nominal operating conditions

Installation conditions

Installation instructions

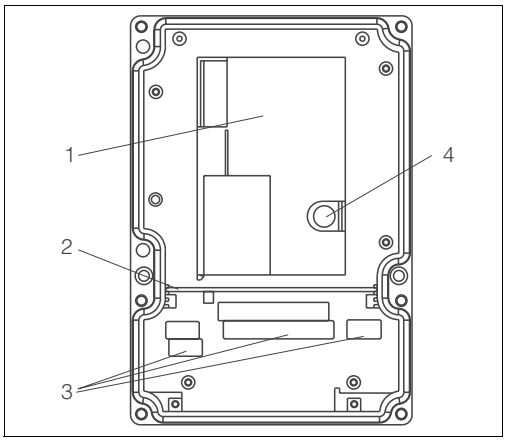


Field instrument



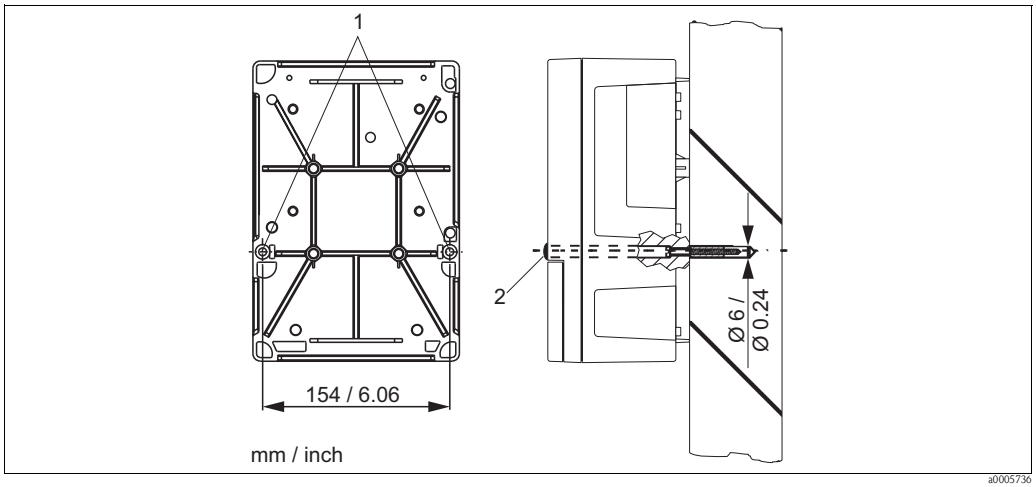
Mounting on pipes

1 - 3 Mounting screws and mounting plate



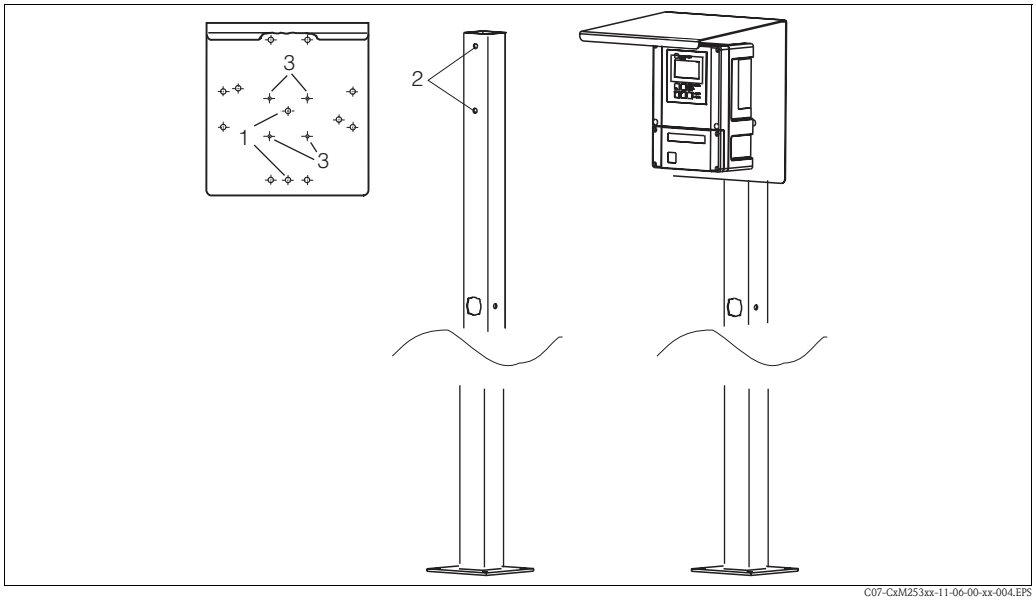
1 Removable electronics box
2 Partition plate
3 Terminal blocks
4 Fuse

Inside of field instrument



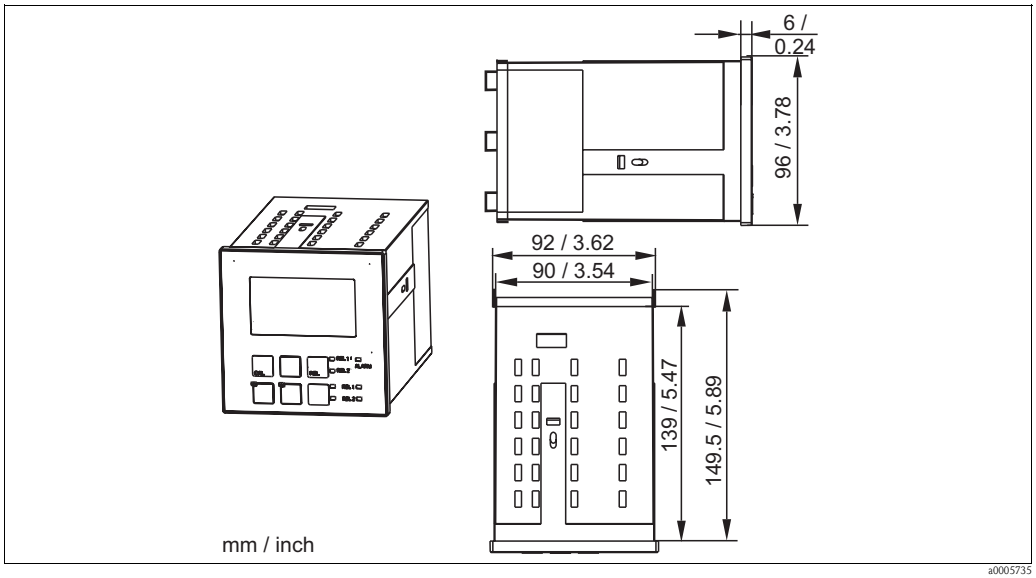
Wall mounting of the field instrument

1 Mounting holes
2 Protecting cap

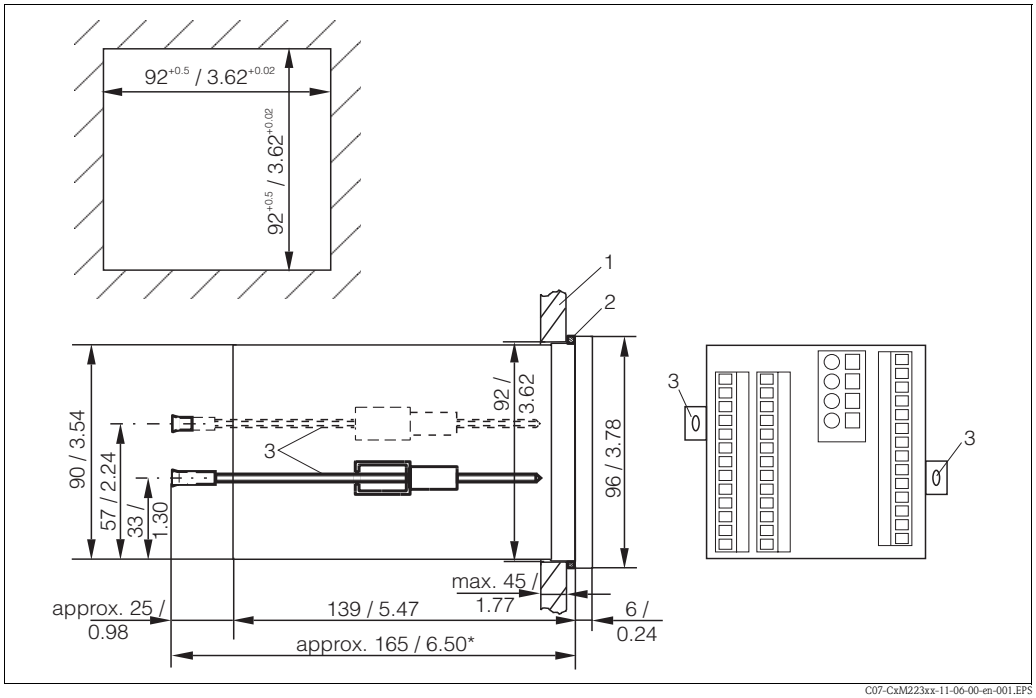


Mounting of the field instrument with mounting post and weather protection cover

1 -3 Mounting holes



Dimensions panel-mounted instrument



Installation of the panel-mounted instrument

1 Wall of control cabinet
2 Gasket
3 Tensioning screws
** Required installation depth*

Environment

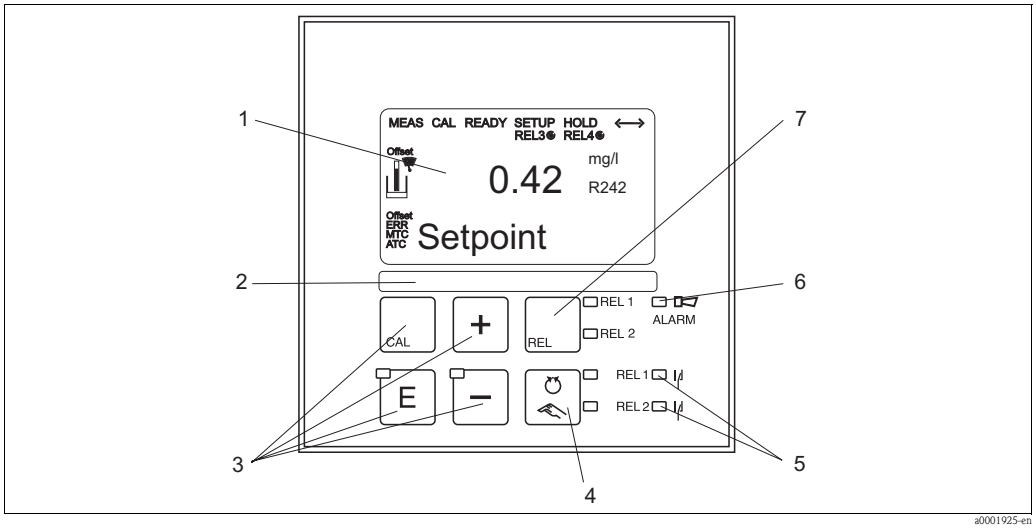
Ambient temperature	–10 to +55 °C (+14 to +131 °F)	
Ambient temperature limit	–20 to +60 °C (-4 to +140 °F)	
Storage and transport temperature	–25 to +65 °C (-13 to +149 °F)	
Electromagnetic compatibility	Interference emission and interference immunity acc. to EN 61326: 1997 / A1: 1998	
Ingress protection	Panel-mounted instrument: Field instrument:	IP 54 (front), IP 30 (housing) IP 65
Relative humidity	10 to 95%, non-condensing	

Mechanical construction

Dimensions	Panel-mounted instrument: Field instrument:	96 x 96 x 145 mm (3.78 x 3.78 x 5.71 inches) Installation depth: approx. 165 mm (6.50") 247 x 170 x 115 mm (9.72 x 6.69 x 4.53 inches)
Weight	Panel-mounted instrument: Field instrument:	max. 0.7 kg (1.5 lb) max. 2.3 kg (5.1 lb)
Materials	Housing of panel-mounted instrument: Field housing: Front membrane:	Polycarbonate ABS PC Fr Polyester, UV-resistant
Terminals	Cross section	max. 2.5 mm^2 (14 AWG)

Human interface

Display elements



Operating elements

1 LC display for displaying the measured values and configuration data
2 Field for user labelling
3 4 main operating keys for calibration and device configuration
4 Changeover switch for automatic/manual mode of the relays
5 LEDs for limit contactor relay (switch status)
6 LED for alarm function
7 Display of the active contact and key for relay changeover in manual mode

Instrument control functions

All instrument control functions are arranged in a logical menu structure. Following access code entry, the individual parameters can be easily selected and modified as needed.

Certificates and approvals

CE symbol

Declaration of conformity
The product meets the legal requirements of the harmonized European standards.
The manufacturer confirms compliance with the standards by affixing the CE symbol.

Ex approval for zone 2

Explosion protection for Zone 2

Version	Approval
CCM253-..6...	ATEX II 3G EEx nA[L] IIC T4
CCM253-..4... CCM223-..4... CCM223-..6...	ATEX II 3G [EEx nAL] IIC

Ordering information

Product structure

	Version	
	EK	Chlorine/chlorine dioxide/total chlorine measurement, basic version
	ES	Chlorine/chlorine dioxide/total chlorine measurement, with additional functions (Plus package)
	EP	Chlorine/chlorine dioxide/total chlorine measurement, with additional functions (Plus package) with additional pH or ORP measurement (switchable)

		Power supply; approval	
		0	230 V AC
		1	115 V AC
		2	230 V AC; CSA Gen. Purp.
		3	115 V AC; CSA Gen. Purp.
		4	230 V AC; ATEX II 3G [EEx nAL] IIC
		5	100 V AC
		6	24 V AC/DC; ATEX II 3G [EEx nAL] IIC for CCM223, EEx nA[L] IIC T4 for CCM253
		7	24 V AC/DC; CSA Gen. Purp.
		8	24 V AC/DC

			Output	
			0	1 x 20 mA, chlorine/chlorine dioxide/total chlorine
			1	2 x 20 mA, chlorine/chlorine dioxide/total chlorine and temperature/main measured value/actuating variable
			3	PROFIBUS PA
			4	PROFIBUS DP
			5	1 x 20 mA, chlorine/chlorine dioxide/total chlorine with HART®
			6	2 x 20 mA, chlorine/chlorine dioxide/total chlorine with HART® and temp./main measured value/actuating variable

				Additional contacts; analog input	
				05	Not selected
				10	2 x relay (limit/controller/timer)
				15	4 x relay (limit/controller/Chemoclean/3-point step controller for Cl_2/ClO_2)
				16	4 x relay (limit/controller/timer/3-point step controller for Cl_2/ClO_2)
				20	2 x relay (limit/controller/timer); current input
				25	4 x relay with cleaning (limit/controller/Chemoclean/3-point step controller for Cl_2/ClO_2); current input
				26	4 x relay with timer (limit/controller/timer/3-point step controller for Cl_2/ClO_2); current input

CCM253-						complete order code
CCM223-						

Additional functions of the Plus package

Version ES

Compared to the basic EK version, this version is extended by the Plus package:

- Manual pH compensation for free chlorine, fields B2 and B3
- Current output table, fields O33x
- Sensor and process monitoring, function group P
- Automatic start of cleaning function, field F8.

Version EP

This version includes the functions of the ES version and in addition:

- Optional pH or ORP measurement, field B1
- Automatic pH compensation for free chlorine
- Sensor and process monitoring even for pH or ORP, fields P12x
- Limit contact for pH or ORP, fields R22x
- pH value control, fields R25x.

Scope of delivery

The delivery of the field instrument includes:
- 1 transmitter CCM253
- 1 plug-in screw terminal
- 1 cable gland Pg 7
- 1 cable gland Pg 16 reduced
- 2 cable glands Pg 13.5
- 1 Operating Instructions BA214C/07/en
- versions with HART communication:
  1 Operating Instructions Field Communication with HART, BA208C/07/en
- versions with PROFIBUS communication:
  1 Operating Instructions Field Communication with PROFIBUS PA/DP, BA209C/07/en
- versions with explosion protection for hazardous area zone II (ATEX II 3G):
  Safety instructions for use in explosion-hazardous areas, XA194C/07/a3

The delivery of the panel-mounted instrument includes:
- 1 transmitter CCM223
- 1 set of plug-in screw terminals
- 2 tensioning screws
- 1 Operating Instructions BA214C/07/en
- versions with HART communication:
  1 Operating Instructions Field Communication with HART, BA208C/07/en
- versions with PROFIBUS communication:
  1 Operating Instructions Field Communication with PROFIBUS PA/DP, BA209C/07/en
- versions with explosion protection for hazardous area zone II (ATEX II 3G):
  Safety instructions for use in explosion-hazardous areas, XA194C/07/a3

Accessories

Sensors

- CCS120
  Amperometric sensor for total chlorine
  measuring range 0.1 to 10 mg/l
  Ordering acc. to product structure, see Technical Information (TI388C/07/en)
- CCS140
  Membrane-covered amperometric sensor for free chlorine
  measuring range 0.05 to 20 mg/l
  Ordering acc. to product structure, see Technical Information (TI058C/07/en)
- CCS141
  Membrane-covered amperometric trace sensor for free chlorine
  measuring range 0.01 to 5 mg/l
  Ordering acc. to product structure, see Technical Information (TI058C/07/en)
- CCS240
  Membrane-covered amperometric sensor for chlorine dioxide
  measuring range 0.05 to 20 mg/l
  Ordering acc. to product structure, see Technical Information (TI114C/07/en)
- CCS241
  Membrane-covered amperometric trace sensor for chlorine dioxide
  measuring range 0.01 to 5 mg/l
  Ordering acc. to product structure, see Technical Information (TI114C/07/en)

Assemblies

- Flow assembly CCA250
  for chlorine, chlorine dioxide, pH and ORP;
  Ordering acc. to product structure, see Technical Information (TI062C/07/en)
- Immersion assembly Dipfit W CYA611
  for sensor immersion in basins, open channels and tanks, PVC;
  Ordering acc. to product structure (Technical Information TI166C/07/en)

Connection accessories

CYK71 measuring cable
- non-terminated cable for the connection of sensors or the extension of sensor cables
- Sold by the meter, order numbers:
  – non-Ex version, black: 50085333
  – Ex version, blue: 51506616

- CMK special measuring cable
  for cable extension between junction box and transmitter, non terminated, sold by the metre
  Order no. 50005374

- CPK1 special measuring cable
  For pH/ORP electrodes with GSA plug-in head
  Ordering acc. to product structure, see Technical Information (TI118C/07/en)

- Special measuring cable CPK9-N*A1B internal PM wire
  For sensors with TOP68 plug-in head, for high-temperature and high-pressure applications, IP 68
  Ordering acc. to product structure, see Technical Information (TI118C/07/en)

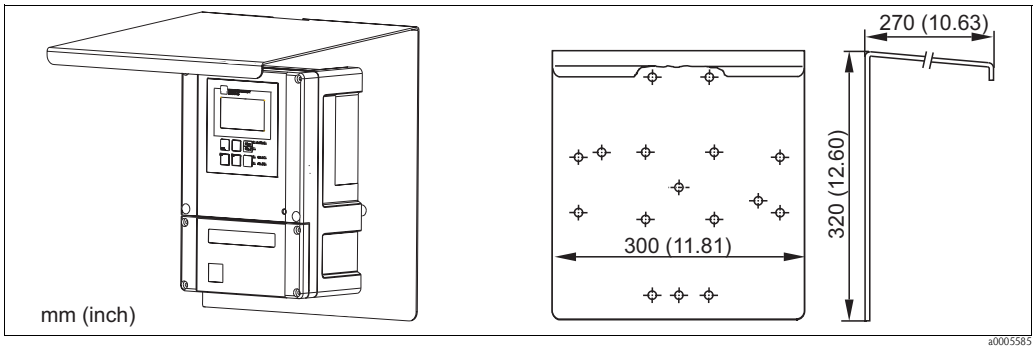
- Extension cable MK
  Two-wire signal cable with additional screen and PVC insulation. Particularly for the transmission of output signals of transmitters or input signals of controllers and for temperature measurement.
  Order no. 50000662

- Junction box VBC
  Metallic junction box for cable extension,
  dimensions (W x D x H): 125 x 80 x 54 mm / 4.92 x 3.15 x 2.13 inches
  Order no. 50005181

Junction box VBM
- For cable extension, with 10 terminals
- IP 65 / NEMA 4X
- Material: aluminum
- Order numbers:
  – cable entry Pg 13.5: 50003987
  – cable entry NPT ½": 51500177

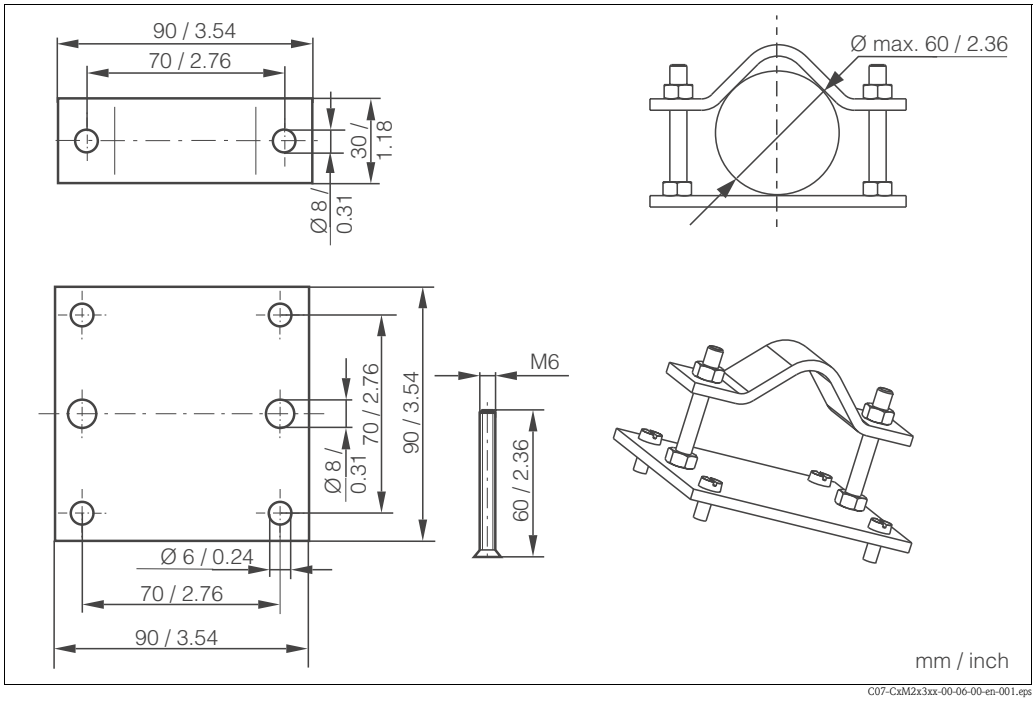
Mounting accessories

- Weather protection cover CYY101 for mounting of field housing, for outdoor installation
  material: stainless steel 1.4031;
  order no. CYY101-A



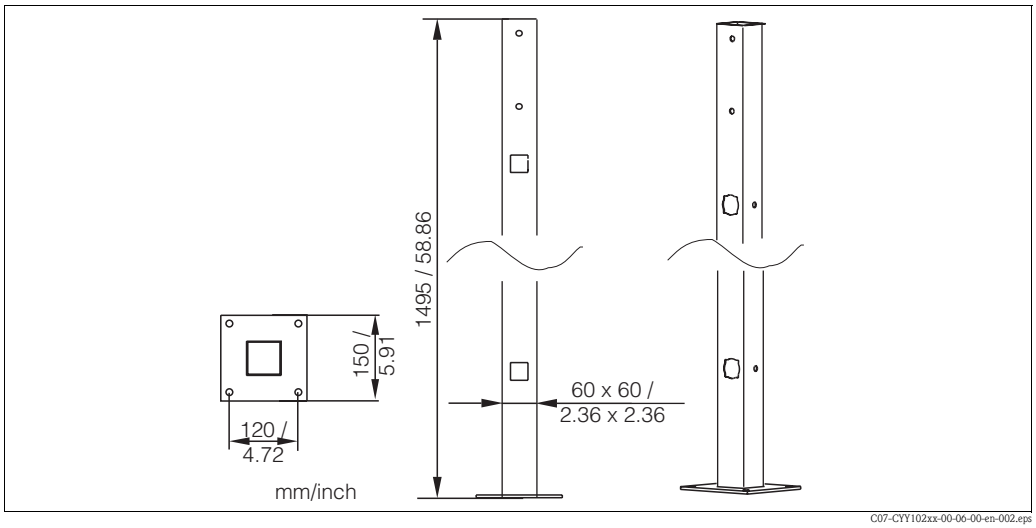
Weather protection cover for field instrument

- Kit for mounting of field housing on horizontal or vertical pipes (Ø max. 60 mm (2.36"))
  order no. 50086842



Pipe mounting kit

- Universal upright post CYY102
  Square post for mounting of field housing, material: stainless steel 1.4301;
  order no. CYY102-A



Square post CYY102

Measuring system

- Compact chlorine system CCE1
  Factory-assembled and wired panel for transmitter with flow assembly CCA250-A1; see also Technical Information TI014C/07/en

Calibration tool

- Photometer CCM182; microprocessor-controlled photometer for chlorine, pH value, cyanuric acid;
  Chlorine measuring range: 0.05 to 6 mg/l
  pH measuring range: 6.5 to 8.4

Optoscope

- Optoscope
  Interface between transmitter and PC / laptop for service purposes.
  The Windows software "Scopeware" required for the PC or laptop is supplied with the Optoscope. The Optoscope is supplied in a sturdy plastic case with all the accessories required.
  Order no. 51500650

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