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

Technical Information

CUM750 / CUS70

Ultrasonic Measuring System for Separation Zone and Sludge Level Detection

In many instances in process engineering, suspensions are separated into their solid and liquid components by sedimentation. To operate this process economically and efficiently in practice, it is indispensable to monitor the separation and transition zones of the clarification and settling phases continously.

Applications

- Wastewater treatment: primary clarifier, sludge thickener
- Water purification: settling basin after flocculant dosage, sludge height in contact sludge process
- Chemical industry: static separation process

Your benefits

- Reliable concentration measurement
  - Ultrasonic measurement method
  - Detection of sludge concentration profile
  - Ultrasonic sensor with large measuring range at small beam angle
  - Insensitive to scum
  - New software release for optimized sludge level detection
- Simple operation
  - Configuration, calibration and adjustment via menu-assisted user interface
  - Backlit multifunctional display for graphical and numerical display
  - Multi-channel version for parallel measurement in up to four basins
  - Automatic sensor cleaning with self-priming pump (optional)
- Simple installation
  - Easy to install
  - New software release for simplified commissioning

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51503544

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People for Process Automation

Function and system design

Measuring principle

Ultrasonic sensor CUS70
A piezoelectric crystal is integrated in a flat cylindrical plastic housing. When the crystal is excited by an electrical voltage, it generates a sonar signal. The ultrasonic waves are transmitted at a frequency of 657 kHz at an angle of 6° to scan the separation zones.
The parameter measured is the time it takes for the transmitted ultrasonic signal to reach the solid particles in the separation zone and return to the receiver.

Function

The speed of the sound varies according to the physical properties of the measuring medium and is affected by temperature and air pressure. The liquid zones and solids content of the medium also vary.
To obtain precise measurement results, it is therefore vital to adapt system variables to the process, e. g. pulse length and the speed of the sound.
The 32-bit processor offers the following possibilities for signal evaluation:

- Mask out regions where the separation zone is not expected.
- Evaluate received signal strengths differently.
- Select leading or trailing signal edges in the evaluation.
- Amplify sensor signals at different rates, e. g. for floating sludge.
- Define a region (gate) above and below the separation zone. Signal evaluation only takes place in the defined region. The gate wanders with the separation zone. This makes smoothing algorithms unnecessary.
- Arrow indicator for basin floor.

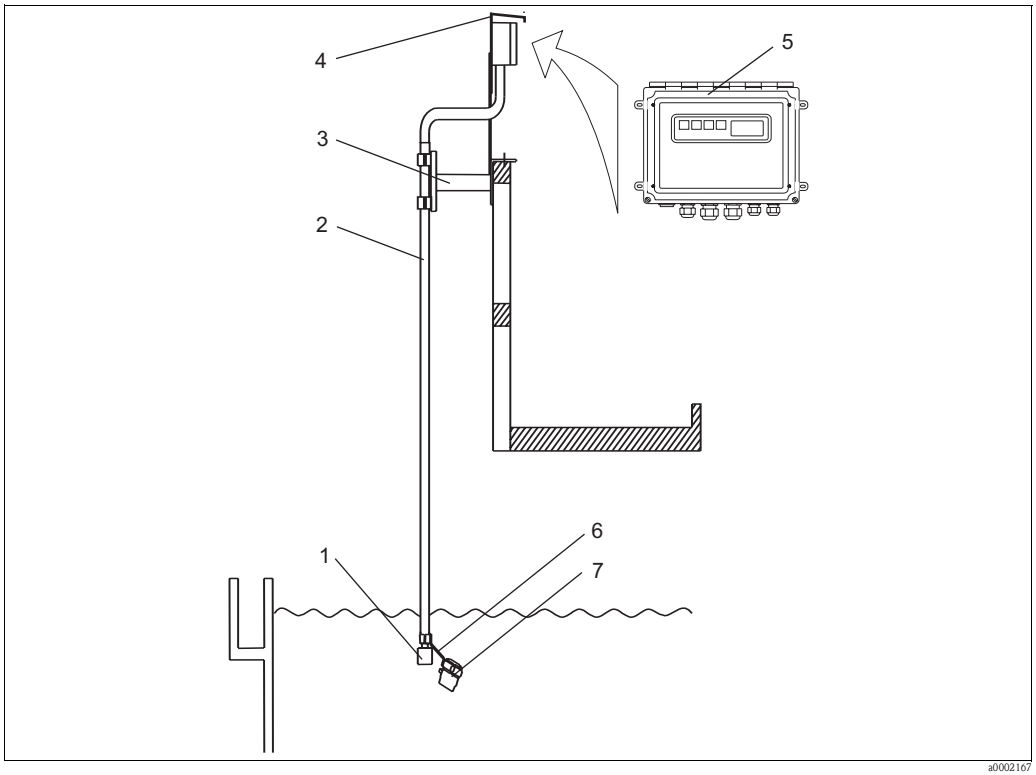
Measuring system

The complete measuring system consists of:

- The CUM750 transmitter
- The CUS70 ultrasonic sensor

It also consists optionally of the following elements which can be ordered as accessories:

- A CYY101 weather protection cover
- A railing bracket for CUS70
- An immersion tube
- A cleaning pump



Complete CUM750 measuring system

1	*CUS70 ultrasonic sensor*	*5*	*CUM750 transmitter*
2	*Immersion tube (accessories)*	*6*	*Fixing bracket for pump (accessory)*
3	*Railing bracket (accessory)*	*7*	*Cleaning pump (optional)*
4	*Weather protection cover (accessory)*		

Input

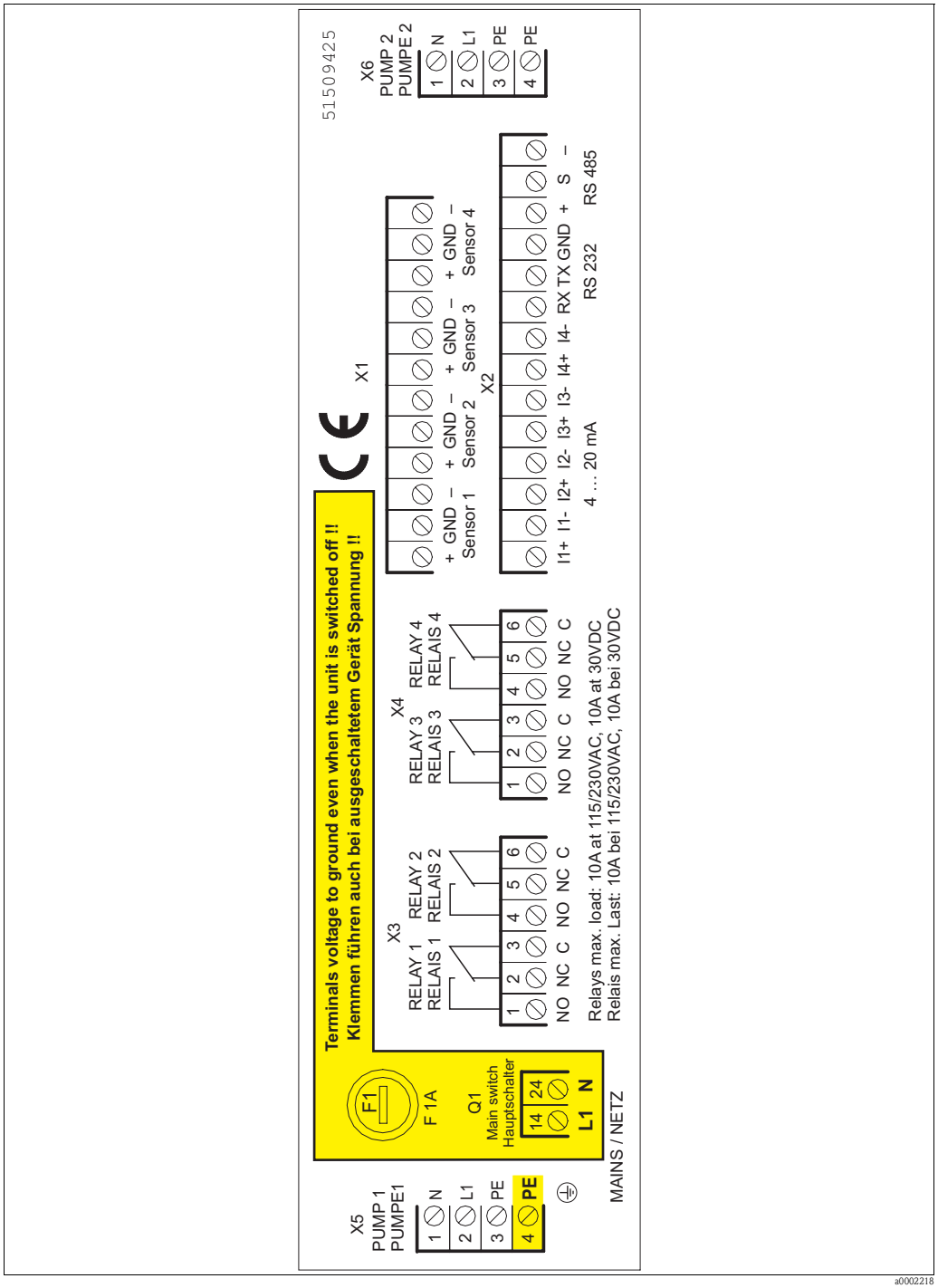
Measured variable	Height measurement
Measuring principle	Ultrasonic measurement
Frequency	657 kHz
Wavelength	0.2 cm (0.79")
Measuring beam angle	6°
Dead zone (blocking distance)	30 cm (11.81")
Measuring range	0.3 ... 100 m (0.98 ... 328 ft.)
Signal resolution	0.03 m (1.18 ft.)
Accuracy	±1 % of measuring range

Output

Output signal	0/4 ... 20 mA for height measurement
Number of signal outputs	max. 4
Load	max. 500 Ω
Switching outputs	max. 4 relay contacts
Switching capacity	10 A at 115/230 V AC, 10 A at 30 V DC
Serial ports	RS 232, RS 485

Power supply

Electrical connection



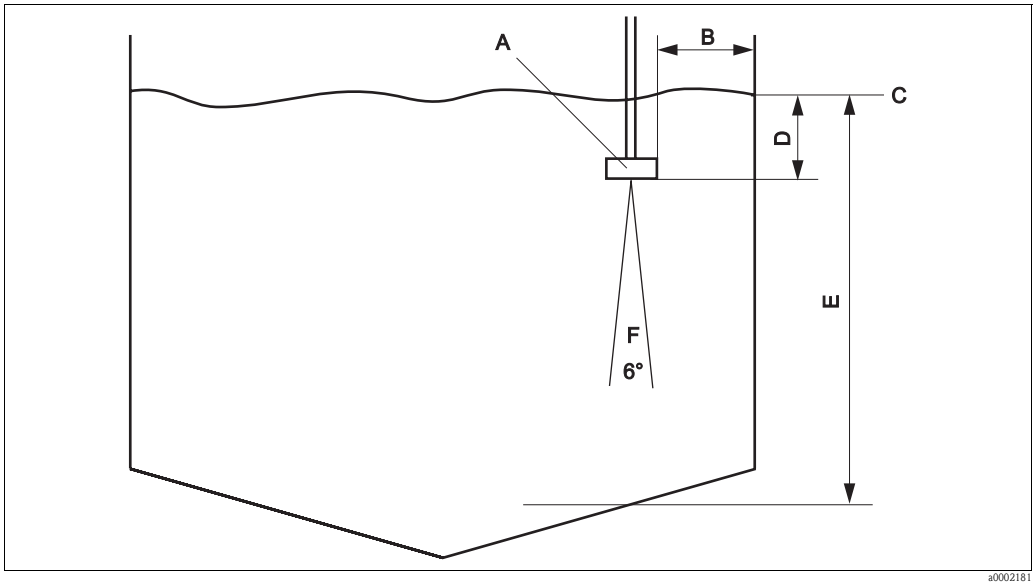
Electrical connection of the transmitter

Supply voltage	115/230 V AC, 50/60 Hz +6 ... -10 %
Power consumption	max. 40 VA
Mains fuse	Fine-wire fuse, quick-blow, F 1 A

Installation

Installation instructions

Basin configuration



Basin configuration

A Sensor
B Minimum distance of sensor to basin wall = 45 cm (1.48 ft.)
C Reference point e.g. water surface
D Zero point
E Basin depth
F Opening angle of ultrasonic cone, 6°

Installation instructions
Look at the construction drawing of the basin for a suitable position for the sensor. In doing do, you must take the following factors into account:

- The minimum distance between the basin wall and the sensor is 45 cm (1.48 ft.) (sensor emits ultrasound in conical form).
- There should not be any basin wall protrusions or piping in the measuring range below the sensor. Scrapers that are only temporarily in this area are permitted.
- Do not install the sensor in zones in which air bubbles, turbulence, high levels of turbid material or suspended matter or foam formation occur (e.g. inlet).
- Using an immersion tube, install the sensor 20 cm (0.66 ft.) beneath the surface of the water.
- The transmitter may not be installed in a second enclosure (heat accumulation).
- If possible, do not install the transmitter near high voltage sources. In addition, also avoid sources of magnetic fields, e.g. large transformers or frequency converters.
- The system can only detect a separation zone if there is a clear transition between the zones. Unclear transition from the liquid to the solid phase cannot be detected.

Environment

Ambient temperature

Transmitter:	-20 ... +50 °C (-4 ... +122 °F)
Sensor:	max. 60 °C (140 °F)

Ingress protection

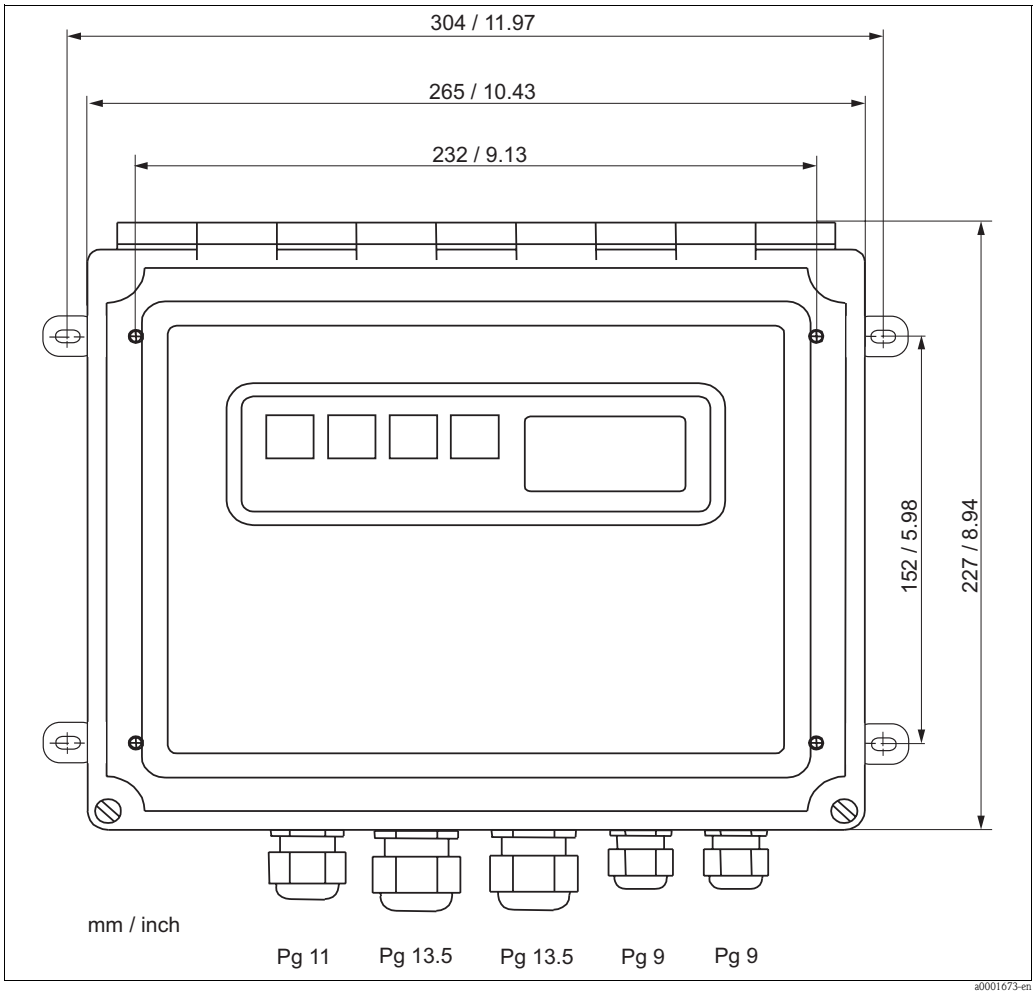
IP 65

Pressure (sensor)

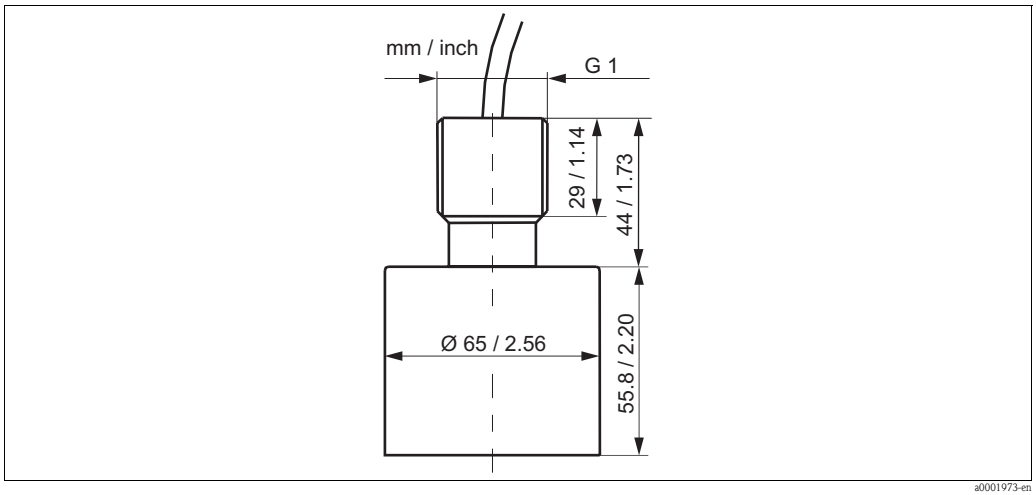
max. 6 bar (87 psi)

Mechanical construction

Design, dimensions



Dimensions of CUM750 transmitter



Dimensions of CUS70 ultrasonic sensor

Weight	Transmitter: Sensor:	ca. 4 kg (8.8 lb.) ca 0.5 kg (1.1 lb.)
Materials	Housing: Display window: Sensor: Sensor cable:	Fibre-glass reinforced polyester Plexiglas® Epoxy plastic Polyurethan covered
Cable length	6 m (19.69 ft.)	
Max. distance between sensor and transmitter	100 m (328 ft.)	

Human interface

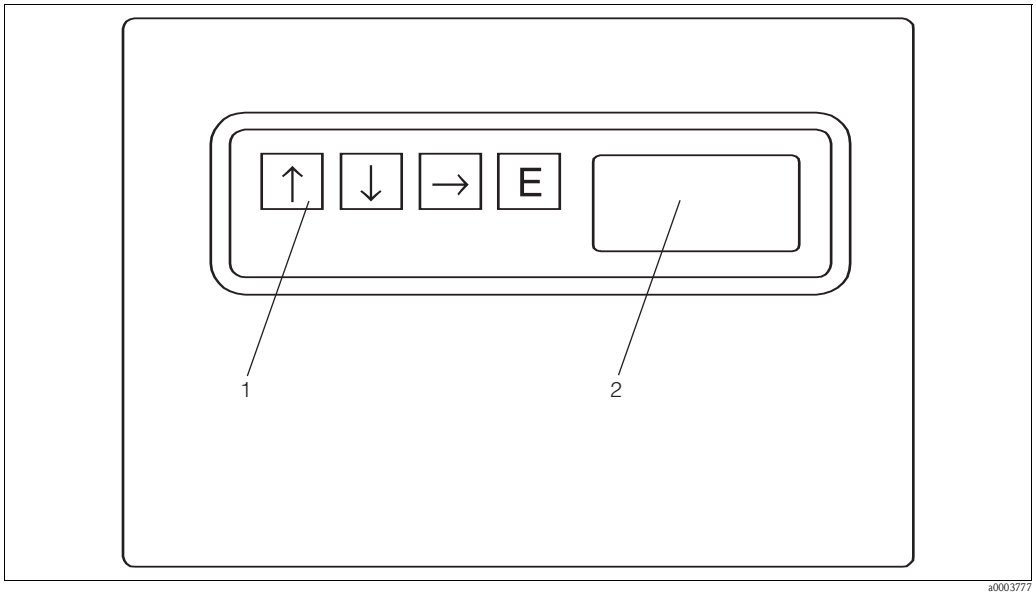
Operation

The transmitter can be completely set up and calibrated via the dirt-proof membrane keypad. The operator is guided interactively via the operating menu. The interface is a two-line plaintext display.
The user can select from three configurations:

- one factory configuration
- two user-defined configurations

If the scraper causes interference, the signal can be smoothed and filtered. Interference from floating sludge can be eliminated by the cleaning pump.
All the calibration data and parameters are retained if there is a power failure or when the device is shut down (non-vlatile RAM).

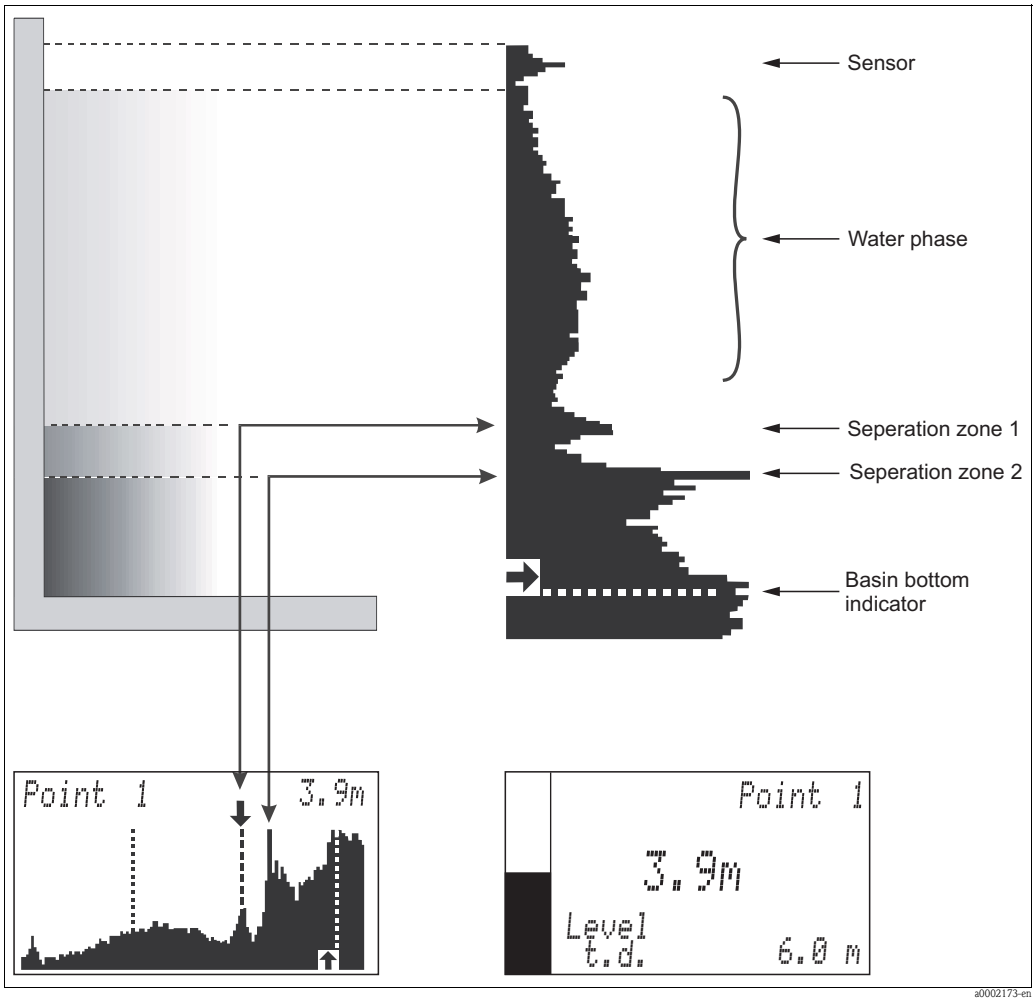
Display and operating elements



Operating elements

1 Membrane keypad
2 Large LC display for graphical and numerical display

Display



Sludge level measurement in primary clarifier

Ordering information

Product structure CUM750

	Version	
	1	One-channel version
	2	Two-channel version
	3	Three-channel version
	4	Four-channel version

		Language version	
		D	German
		E	English

			Power supply	
			0	Power supply 230 V AC, 50/60 Hz
			1	Power supply 115 V AC, 50/60 Hz

				Communication	
				A	RS 232 and 4 ... 20 mA
				B	RS 485 and 4 ... 20 mA

					Additional equipment	
					A	Basic version

CUM750-						complete order code

Product structure CUS70

	Version	
	1	Standard

		Cable length	
		A	13 m (42.65 ft) cable

			Cleaning	
			1	Without cleaning
			2	With cleaning pump 230 V AC, mounting bracket
			3	With cleaning pump 115 V AC, mounting bracket

				Additional equipment	
				A	Basic version

CUS70-					complete order code

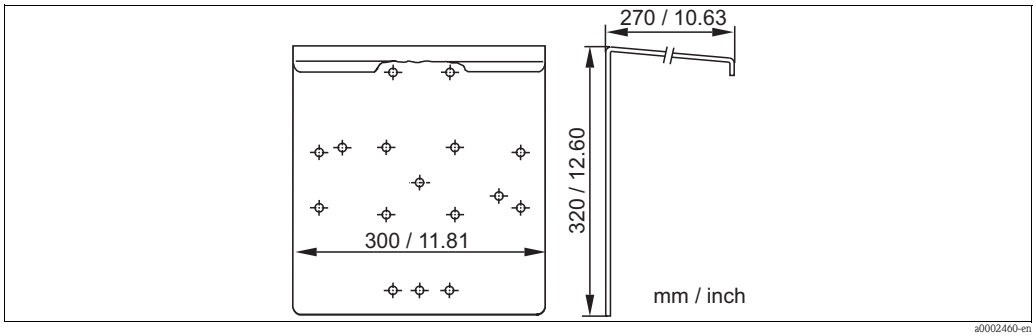
Certificates and approvals

CE approval

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

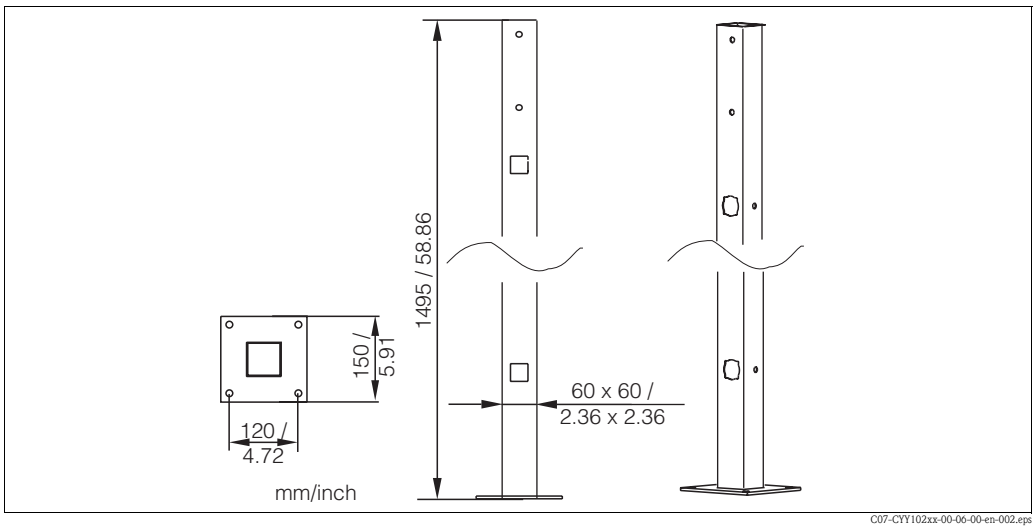
Accessories

- Weather protection cover CYY101 for mounting on the field device, absolutely essential for operation in the open air
  Material: stainless steel 1.4031;
  Order No. CYY101-A



Weather protection cover

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



Square post CYY102

- Wall bracket for immersion tube DN 40, 300 mm (11.81 ") wall clearance
  Order No.: 51503581
- Railing bracket for CUS70 with 300 mm (11.81 ") wall clearance
  Order No.: 51503582
- Railing bracket for CUS70 with 300 mm (11.81 ") wall clearance
  Weather protection cover
  Order No.: 51503583
- Immersion tube DN 40, stainless steel
  Length 2 m (6.56 ft.); Order No.: 51504162
  Length 3 m (9.84 ft.); Order No.: 51504163

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TI225C/07/en/05.05
51503544
Printed in Germany / FM+SGML 6.0 / DT

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