

CUC 101

Optical measuring system for sludge level and interface detection



Clarifiers, thickeners and flotation cells are among the methods used in various industries to process mixed liquors in order to separate solids from liquids. Performance can be greatly improved by monitoring and controlling the location of the interface.

Applications

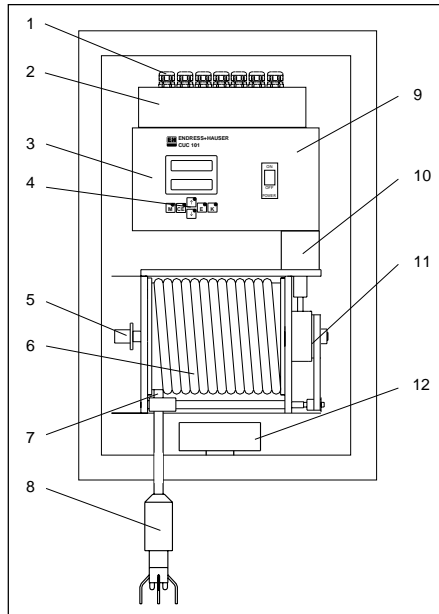
- Wastewater treatment: secondary clarifier, DAF, and sludge thickener
- Water treatment: settling tanks, sludge contact processes
- Chemical, mining, pulp and paper; for thickening, clarifying and flotation

Benefits at a glance

- Reliable concentration measurement based on an optical sensor
- Continuous measurement of level using a zone concentration tracking immersion sensor
- Simultaneous measurement of concentration and depth for profiling
- User friendly menu driven software
- Backlit display
- Sensor goes to safe position while the rake goes and holds signal
- Automatic zero of level measurement

Measuring Instrument

- 1 Cable entries
- 2 Terminal chamber
- 3 Electronics housing
- 4 User interface
- 5 Slip ring
- 6 Cable drum
- 7 Cable guide
- 8 Suspended solids sensor
- 9 Stepper motor controller
- 10 Stepper motor
- 11 Toothed belt ratio
- 12 Heater with thermostat



The complete measuring system is installed in a closed plastic housing.

The main system components include:

- stepper motor controller
- tracking unit (motor, cable drum and signal transfer)
- suspended solids measuring transmitter
- suspended solids sensor

Measuring Principle

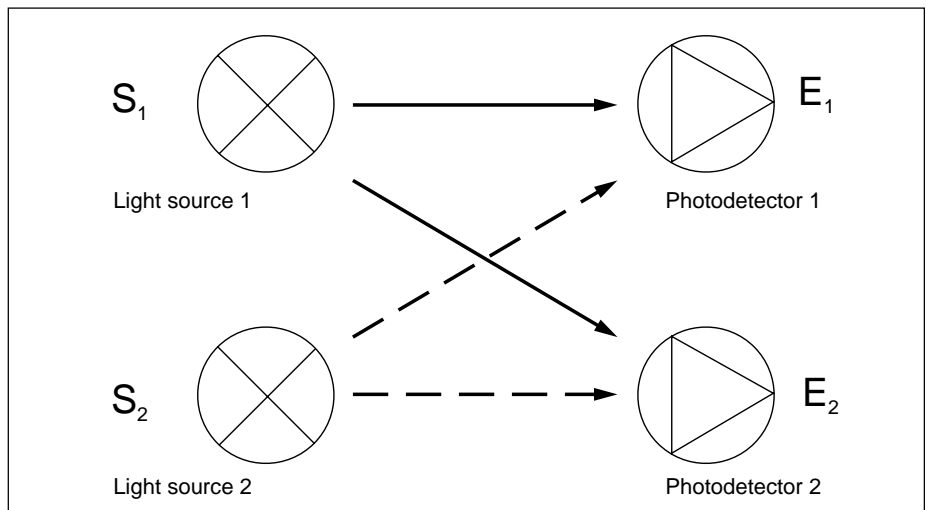
Multi-beam pulsed light process

The CUC 101 measuring system was specially designed to detect separation zones and sludge levels in sedimentation processes. Separation zones are detected by measuring suspended solids concentration. This process is based on the conventional multi-beam pulsed light principle.

The signals of the two photodetectors are separately converted into logarithmic functions and ratioed. This compensates for both sensor fouling and component aging.

Suspended solids are measured by light absorption. The monochromatic light sources are two long-life LEDs ($\geq 20,000$ operating hours).

Principle of measuring light transmission



Function

The sensor generates a signal proportional to the concentration of solids in suspension which is converted into a frequency signal. The frequency signal is transferred without interference via slip rings made of stainless steel.

The measured signal is compared with a preselected reference value for sludge concentration in the measuring transmitter. If there is a deviation, the sensor moves up or down until it reaches the reference (separation zone).

In order to save time, the tracking speed is controlled. This means that the greater the difference between the actual and the reference concentrations, the faster the sensor approaches the separation zone. The plastic cable drum used for this purpose is driven by a low-maintenance stepper motor.

An electronic device determines the sludge level height from the number of steps carried out by the stepper motor and supplies the result as an analog signal. To avoid incorrect signals caused by stepper losses (e.g. power failure or maintenance work), an automatic zero point compensation of the level measurement takes place. The sensor moves to a specific reference point for automatic zero point compensation.

A synchronization input allows the sensor to be raised quickly.

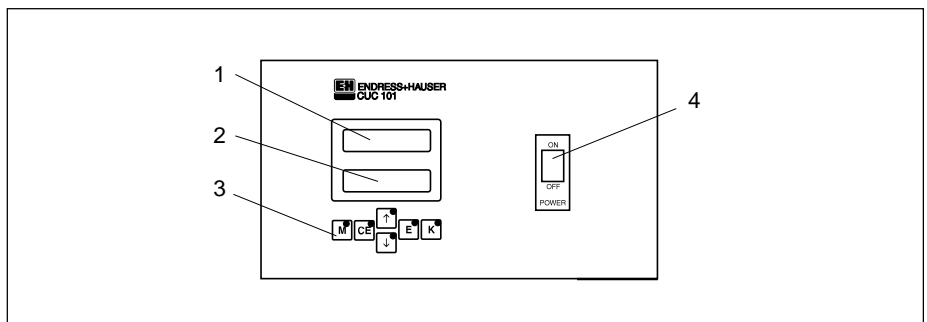
This is required for the following situations:

- rake passage
- sensor cleaning

The analog signal is held during this time at the value last measured. When the synchronization contact opens, the sensor moves to its original position and sends the current measured value again. An additional alarm contact signals when the measuring range is exceeded or when the sensor is soiled.

User interface:

- 1 Large 14 mm display with 4 1/2-digit for current sludge level depth
- 2 LC display for menu guidance
- 3 Membrane keypad
- 4 Main power switch



Operation

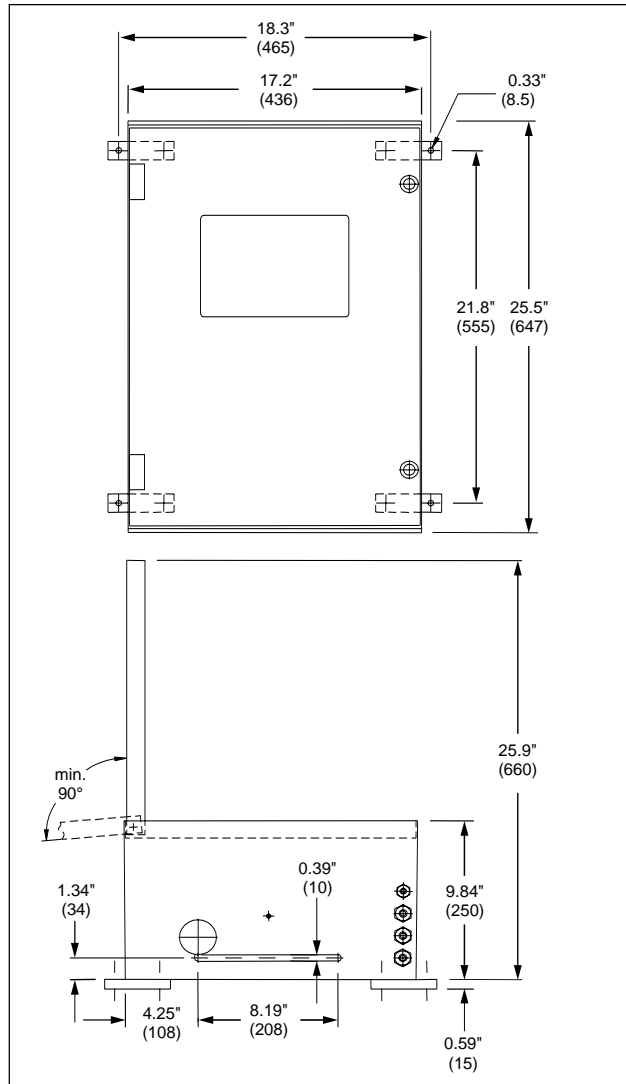
The CUC 101 can be completely set up and calibrated via the dirt-proof membrane keypad. The operator is guided interactively through the operating menu. The interface is a two-line, plain text display.

A language selection menu permits the device to be operated in various languages.

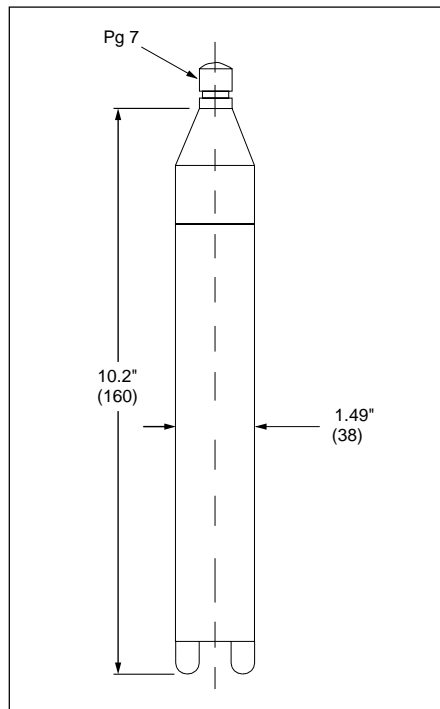
Programming levels which go beyond everyday operation processes are only accessible by entering a password.

All the calibration data and parameters are retained should a power failure occur or when the device is shut down (non-volatile RAM).

Dimensions

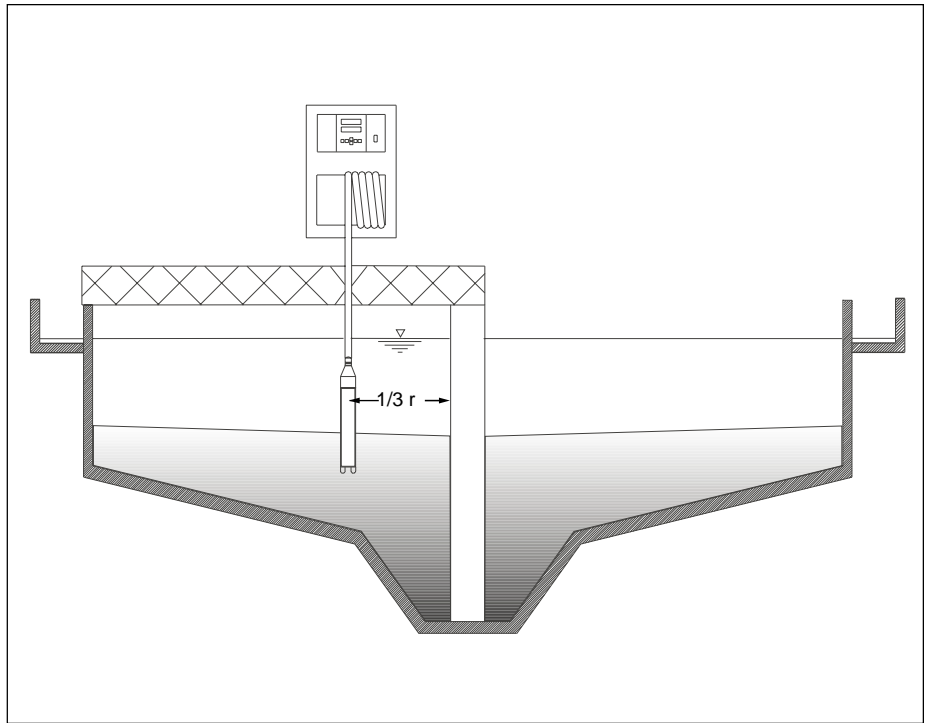


Measuring transmitter dimensions in inches (mm)

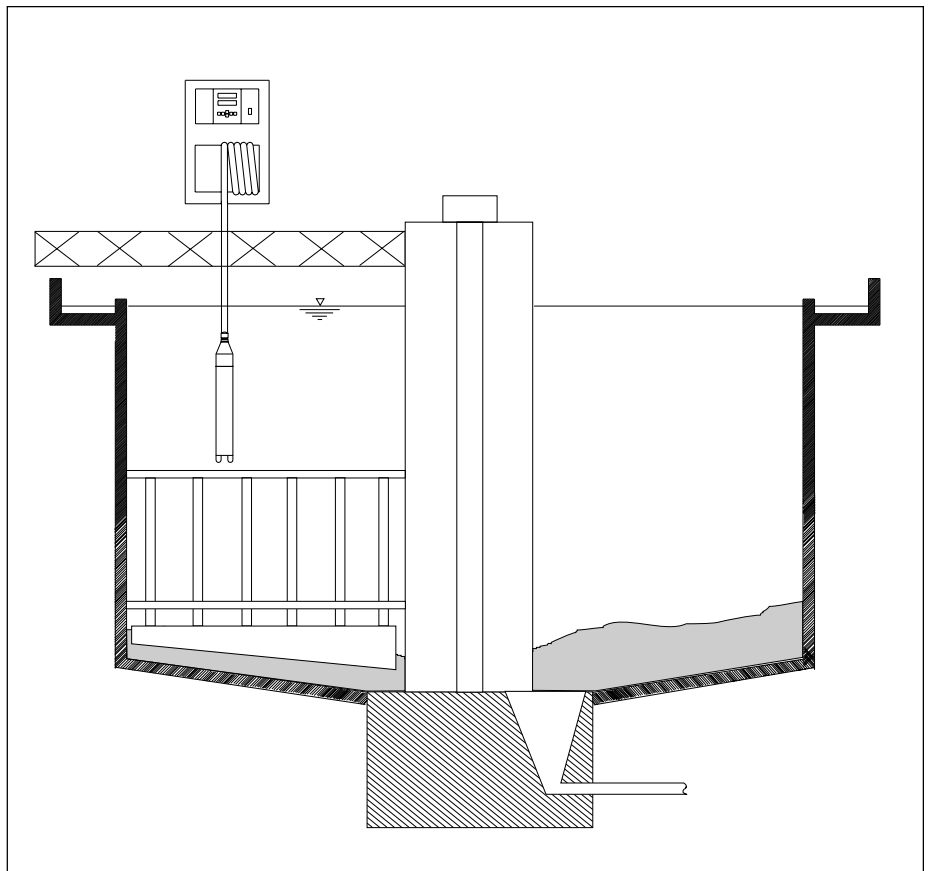


Measuring sensor dimensions in inches (mm)

Installation



Continuous sludge level measurement in secondary clarifier. Installed on moving bridge.



Continuous separation zone measurement in sludge thickener

Technical Data

General data

Manufacturer	Endress+Hauser
Instrument designation	Sludge level measuring system CUC 101

Measuring transmitter

Dimensions (L x W x D)	25.5" x 17.2" x 9.8" (647 x 436 x 250 mm)
Total weight	Including sensor and tracking unit, approximately 66 lbs. (30 kg)
Display	LED display 0.55" (14 mm) for current measured value, 2-line LC display 0.19" (5 mm) for programming

Mechanical data

Housing	Polyester, IP 30, connector between electronics and tracking unit
Sight glass	Polycarbonate
Protection class	IP 30

Input

Signal input 1	Measuring input
Measured variable	Suspended solids concentration measurement, level/depth measurement
Principle of measurement	Multi-beam pulsed light process for suspended solids
Measuring light	Infrared light at 880 nm
Measuring range	0 to 12 g/l
Accuracy	± 1% of measured value
Reproducibility	0.5%
Height measurement	Stepper motor control
Measuring range	0 to 11 m, free parameter entry
Signal input 2 (24 VDC)	Synchronization, e.g. to run up sensor during rake passage
Signal input 2 (24 VDC)	Profile run

Output

Signal output 1	0/4 to 20 mA for sludge level measurement (height)
Signal output 2	0/4 to 20 mA for solids measurement (concentration)
Load	Maximum 500 Ω
Switching outputs	2 limit relay contacts, freely configurable 1 relay contact for sensor cleaning 1 relay contact for alarm signal 1 relay contact each for messages 1 and 2
Switching power	2 A at 115/230 VAC, 1 A at 30 VDC

Electrical connection

Power supply	230 / 115 VAC, 50/60 Hz, +6 to -10%
Power consumption	Maximum 105 VA (electronics + heater)

Heater

Heating capacity	Thermostatically controlled, 55 VA
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Ambient conditions

Ambient temperature	-4 to +140°F (-20 to +60°C)
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Reeling Unit

Components

Cable drum (w x Ø)	8.27" x Ø 6.3" (210 x Ø 160 mm)
Cable length	42 ft. (13 m)
Drive	Stepper motor with worm gear and toothed belt
Stepping rate	200 steps per revolution
Signal transfer	Nobel metal slip rings
Zone-tracking rate	Maximum 10 m/s

Sensor

Physical data

Dimensions	10" x Ø 1.5" (260 x Ø 38 mm)
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Material

Sensor	316 Ti SS and polyoxymethylene (POM)
Sensor cable	Polyurethane jacket
Sensor weight	316 Ti SS and polyamide 6.6 GFRP
Protection guard	316 Ti SS

Height measurement

Maximum sensor stroke	37 ft. (11.4 m)
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Operating conditions

Maximum temperature	122°F (50°C)
Pressure	Maximum 87 psi (6 bar)

Accessories

- Railing-mounting bracket with weather protection cover
Part No.: 51503584
- Cleaning brush for cable
Part No.: 51503585
- Sensor rinsing device, SS VA, DN 200 including solenoid valve
Part No.: 51503586
- Sensor rinsing device, plastic PP, DN 300 including solenoid valve
Part No.: 51503587
- Sensor protection guard with 90° angle bracket
Part No.: 51503783
- Winterization for extremely cold areas
Part No.: 51517538

Ordering Information

CUC 101 Sludge level measuring system

CUC 101 - ¹ ²

- 1 Version
 - A Standard
 - Y Special version
- 2 Power Supply
 - 0 230 VAC, 50/60 Hz
 - 1 115 VAC, 50/60 Hz
 - 9 Special version

For application and selection assistance,
in the U.S. call 888-ENDRESS

For total support of your installed base, 24 hours
a day, in the U.S. call 800-642-8737

Visit us on our web site, www.us.endress.com

United States

Endress+Hauser, Inc.
2350 Endress Place
Greenwood, IN 46143
Phone: (317) 535-7138
888-ENDRESS
FAX: (317) 535-8498

Canada

Endress+Hauser
Canada Ltd.
1440 Graham's Lane
Unit 1, Burlington
ON, L7S 1W3
Phone: (905) 681-9292
800-668-3199
FAX: (905) 681-9444

Mexico

Endress+Hauser
Paseo del Pedregal No. 610
Col. Jardines del Pedregal
01900, Mexico D.F.
Mexico
Phone: (525) 568-2405
FAX: (525) 568-7459

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