A MEMBER OF THE ABB GROUP

USER'S MANUAL

OC

Optical Consistency Transmitters

A MEMBER OF THE ABB GROUP

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This manual is suitable for SW V1.02 and newer

1 Contact information

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2 Description

2.1 System components

The OC transmitter includes sensor, 10 m interconnect cable and OC display unit.

The OC sensor is made in acid proof stainless steel and there are few different models available. Sensor can be for in-line or by-pass line installation.

The measuring lenses in the steel cell are made of sapphire glass to withstand abrasive liquids. Electronic and optical components are well protected within the steel enclosure to handle very demanding environments.

The sensors are available with:

1. OC P 03/25 by-pass sensor Polarized light with 25 mm (1” NPT) connection.
2. OC 20/50 by-pass sensor with 50 mm (2” NPT) connections.
3. OC 20/25 by-pass sensor, OC 20/25 LC by-pass sensor and OC 20/25 K by-pass sensor, with 25 mm (1” NPT) connections.
    - The LC sensor is a special type for very low consistencies.
    - The K sensor is a special type for applications with aggressive media, i.e. white/green liquors, supplied with Kalrez sealings.
4. OC IL 20/70 in-line sensor.
5. OC IL 20/38 HP in-line sensor for High Pressure Design.

The display unit supplies power to the sensor and communicates with the sensor. The power supply required is 86 – 264 VAC, 50 – 60 Hz. Display unit outputs the analog outputs and alarms to the DCS.

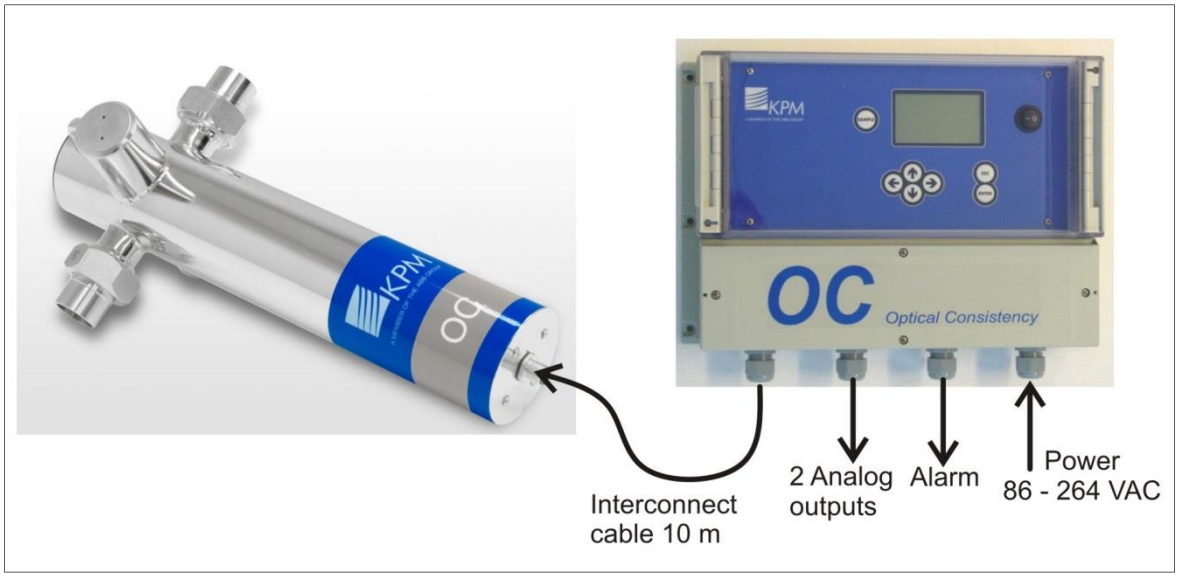
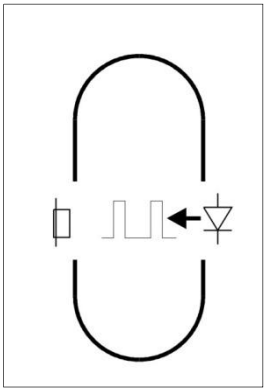


Fig. 1. System components.

2.2 Measuring principle

2.2.1 OC 20/25, OC 20/25 LC, OC 20/25 K, OC 20/50

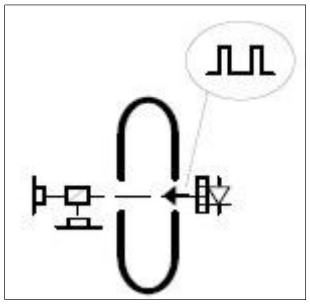
The sensor measures transmitted light through the liquid. The measuring principle is based on the suspended particles' ability to absorb and reflect light. The light source is LED pulsing monochromatic NIR light at high power. The detected measuring signal is inversely logarithmically proportional to the consistency or suspended solids. Signal treatment is done by the display unit. The temperature is measured by the transmitter to be used for temperature compensation of the measured value.



2.2.2 OC P 03/25

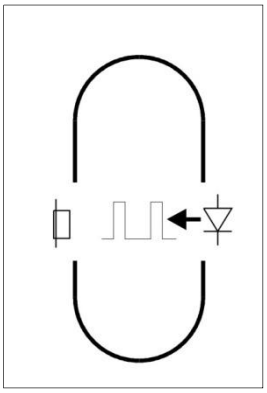
The OC P 03/25 measures through the medium. The transmission is made with polarized, monochromatic light. The measuring principle is based on the ability of fibers to depolarize the light to a much greater degree than solid particles. The light source consists of a bright, light-emitting diode which is pulsed with high power.

The light is filtered so that only one plane of polarization is emitted. Two detectors measure the V and H polarization planes. The detector signals are processed in the display unit and are presented as fiber consistency. The temperature is measured by the transmitter to be used for temperature compensation of the measured value. It can be read in the display unit, and used as secondary value when a transmitter is configured to use both analog outputs of the unit. The temperature is not a precision measurement, but shall be seen as an indication.



2.2.3 OC IL

The sensor measures transmitted light through the liquid. The measuring principle is based on the suspended particles' ability to absorb and reflect light. The light source is LED pulsing monochromatic NIR light at high power. The detected measuring signal is inversely logarithmically proportional to the consistency or suspended solids. Signal treatment is done by the display unit. The temperature is measured by the transmitter to be used for temperature compensation of the measured value.



3 Installation instructions

3.1 Installation instructions

Manufacturer supplied components:

- OC sensor unit, 1 ea
- Display unit, 1 ea
- Interconnect cable 10 m, 1 ea

By-pass sensors are normally installed over a pump so that the sample is taken from the pressure side and returned to suction side of pump. Sensors require a minimum flow rate of 20 liters per minute (OC P03/25 sensor only 10 l /min).

In-line sensor is installed on the pressure side of pump in the straight pipe section. These in-line sensors requires normally a minimum flow rate of 1 m/s.

3.2 General installation recommendations

- The temperature of the sensor must not exceed 65 ºC (150 ºF).
- Process pressure should be over 1.5 bar to avoid air in pulp.
- Install the sensor to avoid exposure to considerable and fast changes in temperature.
- Avoid installation where the sensor is exposed to severe cold weather or direct sunlight.
- Protect the sensor from high pressure water spraying.
- The sensor should never be submerged under water.
- Install the sensor to avoid extreme vibrations.
- The sensor must not be removed while still under process pressure.
- The sensor must always be mounted with the cable connector pointing downwards.

3.3 Display unit installation

Install the display unit to the wall for easy access. Standard interconnect cable length is 10 meter to the sensor, but longer cables are available. Cable has quick connector at both ends one for sensor and another for display unit.

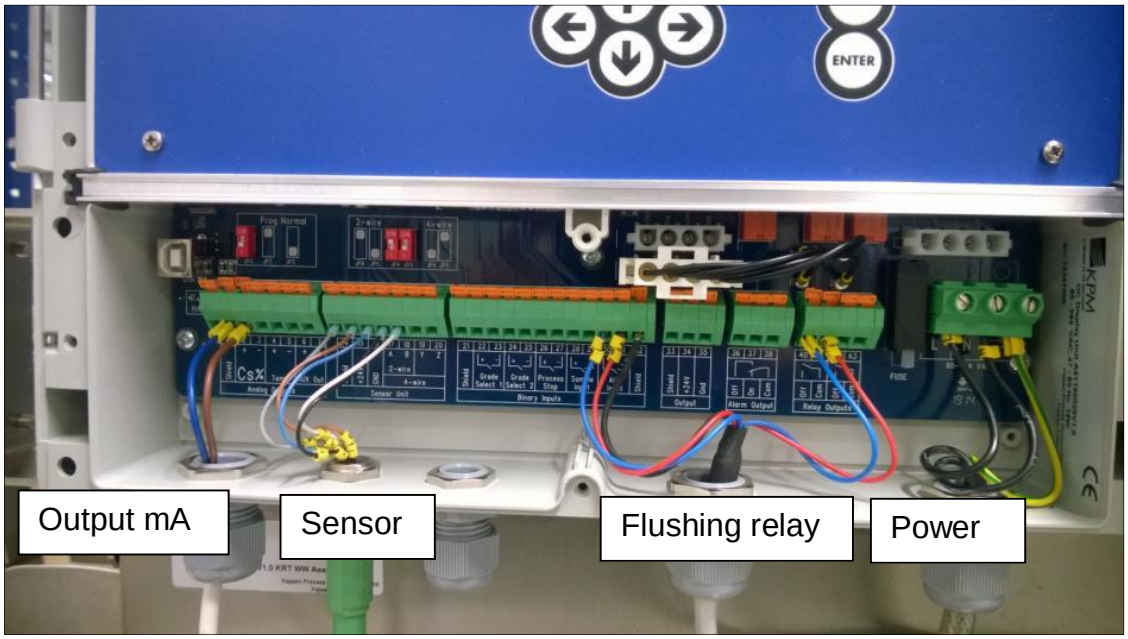


Fig. 2. OC wiring.

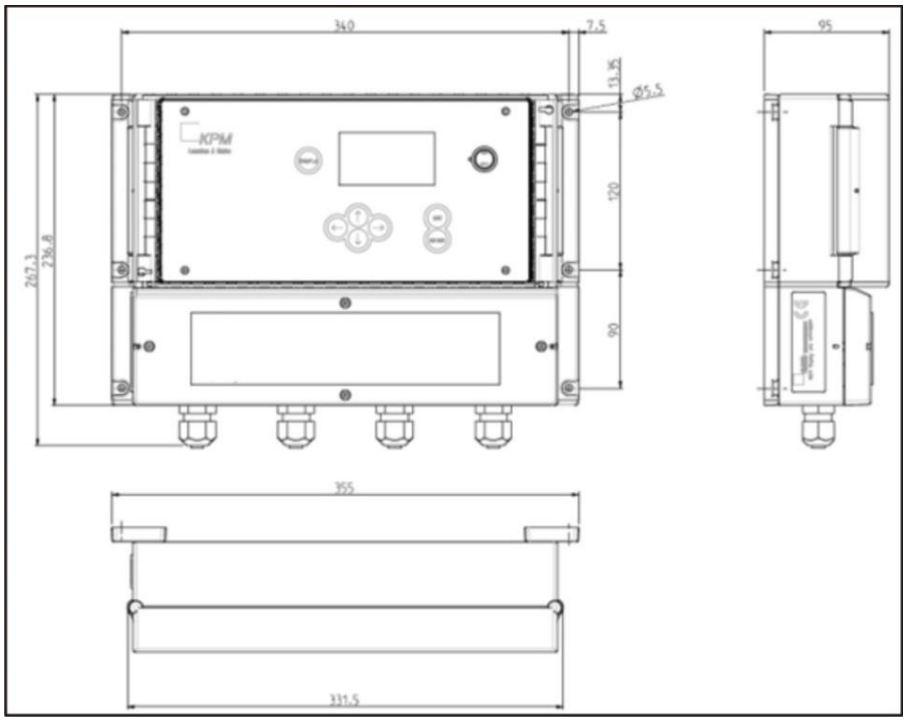


Fig. 3. Display unit dimensions

3.4 OC 20/25 and OC 20/50 sensor installation & locations

The OC 20/25 can be mounted directly in a 25mm (1”) pipe, OC 20/50 in a 50mm (2”) pipe. With larger pipes a by-pass line should be used which is normal case.

The sensor must always be mounted with the cable connector pointing downwards.

The sensor must not be removed while still under process pressure.

There are three ways to mount the sensors:

– butt weld end connection,
– NPT-couplings (US) or
– hose connections.

3.4.1 By-pass line installation

The inlet to the by-pass pipe should be in location where the suspension is well mixed and the flow is turbulent. Distance from a pump discharge or a pipe elbow is about five pipe diameters downstream. The by-pass pipe should be short and straight.

Install the by-pass pipe inlet before an elbow or pipe reduction to obtain the highest possible turbulent flow rate in the by-pass pipe.

To avoid the water film on pipe walls, the by-pass pipe should extend at least 20 mm (¾”) into the pipe.

For OC 20/25 and OC 20/50 the by-pass pipe for sensor should be 25 mm (1”) and 50 mm (2”) respectively.

The by-pass pipe should not have any throttling valve or pipe bend closer than 0.5 m (20”) before the sensor.

The by-pass pipe must not dewater the pulp stock at shutdown. Therefore the valve upstream the sensor should be closed automatically when the pump stops running.

The flow rate in the by-pass pipe should be same as in the main pipe but not less than 20 l/min (5 gpm) for OC20/25 and 60 l/min (15 gpm) for OC 20/50 sensors. At lower rates a risk of dewatering and building up on the glass windows exists. For pulp stock with printing ink and resin, the flow rate should be twice as high.

Automatic cleaning is recommended for recycled fiber applications and then the flushing water pressure should be higher than process pressure.

In recycled fiber applications the valve after the sensor should be completely open to purge the sensor throughly.

For further instructions on white and green liquor applications, see Appendix 1.

3.4.2 OC 20/25 sensor dimensions

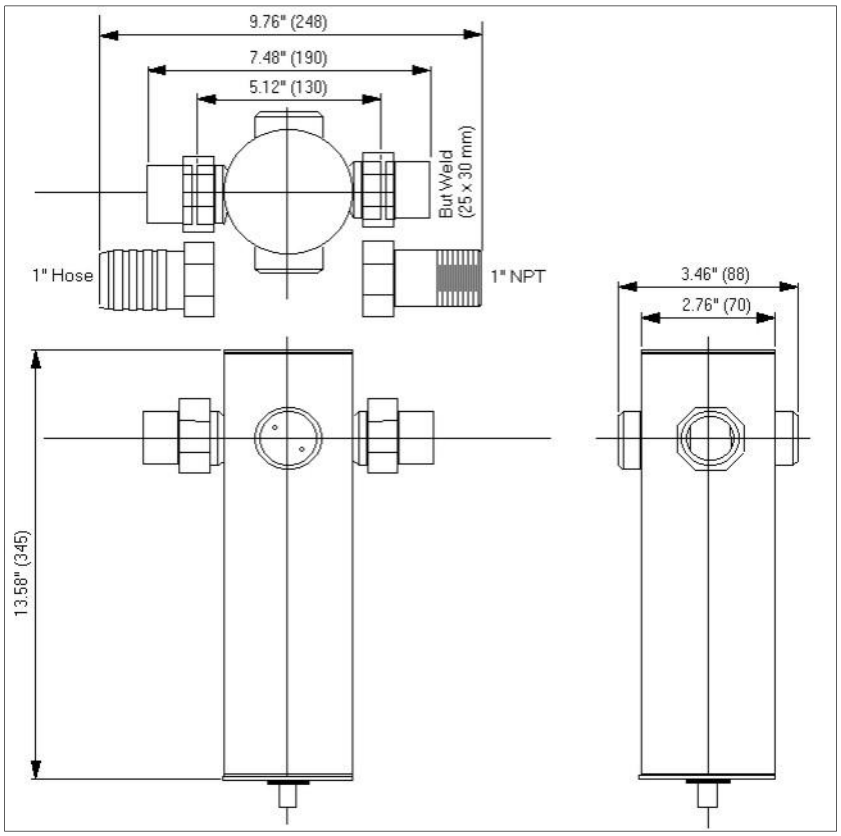


Fig. 4. OC 20/25 sensor dimensions.

3.4.3 OC 20/50 sensor dimensions

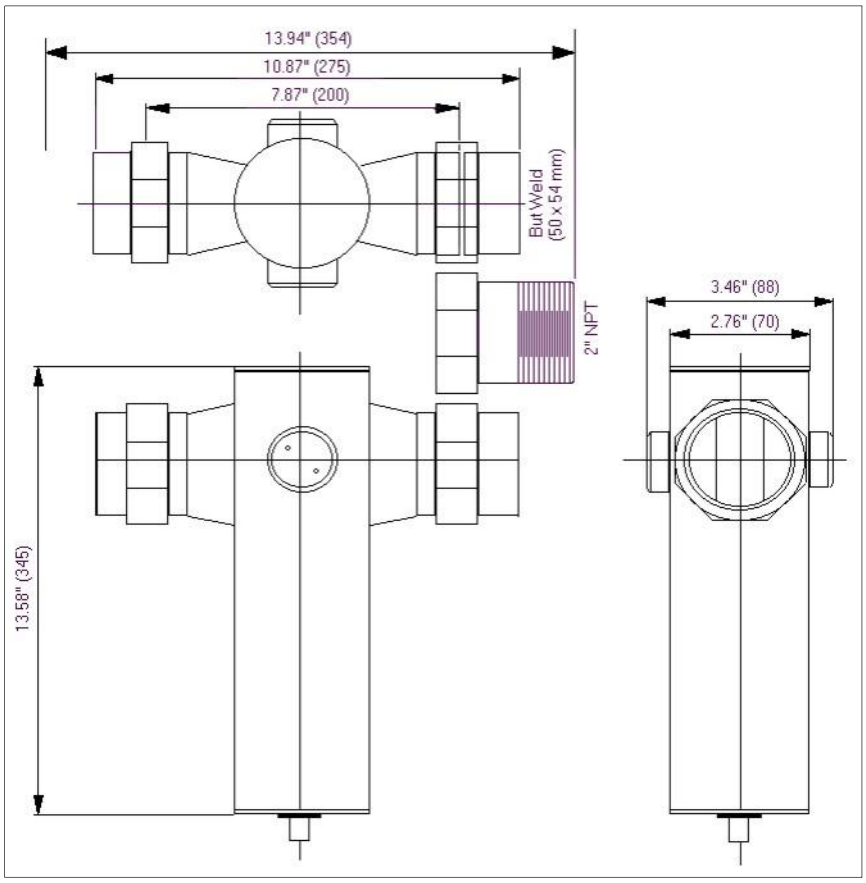


Fig. 5. OC 20/50 sensor dimensions.

3.5 OC P03/25 installation

OC P03/25 sensor is a total Consistency Sensor for low consistency (0–1.5 %) applications. Normally installations are on the short circulation of the paper machine.

Sensor is normally installed on the by-pass line of 25 mm (1”) or 19 mm (¾”).

Total consistency sensor has a 3 mm gap between lenses so screened pulp is needed.

Sensor can be installed directly to places, where there is over 1 bar pressure in the pipeline. This will ensure a proper sample flow through the sensor. In case pressure is low then a pump is needed to supply enough pulp to sensor.

In some installations also a backflushing is needed to ensure clean optics.

3.5.1 OC P03/25 sensor installation

Sensor is normally installed on by-pass line of 25 mm (1”) or 19 mm (¾”).

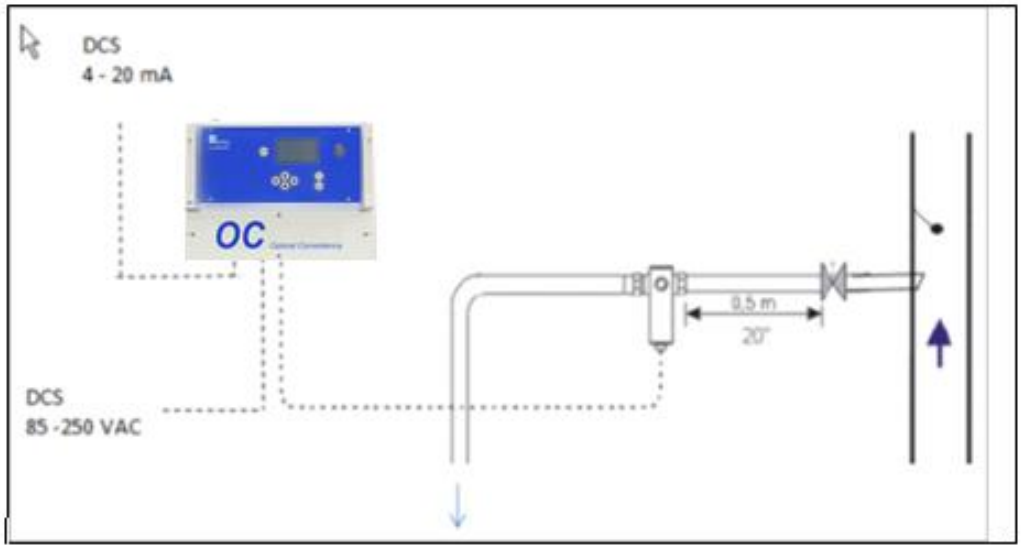


Fig. 6. OC by-pass sensor installation.

The installation of sample tap into a process pipeline. The tap should be inserted 2 cm or ¾” into a pipeline and the closing valve should be an automatic valve to be closed during the process stop to avoid draining.

The sample line piping is preferred short to avoid contaminations.

Incoming sampling line can also be a hard piping, which will support the sensor (in this case no stand needed for sensor).

The measured sample can be returned to the suction side of the pump or back to the process.

3.5.2 OC P03/25 sensor installation with pump and flushing

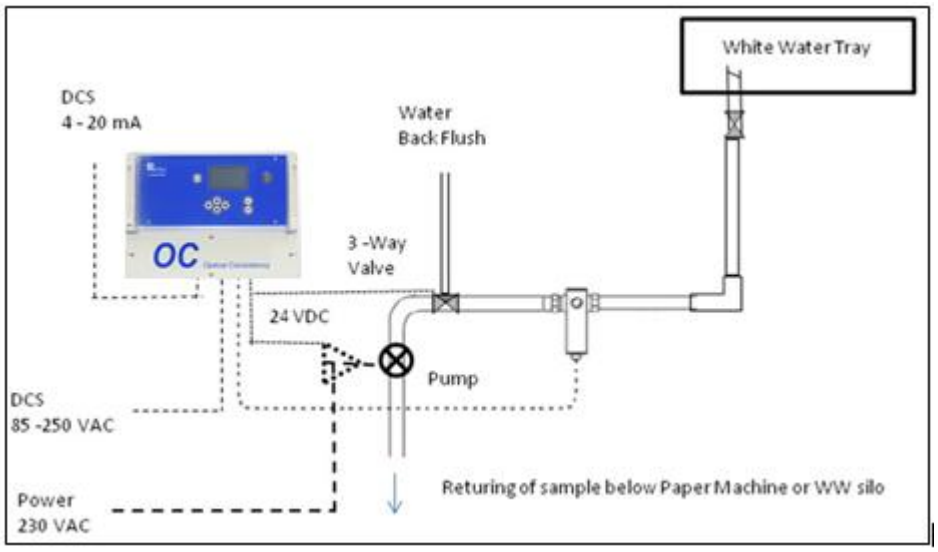


Fig. 7. OP sensor installation with pump and flushing.

Cleaning cycle is controlled by OC Display.

The back flushing valve (3-way valve) will be installed after senor. The sample flows normally direct through the valve opening. Cleaning water is connected to this 3-way valve. Warm water is preferred since cold water may cause condensation problem in the sensor. The pneumatic valve needs also an instrument air connection.

The solenoid valve control is done in the OC display unit.

Pump installation on a platform or stand. Available from KPM.

The sample pump should be controlled with OC display. When the back flushing is controlled through OC display, the pump should be stopped for a flushing period.

Additionally the pump must be stopped during the process stop to avoid the pump running dry.

This needs a contactor to stop the pump (contactor 24/230 V) during the flushing.

KPM can supply a pump with an inverter and control.

3.6 Installing and removing OCIL sensors

Mounting inline sensor in the place where the suspension is well mixed and the flow is turbulent. An appropriate distance from a pump discharge or a pipe elbow is about five pipe diameters downstream. A turbulent flow is necessary for a good performance. Depending on the consistency the flow velocity has to meet these minimum levels to reach turbulence:

- >0 % min 0.05 m/s (0.15 fps)
- < 1 % min 1.0 m/s (3.3 fps)
- > 1 % min 1.5 m/s (4.9 fps)

The sensor is mounted with the measuring gap in line with the process flow. Three lines on the sensor flange indicate the orientation of the gap. The two thinner lines must be parallel with the process flow, the thicker line indicates the position of the gap and must be perpendicular to the flow. In some cases the measurement is improved by facing the gap a few degrees towards the flow.

3.6.1 OC IL 20/70 sensor installation and dimensions

The OC IL sensor is made in acid proof stainless steel and is installed directly onto the process pipe. OC IL 20/70 is installed using a 70 mm butt weld adapter. Make hole in the process pipe (Ø75 mm, ~3") and fit the butt weld end. A minimum pipe diameter is 100 mm (~4"). The temperature of the OC IL 20/70 sensor must not exceed 95ºC (203ºF).

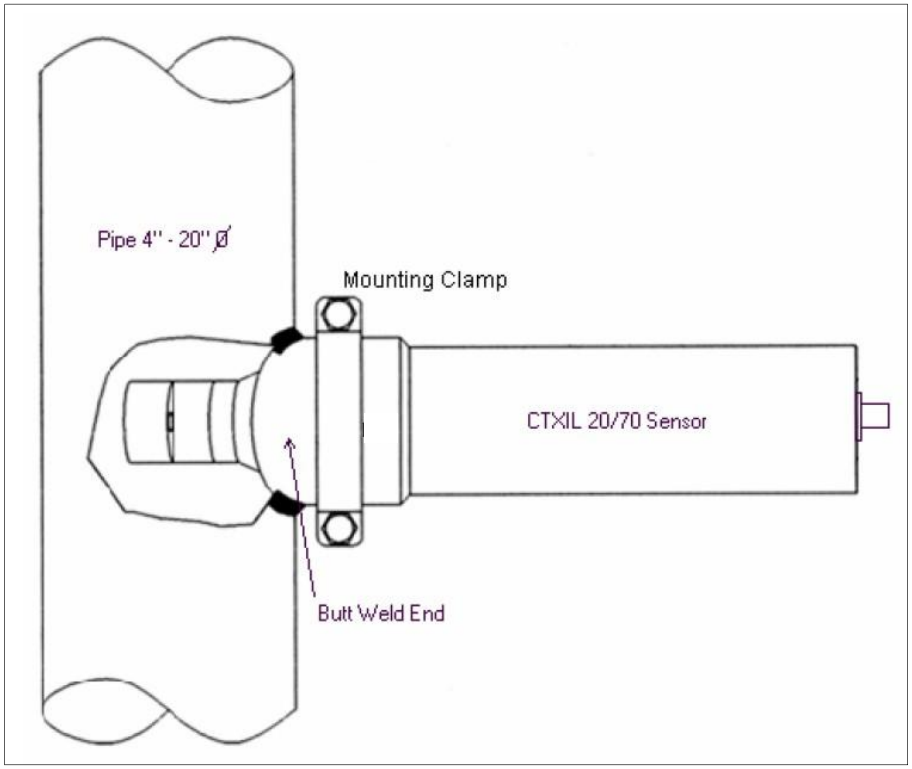


Fig. 8. OC IL 20/70 installation.

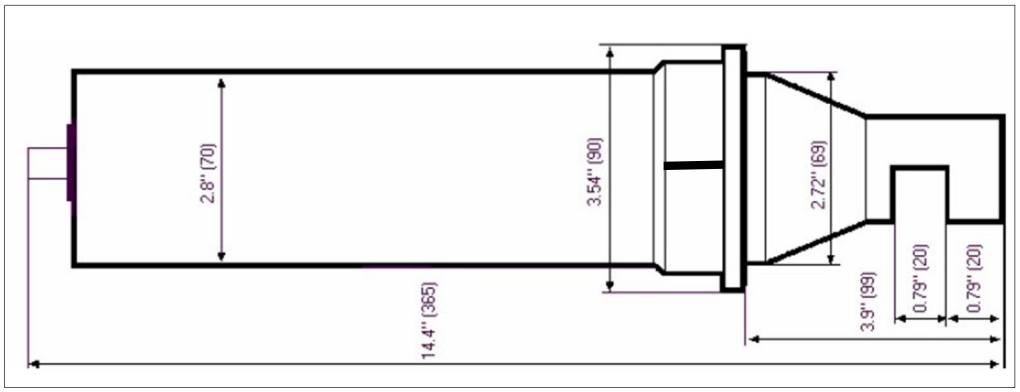


Fig. 9. OC IL 20/70 sensor dimensions.

3.6.2 Removing OC IL 20/70 sensor needs attention

The sensor must never be dismounted under process pressure. Before the sensor is removed, pressure in the process pipe must be relieved. Make sure that no flow passes through the pipe. If the sensor is removed under process pressure this could cause serious injury or even death. KPM does not accept any responsibility for accidents caused when the sensor is disconnected under a line pressure.

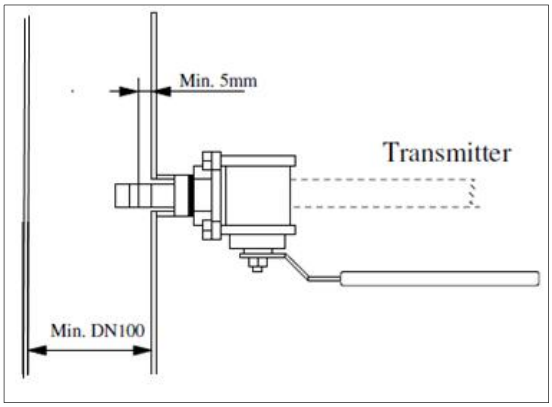
- The sensor must only be removed when the process pipe has been drained.
- Clean the measuring gap with a brush or clean cloth. Do not use a wire brush!
- Flush the sensor thoroughly.

3.6.3 Mounting OC IL 20/38 HP

The OC IL 20/38 HP is made of acid proof stainless steel. The sensor must always be mounted with the cable connector pointing downwards.

The temperature of the OC IL 20/38 HP sensor must not exceed 100°C (212°F).

The sensor shall be mounted with its measure gap inside the line (at least 5 mm) and in line with the process flow.



The OC IL 20/38 HP sensor is installed through a 50 mm isolation valve, through a SS housing and installation stud. Installation includes also winch. Please see Fig. 11.

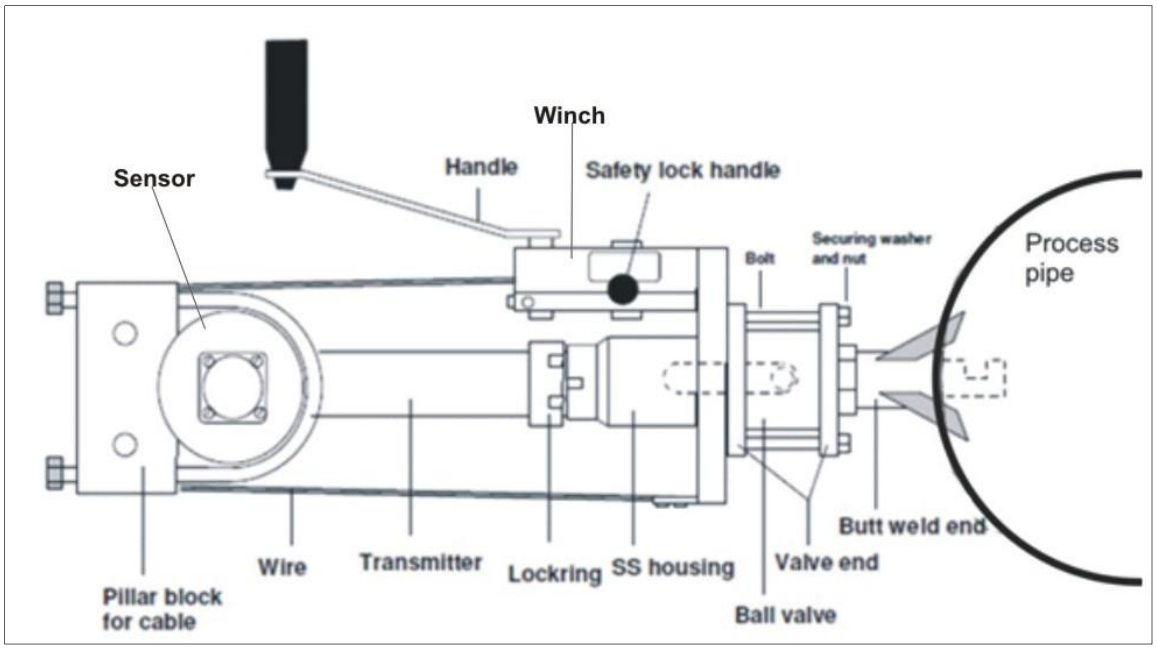


Fig. 11. OC IL 20/38 HP sensor installation.

The winch allows the sensor removal and installation to the process without emptying the process line.

OC IL 20/38 HP transmitter is stuck in the SS housing and cannot be removed from it. This connection unit has two functions:

– To lock the tension ring that keeps the transmitter in position.
– To prevent the transmitter to come off the valve.

The sensor shall be mounted with its measure gap in line with the process flow. The winch position directes sensor to the correct position. Make sure the winch is mounted in the right direction to get the measuring gap of the sensor along the direction of the flow.

The sensor housing is parallel to the gap (Fig. 11), before tightening the sensor, the sensor housing shall be oriented parallel to the flow. In some applications the measurement is improved by facing the gap a few degrees towards the flow. With the locking ring the angle can be adjusted +- 25 degrees.

Please note, that if the winch is turned, the measuring gap will be in the wrong position, giving an incorrect measuring result. Make sure to mark on which side of the sensor the gap is located to avoid facing it away from the flow.

Mounting stud, isolation valve and winch

Make a hole (61 mm, 2.4") in the process pipe and install the butt weld end. For extra strength for welding, a piece of 3 mm (1/8") sheet metal can be used according to the figure below.

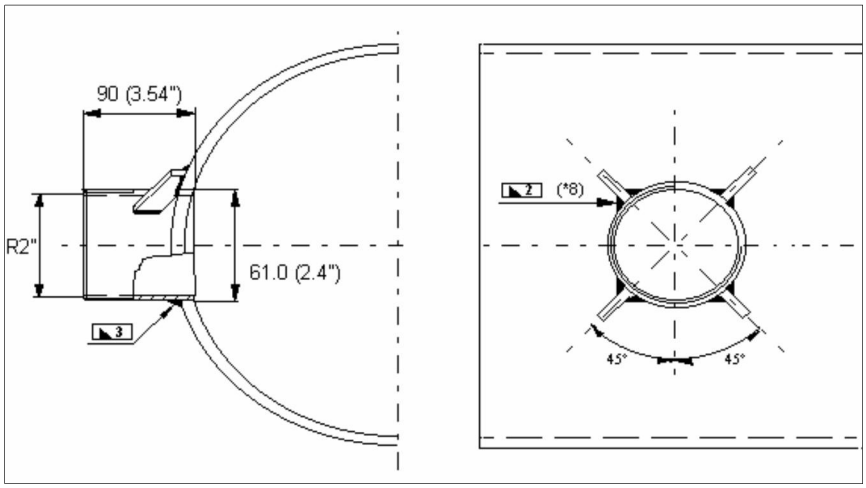


Fig. 12. Mounting the butt weld end.

The isolation ball valve with the winch is mounted onto the threaded butt weld end. Use a lot of flaxen hair and joint paste. Be aware not to pull the valve end to the bottom.
The winch must be mounted in the correct direction.

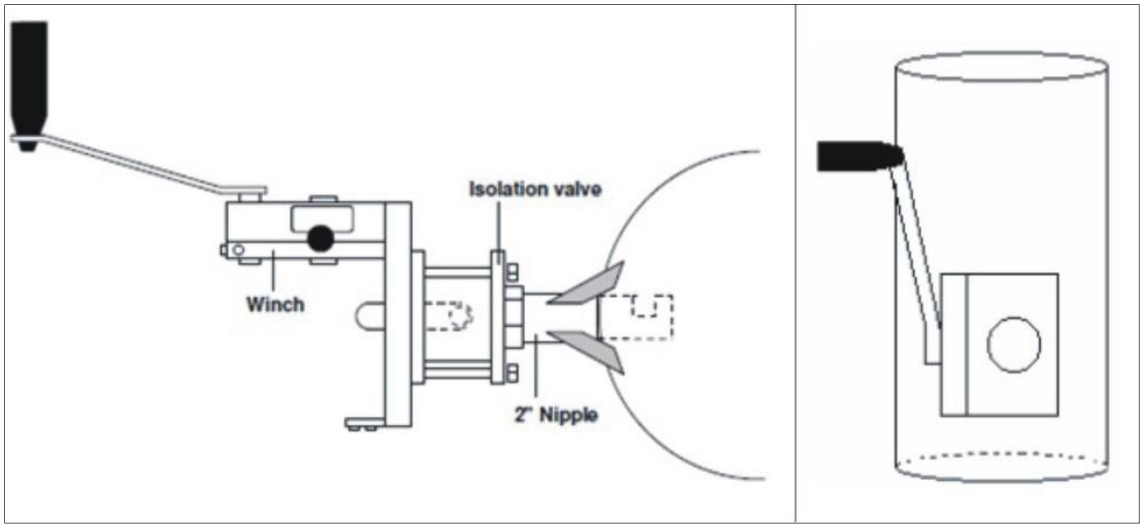


Fig. 13. Mounting of isolation ball valve with winch.

Make sure there is space to turn the handle of the ball valve to open and close. Check that the locking washers are in place and the nuts tightened before the process pressure is applied.

When the unit cannot be mounted in one piece, it can be mounted in following steps.

1. Mount the valve end into the butt weld end (use plenty of sealant), make sure the handles of the valve and winch will point to the right direction.
2. Mount the valve, valve end and winch with the bolts.
3. Fasten the bolts using locking washer and nut.

Mounting the sensor

The sensor shall be mounted with its measure gap in line with the process flow. The sensor house is parallel to the gap, before tightening the sensor, the sensor house shall be oriented parallel to the flow. Make sure to mark on which side of the sensor the gap is located to avoid facing it away from the flow.

The OC IL HP is installed through SS housing. The transmitter is stuck in the housing and cannot be removed from it. This connection unit has two functions:

– To lock the tension ring that keeps the transmitter in position.
– To prevent the transmitter to come off the valve.

Always check the winch wire and all connections before the trans-mitter is mounted or dismounted. Always use the attached spanner wrenches (2 pcs**)** when mounting/ demounting. If not used, it might be a risk that the isolation valve in the nipple turns around.

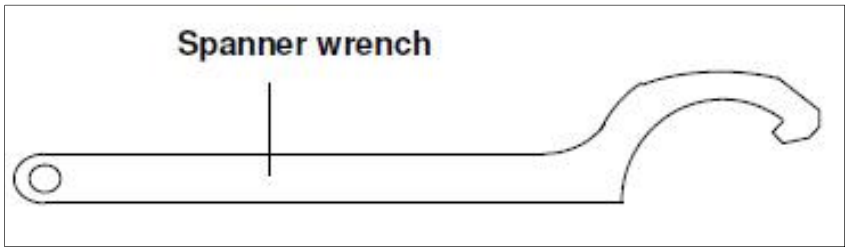


Fig. 14. Spanner wrench.

The sensor can, without leakage be mounted/dismounted during operation. Maximum pressure is 16 bars.

After loosening the tension ring with the spanner wrenches open the ball valve and crank the transmitter to its measuring position. It is 460 mm between the sensor tip and nut hold. See Fig. 15.

The transmitter is moved in the direction indicated with the label located under the crank. The measuring gap must be at least 5 mm inside the pipe wall. In the measuring position the sensor is fixed with the locking ring.

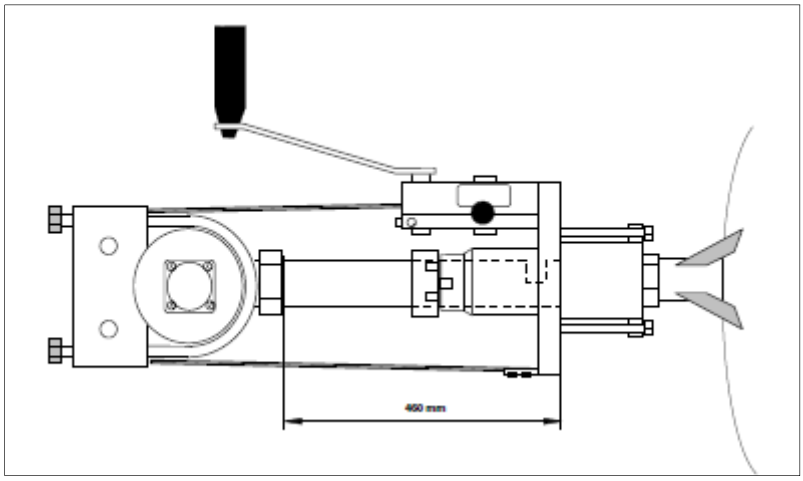


Fig. 15. Transmitter measuring position.

WARNING: If you mount the sensor during operation at full pressure, you must use the winch. Always check the wire and the other mechanical parts before mounting/ removal. When visually damaged, it should be replaced.

This instruction must be fulfilled in all parts to avoid accidents or personal damage. If the instructions cannot be fulfilled in all parts, the transmitter should not be mounted or dismounted under process pressure.

KPM cannot be responsible for accidents caused by not using this winch or that the instructions have not been followed.

WARNING: Be careful mounting the sensor in the straight position. If the transmitter is not cranked straight, damages on the sensor or valve can follow.
WARNING: If the sensor is hard to mount and you suspect something is stuck or that the sensor is not mounted straight, crank it out and check that everything is OK.

To release the crank, the locking pin must be released. When this is done the crank must be held in a steady grip because the process pressure can push the sensor outwards. The locking pin can release big forces. Do never loose the pin without holding the crank handle steady.

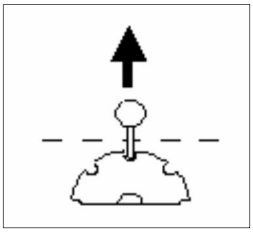


Fig. 16. Loking pin.

3.6.4 Removing the OC IL 20/38 HP

Removal of the OC IL 20/38HP must be done in the following steps:

- Loose the locking ring with the spanner wrenches.
- Grab the crank handle and lift up the locking pin.
- Check the direction of force from the line pressure.
- Crank out the sensor to the mechanical stop.
- Close the ball valve and open the smaller valve to reduce the pressure.
- The pillar block and the transmitter can now be removed.
- Removing the sensor must only be done with the winch.
- These instructions must be fulfilled in all parts to avoid the possibility of accidents and personal damage.
- In spite that the OC IL HP has an end stop to prevent the sensor to come out of the pipe, the force from the process pressure can lead to severe damage if the sensor is let free.
- KPM can not be held responsible for accidents caused by not using the winch or by not following the instructions.

4 Wiring

4.1 OC wiring

The terminals for the electrical cables are located under the bottom cover of the display unit. The layout of the connection board is shown in the following figure.

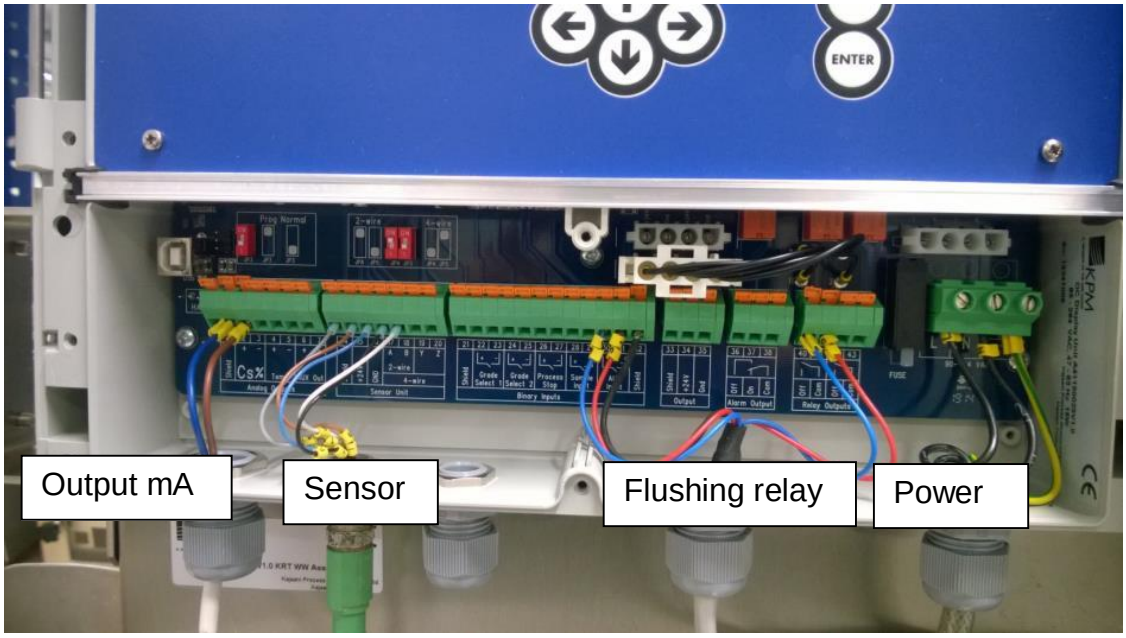


Fig. 17. Display unit wiring.

4.2 Electric connections

Display unit is connected to sensor unit with 10 meter interconnect cable. Cable will be connected with quick connectors to the sensor end of the display unit. Locate the display unit in place for easy access.

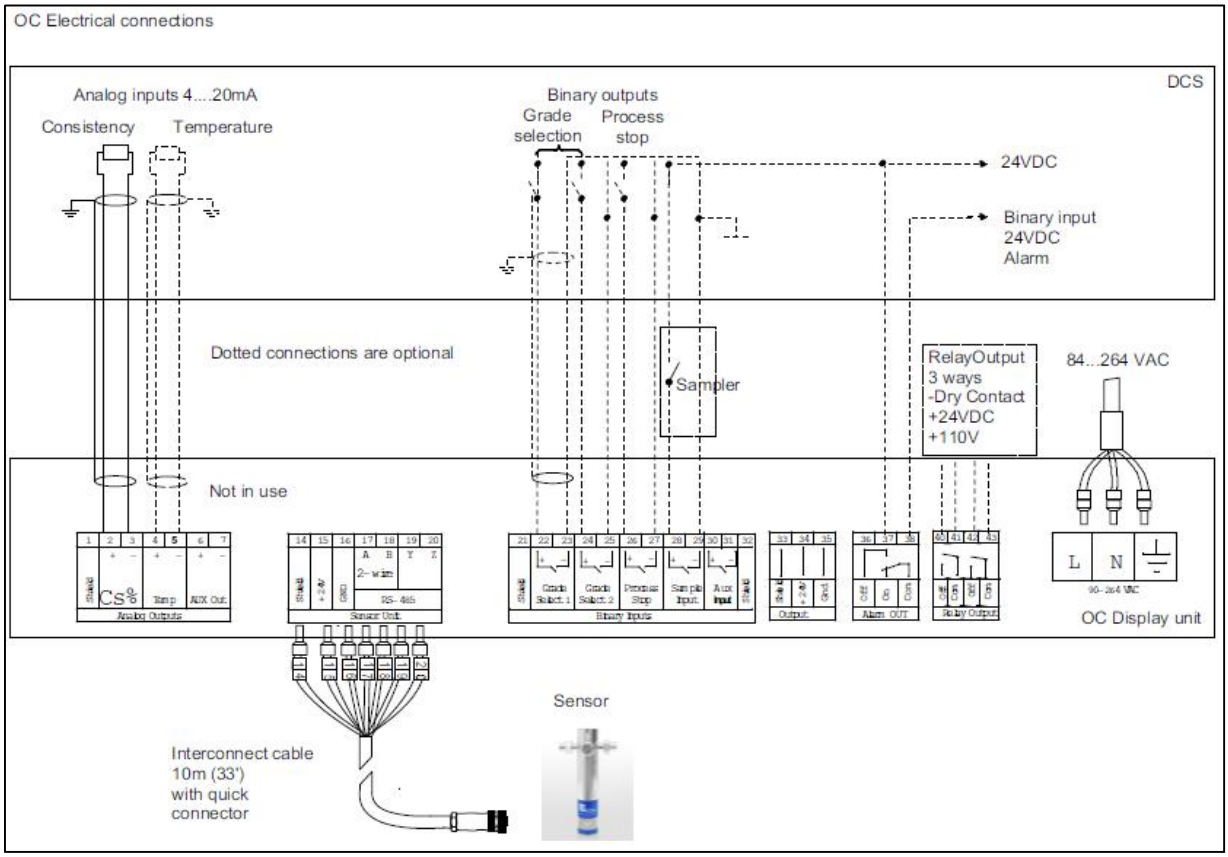


Fig. 18. OC Display unit terminal strip.

Connect power (86 – 264 VAC, 47 – 63 Hz) to terminal strip on the right side in the display unit.

Sensor cable (Interconnect cable) connection to terminals 14 - 20.

Current output terminals 2 and 3 are for Consistency. Terminals 4 and 5 are reserved for Temperature. Current outputs are active and isolated.

Binary inputs are closing contacts only. No power needed.

Alarm relay is used for informing faulty.

Cleaning cycle control in terminals 40 - 41. Relay is controlling the flushing valve to purge the sensor measurement cap with water. The cleaning cycle can be activated and configured in Maintenance menu.

Pump control in terminals 42 – 43. Normally the pump is stopped during the cleaning sequence. The pump should be stopped also during process stop.

5 Display unit operation and configuration

5.1 Display and operating keyboard

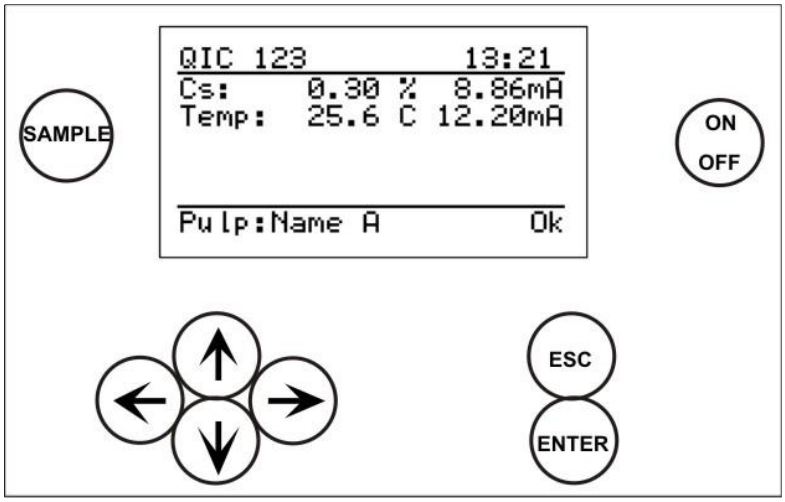


Fig. 19. Display and keyboard.

Main display

The display contains 7 lines, 21 characters in a line. The main display (Fig. 19) shows:

- Tag number and time.
- Consistency signal level as percentage and output in milliamps.
- Temperature as degrees (C / F) and output in milliamps.
- Recipe and status.

Common properties in other menus

- Selected line is highlighted
- Upper right corner shows:
  - Number of lines/pages in that menu.
  - Arrow indicates hidden lines.
- Help menus in the bottom.

Keyboard

- **ON/OFF button:** Switch the mains on/off.
- **Arrows**: Scroll the menus and rows or adjust values.
- **Esc**: Delete changes and/or return back to the previous menu.
- **Enter**: Accept data and input changes.
- **Sample**: Averages the measured values. After sampling the program asks if the values will be stored (ENTER) or discarded (ESC). In case no key is pressed, the sensor stores automatically sample values after 3 minutes.

5.2 Start-up

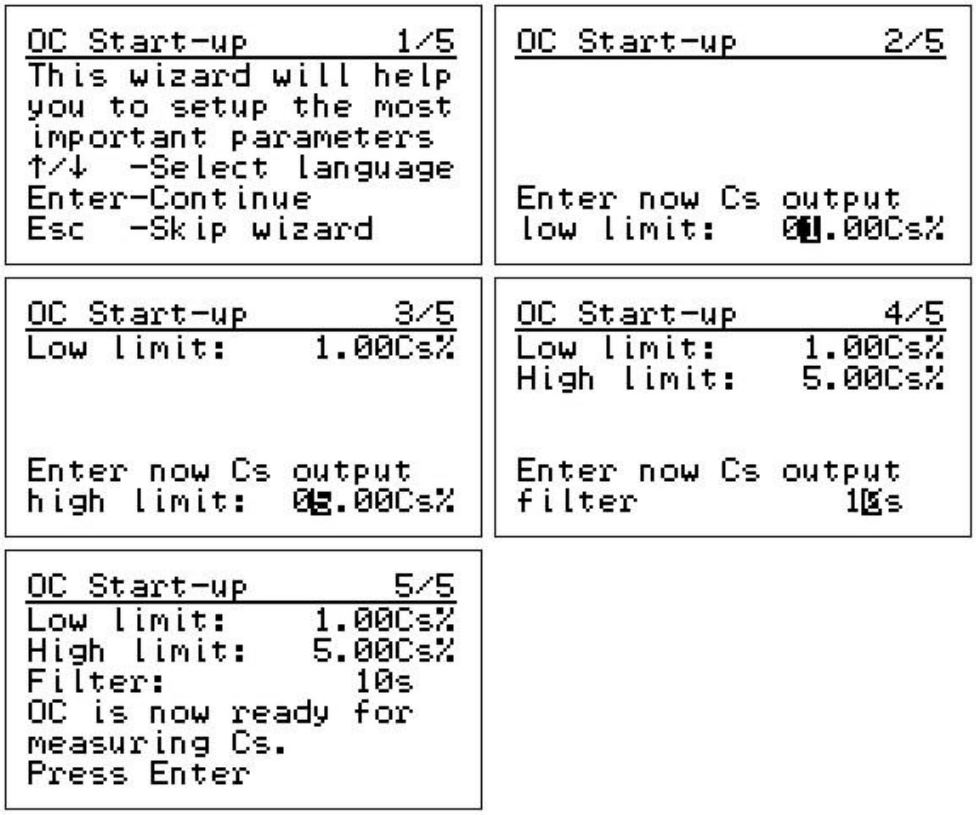
5.2.1 Sensor installation

1. Make sure that the sensor is installed correctly and pressure and flow rate requirements are filled. Pressure should be over 1.5 bar to avoid free air in pulp.
2. Connect the sensor cable, turn the power ON.

5.2.2 Set-up

OC is delivered with factory calibration, which means that the device will measure consistency as soon as you switch the power on.

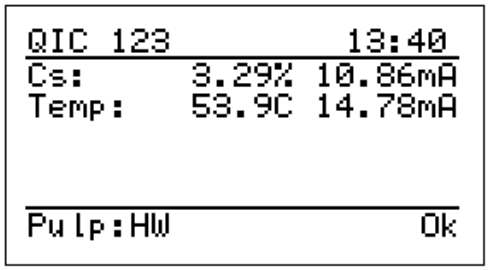
When power is switched on first time, OC goes to start-up wizard. The wizard guides through the mandatory settings. After the wizard has completed, OC is ready to measure and report the consistency to the DCS.



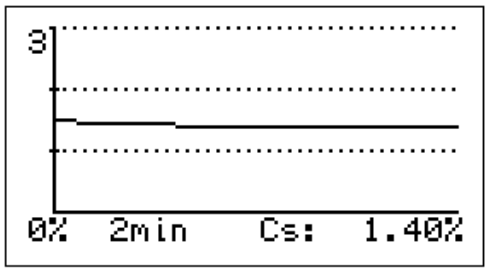
Check the measurement reading by comparing it with a laboratory sample. Take one laboratory sample and press SAMPLE to store OC readings. In case reading differs, please make 1 point calibration.

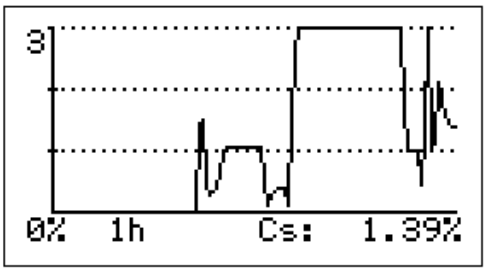
If the Wizard is not used, the configuration of the Analog output can be done in Parameters menu.

5.3 Main display



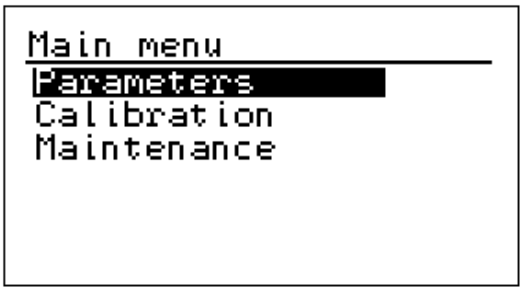
Arrow right or left brings Trend data display of Consistency. There are three time levels (2 min, 1 hour and 24 hour).





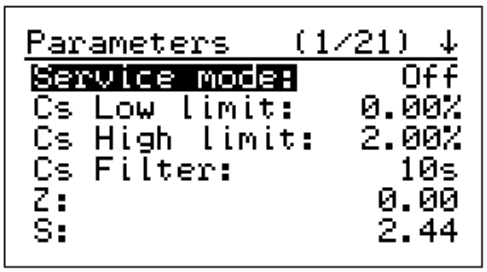
Arrow down key in Trend data display brings to Temperature trend display.

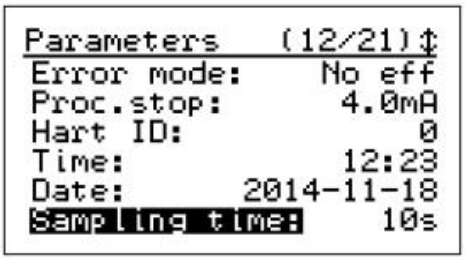
5.4 Main menu



5.5 Parameters

In Parameters menu all existing parameters can be reviewed and edited.





Service mode: Service mode ON allows You operate display unit without pump running. You can also simulate relays and analog outputs. Measurement works when service mode is OFF.

Cs Low limit: Consistency low limit value, default 0.00 %. Corresponding to the 4 mA value of the analog output 1 signal.

Cs High limit: Consistency high limit value, default 2,00 %. Corresponding to the 20 mA value of the analog output 1 signal.

Cs Filter: Output signal filtering time, 1 – 99 seconds, default 10 s.

Z / S: Calibration parameters, Z = zero and S = slope. Default Z=0 and S=1.0.

Error mode: Effect on display when self-diagnostics detects an error: No eff, Freeze, 22.0mA, 3,5mA.

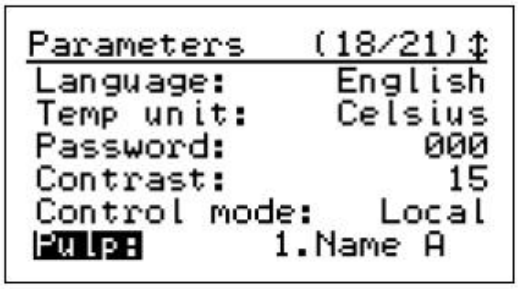
Proc.Stop: Analog output level, when Process stop binary input is activated:

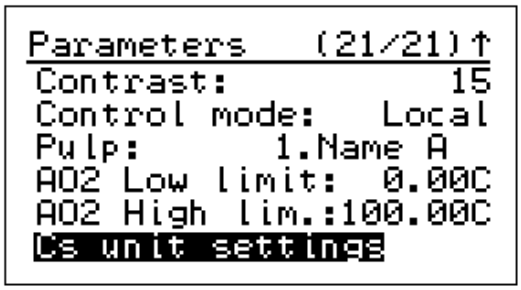
No eff, Freeze, 20.0 mA, 4.0 mA. This is normally used to force measurement to 4 mA, when pipeline is empty or when pump is not running. Binary input is a contact information only. Process stop information is also used to control the sample pump in case it is used to supply sample to sensor.

Hart id: Hart id address.

Time / Date: For sampling identification and error log.

Sampling time: Averaging time after the SAMPLE button is pressed.





Language: For local setting (English and Finnish available).

Temp. unit: Temperature setting (Celcius and Fahrenheit available).

Password: For operating OC display. 000 = no password. (633, works always.)

Contrast: Display intensity, default 15.

Control mode: Local = grade is set manually. Remote = grade changed by binary inputs, (terminals 20 … 23).

Grade selection based on binary inputs:

Grade	Grade select 1 (20,21)	Grade select 2 (22,23)
Grade 1 (Name A)	0	0
Grade 2 (Name B)	1	0
Grade 3 (Name C)	0	1
Grade 4 (Name D)	1	1

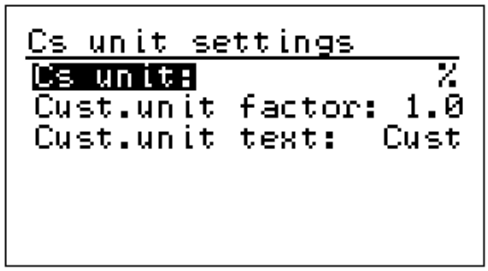
Pulp: Pulp grade can be changed, when Control mode is Local.

– Up and down arrows: Scrolling grades (4). Grade name can be edited. Normally only one grade is needed.

AO2 Low/High limit: Temperature low/high values for Analog Output 2 scaling. Filter time is same as Analog Output 1.

Cs unit settings: Opens settings display (see below).

Consistency unit can be changed to e.g. percentage or grams per liter.



Cs unit: Unit to be used in measurements: %, Cust, Brix, kg/t, g/l

Cust. unit factor: If Cust selected for “Cs unit”, setting of factor. 0.1, 1.0, 10

Cust. unit text: If “Cust” selected for “Cs unit”, editing the text.

5.6 Calibration

The OC is delivered with factory calibration, which means that it will measure consistency as soon as you switch the power on. Factory calibration is performed on the device in connection with final testing using clean water and reference sample.

Default value for slope is S = 1.0 and for offset Z = 0.0.

We recommend that you check the calibration or calibrate the device again when setting it up. This allows the device settings to be optimized for the conditions in which it will be used.

OC measures raw Cs (N). Consistency is calculated as follows (S = slope and Z = zero):

$$Cs = S * N + Z$$

5.6.1 Single point calibration

Use the single point calibration when it is difficult to change the process consistency. The Single point calibration calculates a new calibration line through a collected sample point and factory calibrated water point.

The single point calibration can be done in 2 different ways:

1. Perform calibration by taking a consistency sample and pressing SAMPLE button to store measured values.
   Enter the Laboratory value in CALIBRATION -> LAB VALUES.
   After this perform CALIB. CALCULATION and save calculation results (new S and Z values) with ENTER.
2. Or calculate a new S (Slope) value manually:
   New S = Old S * (Lab-value / OC consistency)
   E.g. OC consistency = 3,20 % and laboratory result is 3.33 %. Old S = 1.00.
   New S= 1.00 * (3.33 / 3.20) = 1.04
   Enter a new S-value in the Calibration menu.

5.6.2 Multi point calibration

Use that in applications where consistency may vary in wide range, and where consistency is possible to change to during the calibration.

NOTE: At least 25% difference between consistency minimum and maximum values is needed to calculate Slope = S reliably.

$$\frac{(Csmax - Csmin)}{Csmax} x100 > 25\%$$

Otherwise it is needed to use water point as one calibration point.

Calibration by using OC display

Take multiple samples from all required measurement ranges by pressing the SAMPLE button, the sensor stores measured values in memory. Laboratory values should be entered respectively in OC memory. When 2 or more samples are stored, calculation can be performed in CALIB. CALCULATION. It is possible to select, if water point is used or not in calibration calculation. Use the right arrow key (→) to see graph.

Calibration by using Excel™ program available from KPM

Write down N-value or Cs-value and analyzed laboratory consistency and type those to prepared Excel™ program available from KPM to calculate new S and Z.

5.6.3 Unlinear calibration

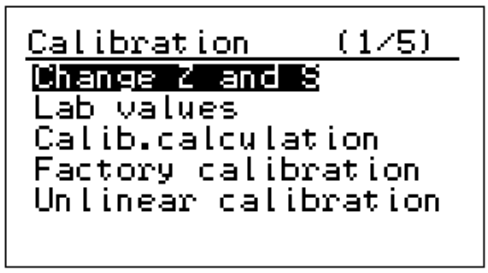
It is possible to make unlinear points with 5 sampling points. Use that if consistency range is very wide or measured material does not give linear response. Unlinear calibration is based on raw measurement Ms-value and laboratory sample.

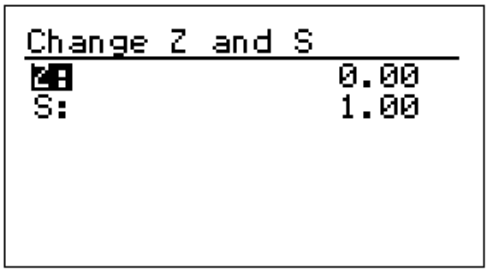
Take multiple samples from all required measurement range. Write down Ms-value from MAINTENANCE- ON-LINE SIGNALS (Note, not N as in linear calibration) and analyzed laboratory consistency and type those to Unlinear calibration. Use the right arrow key (→) to see graph.

5.7 Calibration menu

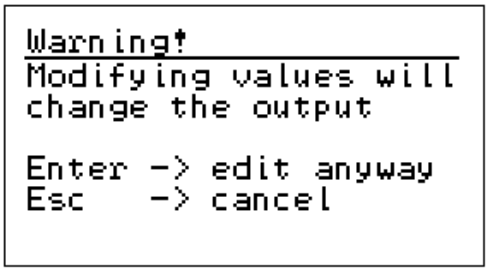
5.7.1 Change Z and S

1 point calibration can also be done by changing S (Slope) -value.





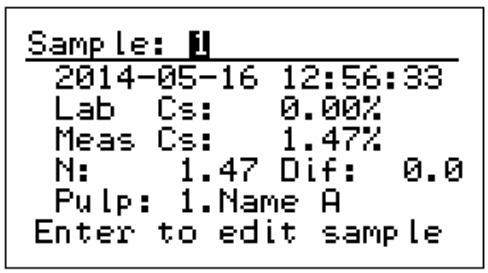
Warning will appear, if active existing calibration value is changed. Active means the grade, which is selected to measurement and for Analog Output.

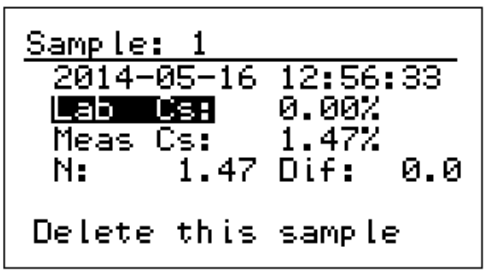


5.7.2 Lab values

Laboratory values can be entered after sample has been stored in the device memory. When the SAMPLE button has been pressed the raw measurements are stored. This can be done by pressing ENTER button right after sample taking or the device stores values automatically after 5 minutes if no button is pressed.

Entering laboratory values first choose a sample based on date and time. Last sample is always set as number 1 and there are 20 latest samples stored in the memory. When a new sample is stored, it deletes the oldest sample if the memory is full.



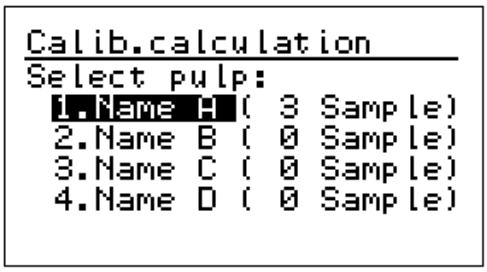


Pressing arrow key right displays Ms-value (Raw measurement) and Temperature.

5.7.3 Calibration calculation

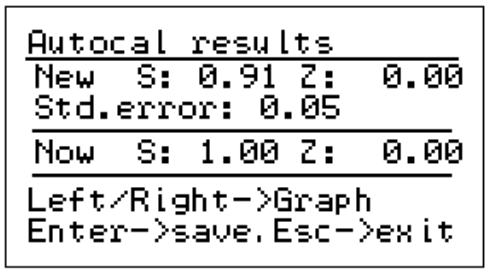
Calibration calculation is grade dependent. Grade can be changed manually as shown in chapter 5.5 Parameters in line Pulp when Control mode is local.

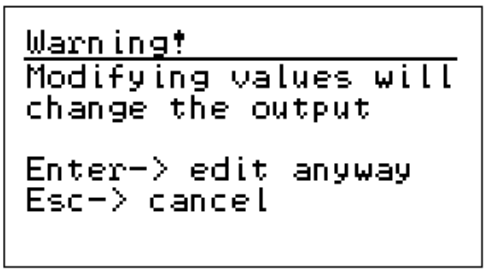
Calibration calculation can be done as soon as 1 sample has been taken and laboratory value entered. Choose the grade with arrow right and a display opens asking for including the zero point for calibration. Normally, accept with YES.



Calibration calculation displays New Slope value and standard error of estimate. Below are the existing calibration values in the line identified row:

Now: Calibration calculation displays S (New Slope) & Z (standard error) of estimate.



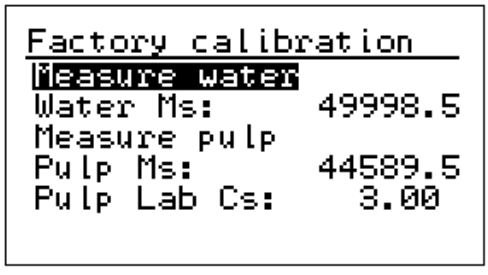


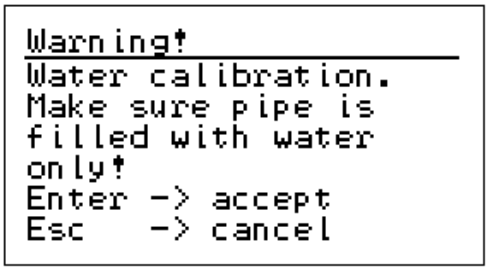
Warning will appear when active existing calibration is changed. Active grade meaning the grade selected to Analog Output.

5.7.4 Fact calibration

Factory calibration is done during the final testing using clear water and reference plate as pulp. There is no need to change the factory calibration.

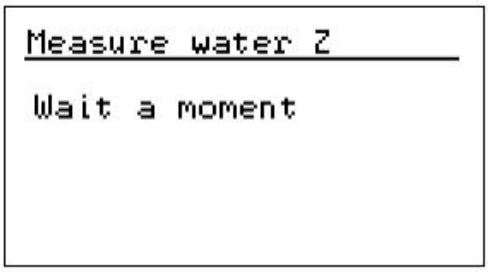
These settings will effect on the basic calibration of the sensor and may be harmfully to change.

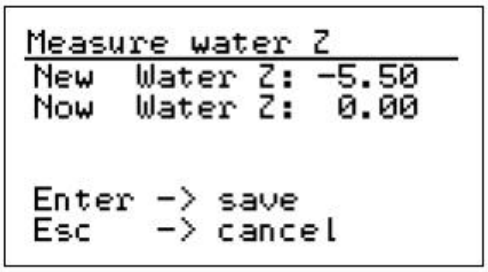




NOTE: Factory calibration is normally done during manufacturing.

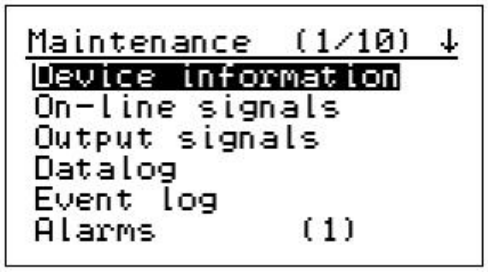
Water Calibration can be done in special cases when assumed that e.g. windows are getting dirty. When doing water calibration it is important that pipeline is filled with clean water and there are no air bubbles in water.

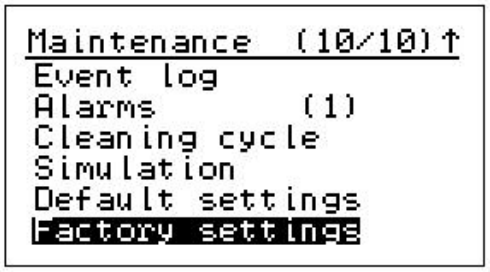




Pulp calibration would be done manually by entering measured Ms-value and actual pulp consistency.

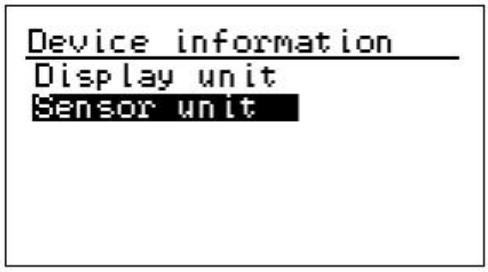
5.8 Maintenance

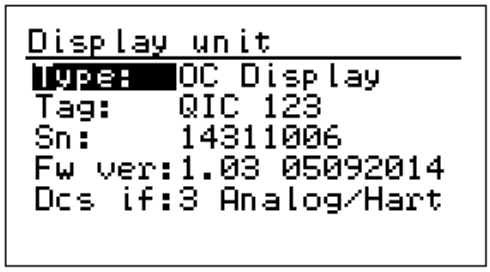


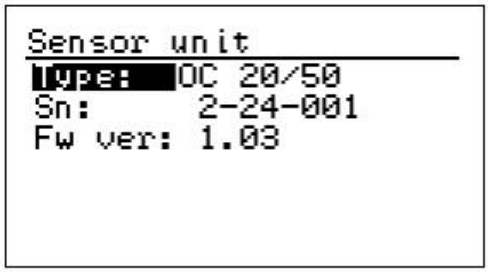


5.8.1 Device info

From Device information menu you get to Display and Sensor unit displays showing e.g. unit type, software version and serial number.

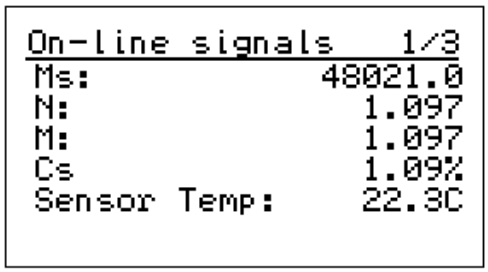


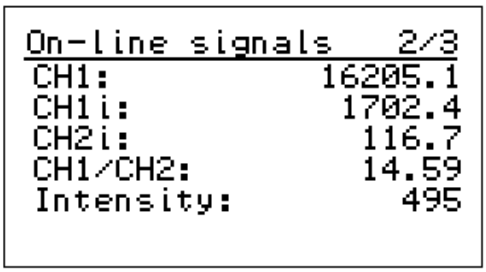


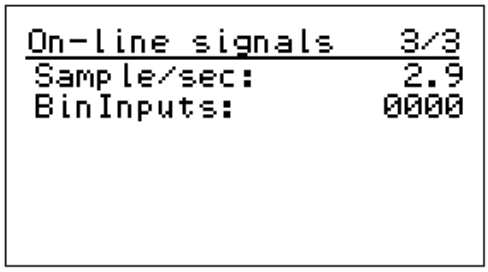


5.8.2 On-line signals

On-line signals display show measured signal levels, which may be needed for troubleshooting purposes.







MS: Raw measurement value of the sensor.

N: Linearized Consistency measurement before water calibration.

M: Consistency measurement after compensations.

Cs: Consistency measurement after customer calibrations (Cs = S * M + Z).

Sensor Temp: Sensor temperature (electronics)

CH1: Channel 1 measurement.

CH1i/2i: Standarizied channel measurement.

CH1/CH2: Ratio between channels.

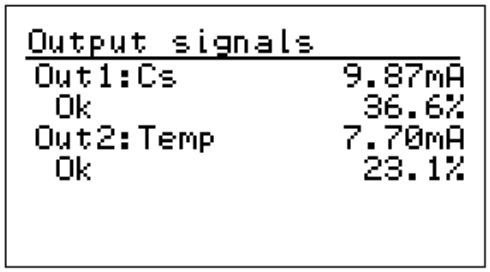
Intensity: Control of the light intensity.

Sample/sec: Measured samples in one second.

Bin. Inputs: Status of the binary inputs.

5.8.3 Output signals

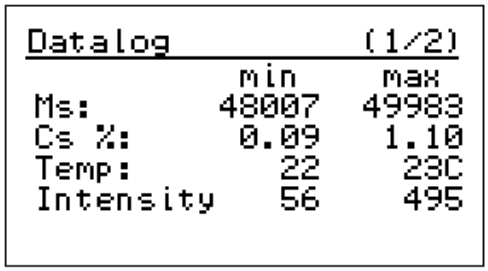
The display shows existing Analog outputs in milliamps and percentage.

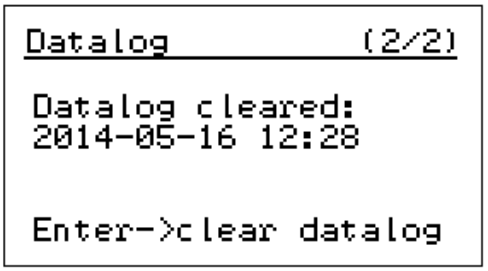


5.8.4 Data log

Datalog collects minimum and maximum values since clearance time.

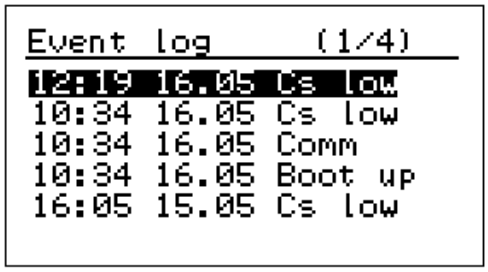
NOTE: Remember to clear these counters during the start-up.

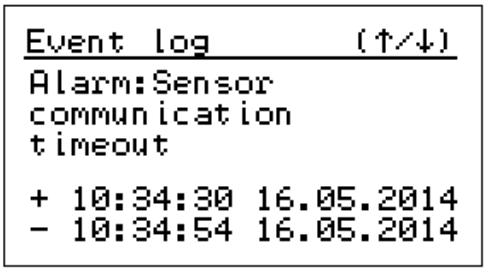




5.8.5 Event log

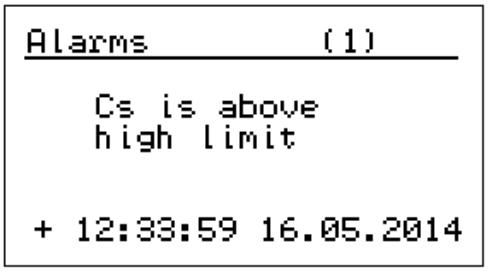
Event log collects all configuration changes, errors, boot-ups etc. 250 last events stay in memory. By selecting an event and pressing ENTER you will find more info about that event. Plus (+) indicates time when event has occurred and minus (-) when it has been removed.



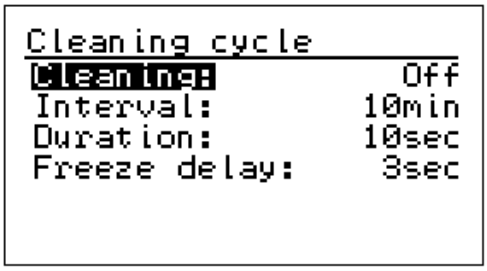


5.8.6 Alarm

Alarm display shows active alarms at the moment. If there are no active alarms in sensor, the display will not open. If more than one alarm is active at the same time, then the number of alarms is shown in brackets in the caption line. Scroll alarms with arrow key down.



5.8.7 Cleaning cycle



In case automatic cleaning equipemts has been installed the relay control can be activated with this.

In case there is no cleaning, please choose OFF.

Cleaning: Setting of cleaning: On/Off.

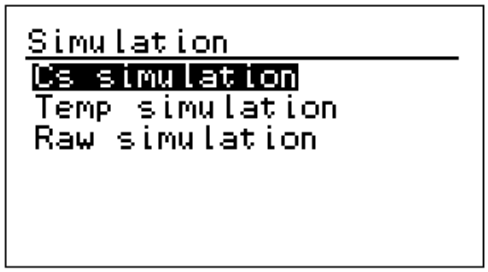
Interval: Time from a start of cleaning to the next start of cleaning, minutes.

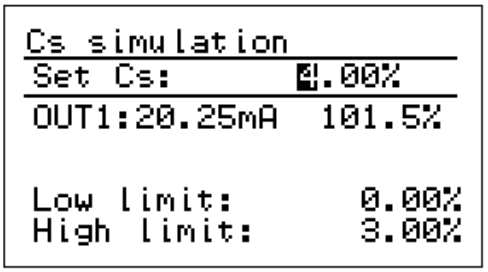
Duration: Cleaning time, seconds.

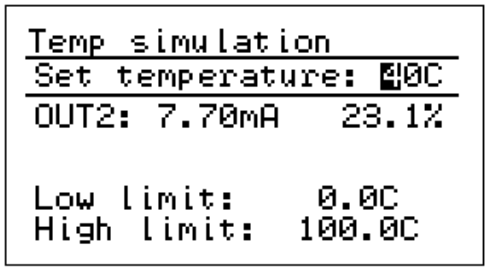
Freeze delay: Freezes analog output druing cleaning time plus delay time after cleaning period has stopped. This time is reserved for new fresh pulp to enter to sensor before measurement.

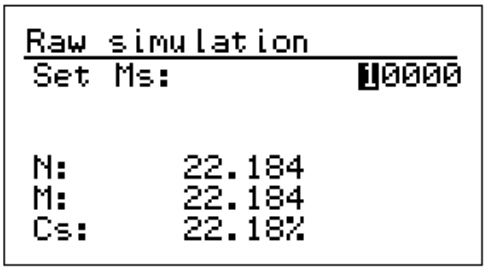
5.8.8 Simulation

Cs and Temp simulation simulate Analog output signal for Consistency and Temperature. Raw simulation simulates calculation.



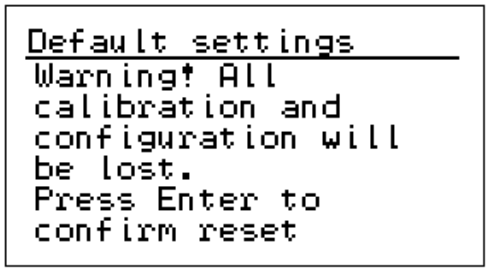






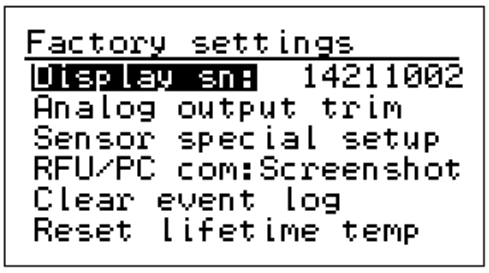
5.8.9 Default settings

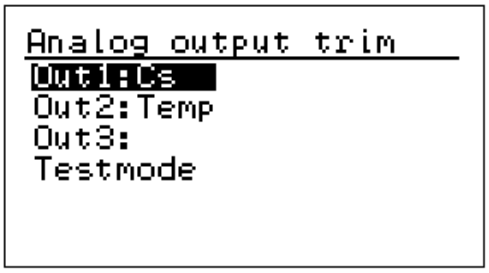
Default settings will reset the parameters to default settings of the unit. This is normally done during start-up only.

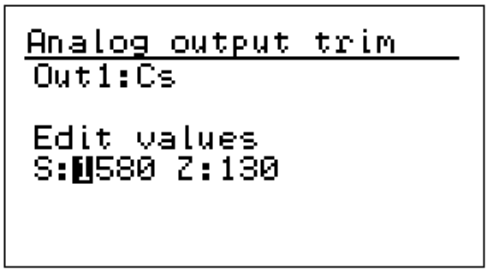


5.8.10 Factory settings

The basic configuration of the unit is set in Factory settings. The customer does not need to enter this menu.







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6 Specifications

SENSOR TYPE	Optical Consistency Transmitter
OUTPUT SIGNAL	Analog Outputs 4 - 20 mA
BINARY INPUTS	24 VDC, Process Stop, Grade Change (2) and Sampler Input
BINARY OUTPUT	2 x Closing or opening contact max. 250 VAC, 2A; 220VDC, 2 A For Alarm and flushing control

MEASUREMENT RANGE & PROCESS TEMPERATURE& MINIMUM FLOW VELOCITY& PRESSURE CLASS PROCESS CONNECTION

OC 20/25	OC 20/25-K	OC 20/25-LC	OC 20/50	OC P3/25	OC IL 20/70	OC IL 20/70-SE	OC IL 20/38-HP
0 – 2%	0-5%	0 – 0,02%	0 – 5%	0 – 1,5 %	0 – 5%	0 – 5%	0 – 5%
90 °C	90 °C	50 °C	90 °C	60 °C	90 °C	90 °C	100 °C
20 l / min	20 l / min	20 l / min	60 l / min	10 l / min	Cs<1% 1m/s Cs>1% 1.5m/s	Cs<1% 1m/s Cs>1% 1.5m/s	Cs<1% 1m/s Cs>1% 1.5m/s
PN25	PN25	PN25	PN25	PN25	PN16	PN16	PN16
By-pass line 25mm	By-pass line 25mm	By-pass line 25mm	By-pass line 50mm	By-pass line 25mm	NS70 saddle	NS70 saddle	DN50 Ball valve and weld stud

APPLICATIONS	OC 20/xx models only clean pulps
MINIMUM CONSISTENCY	0.001 %, 10 ppm
PROCESS PRESSURE	Minimum 1 bar (15 psi);
AMBIENT TEMPERATURE	Sensor, 0 - 60°C (32 - 140°F); Display Unit = - 10 - 60°C (-14...140°F)
CABLING	10 m interconnect cable from Sensor to Display Unit
WETTED MATERIALS	AISI316

WEIGHT

Display Unit	OC 20/25	OC 20/25-K	OC 20/25-LC	OC 20/50	OC P3/25	OC IL 20/70	OC IL20/70-SE	OC IL20/38-HP
2.3 kg 5,1 lbs	3.0 kg 6.6 lbs	3.0 kg 6.6 lbs	3.0 kg 6.6 lbs	3.7 kg 8.2 lbs	3.7 kg 8.2 lbs	3.7 kg 8.2 lbs	1.5 kg 3.3 lbs	7.0 kg 15.4 lbs

CONFORMANCE	73/23/EEC, 89/336/EEC, EN 61000-6-4:2001, EN 61000-6-2:2001, EN 61010-1:2001
ENCLOSURE CLASS	IP65, Nema 4X
POWER SUPPLY	86 to 264 VAC, 47 - 63Hz; 20V

Appendix 1. White and green liquor applications

The OC 20/25 K sensor is primarily used after white and green liquor filters where you are looking for an early warning of holes in the filter cloth. With an early detection, the damaged cloth can be quickly replaced, preventing excessive amounts of lime mud and dregs in the liquor to disturb later processes.

If used after a clarifier, the sensor reading gives an indication of the amount of lime mud or dregs in the clarifier or whether the clarifier is overloaded. This might also be caused by improper adjustment of the riser pipes.

Installation

The sensor is typically installed in a by-pass pipe with the inlet on the discharge of a pump and return on the suction side. The flow in the by-pass pipe should exceed 20 l/min (10 glm) to have the necessary turbulence. A pressure of 1 bar (15 psig) ensures air bubbles, if any, to be sufficiently compressed not to disturb the measurement. The by-pass pipe inlet should be after a straight pipe of at least 0.5 m after a pipe bend or a pump. The by-pass pipe should also be as short as possible and properly insulated to maintain a high temperature (85 – 95 ºC / x –y ºF) which reduces the risk of contaminants on the sensor cell windows. The sensor is installed between isolation valves for easy dismantling for inspection or cleaning. The valve prior to the sensor should always be fully open or closed. The flow velocity and pressure are adjusted with the valve downstream the sensor.

Cleaning

For automatic flushing of the sensor with hot water, two 3-way valves can be installed and controlled by the same signal. In some applications where a small amount of water into the liquor can be acceptable, one of the 3-way valves can be excluded. 1-2 times per month the sensor must be dismantled and manually cleaned using an acid solution (5 % hydrochloric acid or sulphamic acid) and a bottle brush. Experience shows that high temperature and high flow velocity prolongs the intervals for manual cleaning. At each process shut-down the sensor must be automatically flushed before going to stand-by.

Clean water reading

The OC Display can present the reading during flushing cycle. This information should be read regularly to follow the contamination of the sensor windows. This feature can help to reduce the maintenance and improve the overall performance.

Sampling

Correct manual samples are very important for calibrating and occasionally verifying the calibration. The manual sampler should be installed close to the by-pass inlet. The same rules for pipe bends and pumps, as for the senor, apply.