KPM KRA, KPM KRT

Retention Measurement

OPERATING INSTRUCTIONS

KPM KRA, KPM KRT

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Original instructions

SAFETY INFORMATION

All personnel must have the necessary knowledge and training for the work, to minimize risk of injury and damage. All adjustments, settings, calibration routines and service work must be done only by specially trained personnel. It is the responsibility of the supervisor to ensure that this is the case.

All covers must be in place during normal operation. Most of the instruments have moving parts that are operated pneumatically and / or electrically, and some incorporate sharp edges that are capable of causing serious injury. A large part of the service work needs to be done with the compressed air supply connected.

Always read the instructions carefully before operating the equipment. The following notations are used to emphasize important and critical instructions:

	NOTE This label is used for instructions that are important but not related to hazards.
	WARNING This label is used to indicate potential risk of severe injury or damage if warning is ignored.

	WARNING Make sure that the process pipe is empty and depressurized before installing any mounting parts!

	WARNING During installation, maintenance and service operations, remember that system may contain hot sample or water - be careful!

	WARNING Before any welding works in the vicinity of the devices, make sure that operating voltage is not connected!

	WARNING The device may contain moving parts. Be careful when testing the device! Do not push your fingers between any moving parts!

	WARNING Applicable electrical safety regulations must be closely followed in all installation work! All electric connections must be done by authorized persons!

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1. Warnings

NOTE

Always check input supply voltage & frequency before making any connections. Incorrect connections will damage the equipment! Applicable electrical safety regulations must be closely followed in all installation work!

NOTE

Please NOTE that the pump should never be run dry (=without sealing water). Running the pump dry will damage the mechanical seals.

Before operating the white water sensor with sample pump, please confirm that the pump has sealing water connected and flowing at flow rate of 1-2 liters/minute. The KPM KRA/T white water sensor is delivered with process stop connection enabled so that the pump will not be run dry by accident.

There are two different safety features, both have to be changed in order to get the pump to operate.

- Hardwiring: Process stop signal has been connected to display unit with an external jumper between terminals 26 (+) and 27 (-), see the figure 1. Please, connect process stop binary input from DCS system to replace this external jumper. Use paper machine fan pump running/not running information or similar to activate the process stop.
- Software: Sensor has been programmed to "Service mode" → "On" in "Parameters" and this must be changed to "Off". In service mode sensor parameters can be seen and changed, but pump cannot be run by accident.

Figure 1. Process stop jumper wiring of delivered white water sensor with pump.

2. Contact information

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3. Description

3.1 First-pass retention of paper and board machine

First-pass retention gives a practical indication of the efficiency by which fine materials are retained in a web of paper/board as it is being formed. First-pass retention values can be calculated from just two consistency measurements, the headbox consistency, and the white water consistency. There is a very wide diversity of first-pass retention on different paper/board machines, from less than 50% to almost 100%. The key rules that papermakers follow are that (a) first-pass retention should have a steady value, and (b) that value should be high enough to avoid operational problems or an excessively two-sided sheet. Some operational problems that can be caused by low values of first-pass retention are increased frequency of deposit problems, filling of wet-press felts, poor drainage, and unsteady drainage rates and sheet moistures.
[https://projects.ncsu.edu/project/hubbepaperchem/Defnitns/FrstPsRt.htm]

First-pass total retention (later refered as total retention) is calculated with following equation:

$$\text{Total Retention \%} = \frac{\text{Tot Cs}_{HB} - \text{Tot Cs}_{WW}}{\text{Tot Cs}_{HB}} * 100\ \%$$

where, Tot Cs_{HB} is headbox total consistency
Tot Cs_{WW} is white water total consistency

First-pass ash retention (later refered as ash retention) is calculated with following equation:

$$\text{Ash Retention \%} = \frac{\text{Ash Cs}_{HB} - \text{Ash Cs}_{WW}}{\text{Ash Cs}_{HB}} * 100\ \%$$

where, Ash Cs_{HB} is headbox ash consistency
Ash Cs_{WW} is white water ash consistency

3.2 Retention measurement system with two sensors

Two KPM KRA/T sensors can be used to create a retention monitoring and control system for paper or board machine. The difference between KPM KRA and KPM KRT is a different optical module, other components are identical. KPM KRT is applicable for total consistency measurement of paper and board machines with or without ash addition. Two sensors measure the total consistency of the headbox and white water sample. The measurement principle is based on the ability of fibers and particles to depolarize and transmit light.

The KPM KRA is applicable for total and ash consistency measurement of paper and board machines with ash addition. The measurement principle is based on the ability of fibers and particles to depolarize, transmit and scatter light.

The KPM KRA/T bypass sensor measures headbox or white water stock. Application specific modules for headbox and white water measurements are available to ensure trouble-free performance. Sample valve and plastic FEP sample line is used to bring the stock to sensor. Pressurized sample without air from headbox or dilution white water line is measured as such with headbox-type sensor. White water sample from tray goes first to deaeration module and then sample pump or hydrostatic pressure is utilized to get sufficient sample flow to sensor. Calculated total (and ash with KPM KRA) consistency signal(s) are connected to DCS, where retention can be calculated (figure 2).

The optical module of the sensor has a 3 mm gap between the lenses, which produces a self-cleaning effect due to the increased velocity. This is the case especially with headbox sample which includes pulp fibers. The white water-type sensor is equipped with automatic flushing module to keep the sensor and deaeration module clean without external maintenance. Warm flushing water must be used for better cleaning efficiency and to prevent condensation of optical module. Flushing of headbox sensor with water is also possible, backwards to process or forwards to laboratory funnel. Sensors can have four remotely selectable calibration curves for applications with varying furnishes. Normally only one calibration grade is needed when whole production range is covered in calibration modelling.

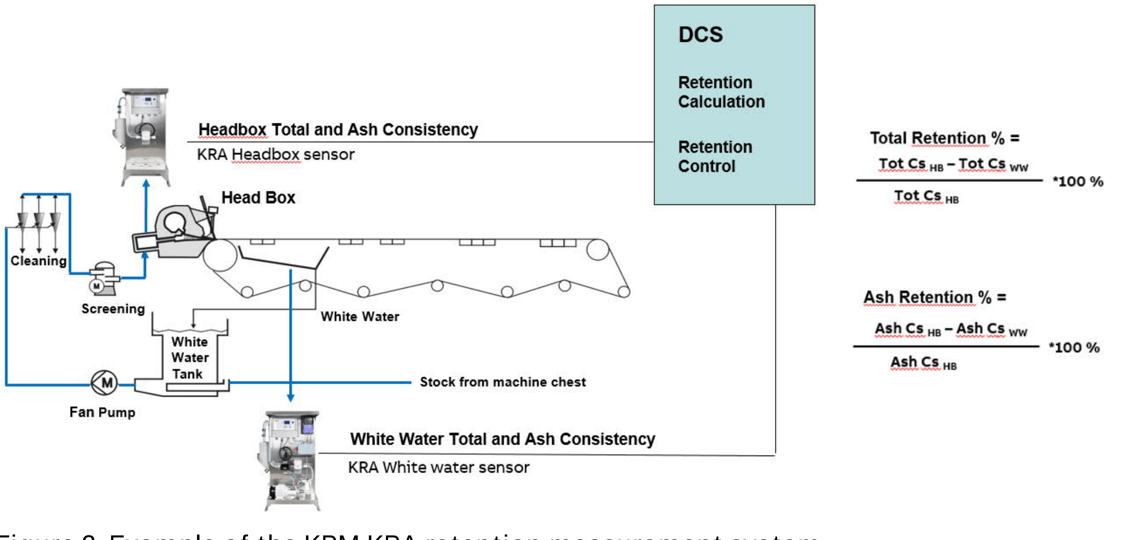


Figure 2. Example of the KPM KRA retention measurement system.

3.3 System components

The retention measurement system contains two different sensors with a stand and integrated display unit. Pressurized sample without air from headbox or dilution white water line is measured as such with headbox-type sensor (figure 3). White water-type (figure 4 with sample pump) sensor is used with sample taken from white water tray. Sample goes first to deaeration module and then sample pump or hydrostatic pressure is utilized to get sufficient sample flow to sensor. White water sensor can be used without sample pump if hydrostatic pressure of 5 - 6 meters (16-20 ft) is available.

Figure 3. KPM KRA/T headbox sensor.

Figure 4. KPM KRA/T white water sensor.

The retention measurement system contains two different sensors. Suitable type of sensor needed depends on process. There are two different sensor types:

HEADBOX SENSOR

- Optical module and display unit
- Laboratory sample funnel
- Flushing module (optional)

Connections:

- Sample valve & sample line
- Power, 1-phase
- Analog & binary signals
- Discharge; laboratory funnel
- Flushing water (warm, if flushing module used)
- Instrument air (if flushing module used)

WHITE WATER SENSOR

- Optical module and display unit
- Laboratory sample funnel
- Deaeration module
- Backflushing module
- Pump module with inverter (Optional)

Connections:

- Sample valve & sample line
- Power, 1-phase
- Analog & binary signals
- Instrument air
- Flushing water (warm)
- Pump sealing water (if pump used, same inlet with flushing water)
- Discharge; laboratory funnel & deaeration module

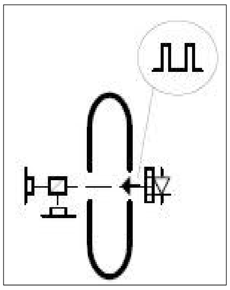
The sensor stand and wetted metallic parts are constructed of AISI316. The optical module measuring cell is stainless steel with sapphire windows making the sensors able to withstand the most aggressive media. The sensor pressure class is PN10. The display unit and sensor have protection class of IP65 (Nema 4X) and do not need protective housing to withstand difficult conditions at the paper/board machine wet end.

Optional accessory modules (figure 5)

- Sample valve and FEP sample line for headbox or white water sensor (A)
- Deaeration module for white water sensor (B)
- Flushing module for headbox or white water sensor (C)
- Sample pump and inverter for white water sensor (D)

Figure 5. Optional accessories for sensors

3.4 Measurement principle



KPM KRT sensor measures transmitted and depolarized light through the liquid. The measuring principle is based on the particles ability to absorb, transit and depolarize light. The light source is LED pulsing monochromatic NIR light. The detected measurement signal is calibrated to correlate with consistency or suspended solids. The measuring signal treatment is done by the display unit.

KPM KRA sensor measures transmitted, depolarized and scattered light through the liquid. The measuring principle is based on the particles ability to absorb, transit, depolarize and scatter light. The light source is LED pulsing monochromatic NIR light. The measuring signal treatment is done by the display unit. Multivariable regression analysis is used to correlate the signals with laboratory values.

4. Installation instructions

Locate the sensor in a place which is easy to access for operation and maintenance. Space requirements shown is chapter 4.2.1/headbox sensor and 4.3.1/white water sensor. Utility connections depends on included modules.

4.1 Delivery limits

Required system components depends on process type. The minimum manufacturer supplied components are:

- KC9-A or KC9-P sensor unit, 1 piece
- Display unit, 1 piece
- Interconnect cable, 1 piece
- Stand unit, 1 piece

Customer takes care of installation and utility connections. Required utility connections depends on process/system type, connections are listed in chapter 3.3 and described in following chapters.

4.2 KPM KRA/KRT headbox sensor

4.2.1 Main parts and installation space requirement

Locate the sensor so that it is easy to operate and maintain. Figure 6 shows the main parts of the sensor and sample flow direction.

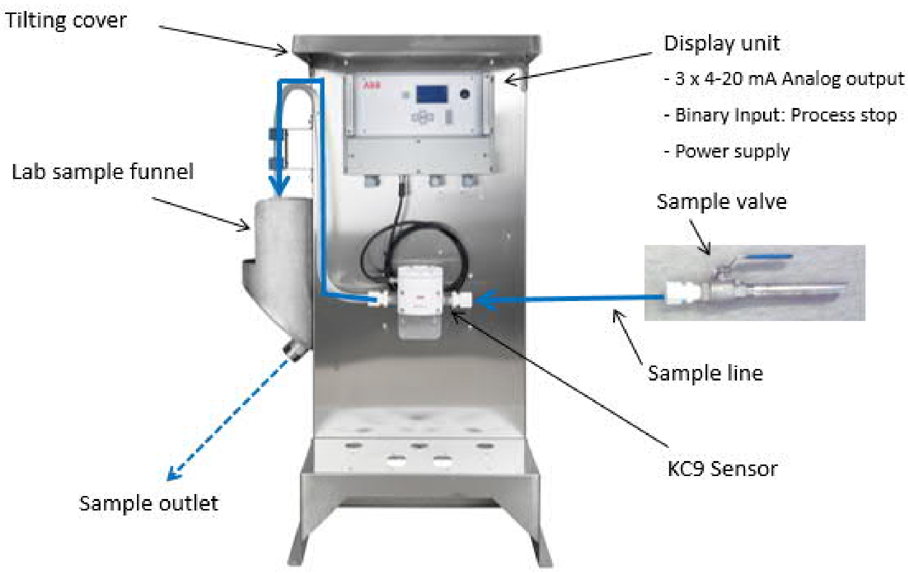


Figure 6. KPM KRA/T headbox sensor, main parts and sample flow.

Figure 7 shows the installation space required on the floor for the sensor and the location of holes for mounting bolts.

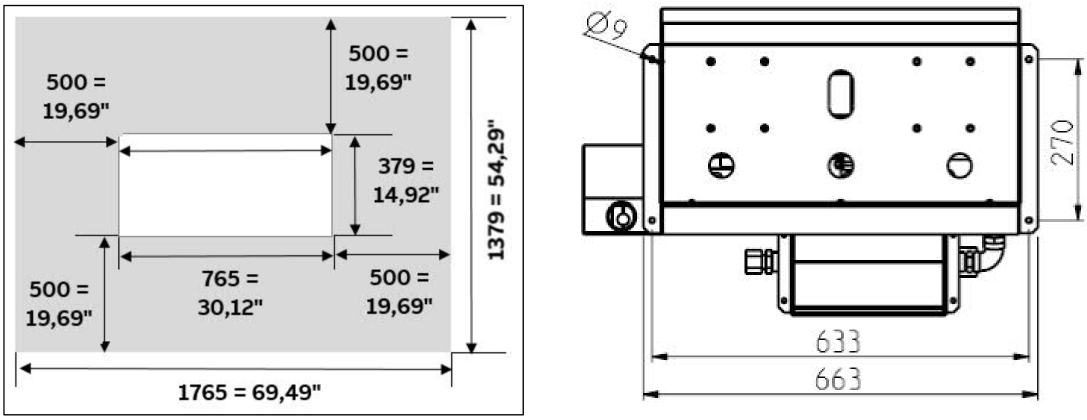


Figure 7. Space needed for headbox sensor on the left, sensor mounting bolt locations on the right.

4.2.2 Dimensions of headbox sensor

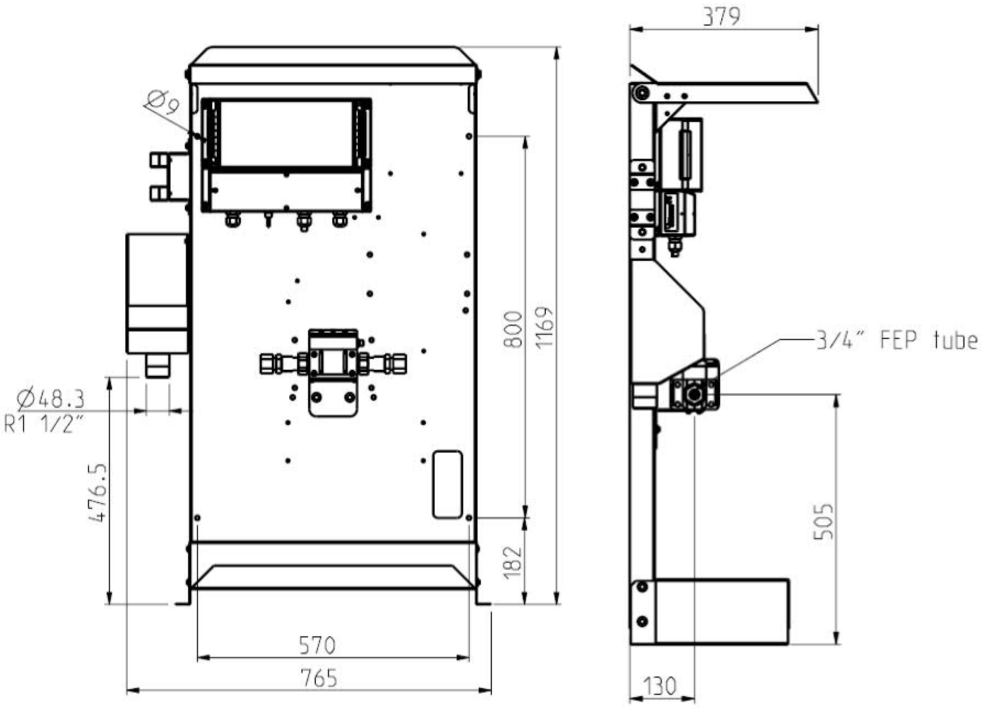


Figure 8. Dimensions of the headbox sensor.

4.2.3 Connections of headbox sensor and installation to process

- Installation of sample valve into process pipeline of headbox or dilution white water recirculation line before pressure control valve.
- Sample line piping preferred as short as possible and without tight curves.
- Sample line recommendation material FEP, can also be hard piping.
- Measured sample can be returned under paper machine or in WW silo or tray.
- Power for sensor (90 - 264 VAC, 50/60 $\pm$ 3 Hz).
- Analog output connection(s) to DCS.
- Binary output (alarm) and inputs (process stop, grade selection) connections to DCS.
- Headbox sensor discharge is R1 1/2" from laboratory sample funnel (figure 8)

Sample valve outlet has R1/2" thread and 3/4" polypropylene (PP) connector included. It is recommended to use fluorinated ethylene propylene (FEP) sample line. Sample valve and optical module includes connector for 3/4" FEP tube. Internal tubing of sensor is 3/4" FEP and tubing connectors are made of PP.

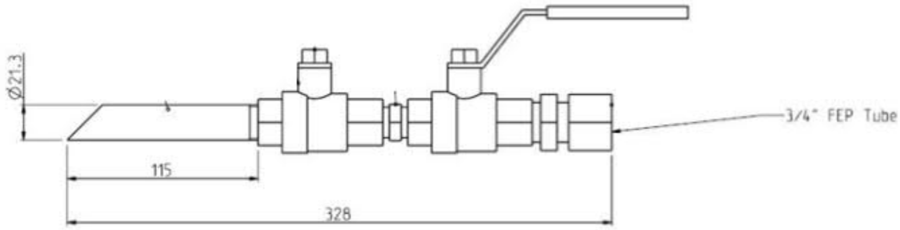


Figure 9. Dimensions of the sample valve in millimeters.

Verify that the process is shut down, appropriate valves are closed and the pressure inside the pipe is fully released. The pipe should also be empty.

Make a 22 mm hole to the wall of the process pipe. To prevent fiber debris from collecting on the edge of the cut-out, ensure that the edges of the hole inside the pipe are ground smooth. Install sample valve tip about 2.5 cm (1") inside pipe and weld the sampler perpendicular to the pipe wall. Install valve so that the flow is facing the shorter side of the valve. The handle is on the shorter side (figures 9 & 10).

Best location for sample valve in pressurized line is the end of a horizontal or vertical section where the flow has stabilized. Sufficient section of straight pipe is about 3 x pipe diameter before and after sample valve.

Install the sample valve into process pipeline of headbox or dilution white water recirculation line before pressure control valve (figure 11).

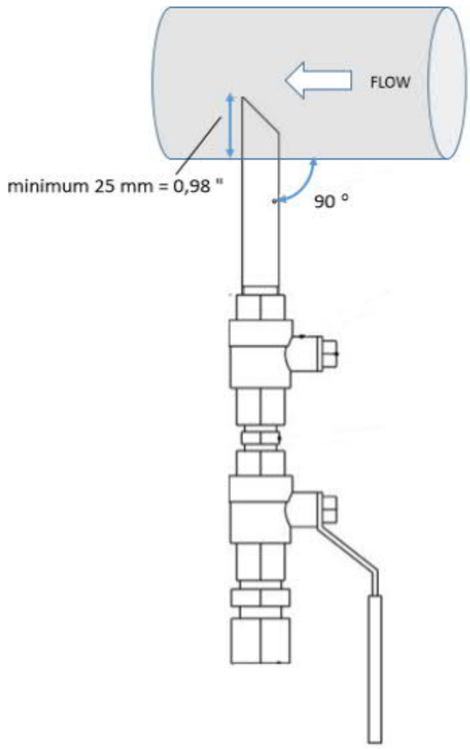


Figure 10. Installation of the sample valve to process pipe.

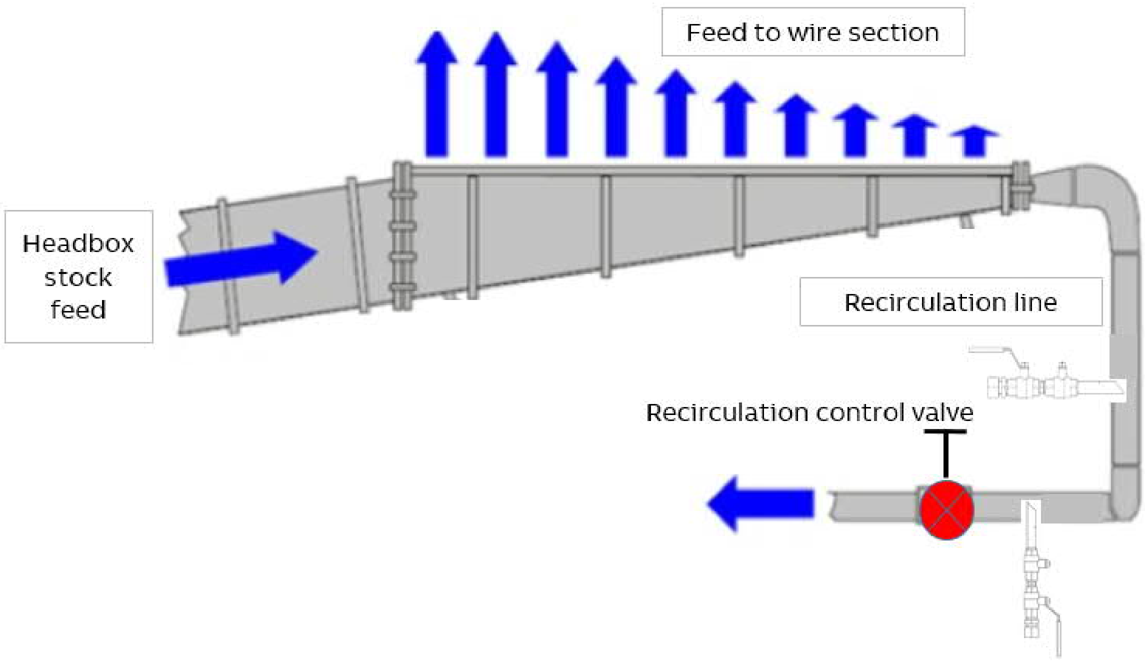


Figure 11. Installation of sample valve to headbox or dilution white water process pipe. Install the sample valve before recirculation pressure control valve.

Analyzed sample discharge can be returned to white water tray (figure 12).

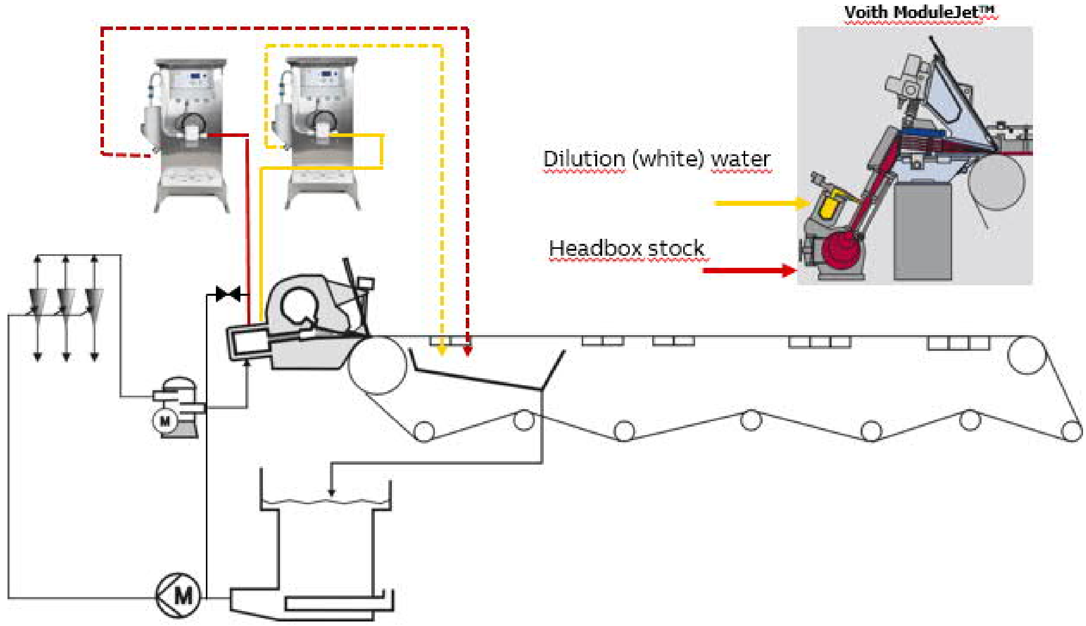


Figure 12. Installation of headbox sensor into the process.

4.3 KPM KRA/KRT white water sensor

4.3.1 Main parts and installation space requirement

Locate the sensor so that it is easy to operate and maintain. Figure 13 shows the main parts of the sensor.

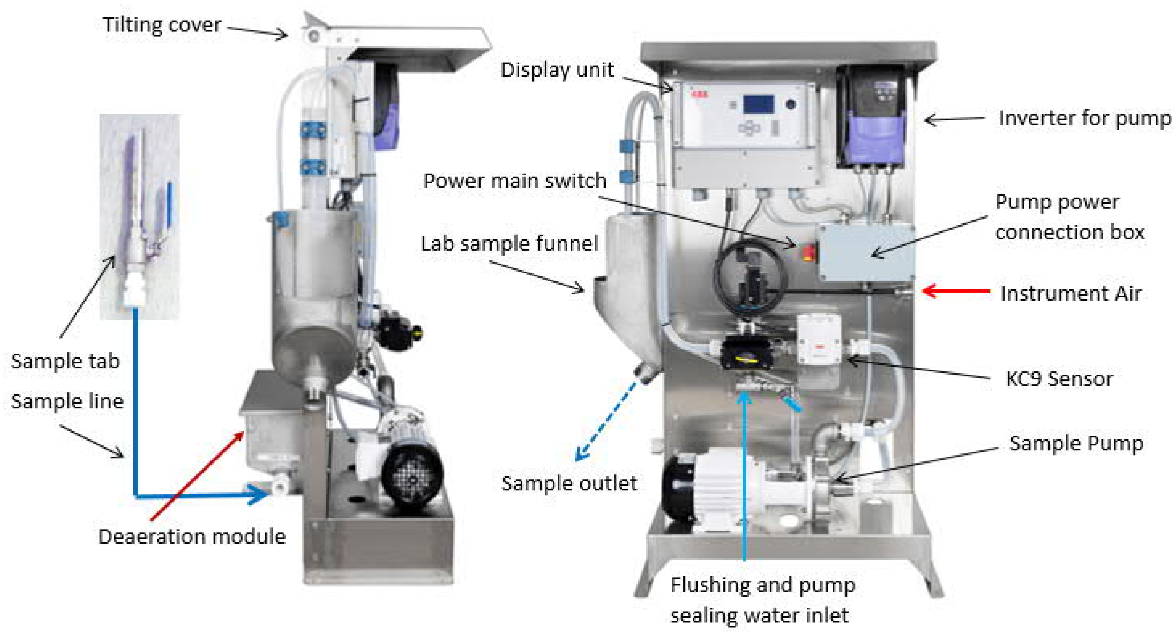


Figure 13. KPM KRA/T white water sensor main parts.

Figure 14 shows the installation space required on the floor for the sensor and the location of holes for mounting bolts.

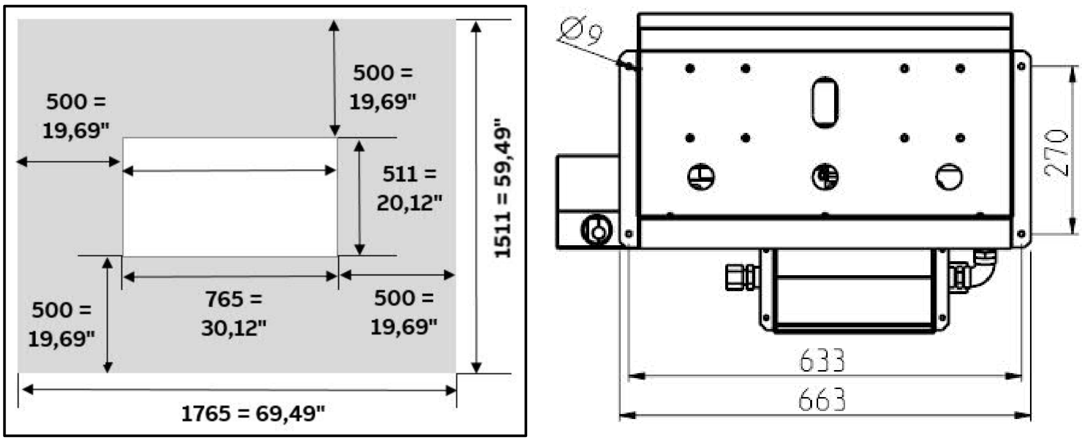


Figure 14. Space needed for white water sensor on the left, sensor mounting bolt locations on the right.

4.3.2 Dimensions of white water sensor

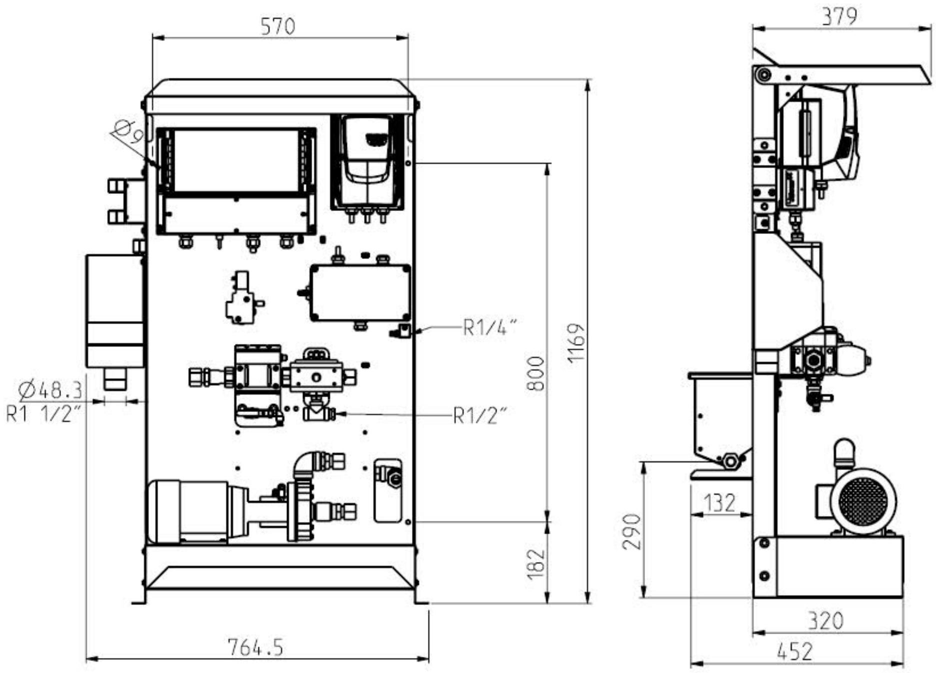


Fig. 15. Dimensions of white water sensor.

4.3.3 Flushing water, pump sealing water and instrument air connections

- Flushing and pump sealing water have a common connection: R1/2" (Figure 6, A).
- Instrument air connection: R1/4" (Figure 6, B)

Flushing water must be same temperature or warmer than sample.
Additionally pump sealing water must meet sealing water specifications:

- No impurities, such as clay, smaller than 10 micrometers
- No particles larger than 50 micrometers
- No more than 10 milligrams of silicate content per liter
- No more than 30 milligrams of organic impurities per liter
- No more than 1 milligram of iron per liter
- The total water hardness should be lower than 10 degrees dH (medium hardness)

Instrument air must be oil-free, pressure regulated to 4 – 8 bar.

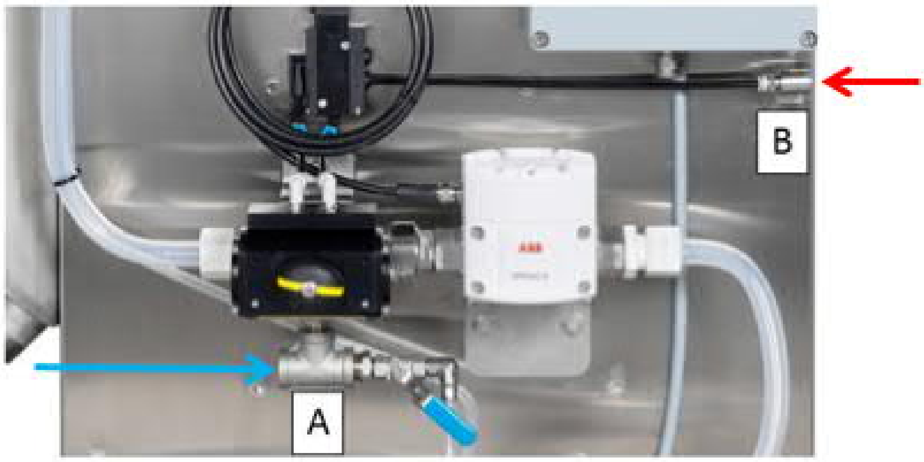


Figure 16. Flushing/sealing water (A) and instrument air (B) connections.

4.3.4 Discharge and sample line connections

- Headbox sensor discharge is R1 1/2” from laboratory sample funnel (figure 17 left side)
- White water sensor has two R1 1/2” discharge connections; from laboratory sample funnel and from deaeration module
- Sample line connector of headbox and white water sensor without pump is R3/4” PP (for 3/4” FEP tube, see figure 17 left side).
- Sample line connector of white water sensor with pump is R3/4” PP (for 3/4” FEP tube). Sample line is connected to deaeration module (see figure 17 right side).

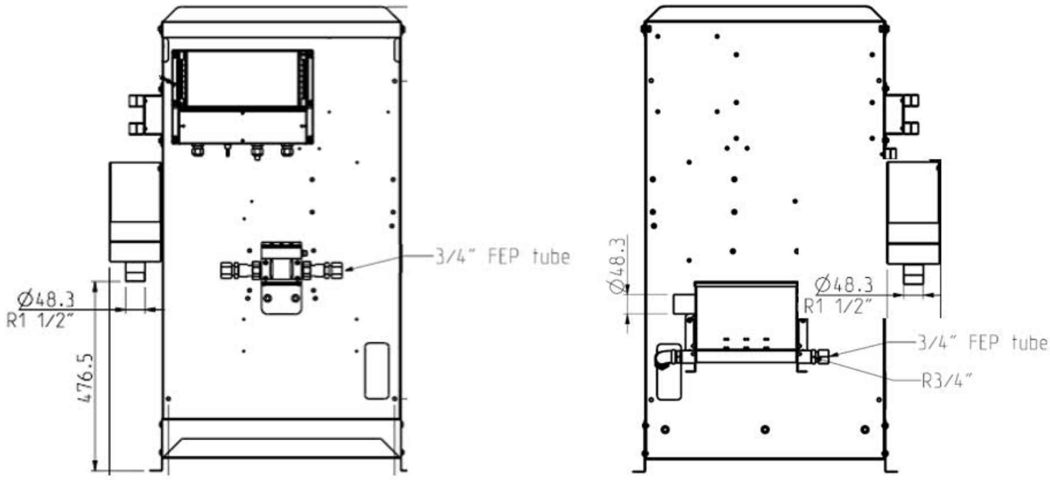


Figure 17. Sample line and discharge connections. Headbox sensor front view on the left, white water sensor with sample pump backside view on the right side.

Discharge line must be as short as possible. The end of discharge pipe/tube must not be under water. Discharge line must have a steady decline at minimum rate of 12,7 mm (0,5”) / meter (3,3 ft).

4.3.5 Connections of white water sensor and installation to process

- Installation of sample valve into first pass wire channel/tray.
- With sample pump: Installation of the sensor close to wire channel/tray.
- Without sample pump: Installation of deaeration module close to wire channel/tray and sample valve. Sensor installation to lower floor.
- When there is enough hydrostatic pressure (about 5 - 6 meters, 16-20 ft) to provide sufficient flow through the sensor (10 l/min, 2.6 gpm) then the pump is not needed.
- Installation of the FEP sample line avoiding tight bends. Line as short as possible.
- Power for WW- sensor with sample pump 100 – 115 VAC or 200-240VAC, 50/60 $\pm$ 2 Hz.
- Power for WW- sensor without pump 90 – 264 VAC, 50/60 $\pm$ 3 Hz.
- Backflushing module requires water and instrument air connections.
  - Warm water supply to sensor (to prevent condensation inside transmitter)
  - oil-free instrument air to operate the valve actuator
- Sample pump requires sealing water (common inlet with backflushing).
- Discharge tubing for sensor and deaeration module.
- Return of the measured sample can be done with separate return pump.
- Analog output connection to DCS.
- Binary output (alarm) and inputs (process stop, grade selection) connections to DCS.

Sample valve outlet has R1/2” thread and 3/4” polypropylene (PP) connector included. It is recommended to use fluorinated ethylene propylene (FEP) sample line. Sample valve, deaeration module, optical module and sample pump includes connector for 3/4” FEP tube. Internal tubing of sensor is 3/4” FEP and tubing connectors are made of PP.

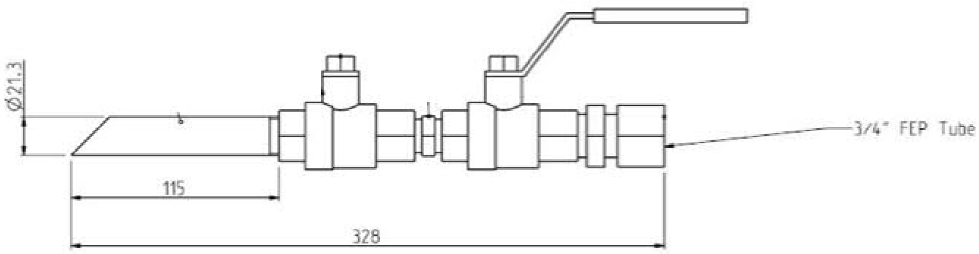


Figure 18. Dimensions of the sample valve in millimeters.

Make a 22 mm hole to the wall of the process pipe. To prevent fiber debris from collecting on the edge of the cut-out, ensure that the edges of the hole inside the pipe are ground smooth. Install sample valve tip about 2.5 cm (1") inside pipe and weld the sampler perpendicular to the pipe wall. Install valve so that the flow is facing the shorter side of the valve. The handle is on the shorter side (figures 18 & 19).

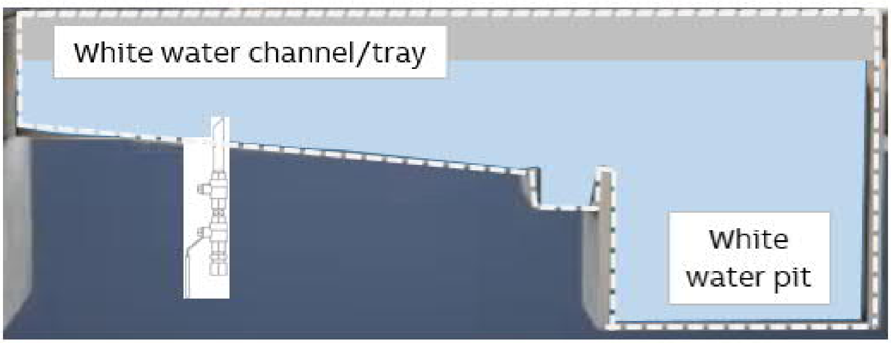


Figure 19. Installation of sample valve in white water channel/tray

Installation of deaeration module depends on system type:

- If sample pump is used deaeration module can be in the backside of sensor (as it is delivered, see figure 20).
- If hydrostatic pressure (about 5 - 6 meters, 16-20 ft) is utilized to provide sufficient sample flow → install deaeration module upstairs close to sample valve, little bit lower than sample valve (figure 21).

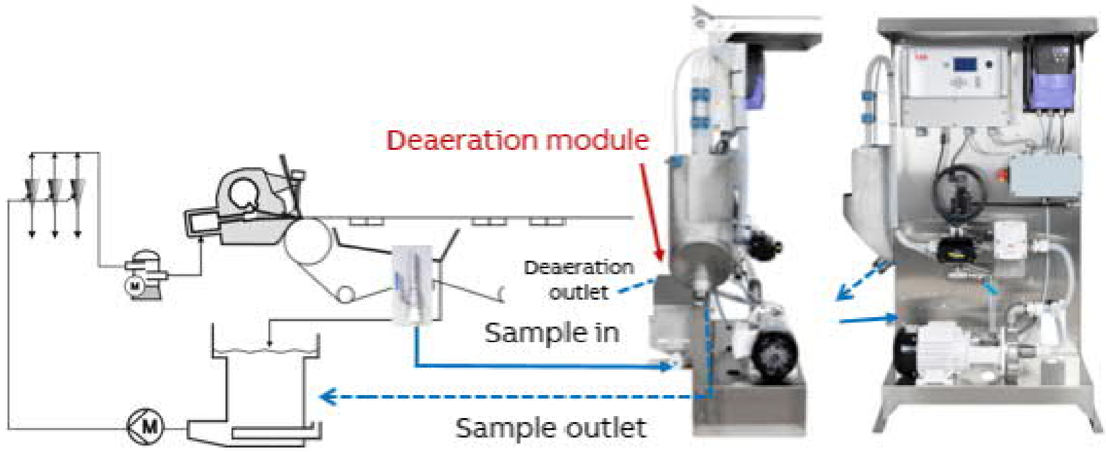


Figure 20. Installation of white water sensor with sample pump into the process.

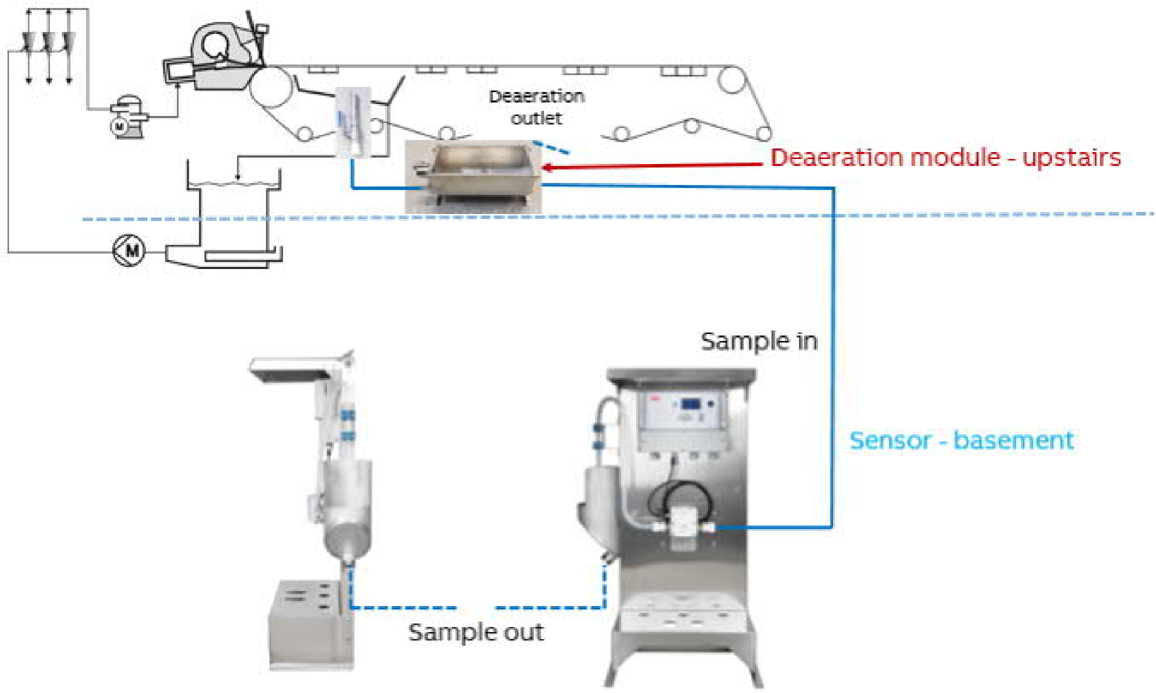


Figure 21. Installation of white water sensor without sample pump into the process.

5. Retention system and control

- Easy one point initial calibration of the KPM KRA/T retention sensors based on laboratory analysis. More samples are collected from whole production range and final calibration calculated with regression analysis tools.
- Water-proof sensors (IP65, Nema4X).
- Complete system with all the installation material available.
- Retention calculation and control are configured in DCS (figure 22).
- After final calibration of sensors, bump-test(s) with retention aid can be performed to tune the controls.

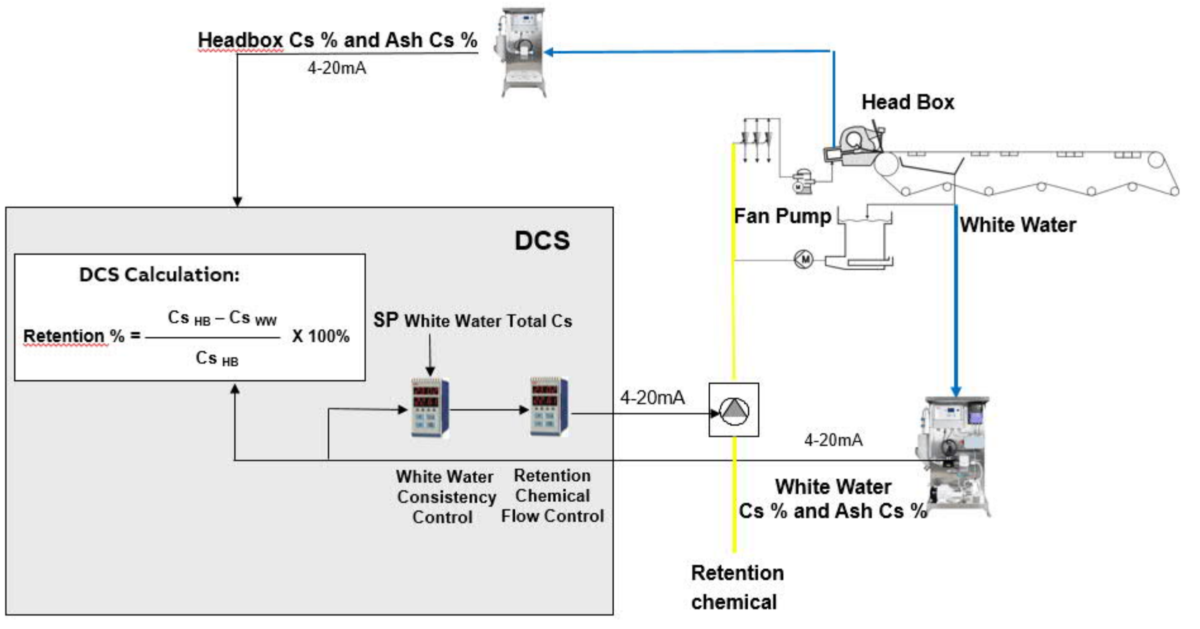


Fig. 22. Retention system and control.

6. Electric connections

NOTE
Always check input supply voltage & frequency before making any connections. Incorrect connections will damage the equipment!

WARNING
Applicable electrical safety regulations must be closely followed in all installation work!
All electric connections must be done by authorized persons!

Supply power wiring connection supplied by customer depends on sensor type. All sensor type require only 1-phase supply. The supply power cable minimum size is 3 * 1,5 mm^2 or similar. Use of 10A fuse and separate safety switch is recommended. Display power can be turned off from internal switch but it requires opening of display protection panel. White water sensor with pump has a main switch but it is not a safety switch.
Electric connections need attention since power connection depends if pump is used or not.

- For headbox sensor supply power is connected to the display unit. Connect 90 – 264 VAC, 50 / 60 $\pm$ 3 Hz to terminal strip that is located on the lower right corner of the display unit.
- For white water unit without pump main power is connected same way as headbox unit.
  For white water sensor with sample pump, see chapter 6.2 Main supply power is connected to connection box terminals from where it is internally divided to display and pump inverter.
- Sensor interconnect cable is connected with a quick connector to the bottom of the display unit (delivered connected).
- Current output terminals 2 and 3 are for total consistency. Terminals 4 and 5 are reserved for sensor temperature.
- Current output terminals 6 and 7 are for ash consistency (available with KPM KRA).
- Current outputs are active and isolated. No voltage supply needed. See 6.1.1
- Binary inputs are closing contacts only. No supply voltage needed. See 6.1.2
- Binary output alarm can selected closing or open contact. No supply voltage needed. See 6.1.3.

6.1 Display unit wiring

Analog outputs, binary inputs and alarm binary output are connects to display unit. The terminals for the electrical cables are located under the bottom cover of the display unit.

6.1.1 Analog outputs

Analog output wiring is provided by customer (figure 23 light-blue box). Analog outputs are active, no voltage supply required.

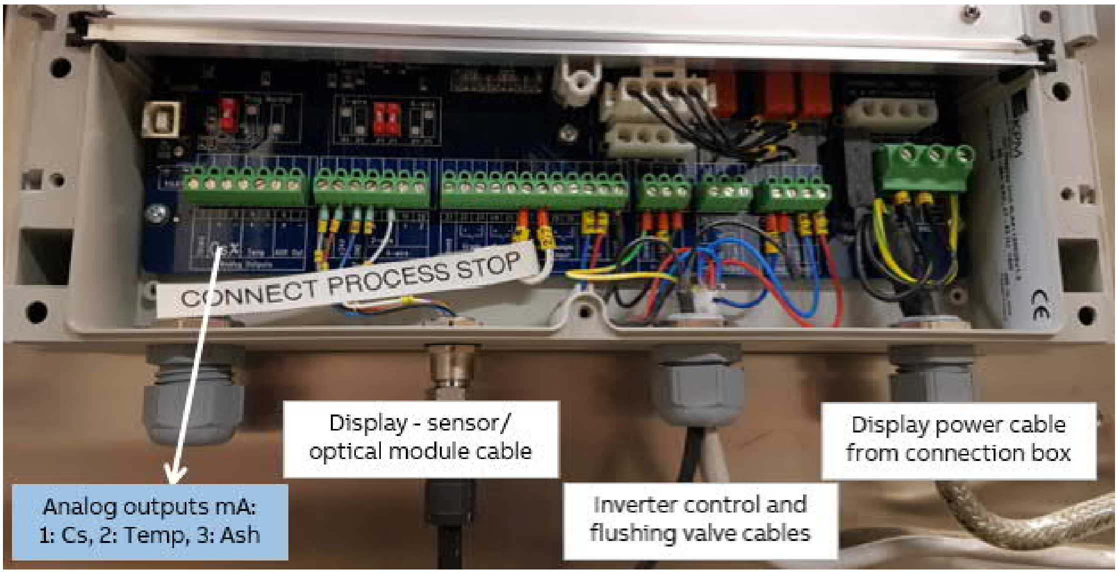
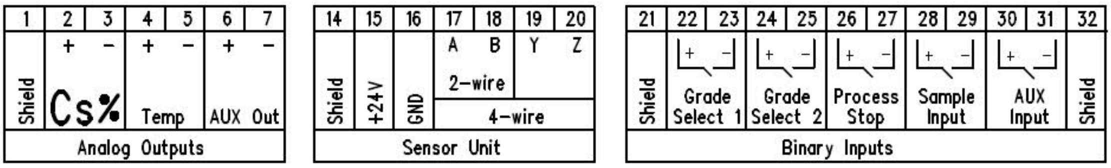


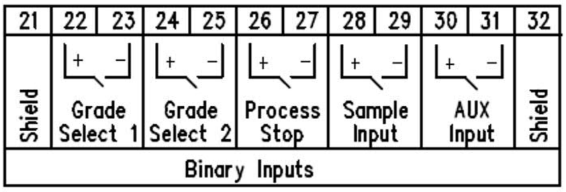
Figure 23. Display unit terminal strip of white water unit with sample pump.

- Total Consistency analog output is connected to terminals 2 (+) and 3 (-) in KPM KRA/T.
- Ash Consistency analog output is connected to terminals 6 (+) and 7 (-) in KPM KRA.
- Temperature analog output is connected to terminals 4 (+) and 5 (-) KPM KRA/T.
- Terminal 1 is for cable shield. Only connect cable shield at one end (DCS)



6.1.2 Binary inputs

Binary inputs are closing contacts only. No supply voltage needed.



- Terminals 22, 23 are for Grade Select 1
- Terminals 24, 25 are for Grade Select 2
- Grade selection table is based on binary inputs:

Grade	Grade select 1 (22,23)	Grade select 2 (24,25)
Grade 1 (Name A)	0	0
Grade 2 (Name B)	1	0
Grade 3 (Name C)	0	1
Grade 4 (Name D)	1	1

- Terminals 26, 27 are for Process Stop. Close = process stop, Open=Run
  Use paper machine fan pump running/not running information or similar to activate the process stop.

- Terminals 28, 29 are for Sampler information to give timestamp to save readings
  No need to connect with KPM KRA/KRT.

- Terminals 30, 31 are for Aux Input
  Connected internally if sample pump is used

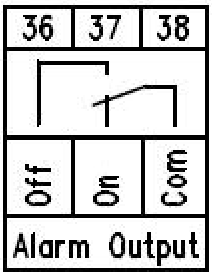
- Terminals 21 and 32 are for cable shield. Only connect shield at one end (DCS)

6.1.3 Binary output

There is one binary output for system alarm. Output can be open or closing contact. Terminals 38 is common, 36 is alarm relay OFF/normally closed. Contact opens in case the built-in self-diagnostics detects a failure. If power is lost or turned off, the alarm relay OFF is OPEN.

Alarm ON works in the opposite way, 37 is alarm relay ON/normally open. Contact closes in case the built-in self-diagnostics detects a failure. If power is lost or turned off, the alarm relay ON is CLOSED.

Connect suitable external voltage (24 VDC or 110 VAC) if needed for DCS.



6.2 Main power connection for the white water sensor with pump

The white water sensor with sample pump has a main switch for supply power (100-115 VAC, or 200-240 VAC, 50/60 ±2 Hz). Power is distributed for the inverter and display unit with internal connections. The inverter provides the 3-phase voltage needed for the pump motor. Pump is connected to delta.

The mill 1-phase supply voltage is connected to the connection box terminals. Picture of connection box in the figure 26. The display and inverter controls the pump and stops the pump operation during flushing cycle and during process stop. Therefore it is important to connect the process stop signal to the display unit binary input, see figure 23 (terminals 26 and 27).

Main voltage supply connection as in figure 24.

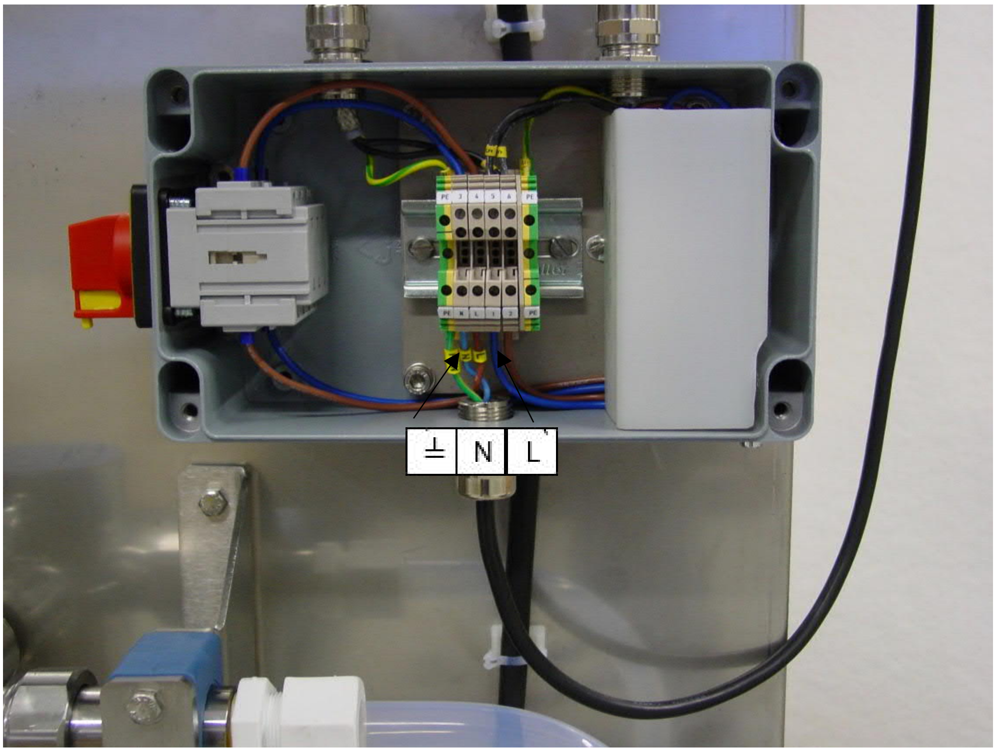


Figure 24. 1-phase supply voltage connection to connection box terminals of white water sensor with sample pump.

7. Display unit operation and configuration

7.1 Display and operating keyboard

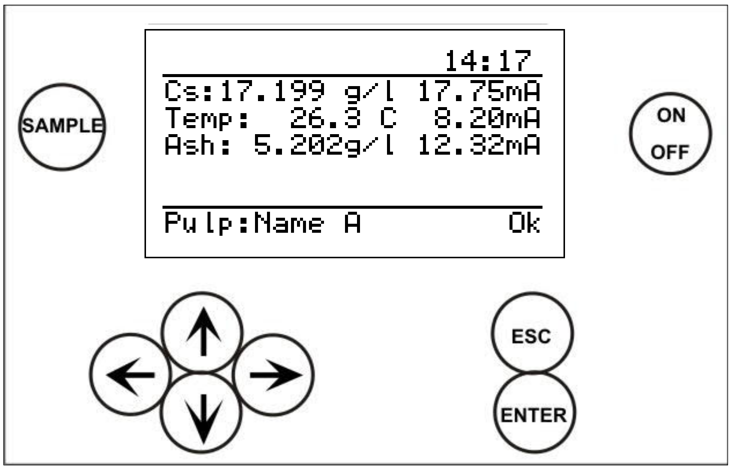


Figure 25. Display and keyboard.

Main display

The main display shows:

- First row: Left corner; Tag name/number Right corner; time.
- Second row: Consistency signal and analog output in milliamps.
- Third row: Temperature as degrees (C / F) and output in milliamps.
- Fourth row: Ash consistency signal and analog output in milliamps (in KPM KRA).
- Fifth row: Information text when available:
  - Start cleaning
  - Cleaning in progress
  - Cleaning delay
  - Process stop
  - Service mode
- Sixth row: Left corner; Selected pulp grade, default Name A
- Right corner; Status information Ok or Error

Common properties in other menus

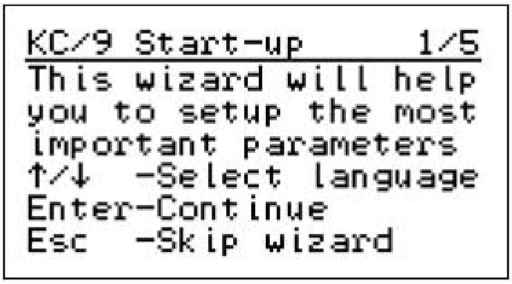
- The display contains 7 lines, 21 characters in a line.
- Selected line is highlighted
- Upper right corner shows:
  - Number of lines or pages in that menu.
  - Arrow indicates hidden lines.
- Help menus in the bottom.

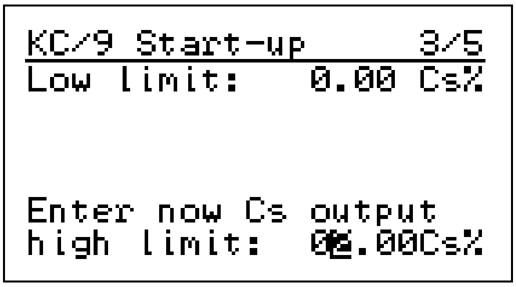
Keyboard

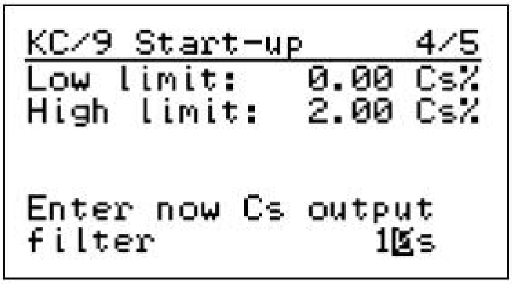
- ON/OFF button: Switch the main power on/off.
- Arrows: Scroll the menus and rows or adjust values.
- Esc: Delete changes or return back to the previous menu.
- Enter: Accept data and input changes.
- Sample: Averages the measured values. After sampling the program asks if the values will be stored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

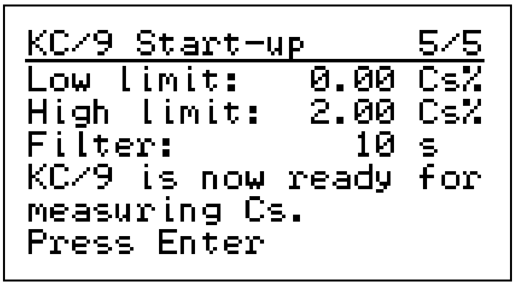
7.2 Wizard

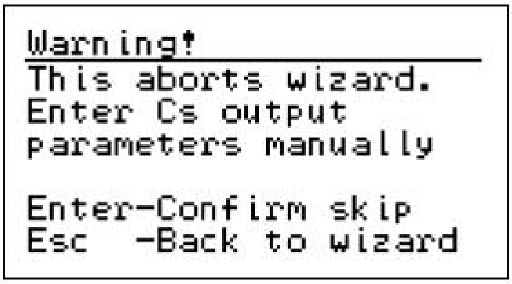
KPM KRA/T sensor is delivered with factory calibration, which means that the device will measure consistency as soon as you switch the power on.
When power is switched on the first time, the sensor goes to start-up wizard. The wizard guides through the mandatory settings. After the wizard has finished, the sensor is ready to measure and report the total consistency to the DCS.
Language can be selected in first page with up/down keys; English, Finnish and German available. Wizard can be skipped with Esc, warning is given if wizard will be aborted.











If you want to return to wizard go to the Maintenance menu → Default Settings. This will take all settings to default – DO NOT use if you are totally sure it is needed.

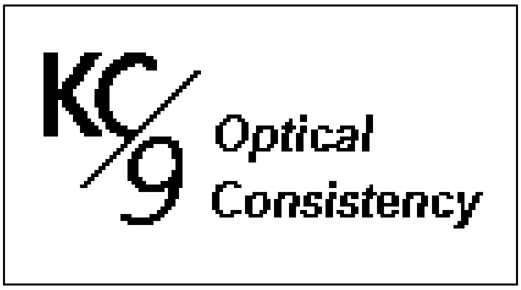
If the Wizard is not used, the configuration of Analog output can be done as follows:

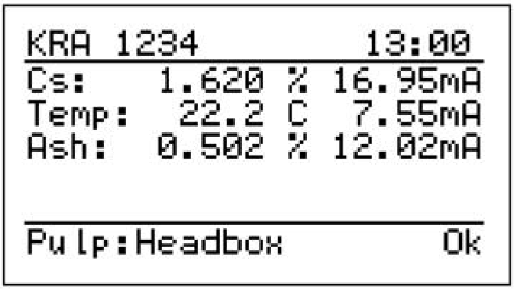
- Configure Analog output scaling and filtering in “Parameters” menu and unit is ready to measure consistency.

- With KPM KRA the Analog output 3: Ash scaling has to be configured manually, it is not configured by wizard!

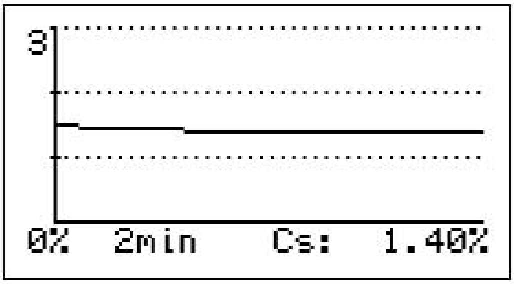
7.3 Main display

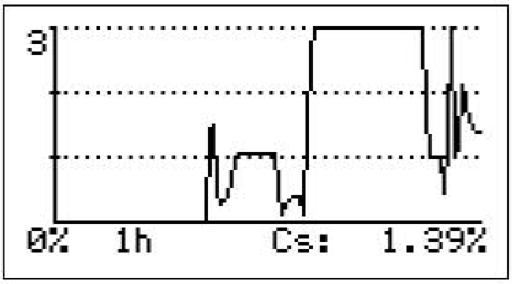
When power is turned on device will briefly show boot-display (KC/9 Optical Consistency) and then display the main menu.
Device tag can be entered from → Maintenance → Device information → Display unit → Tag.
Tag will be shown in the left-right corner, if configured.





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

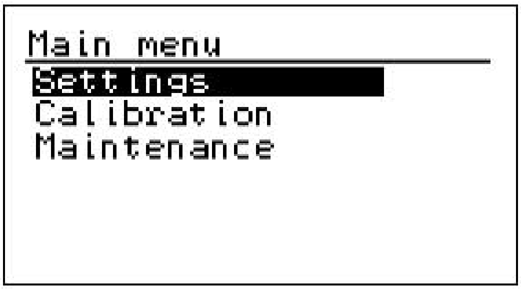




Arrow down key in Trend data display brings ash trend (with KPM KRA) and further down Temperature trend display.

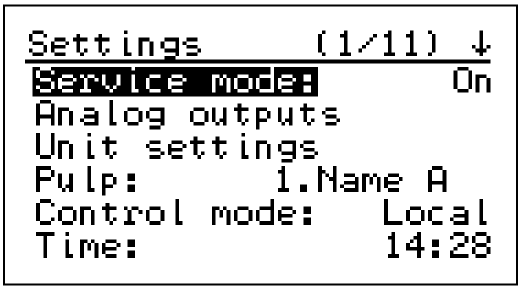
7.4 Main menu

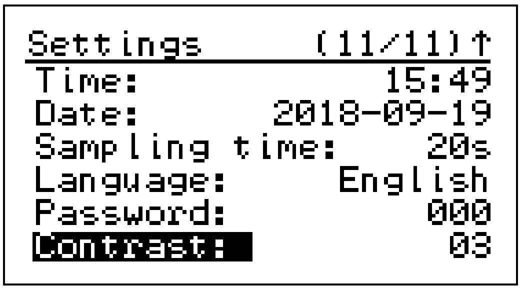
Arrow up or down in main display shows Main menu. Submenus can be accessed from main menu.



7.4.1 Settings

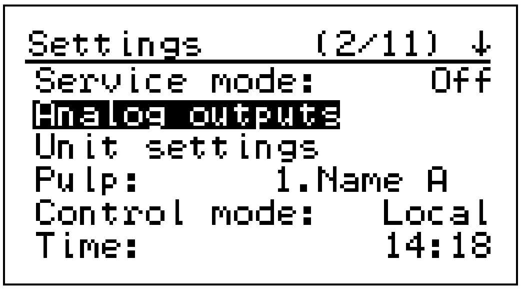
From Settings menu parameters can be reviewed and edited.

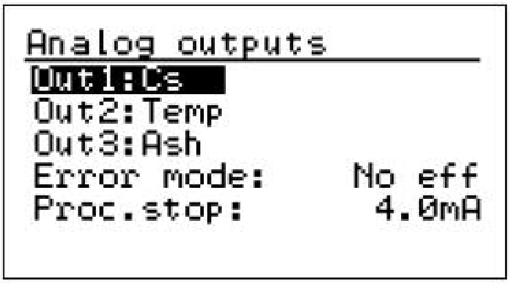


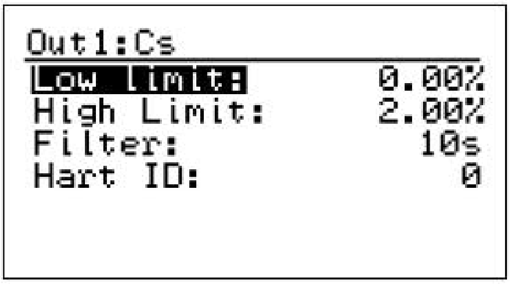


Service mode: ON = pump is not running, analog outputs are not updated.
OFF = normal measurement operation.

Analog Outputs:

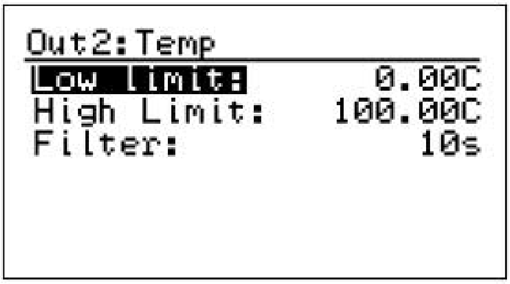


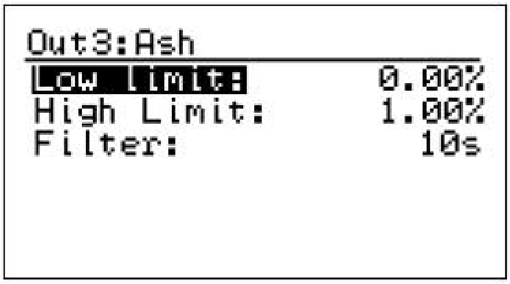




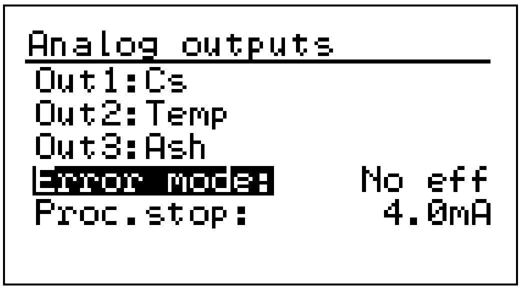
Output 1: Cs Low limit: Consistency low limit value, default 0.00 %. Corresponding to the 4 mA value of the analog output 1 signal.
Output 1: Cs High limit: Consistency high limit value, default 2,00 %. Corresponding to the 20 mA value of the analog output 1 signal.
Cs Filter: Output signal filtering time, 1 – 99 seconds, default 10 s.
Hart ID: Hart ID Address: Default O. Hart communication is available only at AOutput 1

Output 2 is reserved for sensor temperature
Output 3 is for ash consistency. The ash is calibrated to grams/l or %.



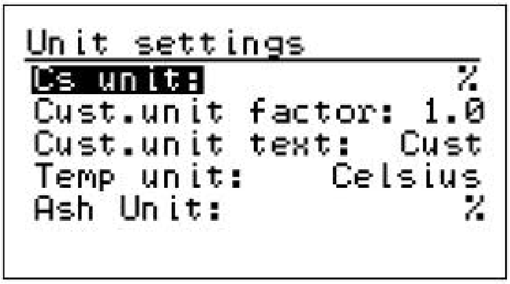


Error mode: Effect for analog outputs 1 and 3, when self-diagnostics detects an error: No effect, Freeze, 3.5 mA or 22.0 mA.
Proc.Stop: Analog output level, when Process stop binary input is activated. No effect, Freeze, 4.0 mA or 20.0 mA



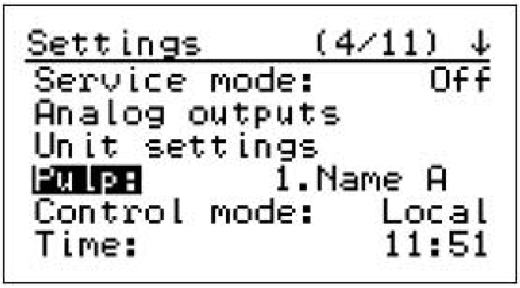
Consistency unit can be chosen %, g/l, mg/l, kg/t, Brix.
There is also one customer specified unit (Cust) where multiplier factor can be adjusted.
Ash unit is g/l or %.

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.
Cust. unit text: If “Cust” selected for “Cs unit”, editing the text.
Temperature can be chosen Celsius or Fahrenheit.



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

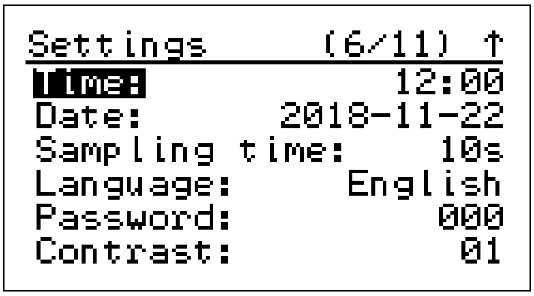
- Up and down arrows: Scrolling grades (4). Grade name can be edited. Normally only one (calibration) grade is needed.



Control mode: Local = grade is set manually.
Remote = grade changed by binary inputs named Grade 1 and Grade 2.
Grade selection is based on binary inputs. Grade select 1 and Grade select 2 combination as described in the table below:

Grade	Grade select 1 (22,23)	Grade select 2 (24,25)
Grade 1 (Name A)	0	0
Grade 2 (Name B)	1	0
Grade 3 (Name C)	0	1
Grade 4 (Name D)	1	1

Time / Date: For sampling identification and error log.
Sampling time: Averaging time after the SAMPLE-button is pressed.
Language: For display settings (English, Finnish and German available).



Password: For operating the display. 000 = no password requested. 633, works always.
Contrast: Display intensity, default 15 (brightest). Normally 01 is ok.

7.4.2 Calibration

The sensor is delivered with factory calibration, meaning it will show results as soon as you switch power on. Factory calibration is performed for the device in factory final testing using clean water and reference sample.

Default value for initial calibration Cs M-sig. S = 1.0 and Cs M-sig Z = 0.0
Default value for final consistency Slope (=gain) is S = 1.0 and for Zero (=offset) Z = 0.0.

Initial calibration should be performed with single laboratory sample. This allows the device settings to be optimized for the conditions in which it will be used.
The result from this check is set to:
Calibration → Initial calibration → Cs calibration → Cs M-sig. S and Cs M-sig Z

Sensor measures raw consistency (N) from = (Polar ratio Cs * PRatio gain) + (FS15V Cs * FS15V gain) + (FS30V Cs * FS30V gain) + (FS15H Cs * FS15H gain) + (BS15 Cs * BS15 gain) + (BS30 Cs * BS30 gain) + (X/Y Cs * XY gain) + (FS0S Cs * FS0S gain) + (FS0P Cs * FS0P gain).

From N Consistency M is calculated = (N+ CsMsigOffset) * CsMsigGain

- CsMsigOffset comes from single point calibration and should be close to zero (later offset comes from multivariable regression analysis, then value is not zero).
- CsMsigGain comes from single point calibration

NOTE! later when multivariable regression analysis is performed CsMsigGain must be set to 1.0

Final consistency is calculated as follows: Cs = S * M + Z

- S = slope/gain for result, adjusted by end user if necessary
- Z = zero or offset, adjusted by end user if necessary

This adjustment is explained in chapter 7.4.4

Sensor measures raw ash consistency (N ash) from = (Polar ratio * PRatio gain) + (FS15V Ash * FS15V gain) + (FS30V Ash * FS30V gain) + (FS15H Ash * FS15H gain) + (BS15 Ash * BS15 gain) + (BS30 Ash * BS30 gain) + (X/Y Ash * XY gain) + (FS0S Ash * FS0S gain) + (FS0P Ash * FS0P gain).

From N Ash M is calculated = (N Ash + Ash CsMsigOffset) * Ash CsMsigGain

- Ash CsMsigOffset comes from single point calibration and should be close to zero (later offset comes from multivariable regression analysis, then value is not zero).
- Ash CsMsigGain comes from single point calibration

NOTE! later when multivariable regression analysis is performed Ash CsMsigGain must be set to 1.0

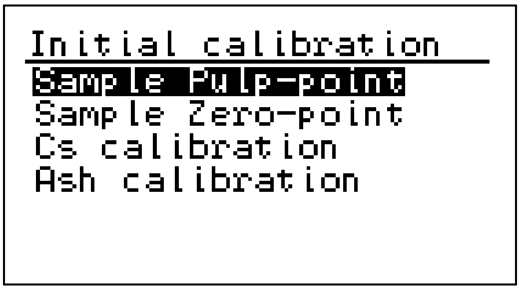
Final Ash consistency is calculated as follows: Ash = S * M + Z

- S = slope/gain for result, adjusted by end user if necessary
- Z = zero or offset, adjusted by end user if necessary

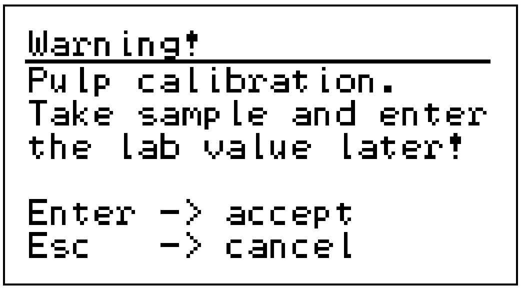
This adjustment is explained in chapter 7.4.4

Single point total consistency calibration (KPM KRA and KPM KRT)
Use the single point calibration in the start-up to get result trends to correct level.

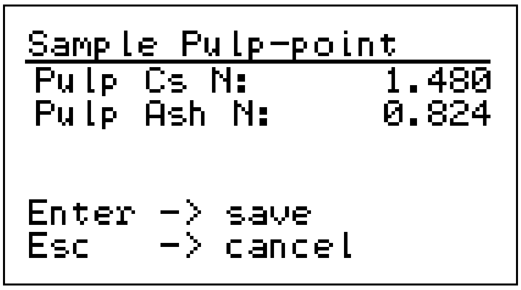
1. Perform initial calibration by taking a sample from Calibration → Initial calibration → Cs calibration → Sample pulp point → (Arrow right)



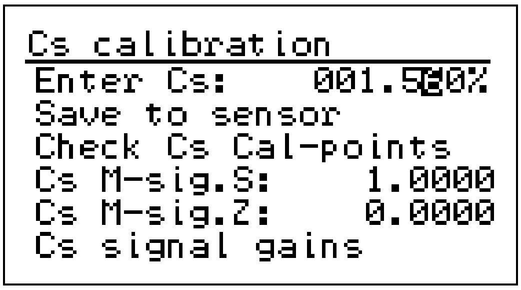
2. There is a warning preventing calibration by mistake (Press escape if you don't want to make initial calibration). Make sure sample is flowing and the conditions are normal. Press Enter and take sample for laboratory analysis.



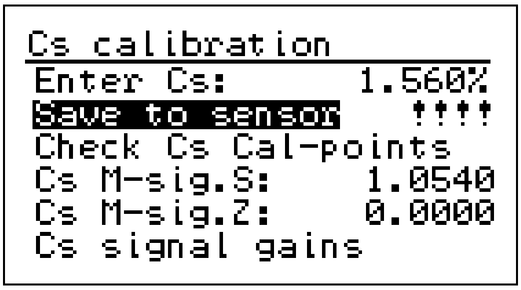
3. Pulp-point N values are shown, store those by pressing Enter



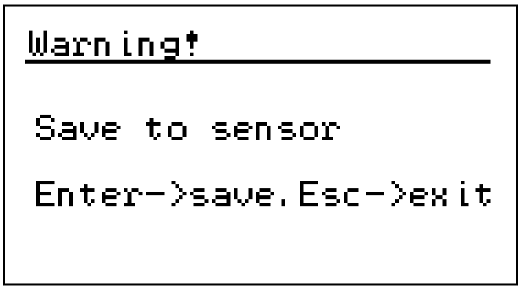
4. Enter the consistency result from laboratory to Calibration → Initial calibration → Cs calibration → Enter Cs (in example 1,480 is changed to 1,560 %)

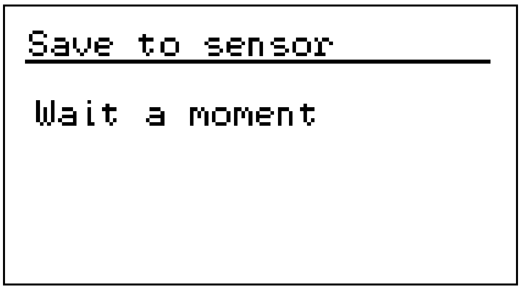


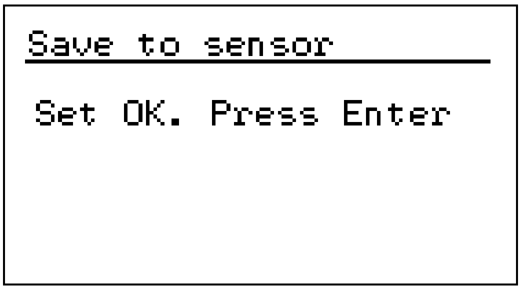
5. New values will be calculated to Cs M-sig. S: and Cs M-sig Z:
M-sig. S has a new value. Cs M-sig Z should be zero.
Save these values to sensor from “Save to sensor !!!”



There is a warning preventing calibration by mistake (Press escape if you don’t want to save values to sensor). Press Right arrow-button to save the values.







Single point ash consistency calibration (KPM KRA)
Use the single point calibration in the start-up to get result trends to correct level.
Same pulp point can be used both total and ash consistency. In this case phases 4-5 are needed. If you will calibrate ash on separate occasion, do phases 1-5

1. Perform initial calibration by taking a sample from Calibration → Initial calibration → Ash calibration → Sample pulp point → (Arrow right)

```
Initial calibration
Sample Pulp-point
Sample Zero-point
Cs calibration
Ash calibration
```

2. There is a warning preventing calibration by mistake (Press escape if you don't want to make initial calibration). Press Enter and take sample for laboratory analysis

```
Warning!
Pulp calibration.
Take sample and enter
the lab value later!

Enter -> accept
Esc   -> cancel
```

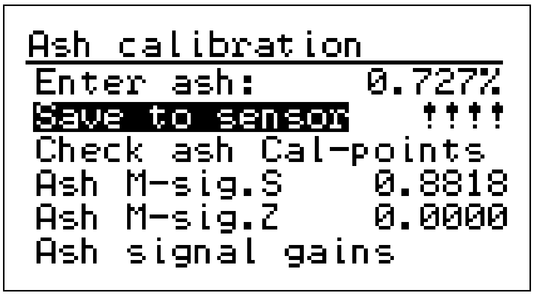
3. Pulp-point N values are shown, store those by pressing Enter

```
Sample Pulp-point
Pulp Cs N:       1.480
Pulp Ash N:      0.824


Enter -> save
Esc   -> cancel
```

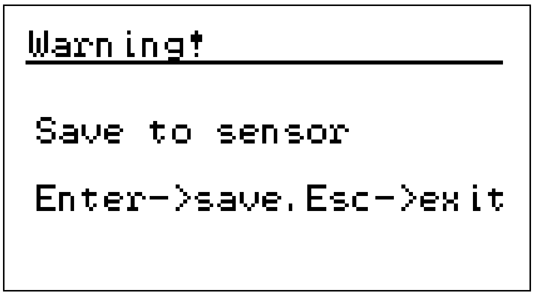
4. Enter the consistency result from laboratory to Calibration → Initial calibration → Cs calibration → Enter ash (in example 0,824 is changed to 0,727 %)

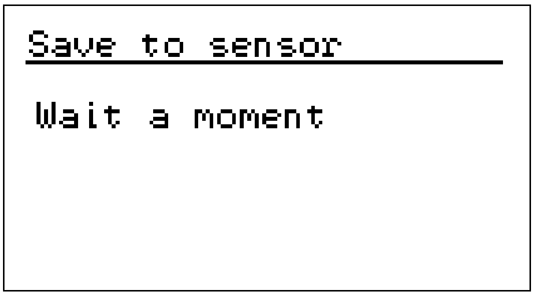
```
Ash calibration
Enter ash:    000.727%
Save to sensor
Check ash Cal-points
Ash M-sig.S     1.0000
Ash M-sig.Z     0.0000
Ash signal gains
```

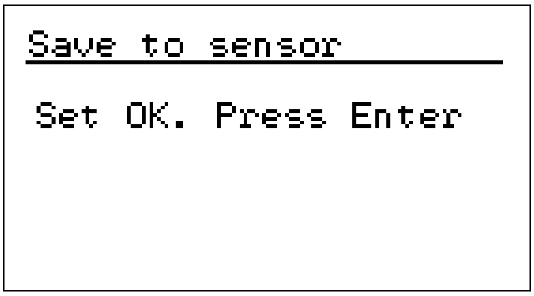
5. New values will be calculated to Ash M-sig. S: and Ash M-sig Z:
   Save these values to sensor from “Save to sensor !!!”



   There is a warning preventing calibration by mistake (Press escape if you don’t want to save values to sensor). Press Right arrow-button to save the values.







Multi point calibration of KPM KRA/T

Multi point calibration is required to get optimal accuracy of measurements. The amount of the samples depends on the grade structure and furnish of the machine. Minimum 20 points covering the full range of produced grades is required. The results are correlated to the laboratory results and the calibration formula to calculate N is defined.

> **NOTE**
> A difference of at least 25 % between consistency minimum and maximum values is needed to accurate calibration.

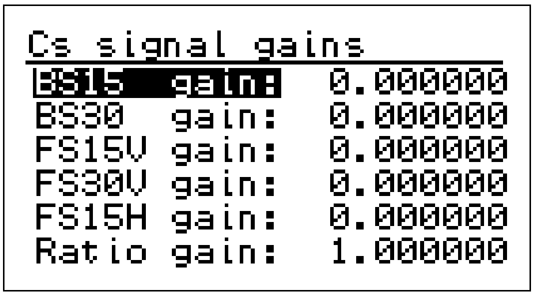
$$\frac{(Csmax - Csmin)}{Csmax} x100 > 25\%$$

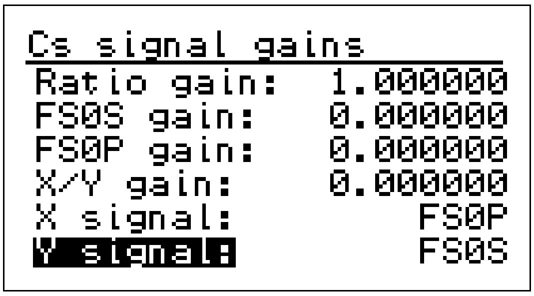
Collect samples and remember to press SAMPLE-button. Enter laboratory values for collected samples. Read sample data and send to ABB KPM Kajaani for calibration coefficient calculation.

For KPM KRT Cs M-sig.Z and Cs M-sig.S can be adjusted based on single variable regression analysis. The offset/zero is set to Calibration → Initial calibration → Cs calibration → Cs M-sig.Z. The gain/slope is set to Cs M-sig.S

For KPM KRA the gain(s)/slope(s) for calibration signals calculated with multivariable regression analysis are set to Calibration → Initial calibration → Cs OR Ash calibration → Cs OR Ash signal gains

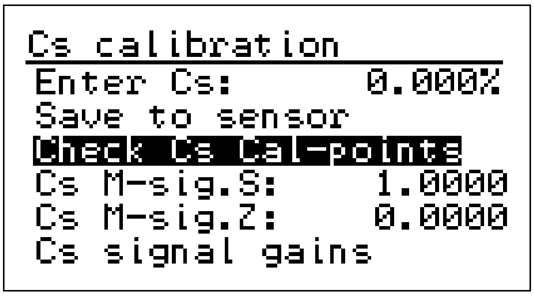
Default gain used with single point calibration is Ratio gain: 1.0 for total consistency and BS30 gain: 0.0057 for ash consistency. There must only be gain values in selected calibration signals based on regression analysis. Set all other gains to 0.0 (if Ratio OR BS30 signal is not used as calibration signal set it also to 0.0).





KPM KRA: The offset/zero of multivariable regression analysis is set to Calibration → Initial calibration → Cs OR Ash calibration → Cs M-sig.Z AND/OR Ash Cs M-sig.Z

KPM KRA: Cs M-sig.S AND/OR Ash Cs M-sig.S Gain must be set to 1.0. Slope/gain in this is only used with single point calibration with KPM KRA.



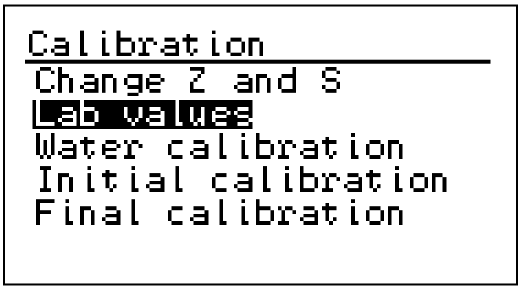
7.4.3 Laboratory values

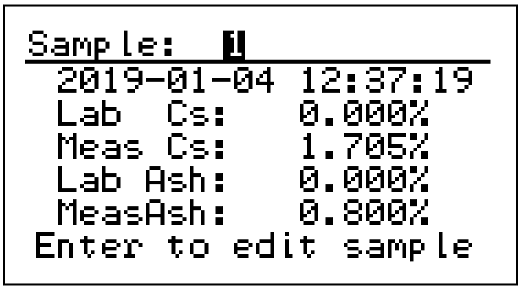
Laboratory values can be entered after the sample has been stored in the device memory. When the SAMPLE button has been pressed the raw measurements are stored. This can be done by pressing ENTER button right after sample taking. The device stores values automatically after 5 minutes if no button is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

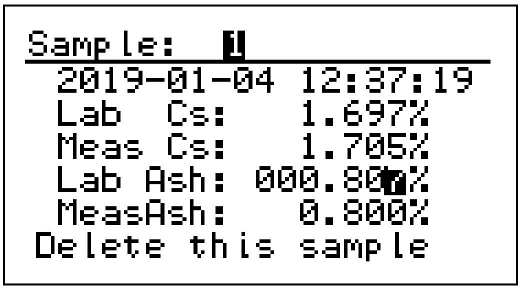
When entering laboratory values first choose a sample based on date and time. Last sample is always set as number 1 and there are 100 latest samples stored in the memory. When a new sample is stored, it deletes the oldest sample if the memory is full.

Calibration → Lab values → Press Enter to edit sample → Give laboratory Cs or g/l (and laboratory ash Cs or g/l with KRA)

Numbers are selected with arrows-buttons and value saved by pressing Enter



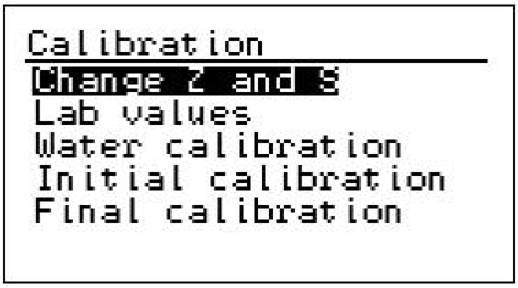




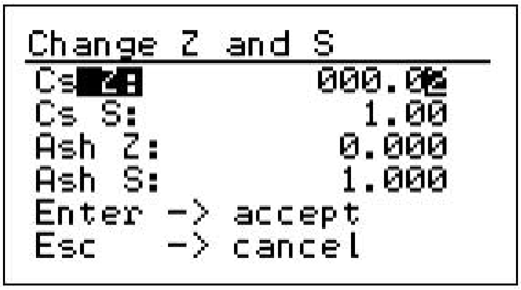
7.4.4 Change Z and S

Calculated consistency and ash result can be adjusted with S = slope (=gain) and / or Z = zero (=offset).

Calibration → Change Z and S



Arrow right → give new value with arrow up / down
Store new value with Enter.

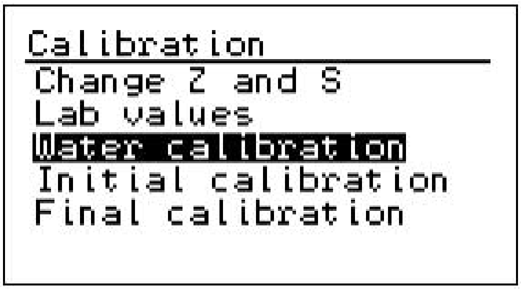


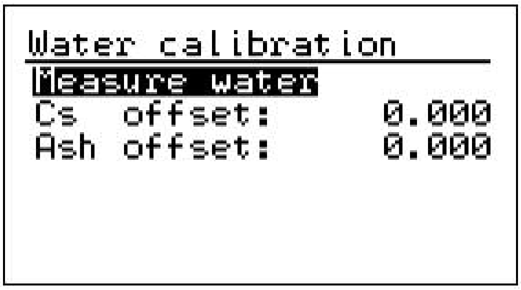
7.4.5 Water calibration

Water calibration is done in production. Normally there is no need to change water calibration.

Use the single point calibration in the start-up to get result trends to correct level.

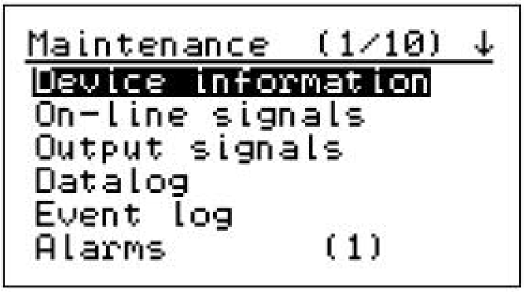
> **NOTE**
> Water calibration is normally only done during manufacturing.

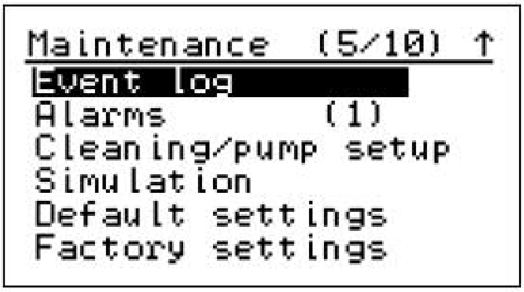




7.5 Maintenance

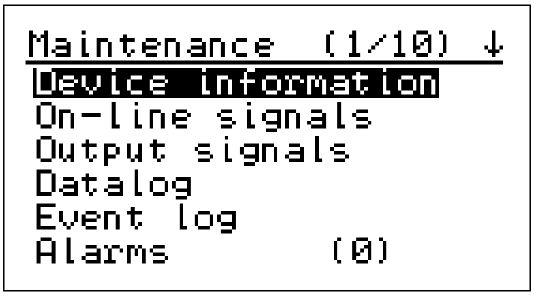
From maintenance menu device information and operation can be checked. There is also possibility to to check diagnostic data, set cleaning and sample pump settings and perform simulation for relays. Default and factory settings are usually not needed by customer.

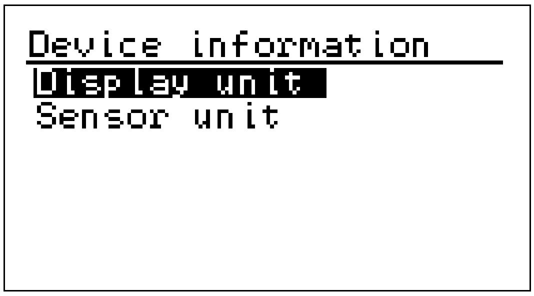


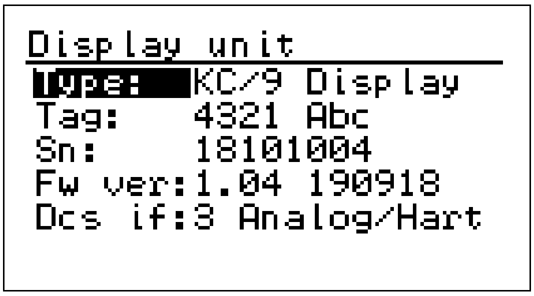


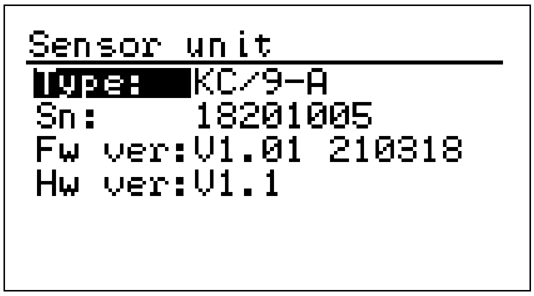
7.5.1 Device info

From Device information display and sensor unit type, software version and serial number can be checked.









7.5.2 On-line signals

On-line signals displays show measured signal levels and other related information, which may be needed for troubleshooting purposes.

FS0S: Raw attenuation measurement value.
FS0P: Raw depolarized measurement value.
N: Raw consistency measurement.
M: Calibrated consistency measurement.
Cs: Consistency measurement after customer calibrations (Cs = S * M + Z).

```
On-line signals   1/6
FS0S:           107.4
FS0P:            79.5
N:              1.479
M:              1.559
Cs:           1.559 %
```

Intensity: Control of the light intensity.
Optic Temp: Optics temperature.
Sensor Temp: Sensor board temperature.
Display Temp: Display temperature.
Sample/sec: Measured samples in one second.
Bin. Inputs: Status of the binary inputs.
First digit is grade selection 1, second is grade selection 2, third is process stop (1=stop on, 0=stop off), fourth is sample input, fifth one is pump control

```
On-line signals   2/6
Intensity:        13%
Optic Temp:     24.6C
Sensor Temp:    30.5C
Display temp:   34.0C
Sample/sec:       3.8
BinInputs:      00000
```

Ash N: Raw ash consistency measurement.
Ash M: Calibrated ash consistency measurement
Ash: Calculated ash measurement after customer calibrations (Ash = S * M + Z).

```
On-line signals   3/6
N Ash:          0.826
M Ash:          0.729
Ash:          0.728 %
```

Dir Cs FS0S/FS0P: Preliminary measurement before any compensation
Cs X/Y: Result of calculation
Ash X/Y: Result of calculation

```
On-line signals   4/6
Dir Cs FS0S:    495.3
Dir Cs FS0P:    366.3
Cs X/Y:         49.44
Ash X/Y:         1.07
```

FS0S: Raw attenuation measurement value
FS0P: Raw depolarized measurement value
FS15V-30V-15H: Forward scattering signals raw measurement value
BS15/BS30: Backward scattering signals raw measurement value
All with 2 different LED current

```
5/6      52.7  250.0mA
FS0S    107.5   2470.2
FS0P     79.5   1834.7
FS15V    29.0    680.7
FS30V    36.2    832.3
FS15H    31.8    726.6
BS15    159.0   3670.7
```

IrLvl: Light intensity
Zero: Electronics base
Ratio: Basic raw measurement
NrmIR: Normalization of IR
Scal.Fa: Scaling factor for signals

```
6/6      52.7  250.0mA
IrLvl   382.0   1841.7
BS30    206.5   3934.2
Zero    253.7    256.0
Ratio   0.739    0.742
NrmIR    83.0   1888.0
SclFa   0.217    1.025
```

7.5.3 Output signals

The display shows existing analog Output signals in milliamps and percentage of the scaled output.

```
Output signals
Out1:Cs          16.46mA
 Ok                77.8%
Out2:Temp         7.95mA
 Ok                24.6%
Out3:Ash         15.66mA
 Ok                72.8%
```

7.5.4 Data log

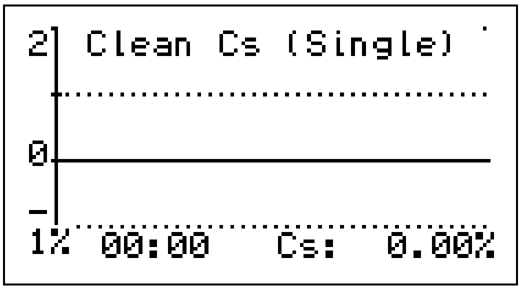
Datalog collects minimum and maximum values since clearance time.
Cleaning displays are shown whenever cleaning sequence has been configured.
First graphics shows last measured water value and second display 24 hour trend.

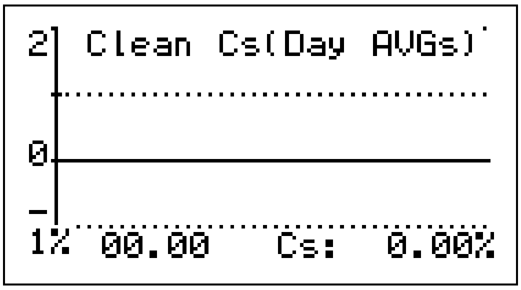
Remember to clear these counters during the start-up.

Clearing is done in page 2 by pressing ENTER

```
Datalog            (1/4)
              min    max
N:            0.00   1.48
Cs %:         0.00   2.03
Temp:           21    24C
Intens. %:       3     13
Ash %:        0.72  22.31
```

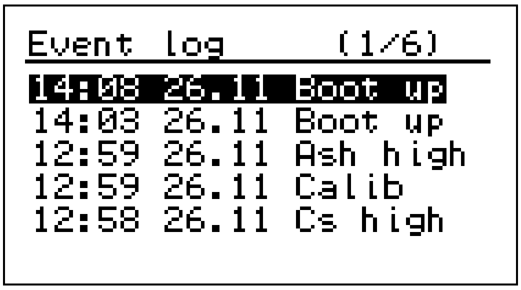
```
Datalog            (2/4)
Clean.Cs:          0.00%
    FS0S:              0

Datalog cleared:
2018-11-26 14:19
Enter->clear datalog
```

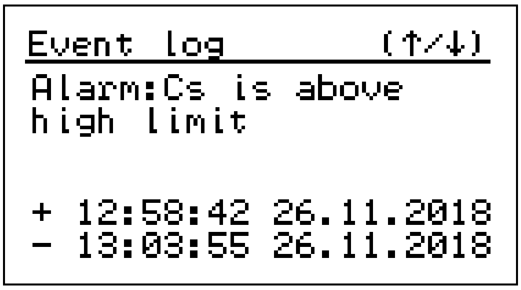




7.5.5 Event log

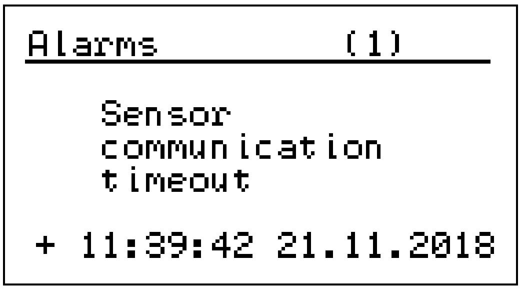
Event log collects all configuration changes, errors, boot-ups etc. 250 last events stay in memory. By selecting an event and pressing ENTER you will find more info about the event. Plus indicates time when event has occurred and minus when it has been removed.

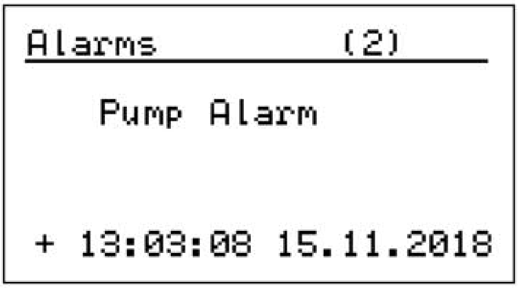


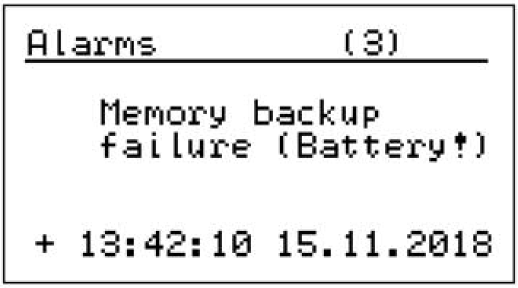


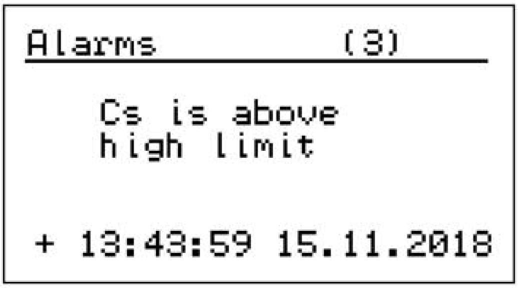
7.5.6 Alarm

Alarm display shows active alarms at the moment. If there are no active alarms in memory, 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.









7.5.7 Cleaning cycle / pump setup

Cleaning: Setting cleaning On/Off.
Interval: Time between cleanings.
Duration: Cleaning time, seconds.
Freeze delay: Analog output continues to be frozen after the cleaning period has stopped. Time required for fresh pulp to enter to sensor.
Pump monitor: Pump alarm can be activated. Used for white water sensor with pump. Alarm will effect also consistency output when configured on.
Pump Ok: Pump monitoring can be open or closed contact.

```
Cleaning/pump setup
Cleaning:           Off
Interval:         60min
Duration:         15sec
Freeze delay:     10sec
Pump monitor:        On
Pump Ok:Close contact
```

7.5.8 Simulation

Cs and Temp simulation simulate analog output signal for Consistency and Temperature. Raw simulation simulates calculation. Ash signal simulates Analog output 3.

```
Simulation
Cs simulation
Temp simulation
Raw simulation
Relay simulation
Ash simulation
```

```
Cs simulation
Set Cs:          1.00%
OUT1:11.99mA     49.9%

Low limit:       0.00%
High limit:      2.00%
```

```
Simulation
Cs simulation
Temp simulation
Raw simulation
Relay simulation
Ash simulation
```

```
Raw simulation
Set FS0S:        00107
Set FS0P:        00089

N:        0.831
M:        0.876
Cs:       0.88%
```

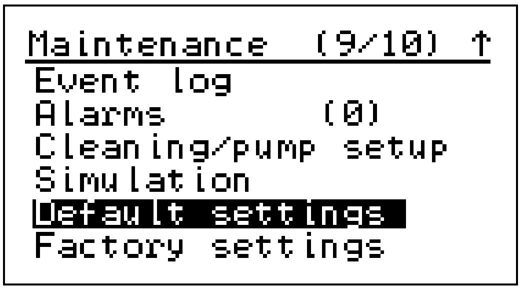
```
Warning!
Use caution when
changing state
of relays.

Enter  -> accept
Esc    -> cancel
```

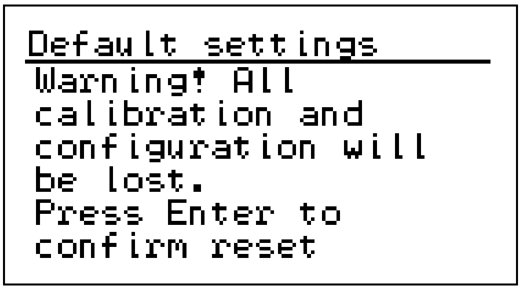
```
Relay simulation
Wash:         Off
Pump:         On
Alarm:        Off
```

7.5.9 Default settings

Default settings will reset the parameters to default settings of the unit. Normally user does not need to take default settings.

> **NOTE**
> Default settings are normally only taken during manufacturing or software update.

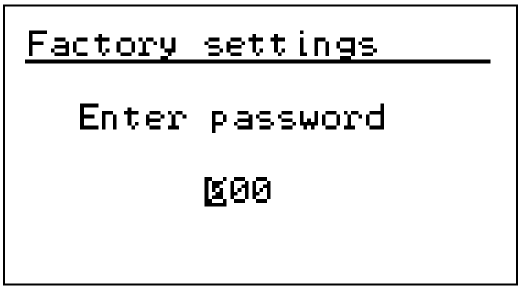


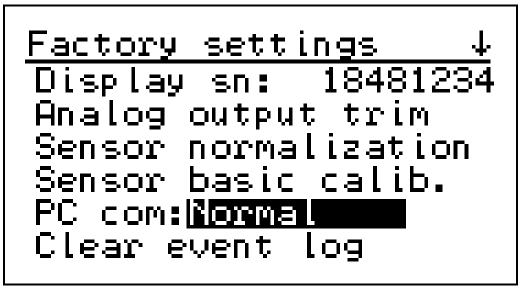


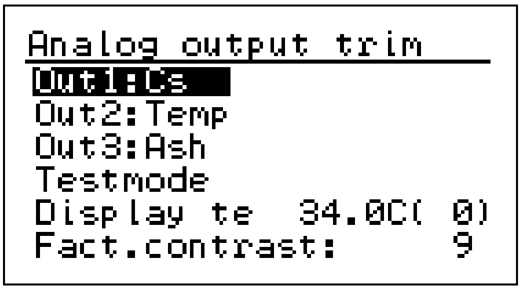
7.5.10 Factory settings

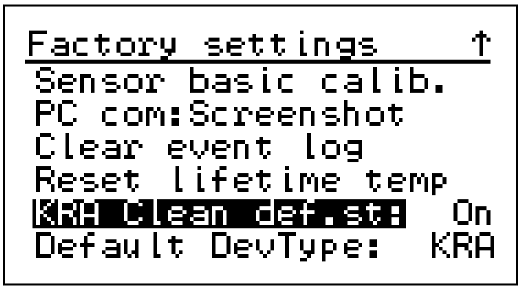
The basic configuration of the unit is set in factory settings. Normal user does not need to enter this menu.

> **NOTE**
> Factory settings are normally only adjusted in manufacturing or software update.









8. Pump unit

8.1 Pump and motor

The pump is a normal priming centrifugal pump with a double mechanical seal. Pump model is Schmitt UP DO130, which is robust and suitable for this application. The maximum pumping capacity is 60 l / min to 10 meter height. The pump casing is of stainless steel 316L. The proper sample flow for this application is 10 – 20 l / second (2,5 – 5 gal / min).

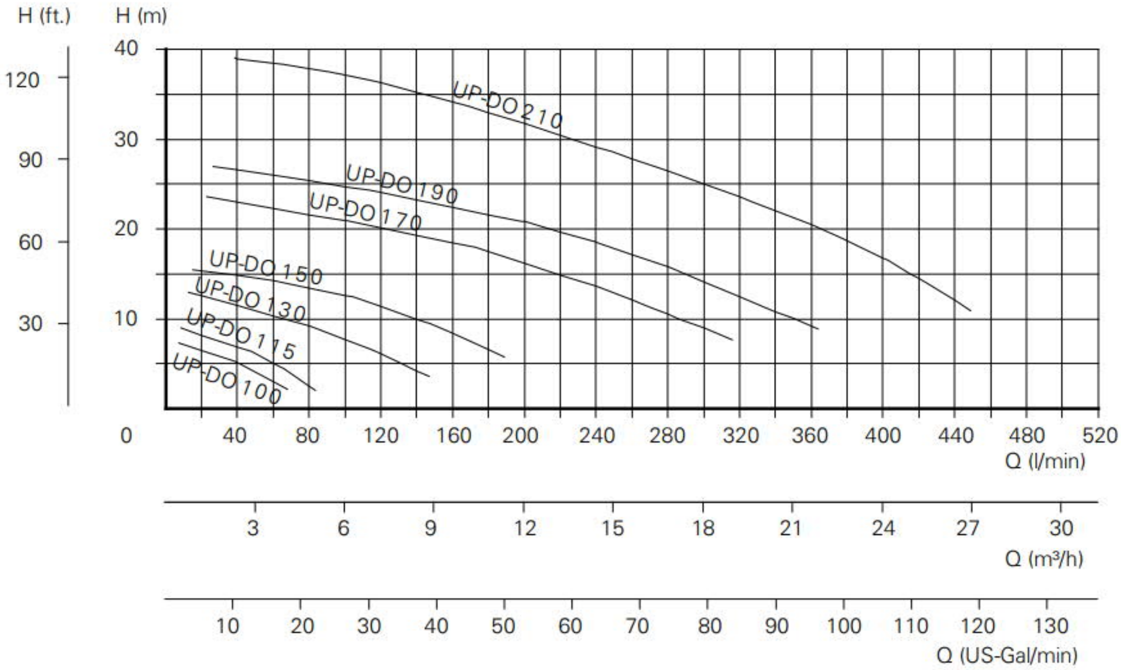


Figure 25. Characteristics of the UP-DO 100 - UP-DO 210 pumps

It is very important to know, that the pump has a standard double mechanical seal and needs sealing water to run. The seal can be damaged after a short time, if no lubricant is available.

Motor is 0.48 kW. Pump running speed default is 2750 RPM with 50 Hz and 3300 with 60 Hz. KPM KRA / T pump running speed can be adjusted with inverter, typical setting is 1800 – 2100 RPM.

Please see more details on the pump manual attached in the end of this manual. Additional information can be found under www.schmitt-pumpen.de

8.2 Inverter

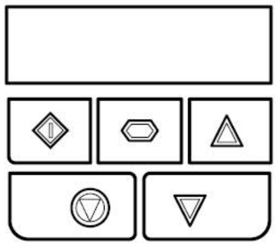
An inverter is used to control the pump motor. There is two inverter models is Optidrive E3 model ODE-3-120043-1F1X for 230V single phase input feed and ODE-3-110043-101X for 110V single phase input.

KPM KRA/T display controls the inverter operation. Pump will be stopped for each cleaning period since flushing works backwards. Also during the process stop the KPM KRA/T pump will be stopped. That is why it is important to bring the process stop binary input for the KPM KRA/T sensor.

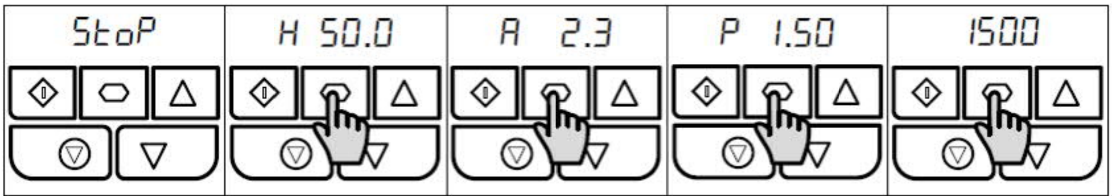
Pumping speed P02 has been preset to 2100 RPM or 30 Hz for KPM KRA/T application. Preset pumping about 12 – 15 Liters per minute. Pumping speed can be changed in case pumping volume is under specified minimum flow 10 liter/ minute (2.5 GPM).

The drive is configured and its operation monitored via the keypad and display.

Key	Name	Function
	NAVIGATE	Used to display real-time information, to access and exit parameter edit mode and to store parameter changes.
	UP	Used to increase speed in real-time mode or to increase parameter values in parameter edit mode.
	DOWN	Used to decrease speed in real-time mode or to decrease parameter values in parameter edit mode.
	RESET / STOP	Used to reset a tripped drive. When in Keypad mode is used to Stop a running drive.
	START	When in keypad mode, used to Start a stopped drive or to reverse the direction of rotation if bi-directional keypad mode is enabled.

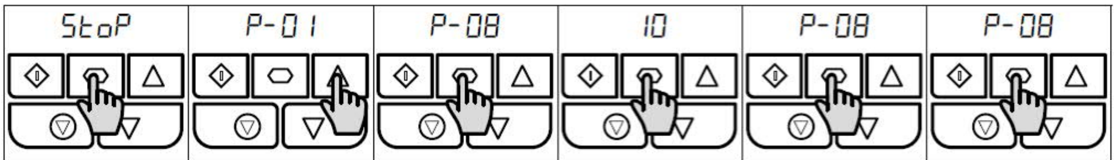


Operating Displays



Drive Stopped / Disabled	Drive is enabled / running, display shows the output frequency (Hz)	Press the Navigate key for < 1 second. The display will show the motor current (Amps)	Press the Navigate key for < 1 second. The display will show the motor power (kW)	If P-10 > 0, pressing the Navigate key for < 1 second will display the motor speed (RPM)

Changing Parameters



Press and hold the Navigate key > 2 seconds	Use the up and down keys to select the required parameter	Press the Navigate key for < 1 second	Adjust the value using the Up and Down keys	Press for < 1 second to return to the parameter menu	Press for > 2 seconds to return to the operating display

Preset Inverter parameters:
P01= 3000 rpm or 50 Hz Maximum Speed/Frequency
P02= 2100 rpm or 30 Hz Minimum Speed/Frequency
P03= 2.0 s Acceleration Ramp
P04= 2.0 s Deceleration Ramp
P05= 0, Ramp to stop, Stop mode select
P06= 0, Disable Energy optimizer
P07= 230V Motor rated Voltage
P08= 1.0 A Motor rated Current
P09= 50 Hz , Motor rated Frequency
P10= 2800 rpm, Motor rated speed
P11= 3% Voltage boost
P12=0 Terminal mode
P13= Trip log
P14= 0 Extended menu

The following faults will result in a drive trip, auto reset and restart:
O-Volt (Over Voltage on DC Bus)
U-Volt (Under Voltage on DC Bus)
h O-I (Fast Over-current Trip)
O-I (Instantaneous over current on drive output)
Out-F (Drive output fault, Output stage trip)

Fault Code Messages

Fault Code	No.	Description	Suggested Remedy
no-FLt	00	No Fault	Not required.
OI-b	01	Brake channel over current	Check external brake resistor condition and connection wiring.
OL-br	02	Brake resistor overload	The drive has tripped to prevent damage to the brake resistor.
O-I	03	Output Over Current	Instantaneous Over current on the drive output. Excess load or shock load on the motor. **NOTE** Following a trip, the drive cannot be immediately reset. A delay time is inbuilt, which allows the power components of the drive time to recover to avoid damage.
I_t-trP	04	Motor Thermal Overload (I2t)	The drive has tripped after delivering >100% of value in P-08 for a period of time to prevent damage to the motor.
PS-trP	05	Power stage trip	Check for short circuits on the motor and connection cable
O-Volt	06	Over voltage on DC bus	Check the supply voltage is within the allowed tolerance for the drive. If the fault occurs on deceleration or stopping, increase the deceleration time in P-04 or install a suitable brake resistor and activate the dynamic braking function with P-34.
U-Volt	07	Under voltage on DC bus	The incoming supply voltage is too low. This trip occurs routinely when power is removed from the drive. If it occurs during running, check the incoming power supply voltage and all components in the power feed line to the drive.
O-t	08	Heatsink over temperature	The drive is too hot. Check the ambient temperature around the drive is within the drive specification. Ensure sufficient cooling air is free to circulate around the drive.
U-t	09	Under temperature	Trip occurs when ambient temperature is less than -10°C. Temperature must be raised over -10°C in order to start the drive.
P-dEF	10	Factory Default parameters loaded	
E-trip	11	External trip	E-trip requested on digital input 3. Normally closed contact has opened for some reason. If motor thermistor is connected check if the motor is too hot.
SC-Obs	12	Optibus comms loss	Check communication link between drive and external devices. Make sure each drive in the network has its unique address.
FLt-dc	13	DC bus ripple too high	Check incoming supply phases are all present and balanced.
P-LOSS	14	Input phase loss trip	Check incoming power supply phases are present and balanced.
h O-I	15	Output Over Current	Check for short circuits on the motor and connection cable. Note: Following a trip, the drive cannot be immediately reset. A delay time is inbuilt, which allows the power components of the drive time to recover to avoid damage.
th-FLt	16	Faulty thermistor on heatsink	
dAtA-F	17	Internal memory fault (IO)	Press the stop key. If the fault persists, consult you supplier.
4-20 F	18	4-20mA Signal Lost	Check the analog input connection(s).
dAtA-E	19	Internal memory fault (DSP)	Press the stop key. If the fault persists, consult you supplier.
F-Ptc	21	Motor PTC thermistor trip	Connected motor thermistor over temperature, check wiring connections and motor.
FAn-F	22	Cooling Fan Fault (IP66 only)	Check / replace the cooling fan.
O-hEAt	23	Drive internal temperature too high	Drive ambient temperature too high, check adequate cooling air is provided.
OUt-F	26	Output Fault	Indicates a fault on the output of the drive, such as one phase missing, motor phase currents not balanced. Check the motor and connections.

Please see more details on the inverter manual. Additional information can be found under www.invertekdrives.com.

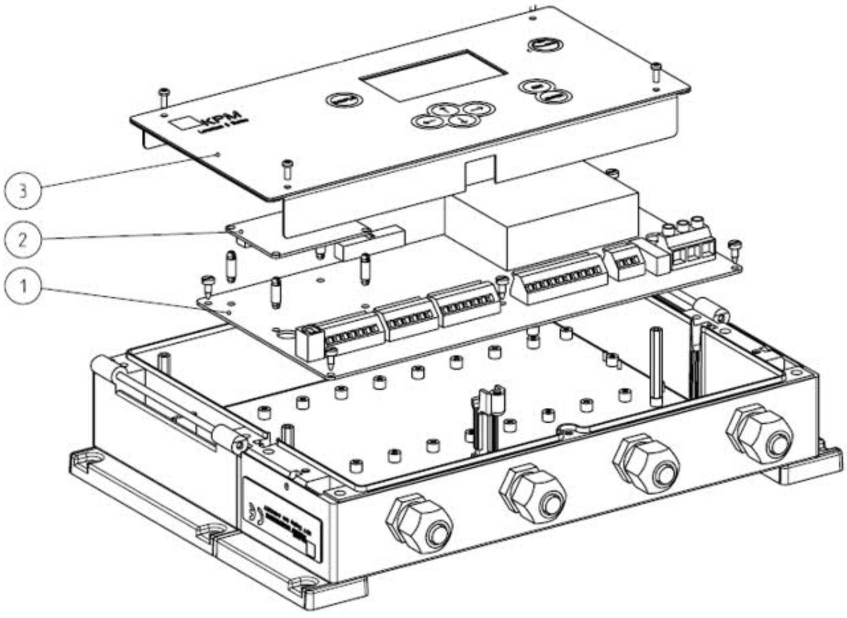
Appendix 1: Technical Specifications

Technical specifications – KPM KRA/KPM KRT retention sensor	
Sensor type	Retention sensor with optical consistency transmitter
Measurement range	KPM KRT - Total Consistency 0 – 2.0 %, minimum 0.005 %, 50 ppm KPM KRA - Total Consistency 0 – 2.0 %, minimum 0.005 %, 50 ppm KPM KRA - Ash Consistency 0 – 1.0 %, minimum 0.005 %, 50 ppm
Process temperature	10 - 60 °C (50 - 140 °F)
Process pressure	Max 10 bar (140 psi)
Sample flow rate	Minimum 10 l/min (2.5 gpm)
Process connection	Sample valve, diameter 21,3 mm with 3/4” tube connector
Sample line	Fluorinated ethylene propylene (FEP) recommended
Output signals	3 × 4–20 mA, Active, Consistency, Ash Consistency (KPM KRA) and Temperature
Binary inputs	4, Closing dry contact , Process stop, Grade change (2), Sampler input
Binary output	1 x Closing or opening dry contact for general alarm.
Power requirements	Headbox sensor: 90-264 VAC 50/60±3 Hz; 20 VA White water sensor: 100-115 VAC or 200-240VAC, 50/60±2 Hz; 800 VA
Ambient temperature	0 – 50°C (32 - 122°F)
Flushing water	Mechanically or Chemically purified, temperature 25-60 °C (77-140°F) Same as sample or max 20°C (68°F) warmer, Pressure 2–6 bar (30–90 psi)
Sealing water	Sealing water quality, needed when sample pump included Same water will be used for flushing, when pump included
Instrument air	Pressure 4 – 8 bar (60 – 120 psi), oil-free
Interconnect cable	From sensor to display unit, Included automatically, 1,0-2,0 meters
Sensor materials	Wetted metal parts AISI 316, lenses sapphire, Wetted tubing FEP
Conformance	73/23/EEC, 89/336/EEC, EN 61000-6-4:2001, EN 61000-6-2:2001, EN 61010-1:2001
Enclosure class	IP 65 (Nema 4x)
Dimensions (L x W x H)	Headbox sensor 379 x 765 x 1170 White water sensor (with deaeration module) 511 x 765 x 1170
Weight	Headbox sensor 26 kg White water sensor 48 kg

Appendix 2: Spare parts

Display unit 4LA41150025V1.3

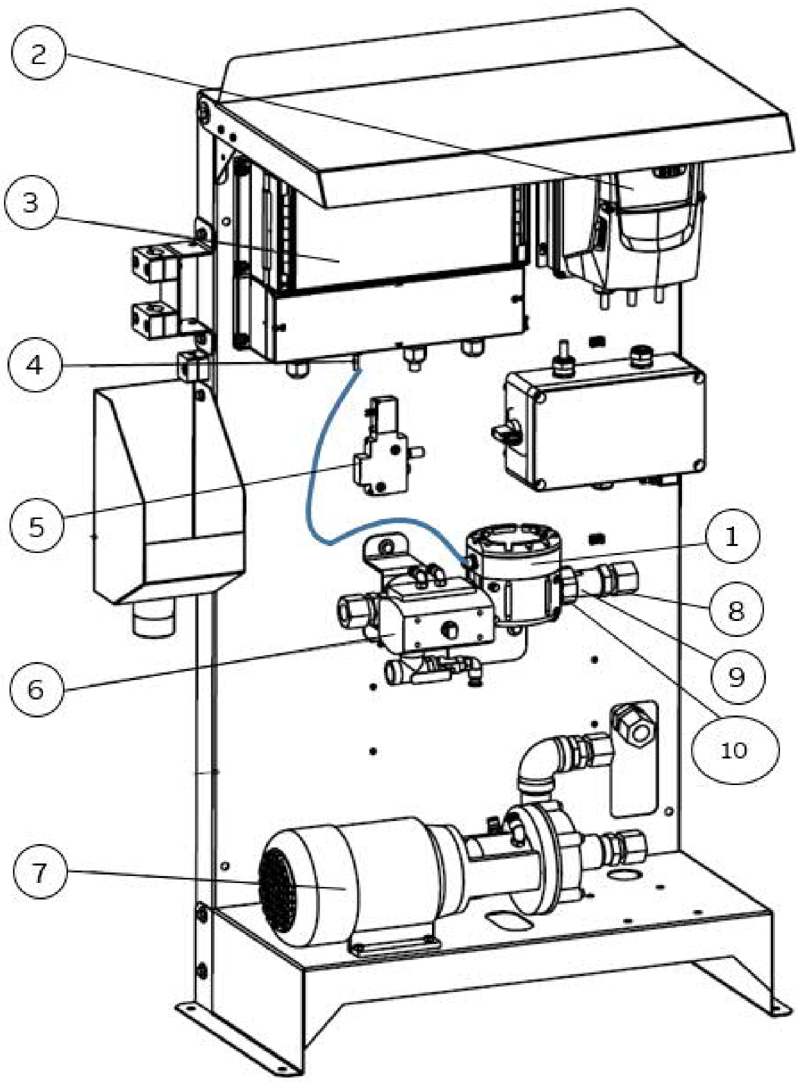
1. 4LA41150084V1.2 Connection Board OC/KC9 L
2. 4LA41140086V2.0 Analog Board OC/KC9 L
3. 4LA41140033V1.2 Display Plate Assembly (including Graphical Display and Keyboard)



Sensor unit

1. 4LA41150280V1.0 KC9-A Total and Ash Consistency Flow-through sensor 0-2,0%
1. 4LA41150403V1.0 KC9-P Total Consistency Flow-through sensor 0-2,0%
2. 4L2800005 AC Variable Speed Drive 230VAC
2. 4L2800004 AC Variable Speed Drive 110VAC
3. 4LA41150025V1.3 Display unit
4. 4L2900008 Sensor Display interconnect cable 2 m, 6.6 ft
5. 4L2200013 Solenoid valve 4/2 24 VDC 6/4 mm inlet & outlets
6. 4LA41150020V1.1 KR Back Flushing Valve Assy

   4L2150009 Actuator, flushing valve, 4L2400008 3-way valve, flushing
7. 4L2550004 Pump Schmitt (without connectors)
8. 4L2450024 Connector R3/4-OD3/4"
9. 4LH41150424V1.0 Mounting Nut M38 x 1,5
10. 4LH41150407V1.0 Connector gasket KC9-A/P



Waste Electronics and Electrical Equipment (WEEE)

This product is labelled with this symbol in accordance with European Directive 2012/19/EU, to indicate that it must not be disposed with your other household waste. Disposing of this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

In the European Union

Please contact your local ABB representative who will inform you about the take-back of the product. Small products (and small amounts) might be taken back by your local collection facilities.

In countries outside the European Union

Please contact your local authorities and ask for the correct method of disposal.

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