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1. General information

It is of great importance to read all parts of this manual prior to startup of the instrument. If the Blanket Monitor is not used and handled according to this manual, then the life and functionality may be jeopardized, and all warranties will be voided.

Security information

This instrument should be used by qualified and authorized personnel only.



It is mandatory to follow all security and other routines that apply at site when using the CBX.

Within EU it is prohibited to dispose of electric and electronic waste in regular waste as these may contain harmful substances. All electric and electronic waste must be sorted and left for recycling. Such products are labeled with an X-marked waste bin. It is important that everyone cooperate in order to secure a high level when it comes to recycling and help to save our environment. If such waste is handled and recycled according to regulation (EC Directive 2002/96/EC) the environment as well as people's health may be jeopardized.



The cable or the sensor must not be touched while it is going up or down (pinching).

CBX noise level is below 70 dB(A).

Description of the function

CBX is an optical suspended solids meter designed to measure sludge and fluff blanket depth in clarifiers, thickeners, etc. in water and wastewater plants, as well in other facilities. It is possible to display measured values as text or as a graphic image of the sludge profile.

Working principle

The sensor is sent down into the clarifier/thickener and measures the suspended solids as it descends and sends the data via a communication cable to the Control Box. By submersing the sensor into the liquid you are able to obtain reliable suspended solids readings versus depth and avoid problems from foam and fluff layers in the clarifier/thickener.

Sensor body

The sensor body contains optics and electronics that should not be exposed to mechanical abuse or high temperatures. If the sensor body has mechanical damages, water may penetrate into the sensor and destroy the electronics and optics. Please see section Maintenance for more information.

2. Installation



It is important that installation, maintenance and configuration only are done by authorized personnel to avoid damages on the product. .

Unpacking

The unit has been tested and approved before delivery from factory. Please check to confirm that no visible damages occurred during shipment. Make sure that all equipment inside the cabinet is secure and that the sensor and cable can move freely.

Damages

If damages occurred during shipment, immediately contact your shipper as well as your Cerlic representative within 2 days of receipt. The shipment may be returned only after contact has been made with Cerlic.

Packing

The original packing is designed to protect the equipment and should be used for storage or if the goods must be returned. If other packing material is used Cerlic is not responsible for damages during transport.

Content

Please check that the content corresponds to your order and packing list.

3. Starting up

Connect power to the CBX and the Control Box (BB1/BB2). Connect the signal cable between both units. The Control Box must have program version 3.1 or higher so it will automatically detect and connect to the CBX.

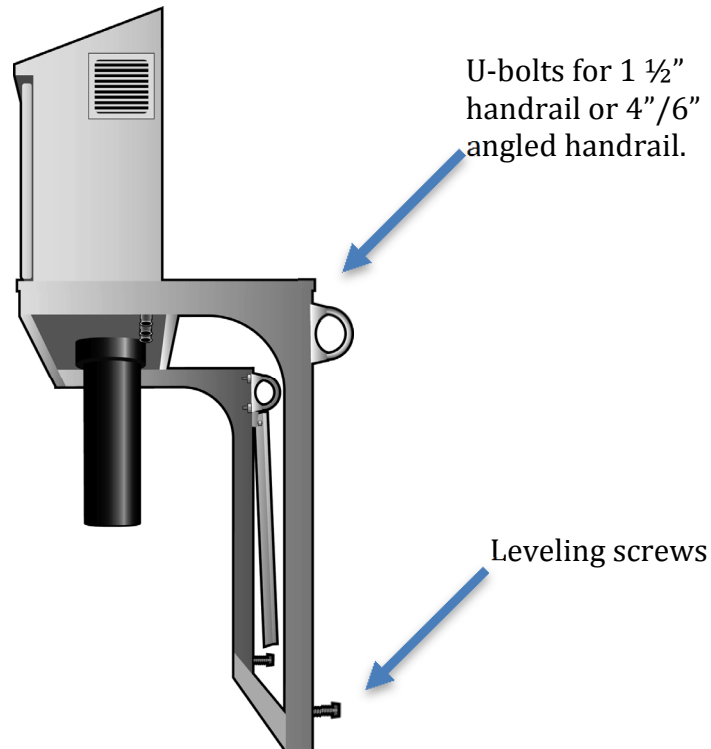


It is a good idea to power CBX from the same group as the rake/stirrer if one exists. Then both will stop at the same time at power failure or triggered fuse. This avoids tearing the sensor off if the CBX loses power while the rake/stirrer continues to move.

Mechanical installation

The support consists of two brackets, left and right hand, and a crossbar brace. Assemble the parts according to the figure.

Hang the assembly on the handrail with the 1 ½" u-bolts or special L brackets for 4" or 6" handrails with supplied set screws. There are two leveling screws to adjust the stand to hang horizontal/vertical.



Mount the CBX so there is no risk that the sensor will be stuck in something on the way down in the basin. This is extra important for outdoor installations where wind can make the sensor swing so much that it is a risk that it will stuck in, for example a hand railing.

Make sure that the sensor runs freely, or through a detachable protection at least 50 cm from the flushing tube. This is for reaching the sensor for control, cleaning and calibration.

When CBX is installed outdoors there is a risk of flush lines freezing at sub zero temperatures. This will not damage the instrument but the automatic cleaning function will stop working. It is also recommended to use a CBX Jacket (P/N 11205969) when there is a risk of temperatures below 23°F (-5°C).

Water connections

On the bottom right hand side of the cabinet there is a ¼ " male connection for flexible flush hose. Connect a tube with at least ½" diameter for flushing. The water pressure shall be between 2 – 6 bar and must not exceed 6 bar (90 psi). Outdoor installations must protect water pipe or hose from freezing conditions or the water must be disconnected and emptied to avoid the hose or valve from freezing. Under all circumstances flushing should be avoided when the outdoor temperature is below 0 °C (32°F).

Electrical connection

In the bottom lower left corner of the cabinet there are the four ½" npt female electrical connections. Any wires required to go outside the cabinet can be found here. Electrical connections must be installed by authorized personnel only. The connections are terminated in the junction box inside the cabinet on the left side.

Connection box for power supply & rake limit switch

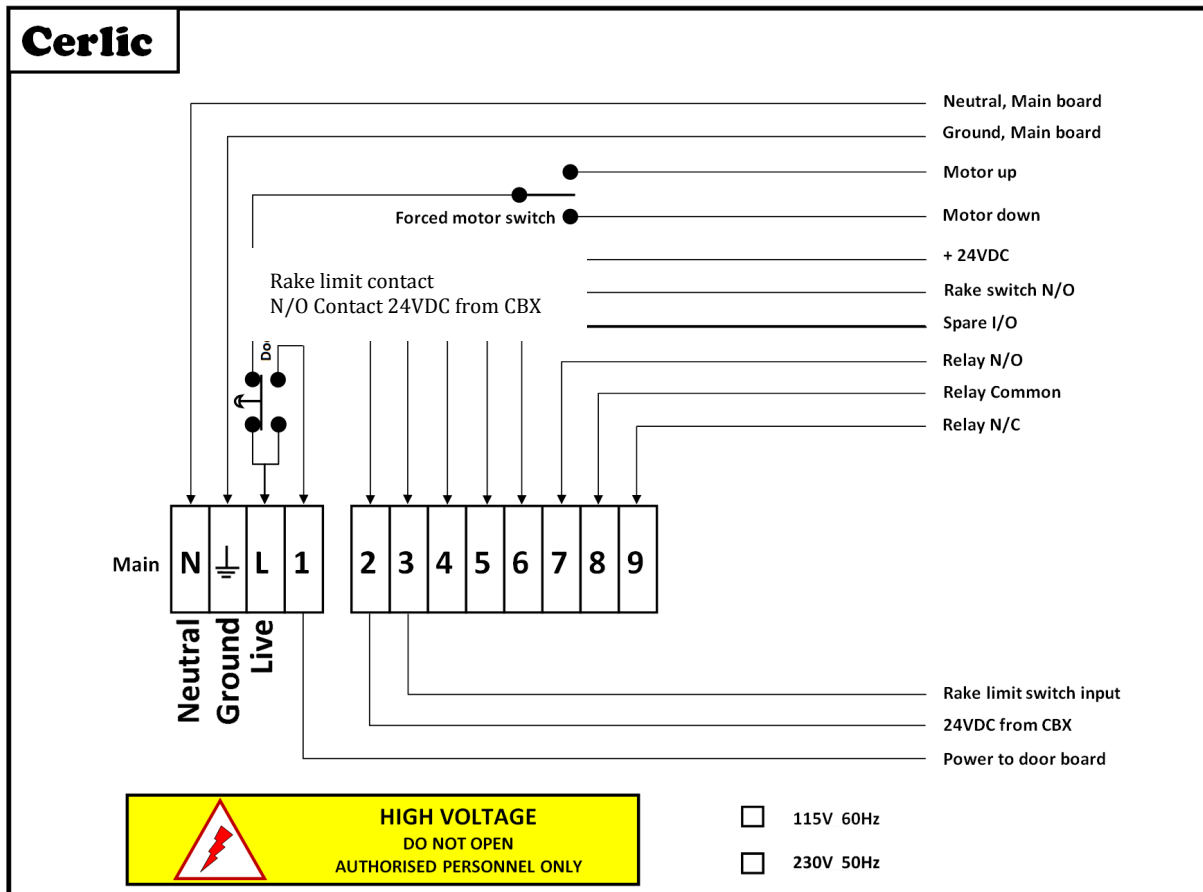


fig 16

If emergency winding/unwinding is to be performed, use the up / down switch. NOTE! Binding risk between cable drum and droplet drainage.

Sludge rake guard limit switch, Trigger

CBX can be installed in an environment where a moving rake is being used. This is done by installing a border contact, closing (NO), which is controlled by the scraper's movement. The signal generated will be used to start the measuring cycle. It is important that there are no objects in front of or behind the sensor when the measuring starts.

The location of the border contact is crucial for achieving reliable sampling. See **contact 2 and 3** (Rake limit switch) in fig 16.

All sampling modes are dependent of the connection of a rake guard limit switch which is a N/O (normally open) contact. The digital input for the limit switch can be used in several different ways for control of the CBX



NOTE! A limit switch must be used in all applications where a rake or other moving equipment may come in contact with the sensor or cable. Cerlic Controls AB does not assume any responsibility for damages caused by the absence or malfunction of the rake guard limit switch.

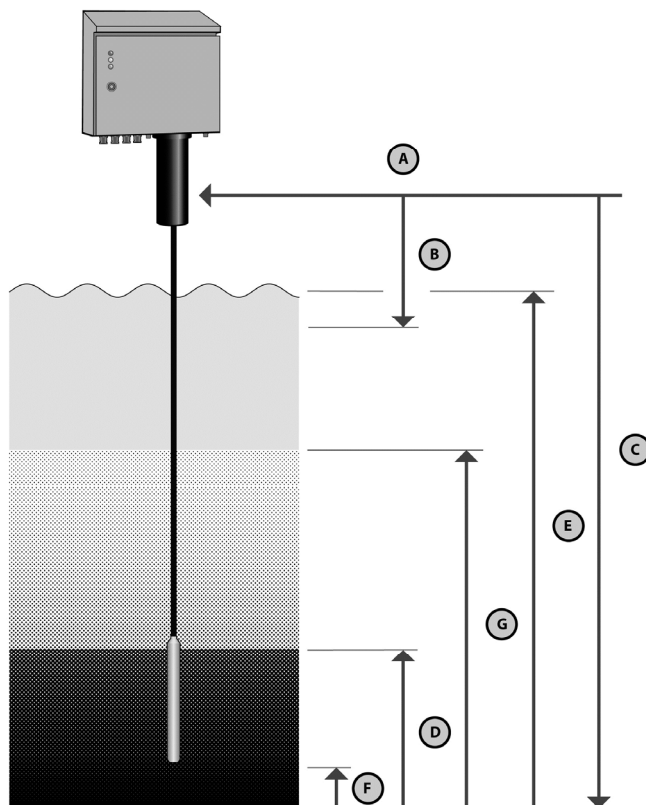
Relay contact 4, 5 and 6 in fig 16. Depending on the setting on the motherboard, this relay can be used for to indicate a fault (alarm) or ongoing measurement.

User interface

The Control Box (BB1/BB2) will show the CBX as a standard “X” sensor on the display and it will show both sludge and fluff level in text on the display. If only one sensor location is used on the Control Box, CBX will display the previous sludge level, concentration and depth in real time during soldering. All configuration is done via the Control Box to which CBX is connected.

Description of important distances when installing CBX

The figure below shows the different terms used for distances that are involved in the configuring of the CBX.



Home position, A

The sensor will always return to this position.

Blind zone, B

Sludge or foam detected in this zone during lowering of the sensor is not registered. Unwanted interference is prevented by setting this zone to be 1' (0.3m) below the normal liquid surface. Sensor does not start to measure until it reaches this distance.

Max depth, C

This is the maximum distance from the home position. The sensor will stop at this depth if no sludge is detected. The sensor might stop and return at a shorter distance if a rake guard offset is entered (F).

Sludge level, D

The sludge level distance from bottom found when the preset sludge concentration is reached.

Measured range, E

The output signal will vary from 4-20 mA within this range.

Raker, F

This denotes the safe height from the bottom (Max depth) to a point where the sensor always must stop and then turn back to home position to alleviate hitting the bottom rake.

Fluff, G

The fluff layer or depth found when the present fluff concentration is reached.

Installation, software

Turn on power to the device.

Configuration mode

Set the CBX in configuration mode, using the control panel:

Menu path	CBX → Calibrate → Mod → Conf
-----------	------------------------------



The green LED on the door should now blink. This indicates that it is in configuration mode. In this mode no automatic measurements will take place, only manual control is allowed. The Trig signal is ignored, this means also that the operator is responsible for having the cable stretched and that a safe measurement can take place (no rake nearby).

Parameters

The following procedure sets the different depths and controls the calibration. This must not be done without controlling if the sensor can move freely into the basin with regard to scrapers, rakes, stirrers or such.

Go to calibration menu and chose manual operation and press down. The sensor will now start to lower itself towards the liquid surface. Stop when it is a few centimeters below the surface.

Note the depth on the display. This gives the value for "Blind zone".

Keep an eye on the measurement (sludge). It should now be relatively low being in the clear phase.

On the way down, observe the variation of the sludge value with the depth. Often two rather sudden leaps can be observed, first when the clear phase goes to fluff and then when fluff merges to sludge.

Check to see if there is a suitable value for fluff and sludge.

Example:

The sensor measures about 500 mg/l in clear phase, 1500 mg/l in fluff-area, and 10000 mg/l in sludge.

Appropriate thresholds are 1000 mg/l for fluff, and 6000 mg/l for sludge.

Memorize or note these leap values.

Be observant when the sensor starts to reach the bottom. If the basin is equipped with scrapers on chains, you will have to find out the max depth from the drawings of the basin, then the CBX will make an automatic adjustment to the height of the scrapers, after a correct "Rake Height" has been noted.

If there is clear ground between the scrapers, then the following procedure can be used: When the sensor is touching the bottom the cable will go slack. Stop immediately and feed the sensor back up until the sensor hangs freely and the cable is stretched. Note the distance on the BB1/BB2, this is the **Max Depth (C)**. Feed sensor all the way back up.

Advanced settings (Defaults)

Now fill in the values that you recorded at the test above.

Menu path CBX → Set up → Avanc.CBX → Max depth

The value for this shall be the deepest value in the basin, which can be calculated from the construction drawing.

Menu path CBX → Set up → Avanc.CBX → Blindzone

This shall be the value down to several inches below the surface. This will prevent the sensor from measuring in the air or surface sludge.

Menu path CBX → Set up → Avanc.CBX → Rake height

If there are scrapers, then note the height on these here, to prevent the sensor from reaching them.

If not, leave the value at 0.

Menu path CBX → Set up → Avanc.CBX → Trig

This set up is for how many trig-signals pass before a measurement starts. If the value is 1, a measurement will be done at every trig-signal. At 2, every other. Normally the trig-signal is connected to the scrape, and after it passes a measurement will be done, for example every 5th time or suitable interval depending on the speed of the scrape. **This value must not be 0** (other than a method to shut off the measurement in an empty basin) **as no measurement will be taken.**

Verify remaining set-ups in this menu:

Menu path CBX → Set up → Avanc.CBX → Mains frek

Main frequency. 50 or 60 Hz.

Menu path CBX → Set up → Avanc.CBX → Rake int.

Delay after trig. With this the measurement can be delayed a number of desired seconds after the trig signal. This can be very useable if you want to extend the distance after the passage of the scrape until the measuring point.

Menu path CBX → Set up → Avanc.CBX → Track

Level: Normal location. CBX measures until known sludge threshold is found, and then returns to box.

Profile: In this mode the sensor measures the depth of the whole basin to enable to superior system which can draw a sludge profile. This demands a rather advanced preparation in superior system and central unit, see app. 1.

CBX Mode

There is two different modes the CBX can be set to, **Setup** and **Trig**.

Trig is the normal working mode. In this mode the CBX will take a sample on every external trig from the rake limit switch.

Setup, the CBX must be set to this mode before changing calibration parameters or using “**MANUAL UP/DOWN**” button.

Rake interval

The rake limit switch starts a measuring cycle. When the rake is passing the rake limit switch the CBX will execute a sampling cycle. It is possible to configure the number of pulses from the rake switch that is needed for a measuring cycle to start, called “**trig**”. This parameter is called “**trig int**”. To delay the time between the samples use “**trig int**”, (normally you will take a sample every 30 - 45 minute). This can be of use if you have several rakes or if you want to extend the time between the samples. The pulse from the rake limit must not be longer than one complete measuring cycle on the CBX.

Normal setting

Go back one step in the menu to come to the usual set-ups.

Menu path CBX → Set up → Deep unit

Note decired unit for to show depth/hight

Menu path CBX → Set up → Kons unit

Note decired unit for sludge concentration

Menu path CBX → Set up → Analogue

Note decired mA output(s) for measuring value. For to have measurement of fluff (see below) at the same time, use two outputs.

Menu path CBX → Set up → Secondary

If signal for fluff is desired, choose this as a secondary signal.

Menu path CBX → Set up → Sludge blanket

Note the leap value for what is defined as sludge. See discussion regarding this in the previous chapter.

Menu path CBX → Set up → Fluff

Note the leap value for what is defined as fluff. See discussion regarding this in the previous chapter.



The value for sludge blanket (and fluff) must never be put higher than the performance of the sensor. The sensor will reach the bottom at too high of a sludge concentration, if a threshold higher than this value is noted it will never be reached. The sensor will, regardless of actual concentration, never find any sludge blanket.



If you need to adjust the level measurement, it is strongly recommended to modify these thresholds rather than calibrate the sensor.

Save and exit

Change to Mod Trig.

Menu path CBX → Calibrate → Mod → Trig

The set ups will be saved. The sensor will return to box (if it is not there already) and thereafter a green lamp shines solidly to indicate that CBX is ready to start as soon as the trig-term is being met.

Operation

All configurations are done via BB1/BB2 that is connected to the CBX. All settings shall be done and saved (done by exiting the menu) before a new sampling is performed. Depth and concentration is shown on the BB1/BB2 on-line during a sampling cycle.

Emergency retraction of the cable

If the CBX for some reason does not retract the cable, then it is possible to do manually. But always try to switch off the main power to the CBX for 10 seconds and then back on line again. The CBX will always start with retracting the cable to “**home position**” after a power loss. If the cable still does not retract use the emergency motor control switch that is located on the box for the terminal block inside the CBX.



NOTE!

Binding risk between cable drum and droplet drainage.

LED indication

Red	Yellow	Green	Status
			CBX Start Up, Light Test
			Standby, waiting for next sample cycle
			Configuration or Setup Mode
			Sampling
			Configuration or Setup error, check parameters
			Mechanical or Electrical Problem
			Cold Temp, less than 36°F inside the unit. Shut down the CBX to alleviate cold weather damage

BB1/BB2 menu for CBX



This section describes the menus used in BB1/BB2 to set up the CBX for operation. **! Important**, you need to exit the Settings menu to save the parameters or changes!

Settings

Tag	Name of the sensor (10 characters) shown on the main display.
I-Time[s]	Integration time or dampening - can be set up to 999 seconds. This is integration in BB1/BB2. The value coming from CBX is normally also an average.
Manual up/down	Depth/Hight. Chose how to measure the sludgelevel; from surface and down (Depth) or from bottom to top (Hight).
Remote control up/down	Manual operation of the sensor up/down via BB1/BB2. To make this function work the unit must switch from “trig” to “conf”.
Depth Unit	Unit used for distances in CBX settings in m, cm, inches or feet & inches.
Cons units	Unit for measure in “%”, “ppm”, “g/l”, or “mg/l”
Analog	Set the analog output channels for sludge blanket depth (distance D in fig 4) as primary and (optional) second analog for fluff (distance G in fig 4) if used.. 1, 2, 3, 4, 1&2, 3&4, all or none. Standard is all .
Second Blanket Concentration	This shows the height of the fluff layer from the bottom Set the consistency that will define the blanket. This can be done by entering a blanket concentration.
Fluff Cons	(optional) Set the concentration that will define the fluff layer. This can be done by entering a fluff concentration.

CBX Setup

Sub Program for initial CBX set-up

CBX setup

Mains freq

The frequency of the power, i.e. 50HZ in Europe and 60Hz in the USA.

Trig

Number of trig closures before lowering the sensor

Max depth The maximum travel distance from home position (**A**). The sensor will stop at this depth if no blanket or sludge is detected (**Distance C**). This travel distance will be shortened if a rake offset exists (**distance F**)

Blind zone **Distance B**. Distance to where sensor must travel before it starts to measure solids. Sludge or foam detected in this zone during lowering is not registered. Unwanted false blanket depth is prevented by setting this zone to be approximately 25cm (1 ft) below liquid surface.

Rake height **Distance F**. This denotes the safe height from the bottom (**Max depth**) to a point where the sensor always must stop and then turn back to home position to alleviate hitting the bottom rake.

Rake int The rake switch starts a measuring cycle. When the rake has activated the rake switch so the CBX will execute a sampling cycle. It is possible to configure the number of pulses from the rake switch that is needed for a measuring cycle to start.

Track **Profile/Level**. You can set if the CBX shall measure sludge profile or only sludge and fluff levels. If the CBX is set to **Level** the sensor will stop when it detects the sludge level and return home.

Calibration

Mode

Setup: The CBX must be set to this conf. mode before changing calibration parameters or using “**MANUAL UP/DOWN**” button.

Trig: This is the normal working mode. In this mode the CBX will take a sample on every external trig. Set CBX back to Trig for normal use..

Manual up/down

Enables the BB1/BB2 to control the sensor in the CBX to go UP and DOWN. In this mode the depth and concentration are displayed in the BB2. . Must change “**MODE**” to “**TRIG**” to activate.

Take sample

No / Zero / Sample - Chose the type of calibration. Zero is for clean water and Sample is sludge sample or concentration.

Cons

Current concentration.

Sample

Enter concentration from Lab test – concentration/suspended solids value for Sample.

Cleaning

Cleaning	Yes/No Yes, flush cleaning is switched ON . No, the flush is switched OFF .
Manual up/down	Enables the BB1/BB2 to control the sensor in the CBX to go UP and DOWN. In this mode the sensor is switched off and can be left out for an unlimited time for cleaning. Must change “ MODE ” to “ TRIG ” to activate.

Scale / Alarm

Max	Max level or 20 mA output, distance E in fig 2
Min	Min level or 4 mA output
Hi-Alarm	Max level for alarm
Low-Alarm	Min level for alarm
Alarm Relay	Pick which alarm relay is to be used on the BB1/BB2

System

Type	Type of sensor, read only information
Serial	Serial number of the sensor, read only information
SoftW	Software version of the sensor, read only information
Info	
Ch1	Info, measured light value on channel 1
Ch2	Info, measured light value on channel 2
Samples	Counter that shows total number of samples taken by the CBX from the last power off.

Timer

Timer	On/Off, switch the timer function on or off
Interval min	Delay time between samples in minutes
Relay	Relay 1/ Relay 2, can be used as level alarms. You can configure one of the internal relays as a timer to start the CBX if you do not have a rake to use as a trigger.
Next time	Next time the sample starts

Information display

If you press ↓ and ENT key at the same time you will see an information display that shows the status of the display.

If you press one more time at the ↓ and ENT key you will see a graphical profile of the last sampling (available on software on the BB1/BB2 3.23 and later).

The profile shows fluff and sludge level, the top number is fluff level and the lower number is sludge level measured from the tank bottom and up.

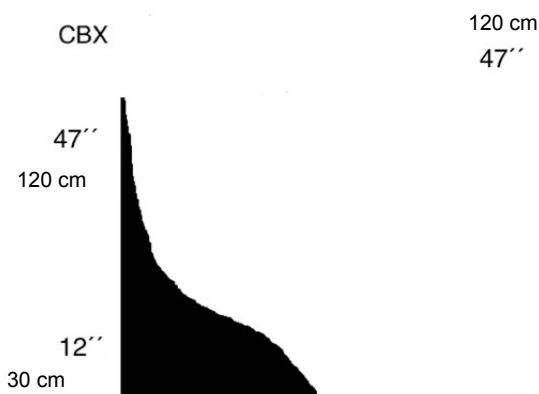


fig 3

Calibration

Before leaving the factory the CBX sensor is calibrated to give accurate measurement directly at installation. Normally the calibration only needs to be verified with even intervals. The status of the sensor can disturb the calibration if it has got a coating on the glasses in the measuring gap, it will then show a too high value.

Zero calibration is done with clean, de-aerated water in a bucket without direct sunlight. Sludge (Sample) calibration is done with a known concentration in a bucket.

Calibration of sensor

1. Enter the menu in the central unit by holding "ENTER" for five seconds. Choose Calibrate in the menu and press "ENTER".
Change "MOD" value from "Trig" to "Conf" confirm with "ENTER". The green LED lamp on the door starts to flash. The display now shows Measured value display.
2. Enter the CBX menu again by pressing "ENTER" for five seconds. Chose Calibrate again. Now it says "Mod" on "Conf" (configurate).
Scroll down to "Remote control" and confirm with "ENTER". Here it is possible to hover the sensor up and down with the keys.
Press arrow down to hover down the sensor. OBS; The cable must be held stretched. The sensor shall be vertical on the way down, if you angle it more than 50° it will stop.
Leave the menu, and go back to Calibrate by pressing "ENTER".

3. Clean and control the lenses, lower the sensor in clean water. Look at the "Conc" value: **If this is close to 0** move on and control sludge. Put the sensor in sludge. If an expected value is shown then no calibration is necessary. Move on to item 7.
4. **If it shows another value**, calibration shall be done:
Go to "Take Sample" and confirm with "ENTER". Chose "Zero" on the right side in the display and confirm with "ENTER". Next window asks: This will change the calibration. Continue? Chose "Yes" and confirm with "ENTER". Next window wants you to acknowledge sensor in clean water, confirm with "ENTER". Now the zero-point is calibrated.
5. Test calibration; Choose "Take sample" in the menu and then "Sample". Stir the sample so it will not settle. Confirm with "ENTER". Next window asks: This will change the calibration. Continue? Chose "Yes" and confirm with "ENTER". Lower the sensor in a bucket with the sludge sample. New window wants you to acknowledge sensor in test 1, confirm with "ENTER".
6. Continue to "Value" and press "ENTER". Put in the lab sample value. If you do not have this take an estimated value. This can be changed afterwards*.
7. Go to "Mod" and chose "Trig" and press "ENTER".
The central unit will now show the Measuring values menu again. The green LED lamp on the door shall now go back to steady light which indicates working position.

*If you do not have the value for the lab test you can write an estimated value. Later, when you have the real value from the lab you put that in instead, with no need to do the calibration again. If you get the value of the lab sample after a couple of days you must go to "Calibrate" in the menu and change the estimated value to the correct one. Exit all menus back to measuring value display again.

4. Detailed information of CBX

The sludge blanket monitor system is constructed from parts built inside a cabinet. The parts are described and illustrated in the sections below.

Main control board

Huvudkortet styr och hanterar alla signaler som fläkt, värme och motorstyrning och BB1/BB2 kommunikation. All data som hanteras från givaren till BB1/BB2 är digitala.

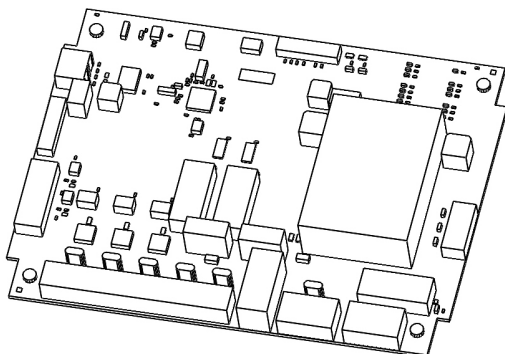


fig 5

The main control board controls the mechanical events in the cabinet and communicates with both sensor and BB1/BB2. The BB1/BB2 communication is done through RS-485 interface.

Other signals going in and out of the cabinet are also connected to the main control board.

The board collects the values of sludge concentration from the sensor and distributes them to the BB1/BB2 for presentation.

Sensor

The sensor is connected to a cable that supplies it with power and transmits the communication signals. The sensor contains a near-infrared light source and a receiver that are positioned in such a way that the light passes through the liquid.



fig 8

Cable drum assembly

The cable drum moves the sensor up and down in the clarifier. It is mounted directly on the axle of a synchronous motor, hidden behind the drum mounting plate, with a very constant speed. Since the diameter of the cable roll in the drum varies, the speed of the sensor will vary. It will move slower during the end of the sampling cycle.

The cable and sensor are cleaned by a water spray in the flushing tube mounted below the SS enclosure during return of the sensor to the home position.

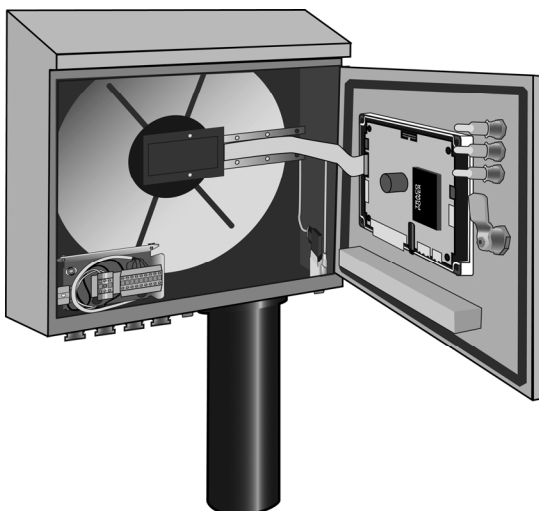


fig 9

Heater & fan

Hidden behind the drum mounting plate there is a heater which is used in cooperation with the fan to maintain a stable temperature inside the cabinet. The fan is mounted on the top right side of the cabinet, *fig10*.

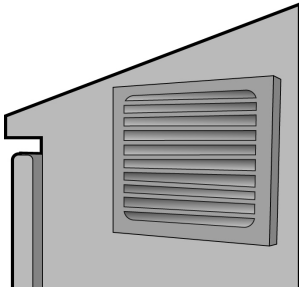


fig 10

Flushing tube & valve

The flushing tube contains a flushing nozzle ring that sprays cleaning water around the sensor and cable during the return or rising of the sensor to the home position.

The flushing valve is controlled by the main control board.

In the top of the flushing tube is the home position sensor. There is an inductive limit switch in the top of the flushing tube to determine the correct position or home position of the sensor. There is a SS clip on the cable for the limit switch to detect when in the home position, *fig 11*.

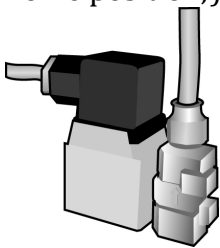


fig 11

Connection terminal

In the lower left corner of the cabinet there are connection terminals for the external wire connections. To the lower left corner of this terminal block there is a safety switch that will disconnect the power when the cabinet door is opened. There is also an emergency motor control switch that is located on the box for the terminal block inside the CBX. The switch can be located on top of the terminal box or under the lid, *fig 12*.

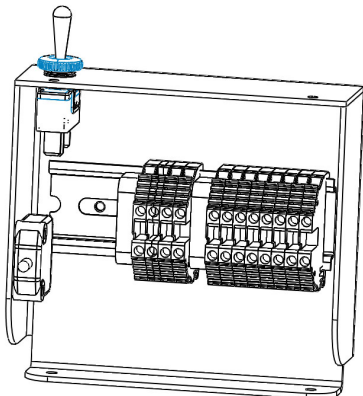


fig 12

5. Safety instructions, CE marking

The instrument is CE marked and follows EU directives and standards as listed below.

Installation of the equipment should be done by authorized personnel only.

CBX may not be installed so that the safety of the plant is affected or where there is a risk of explosion.

Operation and service may only be carried out by trained personnel. The equipment should be installed with a safety switch to facilitate installation and service.

The electrical equipment fulfills applicable regulations and the electronics are encapsulated (IP 65, NEMA 4). Electrical connections must only be carried out by authorized personnel.

CBX conforms to the following EC Directive(s) when installed in accordance with the installation instructions contained in the product documentation:

Machine Directive: 2006/42/EG

Low Voltage Directive: 2014/35/EU

EMC Directive: 2014/30/EU

The standards and/or technical specifications referenced below have been applied:

For Low Voltage Directive:

SS-EN-60950 1 Ed 2:2006 Information technology equipment. – Safety – Part 1: General requirements.

SS-EN 61010-1 Ed 3:2010 Electrical equipment for measurement, control and laboratory purposes – Safety – Part 1: General requirements.

For EMC-directive:

SS-EN 61000-6-2 Ed 3:2005 Electromagnetic compatibility part 6-2: Generic standards – Immunity for equipment in industrial environments.

SS-EN 61000-6-4 Ed 2:2007 Electromagnetic compatibility part 6-4: Generic standards – Emission standard for equipment in industrial environments.

5. Maintenance

The electronics have a built-in system for monitoring sensors, communication and mechanics. Nevertheless, we recommend a regular inspection of mechanics and sensors as shown below, as CBX is a mechanical product. How often a CBX requires a more comprehensive service is primarily determined by how hard the machine is loaded and the environment in which it is installed.

The wear is mainly dependent on is mainly dependent on how many meters of cable which is wound by the CBX per time unit.

The wear rate thus depends on how often the sensor is transmitted down/up by the CBX and the length of cable that is wound at each time.



The length of wound cable per year can be calculated using the following formula:

L = Total length in that has been wound per year

N = Number of times per hour that the sensor has been lowered.

D = Length in meter at every occasion.

$$L = (N \times 24 \times 365 \times D \times 2) / 1000$$

Ex:

The sensor is lowered 1 time/hour and 5 m cable is rolled out at every occasion will be total length cable in km per year:

$$L = (1 \times 24 \times 365 \times 5 \times 2) / 1000 = 87,6 \text{ km/year}$$

IMPORTANT!

To ensure the reliability of CBX, we recommend a more comprehensive service every 100 km of wound cable. Cerlic recommends that one of Cerlic trained service technicians perform this function and wear control as well as required calibration on CBX. Performed actions are documented in a quality protocol for each instrument

The functional guarantee provided by Cerlic on CBX assumes that maintenance and service are performed as above.

Manual operation of CBX

It is possible initiate a manual trig of a sample. By holding down the “down arrow” for 5 sec on the BB1/BB2. The CBX starts a sampling cycle ASAP and returns the sensor back home and normal mode. If more then one sensor (BB2) is connected this function will be disabled.

↓ Starts lowering of sensor.

↑ Stops lowering of sensor and returns the sensor home.

Maintenance schedule

Once a month	Once every 6 months	Once a year
Check sensor for buildup, clean with damp cloth if necessary	Clean sensor lens. Check if the sensor measures around 0 in clean water. If not perform a 0 calibration. Oil the cable guiding wheel with silicon spray.	General check and cleaning of mechanics, cable and fan filter.

Cable and sensor

Visually check that the cable is correctly wound on the drum and that cable does not show wear.

Sensor lenses.

Visual check of the lenses. Clean with Cerlic (CSC) sensor cleaning liquid and use a soft rag if necessary. Check for build up or “film” on lenses.

Fan

Air filter, remove the cover from the outside and check the filter. The air filter might need to be replaced or cleaned if the equipment is installed in a dusty environment. Remove the protective grating by popping it off with a screwdriver and put it back on by pressing it with your hand. Make sure the fan starts every time when the sensor is on the way up. Be aware of condensation inside the CBX which can cause problems.

Screws and nuts

Verify that everything is properly secured, no loose parts or rattling

Sensor check

The sensor is easily checked by immersion in clean water. This should give a low value of about 0 ppm . By putting something solid (a finger) in the gap a value of 3000 - 9999 depending on calibration, should be given.

6. Troubleshooting

If external power surges, or any other problems, have caused the electronics to stop, then a reset may be performed by switching the power OFF and then ON. This can easily be done by opening the CBX door and then closing.

Alarm

A number of errors can be detected and shown on the BB1/BB2. The alarm error is displayed in plain text and the alarm contact is closed. It may stop the operations of the CBX and it is reset by pressing ENTER on the BB1/BB2.

SENSOR TILT means that the sensor has tilted more than 45 degrees and the tilt switch in the sensor has detected this. The sensor is retracted to home position and an alarm is shown.

SENSOR ERROR means that no signals are being received from the sensor. The sensor is retracted to home position and an alarm is given.

SENSOR STOPPED means that the drum with sensor and cable is standing still when it should be moving. The control stops and an alarm is given.

SOFTWARE means that the software on the CBX and Central Unit is not fully compatible. Contact Cerlic Controls AB for an update.

Common symptoms and possible causes

Symptoms	Possible causes
The sensor reads, but never finds any sludge.	<ul style="list-style-type: none"> • Too high of threshold • Incorrect calibration
The sensor starts but returns immediately	<ul style="list-style-type: none"> • None, or too short blind zone is noted • Too low of threshold is entered • Incorrect calibration • Lenses in need of cleaning
The sensor does not move	<ul style="list-style-type: none"> • The sensor is put in conf-mode (Green LED flushes) • Trig is noted to 0 • The external trig signal is wrong or missing • The temperature in the box is close or under freezing
The cable is tangled	<ul style="list-style-type: none"> • The cable needs cleaning (sticking between the yards) • The wheel sheaves (lubricate only with teflon oil) • The sensor is not moving freely • Heavy wind captures the sensor, long distance to the surface • CBX is not correctly mounted, horizontally • Wrong max depth noted, the sensor reaches the bottom. • The sludge is so thick that the sensor cannot penetrate it by its own weight.
BB1/BB2 cannot find the CBX	<ul style="list-style-type: none"> • The cable between BBX and CBX not properly fixed • BBX not restored before initial connection to CBX • BBX and CBX not restarted at the same time when first switched on
Measurement over time shows high spikes that do not correspond to reality	<ul style="list-style-type: none"> • Too low of threshold is entered • Too short blind zone • Lenses need cleaning
Measurement over time shows low spikes that do not correspond to reality	<ul style="list-style-type: none"> • Too high of threshold entered

Tests

Quick control of the calibration.

1. Put the sensor in conf mode

Menu path CBX → Calibrate → Mod → Conf

2. Lower the sensor manually so it will be reached for inspection.

Menu path CBX → Calibrate → Remote Control

3. Wipe the gauge with a cloth, paper, etc.

Now read the measurement value of the sludge. It should be about 0-500 mg/l in air or clean water.

Insert a finger into the gauge. This should yield about 7000-9000 mg/l

If these values are obtained, the sensor's factory calibration is intact. If not, it should be re-calibrated, see section calibration in the manual.

4. Reset the sensor to trig-mode

Menu path CBX → Calibrate → Mod → Trig

Control of max value

1. Put the sensor in conf mode

Menu path CBX → Calibrate → Mod → Conf

2. Lower the sensor manually so it will be reached for inspection.

Menu path CBX → Calibrate → Remote Control

3. Block the sensor gauge completely by placing a metal item that covers the entire gauge. Read the value in the display. Normal value is 10,000-20,000 mg/l depending on calibration .

The threshold values for sludge and fluff must therefore be below the measured value.

4. Reset the sensor to trig-mode.

Menu path CBX → Calibrate → Mod → Trig

7. Contact information

Actual visit and receiving address is always available at the Cerlic web page.

Cerlic Controls AB

Mälarvägen 3, SE 141 71 SEGELTORP, Sweden

Phone:+46 850 169 400

Mail address: P.O. Box 5084, SE-141 05 KUNGENS KURVA, Sweden

web: www.cerlic.com

8. Warranty

Instruments delivered from Cerlic Controls AB, are carefully checked and tested prior to the shipment.

Cerlic performs warranty repair of the CBX if it is determined that the problem is of any fault in manufacturing or equipment during the warranty period.

9. Specification, CBX

Manufacturer	Cerlic Controls AB, Sweden. Made in Sweden
Name	CBX
P/N	12705887A (230VAC) 12705887B (115 VAC)
Dimensions	See drawing page 30
Weight	21 Kg (46 lb) incl. accessories
Enclosure	NEMA4 (IP65), Stainless steel
Measuring principle	By optical sensor with straight light transmission of NIR-light for suspended solids monitoring.
Supply voltage	115 V/1/60 Hz (US) 230-240 V 50 Hz (Europe)
Fuse (S1)	5 A(T1AH, 20 x 5 mm fuse)
Power Usage	Max 450 W (24 V electronics)
Stand by power	10 W
Ambient temp	-5°C to +50 °C (22°F to 122°F)
Optional Jacket	-20°C to +50 °C (-4°F to 122°F)
Internal heating	Full power below 5 °C (41°F), Off above 15 °C (59°F)
Storage temp	-20 to +60 °C (-4°F to 140°F)
Rake Limit Switch	Closing, contact normally open. 24VDC is supplied from CBX.
Sensor	Waterproof to 10m (30 ft.) in stainless steel 2343 with cable in PUR
Motor	Electric, (Brushless AC)
Lowering speed	110V; max 15cm/s. 220V; 12.5 cm/s. Full cycle time for 10 meters (33') is 3min.
Measuring depth	0... 10 m (33')
Measuring range CBX	0 – 20 000 mg/l
Measuring range CBX plus	0 – 50 000 mg/l
Resolution CBX	+/- 50 mg/l (depending on type of sludge)
Resolution CBX plus	+/- 1 mg/l (depending on type of sludge)

10. Spare parts and Options

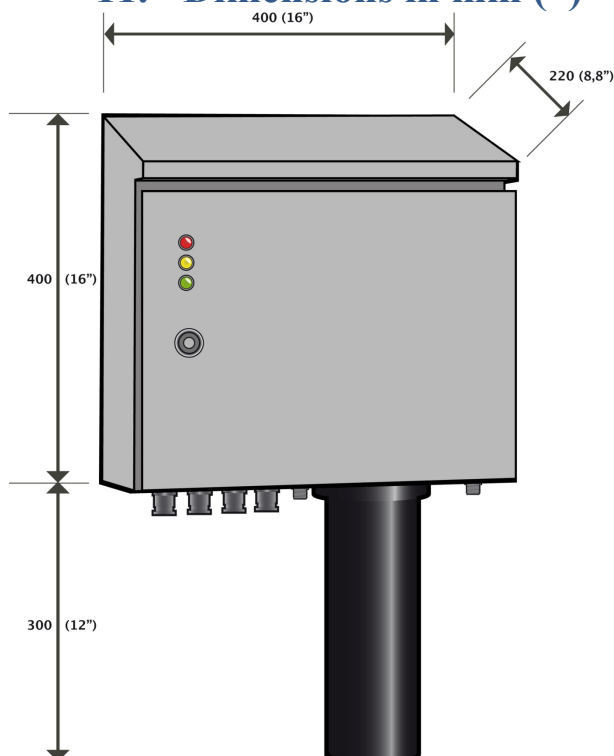
Spareparts

	P/N
• SS Handrail Mounting Bracket	10305893
• BB1 Control Box	11905885
• BB2 Control Box	11905426
• Mounting plate for BB1/BB2	10305532
• M12 Cable 1.5m (5')	20805752
• M12 Cable 10m (33')	20805510
• M12 Cable 30m (100')	20850727
• Solenoid Valve 115V	21750716
• Solenoid Valve 230V	21750710
• Motor 115V	21750924
• Motor 230V	21750925
• Door key	20305403

Options

• CBX Jacket (for cold weather)	11205969
• Isolation & heating for flush tube	21705987
• 4-20 mA expansion board	11905782
• Profibus DP module	21705681

11. Dimensions in mm (“)



Appendix 1, Profile

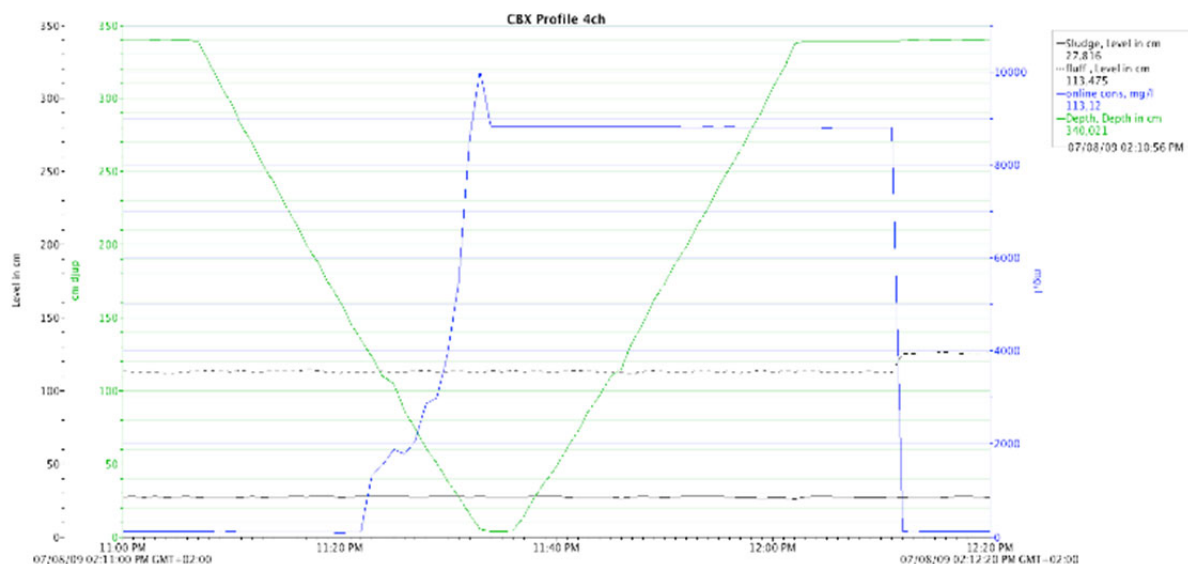
CBX users can get the sludge profile using the 4 output signals on the BB2. It is updated at the end of each sampling cycle (channel 3 & 4 are on-line during sampling). This option requires an extra card in the BB2 unit with two more 4-20mA signals (total 4 outputs). For to have a good resolution on the profile, sample CH1 and CH2 with 1 Hz. Attach the extra mA card to the BB2 (P/N 11905782) see appendix 6.

Follow the checklist below to get started

- Set the analog outputs on the BB2 to “all” (settings/analog)
- Set second to “fluff” (settings/second)
- Set the track to “profile” (settings/CBX setup/track)

The analogue 4-20mA assign to the following channels when using “profile”

Channel 1	High of sludge blanket, signal updated every time a new measurement is done. Scale is the same as (scale/alarms/Max depth).
Channel 2	High of fluff blanket, signal updated every time a new measurement is done (scale/alarms/Max depth).
Channel 3	Concentration on-line during a sample otherwise 0. Scale is locked to 0-30000 mg/l.
Channel 4	Depth of sensor on-line during sampling otherwise 20mA. Scale is same as (scale/alarms/Max depth) See graph below how a typical profile can look like when you have about 1ft of sludge and 3ft fluff on top of the sludge.





Appendix 3, Setup Form

This sheet can be used to document the setup of a sensor.

Sensor Type _____
Position / Tag _____

In the System sub menu of the sensor menu the following information can be collected.

Serial _____
SoftW _____
Samples _____

In the Settings sub menu of the sensor menu the following parameters can be set.

I-time _____
Analog _____
Blanket Conc. _____
Fluff Conc. _____
Mode _____
Mains Freq. _____
Trigger _____
Max depth _____
Blind zone _____
Rake height _____
Track _____

In the Scale sub menu of the sensor menu the following parameters can be set.

Max _____
Min _____
High alarm _____
Low alarm _____
Alarm Relay _____

Leave the BB1/BB2 menu by pressing . and ENTER at the same time.