ITX 20

Suspended Solids Sensor

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1. Introduction

The ITX sensor is designed to measure suspended solids concentrations in liquids. Combined with the BB2 control box, the sensor is used to measure suspended solids content as a function of the ability of suspended materials to absorb and reflect NIR-light (Near Infra-Red).

2. A few words about this manual

This manual details installation procedures and operational features of the Cerlic ITX sensor. Menu navigation and technical data for the BB2 control box can be found in the BB2 service manual.

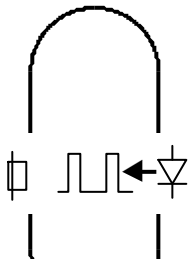
3. Design

The ITX sensor is manufactured with 316SS (SS2343) stainless steel. The inside of the sensor is designed to achieve the highest self-cleaning effect, providing an exact and reliable measurement with the least possible maintenance under critical applications. The measuring lenses within the housing are made of glass. The electronics and optics are protected in the rugged casing, ensuring its reliability in very demanding environments.

The sensor has a fixed, shielded 10 m (33') cable used for signal transmission between the sensor and the BB2 control box. The cable sheath is made of Hytrel and is highly resistant to aggressive materials and fluids.

4. Measuring principle

The ITX measures transmitted light through the liquid. The measuring principle is based on the suspended particles' ability to absorb and reflect NIR (Near Infra-red) light. The light source is a light emitting diode that pulses and emits monochromatic light with a wavelength of 880 nm. The detected measuring signal is inversely logarithmical proportional to the consistency or suspended solids. Signal treatment or linearization is done within the BB2 control box.



Cross-section of measuring gap.

5. Unpacking the ITX Suspended Solids Sensor

The unit has been tested and approved before delivery from the supplier. Please check to confirm that no visible damages occurred during shipment.

Damages

If damages occurred during shipment, immediately contact UPS or other truck line as well as your Cerlic representative. The shipment can be returned only after contact has been made with Cerlic.

Packaging

The original packaging is designed to protect the equipment and should be used for storage or if the goods must be returned.

Content

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

Every shipment should include:

- ITX Sensor w/ 10 m (33ft) cable and flushing hose, P/N 11305455

Optional parts for ITX Suspended Solids Sensor:

- Mounting bracket X, incl. rod holder P/N 11205539
- Telescopic rod, 4 m, incl. transmitter holder P/N 20205501
- Adjustable slide rail sensor holder P/N 11205600
- Solenoid valve for flushing P/N 11705516
- Aluminum handrail mounting plate predrilled for BB2 and solenoid valves w/ u-bolts, outside US version P/N 10605533
- Aluminum handrail mounting plate predrilled for BB2 or solenoid valves w/ u-bolts, US version P/N 31204049
- 33 ft. (10m) extension cable with plug-in connectors. P/N 20805510
- Y-Splitter for two sensors to one BB2 control box P/N 21505534

6. Mounting of ITX Suspended Solids Sensor

The ITX is mounted on a telescopic fiberglass rod and placed in a mounting bracket that fastens to a handrail. Please refer to Appendix 1. As an alternative way of mounting the sensor, an adjustable slide rail holder is available, please refer to the Appendix 2 for further details.

When the sensor is measuring in a fume, it is important to find a place where the suspended solids concentration is representative.

Make sure the flushing nozzle is downstream from the lenses pointing against the stream. This will avoid having the measurement disturbed by turbulence from the nozzle. At the same time it will produce a shield around the nozzle, due to a constant over pressure, preventing particles from getting in.

Cable Connections

Connect the sensor to the BB2 control box using the attached connector on the end of the sensor cable. In the event that two sensors are to be connected to the same BB2 control box, use the Y-splitter.

NOTE! Never try to turn the connector housing to fasten or remove the connector, only the fluted ring at the top of the connector shall be turned.

Installation Tips

- Adjust the rod so that the sensor is at least 12” below the liquid surface or the lowest water level in decant applications to prevent the sensor from coming out of the liquid.
- In an aeration tank, ensure that the sensor is not directly above a diffuser head. It should be on the backside of the rolling diffuser effect.
- Flushing may not be required if the tank is well agitated. To verify the need for flushing, remove the sensor from the liquid after it has been in the liquid for several days. Place the sensor in a bucket of clean water and note the concentration value. If the value does not get close to zero, then the flush system should be utilized.
- When installing in a clarifier, compressed air flushing is required due to no agitation of liquid and to remove oil and grease film on lens. This is especially applicable in primary clarifiers.
- When using the ITX for influent applications, always install the unit after the bar screen. If the bar screen spacing is larger than ¼’ (6 mm), then a baffle or diffuser plate should be installed in front of sensor to prevent rags from catching on the sensor head. On influent applications, compressed air flushing is recommended due to the oil or grease in the liquid.
- In effluent applications a CTX type of sensor is recommended, it has better resolution at low concentrations.

7. Removing the sensor

The sensor is removed in the following steps:

- Disconnect the sensor cable from the BB2 and the flushing hose from solenoid.
- Open the clamp, and pull the rod out of the mounting bracket
- Make sure all water inside the rod is drained.
- Clean the sensor and rod with a brush or clean cloth. Do not use a wire brush!
- Open the black sensor adapter.
- Flush the inside of the rod with clean water.
- Mount the protective cap (or a small plastic bag) on the sensor cable connector.
- Pull the cable and flushing hose out of the rod.
- Blow compressed air through the flushing hose to get rid of the water in the hose and the sensor.

8. Cleaning

The sensor is equipped with built-in flushing nozzles. The nozzles are used to direct the cleaning liquid or air through a ¼" hose that is connected to the top of the sensor housing. A solenoid valve that is wired to an alarm relay in the BB2 control box controls the air or liquid. Water is recommended for flushing in aeration basins. Compressed air is recommended for most other applications.

Flushing must be activated in the "Settings" menu in the BB2 control box:

- Select the ITX transmitter in the Main Menu by using the ⬇ or ⬆ buttons.
- Press ENTER for approximately five seconds to enter the Transmitter Menu.
- Use the arrows to select "Settings" and press ENTER.
- Use the arrows to select "Cleaning" and press ENTER.
- In the "Cleaning" submenu, adjust the "Cleaner" setting to "flush" and specify the cleaning interval in minutes and the flush time in seconds.
- Specify the relay to be used according to the wiring inside the control box. For example, if the solenoid is wired to relay #1, select "#1" for flushing.
- "Next time" displays the next time flush will be activated, pushing ENTER will set it to current time and those start cleaning..

NOTE! Pay attention to the requirements for protection against backflow, according to the EN 1717 standard for drinking water devices. If possible, use plant reuse water or effluent water for cleaning.

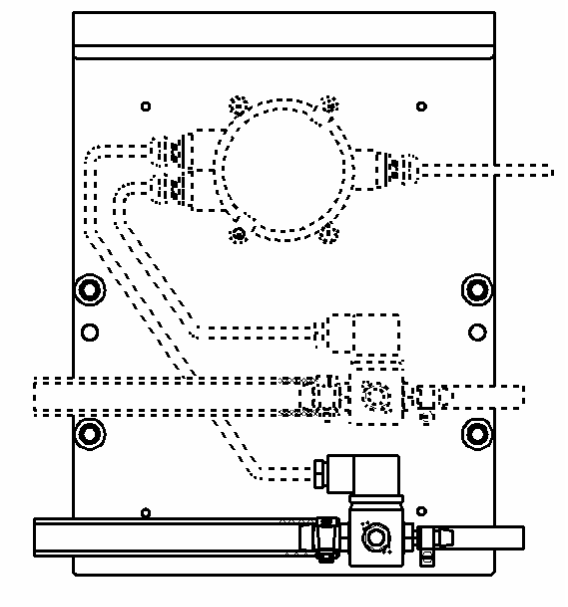
Cleaning the Flushing Nozzle

The flushing nozzle and sensor cannot be disassembled in the field. An attempt to disassemble will void the warranty. If the flushing nozzle becomes plugged, it can usually be cleaned by backflushing it with clean water. Before attempting to backflush, close the valve for the flush water source and disconnect the sensors flushing hose from the solenoid valve. Then, place a ½" hose over the flush nozzle and carefully open the water valve. The pressure should clear the line of solids. If backflushing does not work initially, try cleaning the three flushing nozzles with a needle. Try backflushing the nozzles again as described above until clean water comes out at the solenoid valve end of the hose.

Mounting plate for cleaning solenoid valves

To provide an easy mounting of solenoid valves for the built-in flushing nozzles Cerlic offers a predrilled Aluminum handrail mounting plate. The Mounting plate is fixed to the rail using two u-bolts.

Please see technical specifications for details and ordering information on Solenoid Valves and Mounting Plate.



Mounting plate for one or two solenoids, outside US version.

9. Menu for ITX sensor

Use ⬆ or ⬇ to select the sensor in the main display. The menu for the selected sensor is accessed by pressing ENTER for five seconds. If the selected sensor is not active (the text **No transmitter** is shown) a warning is displayed that asks you to make another choice in order to show the sensor menu.

Settings

I-Time	Integration time or dampening - can be set up to 999 seconds
Unit	"%", "ppm", "g/l", or "mg/l"
Alarm Relay	"-" "#1", "#2", or "#1 and #2". Check that the relay is not being used for cleaning
Analog	"None", "Channel 1", "Channel 2", or "Both". Pick which analog output contacts are to be used with sensor
Cleaning	Press ENTER to go to Cleaning program
Cleaner	"None", "Flush", or "Brush". Do not select "Brush" since this does not exist for ITX sensor
Interval min	0-999 minutes, time between cleaning cycles
Length sec	0-999 seconds, duration of flushing cycle
Freeze sec	0-999 seconds, extra freeze time of output signal after a flushing cycle
Relay	"-", "#1", or "#2". Select relay to operate solenoid for flush cycle. These are the same relays used for "Alarm relay" above
Next time	The next scheduled cleaning time. Pushing "Enter" on this line will set the time to current time and start a cleaning cycle. This could be used to test the "Flush" cycle.

Calibrate

Take sample	No, Zero, #1, n#2, #3, #4, #5. Sensor stores current MS (light) value in memory and you enter a lab solids value below to complete calibration.
Con	Current concentration, (same as shown in the main menu)
Sample #1	Lab test – consistency/suspended solids value for Sample 1
Sample #2	Lab test – consistency/suspended solids value for Sample 2
Sample #3	Lab test – consistency/suspended solids value for Sample 3
Sample #4	Lab test – consistency/suspended solids value for Sample 4
Sample #5	Lab test – consistency/suspended solids value for Sample 5

Scale

Max	0-99.9 % or 0-99999.9 ppm, mg/l, or g/l (units selected in the "Settings" menu), equal to 20 mA output signal.
Min	0-99.9 % or 0-99999.9 ppm, mg/l, or g/l (units selected in the "Settings" menu), equal to 4 mA output signal.
Hi Alarm	0-99.9 % or 0-99999.9 ppm, mg/l, or g/l (units selected in the "Settings" menu) , the value zero inactivates the alarm
Low Alarm	0-99.9 % or 0-99999.9 ppm, mg/l, or g/l (units selected in the "Settings" menu) , the value zero inactivates the alarm

System

Type	Type of sensor, read only
Serial	Serial number of the sensor, read only
SoftW	Software version of the sensor, read only
Temp	Sensor temperature, read only
Samples	Press "ENTER" to go to view SA values and consistency or suspended solids values. This is a **READ ONLY** Section.
SA 0	SA value for zero sample
SA 1	SA value for sample # 1
Cons 1	Lab test - consistency or suspended solids value for Sample # 1
….	SA and Cons repeated for samples 2 to 5
Info	Press "ENTER" to go to "info" read only menu. This menu is for Cerlic internal use, it may change without notice
MS	linearized light signal, which are SA values in calibration chart
Con	Unit value in %, ppm, mg/l, or g/l after MS value has been converted to units due to sample values. This is displayed on main screen
SA 0	SA value for zero sample
SA 1	SA value for sample # 1
Cons 1	Lab test - consistency or suspended solids value for Sample # 1
Ch1a	Raw value for channel 1
Ch1	Raw value for channel 1, compensated for changed intensity
Zero Int	Intensity for clear water, set during zero calibration
Intensity	Currently used intensity
I-offset	Intensity offset, set during zero calibration
Temp Calib	Compensation factor for temperature drift on low solids applications
Samp/s	Number of samples per second
Service	Not accessible for users.

10. Calibration

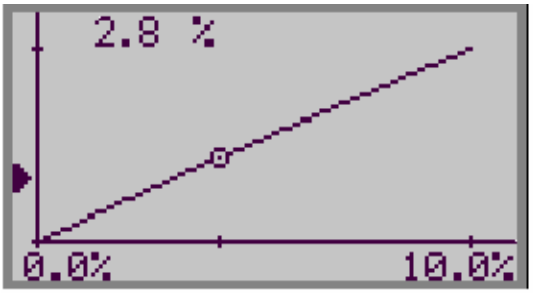
The BB2 has a self-optimizing calibration algorithm/curve able to handle several calibration points in order to give maximum measuring precision in difficult applications. Usually however, a single point calibration is preferred. After a calibration has been carried out, make it a habit to look at the calibration curve in the sensor information screen to make sure it represents a smooth line without ant sharp bends.

Getting good measurement

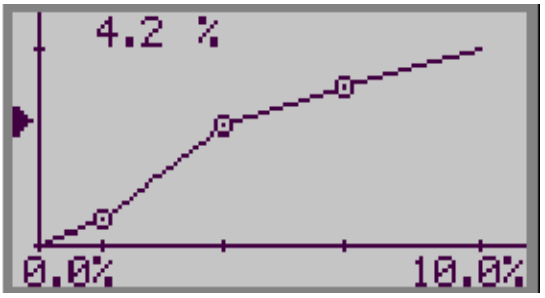
Statistic adjustment of the lab sample value is a much better way to good measurement than frequent calibration. This is done comparing the lab results with the instrument reading over time. If a systematic discrepancy is detected, the value of the lab sample used in BB2 is changed accordingly. If for example several lab results for a period of time in average shows 5% more than the instrument, the sample value in BB2 shall be increased 5% of its value, e.g. if the sample value is 10000 mg/l it shall be changed to 10500. Using statistic method will increase the accuracy and reliability of the measurement as time passes while new calibrations will start from scratch.

Calibration screen

The ITX sensor information menu is the calibration curve screen. To change between the main menu and the calibration screen, press ⬇ and ENTER simultaneously.



Two points calibration



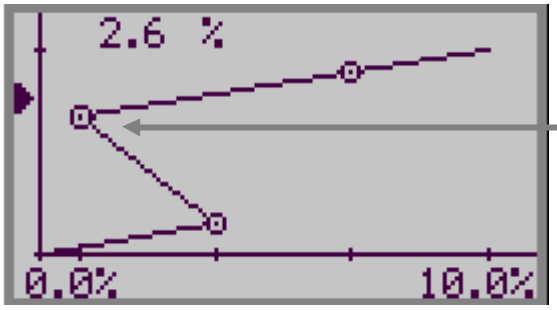
Several points calibration

BB2 uses at least a zero sample and one sample (two point's calibration). Up to five samples may be used to create a calibration curve (multi point calibration). The samples are sorted internally in order of signal intensity. The sample numbers however, doesn't change, only the order they are used. The calibration menu displays sample values placed in a graph.

- X-scale displays consistency/suspended solids, where **min** –value (4 mA output) is shown to the left and **max** -value (20 mA output) is shown to the right.
- Y-scale displays the light loss due to solids from the sensor light source. BB2 uses the light loss values to calculate which measuring signal corresponds to min-consistency/suspended solids and max-consistency/suspended solids.
- Actual measuring value is indicated with an arrow that moves up and down to the left of the Y-scale axis.
- Samples that are not within the chosen scale of the active sensor are not displayed on the calibration screen. However, these samples are still used in the calculations. If

you want to see a point outside the sensor scale, then you may temporarily change the scale under SETTINGS in the sensor menu.

If the sample values are switched or the lab result is incorrectly performed, then the calibration curve will be incorrect. Such a mistake is easy to discover on the calibration screen since a part of the calibration curve will go in the wrong direction. Different measuring values should never correspond to the same consistency / suspended solids.



The curve goes backwards because two samples have been exchanged when entering the lab results. Higher Y-value must mean higher X-value. The curve must have a direction upwards and to the right.

Incorrect calibration!

Zero Calibration

The sensor is zero calibrated at the factory, and does not often need to be zero calibrated. Before doing a zero calibration, always check that it is really needed. Make sure the lenses are clean, and use clean de-aerated water to check the meter reading. Tap water is best de-aerated by leaving the water in an open bucket for at least two hours

Running a zero calibration:
It is important that the instrument has been turned on for about 30 minutes prior to calibration so that the sensor and electronics can stabilize. Please check that the correct unit (consistency/suspended solids) is selected for the application. Select unit in the sensor menu "SETTINGS" – "UNIT".

- Remove the sensor from the process, clean the sensor head, and dip it in a bucket of clean water. Even though the sensors have daylight-filters they are sensitive to the infrared parts of the sunlight. Always cover the sensor and the bucket before calibration.
- Select the sensor to be calibrated in the menu by using ⬆ or ⬇ arrows
- Press ENTER for approximately five seconds to enter the sensor menu.
- Use ⬆ and ⬇ arrows to select "Calibrate" and select "Take sample". Press ENTER.
- Select "Zero" and press ENTER.
- To acknowledge that you really want to change the zero calibration, select "Yes" and then press ENTER.
- BB2 will ask you to put the sensor in clean water. Submerge the sensor into the clean water and cover it from direct sunlight, then press ENTER.
- Wait for the zero calibration to finish. It will take approximately ten to twenty seconds before the unit returns to the menu.

Detailed procedures for navigating the BB2 software can be found in the BB2 service manual.

Entering sample calibration points – using a sample bucket

Fill a bucket with a sample of the liquid you intend to measure. Submerge the sensor into the liquid. Even though the sensors have daylight-filters they are sensitive to the infrared parts of the sunlight. Always cover the sensor and the bucket before calibration.

Select the sensor to be calibrated in the menu by using ⬆ or ⬇ arrows

- Press ENTER for approximately five seconds to enter the sensor menu.
- Use ⬆ and ⬇ arrows to select "Calibrate" and select "Take sample". Press ENTER.
- Select "#1"and press ENTER.
- Use the sensor to stir the sample in the bucket until the calibration is finished so the solids do not settle during calibration. It will take between ten and twenty seconds.
- Replace the rod/sensor in the SS mounting bracket so the sensor is at least 12" (36 cm) below the lowest liquid level in the basin. Take the bucket to the lab for analysis. Note the concentration of the sample determined at the lab.
- Enter sample #1 concentration by going to Sample #1 in the calibration menu and pressing ENTER. Use the arrows to change the values and ENTER to go to the next digit.
- When all digits have been entered, you have completed a calibration point.
- Continue the above process to enter additional sample points when desired or required. Do not enter samples that are identical in concentration or less than 10% from initial values.

Alternate calibration, placing sensor in a basin or channel

- Calibration can be done without the use of a bucket. Make sure that the sensor is at least 30 cm (12') below the lowest liquid level. While the ITX is calibrating, grab a sample of the liquid with a dip bucket to take to the lab for analysis. Make sure to grab a sufficiently large sample volume for low solids applications.

11. Scaling

The "SCALE" menu (see the BB2 manual) allows the user to set the high and low boundaries for a 4-20mA output signal. In addition, this menu allows the user to set high and low alarms values that can be used to notify when solids have reached critical points.

MAX	sets the 20 mA point output
MIN	sets the 4 mA point output (may be a negative value for special applications)
H-ALARM	sets the High Alarm set point, the value zero inactivates the alarm
L-ALARM	sets the Low Alarm set point, the value zero inactivates the alarm

12. Technical description of sensor ITX 20

ITX 20	P/N 11305455
Material	316SS (SIS2343)
Dimensions	See section 13.
Weight	3.5 lbs. (1,6 kg)
Process connection	Submerged
Max Depth	33 ft. (10 m)
Max temperature	140°F (60°C)
Measuring principle	Straight transmission, 20 mm measuring line
Light source	GaAs diode, 880 nm monochromatic
Cable, connection	5-pin M12-plug
Cable, length	33 ft. (10 m)
Cable, material	Hytrel
Flushing, Pressure	60-90 psi (4-6 bar)
Flushing hose, length	33 ft. (10 m)
Flushing hose, material	PVC
Enclosure	IP68 NEMA 4X

Certificate of conformity

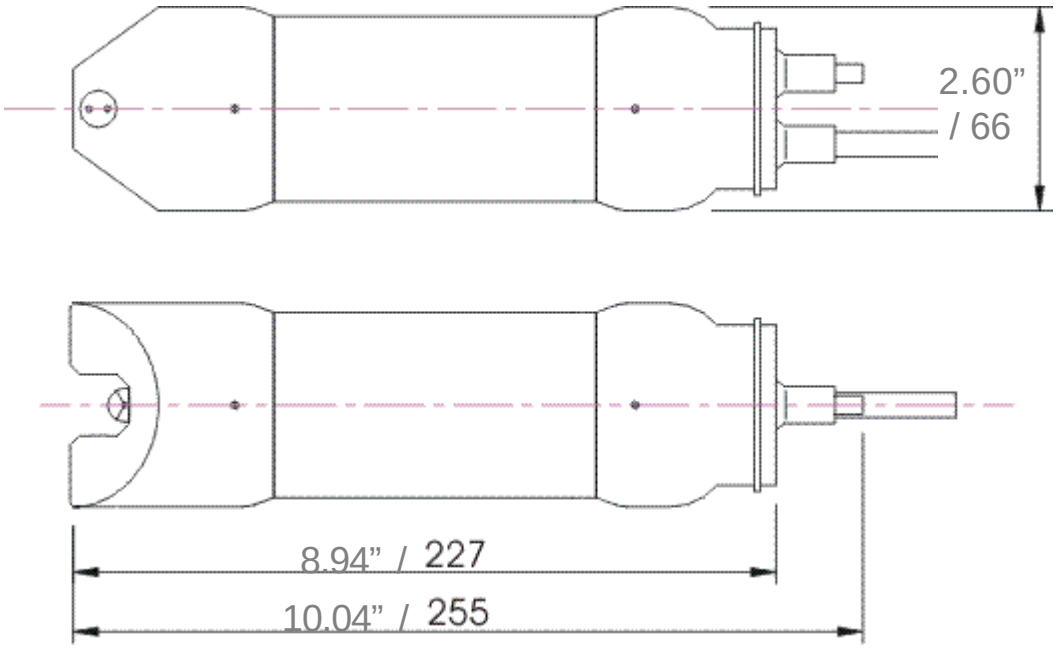
The Sensor has been developed and manufactured in accordance with the following standards:

SS-EN50 082-2 (immunity), SS-EN50 081-2 (emission), SS-EN61 010-1 (safety)
89/336/EEC, 92/31/EEC, 93/36/EEC, 73/23/EEC

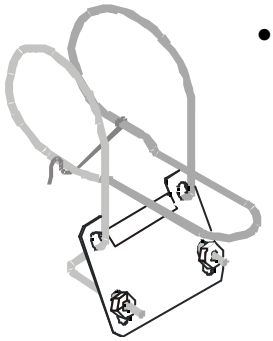
Optional parts for ITX Suspended Solids Sensor:

- Mounting bracket X, including rod holder P/N 11205539
- Telescopic rod, 4 m, including transmitter holder P/N 20205501
- Adjustable slide rail sensor holder P/N 11205600
- Solenoid valve for flushing P/N 11705516
- Aluminum handrail mounting plate predrilled for BB2 or solenoid valves w/ u-bolts, outside US version P/N 10605533
- Aluminum handrail mounting plate predrilled for BB2 or solenoid valves w/ u-bolts, US version P/N 31204049
- 33 ft. (10m) extension cable with plug-in connectors. P/N 20805510
- Y-Splitter for two sensors to one BB2 control box P/N 21505534

13. Dimensions

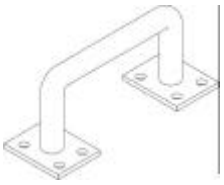


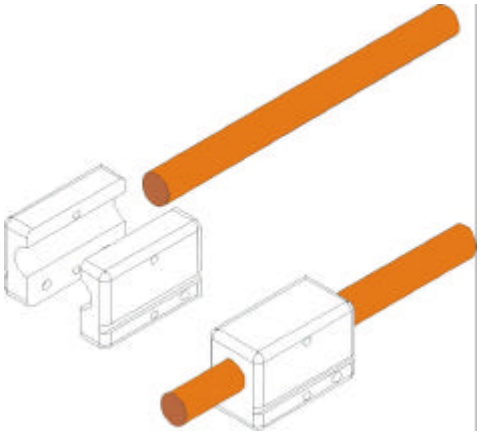
Appendix 1, Assembly of handrail mounting kit



- Mount the Flexible Mounting Bracket on existing handrail or on separate holder. The bent lip on the mounting plate shall be on top and faced toward the liquid or tank. Adjust the Mounting Bracket to the correct angle and tighten the nuts. The bracket shall be fixed to the rail, and must not be able to rotate around it.

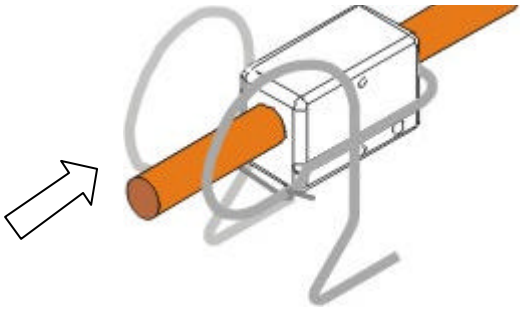
Example of a holder to be used for the mounting bracket when no handrail is





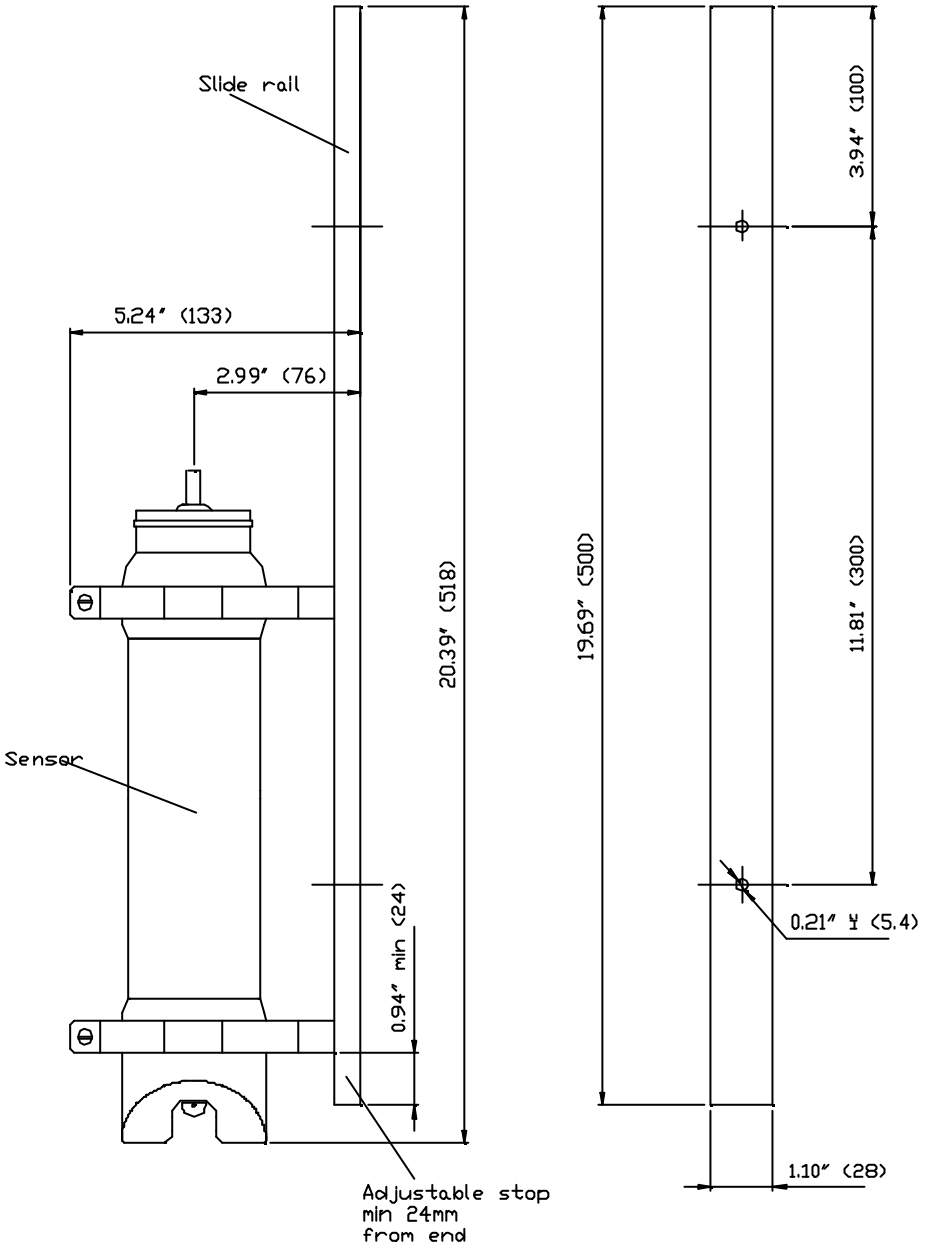
- Disassemble the bracket guide and place around the telescopic rod.
- Use the SS screws on bracket to tighten the bracket to the rod.

- Pull the cable and hose through the sensor holder and rod.
- Connect the telescoping fiberglass rod to the sensor with the two piece black PVC adapter.
- The adapter halves should be tightened until snug, which will leave about 1/16" gap.
  NOTE! The gap is required so the water can drain from the rod.
- Adjust the length of the telescopic sensor rod as necessary by twisting the nuts while holding the rod.
  NOTE! Do not extend the rod sections beyond the black lines. This could lead to rod damage.



- Insert the PVC bracket guide with the telescopic rod into the mounting bracket. Make sure that the bracket guide tracks are properly seated in the bracket.
- Fasten the safety-locking clamp.
- Check that the bracket is safely fixed to the rail for the spring to work the way it is intended.

Appendix 2, Assembly of adjustable slide rail



Appendix 3, Support information

Before calling Cerlic Support, please collect the information in this form and have it at hand.

Company _____

Name _____

Phone _____

E-mail _____

Sensor Type _____

Position / Tag _____

First go to the BB2 menu, it is accessed by pressing ⬆ and ENTER at the same time for five seconds. Select “System” and press ENTER, then select “Status” and press ENTER again.

Version _____

Serial _____

Box temp _____

Leave the BB2 menu by pressing ⬆ and ENTER at the same time. Use ⬆ or ⬇ to select the sensor in the main display. Go to the sensor menu, it is accessed by pressing ENTER for five seconds. Select “System” and press ENTER.

Type _____

Serial _____

SoftW _____

Temp _____

Select “Samples”, then press “ENTER” to go to the “Samples” sub menu.

SA 0 _____

SA 1 _____

Cons 1 _____

SA 2 _____

Cons 2 _____

SA 3 _____

Cons 3 _____

SA 4 _____

Cons 4 _____

SA 5 _____

Cons 5 _____

Return to the “System” menu. Select “Info”, then press “ENTER” to go to the “info” menu.

MS _____

Con _____

SA0 _____

SA1 _____

Cons 1 _____

Ch1a _____

Ch1 _____

Zero Int _____

Intensity _____

I-offset _____

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

Appendix 4, Setup information

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 _____

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

I-time _____

Unit _____

Alarm Relay _____

Analog _____

Cleaner _____

Cleaning interval _____

Cleaning length _____

Cleaning relay _____

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

Max _____

Min _____

High alarm _____

Low alarm _____

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