Instruction Manual

IRM-11 Refractometer

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1 General

1.1 Description

The IRM-11 refractometer has been specifically design for hygienic applications in the Food, Beverage and Pharmaceutical industries. The IRM uses a LED light source that directs light through specialized optics into the process media. The density of the liquid at the surface of the lens will directly impact the speed of light changing the index of refraction of the light. An internal receiver array which senses the index of refraction coupled with a temperature measurement to compensate for thermal effect is processed by the on-board electronics that produce a 4-20mA output that is scaled to the customer's choosing. The units are communicated in BRIX sucrose, Plato, refractive index, or other units depending on scale selection. The IRM-11 is 3-A authorized with all wetted parts constructed from 316L stainless steel, sapphire and 3-A approved adhesive.

1.2 Specifications

Process connection	2" TC Varivent type N, DN 40/50	
Materials	Connecting head Sensor Lens Plastic cover	Stainless steel 304 Stainless steel (316L) Sapphire Polycarbonate
Temperature ranges	Ambient Process CIP/SIP	-10…60 °C (14...140 °F) 20...100 C (-4...212 F) compensated range Up to 140 °C (284 °F) max. 60 min
Process pressure	-1…20 bar (-14.5 psi...290 psi)	
Measurement range (Factory Selected)	0-85 BRIX, nD 1.3330-1.5000 Refractive Index	
Repeatability	BRIX 0.09, nD 0.0001	
Accuracy	BRIX +/-0.1, nD +/-0.0002	
Response time	3s	
Output	1 analog output 4...20 mA (scaled to measurement range)	
Communication	zero adjustment via USB and PC interface	
Electrical connection	Cable gland Cable connection Supply voltage Protection class	M16 x 1.5 M12 connector 5…24 V DC max. 150 mA IP69K
Weight	480 g (1 lbs)	

1.3 General Safety

These safety instructions have to be strictly observed in order:
• To not endanger the safety of persons and environment
• To avoid any damages to the measuring instrument
• To prevent any faulty product as a result of use

The electric connection may only be carried out by qualified persons who have the necessary electrical knowledge and have been authorized by the owner to do so. The wiring of the voltage supply and the output has to be carried out professionally in consideration of current electrical design and regulation. Also refer to chapter 3 "Installation"/"Electrical" for more information.

In particular, the following references have to be observed:

• Safety instructions
• Electrical connection information

1. All persons who are involved in the installation, commissioning, operation, service, and maintenance of the meter have to be qualified accordingly.
2. This instruction manual has to be strictly observed. The user of the meter has to assured that the personnel concerned has read and fully understood the instruction manual.
3. All work done must be carried out by authorized and trained personnel only.
4. The instruction manual should be kept in close proximity to the device for reference to the operators.
5. Before starting any cleaning, conversion, service or maintenance work, the measuring device has to be switched off and disconnected from the power. This requires a device for separating all live wires, e.g. a 2-pole main switch in the control cabinet. The associated device has to be protected against unauthorized switching-on.
6. Before starting any service and maintenance work, the system has to be flushed with water and emptied. If the meter has to be removed from the pipe system, all pipelines will have to be emptied prior to removal and protected by a maintaining an opening to atmosphere or a shut-off method to prevent refilling.
7. Never remove or put out of action any safety devices through modification of the meter.
8. Do not touch any part of the meter while the measuring instrument is cleaned as there is a risk of getting burned!
9. To minimize the danger of injury, the working area around the meter should have sufficient free space.
10. The technical data according to the instruction manual, nameplate needs to be considered against the requirements of the application.

If damage is done to the meter, all warranties are void.

Dangers not resulting from the functionality of the device, but from the ambient and operating conditions present at the place of application, have to be referred to in appropriate instructions to the operators and by the use of danger signs. The user of the device is exclusively responsible for the compliance with these instructions!

1.4 Intended use

The IRM-11 refractometer is only to be used for the application that it has been designed, dimensioned and built. The electrical connection must be made to a direct current network (see the nameplate). The intended purpose of the refractometer is the measurement of refractive index in the food processing, beverage, pharmaceutical and chemical industries. This meter is not suitable for the measurement of hazardous, explosive, and combustible liquids of PED group. Any modifications to the measuring device that might have an influence on the function and the safety devices of the meter are only allowed to be carried out by authorized persons of Anderson Instrument Company. Possible misuse including any use in contradiction to the above-mentioned application is an indication of misuse of the measuring instrument!

In such a case Anderson does not assume any responsibility for safety.

2 Application Requirements

2.1 Conditions required for the meter

The meter has to be installed in the product line with power supplied for operation. When selecting the place for the installation of the meter you should ensure that the housing can be opened for service work whenever needed and that the meter can be simply removed, if necessary. In order to protect the electronics from damage, select an installation location so that:

Warning! Do not subject this sensor to pressure that exceeds the specified upper range limit. Over-pressure may cause premature failure, incorrect output signal, or possible human injury.

- Product temperature is always kept within the admissible temperature

Caution: Do not expose the sensor to process or ambient temperatures that exceed the rated specifications. Physical damage, incorrect output signal, or premature failure may result.
Piping is securely mounted (e.g. to avoid vibration)

- Meter can be emptied if there is a risk of freezing
- Connection housing is not permanently exposed to dripping water

2.2 Mounting Position

Correct installation:

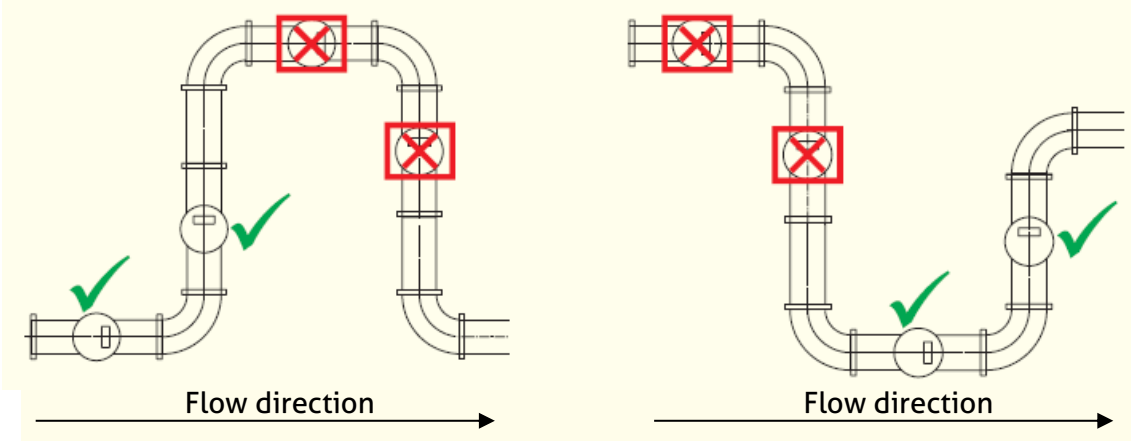
• In or in front of ascending pipes

Wrong installation:

• In or in front of descending pipes
• Into the highest point of a pipe. Air or air bubbles will concentrate there. Refer to drawings below for examples.

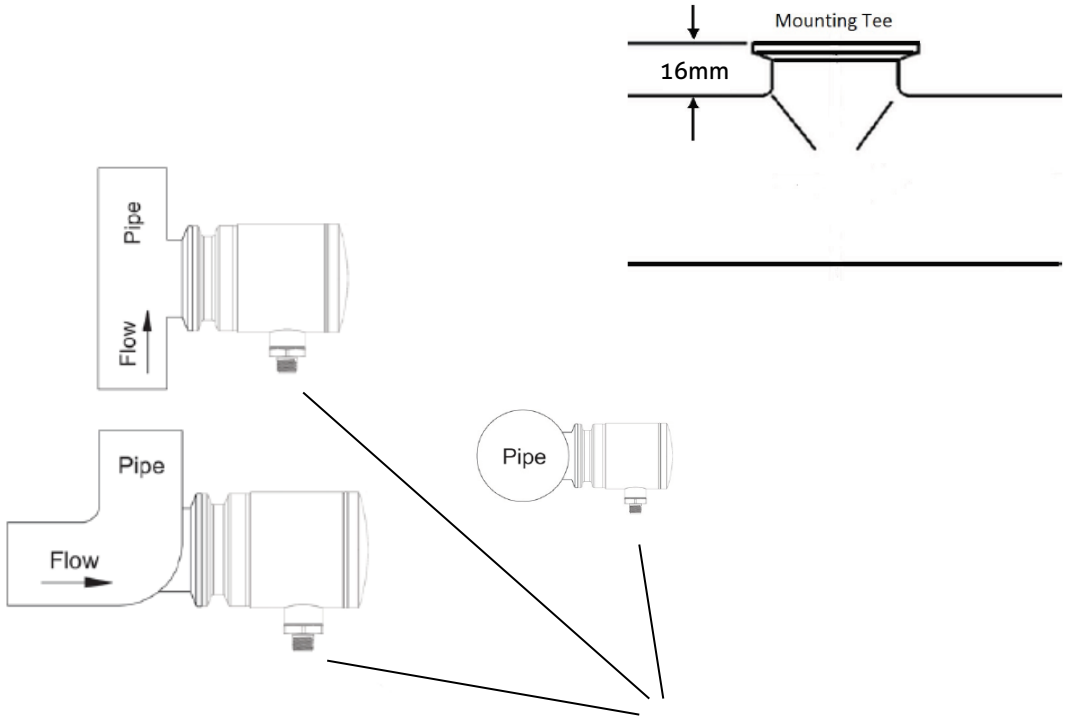
Mechanischer Anschluss / Einbauhinweise

- Ensure that the mounting position of the sensor guarantees that the measurement tube is always full with media. Air or air bubbles are measured like turbidity.



2.3 Mounting in a pipe

The IRM is designed to be installed in a short outlet tee in the orientations shown below. The distance from the clamping face to the wall of the main pipe should measure at 16mm (.625") or less.

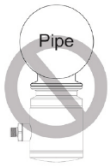


Mount with connector downward in all installations.

DO NOT mount IRM-11 on top or bottom of piping as resulting air space or sediment collection may cause erroneous readings.

Standard Clamp and Gasket Required

(Not Supplied)



Caution

- Pay careful attention near the sapphire sensor face
- Do not strike with hard or sharp object
- Clean with soft cloth

3 Installation

3.1 Mounting in the line

Caution: Handle with care during installation to avoid damage to the sensor. Physical damage, especially to the sensing surface can cause incorrect output signal or premature failure.
The IRM-11 is designed to be installed in a supported pipeline.

Caution: For proper mounting of this sensor, verify that the fitting connection type, size, gasket or seal, and holding ring or clamp match the process connection it is being mounted to. Improper mounting can cause process leakage, reduced pressure ratings, and/or contamination issues.

3.2 Electrical

3.2.1 Cabling and Connections

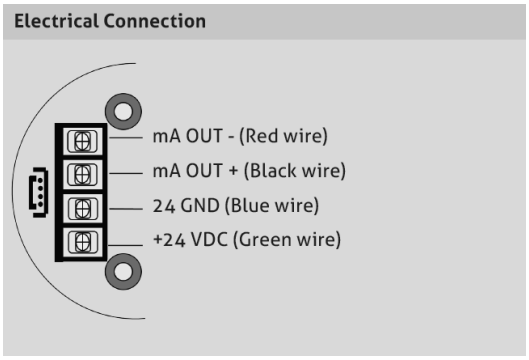
Anderson-Negele recommends the use of a five wire molded cordset to provide the best protection in wet environments (part number 42117H0XXX). When selecting cable the wire should be 18-24AWG, 4-conductor cable to power the IRM-11 and provide for both a 4-20mA signal return and earth ground connection (if needed). In addition, it should be foil shielded with a continuous drain wire. The IRM is provided with either a M12 quick disconnect electrical connector that will prevent moisture from entering the electronics housing, M16 cable gland or ½" NPT conduit connection. In the instance of the latter two choices it should be noted that care needs to be taken to ensure that moisture is prevented from entering the electronics housing.

WARNING: To prevent signal interference, do not run signal cable closer than 12" to AC wiring.

3.2.2 Power and Wiring

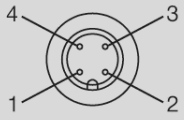
Warning! This unit accepts DC voltage only, connection to AC voltage can cause failure of the sensor and/or risk of electrocution

The IRM-11 requires 24 (5-24 VDC) at 150mA current for proper operation. The diagram below illustrates the pin assignments for the M12 connectors used on the IRM-11.



M12 plug (4 pin)

1: Analog output -
2: Analog output +
3: Power supply +24 V DC
4: Power supply -



4 Commissioning

Following mounting and electrical connections, the IRM is now ready for use. Once powered, confirm that the device displaying the measurement is properly interpreting the 4-20mA signal from the IRM and that the IRM is showing a green status light.

5 Operation

Following a successful installation and commissioning, there is nothing else needed to use the IRM. It will output a 4-20mA signal that is ranged to the internally programmed scale.

6 Parameterization and Adjustment

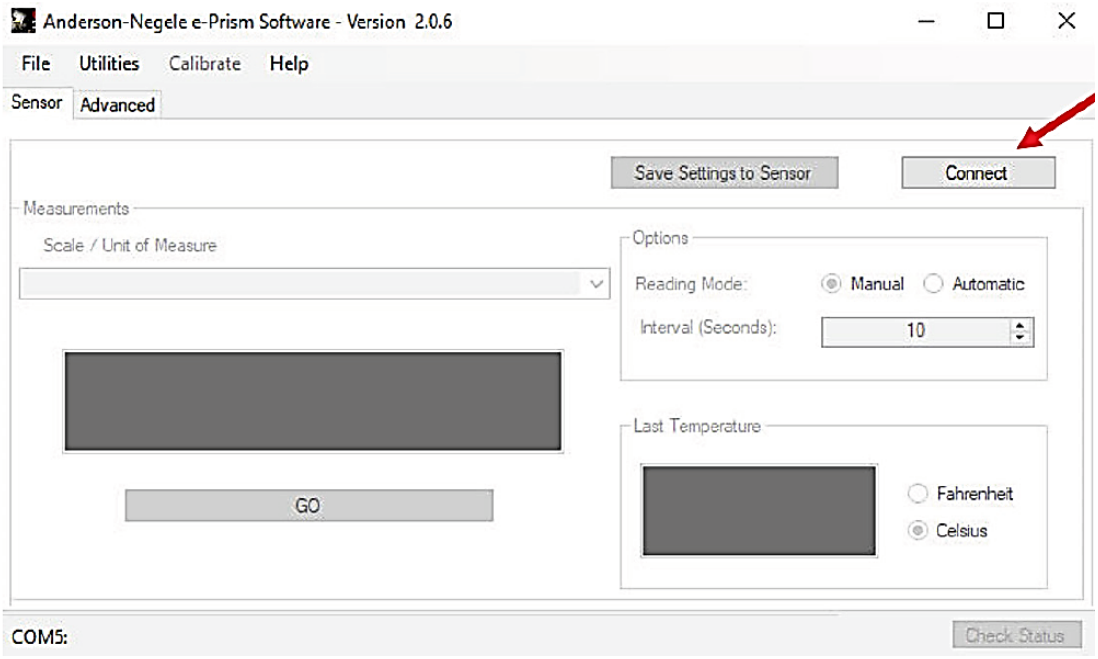
The following procedures will involve the use of the Anderson-Negele e-Prism software (available at no charge on the Anderson-Negele website) and a USB to micro USB cable (not provided). Following download and installation of the software it will be possible to make changes to the measurement scale, time interval, and also field adjust the calibration.

6.1 Connecting the IRM to a PC

Following installation on a PC,open the e-Prism software on your computer, then using the micro-usb connector end of your cable connect to the port in the IRM.

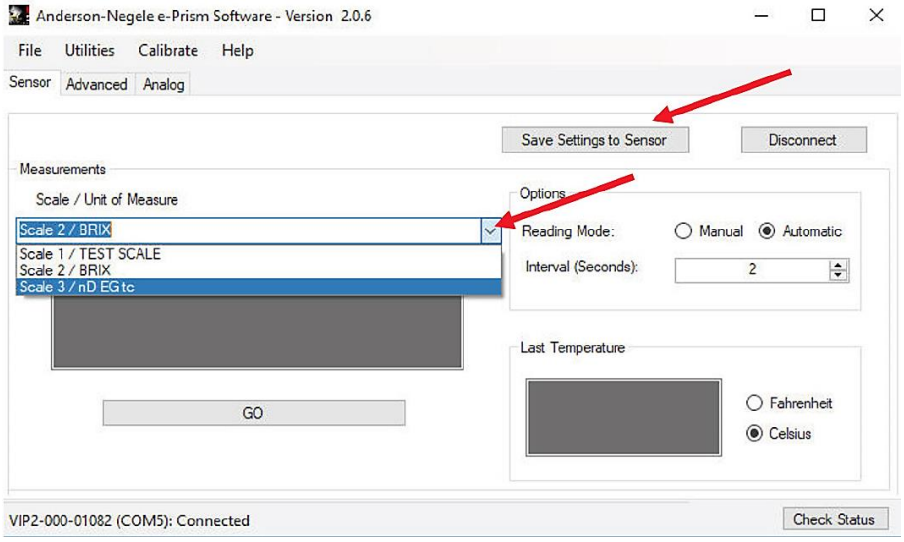
Once the IRM has powered up, you should be able to initiate communication by clicking on the connect button on the e-Prism software.

Once connected it is now possible to change settings and calibration of the IRM-11



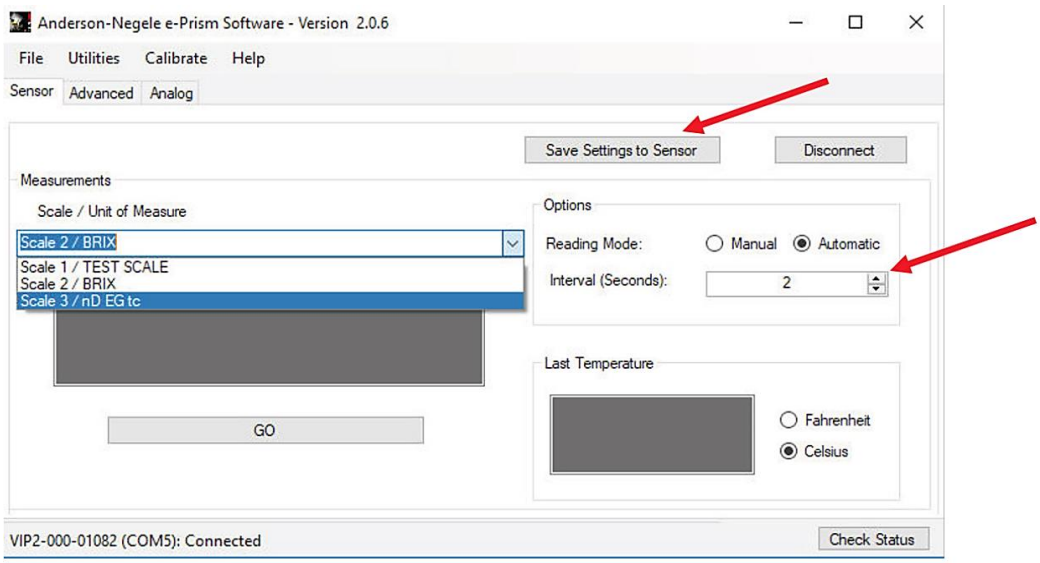
6.2 Changing Scale

The scale used in the IRM determines what units of measure are calculated from the refractive index measurement and the range that will be used for the 4-20mA output. If it is desired to change the scale of the IRM from what was set at the factory, the standard device has three internal scales available to choose from. By clicking on the dropdown arrow to the right of the current scale the possible choices are displayed and can be selected by highlighting the desired units. Once highlighted, to load this scale into the sensor click on the "Save Settings to Sensor" button to change the IRMs configuration.



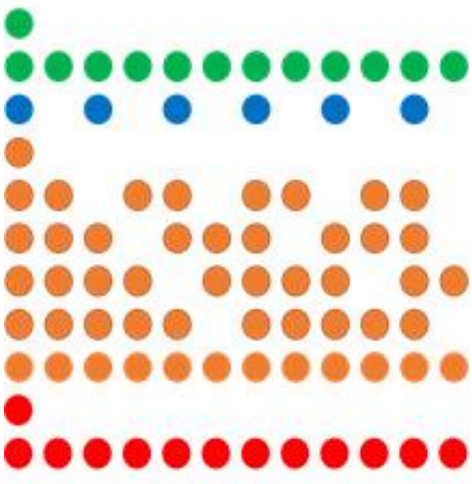
6.3 Changing the Time Interval

The time interval setting affects the amount of information the IRM will gather to calculate and output a measurement. The longer the interval the more stable the output will be. For applications involving control based on the measurement the interval should stay short whereas in monitoring applications a longer interval will give a more stable display value. The IRM is factory set at 3 seconds for the time interval and can be increased using the setting in the options box. Using the up/down arrows the setting be adjusted and then saved to the sensor using the "Save Settings to Sensor" button.



7 Troubleshooting

The IRM is equipped a status light that will give indication of the changing conditions that an IRM is subjected to. Below is a chart which gives the types of lights that are used and the conditions that they indicate. It is worth noting that the IRM will combine these indications when more than one status is occurring, and example is alternating between a steady on green and a flashing blue which indicates the unit is OK and in calibration.



Steady On	Green	Powered and working properly
Flickering	Green	Communicating with host
Flashing	Blue	Calibration in progress
Steady On	Orange	General error – cycle power to reset
Flashing 2x	Orange	Air in system
Flashing 3x	Orange	Temperature out of range
Flashing 4x	Orange	Temperature out of range
Flashing 5x	Orange	Measurement out of range
Flashing 6x	Orange	Ambient light error – shield from light
Steady On	Red	Fatal error – return to factory
Flashing	Red	Programming sensor

8 Maintenance and Cleaning

The IRM-11 requires no regular maintenance other than the periodic changing of process connection gaskets. This should be done annually or at the same intervals as your plant gasket maintenance. The product contact and exterior of the IRM-11 is designed to be cleaned under the same conditions as required in food and pharma processing facilities including CIP cleaning methods. High pressure hoses, abrasive brushes or pads and harsh detergents should not be used to clean the IRM-11s product contact and external surfaces.

9 Service and Calibration

9.1 Service

Warning! Do not remove this sensor from the process while it is operating. Removal while the process is operating can contaminate the process and could cause human injury.

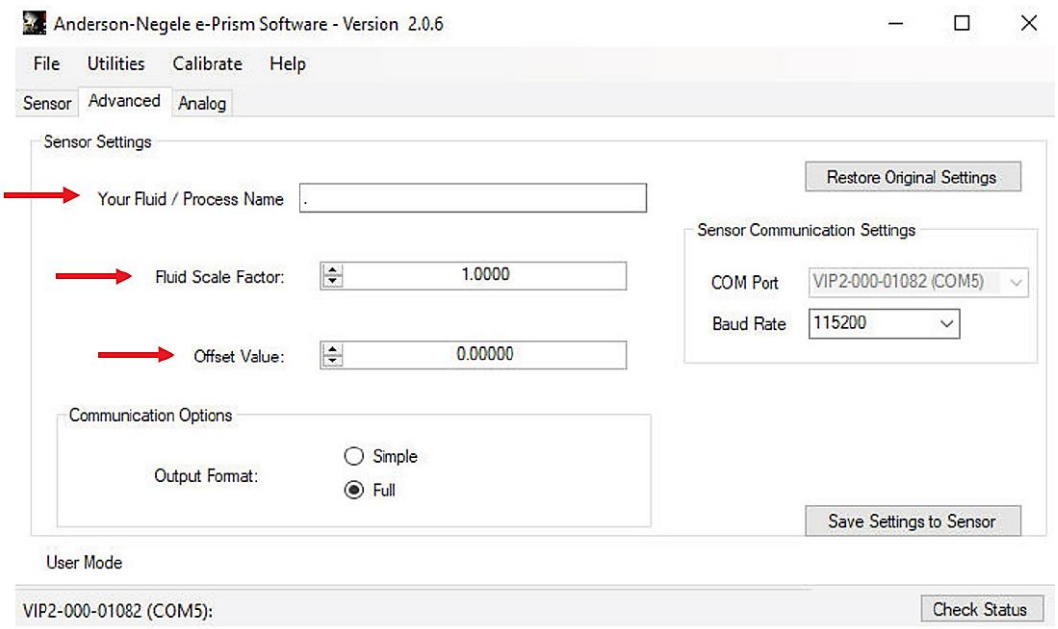
Caution: Improper replacement of components during service can result in process leakage, reduced pressure rating, system clean ability issues, incorrect output signal, or error code(s).

There are no serviceable electronic or optical components in the IRM-11. All required repairs require returning the device to the factory

9.2 Calibration

Although a full calibration of the IRM-11 requires the device to be returned to the factory it is possible to check and correct the IRM-11s performance against known liquids.

As the IRM is factory calibrated it is not normally necessary to change its calibration for proper operation. In the instance where the reading does not match an accepted standard at the plant such as a handheld or lab refractometer, the IRM does have field adjustment factors available to align the IRM reading with the plant standard. To make changes to the field factors using the e-Prism program click on the Advanced tab to access the field calibration parameters.



There is an available field labeled "Your Fluid / Process Name" that can be used to specifically call out where this sensor is used. This can be helpful as most field calibrations are driven by process related influences and knowing where the sensor is used can help understand why it was field calibrated. The next two parameters are Fluid Scale factor and Offset value, adjustment of both the Scale Factor and Offset is done by increasing or decreasing the displayed value using the arrows located to the left of the value. The Fluid Scale Factor is a direct multiplier value that starts at 1.0000. If this value was doubled to 2.0000 the meter reading will also double so calculating a new Scale factor is done by the following formula: New Fluid Scale Factor = (Measured value ÷ known value) X (old Fluid Scale Factor) This factor is used for larger measurement errors that exist in the upper half of the meters measurement range and may be used in conjunction with the "Offset Value" to correct the linearity of the output. The Offset Value is an adder value and so it is indicated in scale measurement units.

To use the offset value, if the Brix measurement was 1.2 Brix high, you would reduce the offset by 1.2000 and the reading would drop accordingly. In the same manner, increasing the value by the amount the reading is short will increase the meters reading by that amount. Following adjustment of these values it is important to click on the "Save Settings to Sensor" button in the lower left corner.