



Installation, Operation & Maintenance Instructions



Model WC Smart Inventory Monitoring Sensor

Thank you for purchasing the Model WC Smart Inventory Monitoring Sensor from BlueLevel Technologies. We sincerely appreciate your business and strive to make your experience with us and our products uniquely positive.



This document contains information necessary to ensure a safe and successful installation. **PLEASE READ ALL INSTRUCTIONS CAREFULLY BEFORE PROCEEDING** and comply with the section on page 3 of this document pertaining to SAFETY to ensure proper operation of the equipment and personnel safety.



Before discarding the shipping container, please inspect it thoroughly and verify that all parts are accounted for. If you have any questions please do not hesitate to contact us on our website at www.blueleveltechnologies.com, by email bluelevel@blueleveltechnologies.com or by phone at 330-523-5215 or by fax at 330-523-5212.

Contents

Safety Terms & Symbols	3
Mechanical Installation	4
Instrument Function	11
Electrical Connections	16
Setup	20
Maintenance	27
Technical Data	31
Dimensions	32
Our Commitment	33
Standard Warranty	33

Safety Terms & Symbols



WARNING: Warning statements identify conditions or practices that could result in injury or loss of life. Risk of electrical shock exists.



CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

Safety Summary



General Safety

CAUTION: It is important that all instructions within this manual be followed to ensure proper operation of the equipment and safety of operating personnel. The product should be installed, commissioned and maintained by qualified and authorized personnel only. Install according to installation instructions and comply with all National and Local codes. Use electrical wire that is sized and rated for the maximum voltage and current of the application.



Electrical Shock Caution

Model WC Smart Inventory Monitoring Sensors are powered with HIGH VOLTAGE. No operator serviceable parts are inside. All servicing is to be performed by qualified personnel. Each Model WC is provided with a “protective conductor terminal” which shall be terminated to earth ground potential (see Connections). This product’s design complies with EN61010-1 installation category II and pollution degree 2.



Electrical Location Caution

The Model WC smart inventory monitoring sensor are suitable for Ordinary Hazardous Locations only (refer to Technical Data).



Enclosure Integrity – The Model WC enclosure is manufactured from aluminum, sensing cable is Nylon jacketed stainless steel and sensing weight may be aluminum, stainless steel or plastic. The user or installer should consider the performance of these materials with regard to attack by aggressive substances that may be present. The dimensions of the enclosure shall not be altered.



Maintenance – Power to all circuits must be disconnected before conducting any investigation, setup or maintenance of the unit.

Electromagnetic Compatibility (EMC):

The Model WC smart inventory monitoring sensor was tested and found to comply with the standards listed below:

Low Voltage Directive:	73/23/EEC
Standard IEC:	61010-1 (ED.2):2004
EMC Emissions	EN 61326-1:2006
EMC Immunity	EN 61326-1:2006

Models:	Model WC Universal 100-240Vac
---------	----------------------------------

All test reports and documentation can be obtained from BlueLevel Technologies, Inc. located in Sterling, IL.

Mechanical Installation

PRIOR TO INSTALLATION:

- 1. Placement of Sensor** - If using the Model WC to measure inventory or distance/level of a powder or other bulk solid granular material the shape of the material surface should be considered prior to selecting a mounting location for the sensor. While liquid materials will have a flat surface, most bulk solid materials will have an angle or slope to their material surface.

The Model WC smart inventory monitoring sensor will measure the empty space distance or material height directly beneath the sensor mounting location. In order to provide the most applicable distance/level measurement it is ideal to locate the sensor where the measuring point on the surface of the material represents a “neutral” condition. This location of a neutral point is where the amount of material above the measuring point is equal to the empty space below the measuring point. This is difficult to achieve in some installations, especially where an off-center fill or discharge is involved. Refer to Figure 1.

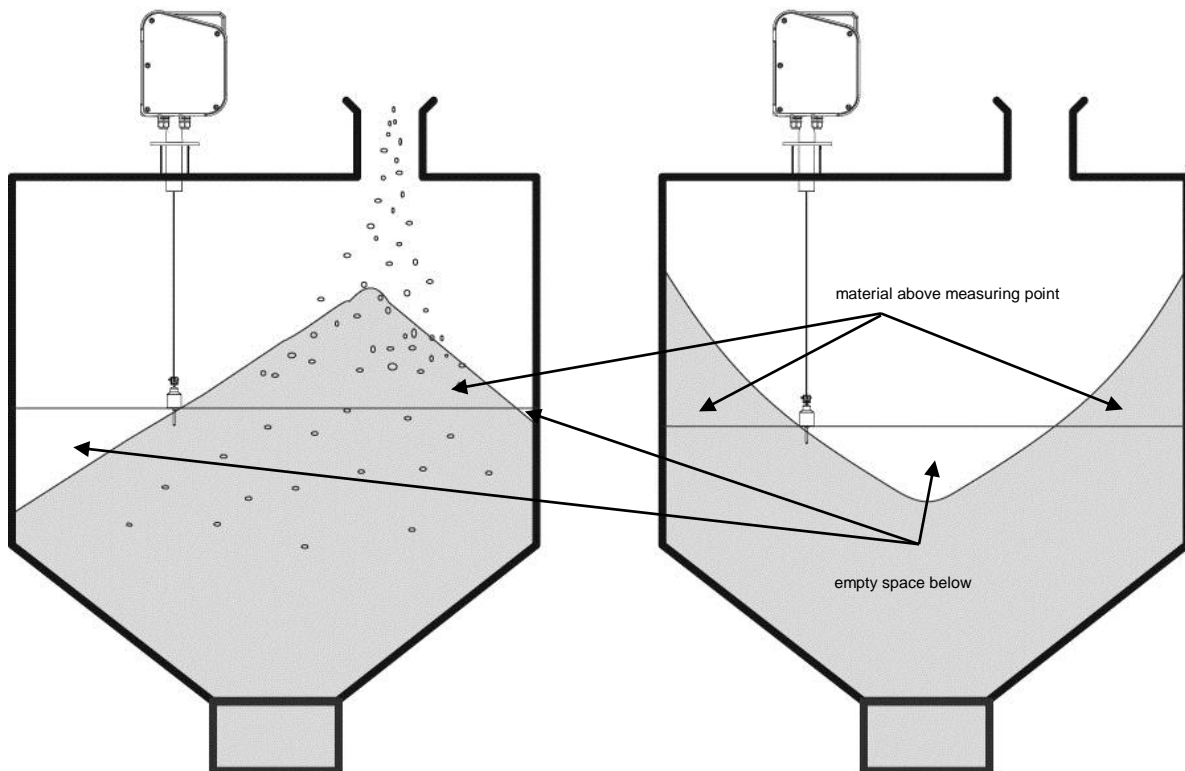


Figure 1: Placement of Sensor at most appropriate “neutral” point

Mechanical Installation Cont'd

PRIOR TO INSTALLATION CONT'D:

For center fill/discharge vessels the optimal mounting location is attained by mounting the Model WC sensor at a distance from the sidewall of the vessel equal to $1/6^{\text{th}}$ of the diameter of the vessel, assuming a cylindrical vessel.

In addition to considering the angle of repose or shape of the material surface, it is important to maximize the distance from the filling inlet(s), as well as at least 1.6' (0.5m) from vessel walls wherever possible wherever possible. Refer to Figure 2.

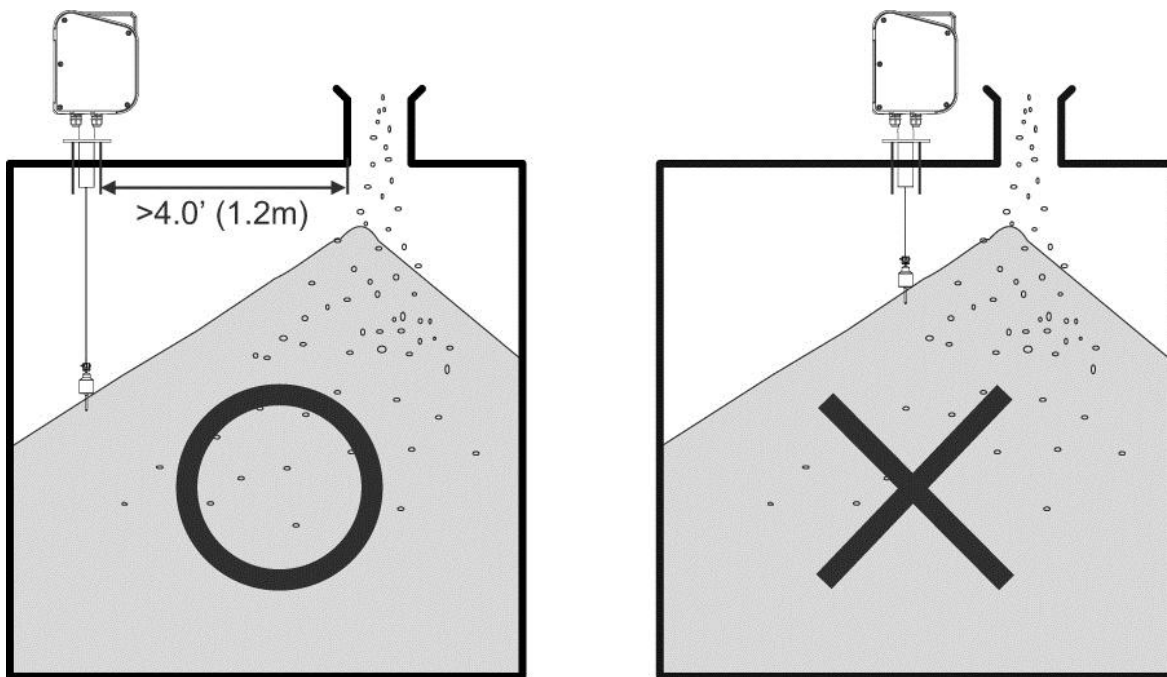


Figure 2: Mounting of sensor away from fill inlet and vessel walls

- 2. Mounting the Sensor “Plumb” / Level** - The Model WC inventory sensor must be mounted plumb so that the sensing weight and cable is perpendicular to level, within one degree. To assist in ensuring a level or plumb installation each Model WC is provided with a “bulls-eye” style level. Mounting the sensor so that the “bubble” in the bulls-eye level is directly in the center should achieve a level and plumb installation. Refer to Figure 3.

Mechanical Installation Cont'd.

PRIOR TO INSTALLATION CONT'D:

The Model WC can be provided with a flat or angled mounting flange. The angled flanges can be provided to fit either a 5 degree or 10 degree vessel roof and allow for a plumb or level installation. These angled flanges equate to a 1:11.5 roof pitch for the 5 degree angled flange, and a 2:11.5 roof pitch for the 10 degree. A common 1:12 pitch (4.76 degrees) can utilize the 5 degree, and a 2:12 pitch can use the 10 degree flange.

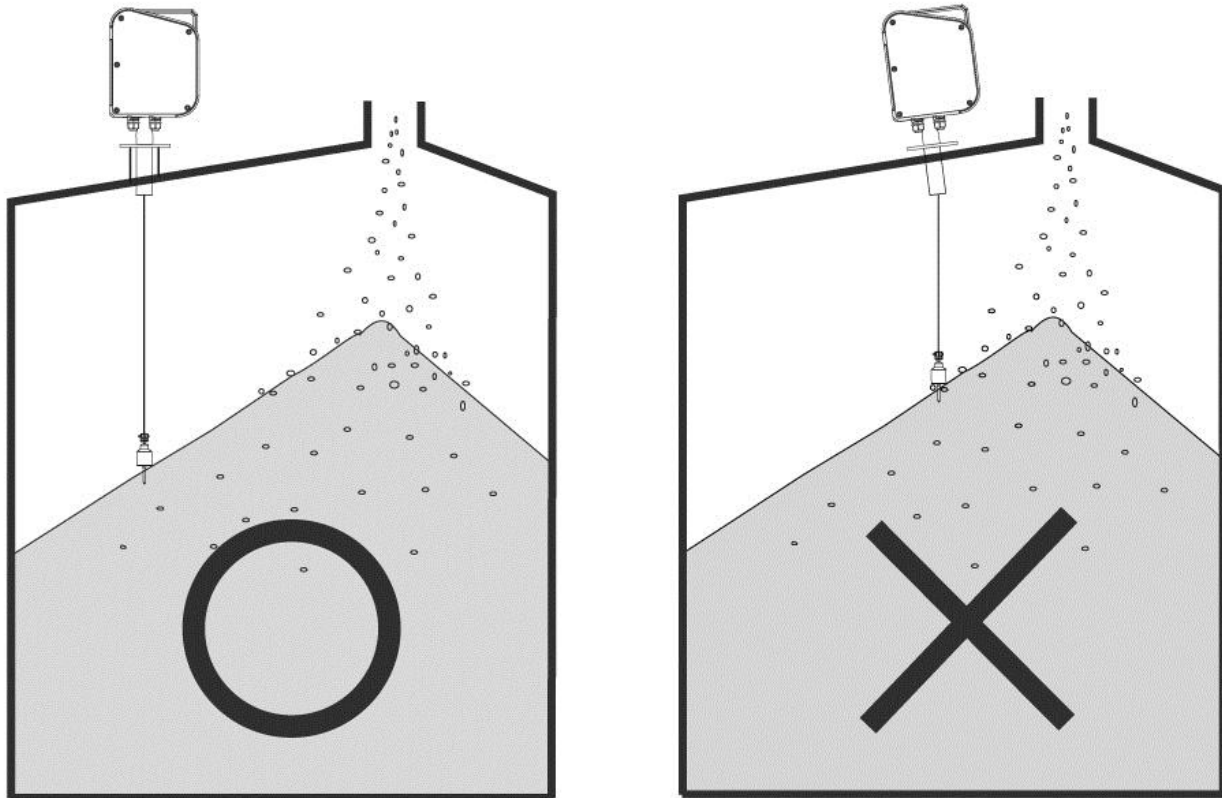


Figure 3: Mount the Model WC inventory sensor plumb/level

- 3. Environment** - The Model WC inventory monitoring sensor should be mounted where the unit will be within its environmental specifications. Consider the ambient temperature limits of the sensor (-31°F/-35°C to +140°F/60°C). Operating temperature limits for internal bin temperatures are -31°F/-35°C to +176°F/80°C.

The sensor should be mounted within installations and environments where the materials of construction are compatible with the material being measured and surrounding environments.

Mechanical Installation Cont'd.

PRIOR TO INSTALLATION CONT'D:

- 100% Full Measuring Point** - The Model WC smart inventory sensor is provided with a built-in deadband of 15.2" (385mm) plus the height of the sensing weight, as shown in Figure 4, including the pipe assembly (6.5" / 165mm) that encloses the cable wiping mechanism and the modifiable stainless steel chain connection between the Nylon jacketed stainless steel cable and the sensing weight (8.7" / 220mm).

This means the Model WC can accommodate measurements where the installation utilizes a nozzle and the typical situation where the 100% full measuring point is below the inside of the roof.

Prior to installation you should consider where your 100% full point is in relation to the sensor mounting flange. If the distance from the mounting flange to the 100% point needs to be increased beyond the built-in 15.2", adjustment can be made using the configuration parameter "Air Range". Refer to Sensor Setup section.

Reducing the total deadband can be accomplished by eliminating sections of the stainless steel chain connecting the sensing weight to the Nylon jacketed stainless steel measuring cable. Refer to Maintenance section.

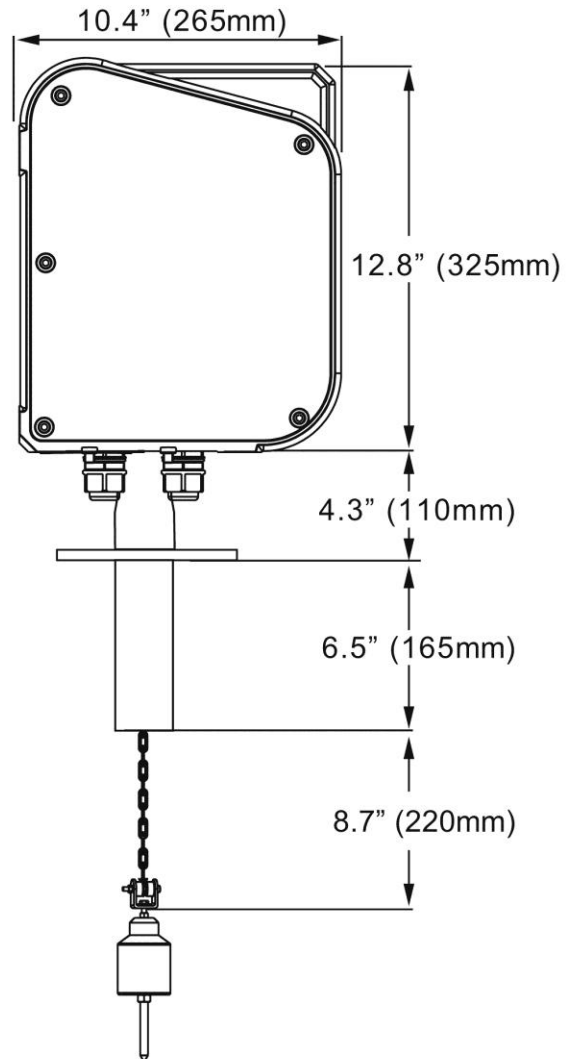


Figure 4

MOUNTING/INSTALLING THE SENSOR:

- Location** - Choose the sensor mounting location according to section titled "PRIOR TO INSTALLATION".
- Flange Mounting** - The Model WC inventory monitoring sensor includes a mounting flange / pipe assembly. See Figures 5, 6, 7 and 7a.

Mechanical Installation Cont'd.

PRIOR TO INSTALLATION CONT'D:

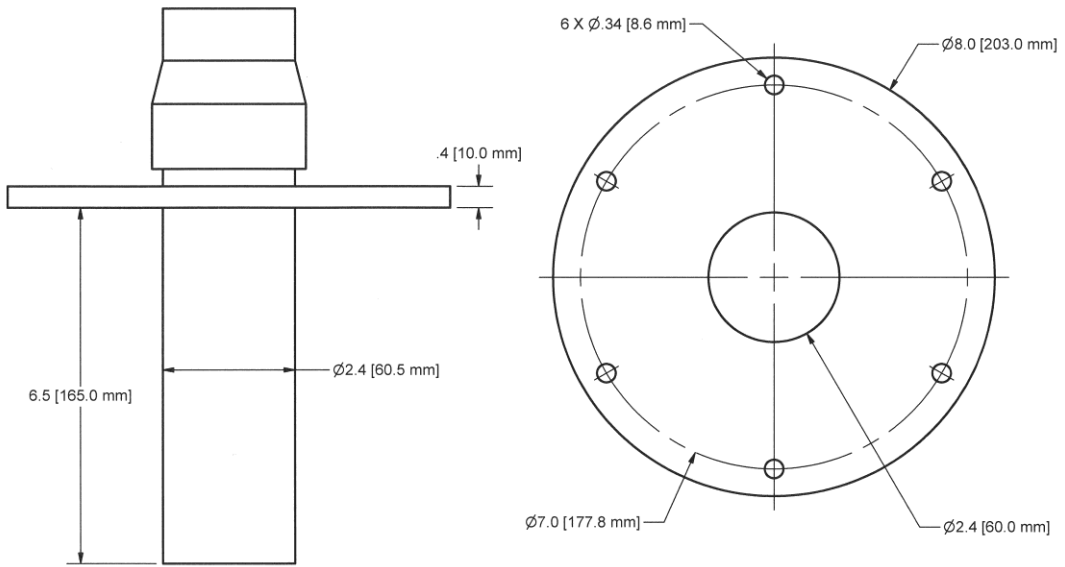


Figure 5: Flat mounting flange / pipe assembly

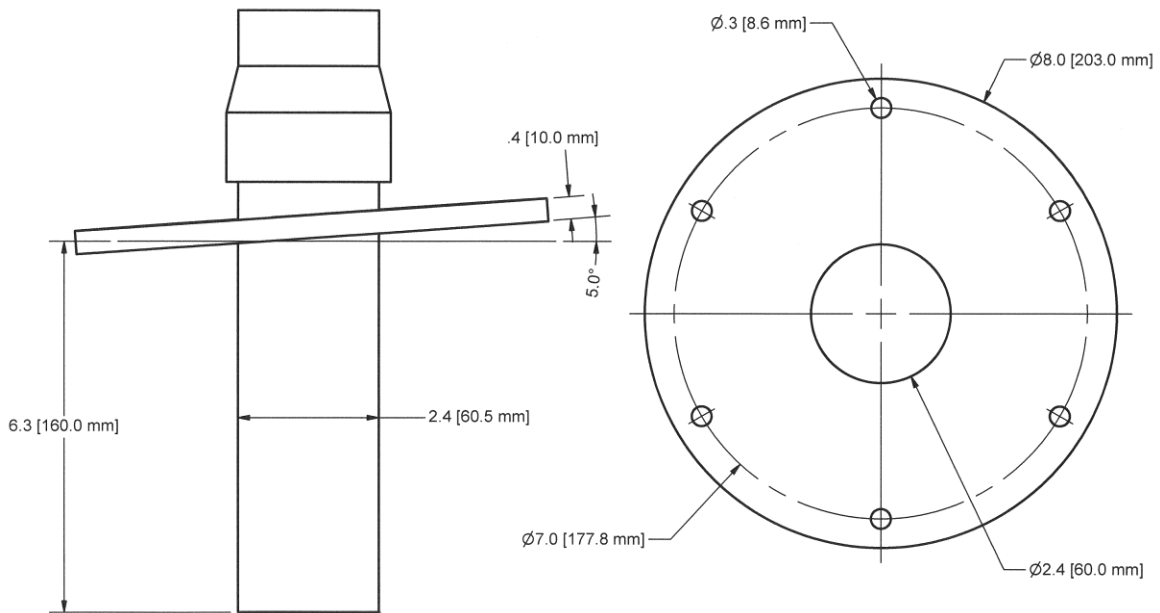


Figure 6: 5 degree angled flange / pipe assembly

Mechanical Installation Cont'd.

MOUNTING / INSTALLING THE SENSOR CONT'D:

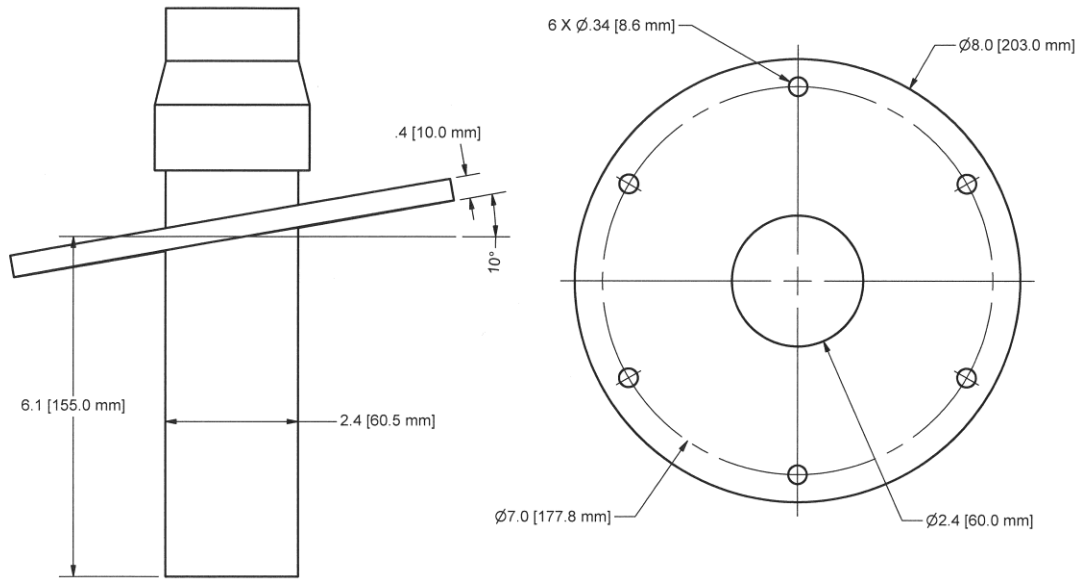


Figure 7: 10 degree angled mounting flange / pipe assembly

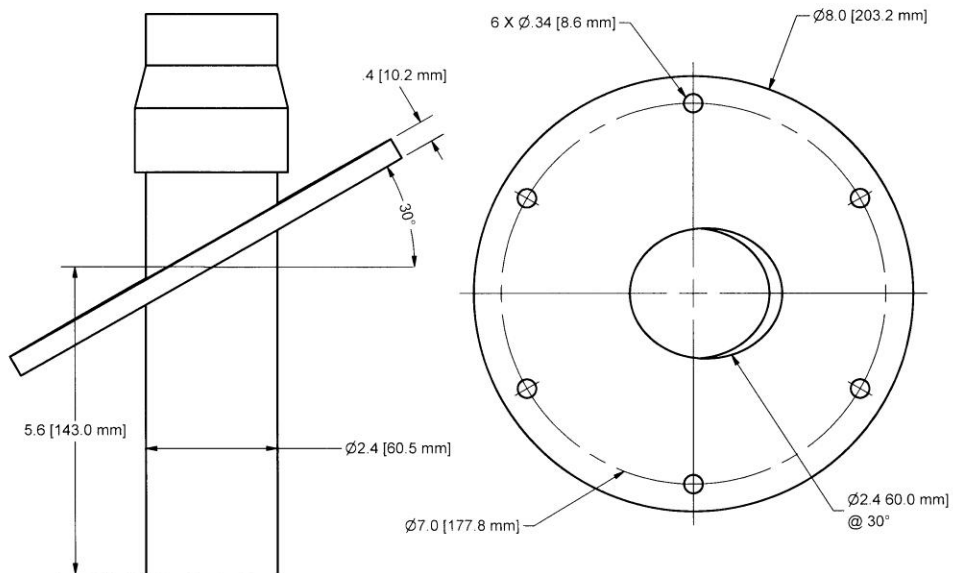


Figure 7a: 30 degree angled mounting flange / pipe assembly

Mechanical Installation Cont'd.

MOUNTING / INSTALLING THE SENSOR CONT'D:

If mounting the sensor using the flat flange and a mounting nozzle on top of the vessel, make sure the minimum ID of the nozzle is 4.0" (101mm).

If mounting using either flange on the surface of the vessel roof, cut a 4.0" to 5-1/2" (101-140mm) diameter center hole and drill holes for six (6) 5/16" (8mm) bolts equally spaced on a 7.0" (178mm) bolt circle.

Install gasket, place sensing weight and pipe assembly into center hole and secure in place using 5/16" (8mm) bolts.

- 3. Installing sensor with optional sensing weights** - The aluminum alloy sensing weight is the standard sensing weight for all Model WC inventory monitoring sensors. Optional sensing weights are available, including the Umbrella, Plastic Auto Fall-Off and Ball Float sensing weights. Refer to Figure 8.

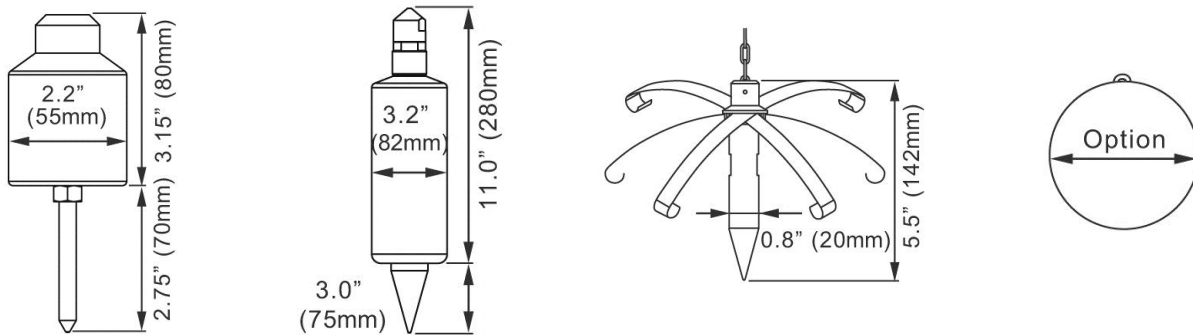


Figure 8: Sensing weights; standard, umbrella, plastic, ball

A standard aluminum alloy sensing weight is provided with each Model WC, unless ordered with the optional plastic auto fall-off sensing weight or a ball float with a diameter of 5-1/2" or less.

If ordered with the plastic or ball sensing weight the optional sensing weights will be installed on the Model WC and mounting can proceed.

Mechanical Installation Cont'd.

MOUNTING / INSTALLING THE SENSOR CONT'D:

Should your Model WC sensor have been ordered with the optional umbrella weight you must first install the Model WC sensor with the standard aluminum alloy weight attached. Depress the “UP” and “RUN” keys located on the top circuit board inside the electronics compartment of the Model WC sensor simultaneously to enter the “Test Mode” where you can manually lower and raise the sensing weight / cable system. Depress and hold the “RUN” key to lower the sensing weight / cable. Release the “RUN” key to stop lowering the sensing weight /cable. Depress and hold the “UP” key to raise the sensing weight / cable. Using these keys in the Test Mode, lower the sensing weight / cable into the vessel so that enough cable has been let out that you can access the sensing weight from an access hatch or vent on top of the vessel and pull it out through the hatch/vent. All sensing weights are attached to the stainless steel chain at the end of the sensing weight cable chain with an assembly as shown in Figure 9. Detach the standard sensing weight and attach the optional umbrella weight.

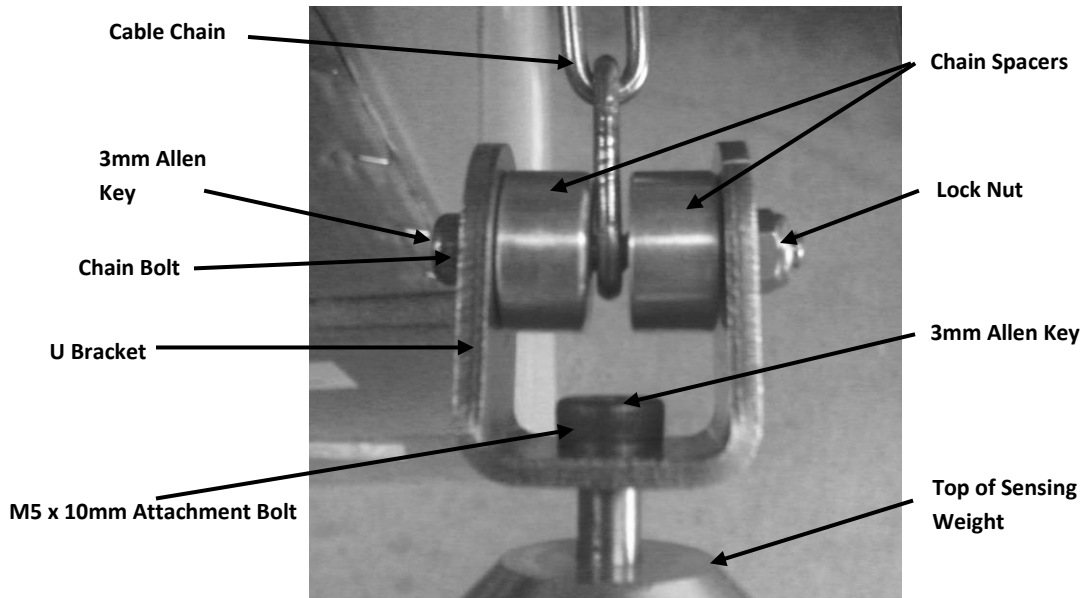


Figure 9: Sensing weight attachment to cable chain

- 4. Using air purge connection** - Each Model WC sensor includes a ¼” NPT threaded female connection located on the underside of the enclosure on the mechanics compartment side. This threaded connection can be used to connect an external source of dry, clean air or non-combustible gas to the Model WC enclosure.

By adding a positive air pressure to the air purge connection that is slightly greater than that of the pressure inside the vessel during filling or discharge conditions, material and dust from the vessel can be prevented from entering the mechanics compartment of the unit. The external pressure should be one (1) psi greater than the maximum ambient pressure within the vessel. Always use air that is free from moisture and other contaminants.

IT IS STRONGLY RECOMMENDED that the air purge connection be properly used and connected to a dry air source of adequate air pressure, especially when the Model WC smart inventory sensor is being used in the Auto or SmartStart™ measuring mode and the material being measured is a dusty powder.

Mechanical Installation Cont'd.

MOUNTING / INSTALLING THE SENSOR CONT'D:

- 5. Removing and attaching the Model WC covers** - The Model WC inventory monitoring sensor is equipped with a removable cover on both the electronics and mechanics compartments. These two compartments are isolated from each other within the cast aluminum enclosure. The two covers are identical except that the mechanics compartment has five (5) attachment bolts and the electronics compartment has four (4). Each bolt is identical and also has a washer with it. Be careful when removing and storing the bolts/washers as the washer is not captive to the bolt. The washers are important to the proper sealing of each compartment. The bolts used to secure the two covers are hexagon socket head cap screws M6 x 12mm size. They can be removed by using a 5mm Allen wrench (a.k.a. hex key, Allen key).

Instrument Function

Introduction:

The Model WC is a smart inventory monitoring sensor of high quality design and ergonomics, which provides reliable measurements of the empty space distance and material level of a powder, granular or liquid contained within a bin, tank, silo or other vessel.

The Model WC is a smart instrument that self-validates the measurement cycle. It is capable of detecting a broken cable or buried sensing weight, should those conditions ever occur, and indicating this condition locally on the display within the sensor electronics compartment of the enclosure and remotely via a relay output. It is recommended that this relay be monitored by a control system or some remote receiving mechanism (a light etc.).

Principle of Operation:

The Model WC smart inventory monitoring sensor is a 3G instrument for measuring material inventories in bins, tanks, silos and other vessels. Using third generation weight & cable technology a measurement cycle can be initiated manually (local or remote initiation), automatically via a configuration timing sequence parameter ("Timer") or via a unique SmartStart™ function utilizing a built-in algorithm and an additional timing parameter called ("Smart"). The SmartStart function adapts the cycle timer so that the time between measurement cycles is shorter the closer the material level is to a full condition. Refer to the Setup section for more information.

Upon initiation of a measuring cycle the Model WC utilizes its intelligent motor control system to control the lowering of the sensing weight into the vessel. The sensing weight is securely attached to a heavy duty 270lb tensile strength Nylon jacketed stainless steel cable via a heavy duty stainless steel chain. The Model WC sensor measures the distance of empty space by measuring the amount of cable being dispensed until the material surface is contacted. This distance measurement is accomplished by using a combination of a high speed timing sequence within the electronics and a Hall sensor that monitors the rotation of the measuring pulley located in the mechanics compartment of the enclosure.

The downward travel of the sensing weight / cable is controlled by the intelligent measurement system at an optimal rate designed to maximize motor and cable life while ensuring a rapid completion of the measurement sequence. The intelligent motor control system combines mechanic design and electronics technology to accurately detect the sensing weight contact with the material surface. When this occurs, or when the AutoReturn™ distance is reached, the motor is stopped and then started again in the reverse direction to retract the sensing weight / cable system and return it to its original starting position docked tightly into the Model WC sensor assembly. The empty space distance is again measured during the return travel and the speed controlled to ensure proper cable wrapping.

Instrument Function Cont'd.

The downward travel of the sensing weight / cable is controlled by the intelligent measurement system at an optimal rate designed to maximize motor and cable life while ensuring a rapid completion of the measurement sequence. The intelligent motor control system combines mechanic design and electronics technology to accurately detect the sensing weight contact with the material surface. When this occurs, or when the AutoReturn™ distance is reached, the motor is stopped and then started again in the reverse direction to retract the sensing weight / cable system and return it to its original starting position docked tightly into the Model WC sensor assembly. The empty space distance is again measured during the return travel and the speed controlled to ensure proper cable wrapping.

The AutoReturn™ function is a standard feature of the Model WC sensor. This function ensures that the sensing weight / cable travel will never exceed the configured maximum measuring distance parameter ("H"). Refer to the Setup section for more information.

Intelligent motor control operates continuously during the measuring sequence. During the return of the sensing weight / cable to its original docked starting position the Model WC sensor will be able to detect any delay, even a delay that results in prematurely stopping the return travel.

If the sensing weight travel is stopped prior to its return to the original starting position the sensor will indicate a buried sensing weight via an LED on the main circuit board and activation of the sensor error relay sequence for a buried sensing weight condition. During this stopped condition the Model WC intelligent control system will periodically continue to attempt returning the sensing weight / cable to its original starting position. If it is successful the self-validated "buried" condition will be cleared (buried condition LED returns to "off" condition and relay returns to its normal state) and normal operation will resume.

Once the successful measuring sequence is completed, the output data, built-in LCD display and any logic control (material level alarm relays) that has been setup will be activated or updated. The Model WC smart inventory monitoring sensor includes multiple outputs as a standard feature, including MODBUS serial communication, 0/4-20mA analog output, a DC transistor pulse output, an AC relay pulse output and Hi and Lo material level alarm relay outputs.

Application or Use:

The Model WC is an inventory monitoring sensor for use in measuring material levels in bins, tank, silos and other vessels. The material is typically a powder or granular material but the sensor can also be used to measure liquid material levels as well.

The Model WC includes two relay outputs for use as material level alarms, Hi and Lo. However, these relay outputs are not intended to act as the sole indication of Hi or Lo level conditions for the purpose of controlling a vessel filling system. It is recommended that the vessel filling system be controlled using separate and independent level control sensing devices such as the BlueLevel Model RH/RHX Rotary Paddle Bin Level Indicator, Model VHS Vibrating Element Point Level Sensors or Model CPH/CPU Capacitive Proximity Switches.

Instrument Function Cont'd.

MODBUS Serial Communication:

MODBUS is a serial communication link protocol developed and first implemented in 1979 by Modicon for use in communicating with its PLC's. It is currently a de facto standard communication protocol that is well established, open, royalty free, easy to implement and in use with thousands of products. MODBUS allows for communication between many devices connected to the same network, typically up to 240. MODBUS protocol and updates today is controlled by the MODBUS Organization (www.modbus.com).

There are several variants of MODBUS protocol. The most commonly used for serial data communications, such as in the Model WC smart inventory monitoring sensor, are MODBUS RTU and MODBUS ASCII. MODBUS RTU is the most common implementation. The Model WC allows for selection of either RTU or ASCII protocol. A selection of different frames (separation between messages by idle or silent periods) is available. However, most often the Model WC will operate in the RTU mode with Frame C8N1. Consult with the manufacturer or supplier of the receiving device you are connection the Model WC into for additional information if needed. Use terminals 14 and 15.

Analog Output:

Each Model WC is also provided with an analog output (terminals 5 and 6). This output can change with each measurement. The analog output can be selected to be 0-20mA or 4-20mA. The most commonly used analog signal is 4-20mA. Consult with the manufacturer of the receiving device for the most appropriate analog output. The analog output signal represents either DISTANCE or MATERIAL LEVEL based upon the configuration of the "ADD/DEC" parameter. Refer to Setup section.

DC Pulse Output:

Each Model WC inventory monitoring sensor is equipped with two pulse outputs, a DC transistor pulse and an AC relay pulse. The DC transistor pulse output is typically used to interface with PLC's and other devices where a DC voltage pulse generated by a transistor is desired. The pulse output is a counting output that represents the empty space distance measured by the Model WC sensor. Whether the receiving device (PLC or other) counts up (distance measured display) or counts down (material level display) is dependent on the receiving device and your need. The value of each DC transistor (NPN or PNP) pulse is either 0.1ft per pulse ("ft" setting for units) or 10mm/pulse ("m" setting for units). Refer to Setup section for more information. Use terminals 1 and 2 for NPN, terminals 3 and 4 for PNP.

AC Pulse Output:

The AC relay pulse output uses an electromechanical relay (3A @ 250VAC) and generates pulses that can be read by a variety of counting devices. The pulse output is a counting output that represents the empty space distance measured by the Model WC sensor. Whether the receiving device (PLC or other) counts up (distance measured display) or counts down (material level display) is dependent on the receiving device and your need. The value of each AC relay pulse is either 0.1ft per pulse ("ft" setting for units) or 100mm/pulse ("m" setting for units). Refer to Setup section for more information. Use terminals 7 and 8.

Material Level Alarm Relay Outputs:

Two material alarm relay outputs are provided with each Model WC inventory monitoring sensor. One relay output is provided for use as a High material level alarm, one is provided for use as a Low material level alarm. The Model WC level alarms are NOT provided to be a replacement to your primary level control sensors for vessel filling control. Separate level sensors should be used for control purposes to avoid a loss of fill control should the inventory monitoring sensor fail for any reason, such as a power failure. Each Model WC material level alarm relays provides a SPDT contact arrangement (terminals 9, 10 and 23 for High; terminals 24, 25 and 26 for Low).

Instrument Function Cont'd.

LED Indicators:

Eight (8) LED's are included on the main circuit board (Table 1):

Table 1: LED indicators on main printed circuit board

LED INDICATOR	FUNCTION
LOCK	remote lockout engaged; can be used to prevent sensor measurement cycle during filling of vessel
HI	indicate high material level alarm; illuminates when material level exceeds High level alarm setting
LOW	indicate low material level alarm; illuminates when material level is below Low level alarm setting
AUTO	LED is on when sensor is operating in the Automatic mode
RUN	indicates sensor is in an active measuring cycle
BURIED	blink on/off (1 second period) if sensor has detected a buried sensing weight condition; off during normal operation
BREAK	blink on/off (2 second period) if sensor has detected a broken cable condition; off during normal operation
POWER	illuminates when power to sensor is "on"

Self-Validating Sensor Status Output:

All Model WC units self-validate the measurement cycle to ensure proper measurement function, accuracy and to indicate measurement sensor cycle error should it ever occur.

Sensor errors that can be detected and indicated include 1) Buried sensing weight, 2) a sensing weight cable Break, and 3) the activation and existence of a sensor Lockout condition.

Should a sensor error condition be detected the condition will be indicated through the blinking of one or more of the sensor error LED's on the main circuit board and cycling (energize de-energize energize de-energize, etc.) of the sensor error relay output (terminals 11, 12 and 13).

Measurement Initiation Methods and SmartStart™ Function:

There are three methods to initiate a primary measurement update; Auto, Manual and SmartStart™.

Auto - once setup the Model WC will acquire a new measurement with update frequency based upon the Timer configuration parameter, **adjustable from 0.1 to 99.99 in terms of hours**

Instrument Function Cont'd.

Measurement Initiation Methods and SmartStart™ Function Cont'd.:

Manual - acquiring a measurement update can be initiated at anytime **manually from the internal display/keys, external contact closure and MODBUS serial communication**

SmartStart™ measurement **update frequency increases as empty space distance decreases** (used to assist in preventing overfilling and assist in vessel level control)

The SmartStart™ algorithm for measurement update frequency is as follows:

$$\text{Cycle Time } t = \text{SmartStart™ Timer} + ((\text{Actual Measured Distance/Height}) \times (\text{Auto Timer-SmartStart™ Timer}))$$

The *Auto* Timer must always be set to a value greater than the SmartStart™ Timer when SmartStart™ is being utilized. A SmartStart Timer of 0.0 means the SmartStart™ algorithm is not in effect.

EXAMPLES:	Auto Timer =	1.1 hours
	SmartStart™ Timer =	0.5 hours
	Height =	33ft (10m)
	Last Distance Measured =	16.4ft (5m);
	Measurement Frequency =	0.8 hours
	Last Distance Measured =	5ft (1.5m);
	Measurement Frequency =	0.6 hours
	Auto Timer =	1.1 hours
	SmartStart™ Timer =	0.9 hours
	Height =	33ft (10m)
	Last Distance Measured =	16.4ft (5m);
	Measurement Frequency =	1.0 hours
	Last Distance Measured =	5ft (1.5m);
	Measurement Frequency =	0.93 hours
	Auto Timer =	0.4 hours
	SmartStart™ Timer =	0.1 hours
	Height =	33ft (10m)
	Last Distance Measured =	16.4ft (5m);
	Measurement Frequency =	0.25 hours
	Last Distance Measured =	5ft (1.5m);
	Measurement Frequency =	0.145 hours

When using SmartStart™ the measurement update frequency will never be greater than the Auto Timer value, nor will it be less than the SmartStart™ Timer value. It will vary between the Auto and SmartStart™ timer values dependent on the actual measured distance.

Electrical Connections

Hazardous Location Precautions:



Refer to Safety Summary section on pages 3 and 4 of this manual before beginning electrical connections.

The Model WC smart inventory monitoring sensor is **NOT** certified for use in and should not be used or installed and operated in hazardous locations.

For all models, ensure that the power source is disconnected before removing the covers, and upon completion ensure that the covers are completely re-attached.

Permanently Connected Equipment:



Disconnecting devices shall be included in the system installation. In installations where multiple circuits are used, individual disconnects are required.

Disconnects shall be within close proximity of the equipment, accessible to operators, and marked appropriately as being the specific disconnect for the associated circuit.

Assure all disconnect ratings are appropriately sized for the circuit protected (Refer to Technical Data section).

Protective Earth Ground:



Each Model WC unit is provided with a “protective conductor terminal” which shall be terminated to the local earth ground potential to eliminate shock hazard. There is a ground terminal located on the inside and outside of the enclosure marked by a earth ground symbol as shown below. Select a wire size that can carry in excess of the sum of the maximum amperage of all circuits.



Circuit Separation:



Since the wiring compartment of the Model WC cannot absolutely protect against physical contact between multiple circuits, it is required that all wiring used must have an insulation rating of 300v minimum, and a minimum temperature rating of 194° F (90° C).

General:

The Model WC smart inventory monitoring sensor can be powered with 100-240VAC, 50/60Hz supply voltages.

Field wiring should conform to all national and local electrical codes and any other agency or authority having jurisdiction over the installation. Electrical wiring connections and installation shall be done by qualified personnel.

Refer to Figure 10 for all wiring connections.

Electrical Connections Cont'd.

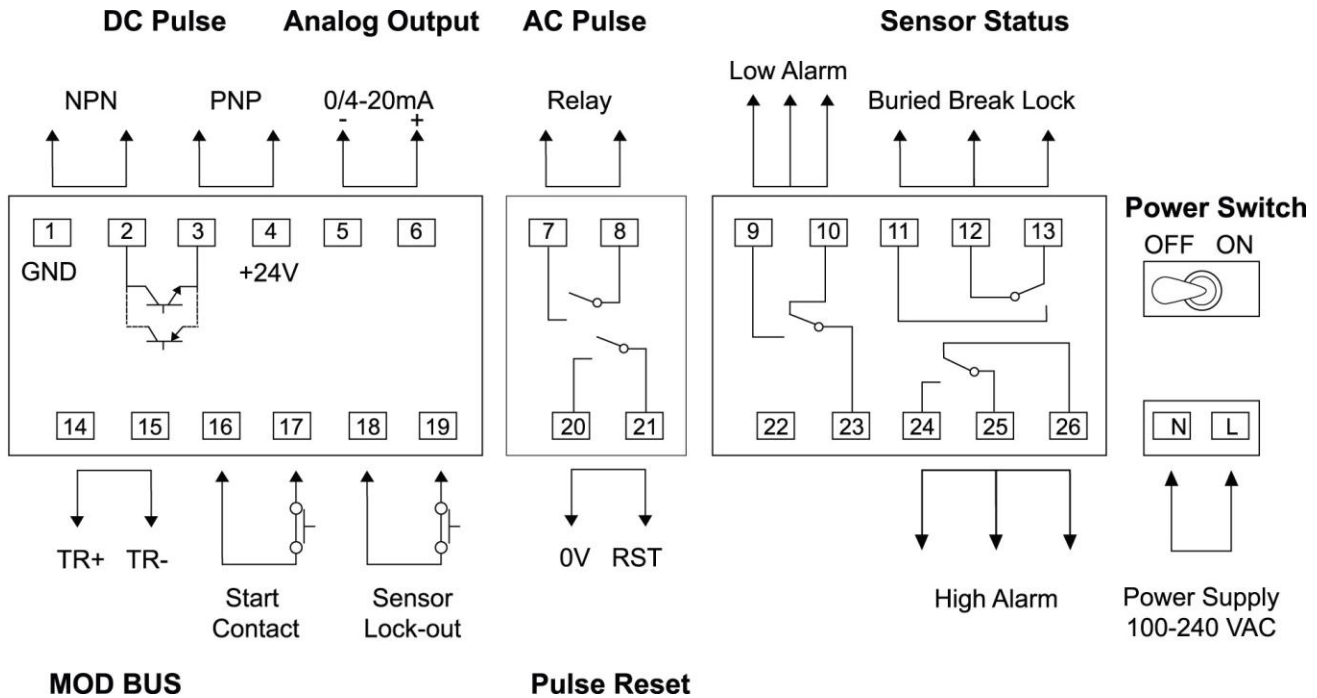



Figure 10: Electrical connections

Input Power:

Power input to the Model WC is connected to terminals labeled N and L. Refer to Figure 10. If one of your AC supply conductors is grounded, it should be connected to the ground screw located inside or outside the Model WC enclosure as indicated by the ground symbol shown on page 20. The ungrounded supply conductor should be connected to the L terminal. If neither of your AC supply conductors is grounded, then one of them is connected to the N terminal and the other to the L terminal.

Grounding:



Refer to the "Protective Earth Ground" section on page 20. An equipment grounding connection (earth ground) must be supplied to the unit for safety. Connect the ground conductor to the protective conductor terminal as marked with the  symbol.

MODBUS:

The MODBUS measured value shall be either the measured distance "ADD" or material level "DEC" depending upon configuration during the sensor setup. Refer to the Setup section for more information.

MODBUS measured value is updated at the completion of the measurement cycle, when the sensing weight has returned to its original starting position.

MODBUS serial connection is an RS485 2-wire serial communication link using a shielded twisted pair cable such as Belden 9463, 9322 or equivalent.

Electrical Connections Cont'd.

MODBUS Cont'd.

Model WC sensors must be connected in a “daisy-chain, multi-drop configuration. The order of connection is not important, however, the MODBUS communication network wiring interconnection must have only two ends with all units serial inline, without electrical “T” connections. All MODBUS wiring joints should be at the Model WC wiring terminals. Refer to Figure 10. Use terminals 14 (TR+) and 15 (TR-) for MODBUS wiring connections. Shield connection is made to terminal 1.

Line termination may be required for proper implementation of the entire serial bus. A reflection in the transmission line can result from an impedance discontinuity. To minimize the reflections place a line termination resistor at each of the two ends of the bus. The line termination resistor can be a 0.5W 140ohm resistor.

For further information regarding MODBUS refer to the document titled “MODBUS over Serial Line Specification & Implementation Guide V1.0” dated 12/2/02 available at www.modbus.org.

Analog Output:

The analog output signal can be configured to either 0-20mA or 4-20mA. Refer to the Setup section for more information. The analog output signal connects using terminals 5 (-) and 6 (+). Refer to Figure 10.

The analog value shall represent either the measured distance “ADD” or material level “DEC” depending upon configuration during the sensor setup. Refer to the Setup section for more information.

The analog value is updated at the completion of the measurement cycle, when the sensing weight has returned to its original starting position.

DC Pulse Output:

The Model WC provides a DC pulse output using a solidstate transistor. The output connections can be for either a NPN or PNP configuration. NPN connections use terminals 1 (GND) and 2 as shown in Figure 10. The PNP connection uses terminals 3 and 4 (+24V).

The pulse outputs always transmit the empty space distance, NOT material level. The measured value is transmitted as cable distance increases when the measurement cycle begins. The pulse output stops when the material surface is contacted.

DC Pulse Output Cont'd.

Prior to beginning transmission of pulses representing the measured distance, the Pulse Reset output is activated. This can be used to reset pulse counters to zero.

AC Pulse Output:

The Model WC provides an AC pulse output using an electromechanical relay. The output connections for the AC pulse output use terminals 7 and 8 as shown in Figure 10.

The pulse outputs always transmit the empty space distance, NOT material level. The measured value is transmitted as cable distance increases when the measurement cycle begins. The pulse output stops when the material surface is contacted.

Prior to beginning transmission of pulses representing the measured distance, the Pulse Reset output is activated. This can be used to reset pulse counters to zero.

Electrical Connections Cont'd.

Remote Manual Start Input:

Manually initiation of a measuring cycle can be accomplished remotely by a contact closure. This dry contact closure should be connected to the Model WC sensor using terminals 16 and 17 as shown in Figure 10.

SENSOR LOCKOUT INPUT:

The weight & cable inventory sensor is not specifically intended to perform measuring cycles during vessel filling. Inventory monitoring is the intended design purpose of these units and, as such, measurement during static conditions (no vessel filling) is typically all that is required.

The Model WC allows for automatic measuring cycles based on a Timer, as discussed in the Setup section. Therefore, to prevent measuring cycle during a filling cycle when Auto or SmartStart™ measuring modes are selected, or at anytime desired, the Model WC is equipped with a sensor Lockout input. Upon initiation of a remote contact closure the Model WC shall not allow any measurement cycle initiation.

BlueLevel Technologies

Normal measurement cycles will return when the remote dry contact closure returns to the normal open contact state. The Lockout input uses terminals 18 and 19 as shown in Figure 10.

Material Level Alarm Relay Outputs:

The Model WC is provided with two material level alarms and a relay output for each. One is for High material level condition and the other is Low level. It is strongly recommended that these relay outputs not be used as the sole level control for vessel filling especially. Independent level control sensors should always be used. The material level alarm relays are SPDT providing both a normally-open and a normally-closed contact for each. The High level alarm relay connects using terminals 24 (NO), 25 (NC) and 26 (C) as shown in the diagram in Figure 10. The Low level alarm relay connects using terminals 9 (NO), 10 (NC) and 23 (C) as shown in the diagram in Figure 10. The material level alarms activate when the measuring cycle is complete and the sensing weight is returned to its starting position, should a material level alarm condition exist.

Sensor Error Relay Output:

The Model WC is a self-validating device that continuously monitors its measuring cycles. The sensor is capable of detecting both buried sensing weight and broken cable conditions. Should either of these conditions be detected the appropriate LED indicator on the main circuit board will illuminate and the Sensor Error relay output will activate according to Table 1 below. This relay output will also indicate if the sensor is in a locked condition based on the closure of a remote sensor lockout input.

Electrical Connections Cont'd.

Table 2: Sensor error relay output action

SENSOR STATUS	NORMAL	ERROR ALARM
Lockout Terminals 12/13 Terminals 11/12 Terminals 11/13	Closed Open Open	Open Closed Open
Buried Weight Terminals 12/13 Terminals 11/12 Terminals 11/13	Closed Open Open	Blink (open/close) Blink (open/close) Open
Cable Break Terminals 12/13 Terminals 11/12 Terminals 12/13	Closed Open Open	Blink (open/close) Blink (open/close) Open

Blink error alarm time interval is approximately every one (1) second for Buried alarm indication and approximately two (2) second time interval for Break sensor error alarm. Relay state returns to normal automatically as the error alarm condition is cleared.

Setup

Sensor Configuration

There are two modes of configuration for each Model WC smart inventory monitoring sensor, Normal Mode and Test Mode. The Test Mode is only used during servicing or changing of sensing weight to the larger umbrella weight during initial installation. The Normal Mode is used to establish application parameters unique to each sensor.



The configuration of the AutoReturn™ function by adjusting parameter “H” (maximum measuring height) for the specific application must be done properly in order to ensure that the sensing weight does not travel into the vessel discharge should a measurement cycle be initiated with an empty vessel condition.

Setup Cont'd.

Sensor Configuration Cont'd.

NORMAL MODE

Adjustment of configuration parameters is done using the LCD display and keys within the Model WC. Refer to Figure 11, Table 2 and 3.



Figure 11: Main PCB with LCD display, configuration keys & terminal connections

Setup Cont'd.

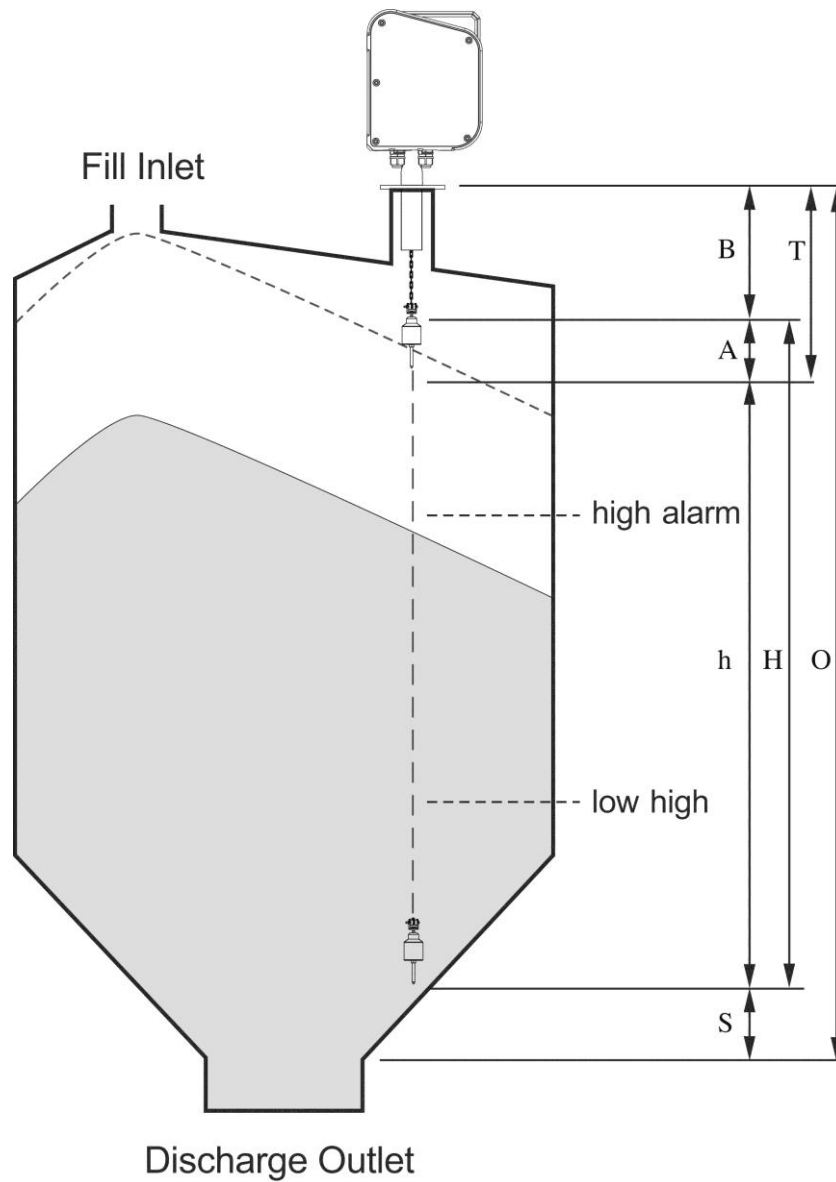
Table 3: Keys and their function

KEY	FUNCTION
UP	<ul style="list-style-type: none"> • Increase Configuration Parameter Value • Change Configuration Parameter Selection • Exit Configuration Mode
LEFT	<ul style="list-style-type: none"> • Entry to Configure Specific Parameter • Move Curser (during parameter value entry)
ENT	<ul style="list-style-type: none"> • Enter Configuration Normal Mode • Exit Specific Configuration Parameter • Proceed Through Configuration Menu (move from parameter to parameter)
RUN	<ul style="list-style-type: none"> • Manually Initiate Measuring Cycle (display must be on)

UP, LEFT and ENT keys can be used to turn on LCD display by pressing either of these keys when LCD display is off.

Table 3 identifies and defines each configuration parameter. Please refer to and understand each parameter **before** attempting setup. Also refer to Figure 12 to assist in setup of each Model WC sensor for the specific vessel application. Scroll through all parameters and adjust the “m / ft” engineering unit parameter first if required. The default from the factory will be set to English units or to display and output in feet “ft”. If this default setting is acceptable then begin parameter adjustment from the beginning.

Setup Cont'd.



ICON	FEATURE	DEFINITION
O	Vessel Height	distance from sensor mounting flange to vessel discharge/outlet
B	Blind Distance	distance from sensor flange where measurement will not take place
A	Air Zone	adjustable deadband (factory set to 0); sets where measurement begins
T	Total Deadband	includes blind distance (B) and air zone (A)
H	Height	AutoReturn™ distance - the maximum measuring distance and the maximum travel
h	Effective Distance	distance of sensing weight/cable for specific application
S	Safety Zone	effective measuring distance; varies based on values of H and A; corresponds to the analog 0/4-20mA output signal range
		distance between AutoReturn™, H above, and discharge opening

Figure 12: Establishing specific vessel application parameters

Setup Cont'd.

Table 4: Normal mode configuration parameters for Model WC sensor

PARAMETER DISPLAY / DEFAULT	DEFINITION	ADJUSTMENT
0/4-20; 0-20	Analog output type selection; 0-20mA or 4-20mA	Use LEFT key to enter parameter, UP key to change selection, ENT key to exit and return to parameter display
ADD/DEC; DEC	Select Distance or Level for local display and output (MODBUS and Analog)	Use LEFT key to enter parameter, UP key to change selection, ENT key to exit and return to parameter display
A/H/S; AUTO	Select measuring mode; Automatic, Manual and SmartStart™	Use LEFT key to enter parameter, UP key to change selection, ENT key to exit and return to parameter display
Timer; 01.0	When AUTO is selected this timer controls the frequency of measuring cycles (example: 1.0 = measuring cycle start every 1.0 hour); adjustment from 00.1 to 99.9h	Use LEFT key to enter parameter, UP key to increase value one place at a time, use LEFT key to move from value place to place, ENT key to exit and return to parameter display
smart; 01.0	SmartStart™ timer adjustment, functions only when SmartStart is selected for measuring mode; adjustment from 00.1 to 99.9h; smart must be < Timer value for proper operation of SmartStart REFER TO SMARTSTART DESCRIPTION IN INSTRUMENT FUNCTION SECTION	Use LEFT key to enter parameter, UP key to increase value one place at a time, use LEFT key to move from value place to place, ENT key to exit and return to parameter display

Table 5 Cont'd: Normal mode configuration parameters for Model WC sensor

PARAMETER DISPLAY / DEFAULT	DEFINITION	ADJUSTMENT
H; 30.00	Maximum measuring distance / material level; Refer to Figure 12	Use LEFT key to enter parameter, UP key to increase value one place at a time, use LEFT key to move from value place to place, ENT key to exit and return to parameter display
Air Zone; 00.00	Adjustable deadband sets where distance measurement will begin and where 100% material level is	Use LEFT key to enter parameter, UP key to increase value one place at a time, use LEFT key to move from value place to place, ENT key to exit and return to parameter display
Hi Alarm; 05.00	Material level where high alarm point exists; Hi level alarm will initiate (LED and relay output) when material level measured meets or exceeds this setting	Use LEFT key to enter parameter, UP key to increase value one place at a time, use LEFT key to move from value place to place, ENT key to exit and return to parameter display

Setup Cont'd.

Table 5 Cont'd: Normal mode configuration parameters for Model WC sensor

PARAMETER DISPLAY / DEFAULT	DEFINITION	ADJUSTMENT
Lo Alarm; 20.00	Material level where low alarm point exists; Lo level alarm will initiate (LED and relay output) when material level measured meets or is below this setting	Use LEFT key to enter parameter, UP key to increase value one place at a time, use LEFT key to move from value place to place, ENT key to exit and return to parameter display
Format; RTU	MODBUS protocol can be either RTU or ASCII; RTU is most common and should be used with BlueLevel remote readout display devices unless instructed otherwise, RTU and ASCII use different redundancy checks	Use LEFT key to enter parameter, UP key to change selection, ENT key to exit and return to parameter display
ID; 001	MODBUS sensor ID number; identifies sensor for remote devices	Use LEFT key to enter parameter, UP key to increase value one place at a time, use LEFT key to move from value place to place, ENT key to exit and return to parameter display
BaudRate; 9600	MODBUS BaudRate selection	Use LEFT key to enter parameter, UP key to change selection, ENT key to exit and return to parameter display
Frame; C8N1	The messages between MODBUS master and slave units are called frames; two types of frames exist, PDU (protocol data unit) and ADU (application data unit); Select Frame for MODBUS communication; leave as default unless directed or known to be different for your receiving device	Use LEFT key to enter parameter, UP key to change selection, ENT key to exit and return to parameter display
m / ft; ft	Selection of engineering units to be either Metric or English / Imperial; Metric will mean display and output in meters "m", English / Imperial units will mean display and output in feet "ft"	Use LEFT key to enter parameter, UP key to change selection, ENT key to exit and return to parameter display

Setup Cont'd.

TEST MODE

Test Mode is only used during servicing or changing of sensing weight to the larger umbrella weight during initial installation.

To enter the Test Mode, while at the measured value being displayed on the LCD display press the UP + RUN keys simultaneously. When in the Test Mode press RUN to lower sensing weight/cable assembly, press UP to raise the sensing weight/cable assembly. The distance lowered or raised is momentary based on when the RUN or UP keys are released.

To exit the Test Mode press the ENT + LEFT keys simultaneously.

MODBUS serial communication address table is as shown below in Table 6.

Table 6: MODBUS address table

Address	Parameter	Description	Read/Write
0	Measured Value Metric Units	value measured last cycle in Metric units only	R
1	0/4-20mA	0 = 4-20mA; 1 = 0-20mA	R/W
2	Distance or Level	0 = ADD (distance); 1 = DEC (material level)	R/W
3	Auto/Manual/Smart	measuring mode of operation 0 = Auto; 1 = Manual Only; 3 = SmartStart™	R/W
4	Timer	automatic measuring mode cycle timer 00.1-99.9h	R/W
5	Smart	SmartStart™ timer (must be smaller than Timer value) 00.1-99.9h	RW
6	"H"	maximum measuring distance Metric only; 00.00 - 300.00cm	R/W
7	Air Zone	adjustable deadband or blocking distance Metric only; 0-300.00cm	R/W
8	Hi Alarm	High alarm value Metric Only; 0-3000mm	R/W
9	Lo Alarm	Low alarm value Metric only; 0-300.00cm	R/W
10	RTU/ASCII	0 = RTU; 1 = ASCII	R/W
11	ID	Sensor ID (001-255)	R/W
12	BaudRate	BaudRate 0-8 (1200, 2400, 4800, 9600, 11520, 14400, 19200, 28800 and 57600bps)	R/W
13	Frame	MODBUS Frame 0-8 (C8N1, C8N2, C8O1, C8E1, C7N2, C7O1, C7E1, C7O2, C7E2)	R/W
14	Sensor Alarm	0 = Normal; 1 = Buried Sensing Weight; 2 = Break in Cable; 3 = Sensor Lockout; 4 = Knot	R

Setup Cont'd.

Table 6: MODBUS address table

Address	Parameter	Description	Read/Write
15	Motor Run	Motor Running; 0 = No (Stopped); 1 = Yes (Running)	R
16	Motor Run Direction	0 = Stopped; 1 = Running Clockwise CW (down, sensing weight being lowered); 2 = Running Counter-Clockwise CCW (up, sensing weight being raised)	R
17	Measuring Cycle Initiation	Run Measurement Update; 0 = Stop; 1 = Run	R/W
18	Sensor Lockout	Lockout sensor measurement; 0 = Unlock; 1 = Lock	R/W
19	Measured Value English Units - High Byte	value measured last cycle in English units only; High Byte; 00.00-98.00 ft	R
20	Measured Value English Units - Low Byte	value measured last cycle in English units only; Low Byte; 00.00-98.00 ft	R
21	"H"	maximum measuring distance English units only; High Byte; 00.00 - 98.00 ft	R/W
22	"H"	maximum measuring distance English units only; Low Byte; 00.00 - 98.00 ft	R/W
23	Air Zone	adjustable deadband or blocking distance English units only; High Byte; 00.00-98.00 ft	R/W
24	Air Zone	adjustable deadband or blocking distance English units only; Low Byte; 00.00-98.00 ft	R/W
25	Hi Alarm	High alarm value English units only; High Byte; 00.00-98.00 ft	R/W
26	Hi Alarm	High alarm value English units only; Low Byte; 00.00-98.00 ft	R/W
27	Lo Alarm	Low alarm value English units only; High Byte; 00.00-98.00 ft	R/W
28	Lo Alarm	Low alarm value English units only; Low Byte; 00.00-98.00 ft	R/W

Maintenance

Preventive Maintenance:

Regularly check the secure assembly of all parts and examine the operation of a measurement cycle from the mechanics compartment. Check the sensing weight attachment for secure assembly. Check the cable during a measurement cycle to see if it is broken, knotted, kinked, frayed or cut. Replacement cable and/or sensing weight if any damage has occurred that is believed will impact the operation or reliability of the Model WC sensor.

Cable Replacement:

Cable life can extend to over tens-of-thousands of cycles depending upon the application. However, some applications with abrasive materials can reduce this life. Cables noted to have kinks, fraying or peeling of coating require immediate replacement.

Maintenance Cont'd.

Cable Replacement Cont'd:

Before starting disconnect the power source. It may be easier to accomplish cable replacement by removing the sensor from the vessel and performing the cable replacement on a shop bench.

Remove the covers from the Model WC sensor.

1. Remove sensing weight from chain. Refer to Figure 9. Retain all attachment hardware.
2. Remove flange/pipe assembly by unthreading it from the standpipe. Refer to Figure 13.

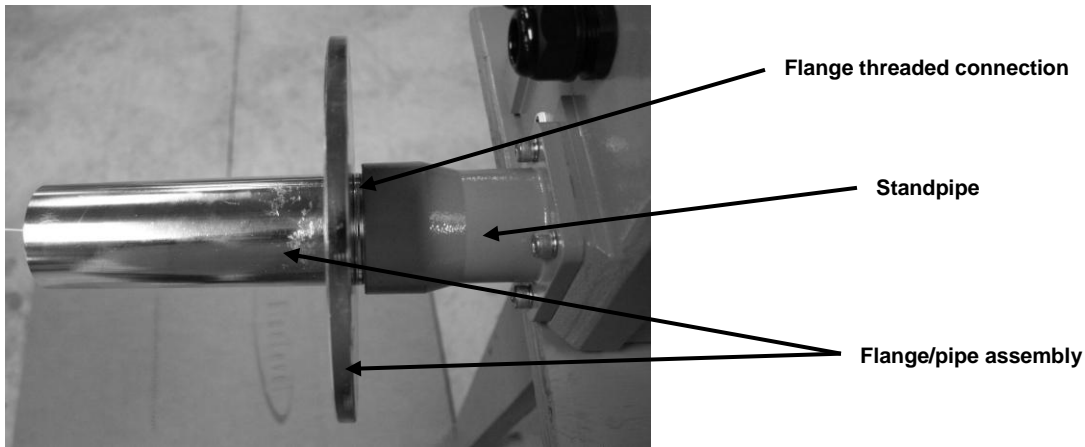


Figure 13

3. Depress the RUN and UP keys simultaneously to enter the Test Mode in order to lower and raise the sensing weight/cable assembly manually. After entering the Test Mode depress the RUN key to lower the sensing weight/cable until all cable is paid out. Keep the cable taut and pull on the cable as it spools off the storage pulley. Alternately: you can use the RUN key and the power on-off switch to stop the cable when the storage pulley is empty. Press the RUN key and keep cable taut to ensure cable sensing weight are not retracted. Turn power switch OFF when cable is empty from storage pulley.

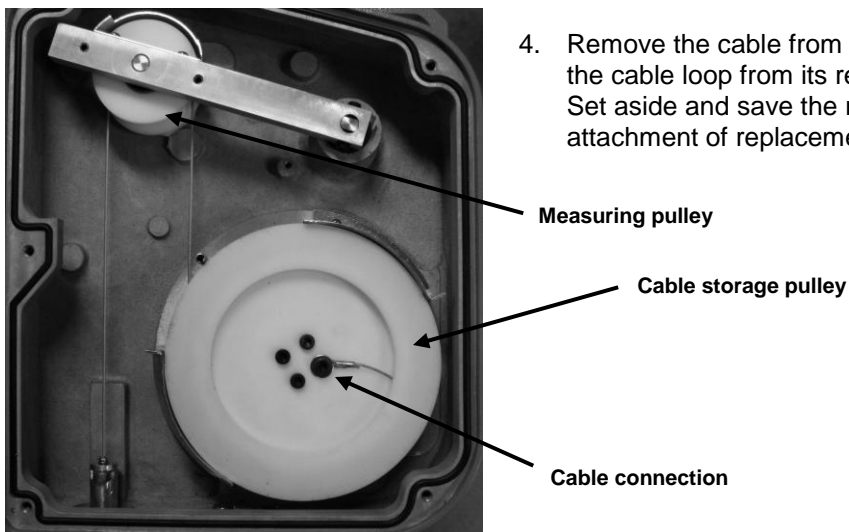


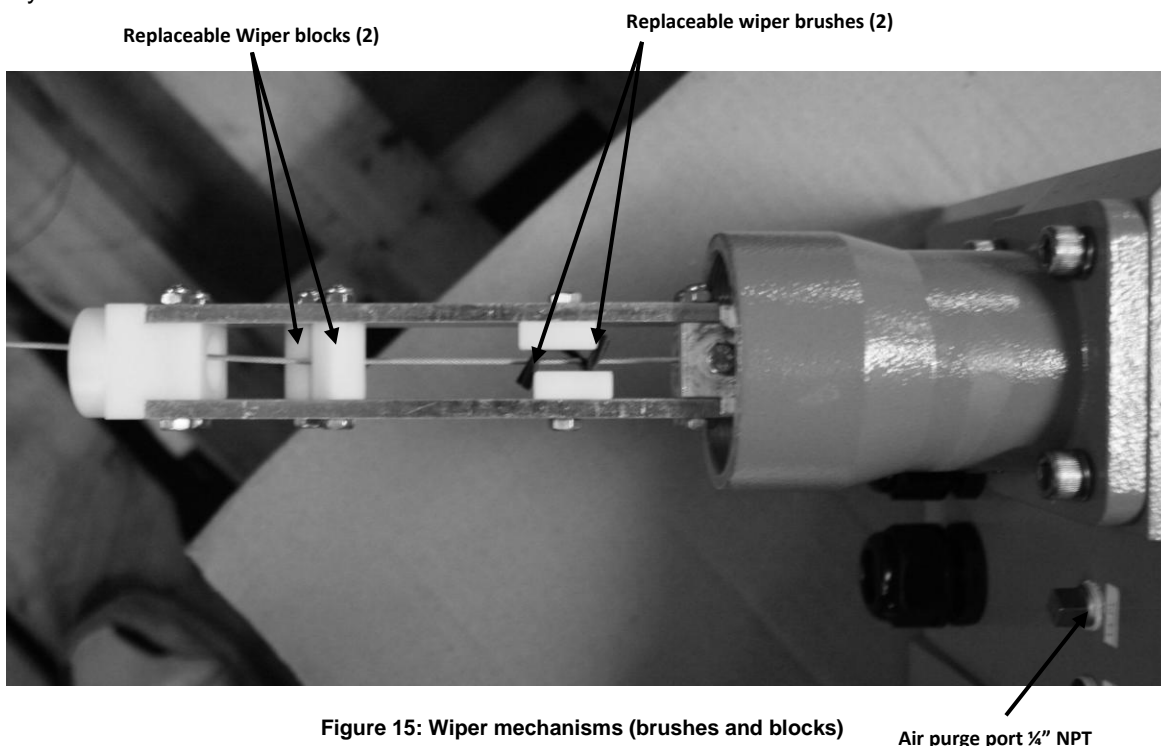
Figure 14

4. Remove the cable from the storage pulley by disconnecting the cable loop from its retaining fastener. Refer to Figure 14. Set aside and save the retaining fastener and washer for attachment of replacement cable.

Maintenance Cont'd

Cable Replacement Cont'd:

5. Cut new length of replacement cable. Refer to BlueLevel Technologies for replacement cable.
6. Inspect wiper brushes and wiper blocks. This is a good time to replace all wiper brushes and blocks. Contact BlueLevel Technologies for replacement parts.
7. Thread replacement cable through wiper mechanisms into the enclosure, around the small measuring pulley, then under the storage pulley and through the opening to get the cable to the cable fastener. Refer to Figure 15. Create a loop in the cable and secure with compression sleeve and crimp tool. Attach loop to storage pulley fastener.



8. If you previously placed the Model WC in the Test Mode then depress and hold the UP key to retract the replacement cable. Hold the cable taut and observe that it winds onto the storage pulley in an orderly manner. Leave 2-3 feet of cable extending out of the wiping assembly.
9. Reattach the flange/pipe assembly.
10. Create a loop at the end of the replacement cable with the chain within the loop. Make sure that the cone shaped "stop" is in place on the cable before making the loop. Secure the cable loop using a compression sleeve and pull aluminum "stop" down over the cable loop. Contact BlueLevel Technologies for replacement parts.
11. Reattach the sensing weight using the fastener parts that were previously removed.

Maintenance Cont'd

Troubleshooting:

Issue	Possible Cause	Check	Solution
No display No LED's No measurement	No power Power switch OFF Broken wire(s) Circuit dead Power supply failed	Check power switch Check voltage at input Check fuse Check secondary power supply voltage (24V)	Turn on power Replace wire or provide correct voltage Replace fuse Replace power supply module, contact BlueLevel Technologies
Display but no execution of measurement cycle	Remote start wire broken at terminals 16, 17 Motor wire broken Very high pressure in vessel, sensing weight can't drop Firmware failure	Check if RUN commands works properly Check motor wires See if vapor or dust is coming out of vessel through the Model WC sensor Disconnect and reapply power and check if occurs again	Repair wire(s) at terminals 16, 17 Replace motor wire or contact BlueLevel Technologies Check to make sure the Model WC sensor covers are secure, tighten fasteners if needed Contact BlueLevel Technologies
"Broken" message on LCD display	Sensing cable or chain broken System failure	Check the sensing cable and chain Disconnect power then reconnect	Replace cable or reassemble Contact BlueLevel Technologies
"Buried" message on LCD display	Sensing weight is buried Material level being measured is greater than length of cable	Check to see if sensing weight is buried through a hatch opening on the vessel or by removing the sensor The sensing weight is always indicating a "buried" condition, but the sensing weight is not buried by much material	Stop filling, if fill is in process, and await restart automatically Replace with a longer cable length or change value for "H" maximum measuring range
"Broken" and "Buried" both indicated on LCD display	Wiring terminal connector in incorrect terminal plug socket Component failure	Check all terminal plug connectors Make sure all terminal block connectors are in the correct placement	Re-plug terminal block connector Contact BlueLevel Technologies

Technical Data

Power Supply:	100-240VAC; ±10%; 50/60Hz
Power Consumption:	6VA
Ambient Temperature:	-31°F to +140°F (-35°C to +60°C)
Process Temperature:	-31°F to +176°F (-35°C to +80°C)
Enclosure:	NEMA Type 4X, IP66, Powder Coated, Cast Aluminum
Outputs:	
Serial	MODBUS
Analog	0-20mA or 4-20mA
DC Pulse	Transistor NPN/PNP; 0.1ft/pulse or 10mm/pulse; Pulse duration 10ms; ± 3 pulses resolution
AC Pulse	Relay 250VAC; 0.1ft/pulse or 100mm/pulse; Pulse duration 15ms; ± 1 pulse resolution
Material Level	
High Level	SPDT, 3A@250VAC
Low Level	SPDT, 3A@250VAC
Self-Validation	SPDT, 3A@250VAC, Flashes 1s for Buried Sensing Weight, 2s for Broken Cable; Steady for Lockout
Measuring Speed:	0.75ft/s (0.23m/s)
Measurement:	Distance or Material Level
Measuring Range:	98ft (30m) Maximum
Measuring Modes:	
Manual	Remote Contact, Local Keypad, MODBUS
Auto Timer	0.1 to 99.9 hours
SmartStart™ Timer	0.1 to 99.9 hours
Accuracy:	<0.5% of distance reading
Display/Keys:	Dot Matrix, 8x8, LCD; UP, LEFT, ENT, RUN
Process Connection:	Flange - six (6) 0.34" diameter holes on 7.0" bolt circle; Flat, 5 Degree or 10 Degree
Electrical Entry:	Two (2) M25 x P1.5 Cable Glands
Measuring Cable:	¼" Dia. Nylon Coated, 7x7 304 SS, 270lb Strength
Air Purge:	¼" NPT
Weight:	38.5lbs (17.5kg)
Certifications:	CE Mark

Technical Data Cont'd.

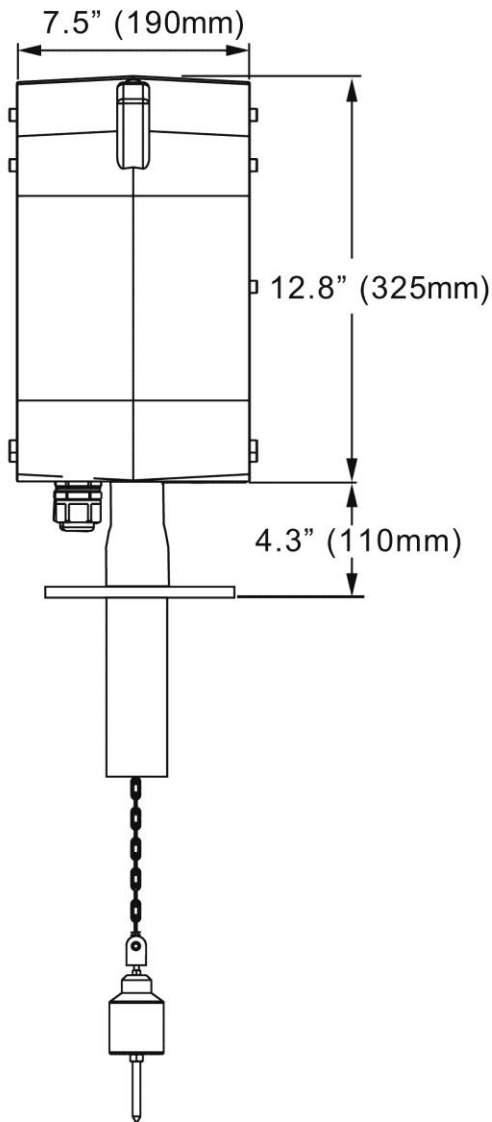
Materials:

- Enclosure
- Sensing Weights
 - Standard
 - Umbrella
 - Plastic Auto Fall-Off
- Cable

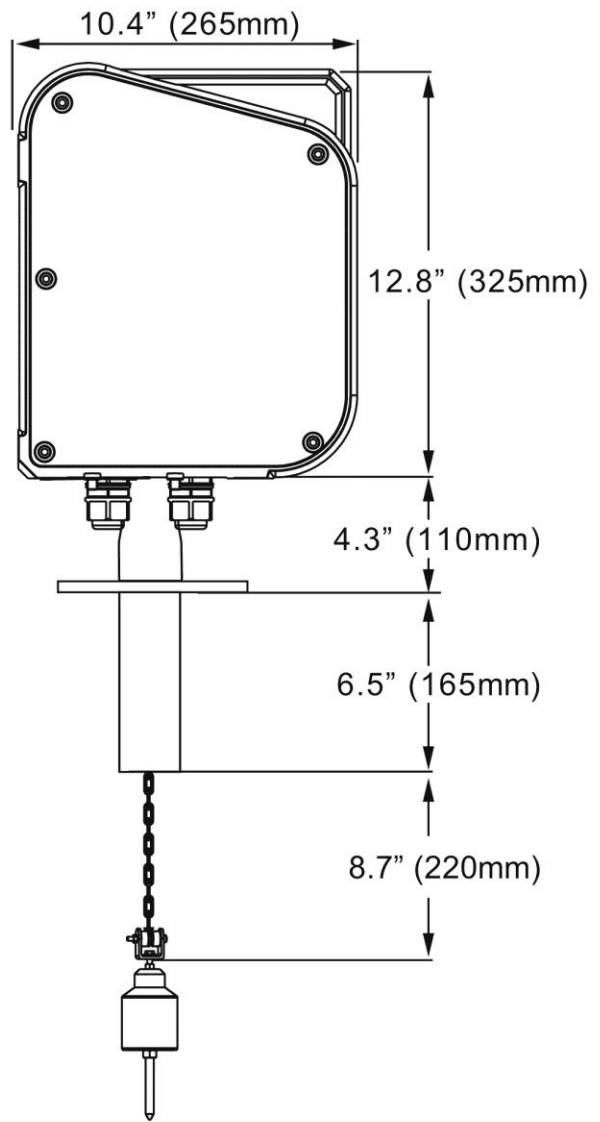
Cast Aluminum, Powder Coated

- Aluminum
- Stainless Steel
- Polyethylene
- 1/16" Dia. Nylon Coated Stainless Steel

Dimensions



SIDE VIEW



FRONT VIEW

Our Commitment Stands

-Golden Parachute:

Each BlueLevel Technologies Model WC Smart Inventory Monitoring Sensor is backed by our **Golden Parachute** support program. If you are the initial purchaser and purchased the product directly from BlueLevel Technologies, this provides you with added assurance.

The Golden Parachute support program gives the initial purchaser **90 days to evaluate the product**. Within this time frame if you are not satisfied for any reason, call us and request a “Golden RMA”, providing your order details and serial number on the unit, and then return the unit and request a replacement or a credit to your account for the cost of the equipment as shown on your invoice from BlueLevel Technologies. In addition, Model WC products are covered by our industry-leading 2-year limited warranty. Consult our Warranty statement for details.

Standard Warranty

Each BlueLevel Technologies Model WC Smart Inventory Monitoring Sensor product is backed by our industry-leading 2-year limited warranty. Should you experience a problem with one of our products deemed by our factory to be a product failure covered by our warranty, for a period of 2-years from the date of shipment we will repair the unit at our factory or provide you with a replacement unit or sub-assembly at our discretion. A return authorization number must be obtained from a BlueLevel Technologies customer service technician BEFORE returning any unit. Refer to the below details for more information.

Details:

We warrant BlueLevel Technologies products to be free from defects in workmanship and materials when operated under normal conditions and in accordance with nameplate characteristic limits. Products must be installed and maintained in accordance with BlueLevel Technologies installation, operation and maintenance instructions. Users are responsible for the suitability of the products to their application. There is no warranty against damage resulting from misapplication, improper specifications, or other operating conditions beyond our control. Claims against carriers for damage in transit must be filed by the buyer.

This warranty shall be in effect for a period of twenty-four months from the date of shipment. THIS WARRANTY SHALL BE IN LIEU OF ANY OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BlueLevel Technologies will repair or replace, at its option, any product which has been found to be defective and is within the warranty period, provided that the product is shipped, with previous factory authorization, freight prepaid, to the factory in Rock Falls, Illinois, U.S.A., or to the nearest service station. BlueLevel Technologies is not responsible for removal, installation, or any other incidental expenses incurred in shipping the products to or from BlueLevel Technologies. BlueLevel Technologies' liability under this warranty shall be solely limited to repair or replacement of the products within the warranty period, and BlueLevel Technologies shall not be liable, under any circumstances, for consequential or incidental damages, including, but not limited to, personal injury or labor costs. Under no circumstances will BlueLevel Technologies be responsible for any expense in connection with any repairs made by anyone other than the factory or an authorized service station, unless such repairs have been specifically authorized in writing.



3778 Timberlake Drive, Richfield, OH 44286
Ph: 330-523-5215 | Fx: 330-523-5212
www.blueleveltechnologies.com
bluelevel@blueleveltechnologies.com

© Copyright 2011 BlueLevel Technologies, Inc.
Form 759 • Printed in USA 12/12