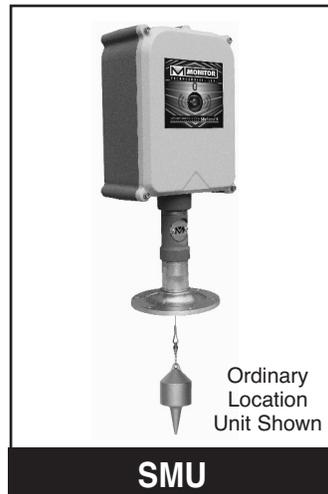


# BULLETIN 344A

## INSTALLATION & OPERATION

### SiloPatrol® SE Silo Monitoring Unit (SMU)



#### Important Notice

SMU has wireless  
Bluetooth® set-up.

See Page 8 for more  
details and instructions  
on downloading  
ConfigureSensor app.



Thank you for purchasing a quality product manufactured by Monitor Technologies LLC. We realize that you do have a choice of vendors when procuring level measurement equipment and we sincerely appreciate your business!



This manual contains the information necessary to ensure a safe and successful installation. Please read and comply with the section on page 18 of this manual pertaining to SAFETY. Doing so will ensure proper operation of the equipment and the safety of all personnel.



Before discarding the shipping container, please inspect it thoroughly and verify that all parts ordered are accounted for. Observe the specification label on the SMU cover. Verify the voltage, output type, cable type, cable length, flange style, and location approval (ordinary or hazardous). All SMUs are shipped with a standard plumb bob to ease installation. If an alternate plumb bob is ordered, it will be packed separately. See Mechanical Installation section for method to change plumb bob.

In the event that information contained herein does not completely satisfy your requirements or answer your questions, you may contact Technical Support on our website [www.monitortech.com](http://www.monitortech.com), by telephone at 800-766-6486 (630-365-9403), or by e-mail at [techsupport@monitortech.com](mailto:techsupport@monitortech.com). If your SMU ever requires service either in or out of warranty, please contact us and obtain an RMA number prior to shipping the unit to us.



[www.monitortech.com](http://www.monitortech.com)

## PRINCIPLE OF OPERATION

Once a measurement cycle is initiated, the **SiloPatrol**<sup>®</sup> SE sensor (SMU) “smart” motor system controls the descent of a plumb bob, attached to a heavy-duty stainless steel cable, into the vessel. The SMU measures the amount of cable dispensed via its unique optical sensing system. The SMU’s optic system is completely sealed from the internal environment of the electronics compartment, which is isolated and sealed from material ingress in the mechanical compartment, to ensure long-term reliable operation.

The descent of the bob is maintained at an optimal speed by the “smart” motor control system, which contributes to maximizing the motor life. In conjunction with the unique dual optical sensing system, the “smart” motor control system guarantees that the bob will stop when it contacts the material surface and eliminates the need for a mechanical brake. When the bob reaches the material surface, the SMU reverses the direction of the motor and transmits the distance value.

In addition, the “smart” motor control system now has an enhancement feature called Descend-Assist. This feature would be used if a particular application may be causing the plumb bob to “cling” to the socket. See Pg. 10 (RS-485) or Pg. 13 (Analog) of this document to Turn “ON” Descend-Assist through the ConfigureSensor app in the MISC SETTINGS section.

During the ascent of the bob, the SMU measures the amount of cable gathered and controls the speed of ascent. This ensures proper cable wrapping in the patented storage reel and tangle-free operation.

The SMU also includes a Hall effect sensor array that monitors the movement and position of the swing-arm that controls the absorption of slack in the cable system during descent and ascent. The SMU is smarter than ever and uses this technology to control the cable and plumb bob travel to ensure reliability of the measurement cycle, even with harsh changing conditions in the most severe applications.

The SMU has two output types available that must be selected at the time of purchase: RS-485 version and Analog 4-20mA version. The **SiloPatrol** SE system, if so equipped, will also generate auxiliary analog and/or relay outputs. RS485 communications can be accomplished via hardwiring or with wireless transceivers.

## PRE-INSTALLATION CONSIDERATIONS

**Choosing a Location for SMU** (See Figure 1 and 2)

- 1) Environment** - SMUs can be configured for ordinary locations or hazardous locations. The application location must comply with the SMU classification listed in the specifications. All SMUs are weatherproof and therefore suitable for outdoor applications. Note the temperature limits in the specifications.
- 2) Placement** - Consider the effect that the material's angle of repose will have on the operation. The SMU will measure the material height directly below its mounting. For center-fill and center-discharge vessels, the volumetric average can be attained by mounting the SMU at a distance equal to 1/6 the vessel diameter away from the outer edge of the vessel. Mount the SMU away from internal obstructions and away from areas where in-flow of material may directly contact the plumb bob during operation. **Ensure the cable length will not cause plumb bob extension into augers, slide gates or feeders.** This measurement device cannot factor varying angles of repose in it's calculated volumetric displays representing the material being measured if it is solid as opposed to liquid.
- 3) Plumb** - The SMU must be mounted plumb (perpendicular to the ground) within 1 degree. Do not mount the SMU on an angle. Install an adapter or consider use of a 5 degree or 10 degree flange which can be supplied by Monitor. If the angle of the roof is unknown, use Figure 1 to approximate. Each 1 inch (25.4 mm) of drop per 11.5 inches (292 mm) of horizontal movement represents approximately five degrees.

DIMENSIONS ARE SHOWN IN INCHES WITH MILLIMETER EQUIVALENT IN BRACKETS

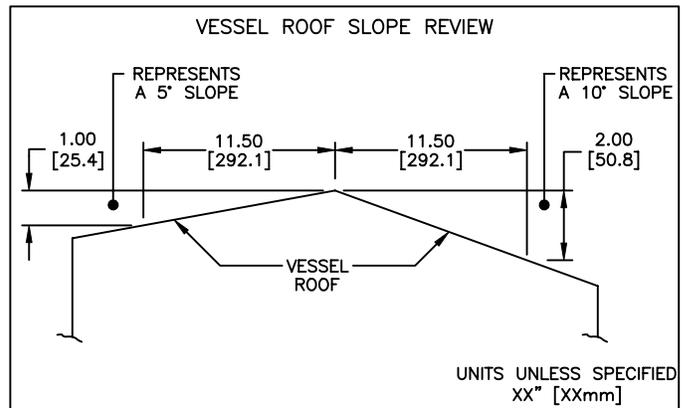


Figure 1

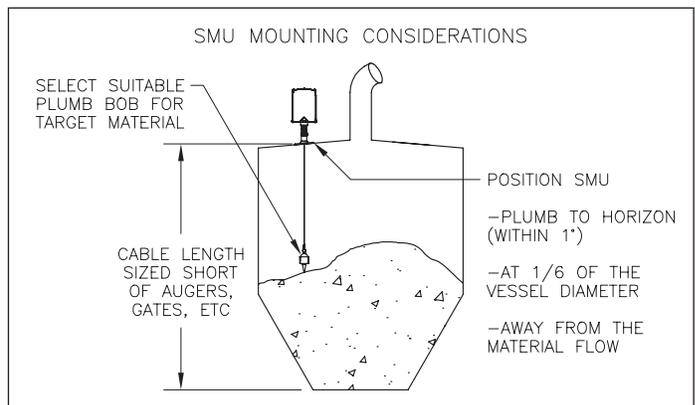


Figure 2

## MECHANICAL INSTALLATION

### SMU Mounting (See Figure 3)

- 1) **Location** - Select a mounting location in accordance with the Pre-Installation Considerations.
- 2) **Preparation** - If using Monitor's K-style flange (flat, 5 degree or 10 degree pitch), cut a 5-1/2 inch (133 mm) diameter center hole and drill six 11/32 inch (9 mm) diameter mounting holes (for 5/16" bolts) on a 7 inch (178 mm) bolt circle.
- 3) **Mounting** - Install gasket, place plumb bob in center hole and secure flange with 5/16" bolts.
- 4) **Other flanges** - If mounting of the SMU is done via an ANSI or similar flange, ensure that the center bore on the flange is sized to mate with the 2" NPT standpipe.
- 5) **Non-standard plumb bobs** - Plumb bobs greater than 5 1/2 inch (133 mm) in diameter must be attached to the SMU after mounting. A standard plumb bob is provided with each SMU. To change the plumb bob, first install the SMU which will ensure that the cable will not become tangled during the plumb bob exchange. Use the "motor control switches" to lower the standard plumb bob in the vessel (See Setup section for details). Then pull the standard plumb bob out through an access hatch/vent. All bobs are held on to the cable by a splitting fastener. Remove standard plumb bob from split-ring and reattach appropriate plumb bob. Gently release plumb bob into vessel, then press the "reset" switch on the SMU logic circuit board to pull plumb bob back to start position.
- 6) **Cover attachment** - The side covers are retained by 4 socket head cap screws. These 5/16 -18 screws can be removed with a 1/4" Allen wrench. The cover with a lens is for the electrical side of the unit. **Note:** A hazardous location SMU **IS NOT** available with a lens-equipped cover.

### ATEX and IECEx Supplemental Instructions:

Do not open the enclosure when an explosive atmosphere is present. Whenever the covers are removed for servicing, if ANY PORTION of the cover gasket adheres to the housing face, a new cover gasket must be reinstalled prior to replacing the covers. The gasket must be installed such that it is bottomed out in the groove of the cover. See Bulletin 344K (Mechanical Installation) for further instructions.

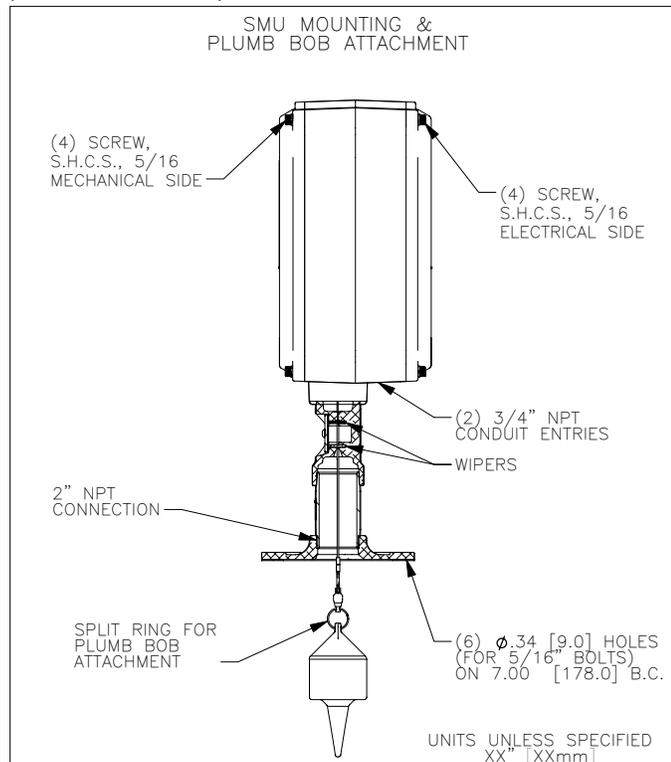


Figure 3

## ELECTRICAL INSTALLATION

### General (All SMUs) (See Figure 4)

- 1) **Dust-Ignition-Proof Precautions** - When installing a hazardous location SMU, observe all regulations applicable to local codes. Do not open the enclosure when an explosive atmosphere is present. When reattaching covers, ensure that gaskets are clean and that screws are fully engaged. Tighten in a criss-cross pattern.
- 2) **Factory Wiring/Compartment** - The SMU motor, encoder, and swing arm sensor leads are prewired to the PCB module. **DO NOT** alter or make additional external connection to these terminals. Doing so will likely cause damage to the SMU. Do not remove cover protecting the optical sensing compartment.
- 3) **Permanently Connected Equipment** - Disconnecting devices shall be included in the system installation. In installations where multiple circuits are used (i.e. independent circuits for power input, cycle, count, sound and lockout), individual disconnects are required. The disconnects shall be within close proximity of the equipment, accessible to operators, and marked appropriately. Assure the disconnect ratings are appropriately sized for the circuit protected (See Specifications).
- 4) **Circuit Separation** - Two cable entry locations are provided to aid in maintaining separation of "hazardous live" and limited circuits. It is required that all wiring have an insulation rating of 300V minimum, and a temperature rating of 80° C (176° F) minimum.
- 5) **Protective Earthing** - Each SMU is provided with a "protective conductor terminal" ⊕ which shall be terminated to the local earth ground potential. Select a wire size that can carry in excess of the sum of all circuit's maximum amperage.

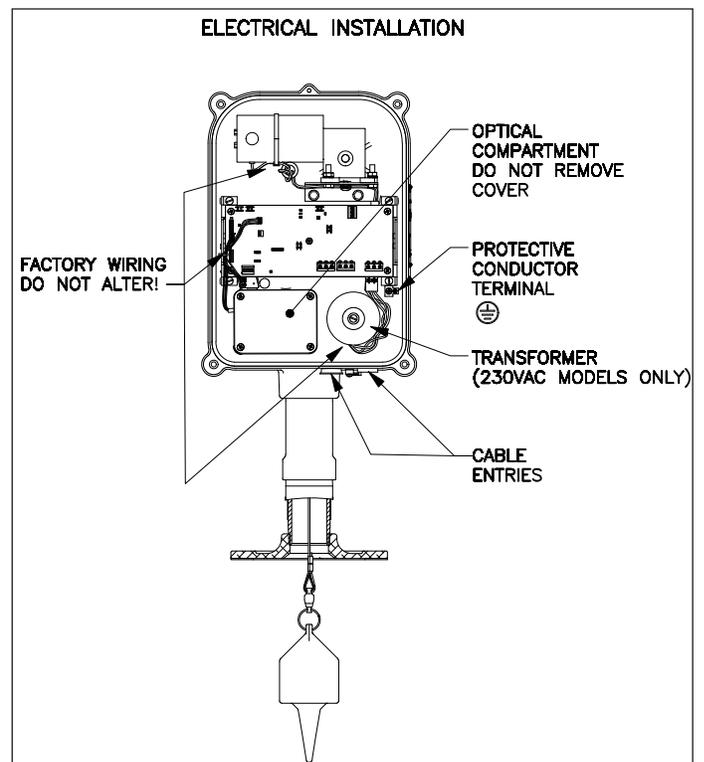


Figure 4

**SMU RS-485 Model** (See Figure 5)

- 1) **Power Input** - The SMU is designed to accept either 115VAC or 230VAC (factory set). Verify the intended voltage supply is compatible with the voltage configuration indicated on the electronics and the external nameplate. Connect power as shown to "L1" and "N" being sure to observe polarity. The connector can be unplugged from the bottom PCB for your wiring convenience.
- 2) **RS-485 Network** - The SMU interconnection of the network is made with a 2-conductor shielded cable (such as Belden 9322). All SMUs are interconnected in a daisy-chain, multi-drop configuration. Order of connection is not important (i.e. the operator interface can be placed between SMUs if necessary). A communication network such as this operates most effectively when the interconnection has only two ends. "T"s should be avoided whenever possible. Observe polarity when making the communication interconnection (+D and -D). Attach the cable shield in the terminal identified as "SHD". Do not run communication cable in the same conduit as power.

- 3) **Lock-Out** - The "lock-out" input can prohibit the SMU from making a measurement cycle (i.e. protection against taking measurement during a filling cycle). *This is not to be used as a safety lock-out!* If a "lock-out" signal is provided while a measurement cycle is already in process, the plumb bob will immediately return to the start/socket position. The lock-out function is activated when a voltage is provided to either "Vhi" (98-265VAC/DC) or "Vlo" (20-55VAC/DC) with respect to the "COM" terminal. The SMU lock-out circuit is "dry", meaning that the voltage must be provided for operation (i.e. just making a switch connection between "Vhi" and "COM" will not lock out the SMU operation). Refer to the Specifications section for electrical ratings.
- 4) **Relay Output** - The "Relay Output" is a configurable isolated SPDT switch. See Figure 11 & 12 for description of configurable functions. The SMU "relay output" circuit is "dry". Direct connection of voltage from COM & N/O or COM & N/C terminals will damage the output, a voltage with a series load must be wired to the "relay output". The relay's normal state is energized, so if power to the SMU is interrupted the relay will de-energize to provide the same state as an alarm condition. When the orange LED is on, the relay is energized. Refer to the Specifications section of this manual for electrical ratings.

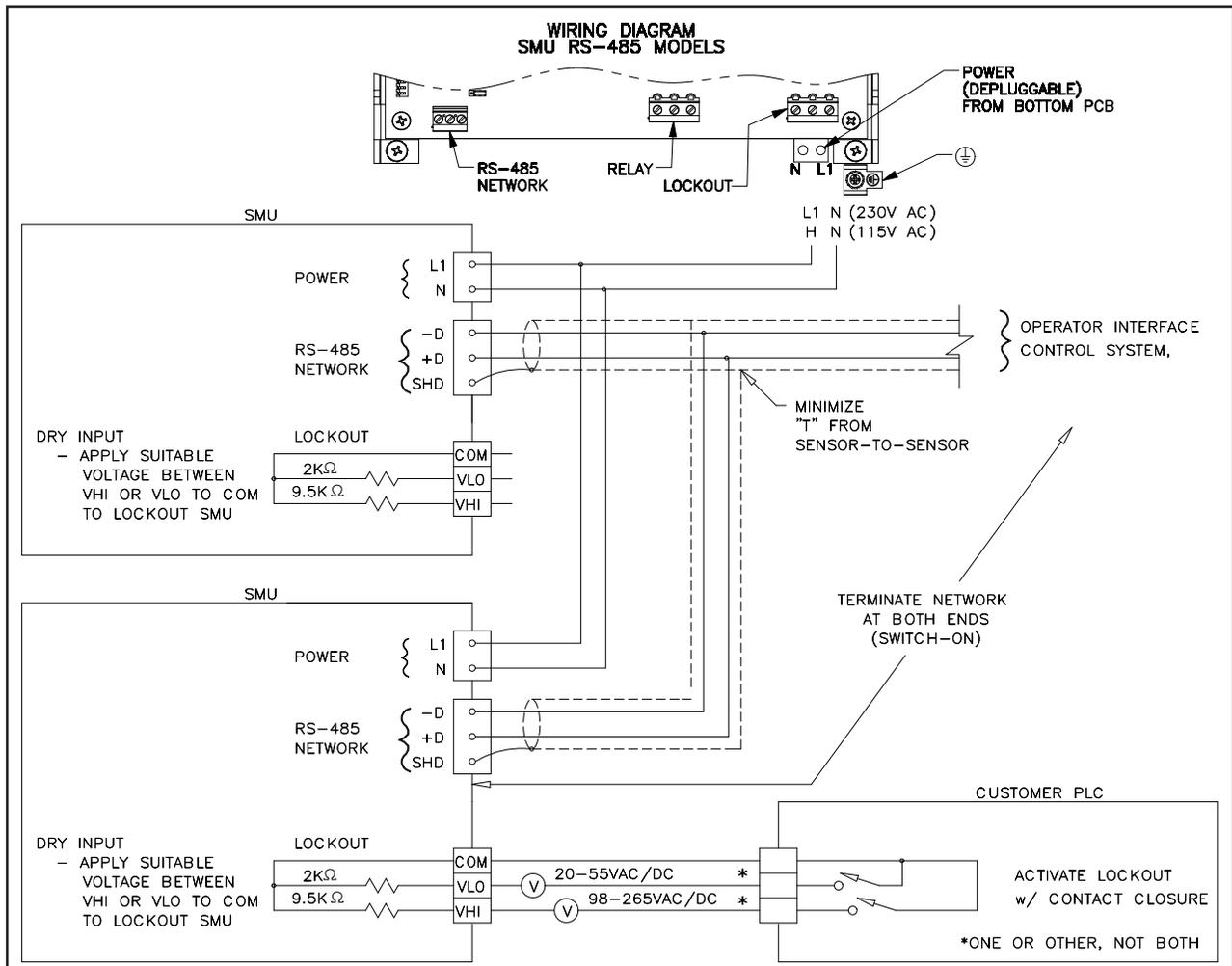
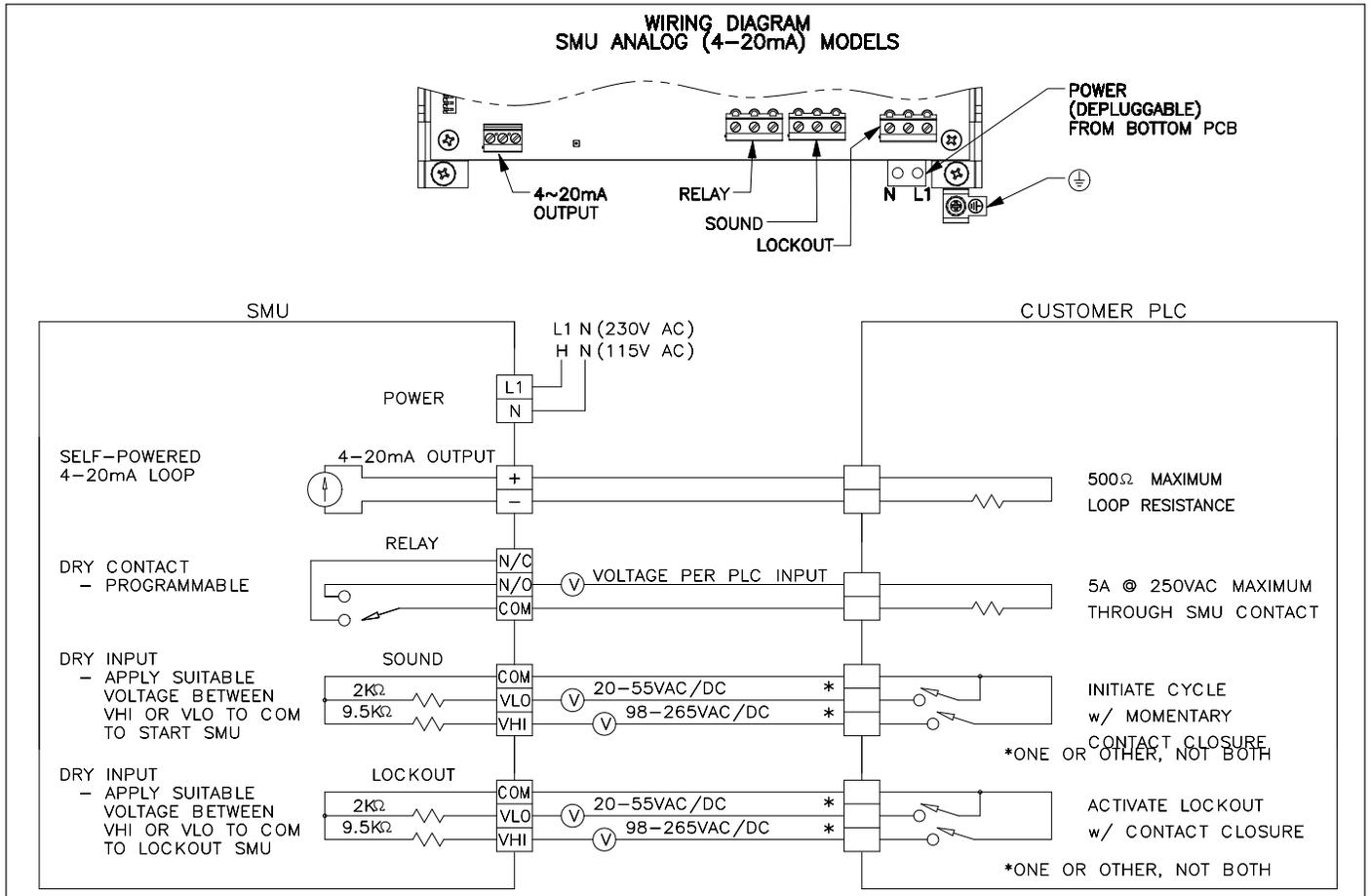


Figure 5



**SMU Analog(4-20mA) Model** (See Figure 6)

- 1) **Power Input** - The SMU is designed to accept either 115VAC or 230VAC (factory set). Verify the intended voltage supply is compatible with the voltage configuration indicated on the electronics and the external nameplate. Connect power as shown to "L1" and "N" being sure to observe polarity. The connector can be unplugged from the bottom PCB for your wiring convenience.
- 2) **Sound** - The "sound" input starts the SMU measurement by an external contact closure (switch). The external switch must provide voltage to either "Vhi" (98-265VAC/DC) or "Vlo" (20-55VAC/DC) with respect to the "com" terminal. The SMU sound circuit is "dry" meaning that voltage must be provided to the circuit (i.e. just making a switch connection between "Vhi" and "com" will not start the SMU). It is permissible to start all SMUs with a single switch (parallel wiring to each SMU). Refer to Specifications section for electrical ratings.
- 3) **Relay Output** - The "Relay Output" is a configurable isolated SPDT switch. See Figure 12 for description of configurable functions. The SMU "relay output" circuit is "dry". Direct connection of voltage from COM & N/O or COM & N/C terminals will damage the output, a voltage with a series load must be wired to the "relay output". The relay's normal state is energized, so if power to the SMU is interrupted the relay will de-energize to provide the same state as an alarm condition. When the orange LED is on the relay is energized. Refer to the Specifications section of this manual for electrical rating.

- 4) **4-20mA** - The "4-20mA" output is an isolated, self-powered current loop. The term "self-powered" refers to the ability of the SMU to create the 4-20mA signal without needing an external power supply. The "self-powered" current loop can drive up to 500 ohms of loop resistance before degradation of the current output begins. The 4 and 20mA limits (relating to material levels) are established through the configuration as explained in the Setup section of this manual. Each SMU 4-20mA output signal must be kept independent from each other. Observe polarity when connecting to the "+" and "-" terminals. Refer to Specifications section for electrical ratings.
- 5) **Lock Out** - The "lockout" input can prohibit the SMU from making a measurement cycle (i.e. protection against taking measurement during a filling cycle). *This is not to be used as a safety lockout!* If a "lockout" signal is provided while a measurement cycle is already in process, the plumb bob will immediately return to the start/socket position. The lockout function is activated when a voltage is provided to either "Vhi" (98-265VAC/DC) or "Vlo" (20-55VAC/DC) with respect to the "COM" terminal. The SMU lockout circuit is "dry" meaning that the voltage must be provided for operation (i.e. just making a switch connection between "Vhi" and "COM" will not lockout the SMU operation). Refer to the Specifications section of this manual for electrical ratings.

## SETUP

### SMU RS-485 Model (See Figure 9)

#### Hardware:

- 1) SMU Network Termination Selector** - Each SMU has a network termination selector in close proximity to the RS-485 network terminal block. The purpose of this selector is to provide impedance matching on the network to minimize signal distortion. The two instruments positioned at the network ends must have their termination selectors "on". The remaining devices on the network must have their termination selectors "off". Improper setup of the termination switches could result in occasional communication problems and reduce how robust the network system is.
- 2) SMU Network Bias Selector** - Each SMU has a bias termination selector in close proximity to the RS-485 network terminal block. The purpose of the bias selector is to provide stability to the RS-485 network when communications are idle. The operator interface on the RS-485 network should have the bias selector in the ON position. The other devices (slaves) should have their bias selector in the off position. If a bias switch is not offered on the operator interface, then set the bias selectors to the ON position of the two instruments at the network ends.
- 3) SMU General Status Indicators** - (viewable through lens)  
**"Lockout" (orange):** When illuminated, it indicates that the SMU has received a signal on the "lockout" input terminal and that measurement cycles will be prohibited. When flashing, it indicates that a start (sound) command is being requested (either manually through Manual Start Switch or from HMI2/SiloTrack).  
**"Error" (red):** When illuminated, indicates some form of an error has occurred, usually cleared by performing a new sounding measurement.  
**"Power" (green):** When illuminated, indicates power is applied to the SMU, and the micro-controller is performing properly. When flashing at a fast rate, indicates a sounding is currently in process.  
**"Bluetooth" (blue):** When illuminated, indicates that a Bluetooth® device has connected to the SMU.
- 4) SMU Motor Controls Indicators** -  
**"Cycling" (orange):** When illuminated, it indicates that power is applied to the SMU motor.  
**"Down" (green):** When illuminated, it indicates that the SMU plumb bob is descending toward the material.  
**"Up" (yellow):** When illuminated, it indicates that the SMU plumb bob is ascending toward the socket position. When the unit is powered and the bob is in an idle state at the socket position, the "Up" (yellow) will be illuminated.
- 5) SMU Communications Indicators** -  
**SMU Rx (yellow):** When illuminated, indicates that the SMU is receiving data in from the RS-485 network.  
**SMU Tx (orange):** When illuminated, indicates that the SMU is transmitting data out onto the RS-485 network.  
**"Status" (yellow):** When flashing, indicates the general well being of the on board Bluetooth radio. When flashing rapidly, indicates that the Bluetooth radio is currently being programmed, and is not available for Bluetooth connections, nor is the SMU able to take a sounding. Off indicates the Bluetooth radio is in sleep mode, common during a sounding process.
- 6) SMU Control Switches** - A sounding can be initiated at the sensor by pressing the "Manual Sound Switch". A complete measurement cycle will occur, acquiring a new measurement value.

In addition, the control of the motor can be overridden by the "Motor Control Switches" (up and down). These are useful when servicing the SMU's cable, wiper seal or plumb bobs. Press and hold the "Motor Control Switches" to place the bob at the desired height, and then remove power from SMU as you work with the cable. Care should be taken when these switches are used as all material or socket sensing capability is disabled; also, do not allow the cable to go slack or become tangled.

### SMU RS-485 Model (See Figure 9)

#### Specific Configuration Parameters:

There are many parameters that can be configured into the RS-485 SMU. The parameters specific to the RS-485 version include:

- 1) Communications Selection** - There are three protocols that can be selected for the RS-485 communications:
    - **SiloPatrol** - for use with Monitor's HMI2 or SiloPatrol software.
    - **Modbus RTU** and • **Modbus Ascii** - Generic protocols for interfacing to the customer's operator interface system.
  - 2) Communications Parameters** - When the SiloPatrol protocol is selected, the default communications parameter are automatically selected. There are various communications parameters available for your Modbus communications to select from; baud rate, # bit, parity, # stop bit. See Page 8 for more details.
  - 3) SMU Address** - Each SMU must be given a unique network address which is configured into the SMU. The network address corresponds with the HMI2 (or other operator interface) channel number. Communication problems will occur if multiple SMUs have the same address on the same RS-485 network. See Page 8 for more details on how to configure.
- NOTE:** The RS-485 version of the SMU SE and the RS-485 version of Flexar® may coexist on the same RS-485 communications network only if HMI2 is the operator interface. (Please see Bulletin 344B for specific configuring information.) The RS-485 version of the SMU-se and the RS-485 Flexar cannot coexist on the same RS-485 communications network for any other operator interface.
- 4) Modbus™ Parameters** - See Bulletin 344N to view the Modbus register map.

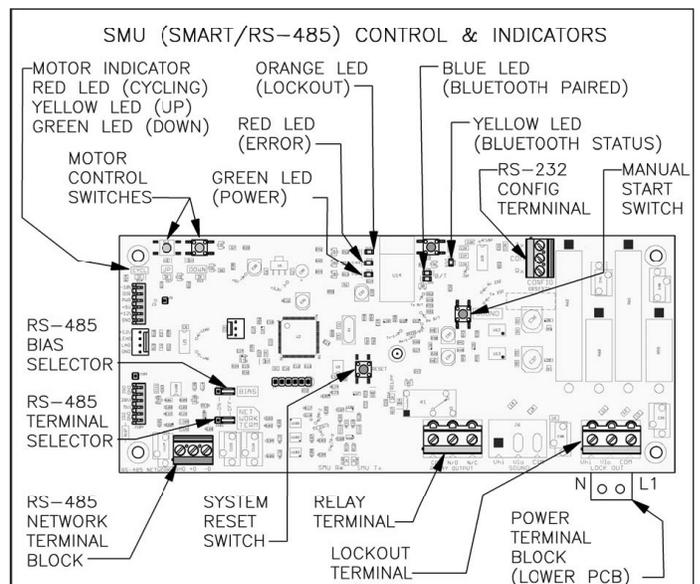


Figure 9

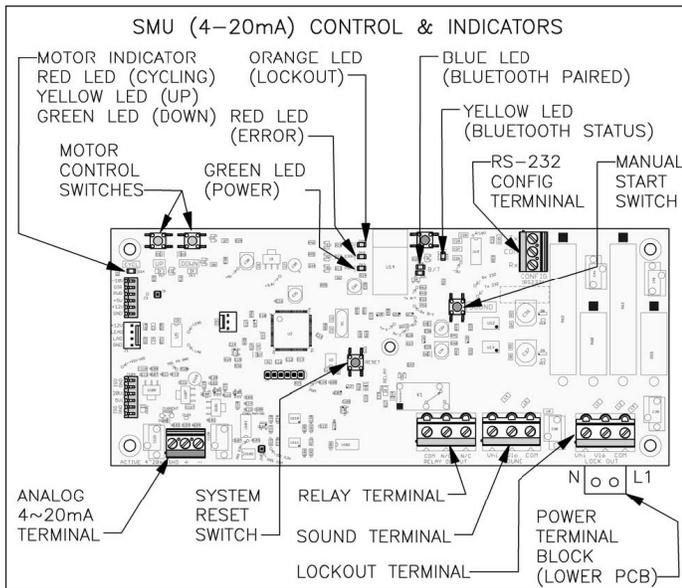


Figure 10

**SMU Analog(4-20mA) Model** (See Figure 10)

- 1) **Auto Timer** - If desired, the SMU can be configured to self start at regular time intervals. The auto timer function must be turned on, and the interval value configured. Then, the SMU will start a sounding after the passing of the time interval selected. If auto timer is not desired, then select the auto timer to be off, and apply a signal to the SOUND terminal to initiate the measurement process.
- 2) **Values** - The 4~20mA Analog SMU needs to have the 4mA & 20mA values defined. Configure the distance value down from the SMU flange that you want to correspond to 4mA & 20mA values. This can be done either way, with 4mA when vessel is empty and 20mA when vessel is full, or visa versa. The active signal will over range as much as 3mA and 21.5mA. See Page 8 for the configuration process.
- 3) **Error Reaction** - The 4~20mA analog SMU can be configured to produce an "error" signal on the 4~20mA signal. Upon an operational error, the SMU will produce a current value of <2mA or >23mA. The receiving device must be configured with a respective threshold to recognize the signal is outside of the standard operational range (3~21.5mA), and that some form of error has occurred.
- 4) **Signal** - The current signal can be adjusted to update the signal in two different modes:
  - CONTINUOUS** - Upon the start of a sounding, the 4~20mA current value will snap to the value that corresponds to a vessel full, and then will progress as the bob travels through its range of motion.
  - EOT** - Upon the start of a sounding, the 4~20mA current value will hold a value that corresponds to the previous distance measurement. When the bob has reached its End Of Travel, the current output will snap to a value that corresponds to the new reading.

## SETUP - CONTINUED



### Configuration Parameters:

The SMU has multiple parameters to be selected.

**Bluetooth®** - Parameter programming is performed via a wireless Bluetooth connection using a customized Monitor ConfigureSensor app loaded onto a Bluetooth compatible Android-based device (phone/tablet).

- Ordinary Location models include a lens on the electrical side cover which allows easy passage of the Bluetooth signal and convenient viewing of the connectivity status (blue light).
- Hazardous Location models do not include a lens. Testing has shown that Bluetooth connection is possible through the cover without the benefit of a lens. However, this is not 100% predictable as phones/tablets emit varying amounts of energy. Therefore, it is recommended that users attempt to make connection while cover is still attached. If suitable connection is not possible, then user must remove cover to use the Bluetooth set-up.

**CAUTION:** Do not open the enclosure when an explosive atmosphere is present.

### App Installation Methods:



- Download the app from from the Google Play app store.
  - This method requires a WiFi or mobile data service provider and an active Google Play account (free using an e-mail address).
  - If not already enabled, switch on Wi-Fi, 3G, 4G or 5G service on your Android smartphone / tablet.
  - Navigate to the Google Play icon on the device and tap it. Note: If not already a registered user, a prompt will appear to guide you through the service.
  - From the GooglePlay app store, type "SiloPatrol" or "Monitor Technologies" or "ConfigureSensor" into the search bar.
  - From the listed search results, choose the Monitor Technologies ConfigureSensor search result.
  - From the ConfigureSensor app page, tap the "Install" icon.
  - The app will now be installed and you will be made aware of any future updates through the Google Play store.
- Download the app to the smart phone or tablet from Monitor's website at: <http://www.monitortech.com/apps> or scan the following QR-Code. <sup>1</sup>
- Install the app from an e-mail. (Consult factory.)
- If device does not have Wi-Fi connection or mobile data service, other options like transferring the app from a PC to the device via a USB connection might be available. (Consult factory.)



App must be connected with the SMU through Bluetooth in order to display configuration menus. Without connectivity, you will not see any of the menus. Best connection is obtained when the smartphone or tablet is located within 10ft [3.05m] of the SMU (ideally facing the electrical or lens side).

Activate the Bluetooth function from the ConfigureSensor app on the smartphone or tablet when in proximity to the targeted SMU. The smartphone or tablet will search for Bluetooth devices and will list them by name. The default name for each SMU will be the factory serial number. The serial number is found on the nameplate attached to the side of the SMU. Connection will be confirmed via the blue LED on the SMU.

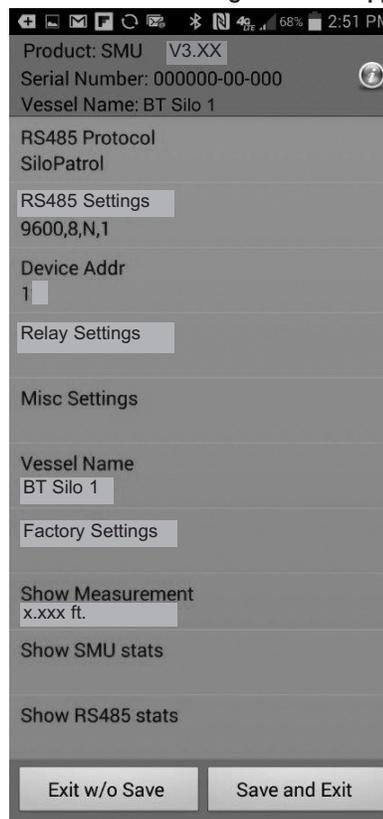
\*\*See the charts on the following pages for ConfigureSensor app menu selections.\*\*

Make all configuring selections as desired from the various app menus. Once complete, save settings and exit app. All changes will be lost if the "save" activity is not completed at the end of the process. The app also allows for the capability to save a copy of all settings on the smart phone/tablet for recording-keeping and reference purposes. The blue LED on the SMU will turn off when the app is no longer connected to the SMU.

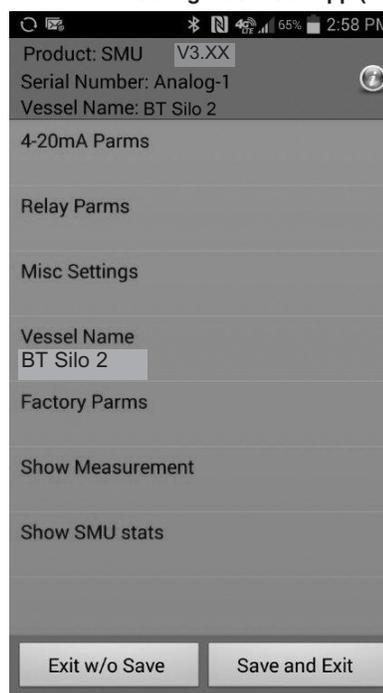
### NOTE:

- 1) To install the ConfigureSensor app from Monitor's Web site you may need to go into your device settings and select to "Allow install of unknown sources / non-Market apps". Once app is installed you can go back and unselect this option if desired.

### View of Main Menu for ConfigureSensor App (RS-485)



### View of Main Menu for ConfigureSensor App (Analog 4-20mA)



**Menu Selection for ConfigureSensor App - RS-485**  
**(Factory Defaults are Shown in Bold)**

Figure 11

MAIN MENU	SUB MENU 1	SUB MENU 2	SUB MENU 3	COMMENTS
RS485 PROTOCOL	Modbus RTU			Select for generic Modbus RTU protocol.
	Modbus Ascii			Select for generic Modbus Ascii.
	<b>SiloPatrol (default)</b>			Select for proprietary SiloPatrol protocol.
RS485 SETTINGS	<u>Modbus RTU</u>  9600,8,E,1 9600,8,N,1 9600,8,N,2 9600,8,O,1  19200,8,E,1 19200,8,N,1 19200,8,N,2 19200,8,O,1	<u>Modbus ASCii</u> 9600,7,E,1 9600,7,N,2 9600,7,O,1 9600,8,E,1 9600,8,N,1 9600,8,N,2 9600,8,O,1 19200,7,E,1 19200,7,N,2 19200,7,O,1 19200,8,E,1 19200,8,N,1 19200,8,N,2 19200,8,O,1	<u>SiloPatrol</u>  <b>9600,8,N,1</b>	baud rate, # bit, parity, # stop bit  Options available are dependent on the protocol selected.  <b>(default protocol: SiloPatrol)</b> <b>9600,8,N,1</b>  <i>For SiloTrack Cloud select:            Modbus RTU 9600,8,N,1</i>
DEVICE ADDRESS *	Modbus RTU  #1 - 247	Modbus Ascii  #1 - 247	SiloPatrol  #1 - 16	Acceptable addresses are dependent on the protocol selected. <b>(default address: #1)</b>
RELAY SETTINGS	RELAY ACTION *	OFF		No relay action, energized whenever power is applied.
		<b>CYCLE OPERATE</b>		Relay relaxed while SMU is sounding, energized when bob idle. <b>(default: CYCLE OPERATE)</b>
		ERROR		Relay relaxed when error is detected, energized when error dismissed.
		LOW THRESHOLD		When distance => thres, relay relaxed When distance < thres, relay energized Use distance from latest measure, only update on "good" cycles, relaxed if Genesis.
		HIGH THRESHOLD		When distance > thres, relay energized When distance <= thres, relay relaxed Use distance from latest measure, only update on "good" cycles, relaxed if Genesis.
	FORCE RELAY	NOT ACT (on)		Relay temporarily not activated (on) regardless of status.
		ACT (off)		Relay temporarily activated (off) regardless of status.
RELAY THRESHOLD	###.#		Distance threshold range: 0 ~ 200ft / 0 ~ 61.0m <b>(default: 200ft)</b>	

\* Denotes that parameter can also be adjusted with Modbus communications.

**Menu Selection for ConfigureSensor App - RS-485 [Continued] (Factory Defaults are Shown in Bold)**

MAIN MENU	SUB MENU 1	SUB MENU 2	SUB MENU 3	COMMENTS
MISC SETTINGS	CYCLE LIMIT *	###.#		Define distance limit, stop upon reaching value. Range: 1~150Ft / 0.3~45.7m
	CABLE LENGTH * (CSL)	READ ONLY		Defines physical length of cable. Sets max value for relay threshold & cycle limit. Sounding stops upon measure reaching value. Also presets the time values in Descend-Assist of Zone-1. Range: 1Ft~150Ft typc, 1Ft~200Ft special cases
	UNIT OF MEASURE *	<b>ENGLISH</b>		Select UOM to display relay & cycle limit thresholds, and distance & temperature reported in Modbus protocol (SiloPatrol always reported in 0.01ft). <b>(default: ENGLISH)</b>
		METRIC		
	SHOW TEMP *	READ ONLY		Display internal sensor temp.
	AUTO TIMER *	<b>OFF</b>		Select auto start is ON or OFF. <b>(default: OFF)</b>
		ON		
	AUTO TIME PERIOD	###.##		Time period of auto-start. (Auto Timer must be ON.) UOM = hour Analog range = 0.008 ~ 168H RS-485 range = 0.008 ~ 168H
	BT Radio ID	<b>Track S/N</b>		BT radios available for connection will display SMU S/N.
		Track Vessel Name		BT radios available for connection will display customer specified vessel name.
	DESCEND-ASSIST	<b>OFF</b>		Select DESCEND-ASSIST feature ON or OFF to restart SOUNDING in an application where the plumb bob might cling to socket. <b>(default: OFF)</b>
		ON		
	ZONE1 MAX REPEATS	1		Select number of attempts the SMU will restart SOUNDING if plumb bob clings to socket. <b>(default: 2)</b> This option is only viewable when Descend-Assist is ON.
<b>2</b>				
3				
4				
5				
DISTANCE UPDATE	Continuously		SMU will periodically report distance measured thus far while still sounding.	
	<b>End Of Travel</b>		SMU will only report the completed measurement (EOT value).	
VESSEL NAME *	#ABCDEFGHIJKLM		14 alpha/numeric characters available. <b>(default: "NOT SET")</b>	
FACTORY SETTINGS	X	X	X	For Monitor factory use only.
SHOW MEASUREMENT *	EXISTING MEASUREMENT *			Report previous sounding measurement value.
	CYCLE OPERATE *			Initiate sounding, report new measure value when complete.
	SHOW TEMP *	##.##°F ##.##°C		Show temperature of logic PCB.
SHOW SMU STATS *	SW Version *	V##.##		Read SMU sensor software revision.
	SW Date/Time *			Read date stamp on SMU software revision.
	GOOD CYCLES *	#,###,###		Read accumulated good cycles.
	BAD CYCLES *	#,###,###		Read accumulated bad cycles.
	IndexCnt *	V##.##		Read SMU sensor software revision.
	SoundCnt *			# of cycles occurred (including good & bad cycles) since SMU boot.
	CycleLimCnt *			# cycles when SMU was halted because reached a down meas value => CYCLE LIMIT value, since SMU boot.

\* Denotes that parameter can also be adjusted with Modbus communications.

**Menu Selection for ConfigureSensor App - RS-485 [Continued]**  
**(Factory Defaults are Shown in Bold)**

MAIN MENU	SUB MENU 1	SUB MENU 2	SUB MENU 3	COMMENTS
SHOW RS485 STATS *	#BusMsgs *			Consult Factory
	#CommEvents *			Consult Factory
	#BusCommErrs *			Consult Factory
	#SlaveMsgs *			Consult Factory
	#SlvBusys *			Consult Factory
	#SlvOverruns *			Consult Factory
	#SlvExceptions *			Consult Factory
	#SlvNoResps *			Consult Factory
	#SlvNAKs *			Consult Factory
	#CommEventStatus *			Consult Factory
	#DiagnosticReg *			Consult Factory
	<i>Additional stats may be shown depending on protocol selected.</i>			Consult Factory
SHOW REG MAP				<i>For Modbus protocols only.</i> Displays the Modbus register map as can be see in Installation Bulletin 344N.

\* Denotes that parameter can also be adjusted with Modbus communications.

**Menu Selection for ConfigureSensor App - Analog 4-20mA**  
**(Factory Defaults are Shown in Bold)**

Figure 12

MAIN MENU	SUB MENU 1	SUB MENU 2	SUB MENU 3	COMMENTS	
4-20mA SETTINGS	4mA DISTANCE	#0 ~ 200ft		Can be configured as 4-20 or 20-4mA, depending which value is closer to NEAR SOCKET & NEAR EOT <b>(default: 4mA: CSL; 20mA: 0Ft)</b>	
	20mA DISTANCE	#0 ~ 200ft			
	ERROR REACTION	<2mA			Tx value <2mA upon error detection.
		>23mA			Tx value >23mA upon error detection.
	FORCE CURRENT	OFF			Selected 4~20mA signal temporarily emitted. *denotes error signals
		< 2mA*			
		4mA			
		12mA			
		20mA			
		>23mA*			
TRIM 4mA	-50 ~ +50			Display unit less number while calibrating, ± 0.25mA offset.	
TRIM 20mA	-50 ~ +50			Display unit less number while calibrating, ± 0.25mA @ F.S.	
CURRENT UPDATE	Continuously			4~20mA value will be updated progressively as bob descends, holding a value that corresponds to EOT (error signal may override when bob reaches socket).	
	<b>End Of Travel</b>			4~20mA value will be updated only when bob reaches EOT (error signal may override when bob reaches socket).	
RELAY SETTINGS	RELAY ACTION	OFF		No relay action, energized whenever power is applied.	
		<b>CYCLE OPERATE</b>		Relay relaxed while SMU is sounding, energized when bob idle. <b>(default: CYCLE OPERATE)</b>	
		ERROR		Relay relaxed when error is detected, energized when error dismissed.	
		LOW THRESHOLD		When distance => thres, relay relaxed When distance < thres, relay energized Use distance from latest measure, only update on "good" cycles, relaxed if Genesis.	
		HIGH THRESHOLD		When distance > thres, relay energized When distance <= thres, relay relaxed Use distance from latest measure, only update on "good" cycles, relaxed if Genesis.	
	FORCE RELAY	NOT ACT (on)			Relay temporarily not activated (on) regardless of status.
		ACT (off)			Relay temporarily activated (off) regardless of status.
	RELAY THRESHOLD	###.#			Distance threshold range: 0 ~ 150ft / 0 ~ 45.7m <b>(default: 150ft)</b>

**Menu Selection for ConfigureSensor App - Analog 4-20mA [Continued]**  
**(Factory Defaults are Shown in Bold)**

MAIN MENU	SUB MENU 1	SUB MENU 2	SUB MENU 3	COMMENTS
MISC SETTINGS	CYCLE LIMIT	###.#		Define distance limit, stop upon reaching value. Range: 1~150Ft / 0.3~45.7m
	CABLE LENGTH * (CSL)	READ ONLY		Defines physical length of cable. Sets max value for relay threshold & cycle limit. Sounding stops upon measure reaching value. Also presets the time values in Descend-Assist of Zone-1. Range: 1Ft~150Ft typc, 1Ft~200Ft special cases
	SHOW TEMP	READ ONLY		Display internal sensor temp.
	AUTO TIMER	OFF		Select auto start is ON or OFF. <b>(default: OFF)</b>
		ON		
	AUTO TIMER PERIOD	###.##		Time period of auto-start. (Auto Timer must be ON.) UOM = hour Analog range = 0.008 ~ 168H RS-485 range = 0.008 ~ 168H
	BT Radio ID	Track S/N		BT radios available for connection will display SMU S/N.
		Track Vessel Name		BT radios available for connection will display customer specified vessel name.
	DESCEND-ASSIST	OFF		Select DESCEND-ASSIST feature ON or OFF to restart SOUNDING in an application where the plumb bob might cling to socket. <b>(default: OFF)</b>
		ON		
ZONE1 MAX REPEATS	1		Select number of attempts the SMU will restart SOUNDING if plumb bob clings to socket. <b>(default: 2)</b>  This option is only viewable when Descend-Assist is ON.	
	2			
	3			
	4			
	5			
	No Limit			
VESSEL NAME	#ABCDEFGHIJKLM			14 alpha/numeric characters available. <b>(default: "NOT SET")</b>
FACTORY PARMS	X	X	X	<u>For Monitor factory use only.</u>
SHOW MEASURE-MENT	EXISTING VALUE			Report previous sounding measurement value.
	CYCLE OPERATE			Initiate sounding, report new measure value when complete.
	SHOW TEMP	##.#°F ##.#°C		Show temperature of logic PCB.
SHOW SMU STATS	SW Version	V##.##		Read SMU sensor software revision.
	SW Date/Time			Read date stamp on SMU software revision.
	GOOD CYCLES	#,###,###		Read accumulated good cycles.
	BAD CYCLES	#,###,###		Read accumulated bad cycles.
	IndexCnt	V##.##		Read SMU sensor software revision.
	SoundCnt			# of cycles occurred (including good & bad cycles) since SMU boot.
	CycleLimCnt			# cycles when SMU was halted because reached a down meas value => CYCLE LIMIT value, since SMU boot.
	HdwErrCnt			# of soundings when swing arm was out of range, since SMU boot. Displayed only if not zero.
	SwingArnErrCnt			# of soundings when swing arm was out of range, since SMU boot. Displayed only if not zero.

## OPERATION

### General Operational Guidelines - All versions

- 1) Operation duty cycle** - Although the SMU has passed tests that have accumulated over 150,000 operations, it is recommended that the SMU be utilized as a periodic measurement device. Applications requiring measurement more than fifty times in a 24 hour period are not recommended. However, there are no physical limitations to the number of operations which can occur in one hour (i.e. the motor can run continuously and not overheat). For a fully continuous measurement device, consult the factory for other technologies.
- 2) Measurement rate** - The average measurement rate of an SMU is influenced by the amount of cable on the storage reel. The speed of the plumb bob descent and ascent is faster when more cable is wound on the storage reel. The rate of plumb travel can range from 1.0 ft/second to 1.5 ft/second (300-450 mm/second).
- 3) Application restrictions** - The SMU is equipped with a motor and spring tension system which is designed to maximize the pull-out capacity in the event that a plumb bob becomes entangled or buried. The SMU has been successfully tested for operation in silo filling cycles in free flowing material applications. In applications where severe bridging or clinging occurs, it is not recommended to operate during a filling operation. Consult the factory for additional recommendations.

### Operation of SMU/HMI<sup>2</sup> System

- 1) Ensure SMU network address is set and that the HMI<sup>2</sup> channel is active.
- 2) Press MEAS to enter the measurement mode.
- 3) Use number pad to enter channel number, or use arrow key to select "all" channel read.
- 4) Press ENTER.
- 5) If SMU is in "LOCKOUT" status, the SMU will not operate and a message denoting such will be indicated on the HMI<sup>2</sup> display.
- 6) If SMU is not in "LOCKOUT" status, the SMU's plumb bob will descend as depicted by "↓" on HMI<sup>2</sup> display.
- 7) Upon material contact the new measurement will be displayed and the plumb bob will ascend as depicted by the "↑" on the HMI<sup>2</sup> display.
- 8) Once returned to the start/socket position, the "↑" will disappear. If any errors were detected, they will be indicated on the HMI<sup>2</sup>. The following error conditions are analyzed and displayed if applicable.
  - Com Error: Communication between HMI<sup>2</sup> and SMU is faulty
  - Return Error: The measurement of descent was greater than the ascent  
(If > 4" (100mm)+1% upward travel)
  - Index Error: The measurement of ascent was greater than the descent (If > 4" (100mm))
  - Motion Error: The plumb bob did not move upon initiation of a measurement cycle. (If < 4" (100mm))

### Operation of SMU Analog(4-20mA) Output

- 1) Ensure the SMU is setup to correlate the 4mA and 20mA values to subsequent vessel values.
- 2) Initiate an SMU measurement with a contact closure on the applicable sound input.
- 3) SMU's plumb bob will descend and the measurement process will begin.
- 4) Upon material contact the new measurement will be output as a 4-20mA signal and the plumb bob will ascend. The SMU calculates between a range of 3-21.5 mA.
- 5) Once returned to the start/socket position, the following error conditions are analyzed then indicated by the selected fail-safe limit if applicable. If an error is detected, the 4-20mA output will respond per the configured parameter named "Err Sig".
  - Return Error: The measurement of descent was greater than the ascent (If > 4" (100mm) + 1% upward travel)
  - Index Error: The measurement of ascent was greater than the descent (If > 4" (100mm))
  - Motion Error: The plumb bob did not move upon initiation of a measurement cycle. (If < 4" (100mm))

### Operation of SMU/SiloTrack™ System

See Bulletin 344D(**SiloTrack** V 1.0) or 344G(**SiloTrack** V 2.0) or Bulletin 344J(**SiloTrack** V 3.X).

## MAINTENANCE

### Fuse Replacement

The fuses incorporated into the SMU PCBs are not intended for operator replacement. Direct access to the fuses is restricted. A qualified technician can replace the applicable fuse(s) according to the following specifications. If necessary, consult the factory for additional technical assistance or for return of SMU.

#### 115VAC

F1: 5x20mm, 0.63A Time Lag (Slo-Blo), 250VAC  
LittelFuse #218.630 or Bussmann #GDC-630mA  
F2, F3: 5x20mm, 0.2A Time Lag (Slo-Blo), 250VAC  
LittelFuse #218.200 or Bussmann #GDC-200mA

#### 230VAC

F1: 5x20mm, 0.315A Time Lag (Slo-Blo), 250VAC  
LittelFuse #218.315 or Bussmann #GDC-315mA  
F2, F3: 5x20mm, 0.1A Time Lag (Slo-Blo), 250VAC  
LittelFuse #218.100 or Bussmann #GDC-100mA

## Preventive Maintenance

The SMU design is virtually maintenance free. Applications with airborne dust within the vessel should be setup on a periodic maintenance schedule to ensure optimum performance. Evaluation should be conducted twice a year. General interior cleaning and/or cable and wiper seal replacement as described below should be the primary emphasis. **ATEX and IECEx:** It is advised that the motor be removed periodically for inspection and cleaning of the shaft.

## Cleaning Requirements

Ensure cover gaskets remain clean so hazardous/environmental protection is maintained. If necessary, remove excess dust from inside the SMU with compressed air. Ensure all mechanical parts can rotate/swing freely. If necessary, replace the wiper seal as described to ensure free cable travel. Remove any material build-up which may occur on the plumb bob.

## ATEX and IECEx Supplemental Instructions (Maintenance)

See Bulletin 344K.

## Cable and wiper seal replacement

- 1) Manufacturer observations** - Cable life can last over 100,000 operations. However, in applications with coarse material or temperature swings, life can be reduced. Cables that are kinked, frayed or which have peeling of the jacket require immediate replacement to ensure proper operation.
- 2) Target operation** - Reliable operation requires a damage-free cable which can easily navigate through the wiper seal, around the cable rollers and onto the storage wheel. Cables should pass through wipers without any resistance.

## Cable Replacement Procedure

- 1. Access plumb bob:** Press the "Down" motor control switch until enough cable is spooled out so the plumb bob can be accessed from a port on the vessel. Disconnect power plug.
- 2. Remove cable:** Cut the cable just above the thimble at the plumb bob end. Retain hardware. Remove the storage wheel cover by removing the four screws. Remove cable from the SMU.
- 3. Remove wiper seals:** Remove the wiper seal cover. Pull out wiper seals. Clean wiper seal compartment. Do not install wiper seals at this time.
- 4. Attach cable to hub:** Insert cable into slot of reel hub. Loop the cable over the closest casting boss. Secure cable with one compression sleeve. Replace storage reel side cover and route cable around lower corner roller.
- 5. Spool cable:** Reapply power to the SMU. Motor will briefly start pulling in cable. Press the "Up" motor control switch and allow motor to wind cable onto storage reel in even manner. Release switch when there is just enough cable to perform the actions outlined in steps 6 and 7 below.
- 6. Route cable:** Position cable around rollers, measuring wheel and through the wiper seal compartment and mounting flange. Do not install wiper seals yet.
- 7. Reattach plumb bob:** Pass cable through two compression sleeves, around thimble and back through compression sleeves. Crimp compression sleeves.
- 8. Install wiper seals:** Install wiper seals as explained in the Wiper Seal Replacement section.
- 9. Re-establish operation:** Remove all slack from cable and be sure it passes freely through both wipers. Press System Reset Switch and allow SMU to fully wind cable onto storage reel.

## Wiper Seal Replacement (See Figure 13)

- 1. Create cable stack:** Press the "Down" motor control switch so plumb bob is not socketed and until there is enough cable slack to allow setting the plumb bob aside.
- 2. Wiper removal from the cartridge:** Grasp the cable from between the two wipers and pull toward you in direction of arrow "A" while also pulling on the wipers. There is a slot on the Viton® wiper that must be aligned parallel with the cable (facing toward the back of the cartridge). It is necessary for the cable to be aligned and somewhat embedded in the slot in order to remove the wiper without pinching the cable. The brush wiper can be pulled out regardless of alignment.
- 3. Wiper removal from cable:**  
Viton wiper: Firmly pull cable through the slot in direction of arrow "B".  
Brush wiper: Spread open the wiper enough to pull cable through.
- 4. Install replacement wipers or cleaned originals:**  
Brush wiper: Spread open the wiper enough to pull cable through and slide it onto the cable until centered and reclose.  
Viton wiper: Firmly pull cable through the slot until the cable pops into the center hole. Do not flex or bend this wiper or the bond between the metal and rubber components may be compromised.
- 5. Install wipers in cartridge slots:**  
Viton wiper: Align the wiper so that the slot faces the back of the cartridge (direction of arrow "B"). Align the cable parallel over the slot so that it almost lies in the slot. This is necessary to prevent the cable from getting pinched or jammed between the wiper and the cartridge slot. Slide the wiper into the cartridge slot. The cable must move freely through the hole once installed.  
Brush wiper: Slide the wiper into the cartridge slot while slowly rotating the wiper around the cable. Rotating the wiper helps keep the bristles from getting hung up on the front edge of the cartridge slot. Installed correctly, the wiper should be fairly easy to revolve around the cable.
- 6. Re-establish operation:** Remove all slack from cable and be sure it passes freely through both wipers. Press System Reset Switch and allow SMU to fully wind cable onto storage reel.

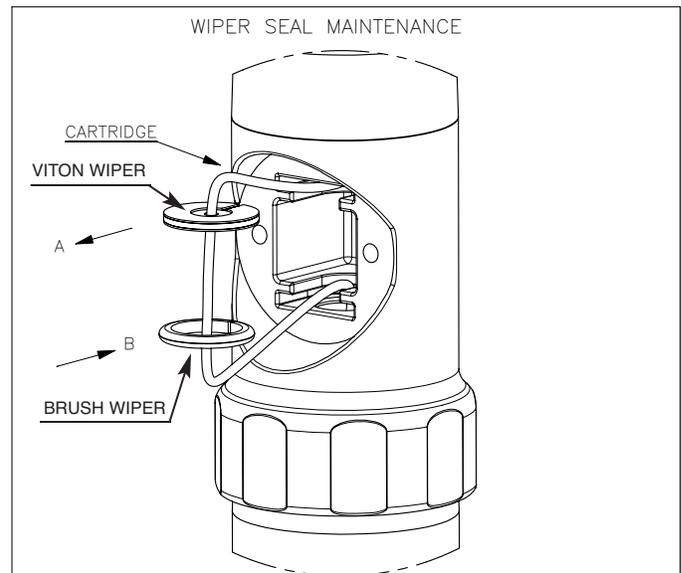


Figure 13

## TROUBLESHOOTING

**PROBLEM:** The SMU will not make a measurement (take a sounding)

**CAUSE/SOLUTION:**

1. (All models) Lock-out feature is "active". Remove "lock-out" signal from the lock-out terminal block.
2. (RS-485) The address of the SMU and the operator interface channel do not match, or there are multiple SMUs with the same address. Create a unique address for each SMU on the network and ensure they match-up with a operator interface channel #.
3. (RS-485) The network termination switches are improperly set. Verify that only the devices on the physical ends of the network have the network termination switches "ON", and all others are "OFF".
4. (Analog) The automatic timer is not activated. Verify that the parameter AutoTime is "ON" if automatic measurement cycles are desired.

**PROBLEM:** The SMU reports an "Error" after a measurement cycle is completed

**CAUSE/SOLUTION:**

1. (Return Error) The plumb bob did not travel as far when ascending as it did when descending. Determine if plumb bob is trapped in material. Request another measurement. A subsequent "motion" error confirms an entrapment. A subsequent "index" error indicates that plumb bob has freed itself. Request another measurement and errors will likely cease.
2. (Index Error) The plumb bob did not travel as far when descending as it did when ascending. Determine if mounting is causing the plumb bob to return to an inconsistent location at the start/socket position.
3. (Motion Error) The plumb bob did not travel a far enough distance when measurement was requested. Consider the following possibilities:
  - Plumb bob is trapped in material
  - Plumb bob is stuck to mounting surface
  - Cable is broken
  - Cable is restricted in wiper seal
  - Cable is damaged

**PROBLEM:** The plumb bob gets stuck in the socket

**CAUSE/SOLUTION:**

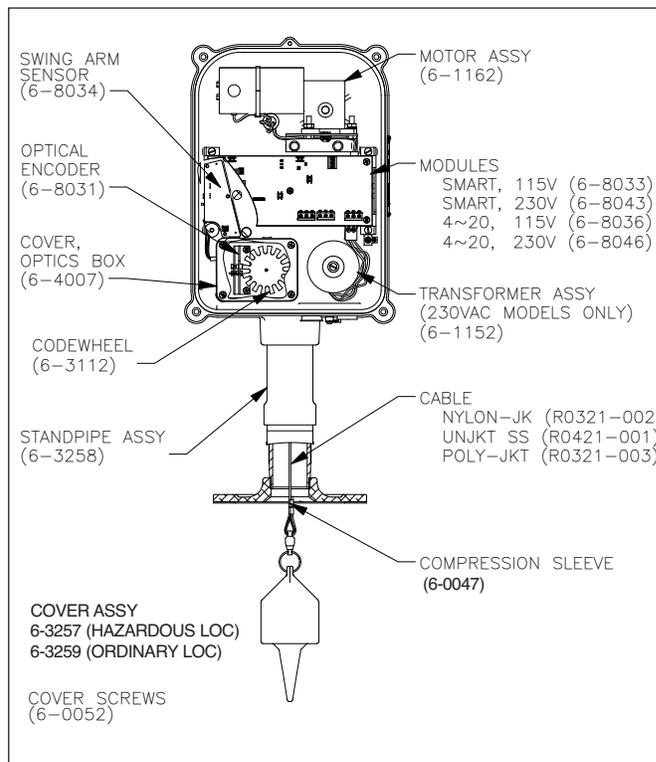
1. Material build-up may be causing plumb bob to "cling" to the socket. Turn "ON" the Descend-Assist feature through the ConfigureSensor app in the MISC SETTINGS section. See Pg. 10 (RS-485) or Pg. 13 (Analog) of this document.

**PROBLEM:** The SMU measurement is not accurate

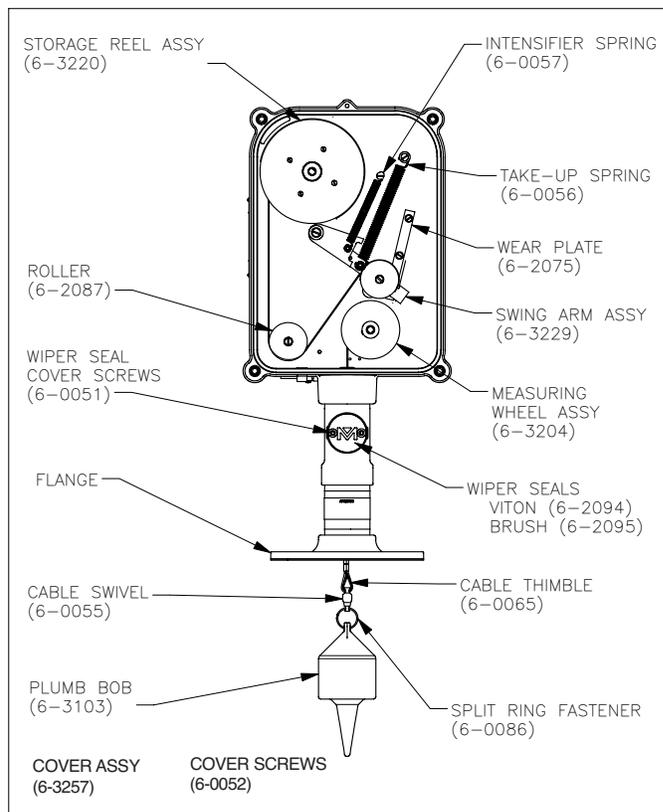
**CAUSE/SOLUTION:**

1. Cable length is too short for application. Replace cable with suitable length.
2. Wiper seals are creating excessive drag resulting in premature reversing of plumb bob. Clean or replace wiper seals.
3. Cable is slipping on measuring wheel due to the lubricity of the material being measured. Consult factory.
4. Cable is damaged (kinked, frayed) somewhere through its length resulting in premature reversing of plumb bob. Replace cable.
5. Cycle Limit function CycLimit is causing plumb bob to reverse before reaching material surface. Configure CycLimit value to suit application.

## MECHANICALS



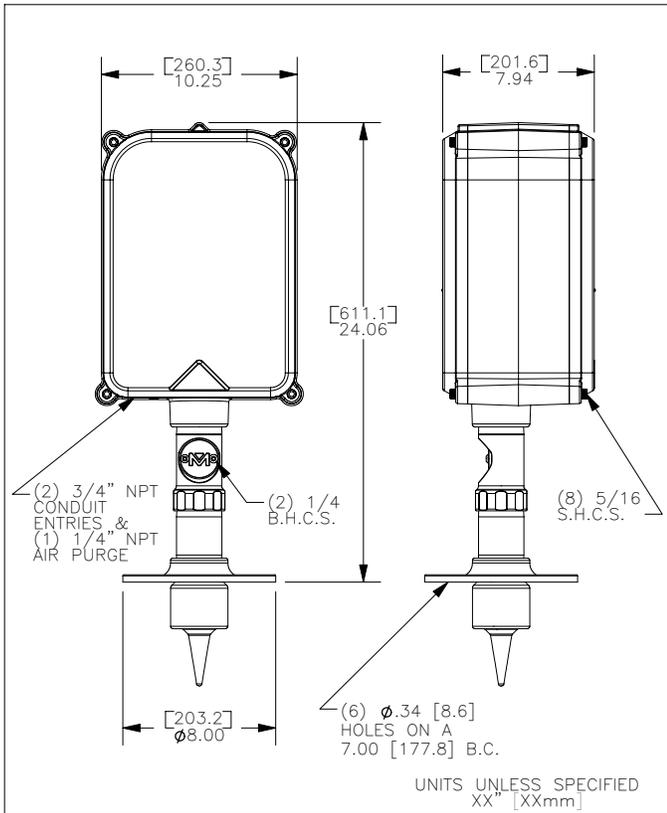
SMU Replacement Parts (Electrical Side)



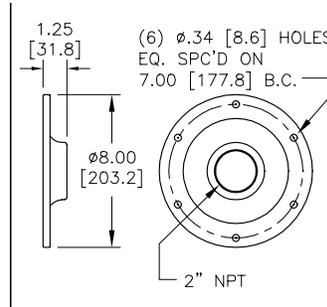
SMU Replacement Parts (Mechanical Side)

# MECHANICALS

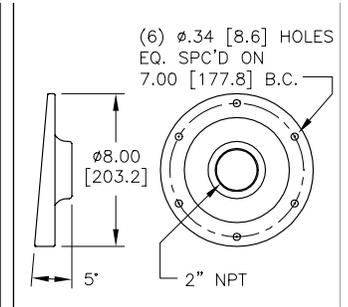
DIMENSIONS ARE SHOWN IN INCHES WITH MILLIMETER EQUIVALENT IN BRACKETS



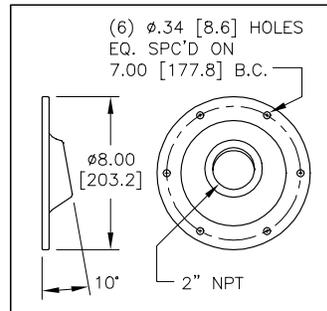
**Silo Monitoring Unit (SMU)**



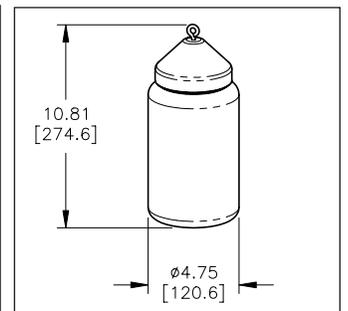
**Standard K-Flange (6-3105)**



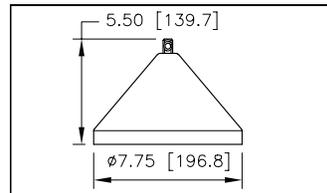
**5° K-Flange (6-3125)**



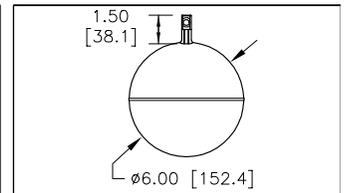
**10° K-Flange (6-3128)**



**Digestible Plumb Bob (6-2190)**

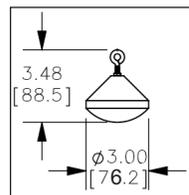


**Inverted Cone Plumb Bob (6-4106)**

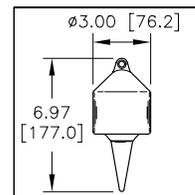


**Ball Float Plumb Bob (6-4108)  
Ball Float Teflon®-Coated Plumb Bob (6-4128)**

**Inverted Cone Teflon®-Coated Plumb Bob (6-4126)**

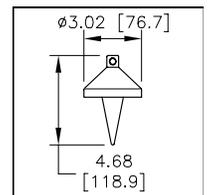


**Solid / Water Interface Style Stainless Steel Plumb Bob (6-4112)**



**Standard Aluminum Plumb Bob (6-3103)**

**Standard Aluminum Teflon-Coated Plumb Bob (6-3123)**



**Standard Stainless Steel Plumb Bob (6-3136)**

# BULLETIN 344A

## SAFETY

### ⚠ General Safety

**CAUTION:** It is essential that all instructions in this manual be followed to ensure proper operation of the equipment and safety of operating personnel. The use of this symbol is used throughout this manual to highlight important safety issues. Please pay particular attention to these items.

### ⚠ Electrical Shock Caution

SMUs are powered with HIGH VOLTAGE. No operator serviceable parts are inside. All servicing is to be performed by qualified personnel. Each SMU is provided with a "protective conductor terminal" (⊕) which shall be terminated to earth ground potential (See Electrical Installation). This product's design complies with EN61010-1 installation category II and pollution degree 2.

### ⚠ Hazardous Location Caution

Certain SMUs can be used in Hazardous Locations (See Specifications). These models shall only be used in applications covered by stated ratings or those considered non-hazardous. Failure to comply could result in damage to personnel and property. The following must be maintained to assure safe operation:

- 1) Enclosure integrity** - the dimensions of the housing, side covers, cover retention hardware, or through shafts shall not be altered.
- 2) Maintenance** - Power to all circuits must be disconnected before conducting any investigation, setup, or maintenance when in a hazardous atmosphere.

### ⚠ Mechanical Hazards

Consider the SMUs weight whenever lifting or moving the instrument. When being serviced by authorized personnel, extreme caution shall be taken whenever power is supplied to a SMU unit and the cable and associated mechanisms are accessible. The gear motor has sufficient torque to pinch fingers between the cable and other mechanical parts. Particular areas of danger include the storage reel, measuring wheel, rollers, and take-up spring assembly.

### Electromagnetic Compatibility (EMC)

The SMU was tested and found to comply with the standards listed below. The SMU should not be used in residential or commercial environments. Compliance to the EMC standards was demonstrated by means of a test setup using the following installation methods.

- 1) SMU enclosure** was connected to earth ground (protective earth). (⊕)
- 2) Shielded cable** was used to interconnect the RS-485 network (connections +D and -D). The shield drain was connected to (SHD terminal) at each end.

### EMC Emissions:

Meets	EN 61326-1	Electrical Equipment for Control Use, EMC Radiated and conducted emissions (Class A - industrial)
	EN 55011	
	EN 61000-2	Harmonic Current Emissions
	EN 61000-3	Voltage Fluctuation & Flicker
Meets	FCC Part 15B	RF Devices, Unintentional Radiators
	CISPR 11	Radiated and conducted emissions (Class A- industrial)

### EMC Immunity:

Meets	EN 61326-1	Electrical Equipment for Control Use, EMC
	EN 1000-4-2	Electrostatic discharge (industrial)
	EN 1000-4-3	RF radiated EM fields (industrial)
	EN 1000-4-4	Electrical fast transients (industrial)
	EN 1000-4-5	Electrical surges (industrial)
	EN 1000-4-6	RF conducted EM energy (industrial)
	EN 1000-4-8	Power frequency magnetic fields (industrial)
	EN 1000-4-11	Source voltage deviation

## SPECIFICATIONS

Power Reqs:	115 VAC (±15%) or 230 VAC (±15%), 50/60 Hz
Power Consumption:	6 VA continuous, 50 VA intermittent
Altitude:	6562 ft (2000m) max
Relative Humidity:	Suitable for Outdoors
Installation Category:	II
Pollution Degree:	4, Suitable for indoor/outdoor use
Operating Temp:	-40° F to 150° F (-40° C to 65° C)
Max. Int Bin Temp:	Up to 300°F (149°C) w/use of bare SS cable; Up to 200°F (93°C) w/use of nylon or polyethylene jacketed cables

Max. Vessel Pressure:	15 PSI
Measurement Range:	150 feet maximum (45.7 m)
Measurement Rate:	1.0 foot/second (typical) (0.3 m/s)
Accuracy:	± 0.25% (distance or level)
Repeatability:	0.1 feet (30 mm)
Resolution:	1/100 foot (3 mm)
Mounting:	Freeze-Resistant "K" flange, 8" dia. w/ 7" bolt circle
Conduit Entry:	(2) 3/4" NPT
Cable:	1/16" nylon-jktd (270 lb/123 kg); 3/64" SS unjktd (270 lb/123 kg); 1/16" polyethylene-jktd (270 lb/123 kg)

SMU Weight (Approx.):	42 lbs (19.1 kg)
Plumb Bob Weight:	2 lbs (0.9 kg)
Shipping Weight (Approx.):	45 lbs (20.4 kg) - [Includes SMU, plumb bob, cable and carton]
Ship Carton Dimensions:	34 x 15 x 16 inches (864 X 381 X 406 mm) - [Includes SMU, plumb bob & cable]
Enclosure/Housing:	Cast Aluminum, powder coat finish
Air Purge Connection:	1/4" NPT
Protection:	NEMA 4X / Enclosure Type 4X; IP66
Approvals:	CSA <sub>us/c</sub> : Ordinary Locations; Class II, Group E,F,G; Class III

ATEX:	⊕ II 1/2 D c Ex tb IIIC T75°C Db IP66 (Ta -40°C TO +65°C)
IECEX:	Ex tb IIIC T75°C Db IP66 (Ta -40°C TO +65°C)



CHINA RoHS 2

### RS-485 Model

Input/Output:	RS-485, half-duplex, isolated, proprietary protocol
Address Selection:	1-16 (SiloPatrol); 1-247 (Modbus)
Wiring Distance:	3280 ft (1000 m) @ 9600 baud, 26 AWG
Relay Output:	5A @ 250VAC max, isolated, dry contact
Sound/Lockout:	(Vhi) 9 8-265VAC/DC, 9.5K ohm input resistance, isolated; (Vlo) 20-55 VAC/DC, 2.0K ohm input resistance, isolated

### Analog(4-20mA) Model

4-20mA:	Reversible to 20-4mA, self powered 500 ohm max loop, isolated
Relay Output:	5A @ 250VAC max, isolated, dry contact
Sound/Lockout:	(Vhi) 98-265VAC/DC, 9.5K ohm input resistance, isolated; (Vlo) 20-55 VAC/DC, 2.0K ohm input resistance, isolated

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## WARRANTY

Monitor Technologies LLC warrants each **SiloPatrol®** SE SMU inventory monitoring system it manufactures to be free from defects in material and workmanship under normal use and service for two (2) years from the date of purchase. The purchaser must notify Monitor of any defects within the warranty period, return the product intact, and prepay transportation charges. The obligation of Monitor Technologies LLC under this warranty is limited to repair or replacement at its factory. This warranty does not apply to any product which is repaired or altered outside of Monitor Technologies' factory, or which has been subject to misuse, negligence, accident, incorrect wiring by others, or improper installation. Monitor Technologies LLC reserves the right to change the design and/or specifications without prior notice.

**Monitor Technologies LLC**

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