Installation, Operation & Maintenance Instructions

Model VHS
Vibrating Element Point Level Sensor

Thank you for purchasing the Model VHS Vibrating Element Point Level 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

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

The Model VHS Vibrating Element Point Level Sensor can be powered with HIGH VOLTAGE. No operator serviceable parts are inside. All servicing is to be performed by qualified personnel. Each Model VHS 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.

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

Safety Summary Cont'd.

Electromagnetic Compatibility (EMC):
The Model VHS vibrating element point sensor was tested and found to comply with the standards listed below:

Low Voltage Directive:	73/23/EEC
Standard IEC:	61010-1:2001
EMC	89/336/EEC
CE Mark	93/68 EEC
RoHS	2002/95/EC
WEEE	2002/96/EC

Models:	Model VHS (all versions)

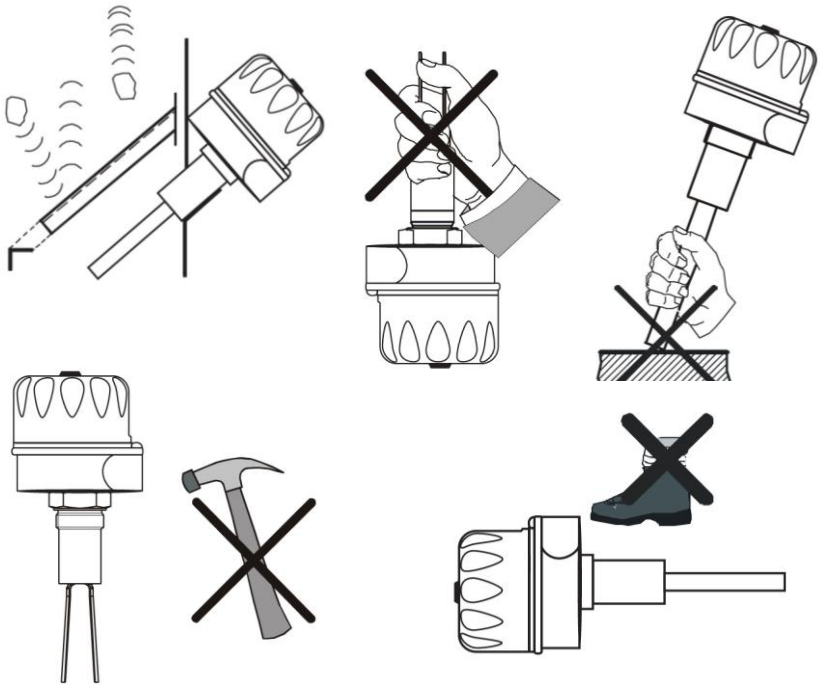
All test reports and documentation can be obtained from BlueLevel Technologies, Inc. located in Sterling, IL.

Mechanical Installation

Prior to installation it is advised to check the switching function and operation of the Model VHS vibrating element point level sensor on a small sample of material if possible in order to set the proper density switch setting. In addition, some materials with very large particle size or little friction may not work with the Model VHS.

Caution: Handle the Model VHS with great care, especially the sensing probe (rod or fork). See illustrations below. Any impact on the sensing probe may damage the resonance system.

Caution: A protective shield should be installed if the probe is exposed to falling material or may be exposed to excessive mechanical load. Refer to illustrations below.

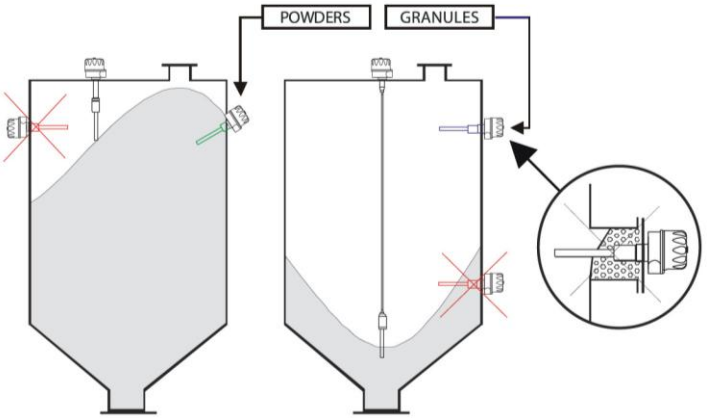


Mechanical Installation Cont'd.

Choose an appropriate mounting location based upon the below figures for the Rod or Fork unit. Consult with the BlueLevel technologies factory if needed to assure a best location.

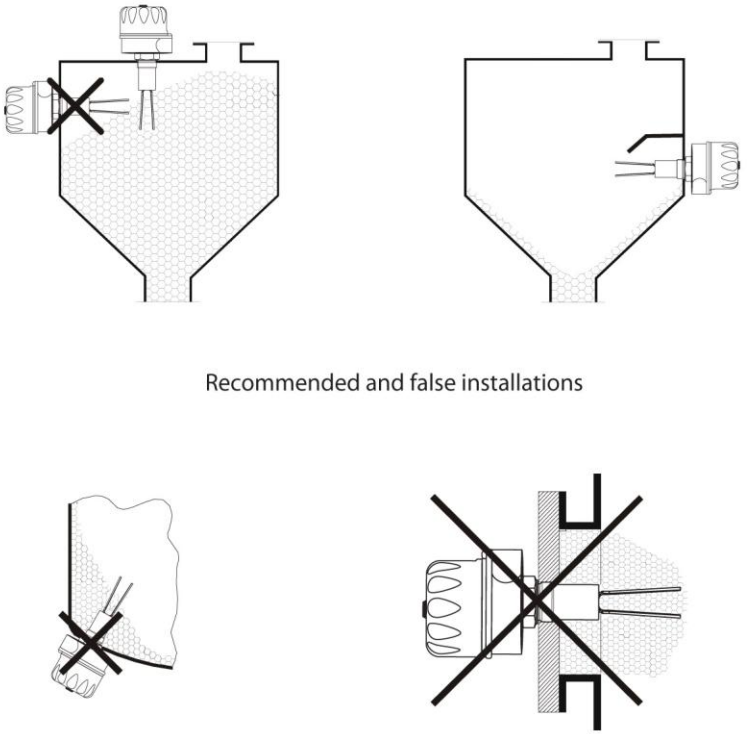
Figure 1: Proper mounting for Model VHS "Rod" type level sensor

	High level	Low level*
Standard	Side mount	Side or bottom mount
Pipe extended	Top mount	Side or bottom mount
Cable extended	Top mount	Top mount



Mechanical Installation Cont'd.

Figure 2: Proper mounting for Model VHS "Fork" type level sensor



Caution: Do not use the Model VHS housing to screw the device into its process connection.

Screw in the Model VHS by its hexagon neck. After screwing tight into the process connection, the housing can be rotated a maximum of 300° in order to align and adjust the conduit connections to the required position. The conduit entrances must be positioned so they are pointing with a downward slope to drain any condensation away from the enclosure.

Mechanical Installation Cont'd.

INSTALLATION NOTES FOR "FORK" PROBE DEVICES:

1. The plane of the fork tines should be positioned to the desired direction. In horizontal mounting of level sensor, vertical positioning of the fork tines is recommended to assist with shedding material. The plane of the fork tines is perpendicular to the marked plane of the hexagonal neck.

   If directional positioning of the fork tines is need, as in the case of horizontal side mounting, use Teflon sealing tape applied to the process connection thread and position the fork tines to the desired direction.

2. The recommended mounting position for detecting lightweight, free flowing solids is vertical or top mounting (see Figure 2). However, side mounting can be used if the fork tines are easily freed from the process material. In the case of side mounting the Model VHS must be installed with the fork tines standing vertically as mentioned above. To determine the best mounting location, material "caving" and "arching" should be taken into consideration.

3. The Model VHS forks should be protected against falling material so that material will not clog the fork tines or damage the unit (see Figure 2).

4. Avoid mounting in a recess (see Figure 2).

5. In case of vessels that are likely to be exposed to intense vibrations, necessary provisions should be made for dampening the vibrations acting on the Model VHS.

INSTALLATION NOTES FOR "ROD" PROBE DEVICES:

1. It may be necessary to install the Model VHS rod point level sensor at an angle or offset level position relative to the switching level actually required in order to take into account caving or arching of the material in the vessel (see Figure 1).

Mechanical Installation Cont'd.

2. With powder level detection the Model VHS should be installed at an incline angle exceeding the angle of repose of the material within the vessel (or in case of high level detection, top mount or vertical installation). See Figure 1. This will prevent powder deposits remaining on the vibrating rod probe element, which would reduce substantially the self-cleaning ability of the probe.

3. Avoid mounting the vibrating rod in a recess (see Figure 1).

4. In case of vessels that are likely to be exposed to intense vibrations, necessary provisions should be made for dampening the vibrations acting on the Model VHS.

Instrument Function

Introduction:

The Model VHS is a vibrating element style point level sensor or bin level indicator (a.k.a. level control, bin indicator, etc.) of high quality design and ergonomics, which provides reliable indication of the presence and absence of bulk solids, including powder, pellet and granular materials.

The Model VHS is an instrument with a switch selectable Fail-Safe relay that will fail to a “safe” (material alarm state) condition in the event of a failure of the power supply to the unit.

Principle of Operation:

The Model VHS uses a mechanical resonance system. The mechanical element is excited and kept in resonance by the sensor’s electronic circuitry. An electrical signal is applied to a piezoelectric crystal at the natural resonant frequency of the mechanical system. This electrical excitation causes physical deformation of the crystal, which in-turn creates the probe element vibration. When no material is present around the probe, the vibration exists. With material present and surrounding the probe element, the vibration is dampened and detected by the electronic circuitry. This results in a change in the relay output and local LED indication.

Application or Use:

Model VHS vibrating element point level sensors are used to detect the presence and absence of powders and granular bulk solid materials in bins, hoppers and silos. Best performance and use can be found with dry and free-flowing materials. For the Rod probe the unit can detect materials with density as low as 3.12lbs/ft^3 (0.05kg/dm^3). The minimum density for the Fork probe is 0.624lbs/ft^3 (0.01kg/dm^3). Model VHS vibrating element level sensors are also great for vessels with changing contents as the sensor does not require calibration, unlike RF admittance/capacitance sensors.

Instrument Function Cont'd.

Relay Output Action:

The Model VHS uses a Fail-Safe selection switch. There are two positions for this switch: High and Low as indicated in the labeling on the electronics module within the sensor enclosure (refer to Electrical Connections and Setup sections).

The relay coil is always energized in the "normal" state of the material level indicator (refer to Application or Use above; uncovered for High level application; covered for Low level application). Upon the occurrence of the material level alarm condition, or a power failure event, the relay will de-energize and the contacts will change state indicating that an alarm condition exists.

FAIL-SAFE HIGH – Fail-Safe HIGH means that the relay will be energized when the Model VHS probe element is free of material and vibrating at its natural resonant frequency and will de-energize when the vibrating element is dampened by the presence of material. Failure of the power supply to the unit will cause the relay to de-energize indicating that a High level alarm exists, just as if the sensing element vibration were dampened by the material (material presence alarm).

FAIL-SAFE LOW – Fail-Safe LOW means that the relay will NOT be energized (alarm condition) when the vibrating element is free of material and vibrating at its natural resonant frequency, uncovered of material, and will energize when vibration is dampened by the presence of the material. A failure of the power supply to the unit will cause the relay to de-energize indicating a Low level alarm condition (material absence alarm).

LED Indicator Action:

All Model VHS level sensors are provided with a bi-color LED on the electronics module located inside the enclosure, green and red. Model VHS units are suitable for use only in Ordinary Locations. The VHS units incorporate a light-pipe lens in the instrument cover so the LED illumination is visible locally from outside the enclosure. The action of the Green and Red LED illumination is as follows:

Instrument Function Cont'd.

Red LED illuminated – MATERIAL ALARM CONDITION; Power-On
Green LED illuminated – NORMAL CONDITION; Power-On

No LED illumination – Power-Off or Power Failure

The material alarm condition (covered or uncovered) is dependent on the position of Fail-Safe switch.

Electrical Connections

Electrical Precautions:

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

Observe all government regulations regarding equipment in hazardous locations.

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

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 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 VHS unit is provided with a “protective conductor terminal” ⏚ which shall be terminated to the local earth ground potential to eliminate shock hazard. Select a wire size that can carry in excess of the sum of the maximum amperage of all circuits.

Electrical Connections Cont'd.

Circuit Separation:

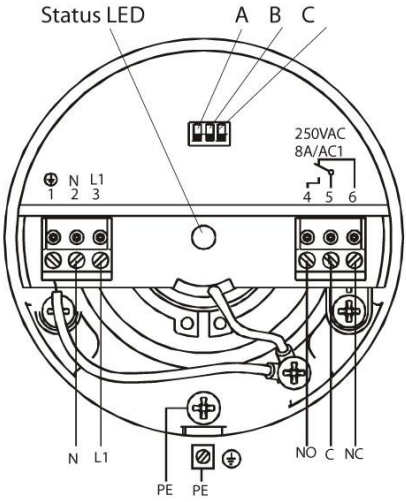
Since the wiring compartment of the Model VHS cannot absolutely protect against physical contact between multiple circuits, it is required that all wiring used must have an insulation rating of 300v minimum, and a minimum temperature rating of 194° F (90° C).

1. General Model VHS ROD versions:

The Model VHS Rod is available to be powered from 20-255VAC, 50/60Hz supply voltages or 20-255VDC.

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.

Do not remove the wire from terminal pin 1 (see Figure 3) because it is an internal connection.



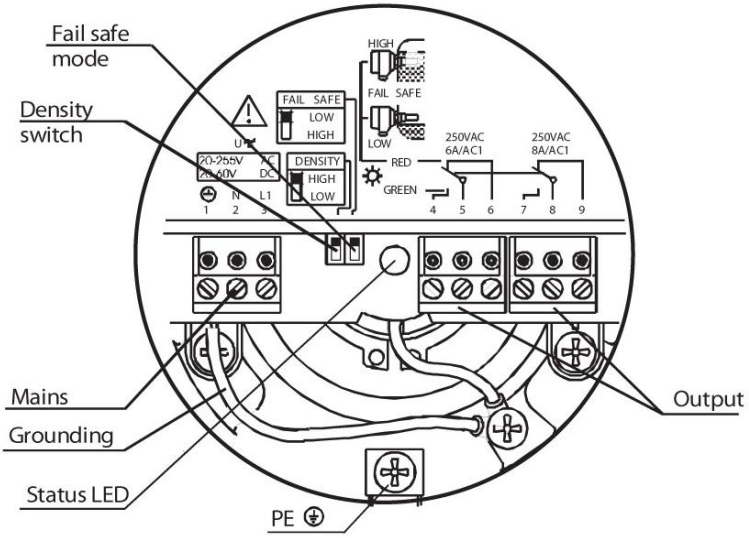
Switch	Adjustment
A	DENSITY
B	DELAY
C	FAIL SAFE mode

Figure 3: Electrical connections for Model VHS ROD version

Electrical Connections Cont'd.

2. General Model VHS FORK versions:

Figure 4: Electrical connections for Model VHS FORK version



The Model VHS Fork is available to be powered from 20-255VAC, 50/60Hz supply voltages or 20-60VDC.

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.

Do not remove the wire from terminal pin 1 (see Figure 4) because it is an internal connection.

Electrical Connections Cont'd.

3. Grounding:

Refer to the "Protective Earth Ground" section on page 13. 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.

Setup

Remove the cover from the enclosure to access adjusting switches.

After proper installation and electrical connections determine that the Model VHS is ready for operation. The power-on state is indicated by the illumination of the bi-color LED.

Model VHS Rod version

The DENSITY switch (switch A) is to be set according to the density of the material to be sensed:

- LOW position is recommended for loose and light materials with bulk density below 6.24lbs/ft^3 (0.1kg/dm^3). This setting represents great sensitivity of material detection as well as small amplitude of vibration in the probe element.

- HIGH position is recommended for thick and heavy materials with bulk density greater than 6.24lbs/ft^3 (0.1kg/dm^3). This setting represents a lower sensitivity and provides vibration of higher amplitude.

- The Model VHS Rod may not switch appropriately in materials with density less than 3.12lbs/ft^3 (0.05kg/dm^3) or with materials that have very low frictional coefficients. Consider using the Model VHS Fork version for these applications.

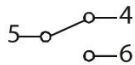
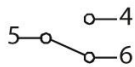
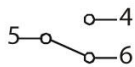
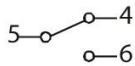
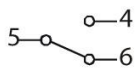
Refer to Figure 5 for an operational diagram of the Model VHS Rod version.

To obtain Fail-Safe alarm operation (switch C) use the de-energized or open state of the output as an alarm, thus a power failure will also be considered as an alarm. Refer to operating diagram in Figure 5.

The time delay (switch B) should be selected to comply with the process control requirements of the application. Refer to the Technical Data Specifications and labeling on the electronics module.

Setup Cont'd.

Figure 5: Operating diagram for Model VHS Rod version

POWER	PROBE	FAIL-SAFE MODE		Status LED	RELAY
ON	Not vibrating (covered)		LOW	GREEN	 ENERGISED
			HIGH	RED	 DE-ENERGISED
	Vibrating (free)		LOW	RED	 DE-ENERGISED
			HIGH	GREEN	 ENERGISED
OFF	–	LOW vagy HIGH		NOT LIT	 DE-ENERGISED

Model VHS Fork version

The DENSITY switch is to be set according to the density of the material to be sensed:

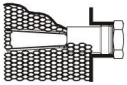
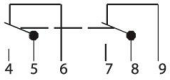
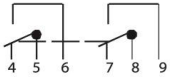
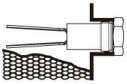
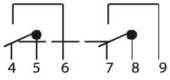
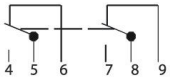
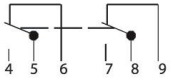
- LOW position is recommended for loose and light materials with bulk density below 6.24lbs/ft^3 (0.1kg/dm^3). This setting represents very high sensitivity of material detection as well as small amplitude of vibration in the probe element.

Setup Cont'd.

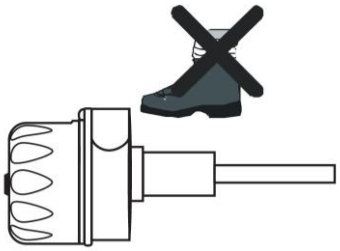
- HIGH position is recommended for thick and heavy materials with bulk density greater than 6.24lbs/ft^3 (0.1kg/dm^3). This setting represents a lower sensitivity and provides vibration of a higher amplitude.

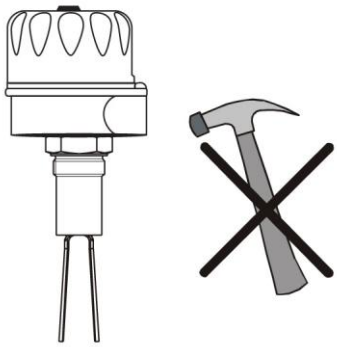
- The Model VHS Fork may not switch appropriately in materials with density less than 0.624lbs/ft^3 (0.01kg/dm^3) or with materials that have extremely low frictional coefficients.

Figure 6: Operating diagram for Model VHS Fork version

Power supply	Fork	Switch pos.	Operation mode		Output	
			Fail safe	Status LED		
Yes	 Immersed		HIGH	RED		De-energised
			LOW	GREEN		Energised
	 Free		HIGH	GREEN		Energised
			LOW	RED		De-energised
No	Free or immersed	HIGH or LOW		NOT LIT		De-energised

Maintenance





Do not use the Model VHS sensor as a step.

Do not hit the Model VHS sensor to remove any material build-up.

Model VHS vibrating element point level sensors do not require maintenance on a regular basis. In some instances, however, the vibrating section may need to be cleaned from deposited material. This must be carried out carefully and without damaging the vibrating element. Do not use any tool or banging to effect cleaning if necessary.

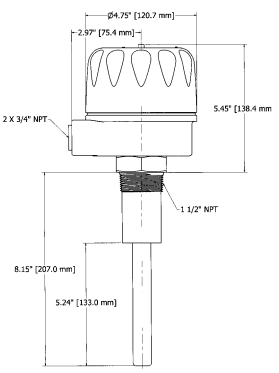
Technical Data

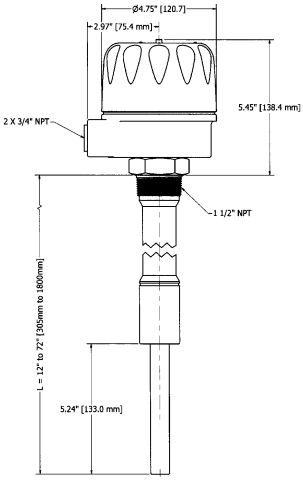
Power Supply:	
Universal	
Rod Probe Style	20-255VAC/DC; AC 50/60Hz
Fork Probe Style	20-255VAC/20-60VDC; AC 50/60Hz
Power Consumption:	
Rod Probe Style	≤ 2.5VA / ≤2W
Fork Probe Style	≤ 1.7VA / ≤ 3W
Ambient Temperature	-22° F to +140° F (-30° C to +60° C)
Process Temperature:	
Rod Probe Style	
Std. and Pipe Ext. Versions	-22° F to +230° F (-30° C to +110° C)
High Temp Versions	-22 F to +320° F (-30° C to +160° C)
Cable Extended Versions	-13° F to +194° F (-25° C to +90° C)
Fork Probe Style	-40° F to +266° F (-40° C to +130° C)
Maximum Pressure:	
Rod Probe Style	
Std. and Pipe Ext. Versions	368psi (25bar)
Cable Extended Version	88psi (6bar)
Fork Probe Style	588psi (40bar)
Enclosure:	NEMA Type 4X, IP65, Cast Aluminum with FDA Compliant Powder Coat
Output:	SPDT Relay, 8A @ 250VAC, Fail-Safe on Power Failure
Fail-Safe Selection:	Switch Selectable, High or Low
Density Selection:	Switch Selectable, LOW or HIGH
Rod Probe Style	LOW - density ≤ 6.24lbs/ft^3 (0.1kg/dm^3) HIGH - density> 6.24bs/ft^3 (0.1kg/dm^3)
Time Delay:	
Rod Probe -	
Switch Selectable	Covered: <1.8sec or 5 ± 1.5sec Uncovered: <2sec or 5 ± 1.5sec

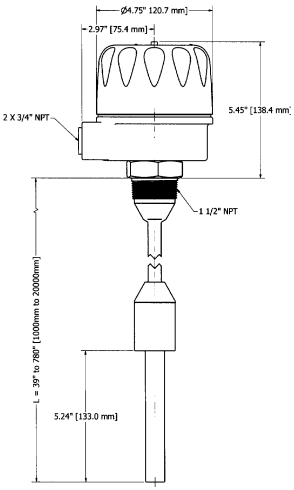
Technical Data Cont'd.

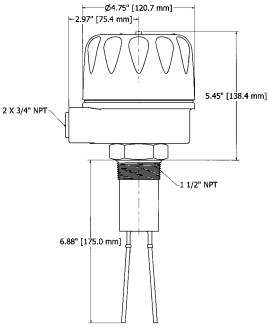
Fork Version	
Fixed Delay	Covered: ≤0.5sec Uncovered: ≤1sec @ HIGH density setting; ≤2sec @ LOW density setting
Process Connection:	1½" NPT
Conduit Entry:	Two (2) ¾" NPT
Materials of Construction:	
Enclosure	Powder Coated Cast Aluminum
Probe	316Ti Stainless Steel
Pipe Extension (Rod only)	316 Stainless Steel
Cable Extension (Rod only)	Polyethylene Coated, Steel Reinforced
Weight:	
Rod Probe Style	
Standard Version	5.4lbs (1.68kg)
Fork Probe Style	
Standard Version	4.5lbs (2.01kg)
Certifications:	CE Mark

Dimensions


Ø4.75" [120.7 mm]
2.97" [75.4 mm]
5.45" [138.4 mm
2 X 3/4" NPT
1 1/2" NPT
8.15" [207.0 mm]
5.24" [133.0 mm]


Ø4.75" [120.7]
2.97" [75.4 mm]
5.45" [138.4 mm]
2 X 3/4" NPT
1 1/2" NPT
L = 12" to 72" [305mm to 1800mm]
5.24" [133.0 mm]


Ø4.75" 120.7 mm]
2.97" [75.4 mm]
5.45" [138.4 mm
2 X 3/4" NPT
1 1/2" NPT
L = 39" to 780" [1000mm to 20000mm]
5.24" [133.0 mm]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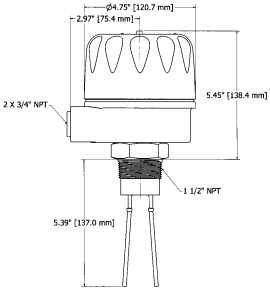
5.45" [138.4 mm]
2 X 3/4" NPT
1 1/2" NPT
6.88" [175.0 mm]


Ø4.75" [120.7 mm]
2.97" [75.4 mm]
5.45" [138.4 mm]
2 X 3/4" NPT
1 1/2" NPT
5.39" [137.0 mm]

Our Commitment Stands

Golden Parachute:

Each BlueLevel Technologies Model VHS vibrating element point level 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 of the cost of the equipment as shown on your invoice from BlueLevel Technologies. In addition, Model VHS products are covered by our industry-leading 2-year limited warranty. Consult our Warranty statement for details.

Standard Warranty

Each BlueLevel Technologies Model VHS vibrating element point level 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.

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Form 747 • Printed in USA 12/12