



Installation, Operation & Maintenance Instructions / Technical Document



Model VHL Mini Vibrating Fork Point Level Sensor for Liquids

Thank you for purchasing the Model VHL Mini Vibrating Fork Point Level Sensor for Liquids 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.

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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

Some Model VHL Mini Vibrating Fork Point Level Sensors for Liquids can be powered with HIGH VOLTAGE. No operator serviceable parts are inside. All servicing is to be performed by qualified personnel. Each Model VHL Mini 2-Wire AC sensor is provided with a “protective conductor wire” (green/yellow) which shall be terminated to earth ground potential (see Connections).

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 VHL Mini vibrating fork point level sensor for liquids was tested and found to comply with standards for electric shock and electromagnetic compatibility for CE marking.

This product complies with the following regulations of the EC:

Directive 93/68/EEC (CE Mark)
Directive 2006/95/EC (LVD)
Directive 2004/108/EC (EMC)
Directive 2002/95/EC (RoHS)
Directive 2002/96/EC (WEEE)

The product has been tested according to the following standards:

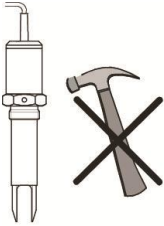
IEC 61010-1:2010
IEC 61326-1:2005

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

Mechanical Installation



Prior to installation handle the Model VHL Mini in a careful manner to prevent any mechanical damage.



Prevent Damage

If side mounting the VHL Mini vibrating fork point level sensor then positioning of the fork tines is required so that the forks are vertical. Use Teflon sealing tape on the threaded process connection to seal the threads and position the fork tines appropriately using the mark “O” on the hex nut above the process connection.

Low Viscosity Fluids

In applications where the fork tines are easily freed from the process medium any mounting shown in Figure 1 is possible.

High Viscosity Fluids

In applications where the tines are not easily freed from the process medium, side or horizontal mounting is recommended.

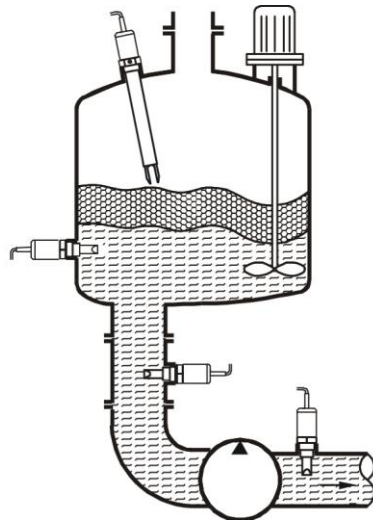
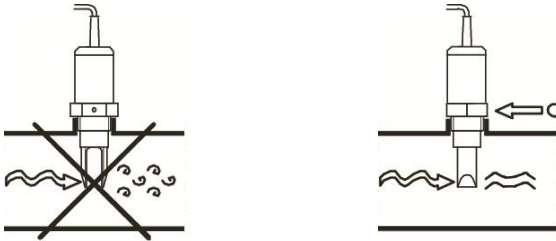


Figure 1: Mounting Arrangements

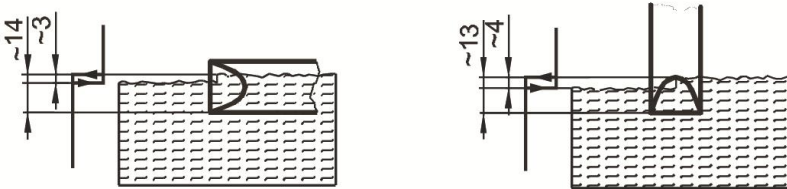
Mechanical Installation Cont'd.

For pipe mounting the fork tines must be parallel to the flow of the fluid.



Pipe Mounting

The switching point and the switch differential depends on the density of the liquid and the mounting orientation (side/horizontal or top/vertical).



*Switching Point and Differential for Water at +77°F (+25°C)
(dimensions shown in mm, divide by 25.4 to convert to inches)*

Instrument Function

Introduction:

The Model VHL Mini is a vibrating fork style point level sensor for liquids of high quality design and ergonomics, which provides reliable indication of the presence and absence of a wide range of liquids.

The Model VHL Mini is an instrument that can be used for either High or Low level detection with output suitable for switching low current loads or as input to a PLC or other type of control system.

Principle of Operation:

The Model VHL Mini 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 fluid is present around the probe, the vibration exists. With fluid present and surrounding the probe element, the vibration is dampened and detected by the electronic circuitry. This results in a change in the output and local LED indication.

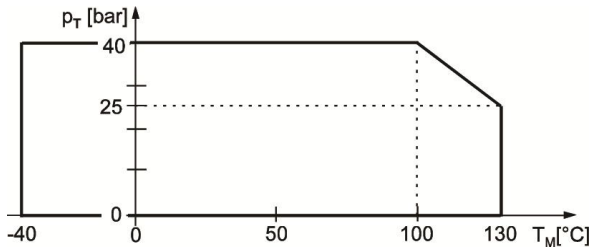
Application or Use:

Model VHL Mini vibrating fork point level sensors are used to detect the presence and absence of a variety of fluids with a minimum density of 0.7 Specific Gravity or 0.7 g/cm^3 (0.7 kg/dm^3).

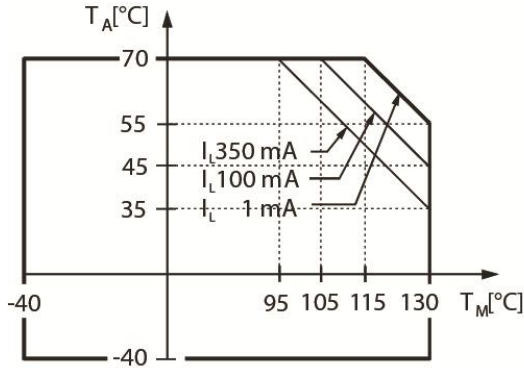
Operating Conditions

Temperature and Pressure play a factor in the performance and operation of the Model VHL Mini vibrating fork point level sensor for liquids. The charts shown in Figure 2 illustrate the relationship between the Pressure and medium (liquid) Temperature, as well as the relationship between the medium and ambient temperatures of the two primary versions of the Model VHL Mini level sensor.

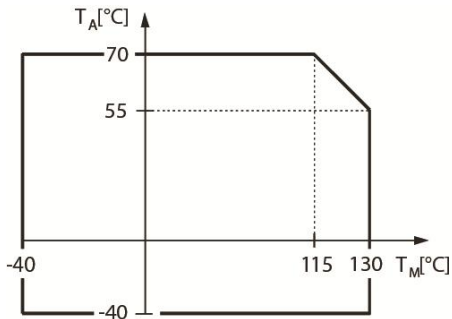
Instrument Function Cont'd.



Pressure (P_T) as a Function of Temperature (T_M) for All Versions (°C shown)



Temperature Limits DC versions (T_A ambient and T_M medium in °C) and Load Current (I_L)



Temperature of AC Versions, Ambient (T_A) and Medium (T_M) Temperatures (shown in °C)

Figure 2: Pressure [P_T] as a Function of Temperature [T_M] and Temperature Limits

Instrument Function Cont'd.

Response Time

It is important to understand the time it takes for the Model VHL Mini sensors to respond when immersed and when getting free from the process fluid. The time to respond when immersed is generally fixed to 0.5 seconds. However, the response time when getting free is a function of the viscosity of the fluid. Refer to the diagram in Figure 3.

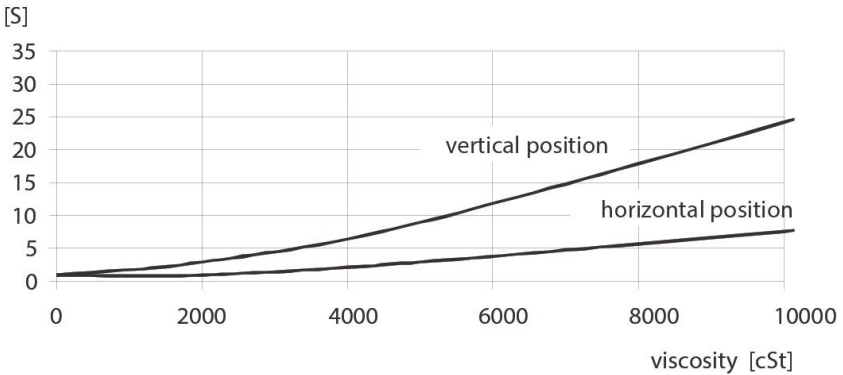


Figure 3: Response Time Diagram (when getting free); Response Time Vs. Viscosity

Output Mode LED Indication

The Model VHL Mini vibrating fork point level sensor incorporates a bi-color LED for local indication of output state. After proper mechanical and electrical installation, and checking to ensure the Model VHL Mini level sensor is operational, you can confirm proper operation using the BlueLevel Technologies test magnet (magnet end of BlueLevel screwdriver included) and the sensor LED (bi-color; red and green). For further information refer to Setup section.

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 installing or servicing the unit.

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 AC powered Model VHL Mini unit is provided with a “protective conductor wire” 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.

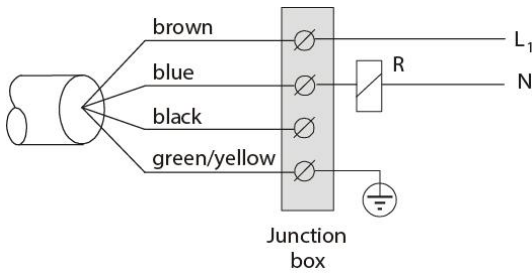
Electrical Connections Cont'd.

2-Wire AC Versions:

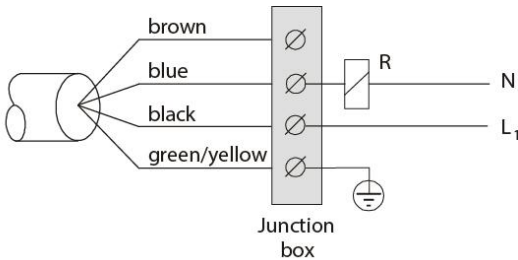


DO NOT POWER UP THE DEVICE WITHOUT A LOAD CONNECTED IN SERIES WITH THE UNIT AND WITHOUT PROPER GROUNDING!

The 2-wire AC version is provided with a 4 wire cable. Only one of either the BLACK or BROWN wires will be used (not both) as this is dependent upon whether the application is to use the Model VHL Mini as a HIGH-level limit switch or as a LOW-level limit switch. Refer to wiring diagram shown in Figure 4. Refer to Setup section for additional information regarding output state and wiring Mode (High or Low)



HIGH LEVEL Mode Limit Switch



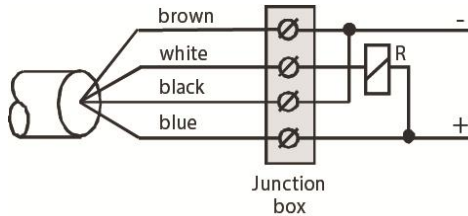
LOW LEVEL Mode Limit Switch

Figure 4: 2-Wire AC Versions Wiring Diagram (High and Low Level)

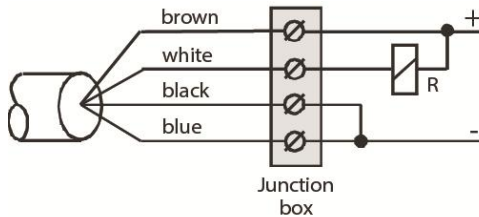
Electrical Connections Cont'd.

3-Wire DC Versions:

The 3-wire DC versions are typically used for either the input to a PLC or for engaging the coil of an external relay. Wiring diagrams are shown for both applications, Relay (Figure 5) and PLC (Figure 6) and for wiring as NPN or PNP output types.



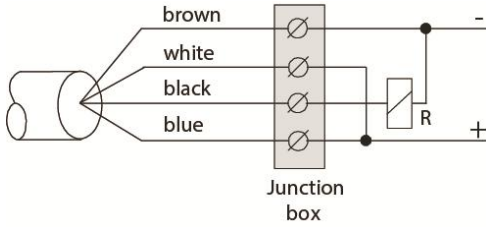
NPN Wiring as HIGH LEVEL Mode Limit Switch



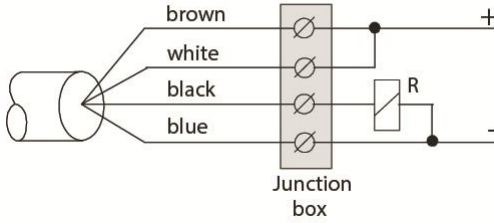
NPN Wiring as LOW LEVEL Mode Limit Switch

Figure 5a: Wiring for DC (NPN) Versions in Applications with Relay

Electrical Connections Cont'd.



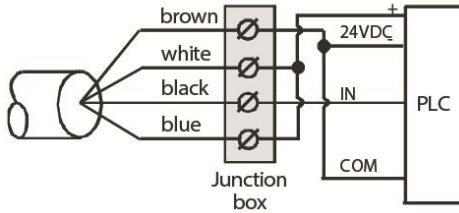
PNP Wiring as HIGH LEVEL Mode Limit Switch



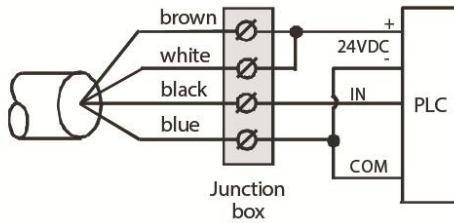
PNP Wiring as LOW LEVEL Mode Limit Switch

Figure 5b: Wiring for DC (PNP) Versions in Applications with Relay

Electrical Connections Cont'd.



PNP Wiring as HIGH LEVEL Mode Limit Switch



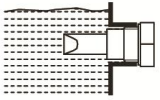
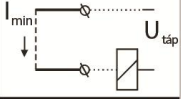
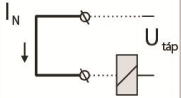
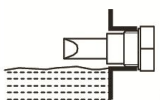
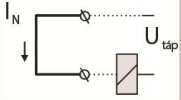
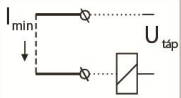
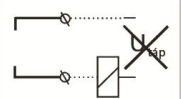
PNP Wiring as LOW LEVEL Mode Limit Switch

Figure 6: Wiring for DC Versions in Applications with PLC

Setup

Before placing the Model VHL Mini level sensor in operation check and verify the connection of wiring and mechanical installation and understand the intended use (High or Low Level Limit Switch) and output action that you require.

The operation of the Model VHL Mini vibrating fork point level sensor is summarized as follows in the below table ($U_{TAP} = \text{Power Supply Voltage}$):

POWER SUPPLY	FORK	MODE	DISPLAY (LED)	OUTPUT	
ON	 Immersed	HIGH	RED	OFF	
		LOW	GREEN	ON	
	 Free	HIGH	GREEN	ON	
		LOW	RED	OFF	
NONE	Free or immersed	HIGH or LOW	NOT LIT	OFF	

Operational Test

Correct operation of an installed Model VHL Mini vibrating fork point level sensor for liquids switching circuit can be tested and verified with the test magnet supplied (at end of BlueLevel Technologies screwdriver included in instruction package). Moving the test magnet in front of the mark on the cover of the housing the device will perform a switching action (LED will change color)

Maintenance

In some instances the sensor probe may require occasional cleaning to remove surface deposits. This should be carried out gently without damaging the vibrating section of the Model VHL Mini vibrating fork point level sensor.



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



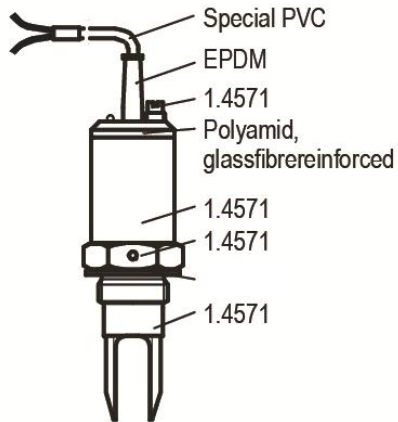
Do not use any banging to effect the cleaning if ever necessary.



Technical Data

GENERAL

Medium Pressure:	588psi (40bar) (see diagram on page 8)
Probe Lengths:	Short – 2.72" (69mm) Standard – 4.92" (125mm) Long – 7.87" (200mm) Extended Lengths – >7.87" (200mm) up to 118" (3m)
Wetted Parts Materials:	316Ti (DIN 1.4571) Stainless Steel
Medium Temperature:	See diagrams on page 8
Ambient Temperature:	See diagrams on page 8
Liquid Density:	0.7 S.G. (0.7g.cm ³)
Liquid Viscosity:	≤ 10,000 cSt (mm ² /s)
Response Time:	
When Immersed	0.5sec
When Free	≤ 1.0sec (see Figure 3 on page 9)
Output Mode Indication:	Bi-Color LED (Red/Green)
Operation Test:	Output can be changed by test magnet
Materials:	



Technical Data Cont'd.

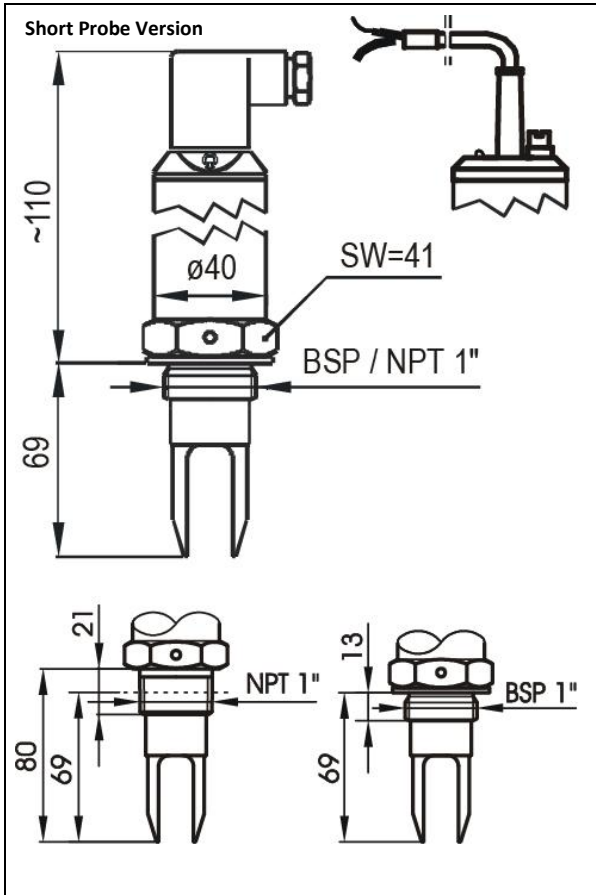
2-WIRE AC VERSIONS

Electrical Connections:	Integral prewired cable (4 conductors); 3m Length
Housing Protection:	IP68
High/Low Mode Setting:	Wiring selectable
Output:	2-wire AC for serial connection with load
Supply Voltage:	20-255VAC, 50/60Hz
Power Consumption:	Load Dependent
Voltage Drop (switched-on): (switched-on state)	<10.5V
Electrical Protection:	Class I (appliance class)
Current Load:	
Maximum Continuous	350mA AC-13 (IEC Utilization Category)
Minimum Continuous	10mA @ 255V, 25mA @ 24V
Maximum Impulse	1.5A for 40msec
Residual Current (switched off):	<6mA

3-WIRE DC VERSIONS

Electrical Connections:	Integral prewired cable (4 conductors); 3m Length
Housing Protection:	IP68
High/Low Mode Setting:	Wiring selectable
Output:	Field selectable PNP/NPN transistor switch
Output Protection:	Reverse polarity, overcurrent and short-circuit protected
Supply Voltage:	12-55VDC
Power Consumption:	<0.6W
Voltage Drop (switched-on): (switched-on state)	<4.5V
Electrical Protection:	Class III (appliance class)
Current Load:	
Maximum Continuous	$I_{\max} = 350\text{mADC} / U_{\max} = 55\text{VDC}$ See diagram on page 8
Residual Current (switched off):	<100 μ A

Dimensions

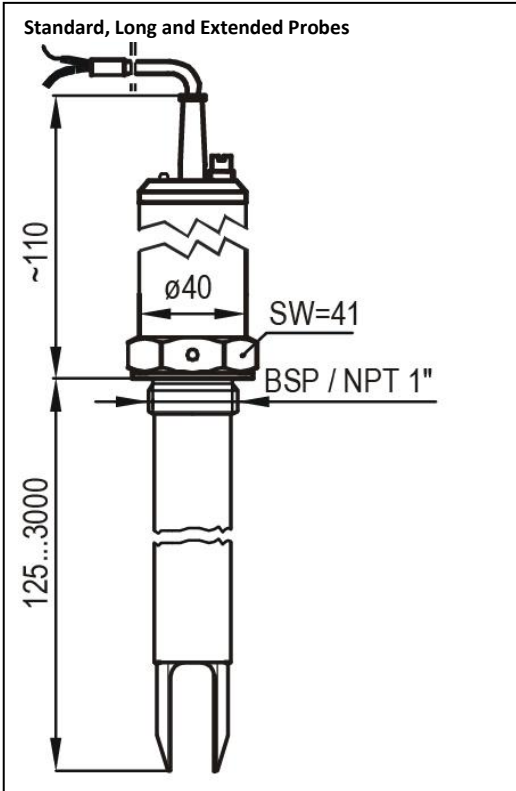


Dimensions shown in "mm", convert to inches by dividing by 25.4.

Connector top shown not yet available. Prewired top shown in top right corner.

BSP Threaded connection not yet available. Consult factory.

Dimensions Cont'd.



Dimensions shown in “mm”, convert to inches by dividing by 25.4.

BSP threaded connection not yet available. Consult factory.

Our Commitment Stands

Golden Parachute:

Each BlueLevel Technologies Model VHL Mini vibrating fork point level sensor for liquids 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 VHL Mini products are covered by our industry-leading 2-year limited warranty. Consult our Warranty statement for details.

Standard Warranty

Each BlueLevel Technologies Model VHL Mini vibrating fork 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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