Installation, Operation & Maintenance Instructions

Model RH/RHX
Rotary Paddle Bin Level Indicator

Thank you for purchasing the Model RH/RHX Rotary Paddle Bin Level Indicator 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

Certain Model RH/RHX Rotary Paddle Bin Level Indicators are powered with HIGH VOLTAGE. No operator serviceable parts are inside. All servicing is to be performed by qualified personnel. Each Model RH/RHX 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.

Safety Summary Cont'd.

Hazardous Location Caution

The Model RHX rotary paddle bin level indicators can be used in Hazardous Locations (refer to Technical Data). These models shall only be used in applications covered by the 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 Model RHX is manufactured from aluminum and stainless steel, with FKM and nitrile rubber seals. The user or installer should consider the performance of these materials with regard to attack by aggressive substances that may be present in a hazardous location. The dimensions of the enclosure base and cover, or the driveshaft shall not be altered.

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

Electromagnetic Compatibility (EMC):
The Model RH/RHX rotary paddle bin level indicator was tested and found to comply with the standards listed below:

Low Voltage Directive:	73/23/EEC
Standard IEC:	61010-1 (ED.2):2004
EMC Emissions	EN 61326-1:2006
EMC Immunity	EN 61326-1:2006
Models:	Model RH/RHX 24Vac, 115Vac, 230Vac, 12Vdc and 24Vdc versions

All test reports and documentation are held and can be obtained from BlueLevel Technologies, Inc. located in Richfield, OH.

Mechanical Installation

Protective Mounting (Figure 1):

1. **Material Flow:** Mount the Model RH/RHX so that it will NOT be in the path of incoming flow. The unit's paddle must be at a point where incoming material will reach and cover the paddle in its normal flow, and when receding, the material will flow away from the paddle in an even manner.

2. **Protective Roof:** The installation of a protective roof or baffle is recommended for low level monitoring when material bulk density exceeds 1050Kg/cm^3 (65lbs/ft^3).

3. **Vibration:** Mount at a location where limited vibration exists.

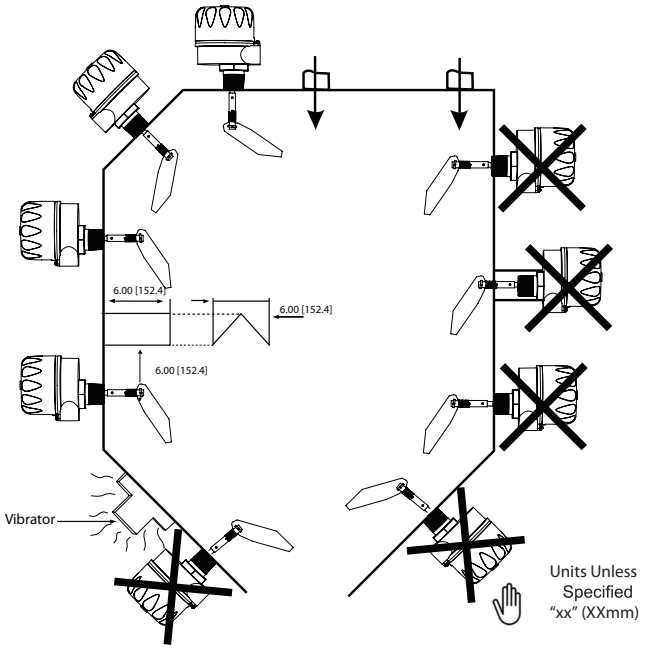


Figure 1: Protective Mounting

Mechanical Installation Cont'd.

Attaching Using a Coupling Process Connection:

Use a welded coupling when the rotary paddle bin level indicator will be assembled during installation or when an Insertable style paddle is used.

TOP MOUNT (Figure 2)

1. Locate and cut hole in top of bin to fit the outside diameter of 1-1/4" full pipe coupling.

2. Position coupling halfway into bin and weld.

3. Screw the Model RH/RHX into the coupling as shown in Figure 3.

4. Turn conduit entrances so they are in the correct position as shown in Figure 4.

5. Attach flexible coupling to output shaft of Model RH/RHX and add ¼" extension pipe to flexible coupling at desired length with standard ¼" coupling on bottom end.

6. Cut 1-1/4" support pipe (guard) approximately 4" shorter than the overall length of the ¼" extension pipe (because of length of flexible coupling).

7. Insert 1-1/4" guard pipe into underside of full pipe coupling and tighten.

8. Insert paddle into ¼" coupling at end of ¼" extension pipe and attach with lock pins (drill holes for pins if needed).

Guard Reinforcement: When using rigid extensions and guards in top mount applications, select a location where it is feasible to reinforce the guard to the vessel wall.

Use Lock Pins: Always attach paddles, extensions, couplings etc. with lock pins. Do not rely on threaded connection of these items to securely attach them.

Mechanical Installation Cont'd.

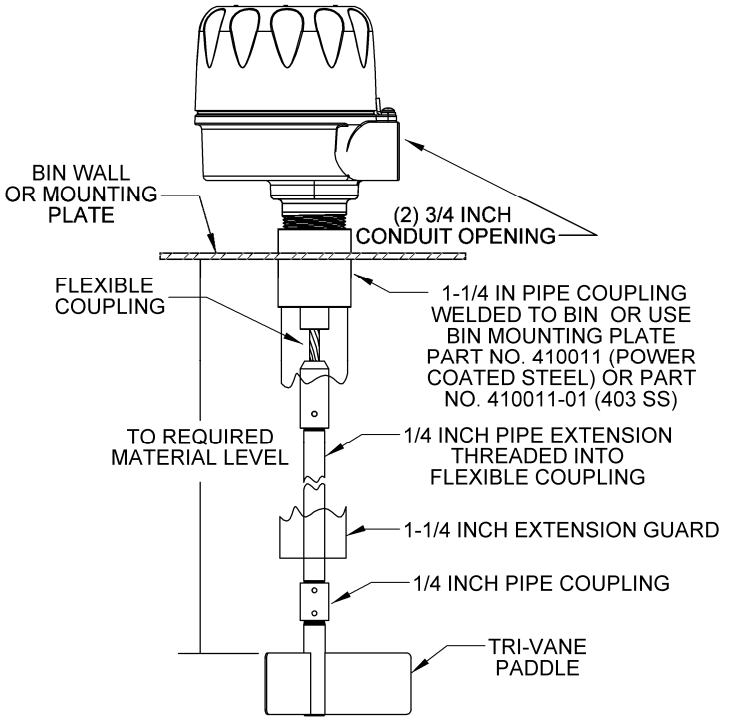


Figure 2: Top Mount Installation

Mechanical Installation Cont'd.

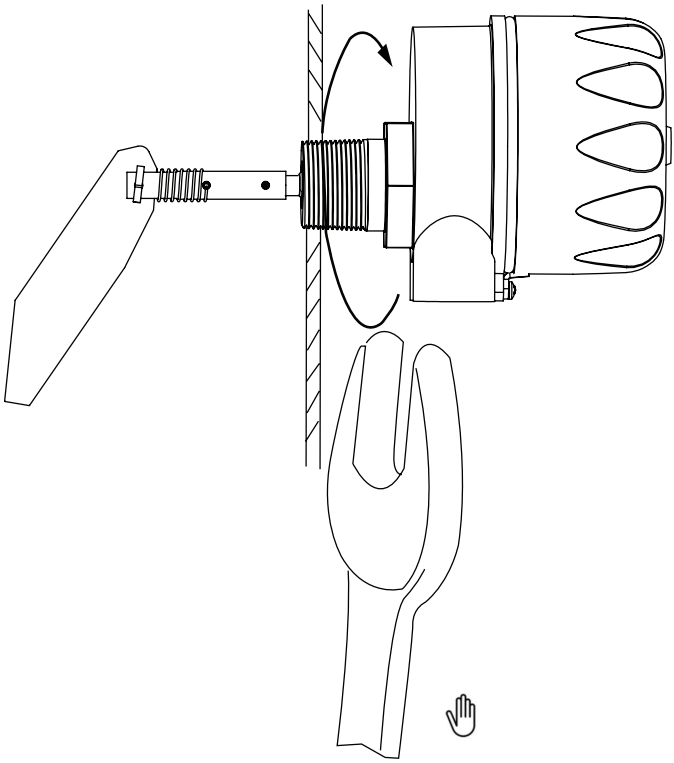


Figure 3: Attaching to Process Connection

Mechanical Installation Cont'd.

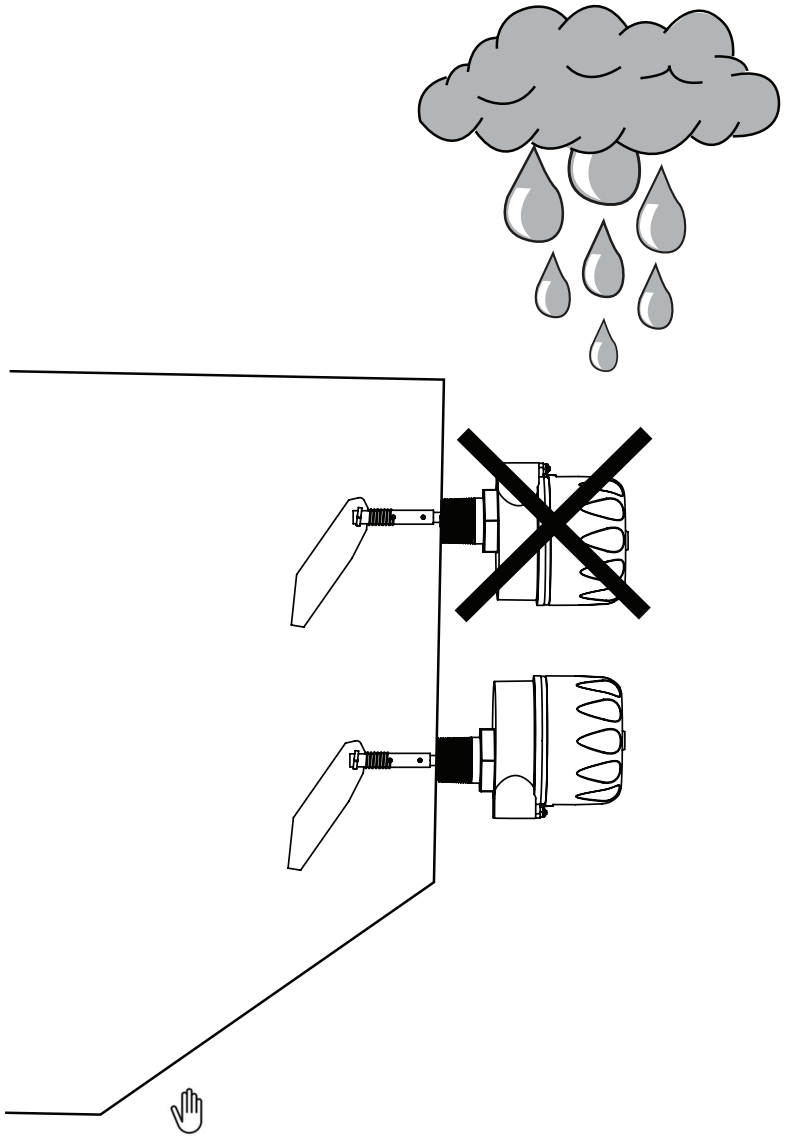


Figure 4: Correct Housing Orientation

Mechanical Installation Cont'd.

SIDE MOUNT (Figure 5)

1. It is recommended that side mount installation use folding insertable paddles or fixed insertable paddles rather than a tri-vane that must be installed either from inside the bin or by using a half-coupling mounting plate.

2. Using an Insertable paddle:

    a. Attach paddle to power pack output shaft using lock pin if a folding paddle is used.

    b. If using a fixed Insertable paddle, attach the paddle to power pack output shaft using standard coupling and threading paddle into coupling. SECURE USING LOCK PIN. Paddle attachment will not be secure without lock pin installed.

    c. Locate and cut hole in side of bin to fit the outside diameter of 1-1/4" half pipe coupling.

    d. Weld 1-1/4" half pipe coupling to bin wall flush with inside of bin.

    e. Screw the Model RH/RHX into the coupling as shown in Figure 3.

3. Turn conduit entrances so they are in the correct position as shown in Figure 4.

4. Shaft and paddle should be shielded in low level applications as shown in Figure 1.

Mechanical Installation Cont'd.

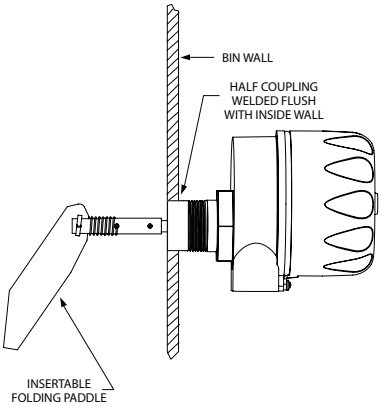


Figure 5: Side Mount Installation Assembly

Attaching With Mounting Plates:

Mounting plates are necessary when a completely assembled unit is to be mounted on the bin wall from the outside and when a fixed tri-vane paddle is used and paddle installation from inside the bin is to be avoided.

A 5-1/2" diameter hole is cut in the bin (or smaller so long as the hole will allow the paddle to pass through).

Six bolt holes are drilled around the hole to match the mounting plate. The gasket supplied with the mounting plate as provided by BlueLevel Technologies can be used as a template.

The plate, with the Model RH/RHX bin level indicator assembly attached, is then bolted in place.

Figure 6 illustrates a half coupling mounting plate (for side mounting installations) and a full coupling mounting plate (for top mount installations).

Note: An Insertable paddle may eliminate the need for use of a mounting plate. Consult the factory for Insertable paddle options.

Mechanical Installation Cont'd.

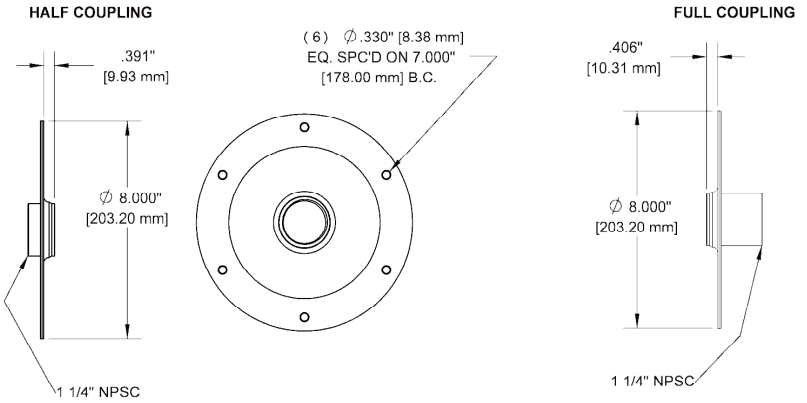


Figure 6: Half and Full Coupling Mounting Plates

HIGH-TEMPERATURE MODELS (Figure 7)

1. Mounting - Using the high temperature gasket as a template, mark the locations of the six bolt holes on the bin. Drill the six holes at the diameter applicable to the attachment method being used (i.e. tapped holes or clearance holes for bolt/nut combination). For example, drill six clearance holes at 11/32 inch (9 mm) diameter for use with 5/16" bolts. The bolts may be secured by tack welding the bolt heads to the vessel, or by an adjoining nut. Cut a hole (suggested size 2-5 inches(50-125 mm)) centered within the bolt circle to allow the paddle when attached to the Model RH/RHX to fit within the bin. Attach gasket and high temperature Model RH/RHX to the vessel positioning the conduit entrance in a manner, which restricts moisture infiltration (Figure 4).

2. Extensions/Guards - Use of extensions is permissible on high temperature units. (See Extension/Guard Installation section). Installing guards on high temperature models requires modifications in the field. Consult BlueLevel Technical factory support for guidance.

Mechanical Installation Cont'd.

HIGH TEMPERATURE MODELS CONT'D:

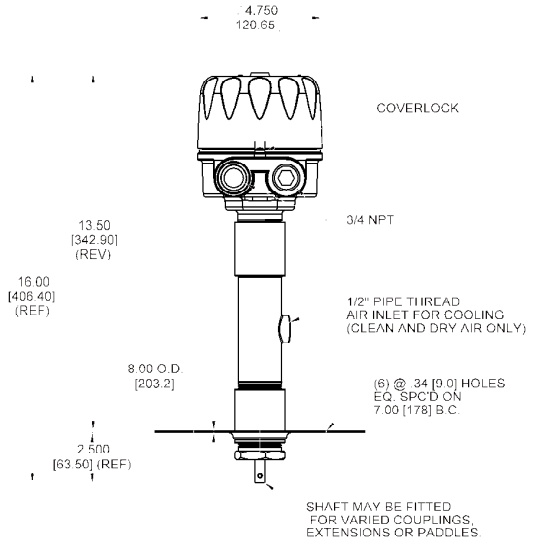


Figure 7: High Temperature Model RH/RHX Units

3. Effective Cooling - The high temperature model includes a steel lagging pipe, which thermally insulates (via lag pipe material and physical separation) the internal bin temperature from the paddle unit power pack thereby protecting its critical components. This technique is very effective but is dependent on careful consideration of ambient air temperature surrounding Model RH/RHX enclosure, thermal conductivity of the material being sensed, and the actual temperature present at the mounting point. The following chart is intended to provide general guidance for installation. Each application should be evaluated to insure that the Model RH/RHX operating temperature is not exceeded. In addition, an air connection is provided on the lagged pipe to further increase the

Mechanical Installation Cont'd.

HIGH TEMPERATURE MODELS CONT'D:

cooling capacity of the unit. When applicable, connect an airline to the ½" coupling provided on the high temperature model using only the recommended air pressure, which must exceed the internal bin pressure in order to be effective. The air should be clean and dry and is required to be continually supplied to the Model RH/RHX high temperature unit to assure cooling.

Internal Temp.	Model	Air Required	CFM
< 300°F (150°C)	Standard	None	N/A
300-500°F (150-260°C)	High Temp	None	N/A
500-750°F (260-400°C)	High Temp.	1/2 psig	2.14

Instrument Function

Introduction:

The Model RH/RHX is a rotating paddle style bin level indicator (a.k.a. level sensor, 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 RH/RHX 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 RH/RHX incorporates a heavy-duty synchronous drive motor which rotates the drive shaft and paddle at 1 RPM. When the material within the vessel fills to the level of the unit's paddle, the material causes the paddle to stop rotating indicating a covered condition. When the material recedes and falls away from the paddle, the paddle begins rotating again, indicating an uncovered condition.

Instrument Function Cont'd.

Application or Use:

The Model RH/RHX can function as a High or Low material level indicator. As a HIGH level indicator the covered condition (material presence) will be the alarm state, uncovered is the normal state.

In a LOW level application, the covered condition is the normal state and the uncovered condition is the alarm state.

Relay Output Action:

The Model RH/RHX uses a Fail-Safe selector switch. There are two positions for this switch: High (**H**) and Low (**L**) as indicated by the H and L on the circuit board (refer to Electrical Connections).

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 paddle is rotating, uncovered of material and will de-energize when paddle is covered. Failure of power supply to the unit will cause relay to de-energize indicating an alarm exists, just as if the paddle were covered (material presence alarm). (Figure 7).

FAIL-SAFE LOW – Fail-Safe LOW means that the relay will NOT be energized (alarm condition) when paddle is rotating, uncovered of material, and will energize when paddle is covered. A failure of the power supply to the unit will cause the relay to de-energize indicating an alarm condition just as if the paddle is uncovered (material absence alarm). (Figure 7).

Instrument Function Cont'd.

Relay Output Action Cont'd.:

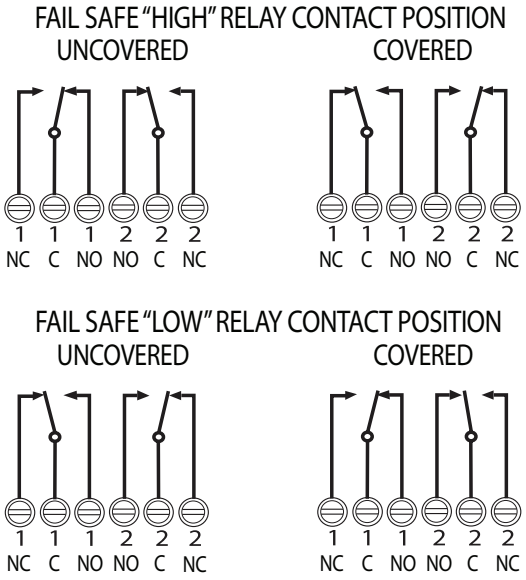


Figure 7: Fail-Safe Relay Contacts Position

LED Indicator Action:

All Model RH/RHX Rotary Paddle Bin Level Indicators are provided with two high intensity LED's on the internal circuit board, blue and red. Model RH units are suitable for use only in Ordinary Locations. Only the Model RH units incorporate a high visibility lens in the instrument cover so the LED illumination is visible locally from outside the enclosure. The action of the Blue and Red LED's is as follows:

Red LED illuminated – MATERIAL ALARM CONDITION; Power-On

Blue 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 selector switch.

Electrical Connections

Hazardous Location 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. In particular, for Model RHX hazardous location units, install a conduit seal fitting within 18 inches (457mm) of the Model RHX Rotary Paddle Bin Level Indicator for Class I 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 RH/RHX 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 RH/RHX 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:

The Model RH/RHX Rotary Paddle Bin Level Indicator is available to be powered from 24VAC, 115VAC and 230VAC, 50/60Hz as well as 12VDC and 24VDC supply voltages. Refer to the voltage rating on the units' data nameplate (refer to Figure 8a and 8b) for the appropriate supply voltage.

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.

2. Input Power:

Power input to the Model RH/RHX is connected to the terminals labeled L and N for AC voltages and terminals labeled + and - for DC voltages. Refer to Figure 9. If one of your AC supply conductors is grounded, it should be connected to the N terminal. The ungrounded conductor should be connected to the L terminal. If neither of your AC supply conductors is grounded, then one of them is connected to the N terminal and the other to the L terminal. For DC voltages be sure to observe proper polarity + and - in order for the Model RH/RHX to operate properly.

3. Grounding:

Refer to the "Protective Earth Ground" section on page 15. 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.

Electrical Connections Cont'd.

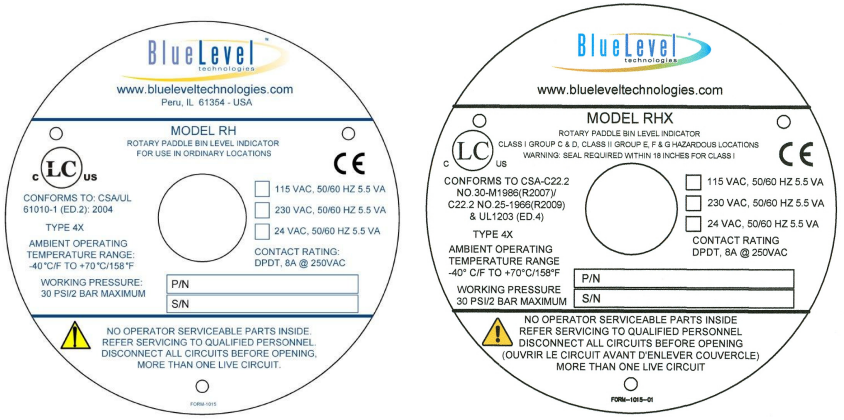


Figure 8a: Data Nameplate (AC voltages)

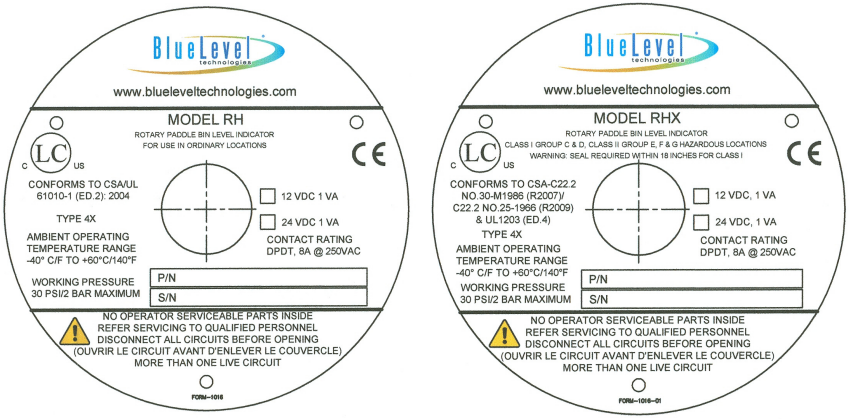
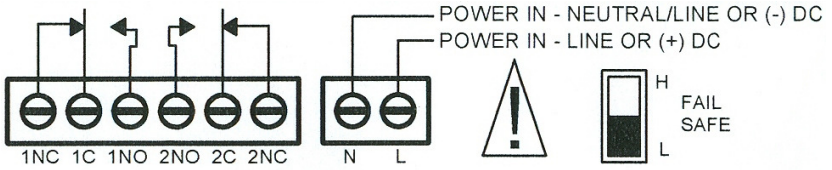


Figure 8b: Data Nameplate (DC voltages)

Electrical Connections Cont'd.

4. **DPDT Relay Output Contacts:**

   Refer to Figure 9 as well as the "Instrument Function" section of this manual.



CONTACT POSITION WHEN RELAY IS DE-ENERGIZED

CABLES SHALL BE RATED FOR MIN. +90°C/194°F

FAIL SAFE SWITCH POSITION	PADDLE POSITION	
	UNCOVERED	COVERED
HIGH	ENERGIZED	DE-ENERGIZED
LOW	DE-ENERGIZED	ENERGIZED

Figure 9: Electrical Connections

WIRING INFORMATION & EXAMPLES

Bin level indicators are generally wired to provide a "dry" or "hot" output. A "dry" output does not have any power through the bin level indicator contacts. A "hot" output provides power out of a closed contact from the bin level indicator. There are two types of "hot" output wiring schemes; these are the Isolated and Non-Isolated types.

A "dry" output wiring scheme is typical of an arrangement where the contact closure/open contact from the bin level indicator is used as an input to a PLC or other computer control system.

A "hot" output wiring is providing power through the bin level indicator contacts to turn something on or off, such as a light or the coil of an external relay. The Isolated wiring scheme uses a source of power external and separate from the power source and supply to the bin level indicator itself. A Non-Isolated wiring scheme uses the bin level indicator power supply source by use of a jumper between the "L" or Line (hot)

power input terminal and either/or the 1C and 2C common terminals in the relay output terminal block.

In the Model RH/RHX rotary paddle bin level indicator there are two independent and isolated sets of contacts; set 1 and set 2. Therefore there are terminals labeled 1NO, 1C, 1NC and also 2NO, 2C, 2NC. It is possible to have one set be wired as a “hot” wiring scheme and the second set to be wired as a “dry” wiring scheme. Or, both sets can be wired as “hot” with one being setup as a Non-Isolated wiring scheme and the other an “Isolated” wiring scheme.

TWO IMPORTANT ITEMS:

1. SET THE 2-POSITION FAIL-SAFE SWITCH TO “H” (factory set position) FOR HIGH LEVEL INDICATOR APPLICATIONS OR TO “L” FOR LOW LEVEL INDICATOR APPLICATIONS.

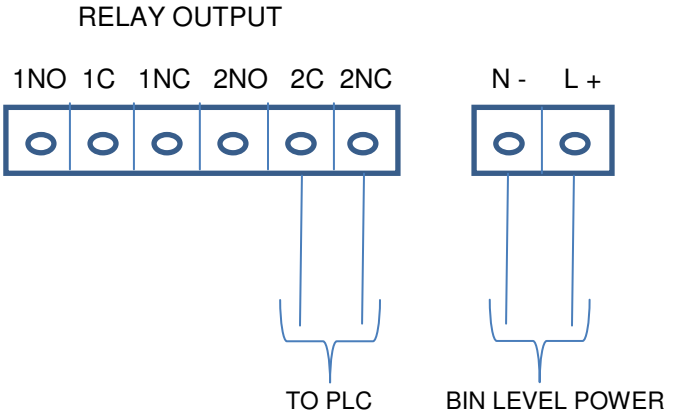
   NOTE: THE *ALARM* CONDITION IN A “H” OR HIGH LEVEL APPLICATION IS WHEN MATERIAL IS *PRESENT AND COVERING* THE BIN LEVEL INDICATOR PADDLE. THE *ALARM* CONDITION IN A “L” OR LOW LEVEL APPLICATION IS WHEN MATERIAL IS *ABSENT AND UNCOVERING* THE BIN LEVEL INDICATOR PADDLE.

2. THE CONTACT CONDITION SHOWN IN THE WIRING DIAGRAMS BELOW, WITHIN THE INSTALLATION MANUAL AND INSIDE OF THE MODEL RH/RHX ENCLOSURE ARE THE STATE OR POSITION THE CONTACTS WILL BE IN WHEN THE MODEL RH/RHX IS IN THE *ALARM CONDITION*.

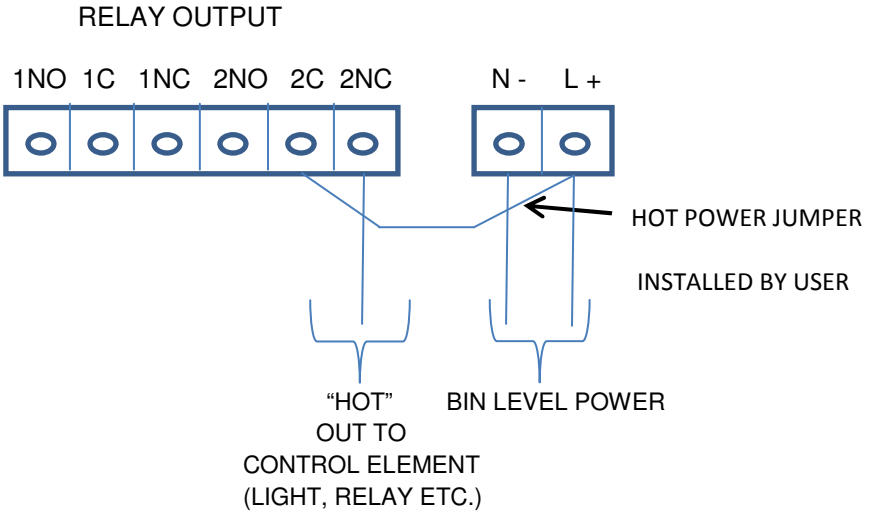
Refer to the diagrams below for wiring examples:

Note: Contact set 2 and NC used only as example.

DRY WIRING SCHEME (shown to have a dry contact closure upon Alarm)

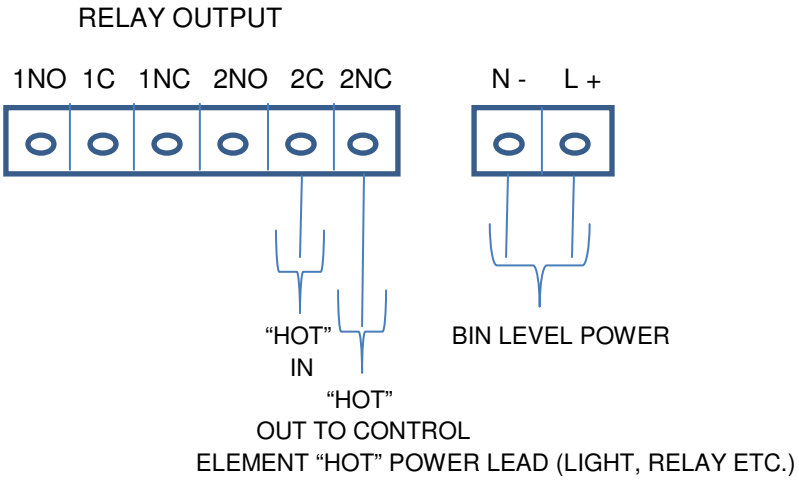


HOT WIRING SCHEME (Non-Isolated Scheme, contact closure upon Alarm)



Use NC contact terminal to "make" a circuit upon *Alarm* condition. Use NO contact terminal to "break" a circuit upon *Alarm* condition.

HOT WIRING SCHEME (ISOLATED Scheme, contact closure upon Alarm)



Use NC contact terminal to "make" a circuit upon *Alarm* condition. Use NO contact terminal to "break" a circuit upon *Alarm* condition.

Setup

Paddle Selection:

The best "calibration" can be achieved by proper paddle selection. Incorrect paddle selection may lead to false sensing and therefore a poor "calibration". BlueLevel Technologies offers a variety of folding and fixed paddle assemblies to meet the needs of a wide variety of applications.

Different material densities, particle sizes and flow characteristics require specific paddles to provide optimum performance. Insure that the paddle being used for the application corresponds with the recommendations found in the Technical Information Document 434 available from the factory.

Setup Cont'd.

Sensitivity Spring:

1. Factory Setting:

All Model RH/RHX Rotary Paddle Bin Level Indicators are shipped from the factory with the sensitivity spring tension preset in a mid-range setting. In a large majority of the applications this setting and proper paddle selection results in acceptable operation.

Changes to the factory setting should only be done after consulting with technical support personnel at the BlueLevel Technologies factory. Please call toll-free at 888-61LEVEL (53835). You can also reach us at 330-523-5215 or email: bluelevel@blueleveltechnolgoies.com

2. Increased Sensitivity:

When sensing extremely light materials (less than 10 lbs/ft^3, 160kg/m^3), please contact the factory

3. Decreased Sensitivity:

When sensing extremely heavy materials (greater than 75 lbs/ft^3, 1200kg/m^3) or materials **which have a tendency to stick or build up around shaft seal**, it may be desirable to move the sensitivity spring drive pin to a hole which exerts greater spring tension. The increased spring tension will require greater material restriction at the paddle but prevent situations where the RH/RHX unit might remain in the "material present" condition when material is absent.

Maintenance

No Step:

Refer to Figure 10.

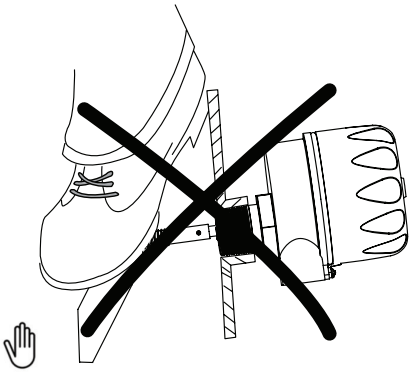


Figure 10: Do Not Use As Step

Removing Material Build-Up:

Refer to Figure 11.

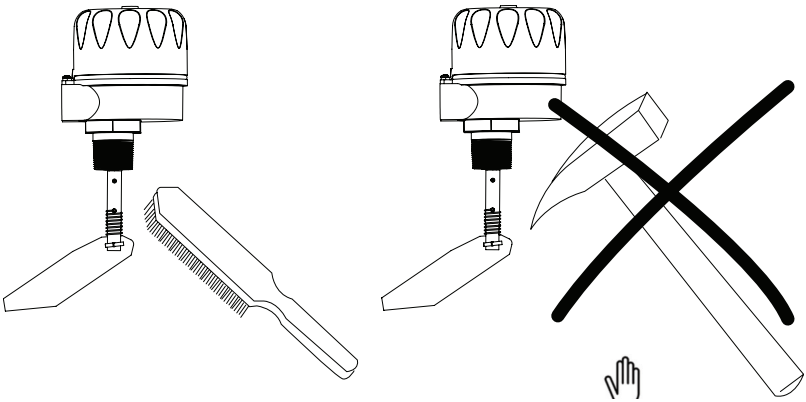
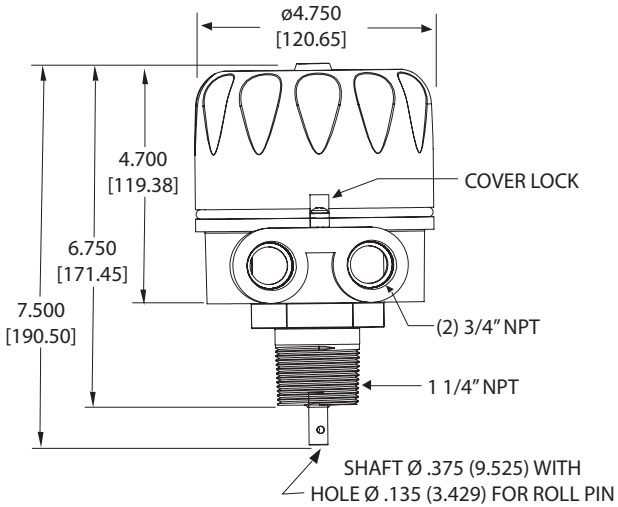


Figure 11: Removing Material Build-Up

Technical Data

Power Supply:	24VAC, 115VAC, or 230VAC; 50/60Hz; +10%/-15%; 12VDC or 24VDC
Power Consumption:	5.5VA, 1W
External Ambient Temp:	
AC Supply Units	-40° F to +158° F (-40° C to +70° C)
DC Supply Units	-40° F to +140° F (-40° C to +60° C)
Internal Bin Temp:	
Standard Version	to 300° F (149° C)
High Temperature Version	to 750° F (399° C)
Enclosure:	Type 4X, IP65, Die-Cast Aluminum, Powder Coating (FDA Compliant)
Relay Output:	DPDT, 8A @ 250VAC
Fail-Safe:	Switch Selectable “High” or “Low”
Process Connection:	1-1/4” NPT
Conduit Entry:	¾” NPT; (Use Watertight Conduit/Fittings)
Shaft Seal:	½ micron, 30psi (2 bar)
Listings/Certification:	
Model RH	c LC us Ordinary Locations
Model RHX	c LC us Class I, Div.1 & 2, Groups C, D; Class II, Div. 1 & 2, Groups E, F, G
Models RH/RHX:	CE Mark

Dimensions (PN 40-1111-111 shown)



UNITS UNLESS SPECIFIED
xx" (XXmm)

Our Commitment Stands

Golden Parachute:

Each BlueLevel Technologies Model RH/RHX Rotary Paddle Bin Level Indicator 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 RH/RHX products are covered by our industry-leading 2-year limited warranty. Consult our Warranty statement for details.

Standard Warranty

Each BlueLevel Technologies Model RH/RHX Rotary Paddle Bin Level Indicator product is backed by our industry-leading 2-year limited warranty (1-year for DC supply units). 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 (1-year for DC supply units) 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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