



INSTALLATION
OPERATION &
MAINTENANCE
GUIDE



ELECTRIC LEVEL SENSOR

FLOAT OPERATED CONTROLLERS

MODEL: Electric Level Sensor

Installation, Operation & Maintenance Guide



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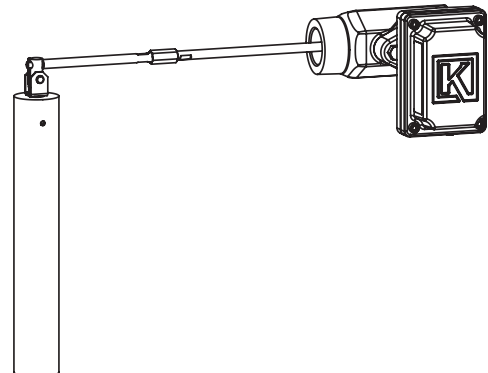
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If you have any questions about this manual, contact your Kimray applications support group before proceeding.

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A1 Before you start

General Safety Information

The symbol  indicates a NOTE, CAUTION OR WARNING with a statement that immediately follows the symbol. The CAUTION & WARNING statements must be strictly observed to prevent personal injury or equipment damage. The manual must be consulted in all cases where this symbol is marked to find out the nature of the potential HAZARDS & any actions which must be taken to avoid them.

CAUTION:

All instructions provided herein should be completely reviewed & understood before installing, operating, performing maintenance or repairing this equipment.

WARNING:

Injury Hazard: Always wear protective gloves, shoes, clothing, eye wear, ear wear & any other suitable Personal Protective Equipment when performing any work to avoid personal injury.

CAUTION:

Injury or Equipment Damage Hazard: If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

NOTE:

The safety of any system incorporating the equipment is the responsibility of the assembler of the system. Equipment should be fully assembled & ready for commissioning before it arrives on site.

WARNING:

Injury or Unexpected Pressure Release Hazard: Before beginning equipment installation, make sure all pressure is released from vessel in a safe manner.

WARNING:

Injury, Equipment Damage or Unexpected Pressure Release Hazard: Do not install equipment in an application where Maximum Allowable Working Pressure could be exceeded.

WARNING:

Explosion Hazard: All components & surfaces inside of the cover & enclosure must remain undamaged to maintain equipment ratings. Replace any damaged equipment.

WARNING:

Equipment Damage or Explosion Hazard: To ensure equipment ratings are valid, follow instructions for torque specifications & ensure all o-rings are installed & damage free.

WARNING:

Explosion Hazard: Keep cover tight, do not open cover when explosive atmosphere is present or while circuits are energized. Do not connect or disconnect this equipment unless power has been removed or the area is known to be nonhazardous.

CAUTION:

Equipment Damage Hazard: Before performing any cleaning or maintenance, ensure that equipment is de-energized regarding all WARNINGS provided.

WARNING:

Explosion Hazard: Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.

CAUTION:

Potential Static Hazard: Clean only with a water wetted cloth.

WARNING:

Explosion Hazard: All field installed entry devices must have a flameproof rating of "Ex db" at minimum & be marked with the thread size & type.

NOTE:

All cable glands and/or blanking elements, as installed, must be rated to a minimum of Class I, Div1, Group B.

NOTE:

All cable glands and/or blanking elements, as installed, must be rated to a minimum of IP66.

CAUTION:

Explosion Hazard: Conduit seals are required within 2 inches (50 mm) of the enclosure conduit.

WARNING:

Explosion Hazard: To reduce the risk of ignition of hazardous atmospheres, conduit runs must have a seal fitting as specified above.



NOTE:

Use good electrical wiring practices & consult with an electrician.



NOTE:

This equipment may only be powered by a power supply unit with a limited energy electric circuit in accordance with CAN/CSA C22.2 No. 61010-1-12 & ANSI/UL 61010-1, or Class 2 as defined in the Canadian Electrical Code C22.1, Section 16-200 and/or National Electrical Code (NFPA 70), article 725.121.



NOTE:

The sensor is designed to operate using a 10 to 30 VDC loop supply capable of sourcing at least 30 mA. Care should be taken to not exceed 30V to prevent overvoltage damage to equipment.



NOTE:

If installing equipment in a classified Hazardous location, wiring to or from this device, which enters or leaves the system enclosure, must utilize wiring methods suitable for Class I, Division 1 & Zone 1 Hazardous Locations.



NOTE:

Wire details: size must be between 12AWG to 24AWG & wire type must have a temperature rating $\geq 105^{\circ}\text{C}$.



NOTE:

Size wiring appropriately for long runs to account for voltage drop, maintaining the supply voltage within the equipment's specified range.



NOTE:

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



NOTE:

Failure to tighten cover screws according to specification will invalidate equipment ratings.

A2 Conditions of Use

1. This equipment may only be powered by a power supply unit with a limited energy electric circuit in accordance with CAN/CSA C22.2 No. 61010-1-12 & ANSI/UL 61010-1, or Class 2 as defined in the Canadian Electrical Code C22.1, Section 16-200 and/or National Electrical Code (NFPA 70), article 725.121.
2. Flameproof joints are not intended to be repaired.

A3 Scope

This document contains installation, operation & repair/maintenance information for the Electric Liquid Level Sensor. For ordering information, see Kimray Product Catalog or contact your Kimray Sales Representative.

A4 Ratings & Specifications

Ratings	
Electrical	10 to 30 VDC, 30 mA maximum
Ambient Temperature	-40 °F to 185 °F (-40 °C to 85 °C)
Pressure	see product catalog
Specifications	
Sensitivity	see note 1
Maximum Deadband	0.1 inch
Temperature Drift	6 $\mu\text{A}/^{\circ}\text{F}$ (signal decreases from 68 °F)
Maximum Non-Linearity	350 μA
Minimum Differential Specific Gravity at Interface	0.2 with 2 inches of level change
Weight	17.6 lbs (8.0 kg)
Notes	
1. Sensitivity = 16 mA / displacer length, example, for 11.69 inch displacer length, sensitivity = 16 mA/11.69 inch = 1.36 mA/inch	

A5 Environmental Conditions:

This equipment is intended for operating in the following environmental conditions:

- Pollution Degree: 2
- Overvoltage Category: II
- Maximum use altitude: 2000 m above sea level

A6 Intended Use of Equipment

The Kimray Electric Liquid Level Sensor is intended for continuous measurement of liquid level in pressurized process vessels.

The sensor is designed to be direct acting for integration with process control systems that accept a 4-20 mA analog input, including programmable logic controllers (PLCs) & other compatible instrumentation. It may be used for continuous level indication or as an input to an automatic level control system.

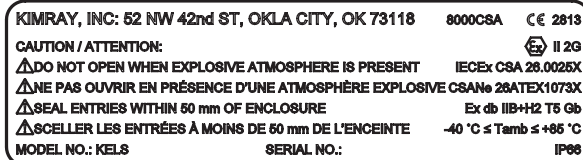
The sensor is shipped factory calibrated for single-liquid-phase level measurement using water. This default operating configuration is suitable for most single-liquid level applications. The sensor also supports liquid-liquid interface measurement & can be field calibrated for a wide range of process conditions, including applications with low specific gravity differential between the interface fluids.

The sensor shall be installed and operated only within the environmental, process, and operating limits specified in this manual.

MODEL: *Electric Level Sensor*
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A7 Markings

The following markings will be attached to the sensor:



The equipment has been tested against the requirements of IEC 60529 & it meets IP66

A8 Definitions

Left Hand Mount: used to describe the configuration where sensor is installed on left hand side of vessel & enclosure opening faces operator.

Right Hand Mount: used to describe the configuration where sensor is installed on right hand side of vessel & enclosure opening faces operator.

Single Phase Application: interface between gas & a single liquid (such as water or oil) is controlled

Interface Application: interface between two immiscible liquids (such as oil & water) is controlled

4-20 mA loop-powered system: A circuit having a power supply, a sensor & one or more controllers connected in a single loop. The sensor, being powered by 3.5 mA or less of the loop current, regulates that same loop current to between 4 mA & 20 mA in response to changes in the process variable. Ideally loop current for proportional output devices responds linearly to process variable changes but in practice performance is subject to non-linearities & deadband effects. The regulated loop current is then received & processed by the system's controller(s).

Direct Acting: used to describe sensor output that trends in the same direction as process variable changes. For example, regulated loop current for a direct acting liquid level sensor increases in response to increases in the process liquid level.

Displacer: the part of the sensor that is in physical contact with & that displaces the fluids being measured.

Calibrated Zero Point (CZP): vessel liquid level present when the interface being controlled just contacts the bottom of the displacer. Once the CZP is established, it is good practice to assign the Process Zero Point far enough above the CZP to account for deadband & rounding errors associated with controllers in the system. Otherwise actuating signals may not occur as expected.

Calibrated Span Point (CSP): vessel liquid level present when the interface being controlled is above the displacer. Once the CSP is established, it is good practice to assign the Process Span Point far enough below the CSP to account for deadband & rounding errors associated with controllers in the system. Otherwise actuating signals may not occur as expected.

A9 Tooling Requirements

There are no special tools required

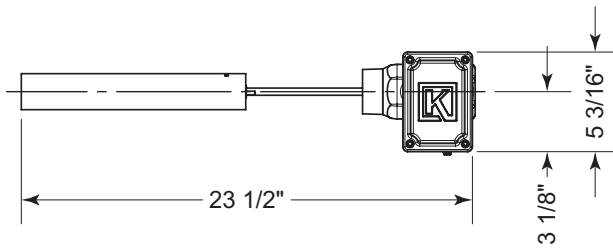
Standard tools for installation:

1. Pipe wrench or other wrench to fit 2-1/2" Flats

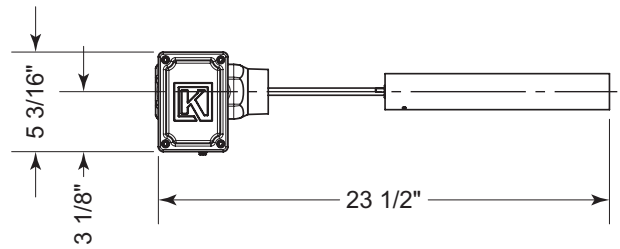
Standard tools for Maintenance:

1. 9/16" wrench for the mount screws
2. 5 mm hex key for cover screws
3. T25 hexalobular (Torx) key for internal screws
4. 5/16" standard screwdriver or 5/16" nut driver for grounding screws
5. Pick & hook combo for extracting torsion beam or replacing O-ring

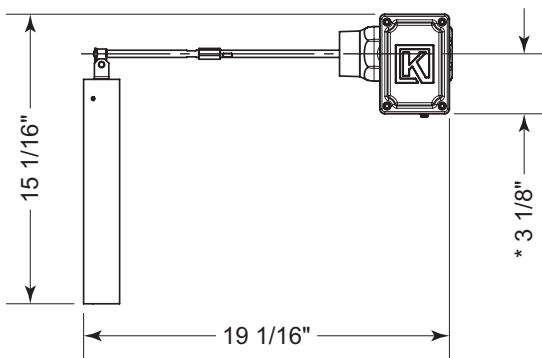
A0 Configurations & Dimensions



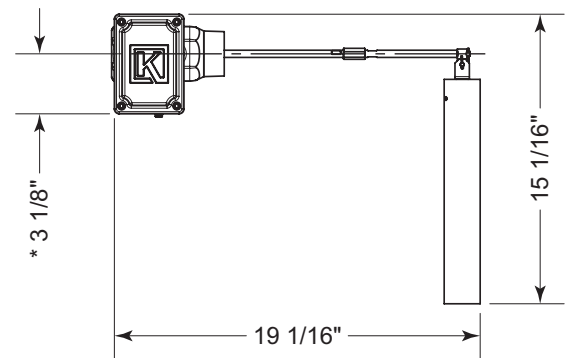
Left Hand / Horizontal Displacer / NPT Body



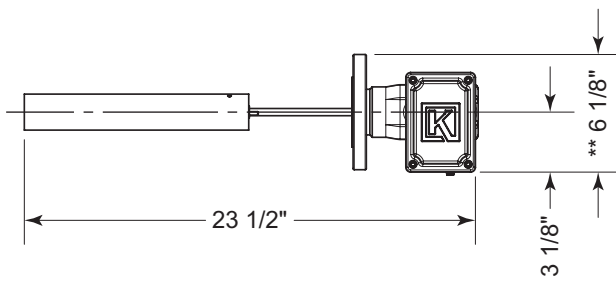
Right Hand / Horizontal Displacer / NPT Body



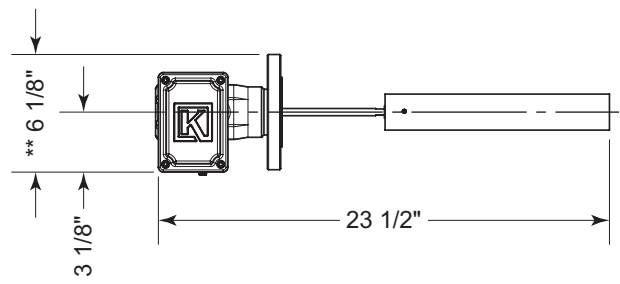
Left Hand / Vertical Displacer / NPT Body



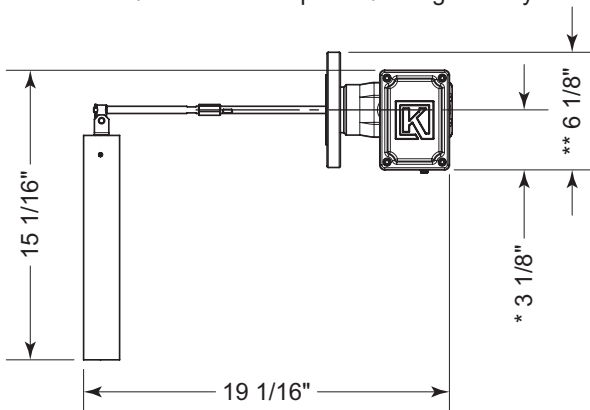
Right Hand / Vertical Displacer / NPT Body



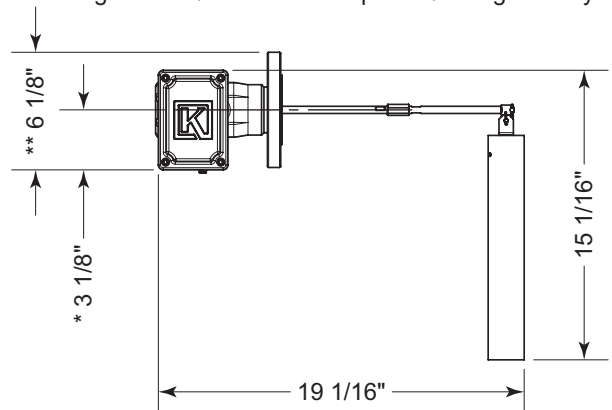
Left Hand / Horizontal Displacer / Flanged Body



Right Hand / Horizontal Displacer / Flanged Body



Left Hand / Vertical Displacer / Flanged Body



Right Hand / Vertical Displacer / Flanged Body

* Dimension is from bottom of enclosure to center of flange

** Flange diameter varies based on type & size

*** All dimensions shown are for standard offerings, see product catalog for other options.

INSTALLATION

1 Mechanical Installation

For Vessels with NPT Connections:

Apply PTFE tape or pipe compound to the male threads of the threaded mount. Tighten sufficiently to seal the threads using a wrench on the flats of the mounting piece. Do not use a wrench on the aluminum enclosure/cover to tighten the connection.



NOTE:

Ensure enclosure is oriented vertically such that the conduit entry is on the bottom.

For Vessels with Flanged Connections:

Remove the masking sticker from the raised face of each end connection & use a suitable gasket between the mount & the vessel connection flange.



NOTE:

Ensure enclosure is oriented vertically such that the conduit entry is on the bottom.

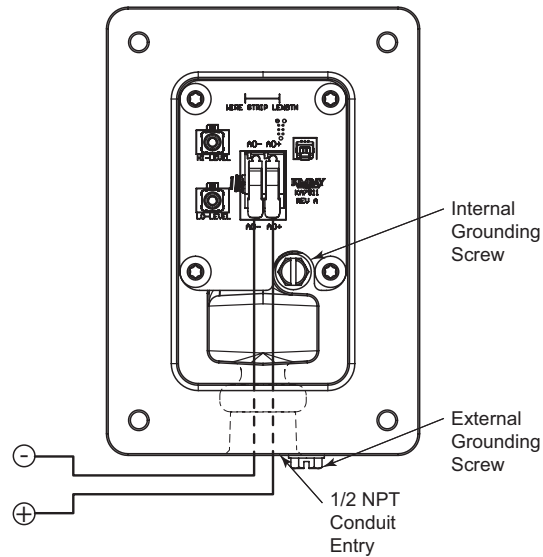


Figure 1: Kimray Electric Level Sensor

2 Electrical Installation

Both internal & external green grounding screws are provided to facilitate user grounding of the equipment. Other than the grounding screws this sensor has only 2 connections, labelled in Figure 1 as “AO+” & “AO-”. Ensure the implemented circuit configuration is wired according to Figure 1 & one of the Figures 2 to 7.

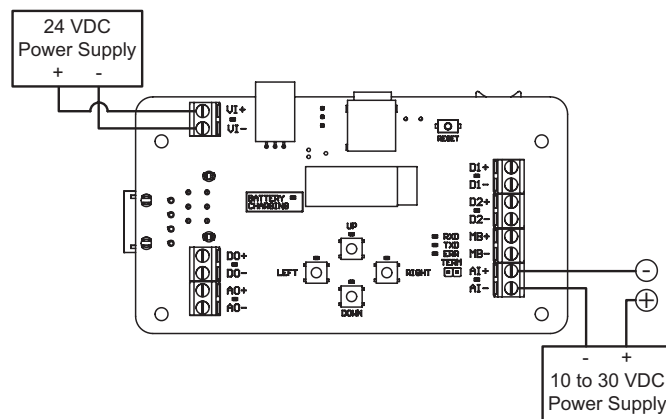


Figure 2: Kimray Electric Actuator with Separate Board Power & Loop Power Supplies

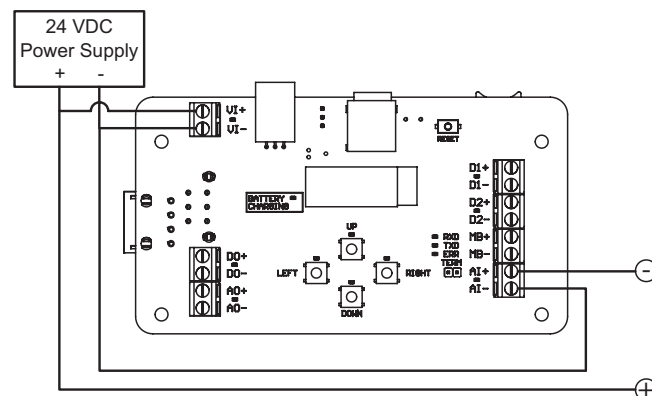


Figure 3: Kimray Electric Actuator Sharing Board Power & Loop Power

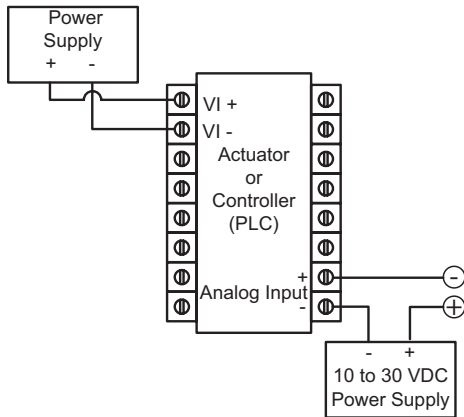


Figure 4: Electric Actuator with Separate Board Power & Loop Power Supplies

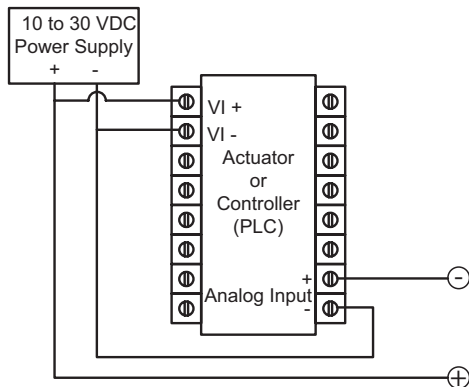


Figure 5: Electric Actuator Sharing Board Power & Loop Power (Isolated Analog Inputs)

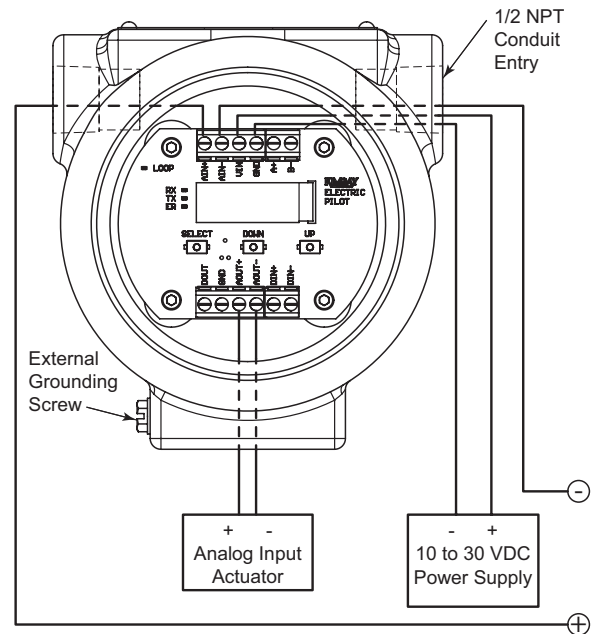


Figure 7: Electric Actuator Controlled by Kimray Electric Pilot

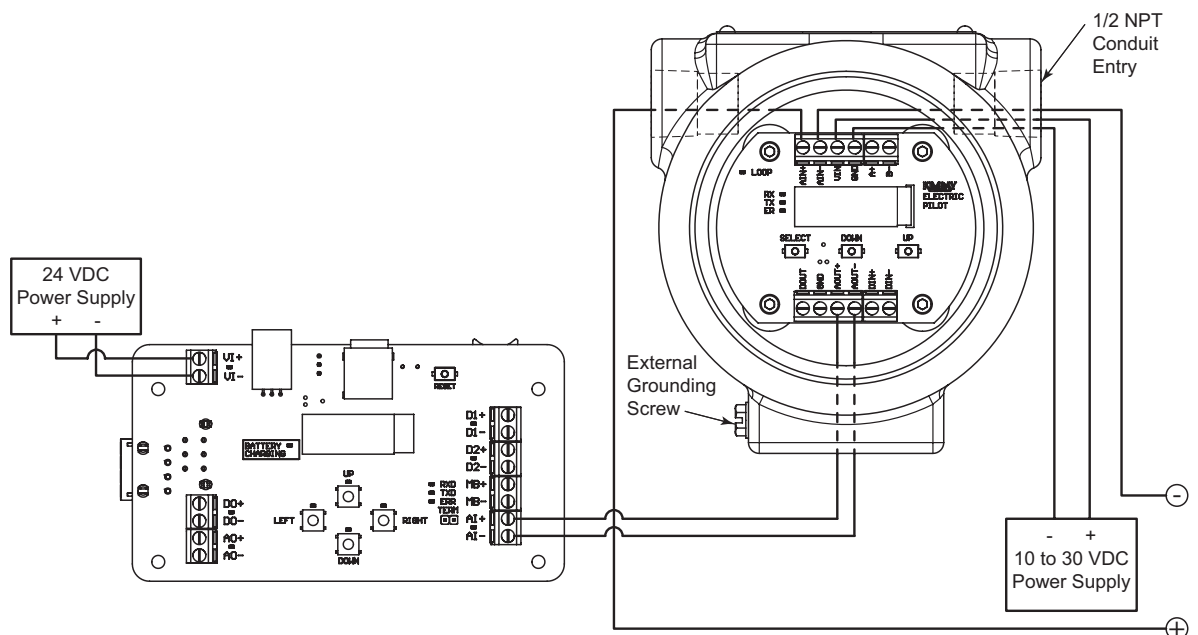


Figure 6: Kimray Electric Actuator Controlled by Kimray Electric Pilot

MODEL: Electric Level Sensor

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Operation

The sensor is direct acting & it converts changes in liquid level into a proportional 4-20 mA analog output signal for use by external monitoring & control equipment.

Liquid level is measured by sensing changes in buoyant force acting on a displacer suspended within the vessel. These forces are mechanically transmitted as torque to a torsion beam, which generates a corresponding electrical output on a standard 4-20 mA current loop.



CAUTION:

Failure to properly condition signals can lead to premature equipment failure.

Maintenance

Maintenance is divided into 4 Groups:

1. Calibration Instructions
2. Displacer Group
3. Mount Group
4. Enclosure Group

Calibration & Commissioning Instructions

The sensor is shipped to you factory calibrated for single liquid-phase applications in water. A user calibration is available to dial in the application & account for different specific gravities.

Performing user calibration:

1. Hold HI-LEVEL button down until LEDs illuminate then release button immediately
2. The HI-LEVEL LED should be blinking to indicate that unit is in calibration mode
3. While the HI-LEVEL LED is blinking, completely submerge the displacer in fluid (if interfacing, submerge the displacer in the heavier of the two fluids.)
4. Press & release the HI-LEVEL button
5. Wait for the LO-LEVEL LED to begin flashing
6. Lower the liquid level so that the displacer is hanging dry (if interfacing, the float should be submerged in the lighter of the two fluids)
7. Press & release the LO-LEVEL button

8. Wait for both LEDs to flash five times. This may take a minute or two.
9. The unit is now calibrated for the application

Cancelling user calibration:

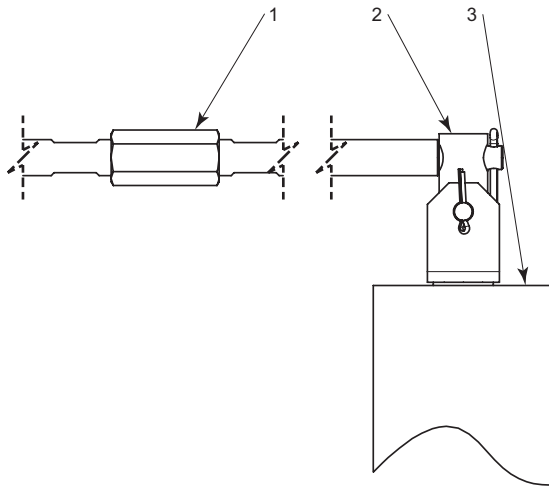
1. Cycle power or press & release button with non-flashing LED

Restoring unit to factory calibration:

1. Hold HI-LEVEL button down until LEDs illuminate then release button immediately
2. The HI-LEVEL LED should be blinking to indicate the unit is in calibration mode
3. Press & hold either button until both leds turn on solid. Release the button, unit is now restored to factory calibration

DISPLACER GROUP

Displacer Group - Components



Displacer Group – Disassembly

If displacer is in the horizontal orientation, then skip to Step 3.

- Step 1 - Remove coupling nut (item 1) from Rod Assembly (item 2)
- Step 2 - Remove Rod Assembly (item 2) from Displacer (item 3)
- Step 3 - Step 3 – Repair, replace & clean components as needed

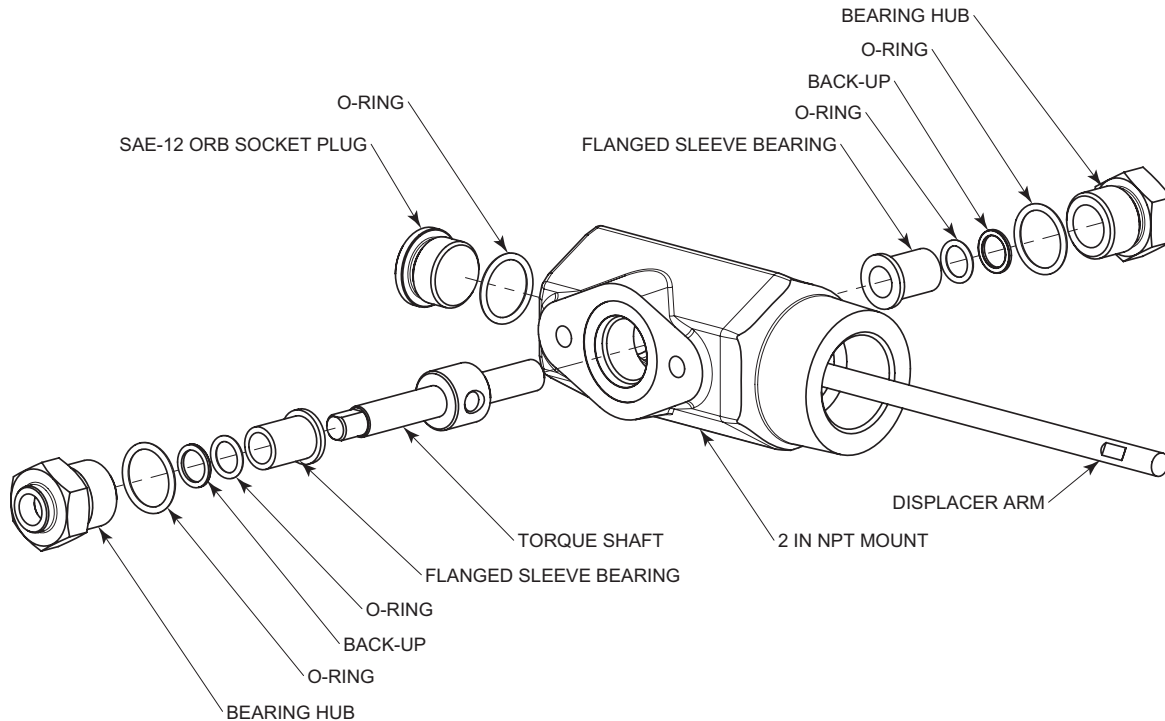
Displacer Group – Reassembly

If displacer is in the horizontal orientation, then skip to Step 2.

- Step 1 - Apply single drop of blue Loctite to threaded end of Rod Assembly (item 2) & tighten coupling nut (item 1) onto Rod Assembly (item 2)
- Step 2 - Apply single drop of blue Loctite to the Displacer (item 49) threads & tighten Displacer (item 3) onto the screw of the Rod Assembly (item 2)

MOUNT GROUP

Mount Group - Components



Mount Group – Disassembly

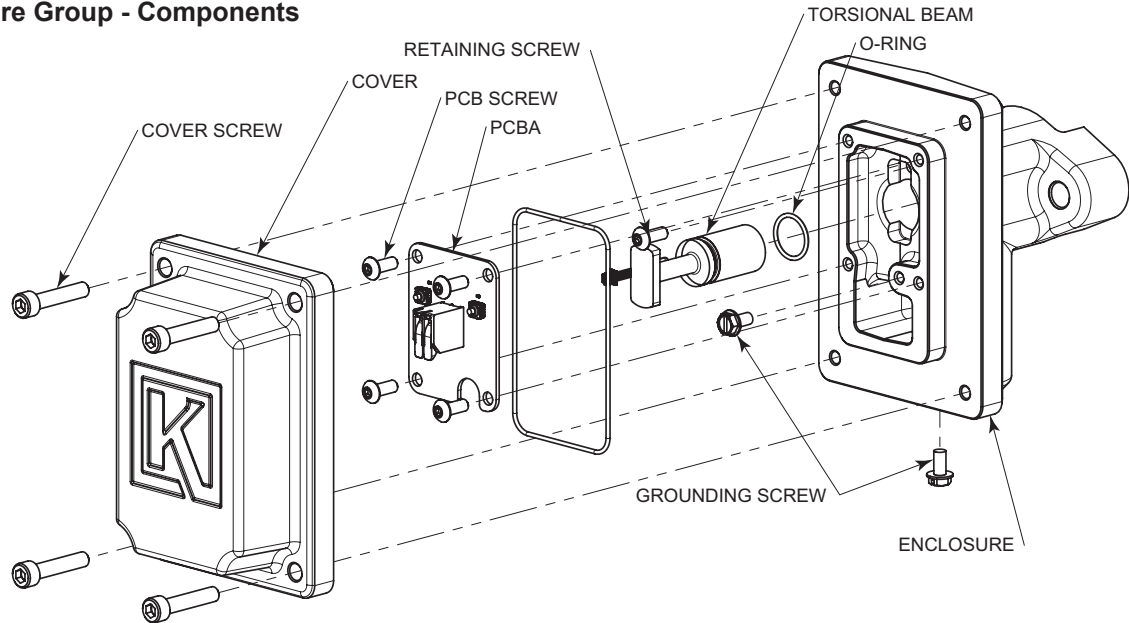
- Step 1 - Secure entire assembly in vise or stand if available
- Step 2 - Remove displacer arm & extensions from mount
- Step 3 - Remove mount screws & lift Enclosure Group from off of the mount, leaving mount in vise if available.
- Step 4 - Remove first bearing hub & shaft. Flip mount & remove second bearing hub. Remove socket plug from end of mount. Remove & discard O-rings from threads.
- Step 5 - Remove flanged bearings from hubs. Remove & discard O-rings & back-up rings inside hubs.
- Step 6 - Repair or replace any component with wear or damage. Clean out inside of mount.

Mount Group – Reassembly

- Step 1 - Install O-ring over threaded hubs & socket plug. Do not push or roll O-ring over threads. Use a hook to gently pull O-ring over threads & into its gland. Install socket plug. Tighten to 360-420 inch-lbf.
- Step 2 - Insert components into both hubs in the following order: back-up ring (ensure flat side of back-up ring goes in first), O-ring, flanged bearing.
- Step 3 - Install the bearing hub without a nose on the side of mount with no screw holes. Insert shaft with flats facing side of mount that attaches to enclosure. Install the bearing hub with a nose over shaft. Tighten both bearing hubs to 360-420 inch-lbf.
- Step 4 - Apply blue Loctite to mount screws then fasten the Enclosure Group to the mount body, tighten mount screws to 259-269 inch-lbf.
- Step 5 - Apply blue Loctite to displacer arm & extension threads (if applicable) & install in shaft.
- Step 6 - Install & close cover. Tighten cover screws to 80-90 inch-lbf.

ENCLOSURE GROUP

Enclosure Group - Components



Enclosure Group – Disassembly

- Step 1 - Place Enclosure Group in a vise & secure it
- Step 2 - Remove the two mount screws if they are still with the unit
- Step 3 - Remove cover screws & remove cover from enclosure housing
- Step 4 - Remove PCB screws

NOTE:

- Handle Torsion Beam & PCB with care, the Torsion Beam is plugged into the rear of the PCB
- Step 5- Separate PCB from enclosure housing & disconnect Torsion Beam, set PCB aside
- Step 6- Remove the Torsion Beam retaining screw
- Step 7- Hook the Torsion Beam from the front side or push the Torsion Beam from the rear side to remove it from the enclosure housing
- Step 8- Hook the o-ring & remove it from the Torsion Beam being careful not to scratch surfaces
- Step 9- Remove & discard the enclosure housing o-ring
- Step 10- Remove the two grounding screws

Enclosure Group – Reassembly

- Step 1 - Install the two grounding screws, tighten them sufficiently to prevent backing out during transit to the site
- Step 2 - Install a new enclosure housing o-ring without rolling or twisting it
- Step 3 - Apply light grease to the Torsion Beam o-ring & install it using the hook to prevent rolling or twisting being careful not to scratch surfaces

- Step 4 - Install Torsion Beam into the enclosure housing, the last bit of insertion will require more force to get the o-ring compressed into the finished bore.

NOTE:

Be careful not to pinch the cable assembly of the Torsion Beam

- Step 5 - Apply a single drop of blue Loctite to the Torsion Beam retaining screw & install it in the appropriate hole, tighten to 25 ± 5 inch-lbf

- Step 6 - Connect the Torsion Beam cable assembly to the rear of the PCB

- Step 7 - Align PCB mounting holes with enclosure housing mounting holes with terminal connections facing outward. Apply a single drop of blue Loctite to each PCB mounting screw & tighten each screw to 25 ± 5 inch-lbf.

NOTE:

Be careful not to get Loctite on any other surfaces.

- Step 8 - Align cover with Kimray's Logo right side up to the enclosure housing mounting holes. Apply a single drop of blue Loctite to each cover screw & tighten each screw to 80-90 inch-lbf.

NOTE:

Be careful not to get Loctite on any other surfaces.

- Step 9 - Secure the two mount screws to the housing so as not to lose them

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TROUBLESHOOTING

Problem	Possible Cause(s) with Solution(s)
Sensor is not outputting a signal	1. Check wiring is connected 2. Check for valid wire polarity 3. Check for valid power at the sensor terminals 4. Check wiring is not shorted against conduit, enclosure or itself. Bypass wiring & supply power directly to terminals if needed to rule out possible shorts 5. Check to see if an LED is flashing, if so then sensor is in calibration mode. Either complete the calibration or abort calibration by pressing non-flashing LED or cycling power. 6. Sensor calibration is not valid, re-calibrate 7. Circuit is damaged, replace KA7511 & re-calibrate 8. Torsion Beam is damaged, replace 7953 & re-calibrate
Sensor output is constant even though level is changing	1. Check to see if an LED is flashing, if so then sensor is in calibration mode. Either complete the calibration or abort calibration by pressing non-flashing LED or cycling power. 2. Sensor calibration is not valid, re-calibrate 3. Enclosure mount screws are loose, tighten screws to specification & re-calibrate 4. Displacer has detached, remove unit from vessel & repair or replace parts as necessary & re-calibrate 5. Circuit is damaged, replace KA7511 & re-calibrate 6. Torsion Beam is damaged, replace 7953 & re-calibrate
Sensor output changes with level but does not output full range as expected	1. Sensor comes from factory calibrated for single phase application in water, if your application is different you will need to run a calibration 2. Enclosure mount screws are loose, tighten screws to specification & re-calibrate 3. Over time the sensing element inside the vessel will collect enough paraffins to cause a skewed sensor output. For many cases the amount of output skew is manageable. One way to deal with this is to re-calibrate to account for the added paraffins. Another approach is to remove the paraffins using the provided clean out port. 4. Circuit is damaged, replace KA7511 & re-calibrate 5. Torsion Beam is damaged, replace 7953 & re-calibrate
Contamination inside of sensor enclosure	1. Loss of seal around cover due to O-ring missing, inappropriately installed or damaged. Repair or replace 7954V as needed. 2. Loss of seal around torsion shaft due to O-ring missing, inappropriately installed or damaged. Repair or replace 7958V as needed.
Well fluids emitting from sensor	1. Maximum Rated Working Pressure exceeded, reduce pressure. 2. Loss of seal around NPT body due to insufficient torque applied to NPT body. Apply sufficient torque to NPT body to prevent leaks. Ensure enclosure is oriented vertically such that the conduit entry is on the bottom. 3. Loss of seal around NPT body due to pipe tape or sealing compound missing, inappropriately installed or damaged. Repair or replace tape or compound as needed. 4. Loss of seal around NPT body due to O-ring(s) missing, inappropriately installed or damaged. Repair or replace O-rings as needed.

FIRMWARE REVISION

Firmware Revision	Date	Notes
1.0	5/27/2026	Initial release



FLOAT OPERATED CONTROLLERS

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Kimray is an ISO 9001- certified manufacturer.
Kimray quality assurance process maintains strict controls
of materials and the certification of parts used in the Kimray severe service control valve.

Please visit our website for up to date product data www.Kimray.com

WHO WE ARE

Kimray is a manufacturer of oil and gas control equipment based in Oklahoma City, Oklahoma, USA.

Trusted for generations, Kimray has been creating simple, effective solutions for temperature, level, flow, and pressure control since 1948. Common applications include separation, heating, compression, dehydration, and artificial lift.

Buying from Kimray is about much more than the product. We are partners with hearts to serve. The relationships between our representatives and our customers extend from before the sale through the life of the product. Our focus is not on short-term profits but long-term growth for our customers.

Visit [Kimray.com](https://kimray.com) to learn more about our company and the products we create.



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