MODEL VLI-1250A & VLIT-1250A

Installation and Operating Manual

VISUAL LEVEL INDICATORS

Innovative Solutions

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Read this Manual Before Installing

This manual provides information on the VLI-1250A & VLIT-1250A Visual Level Indicators. It is important that all instructions are read carefully and followed in sequence. Detailed installation and wiring instructions are included in this manual.

Conventions Used in this Manual

Certain conventions are used in this manual to convey specific types of information. General technical material, support data, and safety information are presented in narrative form. The following styles are used for notes, cautions, and warnings.

NOTES

Notes contain information that augments or clarifies an operating step. Notes do not normally contain actions. They follow the procedural steps to which they refer.

Cautions

Cautions alert the technician to special conditions that could injure personnel, damage equipment, or reduce a component's mechanical integrity. Cautions are also used to alert the technician to unsafe practices or the need for special protective equipment or specific materials. In this manual, a caution box indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Notice of Trademark, Copyright, and Limitations

Performance specifications are effective with date of issue and are subject to change without notice. Innovative Solutions reserves the right to make changes to the product described in this manual at any time without notice. Innovative Solutions makes no warranty with respect to the accuracy of the information in this manual.

Warranty

All Innovative Solutions mechanical level and flow controls are warranted free of defects in materials or workmanship for one full year from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Innovative Solutions will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

Innovative Solutions shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some Innovative Solutions products.

Quality Assurance

The quality assurance system in place at Innovative Solutions guarantees the highest level of quality throughout the company. We are committed to providing full customer satisfaction both in quality products and quality service.

MODEL VLI-1250A & VLIT-1250A
VISUAL LEVEL INDICATORS

Table of Contents

1.0 Installation

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

1.1 Unpacking

Unpack the instrument carefully. Inspect all units for damage. Report any concealed damage to carrier within 24 hours. Check the contents of the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.

Caution: Do not discard the shipping container until all parts are checked.

1.2 Pre-installation Checklist

1. Manually move the float from 0% to 100% to 0% prior to start up/check out in order to reinitialize the accessory products, if so equipped. Accessories may inadvertently change state due to rough handling in shipment.
2. Remove float prior to pressure testing tank.

Caution: Float damage will occur if not removed from chamber prior to pressure testing the tank.

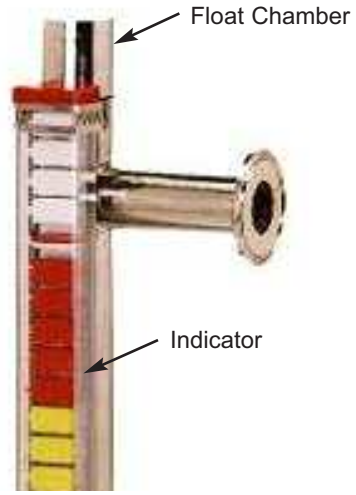
3. Verify the VLI's center to center distance equals the vessel's center to center.

1.3 Equipment and Tools

- Open-end wrenches or adjustable wrench to fit the process studs and nuts. A torque wrench is highly desirable.
- Flat-blade screwdriver
- Digital multimeter or digital volt/ammeter if transmitters or switches are attached
- Level
- Gasket for mating flanges
- Teflon tape & "never seize" for threaded units
- Pipe wrench for threaded units

1.4 Side Mount Installation

Caution: This instrument is intended for use in Installation Category II, Pollution Degree 2 locations.



Model VLI-1250A
Single Chamber

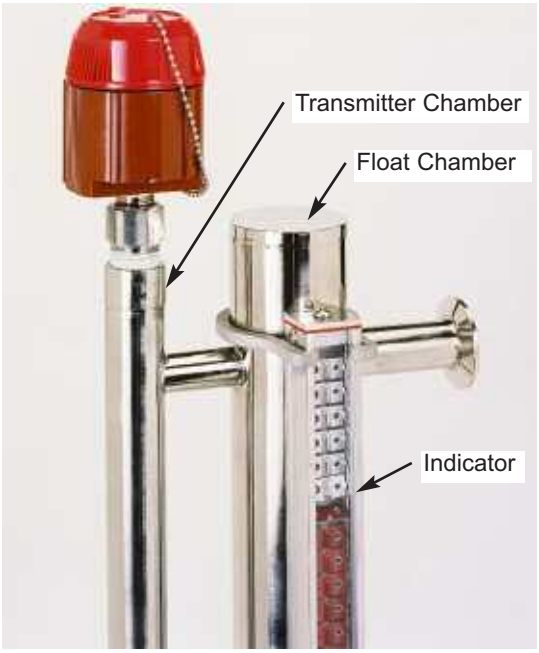
Isolation valves are recommended for installation between vessel and VLI. Check to ensure the VLI is vertical. All piping should be straight and free of "low spots" or "pockets" so that the lower liquid connection will drain toward the VLI. Adjust piping as required.

It is recommended a drain valve be installed in the bottom flange to allow cleaning and checking level. Close the isolation valves until start up.

Carefully unpack the VLI and stand it up vertically.

Initial installation of the Visual Level Indicator is simple. Unless otherwise specified, VLIs will be shipped from the factory fully assembled. All flanges will be torqued to ANSI specifications. Make sure all process connections attached to the vessel are vertically level, and flanges, if any, are level.

NOTE: Longer units require support of the entire length of the chamber while being lifted in place vertically. This will prevent bowing of the chamber, that could result in damage to the unit. The indicator is mounted to the chamber at the factory. When liquid level rises inside the chamber, the indicator will become operational.



Model VLIT-1250A
Dual Chamber

Isolation valves are recommended, but not required. If isolation valves are used, care must be used when opening the valves to prevent a surge of fluid or gases through the chamber. A surge can cause the float to be propelled to the far end of the chamber, and float damage could result.

Caution: If for any reason the VLI is pressurized higher than the maximum pressure indicated on the name tag, the float inside the chamber is subject to collapsing and causing float failure.

NOTE: Float is shipped separately.

1.5 Top/Bottom Connection Installation

Caution: This instrument is intended for use in Installation Category II, Pollution Degree 2 locations.

Carefully unpack the VLI and stand the unit up vertically. Note the tag "TOP" at the top of the indicator. This always indicates the top of the indicator.

The float is shipped separately.

Caution: Smooth float travel must be assured by no bending of the chamber pipe.

1.6 Start-up

Increase system pressure slowly while commissioning the instrument. Thoroughly check for leaks, and verify that the local indicator device accurately tracks the liquid level. Verify external accessory devices (switches, transmitter, etc.) are functional and properly calibrated.

Caution: Do not open the bottom isolation valve quickly. Allow the level to rise until the VLI displays the correct level in the vessel.

1.7 Alarm Switch Installation

1.7.1 Optional Reed Switch Alarm

The optional reed switch alarm is available to augment the control capabilities of the extensive line of visual level indicators. Housed in a stainless steel enclosure, the switch mounts to the outside of the VLI via a screwed on clamp. This mounting style allows addition or repositioning of switches at any time, without disruption of the process.

The switch(es) are pre-installed, calibrated, and checked for proper orientation at the factory. Your unit may be equipped with one or more switches for alarming or control. To change the location of the switch in the field, simply unscrew the clamp and slide the switch to a new location. See Figure 1.

Figure 1

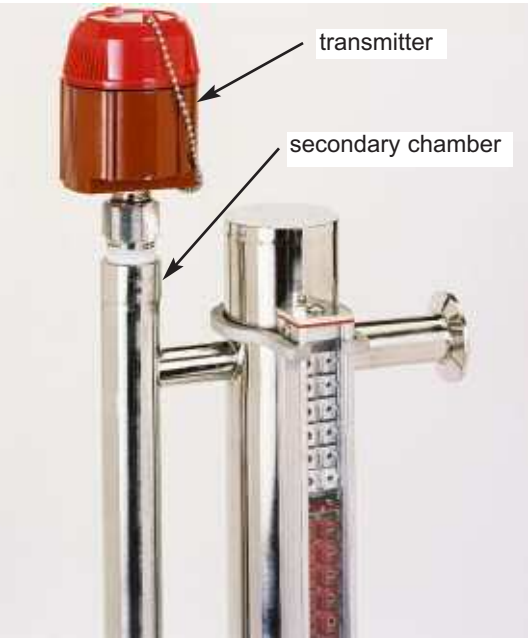


Figure 2
(All Transmitters)

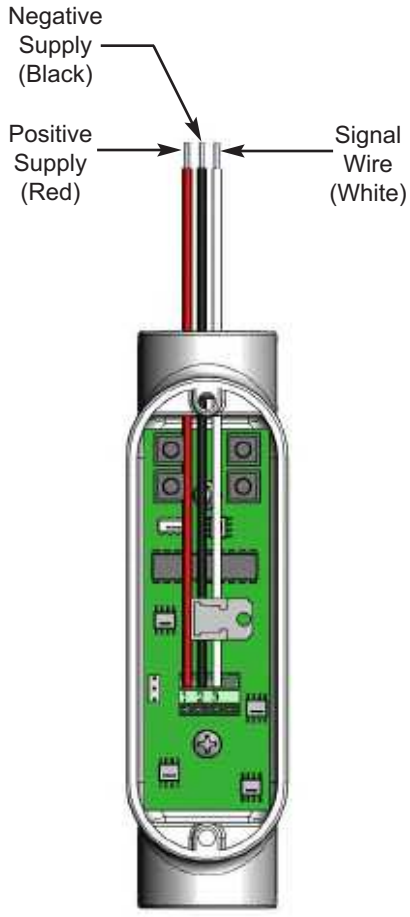


Figure 3
(Capacitance Unit)

1.8 Model VLIT: CS01 Capacitance Transmitter

The CS01 Capacitance Transmitter is designed to require minimal to no initial calibration. The transmitter is shipped from the factory with the (0%) point set on empty indication, and the (100%) point set at the full indication. The points can be readjusted if need be.

See Figure 3.

Also see the instructions supplied with the unit for further wiring information.

NOTE: For supply connections, use wire with a minimum rating of +167° F (+75° C) as required by process conditions. Use 18-22 AWG wire for power and ground field wires.

NOTE: It is the responsibility of the customer to comply with applicable installation codes and practices. Class I, Division 1 locations may contain explosive gas mixtures. Appropriate precautions must be taken. Installation should be performed by qualified personnel.

Caution: In hazardous areas, do not power the unit until the conduit is sealed and the enclosure cover is screwed down securely.

To install General Purpose or Non-Incendive wiring:

1. Remove the cover of the transmitter. Install the conduit plug in the unused opening.
2. Install a conduit fitting and pull the supply wires through.
3. Connect the positive supply wire to the #1 terminal and the negative supply wire to the #2 terminal.
4. Connect the signal wire to #3 terminal. Run wires to your device to make proper terminations for signal there.
5. Replace the cover of the transmitter.

1.9 Model VLIT: 703 GWR Transmitter

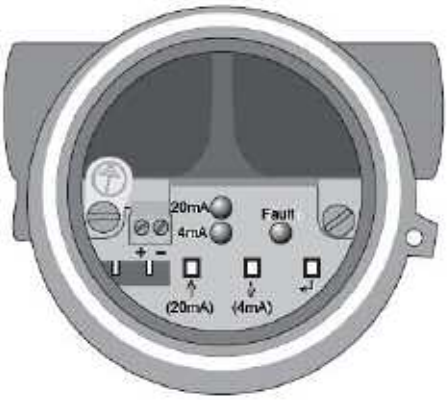


Figure 4
(GWR Unit)

The Model 703 Guided Wave Radar Transmitter can be mounted in the VLIT-1250A. Due to the physical size, the coaxial type probe must be used. Caution should be exercised in probe selection to take into account, media dielectric, viscosity, temperature, pressure, transition zone distances and overfill requirements. Each unit will be supplied complete with an instruction manual. A review of the manual is recommended prior to installation of the VLIT unit. See Figure 4.

To install General Purpose wiring:

1. Remove the cover of the transmitter. Install the conduit plug in the unused opening.
2. Install a conduit fitting and pull the supply wires through.
3. Connect shield to an earth ground at power supply and at the transmitter.
4. Connect an earth ground wire to the green ground screw.
5. Connect the positive supply wire to the (+) terminal and the negative supply wire to the (-) terminal. This is a loop powered device.
6. Replace the cover of the transmitter.

2.0 Reference Information

2.1 Description

Visual Level Indicators (VLIs) are suitable for installation on process applications that will not restrict float travel in the piping column. It is a magnetic coupled, local level indicator which is isolated from the process in a sealed non-magnetic external cage. Bi-color flags provide visual indication of level up to 100 feet away. Field-adjustable level switches and transmitters are available as options.

The VLI-1250A is a magnetically coupled local level indicator isolated from the process via a sealed non-magnetic external chamber. A series of bi-colored flags provide visual indication of liquid level from distances of up to 100 feet away. Available switches for point alarms are available. Transmitter technologies for continuous 4–20 mA outputs include reed, capacitance, and guided wave radar.

The VLIT-1250A incorporates the same features as the VLI-1250A except it also has a secondary chamber for the addition of an electronic transmitter that provides a redundant combination of level control.

2.2 Theory of Operation

2.2.1 Model VLI

Figure 5

A float equipped with a strong magnet assembly inside and weighted to the specific gravity of the fluid to be measured, moves up and down in a non-magnetic chamber, as the fluid inside rises and falls with the level of the liquid in the vessel.

Attached to the external wall of the non-magnetic chamber is an all plastic or aluminum/glass channel. Inside this channel are highly visible flags with a strong magnetic assembly inside. See Figures 5 and 6.

The indicator is always coupled to the float magnetically, to indicate the exact measurement of the fluid.

2.2.2 Model VLIT

A float equipped with a strong magnet assembly inside and weighted to the specific gravity of the fluid to be measured, moves up and down in a non-magnetic chamber, as the fluid inside rises and falls with the level of the liquid in the vessel.

Attached to the external wall of the non-magnetic chamber is an all plastic or aluminum/glass channel. Inside this channel are highly visible flags with a strong magnetic assembly inside. See Figures 5 and 6.

The indicator is always coupled to the float magnetically, to indicate the exact measurement of the fluid.

The secondary chamber houses the CS01 or Model 703 transmitters to provide a redundant reading of the liquid level being measured. The transmitter provides a continuous output reading that correlates to the liquid level within the vessel.

Cut-Away Section
of Float Chamber

Figure 6

2.3 Troubleshooting

2.3.1 VLI & VLIT

Problem	Solution
Flags do not rotate with level change.	Test flags with a magnet from bottom to top (magnet not included). If flags test okay, check for float obstruction. Isolation valves might be partially closed.
Flags rotate at different height than actual level.	Float selected for different specific gravity. Replace float with a float with correct specific gravity rating. Confirm correctness of float orientation. Top is up.
Float inside the level gauge is moving slow or not at all.	Make sure the VLI is level vertically. The process fluid being measured may be too viscous and heat tracing may be required to make the material more fluid. The specific gravity of the process fluid and the float weight may need to be reverified. The liquid being measured may contain magnetic particles collecting on the magnetic section of the float causing drag. If this happens, magnetic trap assemblies can be purchased from the factory. Visual inspection of the float may be required to see if the float has collapsed. Isolation valves might be partially closed.

2.4 Maintenance

Periodic inspections are a necessary means to keep your level control in good working order. This control is a safety device to protect the valuable equipment it serves.

If the process liquid is clean (no solids or deposits), the VLI should require minimum maintenance. If the process liquid is dirty (solids and deposits), it is recommended the external cage be isolated from the process and flushed periodically. For complete cleaning, after draining the unit, remove the float access flange and float, inspect cage and float for buildup and clean if required.

Magnetic traps are available to prevent magnetic particulate travel from the vessel to the chamber.

2.5 Spare Parts

Spare parts are available for the VLIs and certain switches and transmitters. Please consult the factory. Have the unit model number and serial number available for reference.

2.6 Specifications

2.6.1 Visual Level Indicator

Design	VLI-1250A – single chamber
	VLIT-1250A – dual chamber with transmitter
Materials of construction – VLI	Metal alloys 316/316L
	Plastics PVC, CPVC
Materials of construction – Float	316 SS or titanium standard
Pressure class ratings	ANSI 150#, 300#
Process connection sizes	½" to 4"
Process connection types	MNPT, FNPT, threaded couplings, tri-clamp fitting, ANSI flanges
	threaded nipples, buttweld nipples, plain-end nipples
Measuring range	7 to 240 inch standard
	Consult factory for lengths over 240 inches (20 feet)
Temperature range	-20° to +400° F
Pressure range	Full vacuum to 400 psig
Specific gravity range	As low as 0.40 S.G.
Indicators	Magnetically actuated flag assembly in contrasting gold/black or
	red/white colors. Other colors available, contact factory.
Visual indication	Easily visible from 75 to 100 feet (23 to 30 meters)
Scale options	Etched stainless steel or silk screened with either height, volume,
	or percentage units
Switch options	Reed type
Transmitter options	Model 703 Guided Wave Radar Transmitter
	Model CS01 Capacitance Transmitter

2.7 VLIT Options

2.7.1 External Reed Switch

- Electric reed switch, hermetically sealed
- 100 Watt SPDT std. (contact factory for other options)
- Stainless steel enclosure with mounting tabs
- ±0.5" float travel
- -40° to +175° F
- Stainless steel enclosure with mounting bracket

2.7.2 Model 703 Guided Wave Radar Transmitter

Power:	24 VDC
Maximum Range:	Up to 20 feet
	(Consult factory for longer lengths)
Accuracy:	±0.125"
Output:	4–20 mA
Temperature range:	-40° to +175° F

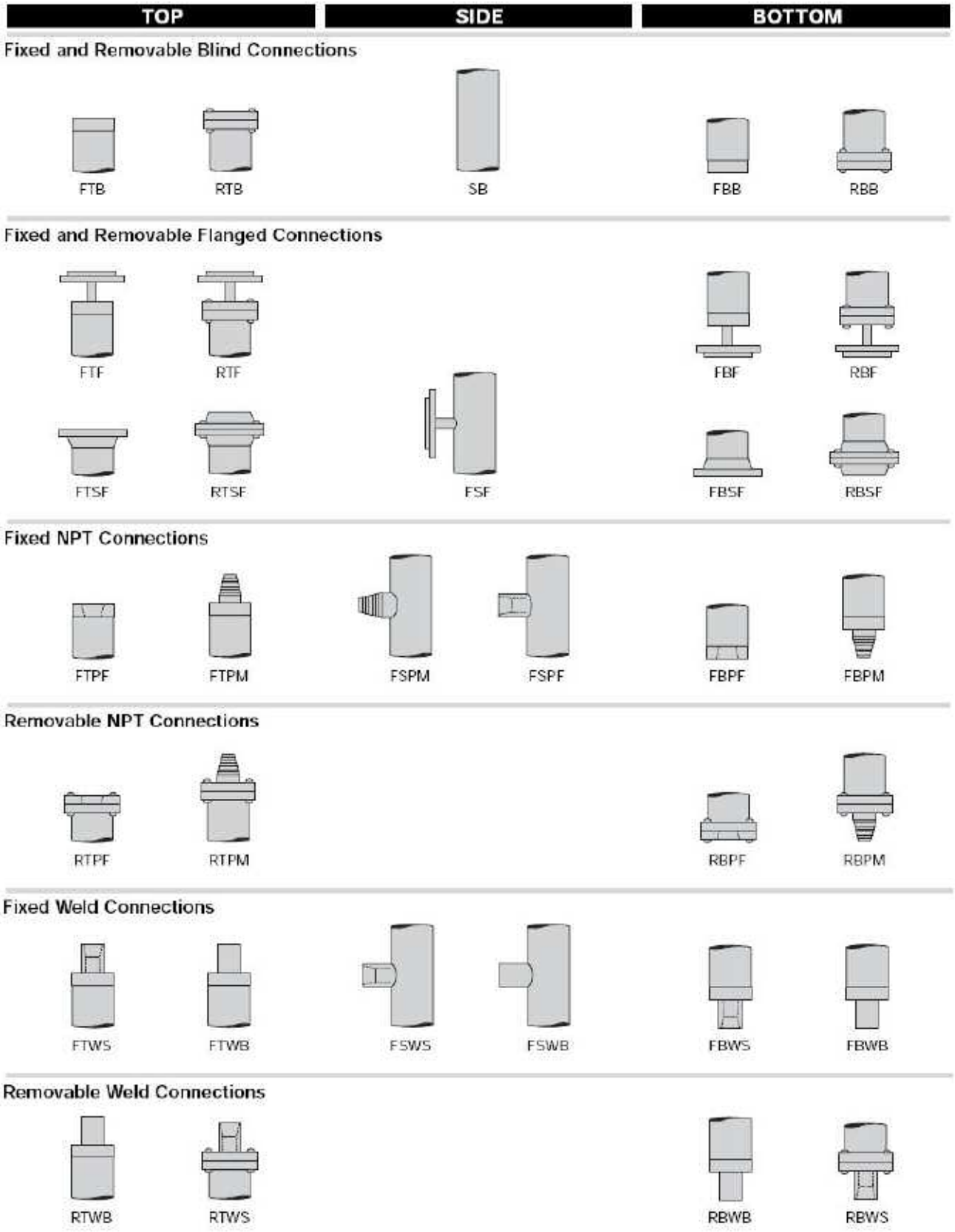
2.7.3 Model CS01 Capacitance Transmitter

Power:	24 VDC OR 12 VDC
Maximum Range:	Up to 20 feet
	(Consult factory for longer lengths)
Accuracy:	±0.125"
Output:	4–20 mA or 0-5 VDC
Temperature range:	-40° to +158° F

Since there are many options to choose from, please consult factory for configuring the VLI or VLIT units.

2.8 Process Connections

2.8.1 Visual Level Indicator

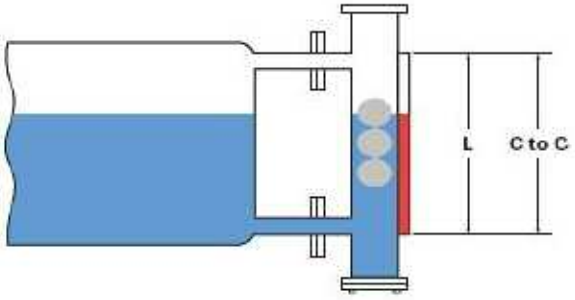


2.9 Mounting Configurations

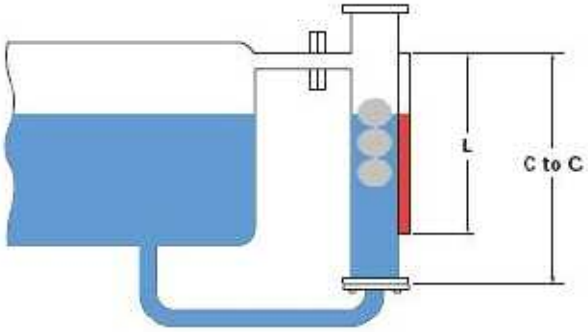
2.9.1 Visual Level Indicator

Standard mounting for the VLI are the following combinations of side, top, and bottom connections. These are the positions where the liquid will enter and leave the indicator.

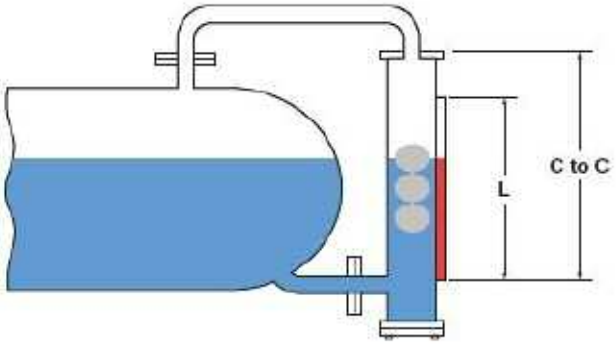
"L" = Indication Length



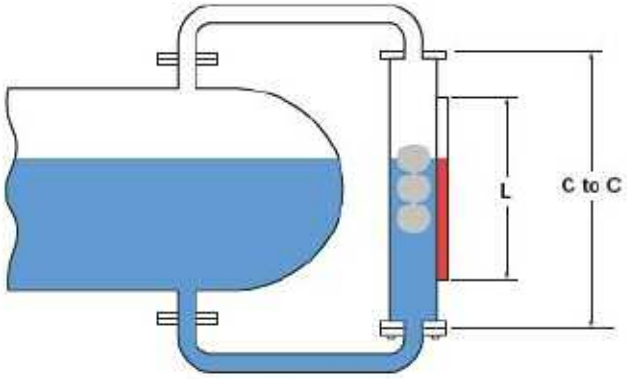
Type SS
Side and Side Process Connections
C to C = L



Type SB
Side and Bottom Process Connections
C to C = L + 5" (127 mm)



Type TS
Top and Side Process Connections
C to C = L + 3 (76 mm)



Type TB
Side and Bottom Process Connections
C to C = L + 7.72" (196 mm)

These dimensions are for reference purposes in standard configurations and may vary with special connections, material, or specific gravity. The maximum available indication length is 240" (20 feet). The minimum specific gravity is 0.40. Please consult the factory for special designs and calibrations.

Notes

Service Policy

Owners of Innovative Solutions controls may request the return of a control or any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Controls returned under our service policy must be returned by Prepaid transportation. Innovative Solutions will repair or replace the control at no cost to the purchaser (or owner) other than transportation if:

1. Returned within the warranty period; and
2. The factory inspection finds the cause of the claim to be covered under the warranty.

If the trouble is the result of conditions beyond our control; or, is NOT covered by the warranty, there will be charges for labor and the parts required to rebuild or replace the equipment.

In some cases it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labor, direct or consequential damage will be allowed.

Return Material Procedure

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorization" (RMA) number be obtained from the factory, prior to the material's return. This is available through Innovative Solutions local representative or by contacting the factory. Please supply the following information:

1. Company Name
2. Description of Material
3. Serial Number
4. Reason for Return
5. Application

Any unit that was used in a process must be properly cleaned in accordance with OSHA standards, before it is returned to the factory.

A Material Safety Data Sheet (MSDS) must accompany material that was used in any media.

All shipments returned to the factory must be by prepaid transportation.

All replacements will be shipped F.O.B. factory.

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