

VLI/VLIT2500 VISUAL LEVEL INDICATOR

INSTALLATION AND OPERATIONS MANUAL

Single or Dual Chamber Visual Level Indicator
With or Without Level Transmitter



SOLUTIONS WITH INNOVATION

AN INNOVATIVE SENSING COMPANY

ISO 9001:2008 CERTIFIED



READ THIS MANUAL PRIOR TO INSTALLATION

This manual provides information on the **VLI2500 & VLIT2500 Visual Level Indicators**. It is important that all instructions are read carefully and followed sequentially. Detailed instructions are included in the **Complete Installation** section of 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 and often 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 of unsafe practices, the need for special protective equipment, or specific materials. In this manual, a caution indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury.

Warnings

Warnings identify potentially dangerous situations, or serious hazards. In this manual, a warning indicates an imminently hazardous situation which, if not avoided, may result in serious injury or death.

Safety Messages (VLIT2500 ONLY)

Follow all standard industry procedures for servicing electrical and computer equipment when working with, or around high voltage. Always shut off the power supply before touching any components. Although high voltage is not present in this system, it may be present in other systems.

Electrical components are sensitive to electrostatic discharge. To prevent equipment damage, observe all safety precautions when working with electrostatic-sensitive components.

WARNING! (VLIT2500 ONLY)

EXPLOSION HAZARD! DO NOT CONNECT OR DISCONNECT THE UNIT UNLESS THE POWER HAS BEEN SWITCHED OFF.

Low Voltage Directive (VLIT2500 ONLY)

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

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Warranty

All Solutions With Innovation Mechanical Level and Flow Controls are warranted free of defects in materials and workmanship for one full year from the date of the 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, Solutions With Innovation will repair or replace the product at no cost to the purchaser (or owner) other than transportation.

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Quality Assurance

The Quality Assurance System in place at Solutions With Innovation guarantees the highest level of quality throughout the company. Solutions With Innovation is committed to providing full customer satisfaction; both in quality products and in quality service.

Contacts

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VLI/VLIT2500 VISUAL LEVEL INDICATOR

With or Without Level Transmitter

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1.0 INSTALLATION

This section provides detailed procedures on properly installing the VLI2500 or VLIT2500 Visual Level Indicator.

 **CAUTION!** IF THE EQUIPMENT IS USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER, PROTECTION PROVIDED BY THE EQUIPMENT MAY BE IMPAIRED.

 **CAUTION!** THIS UNIT MAY CONTAIN REED SWITCHES THAT CAN BE PERMANENTLY DAMAGED BY MECHANICAL SHOCK OR VIBRATION. AVOID DROPPING OR HITTING THE DEVICE AGAINST HARD SURFACES.

1.1 UNPACKING

Unpack the instrument, carefully. Make sure that all components have been removed from the packing material. Inspect all components for damage. Report any concealed damage to the carrier within 24 hours of receiving. Compare the contents with the packing slip and report any discrepancies to the factory immediately. Record the sales order number and/or serial number for future reference when ordering parts.

Before Proceeding to Installation, Complete the Following:


- Inspect all components for damage. Report any damage to the carrier within 24 hours of receiving.
- Record the model and serial numbers for future reference when ordering parts.

Model Number _____

Serial Number _____


 **CAUTION!** DO NOT DISCARD THE SHIPPING CONTAINER UNTIL ALL PARTS ARE CHECKED.

1.2 BEFORE YOU BEGIN

 **CAUTION!** DURING THE INSTALLATION OF THE VLI2500 OR VLIT2500, THE FLOAT SURFACE MUST BE KEPT FREE OF METALLIC PARTICLES.

1.2.1 Pre-Installation Checklist

- 1 Manually move the float from 0% to 100% and back to 0% prior to installation in order to re-initialize the accessory products, if so equipped. Accessories may inadvertently change state due to rough handling during shipment.
- 2 Remove the float prior to pressure testing the tank.

 **CAUTION!** FLOAT DAMAGE WILL OCCUR IF IT IS NOT REMOVED FROM THE CHAMBER PRIOR TO PRESSURE TESTING THE TANK.

- 3 Verify that the VLI's center to center distance equals the vessel's center to center distance.
- 4 Ensure that there are no interferences from surrounding equipment at the installation location.

1.2.2 Equipment and Tools

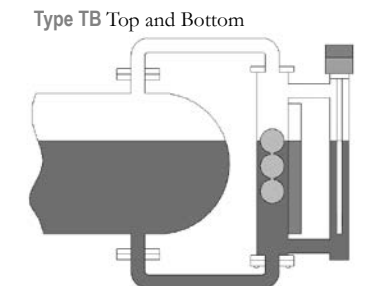
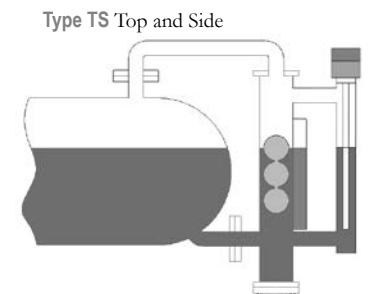
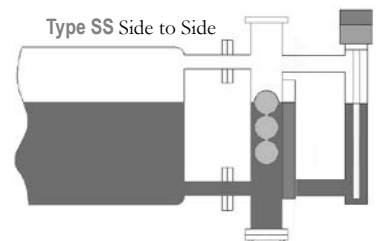
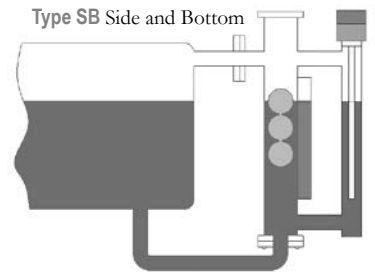
- Open-End Wrenches or An Adjustable Wrench to Fit the Process Studs and Nuts
(*A Torque Wrench is Highly Recommended*)
- Flat-Blade Screwdriver
- Digital Multimeter or Digital Volt/Ammeter (*For Transmitter or Switch Attachments Only*)
- Level
- Gasket for Mating Flanges
- Teflon[®] Tape & “Never Seize” for Threaded Units
- Pipe Wrench for Threaded Units

1.3 MOUNTING

The VLI2500 and VLIT2500 Visual Level Indicators are available in a variety of process connections. These devices can be installed on the top, side or bottom of a process tank depending on the connection type.

1.3.1 Side Mounting

- 1 Carefully, unpack the unit and position it vertically upright.
- 2 Install isolation valves, if required and tighten them to the appropriate specifications.
- 3 Install the visual level indicator into place. Tighten the process connections in accordance to the appropriate specifications.
- 4 Remove the flange cover on the bottom or top of the chamber. Insert the float with the “Top” marking directing upward.
- 5 If required, install a drain valve in the cover opening and then reposition the flange cover over it. Torque the bolts to the ANSI standard.
- 6 *For VLIT2500:* Connect the transmitter and/or switches in accordance with the applicable cores and practices illustrated in the following sections.



1.3.2 Top/Bottom Mounting

- 1 Carefully, unpack the unit and position it vertically upright.
- 2 Install isolation valves, if required and tighten them to the appropriate specifications.
- 3 Remove the chamber flange cover. Insert the float with the “Top” marking directing upward.
- 4 Reinstall the chamber flange cover and torque the bolts to the ANSI standard.
- 5 Install the visual level indicator into place. Tighten the process connections in accordance with the appropriate specifications.
- 6 *For VLIT2500:* Connect the transmitter and/or switches in accordance with the applicable cores and practices illustrated in the following sections.

1.4 OPTIONAL ALARM SWITCH INSTALLATION

An optional switch is available to augment the control capabilities of the extensive line of visual level indicators. The switch mounts to the outside of the visual level indicator with an attached clamp. This mounting style allows the addition or repositioning of switches at any time without disrupting the process.

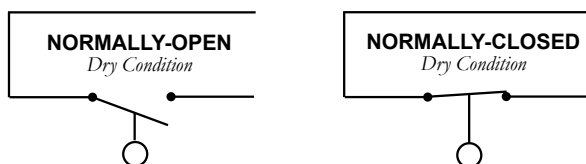
The switch(es) are pre-installed, calibrated and checked for proper orientation at the manufacturer. Your unit may be equipped with one or more switches for alarming or control. To change the location of the switch in the field, simply unscrew the clamp and slide the switch to a new location.

1.4.1 Switch Wiring

⚡ CAUTION! OBSERVE ALL APPLICABLE ELECTRICAL CODES AND PROPER WIRING PROCEDURES.

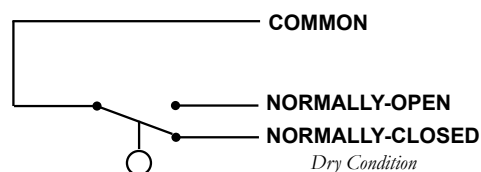
SPST Reed Switch:

- 1 Connect the wiring to the switch leads or terminals, as illustrated below.



SPDT Reed Switch:

- 1 Connect the wiring to the proper switch leads or terminals, as illustrated below.



Contact Protection:

In order to maintain the life and reliability of the switch, it is essential to provide protection when switching inductive loads. The use of a diode for DC circuits and a resistor-capacitor network for AC circuits will ensure reliable performance from the switch.

1.5 MODEL VLIT: CS02 CAPACITANCE TRANSMITTER

The CS02 Capacitance Transmitter requires minimal to no initial calibration depending on the media. The device is shipped from the factory with its 0% level set on empty indication and its 100% level set on full indication. All devices have been calibrated and validated to function in water, unless another media was specified during the ordering process. Refer to the CS02 instruction manual for additional information.

CAUTION! THE CS02 CAPACITANCE TRANSMITTER ELECTRONICS OPERATE AT VOLTAGES OF 9 - 45 VDC. A HIGHER VOLTAGE WILL DAMAGE THE TRANSMITTER.

WARNING! DO NOT DISCONNECT THE EQUIPMENT UNLESS THE POWER IS SWITCHED OFF.

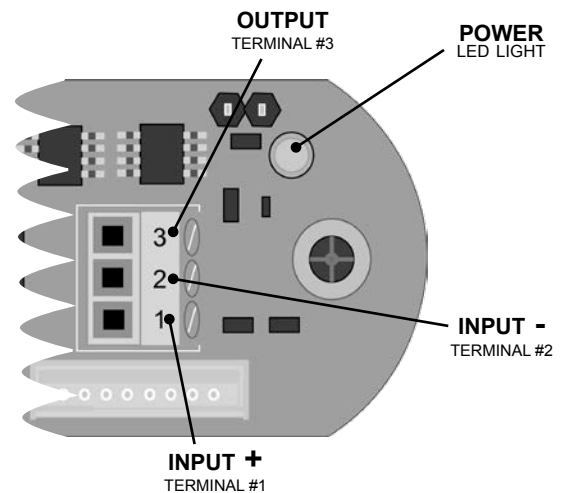
NOTE: WIRING BETWEEN THE POWER SUPPLY AND CS02 ELECTRONICS SHOULD BE MADE USING 18 - 22 AWG HOOK UP WIRE.

1.5.1 CS02 General Purpose Wiring

A *General Purpose* installation **DOES NOT** have flammable media present.

How To Install General Purpose Wiring:

- 1 Remove the cover of the transmitter.
- 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 the #3 terminal. Then, run the wires to your device to make proper terminations for signal there.
- 5 Re-install the cover of the transmitter.



1.5.2 CS02 Intrinsically Safe Wiring

- An *Intrinsically Safe* installation **DOES** have potentially flammable media present.
- An approved intrinsically safe barrier must be installed in the non-hazardous (safe) area.

How To Install Intrinsically Safe Wiring:

- 1 Verify that the intrinsically safe barrier is properly installed in the safe area. Then, complete the wiring from the barrier to the transmitter.
- 2 Remove the cover of the transmitter.
- 3 Install a conduit fitting and pull the supply wires through.
- 4 Connect the positive supply wire to the #1 terminal and the negative supply wire to the #2 terminal.
- 5 Connect the signal wire to the #3 terminal. Then, run the wires to your device to make proper terminations for signal there.
- 6 Re-install the cover of the transmitter.

2.0 PREVENTATIVE MAINTENANCE

Periodic inspections are necessary to maintain the proper functionality of the VLI2500 and VLIT2500 Visual Level Indicators. The indicators are safety devices that protect the equipment they serve. A systematic program of preventative maintenance should be implemented at the time of installation. If the following instructions are completed routinely, the switch will provide continuous, reliable protection.

2.1 MAINTENANCE PROCEDURES

2.1.1 Inspect Unit Periodically

Verify that there are no cracks or defective surfaces on the unit. Should the float, chamber(s), or transmitter*(*VLIT only*) become damaged, obtain a replacement immediately.

2.1.2 Inspect Transmitter Connections Monthly




VLIT2500 Visual Level Indicators contain transmitters that may be vulnerable to extreme heat and excessive moisture.

- Inspect all wiring, carefully and replace any wires exhibiting signs of brittle insulation.
- Inspect all electrical connections to ensure tightness.

2.1.3 Keep Unit Clean

Periodic cleanings of the process liquid to remove any solids or deposits will ensure the continual, uninterrupted movement of the float assembly. If the process liquid is frequently dirty, the external chamber should be isolated from the process and flushed periodically as well. After draining the unit, remove the float access flange and float to inspect the chamber for potential buildup. For VLIT models, remove the probe as well. Clean the components if necessary. Objects and debris may cause systematic interruptions and a loss in equipment functionality.

2.2 WHAT TO AVOID

-  **NEVER LEAVE THE TRANSMITTER'S COVER OFF, EXPOSING THE ELECTRONICS TO THE ELEMENTS.**
-  **NEVER PLACE A JUMPER WIRE ACROSS THE TERMINALS ON A TRANSMITTER TO "CUT-OUT" THE CONTROL.**
If a jumper is necessary for testing purposes, ensure that it is removed prior to placing the control into service.
-  **NEVER USE IN SYSTEMS CONTAINING IRON PARTICLES.** *The magnet within the float assembly can attract the particles and become jammed.*

2.3 REPLACEMENT PARTS

Replacement parts are available for the visual level indicators, certain switches, and the transmitters. Consult the manufacturer by calling **203-729-6434**. For a quicker reordering process, have the unit's model number and serial available for reference.

3.0 REFERENCE INFORMATION

This section illustrates an overview of the VLI2500 and VLIT2500 Visual Level Indicators, as well as information on troubleshooting common problems, agency approval listings, and detailed physical, functional and performance specifications.

3.1 DESCRIPTION

Visual Level Indicators (VLIs) are magnetically-coupled, electronic-free devices that provide continual level indication on the exterior of a tank or process vessel. A scale of high-contrast, dual color flags rotate to mark the liquid level that is easily visible up to 100 feet away. Various threaded, flanged and weld connections are available to mount the unit on the top, bottom or side of the tank. Further custom options include level switch and level transmitter integration as well as flag color combinations and graduated scales.



3.1.1 VLI2500

The VLI2500 Single Chamber Visual Level Indicator is a practical alternative to fragile, easily-clouded sight glasses. Its electronic-free operation provides safe, durable and easy-to-read indication in various liquids while remaining isolated from potential media contamination. The unit's 2 1/2" (63.5 mm) diameter 316 stainless steel chamber is capable of withstanding pressures up to 750 PSIG (51.7 bar) and its versatile design can integrate separate point level switch outputs for alarm and valve control functions.

3.1.2 VLIT2500

The VLIT2500 Dual Chamber Visual Level Indicator incorporates the same features as the VLI2500 with sophisticated transmitter technologies. Its second chamber integrates the CS02 Capacitance level transmitter to provide continuous output readings correlating to the fluid level within the process vessel. Due to the use of electronics, the VLIT2500 withstands pressures only up to 400 PSIG (27 bar).

3.2 THEORY OF OPERATION

3.2.1 VLI2500

Within a non-magnetic chamber of the indicator, a float rises and falls according to the fluid level. The float is weighted to the specific gravity of the chamber fluid, despite containing a strong magnetic assembly. As the float is carried by the fluid level, its internal magnets attract the external line of highly visible magnetic flags. Once the flags attract, they rotate and visibly track the exact measurement of the fluid.

3.2.2 VLIT2500

Within a non-magnetic chamber of the indicator, a float rises and falls according to the fluid level. The float is weighted to the specific gravity of the chamber fluid, despite containing a strong magnetic assembly. As the float is carried by the fluid level, its internal magnets attract the external line of highly visible magnetic flags. Once the flags attract, they rotate and visibly track the exact measurement of the fluid.

A second chamber on the indicator houses a CS02 Capacitance Level Transmitter. The transmitter provides a continuous output reading that correlates to the fluid level within the vessel.

3.3 TROUBLESHOOTING

The VLI2500 and VLIT2500 Visual Level Indicators are designed and manufactured for trouble-free operation over a wide range of operating conditions. Common problems are discussed in terms of their symptoms and recommended corrective actions.

3.3.1 VLI Problems

SYMPTOM	PROBLEM	SOLUTION
THE FLAGS DO NOT ROTATE WITH THE LEVEL CHANGE.	WEAK MAGNETIC FIELD.	TEST FLAGS WITH A MAGNET FROM THE BOTTOM TO THE TOP (MAGNET NOT INCLUDED). IF THE FLAGS ARE MAGNETICALLY RESPONSIVE, CHECK FOR FLOAT OBSTRUCTION AND REPLACE THE FLOAT IMMEDIATELY. DO NOT ATTEMPT TO REPAIR THE FLOAT. THE ISOLATION VALVES MAY ALSO BE PARTIALLY CLOSED.
THE FLAGS ROTATE AT A DIFFERENT HEIGHT THAN THE ACTUAL LEVEL.	FLOAT SPECIFIC GRAVITY IS INCORRECT.	REPLACE THE FLOAT WITH THE CORRECT SPECIFIC GRAVITY RATING. VERIFY THE FLOAT ORIENTATION. TOP IS DIRECTED UPWARD.
FLOAT INSIDE THE LEVEL GAUGE IS MOVING SLOW OR NOT AT ALL.	THE UNIT IS NOT COMPLETELY VERTICAL.	USE A LEVEL TO VERIFY THAT THE UNIT IS COMPLETELY VERTICAL.
	PROCESS FLUID IS TOO VISCOUS.	HEAT TRACING MAY BE REQUIRED TO MAKE THE PROCESS MATERIAL MORE FLUID.
	FLOAT WEIGHT AND SPECIFIC GRAVITY OF THE PROCESS FLUID ARE INCORRECT.	REVERIFY THE SPECIFIC GRAVITY OF THE PROCESS FLUID AND THE FLOAT WEIGHT. REPLACE THE FLOAT TO ACCOMMODATE THE CORRECT SPECIFIC GRAVITY.
	THE PROCESS FLUID CONTAINS METALLIC PARTICLES.	IF THE LIQUID BEING MEASURED CONTAINS MAGNETIC PARTICLES, THEY MAY BE COLLECTING ON THE MAGNETIC SECTION OF THE FLOAT, CAUSING IT TO DRAG. OBTAIN A MAGNETIC TRAP ASSEMBLY FROM THE MANUFACTURER.
	COLLAPSED FLOAT.	VISUALLY INSPECT THE FLOAT. IF THE FLOAT HAS COLLAPSED, OBTAIN A REPLACEMENT. DO NOT ATTEMPT TO REPAIR THE FLOAT. THE ISOLATION VALVES MAY ALSO BE PARTIALLY CLOSED.



If you are still in doubt about the condition or performance of your device, consult the factory for further instructions.

3.3.2 Transmitter Problems



WARNING! DO NOT DISCONNECT THE EQUIPMENT UNLESS THE POWER IS SWITCHED OFF.

For VLIT Units: If the transmitter seems to be the issue, refer to the installation and operations manual for the CS02.

3.4 SPECIFICATIONS

3.4.1 VLI2500 Specifications

MODEL	
TECHNOLOGY:	Visual Level Indicator
DESIGN:	Single Chamber
CHAMBER SIZE:	2 ½" Diameter
INPUT	
MEASUREMENT PRINCIPLE:	Magnetic Coupling Level Indication
MEASURED VARIABLE:	Magnetically-Actuated Flag Rotation
RANGE:	7" to 240" (17.8 cm to 609.6 cm) <i>For Over 240" Consult the Manufacturer</i>
POWER:	None
OUTPUT	
SIGNAL:	Dual-Sided Flag Rotation
INDICATOR:	Orange/Black Flags (<i>Other Color Combinations Are Available</i>)
VISUAL RANGE:	75 to 100 Feet (23 to 30 Meters)
ENVIRONMENTAL	
PROCESS TEMPERATURE:	+400 °F (+204.4 °C)
PROCESS PRESSURE:	750 PSIG (51.7 bar)
PRESSURE CLASS RATING:	ANSI #150, #300
SPECIFIC GRAVITY RANGE:	As Low As 0.40
PROCESS CONNECTION SIZES:	½" to 4"
PROCESS CONNECTION TYPES:	<ul style="list-style-type: none"> • MNPT • FNPT • Threaded Couplings • Tri-Clamp Fitting • ANSI Flanges • Threaded Nipples • Butt-Weld Nipples • Plain-End Nipples
SCALING:	Height, Volume or Percentage Units
MATERIALS OF CONSTRUCTION	
MOUNT & CHAMBER:	316/316L Stainless Steel
FLOAT:	316 Stainless Steel, Titanium, PVC, or CPVC
SCALE:	Etched Stainless Steel or Silk-Screened Nylon
INDICATOR FLAGS:	Aluminum

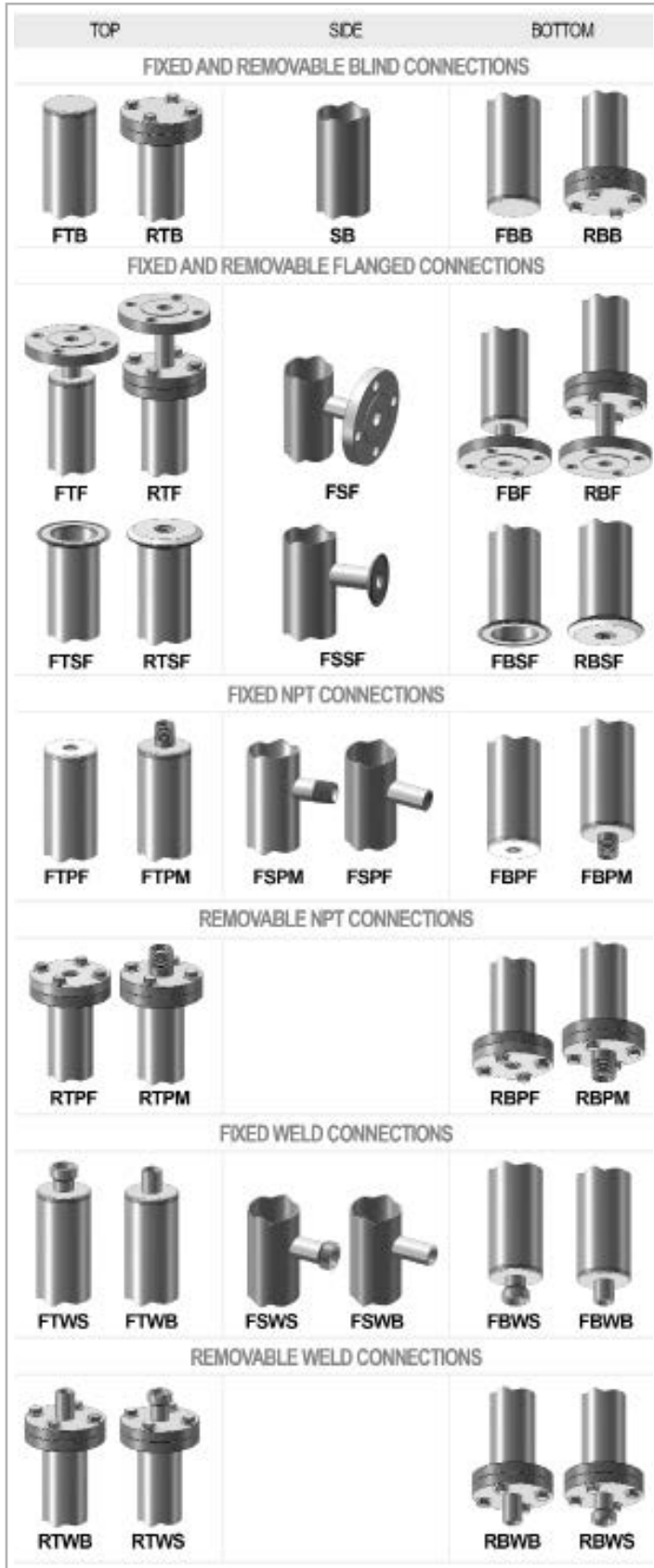
3.4.2 VLIT2500 Specifications

MODEL	
TECHNOLOGY:	Visual Level Indicator with Level Transmitter
DESIGN:	Dual Chamber
CHAMBER SIZE:	2 ½" Diameter (2)
INPUT	
MEASUREMENT PRINCIPLE:	VLIT: Magnetic Coupling Level Indication CS02: RF Capacitance Transmitter
MEASURED VARIABLE:	VLIT: Magnetically-Actuated Flag Rotation CS02: Capacitance Level, Determined by the Media Level on the Probe and a Proportionally-Conditioned Output Signal
RANGE:	7" to 192" (17.8 cm to 487.6 cm) <i>For Over 192" Consult the Manufacturer</i>
INDICATION LENGTH:	CS02: 4" to 180" (10 cm to 458 cm)
POWER:	REED SWITCH: SPDT 25 Watt Max. CS02: 9 to 45 VDC
OUTPUT	
SIGNAL:	VLIT: Dual-Sided Flag Rotation CS02: 4-20 mA, 0-5 VDC or 1-5 VDC
INDICATOR:	Orange/Black Flags (<i>Other Color Combinations Are Available</i>)
VISUAL RANGE:	75 to 100 Feet (23 to 30 Meters)
OPTIONAL SWITCH:	SPDT (Latch) 25 Watt Maximum
ENVIRONMENTAL	
OPERATING TEMPERATURE:	SWITCH: -40 to +300 °F (-40 to +148.9 °C) CS02: -20 to +185 °F (-29 to +85 °C)
PROCESS TEMPERATURE:	-40 to +400 °F (-40 to +204.4 °C)
PROCESS PRESSURE:	400 PSIG (27.6 bar)
PRESSURE CLASS RATING:	ANSI #150, #300
SPECIFIC GRAVITY RANGE:	As Low As 0.40
PROCESS CONNECTION SIZES:	½" to 4"
PROCESS CONNECTION TYPES:	<ul style="list-style-type: none"> <li style="width: 33%;">• MNPT <li style="width: 33%;">• Threaded Nipples <li style="width: 33%;">• Tri-Clamp Fitting <li style="width: 33%;">• FNPT <li style="width: 33%;">• Butt-Weld Nipples <li style="width: 33%;">• ANSI Flanges <li style="width: 33%;">• Threaded Couplings <li style="width: 33%;">• Plain-End Nipples
SCALING:	Height, Volume or Percentage Units
PERFORMANCE	
REPEATABILITY:	CS02: > 96%
LINEARITY:	CS02: ± 0.50%
RESOLUTION:	CS02: 1024 Points Over Span (Default)
MATERIALS OF CONSTRUCTION	
MOUNT & CHAMBER:	316/316L Stainless Steel
FLOAT:	316 Stainless Steel, Titanium, PVC, or CPVC
SCALE:	Etched Stainless Steel or Silk-Screened Nylon
INDICATOR FLAGS:	Aluminum

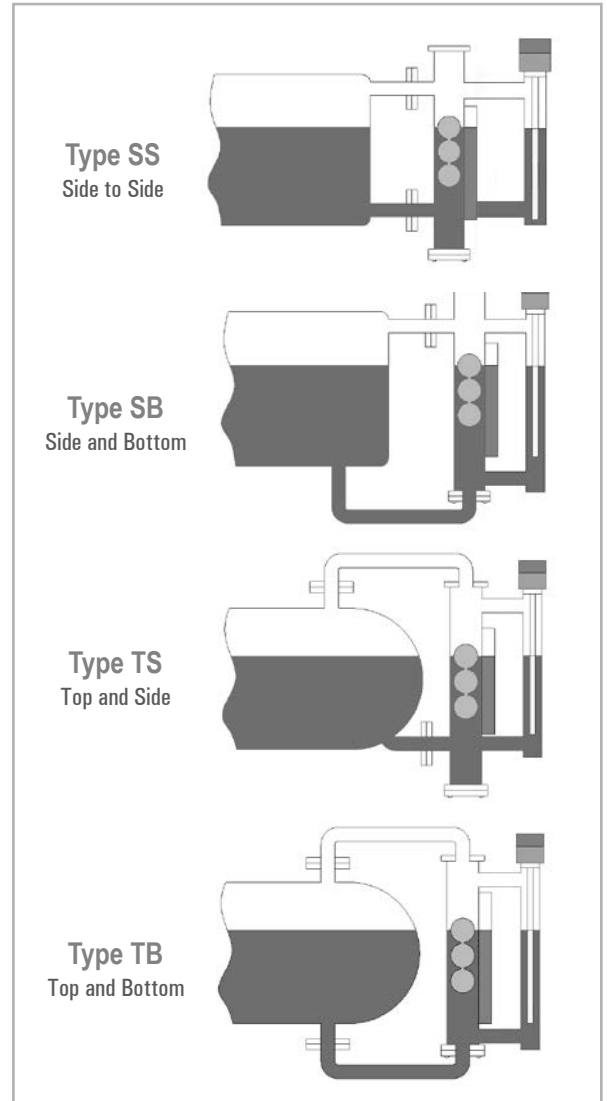
For more specifications regarding the CS02, refer to the Installation and Operations Manual.

3.5 ADDITIONAL OPTIONS

PROCESS CONNECTIONS



MOUNTING CONFIGURATIONS



**For additional options, consult the manufacturer.*

3.6 NOTES

ASSURED QUALITY & SERVICE COST LESS

Service Policy

Owners of Solutions With Innovation products may request a return of the product, or any part of the product for complete rebuilding or replacement. Units will be rebuilt or replaced promptly. Products returned under the SWI Service Policy must be returned by prepaid transportation. Solutions With Innovation will repair or replace the product at no cost to the purchaser (or owner) other than transportation if:

- 1 Returned within the warranty period; and
- 2 Factory Inspection finds the cause of the claim to be covered under the warranty.

If the problem is due to circumstances beyond Solutions With Innovation's liability, or is NOT covered by the warranty, there will be charges for labor in addition to the parts required to rebuild or replace the equipment.

In rare cases, it may be expedient to ship replacement parts; or in extreme cases, an entire product before the damaged product is returned. If a quick replacement service is necessary, notify the manufacturer of the damaged product's model and serial number. In such cases, credit for the returned materials will be determined on the applicability of the warranty.

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

Return Material Procedure

In order to efficiently process any returned materials, it is essential that a *Return Material Authorization* (RMA) number be obtained from the manufacturer prior to an item's return. RMA's can be issued through local representatives, or by contacting the factory directly.

Please supply the following information:

- 1 The Company's Name
- 2 Description of the Material
- 3 Product Serial Number
- 4 Reason for Return
- 5 Product's Application

Used units must be properly cleaned in accordance with OSHA standards before it is returned to the manufacturer. A *Material Safety Data Sheet* (MSDS) must accompany units or materials that were used in any type of media. All return shipments to the factory must be by done via prepaid transportation. All product replacements will be shipped F.O.B. manufacturer.



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