



# INSTALLATION MANUAL

## Submersible Product Installation Manual Model series 313, 313L, 313S, 313L-NI & 311-M351

### Product Overview:

This manual is applicable for standard product under the Model series 313, 313L, 313S, 313L-NI and 311-M351 submersible product line.

If the product you have has a different prefix part number than listed above please contact the factory for the application installation manual. The part number and/or serial number will help identify the exact product you have. Failure to identify the product you have before installation may cause permanent damage to the instrument and in most cases, void the manufacturer's warranty.

GP:50's standard submersible level transmitters utilize two sensor technologies, depending on the model ordered, a strain gauge or silicon piezo-resistive sensor may be utilized. Both offer an accurate solution to hydrostatic level measurement.

The model series determines the output. The 113 series is a mV/V output, the 213 or 211-M351 series is a VDC output, typically 0-5 VDC and the 300 series is a 4-20mA output. Pressure ranges are available from 0-20 inches of water thru 0-500 PSI.

GP:50 submersible level transmitters are designed to be submerged directly in the media being measured. Various materials of construction are available to resist corrosion. 316L stainless steel or titanium construction with Polyurethane or Tefzel cable is the most common configuration. These transmitters may also include other wetted parts such as ceramic or neoprene. Please contact the factory with your model number if you are uncertain as to what materials of construction you have.

Always be sure that the transmitter you have is compatible with the media being measured. Failure to do so may cause catastrophic failure of the device and void the warranty.

Polyurethane and Tefzel cable are available on all Models. Both cables are ~0.330" OD with multi-conductors. Internal wires are 22AWG with a drain / shield and 1/8" OD vent tube for barometric reference.

### Standard Wiring for each unit is as follows:

Model	111-M351 & 113	211-M351 & 213	311-M351 & 313 Series
Wire Color	Function (mV/V)	Function (VDC)	Function (4-20mA)
Red	+ Excitation	+ Excitation	+Excitation/Signal
Green	+ Signal	+ Signal	NC
White	- Signal	NC	NC
Black	-Excitation	-Excitation/Signal	-Excitation/Signal
Shield	Shield	Shield	Shield

GP:50's Model 313 submersible transmitters are available with optional lightning protection. Option Code JV and G2. The Model 311-M351 comes standard with this protection. This is discussed in detail later.

All of GP:50's submersible transmitters are calibrated at the factory per the range and output ordered. An optional in-line zero and span adjust is available but standard units are not field adjustable. Units should perform as indicated on the Performance Certificate and product label.



The barometric reference vent tube is terminated at the opposite end of the transmitter with a special porous plug to prevent water intrusion. See care & maintenance section for further instructions on this vent.

### Installation:

GP:50's level submersible transmitters provide an accurate level reading via hydrostatic head pressure.

The transmitter is lowered into the media to the desired depth. The transmitter provides a linear output in relation to the depth / head pressure above the lowest point on the transmitter to the top of the media level.

The transmitter can be suspended vertically with the nose on the bottom of the tank or well for optimum resolution. It may also be elevated off the bottom if sludge or other solids on the bottom will clog the transmitter. The Model 311-M351 provides a large diameter sensing area to reduce the chances of plugging but suspending slightly off the bottom will provide a path for liquid media to continual clean the sensor face. These units may also lay horizontal on the bottom if desired.

A stilling well / perforated stand pipe may also be utilized which helps protect the transmitter from debris floating in the media which could strike the transmitter causing damage. It will also help reduce the chance of the transmitter striking the tank or well wall if turbulent flow conditions are present.

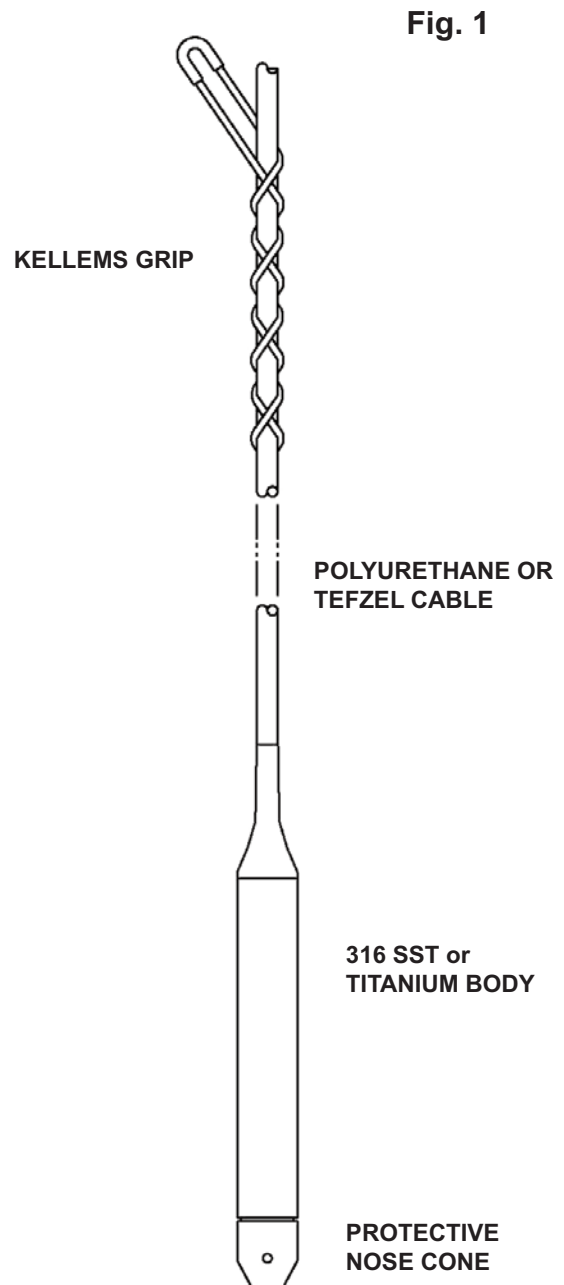
Care should be taken when lowering the unit into your media. Throwing or dropping the transmitter from an extreme height may cause damage to the sensor. The impact on the media surface could exert extreme pressure on the sensor face exceeding the maximum pressure rating. This could damage the transmitter and void the warranty. These transmitters are supplied with a protective nose cone or baffle plate to reduce the chances of damage but care should be taken when installing these transmitters.

Care must be taken to insure the media being measured is compatible with all wetted parts.

Standard submersible products come with Polyurethane cable attached to an all 316 stainless steel transmitter. A neoprene seal is also used in conjunction with this assembly.

Any of the standard 313 & 311-M351 series transmitters may be suspended by the supplied cable. However it is recommended to suspend these transmitters via an external support grip. A Kellems grip is one recommended means of suspending the cable.

**Fig 1 shows typical installation utilizing a Kellems grip.**





Gauge format transmitters, typically less than 300 PSI have an internal vent tube. Care needs to be taken not to crush the cable which in turn may close the vent tube and cause the appearance of drift in the transmitters output.

The cable attached to this instrument is specifically engineered for submersible applications. The standard polyurethane outer jacket provides long-term reliability under most conditions. Care should be taken to insure the cable and transmitter are fully compatible with the media being measured.

The cable should be handled carefully as the jacket may be subject to damage if “raked” over sharp edges such as a well casing.

The cable is fully shielded with the shield connected to the metal housing at the transducer end and terminated in an insulated wire at the termination end. The shield should be terminated to a good earth ground.

The termination end of the cable typically provides 2 signal wires, a ground wire and barometric reference tube. This vent is specially prepared at the factory to help eliminate moisture migration with a vent tube filter. (PN: VT-PB).

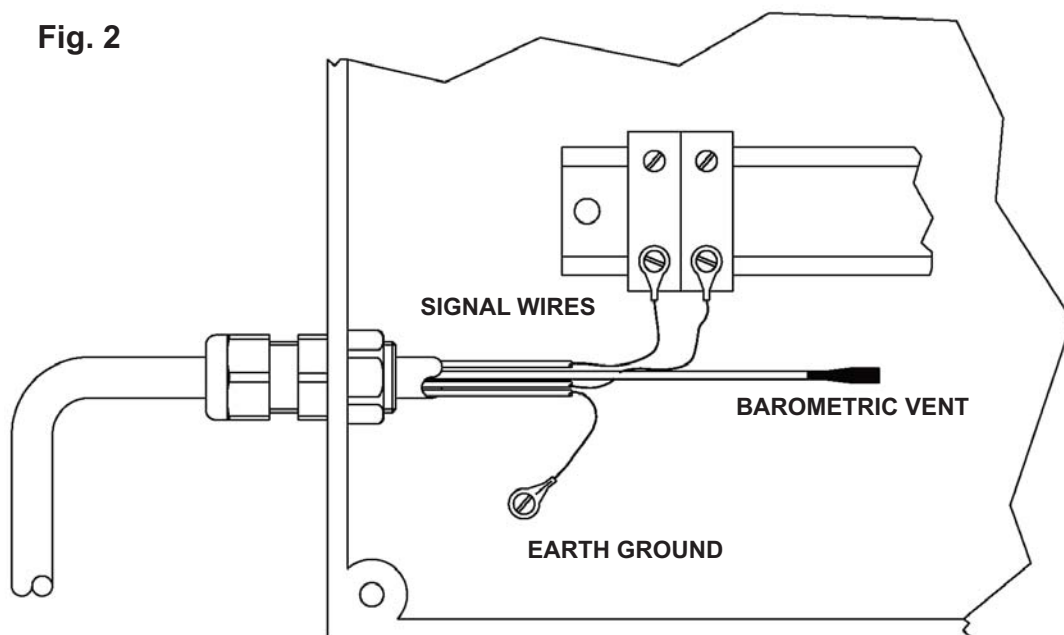
Every effort should be made to leave this vent tube filter intact. Should the cable be longer than is required, it is recommended that the excess length be accommodated in a service loop. If this is not possible, a replacement filter may be purchased from GP:50. This PN is: VT-PB and is installed in a similar fashion to shrink fit.

An inexpensive way to protect the cable from damage and rigidly support the transmitter is via the ½” NPT Male conduit connection. This comes standard on the Model 311-M351 and optionally available on the 313 series. A rigid metal or plastic pipe can then be attached to the transmitter and lowered into the well. This will protect the cable and allow for a more rigid mount.

Our polyurethane and Tefzel jacketed cables are quite flexible. If your installation requires bending the cable, take care not to crimp the integral vent tube. Consequently, do not bend the cable more than a radius of 1 inch.

A water tight compression style fitting may be used to secure our Tefzel or polyurethane jacketed cable as it enters a junction box. Care needs to be taken to not over tighten the fitting so as to damage the cable or crush the integral vent tube.

**Fig. 2**





## Pressure and Level Instrumentation

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The 4-20mA transmitter requires a DC power supply, (typically 10-36 VDC) and mA meter wired in a current loop. Connect the red lead of the transducer to the + terminal of the power supply. Connect the black lead of the transducer to the + input terminal of the meter. Connect the – input terminal of the meter to the – terminal of the power supply.

If this is a VDC or mV/V transducer a DC power supply (10-36 VDC on the 0-5 VDC version and a regulated 5-15 VDC on the mV/V version) and voltmeter are required. Connect the Red wire from the transducer to + on the power supply, the green wire to the +signal of the VDC meter and the Black wire from the transducer to both the –Power on the power supply and – signal on the VDC meter. (See the wiring chart in the beginning of the manual)

### Lightning Protection

GP:50 offers enhanced surge suppression also known as lightning protection as an integral part of the transmitter.

There are 2 levels of protection available designated by option codes JV & G2. Option code G2 must be ordered in conjunction with JV but JV maybe ordered as a stand alone option. JV comes standard our Models 313, 313L, 313S & 311-M351. G2 also comes standard on our Model 311-M351. G2 is optionally available on all of these products as well as our pressure transmitters but again only in conjunction with the option JV.

The JV option provides a gas tube arrestor across the input power leads. The gas tube arrestor can absorb high energy associated with a lightning strike. The G2 option provides a MOV (Metal Oxide Varistor)to ground which provides secondary protection and in some instances can react quicker when used in conjunction with the gas tube suppressor. Typically the MOV will discharge the initial buildup of the surge limiting the energy to the circuit.

Nothing is 100% effective, especially if hit with a direct lightning strike. If an area is prone to strikes using a combination of these options greatly reduces the risk of failure.

GP:50 also recommends the use of surge protection at the termination end of the cable, typically inside the panel box. This insures further protection of the transmitter and additional equipment on the line. GP:50 also offers DIN rail mounted surge protection. Contact the factory for more information.

### Care & Handling

GP:50 submersible transmitters consist of a transmitter either constructed of 316 stainless steel or titanium coupled to either polyurethane or Tefzel® jacketed cable. This cable to transmitter transition may also include a neoprene seal. Consult the factory or data sheet for your particular product.

In regards to material compatibility, much of the data represented in this manual is based on field experience and published data. However, because of the wide variety of processes and applications it is impossible to guarantee material compatibility in a given process without performing corrosion tests under actual operating conditions. Therefore ultimate responsibility for material selection remains with the end user.

Insuring that the media being measure is compatible with materials of construction will insure a long life and accurate measurement and safe operation.

The model series 313 comes standard with a protective PVC nose cone installed. This is to provide a general level of protection to the sensing diaphragm during installation and when being handled. This protective nose cone may be removed to inspect the sensing area for obstruction if the transmitter is not operating properly.

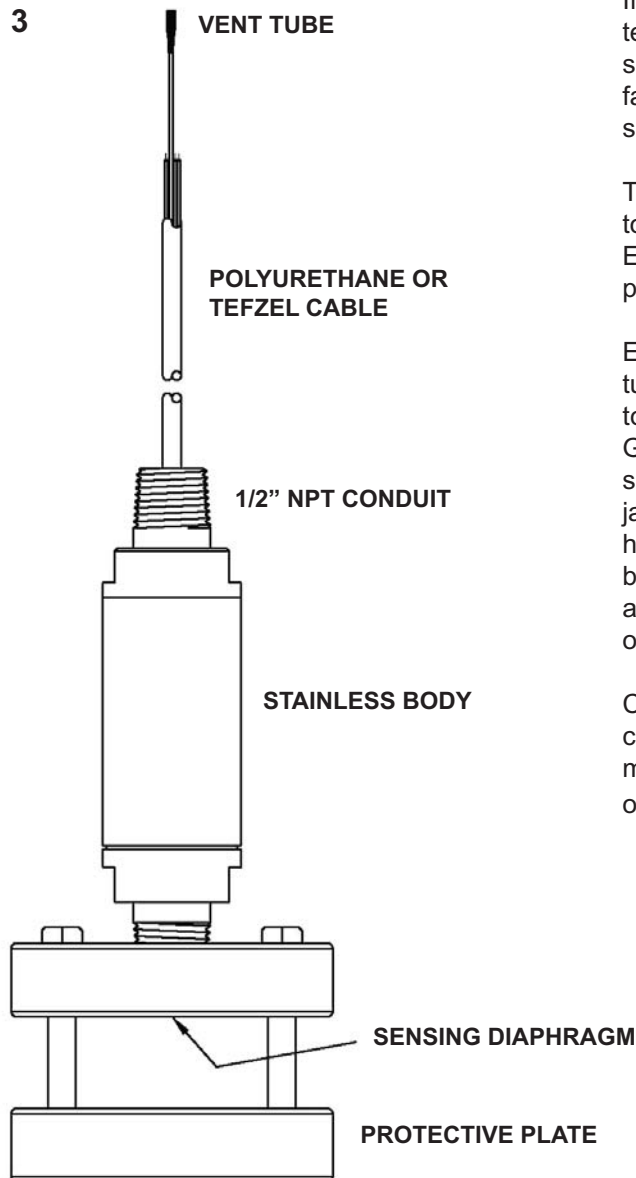
Fowling or plugging of the sensor port will affect the reading and cause either slow response to readings or no reading at all. If it appears a substance has plugged or fouled the transmitters opening, typically flushing this end of the transmitter in a warm bucket of water will loosen the debris. A mild non-corrosive detergent may be used to soak the transmitter portion to further loosen debris.



The Model 311-M351 has a special baffle plate attached to the transmitters sensor face. (See fig 3) This is to provide protection to the sensor face during installation, operation and handling. This protective plate should not be removed unless absolutely necessary. Doing so will expose the sensor face which can be damaged if not handled properly.

If this transmitter becomes clogged during use, flushing this end of the transmitter in a warm bucket of water should loosen debris. A mild non-corrosive detergent may be used to soak the transmitter in to further loosen debris.

**Fig. 3**



If this does not resolve the issue then carefully remove the protective baffle. Removing this baffle will not effect calibration. No sharp instruments should be used to scrape or brush the sensor face. This may damage the sensor. It is best to then soak the sensor in a bucket of warm soapy water as described earlier.

The baffle plate should then be carefully reinstalled insuring not to strike the sensing diaphragm with any sharp or blunt object. Excessive pressure on the sensing diaphragm could also over-pressure the transmitter.

Each submersible transmitter is supplied with a barometric vent tube which is integral to the cable. This vent tube is connected to the reference side of the sensor inside the housing (see GP:50's tech note 2 – Breathing philosophy for a thorough description of this). The other end is terminated outside the cable jacketing with a special porous breather element. This element helps eliminate water intrusion into the vent tube. Care should be taken when installing the terminated end of the cable in a dry area outside the elements. A simple enclosure as shown previously in the manual will help protect this vent filter.

Care should be taken to insure the integral cable does not become cut or nicked during use or installation. Failure to do so may cause water intrusion into the cable and eventually failure of the transmitter.



In the event this breather element becomes damaged or torn off the vent tube, GP:50 can supply a replacement element. Part No: VT-PB. Consult the factory for this part

If upon receipt of your device it is evident the cable supplied was not ordered to the correct length or if you wish to add more length a simple solution is to provide a termination box where the vented cable from the transmitter can be spliced to any non-vented or vented cable. The termination box can be vented but not allow water to intrude. Fig 2 previously shown, displays typical terminations. Never splice the cable and submerge under water. GP:50 has found that an underwater splice is unreliable and prone to failure.

If the transmitter fails to respond or provide proper readings a few simple trouble shooting techniques should be employed before sending the unit back to the factory or replacing.

If possible isolate the transmitter from the reading device such as a panel meter or PLC. If possible use a different power supply and handheld multimeter that is capable of reading the 20mA or 5 VDC output.

This ensures that the transmitter is the culprit in question in the system. If the transmitter reads the proper output then the power supply, meter or PLC may be at fault.

If isolating the transmitter from the system still provides poor or no reading the transmitter should be removed from the system and visually inspected. If damage to the cable is found it is likely that water intrusion has occurred and the assembly cannot be repaired and a replacement unit must be purchased. If upon visual inspect all looks good a continuity check may be performed between the power or signal wires and the case of the transmitter. A reading between the signal or power wires and the case or shield /ground wire probably indicates a short by water intrusion or it may indicate a lightning strike has damaged the unit.

If the failure still is uncertain returning the transmitter to GP:50 for analysis is recommended. GP:50 requests that the transmitter be sanitized if in a sewage application and then sent back.

Please contact the factory first to obtain an RMA number. A request for RMA can also be found on our web site [www.gp50.com](http://www.gp50.com).

If you have any further questions regarding installation, care and handling or trouble shooting please feel free to contact one of our application specialist to assist you.

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