



# **INSTALLATION, OPERATION, & MAINTENANCE GENERAL MANUAL**

**Thermaflo Engineering Company**

## **STEAM-TO-STEAM GENERATORS**

Note:

Each Thermaflo Clean Steam Generator has its own unique detailed submittal data that is detailed by Item. In most cases this IOM is attached to the submittal data. Each individual item has an IOM for the particular part for reference.

Please contact Thermaflo with the specific project number so that your correct project submittal can be located.

**NEVER ATTEMPT TO STARTUP BEFORE READING THIS  
MANUAL**



## THERMAFLO ENGINEERING COMPANY, INC. LIMITED WARRANTY AND REMEDY

Thermaflo Engineering Company Inc. warrants to the original user of the Thermaflo Engineering equipment supplied by it and used in the service and in the manner for which they are intended, that such product shall be free from defects in material and workmanship for a period of 1 year from the date of installation, but no longer than 18 months from the date of shipment from the factory (unless a special warranty period applies as listed below). This warranty does not extend to any product that has been subject to misuse, neglect, or alteration after shipment from the Thermaflo Engineering Company factory, except as may be expressly provided in a written agreement between Thermaflo Engineering Company and the user, which is signed by both parties.

THERMAFLO DOES NOT MAKE ANY OTHER REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

The sole and exclusive remedy with respect to the above limited warranty or with respect to any other claim relating to the products or to the defects or any condition or use of the products supplied by Thermaflo, however cause, and whether such claim is based upon warranty, contract, negligence, strict liability, or any other basis or theory, is limited to Thermaflo's repair or replacement of the part or product, excluding labor or any other cost to remove or install said part of product, or at Thermaflo's option, to repayment of the purchase price. As a condition of enforcing any rights or remedies relating to Thermaflo products, notice of any warranty or other claim relating to the products must be given in writing to Thermaflo: (i) within 30 days of the last day of the applicable warranty period, or (ii) within 30 days of the date of the manifestation of the conditions or occurrence giving rise to the claim, whichever is greater. In no event shall Thermaflo Engineering Company be liable for special, direct, indirect, incidental, or consequential damages including, but not limited to, loss of use or profits or interruption of business. Thermaflo Engineering Company will not be held responsible for piping leaks after factory hydrotesting. Remedy of piping leaks



and their prompt repair are the sole responsibility of the installer or user. The Limited Warranty and Remedy terms herein apply notwithstanding and contrary terms in any purchase order or form shall be deemed rejected by Thermaflo Engineering Company Inc.

### STANDARD TERMS & CONDITIONS

1. All purchase orders are subject to written acceptance at the office of Thermaflo Engineering Company, 2880 Fair Avenue Newberry, S.C. 29108.
2. Cancellation charges of 100% will apply if cancellation occurs after receipt of signed submittal drawings and release for fabrication.
3. Payment Terms: Net 30 Days from date of invoice unless other terms are stated as part of our quotation.
4. All invoices over thirty days will be subject to finance charges of 1½% per month.
5. Warranties are the responsibility of the manufacturers represented by Thermaflo Engineering Company. A copy of the manufacturer's standard warranty may be included with this proposal.
6. All sales are FOB: Factory unless otherwise specified by Thermaflo Engineering Company. Transportation will be at the buyer's sole risk and claims for loss or damages in transit are the responsibility of and must be filed by the buyer within 5 days of shipment delivery.
7. No terms, warranties, or guarantees express or implied, except as stated herein, shall apply to any quotation, sale, or contract for sale unless approved in writing by Thermaflo Engineering Company.
8. If shipment is deferred at buyer's request, payment shall nevertheless be due after notice to the buyer that the equipment is ready for shipment. Reasonable storage charges shall be paid by the buyer after seven days.



## INTRODUCTION

Thermaflo Engineering Company (TEC) manufactures steam-to-steam generators using high pressure steam (150 psig max) to produce lower pressure clean steam. Thermaflo generators can also use high temperature hot water or hot oil to produce low-pressure steam. This manual will review all aspects of operation in a complete but general nature.

Each generator is custom engineered to furnish clean or pure steam to its users. All Thermaflo Steam-to-Steam Generators are furnished with manuals on each of the controlling or indicating components. These individual manuals should be reviewed for proper operation and troubleshooting if necessary.

All Thermaflo Engineering Steam-to-Steam Generators are constructed to the strict guidelines of the ASME Code and stamped in accordance with this code. Local codes should be reviewed before installation and made available to Thermaflo Engineering Company.

Thermaflo Engineering Company is not responsible for product damages or injuries due to the improper operation or maintenance of its equipment.

Thermaflo Engineering Company selects and uses products of other manufacturers to properly control their equipment and cannot be held responsible for the proper maintenance and operation of the components or the manuals furnished by these manufacturers. These manufacturers are selected on their high quality and past experienced reliability. Their manuals should be reviewed and Thermaflo Engineering strongly encourages that these companies be consulted as the need requires for information, maintenance, or operating manuals.

Always refer to your specific submittal data and product data sheets for details.



## GENERAL OPERATIONAL DESCRIPTION

Thermaflo Engineering Steam-to-Steam Generators are constructed with two major component systems.

➤ *U Tube Heat Transfer Bundle*

This is the inner tube U bundle. The steam, high temperature water, or hot oil enters the generator at the tube bundle head and delivers the heat to the feedwater until it changes from a liquid state into the vapor state STEAM. Steam is a useful but hot and dangerous medium. Frequent startup and shutdowns are NOT recommended and will lead to tube failure not covered by warranty.

➤ *Feedwater or Makeup System*

As the liquid feedwater is changed by heat energy into a vapor state STEAM, and is delivered out to its point of use, it must be replaced by additional feedwater or makeup so that the vapor supply can continue to be delivered. The feedwater system automatically replenishes this makeup to the generator shell where the change in state can take place.

The heating supply in most cases is high-pressure steam or a steam at a higher pressure in the tubes than is being produced from the shell. This source steam is controlled to the tube bundle by a steam control valve and a feedback controller. The feedback controller senses the clean steam pressure being produced in the shell, compares the pressure to its set point, and sends the steam control valve a signal as to open or close proportionally to hold the set point. The standard steam control and makeup water control valve is the Thermaflo JVV Segmented V steam control valve. Please refer to the JVV Control Valve IOM for reference on this valve.

As the feedwater in the shell (outside the inner tube bundle) is heated by the incoming steam (inside the tube bundle) to its saturation point, the feedwater changes state and becomes a vapor (steam).

As the steam flows from the generator outlet to its point of use, the feed water level drops. A level controller senses this level drop and sends a control signal to the makeup control valve to open or close in order to hold a precise level of feedwater in the shell. All Thermaflo Generators are fitted with a modulating feedwater level system to ensure steam quality of the discharge.

These two systems operate in conjunction with each other to create a supply of clean steam to its users. Some generators are fitted with feed water stainless steel preheaters which accept the main coil condensate into its shell and preheat the incoming feed water to the shell. Please refer to your submittal and specific drawing for details.

### **Control Panel Operation Note:**

***\*\*Important- Repeated cycling of power on the Watlow 98 series controller will cause saved program error. The Watlow 98 was used from 2001-2020. After 2020 the EC1000 was used. This will void the factory warranty setup in the controller.\*\****

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www.thermafloengineering.com



## INSTALLATION

- *Location*

Thermaflo Steam-to-Steam Generators should be located in a space where maintenance, when required, can be performed without removal of other equipment. A major consideration for installation would be the unobstructed distance in front of the head for tube bundle removal. This distance is indicated on the submittal drawing furnished with each unit. A proper housekeeping concrete pad should be constructed of approx. 4" in height so that the loner saddle or frame supports are not subjected to water, chemicals, or excessive moisture causing rust or deterioration. Steam supply, clean steam outlet, and feedwater piping connections should be close to the unit for ease of accessibility. A proper blowdown drainage point should be located in the area and it is highly recommended to use a Thermaflo type JASR or JSA Blowdown Aftercooler /Separator unit to accommodate blowdown in the area. **REMEMBER: Do not discharge hot blowdown above 140 °F to drain. Check with local codes for proper drain regulation.**

- *Mounting/Install*

The Thermaflo Steam-to-Steam Generator should be properly secured to the housekeeping pad or floor. Anchor points are provided with each unit for this purpose. Be sure to check the specifications for proper fasteners and seismic codes for the site or project.

- *Steam or HTHW Supply Piping* **VERY IMPORTANT READ**

The supply steam piping should be saturated and dry. A main drip trap point is supplied with each unit located at the inlet to the control valve. The steam supply line should never be smaller than the source steam inlet connection. The inlet source steam connection can be located in the submittal drawing connection schedule and has been properly sized for the load by Thermaflo. The main supply line should have a full size drip point within 24" of the main steam control valve or a HSS steam separator to eliminate condensate from the process steam supply. This also stops control valve seat failures and tube bundle failures. **The steam piping MUST be 100% supported so NO weight loading is on the head or gasket leaks will occur over time.**

Water hammer will destroy the tube bundle and control valve internals. Always start up the system slowly to avoid this situation. It is always advisable to contact your local Thermaflo representative about proper steam piping design.

Loading recommendations are the same for HTHW. Always include a strainer on the inlet. Dry steam means long life and optimum performance.

- *Feedwater Supply*



The feedwater supply to the generator should be clean, filtered, and softened to avoid hard water scale out. Deionized and RO water can be used in the standard Thermaflo THCS Clean Steam Generator but should be in the 6-8 PH range and monitored constantly. A range of 100 to 1500 us/cm microsiemens per centimeter is considered normal or basic guidelines. The feedwater supply should be at least one pipe size larger than the feed water control valve size to allow for minimum pressure drop on long runs. The feed water pressure should always be at minimum 15 psig above the clean steam pressure being generated. For example, if the clean steam pressure being generated is 15 psig, the feedwater pressure should be 30 psig minimum. **Water should be no more than 1 grain per gallon hardness. Hardness buildup will greatly reduce the heat transfer rate and reduce capacity. Hardness buildup will expand the inner tubes as it grows and pull tubes from the tubesheet and create uneven pressures at the head gasket causing gasket leaks. It is 100% the responsibility of the user to maintain the hardness at or below 1 grain per gallon.** Timed blowdown is standard on all THCS clean steam generators. The blowdown rate is set based on operating pressure and type of water used. All feedwater level control valves must be calibrated with the system or high and low levels can persist. All Thermaflo Steam-to-Steam Generators require a check valve on the outlet of the clean steam outlet and a the makeup level control valve. If the generator is being supplied feedwater via a feed pump, a feedwater control valve may or may not be furnished. Check the 'Submittal Sheet' or contact your Thermaflo representative. Installers should be careful when using Teflon tape or excessive joint compound as not to let this material flow into the check valve or feedwater control valve. Correct water treatment is 100% the responsibility of the user.

- *Safety Relief Valves*

Each Thermaflo Steam-to-Steam Generator is fitted with pressure safety relief valves to protect the shell against overpressure and not the clean steam system. Clean Steam system should employ a separate valve for this function if deemed required. The outlet should be piped unrestricted to atmosphere. Never install a valve of any type on the outlet of the safety valve. This could cause serious injury and major damage to the generator. Local piping codes and engineers' specifications should be followed.

The discharge point should be to an area where it cannot be in contact with any person, equipment, or other obstruction. The discharge will consist of steam and hot water and is dangerous. It is the sole responsibility of the installer to locate, size, and pipe the discharge correctly.

Safety relief valves should be tested often minimum yearly and for proper operation per local codes for proper function.

- *Electrical Connections*

Thermaflo Steam-to-Steam Generators require a single point power connection in most cases. The source power requirements are 110 volt / 1 phase / 60 Hz except when noted on the project 'submittal sheet'. Electrical power should be furnished to the unit via proper wiring codes by a certified electrician. A 20 Amp service is recommended.

- *Surface and Lower Blowdown Piping*

As indicated earlier, Thermaflo Steam-to-Steam Generators require blowdown for operation when using standard soft water. A series of valves are located on the bottom of each shell for this purpose. The blowdown discharge line should be the same size as the valve provided and should be piped to a properly. Shell blowdown should be done monthly for 3-5 seconds.

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Blowdown is very hot and can cause injury to personnel if proper precaution is not taken with the discharge piping.

Other blowdown points from the generator should also be piped to drain. These points include the level controller and surface blowdown valve.

Local codes and engineers' project specifications for blowdown piping should be followed.

Hot blowdown should never be discharged to drain without a properly installed tempering system for cooling.

When using RO or Deionized Water for Clean Steam makeup blowdown of the surface is not as important so a timer blowdown is always installed and is generally set for 1 minute duration 2 times in 24hrs, The bottom blowdown valve should be operated on a biweekly basis for 3 seconds. This means open and close the valve for a short count of 3 seconds. Standard city softened water the surface blow down is set for 1 minute duration 2 times in 24 hrs. Lower blowdown same duration but weekly. **The timing is fully adjustable on the EC1000 controller and can be set time and duration.**

These parameters are set at the factory depending upon the type of water used.

- *Clean Steam Outlet*

The outlet clean steam discharge connection will be sized for the application. Check the project 'submittal sheet' for this size. Never downsize this line or proper flow could be compromised for capacity. **Always install a check valve on the generator outlet to avoid backflow to the shell which will cause high level alarm problems. Or if space is a concern the installer can locate an elbow directly off the outlet and slope all discharge piping away from generator to trap station. This is the installers responsibility.**

- *Condensate Return Piping*

Each Thermaflo Steam-to-Steam Generator is fitted with a properly sized F&T (Float & Thermostatic) steam trap to drain the inner energy source steam coil and a main drip trap at the control valve inlet. **The size of the condensate line will be indicated on the individual 'submittal sheet' for the unit and should never be downsized or piped to a pressurized return or lifted overhead. Install a condensate pump to allow proper drainage to return.** Proper condensate piping will enable the generator to operate properly without water hammer and thermal shock. **Condensate from clean steam generators will exceed 212F at all times. Proper flash tanks or condensors along with proper piping practice should be used.**

- *Piping Confirmation*

All Thermaflo Steam-to-Steam Generators are fitted with high quality pipe fittings and valves and have been factory hydrotested for leaks. During transportation from the factory to jobsite locations, road travel vibration, and jobsite fitups can work a joint loose. Upon startup, all joints should be inspected for leaks and some retightening may be required. **Any leak should be retightened before erosion takes place at the joint immediately.**

- **Never allow steam supply piping or condensate return piping to be supported in any way on the clean steam head connections or this will eventually cause head gasket leaks. The thermal expansion will pull at the head bolts and remove proper torque.**





Thermaflo Engineering Company cannot be held responsible for leaks or piping drips after hydrotest and shipment from the factory. It is the sole responsibility of the installer to provide full piping confirmation after shipment and eliminate any leak points found. The installer shall also follow proper retorquing procedures as listed in this manual before and after startup to avoid head and gasket leaks. Clean steam system piping must be the same materials as the generator construction. For example 316L generator materials piping should be 316L not carbon steel.

**NOTE: Always refer to your specific generator submittal package and drawing for individual details on each component.**

**STARTUP PROCEDURE**

*Foreword*

It is advisable to the installer to have a factory representative or trained manufacturer's representative on site and present for startup assistance. All 'submittal sheet' details and component manufacturer's data should be reviewed before startup is attempted. **READ CAREFULLY** Unless otherwise specified all Clean Steam generators are preprogrammed and are equipped with a slow startup feature in the PID controller. NOTE: All THCS EC1000 Controller equipped generators after Jan 1, 2023 are furnished with a slow staged steam and feedwater startup system that slowly over time brings on the steam supply and feedwater level valve to avoid thermal shock, piping stress and waterhammer. **STARTUP:**

1. The main steam valve should be closed and the outlet steam valve from the shell should be closed. **Do not open any steam valves until the level has been set, and the system controller is completely functional.**

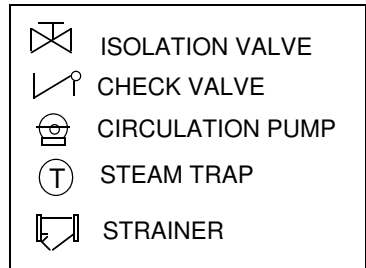
2. The lower blowdown valves should be closed. Open the condensate valves on trap outlets.
3. Most units are equipped with Vega 63 level transmitter or a Vega 63 level switch makeup always refer to your specific submittal before starting the equipment. Level switches do not require calibration and filling of level lines but the DP transmitters do. See DP fill instructions located at the end of this manual. DP Transmitters were discontinued on 2020.
4. Electrical power should be turned on to the unit. This will power up the control panel. With the shell empty of feedwater at this point, the low level alarm will sound. Push the silence button and open the manual valve on the feedwater supply line. This will allow feedwater to enter the shell through the feedwater JVV control valve. If a feedwater pump is being used for fill, this action will start the pump, sending feedwater into the shell.
5. The feedwater will begin filling the generator shell and the low level alarm will shut off as this level comes up. A sight glass has been provided with the level controller assembly so that the operator has a visual sight of this process. Be sure power is on both control valves.
6. The inlet filling feedwater will reach a point just below the inner tube bundle or about the halfway point on the level gauge before the level controller closes the makeup feedwater control valve and or stops the feed pump. *Note: In some cases, the feed pump runs continuously and the feedwater control valve will stop the feedwater fill flow see data sheet. All feedwater valves are modulating type after 2009 manufacturing date.*

It is critical that this fill cycle function properly in order to operate the generator.

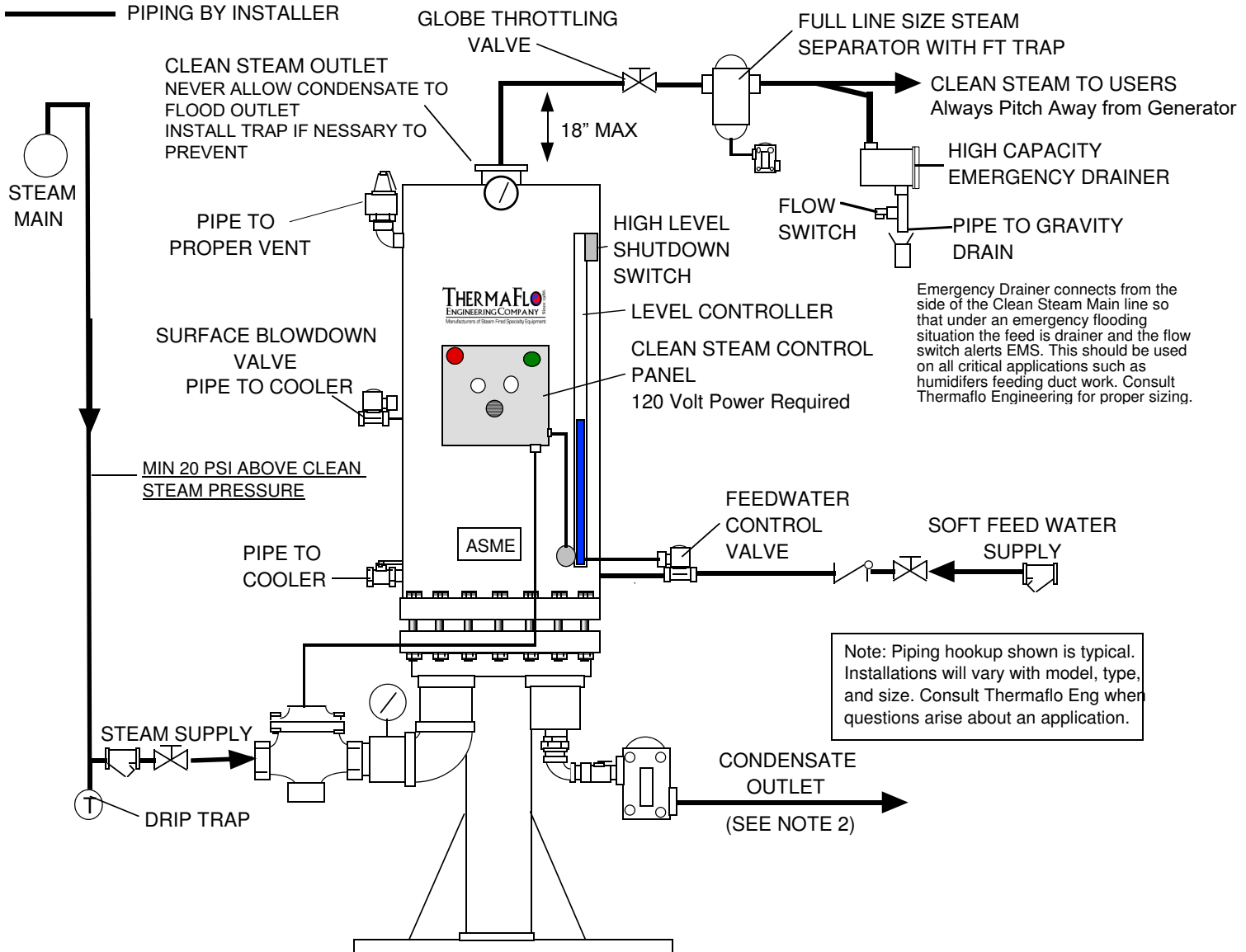
**Levels are preset at the factory before shipment approx 24" above the shell flange. Do not change this without consulting with the factory.**



7. With the shell filled with feed water and the level controls operating properly, the steam source to the tube bundle can be started. Do this manually very slowly with the isolation valve. Two types of level controls are used for the Clean Steam Generators (A) Differential Pressure Transmitter 2008-2020, (B) High Temp Vega 63 Probe Transmitter after December 31, 2020. The DP transmitter will require a span zero before putting into service see instructions attached. The Vega Probe requires no adjustment. The Vega Probe instructions are attached. The Vega Probe can be easily recognized by a bright yellow head. Levels are preset at the factory. Check and make sure power is on to both the JVV level and pressure control valves. Low alarm will be on until water fills generator.
8. Set the shell pressure controller to the desired set point (refer to the 'submittal sheet'). *The Clean Steam Outlet setpoint is factory set per order. This is on Channel 1 of the controller and is clearly displayed on the EDA or DPG Pressure Transmitter located on the upper shell. The transmitter or Vega probe sends the 4-20 ma clean steam shell pressure signal to the controller. (See the P51 data sheet attached to this IOM furnished after 2020)* Now slowly open the inlet supply steam valve and feed steam to the JVV pressure control valve. This procedure should be done very slowly so that thermal expansion of the inner tube bundle can take place. The clean steam pressure in the shell will slowly begin to rise to the set point on the controller and the source control valve will begin to modulate closed to hold this set point. **If the unit is started unsupervised water hammer and thermal shock will occur and cause bundle failures and gasket and fitting leaks. See prior note on staging.**
9. At this point on the initial system startup, the generator should be held at setpoint pressure for a period of 30 minutes to assure proper cleaning of the generator shell. *If this is not the initial startup, proceed to Step 10.*  
After 30 minutes at setpoint, close the main energy source valve and slowly drain the shell via the bottom manual blowdown valve. Be sure the blowdown cooling system is operational. When the low level alarm sounds, close the bottom blowdown valve and allow the fill feedwater cycle to repeat. Again, slowly open the source valve and allow the generator to come back up to setpoint pressure.  
The main clean steam outlet valve can now be opened to the system. This should be done very slowly as to avoid thermal shock and water hammer. The valve should be opened in 5% increments to maintain control of the outlet clean steam flow. It is the responsibility of the startup installer to slowly warm up the clean steam system properly.
10. On initial startup, it is advisable to set a small steam purge to atmosphere for a minimum of 15 minutes to observe operation. Be sure to discharge steam to a safe place and at a low noise level.
11. At this point, the unit is ready for normal operation.
12. **Important: Head Bolts must be re-torqued after initial startup to prevent leakage between the gaskets located on either side of the tube bundle. Periodic torque checks should be done during scheduled maintenance. See pages 11 through 13 specifically for torque rating for correct torque procedure. Important.**  
**If any drip leak occurs torque immediately at the leak spot and follow sequential pattern at 10 additional ft/lbs. Head gasket leaks due to neglect and improper torque requirement procedure will not be considered warranty by Thermaflo Engineering as this is very clear.**
13. All Thermaflo Engineering, Inc. Clean Steam Generators are furnished with blowdown controls. Applications require different types. Review the type and setup so that proper calibration and operation occurs. Consult factory with questions.



## THCS Vertical Clean Steam Generator Unit Piping Hookup



**Notes:**

1. SUGGESTED PIPING DESIGN. DESIGNER SHOULD CONSULT LOCAL CODES TO VERIFY COMPLIANCE.
2. ALWAYS PIPE OUTLET CONDENSATE TO GRAVITY ATMOSPHERIC RETURN LINES, TO AVOID WATERHAMMER AND INTERNAL STEAM SPACE FLOODING.
3. ALWAYS PIPE SUPPLY STEAM FROM THE TOP OF THE HEADER AS SHOWN, AND INSTALL A MAIN DRIP BEFORE CONTROL VALVE INLET.
4. SOFT WATER 1 GRAIN PER GALLON MAX TO AVOID SCALING.
5. INSTALL A LINE SIZE SEPARATOR OR FULL LINE SIZE MAIN DRIP WITH FT STEAM TRAP TO AVOID CARRYOVER. PITCH STEAM LINE AWAY FROM THE CLEAN STEAM OUTLET. ALWAYS PIPE OUTLET STEAM INLET INTO THE TOP OF THE HEADER AND PITCH LINE AWAY TO AVOID CONDENSATE BACKFLOW AND HIGH LEVEL. CHECK VALVES SHOULD BE INSTALLED DIRECTLY ON THE OUTLET AND NEVER ALLOW CONDENSATE TO DRAIN FLOOD OUTLET.
6. FEEDWATER SHOULD BE SUPPLIED 15 PSI MIN ABOVE CLEAN STEAM OUTLET PRESSURE AT ALL TIMES.
7. ALWAYS PIPE BLOWDOWN TO A COOLER BEFORE PIPING TO DRAIN.

## JVV Actuator Digital Display



"Set V" Actual Opening Position from the Controller  
"Angle" Actual Valve Opening Position

Manual Allen Head Over Ride Opening Slot

Visual Positioner Red is closed and Yellow is Open This valve is slightly 11.1% Open as example  
If no indication is showing 24V DC Power is not reaching the valve. If no Set V is showing no signal is reaching the valve.

Supply Voltage: 24V DC  
Signal: 0-10 Volts

## Important JVV Actuator Notes Please Read"

1. Never use the manual over ride while the valve is powered on with a signal or you will strip in internal gearing.
2. Before any manual steam or water makeup valves are opened on startup make sure the main controller is powered up and the JVV control valves are receiving power and charging up. On startup both valves should say 98 to 100% SetV and Angle because the generator is empty of makeup water and no shell steam pressure exist.
3. Both the process steam or HTHW side generator and makeup water valves are set to FAIL CLOSED. Test these before any manual valves are opened.
4. Never introduce steam or HTHW to the bundle side before setting the makeup level in the shell, opening the outlet clean steam discharge valve. Remember you must have a load to properly setup a clean steam generator.

## SHUTDOWN PROCEDURES

1. Close the main steam valve, feeding the heat exchanger bundle.
2. Close the outlet clean steam supply valve.
3. Shutdown the pneumatic and or electrical power and lock out these sources.
4. Slowly open the lower blowdown valve and drain the shell completely. This valve should remain open on shutdown.
5. Open the lower drain valve on the level controller assembly and sight glass.

### • Inner Bundle Removal

All Thermaflo Engineering Inc. internal bundles can be fully removed without disturbing the shell or source heating piping. This can be accomplished by shutting down all incoming and outgoing piping, and draining the generator. After the unit has cooled the lower head can be removed by breaking the source flanges and removing the head to shell bolts. The inner bundle drops from the bottom on a vertical and from the front on a horizontal unit. After cleaning or inspecting the bundle. Replace the inner and outlet gaskets and slide the bundle back into the shell with head matching cross section plate for 2 pass steam. In the bundle tube sheets for all generators 1/2" lifting points are installed to help facilitate the vertical lift. Install head bolts and retorque to the specifications attached below. All Thermaflo heads are fitted with heat treated B7 ANSI bolts.

Reinstall the source heating inlet and outlets and startup up, After an hour of run time retorque the bolts to avoid leaks due to thermal expansion.

**Note: After December 2020 the clean steam generators have been equipped with a 2" visable bundle view port. Remove this flange and inspect before removal. On a yearly basis this flange can be removed to inspect the actual bundle apperance for any scale or buildup.**

**See Maintenance Section of this Manual.**

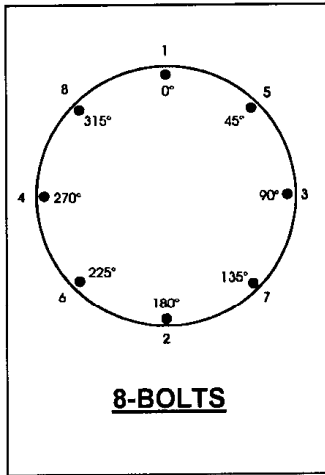



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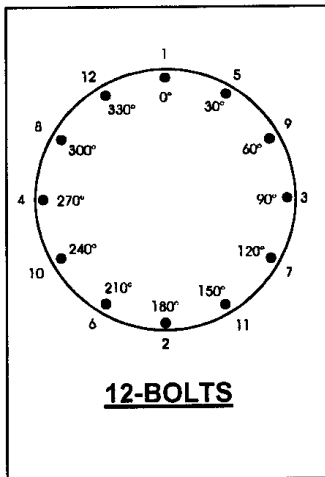
## Appendix A

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### Bolt Torque Procedure



<u>SEQUENTIAL ORDER</u>	<u>ROTATIONAL ORDER</u>
1 - 2	1
3 - 4	5
5 - 6	3
7 - 8	7
	2
	6
	4
	8

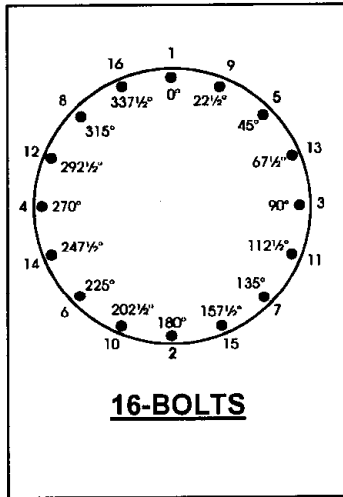


<u>SEQUENTIAL ORDER</u>	<u>ROTATIONAL ORDER</u>
1 - 2	1
3 - 4	5
5 - 6	9
7 - 8	3
9 - 10	7
11 - 12	11
	2
	6
	10
	4
	8
	12

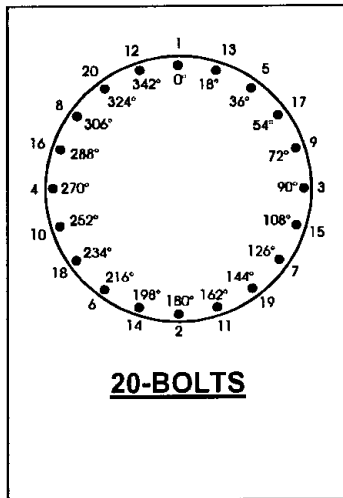


**Appendix A (cont'd)**

**Bolt Torque Procedure**



<u>SEQUENTIAL ORDER</u>	<u>ROTATIONAL ORDER</u>
1 - 2	1
3 - 4	9
5 - 6	5
7 - 8	13
9 - 10	3
11 - 12	11
13 - 14	7
15 - 16	15
	2
	10
	6
	14
	4
	12
	8
	16



<u>SEQUENTIAL ORDER</u>	<u>ROTATIONAL ORDER</u>
1 - 2	1
3 - 4	13
5 - 6	5
7 - 8	17
9 - 10	9
11 - 12	3
13 - 14	15
15 - 16	7
17 - 18	19
19 - 20	11
	2
	14
	6
	18
	10
	4
	16
	8
	20
	12



### Bolt Size and Torque Requirements

Heat Exchanger Bolt Size # of Bolts Torque FT/lb 150lb Flg

Size	Bolt Size	Qty	Torque Required Min
6"	.75	8	117
8"	.75	8	210
10"	.87	12	210
12"	.87	12	260
14"	1.00	12	317
16"	1.00	16	490
18"	1.13	16	710
20"	1.13	20	710
24"	1.25	20	1000

### Garlock 5500 Gaskets

#### **Maintenance**

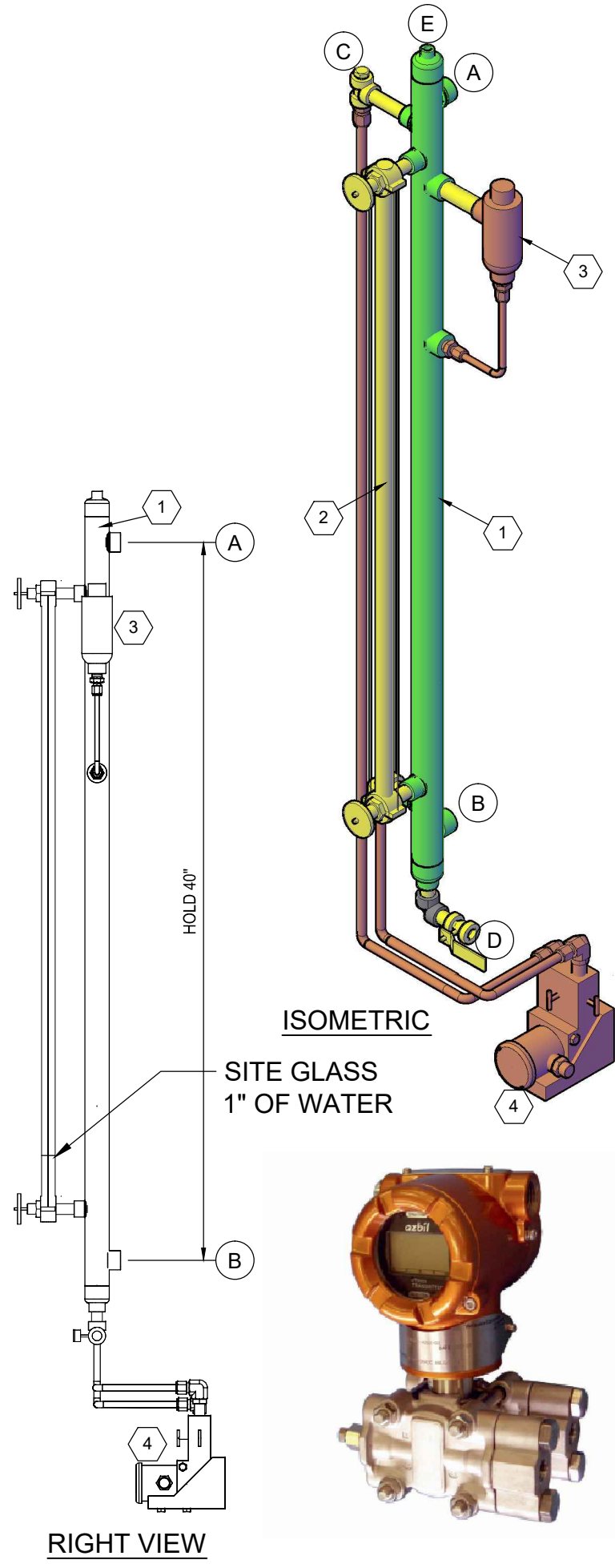
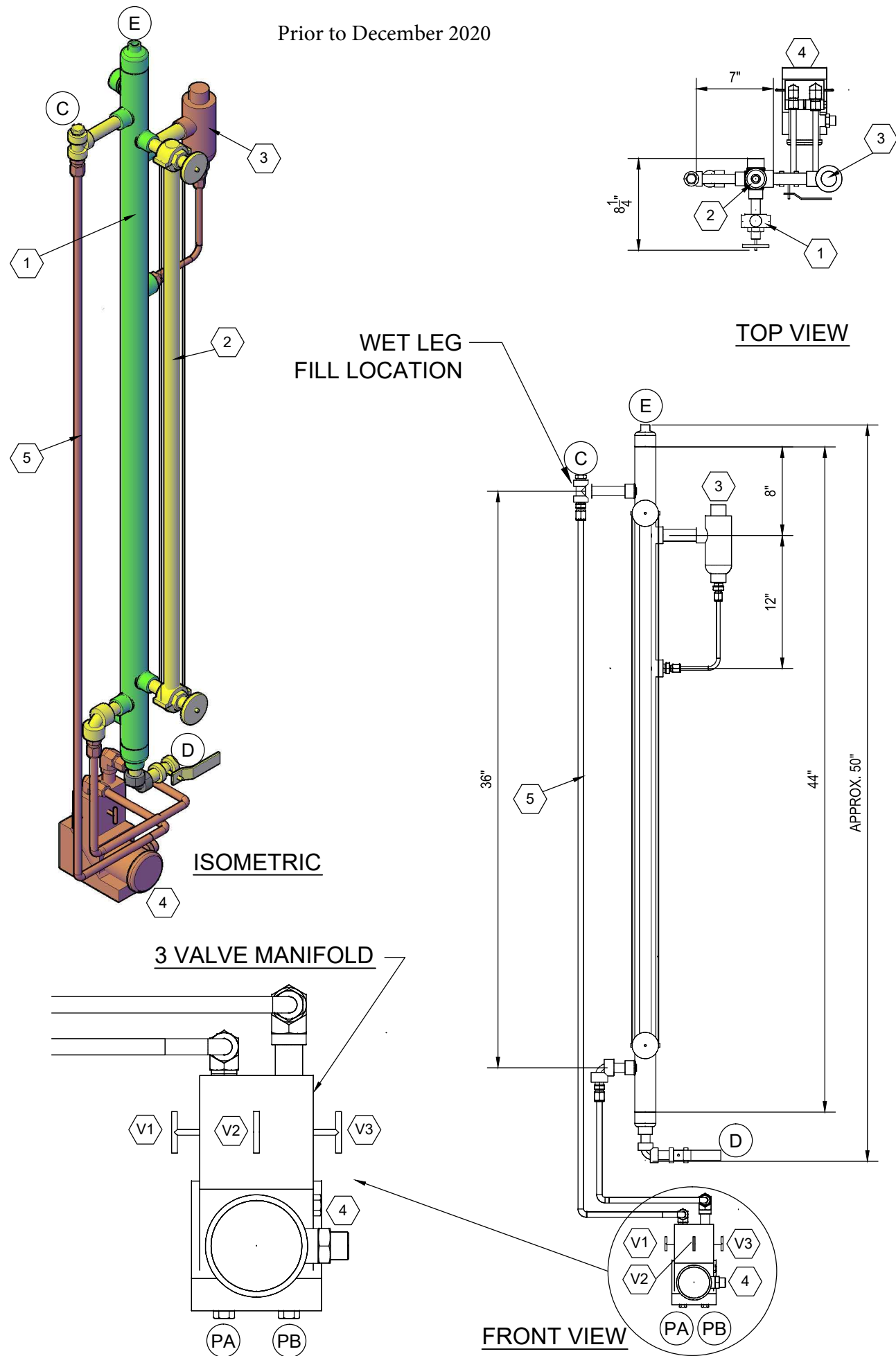
##### Monthly:

1. Check the sight glass to make sure the level is clearly visible. If the sight glass is becoming cloudy schedule cleaning at a shutdown.
2. Check to make sure the system is holding the desired outlet clean steam pressure and the makeup and steam control valves are modulating properly.
3. Check the timer blowdown for operation. This is generally set for 1 minute duration twice daily however the timer does have a test button.
4. Check operation of the inlet steam and shell pressure gauges for function.
5. Check the inlet makeup water for hardness and log results.
6. Manually blowdown the shell for 2-3 seconds with the lower hand valve at the bottom of the shell. This will remove and scale buildup in the shell.

##### Yearly:

1. After December 2020 each Thermaflo Clean Steam Generator has been equipped with a 2" flanged port at the lower shell so that the condition of the inner bundle can be viewed. Shutdown the generator after blowing down for 5 seconds while operating at normal pressure. Allow the unit to cool and isolate all inputs of water and steam manually. Remove the 2" 150lb blind flange and observe the inner tube bundle. The bundle stainless steel tubes should be clearly visible with no buildup. If buildup is visible remove bundle and clean with high pressure water only, and reinstall. Gasket and Torque instructions are listed above.

Prior to December 2020



DESIGN DATA		
CONDITIONS OF SERVICE AND PERFORMANCE DATA		
Max. Operating Pressure	50 PSIG	
Max. Operating Temperature	300° F	
BILL OF MATERIALS		
Item	Description	
1	ThermaFlo Engineering LS Level Standpipe Manifold 1 1/2" diameter 316 stainless steel construction complete, overall length to fit shell as applicable, rated 50 psig @ 300F operating pressure and temperature fitted with a 1/2" lower drain valve.	
2	Conbraco Model 23 - 450 Sight Glass Assembly complete with isolation and check valves, stainless steel construction, fitted with internal check valves and clear visual tank level sight glass with protection rods ASME style to check in stock conforming to	
3	GEMS LS-800-5 High / High Independent Shutdown Switch	
4	DIFFERENTIAL PRESSURE LEVEL TRANSMITTER	
5	316L Stainless Steel Tube & Fittings	
CONNECTIONS		
Item	Size (in.)	Service
A	3/4	Upper Tank Connection
B	3/4	Lower Tank Connection
C	1/2	Low Leg Fill Point
D	1/2	Drain
E	1/4	Vent

**How to Calibrate:**

- Unit needs to be at atmospheric pressure to begin, make sure all unit's inlets and outlets are closed (steam and water).
- Remove plug from SS tee at top of stilling well and open valves V1, V2 & V3 on 3-valve manifold transmitter is mounted to (see diagram for valve #'s); turn counterclockwise to open, clockwise to close.
- Slowly pour water into tee until there is approx. 1" of water visible in sight glass.
- Use adjustable or socket wrench to bleed water out of ports PA & PB on the bottom side of the manifold. Just allow water to trickle out of each port for 1 second or so, this is to remove any air pockets from the manifold and SS tubing attached.
- Close valve #V3 on manifold.
- Make sure "wet leg" (tubing connected to valve V1 on manifold) is completely full of water, if not; slowly pour more water into the tee that was unplugged to top it off.
- Drain water in sight glass to be level with the top of the lower sight glass valve nut.
- Use magnet stick provided with transmitter to set zero, this is done by holding the felt tip of the magnet stick to the bottom of the transmitter screen until screen briefly reads, "zero." To identify top and bottom of screen simply check the orientation of the writing on it.
- Re-plug tee at top of stilling well.
- Open make-up water valve and fill stilling well until water is level with the bottom of the upper sight glass valve nut.
- Hold felt tip of magnet stick provided to the top of the transmitter screen until screen briefly reads, "span."
- Drain stilling well until water only remains in about 10% of the sight glass.
- Check reading on Watlow controller screen (mounted onto generator's control panel).
  - Screen will usually be cycling between 2 readouts, loop 1 is pressure and loop 2 is water level. Loops 1 and 2 both display actual/set point.
  - At this time the top number for water level should be showing around 10 (should reflect % of sight glass full) and the bottom will be showing whatever level set point is, usually around 30.
- Allow make-up water valve to modulate to fill tank back up to set point and watch for 5-10 minutes to make sure unit maintains level control. Use a marker or zip tie to mark your set point on sight glass to help easily keep an eye on accuracy of level control.
- If needed, adjust level set point by using up and down arrows on Watlow controller to have set point at a level that will immerse the generator's coil about 2/3 with water.

\*SEE NEXT PAGE FOR LARGE PRINT\*

#	DATE	REVISION

**THERMAFLO**  
ENGINEERING INC. Since 1986

Manufacturers Of Steam Fired Specialty Equipment  
12249 Nations Ford Road, Pineville NC 28134  
(704) 940-1228 www.thermafloengineering.com

DESCRIPTION:  
**DP LEVEL CONTROL SYSTEM**

CUSTOMER:	JOB #	QTY.	DATE:
<b>Tech. Data Sheet</b>	-	-	03/25/15
SCALE:	DRAWN:	PO #	PLAN #
NTS	TCru	-	-
FILE:	REV. #	PAGE:	
CLS LEVEL SYSTEM	-	1 of 1	





## How to Calibrate DP Level Control System Used Prior to December 2020

1. Unit needs to be at atmospheric pressure to begin, make sure all unit's inlets and outlets are closed (steam and water).
2. Remove plug from SS tee at top of stilling well and open valves V1, V2 & V3 on 3-valve manifold transmitter is mounted to (see diagram for valve #'s); turn counterclockwise to open, clockwise to close.
3. Slowly pour water into tee until there is approx. 1" of water visible in sight glass.
4. Use adjustable or socket wrench to bleed water out of ports PA & PB on the bottom side of the manifold. Just allow water to trickle out of each port for 1 second or so, this is to remove any air pockets from the manifold and SS tubing attached.
5. Close valve #V3 on manifold.
6. Make sure "wet leg" (tubing connected to valve V1 on manifold) is completely full of water, if not; slowly pour more water into the tee that was unplugged to top it off.
7. Drain water in sight glass to be level with the top of the lower sight glass valve nut.
8. Use magnet stick provided with transmitter to set zero, this is done by holding the felt tip of the magnet stick to the bottom of the transmitter screen until screen briefly reads, "zero." To identify top and bottom of screen simply check the orientation of the writing on it.
9. Re-plug tee at top of stilling well.
10. Open make-up water valve and fill stilling well until water is level with the bottom of the upper sight glass valve nut.
11. Hold felt tip of magnet stick provided to the top of the transmitter screen until screen briefly reads, "span."
12. Drain stilling well until water only remains in about 10% of the sight glass.
13. Check reading on Watlow controller screen (mounted onto generator's control panel).
  - a. Screen will usually be cycling between 2 readouts, loop 1 is pressure and loop 2 is water level. Loops 1 and 2 both display actual/set point.
  - b. At this time the top number for water level should be showing around 10 (should reflect % of sight glass full) and the bottom will be showing whatever level set point is, usually around 30.
14. Allow make-up water valve to modulate to fill tank back up to set point and watch for 5-10 minutes to make sure unit maintains level control. Use a marker or zip tie to mark your set point on sight glass to help easily keep an eye on accuracy of level control.
15. If needed, adjust level set point by using up and down arrows on Watlow controller to have set point at a level that will immerse the generator's coil about 2/3 with water.
16. Keep an eye on water level control throughout remainder of start-up to make sure transmitter has been calibrated correctly as water level control is among the most important operating features of the unit.



## Vega 63 Makeup Water Transmitter Probe

Function Note: The Vega 63 Transmitter is fitted in the 316 stainless steel external stilling well and produces a 4-20 ma signal for 3 functions.

1. Level Control of the Makeup Water in the shell via the JVV Modulating Makeup Valve. The 4-20 ma signal is wired into the EC1000 Control Panel. The EC1000 panel has a PID level control loop that modulates the makeup valve to precisely hold level.
2. Generates a high level alarm before the high high level alarm shutdown the system.
3. Generates a low level alarm



Thermaflo Engineering Inc 704-940-1228

## Product information

### Capacitive

After December 2020 Thermaflo as a standard level controller employed the Vegacal 63 mounted in a side mount 316L stainless steel stilling well fitted with sight glass.

Level measurement in liquid

VEGACAL 62

VEGACAL 63 ←

VEGACAL 64

VEGACAL 66

VEGACAL 69




Makeup Level Controller  
4-20 MA Input to EC1000  
Touchscreen Panel.



## Contents

1	Description of the measuring principle .....	3
2	Type overview .....	5
3	Housing overview .....	6
4	Mounting instructions .....	7
5	Electrical connection .....	9
6	Adjustment .....	10
7	Dimensions .....	12

### Take note of safety instructions for Ex applications

 Please note the Ex specific safety information that you can find at [www.vega.com](http://www.vega.com) and that comes with each instrument. In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units. The sensors must only be operated on intrinsically safe circuits. The permissible electrical values are stated in the certificate.

## 1 Description of the measuring principle

### Measuring principle

Probe, measured product and vessel wall form an electrical capacitor. The capacitance is influenced by three main factors.

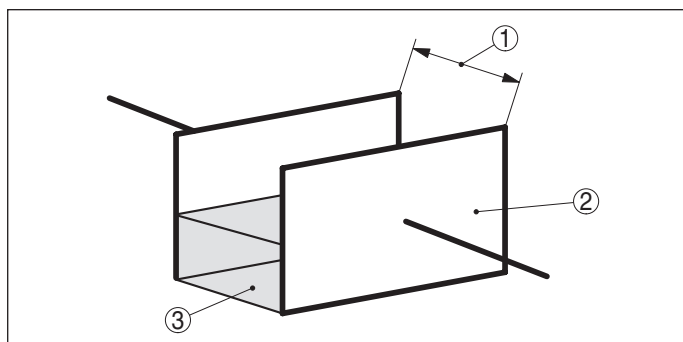


Fig. 1: Functional principle - Plate capacitor

- 1 Distance between the electrode surfaces
- 2 Size of the electrode surfaces
- 3 Type of dielectric between the electrodes

The probe and the vessel wall are the capacitor plates. The measured product is the dielectric. Due to the higher dielectric constant of the product compared to air, the capacitance increases as the probe is gradually covered.

The capacitance as well as the resistance change are converted by the electronics module into a level-proportional signal.

The more constant the conductivity, concentration and temperature of a product, the better the conditions for admittance measurement. Changes in the measuring conditions are generally less critical when detecting materials with high DK values.

The sensors are maintenance free and rugged and can be implemented in all areas of industrial measurement engineering.

Admittance probes have no minimum distances or dead band in which measurement is not possible.

Whereas partly insulated versions are predominantly used for solids, fully insulated versions are preferred for liquids.

### Corrosive and adhesive products

Implementation in very adhesive or corrosive products is no problem. Since the admittance measuring principle places no special requirements on mounting, a host of different applications can be equipped with VEGACAL series 60 probes.

### Wide application range

With measuring ranges up to 32 m (105 ft), the sensors are well suited for tall vessels. Temperatures up to 200 °C (392 °F) and pressures from vacuum to 64 bar (928 psig) cover a wide range of applications.

## 1.2 Application examples

### Liquid vessels up to 6 m high

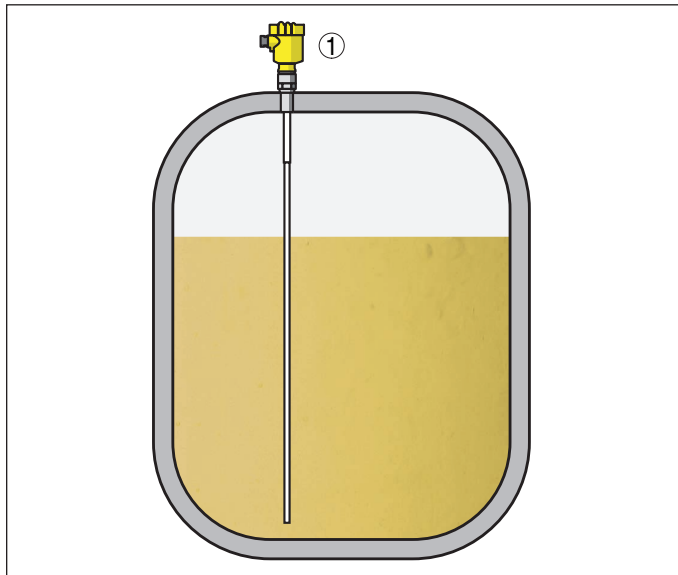


Fig. 2: Small liquid tank

- 1 Fully insulated rod probe VEGACAL 63

Admittance probes can be used in liquid vessels where products are stored or further processed. To avoid incorrect measuring results in applications with non-conductive products, the measured medium must always remain the same. A change of the medium (different dielectric value) necessitates a fresh calibration. When the conductivity is approx. 100  $\mu\text{S}/\text{cm}$  or above, different products or even mixtures can be measured without renewed calibration.

The dielectric value determines whether a partly or fully insulated probe must be used. If the value is in the range up to 5, a partly insulated probe will be sufficient, from 5 on, a fully insulated probe should be used.

Because admittance measuring probes have no dead band and impose no restrictions on mounting, they are well suited for small vessels. The measuring probes are not affected by high sockets and wall distances upwards of approx. 100 mm.

Advantages:

- No dead bands
- Low min. distance
- Unaffected by sockets and vessel installations
- High chemical resistance

### Liquid vessels higher than 6 m and vessels in roofed-over spaces

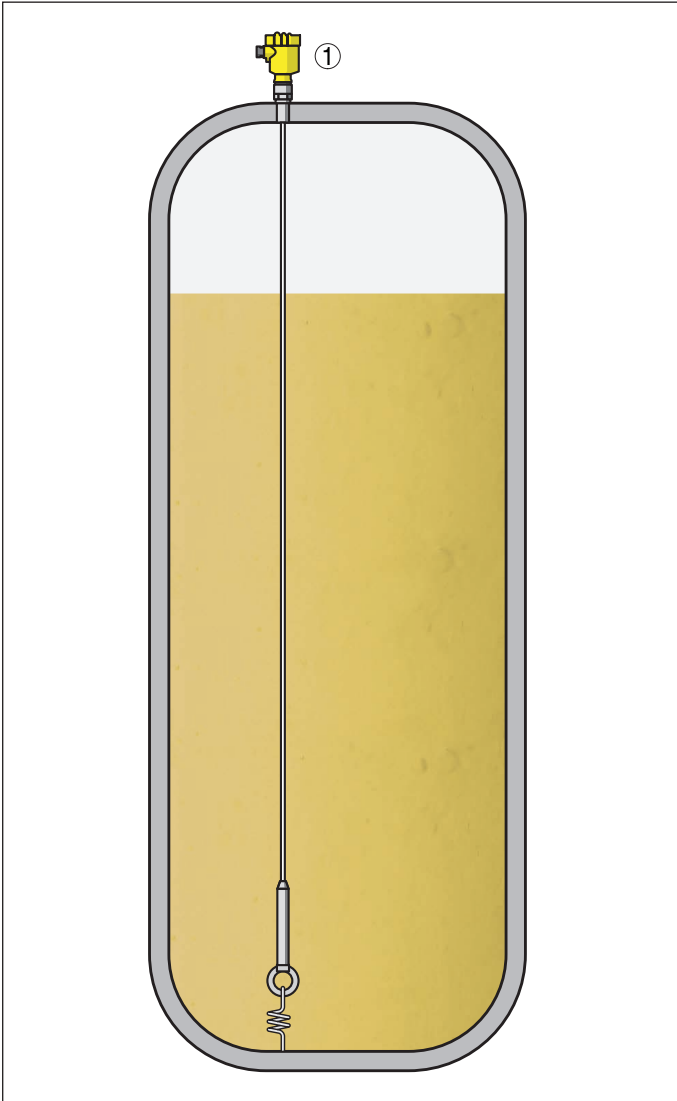


Fig. 3: High liquid tank

1 Fully insulated cable probe VEGACAL 66 mounted with straining spring

Cable measuring probes are preferred for tall vessels (higher than 6 m) and vessels situated in roofed-over spaces. Meas. lengths up to 32 m enable installation in very tall vessels. Flexible cable probes allow easy installation even in tight quarters.

Since the distance to the vessel wall should be stable, securing the gravity weight to the bottom of the vessel is recommended.

Advantages:

- Long meas. lengths
- No dead band
- Low min. distance
- Unaffected by sockets and vessel installations
- High chemical resistance

### Vessel with adhesive, conductive liquids

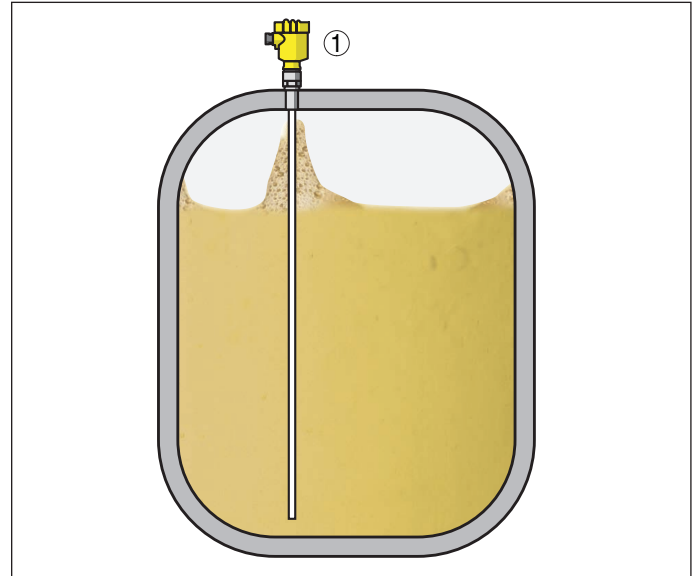


Fig. 4: Level measurement in very adhesive liquids

1 Fully insulated rod probe VEGACAL 64 for adhesive products

Whereas electrically non-conductive products are no problem for admittance measurement, adhesive, conductive products cause measurement errors. Due to the mechanical construction of VEGACAL 64 and the admittance processing, this effect is neutralised. Even strong conductive buildup is compensated and thus does not rule out good measuring results.

Advantages:

- Immune even to heavy buildup
- No dead bands
- Low min. distance
- Unaffected by sockets and vessel installations

2 Type overview

VEGACAL 62



VEGACAL 63



VEGACAL 64

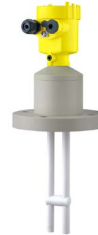


<b>Preferred applications</b>	Liquids, non-conductive	Liquids, conductive	Liquids, conductive
<b>Version</b>	Rod - partly insulated	Rod - fully insulated	Rod - fully insulated Suitable for very adhesive products
<b>Insulation</b>	PTFE	PE, PTFE	FEP
<b>Length</b>	0.2 ... 6 m (0.656 ... 19.69 ft)	0.2 ... 6 m (0.656 ... 19.69 ft)	0.2 ... 4 m (0.656 ... 13.12 ft)
<b>Process fitting</b>	Thread from G $\frac{3}{4}$ , flanges	Thread from G $\frac{3}{4}$ , flanges	Thread from G1, flanges
<b>Process temperature</b>	-50 ... +200 °C (-58 ... +392 °F)	-50 ... +200 °C (-58 ... +392 °F)	-50 ... +200 °C (-58 ... +392 °F)
<b>Process pressure</b>	-1 ... 64 bar/-100 ... 6400 kPa (-14.5 ... 928 psig)	-1 ... 64 bar/-100 ... 6400 kPa (-14.5 ... 928 psig)	-1 ... 64 bar/-100 ... 6400 kPa (-14.5 ... 928 psig)

VEGACAL 66










VEGACAL 69



<b>Preferred applications</b>	Solids, liquids	Liquids
<b>Version</b>	Cable - insulated	Double rod - fully insulated
<b>Insulation</b>	PTFE	FEP
<b>Length</b>	0.4 ... 32 m (1.312 ... 105 ft)	0.2 ... 4 m (0.656 ... 13.12 ft)
<b>Process fitting</b>	Thread from G $\frac{3}{4}$ , flanges	Flange (PP or PTFE)
<b>Process temperature</b>	-50 ... +200 °C (-58 ... +392 °F)	-40 ... +100 °C (-40 ... +212 °F)
<b>Process pressure</b>	-1 ... 64 bar/-100 ... 6400 kPa (-14.5 ... 928 psig)	-1 ... 2 bar/-100 ... 200 kPa (-14.5 ... 29 psig)

### 3 Housing overview

<b>Plastic PBT</b>			
<b>Protection rating</b>	IP 66/IP 67	IP 66/IP 67	
<b>Version</b>	Single chamber	Double chamber	
<b>Application area</b>	Industrial environment	Industrial environment	
<b>Aluminium</b>			
<b>Protection rating</b>	IP 66/IP 67, IP 66/IP 68 (1 bar)	IP 66/IP 67, IP 66/IP 68 (1 bar)	
<b>Version</b>	Single chamber	Double chamber	
<b>Application area</b>	Industrial environment with increased mechanical stress	Industrial environment with increased mechanical stress	
<b>Stainless steel 316L</b>			
<b>Protection rating</b>	IP 66/IP 67	IP 66/IP 67, IP 66/IP 68 (1 bar)	IP 66/IP 67, IP 66/IP 68 (1 bar)
<b>Version</b>	Single chamber, electropolished	Single chamber, precision casting	Double chamber, precision casting
<b>Application area</b>	Aggressive environment, food processing, pharmaceutical	Aggressive environment, extreme mechanical stress	Aggressive environment, extreme mechanical stress



## 4 Mounting instructions

### Pressure/Vacuum

The process fitting must be sealed if there is gauge or low pressure in the vessel. Check if the seal material is resistant against the measured product and the process temperature.

Insulating measures in metal vessels such as e.g. covering the thread with teflon tape can interrupt the necessary electrical connection to the vessel. Ground the probe on the vessel.

### Mounting socket

In adhesive products, the probe should protrude into the vessel (horizontal mounting), to avoid buildup. In such cases, avoid sockets for flanges and threaded fittings.

### Measuring range

Please note that with fully insulated cable probes, measurement in the area of the gravity weight is not possible (L - length of the gravity weight).

With fully insulated rod probes, measurement is not possible within the 20 mm of the probe tip (L - 20 mm).

If necessary, use a correspondingly longer meas. probe.

### Agitators

Excessive system vibration or shocks, e.g. caused by agitators or turbulence in the vessel (e.g. from fluidisation) can cause the probe of VEGACAL to vibrate in resonance. This can lead to increased material stress. Should a longer rod probe be necessary, you can provide a suitable support or guy directly above the end of the probe to stabilise it.

### Inflowing medium

If VEGACAL is mounted in the filling stream, unwanted false measurement signals can be generated. For this reason, mount VEGACAL at a position in the vessel where no disturbances, e.g. from filling openings, agitators, etc., can occur.

This applies particularly to instrument versions with a longer probe.

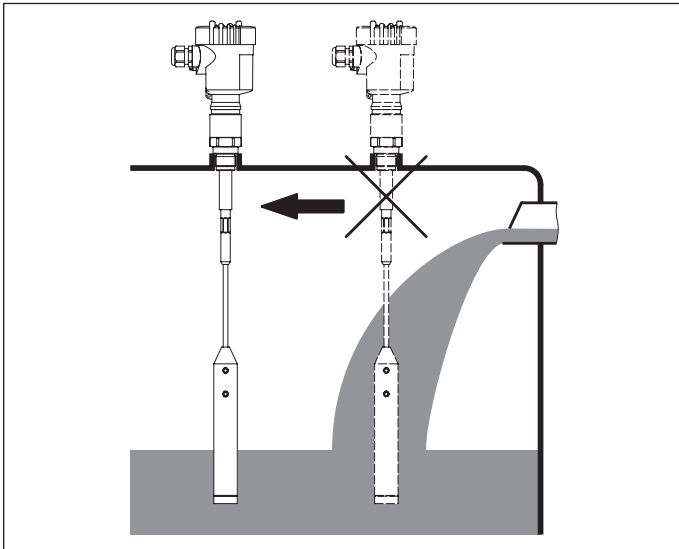


Fig. 17: Inflowing medium

### Vessel forms

If possible, the admittance probe should be mounted vertically or parallel to the counter electrode. This applies particularly to applications in non-conductive products.

In cylindrical tanks, spherical tanks or other asymmetrical tank forms, nonlinear level values are generated due to the varying distance to the vessel wall.

Use a double rod electrode, a concentric tube or linearise the measuring signal.

### Vessel material

#### Metal vessel

Make sure that the mechanical connection of the probe to the vessel is electrically conductive to ensure sufficient grounding.

Use conductive seals, such as those made of copper or lead, etc. Insulating measures, such as covering the thread with Teflon tape, can interrupt the necessary electrical connection with metal vessels. For this reason, ground the probe on the vessel or use a conductive seal material.

#### Non-conductive vessels

In non-conductive vessels, e.g. plastic tanks, the second pole of the capacitor must be provided separately. Use a double rod electrode or mount a concentric tube.

#### Operating temperatures

If the housing is subject to high ambient temperatures, you have to either use a temperature adapter or disconnect the electronics from the probe and install it in a separate housing at a cooler place.

Make sure that the probe is not covered by an existing vessel insulation.

The temperature ranges of the probes are listed in chapter "Technical data".

#### Corrosive, abrasive products

Various isolating materials are available for very corrosive or abrasive products. If metal is not chemically resistant to the medium, use a plated flange.

### Fasten

#### Rod versions

During operation, the probe must not touch any installations or the vessel wall. The measured value can also change if the distance to the vessel wall changes considerably. If necessary, secure the end of the probe (insulated).

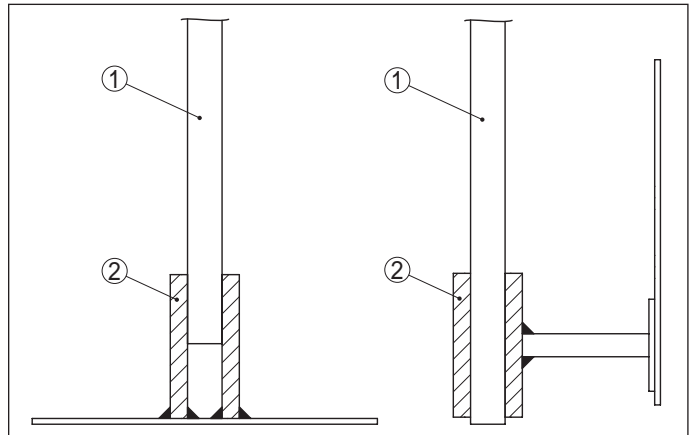


Fig. 18: Fasten the probe

- 1 Probe - fully insulated
- 2 Metal socket
- 3 Probe - bare
- 4 Plastic or ceramic socket

#### Cable versions

Long cable versions are particularly susceptible to product movement, i.e. they may touch the vessel wall if the forces are strong enough. For that reason, the measuring probe should be firmly secured.

In the gravity weight there is a thread (M12), e.g. for a ring bolt (article no. 2.27424). The thread is already insulated in the gravity weight.

Make sure that the probe cable is not completely taut. Avoid tensile loads on the cable. In our line of accessories you will find a straining spring that can be applied to avoid cable overload.

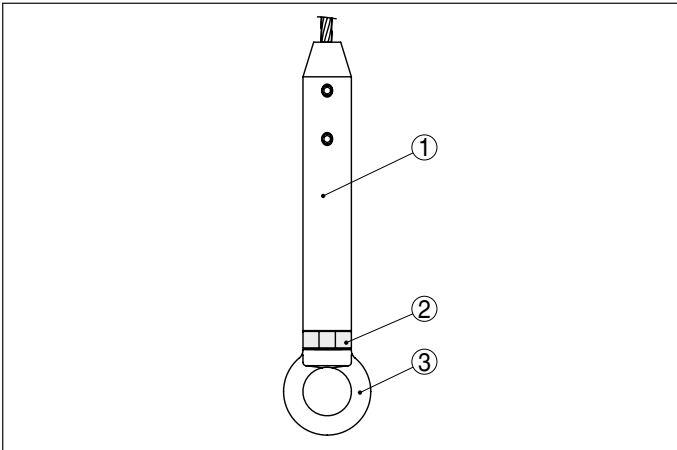


Fig. 19: Fasten the probe

- 1 Gravity weight (316L)
- 2 Threaded insert M12 insulated, of PEEK
- 3 Ring bolt M12 of 316L (article no. 2.27423)

In vessels with conical bottom it can be advantageous to mount the sensor in the centre of the vessel, as measurement is then possible down to the bottom.

Measurement is not possible over the length of the gravity weight of the fully insulated probe. The measuring range of the probe ends at the upper edge of the gravity weight.

#### Protective cover

To protect the sensor against pollution and strong heat due to the sun, you can snap a weather protection cover onto the sensor housing.

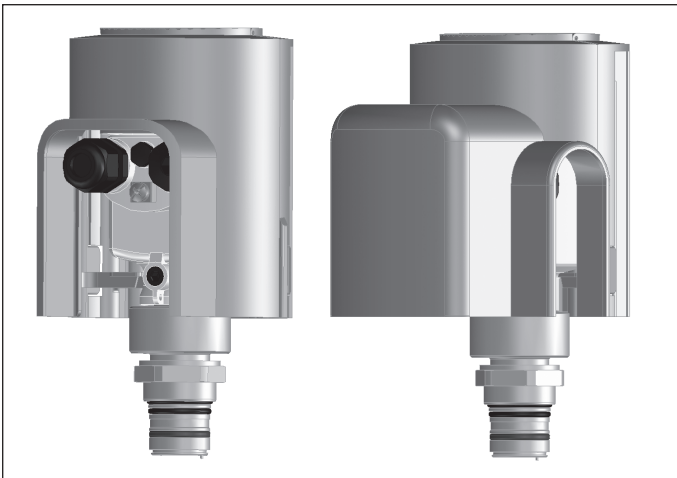


Fig. 20: Weather protection cover in different versions

## 5 Electrical connection

### 5.1 General requirements

The supply voltage range can differ depending on the instrument version. You can find exact specifications in chapter "Technical data".

The national installation standards as well as the valid safety regulations and accident prevention rules must be observed.



In hazardous areas you must take note of the respective regulations, conformity and type approval certificates of the sensors and power supply units.

### 5.2 Voltage supply

#### General information

Supply voltage and current signal are carried on the same two-wire cable. The requirements on the power supply are specified in chapter "Technical data".

#### Two-wire 4 ... 20 mA/HART, > 4 ... < 20 mA

The VEGA power supply units VEGATRENN 149AEx, VEGASTAB 690, VEGADIS 371 as well as VEGAMET signal conditioning instruments are suitable for power supply. When one of these instruments is used, a reliable separation of the supply circuits from the mains circuits according to DIN VDE 0106 part 101 is ensured for the sensor.

#### Profibus PA

Power is supplied by a Profibus DP/PA segment coupler or a VEGALOG 571 EP input card.

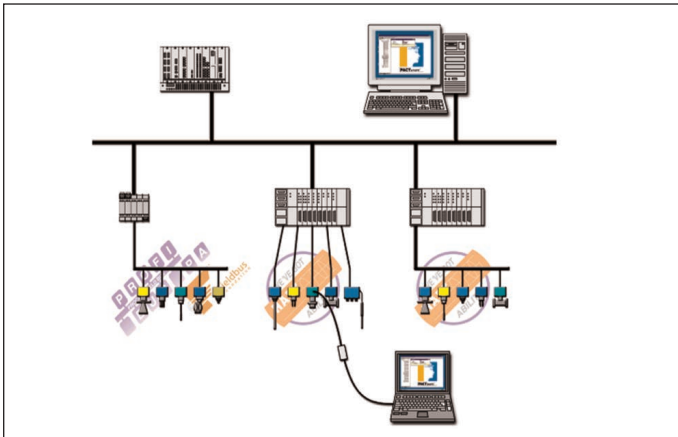


Fig. 21: Integration of instruments in a Profibus PA system via segment coupler DP/PA or data recording systems with Profibus PA input card

#### Foundation Fieldbus

Power supply via the H1 Fieldbus cable.

### 5.3 Connection cable

#### General information

The sensors are connected with standard cable without screen. An outer cable diameter of 5 ... 9 mm ensures the seal effect of the cable entry.

#### Two-wire 4 ... 20 mA/HART, > 4 ... < 20 mA

If electromagnetic interference is expected, screened cable should be used for the signal lines.

#### Profibus PA, Foundation Fieldbus

The installation must be carried out according to the appropriate bus specification. The sensor is connected respectively with screened cable according to the bus specification. Make sure that the bus is terminated via appropriate terminating resistors.

For power supply, an approved installation cable with PE conductor is also required.



In Ex applications, the corresponding installation regulations must be noted for the connection cable.

### 5.4 Connection of the cable screen and grounding

#### Two-wire 4 ... 20 mA/HART, > 4 ... < 20 mA

The cable screen must be connected on both ends to ground potential. If potential equalisation currents are expected, the connection on the evaluation side must be made via a ceramic capacitor (e.g. 1 nF, 1500 V).

#### Profibus PA, Foundation Fieldbus

In systems with potential separation, the cable screen is connected directly to ground potential on the power supply unit, in the connection box and directly on the sensor.

In systems without potential equalisation, connect the cable screen directly to ground potential only at the power supply unit and at the sensor - do not connect to ground potential in the connection box or T-distributor.

### 5.5 Wiring plan

#### Single chamber housing

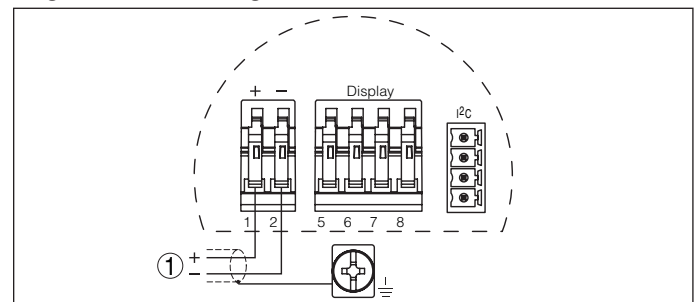


Fig. 22: Connection HART two-wire, Profibus PA, Foundation Fieldbus

1 Voltage supply and signal output

#### Two-wire output > 4 ... < 20 mA

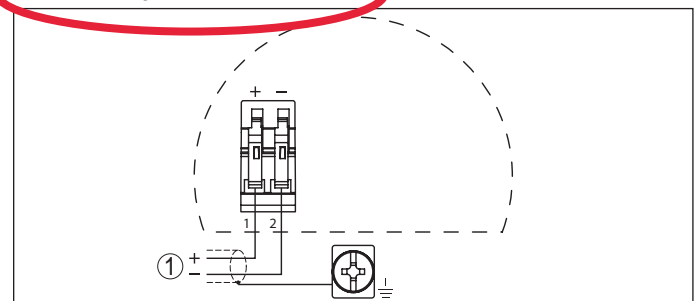


Fig. 23: Connection > 4 ... < 20 mA (not standardised) for connection to a signal conditioning instrument

1 Voltage supply/Signal output

#### Double chamber housing - two-wire

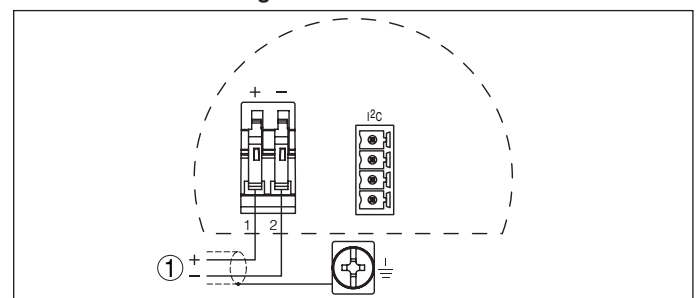


Fig. 24: Connection HART two-wire, Profibus PA, Foundation Fieldbus

1 Voltage supply and signal output

## 6 Adjustment

### 6.1 Adjustment on the measurement loop

#### Via the display and adjustment module through keys

The plug-in display and adjustment module is used for measured value indication, adjustment and diagnosis. It is equipped with an illuminated full dot matrix as well as four keys for adjustment.



Fig. 25: Display and adjustment module with single chamber housing

#### Via the display and adjustment module through magnetic pen

With the Bluetooth version of the display and adjustment module, the sensor can also be adjusted with the magnetic pen. This is done right through the closed lid (with inspection window) of the sensor housing.



Fig. 26: Display and adjustment module - with adjustment via magnetic pen

#### Via a PC with PACTware/DTM

The interface converter VEGACONNECT is required for connection of the PC. The converter is placed on the sensor instead of the display and adjustment module and connected to the USB interface of the PC.

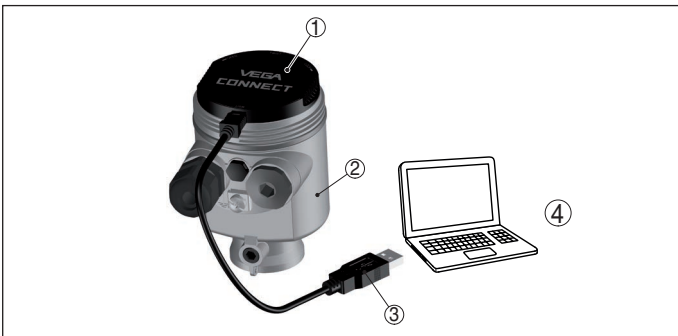


Fig. 27: Connection of the PC via VEGACONNECT and USB

- 1 VEGACONNECT
- 2 Sensor
- 3 USB cable to the PC
- 4 PC with PACTware/DTM

PACTware is an adjustment software for configuration, parameter adjustment, documentation and diagnosis of field devices. The corresponding device drivers are called DTMs.

### 6.2 Operation in the measurement loop environment - wireless via Bluetooth

#### Via a smartphone/tablet

The display and adjustment module with integrated Bluetooth functionality allows wireless connection to smartphones/tablets with iOS or Android operating system. The adjustment is carried out via the VEGA Tools app from the Apple App Store or Google Play Store.

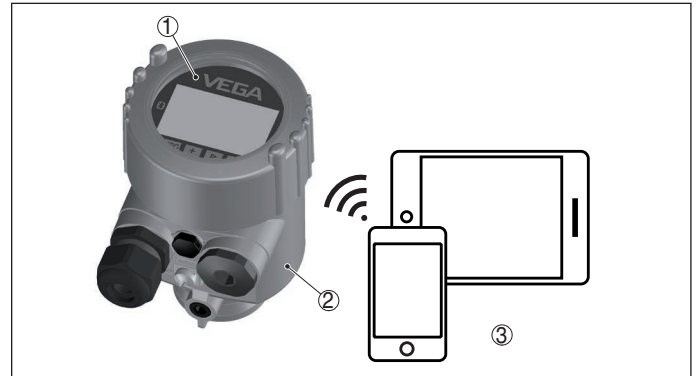


Fig. 28: Wireless connection to smartphones/tables

- 1 Display and adjustment module
- 2 Sensor
- 3 Smartphone/Tablet

#### Via a PC with PACTware/DTM

The wireless connection from the PC to the sensor is carried out via the Bluetooth USB adapter and a display and adjustment module with integrated Bluetooth function. The adjustment is carried out via the PC with PACTware/DTM.

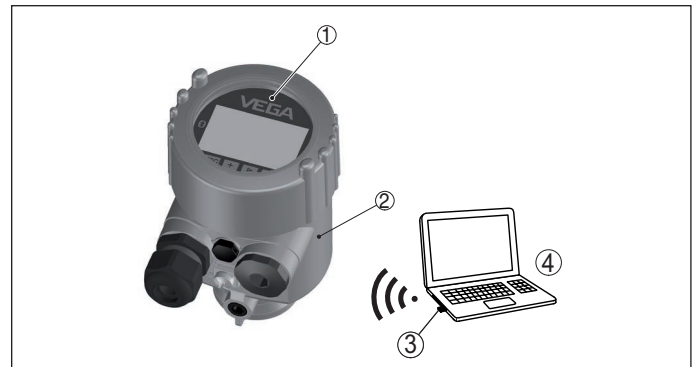


Fig. 29: Connection of the PC via Bluetooth adapter

- 1 Display and adjustment module
- 2 Sensor
- 3 Bluetooth USB adapter
- 4 PC with PACTware/DTM

### 6.3 Adjustment carried out at position remote from the measuring point - wired

#### Via external display and adjustment units

For this, the external display and adjustment units VEGADIS 81 and 82 are available. The adjustment is carried out via the keys of the built-in display and adjustment module.

The VEGADIS 81 is mounted at a distance of 50 m from the sensor and directly to the sensor electronics. VEGADIS 82 is looped directly into the signal cable at any point.

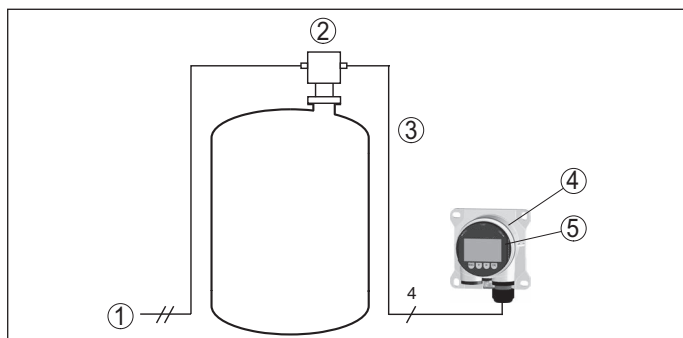


Fig. 30: Connection of VEGADIS 81 to the sensor

- 1 Voltage supply/Signal output sensor
- 2 Sensor
- 3 Connection cable sensor - external display and adjustment unit
- 4 External display and adjustment unit
- 5 Display and adjustment module

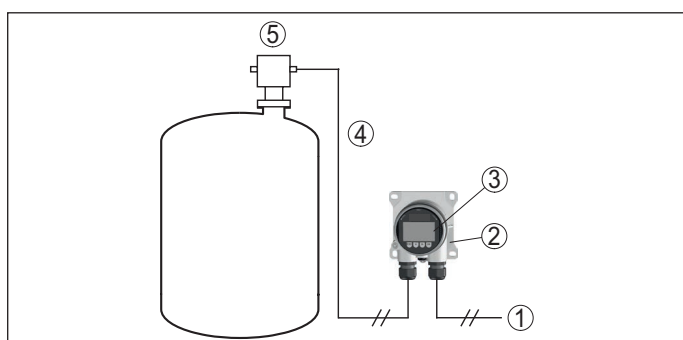


Fig. 31: Connection of VEGADIS 82 to the sensor

- 1 Voltage supply/Signal output sensor
- 2 External display and adjustment unit
- 3 Display and adjustment module
- 4 ... 20 mA/HART signal cable
- 5 Sensor

#### Via a PC with PACTware/DTM

The sensor adjustment is carried out via a PC with PACTware/DTM.

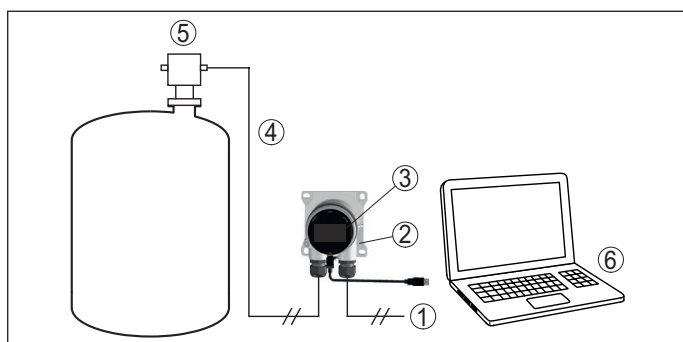


Fig. 32: Connection of VEGADIS 82 to the sensor, adjustment via PC with PACTware

- 1 Voltage supply/Signal output sensor
- 2 External display and adjustment unit
- 3 VEGACONNECT
- 4 ... 20 mA/HART signal cable
- 5 Sensor
- 6 PC with PACTware/DTM

### 6.4 Adjustment carried out at position remote from the measuring point - wireless through mobile network

As an option, the radio module PLICSMOBILE can be mounted into a plics® sensor with double chamber housing. It is used for transmission of measured values and for remote parameter adjustment of the sensor.



Fig. 33: Transmission of measured values and remote parameter adjustment of the sensor via mobile phone network.

### 6.5 Alternative adjustment programs

#### DD adjustment programs

Device descriptions as Enhanced Device Description (EDD) are available for DD adjustment programs such as, for example, AMS™ and PDM.

The files can be downloaded at [www.vega.com/downloads](http://www.vega.com/downloads) under "Software".

#### Field Communicator 375, 475

Device descriptions for the instrument are available as EDD for parameter adjustment with the Field Communicator 375 or 475.

For the integration of the EDD in the Field Communicator 375 or 475, the software "Easy Upgrade Utility" is required which is available from the manufacturer. This software is updated via the Internet and new EDDs are automatically taken over into the device catalogue of this software after they are released by the manufacturer. They can then be transferred to a Field Communicator.

## 7 Dimensions

### Housing

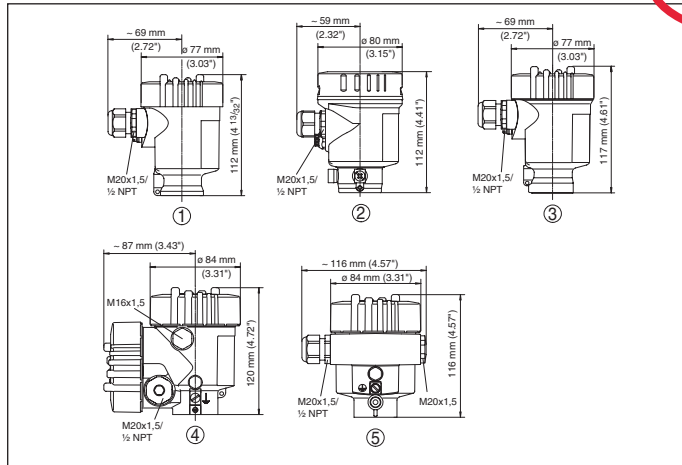


Fig. 34: Housing versions

- 1 Plastic housing
- 2 Stainless steel housing
- 3 Stainless steel housing - precision casting
- 4 Aluminium double chamber housing<sup>1)</sup>
- 5 Aluminium housing

### VEGACAL 62

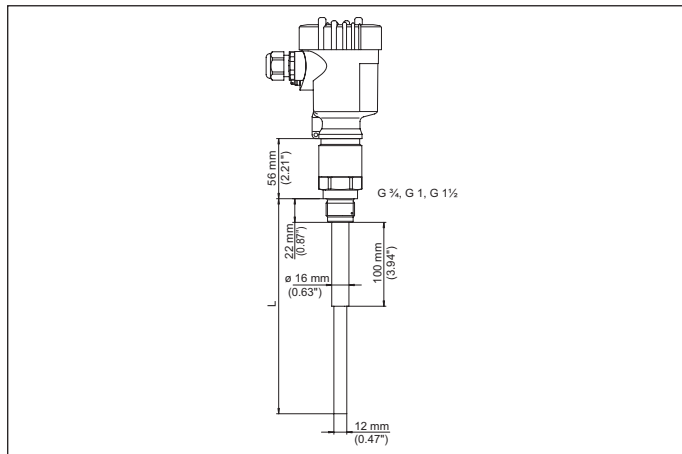


Fig. 35: VEGACAL 62 - threaded version

L Sensor length, see chapter "Technical data"

### VEGACAL 63

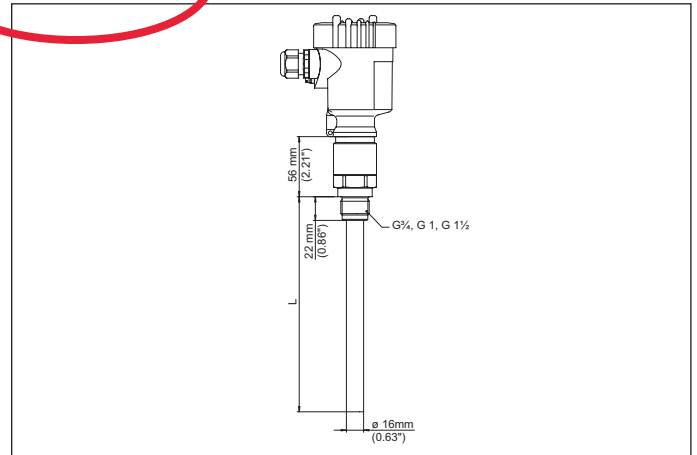


Fig. 36: VEGACAL 63 - threaded version

L Sensor length, see chapter "Technical data"

### VEGACAL 64

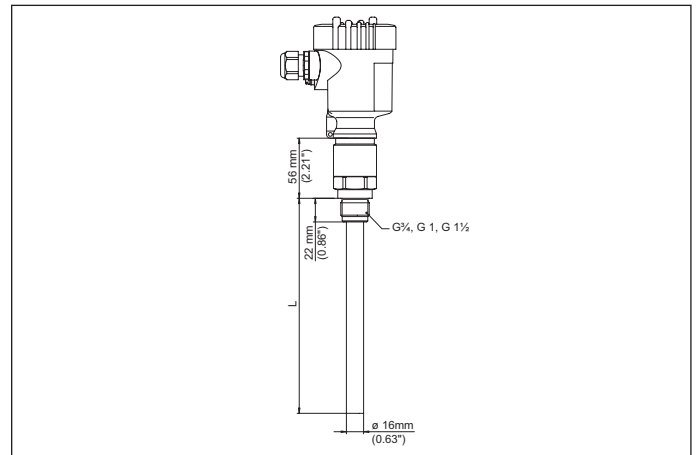


Fig. 37: VEGACAL 64 - threaded version

L Sensor length, see chapter "Technical data"

<sup>1)</sup> Not with electronics version two-wire output > 4 ... < 20 mA.

VEGACAL 66

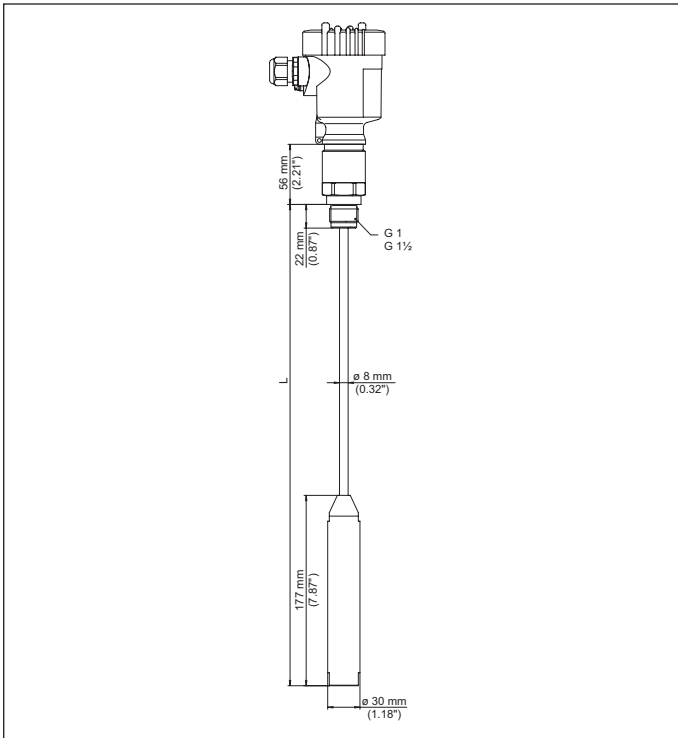


Fig. 38: VEGACAL 66 - threaded version

L Sensor length, see chapter "Technical data"

VEGACAL 69

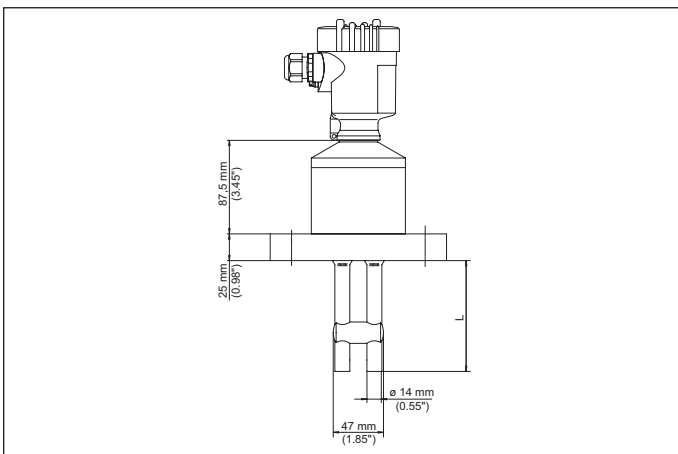


Fig. 39: VEGACAL 69

L Sensor length, see chapter "Technical data"

Consult Thermaflo 704-940-1228 for Calibration/Settings and Troubleshooting

All Vegacal 63 Probes are calibrated and tested before shipment from the Thermaflo Engineering Manufacturing Facility.  
NO Additional calibration should be required in the field.





## Vega 61 High High Level Switch Assembly

Note: This switch is mounted in the top of the level column and will only operate or make contact on extreme high level. When contact is made the makeup water and steam valve close and high level alarm alerts the operator. Mounting after 6/1/2023 will be in the top back shell in lieu of the level column. This switch has NO moving parts or inner floats to fail, and is rated to 482F.



Thermaflo Engineering Inc 704-940-1228

## Product information

### Vibrating

Level detection in liquids

VEGASWING 51

VEGASWING 53

VEGASWING 61 ←

VEGASWING 63

VEGASWING 66

Thermaflo Engineering after December 31, 2020 employed the Vega Swing 61 Level Switch for High High Level for all Clean Steam Generators

Page 33



High High Level Switch



## Contents

1	Measuring principle.....	3
2	Type overview.....	7
3	Instrument selection.....	8
4	Instrument features .....	9
5	Accessories.....	10
6	Selection criteria.....	11
7	Housing overview - VEGASWING 61, 63, 66.....	12
8	Mounting.....	13
9	Relay output .....	14
10	Transistor output.....	15
11	Contactless electronic switch .....	17
12	Two-wire output.....	18
13	NAMUR output.....	19
14	IO-Link output.....	20
15	Adjustment .....	21
16	Dimensions.....	23

### Take note of safety instructions for Ex applications



Please note the Ex specific safety information that you can find at [www.vega.com](http://www.vega.com) and that comes with each instrument. In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units. The sensors must only be operated on intrinsically safe circuits. The permissible electrical values are stated in the certificate.

## 1 Measuring principle

### Measuring principle

VEGASWING is a point level sensor with tuning fork for point level detection.

It is designed for industrial use in all areas of process technology, but preferably in liquids.

The vibrating element (tuning fork) is piezoelectrically energized and vibrates at its mechanical resonance frequency. The piezo elements are mechanically fixed and are hence not subject to temperature shock limitations. If the vibrating element is submerged in the product, the vibrating frequency changes. This change is detected by the integrated electronics module and converted into a switching command.

### Configuration

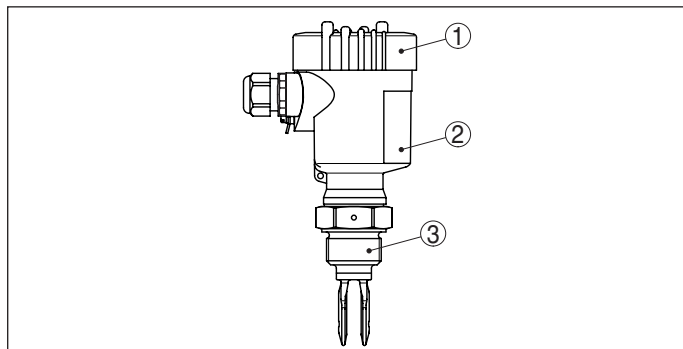


Fig. 1: Vibrating level switch VEGASWING, for example VEGASWING 61 with plastic housing

- 1 Housing lid
- 2 Housing with electronics
- 3 Process fitting

Typical applications are overflow and dry run protection. Thanks to its simple and robust measuring system, VEGASWING is virtually unaffected by the chemical and physical properties of the liquid.

It also works when subjected to strong external vibrations or changing products.

### Function monitoring

The electronics module of VEGASWING continuously monitors the following criteria:

- Strong corrosion or damage on the tuning fork
- Loss of vibration
- Line break to the piezo drive

If one of the stated malfunctions is detected or in case of voltage supply, the electronics takes on a defined switching status, for example the switching output is open (safe state).

### Function test

The recurring function test is used to check the safety function, in order to reveal possible dangerous unrecognized faults. The function of the measuring system must be checked in regular, adequate intervals.

There are two different ways to carry out a function test:

VEGASWING 61, 63, 66 with two-wire electronics in conjunction with a VEGATOR controller.

- Test key on the VEGATOR controller

VEGASWING 61, 63, 66 with two-wire electronics in conjunction with a VEGALOG processing system or a PLC.

- Brief interruption of the connection cable to the PLC

## 1.2 Application examples

### Chemical industry - Solvents



Fig. 2: Level detection in vessels with solvents

Apart from the continuous level measurement, level detection is an essential safety feature for storage tanks. Many modern sensors for continuous level measurement are actually approved as overflow protection system, however, a second, physically different measuring system provides the best safety and redundancy.

Thanks to their manifold application possibilities, VEGASWING vibrating level switches are ideal for all applications in the area of liquids warehousing. A large number of electrical and mechanical versions ensures simple integration into existing control systems.

Advantages:

- Various electrical versions
- Product-independent
- Universal level detection for all liquids

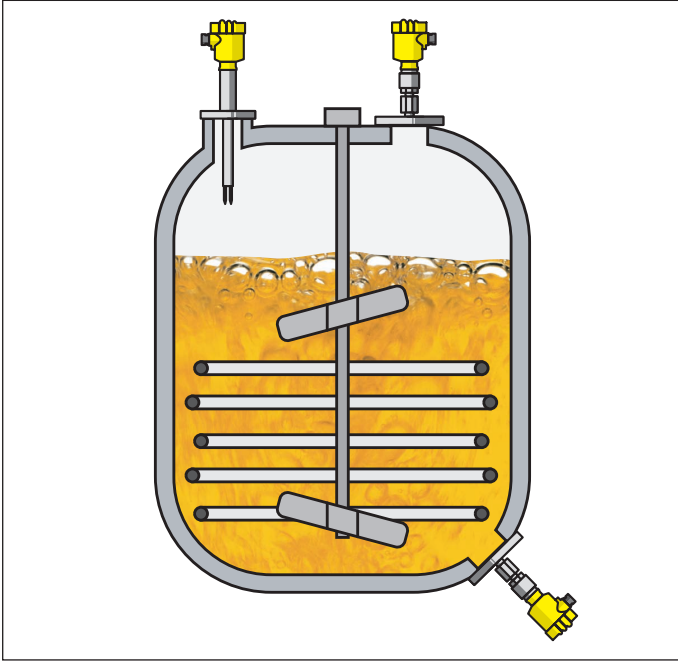
**Chemical industry - reactors**

Fig. 3: Level detection in chemical reactors

Because they prevent overflowing or dry running of pumps, sensors for level detection are an important safety element in reactors. Due to their universal applicability, VEGASWING level switches are well suited for use in reaction vessels. Even high viscosities, temperatures up to 250 °C and pressure up to 64 bar do not impair their function.

To provide the required chemical resistance, high resistance materials and enamelled versions are available.

In toxic products, the VEGASWING version with metallic process separation ensures a high level of safety. To prevent product leakage even in case of corrosion on the tuning fork, a glass seal is also welded in. This ensures optimum protection.

To provide optimal resistance to the measured medium, whatever its composition and corrosive properties may be, sensors made of 316L or Alloy, or sensors in plastic-coated and enamelled versions, are available.

Thanks to their manifold application possibilities, VEGASWING vibrating level switches are ideal for all applications in the area of liquids storage. A large number of electrical and mechanical versions enables simple integration into existing control systems.

Advantages:

- Various electrical versions
- Product-independent
- Completely gas-tight
- High reliability
- Universal level detection for all liquids

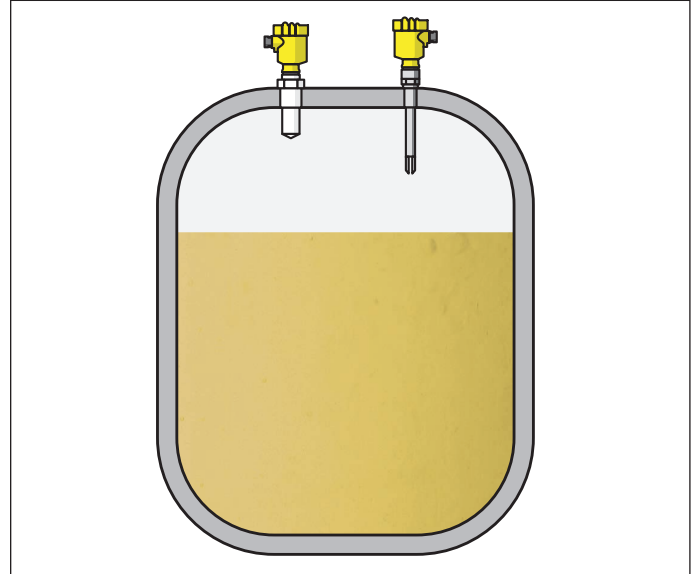
**Water/Sewage water plants**

Fig. 4: Precipitants in sewage water processing

Chemicals are required for sewage water treatment. They are applied to promote chemical precipitation. Phosphates and nitrates are thus sedimented and separated. In addition to lime water and ferric chloride, various acids and alkalis are stored for use in digested sludge treatment and neutralisation.

These substances are subject to the regulations covering water-endangering substances. Overflow protection systems thus have to be installed on the storage tanks.

Since they prevent the overflowing of vessels containing toxic products, sensors for level detection are an important safety element.

Due to their versatile nature, VEGASWING vibrating level switches are also well qualified for use with water-endangering substances. To provide optimal resistance to the measured medium, whatever its composition and corrosive properties may be, sensors made of 316L or Alloy, as well as sensors in plastic-coated or enamelled versions, are available.

Advantages:

- Small non-repeatability
- High-resistance sensor materials such as PFA, ECTFE, Alloy C22 (2.4602), enamel

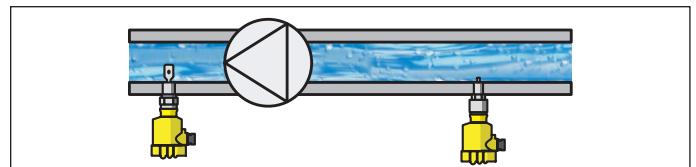
**Pipelines**

Fig. 5: Dry run protection in pipelines

Monitoring of levels is also important in pipelines, as dry running often causes damage or complete breakdown of the pumps.

The VEGASWING level switch is recommended as dry run protection system, e.g. for drinking water pumps. With a fork only 40 mm (1.575 in) long (VEGASWING series 60), this level switch functions quite reliably, even in pipes with small diameters from DN 32.

Advantages:

- Universal level detection for all liquids
- Adjustment and maintenance-free

**Food processing industry**

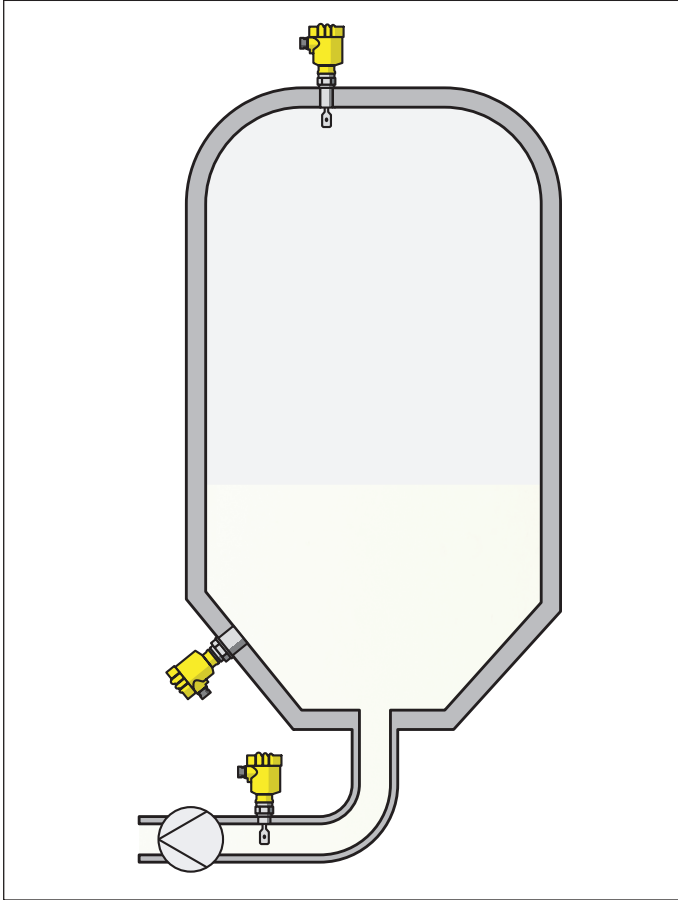


Fig. 6: Level detection and dry run protection in a tank storing milk

The processes in food processing tanks, e.g. for milk, place heavy demands on the installed measurement technology. High pressures and temperatures are generated during sterilization and cleaning of the tanks. That means that the implemented level measuring instruments and level detectors must meet the requirements of hygienic design. The innocuousness of all wetted materials must be proven and optimum cleanability must be ensured through hygienic technical design.

VEGASWING is installed for level detection and as dry run protection system. The tuning fork is highly polished for use in sensitive foodstuffs such as milk.

Advantages:

- Universal level detection for all liquids
- High-resistance sensor materials such as PFA, ECTFE, Alloy C22 (2.4602), enamel
- Adjustment and maintenance-free

**Cryogenic processes**

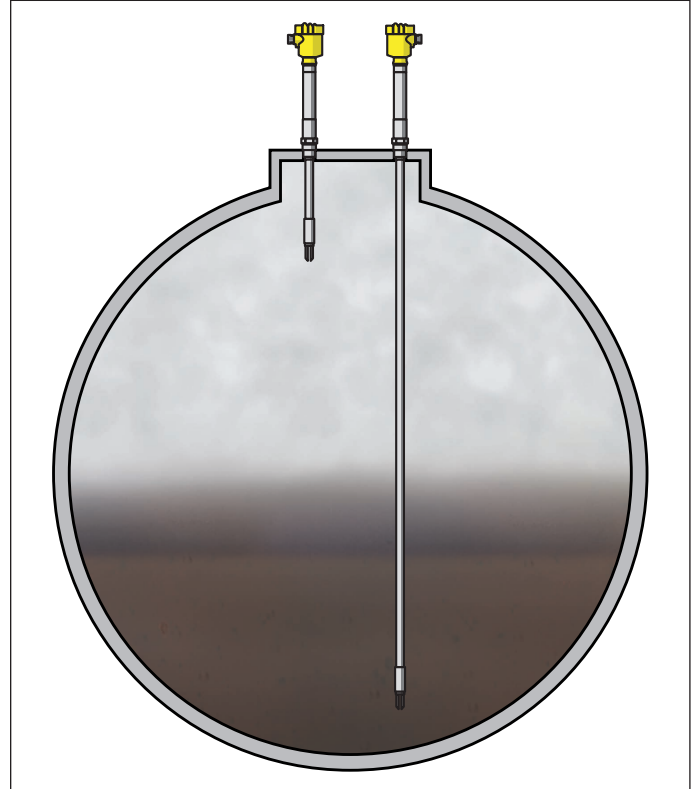


Fig. 7: Level detection in a liquid gas vessel

The extremely low temperatures in liquid tanks are a challenge for the installed measurement instrumentation. Petroleum gas is stored for example at  $-162\text{ °C}$  ( $-260\text{ °F}$ ) and nitrogen even at  $-196\text{ °C}$  ( $-321\text{ °F}$ ). The VEGASWING 66 with  $-196\text{ ... }+450\text{ °C}$  ( $-321\text{ ... }+482\text{ °F}$ ) can cover a large temperature range.

Advantages:

- Universal use, because only low min. density of the medium required.
- Double safety through Second Line of Defense
- Cost-optimized setup without medium

**Steam vessel**

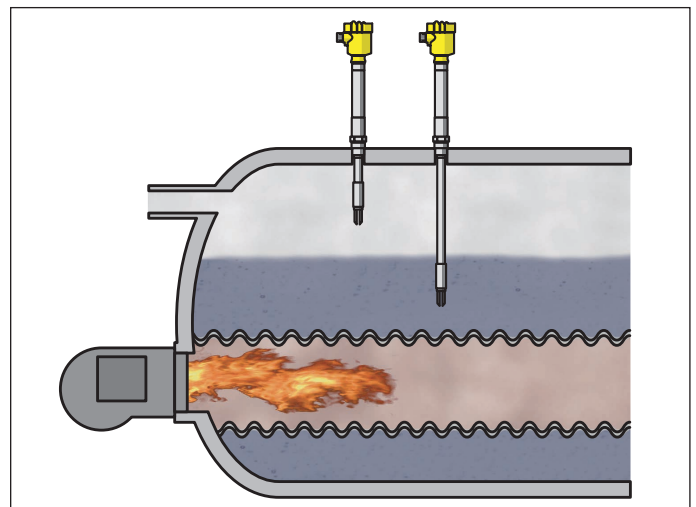


Fig. 8: Level detection in a steam boiler

Point level measurement in steam boilers monitors the high and low water level of the vessel. The point level measurement is independent of vessel pressure and temperature as well as the density of the water or the saturated steam. With its pressure range up to 160 bar (2320 psig) and a max. temperature up to  $+450\text{ °C}$  ( $+482\text{ °F}$ ), the VEGASWING 66

covers the majority of saturated steam applications.

Advantages:

- Reliable and quick function test
- Double safety through Second Line of Defense
- Flexible and high availability in applications up to SIL3

2 Type overview



<b>Applications</b>	Point level measurement in liquids	Point level measurement in liquids	Point level measurement in liquids	Point level measurement in liquids	Point level measurement in liquids High and low process temperatures High process pressures
<b>Length</b>	-	100 ... 1000 mm (3.94 ... 39.37 in)	-	80 ... 6000 mm (3.15 ... 236.22 in)	260 ... 3000 mm (10.24 ... 118.11 in)
<b>Process fitting</b>	Thread G½, G¾, G1 Hygienic fittings	Thread G¾, G1 Hygienic fittings	Thread G¾, G1 Flanges Hygienic fittings	Thread G¾, G1 Flanges Hygienic fittings	Thread G1 Flanges
<b>Process temperature</b>	-40 ... +100 °C (-40 ... +212 °F) -40 ... +150 °C (-40 ... +302 °F) with temperature adapter	-40 ... +100 °C (-40 ... +212 °F) -40 ... +150 °C (-40 ... +302 °F) with temperature adapter	-50 ... +150 °C (-58 ... +302 °F) -50 ... +250 °C (-58 ... +482 °F) with temperature adapter	-50 ... +150 °C (-58 ... +302 °F) -50 ... +250 °C (-58 ... +482 °F) with temperature adapter	-196 ... +450 °C (-321 ... +482 °F)
<b>Process pressure</b>	-1 ... 64 bar (-14.5 ... 928 psig)	-1 ... 64 bar (-14.5 ... 928 psig)	-1 ... 64 bar (-14.5 ... 928 psig)	-1 ... 64 bar (-14.5 ... 928 psig)	-1 ... 160 bar (-14.5 ... 2321 psig)
<b>Signal output</b>	Transistor Contactless electronic switch IO-Link	Transistor Contactless electronic switch IO-Link	Relay Transistor Two-wire NAMUR Contactless electronic switch	Relay Transistor Two-wire NAMUR Contactless electronic switch	Relay Transistor Two-wire
<b>Ruggedness</b>	+	+	+	+	+
<b>Sensitivity</b>	+	+	++	++	++
<b>Buildup</b>	++	++	+	+	+
<b>Cleanability</b>	++	++	++	++	++
<b>Installation length</b>	++	++	++	++	++



### 3 Instrument selection

#### VEGASWING 51, 53

VEGASWING 51 is a universal level switch with small dimensions. Independent of the mounting position, it detects the level reliably and with millimetre accuracy. The instrument can be used for full or empty alarm, as approved overflow protection or dry run or pump protection in vessels and pipelines. VEGASWING 51 is an economical solution with a small, compact stainless steel housing and is available with the electronics versions transistor output, contactless electronic switch and IO-Link.

On VEGASWING 53, the switching point can be adapted to the process with a freely selectable extension tube.

#### VEGASWING 61, 63

VEGASWING series 60 level switches are instruments from the VEGA plics® series, which are available in standard and tube version. Thanks to the many different process fittings, housings and electronics versions, plics® instruments can be configured in versions suitable for any application. They have all standard approvals and the tuning fork can also be polished, e.g. for applications in the food processing industry.

On VEGASWING 63, the switching point can be adapted to the process with a freely selectable extension tube.

VEGASWING are virtually unaffected by product properties and thus do not have to be adjusted.

The level switches are used in applications with process temperatures up to +250 °C (+482 °F) and pressures of up to 64 bar (928 psig).

They detect liquids from 0.5 ... 2.5 g/cm<sup>3</sup> (0.018 ... 0.09 lbs/in<sup>3</sup>).

All electronics are qualified for the function "overflow and dry run protection" according to IEC 61508 and 61511 for SIL2, in redundant version also up to SIL3.

#### VEGASWING 66

The point level sensors VEGASWING 66 are instruments from the VEGA plics® series and available in standard and tube version. The instruments are suitable for liquids with extremely low and high process temperatures. With their many different process fittings, housings and electronics versions, plics® instruments can be ideally configured for any application. They have all standard approvals.

VEGASWING are virtually unaffected by product properties and thus do not have to be adjusted.

The level switches are used in applications with process temperatures up to -196 ... +450 °C (-321 ... +482 °F) and pressures of up to 160 bar (2321 psig).

They detect liquids from 0.42 to 2.5 g/cm<sup>3</sup> (0.015 to 0.09 lbs/in<sup>3</sup>).

All electronics are qualified for the function "overflow and dry run protection" according to IEC 61508 and 61511 for SIL2, in homogeneous redundant version also up to SIL3.

## 4 Instrument features

### Second Line of Defense

To increase safety in applications with dangerous or toxic products, the series 60 sensors can be ordered with a welded, gas-tight feedthrough (Second Line of Defense).

### Temperature adapter

For VEGASWING 61 and 63, a temperature adapter is optionally available. With it you can increase the max. permissible process temperature from +150 °C (+302 °F) to +250 °C (+482 °F).

### SIL qualification

As an option, the sensors of VEGASWING series 60 can be ordered with SIL qualification. The sensors can thus be used in applications according to SIL2. In a homogeneously redundant configuration, they can also be used up to SIL3.

### Coating

To make the use of VEGASWING series 60 sensors possible in aggressive or corrosive products, different coatings are optionally available. The following coating materials can be used depending on the required resistance. Our application engineers will be pleased to give you advice on resistances and the possibilities the sensors offer.

- ECTFE
- PFA
- Enamel

## 5 Accessories

### Protective cover

To protect the sensor against pollution and strong heat due to the sun, you can snap a weather protective cover onto the sensor housing.

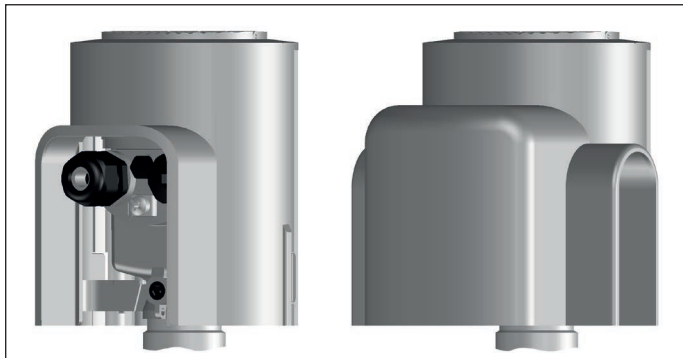


Fig. 9: Weather protection cover in different versions

### Display module PLICSLED

The display module allows you to clearly display the switching status of the sensor. For this purpose, housing lids with inspection windows in different materials are available. The plastic housing is optionally available with a transparent lid through which you can see the indicator lamp from the side.

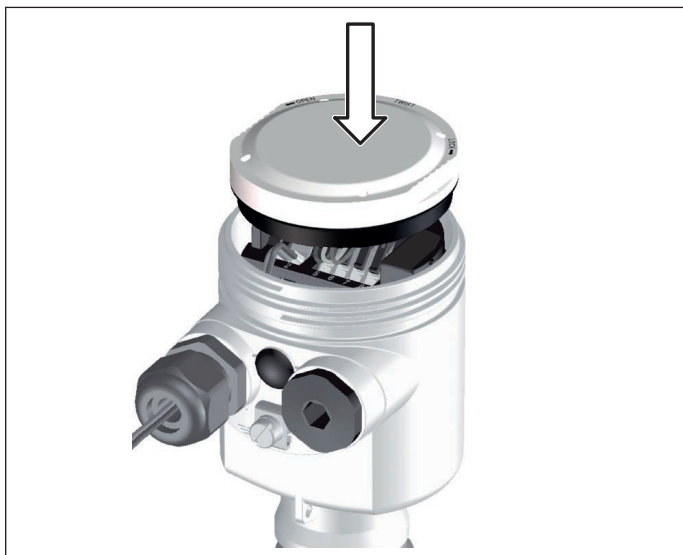


Fig. 10: Display module PLICSLED

### Lock fitting

VEGASWING in tube version can be mounted with a lock fitting for infinitely variable height adjustment. Take note of the pressure specifications of the lock fitting.

Keep in mind that the lock fitting must not be used with coated instrument versions.



Fig. 11: Lock fitting - e.g. ARV-SG63.3 for VEGASWING 63 up to 64 bar

### Plug connector

Instead of a cable gland, you can also use various plug connectors for making connections. The following plug connectors are available for VEGASWING series 60:

- ISO 4400
- ISO 4400 with Quick-On fitting
- Amphenol-Tuchel
- Harting HAN 7D
- Harting HAN 8D
- M12 x 1



Fig. 12: Plug connector - e.g. VEGASWING series 60 with ISO 4400 plug

There are no cable glands possible for the VEGASWING of series 50. The instruments are available with the following plug connectors:








- ISO 4400
- ISO 4400 with Quick-On fitting
- M12 x 1

6 Selection criteria

Version		VEGASWING		VEGASWING		VEGASWING 66	
		51 Compact	53 Tube	61 Compact	63 Tube	66 Compact	66 Tube
Vessel	Probe length max. 3 m	-	●	-	●	-	●
	Probe length max. 6 m	-	●	-	●	-	-
	Cryogenic applications	-	-	-	-	●	●
	Pipelines	●	-	●	●	●	●
Process	Aggressive liquids	○	○	○	○	○	○
	Bubble or foam generation	●	●	●	●	●	●
	Wave movements at the surface	●	●	●	●	●	●
	Steam or condensation	●	●	●	●	●	●
	Buildup	○	○	○	○	○	○
	Changing density	●	●	●	●	●	●
	Temperatures up to +150 °C	●	●	●	●	●	●
	Temperatures up to +250 °C	-	-	●	●	●	●
	Temperatures > +250 °C	-	-	-	-	●	●
	Pressures up to 64 bar	●	●	●	●	●	●
	Pressures up to 160 bar	-	-	-	-	●	●
	Hygienic applications	○	○	●	●	-	-
	Narrow space above the vessel	●	●	●	●	-	-
	Steam boiler application	-	-	-	-	●	●
Process fitting	Threaded fittings	●	●	●	●	●	●
	Flange connections	-	-	●	●	●	●
	Hygienic fittings	●	●	●	●	-	-
Sensor	Stainless steel	●	●	●	●	●	●
	Coating	-	-	●	●	-	-
	Polished version	●	●	●	●	-	-
	SIL qualification	-	-	●	●	●	●
Industry	Chemical	●	●	●	●	●	●
	Power generation	○	○	○	○	●	●
	Foodstuffs	○	○	●	●	-	-
	Offshore	●	●	○	○	●	●
	Petrochemical	○	○	○	○	●	●
	Pharmaceutical	○	○	●	●	-	-
	Shipbuilding	●	●	●	○	●	○
	Environment and recycling industry	●	●	●	●	●	●
	Water	●	●	●	●	○	○
Waste water	○	○	○	○	○	○	

- = optimum suitability
- = possible with limitations
- = not recommended

**7 Housing overview - VEGASWING 61, 63, 66**

<b>Plastic PBT</b>			
<b>Protection rating</b>	IP66/IP67	IP66/IP67	
<b>Version</b>	Single chamber	Double chamber	
<b>Application area</b>	Industrial environment	Industrial environment	
<b>Aluminium</b>			
<b>Protection rating</b>	IP66/IP67, IP66/IP68 (1 bar)	IP66/IP67, IP66/IP68 (1 bar)	
<b>Version</b>	Single chamber	Double chamber	
<b>Application area</b>	Industrial environment with increased mechanical stress	Industrial environment with increased mechanical stress	
<b>Stainless steel 316L</b>			
<b>Protection rating</b>	IP66/IP67	IP66/IP67, IP66/IP68 (1 bar)	IP66/IP67, IP66/IP68 (1 bar)
<b>Version</b>	Single chamber, electropolished	Single chamber, precision casting	Double chamber, precision casting
<b>Application area</b>	Aggressive environment, food processing, pharmaceutical	Aggressive environment, extreme mechanical stress	Aggressive environment, extreme mechanical stress

## 8 Mounting

### Switching point

In general, VEGASWING can be installed in any position. The instrument only has to be mounted in such a way that the vibrating element is at the height of the desired switching point.

The tuning fork has lateral markings (notches) marking the switching point with vertical installation. The switching point refers to the medium water with basic setting of the density switch  $\geq 0.7 \text{ g/cm}^3$  (0.025 lbs/in<sup>3</sup>). Keep in mind that foams with a density  $> 0.45 \text{ g/cm}^3$  (0.016 lbs/in<sup>3</sup>) are detected by the sensor.

### Mounting socket

The vibrating element should protrude into the vessel to avoid buildup. For that reason, avoid using mounting bosses for flanges and screwed fittings. This applies particularly to horizontal installation and use with adhesive products.

### Agitators

Due to agitators, vibration or similar, the level switch can be subjected to strong lateral forces. For this reason, do not use an overly long extension tube for VEGASWING 63 or 66, but check if a VEGASWING 51 or 61 level switch without tube extension couldn't be used instead, mounted on the side of the vessel in horizontal position.

Extreme vibration caused by the process or the equipment, e.g. agitators or turbulence in the vessel, can cause the extension tube of VEGASWING to vibrate in resonance. This leads to increased stress on the upper weld joint. Should a longer tube version be required, you can provide a suitable support or guy directly above the vibrating element to secure the extension tube.



This measure applies mainly to applications in Ex areas. Make sure that the tube is not subject to bending stress due to this measure.

### Inflowing medium

If VEGASWING is mounted in the filling stream, unwanted false measurement signals can be generated. For this reason, mount VEGASWING at a position in the vessel where no disturbances, e.g. from filling openings, agitators, etc., can occur.

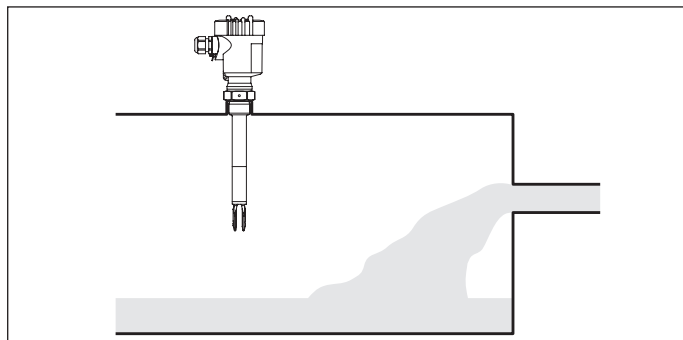


Fig. 13: Inflowing medium

### Product flow

To make sure the tuning fork of VEGASWING generates as little resistance as possible to product flow, mount the sensor so that the surfaces are parallel to the product movement.

### Lock fitting

VEGASWING in tube version can be mounted with a lock fitting for infinitely variable height adjustment. Take note of the pressure specifications of the lock fitting.

Keep in mind that the lock fitting must not be used with coated instrument versions.

### Pressure/Vacuum

The process fitting must be sealed if there is gauge or low pressure in the vessel. Check if the sealing material is resistant against the measured product and the process temperature.

### Protective cover

To protect the sensor against pollution and strong heat due to the sun, you can snap a weather protective cover onto the sensor housing.

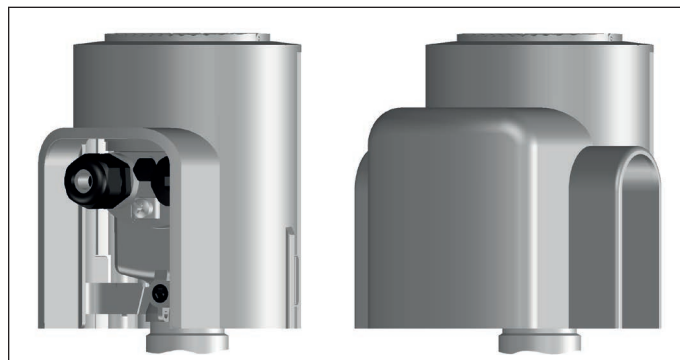


Fig. 14: Weather protection cover in different versions

## 9 Relay output

### Preparing the connection

#### Note safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage

#### Take note of safety instructions for Ex applications

In hazardous areas you must take note of the respective regulations, conformity and type approval certificates of the sensors and power supply units.

#### Select voltage supply

Connect the operating voltage according to the following diagrams. The oscillator with relay output is designed in protection class 1. To maintain this protection class, it is absolutely necessary that the ground conductor be connected to the internal ground terminal. Take note of the general installation regulations. As a rule, connect VEGASWING to vessel ground (PA), or in case of plastic vessels, to the next ground potential. On the side of the housing there is a ground terminal between the cable entries. This connection serves to drain off electrostatic charges. In Ex applications, the installation regulations for hazardous areas must be given priority.

#### Select connection cable

The VEGASWING is connected with standard three-wire cable without screen with round cross-section. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Use a suitable cable gland and select a suitable seal depending on the cable diameter.



In hazardous areas, use only approved cable connections for VEGASWING.

#### Select connection cable for Ex applications

Take note of the corresponding installation regulations for Ex applications.

### VEGASWING 61, 63

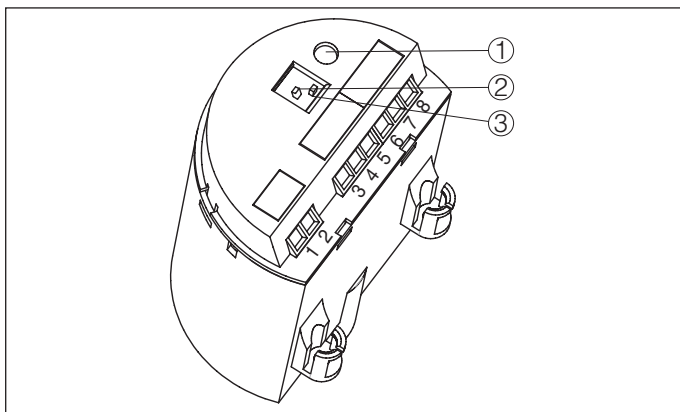


Fig. 15: VEGASWING 61, 63 - electronics module with relay output

- 1 Control lamp
- 2 DIL switch for mode adjustment
- 3 DIL switch for sensitivity adjustment

We recommend connecting VEGASWING in such a way that the switching circuit is open when there is a level signal, line break or failure (safe state).

The relays are always shown in non-operative condition.

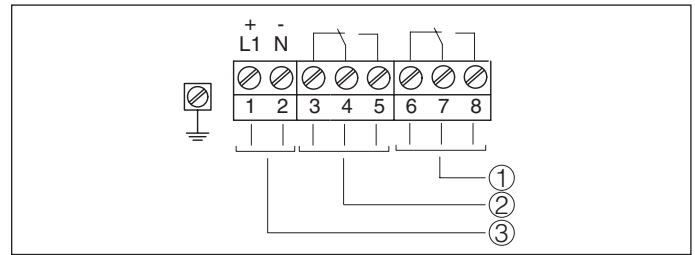


Fig. 16: VEGASWING 61, 63 - wiring plan - relay output

- 1 Relay output
- 2 Relay output
- 3 Voltage supply

### VEGASWING 66

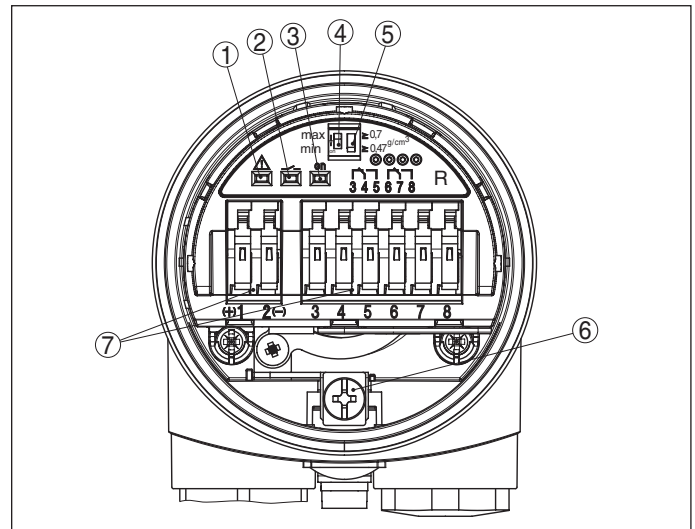


Fig. 17: Electronics and connection compartment, single chamber housing

- 1 Control lamp - fault indication (red)
- 2 Control lamp - Switching status (yellow)
- 3 Control lamp - Operating status (green)
- 4 Mode switch for selecting the switching behaviour (min./max.)
- 5 DIL switch for sensitivity adjustment
- 6 Ground terminal
- 7 Connection terminals

We recommend connecting VEGASWING in such a way that the switching circuit is open when there is a level signal, line break or failure (safe state).

The relays are always shown in non-operative condition.

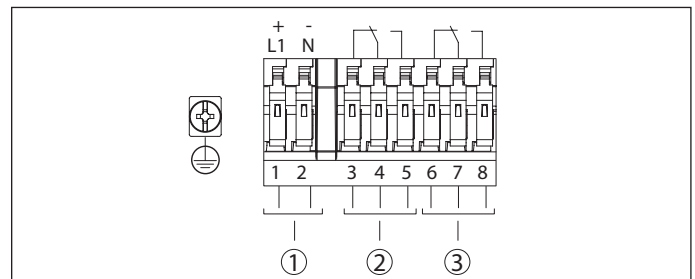


Fig. 18: Wiring plan, single chamber housing

- 1 Voltage supply
- 2 Relay output SPDT
- 3 Relay output SPDT

## 10 Transistor output

### Preparing the connection

#### Note safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage

#### Take note of safety instructions for Ex applications

In hazardous areas you must take note of the respective regulations, conformity and type approval certificates of the sensors and power supply units.

#### Select voltage supply

Connect the voltage supply according to the following diagrams. Take note of the general installation regulations. As a rule, connect VEGASWING to vessel ground (PA), or in case of plastic vessels, to the next ground potential. On the side of the instrument housing there is a ground terminal between the cable entries. This connection serves to drain off electrostatic charges. In Ex applications, the installation regulations for hazardous areas must be given priority.

#### Select connection cable

The VEGASWING is connected with standard two-wire cable without screen with round cross-section. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Use a suitable cable gland and select a suitable seal depending on the cable diameter.



In hazardous areas, use only approved cable connections for VEGASWING.

#### Select connection cable for Ex applications

Take note of the corresponding installation regulations for Ex applications.

#### Transistor output

We recommend connecting VEGASWING in such a way that the switching circuit is open when there is a level signal, line break or failure (safe state).

The instrument is used to control relays, contactors, magnet valves, warning lights, horns as well as PLC inputs.

### VEGASWING 61, 63

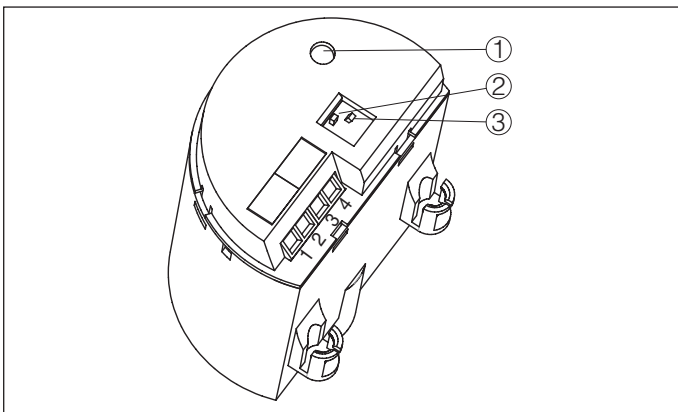


Fig. 19: VEGASWING 61, 63 - electronics module with transistor output

- 1 Control lamp
- 2 DIL switch for mode adjustment
- 3 DIL switch for sensitivity adjustment

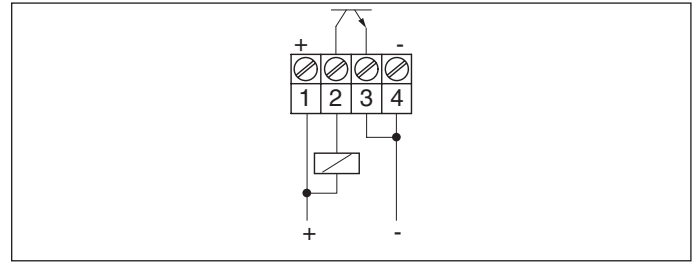


Fig. 20: VEGASWING 61, 63 - transistor output - NPN action

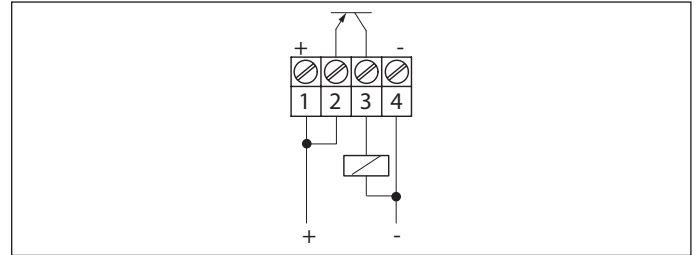


Fig. 21: VEGASWING 61, 63 - transistor output - PNP action

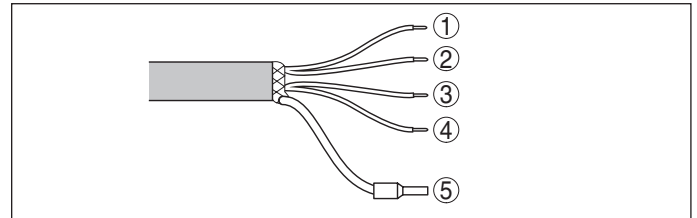


Fig. 22: Wire assignment connection cable. The numbers of the wires correspond to the terminals of the instrument.

- 1 brown (+) voltage supply
- 2 White
- 3 Yellow
- 4 blue (-) voltage supply
- 5 Shielding

### VEGASWING 66

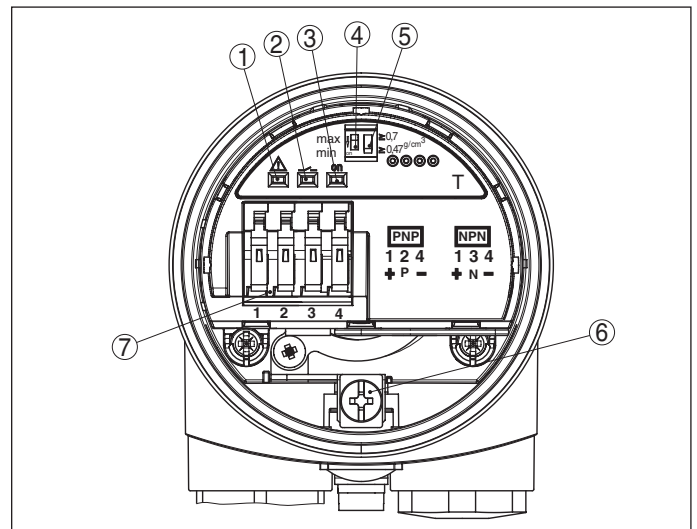


Fig. 23: VEGASWING 66 - electronics module with transistor output

- 1 Control lamp - fault indication (red)
- 2 Control lamp - Switching status (yellow)
- 3 Control lamp - Operating status (green)
- 4 Mode switch for selecting the switching behaviour (min./max.)
- 5 DIL switch for sensitivity adjustment
- 6 Ground terminal
- 7 Connection terminals



We recommend connecting VEGASWING according to the closed-circuit principle, i.e. the switching circuit is open when there is a level signal, line break or fault (safe state).

The instrument is used to control relays, contactors, magnet valves, warning lights, horns as well as PLC inputs.

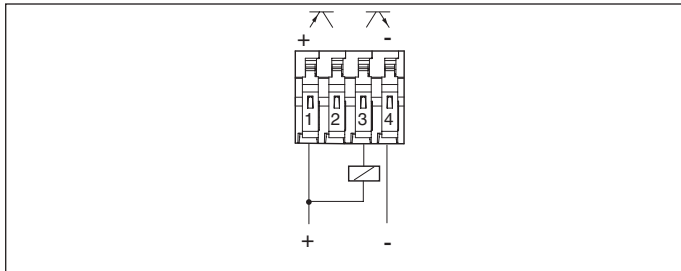


Fig. 24: VEGASWING 66 - transistor output - NPN action

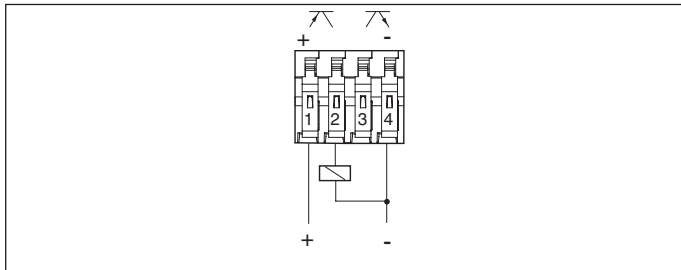


Fig. 25: VEGASWING 66 - transistor output - PNP action

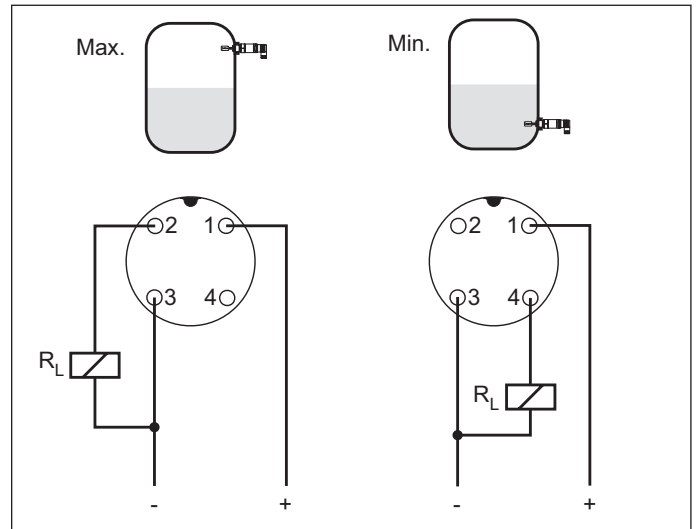


Fig. 27: VEGASWING 51, 53 - transistor output with M12 x 1 plug connection (housing)

- 1 Brown
- 2 White
- 3 Blue
- 4 Black
- RL Load resistance (contactor, relay, etc.)

**VEGASWING 51, 53**

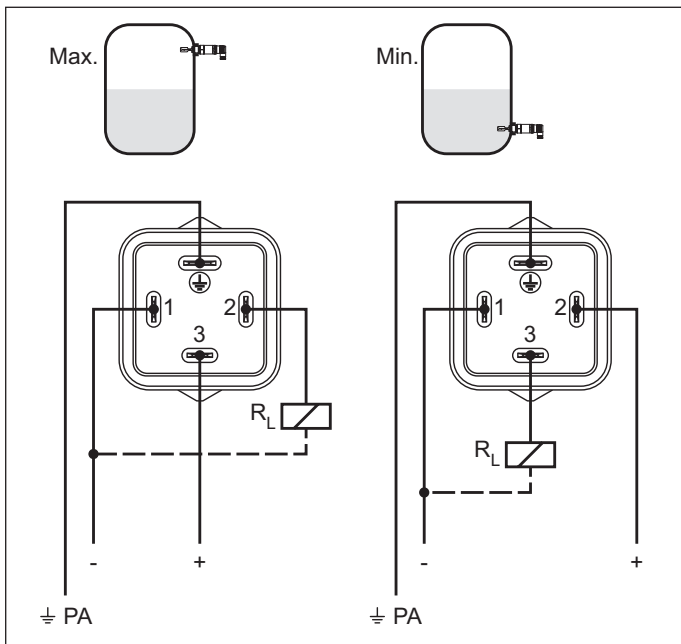


Fig. 26: VEGASWING 51, 53 - transistor output with valve plug ISO 4400

- PA Potential equalisation
- RL Load resistance (contactor, relay, etc.)

## 11 Contactless electronic switch

### Preparing the connection

#### Note safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage

#### Take note of safety instructions for Ex applications

In hazardous areas you must take note of the respective regulations, conformity and type approval certificates of the sensors and power supply units.

#### Select voltage supply

Connect the operating voltage according to the following diagrams. The electronics module is designed in protection class 1. To maintain this protection class, it is absolutely necessary that the ground conductor be connected to the internal ground terminal. Take note of the general installation regulations. As a rule, connect VEGASWING to vessel ground (PA), or in case of plastic vessels, to the next ground potential. On the side of the housing there is a ground terminal between the cable entries. This connection serves to drain off electrostatic charges. In Ex applications, the installation regulations for hazardous areas must be given priority.

#### Select connection cable

The VEGASWING is connected with standard three-wire cable without screen with round cross-section. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Use a suitable cable gland and select a suitable seal depending on the cable diameter.



In hazardous areas, use only approved cable connections for VEGASWING.

#### Select connection cable for Ex applications

Take note of the corresponding installation regulations for Ex applications.

#### Contactless electronic switch

We recommend connecting VEGASWING in such a way that the switching circuit is open when there is a level signal, line break or failure (safe state).

The contactless electronic switch is always shown in non-operative condition.

The instrument is used for direct control of relays, contactors, magnet valves, warning lights, horns etc. It must not be operated without an intermediately connected load, because the electronics would be destroyed if connected directly to the mains. It is not suitable for connection to low voltage PLC inputs.

Domestic current is temporarily lowered below 1 mA after switching off the load so that contactors, whose holding current is lower than the constant domestic current of the electronics, are reliably switched off.

When VEGASWING is used as part of an overflow protection system according to WHG, also note the regulations of the general type approval.

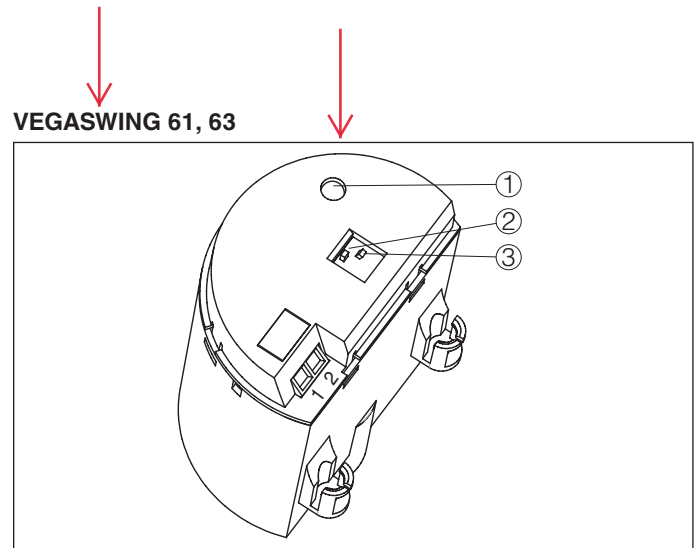


Fig. 28: VEGASWING 61, 63 - electronics module with contactless electronic switch

- 1 Control lamp
- 2 DIL switch for mode adjustment
- 3 DIL switch for sensitivity adjustment

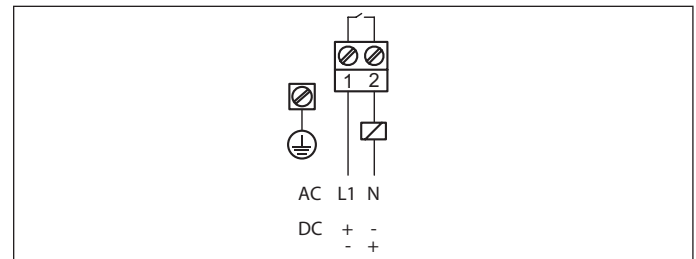


Fig. 29: VEGASWING 61, 63 - wiring plan - output, contactless electronic switch

### VEGASWING 51, 53

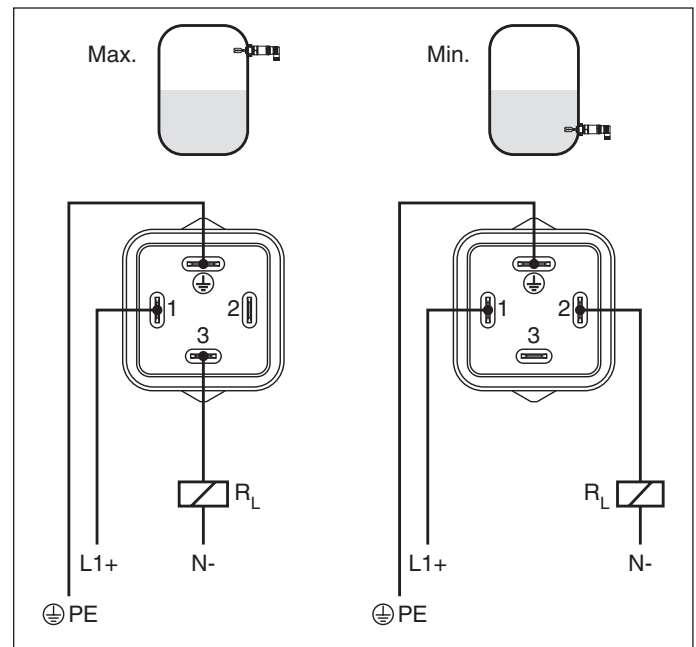


Fig. 30: VEGASWING 51, 53 - contactless electronic switch with valve plug ISO 4400

- PE Protection earth  
 RL Load resistance (contactor, relay, etc.)

## 12 Two-wire output

### Preparing the connection

#### Note safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage

#### Take note of safety instructions for Ex applications

In hazardous areas you must take note of the respective regulations, conformity and type approval certificates of the sensors and power supply units.

#### Select voltage supply

Connect the voltage supply according to the following diagrams. Take note of the general installation regulations. As a rule, connect VEGASWING to vessel ground (PA), or in case of plastic vessels, to the next ground potential. On the side of the instrument housing there is a ground terminal between the cable entries. This connection serves to drain off electrostatic charges. In Ex applications, the installation regulations for hazardous areas must be given priority.

#### Select connection cable

The VEGASWING is connected with standard two-wire cable without screen with round cross-section. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Use a suitable cable gland and select a suitable seal depending on the cable diameter.



In hazardous areas, use only approved cable connections for VEGASWING.

#### Select connection cable for Ex applications

Take note of the corresponding installation regulations for Ex applications.

### Two-wire output

#### VEGASWING 61, 63

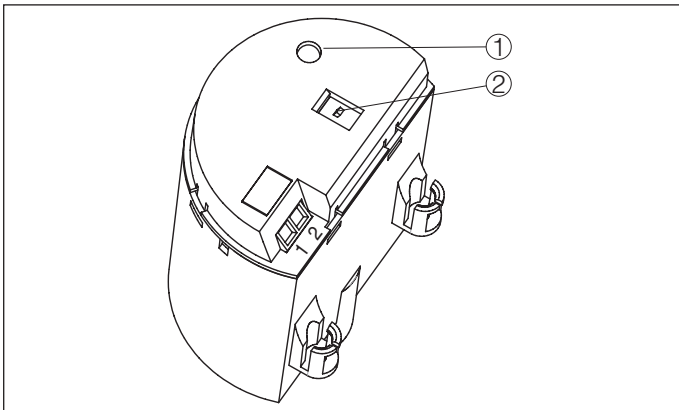


Fig. 31: VEGASWING 61, 63 - electronics module with two-wire electronics

- 1 Control lamp
- 2 DIL switch for sensitivity adjustment

We recommend connecting VEGASWING in such a way that the switching circuit is open when there is a level signal, line break or failure (safe state).

For connection to a controller, ditto Ex operating voltage via the connected controller.

The wiring example is applicable for all suitable controllers.

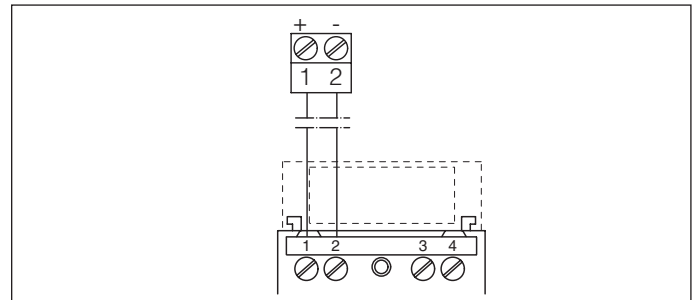


Fig. 32: VEGASWING 61, 63 - wiring plan - two-wire output

#### VEGASWING 66

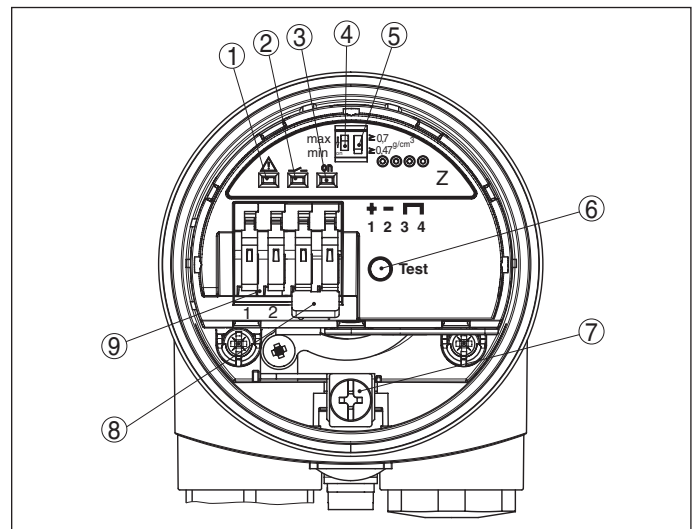


Fig. 33: VEGASWING 66 - electronics module with two-wire electronics

- 1 Control lamp - fault indication (red)
- 2 Control lamp - Switching status (yellow)
- 3 Control lamp - Operating status (green)
- 4 Mode switch for selecting the switching behaviour (min./max.)
- 5 DIL switch for sensitivity adjustment
- 6 Test key
- 7 Ground terminal
- 8 Connector block
- 9 Connection terminals

We recommend connecting VEGASWING in such a way that the switching circuit is open when there is a level signal, line break or failure (safe state).

For connection to a controller, ditto Ex operating voltage via the connected controller.

The wiring example is applicable for all suitable controllers.

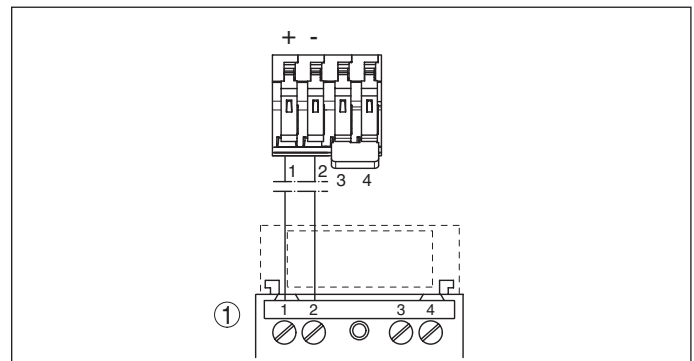


Fig. 34: VEGASWING 66 - wiring plan - two-wire output

- 1 Controller

### 13 NAMUR output

#### Preparing the connection

##### Note safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage

##### Take note of safety instructions for Ex applications

In hazardous areas you must take note of the respective regulations, conformity and type approval certificates of the sensors and power supply units.

##### Select voltage supply

Connect the voltage supply according to the following diagrams. Take note of the general installation regulations. As a rule, connect VEGASWING to vessel ground (PA), or in case of plastic vessels, to the next ground potential. On the side of the instrument housing there is a ground terminal between the cable entries. This connection serves to drain off electrostatic charges. In Ex applications, the installation regulations for hazardous areas must be given priority.

##### Select connection cable

The VEGASWING is connected with standard two-wire cable without screen with round cross-section. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Use a suitable cable gland and select a suitable seal depending on the cable diameter.



In hazardous areas, use only approved cable connections for VEGASWING.

##### Select connection cable for Ex applications

Take note of the corresponding installation regulations for Ex applications.

#### NAMUR output

#### VEGASWING 61, 63

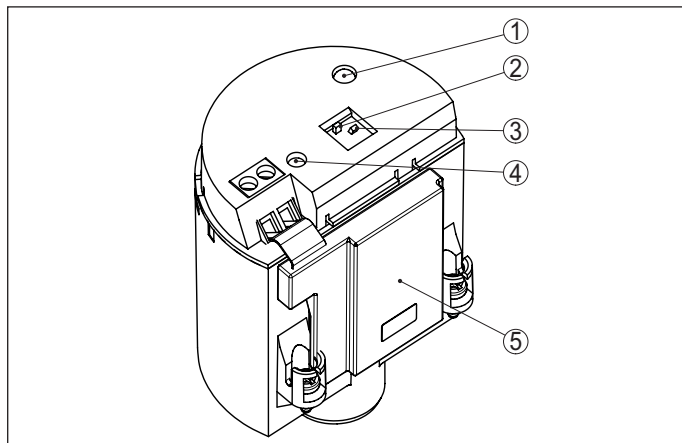


Fig. 35: VEGASWING 61, 63 - electronics module with NAMUR electronics

- 1 Control lamp
- 2 DIL switch for characteristics reversal
- 3 DIL switch for sensitivity adjustment
- 4 Simulation key
- 5 EMC filter element

For connection to an amplifier according to NAMUR (IEC 60947-5-6, EN 50227).

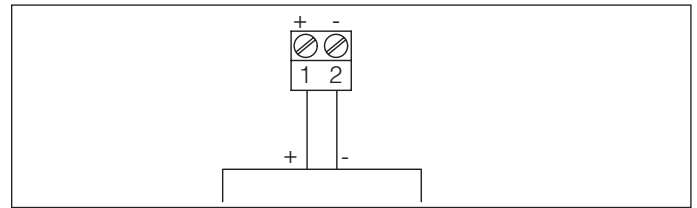


Fig. 36: Wiring plan - NAMUR output

## 14 IO-Link output

### Preparing the connection

#### Note safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage.
- The electrical connection must only be carried out by trained, qualified personnel authorised by the plant operator.
- Always switch off power supply, before connecting or disconnecting the instrument.

#### Select voltage supply

Connect the power supply according to the following wiring diagrams. Observe the general installation instructions.

#### Select connection cable

The instrument is connected with standard three-wire cable without screen. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Make sure that the cable used has the required temperature resistance and fire safety for max. occurring ambient temperature

#### Plug versions

#### M12 x 1 plug connection

This plug connection requires a prefabricated cable with plug. Depending on the version, protection IP66/IP67 or IP68 (0.2 bar).

#### IO-Link output

#### VEGASWING 51, 53

For connection to binary inputs of a PLC.

For power supply, use an energy-limited circuit according to EN 61010.

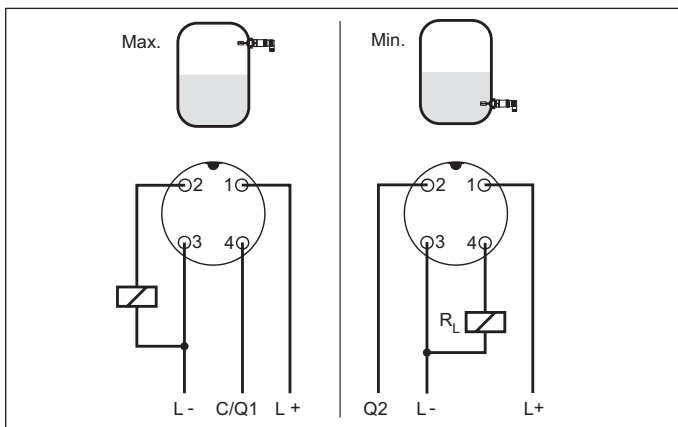


Fig. 37: Wiring plan (housing), terminal assignment IO-link output with M12 x 1 plug connection

- 1 L+ Voltage supply (brown)
  - 2 Max. level detection (white)
  - 3 L- Voltage supply (blue)
  - 4 Min. level detection/IO-Link communication (black)
- $R_L$  Load resistance (contactor, relay, etc.)

## 15 Adjustment

### 15.1 VEGASWING 51, 53

#### Switching point adaptation

Products with a density  $> 0.7 \dots 2.5 \text{ g/cm}^3$  ( $0.025 \dots 0.09 \text{ lbs/in}^3$ ) can be detected. This setting cannot be modified.

The switching status of VEGASWING can be checked when the housing is closed (signal lamp, illuminated ring below the plug).

#### Simulation

VEGASWING has an integrated test switch which can be activated magnetically. To test the instrument, you have to hold the test magnet (accessory) to the magnet symbol on the instrument housing.

The test magnet changes the current switching condition of the instrument. You can check the change on the signal lamp. Please note that the connected instruments are activated during the test.

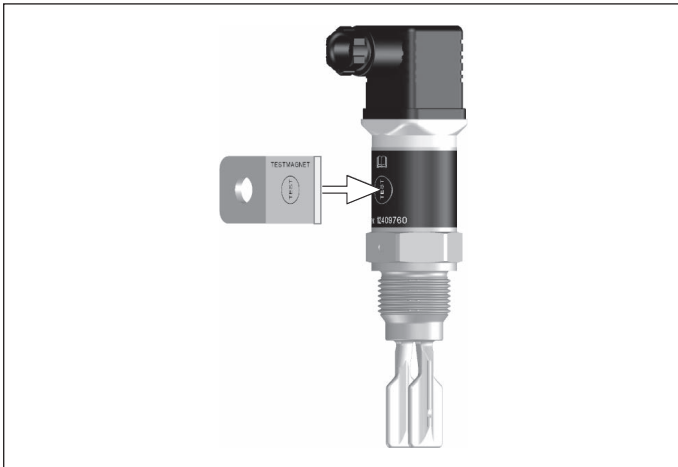


Fig. 38: Simulation of the output signal

#### Mode adjustment

Due to the respective polarisation of the operating voltage, the switching behaviour can be defined (max. detection/min. detection). by different connection of the consumer (load) PNP or NPN behaviour can be reached for the version with transistor output.

#### Control lamp (LED)

The switching status of VEGASWING is visible from outside (control lamp, illuminated lens below the plug).

### 15.2 VEGASWING 61, 63

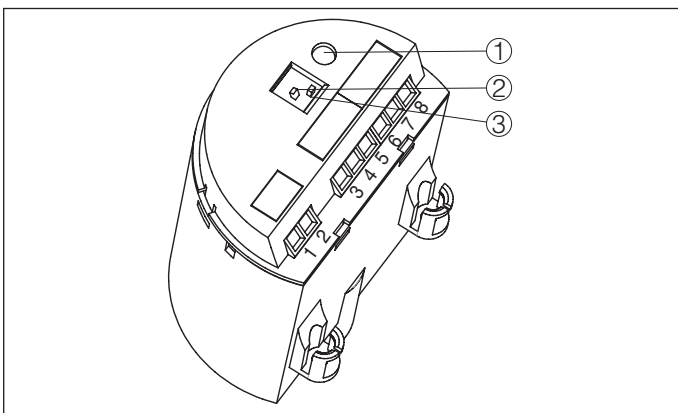


Fig. 39: Oscillator SWE60R - Relay output

- 1 Control lamp (LED)
- 2 DIL switch for mode adjustment
- 3 DIL switch for sensitivity adjustment

#### Switching point adaptation

With this DIL switch (3) you can set the switching point to liquids having a density between  $0.5$  and  $0.7 \text{ g/cm}^3$  ( $0.018$  and  $0.025 \text{ lbs/in}^3$ ). With the basic setting, liquids with a density of  $\geq 0.7 \text{ g/cm}^3$  ( $0.025 \text{ lbs/in}^3$ ) can be detected. In liquids with lower density, you must set the switch to  $\geq 0.5 \text{ g/cm}^3$  ( $0.018 \text{ lbs/in}^3$ ). The specifications for the position of the switching point relate to water - density value  $1 \text{ g/cm}^3$  ( $0.036 \text{ lbs/in}^3$ ). In products with a different density, the switching point will shift in the direction of the housing or tuning fork end depending on the density and type of installation.

#### Mode adjustment

With the mode adjustment (min./max.) you can change the switching condition of the output. You can set the required mode (A/max. - max. detection or overflow protection, B/min. - min. detection or dry run protection).

#### Control lamp (LED)

Diode for indication of the switching status (with plastic housing visible from outside).

### VEGASWING 61, 63 - NAMUR electronics

#### Simulation key

The simulation key is located in a recess on the upper side of the electronics module. Push the simulation key with a suitable object (screwdriver, pen, etc.).

When the key is pushed, a line break between sensor and processing unit is simulated. The signal lamp on the sensor extinguishes. The measuring system must signal a fault and take on a safe state when the key is pushed.

Keep in mind that downstream connected instruments will be activated during operation. This allows you to check the correct function of the measuring system.

#### Characteristics reversal

The characteristics of the NAMUR electronics can be reversed with the DIL switch. You can choose between falling characteristic curve (switch position max.) and rising characteristic curve (switch position min.). This allows you to output the desired current.

#### Modes

- min. - rising characteristic curve (High current when immersed)
- max. - falling characteristics (Low current when immersed)

The NAMUR output can be switched to falling or rising characteristics.

For applications according to WHG, the DIL switch must be set to position max.

### 15.3 VEGASWING 66

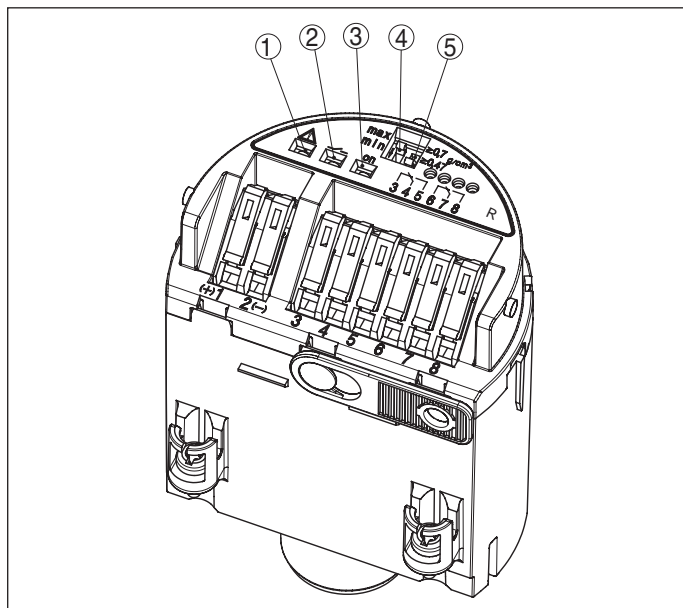


Fig. 40: Electronics module - VEGASWING 66, e.g. relay output

- 1 Control lamp for fault indication (red)
- 2 Control lamp for indication of the switching status (yellow)
- 3 Signal lamp for indication of the operating status (green)
- 4 Mode switch for selecting the switching behaviour (min./max.)
- 5 DIL switch for sensitivity adjustment

#### Switching point adaptation

With this DIL switch (3) you can set the switching point to liquids having a density between  $0.47$  and  $0.7$  g/cm<sup>3</sup> ( $0.017$  and  $0.025$  lbs/in<sup>3</sup>). With the basic setting, liquids with a density of  $\geq 0.7$  g/cm<sup>3</sup> ( $0.025$  lbs/in<sup>3</sup>) can be detected. In liquids with lower density, you must set the switch to  $\geq 0.47$  g/cm<sup>3</sup> ( $0.017$  lbs/in<sup>3</sup>). The specifications for the position of the switching point relate to water - density value  $1$  g/cm<sup>3</sup> ( $0.036$  lbs/in<sup>3</sup>). In products with a different density, the switching point will shift in the direction of the housing or tuning fork end depending on the density and type of installation.

Optionally the instrument can be also delivered with a min. density range of  $\geq 0.42$  g/cm<sup>3</sup> ( $0.015$  lbs/in<sup>3</sup>). In this case, the max. permissible process pressure is limited to 25 bar (363 psig). This instrument version may not be used in safety-instrumented systems (SIL) or in applications according to WHG.

#### Mode adjustment

With the mode adjustment (min./max.) you can change the switching condition of the output. You can set the required mode (A/max. - max. detection or overflow protection, B/min. - min. detection or dry run protection).

#### Control lamp (LED)

Diode for indication of the switching status (with plastic housing visible from outside).

## 16 Dimensions

## VEGASWING 51, standard version, thread

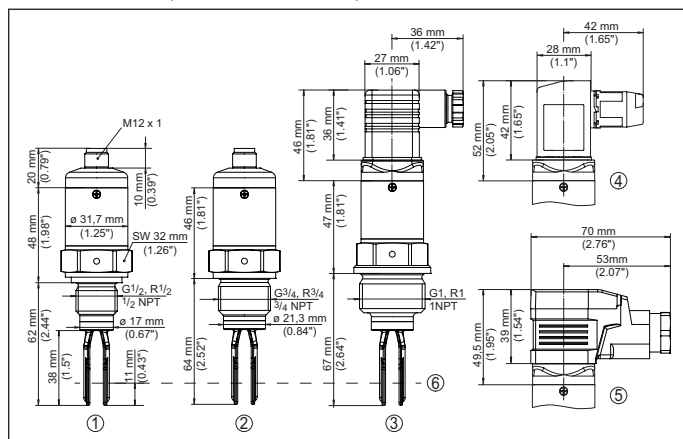


Fig. 41: VEGASWING, standard version, threaded fittings

- 1 Thread G $\frac{1}{2}$  (DIN ISO 228/1),  $\frac{1}{2}$  NPT, M12 x 1 plug<sup>1)</sup>
- 2 Thread G $\frac{3}{4}$  (DIN ISO 228/1),  $\frac{3}{4}$  NPT, M12 x 1 plug
- 3 Thread G1 (DIN ISO 228/1), 1 NPT, valve plug ISO 4400
- 4 Valve plug ISO 4400 with IDC method of termination
- 5 Valve plug ISO 4400 with hinged cover
- 6 Switching point

## VEGASWING 51, high temperature version

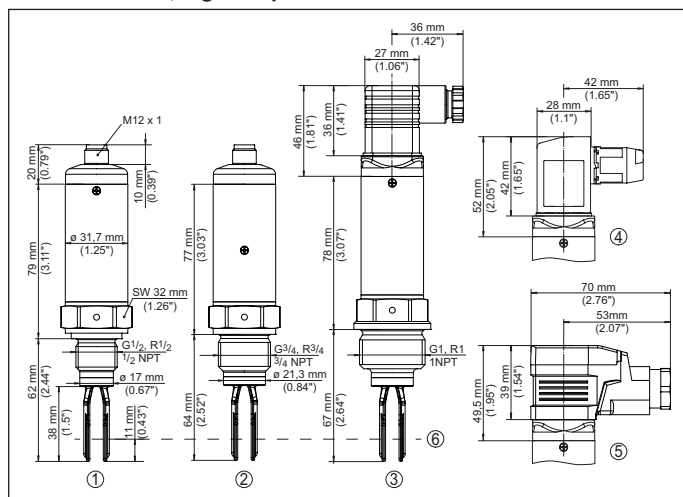


Fig. 42: VEGASWING, high temperature versions, threaded fittings

- 1 Thread G $\frac{1}{2}$  (DIN ISO 228/1),  $\frac{1}{2}$  NPT, M12 x 1 plug
- 2 Thread G $\frac{3}{4}$  (DIN ISO 228/1),  $\frac{3}{4}$  NPT, M12 x 1 plug
- 3 Thread G1 (DIN ISO 228/1), 1 NPT, valve plug ISO 4400
- 4 Valve plug ISO 4400 with IDC method of termination
- 5 Valve plug ISO 4400 with hinged cover
- 6 Switching point

## VEGASWING 51, hygienic versions

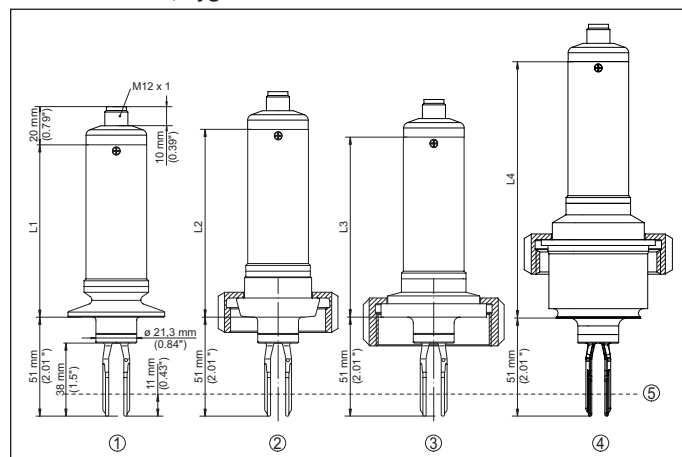


Fig. 43: VEGASWING, hygienic versions, hygienic fittings

- 1 Clamp, M12 x 1 plug
  - 2 Slotted nut, M12 x 1 plug
  - 3 SMS 1145, M12 x 1 plug
  - 4 Hygienic fitting with compression nut, M12 x 1 plug
  - 5 Switching point
- L1 Length with Clamp  
 Clamp 1": 90 mm (3.54 in)  
 Clamp 1½": 90 mm (3.54 in)  
 Clamp 2": 89 mm (3.50 in)
- L2 Length with slotted nut  
 DN 25 PN 40: 98 mm (3.86 in)  
 DN 40 PN 40: 103 mm (4.06 in)  
 DN 50 PN 25: 104 mm (4.09 in)
- L3 Length with SMS  
 DN 38 PN 6: 94 mm (3.70 in)
- L4 Length with aseptic fitting  
 134 mm (5.28 in)

## VEGASWING 53, standard version, threaded fittings

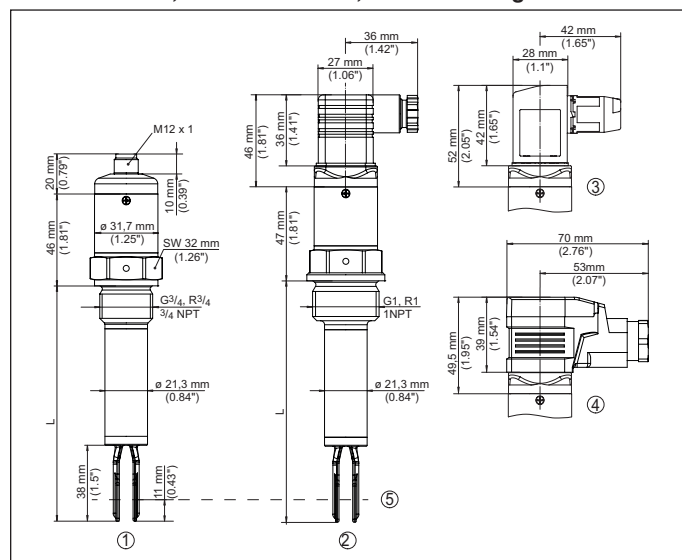


Fig. 44: VEGASWING, standard version, threaded fittings

- 1 M12 x 1, Thread G $\frac{3}{4}$  (DIN ISO 228/1),  $\frac{3}{4}$  NPT<sup>2)</sup>
- 2 Valve block ISO 4400, Thread G1 (DIN ISO 228/1), 1 NPT
- 3 Valve plug ISO 4400 with IDC method of termination
- 4 Valve plug ISO 4400 with hinged cover
- 5 Switching point
- L Sensor length

<sup>1)</sup> Keep in mind that the total length is extended by the plug connection.

<sup>2)</sup> Keep in mind that the total length is extended by the plug connection.



**VEGASWING 53, high temperature versions, threaded fittings**

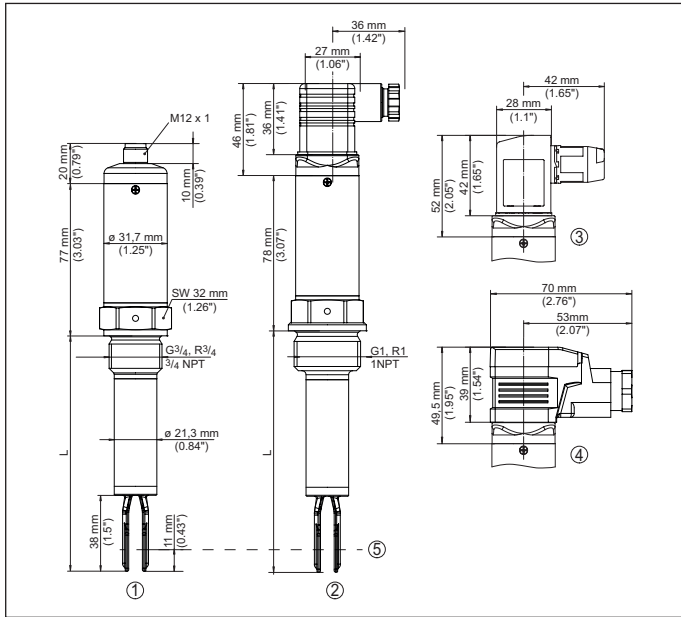


Fig. 45: VEGASWING, high temperature versions, threaded fittings

- 1 M12 x 1, Thread G $\frac{3}{4}$  (DIN ISO 228/1),  $\frac{1}{4}$  NPT<sup>3)</sup>
- 2 Valve block ISO 4400, Thread G1 (DIN ISO 228/1), 1 NPT
- 3 Valve plug ISO 4400 with IDC method of termination
- 4 Valve plug ISO 4400 with hinged cover
- 5 Switching point
- L Sensor length

**VEGASWING 53, hygienic versions, hygienic fittings**

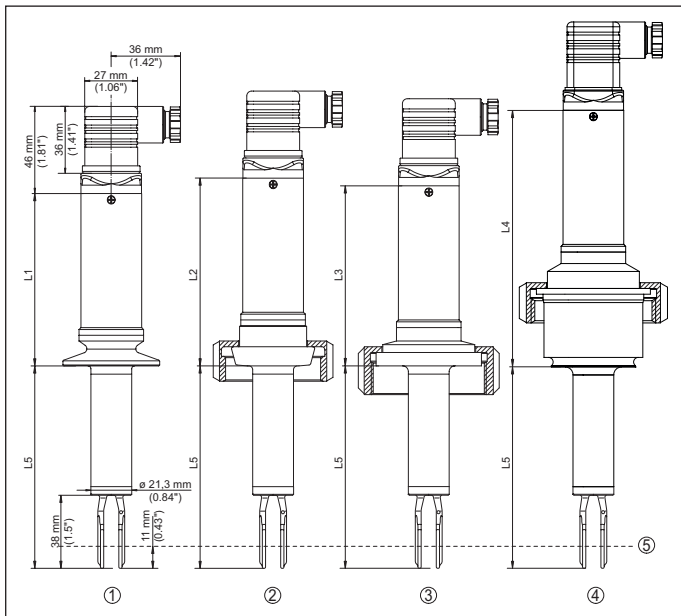


Fig. 46: VEGASWING, hygienic versions, hygienic fittings

- 1 Valve plug ISO 4400, Clamp
- 2 Valve plug ISO 4400, slotted nut
- 3 Valve plug ISO 4400, SMS 1145
- 4 Valve plug ISO 4400, hygienic connection with compression nut
- 5 Switching point
- L1 Clamp 1": 90 mm (3.54 in)  
Clamp 1½": 90 mm (3.54 in)  
Clamp 2": 89 mm (3.50 in)
- L2 Slotted nut DN 25 PN 40: 98 mm (3.86 in)  
Slotted nut DN 40 PN 40: 103 mm (4.06 in)  
Slotted nut DN 50 PN 25: 104 mm (4.09 in)
- L3 SMS fitting: 94 mm (3.70 in)
- L4 Hygienic fitting: 134 mm (5.28 in)

<sup>3)</sup> Keep in mind that the total length is extended by the plug connection.

**Housing VEGASWING 61, 63, 66**

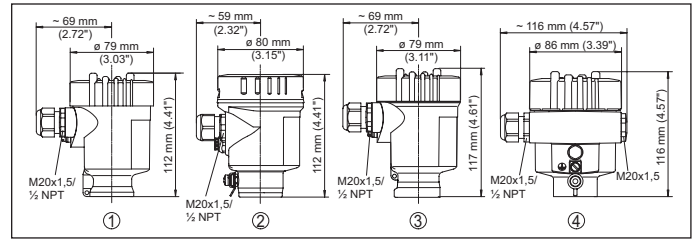


Fig. 47: Housing versions for VEGASWING 61, 63, 66

- 1 Plastic housing
- 2 Stainless steel housing (electropolished)
- 3 Stainless steel housing (precision casting)
- 4 Aluminium housing

**Housing in protection IP66/IP68 (1 bar)**

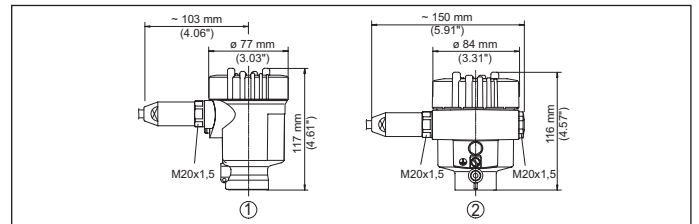


Fig. 48: Housing versions with protection rating IP66/IP68 (1 bar) for VEGASWING 61, 63, 66

- 1 Stainless steel housing (precision casting)
- 2 Aluminium housing

**VEGASWING 61**

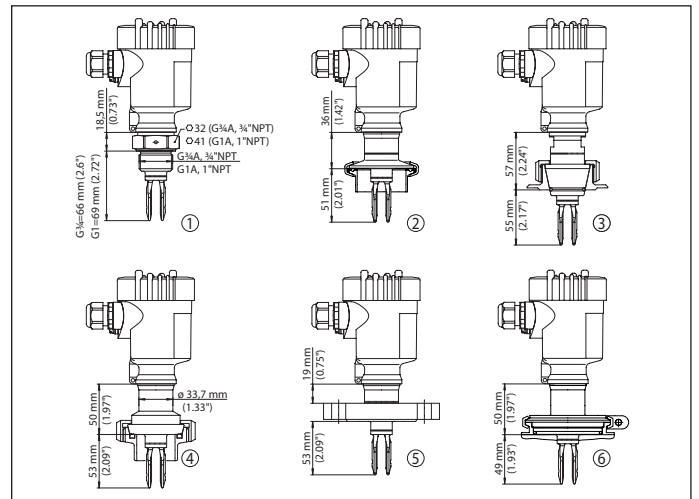


Fig. 49: VEGASWING 61

- 1 Thread
- 2 Clamp
- 3 Cone DN 25
- 4 Slotted nut DN 40
- 5 Flange
- 6 Gas-tight leadthrough
- 7 Temperature adapter

VEGASWING 63

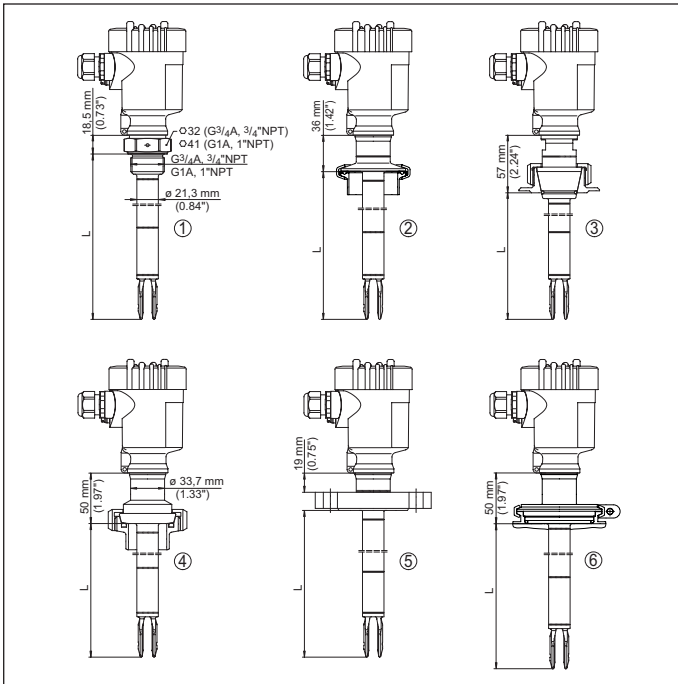


Fig. 50: VEGASWING 63

- 1 Thread
- 2 Clamp
- 3 Cone DN 25
- 4 Slotted nut DN 40
- 5 Flange
- 6 Gas-tight leadthrough
- 7 Temperature adapter
- L Sensor length, see chapter "Type overview"

Temperature adapter - VEGASWING 61, 63

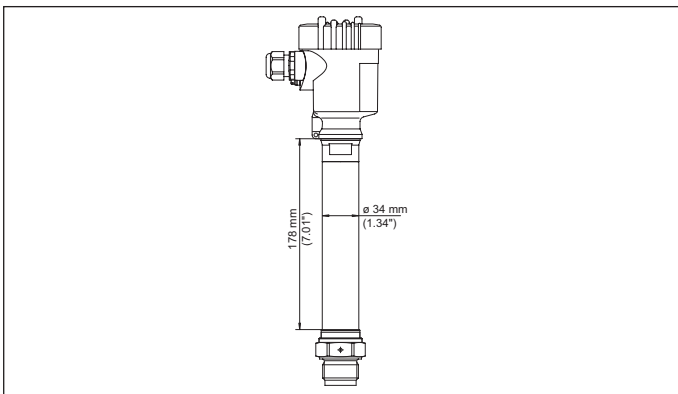


Fig. 51: Temperature adapter up to +250 °C (+482 °F) for VEGASWING 61 and 63

VEGASWING 66

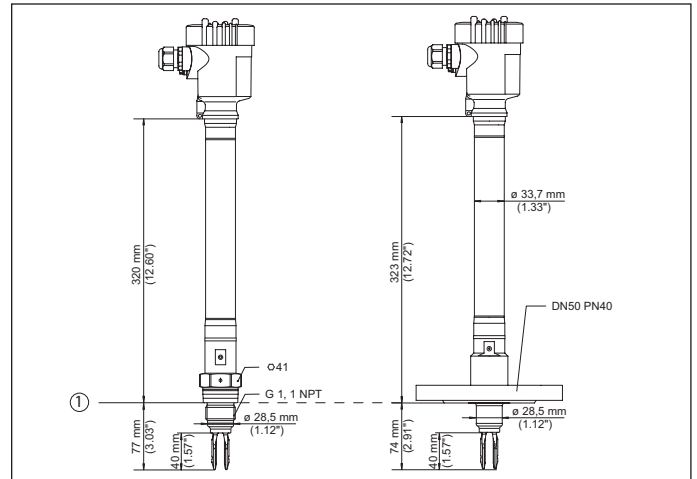


Fig. 52: VEGASWING 66 - compact version, -196 ... +450 °C (-321 ... +842 °F)

- 1 Sealing surface

VEGASWING 66

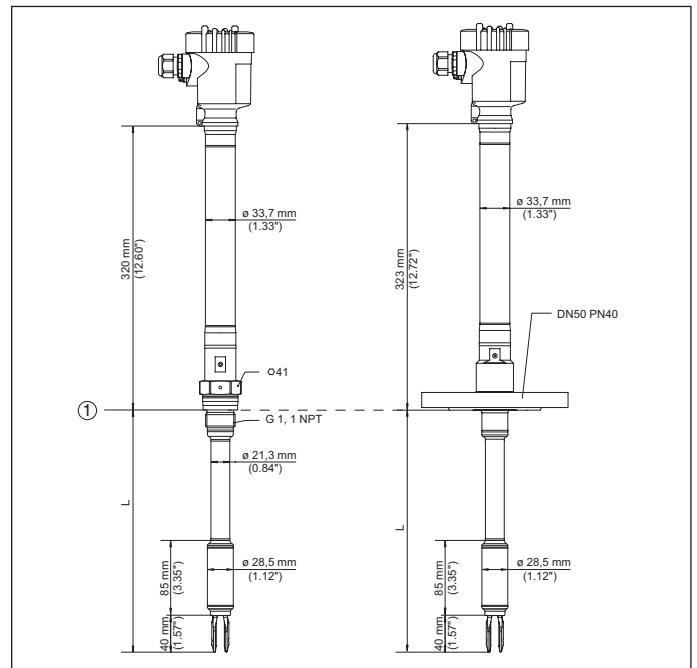


Fig. 53: VEGASWING 66 - tube version, -196 ... +450 °C (-321 ... +842 °F)

- 1 Sealing surface
- L Sensor length, see chapter "Type overview"



EC1000 Bacnet System Control Panel Data Sheet and Wiring

STANDARD TOUCHSCREEN IS 7"



## EC1000 SERIES TOUCHSCREEN CONTROL PANEL



### DESCRIPTION

The Thermaflo EC1000 Electronic Controller combines full PID BacNet based control of temperature pressure level or flow and a combination one simple dynamic panel. Over 40 years of field experience has been designed into the EC1000. Standard application for the EC1000 are as follows:

- Temperature control of Heat Exchangers, Process Vessels, Hot Water Hydronic Heating Systems, as well as Domestic Water Systems
- Pressure Control of Steam Pressure Reducing Stations, VFD drive pump controls, Boiler and Deaerator systems, and Clean Steam Generators
- Level control of Feed Water and Deaerator Tanks, Process Tanks and Vats, Clean Steam Generators and Boiler Systems
- Flow control of heating logics, steam flow into processors, and buildings with BTU /Steam Flow/or Water Flow Measurements
- Simple standard functions, all EC1000 controllers are designed to operate with Thermaflo water heating clean steam and feedwater systems. Standard features include high temperature alarms, valve shutdowns, slow ramp startup, remote BacNet or 4-20 ma control, remote on-off and real time trending of set points versus actual with 24 hour 10 year backup for BAC systems
- Single point wiring: These controllers only require one 120VAC connection for operation and internal system wiring required on packages with built in surge protection 5 AMP service required
- The EC1000 features a NEMA standard enhanced white panel completely programmed, wired, and tested ready for operation

**Touchscreen Control:** The standard 4.5" touchscreen keeps the user informed of set point versus actual, alarms, go off operating of control valve while allowing simple adjustments to be made available in 7" and 10" optional sizes.

**Alarm Function:** Closes control valves and safety shutdown valve in the event of high temperature or pressures, plus has a latching or non-latching feature. These alarm points are fully programmable.

**Ramp Control System:** This feature slowly starts a system by incrementally opening at a programmed rate a steam or hotwater control valve thus eliminating thermal shock, water hammer or system overload. Startup is made simple and controlled and can be automatically, or remotely activated

**Contacts for BMS (Building Management Systems):** Building management systems are fully informed 24/7 with BacNet, Dry Contact or 4-20 MA of alarms, set points, Control valve positions, and control. Remote control of set points and On-Off are standard.

**Single Point UL Wiring:** Each EC1000 has single point 120 vac power connection and is UL Certified

**Custom Setup and Programming:** Thermaflo application Technicians can setup program, and test the EC1000 for your specific needs in our live system and hydronic testing at facility.

<b>Supply Voltage</b>	120 Volts AC @ 5AMPS
<b>Power Consumption</b>	24 Volts DC 60 Watts
<b>Power Supply Output</b>	24V DC 60 Watt
<b>Inputs</b>	MA, RTD, 1000
<b>Up to</b>	OHM Thermister
<b>BacNet Remote</b>	Dry Contacts or EMS Signal
<b>Outputs</b>	0-20 MA, 4-20
<b>PDI and BacNet</b>	Ma 0-10 Volts, Dry Contact Relay
<b>Control Actions</b>	Direct or Reverse on all outputs heating, cooling or level
<b>Display Standards</b>	Touchscreen 4.9" LLC (7" and 10" Optional)
<b>Real Time Clock</b>	10,000 Hours continuous
<b>Internal Power Supply</b>	24 VDC 60 Watts for control valve actuator power
<b>Ambient Temperature</b>	-4° to 140° F Cooling optional
<b>Accuracy Enclosure Approval</b>	UL Listed NEMA _____ Standard NEMA 4x Optional
<b>Weight</b>	22 lbs
<b>Overall Dimensions</b>	16" width x 20" height x 8" depth

## Model Number Code EC1000-01-04.5-1-120V

Programmed PID Loops \_\_\_\_\_  
 01 Standard  
 02 2 Loops  
 03 3 Loops  
 04 4 Loops

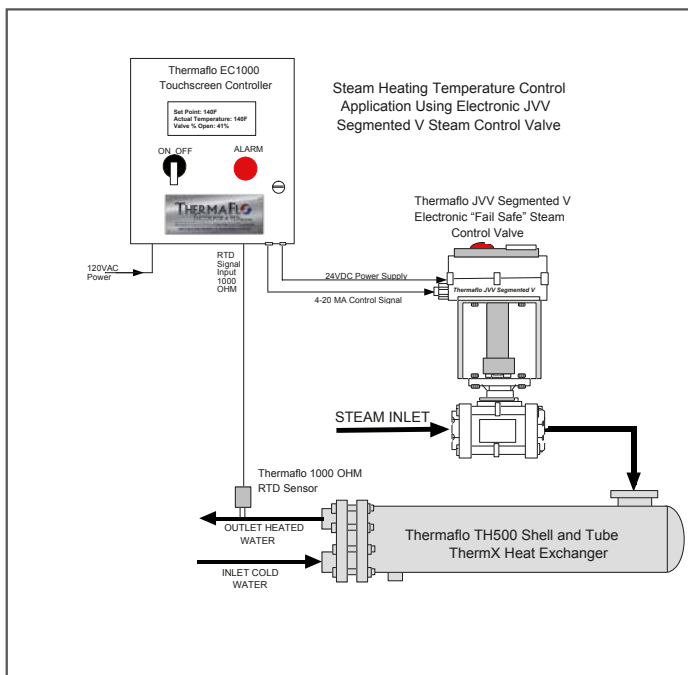
Touchscreen Size \_\_\_\_\_  
 04.5 4.5" Standard  
 07 7" Optional  
 010 10" Optional  
 Note: 10" Option increases panel size to 20"x 24" x 6"

NEMA Panel Rating \_\_\_\_\_  
 1 NEMA 1 Standard  
 4 NEMA 4  
 4X NEMA 4X

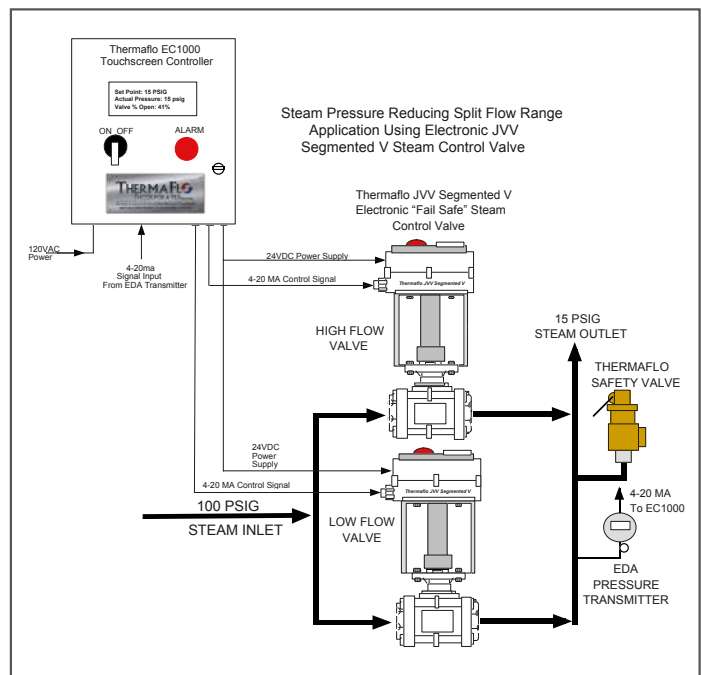
120V Power 60Hz Standard  
 50 Hz Available

**When ordering specify control mode of each loop for example:**  
**01- Temperature**  
**02- Pressures**  
**03- (2) Temperatures**  
**(1) Pressure**

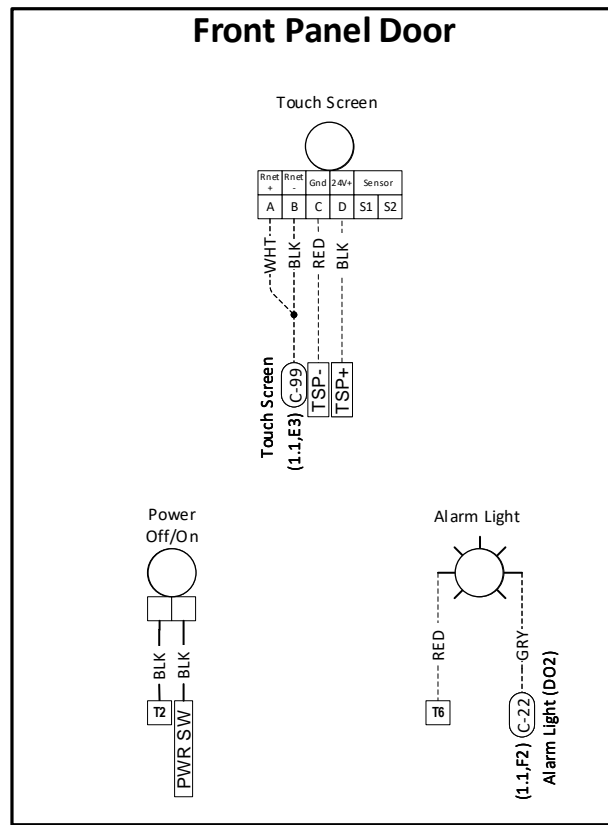
### Thermaflo EC1000 JVV Single Valve Hookup



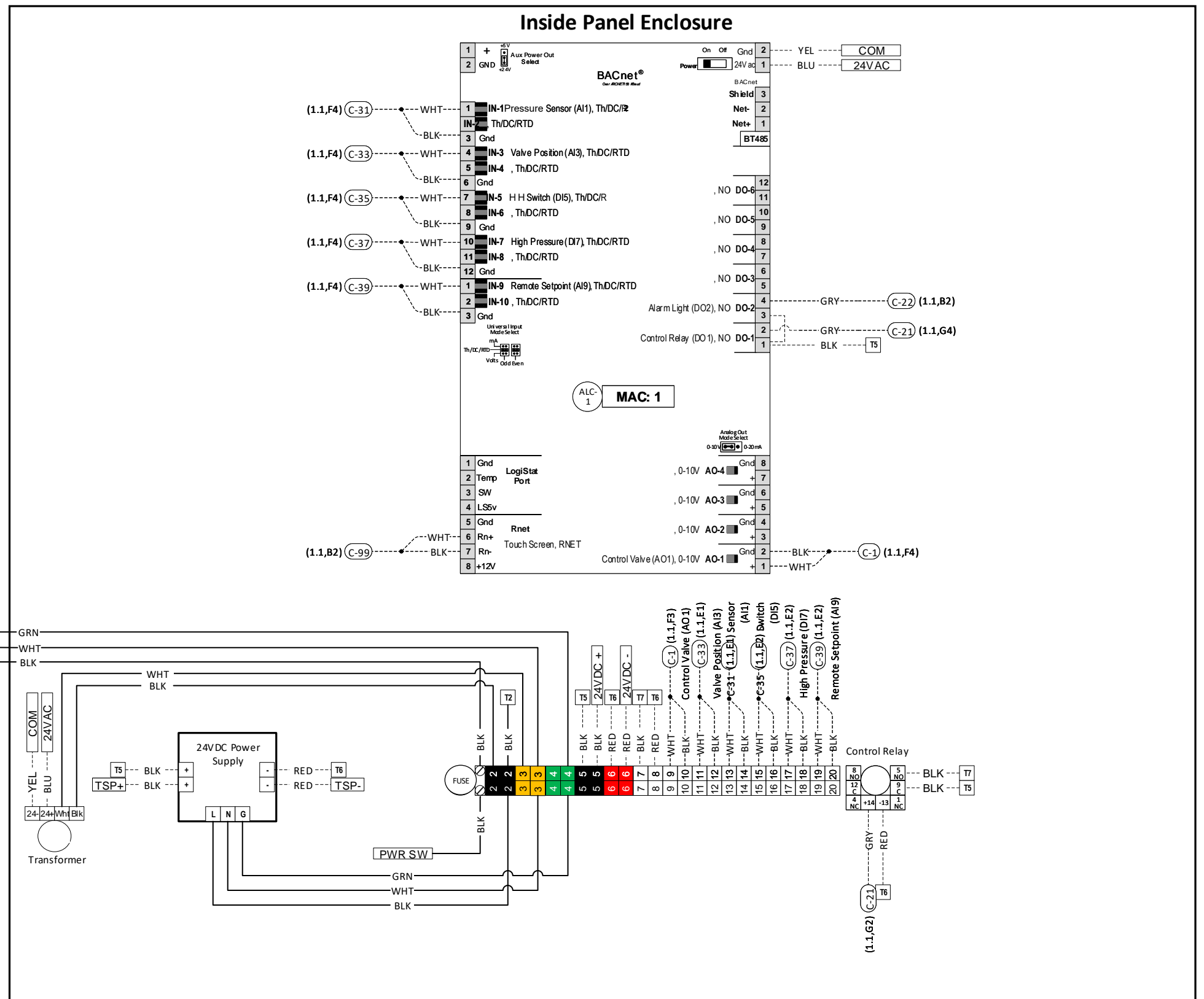
### Thermaflo EC1000 JVV Dual PRV Valve Hookup



Panel Size: 16" Wide x 20" OAH, 4.5" Deep  
White Gloss Color



CLEAN STEAM 7" TOUCHSCREEN



**Clean Steam Inputs:**  
 4-20 MA Clean Steam Outlet Pressure  
 4-20 MA Clean Steam Level and Alarms  
 High High Level Switch  
 High Pressure Switch

**Control Points:**

Clean Steam Outlet 15 psig Pressure 0-10V

Makeup Feedwater Level 0-10V

Standard 24VDC Transformer to operate the  
 Thermaflo JVV Segmented V Control Valve

**Alarms:**  
 High Pressure Alarm  
 High Level Alarm  
 High High Level Alarm  
 Low Level Alarm



Type JVV Steam Control Valve and Makeup Water Valve General Data Sheets

**THERMAFLO**  
INCORPORATED SINCE 1986

MANUFACTURERS OF STEAM FIRED SPECIALTY EQUIPMENT  
2880 FAIR AVENUE, NEWBERRY, SC. 29108 | PHONE: 704-940-1228

## JV V SERIES ELECTRONIC "V BALL" STEAM AND HIGH-TEMPERATURE HOT WATER CONTROL VALVES

The Thermaflo JVV V Ball Series Control Valve is designed for high speed 100% duty for temperature, pressure and level control applications. Specifically designed for steam, high-temperature hot water, and other rigorous control applications.

The equal percentage segmented V inner ball design provides the user with accurate control over a 300:1 flow turndown rangeability. Half the size and weight of any conventional globe control valve, the JVV is simple to install. The high-speed electronic actuator fails closed on power loss and totally eliminates air supply. The fully programmable actuator accepts 0-10V or 4-20 ma input control signal and can be split range controlled when required. The JVV Series high flow CVs reduces valve size, space and overall weight of any application in your piping system.



### JVV V-BALL STANDARD FEATURES

**PRECISION MACHINED 316 STAINLESS  
STEEL CONTROL SHAFT**

**ENGINEERED HIGH TEMPERATURE EXTENDED  
MOUNTING BRACKET**

**HIGH SPEED FAIL SAFE MODULATING ACTUATOR 0-10V  
OR 4-20MA CONTROL SIGNAL INPUT**

**HIGH TEMP CHEVRON SEAT AND STEM SEALS IN A  
ISO MACHINED BASE MOUNT**

**COMPLETE 316 STAINLESS STEEL  
BODY, BALL, AND STEM CONSTRUCTION**

**BUBBLE TIGHT CLASS VI STEAM AND HOT  
WATER SHUTOFF**

**HIGH V PORT CV FLOW CAPACITIES  
AND EXCELLENT EQUAL PERCENTAGE  
CHARACTERIZED FLOW**

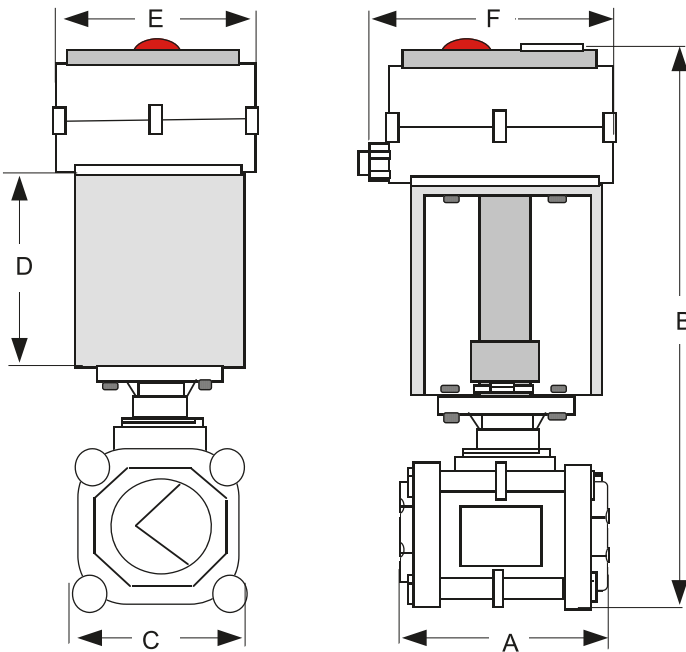
**VALVE POSITION FEEDBACK AND ALARMS**

- MAX OPERATING PRESSURE/TEMPERATURE  
450F @ 200 PSIG (HIGHER RATINGS AVAILABLE)
- MAXIMUM AMBIENT TEMPERATURE: 120F
- CUSTOM SLOTTED BALL AND CVS AVAILABLE
- SIZES: 1/2" THRU 3" CONNECTIONS: NPT OR  
SOCKET WELD UP TO 8" 150/300 LB AVAILABLE
- MATERIALS OF CONSTRUCTION: 316 STAINLESS  
STEEL BODY, BALL, AND STEM
- REINFORCED HIGH TEMPERATURE TEFLON SEATS



**SIZING NOTES:**

1. OPTIMUM CONTROL RANGE 30% TO 90%.
2. CV REDUCED 30% WHEN INSTALLING IN A PIPE WHERE VALVE SIZE IS MORE THAN HALF THE PIPE SIZE. EXAMPLE 2" PIPE AND CONTROL VALVE SIZE 3/4"



**DIMENSIONS (Shown in Inches)**

VALVE SIZE	A	B	C	D	E	F
1/2"	2.5	14	2	6	3	4
3/4"	2.9	14	2	6	3	4
1"	3.4	14.5	2.2	6	3	4
1.25"	3.7	14.6	2.9	6	4	6
1.5"	4.3	15	3.2	6	4	6
2"	5.8	15.3	3.5	6	4	6
3"	8	21	9	6	4	6

**NOTE:** Dimensions may change with inlet pressures over 150 psig due to actuator selection. Consult Factory.

3" Valve is 150lb Flanged Connection

**POWER REQUIREMENTS**

**06T** 60w at 24 VDC

**FLOW PERFORMANCE DATA VALVE**  
CV % of Opening 90% Segmented V

SIZE	30%	50%	80%	100%
1/2"	.85	2	8	14
3/4"	1	2.6	10	20
1"	2.7	7.7	24	43
1.25"	3	10.2	34	65
1.5"	3	14	48	90
2"	7.2	25	87	167
3"	8.65	42	161	359

**JVV V BALL SERIES MODEL NUMBER DESIGNATION**

SIVALVE SIZE: 1/2", 3/4", 1", 1.25", 1.5", 2", 3"  
VALVE CONSTRUCTION: S 316 STAINLESS STEEL

ALL TRIMS ARE 316 STAINLESS STEEL BALL AND STEM  
VALVE SEATS RT REINFORCED TEFLON 400F

END CONNECTIONS SE SCREWED ENDS 150LB FLG 3" ONLY

SW SOCKET WELD FAIL POSITION FC FAIL CLOSED

FO FAIL OPEN CONTROL PORT V90 90 DEGREPORT

INPUT SIGNAL

1 0-10 VOLTS 2 4-20 MA

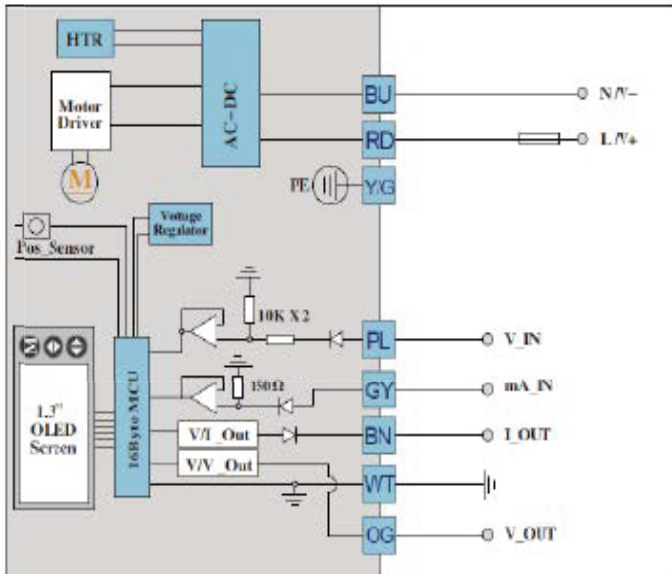
JVV-1" SRT-SE-FCV90-1 NEMA 2 4 (OPTIONAL)



# INTELLIGENT MODULATING ACTUATOR USAGE INSTRUCTIONS

**NEVER REMOVE THE TOP HOUSING OF THE ACTUATOR OR YOU WILL VOID THE WARRANTY CONTACT 704-940-1228 FOR HELP**

## WIRING DIAGRAM



- 1 BLUE
- 2 RED
- 3 YELLOW/GREEN
- 4 PURPLE
- 5 ORANGE
- 6 WHITE

SET V % open set from the control signal.  
 ANGLE Actual Valve Position  
 IDLE Screen will appear when the valve input signal is holding constant. This will toggle off to normal screen and toggle every 30 seconds  
 LED Power Light Valve Indicator  
**RED is Closed**  
**Yellow is Open**



**24VDC Power is Recommended**  
**FORMELY 06T**

## POWER REQUIREMENTS

### S80 Series 60W @ 24vdc

S80 (Formely 06T)	Valve Sizes . 5" to 2"
RED	24V DC DC ONLY
BLUE	NEUTRAL - Volt
PURPLE	0-10V Control INPUT SIGNAL
WHITE	COMMON
GREEN /YELLOW	GROUND
ORANGE	SIGNAL FEEDBACK

**NOTE:** Factory Control Signal is 0-10V Calibrated Input and Output

**24VAC can be used. However 24VDC will enable the actuator to be 100% duty cycle**

**Note:**  
**Whenever the actuator is first powered up at anytime it will take approx 45-60 seconds to fully charge the internal capacitor. This will be noticed on the top actuator screen and the green indicator light will come on.**