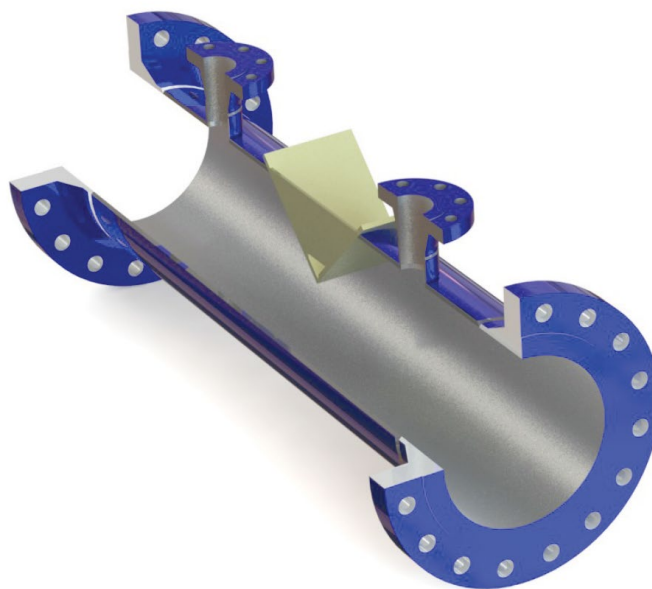


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Wedge Type Flow Meter

Installation and Operation Manual



**Please read and save
these instructions.**

Wedge Type Flow Meter

PLEASE READ THIS FIRST!

The purpose of this document is to provide guidance and instruction to installers and operators of the referenced equipment such that optimum performance and long service life may be obtained. It is recommended that this document be thoroughly reviewed with particular attention being devoted to warnings and notices, as ignorance thereof may adversely affect the expected performance of the installation, result in damage to the equipment or process upset, or bodily injury or harm.

WARNINGS:

Never exceed maximum rated pressure or temperature of the flow element.

Process pressure and/or process materials remaining in flow element can cause injury.

Standard plant safety procedures should be followed when removing element from service.

Maintenance must be performed by qualified technicians.

Disconnect all power sources to avoid electrical shock when servicing.

Keep these instructions for future reference.

General Information

The Wedge type flow meter element, in any of its iterations, is a high quality, precision flow meter designed to provide reliable pressure differential signal that is related inferentially to the volumetric flow rate passing through the element. By use of properly matched secondary instrumentation, the signal developed by this flow element can be converted into appropriate output, including local indication or 4-20mA signal for transmission to other processing systems as may be required.

As a result of the open region beneath the wedge, this meter type is excellent for process fluids that are highly viscous, sediment bearing and/or harsh, in addition to clear liquids, gases or steam.

The wedge type flow meter is known to possess excellent repeatability, a good uncalibrated accuracy and an excellent calibrated accuracy.

The scope of this document includes instruction for the typical installation, operation and maintenance of the flow element as well as proper connection of secondary instrumentation.

This document does not include specific instruction concerning the installation, calibration and start-up of secondary instrumentation equipment, if any. Please obtain specific instructions from the secondary instrumentation manufacturer.

The characteristic performance envelope of the flow element is disclosed in the body of this document. Further information as may be required, is available by contacting your authorized wedge type flow meter distributor or by contacting Armstrong directly.

Installation

General

A horizontal orientation of the flow element with impulse tap positioning between 45 to 90 degrees from vertical centerline of impulse tap component(s) is generally preferred (see figure 1.)

This installation protocol allows free passage of secondary phase solids through the wedge segment region and prevents entrapment of air (gas) in liquid phase process which otherwise will have an adverse effect on transmitter (secondary instrumentation) readings and accuracy.

In the event orientation other than that which is recommended above is required, satisfactory performance may be achieved subject to strict attention being given to:

- Properly venting transmitter;
- Adjust transmitter zero setting to compensate for relative difference in impulse piping elevations thus accommodating the hydrostatic head effect thereby introduced (this is especially significant in vertical orientation of the Wedge type flow element.)

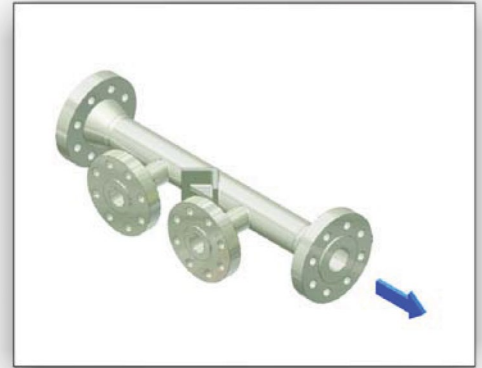


Figure 1: Recommended Installation Orientation

Straight Pipe Run Requirements

Typical of all flow meters is an effect on installed accuracy based on upstream and downstream disturbances. The standard method for elimination or mitigation of this effect is the installation of adequate unrestricted straight run process piping upstream and downstream of an internal diameter equal to that of the flow element entrance and exit sections, respectively.

Please Note: For applications where installed accuracy is critical, laboratory flow calibration for Coefficient of Discharge that includes the upstream and downstream disturbers properly modeled will provide optimum accuracy over the service flow range is required. This service is optional but can be provided at additional cost.

<u>Upstream Disturber</u>	<u>Preferred</u>		<u>Minimum</u>	
Partially Opened Gate Valve	10 Dia.	5 Dia.	10 Dia.	3 Dia.
Concentric Increaser	10 Dia.	5 Dia.	5 Dia.	3 Dia.
Concentric Reducer	10 Dia.	5 Dia.	5 Dia.	3 Dia.
1 Elbow	10 Dia.	5 Dia.	5 Dia.	3 Dia.
2 Elbows Close Coupled in Plane	10 Dia.	5 Dia.	5 Dia.	3 Dia.
2 Elbows Close Coupled out of Plane	10 Dia.	5 Dia.	10 Dia.	3 Dia.

Table 1: Typical Straight Pipe Length Requirements

Table 1 provides recommended straight pipe requirements necessary to properly counteract the effects of the listed disturbances. For especially difficult installation conditions please contact Armstrong for further guidance.

Installation

Installation and Connection

To obtain the best performance from your wedge type flow element, please observe the following guidance:

Preliminary Inspection

All flow elements are shipped with proper thread, impulse tap, and process connection surface(s) protection in place. In addition, all equipment is supplied with a permanent identification plate in place containing a flow directional arrow.

Prior to installation, examine and inspect the flow element for any damage especially at:

- All sealing and connection surfaces;
- All threaded surfaces;
- Interior tap locations;
- Identification plate;

In the event any of the foregoing are found to be defective or damaged, contact the factory for further instruction.

Standard wedge type flow elements equipped with connection flanges require appropriate gaskets between process and flow element mating flanges in order to effect a proper and secure installation. Gasket selection and provision is customer's responsibility. Please make certain that gaskets are rated to withstand maximum operating pressure and temperature of the installation as well as the action of the process composition itself. Gaskets are not provided.

Verify that process piping flanges are compatible with flow element mating flanges.

Pipe flanges must be parallel and properly aligned with meter flanges to prevent cracking of flanges. Meter should be centered carefully in pipe.

Verify that the flow directional arrow on the identification plate of the flow element coincides with the process flow direction.

Verify that process flanges are suitable for process pressure and temperature.

Gaskets must be properly placed and centered on bolt circle of mating flange(s) and must not protrude into the pipe opening. Failure to do so may adversely effect the accuracy of the installation.

Bolt the wedge type flow element into the process line using hardware appropriate to the flange(s). Bolting torque must conform to those recommended for the class and type rating of the flange(s). Mating flange hardware is not provided.

All sealing surfaces must be properly gasketed.

All connection hardware must be of size and material composition appropriate to the type and rating of the flange(s), the maximum temperature, maximum pressure, and process fluid composition.

Torque all flange bolting as recommended and required for ANSI flange ratings. DO NOT OVER TORQUE BOLTS.

Flange bolt tightening sequence should follow the standard star pattern protocol. Select each successive bolt assembly to be tightened opposite to the previous bolt, and then bisect the radial angle between the remaining bolts to be tightened until finished. This procedure is intended to avoid localized stresses on the gaskets. Installation of remote seal or chemical tee sensors shall follow the standard guidelines provided above, however, refer to transmitter manual installation instructions for further detailed guidance.

Installation

Installation-Secondary Instrument (Transmitter)

These instructions refer to the proper installation of differential pressure (DP) transmitters and more particularly, the impulse piping directly coupled to the pressure tap set(s) provided on the wedge type flow element.

The high pressure impulse line connection must be attached to the upstream pressure tap. The low pressure impulse line connection must be attached to the downstream pressure tap.

Fittings used to complete the impulse line connection(s) must be suitable for the process pressure and temperature conditions, as well as resist the adverse and/or corrosive nature of the process fluid, if any.

The mating end connections of impulse piping intended for wedge type flow elements equipped with chemical tee or flanged pressure tap end connections must exactly correspond to the flange type and rating of the flow element.

Start-Up Procedures

In order to start-up a wedge type flow element installation, first make certain that all connections have been properly made, that the flow element is installed with the flow directional arrow inscribed on the identification plate coinciding with the process flow direction, and that necessary power required by the secondary instrumentation is available and active.

The DP transmitter must then be adjusted to coordinate its zero reading to a confirmed no-flow condition in the flow element.

This can be achieved by use of a shutoff valve downstream of the flow element installation.

- Open shutoff valve for a brief period of time to establish flow.
- Purge any air (gas) from the DP transmitter body and impulse piping by relieving vent valves on the high and low side flanges of the DP transmitter.
 - If you have coupled an instrument manifold to the DP transmitter, the vent valves on the manifold may be used for venting purposes.
 - Any gas remaining in the flow element, impulse piping or transmitter body will result in a false zero reading and prevent metering accuracy, repeatability and reliability.
 - Once gas has been fully purged, close the shutoff valve.
 - Purge requirements does not apply to gas phase process line fluid applications.
- While under operating line pressure and temperature, but with no flow in the line, adjust the transmitter reading using the readout device (handheld or otherwise, as appropriate) to zero reading.
 - Open the shutoff valve, and then close. The transmitter reading should indicate flow, and then return to zero when no flow is occurring.
 - Repeat this process several times, making any fine adjustments as required to obtain a true zero.
- If the wedge type flow element being installed has been laboratory calibrated, using the calibration report verify that the calculated differential of the flow element corresponds to the differential span of the DP transmitter. If it does not, the transmitter will need to be recalibrated. Consult the installation instruction provided by the DP transmitter manufacturer for further guidance.

Safety

Prior to Start-Up

- Determine that the meter is properly installed. The wedge type meter is a piping component and should be handled accordingly with the same precautions. **DO NOT HANDLE METER FROM ITS INSIDE.**
- Determine that the pressure connections are properly made and are appropriate for the intended service.
- Determine that meter has been installed in strict conformance with the “Installation Directions” included in this manual.
- If the meter appears damaged in any way, contact Armstrong.

At Start-Up

- Do not over-pressurize the meter. Refer to approval drawing for design pressure.
- Do not subject meter to shock pressures or water hammer.
- When filling pipe line, bleed-off air in the proper fashion.

After Start-Up

- Do not over-pressurize the meter. Refer to approval drawing for design pressure.
- Do not subject meter to shock pressures or water hammer.
- Conform to “Preventive Maintenance” procedures included in this manual.
- Proper venting and draining is required in pipeline.
- Do not use meter as a pipe support. Support pipes on either side of meter. Meter can be supported, but not at throat (center of meter at wedge).
- All operational loading is not covered by meter manufacturer. This would be the responsibility of the owner/user unless specific loading information is noted at the time of the purchase order and included in approved meter submittal.

Preventive Maintenance

Removing Element from Service

Line Pressure and line fluid retained in the wedge type flow element may cause injury and damage to equipment and facilities. Standard plant safety procedures must be followed when removing the flow element from service.

The wedge type flow element has no moving parts that require servicing therefore removal of the flow element is not routinely or generally required except when process lines would otherwise be cleaned.

Prior to removal please observe these minimum precautions:

- Shut off all process flow.
- Shut off all process pressure.
- Drain process line, if possible.
- Disconnect transmitter connection(s).
- Disconnect impulse line connection(s).
- Remove remote seal elements (if any).
- Loosen and disconnect flow element process piping mating connections.
- Remove from process pipe line.

Inspection

Depending upon the nature of the process fluid, it is a generally accepted practice to periodically examine sealing surfaces for nicks, gouges or other emerging surface defects.

Examine the condition of pressure taps.

Examine the condition of any remote seal sensors for emerging surface defects.

In extremely harsh service applications, rigorous inspection and examination for evidence of erosion and/or corrosion.

Reinstallation

Upon reinstallation of an Armstrong flow element removed from service, please make certain to obtain and utilize all new gaskets as required.

Follow instructions in the “Installation” section contained in this document.

Storage Requirements

The wedge type flow element is a precision piece of equipment and must be handled carefully in order to preserve the performance envelope and service life expectancy inherent with the design.

Indoor Storage:

- The wedge type flow meters can be stored indefinitely indoors in a clean, non-corrosive environment. If environment is not clean, meters must be covered.
- Meters should be stored away from high traffic areas in order to minimize damage risk.
- Meters must not be stacked.
- Flanged meters may have bare iron or steel flange faces, or lightly primed flange faces as required by the specification.
- If meters will be stored in humid or corrosive areas, the flange faces may need to be coated with a suitable rust preventative. Note that any coating or sealant may need to be removed prior to installation; refer to the specification and applicable standards or codes. Temperature and humidity fluctuations should be minimized.
- Prolonged exposure to sunlight or other ultraviolet sources (fluorescent lights, etc.) may discolor, degloss, or chalk the exterior finish. See specific meter coating information.
- If storage is to be long-term, it is recommended that meters be covered with a tarp or heavy plastic sheeting.

Outdoor Storage – Short Term (less than 3 months):

- Meters should be stored away from high traffic areas in order to minimize damage risk.
- Meters must not be stacked.
- If meters will be stored in humid or corrosive areas, the flange faces may need to be coated with a suitable rust preventative appropriate for outdoor exposure. Note that any coating or sealant may need to be removed prior to installation; refer to the specification and applicable standards or codes.
- The ends are capped to eliminate foreign matter from damaging the internal portions of the meter. These caps must not be removed until installation.
- The pressure sensing tap connections have pipe plugs to eliminate the possibility of clogging. These caps must not be removed until installation.
- If the exterior finish gets damaged, it must be touched-up with the same or a compatible coating system. Note that prolonged exposure to sunlight may discolor, de-gloss, or chalk exterior finish.
- It is recommended that the meters be covered with a tarp or heavy plastic sheeting.

Long Term Storage:

- Long-term storage requires indoor storage where temperature and humidity fluctuations are minimized. Otherwise, contact Armstrong.

Meter Transport:

- Depending on unit and order size, the wedge meters are strapped or lagged onto pallets or custom skids.
- Using the skids, the meters can be moved with a forklift of adequate capacity. DO NOT DRIVE THE FORKLIFT THROUGH THE FLANGE CAPS OR INTO THE METER INTERIOR.
- The meters can be lifted by a crane or forklift in conjunction with an appropriate sling.
- Do not scrape or scratch the coated surfaces. Touch-up coatings as needed.

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VERIS, Inc.
Limited Warranty and Remedy

Veris, Inc. ("Veris") warrants to the original user of those products supplied by it and used in the service and in the manner for which they are intended shall be free from defects in material and workmanship for a period of five (5) years from the date of installation, but not longer than 63 months from the date of shipment from the Veris factory, unless a Special Warranty Period applies, as noted below. This warranty does not extend to any product that has been subject to misuse, neglect or alteration after shipment from the Veris factory. Except as may be expressly provided in a written agreement between Veris and the user, which is signed by both parties, Veris **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 defects or any condition or use of the products supplied by Veris, however caused, and whether such claim is based upon warranty, contract, negligence, strict liability, or any other basis or theory, is limited to Veris' repair or replacement of the part or product, or, at Veris' option, to repayment of the purchase price. In addition to replacing any part of parts found to Veris' satisfaction to be defective, Veris will pay the cost of shipment of both the defective part to the Veris plant and the replacement part to the original user. As a condition of enforcing any rights or remedies relating to Veris products, notice of any warranty or other claim relating to the products must be given in writing to Veris: (i) within 30 days of last day of the applicable warranty period, or (ii) within 30 days of the date of the manifestation of the condition or occurrence giving rise to the claim, whichever is earlier. **IN NO EVENT SHALL VERIS BE LIABLE FOR SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOSS OF USE OR PROFITS OR INTERRUPTION OF BUSINESS.** The Limited Warranty and Remedy terms herein apply notwithstanding any contrary terms in any purchase order or form submitted or issued by any user, purchaser, or third party and all such contrary terms shall be deemed rejected by Veris.

Special Warranty Periods are as follows:

Vortex Shedders, Venturi, Orifice Plates, Flow Nozzles and Wedge Meters: one (1) year from the date of installation, but not longer than 15 months from the date of shipment from the Veris factory.

Electromagnetic Flow and BTU Meters, Ultrasonic Flow and BTU Meters: 21 months from the date of installation, but not longer than 24 months from the date of shipment from the Veris Factory.

Electronic components, including without limitation, differential pressure transmitters, multivariable transmitters, flow computers, rate or totalizer displays: one (1) year from the date of installation, but not longer than 15 months from the date of shipment from the Veris factory.

Designs, materials, weights and performance ratings are approximate and subject to change without notice.
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