KANAGAWA INSTRUMENTS

Averaging Pitot Tube Flowmeter

Model: KPTF





Overwiew

The averaging pitot tube flowmeter requires the least installation effort of all DP flowmeters. It is cost-effective and suitable for a variety of applications. Its low remaining pressure loss and bi-directional flow capabilities make it the preferred instrument for water, sea water, condensate, cooling water, crude oil, saturated and superheated steam, nitrogen, combustion gases, ventilation air and many other liquids and gases. It can also be used for dust-laden gases at high-temperatures. The Kanagawa averaging pitot tube flowmeter covers big diameters, round and rectangular pipes and ducts. Due to the low flow profile constriction it generates only a minimal residual pressure loss.

Features

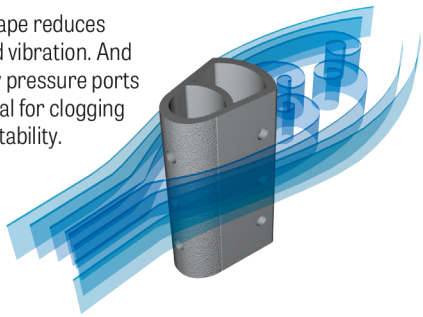
Fast and easy installation without additional engineering, impulse lines and supports – allowing perfect retrofit capabilities
Averaging flow profile for shortest in- and outlet runs
Symmetrical design allows bidirectional flow measurement
Low TCO due to reduced engineering, commissioning and installation costs
Reduced need for recalibration in the field through advanced 3-D linearised KPTF transmitters
Complete flowmeter solution with averaging pitot tube, manifold, DP transmitter from a single source
HART®7, Foundation fieldbus and Profibus-PA communication options
SIL declared versions
Ex ia, Ex d, Ex t approvals
Redundant versions, pressure and temperature compensated versions available

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The Most Accurate and Reliable Technology for Measuring Gas, Liquid and Steam

Developed from aerospace technology, the Kanagawa KPTF pitot flow sensor provides unsurpassed accuracy and reliability. With its solid one-piece construction and bullet shape, the KPTF makes flow measurement clog-free and precise.

The unique sensor shape reduces drag and flow induced vibration. And the location of the low pressure ports eliminates the potential for clogging and improves signal stability.



Accuracy You Can Trust And the Data to Back It Up

The unique and exclusive break-through in improved accuracy derived from the development of a **verified theoretical model** predicts the KPTF flow coefficients.

This eliminates the need for calibration tests to characterize the flow coefficients.

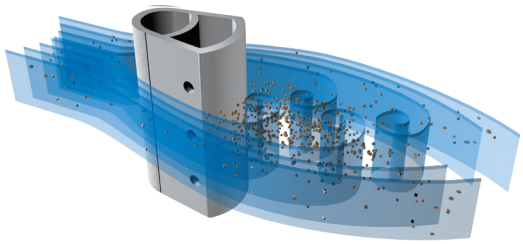
$$K = \frac{1}{\sqrt{\left(\frac{1}{1-C_b\beta_v}\right)^2 + C_\infty}}$$

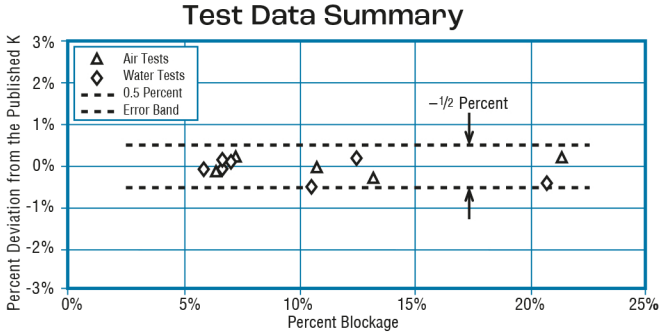
Without such a model, the uncertainty of the flow coefficients is dramatically increased and expensive calibration may be required. Empirical test data from independent laboratories verified the theoretical model and flow coefficients as a constant, independent of Reynolds number and within ±0.5% of the predicted value. The derivation of the theoretical model and test data is published in the KPTF Flow Test Report (ED-100).



Superior Signal Stability and Greater Resistance to Clogging

Clogging can occur in low pressure ports located in or near the partial vacuum at the rear of the sensor. The KPTF design locates the low pressure ports on the sides of the sensor, forward of the fluid separation point and turbulent wake area. This virtually eliminates clogging and produces an extremely stable signal.

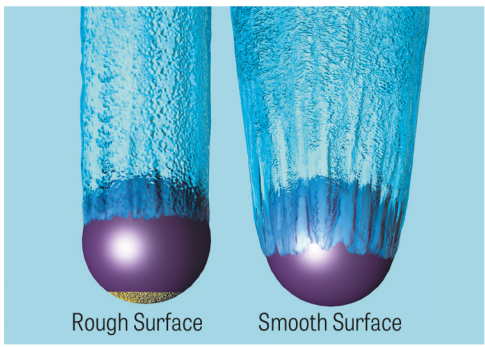




Lower Drag and Extended Turndown

Golf balls fly farther because they have a dimpled surface that lowers aerodynamic drag.

The grooves and roughness on the KPTF's frontal surface apply the same principle. This simple design feature relieves the partial vacuum at the rear of the sensor, reducing the pressure drag. This extends the accuracy and rangeability to very low velocities.



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Unique Valve Head

KPTF offers a new concept... built-in valves in the head of the instrument.

This superior design:

- Simplifies installation and maintenance.
- Lowers the connecting hardware cost by reducing the number of fittings.





Partial Insert

- Designed specifically for high velocity cooling water applications, large diameter pipes, large vertical stacks and buried water lines.
- Extends 1/3 into pipe to reduce procurement and installation costs — specifically useful when a hot tap is required.
- Partial Insert hot tap sensors can be inserted/retracted with no reduction in flow rate.

Transmount

A Transmount flow system is the first choice for all liquids; and for gas and steam applications, with slight variations in pressure and temperature.

Mass Transmount

A Mass Transmount flow system should be selected on steam and gas applications with variable temperature and pressure.

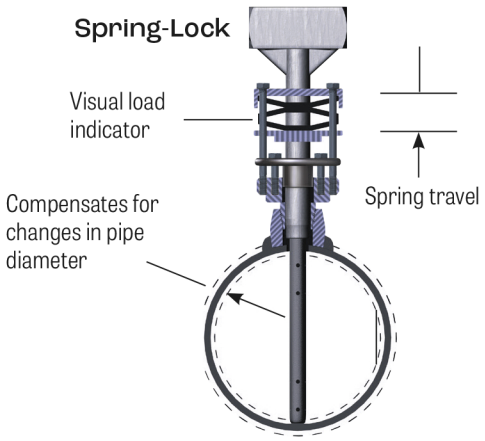


Spring-Lock... Offers a Superior Mounting Method

This advanced, patented design ensures the sensor remains sealed, locked and pre-loaded to the opposite wall regardless of changes in pipe diameter due to pressure, temperature or mechanical force.

This design has important advantages:

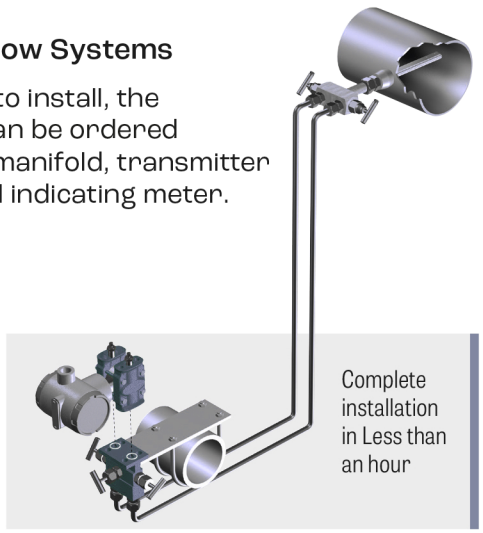
- Fugitive emission and leak prevention...The Spring-Lock continually compensates for the differential in packing and body growth rates due to increased temperature.



- Increases sensor strength, thereby eliminating the need for an opposite wall support. A locked, pre-loaded sensor is four times stronger than a non-preloaded, cantilevered sensor.
- Other mounting methods do not pre-load the sensor or the packing seal and are subject to increased sensor vibration, metal fatigue, breakage and leakage.

Field Flow Systems

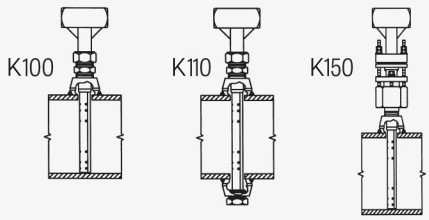
Ready to install, the KPTF can be ordered with a manifold, transmitter or local indicating meter.



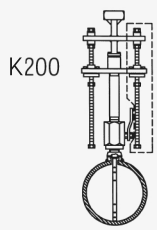
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KPTF MODEL SELECTOR

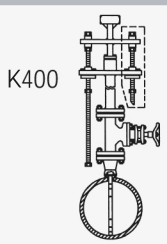
Regular Models — (Threaded Components)

Model Number	Type of Mounting
	**Tube Fitting** K100 (Single Support) K110 (Double Support)
	Spring-Lock K150 (No opposite support required)

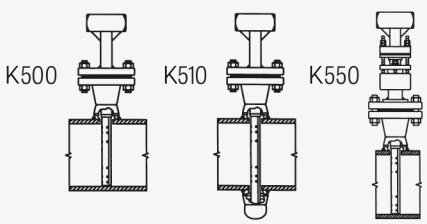
Hot Tap Models — (Threaded Components)

Model Number	Type of Mounting
	Screw Drive K200

Hot Tap Models — (Flanged Components)

Model Number	Type of Mounting
	Screw Drive K400

Flanged Models — (Flanged Components)

Model Number	Type of Mounting
	Flanged K500 (Single Support K510 (Double Support
	Flanged Spring-Lock K550 (No Opposite Support Required)

KPTF APPLICATIONS

The KPTF offers the widest application range of any flow sensor. It accurately measures gas, liquid and steam.

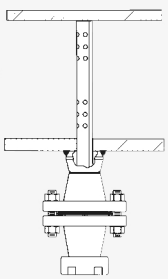
Gas	Liquid	Steam
Natural Gas	Cooling/Chilled water	Saturated
Compressed Air	Boiler Feed Water	Superheated
Combustion Air	De-Mineralized Water	Main Header
Hydrocarbon Gas	Hydrocarbon Liquids	Custody Transfer
Hot Air	Cryogenic	Distribution
Blast Furnace Gas	Thermal Transfer Fluids	Energy Studi

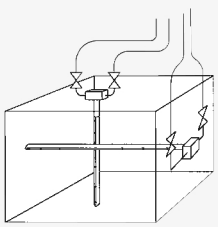
Extended Range Applications

The KPTF's versatile design lends itself to a wide range of applications. Contact Kanagawa application engineering for your special requirements.

High Pressure Design

2500 lb. (1134 kg) ANSI Class
6000 psi (414 bar)
2102°F (1150°C)

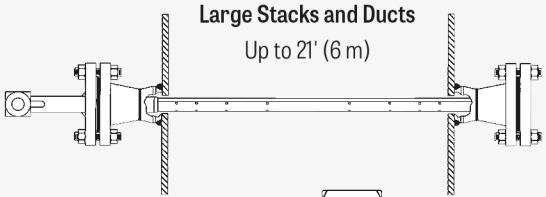




Square and Rectangular Ducts

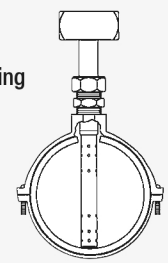
Large Stacks and Ducts

Up to 21' (6 m)



Specialized Mounting

- PVC
- Concrete
- FRP
- Cast Iron Pipe



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Through Accuracy of Measurement, Low Installed and Operating Costs, KPTF Proves its Performance, Efficiency and Value.

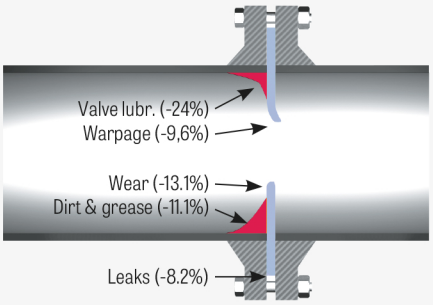
KPTF Maintains Its Accuracy

Orifice plates show long term deterioration of accuracy.

The initial accuracy of the orifice plate is ±1%. However, long term accuracy deteriorates unless the plate is periodically inspected. Senior, dual chamber fittings are available to check the plate without requiring system shutdown, but such fittings are very expensive.

Orifice Plate Test Results

Florida Gas Transmission Company conducted a test to quantify various conditions which can result in inaccurate measurement. A partial list of the results is shown:



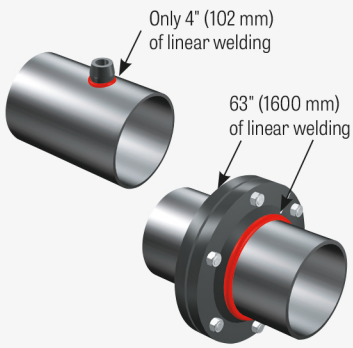
Condition	% Deviation
Wear of knife edge:	
0.010" (0.254 mm)	-2.2
0.020" (0.508 mm)	-4.5
0.050" (1.27 mm)	-13.1
Dirt and grease	
Deposits in pipe	-11.1
Valve lubrication upstream:	
One side of plate	-15.8
Both sides	-24.0
Leaks around plate	-8.2
Plate warpage	-9.6

KPTF Lowers Installed Costs

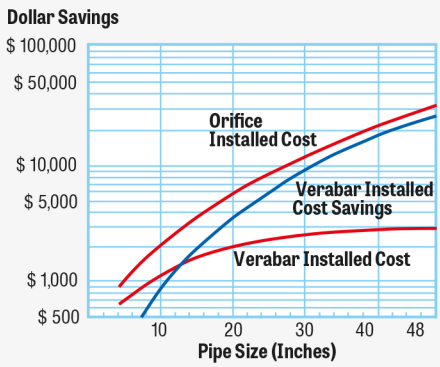
KPTF can save you more than 60% in installation costs over an orifice plate in a 10" (254 mm) pipe.

The graph shows the total installed cost by pipe size of the orifice plate, the KPTF, and the resultant KPTF savings . The most significant portion of the savings is the reduction in the linear inches of weld.

Savings in Weld Time



KPTF Installed Cost Savings

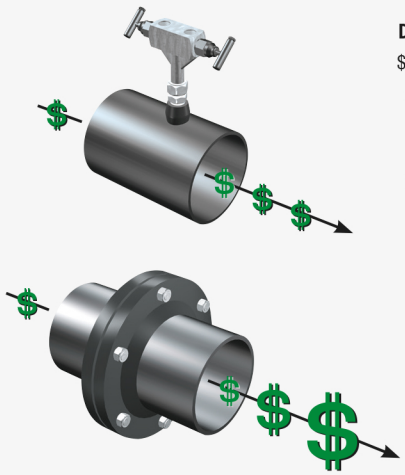


KPTF Has the Lowest Operating Costs

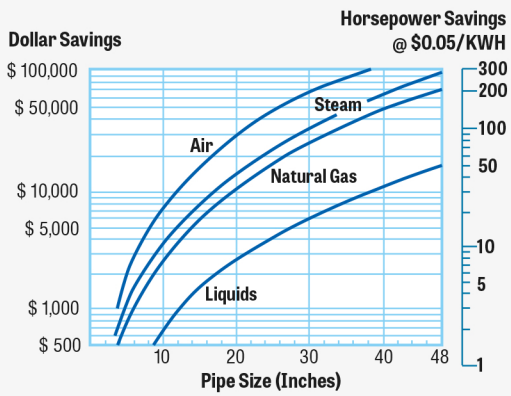
KPTF, pay for itself in less than a year.

The graph shows the yearly operating cost savings and equivalent horsepower savings of the non-constricting, low permanent pressure loss KPTF compared to the extremely constricting, high permanent pressure loss orifice plate. Savings are shown for gases, liquids and steam—at typical design velocities, by pipe size.

vs. Orifice



Operating Cost Savings



Quality Assurance

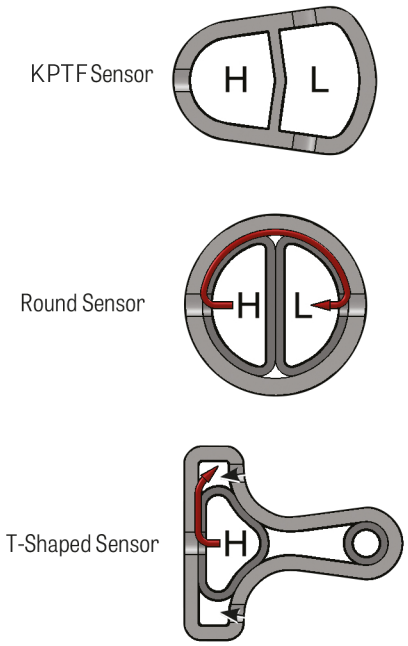
KPTF manufactures its own leak-proof, solid one-piece sensor. Our primary goal is to provide the highest quality and most accurate sensor in the industry.

Other manufacturers use a three-piece sensor design that has no positive mechanical method of maintaining a seal between the tubes. Therefore, temperature, pressure, vibration and even manufacturing variations can cause leakage between the chambers.

This can result in a significant undetectable loss in accuracy.

KPTF is designed to meet or exceed applicable ANSI and ASME codes. The KPTF is available to meet B31.1, B31.3, B31.8, NACE MR-01-75, etc.

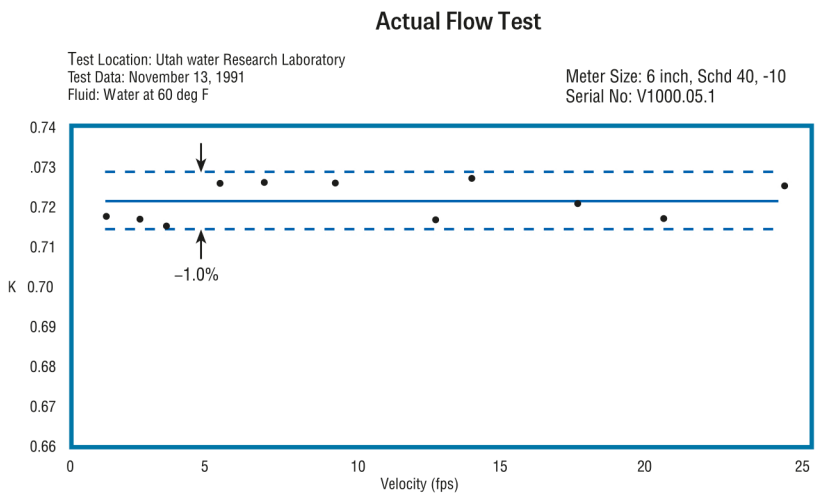
Additional QA capabilities include code welding, hydrostatic and other non-destructive testing.



The Proof of KPTF Accuracy

ACCURATE FLOW COEFFICIENTS

The true test of a flow measurement device is its ability to repeat its published flow coefficient within its accuracy band. KPTF has been thoroughly tested at independent flow laboratories (all sensor sizes, in multiple pipe sizes, in gas and liquids).



Why Average the Velocity Profile?

KPTF averages the velocity profile through multi-sensing ports which span the entire pipe diameter. Other types of non-averaging insert meters are SINGLE POINT INSERT METERS (turbine, vortex, magnetic, sonic, etc.). They assume a "textbook: turbulent velocity profile, and use a single "critical" point to infer an average velocity. In actual industrial applications, sensors are located downstream of disturbances, such as elbows or valves, which produce non-uniform velocity profiles. This makes it virtually impossible to locate a single point that represents the average velocity.

RESULT:
Inaccuracy ranging from ±10% to ±20%.

