Appendix G

Product Information

FT415 Flow Computer, GPI TM150, and Endress+Hauser Prowhirl 72F

GPI TM150 Turbine Meter

SAVE THESE INSTRUCTIONS

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GREAT PLAINS INDUSTRIES, INC.
"A Great Plains Ventures Subsidiary"
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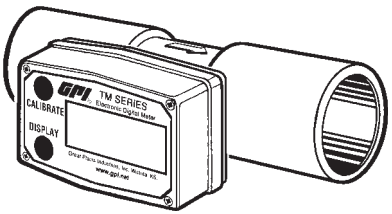
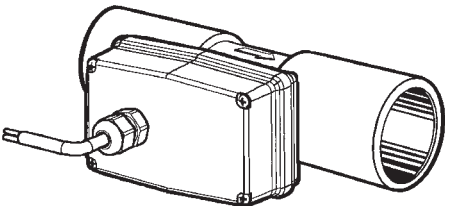
TM Series Electronic Water Meters CE

User Manual



TM Meter with Computer Display



TM Digital Pulse Meter

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ENGLISH

IMPORTANT NOTICE

Use TM Series meters with water and other chemicals compatible with wetted components (see Specifications Section). Do not use to meter fuel or incompatible chemicals. TM Series meters are available with either a computer for local electronic display, or a conditioned signal output module to provide a digital signal to customer interfacing equipment. TM Series meters with computer display measure in gallons or litres. Refer to the Calibration Section for details.

These meters are not legal for trade applications.

TM Series meters are very sensitive to electric noise if operated within 1 to 2 inches of some electric motors or other sources of electronic noise.

INSTALLATION

Connections

Install your meter in-line either horizontally or vertically or at the end of the hose adjacent to the nozzle. Installation to metal connections is not recommended. Install as follows:

1. Plan to install turbine with a minimum straight pipe length as follows:
   - Upstream from the turbine, allow a minimum straight pipe length of 10 times the internal diameter of the turbine.
   - Downstream from the turbine, allow a minimum straight pipe length of 5 times the internal diameter of the turbine.
2. For Spigot (Pipe) End use only primer and solvents approved for PVC gluing.

For NPT Fittings wrap all connections with 3 to 4 wraps of thread tape. Make sure the tape does not intrude into the flow path.

3. Attach meter with arrow pointed in the direction of flow.
4. For NPT Fittings - Hand tighten the meter at the housing ends. Do no use a wrench or similar tool to tighten. This can damage the housing.

Conditioned Signal Output Module Wiring

This conditioned signal output module can be wired to provide an open collector signal output or 6-volt square wave output.

Open Collector Signal Output

To achieve an open collector signal output, reference Wiring Diagram 1. The terminal block is located on the back side of the module. The module is factory assembled for open collector signal output. Please provide the (820 ohm minimum) resistor.

Ten feet (3m) of cable is provided with the module. Trim it to desired length or extend it as necessary. Distances up to 5,000 feet (1,524m) can be achieved for open collector signal output.

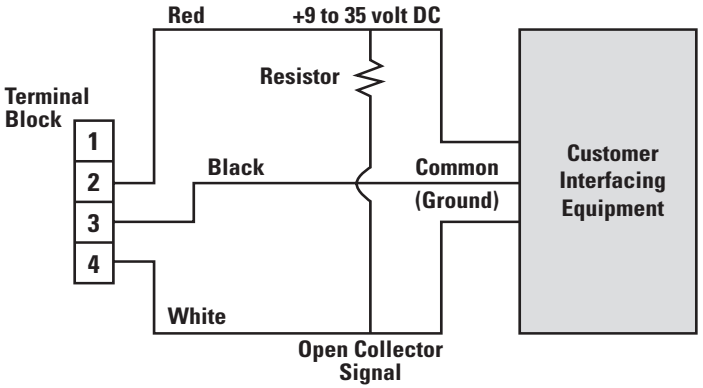
Square Wave Output

To achieve square wave output, reference Wiring Diagram 2 and use an Electronic Digital Meter Battery Kit (sold separately) for battery power. The terminal block and battery location are located on the back side of the module. Access as follows:

1. Remove the four Phillips-head screws from the front of the module and lift the module from the turbine.
2. To change terminal block connections, loosen the appropriate screws. Reconnect the wires in the proper positions and tighten the screws.
3. Install the batteries. Make sure the positive post is in the correct position.
4. Position the module on the turbine housing. To avoid moisture damage, make sure the seal is fully seated. Tighten the four screws on the front of the module.

Wiring Diagram 1

OPEN COLLECTOR SIGNAL OUTPUT

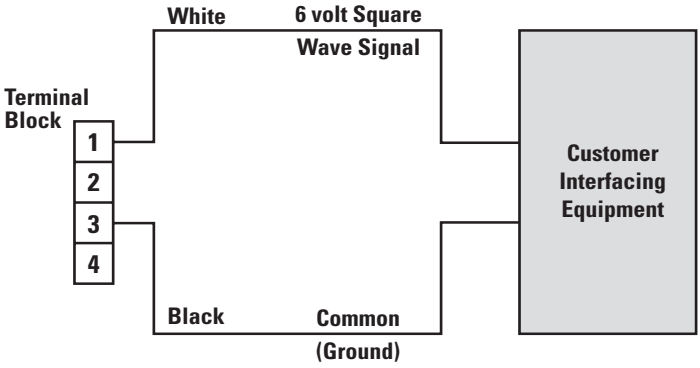


The terminal block is identified as follows:

Pin #1 6 volt square wave (not used)
Pin #2 +9 to 35 volt DC Input
Pin #3 Common Ground
Pin #4 Open Collector signal Output

Wiring Diagram 2

SQUARE WAVE OUTPUT



The terminal block is identified as follows:
Pin #1 6 volt square wave
Pin #2 +9 to 35 volt DC Input (not used)
Pin #3 Common Ground
Pin #4 Open Collector signal Output (not used)

Ten feet (3m) of cable is provided with the module. Trim the cable to desired length or extend it as necessary.

Verify Meter Accuracy

Before using, check the meter's accuracy and verify calibration.

1. Make sure there is no air in the system by starting the flow until it runs steadily. Then, stop the flow using a valve or nozzle.
2. Meter an exact known volume into an accurate container. For best results, meter with one continuous full stream.
3. Check the volume against the display or recording equipment. If the amount metered is accurate, further calibration is not necessary. If not, refer to the Calibration Section for further instructions.

OPERATION

Computer Display – Batch and Cumulative Totals

The computer maintains two totals. The Cumulative Total provides continuous measurement and cannot be manually reset. The Batch Total can be reset to measure flow during a single use. The Cumulative Total is labeled with TOTAL 1 LOCKED indicating that this total is locked and cannot be manually zeroed. Batch Total is labeled with TOTAL 2.

When the Cumulative Total reaches a maximum reading of 999,999, it will automatically reset to zero.

Press the DISPLAY button briefly to switch between the batch, cumulative total, and flowrate.

NOTE: Totalization counts total units without differentiating between gallons, litres or field calibrated units.

Flowrate Feature

To use this feature, press and release DISPLAY until FLOWRATE appears to the left of the bottom line.

When FLOWRATE is displayed, the numbers on the middle line reflect the rate of flow, for example, the current gallons per minute (GPM) or litres per minute (LPM).

Activate the Meter

Turn the computer display ON by starting water flow or briefly pressing the DISPLAY button. The Batch or Cumulative Total from last use will be displayed.

Press DISPLAY briefly to display the Batch Total. Hold the DISPLAY button down for 3 seconds to reset the Batch Total to zero.

The computer display is programmed to turn off automatically if not used for 4 minutes.

Factory and Field Calibration Curves

All calibration information is visible to the user as words in the upper part of the display, above the numeric digits.

All units are configured with a "factory" calibration curve. Both gallons and litres are available ("GAL" or "LTR" will be displayed). Use the CALIBRATE and DISPLAY buttons to switch between gallons and litres. This curve is NOT user adjustable: the word "PRESET" is displayed to show this. (The factory calibration is stored permanently in the computer's memory.)

The "field" calibration curve may be set by the user, and can be changed or modified at any time using the calibration procedure described below in the Calibration Section. Totals or flowrate derived from the field calibration are visible when the field calibration setting is selected ("CAL B" will be visible on the top line).

Selecting a Different Calibration Setting

You can switch between GAL and LTR modes at will without "corrupting" totalizer contents. For example, the computer can totalize 10.00 gallons. If the user switches to LTR mode, the display will immediately change to "37.85" (the same amount in units of litres). GAL / LTR switching also works in FLOWRATE mode.

To select a different calibration setting, first press and hold the CALIBRATE button. Continue to hold it while also pressing and releasing the DISPLAY button. (You may then also release the CALIBRATE button.) The flag indicators in the top line of the display will change to show the newly selected calibration setting. Calibration settings change in this order: GAL, LTR, CAL B, GAL, etc. While fluid is flowing, only the GAL and LTR selections may be made. However, when NO fluid flow is occurring, any setting may be selected.

CALIBRATION

Before Beginning Field Calibration

For the most accurate results, dispense at a flowrate which best simulates your actual operating conditions. Avoid "dribbling" more fluid or repeatedly starting and stopping the flow. This can result in less accurate calibrations.

Make sure you meet the meter's minimum flowrate requirements:

TM Series Meters	
1/2 inch meter	1 GPM (3.8 LPM)
3/4 inch meter	2 GPM (7.5 LPM)
1 inch meter	5 GPM (18.8 LPM)
1-1/2 inch meter	10 GPM (37.5 LPM)
2 inch meter	20 GPM (75 LPM)

The use of a uniformly dependable, accurate calibration container is highly recommended for the most accurate results. Due to high flowrate, it is strongly recommended that calibration be completed with a combination of volume and weight using fine resolution scales.

For best results, the meter should be installed and purged of air before field calibration.

Field Calibration with Computer Display

Field Calibration and Factory Calibration are defined in the previous section. Factory calibration settings are custom programmed into each computer during production, using water at 70°F (21°C). Readings using the standard factory calibration curves may not be accurate in some situations, for example, under extreme temperature conditions or with fluids other than water.

For improved accuracy under such conditions, the GPI flow computer allows for "field" calibration, that is, user entry of custom calibration parameters. A "single point" calibration may yield acceptable accuracy in the middle of the flow range, but five or more calibration points may yield a higher level of accuracy, especially at the lower end of the flow range. Up to 15 custom calibration points can be entered.

Dispense/Display Field Calibration Procedures

1. Hold down CALIBRATE while pressing and releasing DISPLAY until the field calibration curve appears ("CAL B" message will be displayed). Release both buttons.
2. To calibrate, press and hold the CALIBRATE button. While continuing to hold CALIBRATE, also press and hold the DISPLAY button. Hold both buttons for about 3 seconds until you see a blinking "dd CAL" message. Once the "dd CAL" message appears, release both buttons. You are now in field calibration mode.
3. Once the buttons have been released from Step 2, the display will show the blinking message "run 01". If you want to exit the calibration now before dispensing any fluid, go to Step 11.
4. If you want to continue with the calibration, but have not dispensed any fluid yet, make your final preparations to your pumping system, but don't start pumping yet.
5. Start your pumping system so that fluid flows through the meter. The display will stop blinking and show the "run 01" message. Dispense into a container that allows you to judge the amount of fluid pumped. When you have pumped the desired amount (for example, 10 gallons), stop the fluid flow quickly.
6. Once the flow has stopped, briefly press and release both buttons. At this point the computer display will change to "0000.00" with the left-hand digit blinking.
7. Enter the volume (amount) of fluid that you dispensed (for example, if your 10-gallon container is full, enter "10.0" for gallons or "37.85" for litres). To enter numbers, use the CALIBRATE button to change the value of the digit that is blinking and use the DISPLAY button to shift the "blink" to the next digit.
8. Once the correct number is entered, briefly press and release both buttons. The display will now change to a blinking "run 02" message. You have installed the new cal-curve point. You are ready to end calibration (Step 10) or enter another new calibration point (Step 9).
9. To enter another calibration point, go back and repeat Steps 3 through 8. It is possible to set up to 15 cal-curve points, and the "run ##" message will increment each time you repeat the calibration process (run 01, run 02, run 03, etc., up to run 15).
10. To end calibration, press and hold both buttons for about 3 seconds until you see the "CAL End" message. After you release the buttons the computer will resume normal operations with the new cal point(s) active.
11. If you HAVE NOT dispensed any fluid, you can exit calibration without changing the cal curve. If the message "run 01" is showing and you have not dispensed any fluid, hold both buttons for about 3 seconds until you see a "CAL End" message. After you release the buttons, the computer will resume normal operation and the old curve (if you entered one in the past) is still intact.

Calibration with Conditioned Signal Output Module

The K-factor of your meter appears on the calibration report as the number of pulses per gallon. The factor is determined during production using water at 70°F (21°C). This K-factor may be used for "single point" calibration and provide acceptable accuracy. However, readings may not be accurate when using this calibration method in some situations. One example is when using the meter under extreme temperature conditions or with fluids other than water.

For improved accuracy under such conditions, we recommend that a K-factor specific to the application be determined and used for calibration. A "single point" calibration may yield acceptable accuracy in the middle of the flow range, but five or more calibration points may yield a high level of accuracy, especially at the lower end of the flow range.

MAINTENANCE

Proper handling and care will extend the life and service of the meter.

Turbine Rotor

The meter is virtually maintenance-free. However, it is important the rotor moves freely. Keep the meter clean and free of contaminants.

If the rotor does not turn freely, apply a penetrating lubricant on the rotor, shaft, and bearings. Remove any debris or deposits from the rotor using a soft brush or small probe. Be careful not to damage the turbine rotor or supports.

⚠ CAUTION

Blowing compressed air through the turbine assembly could damage the rotor.

Battery Replacement

The computer display is powered by two 3-volt lithium batteries which may be replaced while the meter is installed. When batteries are removed or lose power, the batch and cumulative totals reset to zero but the field and factory calibrations are retained.

If the display becomes dim or blank, replace the batteries as follows:

1. Remove the four Phillips-head screws from the face of the meter and lift the faceplate from the turbine.
2. Remove the old batteries and clean any corrosion from the terminals.
3. Install new batteries. Make sure the positive post is in the correct position.
4. When the batteries are replaced, the faceplate will power ON. Check the display to ensure normal functions have resumed before assembling again.
5. Reseat batteries, if necessary, and position the faceplate on the turbine housing. To avoid moisture damage, make sure the seal is fully seated. Tighten the four screws on the faceplate.

SPECIFICATIONS

Inlet and Outlet:

Spigot (Pipe) End Models:

TM050/TM050-P	1/2 inch Schd. 80, Spigot (Pipe)
TM075/TM075-P	3/4 inch Schd. 80, Spigot (Pipe)
TM100/TM100-P	1 inch Schd. 80, Spigot (Pipe)
TM150/TM150-P	1-1/2 inch Schd. 80, Spigot (Pipe)
TM200/TM200-P	2 inch Schd. 80, Spigot (Pipe)

NPT Models:

TM050-N/TM050-N-P	1/2 inch NPT
TM075-N/TM075-N-P	3/4 inch NPT
TM100-N/TM100-N-P	1 inch NPT
TM150-N/TM150-N-P	1-1/2 inch NPT
TM200-N/TM200-N-P	2 inch NPT

Design Type: Turbine

Wetted Components:

Housing: PVC
Journal Bearings: Ceramic
Shaft: Tungsten Carbide
Rotor and Supports: PVDF
Retaining Washer: Stainless Steel

Fitting Types: Spigot - Schd. 80 or NPT (female)

Max. Working Pressure: 225 PSIG @ 73°F

U.S. Measurement

Unit of Measure: Gallon

Flow Range:

1/2 inch	1 - 10 GPM
3/4 inch	2 - 20 GPM
1 inch	5 - 50 GPM
1-1/2 inch	10 - 100 GPM
2 inch	20 - 200 GPM

Accuracy with Computer: ± 3.0% (Accuracy can be improved with field calibration)

Operating Temperature: +32° to +140° F (Do not allow fluid to freeze inside meter.)

Storage Temperature: –40° to +158° F

Product Weight:*

	Spigot (Pipe)	NPT
1/2 inch	.38 lbs.	.55 lbs.
3/4 inch	.43 lbs.	.67 lbs.
1 inch	.49 lbs.	.84 lbs.
1-1/2 inch	.66 lbs.	1.38 lbs.
2 inch	.78 lbs.	1.78 lbs.

Dimensions - Inches (W x H x L):**

	Without Fitting	With Fitting
1/2"	2.0 x 2.6 x 3.8	2.0 x 2.8 x 5.5
3/4"	2.0 x 2.7 x 3.8	2.0 x 2.9 x 5.5
1"	2.0 x 3.1 x 4.1	2.0 x 3.3 x 6.2
1-1/2"	2.1 x 3.7 x 5.4	2.3 x 3.9 x 7.6
2"	2.4 x 4.2 x 5.5	3.5 x 4.5 x 7.9

* Weight with computer display. Conditioned signal output module adds .30 lbs.

** Dimensions with computer display. Conditioned signal output module adds 1.1 inch to height.

Metric Measurement

Unit of Measure: Litre

Flow Range:

1/2 inch	3.8 - 38 LPM
3/4 inch	7.6 - 76 LPM
1 inch	19 - 190 LPM
1-1/2 inch	38 - 380 LPM
2 inch	76 - 760 LPM

Accuracy with Computer: ± 3.0% (Accuracy can be improved with field calibration)

Operating Temperature: 0° to +60° C (Do not allow fluid to freeze inside meter.)

Storage Temperature: –40° to +70° C

Product Weight:*

	Spigot (Pipe)	NPT
1/2 inch	.172 kg	.249 kg
3/4 inch	.195 kg	.304 kg
1 inch	.222 kg	.381 kg
1-1/2 inch	.299 kg	.626 kg
2 inch	.354 kg	.807 kg

Dimensions - cm (W x H x L):**

	Without Fitting	With Fitting
1/2"	5.0 x 6.6 x 9.6	5.0 x 7.1 x 13.9
3/4"	5.0 x 6.8 x 9.6	5.0 x 7.3 x 13.9
1"	5.0 x 7.8 x 10.4	5.0 x 8.3 x 15.7
1-1/2"	5.8 x 9.3 x 13.7	5.8 x 9.9 x 19.3
2"	6.0 x 10.6 x 13.9	8.8 x 11.4 x 20.0

* Weight with computer display. Conditioned signal output module adds .136 kg.

** Dimensions with computer display. Conditioned signal output module adds 2.8 cm to height.

PARTS

The following replacement parts and accessories are available for the TM Series meters:

Part No.	Description
113435-1	Conditioned Signal Output Module
113520-1	Battery Replacement Kit
116000-1	Calibration Container, Large (5 gallon)
125508-03	1/2 inch, Turbine Assy Kit
125508-04	1/2 inch NPT, PVC Turbine Assy Kit
125510-03	3/4 inch, Turbine Assy Kit
125510-04	3/4 inch NPT, PVC Turbine Assy Kit
125512-03	1 inch, Turbine Assy Kit
125512-04	1 inch NPT, PVC Turbine Assy Kit
125514-03	1-1/2 inch, Turbine Assy Kit
125514-04	1-1/2 inch NPT, PVC Turbine Assy Kit
125516-03	2 inch, Turbine Assy Kit
125516-04	2 inch NPT, PVC Turbine Assy Kit
901002-52	Seal
Computer Kits:	
125509-03	1/2 inch, Computer Assy Kit
125511-03	3/4 inch, Computer Assy Kit
125513-03	1 inch, Computer Assy Kit
125515-03	1-1/2 inch, Computer Assy Kit
125517-03	2 inch, Computer Assy Kit

SERVICE

For warranty consideration, contact your local distributor. If you need further assistance, contact the GPI Customer Service Department at:

1-800-835-0113

You will need to:

- Provide information from the decal on your meter.
- Receive a Return Authorization number.
- Flush any fluid from the meter before shipping to the factory.
- If possible leave customer installed fittings or ample length of bare pipe for reinstallation.

⚠ CAUTION

Do not return the meter without specific authority from the GPI Customer Service Department. Due to strict regulations governing transportation, handling, and disposal of hazardous or flammable liquids, GPI will not accept meters for rework unless they are completely free of liquid residue.

WEEE DIRECTIVE

The Waste Electrical and Electronic Equipment (WEEE) directive (2002/96/EC) was approved by the European Parliament and the Council of the European Union in 2003. This symbol indicates that this product contains electrical and electronic equipment that may include batteries, printed circuit boards, liquid crystal displays or other components that may be subject to local disposal regulations at your location. Please understand those regulations and dispose of this product in a responsible manner.

ESPAÑOL

AVISO IMPORTANTE

Utilizar los medidores de los Series del TM con agua y otros productos químicos que son compatibles con los componentes que se exponen al líquido (véase la sección de especificaciones). No utilizar este medidor con combustible u otros productos qulmicos incompatibles. Los medidores de la serie de TM están disponibles con una computadora para la visualización electrónica local, o un módulo de salida condicionado de la señal que proporcione una señal numérica al equipo de interconexión del cliente. Los medidores de las Series TM miden en galones o litros. Referirse a la sección de la calibración para mayores detalles.

Estos medidores no son legales para las aplicaciones comerciales.

Los medidores de las Series TM son muy sensibles a interferencia electrónica si funcionan a 1 o 2 pulgadas de algunos motores eléctricos o de otras fuentes del uso electrónico.

INSTALACIÓN

Conexiones

Instalar su medidor en línea, u horizontalmente, o verticalmente, o en el extremo de la manguera adyacente al inyector. No se recomienda la instalación a las conexiones de metal. Siga estos pasos para instalar:

1. Planee instalar la turbina con una longitud mínima de la pipa recta de esta manera:
   - Contra la corriente de la turbina, permita a una longitud mínima de la pipa recta de 10 veces el diámetro interno de la turbina.
   - Con la corriente de la turbina, permita una longitud mínima de la pipa recta de 5 veces el diámetro interno de la turbina.
2. Para Espiga (de tubo) Fin utilizar solamente los solventes aprobados para pegar PVC.
   Para Las Conexiones Del NPT cubrir las conexiones de pipa con la cinta del Teflon® 3 a 4 veces. Cerciorarse de que la cinta no imponga en la trayectoria del flujo.

3. Unir el medidore con la flecha señalada en la dirección del flujo.

4. Para Las Conexiones Del NPT utilizar solamente sus manos para apretar las conexiones del medidore. No utilizar una llave inglesa o una herramienta similar para apretar. Esto puede dañar la cubierta.

Señal de Salida Condicionada Cableado De Módulo

Este módulo de Señal de salida condicionada se puede conectar para proporcionar una salida de colector abierta o de señal de onda cuadra-da de 6-voltios.

Señal de Salida De Colector Abierto

Para alcanzar una señal de salida de colector abierto, refierase por favor al digrama eléctrico 1. El bloque de terminales está situado en el lado trasero del módulo. El módulo viene montado de fábrica para señal de colector abierta. Por favor proporcionar el resistor de un minimo de 820 ohmios.

Diez pies (3m) de cable se proporcionan con el módulo. Ajustar el cable a la longitud deseada o extender el cable cuanto le sea necesario. Se puede alcanzar una señal de salida de colector abierto hasta distancias de 5.000 pies (1,524m).

Salida de corrente de Onda Cuadrada

Para lograr una salida de corriente de onda cuadrada, refierase por favor al digrama eléctrico 2 y utilize un kit electrónico de bateria del medidor digital (vendido por separado) para la fuente de energia de la bateria. El bloque de terminales y la localización de la bateria están situados en el lado trasero del modulo. Acceda al módulo de la siguiente manera:

1. Quitar los cuatro tornillos de cabeza Phillips del frente del módulo. Levantar el módulo de la turbina.

2. Para cambiar las conexiones del bloque de terminales, aflojar los tornillos apro-piados. Volver a conectar los alambres en las posiciones apropiadas y apretar los tornillos.

3. Instalar las baterias. Cerciorarse de que el poste positivo esté en la posición correcta.

4. Colocar el módulo en la cubierta de la turbina. Para evitar daños causados por la humedad, cerciorarse de que el anillo esté asentado completamente. Apretar los cuatro tornillos en el frente del módulo.

Diez pies (3m) de cable se proporcionan con el módulo. Ajustar el cable a la longitud deseada o extender el cable cuanto le sea necesario.

Verificar La Exactitud Del Metro

Antes de usar, comprobar la exactitud del metro y verificar la calibración.

1. Cerciorarse de que no haya aire en el sistema comenzando el flujo hasta que funciona constantemente. Entonces, detenga el flujo usando una válvula o un inyector.

2. Con el medidor, mida un volumen exacto en un envase exacto. Para mejores resultados, medir con una corriente complete y continua.

3. Comprobar el volumen con lo indicado en la pantalla o el equipo de grabación. Si la cantidad medida es exacta, no es necesario mayor calibración. Si no, referir a la sección de la calibración.

OPERACIÓN

Pantalla De la Computadora – lotes y totales acumulativos

El computadora mantiene dos totales. El total acumulativo proporciona la medida continua y no puede ser reajustado manualmente. El total de hornada se puede reajustar para medir el flujo durante una sola vez. El total acumulativo se etiqueta con el TOTAL 1 LOCKED. Esto indica que el total esta bloqueado y no puede ser puesto a cero manualmente. El total de hornada se etiqueta con el TOTAL 2.

Cuando el total acumulativo alcanza una lectura máxima de 999.999, se reajustará automáticamente a cero.

Presionar el botón de DISPLAY brevemente para cambiar entre la hornada, el total acumulativo, y el índice de flujo.

NOTA: Totalization cuenta las unidades totales sin distinguir entre los galones, los litros o las unidades calibradas de campo.

Atributo Del Indice De Flujo

Para utilizar este atributo, presionar y soltar el "DISPLAY" hasta que "FLOWRATE" aparezca abajo a la izquierda.

Cuando aparece "FLOWRATE", los números en la linea de el centro reflejan el Índice de flujo. Por ejemplo, los galones por minuto (GPM) o litros por minuto (LPM).

Activar El Medidor

Encienda el pantalla de la computadora comenzando el flujo del agua o brevemente presionando el botón del DISPLAY. El lote o el total acumulativo del uso pasado será exhibido.

Presionar el botón del DISPLAY brevemente para exhibir el total de hornada. Oprima el botón de DISPLAY por 3 segundos para reajustar el total de hornada a cero.

El medidor se apaga automáticamente si no es usado durante 4 minutos.

Curvas De Calibración De La Fábrica y Del Campo

Toda la información de la calibración es visible al usuario como palabras en la parte superior de la exhibición, sobre los dígitos numéricos.

Todas las unidades se configuran con una curva de calibración de la "fábrica". Los galones y los litros están disponibles. (el "GAL" o el "LTR" será visible). Utilizar los botones del CALIBRATE y del DISPLAY para cambiar entre los galones y los litros. Esta curva de calibración no es ajustable por el usuario. La palabra PRESET se exhibe para demostrar esto. (La calibración de la fábrica se almacena permanentemente en la memoria de computadora.)

La curva de calibración de "campo" se puede fijar por el usuario. La calibración se puede cambiar o modificar en cualquier momento usando los procedimientos de la calibración descritos en la sección de la calibración. Los totales o el índice de flujo derivados de la calibración de campo son visibles cuando se selecciona el ajuste de la calibración de campo (la "CAL B" será visible en la línea superior).

Seleccionar un Ajuste Diverso De La Calibración

Usted puede cambiar entre los modos del GAL y del LTR a voluntad sin afectar los totales. Por ejemplo, la computadora puede sumar 10,00 galones. Si el usuario cambia al modo del LTR, la exhibición cambiará inmediatamente a "37,85" (la misma cantidad en las unidades de los litros). La conmutación del GAL/LTR también trabaja en el modo del FLOWRATE.

Para seleccionar un ajuste diverso de CALIBRATE, oprima y sostenga el botón de la CALIBRATE. Continuar presionando el botón mientras que también presiona y suelta el botón de DISPLAY. (usted puede entonces también soltar el botón de CALIBRATE.) Los indicadores de la bandera de la línea superior de la exhibición cambiarán para demostrar el nuevo ajuste seleccionado de la calibración. Los ajustes de la calibración se cambian en este orden: GAL, LTR, CAL B, GAL, etc. Mientras que está fluyendo el líquido, sólo las selecciones del galón y del litro pueden ser hechas. Sin embargo, cuando no está fluyendo NINGÚN líquido, cualquier selección puede ser hecha.

CALIBRACIÓN

Antes De Comenzar La Calibración

Para resultados más exactos, dispense un índice de flujo que simule lo mejor posible sus condiciones de funcionamiento reales. Evite "de gotear" más líquido o en varias ocasiones, o el comenzar y de parar el flujo. Estas acciones darán lcomo resultado calibraciones menos exactas.

Cerciorese de reunir todos los requisitos mínimos del índice de flujo del medidor:

Metros de la Serie TM

Medidores de 1/2 pulgada de
1 GPM (3,8 LPM)

Medidores de 3/4 pulgada de
2 GPM (7,5 LPM)

Medidores de 1 pulgada de
5 GPM (18,8 LPM)

Medidores de 1-1/2 pulgadas de
10 GPM (37,5 LPM)

Medidores de 2 pulgadas de
20 GPM (75 LPM)

Se recomienda para resultados más exactos de la calibración el uso de un envase uniforme, confiable, y exacto. Debido al alto indice de flujo, se recomienda que la calibración esté terminada con una combinación de volumen y de peso usando escalas de alta resolución.

Para mejores resultados, el medidor se debe instalar y purgar del aire antes de la calibración de campo.

Calibración De Campo Con La Pantalla De La Computadora

La calibración de campo y la calibración de fábrica se explican en la sección anterior. La calibración de campo y la calibración de fábrica se explican en la sección anterior. Los ajustes de la calibración de la fábrica se programan especificamente en cada flujó-medidor durante su producción usando agua a 70°F (21°C). Las lecturas que utilizan las curvas de calibración estándares de la fábrica pueden no ser exactas en algunas situaciones. Por ejemplo, cuando se encuentran bajo condiciones de temperatura extremas, o con los liquidos con excepción del agua.

Para la exactitud mejorada bajo tales condiciones, la computadora GPI de flujo tienen en cuenta la calibración del "campo" (es decir un apunte del usuario dentro de los parámetros de calibración especiales). La calibración de "un solo punto" puede rendir una exactitud aceptable en medio de la gama del flujo. Cinco o más puntos de calibración pueden rendir un nivel más alto de exactitud, especialmente en el extremo inferior de la gama del flujo. Hasta 15 puntos de calibración especiales pueden ser inforporados.

Dispensar/Presentar Los Procedimientos De La Calibración De Campo

1. Mantener oprimido el botón del CALIBRATE mientras que presiona y suelta el boton DISPLAY hasta que aparece la curva de calibración de campo (mensaje de "CAL B" será exhibido). Suelte ambos botones.
2. Para calibrar, presionar y sostener el botón del CALIBRATE. Mientras que continúa oprimiendo el CALIBRATE, también presionar y sostener el botón del DISPLAY. Sostener ambos botones por cerca de 3 segundos hasta que usted vea el mensaje de "dd-CAL" en centelleo. Una vez que mensaje del "dd-CAL", aparezca, suelte ambos botones. Usted ahora está en el modo de la calibración de campo.
3. Una vez que los botones se hayan soltado (el paso 2), la exhibición demostrará el mensaje del centelleo "RUN 01". Si usted desea salir del proceso de la calibración antes de dispensar cualquier líquido, ir al paso 11.
4. Si usted desea continuar con la calibración, pero no ha dispensado ningún líquido todavía, hacer las preparaciones finales a su sistema de bombeo, pero no comenzar a bombear todavía
5. Comience su sistema de bombeo de modo que el líquido atraviese el medidor. La exhibición parará el centelleo y demostrará el mensaje del " RUN 01". Dispense el líquido en un envase que permita que usted juzgue la cantidad de líquido bombeada. Cuando usted ha bombeado la cantidad deseada (por ejemplo, 10 galones), detenga el flujo fdel liquido inmediatamente.
6. El flujo ha parado; brevemente presione y suelte una vez ambos botones. En este momento la exhibición de la computadora cambiará al "0000.00" con el centelleo a la izquierda del dígito.
7. Introduzca el volumen (cantidad) de líquido que usted ha dispensado (por ejemplo, si su envase de los 10-gallon esté lleno, introducir "10,0" para los galones o "37,85" para los litros). Para incorporar los números, utilizar el botón del CALIBRATE para cambiar el valor del dígito que está en centelleo. Utilizar el botón del DISPLAY para cambiar de puesto el "centelleo" al dígito siguiente.

8. Una vez que se incorpore el número correcto, presionar y soltar brevemente ambos botones. La exhibición ahora cambiará a un mensaje “RUN 02” en centelleo. Usted ahora ha instalado el nuevo punto de la cal-curva. Usted esta listo para terminar la calibración (paso 10) o incorporar otro nuevo punto de calibración (paso 9).
9. Para incorporar otro punto de calibración, vuelva a repetir los pasos del 3 al 8. Es posible fijar hasta 15 puntos de la cal-curva, y “run ##” del funcionamiento incrementará cada vez que usted repite el proceso de la calibración (run 01, run 02, run 03, etc., hasta el run 15).
10. Para terminar el proceso de la calibración, presionar y sostener ambos botones por cerca de 3 segundos hasta que usted vea el mensaje del “CAL End”. Después de que usted suelte los botones, la computadora reasumirá las operaciones normales con el nuevo punto(s) activos calibrados.
11. Si usted no ha dispensado ningún líquido, usted puede salir de la calibración sin cambiar la curva. Si el mensaje “run 01” está mostrando y usted no ha dispensado ningún líquido, sostenga ambos botones por cerca de 3 segundos hasta que usted vea el mensaje en un extremo del “CAL End”. Después de soltar los botones, la computadora reasumirá la operación normal y la vieja curva (si usted introdujo una en el pasado) sigue intacta.

Calibración Con El Módulo De Señal De Salida Condicionada

El factor K de su medidor aparece en el informe de la calibración como el número de pulsos por galón. El factor se determina durante la producción usando el agua a 70°F (21°C). Este factor K se puede utilizar para la calibración de “un solo punto” y proporcionará una exactitud aceptable. Sin embargo, las lecturas pueden no ser exactas cuando usted utiliza este método de la calibración en algunas situaciones. Un ejemplo es cuando usted utiliza el metro bajo condiciones de temperatura extremas o lo utiliza con los liquidos con excepción del agua.

Para mejorar la exactitud durante tales condiciones, recomendamos que un factor K especifico de uso esté determinado y utilizado para la calibración. Una calibración de “un solo punto” puede rendir una exactitud aceptable en el centro de la gama del flujo, pero cinco o más puntos de calibración pueden rendir un alto nivel de exactitud, especialmente en el extremo inferior de la gama del flujo.

MANTENIMIENTO

La utilización y el cuidado apropiados ampliarán la vida y el servicio del medidor.

Rotor De Turbina

El medidor practicamente no tiene necesidad de mantenimiento. Sin embargo, es importante que los movimientos del rotor ocurran libremente. Mantener el medidor limpio y libre de contaminantes.

Si el rotor no da vuelta libremente, aplicar un lubricante penetrante en el rotor, el eje, y los rodamientos. Quitar cualquier desecho o depósito del rotor usando un cepillo suave o una punta de prueba pequeña. Tenga cuidado de no dañar el rotor de turbina o los soportes.

⚠ PRECAUCIÓN

El aire comprimido a través del montaje de la turbina podría dañar el rotor.

Reemplazo De La Batería

El pantalla de la computadora funciona a través de dos baterías del litio de 3-voltios que puedan ser substituidas mientras que el medidor está instalado. Cuando las baterías se quitan o pierden la potencia, la hornada y los totales acumulativos seran reajustados a cero, pero las calibraciones de campo y de la fábrica se conservan.

Si la exhibición del medidor llega a estar débil o en blanco, substituir las baterías de esta manera:

1. Quitar los cuatro tornillos de la cara del metro y levantar la placa frontal de la turbina.
2. Quitar las viejas baterías y limpiar cualquier corrosión de los terminales.

3. Instalar las baterías nuevas. Cerciorarse de que el poste positivo esté en la posición correcta.
4. Cuando se substituyen las baterías, la placa frontal estará encendida. Comprobar la exhibición para asegurarse de que las funciones normales han resumido antes de montar otra vez.
5. Volver a sentar las baterías, en caso necesario, colocar la placa frontal en la cubierta de la turbina. Evite el daño causado por la humedad, cerciorarse de que el anillo esté asentado completamente. Apretar los cuatro tornillos en la placa frontal.

ESPECIFICACIONES

Entrada y Enchufe:

Modelos de Espiga (de tubo)

TM050/TM050-P	1/2 pulgada de 80, Espiga (de tubo)
TM075/TM075-P	3/4 pulgada de 80, Espiga (de tubo)
TM100/TM100-P	1 pulgada de 80, Espiga (de tubo)
TM150/TM150-P	1-1/2 pulgada de 80, Espiga (de tubo)
TM200/TM200-P	2 pulgada de 80, Espiga (de tubo)

Modelos de NPT

TM050-N/TM050-N-P	1/2" de NPT
TM075-N/TM075-N-P	3/4" de NPT
TM100-N/TM100-N-P	1" de NPT
TM150-N/TM150-N-P	1-1/2" de NPT
TM200-N/TM200-N-P	2" de NPT

Tipo Del Diseño: Turbina

Componentes Mojados:
Cubierta: PVC
Rodamientos: De Cerámica
Eje: Carburo De Tungsteno
Rotory Soportes: PVDF
Arandela De Retención: Acero Inoxidable

Tipo De Las Guarniciones: Espiga - de 80 o NPT (hembra)

Máxima Presión De Funcionamiento:
225 PSIG a los 73°F

Medidas De Estados Unidos

Unidad De La Medida: Galón

Gama Del Flujo:

1/2 pulgada	1 - 10 GPM
3/4 pulgada	2 - 20 GPM
1 pulgada	5 - 50 GPM
1-1/2 pulgada	10 - 100 GPM
2 pulgada	20 - 200 GPM

Exactitud con la Computadora: ±3.0% (la exactitud se puede mejorar con la calibración del campo)

Temperatura De Funcionamiento:
+32° a +140° F (No permitir que el líquido se congele dentro del metro.)

Temperatura Del Almacenaje:
-40° a +158° F

Peso Del Producto:*

	Espiga (de tubo)	NPT
1/2 pulgada	.38 lbs.	.55 lbs.
3/4 pulgada	.43 lbs.	.67 lbs.
1 pulgada	.49 lbs.	.84 lbs.
1-1/2 pulgada	.66 lbs.	1.38 lbs.
2 pulgada	.78 lbs.	1.78 lbs.

Dimensiones - Pulgadas (Grosor x Altura x Longitud):**

	Sin conexión	Con conexión
1/2"	2.0 x 2.6 x 3.8	2.0 x 2.8 x 5.5
3/4"	2.0 x 2.7 x 3.8	2.0 x 2.9 x 5.5
1"	2.0 x 3.1 x 4.1	2.0 x 3.3 x 6.2
1-1/2"	2.1 x 3.7 x 5.4	2.3 x 3.9 x 7.6
2"	2.4 x 4.2 x 5.5	3.5 x 4.5 x 7.9

* El peso con la pantalla de la computadora. El módulo de señal de salida condicionada agrega .30 libras.

** Las dimensiones con la pantalla de la computadora. El módulo señal de salida condicionada agrega 1.1 pulgadas a la altura.

Medida Métrica

Unidad De La Medida: Litro

Gama Del Flujo:

1/2 pulgada	3,8 - 38 LPM
3/4 pulgada	7,6 - 76 LPM
1 pulgada	19 - 190 LPM
1-1/2 pulgada	38 - 380 LPM
2 pulgada	76 - 760 LPM

Exactitud con la Computadora: ±3.0% (la exactitud se puede mejorar con la calibración del campo)

Temperatura De Funcionamiento:
0° a +60° C (No permitir que el líquido se congele dentro del metro.)

Temperatura Del Almacenaje:
-40° a +70° C

Peso Del Producto:*

	Espiga (de tubo)	NPT
1/2 pulgada	.172 kg	.249 kg
3/4 pulgada	.195 kg	.304 kg
1 pulgada	.222 kg	.381 kg
1-1/2 pulgada	.299 kg	.626 kg
2 pulgada	.354 kg	.807 kg

Dimensiones - Centímetro (Grosor x Altura x Longitud): **

	Sin conexión	Con conexión
1/2"	5.0 x 6.6 x 9.6	5.0 x 7.1 x 13.9
3/4"	5.0 x 6.8 x 9.6	5.0 x 7.3 x 13.9
1"	5.0 x 7.8 x 10.4	5.0 x 8.3 x 15.7
1-1/2"	5.8 x 9.3 x 13.7	5.8 x 9.9 x 19.3
2"	6.0 x 10.6 x 13.9	8.8 x 11.4 x 20.0

* El peso con la pantalla de la computadora. El módulo de señal de salida condicionada agrega .136 kg.

** Las dimensiones con la pantalla de la computadora. El módulo señal de salida condicionada agrega 2.8 cm a la altura.

PIEZAS

Las piezas y los accesorios siguientes de recambio están disponibles para los medidores de los Series del TM:

Parte No.	Descripción
113435-1	Señal de salida condicionada cableado de módulo
113520-1	Systema de reemplazo de la batería
116000-1	Envase de calibración, grande (5 galones)
125508-03	1/2" - kit de la asamblea de la turbina
125508-04	1/2" NPT, PVC - kit de la asamblea de la turbina
125510-03	3/4" - kit de la asamblea de la turbina
125510-04	3/4" NPT, PVC - kit de la asamblea de la turbina
125512-03	1" - kit de la asamblea de la turbina
125512-04	1" NPT, PVC - kit de la asamblea de la turbina
125514-03	1-1/2" - kit de la asamblea de la turbina
125514-04	1-1/2" NPT, PVC - kit de la asamblea de la turbina
125516-03	2" - kit de la asamblea de la turbina
125516-04	2" NPT, PVC - kit de la asamblea de la turbina
901002-52	Anillo

Kits De la Computadora:

125509-03	1/2" - kit de la asamblea de la computadora
125511-03	3/4" - kit de la asamblea de la computadora
125513-03	1" - kit de la asamblea de la computadora
125515-03	1-1/2" - kit de la asamblea de la computadora
125517-03	2" - kit de la asamblea de la computadora

SERVICIO

Para la consideración de la garantía, contacte con su distribuidor local. Si usted necesita ayuda adicional, contacte con el departamento de servicios al cliente de GPI:

1-800-835-0113

Usted necesitará:

- Proporcionar la información de la etiqueta en su medidor.
- Recibir un número de la autorización de devolución.
- Limpiar cualquier líquido con un chorro de agua del medidor antes de enviar a la fábrica.
- Si es posible, dejar las guarniciones instaladas por el cliente o una longitud amplia de la pipa pelada para la reinstalación.

⚠ PRECAUCIÓN

No devolver el metro sin la autoridad específica del departamento de servicios al cliente de GPI. Debido a las regulaciones terminantes gubernamentales GPI no aceptará los medidores para la reanudación a menos que estén totalmente libres de residuos líquidos peligrosos o inflamables, o líquidos de todos tipos durante el transporte, la dirección, y la disposición.

WEEE DIRECTIVA

La Directiva 2002/96/CE del Parlamento Europeo y del Consejo de la Unión Europea sobre Residuos de Aparatos Eléctricos y Electrónicos (RAEE) fue aprobada por el Parlamento Europeo y el Consejo de la Union Europea en 2003. Este símbolo indica que este producto contiene equipo eléctrico y electrónico que puede incluir baterías, tableros de circuito impresos, indicadores de crystal líquido u otros componentes que pueden estar sujetos a regulaciones locales de desecho. Por favor informese acerca de estas reglas y deseche de este producto de manera responasble.

DEUTSCH

WICHTIGE HINWEISS

Die TM Series Meßinstrumente mit Wasser und anderen Chemikalien benutzen, die mit Bestandteilen kompatibel sind, die Flüssigkeit (Spezifikationen Abschnitt sehen). Dieses Meßinstrument mit Kraftstoff oder anderen inkompatiblen Chemikalien nicht benutzen. TM Series Meßinstrumente sind entweder mit einem Computer für lokale elektronische Anzeige oder einer konditionierten Signalaus-gabebaugruppe vorhanden, die ein digitales Signal zu Kunde Schnittstellenmodul. TM Series mißt in Gallonen oder Litern. Auf den Kalibrie-rungsabschnitt für Einzelheit beziehen.

Diese Meßinstrumente sind nicht für den Handel zulässig.

TM Series Meßinstrumente sind gegen elektronische Störung sehr empfindlich, wenn sie innerhalb 2,5 bis 5 cm einiger Elektromotoren oder anderer Quellen des elektronischen Gebrauches bedient werden.

AUFSTELLUNG

Anschlüsse

Ihr Meßinstrument inline entweder am Ende des Schlauches neben der Düse horizontal oder vertikal anbringen. Installation zu Metallan-schlüssen wird nicht empfohlen. Diesen Schritten folgen, um anzubringen:

1. Planen, die Turbine mit einer minimalen Länge geraden Rohres anzubringen:
   - Gegen den Strom von der Turbine, einer minimalen Länge des geraden Rohres von 10mal dem internen Durchmesser der Turbine erlauben.
   - Stromabwärts von der Turbine, eine minimale Länge des geraden Rohres von 5mal dem inneren Durchmesser der Turbine erlauben.

2. Für Zentrierring (Pipe) Ende nur Spachtelmasse und Lösungsmittel verwenden, die zum Kleben von PVC erlaubt sind.
   Für NPT Befestigungen spule Teflon® Klebeband 3 bis 4 mal um die Pipe-Verbindungen. Sicherstellen, daß das Klebeband nicht das Innere des Rohres berührt.
3. Das Meßinstrument mit dem Pfeil anbringen, der in die Richtung des Flusses zeigt.
4. Für NPT Befestigungen nur Ihre Hände benutzen um die Pipe-Verbindun. Wenn Sie die Anschlüsse festziehen, sich erinnern, keine Werkzeuge zu benutzen.

Konditioniertes Signal Ausgeben Baugruppenverdrahtung

Diese konditionierte Signalausgabebaugruppe kann verdrahtet werden, um einen geöffneten Kollektorsignal-Ausgang oder Welle des Quadrats 6-volt Ausgang zur Verfügung zu stellen.

Öffnen Kollektor-Signal-Ausgang

Um einen geöffneten Kollektor Ausgang zu erzielen, Bezugsbauschaltplan 1 signalisieren. Der Klemmenblock ist auf der Rückseite des Moduls. Das Modul ist die Fabrik, die für geöffneten Kollektorsignalausgang. Zusammengebaut wird Den (820-Ohm-Minimum) Widerstand bitte zur Verfügung stellen.

10 Fuß (3m) Kabel wird mit dem Modul. Versehen Das Kabel zur gewünschten Länge trimmen oder das Kabel wie benötigt verlängern. Abstände bis 5.000 Fuß (1,524m) könne für geöffneten Kollektorsignalausgang erzielt werden.

Quadratischer Welle Ausgang

Um Quadratischen Welle Ausgang zu erzielen, Bezugsbauschaltplan 2 signalisieren und einen elektronischen Digital Meßinstrument-Batterie-Installationssatz (separat verkauft) für die Batterieleistung benutzen. Der Klemmenblock und die Batterieposition sind auf der Rückseite des Moduls. Zugang wie folgt:

1. Die vier Kreuzkopfschrauben von der Frontseite des Moduls entfernen. Das Modul von der Turbine anheben.
2. Um die Klemmenblockanschlüsse zu ändern, die passenden Schrauben lösen. Die Leitungen in den korrekten Positionen wieder anschließen und die Schrauben festziehen.
3. Die Batterien anbringen. Sicherstellen, daß der positive Pfosten in der richtigen Position ist.
4. Das Modul auf das Turbinegehäuse in Position bringen. Um Feuchtigkeit Beschädigung zu vermeiden, sicherstellen daß der dichtung völlig setzt. Die vier Schrauben an der Frontseite des Moduls festziehen.

10 Fuß (3m) Kabel wird mit dem Modul versehen. Das Kabel zur gewünschten Länge trimmen oder das Kabel wie benötigt verlängern.

MeßinstrumentGenauigkeit Überprüfen

Bevor Sie verwenden, die Genauigkeit des Meßinstruments überprüfen und die Kalibrierung überprüfen.

1. Überprüfen, daß es keine Luft in der Anlage gibt, indem Sie den Fluß beginnen, bis er ständig läuft. Dann den Fluß mit einem Ventil oder einer Düse stoppen.
2. Das Meßinstrument ein genau bekanntes Volumen in einen genauen Behälter abgeben lassen. Für beste Resultate mit einem ununterbrochenen vollen Strom messen.
3. Das Volumen gegen die Anzeige Oder die Aufnahmeausrüstung überprüfen. Wenn die Menge, die gemessen wird, genau ist, ist weitere Kalibrierung nicht notwendig. Wenn nicht, auf den Kalibrierungsabschnitt für weitere Anweisungen beziehen.

BETRIEB

Computer-Anzeige – Reihe und kumulative Gesamtmengen

Das Fließgeschwindigkeit-Eigenschaft behält zwei Gesamtmengen bei. Die kumulative Gesamtmenge liefert ununterbrochenes Maß und kann nicht manuell zurückgestellt werden. Die Zwischensumme kann zurückgestellt werden, um den Fluß während eines einzelnen Gebrauches zu messen. Die kumulative

Gesamtmenge wird mit TOTAL 1 LOCKED beschriftet. Dieses zeigt an, daß die Gesamtmenge verschlossen ist und nicht manuell auf Null eingestellt werden kann. Zwischensumme wird mit TOTAL 2 beschriftet.

Wenn die kumulative Gesamtmenge eine maximale Anzeige von 999.999 erreicht, stellt sich sie automatisch bis null zurück.

Die DISPLAY Anzeigentaste kurz betätigen, um zwischen Reihe, kumulative Gesamtmenge und Fließgeschwindigkeit zu schalten.

ANMERKUNG: Totalization zählt die Gesamtmaßeinheiten, ohne zwischen Gallonen, Litern oder nachgeeichten Maßeinheiten zu unterscheiden.

Fließgeschwindigkeit-Eigenschaft

Diese Funktion zu benutzen, betätigen und freizugeben "DISPLAY" bis "FLOWRATE" zu erscheint auf der linken Seite des Endergebnisses.

Wenn "FLOWRATE" angezeigt wird, reflektieren die Zahlen auf der mittleren Linie die Durchflußgeschwindigkeit, Z.B. die gegenwärtigen Gallonen pro Minute (GPM) oder Liter pro Minute (LPM).

Das Meßinstrument betätigen

Das Computeranzeige einschalten, indem Sie den Wasserfluß beginnen oder indem Sie kurz die DISPLAY-Taste betätigen. Die Reihe oder die kumulative Gesamtmenge vom letzten Gebrauch werden angezeigt.

Die DISPLAY-Taste kurz betätigen, um die Zwischensumme anzuzeigen. Die DISPLAY-Taste 3 Sekunden lang niederhalten, um die Zwischensumme auf Null zurückzustellen.

Das Meßinstrument ist so programmiert, das es sich automatisch abschaltet, wenn es 4 Minuten lang nicht in Betrieb ist.

Fabrik- und Nacheichungskurven

Alle Kalibrierungsinformationen sind als Wörter im oberen Teil der Anzeige, über den numerischen Stellen sichtbar.

Alle Maßeinheiten werden mit einer "Fabrik" Eichkurve hergestellt. Sie können entweder Gallonen oder Liter wählen ("GAL" oder "LTR" sind sichtbar). Die CALIBRATE und DISPLAY Tasten benutzen, um zwischen Gallonen und Liter zu schalten. Diese Eich-kurve ist NICHT vom Benutzer verstellbar. Das Wort PRESET Wird angezeigt, um dieses zu zeigen. (die Fabrikkali-brierung wird dauerhaft im Computerspeicher gespeichert.)

Die "Nacheichungskurve" kann vom Benutzer eingestellt werden. Die Kalibrierung kann jederzeit mit den Kalibrierungsverfahren, die im Kalibrierungsabschnitt beschrieben sind, geändert oder umgesteuert werden. Gesamtmengen oder Fließgeschwindigkeiten, die auf Nacheichung beruhen, werden sichtbar, wenn die Nacheichungseinstellung vorgewählt wird ("CAL B" ist auf der oberen Linie sichtbar).

Eine andere Kalibrierungseinstellung vorwählen

Sie können mit Leichtigkeit von GAL zum LTR Modus wechseln, ohne die Gesamtmengen zu verderben. Z.B. kann der Computer 10,00 Gallonen zusammenzählen. Wenn der Benutzer zum LTR-Modus schälter, auf ändert die Anzeige sofort "37,85" (die gleiche Menge in den Maßeinheiten von Litern). GAL/LTR-Schaltung arbeitet auch im FLOWRATE-Modus.

Um eine andere Kalibrierungseinstellung zu wählen, zuerst die CALIBRATE Taste drücken und halten. Weiterhin halten, Uahrend Sie die DISPLAY Taste ebenfalls pressen und freigeben. (Sie können die KALIBRIEREN-TASTE dann auch freigeben.) Die Markierungsfahnenanzeiger auf der obersten Linie ändern sich, sodass sie die neugewählte Kalibrierung anzeigen. Die Kalibrierungseinstellungen ändern sich in dieser Reihenfolge: GAL, LTR, CAL B, GAL, usw. Während die Flüssigkeit fließt, können nur GAL oder LTR gewahlt werden. Jedoch wenn KEINE Flüssigkeit fließt, kann irgendeine Vorwähl betätigt werden.

KALIBRIERUNG

Vor Dem Beginn, Kalibrierung auffangen

Für die genauesten Resultate an einer Fließgeschwindigkeit zuführen, die gut Ihre tatsächlichen Betriebsbedingungen. Simuliert Vermeiden, mehr Flüssigkeit "zu tröpfein" oder wie-

derholt den Fluß zu beginnen und zu stoppen. Dieses kann weniger genaue Kalibrierungen ergeban.

Stellen Sie Treffen die minimalen Fließgeschwindigkeitanforderungen des Meßinstruments sicher:

TM Series Meßinstrumente	
1/2 Zoll	1 GPM (3,8 LPM)
3/4 Zoll	2 GPM (7,5 LPM)
1 Zoll	5 GPM (18,8 LPM)
1-1/2 Zoll	10 GPM (37,5 LPM)
2 Zoll	20 GPM (75 LPM)

Der Gebrauch eines gleichmäßig zuverlässigen, genauen Kalibrierung Behälters wird in hohem Grade für die genauesten Resultate empfohlen. Wegen der hohen Fließgeschwindigkeit, wird es stark empfohlen, daß Kalibrierung mit einer Kombination des Volumens und des Gewichts mit feine Auflösung Skalen durchgeführt wird.

Für beste Resultate sollte das Meßinstrument angebracht werden und bereinigt worden von der Luft vor Kalibrierung auffangen.

Kalibrierung mit Computer-Anzeige auffangen

Kalibrierung auffangen und Fabrik-Kalibrierung werden im vorhergehenden Abschnitt definiert. Die Fabrikkalibrierungseinstellung ist in jeden Strömungsmesser zur Zeit der Herstellung einprogrammiert worden, indem Wasser von 70°F (21°C) verwendet wurde. Anzeigen, die die Standardfabrikeichkurven benutzen, können möglicherweise nicht in einigen Situationen genau sein, Z.B. unter extremen Temperaturbedingungen. Wenn Sie ander Flüssigkeiten ausgenommen Wasser benutzen, können Sie Bereich-Kalibrieren das Meßinstrument.

Für verbesserte Genauigkeit unter solchen Bedingungen, erlaubt der Computer Nachei-chung, d.h., kundenspezifischen Kalibrierung-sparameter können eingegeben werden. Kalibrierung auf eine “einzelnen Punk” kann akzeptable Genauigkeit in der Mitt der Durchflußmenge ergeben, fünf oder mehr Kalibrierstellen können ein höheres Niveau der Genauigkeit, besonders am untereren Ende der Durchflußmenge erbringen. Bis 15 kundenspezifische Kalibrierstellen können eingetragen werden.

Zuführen/Anzeige auffangen Kalibrierung Verfahren

1. Die CALIBRATE-Taste heruntergedrückt halten während Sie DISPLAY betätigen und freigeben, bis die Nacheichungs-kurve erscheint (“CAL B” wird angezeigt). Beide der Tasten freigeben.
2. Zum Kalibrieren, die CALIBRATE-Taste betätigen und halten. Fortfahren, CALIBRATE Zu halten, die DISPLAY-Taste auch betätigen und halten. Beide der Tasten für ungefähr 3 Sekunden halten, bis Sie die blinkende Anzeige “dd-CAL” sehen. Sobald “dd-CAL” erscheint, beide der Tasten freigeben. Sie sind jetzt im Nacheichungsmodus.
3. Sobald die Tasten von Schritt 2 freigegeben worden sind, erscheint die Blinkenanzeige “run 01”. Wenn Sie den Kalibrierungsprozeß jetzt beenden möchten, bevor Sie irgendeine Flüssigkeit zuführen, zu Schritt 11 gehen.
4. Wenn Sie mit der Kalibrierung fortfahren möchten, aber noch keine Flüssigkeit zugeführt haben, die abschließenden Vorbereitungen an Ihrem Pumpsystem ausführen ohne mit pumpen anzufangen.
5. Ihr Pumpsystem anlassen, damit Flüssigkeit das Meßinstrument durchfließt. Die Anzeige stoppt zu blinken und zeigt die Anzeige “run 01”. Flüssigkeit in einen Behälter zuführen, der Ihnen erlaubt, die Menge der Flüssigkeit zu beurteilen. Wenn Sie die gewünschte Menge (zum Beispiel, 10 Gallonen) gepumpt haben, den Fluß schnell stoppen.
6. Wenn die Flüßigkeit aufgehört hat, zu fliessen, beide Tasten kurz betätigen und freigeben. An diesem Punkt ändert sich die Computeranzeige zum “0000.00” mit dem linken Stellenblinken.
7. Das Volumen (Menge) der Flüssigkeit eintragen, die Sie gepumpt haben (wenn Ihr 10-Gallonen-Behälter voll ist, “0,0” für Gallonen oder “37,85” für Liter zum Beispiel eintragen). Um die Zahlen einzutragen, die CALIBRATE-Taste benutzen, um den Wert der Stelle zu ändern, die blinkt. Die DISPLAY-Taste benutzen, um das “Blinzeln” auf die folgende Stelle zu verschieben.

8. Sobald die korrekte Zahl eingetragen ist, beide der Tasten kurz betätigen und freigeben. Die Anzeige ändert sich jetzt zum blinkenden “run 02”. Sie haben jetzt den neuen Calkurvenpunkt angebracht. Sie sind bereit, Kalibrierung (Schritt 10) zu beenden oder eine andere neue Kalibrierstelle (Schritt 9) einzutragen.

9 Um eine andere Kalibrierstelle einzutragen, zurück gehen und Schritte 3 bis 8 wiederholen. Es ist möglich, bis 15 Calkurvenpunkte einzustellen, und die “run ##” erhöht sich jede Mal, wenn Sie den Kalibrierungsprozeß wiederholen (run 01, run 02, run 03, usw., bis run 15).

10. Um den Kalibrierungsprozeß zu beenden, beide der Tasten für ungefähr 3 Sekunden betätigen und halten, bis Sie Anzeige “CAL End” sehen. Nachdem Sie die Tasten freigeben, nimmt der Computer Normalbetriebe mit dem neuen aktiven cal-point(s) wieder auf.

11. Wenn Sie keine Flüssigkeit zugeführt haben, können Sie Kalibrierung beenden, ohne die cal-Kurve zu ändern. Wenn “run 01” angezeigt ist und sie keine Flüßigkeit ausgelassen haben, beide Tasten ungefähr 3 Sekunden lang halten, bis Sie Anzeige “CAL End” sehen. Nach dem Sie die Tasten freigeben, nimmt der Computer Normalbetrieb wieder auf und die alte Kurve (wenn Sie vorher eine eingaben), ist noch intakt.

Kalibrierung mit konditionierter Signal-Ausgabebaugruppe

Der K-Faktor Ihres Meßinstruments erscheint auf dem Kalibrierung Report als die Zahl Impulsen pro Gallone. Der Faktor wird während der Produktion mit Wasser an 70°F (21°C) festgestellt. Dieser K-Faktor kann für Kalibrierung “des einzelnen Punktes” verwendet werden und wird eine annehmbare Genauigkeit liefern. Jedoch können die Messwerte möglicherweise nicht genau sein, wenn Sie diese Kalibrierung Methode in einigen Situationen verwenden. Ein Beispiel ist, wenn Sie das Meßinstrument unter extremen Temperaturbedingungen benutzen oder mit Flüssigkeiten anders als Wasser verwenden.

Für verbesserte Genauigkeit unter solchen Bedingungen, empfehlen wir, daß ein K-Faktor Besondere zur Anwendung für die Kalibrierung festgestellt und verwendet wird. Eine Kali-brierung “des einzelnen Punktes” kann eine annehmbare Genauigkeit mitten in der Fluß-strecke erbringen, aber fünf oder mehr Kalibrierstellen können ein hohes Niveau der Genauigkeit, besonders am untereren Ende der Fluß-strecke erbringen.

WARTUNG

Die korrekte Behandlung und die Wartung verlängern das Leben und den Service des Meßinstruments.

Turbinenrotor

Das Meßinstrument ist praktisch wartungsfrei. Jedoch ist es wichtig, dass sich der Rotor frei bewegen kann. Das Meßinstrument sauber halten und von Verunreinigung freihalten.

Wenn der Läufer sich nicht frei dreht, ein Durchdringungsschmiermittel auf dem Läufer, der Welle und den Wellenlagern anwenden. Allen möglichen Rückstand oder Ablagerungen vom Läufer mit einer weichen Bürste oder einem kleinen Fühler entfernen. Achtgeben, daß Sie nicht den Turbinenrotor oder die Stützen beschädigen.

⚠ VORSICHT

Pressluft durch die Turbine blasen kann den Rotor beschädigen.

BatterieAustausch

Das Computeranzeige wird durch zwei 3-Volt Lithium Batterien angetrieben, die ausgetauscht werden können, während das Meßinstrument installiert ist. Die Zwischensummen und kumulativen Gesamtmengen stellen sich auf Null zurück, wenn die Batterien schwach werden oder entfernt worden sind. Die Fabrik- und Nacheichung bleibt erhalten.

Wenn die Meßinstrumentanzeige sich verdunkelt oder ausgeht, die Batterien austauschen, wie folgt:

1. Die vier Kreuzschlitzschrauben von der Vorderseite des Meßinstruments entfernen und die Frontplatte von der Turbine anheben.
2. Die alten Batterien entfernen und jede mögliche Korrosion von den Klemmen säubern.
3. Neue Batterien anbringen. Überprüfen, daß der positive Pfosten in der richtigen Position ist.
4. Wenn die Batterien ausgetauscht sind,zeigt die Frontplatte “POWER ON”. Die Anzeige überprüfen, um normale Funktionen sicherzustellen, bevor Sie wieder zusammenbauen.
5. Falls nötig, Batterieeinsetzung berichtigen, und die Frontplatte auf das Turbinegehäuse in Position bringen. Um Feuchtigkeitsbeschädigung zu vermeiden, überprüfen, daß der dichtung völlig sitzt. Die vier Schrauben an der Frontplatte festziehen.

SPEZIFIKATIONEN

Eingang und Anschluß:

Zentrierring (Pipe) Ende

TM050/TM050-P	1/2" Zeitplan 80, Zentrierring (Pipe) ende
TM075/TM075-P	3/4" Zeitplan 80, Zentrierring (Pipe) ende
TM100/TM100-P	1" Zeitplan 80, Zentrierring (Pipe) ende
TM150/TM150-P	1-1/2" Zeitplan 80 Zentrierring (Pipe) ende
TM200/TM200-P	2" Zeitplan 80, Zentrierring (Pipe) ende

Für NPT Befestigungen

TM050-N/TM050-N-P	1/2 Zoll NPT
TM075-N/TM075-N-P	3/4 Zoll NPT
TM100-N/TM100-N-P	1 Zoll NPT
TM150-N/TM150-N-P	1-1/2 Zoll NPT
TM200-N/TM200-N-P	2 Zoll NPT

DesignBaumuster: Turbine

Naßgemachte Bauteile:

Gehäuse: PVC
Achslager: Keramisch
Welle: Hartmetall
Läufer und Halterungen: PVDF
Haltering: Rostfreier Stahl

Zentrierring

Verbindungstyp: Zentrierring - Zeitplan 80 oder NPT (*Hohlgewinde)

Max. FunktionsDruck: 150 PSIG @ 73°F

U.S. Maß

Maßeinheit der Maßnahme: Gallone

FlußStrecke:

1/2 Zoll	1 - 10 GPM
3/4 Zoll	2 - 20 GPM
1 Zoll	5 - 50 GPM
1-1/2 Zoll	10 - 100 GPM
2 Zoll	20 - 200 GPM

Genauigkeit mit Computer: ± 3.0% (Genauigkeit kann mit verbessert werden auffangen Kalibrierung)

Betriebstemperatur: +32° zu +140° F (Flüssigkeit nicht innerhalf des Meßinstruments einfrieren lassen.)

SpeicherTemperatur: -40° zu +158° F

Gewicht des Produktes:*

	Zentrierring (Pipe)	NPT
1/2 Zoll	.38 lbs.	.55 lbs.
3/4 Zoll	.43 lbs.	.67 lbs.
1 Zoll	.49 lbs.	.84 lbs.
1-1/2 Zoll	.66 lbs.	1.38 lbs.
2 Zoll	.78 lbs.	1.78 lbs.

Abmessungen - Zoll (W x H x L):**

	Ohne Befestigungen	Mit Befestigungen
1/2"	2.0 x 2.6 x 3.8	2.0 x 2.8 x 5.5
3/4"	2.0 x 2.7 x 3.8	2.0 x 2.9 x 5.5
1"	2.0 x 3.1 x 4.1	2.0 x 3.3 x 6.2
1-1/2"	2.1 x 3.7 x 5.4	2.3 x 3.9 x 7.6
2"	2.4 x 4.2 x 5.5	3.5 x 4.5 x 7.9

* Das Gewicht mit der Computeranzeige. Die konditionierte Signalausgabebaugruppe addiert .30 Pfund.

** Die Maße mit der Computeranzeige. Konditionierte Signalausgabebaugruppe fügt 1.1 Zoll Höhe. hinzu.

Metrisches Maß

Maßeinheit: Liter

FlußStrecke:

1/2 Zoll	3,8 - 38 LPM
3/4 Zoll	7,6 - 76 LPM
1 Zoll	19 - 190 LPM
1-1/2 Zoll	38 - 380 LPM
2 Zoll	76 - 760 LPM

Genauigkeit mit Computer: ±3.0% (Genauigkeit kann mit verbessert werden auffangen Kalibrierung)

Betriebstemperatur: 0° zu +60° C (Flüssigkeit nicht innerhalf des Meßinstruments einfrieren lassen.)

SpeicherTemperatur: -40° zu +70° C

Gewicht des Produktes: *

	Zentrierring (Pipe)	NPT
1/2 Zoll	.172 kg	.249 kg
3/4 Zoll	.195 kg	.304 kg
1 Zoll	.222 kg	.381 kg
1-1/2 Zoll	.299 kg	.626 kg
2 Zoll	.354 kg	.807 kg

Abmessungen - Zentimeter (W x H x L):**

	Ohne Befestigungen	Mit Befestigungen
1/2"	5.0 x 6.6 x 9.6	5.0 x 7.1 x 13.9
3/4"	5.0 x 6.8 x 9.6	5.0 x 7.3 x 13.9
1"	5.0 x 7.8 x 10.4	5.0 x 8.3 x 15.7
1-1/2"	5.8 x 9.3 x 13.7	5.8 x 9.9 x 19.3
2"	6.0 x 10.6 x 13.9	8.8 x 11.4 x 20.0

* Das Gewicht mit der Computeranzeige. Die konditionierte Signalausgabebaugruppe addiert 136 Kilogramm.

** Die Maße mit der Computeranzeige. Konditionierte Signalausgabebaugruppe fügt 2.8 Zentimeter Höhe. hinzu

TEILE

Die folgenden Ersatzteile und die Zusatzgeräte sind für die TM Series Meßinstrumente vorhanden:

Teil Nr.	Beschreibung
113435-1	Konditioniertes Signal-Ausgabebau-gruppe
113520-1	Batterie AustauschInstallationssatz
116000-1	Kalibrierungsbehälter, groß (5 Gallone)
125508-03	1-/2 Zoll, Turbineeinheitsinstallationssatz
125508-04	1-/2 Zoll, NPT, PVC, Turbineeinheitsinstallationssatz
125510-03	3/4 Zoll, Turbineeinheitsinstallationssatz
125510-04	3/4 Zoll, NPT, PVC, Turbineeinheitsinstallationssatz
125512-03	1 Zoll, Turbineeinheitsinstallationssatz
125512-04	1 Zoll, NPT, PVC, Turbineeinheitsinstallationssatz
125514-03	1-1/2 Zoll, Turbineeinheitsinstallationssatz
125514-04	1-1/2 Zoll, NPT, PVC, Turbineeinheitsinstallationssatz
125516-03	2 Zoll, Turbineeinheitsinstallationssatz
125516-04	2 Zoll, NPT, PVC, Turbineeinheitsinstallationssatz
901002-52	Dichtung
Computereinheitsinstallationssatz:	
125509-03	1-/2 Zoll, Computereinheitsinstallationssatz
125511-03	3/4 Zoll, Computereinheitsinstallationssatz
125513-03	1 Zoll, Computereinheitsinstallationssatz
125515-03	1-1/2 Zoll, Computereinheitsinstallationssatz
125517-03	2 Zoll, Computereinheitsinstallationssatz

SERVICE

Für Garantiansprüche mit Ihrem lokalen Verteiler in Verbindung treten. Wenn Sie weitere Unterstützung benötigen, mit der GPI-Kundendienstabteilung in Verbindung treten:

1-800-835-0113

Sie benötigen:

- Informationen vom Abziehbild auf Ihrem Meßinstrument zur Verfügung stellen.
- Eine Rückholermächtigungszahl empfangen.
- Jede mögliche Flüssigkeit vom Meßinstrument spülen, bevor Sie zur Fabrik versenden.
- Wenn möglich, Abnehmer-angebrachte Befestigungen oder eine reichliche Länge des Rohres für Wiedereinbau belassen.

⚠VORSICHT

Das Meßinstrument nicht ohne die spezifische Berechtigung der GPI-Kundendienstabteilung zurückbringen. Wegen der strengen Regelungen des Transportes, der Behandlung und der Beseitigung der gefährlichen oder feuergefährlichen Flüssigkeiten, nimmt GPI nicht Meßinstrumente für Überarbeitung an, es sei denn, class sie vom flüssigen Überrest vollständig frei sind.

WEEE RICHTLINIE

Der Richtlinie 2002/96/EG über Elektro- und Elektronik-Altgeräte (WEEE) des Europäischen Parlaments bzw. des EU-Ministerrats. Dieses simbol zeigt an, daß dieses Produkt elektrische und elektronische Ausrüstung, die Batterien mit einschließen kann, Printplatte verschalt, Flüssigkristall-Sichtanzeigen oder andere Bestandteile enthält, die abhängig von Einheimischvergeudung Regelungen sein können. Bitte verstehen Sie jene Regelungen wenn Sie dieses Produkt sich entledigen.

ITALIANO

AVVISO IMPORTANTE

Usare i tester dei Series del TM con acqua ed altri prodotti chimici che sono compatibili con le parti che sono esposti a liquido (vedere la sezione di specifiche). Non utilizzare questo tester con combustibile o altri prodotti chimici incompatibili. I tester di serie de TM sono disponib ili con un calcolatore per visualizzazione elettronica locale, o un modulo di uscita condizionato del segnale che fornisce un segnale numerico all'apparecchiatura di collegamento del cliente. I Series di TM misura la misura con un contatore nei galloni o nei litri. Riferirsi alla sezione di taratura per i particolari.

Questi tester non sono per le applicazioni commerciali.

I tester dei Series del TM sono molto sensibili ad interferenza elettronica se sono funzionati all'interno di 1 - 2 pollici di alcuni motori elettrici o di altre fonti di uso elettronico

INSTALLAZIONE

Collegamenti

Installare il vostro tester in linea orizzontalmente o verticalmente o all'estremità del tubo flessibile adiacente all'ugello. L'installazione ai collegamenti del metallo non è suggerita. Seguire questi punti per installare:

1. Progettare installare la turbina con una lunghezza minima del tubo diritto:
   - A monte dalla turbina, concedere ad una lunghezza minima di un tubo diritto di 10 volte il diametro interno della turbina.
   - A valle dalla turbina, concedere ad una lunghezza minima di un tubo diritto di 5 volte il diametro interno della turbina.
2. Per Spigot (Tuboture) scade usare soltanto più solventi approvati per l'incollatura del PVC.
   Per i Montaggi Del NPT circondare i collegamenti di tubo con nastri adesivi del Teflon® 3 -4 volte.
3. Fissare il tester con la freccia indicata nel senso del flusso.

4. Per i Montaggi Del NPT utilizzare soltanto le vostre mani per stringere i collegamenti. Non utilizzare gli attrezzi per stringere. Ciò può causare danni.

Segnale Condizionato Produrre Cablaggio Di Modulo

Questo modulo di segnale condizionato del può essere legato per fornire del collettore dell' segnale aperta o dell'onda del quadrato di 6-volti.

Collettore dell'Segnale Aperta

Per raggiungere Collettore dell' Segnale Aperta, Riferiscasi allo schema elettrico di riferimento 1. Il blocchetto terminali è situato dal lato posteriore del modulo. Il modulo è fabbrica montata per collettore dell' segnale aperta. Fornire prego il resistore di minimo di 820 Ohm.

Dieci piedi (3m) di cavo è fornito del modulo. Assettare il cavo alla lunghezza voluta o estendere il cavo come necessario. Le distanze fino a 5.000 piedi (1,524m) possono essere realizzate per l'collettore dell' segnale aperta.

Segnale Dell'Onda Quadrata

Per raggiungere segnale Dell'Onda Quadrata, Riferiscasi allo schema elettrico di riferimento 2 ed usare un corredo elettronico della batteria del tester di Digital (venduto esclusivamente) per la potenza della batteria. Il blocchetto terminali e la posizione della batteria sono situati dal modulo. Accesso come segue:

1. Rimuovere le quattro viti Phillips dalla parte anteriore del modulo. Alzare il modulo dalla turbina.
2. Per cambiare i collegamenti del blocchetto terminali, allentare le viti adatte. Ricollegare i legare nelle posizioni adequate e stringere le viti.
3. Installare le batterie. Assicurarsi che l'alberino positivo è nella posizione corretta.
4. Posizionare il modulo sull'alloggiamento della turbina. Evitare danni dell'umidità, assicurarsi che l'anello completamente è messo. Stringere le quattro viti sulla parte anteriore del modulo.

Dieci piedi (3m) di cavo è fornito del modulo. Assettare il cavo alla lunghezza voluta o estendere il cavo come necessario.

Verificare L'Esattezza Del Tester

Prima di utilizzare, controllare l'esattezza del tester e verificare la taratura.

1. Assicurarsi che non ci è aria nel sistema iniziando la quantità di fluido fino a che non funzioni costantemente. Allora, arrestare il flusso usando una valvola o un ugello.
2. Per mezzo del tester, misurare un volume conosciuto esatto in un contenitore esatto. Per i risultati migliori, misurare con un flusso pieno continuo.
3. Controllare il volume contro l'esposizione o l'apparecchiatura di registrazione. Se l'importo misurato è esatto, ulteriore calibratura non è necessaria. Se non, riferirsi alla sezione di taratura per ulteriori istruzioni.

FUNZIONAMENTO

Visualizzatore del computer - Partita e totali comulativi

Il computer effettua due totali. Il totale cumulativo fornisce la misura continua e non può essere ripristinato manualmente. Il totale in lotti può essere ripristinato per misurare il flusso durante il monouso. Il totale cumulativo è identificato con il del TOTAL 1 LOCKED. Ciò indica che il totale è locked e non può essere azzerato manualmente. Il totale in lotti è identificato con il TOTAL 2.

Quando il totale cumulativo raggiunge una lettura massima di 999.999, si ripristinerà automaticamente a zero.

Premere il tasto dell' DISPLAY brevemente per commutare fra il batch, il totale cumulativo ed il debito.

NOTA: Totalization conta le unità totali senza differenziare fra i galloni, i litri o le unità campotaratura.

Caratteristica indice di flusso

Usare questa caratteristica, premere e liberare "DISPLAY" fino "FLOWRATE" compare alla sinistra della linea inferiore.

Quando "FLOWRATE" è visualizzato, i numeri sulla linea centrale riflettono la portata. Per esempio, i galloni correnti per il minuto (gal/mn) o litri al minuto (LPM).

Attivare il Tester

Accendere il visualizzatore del computer iniziando il flusso dell' acqua o brevemente premendo il tasto del DISPLAY. Partita o il totale cumulativo dall'ultimo uso sarà visualizzato.

Premere il tasto del DISPLAY brevemente per visualizzare il totale in lotti. Tenere il tasto dell' DISPLAY affinchè 3 secondi ripristinino il totale in lotti a zero.

Il tester è programmato per spenga di automaticamente se non usato per 4 minuti.

Curve di calibratura del campo e della fabbrica

Tutte le informazioni di taratura sono visibili all'utente come parole nella parte superiore dell'esposizione, sopra le cifre numeriche.

Tutte le unità sono configurate con una curva di taratura "della fabbrica". Potete scegliere i galloni o i litri ("GAL" o "LTR" sarà visibile). Utilizzare i tasti del DISPLAY el del CALIBRATE per alternarsi fra i galloni ed i litri. Questa curva di taratura non è utente registrabile. La parola PRESET é visualizzata per mostrare questa. (la taratura della fabbrica sarà immagazzinata permanente nella memoria del calcolatore.)

La curva di taratura "del campo" può essere regolata dall'utente. La taratura può essere cambiata o modificata in qualunque momento seguendo le procedure di taratura descritte nella sezione di taratura. I totali o il debito hanno derivato dalla taratura del campo sono visibili quando la regolazione di taratura del campo è selezionata ("CAL B" sarà visibile sulla linea superiore).

Selezione della regolazione differente di calibratura

Si può commutare fra i modi del LTR e del GAL alla volontà senza "corrompere" i totali. Per esempio, il calcolatore può ammontare a 10,00 galloni. Se l'utente commuta al modo del LTR, l'esposizione immediatamente cambierà "a 37,85" (la stessa quantità nelle unità dei litri). La commutazione del GAL/LTR inoltre funziona nel modo del FLOWRATE.

Per selezionare una regolazione differente di taratura, una prima pressa e tenere il tasto di taratura (CALIBRATE). Continuare a tenere il tasto mentre però premendo e liberando il tasto dell'Esposizione (DISPLAY). (si può allora anche liberare il tasto di CALIBRATE.) Gli indicatori della bandierina nella linea superiore dell' esposizione cambieranno per mostrare la regolazione recentemente selezionata di taratura. Le regolazioni di taratura cambiano in questo ordine: GAL, LTR, CAL B, GAL, ecc. Mentre il liquido sta fluendo, solo le selezioni di LTR e di GAL possono essere fatte. Tuttavia, quando NESSUN liquido sta fluendo, qualsiasi selezione può essere fatta.

CALIBRATURA

Prima Di Cominciare Calibratura Del Campo

Per i risultati più esatti, erogare ad un debito che simula il più bene le vostre condizioni di gestione reali. Evitare di "gocciolare" più liquido o ripetutamente iniziare ed arrestare il flusso. Queste azioni provocheranno le calibrature meno esatte.

Vi assicurate raduno i requisiti minimi di debito del tester:

Tester Di Series di TM
Tester di 1/2 Pollice 1 GPM (3,8 LPM)
Tester da 3/4 di Pollice 2 GPM (7,5 LPM)
Tester da 1 Pollice 5 GPM (18,8 LPM)
Tester di 1-1/2 Pollice 10 GPM (37,5 LPM)
Tester da 2 Pollici 20 GPM (75 LPM)

Usando un contenitore credibile e ed esatto di taratura altamente è suggerito per i risultati più esatti. Dovuto l' alto debito, è suggerito vivamente che la calibratura è completata con una combinazione di volume e di peso usando le scale di alta risoluzione.

Per i risultati migliori, il tester dovrebbe essere installato ed eliminato l'inceppo di aria prima della taratura del campo.

Calibratura del campo con il visualizzatore del computer

La calibratura del campo e la calibratura della fabbrica sono definite nella sezione precedente. Le regolazioni di calibratura della fabbrica l'abitudine si è programmata in ogni flussometro durante la loro produzione usando l'acqua

a 70°F (21°C). Le letture che usano le curve di taratura standard della fabbrica non possono essere esatte in alcune situazioni. Per esempio, quando nelle condizioni termiche estreme. Potete campo calibrare il tester se decidete misurare i liquidi tranne acqua.

Per esattezza migliorata in tali circostanze, i GPI fluiscono calcolatore tengono conto la taratura "del campo" (entrata di utente dei parametri di taratura su ordinazione) A "che la taratura del singolo punto" può rendere un'esattezza accettabile nel mezzo della gamma di flusso. Cinque o il più punti di taratura possono rendere un livello elevato di esattezza, particolarmente all'estremità più inferiore della gamma di flusso. Fino a 15 punti di taratura su ordinazione possono essere inseriti.

Erogare/Procedure Di Calibratura Campo Dell'Esposizione

1. Mantenere il tasto del CALIBRATE mentre premere e liberare il DISPLAY si abbottonano fino a che la curva di taratura del campo non compaia (messaggio di "CAL B" sarà visualizzata). Liberare entrambi i tasti.
2. Per calibrare, premere e tenere il tasto del CALIBRATE. Mentre continuano a tenere il CALIBRATE, inoltre premere e tenere il tasto del DISPLAY. Tenere entrambi i tasti per circa 3 secondi fino a che non vediate messaggio del "dd-CAL" di lampeggiamento. Una volta che il messaggio del "dd-CAL" compare, liberare entrambi i tasti. Siete ora nel modo di taratura del campo.
3. Una volta che i tasti sono stati liberati da punto 2, l'esposizione mostrerà che il messaggio di lampeggiamento "run 01". Se desiderate ora rimuovere il processo di taratura prima dell' erogazione del qualsiasi liquido, passare al punto 11.
4. Se desiderate continuare con la taratura, ma non avete erogato alcun liquido ancora, fare le vostre preparazioni finali al vostro sistema di pompaggio, ma non iniziare a pompare ancora.
5. Iniziare il vostro sistema di pompaggio in modo che il liquido attraversi il tester. L'esposizione smetterà di lampeggiare e mostrerà il messaggio di "run 01". Erogare il liquido in un contenitore che permette che giudichiate la quantità di liquido pompata. Quando avete pompato l'importo voluto (per esempio, 10 galloni), arrestare rapidamente la quantità di fluido.
6. Una volta il flusso ha arrestato, brevemente preme e libera entrambi i tasti. A questo punto il visualizzatore del computer cambierà a "0000.00" con il lampeggiamento a mano sinistra della cifra.
7. Entrare nel volume (importo) di liquido quello che avete erogato (per esempio, se il vostro contenitore di 10-gallon è pieno, impostare "10,0" per i galloni o "37,85" per i litri). Per entrare nei numeri, utilizzare il tasto del CALIBRATE per cambiare il valore della cifra che sta lampeggiando. Utilizzare il tasto del DISPLAY per spostare "il lampeggio" alla cifra seguente.
8. Una volta che il numero corretto è inserito, brevemente premere e liberare entrambi i tasti. L'esposizione ora cambierà ad un messaggio "run 02" di lampeggiamento. Ora avete installato il nuovo punto della caloria-curva. Siete pronti a concludere la taratura (punto 10) o ad entrare in un altro nuovo punto di taratura (punto 9).
9. Entrare in un altro punto di taratura, andare indietro e ripetere punti da 3 a 8. È possibile da installare a 15 punti della caloria-curva e il messaggio del "run ##" di funzionamento increment ogni volta ripetete il processo di taratura (run 01, run 02, run 03, ecc., fino al run 15).
10. Per concludere il processo di taratura, premere e tenere entrambi i tasti per circa 3 secondi fino a che non vediate messaggio dell "CAL End". Dopo che liberiate i tasti il calcolatore riprenderà i funzionamenti normali con il nuovo point(s) di caloria attivo.
11. Se non avete erogato alcun liquido, si può rimuovere la taratura senza cambiare la curva di caloria. Se il messaggio "run 01" sta mostrando e non avete erogato alcun liquido, tenete entrambi i tasti per circa 3 secondi fino a che non vedeste il messaggio dell' "CAL End". Dopo voi liberare i tasti, il calcolatore riprenderà il funzionamento normale e la vecchia curva (se impostaste uno nel passato) è ancora intatta.

Calibratura con il modulo di Segnale Condizionato Produrre

Il fattore K del vostro tester compare sul rapporto di calibratura come il numero di impulsi per il gallone. Il fattore è determinato durante la produzione usanto l'acqua a 70°F (21°C). Questo fattore K può essere usato per "la calibratura del singolo punto" e fornirà un'esattezza accettabile. Tuttavia, le letture non possono essere esatte quando usate questo metodo di calibrature in alcune situazioni. Un esempio è quando utilizzate il tester nelle condizioni termiche estreme o usate con i liquidi tranne acqua.

Per esattezza migliorata in tali circostanze, suggeriamo che un fattore K specifico all'applicazione è determinato ed usato per la calibratura. "Una calibratura del singolo punto" può rendere un'esattezza accettabile nel mezzo della gamma di flusso, ma cinque o il più punti di calibratura possono rendere un livello elevato di esattezza, particolarmente all'estremità più inferiore della gamma di flusso.

MANUTENZIONE

Il maneggiamento e la cura adeguati estenderanno la durata ed il servizio del tester.

Rotore Di Turbina

Il tester è virtualmente manutenzione-free. Tuttavia, è liberamente importante i movimenti del rotore. Mantenere il tester pulito ed esente dagli agenti inquinanti.

Se il rotore non gira liberamente, applicare un lubrificante penetrante sul rotore, sull'albero e sui cuscinetti. Rimuovere tutti i residui o depositi dal rotore usando una spazzola molle o una piccola sonda. Fare attenzione non danneggiare il rotore di turbina o i supporti.

⚠ ATTENZIONE

Appiattito fornisc tramite il complessivo della turbina ha potuto danneggiare il rotore.

Rimontaggio Della Batteria

Il visualizzatore del computer è alimentato da due batterie del litio 3-volt che possono essere sostituite mentre il tester è installato. Quando le batterie sono rimosse o perdono l'alimentazione, il batch ed i totali cumulativi ripristinati a zero ma le calibrature della fabbrica e del campo sono mantenuti.

Se l'esposizione del tester diventa fioca o in bianco, sostituire le batterie come segue:

1. Rimuovere le quattro viti della Phillips-testa dalla faccia del tester ed alzare la piastra frontale dalla turbina.
2. Rimuovere le vecchie batterie e liberare tutta la corrosione dai terminali.
3. Installare le nuove batterie. Assicurarsi che l'alberino positivo è nella posizione corretta.
4. Quando le batterie sono sostituite, la piastra frontale alimenterà SOPRA. Controllare l'esposizione per accertare le funzioni normali hanno ripreso prima del montaggio ancora.
5. Riposizionare le batterie, se necessario e posizionare la piastra frontale sull'alloggiamento della turbina. Evitare danni dell' umidità, assicurarsi che l'anello completamente è messo. Stringere le quattro viti sulla piastra frontale.

SPECIFICHE

Ingresso e Presa:

Montaggi Spigot (Tuboture) scade

TM050/TM050-P	1/2" Programma 80, Spigot (Tuboture)
TM075/TM075-P	3/4" Programma 80, Spigot (Tuboture)
TM100/TM100-P	1" Programma 80, Spigot (Tuboture)
TM150/TM150-P	1-1/2" Programma 80, Spigot (Tuboture)
TM200/TM150-P	2" Programma 80, Spigot (Tuboture)

Montaggi Del NPT

TM050-N/TM050-N-P	1/2 pollice NPT
TM075-N/TM075-N-P	3/4 pollice NPT
TM100-N/TM100-N-P	1 pollice NPT
TM150-N/TM150-N-P	1-1/2 pollice NPT
TM200-N/TM200-N-P	2 pollice NPT

Tipo Di Disegno: Turbina

Componenti Bagnati:

Alloggiamento: PVC
Cuscinetti: Di Ceramica
Albero: Carburo Di Tungsteno
Rotore e Supporti: PVDF
Fermo: Acciaio Inossidabile

Tipo Dei Collegamento: Spigot - Programma 80, o NPT (femmina)

Massimo Pressione Di Esercizio: 225 PSIG @ 73°F

Misura Degli Stati Uniti

Unità Della Disura: Gallone

Gamma Di Flusso:

1/2 pollice	1 - 10 GPM
3/4 pollice	2 - 20 GPM
1 pollice	5 - 50 GPM
1-1/2 pollice	10 - 100 GPM
2 pollice	20 - 200 GPM

Esattezza con il computer: ±3.0% (esattezza può essere migliorata con la calibratura del campo)

Temperatura Di Funzionamento: +32° a +140° F (Non lasciare che il liquido congeli all'inerno del tester.)

Temperatura Di Immagazzinaggio: -40° a +158° F

Peso Del Prodotto:*

	Spigot (Tuboture)	NPT
1/2 pollice	.38 lbs.	.55 lbs.
3/4 pollice	.43 lbs.	.67 lbs.
1 pollice	.49 lbs.	.84 lbs.
1-1/2 pollice	.66 lbs.	1.38 lbs.
2 pollice	.78 lbs.	1.78 lbs.

Dimensioni - Pollici (Larghezza, Altezza, Lunghezza):**

	Senza Montaggio	Con Montaggio
1/2"	2.0 x 2.6 x 3.8	2.0 x 2.8 x 5.5
3/4"	2.0 x 2.7 x 3.8	2.0 x 2.9 x 5.5
1"	2.0 x 3.1 x 4.1	2.0 x 3.3 x 6.2
1-1/2"	2.1 x 3.7 x 5.4	2.3 x 3.9 x 7.6
2"	2.4 x 4.2 x 5.5	3.5 x 4.5 x 7.9

* Il peso con il visualizzatore del computer. Il modulo di segnale condizionato produrre aggiunge .30 libbre.

** Le dimensioni con il visualizzatore del computer. Il modulo di segnale condizionato produrre aggiunge 1.1 pollice ad altezza.

Misura Metrica

Unità Della Misura: Litro

Gamma Di Flusso:

1/2 pollice	3,8 - 38 LPM
3/4 pollice	7,6 - 76 LPM
1 pollice	19 - 190 LPM
1-1/2 pollice	38 - 380 LPM
2 pollice	76 - 760 LPM

Esattezza con il computer: ± 3.0% (esattezza può essere migliorata con la calibratura del campo)

Temperatura Di Funzionamento: 0° a +60° C (Non lasciare che il liquido congeli all'inerno del tester.)

Temperatura Di Immagazzinaggio: -40° a +70° C

Peso Del Prodotto:*

	Spigot (Tuboture)	NPT
1/2 pollice	.172 kg	.249 kg
3/4 pollice	.195 kg	.304 kg
1 pollice	.222 kg	.381 kg
1-1/2 pollice	.299 kg	.626 kg
2 pollice	.354 kg	.807 kg

Dimensioni - Centimetro (Larghezza, Altezza, Lunghezza):**

	Senza Montaggio	Con Montaggio
1/2"	5.0 x 6.6 x 9.6	5.0 x 7.1 x 13.9
3/4"	5.0 x 6.8 x 9.6	5.0 x 7.3 x 13.9
1"	5.0 x 7.8 x 10.4	5.0 x 8.3 x 15.7
1-1/2"	5.8 x 9.3 x 13.7	5.8 x 9.9 x 19.3
2"	6.0 x 10.6 x 13.9	8.8 x 11.4 x 20.0

** Il peso con il visualizzatore del computer. Il modulo di segnale condizionato produrre aggiungil 136 chilogrammo.

*** Le dimensioni con il visualizzatore del computer. Il modulo di segnale condizionato produrre aggiunge 2.8 centimetri ad altezza.

PARTI

Le seguenti parti ed accessori di ricambio sono disponibili per i tester dei Series del TM:

Parte No.	Descrizione
113435-1	Segnale Condizionato Cablaggio Di Modulo
113520-1	Corredo Del Rimontaggio Della Batteria
116000-1	Contenitore Di Taratura, Grande (5 galloni)
125508-03	1/2 Pollice, Corredo Dell' Assemblea Della Turbina
125508-04	1/2 Pollice, NPT, PVC, Corredo Dell'Assemblea Della Turbina
125510-03	3/4 Di Pollice, Corredo Dell' Assemblea Della Turbina
125510-04	3/4 Di Pollice, NPT, PVC, Corredo Dell'Assemblea Della Turbina
125512-03	1 Pollice, Corredo Dell' Assemblea Della Turbina
125512-04	1 Pollice, NPT, PVC, Corredo Dell'Assemblea Della Turbina
125514-03	1-1/2 Pollice, Corredo Dell' Assemblea Della Turbina
125514-04	1-1/2 Pollice, NPT, PVC, Corredo Dell'Assemblea Della Turbina
125516-03	2 Pollici, Corredo Dell' Assemblea Della Turbina
125516-04	2 Pollici, NPT, PVC, Corredo Dell'Assemblea Della Turbina
901002-52	Anello
Corredo Del Calcolatore:	
125509-03	1/2 Pollice, Corredo Dell' Assemblea Del Calcolatore
125511-03	3/4 Di Pollice, Corredo Dell' Assemblea Del Calcolatore
125513-03	1 Pollice, Corredo Dell' Assemblea Del Calcolatore
125515-03	1-1/2 Pollice, Corredo Dell' Assemblea Del Calcolatore
125517-03	2 Pollici, Corredo Dell' Assemblea Del Calcolatore

SERVIZIO

Per considerazione della garanzia, mettersi in contatto con il vostro distributore locale. Se avete bisogno di ulteriore assistenza, mettersi in contatto con il reparto di servizio del cliente di GPI a:

1-800-835-0113

Avrete bisogno di:

- Fornire le informazioni dalla decalcomania sul vostro tester.
- Ricevere un numero di ritorno di autorizzazione.
- Irrigare tutto il liquido dal tester prima della spedizione alla fabbrica.
- Se possibile, lasciare i montaggi cliente-installati o una lunghezza ampia del tubo nudo per reinstallazione.

⚠ ATTENZIONE

Non restituire il tester senza l'autorità specifica dal reparto di servizio del cliente di GPI. dovuto le regolazioni rigorose governare il trasporto, il maneggiamento e l'eliminazione dei liquidi pericolosi o infiammabili, GPI non accetterà i tester per la ripresa a meno che siano completamente esenti da residuo liquido.

WIII DIRETTIVA

La direttiva 2002/96/EC del Parlamento europeo e del Consiglio dell'Unione europea sui rifiuti di apparecchiature elettriche ed elettroniche (RAEE) e stato aprovatto del Parlamento europeo e del Consiglio dell'Unione europea. Questo simbolo indica che questo prodotto contiene l'apparecchiatura elettrica ed elettronica che può includere le batterie, i bordi stampati del circuito, i display a cristalli liquidi o altri componenti che possono essere conforme alle regolazioni locali di eliminazione. Prego capire quelle regolazioni e disfare di questo prodotto in un modo responsabile.

FRANÇAIS

NOTIFICATION IMPORTANTE

Utilisez les compteurs de Séries de TM avec l'eau et d'autres produits chimiques qui sont compatibles avec les composants qui sont exposés au fluide (voir la section de caractéristiques). N'utilisez pas ce compteur avec du carburant ou d'autres produits chimiques incompatibles. Les compteurs de la série de TM sont disponibles avec un ordinateur pour la visualisation électronique locale, ou module du signal de sortie conditionné qui fournit un signal numérique à l'équipement d'interface de client. Les Séries de TM dosent la mesure en gallons ou litres. Référez-vous à la section de calibrage pour des détails.

Ces compteurs ne sont pas légaux pour les applications commerciales.

Les compteurs de Séries de TM sont très sensibles à l'interférence électronique s'ils sont actionnés à moins de 1 à 2 pouces de quelques moteurs électriques ou d'autres sources de bruit électronique.

INSTALLATION

Raccordements

Installez votre compteur en ligne horizontalement ou verticalement ou à l'extrémité du tuyau à côté du bec. L'installation aux raccordements en métal n'est pas recommandée. Suivez ces étapes pour installer:

1. Projetez installer la turbine avec une longueur minimum de pipe droite :
   - En amont de la turbine, permettez à une longueur minimum de la pipe droite de 10 fois le dia diamètre interne de la turbine.
   - En aval de la turbine, permettez à une longueur minimum de la pipe droite de 5 fois le diamètre interne de la turbine.
2. Pour des Spigot (Pipeau) Fin employez seulement mieux habillé et les dissolvants approuvés pour le collage de PVC.
   Pour des Raccordements de NPT enveloppez tous les raccordements de pipe avec la bande adhésive de Teflon® 3 ou 4 fois. Ne laissez pas le Teflon® glisser à l'intérieur de la pipe.
3. Attachez le compteur avec la flèche dirigée dans la direction de l'écoulement.
4. Pour des Raccordements de NPT utilisez vos mains pour serrer le compteur aux extrémités des raccordements. N'utilisez aucun outil pour serrer. Ceci peut endommager le logement.

Le Signal de Sortie Conditionné Le Câblage de Module

Ce module du signal de sortie conditionné peut être installer pour fournir un signal ouvert collecteur de sortie ou un signal carré de sortie de 6-V.

Le Signal Ouvert Collecteur de Sortie

Pour obtenir un signal ouvert collecteur de sortie, référez le diagramme de câblage 1. Le bloc terminal est situé de l'arrière du module. Le module est usine assemblée pour le signal ouvert collecteur de sortie. Fournissez la résistance (de minimum de 820 ohms).

Dix pieds (3m) de câble est fourni avec le module. Coupez le câble à la longueur désirée ou prolongez le câble selon les besoins. Les distances jusqu'a 5.000 pieds (1,524m) peuvent être obtenues pour le signal ouvert collecteur de sortie.

Le Signal Carré de Sortie

Pour obtenir le signal carré de sortie, référez le diagramme de câblage 2 et utilisez un kit électronique de batterie de compteur numérique (vendu séparément) pour la puissance de batterie. Le bloc terminal et l'endroit de batterie sont situés de'arière du module. Accès comme suit:

1. Enlevez les quatre vis Phillips de'avant du module. Soulevez le module de la turbine.

2. Pour changer les raccordements du block terminal, desserrez les vis appropriées. Rebranchez les fils en les positions appropriées et serrez les vis.
3. Installez les batteries. Assurez-vous que le poteau positif est en la position correcte.
4. Placez le module sur le logement de la turbine. Pour éviter les dommages d'humidité, vérifiez que le rondelle est entièrement sécurise. Serrez les quatre vis sur l'avant du module.

Dix pieds (3m) de câble est fourni avec le module. Coupez le câble à la longueur désirée ou prolongez le câble selon les besoins.

Vérifiez L'Exactitude de Compteurs

Avant l'utilisation, vérifiez l'exactitude du compteur et vérifiez le calibrage.

1. Assurez-vous qu'il n'y a aucun d'air dans le système en commençant l'écoulement de fluide jusqu'à ce qu'il fonctionne de façon constante. Puis, arrêtez l'écoulement en utilisant une valve ou un bec.
2. Mesurez un volume connu exact dans un récipient précis. Pour les meilleurs résultats, dosez avec un plein jet continu.
3. Vérifiez le volume contre l'écran ou l'équipement d'enregistrement. Si la quantité dosée est précise, le calibrage n'est pas nécessaire. Si pas, référez-vous à la section de calibrage pour des instructions complémentaires.

OPÉRATION

L'Ecran d'Ordinateur - La Groupe et les Totaux Cumulatifs

Le compteur maintient deux totaux. Le total cumulatif fournit la mesure continue et ne peut pas être manuellement remis à zéro. Le total de contrôle peut être remis à zéro pour mesurer l'écoulement pendant un à usage unique. Le total cumulatif est marqué avec le TOTAL 1 LOCKED. Ceci indique que le total est verrouillé et ne peut pas être manuellement mis à zéro. Le total de contrôle est marqué avec le TOTAL 2.

Quand le total cumulatif atteint une lecture maximum de 999.999, il remettra à zéro automatiquement à zéro.

Appuyez sur le bouton DISPLAY brièvement pour commuter entre le groupe, le total cumulatif, et le débit.

NOTE : Le compte totalization nombre toutes les unités sans différencier entre les gallons, les litres ou les unités champ-calibrées.

La Caractéristique du Débit

Pour utiliser cette caractéristique. Serrez et libérez DISPLAY jusqu'au FLOWRATE apparaît à la gauche du résultat inférieur.

Quand le FLOWRATE est montré, les nombres sur la ligne moyenne reflètent le débit, par exemple, les gallons par minute (GPM) ou les litres par minute (LPM).

Activez le Compteur

Mettez le L'ecran d'ordinateur ON en commençant l'écoulement de l'eau ou en appuyant sur brièvement le bouton de DISPLAY. Le groupe ou le total cumulatif de la dernière utilisation sera montré.

Appuyez sur le bouton de DISPLAY brièvement pour montrer le total de contrôle. Maintenez le bouton de DISPLAY pendant 3 secondes pour remettre le total de contrôle à zéro.

L'écran d'ordinateur est programmé pour s'arrêter automatiquement si non utilisé pendant 4 minutes.

Les Courbes Calibrage d'Usine et de Domaine

Toute l'information de calibrage est évidente à l'utilisateur comme mots dans la partie supérieure de l'affichage, au-dessus des chiffres numériques.

Toutes les unités sont configurées avec une courbe de calibrage "d'usine". Les gallons et les litres sont disponibles ("GAL" ou "LTR" sera évident). Utilisez les boutons de CALIBRATE et de DISPLAY pour commuter entre les gallons et les litres. Cette courbe de calibrage n'est pas utilisateur réglable. Le mot PRESET est montré pour montrer ceci. (Le calibrage d'usine est stocké de manière permanente dans la mémoire d'ordinateur.)

La courbe de calibrage de “champ” peut être placée par l’utilisateur, et peut être changé ou modifié à tout moment en utilisant les procédures de calibrage décrites dans la section de calibrage. Les totaux ou le débit ont dérivé du calibrage de champ sont évidents quand l’arrangement de calibrage de champ est choisi (“CAL B” sera évidente sur la ligne supérieure).

La Sélection d’un Réglage de Calibrage Différent

Vous pouvez commuter entre les modes de GAL et de LTR à la volonté sans contenu “de corruption” les totaux. Par exemple, l’ordinateur peut se monter à 10.00 gallons. Si l’utilisateur commute au mode de LTR, l’affichage changera immédiatement en “37.85” (la même quantité dans les unités des litres). La commutation de GAL/LTR fonctionne également en mode de FLOWRATE.

Pour choisir un arrangement différent de calibrage, une première, pressez et teniz le bouton de CALIBRATE. Continuez à tenir le bouton tout en également poussant et en libérant le bouton de DISPLAY. (Vous pouvez alors également libérer le bouton de CALIBRATE.) Les indicateurs dans la ligne supérieure de l’affichage changeront pour montrer le réglage nouvellement choisi de calibrage. Les arrangements de calibrage changent dans cet ordre: GAL, LTR, CAL B, GAL, etc… Tandis que le fluide coule, seulement les choix de GAL et de LTR peuvent être faits. Cependant, quand AUCUN fluide ne coule, n’importe quel réglage peut être choix.

CALIBRAGE

Avant de Commencer le Calibrage de Champ

Pour les résultats les plus précis, distribuez au débit qui simule mieux vos conditions de fonctionnement réelles. Évitez “de ruisseler” plus de fluide ou à plusieurs reprises de commencer et arrêter l’écoulement. Ces actions auront comme conséquence des calibrages moins précis.

Assurez-vous de répondre aux conditions minimum du débit du compteur:

Les Compteurs de Série de TM
Compteur de 1/2 pouce 1 GPM (3.8 LPM)
Compteur de 3/4 pouce 2 GPM (7.5 LPM)
Compteur de 1 pouce 5 GPM (18.8 LPM)
Compteur de 1-1/2 pouce 10 GPM (37.5 LPM)
Compteur de 2 pouces 20 GPM (75 LPM)

L’utilisation d’un récipient uniformément sûr et précis de calibrage est fortement recommandé pour les résultats les plus précis. En raison du débit élevé, on lui recommande vivement que le calibrage de champ soit accompli avec combinaison de volume et de poids en utilisant des balances de résolution fine.

Pour les meilleurs résultats, le compteur devrait être installé et purgé d’air avant le calibrage de champ.

Calibrage de Domaine avec l’Ecran d’Ordinateur

Le calibrage de domaine et le calibrage d’usine sont définis dans la section précédente. Les arrangements de calibrage d’usine sont programmés coutumes dans chaque ordinateur pendant leur production en utilisant l’eau à 70°F (21°C). Les lectures qui emploient les courbes de calibrage standard d’usine ne peuvent pas être précises dans quelques situations. Par exemple, dans des conditions extrêmes de la température ou avec les fluides autrement que l’eau.

Pour l’exactitude améliorée dans de telles conditions, l’ordinateur coulent de GPI tiennent compte du calibrage de “champ” (entrée d’utilisateur des paracompteurs de calibrage faits sur commande) Un calibrage de “seul point” peut rapporter une exactitude acceptable au milieu de la gamme d’écoulement, mois 5 points de calibrage ou plus peuvent rapporter un niveau plus élevé d’exactitude, particulièrement à l’extrémité inférieure de la gamme d’écoulement. Jusqu’à 15 points de calibrage faits sur commande peuvent être écrits.

Les Procédures de Distribuer/ Montrer de Calibrage de Champ

1. Maintenez le bouton de CALIBRATE tout en poussant et en libérent du DISPLAY jusqu'à ce que la courbe de calibrage de champ apparaisse (message de "CAL B" sera montré). Libérez les deux boutons.
2. Pour calibrer, pressez et tenez le bouton de CALIBRATE. Tout en continuant à tenir le CALIBRATE, également pressez et tenez le bouton de DISPLAY. Tenez les deux boutons pendant environ 3 secondes jusqu'à ce que vous voyiez un message clignotement "dd-CAL". Quand le message du "dd-CAL" apparaît, libérez les deux boutons. Vous êtes maintenant en mode de calibrage de champ.
3. Quand les boutons ont été libérés de l'étape 2, l'affichage montrera le message de clignotement "run 01". Si vous voulez sortir le procédé de calibrage maintenant avant de distribuer n'importe quel fluide, passez à l'étape 11.
4. Si vous voulez continuer le calibrage, mais n'as pas distribué n'importe quel fluide encore, faites vos préparations finales à votre système de pompage, mais ne commencez pas à pomper encore.
5. Commencez votre système de pompage de sorte que le fluide traverse le compteur. L'affichage cessera de clignoter et montrera le message de "run 01". Distribuez le fluide dans un récipient qui vous permet de juger la quantité de fluide pompée. Quand vous avez pompé la quantité désirée (par exemple, 10 gallons), arrêtez le flux de fluide rapidement.
6. Quand l'écoulement a arrêté, brièvement pressez et libérez tous les deux boutons. En ce moment l'affichage d'ordinateur changera en "0000.00" avec le chiffre à gauche clignotant.
7. Entrez le volume (quantité) de fluide cela que vous avez distribué (par exemple, si votre récipient de 10-gallon est plein, écrivez "10.0" pour des gallons ou "37.85" pour des litres). Pour écrire les nombres, utilisez le bouton de CALIBRATE pour changer la valeur du chiffre qui clignote. Utilisez le bouton de DISPLAY pour décaler le "clignotement" au prochain chiffre.
8. Quand le nombre correct est écrit, brièvement pressez et libérez tous les deux boutons. L'affichage changera maintenant en message de clignotement à "run 02". Vous avez maintenant installé le nouveau point de cal-courbe. Vous êtes prêts à finir le calibrage (étape 10) ou à écrire un autre nouveau point de calibrage (étape 9).
9. Pour écrire un autre point de calibrage, retournez et répétez les étapes 3 à 8. Il est possible d'installer à 15 points de cal-courbe, et le message de "run ##" incrémentera chaque fois que vous répétez le procédé de calibrage (run 01, run 02, run 03, etc., jusqu'à la run 15).
10. Pour finir le calibrage, pressez et tenez tous les deux boutons pendant environ 3 secondes jusqu'à ce que vous voyiez le message "CAL End". Après que vous libérez les boutons l'ordinateur reprendra des opérations normales avec le nouveau point(s) de calibrage actif.
11. Si vous n'avez distribué aucun fluide, vous pouvez sortir le calibrage sans changer la courbe de calibrage. Si le message "run 01" et vous n'avez distribué aucun fluide, tenez les deux boutons pendant environ 3 secondes jusqu'à ce que vous voyiez le message de "CAL End". Après vous libérez les boutons, l'ordinateur reprendra l'opération normale et la vieille courbe (si vu écriviez un du passé) est encore intacte.

Le Calibrage avec le Signal de Sortie Conditionné

Le K-facteur de votre compteur apparaît sur le rapport de calibrage comme les nombres d'impulsions par gallon. Le facteur est déterminé pendant la production en utilisant l'eau à 70°F (21°C). Ce K-facteur peut être utilisé pour le calibrage de "Point Seul" et fournira une exactitude acceptable. Cependant, les indications ne peuvent être pas précises quand vous utilisez cette méthode de calibrage dans quelques situations. Par exemple, quand vous utilisez le compteur dans les conditions extrêmes de la température ou quand vous utilisez le compteur avec d'autres fluides que l'eau.

Pour l'exactitude améliorée dans de telles conditions, nous recommandons qu'un K-facteur spécifique à l'application soit déterminé et utilisé pour le calibrage. Un calibrage de "Point Seul" peut produire une exactitude acceptable au milieu de la gamme de débit, mais cinq ou plus points de calibrage peuvent produire un niveau élevé d'exactitude, particulièrement à l'extrémité inférieure de la gamme de débit.

ENTRETIEN

La manipulation et le soin appropriés prolongeront la vie et le service du compteur.

Rotor De Turbine

Le compteur est pratiquement exempt d'entretien.Cependant, il est important que les rotor bouge librement. Maintenez le compteur propre et exempt des contaminations.

Si le rotor ne tourne pas librement, appliquez un lubrifiant pénétrant sur le rotor, l'axe, et les roulements. Enlevez tous les débris ou gisements du rotor en utilisant une brosse molle ou une petite sonde. Faites attention à n'endommager pas le rotor de turbine ou les appuis.

⚠ ATTENTION

Soufflage d'air comprimé à la turbine pourrait endommager le rotor.

Le Remplacement de la Batterie

L'écran d'ordinateur est actionné par deux batteries du lithium 3-volt qui peuvent être remplacées tandis que le compteur est installé. Quand les batteries sont enlevées ou perdent la puissance, le groupe et les totaux cumulatifs remis à zéro mais les calibrages de champ et d'usine sont maintenus.

Si l'affichage de l'écran d'ordinateur devient faible ou blanc, remplacez les batteries comme suit :

1. Enlevez les quatre vis de "Phillips" d'avant du compteur et soulevez et la plaque avant de la turbine.
2. Enlevez les vieilles batteries et nettoyez toute corrosion des bornes.
3. Installez les nouvelles batteries. Assurez-vous que le poteau positif est en position correcte.
4. Quand les batteries sont remplacées, la plaque actionnerait ON. Vérifiez l'affichage pour assurer des fonctions normales ont repris avant de se réunir encore.
5. Repositionnez les batteries, si nécessaire, et placez la plaque avant sur le logement de turbine. Pour éviter des dommages d'humidité, vérifiez que l'rondelle entièrement sécurise. Serrez les quatre vis sur l'avant de la plaque.

CARACTÉRISTIQUES

Admission Et Sortie:

Spigot (Pipeau) Fin de Modèle

TM050/TM050-N	Programme 80, Spigot (Pipeau) De 1/2"
TM075/TM075-N	Programme 80, Spigot (Pipeau) De 3/4"
TM100/TM100-N	Programme 80, Spigot (Pipeau) De 1"
TM150/TM150-N	Programme 80, Spigot (Pipeau) De 1-1/2"
TM200/TM200-N	Programme 80, Spigot (Pipeau) De 2"

Raccordements de NPT de Modèle

TM050-N/TM050-N-P	NPT De 1/2"
TM075-N/TM075-N-P	NPT De 3/4"
TM100-N/TM100-N-P	NPT De 1"
TM150-N/TM150-N-P	NPT De 1-1/2"
TM200-N/TM200-N-P	NPT De 2"

Type de Plan: Turbine

Composants Mouillés:
Loger: PVC
Coussinets: En Céramique
Axe: Carbure De Tungstène
Rotor Et Supports: PVDF
Arrêtoir: Acier Inoxydable

Type de Garniture: Spigot - Programme 80, ou NPT (femelle)

Pression d'Utilisation Maximale:
225 PSIG @ 73°F

Mésure des U.S.

Unité de Mesure: Gallon

Chaîne de écoulement:

1/2 pouce	1 - 10 GPM
3/4 pouce	2 - 20 GPM
1 pouce	5 - 50 GPM
1-1/2 pouce	10 - 100 GPM
2 pouce	20 - 200 GPM

L'exactitude avec l'ordinateur: ± 3.0% (l'exactitude peut être améliorée avec le calibrage de champ)

La Température de Fonctionnement: +32° à +140° F (Ne laissez pas le fluide de geler à l'intérieur du compteur.)

La Température de Stockage: -40° à +158° F

Les Poids de Produit:*

	Spigot (Pipeau)	NPT
1/2 pouce	.38 lbs.	.55 lbs.
3/4 pouce	.43 lbs.	.67 lbs.
1 pouce	.49 lbs.	.84 lbs.
1-1/2 pouce	.66 lbs.	1.38 lbs.
2 pouce	.78 lbs.	1.78 lbs.

Les Dimensions - Pouces (W x H x L):**

	Sans Raccord	Avec Raccord
1/2"	2.0 x 2.6 x 3.8	2.0 x 2.8 x 5.5
3/4"	2.0 x 2.7 x 3.8	2.0 x 2.9 x 5.5
1"	2.0 x 3.1 x 4.1	2.0 x 3.3 x 6.2
1-1/2"	2.1 x 3.7 x 5.4	2.3 x 3.9 x 7.6
2"	2.4 x 4.2 x 5.5	3.5 x 4.5 x 7.9

* Le poids avec l'écran d'ordinateur. Le signal de sortie conditionné ajoute .30 livres.

** Les dimensions avec l'écran d'ordinateur. Le signal de sortie conditionné ajoute 1.1 pouce à la hauteur.

Mesure Métrique

Unité de Mesure: Litre

Chaîne de l'Ecoulement:

1/2"	3.8 - 38 LPM
3/4"	7.6 - 76 LPM
1"	19 - 190 LPM
1-1/2"	38 - 380 LPM
2"	76 - 760 LPM

L'exactitude avec l'ordinateur: ± 3.0% (l'exactitude peut être améliorée avec le calibrage de champ)

La Température de Fonctionnement: 0° à +60° C (Ne laissez pas le fluide de geler à l'intérieur du compteur.)

La Température de Stockage: -40° à +70° C

Les Poids de Produit:*

	Spigot (Pipeau)	NPT
1/2 inch	.172 kg	.249 kg
3/4 inch	.195 kg	.304 kg
1 inch	.222 kg	.381 kg
1-1/2 inch	.299 kg	.626 kg
2 inch	.354 kg	.807 kg

Les Dimensions - cm (W x H x L):**

	Sans Raccord	Avec Raccord
1/2"	5.0 x 6.6 x 9.6	5.0 x 7.1 x 13.9
3/4"	5.0 x 6.8 x 9.6	5.0 x 7.3 x 13.9
1"	5.0 x 7.8 x 10.4	5.0 x 8.3 x 15.7
1-1/2"	5.8 x 9.3 x 13.7	5.8 x 9.9 x 19.3
2"	6.0 x 10.6 x 13.9	8.8 x 11.4 x 20.0

* Le poids avec l'écran d'ordinateur. Le signal de sortie conditionné ajoute 136 kilogramme.

** Les dimensions avec l'écran d'ordinateur. Le signal de sortie conditionné ajoute 2.8 centimètres à la hauteur.

PIÉCES

Les pièces et les accessoires de rechange suivants sont disponibles pour les compteurs de Séries de TM :

Le Numéro de Pièce	La Description
113435-1	Le Signal Conditionné Câblage de Module
113520-1	Kit de rechange de Batterie
116000-1	Récipient de calibrage, grand (5 gallons)
125508-03	1/2 pouce, kit d'Assemblée de turbine
125508-04	1/2 pouce, NPT, PVC, kit d'Assemblée de turbine
125510-03	3/4 pouce, kit d'Assemblée de turbine
125510-04	3/4 pouce, NPT, PVC, kit d'Assemblée de turbine
125512-03	1 pouce, kit d'Assemblée de turbine
125512-04	1 pouce, NPT, PVC, kit d'Assemblée de turbine
125514-03	1-1/2 pouce, kit d'Assemblée de turbine
125514-04	1-1/2 pouce, NPT, PVC, kit d'Assemblée de turbine
125516-03	2 pouces, kit d'Assemblée de turbine
125516-04	2 pouces, NPT, PVC, kit d'Assemblée de turbine
901002-52	Rondelle

Kits D'Ordinateur:

125509-03	pouce de 1/2, kit d'Assemblée d'ordinateur
125511-03	3/4 pouce, kit d'Assemblée d'ordinateur
125513-03	1 pouce, kit d'Assemblée d'ordinateur
125515-03	1-1/2 pouce, kit d'Assemblée d'ordinateur
125517-03	2 pouces, kit d'Assemblée d'ordinateur

SERVICE

Pour la considération de garantie, contactez votre distributeur local. Si vous avez besoin d'aide, contact le service à la clientèle de GPI à:

1-800-835-0113

Vous aurez besoin:

- Fournissez les informations du décalque sur votre compteur.
- Recevez un nombre de retour d'autorisation.
- Rincez n'importe quel fluide du compteur avant l'expédition à l'usine.
- S'il est possible, laissez les garnitures installées par client ou de la longueur suffisante de la pipe nue pour la réinstallation.

⚠ ATTENTION

Ne renvoyez pas le compteur sans autorité spécifique du département de service à la clientèle de GPI. En raison des règlements stricts régir le transport, la manipulation, et la disposition des liquides dangereux ou inflammables, GPI n'acceptera pas des compteurs pour la reprise à moins qu'ils soient complètement exempts de résidu liquide.

WEEE DIRECTIVE

Le Waste Electrical and Electronic Equipment (WEEE) directive (2002/96/EC) a été approuvé par le Parlement Européan et le Conseil de l'Union Européene en 2003. Ce symbole indique que ce produit contient l'équipement électrique et électronique qui peut inclure les batteries, les cartes électroniques les affichages à cristaux liquides ou d'autres composants qui peuvent être sujets à des règlements locaux de disposition à votre endroit. Veuillez comprendre ces règlements et débarassez-vous de ce produit d'une façon responsable.

Declaration of Conformity

Manufacturer's Name:	Great Plains Industries, Inc.
Manufacturer's Address:	5252 East 36th Street North Wichita, KS USA 67220-3205

Declares, that the product:

Product Name:	Conditioned Signal Module TM Water Meter / Pulse Out
Model Numbers:	0N-0278 TM***-P TM***-N-P

Model numbers include all combinations of an alpha-numeric series as illustrated above.

Conform to the following Standards:

EMC:	EN 50081-1 (Reference EN 55022) EN 55082-1 EN 61000-3-2 EN 61000-3-3 EN 61000-4-2 EN 61000-4-3

Supplementary Information:
"The products comply with the requirements of the EMC Directive 89/336/EEC."

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

Signature:	
Full Name:	Mr. Grant Nutter
Position:	President Great Plains Industries, Inc.
Place:	Wichita, KS USA November 2007

CE

Declaration of Conformity

Manufacturer's Name:	Great Plains Industries, Inc.
Manufacturer's Address:	5252 East 36th Street North Wichita, KS USA 67220-3205

Declares, that the product:

Product Name:	TM Series Water Meter
Model Numbers:	TM050 TM075 TM100 TM150 TM200

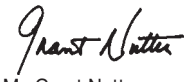
Model numbers may include the suffix "-N" to indicate thread type.

Conform to the following Standards:

EMC:	EN 50081-1 (Reference EN 55022) EN 55082-1

Supplementary Information:
"The products comply with the requirements of the EMC Directive 89/336/EEC."

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

Signature:	
Full Name:	Mr. Grant Nutter
Position:	President Great Plains Industries, Inc.
Place:	Wichita, KS USA November 2007

CE

Limited Warranty Policy

Great Plains Industries, Inc. 5252 E. 36th Street North, Wichita, KS USA 67220-3205, hereby provides a limited warranty against defects in material and workmanship on all products manufactured by Great Plains Industries, Inc. This product includes a 1 year warranty. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturer's option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. The warranty shall extend to the purchaser of this product and to any person to whom such product is transferred during the warranty period.

The warranty period shall begin on the date of manufacture or on the date of purchase with an original sales receipt. This warranty shall not apply if:

A. the product has been altered or modified outside the warrantor's duly appointed representative;
B. the product has been subjected to neglect, misuse, abuse or damage or has been installed or operated other than in accordance with the manufacturer's operating instructions.

To make a claim against this warranty, contact the GPI Customer Service Department at 316-686-7361 or 888-996-3837. Or by mail at:

Great Plains Industries, Inc.
5252 E. 36th St. North
Wichita, KS, USA 67220-3205

The company shall, notify the customer to either send the product, transportation prepaid, to the company at its office in Wichita, Kansas, or to a duly authorized service center. The company shall perform all obligations imposed on it by the terms of this warranty within 60 days of receipt of the defective product.

GREAT PLAINS INDUSTRIES, INC., EXCLUDES LIABILITY UNDER THIS WARRANTY FOR DIRECT, INDIRECT, INCIDENTAL AND CONSEQUENTIAL DAMAGES INCURRED IN THE USE OR LOSS OF USE OF THE PRODUCT WARRANTED HEREUNDER.

The company herewith expressly disclaims any warranty of merchantability or fitness for any particular purpose other than for which it was designed.

This warranty gives you specific rights and you may also have other rights which vary from U.S. state to U.S. state.

Note: In compliance with MAGNUSON MOSS CONSUMER WARRANTY ACT – Part 702 (governs the resale availability of the warranty terms).

5252 East 36th Street North
Wichita, KS USA 67220-3205
TEL: 316-686-7361
FAX: 316-686-6746

GREAT PLAINS INDUSTRIES, INC.
"A Great Plains Ventures Subsidiary"
www.gpi.net
1-888-996-3837

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Endress+Hauser Prowirl 72F

Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Proline Prowirl 72F, 72W, 73F, 73W

Vortex flow measuring system
Reliable flow measurement of gas, steam and liquids

Application
For the universal measurement of the volume flow of gases, steam and liquids.
The mass flow of steam, water (as per IAPWS-IF97 ASME), natural gas (as per AGA NX-19/AGA8-DC92 detailed method/AGA8 Gross Method 1/SGERG-88), compressed air, other gases and liquids can also be measured with the aid of integrated temperature measurement and by reading in external pressure values (optional).

Maximum range of applications thanks to:
- Fluid temperature range from –200 to +400 °C
- Pressure ratings up to PN 250/Class 1500
- Sensor with integrated (optional) diameter reduction by one line size (R Style) or two line sizes (S Style)
- Dualsens version (optional) for redundant measurements with two sensors and electronics

Approvals for:
- ATEX, FM, CSA, TIIS, NEPSI, IEC
- HART, PROFIBUS PA, FOUNDATION Fieldbus
- Pressure Equipment Directive, SIL 2

Your benefits
The robust **Prowirl sensor**, tried and tested in over 100 000 applications, offers:
- High resistance to vibrations, temperature shocks, contaminated fluids and water hammer
- No maintenance, no moving parts, no zero-point drift ("lifetime" calibration)
- Software initial settings save time and costs

Additional possibilities:
- Complete saturated steam or liquid-mass measuring point in one single device
- Calculation of the mass flow from the measured variables volume flow and temperature in the integrated flow computer
- External pressure value read-in for superheated steam and gas applications (optional)
- External temperature value read-in for delta heat measurement (optional)

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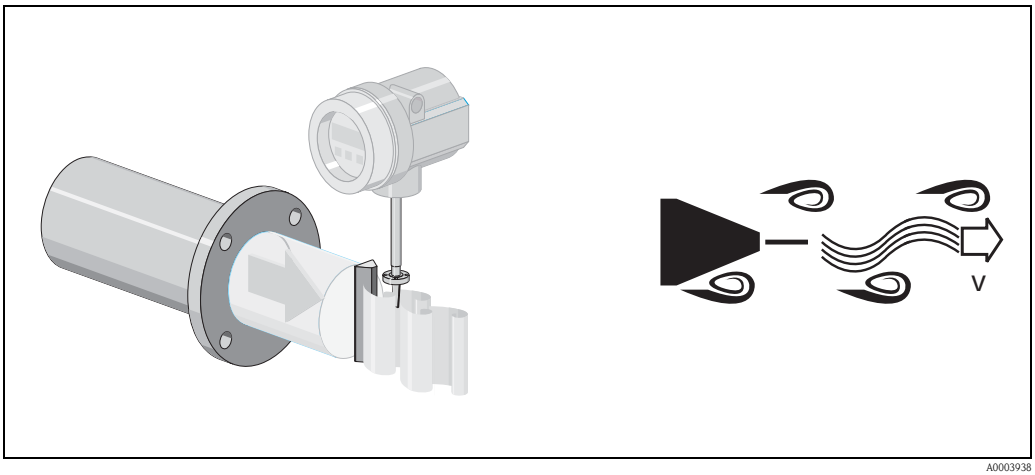
Endress+Hauser
People for Process Automation

Table of contents

Function and system design

Measuring principle

Vortex meters work on the principle of the Karman vortex street. When fluid flows past a bluff body, vortices are alternately formed on both sides with opposite directions of rotation. These vortices each generate a local low pressure. The pressure fluctuations are recorded by the sensor and converted to electrical pulses. The vortices develop very regularly within the permitted application limits of the device. Therefore, the frequency of vortex shedding is proportional to the volume flow.



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The K-factor is used as the proportional constant:

$$\text{K-Factor} = \frac{\text{Pulses}}{\text{Unit Volume } [\text{dm}^3]}$$

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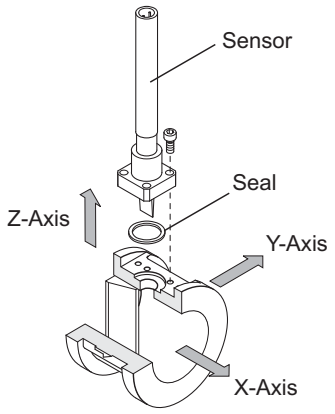
- Within the application limits of the device, the K-factor only depends on the geometry of the device. It is independent of the fluid velocity and the fluid properties viscosity and density. In this way, the K-factor is also independent of the type of matter that is to be measured, regardless of whether this is steam, gas or liquid.
- The primary measuring signal is already digital (frequency signal) and linear to the flow.
  After production, the K-factor is determined in the factory by means of calibration and is not subject to long-term or zero-point drift.
- The device does not contain any moving parts and does not require maintenance.

The capacitive sensor

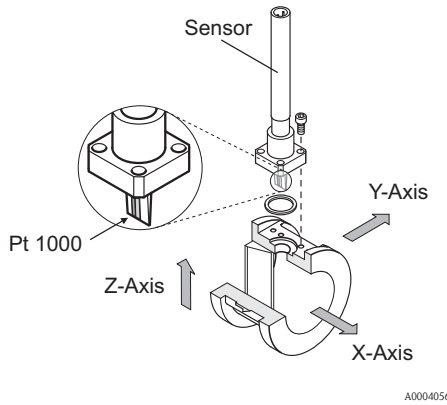
The sensor of a vortex flowmeter has a major influence on the performance, robustness and reliability of the whole measuring system.

The robust DSC sensor – with an integrated temperature measurement (Pt 1000) with Prowirl 73 – is burst-tested and vibration and temperature-shock-tested (temperature shocks of 150 K/s). The Prowirl uses the tried-and-tested capacitive measuring technology of Endress+Hauser applied in over 100 000 measuring points worldwide.

The DSC (differential switched capacitance) sensor patented by Endress+Hauser has complete mechanical balancing. It only reacts to the measured variable (vortex), not to vibrations. Even in the event of pipe vibrations, the smallest of flows can be reliably measured at low density thanks to the unimpaired sensitivity of the sensor. Thus, the wide turndown is also maintained even in the event of harsh operating conditions. Vibrations up to 1 g, in frequencies up to 500 Hz in every axis (X, Y, Z), do not affect the flow measurement. Due to its design, the capacitive sensor is also particularly mechanically resistant to temperature shocks and water hammers in steam lines.



DSC sensor, Prowirl 72



DSC sensor, Prowirl 73 with integrated thermometer (Pt 1000)

"Lifetime" calibration

Experience has shown that recalibrated Prowirl devices exhibit a very high degree of stability compared to their original calibration: The recalibration values were all within the original measuring accuracy specifications of the devices.
Various tests and simulation procedures carried out on devices by filing away the edges of Prowirl's bluff body found that there was no negative impact on the accuracy up to a rounding diameter of 1 mm.

Generally the following statements are true:
- Experience has shown that if the fluid is non-abrasive and non-corrosive (e.g. most water and steam applications), the meter's edges will never show rounding at the edges that is 1 mm or more.
- If the rounding of the meter's edges is always 1 mm or less, the meter will never show a calibration shift that is out of the meter's original specifications.
- Typically, the bluff body's edges exhibit a small rounding that is less than 1 mm. The meter, however, is calibrated with this rounded edge. Therefore, the meter will stay within the tolerance specifications as long as the additional wear and tear of the edge does not exceed an additional 1 mm.

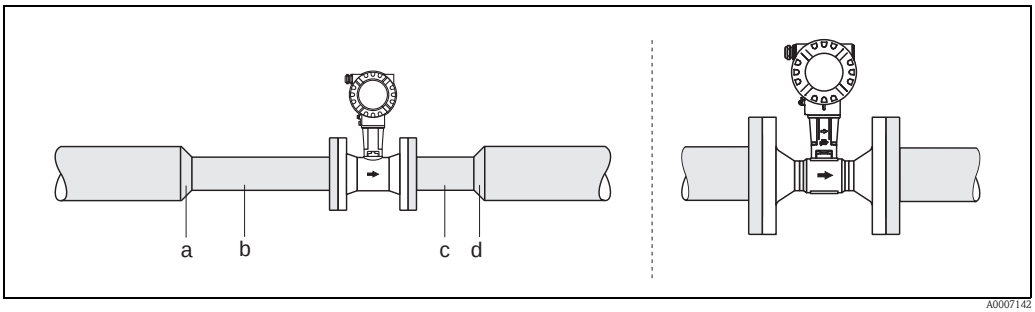
Thus, the Prowirl product line offers calibration for life if the measuring device is used in non-abrasive and non-corrosive fluids.

Sensor with integrated nominal diameter reduction

In many applications, the nominal diameter of the customer's pipe does not correspond to the nominal diameter that is optimum for a vortex meter as the flow velocity is too low for vortex formation after the bluff body. This is expressed in a signal loss in the lower flow range. To reduce the nominal diameter by one or two steps, and thus increase the flow velocity, it is common practice nowadays to fit such measuring points with the following adapters:

- Reducer (a)
- Straight pipe segment (b) as the inlet run (min. 15 × DN) in front of the vortex meter
- Straight pipe segment (c) as the outlet run (min. 5 × DN) after the vortex meter
- Expansion (d)

Endress+Hauser is now offering the Prowirl 72/73 vortex meter with integrated nominal diameter reduction for such applications.



Left: Traditional means for reducing pipeline section
Right: Nominal diameter reduction by using Prowirl with integrated line size reduction

Nomenclature for Prowirl vortex meters (flanged devices) with integrated nominal diameter reduction:
- Prowirl 72F/73F "R Style": single reduction of line size, e.g. from DN 80 to DN 50
- Prowirl 72F/73F "S Style": double reduction of line size, e.g. from DN 80 to DN 40 (S = "super" reduced).

These models offer the following benefits:

- Cost and time saving as the adapter pieces with inlet and outlet runs are completely replaced by one single device (additional inlet and outlet runs to be considered → 25)
- Measuring range extended for lower flow rates
- Lower risk (of incorrect measuring device layout) in the planning phase as R Style and S Style measuring devices have the same lengths as standard flanged devices. Each device type can be used alternatively without making complicated changes to the layout.
- Accuracy specifications identical to those for standard devices.

Temperature measurement (Prowirl 73)

In addition to the volume flow, the Prowirl 73 also measures the fluid temperature. The temperature is measured by means of a temperature sensor Pt 1000 which is located in the paddle of the DSC sensor, i.e. directly in the fluid (→ 4).

Flow computer (Prowirl 73)

The electronics of the measuring device have an integral flow computer. With the aid of this flow computer other process variables can be calculated from the primary measured variables (volume flow and temperature), e.g.:
- The mass flow and heat flow of saturated steam and water in accordance with IAPWS-IF97/ASME
- The mass flow and heat flow of superheated steam (at constant pressure or pressure read in via HART/ PROFIBUS PA/FOUNDATION Fieldbus) in accordance with IAPWS-IF97/ASME
- The mass flow and corrected volume flow of gases (at constant pressure or pressure read in via HART/ PROFIBUS PA/FOUNDATION Fieldbus), e.g. compressed air and natural gas AGA NX-19 (see below). Additional gases can be programmed using the real gas equation.
  In the case of 4 to 20mA HART devices, the following gases are preprogrammed:

Ammonia	Helium 4	Nitrogen
Argon	Hydrogen (normal)	Oxygen
Butane	Hydrogen chloride	Propane
Carbon dioxide	Hydrogen sulfide	Xenon
Chlorine	Krypton	Mixtures of up to 8 components of these gases
Ethane	Methane	
Ethylene (ethene)	Neon	

The heat flow (energy) of these gases is calculated as per ISO 6976 – based on the net calorific value or gross calorific value.

- Optional: natural gas AGA NX-19 (corrected volume flow and mass flow);
  Only for 4 to 20 mA HART: AGA8-DC92/ISO 12213-2/AGA8 Gross Method 1/SGERG-88 (corrected volume flow, mass flow, heat flow). For AGA8 Gross Method 1 and SGERG-88, the gross calorific value or the net calorific value can be entered to calculate the heat flow (energy). For AGA8-DC92 and ISO 12213-2, the data for the gross calorific value and net calorific value are stored in the device according ISO 6976.
- The mass flow of any liquid (linear equation). The gross calorific value or the net calorific value can be entered to calculate the heat flow (energy).
- Delta heat between saturated steam and condensate (second temperature value read in via HART) in accordance with IAPWS-IF97/ASME,
- Delta heat between warm water and cold water (second temperature value read in via HART) in accordance with IAPWS-IF97/ASME,
- In saturated steam measurements, the pressure of the steam can also be calculated from the measured temperature and output in accordance with IAPWS-IF97/ASME.

The mass flow is calculated as the product of volume flow x operating density. In the case of saturated steam, water and other liquids, the operating density is a function of the temperature. In the case of superheated steam and all other gases, the operating density is a function of the temperature and pressure.
The corrected volume flow is calculated as the product of volume flow x operating density, divided by the reference density. In the case of water and other liquids, the operating density is a function of the temperature. In the case of all other gases, the operating density is a function of the temperature and pressure.
The heat flow is calculated as the product of volume flow x operating density. In the case of saturated steam and water, the operating density is a function of the temperature. In the case of superheated steam, natural gas AGA8-DC92, natural gas ISO 12213-2, natural gas AGA8 Gross Method 1 and natural gas SGERG-88, the operating density is a function of the temperature and pressure.

Diagnostic functions (Prowirl 73)

Extensive diagnostic options, such as retracing fluid and ambient temperatures, extreme flows etc., are also optionally available for the measuring device.

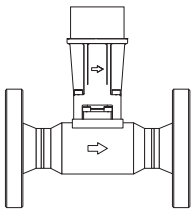
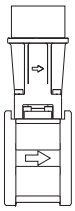
Measuring system

The measuring system comprises a sensor and a transmitter. Two versions are available:
- Compact version: sensor and transmitter form a mechanical unit.
- Remote version: sensor is mounted separate from the transmitter (up to max. 30 m).

Transmitter

Prowirl 72  A0009906	■ Two-line liquid crystal display ■ Configuration using pushbuttons ■ Quick Setup for rapid commissioning ■ Volume flow and calculated variables (mass flow or corrected volume flow)
Prowirl 73  A0009906	■ Two-line liquid crystal display ■ Configuration using pushbuttons ■ Quick Setup for rapid commissioning ■ Volume flow and temperature as well as calculated variables (mass flow, heat flow or corrected volume flow)

Sensor

F  A0009921	■ Flanged version ■ Range of nominal diameters DN 15 to 300 (½" to 12") ■ Material of measuring tube: e.g. – Stainless steel, A351-CF3M – Alloy C-22 (only for Prowirl 72)
W  A0009922	■ Wafer version (flangeless version) ■ Range of nominal diameters DN 15 to 150 (½" to 6") ■ Material of measuring tube: e.g. stainless steel, A351-CF3M

Input

Measured variable

Prowirl 72

- Volumetric flow (volume flow) is proportional to the frequency of vortex shedding after the bluff body.
- The following can be output as the output variable:
  - Volume flow
  - Mass flow or corrected volume flow (if process conditions are constant)

Prowirl 73

- Volumetric flow (volume flow) is proportional to the frequency of vortex shedding after the bluff body.
- The temperature can be output directly and is used to calculate the mass flow for example.
- The following can be output as the output variable:
  - The measured process variables volume flow and temperature
  - The calculated process variables mass flow, heat flow or corrected volume flow

Measuring range

The measuring range depends on the fluid and the nominal diameter.

Start of measuring range

Depends on the density and the Reynolds number (Re_{min} = 4000, Re_{linear} = 20 000).
The Reynolds number is dimensionless and is the ratio of inertial forces to viscous forces of the fluid. It is used for characterizing the flow. The Reynolds number is calculated as follows:

$$Re = \frac{4 \cdot Q\,[m^3/s] \cdot \rho\,[kg/m^3]}{\pi \cdot di\,[m] \cdot \mu\,[Pa{\cdot}s]}$$

A0003794-en

Re = Reynolds number; Q = flow; di = internal diameter; m = dynamic viscosity, r = density

$$\text{DN 15...25} \rightarrow v_{min.}^{*} = \frac{6}{\sqrt{\rho\,[kg/m^3]}}\,[m/s] \qquad \text{DN 40...300} \rightarrow v_{min.}^{*} = \frac{7}{\sqrt{\rho\,[kg/m^3]}}\,[m/s]$$

A0003239-en

** with amplification 5*

Full scale value

Liquids: v_{max} = 9 m/s
Gas/steam: see table

Nominal diameter	v_{max}
Standard version: DN 15 (½") R Style: DN 25 (1") > DN 15 (½") S Style: DN 40 (1½") >> DN 15 (½")	46 m/s or Mach 0.3 (depending on which value is smaller)
Standard version: DN 25 (1"), DN 40 (1½") R Style: – DN 40 (1½") > DN 25 (1") – DN 50 (2") > DN 40 (1½") S Style: – DN 80 (3") >> DN 40 (1½")	75 m/s or Mach 0.3 (depending on which value is smaller)
Standard version: DN 50 (2") to 300 (12") R Style: – DN 80 (3") > DN 50 (2") – Nominal diameters larger than DN 80 (3") S Style: – DN 100 (4") >> DN 50 (2") – Nominal diameters larger than DN 100 (4")	120 m/s or Mach 0.3 (depending on which value is smaller) Calibrated range: up to 75 m/s

Note!
By using the selection and planning program "Applicator", you can determine the exact values for the fluid you use. You can obtain the Applicator from your Endress+Hauser sales center or on the Internet under www.endress.com.

K-factor range

The table is used for orientation purposes. The range in which the K-factor can be is indicated for individual nominal diameters and designs.

Nominal diameter		K-factor range (pulses/dm³)	
DIN/JIS	ANSI	72F/73F	72W/73W
DN 15	½"	390 to 450	245 to 280
DN 25	1"	70 to 85	48 to 55
DN 40	1½"	18 to 22	14 to 17
DN 50	2"	8 to 11	6 to 8
DN 80	3"	2.5 to 3.2	1.9 to 2.4
DN 100	4"	1.1 to 1.4	0.9 to 1.1
DN 150	6"	0.3 to 0.4	0.27 to 0.32
DN 200	8"	0.1266 to 0.1400	–
DN 250	10"	0.0677 to 0.0748	–
DN 300	12"	0.0364 to 0.0402	–

Measuring range for gases [m³/h or Nm³/h]

In the case of gases, the start of the measuring range depends on the density. With ideal gases, the density [ρ] or corrected density [ρ_N] can be calculated using the following formulae:

$$\rho\ [kg/m^3] = \frac{\rho_N\ [kg/Nm^3] \cdot P\ [bar\ abs] \cdot 273.15\ [K]}{T\ [K] \cdot 1.013\ [bar\ abs]} \qquad \rho_N\ [kg/Nm^3] = \frac{\rho\ [kg/m^3] \cdot T\ [K] \cdot 1.013\ [bar\ abs]}{P\ [bar\ abs] \cdot 273.15\ [K]}$$

A0003946-en

The following formulae can be used to calculate the volume [Q] or corrected volume [Q_N] in the case of ideal gases:

$$Q\ [m^3/h] = \frac{Q_N\ [Nm^3/h] \cdot T\ [K] \cdot 1.013\ [bar\ abs]}{P\ [bar\ abs] \cdot 273.15\ [K]} \qquad Q_N\ [Nm^3/h] = \frac{Q\ [m^3/h] \cdot P\ [bar\ abs] \cdot 273.15\ [K]}{T\ [K] \cdot 1.013\ [bar\ abs]}$$

A0003941-en

T = Operating temperature, P = operating pressure

Input signal

HART input functionality

Prowirl 73 (4 to 20 mA/HART version) is able to read in an external pressure, temperature or density value. The following order options are required for this purpose:

- Prowirl 73: output/input → option W (4–20 mA HART) or A (4–20 mA HART + frequency)
- 2 × active barrier RN221N–x1 (for x: A = for non-hazardous areas, B = ATEX, C = FM, D = CSA)
- If reading in pressure: 1 × Cerabar M or Cerabar S in burst mode (Cerabar can be set to burst mode using a HART handheld DXR275 or DXR375. Cerabar S Evolution can also be set to the burst mode via "FieldCare". Alternatively, Cerabar can also be ordered with the burst mode ready activated as a special product with the following order number: Cerabar M: TSPSC2821/52025523; Cerabar S: TSPSC2822/52025523.

When this functionality is used, the following signals can be made available to the control system, e.g. in an application with superheated steam:

- Pressure as 4 to 20 mA signal
- Temperature as 4 to 20 mA signal or frequency signal (only for Prowirl 73, option A (4 to 20 mA HART + frequency))
- Mass flow as pulse or frequency signal (only for Prowirl 73; output/input → option A)

Pressure input (PROFIBUS PA, FOUNDATION Fieldbus)

An external pressure value function block can be read in with Prowirl 73 (bus version). The following order options are required for this purpose:

PROFIBUS PA:
- Prowirl 73 → output/input → option H (PROFIBUS PA)
- Cerabar M → electronics/display → option P or R; → ceramic sensor → option 2F, 2H, 2M, 2P or 2S
  Cerabar S Evolution → output/operation → option M, N or O; → d:sensor range → option 2C, 2E, 2F, 2H, 2K, 2M, 2P or 2S

FOUNDATION Fieldbus (FF):
- Prowirl 73 → output/input → option K (FOUNDATION Fieldbus)
- Cerabar S Evolution → output/operation → option P, Q or R; → d:sensor range → option 2C, 2E, 2F, 2H, 2K, 2M, 2P or 2S

Output

Prowirl 72
By means of the outputs in the 4 to 20 mA/HART version of Prowirl 72, the volume flow and, if process conditions are constant, the calculated mass flow and corrected volume flow can be output via the current output and optionally via the pulse output or as a limit value via the status output.

Prowirl 73
By means of the outputs in the 4 to 20 mA/HART version of Prowirl 73, the following measured variables can generally be output:

	4 to 20 mA HART measuring devices				Profibus - PA (4 AI Blocks)	Foundation Fieldbus FF (7 AI Blocks)
	Current output	**Frequency output (only for output option A)**	**Pulse output (only for output option A)**	**Status output (only for output option A)**		
Saturated steam	■ Volume flow/ mass flow/heat flow ■ Temperature ■ Saturation steam pressure	■ Volume flow/ mass flow/heat flow ■ Temperature ■ Saturation steam pressure	■ Volume ■ Mass ■ Heat	■ Volume flow/ mass flow/heat flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ Calculated saturated steam pressure limit value	■ Volume flow/ mass flow/heat flow ■ Temperature ■ Saturation steam pressure ■ Specific enthalpy ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: – Reynolds number – Electronics temperature	■ Volume flow/ mass flow/heat flow ■ Temperature ■ Saturation steam pressure ■ Specific enthalpy ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: – Reynolds number – Electronics temperature
Superheated steam	■ Volume flow/ mass flow/heat flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume flow/ mass flow/heat flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume ■ Mass ■ Heat	■ Volume flow/ mass flow/heat flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External pressure limit value (if it can be read in)	■ Volume flow/ mass flow/heat flow ■ Temperature ■ Specific enthalpy ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: – Reynolds number – Electronics temperature	■ Volume flow/ mass flow/heat flow ■ Temperature ■ Specific enthalpy ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: – Reynolds number – Electronics temperature
Water	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume ■ Mass ■ Heat ■ Corrected volume	■ Volume flow/ mass flow/heat flow/corrected volume flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External pressure limit value (if it can be read in)	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ Specific enthalpy ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: – Reynolds number – Electronics temperature	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ Specific enthalpy ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: – Reynolds number – Electronics temperature

	4 to 20 mA HART measuring devices				Profibus - PA (4 AI Blocks)	Foundation Fieldbus FF (7 AI Blocks)
	Current output	**Frequency output (only for output option A)**	**Pulse output (only for output option A)**	**Status output (only for output option A)**		
Compressed air	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume ■ Mass ■ Corrected volume	■ Volume flow/ mass flow/heat flow/corrected volume flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External pressure limit value (if it can be read in)	■ Volume flow/ mass flow/ corrected volume flow ■ Temperature ■ Compressibility ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: – Reynolds number – Electronics temperature	■ Volume flow/ mass flow/ corrected volume flow ■ Temperature ■ Compressibility ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: – Reynolds number – Electronics temperature
Ar, NH3, C4H10, CO2, CO, Cl2, C2H6, C2H4, He 4, H2 (normal), HCl, H2S, Kr, CH4, Ne, N2, O2, C3H8, Xe*	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume ■ Mass ■ Heat ■ Corrected volume	■ Volume flow/ mass flow/ corrected volume flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External pressure limit value (if it can be read in)	No data → Use real gas equation	No data → Use real gas equation
Mixtures of up to 8 of the components above	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume ■ Mass ■ Heat ■ Corrected volume	■ Volume flow/ mass flow/ corrected volume flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External pressure limit value (if it can be read in)	No data → Use real gas equation	No data → Use real gas equation
Real gas equation	■ Volume flow/ mass flow/ corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume flow/ mass flow/ corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume ■ Mass ■ Corrected volume	■ Volume flow/ mass flow/ corrected volume flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External pressure limit value (if it can be read in)	■ Volume flow/ mass flow/ corrected volume flow ■ Temperature ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: electronics temperature	■ Volume flow/ mass flow/ corrected volume flow ■ Temperature ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: electronics temperature

* Argon, ammonia, butane, carbon dioxide, carbon monoxide, chlorine, ethane, ethylene (ethene), helium 4, hydrogen (normal), hydrogen chloride, hydrogen sulfide, krypton, methane, neon, nitrogen, oxygen, propane, xenon

	4 to 20 mA HART measuring devices				Profibus - PA (4 AI Blocks)	Foundation Fieldbus FF (7 AI Blocks)
	Current output	**Frequency output (only for output option A)**	**Pulse output (only for output option A)**	**Status output (only for output option A)**		
Natural gas AGA NX-19	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume ■ Mass ■ Heat ■ Corrected volume	■ Volume flow/ mass flow/ corrected volume flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External pressure limit value (if it can be read in)	■ Volume flow/ mass flow/ corrected volume flow ■ Temperature ■ Supercompressibility ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: – Reynolds number – Electronics temperature	■ Volume flow/ mass flow/ corrected volume flow ■ Temperature ■ Supercompressibility ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: – Reynolds number – Electronics temperature
Natural gas AGA8-DC92 detailed method	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume ■ Mass ■ Heat ■ Corrected volume	■ Volume flow/ mass flow/heat flow/corrected volume flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External pressure limit value (if it can be read in)	No data → Use natural gas AGA NX-19 or real gas equation	No data → Use natural gas AGA NX-19 or real gas equation
Natural gas ISO 12213-2	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume ■ Mass ■ Heat ■ Corrected volume	■ Volume flow/ mass flow/heat flow/corrected volume flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External pressure limit value (if it can be read in)	No data → Use natural gas AGA NX-19 or real gas equation	No data → Use natural gas AGA NX-19 or real gas equation
Natural gas AGA8 Gross Method 1	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume ■ Mass ■ Heat ■ Corrected volume	■ Volume flow/ mass flow/heat flow/corrected volume flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External pressure limit value (if it can be read in)	No data → Use natural gas AGA NX-19 or real gas equation	No data → Use natural gas AGA NX-19 or real gas equation
* Argon, ammonia, butane, carbon dioxide, carbon monoxide, chlorine, ethane, ethylene (ethene), helium 4, hydrogen (normal), hydrogen chloride, hydrogen sulfide, krypton, methane, neon, nitrogen, oxygen, propane, xenon						

	4 to 20 mA HART measuring devices				Profibus - PA (4 AI Blocks)	Foundation Fieldbus FF (7 AI Blocks)
	Current output	**Frequency output (only for output option A)**	**Pulse output (only for output option A)**	**Status output (only for output option A)**		
Natural gas SGERG-88	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External pressure (if it can be read in)	■ Volume ■ Mass ■ Heat ■ Corrected volume	■ Volume flow/ mass flow/heat flow/corrected volume flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External pressure limit value (if it can be read in)	No data → Use natural gas AGA NX-19 or real gas equation	No data → Use natural gas AGA NX-19 or real gas equation
User-defined liquid	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature	■ Volume ■ Mass ■ Heat ■ Corrected volume	■ Volume flow/ mass flow/ corrected volume flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value	■ Volume flow/ mass flow/ corrected volume flow ■ Temperature ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: electronics temperature	■ Volume flow/ mass flow/ corrected volume flow ■ Temperature ■ Frequency ■ Flow velocity ■ Totalizer ■ Optional: electronics temperature
Water delta heat application	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External temperature	■ Volume flow/ mass flow/heat flow/corrected volume flow ■ Temperature ■ External temperature	■ Volume ■ Mass ■ Heat ■ Corrected volume	■ Volume flow/ mass flow/heat flow/corrected volume flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External temperature limit value	No data	No data
Saturated steam delta heat application	■ Volume flow/ mass flow/heat flow ■ Temperature ■ External temperature	■ Volume flow/ mass flow/heat flow ■ Temperature ■ External temperature	■ Volume ■ Mass ■ Heat	■ Volume flow/ mass flow/heat flow limit value ■ Temperature limit value ■ Totalizer limit value ■ Velocity limit value ■ External temperature limit value	No data	No data
* Argon, ammonia, butane, carbon dioxide, carbon monoxide, chlorine, ethane, ethylene (ethene), helium 4, hydrogen (normal), hydrogen chloride, hydrogen sulfide, krypton, methane, neon, nitrogen, oxygen, propane, xenon						

If configured, the following calculated measured variables can also be displayed via the local display in Prowirl 73:
- Density
- Specific enthalpy
- Saturation steam pressure (for saturated steam)
- Z-factor
- Flow velocity

Output signal

Prowirl 72

Current output:

- 4 to 20 mA with HART,
- Full scale value and time constant (0 to 100 s) can be set

Pulse/status output:

- Open collector, passive, galvanically isolated
  - Non-Ex, Ex d/XP version: U_{max} = 36 V, with 15 mA current limiting, R_i = 500 Ω
  - Ex i/IS and Ex n version: U_{max} = 30 V, with 15 mA current limiting, R_i = 500 Ω

The pulse/status output can be configured as:

- Pulse output:
  - Pulse value and polarity can be selected
  - Pulse width can be configured (0.005 to 2 s)
  - Pulse frequency max. 100 Hz
- Status output:
  Can be configured for error messages or flow limit values
- Vortex frequency:
  - Direct output of unscaled vortex pulses 0.5 to 2850 Hz
    (e.g. for connecting to an RMC621 flow computer)
  - Pulse ratio 1:1
- PFM signal (pulse/frequency modulation):
  With external connection via flow computer RMC621 or RMS621

PROFIBUS PA interface:

- PROFIBUS PA in accordance with EN 50170 Volume 2, IEC 61158-2 (MBP), galvanically isolated
- Current consumption = 16 mA
- Error current FDE (fault disconnection electronic) = 0 mA
- Data transmission rate: supported baudrate = 31.25 kBit/s
- Signal encoding = Manchester II
- Function blocks: 1 × Analog Input, 1 × totalizer
- Output data: volume flow, calculated mass flow, corrected volume flow, totalizer
- Input data: positive zero return (ON/OFF), totalizer control
- Bus address can be set at the device via DIP switches

FOUNDATION Fieldbus interface:

- FOUNDATION Fieldbus H1, IEC 61158-2, galvanically isolated
- Current consumption = 16 mA
- Error current FDE (fault disconnection electronic) = 0 mA
- Data transmission rate: supported baudrate = 31.25 kBit/s
- Signal encoding = Manchester II
- Function blocks: 2 × Analog Input, 1 × Discrete Output
- Output data: volume flow, calculated mass flow, corrected volume flow, totalizer
- Input data: positive zero return (ON/OFF), totalizer reset
- Link Master (LM) functionality is supported

Prowirl 73

Current output:

- 4 to 20 mA with HART,
- Full scale value and time constant (0 to 100 s) can be set

Frequency output, pulse/status output:

- Frequency output (optional): open collector, passive, galvanically isolated
  - Non-Ex, Ex d/XP version: U_{max} = 36 V, with 15 mA current limiting, R_i = 500 Ω
  - Ex i/IS and Ex n version: U_{max} = 30 V, with 15 mA current limiting, R_i = 500 Ω

The pulse/status output can be configured as:
- Frequency output:
  - End frequency 0 to 1000 Hz (fmax = 1250 Hz)
- Pulse output:
  - Pulse value and polarity can be selected
  - Pulse width can be configured (0.005 to 2 s)
  - Pulse frequency max. 100 Hz
- Status output:
  Can be configured for error messages or flow values, temperature values, pressure limit values
- Vortex frequency:
  - Direct output of unscaled vortex pulses 0.5 to 2850 Hz
    (e.g. for connecting to an RMC621 flow computer)
  - Pulse ratio 1:1

PROFIBUS PA interface:

- PROFIBUS PA in accordance with EN 50170 Volume 2, IEC 61158-2 (MBP), galvanically isolated
- Current consumption = 16 mA
- Error current FDE (fault disconnection electronic) = 0 mA
- Data transmission rate: supported baudrate = 31.25 kBit/s
- Signal encoding = Manchester II
- Function blocks: 4 × Analog Input, 2 × totalizer
- Output data: volume flow, mass flow, corrected volume flow, heat flow, temperature, density, specific enthalpy, calculated steam pressure (saturated steam), operating Z-factor, vortex frequency, electronics temperature, Reynolds number, velocity, totalizer
- Input data: positive zero return (ON/OFF), totalizer control, absolute pressure, display value
- Bus address can be set at the device via DIP switches

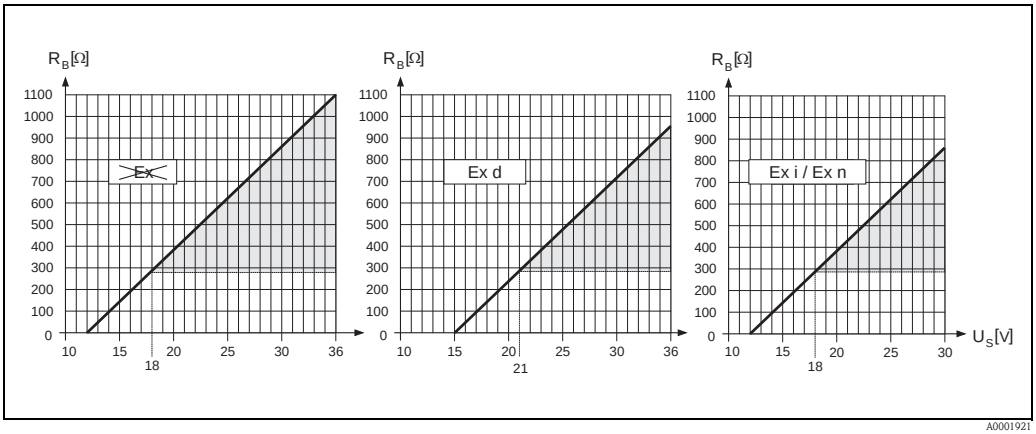
FOUNDATION Fieldbus interface:

- FOUNDATION Fieldbus H1, IEC 61158-2, galvanically isolated
- Current consumption = 16 mA
- Error current FDE (fault disconnection electronic) = 0 mA
- Data transmission rate: supported baudrate = 31.25 kBit/s
- Signal encoding = Manchester II
- Function blocks: 6 × Analog Input, 1 × Discrete Output, 1 × Analog Output
- Output data: volume flow, mass flow, corrected volume flow, heat flow, temperature, density, specific enthalpy, calculated steam pressure (saturated steam), operating Z-factor, vortex frequency, electronics temperature, Reynolds number, velocity, totalizer 1 + 2
- Input data: positive zero return (ON/OFF), totalizer reset, absolute pressure
- Link Master (LM) functionality is supported

Signal on alarm

- Current output: error response can be selected (e.g. in accordance with NAMUR Recommendation NE 43)
- Pulse output: error response can be selected
- Status output: "not conducting" in event of fault

Load



The area shaded gray refers to the permitted load (for HART: min. 250 Ω)
The load is calculated as follows:

$$R_B = \frac{(U_S - U_{Kl})}{(I_{max} - 10^{-3})} = \frac{(U_S - U_{Kl})}{0.022}$$

R_B Load, load resistance
U_S Supply voltage: non-Ex = 12 to 36 V DC; Ex d /XP= 15 to 36 V DC; Ex i /IS and Ex n = 12 to 30 V DC
U_{Kl} Terminal voltage: non-Ex = min. 12 V DC; Ex d/XP = min. 15 V DC; Ex i/IS and Ex n = min. 12 V DC
I_{max} Output current (22.6 mA)

Low flow cut off

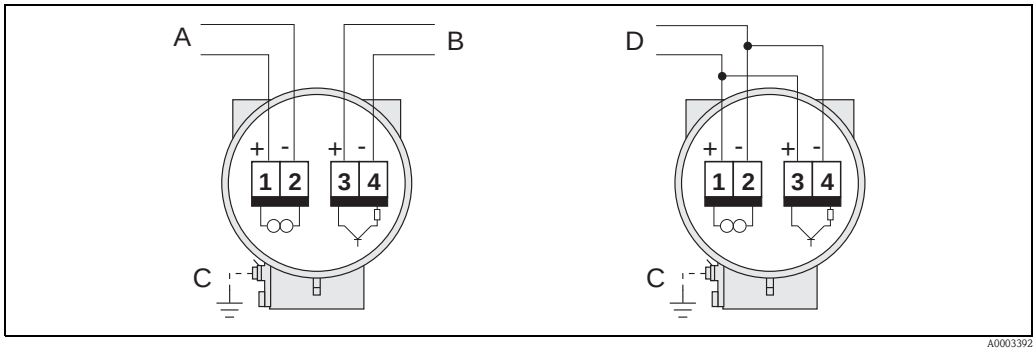
Switch points for low flow cut off can be selected as required.

Galvanic isolation

All electrical connections are galvanically isolated from one another.

Power supply

Electrical connection



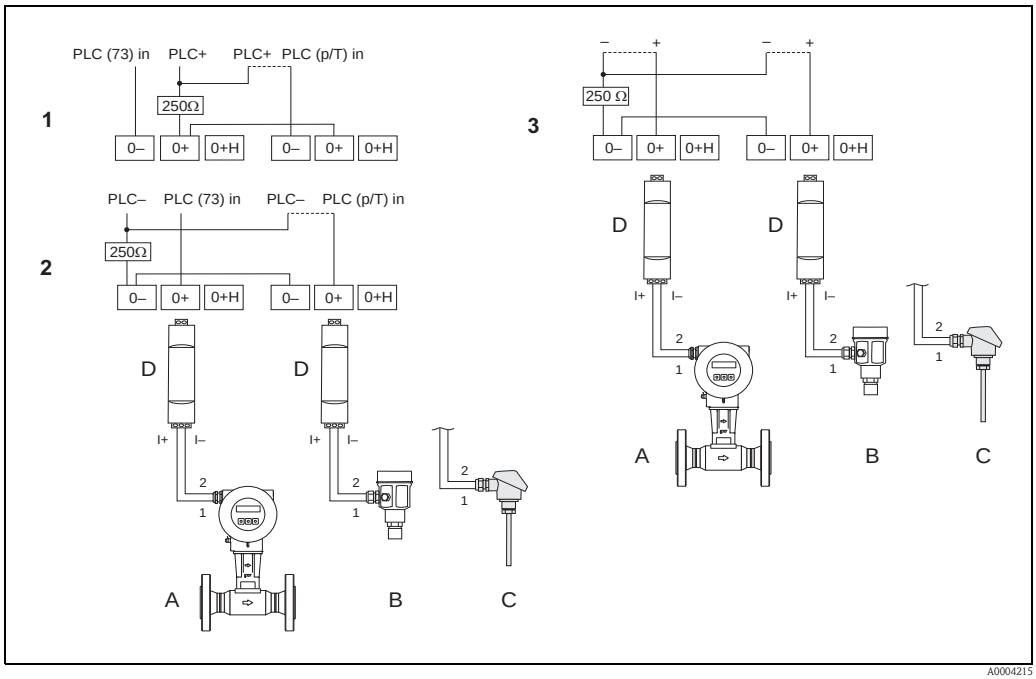
A – HART: power supply, current output
– PROFIBUS PA: 1 = PA+, 2 = PA–
– FOUNDATION Fieldbus: 1 = FF+, 2 = FF–

B Optional pulse output (not for PROFIBUS PA and FOUNDATION Fieldbus), can also be operated as:
– Status output
– Only Prowirl 73: frequency output
– Only Prowirl 73: as a PFM output (pulse/frequency modulation) together with an RMC621 or RMS621 flow computer

C Ground terminal (relevant for remote version)

D Only Prowirl 72: PFM (pulse/frequency modulation) wiring for connecting to flow computer RMC621 or RMS621

Wiring HART input



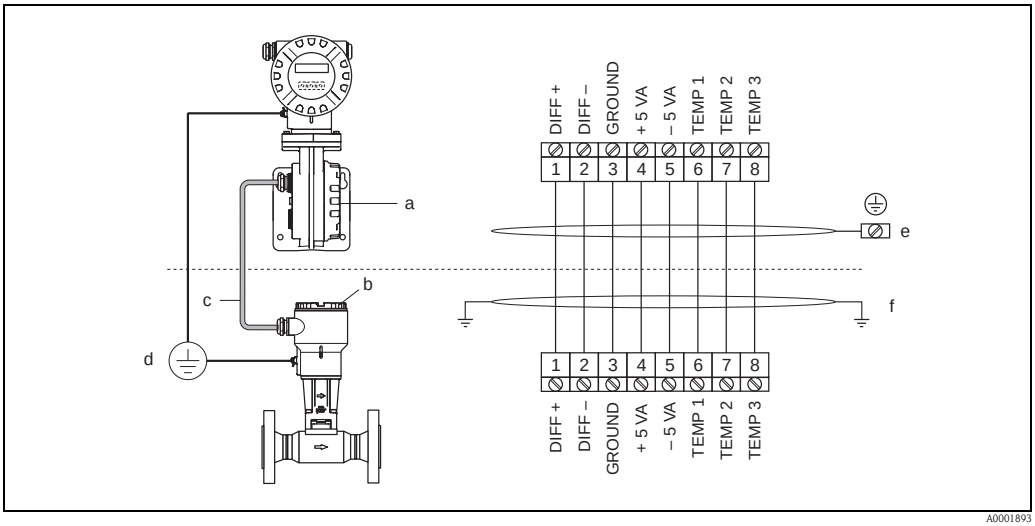
1 Connection diagram for PLC with common "plus"
Dotted line = alternative wiring when only the signal of the Prowirl 73 is fed to the PLC.

2 Connection diagram for PLC with common "minus"
Dotted line = alternative wiring when only the signal of the Prowirl 73 is fed to the PLC.

3 Connection diagram without PLC
Dotted line = wiring without connection to external components (e.g. recorder, displays, Fieldgate, etc.)

A = Prowirl 73, B = pressure sensor (Cerabar M), C = temperature sensor (Omnigrad TR10) or other external measuring devices (HART-enabled and burst-enabled), D = active barrier RN221N

Wiring remote version



Connecting the remote version

a = Connection compartment cover (transmitter)
b = Connection compartment cover (sensor)
c = Connecting cable (signal cable)
d = Identical potential matching for sensor and transmitter
e = Connect shielding to ground terminal in transmitter housing and keep as short as possible
f = Connect shielding to cable strain relief clamp in connection housing

Wire colors (color code according to DIN 47100):
Terminal number: 1 = white; 2 = brown; 3 = green; 4 = yellow, 5 = gray; 6 = pink; 7 = blue; 8 = red

Supply voltage

HART:

- Non-Ex: 12 to 36 V DC (with HART: 18 to 36 V DC)
- Ex i/IS and Ex n: 12 to 30 V DC (with HART: 18 to 30 V DC)
- Ex d/XP: 15 to 36 V DC (with HART: 21 to 36 V DC)

PROFIBUS PA and FOUNDATION Fieldbus:

- Non-Ex: 9 to 32 V DC
- Ex i/IS and Ex n: 9 to 24 V DC
- Ex d/XP: 9 to 32 V DC
- Current consumption → PROFIBUS PA: 16 mA, FOUNDATION Fieldbus: 16 mA

Cable entries

Power supply and signal cables (outputs):
- Cable entry M20 × 1.5 (6 to 12 mm)
- Thread for cable entry: ½" NPT, G ½", G ½" Shimada
- Fieldbus connector

Cable specifications

- Permitted temperature range:
  Between –40 °C and the max. ambient temperature permitted plus 10 °C

Power supply failure

- Totalizer stops at the last value determined.
- All settings are kept in the EEPROM.
- Error messages (incl. value of operated hours counter) are stored.

Performance characteristics

Reference operating conditions

Error limits following ISO/DIN 11631:
- 20 to 30 °C
- 2 to 4 bar
- Calibration rig traceable to national calibration standards
- Calibration with the process connection corresponding to the standard in question.

Maximum measured error

Prowirl 72

- Liquid:
  <0.75% o.r. for Re > 20 000
  <0.75% o.f.s for Re between 4000 and 20 000
- Gas/steam:
  <1% o.r. for Re > 20 000 and v < 75 m/s
  <1% o.f.s for Re between 4000 and 20 000

o.r. = of reading, o.f.s = of full scale value, Re = Reynolds number

Prowirl 73

- Volume flow (liquid):
  <0.75% o.r. for Re > 20 000
  <0.75% o.f.s for Re between 4000 and 20 000
- Volume flow (gas/steam):
  <1% o.r. for Re > 20 000 and v < 75 m/s
  <1% o.f.s for Re between 4000 and 20 000
- Temperature:
  <1°C (T > 100 °C, saturated steam and for liquids at ambient temperature);
  <1% o.r. [K] (gas)
  Rise time 50% (agitated under water, following IEC 60751): 8 s
- Mass flow (saturated steam):
  – For flow velocities 20 to 50 m/s, T > 150 °C (423 K)
    <1.7% o.r. (2% o.r. for remote version) for Re > 20 000
    <1.7% o.f.s (2% o.f.s for remote version) for Re between 4000 and 20 000
  – For flow velocities 10 to 70 m/s, T > 140 °C (413 K)
    <2% o.r. (2.3% o.r. for remote version) for Re > 20 000
    <2% o.f.s (2.3% o.f.s for remote version) for Re between 4000 and 20 000
- Mass flow of superheated steam and gas (air, natural gas AGA NX-19, AGA8-DC92, ISO 12213-2, AGA8 Gross Method 1, SGERG-88, preprogrammed gases - does not apply to the real gas equation):

  ✎ Note!
  A Cerabar S device has to be used for the measuring errors listed below. The measured error used to calculate the error in the measured pressure is 0.15%.

  <1.7% o.r. (2.0% o.r. for remote version) for Re > 20 000 and process pressure < 40 bar abs
  <1.7% o.f.s. (2.0% for remote version) for Re between 4000 and 20 000 and process pressure < 40 bar abs
  <2.6% o.r. (2.9% o.r. for remote version) for Re > 20 000 and process pressure < 120 bar abs
  <2.6% o.f.s. (2.9% o.r. for remote version) for Re between 4000 and 20 000 and process pressure < 120 bar abs
- Mass flow (water):
  <0.85% o.r. (1.15% o.r. for remote version) for Re > 20 000
  <0.85% o.f.s (1.15% o.f.s for remote version) for Re between 4000 and 20 000
- Mass flow (customer-defined liquids):
  To specify the system accuracy, Endress+Hauser requires information on the type of liquid and its operating temperature, or information in tabular form on the dependency between the liquid density and temperature. Example: Acetone is to be measured at fluid temperatures between 70 and 90 °C. The parameters TEMPERATURE VALUE (here 80 °C), DENSITY VALUE (here 720.00 kg/m^3) and EXPANSION COEFFICIENT (here 18.0298 x 10E-4 1/°C) have to be entered in the transmitter for this purpose. The overall system uncertainty, which is smaller than 0.9% for the example cited above, is made up of the following measuring uncertainties: Uncertainty of volume flow measurement, uncertainty of temperature measurement, uncertainty of the density-temperature correlation used (incl. the resulting uncertainty of density).
- Mass flow (other fluids):
  Depends on the pressure value specified in the device functions and the fluid selected.
  An individual error observation must be carried out.

o.r. = of reading, o.f.s = of full scale value, Re = Reynolds number

Diameter mismatch correction

Both Prowirl 72 and 73 can correct shifts in the calibration factor – e.g. caused by a change in the diameter between the device flange (e.g. ANSI, 2", Sched. 80) and the mating pipe (ANSI, 2", Sched. 40). The diameter mismatch should only be corrected within the limit values listed below, for which test measurements have also been performed.

Flange connection:
- DN 15 (½"): ±20% of the internal diameter
- DN 25 (1"): ±15% of the internal diameter
- DN 40 (1½"): ±12% of the internal diameter
- DN ≥ 50 (2"): ±10% of the internal diameter

Wafer:
- DN 15 (½"): ±15% of the internal diameter
- DN 25 (1"): ±12% of the internal diameter
- DN 40 (1½"): ±9% of the internal diameter
- DN ≥ 50 (2"): ±8% of the internal diameter

If the standard internal diameter of the process connection ordered for the measuring device and the internal diameter of the mating pipe differ, an additional measuring uncertainty of typically 0.1% o.r. (of reading) must be added for every 1 mm diameter deviation.

Repeatability

±0.25% o.r. (of reading)

Reaction time/step response time

If all the configurable functions for filter times (flow damping, display damping, current output time constant, frequency output time constant, status output time constant) are set to 0, a reaction time/step response time of 200 ms must be reckoned with for vortex frequencies as of 10 Hz. For other settings, a reaction time/step response time of 100 ms must always be added to the total filter reaction time for vortex frequencies as of 10 Hz.

Influence of ambient temperature

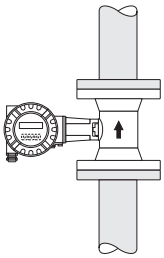
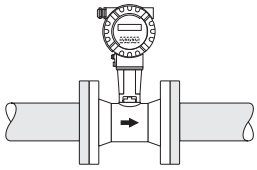
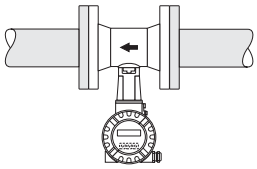
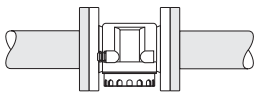
Current output (additional error, in reference to the span of 16 mA):
- Zero point (4 mA):
  Average Tk: 0.05%/10K, max. 0.6% over the entire temperature range –40 to +80 °C
- Span (20 mA):
  Average Tk: 0.05%/10K, max. 0.6% over the entire temperature range –40 to +80 °C

Digital outputs (pulse output, PFM, HART, frequency output; Prowirl 73 only)
Due to the digital measuring signal (vortex pulse) and further digital processing, there is no interface-related error from changing ambient temperature.

Operating conditions: installation

Installation instructions

Vortex meters require a fully developed flow profile as a prerequisite for correct volume flow measurement. Make sure that the direction of the arrow on the nameplate of the sensor matches the direction of flow (direction of fluid flow through the pipe).
The device can generally be installed in any position in the piping. However, note the following points:

Orientation		High fluid temperature (TM) ≥ 200 °C	Low fluid temperature (TM)
Fig. A: Vertical orientation	 A0009522	Recommended (①)	Recommended (①)
Fig. B: Horizontal orientation Transmitter head up	 A0009523	Not permitted for Prowirl 73 W DN 100 (4")/DN 150 (6") (②)	Recommended (③)
Fig. C: Horizontal orientation Transmitter head down	 A0009524	Recommended (④)	
Fig. D: Horizontal orientation Transmitter head at front with display pointing downwards	 A0009525	Recommended (④)	Recommended (③)

① In the case of liquids, there should be upward flow in vertical pipes to avoid partial pipe filling (see Fig. A).

Caution!
Disruption in flow measurement!
To guarantee the flow measurement of liquids, the measuring tube must always be completely full in pipes with vertical downward flow.

② Caution!
Danger of electronics overheating!
If fluid temperature is ≥200 °C, orientation B is not permitted for the wafer version (Prowirl 73 W) with nominal diameters DN 100 (4") and DN 150 (6").

In order to ensure that the maximum permissible ambient temperature for the transmitter is not exceeded (→ 27), we recommend the following orientations:

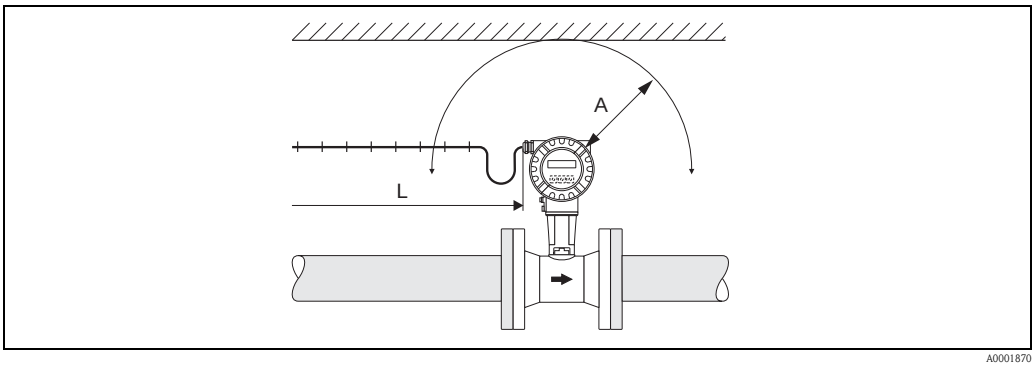
③ Select orientation C or D for hot fluids (e.g. steam or fluid temperature (TM) ≥200 °C

④ Select orientation B or D for very cold fluids (e.g. liquid nitrogen).

Minimum spacing and cable length

To ensure problem-free access to the measuring device for service purposes, we recommend you observe the following dimensions:

- Minimum spacing (A) in all directions = 100 mm
- Necessary cable length (L): L + 150 mm



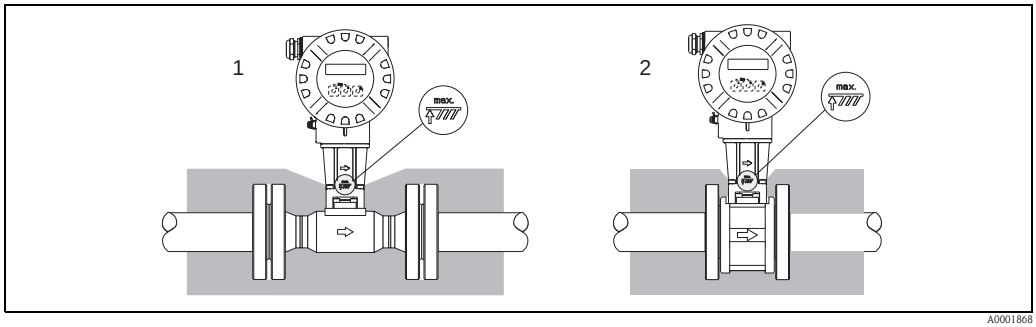
A0001870

Rotating the electronics housing and the display

The electronics housing can be rotated continuously 360° on the housing support. The display unit can be rotated in 45° stages. This means you can read off the display comfortably in all orientations.

Piping insulation

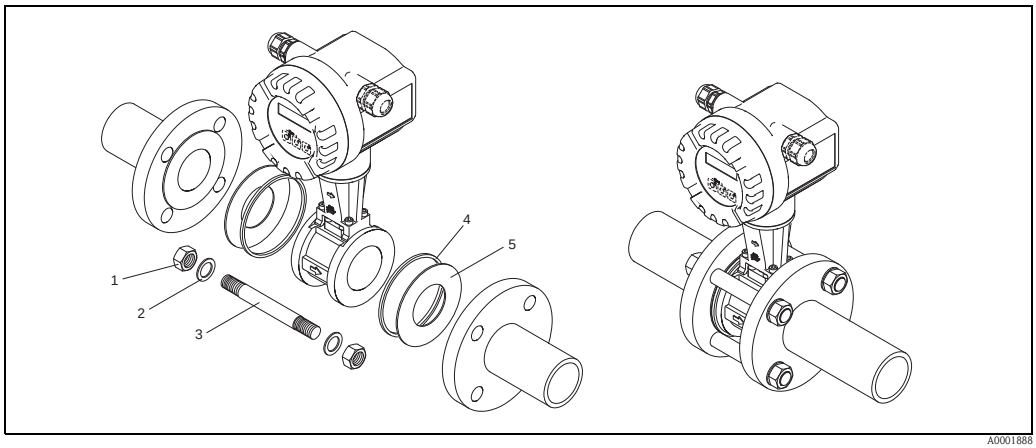
When insulating, please ensure that a sufficiently large area of the housing support is exposed.
The uncovered part serves as a radiator and protects the electronics from overheating (or undercooling).
The maximum insulation height permitted is illustrated in the diagrams. These apply equally to both the compact version and the sensor in the remote version.



1 = Flanged version
2 = Wafer version

Wafer version mounting set

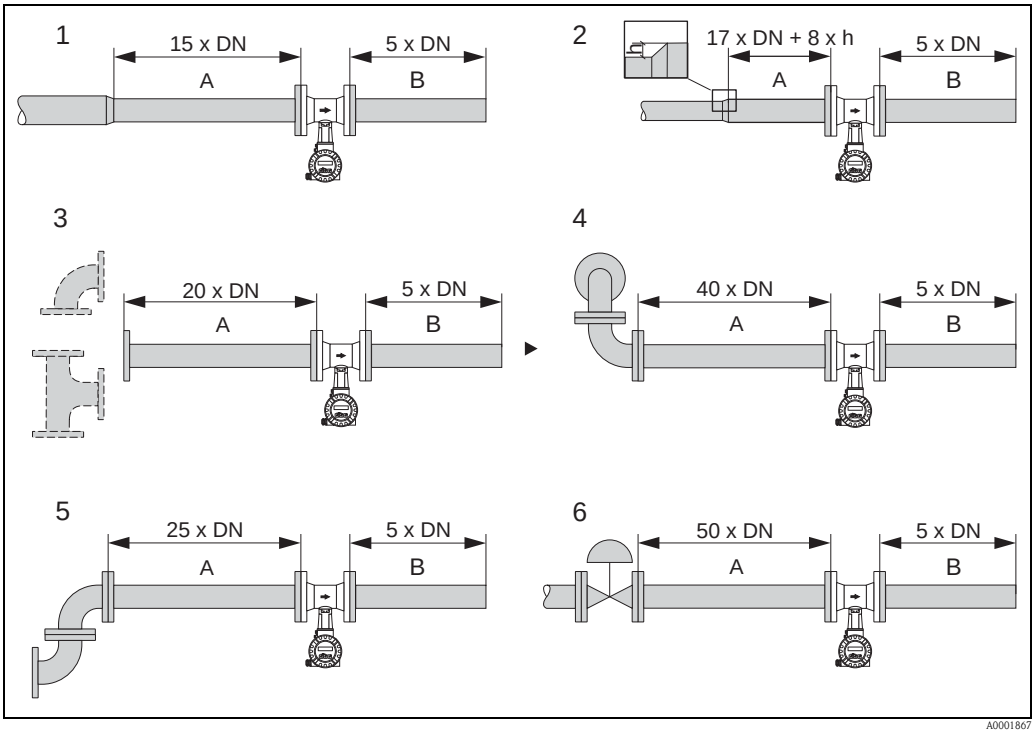
The centering rings supplied are used to mount and center the wafer-style devices. A mounting set consisting of tie rods, seals, nuts and washers can be ordered separately.



Mounting wafer version
1 = Nut
2 = Washer
3 = Tie rod
4 = Centering ring (is supplied with the device)
5 = Seal

Inlet and outlet run

As a minimum, the inlet and outlet runs shown below must be observed to achieve the specified accuracy of the device. The longest inlet run shown must be observed if two or more flow disturbances are present.



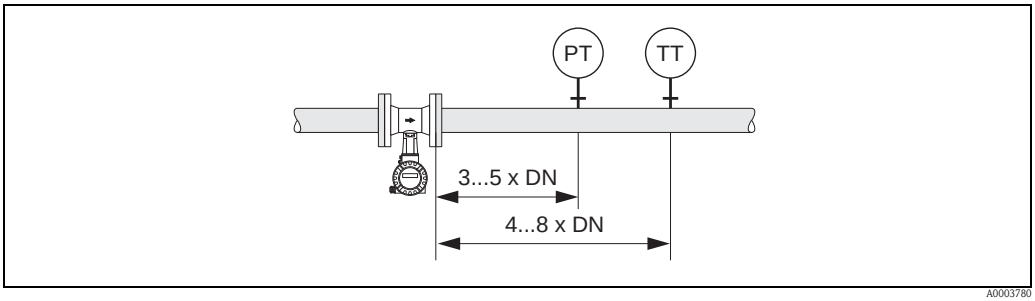
Minimum inlet and outlet runs with various flow obstructions

A = Inlet run
B = Outlet run
h = Difference in expansion
1 = Reduction
2 = Extension
3 = 90° elbow or T-piece
4 = 2× 90° elbow, 3-dimensional
5 = 2× 90° elbow
6 = Control valve

Note!
A specially designed perforated plate flow conditioner can be installed if it is not possible to observe the inlet runs required (→ 🖹 26).

Outlet runs with pressure and temperature measuring points

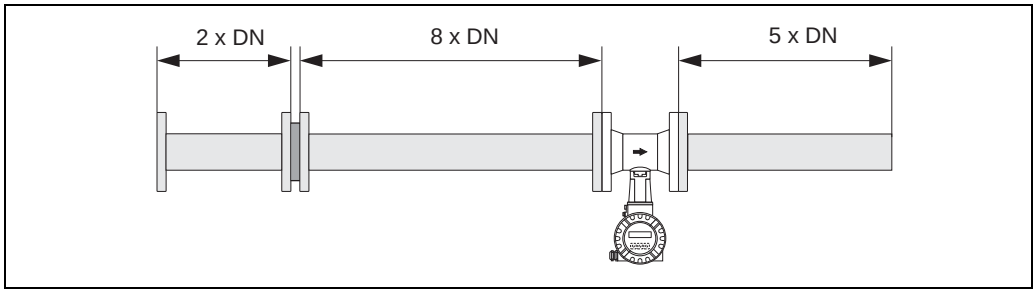
If pressure and temperature measuring points are installed after the device, please ensure there is a large enough distance between the device and the measuring point so there are no negative effects on vortex formation in the sensor.



PT = Pressure measuring point
TT = Temperature measuring point

Perforated plate flow conditioner

A specially designed perforated plate flow conditioner, available from Endress+Hauser, can be installed if it is not possible to observe the inlet runs required. The flow conditioner is fitted between two piping flanges and centered with the mounting bolts. Generally, this reduces the inlet run required to 10 x DN with complete accuracy.



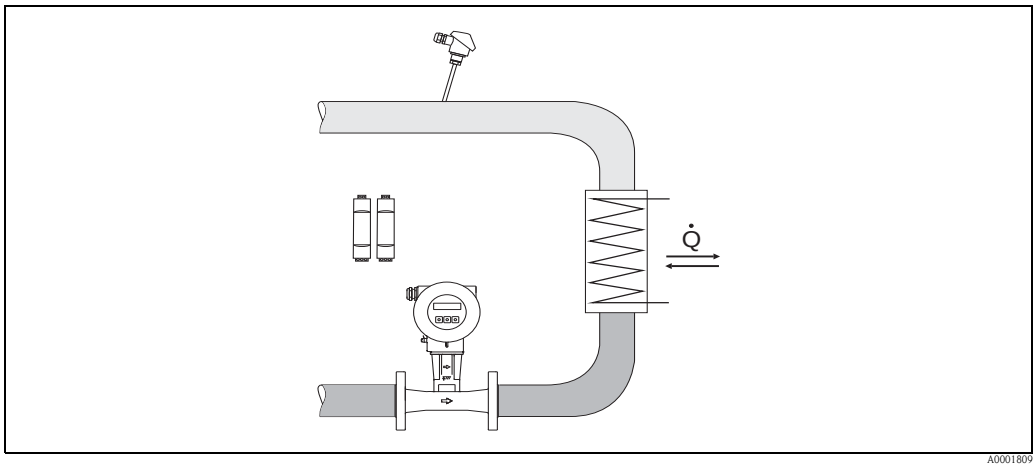
The pressure loss for flow conditioners is calculated as follows:
Δp [mbar] = 0.0085 · ρ [kg/m³] · v² [m/s]

Example with steam
p = 10 bar abs
t = 240 °C → ρ = 4.39 kg/m³
v = 40 m/s
$\Delta p = 0.0085 \cdot 4.39 \cdot 40^2 = 59.7$ mbar

Example with H_2O condensate (80 °C)
ρ = 965 kg/m³
v = 2.5 m/s
$\Delta p = 0.0085 \cdot 965 \cdot 2.5^2 = 51.3$ mbar

Installation for delta heat measurement (Prowirl 73 HART)

- The second temperature measurement takes place by means of a separate sensor and is read in via HART.
- Prowirl 73 generally has to be installed on the steam side for saturated steam delta heat measurement.
- For water-delta heat measurement, Prowirl 73 can be installed on both the cold side and the warm side.
- The inlet and outlet runs specified above must be observed.



Layout for delta heat measurement of saturated steam and water

Operating conditions: environment

Ambient temperature range

- Compact version:
  - Standard: –40 to +70 °C
  - EEx-d/XP version: –40 to +60 °C
  - ATEX II 1/2 GD version/dust ignition-proof: –20 to +55 °C
  - Display can be read between –20 and +70 °C
- Remote version sensor:
  - Standard:–40 to +85 °C
  - ATEX II 1/2 GD version/dust ignition-proof: –20 to +55 °C
- Remote version transmitter:
  - Standard: –40 to +80 °C
  - EEx-d/XP version: –40 to +60 °C
  - ATEX II 1/2 GD version/dust ignition-proof: –20 to +55 °C
  - Display can be read between –20 and +70 °C
  - Version up to –50 °C on request

When mounting outside, protect from direct sunlight with a protective cover (order number 543199-0001), especially in warmer climates with high ambient temperatures.

Storage temperature

- Standard: –40 to +80 °C
- ATEX II 1/2 GD version/dust ignition-proof: –20 to +55 °C
- Version up to –50 °C on request

Degree of protection

IP 67 (NEMA 4X) in accordance with EN 60529

Vibration resistance

Acceleration up to 1 g, 10 to 500 Hz, following IEC 60068-2-6

Electromagnetic compatibility (EMC)

To IEC/EN 61326 and NAMUR Recommendation NE 21.

Operating conditions: process

Medium temperature range

Prowirl 72

DSC sensor (differential switched capacitor; capacitive sensor)	
DSC standard sensor	–40 to +260 °C
DSC high/low temperature sensor	–200 to +400 °C
DSC sensor Inconel (PN 63 to 160, Class 600, JIS 40K)	–200 to +400 °C
DSC sensor titanium Gr. 5 (PN 250, Class 900 to 1500 and butt-weld version)	–50 to +400 °C
DSC sensor Alloy C-22	–200 to +400 °C
Seals	
Graphite	–200 to +400 °C
Viton	–15 to +175 °C
Kalrez	–20 to +275 °C
Gylon (PTFE)	–200 to +260 °C
Sensor	
Stainless steel	–200 to +400 °C
Alloy C-22	–40 to +260 °C

Special version for high fluid temperatures	–200 to +450 °C
(on request)	–200 to +440 °C, Ex version

Prowirl 73

DSC sensor (differential switched capacitor; capacitive sensor)	
DSC standard sensor	–200 to +400 °C
DSC sensor Inconel (PN 63 to 160, Class 600, JIS 40K in development)	–200 to +400 °C

Seals	
Graphite	–200 to +400 °C
Viton	–15 to +175 °C
Kalrez	–20 to +275 °C
Gylon (PTFE)	–200 to +260 °C

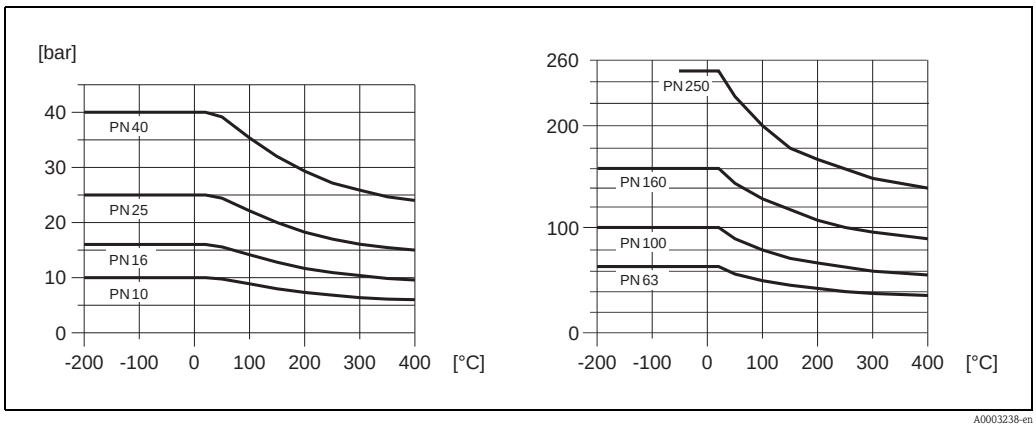
Sensor	
Stainless steel	–200 to +400 °C
Special version for high fluid temperatures	–200 to +450 °C
(on request)	–200 to +440 °C, Ex version

Medium pressure

Prowirl 72

Pressure-temperature curve to EN (DIN), stainless steel

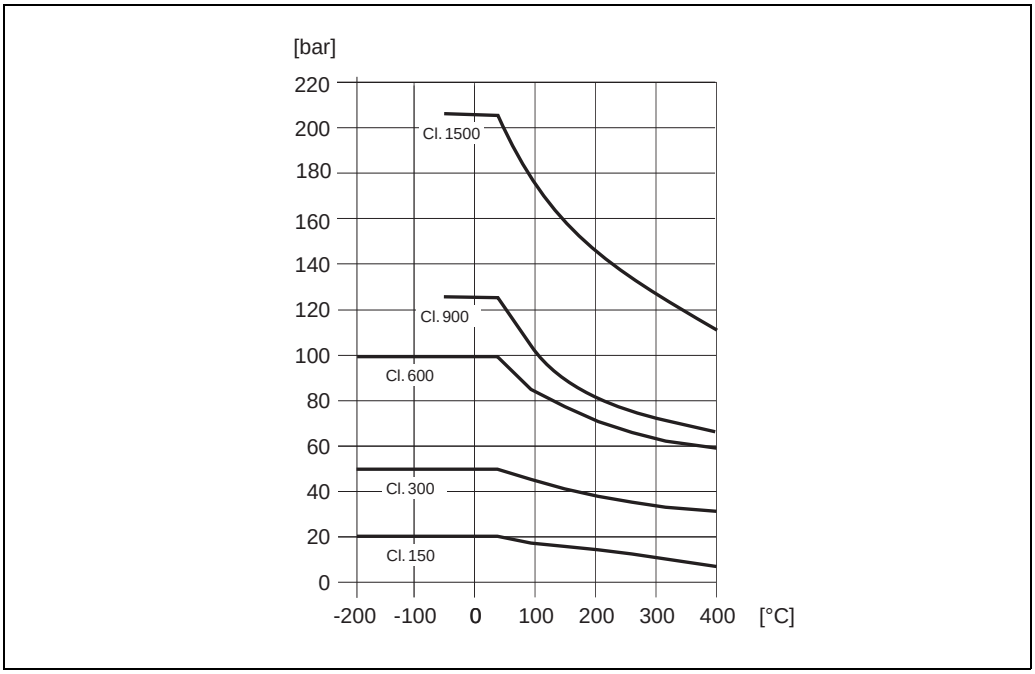
PN 10 to 40 → Prowirl 72W and 72F
PN 63 to 250 → Prowirl 72F



A0003238-en

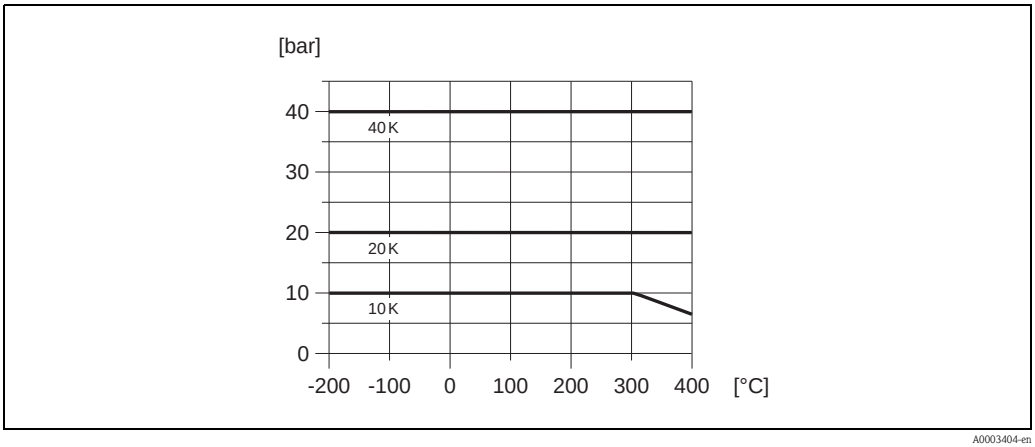
Pressure-temperature curve to ANSI B16.5, stainless steel

Class 150 to 300 → Prowirl 72W and 72F
Class 600 to 1500 → Prowirl 72F



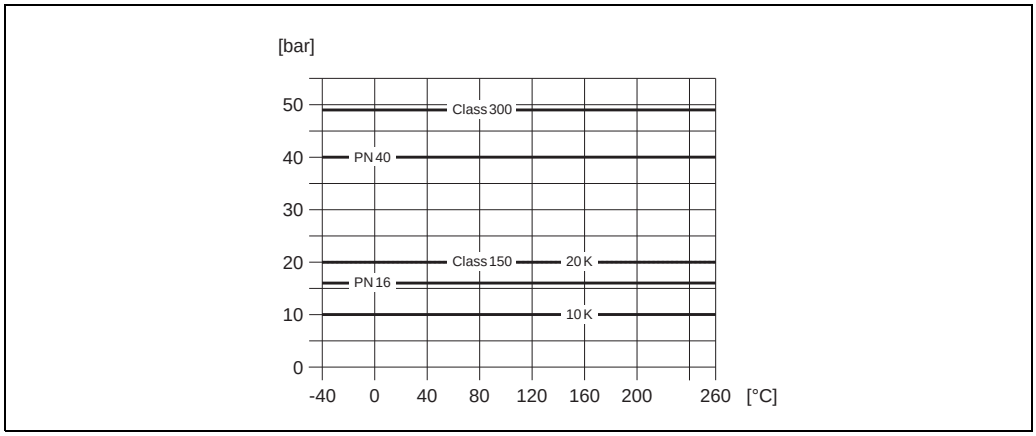
Pressure-temperature curve to JIS B2220, stainless steel:

10 to 20K → Prowirl 72W and 72F
40K → Prowirl 72F



Pressure-temperature curve to EN (DIN), ANSI B16.5 and JIS B2220, Alloy C-22

PN 16 to 40, Class 150 to 300, 10 to 20K → Prowirl 72F

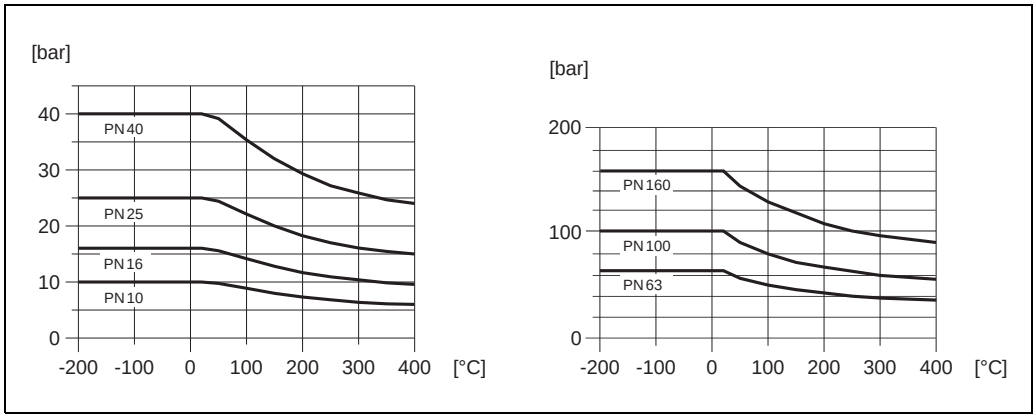


A0003395-en

Prowirl 73

Pressure-temperature curve to EN (DIN), stainless steel

PN 10 to 40 → Prowirl 73W and 73F
PN 63 to 160 → Prowirl 73F (in development)

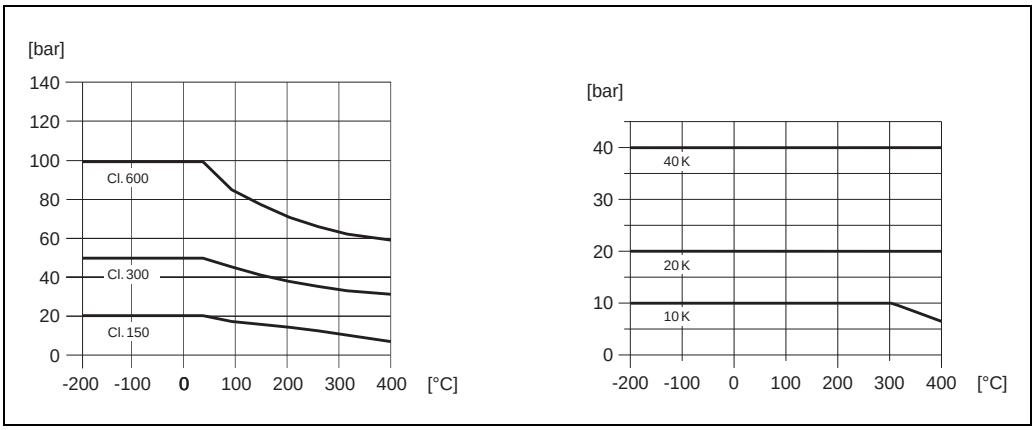


A0007085-em

Pressure-temperature curve to ANSI B16.5 and JIS B2220, stainless steel

ANSI B16.5:
Class 150 to 300 → Prowirl 73W and 73F
Class 600 → Prowirl 73F (in development)

JIS B2220:
10 to 20K → Prowirl 73W and 73F
40K → Prowirl 73F (in development)



A0001923-en

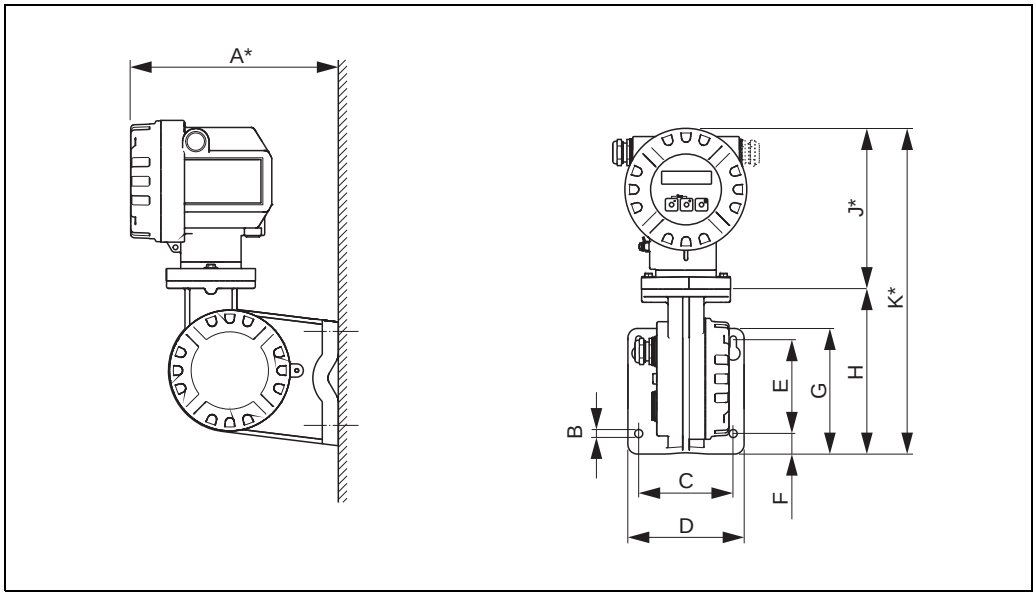
Pressure loss

The pressure loss can be determined with the aid of the Applicator. The Applicator is software for selecting and planning flowmeters. The software is available both via the Internet (www.applicator.com) and on a CD-ROM for local PC installation.

Mechanical construction

Design, dimensions

Dimensions of transmitter, remote version



A0003594

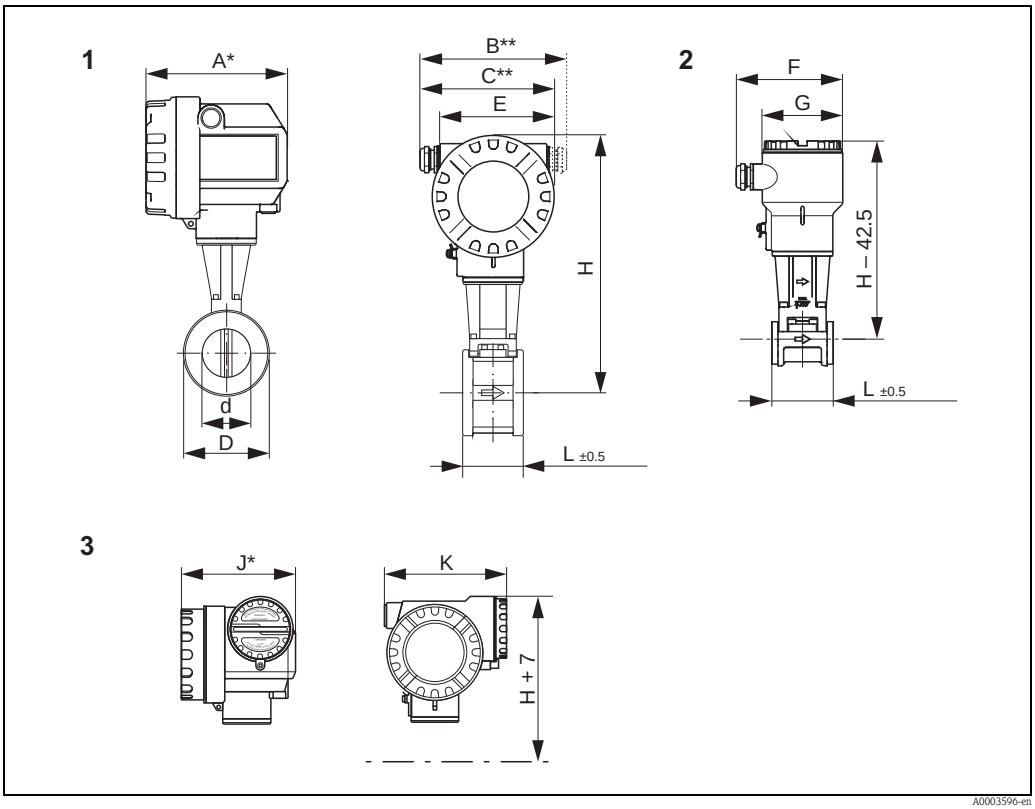
A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	J [mm]	K [mm]
232	Ø 8.6 (M8)	100	123	100	23	144	170	170	340

* The following dimensions differ depending on the version:
– The dimension 232 mm changes to 226 mm in the blind version (without local operation).
– The dimension 170 mm changes to 183 mm in the Ex d/XP version.
– The dimension 340 mm changes to 353 mm in the Ex d/XP version.

Note!
The transmitter housing has one cable gland or cable entry. Measuring devices with a pulse, frequency or status output have two cable glands or cable entries (devices with TIIS approval only have one cable gland).

Dimensions of wafer versions
Prowirl 72W, 73W

Wafer version for flanges to:
- EN 1092-1 (DIN 2501), PN 10 to 40
- ANSI B16.5, Class 150 to 300, Sch. 40
- JIS B2220, 10 to 20K, Sch. 40



1 = Standard as well as Ex i/IS and Ex n version
2 = Remote version
3 = Ex d version (transmitter)

A [mm]	B [mm]	C [mm]	E [mm]	F [mm]	G [mm]	J [mm]	K [mm]
149	161 to 181	141 to 151	121	105	95	151	157

* The dimensions change as follows in the blind version (without local operation):
– Standard, Ex i/IS and Ex n version: The dimension 149 mm changes to 142 mm in the blind version.
– Ex d/XP version: The dimension 151 mm changes to 144 mm in the blind version.
** The dimension depends on the cable gland used.

Note!
The transmitter housing has one cable gland or cable entry. Measuring devices with a pulse, frequency or status output have two cable glands or cable entries (devices with TIIS approval only have one cable gland).

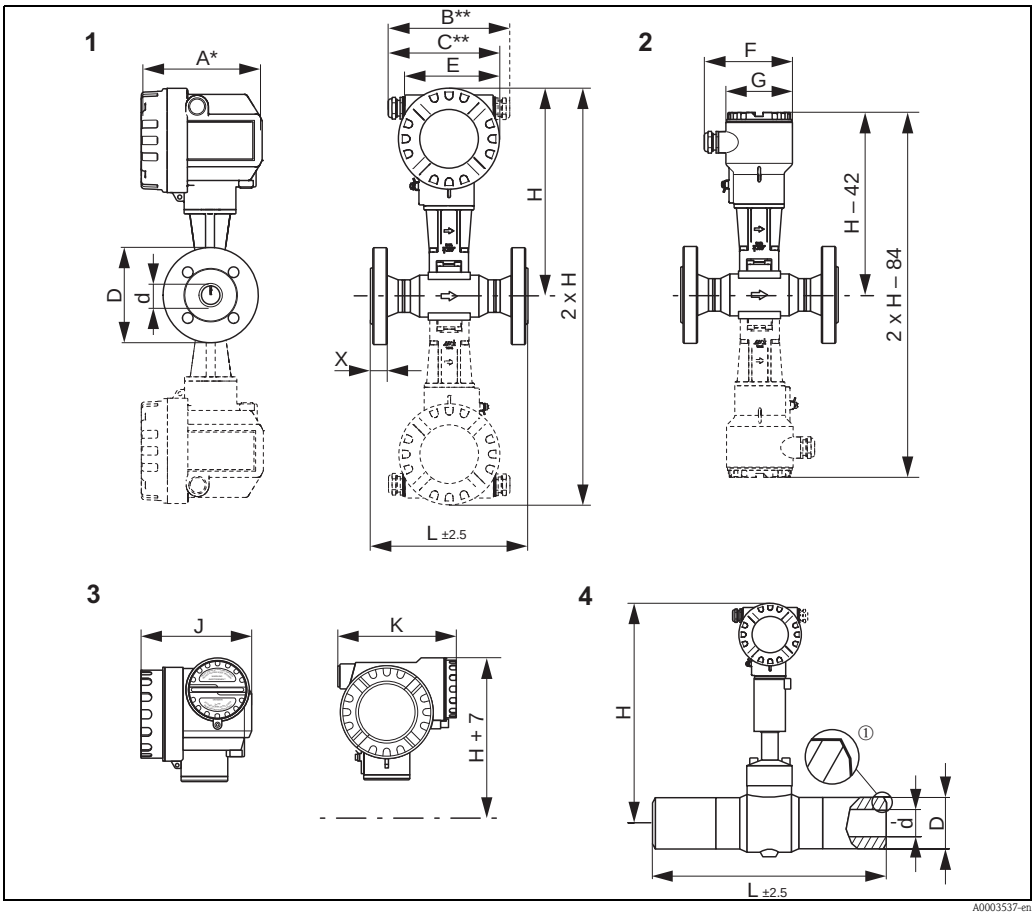
DN		d	D	H[1]	L	Weight[2]
DIN/JIS	ANSI	mm	mm	mm	mm	kg
15	½"	16.5	45.0	247	65	3.0
25	1"	27.6	64.0	257	65	3.2
40	1½"	42.0	82.0	265	65	3.8
50	2"	53.5	92.0	272	65	4.1
80	3"	80.3	127.0	286	65	5.5
100 (DIN)	–	104.8	157.2	299	65	6.5
100 (JIS)	4"	102.3	157.2	299	65	6.5
150	6"	156.8	215.9	325	65	9.0

1) The dimension H increases by 29 mm for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (version with extended temperature range).
2) The weight data refer to the compact version. The weight increases by 0.5 kg for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (version with extended temperature range).

Dimensions of flanged versions (standard devices)
Prowirl 72F, 73F

Flange connection dimensions in accordance with flange standard:
- EN 1092-1 (DIN 2501), Ra = 6.3 to 12.5 µm
- Raised face to:
  - EN 1092-1 Form B1 (DIN 2526 Form C), PN 10 to 40, Ra = 6.3 to 12.5 µm, optional with groove to EN 1091-1 Form D (DIN 2512 Form N)
  - EN 1092-1 Form B2 (DIN 2526 Form E), PN 63 to 100, Ra = 1.6 to 3.2 µm[1) 2)]
  - DIN 2526 Form E, PN 160 to 250[3)], Ra = 1.6 to 3.2 µm[1)]
- ANSI B16.5, Class 150 to 1500, Ra = [1) 2)]125 to 250 µin[2)]
- JIS B2220, 10 to 40K[1)], Ra = 125 to 250 µin

[1)] Prowirl 73F: PN 63 to 160, Class 600 and 40K in development
[2)] Prowirl 73F: only Class 150 to 600
[3)] Prowirl 73F: only PN 160



1 = Standard, Ex i and Ex n version ; d: connection pipe internal diameter
2 = Remote version
3 = Ex d /XP version (transmitter)
4 = Butt-weld version (only available for Prowirl 72)

① Groove type 22 in accordance with DIN 2559
Dotted line: Dualsens version

A [mm]	B [mm]	C [mm]	E [mm]	F [mm]	G [mm]	J [mm]	K [mm]
149	161 to 181	141 to 151	121	105	95	151	161

A [mm]	B [mm]	C [mm]	E [mm]	F [mm]	G [mm]	J [mm]	K [mm]

* The dimensions below change as follows in the blind version (without local operation):
– Standard, Ex i/IS and Ex n version: The dimension 149 mm changes to 142 mm in the blind version.
– Ex d/XP version: The dimension 151 mm changes to 144 mm in the blind version.
** The dimension depends on the cable gland used.

✎ Note!
The transmitter housing has one cable gland or cable entry. Measuring devices with a pulse, frequency or status output have two cable glands or cable entries (devices with TIIS approval only have one cable gland).

Flanged versions (standard devices) to EN 1092-1 (DIN 2501)
Prowirl 72F, 73F

DN	Pressure rating	d [mm]	D [mm]	H[3] [mm]	L [mm]	X [mm]	Weight[4] [kg]
15[5]	PN 40	17.3	95.0	248	200	16	5
	PN 160[2]	17.3	105.0	288	200	23	7
	PN 250[1]	16.1	130.0	310	248	26	15
	Butt-weld[1]	16.1	23.4	310	248	–	9
25[5]	PN 40	28.5	115.0	255	200	18	7
	PN 100[2]	28.5	140.0	295	200	27	11
	PN 160[2]	27.9	140.0	295	200	27	11
	PN 250[1]	26.5	150.0	310	248	28	16
	Butt-weld[1]	24.3	35.6	310	248	–	9
40	PN 40	43.1	150.0	263	200	18	9
	PN 100[2]	42.5	170.0	303	200	31	15
	PN 160[2]	41.1	170.0	303	200	31	15
	PN 250[1] [5]	38.1	185.0	315	278	34	21
	Butt-weld[1] [5]	38.1	48.3	315	278	–	9
50	PN 40	54.5	165.0	270	200	20	11
	PN 63[2]	54.5	180.0	310	200	33	17
	PN 100[2]	53.9	195.0	310	200	33	19
	PN 160[2]	52.3	195.0	310	200	33	19
	PN 250[1] [5]	47.7	200.0	306	288	38	23
	Butt-weld[1] [5]	47.7	60.3	306	288	–	9
80	PN 40	82.5	200.0	283	200	24	16
	PN 63[2]	81.7	215.0	323	200	39	24
	PN 100[2]	80.9	230.0	323	200	39	27
	PN 160[2]	76.3	230.0	323	200	39	27
	PN 250[1] [5]	79.6	255.0	311	325	46	41
	Butt-weld[1] [5]	79.6	101.6	311	325	–	13
100	PN 16	107.1	220.0	295	250	20	18
	PN 40	107.1	235.0	295	250	24	21
	PN 63[2]	106.3	250.0	335	250	49	39
	PN 100[2]	104.3	265.0	335	250	49	42
	PN 160[2]	98.3	265.0	335	250	49	42
	PN 250[1] [5]	98.6	300.0	323	394	54	64
	Butt-weld[1] [5]	98.6	127.0	323	394	–	21

Flanged versions (standard devices) to EN 1092-1 (DIN 2501)
Prowirl 72F, 73F

DN	Pressure rating	d [mm]	D [mm]	H[3] [mm]	L [mm]	X [mm]	Weight[4] [kg]
150	PN 16	159.3	285.0	319	300	22	30
	PN 40	159.3	300.0	319	300	28	37
	PN 63[2]	157.1	345.0	359	300	64	86
	PN 100[2]	154.1	355.0	359	300	64	88
	PN 160[2]	146.3	355.0	359	300	64	88
	PN 250[1] [5]	142.8	390.0	339	566	68	152
	Butt-weld[1] [5]	142.8	177.8	339	566	–	53
200	PN 10	207.3	340.0	348	300	42	63
	PN 16	207.3	340.0	348	300	42	62
	PN 25	206.5	360.0	348	300	42	68
	PN 40	206.5	375.0	348	300	42	72
250[5]	PN 10	260.4	395	375	380	48	88
	PN 16	260.4	405	375	380	48	92
	PN 25	258.8	425	375	380	48	100
	PN 40	258.8	450	375	380	48	111
300[5]	PN 10	309.7	445	398	450	51	121
	PN 16	309.7	460	398	450	51	129
	PN 25	307.9	485	398	450	51	140
	PN 40	307.9	515	398	450	51	158

[1] In contrast to the other versions, devices have a sensor in the bluff body.
Only available for 72F.
[2] Pressure ratings are in development for Prowirl 73.
[3] The dimension H increases by 29 mm for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure ratings up to PN 40, Cl. 300, 20K).
[4] The weight data refer to the compact version. The weight increases by 0.5 kg for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure rating up to PN 40, Cl. 300, 20K). The weight is increased by 6 kg for the Dualsens version.
[5] Not available as Dualsens version.

Flanged versions (standard devices) to ANSI B16.5
Prowirl 72F, 73F

DN	Pressure rating		d mm	D mm	H[3] mm	L mm	X mm	Weight[4] kg
½" [5]	Schedule 40	Cl. 150	15.7	88.9	248	200	11.2	5
		Cl. 300	15.7	95.0	248	200	14.2	5
	Schedule 80	Cl. 150	13.9	88.9	248	200	11.2	5
		Cl. 300	13.9	95.0	248	200	14.2	5
		Cl. 600[2]	13.9	95.3	288	200	23	6
		Cl. 1500[1]	14.0	120.6	310	262	22.3	13
		Butt-weld[1]	14.0	21.3	310	248	–	9
1" [5]	Schedule 40	Cl. 150	26.7	107.9	255	200	15.7	6
		Cl. 300	26.7	123.8	255	200	19.1	7
	Schedule 80	Cl. 150	24.3	107.9	255	200	15.7	6
		Cl. 300	24.3	123.8	255	200	19.1	7
		Cl. 600[2]	24.3	124.0	295	200	27	9
		Cl. 1500[1]	24.3	149.3	310	287.7	28.4	17
		Butt-weld[1]	24.3	33.4	310	248	–	9

Flanged versions (standard devices) to ANSI B16.5 Prowirl 72F, 73F								
DN	Pressure rating		d mm	D mm	H[3] mm	L mm	X mm	Weight[4] kg
1½"	Schedule 40	Cl. 150	40.9	127.0	263	200	17.5	8
		Cl. 300	40.9	155.6	263	200	20.6	10
	Schedule 80	Cl. 150	38.1	127.0	263	200	17.5	8
		Cl. 300	38.1	155.6	263	200	20.6	10
		Cl. 600[2]	38.1	155.4	303	200	31	13
		Cl. 1500[1) 5]	38.1	177.8	315	305.8	31.7	20
		Butt-weld[1) 5]	38.1	48.3	315	278	–	9
2"	Schedule 40	Cl. 150	52.6	152.4	270	200	19.1	10
		Cl. 300	52.6	165.0	270	200	22.4	12
	Schedule 80	Cl. 150	49.2	152.4	270	200	19.1	10
		Cl. 300	49.2	165.0	270	200	22.4	12
		Cl. 600[2]	49.2	165.1	310	200	33	14
		Cl. 1500[1) 5]	49.3	215.9	306	344	38.1	30
		Butt-weld[1) 5]	47.7	60.3	306	288	–	9
3"	Schedule 40	Cl. 150	78.0	190.5	283	200	23.9	15
		Cl. 300	78.0	210.0	283	200	28.4	19
	Schedule 80	Cl. 150	73.7	190.5	283	200	23.9	15
		Cl. 300	73.7	210.0	283	200	28.4	19
		Cl. 600[2]	73.7	209.6	323	200	39	22
		Cl. 900[1) 5]	73.7	241.3	311	349	38.1	37
		Cl. 1500[1) 5]	73.7	266.7	311	380.4	47.7	49
		Butt-weld[1) 5]	73.7	95.7	311	325	–	13
4"	Schedule 40	Cl. 150	102.4	228.6	295	250	24.5	22
		Cl. 300	102.4	254.0	295	250	31.8	30
	Schedule 80	Cl. 150	97.0	228.6	295	250	24.5	22
		Cl. 300	97.0	254.0	295	250	31.8	30
		Cl. 600[2]	97.0	273.1	335	250	49	43
		Cl. 900[1) 5]	97.3	292.1	323	408	44.4	57
		Cl. 1500[1) 5]	97.3	311.1	323	427	53.8	71
		Butt-weld[1) 5]	97.3	125.7	323	394	–	21
6"	Schedule 40	Cl. 150	154.2	279.4	319	300	25.4	34
		Cl. 300	154.2	317.5	319	300	36.6	50
	Schedule 80	Cl. 150	146.3	279.4	319	300	25.4	34
		Cl. 300	146.3	317.5	319	300	36.6	50
		Cl. 600[2]	146.3	355.6	359	300	64	87
		Cl. 900[1) 5]	131.8	381.0	339	538	55.6	131
		Cl. 1500[1) 5]	146.3	393.7	339	602	82.5	173
		Butt-weld[1) 5]	146.3	168.3	339	566	–	53
8"	Schedule 40	Cl. 150	202.7	342.9	348	300	42	64
		Cl. 300	202.7	381.0	348	300	42	76
10" [5]	Schedule 40	Cl. 150	254.5	406.4	375	380	48	92
		Cl. 300	254.5	444.5	375	380	48	109
12" [5]	Schedule 40	Cl. 150	304.8	482.6	398	450	60	143
		Cl. 300	304.8	520.7	398	450	60	162

Flanged versions (standard devices) to ANSI B16.5
Prowirl 72F, 73F

DN	Pressure rating	d mm	D mm	H[3] mm	L mm	X mm	Weight[4] kg

[1] In contrast to the other versions, devices have a sensor in the bluff body.
Only available for 72F.
[2] Pressure ratings are in development for Prowirl 73.
[3] The dimension H increases by 29 mm for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure ratings up to PN 40, Cl. 300, 20K).
[4] The weight data refer to the compact version. The weight increases by 0.5 kg for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure rating up to PN 40, Cl. 300, 20K). The weight is increased by 6 kg for the Dualsens version.
[5] Not available as Dualsens version.

Flanged versions (standard devices) to JIS B2220
Prowirl 72F, 73F

DN	Pressure rating		d [mm]	D [mm]	H[2] [mm]	L [mm]	X [mm]	Weight[3] [kg]
15[4]	Schedule 40	20K	16.1	95	248	200	14	5
	Schedule 80	20K	13.9	95	248	200	14	5
	Schedule 80	40K[1]	13.9	115	288	200	23	8
25[4]	Schedule 40	20K	27.2	125	255	200	16	7
	Schedule 80	20K	24.3	125	255	200	16	7
	Schedule 80	40K[1]	24.3	130	295	200	27	10
40	Schedule 40	20K	41.2	140	263	200	18	9
	Schedule 80	20K	38.1	140	263	200	18	9
	Schedule 80	40K[1]	38.1	160	303	200	31	14
50	Schedule 40	10K	52.7	155	270	200	16	10
	Schedule 40	20K	52.7	155	270	200	18	10
	Schedule 80	10K	49.2	155	270	200	16	10
	Schedule 80	20K	49.2	155	270	200	18	10
	Schedule 80	40K[1]	49.2	165	310	200	33	15
80	Schedule 40	10K	78.1	185	283	200	18	14
	Schedule 40	20K	78.1	200	283	200	22	15
	Schedule 80	10K	73.7	185	283	200	18	14
	Schedule 80	20K	73.7	200	283	200	22	15
	Schedule 80	40K[1]	73.7	210	323	200	39	24
100	Schedule 40	10K	102.3	210	295	250	18	18
	Schedule 40	20K	102.3	225	295	250	24	21
	Schedule 80	10K	97.0	210	295	250	18	18
	Schedule 80	20K	97.0	225	295	250	24	22
	Schedule 80	40K[1]	97.0	240	335	250	49	36
150	Schedule 40	10K	151.0	280	319	300	22	33
	Schedule 40	20K	151.0	305	319	300	28	40
	Schedule 80	10K	146.3	280	319	300	22	33
	Schedule 80	20K	146.3	305	319	300	28	40
	Schedule 80	40K[1]	146.6	325	359	300	64	77
200	Schedule 40	10K	202.7	330	348	300	42	58
	Schedule 40	20K	202.7	350	348	300	42	64
250[4]	Schedule 40	10K	254.5	400	375	380	48	90
	Schedule 40	20K	254.5	430	375	380	48	104

Flanged versions (standard devices) to JIS B2220
Prowirl 72F, 73F

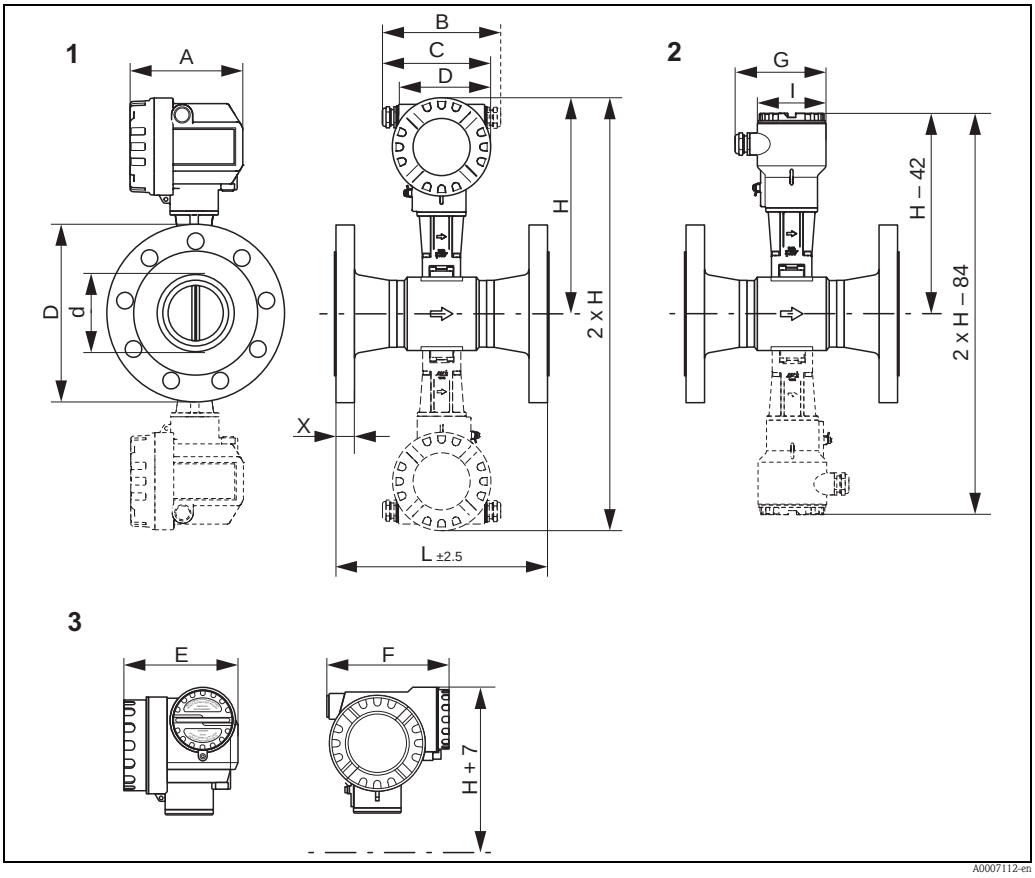
DN	Pressure rating		d [mm]	D [mm]	H[2] [mm]	L [mm]	X [mm]	Weight[3] [kg]
300[4]	Schedule 40	10K	304.8	445	398	450	51	119
	Schedule 40	20K	304.8	480	398	450	51	134

1) Pressure rating 40K for Prowirl 73 in development.
2) The dimension H increases by 29 mm for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure ratings up to PN 40, Cl. 300, 20K).
3) The weight data refer to the compact version. The weight increases by 0.5 kg for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure rating up to PN 40, Cl. 300, 20K). The weight is increased by 6 kg for the Dualsens version.
4) Not available as Dualsens version.

Dimensions of flanged versions "R Style" (single reduction of line size)
Prowirl 72F, 73F

Versions with integrated line size reduction (hydraulically effective cross-section smaller than connection nominal diameter) offering improved measurement in the lower flow range.

Flange connection dimensions in accordance with flange standard:
- EN 1092-1 (DIN 2501), Ra = 6.3 to 12.5 µm
- Raised face to:
  EN 1092-1 Form B1 (DIN 2526 Form C), PN 10 to 40, Ra = 6.3 to 12.5 µm,
  optional with groove to EN 1091-1 Form D (DIN 2512 Form N)
- ANSI B16.5, Class 150 to 300, Ra = 125 to 250 µin
- JIS B2220, 10 to 20K, Ra = 125 to 250 µin



1 = Standard, Ex i and Ex n version ; d: connection pipe internal diameter
2 = Remote version
3 = Ex d /XP version (transmitter)

Dotted line: Dualsens version

A [mm]	B [mm]	C [mm]	E [mm]	F [mm]	G [mm]	J [mm]	K [mm]
149	161 to 181	141 to 151	121	105	95	151	161

* The dimensions below change as follows in the blind version (without local operation):
– Standard, Ex i/IS and Ex n version: The dimension 149 mm changes to 142 mm in the blind version.
– Ex d/XP version: The dimension 151 mm changes to 144 mm in the blind version.
** The dimension depends on the cable gland used.

Note!
The transmitter housing has one cable gland or cable entry. Measuring devices with a pulse, frequency or status output have two cable glands or cable entries (devices with TIIS approval only have one cable gland).

Flanged versions (R Style) to EN 1092-1 (DIN 2501)
Prowirl 72F, 73F

DN	Inner diameter	Pressure rating	d [mm]	D [mm]	H[1] [mm]	L [mm]	X [mm]	Weight[2] [kg]
25[3]	15	PN 40	22.0	115	248	200	18.0	6
40[3]	25	PN 40	30.0	150	255	200	21.0	10
50	40	PN 40	45.0	165	263	200	22.0	12
80	50	PN 40	56.5	200	270	200	25.0	16
100	80	PN 16	87.0	220	283	250	22.0	20
		PN 40	87.0	235	283	250	26.5	23
150	100	PN 16	112.0	285	295	300	25.0	36
		PN 40	112.0	300	295	300	31.0	42
200	150	PN 10	146.3	340	319	300	24.0	48
		PN 16	146.3	340	319	300	24.0	48
		PN 25	146.3	360	319	300	30.0	55
		PN 40	146.3	375	319	300	36.5	63

1) The dimension H increases by 29 mm for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure ratings up to PN 40, Cl. 300, 20K).
2) The weight data refer to the compact version. The weight increases by 0.5 kg for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure rating up to PN 40, Cl. 300, 20K). The weight is increased by 6 kg for the Dualsens version.
3) Not available as Dualsens version.

Flanged versions (R Style) to ANSI B16.5
Prowirl 72F, 73F

DN	Inner diameter	Pressure rating		d mm	D mm	H[1] mm	L mm	X mm	Weight[2] kg
1" [3]	½"	Sched. 40	Cl. 150	22.0	108.0	248	200	18	6
		Sched. 40	Cl. 300	22.0	124.0	248	200	22.0	8
		Sched. 80	Cl. 150	22.0	108.0	248	200	18.5	6
		Sched. 80	Cl. 300	22.0	124.0	248	200	22.0	8
1½" [3]	1"	Sched. 40	Cl. 150	30.0	127.0	255	200	18.0	7
		Sched. 40	Cl. 300	30.0	155.4	255	200	25.0	10
		Sched. 80	Cl. 150	30.0	127.0	255	200	18.0	7
		Sched. 80	Cl. 300	30.0	155.4	255	200	25.0	10
2"	1½"	Sched. 40	Cl. 150	45.0	152.4	263	200	20.0	10
		Sched. 40	Cl. 300	45.0	165.1	263	200	25.0	12
		Sched. 80	Cl. 150	45.0	152.4	263	200	20.0	10
		Sched. 80	Cl. 300	45.0	165.1	263	200	25.0	12
3"	2"	Sched. 40	Cl. 150	56.5	190.5	270	200	23.9	15
		Sched. 40	Cl. 300	56.5	209.6	270	200	28.9	22
		Sched. 80	Cl. 150	56.5	190.5	270	200	23.9	15
		Sched. 80	Cl. 300	56.5	209.6	270	200	28.9	22
4"	3"	Sched. 40	Cl. 150	87.0	228.6	283	250	24.5	22
		Sched. 40	Cl. 300	87.0	254.0	283	250	31.8	31
		Sched. 80	Cl. 150	87.0	228.6	283	250	24.5	22
		Sched. 80	Cl. 300	87.0	254.0	283	250	31.8	31

Flanged versions (R Style) to ANSI B16.5
Prowirl 72F, 73F

DN	Inner diameter	Pressure rating		d mm	D mm	H[1] mm	L mm	X mm	Weight[2] kg
6"	4"	Sched. 40	Cl. 150	112.0	279.4	295	300	25.5	38
		Sched. 40	Cl. 300	112.0	317.5	295	300	38.5	55
		Sched. 80	Cl. 150	112.0	279.4	295	300	26.0	38
		Sched. 80	Cl. 300	112.0	317.5	295	300	39.0	55
8"	6"	Sched. 40	Cl. 150	146.3	342.9	319	300	28.4	55
		Sched. 40	Cl. 300	146.3	381	319	300	41.1	75

[1] The dimension H increases by 29 mm for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure ratings up to PN 40, Cl. 300, 20K).
[2] The weight data refer to the compact version. The weight increases by 0.5 kg for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure rating up to PN 40, Cl. 300, 20K). The weight is increased by 6 kg for the Dualsens version.
[3] Not available as Dualsens version.

Flanged versions (R Style) to JIS B2220
Prowirl 72F, 73F

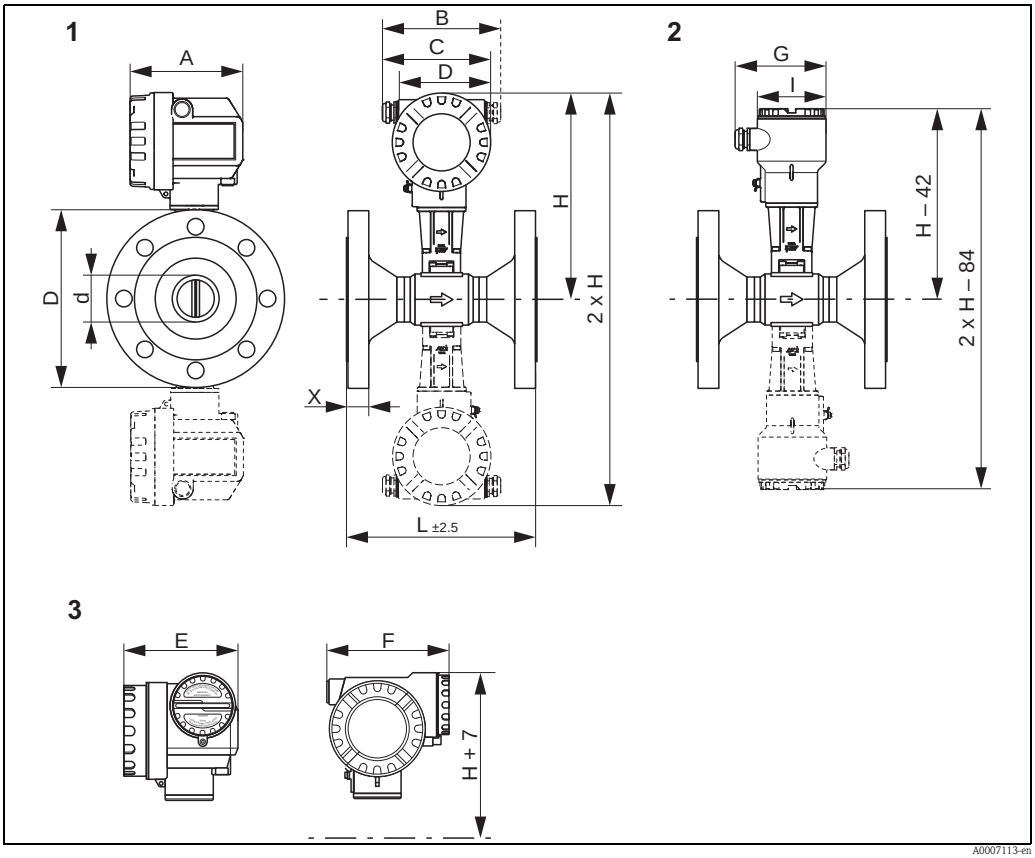
DN	Inner diameter	Pressure rating		d [mm]	D [mm]	H[1] [mm]	L [mm]	X [mm]	Weight[2] [kg]
25[3]	15	Sched. 40	20K	22.0	125	248	200	18.5	7
		Sched. 80	20K	22.0	125	248	200	18.5	7
40[3]	25	Sched. 40	20K	30.0	140	255	200	18.5	8
		Sched. 80	20K	30.0	140	255	200	19.0	8
50	40	Sched. 40	10K	45.0	155	263	200	20.0	10
		Sched. 40	20K	45.0	155	263	200	22.0	10
		Sched. 80	10K	45.0	155	263	200	20.0	10
		Sched. 80	20K	45.0	155	263	200	22.0	10
80	50	Sched. 40	10K	56.5	185	270	200	22.0	13
		Sched. 40	20K	56.5	200	270	200	26.5	16
		Sched. 80	10K	56.5	185	270	200	22.0	13
		Sched. 80	20K	56.5	200	270	200	27.0	16
100	80	Sched. 40	10K	87.0	210	283	250	22.0	17
		Sched. 40	20K	87.0	225	283	250	25.5	20
		Sched. 80	10K	87.0	210	283	250	22.0	17
		Sched. 80	20K	87.0	225	283	250	26.0	20
150	100	Sched. 40	10K	112.0	280	295	300	31.0	36
		Sched. 40	20K	112.0	305	295	300	37.5	46
		Sched. 80	10K	112.0	280	295	300	31.5	36
		Sched. 80	20K	112.0	305	295	300	37.5	46
200	150	Sched. 40	10K	146.3	330	319	300	26.5	45
		Sched. 40	20K	146.3	350	319	300	31	53

[1] The dimension H increases by 29 mm for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure ratings up to PN 40, Cl. 300, 20K).
[2] The weight data refer to the compact version. The weight increases by 0.5 kg for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure rating up to PN 40, Cl. 300, 20K). The weight is increased by 6 kg for the Dualsens version.
[3] Not available as Dualsens version.

Dimensions of flanged versions "S Style" (double reduction of line size)
Prowirl 72F, 73F

Versions with integrated line size reduction (hydraulically effective cross-section smaller than connection nominal diameter) offering improved measurement in the lower flow range.

Flange connection dimensions in accordance with flange standard:
- EN 1092-1 (DIN 2501), Ra = 6.3 to 12.5 µm
- Raised face to:
  EN 1092-1 Form B1 (DIN 2526 Form C), PN 10 to 40, Ra = 6.3 to 12.5 µm,
  optional with groove to EN 1091-1 Form D (DIN 2512 Form N)
- ANSI B16.5, Class 150 to 300, Ra = 125 to 250 µin
- JIS B2220, 10 to 20K, Ra = 125 to 250 µin



1 = Standard, Ex i and Ex n version ; d: connection pipe internal diameter
2 = Remote version
3 = Ex d/XP version (transmitter)

Dotted line: Dualsens version

A [mm]	B [mm]	C [mm]	E [mm]	F [mm]	G [mm]	J [mm]	K [mm]
149	161 to 181	141 to 151	121	105	95	151	161

* The dimensions below change as follows in the blind version (without local operation):
– Standard, Ex i/IS and Ex n version: The dimension 149 mm changes to 142 mm in the blind version.
– Ex d/XP version: The dimension 151 mm changes to 144 mm in the blind version.
** The dimension depends on the cable gland used.

Note!
The transmitter housing has one cable gland or cable entry. Measuring devices with a pulse, frequency or status output have two cable glands or cable entries (devices with TIIS approval only have one cable gland).

Flanged versions (S Style) to EN 1092-1 (DIN 2501)
Prowirl 72F, 73F

DN	Inner diameter	Pressure rating	d [mm]	D [mm]	H[1] [mm]	L [mm]	X [mm]	Weight[2] [kg]
40[3]	15	PN 40	22	150	248	200	21.0	9
50[3]	25	PN 40	30	165	255	200	21.0	11
80	40	PN 40	45	200	263	200	25.5	16
100	50	PN 16	62	220	270	250	24.0	19
		PN 40	62	235	270	250	27.5	22
150	80	PN 16	92	285	283	300	25.0	32
		PN 40	92	300	283	300	32.0	42
200	100	PN 10	112	340	295	300	26.0	48
		PN 16	112	340	295	300	27.0	48
		PN 25	112	360	295	300	33.5	59
		PN 40	112	375	295	300	38.5	69
250	150	PN 10	202.7	395	319	380	24	64
		PN 16	202.7	405	319	380	27	66.5
		PN 25	202.7	425	319	380	32	79
		PN 40	202.7	450	319	380	39	103

1) The dimension H increases by 29 mm for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure ratings up to PN 40, Cl. 300, 20K).
2) The weight data refer to the compact version. The weight increases by 0.5 kg for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure rating up to PN 40, Cl. 300, 20K). The weight is increased by 6 kg for the Dualsens version.
3) Not available as Dualsens version.

Flanged versions (S Style) to ANSI B16.5
Prowirl 72F, 73F

DN	Inner dia-meter	Pressure rating		d mm	D mm	H[1] mm	L mm	X mm	Weight[2] kg
1½"[3]	½"	Sched. 40	Cl. 150	22	127.0	248	200	19.0	8
		Sched. 40	Cl. 300	22	155.4	248	200	27.0	11
		Sched. 80	Cl. 150	22	127.0	248	200	19.5	8
		Sched. 80	Cl. 300	22	155.4	248	200	27.0	11
2"[3]	1"	Sched. 40	Cl. 150	30	152.4	255	200	21.0	10
		Sched. 40	Cl. 300	30	165.1	255	200	26.0	13
		Sched. 80	Cl. 150	30	152.4	255	200	21.0	10
		Sched. 80	Cl. 300	30	165.1	255	200	26.0	13
3"	1½"	Sched. 40	Cl. 150	45	190.5	263	200	25.0	17
		Sched. 40	Cl. 300	45	209.6	263	200	37.9	22
		Sched. 80	Cl. 150	45	190.5	263	200	25.0	17
		Sched. 80	Cl. 300	45	209.6	263	200	37.9	22
4"	2"	Sched. 40	Cl. 150	62	228.6	270	250	26.5	23
		Sched. 40	Cl. 300	62	254.0	270	250	31.8	31
		Sched. 80	Cl. 150	62	228.6	270	250	26.5	23
		Sched. 80	Cl. 300	62	254.0	270	250	31.8	31
6"	3"	Sched. 40	Cl. 150	92	279.4	283	300	26.5	40
		Sched. 40	Cl. 300	92	317.5	283	300	41.5	60
		Sched. 80	Cl. 150	92	279.4	283	300	27.0	40
		Sched. 80	Cl. 300	92	317.5	283	300	42.0	60

Flanged versions (S Style) to ANSI B16.5
Prowirl 72F, 73F

DN	Inner diameter	Pressure rating		d mm	D mm	H[1] mm	L mm	X mm	Weight[2] kg
8"	4"	Sched. 40	Cl. 150	112	342.9	295	300	28.4	61
		Sched. 40	Cl. 300	112	381.0	295	300	47.5	92
10"	6"	Sched. 40	Cl. 150	202.7	406.4	319	380	31.4	91
		Sched. 40	Cl. 300	202.7	444.5	319	380	46.9	129

[1] The dimension H increases by 29 mm for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure ratings up to PN 40, Cl. 300, 20K).
[2] The weight data refer to the compact version. The weight increases by 0.5 kg for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure rating up to PN 40, Cl. 300, 20K). The weight is increased by 6 kg for the Dualsens version.
[3] Not available as Dualsens version.

Flanged versions (S Style) to JIS B2220
Prowirl 72F, 73F

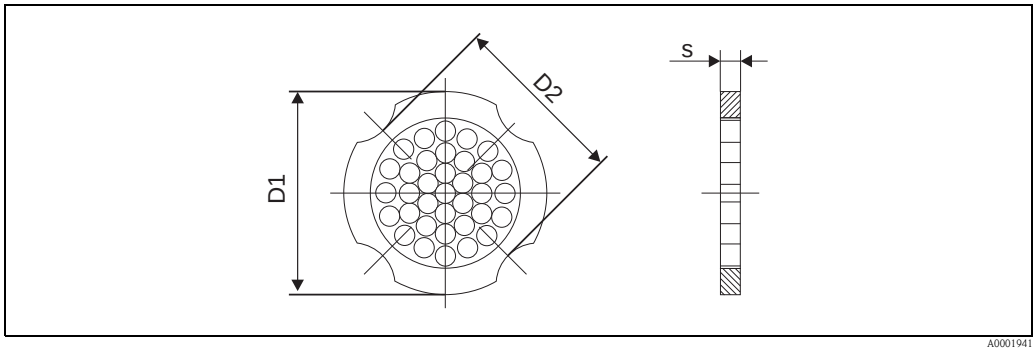
DN	Inner diameter	Pressure rating		d [mm]	D [mm]	H[1] [mm]	L [mm]	X [mm]	Weight[2] [kg]
40[3]	15	Sched. 40	20K	22	140	248	200	20.5	8
		Sched. 80	20K	22	140	248	200	20.5	8
50[3]	25	Sched. 40	10K	30	155	255	200	20.5	9
		Sched. 40	20K	30	155	255	200	21.0	11
		Sched. 80	10K	30	155	255	200	20.5	9
		Sched. 80	20K	30	155	255	200	21.0	11
80	40	Sched. 40	10K	45	185	263	200	22.0	13
		Sched. 40	20K	45	200	263	200	25.5	17
		Sched. 80	10K	45	185	263	200	22.0	13
		Sched. 80	20K	45	200	263	200	25.5	17
100	50	Sched. 40	10K	62	210	270	250	25.5	17
		Sched. 40	20K	62	225	270	250	29.0	21
		Sched. 80	10K	62	210	270	250	26.0	17
		Sched. 80	20K	62	225	270	250	29.5	21
150	80	Sched. 40	10K	92	280	283	300	31.0	34
		Sched. 40	20K	92	305	283	300	38.5	45
		Sched. 80	10K	92	280	283	300	31.5	34
		Sched. 80	20K	92	305	283	300	39.0	45
200	100	Sched. 40	10K	112	330	295	300	33.5	50
		Sched. 40	20K	112	350	295	300	43.5	67
250	150	Sched. 40	10K	202.7	400	319	380	30.5	73
		Sched. 40	20K	202.7	430	319	380	37	95

[1] The dimension H increases by 29 mm for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure ratings up to PN 40, Cl. 300, 20K).
[2] The weight data refer to the compact version. The weight increases by 0.5 kg for Prowirl 72 (high-temperature version and for the version with a DSC sensor made of Alloy C-22) and for Prowirl 73 (pressure rating up to PN 40, Cl. 300, 20K). The weight is increased by 6 kg for the Dualsens version.
[3] Not available as Dualsens version.

Dimensions of flow conditioner to EN (DIN)/ANSI/JIS (accessory)

Dimensions to:
- EN 1092-1 (DIN 2501)
- ANSI B16.5
- JIS B2220

Material 1.4404 (316L) or 1.4435 (316L), in compliance with NACE MR0175-2003 and MR0103-2003.



D1: The flow conditioner is fitted at the external diameter between the bolts.
D2: The flow conditioner is fitted at the indentations between the bolts.

Flow conditioner to EN (DIN)					
DN	Pressure rating	Centering diameter [mm]	D1/D2 *	s [mm]	Weight [kg]
15	PN 10 to 40 PN 63	54.3 64.3	D2 D1	2.0	0.04 0.05
25	PN 10 to 40 PN 63	74.3 85.3	D1 D1	3.5	0.12 0.15
40	PN 10 to 40 PN 63	95.3 106.3	D1 D1	5.3	0.3 0.4
50	PN 10 to 40 PN 63	110.0 116.3	D2 D1	6.8	0.5 0.6
80	PN 10 to 40 PN 63	145.3 151.3	D2 D1	10.1	1.4
100	PN 10/16 PN 25/40 PN 63	165.3 171.3 176.5	D2 D1 D2	13.3	2.4
150	PN 10/16 PN 25/40 PN 63	221.0 227.0 252.0	D2 D2 D1	20.0	6.3 7.8 7.8
200	PN 10 PN 16 PN 25 PN 40	274.0 274.0 280.0 294.0	D1 D2 D1 D2	26.3	11.5 12.3 12.3 15.9
250	PN 10/16 PN 25 PN 40	330.0 340.0 355.0	D2 D1 D2	33.0	25.7 25.7 27.5
300	PN 10/16 PN 25 PN 40	380.0 404.0 420.0	D2 D1 D1	39.6	36.4 36.4 44.7

* D1 → The flow conditioner is fitted at the external diameter between the bolts.
D2 → The flow conditioner is fitted at the indentations between the bolts.

Flow conditioner to ANSI						
DN		Pressure rating	Centering diameter [mm]	D1/D2 *	s [mm]	Weight [kg]
15	½"	Cl. 150 Cl. 300	50.1 56.5	D1 D1	2.0	0.03 0.04
25	1"	Cl. 150 Cl. 300	69.2 74.3	D2 D1	3.5	0.12
40	1½"	Cl. 150 Cl. 300	88.2 97.7	D2 D2	5.3	0.3
50	2"	Cl. 150 Cl. 300	106.6 113.0	D2 D1	6.8	0.5
80	3"	Cl. 150 Cl. 300	138.4 151.3	D1 D1	10.1	1.2 1.4
100	4"	Cl. 150 Cl. 300	176.5 182.6	D2 D1	13.3	2.7
150	6"	Cl. 150 Cl. 300	223.9 252.0	D1 D1	20.0	6.3 7.8
200	8"	Cl. 150 Cl. 300	274.0 309.0	D2 D1	26.3	12.3 15.8
250	10"	Cl. 150 Cl. 300	340.0 363.0	D1 D1	33.0	25.7 27.5
300	12"	Cl. 150 Cl. 300	404.0 402.0	D1 D1	39.6	36.4 44.6

* D1 → The flow conditioner is fitted at the external diameter between the bolts.
D2 → The flow conditioner is fitted at the indentations between the bolts.

Flow conditioner to JIS					
DN	Pressure rating	Centering diameter [mm]	D1/D2 *	s [mm]	Weight [kg]
15	10K	60.3	D2	2.0	0.06
	20K	60.3	D2	2.0	0.06
	40K	66.3	D1	2.0	0.06
25	10K	76.3	D2	3.5	0.14
	20K	76.3	D2	3.5	0.14
	40K	81.3	D1	3.5	0.14
40	10K	91.3	D2	5.3	0.31
	20K	91.3	D2	5.3	0.31
	40K	102.3	D1	5.3	0.31
50	10K	106.6	D2	6.8	0.47
	20K	106.6	D2	6.8	0.47
	40K	116.3	D1	6.8	0.5
80	10K	136.3	D2	10.1	1.1
	20K	142.3	D1	10.1	1.1
	40K	151.3	D1	10.1	1.3
100	10K	161.3	D2	13.3	1.8
	20K	167.3	D1	13.3	1.8
	40K	175.3	D1	13.3	2.1
150	10K	221.0	D2	20.0	4.5
	20K	240.0	D1	20.0	5.5
	40K	252.0	D1	20.0	6.2
200	10K	271.0	D2	26.3	9.2
	20K	284.0	D1	26.3	9.2

Flow conditioner to JIS					
DN	Pressure rating	Centering diameter [mm]	D1/D2 *	s [mm]	Weight [kg]
250	10K	330.0	D2	33.0	15.8
	20K	355.0	D2	33.0	19.1
300	10K	380.0	D2	39.6	26.5
	20K	404.0	D1	39.6	26.5

* D1 → The flow conditioner is fitted at the external diameter between the bolts.
D2 → The flow conditioner is fitted at the indentations between the bolts.

Weight

- Weight of Prowirl 72W, 73W → 📄 33 ff.
- Weight of Prowirl 72F, 73F → 📄 35 ff.
- Weight of flow conditioner to EN (DIN)/ANSI/JIS → 📄 48 ff.

Material

Transmitter housing

- Powder-coated die-cast aluminum AlSi10Mg
  - In accordance with EN 1706/EN AC-43400 (EEx d/XP version: cast aluminum EN 1706/EN AC-43000)

Sensor

- Flanged version
  - Stainless steel, A351-CF3M (1.4404), in compliance with NACE MR0175-2003 and MR0103-2003
  - Pressure ratings PN 250, Class 900 to 1500 and butt-weld version (only for Prowirl 72) 1.4571 (316Ti; UNS S31635); in compliance with NACE MR0175-2003 and MR0103-2003
- Alloy C-22 version (only for Prowirl 72)
  - Alloy C-22 2.4602 (A 494-CX2MW/N 26022); in compliance with NACE MR0175-2003 and MR0103-2003
- Wafer version
  - Stainless steel, A351-CF3M (1.4404), in compliance with NACE MR0175-2003 and MR0103-2003

Flanges

- EN (DIN)
  - Stainless steel, A351-CF3M (1.4404), in compliance with NACE MR0175-2003 and MR0103-2003
  - DN 15 to 150 with pressure ratings to PN 40 and all devices with integrated diameter reduction (R Style, S Style): construction with weld-on flanges made of 1.4404 (AISI 316L).
    PN 63 to 160 (in development for Prowirl 73), nominal diameters DN 200 to 300: fully cast construction A351-CF3M (1.4404 (AISI 316L)), in compliance with NACE MR0175-2003 and MR0103-2003
  - Pressure rating PN 250 (only for Prowirl 72) 1.4571 (316Ti, UNS S31635); in compliance with NACE MR0175-2003 and MR0103-2003
- ANSI and JIS
  - Stainless steel, A351-CF3M, in compliance with NACE MR0175-2003 and MR0103-2003
  - ½ to 6" with pressure ratings to Class 300 and DN 15 to 150 with pressure ratings to 20K and all devices with integrated diameter reduction (R Style, S Style): construction with weld-on flanges made of 316/316L, in compliance with NACE MR0175-2003 and MR0103-2003.
    Class 600 (in development for Prowirl 73), DN 15 to 150 with pressure rating 40K,
    (in development for Prowirl 73), nominal diameters 8 to 12": fully cast construction A351-CF3M; in compliance with NACE MR0175-2003 and MR0103-2003
  - Pressure ratings Class 900 to 1500: 316/316L; in compliance with NACE MR0175-2003 and MR0103-2003 (only Prowirl 72)
- Alloy C-22 version (EN/DIN/ANSI/JIS)
  - Alloy C-22 2.4602 (A 494-CX2MW/N 26022); in compliance with NACE MR0175-2003 and MR0103-2003

DSC sensor (differential switched capacitor)

- Wetted parts (marked as "wet" on the DSC sensor flange):
  - Standard for pressure ratings up to PN 40, Class 300, JIS 40K:
    Stainless steel 1.4435 (316L), in compliance with NACE MR0175-2003 and MR0103-2003
  - Pressure ratings PN 63 to 160, Class 600, 40K (in development for Prowirl 73):
    Inconel 2.4668/N 07718 (B637) (Inconel 718); in compliance with NACE MR0175-2003 and MR0103-2003
  - Pressure ratings PN 250, Class 900 to 1500 and butt-weld version (only for Prowirl 72):
    titanium Gr. 5 (B-348; UNS R50250; 3.7165)
  - Alloy C-22 sensor (only for Prowirl 72):
    Alloy C-22, 2.4602/N 06022; in compliance with NACE MR0175-2003 and MR0103-2003

Non-wetted parts

- Stainless steel 1.4301 (304)

Support

- Stainless steel, 1.4308 (CF8)
- Pressure ratings PN 250, Class 900 to 1500 and butt-weld version (only for Prowirl 72): 1.4305 (303)

Seals

- Graphite
  - Pressure rating PN 10 to 40, Class 150 to 300, JIS 10 to 20K: Sigraflex Folie Z
    (BAM-tested for oxygen applications)
  - Pressure rating PN 63 to 160, Class 600, JIS 40K: Sigraflex Hochdruck^{TM} with stainless steel sheet reinforcement made of 316(L)
    (BAM-tested for oxygen applications, "high quality in terms of TA Luft (German Clean Air Act)"
  - Pressure rating PN 250, Class 900 to 1500: Grafoil with perforated stainless steel reinforcement made of 316
- Viton
- Kalrez 6375
- Gylon (PTFE) 3504 (BAM-tested for oxygen applications, "high quality in terms of TA Luft (German Clean Air Act)"

Human interface

Display elements

Liquid crystal display, double-spaced, plain text display, 16 characters per line
Display can be configured individually, e.g. for measured variables and status values, totalizers

Operating elements (HART)

Local operation with three keys ⊞, ⊟, Ⓔ)
Quick Setup for quick commissioning
Operating elements accessible also in Ex-zones

Remote operation

Operation via:
- HART
- PROFIBUS PA
- FOUNDATION Fieldbus
- FieldCare (software package from Endress+Hauser for complete configuration, commissioning and diagnosis)

Certificates and approvals

CE mark

The measuring system described in these Operating Instructions complies with the legal requirements of the EU Directives. Endress+Hauser confirms this by affixing the CE mark to it and by issuing the CE Declaration of Conformity.

C-tick mark

The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

Ex-approval

- Ex i/IS and Ex n:
  - ATEX/CENELEC
    II1/2G, EEx ia IIC T1 to T6 (T1 to T4 for PROFIBUS PA and FOUNDATION Fieldbus)
    II1/2GD, EEx ia IIC T1 to T6 (T1 to T4 for PROFIBUS PA and FOUNDATION Fieldbus)
    II1G, EEx ia IIC T1 to T6 (T1 to T4 for PROFIBUS PA and FOUNDATION Fieldbus)
    II2G, EEx ia IIC T1 to T6 (T1 to T4 for PROFIBUS PA and FOUNDATION Fieldbus)
    II3G, EEx nA IIC T1 to T6 X (T1 to T4 X for PROFIBUS PA and FOUNDATION Fieldbus)
  - FM
    Class I/II/III Div. 1/2, Group A to G; Class I Zone 0, Group IIC
  - CSA
    Class I/II/III Div. 1/2, Group A to G; Class I Zone 0, Group IIC
    Class II Div. 1, Group E to G
    Class III
  - NEPSI
    Ex ia IIC
    Ex nA
- Ex d/XP:
  - ATEX/CENELEC
    II1/2G, EEx d [ia] IIC T1 to T6 (T1 to T4 for PROFIBUS PA and FOUNDATION Fieldbus)
    II1/2GD, EEx ia IIC T1 to T6 (T1 to T4 for PROFIBUS PA and FOUNDATION Fieldbus)
    II2G, EEx d [ia] IIC T1 to T6 (T1 to T4 for PROFIBUS PA and FOUNDATION Fieldbus)
  - FM
    Class I/II/III Div. 1, Groups A to G
  - CSA
    Class I/II/III Div. 1, Groups A to G
    Class II Div. 1, Groups E to G
    Class III
  - TIIS
    Ex d [ia] IIC T1
    Ex d [ia] IIC T4

More information on the Ex-approvals can be found in the separate Ex-documentation.

Pressure measuring device approval

All measuring devices, including those with a nominal diameter smaller than or equal to DN 25, correspond to Article 3(3) of the EC Directive 97/23/EC (Pressure Equipment Directive) and have been designed and manufactured according to good engineering practice. For nominal diameters greater than DN 25 (depending on the fluid and process pressure), there are additional optional approvals according to category II/III.

Certification FOUNDATION Fieldbus

The flowmeter has successfully passed all test procedures and is certified and registered by the Fieldbus FOUNDATION. The device thus meets all the requirements of the following specifications:

- Certified to FOUNDATION Fieldbus Specification
- The device meets all the specifications of the FOUNDATION Fieldbus-H1.
- Interoperability Test Kit (ITK), revision status 4.5 (device certification number available on request): The device can also be operated with certified devices of other manufacturers.
- Physical Layer Conformance Test of the Fieldbus FOUNDATION

Certification PROFIBUS PA

The flowmeter has successfully passed all test procedures and is certified and registered by the PNO (PROFIBUS User Organization). The device thus meets all the requirements of the following specifications:

- Certified to PROFIBUS PA Profile Version 3.0 (device certification number: on request)
- The device can also be operated with certified devices of other manufacturers (interoperability)

Other standards and guidelines

- EN 60529
  Degrees of protection by housing (IP code)

- EN 61010-1
  Safety requirements for electrical equipment for measurement, control and laboratory use

- IEC/EN 61326
  Electromagnetic compatibility (EMC requirements)

- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment

- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal

- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics

- NACE Standard MR0103-2003
  Standard Material Requirements - Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments

- NACE Standard MR0175-2003
  Standard Material Requirements – Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment

- VDI 2643
  Measurement of fluid flow by means of vortex flowmeters.

- ANSI/ISA-S82.01
  Safety Standard for Electrical and Electronic Test, Measuring, Controlling and Related Equipment - General Requirements. Pollution degree 2, Installation Category II

- CAN/CSA-C22.2 No. 1010.1-92
  Safety Standard for Electrical Equipment for Measurement and Control and Laboratory Use. Pollution degree 2, Installation Category II

- The International Association for the Properties of Water and Steam – Release on the IAPWS Industrial Formulation 1997 for the Thermodynamic Properties of Water and Steam

- ASME International Steam Tables for Industrial Use (2000)

- American Gas Association (1962)
  A.G.A. Manual for the Determination of Supercompressibility Factors for Natural Gas - PAR Research Project NX-19.

- American Gas Association Transmission Measurement Committee Report No. 8 (AGA8), November 1992. American Petroleum Institute MPMS Chapter 14.2: *Compressibility and Supercompressibility for Natural Gas and Other Hydrocarbon Gases.*

- ISO 12213 Natural gas (2006) - Calculation of compression factor
  – Part 2: Calculation using molar composition analysis (ISO 12213-2)
  – Part 3: Calculation using physical properties (ISO 12213-2)

- GERG Groupe Européen des Recherches Gazières (1991): Technical Monograph TM 5 - Standard GERG Virial Equation for Field Use. Simplification of the input data requirements for the GERG Virial Equation - an alternative means of compressibility factor calculation for natural gases and similar mixtures. Publishing house of Verein Deutscher Ingenieure (Association of German Engineers), Düsseldorf.

- ISO 6976-1995: Natural gas — Calculation of calorific values, density, relative density and Wobbe index from composition.

- Gas Processors Association GPA Standard 2172-96
- American Petroleum Institute API MPMS 14.5 (1996). Calculation of Gross Heating Value, Relative Density and Compressibility Factor for Natural Gas Mixtures from Compositional Analysis.

Functional safety

Prowirl 72: SIL 2 in accordance with IEC 61508/IEC 61511-1

Prowirl 73: SIL 1

Following the link **http://www.endress.com/sil** you will find an overview of all Endress+Hauser devices for SIL applications including parameters like SFF, MTBF, PFD_{avg} etc.

Ordering information

Ordering information and detailed information on the order code can be obtained from your Endress+Hauser Service Organization.

Additional ordering information for Prowirl 72

Prowirl 72 can also be ordered as a preconfigured unit. For this purpose, the following information is needed when ordering:
- Operating language
- Type of fluid: liquid, gaseous or vaporous.
- 20-mA value: measured value at which a current of 20 mA should be set.
  Optional: time constant and failsafe mode (min. current, max. current, etc.)
- Optionally also pulse value, pulse duration, output signal and failsafe mode if the measuring device has a pulse output.
- Average operating density incl. unit if the flow is to be output in mass units.
- Operating and reference density of the fluid including the unit if the flow is to be output in corrected volume units.
- Optional: assignment of the first and second line on the local display and desired unit for the totalizer.

The measuring device can be reset to the delivery state indicated in the order at any time.

Additional ordering information for Prowirl 73

Prowirl 73 can also be ordered as a preconfigured unit. For this purpose, the following information is needed when ordering:
- Operating language
- Type of fluid: saturated steam, superheated steam, water, compressed air, natural gas AGA NX-19 (optional), real gas, customer-defined liquid, gas volume, liquid volume, water delta heat (only for 4 to 20 mA HART), saturated steam delta heat (only for 4 to 20 mA HART).
- Average operating pressure (in bar absolute) or whether the pressure should be read into Prowirl 73 from an external sensor (possible for superheated steam, compressed air, natural gas AGA NX-19, real gas).
- Average ambient pressure (in bar absolute) if the pressure is read into Prowirl 73 from an external pressure sensor.
- Reference pressure and temperature if corrected volume units are selected as an output.
- For applications with natural gas AGA NX-19, mol-% nitrogen and mol-% carbon dioxide are also required as is the "specific gravity" (ratio of the density of natural gas to that of air at reference operating conditions).
- For real gas applications, the operating Z-factor, the reference Z-factor and the reference density are also required.
- For customer-defined liquid applications, the average operating temperature, the density the fluid has at this temperature and the linear expansion coefficient of the fluid are also required. These values can also be calculated by Endress+Hauser if the customer specifies the fluid and operating temperature or if the dependency between the fluid density and the temperature is made available in tabular form.
- 4-mA value: measured value (e.g. 50 kg/h) at which a current of 4 mA should be output, incl. unit.
- 20-mA value: measured value (e.g. 1000 kg/h) at which a current of 20 mA should be output, incl. unit, time constant and failsafe mode (min. current, max. current etc.)
- Pulse value incl. unit (if the measuring device has a pulse output), pulse duration, output signal and failsafe mode.
- Optional: assignment of the first and second line on the local display and desired unit for the totalizer. In addition, you can also tell us what fault values apply for temperature and pressure, where applicable.

- Optional: configuration of the extended diagnostic functions, e.g. maximum/minimum temperature, maximum flow velocity, etc.

The measuring device can be reset to the delivery state indicated in the order at any time.

Product structure for flanged devices "R Style" and "S Style" (with diameter reduction)

R Style		Single reduction of line size (>)
7*F	**RF** -**********	DN 25 (1") > DN 15 (½")
	RG -**********	DN 40 (1½") > DN 25 (1")
	RJ -**********	DN 50 (2") > DN 40 (1½")
	RK -**********	DN 80 (3") > DN 50 (2")
	RM-**********	DN 100 (4") > DN 80 (3")
	RN -**********	DN 150 (6") > DN 100 (4")
	RR-**********	DN 200 (8") > DN 150 (6")
S Style		Double reduction of line size (>>)
7*F	**SF** -**********	DN 40 (1½") >> DN 15 (½")
	SG -**********	DN 50 (2") >> DN 25 (1")
	SJ -**********	DN 80 (3") >> DN 40 (1½")
	SK -**********	DN 100 (4") >> DN 50 (2")
	SM-**********	DN 150 (6") >> DN 80 (3")
	SN -**********	DN 200 (8") >> DN 100 (4")
	SR -**********	DN 250 (10") >> DN 150 (6")

Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor. Detailed information on the order code in question can be obtained from your Endress+Hauser representative.

Device-specific accessories

Accessory	Description	Order code
Transmitter Proline Prowirl 72/73	Transmitter for replacement or for stock. Use the order code to define the following specifications: ■ Approvals – Degree of protection/version – Cable entry – Display/operation – Software ■ Outputs/inputs	72XXX - XXXXX ****** 73XXX - XXXXX ******

Measuring principle-specific accessories

Accessory	Description	Order code
Mounting kit for Prowirl 72/73W	Mounting kit for wafer comprising: ■ Threaded studs ■ Nuts incl. washers ■ Flange seals	DKW** - ***
Mounting kit for transmitter	Mounting kit for remote version, suitable for pipe and wall mounting.	DK5WM - B
Memograph M graphic display recorder	The Memograph M graphic display recorder provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a DSD card or USB stick. Memograph M boasts a modular design, intuitive operation and a comprehensive security concept. The ReadWin® 2000 PC software is part of the standard package and is used for configuring, visualizing and archiving the data captured. The mathematics channels which are optionally available enable continuous monitoring of specific energy consumption, boiler efficiency and other parameters which are important for efficient energy management.	RSG40 - **********
Flow conditioner	To reduce the inlet run downstream of flow disturbances.	DK7ST - ***
Pressure transmitter Cerabar T	Cerabar T is used to measure the absolute and gauge pressure of gases, steams and liquids (compensation with RMC621 for example).	PMC131 - **** PMP131 - ****
Pressure transmitter Cerabar M	Cerabar M is used to measure the absolute and gauge pressure of gases, steams and liquids. ■ Can also be used for reading external pressure values into Prowirl 73 via the burst mode. ■ Can also be ordered with ready-activated burst mode (special product with version 9=TSPSC2821). ■ Can also be used for reading external pressure values into Prowirl 73 via PROFIBUS PA (only absolute pressure).	PMC41 - ********** PMP41 - ********** PM*4* - ******H/J9***

Accessory	Description	Order code
Pressure transmitter Cerabar S	Cerabar S is used to measure the absolute and gauge pressure of gases, steams and liquids. ■ Can also be used for reading external pressure values into Prowirl 73 via the burst mode. ■ Can also be ordered with ready-activated burst mode (special product with version 9=TSPSC2822). ■ Can also be used for reading external pressure values into Prowirl 73 via PROFIBUS PA or FOUNDATION Fieldbus (only absolute pressure).	PMC71 - ********** PMP71 - ********** PM*7* - *A/B/C********9
RTD temperature Omnigrad TR10	Multipurpose temperature sensor, mineral-insulated insert with protection well and transmitter housing. Together with a HART-compatible transmitter, it can be used for to read the temperature into Prowirl 73 in the burst mode.	TR10 - *******R/T**** THT1-L**
Active barrier RN221N	Active barrier with power supply for safe separation of 4 to 20 mA standard signal circuits: ■ Galvanic isolation of 4 to 20 mA circuits ■ Elimination of ground loops ■ Power supply of two-wire transmitters ■ Can be used in Ex area (ATEX, FM, CSA, TIIS) ■ HART input-compatible (e.g. for reading in an external pressure value) ✎ Note! If RN221N - *3 is used for the HART input, this results in an error message for Prowirl 73 and can not be used for pressure compensation.	RN221N - *1
Process display RIA250	Multifunctional 1-channel display unit: ■ Universal input ■ Transmitter power supply ■ Limit relay ■ Analog output	RIA250 - ******
Process display RIA251	Digital display unit for looping into 4 to 20 mA current loop; can be used in Ex area (ATEX, FM, CSA).	RIA251 - **
Field display RIA261	Digital field display unit for looping into 4 to 20 mA current loop; can be used in Ex area (ATEX, FM, CSA).	RIA261 - ***
Process transmitter RMA422	Multifunctional 1-2 channel top-hat rail device with intrinsically safe current inputs and transmitter power supply, limit value monitoring, mathematic functions (e.g. difference ascertain) and 1-2 analog outputs. Optional: intrinsically safe inputs, can be used in Ex area (ATEX). Possible applications: leak detection, delta heat (between two Prowirl measuring points), totalizing (of flows in two pipes) etc.	RMA422 - *******
Overvoltage protection HAW562Z	Overvoltage protection for restricting overvoltage in signal lines and components.	51003575
Overvoltage protection HAW569	Overvoltage protection for restricting overvoltage for direct mounting to Prowirl 73 and other devices.	HAW569 - **1A
Heat computer RMS621	Steam and heat computer for industrial energy balancing of steam and water. Calculation of the following applications: ■ Steam mass ■ Steam heat quantity ■ Net steam heat quantity ■ Steam delta heat ■ Water heat quantity ■ Water delta heat Simultaneous calculation of up to three applications per device.	RMS621-*********

Accessory	Description	Order code
Energy Manager RMC621	Universal Energy Manager for gas, liquids, steam and water. Calculation of volumetric flow and mass flow, standard volume, heat flow and energy.	RMC621 - **********
Application Manager RMM621	Electronic recording, display, balancing, control, saving, event and alarm monitoring of analog and digital input signals. Values and states determined are output by means of analog and digital output signals. Remote transmission of alarms, input values and calculated values using a PSTN or GSM modem.	RMM621 - **********
Conversion kits	Several conversion kits are available, e.g.: ■ Conversion of Prowirl 77 to Prowirl 72 or 73 ■ Conversion of a compact version to a remote version	DK7UP - **
Weather protection cover	Protective hood against direct sunshine.	543199-0001

Communication-specific accessories

Accessory	Description	Order code
HART Field Communicator DXR375	Handheld terminal for remote configuration and for obtaining measured values via the current output HART (4 to 20 mA) and FOUNDATION Fieldbus (FF). Contact your Endress+Hauser representative for more information.	DXR375 - *******
Fieldgate FXA320	Gateway for remote interrogation of HART sensors and actuators via Web browser: ■ 2-channel, analog input (4 to 20 mA) ■ 4 binary inputs with event counter function and frequency measurement ■ Communication via modem, Ethernet or GSM ■ Visualization via Internet/Intranet in Web browser and/or WAP cellular phone ■ Limit value monitoring with alarms sent by e-mail or SMS ■ Synchronized time-stamping of all measured values	FXA320 - *****
Fieldgate FXA520	Gateway for remote interrogation of HART sensors and actuators via Web browser: ■ Web server for remote monitoring of up to 30 measuring points ■ Intrinsically safe version [EEx ia]IIC for applications in Ex area ■ Communication via modem, Ethernet or GSM ■ Visualization via Internet/Intranet in Web browser and/or WAP cellular phone ■ Limit value monitoring with alarms sent by e-mail or SMS ■ Synchronized time-stamping of all measured values ■ Remote diagnosis and remote configuration of connected HART devices Note! If Fieldgate FXA520 is used for the HART input, this results in an error message for Prowirl 73 and is not recommended.	FXA520 - ****

Accessory	Description	Order code
Fieldgate FXA720	Gateway for remote interrogation of PROFIBUS sensors and actuators via Web browser: – Web server for remote monitoring of up to 30 measuring points – Intrinsically safe version [EEx ia]IIC for applications in Ex area – Communication via modem, Ethernet or GSM – Visualization via Internet/Intranet in Web browser and/or WAP cellular phone – Limit value monitoring with alarms sent by e-mail or SMS – Synchronized time-stamping of all measured values – Remote diagnosis and remote configuration of connected HART devices	FXA720 - ****

Service-specific accessories

Accessory	Description	Order code
Applicator	Software for selecting and planning flowmeters. The Applicator can be downloaded from the Internet or ordered on CD-ROM for installation on a local PC. Contact your Endress+Hauser representative for more information.	DXA80 - *
Fieldcheck	Tester/simulator for testing flowmeters in the field. When used in conjunction with the "FieldCare" software package, test results can be imported into a database, printed out and used for official certification. Contact your Endress+Hauser representative for more information.	50098801
FieldCare	FieldCare is Endress+Hauser's FDT-based plant asset management tool. It can configure all intelligent field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.	See the product page on the Endress+Hauser Web site: www.endress.com
FXA193	Service interface from the measuring device to the PC for operation via FieldCare.	FXA193 – *

Documentation

- Operating Instructions Proline Prowirl 72
- Operating Instructions Proline Prowirl 72 PROFIBUS PA
- Operating Instructions Proline Prowirl 72 FOUNDATION Fieldbus
- Operating Instructions Proline Prowirl 73
- Operating Instructions Proline Prowirl 73 PROFIBUS PA
- Operating Instructions Proline Prowirl 73 FOUNDATION Fieldbus
- Related Ex-documentation: ATEX, FM, CSA etc.
- Supplementary documentation on "Information on the Pressure Equipment Directive"

Registered trademarks

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  Registered trademark of the HART Communication Foundation, Austin, USA
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FM+SGML 6.0 ProMoDo

SeaMetrics FT420 Flow Computer

FT400-Series

FLOW COMPUTER INSTRUCTIONS

- [redacted]
- FT420

FT400-SERIES FLOW COMPUTER INSTRUCTIONS

ISO 9001:2000 CERTIFIED

SeaMetrics

The Leader in Flow Meter Value

TABLE OF CONTENTS

TABLES AND DIAGRAMS

GENERAL INFORMATION

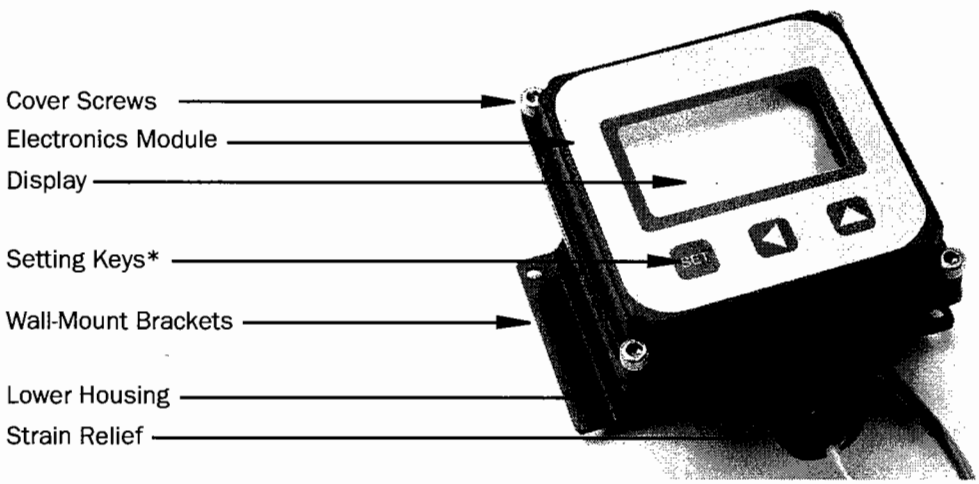
The FT400-Series flow computers are microcontroller-based indicator/transmitters that display flow rate and total and provide output signals. The FT415 is battery-powered and provides a scalable pulse output. The FT420 is powered by external DC voltage and has both pulse and 4-20 mA analog outputs. The FT420 is a "two-wire" or "loop-powered" device, meaning that the 4-20 mA output signal doubles as its power supply. Because of this, it is designed to operate on less than 4 mA of current.

The addition of a dual-relay output board allows for certain applications requiring dry contact output (e.g., certain metering pumps and water treatment controls). Dual relays provide exactly the same pulse output as the standard unit, and each can signal one external device. A non-resettable total is also available. The FT420 can be ordered in a plastic enclosure with a 115 Vac power supply for use with mechanical meters, or with a built-in 115 Vac/12-24 Vdc dual power supply for magmeters.

Both the FT415 and the FT420 can be factory-mounted on the meter (-M) or remotely wall mounted with the brackets provided (-W). The FT420 is also available as a panel mount (-P) with an open back for easy installation in the user's own electrical enclosure. Most FT400's can be converted from wall-to-meter or meter-to-wall mount configurations after installation if needed.

Housings for the -W and -M models are rugged cast aluminum, gasketed for maximum environmental protection. A membrane keypad allows settings to be changed without removing the cover. (Password protection, a standard feature, can be used to prevent settings from being changed.)

FEATURES



*Includes password protection for tamper prevention when needed

SPECIFICATIONS		FT415	FT420
Power		Lithium "C", 3.6 Vdc, replaceable, 3-5 year life	4 mA DC (4-20 mA loop), 12-32 Vdc
Display	**Rate**	6-digit autorange, 1/2" character height	6-digit autorange, 1/2" character height
	Total	8-digit, 5/16" character height	8-digit, 5/16" character height
Output	**Pulse**	0.1 second open collector pulse (scaled) Sensor pulse (unscaled) High alarm or low alarm	0.1 second open collector pulse (scaled) Sensor pulse (unscaled) High alarm or low alarm
	Analog	None	4-20 mA loop; 24-32 Vdc
Pulse Output Range		0.1 - 9999999.9 units/pulse	0.1 - 9999999.9 units/pulse
Input		Micropower GMR Sensor (square wave)	Open collector/switch @ 5 Vdc
Input Range		1.0 - 2,500 pulses/second	1.0 - 10,000 pulses/second
K-Factor Range		.001 - 99999.999	.001 - 99999.999
Flow Alarm Output Range		.01 - 999999.99	.01 - 999999.99
Temperature		0° C - 70° C (32° - 158° F)	0° C - 70° C (32° - 158° F)
Environmental		NEMA 4X	NEMA 4X

INSTALLATION

Wall Mount. To mount an FT400-Series indicator to the wall, hold the unit in the desired position, mark the holes in the mounting feet, drill and mount with screws. With the FT420W-65 option, first remove the front cover to gain access to the mounting screw holes.

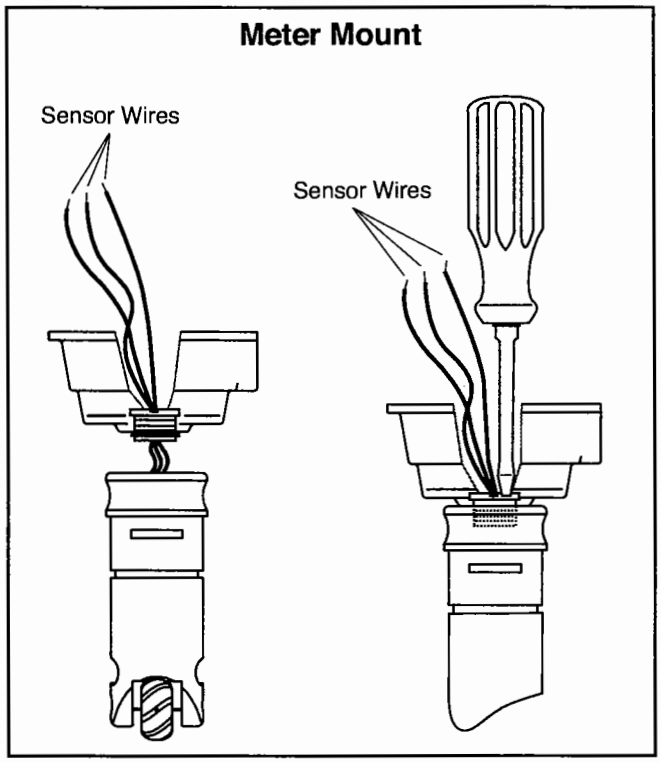
A meter-mounted FT400-Series can be converted to a wall mount using an MK20 mounting kit.

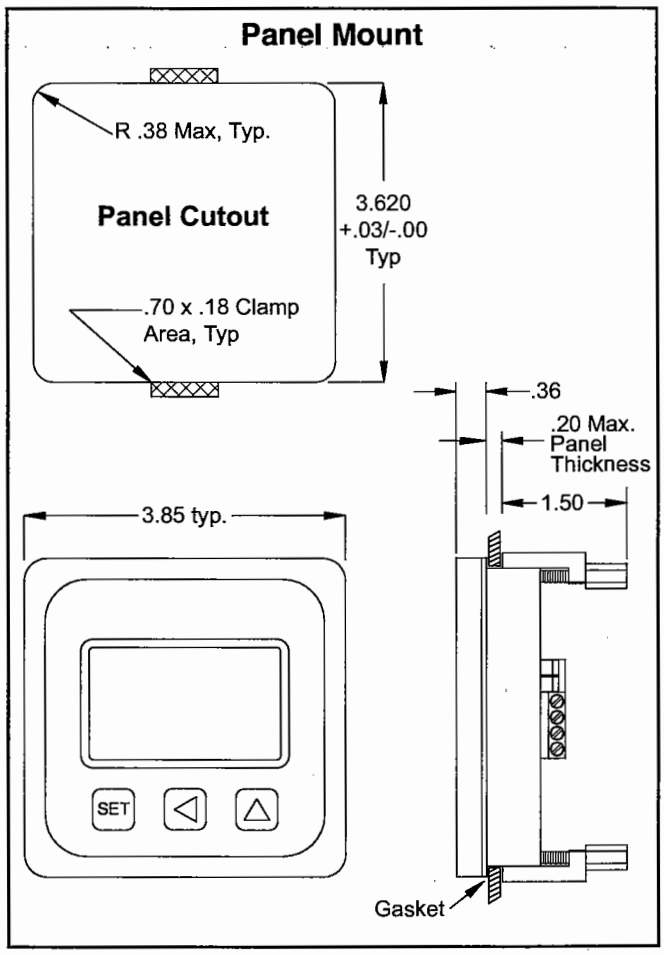
Meter Mount. If the FT400-Series indicator was ordered as an -M model, the housing is already directly mounted to the flow sensor and needs no further installation.

An FT400-Series module can be converted from a wall-to a meter-mount using the MK10 adapter kit that includes a lower housing and associated hardware as follows:

1) Remove the strain relief through which the flow sensor cable runs.
2) Cut the cable to about 6" in length. Carefully strip the cable jacket to expose the three colored wires (red, white, and black) inside.
3) Route the wires through the threaded connector pre-installed in the bottom of the housing.
4) Start the threaded connector into the female thread on the top of the flow sensor. Be sure to match the oblong shape on the bottom of the housing to the depression on the top of the flow sensor.
5) Using an ordinary screwdriver inserted in one side of the slot (see drawing), tighten the screw as much as possible.
6) Strip the wire ends, make the connections to the FT400-Series indicator as shown in Connections Diagrams, and then use the cover screws to attach the indicator to the top of the housing.

Panel Mount (FT420 Only). Using the "Panel Cutout" drawing as a guide, cut a square hole in the panel. Remove the clamps from the back of the FT420P and insert the indicator unit through the cutout, taking care that the panel sealing gasket is in place between the front of the panel and the flange of the indicator. Hold the indicator in place while starting the screw of one of the two clamps. Finger tighten the screw, then install the other clamp. When both are in place, firmly tighten the clamps with a small wrench or nut driver.





Connections. To connect the FT400-Series flow computer to a flow sensor or an external device such as a chemical metering pump, follow the Standard Connections diagrams on pages 4-6.

If the FT420's 4-20 mA current signal is not required, connect the power terminals to any Vdc current source.

Dual Relay Output (Option -98). If you purchase the FT420 with option 98, the required component will come preinstalled, and no extra procedures are required.

If you are retrofitting an existing installation of an FT420 with the dual relay board, please follow the instructions below:

1) Peel the backing off of the double-stick tape and affix it to the bottom of the relay board (part #30221).
2) Carefully attach the board to the FT420 as shown in the FT420-98 Connection diagram on page 5. Be sure that the red wire faces the "Sensor Input" side of the FT420, and that the white wire faces the "Pulse Output" side.
3) Connect the white wire to the "Pulse Scaled" positive terminal, and the red wire to the "Power 4-20 mA" positive terminal.
4) Connect devices to the relays as desired.

-98 Relay Board Specifications

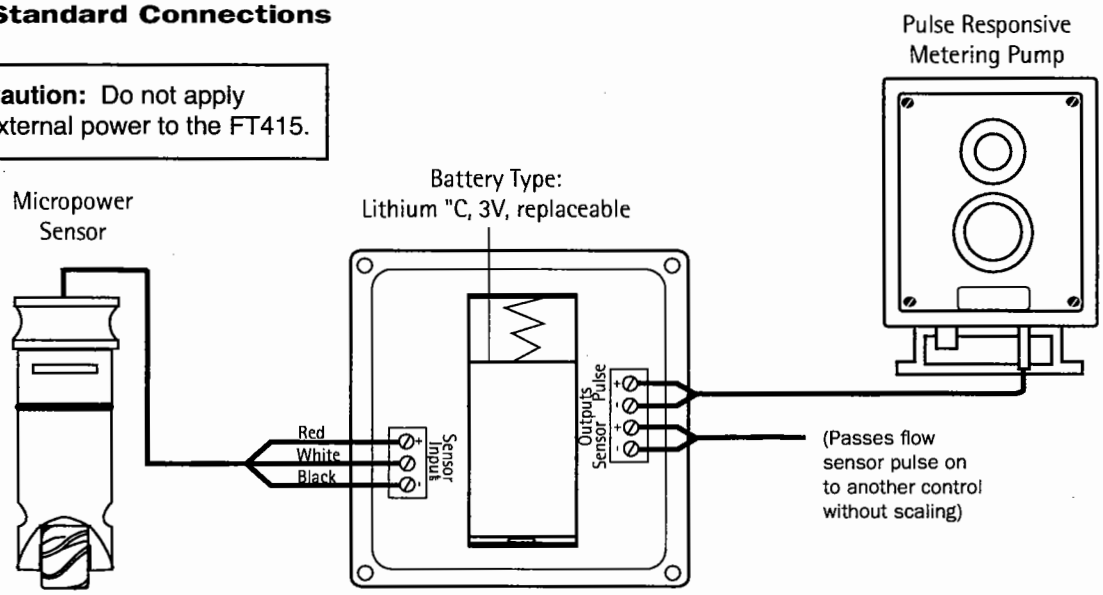
Input Voltage	7-30 Vdc	
Output Current (both outputs)		
Input Voltage	50 C	85 C
12 Vdc	120 mA	70 mA
24 Vdc	120 mA	80 mA
Max Pulses/Second		5
Contact Time Per Output		100 ms

Caution: If output is being used to control an external device, such as a metering pump, do not connect the device until programming is completed. If malfunction or incorrect programming of the output could cause personal injury or property damage, separate safeguards must be installed to prevent such injury or damage.

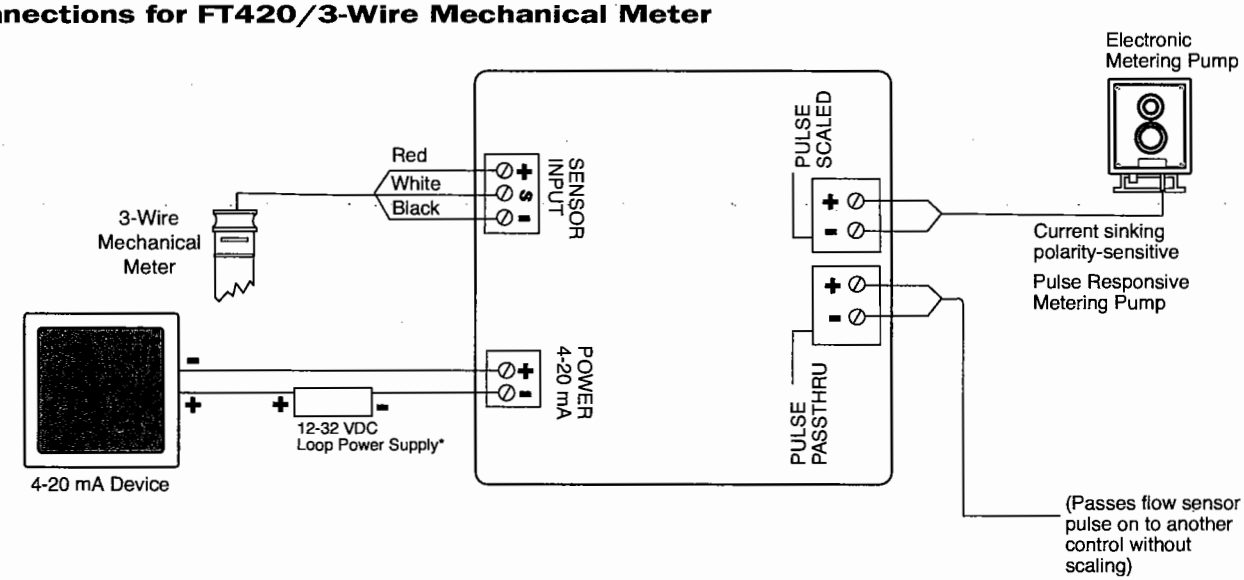
CONNECTION DIAGRAMS

FT415 Standard Connections

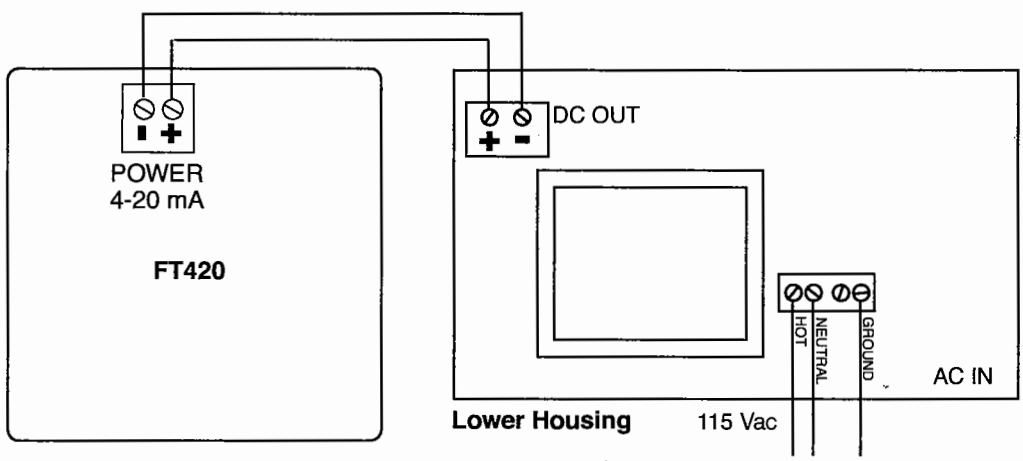
Caution: Do not apply external power to the FT415.



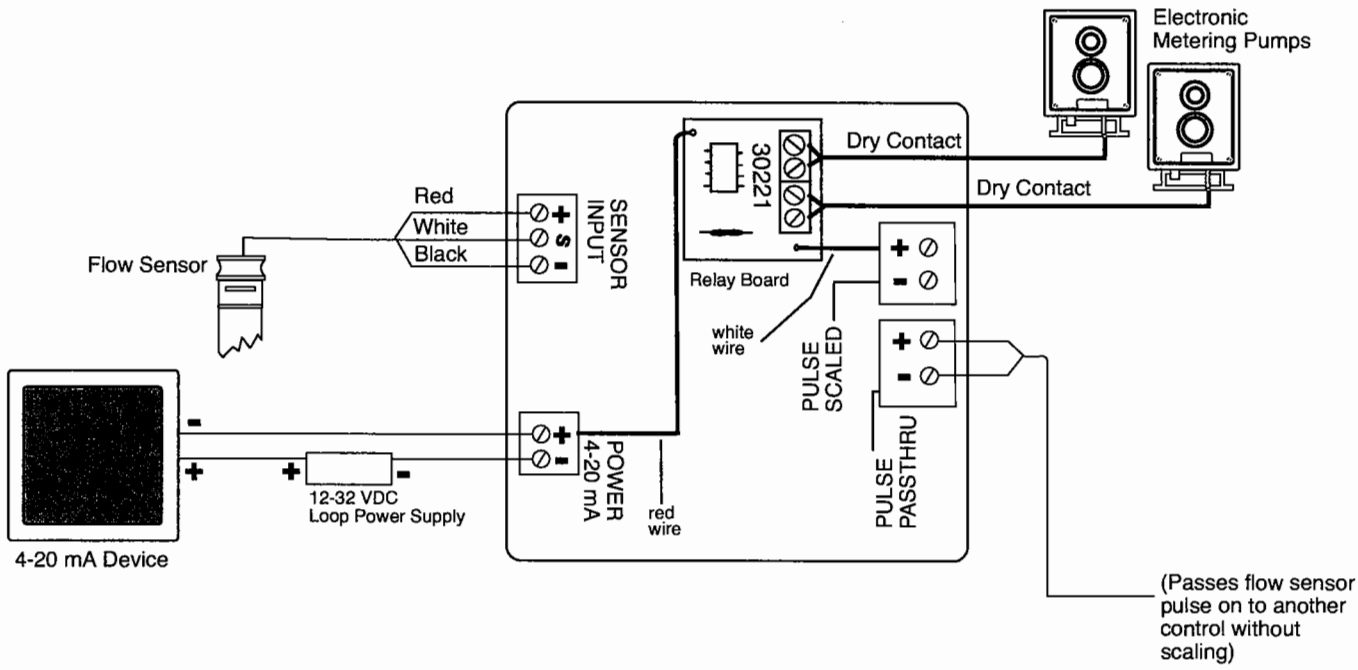
Connections for FT420/3-Wire Mechanical Meter



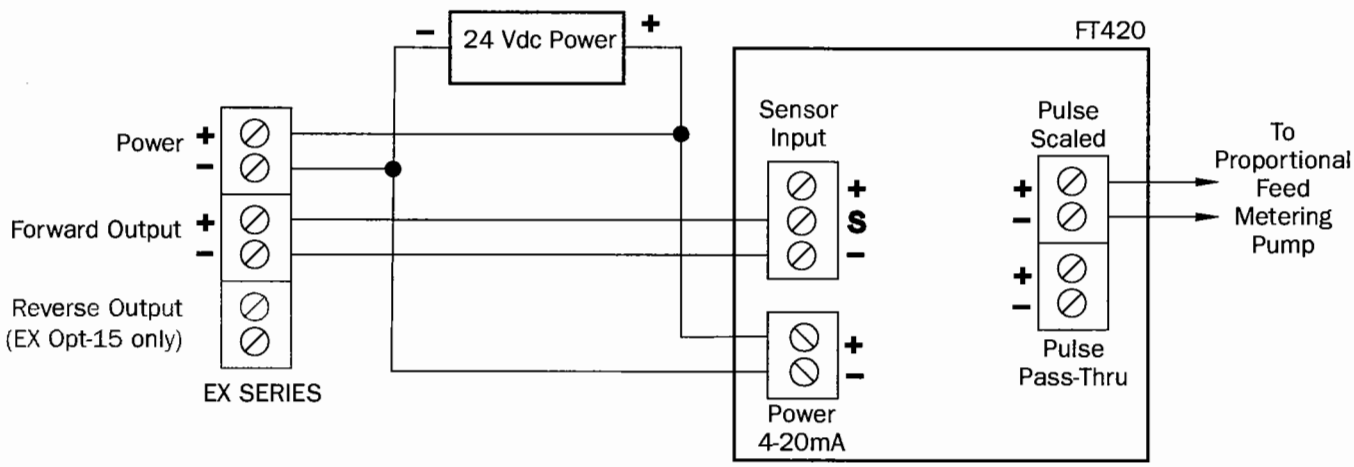
Connections for FT420-65 (115 Vac Option)



Connections for FT420-98 (Dual Relay Output Option)



Connections for FT420/EX Magmeter

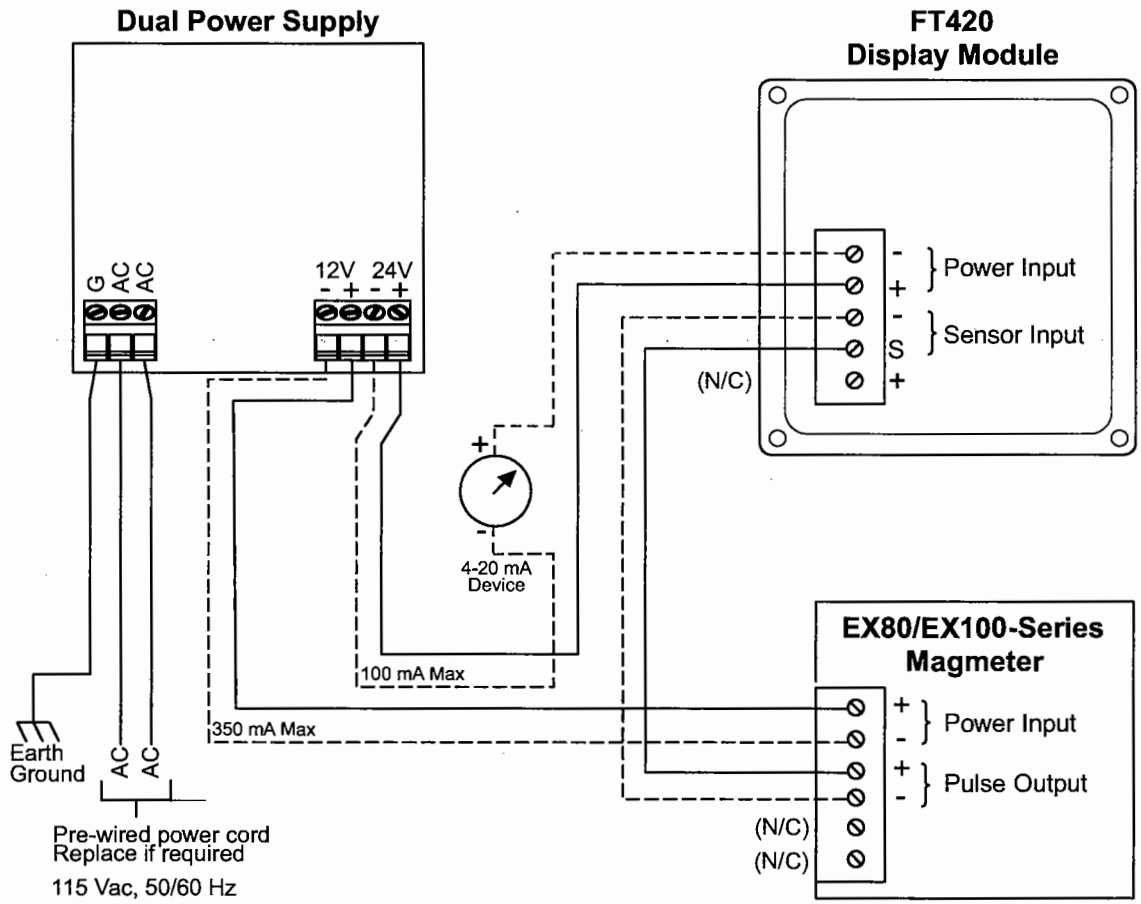


Connections for FT420/EX Magmeter/Dual Power Supply

A dual power supply is required when a 4-20 mA output is needed.

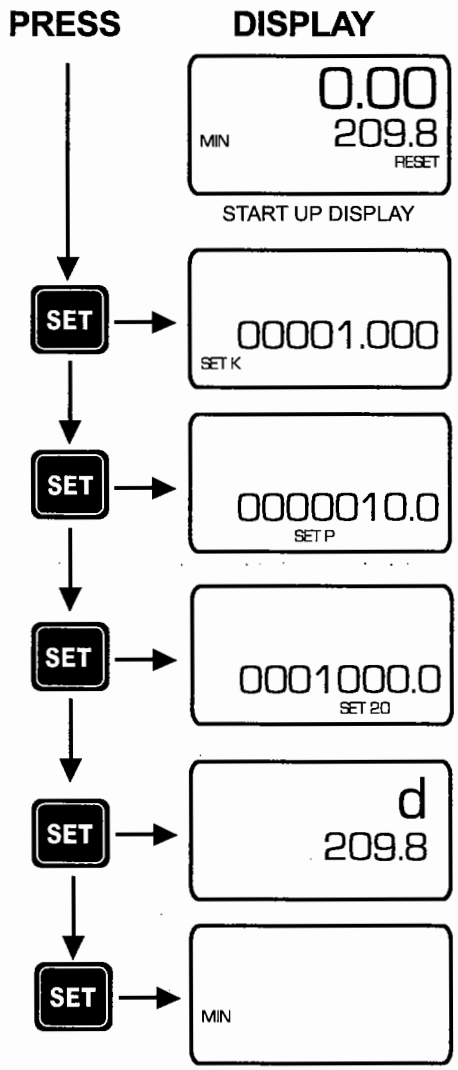
Caution 1: Important! Do not connect power to the power supply until all connections have been made and confirmed correct, and the cover has been put back into place.

Caution 2: It is essential for safety and proper operation to use a ground connection for the 115 Vac power. Do not use this power supply without proper grounding.



QUICK SETTINGS OVERVIEW

See following page for step-by-step instructions on changing these settings



Large digits display instantaneous flow rate (GPM). Small digits display total flow (since last reset).

K is the number of pulses the flow sensor provides for every gallon of flow. Find it on the fitting (80-Series) or chart (100/200-Series) or on the SeaMetrics website.

P is the number of gallons per pulse desired on the scalable pulse output. (Example: P=1 is one pulse per gallon.) Skip without changing if you are not using the pulse output.

20 is the 20 mA maximum analog output. Set the flow rate you want to match maximum output. Example: 250 gpm maximum expected flow, "set 20" to 250. The analog output will scale to 4 mA at zero flow, 20 mA at 250 gpm*. **This setting appears on the FT420 ONLY.**

d is the decimal point. It toggles back and forth with the ▲. Set as many decimal places as needed. For higher flows, no decimal allows maximum number of whole digits.

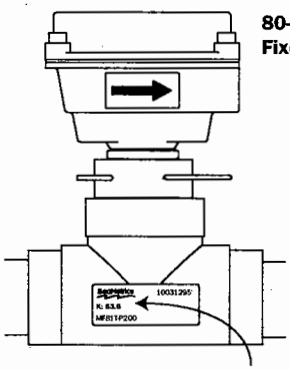
MIN is the time base, for example, gallons *per minute*. Use the ▲ to select sec/min/hour/day.

***NOTE:** Use the up arrow key to reach your desired digit. Then press the left arrow key to move to the next digit. Repeat the process until the entire number is entered.

K-FACTOR

At a minimum, every FT400-Series flow computer must be programmed with the "K-factor". (This is the number of pulses that the meter produces per gallon of flow.) If you wish the FT400 to read in units other than gallons, see below.

The K-factor on any SeaMetrics flow sensor fitting or in-line meter can be found on the model-serial label. The line reading K = xxxx gives the desired number. For depth-adjustable sensors (101,201,115,215 models), look in the instruction manual under your pipe size. For EX meters, use the calculator on our website.



80-Series Fixed Depth Meter

Find Your K-Factor Here

READING IN OTHER UNITS

Changing Volume Units. The default K-factor units are pulses per gallon. To read your total in metric or other units instead, the standard K-factor must be converted to the desired volume units. For example, to read in pulses per liter, the K-factor must be multiplied by the applicable number shown below.

NOTE: Both rate & total will read in whatever units you choose.

To Convert K to:	Multiply by:
Liters	.26418
Cubic Meters	264.18
Fluid Ounces	.0078
Cubic Feet	7.48

Changing Time Units: To read your rate in liters per second (for example), convert the K-factor volume units as shown above and change the time units to Seconds, using the Set Time Unit instructions at right.

Set K. Begin by pressing the SET key once. The prompt SET K should appear on the display. The digit to the far right will be blinking. Use the up arrow key to reach your desired value. Then press the left arrow key to move to the next digit. Repeat the process until the entire number is entered. (Note that the decimal is fixed at three places. If you only have two decimal places for your K-factor, enter a zero for the third digit.) Press SET to advance. (**Note:** If unable to set K-factor, the unit is "locked" to prevent tampering. Please contact your Distributor for assistance.)

Set P/Flow Alarm. At this screen you may select between pulse output (P) or flow alarm (A) functions. If the pulse output and flow alarm features are not being used, this step can be skipped. The P (pulse output) setting does not affect anything if it is not being used.

Set P is the default that appears on a new FT400-Series. On an FT400 that has been previously set up with flow alarm function, an A will appear on this screen. To move between P and A screens, firmly press all three keys for 5-10 seconds, then use the up arrow to scroll through the three options: P, AL HI (high flow alarm) and AL LO (low flow alarm).

Set P. From this screen, follow the same process as for Set K to enter the desired pulse rate. This is the number of gallons (or whatever units are programmed) between pulses. (**Note:** Using the pulse output function disables the high and low flow alarm functions.)

Set Flow Alarm. From the A screen, use the up arrow key to choose either AL HI or AL LO and then press the SET key to set the alarm rate. Use the up arrow and left arrow as above to reach the desired digits. (**Note:** Using the flow alarm function disables the pulse output function.)

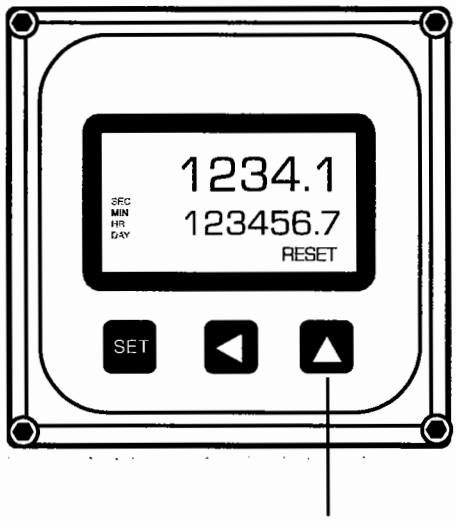
Set 20 mA (FT420 Only). Press the SET key to advance to SET 20, to set the flow rate, in volume units per time unit, at which 20 mA is desired. Use the up arrow key to reach your desired value. Then press the left arrow key to move to the next digit. Repeat the process until the entire number is entered. The processor will automatically scale the 4-20 mA loop accordingly, with 4 mA at zero flow.

Set Decimal Point. Press the SET key again for the D prompt. Pressing the up arrow key switches among no decimal place, one decimal place and two decimal places.

Set Time Unit. When the SET key is pressed again, a blinking time unit appears. Press the up arrow key to select SEC (seconds), MIN (minutes), HR (hours) or DAY (days) (for example, gal/min, or gal/hr).

To return to normal operation after entering settings, press SET again. When the unit is connected to an operating flow sensor, the rate (larger digits) and total (smaller digits) indicator numbers should appear in the display.

Resettable/Non-Resettable Totalizer. Unless the unit has been ordered with the non-reset option, a RESET prompt is visible in the lower right corner above the up arrow key, when the display is in use. Press the up arrow key at any time to reset the totalizer to zero. (**Note:** If you need to reset a unit that has been ordered with a non-resettable totalizer, contact your distributor.)



This key resets total to zero when in normal run mode.

CAUTION: Do not touch up Arrow button unless you intend to RESET Total to Zero. TOTAL IS NOT RECOVERABLE.

Operation of 4-20 mA Output (FT420 Only). If the 4-20 mA output is in use and is correctly connected, the signal should vary between 4 mA and 20 mA in proportion to the flow, with the top flow rate set by the user (see Settings, page 8). At no time should the signal drop below 4 mA. A reading between 0 and 4 mA indicates a fault of some type, typically in the loop power supply or the connections (see Troubleshooting, back page). In the rare instance that the 4-20 signal fluctuates excessively ("paints") it may need to be damped by additional averaging. Contact Seametrics for information on how to increase filtering.

Operation of the Pulse Output. If the pulse output is being used (either standard electronic or relay-type), it should pulse for 0.1 second every time the set number of gallons has been totalized. If a pulse-responsive metering pump is properly connected to this output, it should stroke periodically. If this does not occur, see Troubleshooting, back page.

FT415 Battery Change. The expected average life of the battery ranges between 3-5 years depending on the frequency of the input. The battery is easily pulled and replaced. When the battery is removed, all of the settings will be retained.

CAUTION: During a battery change, the totalizer will reset to a previous total, which represents the last auto-backup (auto backups occur at approximately 4 minute intervals). If it is necessary to save the exact current total at the time of the battery change, save before removing the battery as follows:

1) Simultaneously press the SET and up arrow keys
2) Press SET again
3) Again simultaneously press the SET and up arrow keys

TROUBLESHOOTING

Problem	Probable Cause	Try...
Display blank	No power to the unit	Check for minimum 12 Vdc at power terminals
	Short in sensor circuit	Disconnect sensor, see if display returns (zero flow rate)
	Battery dead or loose (FT415 only)	Wiggle battery, replace if over three years old
Display missing segments	Damaged display module	Contact distributor for return/replacement
Display reading meaningless characters	Unit's microcontroller crashed	Disconnect and reconnect power, if problem repeats, contact distributor for return/replacement
	Battery nearly dead	Replace battery if over three years old
Display reads normally, flow rate incorrect	Wrong K-factor or time base entered	Enter correct K-factor from meter, fitting, or manual
Display reads normally, incorrect pulse output	Wrong pulse output setting	Use "Set P" to correct pulse output setting
	Polarity reversed on pulse output terminals	Reverse leads
Display reads normally, but no (or incorrect) 4-20 mA output (FT420 only)	Wrong 20 mA setting	Use "Set 20" to correct target top flow rate
	Inadequate loop power supply voltage	Check voltage (for 4-20 mA applications, 24 Vdc recommended)
	Polarity incorrect in 4-20 mA loop circuit	Compare to Connections diagram
Display reads zero when there is flow	Flow sensor failed	Consult flow sensor manual for how to test
	Break in flow sensor circuit	Check for continuity with multimeter
	Flow sensor not battery-compatible	Check flow sensor model number for "micropower option"
Display reads flow rate when there is none	Long flow sensor wire, running parallel to power wires	Reroute wire or change to shielded wire
	Flow sensor malfunction	See flow sensor manual to check
	Flow "jitter" (oscillating slosh) reads as flow	Consult factory for "anti-jitter" setting

SeaMetrics

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LT-13314-B
10/9/06

IP80 Series Flow Sensor Instructions

General Information

The IP80 Series are impeller-type insertion meters designed for use in pipe sizes 1/2" to 8". High-quality jewel bearings and nickel-bound tungsten carbide shaft are used for maximum life and extreme low friction. Bodies are machined from solid rod for maximum precision. Low-flow performance is superior. The rotation of the rotor is detected by a non-drag Hall-effect sensor. Output is a pulse-type square wave, which can be sent long distances (up to 2,000 feet) without a transmitter. This signal can be connected directly to SeaMetrics controls, as well as PLC's, counters, and computer cards.

SeaMetrics IP meters are ideal for chemical proportioning applications. If no display is required, a simple divider such as the PD10 provides adjustable pump pacing. For rate and total display, as well as pump pacing, the FT415/420 flow indicator can be mounted directly on the IP80 Series, or remotely on a wall or panel.

The IP80 Series require special fittings, since they are not depth-adjustable as are the IP 100/200 series meters. Installation in the fitting ensures correct depth placement in the pipe. Fittings are available in PVC, brass, and stainless steel. Sensors are available in brass, 316 stainless steel, PVC, and polypropylene. In plastic pipe 3"-8", use an IP82 sensor, which is 1.00" longer than the IP81 to accommodate the larger fittings.

Specifications

Sensor	
Hall Effect Sensor	12 VDC current sinking pulse
Materials	
Sensor Body	PVC, Polypro, Brass, or 316 SS
Rotor	Kynar
Shaft	Nickel-bound tungsten carbide, ceramic optional
Bearings	Ruby jewel
Maximum Pressure	
PVC	175 PSI (12 bar) at 75° *
Polypro	175 PSI (12 bar) at 75° *
Brass	200 PSI (14 bar)
316 SS	250 PSI (17 bar)
Maximum Temperature	
PVC,Polypro	130° F (55° C)*
Brass, SS	200° F (93° C)
Accuracy	1-1/2% FS

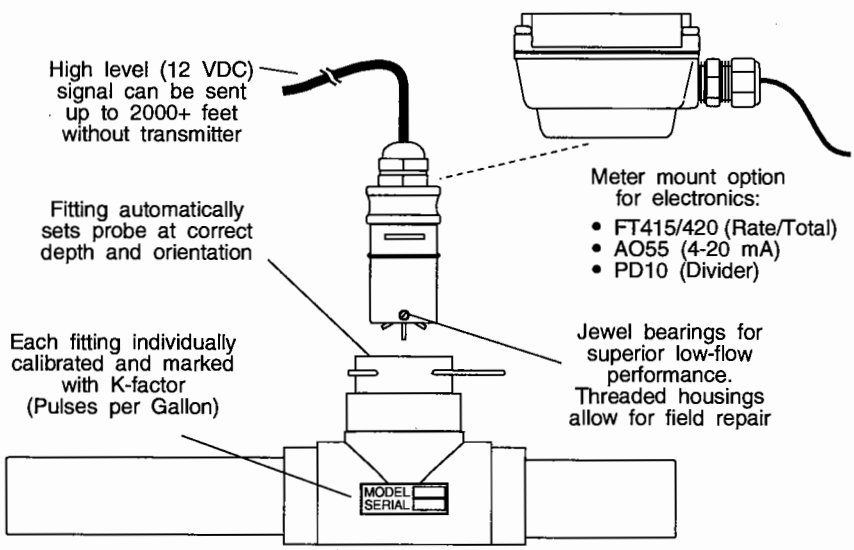
Flow Range (GPM)

	1/2"	3/4"	1"	1-1/2"	2"	3"	4"	6"	8"
Min	0.28	0.5	0.8	1.9	3.1	6.9	12	27	47
Max	28	50	80	190	314	691	1200	2700	4700

Cable	#22 AWG 3-con, 18'

* (see Pressure vs. Temperature chart)

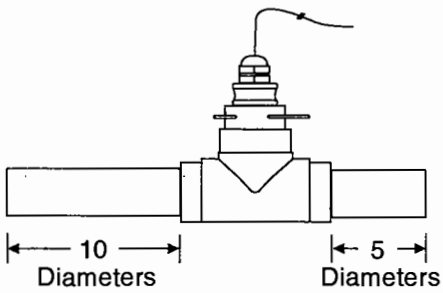
Features



Installation

These water meters are not recommended for installation downstream of the boiler feedwater pump where installation fault may expose the meter to boiler pressure and temperature. Maximum recommended temperature is 130°F (Plastic), 200°F (Metal).

Fitting Installation. IP80 Series meters require special fittings. The meter fitting must first be installed in the pipeline. Straight pipe of at least ten times the diameter upstream of the meter and five diameters downstream are strongly recommended. Inadequate straight pipe, especially downstream of an elbow, change in pipe diameter, or partially-opened valve, can result in significant inaccuracy. Typically this inaccuracy is in the form of the meter reading high. Some IP80 Series meter fittings are supplied with upstream straight pipe.

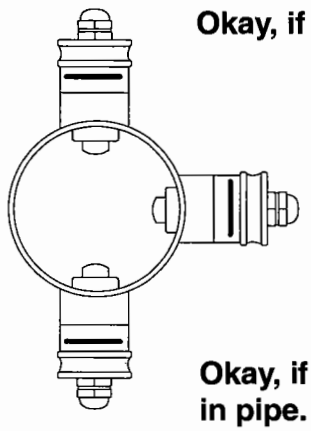


In the larger sizes, the length provided is less than ten diameters upstream and five downstream. It is not advisable to connect directly to the end of these fittings with a flow-disturbing device such as a valve or elbow. If possible, straight pipe should be added to these fittings.

Caution: Never remove the u-clip retainer when the pipe is under pressure. Always remove pressure from the pipe before attempting to remove the meter. Removal under pressure may result in damage or serious injury.

A PVC fitting is usually installed by solvent welding. The stainless steel and brass meter fittings have female pipe threads, requiring the appropriate male threaded fittings. Saddle fittings (size 3" and above) require a hole to be cut in the pipe. The recommended hole size is 1-3/4".

Meter Installation. After the meter fitting is installed in the pipeline, the meter can be installed in the fitting. Press the meter into the fitting as far as it will go. Then retain the meter in place by inserting the u-pin. This pin can be installed from either side. It is sometimes necessary to rotate the probe back and forth slightly to start the pin into the slots on the probe. Slide the pin in as far as it will go.



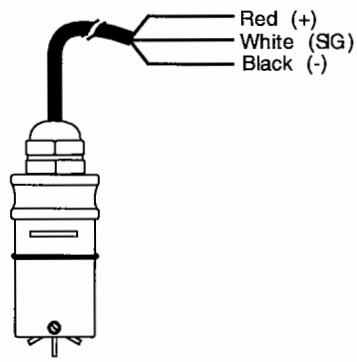
Okay, if no air in pipe

BEST

Okay, if no sediment in pipe.

Meter Connection. See the "IP80 Series Connections" diagram for meter connections. Unless the meter is supplied pre-connected to a meter-mounted FT415/420 flow indicator, three leads must be connected. These three leads are color coded. The red wire is 6-24 VDC positive, the black is negative, and the white wire is the signal lead.

IP80 Series Connections



K-factor. If the IP80 Series meter is ordered with its fitting, the meter is factory calibrated in the fitting. A K-factor (meter factor) is indicated on the side of the fitting. This represents the actual number of pulses per gallon the meter produced during the factory flow test. This number can entered into an FT415/420 or FT5210 flow indicator to make it read properly. If a pulse divider is being used, the K-factor is the starting point for calculating the divider number.

Maintenance and Repair

Rotor Replacement. Rotors are easily field-replaced. Shaft and rotor are a single unit, and are not replaced separately. If replacement is due only to normal shaft wear, bearing replacement is probably not necessary. If the rotor has been damaged by impact, the bearings should also be replaced. Rotor and bearings can be ordered as a kit, Part No.25901. Follow these steps:

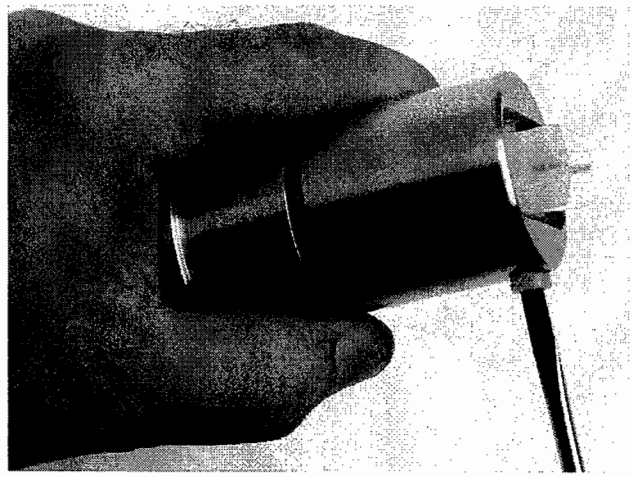
1. Unscrew the threaded bearing housings to expose the shaft ends. If bearings are being replaced, back them completely out.

2. Remove the rotor. Put the new rotor in its place.

3. Thread in one bearing housing part way, then the other. Take care to start the end of the shaft into the bearing hole before tightening further.

4. Screw in bearing housings until they bottom. **Note: Do not use excessive force.**

5. Check for free spin. Blowing lightly on the rotor should result in it spinning rapidly and coasting to a smooth stop.



Sensor Replacement. It is very unusual for a sensor to require replacement in normal use. The primary cause of sensor failure is overvoltage (inadvertent connection of line voltage, for example) or incorrect polarity on hookup. The sensor is replaced by removing the the strain relief, then threading out the sensor retainer plug. Remove the entire sensor capsule by pulling on the cable. The new sensor capsule can then be installed. It is important to orient the sensor capsule properly. Replace the retainer plug, and then replace and tighten the strain relief.

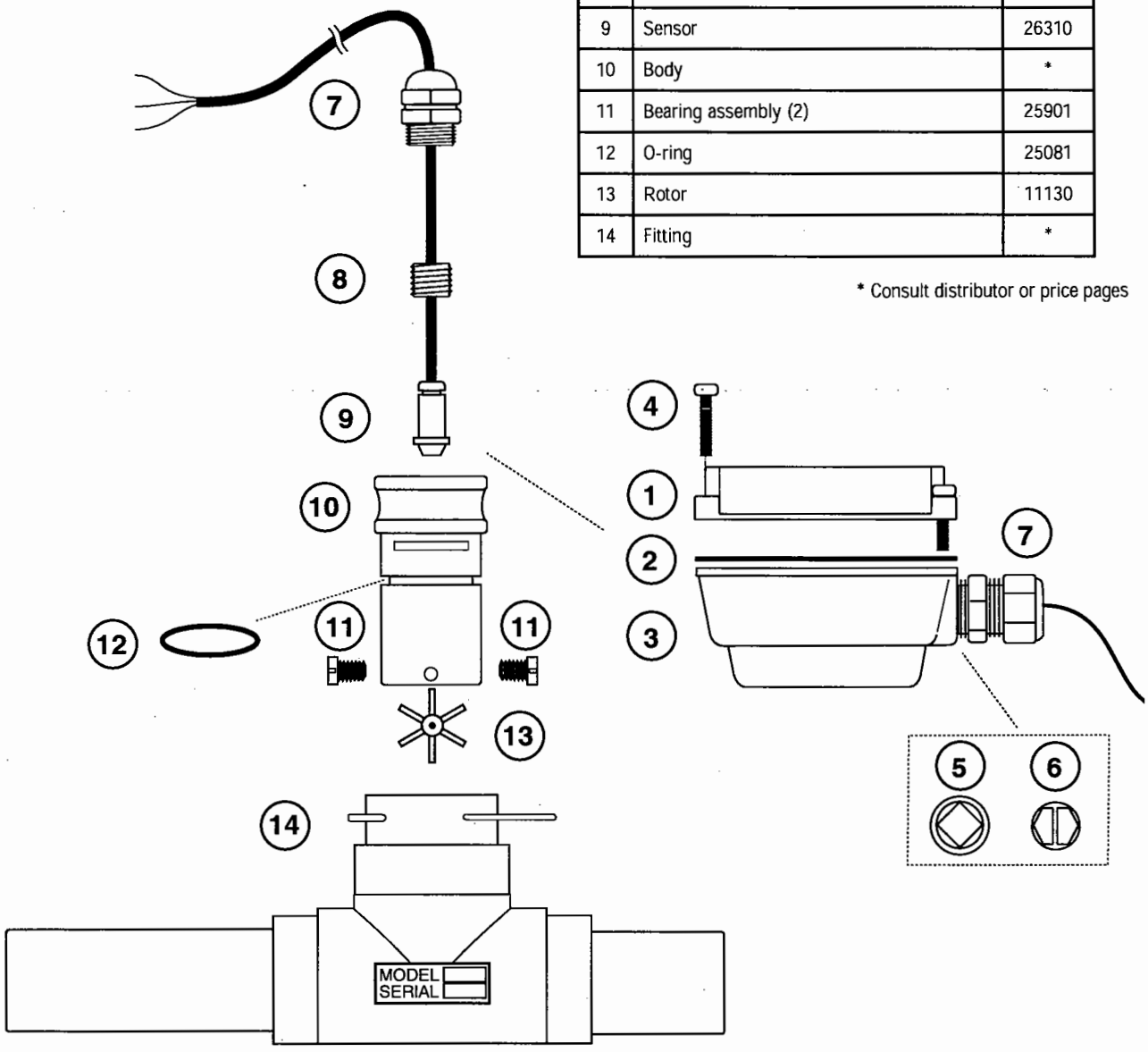
Troubleshooting Guide

Problem	Probable Cause	To Check	To Repair
No signal after installation	Insufficient flow	See Min. GPM for size	Contact SeaMetrics
	Bad connections to control electronics	Check connections at control. Check polarity: red (+), black (-), white (signal)	Re-connect if necessary
	Incompatible control	Does control: 1) provide 6-24VDC power; 2) accept current sinking inputs	Contact SeaMetrics
	Damaged or missing rotor	Remove meter and check visually for free spinning	Obtain new rotor and replace
Inaccurate metering	Not enough straight pipe between meter and flow disturbance	See recommendations, measure	Move meter away from flow disturbance or field calibrate

Fittings Compatibility Chart		
Material	[redacted]	**IP82**
Bronze	1"- 4" Tee	3"- 8" Braze fitting
PVC	1/2"- 2" Tee	3"- 8" Saddle
Polypro	N/A	3"- 8" Tee
Stainless steel	1/2"- 2" Tee	3"- 8" Weld fitting
Carbon steel	1/2"- 2" Tee	3"- 8" Weld fitting

IP80 Series Parts Listing		
1	Upper housing	26181
2	Gasket	26211
3	Lower housing	29930
4	Housing screw	26229
5	Plug, steel	26073
6	Plug, plastic	26079
7	Strain Relief	7655
8	Sensor Retainer	25321
9	Sensor	26310
10	Body	*
11	Bearing assembly (2)	25901
12	O-ring	25081
13	Rotor	11130
14	Fitting	*

* Consult distributor or price pages



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