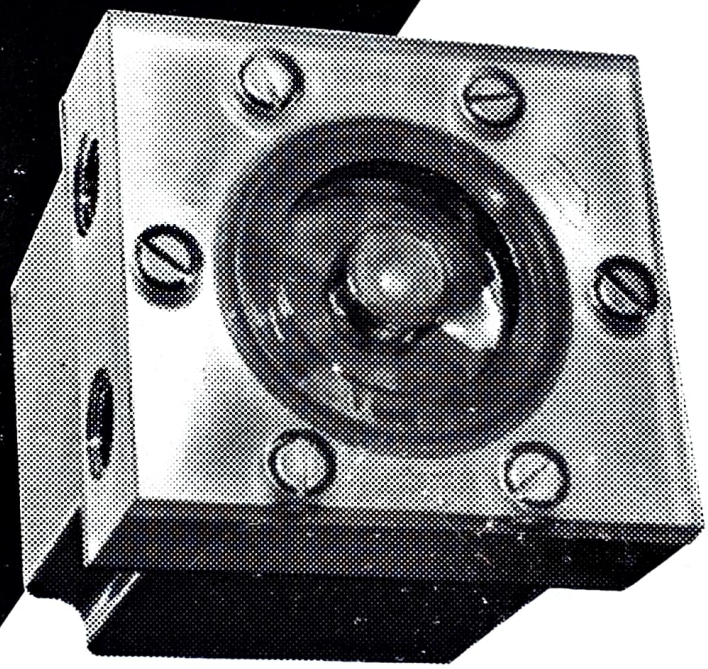
Proteus

300 Series Sensors
100xT Series Transducers

User Manual



Proteus **300 series sensors and 100xT transducers use a turbine principle to generate a pulsed voltage that varies with flow. Magnets in alternate spokes of a rotor induce a voltage in a pickup coil when flow turns the rotor. The variable frequency output from this simple and reliable sensor may be read by your electronics to determine flow rate.**

Proteus Industries Inc.

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OVERVIEW

300 series sensors may be used by themselves or with the Proteus 3000 series meter readout. Use with a readout is described in the 3000 series manual. 100xT transducers are the flow sensing portion of a 100 series flow switch. The operation of a transducer when used as a component of a flow switch is described in the 100 series flow switch manual. Stand alone use of the 300 series sensors and 100xT series transducers are described in this manual. ("x" in 100xT stands for the body material, example: 100BT has a brass body.)

300 series sensors have a protective back cover and a signal cable coming out the back. 100xT transducers have no protective back cover and spade type quick disconnects for the electrical connection. This is the only difference between the two. "Sensor" is used in this manual to refer to either product.

PHYSICAL INSTALLATION

MOUNTING

For the best results, the sensor should be mounted with the face plate in a vertical plane. In general, it is undesirable to mount any plumbing directly over electronic controls or instruments, as leaks could cause damage. If rigid piping (as opposed to flexible tubing) is used, the sensor may also be supported by the plumbing.

PANEL MOUNTING

To mount the sensor behind a panel, the faceplate screws (8-32 X ¾") will need to be replaced with longer screws to compensate for the thickness of your panel. Ensure that the screws are not so long as to hit the back of the tapped hole or rip through the back if over tightened on a plastic body.

To mount behind the panel, evenly space six holes for 8-32 screws on a 2½" bolt circle. (Two of the holes are on the horizontal plane if the label is right side up.) If you wish to see the visible rotor on sensors with

Table 1: Flow Ranges

MODEL 300	MODEL 100XT	FLOW RANGE GPM	FLOW RANGE LPM	INLET PORT	OUTLET PORT	PIPE SIZE
304L	100L	0.08 - 0.8	0.3 - 3.0	A	B	¼" NPT
301	100	0.1 - 1.0	0.4 - 3.8	A	B	¼" NPT
302	100	0.5 - 2.5	1.9 - 9.5	B	C	¼" NPT
303	100	0.8 - 6.0	3.0 - 22.7	D	C	¼" NPT
350	150	1.5 - 12.0	5.7 - 45.4	D	C	½" NPT
355	155	4.0 - 20.0	15.1 - 75.7	D	C	½" NPT
360	160	6.0 - 30.0	22.7 - 113	D	C	¾" NPT
370	170	10.0 - 60.0	37.8 - 227	D	C	1" NPT
371	171	10.0 - 60.0	37.8 - 227	D	C	1" PT*

clear face plates, cut a 1¾" diameter with the same center as the bolt circle. Remove the screws holding the face plate to the sensor body and, placing the sensor behind the panel, insert the longer screws you have selected through the panel and face plate and screw into the flow switch body. The screws should be finger tight (torque about 10 inch-lbs).

PLUMBING CONNECTIONS

Before connecting a sensor into your fluid line, verify that the normal flow rates expected in that line are within the operating range of the sensor. Extended use above the rated maximum may reduce the lifetime of the sensor. The range for each model is shown in **Table 1: Flow Ranges** on page 2.

Fluid lines should be connected to the body using pipe fittings of a similar material to the body. Do not over tighten. A good rule of thumb is to hand tighten plus one turn. The unused ports on the ¼" model sensors are sealed using the pipe plugs supplied with the sensors.

All connections should be sealed using Teflon plumbing tape or standard liquid sealing materials such as TFE based sealants. (Real-Tuff and Hercules are two of the many suitable brands of TFE based sealants.) CAUTION: Do not use anaerobic pipe sealants such as Loctite brand sealants or SWAK on sensors with clear plastic face plates. Because of their aggressive chemical nature they can cause cracking in the face plate. This is true even if only trace amounts are in contact with the face plate, and can occur with a delay of several months. (Real-Tuff, Hercules, Loctite and SWAK are trademarks of their respective holders).

Fluid may contain particles. It is good practice to filter, although it is not essential to the operation of the flow sensor. A 100 micron filter is often used to remove rust and other particles from the fluid. This can increase the life time of pumps and other fluid system components as well as reducing wear in the sensor.

Table 2: Pipe ID

MODEL 300	MODEL 100xT	INLET PORT	BODY TYPE	INSIDE DIAMETER
301	100	1/4"	Plastic/Metal	Not Sensitive
302	100	1/4"	Plastic/Metal	Not Sensitive
303	100	1/4"	Plastic Metal	0.280" 0.355"
304L	100L	1/4"	Plastic/Metal	Not Sensitive
350	150	1/2"	Plastic Metal	0.540" 0.605"
355	155	1/2"	Plastic Metal	0.540" 0.605"
360	160	3/4"	Plastic Metal	0.730" 0.815"
370	170	1"	Plastic Metal	0.900" 1.050"

The electrical polarity of the output is sensitive to the direction of flow. Some user designed electronics may be sensitive to the ploarity. In general, the 303/100xT high flow riange and the 355/155 and larger sensors may have the inlet and outlet shown in **Table 1: Flow Rages** reversed. The others may not.

IMPORTANT INSTALLATION NOTE

Proteus sensors are sensitive to variations in the inside diameter (ID) of the pipe or hose connected to the inlet. Variations in the inside diameter, which are normal from brand to brand of pipe and hose, can cause substantial variations in the sensor output.

To avoid this problem, either of two methods may be used. First, a pipe of the same ID as that used in calibrating the sensor may be used in actual operation. **Table 2: Pipe ID** on page 4 shows the pipe ID's used if sensors were calibrated at Proteus.

If it is not practical to use the same pipe ID when calibrating and when using the sensor, a correction factor my be calculated.

Variations will cause a shift approximately proportional to the variation in the square of the pipe diameter. If V= Variance of reading from a curve based on an inlet pipe ID of R (in the calibration system, as given above), and D=Diameter (inside) of the actual inlet pipe, then the approximate relation is:

$$V=(D/R)^2-1$$

Diagram 1: Waveform

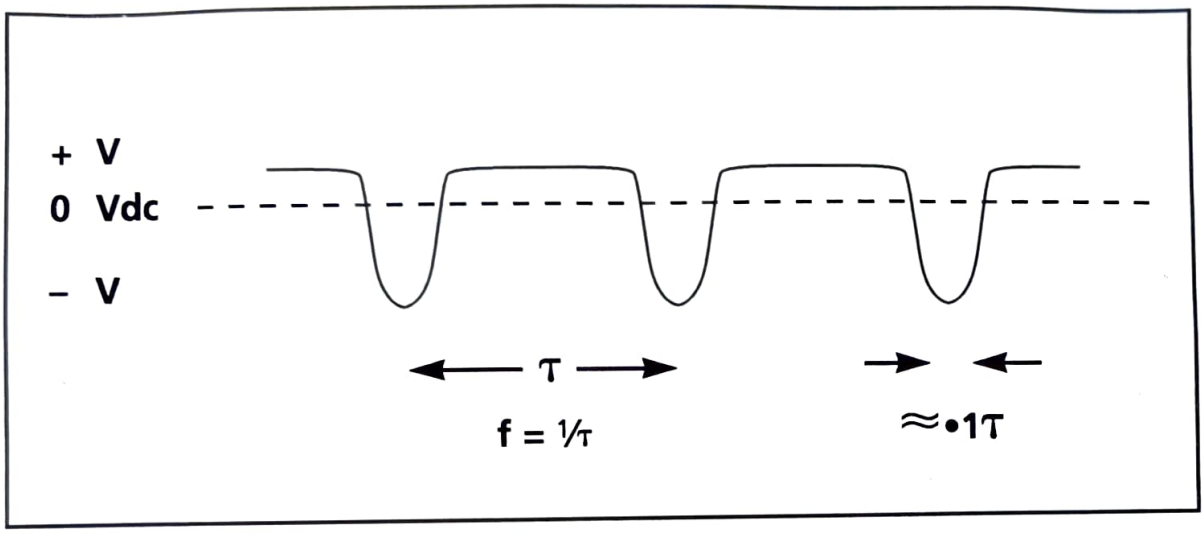

Table 3: Typical Voltage Output

FREQUENCY (Hz)	VOLTAGE (mV*)
20	109
30	156
40	209
50	252
60	304
70	352
80	402
90	454
100	508

* Voltage is negative when waveform is drawn as in Diagram 1.

CALIBRATION

Sensors must be individually calibrated to be accurate. The calibration may be performed at the factory, by the user or at an independent calibration lab. Annual recalibration is recommended.

For initial factory calibration, specify Model 980 calibration when ordering and you will receive a written calibration showing the actual flow rate vs. the pulsed output frequency for each sensor. For factory recalibration, please contact the factory for current price and lead time information and a return authorization number.

General calibration information with typical curves is given in the document "Proteus Flow Note: Calibration Curves."

ELECTRICAL INSTALLATION

OUTPUT SIGNAL

The output signal is the voltage generated by the magnets in three spokes of the rotor passing by the pickup coil.

The waveform varies somewhat with flow rate. It is similar, but not identical to a rectified sine wave. A typical waveform is shown in **Diagram 1: Waveform** on page 6.

It is more accurate to measure frequency than voltage to determine flow rate. The Calibration section above discusses the relation between frequency and flow rate. Typical voltages (measured ground to peak) for any sensor at specific frequencies are shown in **Table 3: Typical Voltage Output** on page 6. The coil has a typical DC resistance of about 200 ohms.

ELECTRICAL CONNECTIONS

The 100xT transducers provide two male spade type quick disconnects to connect to the coil output. Matching female connectors are shipped with the transducer. The female connector is Panduit P/N DNF18-206F1B-M.

The 300 series sensors have a 2 wire cable connecting to the coil output. The signal wire color codes are clear and black.

MAINTENANCE

CLEANING

Maintenance of the sensor is normally limited to cleaning the chamber in which the rotor spins and annual recalibration.

The frequency of cleaning will vary with the type of fluid being run and the cleanliness of the fluid. In most cases, annual cleaning immediately prior to recalibration is sufficient.

To clean the sensor, turn off the fluid, remove the six face plate screws and then the face plate, rotor and pin. Clean each of these as well as the chamber. Usually, wiping with a damp cloth is sufficient. Detergents and alcohols may also be used for cleaning. Acetone and Trichloroethylene will damage the face plate. Check the o-ring to assure that it is not brittle, cracked or damaged. If it is, replace it with a #132 Buna-N o-ring. (Other materials may be used if desired.) Reassemble the sensor, tightening the screws finger tight (about 10 inch-lbs.)

MODEL NUMBERS AND SPECIFICATIONS

Specifications and model numbering information are shown on the data sheet.

FIVE YEAR WARRANTY

Flow sensors are backed by a five year warranty (one year on calibration). The full text is given in our price list.

These products are rated under the German Bauart standards as Installation Category II, not for Heavy Industrial installation. They are Class II devices, no earth ground provided.

Installation of this product should be performed by a qualified service person.

RELATED DOCUMENTS

Document	Number
100 series flow switch data sheet	DS-01-0100
DS-300/3000 series data sheet	DS-03-3000
Mechanical drawing	MD-01-9130
Proteus Flow Note: Calibration Curves	FN-01-9132

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