

1 YEAR
WARRANTY

Ω OMEGA® User's Guide

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FSW-6000/FSW-7000 Series Thermal Dispersion Flow Switches



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Introduction

FSW6000/7000 Thermal Dispersion Flow Switch Monitor



The FSW series of thermal flow switches is designed to monitor flow status of liquids and gases and can also be used to detect level.

A chain of 8 LED's gives the user a visual indication of the flow status of the switch. There are two red LEDs that indicate whether or not the unit has detected flow, a yellow LED to indicate the set point (for increasing or decreasing flows) and 5 green LEDs that indicate the amount of flow beyond the set point of the unit. The FSW also includes a di-chromatic (red/green) LED which shows the switch point status of the unit.

The sensing element and connection of the FSW are made with 316 S.S. and can be coated when necessary. The enclosure is offered in either nylon or aluminum.

All models can be ordered with a great variety of threaded, flange, or sanitary process connections as well as ECTFE or epoxy coating for aggressive mediums.

For ECTFE coating we recommend that the switches are made with flanged connections or a minimum of 1" threaded connection.

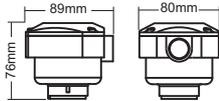
Features

- Simple to install.
- Excellent low flow sensitivity.
- No moving parts-maintenance free reliability.
- Can be coated for aggressive mediums.
- Maximum working pressure of 1450 PSI (100 bar).
- Fast response time for flow or level (Adjustable from 1-10 seconds).
- Available in threaded, sanitary and adjustable insertion length connections.

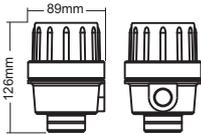
Models and Dimensions

Mounting Options for FSW

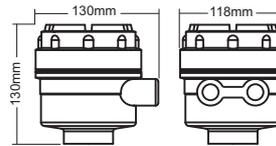
Nylon Housing



Aluminum Housing



Aluminum Housing

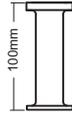


Extended Necks for Higher Temperatures

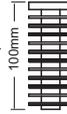
MT



AT



HT

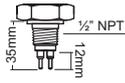


Ultra High temp. neck w/
heat dissipating rings

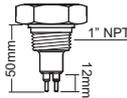
MT - Medium Temperature (up to 120°C)
AT - High Temperature (up to 150°C)
HT - Ultra High temperature (up to 250°C)

Insertion Length

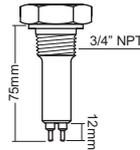
FSW w/ insertion length of 35mm



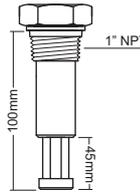
FSW w/ insertion length of 50mm



FSW w/ insertion length of 75mm



FSW for Ultra High temperature w/ minimum insertion length of 100mm



Other insertion lengths are available upon request

Process Connections

Threaded Connections	
1/2"	
3/4"	
1"	
1 1/2"	

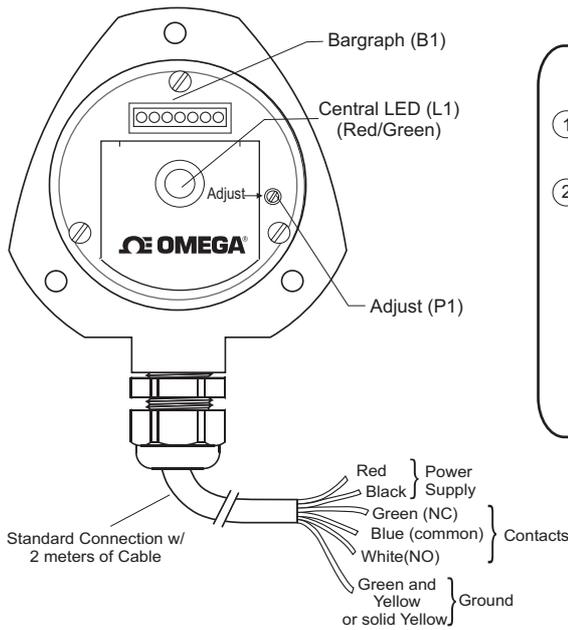
Tri-Clamp Connection	
1"	
1 1/2"	
2"	
2 1/2"	

Flange Connections	
1"	
1 1/2"	
2"	
2 1/2"	
3"	

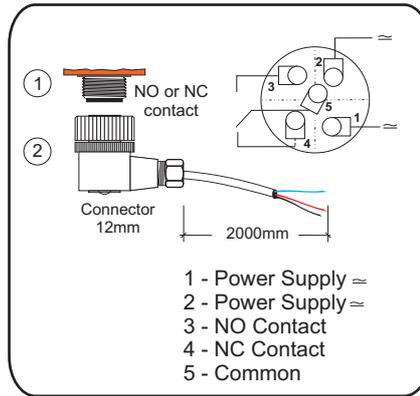
Wiring Diagram

Nylon Housing

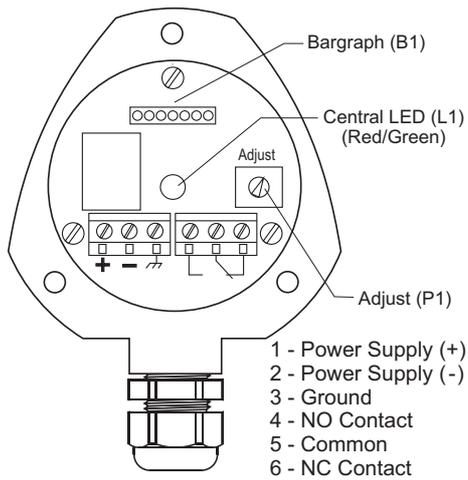
FSW6000 - AC Powered



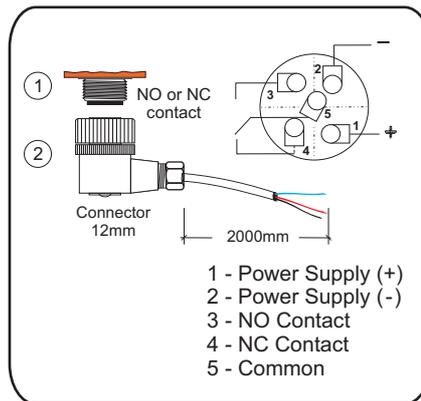
M12 Connector Optional



FSW7000 - DC Powered



M12 Connector Optional



Wiring Diagram

FSW6000/7000 with Aluminum-Housing

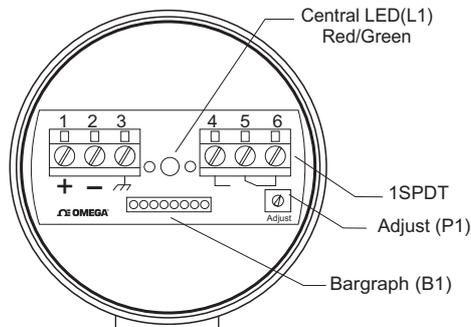
(P1) - Set Point Potentiometer Adjust

(B1) - 8 LED's Bargraph: Red LED
Yellow LED
Green LED

(L1) - Central LED - Green: With flow
Red: No flow

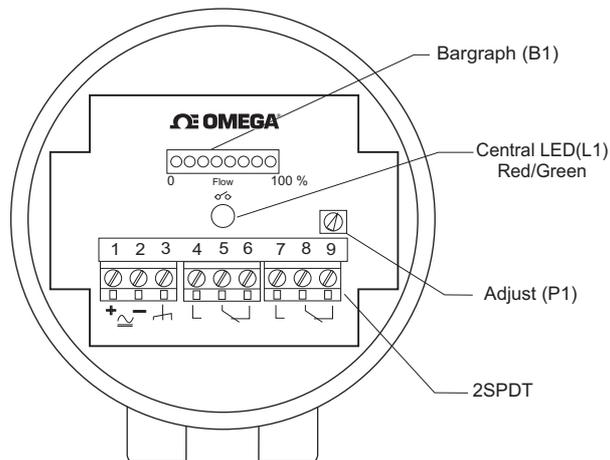
Small Aluminum

- 1 - Power Supply (+)(~)
- 2 - Power Supply (-)(~)
- 3 - Ground
- 4 - NO Contact
- 5 - Common
- 6 - NC Contact

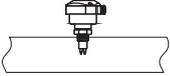
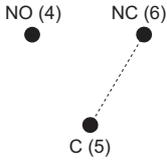
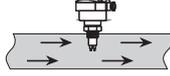
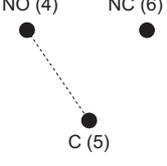


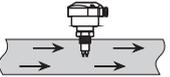
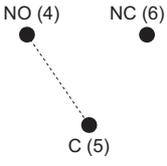
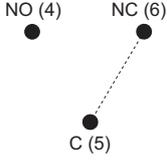
Large Aluminum

- 1 - Power Supply (+)(~)
- 2 - Power Supply (-)(~)
- 3 - Ground
- 4 - NO Contact
- 5 - Common
- 6 - NC Contact
- 7 - NO Contact
- 8 - Common
- 9 - NC Contact



FSW Relay Status Guide

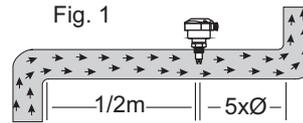
Application FSH	Condition	LED Status	Set Point	FSW SPDT Status
	Normal	RED	OFF	
	Alarm	GREEN	ON	

Application FSL	Condition	LED Status	Set Point	FSW SPDT Status
	Normal	GREEN	ON	
	Alarm	RED	OFF	

Pre-Installation

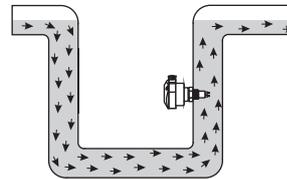
Pre-Installation Checks:

1) Its recommended that the flow switch is installed with a distance of $\frac{1}{2}$ a meter of the pipe bent where the flow enters and 5x times the diameter of the pipe where the flow exits, enabling it to have an accurate reading (Fig. 1).



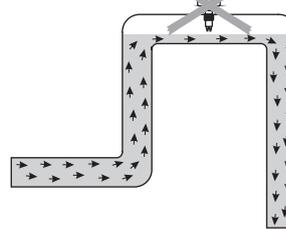
Verify that the installation point isn't near any connections, valves, elbows or anything similar, this can cause errors in the reading of the probe due to turbulence in the pipe.

Fig. 2



2) It is important that the flow switch is not installed at the highest point in the pipe run or in a location where there is the risk of air accumulating in the pipe. Keep in mind that the ideal mounting location is where the pipe is always full. This will ensure that the switch is always immersed in the flow. (Fig. 2 correct, fig. 3 incorrect)

Fig. 3



3) In pipes that have pressure pumps or retention valves, we recommend that the probe be installed before the pump due to the fact that it will have less turbulence. (Fig. 4)

Fig. 4



4) Confirm that the wire connections are correct and that the available power supply is compatible with the FSW unit.

5) Verify that the operating pressure and temperature of the process corresponds to the operating parameters of the FSW unit.

More recommendations and handling instructions can be found on page 14.

Installation

Installation:

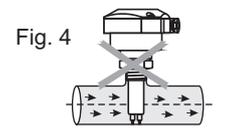
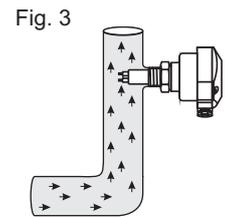
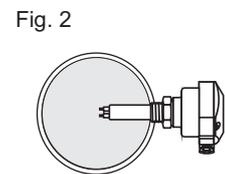
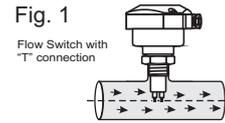
The FSW may be installed in a pipe using a “T” connection (see fig. 1) or inserted directly into the pipe (see fig. 2). The site might need to adapt the installation so that it conforms with the following recommendations.

The FSW is not affected by its fixed position so it may be installed at any angle around the pipe. However we recommend that when the pipe is in a horizontal position the FSW should be installed on the side, as long as the tip of the probe sits within the middle of the pipe (See Fig. 2).

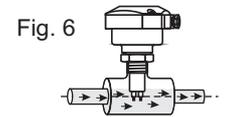
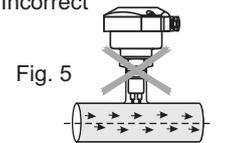
When the pipe is in a vertical position, the FSW should be installed only when the water flow is upward (See Fig. 3).

Care should be taken when installing the FSW that the probe extends to the center of the pipe away from the internal wall and is fully immersed into the flow (Fig. 4 and 5 incorrect, Fig.1 and 2 are correct).

In pipes with smaller diameters use an adaptor to enlarge the diameter of the pipe so that the sensor can be properly installed (See Fig. 6). If the installation is not correct the FSW's performance may be affected.



Incorrect



To Start:

- 1 - Remove the enclosure lid (Note: the screws are self-retaining)
- 2 - Start the power supply and wait 5 minutes until the FSW is active and has reached a stable point within the medium.
- 3 - Let the regular or desired flow reach its point of normal operation.

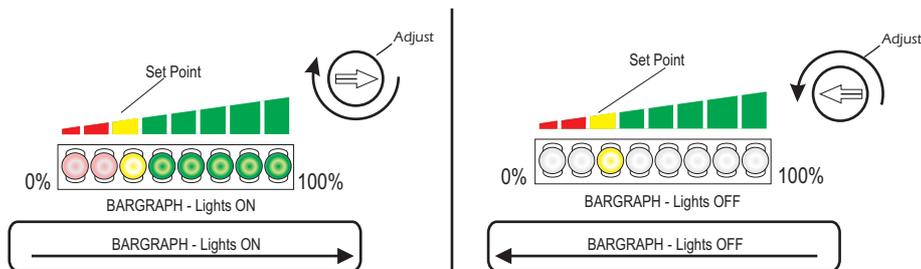
Calibration for Flow / No Flow:

- 1 - Set the flow rate at the normal range of operation.
- 2 - Turn the potentiometer counter-clockwise until the central LED turns red.
- 3 - With the central LED red, turn the potentiometer clockwise until the central LED changes to a blinking green state.
- 4 - Continue to turn the potentiometer clockwise until all green LEDs in the bar graph are on.
- 5 - In order to be sure that the adjustment is not at a critical state give the potentiometer an additional quarter turn clockwise.

Set Point Adjustment:

The flow switch can be adjusted to indicate either increasing flow, or decreasing flow at a specific set point within 3cm/s to 3m/s.

It is important to determine the specific set point at which the flow switch should activate or de-activate.



To Activate The Switch On Increasing Flow:

- 1 - Set the flow rate to the desired set point and allow it to stabilize for 2 minutes.
- 2 - Turn the potentiometer counter-clockwise until the central LED turns red.
- 3 - Turn the potentiometer clockwise until the central LED changes to a blinking green.
- 4 - Continue to turn the potentiometer clockwise until the first 2 green LEDs in the bar graph turn on.

In this mode the FSW will activated on or above the set point. If there is a decrease of flow, the FSW will de-activate. When the flow rate reaches the set point, the FSW will activate.

To De-Activate The Switch On Decreasing Flow:

- 1 - Set the flow rate to the desired set point and allow it to stabilize for 2 minutes.
- 2 - Turn the potentiometer clockwise until the central LED is blinking green.
- 3 - Turn the potentiometer counter-clockwise until the central LED turns red.
- 4 - Continue to turn the potentiometer counter-clockwise until the 2 red LEDs in the bar graph are off.

In this mode the FSW will de-activate on or below the set point. If there is an increase of flow the FSW will activate. When the flow rate reaches the set point, the FSW will de-activate.

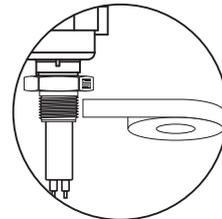
Detecting level:

- 1 - Fill the tank until the probe of the FSW is fully submerged. Turn the potentiometer counter-clockwise until the central LED turns red. With the central LED red, turn the potentiometer clockwise until the central LED changes to a blinking green.
- 2 - Continue to turn potentiometer clockwise until all green LEDs in the bar graph turn on.
- 3 - In order to be sure that the adjustment is not at a critical state give the potentiometer an additional quarter turn clockwise.

Handling

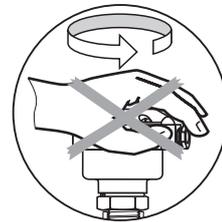
Seal the thread with Teflon tape before installation (Fig. 1).

Fig. 1



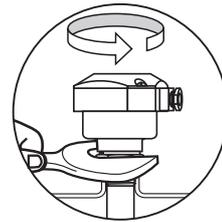
Do not turn or handle by the housing (Fig. 2).

Fig. 2



Use the correct tool during installation (Fig. 3)

Fig. 3



The FSW should not be dropped or suffer any impact or fall that could damage the electronics or the thermal tips of the probe (Fig. 4 and 5).

Periodic visual inspection of the FSW is required to check for corrosion or deposit build-up. If deposits are found, clean the sensor to ensure optimum performance.

Care should be taken when handling and installing probes with coated rods to avoid scratching them. Scratching the coating could interfere with the probe performance.

Fig. 4

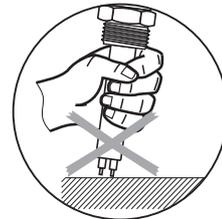
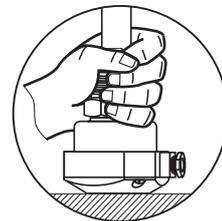
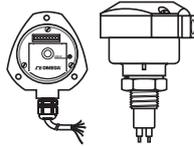


Fig. 5

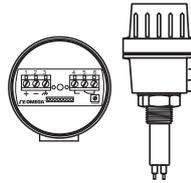


Technical Specifications

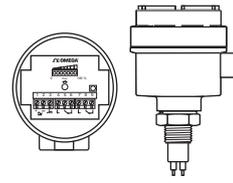
FSW6000



Nylon Housing



Aluminum Housing

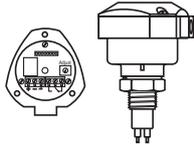


Aluminum Housing

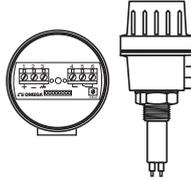
Application	Flow for liquids and gas level for liquids only
Operating Voltage	85-240Vac (50/60hz) or 125Vdc
Current Consumption	+/- 100mA
Output	Relay(SPDT) 5A - 250Vac for Nylon and Small Aluminum Housing (2 SPDT Large Aluminum Housing)
Set Point Range	Liquid: 3 cm/s to 3 m/s - Gas: 5 cm/s to 5 m/s
Accuracy	+/- 10%
Repeatability	+/- 1% setpoint
Response Time	1 to 10s
Gradient Temperature	15°C/min
Flow Rate Indication	Red led - flow is below setpoint Yellow led - flow is at setpoint Green led - flow is above setpoint
Enclosure Material	Glass filled nylon (option - Aluminum)
Electrical Connection	Cable gland w/ 2000mm cable, M12 connector or 1/2" NPT
Process Connection	1/2" to 1 1/2" BSP or NPT, adjustable, sanitary or flanged connections
Wetted Material	316 Stainless Steel
Operating Temperature	14 to 176° F (-10 to 80°C) sanitary option to 248°F (120°C)
Max Pressure	1450 PSI (100 Bar)/ 4500 PSI (300 Bar) upon request
Class Protection	IP 65

Technical Specifications

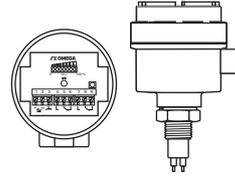
FSW7000



Nylon Housing



Aluminum Housing



Aluminum Housing

Application	Flow for liquids and gas level for liquids only
Operating Voltage	24Vdc (+/- 10%)
Current Consumption	+/- 100mA
Output	Relay(SPDT) 5A - 250Vac for Nylon and Small Aluminum Housing (2 SPDT Large Aluminum Housing)
Set Point Range	Liquid: 3 cm/s to 3 m/s - Gas: 5 cm/s to 5 m/s
Accuracy	+/- 10%
Repeatability	+/- 1% setpoint
Response Time	1 to 10s
Gradient Temperature	15°C/min
Flow Rate Indication	Red led - flow is below setpoint Yellow led - flow is at setpoint Green led - flow is above setpoint
Enclosure Material	Glass filled nylon (option - Aluminum)
Electrical Connection	Cable gland - 1/2" NPT conduit entry or M12 connector
Process Connection	1/2" to 1 1/2" BSP or NPT, adjustable, sanitary or flanged connections
Wetted Material	316 Stainless Steel
Operating Temperature	14 to 176° F (-10 to 80°C) sanitary option to 248°F (120°C)
Max Pressure	1450 PSI (100 Bar) /4500 PSI (300 Bar) upon request
Class Protection	IP 65

Trouble Shooting

Fault	Cause	Solution
Relay does not change state.	LED off, no power	Check power supply
	LED doesn't change color	Check the installation (insertion length)
		Verify the calibration
Flow switch turns on or off suddenly	Radio frequency interference	Use armored cable and shielded housing
Relay remains closed	Sensor is potentially defective	Contact Omega or your local representative for further instruction

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, impropo interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/ DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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TEMPERATURE

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- Recorders, Controllers & Process Monitors
- Infrared Pyrometers

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- Load Cells & Pressure Gages
- Displacement Transducers
- Instrumentation & Accessories

FLOW/LEVEL

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- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

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- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

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- Data Acquisition & Engineering Software
- Communications-Based Acquisition Systems
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- Data Logging Systems
- Recorders, Printers & Plotters

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- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

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- Refractometers
- Pumps & Tubing
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