



# User's Guide



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## FSW 300 Series Flow Switches



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It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

**WARNING:** These products are not designed for use in, and should not be used for, human applications.

<b>Table of contents</b>	<b>Page</b>
1. Device description and intended use .....	2
1.1. Functional principle .....	2
1.2. Component overview.....	2
2. Safety instructions .....	2
2.1. Qualified personnel .....	3
2.2. Special safety instructions.....	3
3. Material specifications of wetted components .....	4
4. Flow switch installation.....	4
4.1. Mechanical installation .....	4
4.2. Electrical connection .....	6
5. Adjusting the switching unit.....	7
5.1. Type of contact.....	7
5.2. Flow switch.....	7
6. Maintenance and repairs.....	8
7. Shut-down and disposal.....	8
8. Technical data .....	9
8.1. Technical data flow switch version.....	9
8.2. Maximum flow rate of the flow switch.....	9

## 1. Device description and intended use

Flow switches are designed for minimum or maximum monitoring of liquid flows. The operational safety of the supplied equipment is only guaranteed if it is operated according to its intended use (flow monitoring of liquids). The specified limit values (see the chapter entitled “Technical data“) should never be exceeded.

It is your responsibility to select a technology which is suitable for your specific application, to install it correctly, to carry out tests and to maintain all the components.

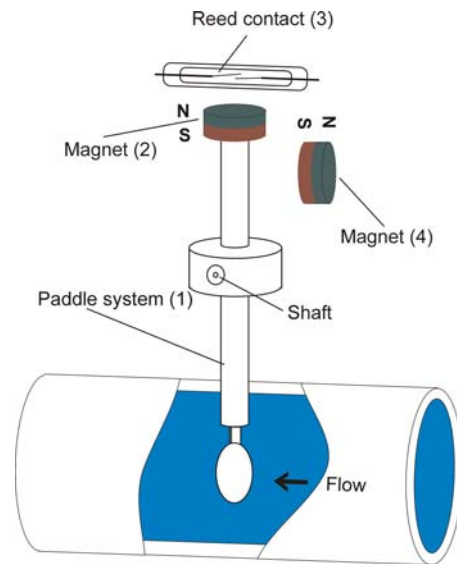
Various device versions are manufactured. The respective type plate displays the version of each device.

### 1.1. Functional principle

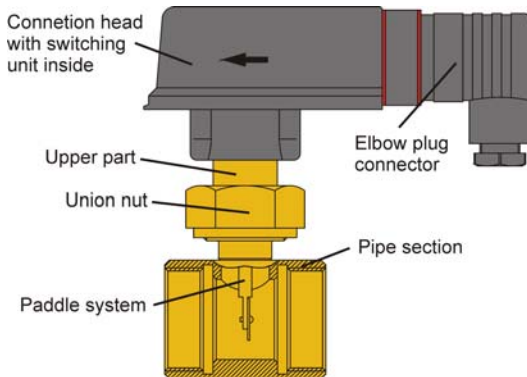
The flow switch consists of a paddle system (1) which has a permanent magnet (2) located at its upper end. A reed contact (3) is positioned outside the flow above this magnet. A second, magnet (4) with opposite polarity is used to create a reset force.

The paddle system is moved once it comes into contact with the flow which is to be monitored. The magnet (2) changes its position in relation to the reed contact (3). The contact opens/closes depending on the contact type (see chapter 5).

As soon as the flow is interrupted, the paddle returns to its original position and the reed contact opens/closes depending on the contact type (see chapter 5).



### 1.2. Component overview



## 2. Safety instructions

Always read these operating instructions carefully prior to installing the new product. Always adhere to the instructions contained herein, especially the safety instructions, otherwise there is a potential risk of personal injury and damage to instruments and plants.

Even though we provides assistance through personal consultation or the respective literature, it is the responsibility of the customers to determine the suitability of the product for the specific application.

The flow switches are state-of-the-art devices. This concerns switching point accuracy, functioning and safe operation of the device.

However, professional and safety conscious conduct of the operator is required to ensure safe operation.

## 2.1. Qualified personnel

- The personnel entrusted with installing, operating and maintaining the flow switches have to be suitably qualified; the required knowledge can be gained via training courses or appropriate on-the-job instruction. The personnel have to be familiar with the contents of these instructions, which have to be available to them at all times.
- The electrical connection should only be carried out by a fully qualified electrician.
- All work has to be carried out in accordance with existing national regulations on accident prevention and safety at work and with any internal regulations of the operator, even if they are not specified in these instructions.

## 2.2. Special safety instructions

- The operational safety of the supplied equipment is only guaranteed if it is operated according to its intended use. The specified limit values (see the chapter entitled “Technical data”) should never be exceeded.
- To avoid damages to the flow switch and the monitored system, only use flow switches for minimum or maximum monitoring of the flow of liquids.
- Always follow and adhere to the flow switch installation instructions.
- Never operate the flow switch in systems which have a greater flow rate than the specified max. flow rate (see the chapter entitled “Technical data”, details of the max. flow rate). Otherwise it will cause irreparable damage to the flow switch.
- Prior to flow switch installation, ensure that all the materials of the flow switch are chemically and mechanically-resistant to the medium which is to be monitored and to all external factors.
- Ensure that the medium is free from magnetic particles.
- Suitable measures should be taken to prevent the medium from freezing.  
If the flow switch is to be used in ambient temperatures of < 39.2 °F, do not carry out any operation beforehand with pure water, e.g. a test run. Residual water in the flow switch can result in frost damage.
- No greases, oils etc. should be used during the installation of the FSW 300 devices due to the material resistance.
- Ensure that the max. specified operating pressure is not exceeded.
- Never remove a flow switch or its upper parts from a pipe system under pressure.
- If the medium which is to be monitored is very hot, the flow switches or their connection fittings will also become very hot. In this case, neither touch the flow switch nor place any heat-sensitive objects in its vicinity.
- Protect the flow switch against external magnetic fields in the immediate vicinity, since these can impair device functioning.
- The technical data of special versions (customised versions) can deviate from the details in these instructions. Please observe the details on the type plate.
- **Caution: Danger of death due to high voltages!**  
Always de-energize the system before connecting the connector cable.
- It is prohibited to remove or make type plates or any other information attached to the equipment indecipherable, otherwise all warranties and the responsibility of the manufacturer no longer apply.

**CAUTION:** Ensure that the maximum electrical contact load specified on the type plate is never exceeded; otherwise the reed contact integrated in the switching unit will be damaged. The switching capacity is reduced with inductive loads. Details of the protective circuit can be requested from the manufacturer.

If problems or questions arise, please contact:



### 3. Material specifications of wetted components

Type	FSW 301, 302, 303, 304	FSW 305, 306, 307
Upper part	2. 0401	PPO (NORYL)
Paddle system	PPO (NORYL) *3	PPO (NORYL) *3
Round head rivet	-----	-----
Bushings	PPO (NORYL)	PPO (NORYL)
Axle	1.4571	1.4571 / PPO
Pipe section *1	none or brass	PVC
Screw-in insert *2	2.0401	1.4571
Seal	NBR	NBR
V seal	EPDM	EPDM / PPO
Magnet	Hard ferrite	Hard ferrite

\*1) only for flow switch with pipe section

\*2) only for flow switch for direct installation, screw connection

\*3) Type FSW 301 (Trimmable paddle) has a stainless steel sleeve (1.4571)

## 4. Flow switch installation

### 4.1. Mechanical installation

#### 4.1.1. General installation instructions

- ⇒ When choosing the installation site, ensure that the specified limit values (see “Technical data”) are not exceeded.
- ⇒ Select suitable measures to prevent the medium from freezing.  
If the flow switch is to be used in ambient temperatures of < 39.2 °F, do not carry out any operation beforehand with pure water, e.g. a test run. Residual water in the flow switch can result in frost damage.
- ⇒ Firstly, clean the pipe system in which the flow switch is to be installed and remove any magnetic particles, e.g. welding residue.
- ⇒ The straight in- and outlet pipe (in front of and behind the flow switch) has to be at least 5 x ID.
- ⇒ The nominal installation position of the flow switch is an “upright standing position” in horizontal pipework.
- ⇒ The switches should only be installed in a vertical position, deviation max. 45° (Fig. 1).
- ⇒ Please contact the manufacturer if other installation positions are desired.
- ⇒ Please make sure that there are no external magnetic fields in the immediate vicinity of the flow switch, since these can impair device functioning (Fig. 2).
- ⇒ There is an arrow on the flow switch. Ensure that this arrow is parallel with the pipe shaft and is facing in the direction of flow during installation (Fig. 2).
- ⇒ The brass and stainless steel union nuts ¾“BSP have a tightening torque of 18.439 ... 22.127 ft lb.
- ⇒ The plastic union nuts have a tightening torque of 5.163 ... 5.901 ft lb.

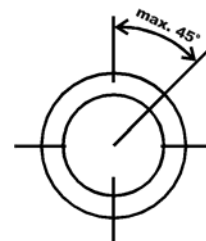


Fig. 1

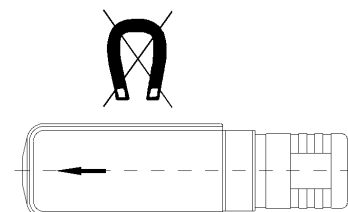
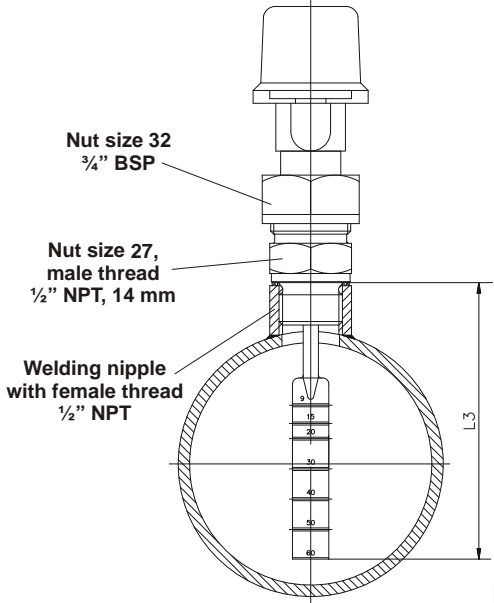
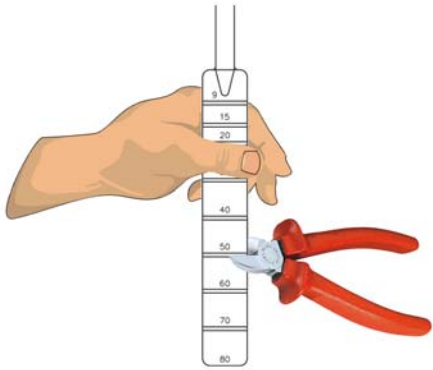


Fig. 2

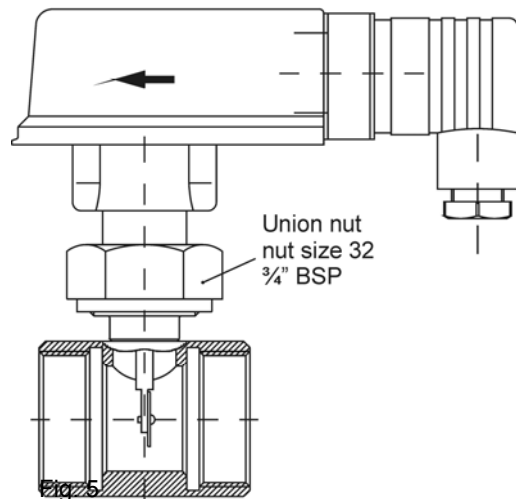
**4.1.2. Flow switch for direct installation**

- ⇒ During flow switch installation, ensure that the paddle does not touch the wall of the pipe.
- ⇒ Carry out installation of your device type as described in the table below.

Flow switch type	Installation type and instructions
<p>FSW 301</p>  <p>Fig. 4</p>	<p>Installation in sockets with a 1/2" NPT female thread  <b>Caution:</b> Please observe the installation height dimensions</p> <p>FSW 301 (Trimmable paddle)</p> <p><b>Important:</b>                  In order to shorten the paddle to the required length, use a side cutter.                  When cutting, hold the paddle tight above the cut surface.</p> 
	<p>Installation in sockets with a 1/2" NPT female thread, should only installed vertically in horizontal pipes.  <b>Caution:</b> Always observe the installation height dimensions</p>

**4.1.3. Flow switch with pipe section**

- ⇒ Install the flow switch pipe section just like a valve in the existing pipe.
- ⇒ The pipe section has a NPT thread connection female according to the nominal diameter. Make sure that the correspondent part has the same NPT thread connection male.
- ⇒ Counterhold! When tightening the correspondent part use only the wrench flat of the flow switch.



## 4.2. Electrical connection

### 4.2.1. General electrical connection information

- ⇒ **CAUTION:** Danger of death due to high voltages!  
Always de-energize the system before connecting the wires of the mains cable.
- ⇒ **CAUTION:** Ensure that the maximum electrical contact load specified on the type plate is never exceeded; otherwise the reed contact integrated in the switching unit will be damaged.  
The switching capacity is reduced with inductive loads. Details on the protective circuit can be requested from the manufacturer.

### 4.2.2. Elbow plug connector EN 175301-803-A

- ⇒ Loosen the central screw (pos. 6) M3x35 and disconnect the junction box EN 175301-803-A

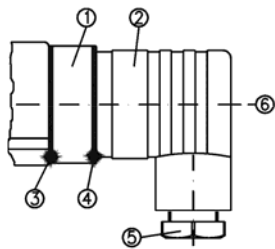


Fig. 6

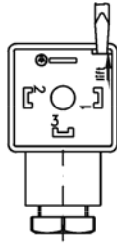


Fig. 7

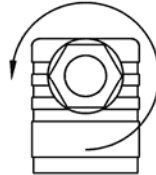


Fig. 8

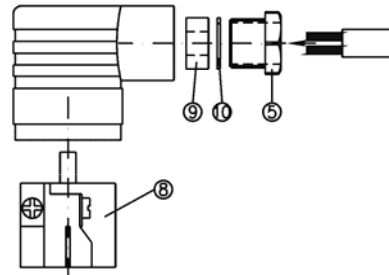


Fig. 9

(pos. 2) from the connector (pos. 1) (Fig. 6). Pull the central screw out of the junction box.

- ⇒ Use a screwdriver or similar tool to press out the core (pos. 8) of the junction box (Fig. 7).
- ⇒ Loosen the screw connection M16x1.5 (pos. 5, Fig. 8).
- ⇒ Feed the connecting cable into the junction box via the screw connection (pos. 5), the clamping ring (pos. 10) and the rubber insert (pos. 9) and subsequently connect the wires as displayed in the connection diagram (see Fig. 9).
- ⇒ Press the core (pos. 8) until it locks into position in the junction box (pos. 2).
- ⇒ Tighten the cable gland M16x1.5 (pos. 5).

### Adjusting the switching unit

- ⇒ Place the junction box (pos. 2) on the connector (pos. 1) and retighten the central screw (pos. 6).
- ⇒ To guarantee the protection class IP 65 according to EN 60529, the applied connecting cable has to have a sheathing diameter of between 0.177 and 0.393 inch.
- ⇒ Furthermore, ensure that all the connector seals (pos. 3, 4 and 9) have been correctly inserted.

### Flow switch

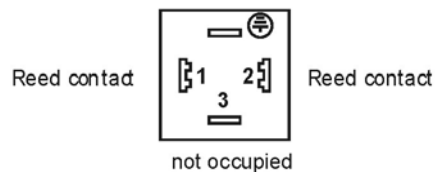
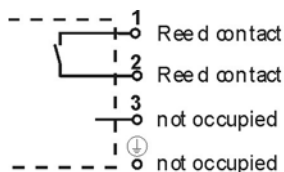
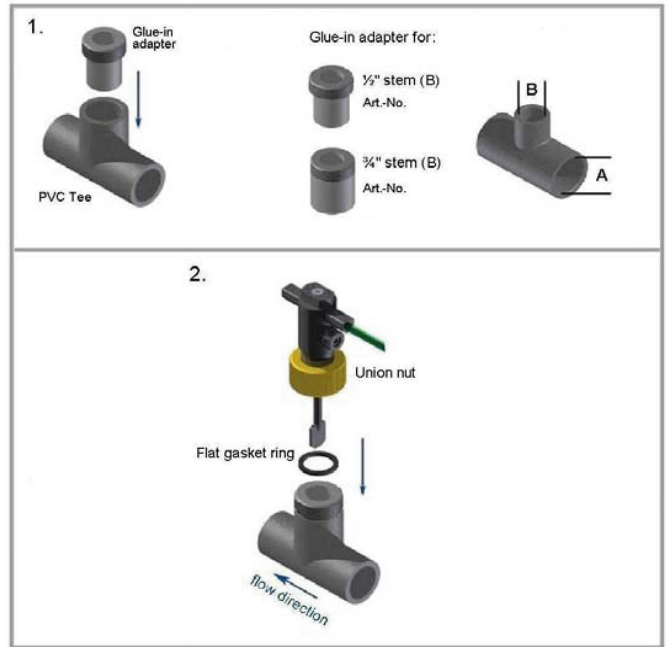


Fig. 10



**4.3 Installation instructions for PVC pipe:**

1. Note the flow direction arrow on the flow switch and install with the arrow pointing in the direction of flow.
2. Position the switch + glue-in adapter + gasket securely into the pvc pipe tee without using adhesive.
3. Inspect inside the pipe to ensure that the paddle moves freely without contacting the walls of the pipe.
4. Mark the glue-in adapter so that you can re-install it back into the ideal position after the adhesive is applied.
5. Remove the switch & adapter, apply the adhesive to the adapter & re-insert it to the position previously marked.
6. After the glue is cured, assemble the gasket & switch. Tighten the union nut to a max of 5.9 ft lbs (aprox. hand tight).



**5. Adjusting the switching unit**

**5.1. Type of contact**

**Standard contact:**

The switching unit of the control switch enables two types of contact:

1. Normally open contact: "RED" arrow on the switching unit
2. Normally closed contact: "WHITE" or "BLUE" arrow on the switching unit

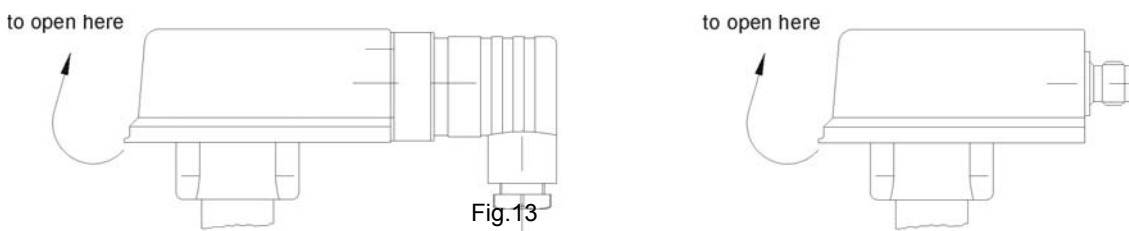
The following table explains the two types of contact:

Type of contact	Setting	Flow rate:	Electric contact
Normally open contact	RED arrow	increasing	closing
		decreasing	opening
Normally closed contact	WHITE or BLUE arrow	increasing	opening
		decreasing	closing

If not otherwise agreed with the customer, the switching unit is factory set as a normally open contact, i.e. the reed contact opens if the set switching point is exceeded.

**5.2. Flow switch**

⇒ In order to adjust the switching unit, open the cover of the switching head (Fig. 13)



⇒ Subsequently loosen the locking screw (2.5 hexagon socket screw for the brass and stainless steel version or recessed head screw for the plastic version) and position the switching unit until the red or white arrow are visible at the entry of the switching contact guide for a desired make contact (Fig. 14) or break contact (Fig. 15) respectively.

- ⇒ The fine adjustment of the switching point can be carried out on the basis of the arrow length:  
Movement towards the arrow head: Switching point is set to lower flow rate.  
Movement towards the arrow tail: Switching point is set to higher flow rate.
- ⇒ Carefully retighten the locking screw.
- ⇒ We recommend you to use lacquer / threadlocker to secure the locking screw of the switching unit after carrying out individual adjustments.
- ⇒ Close the cover until it locks into place.

Adjustment of the switching unit is not required if a desired ex works switching point setting has been agreed with the customer.

make contact (red arrow)

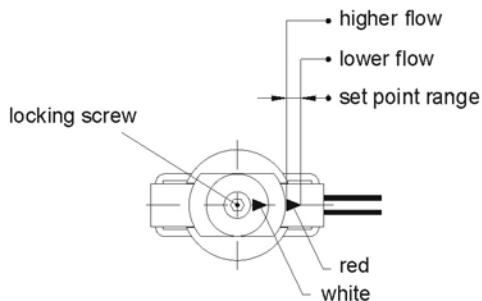


Fig. 14

break contact ( white arrow)

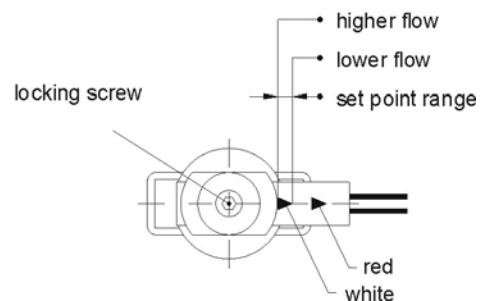


Fig. 15

## 6. Maintenance and repairs

The flow switch is maintenance-free and cannot be repaired by the user. In the unlikely event of a defect, the device has to be returned to the manufacturer for repair work.

## 7. Shut-down and disposal

- ⇒ Never remove a flow switch or its upper part from a system under pressure.
- ⇒ Remove all the electrical connections and dismount the flow switch.
- ⇒ The flow switch consists of various materials (see "Chapter 3"). Never dispose of the flow switch in domestic waste (refer to the crossed out waste bin displayed on the type plate).
- ⇒ Return the flow switch to the manufacturer for correct disposal.

## 8. Technical data

⇒ The technical data of special versions (customised versions) can deviate from the details in these instructions. Please observe the details on the type plate.

### 8.1. Technical data

Series	FSW 301, 302, 303, 304	FSW 305, 306, 307
Nominal pressure	362.6 psi *	145 psi *
Max. medium temperature (the medium should never freeze)	230 °F	212 °F
Ambient temperature (do not store at <4 °F)	176 °F, 212 °F (optional)	158 °F
Max. switching current	1 A	
Max. switching voltage	230 VAC, 48 VDC	
Max. switching capacity	26 VA, 20 W	
Protection class	II	
Degree of protection	IP 65	
Max. permanent temperature load of the cable	—	158 °F 221 °F (optional)
Connecting cable length	—	4.92 ft
Cable cross-shaped section	—	AWG 21
Tolerance of the switching point ranges	±15 %	

\*Reduced pressure level for devices with copper pipe section. Please observe the details on the type plate!

### 8.2. Maximum flow rate of the flow switch

⇒ The max. permissible flow rate can deviate from the specified limit values for customised versions.

#### Flow switch with pipe section

The maximum specifications relate to water as the medium and a continuous flow rate.

Brass/Stainless steel pipe section		
	FSW 301, 302, 303, 304	FSW 305, 306, 307
Size / process connection	Max. flow rate [GPM]	Max. flow rate [GPM]
1/4" NPT	11.7	. / .
3/8" NPT	15.6	. / .
1/2" NPT	17.4	7.8
3/4" NPT	46.8	20.8
1" NPT	50.7	33.8
1 1/4" NPT	62.4	. / .
1 1/2" NPT	104	. / .
2" NPT	104	. / .

#### Flow switch for direct installation

Series FSW301			
	Thread connection	Insert in size	Max flow rate [GPM]
(mounting length 4.37 inch)	1/2" NPT	4"	440
		6"	660
		8"	880

## 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, improper 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.

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## 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.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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

## **ENVIRONMENTAL MONITORING AND CONTROL**

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments

**M-4700/0908**