

CE



User's Guide

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FSV10 SERIES Solenoid Valve

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(a) UNPACKING THE FSV10 DRIVER MODULE

a.1 Inspect Package for External Damage

Your FSV10 Solenoid Valve Driver Module was carefully packed in a sturdy cardboard carton, with anti static cushioning materials to withstand shipping shock. Upon receipt, inspect the package for possible external damage. In case of external damage to the package contact the shipping company immediately.

a.2 Unpack the Valve Driver Module

Open the carton carefully from the top and inspect for any sign of concealed shipping damage. Please keep all packing and notify Omega Customer Service of any damage.

When unpacking the instrument please make sure that you have all the items indicated on the Packing List. Please report any shortages promptly.

a.3 Returning Merchandise for Repair

Please contact the customer service representative at 1-800-826-6342 ext. 2208 for a **Return Authorization Number (AR)**.

It is mandatory that any equipment returned for servicing be purged and neutralized of any dangerous contents including but not limited to toxic, bacterially infectious, corrosive or radioactive substances.

(b) INSTALLATION



Caution: Solenoid Valves or other equipment coming into contact with gas flow should not be used for monitoring OXYGEN unless specifically cleaned and prepared for such application. For more information, contact Omega.

b.1 Electrical Connections

PIN	FUNCTION
1	Valve, E1
2	Valve E2
3	Power supply, positive
4	Power supply, common
5	0 to 5 VDC, signal in
6	0 to 5 VDC, common
7	4 to 20 mA, signal in
8	4 to 20 mA common
9	TTL valve ON/OFF control

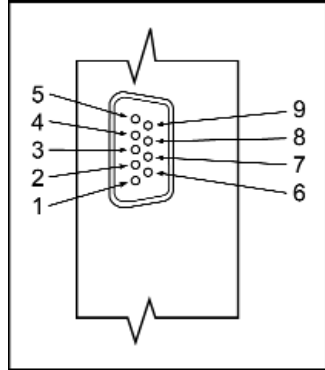


Figure b-1, 9 pin “D” Connector Pinouts for FSV10 Driver Module.



Important notes:

In general, “D” Connector numbering patterns are standardized. There are, however, some connectors with nonconforming patterns and the numbering sequence on your mating connector may or may not coincide with the numbering sequence shown in our pin configuration table above. It is imperative that you match the appropriate wires in accordance with the correct sequence regardless of the particular numbers displayed on your mating connector.

Make sure power is OFF when connecting or disconnecting any cables in the system.

The power input is protected by a 1600mA M (medium time lag) resettable fuse. If a shorting condition or polarity reversal occurs, the fuse will cut power to the valve driver circuit. Disconnect the power to the unit, remove the faulty condition, and reconnect the power. The fuse will reset once the faulty condition has been removed.

Use of the FSV10 valve driver in a manner other than that specified in this manual or in writing from Omega, may impair the protection provided by the equipment.

b.1.1 Valve Connection to FSV10

Connect the two valve solenoid lead wires (E1 and E2) to pins 1 and 2 of the 9 pin “D” connector. There is no polarity on these connections.

b.1.2 Input Reference Signal Connection

Connect the desired analog reference signal input (0 to 5 VDC or 4 to 20 mA) to the appropriate pin locations on the 9 pin “D” connector of the FSV10. The FSV10 will recognize automatically which signal is being provided. If both are connected, the FSV10 will give priority to the 4 to 20 mA signal when that signal is greater than 2 mA.

- a) When using the 0 to 5 VDC reference signal, connect the POSITIVE side of the reference to pin 5, and the NEGATIVE (ground) to pin 6 on the 9 pin “D” connector.
- b) When using the 4 to 20 mA reference signal, connect the POSITIVE side of the reference to pin 7, and the NEGATIVE (ground) to pin 8 on the 9 pin “D” connector.



The NEGATIVE (ground) side of the reference signal inputs is internally connected on the printed circuit board to power ground.

b.1.3 TTL Signal Connection

The TTL valve ON/OFF control feature is not required for the device to function. Use of this SAFETY feature allows for complete de energizing of the solenoid valve to help ensure valve closure. If this feature is not used, a continuous supply of nominal power will be supplied to the solenoid valve.

When left unconnected on the 9 pin “D” connector, the device will default to the “HIGH” setting in accordance with the selected position of the jumper. The factory default setting is LOW (0 VDC) = OFF and HIGH (5 VDC) = ON.

Table I TTL Signal Selection

Jumper Setting (position)	TTL LOW (0 VDC)	TTL HIGH (5 VDC)
4	OFF	ON
5	ON	OFF

To reverse this configuration, remove the square cap on the back of the FSV10 (see Figure e-1). The 4th and 5th position determines the TTL logic configuration. The factory default setting is set with the jumper on position 4. Moving this jumper to position 5 will yield the reverse configuration [LOW (0 VDC) = ON and HIGH (5 VDC) = OFF] (see Table I).



Always make sure that only one jumper is ever applied at any given time to either position 4 or 5. Connecting both at the same time may result in damage to the electronics, and improper control.

b.1.4 Power Connection

With the DC power supply source OFF, connect the power to the DC power jack OR the 9 pin “D” connector.



DO NOT CONNECT POWER TO BOTH CONNECTION POINTS AT THE SAME TIME. This may result in permanent damage to the power supplies and the FSV10.

(c) DESCRIPTION

The FSV10 solenoid driver module is designed to regulate the power supplied to the proportional solenoid valve based on a reference signal. A 0 to 5 VDC or 4 to 20 mA analog set point signal input is used as a reference to proportionally control the output power to the valve. By increasing or decreasing this analog reference signal, the valve volume of gases or liquids processed increases or decreases respectively.

(d) SPECIFICATIONS

Environmental (per IEC 664): Installation Level II; Pollution Degree II.

Connection: 9 pin male “D” connector for input/output signals.

Power Input: +12 to 30 VDC; 1A @12 VDC, 0.5A @24 VDC via 9 pin “D” connector or DC power jack (center positive).

Input Signal: AUTO SELECT feature allows circuit to recognize which analog input reference (0 to 5 VDC or 4 to 20 mA) signal is received.

TTL ON/OFF: Jumper selectable LOW (0 VDC) OFF - HIGH (5 VDC) ON [default setting] or reverse, to select valve ON/OFF status.

Valve Output Power: Jumper selectable to +15, +22, and +29 VDC with adjacent potentiometer to obtain ± 2 VDC [default setting 22 VDC]

Fuse Rating: internal resettable 1.6A fuse protects the electronics on the power input.

Polarity Protection: internal rectifier circuit protects from reversed polarity on the power input.

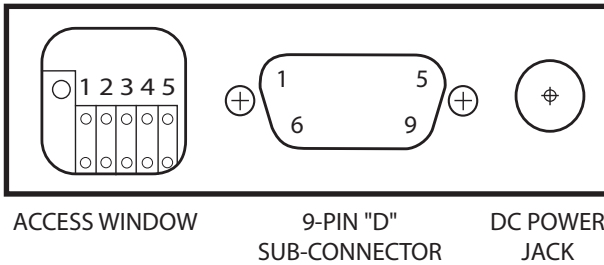
Operating Temperature: 0 °C (32 °F) to 50° (122 °F).

d.1 CE Compliance

Any model FSV10 bearing a CE marking on it, is in compliance with the below stated test standards currently accepted.

EMC Compliance with 89/336/EEC as amended;
Emission Standard: EN 55011:1991, Group 1, Class A
Immunity Standard: EN 55082 2:1995

(e) OPERATING INSTRUCTIONS



CAUTION: If the valve is left in the active mode for an extended period of time, it may become warm or even hot to the touch. Use care in avoiding direct contact with the valve during operation.

e.1 Preparation

It is assumed that the FSV10 has been correctly installed as described in section (b). Turn the DC power source ON. A pilot light on the front of the FSV10 will illuminate indicating the device is active.

e.2 Maximum Output Voltage to Valve

As shown in Figure e-1, remove the square plug of the FSV10 for the access window. Position 1, 2, and 3 on the header block determine the maximum output voltage supplied to the valve. The factory default setting is 22 VDC (position 2).

Jumper Setting (position)	Output Voltage to Valve (VDC)
1	15
2	22
3	29

Table II Maximum Valve Output Selection

The maximum output voltage supplied to the valve, can be set/changed in the field. Changing this will allow for optimal use of the input reference signal to output valve voltage based on the specific flow rate and operating pressure applied to the valve.

With the power ON, use Table II and Figure e-1 to make the appropriate changes as necessary. (Note: This procedure may not need to be performed. It is provided as an added feature to further customize your system.) Move the jumper to either position 1, 2, or 3, and use the adjacent potentiometer [P1] to make fine adjustments to the desired output voltage.



Always make sure that only one jumper is ever applied at any given time to either position 1, 2, or 3. Connecting two or more at the same time may result in damage to the electronics, and improper control.

e.3 Set Point Reference Signal

The FSV10 solenoid valve driver in conjunction with the solenoid valve allow the user to set the flow to any desired flow rate within the range of the particular model installed. The solenoid valve is normally closed when no power is applied.

The set point input responds to an analog 0 to 5 VDC or 4 to 20 mA reference signal. Use this reference signal via the FSV10 valve driver to set the flow rate of the solenoid valve.

e.4 TTL, Valve ON/OFF Control

It may, at times, be desirable to set the flow and maintain that setting while being able to turn the flow control valve off and on again. This can be accomplished by applying a (TTL compatible) high and low signal of +5 VDC and 0 VDC to pin 9 on the 9 pin “D” connector. The factory default configuration is set so that when 0 VDC (LOW) signal is applied, the solenoid valve is not powered and therefore will remain normally closed. Conversely, a +5 VDC (HIGH) signal applied will allow the solenoid valve to remain active. The solenoid valve will remain active when the VALVE OFF pin remains “floating”. (To reverse this configuration, see section b.1.3)

toggling the HIGH/LOW signal on and off will allow for activating and deactivating the solenoid valve. Remember: If the TTL signal line is connected, the valve will only function if the appropriate logic input is applied.

e.5 FSV Proportionating Solenoid Valves

MODEL NUMBER	ORIFICE SIZE		Cv	*maximum flow [ml / min]	
	[inch]	[mm]		Air	Water
FSV11	0.020	0.51	0.009	3500	125
FSV12	0.040	1.02	0.033	13000	400
FSV13	0.055	1.40	0.055	21500	700
FSV14	0.063	1.60	0.068	25000	850
FSV15	0.125	3.18	0.240	100000	2873

* based on 10 psig [690 mbar] differential pressure.

e.5.1 FSV Preperation and Operation

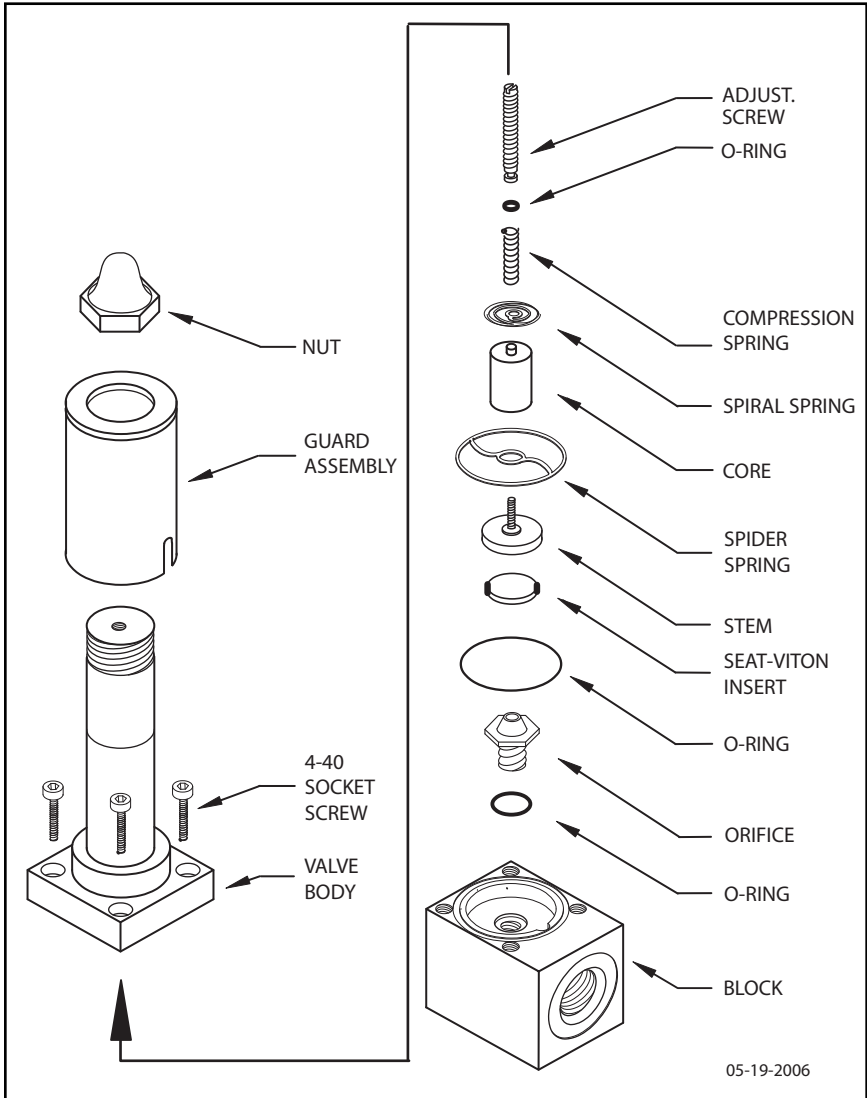
Prior to connecting gas/liquid flow lines inspect all parts of the piping system including ferrules and fittings for dust or other contaminants. Be sure to observe the direction of flow as indicated by the arrow on the front of the valve when connecting the fluid flow system to be monitored.

Insert tubing into the compression fittings until the ends of the properly sized tubing home flush against the shoulders of the fittings. Compression fittings are to be tightened according to the manufacturer's instructions to one and one quarter turns. Avoid over tightening.

Once installed inline with the gas or liquid to be controlled, apply a variable DC power source at the two solenoid wires to proportionally open and close the solenoid valve (there is no polarity). The valve is set to begin opening at approximately 5 VDC. They can also serve as "on off" valves (valves are not guaranteed for absolute closure). Optional FSV D DRIVER MODULE is available when use of a 0 to 5 VDC or 4 to 20 mA reference control signal is desired. Contact Omega® for more information.

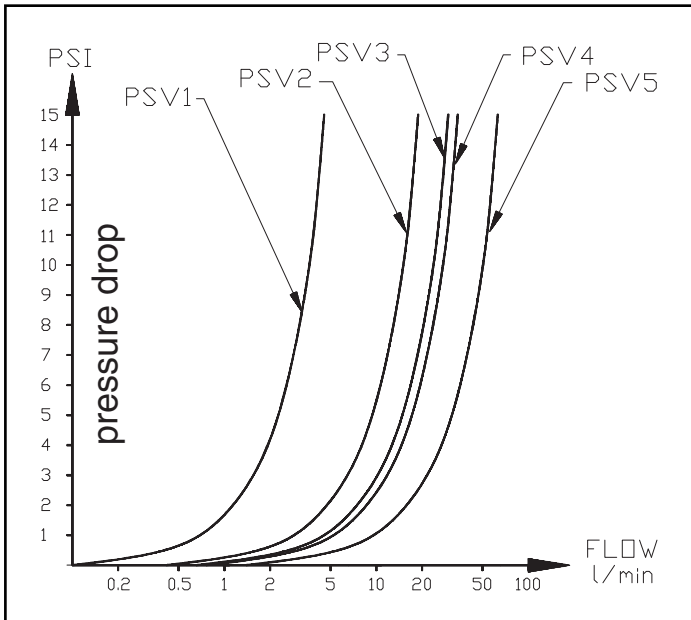
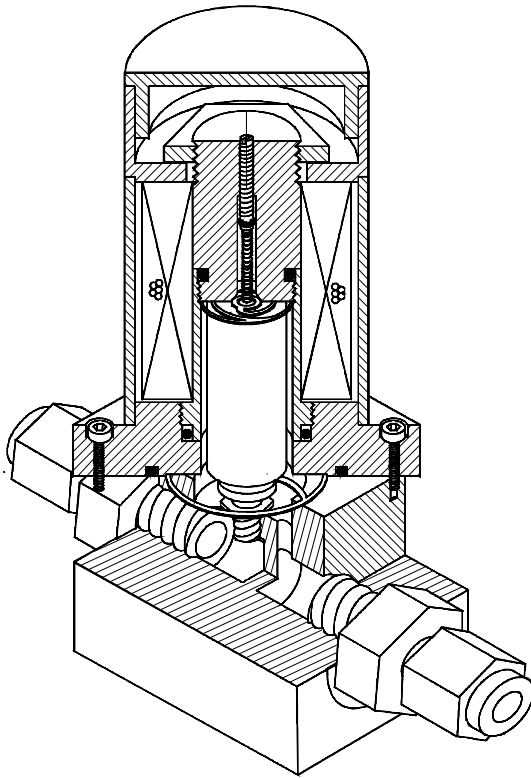
FSV Proportionating Solenoid Valves are uniquely designed to respond to variable power inputs (0-30 VDC) to regulate flow of liquids and/or gases proportionately. For added safety FSV valves are normally closed (NC) when de-energized.

- ⚠ Flow equipment should not be used for monitoring OXYGEN unless specifically cleaned and prepared for such application. For more information, contact Omega®.
- ⚠ If the valve is left in the active mode for an extended period of time, it may become warm or even hot to the touch. Use care in avoiding direct contact with the valve during operation.
- ⚠ To protect servicing personnel it is mandatory that any instrument being serviced is completely purged and neutralized of toxic, bacteriologically infected, corrosive or radioactive contents.
- ⚠ Use of the FSV valve in a manner other than that specified in this instruction sheet, may impair the protection provided by the equipment.



05-19-2006

Omega® reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Omega®.



SPECIFICATIONS	
POWER INPUT:	0 to 30 VDC.
MAXIMUM CURRENT REQUIRED:	400 mA.
ELECTRICAL CONNECTION:	male spade connectors.
TYPE OF OPERATION:	normally closed (nc).
CONNECTIONS:	1/4 inch compression fittings, optional 1/8 inch and 3/8 inch.
DIMENSIONS:	3.55 inch (90.2mm) high x 3.25 inch (82.6mm) long (with fittings) x 1.00 inch (25.4mm) deep.
WETTED MATERIALS:	types 316 and 416 stainless steel, FKM O-rings; BUNA, EPR or Perfluoroelastomer O-rings are optional.
MAXIMUM PRESSURE:	500 psig (3448 kPa).
MAXIMUM DIFFERENTIAL PRESSURE:	50 psid (345 kPa).
LEAK INTEGRITY:	1 X 10 ⁻⁹ scc / sec Helium.
FLUID TEMPERATURE:	14 °F to 122 °F (-10 °C to 50 °C).
MAXIMUM TEMPERATURE (TYPICAL):	174 °F (79 °C) inside, 130 °F (54 °C) outside surface at 24 VDC.
ENVIRONMENTAL (PER IEC 664):	installation level II; pollution degree II.

e.5.2 FSV Maintenance

The solenoid valve consists of 316 and 416 stainless steel, and FKM (or optional BUNA, EPR or Perfluoroelastomer) O-rings and seals. No regular maintenance is required except for periodic cleaning. Various corrosive gases or liquids may demand more frequent replacement of O-rings and seals inside the valve. Be sure to use an elastomer material, appropriate for your specific application. Contact Omega® for optional sealing materials available.

Set the FSV for maximum flow, and attempt to flush through in both directions with a clean, filtered, and neutral gas such as nitrogen. [Another option for fully opening the valve is to remove the plastic cap on top of the valve, and turn the set screw counterclockwise until it stops]. If blockage is not alleviated, return the unit to Omega® for servicing.

(f) TROUBLESHOOTING

f.1 Common Conditions

Your Solenoid Valve Driver Module was thoroughly checked at numerous quality control points during and after manufacturing and assembly operations.

It was carefully packed to prevent damage during shipment. Should you feel that the instrument is not functioning properly please check for the following common conditions first:

Are all cables connected correctly?

Is the power supply correctly selected according to requirements?

Were the connector pinouts matched properly? When interchanging with other manufacturers' equipment, cables and connectors must be carefully wired for correct pin configurations.

f.2 Troubleshooting Guide

Indication	Likely Reason	Remedy
no power to valve	power supply off	check connection of power supply
	fuse blown	disconnect FMA transducer from power supply; remove the shorting condition or check polarities; fuse resets automatically
	power supply problem	check power supply for appropriate output
	pc board defective	return to factory for replacement
no response to set point	inadequate gas pressure	apply appropriate gas pressure
	cable or connector malfunction	check cables and all connections or replace
	set point is too low (<2% of full scale)	re adjust set point
	valve adjustment wrong	re adjust valve
	pc board defective	return to factory for replacement
valve does not work in "active" position	incorrect valve adjustment	re adjust valve
	pc board defect	return to factory for replacement
	cable or connector malfunction	check cable and connectors or replace
	differential pressure too high	decrease pressure to correct level
	insufficient inlet pressure	adjust appropriately
valve does not work in close position	incorrect valve adjustment	re adjust valve
	pc board defect	return to factory for replacement
	cable or connector malfunction	check cable and connectors or replace
	orifice obstructed	disassemble to remove impediments or return to factory

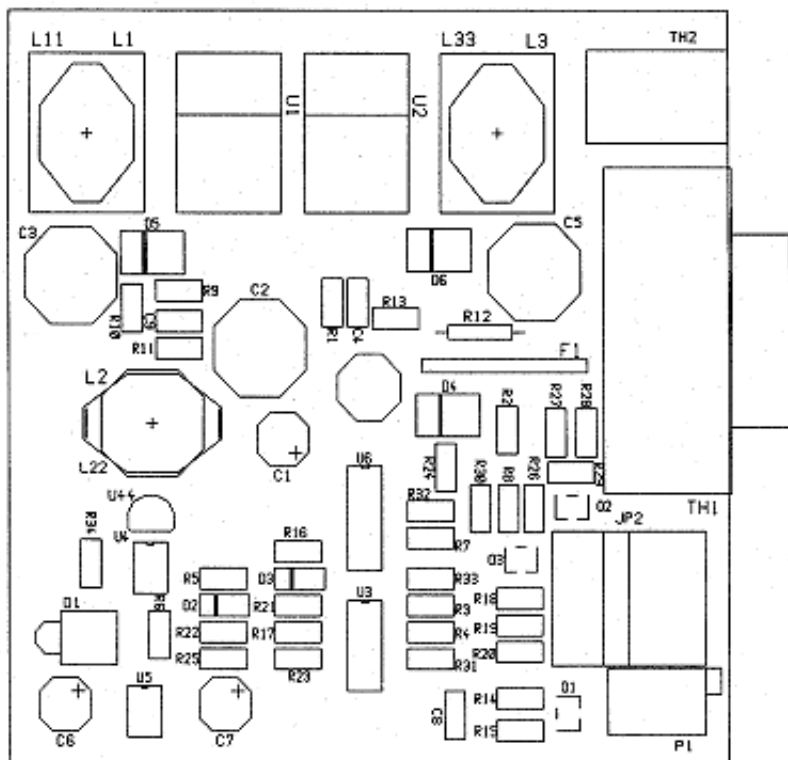
For best results it is recommended that instruments are returned to the factory for servicing. See section a.3 for return procedures.

f.3 Technical Assistance

Omega Engineering will provide technical assistance over the phone to qualified repair personnel. Please call our Flow Engineering Dept. at 800-872-9436 Ext. 2298. Please have your Serial Number and Model Number ready when you call.

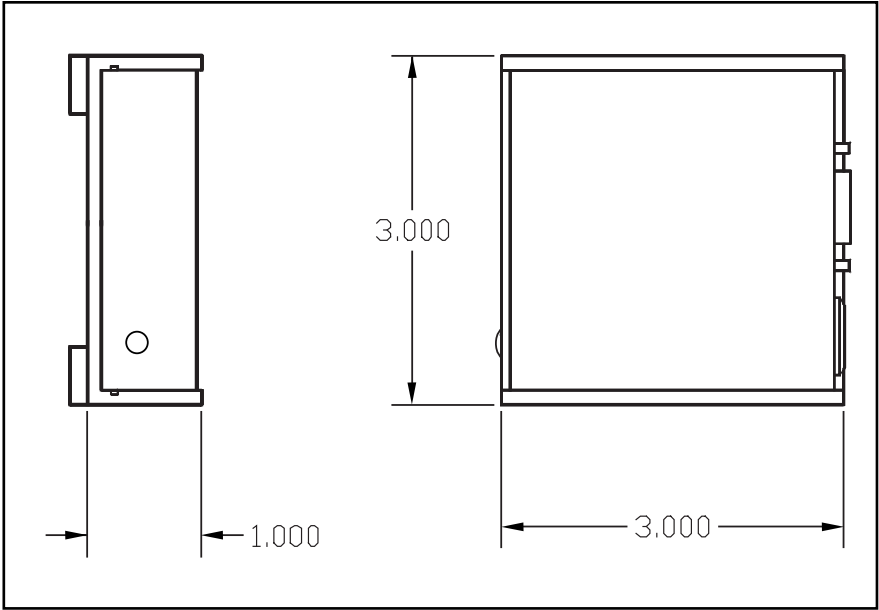
APPENDIX 1

COMPONENTS DIAGRAMS



Omega® reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Omega®.

APPENDIX 2
DIMENSIONAL DRAWINGS

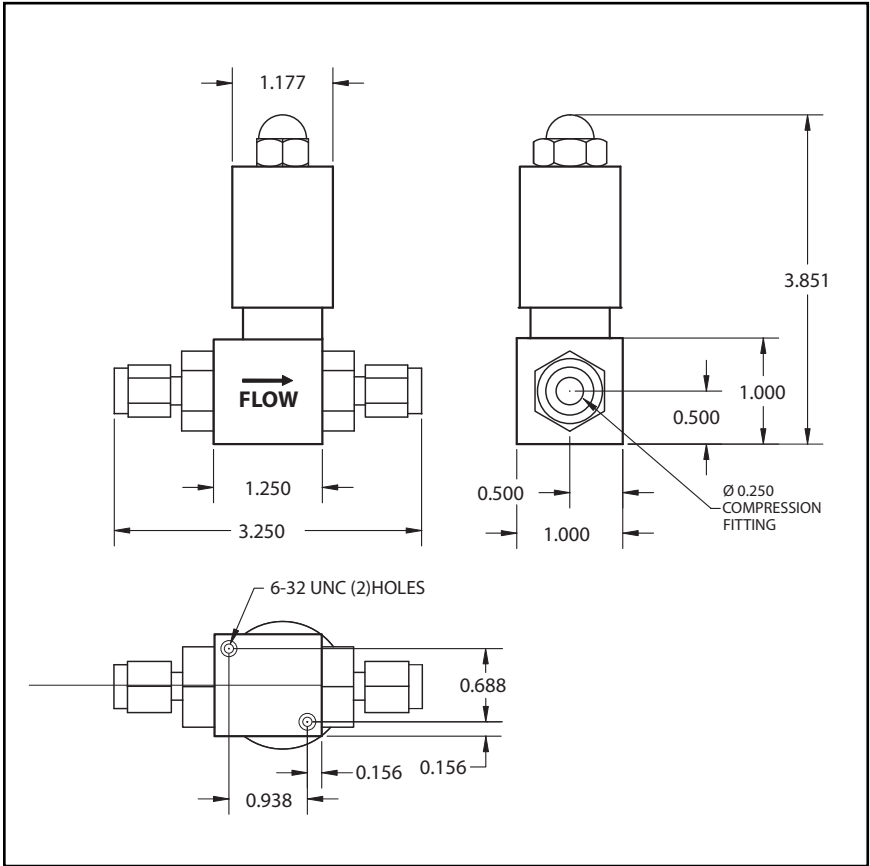


FSV10 SOLENOID VALVE DRIVER MODULE

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APPENDIX 2

DIMENSIONAL DRAWINGS



FSV SOLENOID VALVE

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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 which wear are not warranted, including but 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 it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS 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.

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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