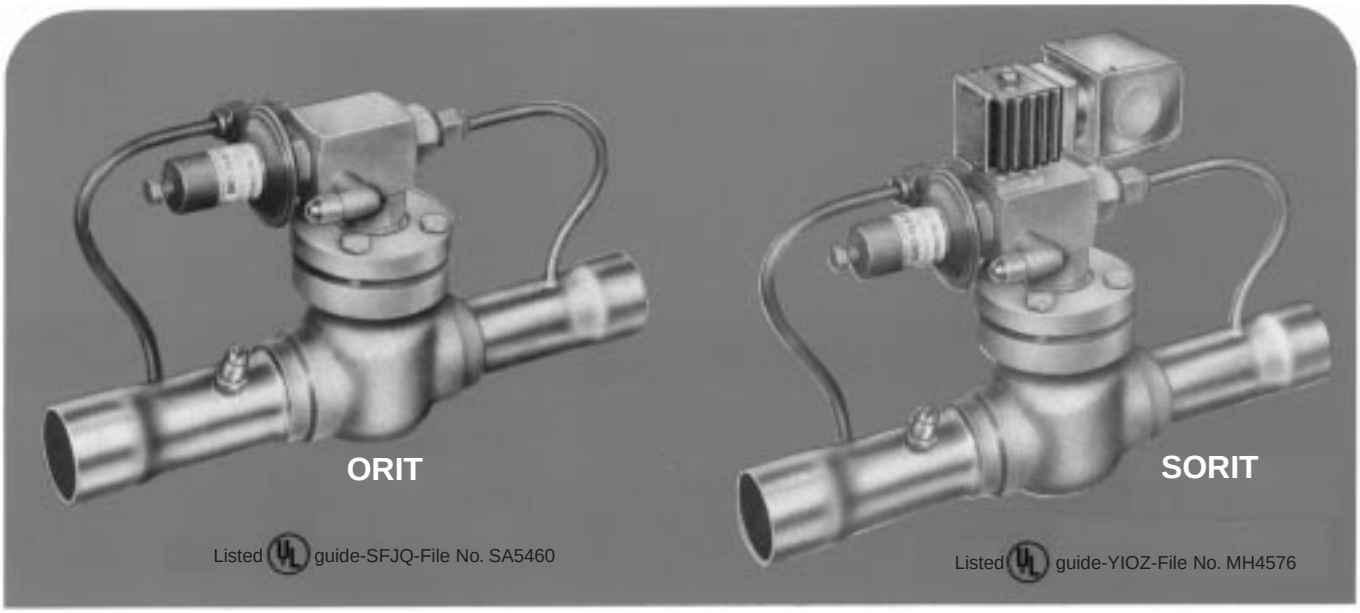
EVAPORATOR PRESSURE REGULATING VALVES

(S)ORIT-12 , (S)ORIT-15 , (S)ORIT-20,



The ORIT-12, 15, and 20 Evaporator Pressure Regulating Valves were developed by Sporlan Valve Company as the first of a new generation of evaporator pressure regulators. This control is a non-electric regulator which uses highside system pressure as a source of operating power. It was developed specifically for systems where **accurate control and minimum pressure drop** are important requirements.

THE ORI DESIGN FEATURES THESE ADVANTAGES:

The use of highside pressure, regulated by a pilot valve, allows operation of the primary port at previously unattainable low pressure drops. These low pressure differentials are directly related to energy savings.

The pilot automatic regulator allows convenient adjustability of the evaporator pressure. This valve is also equipped with an inlet strainer to eliminate potential dirt problems in the pilot assembly.

A pilot valve is available with a solenoid stop feature for gas defrost applications.

The normally open construction allows system evacuation without the use of a manual operator.

Standard adjustment range is 0/75 psi. Other ranges are available, contact Sporlan Valve Company, Washington, MO.

Can be installed with phos-copper; no expensive silver solder required.

EVAPORATOR PRESSURE REGULATING VALVES

The most commonly applied evaporator flow control is the evaporator pressure regulating valve. This device automatically throttles the vapor flow from the evaporator to prevent evaporator pressure from falling below the setting of the valve. Sporlan manufactures three adjustable, pilot operated models of this type — ORIT-12, ORIT-15, and ORIT-20 — available with a nominal adjustment range of 0 to 75 psi. Other ranges are available, contact Sporlan Valve Company, Washington, MO. The valves are supplied with an access valve pressure tap connection that permits the use of a pressure gauge to check the setting.

A pilot valve is available with a solenoid stop feature for gas defrost applications.

The unique and energy saving feature of the ORIT-12, -15, and -20 is their ability to operate at pressure drops of less than 1 psi. A detailed explanation of the operation of the valve will show how this is possible.

OPERATION — EPR

PILOT PORT —The three pressures that control the modulation of the pilot valve, and indirectly control the operation of the main regulating valve, are the ADJUSTMENT spring pressure P1 in Figure 1, which is directly opposed by the external equalizer pressure P2 (evaporator pressure), acting on the underside of the pilot diaphragm. Also working with the evaporator pressure in the closing direction is the bottom spring P3, which exerts its force on the underside of the pin guide, through the push rods, to the underside of the diaphragm.

PRIMARY PORT —The three pressures that control the modulation of the main valve piston are the pilot valve inlet pressure (this is a high pressure source, i.e., a vent line from the top of the receiver or discharge manifold), the kickoff spring pressure P5, and the evaporator pressure P6. NOTE: In order for the valve to modulate correctly, the high side pressure source must be at least 50 psi higher than the suction line pressure downstream of the EPR.

COMBINATION—Evaporator pressure regulating valves respond to variations in inlet pressure (evaporator pressure). The designation for Sporlan evaporator pressure regulating valves describes the operation: Open on Rise of Inlet pressure or ORI. The pilot dome spring pressure P1 should be set to maintain the minimum desired evaporator pressure. When the external equalizer pressure (evaporator pressure) P2 plus the spring pressure P3 falls below the set point of the spring P1, the pilot valve opens and bleeds high pressure P4 into the chamber above the piston of the main valve. This causes the main valve piston to modulate to a more closed position until the evaporator pressure P6 reaches the set point of the pilot valve. The main valve piston is shown in a closed position in Figure 1.

The high side pressure power source does not bleed through the pilot valve to the suction line during periods of full load. When the valve is modulating to control at less than its full rated capacity, there is a small bleed flow rate of less than 0.03 lbs/min at 1 psi pressure drop.

Increases in the evaporator pressure will cause the pilot valve to close and the pressure above the piston of the main valve will vent through the bleed orifice and out to the suction side, allowing the spring force P5 to shift the main piston and open the primary port, as shown in Figure 2. If the optional solenoid stop feature is used, it should be energized during normal operation.

DEFROST OPERATION — When the valve is used with the solenoid pilot, the operation of the valve for hot gas defrost is as follows: The pilot solenoid valve is de-energized causing full highside pressure to be applied to the top of the main valve piston, immediately closing the valve. See Figure 1.

When defrost is complete, the bypass solenoid is de-energized and the pilot solenoid valve on the (S)ORIT is energized. Energizing the pilot solenoid valve allows the high side pressure to be vented from the top of the main valve piston and the (S)ORIT to go full open for rapid pulldown. The hot gas bypass line for defrost should be connected to the suction line upstream of the (S)ORIT and the defrost solenoid valve can be simultaneously energized at the time the pilot solenoid of the (S)ORIT is de-energized to provide the complete control package for defrost.

OPERATION SAVINGS

Any pressure drop in the suction line of a refrigeration system reduces system capacity and causes longer running time. With increasing energy costs, additional suction line pressure drop can result in a considerably higher electrical power cost.

To further understand the effect of even small pressure drops, Table 1 shows the percent of compressor capacity loss due to suction line pressure drop. While any pressure drop results in significant compressor capacity loss, the table indicates that pressure drop becomes much more critical at low evaporator temperatures.

TABLE 1

Suction Line Pressure Drop	% Of Compressor Capacity Loss Due To Pressure Drop		
	R-22	R-22	R-502
	+10°F Evap.	-25°F Evap.	-25°F Evap.
0	—	—	—
1	2.2	5.6	6.1
2	4.4	12.7	10.4
3	7.1	18.1	15.3
4	9.5	24.2	19.5

Based on compressor capacity curves at 100°F. Condensing.

Sporlan's line of Evaporator Pressure Regulators have been developed with energy savings as an objective, and their unparalleled ability to operate at pressure drops of less than one psi can result in notable operating savings.

APPLICATION

Since the basic function of an ORIT is to prevent the evaporator pressure from falling below a predetermined set value, the proper application of such a valve involves the consideration of several system factors.

TYPE OF SYSTEM — One type of application is the **single evaporator system.** Special consideration must be given to these applications because the suction pressure could pull to an undesirable low level when the ORIT throttles to maintain the evaporator pressure. Discharge gas bypass can be successfully applied to the suction line in conjunction with the ORIT for this application to falsely load the compressor. This application has special considerations and is discussed further in Sporlan Bulletin 90-40 covering Discharge Bypass Regulators.

Another type of system is a multi-temperature refrigeration system (see Figure 3) with evaporators operating at different temperatures. A (S)ORIT may be required on one or more of the evaporators to maintain pressures higher than that of the common suction line. For example, if Evaporator A in Figure 3 is designed for -10°F (22.6 psig, Refrigerant 502), and Evaporator B for - 20°F (15.3 psig), the (S)ORIT is used to maintain 22.6 psig in Evaporator A. However, some multi-

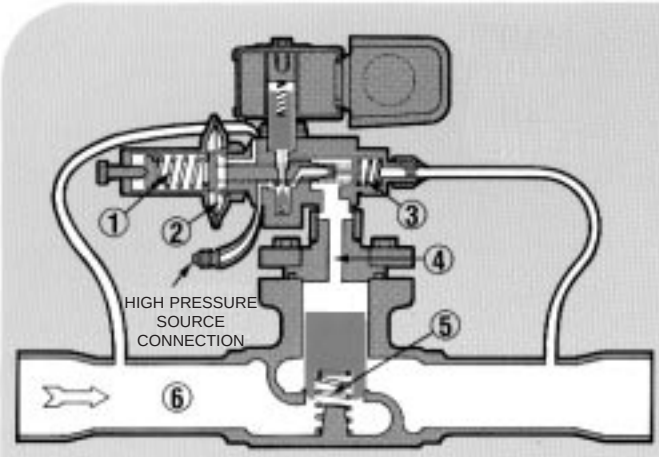


Figure 1
Solenoid Coil DE-ENERGIZED
Valve CLOSED

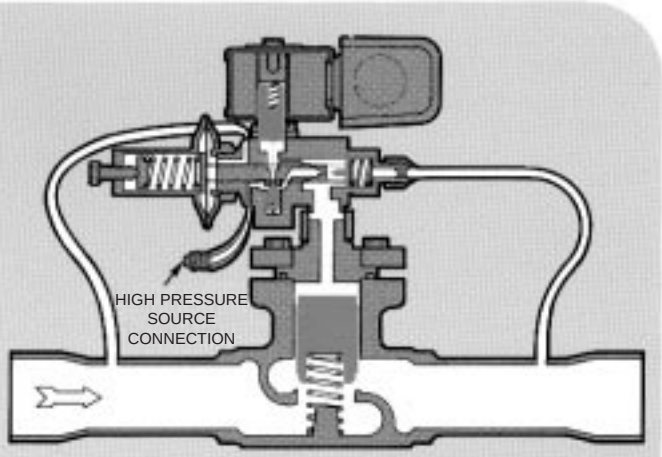


Figure 2
Solenoid Coil ENERGIZED
Valve MODULATING

temperature systems may require a (S)ORIT on each evaporator depending on the type of product being refrigerated.

PIPING SUGGESTIONS — Figure 3 is a piping schematic only to illustrate the general location of the (S)ORIT valves in the system. Sporlan recommends that recognized piping references be consulted for assistance in piping procedures. Sporlan is not responsible for system design, any damage arising from faulty system design, or for mis-application of its products. If these valves are applied in any manner other than as described in this bulletin, the Sporlan warranty is void.

SELECTION PROCEDURE — The actual selection of a (S)ORIT should be based on the evaporator (or evaporators) design capacity. The available pressure drop across the valve at design load is a function of the system involved. On single evaporator systems the valve selection should be made directly from the capacity table at the applicable conditions, and the desired pressure drop. On multiple evaporator systems the natural pressure drop across the valve must be considered.

Example: As in the earlier example, assume that Evaporator A is designed for -10°F (22.6 psig, Refrigerant 502), and Evaporator B is at the common suction level, - 20°F (15.3 psig). Evaporator A is designed for 2.7 tons and Evaporator B for 1.5 tons.

Evaporator A has an available natural pressure drop of 7.3 psi (22.6 minus 15.3); therefore a (S)ORIT-12 would be the proper selection. Evaporator B is operating at the common suction level and the (S)ORIT should be selected from the capacity table for the desired pressure drop. The selection of a (S)ORIT-15 would result in an approximate pressure drop of 1/2 psi across the valve port at the design load.

CAPACITIES — Tons of Refrigeration

Based on 60°F. saturated liquid temperature, 0°F. superheat at the evaporator, installation of the valve in the machine room with 25°F. superheated return gas. *

Valve Type	Evaporator Temperature °F.	REFRIGERANT														
		12					22					502				
		Pressure Drop Across Valve — psi														
		0.5	1	2	5	10	0.5	1	2	5	10	0.5	1	2	5	10
(S)ORIT - 12	40	1.56	2.20	3.10	4.80	6.54	2.30	3.25	4.58	7.15	9.91	1.96	2.77	3.90	6.10	8.47
	30	1.41	1.99	2.79	4.30	582	2.09	2.95	4.15	6.47	8.92	1.77	2.50	3.25	5.50	7.60
	20	1.27	1.78	2.50	3.83	5.13	1.89	2.66	3.74	5.82	7.97	13.59	2.25	3.16	4.92	6.78
	15	1.20	1.69	2.36	3.60	4.80	1.79	2.53	3.55	5.51	7.53	1.51	2.13	2.99	4.65	6.39
	10	1.13	1.59	2.22	3.39	4.48	1.70	2.39	3.36	5.20	7.09	1.43	2.01	2.83	4.39	6.01
	5	1.07	1.50	2.09	3.17	4.17	1.61	2.27	3.18	4.91	6.66	1.35	1.92	2.67	4.14	5.64
	0	1.01	1.41	1.97	2.97	3.87	1.52	2.14	3.00	4.62	6.24	1.27	1.79	2.52	3.89	5.28
	-10	0.89	1.25	1.73	2.58	—	1.36	1.91	2.67	4.08	5.44	1.13	1.59	2.23	3.42	4.59
	-15	0.84	1.17	1.62	—	—	1.28	1.79	2.51	3.81	5.05	1.06	1.49	2.09	3.20	4.27
	-20	0.78	1.09	1.51	—	—	1.20	1.69	2.35	3.56	4.67	1.00	1.40	1.96	2.98	3.95
	-25	—	—	—	—	—	1.13	1.58	2.20	3.32	—	0.93	13.31	1.83	2.77	3.56
	-30	—	—	—	—	—	1.06	1.48	2.06	3.08	—	0.87	1.22	1.71	2.57	3.35
	-35	—	—	—	—	—	0.99	1.38	1.92	—	—	0.81	1.14	1.59	2.38	—
(S)ORIT - 15	40	2.35	3.31	4.64	7.17	9.7.	3.46	4.87	6.86	1.07	15.8	2.94	4.15	5.85	9.14	12.7
	30	2.12	2.98	4.17	6.41	8.64	3.13	4.42	6.22	9.67	13.3	2.66	3.75	5.28	8.22	11.3
	20	1.90	2.67	3.74	5.71	7.60	2.83	3.99	5.61	8.70	11.9	2.39	3.37	4.74	7.36	10.1
	15	1.80	2.53	3.53	5.37	7.09	2.69	3.79	5.32	8.23	11.2	2.67	1.19	4.49	6.96	9.52
	10	1.70	2.38	3.33	5.04	6.61	2.55	3.59	5.04	7.77	10.5	2.14	3.02	4.24	6.56	8.94
	5	1.60	2.25	3.13	4.72	6.13	2.41	3.40	4.76	7.33	9.89	2.02	2.85	4.00	6.18	8.38
	0	1.51	2.12	2.94	4.41	5.67	2.28	3.21	4.50	6.90	9.26	1.91	2.69	3.77	5.80	7.82
	-10	1.33	1.87	2.58	3.82	—	2.03	2.86	3.99	6.07	80.3	1.69	2.38	3.33	5.10	6.80
	-15	1.25	1.75	2.41	—	—	1.91	2.69	3.75	5.68	7.44	1.59	2.24	3.13	4.76	6.31
	-20	1.17	1.64	2.25	—	—	1.80	2.53	3.52	5.30	6.87	1.49	2.10	2.93	4.44	5.83
	-25	—	—	—	—	—	1.69	2.37	3.29	4.93	—	1.40	1.96	2.73	4.12	5.36
	-30	—	—	—	—	—	1.58	2.22	3.07	4.56	—	1.31	1.83	2.55	3.82	4.91
	-35	—	—	—	—	—	1.47	2.07	2.86	—	—	1.22	1.71	2.37	3.53	—
(S)ORIT - 20	40	5.67	7.98	11.2	17.2	23.3	8.35	11.8	16.6	25.8	35.5	7.11	10.0	14.1	22.0	30.4
	30	5.11	7.19	10.1	15.4	20.6	7.58	1.7	15.0	23.3	31.9	6.43	9.06	12.7	19.8	27.2
	20	4.59	6.45	9.01	13.7	18.1	6.85	9.65	13.5	20.9	28.5	5.78	8.15	11.4	17.7	24.2
	15	4.34	6.10	8.50	12.9	16.8	6.50	9.15	12.8	19.8	26.8	5.47	7.72	10.8	16.8	22.8
	10	4.10	5.76	8.01	12.1	15.6	6.16	8.67	12.2	18.7	25.2	5.18	7.29	10.2	15.8	21.4
	5	3.87	5.42	7.54	11.3	14.4	5.83	8.21	11.5	17.6	23.6	4.89	6.89	9.65	14.9	20.0
	0	3.64	5.10	7.08	10.5	13.3	5.51	7.75	10.8	16.6	22.1	4.62	6.49	9.09	13.9	18.7
	-10	3.22	4.50	6.21	90.9	—	4.91	6.89	9.61	14.6	19.1	4.09	5.75	8.03	12.2	16.2
	-15	3.02	4.21	5.80	—	—	4.62	6.49	9.03	13.6	17.6	3.84	5.40	7.53	11.4	15.0
	-20	2.83	3.94	5.40	—	—	4.35	6.09	8.46	12.7	16.2	3.61	5.04	7.05	10.6	13.8
	-25	—	—	—	—	—	4.08	5.71	7.92	11.8	—	3.38	4.74	6.58	9.86	12.77
	-30	—	—	—	—	—	3.82	5.34	7.39	10.9	—	3.16	4.42	6.13	9.13	11.6
	-35	—	—	—	—	—	3.57	4.99	6.88	—	—	2.95	4.12	5.70	8.40	—

REFRIGERANT LIQUID TEMPERATURE CORRECTION FACTORS

Refrigerant Liquid Temperature 0°F		0	10	20	30	40	50	60	70	80	90	100
R-12	Correction Factor	1.24	1.20	1.16	1.12	1.08	1.04	1.00	.95	.92	.87	.83
R-22		1.22	1.18	1.15	1.11	1.07	1.04	1.00	.96	.92	.88	.84
R-502		1.31	1.26	1.21	1.16	1.11	1.05	1.00	.94	.89	.83	.77

*ARI standard capacities are based on 100°F.saturated liquid temperature.Use the correction factor for 100°F. liquid temperature and the capacities at 40°F. evaporator temperature to determine ARI standard capacity ratings.

These factors correct for net refrigerating effect and are based on an average evaporator temperature of 0°F. However, they may be used for any evaporator temperature from -35°F. to 40°F. since the variation in the actual factors across this range is insignificant.

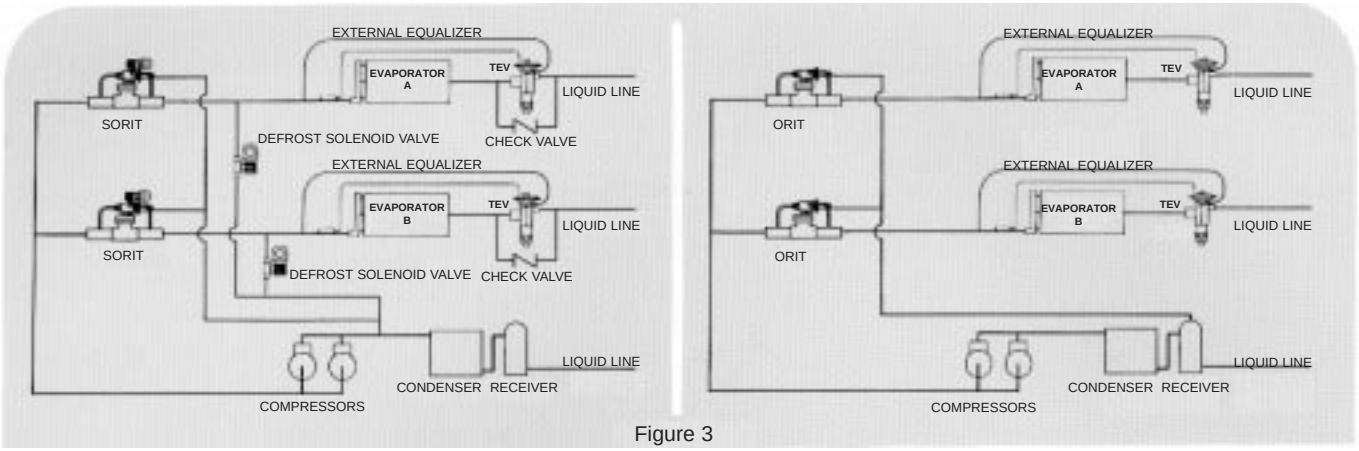


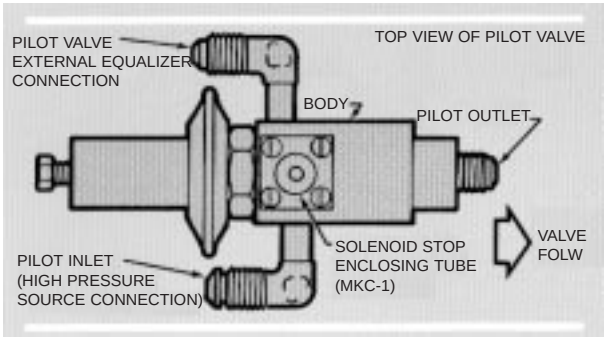
Figure 3

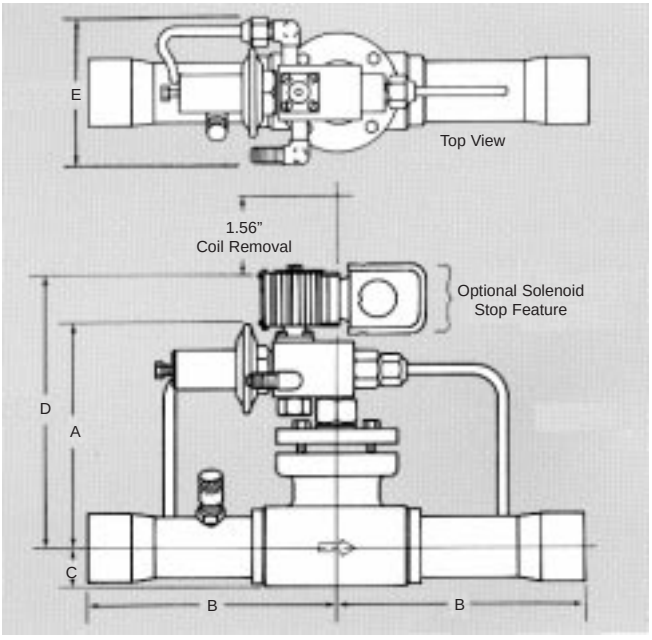
Note : High side pressure for pilot may be taken from discharge or receiver.

SPECIFICATIONS

Type	Port Size Inches	Connections ODF Solder Inches	Operating Range	Standard Coil Ratings *MKC-1		Net Weight Pounds		Shipping Weight Pounds	
				Volts/Cycles	Watts	With Stop	Without Stop	With Stop	Without Stop
(S)ORIT-12	25/32	1-1/8	0/75	24/50-60 120/50-60 208-240-50/60 120-208-240/-50-60	10	4.00	3.50	4.75	4.25
(S)ORIT-15	1	1-3/8				5.75	5.25	7.00	6.50
(S)ORIT-20	1-5/16	1-5/8				9.75	9.25	11.00	10.50

* Available with junction box or conduit boss at no extra charge. For voltages other than listed consult Bulletin 30-10, page 32.





DIMENSIONS - Inches

	A	B	C	D	E
(S)ORIT12-	4.99	4.25	.72	6.50	3.46
(S)ORIT-15	4.91	5.53	.88	6.42	3.46
(S)ORIT-20	5.66	5.53	1.44	7.16	3.50

ORDERING INSTRUCTIONS

Omision of designation for an optional item indicates a request for a valve less that specific option. Example: ORIT-15-0/75-1-3/8 ODF; This indicates a valve less the solenoid stop feature.

When ordering a valve with a solenoid stop feature, specify voltage and cycles.

When ordering the solenoid coil assembly only, specify MKC-1 coil, voltage and cycles. ***Example:*** **MKC-1-120 volts/50-60 cycles.**

EXAMPLE

S ORI T — 15 — 0/75 — 1-3/8 ODF — 120/50-60

S	ORI	T	15	0/75	1-3/8 ODF	120/50-60
Solenoid stop feature, optional	Basic type, Open on rise of inlet pressure	Pressure Tap on inlet connection	Valve size	Adjustment range, psig *	Conn.	Electrical specifications for solenoid stop feature, optional

* Other pressure ranges are available, Consult Sporlan Valve Company, Washington, MO 63090