



Step Motor Expansion Valves

Types SERI-F, -G(S), -J(S), -K(S), -L(S)

Types SER-1.5, -6, -11, -20

Installation and Servicing Instructions
SD-286 /32018



OPERATION

The SER(I) series valves are step motor operated electric expansion valves. Step motors are designed to provide discrete segments of angular motion, or rotation, in response to an electronically generated signal. The advantages of step motors in valve applications are high resolution, repeatability and reliability with low hysteresis. Feedback loops are not required, simplifying controller design and circuitry.

The step motor used in the SERI valves is a 12-volt DC, two-phase, bipolar, permanent magnet rotor type. Motor rotation is converted to linear motion by the use of a lead screw and threaded drive coupling. Forward motion of the motor extends the drive coupling and pin, which moves the valve to the closed position. Backward rotation of the motor retracts the drive coupling and pin modulating the valve in the opening direction. Full forward or backward travel, while the valve is assembled, is limited by the valve seat in the closed position or an upper stop in the open direction. A slight clicking sound may be heard at either of these two positions and does no harm to the valve or drive mechanism.

The valve will operate only when connected to a properly designed controller. Various Sporlan and third party controllers are available for use with the valve. Questions of suitability of a specific controller should be directed to Sporlan Division - Parker Hannifin, Attn.: Product Manager-Electric Valves. Control algorithms for the valve include an initialization sequence that will first over-drive the valve in the closing direction. This is to assure that the valve is completely shut and to establish the "zero" open position. The controller then keeps track of the valve's position for normal operation. During this initialization phase, a light clicking sound may be heard, which will serve as proof of the valves operation and closure.

The valves provide tight shutoff and uniquely characterized pin and port combinations for

exceptional control of refrigerant flow. The seats require no service and are not replaceable. The motor and pin/piston assembly may be easily replaced without removing the valve body from the system on the SERI -F, -G(S), -J(S), -K(S) and -L(S) valves.

INSTALLATION

The SERI series valves are electronically controlled Step Motor Expansion Valves, and are installed before the distributor and evaporator just as one would install a thermostatic expansion valve. The valves are bi-directional and may be used on heat pumps, although the SERI-K and -L will have reduced flow in the reverse direction. See Figure 1 for normal flow direction. Location should be planned to provide serviceability and to allow controller installation within the maximum cable length of forty feet. The valve may be installed in the refrigerated space and may be mounted in any position except with the motor housing below horizontal line. Cable routing should avoid any sharp edges or other sources of potential physical damage such as defrost heaters and fan blades. For neatness and protection, the cable may be fastened to the suction or liquid lines with nylon wire ties.

The SERI valves have copper connections and any standard solder or brazing alloy can be used to install the valve. During installation the torch flame should be directed away from the valve body and cable. The cable may be removed for installation and replaced when the piping has cooled sufficiently to prevent cable damage.

NOTE: The cable connector can be installed in any of the four directions. Pins should be aligned with the connector when installing the cable. When tightening the cable nut, the cable connector should not be twisted or rotated. Do not force the connector onto the valve to avoid damage to the valve and cable. If left attached, care

must be taken to assure that the cable is not damaged either directly from the flame, or indirectly from contact with hot piping. The valve is shipped in the open position to prevent heat from being conducted into the motor, but it is strongly suggested that the body be wrapped in a wet cloth during the soldering operation, to avoid the maximum internal temperature of 250°F (120°C) during install. Nitrogen or other inert gas should be used to displace oxygen in the piping during brazing.

Inlet strainers can be supplied as a separate item, if desired. If installed, strainers must be oriented in the proper direction as shown on the strainer package.

The valve wiring is color-coded and the controller manufacturer should be consulted for the proper attachment to the controller.

The valve will only operate when connected to a properly designed and configured controller. Wire the valve cable to the controller according to the controller specifications. The required valve drive sequence is shown here for reference.

BIPOLAR DRIVE SEQUENCE				
STEP	BLACK	WHITE	RED	GREEN
1	12 volts	0 volts	12 volts	0 volts
2	0 volts	12 volts	12 volts	0 volts
3	0 volts	12 volts	0 volts	12 volts
4	12 volts	0 volts	0 volts	12 volts
1	12 volts	0 volts	12 volts	0 volts

Apply power to the valve controller. The valve is shipped at approximately half stroke, so the controller will overdrive closed to establish the zero position. A light clicking may be heard during this time. Upon completion of initialization, the valve should be ready to begin controlling.

FIELD TROUBLESHOOTING INSTRUCTIONS

1. If the motor fails to operate properly, disconnect the line voltage to the valve controller. Disconnect the valve wires from the controller.
2. Check the resistance of each motor phase. Resistance between Black and White leads or between the Red and Green leads should be approximately 100 ohms. Differences of more than 10% between phases indicate a defective motor. Resistance between Black and Red, or any lead and piping, should be

infinite or “open”. Any resistance reading will indicate a shorted winding and the valve will need to be replaced.

3. If you have access to an SMA-12 test instrument (Part Number 953276), operation of the valve may be proven. Connect the motor leads to the proper color-coded connector on the SMA-12. Set the rate to 200 PPS and toggle in the “OPEN” position. Pressure downstream of the valve should rise indicating valve opening and flow. **NOTE: Care should be taken to assure that flood-back and compressor damage does not occur during the test.** Toggle the SMA-12 to the “CLOSE” position and the pressure downstream of the valve should fall, indicating valve closure. If the valve does not open and close during the procedure, the valve is either full of debris or defective, and must be removed for cleaning or replacement.
4. If the valve responds to the above procedure the failure is in the controller or wiring. The control manufacturer should be consulted for their preferred procedure. In the absence of that information, the output of the controller to the valve may usually be tested with the following procedure.
 - a. Cycle power to controller to reinitialize (zero) the valve. Then monitor valve and system operation.
 - b. If problem remains, disconnect supply voltage to the controller.
 - c. Place a digital voltmeter, on 20-volt AC scale, across the Black and White terminals on the controller. Restore power to the controller. For at least 7 seconds, the voltmeter should read approximately 12 to 14 volts. Significant differences mean the controller is defective or not properly configured for the SERI valve.
 - d. Repeat the procedure above using the Red and Green terminals on the controller.
 - e. If the controller responds properly to the above, the wiring may be damaged or the valve may be plugged with debris or otherwise obstructed.
 - f. The SERI valves may be disassembled for cleaning, inspection or motor assembly replacement. Refer to the following section on reassembly.

VALVE REPLACEMENT

NOTE: If the valve is to be removed from the system, be sure the refrigerant has been reduced to a safe level (0 psig).

The valve may be replaced by unsoldering or cutting the piping. A tubing cutter must be used to prevent creating contaminants in the piping. See the Installation section on procedures to use during valve installation.

VALVE FIELD SERVICE INSTRUCTIONS: SERI ONLY

Motor adapter assemblies are available as replacement parts (see parts list on page 4).

NOTE: Prior to removal of motor adapter assembly, be sure the refrigerant has been reduced to a safe level (0 psig).

1. Using an SMA-12 or the valve controller, fully retract the piston into the motor assembly. Disconnect power to the valve controller.

CAUTION: Failure to retract the piston prior to removal of the motor adapter

assembly can damage the piston or motor.

2. Remove the cable from the valve, and then remove the motor adapter assembly using two wrenches. Inspect valve body and piston for damage or obstructions. An SMA-12 can be used to visually confirm movement of the piston.

CAUTION: Ensure the piston is retracted prior to reassembly. Failure to retreat the piston prior to installation can damage the piston or motor. Replacement assemblies are shipped in the retracted position, and can be installed as received.

3. Lightly oil the threads and gasket. Carefully seat the adaptor on the valve body. Lock nuts should be torqued to approximately 45 ft.-lbs.

4. After the motor is tightened, the cable

Figure 1
SERI VALVE

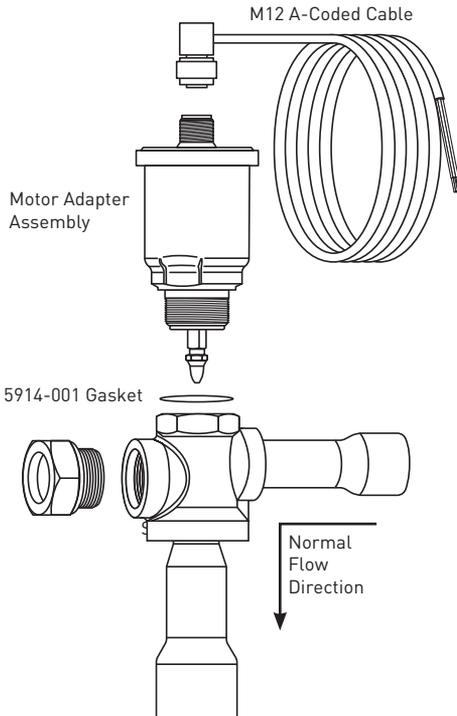
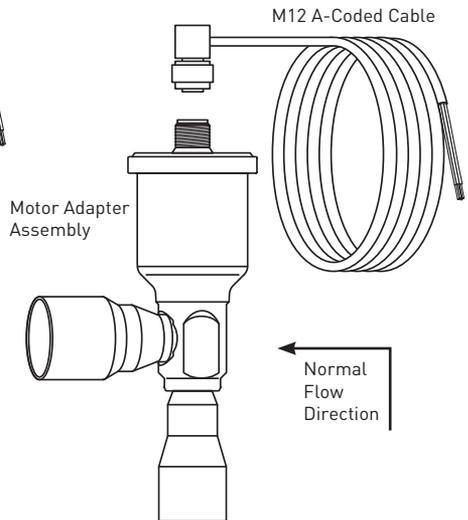


Figure 2
SER VALVE



should be replaced on the valve. The cable can be installed in any of the four directions. Care should be taken to assure the pins are aligned with the connector. When tightening the cable nut, the cable nut should not be twisted or rotated.

5. Pressurize the system and check for leaks.
6. Reapply power to the valve controller. Each

controller manufacturer has a slightly different initialization scheme and the proper procedure must be followed. Since, during service, valve position as calculated by the controller will be lost, the controller should be initialized. In some instances, cycling power to the controller will accomplish this. However, the controller literature or the manufacturer should be consulted.

Table 1

Valve Model	Motor Kit	Cable Kit	Gasket	Motor Phase Resistance Ohms	Number of Steps
SER 1.5, 6, 11, 20	Not available	KIT-Cable-M12	Not available	100 ± 10%	1596
SERI-F	KIT-KS-SER-F M12	KIT-Cable-M12	5914-001	100 ± 10%	2500
SERI-G	KIT-KS-SER-G M12	KIT-Cable-M12	5914-001	100 ± 10%	2500
SERI-J	KIT-KS-SER-J M12	KIT-Cable-M12	5914-001	100 ± 10%	2500
SERI-K	KIT-KS-SER-K M12	KIT-Cable-M12	5914-001	100 ± 10%	2500
SERI-L	KIT-KS-SER-L M12	KIT-Cable-M12	5914-001	100 ± 10%	2500

WARNING – USER RESPONSIBILITY

Failure or improper selection or improper use of the products described herein or related items can cause death, personal injury and property damage.

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