



# SER(I) INSTALLATION INSTRUCTIONS

## STEP MOTOR EXPANSION VALVES

### OPERATION

The SER 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 SER 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. The controller must supply the necessary square wave step signal at 12 volts DC and 200 PPS for the valve to control properly. 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.: Mechatronics Product Group. Control algorithms for the valve include an initialization sequence that will first overdrive 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-G, -J and -K.

## INSTALLATION

The SER 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 (except SERI-K) are bi-directional and may be used on heat pumps. See Figure 1 for 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 the liquid 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 SER valves have copper connections and any 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 is polarized and can only be installed one way. Do not force the connector onto the valve or valve and cable will be damaged. 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. 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.

## FIELD SERVICING INSTRUCTIONS

The SER valves, except SERI-G, -J, and -K, are hermetic and cannot be disassembled for installation or during service; however, the cable and retainer may be replaced if necessary. Motor kits for the SERI-G, -J, and -K are available as replacement parts, see parts list on Page 4.

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

1. Disconnect the line voltage to the valve controller. Disconnect the valve wires from the controller.
2. If the motor fails to operate properly, 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 958737), 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 floodback 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. Disconnect supply voltage to the controller.
  - b. 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 SER(I) valve.
  - c. Repeat the procedure above using the Red and Green terminals on the controller.
  - d. If the controller responds properly to the above, the wiring may be damaged or the valve may be plugged with debris or otherwise obstructed.
  - e. The SERI-G, -J, and -K valves may be disassembled for cleaning, inspection or motor assembly replacement. Refer to the following section on reassembly.

## VALVE REPLACEMENT

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 REASSEMBLY: SERI-G, -J, & -K ONLY

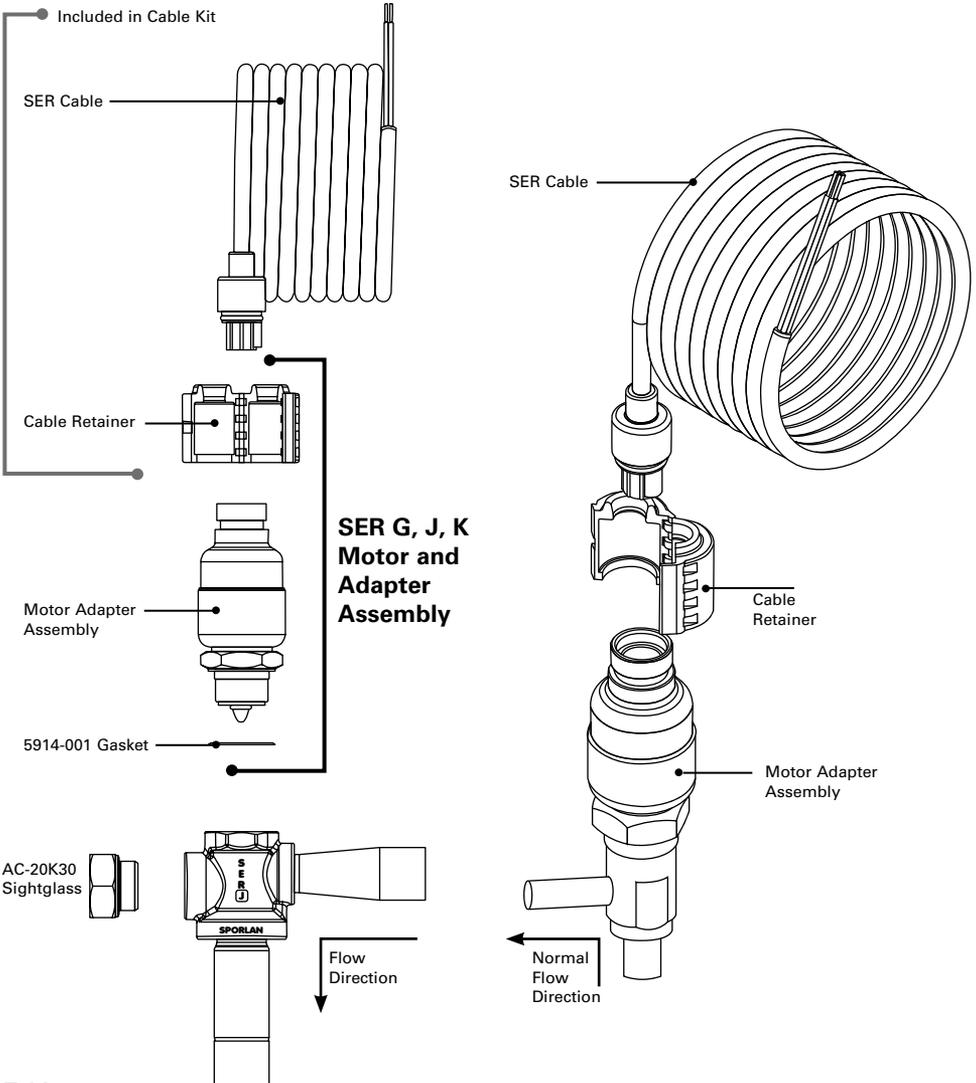
1. Use the SMA in the “OPEN” mode or valve controller to retract the white polyester driver/piston fully into the driver guide. Remove power from the valve or controller.
2. Lightly oil the threads, and gasket or knife-edge on the new motor adaptor. Carefully seat the adaptor on the valve body or engage and tighten the lock nut if used. Lock nuts should be torqued to approximately 45 ft.-lbs. One eighth turn more than hand tight is sufficient to achieve a leak proof seal on knife edge joints.
3. After the motor is tightened, the cable should be replaced on the valve. Care should be taken to assure engagement of the alignment key. Snap on the cable retainer.
4. Pressurize the system and check for leaks.
5. Reapply power to the 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 at least twice. In some instances, cycling power to the controller will accomplish this. However, the controller literature or the manufacturer should be consulted.

**CAUTION:** If the existing motor has been removed for inspection or cleaning, be sure that the piston is fully retracted into the motor assembly before installation on the valve. Failure to do so will permanently damage the drive and motor. Replacement motor assemblies are shipped in the retracted position and may be installed as received.

**SER(I) G, J, K**

**SER 1.5, 6, 11 & 20**

**Figure 1**



**Table 1**

Valve Model	Motor Kit	Cable Kit	Gasket	Motor Phase Resistance Ohms	Number of Steps
<b>SER 1.5, 6, 11, 20</b>	Not available	SER Cable Kit	Not available	100 ± 10%	1596
<b>SER-G</b>	KS-SER-G	SER Cable Kit	5914-001	100 ± 10%	2500
<b>SER-J</b>	KS-SER-J	SER Cable Kit	5914-001	100 ± 10%	2500
<b>SER-K</b>	KS-SER-K	SER Cable Kit	5914-001	100 ± 10%	2500

