

Step Motor Expansion Valves

Types SER-B, C, & D

Installation and Servicing Instructions



Operation

The Sporlan SER valve series 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, bi-polar, 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 or “ratcheting” 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 the Sporlan Division, Parker Hannifin, Attn.: Product Manager — EEVs. Control algorithms for the valve include a 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 valve’s operation and closure.

All valves are tight seating and uniquely characterized by pin and port combinations for exceptional control of refrigerant flow. The seats require no service and are not replaceable.

Installation

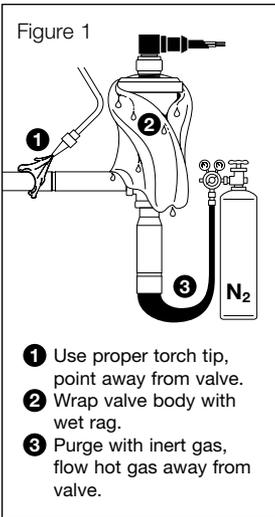
The Sporlan SER valve series are electronically controlled Step Motor Expansion Valves, and are installed before the distributor and evaporator just as one would install a Thermostatic Expansion Valve. The valves are bi-flow capable. Location should be planned to provide cable serviceability and to allow 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. For flexibility, the cable can be removed from the valve and re-positioned in any four configurations. See Table 1 for cable torque. 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.

Table 1

Valve Model	Cable Torque	Maximum Cable Length	Motor Phase Resistance (at 72°F)	Number of Steps	Maximum Internal Temperature During Install
SER-B SER-C SER-D	10-14 in.-lb.	40 feet	100 Ohms ±10%	2500	250°F

The SER has copper connections and any solder or brazing alloy may be used to install the valve. The torch flame should be directed

Figure 1



- 1 Use proper torch tip, point away from valve.
- 2 Wrap valve body with wet rag.
- 3 Purge with inert gas, flow hot gas away from valve.

away from the motor housing and cable. See Figure 1.

In order to maintain IP-67 rating on the cable interface, it is NOT recommended to remove cable during installation. If the cable is removed, take precaution to ensure water does NOT flow down into motor contact pins. Cable must be retightened to the specifications shown in Table 1. 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 being conducted into the motor, but it is strongly suggested that the valve body be wrapped with a wet cloth during the soldering operation. Valve internals **must not experience maximum temperature**, as shown in Table 1, during install. Inlet strainers are supplied optionally, and

if used, should be oriented in the proper direction as shown on the strainer package. The valve should be completely installed before connecting to the controller and applying power. The wiring is color-coded and the controller manufacturer should be consulted for the proper attachment to the controller.

Field Servicing Instructions

1. If the valve fails to operate properly, obtain a digital multimeter and measure motor resistance. Resistance between the black and white leads or between the red and green leads should be as shown in Table 1. Note: Resistance values in the table are at 72°F. Using the same digital multimeter, measure resistance across black and red lead, or any lead and valve housing; resistance should be greater than 1 Mohm. If the resistance is less, the valve should be replaced.
2. If you have access to a SMA test instrument, operation of the valve may be proven. Connect the motor leads to the proper color-coded connector on the SMA. Set the rate to 200 PPS and toggle in the "OPEN" direction. After approximately 15 seconds, the driver should be fully retracted and a light clicking or "ratcheting" sound may be heard, this is normal to the valves and proves operation of the

motor. If the SMA is toggled in the "CLOSE" position, after approximately 15 seconds the driver should be fully extended and a light clicking or "ratcheting" may be heard.

3. If the motor responds to step 2 above, the valve itself should be checked for obstruction. Check for contaminants in the port or strainer, if used.
4. If the port and strainer are clear and the motor operates as in step 2 above, the valve is considered operational and the problem lies in the controller or power supply. The manufacturer of these components should be contacted for further assistance.

Valve Replacement

The entire valve may be replaced if desired. The old valve may be unbrazed or cut out of the piping. If cut out, use a tubing or pipe cutter and not a saw. When installing the new valve any convenient brazing alloy and method may be used. The body and motor assembly should be wrapped with a wet cloth to prevent damage.

Cable can be removed while brazing. If not, extra care should be taken to prevent damage to the motor cable, either directly from the torch, or indirectly from contact with a hot surface. Refer to Installation section.