

## Installation and Service Instructions



# DISCHARGE BYPASS VALVES

## PILOT OPERATED-(S)HGB(E)-8 and SHGB(E)-15

### INSTALLATION INSTRUCTIONS

To ensure proper performance, discharge bypass valves must be selected and applied correctly. However, proper installation procedures are equally as important. Complete selection and application information for the (S)HGB(E)-8 and SHGB(E)-15 is covered in Bulletin 90-40.

#### VALVE LOCATION

(S)HGB(E) valves can be installed in horizontal or vertical lines, whichever best suits the application and permits easy accessibility of the valves. However, consideration should be given to locating these valves so they do not act as oil traps and so solder cannot run into the internal parts during brazing.

The discharge bypass valve should always be installed at the condensing unit rather than at the evaporator section. Not only will this ensure the rated bypass capacity of the valve but it will eliminate the possibility of hot gas condensing in the bypass line (especially on remote systems). In all cases it is important that some precautions be taken in mounting the valves. It is suggested that they be adequately supported to prevent excessive stress on the connections. See the **PIPING** section for additional piping suggestions.

When externally equalized valves are used, the equalizer connection must be connected to the suction line where it will sense the desired operating pressure.

#### PIPING

Sporlan recommends that recognized piping references, such as equipment manufacturers' literature and the ASHRAE Handbooks, be consulted for assistance with proper piping procedures. Sporlan is not responsible for system design, any damage arising from faulty system design, or for misapplication of its products. If these valves are applied in any manner other than as described in this bulletin, Bulletin 90-40 or other Sporlan product literature, the Sporlan warranty is void.

Actual system piping must be done so as to protect the compressor at all times. This includes protection against overheating, slugging with liquid refrigerant, and trapping of oil in various system locations. A few piping guidelines plus some other installation details are given below for the various components involved.

Since the (S)HGB(E) is applied in a bypass line between the discharge line and the low side of a system, the valve may be subjected to compressor vibrations which result from discharge gas pulses and inertia forces associated with the compressor's moving parts. Pulsations are best handled by a good muffler placed as close to the compressor as possible. Vibrations from the moving parts of the compressor are best isolated by using flexible metal hoses for larger lines. For best results, the hoses should be installed as close to the compressor as possible, and

mounted horizontal and parallel to the crankshaft **or** vertically upwards. The hoses should **never** be mounted horizontal **and** 90° from the crankshaft. A rigid brace should be placed on the outlet end of the hose to prevent vibrations beyond the hose.

#### DISCHARGE BYPASS VALVE with OTHER PRESSURE REGULATING VALVES

A discharge bypass valve can be applied on any system that experiences undesirable compressor cycling during low load. However, when other pressure regulating valves are also used, some consideration should be given to prevent undesirable operation. For example, when the bypass valve is required on a system with an evaporator pressure regulating valve (ORIT or other type), less hunting will probably occur if the hot gas is bypassed directly to the suction line along with a desuperheating TEV. However, this may leave oil trapped in the evaporator due to the low velocity flow when the ORIT is throttled. Therefore, depending on the specific system involved, the hot gas may be bypassed either to the evaporator inlet or directly to the suction line.

If the discharge bypass valve is required on a system with a crankcase pressure regulating valve (CRO or other type), the pressure setting of the discharge bypass valve must be lower than the CRO valve setting for each valve to function properly.

Very often, low load conditions will occur during periods when the outdoor ambient drops below 70°F. Head pressure on systems with air cooled condensers becomes too low for satisfactory discharge bypass valve performance at these lower ambient temperatures. Therefore, all air cooled systems that utilize discharge bypass for capacity control should have some type of head pressure control to maintain satisfactory performance.

#### BRAZING PROCEDURES

Any of the commonly used brazing alloys for high side usage are satisfactory. However, when soldering or brazing, it is very important that the internal parts be protected by wrapping the valve with a **WET** cloth to keep the body temperature below 300°F. (S)HGB(E) valves use synthetic material in the piston ring and seating surface that must be protected from overheating. The pilot valve diaphragm and springs are also susceptible to damage from overheating and must be protected. The extended fittings will adequately protect the synthetic material under normal conditions. However, when using high temperature solders, the torch tip should be large enough to avoid prolonged heating of the copper connections. Always direct the flame away from the valve body and pilot valve.

#### TEST and OPERATING PRESSURES

Inert dry gases such as nitrogen, CO<sub>2</sub> or helium are often used for leak detection. Excessive leak testing or operating pressures may damage these valves and reduce the life of

**FOR USE ON REFRIGERATION and/or AIR CONDITIONING SYSTEMS ONLY**

For more information about our products visit us at [www.sporlan.com](http://www.sporlan.com)

the operating components. The maximum allowable test pressure is 450 psig for the (S)HGB(E) and 680 psig for the HGB(E). If greater high side test pressures are to be used, some method must be used to isolate the valve from these high pressures.

**CAUTION: Inert gases must be added to the system carefully through a pressure regulator. Unregulated gas pressure can seriously damage the system and endanger human life. Never use oxygen or explosive gases.**

**VALVE SETTING and ADJUSTMENT**

The table below provides range of adjustment, standard settings, average psi/ton for the (S)HGB(E) products. Adjustment is made by turning the adjusting screw on the

pilot valve. Turning this screw clockwise will increase the valve setting. Turning this screw counterclockwise will decrease the valve setting.

Adjusting these valves can be complicated because the load must be varied during the setting procedure. The load on the system must be decreased to lower the suction pressure so that the valve can control. The valve should then be adjusted to maintain the desired pressure. The load on the system should then be increased to raise the suction pressure above the valve setting to close the valve. Once this is accomplished, the valve setting can be checked by slowly decreasing the load until the discharge bypass valve begins to open (a hissing sound and/or an accompanying pressure rise at the outlet connection will indicate the bypass valve has opened).

STANDARD PRESSURE SETTINGS and AVERAGE PSI CHANGE PER TURN			
MODEL	ADJUSTMENT RANGE	STANDARD SETTING (PSIG)	AVERAGE PSI CHANGE PER TURN
HGB(E)-8	75/150	120	24
SHGB(E)-8	0/100	69	16
SHGB(E)-15	0/75	69	13.5

**Hot gas** may be required for other system functions besides hot gas bypass capacity control, e.g., hot gas defrost and head pressure control. Normally, these functions will not interfere with each other. However, compressor cycling on low suction pressure may be experienced on system startup when the discharge bypass valve is operating and other functions require the hot gas also. For example, the head pressure control valve (e.g., Sporlan ORD-4 type) requires hot gas to adequately pressurize the receiver and liquid line to keep the thermostatic expansion valve operating properly. In this case the discharge bypass valve should be prevented from functioning by keeping the solenoid coil de-energized until adequate

liquid line or suction pressure is obtained.

There are several possible causes for system malfunction when hot gas bypass for capacity control is used. As with any form of troubleshooting, it is essential to know the existing operating temperatures and pressures before the malfunction can be determined. Once the actual malfunction is pinpointed, it is easier to isolate the cause and then take appropriate corrective action.

The following charts list the two basic malfunctions of a discharge bypass valve – failure to open and failure to close – along with possible causes and remedies.

**SERVICE TIPS – (S)HGB(E)-8**

MALFUNCTION - FAILURE TO OPEN	
POSSIBLE CAUSE	REMEDY
1. Pilot solenoid coil de-energized.	1. Energize solenoid coil.
2. Pilot solenoid coil failure.	2. Replace solenoid coil.
3. External equalizer line pinched shut, plugged or not connected.	3. Connect or replace external equalizer line.
4. Main piston sticking due to foreign material.	4. Disassemble valve and clean. Replace piston if necessary.
5. Pilot solenoid port blocked with foreign material. (SHGB(E) models only.)	5. Remove enclosing tube and clean pilot solenoid port.
6. Pilot valve port blocked with foreign material.	6. Disassemble pilot valve and clean.
MALFUNCTION - FAILURE TO CLOSE	
1. Main piston sticking due to foreign material.	1. Disassemble valve and clean. Replace piston if necessary.
2. Pilot valve port not closing due to foreign material.	2. Disassemble pilot valve and clean.
If solenoid coil is de-energized (SHGB(E) models only)	
3. Solenoid plunger not closing solenoid pilot due to foreign materials or damaged enclosing tube.	3. Remove enclosing tube and clean or replace if necessary.
4. Solenoid pilot port worn or damaged due to foreign material.	4. Inspect and replace pilot assembly if necessary.

**SERVICE INSTRUCTIONS – (S)HGB(E)-8**

The (S)HGB(E) valves can be easily disassembled for inspection and cleaning or for replacement of parts. **CAUTION!** The valve should be isolated from inlet, outlet and equalizer pressure before disassembly. Replacement parts are available as described in the Replacement Parts Section.

**PILOT REPLACEMENT INSTRUCTIONS**

1. Disconnect the equalizer connection.
2. With the locknut still intact, place a wrench on the

bottom fitting of the pilot valve. Turn counterclockwise and remove the pilot assembly from adaptor.

3. Install the new pilot assembly. Again place a wrench on the bottom connection of the pilot valve. Turn clockwise until the pilot assembly is firmly in place.
4. Remove the locknut and replace the gasket under the adaptor. Torque the locknut to 30 ft. lbs.
5. Reassemble the valve. Before completely tightening the locknut, rotate the pilot valve to properly align the equalizer connection. Join the equalizer connection and tighten the locknut. The pilot replacement is now complete.

## INTERNAL PARTS REPLACEMENT

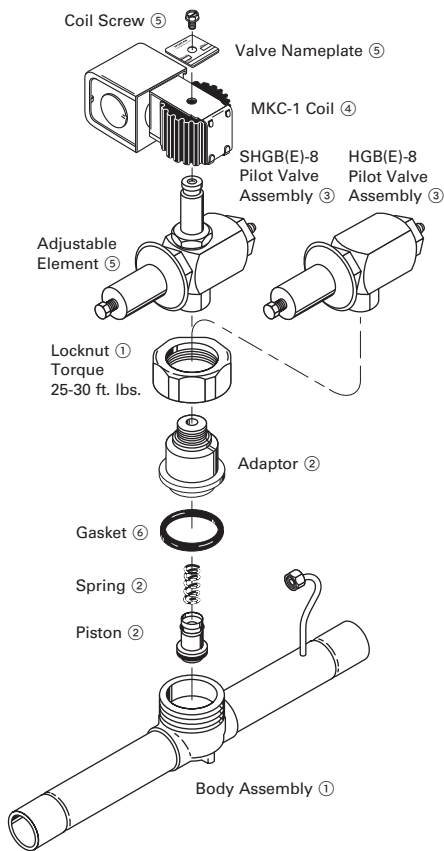
1. Remove the pilot assembly from the adaptor as described in steps 1 and 2 of the pilot replacement instructions.
2. Remove the locknut and replace the adaptor, tetraseal, spring and the piston assembly. Reassemble the valve and tighten the locknut.

3. Reinstall the pilot assembly. Place a wrench on the bottom connection of the pilot valve. Turn clockwise until the pilot assembly is firmly in place.
4. Loosen the locknut and rotate the pilot valve to properly align the equalizer connection. Join the equalizer connection and tighten the locknut. The internal parts replacement is now complete.

(S)HGB(E)-8-0/100 REPLACEMENT PARTS and PARTS KITS			
ITEM NUMBER	PART NUMBER and DESCRIPTION		QUANTITY REQUIRED
<b>REPLACEMENT PARTS SOLD SEPARATELY</b>			
908024	A-4-0/100	Adjustable Element	1
908022	A-4-0/75	Adjustable Element	1
958101	1390-000	Coil Screw	1
—	MKC-1 Coil	MKC-1 Coil (Specify Voltage & Frequency)	1
183620	0123-002	Gasket	1
—	5041-000	Valve Nameplate (SHGB-8) (Specify Volt. & Frequency)	1
—	5041-001	Valve Nameplate (SHGBE-8) (Specify Volt. & Frequency)	
<b>REPLACEMENT PARTS KITS</b>			
<b>PILOT ASSEMBLY KIT</b>			
958157	K-SHGB(E)-8-0/75	Includes: Pilot Valve Assembly, Gasket, Adaptor, Coil Screw, and Valve Nameplate	1
958110	K-SHGB(E)-8-0/100	Includes: Pilot Valve Assembly Only	1
958156	K-HGB(E)-8-75/150	Includes: Pilot Valve Assembly Only	1
<b>INTERNAL PARTS KIT</b>			
958120	KS-(S)HGB(E)-8*	Includes: Adaptor, Gasket, Spring and Piston	1

\* The KS-(S)HGB(E)-8 parts kit is used with both the SHGB(E)-8 and the HGB(E)-8.

- ① Replacement part **not** available.
- ② Part **is not** available separately but, is included with the Internal Parts Kit.
- ③ Part **is not** available separately but, is included with the Pilot Assembly Kit.
- ④ Part **is** available separately.
- ⑤ Part **is** available separately, and **is also** included with the Pilot Assembly Kit.
- ⑥ Part **is** available separately, and **is also** included with the Pilot Assembly Kit and Internal Parts Kit.



## SERVICE TIPS – SHGB(E)-15

<b>MALFUNCTION - FAILURE TO OPEN</b>	
POSSIBLE CAUSE	REMEDY
1. Pilot solenoid coil de-energized.	1. Energize solenoid coil.
2. Pilot solenoid coil failure.	2. Replace solenoid coil.
3. Pilot solenoid port blocked with foreign material.	3. Remove enclosing tube and clean pilot solenoid port.
4. Pilot valve port blocked with foreign material.	4. Disassemble valve and clean.
5. External equalizer line pinched shut, plugged or not connected.	5. Connect or replace external equalizer line.
6. Main piston sticking due to foreign material between piston and sleeve.	6. Disassemble valve and clean. Replace piston and sleeve if necessary.
<b>MALFUNCTION - FAILURE TO CLOSE</b>	
1. Inlet strainer to pilot flange plugged with foreign material.	1. Clean or replace strainer.
2. Pilot valve port not closing due to foreign material.	2. Disassemble pilot valve and clean.
3. Main piston sticking due to foreign material between piston and sleeve.	3. Disassemble valve and clean. Replace piston and sleeve if necessary.
4. Scoring of piston or sleeve causing excessive piston ring leakage.	4. Inspect piston and sleeve and replace if necessary.
<b>If solenoid coil is de-energized</b>	
5. Solenoid plunger not closing solenoid pilot due to foreign material or damaged enclosing tube.	5. Remove enclosing tube and clean or replace if necessary.
6. Solenoid pilot port worn or damaged due to foreign material.	6. Inspect and replace pilot flange assembly if necessary.

## SERVICE INSTRUCTIONS – SHGB(E)-15

The SHGB(E) valves can be easily disassembled for inspection and cleaning or for replacement of parts. **CAUTION!** The valve should be isolated from inlet, outlet and equalizer pressure before disassembly. Replacement parts are available as described in the Replacement Parts Section.

### PILOT REPLACEMENT INSTRUCTIONS

1. Disconnect the two connections of the pilot valve and remove the four cap screws. The complete pilot and body flange assembly can now be lifted off the main valve body and replaced.
2. Install the new gasket and reassemble the valve. A

torque value for the cap screws is not recommended but uniformity of compression from the four cap screws is important. Screw the flange down evenly and firmly.

### INTERNAL PARTS REPLACEMENT

1. Disconnect the two connections of the pilot valve and remove the four cap screws. The complete pilot and body flange assembly can now be lifted off the main valve body and replaced.
2. Replace the piston assembly, body sleeve and spring.
3. Install the new gasket and reassemble the valve. A torque value for the cap screws is not recommended but uniformity of compression from the four cap screws is important. Screw the flange down evenly and firmly.

SHGB(E)-15-0/75 REPLACEMENT PARTS and PARTS KITS			
ITEM NUMBER	PART NUMBER and DESCRIPTION		QUANTITY REQUIRED
<b>REPLACEMENT PARTS SOLD SEPARATELY</b>			
908024	A-4-0/75	Adjustable Element	1
183060	2625-002	Cap Screw	4
958101	1390-000	Coil Screw	1
—	MKC-2 Coil	MKC-2 Coil (Specify Voltage & Frequency)	1
183660	641-3*	Enclosing Tube Gasket	1
382150	13252-1	Enclosing Tube Locknut	1
183675	2645-000	Gasket	1
183602	621-028	O-Ring	1
958042	2445-000	Strainer	1
—	548-001	Valve Nameplate (SHGB) (Specify Voltage & Frequency)	1
—	548-003	Valve Nameplate (SHGBE) (Specify Voltage & Frequency)	1
<b>REPLACEMENT PARTS KITS</b>			
<b>PILOT ASSEMBLY KIT</b>			
958022	K-Y917	Includes: Pilot Valve Assembly, Enclosing Tube Locknut, Enclosing Tube, Stem and Plunger Assembly, Enclosing Tube Gasket, Inlet Strainer Screen and Tetraseal, (4) Cap Screws	1
<b>INTERNAL PARTS KIT</b>			
958021	KS-SHGBE(E)-15	Includes: Piston, Body Sleeve, O-Ring, Spring and Gasket	1
<b>ENCLOSING TUBE KIT</b>			
382355	KE-9	Includes: Enclosing Tube Assembly, Enclosing Tube Gasket, Coil Screw	1

\* If replacing the enclosing tube gasket, torque the locknut to 25-30 ft. lbs. Overtightening can damage the enclosing tube.

- ① Replacement part **not** available.
- ② Part is **not** available separately but, is included with the Parts Kits.
- ③ Part is available separately.
- ④ Part is available separately, and is **also** included with the Pilot Assembly Kit.
- ⑤ Part is available separately, and is **also** included with the Internal Parts Kit.
- ⑥ Part is available separately, and is **also** included with the Pilot Assembly Kit and the Internal Parts Kit.

