HANSEN

Bulletin C457b
AUG 2006

3" Gas-Powered Solenoid Valve

Specifications, Applications, Service Instructions & Parts

HS9B, HS9BW GAS-POWERED SOLENOID VALVES 1-1/4" THRU 6" PORT (32 mm THRU 150 mm)

Flanged 1-1/4" thru 4" FPT, SW, WN, ODS for refrigerants

C US CRN Canadian Registration

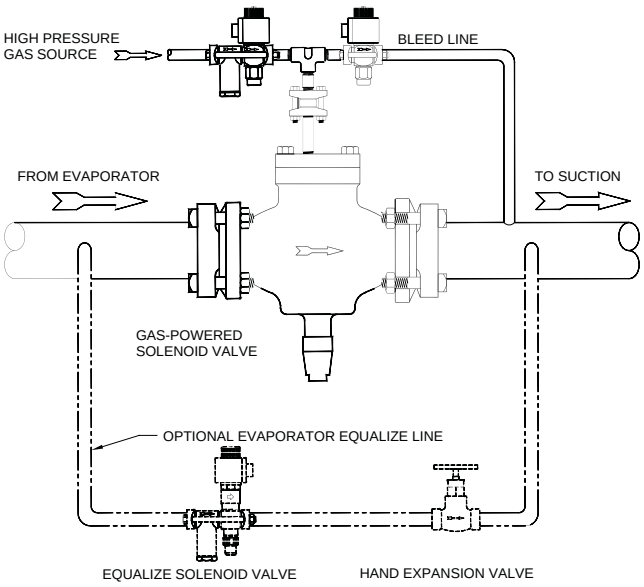
INTRODUCTION

These strong, heavy-duty, gas-powered solenoid valves are designed to control the flow of refrigerant in large commercial and industrial applications. They require no pressure drop to operate and have no internal bleed to suction. A dual pilot solenoid valve assembly introduces a high pressure refrigerant source which closes these valves. To open valves, pressure is bled-off back through the low pressure bleed pilot valve and upstream line pressure plus the spring causes the valve to open wide.

APPLICATIONS

These valves are ideally suited for low temperature applications to positively close suction lines, liquid overfeed and flooded evaporator gas return lines, as well as gravity liquid and gas lines for defrosting. Because they are gas powered, these valves operate reliably at low temperatures and even under viscous oil conditions. They are suitable for ammonia, R22, R134a, CO2 and other approved refrigerants.

TYPICAL APPLICATION



KEY FEATURES

- No pressure drop required to operate
- Teflon piston seal ring
- Dirt resistant piston/seat
- Stainless steel spring
- Durable metal-to-metal seating
- Pilot line disc strainer
- Manual opening stem
- Ductile iron body much stronger and tougher than grey iron or "semi-steel" iron.

MATERIAL SPECIFICATIONS

Body: Ductile iron, ASTM A536,

5" & 6": Cast steel

Top Cover: Steel, ASTM A36

Piston/Seat: Ductile iron, ASTM A536; 1¼" only, stainless steel

Piston Seal: Teflon®, spring activated

Spring: Stainless steel

Gaskets: Non-asbestos, graphite composite

Stem: Plated steel

Stem Seal: O-ring plus graphite composite packing

Seal Cap: Steel, zinc chromate plated; 1¼" only, glass filled polymer

Companion Flanges: Forged steel, ASTM 105

Safe Working Pressure: 400 psig (27 bar), 600 psig (40 bar) for CO2

Operating Temperature: -60°F to +240°F

(-50°C to +115°C)

ADVANTAGES

These valves require no pressure drop to open fully. Unique spool type piston/seats with spring activated teflon piston seal rings are more resistant to dirt and dry oil free systems than typical full skirted piston designs. Protective pilot line strainer valves include manual opening stems. These valves are particularly well suited for use with high pressure refrigerant pilot sources. The stronger ductile iron valve body is more tolerant of abnormal valve closing operation, then its gray iron counterparts.

INSTALLATION

Protect the interior of the valves from dirt and moisture during storage and installation. System should be free of dirt, weld slag, and rust particles. Arrow on valve body should be in normal direction of refrigerant flow. These valves are normally installed in a horizontal line on their side or in a vertical line. Valves require a dual pilot solenoid valve assembly to operate which should be mounted upright. A 5/32" (4 mm) port Hansen HS6 pilot solenoid valve with strainer is recommended to control the high pressure source inlet. If high pressure gas is used, connect upstream of the hot gas solenoid valve. A 5/32" (4 mm) port Hansen HS6 solenoid valve is recommended to bleed-off the high pressure source to open valve. Pilot solenoid valves should be located as close as possible to the main valve. This will minimize the amount of high pressure gas to be relieved past the pilot bleed solenoid valve upon termination of the high pressure source. A single-pole double throw relay or thermostat may be used to control dual pilot solenoid valve assembly. See typical wiring on page 8.

Important: To avoid opening pressure shock after defrost, use a small bypass (equalize) solenoid valve to equalize evaporator pressure before opening gas-powered solenoid valve HS9B, especially for port sizes over 2" (50mm).

Welds should be annealed as necessary in accordance with good practice. Painting of valves and welds is recommended for corrosion protection. Pipe covering, where applied, should have proper moisture barrier. Before putting valves into service, all pipe weld connections, cover seals, and stem seals should be tested for leaks at pressure levels called for in appropriate codes.

SUCTION VAPOR CAPACITIES—TONS (KW)

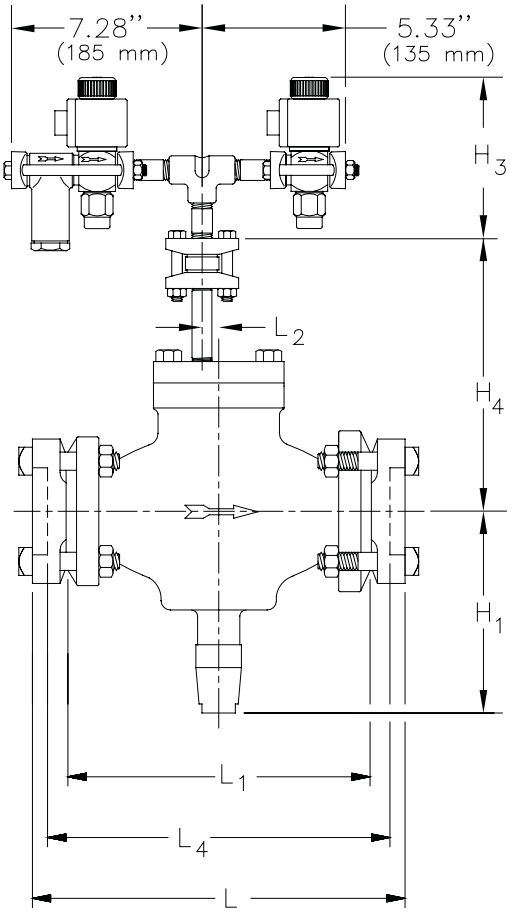
(1 TON= 12,000 BTU/HR= 3042 KCAL/HR)

APPLICATION		PORT SIZE (mm)							
		1-1/4" (32)	1-1/2" (40)	2" (50)	2-1/2" (65)	3" (80)	4" (100)	5" (125)	6" (150)
R717	+20°F (-6.7°C)	24 (84)	58 (204)	68 (239)	110 (386)	156 (548)	341 (1199)	432 (1519)	556 (1955)
	0°F (-17.8°C)	20 (70)	47 (165)	55 (193)	90 (316)	127 (446)	278 (977)	353 (1242)	454 (1597)
	-20°F (-28.9°C)	16 (56)	38 (133)	44 (154)	73 (256)	101 (355)	221 (777)	281 (988)	361 (1270)
	-40°F (-40.0°C)	12 (42)	29 (102)	34 (119)	55 (193)	78 (274)	171 (601)	216 (760)	278 (978)
	-50°F (-45.6°C)	11 (38)	25 (87)	30 (105)	48 (168)	68 (239)	149 (524)	189 (664)	243 (854)
	-60°F (-51.1°C)	9.1 (32)	22 (77)	25 (87)	41 (144)	58 (203)	127 (446)	161 (566)	207 (728)
R22	+20°F (-6.7°C)	10 (35)	24 (84)	28 (98)	46 (161)	65 (228)	143 (503)	181 (637)	233 (819)
	0°F (-17.8°C)	9 (31)	21 (73)	24 (84)	39 (137)	55 (193)	121 (426)	154 (542)	197 (693)
	-20°F (-28.9°C)	7 (24)	17 (59)	20 (70)	32 (112)	45 (158)	99 (348)	126 (443)	162 (570)
	-40°F (-40.0°C)	5.9 (21)	14 (49)	16 (56)	26 (91)	36 (126)	80 (281)	101 (355)	130 (457)
	-50°F (-45.6°C)	5.1 (18)	12 (42)	14 (49)	23 (80)	33 (116)	72 (253)	91 (320)	117 (411)
	-60°F (-51.1°C)	4.6 (16.1)	11 (38)	13 (45)	20 (70)	29 (101)	63 (221)	81 (284)	104 (365)
Cv (Kv)		19.8 (17)	47 (40)	55 (47)	89 (76)	126 (108)	276 (236)	350 (300)	450 (385)

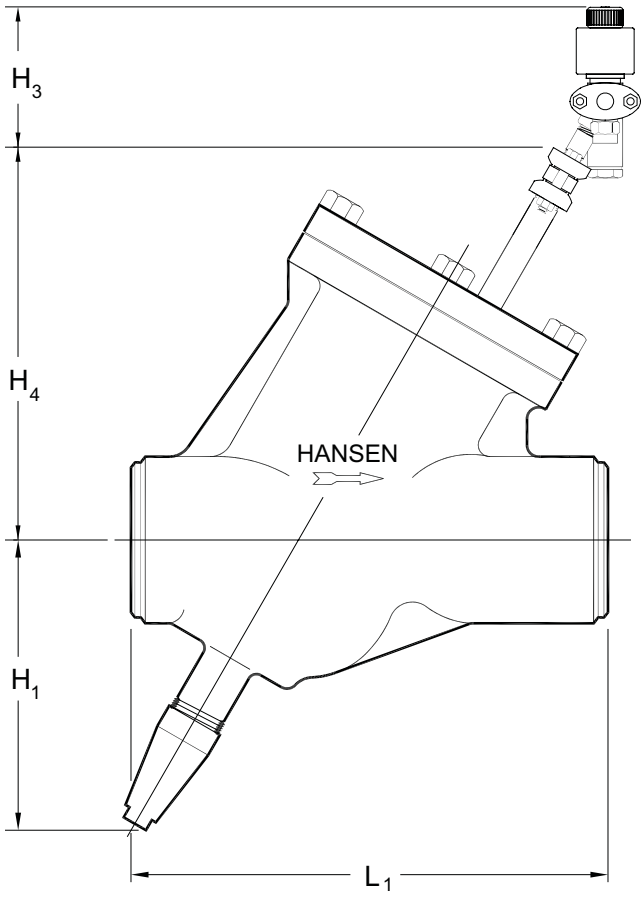
Above capacities based on liquid temperature equal to evaporator temperature and 1 psi drop (0.07 bar) through the valve. For 0.5 psi drop (0.035 bar), multiply above values by 0.71. For liquid overfeed systems, nominal 2:1 to 5:1 ratio, add 20% to the evaporator load and select valve based on the increased load. For gravity flooded application, valve should be same port size as properly sized liquid leg or gas line. Consult flooded evaporator manufacturer for proper line sizing.

INSTALLATION DIMENSIONS

1-1/4" thru 4"
(32 mm thru 100 mm)



5" & 6"
(125 mm thru 150 mm)



PORT SIZE (mm)	DIMENSIONS (mm)								
	H_1*	H_3	H_4	L		L_1†	L_2	L_4	W
				FPT, SW	WN, ODS				
1-1/4" (32)	4.21" (107)	5.93" (150)	8.99" (228)	8.20" (208)	8.94" (227)	6.19" (157)	–	7.20" (183)	4.50" (114)
1-1/2", 2" (40), (50)	7.12" (107)	5.93" (150)	9.55" (243)	12.39" (315)	13.39" (340)	9.88" (251)	0.86" (22)	10.89" (277)	4.50" (114)
2-1/2" (65)	8.06" (205)	5.93" (150)	10.23" (260)	13.01" (330)	14.03" (356)	9.88" (251)	1.15" (29)	11.01" (280)	5.62" (143)
3" (80)	8.38" (213)	5.93" (150)	10.57" (268)	15.38" (391)	16.40" (417)	12.25" (311)	1.15" (29)	13.38" (340)	6.50" (165)
4" (100)	9.88" (251)	5.93" (150)	11.45" (291)	17.01" (432)	20.51" (521)	14.12" (359)	1.50" (38)	15.01" (381)	8.06" (205)
5" (125)	12.13" (308)	5.69" (144)	17.00" (432)	–	–	20.40" (518)	–	–	12.75" (324)
6" (150)	12.13" (308)	5.69" (144)	17.00" (432)	–	–	20.40" (518)	–	–	12.75" (324)

† L_1 dimension is flange face-to-face (except 5" & 6", integral butt weld end only).
* Allow additional 2.75" for seal cap removal. W= maximum width of valve.

HS9B PARTS LIST

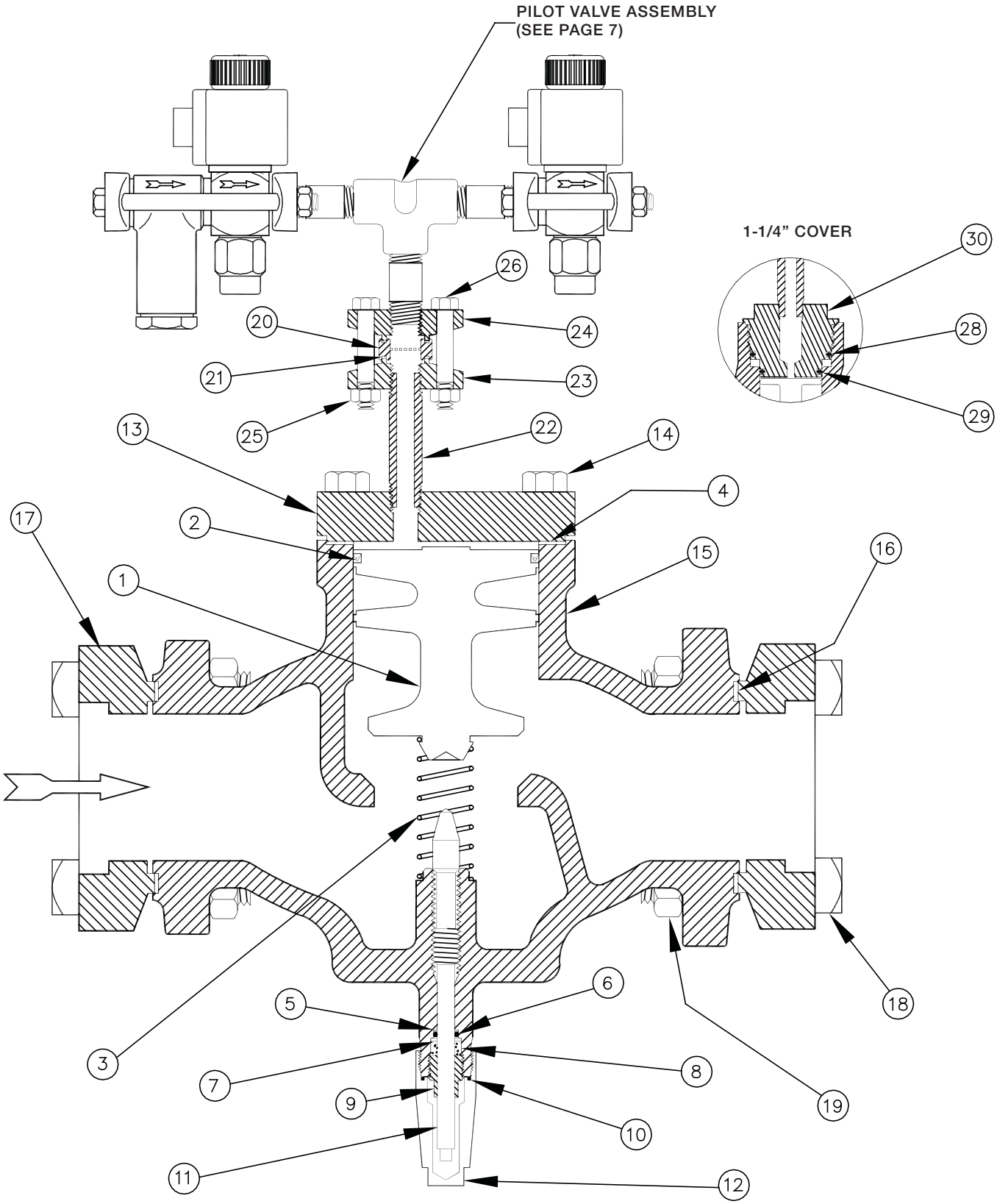
1-1/4” thru 4” (32 mm thru 100 mm)

ITEM	DESCRIPTION	QTY	PART NO
	Piston/Seat Kit 1-1/4"		**75-1115**
	Piston/Seat Kit 1-1/2"		**75-1116**
	Piston/Seat Kit 2"		**75-1117**
	Piston/Seat Kit 2-1/2"		**75-1118**
	Piston/Seat Kit 3"		**75-1119**
	Piston/Seat Kit 4"		**75-1120**
	Above kits consist of:		
1a	Piston/Seat 1-1/4"	1	75-0486
1b	Piston/Seat 1-1/2"	1	75-0597
1c	Piston/Seat 2"	1	75-0282
1d	Piston/Seat 2-1/2", 3"	1	75-0281
1e	Piston/Seat 4"	1	75-0244
2a	Piston Seal Ring 1-1/4"	1	75-0512
2b	Piston Seal Ring 1-1/2", 2"	1	75-0292
2c	Piston Seal Ring 2-1/2", 3"	1	75-0293
2d	Piston Seal Ring 4"	1	75-0236
3a	Spring 1-1/4"	1	75-0446
3b	Spring 1-1/2", 2"	1	75-0130
3c	Spring 2-1/2"	1	75-0131
3d	Spring 3"	1	75-0195
3e	Spring 4"	1	75-0240
28	Upper Body O-Ring (1-1/4" only)	1	70-0131
29	Lower Body O-Ring (1-1/4" only)	1	70-0130
4a	Cover Gasket 1-1/2", 2"	1	75-0196
4b	Cover Gasket 2-1/2", 3"	1	75-0128
4c	Cover Gasket 4"	1	75-0234
21	Disc Strainer Flange Gasket	1	70-0065
	Gasket Kit 1-1/4"		**75-1056**
	Gasket Kit 1-1/2", 2"		**75-1007**
	Gasket Kit 2-1/2"		**75-1008**
	Gasket Kit 3"		**75-1009**
	Gasket Kit 4"		**75-1017**
	Above kits consist of:		
28	Upper Body O-Ring (1-1/4" only)	1	70-0131
29	Lower Body O-Ring (1-1/4" only)	1	70-0130
4a	Cover Gasket 1-1/2", 2"	1	75-0196
4b	Cover Gasket 2-1/2", 3"	1	75-0128
4c	Cover Gasket 4"	1	75-0234
5a	Back-up Washer 1-1/2", 2", 2-1/2", 3"	1	75-0245
5b	Back-up Washer 4"	1	50-0351
6a	Stem O-Ring 1-1/4"	1	70-0010
6b	Stem O-Ring 1-1/2", 2", 2-1/2", 3"	1	50-0179
6c	Stem O-Ring 4"	1	50-0253
7a	Stem Washer 1-1/4"	1	70-0026
7b	Stem Washer 1-1/2", 2", 2-1/2", 3"	1	50-0046
7c	Stem Washer 4"	1	50-0247
8a	Packing 1-1/4"	1	70-0025
8b	Packing 1-1/2", 2", 2-1/2", 3"	1	50-0045
8c	Packing 4"	1	50-0248
9a	Packing Nut 1-1/4"	1	70-0019
9b	Packing Nut 1-1/2", 2", 2-1/2", 3"	1	50-0013
9c	Packing Nut 4"	1	50-0251
10a	Seal Cap O-Ring 1-1/4"	1	70-0011
10b	Seal Cap O-Ring 1-1/2", 2", 2-1/2", 3"	1	50-0432
10c	Seal Cap Gasket 4"	1	50-0270
21	Disc Strainer Flange Gasket	2	70-0065
16a	Flange Gasket 1-1/4"	2	70-0132
16b	Flange Gasket 1-1/2", 2"	2	75-0138
16c	Flange Gasket 2-1/2"	2	75-0125
16d	Flange Gasket 3"	2	75-0137
16e	Flange Gasket 4"	2	75-0253

ITEM	DESCRIPTION	QTY	PART NO
11a	Stem 1-1/4"	1	75-0506
11b	Stem 1-1/2", 2", 2-1/2"	1	75-0118
11c	Stem 3"	1	75-0135
11d	Stem 4"	1	75-0242
12a	Seal Cap 1-1/4"	1	50-0411
12b	Seal Cap 1-1/2", 2", 2-1/2", 3"	1	75-0139
12c	Seal Cap 4"	1	50-0260
30	Cover 1-1/4"	1	70-0279
13a	Cover 1-1/2", 2"	1	70-0279
13b	Cover 2-1/2", 3"	1	75-0107
13c	Cover 4"	1	75-0121
14a	Cover Bolts 1-1/2", 2"	4	75-0175
14b	Cover Bolts 2-1/2", 3"	4	65-0057
14c	Cover Bolts 4"	4	75-0291
15a	Body 1-1/4"	1	75-0492
15b	Body 1-1/2", 2"	1	75-0197
15c	Body 2-1/2"	1	75-0221
15d	Body 3"	1	75-0198
15e	Body 4"	1	75-0238
17	Flange	2	FACTORY
18a	Flange Bolt 1-1/4" (5/8"-11x2.75")	4	70-0339
18b	Flange Bolt 1-1/2", 2" (5/8"-11x3.25")	8	70-0135
18c	Flange Bolt 2-1/2", 3" (3/4"-10x3.75")	8	75-0202
18d	Flange Bolt 4" (7/8"-9x4")	8	75-0279
19a	Flange Nut 1-1/4" (5/8"-11)	4	70-0136
19b	Flange Nut 1-1/2", 2" (5/8"-11)	8	70-0136
19c	Flange Nut 2-1/2", 3" (3/4"-10)	8	75-0210
19d	Flange Nut 4" (7/8"-9)	8	75-0280
20	Disc Strainer Screen Assembly	1	78-0065
21	Disc Strainer Flange Gasket	2	70-0065
22	Nipple (1/2" x 3.5)	1	75-0677
23	Flange 1/2" FPT (Standard)	1	70-0023
24	Flange 1/2" FPT (Standard) SW, WN, ODS Available	1	70-0023
25	Flange Nut	2	70-0055
26	Flange Bolt	2	70-0054

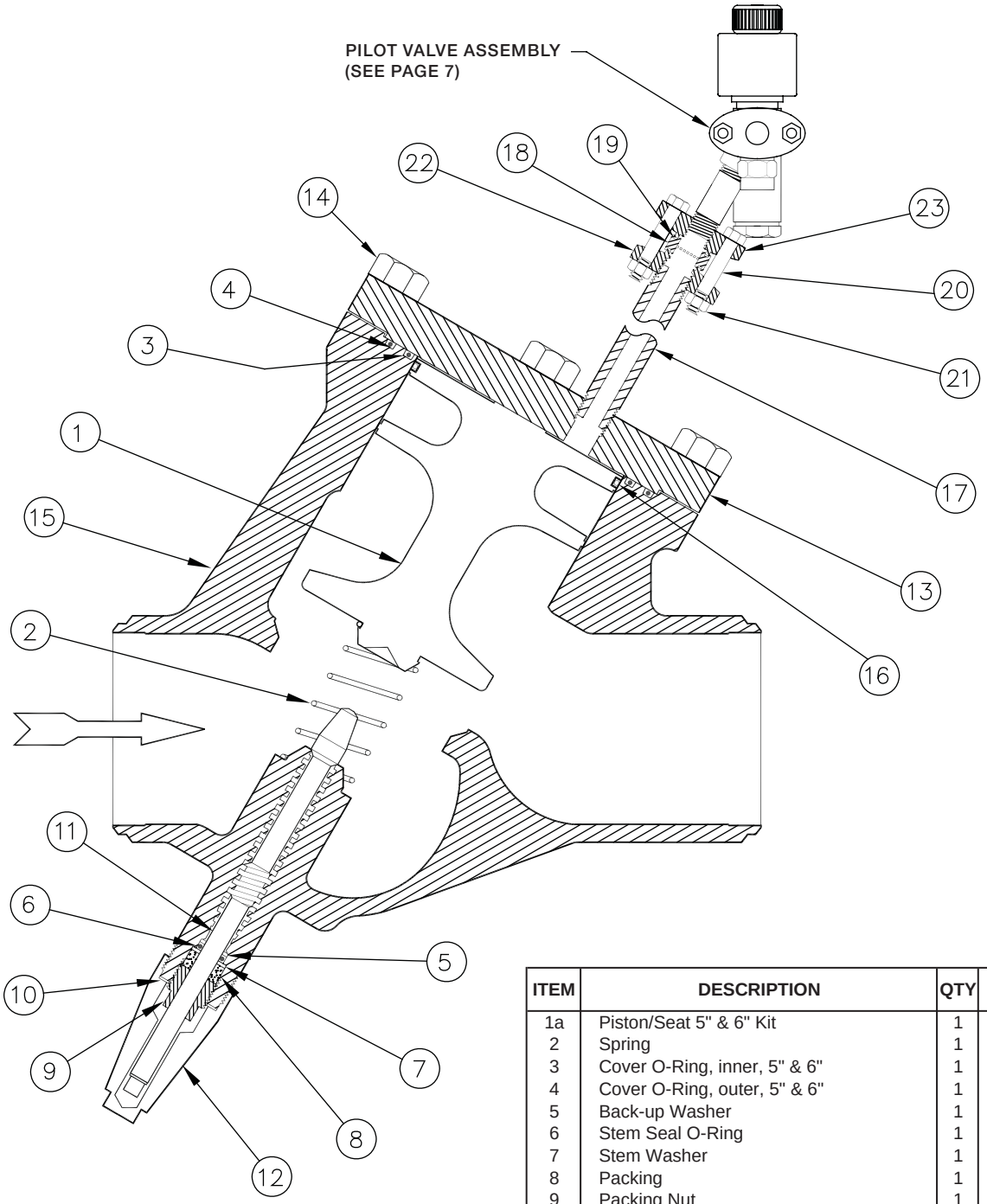
HS9B PARTS LIST

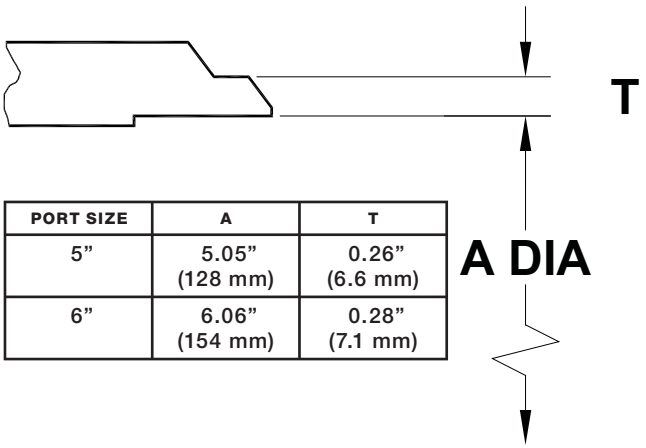
1-1/4” thru 4” (32 mm thru 100 mm)



HS9BW PARTS LIST

5” & 6” (125 mm & 150 mm)

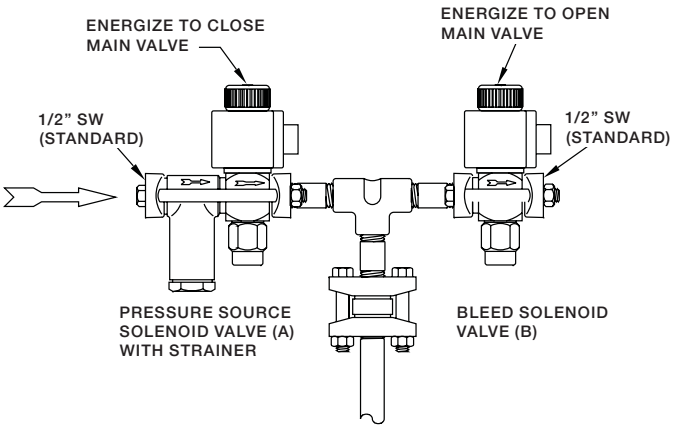




PORT SIZE	A	T
5”	5.05” (128 mm)	0.26” (6.6 mm)
6”	6.06” (154 mm)	0.28” (7.1 mm)

ITEM	DESCRIPTION	QTY	PART NO
1a	Piston/Seat 5" & 6" Kit	1	75-1134
2	Spring	1	75-0600
3	Cover O-Ring, inner, 5" & 6"	1	75-0605
4	Cover O-Ring, outer, 5" & 6"	1	75-0606
5	Back-up Washer	1	50-0324
6	Stem Seal O-Ring	1	50-0293
7	Stem Washer	1	50-0299
8	Packing	1	50-0290
9	Packing Nut	1	50-0292
10	Seal Cap Gasket	1	50-0315
11	Stem	1	75-0584
12	Seal Cap	1	50-0304
13	Cover	1	75-0583
14	Cover Bolts	4	75-0604
15a	Body 5"	1	75-0638
15b	Body 6"	1	75-0639
16	Piston Seal	1	75-0602
17	Nipple (3/4" x 6")	1	75-0680
18	Disc Strainer Screen Assembly	1	78-0049
19	Disc Strainer Flange Gasket	2	70-0065
20	Flange Bolt	2	70-0054
21	Flange Nut	2	70-0055
22	Flange 3/4" FPT	1	70-0024
23	Flange 1/2" FPT (Standard) SW, WN, ODS Available	1	70-0023

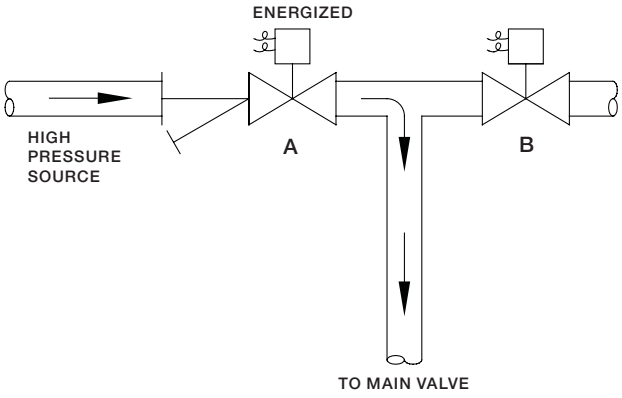
PILOT VALVE ASSEMBLY



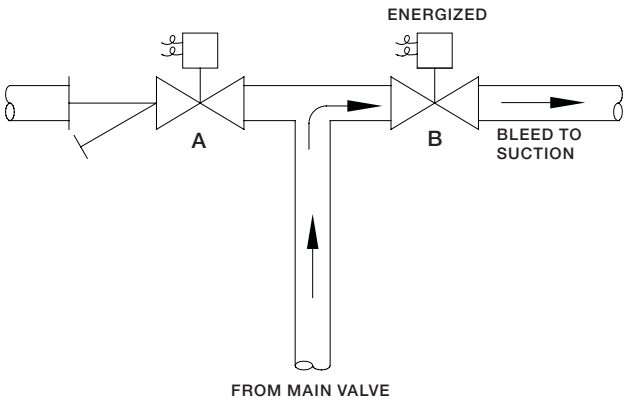
Note: For Pilot Valve Replacement Parts, see Hansen HS6 Solenoid Valve Bulletin S117.

Operation: Main valve is held open by means of a spring and pressure under the piston. When a high pressure source is introduced via the pressure source solenoid valve (A) to the main valve through the pilot line inlet, the combination piston/seat is forced down, compressing the spring and seating the piston/seat firmly on the valve body taper seat. For opening, the high pressure source is interrupted and the remaining high pressure gas is bled-off past the bleed solenoid valve (B). The upstream pressure plus the spring causes the valve to open wide.

TO CLOSE MAIN VALVE



TO OPEN MAIN VALVE



SERVICE AND MAINTENANCE

Failure to close: The pilot high pressure source solenoid valve is not opening. Disc strainer or high pressure pilot line may be plugged. Pilot pressure source is not high enough; it must be at least 10 psi (0.7 bar) above pressure through main valve. Main valve manual opening stem is turned in. Bleed pilot solenoid valve is remaining open; check manual opening stem of pilot valve. Dirt may be lodged between piston/seat and valve piston wall.

Failure to open: The bleed solenoid valve is jammed closed with dirt. Pressure source solenoid valve manual opening stem is turned in. Bleed solenoid valve is not opening, it may be plugged. Dirt may be lodged between piston/seat and valve piston wall. The opening spring may be damaged or broken.

Manual operation: If it is necessary to manually hold open main valve, cautiously remove seal cap and turn manual opening stem in (clockwise) as far as possible. The piston/seat should now be mechanically held open and valve will not close until manual opening stem is turned completely out (counter-clockwise) and pressure is introduced to top of piston/seat. Do not attempt to operate main valve automatically when manual opening stem is partially or totally turned in or stem may break after repeated cycles.

Closing shock: If excessive, use lower pilot pressure (via HA2BOL) or use a needle valve in pilot line.

Opening shock: First, bleed down evaporator pressure with a small bypass solenoid valve before opening the HS9B; coincidentally use the lowest possible terminating defrost pressure.

Disassembly: If it is necessary to remove or disassemble valve for servicing, be sure pilot lines and main valve are completely isolated from refrigeration system and all refrigerant is removed (pumped out to zero pressure). Be sure to follow refrigeration system safe procedures. Disconnect pilot line, clean or replace disc strainer assembly as necessary.

To inspect valve interior, after removing all pressure, slowly loosen the cover bolts equally (or screwed cover of 1¼" HS9B) and break gasket seal, being careful to avoid any refrigerant which may still remain. Remove cover bolts and cover. Remove piston/seat, clean and inspect for burrs and damage to seating surfaces and piston seal ring. Slight marks and burrs on metal surfaces can often be removed with emery paper by hand or power lapping. Damaged parts should be replaced. When replacing piston/seat and piston seal ring in field, for maximum valve tightness it is advisable to lap the seat into valve body. Lightly lubricate main valve interior bore with refrigerant oil and install spring and piston/seat. Manually simulate valve operation by pushing on top of piston/seat. Action should be smooth and spring should readily push piston/seat back; if not replace spring. Re-assemble cover, gasket and bolts, pilot line and disc strainer. Carefully check entire valve for leaks before restoring the valve to service.

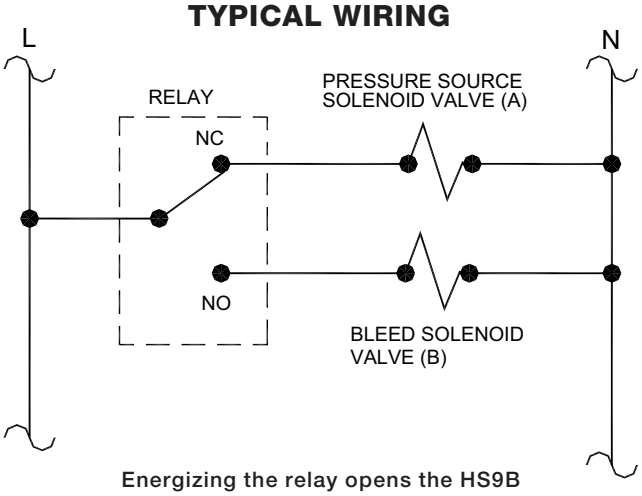
CAUTION

Hansen valves are only for refrigeration systems. These instructions must be completely read and understood before selecting, using or servicing Hansen valves. Only knowledgeable, trained refrigeration mechanics should install, operate, or service these valves. Stated temperature and pressure limits should not be exceeded. Bonnets, solenoid tubes, etc. should not be removed from valves unless system has been evacuated to zero pressure. Must also see Safety Precautions in current List Price Bulletin and Safety Precautions Sheet supplied with product.

WARRANTY

All Hansen products, except electronics, are guaranteed against defective materials or workmanship for one year F.O.B. factory. Electronics are guaranteed against defective materials or workmanship for 90 days F.O.B. factory. No consequential damages or field labor is included.

TYPICAL WIRING

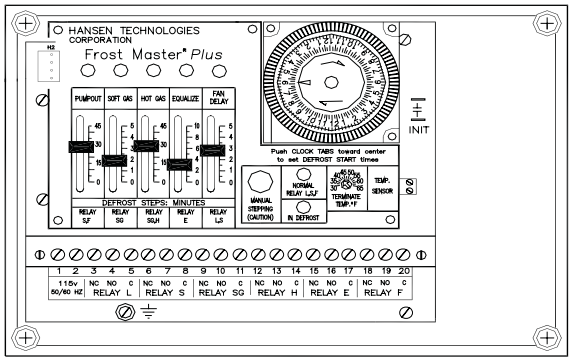


Energizing the relay opens the HS9B

DEFROST CONTROL

Control of the entire defrost process of large, low temperature evaporators, including those using HCK2 Gas-Powered Suction Stop Valves is ideally accomplished by the use of a Hansen Frost Master® or Frost Master® Plus Defrost Controller. In general, the Frost Master® is able to reduce the amount of cold liquid in the coil at the start of defrost, reduce the initial shock of hot gas entry (soft gas), efficiently terminate hot gas stage and to permit the evaporator to return to low pressure with minimum shock to the system and its piping and evaporator.

FROST MASTER® PLUS



ORDERING INFORMATION

PORT SIZE INCHES (mm)	FLANGE CONNECTION STYLE & SIZES		
	FPT, SW, WN		ODS
	STD	ALSO	STD
1-1/4" (32)	1-1/4"	1", 3/4"	1-3/8"
1-1/2" (40)	1-1/2"	2"	1-5/8"
2" (50)	2"	1-1/2"	2-1/8"
2-1/2" (65)	2-1/2"	3"	2-5/8"
3" (80)	3"	–	3-1/8"
4" (100)	4"	–	4-1/8"
5" (125)*	5" BW	–	–
6" (150)*	6" BW	–	–

5" & 6" are integral butt weld end only; Type HS9BW.

TO ORDER: Specify Type HS9B, port size, flange connection style and size, and dual pilot solenoid valve assembly if desired. For pilot solenoid valve assembly, specify pilot solenoid connection style and sizes: ½" SW standard, FPT or WN available; Volts: 115V, 230V, 24V; 50/60Hz. Unless otherwise specified standard coil with ½" fitting for conduit will be supplied with pilot valves. Also available, plug-in coil for grounded cord connection or quick disconnect connection.

TYPICAL SPECIFICATIONS

"Gas-powered solenoid valves shall be remote pilot pressure operated, with no internal bleed, having manual opening stem, and pilot line disc strainer as manufactured by Hansen Technologies Corporation or approved equal."

OPTIONAL BEACON PILOT LIGHTS

Pilot Light Kit includes Beacon pilot light, knob and o-ring. A/C Coils Only.

PILOT LIGHT KIT	
COLOR	PART NO.
Red	70-1100
Amber	70-1101
Green	70-1102

HANSEN

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