RSD – Total Control

Turbo Board Manual

Powered by Sporlan

Revised 7/18/2011

Description

The Turbocor Controller (TC) is a standalone superheat controller. The TC may be connected with a MODBUS master to give remote access to pressure and temperature readings in addition to viewing and editing the controller's setpoints. The user can also take advantage of the easy to use local display to accomplish the same task.

1. TC Configuration

Specifications

Input Voltage: 24 VAC (± 10%), 40 VA minimum to board with external transformer

Operating ambient temperature: -40°F to 120°F

LEDs: Power LED, Alarm LED, Liquid Line Solenoid LED

Communications: 2 RS485 Ports

3 Digit alphanumeric display

Inputs:

- Optical Encoder (Knob)
- One Pressure Input
- One Temperature Input
- One Digital Input
- One Analog (0 to 5 VDC) Input

Valve Control of all Sporlan Valves and Danfoss Valves

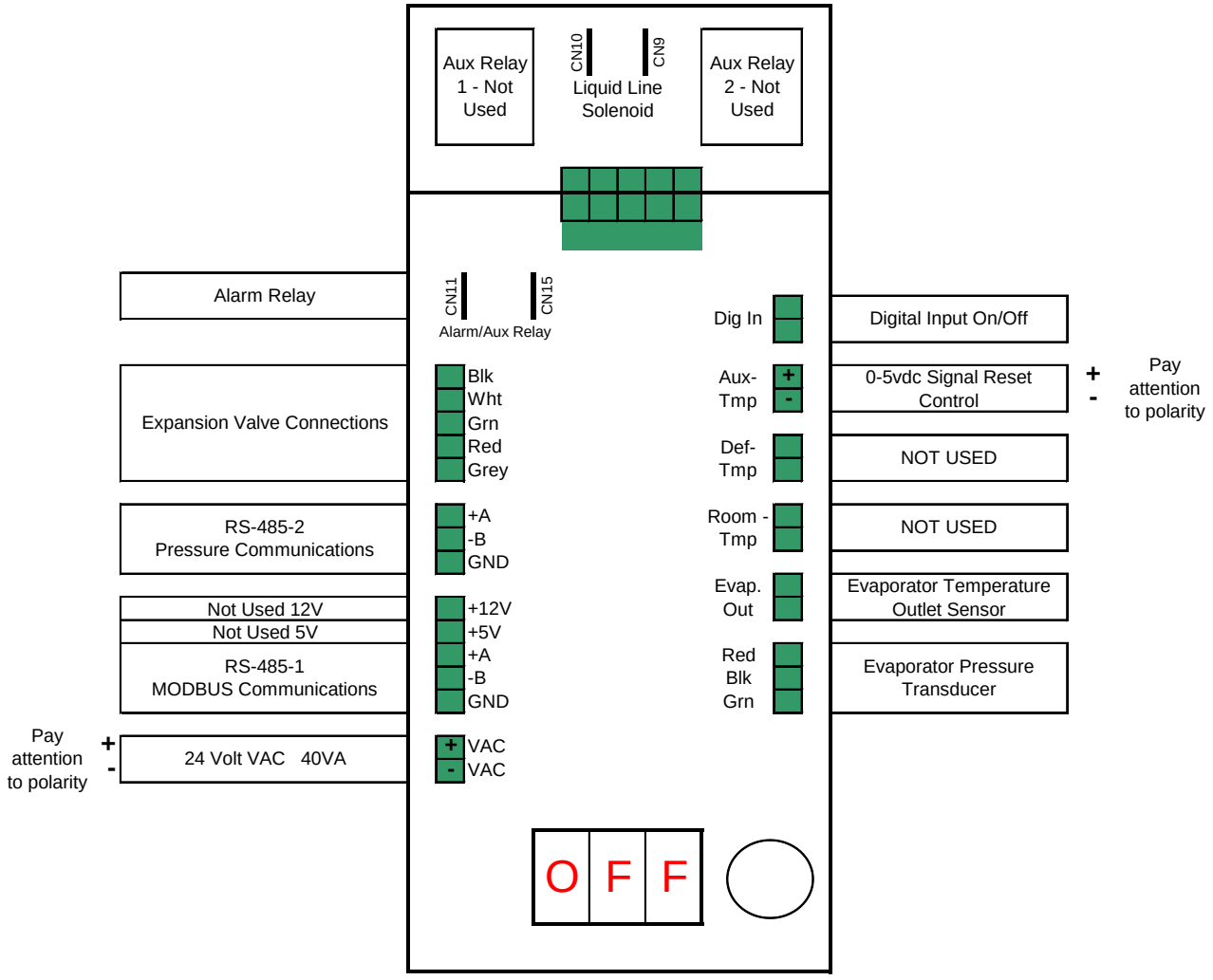
Triac for Liquid Line Solenoid

2. TC Connections

The TC has removable screw terminals on the each side of the controller. The controller should be hooked as noted by the silk screen. The RS-485-1 block is used for MODBUS communications. The RS-485-2 is used when the TCs are networked together in the event that only one TC will have a Suction Pressure transducer and the networked controllers receive the pressure from this 'master'. The other block of note is the Aux-Temp block. It will be used for the analog input. The last connection on the Aux-Temp block should be connected to the voltage input. The other pin is the ground. A drawing of the hookup can be seen on the following page.

TurboBoard Recommended Wiring Specifications								
DEVICE	**Belden Wire**	**40 ft**	**60 ft**	**80 ft**	**100 ft**	**120 ft**	**140 ft**	**160 ft**
Expansion Valve and Hot Gas Valve	4 conductor	18 gauge	16 gauge	14 gauge	14 gauge	12 gauge	12 gauge	12 gauge
Temperature Sensor	2 conductor w/shield	18 gauge	18 gauge	18 gauge	18 gauge	18 gauge	18 gauge	18 gauge
Pressure Transducer	3 conductor w/shield	18 gauge	18 gauge	18 gauge	18 gauge	18 gauge	18 gauge	18 gauge
Reset Voltage Signal	2 conductor w/shield	18 gauge	18 gauge	18 gauge	18 gauge	18 gauge	18 gauge	18 gauge
RS 485 Loop	3 conductor w/shield	18 gauge	18 gauge	18 gauge	18 gauge	18 gauge	18 gauge	18 gauge

Shielded cable should be used and properly connected to ground at one end only. In NO case should the sensor wire run in conduit with, or parallel to, high voltage lines.



It is very important to pay attention to polarity on supply voltage and Superheat Reset Control. Swapping polarity on 24v supply voltage will result in the Superheat Reset feature to operate incorrectly. Swapping polarity on 5vdc signal could result in damage to the Turbo Board and/or signal board. The 24 volt power should also be floating (no grounding of the secondary neutral).

Pressure Tranducer Wiring

Controller Terminal	Old Pigtail leads	New Hermetic Cable
1+ or 2+	Red	Black
1- or 2-	Black	Green
1S or 2S	Green	White

3. TC Display

The TC has a 3 digit alphanumeric display for user menus. The menu scheme is based off a layering methodology. The top layer displays the current mode. The next layer down gives the user a choice of Process Values, Setpoints or clearing alarms. The final layer would be when the user chooses to view the Process Values, view and edit Setpoints or clear alarms.

Table 1 Root Menu

Process Value Text	Meaning
Esc	Travel up
P_V	View Process Values
S_P	View/Edit Setpoints
CLR	Clear Alarms

The next layer down can be seen in the following tables.

3.1. Process Value Menu

Table 2 Process Value Menus

Process Value Text	Meaning	Range
Esc	Travel up	-
Suc	Suction Pressure	0 to 150[1] PSI
S/H	Superheat	0 to 165°F
Vlv	Valve Position	0 to 100 %Open
SuT	Suction Temperature	-40 to 125°F
TSt	Saturation Temperature	-40 to 125°F
SSs	Start/Stop Status	OFF/RUN
Sol	Solenoid Status	CLS/OPN
Alm	Alarm Status	Active alarms
ASH	Active Superheat	0 to 165°F

1 The maximum value varies based on which refrigerant is selected. (410A is 300 PSI and all others are 150 PSI)

The user can enter the Process Values menu by pressing the knob when “P_V” is displayed. The user can then turn the knob to view the other process values of their system. Pressing the knob will alternate between the process values identity and value. For ease of use, the value that is displayed for a process value may come in the form of text to eliminate the need of ‘looking up the meaning’. The menu text and meanings for process values are described in Table 2.

The user can leave this menu by pressing the knob when “Esc” is being displayed.

3.2. Setpoint Menu

The user may also view/edit the setpoints by pressing the knob when "S_P" is displayed. The user may change the setpoints to the value he desires in order to obtain optimum system performance. The menu text and meanings for setpoint values are described in Table 3. *Setpoints are saved to the controller when the user leaves the Setpoint that is being edited.* The user can leave the Setpoint menu by pressing the knob when "Esc" is being displayed.

Table 3 Setpoint Menu

Setpoint Text	Meaning	Range
ESC	Travel up a layer	-
S/H	Superheat Setpoint	5 to 25 °F Default = 10 °F
SRS	Superheat Offset Scale	0 to 20 °F Default = 0 °F
SsD	Solenoid Start Delay	0 to 300 seconds Default = 0 secs
Clp	Cycle Time	1 to 10 seconds Default = 3 secs
SuM	Suction Sensor Mode (Location)	Local, Local and Broadcast or Remote Default = Local (Loc)
Unu	MODBUS address	1 to 32 Default = 1
Rfg	Refrigerant	R22, R134A, 407C Default = R22
_P_	Proportional coefficient	0 to 100 Default = 20
_I_	Integral coefficient	0 to 100 Default = 45
_D_	Derivative coefficient	0 to 100 Default = 5
MOP	Maximum Operating Pressure	0 to 150[2] PSI Default = 120 PSI
VMX	Valve Max	0 to 100 % Default = 100 %
VMN	Valve Minimum	0 to 100 %

2 The maximum value varies based on which refrigerant is selected. (410A is 300 PSI and all others are 150 PSI)

Table 3 Setpoint Menu (Continue)

Setpoint Text	Meaning	Range
		Default = 5 %
VSP	Valve Start Position	0 to 100 % Default = 12 %
VSD	Valve Start Delay	0 to 300 seconds Default = 90 secs
Vty	Valve Type	Sporlan Valves Default = 32K
		ESX, 16K, 25K, 32K, 64K
		Danfoss Valves
		50, 100, 250, 400
MVP	Manual Valve Position	0 to 100 %

4. Sequence of Operation

1.) Digital Input On/Off = Off, Solenoid is Off, Expansion Valve is Closed

2.) Digital Input On/Off = On, Expansion Valve goes to Valve Start Position (VSP). Solenoid Start Delay (SSD) timer starts, turns on solenoid after timer expires. Expansion Valve Start Delay (VSD) timer starts and holds Valve Start Position (VSP) till timer expires.

3.) After Expansion Valve Start Delay (VSD) timer expires the Turboboard will control on Active Superheat Setpoint (ASH).

4.) Active Superheat Setpoint (ASH) is the Superheat Setpoint (S/H) – Superheat Reset Value

5.) The Superheat Reset Value is calculated from the Reset Signal (0-5vdc) which is scaled by the Superheat Offset Scale (SRS). Example –If superheat setpoint(S/H) =15 and if Reset Signal = 2.5 volts and Superheat Offset Scale (SRS) = 10, the reset value is 5. The Active Superheat Setpoint (ASH) = 10 (15-5). If no reset signal is used (0 vdc) than the Active Superheat Setpoint (ASH) = Superheat Setpoint (S/H)

The superheat reset is a very powerful tool and care must be taken to never reset superheat to a level that will compromise the compressor. Only after system operation is observed should it be deployed.

6.) Limits Maximum Operating Pressure (MOP) – prevents the evaporator pressure (psi) from rising above this value by closing the expansion valve. Valve Max (VMX) – sets the limit in percentage (0-100%) on how far the expansion valve will open during normal operation.
Valve Min (VMN) – sets the limit in percentage (0-100%) on how far the expansion valve will close during normal operation.

7.) Features

Cycle Time (Clp) – Control loop speed (0-10 sec). This is the time interval that the controller surveys and updates the inputs. Can be used to speed up or slow down controller without changing PID settings.

Suction Sensor Mode (SuM) – This tells the controller where to look for the suction pressure input. Local (Loc) means that the suction pressure transducer is located at that controller. Local and Broadcast (LoS) means the suction pressure transducer is located at that controller and sending the value via RS485-2 to other controllers. Remote (Rmt) means the controller is receiving the suction pressure input from another controller.

8.) MODBUS Address (Unu) – Controller Identification (1-32)

9.) Refrigerant (Rfg) – Type of refrigerant (R22, R134a, R407c)

10.) Proportional Coefficient (P) – The larger the proportional coefficient, or gain, the larger change in valve position. If the gain is too high it will cause the system to become unstable. If the gain is too small the valve response will be lower than the necessary response to correct the disturbances in the system. This will also determine how quickly the valve can respond to disturbances in the system.

11.) Integral Coefficient (I) – The integral coefficient assists the proportional coefficient in reaching the superheat setpoint and also eliminates steady-state error from the proportional coefficient. The larger the value here the more the overshoot of the superheat value around the setpoint.

12.) Derivative Coefficient (D) – The larger values here will decrease the overshoot caused by the integral but will slow down the response and could lead to instability if the value becomes too large.

13.) Valve Type (Vty) – Valve Type and number of steps.
13.1. 16k – Sporlan SER-1.5, SER-6, SER-11, SER-20

13.2. 25k – Sporlan SER(I)-G, SER(I)-J, SER(I)-K

13.3. 32k – Sporlan SEI-30,

13.4. 64k – Sporlan SEI-50, SEH(I)-100, SEH(I)-175, Y1231

13.5. ESX – Sporlan ESX

13.6. Danfoss – 50, 100, 250, 400

14.) Manual Valve Position (MVP) – Allows user to override controller and manually set valve position. Will default back to regular control after 60 minutes.

15.) TC MODBUS

The TC can communicate with a MODBUS master. The TC will transfer process values and setpoints via MODBUS. The TC only supports the RTU transmission mode. The serial settings are as follows:
9600 baud
8 data bits
1 stop bit
Even parity

The TC supports the 'Read Input Registers', 'Read Holding Register', and 'Write Single Register' function codes. Any other request will result in an exception response. The TC will allow a full and partial block read of the Input and Holding registers.

15.1. MODBUS Memory Map

Table 4 Memory Map

MODBUS Function Code	Mapped Data	Data Map	Range
Read Holding Register (0x03)	Setpoints	0. Superheat Setpoint	5 to 25 °F
		1. Superheat Offset Scale	0 to 20 °F
		2. Solenoid Start Delay	0 to 300 seconds
		3. Cycle Time	1 to 10 seconds
		4. Suction Sensor Mode	0 = Local, 1 = Local and broadcast, 2 = Remote
		5. MODBUS Address	1 to 32
		6. Refrigerant	0 = R22, 1 = R134A, 2 = R410A
		7. Proportional coefficient	0 to 100
		8. Integral coefficient	0 to 100
		9. Derivative coefficient	0 to 100

MODBUS Function Code	Mapped Data	Data Map	Range
		10. MOP	0 to 150[3] PSI
		11. Valve Max	0 to 100 %
		12. Valve Min	0 to 100 %
		13. Valve Start Position	0 to 100 %
		14. Valve Start Delay	0 to 300 seconds
		15. Valve Type	0 = ESX, 1 = 16K, 2 = 25K, 3 = 32K, 4 = 64K, 5 = 050, 6 = 100, 7 = 250, 8 = 400
		16. Manual Valve Position	0 to 100 %
Read Input Registers (0x04)	Process Variables	0. Suction Pressure	0 to 150 PSI
		1. Superheat	0 to 165 °F
		2. Valve Percent Open	0 to 100 %
		3. Suction Temperature	-40 to 125°F
		4. Saturation Temperature	-40 to 125°F
		5. Start/Stop Status	0 = OFF, 1 = RUN
		6. Solenoid Status	0 = CLOSED, 1 = OPEN
		7. Alarm Status	If Bit set then alarm is active: Bit 0 = Suction Transducer Failure Bit 1 = SuT Sensor Failure Bit 2 = High Superheat Bit 3 = Low Superheat Bit 4 = Comm. Alarm
		8. Active Superheat Setpoint	0 to 45 °F
Write Single Register (0x06)	Setpoints	Same as above.	The max number of registers written at a time is 1. The limits can be seen above in the 'Read Holding Register' definition.

[3] The maximum value varies based on which refrigerant is selected. (410A is 300 PSI and all others are 150 PSI)

16.) TC Alarms

The TC has 3 alarms. The following table lists the possible alarms and the text that is seen on the controller. The controller's alarm status can be viewed via MODBUS and the local display.

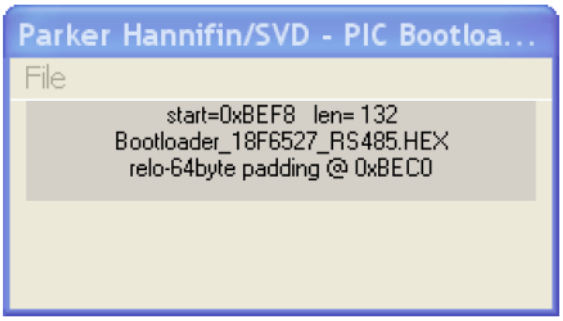
Table 5 Alarms

Alarm Text	Meaning
NoA	No Alarms active
SSA	Pressure Sensor alarm
CSA	Suction Coil Temp. Sensor alarm
CMA	Communications Alarm

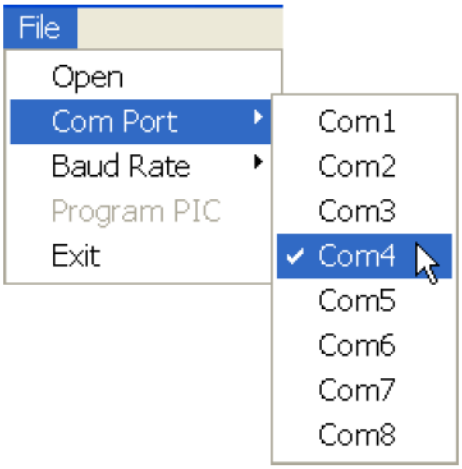
If the user travels to the Alarm Status process value they will be able to see all the active alarms.

17.) Bootloading

The TC bootloader application communications with the TC based controller by sending information to the RS-485 port on your controller. The first thing that needs to be done is verify that the setup is correct. The PC will communicate to the controller using a USB to RS485 converter. The RS-485 line labeled '-' on the controller should be connected to the line labeled '-' on the converter. The two '+' terminals should be hooked in the same manner. If you're unsure of which COM port your converter device is connected to you can view the COM port by clicking on Start->Run. Type in "devmgmt.msc" and press OK. Scroll down to where the Ports (COM & LPT) can be viewed. If the USB->RS485 Converter was properly installed and is currently hooked up to the computer then it should be visible under Ports. We are now ready to start our TC Bootloader program by double left clicking on the Bootload.exe file. It will look like the following:
Click



Click on File to choose the COM port that **your USB-RS485 converter lies on** like the following image:



Note: The image above is for illustration purposes only. Your USB-RS485 converter may not be on COM4.

The Baud rate should be set to 38400. The firmware that is going to be loaded into the PIC should now be selected. It can be selected by clicking on File again and then clicking on Open. Locate the appropriate hex file and click open. **The next few steps must be done in order to achieve success!!**

1. Verify that the Controller is OFF and all the connections are made. Verify that the steps listed above have all been completed.

2. Click on File->Program PIC.

3. Turn ON the power to the Controller.

You should see the progress bar move if everything was done correctly. The controller may be powered off and disconnected when the process has complete.

Setpoint Text	Meaning	Range	Your Setting
ESC	Travel Up to a Layer	-	
S/H	Superheat Setpoint	5 to 25f Default = 10 f	
SRS	Superheat Offset Scale	0 to 20f Default = 0 f	
SsD	Solenoid Start Delay	0 to 300 seconds Default = 0 secs	
Clp	Cycle Time	1 to 10 seconds Default = 3 secs	
SuM	Suction Sensor Mode (Location)	Local, Local and Broadcast or Remote Default = Local (Loc)	
Unu	MODBUS Address	1 to 32 Default = 1	
Rfg	Refrigerant	R22 R134A R407C Default = R22	
_P_	Proportional Coefficient	0 to 100 Default = 20	
_I_	Integral Coefficient	0 to 100 Default = 45	
_D_	Derivative Coefficient	0 to 100 Default = 5	
MOP	Maximum Operationg Pressure	0 to 150 PSI Default = 120 PSI	
VMX	Valve Max	0 to 100% Default = 100%	
VMN	Valve Minimum	0 to 100% Default = 5%	
VSP	Valve Start Position	0 to 100% Default = 12%	
VSD	Valve Start Delay	0 to 300 seconds Default = 90 secs	
VtY	Valve Type	Sporlan Valves Default = 32k	
		ESX 16k 25k	

		32k 64k Danfoss Valve 50 100 250 400	
MVP	Manual Valve Positiion	0 to 100%	

PRESSURE TRANSDUCER and TEMPERATURE SENSOR

INSTALLATION AND SERVICE INSTRUCTIONS

Pressure Transducers and Temperature Sensors are used in conjunction with Sporlan's Temperature Control Board (TCB) or other controllers to control Electronic Expansion Valves, Electronic Discharge Bypass Valves, or Electronic Evaporator Pressure Regulating Valves.

PRESSURE TRANSDUCER

There are several different pressure ranges for the pressure transducer. The two most commonly used transducers measure 150 or 300 psig gage pressure. The Superheat, Chiller, Subcool-O-Matic, Refrigeration, Pressure, and Kelvin (R-410A) use a 300 psig transducer, while the Kelvin for all other refrigernts uses the 150 psig. The transducer can be indentified b the product label on the transducer body

300 psig 2CP5-50-1
150 psig 2CP5-63-2 (Green shrink wrap)

The pressure transducer is used in conjunction with the **Superheat Controller** or **Chiller Controller** to provide pressure/temperature superheat control of Sporlan SEI or SEH Electric Expansion Valves. The transducer is threaded to screw onto a standard 1/4 inch SAE Flare pressure tap, and should be mounted on the suction line near the temperature sensor. There are three color-coded lead wires and the transducer is polarized.

NOTE: Improved Cable for Pressure Transducers
Pressure Transducers Part Numbers 952740 (2m 300psig), 952503 (5m 300psig), 953091 (2m 150psig), 953092 (5m 150psig) now include an improved hermetic cable. **Please note that the color code has changed.**

Controller Terminal	Old Pigtail leads	New Hermetic Cable
1+ or 2+	Red	Black
1- or 2-	Black	Green
1S or 2S	Green	White

Sporlan has three different temperature sensors for different applications. All of them are solid state devices that change electrical resistance in response to a change in temperature.

The **air sensor** (item # 952669) is most often used in the discharge air stream of the evaporator. The sensor location should be chosen using the same criteria as would be used for location of a thermostat. Heat sources such as lights and anti-sweat heaters, as well as areas with poor air flow should be avoided. The sensor should be mounted in the air stream using a clip such as that pictured in figure 1.

The **surface sensor** (item # 952662) is typically mounted on the suction line, as close to the evaporator as possible using the wire ties included, see the diagram in figure 2. In the case of sensors used for **two temperature** superheat control, one sensor is mounted on the liquid line at the inlet to the evaporator, and the other is mounted on the suction line at the outlet of the evaporator.

The **well sensor** (item # 952795) is used on suction lines 7/8" or larger utilizes the same sensing element as the surface sensor, but is provided with a **well.** The **well** is a specially designed brass fitting, which is threaded into a 1/4" NPT hole or fitting in the suction line. The sensor probe is inserted into the well along with the heat transfer grease. See figure 3. These sensors are generally used with iron pipe which has very poor thermal transfer properties. Be sure to wrap the threads on the well fitting with Teflon tape or use some form of thread sealant.

The Kelvin sensor 952551 (white) can be mounted on the suction line for superheat control. Refer to Figure 2. For T2 air control mount sensor as shown in figure 1 in a location best suited for air temperature control.

figure 1

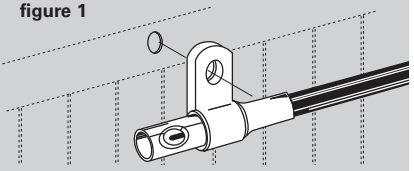


figure 2

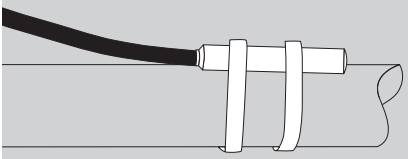
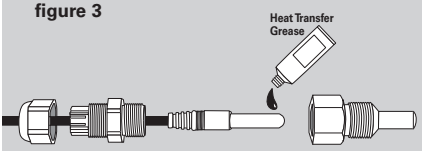


figure 3



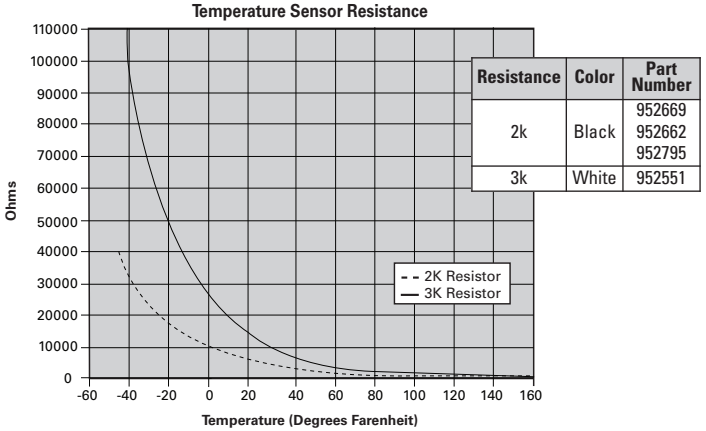
SERVICE INSTRUCTIONS

Neither the pressure transducer or temperature sensor can be repaired. Using the charts below, measurements can be taken to assure that they are functioning correctly. If components are found to be out of tolerance, they should be replaced.

TEMPERATURE SENSOR

As mentioned above, the temperature sensor changes electrical resistance in response to temperature changes. Disconnect the sensor from the controller, then check and record the resistance through the temperature sensor. Check the temperature of the suction line at the sensor location, and compare to the chart in figure 4. Example: at 0° F, the resistance through the 2k temperature sensor should be approximately 10,000 Ohms. Reconnect the temperature sensor to the controller.

figure 4

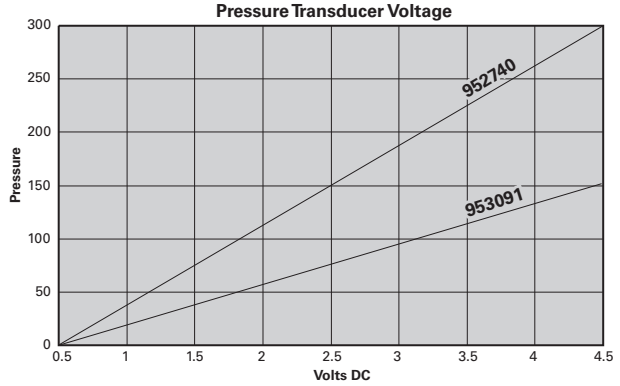


Resistance	Color	Part Number
2k	Black	952669 952662 952795
3k	White	952551

PRESSURE TRANSDUCER

The output voltage of the pressure transducer changes in response to pressure changes within the system. With the system running and using a DC voltmeter, measure the voltage between the white and green lead wires from the transducer. Remove the transducer from its fitting, and replace it with a **union tee** with a core depressor. Install the transducer on one of the male fittings of the **tee,** and a pressure gauge on the other. Read the pressure on the gauge and compare the findings to the chart in figure 5. Example: at 50 PSI, the voltage between the two leads should be approximately 1.1 VDC. Reinstall the pressure transducer on the system.

figure 5



SPORLAN
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°F	Resistance	Volts dc		°F	Resistance	Volts dc		°F	Resistance	Volts dc
-95	187153.23	4.820		-41	32925.47	4.125		13	7941.52	2.661
-94	180597.06	4.814		-40	31986.77	4.104		14	7754.11	2.631
-93	174295.94	4.807		-39	31078.13	4.083		15	7571.75	2.602
-92	168239	4.801		-38	30198.51	4.061		16	7394.27	2.572
-91	162415.87	4.794		-37	29346.88	4.039		17	7221.53	2.543
-90	156816.69	4.787		-36	28522.26	4.017		18	7053.4	2.513
-89	151432.01	4.780		-35	27723.7	3.994		19	6889.73	2.484
-88	146252.85	4.772		-34	26950.29	3.971		20	6730.39	2.454
-87	141270.61	4.765		-33	26201.16	3.948		21	6575.26	2.425
-86	136477.09	4.757		-32	25475.48	3.925		22	6424.2	2.396
-85	131864.46	4.749		-31	24772.42	3.901		23	6277.11	2.367
-84	127425.25	4.740		-30	24091.22	3.877		24	6133.87	2.339
-83	123152.3	4.732		-29	23431.11	3.852		25	5994.36	2.310
-82	119038.81	4.723		-28	22791.39	3.828		26	5858.47	2.282
-81	115078.25	4.714		-27	22171.35	3.803		27	5726.1	2.253
-80	111264.38	4.705		-26	21570.33	3.778		28	5597.16	2.225
-79	107591.26	4.695		-25	20987.68	3.752		29	5471.53	2.197
-78	104053.18	4.686		-24	20422.78	3.726		30	5349.13	2.169
-77	100644.72	4.676		-23	19875.03	3.700		31	5229.86	2.142
-76	97360.65	4.666		-22	19343.87	3.674		32	5113.63	2.114
-75	94196	4.655		-21	18828.72	3.648		33	5000.36	2.087
-74	91146.02	4.644		-20	18329.07	3.621		34	4889.97	2.060
-73	88206.13	4.633		-19	17844.39	3.594		35	4782.36	2.033
-72	85371.99	4.622		-18	17374.18	3.567		36	4677.47	2.006
-71	82639.43	4.611		-17	16917.98	3.540		37	4575.21	1.980
-70	80004.43	4.599		-16	16475.31	3.512		38	4475.52	1.953
-69	77463.19	4.587		-15	16045.74	3.484		39	4378.31	1.927
-68	75012.05	4.574		-14	15628.83	3.456		40	4283.53	1.902
-67	72647.48	4.562		-13	15224.18	3.428		41	4191.1	1.876
-66	70366.15	4.549		-12	14831.37	3.400		42	4100.96	1.850
-65	68164.83	4.536		-11	14450.04	3.371		43	4013.04	1.825
-64	66040.44	4.522		-10	14079.8	3.343		44	3927.29	1.800
-63	63990.03	4.508		-9	13720.31	3.314		45	3843.64	1.776
-62	62010.77	4.494		-8	13371.21	3.285		46	3762.04	1.751
-61	60099.94	4.480		-7	13032.17	3.256		47	3682.43	1.727
-60	58254.95	4.465		-6	12702.87	3.227		48	3604.75	1.703
-59	56473.3	4.450		-5	12383	3.198		49	3528.96	1.679
-58	54752.61	4.435		-4	12072.27	3.168		50	3455	1.655
-57	53090.57	4.419		-3	11770.37	3.139		51	3382.82	1.632
-56	51485	4.403		-2	11477.04	3.109		52	3312.38	1.609
-55	49933.79	4.387		-1	11192	3.079		53	3243.62	1.586
-54	48434.91	4.370		0	10915	3.050		54	3176.51	1.564
-53	46986.41	4.353		1	10645.78	3.020		55	3111	1.541
-52	45586.44	4.336		2	10384.1	2.990		56	3047.04	1.519
-51	44233.21	4.319		3	10129.72	2.960		57	2984.6	1.498
-50	42925	4.301		4	9882.42	2.930		58	2923.63	1.476
-49	41660.16	4.282		5	9641.98	2.900		59	2864.09	1.455
-48	40437.11	4.264		6	9408.19	2.870		60	2805.96	1.434
-47	39254.33	4.245		7	9180.85	2.840		61	2749.18	1.413
-46	38110.36	4.226		8	8959.75	2.811		62	2693.73	1.392
-45	37003.8	4.207		9	8744.71	2.781		63	2639.57	1.372
-44	35933.3	4.187		10	8535.54	2.751		64	2586.67	1.352
-43	34897.57	4.167		11	8332.07	2.721		65	2534.99	1.332
-42	33895.36	4.146		12	8134.12	2.691		66	2484.5	1.313

°F	Resistance	Volts dc		°F	Resistance	Volts dc		°F	Resistance	Volts dc
67	2435.18	1.293		121	900.13	0.571		175	385.68	0.262
68	2386.98	1.274		122	885.01	0.563		176	380.13	0.258
69	2339.89	1.255		123	870.2	0.554		177	374.67	0.255
70	2293.87	1.237		124	855.67	0.546		178	369.31	0.251
71	2248.9	1.218		125	841.43	0.538		179	364.04	0.248
72	2204.95	1.200		126	827.46	0.530		180	358.85	0.244
73	2161.99	1.182		127	813.77	0.522		181	353.76	0.241
74	2120	1.165		128	800.35	0.514		182	348.75	0.238
75	2078.95	1.147		129	787.18	0.507		183	343.83	0.235
76	2038.82	1.130		130	774.27	0.499		184	338.98	0.232
77	1999.59	1.113		131	761.61	0.492		185	334.22	0.228
78	1961.24	1.097		132	749.19	0.485		186	329.54	0.225
79	1923.74	1.080		133	737.01	0.478		187	324.94	0.222
80	1887.06	1.064		134	725.06	0.471		188	320.41	0.219
81	1851.2	1.048		135	713.34	0.464		189	315.96	0.217
82	1816.13	1.032		136	701.84	0.457		190	311.58	0.214
83	1781.83	1.017		137	690.56	0.450		191	307.28	0.211
84	1748.28	1.002		138	679.49	0.444		192	303.04	0.208
85	1715.46	0.986		139	668.63	0.437		193	298.88	0.205
86	1683.36	0.972		140	657.98	0.431		194	294.78	0.203
87	1651.96	0.957		141	647.53	0.424		195	290.75	0.200
88	1621.24	0.942		142	637.27	0.418		196	286.79	0.197
89	1591.18	0.928		143	627.2	0.412		197	282.89	0.195
90	1561.76	0.914		144	617.32	0.406		198	279.06	0.192
91	1532.98	0.900		145	607.62	0.400		199	275.28	0.190
92	1504.82	0.887		146	598.11	0.395		200	271.57	0.187
93	1477.26	0.873		147	588.77	0.389		201	267.92	0.185
94	1450.28	0.860		148	579.6	0.383		202	264.33	0.182
95	1423.88	0.847		149	570.6	0.378		203	260.79	0.180
96	1398.04	0.834		150	561.76	0.372		204	257.31	0.178
97	1372.74	0.822		151	553.09	0.367		205	253.89	0.175
98	1347.98	0.809		152	544.58	0.362		206	250.52	0.173
99	1323.74	0.797		153	536.21	0.357		207	247.2	0.171
100	1300	0.785		154	528.01	0.352		208	243.94	0.169
101	1276.76	0.773		155	519.95	0.347		209	240.73	0.167
102	1254.01	0.761		156	512.03	0.342		210	237.57	0.165
103	1231.72	0.750		157	504.26	0.337		211	234.46	0.162
104	1209.9	0.739		158	496.62	0.332		212	231.39	0.160
105	1188.53	0.728		159	489.13	0.327		213	228.38	0.158
106	1167.6	0.717		160	481.77	0.323		214	225.41	0.156
107	1147.11	0.706		161	474.54	0.318		215	222.49	0.154
108	1127.03	0.695		162	467.43	0.314		216	219.62	0.153
109	1107.36	0.685		163	460.46	0.309		217	216.78	0.151
110	1088.09	0.674		164	453.6	0.305		218	214	0.149
111	1069.21	0.664		165	446.87	0.301		219	211.25	0.147
112	1050.72	0.654		166	440.26	0.297		220	208.55	0.145
113	1032.6	0.644		167	433.76	0.293		221	205.89	0.143
114	1014.85	0.635		168	427.37	0.288		222	203.27	0.141
115	997.45	0.625		169	421.1	0.284		223	200.69	0.140
116	980.4	0.616		170	414.94	0.281		224	198.15	0.138
117	963.7	0.607		171	408.88	0.277		225	195.65	0.136
118	947.32	0.598		172	402.93	0.273		226	193.19	0.135
119	931.27	0.589		173	397.08	0.269		227	190.76	0.133
120	915.54	0.580		174	391.33	0.265		228	188.37	0.131

January 2011 / **BULLETIN 100-20-1**

SPORLAN

Electric Expansion Valves

Parker

ENGINEERING YOUR SUCCESS.

This supplement to Bulletin 100-20 (September 2008) details the updated Sporlan series of Electric Expansion Valves. Built on a foundation of more than 75 years of refrigerant flow control designs, and over 20 years of experience in electronic superheat control, these valves are a perfect fit for today's demanding applications.

From the unique uni-body construction and quad-position cable found on the SER-B through SER-D, to the multiple body configurations and built-in sight glass on the SERI-G through SERI-L, these valves are designed for flexibility, reliability, and ease of use.

Equipped with advanced pin designs and Digital Linear Actuators, Sporlan Electric Expansion Valves have minimal energy requirements, without sacrificing performance. And with nine valves that cover a capacity range of 400 Tons, valve selection and SKU reduction are simplified.

Available Connections

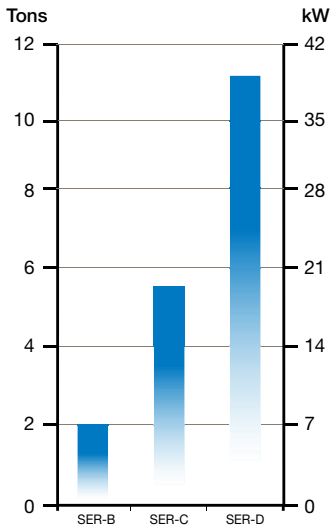
Valve Type	INLET - Inches (ODF)	OUTLET - Inches (ODF)	Configuration	Cable Length		Cable Ends
				Feet	Meters	
SER-B*	1/4, 3/8	3/8, 1/2, 5/8	Angle	10, 20	3, 6	S - Stripped and Tinned
SER-C*	1/4, 3/8	3/8, 1/2, 5/8	Angle			
SER-D*	3/8, 1/2, 5/8	1/2, 5/8, 7/8, 1-1/8	Straight Through Offset			
SERI-G*	5/8, 7/8	1/2, 5/8, 7/8, 1-1/8	Angle or Straight Through Offset	10, 40	3, 12	
SERI-J*	7/8, 1-1/8	7/8, 1-1/8, 1-3/8				
SERI-K†	1-1/8	7/8, 1-1/8, 1-3/8, 1-5/8				
SERI-L†	1-1/8, 1-3/8	1-1/8, 1-3/8, 1-5/8				
SEHI-175	1-1/8, 1-3/8, 1-5/8	2-1/8	Straight Through Offset	10, 20, 30, 40	3, 6, 9, 12	
SEHI-400	1-5/8, 2-1/8, 2-5/8	1-5/8, 2-1/8, 2-5/8, 3-1/8 (ODM)	Angle			

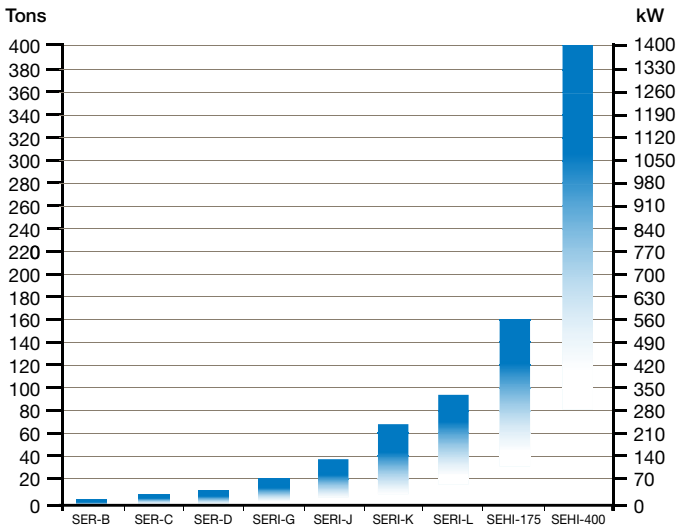
*Suitable for bi-directional applications.
† Bi-sealing, reduced flow in reverse direction.

Specifications

Valve	SER-B, -C, -D	SERI-G, -J, -K, -L	SEHI-175	SEHI-400
Motor Type	2 phase, bipolar wet motor			
Compatible Refrigerant	All common CFC, HCFC and HFC refrigerants, including R-410A and subcritical R-744			All common CFC, HCFC and HFC refrigerants
Compatible Oils	All common Mineral, Polyolester and Alkybenzene oils			
Supply Voltage	12 VDC -5% +10% measured at the valve leads			
Cable Type	IP67 Removable Quad-Position	Removable	Hermetic	Hermetic
Phase Resistance	100 ohms ± 10%	100 ohms ± 10%	75 ohms ± 10%	75 ohms ± 10%
Current Range	120 ma / winding	120 ma / winding	160 ma / winding	160 ma / winding
Power Input	2.8 watts	2.8 watts	3.8 watts	3.8 watts
Recommended Step Rate	200 / second	200 / second	200 / second	200 / second
Number of Steps	2500	2500	6386	6386
Full Motor Transit Time	12.5 seconds	12.5 seconds	34 seconds	34 seconds
Resolution	.000092" (.0023 mm) / step	.00012" (.003 mm) / step	.00008" (.002 mm) / step	.00008" (.002 mm) / step
Stroke	0.23" (5.8 mm)	.297" (7.5 mm)	.500" (12.7 mm)	.500" (12.7 mm)
MOPD	580 psid (40 bar)	500 psid (34 bar)	500 psid (34 bar)	300 psid (21 bar)
MRP	700 psig (48 bar)	700 psig (48 bar)	620 psig (43 bar)	500 psig (34 bar)
Max Internal Leakage	100 cc/min @ 100 psig (6.9 bar), dry air			
Max External Leakage	.10 oz/yr @ 300 psig (2.8 gram/yr @ 20 bar)			
Operating Temp Range	-50°F to 155°F (-45°C to 68°C)			
Materials of Construction	Brass, copper, synthetic seals, stainless steel			

Capacity





R-407C at 100°F (38°C) liquid, 100 psi (7 bar) pressure drop, and 40°F (5°C) evaporator temperature.

R-134a Capacities in Tons (at Evaporator Temperature °F)

	Valve Type	Nominal Capacity	40°F								20°F								0°F							
			Pressure Drop Across Valve (psi)																							
			40	60	80	100	120	140	160	180	40	60	80	100	120	140	160	180	40	60	80	100	120	140	160	180
R-134a	SER-B	1.5	1.26	1.54	1.78	1.99	2.18	2.36	2.52	2.67	1.20	1.46	1.69	1.89	2.07	2.24	2.39	2.54	1.14	1.39	1.61	1.80	1.97	2.13	2.28	2.41
	SER-C	4.2	3.42	4.18	4.83	5.40	5.92	6.39	6.83	7.25	3.24	3.97	4.58	5.12	5.61	6.06	6.48	6.87	3.09	3.78	4.36	4.88	5.35	5.77	6.17	6.55
	SER-D	8.5	6.95	8.51	9.83	11.0	12.0	13.0	13.9	14.7	6.59	8.07	9.32	10.4	11.4	12.3	13.2	14.0	6.28	7.69	8.88	9.93	10.9	11.7	12.6	13.3
	SERI-G	16	13.3	16.3	18.8	21.1	23.1	24.9	26.6	28.2	12.8	15.6	18.0	20.1	22.0	23.8	25.4	26.9	12.1	14.8	17.1	19.1	21.0	22.6	24.2	25.7
	SERI-J	29	24.0	29.3	33.9	37.9	41.5	44.8	47.9	50.8	22.9	28.1	32.4	36.2	39.6	42.8	45.7	48.5	21.8	26.7	30.8	34.4	37.7	40.7	43.5	46.2
	SERI-K	53	43.4	53.2	61.4	68.7	75.2	81.3	86.9	92.1	41.5	50.8	58.7	65.6	71.8	77.6	83.0	88.4	39.4	48.4	55.8	62.4	68.3	73.9	79.0	83.7
	SERI-L	72	59.2	72.5	83.7	93.6	103	111	118	126	56.1	68.8	79.4	88.8	97.2	105	112	119	53.5	65.5	75.6	84.5	92.6	100	107	113
	SEHI-175	126	103	126	146	163	179	193	206	219	98.5	121	139	156	171	184	197	209	94	115	133	148	162	175	187	199
	SEHI-400	307	250	307	354	396	434	469	501	531	238	291	336	376	412	445	475	504	226	277	320	358	392	423	453	480

R-134a Capacities in kW (at Evaporator Temperature °C)

	Valve Type	Nominal Capacity	5°C								-10°C								-20°C							
			Pressure Drop Across Valve (bar)																							
			2.5	4	5.5	7	8.5	10	11.5	13	2.5	4	5.5	7	8.5	10	11.5	13	2.5	4	5.5	7	8.5	10	11.5	13
R-134a	SER-B	5.3	4.22	5.34	6.26	7.06	7.78	8.44	9.05	9.62	4.00	5.06	5.94	6.70	7.38	8.00	8.58	9.13	3.81	4.82	5.65	6.38	7.03	7.62	8.18	8.69
	SER-C	14	11.4	14.5	17.0	19.1	21.1	22.9	24.5	26.1	10.9	13.7	16.1	18.2	20.0	21.7	23.3	24.7	10.3	13.1	15.3	17.3	19.1	20.7	22.2	23.6
	SER-D	29	23.3	29.4	34.5	38.9	42.9	46.5	49.9	53.1	22.1	27.9	32.7	36.9	40.7	44.1	47.3	50.3	21.0	26.6	31.2	35.2	38.8	42.0	45.1	47.9
	SERI-G	56	44.5	56.4	66.1	74.5	82.2	89.3	95.2	102	41.8	53.0	62.1	70.0	77.2	83.7	90.1	95.2	40.0	50.6	59.3	66.9	73.7	80.0	85.9	91.2
	SERI-J	101	80.2	101	119	134	148	161	172	183	75.3	95.2	111	126	139	150	162	172	71.9	91.0	107	121	133	144	154	164
	SERI-K	184	145	184	216	243	268	291	312	332	137	173	202	229	252	273	292	311	130	165	194	218	241	261	280	297
	SERI-L	251	198	251	294	332	365	396	425	452	188	238	279	315	347	376	403	429	179	226	266	300	330	358	384	408
	SEHI-175	437	345	437	512	578	637	691	740	787	324	410	481	542	598	648	695	739	310	392	459	518	571	619	664	706
	SEHI-400	1061	839	1061	1244	1404	1547	1678	1799	1913	796	1006	1180	1331	1467	1591	1707	1814	758	959	1124	1268	1397	1516	1625	1728

R-407C Capacities in Tons (at Evaporator Temperature °F)

	Valve Type	Nominal Capacity	40°F								20°F								0°F							
			Pressure Drop Across Valve (psi)																							
			75	100	125	150	175	200	225	250	75	100	125	150	175	200	225	250	75	100	125	150	175	200	225	250
R-407C	SER-B	2.0	1.74	2.01	2.25	2.46	2.66	2.85	3.02	3.18	1.68	1.94	2.17	2.38	2.57	2.75	2.91	3.07	1.62	1.87	2.09	2.29	2.47	2.64	2.80	2.95
	SER-C	5.5	4.72	5.46	6.10	6.68	7.22	7.72	8.18	8.63	4.56	5.26	5.89	6.45	6.96	7.45	7.90	8.32	4.38	5.06	5.66	6.20	6.69	7.15	7.59	8.00
	SER-D	11	9.61	11.1	12.4	13.6	14.7	15.7	16.6	17.5	9.27	10.7	12.0	13.1	14.2	15.1	16.1	16.9	8.91	10.3	11.5	12.6	13.6	14.6	15.4	16.3
	SERI-G	21	17.9	20.7	23.2	25.4	27.5	29.3	31.1	32.8	17.2	19.9	22.3	24.4	26.3	28.2	29.9	31.5	16.5	19.0	21.3	23.3	25.2	26.9	28.5	30.0
	SERI-J	37	32.3	37.3	41.7	45.7	49.4	52.8	55.9	59.0	31.0	35.8	40.1	43.9	47.4	50.7	53.8	56.7	29.6	34.2	38.3	41.9	45.2	48.4	51.3	54.1
	SERI-K	68	58.6	67.7	75.7	82.9	89.3	96.1	101	107	56.3	65.0	72.6	79.6	86.0	91.9	97.5	103	53.7	62.0	69.3	75.9	82.0	87.6	92.7	97.8
	SERI-L	95	81.8	94.5	106	116	125	134	142	149	79.0	91.2	102	112	121	129	137	144	75.9	87.6	98.0	107	116	124	131	139
	SEHI-175	161	139	161	180	197	212	227	241	254	133	154	172	189	204	218	231	244	127	147	165	180	195	208	221	233
	SEHI-400	400	346	400	447	490	529	566	600	632	334	386	432	473	511	546	579	610	321	371	415	454	491	525	556	586

R-407C Capacities in kW (at Evaporator Temperature °C)

	Valve Type	Nominal Capacity	5°C								-10°C								-20°C							
			Pressure Drop Across Valve (bar)																							
			4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18
R-407C	SER-B	7.1	5.40	6.61	7.63	8.54	9.35	10.1	10.8	11.5	5.14	6.30	7.27	8.13	8.90	9.62	10.3	10.9	4.96	6.07	7.01	7.84	8.58	9.27	9.91	10.5
	SER-C	19	14.6	17.9	20.7	23.1	25.4	27.4	29.3	31.1	13.9	17.1	19.7	22.0	24.1	26.1	27.9	29.6	13.4	16.5	19.0	21.2	23.3	25.1	26.9	28.5
	SER-D	39	29.8	36.5	42.1	47.1	51.6	55.7	59.5	63.2	28.4	34.7	40.1	44.8	49.1	53.0	56.7	60.2	27.3	33.5	38.7	43.2	47.3	51.1	54.7	58.0
	SERI-G	73	55.5	67.9	78.5	87.6	96.1	104	111	117	52.4	64.2	74.1	82.9	91.0	97.8	105	111	50.2	61.5	71.1	79.5	86.7	94.4	100	106
	SERI-J	131	99.5	122	141	158	173	187	200	212	94.4	116	133	149	163	177	189	200	90.1	111	128	143	156	169	181	192
	SERI-K	238	181	222	256	286	314	338	362	384	171	209	241	270	296	320	342	363	164	201	232	259	284	307	328	348
	SERI-L	332	254	311	359	401	439	474	507	538	241	296	342	382	418	452	483	512	233	285	329	368	403	436	466	494
	SEHI-175	566	430	526	608	680	744	804	860	912	406	497	574	642	703	760	812	861	389	477	550	615	674	728	778	826
	SEHI-400	1407	1073	1315	1518	1697	1859	2008	2147	2277	1022	1252	1446	1616	1770	1912	2044	2168	985	1207	1393	1558	1707	1843	1971	2090

Liquid Temperature Correction Factors

°F	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
°C	-18	-12	-7	-1	4	10	16	21	27	32	38	43	49	54	60
R-134a	1.70	1.63	1.56	1.49	1.42	1.36	1.29	1.21	1.14	1.07	1.00	0.93	0.85	0.78	0.71
R-404A	2.04	1.94	1.84	1.74	1.64	1.54	1.43	1.33	1.22	1.11	1.00	0.89	0.77	0.65	0.53
R-407C	1.69	1.62	1.55	1.49	1.42	1.35	1.28	1.21	1.14	1.07	1.00	0.93	0.85	0.77	0.69
R-410A	1.79	1.71	1.63	1.55	1.47	1.40	1.32	1.24	1.16	1.08	1.00	0.92	0.83	0.73	0.62
R-507	1.99	1.89	1.79	1.69	1.59	1.50	1.40	1.30	1.20	1.10	1.00	0.89	0.78	0.66	0.51
R-744	1.13	1.07	1.00	0.93	0.86	–	–	–	–	–	–	–	–	–	–

R-404A Capacities in Tons (at Evaporator Temperature °F)

	Valve Type	Nominal Capacity	40°F								20°F								0°F							
			Pressure Drop Across Valve (psi)																							
			75	100	125	150	175	200	225	250	75	100	125	150	175	200	225	250	75	100	125	150	175	200	225	250
R-404A	SER-B	1.4	1.19	1.38	1.54	1.69	1.82	1.95	2.07	2.18	1.13	1.31	1.46	1.60	1.73	1.85	1.97	2.07	1.07	1.24	1.38	1.51	1.64	1.75	1.85	1.95
	SER-C	3.7	3.24	3.74	4.18	4.58	4.95	5.29	5.61	5.91	3.08	3.55	3.97	4.35	4.70	5.02	5.33	5.62	2.90	3.35	3.75	4.10	4.43	4.74	5.03	5.30
	SER-D	7.6	6.59	7.61	8.50	9.32	10.1	10.8	11.4	12.0	6.26	7.23	8.08	8.85	9.56	10.2	10.8	11.4	5.90	6.82	7.62	8.35	9.02	9.64	10.2	10.8
	SERI-G	15	12.9	15.0	16.7	18.3	19.7	21.1	22.4	23.6	12.2	14.2	15.8	17.3	18.7	20.0	21.3	22.4	11.6	13.3	14.9	16.3	17.6	18.9	20.0	21.1
	SERI-J	27	23.3	26.9	30.0	32.9	35.5	38.0	40.3	42.5	22.0	25.5	28.5	31.2	33.7	36.0	38.2	40.3	20.7	24.0	26.8	29.3	31.7	33.9	36.0	37.9
	SERI-K	49	42.2	48.7	54.5	59.7	64.4	68.9	73.1	77.0	40.0	46.2	51.6	56.5	61.1	65.3	69.3	73.0	37.7	43.4	48.5	53.2	57.5	61.5	65.1	68.7
	SERI-L	65	56.1	64.8	72.4	79.3	85.7	91.6	97.2	102	53.3	61.5	68.8	75.4	81.4	87.0	92.3	97.3	50.3	58.1	64.9	71.1	76.8	82.1	87.1	91.8
	SEHI-175	116	100	116	129	142	153	164	174	183	95.0	110	123	134	145	155	164	173	89.3	103	115	126	136	146	155	163
	SEHI-400	274	237	274	307	336	363	388	411	434	226	260	291	319	345	368	391	412	213	246	275	301	325	348	369	389

	Valve Type	-20°F								-40°F							
		Pressure Drop Across Valve (psi)															
		75	100	125	150	175	200	225	250	75	100	125	150	175	200	225	250
R-404A	SER-B	1.00	1.16	1.29	1.42	1.53	1.64	1.74	1.83	0.93	1.08	1.20	1.32	1.42	1.52	1.62	1.70
	SER-C	2.72	3.14	3.51	3.84	4.15	4.44	4.71	4.96	2.53	2.92	3.26	3.58	3.86	4.13	4.38	4.62
	SER-D	5.53	6.39	7.14	7.82	8.45	9.03	9.58	10.1	5.14	5.94	6.64	7.27	7.86	8.40	8.91	9.39
	SERI-G	10.8	12.4	13.9	15.2	16.5	17.6	18.6	19.6	9.90	11.6	12.9	14.1	15.2	16.3	17.3	18.2
	SERI-J	19.4	22.4	25.0	27.4	29.6	31.6	33.6	35.4	17.9	20.7	23.2	25.4	27.5	29.3	31.1	32.8
	SERI-K	35.1	40.5	45.4	49.6	53.6	57.4	60.9	64.2	32.6	37.6	42.1	46.1	49.7	53.2	56.4	59.4
	SERI-L	47.1	54.4	60.8	66.6	71.9	76.9	81.6	86.0	43.8	50.6	56.5	61.9	66.9	71.5	75.9	80.0
	SEHI-175	83.4	96.3	108	118	127	136	144	152	77.3	89.3	99.8	109	118	126	134	141
	SEHI-400	199	230	257	282	305	326	345	364	185	214	239	262	283	303	321	338

R-404A Capacities in kW (at Evaporator Temperature °C)

	Valve Type	Nominal Capacity	5°C								-10°C								-20°C							
			Pressure Drop Across Valve (bar)																							
			4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18
R-404A	SER-B	4.9	3.70	4.54	5.24	5.86	6.42	6.93	7.41	7.86	3.45	4.23	4.88	5.46	5.98	6.46	6.90	7.32	3.27	4.01	4.62	5.17	5.66	6.12	6.54	6.94
	SER-C	13	10.0	12.3	14.2	15.9	17.4	18.8	20.1	21.3	9.36	11.5	13.2	14.8	16.2	17.5	18.7	19.9	8.87	10.9	12.5	14.0	15.4	16.6	17.7	18.8
	SER-D	27	20.4	25.0	28.9	32.3	35.4	38.2	40.9	43.3	19.0	23.3	26.9	30.1	33.0	35.6	38.1	40.4	18.0	22.1	25.5	28.5	31.2	33.7	36.1	38.3
	SERI-G	53	40.0	48.9	56.4	63.2	69.2	74.7	79.9	84.7	37.1	45.4	52.4	58.7	64.3	69.4	74.2	78.7	35.0	42.9	49.6	55.4	60.7	65.5	70.1	74.4
	SERI-J	95	71.8	88.4	102	114	124	134	144	152	66.7	81.8	94.4	105	116	125	133	142	63.1	77.2	89.3	100	109	118	126	133
	SERI-K	171	130	160	184	206	225	244	261	276	121	148	171	191	210	226	242	257	114	140	162	181	198	214	229	242
	SERI-L	228	174	213	246	275	301	326	348	369	162	199	229	256	281	303	324	344	154	188	217	243	266	287	307	326
	SEHI-175	408	309	379	438	489	536	579	619	656	287	352	406	454	498	538	575	610	271	332	384	429	470	508	543	576
	SEHI-400	964	736	902	1041	1164	1275	1378	1473	1562	686	841	971	1085	1189	1284	1373	1456	650	796	919	1028	1126	1216	1300	1379

	Valve Type	-30°C								-40°C							
		Pressure Drop Across Valve (bar)															
		4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18
R-404A	SER-B	3.08	3.77	4.36	4.87	5.33	5.76	6.16	6.53	2.88	3.53	4.08	4.56	5.00	5.40	5.77	6.12
	SER-C	8.35	10.2	11.8	13.2	14.5	15.6	16.7	17.7	7.82	9.58	11.1	12.4	13.5	14.6	15.6	16.6
	SER-D	17.0	20.8	24.0	26.9	29.4	31.8	34.0	36.0	15.9	19.5	22.5	25.2	27.6	29.8	31.8	33.7
	SERI-G	32.9	40.3	46.6	52.0	57.0	61.5	65.8	69.8	30.7	37.7	43.4	48.5	53.2	57.5	61.5	65.2
	SERI-J	59.2	72.5	83.7	93.5	103	111	118	126	55.3	67.7	78.1	87.6	96.1	104	111	117
	SERI-K	107	132	152	170	186	201	215	228	100	122	142	158	173	188	201	213
	SERI-L	145	177	205	229	251	271	289	307	135	166	192	214	235	253	271	287
	SEHI-175	255	312	361	403	442	477	510	541	238	291	337	376	412	445	476	505
	SEHI-400	612	750	866	968	1061	1146	1225	1299	573	702	811	907	993	1073	1147	1216

Liquid Temperature Correction Factors

°F	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
°C	-18	-12	-7	-1	4	10	16	21	27	32	38	43	49	54	60
R-134a	1.70	1.63	1.56	1.49	1.42	1.36	1.29	1.21	1.14	1.07	1.00	0.93	0.85	0.78	0.71
R-404A	2.04	1.94	1.84	1.74	1.64	1.54	1.43	1.33	1.22	1.11	1.00	0.89	0.77	0.65	0.53
R-407C	1.69	1.62	1.55	1.49	1.42	1.35	1.28	1.21	1.14	1.07	1.00	0.93	0.85	0.77	0.69
R-410A	1.79	1.71	1.63	1.55	1.47	1.40	1.32	1.24	1.16	1.08	1.00	0.92	0.83	0.73	0.62
R-507	1.99	1.89	1.79	1.69	1.59	1.50	1.40	1.30	1.20	1.10	1.00	0.89	0.78	0.66	0.51
R-744	1.13	1.07	1.00	0.93	0.86	–	–	–	–	–	–	–	–	–	–

R-410A Capacities in Tons (at Evaporator Temperature °F)

	Valve Type	Nominal Capacity	40°F								20°F								0°F							
			Pressure Drop Across Valve (psi)																							
			80	120	160	200	240	280	320	360	80	120	160	200	240	280	320	360	80	120	160	200	240	280	320	360
R-410A	SER-B	2.5	1.78	2.19	2.52	2.82	3.09	3.34	3.57	3.79	1.75	2.14	2.47	2.76	3.02	3.27	3.49	3.70	1.70	2.08	2.40	2.69	2.94	3.18	3.40	3.61
	SER-C	6.8	4.84	5.93	6.84	7.65	8.38	9.05	9.68	10.3	4.73	5.80	6.70	7.49	8.20	8.86	9.47	10.0	4.61	5.65	6.52	7.29	7.98	8.62	9.22	9.78
	SER-D	14	9.84	12.1	13.9	15.6	17.0	18.4	19.7	20.9	9.63	11.8	13.6	15.2	16.7	18.0	19.3	20.4	9.38	11.5	13.3	14.8	16.2	17.5	18.8	19.9
	SERI-G	27	19.1	23.4	27.0	30.2	33.1	35.8	38.3	40.6	18.7	22.9	26.4	29.5	32.3	34.9	37.3	39.6	18.1	22.2	25.6	28.7	31.4	33.9	36.3	38.5
	SERI-J	49	34.4	42.2	48.7	54.4	59.6	64.4	68.8	73.0	33.6	41.1	47.5	53.1	58.2	62.8	67.2	71.2	32.6	40.0	46.1	51.6	56.5	61.0	65.2	69.2
	SERI-K	88	62.4	76.4	88.2	98.7	108	117	125	132	60.9	74.6	86.1	96.3	105	114	122	129	59.1	72.4	83.6	93.5	102	111	118	125
	SERI-L	119	83.8	103	119	133	145	157	168	178	82.0	100	116	130	142	153	164	174	79.9	97.8	113	126	138	149	160	169
	SEHI-175	210	148	182	210	234	257	277	296	314	145	177	204	229	250	271	289	307	140	172	199	222	243	263	281	298
	SEHI-400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

R-410A Capacities in kW (at Evaporator Temperature °C)

	Valve Type	Nominal Capacity	5°C								-10°C								-20°C							
			Pressure Drop Across Valve (bar)																							
			5	8	11	14	17	20	23	26	5	8	11	14	17	20	23	26	5	8	11	14	17	20	23	26
R-410A	SER-B	8.9	5.98	7.56	8.86	10.0	11.0	12.0	12.8	13.6	5.85	7.40	8.67	9.78	10.8	11.7	12.5	13.3	5.69	7.20	8.44	9.53	10.5	11.4	12.2	13.0
	SER-C	24	16.2	20.5	24.0	27.1	29.9	32.4	34.8	36.9	15.9	20.1	23.5	26.5	29.2	31.7	34.0	36.2	15.4	19.5	22.9	25.8	28.5	30.9	33.1	35.2
	SER-D	49	33.0	41.7	48.9	55.1	60.8	65.9	70.7	75.2	32.3	40.8	47.8	54.0	59.5	64.5	69.2	73.5	31.4	39.7	46.6	52.5	57.9	62.8	67.3	71.6
	SERI-G	95	63.9	80.8	95.2	107	118	128	137	145	61.8	78.1	91.8	104	114	123	133	141	60.1	76.1	89.3	100	111	120	129	137
	SERI-J	171	115	145	171	192	212	230	247	263	111	140	165	186	205	223	238	253	108	137	161	181	200	217	232	247
	SERI-K	309	208	264	309	349	384	417	447	475	201	255	299	337	371	403	433	460	196	248	291	328	361	392	421	447
	SERI-L	416	281	355	416	470	518	561	602	640	275	347	407	460	506	549	589	626	267	338	397	447	493	535	573	610
	SEHI-175	735	495	626	735	829	913	990	1062	1129	479	605	710	801	883	957	1027	1091	466	589	691	779	859	932	999	1062
	SEHI-400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

R-744 Capacities in Tons (at Evaporator Temperature °F)

	Valve Type	Nominal Capacity	0°F					-20°F					-40°F				
			Pressure Drop Across Valve (psi)														
			100	150	200	250	300	150	200	250	300	350	200	250	300	350	400
R-744	SER-B	4	3.10	3.80	4.39	4.91	5.37	3.80	4.39	4.91	5.38	5.81	4.36	4.88	5.34	5.77	6.17
	SER-C	12	8.41	10.3	11.9	13.3	14.6	10.3	11.9	13.3	14.6	15.8	11.8	13.2	14.5	15.7	16.7
	SER-D	24	17.1	21.0	24.2	27.1	29.6	21.0	24.2	27.1	29.7	32.0	24.1	26.9	29.5	31.8	34.0
	SERI-G	47	32.8	40.2	46.5	51.9	56.9	40.3	46.5	52.0	56.9	61.5	46.2	51.7	56.6	61.1	65.3
	SERI-J	84	59.1	72.4	83.6	93.4	102	72.5	83.7	93.5	102	111	83.1	92.9	102	110	118
	SERI-K	150	107	131	152	169	186	131	152	170	186	201	151	169	185	199	213
	SERI-L	206	146	178	206	230	252	179	206	231	253	273	205	229	251	271	290
	SEHI-175	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	SEHI-400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

R-744 Capacities in kW (at Evaporator Temperature °C)

	Valve Type	Nominal Capacity	-20°C				-30°C				-40°C			
			Pressure Drop Across Valve (bar)											
			8	12	16	20	12	16	20	24	16	20	24	28
R-744	SER-B	15	11.8	14.4	16.6	18.6	14.4	16.6	18.6	20.4	16.5	18.5	20.2	21.9
	SER-C	42	31.9	39.1	45.1	50.4	39.0	45.1	50.4	55.2	44.8	50.1	54.9	59.3
	SER-D	85	64.9	79.4	91.7	103	79.4	91.7	103	112	91.2	102	112	121
	SERI-G	164	122	149	173	193	149	173	193	211	172	192	210	227
	SERI-J	294	220	269	311	347	269	310	347	380	309	345	378	408
	SERI-K	535	398	488	563	630	487	563	629	689	560	626	685	740
	SERI-L	725	552	677	781	874	676	781	873	957	776	868	951	1027
	SEHI-175	–	–	–	–	–	–	–	–	–	–	–	–	–
	SEHI-400	–	–	–	–	–	–	–	–	–	–	–	–	–

Liquid Temperature Correction Factors

°F	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
°C	-18	-12	-7	-1	4	10	16	21	27	32	38	43	49	54	60
R-134a	1.70	1.63	1.56	1.49	1.42	1.36	1.29	1.21	1.14	1.07	1.00	0.93	0.85	0.78	0.71
R-404A	2.04	1.94	1.84	1.74	1.64	1.54	1.43	1.33	1.22	1.11	1.00	0.89	0.77	0.65	0.53
R-407C	1.69	1.62	1.55	1.49	1.42	1.35	1.28	1.21	1.14	1.07	1.00	0.93	0.85	0.77	0.69
R-410A	1.79	1.71	1.63	1.55	1.47	1.40	1.32	1.24	1.16	1.08	1.00	0.92	0.83	0.73	0.62
R-507	1.99	1.89	1.79	1.69	1.59	1.50	1.40	1.30	1.20	1.10	1.00	0.89	0.78	0.66	0.51
R-744	1.13	1.07	1.00	0.93	0.86	–	–	–	–	–	–	–	–	–	–

R-422D Capacities in Tons (at Evaporator Temperature °F)

	Valve Type	Nominal Capacity	40°F								20°F								0°F							
			Pressure Drop Across Valve (psi)																							
			40	60	80	100	120	140	160	180	40	60	80	100	120	140	160	180	40	60	80	100	120	140	160	180
R-422D	SER-B	1.1	0.88	1.08	1.25	1.39	1.53	1.65	1.76	1.87	0.83	1.02	1.18	1.31	1.44	1.55	1.66	1.76	0.78	0.95	1.10	1.23	1.35	1.46	1.56	1.65
	SER-C	2.9	2.39	2.92	3.38	3.77	4.13	4.47	4.77	5.06	2.25	2.76	3.19	3.56	3.90	4.22	4.51	4.78	2.11	2.59	2.99	3.34	3.66	3.95	4.22	4.48
	SER-D	5.9	4.86	5.95	6.87	7.68	8.41	9.08	9.71	10.3	4.58	5.61	6.48	7.25	7.94	8.57	9.17	9.72	4.30	5.26	6.07	6.79	7.44	8.04	8.59	9.11
	SERI-G	12	9.5	11.7	13.5	15.1	16.5	17.8	19.1	20.2	8.9	11.0	12.7	14.2	15.5	16.8	18.0	19.1	8.4	10.3	11.9	13.3	14.5	15.8	16.8	17.8
	SERI-J	21	17.2	21.0	24.2	27.1	29.7	32.1	34.3	36.4	16.1	19.8	22.9	25.5	28.0	30.2	32.3	34.3	15.1	18.5	21.4	23.8	26.2	28.3	30.2	32.0
	SERI-K	38	31.1	38.1	44.0	49.2	53.8	58.2	62.2	65.9	29.3	35.9	41.4	46.3	50.7	54.8	58.6	62.1	27.4	33.5	38.7	43.3	47.4	51.3	54.7	58.1
	SERI-L	51	41.4	50.7	58.5	65.4	71.6	77.4	82.7	87.7	39.0	47.8	55.2	61.7	67.6	73.0	78.1	82.8	36.6	44.8	51.7	57.8	63.4	68.4	73.2	77.6
	SEHI-175	88	72.2	88.4	102	114	125	135	144	153	68.1	83.4	96.3	108	118	127	136	144	63.8	78.2	90.3	101	111	119	128	135
	SEHI-400	214	175	214	248	277	303	327	350	371	165	202	234	261	286	309	330	350	155	190	219	245	268	290	310	328

	Valve Type	-20°F								-40°F							
		Pressure Drop Across Valve (psi)															
		40	60	80	100	120	140	160	180	40	60	80	100	120	140	160	180
R-422D	SER-B	0.72	0.89	1.03	1.15	1.26	1.36	1.45	1.54	0.67	0.82	0.95	1.06	1.16	1.25	1.34	1.42
	SER-C	1.97	2.41	2.78	3.11	3.40	3.68	3.93	4.17	1.82	2.22	2.57	2.87	3.14	3.40	3.63	3.85
	SER-D	4.00	4.90	5.65	6.32	6.92	7.48	7.99	8.48	3.69	4.52	5.22	5.84	6.39	6.91	7.38	7.83
	SERI-G	7.81	9.51	11.0	12.3	13.5	14.6	15.5	16.5	7.11	8.83	10.1	11.3	12.4	13.4	14.3	15.2
	SERI-J	14.0	17.2	19.8	22.1	24.3	26.2	28.0	29.7	12.9	15.8	18.2	20.4	22.4	24.1	25.8	27.4
	SERI-K	25.4	31.1	35.9	40.1	43.9	47.5	50.8	53.9	23.4	28.6	33.1	37.0	40.5	43.8	46.8	49.5
	SERI-L	34	41.7	48.1	53.8	59.0	63.7	68.1	72.2	31.4	38.5	44.5	49.7	54.5	58.8	62.9	66.7
	SEHI-175	59	72.8	84.0	93.9	103	111	119	126	54.9	67.2	77.6	86.7	95.0	103	110	116
	SEHI-400	144	176	204	228	250	270	288	306	133	163	188	210	231	249	266	282

R-422D Capacities in kW (at Evaporator Temperature °C)

	Valve Type	Nominal Capacity	5°C								-10°C								-20°C							
			Pressure Drop Across Valve (bar)																							
			2.5	4	5.5	7	8.5	10	11.5	13	2.5	4	5.5	7	8.5	10	11.5	13	2.5	4	5.5	7	8.5	10	11.5	13
R-422D	SER-B	3.8	2.96	3.74	4.39	4.95	5.45	5.91	6.34	6.74	2.73	3.46	4.05	4.57	5.04	5.46	5.86	6.23	2.57	3.25	3.82	4.30	4.74	5.14	5.52	5.87
	SER-C	10	8.02	10.1	11.9	13.4	14.8	16.0	17.2	18.3	7.41	9.37	11.0	12.4	13.7	14.8	15.9	16.9	6.97	8.82	10.3	11.7	12.9	13.9	15.0	15.9
	SER-D	21	16.3	20.6	24.2	27.3	30.1	32.6	35.0	37.2	15.1	19.1	22.3	25.2	27.8	30.1	32.3	34.4	14.2	17.9	21.0	23.7	26.2	28.4	30.4	32.3
	SERI-G	41	31.9	40.7	47.5	53.6	58.9	64.0	68.7	73.0	29.4	37.4	43.7	49.3	54.3	59.0	63.5	67.3	27.9	35.0	41.1	46.3	51.1	55.6	59.5	63.3
	SERI-J	74	57.7	72.9	85.3	96.4	106	115	124	131	53.0	67.2	78.8	88.9	97.9	106	114	121	49.7	63.2	74.0	83.3	91.9	100	107	114
	SERI-K	134	104	132	155	175	192	209	224	238	96.3	122	143	161	178	193	207	219	90.6	114	134	151	167	181	194	206
	SERI-L	178	139	176	206	232	256	278	298	317	128	162	190	215	237	257	275	293	121	153	179	202	223	242	259	276
	SEHI-175	311	242	307	359	405	447	485	519	552	224	283	332	376	413	446	479	509	211	267	313	353	390	420	453	479
	SEHI-400	754	588	744	872	984	1084	1176	1261	1340	543	687	805	909	1001	1086	1165	1238	511	647	758	856	943	1023	1097	1166

	Valve Type	-30°C								-40°C							
		Pressure Drop Across Valve (bar)															
		2.5	4	5.5	7	8.5	10	11.5	13	2.5	4	5.5	7	8.5	10	11.5	13
R-422D	SER-B	2.41	3.05	3.57	4.03	4.44	4.82	5.17	5.49	2.24	2.84	3.32	3.75	4.13	4.48	4.81	5.11
	SER-C	6.53	8.26	9.69	10.9	12.0	13.1	14.0	14.9	6.08	7.69	9.01	10.2	11.2	12.2	13.0	13.9
	SER-D	13.3	16.8	19.7	22.2	24.5	26.6	28.5	30.3	12.4	15.6	18.3	20.7	22.8	24.7	26.5	28.2
	SERI-G	25.9	32.6	38.4	43.2	47.8	51.8	55.3	58.8	23.8	30.5	35.6	40.1	44.1	48.0	51.5	54.6
	SERI-J	46.6	58.9	69.0	77.9	85.8	93.0	99.9	106	43.0	54.5	64.1	72.2	79.8	86.3	92.6	98.5
	SERI-K	84.3	107	125	141	155	169	181	193	78.4	99.0	116	131	144	157	168	178
	SERI-L	113	143	168	189	209	226	243	258	105	133	156	176	194	211	226	240
	SEHI-175	197	250	293	330	364	394	424	450	184	232	273	307	339	369	395	418
	SEHI-400	479	606	710	801	883	958	1027	1092	446	564	661	746	822	891	956	1016

Liquid Temperature Correction Factors

°F	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
°C	-18	-12	-7	-1	4	10	16	21	27	32	38	43	49	54	60
R-134a	1.70	1.63	1.56	1.49	1.42	1.36	1.29	1.21	1.14	1.07	1.00	0.93	0.85	0.78	0.71
R-404A	2.04	1.94	1.84	1.74	1.64	1.54	1.43	1.33	1.22	1.11	1.00	0.89	0.77	0.65	0.53
R-407C	1.69	1.62	1.55	1.49	1.42	1.35	1.28	1.21	1.14	1.07	1.00	0.93	0.85	0.77	0.69
R-410A	1.79	1.71	1.63	1.55	1.47	1.40	1.32	1.24	1.16	1.08	1.00	0.92	0.83	0.73	0.62
R-507	1.99	1.89	1.79	1.69	1.59	1.50	1.40	1.30	1.20	1.10	1.00	0.89	0.78	0.66	0.51
R-744	1.13	1.07	1.00	0.93	0.86	–	–	–	–	–	–	–	–	–	–

R-507A Capacities in Tons (at Evaporator Temperature °F)

	Valve Type	Nominal Capacity	40°F								20°F								0°F							
			Pressure Drop Across Valve (psi)																							
			75	100	125	150	175	200	225	250	75	100	125	150	175	200	225	250	75	100	125	150	175	200	225	250
R-507A	SER-B	1.3	1.16	1.34	1.49	1.64	1.77	1.89	2.00	2.11	1.10	1.27	1.42	1.55	1.68	1.79	1.90	2.01	1.03	1.19	1.34	1.46	1.58	1.69	1.79	1.89
	SER-C	3.6	3.14	3.62	4.05	4.44	4.79	5.12	5.44	5.73	2.98	3.44	3.84	4.21	4.55	4.86	5.16	5.44	2.81	3.24	3.62	3.97	4.29	4.58	4.86	5.12
	SER-D	7.4	6.38	7.37	8.24	9.03	9.75	10.4	11.1	11.7	6.06	6.99	7.82	8.57	9.25	9.89	10.5	11.1	5.71	6.59	7.37	8.07	8.72	9.32	9.89	10.4
	SERI-G	15	12.7	14.6	16.3	17.9	19.4	20.7	21.9	23.1	12.0	13.9	15.5	17.0	18.4	19.6	20.8	21.9	11.3	13.0	14.6	16.0	17.3	18.4	19.6	20.7
	SERI-J	26	22.8	26.4	29.4	32.2	34.9	37.2	39.4	41.7	21.6	24.9	27.9	30.5	33.0	35.3	37.4	39.4	20.3	23.5	26.3	28.7	31.0	33.2	35.2	37.1
	SERI-K	48	41.3	47.7	53.4	58.4	63.2	67.5	71.6	75.5	39.1	45.2	50.6	55.3	59.8	63.9	67.8	71.5	36.9	42.6	47.6	52.1	56.3	60.2	63.8	67.3
	SERI-L	63	54.4	62.8	70.2	76.9	83.0	88.8	94.2	99.3	51.6	59.6	66.6	73.0	78.8	84.3	89.4	94.2	48.6	56.1	62.8	68.7	74.2	79.4	84.2	88.7
	SEHI-175	113	98.1	113	127	139	150	160	170	179	93.0	107	120	131	142	152	161	170	87.5	101	113	124	134	143	152	160
	SEHI-400	266	230	266	297	325	352	376	399	420	218	252	282	309	334	357	378	399	206	238	266	291	314	336	356	376

	Valve Type	-20°F								-40°F							
		Pressure Drop Across Valve (psi)															
		75	100	125	150	175	200	225	250	75	100	125	150	175	200	225	250
R-507A	SER-B	0.97	1.12	1.25	1.37	1.48	1.58	1.68	1.77	0.90	1.04	1.16	1.27	1.37	1.47	1.56	1.64
	SER-C	2.62	3.03	3.39	3.71	4.01	4.28	4.54	4.79	2.43	2.81	3.14	3.44	3.72	3.98	4.22	4.45
	SER-D	5.34	6.16	6.89	7.55	8.15	8.71	9.24	9.74	4.95	5.72	6.39	7.00	7.56	8.09	8.58	9.04
	SERI-G	10.5	12.2	13.7	15.0	16.2	17.3	18.3	19.3	9.90	11.4	12.7	13.9	15.0	16.1	17.0	17.9
	SERI-J	19.0	21.9	24.6	26.9	29.1	31.1	33.0	34.8	17.7	20.4	22.9	25.0	27.0	28.9	30.6	32.3
	SERI-K	34.5	39.9	44.5	48.8	52.7	56.4	59.8	63.0	32.0	37.1	41.4	45.4	49.0	52.4	55.5	58.6
	SERI-L	45.4	52.5	58.7	64.3	69.4	74.2	78.7	83.0	42.2	48.7	54.5	59.6	64.4	68.9	73.1	77.0
	SEHI-175	81.9	94.6	106	116	125	134	142	150	76.2	87.9	98.3	108	116	124	132	139
	SEHI-400	192	222	248	272	294	314	333	351	179	206	230	252	273	292	309	326

R-507A Capacities in kW (at Evaporator Temperature °C)

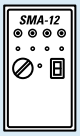
	Valve Type	Nominal Capacity	5°C								-10°C								-20°C							
			Pressure Drop Across Valve (bar)																							
			4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18
R-507A	SER-B	4.7	3.59	4.40	5.08	5.67	6.22	6.71	7.18	7.61	3.34	4.09	4.72	5.28	5.78	6.25	6.68	7.08	3.16	3.87	4.47	5.00	5.47	5.91	6.32	6.70
	SER-C	13	9.73	11.9	13.8	15.4	16.9	18.2	19.5	20.6	9.06	11.1	12.8	14.3	15.7	16.9	18.1	19.2	8.57	10.5	12.1	13.5	14.8	16.0	17.1	18.2
	SER-D	26	19.8	24.2	28.0	31.3	34.3	37.0	39.6	42.0	18.4	22.6	26.0	29.1	31.9	34.5	36.8	39.1	17.4	21.3	24.6	27.6	30.2	32.6	34.9	37.0
	SERI-G	51	39.1	47.9	55.3	61.9	67.7	73.2	78.3	83.0	36.3	44.5	51.3	57.5	62.9	68.0	72.7	77.1	34.3	42.1	48.6	54.3	59.5	64.3	68.7	72.9
	SERI-J	93	70.4	85.9	99.5	111	122	132	141	150	65.4	80.1	92.7	104	113	122	131	139	61.8	75.7	87.6	97.8	107	116	123	131
	SERI-K	168	128	156	180	201	221	239	255	271	118	145	167	187	205	222	237	252	112	138	158	178	194	210	224	238
	SERI-L	221	169	206	238	267	292	315	337	358	157	192	222	248	272	293	314	333	148	182	210	235	257	278	297	315
	SEHI-175	397	303	371	429	479	525	567	606	643	281	345	398	445	487	526	563	597	266	326	376	421	461	498	532	565
	SEHI-400	935	713	874	1009	1128	1236	1335	1427	1514	664	813	939	1050	1150	1242	1328	1408	628	769	888	993	1088	1175	1256	1333

	Valve Type	-30°C								-40°C							
		Pressure Drop Across Valve (bar)															
		4	6	8	10	12	14	16	18	4	6	8	10	12	14	16	18
R-507A	SER-B	2.97	3.64	4.20	4.70	5.15	5.56	5.94	6.30	2.78	3.40	3.93	4.39	4.81	5.20	5.56	5.89
	SER-C	8.06	9.87	11.4	12.7	14.0	15.1	16.1	17.1	7.53	9.22	10.7	11.9	13.0	14.1	15.1	16.0
	SER-D	16.4	20.1	23.2	25.9	28.4	30.7	32.8	34.8	15.3	18.8	21.7	24.2	26.5	28.7	30.6	32.5
	SERI-G	32.3	39.6	45.7	51.2	56.0	60.5	64.7	68.6	30.3	37.1	42.8	47.9	52.4	56.6	60.5	64.2
	SERI-J	58.1	71.2	82.3	91.8	101	109	116	123	54.5	66.7	77.0	85.9	94.4	102	109	116
	SERI-K	105	129	150	167	183	197	211	224	99.0	121	139	156	171	184	197	209
	SERI-L	140	171	197	221	242	261	279	296	130	160	185	206	226	244	261	277
	SEHI-175	251	307	354	396	434	469	501	531	234	287	332	371	406	439	469	497
	SEHI-400	591	724	836	934	1023	1105	1182	1253	552	676	781	873	956	1033	1104	1171

Liquid Temperature Correction Factors

°F	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
°C	-18	-12	-7	-1	4	10	16	21	27	32	38	43	49	54	60
R-134a	1.70	1.63	1.56	1.49	1.42	1.36	1.29	1.21	1.14	1.07	1.00	0.93	0.85	0.78	0.71
R-404A	2.04	1.94	1.84	1.74	1.64	1.54	1.43	1.33	1.22	1.11	1.00	0.89	0.77	0.65	0.53
R-407C	1.69	1.62	1.55	1.49	1.42	1.35	1.28	1.21	1.14	1.07	1.00	0.93	0.85	0.77	0.69
R-410A	1.79	1.71	1.63	1.55	1.47	1.40	1.32	1.24	1.16	1.08	1.00	0.92	0.83	0.73	0.62
R-507	1.99	1.89	1.79	1.69	1.59	1.50	1.40	1.30	1.20	1.10	1.00	0.89	0.78	0.66	0.51
R-744	1.13	1.07	1.00	0.93	0.86	–	–	–	–	–	–	–	–	–	–

Components and Accessories:

Product	Description	Item Number
Kelvin II 	Superheat Controller without Local Display	952560
	Superheat Controller with Display	952561
	Remote Display Only	952562
IB2Q IB6Q 	Interface Board (2500 steps) Interface Board (6386 steps)	983189 952960
Temperature Sensor	External Sensing Bulb	952662
Temperature Well Sensor Kit 	Internal Sensing Element	952795
Pressure Transducer 	150 psig with Cable	953091
	150 psia with Cable	952995
	300 psig with Cable (R-410A applications only)	952740
	500 psig with Cable (R-744 subcritical applications only)	952504
SMA-12 	Test Instrument	953276

⚠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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Strong Points Sporlan Turbocor EXV Controller

Service Supplement

Introduction

This is a supplement to the following Sporlan document

Turbocor Controller User's Manual

This document supplement the manuals dated 12/17/2008, and the manual dated 02/27/2009.

Expansion Valve Controls

Every expansion circuit should have its own metering device (Expansion Valve). Even if the heat exchanger sections are the same size, the fluid (Air or Water) flow over the heat exchanger will be different.

For the same reason, every valve should have individual control

Turbocor Expansion Valve Control

Some expansion valve controllers do not work correctly with a Turbocor compressor. The compressor ramps up slowly,

There have been instances where the compressor is waiting for the expansion valve to open before ramping up, while at the same time the expansion valve controller is waiting for the compressor tor ramp up before opening the expansion valve

Sporlan created a special "Turbocor Controller" to control electronic expansion valves used with Turbocor compressors.

About this Service Supplement

The User's Manual mentioned above was created while the product was under development.

This document provides supplemental information until the next official document is created.

Parts

At this time, parts are available through Refrigeration Supplies Distributor (www.rsd.net).

You should order the following three parts to control one expansion valve

SPO EXV BOARD

SPO EXV PRES TRANSDUCER (Pressure)
SPO EXV SENSOR AND WELL (Temperature)

To find these parts easily, type “Turbocor” in the search box.

If you are controlling multiple EXV’s on the same refrigerant circuit you can save money by installing one pressure sensor at a common location and having it send a signal to one board.

You then connect communications wires between all boards. You configure the one board to transmit the pressure, and the other board to receive the pressure

Installation

Install the temperature sensor and pressure sensor at the same location you would install the TXV Sensing Bulb and External Equalizer line.

Configuration – Step 17 (Valve Type)

The display does not show a decimal, so you must interpret what is says (16K, 25K, 32K, 64K) with what it means (1.6K, 2.5K, 3.2K, 6.4K). Here is a summary:

DSP	STEPS	VALVES
ESX		Sporlan ESX Valve
16K	1,596	SER 1.5, 6, 11, 20
25K		SEI/SER G, J, K
32K	3,193	SEI 30
64K	6,386	SEI/SEH 50, 100, 175, Y1231
050	2.625	Danfoss 25, 50-ton EXV
100	3,530	Danfoss 100-ton EXV
250	3,810	Danfoss 250-ton EXV
400	3,810	Danfoss 400-ton EXV

Operation

The valve is enabled when the dry, non-voltage contacts on an external relay connected to terminals DIG IN close.

The valve is disabled when these contacts open.

They contacts should not close until after the Turbocor RUN contacts have closed to energize the external relay.

EXV Wiring

The Danfoss and Sporlan electronic expansion valves can be controlled by the same controller

For both valves the wire colors are Black, White, Green, Red.

For most Sporlan controllers, the Danfoss valves can be connected is one pair of wires (Either Black-White, or Red-Green) has its color swapped from the Sporlan colors.

However, I think for this controller, the color swap is not necessary. The signal is swapped when Danfoss valves are selected in the configuration.

Note:

This document is still a draft. I have not yet had time to test all these features myself

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