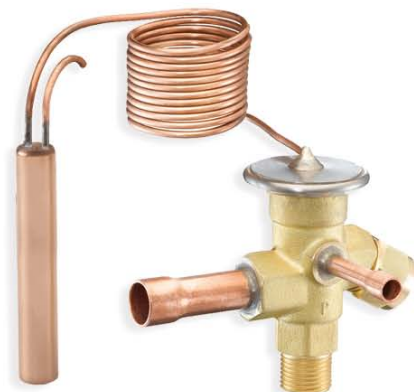


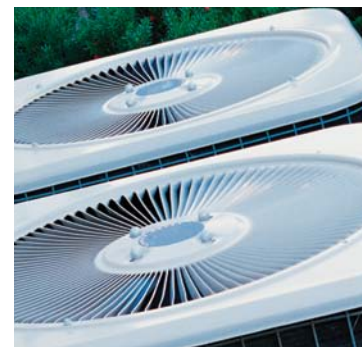


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J8 Thermostatic Expansion Valve

Products & Custom Solutions
 Bulletin 10-10-7, March 2012



ENGINEERING **YOUR** SUCCESS.

The J8 Thermostatic Expansion Valve

Introduction

The J8 Thermostatic Expansion Valves are designed to regulate refrigerant flow into evaporators as a response to sensed superheat value. They can be used in a wide range of AC and refrigeration applications

Features

- Adjustable superheat
- 8 Replaceable orifice assemblies
- Temperature range from -40°C to +15°C
- Thermostatic charges with or without MOP (Maximum Operating Pressure)
- Solder ODF (with inlet connector) or Flare SAE fittings
- Stainless steel thermostatic element
- Copper sensing bulb
- EC compliant (PED & RoHS Compliant)

Technical Specifications

- Maximum bulb temperature: 100°C
- Maximum valve body temperature: 121°C
- Short-lived peak: 149°C
- Maximum working pressure MWP: 34 bar
- Maximum test pressure: 38 bar

J8 valves are supplied as three individual component parts that need to be ordered separately:

- Valve body & Thermostatic element assembly
- Cartridge & Filter assembly
- Inlet ODF adaptor (not mandatory)

Please refer to further sections for selection/ordering information.

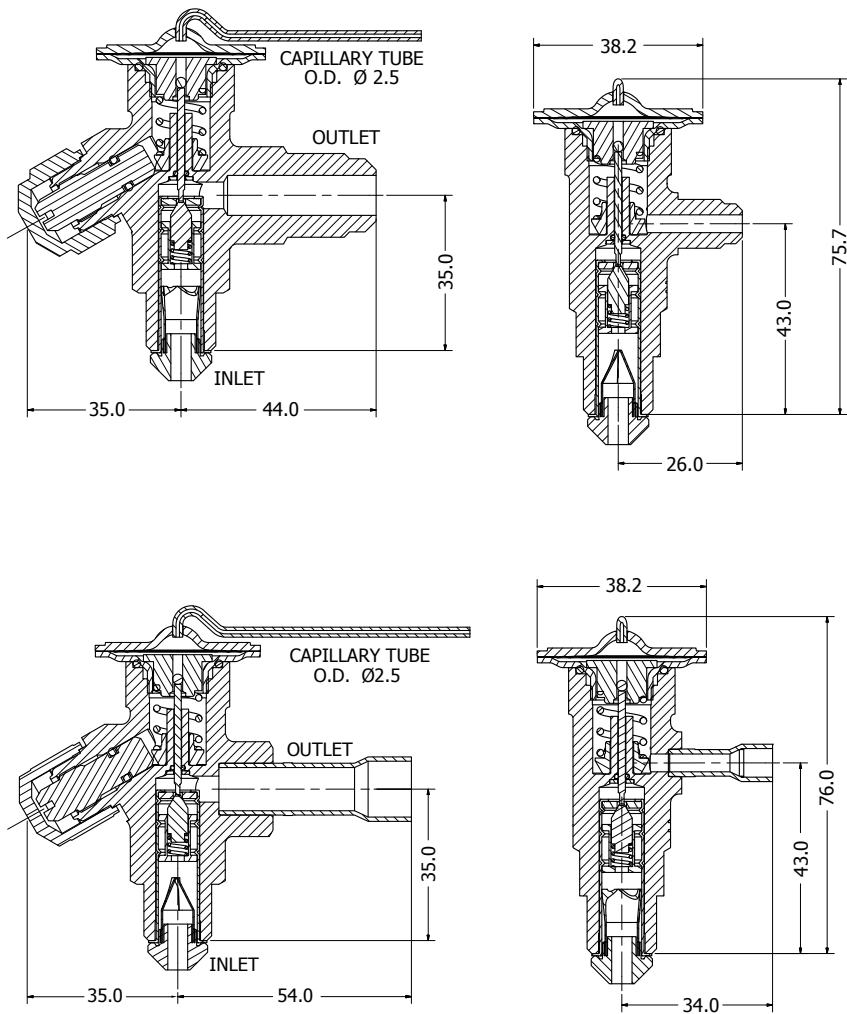
⚠WARNING – USER RESPONSIBILITY

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

- This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.
- The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.
- To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

For safety information see the Safety Guide at www.parker.com/safety or call 1-800-CParker.

J8 Assembly



All dimensions in millimeters (mm).

Valve Nomenclature / Ordering Instructions
EXAMPLE

J8	E	F	N	W
Valve Type	"E" specifies external equalizer. Omission of letter "E" indicates valve with internal equalizer. e.g. J8F-NW	Connection Type: (Inlet always supplied as 3/8" Flare, SAE) F = Flare, SAE M = Metric, ODF S = Standard, ODF (US Customary Units)	Sporlan Code – Refrigerant Element Label Color Code: J = R134a Blue R401A Pink S = R404A Orange R402A Sand R402B Olive R502 Purple R507 Teal N = R407C Lt. Brown	Thermostatic Charge

Valve Body & Thermostatic Element Assembly

Refrigerant	Connections			Capillary Tube Length cm	Evaporator Temperature Range °C	MOP bar / °C	Valve Type	Item Number
	Inlet	Outlet	Equalizer					
R407C	3/8" SAE	1/2" SAE	1/4" SAE	150	-40°C to +15°C	— 6.9 bar / +17°C	J8EF-NW J8EF-NX100	600002-000 600003-000
			Internally Equalized	150	-40°C to +15°C	— 6.9 bar / +17°C	J8F-NW J8F-NX100	600023-000 600024-000
		12mm ODF	6mm ODF	150	-40°C to +15°C	— 6.9 bar / +17°C	J8EM-NW J8EM-NX100	600009-000 600010-000
			Internally Equalized	150	-40°C to +15°C	— 6.9 bar / +17°C	J8M-NW J8M-NX100	600030-000 600031-000
		1/2" ODF	1/4" ODF	150	-40°C to +15°C	— 6.9 bar / +17°C	J8ES-NW J8ES-NX100	600016-000 600017-000
			Internally Equalized	150	-40°C to +15°C	— 6.9 bar / +17°C	J8S-NW J8S-NX100	600037-000 600038-000
R134a R401A	3/8" SAE	1/2" SAE	1/4" SAE	150	-40°C to +15°C	— 4.1 bar / +17°C	J8EF-JW J8EF-JX60	600000-000 600001-000
			Internally Equalized	150	-40°C to +15°C	— 4.1 bar / +17°C	J8F-JW J8F-JX60	600021-000 600022-000
		12mm ODF	6mm ODF	150	-40°C to +15°C	— 4.1 bar / +17°C	J8EM-JW J8EM-JX60	600007-000 600008-000
			Internally Equalized	150	-40°C to +15°C	— 4.1 bar / +17°C	J8M-JW J8M-JX60	600028-000 600029-000
		1/2" ODF	1/4" ODF	150	-40°C to +15°C	— 4.1 bar / +17°C	J8ES-JW J8ES-JX60	600014-000 600015-000
			Internally Equalized	150	-40°C to +15°C	— 4.1 bar / +17°C	J8S-JW J8S-JX60	600035-000 600036-000
R404A R402A R402B R502 R507	3/8" SAE	1/2" SAE	1/4" SAE	150	-40°C to +10°C	— 7.6 bar / +12°C	J8EF-SW J8EF-SX110	600004-000 600005-000
					-40°C to -18°C	2.4 bar / -17°C	J8EF-SX35	600006-000
			Internally Equalized	150	-40°C to +10°C	— 7.6 bar / +12°C	J8F-SW J8F-SX110	600025-000 600026-000
					-40°C to -18°C	2.4 bar / -17°C	J8F-SX35	600027-000
		12mm ODF	6mm ODF	150	-40°C to +10°C	— 7.6 bar / +12°C	J8EM-SW J8EM-SX110	600011-000 600012-000
					-40°C to -18°C	2.4 bar / -17°C	J8EM-SX35	600013-000
			Internally Equalized	150	-40°C to +10°C	— 7.6 bar / +12°C	J8M-SW J8M-SX110	600032-000 600033-000
					-40°C to -18°C	2.4 bar / -17°C	J8M-SX35	600034-000
		1/2" ODF	1/4" ODF	150	-40°C to +10°C	— 7.6 bar / +12°C	J8ES-SW J8ES-SX110	600018-000 600019-000
					-40°C to -18°C	2.4 bar / -17°C	J8ES-SX35	600020-000
			Internally Equalized	150	-40°C to +10°C	— 7.6 bar / +12°C	J8S-SW J8S-SX110	600039-000 600040-000
					-40°C to -18°C	2.4 bar / -17°C	J8S-SX35	600041-000

J8 Cartridge & Filter Assembly

Cartridge and Filter Assembly
Rated Capacities, kW¹

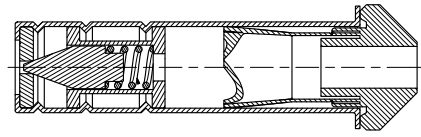
Item Number	Cartridge Type	Rated Capacities, kW ¹			
		R407C	R134a	R404A	R22
506032	C-0X	0.55	0.44	0.42	0.55
506033	C-00	1.2	1.0	0.77	1.1
506034	C-01	2.4	1.6	1.4	2.3
506035	C-02	3.8	2.6	2.1	3.5
506036	C-03	5.2	4.3	3.9	4.9
506037	C-04	9.0	7.0	6.3	8.4
506038	C-05	11.3	8.6	7.7	10.5
506039	C-06	15.0	9.5	8.2	14.0

¹ The rated capacity is based on the following conditions:

Evaporating temperature, $T_e = +5^\circ\text{C}$

Condensing temperature, $T_c = +32^\circ\text{C}$

Refrigerant temperature ahead of valve, $T_1 = +28^\circ\text{C}$



- The cartridge orifice is stamped with the orifice size, ex. C-0X



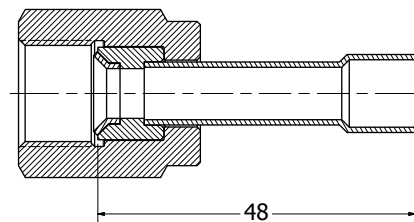
- A metallic tag is provided with each individual cartridge and should be fixed on the cap tube as the orifice is installed in the valve body.

Inlet ODF Adaptor

All J8 Thermostatic Expansion Valves feature 3/8" SAE inlet fitting. Solder inlet adaptors are available from Parker/Sporlan distributors.

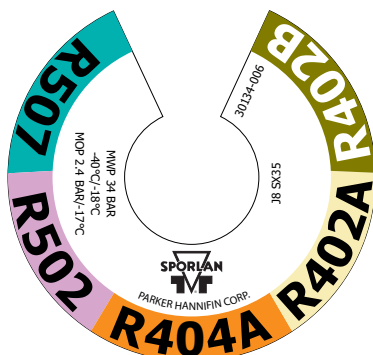
Solder inlet adaptors allow the installation of the J8 TEV and easy access of cartridge orifice & filter assembly. Parker/Sporlan Solder Inlet Adaptors have been designed to be used with flare orifice filter.

Item	Description
A-6M	Solder Inlet Adaptor 3/8" SAE to 6mm ODF
A-10M	Solder Inlet Adaptor 3/8" SAE to 10mm ODF
A-2	Solder Inlet Adaptor 3/8" SAE to 1/4" ODF
A-3	Solder Inlet Adaptor 3/8" SAE to 3/8" ODF



All dimensions in millimeters (mm).

Identification



The main information about the valve is provided on the element label:

- Element J8 SX35
- Refrigerant
- Maximum Working Pressure (MWP) = 34 bar
- Evaporating temperature range in $^\circ\text{C} = -40^\circ\text{C}/-18^\circ\text{C}$
- Maximum Operating Pressure (MOP) point in bar & $^\circ\text{C} = \text{MOP } 2.4 \text{ bar}/-17^\circ\text{C}$

Selection Tables

R407C (kW)

Orifice Number	Pressure Drop Across the Valve (bar)							
	2	4	6	8	10	12	14	16
Evaporating Temperature +10°C								
C-0X	0.44	0.55	0.62	0.67	0.69	0.70	0.69	0.70
C-00	1.0	1.2	1.3	1.4	1.5	1.5	1.5	1.5
C-01	2.1	2.6	3.0	3.1	3.2	3.2	3.3	3.2
C-02	3.1	4.1	4.8	5.2	5.4	5.5	5.6	5.6
C-03	5.2	6.9	8.0	8.6	9.1	9.2	9.3	9.3
C-04	8.8	11.6	13.4	14.6	15.2	15.4	15.6	15.6
C-05	10.6	14.0	16.0	17.4	18.3	18.5	18.7	18.7
C-06	11.8	15.5	17.7	19.1	20.1	20.3	20.5	20.5

Orifice Number	Pressure Drop Across the Valve (bar)							
	2	4	6	8	10	12	14	16
Evaporating Temperature 0°C								
C-0X	0.44	0.55	0.62	0.66	0.69	0.70	0.70	0.69
C-00	0.96	1.1	1.3	1.4	1.4	1.5	1.5	1.4
C-01	1.8	2.3	2.5	2.7	2.8	2.8	2.9	2.9
C-02	2.7	3.5	4.1	4.3	4.6	4.7	4.8	4.8
C-03	4.5	5.9	6.7	7.4	7.7	7.8	7.9	7.9
C-04	7.5	9.9	11.2	12.2	12.8	13.0	13.2	13.3
C-05	9.2	11.9	13.6	14.7	15.5	15.8	15.9	15.9
C-06	10.1	13.1	14.9	16.2	17.0	17.3	17.5	17.5

Orifice Number	Pressure Drop Across the Valve (bar)							
	2	4	6	8	10	12	14	16
Evaporating Temperature -10°C								
C-0X	0.42	0.53	0.59	0.63	0.66	0.68	0.68	0.67
C-00	0.90	1.1	1.2	1.3	1.3	1.4	1.4	1.3
C-01	1.5	1.8	2.1	2.3	2.3	2.3	2.4	2.4
C-02	2.3	3.0	3.3	3.6	3.8	3.9	4.0	3.9
C-03	3.8	4.9	5.6	6.0	6.4	6.6	6.7	6.5
C-04	6.3	8.2	9.2	10.0	10.6	10.8	11.0	10.9
C-05	7.7	9.8	11.1	12.0	12.8	13.0	13.2	13.1
C-06	8.6	10.8	12.2	13.2	14.0	14.3	14.5	14.4

Orifice Number	Pressure Drop Across the Valve (bar)							
	2	4	6	8	10	12	14	16
Evaporating Temperature -20°C								
C-0X	—	0.50	0.56	0.59	0.62	0.63	0.65	0.63
C-00	—	1.0	1.1	1.2	1.2	1.3	1.3	1.2
C-01	—	1.5	1.7	1.8	2.0	2.0	2.0	2.0
C-02	—	2.4	2.7	2.9	3.1	3.1	3.2	3.1
C-03	—	4.0	4.5	4.9	5.1	5.2	5.3	5.2
C-04	—	6.6	7.5	8.1	8.5	8.6	8.8	8.7
C-05	—	8.1	9.1	9.8	10.2	10.5	10.6	10.5
C-06	—	8.8	10.0	10.7	11.3	11.4	11.7	11.6

Orifice Number	Pressure Drop Across the Valve (bar)							
	2	4	6	8	10	12	14	16
Evaporating Temperature -30°C								
C-0X	—	0.45	0.50	0.54	0.56	0.58	0.58	0.58
C-00	—	0.89	1.0	1.1	1.1	1.2	1.1	1.1
C-01	—	1.3	1.4	1.5	1.6	1.5	1.6	1.6
C-02	—	1.9	2.2	2.7	2.5	2.5	2.5	2.5
C-03	—	3.3	3.7	3.9	4.0	4.1	4.2	4.2
C-04	—	5.3	6.1	6.4	6.7	6.8	7.0	6.9
C-05	—	6.5	7.3	7.7	8.1	8.3	8.4	8.4
C-06	—	7.2	8.0	8.6	8.9	9.1	9.3	9.2

Orifice Number	Pressure Drop Across the Valve (bar)							
	2	4	6	8	10	12	14	16
Evaporating Temperature -40°C								
C-0X	—	—	0.46	0.48	0.51	0.53	0.53	0.54
C-00	—	—	0.88	0.92	1.0	1.0	1.0	1.0
C-01	—	—	1.2	1.3	1.2	1.3	1.3	1.4
C-02	—	—	1.7	1.9	1.9	1.9	2.0	1.9
C-03	—	—	2.9	3.1	3.2	3.3	3.3	3.3
C-04	—	—	4.8	5.0	5.2	5.3	5.4	5.4
C-05	—	—	5.8	6.2	6.3	6.6	6.6	6.6
C-06	—	—	6.4	6.8	7.0	7.2	7.3	7.3

Correction Factor, (CF) Liquid Temperature

TEV corrected capacity = Required Evaporator Capacity / Correction Factor, (CF), for Subcooling.

Subcooling	4K	10K	15K	20K	25K	30K	35K	40K	45K	50K
Correction Factor	1.00	1.08	1.14	1.21	1.27	1.33	1.39	1.45	1.51	1.57

Selection Tables

R134a/R401A (kW)

Orifice Number	Pressure Drop Across the Valve (bar)				
	2	4	6	8	10
Evaporating Temperature +10°C					
C-0X	0.37	0.47	0.52	0.55	0.56
C-00	0.78	0.95	1.0	1.1	1.1
C-01	1.4	1.7	1.9	2.0	2.0
C-02	2.0	2.6	3.0	3.1	3.2
C-03	3.4	4.4	5.0	5.2	5.4
C-04	5.7	7.3	8.2	8.7	9.0
C-05	6.9	8.9	9.9	10.8	10.9
C-06	7.6	9.7	10.9	11.5	11.9

Orifice Number	Pressure Drop Across the Valve (bar)				
	2	4	6	8	10
Evaporating Temperature 0°C					
C-0X	0.36	0.46	0.51	0.52	0.54
C-00	0.72	0.86	0.95	1.0	1.0
C-01	1.2	1.4	1.5	1.6	1.6
C-02	1.7	2.2	2.4	2.6	2.6
C-03	2.8	3.7	4.1	4.3	4.4
C-04	4.7	6.0	6.7	7.1	7.3
C-05	5.7	7.3	8.1	8.6	8.8
C-06	6.3	8.0	9.0	9.5	9.7

Orifice Number	Pressure Drop Across the Valve (bar)				
	2	4	6	8	10
Evaporating Temperature -10°C					
C-0X	0.33	0.42	0.47	0.48	0.48
C-00	0.65	0.77	0.85	0.89	0.90
C-01	0.90	1.2	1.3	1.4	1.4
C-02	1.4	1.8	2.0	2.1	2.1
C-03	2.3	2.9	3.3	3.5	3.6
C-04	3.8	4.8	5.3	5.7	5.9
C-05	4.6	5.8	6.5	6.9	7.1
C-06	5.1	6.4	7.2	7.6	7.7

Orifice Number	Pressure Drop Across the Valve (bar)				
	2	4	6	8	10
Evaporating Temperature -20°C					
C-0X	0.31	0.39	0.43	0.45	0.46
C-00	0.58	0.68	0.76	0.79	0.80
C-01	0.73	0.90	1.0	1.1	1.1
C-02	1.1	1.4	1.5	1.6	1.7
C-03	1.9	2.3	2.6	2.7	2.8
C-04	3.0	3.8	4.2	4.5	4.6
C-05	3.7	4.6	5.1	5.4	5.5
C-06	4.1	5.0	5.6	5.9	6.1

Orifice Number	Pressure Drop Across the Valve (bar)				
	2	4	6	8	10
Evaporating Temperature -30°C					
C-0X	0.28	0.35	0.39	0.41	0.42
C-00	0.53	0.61	0.67	0.70	0.70
C-01	0.59	0.72	0.79	0.84	0.86
C-02	0.90	1.1	1.2	1.3	1.3
C-03	1.5	1.9	2.1	2.2	2.2
C-04	2.4	3.0	3.4	3.5	3.6
C-05	3.0	3.6	4.0	4.2	4.3
C-06	3.2	4.0	4.4	4.7	4.8

Orifice Number	Pressure Drop Across the Valve (bar)				
	2	4	6	8	10
Evaporating Temperature -40°C					
C-0X	0.25	0.31	0.35	0.36	0.37
C-00	0.48	0.55	0.59	0.62	0.63
C-01	0.49	0.59	0.65	0.68	0.69
C-02	0.74	0.89	1.0	1.0	1.0
C-03	1.2	1.5	1.7	1.8	1.8
C-04	2.0	2.4	2.7	2.8	2.8
C-05	2.4	2.9	3.2	3.5	3.5
C-06	2.7	3.2	3.6	3.8	3.9

Correction Factor, (CF) Liquid Temperature

TEV corrected capacity = Required Evaporator Capacity / Correction Factor, (CF), for Subcooling.

Subcooling	4K	10K	15K	20K	25K	30K	35K	40K	45K	50K
Correction Factor	1.00	1.08	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.54

Selection Tables

R404A/R507 (kW)

Orifice Number	Pressure Drop Across the Valve (bar)							
	2	4	6	8	10	12	14	16
Evaporating temperature +10°C								
C-0X	0.31	0.39	0.44	0.46	0.47	0.47	0.46	0.45
C-00	0.74	0.90	1.0	1.0	1.1	1.1	1.0	1.0
C-01	1.5	1.9	2.1	2.2	2.3	2.3	2.2	2.1
C-02	2.3	3.0	3.4	3.6	3.7	3.7	3.7	3.6
C-03	3.9	5.1	5.6	6.0	6.2	6.3	6.2	6.0
C-04	6.5	8.5	9.5	10.2	10.5	10.5	10.3	10.1
C-05	7.9	10.2	11.4	12.2	12.5	12.6	12.3	12.0
C-06	8.7	11.3	12.6	13.4	13.8	13.8	13.6	13.2

Orifice Number	Pressure Drop Across the Valve (bar)							
	2	4	6	8	10	12	14	16
Evaporating temperature 0°C								
C-0X	0.33	0.41	0.45	0.46	0.47	0.47	0.47	0.45
C-00	0.75	0.88	1.0	1.0	1.0	1.0	1.0	1.0
C-01	1.4	1.7	1.8	1.9	2.0	2.0	2.0	1.9
C-02	2.1	2.6	3.0	3.1	3.2	3.3	3.2	3.1
C-03	3.5	4.4	5.0	5.2	5.4	5.4	5.3	5.2
C-04	5.8	7.4	8.3	8.7	9.0	9.0	8.9	8.7
C-05	7.0	8.9	10.0	10.5	10.8	10.9	10.8	10.4
C-06	7.7	9.8	11.0	11.6	11.9	12.0	11.8	11.4

Orifice Number	Pressure Drop Across the Valve (bar)							
	2	4	6	8	10	12	14	16
Evaporating temperature +10°C								
C-0X	0.33	0.41	0.44	0.46	0.46	0.46	0.45	0.45
C-00	0.72	0.84	0.90	0.92	1.0	1.0	0.94	0.91
C-01	1.2	1.4	1.5	1.6	1.6	1.7	1.6	1.6
C-02	1.8	2.2	2.5	2.6	2.7	2.7	2.7	2.6
C-03	2.9	3.7	4.2	4.4	4.5	4.5	4.5	4.4
C-04	4.9	6.3	6.9	7.3	7.4	7.5	7.4	7.2
C-05	5.9	7.6	8.4	8.8	9.0	9.1	9.0	8.7
C-06	6.6	8.4	9.3	9.7	9.9	10.0	9.9	9.6

Orifice Number	Pressure Drop Across the Valve (bar)							
	2	4	6	8	10	12	14	16
Evaporating Temperature -20°C								
C-0X	—	0.39	0.42	0.44	0.43	0.44	0.43	0.42
C-00	—	0.77	0.83	0.85	0.87	0.87	0.87	0.84
C-01	—	1.2	1.4	1.4	1.4	1.4	1.4	1.4
C-02	—	1.9	2.0	2.1	2.2	2.2	2.2	2.1
C-03	—	3.1	3.5	3.6	3.7	3.7	3.7	3.6
C-04	—	5.1	5.7	5.9	6.1	6.1	6.0	5.9
C-05	—	6.2	6.9	7.2	7.3	7.3	7.2	7.1
C-06	—	6.8	7.6	7.9	8.0	8.0	7.9	7.7

Orifice Number	Pressure Drop Across the Valve (bar)							
	2	4	6	8	10	12	14	16
Evaporating Temperature -30°C								
C-0X	—	—	0.39	0.41	0.40	0.41	0.40	0.39
C-00	—	—	0.74	0.77	0.77	0.77	0.76	0.74
C-01	—	—	1.1	1.1	1.1	1.1	1.1	1.1
C-02	—	—	1.6	1.7	1.7	1.7	1.7	1.6
C-03	—	—	2.7	2.8	2.9	2.9	2.8	2.7
C-04	—	—	4.5	4.7	4.7	4.7	4.7	4.6
C-05	—	—	5.5	5.7	5.7	5.7	5.7	5.5
C-06	—	—	6.0	6.2	6.3	6.3	6.2	6.1

Orifice Number	Pressure Drop Across the Valve (bar)							
	2	4	6	8	10	12	14	16
Evaporating Temperature -40°C								
C-0X	—	—	0.35	0.36	0.36	0.36	0.35	0.35
C-00	—	—	0.66	0.67	0.68	0.67	0.66	0.65
C-01	—	—	0.83	0.86	0.87	0.86	0.85	0.82
C-02	—	—	1.3	1.3	1.3	1.3	1.3	1.2
C-03	—	—	2.2	2.2	2.2	2.2	2.2	2.1
C-04	—	—	3.5	3.7	3.7	3.7	3.6	3.5
C-05	—	—	4.3	4.4	4.5	4.4	4.4	4.2
C-06	—	—	4.7	4.9	5.0	4.9	4.8	4.7

Correction Factor, (CF) Liquid Temperature

TEV corrected capacity = Required Evaporator Capacity / Correction Factor, (CF), for Subcooling.

Subcooling	4K	10K	15K	20K	25K	30K	35K	40K	45K	50K
Correction Factor	1.00	1.10	1.20	1.29	1.37	1.46	1.54	1.63	1.70	1.78

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5. **Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 60 days after delivery or, in the case of an alleged breach of warranty, within 30 days after the date within the warranty period on which the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for any amount due to Seller from Buyer) must be commenced within thirteen months from the date of tender of delivery by Seller or, for a cause of action based upon an alleged breach of warranty, within thirteen months from the date within the warranty period on which the defect is or should have been discovered by Buyer.
6. **LIMITATION OF LIABILITY.** UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. **IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT,**

TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.

7. **Contingencies.** Seller shall not be liable for any default or delay in performance if caused by circumstances beyond the reasonable control of Seller.
8. **User Responsibility.** The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.
9. **Loss to Buyer's Property.** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.
10. **Special Tooling.** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.
11. **Buyer's Obligation; Rights of Seller.** To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest. Seller shall have a security interest in, and lien upon, any property of Buyer in Seller's possession as security for the payment of any amounts owed to Seller by Buyer.
12. **Improper use and Indemnity.** Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.
13. **Cancellations and Changes.** Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.
14. **Limitation on Assignment.** Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.
15. **Entire Agreement.** This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of the agreement. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.
16. **Waiver and Severability.** Failure to enforce any

provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

17. **Termination.** This agreement may be terminated by Seller for any reason and at any time by giving Buyer thirty (30) days written notice of termination. In addition, Seller may by written notice immediately terminate this agreement for the following: (a) Buyer commits a breach of any provision of this agreement (b) the appointment of a trustee, receiver or custodian for all or any part of Buyer's property (c) the filing of a petition for relief in bankruptcy of the other Party on its own behalf, or by a third party (d) an assignment for the benefit of creditors, or (e) the dissolution or liquidation of the Buyer.

18. **Governing Law.** This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement. Disputes between the parties shall not be settled by arbitration unless, after a dispute has arisen, both parties expressly agree in writing to arbitrate the dispute.

19. **Indemnity for Infringement of Intellectual Property Rights.** Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If a Product is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

20. **Taxes.** Unless otherwise indicated, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of Products.

21. **Equal Opportunity Clause.** For the performance of government contracts and where dollar value of the Products exceed \$10,000, the equal employment opportunity clauses in Executive Order 11246, VEVRAA, and 41 C.F.R. §§ 60-1.4(a), 60-741.5(a), and 60-250.4, are hereby incorporated.



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