



R-290 (Propane) Solutions

Energy Conscious Products & Solutions for Supermarkets

SPORLAN



ENGINEERING YOUR SUCCESS.



R-290 (Propane) Solutions

ENERGY CONSCIOUS PRODUCTS and SOLUTIONS FOR SUPERMARKETS

As a world leader in refrigerant flow controls, Sporlan Division of Parker Hannifin continues to meet the challenges of the future. **Our growing line of products for R-290 (Propane) sets new standards for robust design and advanced technology.**

This condensed catalog contains product information specifically for R-290 (Propane) applications. By including a minimum of engineering information we are able to provide a concise reference to pertinent data and specifications on Sporlan R-290 products.

For additional engineering information and Sporlan product catalogs, please contact your nearest Sporlan Sales Office, Authorized Sporlan Wholesaler or visit sporlan.com.

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For further information on the products featured in this catalog, see Bulletin number listed below.

10-10-8, Form 10-549
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⚠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.

OFFER OF SALE

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated in the detailed "Offer of Sale" elsewhere in this document or available at www.parker.com.

FOR USE ON AIR CONDITIONING AND REFRIGERATION SYSTEMS ONLY

Catalog 290, January 2023, supersedes Catalog 290, June 2022, and all prior publications.

Thermostatic Expansion Valves

R-290

Type NX

Sporlan's small and compact **Type NX Thermostatic Expansion Valves** are ideal for food-service and food retail applications such as display cases, ice machines, frozen drink dispensers and commercial kitchen refrigerators and freezers.

The Type NX valves feature a laser welded stainless steel element, capillary tube, and sensing bulb assembly optimized for reliability and long life. The single pushrod balanced port design ensures precise pin and port alignment, enabling the valve to maintain superior superheat control at all load conditions.

The forged brass NX valve body is available with a straight-through flow configuration and ODF (sweat) copper connections. The valve can be supplied with either an internal or external equalizer and features a field adjustable superheat stem.

For more information on Sporlan NX valves, reference Bulletin 10-10-10.

Maximum Rated Pressure: 700 psig (48.3 bar)



Capacities

Tons ■ psi ■ °F

kW ■ bar ■ °C

VALVE TYPE	CAPACITY CODE	EVAPORATOR TEMPERATURE (°F)					VALVE TYPE	CAPACITY CODE	EVAPORATOR TEMPERATURE (°C)				
		40	20	0	-10	-20			5	-5	-15	-20	-30
NX	A07	0.50	0.41	0.34	0.31	0.27	NX	A07	1.63	1.62	1.37	1.25	0.93
	A10	0.68	0.53	0.44	0.39	0.34		A10	2.24	2.11	1.74	1.58	1.15
	A15	0.90	0.73	0.59	0.52	0.45		A15	2.95	2.87	2.39	2.14	1.52
	A30	1.52	1.30	1.06	0.92	0.79		A30	4.97	5.06	4.24	3.80	2.68
	A45	1.93	1.74	1.46	1.31	1.14		A45	6.32	6.70	5.80	5.30	3.88
	B38	2.42	2.00	1.62	1.43	1.23		B38	7.91	7.80	6.51	5.86	4.20

Liquid Temperature Correction Factors

TEMPERATURE - °F (°C)	50 (10)	60 (15.5)	70 (21)	80 (26.6)	90 (32.2)	100 (38)	110 (43.3)	120 (48.9)
CORRECTION FACTOR	1.36	1.29	1.22	1.14	1.07	1.00	0.93	0.85

Ratings are based on vapor free 100°F (37.8°C) liquid refrigerant entering the expansion valve, a maximum opening superheat of 7°F (4°K), and a standard factory air test setting.

Valve Pressure Drop Correction Factors

EVAPORATOR TEMP. °F	PRESSURE DROP ACROSS TEV (psi)											EVAPORATOR TEMP. °C	PRESSURE DROP ACROSS TEV (bar)							
	30	50	75	100	125	150	175	200	225	250	275		2	4	6	8	10	12	14	16
	CORRECTION FACTOR, CF PRESSURE DROP												CORRECTION FACTOR, CF PRESSURE DROP							
40°	0.55	0.71	0.87	1.00	1.12	1.22	1.32	1.41	1.50	1.58	1.66	5° & 10°	0.58	0.82	1.00	1.15	1.29	1.41	1.53	1.63
20° & 0°	0.49	0.63	0.77	0.89	1.00	1.10	1.18	1.26	1.34	1.41	1.48	-5° & -15°	0.50	0.71	0.87	1.00	1.12	1.22	1.32	1.41
-10° & -20°	0.45	0.58	0.71	0.82	0.91	1.00	1.08	1.15	1.22	1.29	1.35	-20° & -30°	0.45	0.63	0.77	0.89	1.00	1.11	1.18	1.26
-40°	0.41	0.53	0.65	0.76	0.85	0.93	1.00	1.07	1.13	1.20	1.25	-40°	0.41	0.58	0.71	0.82	0.91	1.00	1.08	1.15

Nomenclature and Standard Connections / Options

NXE	A10	JW	B15	3 S x 4 x 2 ODF	60"
Valve Model	Capacity Code	Thermostatic Charge	Bleed Port (Blank for no bleed port)	Connections Inlet x Outlet (Eighths of an Inch) S = Insert Strainer	Cap Tube Length (Blank for 30" standard length)

Distributors

R-290

The Sporlan distributors listed below are ready for service with R-290. The following tables are provided for making selections based on the procedure explained in Bulletin 20-10.

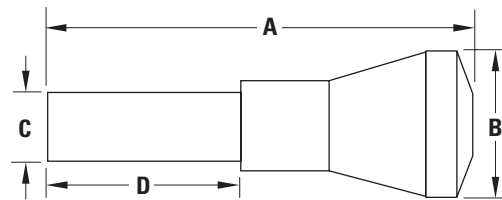
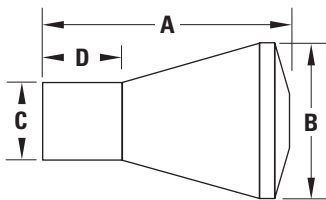


Type D260

Quick Reference

CONNECTION SIZE Inches	TYPICAL TYPES	DISTRIBUTOR TYPE	MAXIMUM NUMBER OF CIRCUITS			NOZZLE TYPE	SIDE CONNECTION	MATERIAL
			5/32	3/16	1/4			
1/2 ODM	NX, NXE, SNXE	1613	6	6	4	PERM.	—	#360 BRASS
		1616	10	8	6	PERM.	—	
		D260	8	6	4	L	—	
		D262	9	9	6	L	—	
5/8 ODM	NX, NXE, SNXE	1620	6	6	4	J	—	
		1622	10	9	7	J	—	
		1651(R)	8	7	5	J (R)	3/8 or 1/2 ODF	

Dimensions



Specifications

NUMBER OF CIRCUITS & TUBING SIZES AVAILABLE	NOZZLE ORIFICE NUMBERS AVAILABLE	NOZZLE & RETAINER RING SIZE	INLET CONNECTION Inches	DISTRIBUTOR	DIMENSIONS								
					Inches				mm				
					A	B	C	D	A	B	C	D	
Type D260 Net Weight - Approximately 2 oz. (60 g)						1.96	0.81	.497 .503	0.79	49.8	20.6	12.6 12.8	20.1
2 to 6	3/16"	1/9 thru 8	L	1/2 ODM Solder									
2 to 4	1/4"												
Type D262 Net Weight - Approximately 3 oz. (80 g)						2.45	1.00	.497 .503	0.79	62.2	25.4	12.6 12.8	20.1
7 to 9	3/16"	1/9 thru 8	L	1/2 ODM Solder									
5 to 6	1/4"												
2 to 4	5/16"												
Type 1613 Net Weight - Approximately 2 oz. (60 g)						1.14	0.81	.497 .501	0.50	29.0	20.6	12.6 12.7	12.7
2 to 7	5/32"	1/2 thru 5	PERM.	1/2 ODM Solder									
2 to 6	3/16"												
2 to 4	1/4"												
Type 1616 Net Weight - Approximately 3 oz. (80 g)						1.53	1.00	.497 .501	0.50	38.9	25.4	12.6 12.7	12.7
8 to 10	5/32"	1/2 thru 5	PERM.	1/2 ODM Solder									
7 to 8	3/16"												
5 to 6	1/4"												
2 to 4	5/16"												
Type 1620 Net Weight - Approximately 2 oz. (60 g)						1.14	0.81	.622 .626	0.69	29.0	20.6	15.8 15.9	17.5
2 to 6	3/16"	1/9 thru 8	J	5/8 ODM Solder									
2 to 4	1/4"												

Distributors

R-290

Capacities

Tons ■ psi ■ °F

kW ■ bar ■ °C

DIST. TUBE DIAMETER Inches	CAPACITY (Tons) per FEEDER TUBE - 24" EVAPORATOR TEMPERATURE °F					DIST. TUBE DIAMETER Inches	CAPACITY (kW) per FEEDER TUBE - 600 mm EVAPORATOR TEMPERATURE °C				
	40	20	0	-20	-40		5	0	-20	-30	-40
5/32	0.265	0.195	0.15	0.107	0.088	5/32	0.932	0.820	0.490	0.376	0.309
3/16	0.49	0.36	0.275	0.21	0.165	3/16	1.723	1.520	0.900	0.739	0.580
1/4	1.4	1.05	0.79	0.60	0.475	1/4	4.924	4.400	2.630	2.110	1.670

Capacities

Tons ■ psi ■ °F

kW ■ bar ■ °C

NOZZLE NUMBER	DISTRIBUTOR NOZZLE CAPACITIES (Tons) EVAPORATOR TEMPERATURE °F					NOZZLE NUMBER	DISTRIBUTOR NOZZLE CAPACITIES (kW) EVAPORATOR TEMPERATURE °C				
	40	20	0	-20	-40		5	0	-20	-30	-40
1/9	0.156	0.120	0.095	0.078	0.065	1/9	0.55	0.488	0.319	0.267	0.228
1/6	0.241	0.185	0.147	0.120	0.101	1/6	0.85	0.754	0.493	0.413	0.352
1/4	0.388	0.298	0.237	0.193	0.162	1/4	1.37	1.21	0.793	0.664	0.567
1/3	0.507	0.390	0.310	0.253	0.212	1/3	1.80	1.59	1.04	0.869	0.742
1/2	0.702	0.539	0.429	0.350	0.294	1/2	2.49	2.20	1.44	1.20	1.03
3/4	1.06	0.814	0.647	0.529	0.443	3/4	3.76	3.32	2.17	1.82	1.55
1	1.42	1.090	0.866	0.708	0.593	1	5.03	4.44	2.90	2.43	2.08
1-1/2	2.06	1.580	1.26	1.03	0.863	1-1/2	7.31	6.46	4.22	3.53	3.02
2	2.83	2.180	1.73	1.41	1.18	2	10.0	8.86	5.80	4.85	4.14

Correction Factors for Distributor Tube Length

TUBE LENGTH - Inches (mm)	12 (300)	18 (450)	24 (600)
CORRECTION FACTOR	1.21	1.09	1.00

Correction Factors for Liquid Temperatures for Nozzles and Tubes

TEMPERATURE - °F (°C)	50 (10)	60 (15)	70 (21)	80 (27)	90 (32)	100 (38)	110 (43)
CORRECTION FACTOR	2.1	1.83	1.59	1.37	1.17	1	0.85

Ratings are based on 100°F (38°C) liquid entering TEV, 25 psi (1.7 bar) ΔP across nozzle and 10 psi (0.68 bar) across the distributor tubes, 24 inch (600 mm).

The universal acceptance of the **Catch-All® Filter-Drier** is due to its unique molded porous core, consisting of a blend of highly effective desiccants. The quality features built into it assure years of service on any refrigeration system.

Moisture – The Catch-All Filter-Drier removes moisture from the refrigerant by adsorbing and retaining it deep within the desiccant granules. The blend of desiccants used in the Catch-All Filter-Drier are specially formulated for exceptional water removal.

Foreign Matter – The Catch-All Filter-Drier will filter out scale, solder particles, carbon, sludge, dirt or any other foreign matter with negligible pressure drop. Fine particles that would go through an ordinary strainer are removed down to a minimum size in one pass filtration. The large filtering area of the Catch-All Filter-Drier core permits it to collect a large amount of dirt without plug up.

Acid – The Catch-All Filter-Drier is unexcelled in acid removal ability. The various organic acids are adsorbed and held by the desiccant in a manner similar to the adsorption of moisture. Tests have demonstrated that the Catch-All Filter-Drier has

superior acid removal ability.

This ability, along with its excellent ability to clean up the oil, is responsible for the excellent field performance in cleaning up severely contaminated systems.

Oil, Sludge and Varnish – Even the best refrigeration oils break down to produce varnish, sludge and organic acids. Only the Catch-All Filter-Drier is capable of efficiently removing these products of oil decomposition.

Special Applications – A special “HH” core Catch-All Filter-Drier is available to remove wax which frequently causes difficulty on low temperature refrigeration systems. For cap tube systems, use the C-032-CAP Catch-All which has fittings suitable for attaching to any size capillary tube.

Remember...It's the CORE that counts!



Sealed Type – Liquid Line and Suction Line Specifications

Tons ■ psi ■ °F



"C" SERIES LIQUID LINE TYPE ODF SOLDER	CONNECTION SIZE Inches	VOLUME of DESICCANT Cubic Inches	OVERALL LENGTH Inches	SOLDER SOCKET DEPTH Inches	DIAMETER of BODY Inches
			ODF SOLDER		
C-032-S	1/4	3	3.81	0.38	1.75
C-032-CAP	Extended 1/4 Male		5.81	—	
C-033-S	3/8		3.88	0.44	
C-052-S	1/4	5	4.19	0.38	2.44
C-0525-S	5/16		4.38	0.44	
C-053-S	3/8		4.31	0.44	
C-082-S	1/4	9	5.12	0.38	2.62
C-0825-S	5/16		5.31	0.44	
C-083-S	3/8		5.25	0.44	
C-084-S	1/2		5.44	0.50	
C-162-S	1/4	16	5.75	0.38	3.00
C-1625-S	5/16		5.94	0.44	
C-163-S	3/8		5.88	0.44	
C-164-S	1/2		6.00	0.50	
C-165-S	5/8		6.31	0.62	

kW ■ bar ■ °C

"C" SERIES LIQUID LINE TYPE ODF SOLDER	CONNECTION SIZE Inches	VOLUME of DESICCANT cm ³	OVERALL LENGTH mm	SOLDER SOCKET DEPTH mm	DIAMETER of BODY mm
			ODF SOLDER		
C-032-S	1/4	49	97	10	44
C-032-CAP	Extended 1/4 Male		148	—	
C-033-S	3/8		99	11	
C-052-S	1/4	82	106	10	62
C-0525-S	5/16		111	11	
C-053-S	3/8		109	11	
C-082-S	1/4	147	130	10	67
C-0825-S	5/16		135	11	
C-083-S	3/8		133	11	
C-084-S	1/2		138	13	
C-162-S	1/4	262	146	10	76
C-1625-S	5/16		151	11	
C-163-S	3/8		149	11	
C-164-S	1/2		152	13	
C-165-S	5/8		160	16	

Liquid Holding Capacity

TYPE	LIQUID HOLDING CAPACITY	
	R-290 at 100°F	R-290 at 38°C
	OUNCES	GRAMS
C-030	0.6	16.6
C-050	1.4	39.3
C-080	2.1	60.6
C-160	3.7	106

Sealed Type – Liquid Line Ratings and Selection Recommendations

Tons ■ psi ■ °F / kW ■ bar ■ °C

TYPE	② FILTERING AREA		WATER CAPACITY DROPS at 60 ppm		① REFRIGERANT FLOW CAPACITY		REFRIGERATION	
	SQUARE INCH	CM ²	75°F 25°C	125° 52°C	TONS at 1 psi ΔP	kW at 0.07 bar ΔP	COMMERCIAL and LOW TEMPERATURE EQUIPMENT	OEM SELF CONTAINED
SEALED TYPE								
C-032-CAP	9	58	68	56	1.5	5.3	1/4	1
C-032-S								
C-033-S								
C-052-S	15	97	181	149	2.2	7.7	1/3	1 thru 3
C-0525-S								
C-053-S								
C-082-S	21	135	269	222	2.2	7.7	1/2 thru 1-1/2	1 thru 5
C-0825-S								
C-083-S								
C-084-S								
C-162-S	33	213	400	330	2.2	7.7	1-1/2 thru 3	2 thru 10
C-1625-S								
C-163-S								
C-164-S								
C-165-S								

① Ratings based on 20°F (-5°C) liquid, -20°F (-30°C) evaporator temperature.

② The filtration area is equal to the core surface area plus the large internal surface available for depth filtration.

The variation in flow ratings of filter-driers having the same size core and shell is caused by the difference in connection sizes used.

Significance of the Type Number

The letters and numerals in the Catch-All® type number each have a significance. The “C” indicates Catch-All. The **first two digits** indicate cubic inches of desiccant. The **last digit** indicate fitting size in eighths of an inch. The “-S” following the last digit indicates solder fittings, and **no letter** indicates a flare fitting.

Other suffix letters indicate special qualities. For example:

“-HH” Indicates a charcoal style core for wax removal and clean-up after a hermetic motor burnout.

“-CAP” Indicates a Catch-All particularly designed for installation on capillary tube systems.

HH Style Catch-All for Wax Removal

Small amounts of wax are often a problem on **low temperature** systems. Even well engineered systems frequently contain minute quantities of wax which are sufficient to clog expansion valve screens or cause sticking of the valve. Sporlan has developed a special blend of desiccants including activated charcoal which removes small amounts of wax in the liquid line before this wax can cause trouble at the expansion valve. These Catch-All Filter-Driers have been very successful in correcting trouble jobs in the field.

Select an HH Style Catch-All Filter-Drier if wax problems occur on low temperature systems. In addition to their wax removal ability, these filter-driers will remove all of the other harmful contaminants that the standard filter-driers remove. Listed in the table are various Catch-All models that incorporate the HH style core.

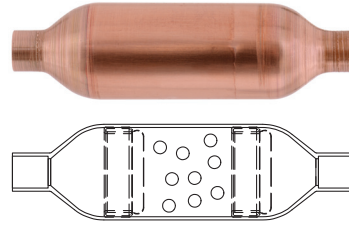
TYPE	CONNECTIONS Inches
C-052-S-HH	1/4 ODF Solder
C-082-S-HH	1/4 ODF Solder
C-083-S-HH	3/8 ODF Solder
C-163-S-HH	3/8 ODF Solder
C-164-S-HH	1/2 ODF Solder
C-165-S-HH	5/8 ODF Solder

Copper Filter-Driers

R-290

Features and Benefits

- 3/4" shell OD, 1/4" ODF connections
- Loose fill style, 100% Molecular Sieve
- Moisture Capacity: 16 drops of water at 50 ppm, 125 degrees
- Refrigerant Holding Capacity: 2.36 g of R-290 at 100°F
- Contaminant Holding: 120 mesh brass screen
- UL Recognized under SMGT2/SMGT8-SA1756



Dimensions and Flow Capacities

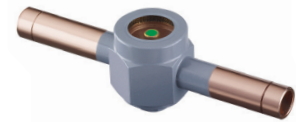
Part No.	Connection Size ODF Solder Inches	Overall Length		Socket Depth		R-290 Holding Capacity at 100°F		Refrigerant Flow Capacity		Refrigeration Selection Recommendation		UL Model	MRP	
		Inches	mm	Inches	mm	Ounces	Grams	Tons at 1 psi ΔP	kW at 0.07 bar ΔP	OEM Self Contained (Tons)	psig		bar	
058832-00	1/4	2.7	69	0.25	6.4	0.08	2.36	2.0	7.0	1.5	700	540	37.2	

See•All® Moisture and Liquid Indicator

8 Outstanding Benefits

- 1. The See•All Moisture and Liquid Indicator provides a true moisture indication for refrigerants.** The dark green indicates dry and a bright yellow indicates wet. The one indicator avoids the confusion found in models with two elements. You cannot pick the wrong element when checking the moisture content of the system.
- 2. Reliable and accurately calibrated color change points.** The See•All Moisture and Liquid Indicator is accurately calibrated in parts per million of moisture for each refrigerant. All moisture indicators change color on the basis of relative saturation of the refrigerant. Therefore, liquid line temperature must be considered if an accurate calibration is to be obtained. For easy comparison, a color chart is part of the label.
- 3. Color changes are easily distinguished and reversible.** The indicator's color differs so widely between WET and DRY conditions that there is no possibility of confusion between the two. Colors will reverse as often as moisture concentration in the system changes.
- 4. Large full view sight glass.** The See•All Moisture and Liquid Indicator has an extra large crystal clear sight glass for viewing the refrigerant. Bubbles indicate a shortage of refrigerants or a restriction in the liquid line.

- 5. Indicator protected from discoloration and dirt.** The indicator is protected by a filter pad and screen. This prevents washing of the indicator by the refrigerant and protects it from system contamination and turbulence.
- 6. Replaceable indicator element.** The color indicator paper can be changed on the new fused glass models without removing the See•All from the line. Replacement is through the bottom (see SA-14SU below). Request the K-SA-4 kit.
- 7. Disassembly not required.** The extended fittings make it unnecessary to disassemble for installation.
- 8. A double duty plastic cap** is supplied to keep the glass free from dust, dirt and grease. It also permits the service engineer to use his own discretion concerning instructions to his customers on observing the See•All Moisture and Liquid Indicator.



MOISTURE CONTENT – PPM			
LIQUID LINE TEMPERATURE	SEE • ALL SHOWS		
	Green DRY	Chartreuse CAUTION	Yellow WET
75°F / 24°C	↓15	15-30	↑30
100°F / 38°C	↓45	45-60	↑60

Specifications

Inches

mm

CONNECTION SIZES Inches	ODF SOLDER		CONNECTION SIZES Inches	ODF SOLDER	
	TYPE NO.	OVERALL LENGTH Inches		TYPE NO.	OVERALL LENGTH mm
1/4	SA-12S	4.62	1/4	SA-12S	117
3/8	SA-13S		3/8	SA-13S	
1/2	SA-14S	4.87	1/2	SA-14S	124
5/8	SA-15S		5/8	SA-15S	

Listed by Underwriters' Laboratories, Inc. – Guide SEYW – File No. SA3182

Maximum Rated Pressure for all models is 650 psig (44.8 barg). Overall width is: 1.31" (33.3 mm) for 1/4" and 3/8" sizes, 1.58" (40.1 mm) for 1/2" and 5/8 sizes, and 1.38" (35.1 mm) for 7/8" and 1-1/8" sizes. Most solder connections can be used as male fittings as well as female fittings. The 1/4" ODF is 3/8" ODM, the 3/8" ODF is 1/2" ODM, the 1/2" ODF is 5/8" ODM, and the 5/8" ODF is 3/4" ODM. Models with female flare and/or swivel nut connections are supplied with a copper gasket in the fitting.

ZoomLock® MAX Refrigerant Fittings

R-290

ZoomLock MAX Flame-Free Refrigerant Fittings, specially designed for the air conditioning and refrigeration markets, allow contractors to make secure leak-free connections in seconds. It means less time on the job and more money in the contractor's pocket.

ZoomLock MAX fittings provide clean, leak-proof connections for refrigerant lines up to 700 psi. By eliminating concerns about gas and flames, ZoomLock MAX fittings offer more flexibility in where and when you can work, plus there's no need to nitrogen-purge the lines.

ZoomLock MAX fittings are available in a wide range of types including caps, couplings, elbows, tees, reducers, SAE flares, and more. Fitting sizes range from 1/4" to 1-3/8".



The ZoomLock MAX Advantage

- Hard, robust copper fittings made from refrigerant grade copper
- Proven three-point press technology providing a leak-free and secure joint
- No crimp gauge needed—connect the fitting with one complete cycle
- Hermetically sealed packaging for debris-free fittings
- Jaws available for most professional brand crimping tools, both large and compact
- Rated for pressures up to 700 psi / 48 bar
- 15-year warranty



See Parker Catalog K-3 for additional information on ZoomLock MAX fittings, jaws, and tools.

ZoomLock MAX



ZoomLock MAX – Secure, Leak-free Refrigerant Connections

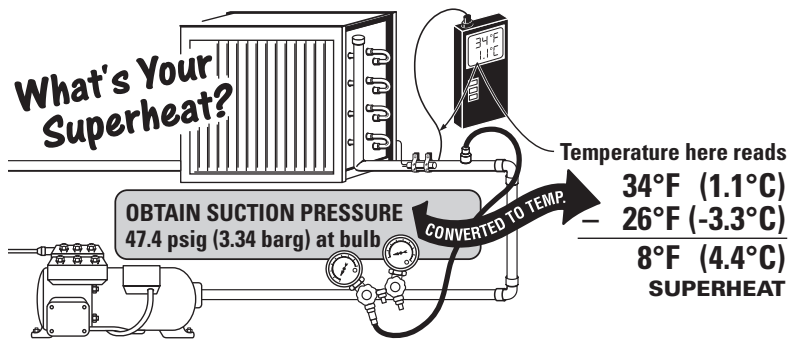
Pressure Temperature Chart

R-290

Refrigerant 290

At Sea Level

Temperature		Pressure		Temperature		Pressure		Temperature		Pressure		Temperature		Pressure	
°F	°C	psig	barg	°F	°C	psig	barg	°F	°C	psig	barg	°F	°C	psig	barg
-40	-40.0	1.42	0.10	5	-15.0	27.6	1.90	50	10.0	77.6	5.35	95	35.0	161.9	11.17
-39	-39.4	1.81	0.12	6	-14.4	28.4	1.96	51	10.6	79.1	5.45	96	35.6	164.3	11.33
-38	-38.9	2.21	0.15	7	-13.9	29.2	2.02	52	11.1	80.6	5.56	97	36.1	166.7	11.49
-37	-38.3	2.61	0.18	8	-13.3	30.1	2.07	53	11.7	82.1	5.66	98	36.7	169.1	11.66
-36	-37.8	3.03	0.21	9	-12.8	30.9	2.13	54	12.2	83.6	5.76	99	37.2	171.5	11.82
-35	-37.2	3.45	0.24	10	-12.2	31.8	2.19	55	12.8	85.1	5.87	100	37.8	173.9	11.99
-34	-36.7	3.88	0.27	11	-11.7	32.7	2.25	56	13.3	86.7	5.97	101	38.3	176.4	12.16
-33	-36.1	4.31	0.30	12	-11.1	33.6	2.31	57	13.9	88.2	6.08	102	38.9	178.9	12.33
-32	-35.6	4.76	0.33	13	-10.6	34.5	2.38	58	14.4	89.8	6.19	103	39.4	181.4	12.51
-31	-35.0	5.21	0.36	14	-10.0	35.4	2.44	59	15.0	91.4	6.30	104	40.0	183.9	12.68
-30	-34.4	5.67	0.39	15	-9.4	36.3	2.50	60	15.6	93.0	6.41	105	40.6	186.5	12.86
-29	-33.9	6.13	0.42	16	-8.9	37.2	2.57	61	16.1	94.7	6.53	106	41.1	189.1	13.04
-28	-33.3	6.61	0.46	17	-8.3	38.2	2.63	62	16.7	96.3	6.64	107	41.7	191.7	13.22
-27	-32.8	7.10	0.49	18	-7.8	39.2	2.70	63	17.2	98.0	6.76	108	42.2	194.3	13.40
-26	-32.2	7.59	0.52	19	-7.2	40.1	2.77	64	17.8	99.7	6.87	109	42.8	197.0	13.58
-25	-31.7	8.09	0.56	20	-6.7	41.1	2.84	65	18.3	101.4	6.99	110	43.3	199.6	13.76
-24	-31.1	8.60	0.59	21	-6.1	42.1	2.91	66	18.9	103.1	7.11	111	43.9	202.4	13.95
-23	-30.6	9.12	0.63	22	-5.6	43.2	2.98	67	19.4	104.9	7.23	112	44.4	205.1	14.14
-22	-30.0	9.65	0.67	23	-5.0	44.2	3.05	68	20.0	106.6	7.35	113	45.0	207.8	14.33
-21	-29.4	10.2	0.70	24	-4.4	45.2	3.12	69	20.6	108.4	7.47	114	45.6	210.6	14.52
-20	-28.9	10.7	0.74	25	-3.9	46.3	3.19	70	21.1	110.2	7.60	115	46.1	213.4	14.72
-19	-28.3	11.3	0.78	26	-3.3	47.4	3.27	71	21.7	112.0	7.72	116	46.7	216.3	14.91
-18	-27.8	11.8	0.82	27	-2.8	48.5	3.34	72	22.2	113.9	7.85	117	47.2	219.1	15.11
-17	-27.2	12.4	0.86	28	-2.2	49.6	3.42	73	22.8	115.7	7.98	118	47.8	222.0	15.31
-16	-26.7	13.0	0.90	29	-1.7	50.7	3.49	74	23.3	117.6	8.11	119	48.3	224.9	15.51
-15	-26.1	13.6	0.94	30	-1.1	51.8	3.57	75	23.9	119.5	8.24	120	48.9	227.8	15.71
-14	-25.6	14.2	0.98	31	-0.6	53.0	3.65	76	24.4	121.4	8.37	121	49.4	230.8	15.91
-13	-25.0	14.8	1.02	32	0.0	54.1	3.73	77	25.0	123.4	8.51	122	50.0	233.8	16.12
-12	-24.4	15.4	1.06	33	0.6	55.3	3.81	78	25.6	125.4	8.64	123	50.6	236.8	16.33
-11	-23.9	16.1	1.11	34	1.1	56.5	3.89	79	26.1	127.3	8.78	124	51.1	239.9	16.54
-10	-23.3	16.7	1.15	35	1.7	57.7	3.98	80	26.7	129.3	8.92	125	51.7	242.9	16.75
-9	-22.8	17.4	1.20	36	2.2	58.9	4.06	81	27.2	131.4	9.06	126	52.2	246.0	16.96
-8	-22.2	18.0	1.24	37	2.8	60.1	4.15	82	27.8	133.4	9.20	127	52.8	249.1	17.18
-7	-21.7	18.7	1.29	38	3.3	61.4	4.23	83	28.3	135.5	9.34	128	53.3	252.3	17.40
-6	-21.1	19.4	1.34	39	3.9	62.7	4.32	84	28.9	137.6	9.48	129	53.9	255.5	17.61
-5	-20.6	20.1	1.38	40	4.4	63.9	4.41	85	29.4	139.7	9.63	130	54.4	258.7	17.84
-4	-20.0	20.8	1.43	41	5.0	65.2	4.50	86	30.0	141.8	9.78	131	55.0	261.9	18.06
-3	-19.4	21.5	1.48	42	5.6	66.5	4.59	87	30.6	144.0	9.92	132	55.6	265.2	18.28
-2	-18.9	22.2	1.53	43	6.1	67.9	4.68	88	31.1	146.1	10.07	133	56.1	268.5	18.51
-1	-18.3	22.9	1.58	44	6.7	69.2	4.77	89	31.7	148.3	10.23	134	56.7	271.8	18.74
0	-17.8	23.7	1.63	45	7.2	70.6	4.87	90	32.2	150.5	10.38	135	57.2	275.1	18.97
1	-17.2	24.5	1.69	46	7.8	72.0	4.96	91	32.8	152.8	10.53	136	57.8	278.5	19.20
2	-16.7	25.2	1.74	47	8.3	73.4	5.06	92	33.3	155.0	10.69	137	58.3	281.9	19.44
3	-16.1	26.0	1.79	48	8.9	74.8	5.15	93	33.9	157.3	10.85	138	58.9	285.4	19.67
4	-15.6	26.8	1.85	49	9.4	76.2	5.25	94	34.4	159.6	11.01	139	59.4	288.8	19.91
												140	60.0	292.3	20.15



Example: Refrigerant 290 at Sea Level



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