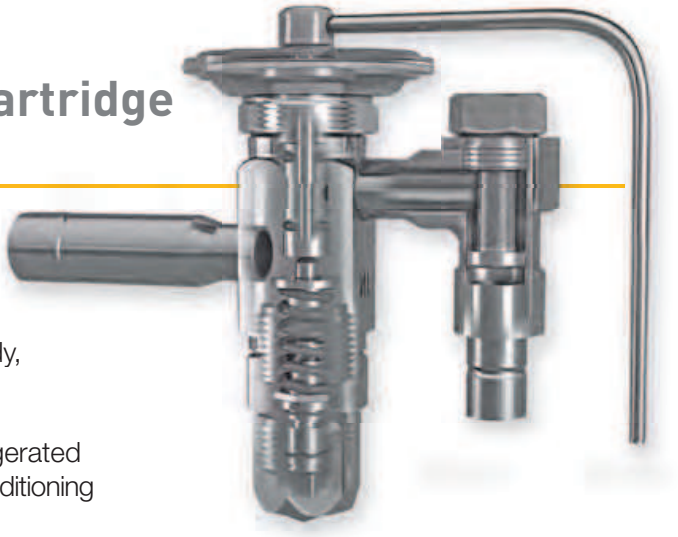
Balanced Ported Exchangeable Cartridge Thermostatic Expansion Valves



Type BQ

The Series **BQ** is replaceable cartridge style balanced port thermostatic expansion valve.
This valve will be supplied as a three component parts, body, cartridge, and thermostatic element.

It is designed for small refrigeration systems, including refrigerated cases, coolers and freezers, and are also well suited for air conditioning and heat pump duty.

Valve Nomenclature/Ordering Instructions

Combine the letters and numbers in the following manner to obtain the complete valve designation. Also include all connection sizes and the capillary tube length.

BQE	-	3/8 x 1/2 x 1/4 SAE	-	BQC	-	AAA	-	KT-43	-	V	-	C	-	5'
BQ, EBQ, SBQ = Internally Equalized **BQE, EBQE, SBQE = Externally Equalized**		Connection Size and Style: Inlet x Outlet x External Equalizer		Cartridge Type		Cartridge Size		Element Kit KT-43 or KT-45 R410A only		Parker Sporlan Code - Refrigerant Element Label Color Code V/N = R-22, R-407C, R-422D Green or Lt. Brown J = R-134A, R-409A, R-401A Blue, Yellow or Pink S = R-404A, R-408A / Orange P = R507 / Teal Z = R-410A / Rose		Thermostatic Charge		Capillary Tubing Length Inches or Feet

Parker Sporlan Selective Charges engineered for peak performance for each specific application
Recommended Thermostatic Charges*

Application	Refrigerant													THERMOSTATIC ELEMENT	SYSTEM MOB psig
	12	22, 422D	134a	401A	402A	404A	407A	407C	408A	409A	410A	502	507		
Air Conditioning	X	-	X	X	-	-	-	-	-	X	-	-	-	KT-43-JCP60	50
	-	X	-	-	-	-	X	X	-	-	-	-	-	KT-43-VCP100	90
	-	X	-	-	-	-	X	X	-	-	-	-	-	KT-43-VGA	-
	-	-	-	-	-	X	-	-	X	-	-	X	-	KT-43-SCP115	105
	-	-	-	-	-	-	-	-	-	-	X	-	-	KT-45-ZGA	-
	-	-	-	-	-	-	-	-	-	-	X	-	-	KT-45-ZCP180	170
Commercial Refrigeration 10°C to -25°C	X	-	X	X	-	-	-	-	-	X	-	-	-	KT-43-JC	-
	-	X	-	-	-	-	X	X	-	-	-	-	-	KT-43-VC	-
	-	-	-	-	-	X	-	-	X	-	-	X	-	KT-43-SC	-
	-	-	-	-	X	-	-	-	-	-	-	-	X	KT-43-PC	-
Low Temperature Refrigeration -20°C to -40°C	-	X	-	-	-	-	-	-	-	-	-	-	-	KT-43-VZ	-
	-	X	-	-	-	-	-	-	-	-	-	-	-	KT-43-VZP40	30
	-	-	-	-	X	X	-	-	X	-	-	X	X	KT-43-SZ	-
	-	-	-	-	X	X	-	-	X	-	-	X	X	KT-43-SZP	35

* **Applications Factors:**

1. The Type ZP,CP charges have essentially the same characteristics as the Type Z,C charge with one exception: they produce a pressure limit. Maximum Operating Pressure (MOP). ZP,CP charges are not intended as replacements for Z,C charges. Each should be selected for its own unique purpose.
2. All air conditioning and heat pump charges are intended for use with externally equalized valves.

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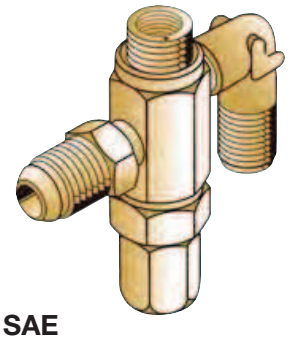
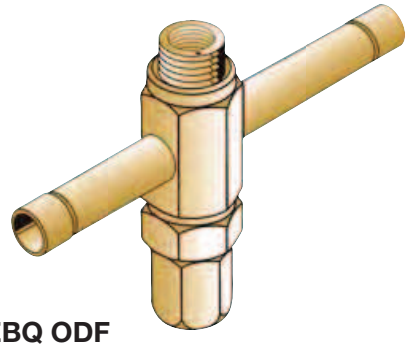
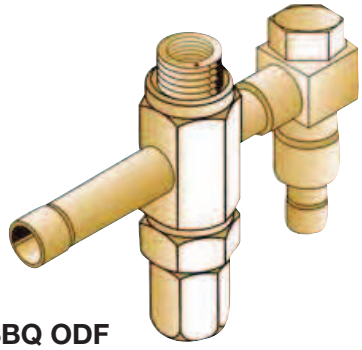
Body Type



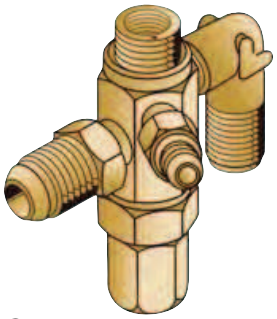
BQ SAE
Internally Equalized



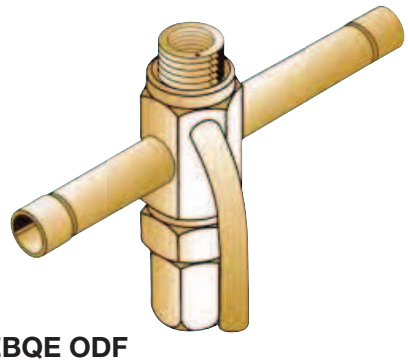
EBQ ODF
Internally Equalized



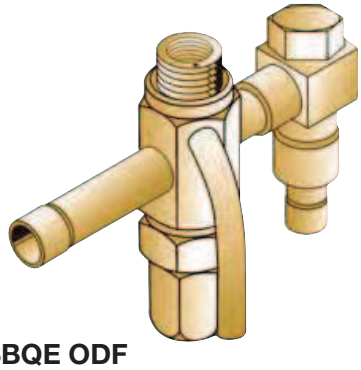
SBQ ODF
Internally Equalized



BQE SAE
Externally Equalized

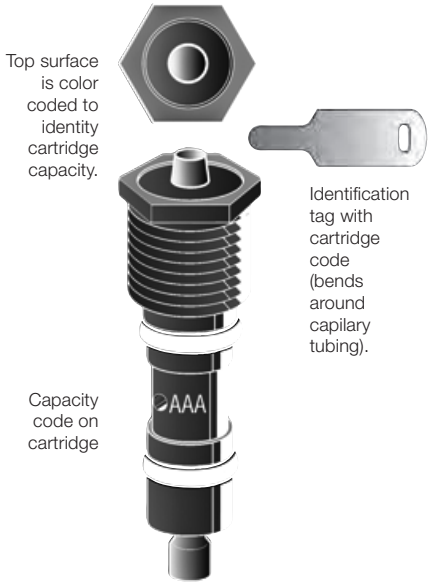


EBQE ODF
Externally Equalized

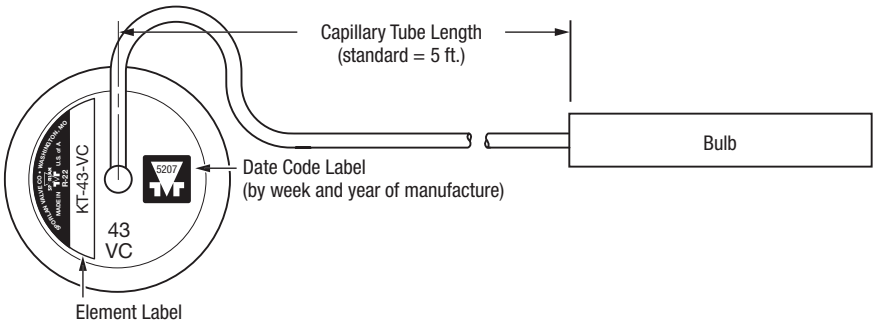


SBQE ODF
Externally Equalized

Cartridge



Thermostatic Element



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Specifications & Materials/Details of Construction

Body	Machined Brass Bar	
Seat	Brass Port Machined in Body	
Pin	Stainless Steel	
Pushrod	Stainless Steel	
Element to Body Joint Type	Knife Edge to Metal	
Connections	SAE Flare, ODF Copper Fittings Silver Soldered to Body	
Inlet Strainer	Insert Strainer, Removable Strainer	
Operating Temp. Range	10°C to -40°C (50°F to -40°F)	
MRP	48.3 bar (700 psig) for R-410A only / 31.0 bar (450 psi)	
Maximum Temperature	121°C (250°F) Limited Exposure Time	
Max Ambient Temp.	60°C (140°F)	
Max Bulb Temp.	ZGA, ZCP180 (R410A) Element Charge	71.1°C (160°F)
	GA, CP, ZP all Refrigerants excl R410A	121°C (250°F)
	JC (R134a) Element Charge	87.8°C (190°F)
	VC (R407C) Element Charge	71.1°C (160°F)
	SC (R404A) Element Charge	65.6°C (150°F)
	SZ (R404A) Element Charge	76.7°C (170°F)
Max External Leakage	.10 oz/yr @ 300 psig (2.8 gram/yr @ 20 bar)	
UL	SA5460	
Compatibility	All HFC, HCFC, Refrigerants and blends	

Approvals:

The Type BQ Thermostatic Expansion Valves comply with the Directive(s) 97-23-EC.

Benefits

- **Selective thermostatic charges provide optimum performance for all common applications - air conditioning and heat pump, medium and low temp. refrigeration**
- **Stainless steel diaphragm and welded element construction**
- **Large flat diaphragm permits precise valve control**
- **Balanced Port Design provides excellent control on applications with widely varying operation conditions**
- **Externally adjustable**
- **Excellent Bi-Flow Control for Heat Pump Applications (only for valves with external equalizer)**
- **The copper bulb design provides an excellent heat transfer**
- **Replaceable Thermostatic Elements**
- **Wide capacity range with only 5 Exchangeable Orifices**

Options

- ZCP180, ZGA and ZZP55 charge available for R410A systems
- SAE (with 100 mesh strainer) or ODF (with 60x 50 mesh stainless steel wire cloth strainer) connections
- External or internal equalizer
- Pressure limiting charge (CP) and anti hunting charge (GA) available
- Cartridge available with 15% bleed port

Nominal Capacity in kW				Cartridge		
R-410A	**R-22, R-407C**	**R-134a**	**R-404A, R507**	**Size**	**Cartridge Code**	**Color Code**
1.17	1.16	0.7	0.7	AAA	BQC-AAA	**Red**
2.64	2.35	1.16	1.16	AA	BQC-AA	**Yellow**
6.15	5.25	3.5	3.5	A	BQC-A	**Blue**
2.3	10.5	6.13	6.13	B	BQC-B	**Pink**
21.1	19.25	10.5	10.5	C	BQC-C	**White**

TEV capacity ratings for R-134a, R-401A, R-404A, R-407C, R-408A, 409A, R-410A, and R-422D are based on vapor free 38°C liquid refrigerant entering the expansion valve, a maximum opening superheat of 4K, and a standard factory air test superheat setting. A discussion of the relationship between valve capacities and superheat settings can be found in Bulletin 10-9.
The ratings for evaporator temperatures 10°C, 5°C, -5°C, -15°C, -20°C, -30°C, -40°C in the capacity tables are in accordance with ANSI/ARI Standard Number 750.
TEVs are tested in accordance with ANSI/ASHRAE 17. For TEV capacity ratings at operating conditions not shown in the following tables, contact RACE Division of Parker.

3 Step Order Selection Guide

1 - Available **BQ Valves** Bodies

Valve Type	Part Number	Valve Description
BQ	168191	BQ BODY 1/4 x 1/2 SAE
	168190	BQ BODY 3/8 x 1/2 SAE
BQE	168184	BQE BODY 1/4 x 1/2 SAE
	168183	BQE BODY 3/8 x 1/2 SAE
SBQ	168193	SBQ BODY 3/8 x 1/2 ODF
SBQE	168198	SBQE BODY 3/8 x 1/2 ODF
EBQ*	168033	EBQ BODY 1/4 x 3/8 ODF
	168051	EBQ BODY 1/4 x 1/2 ODF
	168194	EBQ BODY 1/2 x 3/8 ODF
EBQE*	168035	EBQE BODY 1/4 x 3/8 ODF
	168044	EBQE BODY 1/4 x 1/2 ODF
	168186	EBQE BODY 3/8 x 1/2 ODF
	168187	EBQE BODY 1/2 x 5/8 ODF
	168188	EBQE BODY 1/2 x 7/8 ODF

* All EBQ(E) bodies are supplied with an 877 series inlet strainer.

2 - BQ Valves Cartridge

Size	Color Code	Cartridge Size	Part Number
AAA	Red	BQC-AAA	168303
AA	Yellow	BQC-AA	168304
A	Blue	BQC-A	168306
B	Pink	BQC-B	168307
C	White	BQC-C	168308
AA (bleed port)	Yellow/Black	BQC-AA-BP15	168701
A (bleed port)	Blue/Black	BQC-A-BP15	168702
B (bleed port)	Pink/Black	BQC-B-BP15	168703
C (bleed port)	White/Black	BQC-C-BP15	168704

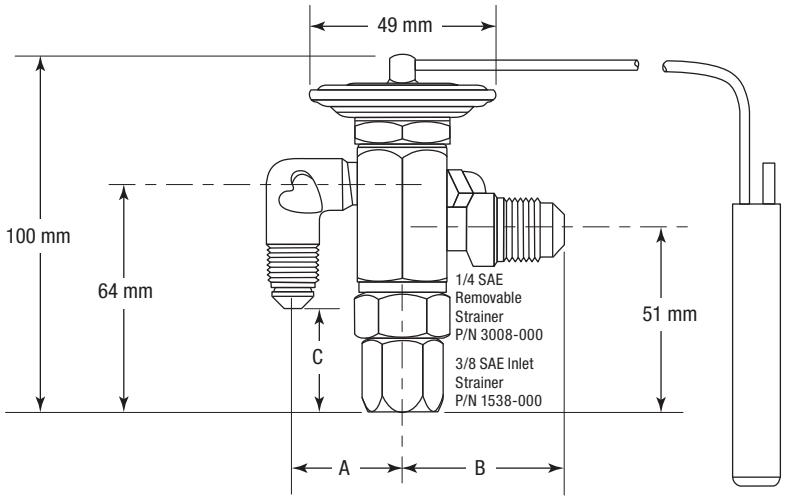
3 - BQ Valves Thermostatic Element Kit*

Refrigerant (Code)	Element Kit No.	Capillary Tube Length	Part Number
410A(Z)	KT-45-ZCP180	1500 mm	181213
	KT-45-ZGA		181212
134a, 409A, 401A (J)	KT-43-JC		180310
	KT-43-JCP60		180312
22, 407C, 422D (V)	KT-43-VGA		180276
	KT-43-VCP100		180272
	KT-43-VC		180319
	KT-43-VZ		180323
	KT-43-VZP40		180324
404A, 408 (S)	KT-43-SC		180204
	KT-43-SCP115		180360
	KT-43-SZ		180318
	KT-43-SZP		180060
507(P)	KT-43-PC		180338
	KT-43-PZ		180068
	KT-43-PZP		180072

** The Kit contain: 1 Thermostatic Element, 2 Bulb Clamps, 2 Bolts and Nuts.

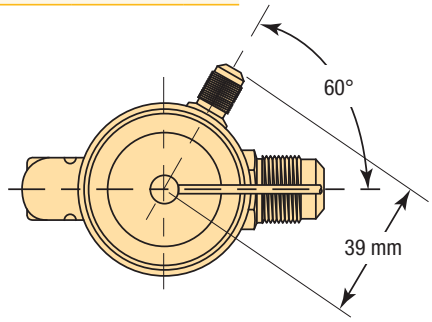
Valve Dimensions

Type BQ & BQE

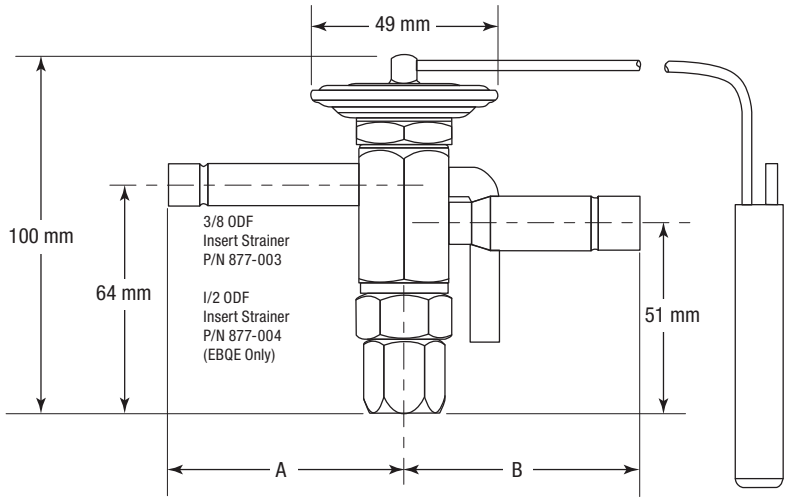


Dimensions - Connections

Fitting Size Inches	mm		
	A	B	C
1/4 SAE, 90° Angle	30	-	37
3/8 SAE, 90° Angle	34	-	27
3/8 SAE	-	41	-
1/2 SAE	-	46	-

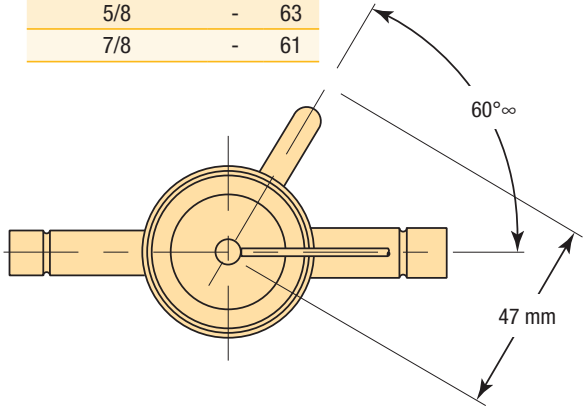


Type EBQ & EBQE

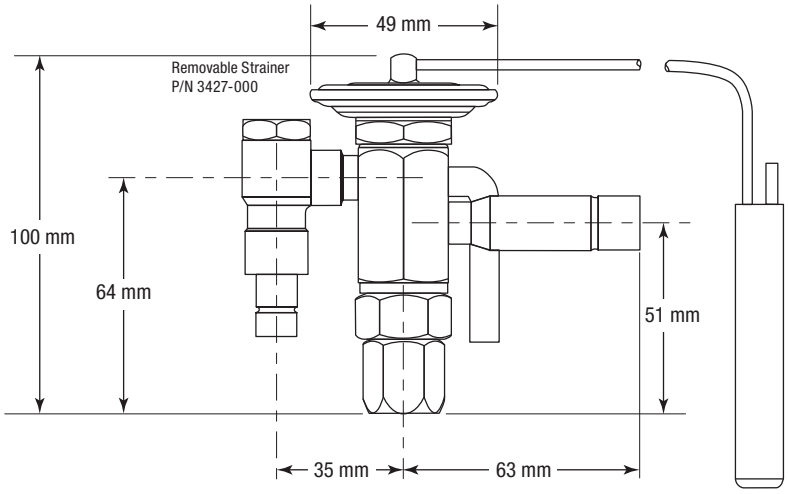


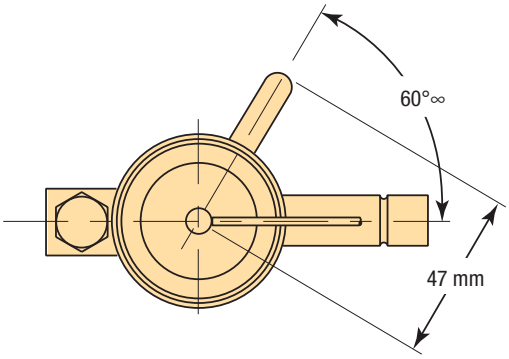
Dimensions - Connections

Fitting Size Inches	mm	
	A	B
3/8	64	-
1/2	61	63
5/8	-	63
7/8	-	61



Type SBQ & SBQE





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Air Conditioning, Heat Pump and Commercial Refrigeration Applications

Orifice Size (Color Code)	Nominal Capacity	Refrigerant R410A			
		Recommended Thermostatic Charge ZCP180*, ZGA			
		Evaporator Temperature °C			
	kW	10°	5°	-5°	-15°
AAA	1.2	1.44	1.43	1.58	1.42
AA	2.6	3.09	3.06	3.38	3.04
A	5.3	6.59	6.53	7.20	6.49
B	11	11.5	11.40	12.60	11.40
C	18	21.4	21.20	23.40	21.10

* MOP point CP180 ≈ 15°C
** MOP point ZP55 ≈ -19°C

Liquid Temperature Entering TEV °C

Refrigerant	20°	30°	40°	50°	60°
	Correction Factor, CF Liquid Temperature				
410a	1.30	1.15	1.00	0.84	0.65

These factors include corrections for liquid refrigerant density and net refrigerating effect and are based on an evaporator temperature of -15°C. However, they may be used for any evaporator temperature from -15°C to 10°C since the variation in the actual factors across this range is insignificant.

Pressure Drop Across TEV (bar)

R410A Evaporator Temperature °C	8	11	14	17	20
	Correction Factor, CF Pressure Drop				
5° & 10°	0.85	1.00	1.13	1.24	1.35
-5° & -15°	0.76	0.89	1.00	1.10	1.20

TEV Capacity = TEV Rating x CF Liquid Temperature x CF Pressure Drop
Example: Actual capacity of a nominal 2.6 kW R-410A BQ valve with a AA cartridge size at -15°C evaporator, 17 bar pressure drop across the TEV and a 30°C liquid temperature entering the TEV = 3.04 (from rating chart) x 1.15 (CF liquid temperature) x 1.10 (CF pressure drop) = 3.85 kW.

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BQ typeThermostatic Expansion Valves Selection Tables

Air Conditioning, Heat Pump and Commercial Refrigeration Applications

Cartridge	Nominal Capacity	Refrigerant											
		R422D							407C				
		Recommended Thermostatic Charge											
		VC, VCP100, VGA				VZ, VZP40**			VC, VCP100*, VGA				
		Evaporator Temperature °C											
	kW	10°	5°	-5°	-15°	-20°	-30°	-40°	10°	5°	-5°	-15°	-20°
AAA	1.2	0.74	0.72	0.79	0.69	0.66	0.45	0.34	1.04	1.02	1.14	1.01	0.97
AA	2.3	1.59	1.55	1.7	1.48	1.49	1.14	0.85	2.23	2.19	2.44	2.16	2.19
A	5.3	3.39	3.31	3.62	3.16	2.98	2.04	1.52	4.76	4.68	5.2	4.61	4.4
B	11	5.93	5.79	6.34	5.52	5.31	3.76	2.81	8.33	8.19	9.1	8.08	7.84
C	18	11	10.7	11.8	10.3	9.75	6.75	5.04	15.5	15.2	16.9	15	14.4

* MOP point CP100 ≈ 14°C
** MOP point ZP40 ≈ -12°C

Liquid Temperature Entering TEV °C

Refrigerant	-10°	0°	10°	20°	30°	50°	60°
	Correction Factor, CF Liquid Temperature						
407C	1.73	1.59	1.45	1.3	1.15	0.84	0.67
422D	1.86	1.68	1.5	1.33	1.14	0.77	0.57

These factors include corrections for liquid refrigerant density and net refrigerating effect and are based on an evaporator temperature of -15°C. However, they may be used for any evaporator temperature from -40°C to 10°C since the variation in the actual factors across this range is insignificant.

Pressure Drop Across TEV (bar)

407C, 422D Evaporator Temperature °C	2	4	6	8	10	12	14	16
	Correction Factor, CF Pressure Drop							
5° & 10°	0.58	0.82	1.00	1.15	1.29	1.41	1.53	1.63
-5° & -15°	0.50	0.71	0.87	1.00	1.12	1.22	1.32	1.41
-20° & -30°	0.45	0.63	0.77	0.89	1.00	1.11	1.18	1.26
-40°	0.41	0.58	0.71	0.82	0.91	1.00	1.08	1.15

TEV Capacity = TEV Rating x CF Liquid Temperature x CF Pressure Drop
Example: Actual capacity of a nominal 2.3 kW R-407C BQ valve with a AA cartridge size at -5°C evaporator, 10 bar pressure drop across the TEV and a 30°C liquid temperature entering the TEV = 2.44 (from rating chart) x 1.15 (CF liquid temperature) x 1.12 (CF pressure drop) = 3.14 kW.

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BQ typeThermostatic Expansion Valves Selection Tables

Air Conditioning, Heat Pump and Commercial Refrigeration Applications

Cartridge	Nominal Capacity	Refrigerant											
		404A, 507***						408A					
		Recommended Thermostatic Charge											
		SCP115*, SC			SZ, SZP**			SCP115, SC			SZ, SZP		
		Evaporator Temperature °C											
	kW	5°	-5°	-15°	-20°	-30°	-40°	5°	-5°	-15°	-20°	-30°	-40°
AAA	0.7	0.72	0.8	0.75	0.82	0.67	0.58	0.97	1.1	1.06	1.16	0.97	0.86
AA	1.2	1.45	1.59	1.5	1.58	1.24	1.07	1.97	2.2	2.11	2.25	1.8	1.59
A	3.5	3.21	3.59	3.41	3.7	3.03	2.61	4.37	4.96	4.79	5.24	4.39	3.88
B	7	5.95	6.48	5.61	5.69	4.41	3.8	8.11	8.95	7.88	8.07	6.39	5.65
C	11	9	9.81	8.49	8.65	6.75	5.82	12.3	13.6	11.9	12.3	9.78	8.65

* MOP point CP115 ≈ 10°C
** MOP point ZP ≈ -17°C
*** R507 capacities are almost identical with the R404A capacities

Liquid Temperature Entering TEV °C

Refrigerant	-10°C	0°	10°	20°	30°	40°	50°	60°
	Correction Factor, CF Liquid Temperature							
404A	1.89	1.72	1.56	1.37	1.19	1	0.79	0.56
507	1.92	1.74	1.56	1.37	1.19	1	0.79	0.54
408A	1.58	1.46	1.34	1.22	1.1	0.97	0.85	0.71

These factors include corrections for liquid refrigerant density and net refrigerating effect and are based on an evaporator temperature of -15°C. However, they may be used for any evaporator temperature from -40°C to 5°C since the variation in the actual factors across this range is insignificant.

Pressure Drop Across TEV (bar)

Evaporator Temperature °C	2	4	6	8	10	12	14	16
	Correction Factor, CF Pressure Drop							
5°	0.58	0.82	1.00	1.15	1.29	1.41	1.53	1.63
-5° & -15°	0.50	0.71	0.87	1.00	1.12	1.22	1.32	1.41
-20° & -30°	0.45	0.63	0.77	0.89	1.00	1.10	1.18	1.26
-40°	0.41	0.58	0.71	0.82	0.91	1.00	1.08	1.15

TEV Capacity = TEV Rating x CF Liquid Temperature x CF Pressure Drop
Example: Actual capacity of a nominal 1.2 kW R-404A BQ valve with a AA cartridge size at -5°C evaporator, 10 bar pressure drop across the TEV, and a 30°C liquid temperature entering the TEV = 1.59 (from rating chart) x 1.19 (CF liquid temperature) x 1.12 (CF pressure drop) = 2.12 kW.

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BQ typeThermostatic Expansion Valves Selection Tables

Air Conditioning, Heat Pump and Commercial Refrigeration Applications

Cartridge	Nominal Capacity	Refrigerant											
		134a				409A				401A			
		Recommended Thermostatic Charge											
		JC, JCP60*				FC, FCP60				FC, FCP60			
		Evaporator Temperature °C											
	kW	10°	5°	-5°	-15°	-30°	5°	-5°	-15°	10°	5°	-5°	-15°
AAA	0.7	0.87	0.85	0.99	0.95	0.67	0.85	1	0.97	0.93	0.91	1.08	1.03
AA	1.2	1.96	1.84	1.97	1.8	1.24	1.85	1.99	1.83	2.1	1.98	2.13	1.96
A	3.5	4.35	4.08	4.37	4	3.03	4.11	4.42	4.07	4.67	4.39	4.73	4.38
B	7	7.4	6.94	7.42	6.8	4.41	6.99	7.51	6.92	7.93	7.47	8.04	7.44
C	11	13.1	12.3	13.1	12	6.75	12.3	13.3	12.2	14	13.2	14.2	13.2

* MOP point CP60 ≈ 12°C

Liquid Temperature Entering TEV °C

Refrigerant	-10°C	0°	10°	20°	30°	40°	50°	60°
	Correction Factor, CF Liquid Temperature							
134a	1.64	1.52	1.39	1.26	1.13	1.00	0.87	0.73
409A	1.51	1.41	1.31	1.21	1.11	1.00	0.89	0.78
401A	1.52	1.42	1.31	1.2	1.09	0.98	0.86	0.74

These factors include corrections for liquid refrigerant density and net refrigerating effect and are based on an evaporator temperature of -15°C. However, they may be used for any evaporator temperature from -15°C to 10°C since the variation in the actual factors across this range is insignificant.

Pressure Drop Across TEV (bar)

Evaporator Temperature °C	2	4	6	8	10	12	14	16
	Correction Factor, CF Pressure Drop							
5° & 10°	0.71	1.00	1.22	1.41	1.58	1.73	1.87	2.00
-5° & -15°	0.58	0.82	1.00	1.15	1.29	1.41	1.53	1.63

TEV Capacity = TEV Rating x CF Liquid Temperature x CF Pressure Drop
Example: Actual capacity of a nominal 1.2 kW R-134a BQ valve with a AA cartridge size at -5°C evaporator, 8 bar pressure drop across the TEV, and a 30°C liquid temperature entering the TEV = 1.97 (from rating chart) x 1.13 (CF liquid temperature) x 1.15 (CF pressure drop) = 2.56 kW.

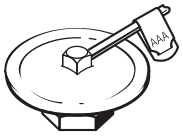
For all requests, consult your nearest Parker Sporlan Wholesaler or contact us on:
racecustomerservice@parker.com / www.parker.com/race

BQ Miscellaneous

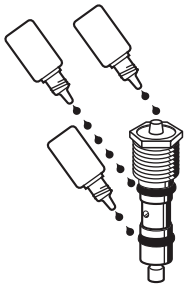
Miscellaneous Parts		Part Number
BQ Cartridge Service Kit (Empty)	BCSK-1	**184010**
(2) AAA, (4) AA, (4) A, (3) B, and (2) C Cartridges and Tags, Oil Bottle (with oil), BQ Cartridge Tool	BQ Cartridge Service Kit	**184007**
BQ Cartridge O-Ring	4508-010*	**958147**
Oil Bottle (With Oil)	OB-1	**184001**
4 mm Allen Wrench	AW-1	**184002**
BQ Cartridge Tool	4444-000	**184008**
KT-43 Element Wrench	180390	**180390**
BQ Valve Assembly Tool - Deep Well Socket	QVT-1	**184005**
Bench Flange	QVT-F	**184006**

* Cartridge requires 2 O-rings

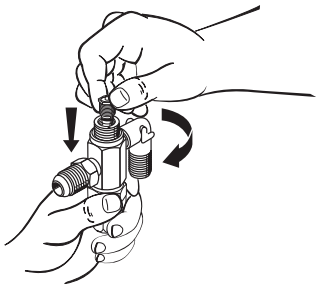
Component Assembly



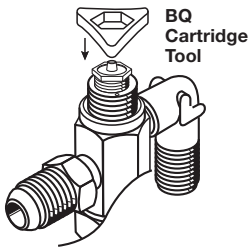
1 Attach cartridge identification tag to element capillary tube.



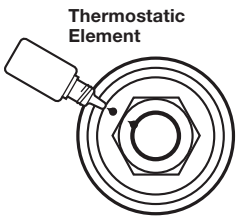
2 (Oil) Lubricate pushrods and O-rings.



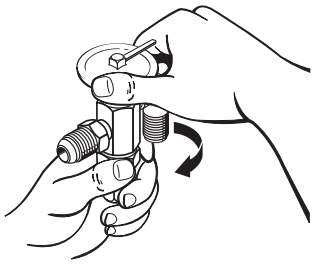
3 Turn clockwise while applying downward force.



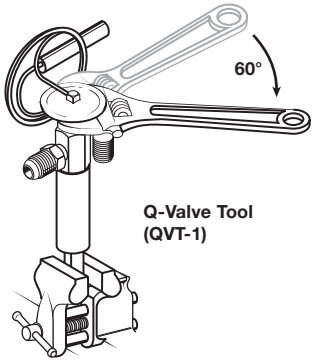
4 Turn clockwise until seated (do not over tighten).

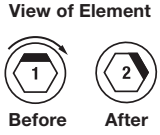


5 (Oil) Lubricate lockring surface.



6 Hand tighten element.





7 After hand tight, turn element clock wise 60° (or movement equal to one hex flat).