

Guideline and Product quick selection HFO-Blend R452A



R404A, R507 are the most commonly used refrigerant in low temperatures refrigeration systems. However, established F-Gas regulation leads the use of refrigerants with low GWP as long term solution. HFO pure and HFO blends with very low GWP are considered as long term refrigerants and viable alternative to natural flammable Hydro Carbon or high pressure CO₂ where the application of natural refrigerants is not favorable.

This short document deals with R452A and it is an extension to previous 2016 HFO/HFO-blends product guide covered R450A, R513A, R448A, R449A and R1234ze. It is intended to provide nominal and extended capacities as well as technical information only related to R452A. All other technical data, features and part code numbers of products can be found in 2016 HFO/HFO-blends product guide.

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Introduction and General Information

Introduction

R452A belongs to group of HFO-blends with lower GWP compare to R404A/R507. Emerson released Alco products in 2016 for five HFO/HFO-blends refrigerants (R450A, R513A, R448A, R449A and R1234ze). All products for R404A/R507 have been qualified also for use with R452A.

Refrigerant	Composition			Safety classification	Interim Replacement for
	R1234yf	R32	R125		
R452A	30%	11%	59%	A1	R404A, R507, R407A, R407F

Capacity changes

Following table indicates the capacity comparison of expansion valves and solenoid valves in relation to R404A and R452A. For retrofit purposes, it is more important to consider readjusting of expansion valves.

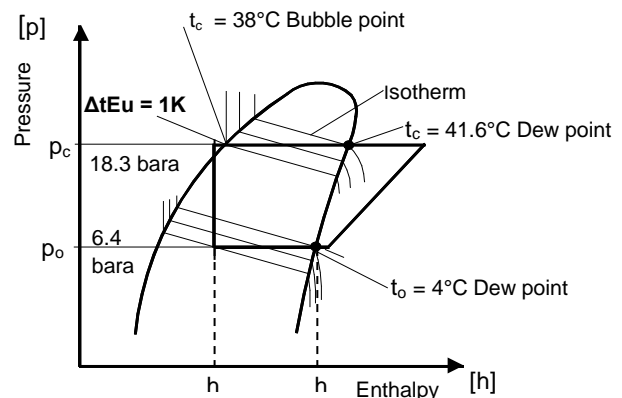
Condensing temperature	30°C						40°C						50°C					
	-40	-30	-20	-10	0	10	-40	-30	-20	-10	0	10	-40	-30	-20	-10	0	10
Evaporating temperature (°C)	Expansion valve and solenoid valve capacity change from R404A to R452A																	
R452A versus R404A	4.8%	5.2%	5.9%	6.8%	8.4%	5.5%	5.8%	6.3%	6.9%	7.9%	7.1%	7.2%	7.4%	7.8%	8.4%	4.8%	5.2%	5.9%

Note: Please see section Thermo™-Expansion Valves for detailed information and guideline for readjustment.

Dimensioning of Thermo™-Expansion Valves for systems with refrigerant having temperature glide

As opposed to single substances (e.g. R134a) where the phase change takes place at a constant temperature/pressure the evaporation and condensation of zeotropic blends are in a "gliding" form (e.g. at a constant pressure the temperature varies within a certain range) through evaporators and condensers. R452A is zeotropic blend.

The condensing /evaporating pressure must be determined at saturated temperatures (bubble for liquid / dew points for vapor) for dimensioning of the expansion valves, solenoid valves etc. The corresponding dew point for liquid pressures is provided in case of compressor selection based on dew point of liquid pressure.



R452A Glide

Temperature (°C)	-40	-30	-20	-10	0	10	20	30	40	50
Dew point pressure (bara)	1.2	1.8	2.8	4.0	5.6	7.7	10.3	13.5	17.5	22.4
Bubble point pressure (bara)	1.4	2.2	3.2	4.6	6.4	8.7	11.5	15.0	19.1	24.1

Subcooling

Subcooling generally increases the capacity of a refrigeration system and may be accounted for when dimensioning an expansion valve by applying the correction factor K_t . The capacity corrections for evaporating temperature, condensing temperature and subcooling are all incorporated in K_t . These are in particular the liquid density upstream from the expansion valve, the different enthalpies of liquid and vapor phase refrigerants as well as certain part of flash gas after expansion. The percentage of flash gas differs with various refrigerants and depends on system conditions.

Heavy subcooling results in very small flash gas amounts and

therefore **increases expansion valve capacities**. These conditions are not covered. Likewise, small flash gas amounts lead to reduced evaporator capacities and may result in substantial discrepancies between the capacities of the Thermo™-Expansion Valve and the evaporator. These effects must be considered during component selection when designing refrigeration circuits.

Quick selection tables are for very small amount of subcooling. For larger subcooling than 5K, please use the following correction factors:

Liquid Subcooling	10 K	20 K	30 K	40 K
Correction factor	0.9	0.8	0.7	0.6

EX2 Pulse Modulated Electronic Expansion Valve

EX2 Series is an electronically controlled expansion device. The capacity is defined through pulse width modulation. The primary application is for display cases and small cold rooms in commercial refrigeration such as supermarkets.

Features

- Pulse width modulated
- Utilizing standard coils ASC 24VAC/ 50 Hz or ASC 230VAC/ 50 Hz (to be ordered separately)
- Shut off function eliminates the necessity of a separate solenoid valve
- Dampened plunger reduces noise and effects of water hammer
- One valve body can be combined with 6 orifices to make 7 capacity ranges. up to 13 kW
- Available with ODF connections
- Long lifetime. high reliability



EX2

Selection table

Type	Part No.	Description	Capacity Q_n at 100% Open Valve (kW)* R452A
EX2-M00	801091	Valve less orifice 10 mm x 12 mm	13
EX2-I00	801090	Valve less orifice 3/8"x / 1/2"	
EXO-004	801089	Orifice 4	8.3
EXO-003	801088	Orifice 3	5.5
EXO-002	801087	Orifice 2	3.3
EXO-001	801086	Orifice 1	2.4
EXO-000	801085	Orifice 0	1.2
EXO-00X	801084	Orifice X	0.7
ASC 24V	801062	Coil ASC 24 VAC / 50 Hz	
ASC 230V	801064	Coil ASC 230 VAC / 50 Hz	

Note1: *) Orifice should be selected at maximum 80% of Q_n to allow covering the load fluctuation.

Note2: Nominal operating condition: +4°C evaporating temperature. +38°C bubble / +41.6°C dew condensing temperature and 1 K subcooling.

EX2 Pulse Modulated Electronic Expansion Valve

EX2: Quick selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C)	R452A Capacity (kW)													Valve/orifice type
	Evaporating temperature (°C)													
	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	
60 bubble/ 62.4 dew point	0.45	0.45	0.45	0.44	0.43	0.42	0.41	0.40	0.38	0.37	0.35	0.33	0.31	EXO-00X
	0.80	0.80	0.80	0.79	0.77	0.75	0.73	0.71	0.68	0.65	0.62	0.59	0.55	EXO-000
	1.60	1.60	1.59	1.57	1.54	1.51	1.46	1.41	1.36	1.30	1.24	1.17	1.11	EXO-001
	2.15	2.16	2.14	2.11	2.08	2.03	1.97	1.90	1.83	1.75	1.67	1.58	1.49	EXO-002
	3.61	3.61	3.59	3.54	3.48	3.39	3.29	3.18	3.06	2.93	2.79	2.64	2.49	EXO-003
	5.46	5.47	5.43	5.36	5.26	5.13	4.99	4.82	4.63	4.43	4.22	4.00	3.77	EXO-004
	8.62	8.63	8.57	8.46	8.30	8.10	7.87	7.60	7.31	7.00	6.66	6.31	5.94	EX2-M/I
50 bubble/ 53.1 dew point	0.49	0.50	0.50	0.51	0.50	0.50	0.49	0.48	0.47	0.46	0.44	0.43	0.41	EXO-00X
	0.87	0.89	0.90	0.90	0.89	0.89	0.87	0.85	0.83	0.81	0.78	0.76	0.73	EXO-000
	1.74	1.78	1.79	1.80	1.79	1.77	1.74	1.71	1.67	1.62	1.57	1.51	1.45	EXO-001
	2.34	2.39	2.41	2.42	2.40	2.38	2.34	2.30	2.24	2.18	2.11	2.03	1.95	EXO-002
	3.92	4.00	4.04	4.05	4.03	3.98	3.92	3.84	3.75	3.64	3.53	3.40	3.27	EXO-003
	5.94	6.05	6.11	6.12	6.10	6.03	5.94	5.82	5.68	5.52	5.34	5.15	4.95	EXO-004
	9.37	9.55	9.65	9.66	9.62	9.52	9.37	9.18	8.96	8.71	8.43	8.13	7.81	EX2-M/I
40 bubble/ 43.6 dew point	0.47	0.50	0.51	0.52	0.53	0.53	0.52	0.52	0.51	0.50	0.49	0.48	0.47	EXO-00X
	0.84	0.88	0.91	0.93	0.93	0.94	0.93	0.92	0.91	0.89	0.87	0.85	0.83	EXO-000
	1.68	1.76	1.82	1.85	1.87	1.87	1.87	1.85	1.82	1.79	1.75	1.71	1.66	EXO-001
	2.26	2.37	2.44	2.49	2.51	2.52	2.51	2.48	2.45	2.40	2.35	2.29	2.23	EXO-002
	3.79	3.96	4.09	4.16	4.20	4.21	4.20	4.16	4.10	4.03	3.94	3.84	3.73	EXO-003
	5.73	6.00	6.19	6.30	6.37	6.38	6.35	6.30	6.21	6.09	5.96	5.81	5.64	EXO-004
	9.05	9.47	9.76	9.95	10.04	10.07	10.03	9.93	9.80	9.62	9.41	9.17	8.90	EX2-M/I
30 bubble/ 33.9 dew point	0.40	0.44	0.47	0.49	0.51	0.52	0.52	0.53	0.52	0.52	0.51	0.50	0.49	EXO-00X
	0.71	0.79	0.84	0.88	0.91	0.92	0.93	0.93	0.93	0.92	0.91	0.90	0.88	EXO-000
	1.42	1.57	1.68	1.76	1.81	1.85	1.87	1.87	1.86	1.85	1.82	1.79	1.75	EXO-001
	1.91	2.11	2.26	2.36	2.44	2.48	2.51	2.51	2.50	2.48	2.45	2.41	2.36	EXO-002
	3.19	3.53	3.78	3.96	4.08	4.16	4.20	4.21	4.19	4.16	4.10	4.03	3.95	EXO-003
	4.83	5.35	5.72	5.99	6.17	6.29	6.35	6.37	6.35	6.29	6.21	6.10	5.98	EXO-004
	7.62	8.44	9.03	9.45	9.74	9.93	10.03	10.05	10.01	9.93	9.80	9.63	9.43	EX2-M/I
20 bubble/ 24 dew point		0.32	0.38	0.42	0.46	0.48	0.49	0.50	0.51	0.51	0.51	0.50	0.50	EXO-00X
		0.57	0.68	0.75	0.81	0.85	0.87	0.89	0.90	0.90	0.90	0.89	0.88	EXO-000
		1.14	1.36	1.51	1.62	1.70	1.75	1.78	1.80	1.80	1.80	1.78	1.76	EXO-001
		1.53	1.82	2.03	2.17	2.28	2.35	2.40	2.42	2.43	2.42	2.40	2.37	EXO-002
		2.56	3.05	3.39	3.64	3.82	3.93	4.01	4.05	4.06	4.05	4.01	3.96	EXO-003
		3.87	4.62	5.14	5.51	5.78	5.96	6.07	6.13	6.15	6.13	6.07	6.00	EXO-004
		6.11	7.29	8.11	8.70	9.11	9.40	9.58	9.68	9.70	9.67	9.58	9.46	EX2-M/I
10 bubble/ 14.1 dew point				0.29	0.35	0.39	0.42	0.44	0.46	0.47	0.47	0.47	0.47	EXO-00X
				0.51	0.62	0.70	0.75	0.79	0.82	0.83	0.84	0.84	0.84	EXO-000
				1.02	1.24	1.40	1.50	1.58	1.63	1.66	1.68	1.69	1.68	EXO-001
				1.36	1.67	1.87	2.02	2.12	2.19	2.24	2.26	2.27	2.26	EXO-002
				2.28	2.79	3.14	3.38	3.55	3.67	3.74	3.78	3.79	3.78	EXO-003
				3.46	4.23	4.75	5.12	5.38	5.56	5.67	5.73	5.74	5.72	EXO-004
				5.46	6.67	7.50	8.08	8.49	8.77	8.95	9.04	9.06	9.03	EX2-M/I
0 bubble/ 4.1 dew point						0.23	0.30	0.35	0.38	0.40	0.41	0.42	0.43	EXO-00X
						0.42	0.54	0.61	0.67	0.71	0.73	0.75	0.76	EXO-000
						0.83	1.07	1.23	1.34	1.41	1.46	1.50	1.51	EXO-001
						1.12	1.44	1.65	1.80	1.90	1.97	2.01	2.03	EXO-002
						1.87	2.41	2.77	3.01	3.18	3.30	3.37	3.40	EXO-003
						2.83	3.65	4.19	4.56	4.82	4.99	5.10	5.15	EXO-004
						4.46	5.76	6.61	7.20	7.60	7.87	8.04	8.13	EX2-M/I

Electrical Control Valves EX4-8

EMERSON **EX4-8** are stepper motor driven valves for precise control of refrigerant mass flow in air conditioning, refrigeration, heat pumps, close control and industrial process cooling applications. The Electrical Control Valves can be used as thermo-expansion duty, liquid injection duty, hot gas bypass, evaporator pressure regulator, crankcase pressure regulator, head pressure regulator or liquid level control.

Features

- Multifunction as expansion valves, hot gas bypass, suction gas throttling, head pressure, liquid level actuator etc.
- Fully hermetic design
- Short opening and closing time
- Very fast full stroke time
- Positive shut-off function to eliminate the use of an additional solenoid valve
- Linear flow capacity
- Extremely wide capacity range (5...100%)
- Ceramic slide and port for accurate flow and minimal wear
- Corrosion resistant stainless steel body and connections



Selection table / Nominal capacities as expansion valves and liquid injection valves (5% ... 100%)

Type	Part No.	Flow pattern	Nominal capacity (kW), R452A	Inlet connection	Outlet connection	Electrical connector
EX4-I21	800615	Uni-flow	12.5	3/8" ODF	5/8" ODF	M12 plug
EX4-M21	800616			10 mm ODF	16 mm ODF	
EX5-U21	800618		38	5/8" (16 mm) ODF	7/8" (22 mm) ODF	
EX6-I21	800620		91	7/8" ODF	1-1/8" ODF	
EX6-M21	800621			22 mm ODF	28 mm ODF	
EX7-I21	800624		250	1-1/8" ODF	1-3/8" ODF	
EX7-M21	800625			28 mm ODF	35 mm ODF	
EX8-M21	800629		666	42 mm ODF	42 mm ODF	
EX8-U21	800630			1-3/8" (35 mm) ODF	1-3/8" (35 mm) ODF	
EX8-I21	800631			1-5/8" ODF	1-5/8" ODF	

Note1: Nominal operating condition: +4°C evaporating temperature, +38°C bubble / +41.6°C dew condensing temperature and 1 K subcooling.

Recommendation to use EX4-8 with EC3-X32/33 and EXD-SH1/2 drivers/controllers in conjunction with R452A

Current software of drivers/controllers supports 16 different refrigerants: R22, R23, R124, R134a, R404A, R407A, R407C, R407F, R410A, R448A, R449A, R450A, R507, R513A, R744, R1234ze. It is possible to use these drivers with R452A with following considerations:

- R404A shall be selected from available refrigerants in menu of parameter related to the refrigerant type
- Set superheat setting 2.5 K higher than design/desired set-point. For example: set superheat setting at 9.5 K in order driver to control superheat at 7 K regardless of other operating conditions.

Note:

- Superheat value in display is 2.5 K higher than real superheat at outlet of evaporator
- Evaporating temperature value in display is 2.5 K lower than real evaporating temperature of system

Example: System with R452A

Design conditions:

- Refrigerant: R452A
- Evaporating temperature: -35°C
- Evaporating pressure would be 1.5 bara according R452A
- Desired superheat: 6K

Setting of controllers before Startup:

- Select Refrigerant R404A
- Set Superheat at 8.5K

Result:

Parameter	Display value	Operational value
Evaporating temperature	-37.5°C	-35°C
Evaporating pressure	1.5 bara	1.5 bara
Superheat	8.5 K	6 K

Electrical Control Valves EX4-8

EX4-8: Quick selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C)	R452A Capacity (kW)													Valve type
	Evaporating temperature (°C)													
	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	
60 bubble/ 62.4 dew point	10.3	10.3	10.1	10.0	9.7	9.4	9.1	8.8	8.4	8.0	7.6	7.1	6.7	EX4
	31	31	31	30	29	29	28	27	25	24	23	22	20	EX5
	75	75	74	72	71	69	66	64	61	58	55	52	49	EX6
	207	206	203	199	194	189	182	175	168	160	151	143	134	EX7
	552	548	541	531	518	503	486	468	447	426	404	380	356	EX8
50 bubble/ 53.1 dew point	11.5	11.6	11.6	11.5	11.4	11.2	11.0	10.7	10.4	10.1	9.7	9.4	9.0	EX4
	35	35	35	35	35	34	33	33	32	31	30	28	27	EX5
	83	84	84	84	83	82	80	78	76	74	71	68	65	EX6
	229	231	232	231	228	225	220	215	209	202	195	187	179	EX7
	611	617	618	615	609	599	587	573	557	539	520	499	478	EX8
40 bubble/ 43.6 dew point	11.4	11.7	11.9	12.0	12.1	12.0	11.9	11.7	11.5	11.3	11.0	10.7	10.3	EX4
	34	35	36	36	37	36	36	36	35	34	33	32	31	EX5
	83	85	87	88	88	87	87	85	84	82	80	78	75	EX6
	227	234	239	241	241	240	238	235	231	226	220	214	207	EX7
	606	624	636	642	644	641	635	626	615	602	586	569	551	EX8
30 bubble/ 33.9 dew point	10.1	10.8	11.3	11.7	11.9	12.0	12.1	12.0	11.9	11.7	11.5	11.3	11.0	EX4
	31	33	34	35	36	36	37	36	36	36	35	34	33	EX5
	74	79	82	85	87	87	88	87	87	85	84	82	80	EX6
	202	217	227	234	238	240	241	240	238	235	231	226	221	EX7
	540	578	605	623	635	641	643	640	635	626	616	603	589	EX8
20 bubble/ 24 dew point	7.3	8.7	9.7	10.4	10.9	11.3	11.5	11.6	11.6	11.6	11.5	11.3	11.2	EX4
	22	26	29	32	33	34	35	35	35	35	35	34	34	EX5
	53	64	71	76	79	82	84	84	85	84	84	83	81	EX6
	147	175	194	209	219	225	230	232	233	232	230	227	223	EX7
	391	466	519	556	583	601	613	619	620	618	613	605	595	EX8
10 bubble/ 14.1 dew point			6.5	8.0	9.0	9.7	10.2	10.5	10.7	10.8	10.9	10.8	10.7	EX4
			20	24	27	29	31	32	33	33	33	33	33	EX5
			48	58	65	70	74	76	78	79	79	79	78	EX6
			131	160	180	194	204	210	215	217	217	217	215	EX7
			349	427	480	517	543	561	572	578	580	578	573	EX8
0 bubble/ 4.1 dew point					5.4	6.9	7.9	8.6	9.1	9.4	9.6	9.8	9.8	EX4
					16	21	24	26	28	29	29	30	30	EX5
					39	50	58	63	66	69	70	71	71	EX6
					107	138	159	173	182	189	193	195	196	EX7
					286	369	423	460	486	504	514	520	522	EX8
-10 bubble/ -5.9 dew point							3.5	5.4	6.5	7.2	7.7	8.0	8.2	EX4
							11	16	20	22	23	24	25	EX5
							26	39	47	52	56	58	60	EX6
							70	108	130	144	154	161	165	EX7
							187	287	346	385	411	429	440	EX8
-20 bubble/ -16 dew point										3.0	4.5	5.3	5.9	EX4
										9	14	16	18	EX5
										22	32	39	43	EX6
										60	89	106	117	EX7
										160	238	284	313	EX8

TI Series - Thermo™-Expansion Valves

EMERSON TI series of Thermo™-Expansion Valves with interchangeable orifices are designed for refrigeration applications.

Features

- Eight interchangeable orifice assemblies provide a capacity range from 0.4...14.8 KW
- 45 bar maximum working pressure allows the use of high pressure refrigerants
- Three styles of connections:
 - TILE: Stainless steel brazed fittings eliminate the need of wet rags during brazing
 - TIS(E): Copper brazed fittings (valve requires wet rag during brazing)
 - TI(E): Flare
- Cleanable / exchangeable inlet strainer in orifice assembly
- Constant superheat across a wide application range
- Large diaphragm eliminates disturbances to the valve and provides smoother and consistent valve control
- Laser welded stainless steel power element
- Internal or external equalizer
- Inlet brazing adapter
- Adjustable static superheat
- Special setting upon request an minimum 100 pieces order quantity



TISE



TIE

Selection table

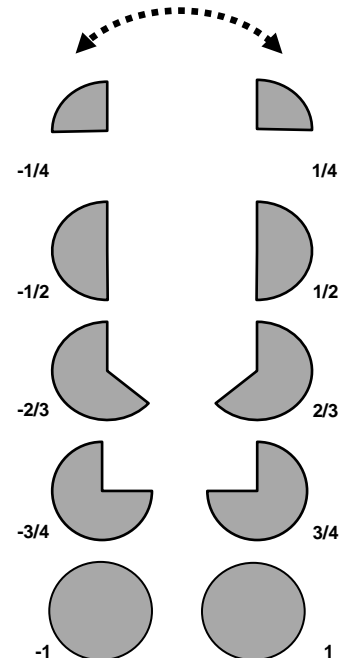
Orifice type	Part No.	Nominal capacity of orifices (kW) R452A
TIO-00X	800532	0.4
TIO-000	800533	1.0
TIO-001	800534	2.4
TIO-002	800535	4.0
TIO-003	800536	6.4
TIO-004	800537	10.5
TIO-005	800538	12.8
TIO-006	800539	14.8

Note:
Nominal operating conditions:
+4°C evaporating temp.,
+38°C bubble / +41.6°C dew
condensing temperature and
1 K subcooling.

The following table/graphic is a guideline for readjustment:

Evaporating temperature (°C)	TI...-SW... Number of turn
-40	+3/4
-30	+1
-20	+1-1/3
-10	+1-3/4
0	+2-1/4
5	+2-1/3

Note:
Number of turns in direction
of clockwise as positive
number and in direction of
counter-clockwise as
negative number.



TI Series - Thermo™-Expansion Valves

TI: Quick selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C)	R452A Capacity (kW)													Orifice type
	Evaporating temperature (°C)													
	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	
60 bubble/ 62.4 dew point	0.31	0.31	0.31	0.31	0.30	0.29	0.26	0.21	0.17	0.14	0.11	0.08	0.07	TIO-00x
	0.81	0.81	0.81	0.80	0.78	0.77	0.67	0.55	0.45	0.35	0.28	0.22	0.17	TIO-000
	2.0	2.0	2.0	2.0	1.9	1.9	1.6	1.4	1.1	0.87	0.68	0.54	0.42	TIO-001
	3.3	3.3	3.3	3.3	3.2	3.1	2.7	2.3	1.8	1.4	1.1	0.9	0.7	TIO-002
	5.3	5.3	5.3	5.2	5.1	5.0	4.4	3.6	2.9	2.3	1.8	1.4	1.1	TIO-003
	8.7	8.7	8.7	8.5	8.4	8.2	7.1	5.9	4.8	3.8	3.0	2.3	1.8	TIO-004
	10.6	10.6	10.5	10.4	10.2	10.0	8.7	7.2	5.8	4.6	3.6	2.8	2.2	TIO-005
	12.2	12.2	12.1	12.0	11.8	11.5	10.0	8.3	6.7	5.3	4.2	3.3	2.6	TIO-006
50 bubble/ 53.1 dew point	0.34	0.35	0.35	0.35	0.35	0.35	0.31	0.26	0.21	0.17	0.14	0.11	0.09	TIO-00x
	0.89	0.90	0.91	0.91	0.91	0.90	0.79	0.67	0.55	0.44	0.35	0.28	0.23	TIO-000
	2.2	2.2	2.2	2.2	2.2	2.2	2.0	1.6	1.3	1.08	0.87	0.69	0.56	TIO-001
	3.6	3.7	3.7	3.7	3.7	3.7	3.2	2.7	2.2	1.8	1.4	1.1	0.9	TIO-002
	5.8	5.9	6.0	6.0	5.9	5.9	5.2	4.4	3.6	2.9	2.3	1.8	1.5	TIO-003
	9.5	9.6	9.7	9.8	9.7	9.6	8.5	7.2	5.8	4.7	3.8	3.0	2.4	TIO-004
	11.5	11.7	11.8	11.9	11.8	11.7	10.3	8.7	7.1	5.7	4.6	3.7	2.9	TIO-005
	13.3	13.5	13.7	13.7	13.6	13.5	11.9	10.0	8.2	6.6	5.3	4.2	3.4	TIO-006
40 bubble/ 43.6 dew point	0.33	0.34	0.35	0.36	0.36	0.37	0.33	0.28	0.23	0.19	0.15	0.12	0.10	TIO-00x
	0.85	0.89	0.92	0.94	0.95	0.95	0.85	0.72	0.60	0.49	0.39	0.32	0.26	TIO-000
	2.1	2.2	2.3	2.3	2.3	2.3	2.1	1.8	1.5	1.20	0.97	0.78	0.64	TIO-001
	3.5	3.6	3.8	3.8	3.9	3.9	3.5	3.0	2.4	2.0	1.6	1.3	1.1	TIO-002
	5.6	5.8	6.0	6.1	6.2	6.2	5.6	4.7	3.9	3.2	2.6	2.1	1.7	TIO-003
	9.1	9.6	9.9	10.0	10.1	10.2	9.1	7.7	6.4	5.2	4.2	3.4	2.8	TIO-004
	11.1	11.6	12.0	12.2	12.3	12.4	11.0	9.4	7.8	6.3	5.1	4.1	3.4	TIO-005
	12.8	13.4	13.8	14.1	14.2	14.3	12.7	10.9	9.0	7.3	5.9	4.8	3.9	TIO-006
30 bubble/ 33.9 dew point	0.28	0.31	0.33	0.34	0.35	0.36	0.33	0.28	0.23	0.19	0.16	0.13	0.11	TIO-00x
	0.72	0.80	0.85	0.89	0.92	0.94	0.85	0.73	0.61	0.50	0.41	0.33	0.27	TIO-000
	1.8	2.0	2.1	2.2	2.3	2.3	2.1	1.8	1.5	1.23	1.01	0.82	0.67	TIO-001
	2.9	3.3	3.5	3.6	3.8	3.8	3.5	3.0	2.5	2.0	1.7	1.4	1.1	TIO-002
	4.7	5.2	5.6	5.8	6.0	6.1	5.6	4.8	4.0	3.3	2.7	2.2	1.8	TIO-003
	7.7	8.5	9.1	9.5	9.8	10.0	9.1	7.8	6.5	5.4	4.4	3.6	2.9	TIO-004
	9.4	10.4	11.1	11.6	12.0	12.2	11.0	9.5	7.9	6.5	5.3	4.3	3.6	TIO-005
	10.8	12.0	12.8	13.4	13.8	14.1	12.7	11.0	9.2	7.5	6.1	5.0	4.1	TIO-006
20 bubble/ 24 dew point	0.22	0.26	0.29	0.32	0.33	0.31	0.27	0.23	0.19	0.16	0.13	0.11	TIO-00x	
	0.58	0.69	0.77	0.82	0.86	0.80	0.70	0.59	0.49	0.40	0.33	0.27	TIO-000	
	1.4	1.7	1.9	2.0	2.1	2.0	1.7	1.5	1.21	0.99	0.82	0.68	TIO-001	
	2.4	2.8	3.1	3.3	3.5	3.2	2.8	2.4	2.0	1.6	1.4	1.1	TIO-002	
	3.8	4.5	5.0	5.4	5.6	5.2	4.6	3.9	3.2	2.6	2.2	1.8	TIO-003	
	6.2	7.4	8.2	8.8	9.2	8.5	7.5	6.3	5.2	4.3	3.6	2.9	TIO-004	
	7.5	9.0	10.0	10.7	11.2	10.3	9.1	7.7	6.4	5.2	4.3	3.6	TIO-005	
	8.7	10.3	11.5	12.3	12.9	11.9	10.5	8.9	7.4	6.1	5.0	4.1	TIO-006	
10 bubble/ 14.1 dew point	0.20	0.24	0.27	0.26	0.24	0.21	0.17	0.15	0.12	0.10	TIO-00x			
	0.52	0.63	0.71	0.68	0.62	0.54	0.45	0.38	0.31	0.26	TIO-000			
	1.3	1.6	1.7	1.7	1.5	1.3	1.11	0.93	0.77	0.65	TIO-001			
	2.1	2.6	2.9	2.8	2.5	2.2	1.8	1.5	1.3	1.1	TIO-002			
	3.4	4.1	4.6	4.5	4.0	3.5	3.0	2.5	2.1	1.7	TIO-003			
	5.5	6.7	7.6	7.3	6.6	5.7	4.8	4.0	3.4	2.8	TIO-004			
	6.7	8.2	9.2	8.9	8.0	7.0	5.9	4.9	4.1	3.4	TIO-005			
	7.7	9.5	10.6	10.3	9.3	8.0	6.8	5.7	4.7	3.9	TIO-006			

Thermo™-Expansion Valves T-Series

EMERSON Take-apart Thermo™-Expansion Valves are designed for air conditioning, chillers, rooftops, close control, A/C transportation, heat pumps, industrial cooling process, refrigeration and numerous special applications. The take-apart expansion valves are ideal for those applications requiring flexibility in selection of capacity and excellent stable superheat control under varying operating conditions such as high and low head pressure, wide load variation and partial load down to 10%. Valves with XB power elements can be applied in systems with Copeland Digital Scroll™ Compressors.

Features

- Take-apart design consists of power element, cage and flange
- Large diaphragm eliminates disturbances to the valve and provides smoother and consistent valve control over wide range of operation
- Constant superheat across a wide application range



Selection table T-Series

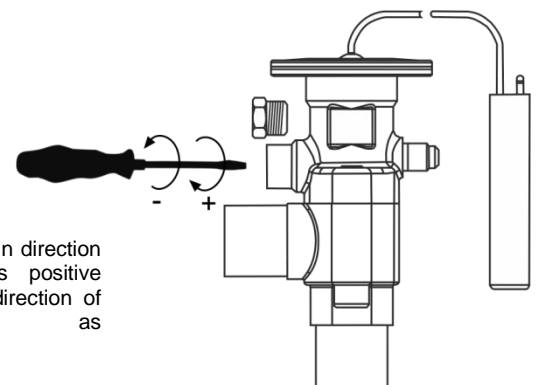
Series	Orifice Type	Power Element	Nominal capacity of orifices (kW) R452A
TCLE-	X22440-B1B	XB1019-SW...1B	1.4
	X22440-B2B		2.8
	X22440-B3B		6.0
	X22440-B3.5B		9.0
	X22440-B4B		13.1
	X22440-B5B		16.8
	X22440-B6B		23.0
	X22440-B7B		31.1
TJRE-	X11873-B4B		43.9
	X11873-B5B		56
TERE	X9117-B6B	XC726-SW...2B	69
	X9117-B7B		79
	X9117-B8B		108
	X9117-B9B		132
TIRE-	X9166-B10B		169
THRE-	X9144-B11B		192
	X9144-B13B		229

Note:

Nominal operating condition: +4°C evaporating temperature, +38°C bubble / +41.6°C dew condensing temperature and 1 K subcooling.

The following table/graphic is a guideline for readjustment

Evaporating temperature (°C)	XB1019-SW...	XC726-SW...
	R452A Number of turn	
-40	+3	+4
-35	+3.5	+4.5
-30	+4	+5
-25	+5	+6
-20	+5.5	+7
-15	+6	+8
-10	+7	+9
-5	+8	+10
0	+8.5	+11.5
5	+9.5	+12.5
10	+10	+13.5



Note:

Number of turns in direction of clockwise as positive number and in direction of counterclockwise as negative number.

Thermo™-Expansion Valves T-Series (Cages sizes 1 to 8)

TCLE: Quick selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C)	R452A												Cage assembly type	
	Capacity (kW)													
	Evaporating temperature (°C)													
	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	
60 bubble/ 62.4 dew point	1.2	1.2	1.2	1.2	1.1	1.1	1.0	0.8	0.7	0.5	0.4	0.3	0.3	X22440-B1B
	2.3	2.3	2.3	2.3	2.2	2.2	1.9	1.6	1.3	1.0	0.8	0.6	0.5	X22440-B2B
	4.9	5.0	4.9	4.9	4.8	4.7	4.0	3.4	2.7	2.1	1.7	1.3	1.0	X22440-B3B
	7.5	7.5	7.4	7.3	7.2	7.0	6.1	5.1	4.1	3.2	2.5	2.0	1.6	X22440-B3.5B
	10.8	10.8	10.8	10.6	10.4	10.2	8.9	7.4	5.9	4.7	3.7	2.9	2.3	X22440-B4B
	13.9	13.9	13.8	13.6	13.4	13.1	11.4	9.5	7.6	6.0	4.8	3.7	2.9	X22440-B5B
	19.0	19.1	18.9	18.7	18.3	17.9	15.6	12.9	10.4	8.3	6.5	5.1	4.0	X22440-B6B
	25.7	25.8	25.6	25.3	24.8	24.2	21.1	17.5	14.1	11.2	8.8	6.9	5.5	X22440-B7B
	29.9	30.0	29.8	29.4	28.8	28.1	24.5	20.4	16.4	13.0	10.2	8.0	6.3	X22440-B8B
50 bubble/ 53.1 dew point	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.0	0.8	0.6	0.5	0.4	0.3	X22440-B1B
	2.5	2.6	2.6	2.6	2.6	2.6	2.3	1.9	1.6	1.3	1.0	0.8	0.6	X22440-B2B
	5.4	5.5	5.5	5.5	5.5	5.5	4.8	4.1	3.3	2.7	2.1	1.7	1.4	X22440-B3B
	8.1	8.3	8.3	8.4	8.3	8.2	7.3	6.1	5.0	4.0	3.2	2.6	2.1	X22440-B3.5B
	11.8	12.0	12.1	12.2	12.1	12.0	10.6	8.9	7.3	5.9	4.7	3.8	3.0	X22440-B4B
	15.1	15.4	15.6	15.6	15.5	15.4	13.6	11.4	9.3	7.5	6.0	4.8	3.9	X22440-B5B
	20.7	21.1	21.3	21.4	21.3	21.0	18.6	15.6	12.8	10.3	8.2	6.6	5.3	X22440-B6B
	28.0	28.5	28.8	28.9	28.7	28.4	25.1	21.1	17.3	13.9	11.1	8.9	7.2	X22440-B7B
	32.6	33.2	33.5	33.6	33.4	33.1	29.2	24.6	20.1	16.2	12.9	10.4	8.3	X22440-B8B
40 bubble/ 43.6 dew point	1.2	1.3	1.3	1.4	1.4	1.4	1.2	1.1	0.9	0.7	0.6	0.5	0.4	X22440-B1B
	2.4	2.5	2.6	2.7	2.7	2.7	2.4	2.1	1.7	1.4	1.1	0.9	0.7	X22440-B2B
	5.2	5.4	5.6	5.7	5.8	5.8	5.2	4.4	3.6	3.0	2.4	1.9	1.6	X22440-B3B
	7.8	8.2	8.4	8.6	8.7	8.7	7.8	6.6	5.5	4.4	3.6	2.9	2.4	X22440-B3.5B
	11.4	11.9	12.3	12.5	12.6	12.7	11.3	9.6	8.0	6.5	5.2	4.2	3.4	X22440-B4B
	14.6	15.3	15.7	16.0	16.2	16.2	14.5	12.4	10.2	8.3	6.7	5.4	4.4	X22440-B5B
	20.0	20.9	21.6	22.0	22.2	22.2	19.9	16.9	14.0	11.4	9.2	7.4	6.0	X22440-B6B
	27.0	28.3	29.2	29.7	30.0	30.1	26.8	22.9	18.9	15.4	12.4	10.1	8.2	X22440-B7B
	31.4	32.9	33.9	34.6	34.9	35.0	31.2	26.6	22.0	17.9	14.4	11.7	9.5	X22440-B8B
30 bubble/ 33.9 dew point	1.1	1.2	1.2	1.3	1.3	1.4	1.2	1.1	0.9	0.7	0.6	0.5	0.4	X22440-B1B
	2.1	2.3	2.4	2.5	2.6	2.7	2.4	2.1	1.7	1.4	1.2	1.0	0.8	X22440-B2B
	4.4	4.8	5.2	5.4	5.6	5.7	5.2	4.4	3.7	3.0	2.5	2.0	1.7	X22440-B3B
	6.6	7.3	7.8	8.2	8.4	8.6	7.8	6.7	5.6	4.6	3.7	3.1	2.5	X22440-B3.5B
	9.6	10.6	11.4	11.9	12.2	12.5	11.3	9.7	8.1	6.7	5.4	4.4	3.6	X22440-B4B
	12.3	13.6	14.6	15.3	15.7	16.0	14.5	12.5	10.4	8.6	7.0	5.7	4.7	X22440-B5B
	16.8	18.6	20.0	20.9	21.5	21.9	19.9	17.1	14.3	11.7	9.6	7.8	6.4	X22440-B6B
	22.8	25.2	27.0	28.2	29.1	29.7	26.8	23.1	19.3	15.9	12.9	10.6	8.7	X22440-B7B
	26.5	29.3	31.4	32.8	33.8	34.5	31.2	26.9	22.5	18.4	15.0	12.3	10.1	X22440-B8B
20 bubble/ 24 dew point	0.8	1.0	1.1	1.2	1.2	1.3	1.2	1.0	0.9	0.7	0.6	0.5	0.4	X22440-B1B
	1.6	2.0	2.2	2.3	2.5	2.5	2.3	2.0	1.7	1.4	1.1	0.9	0.8	X22440-B2B
	3.5	4.2	4.7	5.0	5.2	5.2	4.8	4.2	3.6	3.0	2.5	2.0	1.7	X22440-B3B
	5.3	6.3	7.0	7.5	7.9	7.9	7.3	6.4	5.4	4.5	3.7	3.0	2.5	X22440-B3.5B
	7.7	9.2	10.2	10.9	11.5	11.5	10.6	9.3	7.9	6.5	5.4	4.4	3.7	X22440-B4B
	9.9	11.8	13.1	14.0	14.7	14.7	13.6	11.9	10.1	8.4	6.9	5.7	4.7	X22440-B5B
	13.5	16.1	17.9	19.2	20.1	20.1	18.6	16.3	13.8	11.5	9.4	7.8	6.4	X22440-B6B
	18.3	21.8	24.2	26.0	27.2	27.2	25.2	22.1	18.7	15.5	12.8	10.5	8.7	X22440-B7B
	21.2	25.3	28.2	30.2	31.7	31.7	29.3	25.7	21.7	18.0	14.8	12.2	10.1	X22440-B8B

Thermo™-Expansion Valves T-Series (Larger Cages)

TCLE: Quick selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C)	R452A Capacity (kW)												Cage assembly type	
	Evaporating temperature (°C)													
	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40		-45
60 bubble/ 62.4 dew point	36	36	36	36	35	34	30	25	20	16	12	10	8	X11873-B4B
	46	46	46	45	45	44	38	32	25	20	16	12	10	X11873-B5B
	57	57	57	56	55	54	47	39	31	25	19	15	12	X9117-B6B
	65	65	65	64	63	61	53	44	36	28	22	18	14	X9117-B7B
	90	90	89	88	86	84	73	61	49	39	31	24	19	X9117-B8B
	109	109	108	107	105	102	89	74	60	47	37	29	23	X9117-B9B
	140	140	139	137	135	131	114	95	77	61	48	38	30	X9166-B10B
	158	159	158	156	153	149	130	108	87	69	54	43	34	X9144-B11B
	189	189	188	186	182	178	155	129	104	82	65	51	40	X9144-B13B
50 bubble/ 53.1 dew point	39	40	41	41	41	40	35	30	24	20	16	13	10	X11873-B4B
	50	51	52	52	52	51	45	38	31	25	20	16	13	X11873-B5B
	62	63	64	64	64	63	56	47	38	31	25	20	16	X9117-B6B
	71	72	73	73	73	72	63	54	44	35	28	23	18	X9117-B7B
	97	99	100	100	100	99	87	74	60	48	39	31	25	X9117-B8B
	118	121	122	122	122	120	106	90	73	59	47	38	30	X9117-B9B
	152	155	156	157	156	154	136	115	94	75	60	48	39	X9166-B10B
	172	176	177	178	177	175	154	130	106	86	69	55	44	X9144-B11B
	206	210	212	212	211	209	184	155	127	102	82	66	53	X9144-B13B
40 bubble/ 43.6 dew point	38	40	41	42	42	42	38	32	27	22	18	14	12	X11873-B4B
	49	51	52	53	54	54	48	41	34	28	22	18	15	X11873-B5B
	60	63	65	66	66	67	59	51	42	34	28	22	18	X9117-B6B
	68	72	74	75	76	76	68	58	48	39	31	25	21	X9117-B7B
	94	98	101	103	104	105	93	80	66	53	43	35	28	X9117-B8B
	114	120	123	126	127	127	114	97	80	65	53	43	35	X9117-B9B
	147	153	158	161	163	163	146	124	103	83	67	55	44	X9166-B10B
	166	174	179	183	185	185	165	141	116	95	76	62	50	X9144-B11B
	199	208	214	218	220	221	197	168	139	113	91	74	60	X9144-B13B
30 bubble/ 33.9 dew point	32	36	38	40	41	42	38	33	27	22	18	15	12	X11873-B4B
	41	45	49	51	52	53	48	42	35	29	23	19	16	X11873-B5B
	50	56	60	63	64	66	59	51	43	35	29	23	19	X9117-B6B
	58	64	68	71	74	75	68	59	49	40	33	27	22	X9117-B7B
	79	88	94	98	101	103	93	81	67	55	45	37	30	X9117-B8B
	96	107	114	120	123	126	114	98	82	67	55	45	37	X9117-B9B
	124	137	146	153	158	161	146	126	105	86	70	57	47	X9166-B10B
	140	155	166	174	179	183	165	142	119	98	80	65	53	X9144-B11B
	167	185	198	207	214	218	197	170	142	116	95	78	64	X9144-B13B
20 bubble/ 24 dew point	26	31	34	37	38	36	31	26	22	18	15	12	X11873-B4B	
	33	39	44	47	49	45	40	34	28	23	19	16	X11873-B5B	
	40	48	54	58	60	56	49	41	34	28	23	19	X9117-B6B	
	46	55	61	66	69	64	56	47	39	32	27	22	X9117-B7B	
	64	76	84	90	95	88	77	65	54	44	37	30	X9117-B8B	
	77	92	103	110	115	107	93	79	66	54	45	37	X9117-B9B	
	99	118	131	141	148	137	120	101	84	69	57	47	X9166-B10B	
	112	134	149	160	168	155	136	115	95	79	65	53	X9144-B11B	
	134	160	178	191	200	185	162	137	114	94	77	64	X9144-B13B	

2-Way Solenoid Valves Series

Features

- Normally closed
- Pilot operated requires minimum operating pressure differential
- Compact size
- Extended fittings: No disassembly necessary for brazing
- Coil in 24VAC/50 Hz and 230VAC/50 Hz available



200RB



240RA + ASC

Nominal Capacity Data

Type	Kv (m ³ /h)	ΔP_{\min} (bar)	Nominal capacity for Liquid line (kW), R452A
110RB2	0.2	0	2.9
200RB3	0.4	0.05	5.4
200RB4	0.9		12.7
200RB6	1.6		22.3
240RA8	2.3		30
240RA9	4.8		62
240RA12	5.4		70
240RA16	8.8		114
240RA20	12.8		166

Note: Nominal operating condition: +4°C evaporating temperature. +38°C bubble / +41.6°C dew condensing temperature, 1 K subcooling and 0.15 bar pressure drop.

2-Way Solenoid Valves Series

Liquid line solenoid valve: Quick selection (at 0.15 bar pressure drop)

Condensing temperature (°C)	R452A Capacity (kW)												Solenoid Valve type
	Evaporating temperature (°C)												
	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	
60 bubble/ 62.4 dew point	1.9	1.8	1.7	1.7	1.6	1.6	1.5	1.4	1.4	1.3	1.2	1.2	110RB2
	3.5	3.4	3.3	3.2	3.0	2.9	2.8	2.7	2.5	2.4	2.3	2.2	200RB3
	8.2	8.0	7.7	7.5	7.2	6.9	6.6	6.3	6.0	5.7	5.4	5.1	200RB4
	14.4	14.0	13.6	13.1	12.6	12.1	11.6	11.1	10.6	10.0	9.5	8.9	200RB6
	19.2	18.7	18.1	17.4	16.8	16.1	15.5	14.8	14.1	13.4	12.6	11.9	240RA8
	40.3	39.2	37.9	36.6	35.3	33.9	32.5	31.0	29.5	28.0	26.5	25.0	240RA9
	45.4	44.0	42.6	41.2	39.7	38.1	36.5	34.9	33.2	31.5	29.8	28.1	240RA12
	74	71	69	67	64	62	59	57	54	51	48	46	240RA16
107	104	101	97	94	90	86	82	79	75	70	66	240RA20	
50 bubble/ 53.1 dew point	2.4	2.4	2.3	2.2	2.2	2.1	2.0	2.0	1.9	1.8	1.7	1.7	110RB2
	4.5	4.4	4.3	4.2	4.0	3.9	3.8	3.7	3.5	3.4	3.3	3.1	200RB3
	10.7	10.4	10.1	9.9	9.6	9.3	9.0	8.7	8.4	8.0	7.7	7.4	200RB4
	18.7	18.3	17.8	17.3	16.8	16.3	15.8	15.2	14.7	14.1	13.6	13.0	200RB6
	24.9	24.3	23.7	23.1	22.4	21.7	21.0	20.3	19.6	18.8	18.1	17.3	240RA8
	52.4	51.1	49.8	48.5	47.0	45.6	44.1	42.6	41.1	39.5	37.9	36.3	240RA9
	58.9	57.5	56.0	54.5	52.9	51.3	49.6	47.9	46.2	44.4	42.6	40.8	240RA12
	96	93	91	88	86	83	80	78	75	72	69	66	240RA16
139	136	132	129	125	121	117	113	109	105	101	96	240RA20	
40 bubble/ 43.6 dew point	2.9	2.9	2.8	2.7	2.7	2.6	2.5	2.4	2.4	2.3	2.2	2.1	110RB2
	5.4	5.3	5.2	5.1	5.0	4.8	4.7	4.6	4.4	4.3	4.2	4.0	200RB3
	12.9	12.6	12.3	12.1	11.8	11.5	11.1	10.8	10.5	10.2	9.8	9.5	200RB4
	22.6	22.2	21.7	21.2	20.7	20.1	19.6	19.0	18.4	17.9	17.3	16.7	200RB6
	30.1	29.5	28.9	28.2	27.5	26.8	26.1	25.3	24.6	23.8	23.0	22.2	240RA8
	63.3	62.0	60.6	59.2	57.8	56.3	54.8	53.2	51.6	50.0	48.3	46.7	240RA9
	71.2	69.7	68.2	66.6	65.0	63.3	61.6	59.8	58.0	56.2	54.4	52.5	240RA12
	115	113	111	108	105	103	100	97	94	91	88	85	240RA16
168	165	161	157	154	150	146	141	137	133	128	124	240RA20	
30 bubble/ 33.9 dew point	3.4	3.3	3.3	3.2	3.1	3.1	3.0	2.9	2.8	2.8	2.7	2.6	110RB2
	6.3	6.2	6.1	6.0	5.9	5.7	5.6	5.5	5.3	5.2	5.0	4.9	200RB3
	15.0	14.7	14.5	14.2	13.9	13.6	13.2	12.9	12.6	12.2	11.9	11.5	200RB4
	26.4	25.9	25.4	24.9	24.4	23.8	23.2	22.7	22.1	21.5	20.9	20.3	200RB6
	35.1	34.5	33.8	33.2	32.4	31.7	31.0	30.2	29.4	28.6	27.8	27.0	240RA8
	73.7	72.4	71.0	69.6	68.1	66.6	65.0	63.4	61.8	60.1	58.4	56.7	240RA9
	82.9	81.5	79.9	78.3	76.6	74.9	73.1	71.3	69.5	67.6	65.7	63.8	240RA12
	135	132	130	127	124	121	119	116	113	110	107	103	240RA16
196	193	189	185	181	177	173	169	164	160	155	151	240RA20	
20 bubble/ 24 dew point	3.8	3.7	3.7	3.6	3.5	3.5	3.4	3.3	3.2	3.1	3.1	3.1	110RB2
	7.1	7.0	6.9	6.7	6.6	6.5	6.3	6.2	6.0	5.9	5.7	5.7	200RB3
	16.8	16.5	16.2	15.9	15.6	15.3	15.0	14.6	14.3	13.9	13.6	13.6	200RB4
	29.6	29.1	28.5	28.0	27.4	26.8	26.3	25.7	25.0	24.4	23.8	23.8	200RB6
	39.4	38.7	38.0	37.3	36.5	35.8	35.0	34.2	33.4	32.6	31.7	31.7	240RA8
	82.7	81.2	79.8	78.2	76.7	75.1	73.4	71.8	70.1	68.3	66.6	66.6	240RA9
	93.0	91.4	89.7	88.0	86.3	84.4	82.6	80.7	78.8	76.9	74.9	74.9	240RA12
	151	148	146	143	140	137	134	131	128	125	121	121	240RA16
220	216	212	208	204	200	195	191	186	182	177	177	240RA20	
10 bubble/ 14.1 dew point	4.1	4.1	4.0	3.9	3.8	3.8	3.7	3.6	3.5	3.5	3.5	3.5	110RB2
	7.7	7.6	7.5	7.3	7.2	7.0	6.9	6.7	6.6	6.6	6.6	6.6	200RB3
	18.3	18.0	17.6	17.3	17.0	16.6	16.3	15.9	15.6	15.6	15.6	15.6	200RB4
	32.1	31.6	31.0	30.4	29.8	29.2	28.6	27.9	27.3	27.3	27.3	27.3	200RB6
	42.8	42.0	41.3	40.5	39.7	38.9	38.1	37.2	36.4	36.4	36.4	36.4	240RA8
	89.8	88.3	86.7	85.0	83.3	81.6	79.9	78.2	76.4	76.4	76.4	76.4	240RA9
	101.0	99.3	97.5	95.6	93.8	91.8	89.9	87.9	85.9	85.9	85.9	85.9	240RA12
	164	161	158	155	152	149	146	143	139	139	139	139	240RA16
239	235	230	226	222	217	212	208	203	203	203	203	240RA20	

