

SAIRAC technical talk series – An introduction to - Evaporator selections Catalogue selection

October 2025

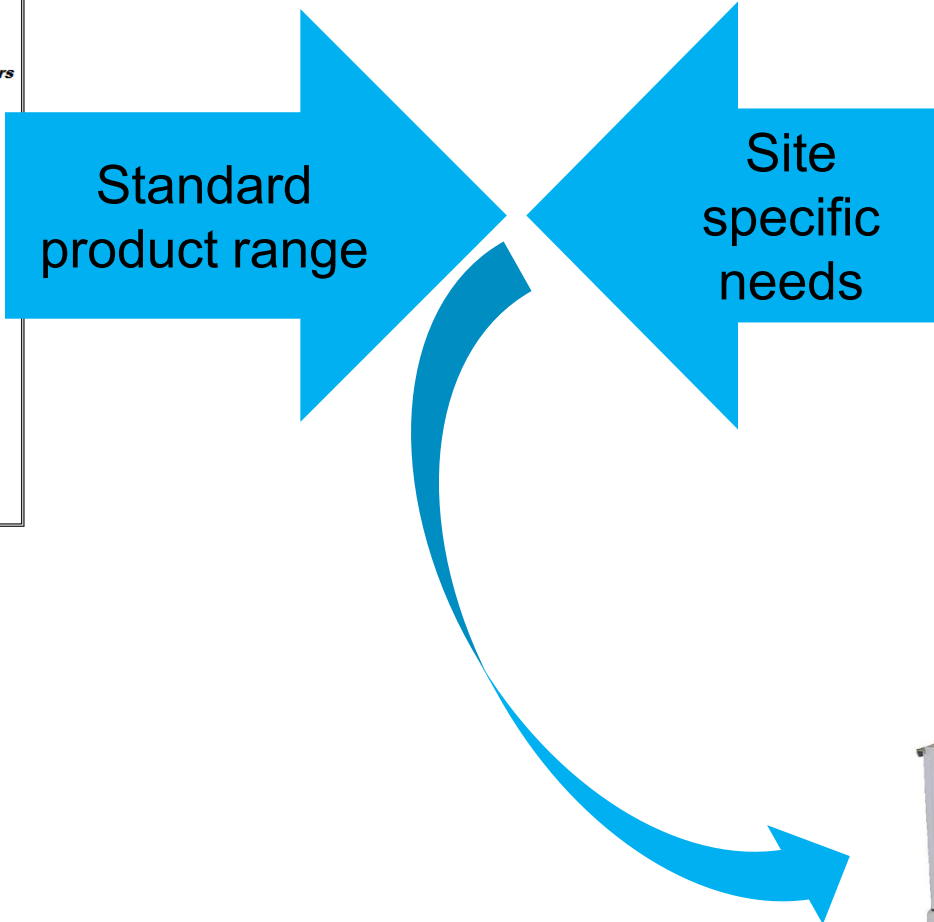
Presented by – Marius La Grange



1 Evaporator coil selection



2 What are we going to do



3 Fin & Tube heat exchanger – DX applications (vapor compression)



4 Evaporator coil selection

- ▶ Selecting from a standard product range
 - - Nominal duties * factors that might apply
 - - Medium temperature or Low Temperature operations
 - 4mm fin spacing or Medium Temperature applications
 - 7mm fin spacing for Low Temperature applications

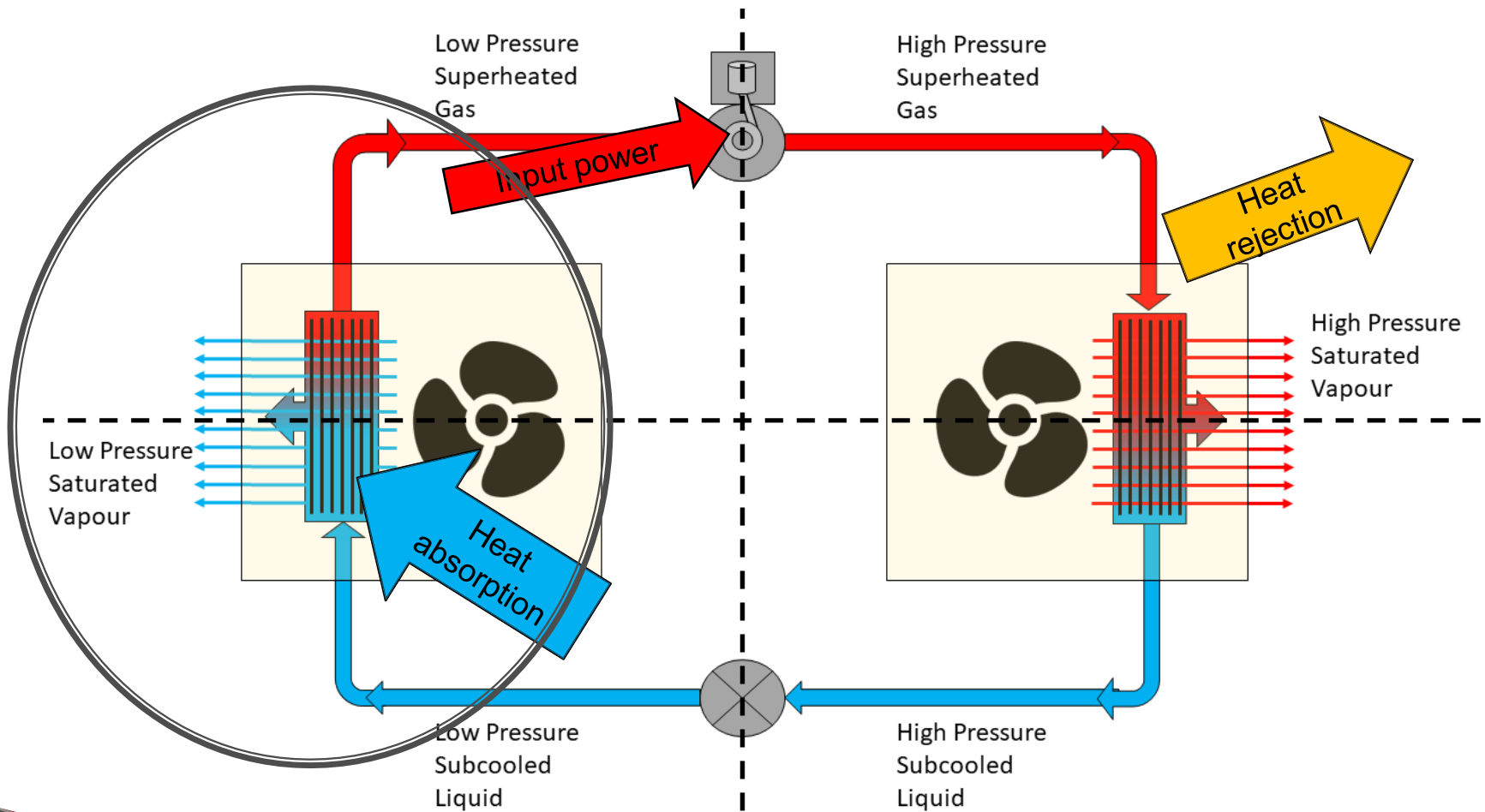


7mm

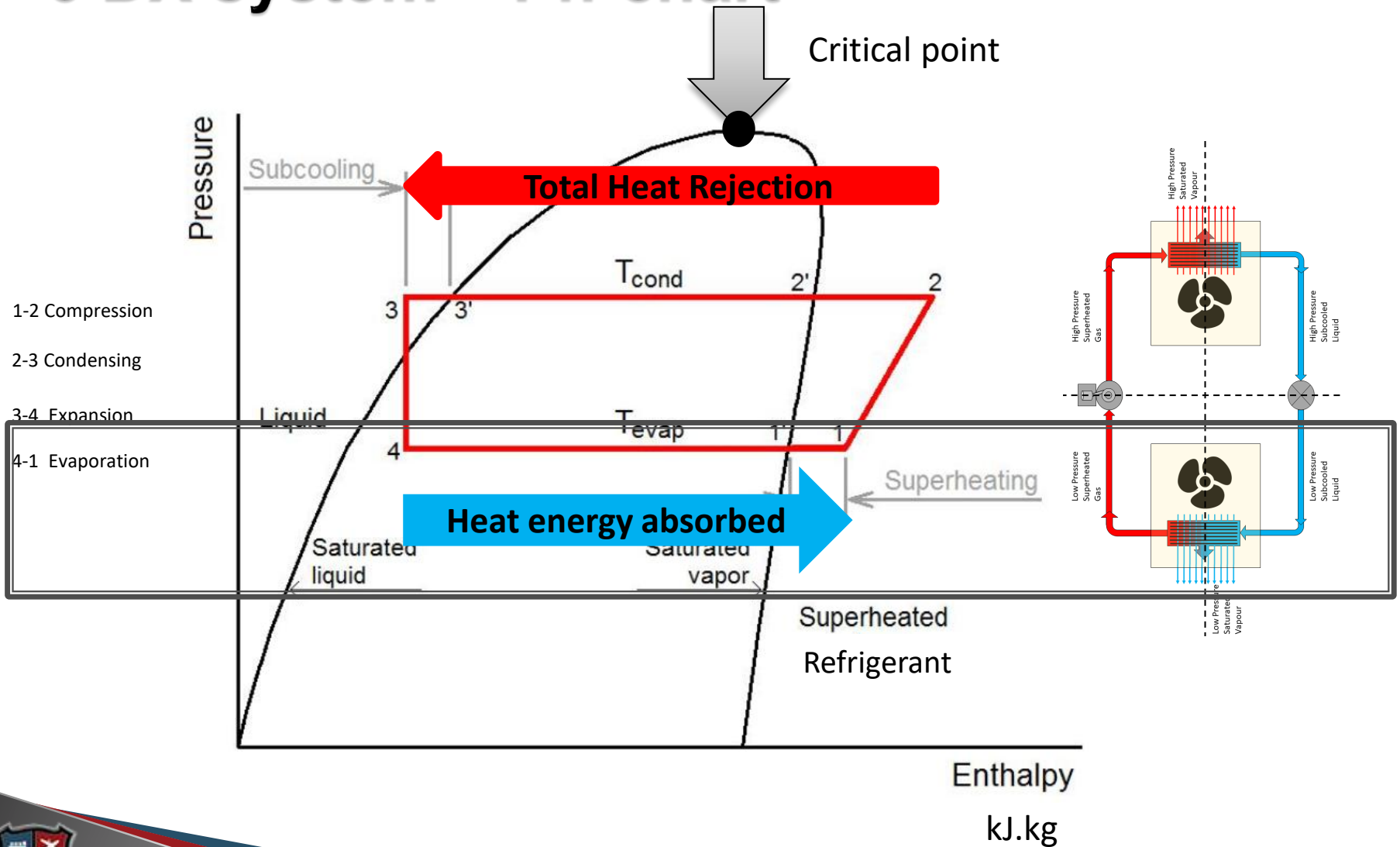


4mm

5 Heat exchanger – DX applications



6 DX system – Ph-chart



7 Why Nominal duties?

-Duties that a specific model will offer at a specific set of conditions.

Eurovent – Standard Conditions (SC2) MT

Eurovent – Standard Conditions (SC3) LT

Standard Conditions for Refrigerants	Air Inlet Temperature (°C)	Evaporating Temperature (°C)
SC1	10	0
SC2	0	-8
SC3	-18	-25
SC4*	-25	-31

*Only for Air Coolers CO2

<https://www.eurovent-certification.com/en/third-party-certification/certification-programmes/he>



8 How do we derive the Nominal capacity

Capacity Data

The nominal cooling capacities are valid for refrigerant R22 and R404a and are based on the Air Inlet Temperature Difference ΔT_1 (difference between cooler air inlet temperature t_{L1} and evaporation temperature t_0 , $\Delta T_1 = t_{L1} - t_0$). These Conditions are marked with ΔT_1 and comply with the ENV 328 Standards and the Eurovent certification regulations.

Correction factors according to Eurovent

This what you need to derive

$$Q_N = \frac{Q_0}{F_1 \times F_2}$$

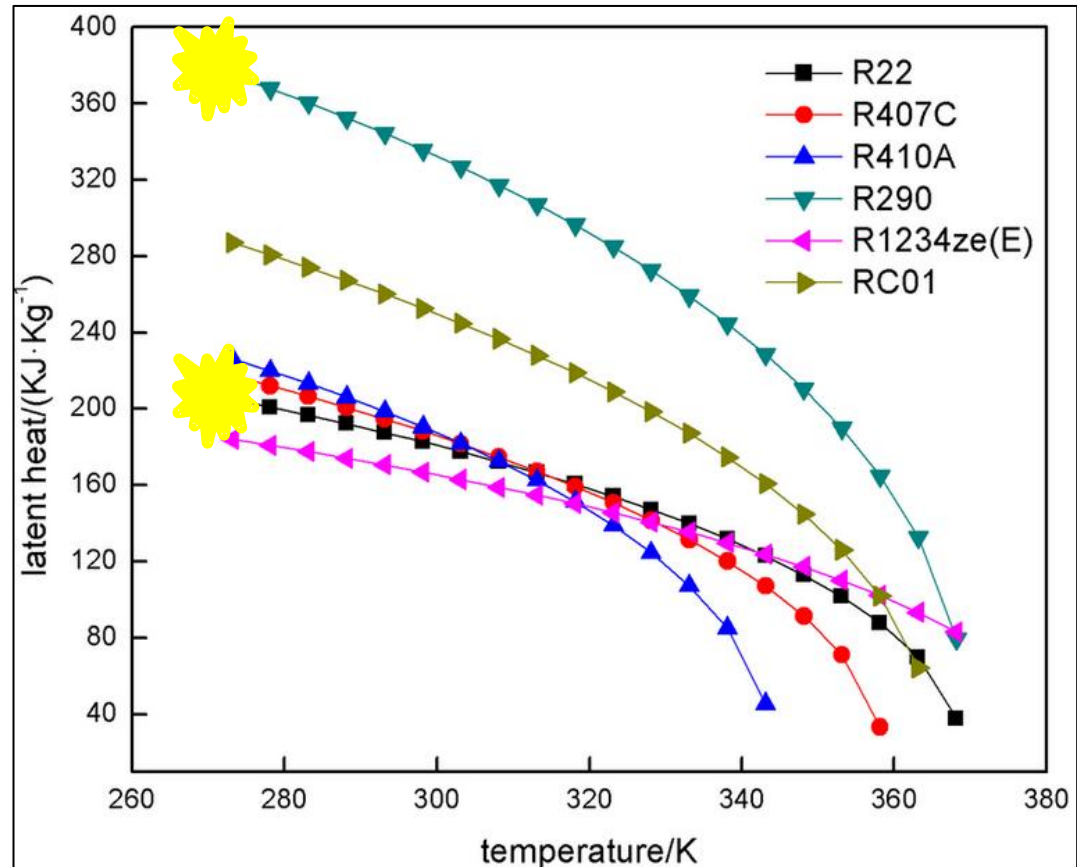
This is what you have

Q_N = Evaporator Nominal Capacity
 Q_0 = Evaporator Capacity

9 HCFC & HFC – Refrigerant

Why does this matter

- - Mainly the latent heat of vaporization
 - The heat energy required to convert a high-pressure liquid to a vapor at a constant temperature & pressure
 - Unit is simply Joules per Kilogram (J/kg)

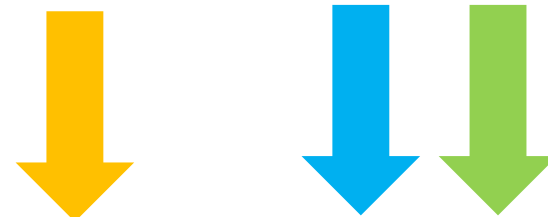


Compare R22 with R290



10 HCFC & HFC – Refrigerant

Capacity Data



The nominal cooling capacities are valid for refrigerant R22 and R404a and are based on the Air Inlet Temperature Difference ΔT_1 (difference between cooler air inlet temperature t_{L1} and evaporation temperature t_0 , $\Delta T_1 = t_{L1} - t_0$). These Conditions are marked with ΔT_1 and comply with the ENV 328 Standards and the Eurovent certification regulations.

F_1 = Correction Factor for Refrigerant
(Based on R404A)

Refrigerant		R404A	R 507A	R134a	R 22
F_1	$t_0 = -8^\circ\text{C}$	1.00	1.00	0.91	0.95
	$t_0 = -25^\circ\text{C}$	1.00	1.00	0.85	0.95

Correction factors according to Eurovent

$$\dot{Q}_N = \frac{\dot{Q}_0}{F_1 F_2}$$

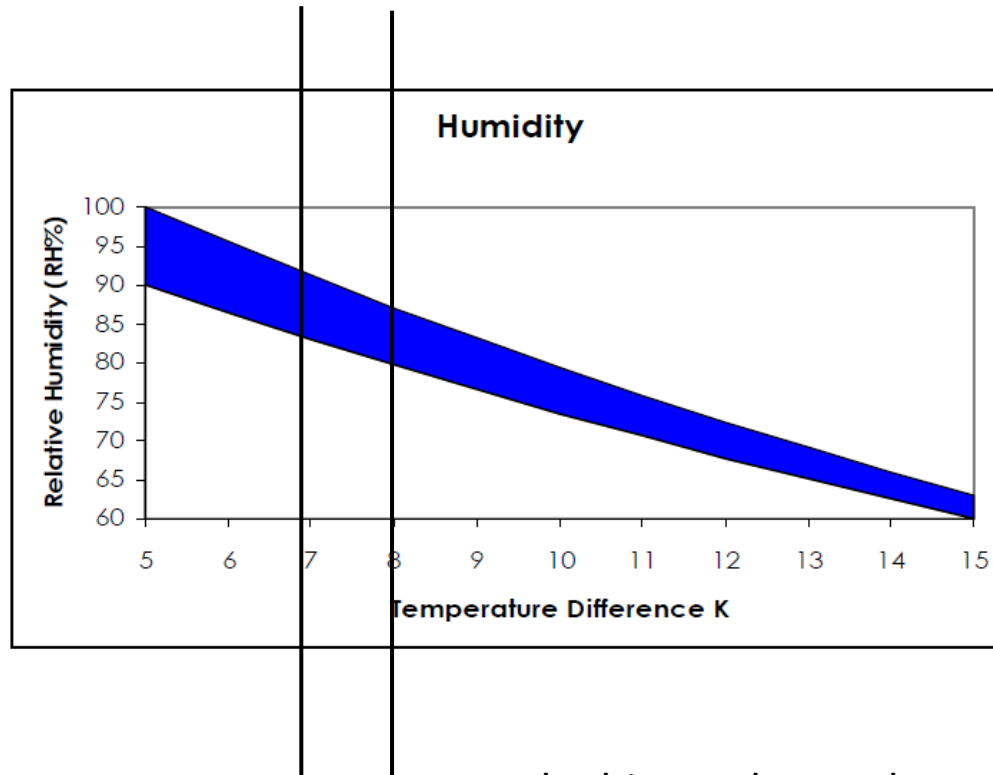
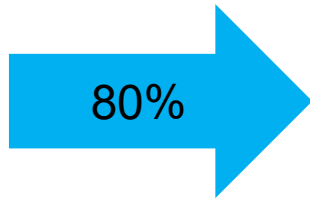
\dot{Q}_N = Evaporator Nominal Capacity
 \dot{Q}_0 = Evaporator Capacity

F_2 = Correction Factor for Fin Material

F_2 : Material	
1.00	Aluminium
0.97	Coated Aluminium
1.03	Copper

The technical data is acquired by theoretical means and is subject to the usual tolerance. Subject to change without prior notice.

11 Relative Humidity



The bigger the ΔT the smaller the change in RH across the coil



12 Operating condition conversion

031.1-B-3-4	7.5	28	4990	3	56	14	2.40	1.40	1.00	10.9	1690	500	450	1380	390	300	4	1/2	11/8	3/4	5	45
031.1-C-3-4	9.0	37	4750	3	56	13	3.80	2.80	1.00	17.3	1690	500	450	1380	390	300	4	1/2	11/8	3/4	7	50
031.1-E-3-4	10.9	55	4280	3	56	12	3.80	2.80	1.00	17.3	1690	500	450	1380	390	300	4	1/2	13/8	3/4	10	62
031.1-B-4-4	9.8	37	6650	4	57	14	3.15	2.00	1.15	14.3	2150	500	450	920	390	300	6	1/2	13/8	3/4	7	58
031.1-C-4-4	12.0	50	6330	4	57	14	5.15	4.00	1.15	23.4	2150	500	450	920	390	300	6	1/2	13/8	3/4	9	64
031.1-E-4-4	14.4	50	5710	4	57	13	5.15	4.00	1.15	23.4	2150	500	450	920	390	300	6	7/8	13/8	3/4	13	80

FAN Rating D315 Fan 220V			
Frequency	Hz	50	60
Speed	RPM	1340	1490
Power Draw	Watts	86	117
Current Draw	Amps	0.38	0.51

		Temperature Difference (K)										
		7	8	9	10	11	12					
Suction Temp (°C)	-10	0.48	0.64	0.81	0.99	1.18	1.37	1.54	1.7			
	-5	0.48	0.64	0.83	1.03	1.22	1.42	1.6	1.8			
	0	0.49	0.64	0.85	1.06	1.28	1.51	1.69	1.9			
	5	0.5	0.65	0.88	1.11	1.36	1.61	1.81	2			
	10	0.51	0.66	0.9	1.17	1.44	1.72	1.93	2.2			

A Temp difference below 7K is only attainable via an Electronic Expansion Valve

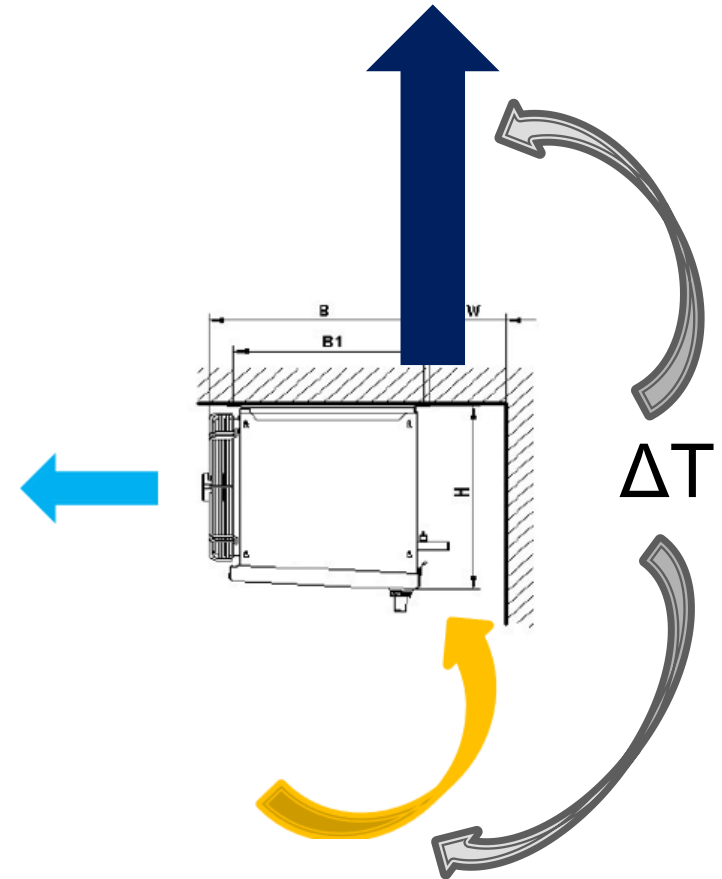
Nominal duty *
conversion factor =
Duty in practice

13 Operating condition conversion

1 is at -8° with ΔT of 8K

Suction Temp (°C)	Temperature Difference (K)							
	5	6	7	8	9	10	11	12
-10	0.46	0.63	0.81	0.99	1.18	1.37	1.54	1.7
-5	0.48	0.64	0.83	1.03	1.22	1.42	1.6	1.8
0	0.49	0.64	0.85	1.06	1.28	1.51	1.69	1.9
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10	0.51	0.66	0.9	1.17	1.44	1.72	1.93	2.2

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Return Air used as control input = warmest air

14 Evaporator – essential info

Application/site related factors

- - Application's Heat load (kW)
- - Room temperature (control temperature)
- - Refrigerant to be used (HCFC (R22) & HFC's excluding R410A)

15 Application – Typical tender info

Parow retail centre

Ventura Consultants

Room No	Description	Refrigerant	Temp range	Room area m ²	Duty required kW	Room temp °C	Suction temperature °C	Condensing temperature °C	No of coils	F1 Ref	F2 Fin Mat	QN kW	ΔT @ conditions K	Conversion factor	QN" kW	Evaporator model
1	General cold room	R507A	MT	27	2.55	0	-8	43	1							
2	Fresh produce room - Cu fin	R134a	MT	14	1.80	2	-5	43	1							
3	Glass door room 4dr	R290	MT	15	2.48	2	-5	43	2							
4	Prep area	R134a	HT/MT	30	1.61	15	5	45	1							
5	General Freezer room	R404A	LT	27	3.05	-18	-25	43	1							
6	Ice cream Freezer room	R404A	LT	5	1.65	-22	-28	43	1							



16 Evaporator coil selection – Fresh produce room



Heat load = 1.8 kW
Room temperature 2°C
Refrigerant R134a

$$Q_N = \frac{Q_0}{F_1 \times F_2} = \frac{1.8}{0.91 \times 1.03} = 1.92 \text{ kW}$$

R134a

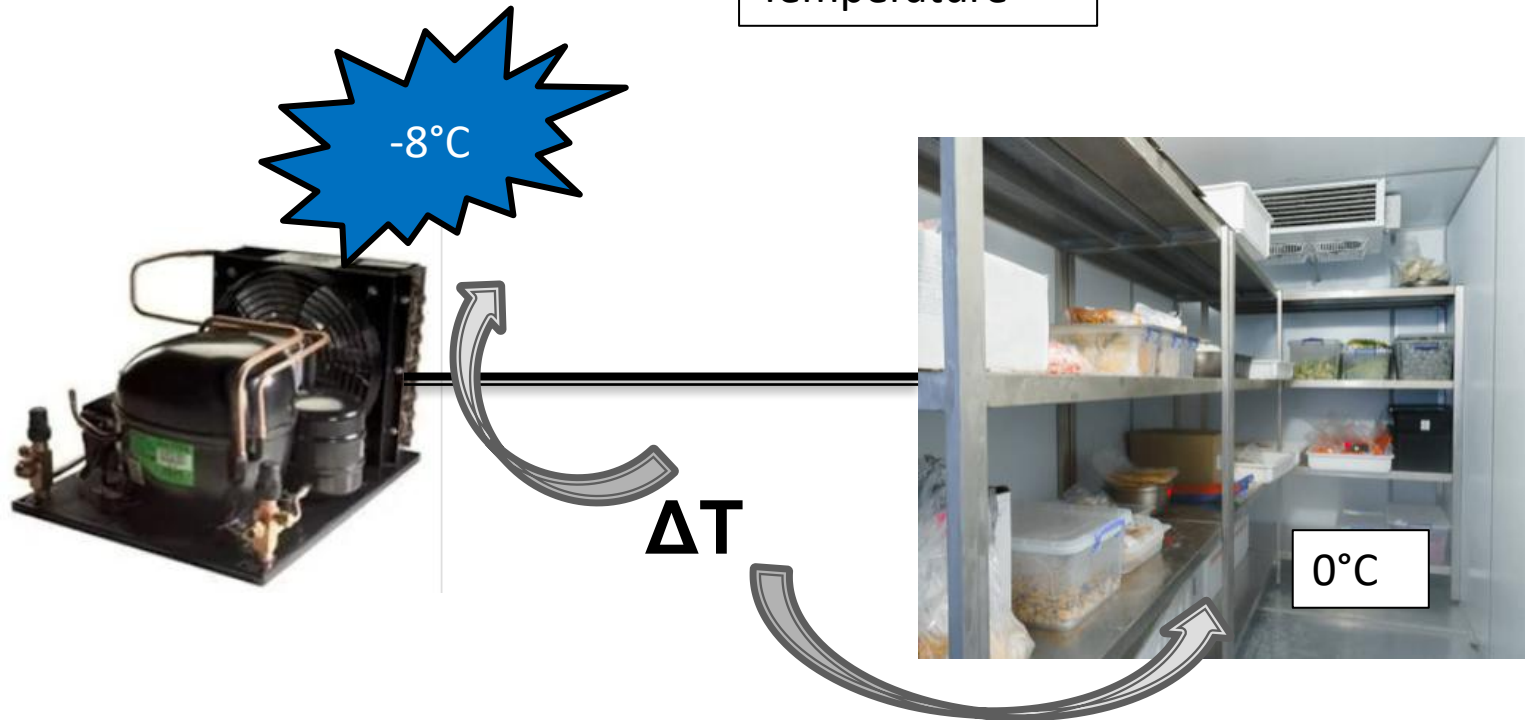
Cu fin C

17 Application – Fin material & refrigerant factors

Parow retail centre				Ventura Consultants								
Room No	Description	Refrigerant	Temp range	Room area	Duty required	Room temp	Suction temprature	Condensing temprature	No of coils	F1	F2	QN
				m ²	kW	°C	°C	°C		Ref	Fin Mat	kW
1	General cold room	R507A	MT	27	2.55	0	-8	45	1	1	1	2.55
2	Fresh produce room - Cu fin	R134a	MT	14	1.80	2	-5	45	1	0.91	1.03	1.92
3	Glass door room 4dr	R290	MT	15	2.48	2	-5	45	2	0.95	1	2.61
4	Prep area	R134a	HT/MT	30	1.61	15	5	45	1	0.91	1	1.76
5	General Freezer room	R404A	LT	27	3.05	-18	-25	43	1	1	1	3.05
6	Ice cream Freezer room	R404A	LT	5	1.65	-22	-28	43	1	1	1	1.65

18 Application – Operating temperature

Medium
Temperature



19 Application – Operating temperatures

Conversion tables

Medium
Temperature

		Temperature Difference (K)							
		5	6	7	8	9	10	11	12
Suction Temp (°C)	-10	0.46	0.63	0.81	0.99	1.18	1.37	1.54	1.7
	-5	0.48	0.64	0.83	1.03	1.22	1.42	1.6	1.8
	0	0.49	0.64	0.85	1.06	1.28	1.51	1.69	1.9
	5	0.5	0.65	0.88	1.11	1.36	1.61	1.81	2
	10	0.51	0.66	0.9	1.17	1.44	1.72	1.93	2.2

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Low
Temperature

		Temperature Difference (K)							
		5	6	7	8	9	10	11	12
Suction Temp (°C)	-35	0.65	0.82	0.98	1.13	1.27	1.45	1.60	1.76
	-30	0.65	0.82	0.98	1.14	1.30	1.45	1.62	1.78
	-25	0.67	0.84	1.00	1.16	1.32	1.48	1.65	1.81
	-20	0.69	0.86	1.04	1.21	1.39	1.56	1.74	1.91
	-15	0.71	0.89	1.08	1.27	1.46	1.65	1.83	2.02
	-10	0.72	0.92	1.13	1.33	1.54	1.75	1.95	2.16
	-5	0.74	0.95	1.16	1.38	1.60	1.82	2.03	2.24

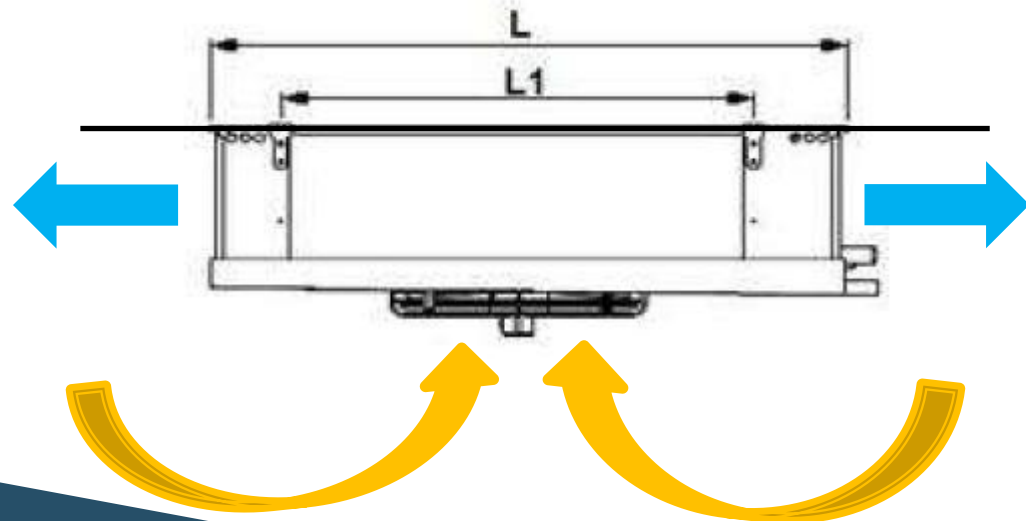
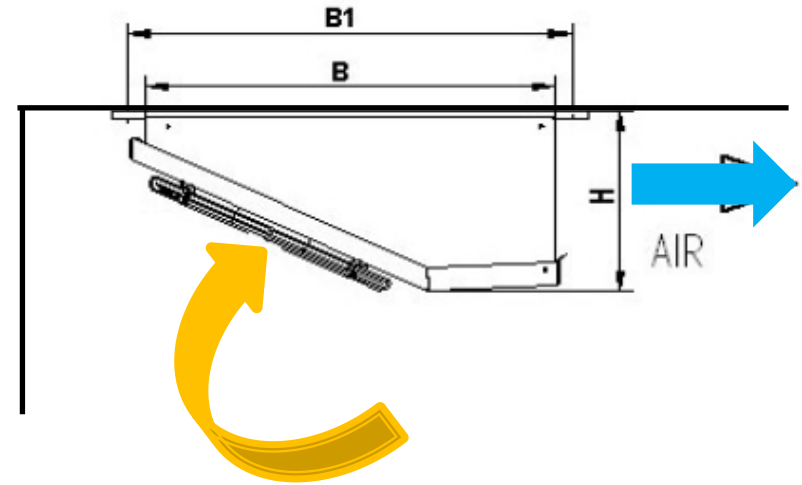
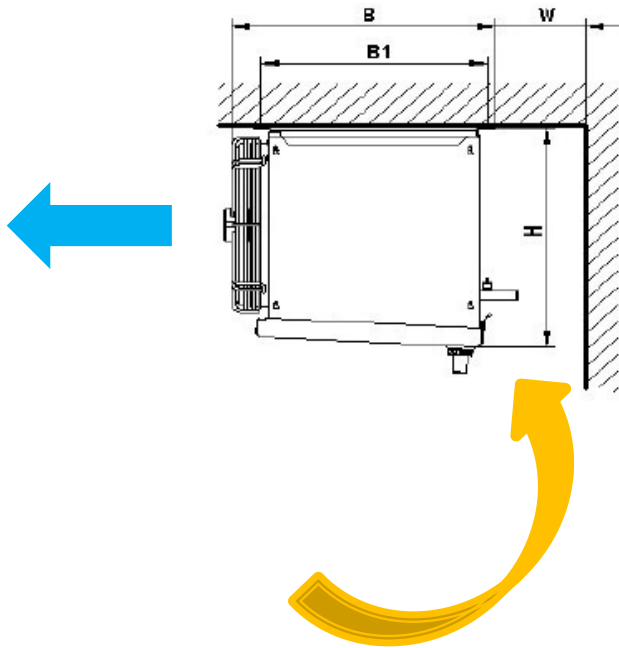
A Temp difference below 7K is only attainable via an Electronic Expansion Valve

20 Application – Conversion factors

Q_N	ΔT @ conditions	Conversion factor	Q_N"
kW	K		kW
2.55	8	1.01	2.52
1.92	7	0.83	2.31
2.61	7	0.83	1.57
1.76	10	1.61	1.10
3.05	7	1	3.05
1.65	6	0.81	2.04

21 Additional factors – Standard ceiling mounted evaporator coils

Thermocoil (Pty) Ltd



22 Application – Suitable model selection

QN"	Evaporator model	
kW		
2.52	TEMB025.1-B-3-4	
2.31	TEB031.1-B-1-4	Cu fin
1.57	TEMB025.1-B-2-4 * 2	2 coils
1.10	TEMB025.1-C-1-4	
3.05	TEB040.1-C-1-7	
2.04	TEMB031.1-E-1-7	

Thanks for your attention

Questions & Answers ?

