

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

August 2026

Presented by – Marius La Grange



# 1 Evaporator coil selection



# 2 What are we going to do



Standard  
product range

Site  
specific  
needs



# 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

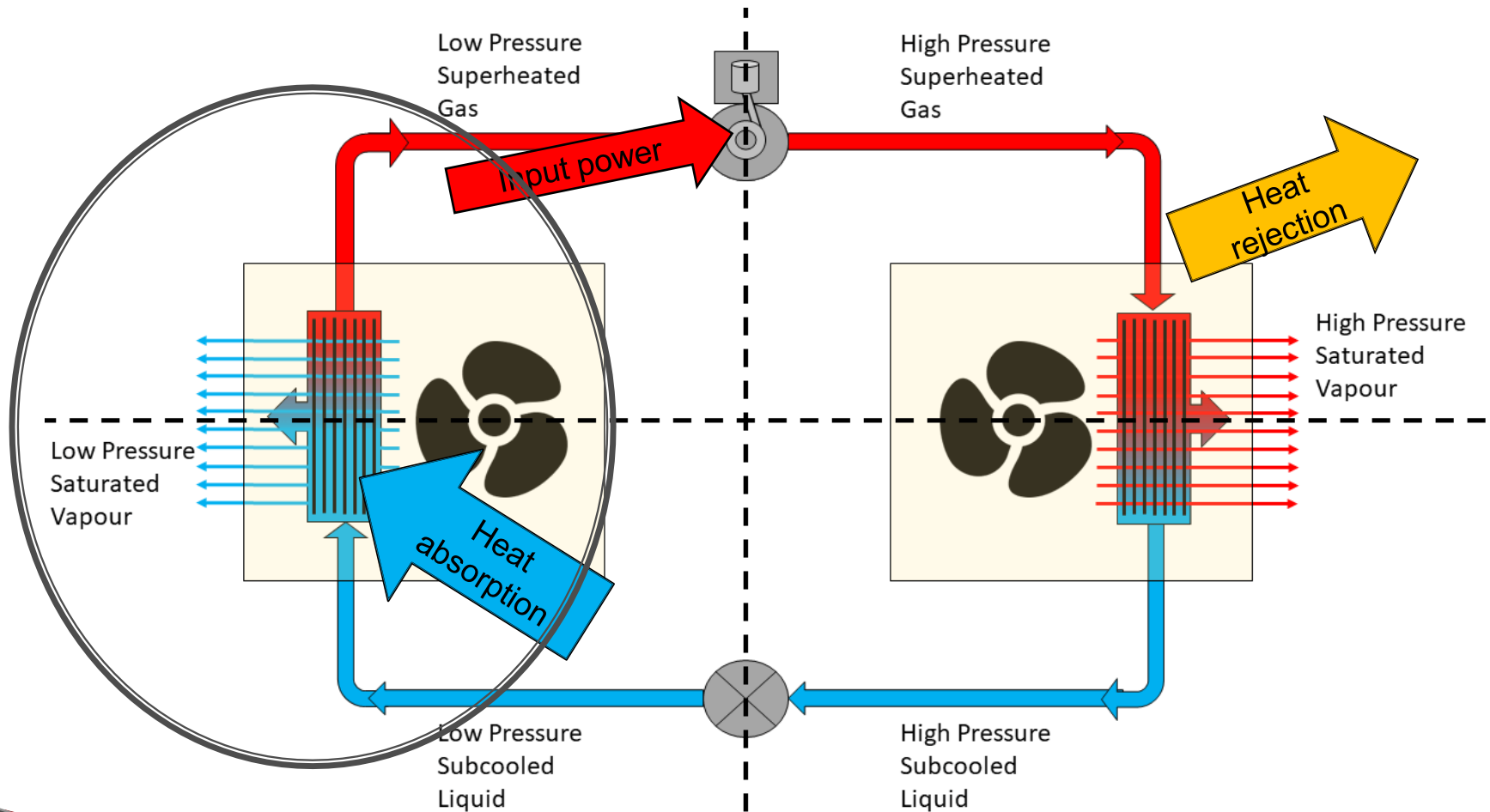


7mm

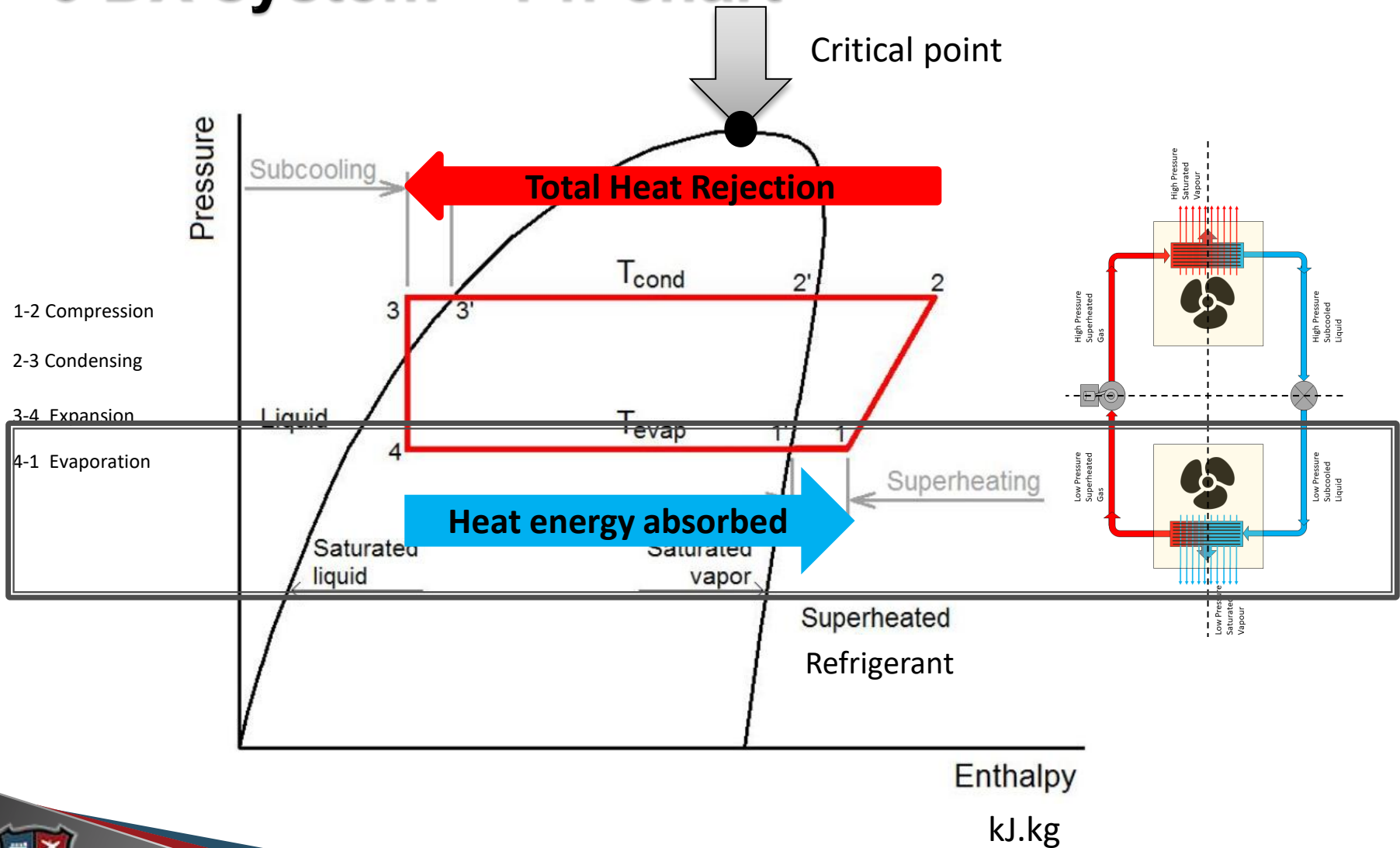


4mm

# 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  $\Delta T_1$  (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  $\Delta T_1$  and comply with the ENV 328 Standards and the Eurovent certification regulations.

Correction factors according to Eurovent

This what you need to derive

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

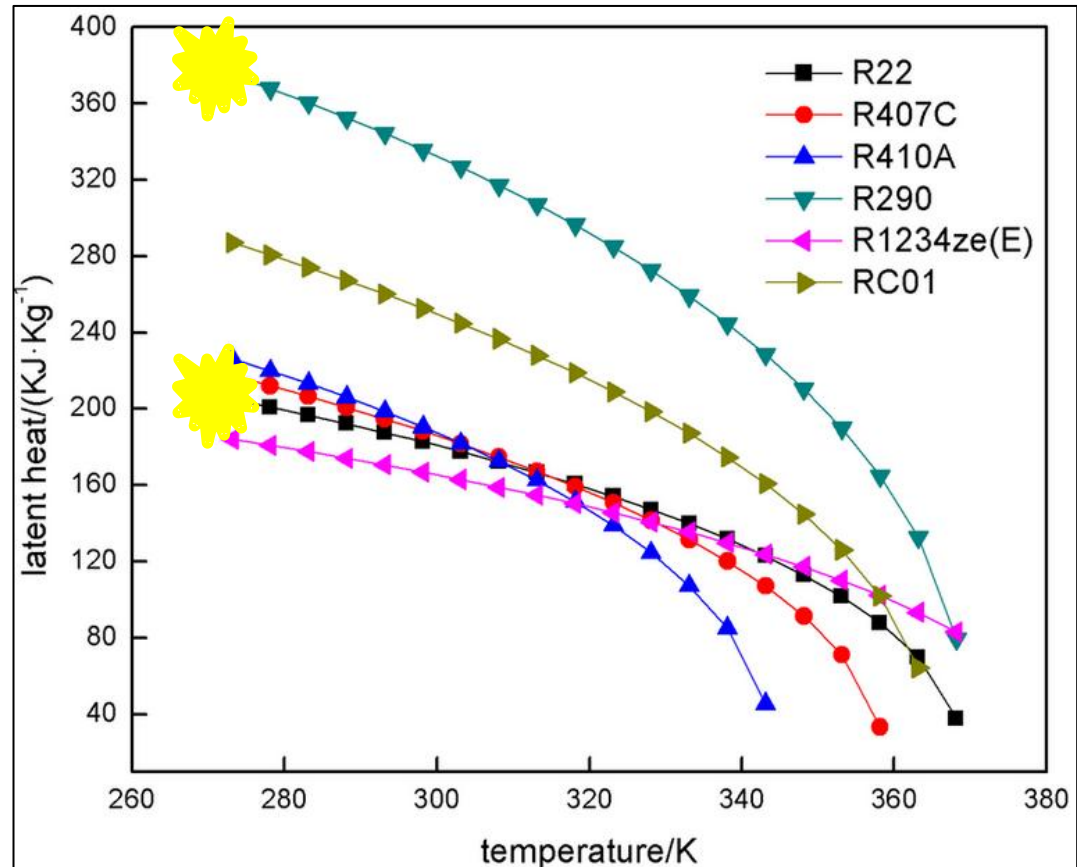
This is what you have

$Q_N$  = 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  $\Delta T_1$  (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  $\Delta T_1$  and comply with the ENV 328 Standards and the Eurovent certification regulations.

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

$F_1$  = 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 |

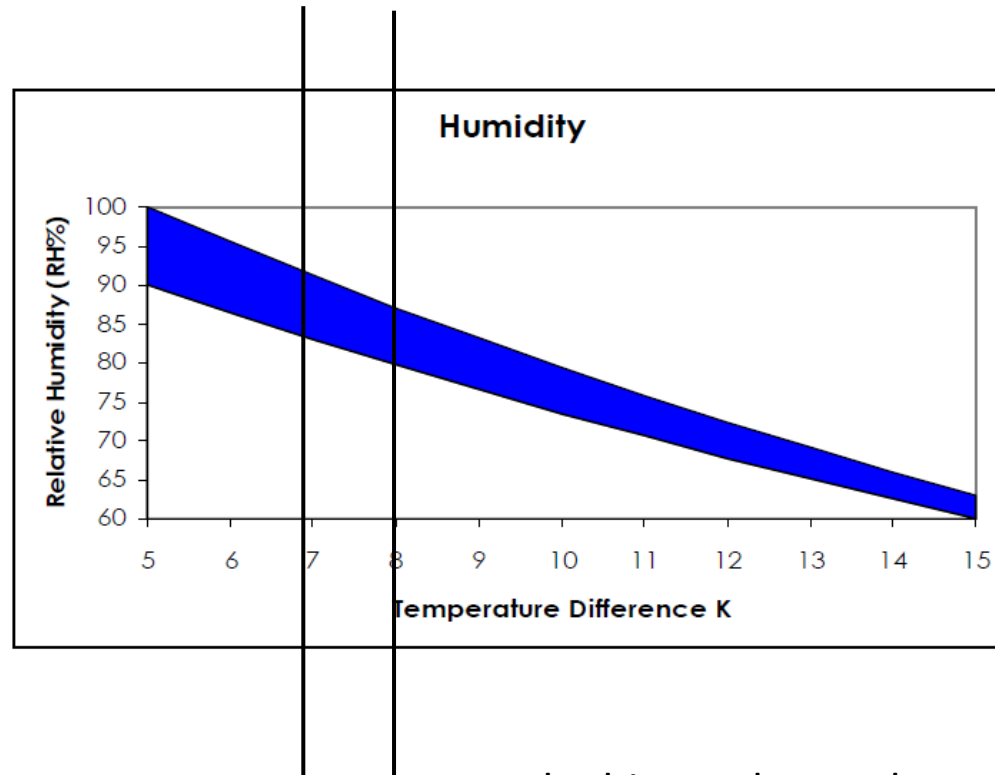
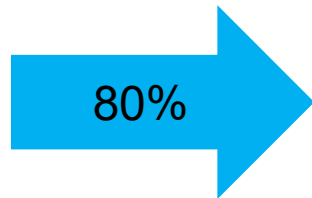
$F_2$  = Correction Factor for Fin Material

| $F_2$ : 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



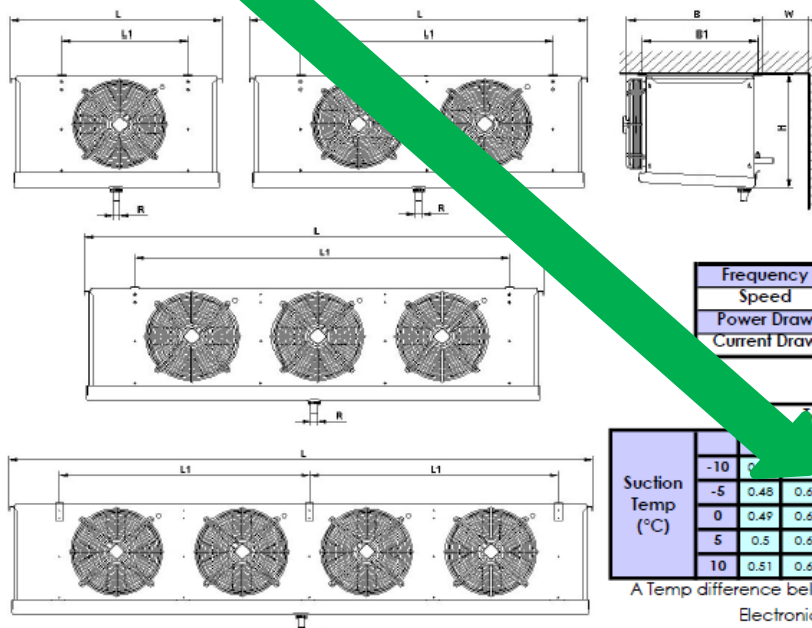
The bigger the  $\Delta T$  the smaller the change in RH across the coil

*Thermocoil* [Pty] Ltd

# 12 Operating condition conversion

Nominal duty \*  
conversion factor =  
Duty in practice

|             |      |    |      |   |    |    |      |      |      |      |      |     |     |      |     |     |   |     |      |     |    |    |
|-------------|------|----|------|---|----|----|------|------|------|------|------|-----|-----|------|-----|-----|---|-----|------|-----|----|----|
| 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 | 75 | 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 |

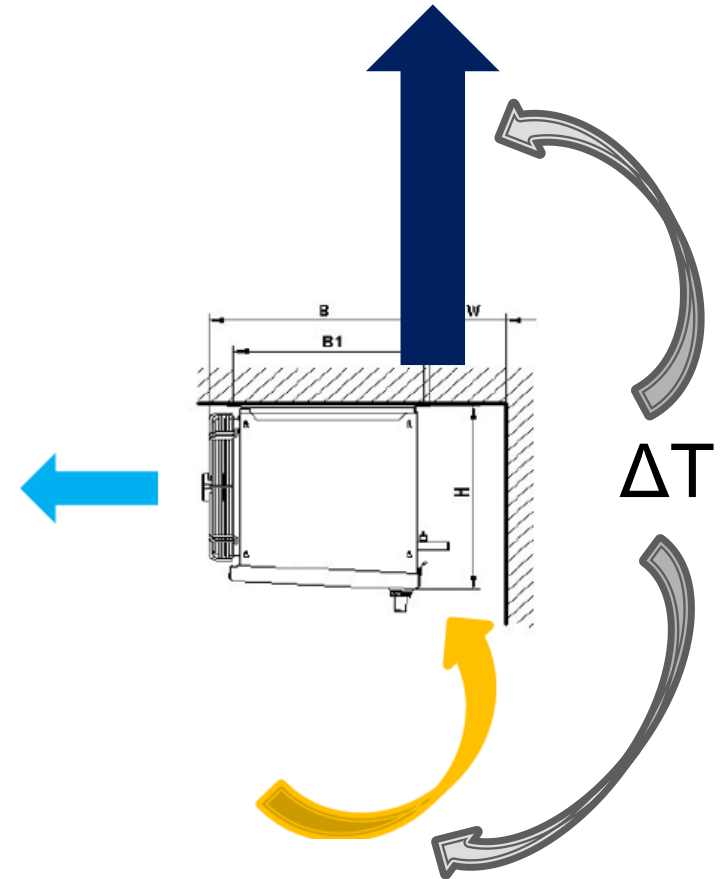
A Temp difference below 7K is only attainable via an Electronic Expansion Valve

# 13 Operating condition conversion

1 is at  $-8^{\circ}$  with  $\Delta T$  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 |
| 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



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

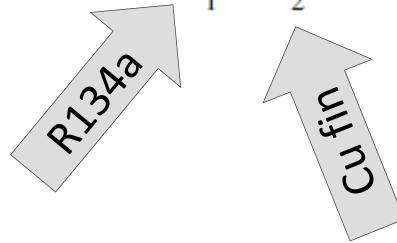
| Room No | Description                 | Refrigerant | Temp range | Room area<br>m <sup>2</sup> | Duty required<br>kW | Room temp<br>°C | Suction temperature<br>°C | Condensing temperature<br>°C | No of coils | F1<br>Ref | F2<br>Fin Mat | QN<br>kW | ΔT @ conditions<br>K | Conversion factor | QN"<br>kW | 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

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

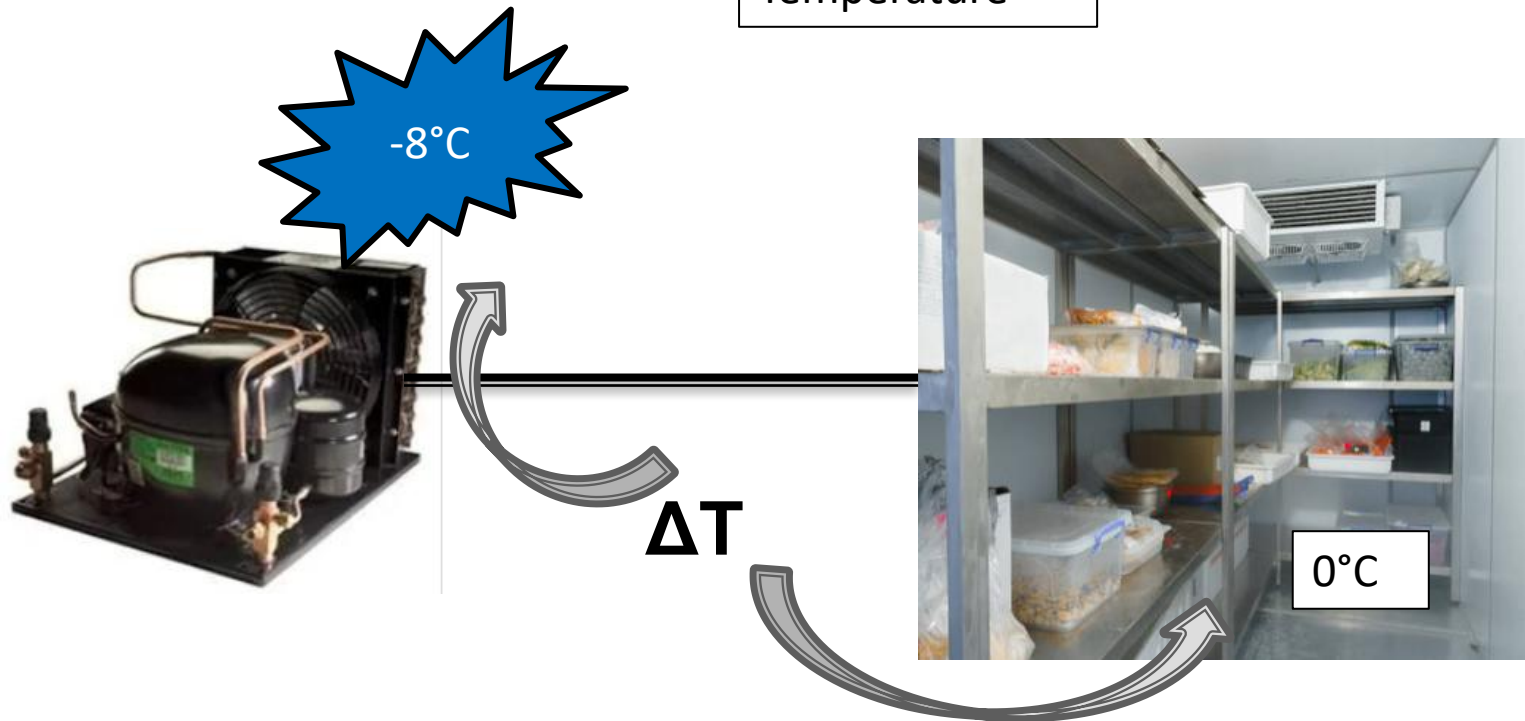


# 17 Application – Fin material & refrigerant factors

| Parow retail centre |                             |             |            | Ventura Consultants |               |           |                    |                        |             |      |         |      |
|---------------------|-----------------------------|-------------|------------|---------------------|---------------|-----------|--------------------|------------------------|-------------|------|---------|------|
| Room No             | Description                 | Refrigerant | Temp range | Room area           | Duty required | Room temp | Suction temprature | Condensing temperature | No of coils | F1   | F2      | QN   |
|                     |                             |             |            | m <sup>2</sup>      | 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) |      |      |      |      |      |      |     |
|-------------------|-----|----------------------------|------|------|------|------|------|------|-----|
| Suction Temp (°C) |     | 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 |
|                   | 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

Low  
Temperature

|                   |     | Temperature Difference (K) |      |      |      |      |      |      |      |
|-------------------|-----|----------------------------|------|------|------|------|------|------|------|
| Suction Temp (°C) |     | 5                          | 6    | 7    | 8    | 9    | 10   | 11   | 12   |
|                   | -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 |

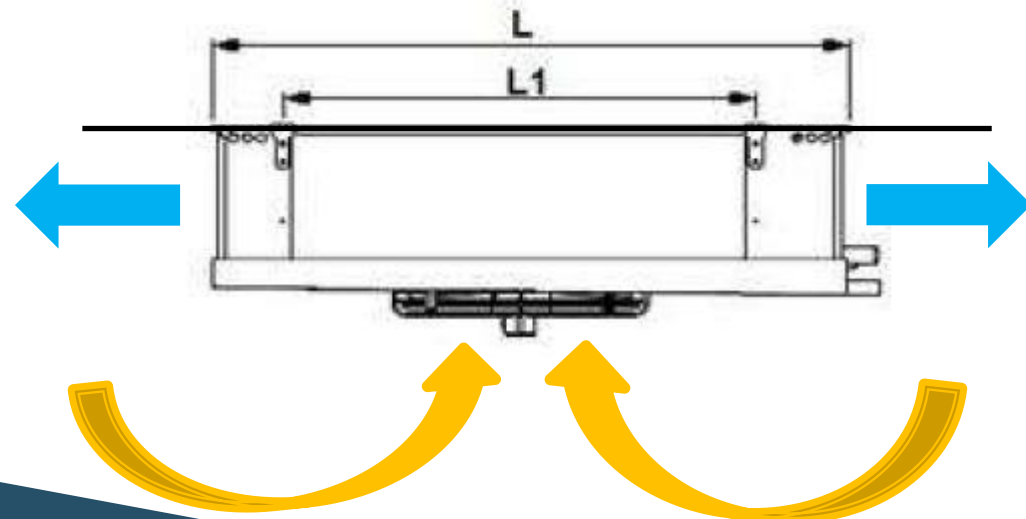
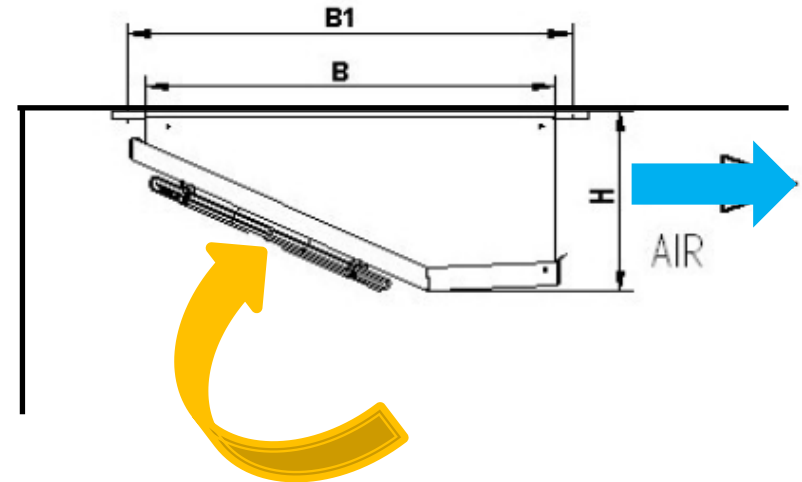
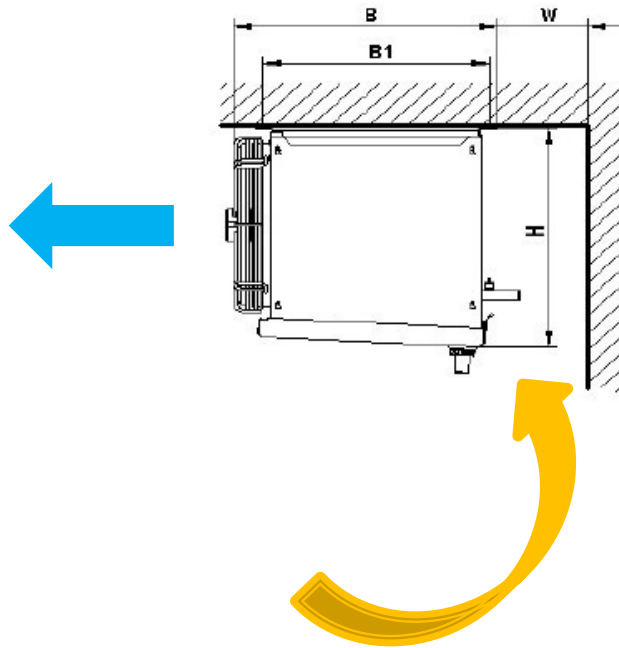
A Temp difference below 7K is only attainable via an  
Electronic Expansion Valve

# 20 Application – Conversion factors

| <b>Q<sub>N</sub></b> | <b>ΔT @ conditions</b> | <b>Conversion factor</b> | <b>Q<sub>N</sub>"</b> |
|----------------------|------------------------|--------------------------|-----------------------|
| <b>kW</b>            | <b>K</b>               |                          | <b>kW</b>             |
|                      |                        |                          |                       |
| <b>2.55</b>          | <b>8</b>               | <b>1.01</b>              | <b>2.52</b>           |
| <b>1.92</b>          | <b>7</b>               | <b>0.83</b>              | <b>2.31</b>           |
| <b>2.61</b>          | <b>7</b>               | <b>0.83</b>              | <b>1.57</b>           |
| <b>1.76</b>          | <b>10</b>              | <b>1.61</b>              | <b>1.10</b>           |
| <b>3.05</b>          | <b>7</b>               | <b>1</b>                 | <b>3.05</b>           |
| <b>1.65</b>          | <b>6</b>               | <b>0.81</b>              | <b>2.04</b>           |

# 21 Additional factors – Standard ceiling mounted evaporator coils

*Thermocoil (Pty) Ltd*



# 22 Application – Suitable model selection

| Q <sub>N</sub> " | 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 ?

