ThermoStar Refrigeration Air Dryers
Why dry compressed air?

Contamination Reduces Efficiency

The air we breathe contains contamination in the form of water vapour and airborne particles.

During the compression process an air compressor concentrates these contaminants and depending on the design and age will even add to the contamination in the form of oil carry over.

Modern air compressors generally have built in aftercoolers that reduce the discharge temperature of the compressed air and with the help of water separators, remove the bulk of liquid water.

In some applications this may be sufficient, but the remaining dirt and moisture content suspended in aerosol form, can, if not removed, damage the compressed air system and cause product spoilage.

The result - higher overall cost of operation from:

- Increased system downtime
- Reduced production efficiency

These problems can be avoided with the correct selection and application of compressed air filters and dryers from Ingersoll-Rand.

The Air Solutions Group at Ingersoll-Rand has the widest selection of products and application knowledge to protect your investment and your compressed air system.

- Filters
- Condensate management
- Cooling systems
- Refrigeration dryers
- Desiccant dryers
- Piping systems
ThermoStar Dryers - The ‘Class’ Solution

Quality Matters

Ingersoll-Rand ThermoStar Refrigeration Dryers are available in 16 model sizes to suit all applications. When installed with compressed air filters they will provide clean compressed air to the classes as prescribed in ISO 8573.1.

ISO 8573.1 Quality Classes

<table>
<thead>
<tr>
<th>QUALITY CLASS</th>
<th>DIRT Particle size in Micron</th>
<th>WATER Pressure Dewpoint °C (ppm. vol.) at 7 bar g</th>
<th>OIL (Including vapour) mg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.1</td>
<td>-70 (0.3)</td>
<td>0.01</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>-40 (16)</td>
<td>0.1</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>-20 (128)</td>
<td>1.0</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>+3 (940)</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>40</td>
<td>+7 (1240)</td>
<td>25</td>
</tr>
<tr>
<td>6</td>
<td>-</td>
<td>+10 (1500)</td>
<td>-</td>
</tr>
</tbody>
</table>

Installation Guide

ISO 8573.1 Class 1.4.1 Dirt, Water and Oil

Air quality - With correct selection, the above schematic relates to an installation that would provide Class 1 dirt, Class 4 water, and Class 1 oil. This is recommended to stop downstream corrosion, prevent product spoilage and prolong the life of pneumatic tools and the compressed air system.

Totally Environmentally Friendly

R407C Refrigerant
Use of environmentally friendly R407C refrigerant ensures compliance with the Montreal Protocol. With no proposed ‘phase out’ of this refrigerant, the dryer will not have to be replaced prematurely.

Energy Efficient
Use of R407C refrigerant can reduce dryer running costs by 10% when compared to widely used R134a.

The use of modern technology scroll refrigeration compressors (3 phase units) will reduce energy consumption by a further 20%.

Fully Recyclable
Fully recyclable materials used throughout.

Compact dryer design means fewer raw materials requiring disposal at the end of its useful life.

Energy Saving Control
Fitted on models TS 110 - TS 1100, an electronic controller provides ‘at a glance’ indication of dryer performance. An integral energy saving control system also reduces power consumption during stand-by periods.
Superior Design

Visual Performance Indicator
Fitted on models TS 040 - TS 080, this provides instant indication of dryer performance.

Refrigerant Scroll Compressors
Fitted on models TS 110 - TS 1100.
✓ Consumes 20% less energy
✓ Robust
✓ Immediate Start Up
✓ 50% fewer moving parts
✓ Lower vibration and noise levels

High Operating Conditions
Designed to operate at 50°C ambient & 60°C inlet suited to:
✓ Warm Countries
✓ Warm Compressor Rooms
✓ Piston Compressors
✓ High Thermal Loading

Capillary Expander
No moving parts provides simplicity and reliability.

Easy access
Easy access to condensate drain simplifies routine cleaning and maintenance.

Electronic Controller
With integral energy savings and remote control alarm.
**Cross Flow Heat Exchanger**

**Benefits**

- Simple, modern design
- Compact and lightweight
- Designed for efficiency
- Modular design
- Reduced risk of leaks

The heart of the dryer is the specially designed cross flow heat exchanger module which incorporates the air to air and air to refrigerant heat exchangers as well as a high efficiency stainless steel demister separator in one compact unit.

The incoming air is first pre-cooled by cool air exiting the dryer as it passes through the air to air heat exchanger. This pre-cooling reduces the refrigeration circuit by as much as 60%. The air is then cooled even further as it passes through the air to refrigerant heat exchanger coupled to the evaporator.

While at its coolest, the air is passed through the minimum resistance integral high efficiency demister separator where both liquid and water aerosols are condensed into liquid water and removed from the air stream. This system ensures minimum air pressure losses whilst ensuring efficient water removal.

Cold air then flows from the outlet of the dryer via the cross flow air to air heat exchanger where it is heated by the incoming air, preventing condensation build up on the outside of downstream piping.

The crossflow heat exchanger modules have been specifically designed to fully optimise R407C refrigerant which is now the most utilised HFC refrigerant and is widely available around the world.

Using R407C and the cross flow heat exchanger module allows the refrigeration circuit to be smaller than equivalent R134a systems, providing a compact design.
### Technical Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Nominal Air Flow</th>
<th>50Hz Models</th>
<th>Maximum Pressure bar g</th>
<th>Air Connections</th>
<th>Dimensions mm</th>
<th>Weight Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m³/min</td>
<td>cfm</td>
<td>Nominal Absorbed kW</td>
<td>Electrical Supply</td>
<td>A</td>
<td>B</td>
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<tr>
<td>TS 040</td>
<td>4.00</td>
<td>141</td>
<td>0.58</td>
<td>230/1/50</td>
<td>12</td>
<td>615 791 552 65</td>
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<tr>
<td>TS 050</td>
<td>5.00</td>
<td>177</td>
<td>0.96</td>
<td>230/1/50</td>
<td>12</td>
<td>615 791 552 66</td>
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<td>230/1/50</td>
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<td>920 1015 672 144</td>
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<td>777</td>
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<td>1010 1500 1310 400</td>
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<td>2.76</td>
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<td>400/3/50</td>
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<td>400/3/50</td>
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<td>9.93</td>
<td>400/3/50</td>
<td>12</td>
<td>1010 1500 1810 660</td>
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### Multiplication Factors for Ambient Temperatures

<table>
<thead>
<tr>
<th>ºC</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
</tr>
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<tbody>
<tr>
<td>CF</td>
<td>1.00</td>
<td>0.96</td>
<td>0.92</td>
<td>0.88</td>
<td>0.80</td>
<td>0.70</td>
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Performances refer to air-cooled models with air suction of FAD 20ºC, 1 bar, and the following operating conditions: 7 bar g working pressure, 3ºC pressure dewpoint, 25ºC ambient temperature, 35ºC compressed air inlet temperature. All indicated data refers to ISO 7183.

### Multiplication Factors for Working Pressure

<table>
<thead>
<tr>
<th>Pressure bar g</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
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<tbody>
<tr>
<td>Correction Factor</td>
<td>0.74</td>
<td>0.84</td>
<td>0.90</td>
<td>0.96</td>
<td>1.00</td>
<td>1.04</td>
<td>1.06</td>
<td>1.09</td>
<td>1.11</td>
<td>1.13</td>
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### Multiplication Factors for Inlet Temperatures

<table>
<thead>
<tr>
<th>ºC</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF</td>
<td>1.20</td>
<td>1.00</td>
<td>0.84</td>
<td>0.71</td>
<td>0.60</td>
<td>0.50</td>
<td>0.45</td>
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</table>

### Multiplication Factors for Dewpoint

<table>
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<th>ºC</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF</td>
<td>1.00</td>
<td>1.14</td>
<td>1.25</td>
<td>1.35</td>
</tr>
</tbody>
</table>

### Operating Limitations

- **Maximum Pressure**: 12 bar g
- **Ambient temperature**: 2ºC - 50ºC
- **Maximum Inlet temperature**: 60ºC
- **IP Rating**: IP 44 Standard, IP 54 option available

### Dryer Selection

Refrigeration dryers must be sized correctly. Flowrates are shown only for the operating conditions specified at 7 bar g.

To select a dryer for the following conditions use the correction factors given:

Example:

- **Ambient temperature**: 30ºC (correction factor 0.96)
- **Inlet temperature**: 40ºC (correction factor 0.84)
- **System pressure**: 6 bar g (correction factor 0.96)
- **Dewpoint**: 3ºC (correction factor 1.00)
- **Customer flowrate**: 10m³/min

\[
\frac{10 \text{m}^3/\text{min}}{0.96 \times 0.84 \times 0.96 \times 1.00} = 12.9 \text{m}^3/\text{min}, \text{ therefore selection = TS 140}
\]
Compressed Air Filters

High quality compressed air is no longer a luxury, it is essential. Compressed air contains contamination, and if not removed, will damage the compressed air system and cause product spoilage. The correct selection and application of Ingersoll-Rand compressed air filters will protect your air system and increase production efficiency.

System Saver Condensate Drains

Removing oily, acidic condensate from any compressed air system is essential, as even a small volume can seriously affect downstream pneumatic equipment and processes.

Ingersoll-Rand System Saver electronic level sensing drains detect and discharge only when condensate is present. Intelligent operation always ensures no unnecessary loss of valuable compressed air.
Ingersoll-Rand air compressors are not designed, intended, or approved for breathing air. Compressed air should not be used for breathing air applications unless treated in accordance with all applicable codes and regulations.

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