

Practical tips Installation requirements

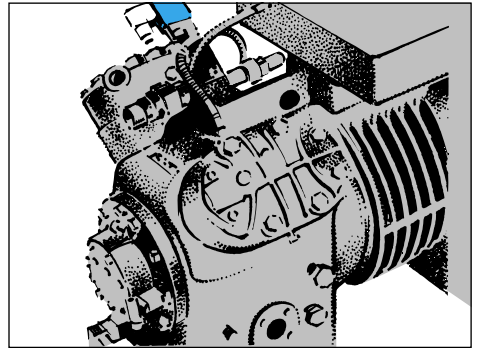
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Installation requirements

More and more commercial refrigeration systems and air conditioning plants of a similar size are built up around hermetic and semihermetic compressors. These compressors, as compared to the open type, are normally more vulnerable to impurities in the refrigerant system and to incorrect operating conditions.

Therefore, in modern refrigeration systems, there are special demands on the quality of installation work and commissioning.



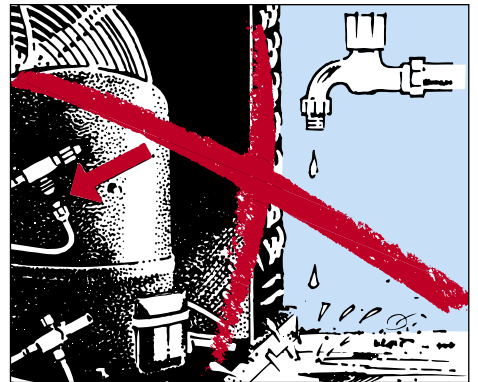
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Tubeing must be kept clean

A well-dimensioned, correctly installed and correctly commissioned refrigerant system is fundamental to a reliable refrigeration system with a long operating life.

An absolute requirement on the refrigerant system is that it shall remain completely free of foreign bodies (impurities).

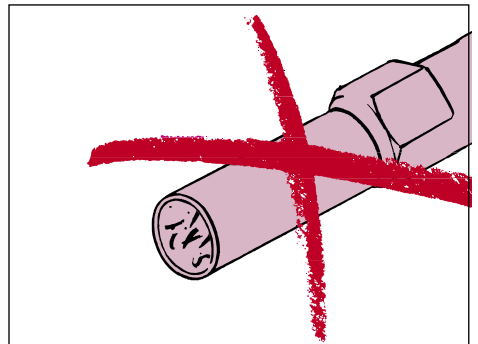
Installation work must therefore be performed with a high degree of cleanliness. This applies especially to systems containing the new refrigerants.



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Particularly damaging impurities

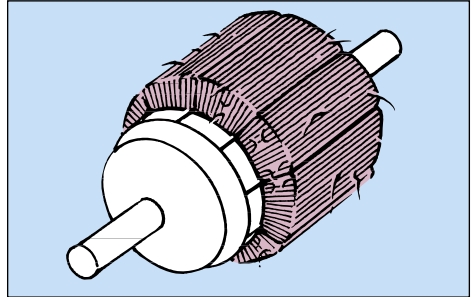
- Moisture
- Atmospheric air
- Soldering flux
- Rust, copper oxide, scale
- Metal swarf
- Unstable oils
- Certain fluorinated solutions (e.g. R 11 or carbon tetrachloride)
- Dirt or dust of any description.



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Problems caused by moisture in the system

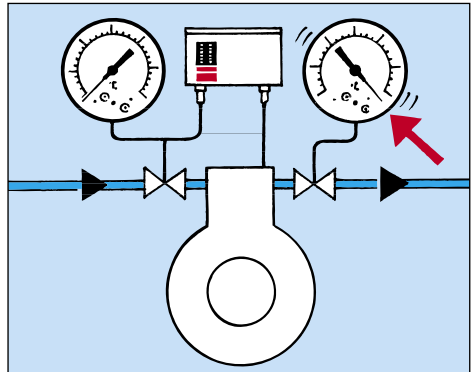
- Water separation and ice formation (blockage) in the expansion valve
- Acid formation
- Ageing and breakdown of the oil
- Corrosion
- Copper precipitation (dissolved copper from tubing deposited on bright steel parts in the compressor)
- Damage to the insulating lacquer on motor windings.



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Problems caused by atmospheric air

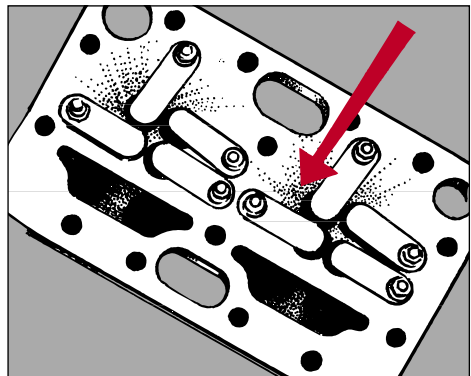
- Aeration
- Chemical reaction between refrigerant and oil
- Increased condensing pressure.



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Problems caused by oil and refrigerant breakdown

- Formation of organic and inorganic acids
- Corrosion
- Poor lubrication
- Abnormal wear
- Oil discolouration (darkening)
- Sludge formation
- Leaking discharge valves because of oil carbon deposits
- Increased discharge gas temperature
- Compressor damage
- Motor burnout



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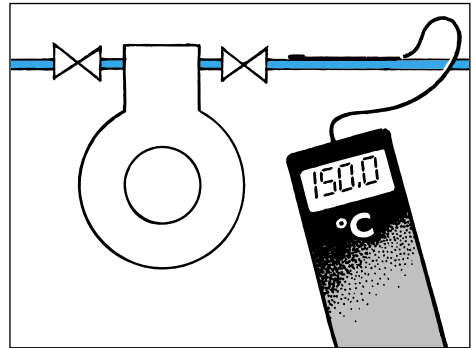
Problems caused by other impurities

The other impurities mentioned can cause:

- Accelerated chemical processes (breakdown)
- Mechanical or electrical faults

High temperature accelerates the breakdown processes, therefore abnormally high condensing temperatures and, especially, abnormally high discharge pipe temperatures must be avoided.

For the reasons just mentioned, a number of requirements must be met. Some of these are described in the next chapter.



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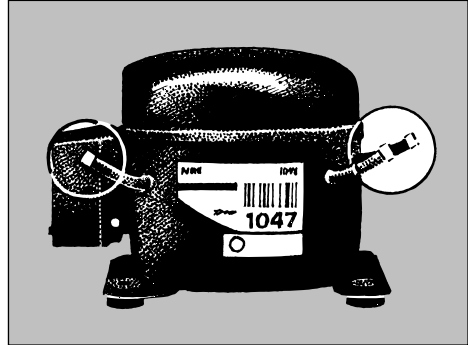
Component and material requirements

Components

Compressors for refrigeration and heat pump systems are put through a comprehensive cleaning process by the manufacturer so that, practically speaking, all traces of moisture and other impurities are removed.

All other components in the system should be of the same standard.

All components must fulfil cleanliness requirements. In cases of doubt, components should be checked.

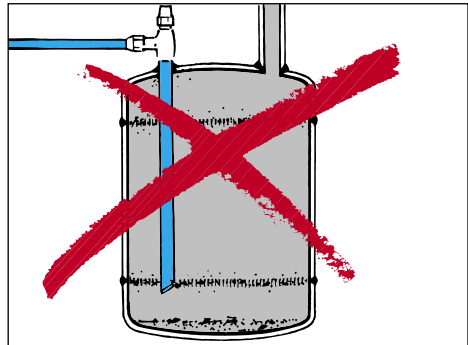


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Impurities and moisture

Impurities that might appear if component manufacturers are less thorough than they should be:

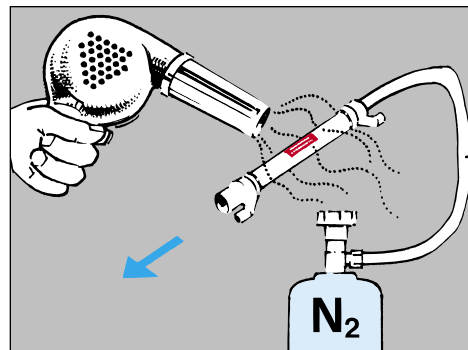
- Rust and scale (loose or embedded)
- Old oil
- Flux
- Metal swarf
- Moisture



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Moisture in smaller quantities in components can be removed by simultaneous heating and blowing through with dry nitrogen (N_2).

It is almost pointless to try removing other impurities. Components containing such impurities should not be used in systems with halogenous refrigerants.



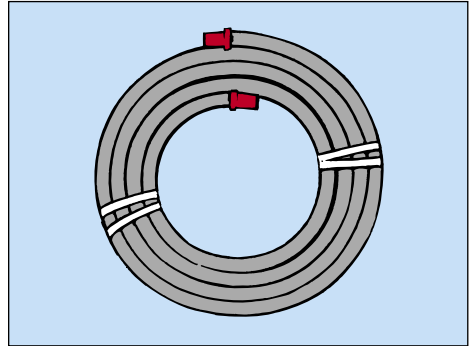
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Copper tubing

Special copper tubing must be used for refrigerant systems, tubing that is completely clean and dry. In addition, the ends of tubes must be hermetically sealed.

Tubing other than the type just described must not be used in refrigerant systems, unless it fulfils the same cleanliness requirements.

All components must remain tightly sealed until the moment they are installed in the system.



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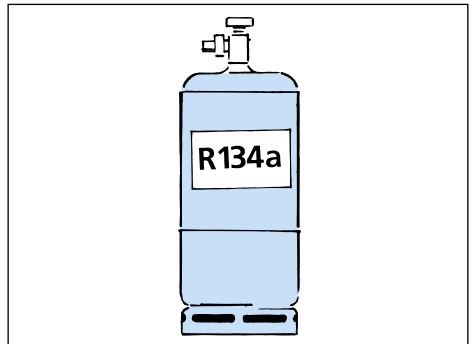
Refrigerant requirements

Refrigerants should only be purchased from accredited distributors.

Refrigerants for hermetic systems must not contain more than:

- 10 ppm = 0.001% water
- 100 ppm = 0.01% high-boiling refrigerant
- 0 ppm = 0% acid
- 15000 ppm = 1.5% non-condensable gases

Care must therefore be exercised when using regenerated refrigerant.



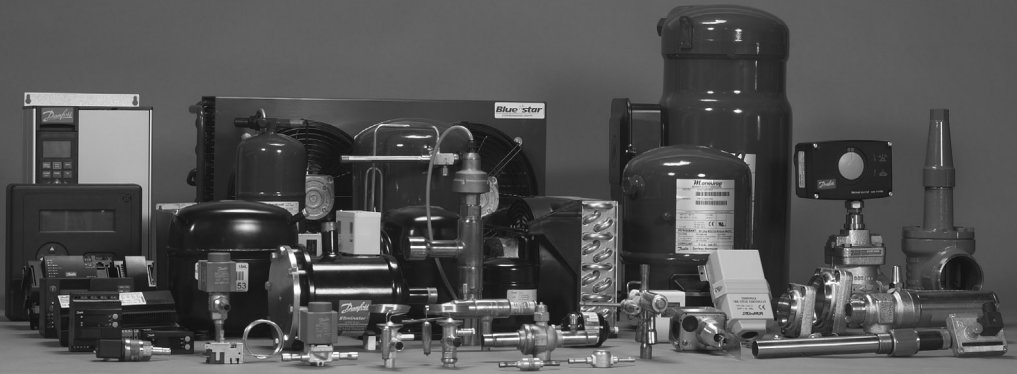
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Compressor oil requirements

Compressor oil must be approved by the compressor manufacturer and must not contain more than 25 ppm (0.0025%) water and 0% acid.



AcO_0007



The Danfoss product range for the refrigeration and air conditioning industry

Appliance Controls

General temperature controls for the home appliance industry. The product range comprises CFC-free electromechanical and electronic thermostats for refrigerators and freezers produced to customer specifications as well as service thermostats for all refrigeration and freezing appliances.

Commercial Compressors

Large hermetic reciprocating and scroll compressor technologies for commercial air conditioning and refrigeration. The compressors and condensing units are used in a large array of applications in both businesses. This ranges from water chillers, large packaged air conditioners as well as medium and low temperature refrigeration systems for food storage and processing.

Danfoss Compressors

Hermetic compressors and fan-cooled condensing units for refrigerators, freezers and light commercial applications such as bottle coolers and display counters. Danfoss also produces compressors for heating pump systems as well as 12 and 24 volt compressors for refrigerators and freezers used in mobile applications and solar power. The division has a leading position within energy utilisation, noise filtering and know-how about environment-friendly compressors.

Refrigeration and air conditioning controls

A comprehensive and highly reputed range of self-acting valves, electronic valves and regulators as well as system protectors and line components for the refrigeration and air conditioning market. These products include thermostatic expansion valves, solenoid valves, thermostat and pressure controls, modulation pressure regulators, filter driers, shut-off valves, sight glasses, check valves, non-return valves and water valves. Decentralised electronic systems for full regulation and control of refrigeration applications are also developed and produced at Danfoss.

Industrial Controls

Products and customer specific solutions for industrial monitoring and controls systems based on the principles of pressure and temperature measurement, electrical power and fluid control. Products include a wide range of automatic controls for process control and regulation such as contactors and motor starters, electrically, pneumatically and temperature activated valves as well as temperature and pressure transmitters and switches.