MAKING MODERN LIVING POSSIBLE

Cooling Matters

Danfoss News for the Refrigeration & Air Conditioning Industry

- News - CO_2 line components, New SGP sight glasses
- Products - VZH variable speed compressor
- Applications - ICF Flexline™
- Fitters Notes - Line components

Volume 1 • 2013

With the continual drive for every increasing efficiency and safety, within the refrigeration and air conditioning industry, it is sometimes hard to keep up with all the new developments whether it be with products or legislation.
At Danfoss we realise it is important for everyone to be kept up to date so we invest a lot of time and effort in producing informative and relevant training offers for the Industry.

Improving system efficiency and safety is not always about fitting the latest technology or gadget, very often it is about understanding and correctly applying all of the system components so that they work effectively giving a well balanced system.
It can be the incorrect fitting or selection of a simple line component that causes a system to run inefficiently, equally it could be poor maintenance that has allowed the system to deteriorate, what is important is being able to understand the signs and deal with them correctly.

In this issue of Cooling Matters we look at what Danfoss has in place to help you with these kind of challenges, from "online" and "face to face" training to our comprehensive range of literature, including the "Fitters Notes" and our extensive range of mobile Apps. You can also read about an ICF Flexline™ application at an Ice Cream factory.
We offer a range of knowledge and information to support you in your daily tasks, so why not take advantage of what Danfoss has to offer .

Contents

New SGP sight glass with higher pressure rating

Danfoss introduces a new high pressure sight glass, type SGP, which offers a MWP of 52 bar.

Available as flare, solder or socket versions there are 3 types of sight glass;

SGP X / SGP RX - without moisture indicator.
SGP I / SGP RI - for refrigerant with mineral oil, e.g. HCFC.
SGP N / SGP RN - for non flammable HFC and CO_2.

The maximum working pressure of 52 bar makes the SGP suitable for use in the liquid line of R410A and sub-critical CO_2 systems.

SH485: the innovative 40 ton scroll that brings more for less

Ideal for large chillers and rooftop units, the SH485 combines several major innovations. Its large capacity and unique features help OEMs to reduce development, installation and servicing costs with superior part-load efficiency coupled to enhanced reliability, optional electronic monitoring and communication abilities. With a 40 ton capacity in the shell of a 30 ton compressor – the compact dimensions simplify the design of systems with manifold configurations. More important for our customers, it provides great savings, low sound levels, increased lifetime and lower maintenance costs to end-users.

High pressure line components for CO_2

Danfoss has introduced GBC ball valves and NRV check valves, with a MWP of 90 bar, suitable for CO_2 applications.

The GBC ball valve is available in sizes 6-22 mm & 1/4-7/8 in and has CE approval.
The valve has single directional flow which is indicated by an arrow on the valve body.
Rigorous testing, including field tests, have proved the valves compatibility with CO_2 and the lubrication oil.

The NRV check valve is available with 10 mm & 3/8 in connections and comes with both CE and UL approval.
The valve allows internal pressure relief when the system is at standstill or during maintenance.
Intensive testing has again proved the compatibility with CO_2 and the lubrication oil.

Both valves are 100% high pressure tested to 130 bar on production line.

A superior solution of safety and convenience

The Danfoss ICLX valves are 2-step servo-operated main valves with pilot solenoid valves. From DN 32 up to DN 150, ICLX valves use an external pressure connection for opening (which means that no opening pressure difference across the ICLX valve is required).

ICLX opens in two steps:

- Step one opens to 10% of the capacity, when the pilot solenoid valves are activated
- Step two opens automatically after the pressure differential across the valve reaches 1.25 bar

Employee knowledge is a valuable asset

At Danfoss we understand the benefits of a well trained and knowledgeable staff for not only ourselves but also the wider industry. It is for this reason that Danfoss is dedicated to providing quality training.

From "face to face" to webinars and online eLessons Danfoss offers a wealth of training for all levels. Whether you require a basic introduction to refrigeration or advanced training on cold room design and selection we have something for you.

All of the different types of training are brought together on a single platform called Danfoss Learning, which is available online, in many local languages, 24/7.

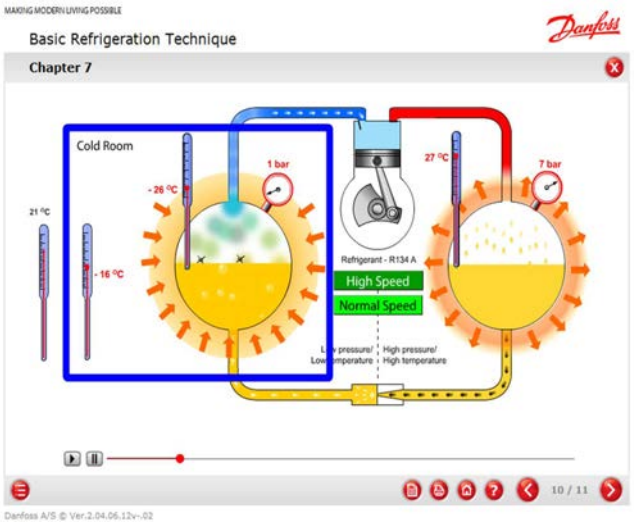
With Danfoss Learning you can access all of the training available in your country whether it is an eLesson, webinar or 'face to face' training, simply sign up for the course you want. Oh, and in case you were wondering, Danfoss never charges for these courses!

No matter what the delivery method is you can be assured that all of our courses have been developed in accordance with best practice principles, by experienced trainers who know their field to the smallest detail. It is your guarantee that your time spent training with Danfoss is time well spent.

So what is available?

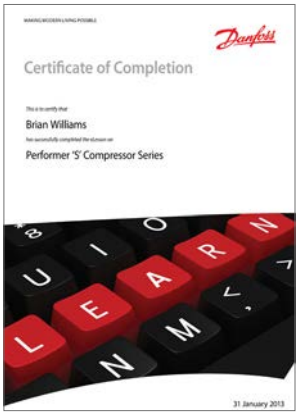
We have developed online courses in four areas: Refrigeration & Air Conditioning, Heating, Power Electronics and Industrial Automation. But our sector is the true powerhouse. Courses about cold rooms, heat pumps, CO_2 applications, selection programs, installation techniques, fault detection… if you can think of a topic, it will be covered

There are currently more than 60 eLessons and self study powerpoint courses available in English many of which have already been translated into German, French, Spanish, Portuguese, Italian, Russian, Danish, Swedish and Finish. The courses include such topics as "Basic refrigeration technique", "Cold Room cooling load calculations", "Condensing Unit installation and servicing guide lines" and "CO_2 Food Retail refrigeration systems and product selection".



Here we see a screen shot of one of the animations from the "Basic Refrigeration Technique" course.

Most of the courses last for 30 or 45 minutes and end with a multiple-choice test. A successful completion of the course allows you to print a certificate showing your result.

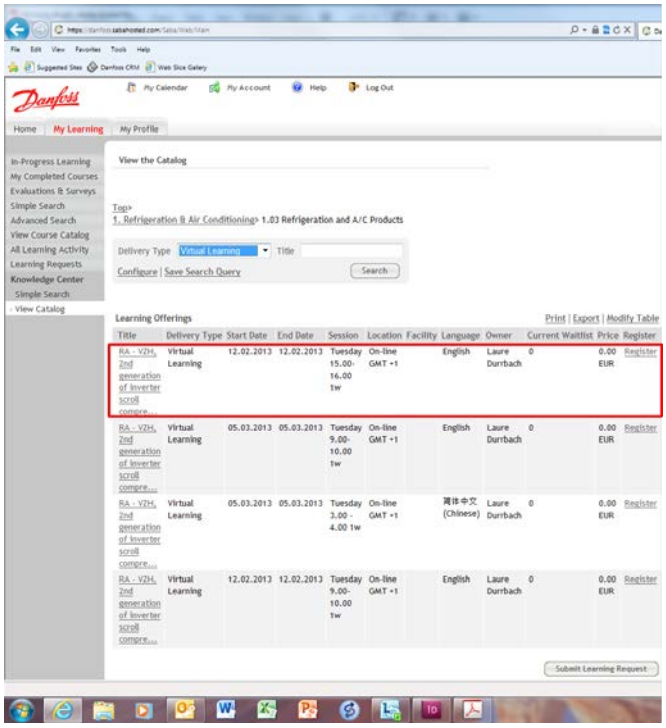


We've even set a minimum score for each module, which shows us that the participant has understood it. If you're not happy with your score, or you haven't passed, that's not a problem. You just go through all or part of the online course again, and take the test (with different questions) again as often as you like.

You can find out more information about all of the online courses available by downloading the course catalogue directly from the Danfoss learning website;

www.learning.danfoss.com

"Webinars" and "face to face" training.
Once registered with Danfoss Learning you will be able to also access "webinars" and "face to face" training that is released for your local area. It should be noted that where the "webinar" is offered by one of our Divisions (Automatic Controls, Commercial Compressors etc.) it will most likely be presented in English, however, locally offered "webinars" will be in your local language.
"Face to face" training is always offered in the local language.



Here we can see a recent offering from our Commercial Compressor Division for VZH inverter scroll training.

When you register for a "webinar" or "face to face" training you will receive an email invitation giving you all the relevant details for the training, including dates, times, venue etc. and for the "webinars" instructions on how to connect to the session.

Within the "Course Catalogue" menu of Danfoss Learning there is also an option to make a "Learning Request" whereby you can ask for specific training either as public training, where the training is available to everyone, or as private training for specific users only. We will assess all requests and where appropriate make an offering available.

So why not take advantage of the training offerings from Danfoss and sign up to Danfoss Learning today.

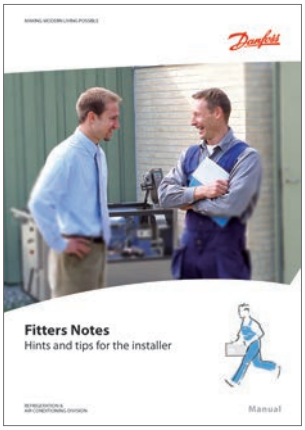
www.learning.danfoss.com

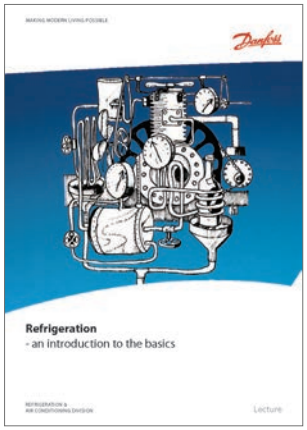
Remember it is free to register and enrol on the courses.

Danfoss Learning
Your online access point to knowledge

Other training aids and material available from Danfoss

Apart from the formal training offers we also have a wealth of other material available. Visit the "Training and Education" pages of you local Danfoss website where you will be able to download documents such as our famous "Fitters Notes" or "Refrigeration - an Introduction to the Basics".





You will also find Posters and video's and animations as well as the Danfoss "Cool-Game". There are product animations that are available to download and can be embedded into PowerPoint presentations.

We also offer a range of mobile Apps for Android and iPhone under the name of "KoolApp™", further information on these Apps is available on the back page.

Finally you will find a range of useful videos on Youtube, simply search for Danfoss.

VZH: the breakthrough for highly efficient HVAC systems

The Danfoss inverter scroll VZH combines the benefits of Danfoss inverter solutions with unmatched performance and capacity modulation possibilities.
The VZH range, from 13 to 26TR, provides the largest cooling capacity with a single hermetic inverter compressor. And in parallel makes Danfoss the supplier offering the widest inverter compressor range in the market.

Why a second generation of variable speed compressor?

One of the Danfoss focuses today is to offer effective and reliable solutions to drive innovation and differentiation while taking up the climate and energy challenges.
Variable speed solutions are the best means to deliver the efficiency and performance levels required for different climates and part load conditions in varied applications in air conditioning such as: VRF, air handling units, chillers, rooftops, packaged splits or IT and process cooling units.
The inverter technology also provides other important benefits such as precise temperature control, especially important for the cooling of IT equipment, industrial processes, or humidity management for building such as museums or libraries, etc.
The Danfoss second generation of inverter solutions are now stepping beyond from the energy point of view. VZH series includes two ranges optimized for low and high pressure ratios.

The inverter drive modulates the cooling capacity from 100% down to 25% with a single
compressor and from 100% down to close to 10% for tandem configurations, which suit well for a
variety of demanding applications where low part loads are needed.

Unmatched performance levels

Tests and calculations demonstrate that energy savings of over 30% can be achieved when using the VZH inverter compressor and compared to a unit equipped with a fixed or mechanically modulating compressor. Compared to tandem configurations around 12 to 15% annual energy savings can be gained whatever the climate conditions.

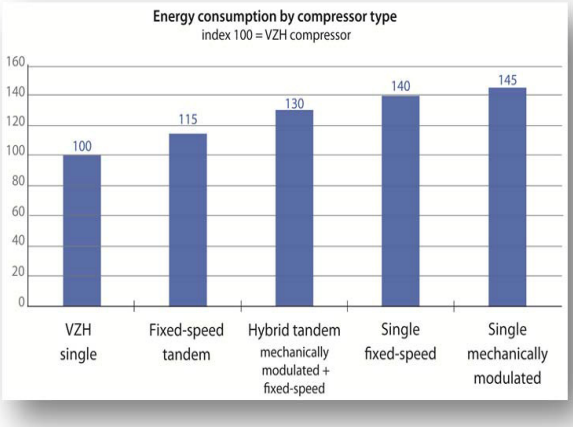


Figure 1: Performance comparison by compressor type

Average consumption index based on simulations for 10-30TR compressors used in applications with low pressure ratio (rooftop)

Index 100 = VZH energy consumption.

Temperature profile Milano - Italy.

Several aspects of the compressor design make this possible:

- optimization for different pressure ratios,
- permanent magnet motor technology,
- capacity modulation,
- manifolding capability.

The optimization for different pressure ratios and permanent magnet motors are the major contributors to these performance levels.

The efficiency comparison between asynchronous and synchronous motors shows instantaneously the great advantages obtained when using a permanent magnet motor technology with:.

- Uniform motor efficiency in operation always above 92% even in part load. This leads to a lower power consumption (see figure 2)
- Coolant stays cooler: motor being more efficient, it will transfer less heat to the refrigerant and thus enhanced the compression efficiency.

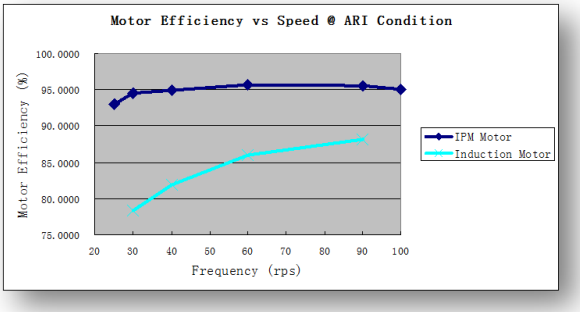


Figure 2: motor efficiency by motor type:

Permanent Magnet Motor and Asynchronous Motor

2 ranges optimized for different pressure ratios:

Scroll compressor designs are optimized for a given pressure ratio. The isentropic efficiency of a scroll compressor reaches a maximum at the built-in pressure ratio. When a compressor is operating below this built-in pressure ratio there are losses called overshoot (discharge gas is at a pressure above the condensing pressure) or backflow (discharge gas is below condensing pressure). So the possibility to choose the adapted built-in pressure ratio when using a scroll is decisive to the system efficiency.

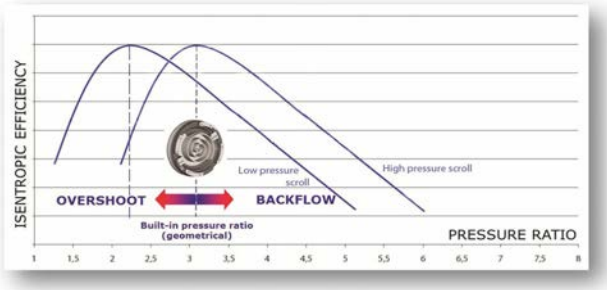


Figure 3: scroll compressor isentropic efficiency by pressure ratio

The VZH offers the choice of 2 built-in pressure ratios to optimize the efficiency of the system according to the application:

- High pressure ratio – mainly for chiller A/W application
- Low pressure ratio – mainly for A/A unit (rooftop) and chiller W/W

Faster time to market

One of the unique values of the Danfoss inverter technology is the prequalified package where compressor and inverter drive have been optimized to work perfectly together. This in-built know-how makes life easier for the manufacturers saving time in unit development, and ensuring a more robust and reliable solution is designed. It is also a more secure solution for the specifying engineers and end-users, who can be assured of a fully tested and qualified solution, and designed from the outset as a dedicated product.

Extended capacity

When in tandem configuration, the VZH compressors range can reach up to 52TR to cool a 2000m^2 building. Danfoss offers its customers a patented manifold design to optimize both performance and cost.

Summary	
Product	Performer® VZH R410A-scroll compressors
Application	Commercial Air Conditioning
Models (3-phase)	VZH088 VZH117 VZH170
Capacity	From **13 to 52 tons*** @ **100Hz** at standard ARI conditions
Features	**Daring efficiency:** • Over 30% thanks to permanent magnet motor and optimized pressure ratios **Precision cooling:** • +/-0.3°C/0.1°F **Faster time to market:** • 6 months reduction with prequalified compressor and drive **Extended modulation and capacity:** • 25-100RPS • Pre-equipped for tandem configurations with a patented manifold design **(47-183kW)*

Saving time and money

ICF Flexline™ Valve Station Application in Ice Cream Factory

During a recent refitting of an ice cream manufacturing plant, the application of ICF Flexline™ valve stations from Danfoss led to a significant reduction in production down-time. It was estimated that approximately 80% improvement was realized when compared to traditional valve assemblies. Also, due to the small footprint of ICF Flexline™ valve stations and their ready-built feature, installation was made much easier and faster. This lead to substantial savings in installation costs, component costs, and loss of valuable production time.

The ice cream factory in Vladivostok, Russia, was founded in 1986. Over the years, increased requirements for product quality and changing technical standards, as well as changes in market demand, mandated that they carry out a full technical re-equipment of their manufacturing plant.

The main goals of the re-equipment were to reduce energy consumption, to install modern and efficient equipment, to optimize temperature levels and to add the possibility of producing more varieties of deep-frozen products.

The ammonia refrigeration plant with compound and single-stage compressor units is supplied by circulation pumps. It supports three different temperature levels: -45° C / -49° F, -40° C / -40° F and -30° C / -22° F. Ice-water is cooled by a liquid separator. The total cooling capacity of the unit is 2.5 MW.

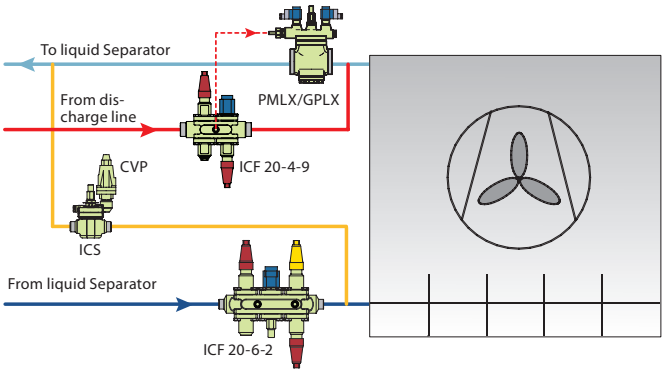


Fig 1: Principle of the evaporation system based on ICF Flexline™ valve stations.

The new refrigeration unit had to be installed within the existing rooms in the plant. However, since the ICF Flexline™ valve stations are very compact in size, this could easily be accommodated. This was one of the benefits the system engineer sited as a reason for developing a solution based on the Danfoss ICF Flexline™ valve stations.

Fig 2: The use of ICF Flexline™ valve stations on the distribution lines of evaporators in storage rooms

Due to the lack of space and the limited time available for installation work, the combined ICF Flexline™ valve station was applied on the distribution lines of the storage chambers. The ICF Flexline™ valve stations were installed on the liquid ammonia lines for the evaporators (fig. 1 and 2) and the hot ammonia gas lines used for defrosting the evaporators (fig. 1 and 4).

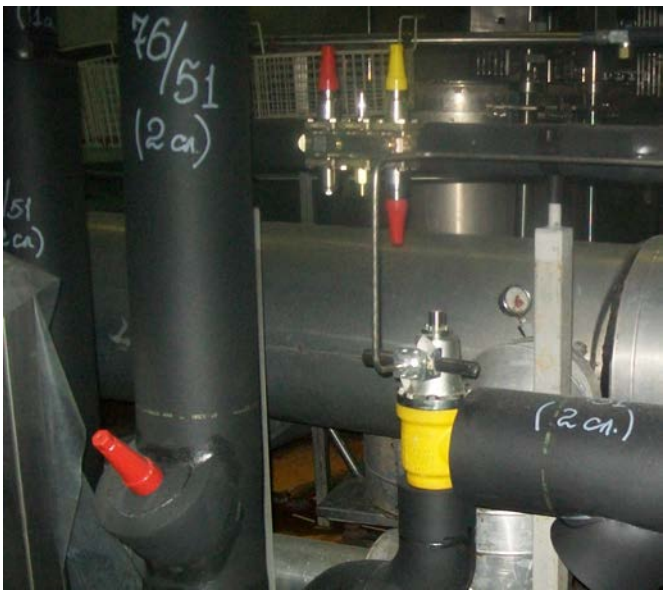


Fig 3: ICF valve stations fitted on evaporator defrosting lines

A similar solution is used in the deep freeze packing shop in the ice cream factory. ICF Flexline™ valve stations are installed in the distribution sections of fast-freezers. The compact design of the valve stations meant that the installation took up six times less space than traditional valve assemblies. Also, ICF Flexline™ valve stations require up to 80 %

less time in installation, which meant that interruption of the production process for the installation was significantly reduced.

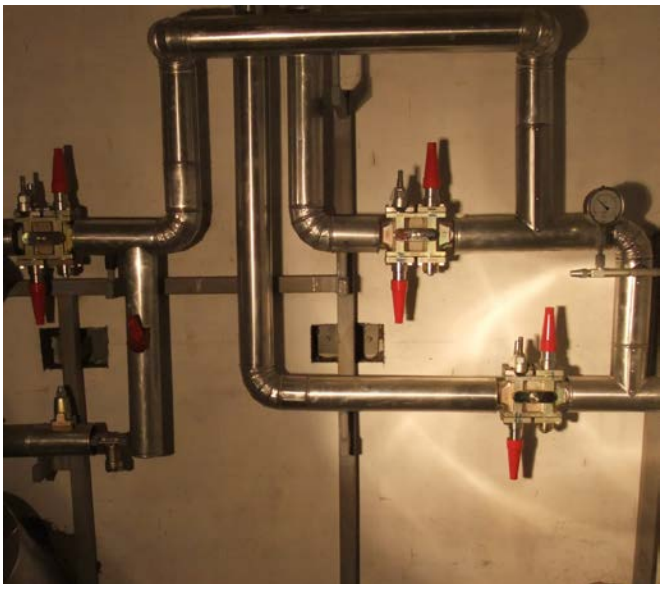


Fig 4: ICF Flexline™ valve stations on defrost lines

The ICF Flexline™ valve station design is based on a multi-ported body less than a foot long that will accept a combination of function modules chosen specifically for the customer's applications. The modular function inserts that can be mounted on an ICF Flexline™ body include stop valves, strainers, solenoid valves, check valves, combination stop/check valves, and motorized or hand expansion valves. Side ports can also be used as shown in Fig.1, 2 and 3. Once ordered, the valve station is delivered by Danfoss fully tested and ready to be installed with just two welds and no disassemble required.

The installation of ICF Flexline™ valve stations was made fast and convenient due to the unification of parts, the compactness and the small amount of ammonia used in the running of the stations.

For help in creating this article we thank technical director of the company OOO "OK", M.Sc. Mr. Kalunov and the head of the compressor shop at the ice cream factory Mr. Mutzhenko.

New EU proposal to significantly reduce the emissions of fluorinated gases (F-Gases)

At the beginning of November 2012 the European Commission presented a proposal to significantly reduce the emissions of fluorinated gases (F-Gases).
In the following article you will find the latest information concerning this subject.

1. Preamble

The EU proposal is a great step in the right direction. Active environmental protection must be a priority. This paper proposes that the 25th anniversary of the Montreal Protocol sets the course for better climatic conditions and it offers economic opportunities.

The emissions of F-Gases with their Global Warming Potential (GWP), can be up to 23,000 times higher than that of CO2 have increased by 60% since 1990 , while all other greenhouse gas emissions have been reducing.

As of 2015, the total consumption of HFCs will be limited and gradually reduced to a fifth of current volume. This measure builds on the successful waiver of R22, which was achieved in the EU ten years earlier than envisaged in the international schedule.

2. Objective

This regulation proposal maintains the current provisions of the F-Gas Regulations, with adjustments to ensure better implementation and enforcement of the legislation by national authorities.
The current F-Gas Regulations are listed below:

> **F-gas Regulation Reg 842/2006 EC**

> **Regulation 1516/2007**
Standard leakage checking requirements for stationary refrigeration, air condition and heat pump equipment containing certain fluorinated greenhouse gases

> **Regulation 1493/2007**
The format for the report to be submitted by producers, importers and exporters of certain fluorinated greenhouse gases

> **Regulation 1494/2007**
The form of labels and additional labelling requirements as regard products and equipment

> **Regulation 308/2008**
Format for notification of the training and certification programmes of the Member States

> **Regulation 303/2008**
Min. requirements for certification of companies and personnel's

> **Regulation 307 /2008**
Minimum requirements for training programmes and the conditions for mutual recognition of training attestations for personnel as regards air-conditioning systems in certain motor vehicles containing certain fluorinated greenhouse gases

3. Impact

One of the main topics is the ban of refrigerants during the time period 2015 to 2020. Furthermore, a phasedown of HFC based on GWP is planned.

Summarized:
3.1 There will be specific bans:
> R404A will be banned in specific system types , and later all HFC's with GWP >150 in specific system typessystems such as (;domestic refrigerators and freezers, sealed commercial systems).
> Servicing systems with 1.3kg or more R404A will be banned from 2020.

3.2 There will be a phasedown of HFCs based on GWP
> Starting with stabilization in 2015, ending with 21% in 2030.

3.1 Specific bans

In Table 1 a summery overview of the new equipment's restrictions are shown:

Products and equipment	Date of prohibition
Domestic refrigerators and freezers with HFCs with GWP of 150 or more	1 January 2015
Refrigerators and freezers for commercial use (hermetically sealed systems)	1 January 2017 for HFCs with GWP of 2500 or more 1 January 2020 for HFCs with GWP of 150 or more
Movable room air-conditioning appliances (hermetically sealed) with HFCs with GWP of 150 or more	1 January 2020

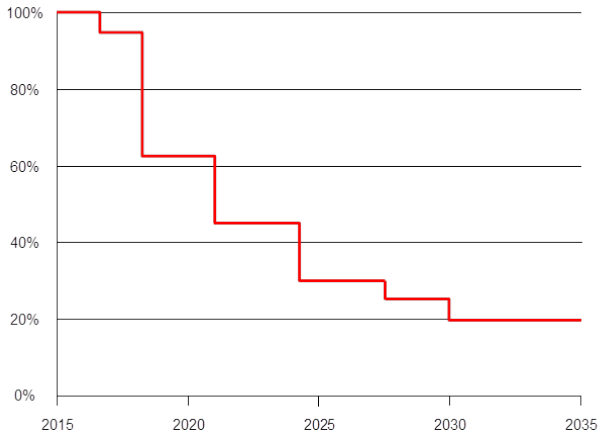
Table 1: Summery overview over the equipment restrictions

In addition, recharging of existing refrigeration equipment with a charge size over 5 tonnes of CO2 equivalent with HFC of very high GWP (>2500) will not be permitted from 2020 onwards as more adequate and energy efficient drop-in refrigerants of lower GWP are already widely available on the market. For R404A tonnes of CO2 equivalent is 1.28kg

3.2 Phasedown of HFCs based on GWP

The phase-down mechanism involves a gradually declining cap on the total placement of bulk HFCs (in tons of CO2 equivalent) on the market in the EU with a freeze in 2015, followed by a first reduction in 2016 and reaching 21 % of the levels sold in 2008–11 by 2030.
Producers of products and equipment who face a restricted supply of F-Gases will switch to alternative technologies where feasible.

Year	Schedule
2015	100%
2016	93%
2018	63%
2021	45%
2024	31%
2027	24%
2030	21%



Tables 2/ 3: GWP weighted phase-down schedule:

The phase-down mechanism is based to a large extent on the experience gained from phasing down the consumption of ODS. Companies that place bulk HFCs on the EU market must have rights to place bulk substances on the EU market for the first time. The Commission allocates free quotas to companies based on past reporting data, with a reserve for new entrants. Companies must make sure that they have enough rights to cover their actual placing of products and equipment on the market. They may transfer quotas among themselves. The Commission checks compliance the following year, with independent verification.
Around 100 companies are expected to participate and a threshold ensures that companies that only place small quantities on the market are exempted.
HFCs imported in pre-charged equipment should also be counted under the phase-down and so complementary

measures are indispensable to tackle these gases to ensure the environmental integrity of the phase-down mechanism and a level playing field in the market. Therefore, non-hermetically sealed HFC appliances would still be able to be produced in, or imported into, the EU but they would have to be filled at the place of installation.

4. Entry into Force & Status

This proposal will now be submitted to the European Parliament and the Council for consideration and adoption by way of the ordinary legislative procedure. The legislation shall apply from 1. January 2014.
The current version is likely to have several changes before the proposal becomes law. Further every Member State has the possibility to prepare its own more even stricter legislation.

The text proposals of the legislation are available on the European Commision website @

http://ec.europa.eu

5. Danfoss Information Package

Danfoss can offer a range of detailed information concerning our products for alternative environmentally freindlier refrigerants.

R407A & R407F
Environmentally friendly substiutes for R404A

R600a & R290
Danfoss your Hydrocarbon Solution Provider

CO_2
Danfoss - Your CO_2 Solution Provider

R32
More environmentally friendly AC Systems & Heatpumps

Line components

It can often be the case that the importance of line components to the safe and efficient running of a refrigeration system is overlooked. In the following article we take a look at the filter driers, sight glasses, stop valves and non return valves, with some useful tips on selection and installation.

Filter Driers

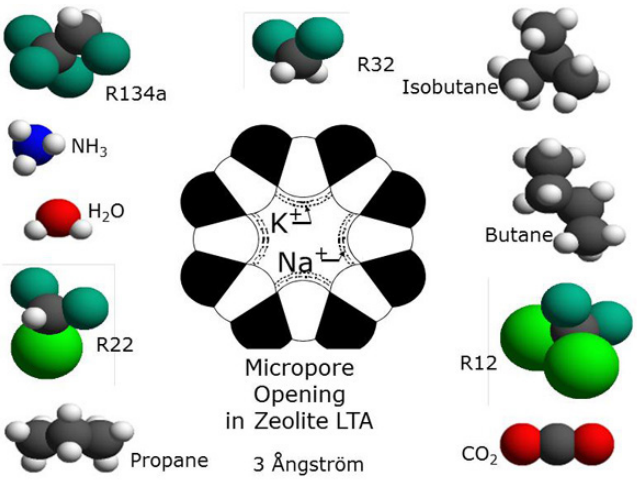
Most filter drier manufacturers say that installing a high quality filter drier is worth the added cost to ensure proper system protection. But what does quality mean in the world of filter driers? What specifications are important and what criticisms are valid? Though filter driers are often viewed as very basic products with no differentiation, each manufacturer has chosen a specific design for a reason. To make sense of the various claims, it's important to understand what happens inside a filter drier.

A filter drier is designed to protect a system from moisture, acids, and solid contaminants. Moisture can clog an expansion device with ice, reduce system efficiency due to the thermodynamic properties of water, or combined with high temperatures and pressures and oils in the system, can form acids, which damage the compressor and other components. Solid contaminants can clog expansion devices and wear compressors prematurely. So quite simply, filter driers should be judged on their ability to protect the system.

If you were to look inside several driers, you would see similarities and differences, beginning with the desiccant core. Some manufacturers use desiccant beads while others use a solid core. Many contractors have heard of beads coming loose or dust developing from beads rubbing together. In most steel-shell driers, current designs are robust enough to hold beads in place, and some manufacturers use beads that have been coated to prevent dust developing from friction. However, coating the beads limits the speed of moisture adsorption, which compounds the issue that beaded designs have unused space around the beads, and thus less desiccant volume than solid core designs.

Solid cores are actually made of loose fill that is mixed with a binding agent to mold the core into a desired shape, strong enough to stand on. To avoid compromising drying capacity, the binding material should be kept to an absolute minimum. For example, Danfoss uses about 6% binding material compared to 20% for another leading solid core brand. Cores generally have a divot at one end, which is not intended to catch dirt as most expect; the flow is actually in the other direction, and this gap is left to draw the refrigerant through the core, rather than letting it flow around, ensuring good contact with the drying material. But the work actually happens at the molecular level.

You may have noticed the word adsorption instead of absorption was used above. Desiccant molecules do not absorb moisture, which would mean moisture is dissolved into the core, but they adsorb moisture, which means water molecules are caught and bonded to the desiccant. Molecular sieve is a compound with pockets perfectly suited to catch water molecules, but too small to capture refrigerant molecules. This compound varies in quality between manufacturers, and the quantity of core material is less important than the quality. Some manufacturers need twice as much material to accomplish the same drying capacity, so the next time you hear that one brand has more desiccant than another, ask instead about moisture capacity.



Molecular sieve has micro-pores perfectly suited to capture water molecules, but allows larger refrigerant molecules flow freely

Molecular sieve is highly efficient at capturing moisture, but not acid. Many filter drier manufacturers offer a blend with either activated alumina or charcoal to capture acid. Most OEMs choose 100% molecular sieve driers, since they have controlled manufacturing environments where risk of contaminants entering the system is minimal. For aftermarket service, most contractors choose a blend of molecular sieve and activated alumina for both high moisture capacity and acid adsorption capacity, given that servicing a system always means the potential for some contaminants to enter.

One important point to note is that materials like activated alumina that adsorb acid are polar, and can also capture other polar substances like oil additives. Some filter drier manufacturers do not publish this, but it is a property of the material, not any manufacturer's particular product, so Danfoss recommends using pure oils without additives with filter driers with acid adsorption capabilities. While a combination of oil additives and a desiccant blend filter drier will not harm a system, some acid capacity will be occupied by the additive and any benefit that you may expect from the additive would be diminished.

There are several filter materials available today. Fiberglass is highly efficient, but since it can be an irritant, some component manufacturers choose to work with other materials. You may have heard that fibers from filters can come loose and clog expansion devices. This happened with early designs, though the major manufacturers producing steel shell driers have addressed this with additional filtering screens. Felt pads are another common and effective filter.

Danfoss solid core filter drier exploded view - flow is from left to right

Two criteria are important in filter performance: dirt capacity and filter efficiency. To put it simply, the drier needs to capture contaminants without clogging and creating a pressure drop, and it needs to filter small enough particles to prevent problems. Danfoss research has shown that particles smaller than 25 microns pass harmlessly through a system, with no danger to any components. But filter driers with 20 micron filters clog faster, which creates an efficiency-zapping pressure drop, without any benefit to the system. Therefore, it's important to choose the right level of filtration: 25 microns.

Copper spun driers generally have loose fillings of beaded desiccant and fibrous filters. Though they generally cost less than steel driers, drying and filtration capacity also tend to be lower. In all but the smallest systems, OEMs prefer steel shelled driers both due to the more robust construction and performance but also to avoid the price volatility of copper.

So how can you decide if the filter you are holding in your hand is a quality product? Look for the right level of moisture capacity, acid capacity, and filtration that you need. For contractors, that means a high quality solid core steel drier in order to have high moisture capacity, a blend of molecular sieve and activated alumina for both water and acid adsorption, and a 25 micron filter with sufficient dirt capacity. By missing this advice, you could end up with less protection than you bargained for.

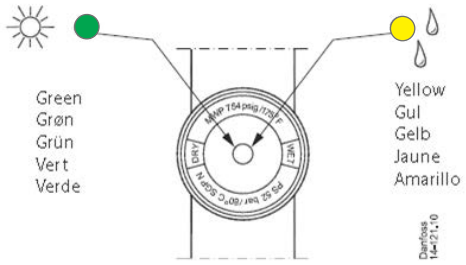
Sight Glasses

There are 3 main areas in a refrigeration system where sight glasses are likely to be used.

- in the liquid line between the filter drier and the expansion valve to monitor the condition and moisture content of the refrigerant.
- in the receiver to monitor the liquid level (socket type).
- in the compressor/oil separator to monitor the oil level (socket type).

Typically sight glasses will be supplied as either solder, flare or socket connection versions and be available with or without a moisture indicator.

Where the sight glass is being fitted in the liquid line, between the filter drier and expansion valve, a version with moisture indicator is used. In this case the sight glass performs 2 functions, monitoring whether the moisture content of the refrigerant is within an acceptable range and also allowing you to see that liquid refrigerant is always present at the expansion vlave.



Sight glasses are quipped with sensitive indicators that reflects a color, which depends on the moisture content of the refrigerant.
The values under “green/dry” are to be considered as perfect condition meaning full protection against harmful effects from moisture.
If the green colour starts to fade, the moisture content is reaching a critical level.
If the colour changes to yellow it is a clear signal, that the capacity of the filter driers is exceeded and should be replaced as soon as possible.

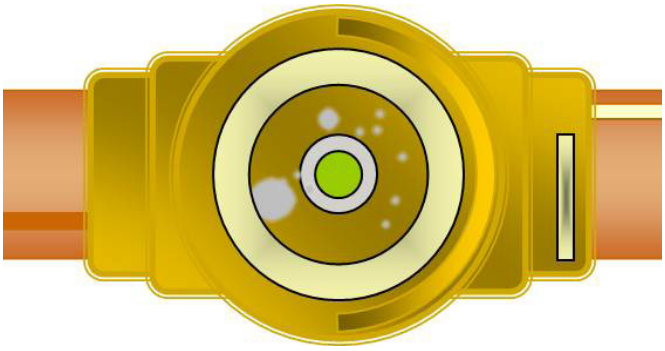
Excessive moisture content can cause icing of the expansion valve if the evaporating temperature is 0 °C or lower. In addition, excessive moisture in the system can react with the oil normally used in modern refrigeration systems (polyester oil) to form acids.

When selecting a sight glass with indicator the following should be considered:

- Type of refrigerant
- Connection size
- The level at which a danger signal is required

You should pay particular attention to the level at which the danger signal is required. It can often be the case that moisture indication of some sight glasses show a system to be dry at much higher levels of moisture content. At Danfoss we have designed these moisture indicators to reflect the requirements of the refrigeration component manufacturers which are especially important where compressors are concerned. So make sure you choose the sight glass that indicates the safest level of moisture content, don't put an expensive compressor at risk.

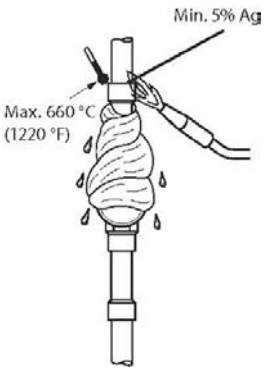
Bubbles in the sight glass indicates a possible shortage of refrigerant, that the refrigerant in the liquid line is not entirely in the liquid state or that the drier is blocked.



Any of these situations is not good for the system, so they should be investigated further to find the cause.

Installation

Installation of the sight glass will depend on whether you are using the solder or flare connection version. When fitting a solder version there are certain precautions you should take.

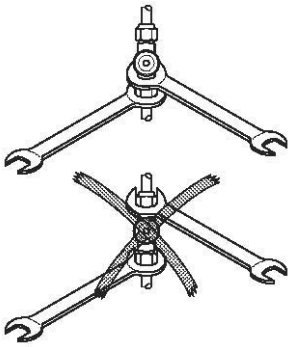


A "wet rag" should be wrapped around the valve body when sodering.

Always point the flame away from the sight glass.

It is recommended that the valve is purged with dry nitrogen when brazing to prevent water condensation under the glass.

When fitting the Flare version you should ensure that both spanners are on the same side of the valve when tightening the flare nut.

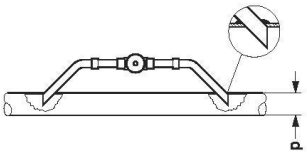


You should also be aware that there is a maximum tightening torque for all sight glasses based on the connection size.

Please check the technical data for this information.

If the diameter of the pipe is too large to fit a sight glass in line you have 2 options.

You can braze a saddle to the pipe and then fit a socket sight glass, alternatively you can instal a solder sight glass in a smaller parallel pipe.



When fitting a socket sight glass it is recommended that you use a hexagonal spanner, again there is a maximum tightening torque for the socket sight glasses.

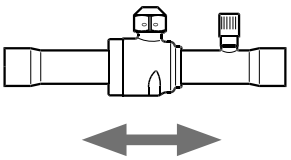
When fitting a sight glass to a receiver or compressor a socket sight glass without a moisture indicator is used, as mentioned above a hexangonal spanner is recommended and be aware of the maximun tightening torque for the sight glass used.

Ball valves

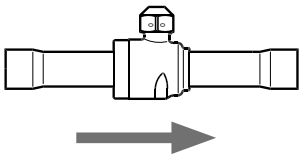
The GBC Ball Valve is a manually operated shut-off valve and is available in a standard version or a high pressure version. The standard version is suitable for R134a, R407C, R507, R404, & R410A while the high pressure version (90 bar) is suitable for CO_2.

Depending on whether you are using the standard or the high pressure version you should be aware of the differences when fitting these valves.

The standard GBC ball valve is suitable for bi-directional flow and can be delivered with or without an external access port.

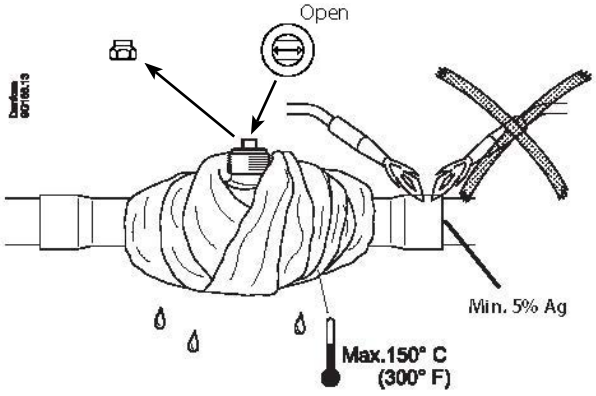


The high pressure GBC ball valves are only for single direction flow and are not available with an external access port.

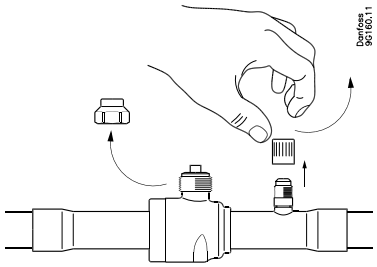


The flow direction ensures the correct positioning of a relief hole, in the ball, to release any entrapped liquid.

When brazing GBC valves you should always remove the cap and insure that the valve is in the open position. A"wet rag" shoud be wrapped around the valve body and always point the flame away from the valve.
It is important to prevent overheating when brazing otherwise you risk damaging the o-ring which may then cause a leak.



If you are brazing a standard valve with an external access port you should also remove the cap from the access port.



It is recommended that the valve is purged with dry nitrogen when brazing.

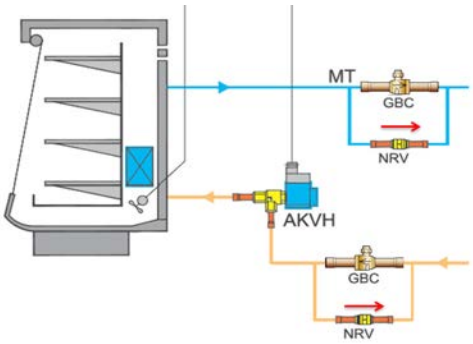
Check valves

NRV check valves ensure that refrigerant can only flow in one direction and are used in liquid, suction and hot gas lines.
There is standard pressure range for HFC refrigerants (R134a, R507, R404A, R407C & R410A) and also a high pressure version for CO_2

The HFC range is available as a straight-way version with solder or flare connection and an angle-way version with solder connection. The straight-way solder versions can be supplied with oversize connections providing flexibility in use.
When sizing the NRV you should aim for the highest capacity at lowest pressure drop across the valve before it closes.

The high pressure NRV 10sH is available for use with CO_2 (90 bar).

This valve can be used as an internal relief valve when fitted in parallel with GBC ball valves or service shut-off valves, at the inlet and outlet of components to be serviced.



The valve can also be used in hot gas defrosting lines.

The Compass Compressor Selection Tool Goes Global

Compass, The **COMP**ressor **A**lternative **S**election **S**oftware for comparison and selection of compressors has now been launched for free use worldwide by refrigeration professionals.

Compass is a fast, intuitive and simple online tool for comparing and selecting the best Danfoss Compressor-match to any competitor.

The current version of Compass can operate with Imperial (US) units and with 60 Hz mains voltage. The comparison tool will be updated as competitor data is made available. The tool does not replace any of the current Danfoss selection or calculation software like Coolselector or Foresee.

Key Features
The Danfoss Compass software provides a quick and easy search-and-find function in the most comprehensive compressor database available in the market. You can search for compressors just by typing in a few letters from the label and the tool will then give you the best matched Danfoss alternative. Because the online software is linked to the Danfoss product catalogue on the website, you can even get detailed information on the suggested Danfoss alternative like datasheets, descriptions and photos.

To access Compass visit your local Danfoss website and select "Software" from the left hand menu of the "Refrigeration and Air Conditioning" pages.

KoolApp™ - Information at your fingertips

Danfoss offers an app library of several practical tools for the refrigeration professional on the go both for iPhones and Androids.

The KoolApp™ Library will continue to expand in the future so please keep yourself updated by regularly visiting the KoolApp™ website!
www.danfoss.com/koolapp

KoolApp™ Refrigerant Slider
The Danfoss KoolApp™ Refrigerant Slider turns your smartphone into a user-friendly, quick pressure-to-temperature refrigerant converter.

In the current version there are 76 different refrigerants including both "natural" and "traditional" refrigerants.

KoolApp™ CoolGame
Test your refrigeration know-how compared to colleagues around the world. Establish your own league against you colleagues or classmates or play against the world!

The gaming concept is that you build a specific refrigeration circuit as fast as possible by placing the components in the correct place in the system.

KoolApp™ Fitters App
Are you experiencing trouble in shooting the problems down? This handy pocket-guide in trouble shooting is intended for helping you to, on-site; identify the problems that caused the refrigeration plant to malfunction.

Identify the problematic area; is it the low-pressure or high-pressure part which is causing trouble? You then get a list of symptoms and for each symptom you, in turn, get a list of possible solutions!

KoolApp™ Compass
The tool provides a quick and easy way to search the most comprehensive compressor comparison database available on the market. You can search for any compressor regardless of its brand just by typing in a few letters from the product label. Compass will then give you the best matched Danfoss alternative.

KoolApp™ - KoolCode
Save time and increase productivity with the Danfoss KoolCode App for "on the spot" ADAP-KOOL® controller information.

Download this App to get a simple off-line tool to easily look up alarm, error, status, and parameter codes without bringing along the printed manual or laptop.

KoolApp™ Danfoss IR App
It is a "One Platform app" for you, who are working with Industrial Refrigeration.

In the Danfoss IR App we will collect apps/tools that we hope will make your work with industrial refrigeration products from Danfoss easier.

All you have to do is download the Danfoss IR app, and you will always be updated on the apps developed for Danfoss Industrial Refrigeration.

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