FST GmbH
Filtrations-Separations-Technik

Compressed air drying

If compressed air simply is to be dry

What is …?

Compressed air

is energy in the form of compressed ambient air. Compressed air is permanently trying to expand back to atmospheric pressure and thus performs work during the expansion process. Besides electrical energy compressed air is one of the most important forms of power for industrial production processes and is widely used thanks to numerous advantages:

- Can be produced locally and on demand
- Can be stored easily and without losses
- Can be transported easily
- High amount of energy per volume
- Can be easily converted to other forms of energy, e.g. blast air, fast linear movement with increased force, rotary movement with increased torque, in a space-saving way
- Versatile applications

The compressed air contains contamination and moisture from the ambient air which are concentrated according to the operating pressure. Oil-lubricated compressors will add amounts of oil to the compressed air. When the compressed and hot air is cooled down to an appropriate operating temperature, larger amounts of water will condense (condensate).

Untreated contamination in the compressed air would contaminate and damage the compressed air system, the compressed air consumers and the products that come into contact with the compressed air.

Compressed air treatment

removes the unwanted contamination and provides the purity of the compressed air required for the application, e.g. standard instrument air, technically oil-free compressed air up to sterile ultra-pure air or medical breathing air. Many industries have a specific air quality requirement governed by best practice or legislation.

The aim of compressed air treatment is to ensure continuous and trouble-free operation of applications using compressed air, to minimise downtimes, unscheduled maintenance and repair work, and to remove specific contamination that may be harmful to the product.

And, most of all, compressed air treatment actively contributes to environmental protection as well as to occupational health and safety. Liquid oil droplets, finest oil mist, oil-contaminated solid particles and gaseous, foul-smelling oil vapour, i.e. contamination which occurs on site during compressed air production, can be completely eliminated and thus will not contaminate the local environment.

The compressed air treatment system comprises several consecutive treatment components, referred to as treatment chain, which treat the compressed air in stages in order to achieve the required purity.

Compressed air drying

is an elementary key component in the treatment chain. The task of compressed air drying is to reduce the amount of moisture contained in the compressed air to a defined residual value.

At the outlet of a compressor there is 1000 times more moisture in the compressed air compared with the sum of all other contaminants. The compressed air is 100% saturated with water moisture which means that even the slightest temperature reduction of the compressed air on its way to the compressed air consumers causes water condensation and thus the formation of condensate within the compressed air.

Compressed air dryers thoroughly eliminate the moisture and thus produce dry, undersaturated compressed air in which no further condensation can occur – neither within the compressed air system nor at the compressed air application.

The different dryer types and the compressed air dryer models available from FST GmbH will be described in more detail in this brochure. The foldout application and the compressed air purity guide can be used as additional assistance in determining an optimised and individual system solution.

Examples of the FST drying technologies

For operating pressures up to 350 bar

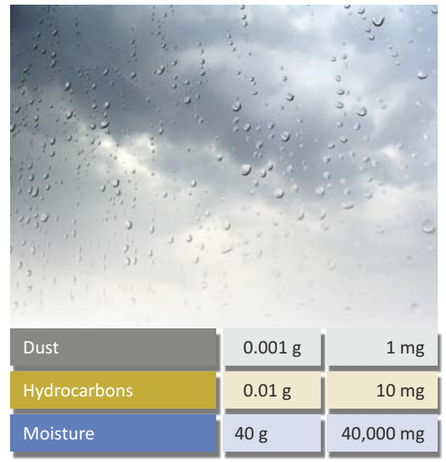
Why compressed air drying?

Moisture in the ambient air is vital for us and fundamental for our life. In compressed air, however, moisture is a “contaminant”, especially when it condenses into liquid water in the compressed air or leads to a build-up of ice, and therefore it must be separated.

Compressed air is ambient air that has been drawn in and compressed by a compressor. As a result, the compressed air also contains moisture from the ambient air which varies according to seasonal and meteorological fluctuations. What is more, the compression results in compressed air that is normally 100% saturated with moisture when it exits the compressor (100% RH).

The maximum amount of moisture that the compressed air can hold depends on the temperature and is shown by the vapour pressure curve or moisture table. The higher the temperature, the more moisture the compressed air can hold. If, when cooling, the amount of moisture in the compressed air is higher than the maximum possible amount for the reduced temperature, the excess moisture will condense as liquid water. Condensate arises in the compressed air.

The moisture-saturated compressed air at the outlet of the compressor is warmer than the ambient air and cools on its way through the “cold” pipelines. Condensate arises in the compressed air. In the case of outdoor installations (seasonal cold temperatures) and the use of compressed air by the application itself (expansion cooling), the compressed air cools again and further condensate arises, sometimes even until ice is formed.

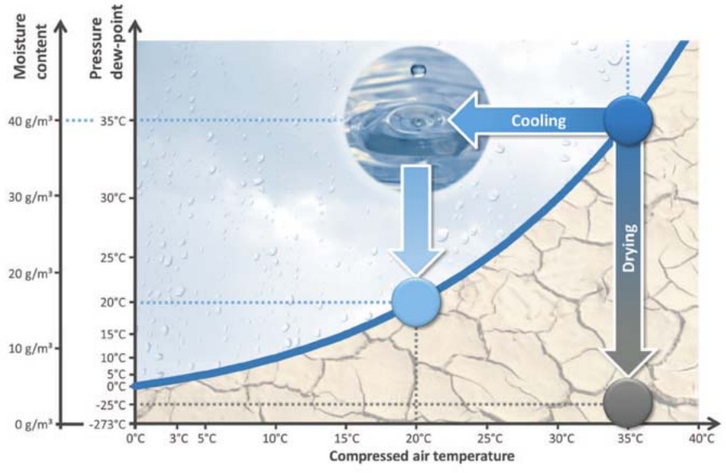


Typical contaminations in compressed air

Compressed air dryers remove the moisture and create dry, undersaturated compressed air.

Different dryer types create different degrees of dryness.
It is useful to state the degree of drying of the compressed air as the **pressure dew-point** in °C.

If the compressed air temperature is higher than the pressure dew-point, then no condensate will form and the compressed air is and will remain dry.

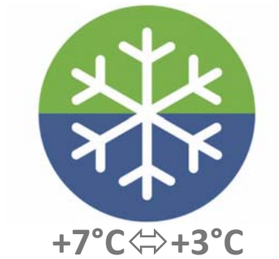


Both coolers and dryers reduce the amount of moisture in the compressed air. However, in the case of coolers the compressed air at the outlet is still 100% saturated with moisture. Coolers are therefore mainly used for temperature reduction, while dryers are specifically used for drying compressed air to a defined pressure dew-point and thus ensure that no further condensation can form.

Dry, undersaturated compressed air is able to take up moisture again. Therefore “wet” sections of a compressed air system can be dried subsequently with dry compressed air.

Further basic and interesting information about compressed air drying and the moisture table can be found at www.fstweb.de in the section Worth knowing about ...

Dryer types



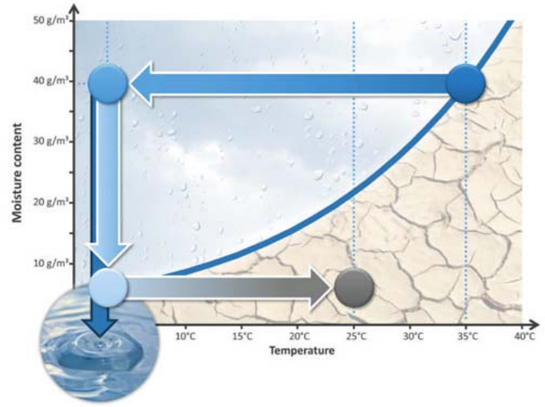
Refrigeration dryer

Pressure dew-points down to +3°C can be achieved with refrigeration dryers.

The areas of application for compressed air dried with refrigeration dryers are generally frost-free indoor installations and compressed air applications with low requirements in terms of the degree of dryness, such as instrument air, blast air, pneumatic tools. Refrigeration dryers are usually used to centrally prepare the compressed air to a “basic degree of dryness”, which is suitable for most installed compressed air applications. Higher degrees of dryness are created for individual applications in a decentralised process and thus only produced in the required amounts.

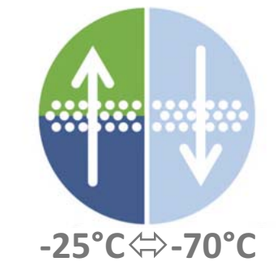
Refrigeration dryers promote premature condensation of the moisture contained in the compressed air by actively cooling it. The condensate that forms is collected in the refrigeration dryer and drained off. The compressed air is then brought to a undersaturated state through warming and thus dried.

Refrigeration dryers are suitable for continuous operation and are available for all volume flow ranges. The pressure range usually extends to 16 bar, however special versions are also available for higher operating pressures.



Fields of application:

- Compressed air drying in central compressed air treatment to a “basic degree of drying”, suitable for all volume flow ranges
- Compressed air drying for frost-free indoor installations with temperatures over 5°C
- Compressed air drying for applications with low requirements in terms of the degree of drying of the compressed air, e.g.
  – Instrument air for pneumatic applications
  – Blast air
  – Pneumatic tools
  – .....



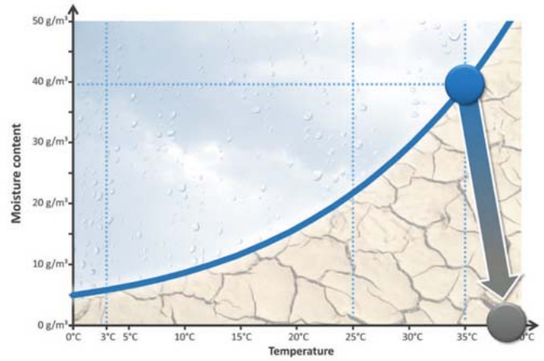
Adsorption dryer

Pressure dew-points down to -70°C can be achieved with adsorption dryers.

The areas of application for compressed air dried with adsorption dryers are generally outdoor installations that are at risk of frost and compressed air applications with very high requirements in terms of the degree of dryness, such as process air in the food, electronic, pharmaceutical, chemical, measuring and process technology industries. Adsorption dryers are used both in centralised and decentralised compressed air treatment due to their unrestricted scalability.

Adsorption dryers remove the moisture directly from the compressed air. The desiccant used in adsorption dryers binds the water molecules and completely separates the moisture from the compressed air. In order to enable continuous operation, adsorption dryers consist of two vessels filled with desiccant, which are alternately used to dry the compressed air (adsorption) and regenerate the desiccant.

Adsorption dryers are suitable for continuous operation and are available for all volume flow and pressure ranges. Adsorption dryers also offer different regeneration types for efficient compressed air drying in the various performance ranges.



Fields of application:

- Compressed air drying in central or decentralised compressed air treatment to a high degree of drying, suitable for all pressure and volume flow ranges
- Compressed air drying for outdoor installations at risk of frost in temperatures below 5°C
- Compressed air drying for applications with very high requirements in terms of the degree of drying of the compressed air, e.g.
  – Electronics industry
  – Food industry
  – Inspection devices, measuring apparatus
  – .....

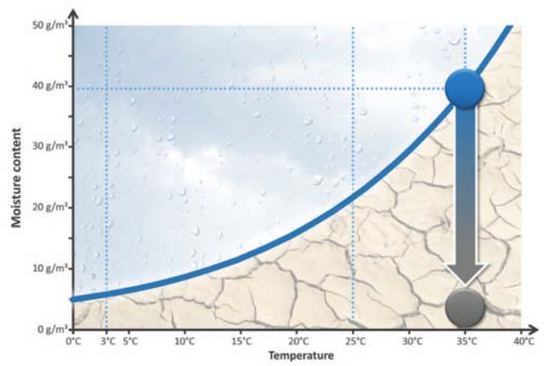
Membrane dryer

Pressure dew-points down to -40°C can be achieved with membrane dryers.

The areas of application for compressed air dried with membrane dryers are compressed air applications with increased requirements in terms of the degrees of dryness and low compressed air demands (< 50 m³/h), such as measuring technology and test stations. Membrane dryers are only used to dry low volume flows due to their mode of operation and ratings.

Membrane dryers consist of a variety of hollow fibre membranes which only allow water molecules to diffuse through them. Expanded, compressed air from the membrane dryer outlet is led to the outside of the hollow fibres and removes the moisture from the compressed air flowing through the hollow fibres. The membrane dryer technology enables small, compact designs and does not require any electricity.

Membrane dryers are suitable for continuous operation and are available for small volume flow ranges. The pressure range normally extends to 12 bar.

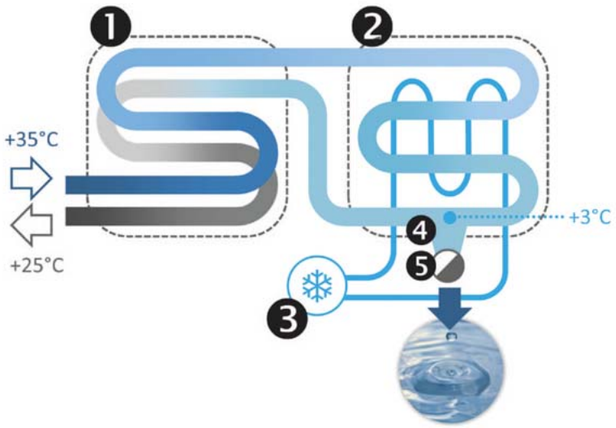


Fields of application:

- Compressed air drying for low volume flows
- Increasing the degree of drying for specific applications with low compressed air consumption, e.g.
  – Individual production machines
  – Inspection devices, measuring apparatus
  – .....

Refrigeration dryer

Design and function



Refrigeration dryers consist of two heat exchangers and a controlled refrigerant circuit.
The compressed air flowing in is pre-cooled in the first heat exchanger, the air-to-air heat exchanger ❶, by the compressed air in counterflow direction, which is already cooled and flowing out.
In the second heat exchanger, the refrigerant-to-air heat exchanger ❷, the compressed air is cooled down to its minimum temperature by the connected refrigerant circuit ❸.
During the entire cooling process, moisture in the compressed air precipitates in the form of condensate which is centrally collected ❹ and automatically discharged ❺.
Finally, using the air-to-air heat exchanger ❶, the compressed air is heated again by the warm, incoming compressed air in counterflow direction and thus brought to an undersaturated state. Provided that the compressed air temperature does not fall below the pressure dew-point, no more condensate can arise.

Control types

To prevent the refrigeration dryer from freezing when being operated at partial load, the cooling capacity generated by the refrigerant circuit needs to be controlled.

Hot gas bypass control DFX series	2-point control DFE series	Cascade/speed control DFL series
In the case of hot gas bypass control, the cooling capacity is controlled by means of a simple, mechanical proportional controller. Depending on the load of the refrigeration dryer, the proportional controller redirects part of the cooling capacity and thus controls the cooling energy supplied to the refrigerant-to-air heat exchanger. The hot gas bypass control enables compact refrigeration dryer designs and is useful for refrigeration dryers in the lower to mid performance range due to its simple construction.	In the case of 2-point control, the refrigerant circuit is combined with a thermal mass storage system. Depending on the load of the refrigeration dryer, the refrigerant circuit is switched on and off to control the cooling capacity. The thermal mass storage smoothes the temperature gradation and ensures suitable switching intervals. Significant energy savings can be gained with 2-point control, depending on the load of the refrigeration dryer. The 2-point control is useful for refrigeration dryers in the mid and high performance ranges.	In the case of cascade control, the cooling capacity generated by the refrigerant circuit is controlled by switching the refrigerant compressors on and off. In the case of speed control, the refrigerant compressor in the refrigerant circuit is controlled with variable speed, the cooling capacity is thus controlled directly in proportion to the load of the refrigeration dryer. Significant energy savings can be gained, depending on the load of the refrigeration dryer. The cascade/speed control is useful for refrigeration dryers in the high performance range.

As a rule, refrigeration dryers should be fitted with a pre-filter which is fitted directly at the inlet of the refrigeration dryer. A pre-filter is useful from an energy point of view and offers the following benefits:

- Condensate that arises in the pipelines to the refrigeration dryer is removed from the compressed air before the drying process. This means the full cooling capacity of the refrigeration dryer is available for compressed air drying.
- Oily contaminants in the compressed air and other contamination are removed and are thus prevented from entering the heat exchangers of the refrigeration dryer. Heat exchangers contaminated with oil and dirt exhibit higher thermal transfer resistance which lowers the efficiency of the drying process. In addition, oily contaminants can accumulate in layers in the heat exchanger and ultimately lead to blockages.

Take note!

“Energy guzzlers”	“Energy savers”
High differential pressure Elaborate piping, insufficiently dimensioned pipeline cross-sections or heat exchangers create high pressure loss. The air compressor has to compensate for the pressure loss with high, additional energy input.	**Low differential pressure** Fully-integrated, generously sized heat exchangers and connection cross-sections ensure low pressure loss. The lower the pressure loss, the lower the operating pressure of the air compressor and thus the lower its power consumption.
High thermal losses Due to insufficient or incomplete insulation, cold is lost to the environment. This cold is no longer available for the drying process and must be generated by the refrigerant compressor using additional energy input.	**Low thermal losses** High-quality and complete insulation minimises thermal losses. The cold capacity generated by the refrigerant circuit is completely transferred to the drying process and used with maximum efficiency.
Time-controlled condensate drains Time-controlled condensate drains discharge the condensate at fixed, pre-set intervals. The amount of condensate arising in compressed air systems varies greatly, depending on the operating conditions. With time-controlled condensate drainage, condensate backflow arises if the intervals are too long or a high amount of compressed air is lost if the intervals are too short. This is compressed air which has been generated by the air compressor using a large amount of energy.	**Level-controlled condensate drains** Level-controlled condensate drains measure the accumulated condensate via an integrated level measurement system and discharge the condensate in an automatic, loss-free, electronically controlled and monitored way.

Energy efficient refrigeration dryers also offer the lowest total costs, which comprises energy (≥70%), maintenance and initial investment costs.

In addition, the criteria of operational reliability, durability, long-term stability and easy maintenance, which also influence the total cost, should be evaluated.

Refrigeration dryers are subject to Directive 842/2006/EC for reducing the emissions of fluorinated greenhouse gases. Further information can be found at www.fstweb.de

The advantages at a glance
Refrigeration dryer DFX, DFE

Fine model range for optimised selection

With a total of 22 models, FST refrigeration dryers offer a fine range of grades which enable performance and cost optimised model selection for each individual requirement. The fine range of grades provides a technically optimal “refrigeration dryer system” with minimal space requirement at the lowest possible cost.

✓ **Minimum total operating costs**

Robust housing with durable coating

FST refrigeration dryers have robust metal housings, which feature a resistant, durable powder coating and above-average wall thickness for quiet, low-vibration and low-noise operation.

✓ **Rugged design and long life**

Fully integrated, completely thermally insulated heat exchanger

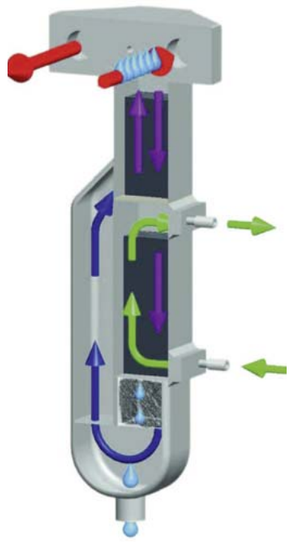
The fully integrated aluminium heat exchangers combine all the components required for reliable and economical drying – the air-to-air heat exchanger, the refrigerant-to-air heat exchanger and the condensate separator system – in a compact, leak-free unit. The integration of all heat transfer processes in just one, generously sized and completely thermally insulated unit results in highly-efficient drying and energy saving operation with minimal thermal losses and reduced differential pressures.

✓ **Maximum operational reliability**
✓ **Minimum total operating costs**
– Energy efficient, minimum-loss heat transfer processes
– Low differential pressures
✓ **Rugged design and long life**

High degree of overload protection

FST refrigeration dryers offer an above average level of overload protection through the adequately sized refrigerant circuit and in particular the generously designed and ventilated refrigerant condenser. Safety shutdown is triggered if the pressure dew-point exceeds 20°C. In this way, FST refrigeration dryers ensure sufficient compressed air drying even under occasional unfavourable operating conditions and they provide a high level of availability.

✓ **Maximum operational reliability**
✓ **Rugged design and long life**



Removable side panels

The removable side panels allow easy and spacious access to the entire interior of the refrigeration dryer for cleaning and maintenance work.

✓ **Easy maintenance**

Electronic, level-controlled condensate drains

All refrigeration dryers are fitted with electronic, level-controlled condensate drains as standard. Level-controlled condensate drains measure the accumulated condensate via an integrated level measurement system and discharge the condensate in an automatic, loss-free, electronically controlled and monitored way.

✓ **Maximum operational reliability**
✓ **Minimum total operating costs**
– Energy efficient condensate draining

Energy-saving control system

Series DFE refrigeration dryers are equipped with an energy-saving control system with 2-point control. The refrigerant circuit is switched on and off depending on the load of the refrigeration dryer and thus the required cooling capacity. The resulting energy saving phases normally enable savings of 20-60% in partial load operation. The sturdy, fully integrated and completely insulated heat exchanger takes on the role of the cold accumulator with its thermal mass and smoothes the pressure dew-point curve.

✓ **Minimum total operating costs**
– Energy efficient control

Comprehensive standard equipment

In addition to electronic, level-controlled condensate drains, all refrigeration dryers include a controller with potential-free alarm contact and freely selectable alarm value, a pressure dew-point display (refrigerant pressure) and a main operating switch as standard.

The DFX series also comes with a pre-installed mains cable with plug and a condensate line.

Simple, space-saving installation and wall mounting

With the DFX series, all connections required for the operation of the refrigeration dryer are made on one side. To save space the refrigeration dryer can be directly placed next to a wall. The DFX 2 to DFX 15 models additionally come ready for wall mounting as standard.

In the case of the DFE series, the compressed air connection is on the top, all other connections are on one side. The DFE series can also be directly placed next to a wall in order to save space thanks to its air inlet at the front and outlet on top.

DFX, DFE series

Pressure dew-points: Down to +3°C
Volume flow rate: 20 m³/h to 1,650 m³/h
Connection: G 3/8 to G 2½

The advantages...

✓ **Fine model range**
– 22 models enable performance and cost optimised model selection

✓ **Robust metal housing**
– Sturdy housing with thick walls
– High-quality, long life powder coating

✓ **Removable side panels**
– Spacious access
– Easy cleaning and maintenance

✓ **Fully integrated, complete thermally insulated heat exchanger**
– Low differential pressure
– Leak-free
– Minimal thermal loss

✓ **High degree of overload protection**
– Reliable drying even under occasional unfavourable conditions

✓ **Level-controlled condensate drains**
– Demand-driven, automatic and loss-free condensate drainage

✓ **Energy-saving control system (DFE)**
– Energy savings in partial load mode usually 20-60%

✓ **Simple, space-saving installation**
– Inputs and outputs on the side/top
– Can be directly placed next to a wall
– Ready for wall mounting (DFX 2-15)

✓ **Comprehensive standard equipment**

.. result in a dryer providing ..

✓ Maximum operational reliability

✓ Minimum total operating costs

✓ Long service life

✓ Easy maintenance

Refrigeration dryers – the minimum drying requirement for every compressed air application

Series DFX and DFE refrigeration dryers can dry the compressed air down to pressure dew-points of +3°C. They generate dry, undersaturated compressed air. No further condensation processes and no formation of liquid can take place in the resulting compressed air at temperatures above the pressure dew-point.

Series DFX and DFE refrigeration dryers consist of up to 14 or 16 bar pressure-rated, fully integrated aluminium heat exchangers, to which a controlled refrigerant circuit is connected. The fully integrated heat exchangers combine the air-to-air heat exchanger, the refrigerant-to-air heat exchanger and the condensate separator system in a compact, leak-free unit. The integration of all the heat transfer processes of a refrigeration dryer in just one thermally insulated unit results in highly-efficient drying and energy saving operation with minimal thermal losses and reduced differential pressures. In the case of the DFX series refrigeration dryers, the partial load control is carried out via hot gas bypass control, in the case of the DFE series refrigeration dryers it is via an energy-saving control system with 2-point control.

Series DFX and DFE refrigeration dryers are equipped with electronic, level-controlled condensate drains, a controller with potential-free alarm contact and freely selectable alarm value, pressure dew-point display and main operating switch as standard.

Available accessories

Bypass line	Switch-over control
	

Technical data

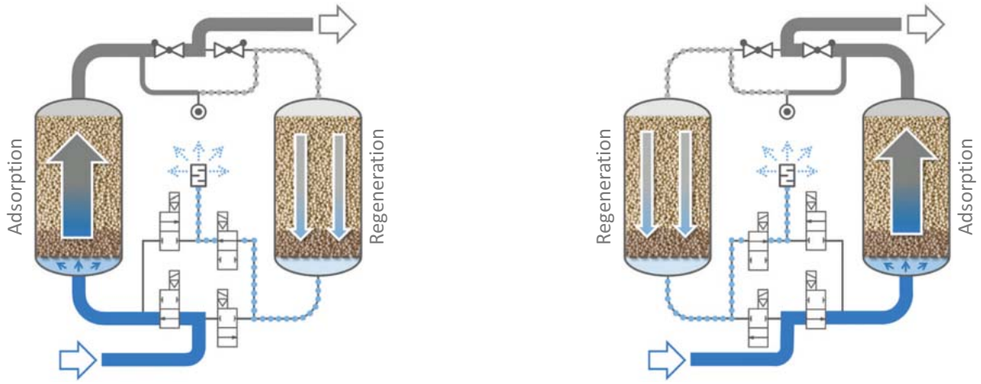
Model	Nominal volume flow*1	Min./max. operating pressure	Connection	Supply voltage	Height	Width	Depth	Weight
DFX 2	20 m³/h	2 - 16 bar	G 3/8	230 V / 50-60 Hz	645 mm	360 mm	410 mm	24 kg
DFX 4	35 m³/h	2 - 16 bar	G 1/2		645 mm	360 mm	410 mm	26 kg
DFX 5	50 m³/h	2 - 16 bar	G 1/2		645 mm	360 mm	410 mm	27 kg
DFX 7	65 m³/h	2 - 16 bar	G 1/2		645 mm	360 mm	410 mm	29 kg
DFX 9	85 m³/h	2 - 16 bar	G 1/2		645 mm	360 mm	410 mm	31 kg
DFX 11	105 m³/h	2 - 16 bar	G 1/2		645 mm	360 mm	410 mm	31 kg
DFX 13	125 m³/h	2 - 14 bar	G 1		645 mm	360 mm	410 mm	33 kg
DFX 15	150 m³/h	2 - 14 bar	G 1		645 mm	360 mm	410 mm	33 kg
DFX 18	180 m³/h	2 - 14 bar	G 1 ¼	230 V / 50 Hz	870 mm	480 mm	660 mm	55 kg
DFX 23	225 m³/h	2 - 14 bar	G 1 ¼		870 mm	480 mm	660 mm	56 kg
DFX 30	300 m³/h	2 - 14 bar	G 1 ¼		870 mm	480 mm	660 mm	57 kg
DFX 36	360 m³/h	2 - 14 bar	G 1 ½		870 mm	480 mm	660 mm	61 kg
DFX 45	450 m³/h	2 - 14 bar	G 1 ½		870 mm	480 mm	660 mm	68 kg
DFX 55	550 m³/h	2 - 14 bar	G 2		1055 mm	645 mm	920 mm	116 kg
DFX 65	650 m³/h	2 - 14 bar	G 2		1055 mm	645 mm	920 mm	118 kg
DFX 75	750 m³/h	2 - 14 bar	G 2		1055 mm	645 mm	920 mm	121 kg
DFX 85	850 m³/h	2 - 14 bar	G 2		1055 mm	645 mm	920 mm	155 kg
DFE 55	550 m³/h	2 - 16 bar	G 2	400 V / 50 Hz	1230 mm	904 mm	805 mm	150 kg
DFE 65	650 m³/h	2 - 16 bar	G 2		1230 mm	904 mm	805 mm	152 kg
DFE 75	750 m³/h	2 - 16 bar	G 2		1230 mm	904 mm	805 mm	166 kg
DFE 85	850 m³/h	2 - 16 bar	G 2		1230 mm	904 mm	805 mm	175 kg
DFE 100	1,000 m³/h	2 - 16 bar	G 2 ½		1230 mm	904 mm	805 mm	177 kg
DFE 120	1,175 m³/h	2 - 16 bar	G 2 ½		1230 mm	904 mm	805 mm	180 kg
DFE 135	1,350 m³/h	2 - 16 bar	G 2 ½		1230 mm	904 mm	805 mm	185 kg
DFE 150	1,500 m³/h	2 - 16 bar	G 2 ½		1230 mm	904 mm	805 mm	190 kg
DFE 165	1,650 m³/h	2 - 16 bar	G 2 ½		1230 mm	904 mm	805 mm	196 kg

*1 – standardised to 1 bar(a) and 20°C for operating conditions 7 bar operating pressure, inlet temperature 35°C, pressure dew-point at outlet 5°C (DFX) or 3°C (DFE)

For detailed technical data and reference variables, please refer to the relevant product data sheet which can be downloaded at www.fstweb.de

Adsorption dryer

Design and function



Images shows an example of a heatless adsorption dryer

Adsorption dryers consist of two pressure vessels, which are both filled with desiccant and are alternately operated via switch-over. The compressed air to be dried flows through a vessel where the moisture is thoroughly removed by the desiccant (**adsorption**). At the same time, the moisture stored in the desiccant in the second vessel is removed (**regeneration**). If the desiccant in the vessel in which adsorption takes place is saturated with moisture then the vessels are switched and the process begins again. One complete run of adsorption and regeneration in a vessel is called a **cycle**, and the time required is the **cycle time**.

Regeneration principles

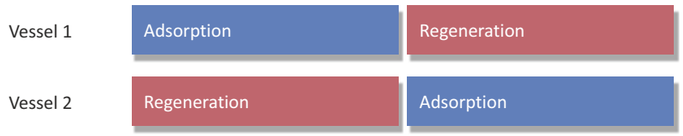
Heatless regeneration DPS, DHM, DHW series	**Heat regeneration** DTS series	**Regeneration with compressor heat** DTC series
In the case of heatless regeneration, some of the dried compressed air from the dryer outlet is taken, decompressed to atmospheric pressure and fed through the regeneration vessel in order to regenerate the desiccant. The dried, decompressed and thus extremely undersaturated air extracts the moisture stored in the desiccant and discharges it to the environment via a silencer. For DPS series dryers, the change interval between adsorption and regeneration is 5 minutes at nominal conditions. The cycle time is therefore 10 minutes.	During heat regeneration, ambient air is drawn in by a vacuum pump/blower, heated to approximately 160°C and fed through the regenerating vessel in order to regenerate the desiccant. The hot air removes the moisture from the desiccant and releases it to the environment at the outlet. If there is no suitable ambient air available, expanded compressed air can be used as an alternative. For DTS series dryers, the change interval between adsorption and regeneration is 6 hours at nominal conditions. The cycle time is therefore 12 hours.	In the case of heat regeneration utilising the compressor heat, hot compressed air from an oil-free compressor is used for regeneration of the desiccant. The hot, compressed air removes the moisture stored in the desiccant and is then led to a condensation cooler. There the moisture condenses and is drained off as condensate. For DTC series dryers, the change interval between adsorption and regeneration is 3 hours at nominal conditions. The cycle time is therefore 6 hours.

Detailed information regarding the different regeneration and control types can be found at www.fstweb.de in the section Products/Drying/Adsorption dryer

Control types

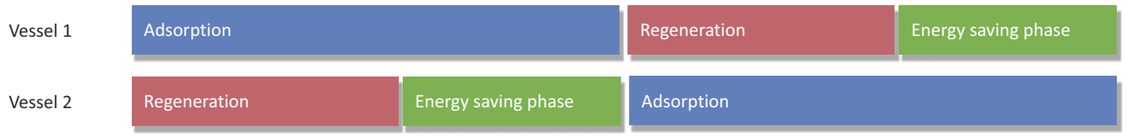
Fixed cycle

In fixed cycle adsorption dryers work with fixed cycle times under the assumption of permanent full load, regardless of the inlet conditions. The adsorption and regeneration phases are equally as long.



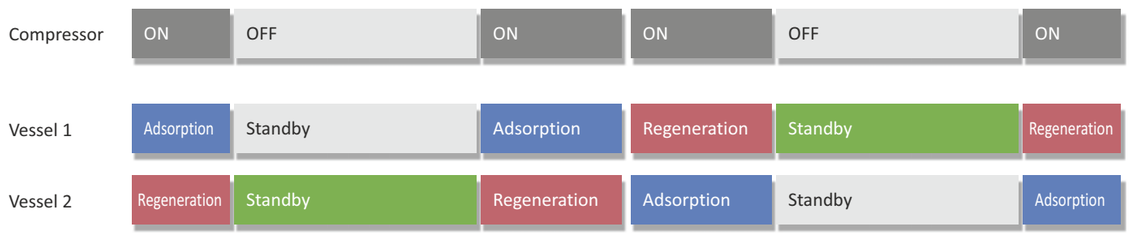
Variable cycle with dew-point dependent control

In variable cycle with dew-point dependent control, a dew-point sensor detects the pressure dew-point at the outlet of the adsorption dryer and extends the adsorption time according to the actual inlet conditions. The extended adsorption time results in energy saving phases, in which no regeneration energy is required. In this way, energy savings of up to 90% can be achieved.



Compressor synchronisation

The compressor synchronisation control is normally used with heatless adsorption dryers and can be used both in fixed as well as variable cycles. The compressor synchronisation control synchronises the adsorption dryer with the air compressor. If the compressor stops then no compressed air is generated for drying and the adsorption dryer stops its cycle (standby). Likewise, if the compressor starts, the adsorption dryer continues its cycle. No regeneration energy is required in the standby phases. This means that considerable energy savings can be achieved.



With compressor synchronisation control, the cycle time is theoretically limitless, however it should not exceed one day.

Adsorption dryer

Energy saving potential of the dew-point dependent control

Adsorption dryers are always designed for full load operation, i.e. maximum volume flow, minimal operating pressure and maximum inlet temperature, in order to ensure the required pressure dew-point is achieved even at correspondingly high load.

In full load operation, the adsorption and regeneration phases are equally as long. There is a permanent requirement for regeneration energy.

However, the specified full load operating conditions rarely occur simultaneously, due to:

- Seasonal and meteorological fluctuations of the inlet temperature
- Fluctuations of the operating pressure within its pressure-band
- Varying volume flows due to requirement fluctuations

An adsorption dryer fitted with a dew-point sensor can detect this type of partial load situation and implement corresponding energy saving phases.

The potential energy savings can be approximately determined with the following diagram using the example of a heatless adsorption dryer.

The actual energy requirement and thus the actual energy saving results from the product of the individual saving values per parameter, in our example

Actual energy requirement = 90% x 70% x 50% = **32%** , i.e. **68% energy saving**

The question of which regeneration type and which control type is the best for a specific application should be answered by means of a professional profitability calculation. The energy savings and the resulting overall costs or payback periods that can be achieved through individual selection and design of the dryer are enormous and sometimes amount to values of up to 90%.

Take note!

“Energy guzzlers”	“Energy savers”
„Cheap“ desiccant Large amounts of regeneration air for heatless adsorption dryers and high regeneration temperatures for heat regenerated adsorption dryers require a large amount of energy for regeneration.	**High-quality desiccant** High quality desiccants result in stable, low pressure dew-points with minimum energy input for regeneration and at the same time they normally provide distinctly better long-term stability and a longer service life.
Short cycle times The shorter the cycle time, the more often pressurisation of the regenerating vessel is required and the higher the compressed air consumption. Short cycle times are normally determined by the desiccants themselves or through reduced amounts of desiccant.	**Long cycle times** Long cycle times keep the number of pressurisation phases, and thus the compressed air consumption, to a minimum, through the use of high-quality desiccant in appropriate quantities.
Operation without dew-point dependent control Without dew-point dependent control there is a permanent requirement for regeneration energy regardless of the load of the adsorption dryer. As adsorption dryers normally work with varying volume flows, operating pressures and inlet temperatures in partial load mode, the energy saving potential is not utilised.	**Operation with dew-point dependent control** Dew-point dependent control facilitates energy saving phases without the need for regeneration energy of up to 230 minutes for heatless adsorption dryers (96%) and up to 84 hours for heat regenerated adsorption dryers (88%) per cycle. Savings of 20-70% are typically achieved with dew-point dependent control.
Regeneration process with purge air requirement Some regeneration processes for heat regenerated adsorption dryers require purge air. Purge air is large amounts of dry compressed air, which is required over long periods to support the cooling phase. The air compressor uses a large amount of additional energy input to generate the purge air.	**Regeneration process without purge air requirement** Regeneration processes that do not require purge air are available, e.g. fast cooling with vacuum or fast closed loop cooling. Compressed air is not required throughout the entire regeneration phase.
Only „standard solutions“ available If heat regenerated adsorption dryers do not have the option to use the customer‘s alternative energy sources, e.g. hot steam, hot water, cooling water, etc. then the thermal energy required for the regeneration must be generated using electricity.	**Integration of external heat or cold sources** Integration of the customer‘s existing alternative energy sources, such as hot steam, hot water, cooling water, etc. can result in enormous energy savings. These cost-effective alternative sources reduce the energy costs of the adsorption dryer.

Energy efficient adsorption dryers also offer the lowest total costs, which comprise energy (≥80%), maintenance and initial investment costs. In addition, the criteria of operational reliability, durability, long-term stability and easy maintenance, which influence the total cost, should be evaluated.

The advantages at a glance
Adsorption dryer all series

Pressure vessels MADE IN GERMANY with high-quality coating

The pressure vessels of FST adsorption dryers are manufactured in Germany and have been produced under a certified quality management system. The pressure vessels are designed, manufactured and inspected according to recognised regulations and standards (AD2000 Codes, Directive 97/23/EC) and comply with the highest and latest safety standards.

International approvals such as ASME (USA), GOST (Russia), SQL (China stamp), AS1210 (Australia), etc. or application-specific approvals such as DNV (Det Norske Veritas), Germanischer Lloyd, etc. are available.

The high-quality, durable coating of the pressure vessel also ensures a long service life and the safe operation of the adsorption dryer. All pressure vessels are sandblasted (ISO 8501), followed by a powder coating or two coats of wet paint (primer and top coat). Fully galvanised piping rounds off FST's claim of high-quality and long life adsorption dryers.

✓ **Maximum operational reliability**

✓ **Rugged design and long life**

High-quality 2-layer desiccant bed

High-quality, robust desiccants form the basis for cost-effective, efficient and stable adsorption drying.

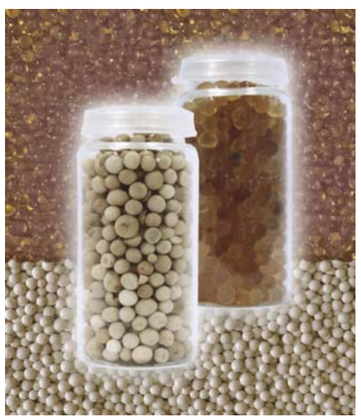
Heatless adsorption dryers from FST are filled with robust, durable and high-grade drying molecular sieve desiccant. With its large specific surface and high drying capacity, molecular sieve ensures a stable and low pressure dew-point down to -70°C. This results in long, energy-saving cycle times. Molecular sieve also has the special ability to achieve stable and low pressure dew-points even under conditions that are unfavourable for desiccant, e.g. in the case of low moisture input due to an upstream refrigeration dryer.

Heat regenerated adsorption dryers are filled with high-capacity, high-grade drying silica gel N desiccant. Silica gel N possesses a comparably large specific surface and drying capacity as molecular sieve, it also achieves pressure dew-points down to -70°C, however it possesses a distinctly lower regeneration temperature which enables energy savings of up to 33% to be achieved.

All FST adsorption dryers are filled with a 2-layer desiccant bed, i.e. with an additional water resistant silica gel WS safeguard layer at the inlet of the desiccant filling. This reliably prevents degradation of the desiccant caused by liquid water and ensures continuous, stable operation of the adsorption dryer as well as long service life of the desiccant.

✓ **Maximum operational reliability**

✓ **Minimum total operating costs**
- High-quality, consistent performance and long life desiccant bed
- Efficient and effective drying
- Energy efficient regeneration principles
- Low maintenance costs



Desiccant type	Specific surface	Required temperature for heat regeneration	Energy requirement for desorption of water
Molecular sieve	800 m²/g	210°C	1.2 kWh/kg
Silica gel N	750 m²/g	160°C	0.8 kWh/kg
Silica gel WS	650 m²/g	160°C	0.8 kWh/kg
Activated alumina	350 m²/g	180°C	1.1 kWh/kg

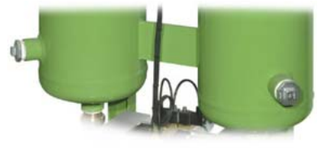
Stainless steel screen and adsorption from bottom to top

All FST adsorption dryers have a free flow area at the entrance to the desiccant filling, created by a stainless steel demister/screen placed in the vessel. Combined with the adsorption flow direction from bottom to top, the free flow area ensures optimal air distribution over the entire cross-sectional area as well as pre-separating liquid contaminants out of the compressed air. The result is a uniform flow through the desiccant over the entire filling volume without any dead spaces or "moisture clusters" in the desiccant bed.

Pre-separation of liquid contaminants reduces the liquid condensate load of the desiccant and also reduces blockage of the desiccant through oily contaminants in the compressed air. This extends the service life of the desiccant. The uniform flow through the desiccant over the entire filling area ensures that all desiccant is used effectively and simultaneously reduces the differential pressure. In addition, the side mounted discharge nozzles allow for a very fast and easy desiccant change.

✓ **Minimum total operating costs**
- High-quality, consistent performance and long life desiccant bed
- Efficient and effective drying
- Low differential pressure

✓ **Easy maintenance**



Adsorption dryers with screen can be identified by their desiccant removal points, located above the bottom welded seam of the pressure vessel.

The advantages at a glance
Heatless adsorption dryer

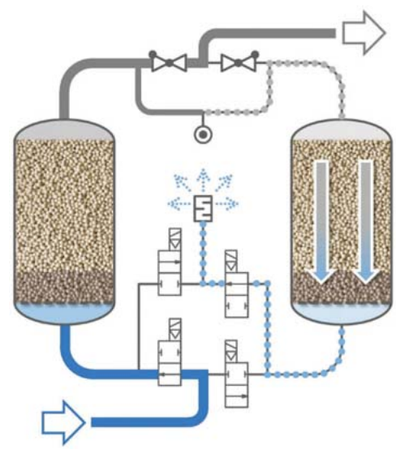
Regeneration from top to bottom

Regeneration from top to bottom prevents turbulence of the upper, loose desiccant during depressurisation. This considerably reduces desiccant abrasion and development of dust during regeneration.

During regeneration, moisture stored in the desiccant, is removed from top to bottom in reverse flow to adsorption via the bottom, wet and water resistant area at the inlet of the dryer (reverse flow principle). This creates a highly regenerated layer of desiccant at the outlet of the dryer, which ensures a stable and low pressure dew-point for the next switch-over.

The reduced desiccant abrasion and the discharge of moisture via the water resistance area also extends the service life of the desiccant and thus the performance stability of the entire adsorption dryer.

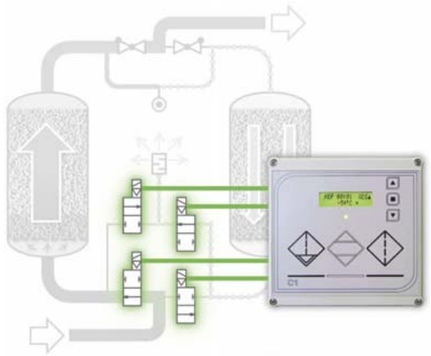
✓ **Minimum total operating costs**
- High-quality, consistent performance and long life desiccant bed



Individual valve control

Each valve is controlled individually with a time-delay, which results in overlap-free switch-over without pressure peaks between adsorption and regeneration. The flow paths through the adsorption dryers are always clearly defined. This eliminates possible incorrect flow from passive devices (e.g. shuttle valves) and thereby prevents malfunction of the dryer. There is always an unrestricted flow path for the compressed air, even in the case of loss of supply voltage. This ensures compressed air supply downstream of the adsorption dryer even in the event of a malfunction.

✓ **Maximum operational reliability**



DPS 1-8 with loose desiccant filling

Even the smallest DPS series have loose desiccant filling. The available vessel volume is completely filled with desiccant – to achieve maximum drying efficiency with compact and space-saving designs. In comparison to cartridge solutions, desiccant replacement does not have any height restriction for removal and is environmentally-friendly and cost-effective as it does not produce unnecessary waste.

✓ **Minimum total operating costs**
- Efficient and effective drying
- Low differential pressure
- Low maintenance costs

✓ **Easy maintenance**

DPS 1-100 with compact valve blocks

The valve blocks of the DPS 1-8 and DPS 10-100 series have generously sized air flow cross-sections. All valves required for operation of the adsorption dryer are compact, free from mechanical strain and integrated into the blocks in a practically leak free manner. In addition, the valve blocks are easy to remove and service and are thus easy maintenance.

✓ **Minimum total operating costs**
- Low differential pressure
- Low maintenance costs

✓ **Easy maintenance**

Efficient noise reduction

Generously sized silencers ensure efficient noise reduction for the escaping regeneration air. Noise reduction down to 75 dB(A) is also optionally available.

The advantages at a glance
Heat regenerated adsorption dryer

Mechanically linked 4/2-way valves

Pneumatically driven 4/2-way valves, which are mechanically connected with a cardan shaft, guarantee an overlap-free, synchronised switch-over between the vessels. In addition, there is always an unrestricted flow path for the compressed air, even in the case of loss of supply voltage. This ensures compressed air supply downstream of the adsorption dryer even in the event of a malfunction.

✓ **Maximum operational reliability**

✓ **Minimum total operating costs**
- Low differential pressure

✓ **Rugged design and long life**

✓ **Easy maintenance**

External heater

In comparison to two internal heaters integrated in the vessels, an external heater offers many advantages. The external heater is located outside the pressure vessel and can thus be directly and easily accessed for maintenance without any height restriction for disassembly. There is no loss of pressure in the adsorption flow path due to an inactive heater. The external heater, located outside the vessel, also permits compact designs as well as allowing the pressure vessel to be completely filled with desiccant. In addition, the external positioning facilitates integration of the customer's existing heat sources, such as hot steam or hot water, into the dryer system and thereby easily and cost-effectively converts them into energy savings.

High-quality heater units with a high power reserve for long life – heating elements with stainless steel casing tubes and low surface heat load (< 4 W/cm²), thermostatic overheating control, etc. are used.

✓ **Maximum operational reliability**

✓ **Minimum total operating costs**
- Low differential pressure

✓ **Rugged design and long life**

✓ **Easy maintenance**

✓ **Comprehensive options to choose**
- Integration of customer's energy sources

In the case of heat regenerated adsorption dryers, regeneration takes place with heat at temperatures of up to 200°C. For successful regeneration, all of the desiccant in a vessel, including the vessel itself, must be heated to these temperatures and kept at this temperature level for several hours. Thermal insulation of the vessels improves the effectiveness of the regeneration by up to 35% and isolates the entire system from ambient temperatures and draughts.

DTS..V and DTS..BVL – fast cooling in suction mode (vacuum) without purge air

Cooling in suction mode with vacuum does not involve any blower heat in the cooling phase. The cooling air, which is up to 28°C cooler in comparison to the blower regeneration, facilitates a rapid and complete cooling phase – **without the use of purge air** (see information). Cooling without purge air has a significant effect on the energy requirement of the entire regeneration phase and thus on the total energy balance of the adsorption dryer. Heat regenerated adsorption dryers with vacuum regeneration exhibit better total energy balance than dryers with blower regeneration.

✓ **Minimum total operating costs**
– Energy efficient regeneration principles

DTS..V – cooling with ambient air from bottom to top

When cooling with ambient air, the unavoidable moisture enters at the bottom, water resistant area of the desiccant bed at the inlet of the dryer. The highly regenerated, dry top layer of the desiccant filling at the outlet of the dryer remains dry. Dew-point peaks do not occur during switch-over and **purge air is not required** (see information) to remove drawn in moisture from the outlet of the dryer during cooling.

✓ **Minimum total operating costs**
– Energy efficient regeneration principles

DTS..BVL – energy-saving, serial heating and fast closed loop cooling in suction mode (vacuum) without purge air

The DTS..BVL series combines the advantages of blower and suction mode and thus achieves the best possible total energy balance. Heating is carried out in blower mode using the blower heat and thus reduces the energy requirement of the downstream electric heating by up to 21%. Cooling is carried out through fast cooling in suction mode **without purge air** (see information) and also in closed loop via a heat exchanger. The cooling phase is thus independent from ambient air and climatic conditions. The customer's existing cold sources, such as cooling water, cold water, can be integrated for further energy optimisation. Through serial heating and fast closed loop cooling, the DTS..BVL series provides the best possible total energy balance and delivers stable dew-points even under climatic conditions with a high proportion of moisture in the ambient air.

✓ **Minimum total operating costs**
– Energy efficient regeneration principles

✓ **Comprehensive options to choose**
– Integration of customer's energy sources

Purge air is dry, expanded compressed air, which is taken from the adsorption dryer outlet in order to accelerate the cooling phase and achieve the cooling end temperature. Typically 10-20% of the nominal volume flow of the dryer is taken as purge air. In relation to the entire cycle, this results in an average compressed air consumption of 2-3% of the nominal volume flow of the dryer. The use of dry compressed air created with high energy input has a considerable negative effect on the energy balance of a heat regenerated adsorption dryer. Therefore use of purge air should be avoided at all costs.

The advantages at a glance Control units

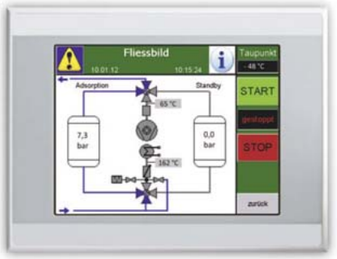
C1

The C1 control unit is a compact, microprocessor controller with plain text display, operation and alarm light and operating elements for controlling heatless adsorption dryers. The C1 control unit controls all operating modes as standard – fixed cycle, variable cycle (dew-point dependent control in conjunction with a dew-point sensor) and compressor synchronisation (remote on/off). The plain text display informs the user, with the aid of symbols, about the current operating status of each vessel, the remaining time until the next cycle step and the achieved pressure dew-point (dew-point sensor required). A maintenance indicator (displayed as a percentage) and maintenance and alarm messages keep the user informed on the overall status of the dryer. All the parameters of the dryer can be directly selected, displayed and edited via a simple menu structure using the operating elements of the C1 control unit. With the help of the cycle counter, the intelligent service management calculates the time until maintenance is required using the actual load of the dryer and extends the maintenance interval accordingly. The C1 control unit offers a variety of additional inputs and outputs as standard, which enables not only an optimal integration into the control system of the compressed air station but also retrofitting of older, existing dryers.

Inputs	Outputs
1 Digital input for compressor synchronisation (remote on/off) 2 Digital inputs, which can be used for monitoring – an electronic condensate drain and/or – differential pressure gauges of the filters 1 Digital input for an external dew-point control system 1 4-20 mA analogue input for a dew-point sensor	4 Digital outputs for the dryer valves 1 Digital output for an optional two stage expansion (DPS) or pressurisation valve for high-pressure dryers (DHM, DHW) 1 4-20 mA analogue output for the pressure dew-point signal 1 Digital output as potential-free alarm contact • Optional GSM module for an alarm message via SMS or e-mail

C10

The C10 control unit is a compact, microprocessor controller with a 5.7" touchscreen. The C10 control unit controls all operating modes for heat regenerated adsorption dryers as standard and offers corresponding, clearly structured, multilingual and graphical status indicators. The input screens can be directly operated using the touchscreen. The convenient information management has several levels and differentiates between operation messages, warnings and error messages. The structure continues with separate alarm contacts for operating message, common warning and common error message. The integrated trend recording stores all the operating parameters and messages of the last two months and offers the option to view and analyse the data on the C10 control unit itself or to transfer the data to a USB stick. The C10 control unit can be upgraded so it always represents state-of-the-art technology. The C10 control unit offers a variety of additional inputs, outputs and interfaces as standard, which enables an optimal integration into the control system of the compressed air station.



Inputs	Outputs/Interfaces
PT01 – Pressure vessel 1 (4-20 mA) PT02 – Pressure vessel 2 (4-20 mA) TT01 – Temperature of regeneration air at vessel inlet (PT100) TT02 – Temperature of regeneration air at vessel outlet (PT100) MT01 – Pressure dew-point (4-20 mA) [optional] TSH01– Heater temperature limiter GS03 – Regeneration air valve final position switch GS01 – Main valve final position switch [optional]	• Digital outputs for dryer operation 3 Digital outputs as potential-free contact (operating message, common warning, common error) 2 4-20 mA analogue outputs (pressure dew-point, operating pressure) 1 USB interface (download of trend recordings) 1 SD memory card slot (firmware upgrade) 1 Ethernet interface (remote monitoring/remote control) with remote client for visualisation/operation from a PC • Optional interfaces: Profibus, Modbus, CANbus

DPS 1-8 (A) series

Type of regeneration: Heatless
Pressure dew-points: -25°C / -40°C / -70°C
Volume flow rate: 8 m³/h to 82 m³/h
Connection: G 3/8 to G 1/2

The advantages...

✓ **Loose desiccant filling**
– Maximum desiccant filling
– Easy, environmentally-friendly and cost-effective maintenance

✓ **Molecular sieve desiccant**
– High-quality, effective desiccant
– Stable pressure dew-points down to -70°C
– Energy-saving cycle time of 10 minutes

✓ **2-layer desiccant bed**
– Stable drying
– Extended desiccant service life

✓ **Evenly distributed flow through stainless steel demister**
– Maximum drying efficiency
– Low differential pressures
– Extended desiccant service life

✓ **Individual valve control**
– No pressure peaks during switch-over
– Reliable compressed air supply

✓ **Fully integrated, compact valve blocks**
– Leak-free
– Easy, cost-effective maintenance

✓ **C1 control unit**
– Plain text display
– Prepared for dew-point dependent control with variable cycle
– Individual choice of alarm management
– ... and much more

.. result in a dryer providing ..

✓ Maximum operational reliability

✓ Minimum total operating costs

✓ Long service life

✓ Easy maintenance

Compressed air drying on a small scale – with the technology and features of a large dryer

Series DPS 1-8 adsorption dryers, optionally available as DPS 1-8 A with additional activated carbon oil vapour adsorber, can dry the compressed air to a pressure dew-point of -25°C, -40°C or down to -70°C. In doing so, they create dry, thoroughly undersaturated compressed air in which no further condensation takes place and thus no formation of liquid water can occur at compressed air temperatures above the pressure dew-point.

Series DPS 1-8 adsorption dryers consist of a powder-coated aluminium profile body which is pressure-rated up to 16 bar. Fully integrated, leak-free valve plates with large flow cross-sections resulting in low differential pressure are connected to the body. The switch-over valves are freely accessible in the lower valve plate and are individually controlled without any overlap. The dryers are operated with a 2-layer desiccant bed, consisting of 20% water resistant silica gel WS and 80% high-grade drying molecular sieve.

Series DPS 1-8 adsorption dryers are equipped with pressure gauges and a pre-filter and after-filter, which can be fitted in various ways, as standard. Wall mounting is simple and easy using commercially available wall brackets. The standard C1 control unit with plain text display and integrated operating elements controls all operating modes for heatless adsorption dryers and enables both independent operation of the dryer as well as integration into the control system of an existing compressed air station. In conjunction with an optional dew-point sensor, the adsorption dryer can be operated depending on the load in variable cycle mode and thus typical energy savings of 20-70% can be achieved.

Available accessories

Dew-point sensor	Differential pressure gauges with alarm contact (DPS 6-8)	Start-up device (minimum pressure valve)	GSM module	Switch-over control
				

Many other options, such as a frost protection heater or pneumatic control, are available on request.

Technical data

Model	Nominal volume flow*1	Min./max. operating pressure	Connection	Supply voltage	Height	Width	Depth	Weight
DPS 1	8 m³/h	4 - 16 bar	G 3/8	230 V / 50-60 Hz 115 V / 50-60 Hz 24 V DC	450 mm	312 mm	185 mm	11 kg
DPS 2	15 m³/h	4 - 16 bar	G 3/8		625 mm	312 mm	185 mm	15 kg
DPS 3	25 m³/h	4 - 16 bar	G 3/8		875 mm	312 mm	185 mm	20 kg
DPS 4	35 m³/h	4 - 16 bar	G 3/8		1125 mm	312 mm	185 mm	25 kg
DPS 6	57 m³/h	4 - 16 bar	G 1/2		1180 mm	484 mm	220 mm	45 kg
DPS 7	72 m³/h	4 - 16 bar	G 1/2		1405 mm	484 mm	220 mm	54 kg
DPS 8	82 m³/h	4 - 16 bar	G 1/2		1605 mm	484 mm	220 mm	62 kg
DPS 1 A	8 m³/h	4 - 16 bar	G 3/8	230 V / 50-60 Hz 115 V / 50-60 Hz 24 V DC	450 mm	412 mm	185 mm	14 kg
DPS 2 A	15 m³/h	4 - 16 bar	G 3/8		625 mm	412 mm	185 mm	20 kg
DPS 3 A	25 m³/h	4 - 16 bar	G 3/8		875 mm	412 mm	185 mm	27 kg
DPS 4 A	35 m³/h	4 - 16 bar	G 3/8		1125 mm	412 mm	185 mm	35 kg
DPS 6 A	57 m³/h	4 - 16 bar	G 1/2		1180 mm	614 mm	220 mm	65 kg
DPS 7 A	72 m³/h	4 - 16 bar	G 1/2		1405 mm	614 mm	220 mm	78 kg
DPS 8 A	82 m³/h	4 - 16 bar	G 1/2		1605 mm	614 mm	220 mm	90 kg

*1 – standardised to 1 bar(a) and 20°C for operating conditions 7 bar operating pressure, inlet temperature 35°C, pressure dew-point at outlet -40°C

For detailed technical data and reference variables, please refer to the relevant product data sheet which can be downloaded at www.fstweb.de

DPS 10-100 (A) series

Type of regeneration: Heatless
Pressure dew-points: -25°C / -40°C / -70°C
Volume flow rate: 110 m³/h to 1,000 m³/h
Connection: G 1 to G 2

The advantages...

✓ **Pressure vessels MADE IN GERMANY**
– Meets the highest safety standards
– High-quality, durable coating

✓ **Molecular sieve desiccant**
– High-quality, effective desiccant
– Stable pressure dew-points down to -70°C
– Energy-saving cycle time of 10 minutes

✓ **2-layer desiccant bed**
– Stable drying
– Extended desiccant service life

✓ **Evenly distributed flow through stainless steel screen**
– Maximum drying efficiency
– Low differential pressures
– Extended desiccant service life

✓ **Individual valve control**
– No pressure peaks during switch-over
– Reliable compressed air supply

✓ **Compact valve blocks**
– Practically leak-free
– Easy, cost-effective service

✓ **C1 control unit**
– Plain text display
– Prepared for dew-point dependent control with variable cycle
– Individual choice of alarm management
– ... and much more

.. result in a dryer providing ..

✓ Maximum operational reliability

✓ Minimum total operating costs

✓ Long service life

✓ Easy maintenance

Efficient and economical compressed air drying – resulting from many features of the DPS series

Series DPS 10-100 adsorption dryers, optionally available as DPS 10-100 A with additional activated carbon oil vapour adsorber, can dry the compressed air to a pressure dew-point of -25°C, -40°C or down to -70°C. In doing so, they create dry, thoroughly undersaturated compressed air in which no further condensation takes place and thus no formation of liquid water can occur at compressed air temperatures above the pressure dew-point.

Series DPS 10-100 adsorption dryers consist of welded and coated steel vessels, which are pressure-rated up to 16 bar, and practically leak-free valve blocks with large flow cross-sections and thus low differential pressure. The valves are individually controlled with a time delay which means there is no overlap. The dryers are operated with a 2-layer desiccant bed, consisting of 20% water resistant silica gel WS and 80% high-grade drying molecular sieve.

Series DPS 10-100 adsorption dryers are fitted with pressure gauges and a pre-filter and after-filter with differential pressure gauge as standard. The standard C1 control unit with plain text display and integrated operating elements controls all operating modes for heatless adsorption dryers and enables both independent operation of the dryer as well as integration into the control system of an existing compressed air station. In conjunction with an optional dew-point sensor, the adsorption dryer can be operated depending on the load in variable cycle mode and thus typical energy savings of 20-70% can be achieved.

Available accessories

Dew-point sensor	Differential pressure gauges with alarm contact	Start-up device (minimum pressure valve)	GSM module	Switch-over control
				

Many other options, such as a frost protection heater, pneumatic control, special coatings, enhanced noise reduction, quick-closing valves, are available on request.

Technical data

Model	Nominal volume flow*1	Min./max. operating pressure	Connection	Supply voltage	Height	Width	Depth	Weight
DPS 10	110 m³/h	4 - 16 bar	G 1	230 V / 50-60 Hz 115 V / 50-60 Hz 24 V DC	1460 mm	675 mm	515 mm	126 kg
DPS 15	150 m³/h	4 - 16 bar	G 1		1700 mm	675 mm	515 mm	142 kg
DPS 20	200 m³/h	4 - 16 bar	G 1		1710 mm	675 mm	515 mm	180 kg
DPS 25	260 m³/h	4 - 16 bar	G 1		1735 mm	675 mm	515 mm	220 kg
DPS 30	320 m³/h	4 - 16 bar	G 1 ½		1825 mm	745 mm	520 mm	255 kg
DPS 40	410 m³/h	4 - 16 bar	G 1 ½		1840 mm	755 mm	525 mm	275 kg
DPS 60	590 m³/h	4 - 16 bar	G 1 ½		1870 mm	775 mm	575 mm	355 kg
DPS 80	770 m³/h	4 - 16 bar	G 2		2045 mm	1050 mm	695 mm	470 kg
DPS 100	1,000 m³/h	4 - 16 bar	G 2		2060 mm	1050 mm	730 mm	560 kg
DPS 10 A	110 m³/h	4 - 16 bar	G 1	230 V / 50-60 Hz 115 V / 50-60 Hz 24 V DC	1460 mm	955 mm	515 mm	173 kg
DPS 15 A	150 m³/h	4 - 16 bar	G 1		1700 mm	955 mm	515 mm	195 kg
DPS 20 A	200 m³/h	4 - 16 bar	G 1		1710 mm	955 mm	515 mm	250 kg
DPS 25 A	260 m³/h	4 - 16 bar	G 1		1735 mm	955 mm	515 mm	300 kg
DPS 30 A	320 m³/h	4 - 16 bar	G 1 ½		1825 mm	1045 mm	520 mm	350 kg
DPS 40 A	410 m³/h	4 - 16 bar	G 1 ½		1840 mm	1095 mm	525 mm	395 kg
DPS 60 A	590 m³/h	4 - 16 bar	G 1 ½		1870 mm	1175 mm	575 mm	525 kg
DPS 80 A	770 m³/h	4 - 16 bar	G 2		2045 mm	1470 mm	695 mm	630 kg
DPS 100 A	1,000 m³/h	4 - 16 bar	G 2		2060 mm	1520 mm	730 mm	740 kg

*1 – standardised to 1 bar(a) and 20°C for operating conditions 7 bar operating pressure, inlet temperature 35°C, pressure dew-point at outlet -40°C

For detailed technical data and reference variables, please refer to the relevant product data sheet which can be downloaded at www.fstweb.de

DPS 120-630 series

Type of regeneration: Heatless
Pressure dew-points: -25°C / -40°C / -70°C
Volume flow rate: 1,200 m³/h to 6,290 m³/h
Connection: DN 50 to DN 125

The advantages...

✓ **Pressure vessels MADE IN GERMANY**
– Meets the highest safety standards
– High-quality, durable coating

✓ **Molecular sieve desiccant**
– High-quality, effective desiccant
– Stable pressure dew-points down to -70°C
– Energy-saving cycle time of 10 minutes

✓ **2-layer desiccant bed**
– Stable drying
– Extended desiccant service life

✓ **Evenly distributed flow through stainless steel wedge screen**
– Maximum drying efficiency
– Low differential pressures
– Extended desiccant service life

✓ **Individual valve control**
– No pressure peaks during switch-over
– Reliable compressed air supply

✓ **3/2-way ball valve with full cross section flow and position indicator**
– Low differential pressures
– Freely accessible allowing easy maintenance

✓ **C1 control unit**
– Plain text display
– Prepared for dew-point dependent control with variable cycle
– Individual choice of alarm management
– ... and much more

.. result in a dryer providing ..

✓ Maximum operational reliability

✓ Minimum total operating costs

✓ Long service life

✓ Easy maintenance

Compressed air drying on a large scale – with maximum efficiency and operational reliability

Series DPS 120-630 adsorption dryers can dry the compressed air to a pressure dew-point of -25°C, -40°C or down to -70°C. In doing so, they create dry, thoroughly undersaturated compressed air in which no further condensation takes place and thus no formation of liquid water can occur at compressed air temperatures above the pressure dew-point. Additionally a separate downstream activated carbon oil vapour adsorber can be provided (see DSS series).

Series DPS 120-630 adsorption dryers consist of welded and coated steel vessels, which are pressure rated up to 11 bar and generously sized, zinc-coated piping and classic individual valves for low differential pressures in this performance range. They feature a pneumatically controlled 3/2-way ball valve with full cross section flow as well as pneumatically controlled angle valves from well-known manufacturers. The valves are individually controlled with a time delay which means there is no overlap. The dryers are operated with a 2-layer desiccant bed, consisting of 20% water resistant silica gel WS and 80% high-grade drying molecular sieve. Generously sized silencers reduce noise emission, optionally down to values of 75 dB(A).

Series DPS 120-630 adsorption dryers are fitted with pressure gauges as standard. Pre-filters and after-filters are optionally available. The standard C1 control unit with plain text display and integrated operating elements controls all operating modes for heatless adsorption dryers and enables both independent operation of the dryer as well as integration into the control system of an existing compressed air station. In conjunction with an optional dew-point sensor, the adsorption dryer can be operated depending on the load in variable cycle mode and thus typical energy savings of 20-70% can be achieved.

Available accessories

Dew-point sensor	Start-up device (minimum pressure valve)	GSM module	Switch-over control
			

Many other options, such as a frost protection heater, pneumatic control, special coatings, enhanced noise reduction, are available on request.

Technical data

Model	Nominal volume flow*1	Min./max. operating pressure	Connection	Supply voltage	Height	Width	Depth	Weight
DPS 120	1,200 m³/h	4 - 11 bar	DN 50	230 V / 50-60 Hz 115 V / 50-60 Hz 24 V DC	2020 mm	1370 mm	570 mm	650 kg
DPS 150	1,480 m³/h	4 - 11 bar	DN 65		2070 mm	1470 mm	650 mm	840 kg
DPS 210	2,080 m³/h	4 - 11 bar	DN 65		2100 mm	1620 mm	745 mm	960 kg
DPS 240	2,430 m³/h	4 - 11 bar	DN 80		2200 mm	1750 mm	800 mm	1080 kg
DPS 290	2,930 m³/h	4 - 11 bar	DN 80		2200 mm	1900 mm	855 mm	1520 kg
DPS 370	3,700 m³/h	4 - 11 bar	DN 100		2340 mm	2070 mm	950 mm	2000 kg
DPS 510	5,080 m³/h	4 - 11 bar	DN 100		2600 mm	2220 mm	1030 mm	2450 kg
DPS 630	6,290 m³/h	4 - 11 bar	DN 125		2820 mm	2420 mm	1100 mm	2900 kg

*1 – standardised to 1 bar(a) and 20°C for operating conditions 7 bar operating pressure, inlet temperature 35°C, pressure dew-point at outlet -40°C

For detailed technical data and reference variables, please refer to the relevant product data sheet which can be downloaded at www.fstweb.de

DSS 1-630 A series

Type of regeneration: ---
Residual oil content: ≤ 0.003 mg/m³
Volume flow rate: 8 m³/h to 6,290 m³/h
Connection: G 3/8 to DN 125

The advantages...

✓ **Pressure vessels MADE IN GERMANY**
– Meets the highest safety standards
– High-quality, durable coating

✓ **Activated carbon pellets**
– High-quality, compressed activated carbon pellets with low dust level

✓ **Loose filling**
– Maximum amount of activated carbon
– Easy, environmentally friendly maintenance

✓ **Stainless steel flow distributor at inlet and outlet**
– Uniform flow distribution
– Reduced dust formation

✓ **Low dust level at outlet through stainless steel screen**
– Reduced dust formation
– Easy maintenance

✓ **Oil indicator as standard**
– Controls the saturation level of the activated carbon
– Control point with lifetime reserve

✓ **Vessel pressure gauge (DSS 10-630)**
– Visual display of the operating situation
– Ensures depressurised state before maintenance work

.. result in an adsorber providing ..

✓ Maximum operational reliability

✓ Long service life

✓ Easy maintenance

Oil vapour adsorption – specific elimination of the second largest vapour phase in compressed air

Series DSS activated carbon oil vapour adsorbers reduce the oil vapour content of the compressed air to low residual levels. Oil vapour is the second largest vapour phase in compressed air and, like moisture, is highly likely to condense – in the case of oil vapour it condenses to form liquid oil. High-grade removal of oil vapour using an activated carbon oil vapour adsorber reliably prevents condensation processes during the cooling of compressed air and thus the formation of liquid oil. In addition, activated carbon oil vapour adsorbers remove a variety of other hydrocarbons, odours and flavours.

Series DSS 1-8 activated carbon oil vapour adsorbers consist of a powder-coated aluminium profile body, which is pressure-rated up to 16 bar and on which two end plates are mounted. Series DSS 10-100 and DSS 120-630 activated carbon oil vapour adsorbers consist of welded and coated steel vessels, which are pressure-rated up to 11 or 16 bar. They are operated with activated carbon filling, consisting of 100% pure activated carbon. Flow distributors or stainless steel demister at the inlet and stainless steel screens or stainless steel demister at the outlet ensure uniform flow and reduced abrasion of the activated carbon.

Series DSS activated carbon oil vapour adsorbers are fitted with an oil indicator as standard, the DSS 10-630 models also feature a vessel pressure gauge. The oil indicator's control point is approximately 15% before the activated carbon filling needs to be replaced in order to ensure sufficient lifetime reserve until the activated carbon is replaced.

Technical data

Model	Nominal volume flow rate*1	Max. allowable operating pressure	Connection	Height	Width	Depth	Weight
DSS 1 A	8 m³/h	16 bar	G 3/8	392 mm	158 mm	180 mm	3 kg
DSS 2 A	15 m³/h	16 bar	G 3/8	567 mm	158 mm	180 mm	5 kg
DSS 3 A	25 m³/h	16 bar	G 3/8	817 mm	158 mm	180 mm	7.5 kg
DSS 4 A	35 m³/h	16 bar	G 3/8	1067 mm	158 mm	180 mm	10 kg
DSS 6 A	57 m³/h	16 bar	G 1/2	1107 mm	208 mm	215 mm	20 kg
DSS 7 A	72 m³/h	16 bar	G 1/2	1332 mm	208 mm	215 mm	24 kg
DSS 8 A	82 m³/h	16 bar	G 1/2	1532 mm	208 mm	215 mm	28 kg
DSS 10 A	110 m³/h	16 bar	G 1	1460 mm	265 mm	350 mm	45 kg
DSS 15 A	150 m³/h	16 bar	G 1	1700 mm	265 mm	350 mm	52 kg
DSS 20 A	200 m³/h	16 bar	G 1	1710 mm	290 mm	350 mm	67 kg
DSS 25 A	260 m³/h	16 bar	G 1	1720 mm	320 mm	350 mm	80 kg
DSS 30 A	320 m³/h	16 bar	G 1 ½	1760 mm	345 mm	350 mm	95 kg
DSS 40 A	410 m³/h	16 bar	G 1 ½	1820 mm	375 mm	350 mm	107 kg
DSS 60 A	590 m³/h	16 bar	G 1 ½	1850 mm	425 mm	350 mm	143 kg
DSS 80 A	770 m³/h	16 bar	G 2	1980 mm	460 mm	400 mm	190 kg
DSS 100 A	1,000 m³/h	16 bar	G 2	2000 mm	515 mm	400 mm	230 kg
DSS 120 A	1,200 m³/h	11 bar	DN 50	2020 mm	450 mm	570 mm	260 kg
DSS 150 A	1,480 m³/h	11 bar	DN 65	2070 mm	500 mm	650 mm	325 kg
DSS 210 A	2,080 m³/h	11 bar	DN 65	2100 mm	600 mm	745 mm	410 kg
DSS 240 A	2,430 m³/h	11 bar	DN 80	2200 mm	650 mm	800 mm	495 kg
DSS 290 A	2,930 m³/h	11 bar	DN 80	2200 mm	700 mm	855 mm	570 kg
DSS 370 A	3,700 m³/h	11 bar	DN 100	2340 mm	800 mm	950 mm	715 kg
DSS 510 A	5,080 m³/h	11 bar	DN 100	2600 mm	850 mm	1030 mm	940 kg
DSS 630 A	6,290 m³/h	11 bar	DN 125	2820 mm	950 mm	1100 mm	1200 kg

*1 – standardised to 1 bar(a) and 20°C for operating condition 7 bar operating pressure

For detailed technical data and reference variables, please refer to the relevant product data sheet which can be downloaded at www.fstweb.de

DTS 45-1470 V series

Type of regeneration: Heat regenerated
Pressure dew-points: -25°C / -40°C / -70°C
Volume flow rate: 410 m³/h to 14,700 m³/h
Connection: DN 40 to DN 200

The advantages...

✓ **Pressure vessels MADE IN GERMANY**
– Meets the highest design and safety standards
– High-quality, durable coating
– Fully zinc-coated piping

✓ **2-layer silica gel desiccant bed**
– High-quality, effective desiccant
– Stable pressure dew-points down to -70°C
– Low regeneration temperatures with energy savings of up to 33%
– Extended desiccant service life

✓ **Uniform flow through stainless steel wedge screen**
– Maximum drying efficiency
– Low differential pressures
– Extended desiccant service life

✓ **Mechanically linked 4/2-way valves (DTS 45 V to DTS 1100 V)**
– Overlap-free, reliable switch-over
– Reliable compressed air supply downstream of the dryer

✓ **External heater**
– No differential pressure in adsorption mode
– Freely accessible, thus easy to maintain
– Easy integration of alternative energy sources

✓ **Fast cooling in suction mode**
– No blower heat input during cooling
– No purge air required

✓ **Cooling from bottom to top**
– Moisture from the ambient air enters only at the bottom, water resistant area at the inlet of the dryer
– No purge air required

✓ **C10 control unit**

.. result in a dryer providing ..

✓ Maximum operational reliability
✓ Minimum total operating costs
✓ Long service life
✓ Easy maintenance
✓ Comprehensive options to choose

Heat regeneration with fast cooling without purge air – economical compressed air drying in the mid to high performance range

Series DTS..V adsorption dryers can dry the compressed air to a pressure dew-point of -25°C, -40°C or down to -70°C. In doing so, they create dry, thoroughly undersaturated compressed air in which no further condensation takes place and thus no formation of liquid water can occur at compressed air temperatures above the pressure dew-point. Additionally a separate downstream activated carbon oil vapour adsorber can be provided (see DSS series).

Series DTS..V adsorption dryers consist of welded and coated steel vessels, which are pressure-rated up to 11 bar, and generously sized, zinc-coated piping. The flow paths are switched over via pneumatically controlled 4/2-way plug valves, which are mechanically connected to each other via a cardan shaft and therefore switch in synch. Model DTS 1280 and higher uses shut-off valves with end position control. The dryers are operated with a 2-layer desiccant bed, consisting of 30% water resistant silica gel WS and 70% high-grade drying silica gel N. The regeneration takes place with ambient air, which is drawn in by a vacuum pump, warmed in an electric heater and fed through the desiccant (heating). Cooling is carried out in a similar manner with the electric heater switched off – without the need for purge air.

Series DTS..V adsorption dryers feature comprehensive standard equipment. Pre-filters and after-filters are optionally available. The standard C10 control unit with 5.7" touch-screen controls all operating modes for heat regenerating adsorption dryers and enables both independent operation of the dryer as well as integration into the control system of an existing compressed air station. In conjunction with an optional dew-point sensor, the adsorption dryer can be operated depending on the load in variable cycle mode and thus typical energy savings of 20-70% can be achieved.

Further energy savings can be made through integration of the customer's alternative energy sources (e.g. steam or hot water) and/or thermal insulation.

Available accessories

Dew-point sensor	Thermal insulation	Start-up device (minimum pressure valve)	Limit switch main valve	Switch-over control
				

Many other options, such as special voltages, special control units, special coatings, are available on request.

Technical data

Model	Nominal volume flow*1	Min./max. operating pressure	Connection	Supply voltage	Height	Width	Depth	Weight
DTS 45 V	410 m³/h	4 - 11 bar	DN 40	400 V / 50 Hz 500 V / 50 Hz 690 V / 60 Hz	2225 mm	1190 mm	1000 mm	465 kg
DTS 55 V	500 m³/h	4 - 11 bar	DN 40		2225 mm	1190 mm	1000 mm	560 kg
DTS 65 V	645 m³/h	4 - 11 bar	DN 50		2325 mm	1310 mm	1085 mm	640 kg
DTS 85 V	790 m³/h	4 - 11 bar	DN 50		2325 mm	1310 mm	1085 mm	780 kg
DTS 125 V	1,210 m³/h	4 - 11 bar	DN 80		2705 mm	1460 mm	1150 mm	1020 kg
DTS 155 V	1,490 m³/h	4 - 11 bar	DN 80		2720 mm	1510 mm	1230 mm	1320 kg
DTS 215 V	2,100 m³/h	4 - 11 bar	DN 80		2770 mm	1600 mm	1460 mm	1690 kg
DTS 250 V	2,440 m³/h	4 - 11 bar	DN 100		2885 mm	2015 mm	1475 mm	1900 kg
DTS 300 V	2,950 m³/h	4 - 11 bar	DN 100		2920 mm	2045 mm	1505 mm	2400 kg
DTS 380 V	3,750 m³/h	4 - 11 bar	DN 100		2970 mm	2160 mm	1590 mm	2800 kg
DTS 430 V	4,250 m³/h	4 - 11 bar	DN 150		3210 mm	2370 mm	1560 mm	3800 kg
DTS 500 V	4,930 m³/h	4 - 11 bar	DN 150		3235 mm	2475 mm	1745 mm	4050 kg
DTS 540 V	5,330 m³/h	4 - 11 bar	DN 150		3250 mm	2520 mm	1870 mm	4220 kg
DTS 650 V	6,510 m³/h	4 - 11 bar	DN 150		3520 mm	2520 mm	1920 mm	5000 kg
DTS 720 V	7,180 m³/h	4 - 11 bar	DN 150		3560 mm	2640 mm	1985 mm	5650 kg
DTS 860 V	8,600 m³/h	4 - 11 bar	DN 200		3585 mm	4400 mm	1995 mm	6380 kg
DTS 940 V	9,400 m³/h	4 - 11 bar	DN 200		3605 mm	4500 mm	1995 mm	7520 kg
DTS 1110 V	11,000 m³/h	4 - 11 bar	DN 200		3650 mm	4750 mm	1995 mm	8730 kg
DTS 1280 V	12,800 m³/h	4 - 11 bar	DN 200		4050 mm	4945 mm	2030 mm	8730 kg
DTS 1470 V	14,700 m³/h	4 - 11 bar	DN 200		4050 mm	5145 mm	2055 mm	8730 kg

*1 – standardised to 1 bar(a) and 20°C for operating conditions 7 bar operating pressure, inlet temperature 35°C, pressure dew-point at outlet -40°C

For detailed technical data and reference variables, please refer to the relevant product data sheet which can be downloaded at www.fstweb.de

DTS 125-1470 BVL series

Type of regeneration: Heat regenerated
Pressure dew-points: -25°C / -40°C / -70°C
Volume flow rate: 1,210 m³/h to 14,700 m³/h
Connection: DN 80 to DN 200

The advantages...

✓ **Pressure vessels MADE IN GERMANY**
– Meets the highest design and safety standards
– High-quality, durable coating
– Fully zinc-coated piping

✓ **2-layer silica gel desiccant bed**
– High-quality, effective desiccant
– Stable pressure dew-points down to -70°C
– Low regeneration temperatures with energy savings of up to 33%
– Extended desiccant service life

✓ **Uniform flow through wedge screen**
– Maximum drying efficiency
– Low differential pressures
– Extended desiccant service life

✓ **Mechanically linked 4/2-way valves (DTS 125 BVL to DTS 1100 BVL)**
– Overlap-free, reliable switch-over
– Reliable compressed air supply downstream of the dryer

✓ **External heater**
– No differential pressure in adsorption mode
– Freely accessible, thus easy to maintain
– Easy integration of alternative energy sources

✓ **Serial heating in blower mode**
– Utilises blower heat
– Energy savings of up to 21%

✓ **Fast cooling in suction mode**
– No blower heat input during cooling
– No purge air required

✓ **Closed loop cooling – water or air-cooled**
– Independent of climatic conditions
– Higher performance due to lack of moisture input
– Easy integration of external cooling sources

✓ **C10 control unit**

.. result in a dryer providing ..

✓ Maximum operational reliability
✓ Minimum total operating costs
✓ Long service life
✓ Easy maintenance
✓ Comprehensive options to choose

Heat regeneration with serial heating and fast closed loop cooling – the most economical method for drying compressed air in the high performance range

Series DTS..BVL adsorption dryers can dry the compressed air to a pressure dew-point of -25°C, -40°C or down to -70°C. In doing so, they create dry, thoroughly undersaturated compressed air in which no further condensation takes place and thus no formation of liquid water can occur at compressed air temperatures above the pressure dew-point. Additionally a separate downstream activated carbon oil vapour adsorber can be provided (see DSS series).

Series DTS..BVL adsorption dryers consist of welded and coated steel vessels, which are pressure-rated up to 11 bar, and generously sized, zinc-coated piping. The flow paths are switched over via pneumatically controlled 4/2-way plug valves, which are mechanically connected to each other via a cardan shaft and therefore switch in synch. Model DTS 1280 and higher uses shut-off valves with end position control. The dryers are operated with a 2-layer desiccant bed, consisting of 30% water-resistant silica gel WS and 70% high-grade drying silica gel N. The heating phase of the regeneration takes place in blower mode using the blower heat. The ambient air intake is pre-warmed, reheated in an electric heater and fed through the desiccant (serial heating). The cooling phase takes place in suction mode and therefore without blower heat (fast cooling) and in a closed loop via a heat exchanger. Cooling takes place without the input of ambient air and therefore independent of climatic conditions – and, of course, without purge air.

Series DTS..BVL adsorption dryers feature comprehensive standard equipment. Pre-filters and after-filters are optionally available. The standard C10 control unit with 5.7" touchscreen controls all operating modes for heat regenerating adsorption dryers and enables both independent operation of the dryer as well as integration into the control system of an existing compressed air station. In conjunction with an optional dew-point sensor, the adsorption dryer can be operated depending on the load in variable cycle mode and thus typical energy savings of 20-70% can be achieved.

Further energy savings can be made through integration of the customer's alternative energy sources (e.g. steam or hot water) and/or thermal insulation.

Available accessories

Dew-point sensor	Thermal insulation	Start-up device (minimum pressure valve)	Limit switch main valve	Switch-over control
				

Many other options, such as special voltages, special control units, special coatings, are available on request.

Technical data

Model	Nominal volume flow*1	Min./max. operating pressure	Connection	Supply voltage	Height	Width	Depth	Weight
DTS 125 BVL	1,210 m³/h	4 - 11 bar	DN 80	400 V / 50 Hz 500 V / 50 Hz 690 V / 60 Hz	On request			
DTS 155 BVL	1,490 m³/h	4 - 11 bar	DN 80					
DTS 215 BVL	2,100 m³/h	4 - 11 bar	DN 80					
DTS 250 BVL	2,440 m³/h	4 - 11 bar	DN 100					
DTS 300 BVL	2,950 m³/h	4 - 11 bar	DN 100					
DTS 380 BVL	3,750 m³/h	4 - 11 bar	DN 100					
DTS 430 BVL	4,250 m³/h	4 - 11 bar	DN 150					
DTS 500 BVL	4,930 m³/h	4 - 11 bar	DN 150					
DTS 540 BVL	5,330 m³/h	4 - 11 bar	DN 150					
DTS 650 BVL	6,510 m³/h	4 - 11 bar	DN 150					
DTS 720 BVL	7,180 m³/h	4 - 11 bar	DN 150					
DTS 860 BVL	8,600 m³/h	4 - 11 bar	DN 200					
DTS 940 BVL	9,400 m³/h	4 - 11 bar	DN 200					
DTS 1110 BVL	11,000 m³/h	4 - 11 bar	DN 200					
DTS 1280 BVL	12,800 m³/h	4 - 11 bar	DN 200					
DTS 1470 BVL	14,700 m³/h	4 - 11 bar	DN 200					

*1 – standardised to 1 bar(a) and 20°C for operating conditions 7 bar operating pressure, inlet temperature 35°C, pressure dew-point at outlet -40°C

For detailed technical data and reference variables, please refer to the relevant product data sheet which can be downloaded at www.fstweb.de

DHM series

Type of regeneration: Heatless
Pressure dew-points: -25°C / -40°C / -55°C
Volume flow rate: 130 m³/h to 1,600 m³/h
Connection: G 1/2 to G 3/4

The advantages...

✓ **Stainless steel seamless vessels MADE IN GERMANY**
– Meet the highest safety standards
– Maximum corrosion resistance

✓ **Molecular sieve desiccant**
– High-quality, effective desiccant
– Stable pressure dew-points down to -55°C
– Energy-saving cycle time of 20 minutes

✓ **2-layer desiccant bed**
– Stable drying
– Extended desiccant service life

✓ **Evenly distributed flow through stainless steel sieve plate**
– Maximum drying efficiency
– Low differential pressures
– Extended desiccant service life

✓ **Individual valve control**
– No pressure peaks during switch-over
– Reliable compressed air supply

✓ **Fully integrated, compact valve blocks**
– Leak-free
– Unique, compact design
– Easy, cost-effective service

✓ **C1 control unit**
– Plain text display
– Prepared for dew-point dependent control with variable cycle
– Individual choice of alarm management
– ... and much more

.. result in a dryer providing ..

✓ Maximum operational reliability

✓ Minimum total operating costs

✓ Long service life

✓ Easy maintenance

Compressed air drying for high pressure applications – the compact DHM series

Series DHM adsorption dryers, optionally available as DHM..A with additional activated carbon oil vapour adsorber, can dry the compressed air down to a pressure dew-point of -25°C, -40°C or -55°C. In doing so, they create dry, thoroughly undersaturated compressed air in which no further condensation takes place and thus no formation of liquid water can occur at compressed air temperatures above the pressure dew-point.

Series DHM adsorption dryers consist of seamless stainless steel vessels, which are pressure-rated up to 350 bar and on which fully integrated, leak-free valve blocks are fitted. The switch-over valves are freely accessible in the lower valve block and are individually controlled without any overlap.

The dryers are operated with a 2-layer desiccant bed, consisting of 20% water resistant silica gel WS and 80% high-grade drying molecular sieve.

Series DHM adsorption dryers are fitted with pressure gauges and a pre-filter and after-filter as standard. The standard C1 control unit with plain text display and integrated operating elements controls all operating modes for heatless adsorption dryers and enables both independent operation of the dryer as well as integration into the control system of an existing compressed air station. In conjunction with an optional dew-point sensor, the adsorption dryer can be operated depending on the load in variable cycle mode and thus typical energy savings of 20-70% can be achieved.

Available accessories

Dew-point sensor	Differential pressure gauges with alarm contact	Start-up device (minimum pressure valve)	GSM module	Switch-over control
				

Many other options are available on request.

Technical data

Model	Nominal volume flow*1	Min./max. operating pressure	Connection	Supply voltage	Height	Width	Depth	Weight
DHM 8/100	130 m³/h	30 - 100 bar	G 1/2	230 V / 50-60 Hz 115 V / 50-60 Hz 24 V DC	1040 mm	782 mm	370 mm	85 kg
DHM 13/100	195 m³/h	30 - 100 bar	G 1/2		1190 mm	782 mm	370 mm	96 kg
DHM 18/100	270 m³/h	30 - 100 bar	G 1/2		1340 mm	782 mm	370 mm	109 kg
DHM 26/100	345 m³/h	30 - 100 bar	G 1/2		1490 mm	782 mm	370 mm	122 kg
DHM 31/100	425 m³/h	30 - 100 bar	G 1/2		1740 mm	782 mm	370 mm	134 kg
DHM 41/100	565 m³/h	30 - 100 bar	G 3/4		1700 mm	850 mm	370 mm	157 kg
DHM 52/100	670 m³/h	30 - 100 bar	G 3/4		1900 mm	850 mm	370 mm	172 kg
DHM 59/100	760 m³/h	30 - 100 bar	G 3/4		2100 mm	850 mm	370 mm	193 kg
DHM 66/100	825 m³/h	30 - 100 bar	G 3/4		2350 mm	850 mm	370 mm	218 kg
DHM 8/350	225 m³/h	30 - 350 bar	G 1/2	230 V / 50-60 Hz 115 V / 50-60 Hz 24 V DC	1040 mm	782 mm	370 mm	130 kg
DHM 13/350	350 m³/h	30 - 350 bar	G 1/2		1190 mm	782 mm	370 mm	151 kg
DHM 18/350	480 m³/h	30 - 350 bar	G 1/2		1340 mm	782 mm	370 mm	177 kg
DHM 26/350	620 m³/h	30 - 350 bar	G 1/2		1490 mm	782 mm	370 mm	209 kg
DHM 31/350	750 m³/h	30 - 350 bar	G 1/2		1740 mm	782 mm	370 mm	237 kg
DHM 41/350	1,100 m³/h	30 - 350 bar	G 3/4		1700 mm	850 mm	370 mm	284 kg
DHM 52/350	1,300 m³/h	30 - 350 bar	G 3/4		1900 mm	850 mm	370 mm	314 kg
DHM 59/350	1,475 m³/h	30 - 350 bar	G 3/4		2100 mm	850 mm	370 mm	356 kg
DHM 66/350	1,600 m³/h	30 - 350 bar	G 3/4		2350 mm	850 mm	370 mm	397 kg

*1 – standardised to 1 bar(a) and 20°C for operating conditions maximum permissible operating pressure, inlet temperature 35°C, pressure dew-point at outlet -40°C

For detailed technical data and reference variables, please refer to the relevant product data sheet which can be downloaded at www.fstweb.de

DHW series

Type of regeneration: Heatless
Pressure dew-points: -25°C / -40°C / -55°C
Volume flow rate: 45 m³/h to 1,560 m³/h
Connection: G 1/2 to G 3/4

The advantages...

✓ **Pressure vessels MADE IN GERMANY**
– Meets the highest safety standards
– High-quality, durable coating

✓ **Molecular sieve desiccant**
– High-quality, effective desiccant
– Stable pressure dew-points down to -55°C
– Energy-saving cycle time of 20 minutes

✓ **2-layer desiccant bed**
– Stable drying
– Extended desiccant service life

✓ **Individual valve control**
– No pressure peaks during switch-over
– Reliable compressed air supply

✓ **C1 control unit**
– Plain text display
– Prepared for dew-point dependent control with variable cycle
– Individual choice of alarm management
– ... and much more

.. result in a dryer providing ..

✓ Maximum operational reliability

✓ Minimum total operating costs

✓ Long service life

✓ Easy maintenance

Compressed air drying for high pressure applications – the individually configurable DHW series

Series DHW adsorption dryers, optionally available as DHW..A with additional activated carbon oil vapour adsorber, can dry the compressed air to a pressure dew-point of -25°C, -40°C or down to -55°C. In doing so, they create dry, thoroughly undersaturated compressed air in which no further condensation takes place and thus no formation of liquid water can occur at compressed air temperatures above the pressure dew-point.

Series DHW adsorption dryers consist of welded and coated steel vessels, which are pressure-rated up to 350 bar. The switch-over valves are freely accessible and are individually controlled without any overlap. The dryers are operated with a 2-layer desiccant bed, consisting of 20% water resistant silica gel WS and 80% high-grade drying molecular sieve.

Series DHW adsorption dryers are fitted with pressure gauges and a pre-filter and after-filter. The standard C1 control unit with plain text display and integrated operating elements controls all operating modes for heatless adsorption dryers and enables both independent operation of the dryer as well as integration into the control system of an existing compressed air station. In conjunction with an optional dew-point sensor, the adsorption dryer can be operated depending on the load in variable cycle mode and thus typical energy savings of 20-70% can be achieved.

Available accessories

Dew-point sensor	Differential pressure gauges with alarm contact	Start-up device (minimum pressure valve)	GSM module	Switch-over control
				

Many other options are available on request.

Technical data

Model	Nominal volume flow*1	Min./max. operating pressure	Connection	Supply voltage	Height	Width	Depth	Weight
DHW 11/50	45 m³/h	17 - 50 bar	G 1/2	230 V / 50-60 Hz 115 V / 50-60 Hz 24 V DC	1155 mm	735 mm	465 mm	65 kg
DHW 19/50	91 m³/h	17 - 50 bar	G 1/2		1425 mm	735 mm	465 mm	80 kg
DHW 39/50	200 m³/h	17 - 50 bar	G 1/2		1525 mm	810 mm	480 mm	105 kg
DHW 49/50	244 m³/h	17 - 50 bar	G 1/2		1715 mm	810 mm	480 mm	115 kg
DHW 72/50	357 m³/h	17 - 50 bar	G 3/4		1780 mm	930 mm	500 mm	150 kg
DHW 96/50	475 m³/h	17 - 50 bar	G 3/4		1780 mm	980 mm	525 mm	180 kg
DHW 156/50	825 m³/h	17 - 50 bar	G 3/4		1870 mm	1080 mm	575 mm	240 kg
DHW 239/50	1,254 m³/h	17 - 50 bar	G 3/4		1870 mm	1190 mm	630 mm	390 kg
DHW 5/100	72 m³/h	30 - 100 bar	G 1/2	230 V / 50-60 Hz 115 V / 50-60 Hz 24 V DC	1155 mm	635 mm	400 mm	100 kg
DHW 9/100	87 m³/h	30 - 100 bar	G 1/2		1205 mm	635 mm	400 mm	110 kg
DHW 12/100	153 m³/h	30 - 100 bar	G 1/2		1220 mm	685 mm	400 mm	115 kg
DHW 24/100	283 m³/h	30 - 100 bar	G 3/4		1350 mm	740 mm	450 mm	144 kg
DHW 37/100	429 m³/h	30 - 100 bar	G 3/4		1410 mm	810 mm	450 mm	200 kg
DHW 58/100	750 m³/h	30 - 100 bar	G 3/4		1710 mm	870 mm	450 mm	275 kg
DHW 5/250	115 m³/h	30 - 250 bar	G 1/2	230 V / 50-60 Hz 115 V / 50-60 Hz 24 V DC	1155 mm	635 mm	400 mm	110 kg
DHW 9/250	140 m³/h	30 - 250 bar	G 1/2		1205 mm	635 mm	400 mm	115 kg
DHW 12/250	270 m³/h	30 - 250 bar	G 1/2		1220 mm	685 mm	400 mm	132 kg
DHW 24/250	500 m³/h	30 - 250 bar	G 3/4		1350 mm	740 mm	450 mm	195 kg
DHW 37/250	800 m³/h	30 - 250 bar	G 3/4		1410 mm	810 mm	450 mm	245 kg
DHW 58/250	1,400 m³/h	30 - 250 bar	G 3/4		1710 mm	870 mm	450 mm	375 kg
DHW 5/350	150 m³/h	30 - 350 bar	G 1/2	230 V / 50-60 Hz 115 V / 50-60 Hz 24 V DC	1155 mm	635 mm	400 mm	110 kg
DHW 9/350	180 m³/h	30 - 350 bar	G 1/2		1205 mm	635 mm	400 mm	115 kg
DHW 12/350	300 m³/h	30 - 350 bar	G 1/2		1220 mm	685 mm	400 mm	145 kg
DHW 24/350	525 m³/h	30 - 350 bar	G 3/4		1350 mm	740 mm	450 mm	225 kg
DHW 37/350	850 m³/h	30 - 350 bar	G 3/4		1410 mm	810 mm	450 mm	280 kg
DHW 58/350	1,560 m³/h	30 - 350 bar	G 3/4		1710 mm	870 mm	450 mm	415 kg

*1 – standardised to 1 bar(a) and 20°C for operating conditions maximum permissible operating pressure, inlet temperature 35°C, pressure dew-point at outlet -40°C

For detailed technical data and reference variables, please refer to the relevant product data sheet which can be downloaded at www.fstweb.de

DM series

Type of regeneration: ---
Pressure dew-points: Down to -40°C
Volume flow rate: 4.2 m³/h to 24 m³/h
Connection: G 1/8 to G 3/8

Series DM membrane dryers can dry small amounts of compressed air to pressure dew-points down to -40°C. In doing so, they create dry, thoroughly undersaturated compressed air in which no further condensation takes place and thus no formation of liquid water can occur at compressed air temperatures above the pressure dew-point.

The pressure dew-point achieved by the membrane dryer is dependent on the inlet temperature and the set amount of purge air. From an energy point of view, the maximum pressure dew-point reduction should be 30°C. For example, at an inlet temperature of 20°C, a pressure dew-point of -10°C is achieved.

Series DM membrane dryers consist of hollow fibre membrane bundles, which are pressure-rated up to 8.5 bar. Only water molecules and therefore moisture can diffuse through the fine pores of these bundles. Expanded, dry compressed air (purge air) from the membrane dryer outlet is led to the outside of the hollow fibres and removes the moisture from the compressed air flowing through the hollow fibres by the means of diffusion.

Solid and oily contaminants must be kept away from the sensitive hollow fibre membranes. If the compressed air purity at the membrane dryer inlet is not sufficient, then a suitable pre-filter must be used.

Series DM membrane dryers are compact, fully integrated compressed air dryers. The DM-SWC series also have a 3 stage purge air setting option for achieving different pressure dew-points.

Available accessories

Pre-filter

Technical data

Model	Nominal volume flow*1	Max. operating pressure	Connection	Height	Width	Depth	Weight
DM-SWCM-08-100	4.2 m³/h	8.5 bar	G 1/8	112 mm	61 mm	31 mm	0.26 kg
DM-SWCM-15-100	7.2 m³/h	8.5 bar	G 1/8	112 mm	61 mm	31 mm	0.27 kg
DM-SWC-01-150	12 m³/h	8.5 bar	G 1/4	165 mm	70 mm	40 mm	0.39 kg
DM-SWC-02-250	18 m³/h	8.5 bar	G 3/8	215 mm	100 mm	50 mm	0.69 kg
DM-SWC-03-250	24 m³/h	8.5 bar	G 3/8	215 mm	100 mm	50 mm	0.71 kg

*1 – standardised to 1 bar(a) and 20°C for operating conditions 7 bar operating pressure, inlet temperature 20°C, 30°C pressure dew-point reduction

For detailed technical data and reference variables, please refer to the relevant product data sheet which can be downloaded at www.fstweb.de

FCA..CMSM series

Type of regeneration: Replacement cartridges
Pressure dew-points: Down to -40°C
Volume flow rate: 0.5 m³/h to 4 m³/h
Connection: G 1/2

Series FCA point of use dryers can dry small amounts of temporarily required compressed air to pressure dew-points down to -40°C. In doing so, they create dry, thoroughly undersaturated compressed air in which no further condensation takes place and thus no formation of liquid water can occur at compressed air temperatures above the pressure dew-point.

Series FCA point of use dryers are also used when sensitive applications with high requirements in terms of the degree of dryness of the compressed air need to be protected against unexpected moisture appearance (safety level for adsorption dried compressed air).

Series FCA point of use dryers consist of housings which are pressure-rated up to 16 bar and a desiccant cartridge with integrated dust filter. As the compressed air flows through the desiccant cartridge, the moisture is thoroughly removed from it by the desiccant (adsorption). The integrated dust filter collects any abrasion particles from the desiccant. Downstream dust filtration is not required.

Oily contaminants would stick to the desiccant and therefore need to be kept away from it. If the compressed air purity at the point of use dryer inlet is not sufficient, then a suitable pre-filter must be used.

The optional moisture indicator approximately determines the degree of dryness of the compressed air and thus when the desiccant cartridge needs to be replaced.

Available accessories

Pre-filter

Moisture indicator

Technical data

Model	Nominal volume flow*1	Capacity*1	Max. operating pressure	Connection	Height	Width	Depth	Weight
FCA90CMSM	0.5 m³/h	11 m³	16 bar	G 1/2	312 mm	130 mm	122 mm	4.0 kg
FCA110CMSM	1.5 m³/h	32 m³	16 bar	G 1/2	412 mm	130 mm	122 mm	4.5 kg
FCA120CMSM	2.5 m³/h	54 m³	16 bar	G 1/2	512 mm	130 mm	122 mm	5.0 kg
FCA130CMSM	4.0 m³/h	95 m³	16 bar	G 1/2	712 mm	130 mm	122 mm	6.5 kg

*1 – standardised to 1 bar(a) and 20°C for operating conditions 7 bar operating pressure, inlet temperature 20°C, pressure dew-point at outlet -40°C

For detailed technical data and reference variables, please refer to the relevant product data sheet which can be downloaded at www.fstweb.de

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