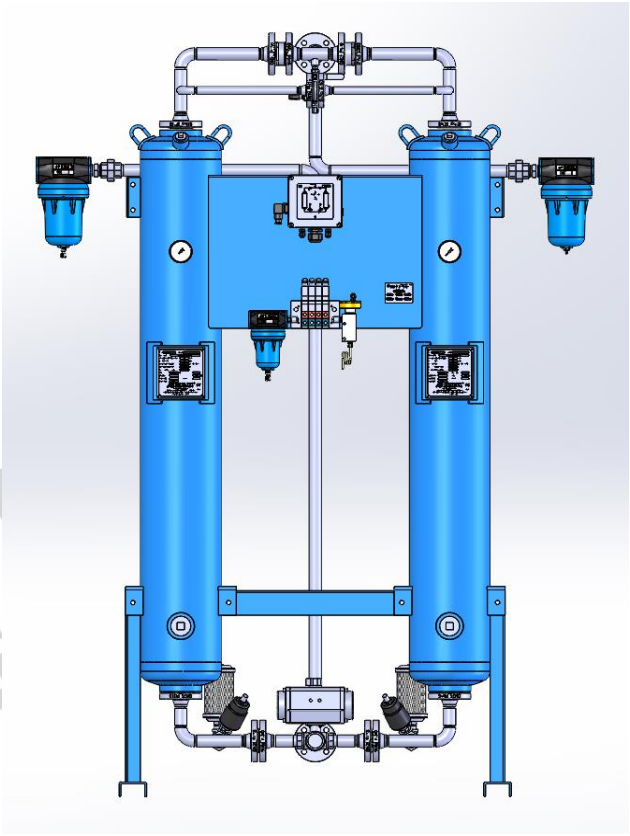
AIRFILTER® ENGINEERING

Adsorption dryer

HDD SERIES

HDD53
HDD67
HDD106
HDD150
HDD181
HDD236
HDD292



Operating manual

V.2024-01_EN
HDC2

Machine detail

Type designation	HDD
Order no.	
Project no.	
Build no.	
Vessel #1 no.	
Vessel #2 no.	
Year of manufacture	
Issue date of these operating instructions	

It is the responsibility of the owner,

- to enter for the first time any appliance data not stated above,
- to keep these appliance data up to date.

The above-stated appliance data provide for a clear identification of the dryer and its components, and significantly facilitate any service measures.

Further important data on the dryer such as the details on the permissible operating pressure and the electrical connection are found on the type plate (for position of the type plate see page 8).

Table of contents

Details on the dryer

Standard equipment

Dryer, comprising

- 2 vessels, filled with desiccant
- 1 upstream filter
- 1 downstream filter
- Piping and silencer
- Control system

Associated documents

- Operating instructions (present)
- Technical documentation (see annex)
- Circuit diagrams (see separate document)

Warranty notes

In the following cases, the warranty shall be void:

- If aggressive media in the compressed air and in the environment cause corrosion damage and functional faults on the dryer.
- If the dryer is used without prior approval and confirmation in writing by the manufacturer for purposes other than those specified in these operating instructions or contractually agreed.
- If preset parameters (e. g. on the control system etc.) are changed without prior approval and confirmation in writing by the manufacturer.
- If the dryer is transported or stored incorrectly.
- If the dryer is sited and installed incorrectly.
- If the dryer is repaired or maintained incorrectly.
- If the dryer is operated by personnel that does not have the requisite qualifications.
- If modifications are carried out on the dryer, the manufacturer did not approve that.

In the event of non-compliance, the manufacturer will not accept any liability for any consequential damage whatsoever.

About these operating instructions

These operating instructions contain basic information on the safe use of the dryer.

Characters and symbols used

- ► Work steps that you have to carry out in the sequence stated are marked by black triangles.
- ■ Lists are marked by a small box.

> **Note**
>
> **These notes provide you with hints and information on the safe and efficient handling of machines and devices.**

Warning

These safety notes warn against damage to property and help you to avoid such damage.

Danger

These danger notes with a grey background warn against personal injury and/or danger to life and limb; danger notes help you to avoid serious or life-threatening situations for yourself and/or third parties.

Target group of these operating instructions

These operating instructions are intended for all persons working on and using the dryer. We assume that all such persons are specialist personnel, e.g. fitters or electricians.

Operating instructions: handling

These operating instructions must be continuously available at the site where the dryer is used. We recommend to prepare a copy and to keep the same in a safe and freely accessible place next to the dryer. Keep the original document in a safe place.

For your own safety

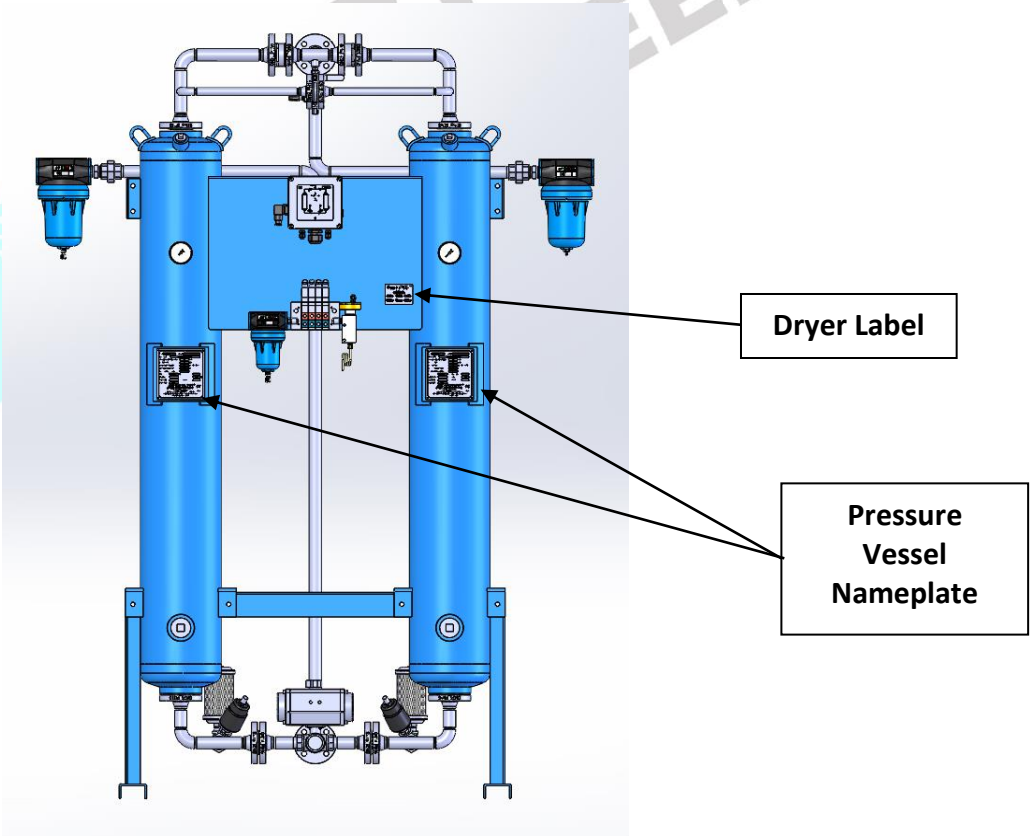
The dryer has been built in accordance with the state of the art and the recognized technical safety regulations. Nevertheless, there is a risk of personnel injury and damage to property when the dryer is used, if

- it is operated by non-qualified personnel
- not used within its intended design specifications,
- is repaired or maintained incorrectly.

> **Note:**
>
> **For your own safety and to prevent machine damage, please note the information and safety notes in these operating instructions when working with the dryer.**

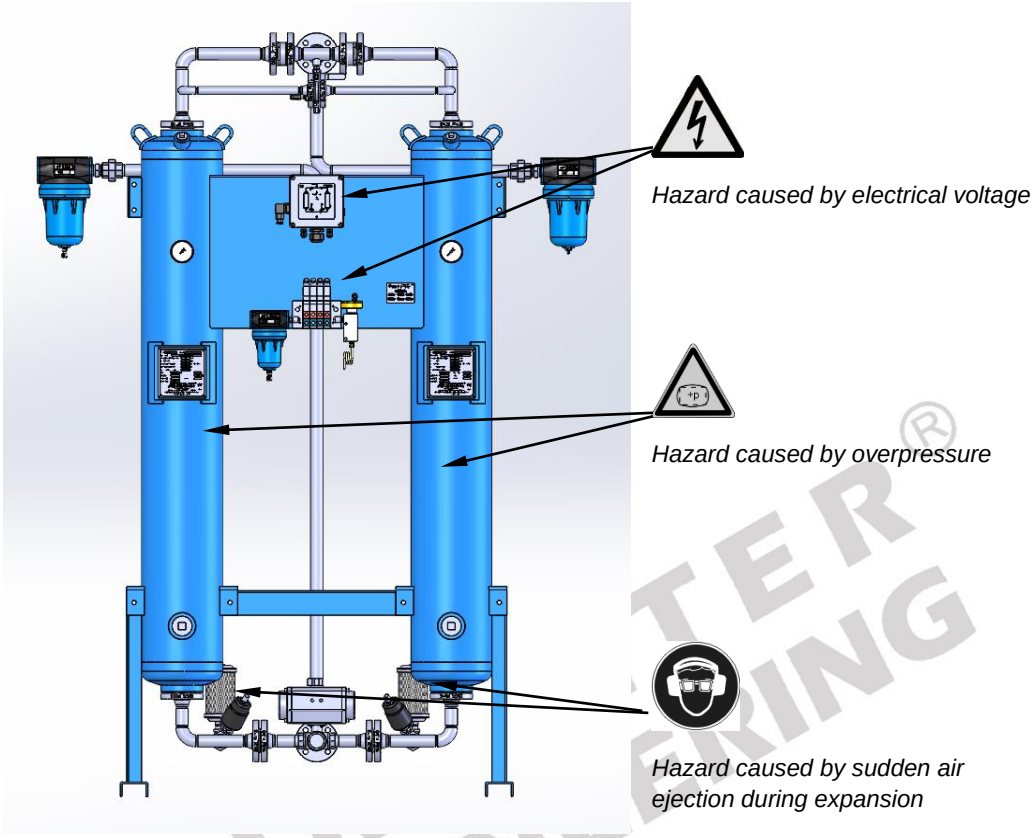
Signs, instruction plates and danger zones at the dryer

Signs and instructions



Please note the above plates and instructions attached to the dryer. Ensure that they are not removed and are always readable.

Hazard areas on the dryer



Hazard area	Symbol in operating instructions
Warning against hazardous electrical voltage Different parts of the dryer carry electrical current. These parts may be connected, opened, and maintained by authorized specialist personnel only.	
Warning against overpressure The entire dryer is under pressure. Before commencing any work, the plant must be depressurised.	
Warning against sudden air ejection When the vessels are depressurised, air flows abruptly out of the silencer: ■ This causes a sudden loud cracking noise. ■ Due to particles carried in the air flow, there is a very considerable risk of eye injury. When working on the dryer, always wear eye and ear protection equipment.	
Skid risk When emptying and filling the vessels with drying agent, there is a risk of skidding caused by spilt drying agent.	

Intended use of the dryer

The dryer is exclusively intended for drying compressed air. Depending on defined input conditions, it dries compressed air for industrial use.

The dryer is designed for compressed air, which is free from aggressive water, oil, and solid matter constituents.

As standard, the dryer is intended to be sited within a building and protected against the weather. When it is sited in the open air (option), the instructions on page 17 must be complied with.

The dryer may be operated only in accordance with the data on the type plate and in accordance with the contractual conditions.

Suspected misuse

The dryer must not be misused as a climbing aid! Pipes, valves, and similar fittings have not been designed for such loads. They could fracture, tear off, or become damaged in another way.

General safety notes

For your own safety, when carrying out any work on the dryer comply with all applicable national safety regulations!

Personnel qualification

Only authorized and qualified specialist personnel may be tasked with the work on the dryer described in these operating instructions.

Conversions and modifications

Without prior approval by the manufacturer, no conversions and modifications must be made to the dryer! Any non-approved modifications may restrict the operational safety of the dryer and cause damage to property or personal injury.

Handling drying agents

The drying agents are perfectly safe when in an unused condition. However, when filling and emptying the vessels with drying agents, increased dust generation may occur. Please comply with the following instructions:

- When filling drying agents into the vessels, wear a dust mask and eye protection!
- If a spillage occurs, any spilt drying agent must be taken up immediately. There is a risk of skidding!

Safety notes on specific operating phases

Transportation and siting

- Only use suitable and technically perfect lifting gear with a sufficient carrying capacity.
- Carefully secure the dryer during transportation.

Start-up

Warning against sudden air ejection!

During expansion the pressure is released suddenly through the silencer:

- **A loud expansion noise is caused which may damage your hearing.**
- **Particles carried in the air can injure your eyes or skin.**

Always wear eye and ear protection, therefore, when you are in the vicinity of the dryer!

Hazard due to a sudden release of pressure!

Never remove any parts of the dryer, or manipulate the same in any way, for as long as the plant is still pressurised! A sudden escape of pressure may cause serious injuries.

Before carrying out any work on the dryer, first depressurise the plant.

- Carry out all prescribed tests and checks.
- The factory settings on the control board in the switchbox must not be changed on any account without prior approval by the manufacturer.
- Before start-up, ensure that no tools or other foreign parts have been left lying in a part of the dryer where they might pose a hazard to the dryer being started up.

Emergency shutdown

- In any emergency, proceed as described in the section on page 37.

Monitor operation

Warning against sudden air ejection!

During expansion the pressure is released suddenly through the silencer:

- **A loud cracking noise occurs which can injure your hearing.**
- **Particles carried in the air flow act like bullets and can injure your eyes or skin.**

Always wear eye and ear protection, therefore, when you are in the vicinity of the dryer!

- Only operate the dryer within the permissible limits (see type plate). By operating the dryer in conditions that go beyond the defined values, the dryer is subjected to loads for which it has not been designed. This may cause functional defects.
- The more powerful the dryer is, the more noise may be generated during operation. Therefore, the operator must provide suitable protective equipment (e. g. ear protection).
- Check the dryer regularly for externally visible damage and defects. Any changes, even in its operating behaviour, must be reported immediately to the competent office or person.
- In the event of an emergency or if a safety-relevant disruption occurs (e.g. escaping compressed air, defective component), the dryer must be shut down immediately as described in the section on page 37). The unit may only be restarted after all defects have been eliminated.

Maintenance of the dryer and fault removal

Hazard due to a sudden release of pressure!

Never remove any parts of the dryer, or manipulate the same in any way, for as long as the plant is still pressurised! A sudden escape of pressure may cause serious injuries.

Before carrying out any work on the dryer, first depressurise the plant.

- Carry out maintenance work only when the plant has been shut down and depressurised!
- The factory settings on the control board in the switchbox must not be changed on any account without prior approval by the manufacturer.
- Bolt connections must be undone with care! Note ram pressure values! Otherwise, emerging media may cause personal injury.
- Never carry out any welding on a or change the same in any other way!
- Never use pipes and fittings as steps or holding points! The components might fracture, or the distortions which occur may cause internal damage on the dryer. There is a risk of injury by slipping off the components, components breaking off, and expanding compressed air!
- Never leave tools, loose parts, or cloths in, at or on the dryer.
- Following maintenance work always test all flange and bolt connections for leak tightness and secure seating.
- Only use replacement that are suitable for the relevant function and meet the technical requirements stipulated by the manufacturer. This is always the case, if you use original replacement parts only.

Disassembly and disposal

Hazard due to a sudden release of pressure!

Never remove any parts of the dryer, or manipulate the same in any way, for as long as the plant is still pressurised! A sudden escape of pressure may cause serious injuries.

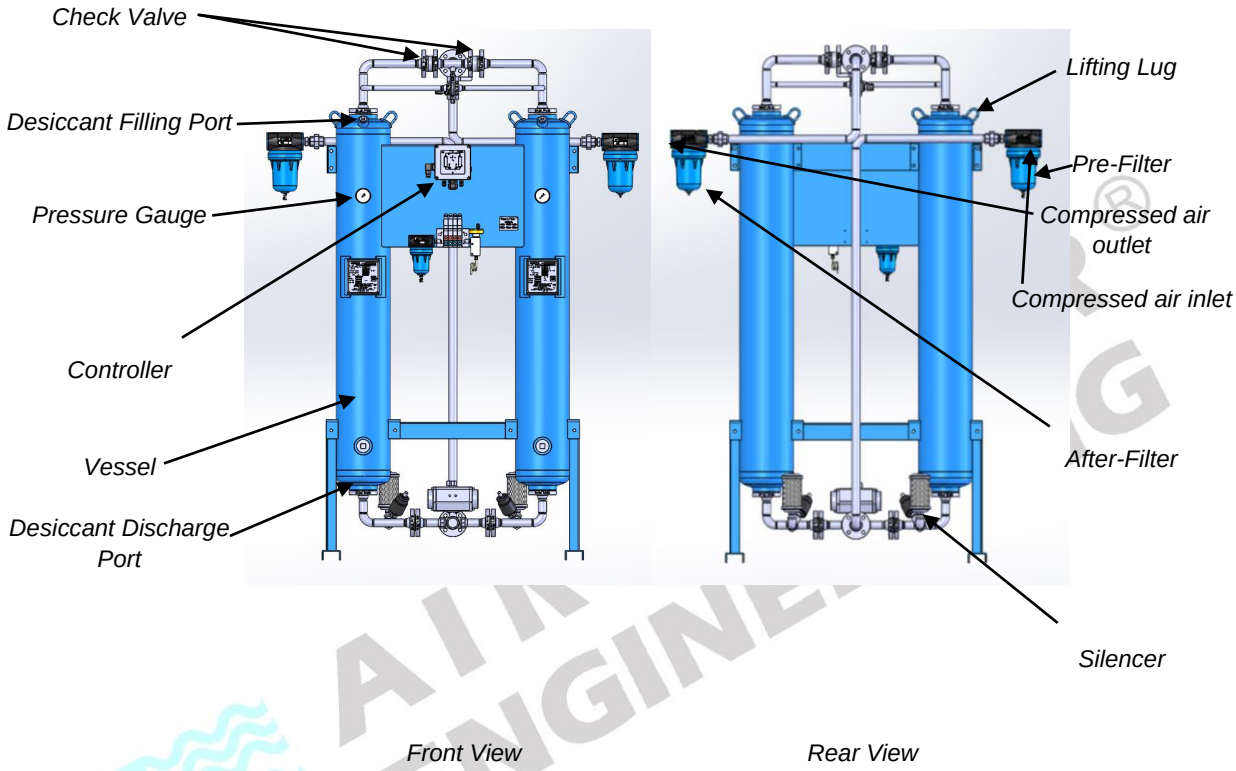
Before carrying out any work on the dryer, first depressurise the plant.

- Dispose all parts of the dryer, the drying agent, and all other operating materials in an environmentally safe way and in accordance with all current statutory regulations. The waste code of the drying agents can be obtained from the manufacturer (for the manufacturer's address see page 5).

Technical product description

Summary drawing

Views



Function description

The dryer dries the compressed air supplied by the compressor and makes it available for industrial use.

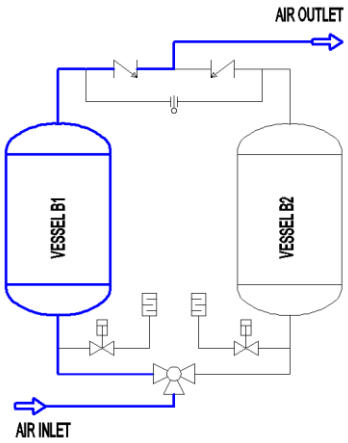
Upstream filters clean the compressed air and remove dust, dirt, oil, and water droplets, before the compressed air reaches the dryer. Thus, an upstream filter is also used for extending the service life of the drying agent.

Downstream filters clean the compressed air from drying agent abrasions, before it is fed into the compressed air system.

The two vessels contain an extremely porous drying agent by means of which humidity is removed from the compressed air and stored just as in a sponge. The stored humidity is then removed again from the drying agent and re-introduced into the ambient environment.

To this end, the two vessels alternate between different operating modes. Whilst in one vessel, compressed air is de-humidified (adsorption), in the other vessel the humid drying agent is prepared for another charge (regeneration). These two states, which run in parallel during compressed air preparation, are described below.

Via a compressor, humid compressed air is supplied to the upstream filter. From here, the compressed flows upwards through the absorption vessel, which is pressurised. In so doing, the drying agent dehumidifies the air. The dry compressed air is supplied to the pipe network via the downstream filter.



Here, adsorption is shown in the left vessel.

Regeneration (running in parallel to the adsorption)

At the same time the other vessel is prepared for a renewed take-up of humidity. This process is called regeneration.

The regeneration is subdivided into three phases: expansion, dehumidification, and pressure build-up.

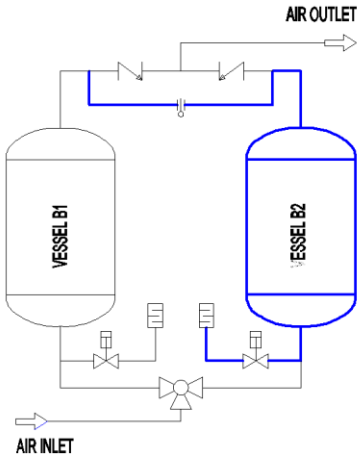
With the *dewpoint-sensing control* option, the regeneration phase is followed by a standby phase.

Expansion

During the expansion phase the pressure in the right vessel is released via the silencer down to ambient pressure within just a few seconds. The outflow of the compressed air becomes noticeable due to a sudden powerful flow noise at the silencer.

Dehumidification

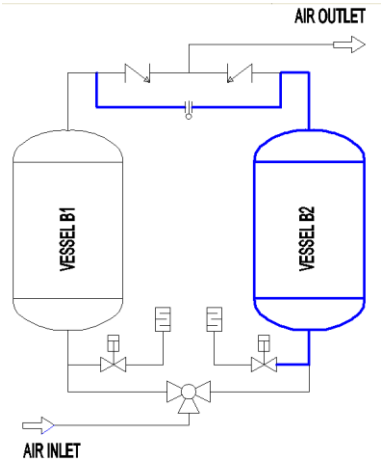
Prior to being released into the pipe network, dried compressed air is bled by means of an orifice plate. This separate regeneration air flow is fed through the depressurised vessel. The humidity stored in the drying agent is taken up by the air flow and expelled into atmosphere via the silencer.



Here, regeneration is shown in the right vessel.

Pressure build-up

After dehumidification the pressure in the regenerated hollow section vessel is built up to operating pressure, so that the switchover from regeneration to adsorption can take place at operating pressure level.



Pressure build-up

Standby phase (only with the *dewpoint-sensing control* option)

When in standby phase, the fully regenerated vessel is ready for absorption operation. The system is switched to this vessel, as soon as the measured dewpoint at the compressed air outlet has reached the set dewpoint value for switchover.

Switchover

When the drying agent in the adsorbing vessel has taken up a sufficient level of humidity, then the switchover between the vessels will commence between the vessels. Following switchover, the above-described process is repeated, with the adsorption and regeneration now taking place in the respective different vessel.

Available options

The following options are available for the dryer:

- Start-up device
- Outside installation
- Auxiliary heater
- Bypass line
- Signalling contacts of control system
- Dewpoint-sensing control
- Pneumatic control
- Paint compatible design

Start-up device

A start-up device basically consists of a pressure holding device, which is located at the rear of the dryer. The pressure holding device ensures that pressure can build up in the dryer and adsorption take place.

It is always required when an empty compressed air reservoir or an empty compressed air system must be filled downstream of the dryer (e.g. following weekend shutdowns and when the pressure in the compressed air system can frequently drop below the stated operating pressure).

Outside installation

As standard, the dryer is not suitable for outside installation, as its function and service life are influenced by the following factors:

- Environmental humidity due to rain (or other deposit)
- Corrosion caused by environmental humidity or a salt-containing environment
- Freezing of valves, cocks, flaps, and other components at low temperatures

Therefore, a planned outside installation must always be discussed in advance with the manufacturer to allow specific technical design measures to be provided for the installation location.

Bypass line

The bypass line is a "detour line", which allows the compressed air system to continue operating even whilst maintenance of the dryer is in progress. However, during this time the air is not dried but flows through the bypass line past the dryer and through to the actual loads.

Filters in the bypass line are meaningful so that the actual loads are largely protected against dirt, water, and oil droplets even whilst maintenance is in progress.

Dewpoint-sensing control

With a dewpoint-sensing control system, you can operate the dryer in fixed or variable cycles. In the fixed cycle, switchover is effected after a fixed time period (usually after 5 minutes). In the variable cycle, the switchover is effected in relation to the dew point reached and the charging of the drying agent. The adsorption time in the variable cycle amounts to 60 minutes maximum.

Pneumatic control

A pneumatic control system can be used wherever an alternative to the electronic control system is required, such as e.g. in explosion hazard areas.

Paint compatible design

Paint shop plants impose particularly stringent requirements with regard to the cleanliness of the compressed air, as already the minutest contaminations can reduce the quality of the paint finish. Even minute quantities of oil and grease containing foreign materials or solvents — above all silicones — are sufficient to cause pits, discolorations, swellings, and other contaminations in the paint finish.

Dryers in a paint compatible design comprise seals and filters that are absolutely free of grease and silicon and thus ensure a high quality of the compressed air used for painting.

Transportation, installation, and storage

Danger due to incorrect transportation!

The dryer must be transported by authorized and qualified specialist personnel only. During transportation all applicable national regulations for accident prevention must be complied with. Otherwise, there is a risk of personal injury.

- Only use suitable and technically perfect lifting gear with a sufficient carrying capacity.
- During transportation the dryer must be carefully secured against falling over.

The manufacturer will not be liable for any damage caused by incorrect storage or incorrect transportation. Please note therefore the following instructions as well as the storage instructions on page 21.

Information on transportation packaging

Depending on the type of transportation, the dryer is delivered in different types of packaging:

- All transportation types: the apertures of the dryer are closed off by means of plugs.
- In addition, when transportation is effected by air: the dryer is packaged in a wooden box.
- In addition, when transportation is effected by ship: the dryer is packaged in a film material and in a wooden box.

If the packaging is undamaged

► The undamaged packaging should be removed only at the final installation site, as it offers protection against any weather influences.

What to do in the case of transport damage occurring?

► Check whether only the packaging or the dryer itself were damaged.

► Inform the haulier immediately in writing of any damages.

► Contact the manufacturer urgently in order to report the damage. You will find the telephone number on page 5.

Warning!

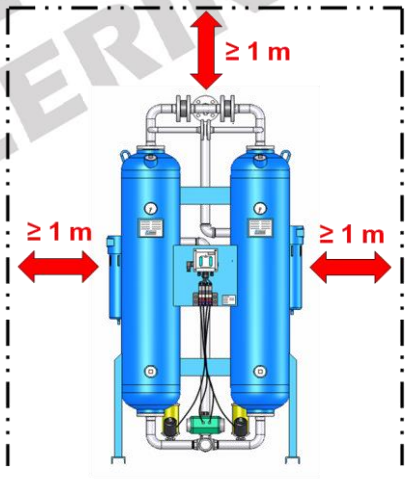
A damaged dryer must not be taken into operation! Damaged components may lead to functional faults and possibly cause further damage.

Transporting and installing the dryer

Requirements for the installation site

The conditions at the installation site have a large influence on the functional capability of the dryer and the service life of the drying agent. In order to ensure a mode of operation, which is as continuous as possible, and low maintenance, the installation site must meet the following requirements:

- The installation site must be located within a building. Protect the dryer against moisture. For outside installation (option) the instructions on page 17 must be complied with.
- The ambient temperature must not drop below +1 °C (33,8 °F). If necessary, an auxiliary heater is to be provided (for information on the auxiliary heater, see page).
- Heed the dryer's noise emission when selecting the installation location.
- The installation area must be level and firm. It must have the necessary carrying capacity for the weight of the dryer. The weight of the dryer is specified in the technical data section of the annex.
- The dryer should be installed with sufficient spacing at the top, sides, and rear, in order to be able to carry out maintenance work and change the drying agent without any hindrances (see figure).



Necessary spacing at the top and sides = min. 1 m

If in doubt, the installation site must be inspected by specialists. If you have any queries in this regard, please contact the manufacturer (for details see page 5).

Transportation using lifting or forklift trucks

Warning against damage to property!

The dryer is delivered lying on its side on a transportation pallet. At the top it is protected by a carton. Top and sides have not been designed for mechanical loads.

Therefore, do not place any load onto the top face. Do not stack.

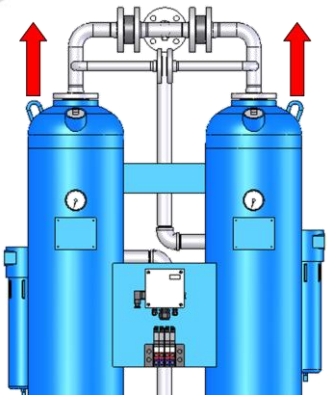
Therefore, always transport the dryer on a lifting or forklift truck.

- ► Secure the dryer on the lifting or forklift truck against sliding movements.
- ► Transport the dryer to its installation site.

Installing and anchoring

Installing by crane

- ► Remove the packaging of the dryer.
- ► Attach suitable lifting gear to the transport lugs of the vessels (see figure).
- ► A spreader bar is specifically design for this project to lift the dryers.



Transport lugs on pressure vessel

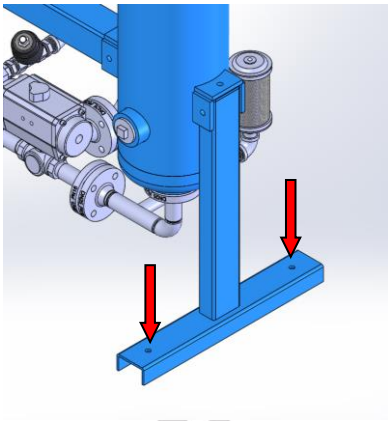
- ► Place dryer in an upright position, and position the same at its installation site (see figure).

Anchoring the dryer

The upright stand profiles of the dryer are provided with four pre-drilled anchorage bores.

► Use suitable attachment material to anchor the dryer to the floor (see figure).

► *In the case of vibrating floors:* place the dryer on suitable vibration dampers.



Bores at the foot of the dryer

Storing the dryer

If the dryer is to be stored for an extended period of time, the storage location must meet the following conditions:

- The dryer must not be stored in the open air.
- The storage room must be dry.
- The storage room must be free from dust or the dryer must be covered by a protective sheet.
- The storage room must have an ambient temperature of at least +1 °C (33.8 °F).

In order to store the dryer, proceed as follows:

► Take dryer out of operation as described on page 37.

► Ensure that the compressed air inlet valve installed by the owner, and the compressed air outlet valve installed by the owner, are both closed, and that the dryer is depressurised.

► Disconnect dryer from the compressed air system.

► Disconnect the dryer from the electrical power supply and all external lines.

► Use film material or similar to close the compressed air inlet apertures and compressed air outlet apertures on the dryer in order to protect them against contamination.

► If possible, cover dryer with a protective sheet.

The dryer can now be stored for long periods.

> **Note:**
>
> **If you wish to take the dryer back into service after an extended period of storage, please proceed as described for its first commissioning and start-up (see page 28).**

Store drying agents

- ► Do not store drying agents in the open air.
- ► Protect drying agents against humidity.

Installation

Only authorized and qualified specialist personnel may carry out work on pipes and electrical systems.

As soon as the dryer has been set up at its installation location, you can install the compressed air infeed and outlet lines make the electrical connections.

Preconditions for installation

For a correct installation the following preconditions must be met on the part of the owner.

- Connections and lines for the infeed and outfeed of compressed air must be provided.
- A compressed air inlet valve as well as a compressed air outlet valve must be installed by the owner, so that the dryer can be installed and maintained in a depressurised condition (see also the installation example on page 24).
- All pipes, couplings, and connections must have the correct diameter and match the operating pressure.

Hazard caused by exceeding the limit values!

A safety device must be provided in order to protect against the maximum permissible operating pressure from being exceeded.

The safety device must be installed so that the dryer is reliably protected from exceeding the maximum permitted operating pressure even when the temperature of the compressed gas increases.

The data required to meet these preconditions are contained in the technical documentation attached in the annex.

Warning!

If the above preconditions are not complied with, a safe operation of the dryer cannot be assured. Also, the functionality of the dryer may be detrimentally affected.

Connect piping

In order to ensure that the dryer operates optimally, the dryer must be assembled into the compressed air system free of all stresses.

► Ensure before connection that all infeed and outfeed compressed air lines and valves are clean and undamaged.

► Check the bolt connections and retighten, if necessary, as they could have worked loose during transportation.

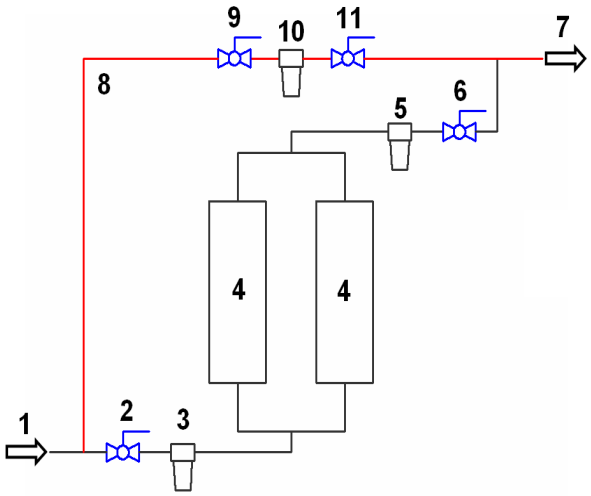
► Remove plugs on the pressure inlet and outlet.

All piping must be free from any stress and tension whatever!

Pipes subject to stress may burst due to the load placed on them during operation. This may cause damage to property and personal injury.

► Use steel pipes to connect the dryer to the compressed air system.

The following figure shows an installation example.

Compressed air system	Item	Component
	1	Entry, humid air
	2	Compressed air inlet valve, owner end
	3	Upstream filter
	4	Dryer
	5	Downstream filter
	6	Compressed air outlet valve, owner end
	7	Outlet, dry air
	8	Bypass line (option)
	9	Valve in bypass line (option)
	10	Bypass filter (option)
	11	Valve, outlet bypass filter (option)

Example of an installation with bypass line

► The connection lines for the upstream filter (3) are to be installed at a slight incline in the direction of the upstream filter.

► One shutdown valve each (2, 6) is to be installed at the compressed air inlet and outlet ends of the dryer.

► *If you fit a bypass line (8) with additional shutdown valve:*
Fit the line such that, when carrying out maintenance work on the dryer, the line system can continue to be supplied with compressed air.

Installing the electrical connection

Warning against electrical voltage

Only qualified specialist personnel may carry out work on the electrical system!

Installing the supply cable

The components of the dryer have been connected to the control cabinet at the factory. You only need to connect the control cabinet to the electrical supply cable.

The switchbox is provided with a connector where electrical power must be connected.

- ► Ensure that the cross-section of the electrical supply cable corresponds to the power rating of the dryer and the electrical voltage provided by the customer.
- ► Make the electrical supply cable to the dryer voltage-free.
- ► Secure the electrical supply cable to the dryer against switch-on.
- ► Now make the cable connection as follows:
  - Earth to terminal PE
  - L1 to terminal 1
  - N to terminal 2

.

- ► In all phases the dryer must be protected against short circuits by means of fuses.
- ► In order to relief cable strain, re-tighten the PG union.

To install the external line, proceed as follows:

- ► Connect the signalling line to the potential-free busbar connection of the compressor to terminals 1 and 2 on the control board (see circuit diagram).

Check bolt connections

Before the initial start-up:

- ► Check all unions and bolt connections as well as the terminals in the control cabinet for secure seating; re-tighten if necessary.

Start-up

Warning!

The dryer must be taken into operation by trained personnel only! Untrained personnel do not have the required knowledge. Such personnel might cause serious faults.

> **Note:**
>
> **You can order the initial commissioning and start-up from the manufacturer and have your personnel trained by the manufacturer. For telephone number, see page 5.**

- Carry out all prescribed tests and checks.
- Before start-up, ensure that no tools or other foreign parts have been left lying in a part of the dryer where they might pose a hazard to the dryer being started up.

Requirements for initial start-up

For the first start-up the following preconditions must have been met:

- The pipe system is free from
  - scales
  - thread abrasions
  - welding beads and
  - other contaminations.
- All shutdown valves
  - of the compressed air inlet and outlet valves installed by the owner
  - in the bypass line (if available)

  are closed.
- The dryer is correctly sited and installed.

Checks before start-up

Ensure that

- all pipe, cable and bolt connections on the dryer have been retightened,
- no pipes chafe against body edges,
- all mountings are perfectly secured,
- the electrical connections are in safe contact and in good condition,
- owner-end and pressurised parts such as safety valves or other devices are not blocked up by dirt or paint,
- all compressed air system parts which are pressurised (valves, hoses etc.) are free from wear symptoms and defects.

Setting times of the operating phases

In its standard version the dryer is delivered with a time-dependent control system. The phase sequence occurs in a fixed cycle.

With the optional dewpoint-sensing control, the dryer can also be operated at variable cycles (depending on the dewpoint).

The following table provides information on the duration of the individual phases.

Phase duration	Fixed cycle	Variable cycle
Adsorption	5 min	30 min, maximum
Regeneration, total	5 min	5 min
– of which: expansion time	~ 0.2 min	~ 0.2 min
– of which: dehumidification time	~ 4 min	~ 4 min
– of which: pressure build-up	~ 1 min	~ 1 min
Standby	—	~ 25 min, maximum

Vessel pressure gauge

On both vessels, pressure gauges are fitted which show the operating overpressure. The operating overpressure indicates the operating phase of the relevant vessel:

- During adsorption the pressure gauge should indicate the nominal operating overpressure.
- During regeneration the indication of the pressure gauge on the regenerating vessel
  - should decrease in the expansion phase from operating overpressure to 0 bar overpressure,
  - indicate an overpressure of 0 bar in the dehumidification phase.

With an increasing duration of operation, a higher overpressure can be indicated during regeneration. This overpressure during regeneration is also designated as dam pressure.

- The dam pressure should not exceed 0.3 bar, otherwise read the instructions on page 43.
- During the pressure build-up phase the indication on the pressure gauge should again rise to operating overpressure level.

Differential pressure gauge

On each of the upstream and downstream filters, a differential pressure gauge is installed. The differential pressure between the filter inlet and outlet ends is used as an indicator for the degree of filter element contamination. The indication should be within the green range up to 0.35 bar maximum, otherwise read the instructions on page 45.

Emergency shutdown

In the event of an emergency, shut down the dryer as described on page 37.

Start-up dryer

Warning against sudden air ejection!

During expansion the pressure is released suddenly through the silencer:

- **A loud cracking noise occurs which can injure your hearing.**
- **Particles carried in the air flow act like bullets and can injure your eyes or skin.**

Always wear eye and ear protection, therefore, when you are in the vicinity of the dryer!

Hazard due to a sudden release of pressure!

Never remove any parts of the dryer, or manipulate the same in any way, for as long as the plant is still pressurised! A sudden escape of pressure may cause serious injuries.

Before carrying out any work on the dryer, first depressurise the plant.

- The more powerful the dryer is, the more noise may be generated during operation. Therefore, the operator must provide suitable protective equipment (e. g. ear protection)
- Only operate the dryer within the permissible limits. By operating the dryer in conditions for which it has not been designed, functional faults may be caused.
- Depending on the size of the dryer and the compressed air network and the respective legal requirements in your country, it may be necessary to perform initialisation according to the directive for pressure equipment 2014/68/EU.
- Check the dryer regularly for externally visible damage and defects. Any changes, even in its operating behaviour, must be reported immediately to the competent office or person.
- In the event of an emergency or if a safety-relevant disruption occurs (e.g. escaping compressed air, defective component), the dryer must be shut down immediately as described in the section on page 37). The unit may only be restarted after all defects have been eliminated.

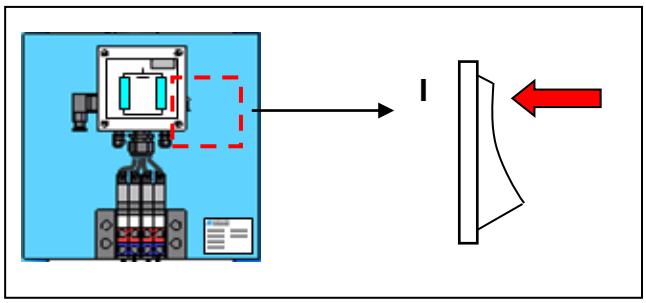
Open compressed air supply and switch on dryer

For start-up, please proceed in the sequence shown here.

► Ensure that the compressed air inlet and outlet valves installed by the owner are closed (see installation example on page 24).

► Ensure that the compressed air system upstream of the dryer is pressurised. If necessary, pressurise (switch on compressor).

► Switch on dryer by setting the ON/OFF switch to **I**. This will initiate the **HDD53 ~ HDD292** control valve to be in such position that ONE vessel is pressurised, and THE OTHER vessel is at atmospheric pressure.



Slowly open compressed air inlet valve!

Avoid sudden pressure build-up in any circumstance! If pressure builds up too fast, this may cause damage to the dryer. Therefore, the compressed air inlet valve must always be opened quite slowly!

- ► Slowly open the compressed air inlet valve, installed by the owner, upstream of the dryer.
- ► If the dryer is taken into operation for the first time, or after a change of drying agent, the following intermediate step is meaningful. In the case of a restart situation, the following intermediate step can be skipped.

Operating the dryer for the first time (or after a change of drying agent) separately

Depending on the transportation and storage conditions, the drying agent in the vessels can already be loaded with humidity from the environment. At each first start-up it makes sense therefore to operate the dryer for some time separately from the compressed air system. This causes the drying agent in each vessel to be regenerated repeatedly and thus to be prepared optimally for the take-up of humidity.

Note:

Depending on the pressure dew point to be achieved, we recommend to operate the dryer at first start-up without compressed air consumption:

- ■ **for at least 4 hours at a pressure dew point of –25 to –40 °C or**
- ■ **for approx. 3 to 5 days at a pressure dew point of –70 °C.**

If you wish to take the dryer into operation in accordance with our recommendation, proceed as follows:

- ► Ensure that the compressed air outlet valve installed by the owner is closed.
- ► Keep the compressed air outlet valve closed for the time period recommended above.
- ► Then the dryer can be taken into service in the compressed air system as described in the following section:

Operate dryer immediately in the compressed air system

► Ensure that the compressed air system downstream of the dryer is pressurised or that a start-up device (option, see page 16) was installed into the compressed air system directly downstream of the dryer.
The importance of this increases with the size of the compressed air system downstream of the dryer. Smaller compressed air systems can be pressurised also by means of compressed air fed through the dryer.

Slowly open compressed air outlet valve!

Avoid a sudden drop in pressure in any circumstances! If pressure drops too fast, this may cause damage to the dryer. Therefore, the compressed air outlet valve must always be opened quite slowly!

► Slowly open the compressed air outlet valve installed by the owner. Observe the vessel pressure gauge of the pressurised vessel. The pressure should not drop below the operating pressure (if possible.). If necessary, keep the compressed air outlet valve in a slightly open position until the compressed air system downstream of the dryer has filled up completely; only then should the valve be opened fully.

The dryer has then been taken into operation within the compressed air system.

In the event of a fault

In the event of an emergency or if a safety-relevant disruption occurs (e.g. escaping compressed air, defective component), the dryer must be shut down immediately as described in the section on page 37).

Then proceed as follows:

Remedy fault

► Look up possible cause of the fault, and how to remedy the same, in the table on page 50.

► Remedy fault.

► Repeat the start-up procedure.

Changing cycle mode (optional)

When *can* I change cycle mode?

If the dryer has been successfully commissioned and is equipped with one of the following options:

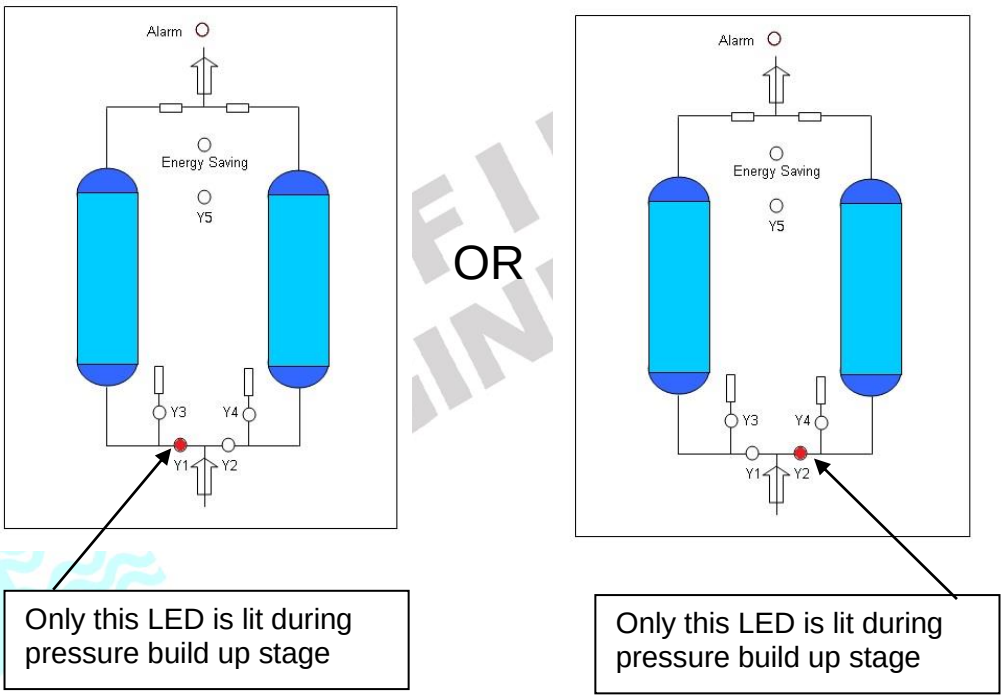
- *compressor synchronisation* or
- *dewpoint-sensing control*

it can be set to *Economy Cycle* mode.

When and how *should* I change cycle mode?

Cycle changes should be made:

<u>During the pressure build-up phase AND prior to vessel switchover</u>;



During this phase, the pressure in both vessels is just below operating pressure so that a fast pressure build-up is prevented when the vessels are switched. During this period, only the adsorption LED is on in the diagram, and the digital display shows step 4 or step 9 for the duration of 1 minute (see logic control diagram; not displayed with dewpoint sensing).

Which cycle modes can I choose?

The dryer can run in **two different cycles**. Firstly, fixed cycle, where the changeover of the towers is purely time-based. Secondly, **dewpoint-dependant cycle**, where the switching of the tower is based on a set changeover point.

With compressor synchronisation (optional)

If compressor synchronisation is enabled, the dryer can only be operated in conjunction with the compressor. As soon as the compressor is switched off, the dryer is automatically set to standby mode. In standby mode, the control system remains on, and the dryer is ready for the next switchover, which is made as soon as the compressor is switched on.

With dewpoint-sensing control (optional)

Dryers equipped with dewpoint-sensing control operated in variable cycle mode, based on the measured dewpoint of the dried air at the compressed air outlet. As soon as a certain dewpoint is reached, as the drying agent in the absorbing vessel is saturated, the vessels are switched. The dewpoint at which a switchover is made is preset at the factory.

How do I change cycle mode?

The cycle mode can be changed via the Protected Setting Mode, described in the next section.

Protecting Setting Mode

What is protected setting mode?

Protected setting mode is a setting mode which allows service personnel to modify the system settings. This setting mode is intended only to be accessed by service personnel.

How to use the protected setting mode?

Protected setting mode can be entered by the following steps:

1. Turn off the power to the control board.
2. **Remove AC-in (Con402) connector to eliminate the presence of AC voltage on the control board.** It is recommended to remove all other connectors on the control board as well. However, Con401 is required to stay connected in order to power the control board.

Warning! Always ensure personal safety by wearing adequate protective gears and exercise due care when working around the presence of AC voltage. AC voltage can be lethal.

3. Press and hold SET button switch (SW101) while turning on the power to the control board.
4. At this stage, the Alarm LED (Red LED) will turn on indicating the SET button switch is held pressed.
5. Release the SET button switch (SW101), the display will show S--- indicating that the control board is ready to enter protected setting mode.

6. Press the SET button switch (SW101) to enter protected setting mode, the display will show S-00. The number after S- represents the parameter number.

   Refer to Table 1 for the interpretation of parameter numbers.

7. Press the UP button switch (SW201) or DOWN button switch (SW202) to scroll through the parameter number until the desired parameter number is shown on the display.

8. Press SET button switch (SW101) to select the desired parameter, the display will show =000 or some other numerical number. The numerical number after = represents the value of the selected parameter.

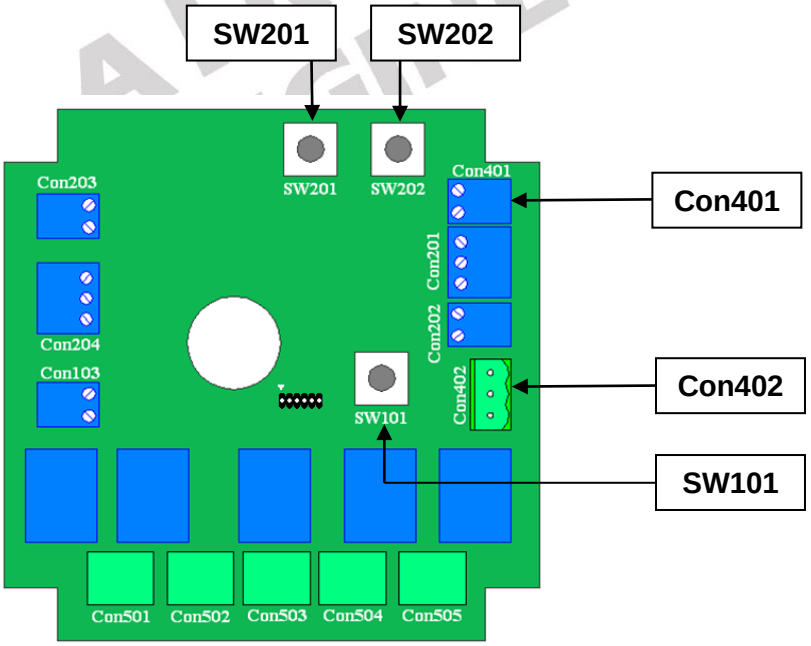
   Refer to Table 1 for the interpretation of the parameter's value.

9. Press the UP button switch (SW201) or DOWN button switch (SW202) to modify the value of the selected parameter.

10. Press SET to save the value for the parameter, the display will return to parameter selection and show the parameter number.

11. Repeat steps 6 to 10 until all the desired parameters are modified.

12. When done, wait for 30 seconds or turn off the power to the control board. Note: In protected setting mode, the control board will automatically reset if there is no button switch press for a period of 30 seconds.



Control board of HDC2

Table 1, interpretation of parameter number and value				
Parameter number	**Name**	**Value**	**Description**	**Default value**
S-00	Modbus address	000 to 147	Modbus node address	001
S-01	Modbus baud rate	000	1,200 bps	004
		001	2,400 bps	
		002	4,800 bps	
		003	9,600 bps	
		004	19,200 bps	
		005	38,400 bps	
S-02	Modbus number of data bit	008	Always 8 bits	008
S-03	Modbus parity bit	000	No parity bit	002
		001	Odd parity bit	
		002	Even parity bit	
S-04	Modbus character timeout	000 to 010	Number of half-character time + 3 half-character time	001
S-05	Modbus respond delay	000 to 100	0 to 100ms	050
S-06	Dryer operation mode	000	Idle	001
		001	Fix mode	
		002	Variable mode	
S-07	Dew point range	000	-50°C to +20°C	000
		001	-100°C to +20°C	
S-08	Service timer (countdown)	000	4000 hours	000
		001	8000 hours	

Table 1: Interpretation of parameter number and value for HDC2 controller

Monitoring dryer operation

The dryer operates fully automatically. However, you should carry out the regular checks described in the Chapter *Maintenance and repair of the dryer*.

Warning against sudden air ejection!

During expansion the pressure is released suddenly through the silencer:

- **A loud expansion noise is caused which may damage your hearing.**
- **Particles carried in the air flow act like bullets and can injure your eyes or skin.**

Always wear eye and ear protection, therefore, when you are in the vicinity of the dryer!

Operating hours counter and service intervals

The dryer control unit has an operating hours counter.
Depending on the version and application, this is set to 4,000 or 8,000 operating hours and appears as a countdown on the display of the HDC2 control unit.
Once the set operating hours have elapsed, the display indicates that the system requires servicing as recommended by the manufacturer.

Important: The function of the appliance is not affected by this message at any time and only serves to ensure process reliability.

The counter is reset using a service dongle. The dongle and the instructions are part of AFE's official spare and maintenance parts delivery programme.
Further details can be obtained directly from the manufacturer or your service partner

With dewpoint-sensing control (optional)

Display of dewpoint

If the dryer is equipped with a dewpoint-sensing control system, the digital display at the front of the switchbox will alternate between the measured dewpoint and a service countdown timer (hours).

When the timer reaches 0, it changes to “SEr" indicating service is required. The dryer is to be serviced and maintained. After that, the timer can be reset using a service dongle that can be obtained from the manufacturer (see page 5).

Depending on the sensor installed, the display range for dewpoint is either -50 °C (-58 °F) to +20 °C (68 °F), or –100 °C (-148 °F) to +20 °C (68 °F).

If the set dewpoint is exceeded, the system automatically completes a switchover between the vessels. The dewpoint at which a switchover is made is preset at the factory.

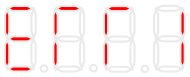
► After commissioning or extensive maintenance work, check the dewpoint display at the dryer.

Under certain circumstances, the desired dewpoint is only reached after prolonged operation.

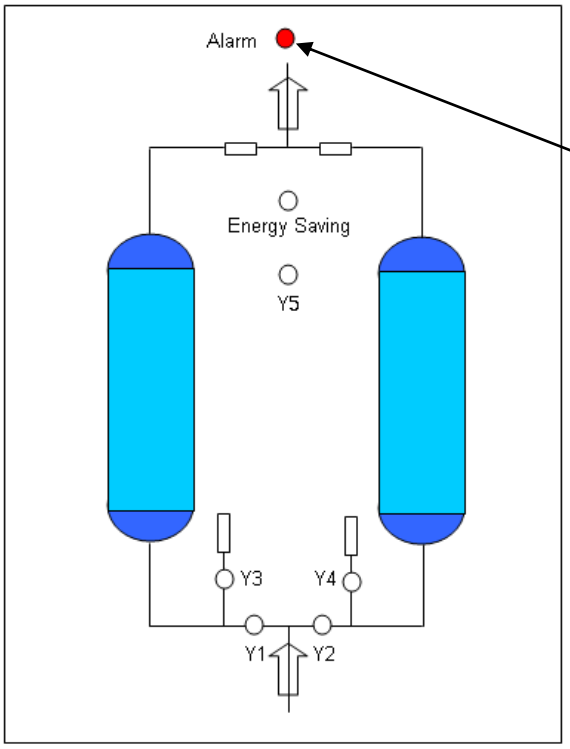
Error messages

If the measured dewpoint exceeds the preset alarm limit +6 °C (42.8 °F) above the switchover value, the displayed dewpoint value will be in flashing condition. In addition, an error message can be issued through the potential-free busbar.

Error codes and their causes:

Display	Cause
Blinking with current dew point reading	■ Upper measuring range limit exceeded
	■ Dewpoint sensor defective ■ Dewpoint sensor not powered ■ Cable defective ■ Sensor defective

For instructions on how to eliminate faults, see chapter *Identify and eliminate faults*



Alarm LED will lit when dew point reading exceeds +6°C of dryer pre-set dewpoint value.

Monitoring via MODBUS RTU

The dryer settings, operation status and measured dewpoint may be monitored remotely via MODBUS RTU. For configuration and settings, refer to the MODBUS RTU Register Map in the Annex of this manual.

Shutdown and restart dryer

In the following cases, the dryer must be fully shut down and depressurised:

- In the event of an emergency or malfunction
- For maintenance work
- For dismantling

Risk of injury from escaping compressed air!

Never remove any parts of the dryer, or manipulate the same in any way, as long as the unit is pressurised! Suddenly escaping compressed air might cause serious injuries.

Prior to any work, release all pressure from the unit.

Note:

If the unit is equipped with a compressor synchronisation system, first switch off the compressor and then wait until the dryer has reached the standby phase before switching it off with the ON/OFF switch.

This ensures that the regeneration cycle is completed, and that the pressure in both vessels is at the same level.

Note:

As soon as the dryer is switched on again, the programme continues the cycle from the point at which it has been stopped.

Emergency shutdown

In any emergency proceed as described in the next section.

Depressurising and shutting down the dryer

In order to make the dryer safe, follow the instructions in the next three sections:

Disconnect dryer from compressed air system

► Close the compressed air outlet valve (provided by operator).

► Close the compressed air inlet valve (provided by operator).

► If installed: Open bypass line.

Depressurise dryer

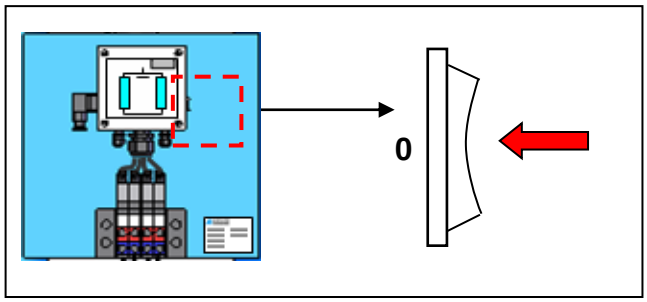
► Leave the dryer on until the expansion phase in both vessels has been completed.

During the expansion phase, the vessels are completely depressurised.

► Check the pressure in the dryer at both vessel pressure gauges. The pressure gauges should show value "0".

Disconnect voltage supply

► Switch off the dryer by setting the ON/OFF switch to position **0**.



If work is to be carried out on the electrical system

► Depressurise and shut down the dryer, following the instructions in the above chapter.

Risk of injury due to voltage-carrying parts!

The electrical supply cable and external power lines are live even after the dryer is switched off and, in the event of body contact, may cause serious injury! Before carrying out any work on the electrical system, the electrical supply cable and all external power lines must be made voltage-free!

► Make the electrical supply cable to the dryer voltage-free.

► Secure the electrical supply cable to the dryer against switch-on.

Restart

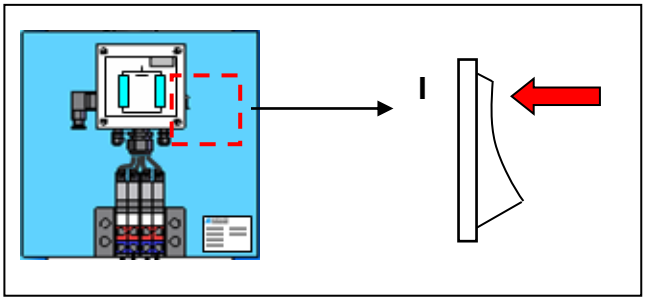
Depending on the fittings installed by the operator and the actual pressure conditions, the unit might have to be restarted at operating pressure. The following general rules apply:

- When switched off, the dryer is blocked in the main flow direction.
- The pressure in the vessel drops (provided that the compressed air outlet valve provided by the operator is opened), if
  - compressed air can escape to the compressed air system,
  - the dewpoint-sensing control is implemented.

If compressed air system and dryer have remained at operating pressure

► Ensure that the compressed air inlet valve (provided by the operator) is open.

► Set ON/OFF switch to **I**. The programme continues the cycle from the point at which it was interrupted



Slowly open compressed air outlet valve!

Avoid a sudden drop in pressure in any circumstance! If pressure drops too fast, this may cause damage to the dryer. Therefore, the compressed air outlet valve must always be opened quite slowly!

- ► **Slowly** open the compressed air outlet valve installed by the owner. Observe the vessel pressure gauge of the pressurised vessel. The pressure should not drop below the operating pressure (if possible). If necessary, keep the compressed air outlet valve in a slightly open position until the compressed air system downstream of the dryer has filled up completely; only then should the valve be opened fully.
- ► If available, block off bypass line.

The dryer is now in operation again and operates fully automatically.

If compressed air system and dryer have not remained at operating pressure

- ► If disconnected, reconnect the voltage supply of the dryer.
- ► Pressurise and switch on the dryer as described in the section *Open compressed air supply and switch on dryer* on page 28.

The dryer is now in operation again and operates fully automatically.

Maintenance and repair of the dryer

In order to allow maintenance work on the dryer to be carried out efficiently and without danger for maintenance personnel, you should comply with the following instructions.

Notes on maintenance

Warning!

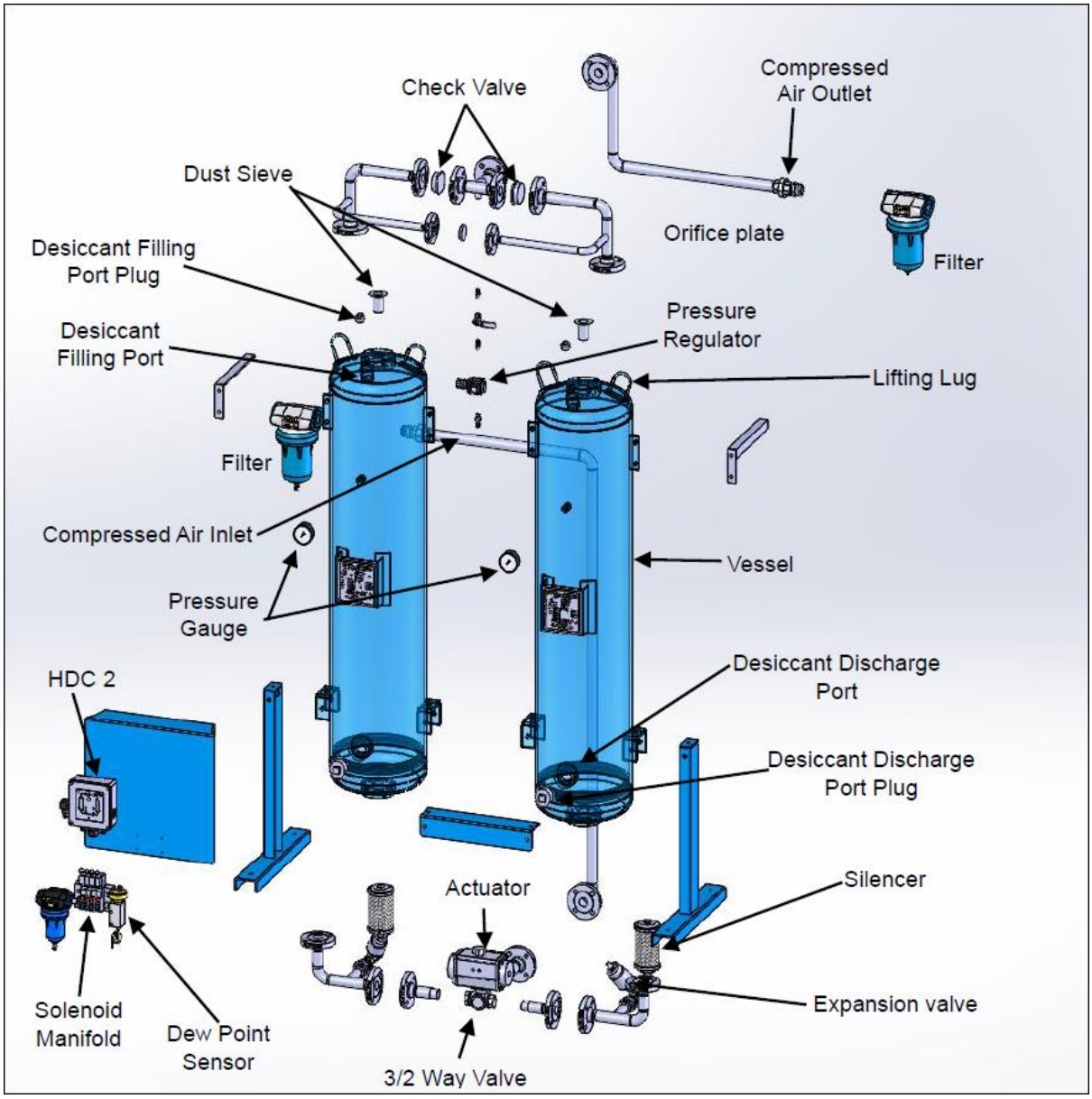
Maintenance tasks may be carried out only by authorized and qualified specialist personnel, and only with the plant in a switched off and depressurised condition.

> **Note:**
>
> **In order to ensure perfect maintenance and reliable operation we recommend that you conclude a maintenance contract (For telephone number, see page 5).**
>
> **When exchange or replacement parts are ordered, always state the dryer type and the build no. of the dryer. These data are found on the type plate attached to the control cabinet door.**

- Carry out all maintenance work only when the plant has been shut down and depressurised!
- Bolt connections must be undone with care! Note ram pressure values! Otherwise, emerging media may cause personal injury.
- Do not modify the factory settings of the control system in any way without prior consultation with the manufacturer.
- Never carry out welding work on a vessel or modify the same in any way!
- Following maintenance work, always check all flange and bolt connections for leakage and secure seating.
- Never use pipes and fittings as steps or holding points! The components might fracture, or the distortions which occur may cause internal damage on the dryer. There is a risk of injury by slipping off the components, components breaking off, and expanding compressed air!
- Never leave tools, loose parts or cloths in, at or on the dryer.
- Only use replacement parts that are suitable for the relevant function and meet the technical requirements stipulated by the manufacturer. This is always the case, if you use original replacement parts only.

Dryer Assembly Mechanism

- Refer to the exploded view drawing below for a better understanding of the **HDD** assembly mechanism



Dryer assembly mechanism for HDD

Regular Maintenance Intervals

Note:

If a vessel has been depressurised, e.g. after completion of the expansion phase, and the pressure remains above 0 bar, the vessel is pressurised by what is known as ram pressure. This might be due to

- **blockage at the silencer(s),**
- **contamination of the dust sieves,**
- **spent drying agent.**

To prevent such malfunctions, regularly service the dryer as described below.

The table provides an overview of the maintenance work to be carried out. The individual tasks are described in the following pages.

Component	Maintenance task to be carried	Maintenance interval						
		daily	weekly	monthly	12 months	24 months	48 months	see page
Complete dryer	Carry out visual and function checks.	▲						43
Vessel pressure gauge	Check dam pressure. For a dam pressure exceeding 0.3 bar: – Check silencer. – Check dust sieve. – Check drying agent.	▲						43
Upstream and downstream filters	Check differential pressure on the upstream and downstream filters. In the event of the differential pressure exceeding 0.35 bar, renew filter element.		▲					44
	Replace all filter elements after 1 year of operation.				●			45
Upstream filter	Check function of the condensate trap, clean if necessary.			▲	●			44
Silencer	Replace silencer after 1 year of operation and after renewing the desiccant.				●		●	45
Dew point sensor (with optional dew point sensing-control	Must be calibrated.				●			
Check valves	Renew.				●			
Solenoid valves	Replace valve bodies.				●			
	Replace pilot valves and solenoids.					●		
Dust sieves, drying agent	Renew.						●	46

Codes: ▲ Check. ● Renew.

***NOTE: The maintenance interval also depends on the operating hours counter (4,000 or 8,000 hours). Depending on whether the operating hours or the months/time have been reached first, we recommend professional maintenance (see page 63 "List of spare parts and consumables").**

When carrying out any maintenance work, comply with the following safety instructions:

Danger!

There is a very considerable risk of personal injury, when carrying out work on the activated and pressurised dryer.

Before commencing any maintenance tasks always shut down the dryer as described on page 37!

Warning against electrical voltage!

Only qualified specialist personnel may carry out work on the electrical system!

Daily maintenance tasks

Carry out visual and function check on the complete dryer

- ► Check dryer for external damage or unusual noise generation.
- ► Duly eliminate any defects found.

Clean dryer

- ► Remove any loose dust by means of a dry cloth, and, if required, also by means of a moist and well wrung cloth.
- ► Clean the surfaces with a moist well wrung cloth.

Check dam pressure

If, following depressurisation of a vessel, e.g. after the expansion phase, the overpressure has not decreased to 0 bar, then there is a residual pressure, designated as dam pressure, in the vessel.

- ► Check for dam pressure: if the dryer functions correctly, the respective pressure gauge indicates 0 bar. Then there is no dam pressure.

If the dam pressure is greater than 0.3 bar:

- ► Depressurise the dryer and shut it down (see page 37).

Dam pressure can be caused by:

- ■ a blocked silencer,
- ■ a blocked dust sieve or
- ■ drying agent which is too old.

The respective necessary maintenance measures are described in the following sections.

Weekly maintenance tasks

Check differential pressure on the filters

► Check the differential pressure on the pressure gauge of the filter.

The differential pressure should be 0.35 bar max. If the differential pressure exceeds 0.35 bar, we recommend that you replace the filter element (see page 45). The filter elements must be replaced in any case every year.

Monthly maintenance tasks

Check the function of the condensate trap on the upstream filter

A level-controlled condensate trap is installed at the upstream filter. The condensate trap drains the condensate automatically whenever a predefined fill level is reached. This trap prevents that the humidity separated from the filter ingresses into the dryer and has a detrimental effect on the drying agent.

Check the condensate trap as follows:

► If a permanent flow noise can be heard when the discharge valve is closed, this indicates a leakage. The condensate trap is poss. contaminated or defective.

► Turn knurled screw (see fig., item 1) on the housing bottom to the right. The condensate trap opens.

If the condensate trap

- operates correctly, some condensate or even just compressed air will emerge.
- is defective, an unusual amount of condensate emerges, or neither condensate nor compressed air emerge.

If no compressed air or an unusually large amount of condensate, or no water condensate at all, emerge, you have to remove the condensate trap, clean and if necessary, replace the same. To this end, proceed as follows:

► Depressurise the dryer and shut it down (see page 37).

► Unscrew the bottom section of the filter housing; remove the condensate trap, clean or fit new condensate trap.

► Refit bottom section of the filter housing: first screw on very tightly then unscrews by a quarter turn.

► Restart dryer (see page 39).

► Recheck function of the condensate trap.

Maintenance work to be completed every 12 months (or after reaching the operation hours)

Renew filter elements on the filters

The filter elements must be replaced every 12 months.

- ► Depressurise dryer and take out of service (see page 37).
- ► Remove the bottom section of the filter housing
- ► Replace filter element.
- ► Refit bottom section of the filter housing: first screw on very tightly, and then unscrew by a quarter turn.
- ► Dispose of used filter element in accordance with the applicable regulations.
- ► Restart dryer (see page 39). Check the all filters for leaks.

Renew silencers

The dryer is equipped with a silencer. If the silencer becomes blocked, a dam pressure is generated which in extreme cases may cause the silencer to burst.

Hazard caused by blocked silencer!

Blocked silencers can cause a dangerous overpressure to build up which may cause the silencers to burst. Flying fragments may cause personal injury and damage to property.

Therefore, the silencers must be replaced every 12 months and after each change of desiccant.

Warning against sudden air ejection!

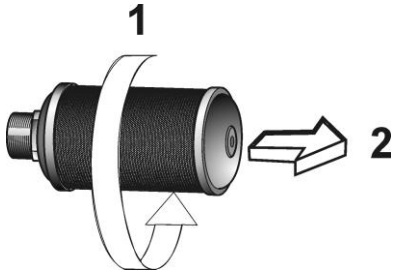
During expansion the pressure is released suddenly through the silencer:

- **A loud cracking noise occurs which can injure your hearing.**
- **Particles carried in the air flow act like bullets and can injure your eyes or skin.**

Always wear eye and ear protection, therefore, when you are in the vicinity of the dryer!

Renew silencer

- ► Depressurise the dryer and shut it down (see page 37).
- ► Unscrew silencer as shown in the opposite figure.
- ► Replace silencer and secure it.
- ► Restart dryer (see page 39).



Undo silencer

Resetting the operating hours counter via service dongle

(see also instructions in the service kit)

Maintenance work to be completed every 48 months (or after reaching the operation hours)

To complete the following maintenance tasks, you must dismantle the pipe bridges and the vessels. We therefore recommend that you carry out these tasks together.

> **Note:**
>
> **In accordance with national regulations, a pressure vessel inspection may be prescribed to be carried out at regular intervals by an independent supervisory office.**
>
> **For an inspection of the pressure vessels, the drying agent must be removed as described as follows.**
>
> **When inspecting the pressure vessels, it is recommended to check the condition of all fittings such as e.g. sieve bottoms and dust sieves, including gaskets. If necessary, these fittings must be cleaned or renewed.**
>
> **In the event of comprehensive maintenance or repair tasks, contact the manufacturer (see page 5).**

Replace dust sieve

Between vessel and top pipe bridge, dust sieves are fitted which retain the drying agent dust. If these dust sieves become blocked, a dam pressure is generated which can cause compressed air fluctuations in the compressed air system.

For disassembling the dust sieves, the entire top pipe bridge complete with all mounted elbow pipes must be removed first.

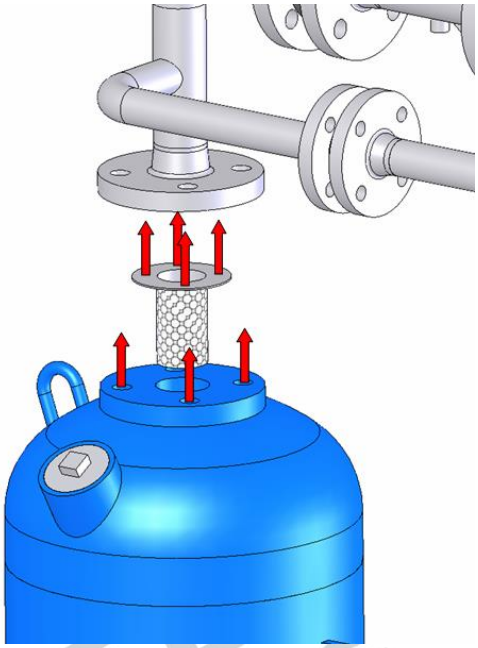
Risk of falls!

The dryer must not be misused as a climbing aid! The components have not been designed for such loads and could fracture.

Only use approved climbing aids when disassembling the top pipe bridge.

► Depressurise dryer and take out of service (see page 37).

- ► Unscrew the nuts securing the block flange.
- ► Withdraw top pipe bridge complete with all mountings.
- ► Remove gaskets and dust sieve.
- ► Use compressed air or wire brush to clean dust sieves or renew if necessary.
- ► Place dust sieve and replace new gaskets if necessary.
- ► Refit complete top pipe bridge, tighten nuts.
- ► Restart dryer (see page 39). Check that the connection is leak tight.



Removal of dust sieve

Renew drying agent

The service life of the drying agent is usually approx. 3 to 5 years. However, in favourable installation conditions, the change of drying agent may be carried out at a substantially later date (for notes on the installation site, see also page 19). The change interval depends very significantly from the degree of contamination in the compressed air (or the quality of the compressed air upstream filters). Oil, dust, and dirt particles cover the drying agent surface and reduce its effective surface, in part quite irreversibly.

If in doubt, have a sample of your drying agent assessed by specialists. Send a sample of approx. 200 g to the manufacturer (for address, see page 5).

Comply with the following safety notes when changing the drying agent:

Wear eye protection and dust mask due to increased dust generation!

When emptying the drying agent, increased dust generation may occur.

In order to avoid any eye irritations, wear protective goggles!

In order to avoid any dust inhalation, wear dust mask!

Risk of skidding!

If drying agent has been spilt on the floor, there is a risk of skidding caused by the drying agent beads. Therefore, spilt drying agent must always be taken up immediately.

Remove used drying agent

► Depressurise dryer and take out of service (see page 37).

► Place suitable collection vessel underneath the drain point.

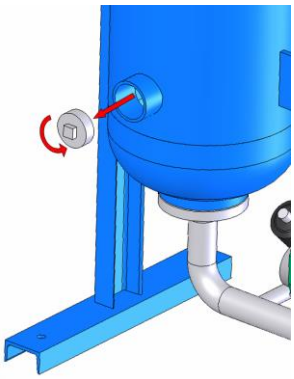
► Unscrew plug on the desiccant discharge port.

► Drain drying agent into the collection vessel.

► Use an industrial vacuum cleaner to hoover up carefully the residues of the drying agent via the drain plug aperture. In this way, you also clean the sieve bottom at the same time from any possible contamination or deposits.

► Screw back the plug.

► Repeat the process on the second vessel.



Unscrew plug

Warning!

If the dryer is not used within specifications, the drying agent can be contaminated with pollutants. Always take this into account for the environmentally safe disposal of the drying agent. The waste code numbers of the drying agent can be obtained from the manufacturer (see page 5).

► Dispose of the used drying agent in accordance with all applicable regulations.

Fill with new drying agent

Risk of falls!

The dryer must not be misused as a climbing aid! The components have not been designed for such loads and could fracture.

Only use approved climbing aids when filling the vessels.

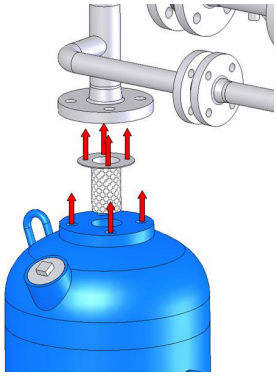
► Remove used drying agent (see above section) and ensure that the discharge point is closed.

► Disassemble top pipe bridge with mountings as well as dust sieves as described on page 46.

► Fill the several drying agents in as separate layers (according to the technical data in the appendix).

If necessary, use a funnel. Take special note of the next step:

► Provide for a high bulk density in the vessel.



Remove top pipe bridge

► Repeat the process on the second vessel.

► Subsequently refit dust sieves and top pipe bridge with mountings as described on page 46.

► Restart dryer (see page 39). Check that the connection is leak tight.

Identify and eliminate faults

The following table provides information on what designatory abbreviations are to be used for the various components. These designations are also found in the technical documentation.

Abbreviation	Component
PG	Pressure gauge
V1–V2 (Y1–Y2)	Main valves (solenoid valves)
V3–V4 (Y3–Y4)	Expansion valves (solenoid valves)
V5–V6	Check valves

Summary of faults

There are different fault types. In the case of most electrical faults (e. g. short circuit, defective fuse etc.) the main valves close. In the case of some process faults, the dryer will continue to operate for some time. Faults on the dryer become noticeable e.g. due to unusual noises and dam pressures.

The following table shows who is allowed to remedy a fault: the owner's specialist personnel or the manufacturer's service engineer.

Table of possible faults

Fault	Possible cause	Remedy	Spec. personnel	Service engineer
Excessive dam pressure during regeneration	Silencer or filter element of the silencer is contaminated.	Check silencers or filter elements for contamination, clean if nec., and poss. renew.	●	●
	Expansion valve V3/V4 does not open correctly.	Check expansion valve for contamination, if nec. clean/renew.	●	●
	Dust sieves are contaminated.	Clean or renew dust sieves.	●	●
Vessel pressure is too low	Excessive differential pressure on the upstream filter.	Check differential pressure on the upstream filter, if. nec. renew filter element.	●	
No pressure builds up	The compressed air system upstream of the dryer is not pressurised.	Check whether the compressed air system upstream of the dryer is pressurised. Remove any faults.	●	
	Solenoid valve Y1/Y2 does not open correctly.	Check supply voltage, cable, contacts, and solenoid; replace, if necessary.	●	●
Excessive compressed air consumption	Leakage.	Check condensate trap at the upstream filter; clean, if necessary.	●	●
Dryer does not switch over	Solenoid valve Y1/Y2 does not open correctly.	Check supply voltage, cable, contacts, and solenoid; replace, if necessary.	●	●
	Solenoid valve Y1/Y2 cannot be opened properly (audible humming sound or valve flapping).	Check supply voltage. Check pilot valves; replace, if necessary.	●	●
	Control board defective.	Check fuse in supply line and in the switchbox; replace, if necessary.	●	●
	Power supply interrupted, cable broken.	Reconnect the unit to the power supply.	●	
	Compressor might be off.	Check compressor synchronisation circuit.		
	Error in control programme.	Restart programme.		●
No expansion	Solenoid valve Y3/Y4 cannot be opened.	Check supply voltage, cable, contacts, and solenoid; replace, if necessary.	●	●
	Solenoid valve Y3/Y4 cannot be opened properly (audible humming sound or valve flapping).	Check supply voltage. Check pilot valves; replace, if necessary. Check valve bodies for contamination; clean or replace, if necessary.	●	●
Dryer is continuously bled	Solenoid valve Y3/Y4 cannot be closed properly (audible humming sound or valve flapping).	Check supply voltage. Check solenoid and diaphragm; replace, if necessary.	●	●
	Main valve V1/V2 does not open.	Check main valve, replace if nec.	●	●
Dryer is excessively bled	Solenoid valve Y1/Y2 cannot be closed.	Check solenoid and diaphragm; replace, if necessary.	●	●

Fault	Possible cause	Remedy	Spec. personnel	Service engineer
Pressure dew point is not reached	Operating pressure is too low.	Increase operating pressure.	●	
	Compressed air volume flow is too high.	Reduce compressed air volume flow	●	
	Compressed air inlet temperature is too high.	Reduce compressed air inlet temperature or pre-connect a compressed air cooler.	●	●
	Control board is defective.	Check control board, if nec. renew.		●
	Differential pressure on the upstream filter is too high.	Check differential pressure on the upstream filter, if nec. renew filter element.	●	
	Condensate trap on the upstream filter does not work.	Check function of the condensate trap, if nec. clean or renew.	●	●
	Drying agent is contaminated or too old.	Check upstream filter for contamination, if nec. renew element.	●	
		Check drying agent for contamination, if nec. renew drying agent.	●	●
	Regeneration gas too low.	Check function of expansion valve V3/V4 and silencer, if nec. renew silencer or filter element.	●	●

Annex with technical documentation

This annex comprises the following information and technical documentation:

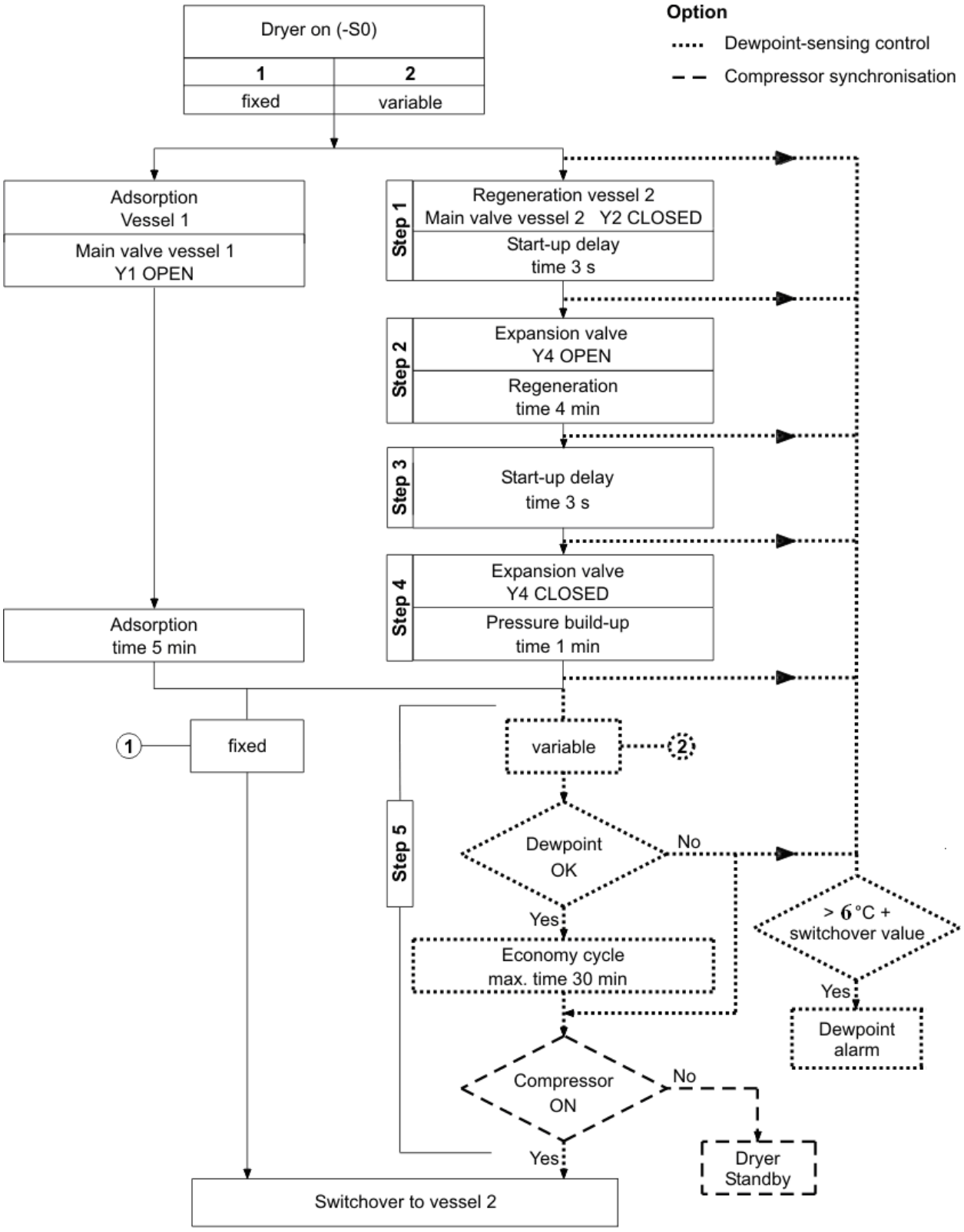
- Replacement and wear parts list
- Logic control diagram
- Flow diagram
- Pneumatic diagram
- Dimensional drawing
- MODBUS RTU Register Map

Replacement and wear parts list

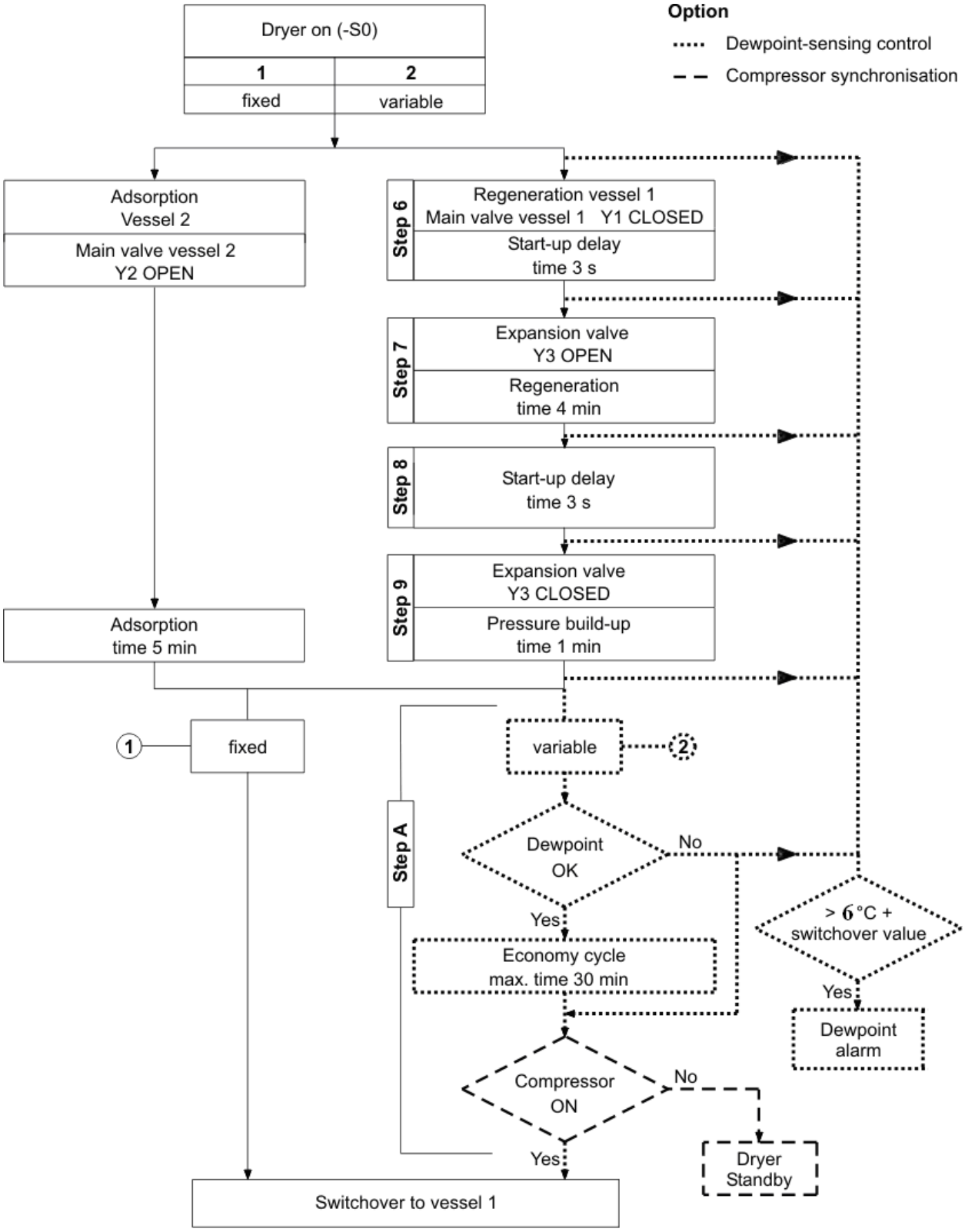
No	Component / Description	HDD 53	HDD 67	HDD 106	HDD 150	HDD 181	HDD 236	HDD 292	AFE Part No
1	Control Panel (HDC 2)	●	●	●	●	●	●	●	D02-195027
2	Check Valve (size)	DN25	DN25	DN25					D02-139018
					DN40	DN40	DN40		D02-139019
								DN50	D02-139020
3	Solenoid Manifold	●	●	●	●	●	●	●	D02-095025
4	Expansion Valve	●	●	●	●				D02-089002
						●	●	●	D02-091011
5	Silencer (size)	3/4”	3/4”	3/4”					D02-076002
					1”	1”	1”		D02-076003
								1-1/2”	D02-076005
6	Dust sieve (size)	DN25	DN25	DN25					D02-079007
					DN40	DN40	DN40		D02-079001
								DN50	D02-079002
7	Pressure gauge	●	●	●	●	●	●	●	D02-063036
8	Pre filter element	●	●	●					EDA10H-WAPE
					●	●	●		EDA16H-WAPE
								●	EDA20H-WAPE
9	After filter element	●	●	●					EDA10U-WAPE
					●	●	●		EDA16U-WAPE
								●	EDA20U-WAPE
10	Gasket (purging)	DN15	DN15	DN15					D02-048007
					DN25	DN25	DN25	DN25	D02-048006
11	Gasket (connection)	DN25	DN25	DN25					D02-048006
					DN40	DN40	DN40		D02-048005
								DN50	D02-048012
12	Drying agent (kg)	60	60	96	134	180	212	268	D02-132002

Logic control diagram

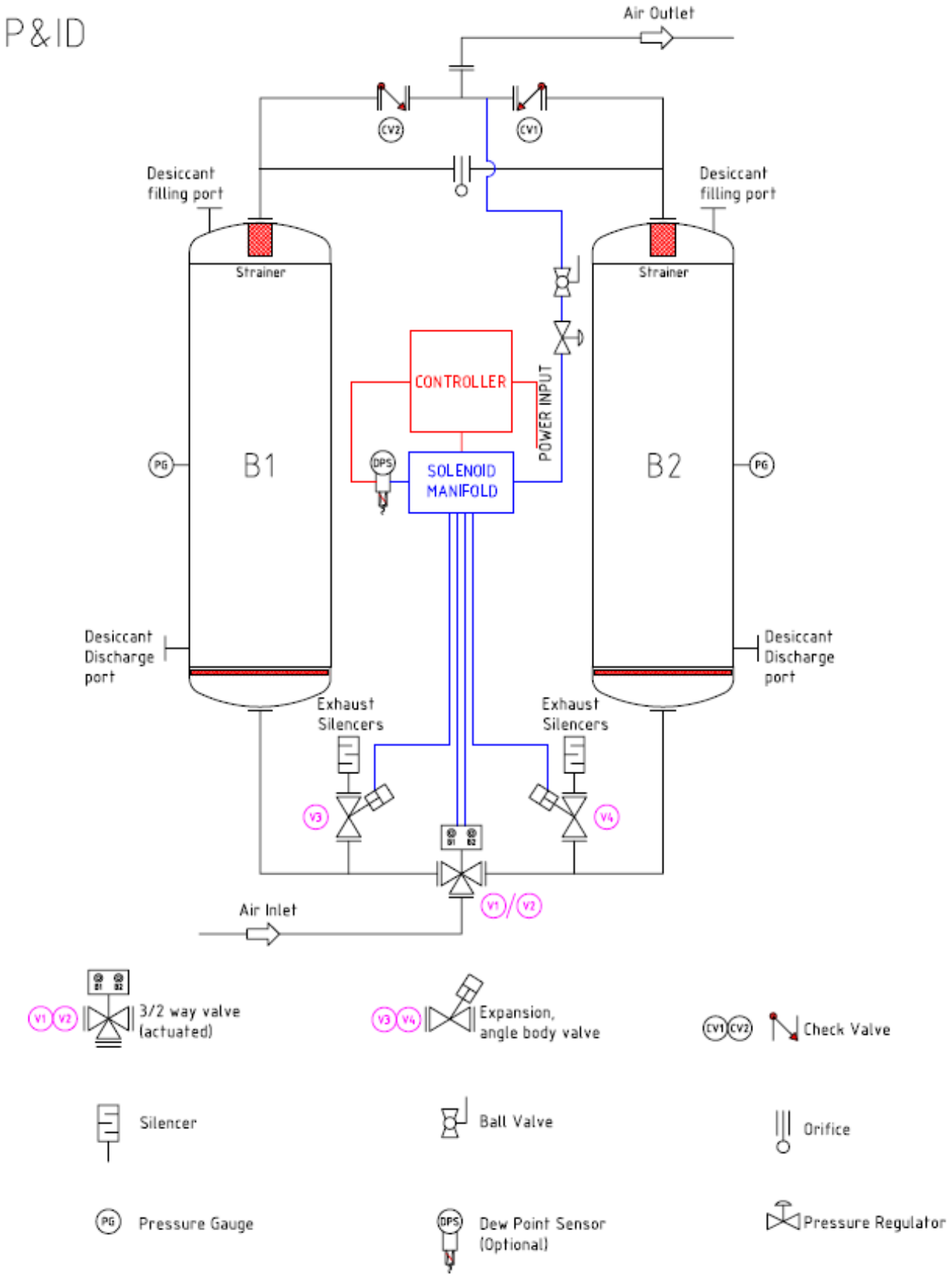
Adsorption in B1 and regeneration in B2



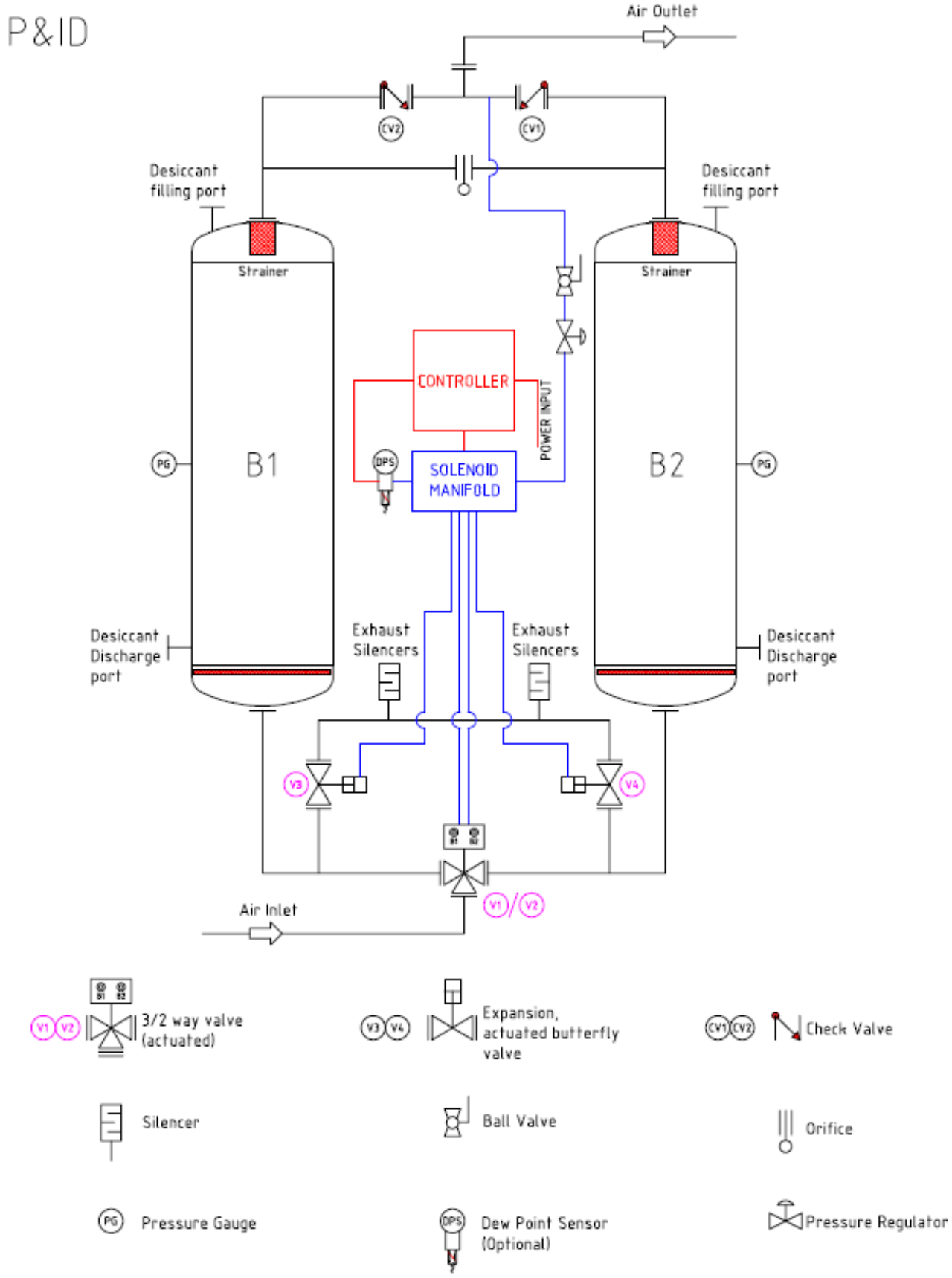
Regeneration in B2 and adsorption in B1



Flow diagram (HDD53~HDD150)



Flow diagram (HDD181~HDD292)

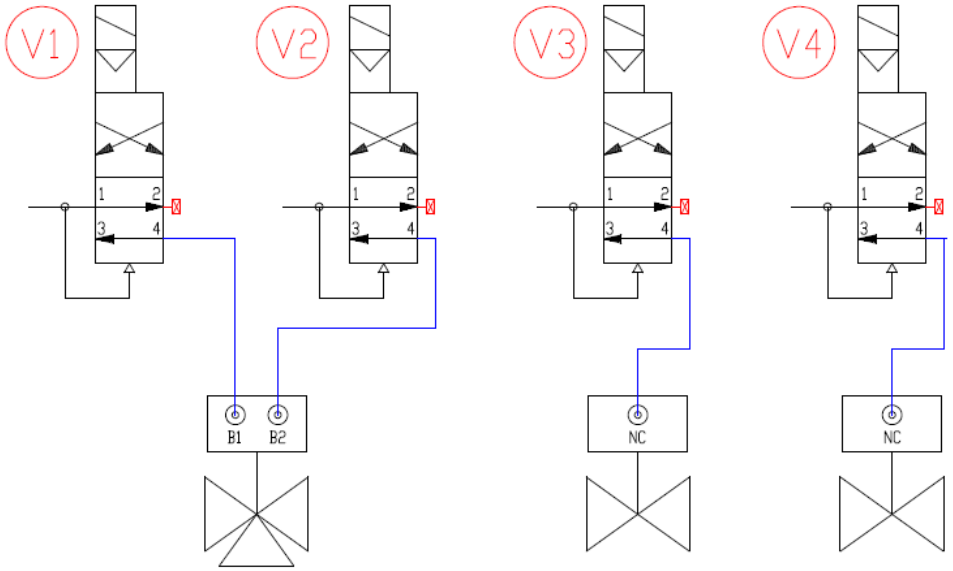


Pneumatic Diagram (HDD53~150)

HDD 53~150

AIRFILTER® ENGINEERING

PNEUMATIC DIAGRAM



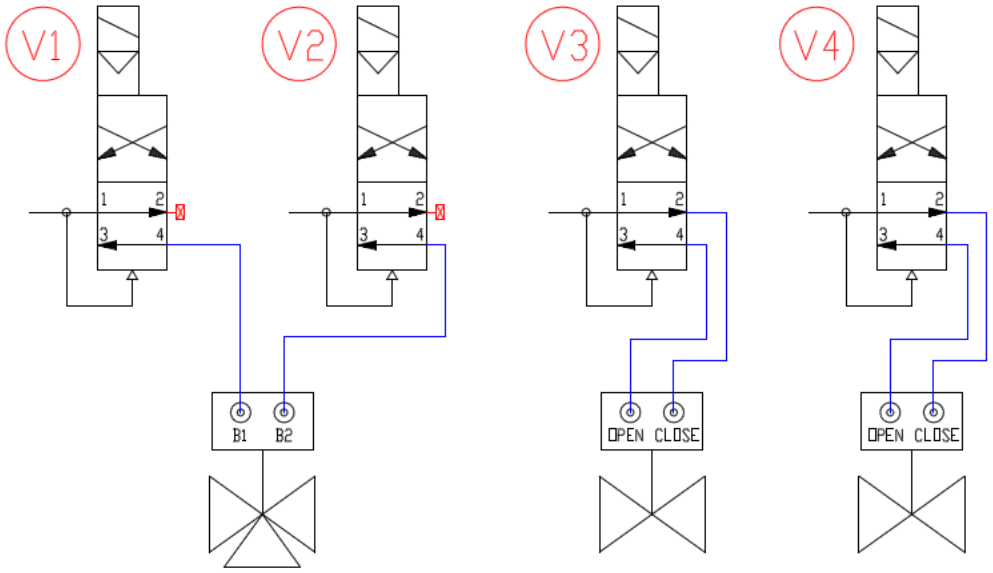
	VESSEL B1	VESSEL B2	V1	V2	V3	V4
START	ADSORPTION	REGEN	○			○
		PRESSURE BUILD UP	○			
CYCLE #2	SWITCH VESSEL			○		
	EXPANSION	ADSORPTION		○	○	
	REGEN			○	○	
	PRESSURE BUILD UP			○		
CYCLE #3	SWITCH VESSEL		○			
	ADSORPTION	EXPANSION	○			○
		REGEN	○			○
		PRESSURE BUILD UP	○			
CYCLE #4	SWITCH VESSEL			○		
	EXPANSION	ADSORPTION		○	○	
	REGEN			○	○	
	PRESSURE BUILD UP			○		

Pneumatic Diagram (HDD181~HDD292)

HDD 181~292

AIRFILTER® ENGINEERING

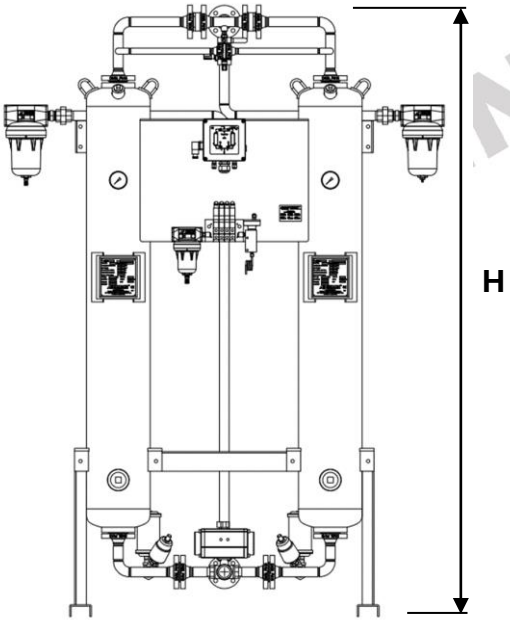
PNEUMATIC DIAGRAM

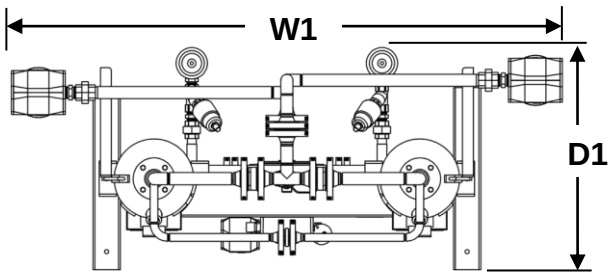


	VESSEL B1	VESSEL B2	V1	V2	V3	V4
START	ADSORPTION	REGEN	○			○
		PRESSURE BUILD UP	○			
CYCLE #2	SWITCH VESSEL			○		
	EXPANSION	ADSORPTION		○	○	
	REGEN			○	○	
	PRESSURE BUILD UP			○		
CYCLE #3	SWITCH VESSEL		○			
	ADSORPTION	EXPANSION	○			○
		REGEN	○			○
		PRESSURE BUILD UP	○			
CYCLE #4	SWITCH VESSEL			○		
	EXPANSION	ADSORPTION		○	○	
	REGEN			○	○	
	PRESSURE BUILD UP			○		

Dimensional Drawing

Model	H (mm)	W1 (mm)	D1 (mm)	Approx Weight (kg)	Connection
HDD53	1953	1515	610	274	G1”
HDD67	2110	1513	610	274	G1”
HDD106	1990	1621	610	370	G1”
HDD150	2211	1736	637	481	G1.1/2”
HDD181	2312	1736	637	553	G1.1/2”
HDD236	2084	1826	637	643	G1.1/2”
HDD292	2365	2075	780	765	G2”





MODBUS RTU Register Map

Modbus RTU default configurations:
Baud rate : 19,200bps
Data bit : 8
Parity bit : even
Stop bit : 1

Note: When no parity is used, there shall be 2 stop bits.
When odd or even parity is used, there shall be only 1 stop bit.

Modbus RTU function code implemented:
1) Function code 3 - read multiple holding registers
2) Function code 4 - read input registers

Notes:
Quantity of register must not exceed 11.
Total number of bytes in a Modbus message frame must not exceed 31.

Register name	Register address		16-bit word	
	Hexadecimal	Decimal	High byte	Low byte
Register segment 0				
Dew point sensor value (x 0.1mA)	0x0000	0	0x00	0 : Sensor not detected 4..200 : 4 to 20.0mA
Dew point sensor range (x 0.1^{o}C)	0x0001	1	0x00	0 : -50.0^{o}C to +20.0^{o}C, 1 : -100.0^{o}C to +20.0^{o}C
Dew point reading (x 0.1^{o}C)	0x0002	2	-1000..+200 : -100.0^{o}C to +20.0^{o}C -32768 : Sensor fault	

Drying Operation Status	0x0003	3	0x00	1) : Adsorption V1 (Y1 LED), 2) : Quick pressurization valve (Power LED), 4) : Energy saving (Energy Saving LED), 8) : Dew point alarm (Alarm LED), 32) : Regeneration V1 (Y3 LED), 64) : Regeneration V2 (Y4 LED), 128) : Adsorption V2 (Y2 LED, 16 : Reserved
Drying cycle selection	0x0004	4	0x00	0 : Idle, 1 : Fixed cycle, 2 : Dew point cycle
Time to next service (second)	0x0005	5	0..65535 : Time to next service (high word)	
	0x0006	6	0..65535 : Time to next service (low word)	
Cycle time program	0x0007	7	0x00	1..7 : Program 1 to program 7
Due point setting (x 0.1^{o}C)	0x0008	8	-490..+200 : -49.0^{o}C to +20.0^{o}C when dew point sensor range (register 1) = 0 -990..+200 : -99.0^{o}C to +20.0^{o}C when dew point sensor range (register 1) = 1	
Dryer state	0x0009	9	0x00	0 : Idle state 1 : Overlapping state 2 : Pre-regeneration (step 1) 3 : Regeneration (step 2) 4 : Post regeneration (step 3) 5 : Refilling state (step 4) 6 : Energy saving state (step 5) 7 : Standby state
Cycle time counter (second)	0x000A	10	0x00	0..9999

AIRFILTER® ENGINEERING

EU-Konformitätserklärung
nach Druckgeräterichtlinie 2014/68/EU
EU Declaration of Conformity
according to Pressure Equipment Directive 2014/68/EU

Baugruppe/assembly group:

Adsorptionstrockner der Serien HDD53-292
Adsorption dryers of the HDD53-292 series

Hersteller/ Manufacturer:
Airfilter Europe Produktionsgesellschaft mbH
Gutenbergstrasse 5
53332 Bornheim
Deutschland

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller.

The sole responsibility for drawing up this declaration of conformity lies with the manufacturer.

Die oben beschriebene Baugruppe der Erklärung erfüllt die einschlägigen Harmonisierungsrechtsvorschriften der Europäischen Union:
The assembly of the declaration described above complies with the relevant harmonisation legislation of the European Union:

Angewandte Konformitätsbewertungsverfahren:	
Applied conformity assessment procedures:	H1
Beschreibung der in der Baugruppe enthaltenden Druckgeräte:	Eine Liste der klassifizierten Druckgeräte dieser Baugruppe wurde der abnehmenden, notifizierten Stelle vorgelegt und ist in den technischen Unterlagen des Herstellers dokumentiert.
Description of the pressure equipment contained in the assembly:	A list of the classified pressure equipment of this assembly has been submitted to the accepting notified body and is documented in the manufacturer's technical documentation.
Angewandte Normen und technische Spezifikationen:	
Applied standards and technical specifications:	DIN EN ISO 12100, EPS 18 ATEX 1232X
Weitere angewandte EU-Richtlinien:	
Further applied EU directives	2014/30/EU(bisher:2004/108/EG), 2014/35/EU (bisher: 2006/95/EG), 2014/68EU Artikel 4 Absatz 3

Eingeschaltete notifizierte Stellen
Notified bodies involved

Überwachung QS-System:	
Monitoring QS system:	-/-
Prüfung / Überwachung / Kontrollen während der Fertigung:	Lloyds Register Deutschland GmbH (Kennnummer 0625)
Testing / monitoring / controls during production:	Überseeallee 10, 20457 Hamburg, Germany

Zugehörige Bescheinigungen
Associated certificates

EU-Entwurfsprüfungs Nr.:	
EU Design Examination Certificate No.:	HAM1963103/ZE-1112-1/3A2

Ort, Datum:
Bornheim den 23.05.2022

ppa.
Unterschrift: Volker Ortjohann
Betriebsleiter

Nordic Filtration

At www.nordicfiltration.com you will find a wide selection of filtration products ready for you to order.

Nordic Filtration offers a wide selection of filtration products for water treatment. We have stock in Denmark from where we distribute all of our products to Scandinavia and the the rest of the world.

You can buy our products on local websites or by contacting us by phone or e-mail. Information about our products as well as brochures and manuals can be found on our website (www.nordicfiltration.com).

We can adapt all of our filtration products to your needs, and we offer visits from our consultants in order to find the right solution for you.

Glasvænget 6
5492 Vissenbjerg
Denmark

+45 72 25 10 00
info@nordicfiltration.com
www.nordicfiltration.com