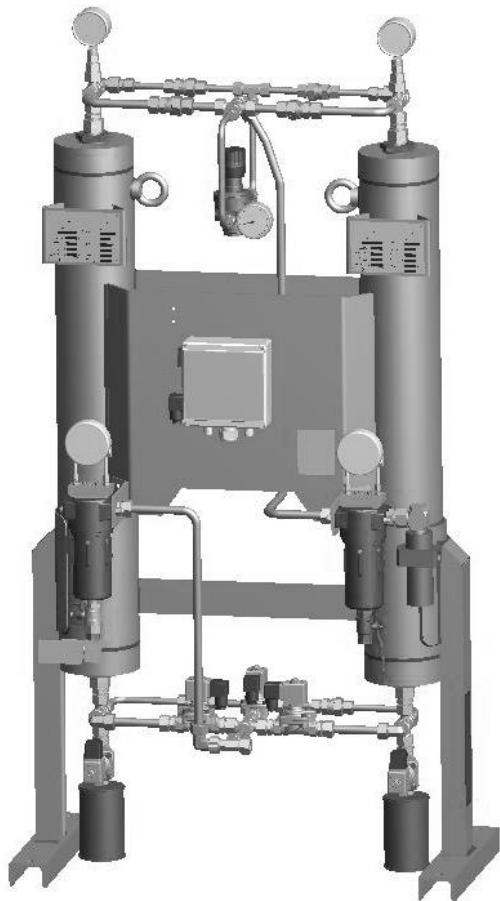


High Pressure Dryer

HDK 18/25—550/50

Dokument-ID: DMN-HDK50/R05



Operating instructions

CE 0525

Revision 05—06-2015/ EN

Declaration of Conformity

Parker Hannifin Manufacturing Germany GmbH & Co. KG
Hiross Zander Filtration Division

Im Teelbruch 118

D – 45219 Essen Kettwig

hereby declares with sole responsibility, that the products

**high pressure dryer
series HDK 18/25 to 600/420**

assembly type: assembly acc. to Art. 3 No. 2.2,

which this declaration refers to, conform to Directive **97/23/EG** and were subjected to a conformity assessment according to Annex III Modules B + D (for assembly assessment).

For the assembly, the EG type approval certificate SIG 0272175/1 by Lloyd's Register Quality Assurance GmbH, Hamburg, is available.

The quality assurance system is monitored by the service provider stated below
Lloyd's Register Quality Assurance GmbH (identification number 0525)
Am Sandtorkai 41, D - 20457 Hamburg.

The assembly consists of pressure appliances according to the classification list (attached to the technical documentation provided by the manufacturer).

The following standards / technical specifications were used:

- harmonized standards: DIN EN ISO 12100, DIN EN 50081, DIN EN 50082,
DIN EN 60204

The following other EG directives were used:

- 2004/108/EG
- 2006/95/EG

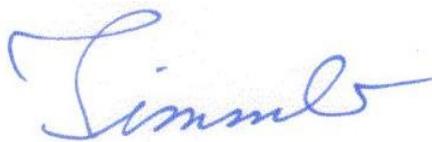
Essen,

03.11.2014

Datum / Date

i. V. Dr. Jürgen Timmler

Leiter Technik und Entwicklung /
Manager Engineering and Development



Machine passport

Type designation	HDK ____
Order no.	
Project no.	
Build no.	
Vessel no.	
Vessel no.	
Year of manufacture	

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 9).

Table of contents

General information	6
Manufacturer's details	6
Details on the dryer	6
About these operating instructions.....	7
Intended use of the dryer.....	7
For your own safety	8
General safety notes	8
Signs, instruction plates and danger zones at the dryer.....	9
Technical product description	11
Summary drawing	11
Function description	12
Available options	14
Transportation, installation and storage.....	16
Information on transportation packaging.....	16
What to do in the case of transport damage occurring?.....	16
Transporting and installing the dryer.....	17
Installing and anchoring.....	18
Storing the dryer.....	18
Installation.....	20
Preconditions for installation.....	20
Connect piping	21
Installing the electrical connection	22
Start-up	24
Requirements for initial start-up.....	24
Setting times of the operating phases.....	25
Overview of operating and control elements.....	25
Emergency shutdown	28
Start up dryer	28
Changing cycle mode (optional)	30
Monitoring dryer operation.....	32
With dewpoint-sensing control (optional)	32
Shutdown and restart dryer.....	33
Emergency shutdown	33
Depressurising and shutting down the dryer.....	33
If work is to be carried out on the electrical system.....	34
Restart	34

Maintenance and repair of the dryer	35
Notes on maintenance	35
Regular maintenance intervals	36
Instructions for use of the dongle	37
Daily maintenance tasks	37
Weekly maintenance tasks	38
Maintenance work to be completed every 12 months	38
Maintenance work to be completed every 48 months	42
Identify and eliminate faults	45
Summary of faults	45
Index	48
Annex with technical documentation	51
Technical data	52
Replacement and wear part list	53
Logic control diagram	55
Flow diagram	57
Dimensional drawing	58

General information

Manufacturer's details

Name and address



*Parker Hannifin Manufacturing Germany GmbH & Co. KG
Hiross Zander Filtration Division*

Im Teelbruch 118
D-45219 Essen

Phone ++49 (0) 2054 934-0
Fax ++49 (0) 2054 934-164

Internet www.parker.com/hzd
E-Mail zander@parker.com

Details on the dryer

Standard equipment

Dryer, comprising

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

Associated documents

- Operating instructions (present)
- Technical documentation (see annex)
- Circuit diagrams (see separate document)
- Manual for installed filters (see separate document)

Notes on supplementary documents

Supplementary documents such as operating manuals for options or pertaining components must always be heeded. They contain additional information, e.g. regarding maintenance, and are therefore necessary for safe operation of the plant.

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.

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 14 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.

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 personal 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.

General safety notes



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



Risk of injury from escaping compressed air!

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

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



Hazard caused by exceeding the limit values!

The dryer may only be operated within the defined operating conditions. Exceeding the maximum permissible conditions can cause serious injuries and death.

The operating company must ensure the maximum operating pressure and permissible fluid temperature are not exceeded by installing corresponding safety devices.



Warning against sudden air ejection!

During expansion the pressure is released suddenly through the muffler:

- 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!



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.

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:

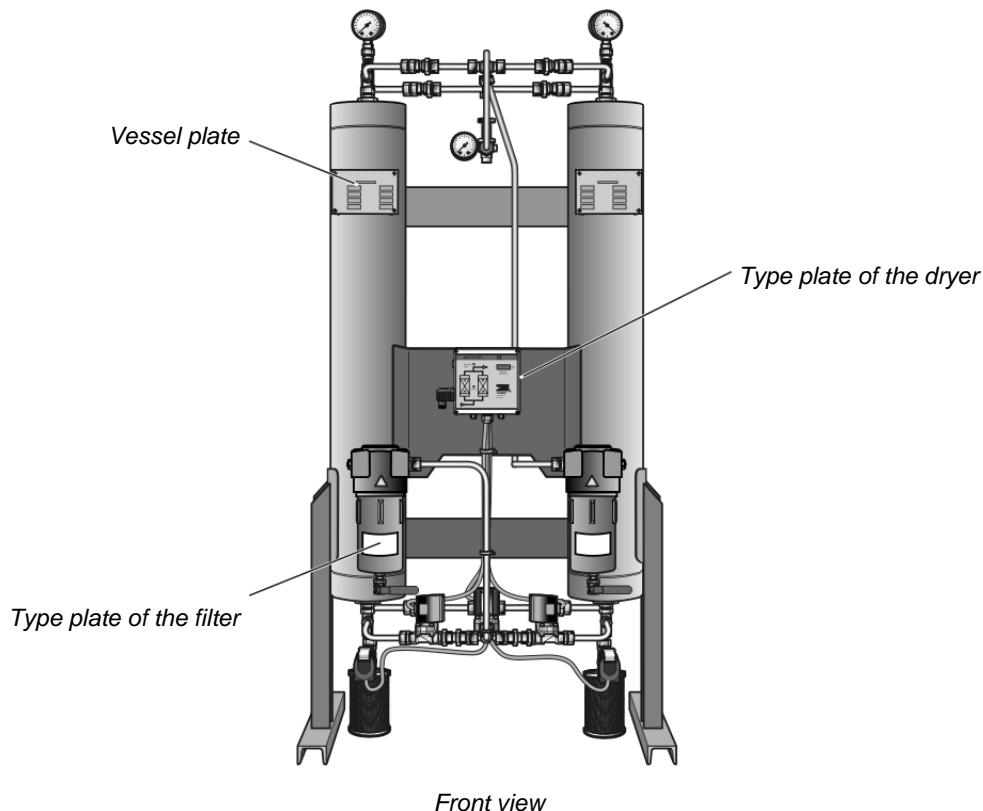
- When filling drying agents into the vessels, wear a dust mask and eye protection!
- If a spillage occurs, any spilt drying agent must be taken up immediately. There is a risk of skidding!

Disassembly and disposal

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.

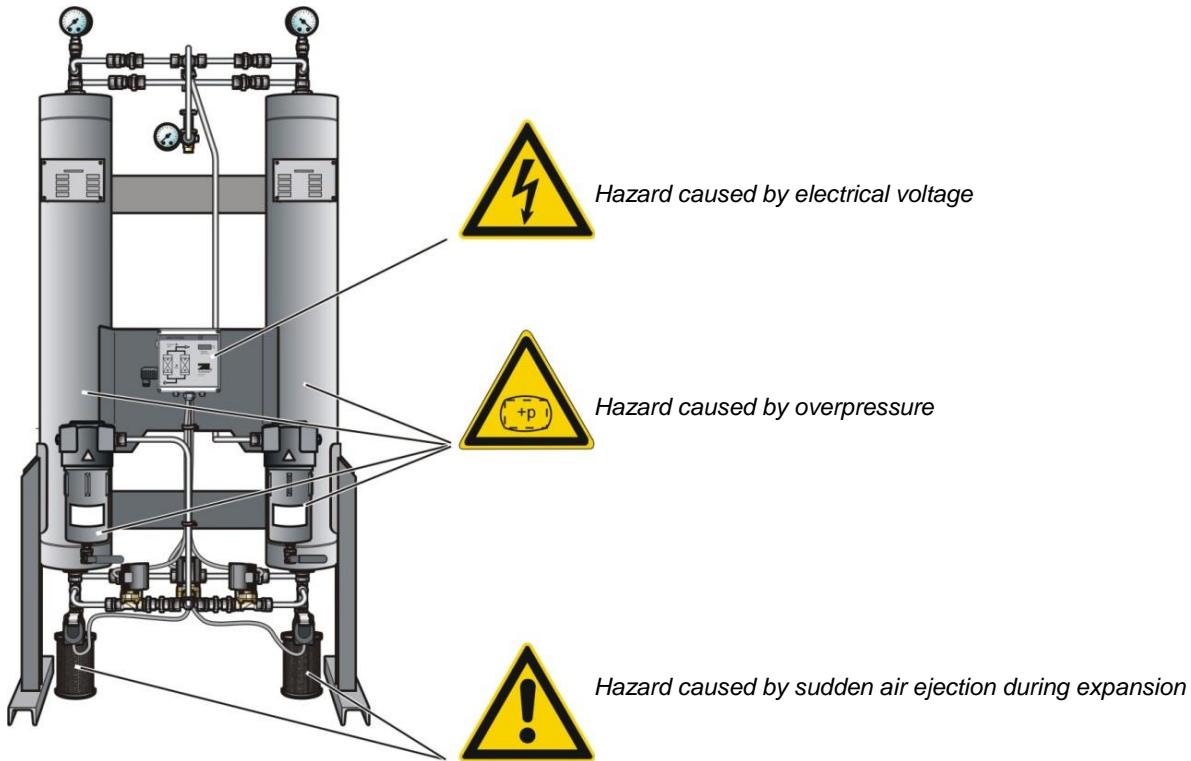
Signs, instruction plates and danger zones at the dryer

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

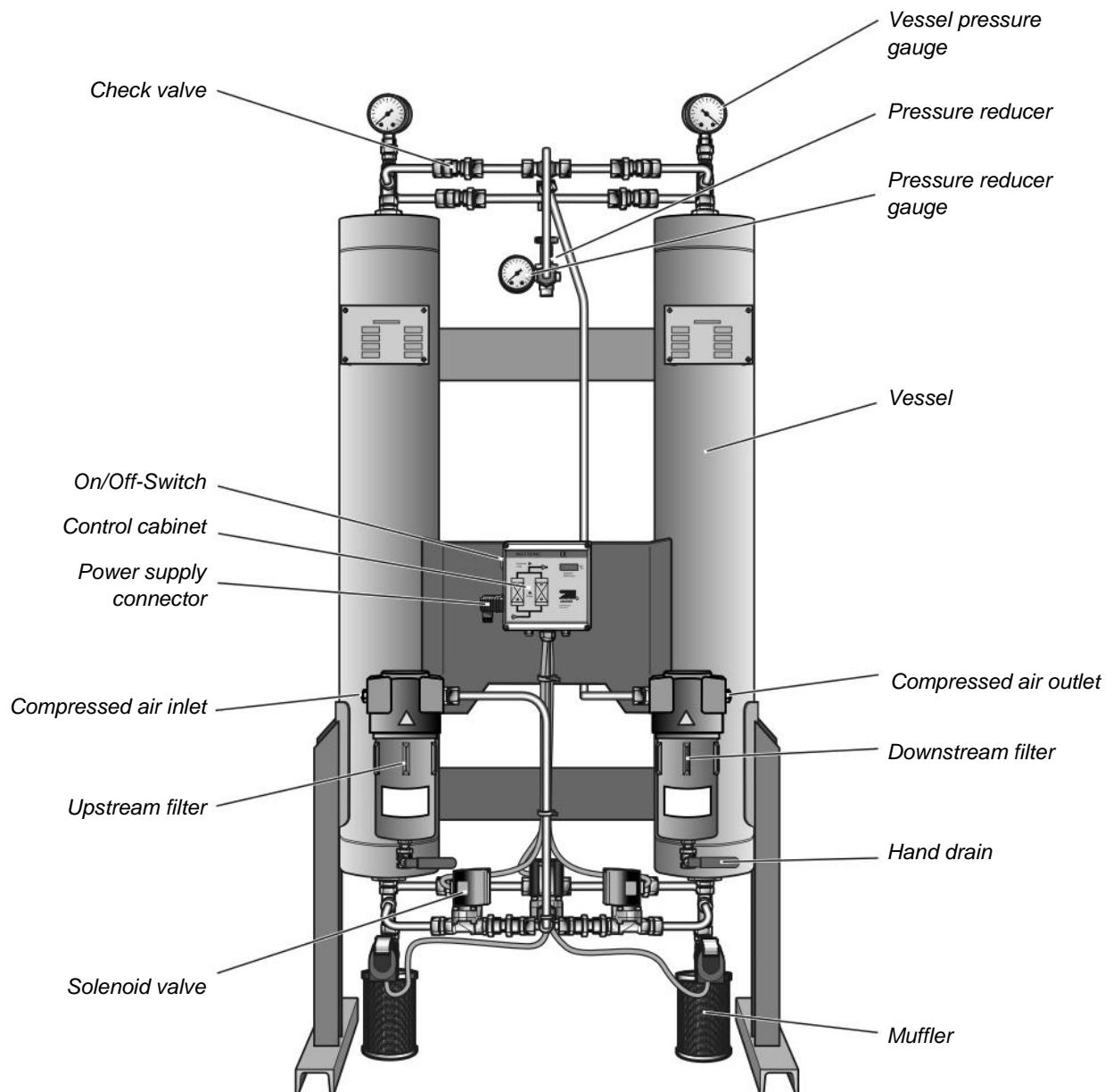


Hazard area	Symbol in operating instructions
Warning against hazardous electrical voltage Different parts of the dryer carry electrical current. These parts may be connected, opened, and maintained by authorized specialist personnel only.	
Warning against overpressure The entire dryer is under pressure. Before commencing any work, the plant must be depressurised.	
Warning against sudden air ejection When the vessels are depressurised, air flows suddenly out of the sound absorber: <ul style="list-style-type: none">■ 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.	

Technical product description

Summary drawing

Front view



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.

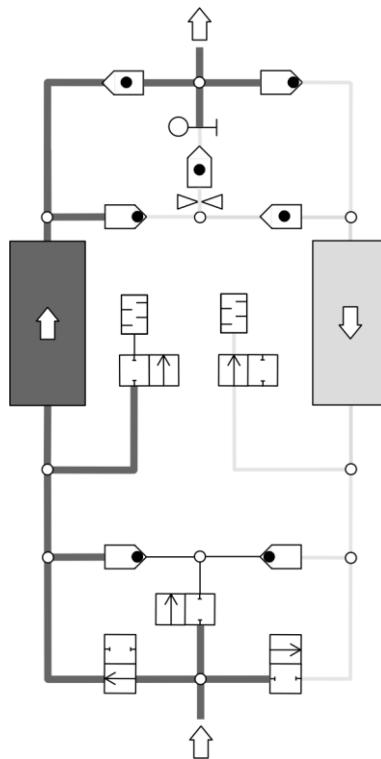
To this end, the two vessels alternate between different operating modes. Whilst in one vessel, compressed air is de-humidified (adsorption), in the other vessel the humid drying agent is prepared for another charge (regeneration). These two states, which run in parallel during compressed air preparation,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

Adsorption

Via a compressor, humid compressed air is supplied to the upstream filter. From here, the compressed air 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.

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.



Here, adsorption is shown in the left vessel.

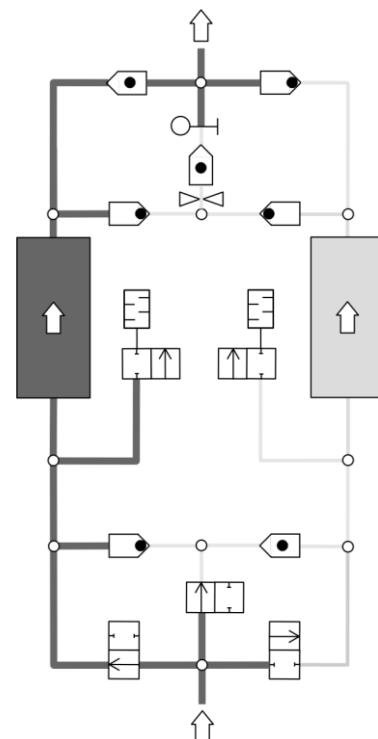
Expansion phase

During the expansion phase the pressure in the right vessel is released via the muffler 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 muffler.

Dehumidification phase

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 muffler.



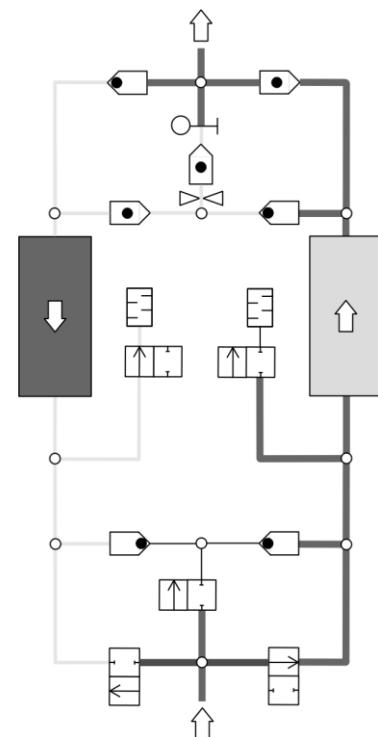
Here, regeneration is shown in the right vessel.

Pressure build-up phase

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.

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.



Pressure build-up

Switchover

When the drying agent in the adsorbing vessel has taken up a sufficient level of humidity, then the switchover between the vessels will be effected 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
- Signalling contacts of control system
- Dewpoint-sensing control
- Pneumatic control
- Condensate drain pipe for preliminary and afterfilter

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 is 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.

Auxiliary heater

For installation sites with temperatures under +1 °C (33,8 °F), the wet side of the dryer must be equipped with an auxiliary heater to prevent valves, cocks, flaps, and other components from freezing up.

Signalling contacts of the control system

The control system is equipped with a digital input for the synchronised operation with a compressor. This feature allows for synchronised and thus efficient dryer operation with discontinuous compressor operation.

Compressor synchronisation helps reduce energy costs, as the dryer can be operated independently of the compressor.

The compressor synchronisation controller is a higher-level controller than the pressure dew point controller (see below). When both options are in place, the compressor synchronisation controller is treated as the prime controller.

The control system can also be equipped with an optional operation signalling contact with which the dryer operation can be monitored from an external device. Dryers with the optional *dewpoint-sensing control* are equipped with such a contact as standard. It is used for the transmission of operating signals and for the output of dewpoint alarms.

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.

Condensate drain systems for preliminary and afterfilter

Condensate drain systems are installed to drain water that has collected in the preliminary or afterfilter from the filter. There are two distinct types of condensate drain system, namely level-controlled systems and time-controlled systems.

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 18.

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 6.

Warning!

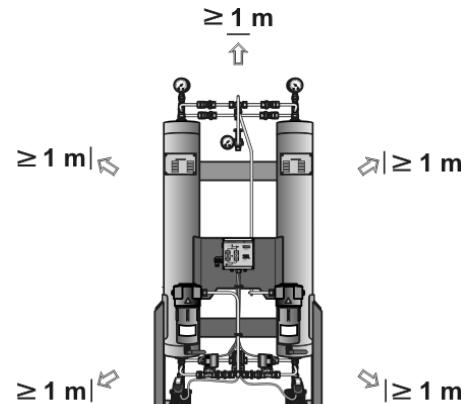
A damaged dryer must not be taken into operation! Damaged components may lead to functional faults and possibly cause further damage.

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 14 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 14).
- Heed the dryer's noise emission when selecting the installation location.
- The installation area must be level, firm and vibration-proof. 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 6).

Transportation using lifting or forklift trucks



Warning against damage to property!

The dryer is delivered on a transportation pallet.

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

- ▶ Remove the packaging of the dryer.
- ▶ Attach suitable lifting gear to the stand profiles and cross beams.



Risk of tilting!

The dryer should only be transported in an upright position. However, this means that the centre of gravity of the unit is located in the upper half of the dryer, so that there is a serious risk that the unit might topple over.

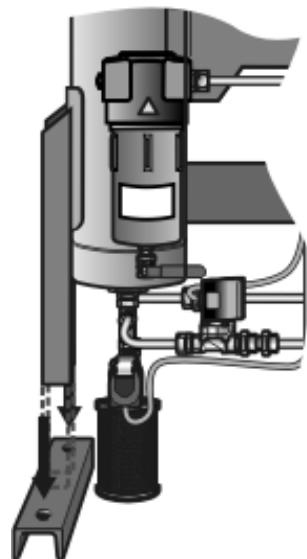
When attaching the dryer to the lifting gear, observe its centre of gravity!

- ▶ Position the dryer at its installation site.

Anchoring the dryer

The upright stand profiles of the dryer are provided with 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 33.
- ▶ Ensure that the compressed air inlet valve installed by the owner, and the installed 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 29).

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 21).
- 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.

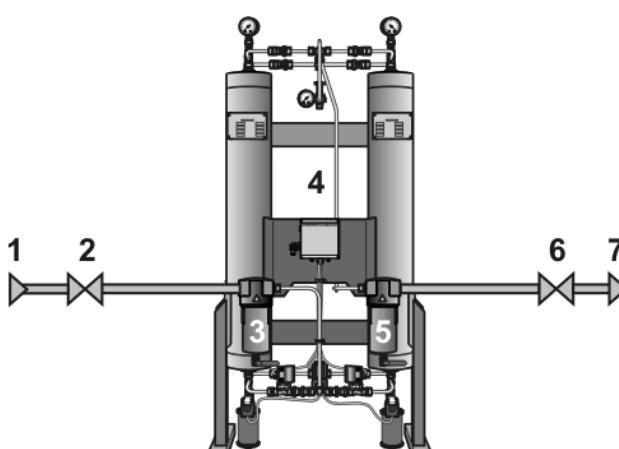


All piping must be free from any stress and tension whatever!

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

Example of an installation

- ▶ 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.



Warning against electrical voltage

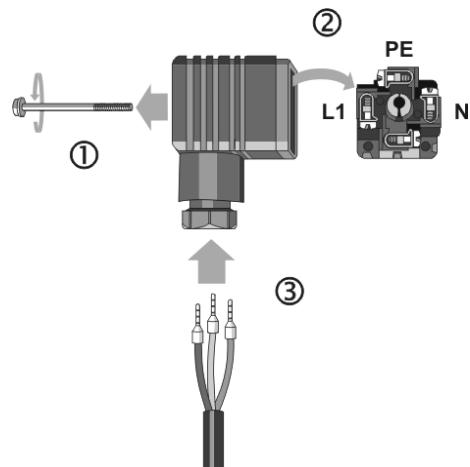
Only qualified specialist personnel may carry out work on the electrical system!

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.
- ▶ Undo bolt (1) on the connector and withdraw connector with seal from the switchbox.
- ▶ Use a suitable tool to remove the terminal block from the connection box.
- ▶ Undo the PG union and pull the cable through the aperture (3). The exposed phase ends should not be longer than 35 mm max.



- ▶ Now make the cable connection as follows:
 - Earth to terminal PE
 - L1 to terminal 1
 - N to terminal 2

Connect electrical cable to device adapter

Terminal 3 is not used.

- ▶ Fit terminal block into the connector and use bolt to remount the connector with seal on the switchbox.
- ▶ In all phases the dryer must be protected against short circuits by means of fuses.
- ▶ In order to relieve cable strain, re-tighten the PG union.

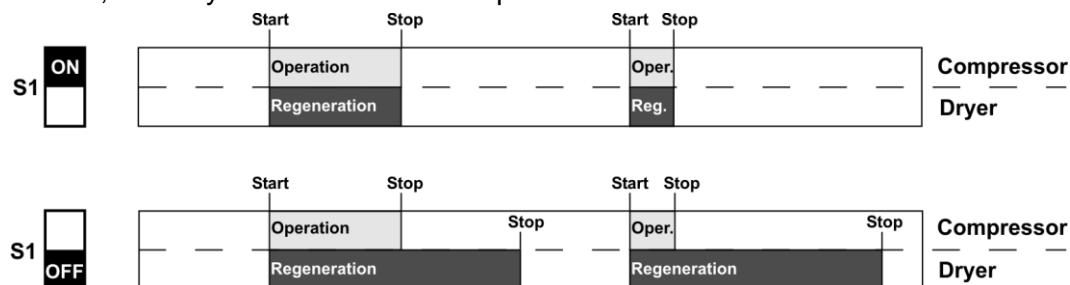
Connecting the external signalling lines

For compressor synchronisation

The controller is fitted as standard with a digital input which makes the dryer regeneration dependent on operation of the compressor (switch S1 on the controller's circuit board, see also figure below).

If switch S1 is in the ON position, operation of the compressor and dryer regeneration run synchronously: When the compressor is stopped, the dryer regeneration also stops. When the compressor is restarted, regeneration also restarts.

If switch S1 is in the OFF position, any regeneration process which has been started, is always continued until completed.



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).

For operation monitoring system (optional)

Operators have the option to connect the dryer to a fault signalling system, connecting the respective line to a potential-free operation signalling contact. With this option, the following statuses and events can for example be transmitted to a remote control room:

- Dryer on (contact made)
- Power supply disconnected (no contact)
- Dewpoint alarm (only with *dewpoint-sensing control* option, no contact)

To install the external lines, proceed as follows:

- ▶ Connect the lines of the fault signalling system to relay K5 (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 against sudden air ejection!

During expansion the pressure is released suddenly through the muffler:

- 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!



Risk of injury from escaping compressed air!

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

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



Warning!

The dryer must be taken into operation by trained personnel only!

Untrained personnel does not have the required knowledge. Such personnel might cause serious faults.

Note:

You can arrange for your distributor to carry out the commissioning and have your personnel trained by the manufacturer.

- 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 contaminations.
- All shutdown valves of the compressed air inlet and outlet valves installed by the owner are closed.
- Check all unions and bolt connections as well as the terminals in the control cabinet for secure seating; re-tighten if necessary.
- 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 secure,
- 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	10 min	60 min, maximum
Regeneration, total	10 min	10 min
– of which: expansion time	~ 0.2 min	~ 0.2 min
– of which: dehumidification time	~ 8 min	~ 8 min
– of which: pressure build-up	~ 2 min	~ 2 min
Standby	—	~ 50 min, maximum

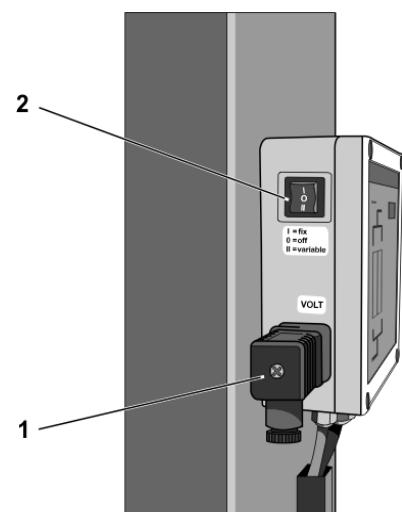
Overview of operating and control elements

ON/OFF switch

The ON/OFF switch (2) is located to the side of the control cabinet and above the mains plug (1, see figure):

- If it is set to **0**, the power supply is disconnected and the dryer is switched off. The main and expansion valves are normally closed. This ensures that the main flow direction is blocked when the dryer is switched off.
- If the switch is set to **I**, the dryer is switched on and begins to operate in fixed cycle mode (i.e. time-controlled).
- If the switch is set to position **II**, the dryer is switched on and begins to operate
 - with compressor synchronisation
 - in variable cycle mode (i.e. dew-point-controlled).

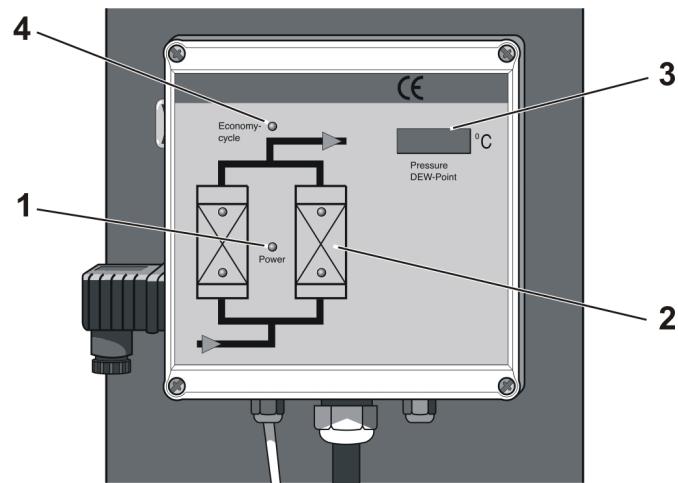
Position **II** is only relevant for operation with the optional *compressor synchronisation* and/or *dewpoint-sensing control*.



Control cabinet with ON/OFF switch

Display panel

The display panel at the switchbox is equipped with LEDs (light emitting diodes) and a digital display, indicating the operating status of the dryer:



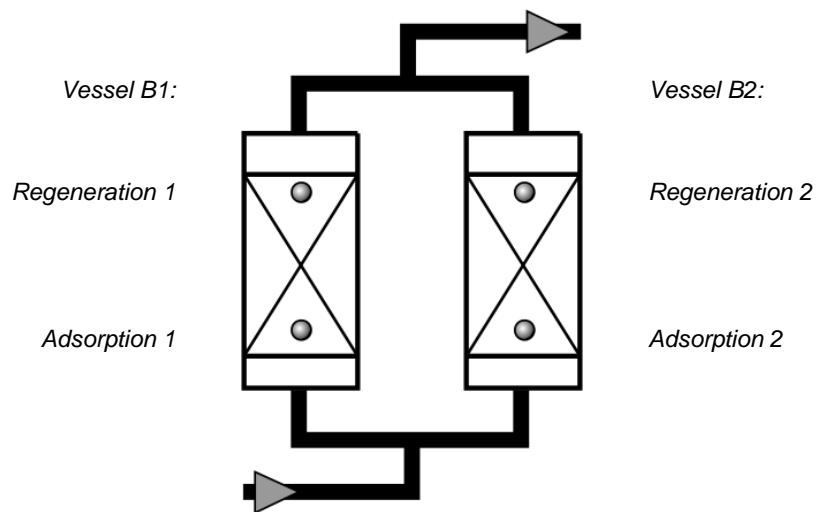
Display panel at the switchbox

LED Power (1)

LED is on when dryer is switched on.

Flow diagram (2)

The current operating phases of the dryer are indicated by means of 4 LEDs:



Depending on the operating phase, the following LEDs might be on simultaneously:

Adsorption B1 and regeneration B2 or regeneration B1 and adsorption B2.

Digital display (3)

The digital display shows the individual programme steps and the respective remaining time. For details regarding the sequence of the individual processing steps and their duration, please refer to the logic control diagram, page 55.

Display	Explanation
2 215	Default display: The figure to the left indicates the current processing step; the figure to the right shows the remaining time in seconds. In this example, step 2 is being completed, whereby there are 215 seconds remaining.
SEr.	After 8000 operating hours, "SEr." (service) is displayed for periods of 1 minute, alternating with the default display. Notify the service personnel of the manufacturer, as a routine service is now due.
- 25	With the <i>dewpoint-sensing control</i> option, the display shows the currently measured dewpoint instead of the default data. The range of display is -100 °C (-148 °F) to +20 °C (68 °F). If the measured dewpoint exceeds the preset alarm limit (5 °C (41 °F) above the switchover value), the displayed dewpoint value is flashing.

With the optional *dewpoint-sensing control*, the following error messages might be displayed:

Display	Cause
+20	■ Upper measuring range limit exceeded
999	■ Dewpoint sensor defective
sens or -999	■ Dewpoint sensor not powered ■ Cable defective or disconnected ■ Sensor defective

LED *Economy cycle* (4)

This LED is only relevant in units that are equipped with the optional *dewpoint-sensing control*. The diode lights up when the dryer is switched on and in the standby phase and no regeneration air is required.

Vessel pressure gauge

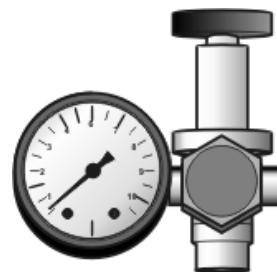
On both vessels, pressure gauges are fitted which show the operating overpressure. The operating overpressure indicates the operating phase of the relevant vessel:

- 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.

Pressure reducer with manometer

The pressure reducer is used to control the regeneration air. By default, it is set to 10 bar. The manometer attached to the pressure reducer allows operators to check the pressure settings.



Emergency shutdown

In the event of an emergency, shut down the dryer as described in chapter *depressurising and shutting down the dryer* on page 33.

Start up dryer



Warning against sudden air ejection!

During expansion the pressure is released suddenly through the muffler:

- 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.
- 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 33). 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 21).
- ▶ Ensure that the compressed air system upstream of the dryer is pressurised. If necessary, pressurise (switch on compressor).



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.
- ▶ Switch on dryer: to this end, set the ON/OFF switch to **I**.

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 from 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 14) 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 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 poss.). 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 be 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 33).

Then proceed as follows:

Remedy fault

- ▶ Look up possible cause of the fault, and how to remedy the same, in the table on page 45.
- ▶ 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 should I change cycle mode?

Cycle changes should be made during the pressure build-up phase and prior to switchover; 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?

If the dryer is connected to a *compressor synchronisation system* and is equipped with the *dewpoint-sensing control* option, these two optional devices can only be started together. The compressor synchronisation has thereby precedence over the dewpoint-sensing control.

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 operate 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?

- ▶ Wait until the dryer has reached the pressure build-up phase (phase prior to switchover).
One LED for *Adsorption B1/B2* is on in the flow diagram.
- ▶ Set the ON/OFF switch to position **II**.

The programme continues the cycle.

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 muffler:

- **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!

Please observe the following notes.

- 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 33). The unit may only be restarted after all defects have been eliminated.

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 shows the currently measured dewpoint. The range of display is -100°C (-148°F) to $+20^{\circ}\text{C}$ (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 (5°C (41°F) above the switchover value), the displayed dewpoint value is flashing. In addition, an error message can be issued through the potential-free busbar.

Error codes and their causes:

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.

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).

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.

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 poss.). 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 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

- on page 29.

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



Attention!

All maintenance work must be completed by authorised and qualified specialist personnel trained by the manufacturer or his distributor.



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 33, *Shutting down an restarting the dryer*.



Warning against sudden air ejection!

During expansion the pressure is released suddenly through the muffler:

- **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!

- 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.

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 muffler(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 out	Maintenance interval				
		daily	weekly	12 months	48 months	see page
Complete dryer	Carry out visual checks and function checks.	▲				37
Vessel pressure gauge	Check dam pressure. For a dam pressure exceeding 0.3 bar: – Check muffler. – Check dust sieve. – Check drying agent.	▲				37
Upstream and downstream filters	Check differential pressure on the upstream and downstream filters.		▲			
Pressure reducer	Check pressure settings; adjust if necessary.		▲			42
Upstream and downstream filters	Renew element.					
Muffler	Renew muffler.			●		39
Dewpoint sensor (with optional dewpoint sensing-control)	Renew.			●		40
Check valves	Clean, replace, if necessary			●		41
Solenoid valves	Clean valve bodies and coils; replace, if necessary.			●		41
Dust sieves, gaskets, drying agent	Renew.				●	42

Symbols:

▲ Check ● Renew

Instructions for use of the dongle

If the message **SEr.** is displayed on the display of the Multitronic controller, the dryer is due for servicing. The message appears, flashing every 60 seconds, once the preset number of operating hours (e. g. 8000 oh) has been reached. After maintenance has been carried out, you can use the dongle to reset the counter to 0 and delete the message from the display. A dongle is enclosed with every service kit. Each dongle can only be used once.

- ▶ Switch off the controller. Caution! The electric line is still live. Do not touch live parts!
- ▶ Open the lid to the Multitronic controller. The circuit board is housed underneath it.
- ▶ Slot the dongle into the dongle interface X9 PC.
- ▶ Press and hold the reset key S3.
- ▶ Switch on the controller. The following appears in the display:

for a short time then flashing	0.SET OFF
-----------------------------------	----------------------------

The service counter is then reset to 0.

If the following appears in the display:

for a short time then flashing	FAIL OFF
-----------------------------------	---------------------------

this means that the dongle has already been used once and cannot be used again.

- ▶ Switch off the controller again and remove the dongle.
- ▶ Dispose of the unusable dongle and use a new one.

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.

If message **SEr.** is displayed, a routine service must be completed:

- ▶ Contact the service department of the manufacturer.

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 33).

Dam pressure can be caused by:

- a blocked muffler,
- 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.

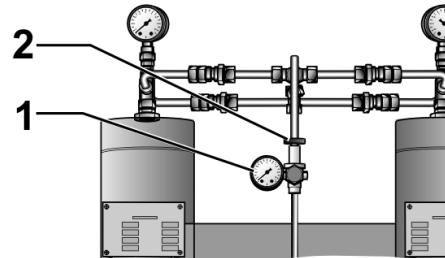
The differential pressure should be 0.35 bar max. If the differential pressure exceeds 0.35 bar, we recommend that you replace the filter element (see filter manual).

Check pressure settings at the pressure reducer

- ▶ At the manometer (1), check pressure settings of the pressure reducer.

The pressure should be set to 10 bar.

- ▶ If the pressure is set to a value above or below 10 bar, turn the thumbscrew (2) to adjust the pressure reducer settings.



Manometer and thumbscrew at the pressure reducer

Maintenance work to be completed every 12 months

Filterelemente an Filtern erneuern

Längstens nach 1 Jahr Betriebszeit sind die Filterelemente zu erneuern.

- ▶ Trockner drucklos machen und außer Betrieb nehmen (siehe Seite 33).
- ▶ Unterteil des Filtergehäuses demontieren. Dazu einen geeigneten Filterschlüssel verwenden.
- ▶ Filterelement erneuern.
- ▶ Unterteil des Filtergehäuses wieder montieren: Dabei zuerst ganz festdrehen und anschließend wieder eine Vierteldrehung zurückdrehen.
- ▶ Gebrauchtes Filterelement gemäß den gültigen Bestimmungen entsorgen.
- ▶ Trockner wiederanfahren (siehe Seite 34). Dabei Dichtigkeit der Filter prüfen.

Renew mufflers

The dryer is equipped with two mufflers. If a muffler becomes blocked, a dangerous pressure is generated which in extreme cases may cause the muffler to burst.



Hazard caused by blocked muffler!

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

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



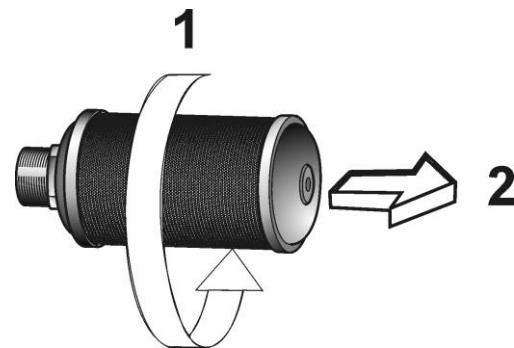
Warning against sudden air ejection!

During expansion the pressure is released suddenly through the muffler:

- 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!

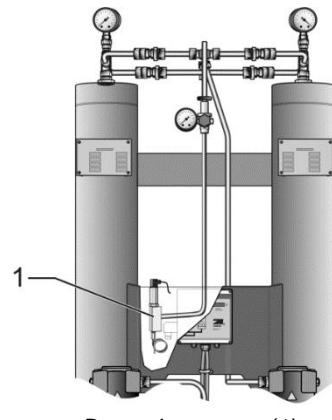
- ▶ Depressurise the dryer and shut it down (see page 33).
- ▶ Unscrew muffler as shown in the opposite figure.
- ▶ Replace muffler and secure it.
- ▶ Restart dryer (see page 34).



Undo muffler

Renew dewpoint sensor

To ensure precision dew point measurement, it is recommended to replace the dew point sensor every year. This period depends however on the actual application and might thus be extended accordingly.



Dewpoint sensor (1)

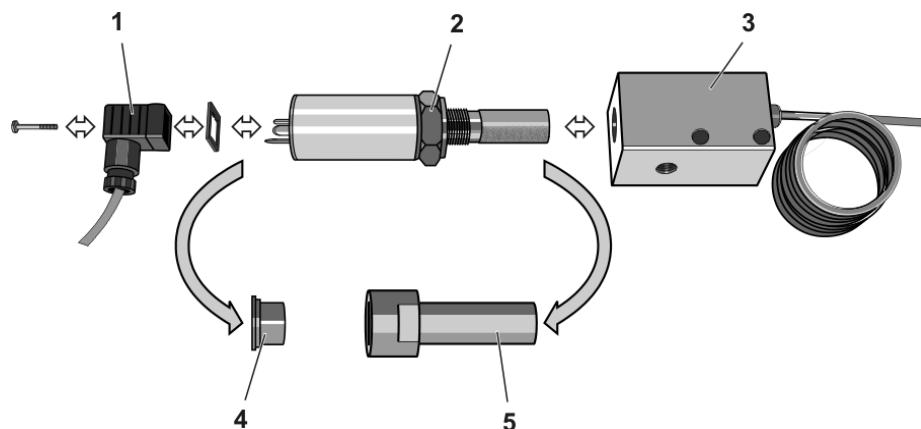
Warning!



The dew point sensor is a sensitive measuring device. It can be damaged if subjected to forceful vibrations or shocks. Therefore, please handle the dew point sensor with great care at all times.

In order to limit the impact on the dryer operation to a minimum, we recommend that you contact the manufacturer well in advance and order a new dewpoint sensor. After receipt of the new pressure dewpoint sensor, replace the sensor as follows:

- ▶ Hold the box of the dewpoint sensor ready.
- ▶ Release pressure from dryer and shut down the unit (see page 33).



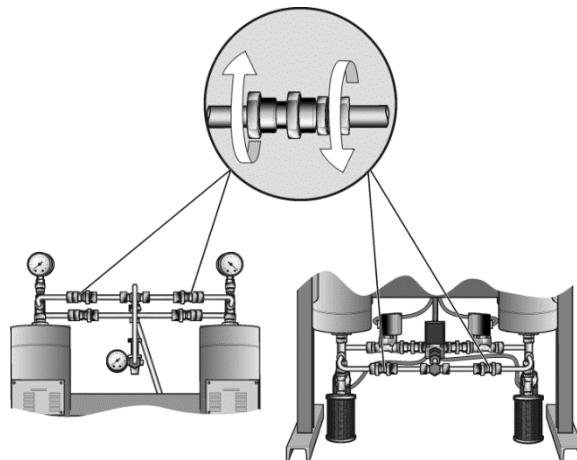
Installing / dismantling pressure dewpoint sensor

- ▶ Loosen the screw at the adapter (1) and disconnect signal cable with the adapter and seal.
- ▶ Remove dewpoint sensor from the sensor cell (3) by turning the nut (2).
- ▶ Take the new dewpoint sensor (2) from the box, remove the protective caps (4, 5) and screw it into the sensor chamber (3).
- ▶ Place seal onto sealing face; connect adapter (1) and secure it by tightening the screw.
- ▶ If no other maintenance work is to be carried out: Restart the dryer (see page 34).
- ▶ Place the protective caps (4, 5) onto the old dew point sensor and dispose of it in accordance with the applicable regulations.

Clean or replace check valves

Check valves are wear parts and should be cleaned, or replaced, every 12 months.

- ▶ Release pressure from dryer and shut down the unit (see page 33).
- ▶ Remove check valves from the pipe bridge by opening the threaded joints.



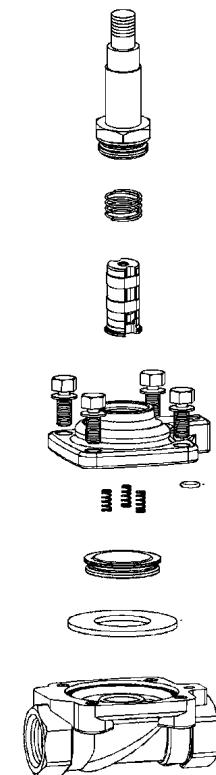
Dismantling of check valves

- ▶ Disassemble check valves and clean all parts.
- ▶ Worn or damaged check valves must be replaced.
- ▶ Remount the check valve in the pipe bridge.
- ▶ If no other maintenance work is to be carried out: Restart dryer (see page 34). Check connection for tightness.

Clean or replace solenoid valve bodies

Solenoid valve bodies are wear parts and should be cleaned, or replaced, every 12 months.

- ▶ Release pressure from dryer and shut down the unit (see page 33).
- ▶ Remove solenoid valves from the casing.
- ▶ Unscrew the coil (without illustration) and remove it.
- ▶ Unscrew the screws at the top of the valve body and remove them.
- ▶ Dismantle valve as shown in the illustration opposite.
- ▶ Carefully clean all parts.
- ▶ Reassemble the valve. Defective solenoid valves must be replaced.
- ▶ Reinstall solenoid valve in pipeline system.
- ▶ If no other maintenance work is to be carried out: Restart the dryer (see page 34). Check connection for tightness.



Dismantling of solenoid valve

Maintenance work to be completed every 48 months

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 6).

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 17). 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.

Note:

The vessels are equipped with dust sieves that hold back drying agent dust particles. If these dust sieves are blocked, back pressure is built up, which might affect the proper functioning of the dryer.

We therefore recommend cleaning, or replacing, the dust sieves each time the drying agent is replaced.

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!



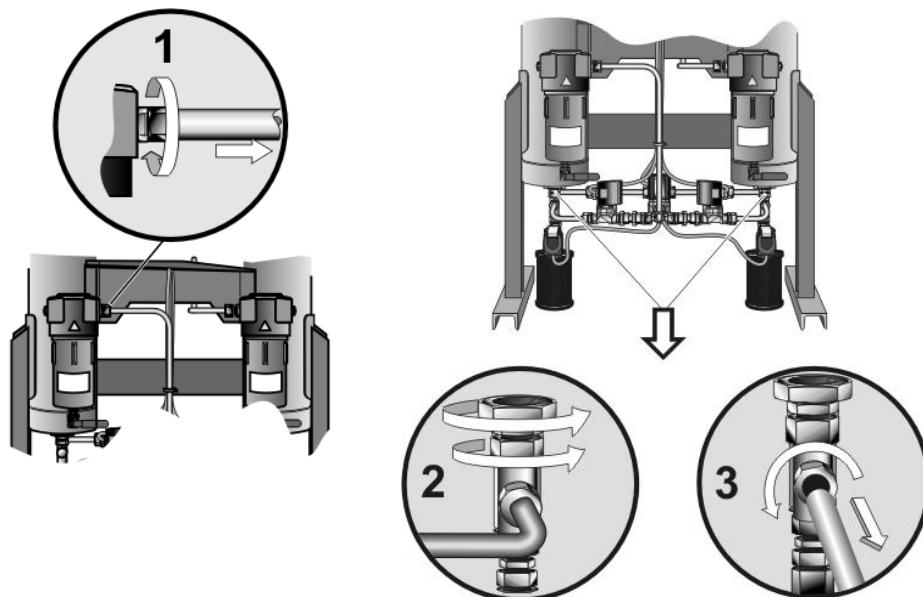


Risk of skidding!

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 33).
- ▶ Place a suitable collecting vessel underneath the unit.
- ▶ Loosen the connection between the lower pipe bridge and the upstream filter (1).
- ▶ Loosen the connection between the lower pipe bridge and the vessels (2, 3).



Dismantling of the lower pipe bridge

- ▶ Remove the dust sieves from the vessels.
- ▶ Clean dust sieves with compressed air or a wire brush. If necessary, replace the dust sieves.
- ▶ Drain drying agent into the collecting vessel. Remove all residue from the vessels, using an industrial vacuum cleaner.
- ▶ Insert cleaned or new dust sieves.
- ▶ Remount lower pipe bridge and upstream filter.



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.

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

Fill with new drying agent

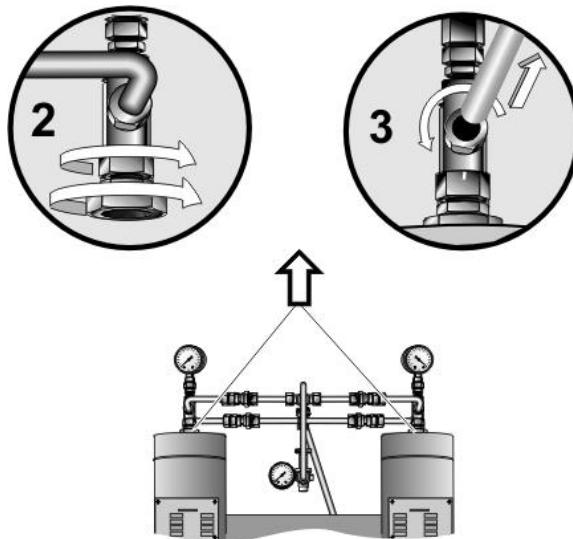


Risk of falls!

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.

- ▶ Loosen the connection between the upper pipe bridge and the downstream filter (1).
- ▶ Loosen the connection between the upper pipe bridge and the vessels (2, 3).



Dismantling of upper pipe bridge

- ▶ Remove the dust sieves from the vessels.
- ▶ Clean dust sieves with compressed air or a wire brush. If necessary, replace the dust sieves.
- ▶ 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.
- ▶ Repeat the process on the second vessel.
- ▶ Insert cleaned or new dust sieves.
- ▶ Remount upper pipe bridge and downstream filter.
- ▶ Restart dryer (see page 34). Check that the connection is leak tight.
- ▶ Complete two dryer cycles, then shut down the unit.
- ▶ Replace muffler as described on page 39.

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.

Used abbreviation	Component
B1/B2	Vessel
PI	Pressure gauge
V1–V2	Main valves (solenoid valves)
V3–V6, V10–V12	Check valves
V7–V8	Expansion valves (solenoid valves)
V9	Pressure build-up valve

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

Certain faults must be due to valves that are not properly opened/closed. For measures to be taken in such cases, please refer to the bottom of the table.

Fault	Possible cause	Remedy	Specialised personnel	Service technician
Dewpoint is not reached	Operating pressure too low	Increase operating pressure	●	
	Excessive differential pressure at upstream filter	Check differential pressure at the upstream filter; replace filter element, if necessary.	●	
	Compressed air volume flow too high	Reduce compressed air volume flow.	●	
	Inlet temperature of compressed air too high	Reduce inlet temperature of compressed air or install preliminary compressed air cooler.	●	●
	Condensate trap (optional) at the upstream filter is not working properly	Check condensate trap (optional); clean or replace, if necessary.	●	●
	Drying agent contaminated or out of date	Inspect upstream filter for contamination; replace filter element, if necessary.	●	
		Inspect drying agent for contamination; replace, if necessary.	●	●
	Control board defective	Check fuses (switchbox, supply line); replace board, if necessary.		●

Fault	Possible cause	Remedy	Specialised personnel	Service technician
	Insufficient regeneration gas	Check function of valve V7/V8 and muffler; replace filter element of muffler, if necessary.	●	●
Pressure in vessel too low	Excessive differential pressure at upstream filter	Check differential pressure at the upstream filter; replace filter element, if necessary.	●	
Backpressure during regeneration too high	Muffler contaminated	Check muffler for contamination; clean or replace, if necessary.	●	●
	Valve V7/V8 does not open properly	see *		
	Dust filters blocked	Clean or replace dust filters..	●	●
No pressure build-up	Compressed pressure system upstream from the dryer is not pressurised	Check whether the compressed pressure system upstream from the dryer is pressurised. Eliminate any faults in the compressed air system.	●	
	Valve V1/V2 or V9 does not open properly.	see *		
Excessive compressed air consumption	Condensate trap (optional) at the upstream filter is not working properly	Check condensate trap (optional); clean or replace, if necessary.	●	●
	Valve V7/V8 does not open properly	see *		
Dryer fails to switch over	Compressor is switched off	Check compressor synchronisation.	●	
	Power supply interrupted, cable broken.	Reconnect the unit to the power supply.	●	
	Valve V1/V2 does not open properly	see *		
	Error in control programme	Restart programme.		●
	Control board defective	Check fuses (switchbox, supply line); replace board, if necessary.	●	●
No expansion in chamber	Valve V7/V8 does not open properly	see *		
Dryer is continuously bled	Valve V7/V8 does not close properly	see *		
	Valve V1/V2 does not close properly			
Dryer is bled excessively	Valves V1/V2, V3, V4, V5, V6 do not close properly	see *		
* Valve fails to open or close properly		Check supply voltage.	●	●
		Check whether coil is properly mounted.	●	●
		Inspect valve for contamination; clean or replace, if necessary.	●	●
		Check voltage at cables, contacts and coils; replace, if necessary.		●

With dewpoint-sensing control (optional)

Fault code	Description of fault	Possible cause	Remedy	Specialised personnel	Service technician
+20	Upper measuring range limit exceeded	Drying capacity exceeded.	See instructions for commissioning. If the drying agent is wet, replace it.	●	
		Error in programme.	Restart programme.		●
999	Dewpoint sensor defective	Sensor defective or irreversibly contaminated.	Replace sensor.	●	●
sens or -999	Sensor not powered, or cable or sensor defective	Sensor, sensor cable or sensor adapter defective.	Visual inspection; check power supply (24 V to terminals 4 and 6). Replace defective component(s).	●	●
SEr	Display for service interval. Regular maintenance tasks must be carried out.	The display appears after every 8000 operating hours.	Inform the manufacturer's service staff and order the appropriate service kit. The package includes a dongle with which you can reset the operating hours counter after maintenance has been carried out. For instructions on how to use the dongle see the enclosed information sheet (in the service kit).	●	●

Index

A

Abbreviation	
components	45
Address, manufacturer	6
Adsorption, explanation	12
air ejection	
hazard	10
Auxiliary heater	14

B

Bolt connections	21
Build no.	53

C

Changing cycle mode	
explanation	30
Check valves	
Maintenance interval	36
Components	45
Compressed air	7, 12
Compressor synchronisation	
option	14
compressor synchronisation controller	14
Compressor synchronisation line	
installation	23
Connection lines	21
Connector	
electrical	22
Control	
dewpoint-sensing	15
Control cabinet	11
Control system	
pneumatic	15
signalling contacts	14
Conversions	9
Cycle	
fixed	15
variable	15
Cycle mode change	
explanation	30

D

Danger notes	
Danger!	7
Danger warning, maintenance	35
Date of manufacture	3
Dehumidification	
explanation	13

Dewpoint-sensing control 15

Digital display

- explanation 26

Documentation, technical 51

Dongle

- use 37

drying agent

- Maintenance interval 36
- service life 42

Drying agent

- charging 15
- storage 19

drying agents

- handling 9

dust generation 9, 42

dust mask 9

Dust sieves

- Maintenance valves 36

E

Ear protection	28, 32
electrical voltage, hazard	10
Example for installation	21
Expansion, explanation	13

F

Fabrication no.	3
Fixed cycle	15
Flow diagram	57

G

gaskets	
Maintenance interval	36

H

hazard areas	10
--------------	----

I

Installation area	17
Installation example	21
Installation site, requirements	17

L

LEDs	
explanation	26
lifting gear	16
Limits, permissible	28

M

Machine passport	3
Mains voltage	52
Maintenance	
check valves	41
dam pressure	37
differential pressure	38
drying agent	42
Muffler	39
sensor	40
solenoid valves	41
Maintenance, danger warnings	35
Misuse	7
Misuse, suspected	7
Modifications on the dryer	9
Muffler	
Maintenance interval	36

N

Notes	
safe, efficient handling	7

O

On/Off switch	
explanation	25
On/Off-Switch	11
Operating instructions	6
safe place	7
target group	7
Operating pressure	29
permissible	3
safety device	20
Operating signalling contact	
installation	23
Operation signalling	
contact	14
Original replacement parts	35
Outside installation	14
overpressure, hazard	10

P

Packaging	16
Personnel qualification	8
Pressure build-up	
explanation	13
sudden	29
pressure vessel	35
Programme	
sequence, steps	55
Protection class	52

R

Regeneration, explanation	12
Regulations for accident prevention	16
Replacement parts	35
Restart	
pressure conditions	34

S

Safety notes	
general	8
Warning!	7
Safety valves	20, 25
Shutdown valves	21
Shutting down	33
emergency	33
Signalling lines	
external	23
skid risk	10
Skidding risk	
charging drying agent	43
Solenoid valves	
Maintenance interval	36
Sound pressure level	52
Specialist personnel	7, 20
Stand profiles	18
Standard equipment	6
Start-up device	14
Start-up, requirements	24
Storage room	
requirements	18
Supply cable, electrical	22
Supply lines	20
symbols, explanation	10

T

Target group	7
Transport damage	16
Type plate	9

U

Use, intended	7
Use, safe	7

V

Variable cycle	15
Vessel pressure gauge	
Maintenance interval	36
vibration dampers	18
Visual inspection	37
Voltage	
electrical	22

Annex with technical documentation

This annex comprises the following information and technical documentation:

- Technical data
- Replacement and wear parts list
- Logic control diagram
- Flow diagram
- Dimensional drawing

Technical data

Scope of application

Installation location	Interior installation, above freezing level, in non-aggressive atmosphere
Ambient temperature	1.5 to 50 °C
Compressed air inlet temperature	30 to 55 °C
Operating pressure, minimum/maximum	
— HDK25	min. 8 bar, max. 25 bar
— HDK50	min. 8 bar, max. 50 bar
Fluid medium	Compressed air and gaseous nitrogen
Fluid group (as per Pressure Equipment Directive)	2

Electrical connection

Mains voltage, standard	230 V, 50-60 Hz
Protection class	IP65
Please note type plate and attached electrical circuit diagram!	

Noise emission

Sound level: +3 dB (A)¹	95 – 115 dB(A)
---	----------------

¹ related to free field measurement, 1 m field

Dimensions

Please observe the dimensional drawing and table with dimensions and weights on page 58.

Desiccant layers

Layer	Desiccant
Vessel 1	100 % Molecular sieve MS
Vessel 2	100 % Molecular sieve MS

Performance details

Type	Capacity*	Connection/ nominal width**	Tower volume	weight	Prefilter	After-filter
25 bar						
HDK 18/25	25	G 1/2i	2,7	38	G3/25XP	G3/25V
HDK 40/25	50	G 1/2i	5,4	49	G3/25XP	G3/25V
HDK 80/25	100	G 1/2i	11,8	65	G5/25XP	G5/25V
HDK 120/25	125	G 1/2i	14,3	70	G7/25XP	G7/25V
HDK 160/25	180	G 1/2i	20,9	91	G9/25XP	G9/25V
HDK 210/25	240	G 1/2i	28,0	112	G9/25XP	G9/25V
HDK 360/25	390	G 1/2i	48,5	141	G11/25XP	G11/25V
HDK 550/25	600	G 3/4i	73,5	240	G12/25XP	G12/25V
50 bar						
HDK 18/50	50	G 1/2i	2,7	38	G3/50XP	G3/50V
HDK 40/50	100	G 1/2i	5,4	49	G3/50XP	G3/50V
HDK 80/50	200	G 1/2i	11,8	65	G5/50XP	G5/50V
HDK 120/50	240	G 1/2i	14,3	70	G7/50XP	G7/50V
HDK 160/50	360	G 1/2i	20,9	91	G9/50XP	G9/50V
HDK 210/50	480	G 1/2i	28,0	112	G9/50XP	G9/50V
HDK 360/50	780	G 1/2i	48,5	141	G11/50XP	G11/50V
HDK 550/50	1180	G 3/4i	73,5	240	G12/50XP	G12/50V

* referred to 1 bar (abs.) and 20 °C at max. operating pressure and an inlet temperature of 35 °C.

** DIN ISO 228 (BSP-P)

Replacement and wear part list

Note:

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.

Desiccant packs (complete dryer)

Order-ID.	18/...	40/...	80/...	120/...	160/...	210/...	360/...	550/...
DESPAC1MS		3x	2x	2x	2x		1x	1x
DESPAC4MS	1x	1x		1x		1x		2x
DESPAC15MS			1x	1x	2x	1x	5x	7x

Spare parts as required

For model	Pos.*	Order-ID.	Scope of delivery	Maintenance interval
All	9	SDD-15/600/AL	Muffler	12 month
	95	ZHM100/450	Dewpoint sensor	12 month
	4	RK-SCD-G32x90/VA-HDK	Dust sieve	
	45	ET-DRM.G08-AIRCOM-5	Pressure reducer (G1/4i)	
	47	ET-MANO.063MR0811	Pressure reducer gauge	
	50	RHD12L0.2BCF	Check valve	
	53	RHD08LCF	Check valve	
H18-210/...	7	ET-321HS3330B-2995-483/S1	Solenoid valve	
H360-550/...	7	ET-321HS3330C-2995-483/S1	Solenoid valve	
H18-210/...	8	RHD15L0.2BCF	Check valve	
H360-550/...	8	RHD22L0.2BCF	Check valve	

As required

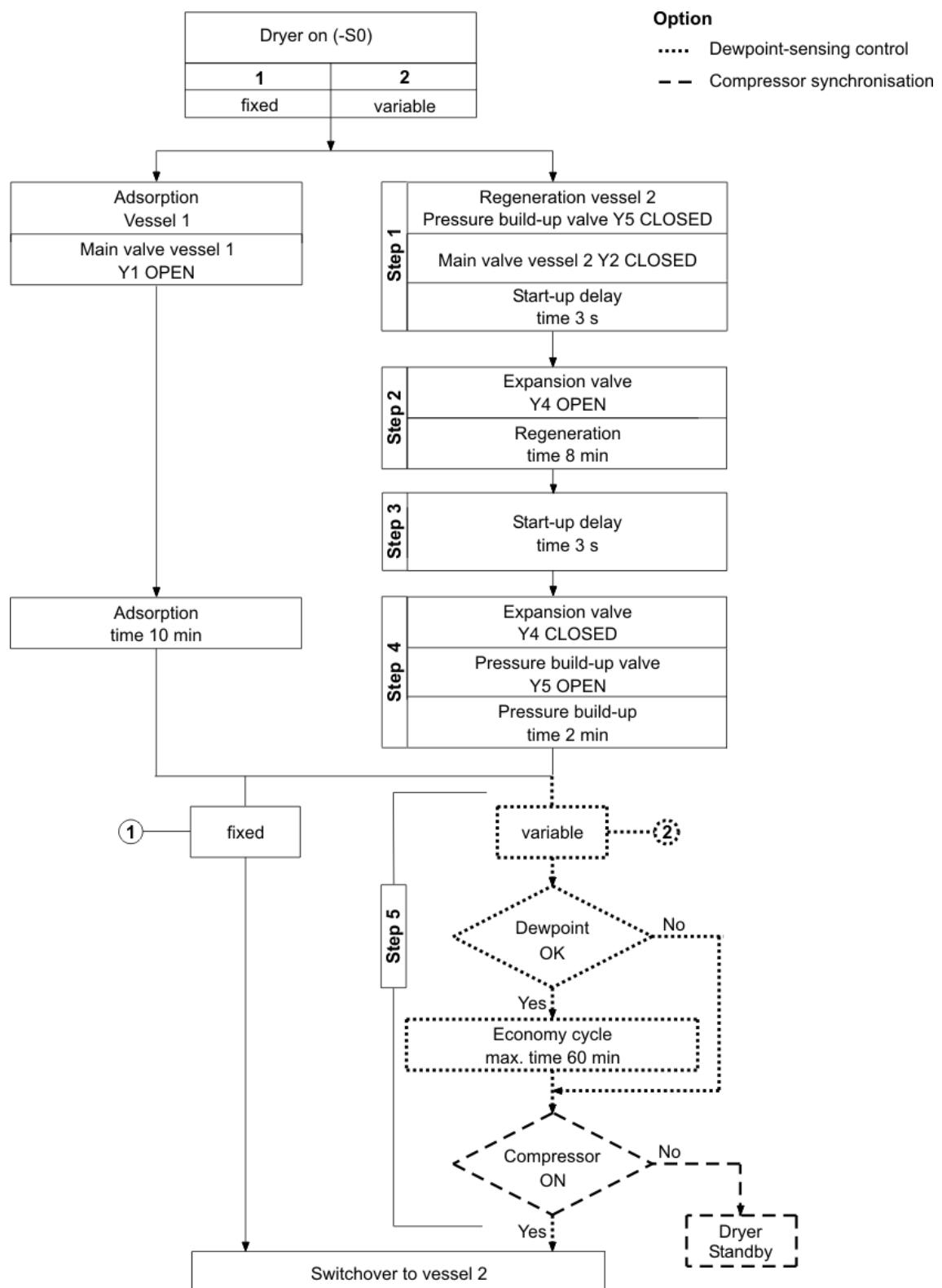
*Positions see dimensional drawing on page 59.

Accessories, separate or installed at factory

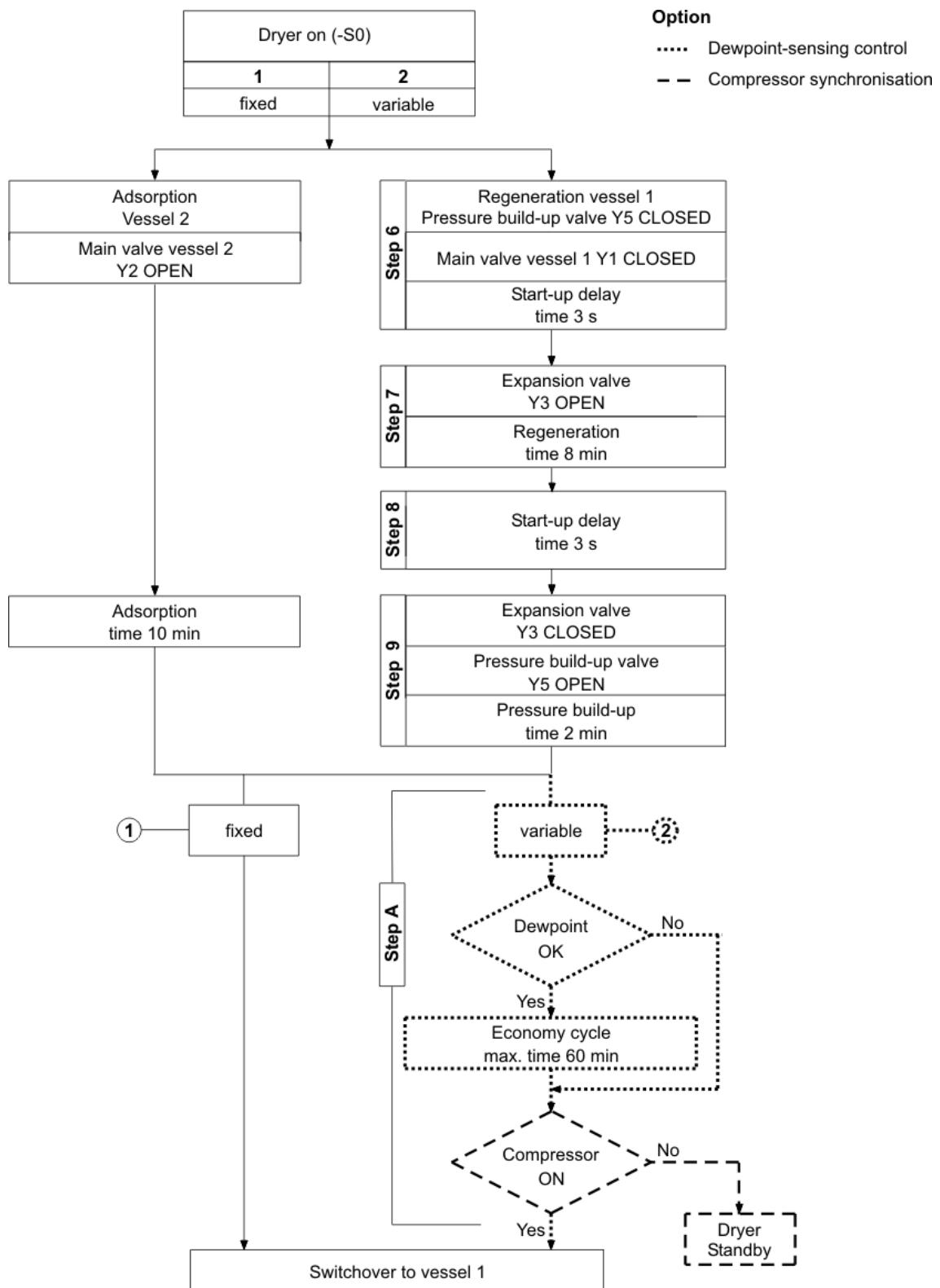
Order-ID.	Description
TRAP2/100-G230/P	Time controlled solenoid valve G1/4i, PN100, 2-55 °C, 115 VAC, IP65
HZD80/420RG	calibrated analogue differential pressure gauge PN420
HZDE80/420RG	calibrated analogue differential pressure gauge PN420 with Reed contact (IP54)
VASMBS420	Contact 4-20 mA for analogue output of dewpoint signal
ET-VENT-HALTE-G20-3	Start-up device DN12,7
See filter-manual!	Upstream and downstream filters

Logic control diagram

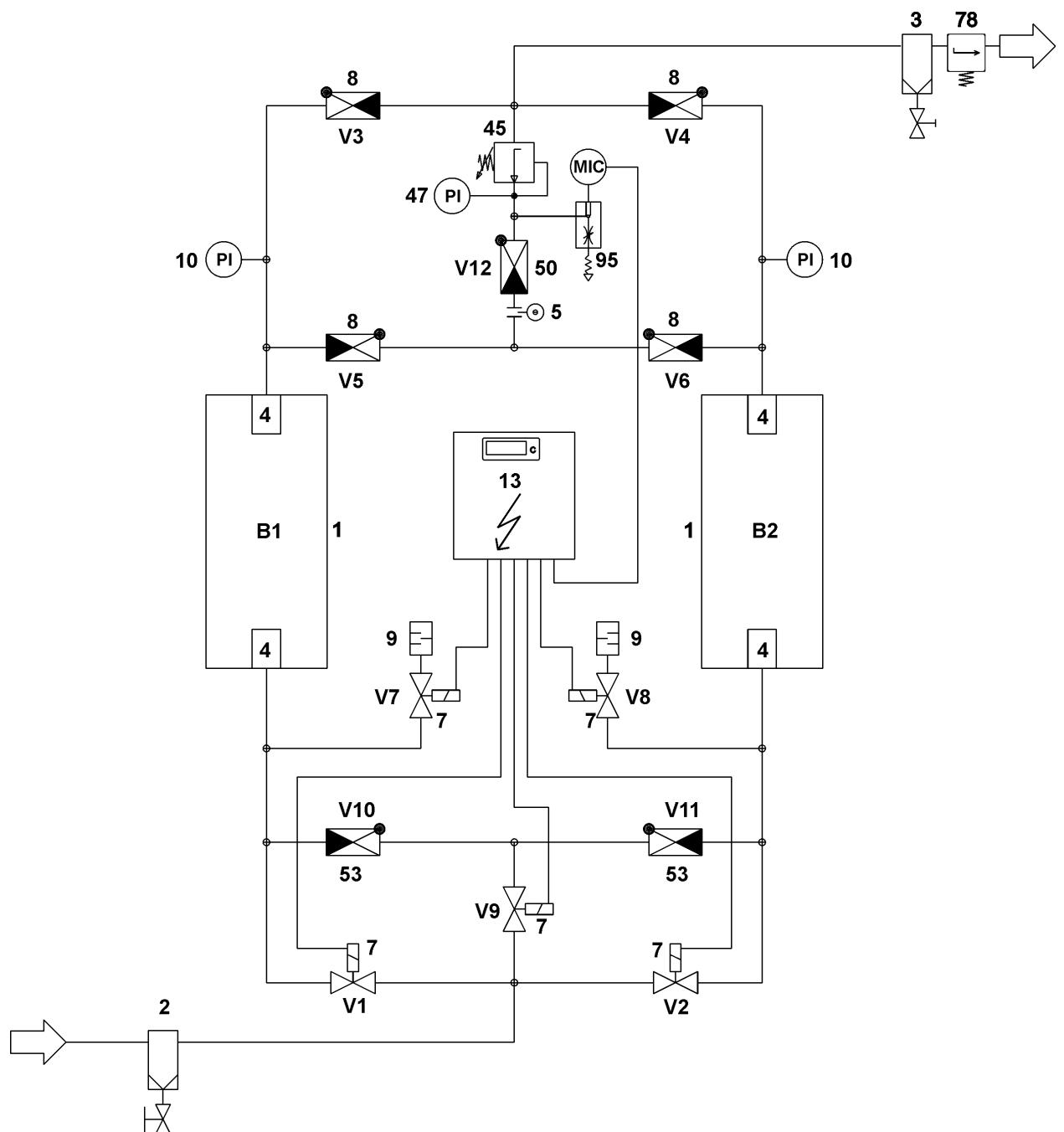
Adsorption in B1 and regeneration in B2



Regeneration in B1 and adsorption in B2



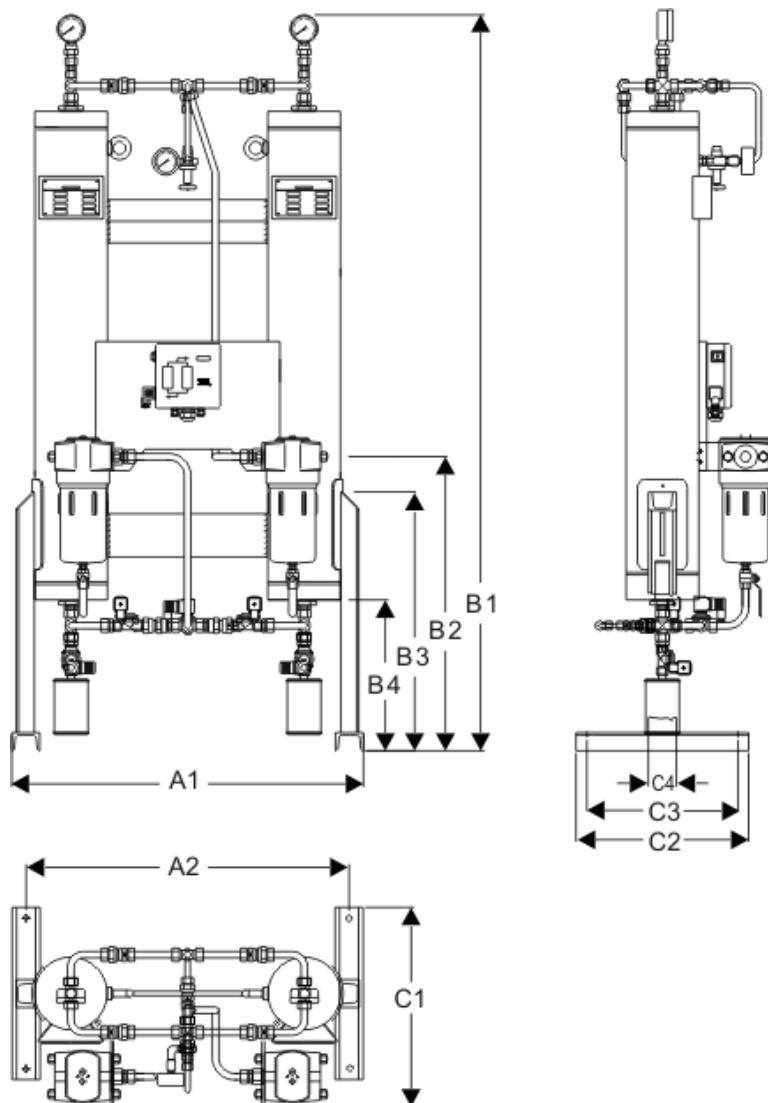
Flow diagram



Item	Designation
1	Vessel
2	Upstream filter
3	Downstream filter
4	Dust sieve
5	Nozzle disc
7	Solenoid valve
8, 50, 53	Check valve
9	Muffler

Item	Designation
10	Pressure gauge
13	Control system
45	Pressure reducer
47	Pressure reducer gauge
	<i>Options:</i>
78	Start-up device
95	Dewpoint –sensing unit

Dimensional drawing



Dimensions	Type HDK 25 bar and 50 bar							
	18/...	40/...	80/...	120/...	160/...	210/...	360/...	550/...
A1	672	685	790	786	815	840	890	945
A2	618	633	720	720	749	773	828	884
B1	1150	1422	1522	1720	1716	1716	1808	1854
B2	460	683	683	683	683	683	683	683
B3	600	600	600	600	600	600	600	600
B4	350	350	350	350	350	350	350	350
C1	402	414	414	412	462	479	509	540
C2	400	400	400	400	400	400	400	400
C3	350	350	350	350	350	350	350	350
C4	50	50	65	65	65	65	65	65

Items

