ADSORPTION ROTARY DEHUMIDIFIER

DRYSTAR

AEROSTAR

Content

1 GENERAL INFORMATION

1.1 Purpose

The adsorption rotary dehumidifier DryStar (hereinafter referred to as the unit) is designed for dehumidifying indoor air (buildings, warehouses, basements, pumping stations with special humidity and temperature parameters) and for use in drying processes. DS desiccant air dryers have high performance and are indispensable at low temperatures and low relative humidity levels. The dehumidifiers are equipped with: a silica gel rotor with a drive, a heating element, fans, air filters. They can work as a stand-alone device or in combination with an air treatment system. The distinguishing features of an adsorption dehumidifier are efficiency at low temperatures, achieving and maintaining:

- maintain the strength of load-bearing structures of various types of facilities, including warehouses, production facilities, ice arenas, hydraulic structures;
- protect windows and glass ceilings from fogging in administrative and residential buildings;
- increase the duration of storage of hygroscopic materials: medicines, washing powders, building materials and other bulk products;
- maintain a low level of humidity in the production of food products and wood, rubber products and plastics, while dressing fur skins;
- reduce the growth of bacteria, etc.

1.2 The principle of operation of the dehumidifier

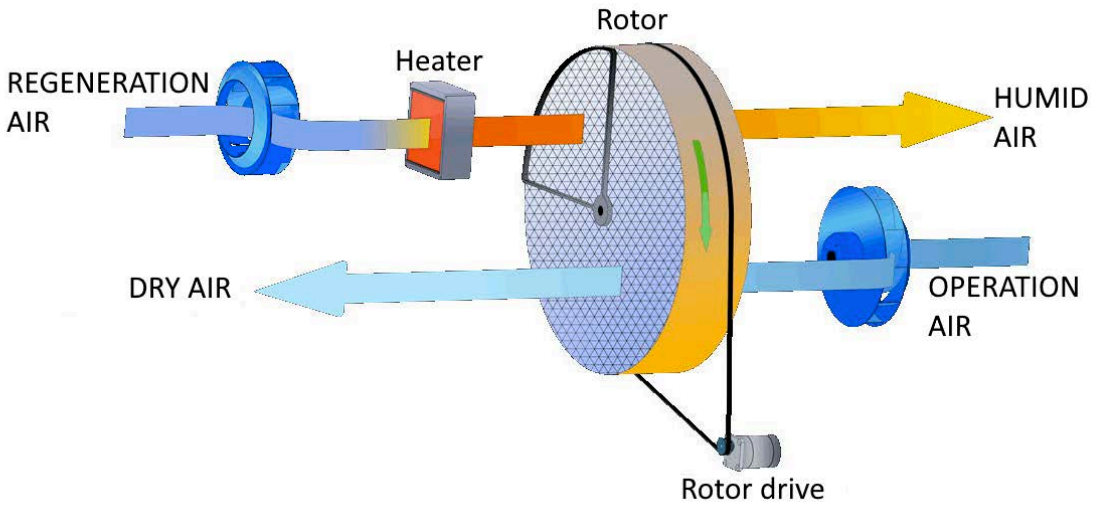

Figure 1.1 - The principle of operation of an adsorption rotary dehumidifier with "direct reactivation"

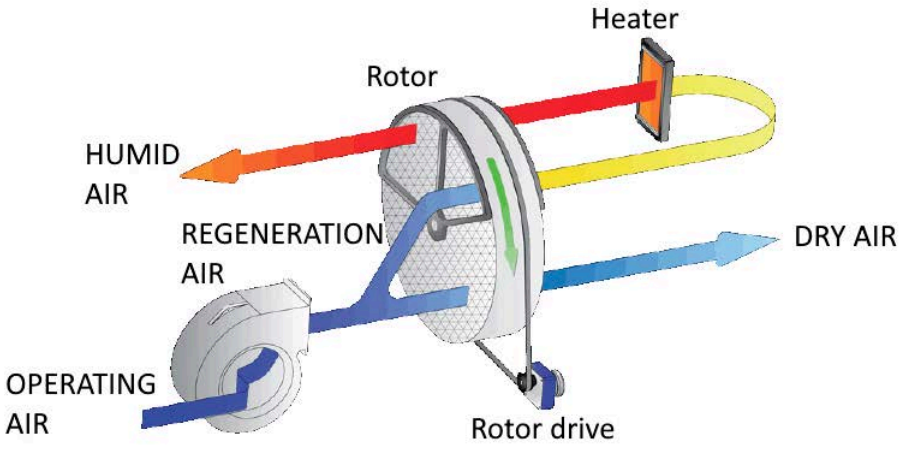

Figure 1.1 - The principle of operation of the adsorption rotary dehumidifier with "reverse" reactivation

The principle of operation of the adsorption rotary air dehumidifier is illustrated in figures 1.1-1.2. The main element of the Unit is a silica gel rotor. Its inner surface is made in the form of honeycombs, which achieves a colossal increase in the moisture-absorbing surface. This also contributes to the laminar flow of air in the rotor, which significantly reduces aerodynamic losses.

This scheme provides for heat recovery. During the regeneration process, the rotor absorbs heat. Due to this, the incoming air is preheated and partially dried and then fed through the heater to the reactivation zone. This solution reduces energy consumption and also reduces the increase in dry air temperature.

Air flows are supplied in such a way that drying air passes through 70% of the rotor surface, and reactivation air passes through 30%. Moist dried air, passing through the rotor, gives moisture to the sorbent. The reactivation air, in turn, is heated in the heater in the range of 90-140˚C, due to which its saturation moisture content increases and, passing through the rotor, restores its sorption capacity. The reactivation air, saturated with water vapor, is expelled outside the dehumidified circuit. This air flow also performs the function of cleaning the rotor from possible contamination. The constant rotation of the rotor ensures a continuous process of sorption-reactivation. To prevent mixing of working and reactivation air flows, special sector seals are used. The absence of condensate in the process of dehumidifying the air allows you to install a dehumidifier without being tied to sewer networks.

1.3 Equipment

The package includes:

- dehumidifier adsorption rotary DryStar..... 1pc;
- passport..... 1pc;
- package..... 1pc.

2 TECHNICAL DATA

2.1 General characteristics

The body is fully sealed, highly corrosion resistant and made of 0.65mm thick sheet steel with 50mm insulation (stone wool). External panels are powder coated. The frame and frame of the dehumidifier are made of 1.5mm thick galvanized steel (with powder coating) to increase the rigidity and strength of the dehumidifier.

Connection of air ducts is made through round air ducts of standard sizes.

Brief technical characteristics

Process air	
Rated flow	1000-25000* m³/h
Filters (pocket)	G4/M5
Reactivation air	
Rated flow	1/3 process* m³/h
Filter (pocket)	G4/M5
Power consumption (3x400V/1x220V 50Hz)	
Other data	
Operating temperatures	-25/+40°C
Maximum noise level without ducts	73 dBA

** - can be changed with the request or agreement of the customer.*

2.2 Overall and connecting dimensions

The overall and connecting dimensions of the adsorption rotary dehumidifier are shown in Figure 2.1. Dimensions (A - length, B - width, C - height) are agreed individually for each

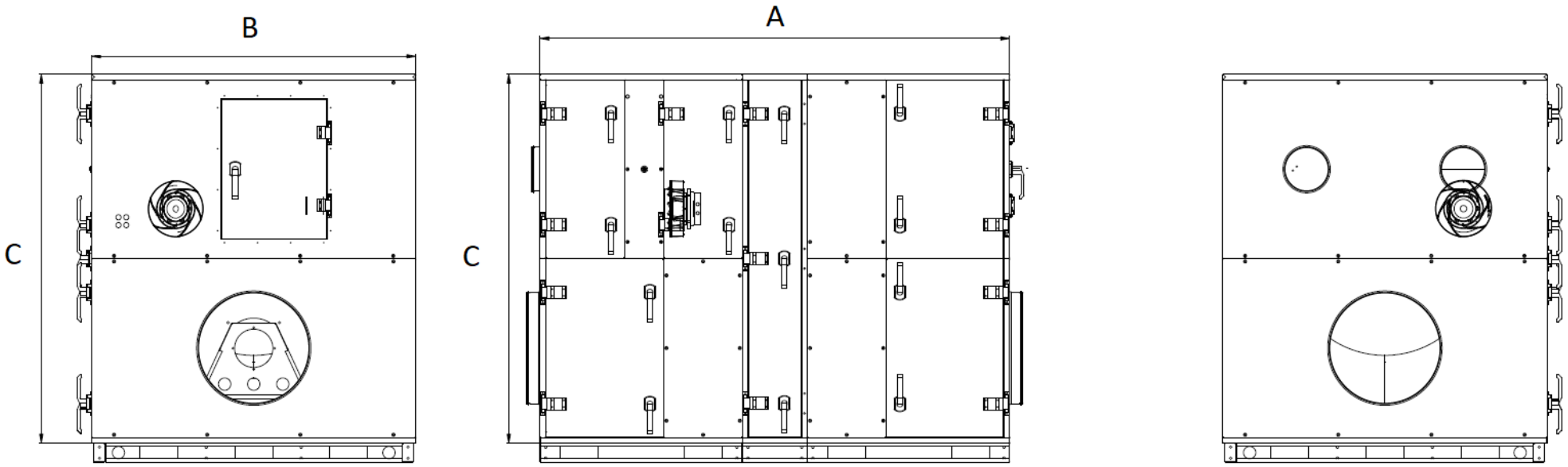

Figure 2.1 - Overall and connecting dimensions of the adsorption rotary air dehumidifier DS

2.3 Fans

The unit uses modern EC fans. Compared to AC fans, the energy efficiency of EC motors is many times higher. The advantage of EC fans is low power consumption and easy control. EC-technology is based on the use of an integrated electronic control system and allows the engine to always work optimally. The built-in electronic control system can change the speed to exactly match the air flow requirements and operate at a high level of efficiency.

The main advantages of EC fans:

- high efficiency (about 93%);
- energy savings reduces operating costs by at least 30%;
- low noise level at relatively high power;
- compact dimensions with relatively high power;
- possibility of smooth and precise adjustment;
- the possibility of programming;
- adjustment of fan performance depending on the level of temperature, pressure, degree of smoke;
- protection of the engine from mechanical influences and electrical overloads;

The EC series motor has a higher reliability compared to an asynchronous motor with a frequency converter when the mains voltage fluctuates, and is also resistant to increased mains voltage. When the mains voltage drops, the EC series motor stops smoothly and issues an alarm.

This unit uses EC fans made in Germany. The impeller of the single suction fan is made with backward curved blades. It has an aerodynamically optimized shape of the impeller blades. Rotating vaneless diffuser increases efficiency and improves acoustic performance. The impeller is made of high strength material according to ISO 1940. The fan is protected against overheating by active temperature control. Compliance standards:

- protection degree IP 54;
- fans are tested in a chamber according to DIN 24163 part 2 or ISO 5801;
- technical characteristics correspond to accuracy class 2 according to DIN 24166;
- efficiency of the electric motor corresponds to the class IE4;

2.4 Rotor

The main fundamental element of the Unit is a European-made SECO silica gel rotor (Fig. 2.2). The rotors are 80% active silica gel for superior performance. Silica gel is a solid adsorbent, a dried gel of polysilicic acid. In its structure, silica gel is a highly porous body formed by the smallest and spherical particles, in chemical composition - silicon dioxide SiO2 (silica).

The main advantages of silica gel include:

- inertness, chemical and biological harmlessness;
- high mechanical strength with respect to abrasion and crushing;
- low temperature required for regeneration (90-140˚C) and, as a result, lower energy consumption;
- explosion and fire safety.

Silica gel rotor is not afraid of acid environment and can be used to dry air with relative humidity up to 100%. This material is highly effective in attracting and holding water molecules. The manufacturing technology of the rotor ensures the production of a product capable of handling moisture-laden air without the risk of destruction.

Figure 2.2 - SECO adsorption rotors

Efficient and reliable design of the rotor determines the unlimited scope of its applications. The rotor has bacteriostatic properties, which allows it to be used where high sanitary and hygienic requirements are imposed. The adsorbing composition of the rotor withstands a huge number of adsorption-regeneration cycles, so the rotors are extremely durable, and their service life is 10-15 years. Also, to prevent mixing of the flows of dried and reactivated air, special seals are used in the places where air passes through the rotor.

It is not allowed to contain powdered sugar and ammonia in the air (both in the working and reactivation ones), as this adversely affects the sorption properties of the rotor.

2.5 Heater

In the dehumidifier, a tubular electric heater (TEH) is used to heat the reactivation air. The heating element is a thin-walled metal tube with a high-resistance wire helix.

2.6 Air filters

Air filters are designed to purify dehumidified air and reactivation air. Pocket-type filters are used to prevent clogging of the silica gel rotor and purify the air to the desired parameters.

2.7 Design features

- The body is fully sealed, highly corrosion resistant and made of 0.65mm thick sheet steel with 50mm insulation (stone wool). The outer panels are powder coated. The frame and frame of the dehumidifier are made of 1.5mm thick sheet steel (with powder coating) to increase the rigidity and strength of the dehumidifier;
- Compact design and low weight of the unit;
- High performance at low temperatures and ensuring an arbitrarily low level of humidity in the served room.
- Optional humidistat as an accessory
- Tubular electric regeneration heater
- Easy access to dehumidifier internal components for maintenance
- EC fans
- EU4 pocket filters
- High efficiency washable silica gel rotor
- All components are exclusively European production

3 STORAGE AND TRANSPORTATION

If it is required to store the Unit before installation, then the following recommendations must be followed:

- do not remove the desiccant from the packaging;
- put the dehumidifier in a horizontal position on a flat hard surface, turning over to either side may cause irreparable damage to some components;
- ensure the protection of the Unit from mechanical damage;
- cover the dehumidifier to protect it from dust, precipitation, frost, chemical aggressive environments, etc.
- The allowable storage period for the dehumidifier depends on the surrounding conditions.
- The maximum period of storage of the Unit in a well-ventilated, heated room is 5 months;
- never put heavy foreign objects on the dehumidifier.
- The unit is shipped assembled. When transporting, do the following:
- the Unit may only be transported in a horizontal position;
- pay special attention to the prevention of mechanical damage to the protruding parts;
- the unit can be transported by any means of transport that ensures its safety and excludes mechanical damage, in accordance with the rules for the carriage of goods in force for this type of transport.

4 INSTALLATION

4.1 Safety requirements

During the installation and operation of the Unit, the requirements of this passport, the Rules for the Arrangement of Electrical Installations, the Rules for the Technical Operation of Consumer Electrical Installations, applicable building codes and regulations, as well as the Fire Safety Rules and other applicable building codes and regulations, must be met.

The adsorption rotary dehumidifier is electrical equipment, so safety rules should be observed when handling electrical equipment. The unit must be used exclusively for its intended purpose. It is forbidden to carry out any work on the unit if it is connected to the power grid.

Never open the door while the dehumidifier is running. To avoid electric shock, only qualified specialists should replace a damaged power cable.

Never open the doors while the dehumidifier is running. To avoid electric shock, only qualified personnel should replace a damaged power cord.

4.2 Placement

The dehumidifier is designed for installation both indoors and outdoors.

Do not install the dehumidifier in damp places where there is a risk of direct water ingress into the equipment; in very dusty or chemically aggressive environments.

The unit must be placed in such a way that it is possible to freely pass to it and further open the doors for maintenance and preventive maintenance or repair of the dehumidifier.

The following installation options are available for the unit in relation to the serviced premises:

- ✓ operation of the dehumidifier according to the "closed" scheme (internal version) - see figure 4.1;
- ✓ operation of the dehumidifier according to the "closed" scheme (outdoor version) - see figure 4.2;
- ✓ operation of the dehumidifier according to the "open" scheme (internal version) - see figure 4.3;
- ✓ operation of the dehumidifier according to the "open" scheme (outdoor version) - see figure 4.4;
- ✓ operation of the dehumidifier according to a "closed" scheme with an admixture of outside air (internal version) - see figure 4.5;
- ✓ operation of the dehumidifier according to a "closed" scheme with an admixture of outside air (outdoor version) - see Figure 4.6;
- ✓ operation of the dehumidifier according to the "closed" scheme in the "drying" mode - see Figure 4.7.

Figure 4.1 shows the option of installing a dehumidifier inside the serviced premises when working on recirculation ("closed" scheme). That is, air is taken from the internal volume, dried and thrown back. The reactivation air is taken outside the serviced premises, where it is thrown out. In automatic mode, the dehumidifier will operate until the set point on the humidistat is reached.

It is forbidden to use the variant of operation of the dehumidifier according to the "closed" scheme if there are particles or substances in the internal air that can damage the elements of the Unit.

Figure 4.2 shows an option for installing a dehumidifier outside the serviced premises when working on recirculation. It differs from the first option (see Figure 4.1) only in the place where the dehumidifier is installed.

Figure 4.3 shows the internal installation of the dehumidifier when operating according to the "open" scheme (in fresh air supply mode). That is, outside dried air is blown into the room. Reactivation air is taken in from outside and thrown out there. This method is used when it is impossible to dry the internal air directly due to the presence of particles and substances in it that can damage individual elements of the dehumidifier.

Figure 4.4 - outdoor installation of the dehumidifier when operating in fresh air supply mode. It differs from the third option (see Figure 4.3) only in the place where the dehumidifier is installed.

Figure 4.5 shows the internal installation of the dehumidifier when operating in the recirculation mode ("closed" scheme) with an admixture of outside fresh air. This option is relevant in cases where it is necessary to ventilate the room with fresh air, or it is necessary to create excess pressure in the serviced room to prevent unorganized inflow of outside air. The outside air duct must be equipped with a manual or automatic control valve to control the amount of fresh air supplied.

Figure 4.6 shows the outdoor installation of the dehumidifier when operating in the recirculation mode ("closed" circuit) with the admixture of outside fresh air. It differs from the fifth option (see figure 4.5) only in the place where the dehumidifier is installed.

Figure 4.7 shows the internal design of the dehumidifier when operating in the recirculation mode with reactivation air intake from the room (room "drying" mode). This option justifies itself, for example, in cases of using the unit for dehumidification of premises after flooding, or before finishing work.

Before choosing the operating mode option and the installation location of the dehumidifier, consult with our specialists.

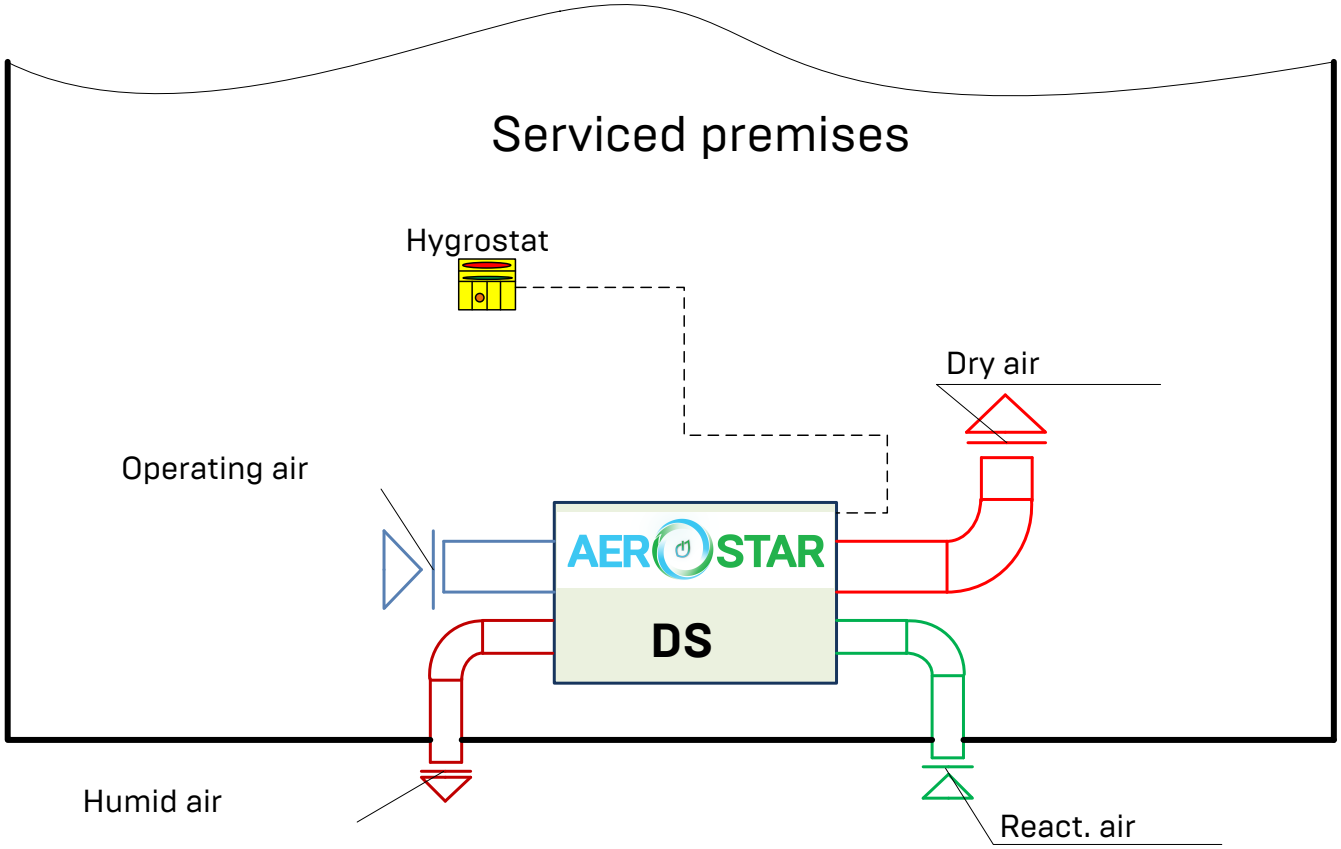

Figure 4.1 - Operation of the dehumidifier according to the "closed" scheme (internal version)

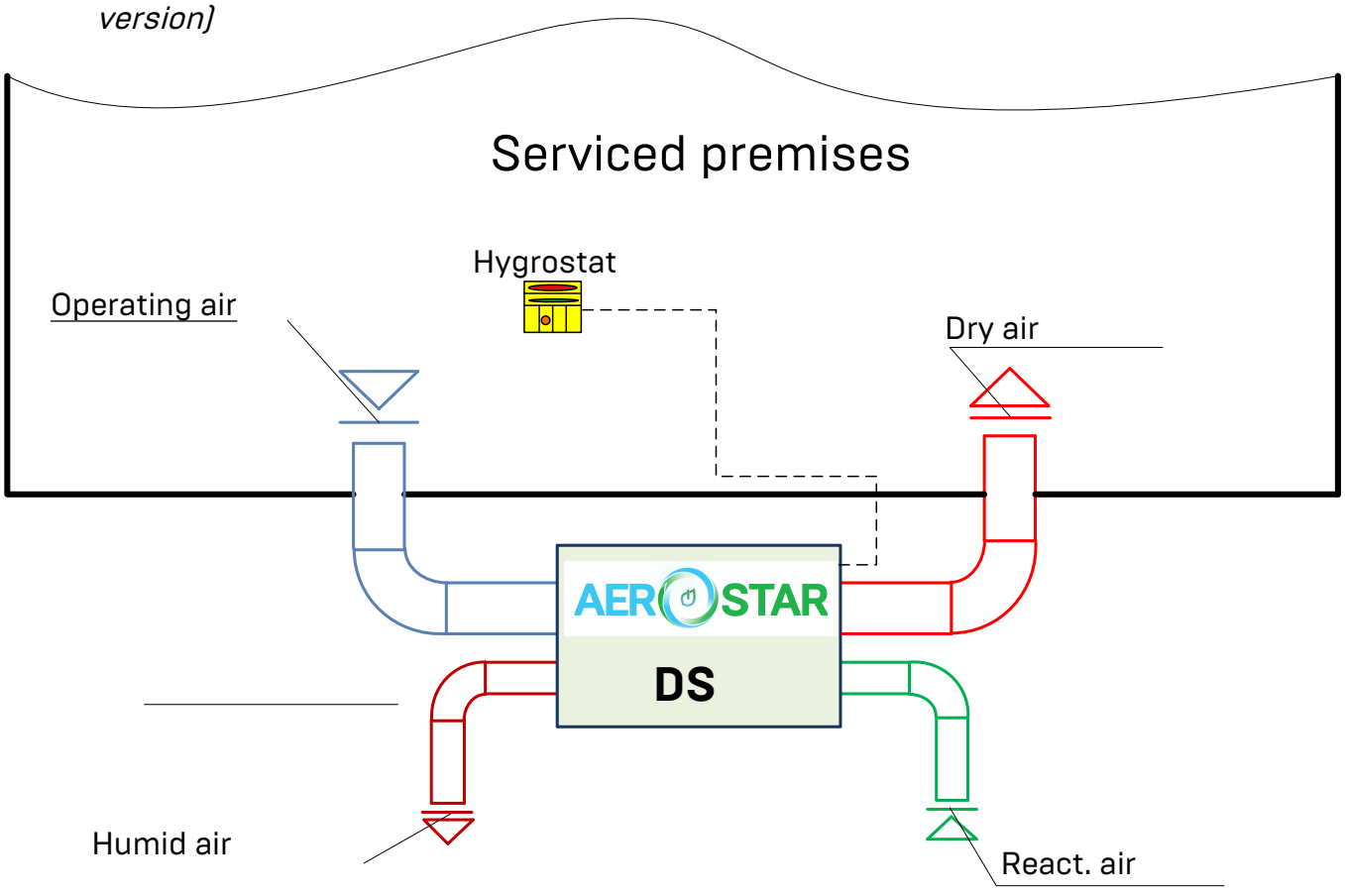

Figure 4.2 - Operation of the dehumidifier according to the "closed" scheme (outdoor version)

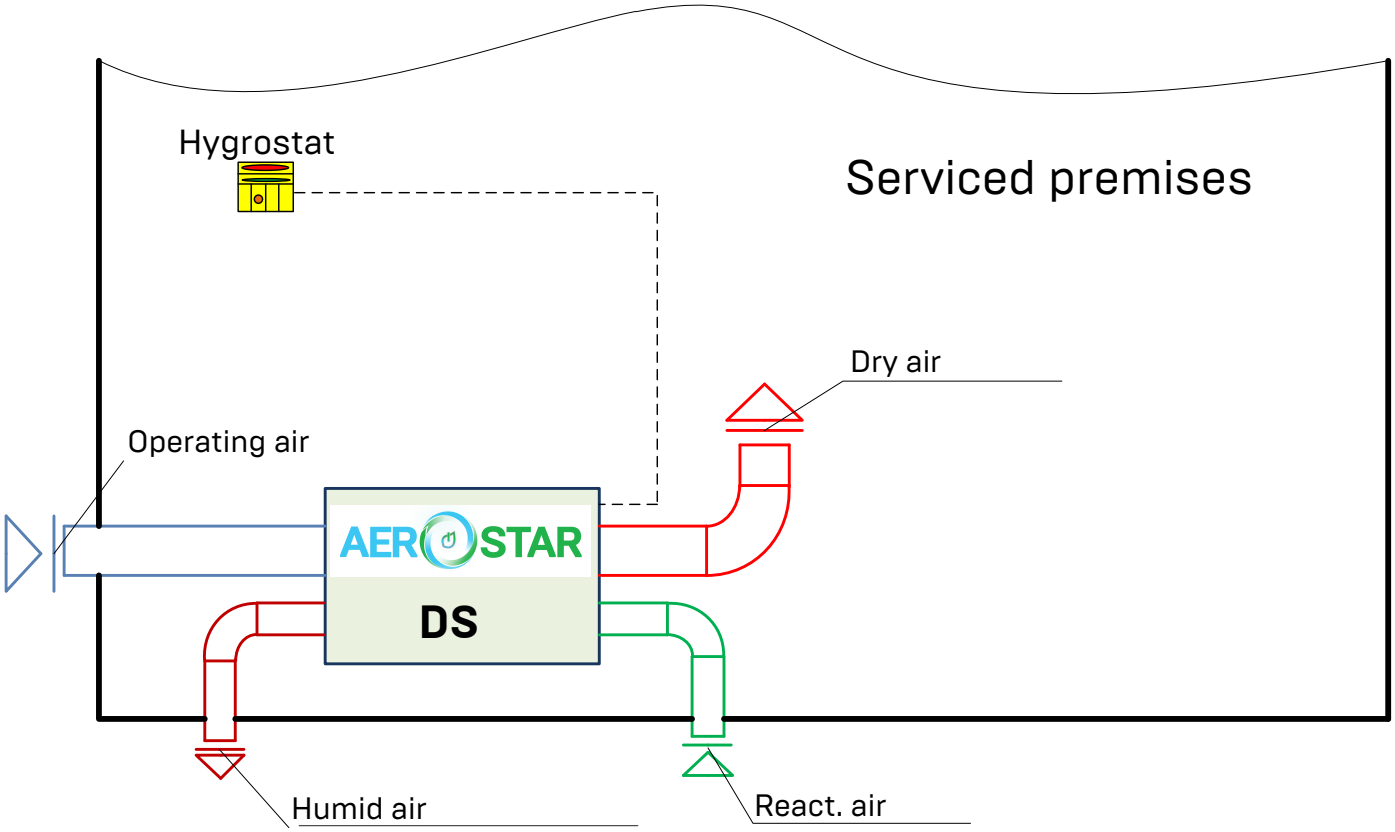

Figure 4.3 - Operation of the dehumidifier according to the "open" scheme (internal version)

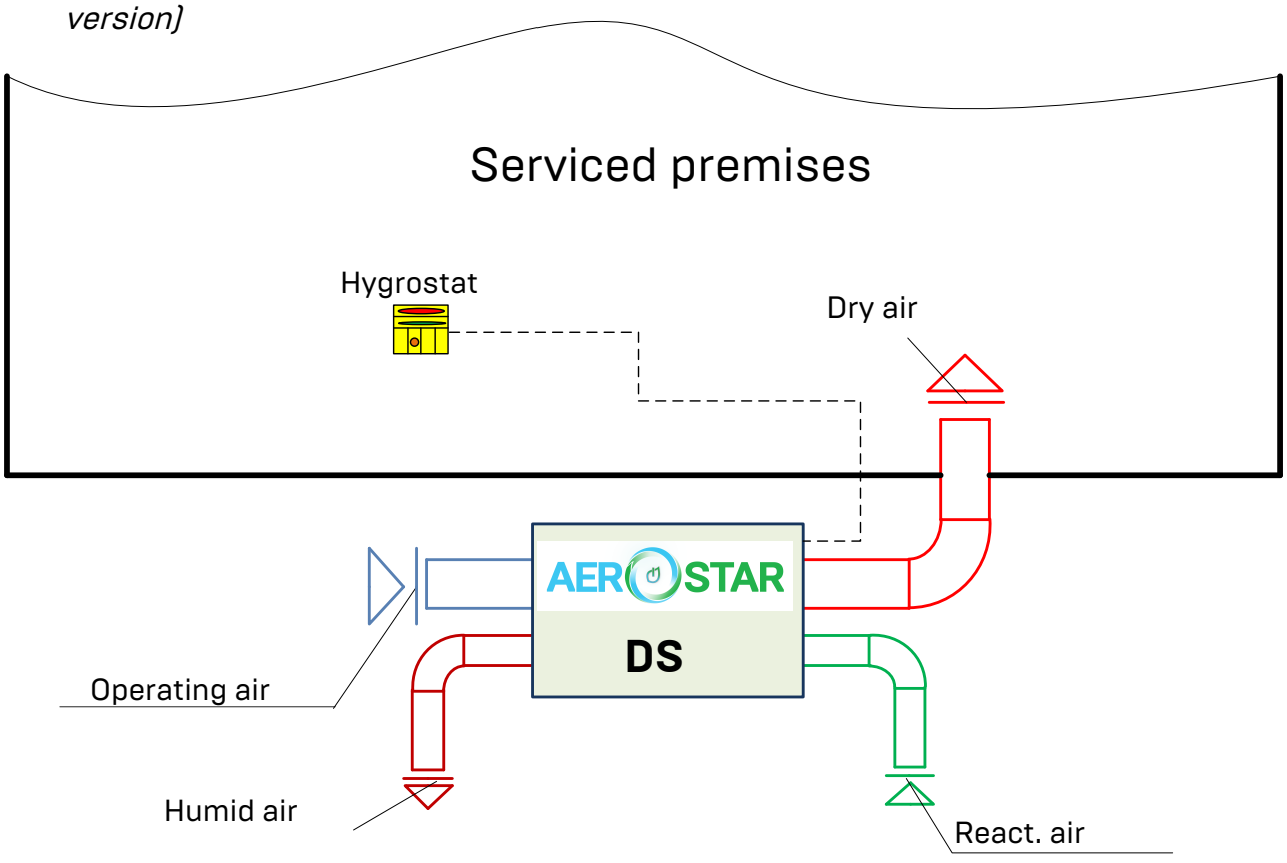

Figure 4.4 - Operation of the dehumidifier according to the "open" scheme (outdoor version)

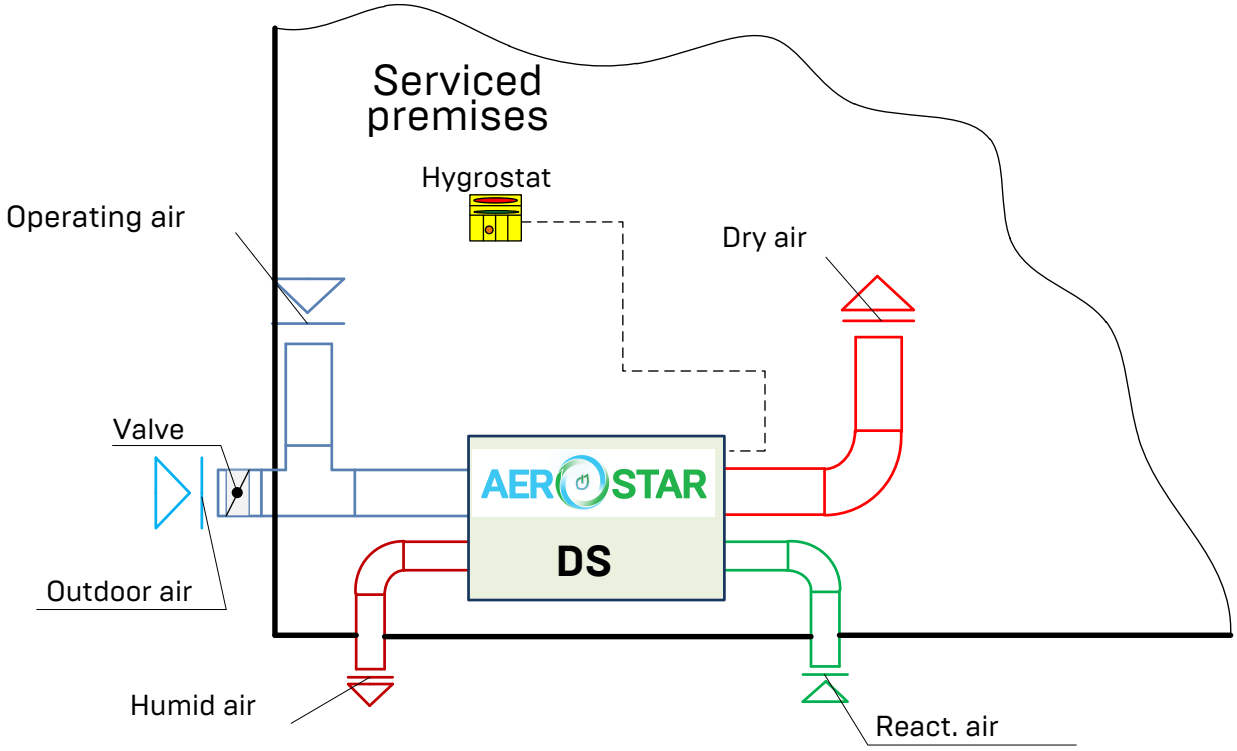

Figure 4.5 - Operation of the dehumidifier according to the "closed" scheme with fresh air admixture (internal version)

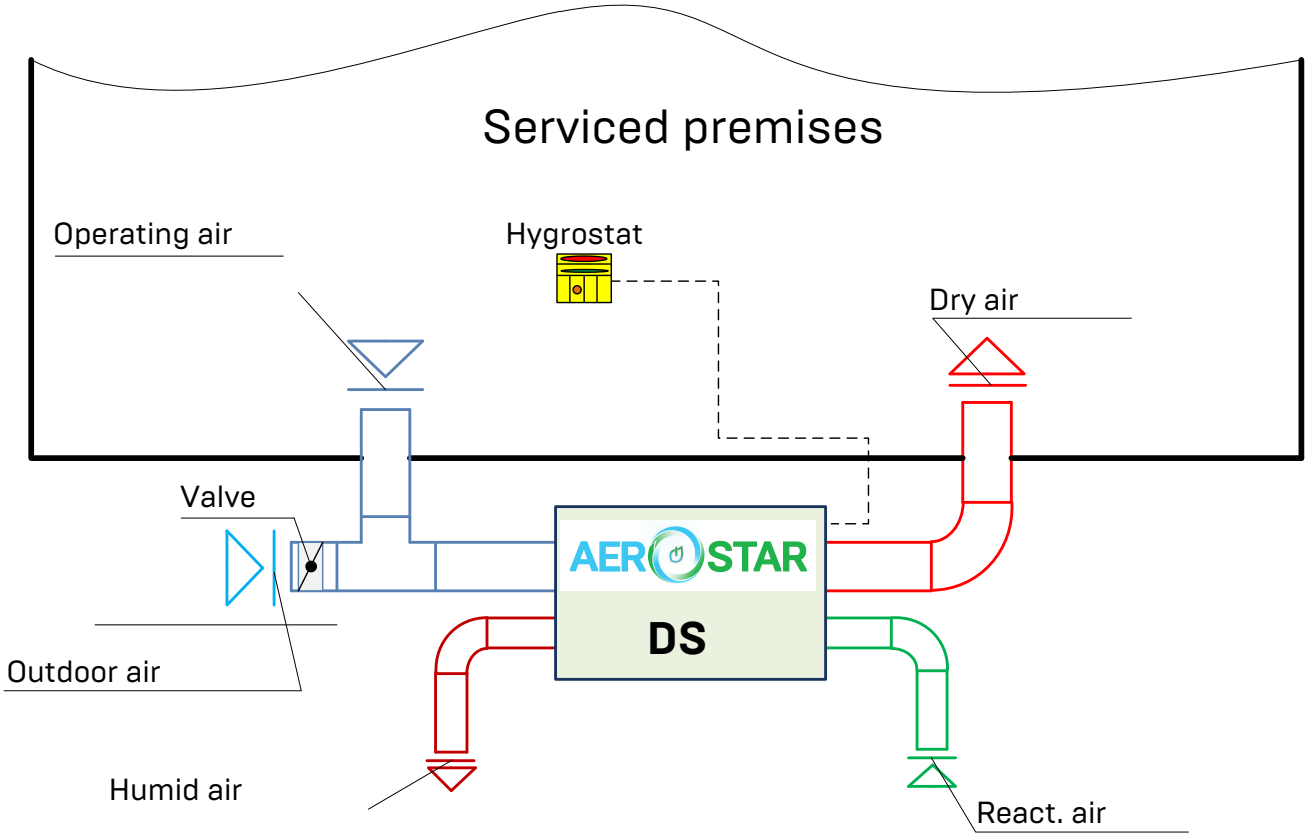

Figure 4.6 - Operation of the dehumidifier according to the "closed" scheme with fresh air admixture (outdoor version)

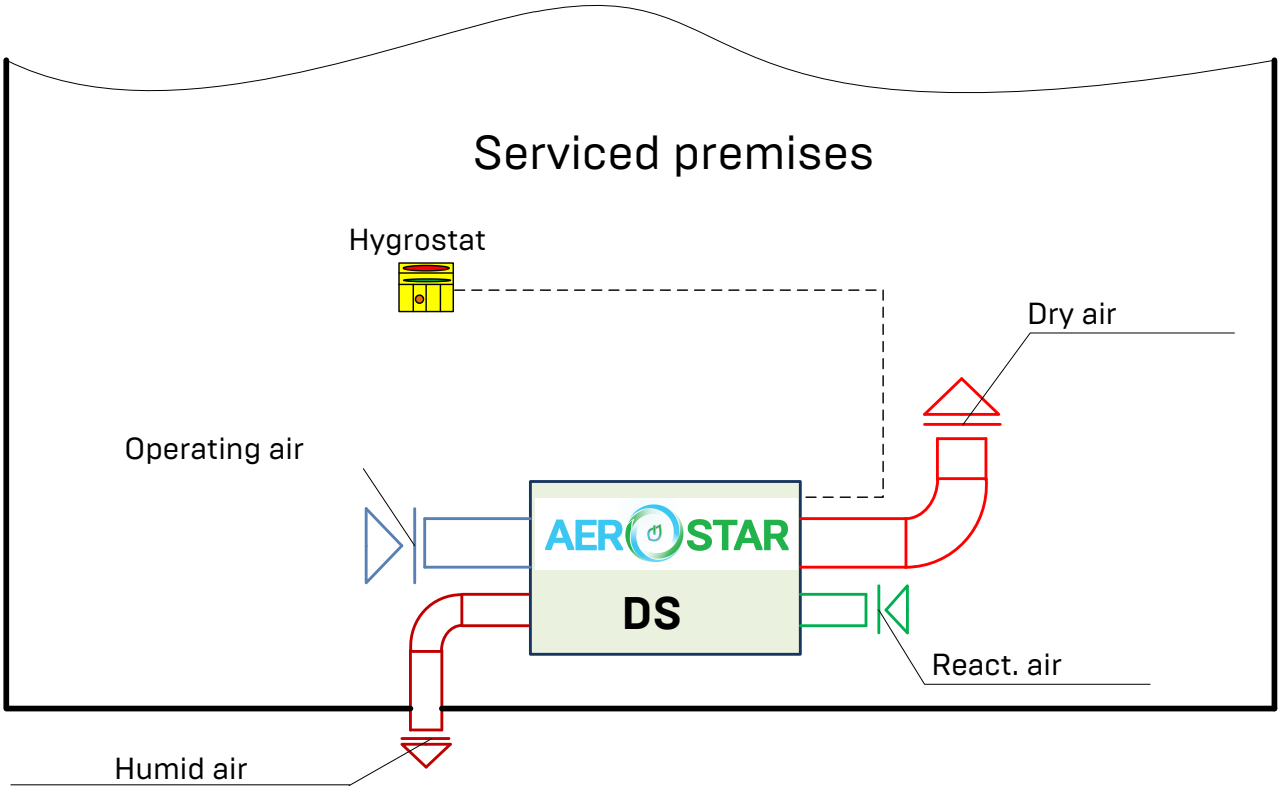

Figure 4.7 - Operation of the dehumidifier in the "drying" mode (internal version)

4.3 Duct connection

The length of the connected duct system should be kept as short as possible to minimize pressure losses. The fan pressure allows you to connect quite complex duct systems to the dehumidifier, but before that, be sure to consult with specialists.

When designing the dehumidifier, special attention was paid to reducing vibrations that occur during operation of the equipment, but, nevertheless, when connecting rigid ducts, flexible connectors should be used.

To reduce the load from its own weight, the air ducts directly connected to the dehumidifier must be mounted on supports.

It is recommended to install manually or electrically operated dampers on the dehumidified and reactivation air ducts to prevent unorganized air flow when the dehumidifier is switched off.

Silencers can be installed at the inlet and outlet of the dried air. This must be done taking into account the noise requirements for the room being serviced.

4.3.1 Dry air intake duct

The duct inlet must be located at a sufficient height above ground level to prevent dust, dirt, sand from entering the system. The air intake must also be located away from sources of possible pollution, such as steam, exhaust gases and other harmful substances.

The place of outdoor air intake is not allowed to be located at a distance closer than 8 m

horizontally from the garbage bin, car parking area, driveways, loading areas, sewer vents, chimney tops and other similar sources of pollution and unpleasant odors.

In areas where intense transfer of dust and sand is possible, it is necessary to provide a chamber behind the air intake device for settling large particles of dust, sand, etc. and place the bottom of the air intake device at least 3 m above ground level.

When the dehumidification system operates according to the "open" scheme (dry air is taken from the street), it is necessary to insulate the working air intake duct and cover the insulation with a vapor-tight material to prevent condensation on the outer surface of the duct.

4.3.2 Reactivation air intake duct

The requirements for connecting the reactivation air intake duct are the same as for connecting the dried air intake duct (see paragraph 4.3.1)). In addition, the reactivation air intake must be carried out exclusively from the street. To avoid condensation on the air duct, it must be insulated and covered with a vapor-tight material.

4.3.3 Duct for extracting humid reactivation air

The duct for extracting moist reactivation air must be made of a corrosion-resistant material (eg stainless steel). The air duct must be able to withstand air temperatures up to 60°C. Humid air leaving the dehumidifier has a very high moisture content, which makes it very likely that condensation will form on the inside of the air duct. To avoid this phenomenon, it is necessary to insulate it.

Horizontal sections of the duct must be laid with a slope (more than 2.5 cm per meter) from the dehumidifier (see figure 4.8). If there are vertical air ducts, then a steam trap is installed at the lowest point to drain condensate if it occurs (see figure 4.9). Humid reactivation air must be discharged at least 2 m from the air intakes of the dried and reactivation air.

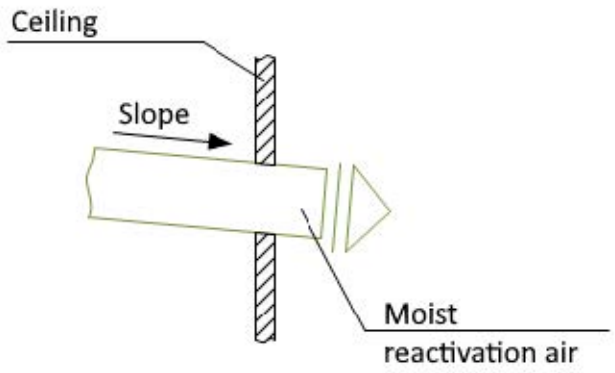

Figure 4.8 - An example of laying a horizontal exhaust reactivation air duct

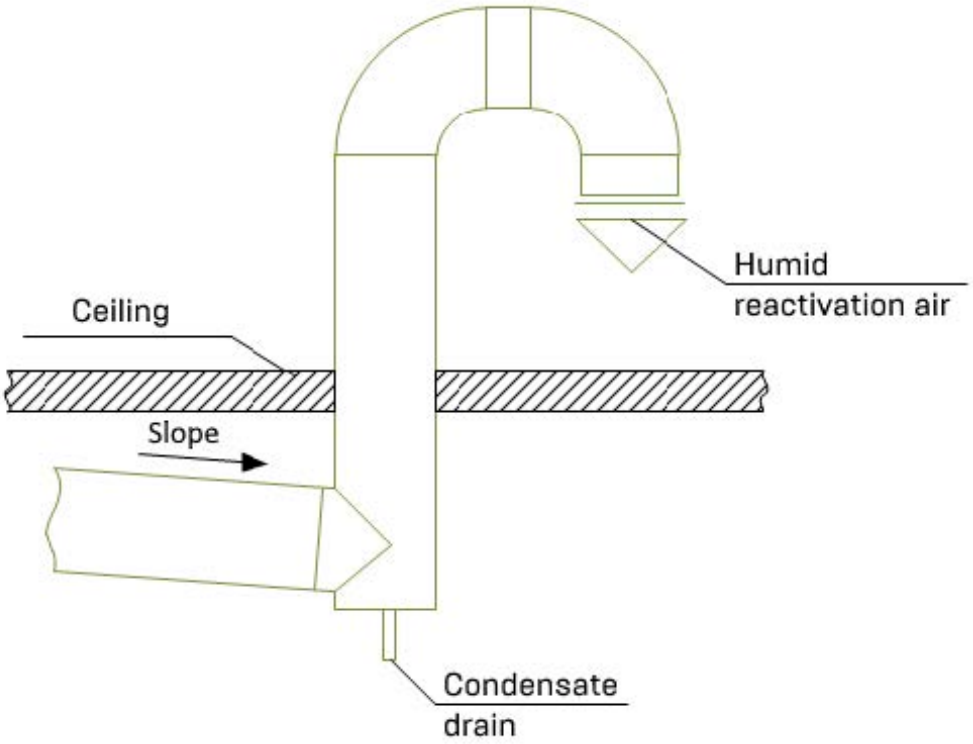

Figure 4.9 - An example of laying a vertical duct for exhaust reactivation air

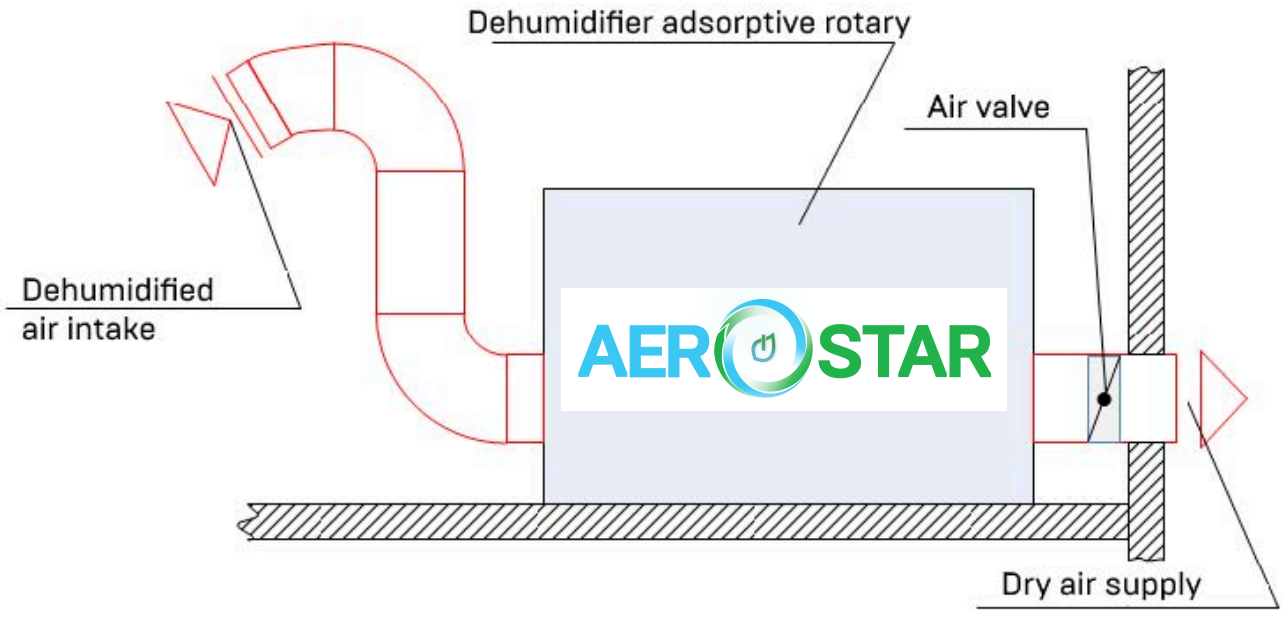

Figure 4.10 - An example of laying air ducts for dried air

5 OPERATION

The adsorption rotary dehumidifier DS requires minimal maintenance. All elements do not require serious maintenance, i.e. lubrication or adjustment.

5.2 Maintenance

The DS dehumidifier is designed for continuous continuous use and is characterized by a high degree of reliability. As with any other piece of equipment, periodic maintenance is required to keep the dehumidifier in optimum condition to ensure efficient operation.

The frequency of maintenance is primarily determined by the operating conditions and the environment in which the dehumidifier is installed. Reduced maintenance intervals are also necessary when the dehumidifier is used intensively. During normal operation of the dehumidifier, the following preventive measures must be taken:

- monthly check and, if necessary, replacement of filters;
- monthly check of rotor rotation;
- monthly inspection of the degree of wear of the rotor drive belt.

In addition, it is recommended that the entire dehumidifier be periodically inspected to ensure that all components are functioning correctly and that there is no wear on the moving parts. This check allows the dehumidifier to operate at peak performance without additional energy consumption.

To ensure high dehumidification efficiency, close the windows and doors of the room being served. Windows and doors should only be opened to ventilate the room.

For maintenance and repair, use only specially designed tools.

6 MAIN TROUBLESHOOTING

Decreased moisture removal performance	Air filters clogged Regeneration heater not working Reduced airflow Rotor not spinning Mixing of working air with regeneration air Changed air volume Changed regeneration temperature Internal air mixing	Replace filter Check fuses Check shut-off valve Check belt tensioner Check rotor seals Check the value of the air volumes Check the operation of the heater Check all dehumidifier seals
The main machine does not work or turns off	Fan failure Large airflow Rotor not spinning Heater not working	Fan check Checking air flows and valves Checking the rotor drive Checking the regeneration heater
Dehumidifier does not turn on	Open circuit Control signal failure Phase failure Malfunction of automatic controls	Checking the machines and the electrical circuit Check external start/stop signal Check circuit breakers and phase sequence Checking all automation components for operability
Rotor does not rotate	Drive belt slipping Drive belt damaged Rotor jammed Rotor drive failure	Checking the belt tensioner Belt replacement Check rotor bearings and seals Rotor drive replacement
No operating or regeneration air	Air filters clogged Faulty fan Phase failure No air flow through ducts	Replace filter Check fan, motor or fan impeller Checking the main machine and phase sequence Check air ducts and valves

7 WARRANTY CONDITIONS

The warranty period for the adsorption rotary dehumidifier DS is 36 months from the date of shipment, but not more than 42 months from the date of manufacture.

- During the warranty period, the manufacturer assumes obligations to eliminate equipment malfunctions that arose as a result of a factory defect of the Unit or its parts and elements.

- The basis for consideration of claims for the fulfillment of warranty obligations is a Reclamation. The procedure for submitting and content of the Claim are specified in Section 10 of this Passport.

- The performed warranty service does not extend the warranty period, the warranty for the replaced parts expires with the expiration of the warranty period for the Unit.

- These warranty terms are valid for all contracts for the purchase of Manufacturer's Units, unless otherwise specified in these contracts.

These warranties do not apply to:

- parts of equipment and operating materials subject to natural physical wear and tear (filters, seals, belts, light bulbs, fuses, etc.)
- damage to the Unit caused by:

a) ingress of foreign objects or liquids into the unit;

b) natural phenomena;

c) environmental influences;

e) unauthorized access to units and parts of the unit by persons not authorized to carry out the specified work,

f) all mechanical damage and breakdowns that occurred as a result of non-compliance with the recommendations of this present passport, norms, standards and rules for the work.

- various modifications, changes in operating parameters, processing, repairs and replacement of parts of the Unit, carried out without the consent of the Manufacturer or his representative.

Warranty works:

- work under this warranty shall be carried out within 30 days from the date of filing the complaint.
  In exceptional cases, this period is extended, in particular when time is required for the delivery of the required part;
- parts that are dismantled from the Unit as part of a warranty repair and replaced with new ones are the property of the Manufacturer;
- the manufacturer has the right to refuse to perform warranty work or service if the customer delays payment for the equipment.

8 COMPLAINT INFORMATION

- If a quality discrepancy is revealed, the consumer is obliged to send the Complaint to the Manufacturer, which is the basis for resolving the issue of the legitimacy of the claim that is presented.
- Complaints in writing must be submitted to the Manufacturer. Complaints may be submitted by fax or e-mail. The complaint must contain the type, serial number and date of transfer of the Unit, as well as the exact address of the installation site of the dehumidifier, telephone numbers of the responsible person.
- The claim must also contain a description of the problems with the Unit and (if possible) the names of the damaged parts.
- If the consumer (Customer) violates the rules for transportation, acceptance, storage, installation and operation of the dehumidifier, claims for quality are not accepted.

9 ACCEPTANCE CERTIFICATE

Dehumidifier adsorptive rotary DS_____

Factory number_____

Release date «_____» 202_

manufactured and accepted in accordance with the mandatory requirements of state standards, current technical documentation and recognized as fit for use.

«___» _____20___

(personal signatures of company officials responsible for equipment acceptance)

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