OMEGA AIR

more than air

REFRIGERATION COMPRESSED AIR DRYERS

Refrigeration compressed air dryers

Background

Compressed air contains contaminants like water, oil, and particulates that need to be removed or reduced to acceptable levels, depending on the specific application requirements.

Standard ISO 8573-1 defines air purity/quality classes for these contaminants. Water vapor content (humidity) is measured in terms of Pressure Dew Point (PDP), which is the temperature at which air becomes 100% saturated with moisture.

When the air temperature drops to or below the dew point, condensation forms. Typically, refrigeration dryers reduce the water content to Pressure Dew Point +3°C, meeting the class 4 for humidity according to standard ISO 8573-1.

Performance

Drying is accomplished through a cooling process inside of a highly efficient and ultra-compact three-stage heat exchanger.

The first stage (air-to-air heat exchanger) pre-cools hot, humid incoming air using cold outgoing air.

In the second stage (air-to-refrigerant heat exchanger) intensive water condensation takes place due to cooling of the air.

Condensed water is then separated from the main compressed air stream in the third stage by the integrated demister.

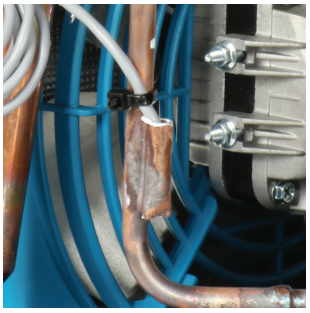
This proven, robust design ensures efficient, reliable operation, quick installation and easy maintenance.

Controller

The control panel contains all the information necessary for the management of refrigeration dryer RDP. It also contains the installed main power button to turn off the refrigerated dryer, dew point display and alarm mode.

Low/high pressure switch

Low/high pressure switches are control devices which are used as safety control. The compressor is stopped by cutting the power supply of the motor of the compressor whenever the refrigerant pressure becomes excessive. This is necessary to prevent the possible damage of equipment. Presence of switch depends on dryer size.

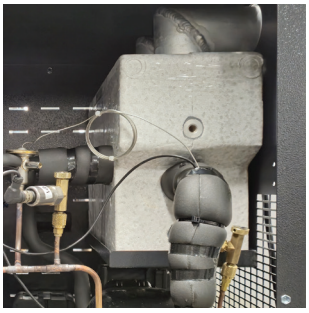


Thermal protection

High temperature in the refrigeration system can cause damage to the system components. High compressor temperature means that the compressor is overheating. High condenser temperature means that the heat rejection to the ambient is insufficient. Both thermal protection actions are included in the control function of our controller. It's algorithms ensure easy and reliable operation with preventive alarm and compressor stop.

Hot gas by-pass valve

RDP/RDT dryers and its derivatives are equipped with hot gas by-pass valve.
The main purpose of hot gas bypass valve is to prevent condensate from freezing on the surface of the evaporator coil when the system is operating at reduced load conditions.



LOW GWP

R513A

Efficent cooling system

The refrigeration compressor pumps hot high pressure gas refrigerant into the condenser which transfers the heat from the refrigerant gas to the ambient air as the gas condenses into a liquid.

Compressor

High efficiency piston and scroll refrigerant compressors assure the circulation of system refrigerant. Compressors have the innovative construction with reduced energy consumption and high reliability levels.

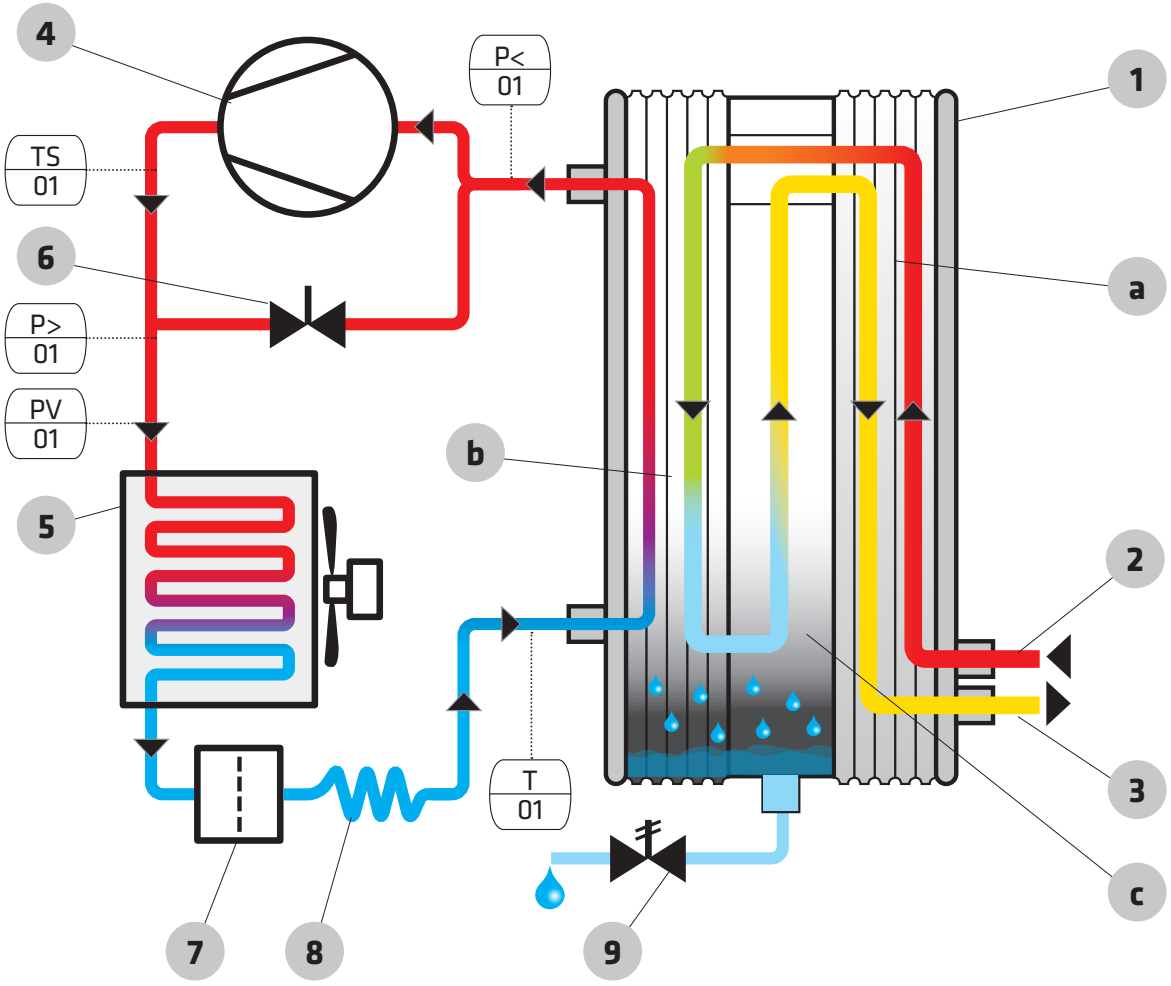
Integrated heat exchanger

The incoming air enters into an air-to-air pre-cooler, where incoming air is cooled by output air. Then air passes through a refrigerant heat exchanger where the air is cooled by the cold evaporating refrigerant. This process causes moisture to condense in demister into liquid water. Condensate is drained from the system by condensate drain.

Sustainable refrigerant

Refrigerant R-513a provides an environmentally responsible alternative to older refrigerants while delivering the same high level of efficiency.
With a low Global Warming Potential, R513A offers a significant reduction in environmental impact compared to traditional refrigerants.

Operating scheme



Operation

Operation of refrigeration compressed air dryer can be divided into two independent circuits:

COMPRESSED AIR CIRCUIT

Warm and humid compressed air enters into three-stage heat exchanger (1). In the first stage "air-air" (a) incoming air is precooled by cold outlet air. This stage is important from energy saving point of view as well as for stable operation of entire system. In the second stage "air-refrigerant" (b) the air is cooled by the cold refrigerant. In this stage water vapour condenses into liquid water. In the third stage "demister" (c) separates all the liquid water from the air stream. Cold dry air then enters "First stage" (a) again where it is re-heated by the hot inlet air. Besides energy saving feature this stage also makes sure that dry air leaving the dryer is warm enough to prevent condensation on the external side of downstream piping. Condensed water is discharged from the system via condensate drain (9).

REFRIGERANT CIRCUIT

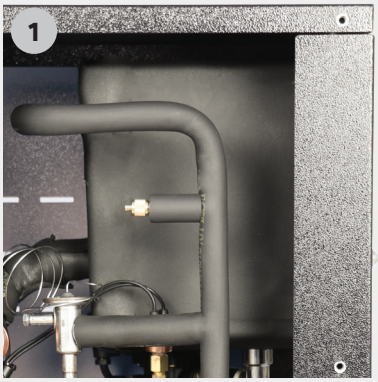
Circulation of the refrigerant gas in the circuit is provided by highly efficient hermetically sealed compressor (4). Compressor rises the pressure of the gas which is then cooled down and condensed in the condenser (5). Electric fan on the condenser can be controlled by temperature or pressure sensor. Liquid refrigerant then flows through capillary tube or thermostatic expansion valve (8) which acts as a metering device to reduce the pressure of the refrigerant. Reduction of the pressure is a design function to achieve target temperature inside the evaporator/three-stage heat exchanger (lower pressure = lower temperature). Filter (7) which is installed upstream the metering device intercepts impurities and assures reliable operation of the system. Low pressure refrigerant in gas form then re-enters the compressor.

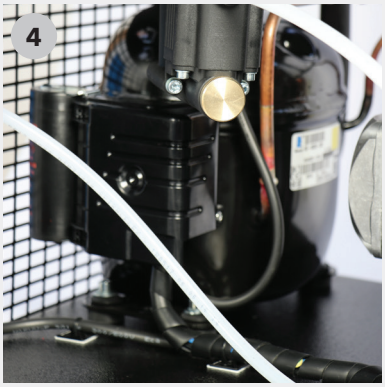
Refrigeration dryers operate based on "non-cycling" operating principle which means that when the dryer is without load (e.g. no or low inlet flow of compressed air), "hot gas by-pass valve" (6) will release part of the hot refrigerant gas (from discharge side of the compressor) back to the suction side of the compressor. As a result evaporation pressure/ temperature will be constant at the factory pre-set value.

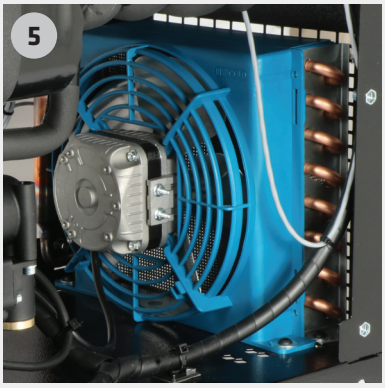
In case of high discharge temperature the controller (10) stops the compressor before permanent damage occurs. Depending on size of the dryer additional safety/protection devices (e.g. low pressure switch, high pressure switch) are installed in on the refrigerant gas circuit.

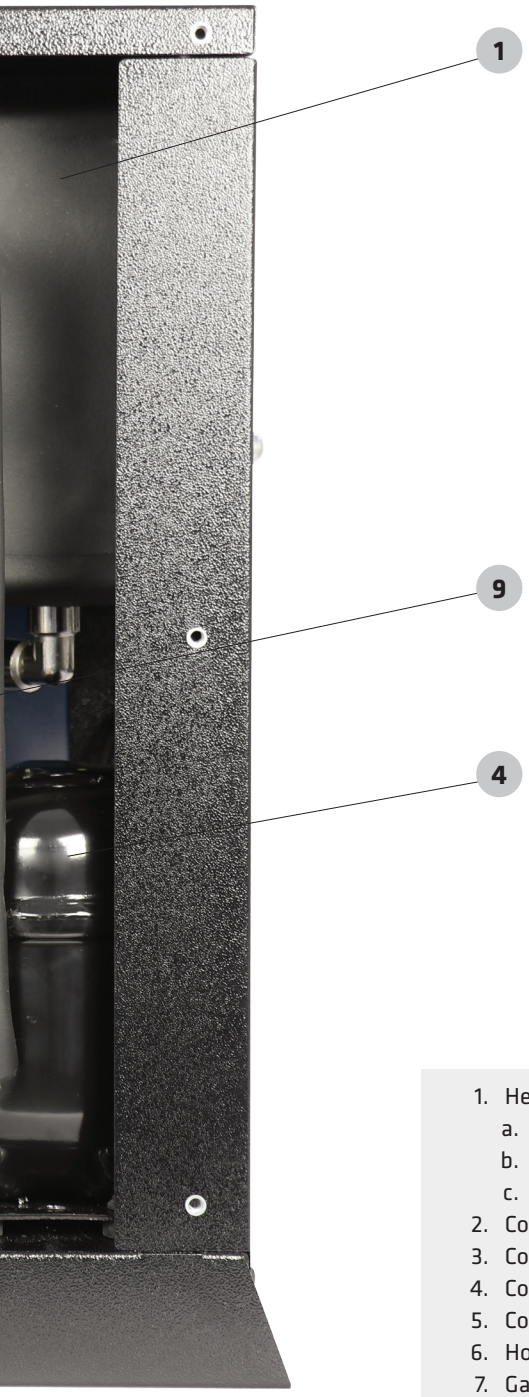
All of our dryers are equipped with good control mechanisms. This allows for a very stable dew point. From the smallest dryer sizes on we offer excellent communication possibilities. Larger dryers are equipped with more powerful controllers offering advanced control and monitoring features.

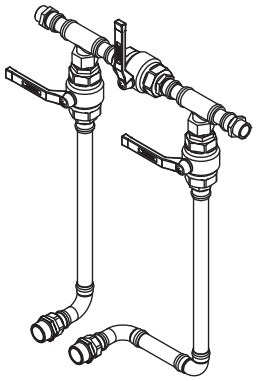
Main components









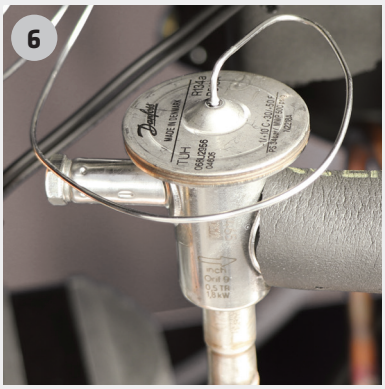


Option: Bypass

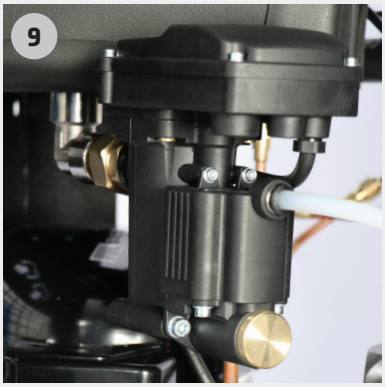
1. Heat exchanger module
   a. Heat exchanger air/air - pre-cooler
   b. Evaporator air/refrigerant
   c. Demister
2. Compressed air input - wet
3. Compressed air output - dry
4. Compressor
5. Condenser
6. Hot gas by-pass valve
7. Gas filter
8. Expansion valve or capillary tube
9. Electronic condensate drain
10. Controller
11. Inverter
12. Brased plate heat exchanger

11

6



9



12

Refrigeration dryer types

	RDP	RDP ES	RDP W	RDT	RDL	RDHP
Rated flow [Nm^3/h]	20 - 13.200	950 - 13.200	950 - 13.200	20 - 1.900	35 - 480	20 - 4.750
Max. pressure [bar_g]	16/14	16/14	16/14	16	13	45
Drain type	zero-loss	zero-loss	zero-loss	timer	zero-loss	timer
Hot gas by-pass valve	Yes	Yes	Yes	Yes	No	Yes
Cooling media	ambient air	ambient air	cooling water	ambient air	ambient air	ambient air
Energy saving function	No	Yes	No	No	No	No

RDP series is designed for versatile industrial applications, offering a wide range of flow rates.
With a maximum pressure rating of 16/14 bar, it is ideal for most uses. It includes a zero-loss drain (9) to reduce air wastage. Hot gas by-pass valve (6) allows efficient operation under fluctuating loads, enabling easy integration into any compressed air system.

RDP ES series comes with an integrated variable-speed compressor and frequency inverter (11).
As the load fluctuates, the compressor adjusts its speed, reducing power consumption and resulting in significant energy savings.

RDP W series utilizes water as the cooling medium instead of ambient air. To achieve this, the condenser with the fan is replaced by a high-performance brazed plate water-refrigerant heat exchanger (12).
This water-cooling system enhances efficiency and ensures the operation remains unaffected by ambient air temperature.

RDT series features a timer drain instead of a zero-loss drain. The choice of using a timer drain depends on user preference, but it typically leads to compressed air losses. As a result, the rated flow of this series is limited.

RDL series was specifically designed for integration with combi compressors. When synchronized with the compressor, a hot gas by-pass valve is unnecessary, as the inlet load remains continuous rather than fluctuating. Its simplified refrigeration circuit enables installation in a very compact cabinet.

RDHP series is an advanced version of the RDP series, specifically designed to accommodate higher pressures of up to 45 bar.
To ensure reliable discharge of condensate while maintaining cost-effectiveness, the RDHP series is equipped with a timer-controlled condensate drain.
This feature ensures efficient operation and effective condensate removal, providing a competitive edge in both performance and price.

OMEGA AIR
more than air

OMEGA AIR d.o.o. Ljubljana
Cesta Dolomitskega odreda 10, 1000 Ljubljana, Slovenia

00 386 1 200 68 00 | info@omega-air.si
www.omega-air.si

950561 - 29/08/25