RDP

Refrigeration compressed air dryers

OMEGA
AIR

RDP series - Refrigeration compressed air dryers

Background

Compressed air contains contaminants such as water, oil and particulates which must be removed or reduced to the acceptable level based on specific application requirements.

Standard ISO 8573-1 specifies air purity/quality classes for these contaminants. Humidity (water vapour content) is expressed in the terms of Pressure Dew Point (PDP) where Dew point is the temperature at which air is 100% saturated with moisture.

When the temperature of the air reduces to or below the dew point, condensation will occur. Reduction of water content down to pressure dew point +3°C is usually achieved with refrigerant dryers.

Performance

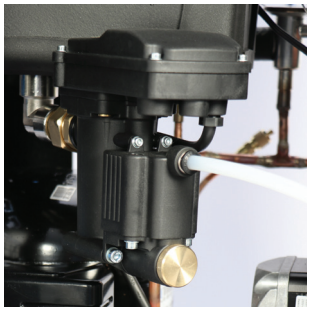
RDP refrigeration dryers have been designed to effectively separate water from the compressed air thus lower pressure dew point all the way down to +3°C.

Drying is achieved on the principle of cooling which takes place inside highly efficient and ultra compact 3 stage heat exchanger. In the first stage (air-air heat exchanger) hot and humid inlet air is being precooled by the cold outgoing air. In the second stage (air-refrigerant heat exchanger) intensive water condensation takes place due to cooling the air.

All condensed water is separated from the main compressed air stream in the third stage by integrated demister. A proven and robust design enables efficient and reliable operation, fast installation and simple 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.

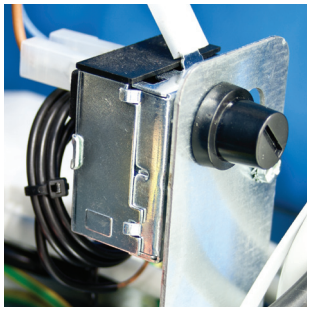


Electronic condensate drain

Integrated electronic condensate drain EMD 12 is designed for fully automatic discharging of condensate without air losses. The special self-cleaning direct acting valve assures reliable operation. EMD 12 is equipped with operational alarm, led indicator, test button and capacitive level sensor.

Low/high pressure switch

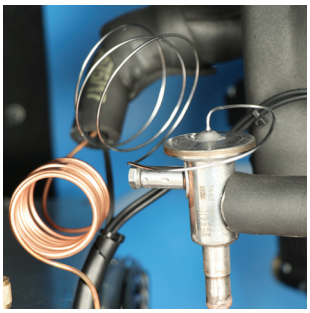
Low/high pressure switch are control devices which are used as safety control. The compressor is stopped by cutting the power supply of the motor of the compressor whenever the refrigerant pressure becomes excessive. This is necessary to prevent the possible damage of equipment. Presence of switch depends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



Thermal switch

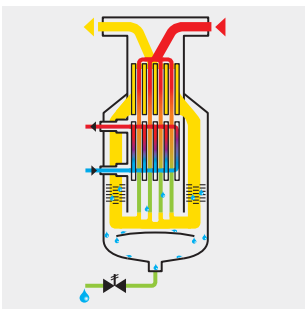
Thermal switch monitors the compressor discharge temperature. If this temperature is too high, it means, that the compressor is overheating, which may cause damage to its internal components.

Depending on the temperature, preventive actions are taken, resulting in cutting the power supply to the compressor.



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 extremely low load conditions.

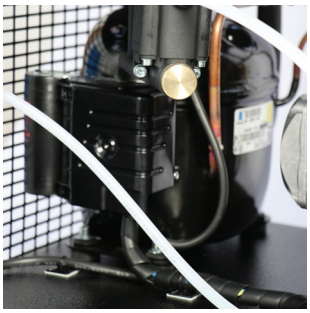


Integrated heat exchanger

The incoming air enters into an air-to-air pre-cooler, where incoming air is heated 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.

Efficent cooling system

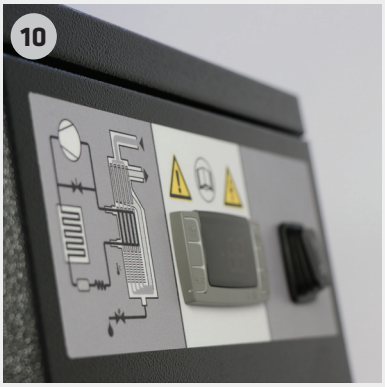
The refrigeration compressor pumps hot high pressure gas refrigerant into the condenser which transfers the heat from the refrigerant gas to the ambient air as the gas condenses into a liquid.

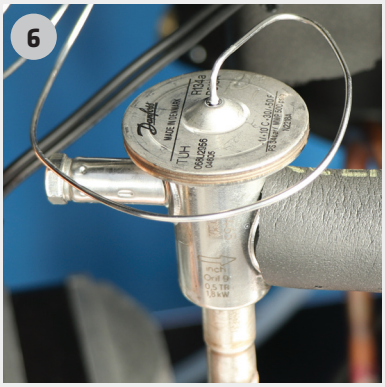


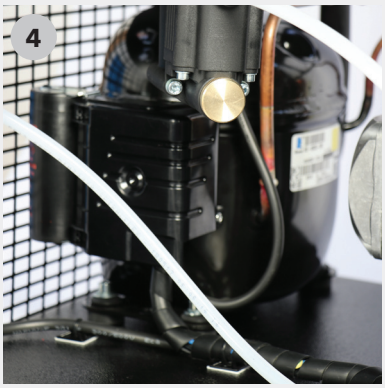
Compressor

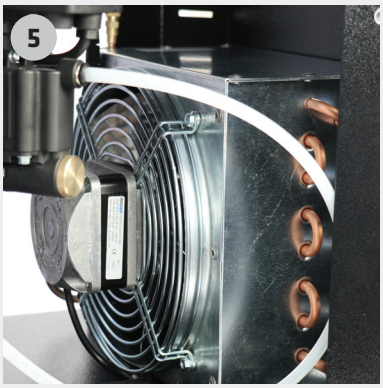
High efficiency piston and rotary refrigerant compressors assure the circulation of system refrigerant. Compressors have the innovative construction with reduced energy consumption and high reliability levels.

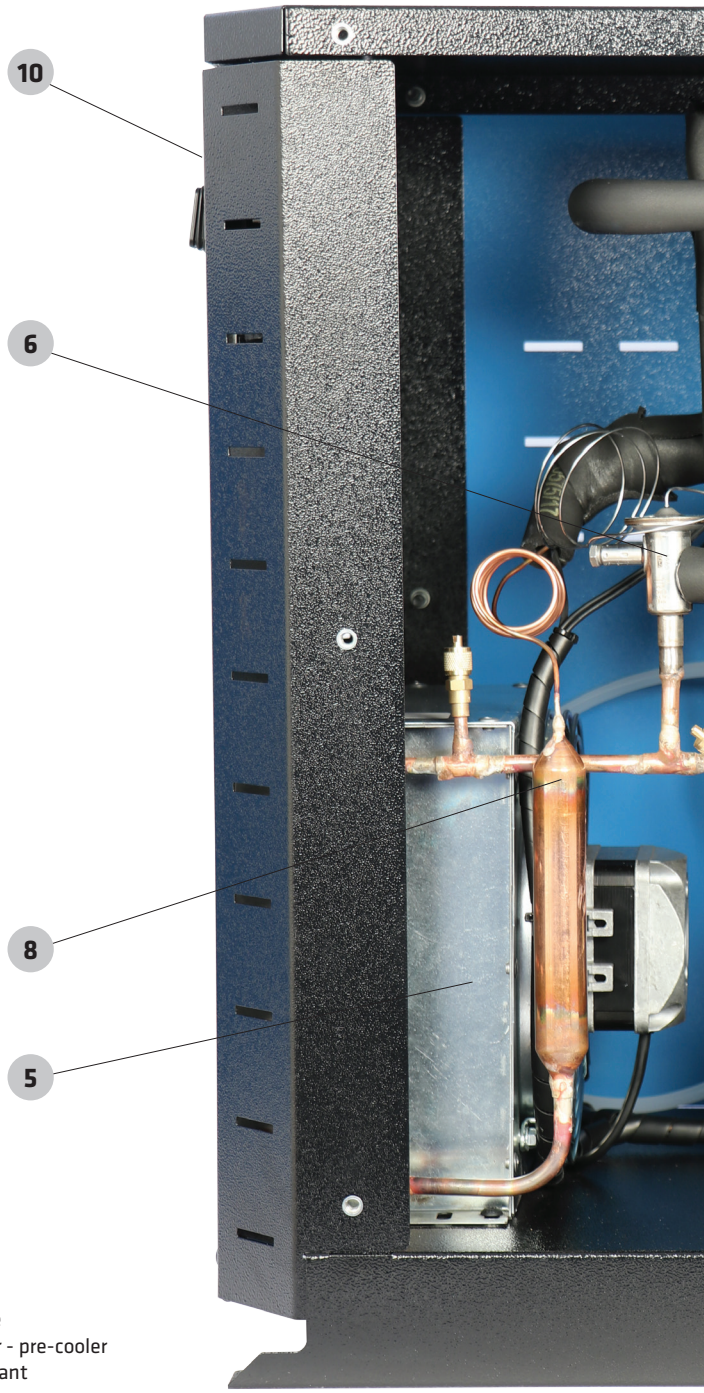
Main components





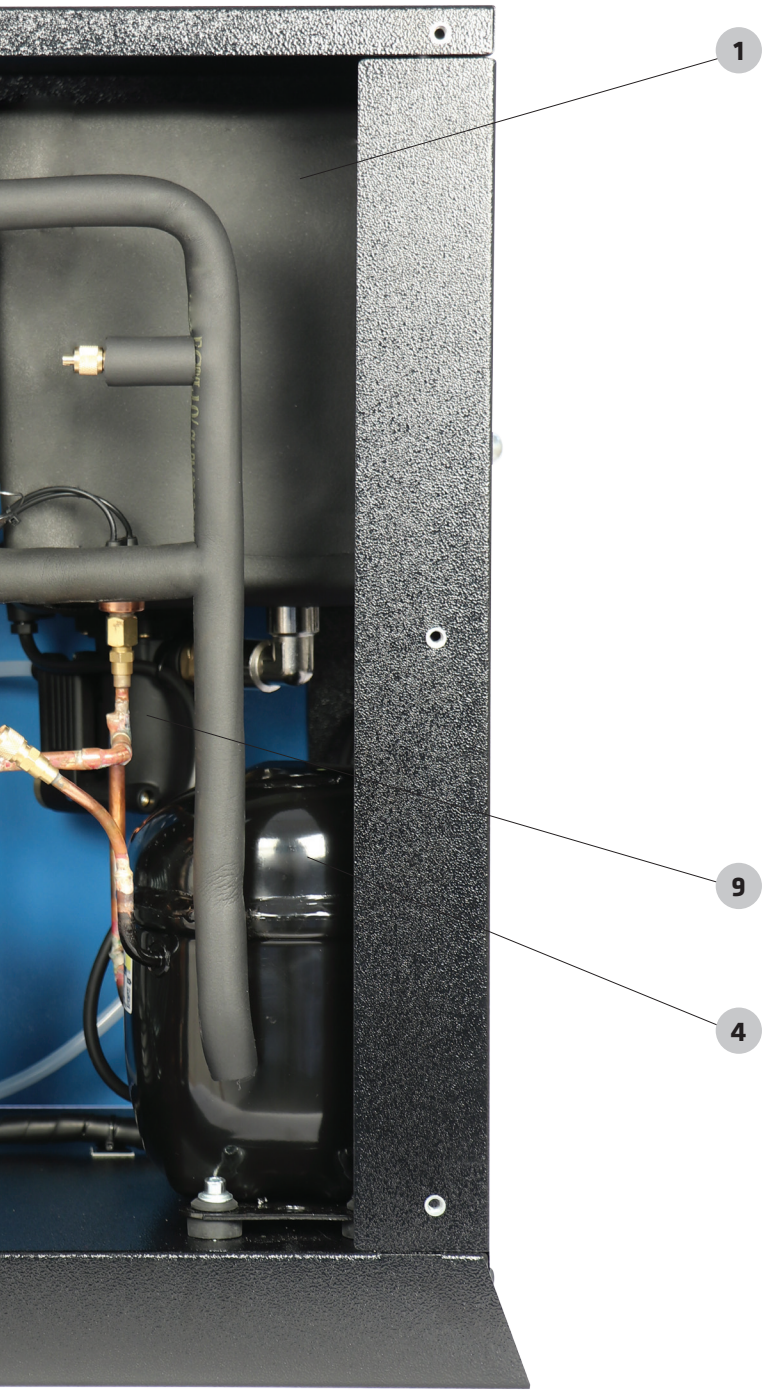






1 Heat exchanger module
- a Heat exchanger air/air - pre-cooler
- b Evaporator air/refrigerant
- c Demister

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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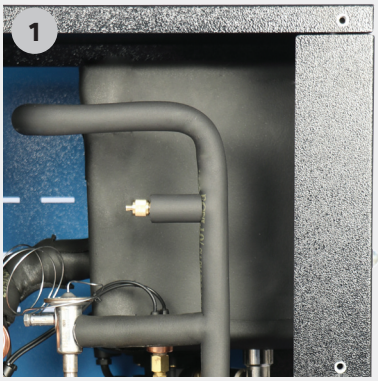
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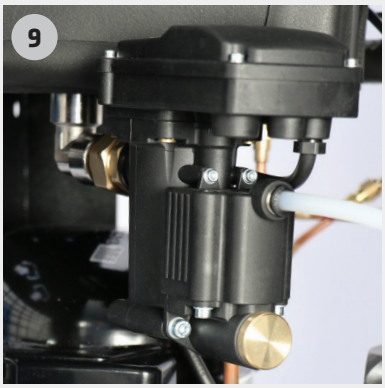
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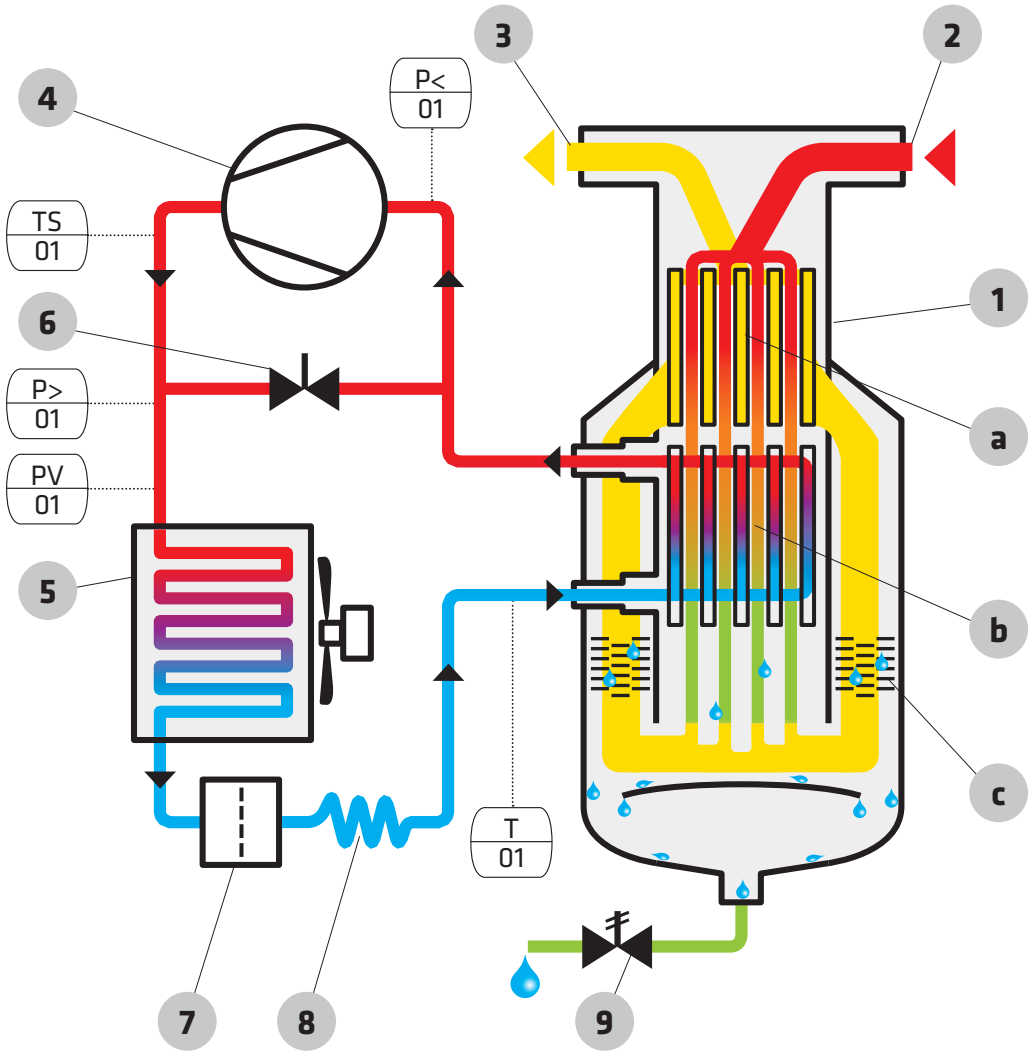
Operating scheme



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. 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 electronic condensate drain.

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 liquified 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 (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.

RDP 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 "thermal switch" 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.

Smaller dryers are equipped with basic controller which mainly monitors dew point of compressed air. Larger dryers are equipped with more powerful controllers offering advanced control and monitoring features.

Technical data

TECHNICAL DATA							
Type	Air flow	Power supply	Dimensions			Power input	Air connection
	Nm^3/h	Ph / V / Hz	W [mm]	L [mm]	H [mm]	W	
RDP 20	20	1/230/50	358	455	604	150	G 3/8" BSP-F
RDP 35	35	1/230/50	358	455	604	150	G 3/8" BSP-F
RDP 50	50	1/230/50	358	455	604	180	G 3/4" BSP-F
RDP 75	75	1/230/50	358	455	604	250	G 3/4" BSP-F
RDP 100	100	1/230/50	358	455	604	360	G 3/4" BSP-F
RDP 140	140	1/230/50	486	580	904	460	G 1" BSP-F
RDP 180	180	1/230/50	486	580	904	590	G 1" BSP-F
RDP 235	235	1/230/50	486	580	904	840	G 1" BSP-F
RDP 300	300	1/230/50	486	580	904	1.200	G 1 1/2" BSP-F
RDP 380	380	1/230/50	596	735	1.104	1.400	G 1 1/2" BSP-F
RDP 480	480	1/230/50	596	735	1.104	1.900	G 1 1/2" BSP-F
RDP 600	600	1/230/50	718	697	1.405	1.900	G 2" BSP-F
RDP 750	750	3/400/50	596	735	1.104	2.700	G 2" BSP-F
RDP 950	950	3/400/50	718	697	1.405	3.800	G 2" BSP-F
RDP 1150	1.150	3/400/50	823	837	1.426	3.700	G 2 1/2" BSP-F
RDP 1300	1.300	3/400/50	823	837	1.426	4.700	G 2 1/2" BSP-F
RDP 1500	1.500	3/400/50	900	1.100	1.500		G 2 1/2" BSP-F
RDP 1900	1.900	3/400/50	900	1.100	1.500		DN80
RDP 2600	2.600	3/400/50	1.200	1.250	1.750		DN100
RDP 3400	3.400	3/400/50	1.200	1.250	1.750		DN100
RDP 4400	4.400	3/400/50	1.200	1.250	1.750		DN125
RDP 5400	5.400	3/400/50	1.350	1.800	1.850		DN125
RDP 6600	6.600	3/400/50	1.350	1.800	1.850		DN150
RDP 7200	7.200	3/400/50	1.350	1.800	1.850		DN150
RDP 8800	8.800	3/400/50	1.350	1.800	1.850		DN200
RDP 10800	10.800	3/400/50	1.600	2.300	2.500		DN200
RDP 13200	13.200	3/400/50	1.600	2.300	2.500		DN200

CORRECTION FACTOR FOR OPERATING PRESSURE CHANGES								
Operating pressure [bar]	4	5	6	7	8	10	12	14
Operating pressure [bar]	58	72	87	100	115	145	174	203
Correction factor	0,77	0,86	0,93	1,00	1,05	1,14	1,21	1,27

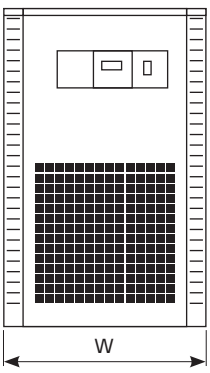
CORRECTION FACTOR FOR DEW POINT CHANGES				
Temperature [°C]	3	5	7	10
Temperature [°F]	37,4	41	44,6	50
Correction factor	1,00	1,099	1,209	1,385

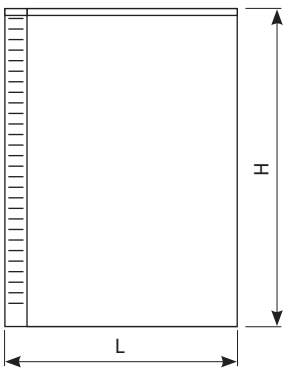
CORRECTION FACTOR FOR INLET TEMPERATURE CHANGES							
Temperature [°C]	≤25	30	35	40	45	50	55
Temperature [°F]	77	86	95	104	113	122	131
Correction factor	1,2	1,12	1	0,83	0,69	0,59	0,5

CORRECTION FACTOR FOR AMBIENT TEMPERATURE CHANGES					
Temperature [°C]	≤25	30	35	40	45
Temperature [°F]	77	86	95	104	113
Correction factor	1	0,96	0,9	0,82	0,72

Data refer to the following nominal condition:
Ambient temperature of 25°C, with inlet air at 7 barg and 35°C and 3 °C pressure Dew Point (-20,5°C atmospheric pressure Dew Point).

Max. working condition: Ambient temperature 45°C, inlet air temperature 55°C and inlet air pressure 14 barg.





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