

Product Data Sheet

Breathing Air Dryer DPS 1-8 BI und BM

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Field of application

Adsorption dryers of the DPS 1-8 BI and BM series are designed for drying and purification of compressed air for breathing air applications. ..BI stands for „Breathing air Industrial“, thus for Industrial use acc. EN12021, and ..BM stands for „Breathing air Medical“, thus medical breathing air acc. Pharmacopée Européenne, as it is demanded for hospitals.

With both systems apart from the drying process to a pressure dew point of -40°C also the components CO , CO_2 , hydrocarbons, nitrogen oxides and SO_2 are reduced so far, to residual values underneath the limit values acc. EN12021 (with series DPS..BI), respectively Pharmacopée Européenne (with series DPS..BM).

Function

For drying the compressed air, and removal of the main content of CO_2 (i.e. "adsorption"), the compressed air flow is led through a vessel filled with desiccant. The desiccant extracts moisture and CO_2 from the compressed air and stores it in its structure until the desiccant is saturated. The saturated desiccant then has to be regenerated, i.e. the moisture and CO_2 stored in the structure has to be "removed" before the desiccant can be used for drying again. Continuous operation of an adsorption dryer therefore requires two vessels that are operated alternately. One vessel is used for drying the compressed air and removal of CO_2 (adsorption) and the other vessel for regenerating the desiccant. For the DPS series the change interval between adsorption and regeneration is 5 minutes at nominal conditions.

For the regeneration a certain quantity of dried compressed air is drawn off at the dryer outlet (*approx. 15% of the nominal volume flow rate at nominal conditions*). This amount of compressed air is expanded to atmospheric pressure and is led through the vessel to regenerate the desiccant. The dried, decompressed air is extremely moisture-subsaturated and thus extracts the moisture stored in the desiccant and discharges it to the atmosphere via a silencer.



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The third vessel is filled with a mixture of special catalyst agent and activated carbon, and has the function to alter CO into CO₂, and afterwards to remove it besides SO₂ and the nitrogen oxides (NO_x).

Important is, that during the absorption the oxygen content remains in the stipulate tolerance acc. EN12021, (for DPS..BI), respectively Pharmacopee Europeene (for DPS..BM).

Features

The desiccant has a high drying capacity for moisture and CO₂, and a long service life. This ensures permanently low and stable pressure dew points and low CO₂ values.

The high quality catalyst agent and the activated carbon guarantee the compliance of the prescribed remaining values for CO, CO₂, SO₂ carbon oxides and nitrogen oxides (NO_x) acc. EN12021, respectively Pharmacopee Europeene.

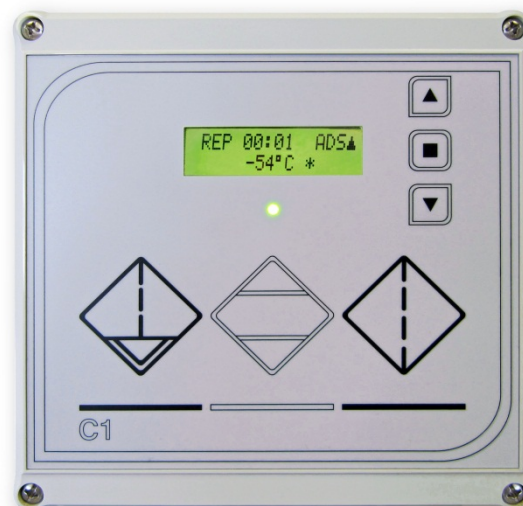
The valves and flow paths required for vessel chamber switch-over are completely installed in valve blocks. This integrated design eliminates the need for time-consuming piping installation and minimises the leak potential. Air flow cross-section sizes above average minimise the pressure loss.

The solenoid valve combination consists of 4 pilot-controlled diaphragm valves. Thanks to the individual control option for each valve, overlapping switch-over and a defined flow path is ensured at any time. The non-return valve combination consisting of 2 non-return valves is also installed in a leak-free aluminium valve block. A silencer is used for effective reduction of the expansion noise.

The valves of the DPS series are controlled by means of a type "C1" processor control system with a 2-line clear text display and 3 operating keys. The control system is installed in a plastic housing with IP65 protection. The clear text display is used for direct and easy-to-understand indication of the operating state, errors, runtimes, service messages etc. If a pressure dew point sensor (option H) is connected, the current pressure dew point of the compressed air is also directly shown on the display and provided as a 4-20 mA signal. The pressure dew point measurement (option H) allows for dew-point dependent operation of the dryer. Depending on the load of the dryer, the adsorption cycle may be extended, i.e. the switch-over frequency is adapted to the operating situation. This minimise the regeneration air consumption and thus the energy costs are minimised.

In addition, the control system provides a compressor synchronising contact. It is used for synchronous operation of the dryer and a compressor which additionally reduces the regeneration air consumption. This function can also be used in conjunction with dew point-dependent operation.

If a differential pressure monitoring system with alarm contact is fitted to the prefilter and afterfilter (option for DPS 6-8), the alarm contacts can be connected to the control system, displayed and processed.



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As standard, the breathing air unit DPS..BI (Industrial) is provided with one pre filter (superfine filter) which prevents solid and liquid contaminants from entering the dryer. This increases the service life of the dryer. As standard, the breathing air unit DPS..BM (Medical) is provided with two pre filters (fine- + superfine) which achieves still lower value of pollution and ensures a higher safeguarding for medical breathing air. An afterfilter (general purpose filter) is also provided as standard on both series. It is used to prevent desiccant and or activated carbon dust from entering the downstream system. The filters are directly flanged to the upper valve block. Therefore, piping material is not required.

The breathing air units comply with the requirements of the Pressure Equipment Directive 2014/68/EU, and some (depending on the model) have the CE marking of this European directive.

Basic data

Model	Nominal volume flow (VN) ^{*1}	Min./Max. allowable operating pressure	Min./Max. allowable operating temperature
DPS 1 BI and BM	8 m ³ /h	4 - 16 bar	+2°C - +50°C
DPS 2 BI and BM	15 m ³ /h		
DPS 3 BI and BM	25 m ³ /h		
DPS 4 BI and BM	35 m ³ /h		
DPS 6 BI and BM	57 m ³ /h		
DPS 7 BI and BM	72 m ³ /h		
DPS 8 BI and BM	82 m ³ /h		

*1 - refers to 1 bar(a) and 20°C at 7 bar operating pressure, inlet temperature 35°C and pressure dew point at outlet -40°C

Volume flow conversion factors

«F1» - Pressure in bar (g)

4 *5	5	6	7	8	9	10	11	12	13	14	15	16
0.63	0.75	0.88	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88	2.00	2.13

*5 - in the event of operating pressures below 4 bar(g), an external instrument air supply must be provided

«F2» - Inlet temperature in °C

25	30	35	40	45	50
1.00	1.00	1.00	0.97	0.87	0.80

Calculation of the converted volume flow

Converted volume flow VK	Nominal required volume flow VN _{min}
$VK = VN \times F1 \times F2$	$VN_{min} = VK / F1 / F2$

VK : Converted volume flow calculated for the operating conditions

VN_{min}: Nominal required volume flow calculated for the operating conditions, based on the volume flow at operating conditions

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Stipulated residual values acc. EN12021 / guaranteed residual values with DPS..BI

Contamination	Stipulated residual value acc. EN12021	Residual value with DPS..BI *2
Water content (H2O)	max. 50mg/m ³ at atmospheric pressure (equates at 10 bar(g) a pressure dew point of -25°C)	Pressure dew point -40°C (at 10 bar(g) = 10,6 mg/m ³)
Lubricants (oil)	< 0,5 mg/m ³	< 0,003 mg/m ³
Carbon dioxide (CO2)	< 500 ppm (< 500 ml/m ³)	< 150 ppm (< 150 ml/m ³)
Carbon monoxide (CO)	< 15 ppm (< 15 ml/m ³)	< 2 ppm (< 2 ml/m ³)
Oxygen content	21 ± 1 Vol. %	20,9 ± 0,2 Vol. %

Stipulated residual values acc. Pharmacopee / guaranteed residual values with DPS.BM

Contamination	Stipulated residual value acc. Pharmacopee	Residual value with DPS..BM *2
Water content (H2O)	67 ppm at atmospheric pressure (equates at 10 bar(g) a pressure dew point of -23°C)	Pressure dew point -40°C (at 10 bar(g) = 11ppm related to atmospheric pressure)
Lubricants (oil)	< 0,1 mg/m ³	< 0,003 mg/m ³
Carbon dioxide (CO2)	< 500 ppm (< 500 ml/m ³)	< 150 ppm (< 150 ml/m ³)
Carbon monoxide (CO)	< 5 ppm (< 5 ml/m ³)	< 2 ppm (< 2 ml/m ³)
Nitrogen dioxide (NO2)	< 2 ppm (< 2 ml/m ³)	< 1 ppm (< 1 ml/m ³)
Nitrogen monoxide (NO)	< 2 ppm (< 2 ml/m ³)	< 2 ppm (< 2 ml/m ³)
Nitrogen oxide (NOx)	< 1 ppm (< 1 ml/m ³)	< 1 ppm (< 1 ml/m ³)
Sulphur dioxide (SO2)	< 0,1 ppm (< 0,1 ml/m ³)	< 0,1 ppm (< 0,1 ml/m ³)
Oxygen content	20,9 ± 0,5 Vol. %	20,9 ± 0,2 Vol. %

*2 – To guarantee the residual values of CO2, CO and Oxygen, are inlet values considered as they are in our standard environment, without higher industrial pollutions :
(CO2 : 300-600 ppm, CO< 20 ppm , O2 : 20,942%)

Maintenance rules

	Maintenance interval and maintenance activities
All Models	<ul style="list-style-type: none"> ■ Once a week : <ul style="list-style-type: none"> - Check differential pressure on the prefilter and afterfilter - Check function of the condensate drain on the prefilter ■ Yearly : <ul style="list-style-type: none"> - Replace filter elements on prefilter and afterfilter - Check expansion silencer, clean or replace, if required - Calibrate dew point sensor (option H) (interchange principle possible) ■ Every 2 years <ul style="list-style-type: none"> - Replace catalyst and activated carbon in the 3rd column*3 and replace demister and seals. - Replace pilot valves of main inlet and expansion valves. ■ Every 4 years: <ul style="list-style-type: none"> - Replace desiccant (Activated Alumina F200) on first 2 vessels *3 and demister and seals - Replace solenoid coils

*3 – The desiccant, the catalyst and the activated carbon must be disposed of according to the European waste code.
A possible oil contamination must be taken into account.

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Product specific data

Specification	
Pressure dew point and residual values	see page 4
Electrical connection	230V 50/60 Hz, alternative 115V 50/60Hz or 24V DC
Power consumption	< 50 Watt
Protection Class	IP 65 (Nema 4)
Valve switching power (for each valve)	20 Watt

Materials

Component	
Extruded aluminium profile	Aluminium AlMg0,7Si, Chrome III passivated (free of chrome VI)
Valve block housing	Aluminium AlMg , anodised
Coating (Aluminium profile outside)	1-component power coating on polyester resin basis (free of TGIC), layer thickness approx. 80 µ
Demister	Stainless steel 304
Valve body, valve seats	Brass, plastic
Sealing materials	NBR, PA (polyamide)
Screws	5.6 steel, zinc-plated
Pipe connection	None (flow paths are integrated in the valve block)
Adjustable feet, wall bracket	Steel, zinc-plated
Desiccant filling	Vessel 1&2 : F200 (special activated Alumina) Vessel 3 : Carulite (catalyst) and activated carbon
Mounted prefilter and afterfilter	See product data sheets for filter housing and filter elements

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Connections, dimensions and weight (including prefilter and afterfilter)

DPS..BI

Model	Connection	Height	Width	Depth	Weight
DPS 1 BI	G 3/8	450 mm	412 mm	185 mm	14 kg
DPS 2 BI	G 3/8	625 mm	412 mm	185 mm	20 kg
DPS 3 BI	G 3/8	875 mm	412 mm	185 mm	27 kg
DPS 4 BI	G 3/8	1125 mm	412 mm	185 mm	35 kg
DPS 6 BI	G 1/2	1180 mm	614 mm	220 mm	65 kg
DPS 7 BI	G 1/2	1405 mm	614 mm	220 mm	78 kg
DPS 8 BI	G 1/2	1605 mm	614 mm	220 mm	90 kg

DPS ..BM

Model	Connection	Height	Width	Depth	Weight
DPS 1 BM	G 3/8	450 mm	502 mm	185 mm	15 kg
DPS 2 BM	G 3/8	625 mm	502 mm	185 mm	21 kg
DPS 3 BM	G 3/8	875 mm	502 mm	185 mm	28 kg
DPS 4 BM	G 3/8	1125 mm	502 mm	185 mm	36 kg
DPS 6 BM	G 1/2	1180 mm	704 mm	220 mm	66 kg
DPS 7 BM	G 1/2	1405 mm	704 mm	220 mm	79 kg
DPS 8 BM	G 1/2	1605 mm	704 mm	220 mm	91 kg

Classification according to Pressure Equipment Directive 2014/68/EU for group 2 fluids

Model	Volume	Category	Marking	Commissioning inspection*4	Routine inspection*4
DPS 1	1.2 litre	Art.3 Par.3	---	---	---
DPS 2	2.2 litre	Art.3 Par.3	---	---	---
DPS 3	3.7 litre	I	CE	AP*5	---
DPS 4	5.1 litre	I	CE	AP*5	---
DPS 6	8.5 litre	I	CE	AP*5	---
DPS 7	10.5 litre	I	CE	AP*5	---
DPS 8	12.5 litre	I	CE	AP*5	---

*4 - In Germany defined by the Ordinance on Industrial Safety and Health of September 27th, 2002 (BGBl. I p. 3777) §14 and §15

*5 - Inspection by Authorised Person (AP) or Notified Body (NB)

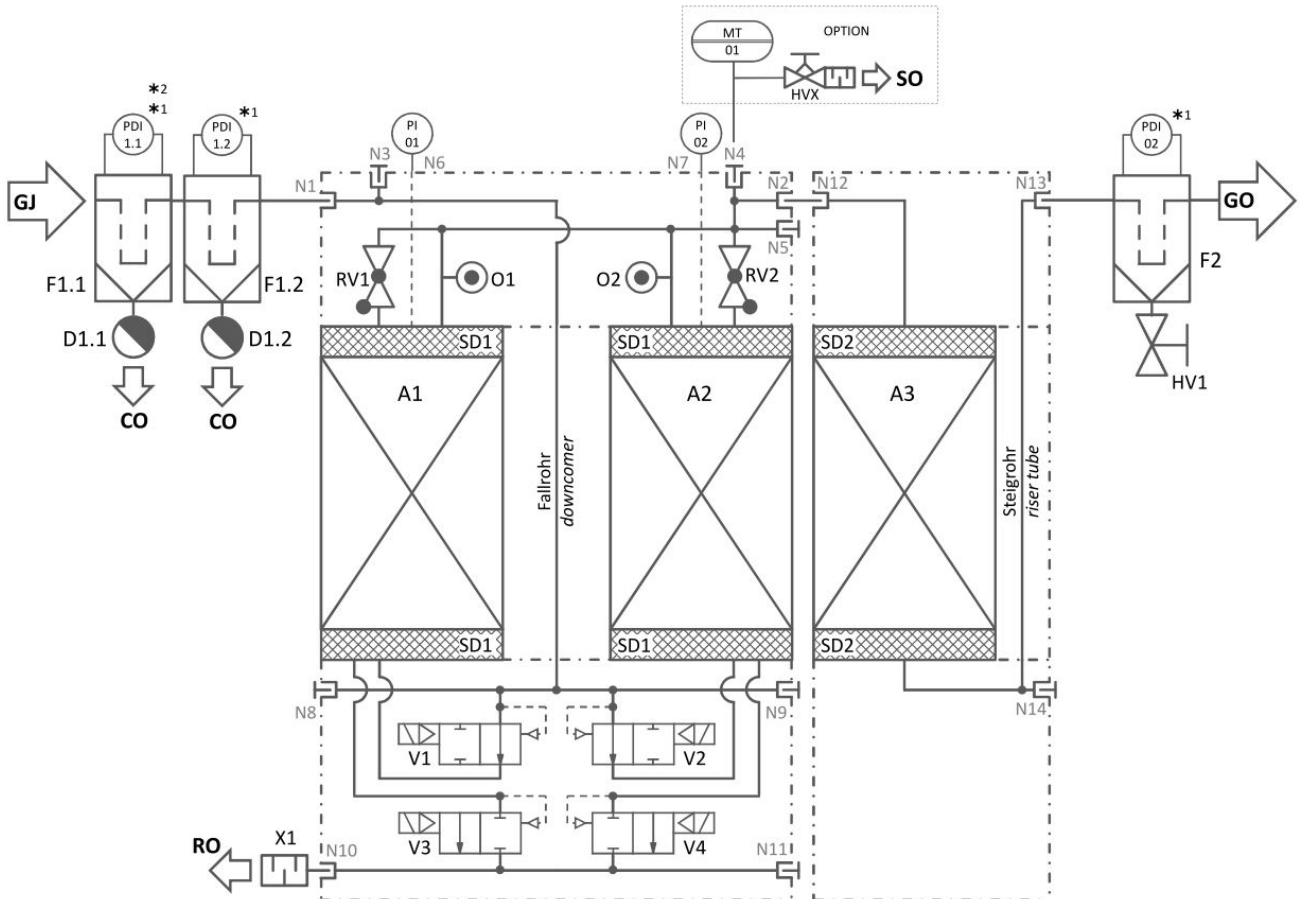
Other Directives

Model	
All Models	<p>EMC-Standard (inspection scope for control system, solenoid valves and dew point measurement): <i>Emitted interference acc. : EN 55011:1998 + A1:1999 + A2:2002 (limit value class: B)</i> <i>EN 61000-3-2:2006-04, EN61000-3-3:2008</i> <i>Interference resistance acc. : EN 61000-6-2:2005</i></p> <p>Machinery Directive 2006/42/EC is not applicable.</p>

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Flow diagram (PID)



*1 = DPI only with DPS 6 - 8
*2 = 2.nd prefilter only with DPS..BM

- | | |
|--------------|---|
| A 1+2 | Dryer vessel |
| A 3 | Purifier vessel |
| F | Filter |
| V | Valve |
| HV | Manual valve |
| RV | Non return valve |
| SD | Demister |
| X | Silencer for expansion |
| D | Condensate drain |
| O | Orifice for regeneration air flow |
| PI | Pressure gauge |
| DPI | Differential pressure gauge |
| MT | Pressure dew point transmitter (option) |
| GJ | Gas inlet |
| GO | Gas outlet |
| RO | Regeneration air outlet |
| CO | Condensate outlet |

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Accessories



The **DA-CM1-230 switch-over control system** enables the control of two redundant compressed air dryers in a compressed air system. The two dryers can be operated alternately while switching-over automatically. All dryers, provided with a «remote start/stop contact» or a «compressor synchronisation contact», can be directly connected to the switch-over control system without the need for any further modifications. The DA-CM1-230 also controls all required shut-off valves (no scope of supply) to open or close the compressed air line to a dryer (e.g. solenoid valves or valves with actuating drive for 230V AC supply voltage). Furthermore, additional input signals can be hooked up to the common alarm message of each dryer. Beside the power supply the DA-CM1-230 provides alarm inputs for condensate drains, differential pressure gauges, etc. for each dryer.



The **GSM Module DA-ETR-107** is an easy to install extension for all dryers with alarm contact. In case of an alarm a SMS message is send to up to 6 different recipients or, if supported by the provider, an email message. Within the message, the dryer type and serial number is transferred, if required.

The programming can be done with a usual mobile phone, protected by the PIN code of the SIM card (no scope of supply) applied to the GSM module. The DA-ETR-107 is operated with 5-32V DC supply voltage. An internal battery ensures operation of up to 120 hours in case of loss of the supply voltage. The GSM module has an integrated antenna while an external antenna can be connected in the case of low signal levels.



The **Start-up device (minimum pressure valve) DA-VPM-...** protects the dryer from overload due to high flow velocities during pressure build-up of the compressed air system. For connection size G ½ to G 2½ spring loaded angle valves are offered (DA-VPM-B../16), providing an opening pressure of 3-5 bar (standard 3.5 bar). For connection size DN80 to DN250 butterfly valves with pneumatic actuator are offered (DA-VPM-F../11), directly operated by the working pressure while opening at 3 bar (full cross-section at 4 bar). Special versions with adjustable opening pressure or working pressures of up to 450 bar are available on request.



Differential pressure gauges FAD01C with potential free alarm contact allow to hook up the differential pressure control of the pre- and after-filter to the common alarm message of each dryer. In order to avoid a false error report due to start-up conditions or short-time peaks, an alarm delay can be set in the dryer control unit. The alarm message then will just be generated, if a too high differential pressure was indicated during the entire delay time interval.

... and many more. Please contact us.