


AD-SP

- Air Dryer
User Manual
Version 001



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1 About This Manual

This manual enables safe and efficient handling of the device.

This manual is an integral part of the device, and must be kept in close proximity to the device where it is permanently accessible to personnel. In addition, instructions concerning labor protection laws, operator regulations tools and supplies must be available and adhered to.

Before starting any work, personnel must read the manual thoroughly and understand its contents. Compliance with all specified safety and operating instructions, as well as local accident prevention regulations, are vital to ensure safe operation.

The figures shown in this manual are designed to be general and informative and may not represent the specific Bruker model, component or software/firmware version you are working with. Options and accessories may or may not be illustrated in each figure.

1.1 Policy Statement

It is the policy of Bruker to improve products as new techniques and components become available. Bruker reserves the right to change specifications at any time.

Every effort has been made to avoid errors in text and figure presentation in this publication. In order to produce useful and appropriate documentation, we welcome your comments on this publication. Support engineers are advised to regularly check with Bruker for updated information.

Bruker is committed to providing customers with inventive, high quality products and services that are environmentally sound.

1.2 Symbols and Conventions

Safety instructions in this manual are marked with symbols. The safety instructions are introduced using indicative words which express the extent of the hazard.

In order to avoid accidents, personal injury or damage to property, always observe safety instructions and proceed with care.

DANGER



DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

This is the consequence of not following the warning.

1. This is the safety condition.
 - ▶ This is the safety instruction.

WARNING



WARNING indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

This is the consequence of not following the warning.

1. This is the safety condition.
 - ▶ This is the safety instruction.

CAUTION



CAUTION indicates a hazardous situation, which, if not avoided, may result in minor or moderate injury.

This is the consequence of not following the warning.

1. This is the safety condition.
 - ▶ This is the safety instruction.

NOTICE

NOTICE indicates a property damage message.

This is the consequence of not following the notice.

1. This is a safety condition.
 - ▶ This is a safety instruction.

SAFETY INSTRUCTIONS

SAFETY INSTRUCTIONS are used for control flow and shutdowns in the event of an error or emergency.

This is the consequence of not following the safety instructions.

1. This is a safety condition.
 - ▶ This is a safety instruction.



This symbol highlights useful tips and recommendations as well as information designed to ensure efficient and smooth operation.

2 Introduction

The supply air for a BCU-Xtreme (BRUKER part number W1212749) must be very dry to ensure its correct operation.

The air dryer AD-SP was especially designed to be used with the BCU-Xtreme and possibly supply a spectrometer requiring very dry air. It is designed to produce air with a very low dew point temperature.



Figure 2.1: New AD-SP Air Dryer and Buffer Tank

Two voltage versions of the dryer AD-SP exist:

- Part number **W1215319**
AD-SP line voltage 230V/50 Hz - 0.2 A delivered with a power cord L = 2 m (P/N 69599) and Europe plug 230V.
- Part number **W1215320**
AD-SP line voltage 115V / 60 Hz - 0.4 A delivered with a power cord L = 2 m (P/N 35929) and US plug 115V.

2.1 Main Components and Parts Location

The main inlet of the dryer is on the left side and the dry gas outlet is on the right side. It has a dew point meter that shows the pressure dew point of the outlet air.

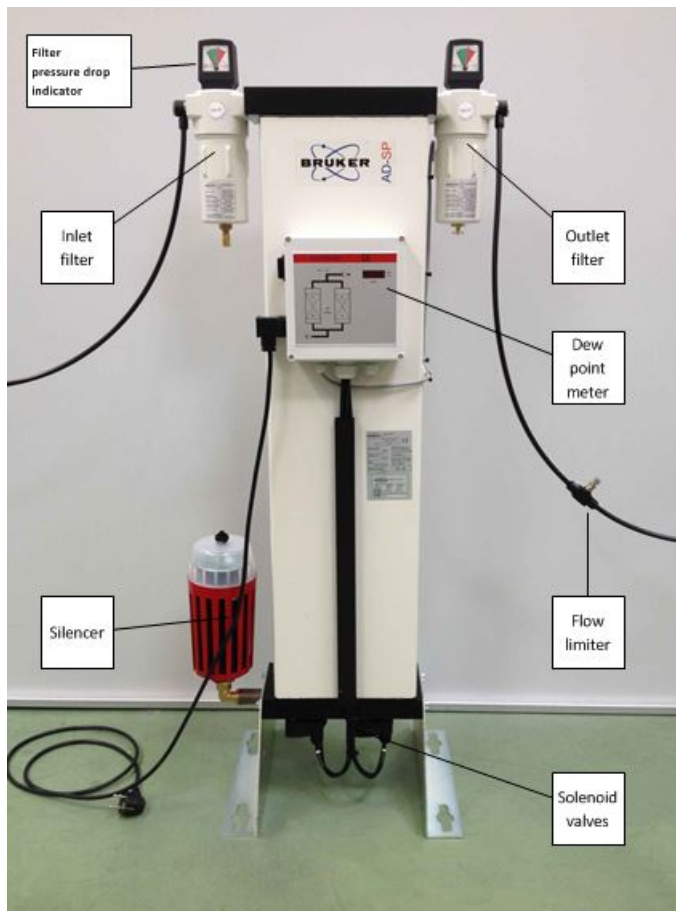


Figure 2.2: Components Identification

3 Safety

Electrical

WARNING



Danger of injury from electrical shock!

A life threatening shock may result when the housing is open during operation.

- ▶ Only qualified personnel should open the housing.
- ▶ Disconnect the device from the electrical power supply before opening the device. Use a voltmeter to verify that the device is not under power!
- ▶ Be sure that the power supply cannot be reconnected without notice.

Strong magnetic field

WARNING



Risk to life due to strong magnetic fields.

Strong magnetic field can cause serious injuries or even death, or significant damage to property.

1. The dryer can be attracted by a strong magnet.
 - ▶ Keep the dryer away from the magnet stray field.

WARNING



Risk to life due to strong magnetic fields.

Strong magnetic field can cause serious injuries or even death, or significant damage to property.

1. The devices electronics contains several relay that are sensitive to strong magnetic fields.
 - ▶ Install the device away from magnet stray fields to avoid a malfunction.

4 Technical Data

4.1 Dew Point

The dew point is the temperature of a surface on which moisture condenses.

The **adsorption dryer AD-SP** adsorbs the moisture of the compressed air up to a pressure dew point of -70°C. The dew point is much lower than standard commercial air dryers.

4.2 Compressed Air Supply

4.2.1 Supply Air Quality

The compressed air for the dryer is provided by an autonomous air compressor delivering clean, dehumidified air (by an after cooler for example) without presence of oil or of dust.

4.2.2 Inlet Pressure

Pressure range: 6 to 10 bar.

4.2.3 Air Inlet and Outlet Ports

8 mm quick couplings ("Legris" type).

4.3 Ambient Conditions

Maximum inlet air temperature: +35 °C (+95°F)

Ambient temperature: +1°C to 35°C (+95°F) max.

4.4 Air Flow

The outlet air flow should not exceed 220 l/min which is the maximum gas flow rate.

Regenerating air is used to reach a very low dew point ~190 NI/min.

Inlet air flow: 11400 min to 24600 NI/hr

Exceeding the maximum flow rate may permanently damage the desiccant material of the dryer.

4.5 Dew Point Meter

An electronic dew point meter with a display is located on the dryer housing. Its range is from -100 °C (-148°F) to +20 °C (+68°F). The dew point meter should be calibrated periodically to ensure its accuracy.

4.6 Silencer

The exhaust is equipped with a silencer (it reduces the noise level by 40 dB). It is mounted in vertical position with a union elbow.

4.7 Inlet and Outlet Filters

4.7.1 Inlet Air Filter

BRUKER Part number: W117288

The inlet air filter removes the residual dust and the oil droplets. It extends the lifespan of the dryer desiccant material. The inlet filter holder is equipped with an automatic drain which evacuates the condensates.



Figure 4.1: Inlet Filter P/N W117288

4.7.2 Outlet Air Filter

BRUKER Part number W117289.

The outlet filter stops desiccant particles that may escape from the dryer columns.

4.8 Mechanical Dimensions

Height	1185 mm
Width	629 mm
Depth	300 mm
Weight	72 kg approx.
Color	Grey color RAL9002.

Table 4.1: Mechanical Dimensions

4.9 Scope of Supply

Part Number	Description	Comments
56758	Air dryer 230V/50 Hz220l/min @-70°C dew point	With W1215319 only
69599	Power line cable Europe, 2 m	With W1215319 only
56757	Air dryer 115/60 Hz 220l/min @-70°C dew point	With W1215320 only
35929	Power line cable US, 2 m	With W1215320 only
45984	Hose 8 mm HDPE black	0.85 m
34548	Needle valve	flow limiter for start-up
W143644	Manual AD-SP maintenance	
W1215321	Buffer tank 20l	With 8 mm fittings

Table 4.2: Scope of Supply

5 Transport, Packaging and Storage

5.1 Packaging

The individual packages are packaged in accordance with anticipated transport conditions. Only environmentally friendly materials have been used in the packaging. The packaging is intended to protect the individual components from transport damage, corrosion and other damage prior to assembly.

Therefore do not destroy the packaging and only remove it shortly before assembly.

Handling Packaging Materials

Dispose of packaging material in accordance with the relevant applicable legal requirements and local regulations.

5.2 Inspection at Delivery

Upon receipt, immediately inspect the delivery for completeness and transport damage. Proceed as follows in the event of externally apparent transport damage:

- Do not accept the delivery, or only accept it subject to reservation.
- Note the extent of the damage on the transport documentation or the shipper's delivery note.
- Initiate complaint procedures.

5.3 Storage of the Packages

Store the packages under the following conditions:

- Do not store outdoors.
- Store in dry and dust-free conditions.
- Do not expose to aggressive media.
- Protect against direct sunlight.
- Avoid mechanical shocks.
- Storage temperature: 15 to 35 °C.
- Relative humidity: max. 60%.
- If stored for longer than 3 months, regularly check the condition of all parts and the packaging. If necessary, top-up or replace preservatives.

Under certain circumstances, storage instructions may be affixed to packages which expand the requirements specified here. Comply with these accordingly.

6 Installation



Installation, initial commissioning, retrofitting, repairs, adjustments or dismantling of the device must only be carried out by Bruker Service or personnel authorized by Bruker. Damage due to servicing that is not authorized by Bruker is not covered by your warranty.

6.1 Pre-installation Guidelines

For the installation of the AD-SP it is necessary to select an appropriate location and make the required provisions for the safe operation of the instrument.

A new dryer is delivered assembled and is ready to be used. It must be firmly fixed on the floor or attached on a wall with its attachments and suitable screws.

The dryer must be installed in a room whose temperature is always above +1°C (56°F) to avoid the internal icing. It must not be exposed to humidity coming from rain or other atmospheric influences.

6.2 Fixing the Air Dryer on the Floor

Fix both attachments with suitable screws on the floor.

6.3 Fixing the Air Dryer on the Wall

The attachments on both sides must be rotated to permit the wall fixing. Follow the procedure below:

- Remove the silencer with its elbow.
- Detach the left and right attachments from housing.
- Turn 90° the attachments towards the wall and lock them.
- Reinstall the silencer on housing.
- Fix the dryer unit with suitable screws on the wall.

The air dryer must be easily accessible for its periodic maintenance (filter replacement, desiccant replacement, etc.). A one meter clearance above and all around the dryer is required to facilitate the maintenance.

6.4 Dew Point and Pressure Information

The dew point at the dryer's outlet depends also on the input air pressure, the higher the input pressure the lower the dew point.

The dew point meter measures the pressure dew point (at the inlet pressure).

The BCU-Xtreme uses air at a lower pressure than the pressure of the compressed air network, typically up to 3 barg according to the type of NMR probe.

For this reason the actual dew point is lower than indicated by the electronic dew point meter.

The table below gives the actual dew point temperature versus inlet pressure.

The coldest internal parts of the BCU-Xtreme exchanger are typically at $-83 \pm 2^{\circ}\text{C}$. The cells of the table in bold are the cases where there is no frost or ice formation in the exchanger because the real dew point is below -83°C .

Dryer inlet pressure (barg)	Dew point indicated by hygrometer ($^{\circ}\text{C}$)	Real dew point at 0 barg ($^{\circ}\text{C}$)	Real dew point at 1 barg ($^{\circ}\text{C}$)	Real dew point at 2 barg ($^{\circ}\text{C}$)	Real dew point at 3 barg ($^{\circ}\text{C}$)
	-70	-82.3	-77.7	-75.1	-73.3
6	-75	-85.8	-82.3	-79.9	-78.1
	-80	-90.3	-87.0	-84.6	-83.0
	-70	-83.7	-79.5	-76.9	-75.1
8	-75	-88.1	-84.0	-81.6	-79.9
	-80	-92.5	-88.6	-86.3	-84.6
	-70	-84.9	-80.8	-78.3	-76.5
10	-75	-89.2	-85.3	-82.9	-81.2
	-80	-93.5	-89.8	-87.5	-85.9

1 barg = 2 bar absolute

Table 6.1: Dew point versus inlet pressure @25°C

If the real dew point temperature is a slightly above -83°C , the BCU-Xtreme will nevertheless function for long period of time because the dry air contains only a negligible quantity of moisture.

The AD-SP dryer was largely dimensioned and one generally reaches a dew point lower than -80°C . It guarantees the correct operation of BCU-Xtreme under various operating conditions.

6.5 Hose Connections

Two fast union elbows for plastic hoses are screwed on the inlet and outlet filters holders (Diameter 8 mm - threading 3/8" LEGRIS code 3118 08 17) directed downwards. The inlet is located at the left side of the dryer (see the figure in [Main Components and Parts Location \[8 \]](#)).

It is recommended to use Polyethylene hoses High Density (HDPE) - external diameter 8 mm to connect the dryer /buffer outlet to the variable temperature unit to the BCU-Xtreme.

This plastic material is impermeable to moisture and avoids the dew point degradation. One prevents thus a dysfunction or even a possible blockage of the BCU-Xtreme.

6.6 Dew Point Meter Display

The digital dew point meter displays the dew point in degree °C or °F (for 115 Volt version). The range is from -100 °C (-148°F) and +20 °C (+68°F).

It measures the dew point under pressure (i.e. the inlet air pressure of the dryer).

6.7 Dew Point Meter Messages

The dew point meter display shows the following messages in case of problem.

Display	Description
+20	Dew point is above high limit
999	Sensor failure
No display	Sensor failure or missing line voltage
-999	Sensor failure
Blinking display	Dew point alarm indication (if it is higher than -65°C/ -85°F)
SEr	When this service message blinks a dryer maintenance is required (every 8000 hours)

Table 6.2: Dew point meter error messages

6.8 Electrical Connections



CAUTION

Risk of equipment damage due to improper voltage.

The electronics will be damaged by overvoltage when the improper voltage is used.

- ▶ Ensure that the line voltage is the same as the voltage marked on the device unit label.

Electrical connections:

- Connect the power cord to a socket-outlet.
- The ON/OFF switch of the hygrometer MULTITRONIC must be in POSITION I (position FIX on label).
- POSITION "0" the dryer is OFF and the power supply is switched OFF.
- In POSITION II, the dryer functions in variable mode (not to be used, this position is planned for other uses).

6.9 Noise

The dryer periodically every five minutes emits a brief noise when the expansion valve opens after a column switching. A damped explosion noise is emitted, attenuated by the silencer.

7 Operation

A very low dew point is obtained only after a several operating hours.

We highly recommend to operate a fresh dryer unit for a certain time with air consumption to obtain a dew point of at least -70°C (-94°F) before connecting it on a BCU-Xtreme or a spectrometer.

The air flow rate should not exceed 220 liter/min to avoid the damaging of the desiccant material.

7.1 Stand-by Mode

NOTICE

Material Damage Due To Moisture

The device may be damaged if the desiccant is saturated with moisture.

- ▶ Whenever air flows through the device, always power **ON** the unit to enable its normal operation.
- ▶ If the device is disconnected or stored, disconnect the inlet and outlet hoses and close both fittings with plugs to avoid the ingress of moisture in the unit. If the fittings are left open, moisture may saturate the desiccant and possibly damage the desiccant that must be replaced

7.2 First Startup with the Flow Limiter

The dryer is delivered with a 8 mm plastic hose with a flow limiter factory pre-set to 50 liter/min. This hose is connected between the inlet and the outlet ports for the shipment (see figure 2.1 in the chapter [Introduction](#) [7]).

The flow limiter is intended to be used only for the first start-up.

- Connect the hose with the limiter to the outlet of the dryer. The correct flow direction is indicated by an arrow on the flow limiter.
- Supply the dryer with compressed air. The air escapes freely into the atmosphere.
- Power **ON** the dryer unit.
- During the first start-up phase, the dew point will slowly decrease and reach -70°C after only several hours. If the dew-point is above -65°C the display blinks.

The flow limiter is only necessary for the first start-up phase. It limits simply the flow rate through the unit. It must be removed when the dryer is connected on the final equipment.



Figure 7.1: Dryer with Buffer with Flow Limiter

7.3 Buffer Tank

The buffer tank is delivering dry air with steady properties even after the column switching.

Remove then the flow limiter and connect the dryer outlet directly to the upper "IN" fitting of the air buffer tank.

Connect the lower outlet of the buffer (W1215321) to the equipment supplied with the dry air.



Figure 7.2: Dryer Outlet Connected to Buffer Tank

8 Troubleshooting

Problem	Possible cause	What to do?
Pressure drop indicator is in red zone	Air filter is clogged	Replace air filter
Display blinks with message "Ser"	Service is required	Service is required every 8000 hours. Service counter is reset.
Noise, sizzling	Solenoid valve vibration	Replace all valves diaphragms and valve plungers
Bad dew point	Desiccant damaged or saturated with moisture	Replace all air filters and desiccant
Bad dew point	Valve rubber diaphragm damaged or cracked	Replace all valve diaphragms

Table 8.1: Troubleshooting Chart

9 Maintenance

CAUTION



Equipment Damage Due to Improper Maintenance

The device may not function properly after an incorrect maintenance operation.

- ▶ The maintenance work must be made by qualified and authorized personnel.
- ▶ The device must not be under pressure and the line voltage must be removed before any intervention.

The dryer unit needs periodic maintenance to keep its performances.

9.1 Every Month

Check the correct operation of the drainer of the inlet filter. The drainer eliminates the condensates automatically as soon as the liquid level threshold is reached. One can check the correct operation of the drainer while turning the knurled screw located at the bottom of the filter holder (to be turned left). If it functions correctly, a little amount of condensates and air leave. If it does not function correctly, it can be either be blocked or possibly have also a permanent leak.

Check that both air filters are not clogged (pressure drop indicator must be in green zone).

9.2 Every Year

Both inlet and outlet filters should be replaced by new filters. The filter holder must be unscrewed to access the filter. Install a new filter and close the filter holder.

12 months maintenance kit is: **W117567**

9.3 Every 24 Months

Same as the yearly maintenance plus replacement of desiccant material.

24 months maintenance kit is: **W117569** same as 12 months plus new desiccant.

9.4 Solenoid Valves

Set of replacement solenoid valves diaphragms and valve plungers. These parts must be replaced when the dryer becomes noisy.

Part number is: **1801833**

9.5 Spare Parts

Part number	Description	Comments
1801850	Reset counter chip	Cannot be ordered separately
W117288	Inlet filter	Cannot be ordered separately
W117289	Outlet filter	Cannot be ordered separately
1801843	Silencer filter	Cannot be ordered separately
1801838	Desiccant 4 kg	Cannot be ordered separately
1801837	Desiccant 1 kg	Cannot be ordered separately
1801833	Set of replacement solenoid valves diaphragms	Contains four valve diaphragms
W117567	12 months maintenance kit is	1801850 +W117288 +W1172289 +1801843
W117569	24 months maintenance kit is	1801850 + W117288 +W1172289 +1801843 +(3 x1801838) +1801837+(2 x1829899 = filter plate)

Table 9.1: Spare Parts List

10 Dismantling and Disposal

Following the end of its operational life, the AD-SP must be dismantled and disposed of in accordance with the environmental regulations.



Installation, initial commissioning, retrofitting, repairs, adjustments or dismantling of the device must only be carried out by Bruker Service or personnel authorized by Bruker. Damage due to servicing that is not authorized by Bruker is not covered by your warranty.

10.1 Dismantling

Before starting dismantling:

1. Shut down the device and secure it to prevent restarting.
2. Disconnect the power supply from the device. Disconnect all air lines.
3. Dispose of in accordance with the environmental regulations.
4. Clean assemblies and parts properly and dismantle in compliance with applicable local occupational safety and environmental protection regulations.

10.2 Disposal

If no return or disposal agreement has been made, send the dismantled components for recycling.

- Scrap metals.
- Send plastic elements for recycling.
- Sort and dispose of other components in accordance with their material composition.

11 Contact

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Please refer to the Model No., Serial No. and Internal Order No. in all correspondence regarding the NMR system or components thereof.

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