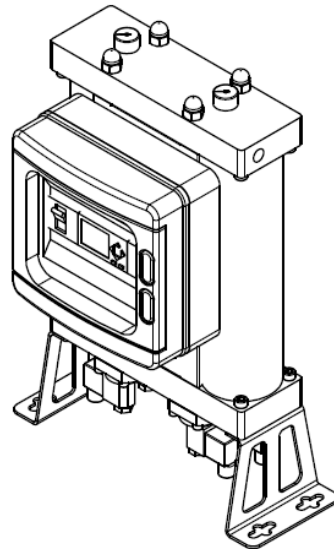


# Installation and operating manual

A-DRY Adsorption Dryer Series with PLC Controller



Please read the following instructions carefully before installing adsorption dryer into service. Trouble free and safe operating of the adsorption dryer can only be guaranteed if recommendations and conditions stated in this manual are respected.

In case of questions please contact manufacturer or your local supplier and specify data from typeplate which can be found on front side of the dryer.

CE



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## 1 General information

### 1.1 Device information

Adsorption dryer model:

Serial number:

Year of production:

Commissioning date:

Type of towers:

Left tower serial number:

Right tower serial number:

Please fill in the fields accordingly. Correct information enables proper and efficient maintenance of the device, selection of spare parts and technical support.

### 1.2 Supplier information

Name:

Address:

Telephone/Fax:

e-mail:

### 1.3 Basics

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 ISO8573-1 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 while for lower pressure dew points adsorption (also called desiccant) dryers are typically used.

### 1.4 Adsorption Dryers

Typical applications for the adsorption dryers are outdoor installations where the risk of freezing occurs and applications with high quality requirements in terms of air dryness (PDP < +3°C) such as the process air in process industry (food and beverage, pharmaceutical, electronic, chemical, ...).

The most common adsorption dryers are heatless regeneration adsorption dryers due to their simplicity, reliability and relatively low investment costs.

### 1.5 Adsorption

Adsorption is a process where specific molecules adhere to the surface of a highly porous solid (adsorbent/desiccant) by electrostatic and molecular forces. The adsorbent is normally formed in sphere form beads. Process of adsorption takes place while air flows through column filled with the beads. Rate of adsorption depends on several factors (type of adsorbent, relative humidity, inlet temperature, contact time, face velocity) and therefore adsorption process is usually set/optimized for every individual application.

## 1.6 Appropriate use



A-DRY series desiccant dryers are intended for highly efficient preparation of top quality dry compressed air. This appliance must be used only for the purpose for which it was specifically designed. All other uses are to be considered incorrect.

Specifically:

- Desiccant dryer can only be used for “GROUP 2” fluids (PED 97/23).
- Desiccant dryer can not be used for explosive, toxic, flammable, corrosive and “GROUP 1” fluids (PED 97/23).

Warning: internal corrosion can seriously reduce the safety of installation: check it during maintenance.

The manufacturer will under no circumstances be responsible for any damage resulting from improper, incorrect or unreasonable use.

Use genuine spare parts only. Any damage or malfunction caused by the use of non-genuine parts is not covered by Warranty or Product Liability.

## 2 Safety instructions



Improper handling of compressed air systems/equipment and electric installations/equipment may result in a serious injury or death



Improper handling (transportation, installation, use/operation, maintenance) of A-DRY series dryer may result in serious injury or death. As a result of improper handling damage or reduced performance can occur.



The relevant safety at work and accident prevention regulations, plus operating instructions, shall apply for operating the adsorption dryer. The adsorption dryer has been designed in accordance with the generally recognized rules of engineering. It complies with the requirements of directive 97/23/EC concerning pressure equipment.



Ensure that installation complies with local laws for operation and routine testing of pressure equipment at the place of installation.



Operator/user of the adsorption dryer should make himself familiar with the function, installation and start-up of the unit.

All the safety information is always intended to ensure your personal safety. If you are not experienced in such systems please contact your local representative or manufacturer of the dryer for help.



## A-DRY with PLC Controller - Installation and Operating Manual

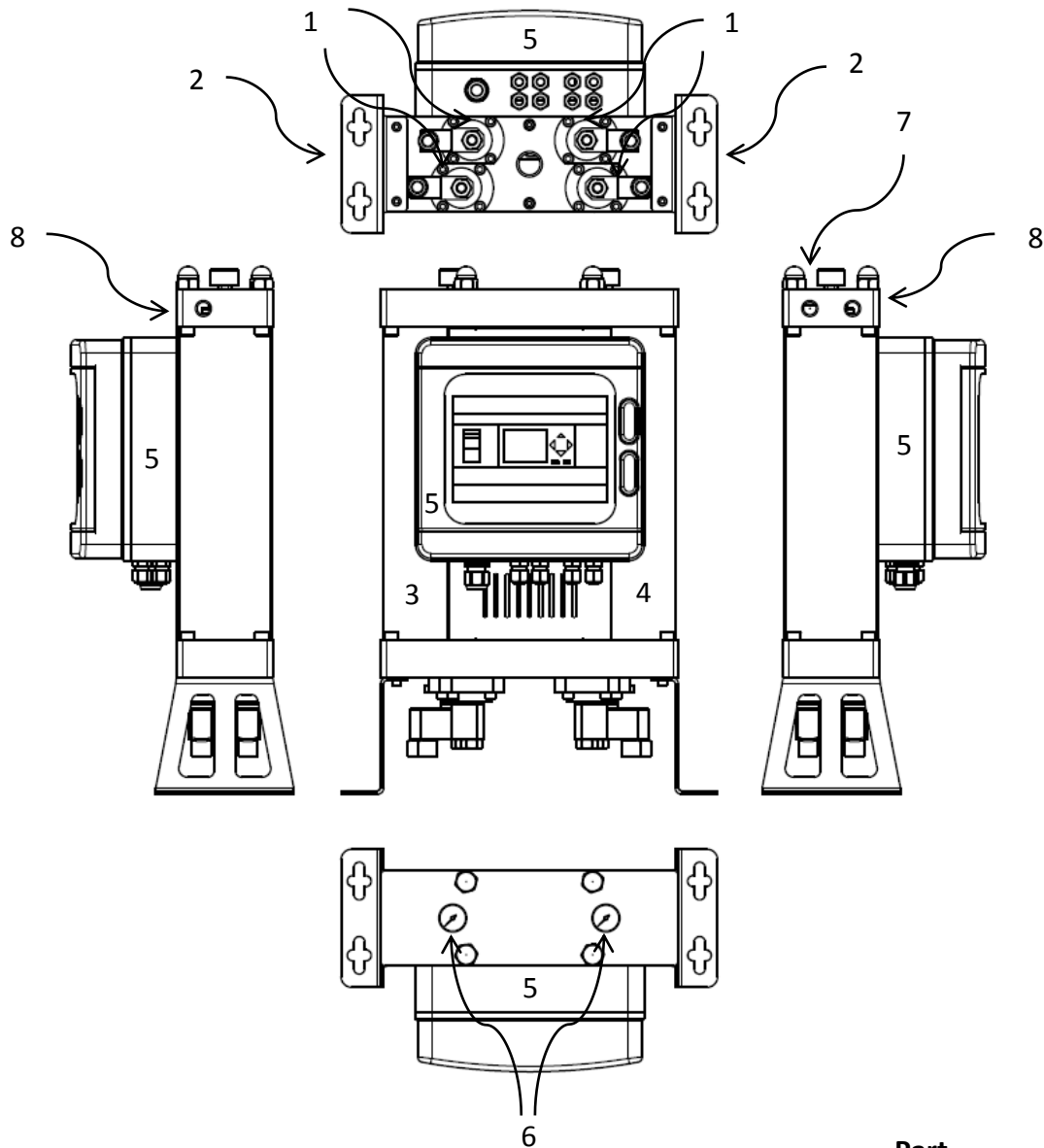
- Before any kind of work on the dryer make sure that it is depressurized (in addition to dryer this also refers to the nearest upstream and downstream part of the installation) and disconnected from power supply.
- Do not exceed maximum operating pressure or operating temperature range (see the technical data in this manual or the data sheet).
- The permissible working temperatures and pressures for the adsorption dryer add-on parts are given under Technical data for those add-ons. Maximum temperature and pressure for assembled system is the lowest of any individual part.
- It is necessary to ensure that the adsorption dryer is equipped with the corresponding safety and test devices to prevent the permissible operating parameters from being exceeded.
- Ensure that the adsorption dryer is not subject to vibrations that could cause fatigue fractures.
- Adsorption dryer is not to be subjected to mechanical stresses.
- The medium used may not have any corrosive components that could attack the materials of the adsorption dryer in a way that is not permitted. Do not use the adsorption dryer in hazardous areas with potentially explosive atmospheres.
- All installation and maintenance work on the adsorption dryer may only be carried out by trained and experienced specialists.
- Make sure that the 4 nuts on the top of the dryer are tightly screwed after any installation or maintenance work.
- It is forbidden to carry out any kind of work on the adsorption dryer, including welding and constructional changes, etc.
- Depressurize the system before carrying out the installation work.
- Wear respiratory protective equipment when working with the molecular sieve. Molecular sieve is a crumbling material that is producing fine dust which can cause respiratory complications if inhaled in sufficient quantities.
- Ensure that the molecular sieve does not come into contact with the liquid water. Unused molecular sieve in liquid water produces thermal energy that can cause the water to boil and can inflict serious burns.

## A-DRY with PLC Controller - Installation and Operating Manual

- At manipulation with adsorbent some amount of adsorbent can stay on the floor. In case of adsorbent on the floor be extremely careful and immediately clean the floor to prevent injuries due to the fall on the slippery surface.
- Ensure that the adsorption dryer is installed as specified and without any stresses.
- Use the original spare parts only.
- Use the device for the intended purpose only.
- Centre of gravity is positioned relatively high meaning there is a risk of tilting the dryer, which can cause serious injury or even death.
- For transportation please check and follow local regulations for lifting and transporting heavy objects.
- Do not climb on the dryer.
- Do not use water to extinguish fire on the dryer or surrounding objects.
- Wear proper personal safety equipment (earplugs, earmuffs, safety goggles, safety helmet, safety gloves, safety shoes etc.).

### 3 Technical data

#### 3.1 Components



**Note:** The adsorption dryer displayed on the pictures of this manual is A-DRY 06 from A-DRY series adsorption dryer.

Part	
1	Control valves
2	Consoles
3	Tower 1
4	Tower 2
5	Controller
6	Pressure indicator
7	Inlet
8	Outlet

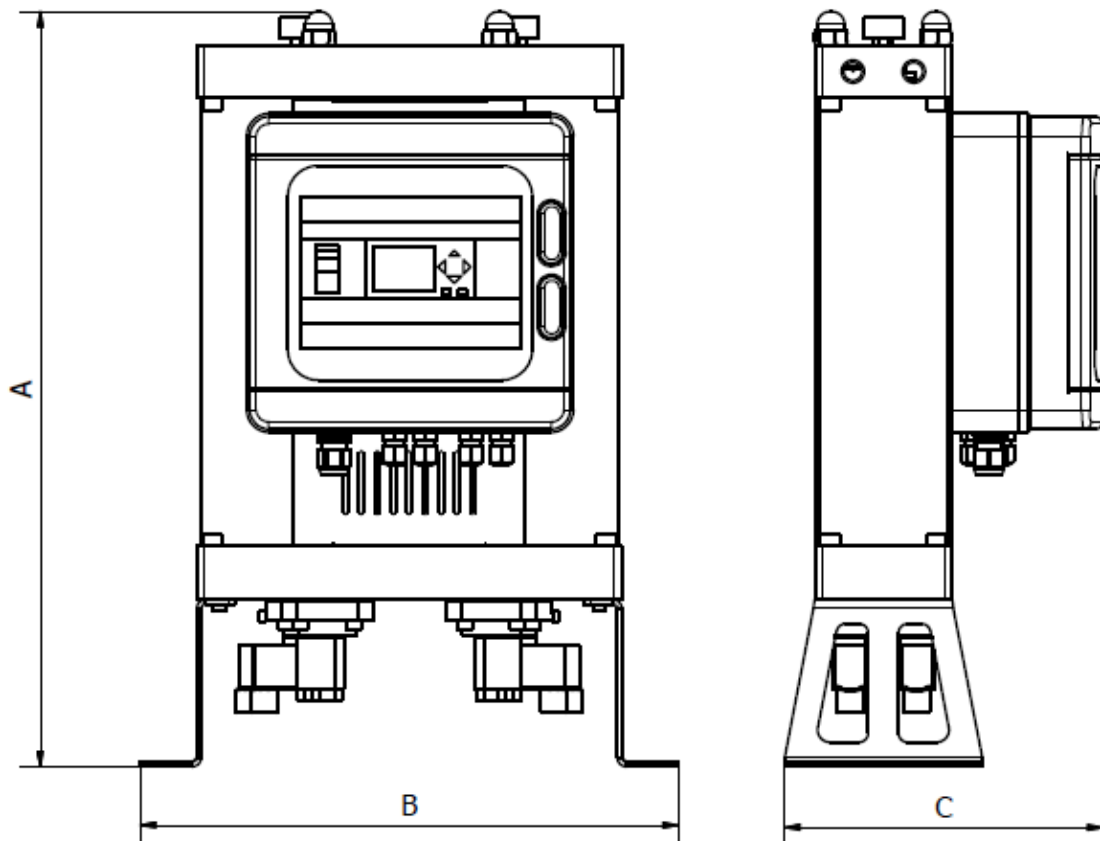
### 3.2 Physical characteristics

MODEL	CONNECTIONS	FLOW CAPACITY		DIMENSIONS [inch]			WEIGHT
	[inch]	[Nm <sup>3</sup> /h]	[scfm]	A	B	C	[kg]
A-DRY 06	NPT 3/8"	6	3,5	19 3/4"	14"	8 1/4"	25 lb 6 oz
A-DRY 12	NPT 3/8"	12	7,1	27 3/8"	14"	8 1/4"	31 lb 5 oz
A-DRY 24	NPT 3/8"	24	14,1	42 3/8"	14"	8 1/4"	42 lb 9 oz
A-DRY 36	NPT 3/8"	36	21,2	58 1/4"	14"	8 1/4"	53 lb 13 oz
A-DRY 60	NPT 3/8"	60	35,3	42 3/8"	16 3/4"	10"	99 lb 3 oz
A-DRY 75	NPT 3/8"	75	44,1	50 3/8"	16 3/4"	10"	116 lb 14 oz
A-DRY 105	NPT 3/8"	105	61,8	65 3/4"	16 3/4"	10"	154 lb 5 oz

Flow capacity at 101,5 psi(g), 68°F

Operating temperature      1,5 - 45 °C      35 - 113 °F

Operating pressure          4 - 16 bar(a)      58 - 232 psi



## MATERIALS

Consoles	Steel
Control blocks	Aluminium
Tower tubes	Aluminium
Panels	Steel
Control valve seats	Aluminium
Non-return valve	Aluminium, Steel, PA (polyamide)
Sealing	NBR
Adsorption material	Silica gel
Corrosion protection	Anodized
Outside protection	Powder paint coated (Epoxy-polyester base)
Lubricant	Shell cassida grease RLS 2
End-caps	PA6
Controller Housing	ABS

## CORRECTION FACTORS

To calculate the correct flow capacity of a given device based on actual operating conditions, multiply the nominal flow capacity by the appropriate correction factor(s).

$$CORRECTED\ CAPACITY = C_{OP} \times C_{IT} \times NOMINAL\ FLOW\ CAPACITY$$

### CORRECTION FACTOR - OPERATING PRESSURE

[bar]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
[psi]	29	44	59	73	88	103	118	132	147	162	176	191	206	220	235
C <sub>OP</sub>	0,38	0,5	0,6	0,75	0,88	1	1,13	1,25	1,38	1,5	1,63	1,75	1,88	2	2,1

### CORRECTION FACTOR - INLET TEMPERATURE

[°C]	25	30	35	40	45	50
[°F]	77	86	95	104	113	122
C <sub>IT</sub>	1,00	1,00	1,00	0,97	0,87	0,80

*Example:* Corrected flow capacity for nominal flow capacity of 36 Nm<sup>3</sup>/h at operating pressure of 6 bar(g) and inlet temperature of 40 °C would be:

$$CORRECTED\ CAPACITY = 0,88 \times 0,97 \times 36\ Nm^3/h = \underline{\underline{30,73\ Nm^3/h}}$$

### 3.3 Pressure Equipment Directive PED 97/23/CE (Fluid group 2)

A-DRY 06/12	Not required
A-DRY 24/36/60/75	Category I, Module A
A-DRY 105	Category II, Module H

Technical datasheet is available. For additional technical specification contact the manufacturer.

### 3.4 Electrical characteristics

Supply voltage	115 V
Supply frequency	60 Hz
Power consumption	<60 W
Stand-by contact	24 VDC
Protection class - housing	IP 65

## 4 Description of operation

Adsorption dryer is intended for removal of vapour from the inlet compressed air in order to reach a desired dew point at the outlet.

During normal operation of the adsorption dryer the non-dried compressed air enters the adsorption dryer through the inlet and passes through the appropriate inlet control valve into a tower where the process of adsorption is in progress. In the tower the air passes the molecular sieve which removes the water vapour content through the process of adsorption. After leaving the tower the dried compressed air leaves the adsorption dryer through the outlet.

If a process of regeneration is underway in the second tower then part of the dried air is lead through a nozzle into the tower where the regeneration is in progress. There the air that has been dried and heated through the process of adsorption expands after leaving the nozzle and passes the molecular sieve. Through the process of desorption the water vapour content gets released from the molecular sieve and is carried by the air through the appropriate release control valve after which it is discharged from the system.

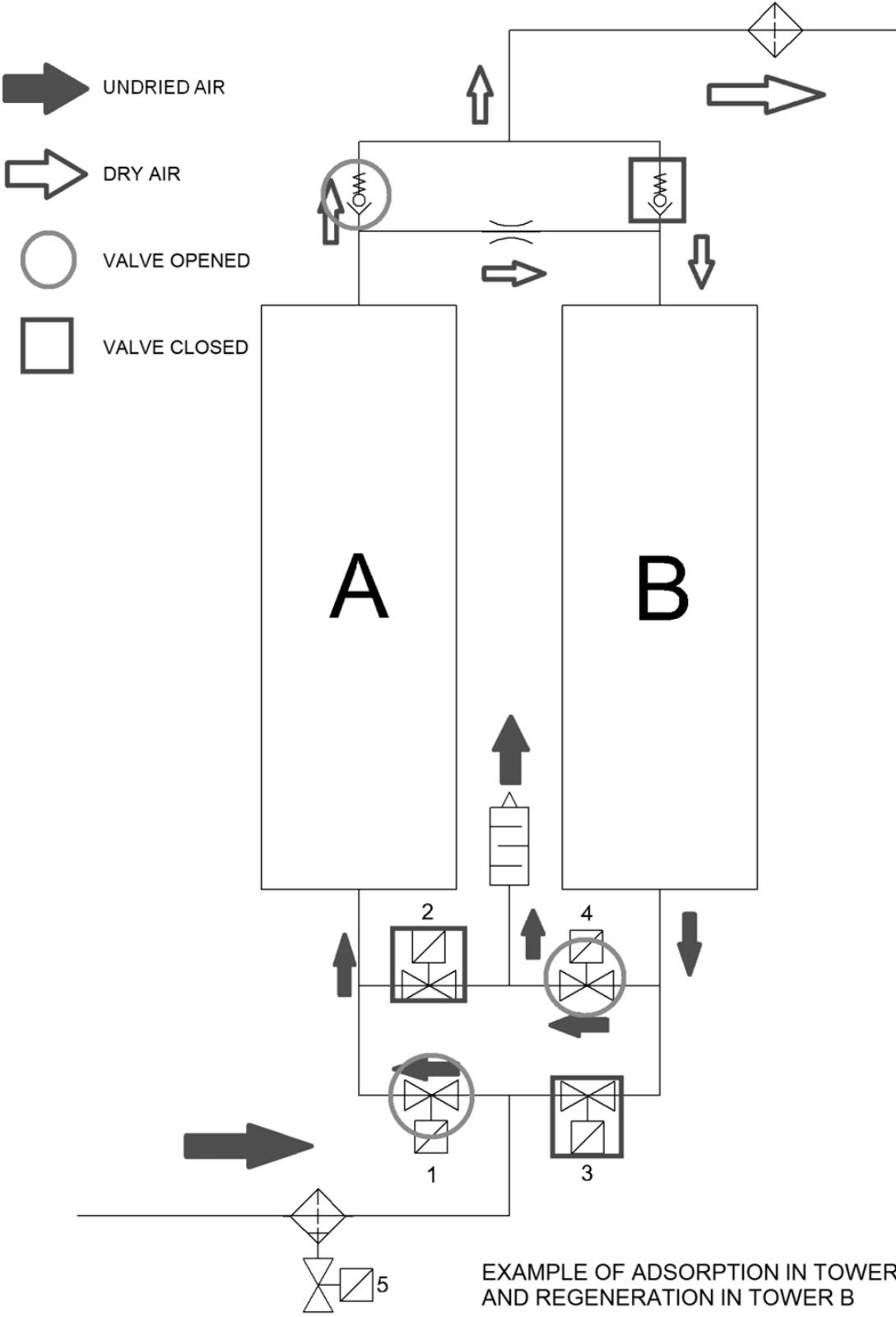
After a set time the adsorption in the first tower is stopped and the control valves are run through a sequence that pressurises both towers and starts the adsorption in second tower and regeneration in the first tower.

Time of regeneration is constant and does not change. The dried air used for regeneration is released which means that while the regeneration is in progress the adsorption dryer operates at a lower efficiency. In most operating conditions the adsorption process can run for a longer time than the time that is needed to regenerate the tower. Consequently although times of regeneration and adsorption can be equal, in most operating conditions it is more economical that the adsorption time is longer since such operation can greatly increase the efficiency of the adsorption dryer.

A-DRY adsorption dryers have a factory pre-set adsorption time adjusted to the operating conditions specified by the costumer to ensure the optimal operation. \*

If the compressed air station shuts down, a stand-by signal is received or the adsorption dryer gets disconnected from the power supply both adsorption dryer inlet control valves open while both release control valves are closed so the air can flow from inlet through the towers to the outlet. After the start signal is received or power returns the adsorption dryer continues where it has stopped.

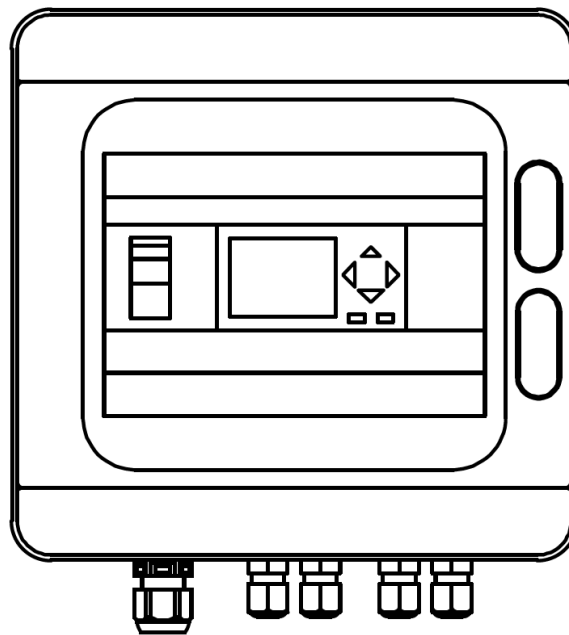
\* For more information contact your supplier.





## 5 Controller

A-DRY adsorption dryer series PLC controller in combination with tower pressure manometers and outlet dew-point sensor enables complete monitoring of the adsorption dryer operation. Controller PLC includes a LCD display interface with buttons that enables the technical expert to examine/change the settings and operating parameters of the system. Typically information such as operating mode and pressure dew point are displayed on main screen. Additionally the controller has stand-by input, electronic drain control output and alarm/warning output. Press ↓ and ↑ to move through the menu screens. Use **OK** to confirm or **ESC** to go back.



*Picture 3: Controller*

## 5.1 Status Screen

To access the controller interface open the transparent cover on the controller housing. The interface on the PLC block has four buttons and can display the information in four lines. To move through the menu press the up and down buttons. To enter a sub-menu or confirm an action press right. To go back press left.

The first screen shows the system status. At the start-up of the dryer the controller is initializing. This phase lasts a few seconds.

I	N	I	T	I	A	L	I	S	I	N	G

When the A-DRY adsorption dryer is in the FIXED CYCLE MODE it is operating with fixed adsorption-regeneration cycles.

A	D	S							R	E	G
		F	I	X		M	O	D	E		
		0	0	:	0	1	h				

When the A-DRY adsorption dryer is in the PDP VARIABLE CYCLE SAVING MODE it is operating in a dew-point dependent energy saving mode with variable adsorption-regeneration cycles.

A	D	S							R	E	G
		V	A	R		M	O	D	E		
		-	4	5				C	t	d	

When the A-DRY adsorption dryer is in the STAND-BY the adsorption-regeneration cycles are stopped for as long as there is a STAND-BY signal on **INPUT I1** (for more information see chapter 5.3).

		S	T	A	N	D	-	B	Y		

## 5.2 Dew-point Monitoring

If the dew-point sensor is connected it is possible to monitor the current dew-point.

Outlet dew-point sensor is connected to the PLC controller analogue **INPUT I7/A1** (0...10VDC, -100...+20°C) and enables the PLC to adjust the adsorption time of the adsorption-regulation cycle in order to reach a set dew-point. The adsorption time is adjusted in such a way that the desired dew-point is reached with a maximum possible adsorption time. A high adsorption : regeneration time ratio means that a smaller percentage of dried air has been use for regeneration resulting in higher efficiency of adsorption dryer system operation.

It is possible to check the current outlet dew-point measurement on the PLC controller display by moving through the menus to the **DEW-POINT SENSOR** screen. When is **STATUS SCREEN** press ↓ to proceed to the **DEW-POINT SENSOR** screen. If the sensor is connected then the set and current dew-point will be displayed. The third line of the screen is showing the set dew-point. The fourth line of the screen is showing the current measured dew-point.

D	E	W	-	P	O	I	N	T			
(	C	t	d	)	:						
S	E	T					-	6	5		
P	D	P					-	6	4		

In case of dew-point sensor malfunction, dew-point rising above the set alarm dew-point or if the dew-point sensor has been unplugged the DEW-POINT SENSOR OFF status will be displayed on the **DEW-POINT SENSOR** screen and alarm/warning output **OUTPUT Q6** (Q2 on the input/output module) will be set to OFF (logical 0).

	D	E	W	-	P	O	I	N	T		
	S	E	N	S	O	R		O	F	F	

The alarm dew-point can be set in the SETTINGS menu. See 5.7 Parameters Settings.

**5.3 Times**

**CYCLE TIMES SCREEN** is showing the set and current adsorption and regulation times. The first line is showing the set adsorption time. The second line is showing the current time of adsorption. The third line is showing the set regeneration time. The fourth line is showing the current time of regeneration.

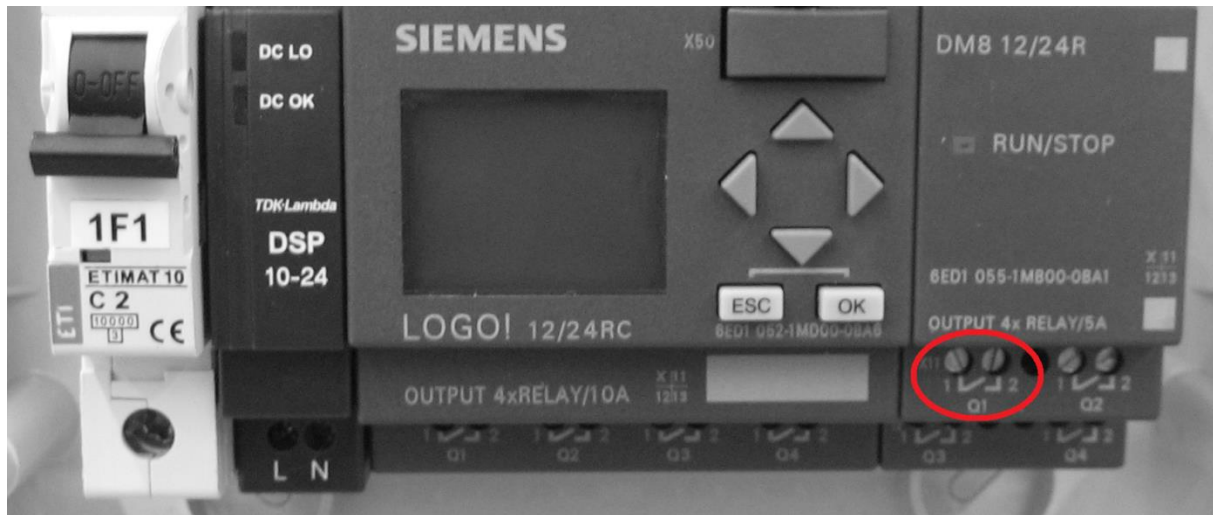
A	D	S						1	2		m
T	=					0	0	:	0	3	h
R	E	G				0	0	:	0	4	h
T	=					0	0	:	0	3	h

**WORKING HOURS AND CYCLES** screen displays the total working hours of the adsorption dryer and the total number of adsorption-regeneration cycles. One adsorption-regeneration cycle consists of two adsorption-regeneration half-cycles.

W	O	R	K		H	O	U	R	S		
											1
C	Y	C	L	E	S						
											6

## 5.4 Drain

A-DRY adsorption dryer controller has an option to control the drain through the **RELAY OUTPUT Q5** (Q1 on the input/output module).



The DRAIN screen displays the drain activation interval time and the duration of the activation.

D	R	A	I	N	(	Q	5	)	:		
I	n	t	e	r		0	5	:	0	0	m
D	u	r	a	t		0	1	:	0	0	s

Interval and duration times can be modified in the controller settings (see 5.7 Parameter Settings).

### 5.5 Manual Selection of Fixed Cycle

It is possible to manually select the fixed cycle mode. If MANUALLY SELECTED FIXED CYCLE is ON the adsorption dryer will operate in the fixed cycle mode regardless of dew-point sensor measurements. If MANUALLY SELECTED FIXED CYCLE is OFF the adsorption dryer will operate in either VARIABLE CYCLE or FIXED CYCLE mode depending on the conditions.

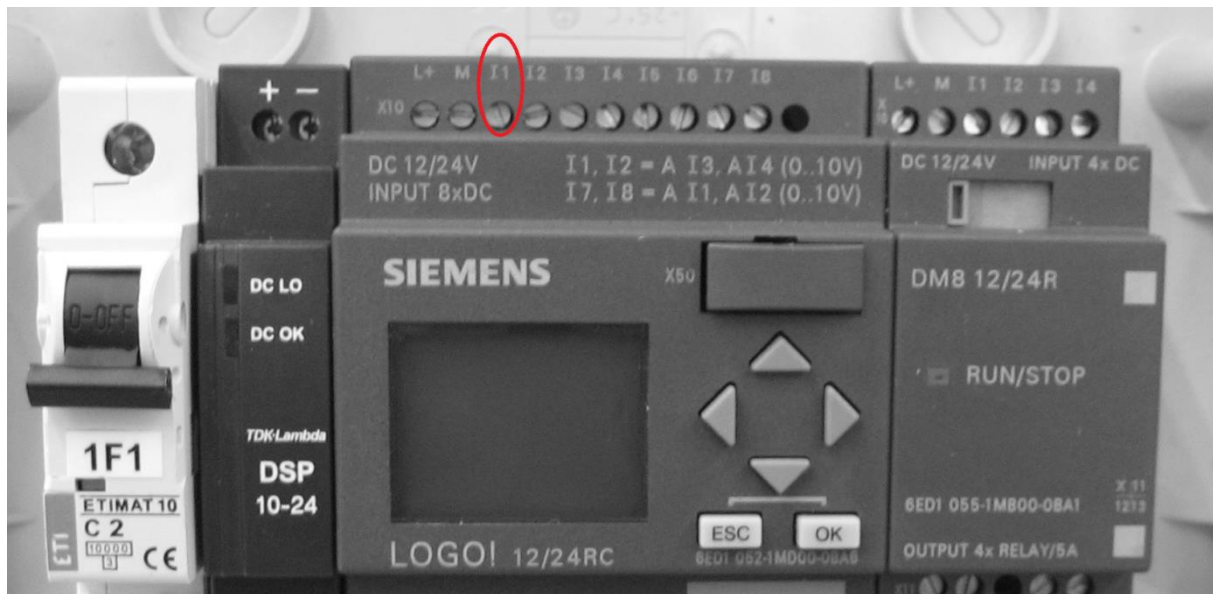
To change from ON to OFF or OFF to on. Press **ESC** button ant then press →.

M	A	N	U	A	L	L	Y				
S	E	L	E	C	T	E	D				
F	I	X	E	D		C	Y	C	L	E	:
O	N										

M	A	N	U	A	L	L	Y				
S	E	L	E	C	T	E	D				
F	I	X	E	D		C	Y	C	L	E	:
O	F	F									

## 5.6 Stand-by

B-AIR series adsorption dryers can receive a stand-by control signal from compressor. To implement this option **INPUT I1** has to be connected to the appropriate control signal on the compressor. Additional cable glands are available on the controller housing.



For the appropriate control voltage levels consult the chart below.

DRYER STATUS

INPUT 1 VOLTAGE LEVEL

STAND-BY MODE

> 12 VDC (logic state 1)

NORMAL OPERATION

< 5 VDC (logic state 0)

The status screen changes to STAND-BY. All other screens remain unaffected.

The controller has the option to either finish the regeneration cycle upon receiving the STAND-BY signal or finishing regeneration immediately and going into STAND-BY mode. The mode of operation can be set up without going into the settings menu. In STAND-BY CYCLE FINISH screen press ESC and < at the same time. The screen will change to STAND-BY CYCLE STOP. You can change the mode again to STAND-BY CYCLE FINISH by pressing ESC and < at the same time.



## 5.7 Parameter Settings

In VARIABLE MODE the dryer A-DRY maintains the set dew-point. The dew-point is pre-set according to a specified value. If you wish to maintain a different dew-point you can set it in **Set Param** section of CONTROLLER SETTINGS.

Additionally drain output interval and duration times can be set in **Set Param** section.

To access the SETTINGS press ↓ until you get to the Date screen.

		W	e		1	5	:	1	7	
	2	0	1	4	-	1	2	-	3	0

Then press **ESC** to get into the SETTINGS. Select **Set Param** by pressing ↓ and **OK**.

>	S	t	o	p						
	S	e	t		P	a	r	a	m	
	S	e	t	..						
	P	r	g		N	a	m	e		

First screen displays the drain out-put parameters. To change the drain out-put parameters press **OK**. To increase the value press **↑**, to decrease the value press **↓**, to move through the values press **←** and **→**. When you are satisfied with the set values press **OK** to complete setting the parameters.

TH is drain activation interval time. TL is drain activation duration time when the drain is opened. Ta is the current time of the drain timer.

D	R	A	I	N							
T	H		=	1	0	:	0	0	m		
T	L		=	0	1	:	0	0	s		
T	a		=	0	8	:	4	1	m		

The following four screens present the parameters of VARIABLE MODE PDP regulation. You can set the desired dew-point here. In the first screen of PDP press **OK** and change the parameter SP which represents the dew-point in °C. To increase the value press **↑**, to decrease the value press **↓**, to move through the values press **←** and **→**. When you are satisfied with the set value press **OK** to complete setting the parameter.

P	D	P						1			
S	P		=			-	4	5			
P	V		=			-	5	6			
A	Q		=					5			

The last screen BO13 allows the user to set the ON and OFF threshold for dew-point alarm.

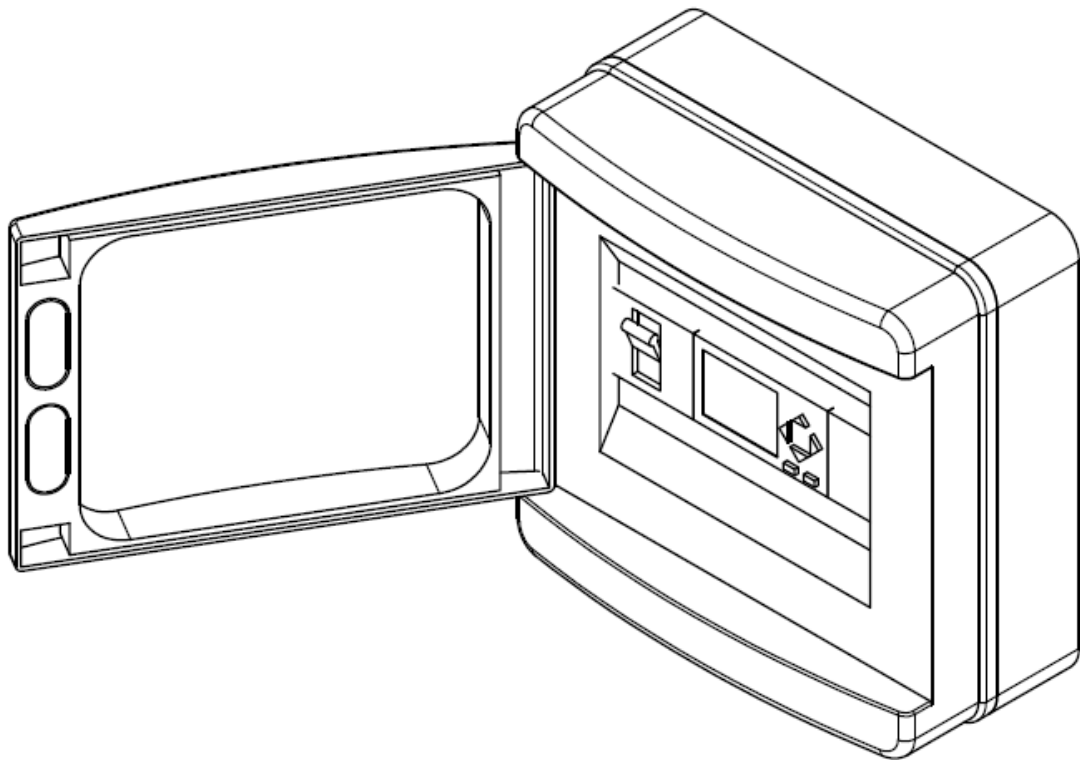
## 5.8 Updating and Reprogramming

Updates of PLC program are not planned and are done under exceptional circumstances. The program update should be provided by OMEGA AIR d.o.o. Ljubljana.

Reprogramming with third party program makes the warranty void.

To update the controller with Siemens LOGO! 0BA6 follow the instructions bellow.

Turn the dryer ON. It can be either in normal operation or in STAND-BY MODE. Open the lid of the dryer controller



## A-DRY with PLC Controller - Installation and Operating Manual

You need to access the SETTINGS menu. To access the SETTINGS press ↓ until you get to the Date screen.

		W	e		1	5	:	1	7	
	2	0	1	4	-	1	2	-	3	0

Then press **ESC** to get into the SETTINGS. Select **Stop** by pressing **OK**.

>	S	t	o	p						
	S	e	t		P	a	r	a	m	
	S	e	t	..						
	P	r	g		N	a	m	e		

Select **Card** by pressing **OK**.

	P	r	o	g	r	a	m	..		
>	C	a	r	d	..					
	S	e	t	u	p	..				
	S	t	a	r	t					

## A-DRY with PLC Controller - Installation and Operating Manual

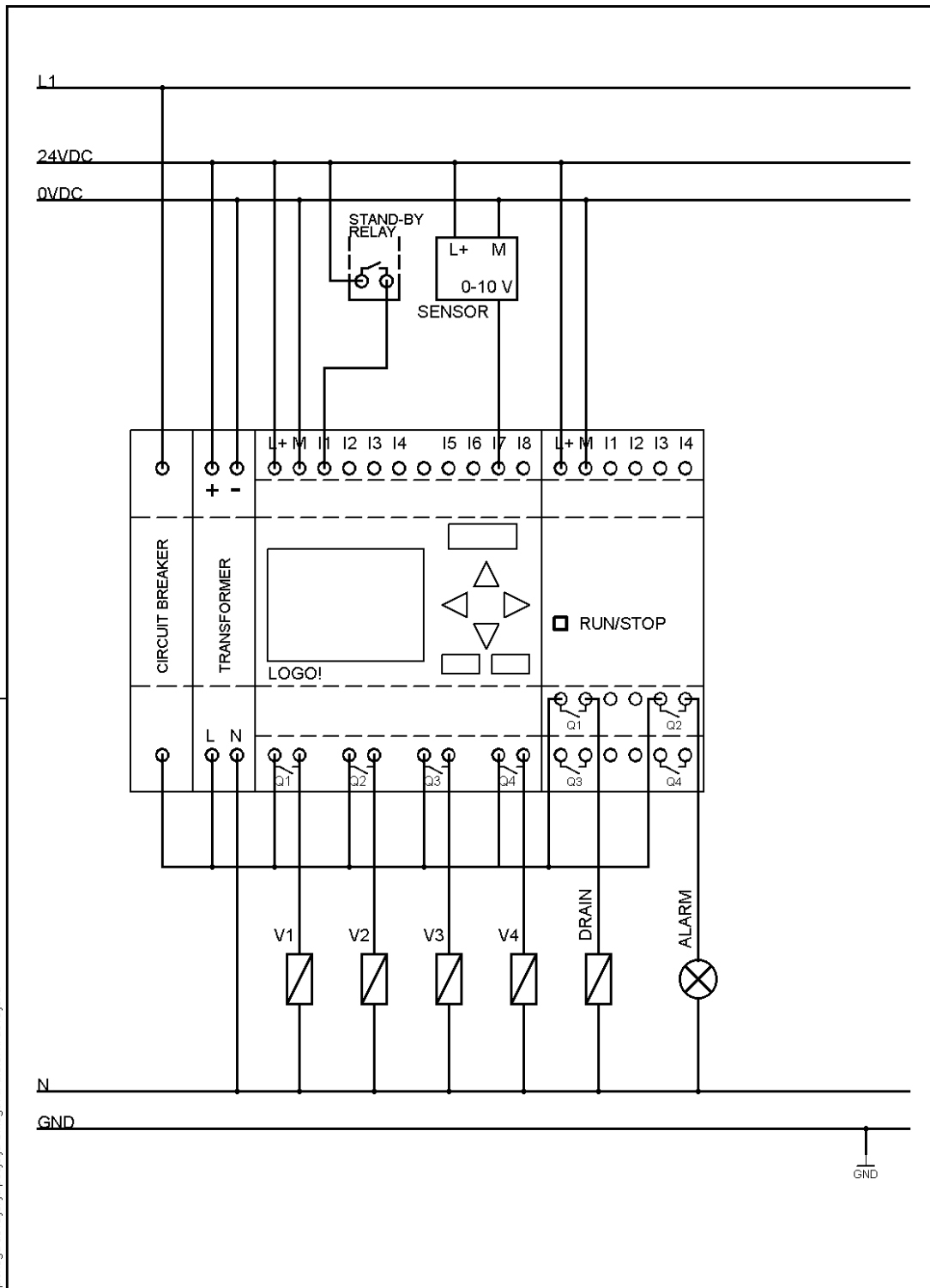
Remove the **X50** lid and insert SIEMENS LOGO! Memory Card. Program the controller by selecting **Card** -> **Controller** and pressing **OK**.



Remove the SIEMENS LOGO! Memory Card and replace the lid. Update is complete. Start the controller by selecting **Start** and pressing **OK**.

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	C	a	r	d	..						
	S	e	t	u	p	..					
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**5.9 Electrical Scheme**



Ta dokument je last podjetja Omega Air d.o.o., kakršnokoli kopiranje ali izdaja tretjim osebam brezpisnega dovoljenja podjetja Omega Air d.o.o. ni dovoljena

Omega Air d.o.o. Ljubljana Cesta Dolomitskega odreda 10 SI-1000 Ljubljana tel.: +386 1 200 68 00 fax.: +386 1 200 68 50 e-mail: info@omega-air.si	Naziv <h3 style="text-align: center;">SHEMA ADC 2.0</h3> St. risbe:	Datum Ime Konst. 30.10.2014 Pregl. LJakopic Datoteka:	Stran <h3 style="text-align: center;">1/1</h3>
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## 6 Efficiency considerations

Efficiency of the adsorption dryer is primarily dependant on the length of the adsorption cycle time (see **Description of operation**) and the nozzle dimensions.

To ensure the most efficient and economical operation of the adsorption dryer A-DRY series dryers are supplied in a wide selection of pre-set controller modes and nozzles that correspond to the varying operating conditions specified by the costumers.

Nozzle dimensions and adsorption cycle time are determined by physical characteristics of the adsorption and desorption processes in given operating conditions. If you want to use the adsorption dryer in a different system configuration or the operating conditions have changed, it is recommended that you contact your supplier for the technical counselling. **Replacement nozzles for different operating conditions are readily available and sold as a separate replacement nozzles kit.**

It is helpful if you can provide the following information:

- Operating pressure
- Volumetric flow
- Ambient temperature
- Inlet compressed air temperature
- Inlet compressed air dew point

### NOTE

In case pre-dried compressed air enters the dryer (e.g. refrigerant dryer is installed upstream adsorption dryer) efficiency can be reduced meaning dryer will not be able to provide desired dew point. Reduced efficiency can also appear in case of extremely dry adsorbent (e.g. at initial commissioning or after adsorbent replacement).

If reduced efficiency appears try to operate with moisture saturated air for a while (usually 1 or 2 days).

## 7 Transportation

- Transportation should be done by appropriately qualified personnel.
- For transportation please check and follow local regulations for lifting and transportation of heavy cargo.
- Provide adequate lifting and transportation equipment.
- Centre of gravity in a vertical position is positioned relatively high resulting in a heightened risk of toppling the dryer due to tilting, which can cause serious injury or even death.
- In case where the dryer is firmly attached to the standard pallet it can be lifted by a forklift.



**Don not under any circumstance use dryer piping installation for lifting or stabilizing purpose.**

Adsorption dryer could be damaged during transportation. Putting a damaged adsorption dryer into operation can result in injury or death! Check the adsorption dryer for any visible damage after removing the packaging. If the adsorption dryer is damaged contact the transportation contractor and supplier. Damaged adsorption dryer should not be put into operation!



## 8 Storage

To prevent the damage to the dryer during storage make sure that the following requirements are fulfilled:

- Dryer can only be stored at a dry and clean indoor location.
- During storage ambient temperature must not exceed 1,5°C – 66°C range. For other storage temperatures please contact the manufacturer.
- Make sure that the inlet and the outlet to the dryer are closed with a plug.

In case you intend to store the dryer which has been in operation follow the procedure specified below:

- Close the outlet valve.
- Leave the dryer to operate for a while (min. 4h).
- Close the inlet valve.
- Decommission the dryer.
- Depressurize the dryer. The dryer should get fully depressurized in one cycle.
- Disconnect the dryer from electric power supply.
- Disconnect the dryer from piping installation.
- Close inlet and outlet of the dryer with plugs.
- Use appropriate cover to protect the dryer from the dust.

## 9 Installation

### 9.1 Initial inspection

Adsorption dryer could be damaged during transportation. Putting a damaged adsorption dryer into operation can result in injury or death! Check the adsorption dryer for any visible damage after removing the packaging. If the adsorption dryer is damaged contact the transportation contractor and supplier. Damaged adsorption dryer should not be put into operation!

### 9.2 General Installation Requirements

A-DRY series adsorption dryer is designed to be installed in a place that meets the following requirements:

- Indoor installation (clean and dry)
- Non aggressive atmosphere
- Ambient temperature 1,5°C to 60°C
- Non explosive environment (Standard version DOES NOT COMPLY WITH ATEX)
- Vibration free installation (refers to floor and piping)

Compressed air which is supplied to A-DRY needs to meet the following requirements:

- Compressed air quality 2 for solid particles (if dryer is equipped with superfine coalescing filter 0,01um)
- Compressed air quality 1 for solid particles (if dryer is not equipped with superfine coalescing filter 0,01um)
- Compressed air quality 2 for oil (if dryer is equipped with superfine coalescing filter 0,01um)
- Compressed air quality 1 for oil (if dryer is not equipped with superfine coalescing filter 0,01um)
- Free from aggressive substances
- Free from substances which could damage adsorbent (if you are not sure about certain substance please contact manufacturer)
- Preferably compressed air should be saturated with moisture (100% relative humidity). Lower relative humidity can reduce efficiency.

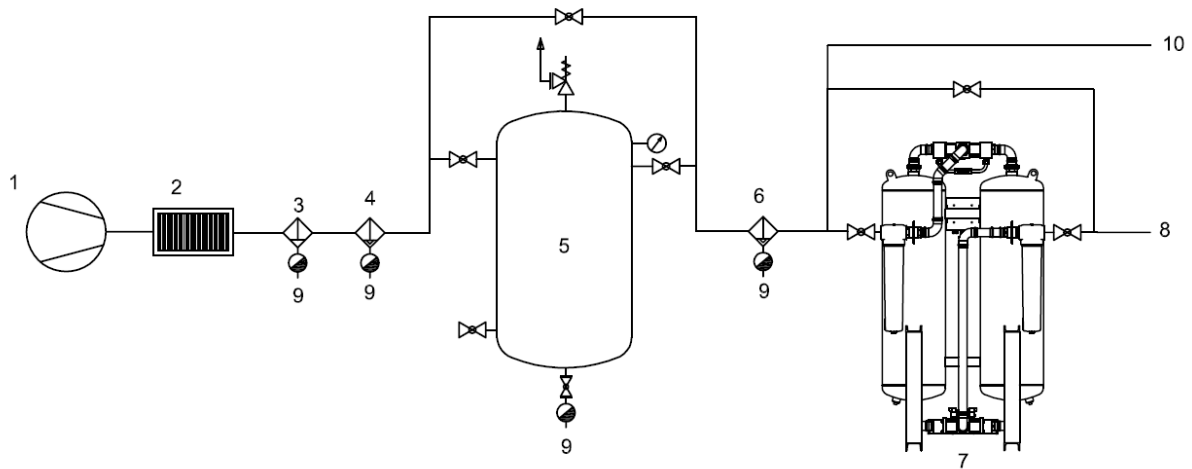
### 9.3 Installation Layout

Below are two of the most common installation layouts for adsorption dryer. The schemes specified below are not obligatory but only provided as an example. Different arrangement of certain components is always possible.

- 1 - Compressor
- 2 – Aftercooler
- 3 – Cyclone separator
- 4 – Pre-filter (e.g. 3um)
- 5 – Pressure vessel
- 6 – Fine filter (e.g. 0,1um)
- 7 – Adsorption dryer
- 8 – Dry air outlet
- 9 – Automatic condensate drain
- 10 – Wet air outlet

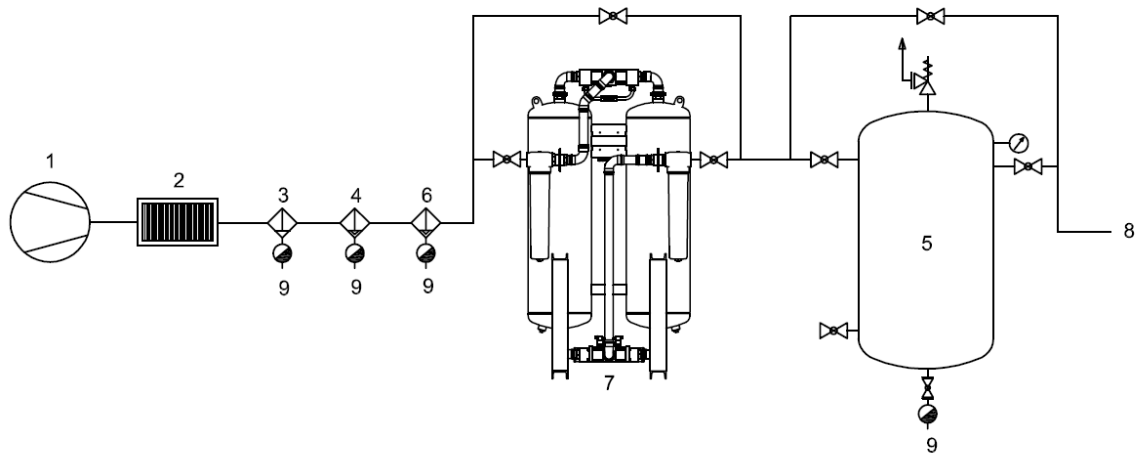
LAYOUT 1 (Dryer is installed downstream from pressure vessel)

- When only partial flow rate of the compressor is treated by the dryer.



LAYOUT 2 (Dryer is installed upstream from pressure vessel)

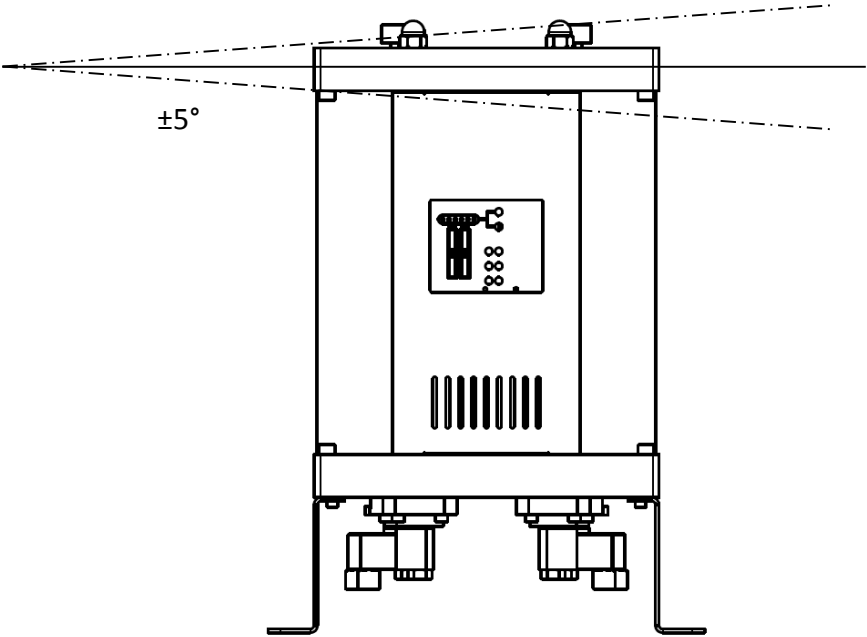
- When total flow rate of the compressor is treated by the dryer.
- When consumption of compressed air varies a lot or when short peaks of high consumption (higher than dryer/compressor capacity) are expected.



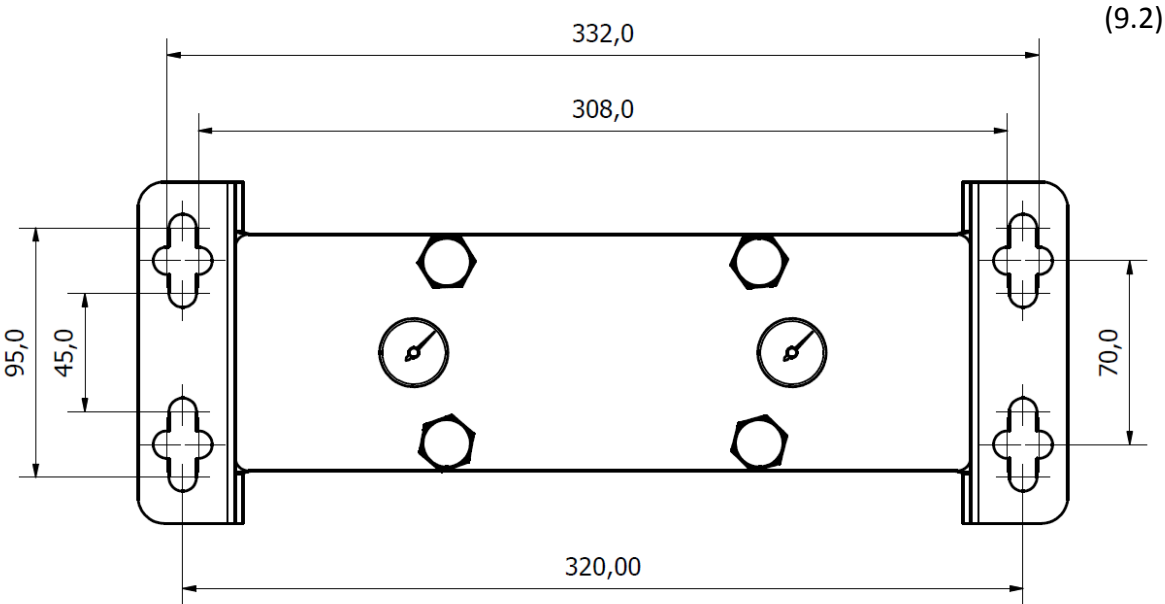
## 9.4 Installation

- Adsorption dryer should be installed in such a way that it is protected from environmental influences (compressor station).
- Install the dryer in the area where people are normally not present because of noise emissions.
- Make sure that the adsorption dryer is protected against vibrations and other mechanical stress.
- Adsorption dryer should stand firmly on the horizontal surface. The inclination of the unit must not exceed  $\pm 5^\circ$ , **see picture (9.1)**. If system is not installed correctly it could not be working properly. Best way to achieve this requirement is by screwing the adsorption dryer to such a surface through the appropriate openings on consoles. See **pictures (9.2) and (9.3)** for openings layout. It is recommended that you use four M10 bolts or screws.
- It is recommended to include shut-off valve with removable coupling at the air inlet and outlet for easier maintenance.
- Install a condensate separator and a pre-filter at the inlet side and an after-filter at the outlet side (for more information see the Additional Equipment section).
- Additionally check that upstream from the dryer sufficient air treatment is provided (e.g. aftercooler, cyclone separator, filter, condensate drains ...)
- Remove caps/plugs from the inlet and the outlet of the dryer.
- Connect the air supply to the inlet of the dryer.
- Connect the downstream piping line to the outlet of the filter.
- It is recommended to make a bypass line.
- Connection to electric power should be done by a qualified expert. Make sure the voltage and the frequency on the mains correspond to the data on the type plate of the dryer. ( $\pm 5\%$  tolerance is acceptable for voltage)
- Connect the dryer to electric power. It is obligatory to provide connection to the ground terminal.
- After the installation or maintenance the A-DRY adsorption dryer must be checked for leakage.
- Regulate the operating pressure so it matches with the specified operating pressure value.
- During normal operation loud noise (depending on the dryer size up to 100dB) can be generated. Persons responsible for installation and the end user are responsible for correct installation of the dryer in order to prevent excessive noise emissions to the work environment. The installer and the end user are also responsible to install the proper safety signs at the installation site.
- Remove any packaging and other material which could obstruct the normal operation of the dryer.

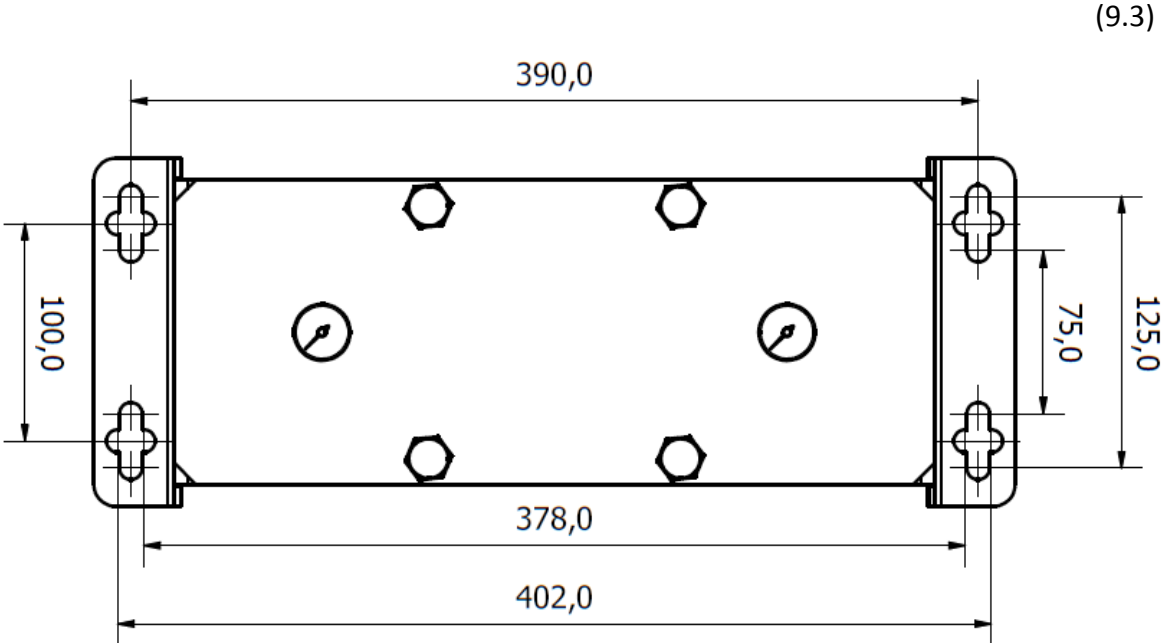
(9.1)



Console layout for: A-DRY 06, A-DRY 12, A-DRY 24 and A-DRY 36



Console layout for: A-DRY 60, A-DRY 75 and A-DRY 105



## 10 Commissioning

### 10.1 Pressurisation

Rapid pressurisation of the dryer can cause pressure blows which can damage the adsorption dryer! Adsorption dryer should be pressurised slowly through an appropriate valve at the inlet.

During the pressurisation process the outlet valve should remain closed and the adsorption dryer should not be operational.

Follow the pressurisation procedure:

- Make certain that the outlet valve is closed.
- Make certain that the adsorption dryer is not in operation. The controller electronics should be turned off (LED interface lights are off).
- Open the inlet valve slightly until you hear first flow noise.
- Wait until you no longer hear flow noise.
- Fully open the inlet valve and wait until the tower manometers indicate that both towers are pressurised to the operating pressure.

### 10.2 Opening Outlet Valve

Opening of the outlet valve should be done extremely slowly especially when the system downstream of the valve is not pressurised.

Follow the procedure:

- Make certain that the adsorption dryer is not in operation. The controller electronics should be turned off (LED interface lights are off).
- Open the outlet valve slightly until you hear first flow noise.
- Wait until you no longer hear flow noise.
- Fully open the outlet valve.



### 10.3 Start-up

After the installation, pressurisation and opening of the outlet valve procedures are completed the start-up procedure can be initiated.

Follow the start-up procedure:

- Visually re-check the installation.
- Make certain that the inlet valve is opened.
- Check the manometers to make certain that both towers are pressurised.
- Make certain that the outlet valve is opened.
- Listen for any leaking sound.
- Turn on the electrical power source (if there is a switch) or simply plug in A-DRY.

## 11 Decommissioning

To decommission A-DRY adsorption dryer follow the decommissioning procedure:

- Close valve upstream and downstream from the dryer.
- The dryer should be depressurized within one half-cycle which takes 5 minutes.
- Disconnect the dryer from electric power supply.
- Make sure that the dryer is depressurized by inspecting the manometers on the upper control block.

To protect the desiccant during storage seal the inlet and the outlet of the dryer.

## 12 Additional equipment

It is necessary that a condensate separator and a pre-filter be installed at the inlet side and an after-filter at the outlet side!

**Condensate separator** removes liquid water and other liquid content from compressed air flow. Removing liquid water and other liquid content with the condensate separator ensures the efficient drying and long life of the molecular sieve. **Condensate drain** has to be installed on the condensate separator!

**Pre-filter** removes the particulate matter from the compressed air flow and extends the life of the molecular sieve. Pre-filter should be at least ISO 8573-1 Class 6 particle filter (3 µm particles). Install the **condensate drain** on the pre-filter housing!

**After-filter** cleans the outlet air of any particulate matter originating from molecular sieve. After-filter should be at least ISO 8573-1 Class 3 particle filter (1 µm particles). It is recommended that all filters and the after-filter in particular be equipped with the **pressure drop indicator** to efficiently detect filter element clogging.

Below is the information on the recommended condensate separators, pre-filters, after-filters and condensate drains that can be ordered as additional equipment for the adsorption dryers.

EQUIPMENT	MODEL	DESCRIPTION
Condensate separator	CKL-B series	Condensate separators
Pre-filter	AF series P filter	Compressed air Class 6 filters
After-filter	AF series R filter	Compressed air Class 3 filters
Condensate drain	BMAG11	Automatic mechanical cond. drain
	AOK20B	Automatic mechanical cond. drain up to 167 l/h
	BTS series	Timer controlled cond. drains up to 95 l/h
	EMD series	Electronic condensate drains up to 12 l/h
	CDI 16B series	Electronic condensate drains up to 45 l/h
Pressure drop indicator	PDi16	Compact differential pressure indicator
	MDA60	Differential pressure indicator
	MDM40	Magnetic differential manometer
	MDM60	Magnetic differential manometer
	MDM60E	Magnetic differential manometer, electronic, LED alarm, battery powered
	MDM60C	Magnetic differential manometer, voltage-free contact for remote alarm
	EPG60 series	Electronic pressure gauge, LED display, alarm, battery powered, filter cartridge condition diagnostic algorithm

Contact your supplier for additional equipment details.

## 13 Maintenance

The molecular sieve, the control valves, the non-return valves and dew-point sensor are subject to wear and need to be replaced according to the service intervals specified bellow.

PART	MAINTENANCE	1 day	1 month	1 year	2 years	4 years
Dryer operation	INSPECTION	x				
Complete dryer	VISUAL INSPECTION		x			
Pre/After filter element	REPLACE			x		
Expansion silencer	REPLACE			x		
Valves*	REPLACE				x	
Adsorbent**	REPLACE					x
Dew-point sensor (optional)	CALIBRATION			x		

\*Refers to moving parts and sealings.

\*\*For stable operation replacement of adsorbent is required after every 4 years of operation. However due to inappropriate use or unexpected inlet/operating conditions adsorbent can be damaged sooner and in this case replacement is required sooner.

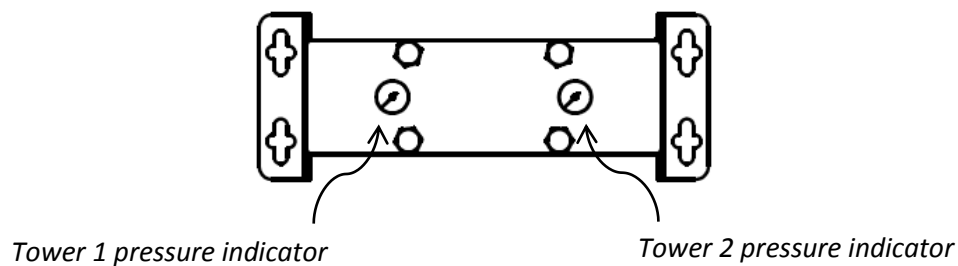


**It is necessary to wear respiratory protective equipment when working with the adsorbent. Adsorbent is a crumbling material that is producing fine dust which can cause respiratory complications if inhaled in sufficient quantities.**

In order to maintain the system efficiency, optimal performance, best air quality and safety these additional rules of proper maintenance should be followed:

- Disconnect the adsorption drier from the compressed air system and the electrical power before conducting any maintenance.
- Make certain that the adsorption dryer is depressurised before conducting any maintenance. You can check this by inspecting the pressure indicators at the top of the adsorption dryer. Pictures (13.1) and (13.2)
- The tower sealing O-rings should be changed at the same time the molecular sieve is changed.
- The damaged components are to be replaced by the new ones. If a marked degree of damage is found, the entire desiccant dryer should to be replaced.
- The pressure vessel has been designed for a life of 10 years.
- Carry out a check for leaks once the maintenance work has been finished.
- While servicing the adsorption dryer it is recommended that you remove any residual condensate or particles on the adsorption dryer parts before reassembling the adsorption dryer.

(13.1)



(13.2)



## A-DRY with PLC Controller - Installation and Operating Manual

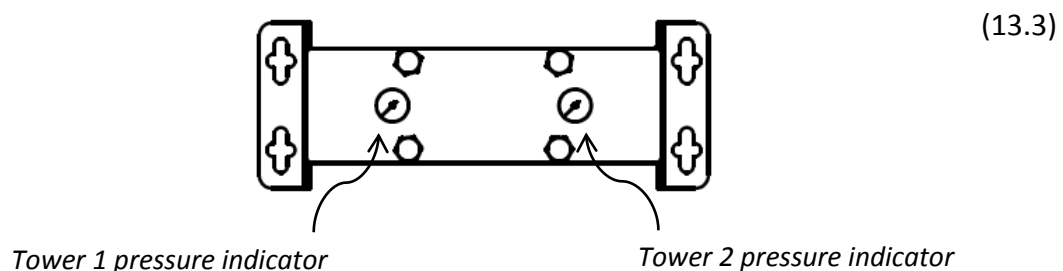
Contact your supplier to order service kits:

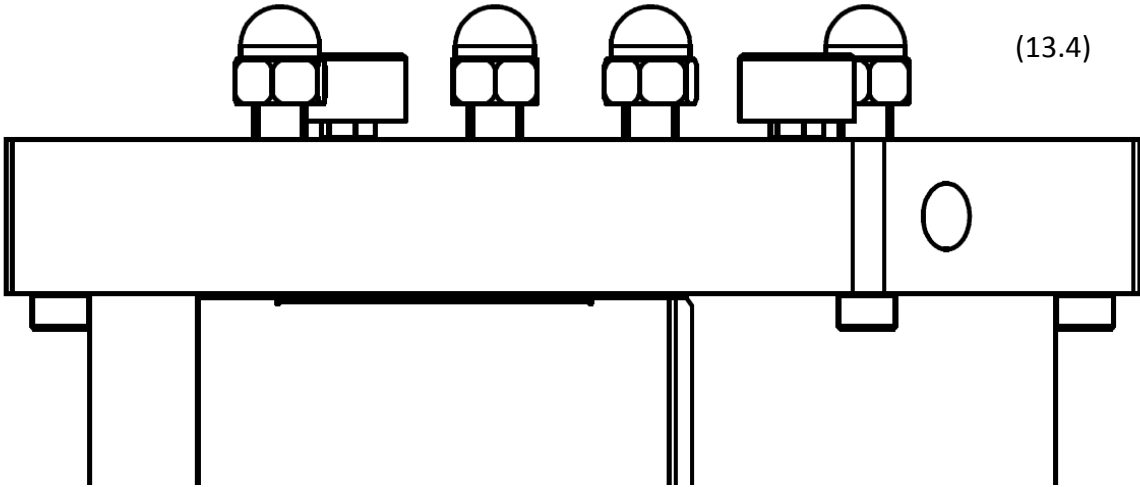
KIT	KIT DESCRIPTION
1 year silencer replacement kit 06-36	2 x purge exhaust silencer
1 year silencer replacement kit 75-105	2 x purge exhaust silencer
2 year replacement kit 06-36	4 x replacement control valves 2 x replacement non-return valves 4 x sealing O-ring 2 x nozzle 2 x purge exhaust silencer
2 year replacement kit 60-105	4 x replacement control valves 2 x replacement non-return valves 4 x sealing O-ring 2 x nozzle 2 x purge exhaust silencer
KIT SERVIS A-DRY 06/48 48 months replacement kit	1 x 2 year replacement kit 06-36 2 x tower tubes including molecular sieve for A-DRY 06
KIT SERVIS A-DRY 12/48 48 months replacement kit	1 x 2 year replacement kit 06-36 2 x tower tubes including molecular sieve for A-DRY 12
KIT SERVIS A-DRY 24/48 48 months replacement kit	1 x 2 year replacement kit 06-36 2 x tower tubes including molecular sieve for A-DRY 24
KIT SERVIS A-DRY 36/48 48 months replacement kit	1 x 2 year replacement kit 06-36 2 x tower tubes including molecular sieve for A-DRY 32
KIT SERVIS A-DRY 60/48 48 months replacement kit	1 x 2 year replacement kit 60-105 2 x tower tubes including molecular sieve for A-DRY 60
KIT SERVIS A-DRY 75/48 48 months replacement kit	1 x 2 year replacement kit 60-105 2 x tower tubes including molecular sieve for A-DRY 75
KIT SERVIS A-DRY 105/48 48 months replacement kit	1 x 2 year replacement kit 60-105 2 x tower tubes including molecular sieve for A-DRY 105

### 13.1 Replacement of the molecular sieve

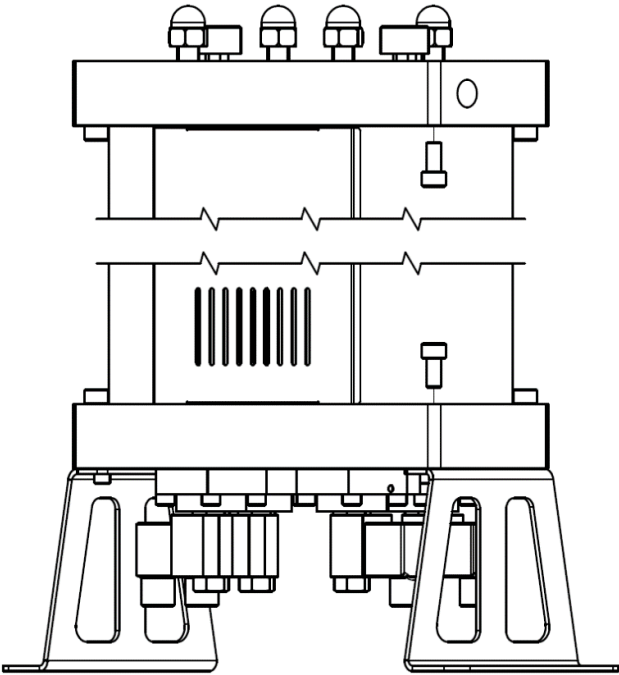
1. Disconnect the adsorption dryer from the compressed air system and the electrical power.
2. Make certain that the adsorption dryer is depressurised. You can check this by inspecting the pressure indicators at the top of the adsorption dryer. Picture (13.3)
3. **If you are replacing the molecular sieve in the towers only it is necessary to wear the respiratory protective equipment. We recommend that you use the anti-dust mask or better.** If you are replacing the whole towers the protection is not needed.
4. It is recommended to replace molecular sieve in one tower and continue with the other tower after replacing the first tower.
5. Unscrew the nuts on the top of the upper block. Picture (13.4)
6. Unscrew the upper and lower screws at the sides of the blocks beside the tower you are servicing. Picture (13.5)
7. Slightly lift the upper block and take the tower out. Picture (13.6)
8. Replace the O-ring seals on the blocks with the O-rings found in the service kit. Remove the used O-rings and wipe any residual condensate and particles from the blocks before replacing the O-rings into the grooves.
9. Use pliers to remove the seeger ring and the nets and remove the molecular sieve. (Pictures (13.7)) \*
10. Fill the tower with the new molecular sieve and replace the nets and the seeger ring.\*
11. Put the tower with replacement molecular sieve back into its position by lifting the upper block, screw the side screws in.
12. After the molecular sieve in both towers has been replaced, screw the nuts tightly to ensure the proper sealing.

\* Steps 9 and 10 only apply if you are replacing the molecular sieve in the towers.

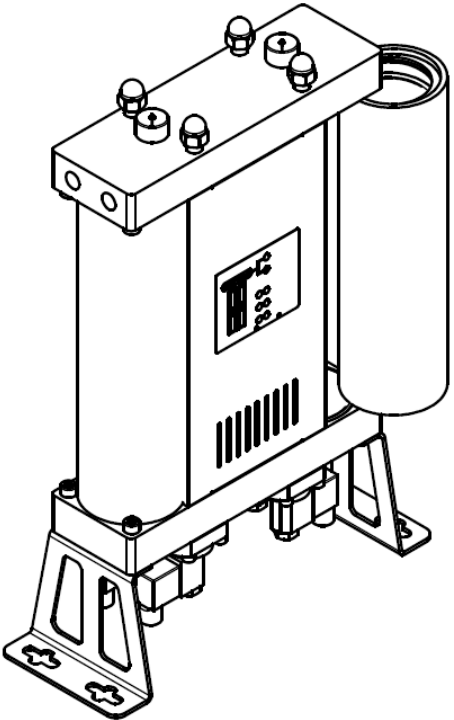


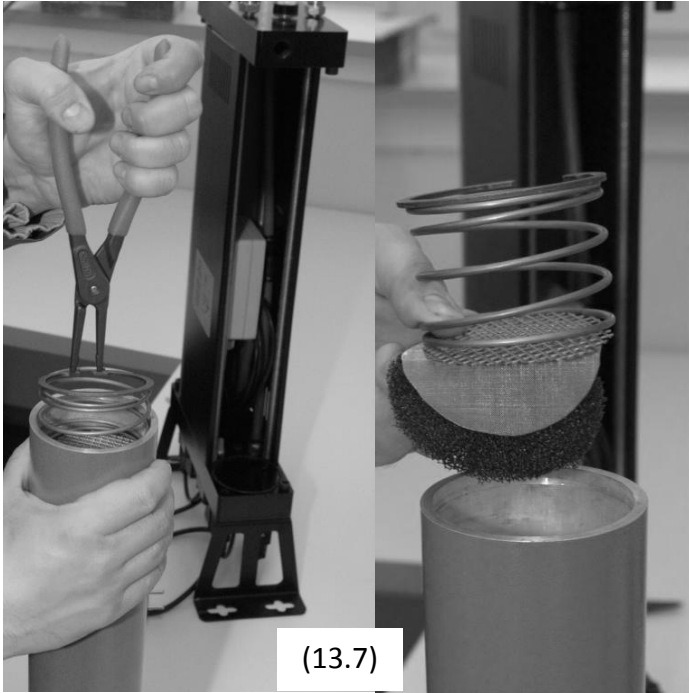


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(13.6)





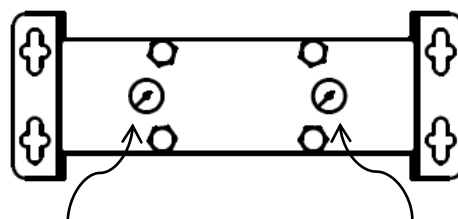


## 13.2 Replacement of the control valves

The following procedure describes the replacement of the normally opened inlet control valves and the normally closed purge control valves. Make sure that you do not mix the valves when replacing the control valves since the normally opened and the normally closed valves fit into any control valve position on the block. All control valves should be installed on the correct control valve position or the adsorption dryer will not operate correctly!

Replacement of the control valves procedure:

1. Disconnect the adsorption dryer from the compressed air system and the electrical power.
2. Make certain that the adsorption dryer is depressurised. You can check this by inspecting the pressure indicators at the top of the adsorption dryer. (Picture 13.8)
3. Carefully place the adsorption dryer on the side. Picture (13.9)
4. Disconnect the connectors on the coils of the electromagnetic control valves.
5. Unscrew the screws that are fixing the control valves to the block. Picture (13.10)
6. Clean the surface of the block of any condensate or particles.
7. Replace the new valves from the control valves kit (Picture (13.11)) on the block. It is recommendable that you replace one control valve at the time.
8. The components are placed in the following order: membrane, spring and valve. The screws can be reused.
9. Make sure that the normally open and the normally closed valves are replaced in the correct positions. The normally open valves have a small screw in the valve seat.

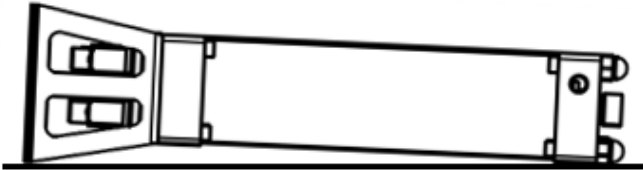


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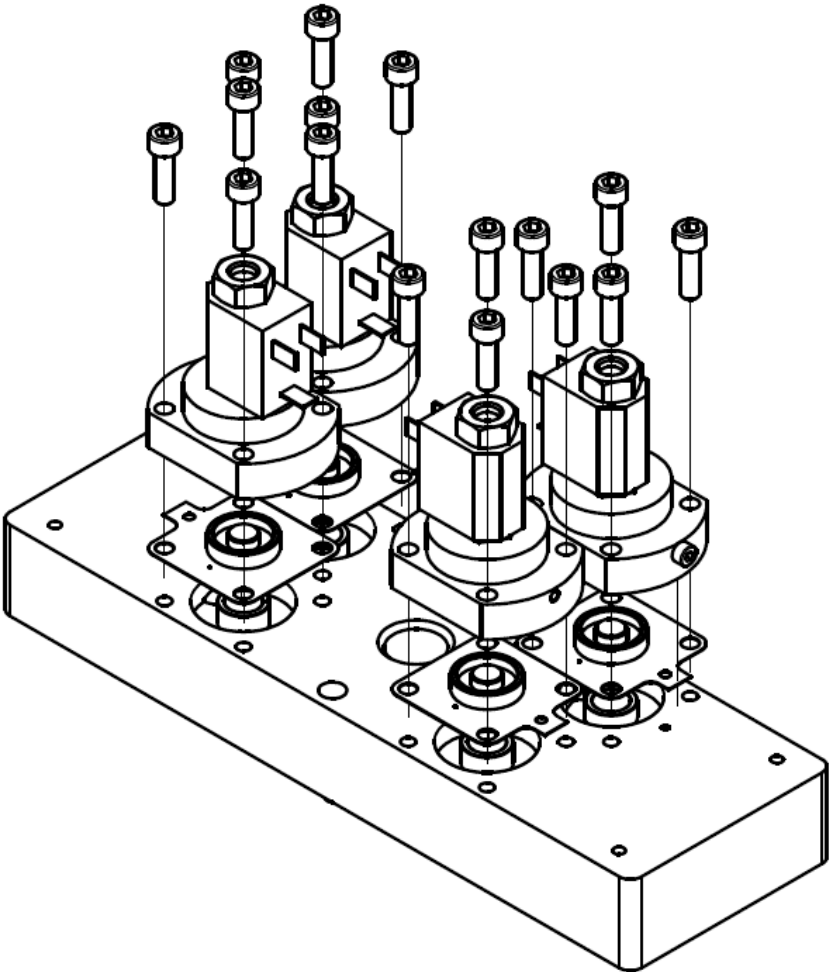
*Tower 1 pressure indicator*

*Tower 2 pressure indicator*

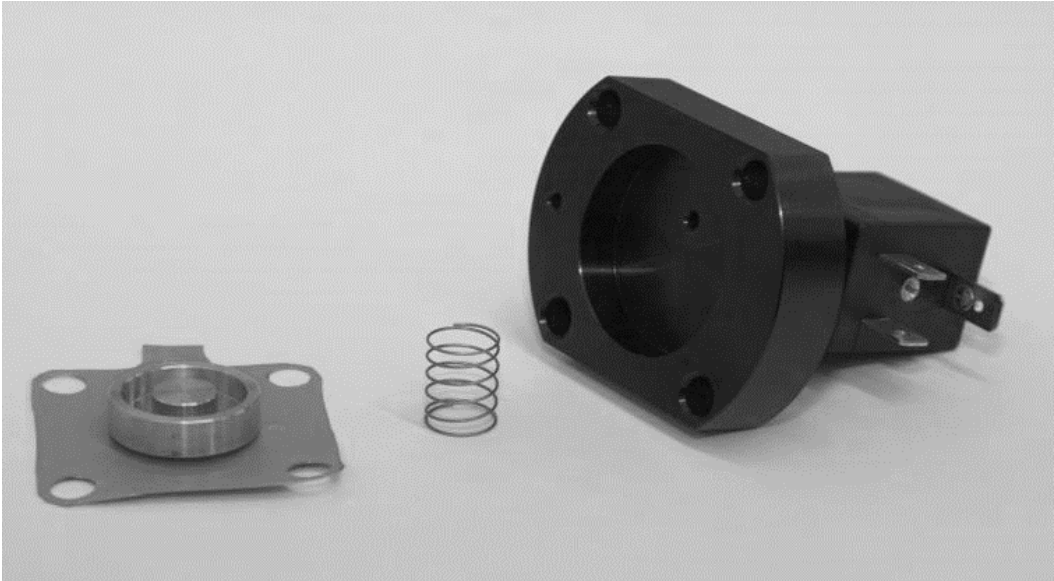
(13.9)



(13.10)



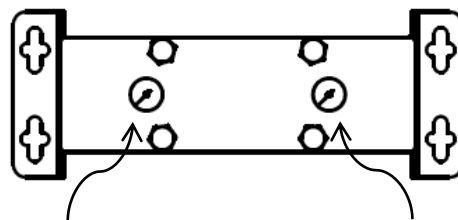
(13.11)



### 13.3 Replacement of the non-return valves

Replacement of the non-return valves procedure:

1. Disconnect the adsorption dryer from the compressed air system and the electrical power.
2. Make certain that the adsorption dryer is depressurised. You can check this by inspecting the pressure indicators at the top of the adsorption dryer. Picture (13.12)
3. Unscrew and pull out the back panel. Picture (13.13)
4. Unscrew the nuts at the top of the adsorption dryer. Picture (13.14)
5. Pull the block connection hose out and remove the upper block.
6. Place the block on a horizontal surface bottom up and clean the bottom surface.
7. Unscrew and remove the non-return valve components. You can screw the valves with pliers.
8. Replace the non-return valves with components from non-return valves kit. Picture (13.15)
9. Replace the O-ring seals on the blocks with the O-rings found in the service kit. Remove the used O-rings and wipe any residual condensate and particles from the blocks before replacement of the O-rings into the grooves.
10. Place the upper block back into position, connect the tube, place the back panel into position and screw the nuts tightly to ensure proper sealing.

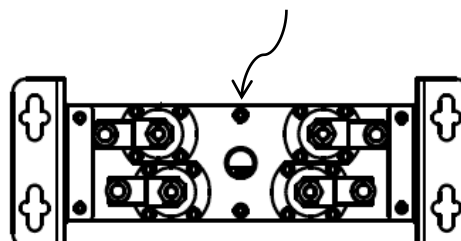


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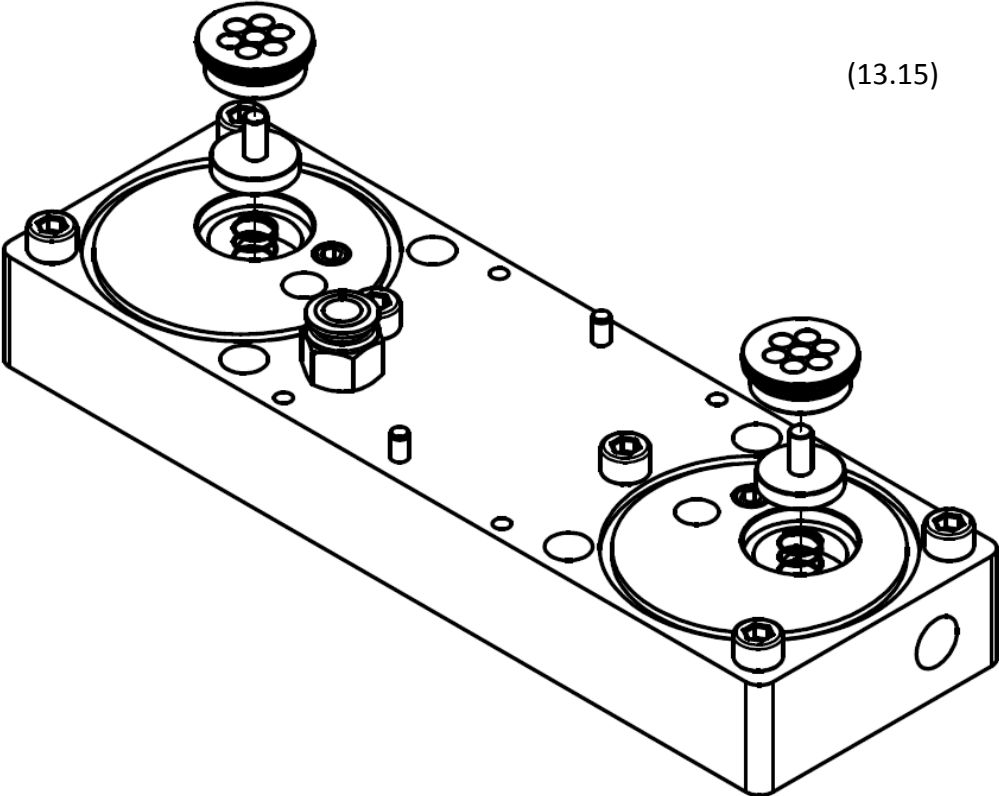
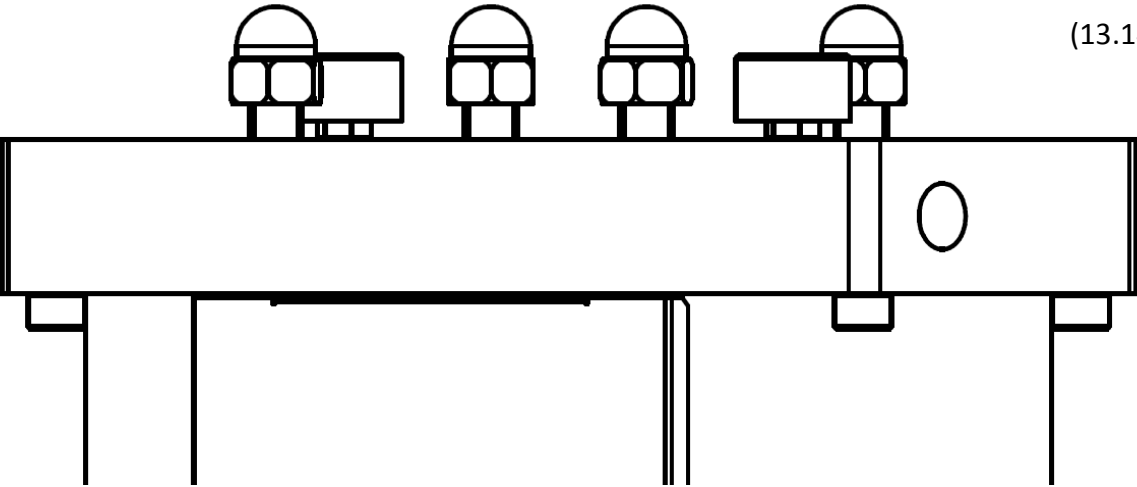
*Tower 1 pressure indicator*

*Tower 2 pressure indicator*

*Back panel fixing screw*



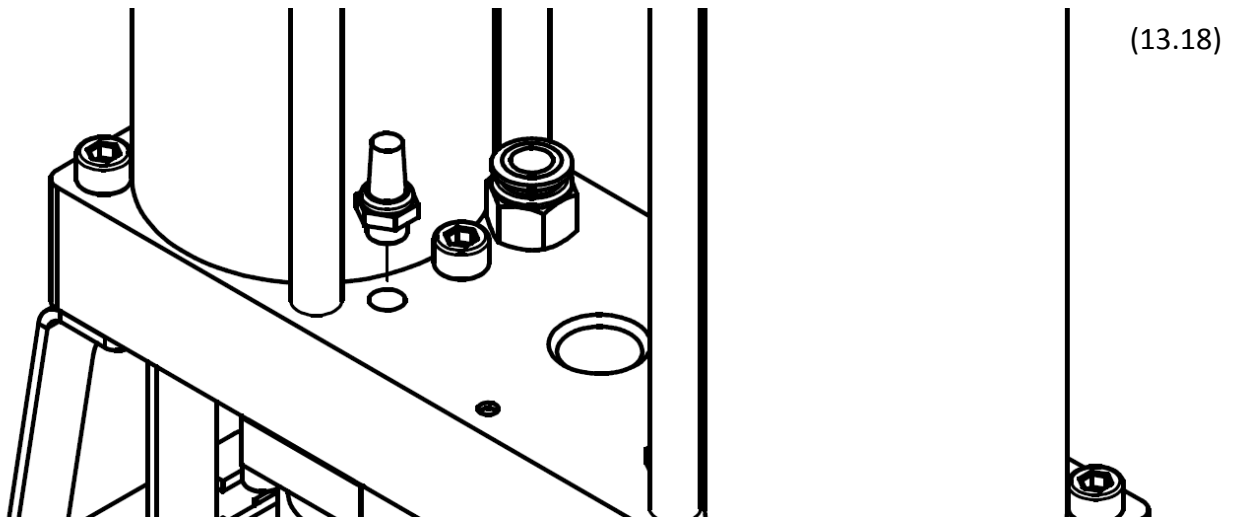
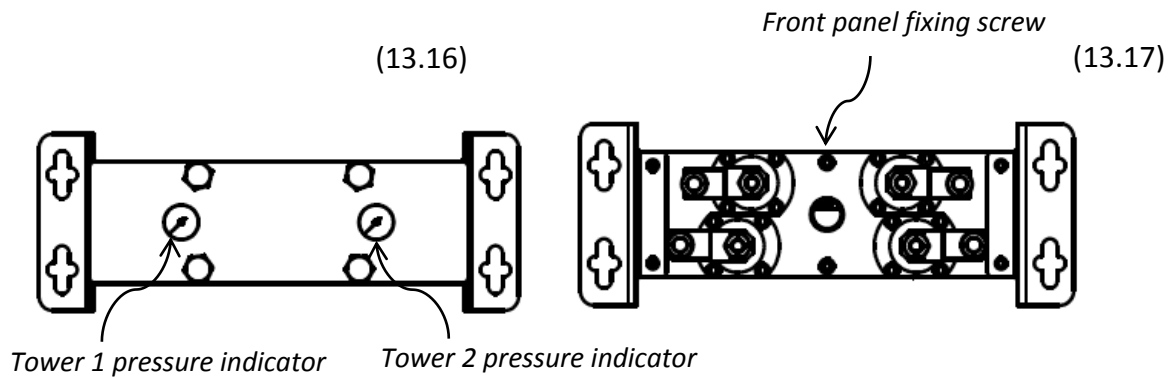
(13.13)



### 13.4 Replacement of the purge exhaust silencers

Replacement of the purge exhaust's silencers:

1. Disconnect the adsorption dryer from the compressed air system and the electrical power.
2. Make certain that the adsorption dryer is depressurised. You can check this by inspecting the pressure indicators at the top of the adsorption dryer. Picture (13.16)
3. Unscrew and pull out the front panel. Picture (13.17)
4. Unscrew the purge exhaust silencers from the bottom block. Picture (13.18)
5. Screw in both silencers.
6. Place the front panel back into position and fix it with the plank fixing screw.

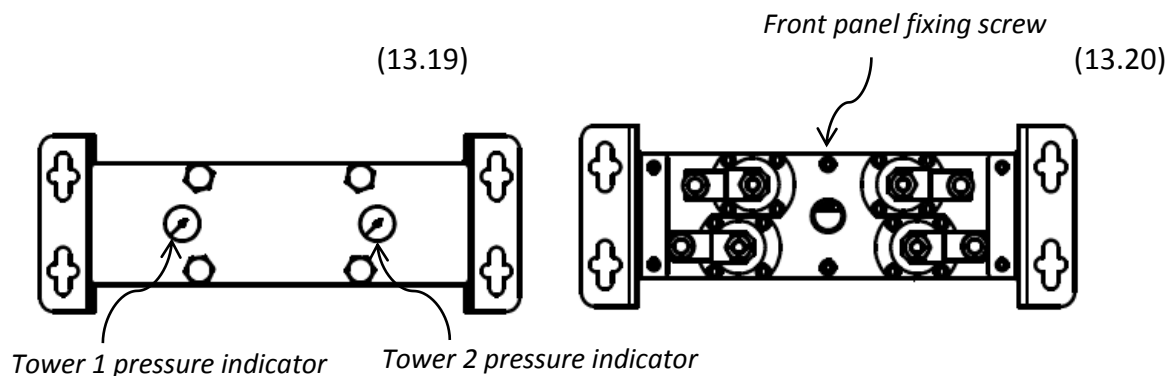


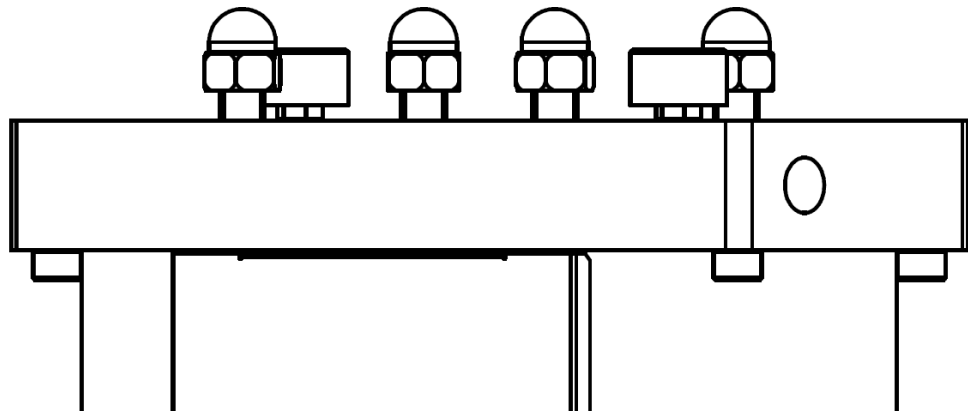
### 13.5 Replacement of the nozzles

If the adsorption dryer operating conditions have changed it is recommendable to contact your supplier to consider different nozzles for a more efficient and economic operation. Find more information in the section *6 Efficiency considerations*.

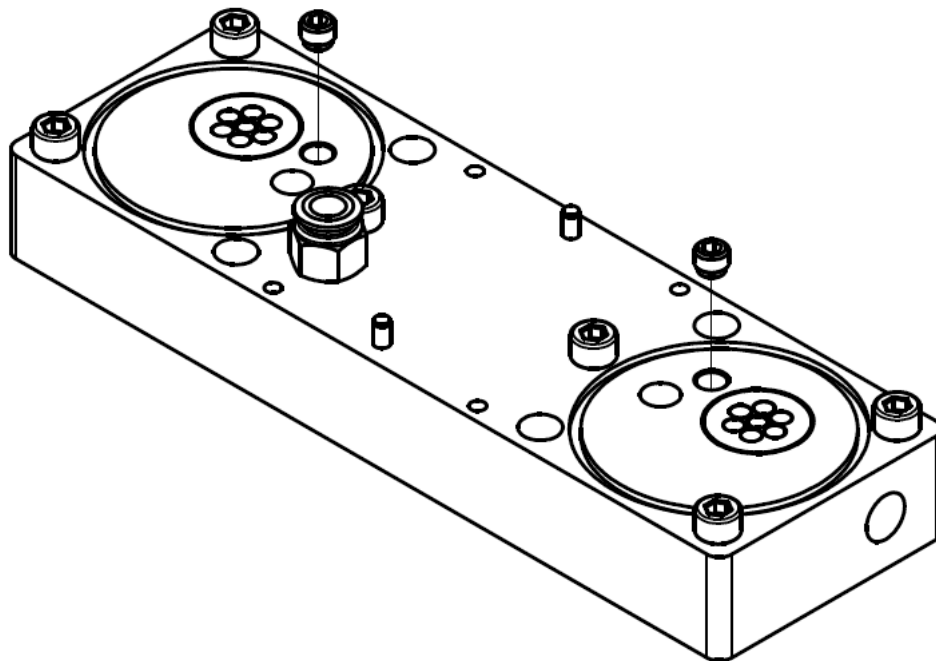
If the operating conditions have not changed since the commissioning or the last maintenance then continue with the following procedure to replace the nozzles:

1. Disconnect the adsorption dryer from the compressed air system and the electrical power.
2. Make certain that the adsorption dryer is depressurised. You can check this by inspecting the pressure indicators at the top of the adsorption dryer. Picture (13.19)
3. Unscrew and pull out the back panel. Picture (13.20)
4. Unscrew the nuts at the top of the adsorption dryer. Picture (13.21)
5. Pull the block connection hose out and remove the upper block.
6. Place the block on a horizontal surface bottom up and clean the bottom surface.
7. Unscrew and remove the nozzles.
8. Screw in the new nozzles. Picture (13.22)
9. Replace the O-ring seals on the blocks with the O-rings found in the service kit. Remove the used O-rings and wipe any residual condensate and particles from the blocks before replacing the O-rings into the grooves.
10. Place the upper block back into position, connect the tube, place the back panel into position and screw the nuts tightly to ensure the proper sealing.





(13.21)



(13.22)

### 13.6 Dew-point Sensor Calibration

Dew-point sensor might become inaccurate due to ageing. To prevent inaccurate readings it is recommended to do a dew-point sensor calibration yearly.

For calibration please contact the manufacturer.



## 14 Troubleshooting

### 14.1 Controller

#### 14.1.1 Controller Turns OFF

Description:

Controller Turns OFF immediately or shortly after start-up.

Possible causes, inspection and fixing procedure:

- **Faulty control valve:** Inspect the control valve coils. If one or more the coils keeps warming up considerably compared to other coils then the coil is malfunctioning and causing circuit breaker to disconnect the controller and the coils from electrical supply. Order the control valves service kit.
- **Faulty wiring or contact:** If the control valves are working properly, inspect the electrical connections within the controller housing. Turn OFF the circuit breaker and disconnect the B-DRY dryer from electrical supply. Unscrew the lid of the housing box. Check if the wires are firmly screwed to the terminals. Screw the wire into terminal firmly is it gets pulled out during inspection. Screw the lid back on and start the dryer operation to see if the problem is solved.
- **Faulty circuit breaker, transformer or PLC:** If the problem is not solved either circuit breaker, transformer or PLC are faulty. Contact your supplier for replacement.

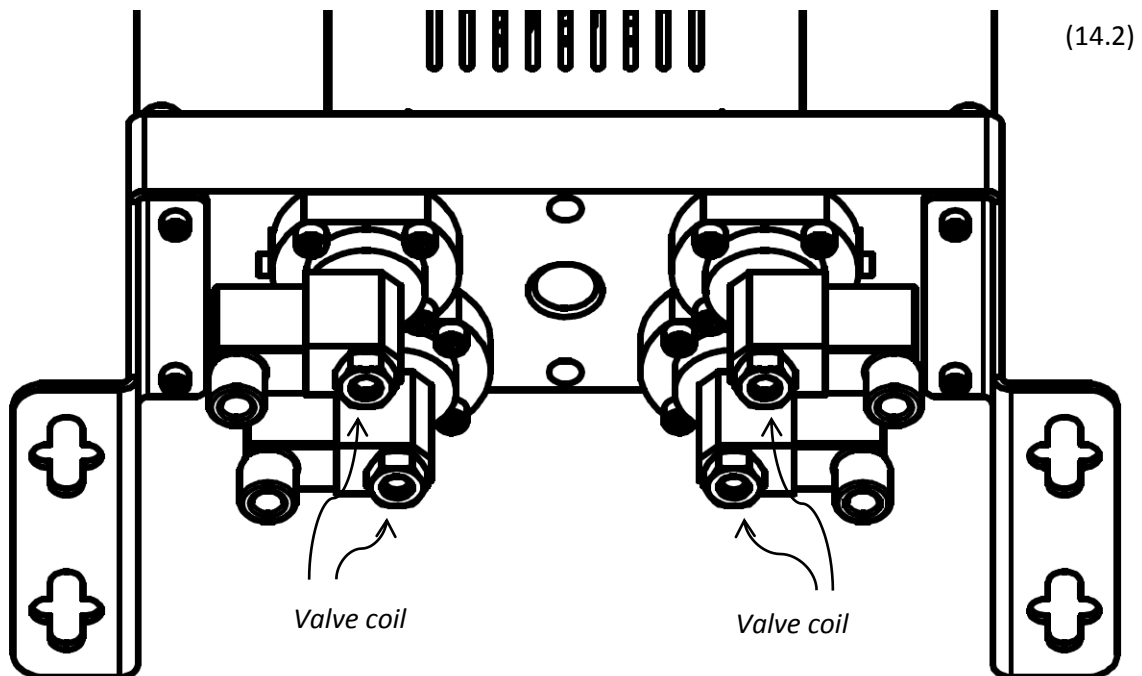
## 14.2 Control Valves

When A-DRY adsorption dryer is not operating properly as described in the section 4 *Description of operation* and the controller is functioning properly without malfunction then one reason for the malfunction could be the control valves.

The functioning of the control valves can be checked during normal operation of the controller. Monitor the adsorption dryer through two adsorption-regeneration cycles. During the stages of the cycles and both switch-over sequences all four valves should be activated. You can check if the valve has been activated by holding a steel object (screw driver etc.) under the coil of the valve. See the bottom picture (14.2). Please mind that the point of view on the picture is due to better presentation, **the adsorption dryer should be in and upright position during the operation**. If the valve has been activated the electromagnetic field generated by the valve coil will cause the steel object in your hand to vibrate slightly.

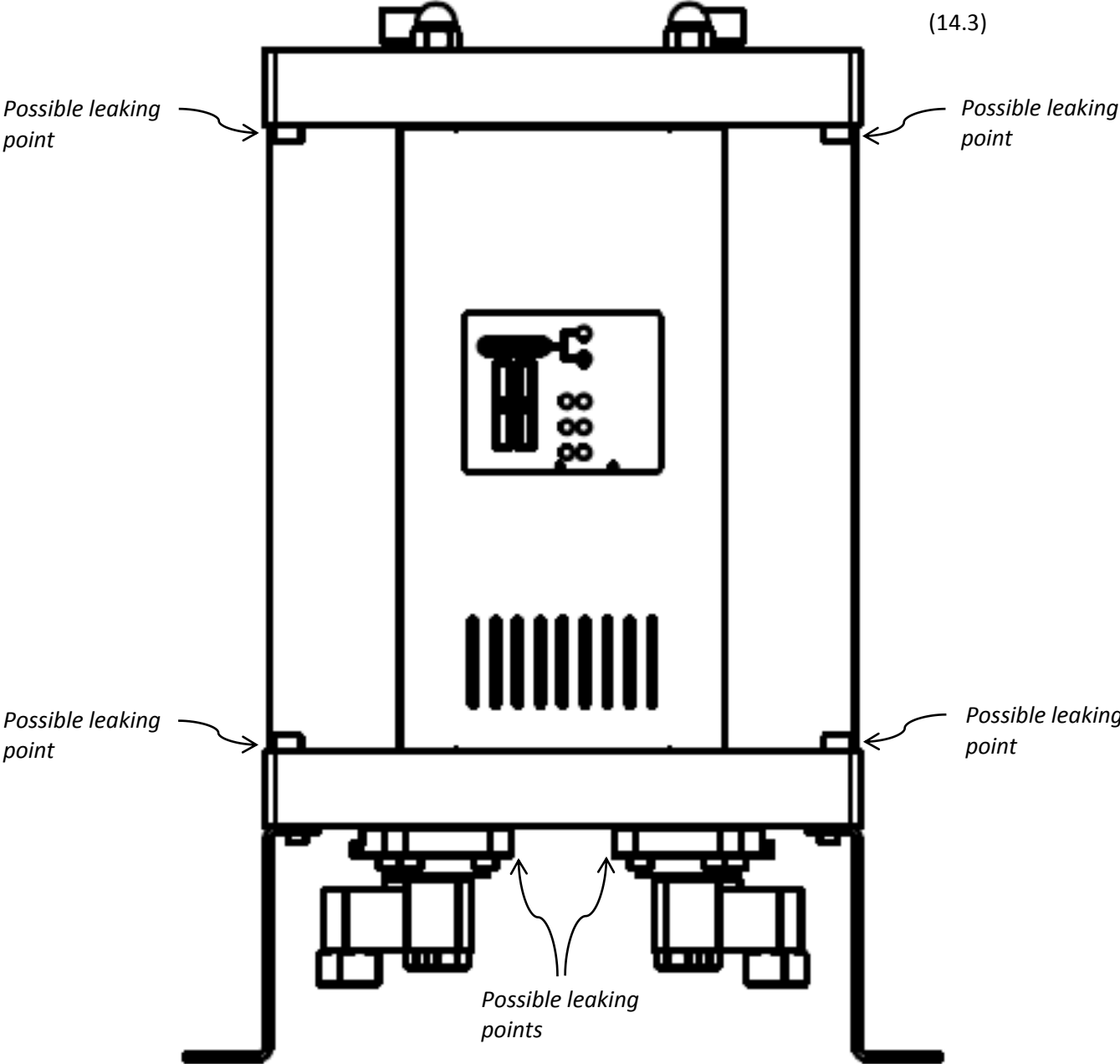
If the electromagnetic valve does not activate during the test then the electromagnetic valve has malfunctioned. Contact your supplier to order the *Valve replacement kit* (check page 32 for more information) or to order the maintenance.

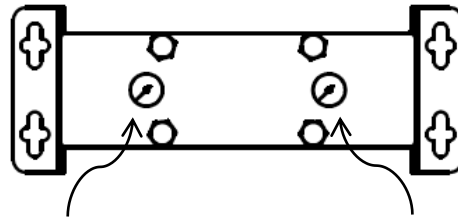
If all electromagnetic valves activate then the electromagnetic part of the valve is working properly and there is a possible malfunction of one of the control valve membranes.



**14.3 Leakage**

A-DRY adsorption dryers contain several NBR seals that seal the possible gaps between the assembled parts. The most critical seals are O-rings between the blocks and the towers and the control valve membranes that also have the function of the seals. See picture (14.3).





(14.4)

*Tower 1 pressure indicator*

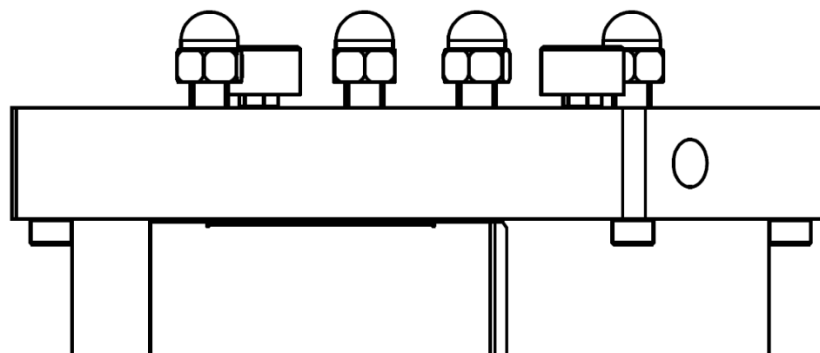
*Tower 2 pressure indicator*

#### 14.3.1 A leak between the block and the tower

**A leak between the block and the tower can mostly be fixed by tightening the nuts on the top of the dryer.** If the leak is not fixed by the procedure then the O-rings need to be replaced. Contact your supplier.

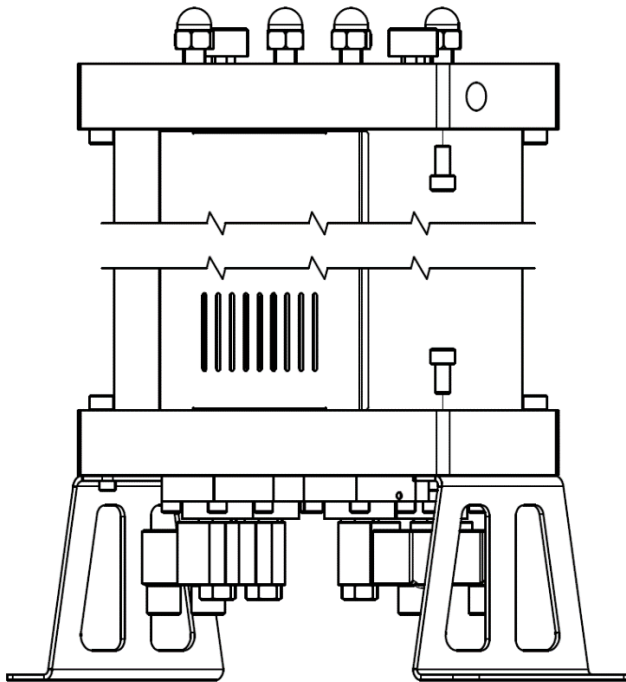
To replace the O-rings follow the procedure:

1. Disconnect the adsorption dryer from the compressed air system and the electrical power.
1. Make certain that the adsorption dryer is depressurised. You can check this by inspecting the pressure indicators at the top of the adsorption dryer. Picture (14.4)
2. Unscrew the nuts on the top of the upper block. Picture (14.5)
3. Unscrew the upper and lower screws at the sides of blocks beside the tower on which you are replacing O-rings. Picture (14.6)
4. Slightly lift the upper block and take the tower out. Picture (14.7)
5. Remove the used O-rings and wipe any residual condensate and particles from the blocks before replacing the O-rings.
6. Replace the O-ring seals into the grooves on the blocks.
7. Put the tower back into its position by lifting the upper block, screw the side screws in.
8. Screw the nuts on the top tightly to ensure the proper sealing.

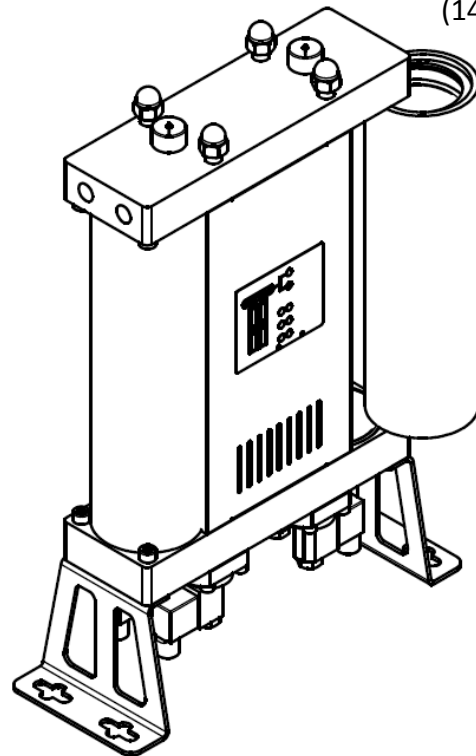


(14.5)

(14.6)



(14.7)



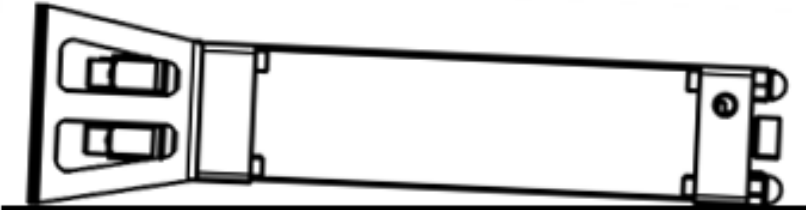
#### 14.3.2 A leak between the valve and the block

**A leak between the valve and the block can mostly be fixed by tightening the screws that attach the valve to the block.** If the tightening of the screws does not solve the leakage problem, follow the procedure below:

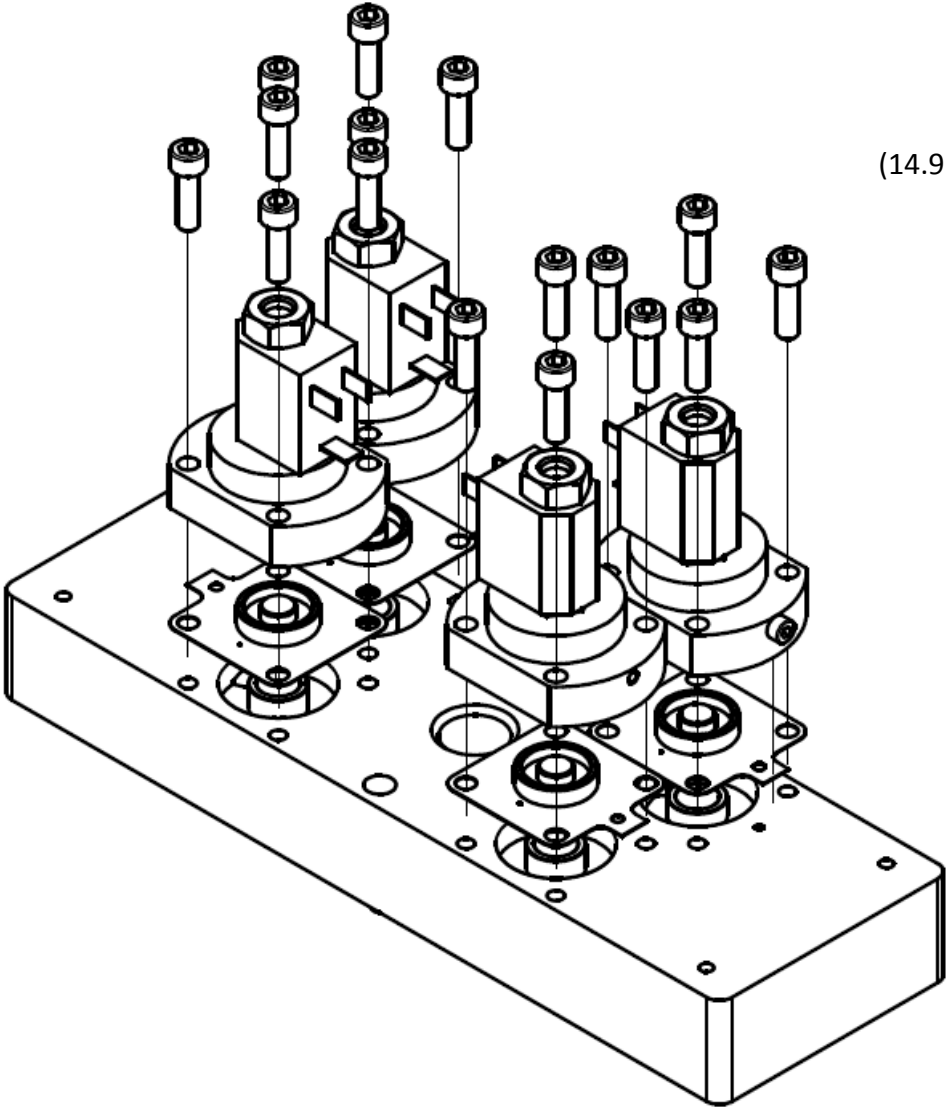
1. Disconnect the adsorption dryer from the compressed air system and the electrical power.
2. Make certain that the adsorption dryer is depressurised. You can check this by inspecting the pressure indicators at the top of the adsorption dryer. Picture (14.4)
3. Carefully place the adsorption dryer on the side. Picture (14.8)
4. Disconnect the connector on the coil of the leaking electromagnetic control valve.
5. Unscrew the screws that are fixing the control valve to the block. You can remove only the leaking valve. Picture (14.9)
6. Clean the surface of the block, bottom surface of the valve and the membrane.
7. Lubricate the membrane with a sealing lubricant.
8. Reassemble the valve and install it back on the block by tightening the screws.
9. The components are placed in the following order as: membrane, spring and valve.

If the leak is not fixed by the procedure then the valve needs to be replaced. Contact your supplier.

(14.8)



(14.9)



## 14.4 High pressure drop

High pressure drop is pressure drop exceeding 1 bar. High pressure drop can be caused by the following conditions.

### 14.4.1 Inadequately dimensioned compressor and dryer

If the compressor supplying the dryer is smaller than rating of the dryer the pressure drop will occur. The size of adsorption dryer towers and purge nozzles is determined by adsorption dryer rating and expected supply of compressed air.

During normal operation where compressor, adsorption dryer and downstream users are properly dimensioned the volumetric air flow losses due to purge air release during regeneration phase are 15-21% of nominal inlet compressed air. Pressure drop will still occur during switchovers and due to filters, valves and tower pressure drops but it will be between 0,2-1,0 bar.

When the compressor is too small the amount of inlet volumetric flow of compressed air that is used by purge release during regeneration will exceed 21% and may even reach 100% in systems with extremely undersized compressors. This condition will cause high pressure drops.

Solution is to either use a stronger compressor, a smaller adsorption dryer or replacement of purge nozzles.

### 14.4.2 The downstream system is oversized

Compressor, adsorption dryer segment and downstream users should be dimensioned accordingly. The problem of undersized compressor has been described on the previous page. The demand of oversized downstream users can cause a high pressure drop on the dryer although the dryer is not the cause. This occurs when the downstream users use more compressed air than the volumetric flow from the outlet of the adsorption dryer can supply.

You will need a stronger compressor and a bigger adsorption dryer.

#### 14.4.3 Oil in the adsorption dryer

The reason for high pressure drop may be the oil from compressor that saturated and blocked the filters. If the oil comes in contact with adsorbent, it will destroy the adsorbent. If you see oil on the after-filter the adsorbent is destroyed, in which case the adsorbent should be changed together with filter cartridges.

Check-up procedure:

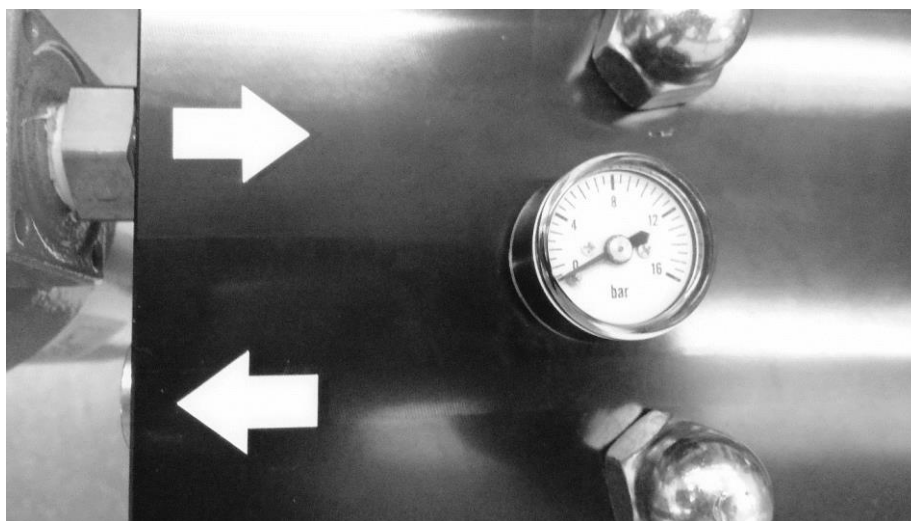
1. Check pre-filter and after-filter for signs of oil and/or other contamination!
2. Change the filter cartridges if needed!
3. If there is oil on the after-filter, change the adsorbent on both towers!
4. Service and/or improve pre-filtration!

Compressed air at the dryer inlet should be free of solid particles, oil particles and liquid water. For more information on proper air preparation see the chapter **Installation Layout!**



#### 14.4.4 Dryer connected to the system in the opposite way

Although it may seem to be a unlikely or even impossible cause of high pressure drop, cases like this do occur. Check the arrows on the top of the dryer that indicate the inlet and outlet to make sure the adsorption dryer is connected to the system correctly.



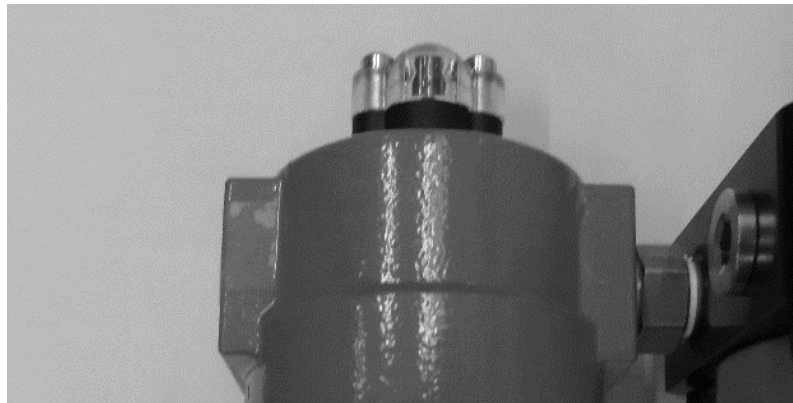


#### 14.4.5 Solenoid control valves malfunction

The cause of high pressure drop could be malfunctioning control valves. In this case the pressure in the towers during adsorption phase will be much lower than the inlet pressure. Check chapter **Control Valves** for more information.

#### 14.4.6 Clogged pre-filter and/or after-filter

Although the service interval for pre-filter and after-filter is 12 months, the filter might have to be changed before the service interval if they are clogged. You can check the status of the filter on the differential pressure indicator on top of each filter housing. If the pressure drop indicator is red, the filter element is clogged.



#### 14.4.7 Increased purge flow on one tower

Description:

Purge flow during one half-cycle is greatly increased compared to the other half-cycle causing the pressure to drop in both regenerating and adsorbing tower.

The causes for greatly increased purge release on one tower are:

- **Faulty nozzle:** Highly unlikely since the nozzle would have to be missing or have wider opening to have this effect.
- **Malfunctioning non-return valve:** If the non-return valve is blocked by particle or has a broken spring and does not close properly the purge release during regeneration phase will be greatly increased. Check the non-return valve and replace it if needed (see **Replacement of non-return valves**).

## 14.5 High outlet dew-point

In normal operating conditions the heatless adsorption dryer A-DRY operates in fixed adsorption-regeneration cycles and maintains a pressure dew-point between -25 and -70 °Ctd. The outlet dew-point is dependant on inlet volumetric flow and inlet air temperature.

**New adsorption dryer** could need a few hours of operation to reach a certain dew-point. This is due to the fact that the adsorbent adsorbs a certain amount of water vapour during production and installation. Depending on the amount of adsorbed water the dryer will need a certain amount of cycles to regenerate both tower enough to reach the desired dew-point.

Lower inlet temperatures and volumetric flows result in more effective adsorption process and thus lower pressure dew-points, all the way down to -70 °Ctd and lower. Higher inlet temperatures and volumetric flows result in lower pressure dew-points, all the way up to -25 °Ctd and higher. Once the dew-point rises above -25 °Ctd the molecular sieve in the towers could be permanently damaged and needs to be replaced.

The following chapters describe the possible causes of high outlet dew-point.

### 14.5.1 Underdimensioned adsorption dryer

If the dryer is underdimensioned and the volumetric flow through the dryer is much higher than the dryer rating the amount of molecular sieve for adsorption and the quantity of the air that passes through the molecular sieve during regeneration will be too small. Consequently the pressure dew-point could continue to rise towards the point where molecular sieve is saturated and the inlet and outlet dew-point are equal.

See chapter **Technical data** for more dimensioning information and correction factors.

#### 14.5.2 Liquid water in the towers

If there is no cyclone separator upstream from the dryer or there is a malfunction of drain on prefilter liquid water could start to gather in the towers. A-DRY has a bed of water resistant silica gel for protection in such cases but if the amount of liquid water is too great and it passes this bed the molecular sieve will be destroyed and it will not adsorb the water vapor anymore. The result is a higher pressure dew-point.

Replace the adsorbent and service and/or improve pre-filtration.

For more information on proper air preparation see the chapter **Installation Layout**.

#### 14.5.3 Oil in the towers

If the compressor produces too much oil in the outlet air and this air reaches the adsorption dryer it will destroy the molecular sieve and pressure dew-point will get higher. In this case however the protective bed of water-resistant silica gel will get destroyed also and the pressure dew-point will rise faster.

Check-up procedure:

1. Check pre-filter and after-filter for signs of oil and/or other contamination!
2. Change the filter cartridges if needed!
3. If there is oil on the after-filter, change the adsorbent on both towers!
4. Service and/or improve pre-filtration!
5. Service the compressor!

Compressed air at the dryer inlet should be free of solid particles, oil particles and liquid water. For more information on proper air preparation see the chapter **Installation Layout**!

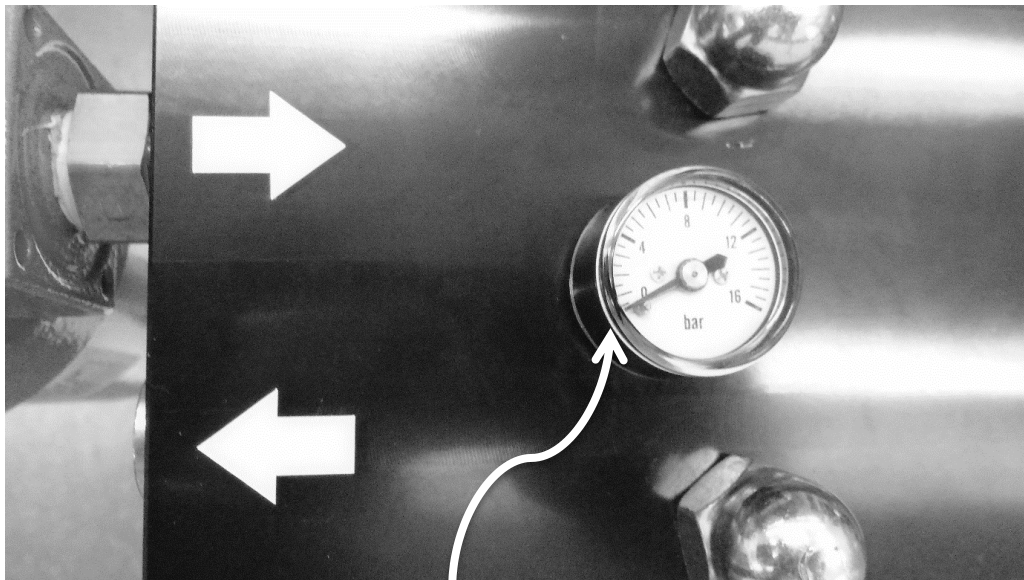
#### 14.5.4 Tower fails to depressurise

##### Description:

During normal operation there is a 4 min interval of purge air release when the tower depressurizes in every-half cycle. During a half-cycle there is no regeneration/purge flow interval on one or both towers.

##### Possible causes, inspection and fixing procedure:

1. **No power supply, controller is OFF:** Connect the power supply.
2. **Dryer is in a STAND-BY MODE:** Inspect the source of the STAND-BY signal.
3. **Faulty control purge release valve:** Inspect the control valve coils. If one or more the coils keeps warming up considerably compared to other coils then the coil is malfunctioning and could be causing the failure to open the purge release valve during the regeneration/purge interval. Order the control valves service kit. For more information see **14.2 Control Valves**.
4. **Clogged nozzle:** Inspect the nozzle. If it is clogged, clean it! For more information see **13.5 Replacement of the nozzles**.
5. **Malfunctioning manometer:** In this case the dryer is operating correctly but a faulty manometer indicates that the tower has not depressurized. If the manometer is faulty it will show that the tower is pressurized even when the dryer is offline and unpressurised. Contact your supplier and replace the manometer.



Manometer indication on unpressurised dryer

## **15 Warranty exclusion**

The guarantee shall be void if:

- The operating instructions were not followed with respect to initial commissioning and maintenance.
- The unit was not operated properly and appropriately.
- The unit was operated when it was clearly defective.
- Non-original spare parts or replacement parts were used.
- The unit was not operated within the permissible technical parameters.
- Unauthorised constructional changes were made to the unit or if parts of the unit that may not be opened were dismantled.

**16 Maintenance record**

TYPE OF MAINTENANCE	DATE	SIGNATURE	NOTES
Commissioned			


**DE SALES & SERVICE**

1211 Old Coochs Bridge Road

NEWARK, DE 19713

Tel.: 302-456-1660

Fax.: 302-456-1660

e-mail: [de.sales@comcast.net](mailto:de.sales@comcast.net)

[www.desales-service.com](http://www.desales-service.com)