



# DESICCANT DRYER

*Instruction and Maintenance Manual*

**DDA 240-320**

## EC DECLARATION OF CONFORMITY



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declares under its own responsibility that the unit to which this declaration relates is in conformity with Pressure Equipment Directive 2014/68/EU as well as the following regulations:

Applied conformity assessment procedures:	<b>Modulo A2</b>
Applied standards and technical specifications:	<b>SIST EN 13445:2014</b>
Other applied EC-Directives:	<b>Low Voltage (LVD) 2014/35/EU Electromagnetic Compatibility (EMC) 2014/30/EU</b>
<b>Engaged notified bodies</b>	
Surveillance of the QS-System:	<b>Modulo A2</b>
Examination / inspections / test during manufacturing:	<b>INSTITUT ZA VARILSTVO D.O.O. / certification body no.: 2042</b>
<b>Certificates which are included</b>	
EU-Design Examination Certificate No.:	/
EU-Type Examination Certificate No.:	/
EU-Certificate of conformity No.:	<b>IZV-PED-CD-A2-830-01-1701</b>

Description:	<b>AIR DRYER</b>	
Type-, serial-, identification-No.:	<b>DDA 240-320</b>	
Year of manufacturing:	-	
Chamber designation:	<b>1</b>	
max. allowable pressure PS:	<b>3 - 16</b>	<b>bar</b>
allowable max./min. temperature TS:	<b>+50 / +2</b>	<b>°C</b>
Volume	-	<b>L</b>
Test pressure PT:	<b>22,88</b>	<b>bar</b>
Pressure test date:	-	
Pressure test medium:	<b>AIR</b>	
Fluid – fluidgroup:	<b>AIR (GROUP 2)</b>	

Name / Surname  
**Joachim Kosinski**

Position  
**Managing Director**

Date  
**07.02.2018**

Signature

*J. Kosinski*

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## 1. GENERAL INFORMATION

### 1.1 FUNCTIONAL DESCRIPTION

The desiccant air dryer is a pressure appliance designed to remove humidity from compressed air.

It is made of two identical pressure vessels, which are filled with:

- aluminum oxide Al<sub>2</sub>O<sub>3</sub> (for DDA -40°C models)
- molecular sieve + aluminium oxide (for DDA -70°C models)

Alumina is an adsorption-drying agent, which binds humidity.









Molecular sieve is an adsorption agent that binds to smaller molecules of water vapour which alumina can't.

The columns are connected with two aluminium blocks. On the lower block are located four valves and one silencer.

The valves force the air into the columns in order to dry the air in one vessel and regenerate the alumina in the second one.

### 1.2 USE OF THE MACHINE IN SAFE CONDITIONS

Symbols applied on the dryer and manual

	General warning		Do not touch electrical hazard
	Danger - high voltage, electrical current		Prohibition of maintenance to unqualified personnel
	Danger point		Environmental requirements
	Mandatory consulting the manual		Recyclable materials

This system has been designed and manufactured in compliance with the European safety directive in force, therefore any installation, use and maintenance operations must be performed respecting the instructions contained in this manual.



Any installation, use and maintenance operation requiring to access the internal parts of the dryer must be performed by qualified personnel.



The manufacturer will not be liable in case of uses different or not complying with those foreseen in this manual.



## **2. TECHNICAL DESCRIPTION**

### **2.1 OPERATION**

The dryer is totally automatic during operation; it needs only a minimum maintenance and care. Each sequence of operations is programmed by a central circuit board or mechanical timer.

Standard dryer operates on a 9-minute cycle with 4,5 minutes drying, 4 minutes regenerating and 30 seconds pressurizing.

### **2.2 AIR CIRCUIT**

The dryer was manufactured in order to dry compressed air; every application of the machine in conditions other than those described in Annex A must be authorized by the manufacturer.

## **3. INSTALLATION**

### **3.1 ACCEPTANCE AND TRANSPORTATION**

At the moment the customer accepts the delivery, he must fully inspect the dryer to verify its integrity and the presence of all the items listed in the shipping documentation.

Eventual claims for missing and/or damaged parts must be addressed directly to our facility or the closest reseller, within 8 (eight) days from the date on which the goods have been received.

It is mandatory to keep the dryer always in vertical position, as indicated by the symbols present on the packaging. For eventual displacements, use adequate devices with reference to the weight of the machine.



Remove the packaging after having positioned the dryer in the installation site. We suggest keep the original packaging at least for the warranty period of the machine. Anyhow, do not forget to dispose the various materials in compliance with the relevant rules locally in force.

Do not remove any panels during transportation and positioning of dryer.

If not in use, the dryer can be stored in its packaging in a dust free and protected site at a maximum temperature of 50 °C, and a specific humidity non exceeding the 90%. Should the stocking time exceed 12 months, please contact the manufacturer.

### 3.2 INSTALLATION SITE

While preparing a proper site for the installation of the dryer, please take into account the following requirements



- The machine must be protected from atmospheric agents and not directly exposed to sun light.



- The seating base must be flat and capable to hold the weight of the machine.

- A clean, dry and without internal air recirculation (we suggest to blow the warm air outside the installation site).

- Make sure to leave sufficient clearance around the dryer in order to allow an adequate cooling of the machine and maintenance/control operations.



The incoming air must be free from smoke or flammable vapours which could lead to explosion or fire risks.

### 3.3 INSTALLATION LAYOUT



Before attempting any installation operation, make sure that:



- no part of the system is under pressure

- no part of the system is electrically powered



- piping connections are properly sized and located in order to avoid any external force on the dryer



- dryer is firmly secured to the ground

- a filter with a minimum filtration rate of 0.01 mg/m<sup>3</sup> has been installed before the dryer



Flexible pipes are recommended to reduce vibration problems.

**WARNING!**  
**Incorrect installation may void warranty!**

### 3.4 CONNECTION TO THE MAINS

**DANGER - High Voltage is present.  
PROPERLY HANDLING PROCEDURES MUST BE USED OF ELECTRICAL SHOCK.**



The connection to the mains, to be carried out by qualified personnel, and the safety systems must comply with local rules and laws.

Before connecting the unit to the electric power, verify that the voltage and the frequency available on the mains correspond to the data reported on the data plate of the dryer. In terms of voltage, a  $\pm 5\%$  tolerance is allowed.

The dryer comes with a mains connecting cable already installed.

The mains socket must be provided with a **mains magneto-thermal differential breaker** and the cross section of the power supply cables must be suitable sized by qualified staff in compliance to rules in force and to the consumption of the dryer (see the nominal values on the data plate of the dryer).

Power the dryer after having checked that the nominal voltage and line frequency are constant and matching the nominal values of the machine. **The user must provide the installation with an adequate line protection and a ground terminal complying with the electrical rules locally in force.**

### 3.5 PIPING ARRANGEMENT

To ensure service and maintenance to the dryer, a three-valve bypass system is suggested.

### 3.6 PREFILTERS and AFTERFILTERS

Prefilters, located before dryer, protect the desiccant bed from contamination by oil, water, pipe scale etc., so to extend the dryer desiccant life.

An automatic drain on the filter is mandatory.

To improve the dryer performance install a complete set of filters upstream of dryer.

A post filter with a filtration rate of 1 micron is recommended to capture the alumina powder.

## 4. START UP

### 4.1 BEFORE START UP



Before starting the machine, make sure that all operating parameters correspond to the nominal data (operating parameters in the list attached).



The dryer is supplied already tested and present for normal operation, and it does not require any calibration. Nevertheless, it is necessary to check the operating performances during the first working hours.

## 4.2 START UP

After all piping and electrical connections have been made, proceed as follows:



SLOWLY pressurize the dryer up to reach full operating pressure.



Energize electrical circuit. The dryer will start automatically.

The dryer may require up to 24 hours of operation to reach normal operating dew points. Therefore, indicators and/or alarms should not be considered until that time.

After start up, some dusting may occur. This will decrease afterwards.

### ON / OFF:

The dryer should start automatically when connected to power supply. If the dryer does not start automatically, use the procedure below:

-Push button  to START the dryer.

-Push button  to STOP the dryer.

When the dryer is turned off, the display shows LED1 blinking (see chapter 5.1)

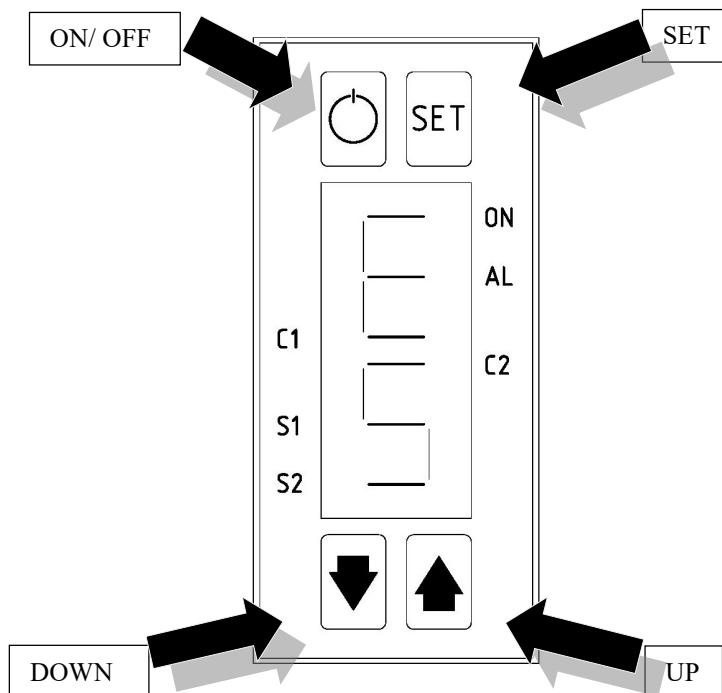
### NOTE

AT INITIAL START-UP, CHECK THE DRYER OPERATION FOR ONE OR TWO CYCLES, ESPECIALLY AT THE TIME OF THE TOWER SHIFT. VERIFY THAT SYSTEM IS OPERATING IN ITS PROPER ORDER AND SEQUENCE. IF THE DRYER IS NOT FUNCTIONING PROPERLY, CONTACT YOU REPRESENTATIVE.



## 5. OPERATION

### 5.1 CONTROLLER



LED	DESCRIPTION	OFF	BLINKING	ON
ON	ON/OFF	Unit is not energised	Unit in standby	Unit is working
C2	Column 2		Column 2 Repressurizing / Column 1 Drying	Column 2 Drying / Column 1 Regenerating
S1	Service advice		Service will be needed soon	
S2	Urgent service		Service is needed	
C1	Column 1		Column 1 Repressurizing / Column 2 Drying	Column 1 Drying / Column 2 Regenerating
AL	Alarm		High dew point alarm	
HD	Alarm *		Dew point set, not reached after 10 min of operation	
ES	Energy Saving *			Energy saving ON

\* Only with dew point sensor installed.

**NOTE:** The controller display can visualize the single horizontal led at ON, C2, S1, S2, C1, AL or compose and visualize letters as per HD and ES.

#### SPECIFICATIONS

- POWER SUPPLY: 230VAC,50-60HZ ., +/-10%
- OUTPUTS: n° 5 RELAYS , 230VAC, 5A
- IP PROTECTION : IP65 (only front panel)
- CERTIFICATION: CE
- STOCKING TEMPERATURE: -40, +50°C
- OPERATING TEMPERATURE: 0 ,+40°C

## 5.2 STANDARD OPERATION

DDA have 3 different operating modes.

1. **TIMED SEQUENCE CONTROL (STANDARD):** the dryer is time controlled. Every working phase is controlled by one of the parameter of the controller. The end user can change the value based on the table on chapter 5.3.
2. **DEW POINT CONTROL (ENERGY SAVING):** the dryer works in Energy saving mode connected with a dew point sensor. Controller is programmed to work with 2 different kind of sensors. Dryer will automatically adjust time of work, but the required dew point value can be adjusted on the controller.
3. **REMOTE CONTROL (SPECIAL APPLICATION):** this special mode is generally used to save energy in special application when -40 °C is not really required. The dryer will keep the timed sequence constant but it will switch on and off depending on the external contact connected on controller.

**NOTE:** Press “up arrow” for operation time cycle visualization. One cycle is the operation of both column.


Press “down arrow” for current dew point temperature visualization, only when dew point sensor is installed.

## 5.3 SET-UP

To set the dryer up, turn it on.

To enter or exit SET MENU press  button for 3 seconds.

After that the display will show first **P1**, then the default value of P1 **03**.

To scroll down the menu keep the button  pressed.

To change the value use “up” and “down” buttons.

To confirm the change press  for 3 seconds. The display will show **SA**.

To set default parameters keep “up” and “down” pressed for 3 seconds. The display will show **dF**.

## PARAMETER TABLE

Parameter	Default	Min.	Max.	STEP	UNIT	REMARKS
P1	3	1	99	1	10*s	Value of repress ration, shown in tens of seconds. Example 3=30 seconds
P2	24	6	36	1	10*s	Value of drying and purge, shown in tens of seconds. Example 24=240 seconds
P3	-39	-80	+20	1	°C	SETPOINT value; the minus sign is shown by the lowest decimal point blinking (39. means -39)
P4	0	0	3	1		CONTROL MODE; selects the CONTROL MODE during OPERATING MODE. 0=TIMED SEQUENCE CONTROL 1=DEW POINT CONTROL SENSOR TYPE 1 2=DEW POINT CONTROL SENSOR TYPE 2 3=REMOTE CONTROL
P5	0	0	1	1		Type of REMOTE CONTROL. 0=normally open contact 1=normally closed contact
P6	0	0	1	1		Type of inlet valve. 0=normally closed 1=normally open

### HOW SET CONTROLLER IN TIMED SEQUENCE CONTROL

If the real flow on the dryer is lower than nominal flow, the end user can reduce the air purge changing parameter P1. Do not change P2 if not agreed with the manufacturer.

P1	3 default	6 / 9	9 / 18
Real Flow %	100 / 85 %	85 / 70 %	70 / 50

To calculate Real Flow % use the follows instructions:

Correction factors for working pressure

Pressure Bar	4	5	6	7	8	9	10
Factor P	0,63	0,75	0,88	1	1,14	1,25	1,39

Correction factors for inlet temperature

Temperature °C	25	30	35	40	45	50
Factor T	1	1	1	0,97	0,88	0,73

Real Flow % = Max real Flow / Adjusted Nominal Flow

Adjusted Nominal Flow = Nominal Flow x Factor P x Factor T

## 6. MAINTENANCE, TROUBLESHOOTING, SPARES AND DISMANTLING

### 6.1 CONTROLS AND MAINTENANCE

#### PLUGS

For safety reasons please check the plugs installed on the dryer every 6 months. Make sure that no plugs are exposed to water (rain, spray...) or moisture.

If corrosion appears on plugs please contact the manufacturer.



#### WARNING

Maintenance on the machine can only be carried out by authorized personnel!

Before attempting any maintenance operation, make sure that:



- no part of the system is under pressure

- no part of the system is electrically powered



**AFTER 2 YEARS OF OPERATION OR WHEN LED LIGHT "SERVICE URGENT" STARTS BLINKING:**

- Replace desiccant alumina
- Replace all O-rings on the dryer
- Replace solenoid valve membranes
- Replace mufflers



**SAFETY VALVE:**

After 2 years of working check the safety valve.

After a long period of operation the safety valve must be checked and approved by a notified body in accordance to safety regulations.

## 6.2 TROUBLESHOOTING



Troubleshooting and eventual control and/or maintenance operations must be performed by qualified personnel.

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Dryer fails to pressurize	Faulty purge valve	Check purge valve Check timer sequencing
Dryer fails to purge	Purge valve does not open	Check solenoid valve. Repair and replace it if necessary
	Purge muffler is clogged	Refer to muffler replacement procedure
Dryer depressurizes too rapidly	Purge valve does not close	Check solenoid valve. Repair and replace it if necessary
The pressure in regenerating tower is high (above 1 bar)	Muffler is clogged	Refer to muffler replacement procedure
	Outlet check valve stays open	Clean and/or replace
The dryer fails to shift towers from drying to regenerating service	There is no input power	Check output voltage to solenoid valve
	Solenoid valve is faulty	Check input voltage to solenoid valve
	Timing on dryer is off	Check controller
There is an excessive pressure drop in the dryer	Excessive flow rate	Check flow rate
	Inlet pressure under design condition	Check pressure source
Dew point is high	Inlet temperature above design condition	Check aftercooler or check compressor
	Water entering desiccant bed	Check air/moisture separator and prefilter and replace desiccant if necessary
	Desiccant contaminated by oil	Install suitable prefilter and replace desiccant if necessary
	Insufficient purge rate	Check muffler

### 6.3 DISMANTLING OF THE DRYER

If the dryer is to be dismantled, it has to be split into homogeneous groups of materials.



<b>PART</b>	<b>MATERIAL</b>
Supports and covers	Carbon steel, Epoxy paint
Refrigeration Compressor	Steel, Copper, Aluminum, Oil
Alumina	Alumina oxide
Upper and Lower blocks	Aluminum,
Non return valves	Stainless steel
Pipe	Extruded Aluminum,
Safety Valve	Brass, Steel
Solenoid Valve	Brass, Steel
Controller	Copper, PVC
Electric cables	Copper, PVC
Electric parts	PVC, Copper, Brass



We recommend to comply with the safety rules in force for the disposal of each type of material. The chilling fluid contains droplets of lubrication oil released by the refrigerating compressor. Do not dispose this fluid in the environment. It has to be discharged from the dryer with a suitable device and then delivered to a collection centre where it will be processed to make it reusable.

# **ATTACHMENT**

## A. DRYER MODELS AND OPERATING CONDITIONS

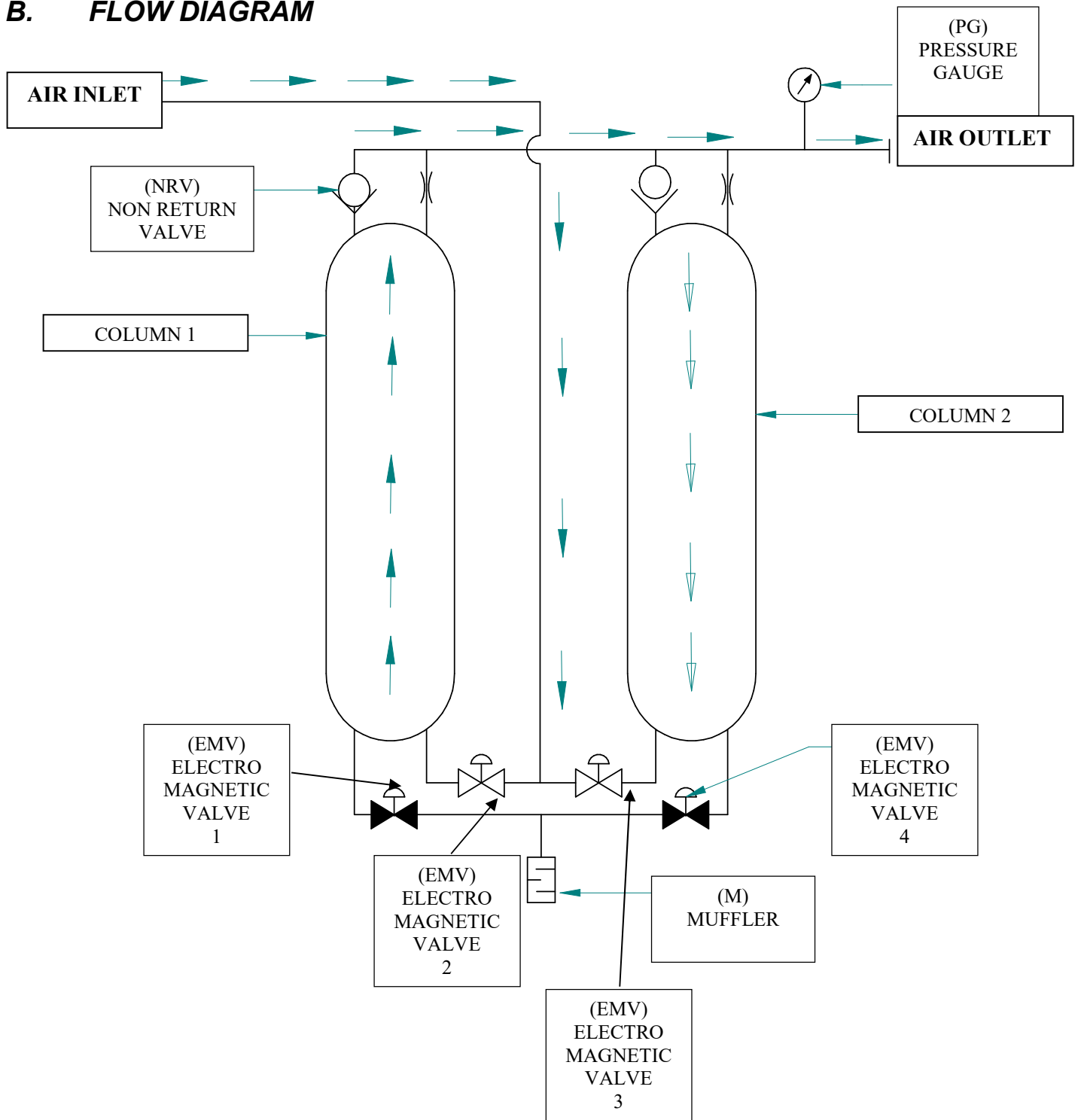
INLET/OUTLET	DDA 240	DDA 320
	DN	1" DN25
m3/h	240	320
SCFM	142	188

Test pressure (PT)	22,8 bar
Minimum working pressure	5 bar
Maximum working pressure	16 bar
Safety device set pressure	16,1 bar
Supply voltage	230 V
Intended use*	Drying compressed air for industrial use
Product (fluid) group	Air (fluid group 2)
Minimum inlet temperature	+1 °C
Maximum inlet temperature	+50 °C
Minimum ambient temperature	+1 °C
Maximum ambient temperature	+45 °C

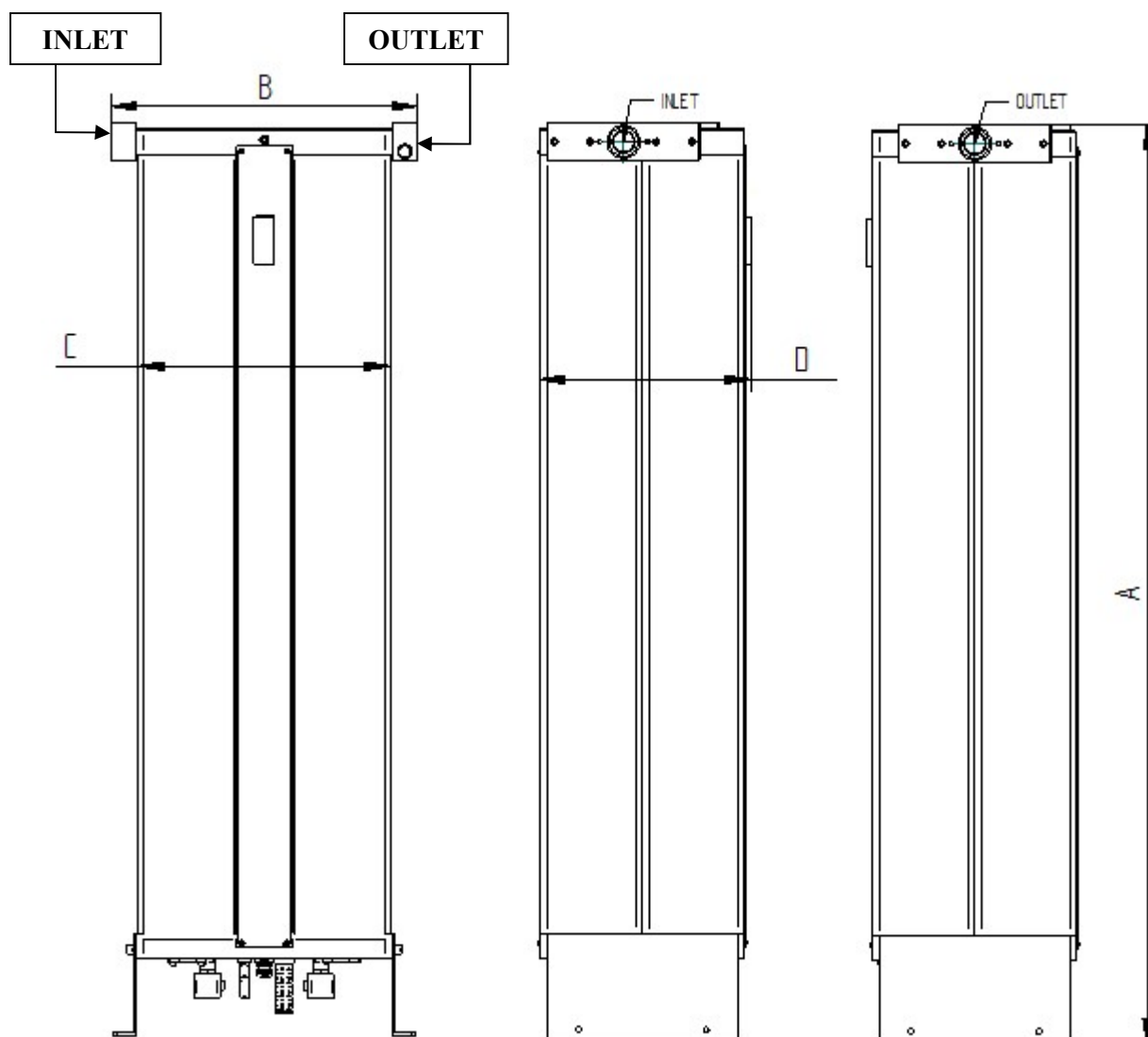
\*Dryer must be kept in dry and dust free area



**B. FLOW DIAGRAM**

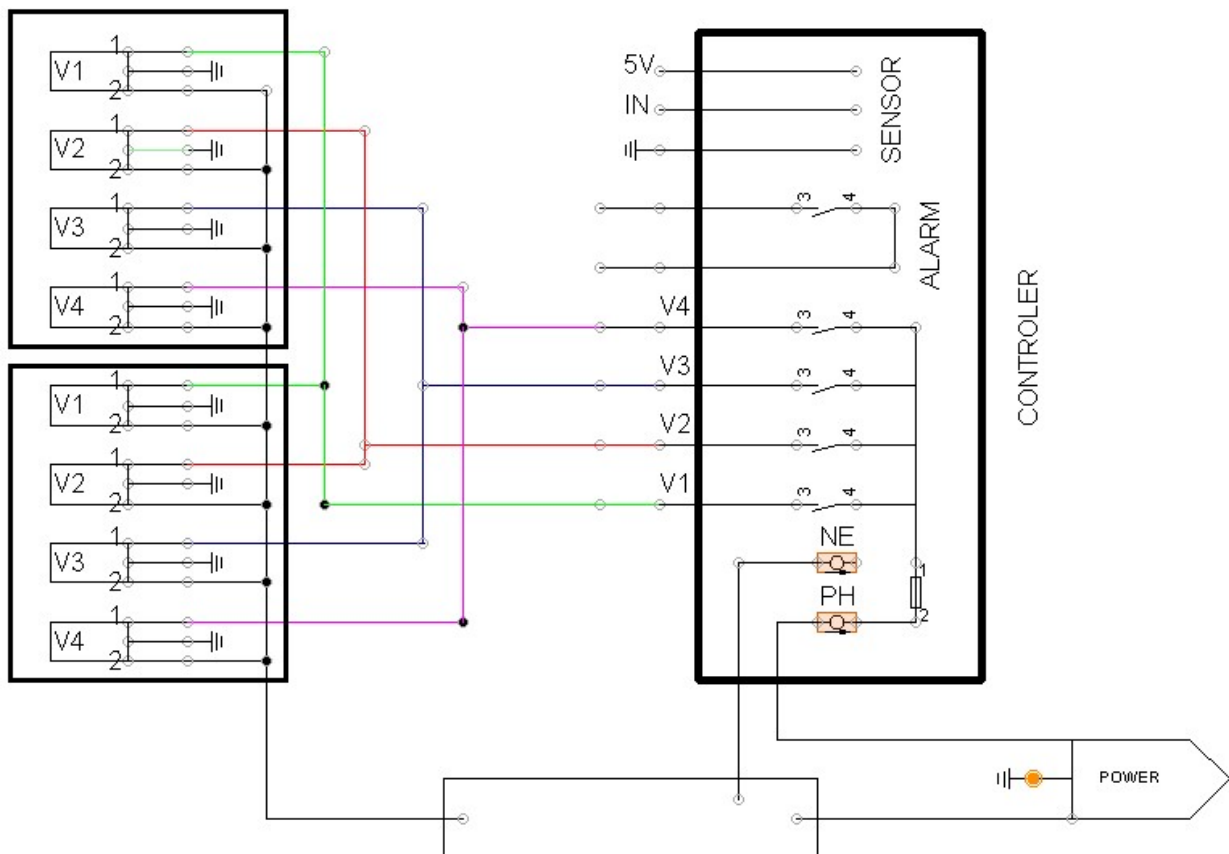


### C. DRYER DIMENSIONS

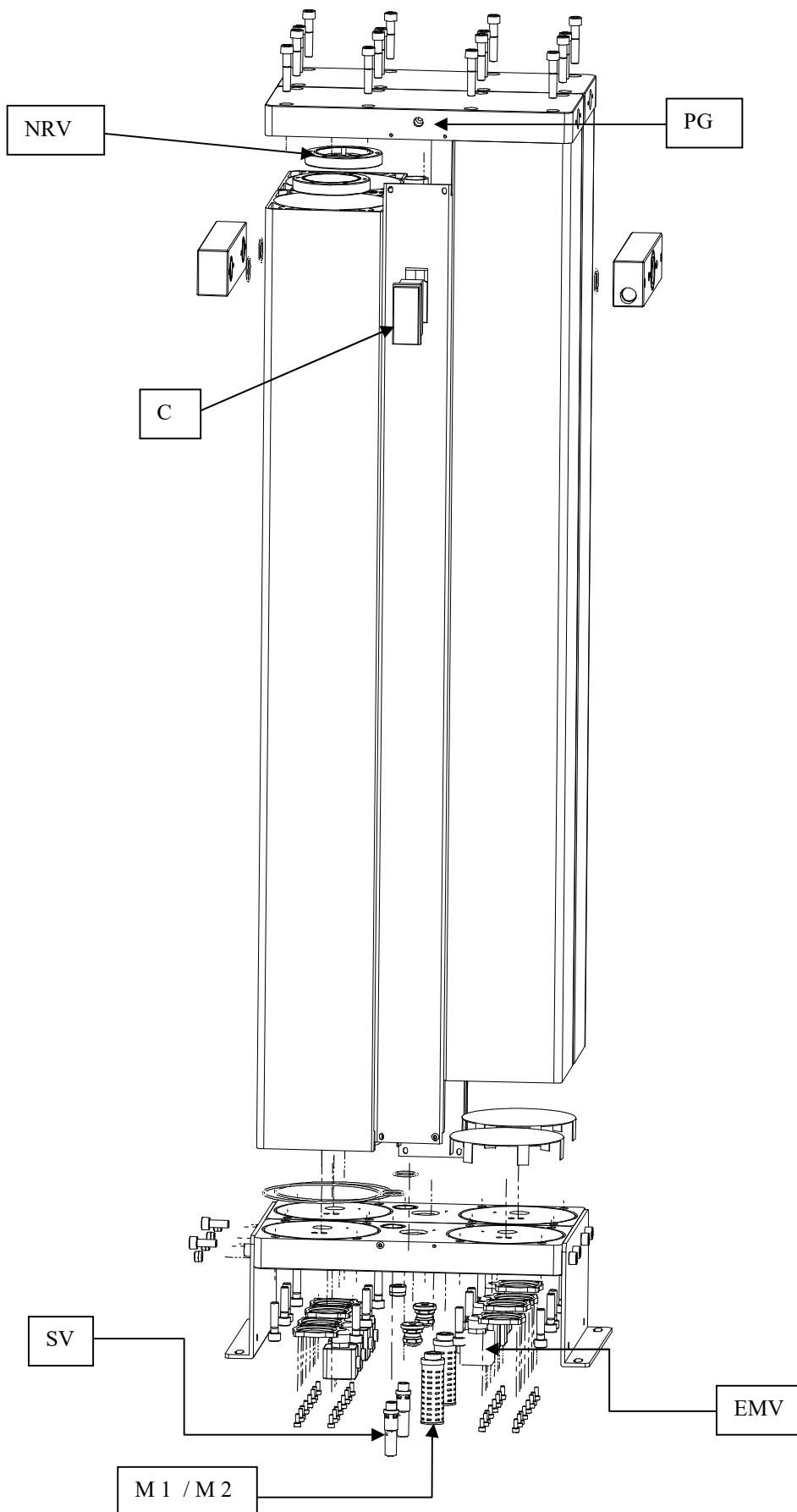


<b>MODEL</b>	<b>240</b>	<b>320</b>
<b>A</b>	1450	1750
<b>B</b>	500	500
<b>C</b>	400	400
<b>D</b>	330	330

**D. WIRING DIAGRAM**



**E. EXPLODED VIEW**



**F. SPARE PARTS**

<b>SPARE PARTS</b>		
DESICCANT REPLACEMENT KIT DDA 240		HGO.K0240
DESICCANT REPLACEMENT KIT DDA 320		HGO.K0320
ORIFICE DDA – DDA 240		0BI.550011
ORIFICE DDA – DDA 320		0BI.550014
NRV	Non Return Valve	0BI.580008
EMVM	Electro Magnetic Valve Membrane	0BI.540024
EMVS	Electro Magnetic Valve Spring	0BI.540016
EMVC	Electro Magnetic Valve Coil	0BI.540025
O	O-ring Set	0BI.540026
M	Muffler	0BI.540013
C	Controller	0BI.590005
PG	Gauge	0BI.540007
SV	Safety Valve	0BI.540006