



Filtering unit **BIG-4000/Ex**

ATEX marking:  **II 3 D Ex tD A22 T200°C**

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1. INTRODUCTION

The purpose of the present Use and Maintenance Manual is to supply User with directions within the range of application, assembly, start-up and operational use of the **BIG-4000/Ex** Filtering unit.



Prior to assembly at the place of operation and use, it is important to get thoroughly acquainted with the contents of the present instruction.



With regard to continuity of work carried on improvement of our products, we reserve for ourselves the revision possibility of the draft and technological changes improving their functional features and safety.

Construction of **BIG-4000/Ex** meets the requirements of the current state of technology as well as the safety and health assurances included in:

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2006/42/EC Directive of the European Parliament and of the Council of the 17 May, 2006 on machinery, amending the 95/16/EC Directive (recast) / Official Journal EC L157 of the 09.06.2006, page 24);

2014/35/EC Directive of the European Parliament and of the Council of the 26 February, 2014 on the harmonisation of the laws of the Member States, relating to the making available on the market of electrical equipment designed for use within certain voltage limits / Official Journal EC L96 of the 29.03.2014;

2014/34/EC Directive of the European Parliament and of the Council of the 26 February, 2014 on the harmonisation of the laws of the Member States, relating to the equipment and protective systems intended for use in potentially explosive atmospheres / Official Journal EC L96 of the 29.03.2014 /

1999/92/EC Directive of the Council of the 19 December, 1999 on minimum requirements regarding safety of health protection of workers employed at workplaces where explosive atmosphere is likely to occur / Official Journal No.138, Pos. 931/

Is in accordance with the subsequent harmonised standards:

EN ISO-12100:2012 Safety of machinery – General principles of design – Assessment and reduction of hazard

EN 60204-1:2018-12 Safety of machinery – Electrical equipment of machines – Part 1: General requirements

EN ISO 13857:2010 Safety of machinery – Safe distances to prevent hazard zones from being reached by upper and lower limbs

EN 60079-0:2013-03/A11:2014-03 Electrical appliances in areas of gas explosion hazard – Part 0: General requirements

EN 1127-1:2011 Explosive atmospheres – Explosion prevention and protection. Basic terminology and methodology

EN ISO 80079-36:2016-07 Explosive atmospheres – Part 36: Non-electrical appliances in areas of explosion risk Methodology and requirements

2. PURPOSE

BIG-4000/Ex is appropriate for cleaning the dust laden air from **dry** dust particles, arising during production processes with occurrence of powdery materials and dust particles of ST1 explosiveness class. The appliance is equipped with 4 cartridge filters, with antistatic polyester membrane – functioning on the basis of surface filtration. Admissible maximum temperature of the filtered air is 40°C.

The device can be applied for such processes as:

- grinding of non-sparking materials,
- sand blasting, shot peening,
- mechanical cutting of metals, gas-, plasma-, laser-, arc cutting of metals,
- polishing, planishing,
- processing of plastics,
- metalization,
- powder varnishing.

Basic advantages of the device are optimum filtration efficiency, long operational use (longevity) of the cartridge filters, low power consumption and simple and fast maintenance. The appliance is admitted for use, according to the Ex marking, for cleaning the air in areas of explosion hazard, according to the ATEX 137 1999/92/EC Directive.

According to ATEX, the operational conditions are specified (as for this device) as follows:

Ex II 3 D Ex tD A22 T200°C. The subsequent markings are interpreted as:

- **group II** – the device is designed for work in enterprises, in on-ground premises, in sites of occurrence of explosion atmospheres, except for application in areas of methane hazard (firedamp), or risk connected with carbon dust;
- **category 3** – the device is designed for application in areas where explosive atmospheres are likely to occur, whereby the explosive atmospheres are of low risk;
- **D hazard** – flammable dusts;
- **Ex** – the electrical appliance is designed for function in areas of explosion hazard;
- **tD** – a marking for Ex protection category of the appliance – tight housing;
- **A22** – control procedure A for the area 22;
- **T200°C** – the surface temperature of any part (of the device) will not exceed 200°C during normal operation.

BIG-4000-Ex filtering unit can be installed, exclusively in areas classified as 22, or in areas not featuring explosive hazard. According to the ATEX 137 Directive, User has to determine the environment where the appliance shall be used.

3. RESERVATIONS OF MANUFACTURER

3.1 Manufacturer is not responsible for damages / malfunctions being caused as a result of reasons mentioned below:

- Any consequences following from the installing that is in contradiction to the present Use and Maintenance Manual.
- Situations where the appliance is connected to the electrical power supply- or the pneumatic system incorrectly.
- Operational use that is in contradiction with the present Use and Maintenance Manual and its specified purpose.
- Installing of any additional elements that are not belonging to the normal device structure (or accessory set) is not acceptable.
- Introduction of any structural or constructional modifications of the system on one's own.
- Situations when the principles of control and maintenance of the appliance are not observed.
- Forwarding of the air containing viscous and aggressive impurities or of the air temperature exceeds 40°C what might result in damage of the filters.

3.2 In the course of operational use, it is important to prevent ignition sources (i.e. sparks, cigarette butts / embers) from getting into the filtering unit.

3.3 Operator should wear antistatic clothes while emptying the waste container, during the technical inspection, maintenance and during any other activities near the filtering unit.

3.4 Do not use mobile phones and devices emitting electromagnetic waves close to the filtering unit and in the vicinity.

3.5 At the side of decompression panel – it is important to create a hazard area of potential explosion according to the Fig. No.2. This area should be free of barriers such as machines, devices, walls etc.

3.6 In case when explosion hazard exists within the whole installation, (where the filtering unit is installed), User should carry out the total risk evaluation, with reference to the being valid regulations and should apply protections of the filtering unit and the fan.

4. TECHNICAL DATA

Table No.1

Type	Maximum volume flow	Maximum vacuum	Motor rate	Supply voltage	Quantity of cartridge filters	Acoustic pressure level	Compressed air consumption	Weight
	[m ³ /h]	[Pa]	[kW]	[V/Hz]	[pcs]	[dB(A)]	[Nm ³ /h]	[kg]
BIG-4000/Ex	5200	2960	5,5	3x400/50	4	74	4,8	710

Cartridge filters: quantity 4 pieces;
diameter Ø325 mm
height 1200 mm
total filtration area 58 m²

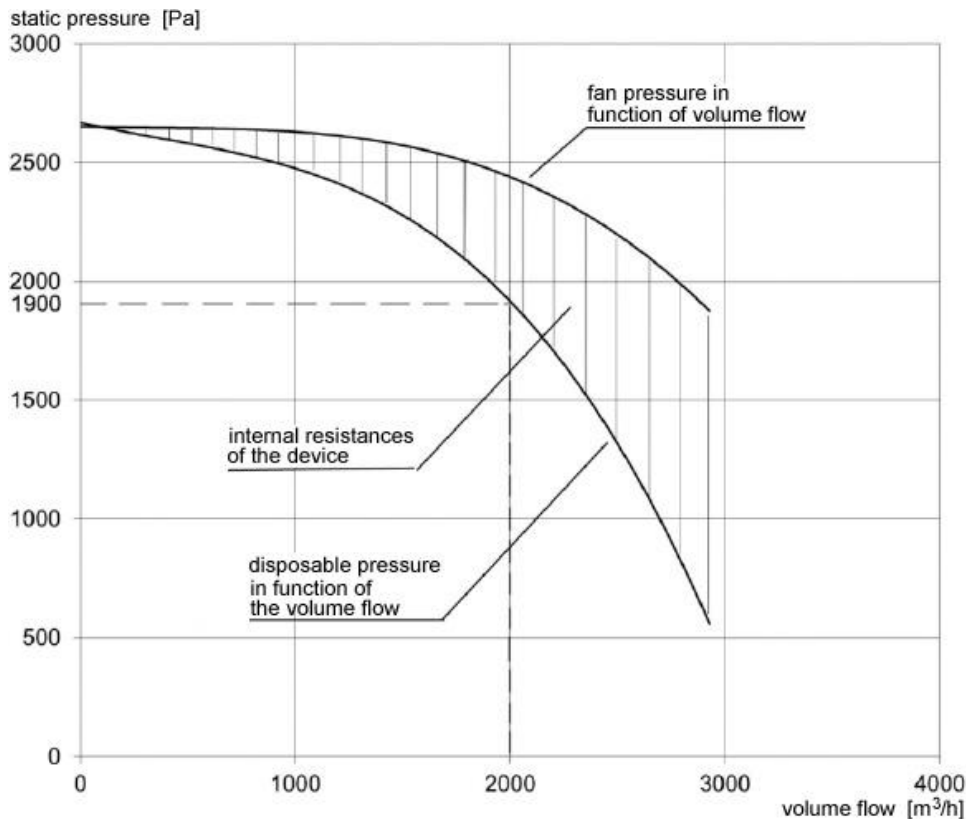


Fig. No.1 – BIG-4000/Ex – Flow chart

According to the 99/92/EC ATEX 137 Directive, manufacturer carried out the classification of the internal and external zones, connected with the explosion hazard during the operation of the filtering unit.

In the Fig. No.2 is presented the classification of the internal zones. The chamber of filters and the hopper chamber along with the waste container have been specified as **zone 20/21**, because in these areas always and in long periods potentially explosive atmosphere occurs.

Whereas, the regeneration chamber is classified as **zone 22**, because the dust occurs in this area sporadically, in case of failures consisting in damage of the cartridge filter or the filter mounting.

External zones can be created:

- while opening the inspection doors,
- during the emptying the waste container.

They have been classified as **zone 22**.

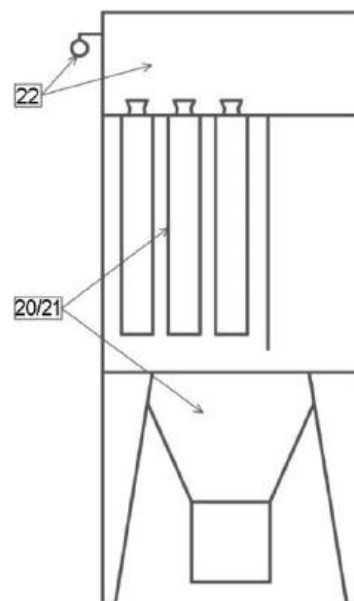


Fig. No.2 – Classification ATEX – internal zones

5. STRUCTURE AND FUNCTION

5.1 Structure

BIG-4000/Ex filtering unit consists of three functional assemblies:

- Regeneration chamber, being the upper part of the device, where are located outlets from the cartridge filters and Venturi Orifices. Outside the regeneration chamber is installed the compressed air installation, consisting of:
 - compressed air tank – constructed for operational pressure not exceeding 0,8 MPa, the tank meets the requirements of the **European Union Directive 87/404/EEG** and **90/488/EEG**;
 - two electromagnetic valves of diameter 1 1/2", designed for regeneration of the cartridge filters, these valves meet the requirements of directives: **ATEX 94/9/EC** and **EMC 89/336/EC**.
- Chamber of filters – forms the middle part of the filtering unit and contains the cartridge filters. On the chamber housing is located the inspection door, (for filter replacement) and a decompression panel lowering the pressure in case of potential explosion. Outside the chamber is installed a micro-controller – to activate the electromagnetic valves, (described in details in Section 7).
- Supporting construction along with the hopper chamber. Underneath the hopper chamber is placed a waste container of capacity 99 litres.

BIG-4000/Ex filtering unit is served by an Ex execution fan, in a fan chamber. The fan chamber is located beyond the device and connected with it by a rigid spiral-seam duct of diameter $\varnothing 315$ mm. The applied fan is type GR 400/2 with a 5,5 kW motor – all this is integrated in the fan chamber of total weight 300 kg, as in details described in separate User's Manual. In Fig. No.3 is illustrated the filtering unit along with the fan chamber. Connection between these two units is an example as applied in the test station at the manufacturer.

To control the devices is applied a switchgear, which should be installed outside (beyond) the zone of explosion hazard. Detailed description can be found in Section 7 of the present Use and Maintenance Manual.
CAUTION: The switchgear, fan along with the fan chamber are delivered upon separate order.



Fig. No.3 – Filtering unit with the fan chamber and connections

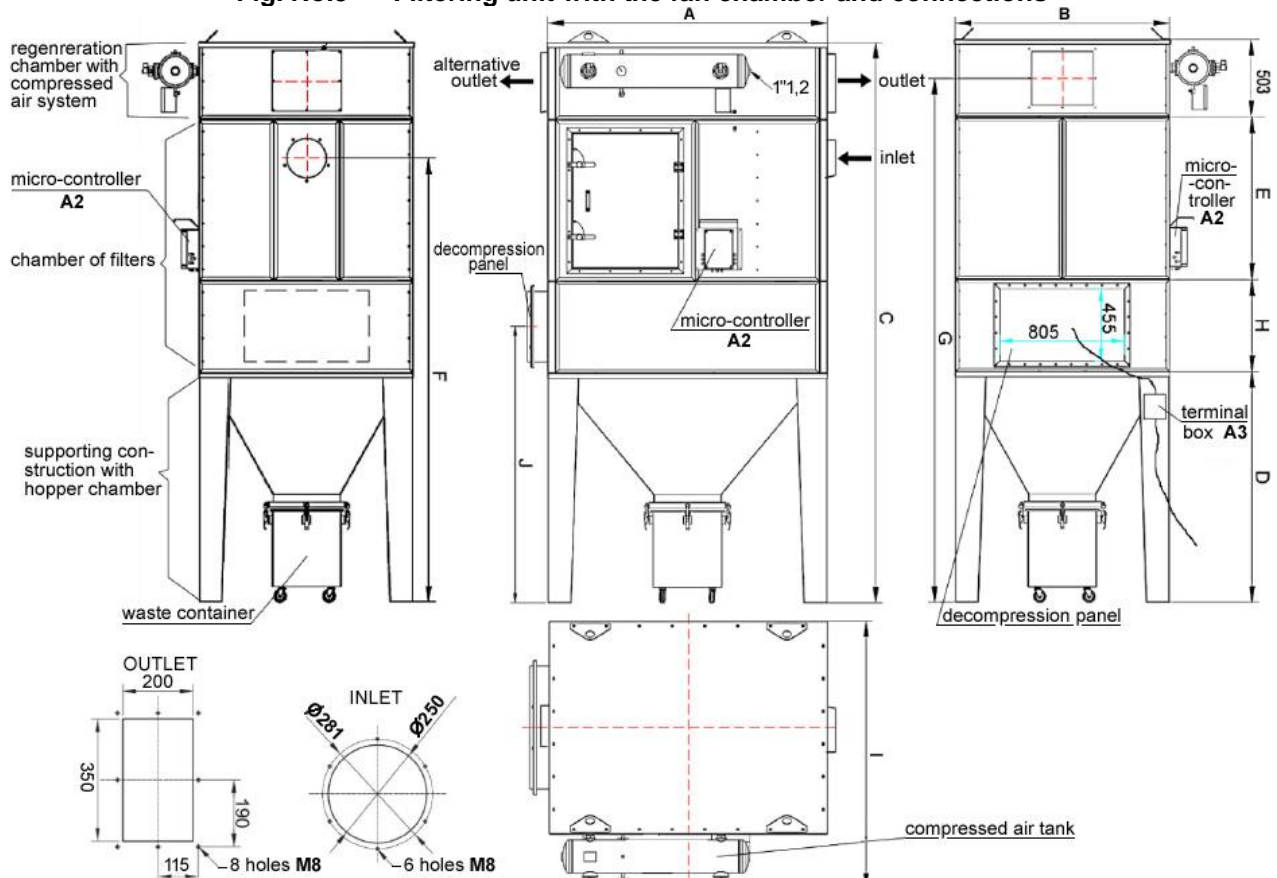


Fig. No.4 – BIG-4000/Ex – Structure and dimensions

Table No.2 – Dimensions

A	B	C	D	E	F	G	H	I	J
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
1390	960	3356	1200	1253	2750	3300	600	1320	1500

5.2 Function

BIG-4000/Ex filtering unit provides separation of the air containing **dry** dust fraction. The dust laden air is guided to the chamber of filters. Here, in the decompression process and because of the flow velocity reduction, larger particles of dust are extracted into the hopper chamber, and subsequently they fall into the waste container. Precise dust cleaning proceeds while the air flows through the cartridge filters. In the Fig. No.5 is presented a run diagram of the air flow through the filtering unit. As the dust accumulates on the operational surface of the cartridge filters, this reduces the air flow intensity. To limit this disturbance, the device is equipped with a continuous regeneration system of the filters. The impulses of compressed air (directed into the cartridge filters) strike off the dust particles. The cleaning air is supplied from the compressed air tank, through the electromagnetic valves that are operated by the micro-controller (in details described in Section No.7).

In the Fig. No.6 is illustrated a schematic diagram of regeneration of the cartridge filters.

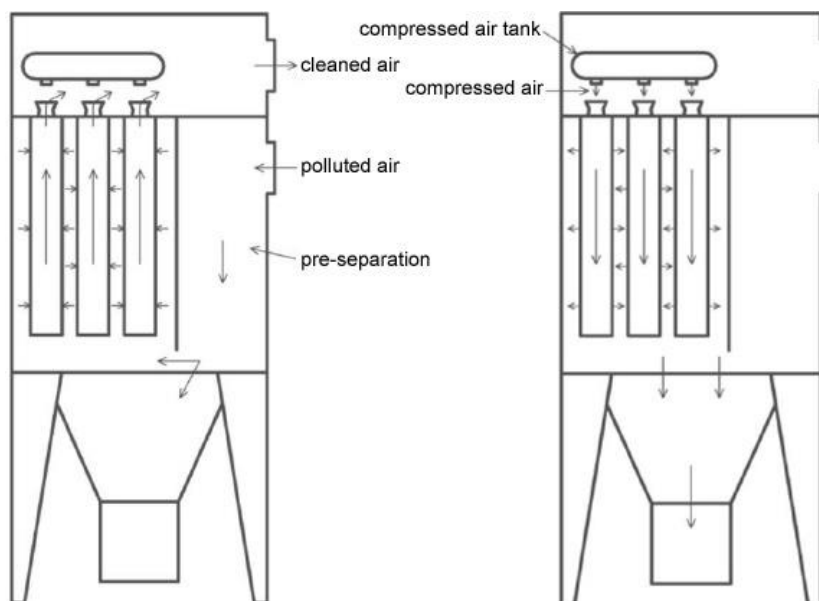


Fig. No.5 Filtration scheme

Fig. No.6 Scheme of filters regeneration

6. ASSEMBLY AND STARTUP

6.1 Description of mounting

Before the assembly of the device in the place of use, check if the device is complete, and if it is not damaged, or there are indentations, etc. The appliance is delivered in two assemblies, so it should be installed by means of adequate lifting devices and by a specialised assembly team.

First, put the supporting structure with the hopper chamber. The supporting frame should be levelled and its legs fastened firmly to the floor. Having installed the first assembly, put the chamber of filters (with the fixed to it regeneration chamber) on it. Handle with care, as the assembly is of large dimensions. At the upper part of the regeneration chamber are installed lifting hooks (for lifting and positioning during the transport and assembly activities).

After the chamber of filters is connected with the supporting structure, seal up the join surface with "silicone" and screw it up thoroughly with bolts. The screws, bolts and "silicone" are delivered by manufacturer along with the device.

The compressed air tank and the electromagnetic valves are delivered to the operator in completely assembled state. Having installed the device, connect it to the external compressed air installation of 0,6 ÷ 0,8 MPa. The pressure air must not contain pollutants, oil and humidity.

The connection must be equipped with a cut-off valve, air filter and a dewaterer. These elements are not delivered along with the device.

The nominal diameter of the compressed air connection (for the device of 4 cartridge filters and at the nominal diameter of the compressed air tank of 8") should be 1"1/2. Connection to the compressed air tank – diameter Ø12mm (quick-connector).

6.2 Start-up

Upon first operation of the compressed air installation (of the device), check if the connected part of the compressed air system is sufficiently cleaned of the metal particles, rust, etc., because the membrane of the electromagnetic valves would get damaged. If in the first stage of start-up there is not enough air flow intensity (in the system) – this means the valves are not tight enough. Shut the cut-off valve in the supply of the compressed air tank. Wait until the air pressure in the system reaches 0,6 ÷ 0,8 MPa, and then quickly open the cut-off valve.

The fan chamber with the Ex fan inside – is located beyond the device and has to be connected with ventilation ducts. Example of such a connection is illustrated in Fig. No.3.

Connect the electrical system, power supply and the control units – strictly according to the enclosed Connection Diagram Fig. No. 7, 8.

As the control system is very complicated, any activity of device connection/energizing must be carried out by an authorised installing team with qualifications. The filtering unit and the fan should be connected to the equilibrating grounding profile. Connect the motor with reference to the adequate data placed on the nominal data plate and in conformity with the Connection Diagram on the cover of the terminal box (fastened to the motor).

Switchgear A1 should be mounted in area, beyond the explosion hazard zone.

6.3 ATEX Directive

BIG-4000/Ex filtering unit has been classified, according to the 2014/34/Ex Directive and therefore, it is important to take precaution measures during the installing and start-up, and follow subsequent aspects:

- As the filtering unit is of Category 3D, it should be installed according to the PN-EN 60079-0:2013, PN-EN 1127-1:2011, PN-EN 13463-1:2010 standards, therefore the installer must be thoroughly acquainted with the contents of these standards.
- Installer should know the ATEX Classification of installing zones, as well as the hazard connected with the atmosphere of explosion risk. Especially, here is important the hazard of explosion, of fire, with the purpose of selection of suitable protection sorts.
- Any activities, related to the installing, necessarily must be performed by a specialised assembly team (after being instructed).
- Having completed the assembly, check the conductivity between the subsequent parts of the device, and check if the maximum resistance does not exceed 10^6 Ohm.
- Grounding of the device and of its parts should be carried out and examined by an authorised person, according to being in force regulations (in this range).
- Any device modification / change, within the construction and mounting, without the consent of deliverer shall cause the invalidation of conformity with requirements of ATEX Directive.

6.4 Precautions measures

- Check if the lifting devices are suitable, approved for use and used by authorized operators;
- During the activity of displacement and assembly – it is important to point out the hazardous zones, that no other people in the vicinity (incidental workers) would enter these zones;
- Transport, assembly and start-up should be executed exclusively by authorized employees, who have been instructed properly and approved by User;
- Prior to any activities connected with mounting and start-up, it is important to get acquainted with the contents of the present Use and Maintenance Manual.

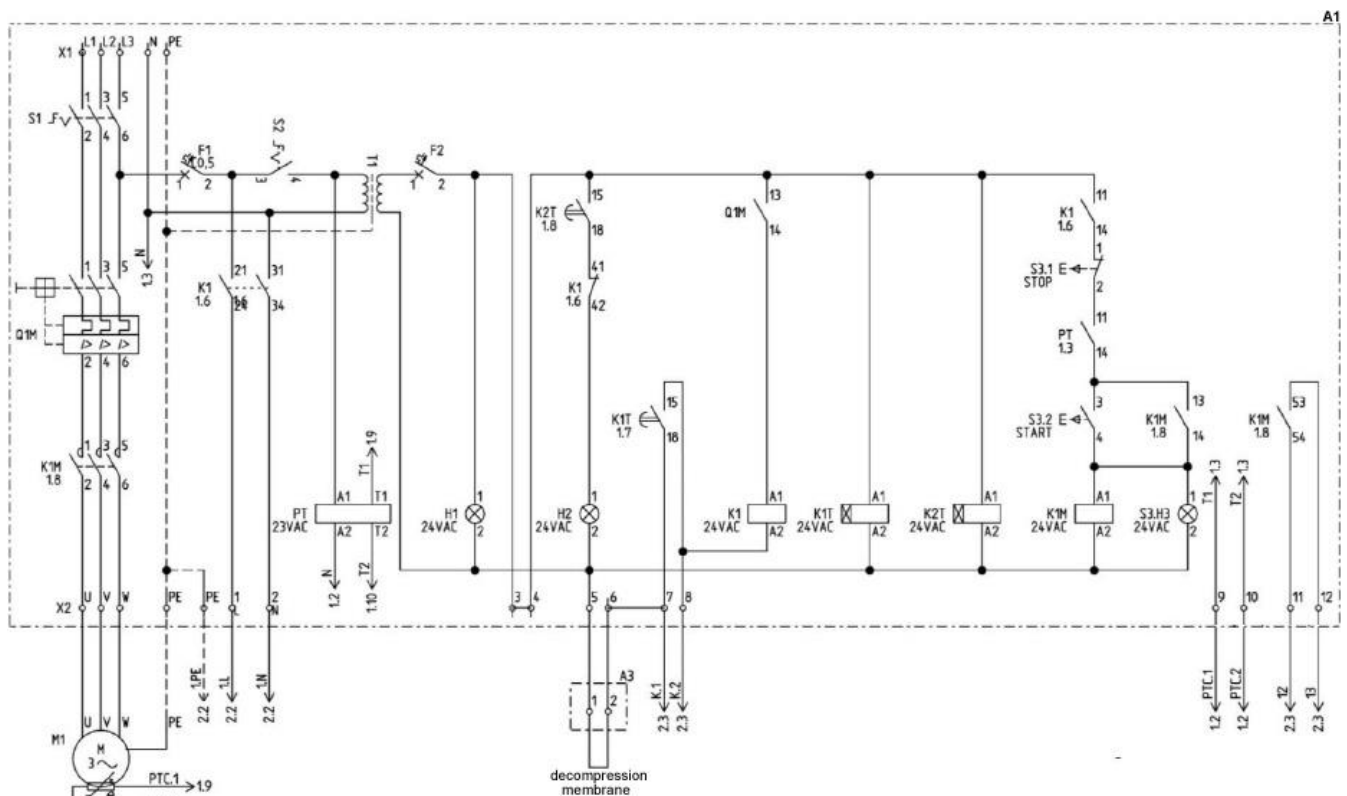


Fig. No.7 – Connection Diagram – switchgear A1 and micro-controller A2

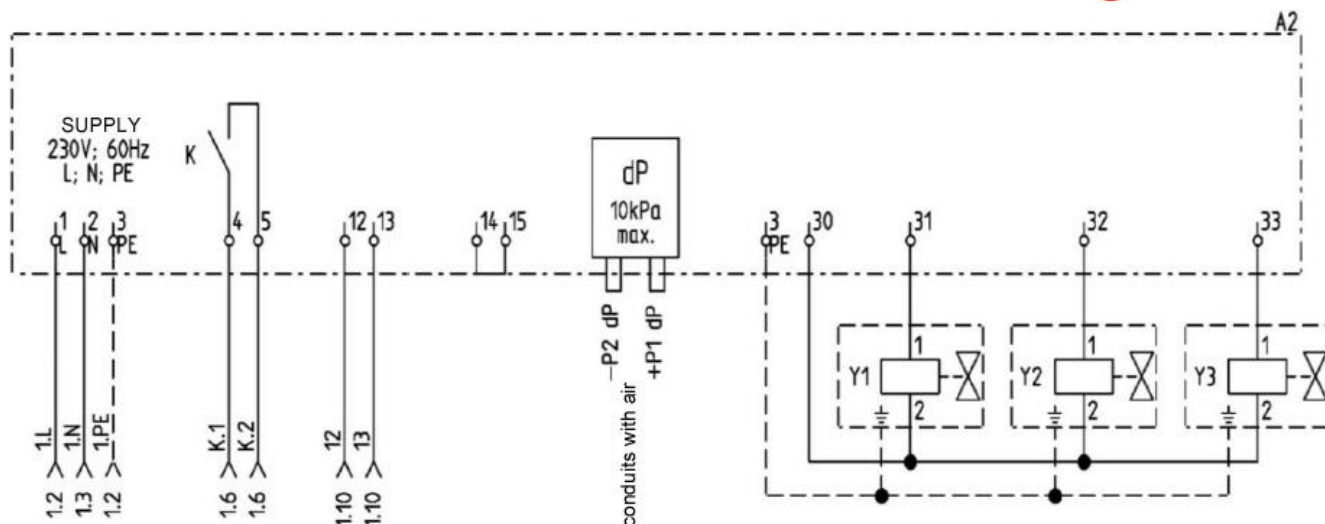


Fig. No.8 – Schematic Diagram – micro-controller A2

7. OPERATIONAL USE

The filtering unit is designed for filtration of the air, at the workplaces, according to the purpose of application as described in Section 2 of the present Use and Maintenance Manual.

7.1 Description of the control system

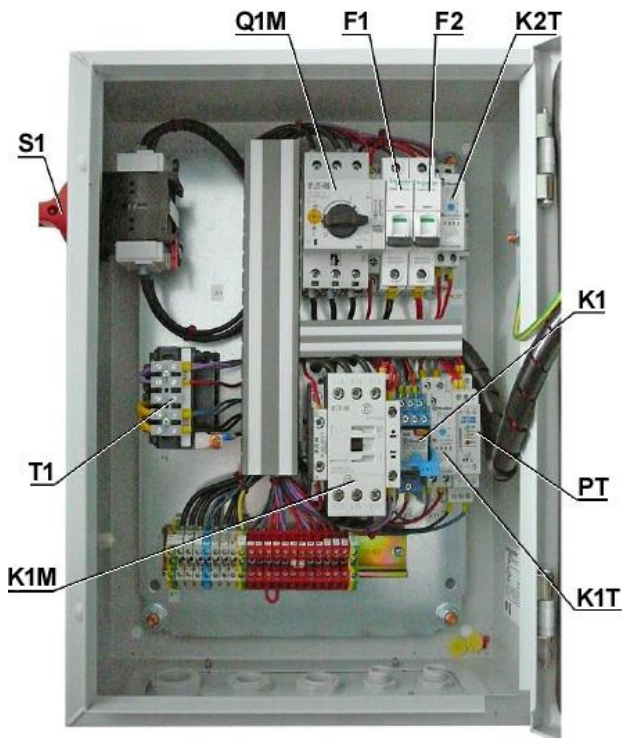
Control unit is designed to operate the filtering unit, providing automatic regeneration of surfaces of the filters, by means of cyclical impulses of compressed air. The control system consists of subsequent assemblies: switchgear A1, micro-controller A2 and a terminal box A3. In the housing of the switchgear A1 are included electrical elements providing the appropriate and safe work of the whole filtering unit.

Power supply $3 \times 400 \pm 10\%$; $50\text{Hz} \pm 1\%$; L1; L2; L3; N; PE.

Fig. No.9 Switchgear A1



- S1 – main switch
- S2 – SUPPLY switch with illuminated ON / OFF
- S3 – double button to control the the fan function with illuminated lamp H3 START / STOP
- H2 – red lamp ALARM



description of the elements in the **A1** switchgear
A1 – metal case
S1 – main switch
Q1M – motor protective switch
F1, F2 – overcurrent disconnectors
T1 – transformer
K1 – electromagnetic relay
K1T, K2T – time relays
K1M – contactor
PT – resistance relay

Fig. No.10 – Switchgear A1, control unit



Fig. No.11 – Micro-controller A2

Micro-controller **A2** provides control of the electromagnetic valves – the function is described in Section 7.2.
 Supply 230V ±10%; 50Hz ±1%; L; N; PE



Fig. No.12 – Terminal box A3

The **A3** terminal box connects the cable to the sensors on the venting panel, with the output cable, (going out of the Switchgear **A1**). When the cable on the panel is interrupted (during the explosion), the device automation disconnects the fan and the system of regeneration of filters. Any electrical connections ought to be performed in conformity with the above placed Connection Diagrams – see Fig. No. 7, 8.

Motor in ATEX execution is secured with the motor switch with protection against the blocked startup, overload, short-circuit- and fade of one phase. Additionally, the motor is protected by the **PTC** sensor, installed directly within its windings, as a protection against the excessive overheating.

7.2 Use of the A2 micro-controller

- press **C** – to get access to the functions **F01 – F13**
- press **C** one more time – to select the requested function
- press **A** – to enter into the selected function
- press **A** or **C** – to introduce changes of the settings
- press **B** – to return to the functions **F01 – F13**
- press **B** one more time – to return to the mode of display of work parameters.

Table No.3 – Functions F01 – F13

F01	external enter	0 – ON; 2 – OFF
F02	time of impulse	0,05 ÷ 5,00 [s]
F03	time of break between the impulses	1 ÷ 999 [s] * (B3x)
F04	quantity of enters	0-48
F05	quantity of regeneration cycles – after the fan is stopped	0 ÷ 99
F06	manual activation	C – selected / A – activation from the external signal
F07	control from the signal dP not active	0 – OFF; 2 – ON
F08	output voltage	24V, 115V, 230V *(HV)
F09	zero point trimming – for dP not active	0,00 *(C8)
F10	regeneration disconnection pressure – from dP not active	0,01 ÷ 9,99 kPa
F11	pressure of regeneration start – from dP not active	0,01 ÷ 9,99 kPa
F12	maximum pressure for the alarm – from dP not active	0,01 ÷ 9,99 kPa
F13	control with the regeneration process	0 – via contact; 1 – by readout from dP

dP – converter of the difference of pressures

7.2.1 Description of the displayed messages of the micro-controller A2

Table No.4 – Messages from the display

OFF	the regeneration is stopped (for the open D6 input)
-0-	final regeneration – after the fan is disconnected (input D1a is open)
1.00/P	final regeneration – for the signal of low pressure difference – from dP (display light is pulsing)
A01	number of the activated electromagnetic valve
...	final regeneration is in progress – after the fan is disconnected (blinking points)
1.23	readout – difference of pressures [kPa]
E	readout – difference of pressures – beyond the scale

Pushbutton **B** – reset of ALARM on the micro-controller

Pushbutton **C** – enter the menu

7.2.2 Description of the displayed ALARM messages on the A2 micro-controller

1.50/H	ALARM of the preset maximum pressure difference (parameter F12) the display is blinking; check the coil of the electromagnetic valve and the frequency of regenerations;
E1/05	overload of the output 05 – the display is blinking; check the connections of the electromagnetic valve, the state of the coil of electromagnetic valve, examine the occurrence of eventual water in the connection plug

7.2.3 Description of the displayed messages on the A2 micro-controller

B1b	selection of the quantity of enters means selection of enters – started from the keyboard in the mode “settings”; if 0 or AUTO is selected, in this function, the micro-controller automatically choses the outputs from electro-valves and ignores the outputs without the overload;
B2x	time of activation of output (time of impulse) from 0,05 up to 5,00 seconds
B3x	time of interval – from 1 up to 999 seconds if the time of impulse is less than 1 second – it is possible to set any interval time – within the indicated range; if the activation time is more than 1 second – the minimum adjustable interval time is: minimum interval time = 5 x impulse time (B2x)

B8a	short-circuit protection of every single output if short-circuit occurs – the output will be automatically ignored – the relay of the K micro-controller, (in the normal mode – active), will be disable; whereby, the contact opens; the display shows alternatively: code E1 and the number of the faulty output; press the pushbutton B – to reset the ALARM;
B10	manual activation of every single output – on the keyboard using the keyboard – it is possible to activate (manually and intermediately) every single output – to carry out the test of function; press the pushbutton A – to select the requested output for activation; press the pushbutton C to activate the output;
C0	numeric input – activated form the keyboard in the set-up it is possible to activate or disable the control with any inputs of the device; if the inputs are disabled – it can be assumed that the inputs are continuously closed;
C1d	numeric control of the pressure control (pressostat) is inactive if the dP control is active (setting F07) – the cleaning cycles are switching ON and OFF – depending on the readout from the dP ; During the dP readout and below the STOP threshold – <u>the cleaning process stops</u> – and the display shows alternatively: dP and the letter P ; During the dP readout and above the STOP threshold – <u>the cleaning process starts</u> ;
C3	readout of the pressure control (pressostat) from the internal converter – maximum 10 kPa (disabled);
C7d1	the contact of ALARM of maximum pressure difference – is open – upon the restart of the ALARM automation (disabled); if the dP readout is above the setup threshold – the maximum value of dP ALARM will be activated; Display shows the code of ALARM condition E7 (see the description of alarm) or shows alternatively – dP readout – and the letter H , according to the model; Adequate relay of the alarm indicated its condition. The alarm will automatically undergo to reset – if the dP readout is again below the alarm threshold; Activation of the alarm is delayed by 20seconds – after the default settings;
C8	setting of ZERO point of the dP (disabled) this function enables the setting the ZERO point of the readout of the pressure control (pressostat); in case of this function: the display shows the dP readout, and (while the fan is stopped; or the pipe conduits are not connected) – if the dP readout does not have the value 0.00 kPa , this can be adjusted with pushbuttons A and C ;
C13_10	full range of dP – 10 kPa maximum value of the pressure difference (measured by the converter) is 10.00 kPa = 100.0 mbar = 1012 mmH₂O ; During the dP readout, where the value is above 10 kPa – the display shoes 'E' – instead of the numeric value of dP ;
D1ab1	additional cycles – after the fan is stopped – in case of the selection of the fan mode; in the settings can be selected mode – to control the function of the regeneration run – connected with the function of the fan and with the cycles of final regeneration; SETTING = 0 (not obtainable in case of option C11a); When is connected a non-potential supporting contact (of the circuit that operates the fan from the micro-controller), it is possible to add a number previously adjusted = that means a number of cycles of cleaning – after the fan is stopped. Their number is adjusted from the keyboard within the range from 0 up to 99 . Cycles of final regeneration – additionally, can be activated, when the dP value = 0 ; (inactive) If the D1a contact is open – the display with show alternatively: ' -0- ' and the dP readout – to indicate that cycles do not proceed, because the fan is switched off; Decimal points on the display with emerge and vanish – during the cycle – after the fan is switched off;
Caution D1a:	Connect the D1a via bridge – if it is not used upon activated inputs (see F01 = 1). If the dP control is activated – it is possible to add the previously adjusted number of cycles of final regeneration. Their quantity can be adjusted form the keyboard within the range 0 up to 99 . The timer will compare the dP readout with the established threshold 0.20 kPa . If the dP readout drops below 0.20 kPa additional cleaning cycles will switch on, in case when the dP readout will reach the value of STOP threshold – during normal function. In case when dP < 0.20 kPa the display will alternatively show: ' -0- ' and the dP readout (disabled).
D6	ON / OFF switch of the cleaning cycle – from external contact If the D6 contact is open – the cleaning cycle is not accessible – and the display will alternatively show: ' OFF ' and the dP readout. After the D6 contact is closed, the cleaning cycle can be operated from the electromagnetic valve.

Caution D6: Apply the bridge for **D6** – if this is not active for the activated outputs (see **F01**)

B2x	Maximum load power on the output 25W
HV	Selection of the supply voltage for inputs / outputs By means of the jumper, select suitable input and output voltage
JP1	Select the supply voltage between 115VAC and 230VAC
JP2	Select the supply voltage between 24, 115, 230V – exclusively at supply 115VAC or 230VAC
JP3	Select the output voltage – between AC and DC – exclusively at JP2 adjusted for 24V .

CAUTION: Set the **F08** into the same value of the output voltage, that has been selected via bridges – to establish the threshold of short-circuit.
Otherwise, this would result in any malfunction or damage of the micro-controller.

7.3 Startup of the system

Connect the elements strictly according to the diagram, using cables selected with reference to current-carrying capacity of the receivers.

- Switch on the protections in the switchgear **A1**.
- Check if the **F1** fuse in the micro-controller **A2** is not damaged.
- Apply the supply voltage with the **S1** disconnector in the switchgear **A1**.
- Switch on the system with the **S2** switch.
- The fan can be safely started with the green button **S3.2** – under the condition that the red lamp **ALARM** (on the **A1** switchgear door) is not on.
- When the green lamp (built in the double button **S3**) is lighting – this is the information that the fan is in operation and the filter regeneration system is switched on; {To make sure, the filter regeneration system is functioning – after the first device startup, examine the device, check (after the **ALARM** state emerges) the communicates emerging on the micro-controller display}. Additionally, after the first start-up, check the rotation sense of the fan impeller.
- To switch off the fan – press the red button **S3.1**.
- The green lamp (built in the button) goes off – subsequently, proceeds the final filters regeneration – at any time the fan can be started again.

7.4 Alarms

In the device can appear states of alarms, caused by:

- activation of the motor protective switch
- interruption of the sensors on the decompression membrane,
- alarm from the micro-controller (controlling the function of the electromagnetic valves) – description in 7.2.2
These alarms are signalled by the red lamp **H2** (placed on the door of the switchgear **A1**). When the alarm occurs, it is important to disconnect the power supply by means of the **S1** disconnector. Next, find the failure/damage, find out its/their reason and remove the malfunction. After the failure is removed correctly, and the power supply is applied again – the filtering unit can be operated again.
- excessive overheating of the motor windings – **PTC** sensor.

The appliance stops working, but the signalling of activation of the protection – relay TP – is possible to localise – after the time passed when the switchgear **A1** opens. Signal from the **PTC** sensor flows to the resistance relay **PT**.

The normal status of the resistance relay **PT-1** is signalled by the green diode **OK**. In case when the motor windings become overheated, (after the resistance of the **PTC** sensor exceeds 3,3k Ω), the relay converts into status of “failure”. Subsequently, the contact of the relay will switch, whereby the red diode **PTC** is lighted. The diode **OK** goes off. When the motor windings cool down, after the resistance of the **PTC** sensor drops below 1,8k Ω , the resistance relay returns to normal status.

When in the **PT** the mode of “memory” is switched on, (despite the motor windings cool down) – the status of “failure” will remain until the button DELETE (KASOWANIE) is pressed by the operator.

In the normal status of the resistance relay **PT**, when the DELETE (KASOWANIE) button is pressed and hold for 1 second – switches on the test of the device (for the time when the button is hold). If the test is switched on, while the device runs in mode “memory”, the status of “failure” will be stored.

In order to return to “normal” state – press the button DELETE (KASOWANIE). The red **PTC** diode is blinking, this indicates the state: the sensor **PTC** has short-cut or disconnected. This situation occurs when the resistance at the input (of the **PTC** sensor) decreases below 40 Ω or increases above 7k Ω . In these cases, the device gets into state of “failure”. The memory of the status “failure” is maintained, also after the supply voltage fades.

CAUTION: When the extraction fan is not functioning correctly, please contact the Deliverer.

7.5 Removal of dust

The dust must be emptied systematically, when the waste container is filled up. User has to give instructions to the operating personnel, that **while disconnection of the waste container from the hopper (by means of the blocking lever) they must take precautions**. In case when the waste container is not sufficiently supported from

underneath, it can be rapidly discarded (thrown away). Mind, the workers should necessarily wear antistatic clothes. Additionally, the waste container (while withdrawal, mounting) must be placed on an antistatic pad. This activity should be carried out, after the fan is switched off and the device disconnected from the power supply mains. When the waste container is fastened back to the device, mind that the contact surfaces are clean and the seal is suitable to the edge between the waste container and the hopper chamber.

7.6 Measures of precautions during the maintenance

- The filtering unit must be used according to the present Use and Maintenance Manual and according to the being in force regulations.
- Maintenance steps / activities should be executed by authorised workers after the instructions.
- In the course of operational use, be careful that no ignition sources (e.g. sparks, cigarette butts, embers) will get into the device.
- During the emptying of the waste container and during any other activity near the filtering unit, it is important to wear the antistatic clothes. Put the antistatic pad/rug underneath the waste container.
- Directly, at the filtering unit, and in the vicinity – do not use mobile phones and other devices emitting electromagnetic waves.

8. TROUBLESHOOTING GUIDE

Table No.5

	Problem	Possible reason	Corrective action
1.	Decrease in the inlet air volume after the period of correct function	Regeneration runs incorrectly, due to too low pressure of the compressed air.	Adjust to obtain the pressure of 0,6÷0,8 MPa in the system
		The cleaning time and work time are not adjusted correctly	Adjust the work of micro-controller according to the present Use and Maintenance Manual
		Too high humidity of the filters, caused by the humid air in the compressed air system	It is important to dewater the compressed air tank, check the state of the compressed air system
		Dust emerges in another area, due to temperature higher than 40°C of the inlet air	Limit the temperature at the inlet
2.	Dust emerges outside the device	The cartridge filter is not tightly connected or damaged	Replace the cartridge filter or improve its mounting
		The dust is of another sort than stated in the instruction.	Contact the manufacturer
		Filtration efficiency is too low	Contact the manufacturer
3.	Dust is appearing outside the filtering unit after a longer period of correct work	The cartridge filter is damaged	Replace the faulty element
		The mounting flange (of the cartridge filter) is deformed or damaged	Replace the faulty element

9. MAINTENANCE AND REPAIR

9.1 Cartridge filters

It is necessary to undertake a visual control of the cartridge filters, at any case when the waste container (underneath the hopper chamber) is emptied of the dust. Examine the state of the mounting elements, the state of the filtration surface, the degree of pollution, the presence of damages, etc. – through the inspection door. Additionally, this revision should be carried out in case when any improper function of the device is noticed.

In case the cartridge filters are damaged or worn out – replace them for new. The filters should be drawn out, beginning from the filter closest to the inspection door. Before User draws out the filter, first release the mounting nuts, turn the filter itself and take it out.

9.2 Fan

Technical revision and maintenance of the fan should be executed according to the instruction of the fan. In case when faulty function of the fan is noticed, please contact the producer. The fan motor must be submitted to systematic maintenance, to provide correct function and safety. Follow steps strictly as described in the instructions of the fan manufacturer. When necessary, replace the fan or motor for new and this can be carried out exclusively by an authorised personnel.

9.3 Compressed air tank.

The compressed air tank must be submitted to technical revision and maintenance, according to the valid regulation on the pressure devices. Periodically, examine all the connections on the compressed air tank. It is important to dewater the tank, through the connection (installed in the lower part of the tank).

9.4 Electromagnetic valves

Electromagnetic valves do not require current maintenance. Simply, it is sufficient to check the electrical connections, the state of grounding and tightness on the pneumatic installation.

It is recommended to replace the valves after 2 years of use, and not later than after 4 years of operational use (but in this case, contact the producer of the filtering unit).

9.5 Recommended periods of technical revisions and maintenance of the filtering unit.

Table No.6

Current check and action after the fill up state of the waste container	Removal of dust from the waste container
Current revision	Systematic cleaning of the device and its assemblies, in order to avoid accumulating of the dust layer exceeding 5 mm
Every time, the waste container is emptied	Control visually the cartridge filters, through the revision door.
Once a month	Check the state of the device grounding, and examine the conductivity between the all assemblies of the device, if the maximum resistance does not exceed 10^6 Ohm
Once for 2 ÷ 3 months	Overall visual control of the supporting construction (base frame) and of the housing. Examine the screw connections and anti-corrosion protection.
Once for 12 months	Check the state of the electrical connections and of the external installation of the compressed air, check the connections of the electromagnetic valves.
Once for 12 ÷ 18 months	Visual control of the compressed air tank and of its dewaterer. When, (with reference to the environment and the state of the pressure air), it is necessary – this revision should be executed more frequently.
Fan – Use and Maintenance Manual of the fan	Follow as according to the instruction
Motor – Use and Maintenance Manual of the of the motor	Follow as according to the instruction

9.6 Measures of precaution during the revision activities and the maintenance

- Maintenance and revision ought to be executed with reference to the being valid regulations, and with the present Use and Maintenance Manual and carried out by authorised workers after being instructed.
- Any activities on the device must be carried out after the fan is switched off and disconnected from the power supply system.
- During these activities it is important to wear antistatic clothes.
- While emptying the waste container of the dust, during the dismantling of the container and its mounting – the waste container must be placed on the antistatic pad/rug.
- Near the device, do not use mobile phone, and other devices emitting electromagnetic waves.
- The filtering unit cannot be submit to modification or complemented with functional parts or control elements, without the consent of the Deliverer.

10. OCCUPATIONAL HEALTH AND SAFETY

- Assembly, installing, start-up and maintenance can be carried out after getting acquainted with the contents of the present Use and Maintenance Manual.
- For safety reasons, the device must be connected to the power supply system – strictly according to the enclosed Connection Diagram, and with the being in force regulations within the range of personal protection against electric shock.
- Connection to the power supply system should be executed by an authorised person with electrical qualifications.
- Maximum operational pressure of the compressed air, for safety reasons, must not exceed 0,8 MPa.
- Any activities, connected with repair and technical revisions as well as emptying the filled up waste containers (underneath the hopper chamber) – should be executed after the fan is switched off and the device disconnected from the power supply.
- The fan as a rotating appliance – constitute a potential source of hazard, therefore installing, start up and maintenance should be carried out by qualified personnel.
- As the filtering unit is equipped with a decompression panel VMP 450x800 (0,34m²) – the whole device should be placed in such a way, that there is provided free access to the control system, and additionally, (in case of explosion) there should be safety area for the discarded vent panel. During the explosion, the control connection shall be interrupted and the filtering unit stops functioning.

11. TRANSPORT AND STORAGE

BIG-4000/Ex filtering unit is transported in two assemblies, wrapped in foil, placed on transport pallets. During the time of transport, the assemblies must be located vertically and protected from overturn (being knocked down) and from displacement. The fan chamber is a separate assembly, it should be placed on a transport pallet too.

As the appliance is a thin-wall construction – handle with care during the lifting the subsequent assemblies, during the transport, unloading and mounting. The device has to be stored in close rooms and in dry rooms and in areas of efficient ventilation.

12. TERMS OF WARRANTY

The period of warranty for the purchased device is indicated in the **Card of Warranty**. The warranty does not comprise:

- mechanical damage and malfunctions caused by User,
- device failures caused during the use which is in contradiction with the purpose of application and with the present Use and Maintenance Manual,
- malfunctions resulting from the improper transport, storage or incorrect maintenance.

Infringement of the Section 3 “Reservations of Producer” of the present Use and Maintenance Manual and, especially modifications undertaken by User on one’s own or use in contradiction with the purpose of application – shall result in the loss of warranty validity.

13. DECLARATION OF CONFORMITY



DECLARATION OF CONFORMITY EC No. _____

Manufacturer (eventually also the authorised representative / importer):

name: **KLIMAWENT S.A.**

address: **81-571 GDYNIA, ul. Chwaszczyńska 194**

A person, authorised for issuing the technical documentation:

name and address: Teodor Świrbutowicz, **KLIMAWENT S.A.**

hereby declares that the product: **Filtering unit**

type / model: **BIG-4000/Ex**

serial number: _____

year of production: _____

Meets the requirements of the subsequent European Directives:

2006/42/EC Directive of the European Parliament and of the Council of the 17 May, 2006 on machinery, amending the 95/16/EC Directive (recast) / Official Journal EC L157 of the 09.06.2006, page 24);

2014/35/EC Directive of the European Parliament and of the Council of the 26 February, 2014 on the harmonisation of the laws of the Member States, relating to the making available on the market of electrical equipment designed for use within certain voltage limits / Official Journal EC L96 of the 29.03.2014;

2014/34/EC Directive of the European Parliament and of the Council of the 26 February, 2014 on the harmonisation of the laws of the Member States, relating to the equipment and protective systems intended for use in potentially explosive atmospheres / Official Journal EC L96 of the 29.03.2014 /

1999/92/EC Directive of the Council of the 19 December, 1999 on minimum requirements regarding safety of health protection of workers employed at workplaces where explosive atmosphere is likely to occur / Official Journal No.138, Pos. 931/

is in accordance with the requirements of the following harmonised standards:

EN ISO-12100:2012 Safety of machinery – General principles of design – Assessment and reduction of hazard

EN 60204-1:2010 Safety of machinery – Electrical equipment of machines – Part 1: General requirements

EN ISO 13857:2010 Safety of machinery – Safe distances to prevent hazard zones from being reached by upper and lower limbs

EN 60079-0:2013-03/A11:2014-03 Electrical appliances in areas of gas explosion hazard – Part 0: General requirements

EN 1127-1:2011 Explosive atmospheres – Explosion prevention and protection. Basic terminology and methodology

EN ISO 80079-36:2016-07 Explosive atmospheres – Part 36: Non-electrical appliances in areas of explosion risk Methodology and requirements

place, date

*signature of the
authorised person*

*name, surname,
function of the signatory*