

This direction for installation of an uncompleted machinery unit includes important instructions and safety warnings.

Please read this direction carefully before using the blower unit.

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KUBÍČEK

SPECIALISTS IN BLOWERS

USER MANUAL

for blower unit in overpressure mode

3D19...E/K

3D28...E/K

3D38...E/K

3D45...E/K

3D55...E/K

3D60...E/K

3D80...E/K

3D90...E/K

3D100...E/K

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1 Introduction

1.1 General

This manual serves for familiarizing the keeper of the blower unit (hereinafter also referred to as “unit”) with description, function and important instructions regarding installation, maintenance and safety of the unit. Please, read this manual carefully. Do not carry out activities connected with the use of the unit until you thoroughly familiarize with this manual and understand all instructions included herein.

Strict observance of all undermentioned instructions is a prerequisite for safe and trouble-free operation of the product. The manufacturer does not accept any responsibility for damages caused by unprofessional handling, installation, inconvenient operating or an error of the operator, and therefore no free repair can be demanded in such cases under the letter of guarantee.

The manual was made in accordance with requirements of the undermentioned valid technical standards and legislative regulations but it cannot cover dangers and risks resulting from any incorrect and unanticipated use of the unit in specific local conditions. For protection before such circumstances, the keeper should elaborate a local operating safety regulation, in which intervals of checks and service examinations shall be specified.

Read this direction carefully before using the blower unit and in case of any uncertainties contact KUBÍČEK VHS, s.r.o. company or an authorized service organization.

Any amendment to this manual may be made only by the company KUBÍČEK VHS, s.r.o. or based on the written consent of the company.

1.2 Type identification of the blower unit

The individual types, variants and sizes of the unit are designated using a code according to the following chart:

	3D	-
rotary blower type (three-lobe)								
size of the rotary blower defined according to the shaft diameter in mm (19; 28; 38; 45; 55; 60; 80; 90; 100)								
width of the rotary blower housing defined using (T, S, A, B, C) code								
DN of the output piping (50; 80; 100; 150; 200; 250; 300; 400; 500)								
safety / starting valve type (V – spring, safety; M – membrane, safety; P – proportional, combined valve)								
acoustic hood equipment (K – internal acoustic hood; E – external acoustic hood; no nomenclature – no cover)								
method of the air supply into the blower (ES – external suction; no nomenclature – suction from cover/suction basket)								

The type nomenclature of the specific product is given in the technical specification and name plate.

1.3 Documents to selected parts

Separate documentation is delivered to some parts of the unit. Such documentation is a part of the accompanying documentation – this only applies to certain orders.






If such documentation is part of the original accompanying documentation, then it is necessary to read and observe it.

2 Marking of instructions

Important instructions and cautions in this operating manual are marked with the following symbols.

2.1 Safety instructions

Very important instructions and warnings in this manual are marked in the following manner:

	Non-observance of these instructions could result in danger to persons or property.
	Non-observance of these instructions could result in danger to persons due to noise emissions.
	Non-observance of these instructions could result in danger to persons due to contact with hot surfaces.
	Non-observance of these instructions could result in danger to persons or property due to electric current.
	Forbidden activities.

2.2 Other instructions

	Maintenance instructions.
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Non-observance of these instructions could cause damage to the equipment.

3 Safety

3.1 Requirements for qualification of personnel

The unit may be installed and put into operation only by the unit manufacturer or a person professionally qualified for these activities, possessing the relevant authorization and familiarized with this user manual.

Routine operation of the unit, which is specified in Chapter 8, may be carried out by a person older than 18 and authorized by the keeper and familiarized with this user manual and the local operating safety regulation.

Maintenance and troubleshooting of the unit, which are specified in Chapter 9, may be carried out by a person older than 18 and authorized by the keeper and having physical and mental qualifications for this activity and familiarized with this user manual and the local operating safety regulation.

The unit may be serviced only by the manufacturer of the unit or by an authorized service organization.

The installation and commissioning can be ordered at KUBÍČEK VHS, s.r.o. company or an authorized service organization.



Operator Responsibilities

- The operator shall ensure that only persons with the required qualifications can carry out the specified activities.
- The keeper shall expressly and provably specify a person authorized to operate the unit.
- The keeper shall expressly and provably specify a person responsible for operation of the unit.

3.2 Observance of the user manual

For safe and trouble-free operation of the unit, it is necessary to observe the instructions given in this user manual.



During installation operation, service and maintenance of the unit, it is prohibited to carry out any activities which do not arise directly from this manual.



When using the unit, observe generally valid and local operating and safety regulations.

3.3 Protection against electrical shock



Never intervene into electrical parts and never open the distribution panel if it does not result from your working obligations and you do not have the relevant electrical qualification.



Familiarize yourself with the position and operation of the main switch and emergency button if it is included on the unit.

3.4 Protection against contact with hot surfaces

Some parts of the unit can have higher surface temperatures and cause contact burns.



During operation avoid direct contact with hot surfaces of the unit, in particular:

- Blower
- Discharge area behind the blower
- Electric motor



Before starting your work, during which you can get in contact with hot surfaces, turn off the unit and wait until the surface temperature drops under 50°C.

3.5 Protection against noise

In the area where the unit is placed (e.g. in the machine room), the noise levels defined by legal regulations for places with permanent operation can be exceeded.



If needed, find out the noise level where the unit is placed. If it is necessary, make suitable measures following from legal regulations – limited stay of operators, use of ear protection, etc.

3.6 Covers and protective equipment

The unit is provided with the following covers and protective equipment:

Name (specification)	position	Purpose of protection
protective cover of belt gear	Belt gear	Moving parts
Noise-dampening cover panels	Noise-dampening cover	noise emissions, contact with hot surfaces



Operate the unit only with operational guards, otherwise there is a risk of injury when limbs or clothes are drawn in. Report any damages of covers and protective equipment immediately to your superior.



Never start the unit if the acoustic hood panels are not mounted.

3.7 Personal protective equipment



Always use the prescribed personal protective equipment.






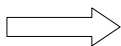

The extent of the use of the personal protective equipment must be specified in a local operating safety regulation based on the following draft:

Danger	Protected part	Protective equipment
Burns from hot medium	whole body	protective clothing
burns from hot surfaces	upper limbs	protective gloves
hot medium leakage	eye	goggles

3.8 Safety and information marking

The unit is provided with safety and information marks according to the following table:

Symbol	Position		Meaning
	without noise-dampening cover	with noise-dampening cover	
	suction silencer	front panel of noise-dampening cover	familiarise with the user manual
	suction silencer	front panel of noise-dampening cover	order to wear ear protection
	suction silencer	front panel of noise-dampening cover	warning, risk of injury by burning

	suction silencer	front panel of noise-dampening cover	warning, risk of injury by entanglement of limbs, clothes
	belt gear cover		warning, risk of injury by entanglement of limbs, clothes
	cover of electrical equipment		warning, risk of electric shock
	lifting point		marking of lifting points (lifting eyes, holes)
 FILTER	suction filter lid		identification of position of suction filter
	on the blower		blower rotor direction of rotation
	It is forbidden to move or cover signs installed on the unit and in case of damage it is necessary to replace them.		

The following name plates are placed on the unit:




preview of the name plate	size and location of the name plate
	45x30 mm <ul style="list-style-type: none"> blower housing 3D19... and 3D28... safety valve or combined safety and starting valve
	75x30 mm <ul style="list-style-type: none"> blower housing 3D38..., 3D45..., 3D55..., 3D60..., 3D80..., 3D90..., 3D100... safety valve or combined safety and starting valve
	95x45 mm <ul style="list-style-type: none"> discharge silencer of the unit 3D19..., 3D28..., 3D38... front surface of the blower 3D45..., 3D55..., 3D60..., 3D80..., 3D90..., 3D100... acoustic hood of the unit 3D19...K, 3D28...K, 3D38...K, 3D45...K, 3D55...K, 3D60...K, 3D80...K, 3D90... K, 3D100...K

3.9 Operation, assembly and repair works, shutdown

The keeper of the unit shall ensure inspections of operation of the unit and tests of the measuring safety features in regular intervals, which are dependent on the character and operation of the unit. The length of the intervals shall be specified in the local safety regulations and shall be based on this user manual. If high vibrations are noticed or measured on the unit, or visible deformations, cracks or leakage appear, it is necessary to immediately put the unit out of operation, i.e. turn off the main switch of the unit and disconnect it from the supplies of working substances – let the pressure in the whole unit drop to the atmospheric pressure and the surface temperature of the unit under 50 °C. Then proceed according to instructions included in Chapter 9 regarding maintenance.

Fittings of the piping running from and to the unit must be closed slowly enough so that no pressure shocks can occur.

	Do not connect the unit to the reservoir, which does not have an installed protection against exceeding maximum operating pressure.
	Do not operate units which have not had the prescribed inspection and testing of safety features at the prescribed intervals.

	Never operate the unit if its operating parts are damaged.
	In the event of a failed unit or a workplace incident, immediately inform the person responsible for the operation of the unit and add an entry in the unit's logbook; Follow the operating and safety regulations.
	During maintenance, assembly and repair activities the unit must be switched off and the following parts of the technological line may not influence the temperature and pressure conditions of the unit. Flange joints may be loosened only when the unit is not under pressure or vacuum!

3.10 Residual risks and prohibited use

Although the unit was designed and manufactured using technical procedures, which are in accordance with safety standards and regulations, it was impossible to eliminate the undermentioned dangers following from its character and intended use. All persons who handle the unit (manufacturer, service worker, person authorized to operate the unit, person responsible for operation of the unit), must act within their competences so that they prevent dangerous situations and avoid damage to health and property.

A. Possible dangers during installation of the unit

- risk of injury when the unit is handled and aligned into the working position
- risk of damage of surfacing (painting) of the unit during the handling
- risk of damage of the other units in the machine room due to incorrect handling of the unit (for instructions see Chapter 6.2)
- risk of damage of the building if the weight of the unit is not considered (e.g. when the machine is installed in a higher floor)
- risk of damage of the unit due to confusion of the input and output piping during the installation in the technological line

B. Possible dangers during operation of the unit

- Risk of damage of the blower unit if it is started incorrectly (for procedure to determine the correct direction of rotation see Chapter 7.2.5)
- risk of damage of measuring elements (manometers, thermometers, etc.) and safety valves when pressure shocks occur
- risk of burns due to contact with the surface of the unit

C. Possible dangers during maintenance and checks and revisions of the unit

- Risk of injury when heavy loads are handled
- risk of burns when works on the unit are started until its surface temperature drops under 50 °C
- Risk of falling from height when checks and revisions are carried out – any work at height more than 1.5m is classified as work at heights

	Never use the unit to transport combustible or explosive gases or mixtures thereof.
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Never use the unit in areas with potential feeds of combustible or explosive gases or mixtures thereof into the suction side of the unit.

4 Related regulations and standards

Act No. 265/2017 Coll.

Amending Act No. 90/2016 Coll., on conformity assessment of specified products when made available on the market and Act No. 22/1997 Coll., on the Technical Requirements for Products, and on a change and addition to certain laws

Government Order No. 320/2017 Coll.

Amending Government Order No. 176/2008 Coll., on technical requirements for machinery (Directive No. 2006/42/EC)

Government Order No. 117/2016 Coll.

Government Order on the assessment of conformity of stated products from the point of view of the electromagnetic compatibility when delivered to the market (Directive No. 2014/30/EU)

Government Order No. 118/2016 Coll.

Government order on the conformity assessment of electrical equipment designed for use within certain voltage limits delivered to the market (Directive No. 2014/35/EU)

Harmonised Czech technical standards:

ČSN EN 1012-1:2011 Compressors and vacuum pumps – Safety requirements

ČSN EN 60204-1:2007 Safety of machinery – Electrical equipment of machines.

ČSN ISO 20816-1:2017 Mechanical vibration – Measurement and evaluation of machine vibration

ČSN EN ISO 3746:2011 Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure

When operating the unit, observe generally valid regulations and standards effective in the country of the keeper regarding especially:

- Work safety
- Operation of machinery
- Operation of electrical equipment.

The unit is provided with an asynchronous motor and therefore basically:

- It cannot cause electromagnetic radiation exceeding the level that enables operation of radio, telecommunication and other units in accordance with the intended purpose and/or contribute to this radiation;
- Its operation shall not be influenced by the presence of electromagnetic waves which can occur or move in operating conditions of the equipment.

5 Description and function

5.1 General

The unit is intended for transport and compression of the air or other non-aggressive, incombustible and non-explosive gases without mechanical additives. Any use for gases other than air must be discussed with the manufacturer.

The unit must be operated in the range of operating conditions specified in part 7.1. The quantity of the transported medium corresponds to the blower speed and back-pressure in the discharge piping (for overpressure see the product catalogue). The air quantity can be controlled only by changing the speed of the blower – electric motor (2-speed electric motor, frequency converter). **Throttle regulation of suction or discharge is impermissible!**

The blower units are manufactured in the version

- with an acoustic hood (types 3D19.-...K, 3D28.-...K, 3D38.-...K, 3D45.-...K, 3D55.-...K, 3D60.-...K, 3D80.-...K, 3D90.-...K, 3D100.-...K),
- with an external acoustic hood (types 3D19.-...E, 3D28.-...E, 3D38.-...E, 3D45.-...E, 3D55.-...E, 3D60.-...E, 3D80.-...E, 3D90.-...E, 3D100.-...E)
- without any acoustic hood (types 3D19.-..., 3D28.-..., 3D38.-..., 3D45.-..., 3D55.-..., 3D60.-..., 3D80.-..., 3D90.-..., 3D100.-...),

and there are two variants of the suction methods for any of the above mentioned unit (ES – external suction; no identification – suction from cover).

The basic parts include:

- rotary blower
- power unit
- suction part
- discharge part
- pressure measurement system
- acoustic hood (types 3D19.-...K, 3D28.-...K, 3D38.-...K, 3D45.-...K, 3D55.-...K, 3D60.-...K, 3D80.-...K, 3D90.-...K, 3D100.-...K, 3D19.-...E, 3D28.-...E, 3D38.-...E, 3D45.-...E, 3D55.-...E, 3D60.-...E, 3D80.-...E, 3D90.-...E, 3D100.-...E)
- external suction (types 3D19.-...K ES, 3D28.-...K ES, 3D38.-...K ES, 3D45.-...K ES, 3D55.-...K ES, 3D60.-...K ES, 3D80.-...K ES, 3D90.-...K ES, 3D100.-...K ES, 3D19.-...E ES, 3D28.-...E ES, 3D38.-...E ES, 3D45.-...E ES, 3D55.-...E ES, 3D60.-...E ES, 3D80.-...E ES, 3D90.-...E ES, 3D100.-...E ES, 3D19.-...ES, 3D28.-...ES, 3D38.-...ES, 3D45.-...ES, 3D55.-...ES, 3D60.-...ES, 3D80.-...ES, 3D90.-...ES, 3D100.-...ES)

5.2 Rotary Blower (p. 35, Fig. 1)

The blower serves as an overpressure (under-pressure) source. This is a “Roots blower” with three-lobe rotary pistons (rotors). Shafts of the rotary pistons are placed in rolling contact bearings and the mutual rotor position is provided by a gearing. The bearings and gearings are lubricated with oil. The working area of pistons is not lubricated. The suction and discharge flange of the blower is connected to the suction and discharge part of the blower unit; the input shaft to the drive unit.

5.3 Drive unit (p. 35, Fig. 2; p. 36, Fig. 6)

The drive unit drives the blower. It consists of a motor, belt gear or clutch, electric motor bedding and belt drive cover, if installed. The driven pulley is fitted onto the blower input shaft. The electric motor housing is provided with mechanical tensioning.

5.4 Suction part (p. 34, Fig. 2, 3; p. 35 Fig. 6; p. 36, 7)

5.4.1 General

The suction part delivers the air to the blower, filters the air and silences the noise on the suction side.

5.4.2 Unit with acoustic hood (p. 35, Fig. 3; p. 37, Fig. 7)

The suction part consists of a suction silencer installed on the suction flange of the blower and an inlet piping to deliver the air from exterior of the acoustic hood. There is an air filter placed in the suction silencer provided with a filter element. According to the method of application (connection), the supply piping is anchored in the acoustic hood panel and closed by the hood grid, or it runs outside the cover and is provided with a rubber equalizer for external suction.

5.4.3 Unit without acoustic hood (p. 34, Fig. 2; p. 36, Fig. 7)

The suction part consists of a suction silencer installed on the suction flange of the blower and a connecting mouthpiece. There is an air filter placed in the suction silencer provided with a filter element. According to the method of application (connection), the connecting neck is closed by a coarse suction strainer or is provided with a rubber compensator for external suction.

5.5 Discharge part (p. 35, Fig. 2, 3; p. 36, Fig. 6; p. 37, Fig. 7)

5.5.1 General

The discharge part takes the air from the blower, silences the noise on the discharge side. This is the basic bearing part of the blower unit.

The discharge part consists of a basic part with a built-in discharge silencer, a backflow valve and a safety or a combined safety and starting valve. The backflow valve is connected to the discharge silencer flange with one side and is provided with a mouthpiece on the other side to connect the connecting piping to a rubber compensator. There is a safety or combined safety and starting valve connected to the backflow valve. The backflow valve is placed in an exhaust channel. The basic part is provided with an elastic mounting for anchoring to the floor.

5.5.2 Function of non-return flap valve

The backflow valve prevents from the air backflow from the connected piping on the discharge part through the blower if the unit is out of operation or after it is turned off. This situation would occur without the backflow valve e.g. in the following cases:

- multiple blowers connected into a single piping system
- the connected piping cannot be depressurized

5.5.3 Function of the safety valve

The safety valve protects the blower from exceeding the maximum allowable working pressure. When the pressure is exceeded (e.g. after the connected discharge piping is closed), the valve opens and the air can escape into the atmosphere.

5.5.4 Function of the safety/starting valve

This valve also serves as safety valve (see 5.5.3) and also makes starting of the unit possible when there is permanent pressure in the connected piping (i.e. start to back-pressure). The valve makes the initial starting of the blower possible with relief into the open atmosphere (especially to protect the electric motor from the initial overloading caused by the back-pressure).



The safety valves are not intended to protect from exceeding the maximum allowable working pressure in the parts connected to the blower.



**When the valve is not operating, the unit can get damaged.
Never change the valve setting.**

5.6 Acoustic hood (p. 35, Fig. 3; p. 37, Fig. 7)

The acoustic hood (K) reduces noise emissions into the environment, protects the blower unit against weather effects and contact with hot surfaces. It consists of a frame and removable panels.

In exceptional cases, the panels can be removed by releasing the locks and sliding out the pins - in order to ensure free access to some parts of the unit - it is also necessary to remove panels that are screwed tight with using standard tools.

The frame is installed on an elastic mounting included in the discharge part. The frame is equipped with a suction channel with a grid to deliver the cooling air to the electric motor, with a hole for the discharge piping (or for external suction as well) and with a bushing (bushings) for the electric cable. It is also equipped with a suction grid connected to the inlet piping of the blower or with a hole to run out the inlet piping of the blower.

The external acoustic hood (E) is also designed to protect the blower unit from weather effects and it is provided with anti-corrosion finish.

The newly designed acoustic hood is fitted with a pan to catch any dripping oil - see section 9.3.5.

5.7 Measurement and control

The blower units can be equipped with measuring and control elements whose type, version and quantity are determined in accordance with requirements of the customer. The following quantities can be measured and controlled: temperature, pressure, frequency – see the following table.

	physical quantity	measuring/control element	position
measurement	gas temperature	thermometer	suction/discharge of the unit
	gas pressure	manometer	suction/discharge of the unit suction/discharge of the blower
control	gas temperature	resistance temperature gauge	suction/discharge of the unit
	gas pressure	pressure sensor	suction/discharge of the unit suction/discharge of the blower
	frequency of blower rotors	speed sensor	under blower pulley
	frequency of electric motor rotor	speed sensor	electric motor
	oil level	level sensor	blower

The temperature measurement system measures gas pressure differences at the input (suction) and output (discharge) of the unit. The thermometers are integrated in the piping using protective wells.

The pressure measurement system measures pressure differences (pressure difference towards the atmospheric pressure) in front of the rotary blower (in the suction part) and behind the blower (in the discharge part). The corresponding manometers are connected through pipes to the suction and discharge flanges of the blower.

The control elements (sensors) are connected to the control system of the keeper and the unit can be automatically turned on and off based on the comparison of momentary values with the pre-set limit values of the relevant physical quantities.

The range of measuring and control elements depends on the particular application.

5.8 Technical specification

Technical parameters of the particular unit are given in the technical specification of the order, which is included in the accompanying documentation.

6 Handling, transport and storage

6.1 Delivery contents

The delivery includes:

- blower unit (including oil fillings in the blower)
- anchoring bolts with dowel pins
- this user manual
- service book
- technical specification of the order
- certificate of acceptance, commissioning and operators' training (if KUBÍČEK VHS, s.r.o. puts the unit into operation)

All parts of the consignment are placed on a common shipping pallet.

6.2 Handling (p. 36, Fig. 8)

The blower can be handled using a stacking or a forklift truck or a crane. The unit is attached to the shipping pallet using nails or wood screws. Before removing the unit from the pallet, remove the shipping container and the pallet anchoring.

• Stacking or forklift trucks

The pallet can be handled in a way common for handling pallets. When handling the unit itself without the shipping pallet, insert the forks of the truck longitudinally under the bottom feet of the elastic mounting.



Be careful when handling the unit because the unit is not balanced and can tip over.

• Crane

For handling the unit by means of the crane, you can use suitable lashing installation points or lifting eyes. The units of sizes 3D45B-150K and more are provided with lifting eyes, which are placed on the noise-dampening cover frame. The lashings means must be soft (non-metallic); steel ropes may be attached to the lifting eyes and the crane and ropes must have sufficient lifting capacities (respecting the weight of the unit) and the geometry must fulfil the condition for the vertex angle ($\alpha \leq 60^\circ$). If the vertex angle is larger, undesirable distortion of the acoustic hood frame could occur.

When handling the unit, remove withdrawable panels of the housing and pay attention to the correct distribution of the weight and position of the centre of gravity of the unit.



For handling the unit by means of the crane, you can use suitable lashing points or lifting eyes if they are provided on the unit; otherwise the stability can be lost and there is a risk of damage to health and property.

The vertex angle size of the lashing may be 60° max.; otherwise there is a risk of damage (distortion) of the acoustic hood frame.

To achieve proper suspension of the unit, do not use the feet the blower unit, flanges of the blower, electric motor or suction silencer.

When handling, observe generally valid and operationally-sound regulations regarding the use of the crane.

6.3 Transport

The unit can be transported in the covered cargo space using common land and air means of transport. To put the unit on the loading area, always use a shipping pallet and lock it against moving.



Never lay the unit on its side. The unit is allowed to be put or handled only in the horizontal position (with the pallet down).

6.4 Blower storage and shutdown

On a short-term basis, the unit may be stored in closed areas protected from direct weather effects. For long-term storage or shutdown period (more than 1 month), the unit must be stored in an enclosed dry area with a permanent temperature, humidity and suitable class of climatic conditions 1K2 according to ČSN EN 60 721-3-1, loosen V-belts and preserve the blower compression section with suitable preservative oil based agents. The other surfaces of the blower can be treated with anti-corrosion agents, seal the suction and discharge flanges (e.g. wrap in waxed paper, cover with plastic covers). During long-term storage, at two-month intervals, it is necessary to spin the blower rotors and electric motor several times and stop at +180° as compared to the initial position. The reason for this is to prevent one-sided stress of the bearings.

7 Installation and commissioning

7.1 Installation conditions

For correct installation and long reliability of the unit, the undermentioned conditions must be fulfilled, which refer to:

- place of installation
- electric power supply
- connected piping.

The above conditions must be complied with in the phase when the project documentation is being made and before the unit is installed.

7.1.1 Place of installation

The unit with acoustic hood (K) is designed for installation in outdoor areas protected from the rain (hereinafter referred to as shelter) or indoors (hereinafter referred to as machine room).

The unit with acoustic hood (E) is designed for outdoor installations.

The unit without acoustic hood is intended to be placed in a room (hereinafter referred to as machine room).

• Dimensions

The dimensions must correspond to the unit size so that a sufficient area can be provided after the installation to do maintenance works according to figures and the table on p. 41.

• Access and handling equipment

In the place of installation, there must be sufficient space for access and work with the handling equipment (pallet jack, forklift, crane, etc.). Requirements for the handling equipment depend on the size of the unit and nature of operations (installation, service, disassembly of the unit or its part – e.g. blower, electric motor).

The minimum dimensions of the door openings of the container or machine room must allow a clearance for the unit in the longitudinal direction.

• Floor

There must be a horizontal solid floor in the place of installation (concrete, floor tiles, etc.) of a suitable capacity and enabling to drill a hole of 70 mm depth to anchor dowel pins.

• Machine room ventilation

The machine room must be provided with a forced or natural ventilation system. The natural ventilation can be used only for a low-loaded blower unit (and when the output air temperature t_2 is not more than 40°C).

The air inlet hole must be dimensioned sufficiently and placed as close as possible to the suction part, the air output hole or exhaust fan must be dimensioned sufficiently and placed in the upper part on the opposite side. Apertures protected by a grid (net) for the air inlet and outlet must be cleaned regularly and must not be covered. The maximum allowable operating temperature in the machine room is specified in the **Ambient conditions at the place of installation** in this section of the chapter; the heat production of the specific type of the unit can be calculated according to its specification if required.

• Hygienic requirements

The place of installation must be equipped with a suitable lighting system in accordance with requirements of legal regulations. In the place of installation, consider noise emissions in relation to requirements of the legal noise level regulations in the working environment and around the place of installation.

• Ambient conditions at the place of installation

	Blower unit with noise-dampening cover	Blower unit without noise-dampening cover
Environment classification according to ČSN EN 60 721-3-3	3K8L, 3Z1, 3B1, 3S2	3K3, 3Z1, 3B1, 3S1
Environment classification according to ČSN EN 60 721-3-4	3K4L, 4Z1, 4Z4, 4Z7	-
Environment classification according to ČSN EN 60 079-10		n danger
temperature		(-20 - + 40)°C
relative humidity		(30 to 80)%
Sea-level altitude		max. 1000 m asl



The unit must not be used in environments where air combustible mixtures can get to the suction side.

7.1.2 Electric power supply

The supply line must be made so that it can comply with the following requirements:

- It must make possible that the unit is connected to the electric power supply line depending on the used electric motor, usually 1x 230V - 50Hz or 3x 230/400V- 50Hz.
- It must be provided with the main switch.
- It must be provided with an emergency stop in accordance with ČSN EN 60204-1. (The main switch of suitable version placed near the unit or a separate emergency stop button can be used as the emergency stop.)
- It must protect against dangerous contact voltage through automatic disconnecting from the power supply unit in accordance with ČSN EN 60204-1.



The electric power supply must be projected and implemented by a person (company) with relevant professional qualification.

• Technical specifications of the power supply

electric power supply	3 x 230/400 V – 50 Hz
protection against dangerous contact voltage of the unit	equipotential bonding
total installed input	see Catalogue and Technical specification *
electric motor protection	IP 55
nominal current	see Electric motor catalogue and Technical specification *
power factor	see Electric motor catalogue and Technical specification *
* ... The Technical specification specifies values for the particular type of the unit.	

• Connection of the unit to the electric network

The power cable is not allowed to limit movement of the motor when the drive unit is adjusted. The electric motor wiring is subject to recommendations of electric motor manufacturers. The wiring diagram is attached on the internal side of the cover of the terminal block of the electric motor.

In order to have free access to the terminal box of the electric motor, some assemblies of the blower have acoustic cover designs which require the removal of acoustic covers that are removable by releasing locks and sliding out pins as well as the removal of acoustic covers that require the use of tools.

• Speed control by pole changing

The rotary field speed (and motor speed) can be changed by changing the number of stator poles. The electric motor must have (i) two separated stator windings with various numbers of poles, which can be in an integer ratio or (ii) tapped windings (Dahlander connection). The two-speed control can be realized by reversing the poles (4 or 2 poles – 1500/3000 rpm; 6 or 4 poles – 1000/1500 rpm). The control must be realized in the same way as switching between two motors. The electric motor must be connected as instructed by the manufacturer.



The poles can be changed during operation of the electric motor if a searching and synchronization unit is installed to the running motor and the electric motor is turned off with free run out. If the above mentioned conditions are not complied with, the pole changing is allowed only when the unit is out of operation. Otherwise there is a risk of damage of the electric motor and blower.

• Speed control with a frequency converter

To control the speed with a frequency converter, use only an electric motor in version for operation with a frequency converter (usually provided with PTC thermistors, dynamically balanced, heat class, etc.). Operation and wiring of the motor must comply with instructions provided by manufacturers of the motor and frequency converter. The electric motor manufacturer does not recommend operation under 25 Hz because of insufficient cooling and adverse torque. (If it is necessary to work at the frequency less than 25 Hz, use a motor with sufficient temperature rating or any motor with external cooling). In case of control over the nominal speed, the shaft torque drops in relation to the speed, and therefore it is necessary to check the maximum speed considering both the motor mechanics and calculation of the high speed torque. Considering the operating parameters of the blower, the specific range of the speed control of the electric motor is defined by the blower manufacturer in the technical specification and the blower unit is marked with the plate stating "PROVOZ s FM (Operation with FC). - .. Hz".



Never adjust a value less than 25Hz on the frequency converter (because of insufficient cooling of the blower), or less than it is specified on the plate "PROVOZ S FM ...- 50 Hz" placed on the terminal box of the electric motor. Otherwise there is a risk of damage or destruction of the unit.

7.1.3 Piping connection

Observe the following principles when projecting the piping:

- The piping diameter should not be less than the output (input) mouth diameter of the unit ($\varnothing D/DN$).
- For designing the piping, the output air temperature t_2 must be considered in relation to the used material of the piping and dilatation.
- End the piping in 5-8 mm distance from the end of the output (input) mouth.
- The piping must be always connected to the mouth using a compensator (a part of the unit).
- The piping must be properly anchored so that it cannot burden the compensator with a radial or axial force.
- In the place of connection, it must be possible to align the piping axis with the axis of the connected mouth.
- The piping and the connected unit must be provided with its own protection against exceeding the maximum allowable working pressure if such a situation can occur during operation.
- In the place of connection, install a stop valve and a manometer to measure the output pressure p_2 of the unit.

7.2 Putting into operation

This includes:

- transport to place of installation
- alignment and anchoring of the unit (any handling of the unit at the destination point will be provided by the buyer – if otherwise not agreed)
- connection to the piping manifold
- first start

The installation is followed by the testing operation of the whole newly operated technology that includes the blower unit.

7.2.1 Transport to the place of installation

During the transport, observe instructions given in Chapters 6.2 and 6.3.

7.2.2 Alignment and anchoring (p. 38, Fig. 12)

To anchor the unit, use anchor screws and dowel pins mounted into the floor. Before anchoring, remove side panels of the cover of the unit with the acoustic hood as specified in 8.2.

During the alignment works, it is recommended to proceed in the following way:

- Check that the floor is horizontal in the place of installation (1 mm per 1 m).
- Align the unit on the required place so that you can connect it in accordance with 7.2.3.
- In case of the blower unit with the acoustic hood, remove the side panels.
- Through holes in the bottom feet of the elastic mounting, drill holes of 70 mm depth into the floor using a Ø12 mm borer.
- Tap dowel pins into the bores (included in the delivery of the unit).
- Through washers, screw on the bottom feet of the elastic mounting using Ø8 mm wood screws (included in the delivery of the unit) to the floor.
- In case of the blower unit with the acoustic hood, mount the side panels.

7.2.3 Connection to the pipe manifold (p. 38, Fig. 10)

Connect the unit to the pipe manifold using a compensator (included in the delivery of the unit). Regarding the compensator length, the distance between the connected mouth and the pipe end must be 5–8 mm. The pipe manifold must be coaxial with the mouth axis and must be properly anchored so that it cannot load the compensator with a radial or axial force. Before connecting the piping, anchor the unit in accordance with 7.2.2. We recommend you to proceed in the following way during this operation:

- Align the pipe end towards the connected mouth (alignment, 5-8mm distance) or check the alignment.
- Fix the pipe end in the connection position or check the fixation.
- Interconnect the connecting mouth and the pipe end using the compensator.
- Attach the compensator using clips.



Connect the piping and the mouth using a protective conductor.

7.2.4 Connection to the electric power supply




The electric power supply may be designed and connected only by a person with relevant professional qualification and relevant authorization to do this activity.

Connect the unit to the electric power supply in accordance with the project documentation. The manufacturer of the unit requires to connect the electric motor in such a manner that smooth starting of the unit is guaranteed and no mechanical shocks and electrical surges can occur.


The manufacturer defines these possible starting options:

Motor output [kW]	Starting method
< 5	Directly from power mains, star-delta transformer, soft starter, frequency convertor
5 -15	star-delta transformer, soft starter, frequency convertor
> 15	soft starter, frequency convertor

	<p>Starting time (deceleration) of blowers must be at least 4 s, otherwise damage may result.</p>
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When connecting, check that the electric power supply complies with the following conditions:

- The unit is connected to the corresponding voltage system.
- Overcurrent protection of the power circuit of the electric motor is provided.
- Protection before dangerous contact voltage through automatic disconnecting from the power supply unit is provided.
- It is provided with the main switch.
- The power supply line is equipped with an emergency stop element. (The main switch of a suitable version and placed near the unit or a separate emergency stop button can serve as an emergency stop.)

	<p>The fulfilment of the above-mentioned conditions is a necessary prerequisite to safely put the unit into operation, in terms of electricity.</p>
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7.2.5 First start

The first start serves to check correct installation and operability. The condition for the first start is to successfully align and anchor the unit, connect the piping and the electric power supply. It is necessary to start the unit when the connected piping is open.

Before starting the unit, check that:

- There is an appropriate quantity of the oil charge (correct height level) in the rotary blower (see section 8.3).
- All fittings in the connected piping are open.
- Shipping clamps in the electric motor bedding are removed.
- The belt gear is checked for condition.
- Screw connections are checked.
- Check of operation and correct sense of rotation of the electric motor (in accordance with the arrow placed on the blower)

For some types of the unit in the acoustic hood version, it is necessary after the checks are completed to disassemble the front panel of the external housing as specified in 8.2.

• Procedure to determine the correct sense of rotation

1. Removal of V-belts.
2. Connection to the power supply and check the sense of rotation independently on the electric motor (it must be identical with the arrow of the sense of rotation on the blower).
3. Put on V-belts and tension as instructed on the rating plate.

4. **Turn on the unit for max. 1 sec. and turn off immediately;** during the running-out phase check that the sense of rotation of the driving shaft of the rotary blower corresponds to the arrow on the blower. If it is not the case, the unit is connected incorrectly and it is necessary to change connection of electric wires in the terminal block of the electric motor.



The sense of rotation of the driving shaft of the blower rotor must be identical with the sense specified by the manufacturer (indicated by an arrow on the unit), otherwise there is a risk of damage or destruction of the unit.



At two speed electric motors, check the correct sense of rotation for both of the speed variants (both stator windings).

- **Check of operation of the unit** (it follows after the correct sense of rotation is determined)
 1. Operation of the unit is regular (rotary blower shall give off monotonous sound without shocks, the belt gear shall operate regularly and quietly without vibrations).
 2. There is no air leak or suction at the parts of the unit, which are not technologically designed for this.
 3. There are no vibrations on the unit or the connected piping.
 4. The value on the overpressure manometer corresponds to the nominal pressure difference specified on the rating plate of the blower unit and in the Technical specification.

In the case of a unit equipped with speed control, test the operation in the whole usable speed range. Read the value on the overpressure manometer at the nominal speed.



If the above mentioned conditions are not fulfilled, it is not allowed to start the testing operation.



If the blower is in operation, it must contain oil charges; otherwise there is a risk of damage or destruction of the unit.



If necessary, contact KUBÍČEK VHS, s.r.o. or an authorised service affiliate.

8 Operator

The unit is designed for long-term permanent operation and therefore operation of the unit includes only turning on/off and operating checks.

8.1 Turning on and off

Turn on and off the unit using the switch placed at the unit. If the unit is equipped with a speed control system (using a change-over switch or a frequency converter), use the corresponding control elements in accordance with the intended use and description on the corresponding distributor. Reasons limiting the frequency range of the electric motor and blower are described in Chap. 7.1.2.



Never turn on the unit during the running out phase of the motor, otherwise there is a risk of damage or destruction of the unit. The unit may be started only when the blower is out of operation.

8.2 Removal of acoustic hood panels

In case of the blower unit with the acoustic hood, it is necessary before the operating check to remove (take off) the top and front panels or the rear panel or to open the side panel.

When working, proceed according to the type of the unit in the following way:

- A. Release locks or brackets of the side panels of the acoustic cover and take off the panels and remove the rear panel if required.
- B. Open the lock and open the cover panel.

Replace the panels in reverse order.



After the works on the unit are completed, it is necessary to replace the acoustic hood panels.

8.3 Operating checks

If the unit is permanently in operation, check **at least once a day** that:

1. Operation of the unit is regular (the rotary blower shall give off monotonous sound without shocks and the belt gear shall operate regularly and quietly without vibrations).
2. There is no air leak or suction at the parts of the unit, which are not technologically designed for this.
3. There are no vibrations on the unit or the connected piping.
4. There is no drop of the oil charge of the blower under the minimum level (see Section **Oil check** of this chapter), no oil leakage from the blower and no hydraulic tensioning.
5. The underpressure manometer (suction) and overpressure manometer (discharge) indication corresponds to values required within the technological use of the unit.
6. No unusual behaviour occurs that can be related to the incorrect operation of the unit.

• Oil check

You can use one of the following procedures:

1. During the regular break of operation

Wait about 1 minute (until the oil level is stabilized) and check that the oil level is visible in both of the oil gauges between the minimum and maximum level and refill or drain the oil if required. The minimum and maximum levels are defined with the lower and upper edge of the circular apertures of the oil gauge mirror (p. 34, Fig. 1).

2. During operation of the unit

During operation of the unit, check the oil in the oil gauges of the blower, check the oil level in the external oil gauge – that the oil level is visible in the oil gauge between the minimum and maximum. The minimum and maximum levels are defined with the lower and upper edge of the circular apertures of the oil gauge mirror (p. 35, Fig. 1). If the oil level sensor is connected, it must be set so that it turns off the unit when the oil level is low.



The oil level must not drop below the defined minimum; otherwise there is a risk of damage or destruction of the unit caused by insufficient lubrication.

Inspection (circular or rectangular) holes to the oil gauges can be made in the acoustic hood panel to make the oil level check easy – it is optional equipment required by the customer.

If the oil level is over the defined maximum, the oil can leak from the blower through de-aerating holes and get into the compression space of the blower.

9 Maintenance and repairs

The proper maintenance is a basic prerequisite for long-term safe and trouble-free operation of the unit. The consistent observance of this manual makes you possible:

- to keep the unit in the permanent operating readiness
- to prevent failures and eliminate useless costs for repairs
- to achieve an optimum lifetime of the unit.



Never do the maintenance works, for which you are not authorized on the basis of your employee rating and qualification (see Chap. 3.1).



Carry out all the works on time and in the specified time intervals and carefully.

9.1 Maintenance and repair records

We recommend you to keep records about the completed maintenance works and repairs, e.g. in the form specified in the Service book.



During the guarantee period, make entries and keep records about the completed maintenance works.

9.2 Maintenance plan

The maintenance plan is specified in the following table:

Interval				Part	Activity	Procedure
Month	3 months	Year	Other			
x				complete unit	complete inspection	see 9.3.4
x				rotary blower	oil charge check	see 9.3.5
x				belt gear	gear check	see 9.3.6
x				valve*	operation check	see 9.3.7
		x		swuction silencer	filter element replacement	see 9.3.8
		x	after the first 500 hours of operation, subsequently in accordance with the operating conditions	rotary blower	oil charge replacement	see 9.3.5
			see the electric motor manual (2,000 hours of operation)	electric motor	lubrication of motor bearings provided with lubrication points	see the electric motor manual



Oil change interval depending on operating conditions:

1. The first oil change after 500 hours of operation.
2. The second oil change during warranty period and further changes after every 2,000 hours (i.e. 3 months of continuous operation). Any failure to comply with such interval will result in reduction or restriction of the blower warranty. If the blower does not complete 2,000 hours of operation within a year, the oil will be changed once a year.
3. The manufacturer recommends oil change in the maximum interval of 2,000 hours after the expiry of warranty (i.e. 3 months of continuous operation). If the blower does not complete 2,000 hours of operation within a year, the oil will be changed once a year.
4. When changing the oil, always replace gaskets and O-rings under the discharge and inlet caps. Blower series 3D38 and above require replacement of gaskets under inlet caps only.

After 3 years of operation, it is necessary to revise or overhaul the blower in cooperation with the manufacturer. During which spare parts and consumable parts, e.g. bearings, seals, etc. are exchanged as a preventive measure. The time period between individual revisions or overhauls of the blower depends on the number of operating hours and on the operating conditions (pressure differences, blower speed, etc.); it is possible to determine this period using the vibration diagnostics system.

9.3 Maintenance procedures

During the maintenance works, proceed in the following way:

1. Do the maintenance activities in accordance with the maintenance plan and procedures specified below.
2. If the procedures are not specified in detail, use common procedures used for maintenance of machinery and units.

9.3.1 Safety

During the maintenance works, observe instructions given in section 3, use common safety procedures (before starting the maintenance e.g. turn off or disconnect the electrical equipment) and the below mentioned maintenance instructions and procedures.

9.3.2 Removal of acoustic hood panels

In case of the blower unit with the acoustic hood before the maintenance it is necessary to remove (take off) the side and rear panels of the housing. The corresponding removal procedure is specified in 8.2.



After the works on the unit are completed, it is necessary to replace the acoustic hood panels.

9.3.3 Removal of the belt bear cover (p. 37, Fig. 11)

When checking the belt gear and replacing the belt pulleys, it is necessary to remove the belt gear cover.



Always turn off the unit using the main switch before removing the cover.

When removing, proceed in the following way:

- Remove the top lid of the cover.
- Remove screws fixing the side panelling to the cover holder.
- Take out the side panelling (6 pieces).

When replacing the cover, proceed in reverse order.



Never start the unit if the cover of the belt gear is not mounted – if installed - and always carry out operations regarding the check and adjustment of the belt gear when the unit is OFF.

9.3.4 Complete inspection

Check the general condition of the unit and carry out the following steps in particular:

1. Operation of the unit is regular (rotary blower should give off monotonous sound without shocks, the belt gear should operate regularly and quietly without vibrations).
2. There is no air leak or suction at the parts of the unit, which are not technologically designed for this.
3. There are no vibrations on the unit itself or the connected piping.
4. No screw connections are loosened, especially on the electric motor bedding.
5. There is no visible oil-leak from the rotary blower.
6. The surface temperature of the rotary blower corresponds to the nominal output temperature t_2 specified in the Technical specification of the order.
7. The turning on/off and emergency stop components of the units are operating.



If the above mentioned conditions are not fulfilled, try to repair the possible failure using procedures specified in 9.4.



If necessary, contact KUBÍČEK VHS, s.r.o. or an authorised service affiliate.

9.3.5 Oil charge for the rotary blower

The rotary blower is equipped with two individual oil charges.

The quantities for the individual blower types are included in the following table:

type of blower	3D19..	3D28..	3D38..	3D45..	3D55..	3D60..	3D80..	3D90..	3D100..
oil charge volume [L]*	0.6	0.8	0.9	1.6	3.0	6.0	8.5	10.5	27.0

* This is the sum of the oil charges in both bearing housings

The total oil volume in the unit is the sum of charges of all the blowers, which are included in the unit.

The blowers are filled with full synthetic oil SAE 5W/40 (DYNAMIC PRIMA 5W/40) as standard. When changing the oil, use the same type or equivalent oil.

Each of the individual oil charges is equipped with an oil gauge, and a fill and a drain opening, which are closed with plugs.

Blower types:

3D..38B	3D..38C
3D..45B	3D..45C
3D..55B	3D..55C
3D..60B	3D..60C
3D..80B	3D..80C
3D..90B	3D..90C
3D..100B	3D..100C

The drain holes are provided with plugs with drain valves and drain hoses with unions.

Specification of equivalent oils

Oil type synthetic motor oil

Viscosity class

SAE 5W-40

Performance levels, approval

ACEA C3-04, ACEA A3/B4-04, API SM/CF, MB229.31,
BMW Longlife-04, VW 502 00/505 00, VW 505 01,
Porsche GL Oil

Kinematic viscosity at 100 °C (mm²/s)

14.5

Kinematic viscosity at 40 °C (mm²/s)

87.9

Density at 15 °C (g/cm³)

0.851

Solidification point (°C)

-42

Oil charge replacement

When replacing, proceed in the following way:

1. Turn off the unit.
2. Unscrew the fill plug.
3. The blowers are provided with common drain plugs. – Unscrew the drain plug and drain the oil.
4. Replace sealing gaskets, install the drain plug and tighten it properly.
5. The blowers are provided with plugs with drain valves. – Unscrew the lid, connect the drain union hose and drain the oil. (Once the cap nut of the drain hose has been connected and screwed on, the plug valve will open.)
6. Disconnect the drain union hose, screw on the lid and tighten lightly.
7. Refill the oil slowly through the fill hole until the oil level in the oil gauge reaches the minimum of the defined range.
8. Wait for about 2 min., check the oil level and refill the oil if need so that the oil level in the oil gauge is in the specified range.
9. Check the drain plug for leakage.
10. Replace sealing gaskets, install the fill plug and tighten it properly.

Check the oil charge quantity during operation according to 8.3.



Always change both of the oil charges.

It is not permissible to fill the blower with the oil below the minimum level of the defined range in the oil gauge.

Always fill the blower with the oil so that the oil level in the oil gauge is within the defined range, otherwise there is a risk that the oil drains due to blowing-off!

Dispose of the used oil in accordance with the valid legal regulations.

For environmental protection, the newly designed acoustic hood is equipped with a drip pan located in the hood frame to catch any oil dripping from the blower, possibly caused when replacing bearing housings, leaking oil plugs, damaged oil marks or leaking housing seals. The pan has a sufficient volume to contain all the oil from both bearing housings of the blower. Regularly check the condition and functionality of the drip pan, collect any drips at designated places and dispose of them in accordance with applicable legislation.

Increased oil leakage caused by leaks indicate an unsatisfactory blower condition. Do not hesitate to contact the manufacturer for repairs. Avoid running the blower with insufficient oil levels!

9.3.6 Belt gear

The standard blower units are provided with the V-belt gear. The belt pulleys are in version with clamping bushings Taper Lock or made from one semi-finished product. Cut narrow V-belts XPZ, XPA, XPB, XPC are used to transmit the output.

The check and maintenance of the belt transmission includes the checking of operation of the belt gear, belts, belt transmission geometry, belt pulleys, mounting of the electric motor and possible adjustment of the belt gear geometry, belt tension, or belt replacement.



The correctly adjusted belt gear has a direct influence on the lifetime of the belts and the whole unit.

Check of operation of the belt gear

Only visual and audio checks of machine operation are carried out during operation of the machine. The operation of the belt gear must be smooth, without vibrations and excessive noise.



Always carry out operations regarding the check and adjustment of the belt gear when the unit is OFF.

• Condition and tension of belts

Replace the belts and adjust their tensions under the following circumstances:

1. The belt is twisted or springs from the drive.
2. The belt springs in the groove.
3. Uneven belt tension of two- or more-belt gears
(tension tolerance between individual belts $\pm 10\%$)
4. Belt vibrations, excessive vibrations.
5. Whistling, slapping sound, excessive noise.
6. Excessively worn-out profile on the sides and at the bottom.
7. Cracks.
8. Side burning and hardening.
9. Extreme harden or swelling and sticky surface.

Check the belt for tension and adjust as specified on the rating plate of the belt gear (the plate data include: belt type, number of pieces, belt sag, belt sag force, belt frequency).



When replacing the belts, use the type as specified on the belt gear rating plate or in the Technical specification. In case of multiple gears, always replace all the belts for new sets. The number of the belts is not allowed to be less than the number of grooves in the belt pulleys.

• Belt gear geometry

Alignment of shafts of the blower and electric motor and of grooves of the pulleys is provided by the manufacturer. The maximum allowable deviation – maximum gap between the belt pulleys and the ruler in the points A,B,C,D = 1 mm (including max. front run-out of pulleys 0.4 mm). Check in several positions by slightly turning the pulleys.

• Belt pulley

The installation of balanced belt pulleys (max. front and circumferential run-out of the groove 0.4 mm. Check the pulley groove for cleanness and wear (shape and depth), then the screwed connections and the belt pulley for fixation on the shaft or clamp bushing (without clearances).



Never disassemble the blower pulleys, modify or change the setting of spacer rings of the pulleys; otherwise there is a risk of damage of the blower.

• Mounting the electric motor and tensioner

The electric motor is mounted on a swinging mounting fixed with a brace. The manufacturer adjusts the mounting so that the belt gear geometry and belt tension is observed. The length change results in a change of the electric motor position (axial distance of shafts of the electric motor and blower) to adjust the belt tension. The tensioner brace also serves for shifting the motor during the belt replacement. The mounting check focuses on the strength of screw connections and perfect condition of the individual components (deformations, cracks, etc.).



Never loosen the screws securing the belt gear alignment.

Replacement of V-belts and adjustment of belt tension

Remove and install the belts when the electric motor tensioner is slack and the axial distance between the belt pulleys is shorter so that it is possible to take off the belts.

When replacing, proceed in the following way:

1. Turn off the unit.
2. Remove the acoustic hood panels – see Chapter 8.2.
3. Loosen the electric motor – loosen the locking nuts on the electric motor brace and turn the nut of the tensioner until the belt(s) can be taken out.
4. Any belt(s) must be replaced with an identical match with respect to type and length!
5. Strain the electric motor and adjust the belt tension – on the spanner of the electric motor bedding and turn the middle nut for spanners to ensure tension to the extent required to achieve correct position and belt tension. Optimum tension values are shown in the table adhered to the belt gear housing (e.g. the table below) and for adjusting use the audio strain gauge, e.g. GATES 507 C.
6. Check the belt gear geometry (according to Fig. below).
7. Check that the screw connections are tightened.

8. Mount the noise-dampening cover panels.
9. Start the unit and check the belt gear for operation (smooth quiet operation without vibrations).


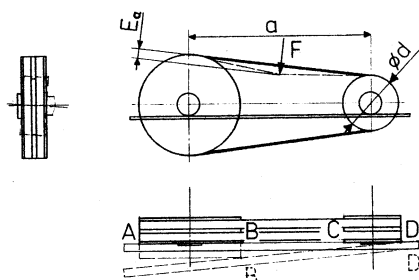
	<p>Never elongate the mounting spanner over the allowable limit – the thread rods must engage the checking holes of the spanner nut.</p>
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Fig. Belt gear geometry




a – axial distance (mm)
 E – unit sag per 100 mm of axial distance
 Ea – sag – measured (mm)
 F – testing force (N)
 $Ea = E \times a / 100$ (mm)

Tab. Belt gear specification

Φ of pulleys D_1-D_{mot}/ D_2-D_{dm}	375-80 /	355-90	mm
no. of notches, belts/ belt type	5 x	XPC 3000 Lw	
sag/ force/ frequency (new)	9.27 mm/ 47-50 N/ 37-38 Hz		
sag/ force/ frequency (used)	9.27 mm/ 40-43 N/ 34-36 Hz		

9.3.7 Safety valve (p. 35, Fig. 2; p. 36, Fig. 6)

Depending on the equipment, the unit is provided with a safety or a combined safety and starting valve. The extent of the equipment is given in the Technical specification.

	<p>The valves (i.e. their opening or closing pressures) were adjusted by the manufacturer and it is not allowed to change the setting, otherwise the blower is subject to risk of damage!</p> <p>When a valve is faulty or not operating, the unit is not allowed to be operated.</p> <p>When the valve sealing is damaged, there is a danger of incorrect operation of the valves and therefore it is necessary to contact KUBÍČEK VHS, s.r.o. company or an authorized service organization.</p>
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Check of the safety valve function

It is necessary to check that the valve opens when the maximum allowable working pressure specified in the Technical specification has been exceeded.

To test, proceed in the following way:

1. When the unit is in operation, close the output fitting of the unit carefully and at the same time watch the output pressure of the unit on the manometer.
2. At a certain time during the closing phase, the valve should open and the air should audibly escape.
3. When the valve works correctly, it should open when the pressure equals approximately the admissible working pressure.

Check of function of the combined safety and starting valve

It is necessary to check that the valve closes after the start-up phase of the unit (start-up function) and opens when the maximum admissible working pressure specified in the Technical specification is reached (safety function). To test, proceed in the following way:

1. Turn off the unit and wait until it runs out.
2. Turn on the unit and check that, when the unit is running, you can hear the air escaping from the valve for about 10 to 60 sec. after the start.
3. If the start-up function works correctly, the air should escape at the beginning and then the air relief should be closed.
4. Let the unit run for about 5 minutes.
5. When the unit is in operation, close the output fitting of the unit carefully and at the same time watch the output pressure of the unit on the manometer.
6. At a certain time during the closing phase, the valve should open and the air should audibly escape.
7. When the valve works correctly, it should open when the pressure equals approx. the admissible working pressure.

9.3.8 Filter element of the suction silencer (p. 35, Fig. 4)

The suction silencer is fitted with a fabric filter element, which must be replaced at regular intervals according to the condition of the element, but no later than at each oil change. The order code of the element is located in the technical specification of the unit and on the production label of the element.



Turn off the unit using the main switch before replacing the bed or dismantling the silencer.

When replacing, proceed in the following way:

1. Remove the lid of the suction silencer (it is marked with the filter symbol).
2. Take out the bed including the filter girdle put on the silencer frame.
3. Take off the filter girdle from the bed frame (basket).
4. Put the new filter girdle on the frame.
5. Put the bed into the silencer.
6. Mount the lid of the filter element and the lid of the suction silencer.

9.4 Failures and troubleshooting

• Summary of failures

The summary of possible failures, their possible causes and remedies are given in the following table:

Part of the unit	Failure symptom	Possible cause	Correction action
rotary blower	uneven operation and unusual noise	worn-out gears, clogged rotor	ask for service intervention *
		other cause	ask for service intervention *
	increased temperature	Increased surrounding temperature	ensure ventilation of machine room
		big quantity of oil charge	adjust the oil level suitably – see 9.3.5
		increased temperature of sucked medium	ensure ventilation of machine room
			decrease input temperature of medium
		exceeded maximum admissible working pressure due to combined failure of valve and increased resistance in connected piping	ask for service intervention *
		worn-out gears, rotors	ask for service intervention *
		other cause	ask for service intervention *
	oil leakage from housing	worn-out sealing	ask for service intervention *
	oil occurrence in transported medium	big quantity of oil charge	adjust the oil level suitably – see 9.3.5
		other cause	ask for service intervention *
electric motor	increased input	big quantity of oil charge	adjust the oil level suitably – see 9.3.5
electric motor	increased input	not projected operating mode	check operating mode (nominal pressure difference) with operating conditions, modify operating mode
		other cause	ask for service intervention *
Belt gear	increased temperature, vibrations, whistling sound	belts wear	replacement – see 9.3.6*
		misalignment and unevenness of belt pulleys	ask for service intervention *
		incorrect function of tension mechanism	ask for service intervention *
		other cause	ask for service intervention *
complete unit	low transported quantity of medium	clogged filter element of suction silencer	replace – see 9.3.8
		incorrect valve function	ask for service intervention *
		worn-out rotary blower	ask for service intervention *

*...During the guarantee period, performance of these activities will be limited to the manufacturer or an authorized person only.

Troubleshooting procedures

When removing a fault, proceed in the following way:

1. For seeking a cause and remedial procedure, use the table included in Chapter 9.4., or common procedures used for servicing machines and units.
2. If you do not succeed in removing a fault using the specified procedure, try to identify a cause of the fault using common procedures used for servicing machines and units. If needed, use the relevant documentation supplied by the manufacturer.
3. Evaluate your troubleshooting possibilities and remove the fault using common procedures used for servicing machines and units, or seek a service intervention.



If you are not sure of the remedy or you have never encountered any similar fault, ask for a service intervention.



Never repair the rotary blower and safety valve by yourself.

9.5 Spare parts

When replacing parts, always use only original parts delivered by KUBÍČEK VHS, s.r.o. company or parts identical with the original ones.



Never mount other than original parts on the unit.

• Ordering

You can order the spare parts from KUBÍČEK VHS, s.r.o. company or an authorized service organization. When ordering, always specify the type and serial number of the unit and part code. To minimize possible downtimes due to wear and tear or damage, we recommend you to have the following spare part available:

- 1 x complete set of V-belts – dimensions are stated in the technical datasheet of the unit
- 1 x filter element – code located in technical datasheet and element label
- sufficient oil quantity of prescribed type for the oil change

10 Servicing

You can order the service from KUBÍČEK VHS, s.r.o. company or an authorized service organization. When ordering, always specify the type and serial number of the unit. Any service task completed shall be always recorded in the Service book.

11 Disassembly and disposal

There are no special removal and disposal procedures. Use common procedures used for removal and disposal of machines and units.

12 Directions for use of subcontracts

The following directions are delivered with the unit:

- Direction for electric motor.

13 Conditions for acceptance of repairs under warranty

1. The claimant must prove

- a) Provable familiarity of the operator with the User manual.
- b) Availability of the user manual for workers operating and servicing the unit.
- c) For the checks according to the maintenance plan in specified intervals see the Service book.

2. Defect origin assessment – The warranty does not apply to defects due to:

- a) Natural disaster.
- b) Local breakdown.
- c) Suction of air with inadequate quantity of solid particles.
- d) Power failure.
- e) EMC influence.
- f) Machine flooding due to back pressure of liquid.
- g) Defect of another product.

3. Claims for repairs under warranty will be void should any of the following provisions have been infringed:

- a) The claimed unit may be dismantled only by the manufacturer or an authorized person.
The user may dismantle the device with consent of its manufacturer only.
- b) The unit may be operated only at parameters specified in the Technical specification or other parameters that were accepted by the manufacturer in written.
- c) The unit may be operated only in environments that are specified in this direction for use.

Appendix No. 1

Rotary blower:

- 1) suction flange
- 2) discharge flange
- 3) input shaft
- 4) fill plug
- 5) oil gauge
- 6) drain plug

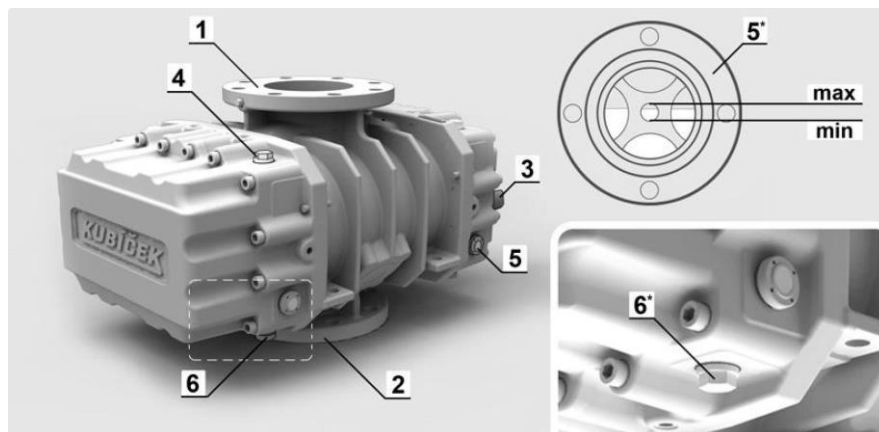


Fig.1

Blower units 3D19 – 3D38:

- 1) electric motor
- 2) suction
- 3) discharge
- 4) blower
- 5) base frame
- 6) suction silencer
- 7) discharge silencer
- 8) suction basket
- 9) valve

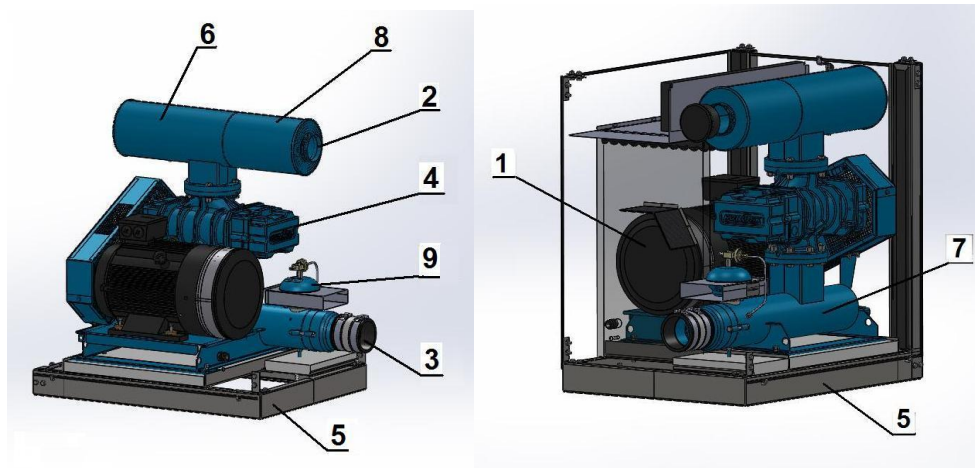


Fig. 2

Blower units 3D19 – 3D38: acoustic hood:

- 1) air grating of the exhaust shaft
- 2) discharge
- 3) upper panel of cover
- 4) front panel of cover
- 5) inspection holes to oil gauges
- 6) frame
- 7) manometer – suction
- 8) manometer – discharge
- 9) compensator to connect external suction

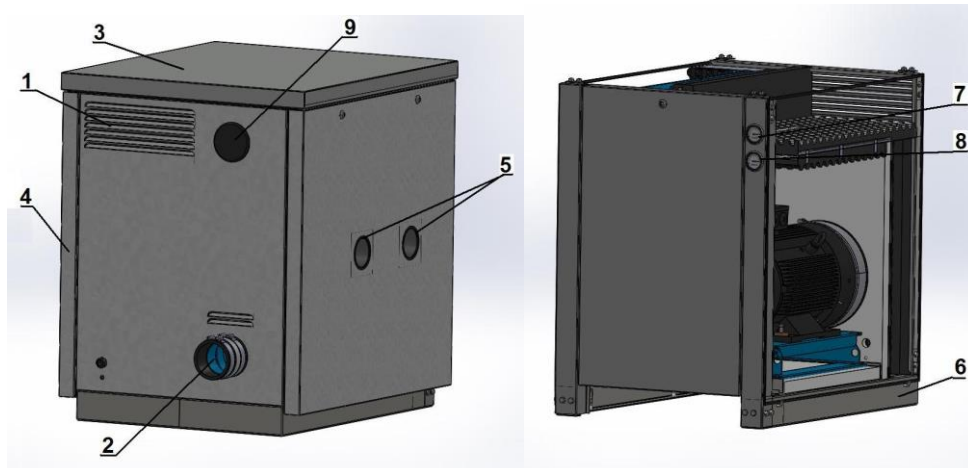


Fig. 3

Suction silencer:

- 1) suction silencer lid
- 2) bed frame with filter girdle
- 3) suction silencer body
- 4) absorbing fabrics

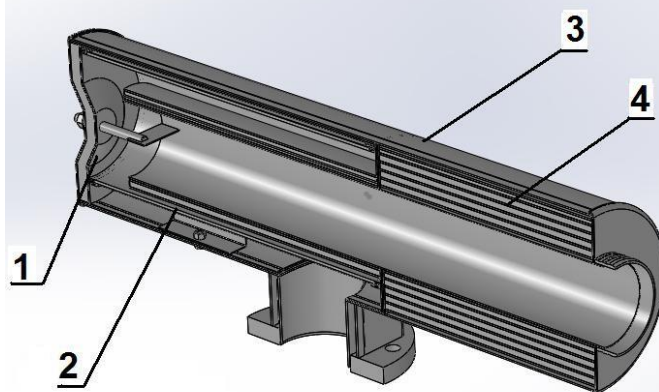


Fig. 4

Blower units 3D45 – 3D100 covered:

- 1) base frame
- 2) electric motor
- 3) belt gear cover
- 4) cover plate of suction

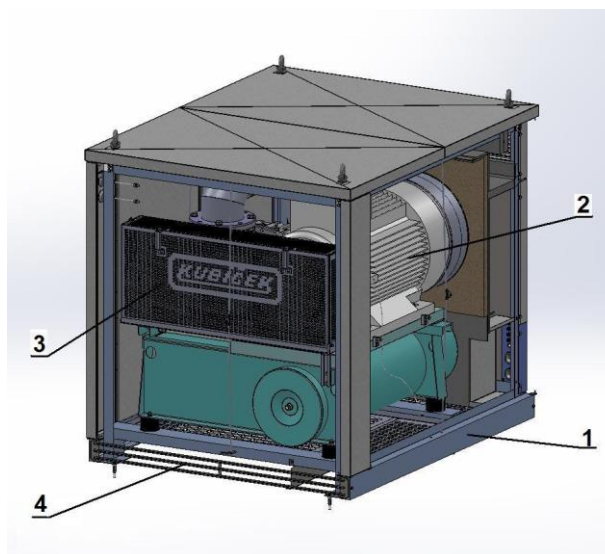


Fig. 5

Blower units 3D45 – 3D100:

- 1) rotary blower
- 2) suction piping
- 3) discharge
- 4) electric motor
- 5) base frame
- 6) suction silencer
- 7) discharge silencer
- 8) suction basket
- 9) compensator to connect external suction
- 10) backflow valve
- 11) valve
- 12) elastic bearing
- 13) manometer – suction
- 14) manometer – discharge

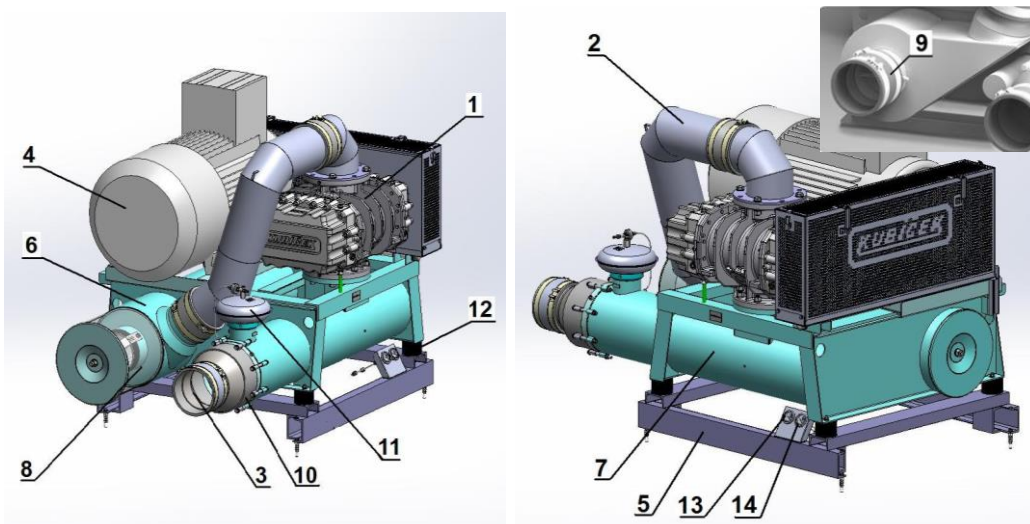


Fig. 6

**Blower units
3D45 – 3D100 covered:**

- 1) cover plate of suction
- 2) discharge
- 3) upper panel of cover
- 4) air grating of the exhaust shaft
- 5) lock
- 6) bushings for electric cables
- 7) external suction

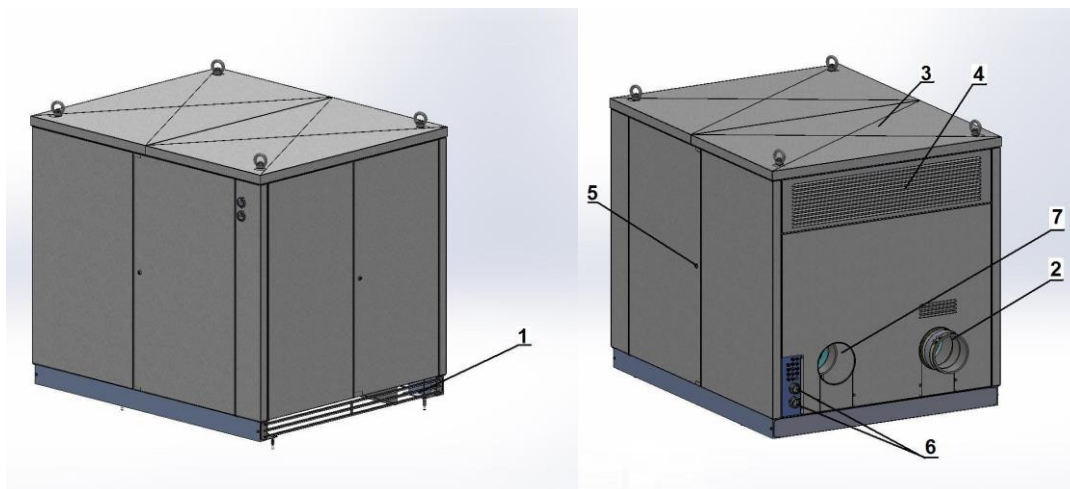


Fig. 7

Handling:

- 1) lift truck and stacker
- 2) crane

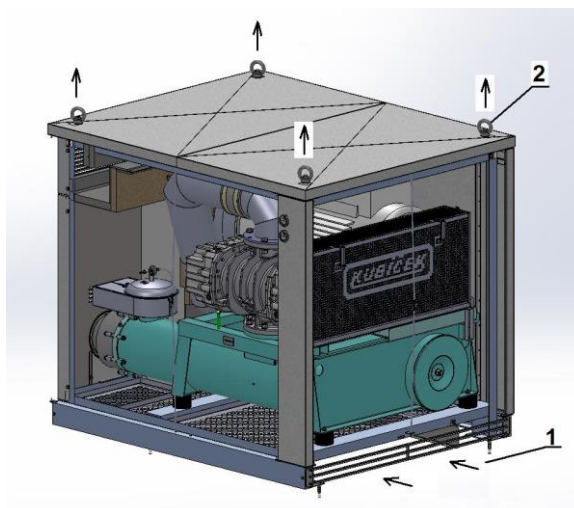


Fig. 8

**Filter element
of the suction silencer:**

- 1) suction silencer lid
- 2) filter girdle
- 3) bed frame

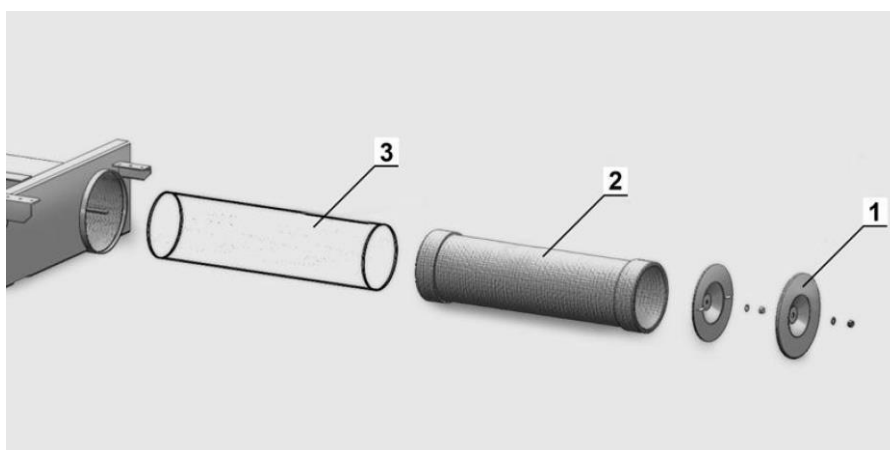


Fig. 9

Connection to the piping manifold

- 1) mouth
- 2) clips
- 3) compensator

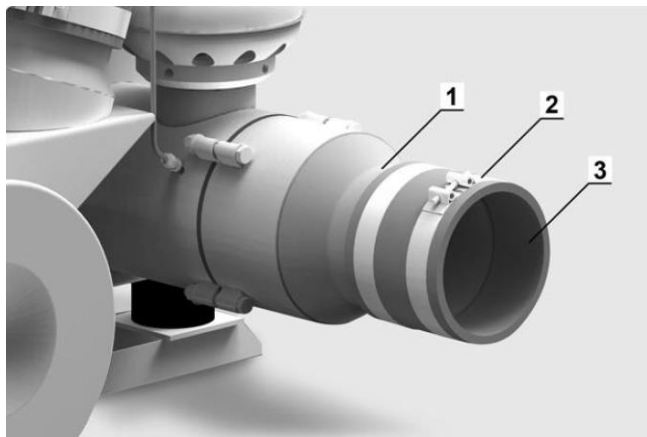


Fig. 10

Belt gear cover

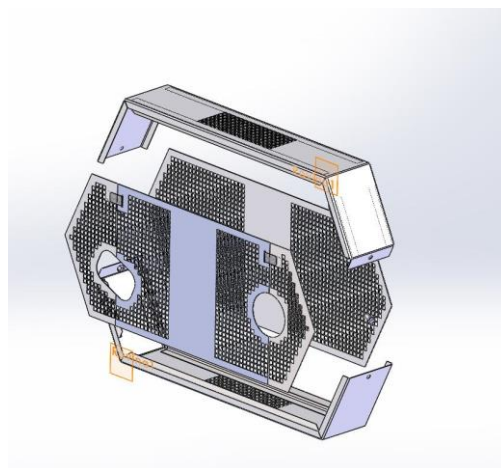


Fig. 11

Fixation of the electric motor with mechanical tensioning, anchoring:

- 1) motor mounting guide
- 2) dowel pin, washer, wood screw

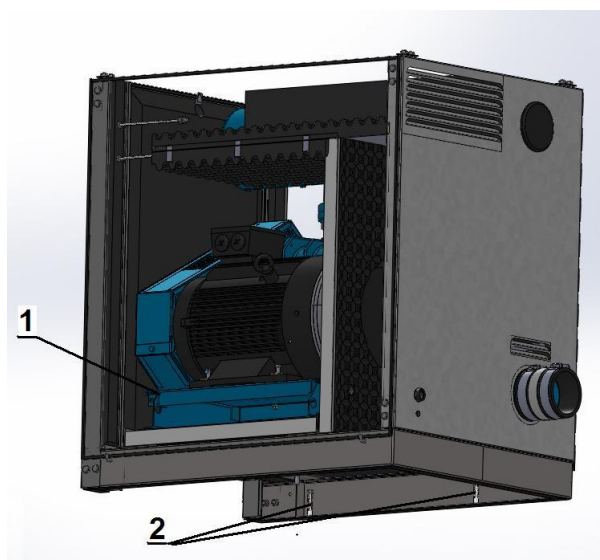
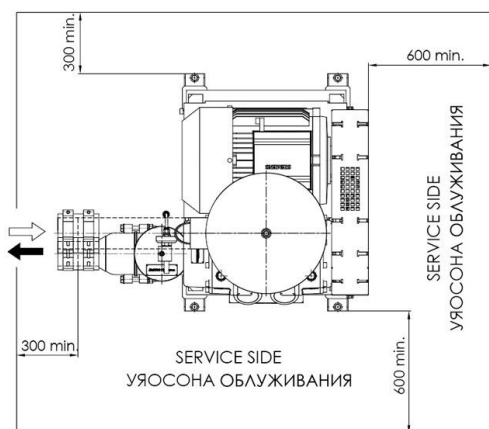
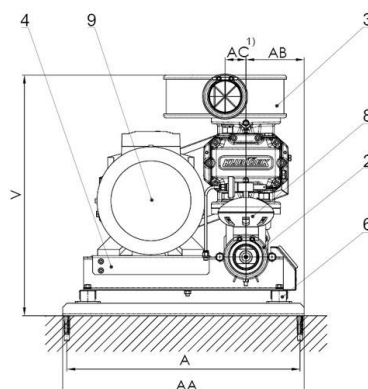
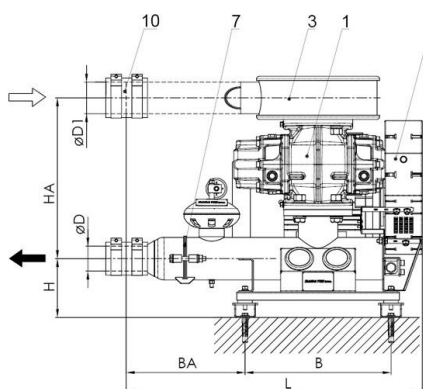


Fig. 12

DIMENSIONS OF BLOWER UNITS WITHOUT COVER – sizes 19, 28, 38

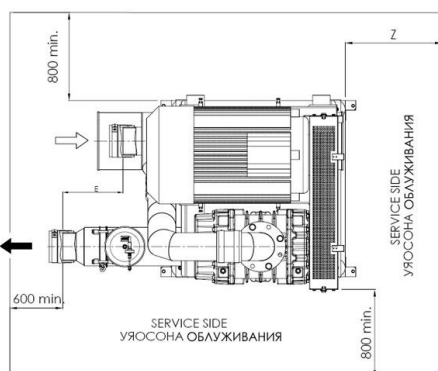
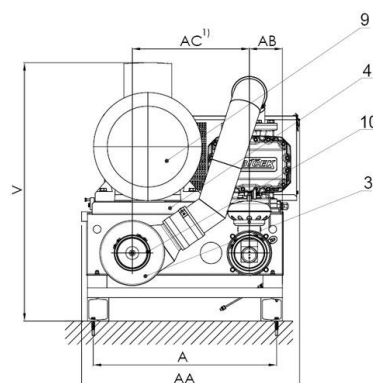
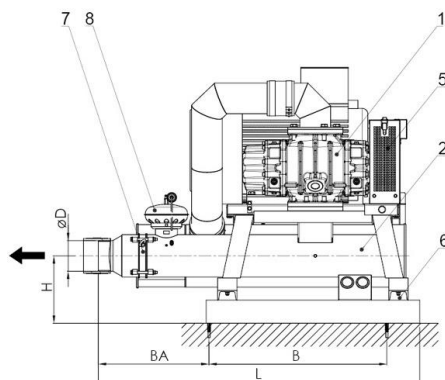


1	Bare-shaft blower	Компрессорный блок
2	Discharge silencer	Глушитель нагнетания
3	Inlet silencer with filter	Глушитель всасывания с фильтром
4	Bed of electric motor	Крепление электродвигателя
5	V-belt drive	Ременная передача
6	Flexible pads	Упругий виброкомпенсатор
7	Non-return valve with flexible pipe coupling	Обратный клапан и компенсатор
8	Pressure relief valve / pressure relief – unloading valve	Предохранительный клапан
9	Electric motor	Электродвигатель
10	Connection of external suction pipeline	Подключение внешнего всасывающего трубопровода

type	ØD/DN	ØD1/DN	A	AA	AB	AC ¹⁾	B	BA	H	HA ¹⁾	L	V	m kg
mm													
3D19T-050	60/50	76/65	460	480	140	50	350	285	110	385	710	580	79
3D19S-050	60/50	76/65	460	480	140	50	350	285	110	385	710	580	80
3D19A-050	60/50	76/65	460	480	140	50	350	285	110	385	710	580	86
3D19B-050	60/50	76/65	460	480	140	50	350	285	110	385	710	580	88
3D19C-050	60/50	76/65	460	480	140	50	350	285	110	385	710	580	92
3D19S-051	60/50	76/65	560	580	140	50	350	285	110	385	710	580	85
3D19A-051	60/50	76/65	560	580	140	50	350	285	110	385	710	580	91
3D19B-051	60/50	76/65	560	580	140	50	350	285	110	385	710	580	93
3D19C-051	60/50	76/65	560	580	140	50	350	285	110	385	710	580	97
3D28A-080	89/80	114/100	700	720	165	35	470	340	140	495	910	710	138
3D28B-080	89/80	114/100	700	720	165	35	470	340	140	495	910	710	145
3D28C-080	89/80	114/100	700	720	165	35	470	340	140	495	910	710	156
3D38B-100	114/100	114/100	730	750	175	0	560	440	195	710	1110	1115	234
3D38C-100	114/100	114/100	730	750	175	0	560	440	195	710	1110	1115	250

m	Weight of blower unit without electric motor	Масса установки без электродвигателя, без капота
1	Alternative configuration – external suction	Исполнение по выбору

DIMENSIONS OF BLOWER UNITS WITHOUT COVER – sizes 45, 55, 60, 80, 90, 100

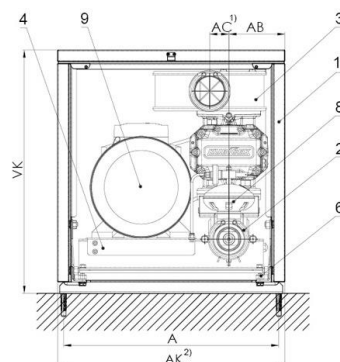
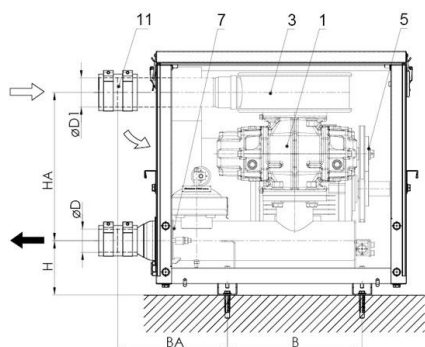


1	Bare-shaft blower	Компрессорный блок
2	Discharge silencer	Глушитель нагнетания
3	Inlet silencer with filter	Глушитель всасывания с фильтром
4	Bed of electric motor	Крепление электродвигателя
5	V-belt drive	Ременная передача
6	Flexible pads	Упругий виброкомпенсатор
7	Non-return valve with flexible pipe coupling	Обратный клапан и компенсатор
8	Pressure relief valve / pressure relief – unloading valve	Предохранительный клапан
9	Electric motor	Электродвигатель
10	Connection of external suction pipeline	Подключение внешнего всасывающего трубопровода

type	ØD/DN	A	AA	AB	AC ¹⁾	B	BA	E	H	L	V	Z	m
						mm							kg
3D45B-150	159/150	940	1120	200	600	920	570	340	350	1660	1325	1100	610
3D45C-150	159/150	940	1120	200	600	920	570	340	350	1660	1325	1100	640
3D55B-150	159/150	940	1120	200	600	920	570	340	350	1660	1325	1100	715
3D55C-200	219/200	1100	1380	230	700	1270	700	355	410	1985	1560	1400	950
3D60B-200	219/200	1100	1380	230	700	1270	700	355	410	1985	1560	1400	1100
3D60C-250	273/250	1690	1760	490	800	965	615	260	470	2095	1760	1550	1515
3D80B-250	273/250	1690	1760	490	800	965	615	260	470	2095	1760	1550	1720
3D80C-300	324/300	1775	1855	480	890	1860	685	535	655	2720	2110	1700	2900
3D90B-300	324/300	1775	1855	480	890	1860	685	535	655	2720	2110	1700	3100
3D90C-400	406/400	2270	2350	620	1000	1800	795	485	670	3195	2450	2100	3960
3D100B-400	406/400	2270	2350	620	1000	1800	795	485	670	3195	2450	2100	4430
3D100C-500	508/500	2430	2500	860	1150	2680	1200	1100	820	4350	3100	2400	8500

Z	Minimal space for filter exchange	Минимальная длина для замены фильтра
m	Weight of blower unit without electric motor	Масса установки без электродвигателя, без капота
1	Alternative configuration – external suction	Исполнение по выбору

DIMENSIONS OF BLOWER UNITS WITH COVER – sizes 19, 28, 38

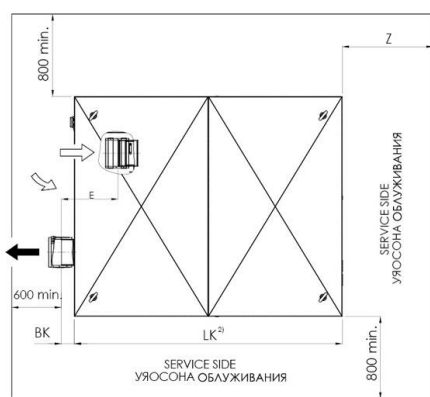
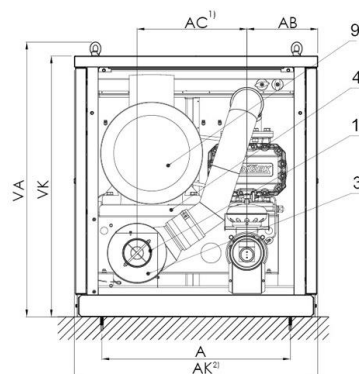
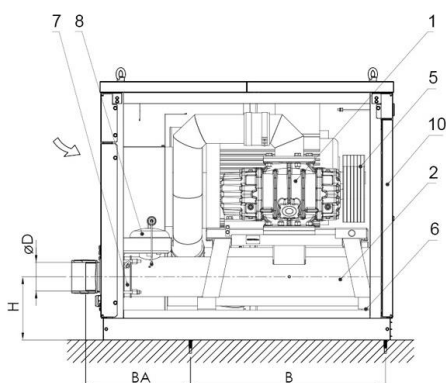


1	Bare-shaft blower	Компрессорный блок
2	Discharge silencer	Глушитель нагнетания
3	Inlet silencer with filter	Глушитель всасывания с фильтром
4	Bed of electric motor	Крепление электродвигателя
5	V-belt drive	Ременная передача
6	Flexible pads	Упругий виброкомпенсатор
7	Non-return valve with flexible pipe coupling	Обратный клапан и компенсатор
8	Pressure relief valve / pressure relief – unloading valve	Предохранительный клапан
9	Electric motor	Электродвигатель
10	Acoustic cover „K / E”	Противошумовой кожух „K / E”
11	Connection of external suction pipe	Подключение внешнего всасывающего трубопровода

type	ØD/DN	ØD1/DN	A	AB	AC ¹⁾	AK ²⁾	B mm	BA	BK	H	HA	LK ²⁾	VK	m kg
3D19T-050K / E	60/50	79/65	460	145	50	490	350	285	100	140	385	650	635	106
3D19S-050K / E	60/50	79/65	460	145	50	490	350	285	100	140	385	650	635	107
3D19A-050K / E	60/50	79/65	460	145	50	490	350	285	100	140	385	650	635	113
3D19B-050K / E	60/50	79/65	460	145	50	490	350	285	100	140	385	650	635	115
3D19C-050K / E	60/50	79/65	460	145	50	490	350	285	100	140	385	650	635	119
3D19S-051K / E	60/50	76/65	560	145	50	590	350	285	100	140	385	650	635	113
3D19A-051K / E	60/50	76/65	560	145	50	590	350	285	100	140	385	650	635	119
3D19B-051K / E	60/50	76/65	560	145	50	590	350	285	100	140	385	650	635	121
3D19C-051K / E	60/50	76/65	560	145	50	590	350	285	100	140	385	650	635	125
3D28A-080K / E	89/80	114/100	720	180	35	750	470	340	100	140	495	860	765	168
3D28B-080K / E	89/80	114/100	720	180	35	750	470	340	100	140	495	860	765	175
3D28C-080K / E	89/80	114/100	720	180	35	750	470	340	100	140	495	860	765	186
3D38B-100K / E	114/100	114/100	880	280	0	935	650	253	53	255	710	1050	1155	304
3D38C-100K / E	114/100	114/100	880	280	0	935	650	253	53	255	710	1050	1155	320

m	Weight of blower unit without electric motor	Масса установки без электродвигателя с капотом
1	Alternative configuration – external suction	Исполнение по выбору
2	Roof panel of external acoustic cover „E” exceeds ground plan of blower by 50 mm at all sides	Размеры кожуха типа „E” для наружного исполнения увеличены пропорционально во все стороны на 50 мм

DIMENSIONS OF BLOWER UNITS WITH COVER– sizes 45, 55, 60, 80, 90, 100



1	Bare-shaft blower	Компрессорный блок
2	Discharge silencer	Глушитель нагнетания
3	Inlet silencer with filter	Глушитель всасывания с фильтром
4	Bed of electric motor	Крепление электродвигателя
5	V-belt drive	Ременная передача
6	Flexible pads	Упругий виброкомпенсатор
7	Non-return valve with flexible pipe coupling	Обратный клапан и компенсатор
8	Pressure relief valve / pressure relief – unloading valve	Предохранительный клапан
9	Electric motor	Электродвигатель
10	Acoustic cover „K / E”	Противошумовой кожух „K / E”
11	Connection of external suction pipe	Подключение внешнего всасывающего трубопровода

type	ØD/DN	A	AB	AC ¹⁾	AK ²⁾	B	BA	BK	E	H	LK ²⁾	VA	VK	Z	m kg
3D45B-150K / E	159/150	1030	385	600	1330	1075	580	85	340	350	1620	1500	1425	1100	830
3D45C-150K / E	159/150	1030	385	600	1330	1075	580	85	340	350	1620	1500	1425	1100	860
3D55B-150K / E	159/150	1030	385	600	1330	1075	580	85	340	350	1620	1500	1425	1100	935
3D55C-200K / E	219/200	1280	430	700	1580	1270	700	80	355	410	1940	1750	1655	1400	1350
3D60B-200K / E	219/200	1280	430	700	1580	1270	700	80	355	410	1940	1750	1655	1400	1500
3D60C-250K / E	273/250	1690	490	800	1760	965	615	115	260	470	1980	2085	1930	1550	1920
3D80B-250K / E	273/250	1690	490	800	1760	965	615	115	260	470	1980	2085	1930	1550	2125
3D80C-300K / E	324/300	1700	565	890	2010	2600	165	130	535	655	2680	2325	2230	1700	3700
3D90B-300K / E	324/300	1700	565	890	2010	2600	165	130	535	655	2680	2325	2230	1700	3900
3D90C-400K / E	406/400	2270	620	1000	2350	1800	795	195	485	670	3000	2735	2620	2100	4960
3D100B-400K / E	406/400	2270	620	1000	2350	1800	795	195	485	670	3000	2735	2620	2100	5430
3D100C-500K / E	508/500	2800	860	1150	2800	2900	1200	540	1100	820	4050	3300	3200	2400	9700

Z	Minimal space for filter exchange	Минимальная длина для замены фильтра
m	Weight of blower unit without electric motor	Масса установки без электродвигателя с капотом
1	Alternative configuration – external suction	Исполнение по выбору
2	Roof panel of external acoustic cover „E” exceeds ground plan of blower by 50 mm at all sides	Размеры кожуха типа „E” для наружного исполнения увеличены пропорционально во все стороны на 50 мм

The installation dimensions of the unit can be changed only after consultation with the manufacturer and on the basis of approval of the relevant project documentation.