KHVG SERIES ASSEMBLY MANUAL

Rev: 06

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INDEX

1. GENERAL SAFETY INSTRUCTIONS

The correct use of pneumatic equipment within a system is the responsibility of the system designer or the person who determines its technical specifications.
The use of safety guards is recommended to minimize the risk of injury to persons; pay close attention to the fact that compressed air may lead to the explosion of closed containers, and vacuum may lead to the implosion of closed containers. The vacuum generator, even if silenced, makes noise: if necessary, wear suitable protection. In the event that, contrary to indications, dusts, oil mists, fumes, etc. are suctioned, these will be mixed with the discharge air of the vacuum generator and expelled via the discharge conduit; use suitable, approved air filters to avoid possible intoxications. The discharge air has a high output speed. Do not obstruct the discharge of the gripper module. Ensure that the components are properly secured; regularly check that connections are in good working order, as high cycles or vibrations may cause them to loosen. Consider the possibility of pressure drops in the pneumatic supply line: then provide for a safety system that, in order to prevent injury to the operator or damage to the machine prevent the risk of the piece being released.
Consider the possibility the electrical or pneumatic supply is interrupted, to protect persons and systems.
Consider the emergency stop when designing the system.

Pneumatic supply and connection

The optimal supply pressure suggested is 5 Bar.
If the compressed air contains impurities, the components may malfunction. Install a filter upstream of the component; the filter grade should be at least 5 µm. Air containing excessive quantities of condensate may cause the components to malfunction. Installing condensate drains or dryers prevents these malfunctions. For more information, see the Installation and Commissioning section.

Electric connection

Connect the cables separately from power or high voltage lines, avoiding parallel wiring or wiring in the same conduit of the same lines. Control circuits that include sensors and coils may malfunction due to the noise from these other lines.
Carefully follow the electrical wiring instructions, paying close attention to avoiding the short-circuiting of loads.

Assembly

Compressed air may be dangerous if used by unskilled personnel. Assembling, using and maintaining systems should solely be carried out by experienced and specially trained personnel. Both for fastening and supplying, solely use the bores and methods provided by the manufacturer. Prior to assembly/disassembly of the components, cut off voltage and pressure. Install and maintain the components only after thoroughly reading and understanding this manual.

Maintenance

Maintenance must be carried out in accordance with the instructions in this manual. Prior to any maintenance work, check the conditions to prevent the sudden release of pieces, then suspend pneumatic/electrical supply, and discharge residual pressure.

Safety instructions

Handle the components with care.
During installation and maintenance, cut off voltage and pressure.
Modifying the components is prohibited.
Cleaning the environment and place of use is recommended.
Follow the installation and commissioning instructions.
The electrical and pneumatic connections should be permanently connected to the component.

Storage

For a correct storage of the system or its spare parts, we recommend:
Exclude outdoor areas, areas exposed to the elements or with excessive humidity or exposed to direct sunlight.
The environment must be sufficiently clean, arrange the system almost in such a way that it has a stable base of support and make sure that there is no risk of unexpected movements.

Intended use

The gripper is intended exclusively for handling, lifting and storing products of appropriate size, as reported in the agreement.

The products handled by this equipment must have the following characteristics:

- They must not be deformed;
- Have a uniform height over the entire gripping surface. Any height differences must be reported in the agreement. If they are not reported, Piab AB and / or Kenos will not be responsible for malfunction.

Not intended use

The gripper must not be used:

- For uses other than those established by the manufacturer or reported in this manual;
- In direct contact with corrosive gases, chemical products, water, vapor or in environments with droplets or splashes of water, oil, etc.;
- In explosive atmospheres;
- In environments subject to strong vibrations and/or impacts;

Waste disposal

In case of disposal of the system or non-working parts, follow these procedures:

Provide for disposal to Authorized Bodies, in full compliance with current regulations regarding waste.

Where non-reusable and / or deemed RAEE "waste" such as electrical and electronic equipment are not to be given in urban waste collection bins. As far as the metal mass of the system is concerned, is sufficient to subdivide the different materials for a correct recycling.

Identification data and product number

Example of label:

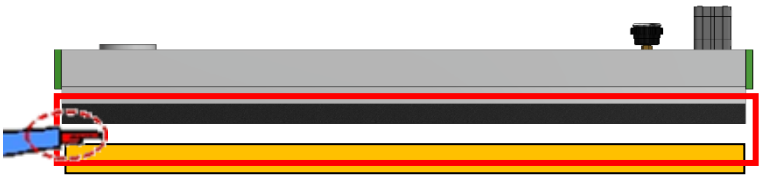
piab

Kenos Code: K-40-00039-00
Type model product: KHVG.800.210.N335.BL2
Item no: 9930607
Foam spare part no: 9930606
Foam spare part MP no: -
Country of origin: ITALY -- 26/02/2019 --

Each system is identified by a label on which the reference data of the same is indelibly marked.
For any communication with Piab AB or Service Centers always refer these references.

2. DANGEROUS AREAS

Areas with danger of crushing



Areas with danger of air ejection

Notes for the final manufacturer of machinery and end user

It is prohibited stopping or passing through the work area of the gripper module. In case of electrical or pneumatic supply failure, the load handled by the module is released.

Never look and / or insert the hands in cavities, holes or openings (for example: air discharge, openings / holes under the foam or suction cups etc.).

The gripping module described in this manual is designed for implementation in industrial systems; therefore, it must not be used with the conditions other than those specified.

The final evaluation of the safety systems to be applied for starting up the system, after the assembly of the gripping module, is the task of the final manufacturer of machinery. It is up to the final manufacturer of machinery to report the PPE needed by the operators who are stationed in the surroundings or the operators who have access to the work area. In addition, the same manufacturer will certify the final commissioning according to the regulations in force for each individual country.

3. PICTOGRAMS

PIC.	DESCRIPTION
	Generic danger. Warning!
	Danger of crushing or entrapment of upper limbs!
	Danger of air ejection or expulsion of particles!

Pictograms related to the operator's qualification highlighted in this manual

PIC.	DESCRIPTION PICTOGRAMS
	**Generic operator:** operator without specific skills, able to perform only simple tasks on the orders of qualified technicians.
	**Mechanical maintenance technician**: qualified technician able to intervene on the mechanical parts to make the necessary adjustments, maintenance and repairs.

4. R.E.S.S. APPLIED AND RESPECTED

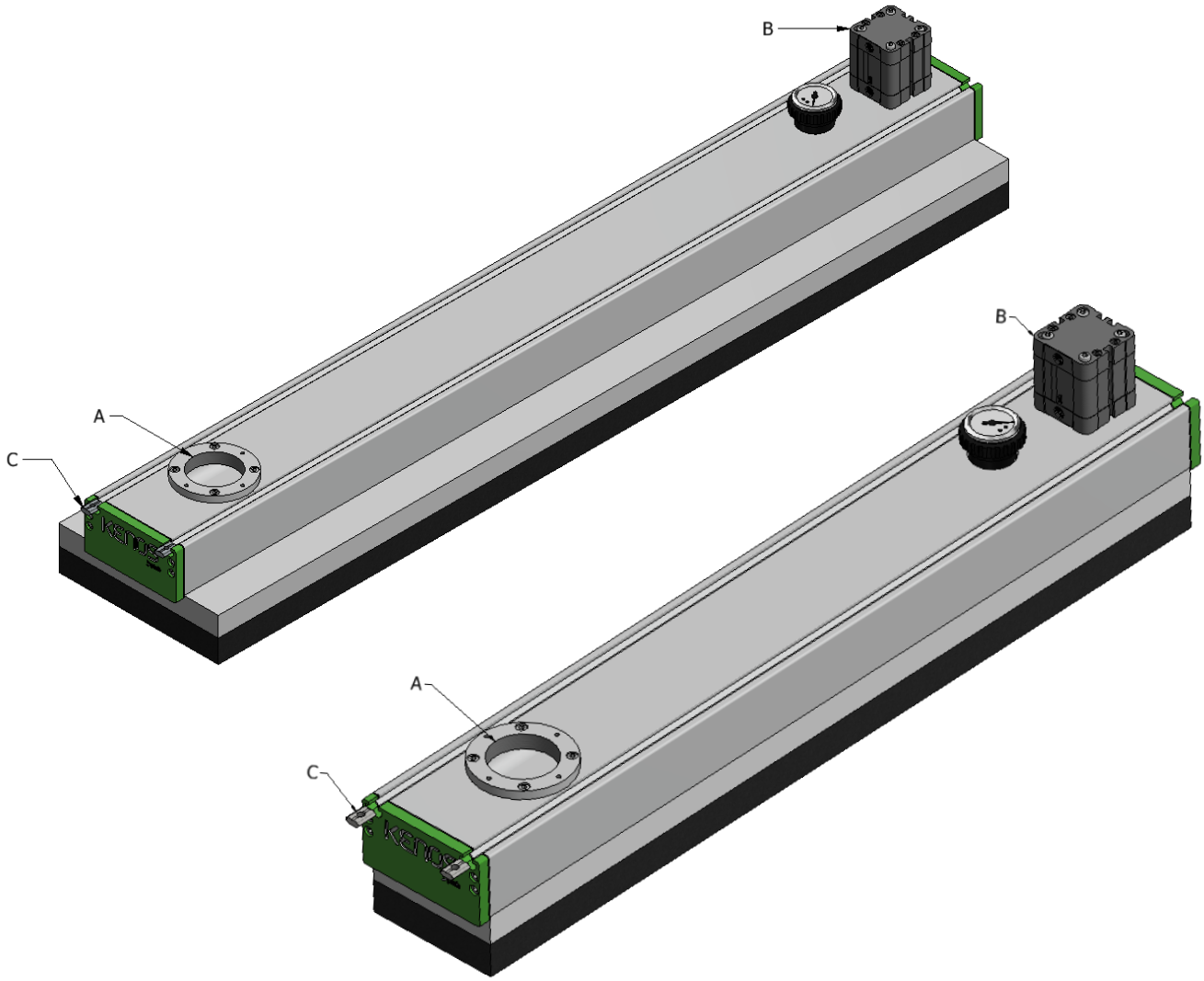
Essential Health and Safety Requirement	**Compliance**
1 ESSENTIAL SAFETY AND PROTECTION OF HEALTH	
1.1 General considerations	
1.1.1 definitions	√
1.1.2 Principles of safety integration	√
1.1.3 Materials and products	√
1.1.4 Lighting	
1.1.5 Design of machinery to facilitate its handling	√
1.1.6 Ergonomics	
1.1.7 Jobs	
1.1.8 Seats	
1.2.1 Safety and reliability of control systems	
1.2.2 Control devices	
1.2.3 Startup	
1.2.4 Shutdown	
1.2.4.1 Normal Shutdown	
1.2.4.2 Operational stop	
1.2.4.3 Emergency Stop	
1.2.4.4 Assembling machines	√
1.2.5 Selection of control or operating	
1.2.6 Failure of the power supply	
1.3 Measures of protection against mechanical hazards	
1.3.1 Risk of loss of stability	
1.3.2 Risk of break-up during operation	√
1.3.3 Risks due to falling or ejected objects	√
1.3.4 Risks due to surfaces, edges or corners	√
1.3.5 Risks related to combined machinery	
1.3.6 Risks related to variations in operating conditions	
1.3.7 Risks related to moving parts	√
1.3.8 Choice of protection against risks related to moving parts	
1.3.8.1 Moving transmission	
1.3.8.2 Moving parts directly involved in the process	
1.3.9 Risks of uncontrolled movements	
1.4 Required characteristics of guards and protection devices	
1.4.1 General Requirement	√
1.4.2 Requirement for special shelters	
1.4.2.1 Repair fixed	
1.4.2.2 Interlocking movable guards	
1.4.2.3 Adjustable guards restricting access	
1.4.3 Special requirements for protective devices	

Essential Health and Safety Requirement	**Compliance**
1.5 Risks due to other hazards	
1.5.1 Electric Power	
1.5.2 Static Energy	
1.5.3 Energy supply other than electricity	√
1.5.4 Assembly errors	
1.5.5 Extreme temperatures	
1.5.6 Fire	
1.5.7 Explosion	
1.5.8 Noise	√
1.5.9 Vibrations	
1.5.10 Radiation	
1.5.11 External Radiation	
1.5.12 laser radiation	
1.5.13 Emission of hazardous materials and substances	
1.5.14 Risk of being trapped in the machine	√
1.5.15 Risk of slipping, tripping or falling	
1.5.16 Lightning	
1.6 Maintenance	
1.6.1 Maintaining the Machine	√
1.6.2 Access to jobs and servicing points used for the maintenance	
1.6.3 Isolation from sources of energy supply	
1.6.4 Operator intervention	√
1.6.5 Cleaning of internal parts	√
1.7 Informations	
1.7.1 Information and warnings on the machine	√
1.7.1.1 Information and information devices	
1.7.1.2 Warning Devices	
1.7.2 Warning of residual risks	√
1.7.4 Instructions	√
1.7.4.1 Basis of preparation	√
1.7.4.2 Contents of the instructions	√
1.7.4.3 Publications illustrative and promotional	

5. INSTALLATION

a. Mounting on the handling system and pneumatic connection

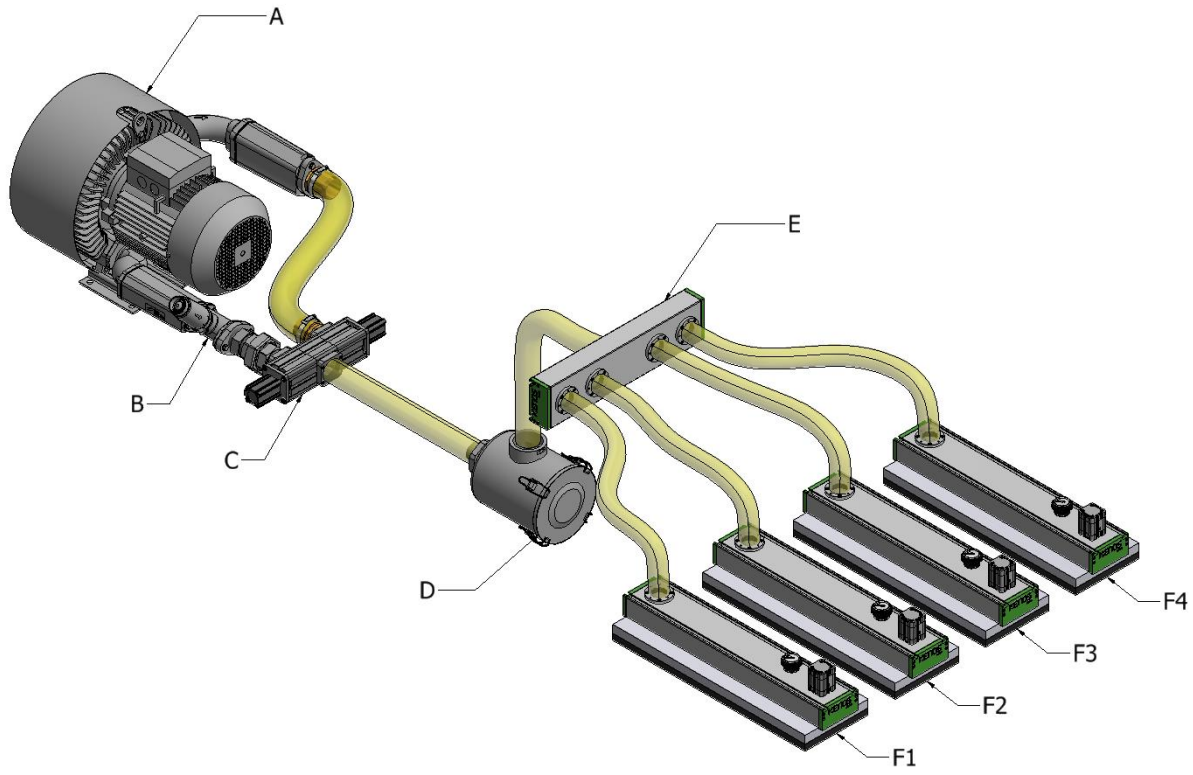
The gripping system is secured with the aid of slot nuts. Special slots for these nuts are provided in the aluminium profile. The gripper can be mounted either directly, via a robot flange or via spring mountings. Information about the special slot nuts are present in the section dedicated to the accessories.



Pos.	Description
A	G 1-1/4" or G 2" Vacuum connection
B	Grip/release switching cylinder with G1/8" threads
C	T-Slot Nut

b. Example of connection

Below an example of connection for 4 KHVG version with blower, vacuum relief valve, kenos reverse valve and filter.
In case of multiple modules with KHVG, we suggest you to connect them in parallel as in the picture and activate sequentially the vacuum from the first module (in this case F1) to the last module (in this case F4), one by one for energy saving.



Pos.	Description
A	Blower
B	Vacuum relief valve
C	KRV Kenos reverse valve
D	Filter
E	Vacuum distributor
F	Kenos vacuum gripper KHVG series

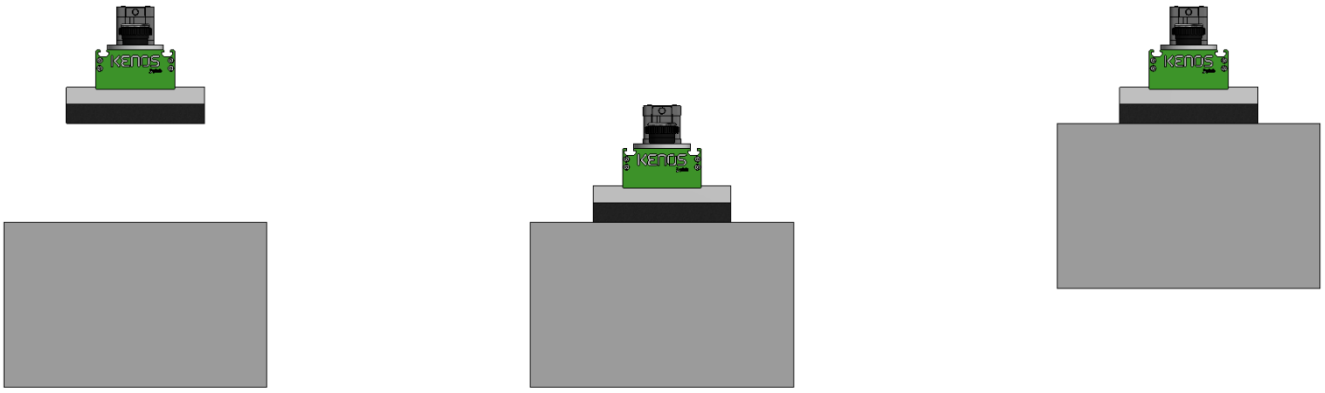
Sequence of activation:

1. At the start-up the system is in stand-by condition, whereby the KRV (C) valve is at neutral position and the cylinders on KHVG (F1, F2.....) are in the release position (suction chambers blocked).
2. Activate the blower (A).
3. Switch KRV (C) valve on aspiration position.
4. Activation of first KHVG: switch the cylinder of the first KHVG (in this case F1) on the grip position (suction chamber in the KHVG activated).
5. Activation of second KHVG: switch the cylinder of second KHVG (in this case F2) on the grip position after previous KHVG (in this case F1) has arrived at full function.
6. Activation of third or other KHVG: follow the same steps described above (from step 4).
7. To release the product, switch the cylinders on the KHVG on release position.

If necessary to blow-off the product, switch the cylinders on the KRV on blowing position, pay attention that in this case the cylinders on the KVG have to be in the grip position (suction chamber activated).
See in the "Pneumatic diagram" section the pneumatic diagram for this example of connection and KRV settings.

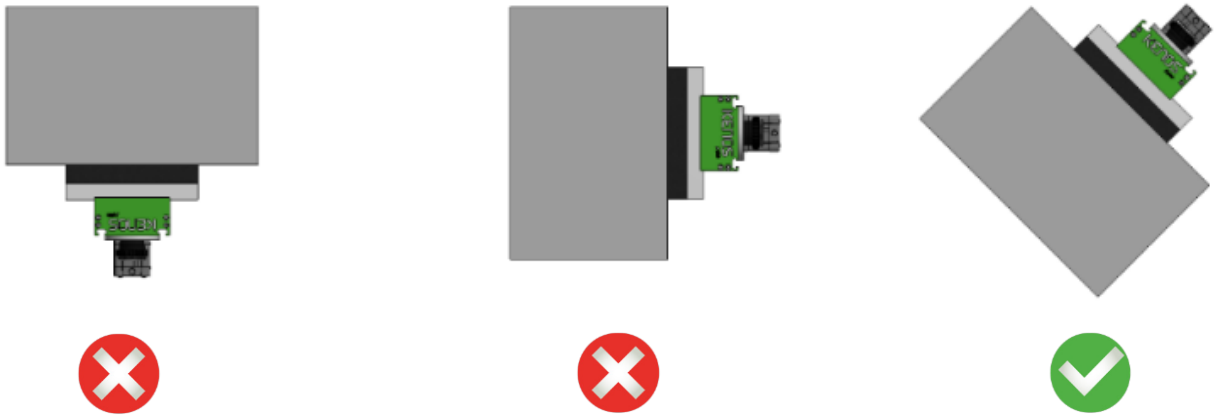
6. WORKING CYCLE DETAILS

The working cycle of the KHVG gripper module with check valve technology consists of distinct stages:



1. Positioning the module at the object to handle with the grip pad parallel to the grip surface.
2. Lowering of module until contact with the grip surface.
3. Vacuum activation.
4. Pick-up of object to handle.
5. Drop-off of object with removal of vacuum and blow-off if necessary.

Note: If vacuum is activated before KHVG is in contact with the workpiece, the workpiece will not be gripped because the check valves will be closed and not allowed the handling.



► The KHVG gripper module is designed for horizontal use; turning the module upside down by 180°, or vertical grips are not possible. Maximum tilt allowed is 45°.

► Stopping or passing through the work area of the gripper module is prohibited, as in case of electrical or pneumatic supply failure, the load handled by the module is released.

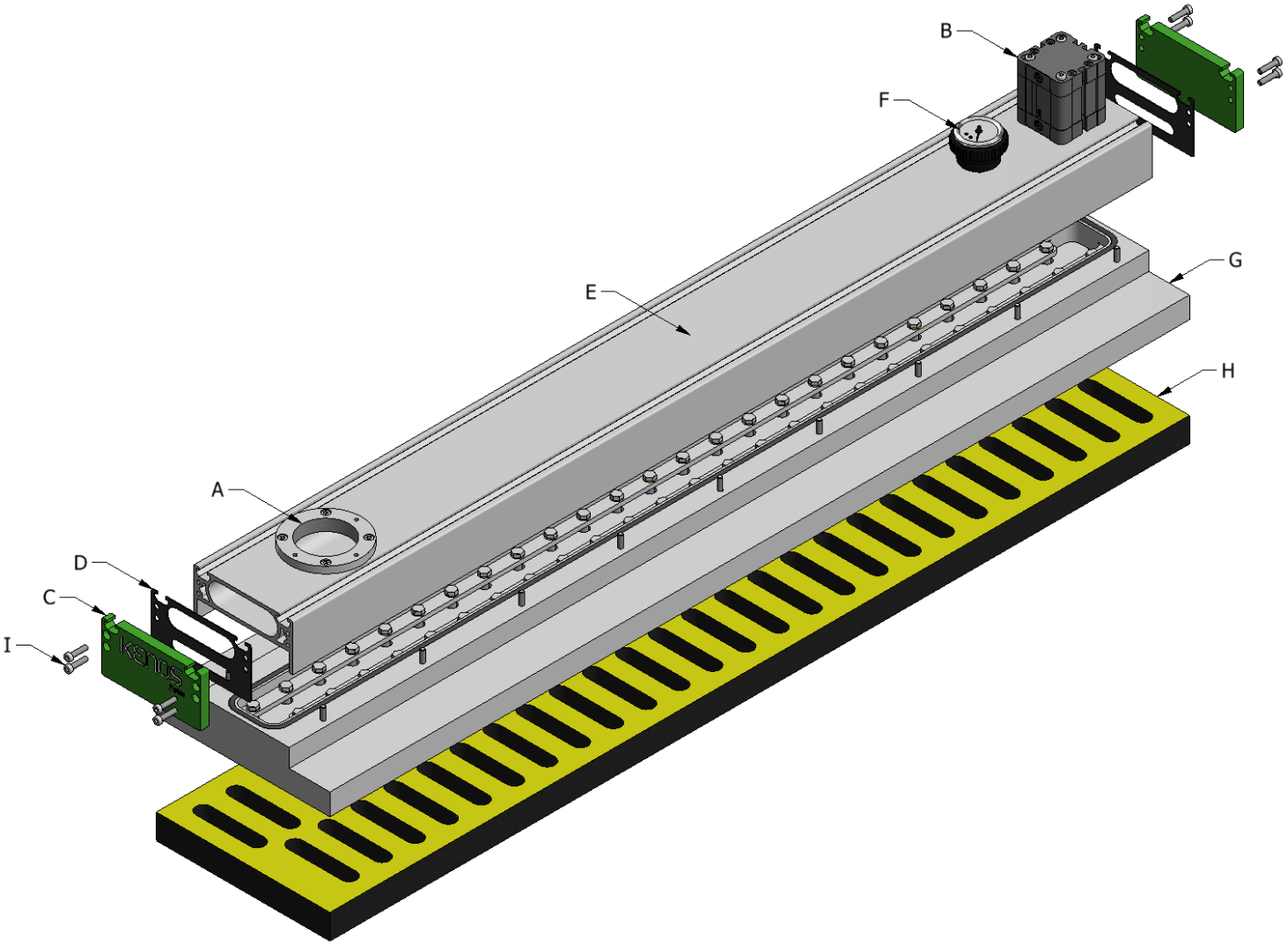
► The maximum vertical acceleration allowed is 5 m/s².

► Note that when check valves are present in the KHVG module, the vacuum value you can measure through a vacuum switch cannot be used as indication for a safe grip of the object.

This because we are detecting the vacuum level inside the gripping module and, thanks to the acting of the CV, it will be high even when the object is not present (CV will close).

Note: We recommend always running preliminary tests with original samples. We are able to perform these tests for you.

7. PARTS LIST



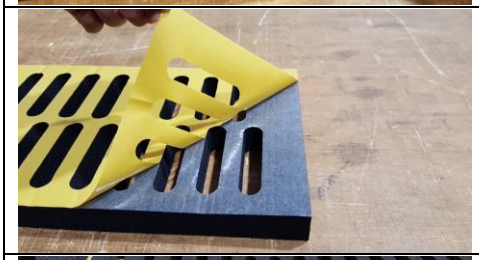
Pos.	Description
A	G 1-1/4" or G 2" external vacuum connection
B	Grip/release switching cylinder
C	Close cover
D	Exhaust cover seal
E	Aluminum profile
F	Vacuum gauge
G	Check valves module
H	Technical foam
I	Close cover screws

1. Aluminum profile is an extruded aluminum section and is available in different lengths.
2. Close covers are made of aluminum properly finished.
3. Technical foam is made of EPDM FOAM.

8. MAINTENANCE

a. Foam maintenance

The foam that builds the gripping surface can be damaged during normal use. The medium lifetime depends on many factors: nature of the handled objects, quality of the gripping surface, work conditions, cycle times, etc.

	Remove the old foam. Clean the base of valves from any adhesive and dust residues (e.g. with solvent). Attention: Check the holes are not obstructed by any kind of residue. If they are obstructed, clean them.
	Remove the silicon paper from the foam.
	Align the holes on the base of valves and on the foam. Fix the new foam on base of valves.
	Attention: Prevent formation of channels, they must be avoided.
	Press the new foam.
To store the foam:	Temperature (5 °C to 25 °C) Not under the light Be free of tension No dust chemical protected In a dry environment

b. Maintenance plan

	Daily	Weekly	Monthly	Every 6 months	Every 12 months
Check Max vacuum level		•			
Check the check valves			•		
Check tightenings				•	
Check the foam	•				
Check supply air pressure			•		
Check the electrical connection			•		
Check the air connection		•			
Check the general condition					•
Clean gripper exterior				•	

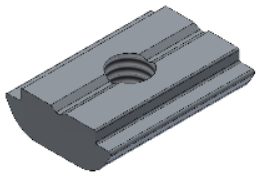
9. PROBLEMS/SOLUTIONS

Problem	Possible reason	Solutions
Insufficient vacuum level or vacuum achieved too slowly	Internal diameter of vacuum hose too small	Use hoses with larger internal diameter
	Damaged sealing	Check and replace if necessary
	Leak in hoses	Check hoses
Object not gripped	Low vacuum level	See above
	Insufficient suction capacity	Increase the suction capacity of blower
	Dirty check valves	Clean
	Lift is too fast	Slow down lift, avoid acceleration peaks (max 5 m/s^2)
	Pieces not suitable for lift with this system	Replace grip solution
Foam wears very quickly	The system is not corrected placed on the workpiece	The gripping system must be parallel to the workpiece surface

Note: We recommend always running preventative tests with original samples. We are available for running such tests.

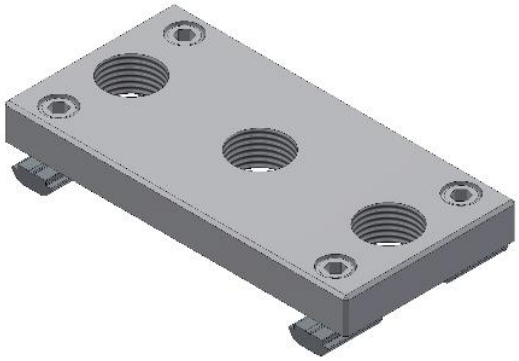
10. ACCESSORIES

a. T-slot nut kits:



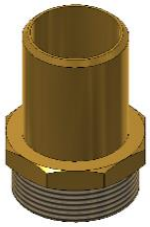
Item n. PIAB	Description
0209862	T-slot nut kit 11079-M4-U10 - 4pcs
0209585	T-slot nut kit 11080-M5-U10 - 4pcs
0209586	T-slot nut kit 11081-M6-U10 - 4pcs
0209588	T-slot nut kit 11082-M8-U10 - 4pcs

b. Kit Flange:



Item n. PIAB	Description
0209503	KIT-FL-FX-KVG120-60

c. Hose Connectors:

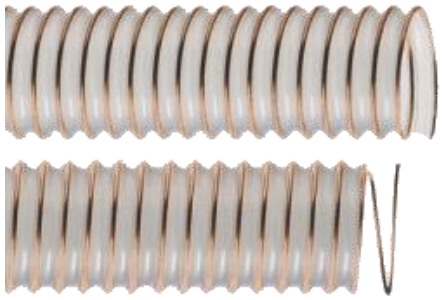


Item n. PIAB	Description
0208949	Hose connector KP-1-1/4-32
0208950	Hose connector KP-1-1/4-40
0208953	Hose connector KP-2-50
0208954	Hose connector KP-2-60

d. Hose Clamps:

Item n. PIAB	Description
0208957	Hose Clamp KB-45-60
0208958	Hose Clamp KB-55-70
0208959	Hose Clamp KB-70-90

e. Hoses:



Item n. PIAB	Description
0210867	Hose KTU-M-41-32-PU
0210660	Hose KTU-M-49-40-PU
0210661	Hose KTU-M-61-50-PU
0210868	Hose KTU-M-70-60-PU

f. Monitoring:

Item n. PIAB	Description
0212040	Vacuum Switch 3-color Digital Display M8

11. TECHNICAL DATA

a. Air

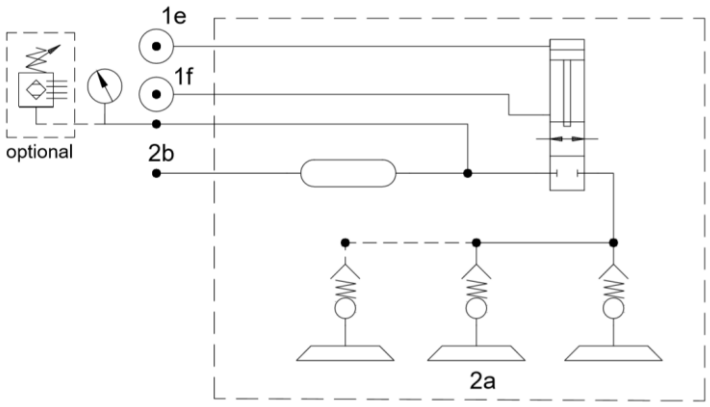
Description	
Supply air connection size for cylinder	G 1/8" connection
Air quality	DIN ISO 8573-1 class 4
Optimal cylinder air supply pressure	0.5 MPa

b. Temperature

Description	
Operating temperature environment	0-50° (32-122F)
Operating temperature workpiece	0-50° (32-122F)

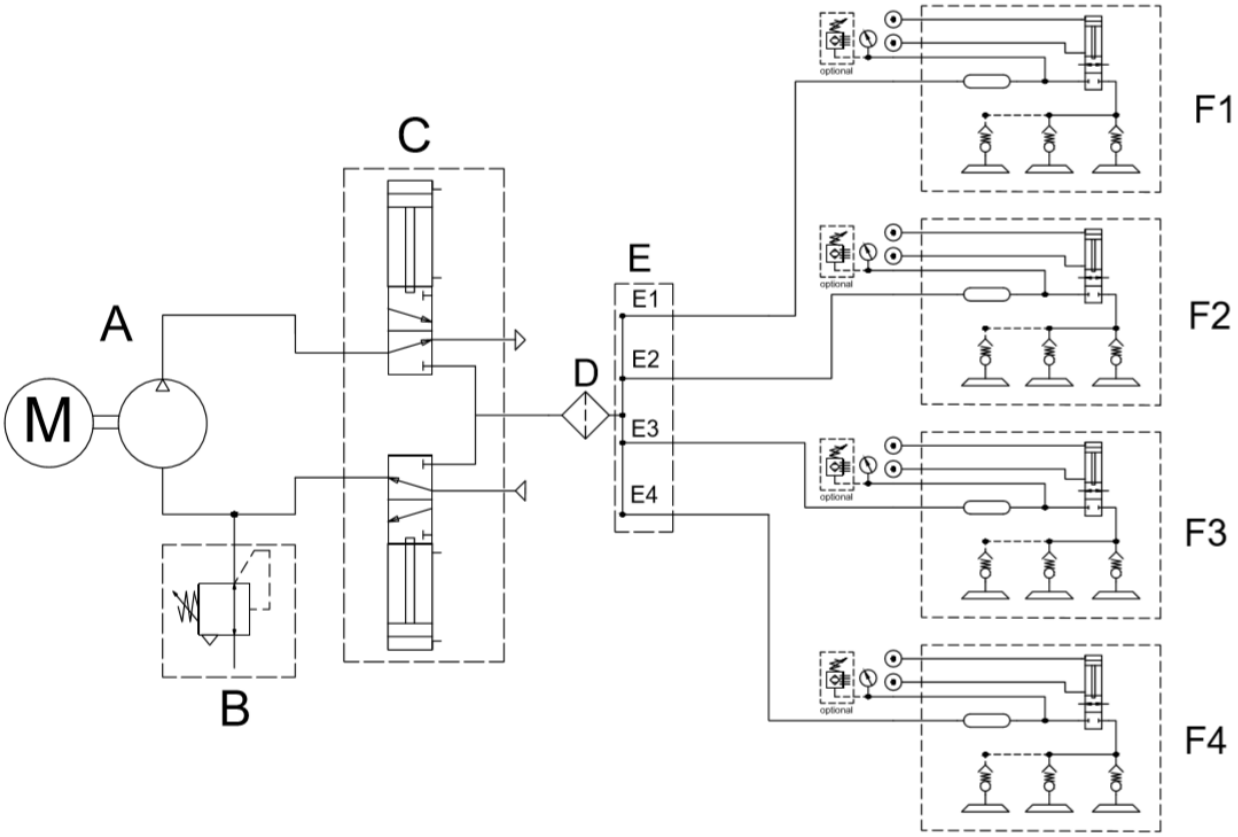
12. PNEUMATIC DIAGRAM

a. Pneumatic diagram for KHVG



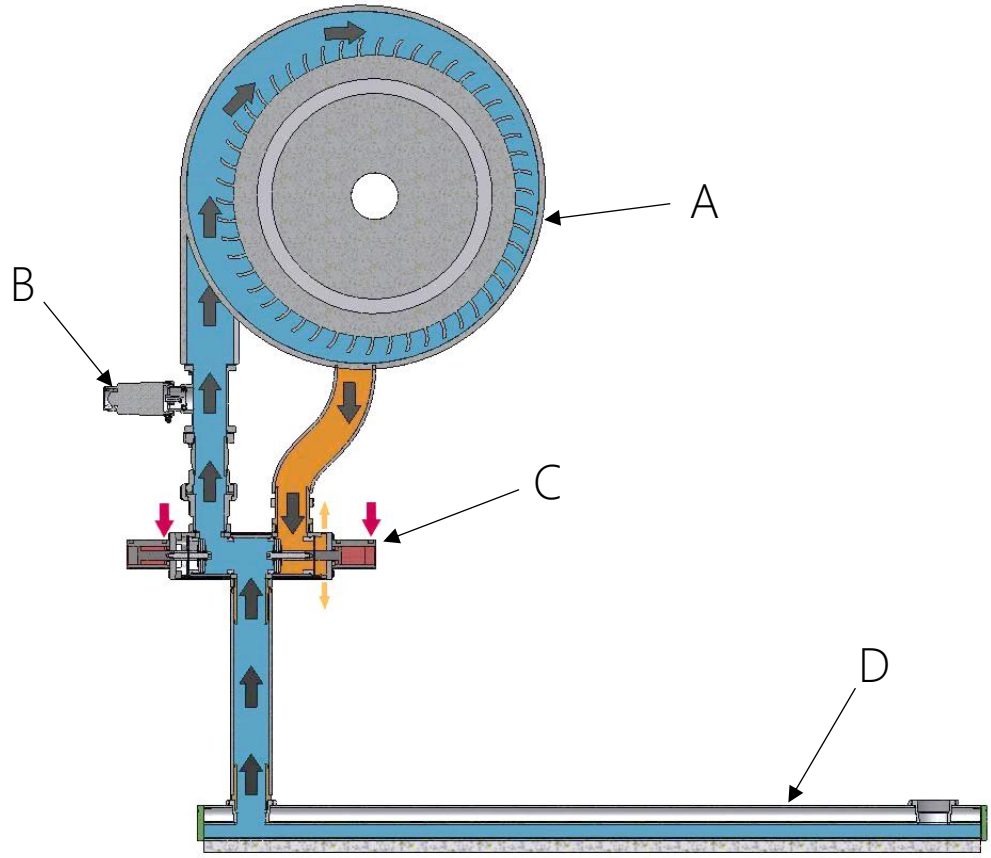
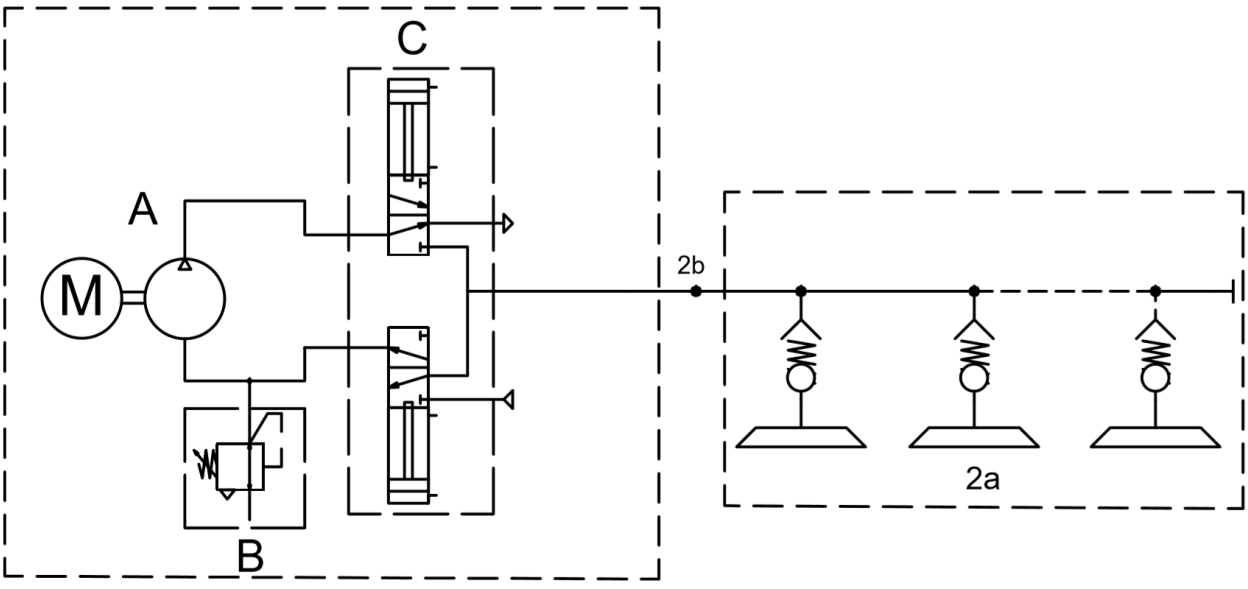
1e = PRESSURE AIR FOR CYLINDER CONTROL (PU)
1f = PRESSURE AIR FOR CYLINDER CONTROL (PU)
2a = VACUUM
2b = VACUUM FOR BLOWER

b. Pneumatic diagram for "Example of connection"

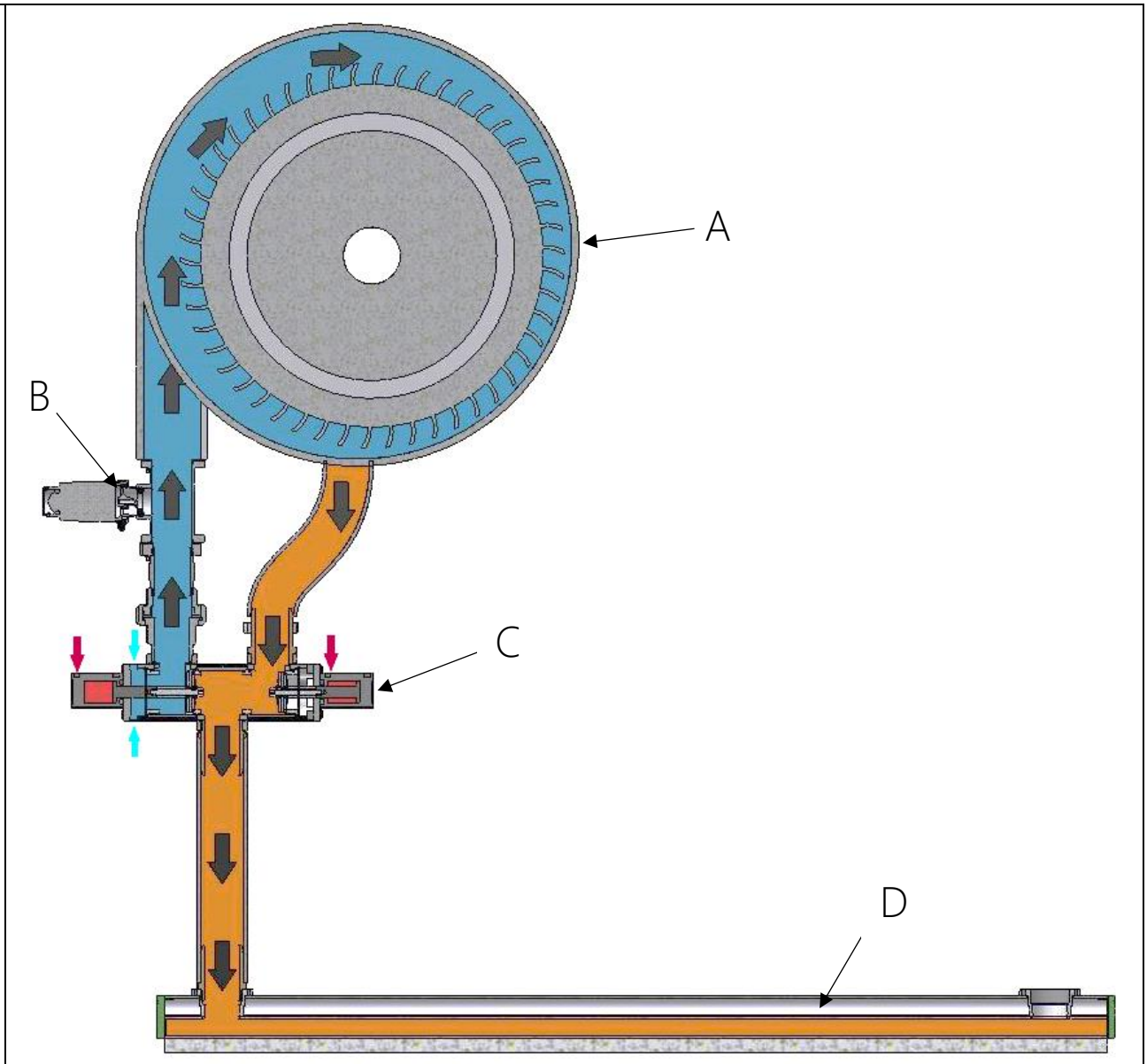


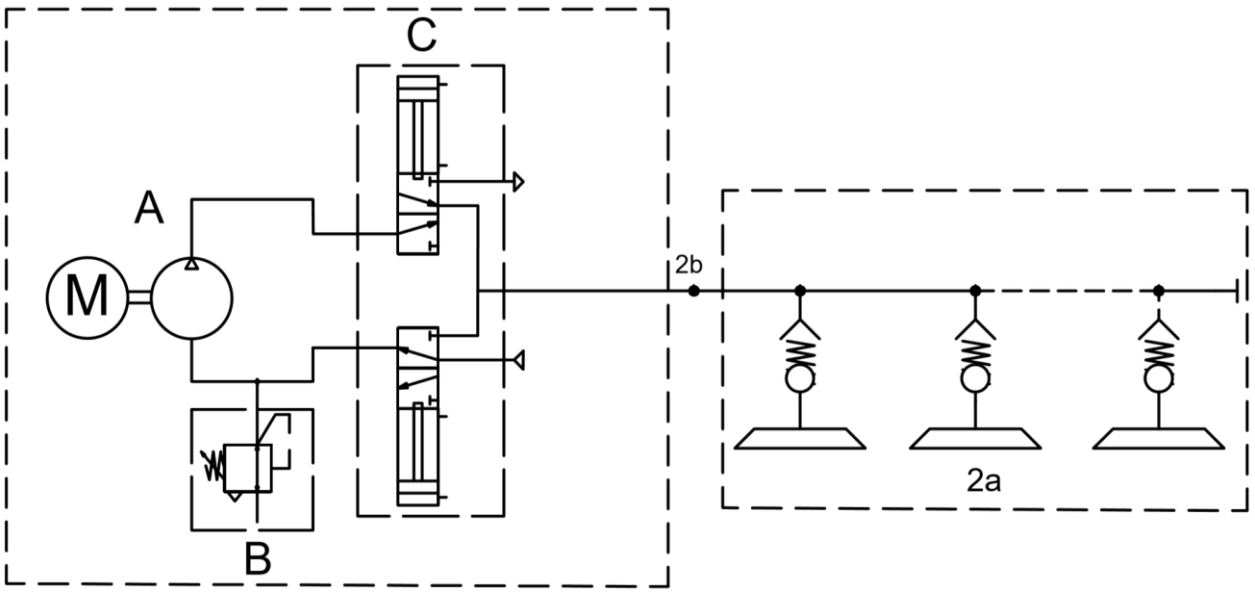
Pos.	Description
A	Blower
B	Vacuum relief valve
C	Filter
D	KRV Kenos reverse valve
E	Vacuum distributor
F	Kenos vacuum gripper KHVG series

c. Kenos reverse valve (KRV) settings:

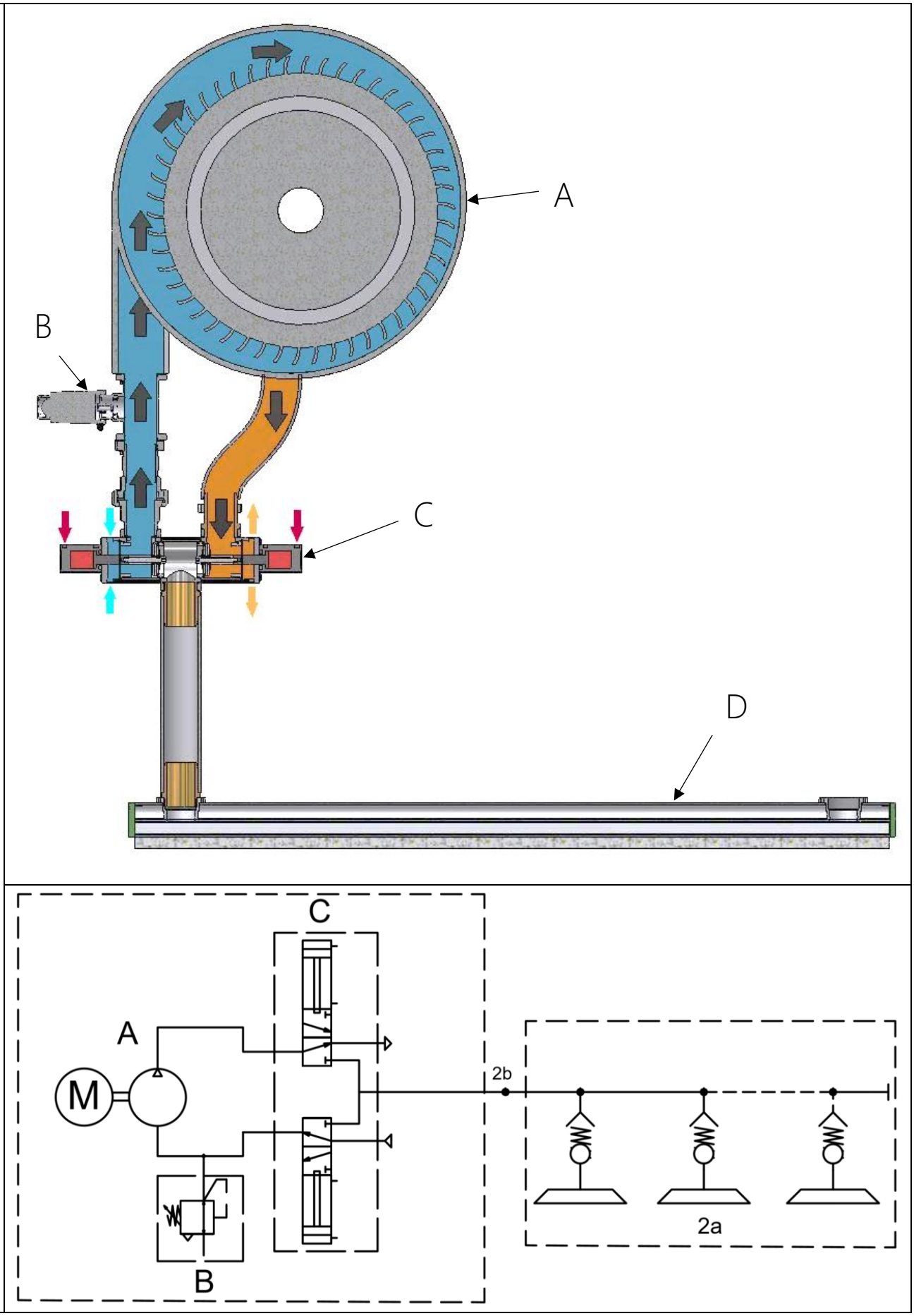
Legend:		SUCKED AIR
		AIR DISCHARGED INTO THE ENVIRONMENT OR BLOWED IN THE HEAD
		COMPRESSED AIR FOR CONTROL OF CYLINDERS
	A	BLOWER
	B	VACUUM RELIEF VALVE
	C	KRV VALVE
	D	GRIPPER
	2a	VACUUM
	2b	VACUUM FOR BLOWER
KRV valve in suction position		
		

KRV valve in the blowing position

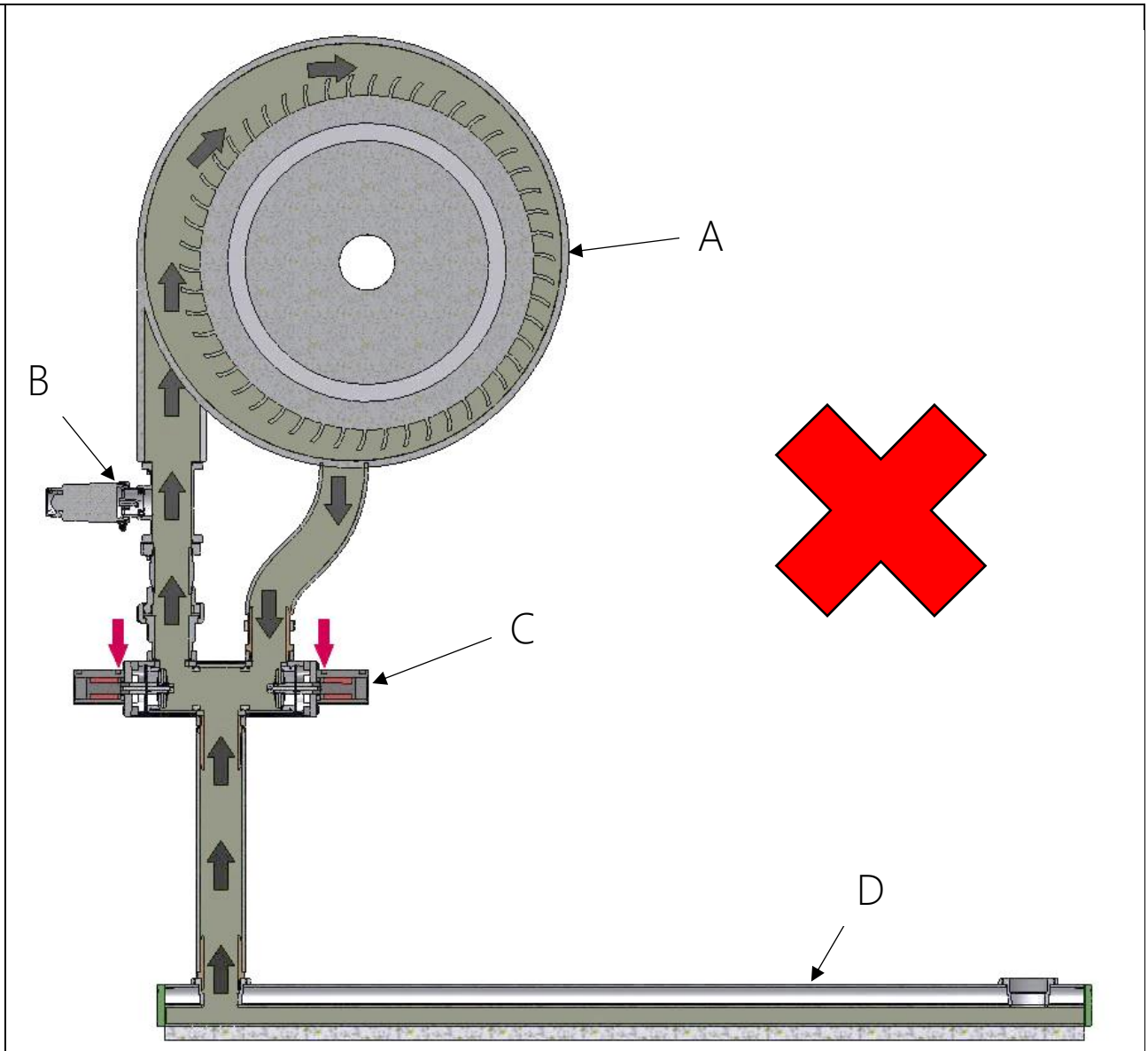


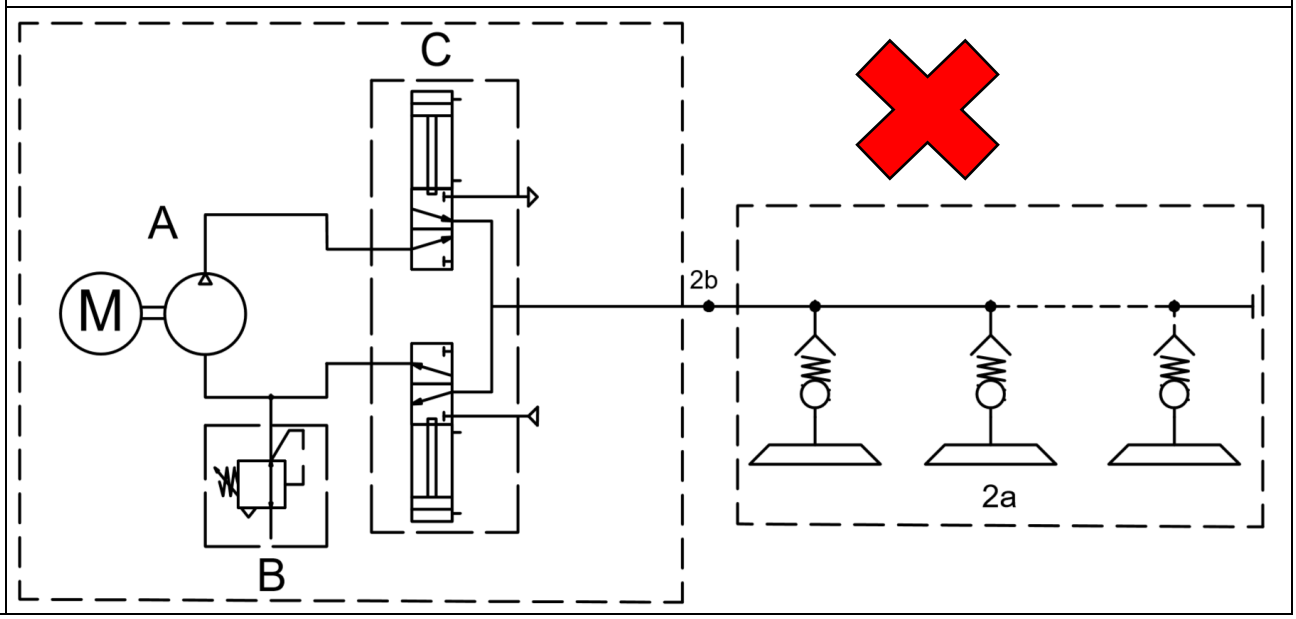


KRV valve in the neutral position



KRV valve in the ERROR position



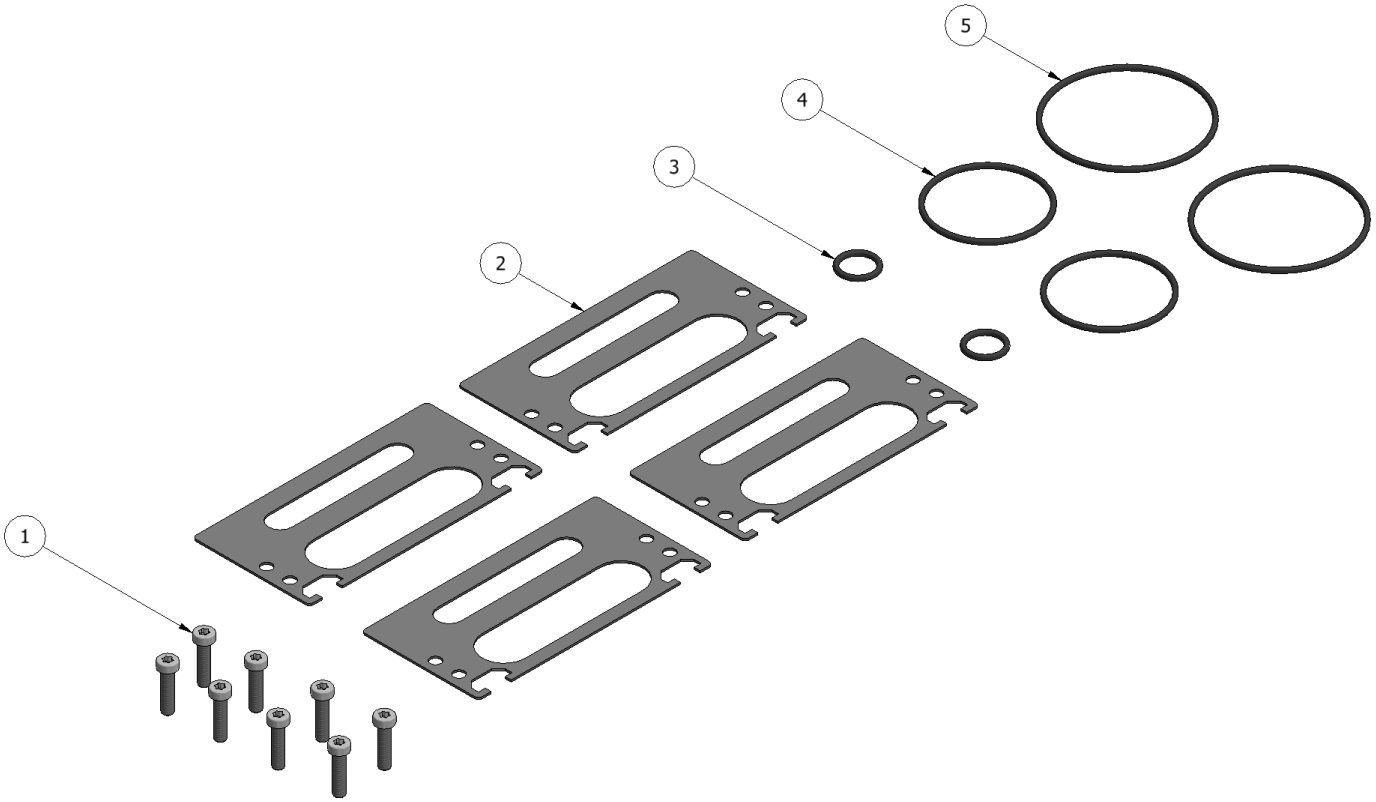


13. SPARE PARTS

a. Vacuum gauge

Item n. PIAB	Description
3101602	Vacuum Gauge

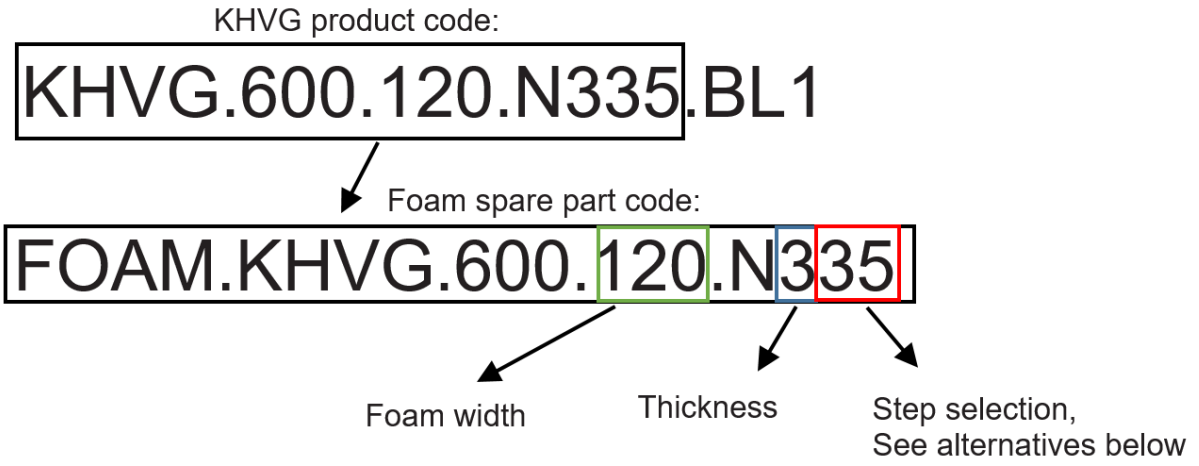
b. Spare parts kit KHVG



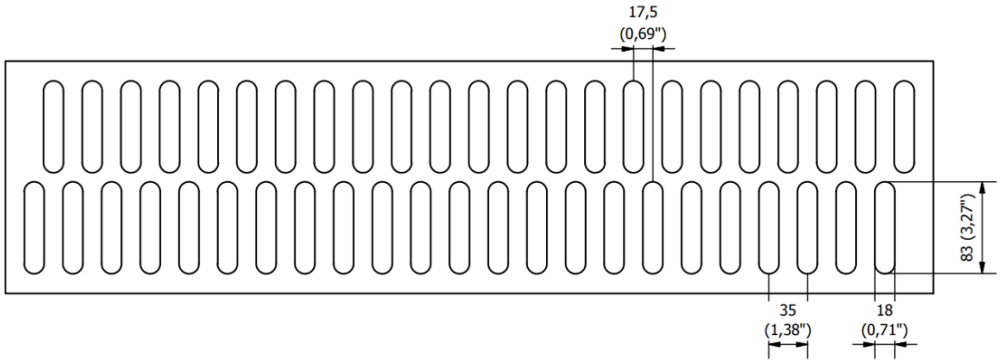
Item n. PIAB	Description
0212713	Spare parts kit KHVG
	8x Cover screw KVG120-60-ISO 14580 – M5 x 20 (1)
	4x Exhaust cover seal KVG120-60 (2)
	2x O-ring NBR 14x2 (3)
	2x O-ring NBR 46x2 (4)
	2x O-ring NBR 62x2 (5)

c. Foam spare parts

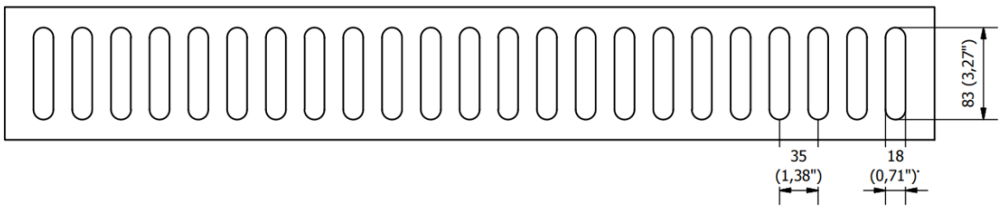
There are different types of foam spare part. If you are unsure which type you have please check the part code of your configured KHVG product, the first part of the code is the foam spare part code, when you put "FOAM" in front, see below.



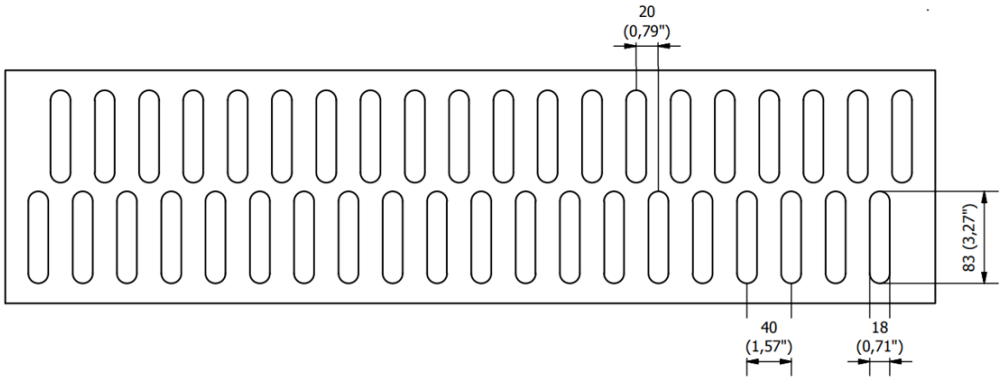
STEP 35 with 210 mm



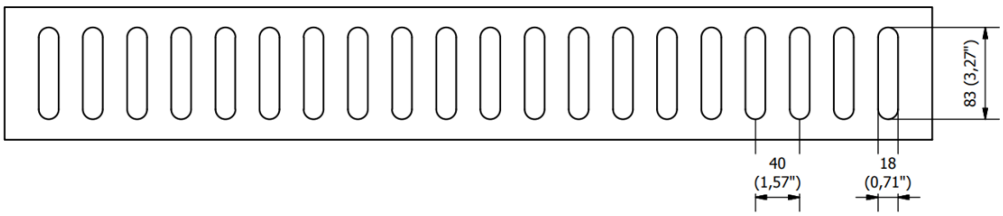
STEP 35 with 120 mm



STEP 40 with 210 mm

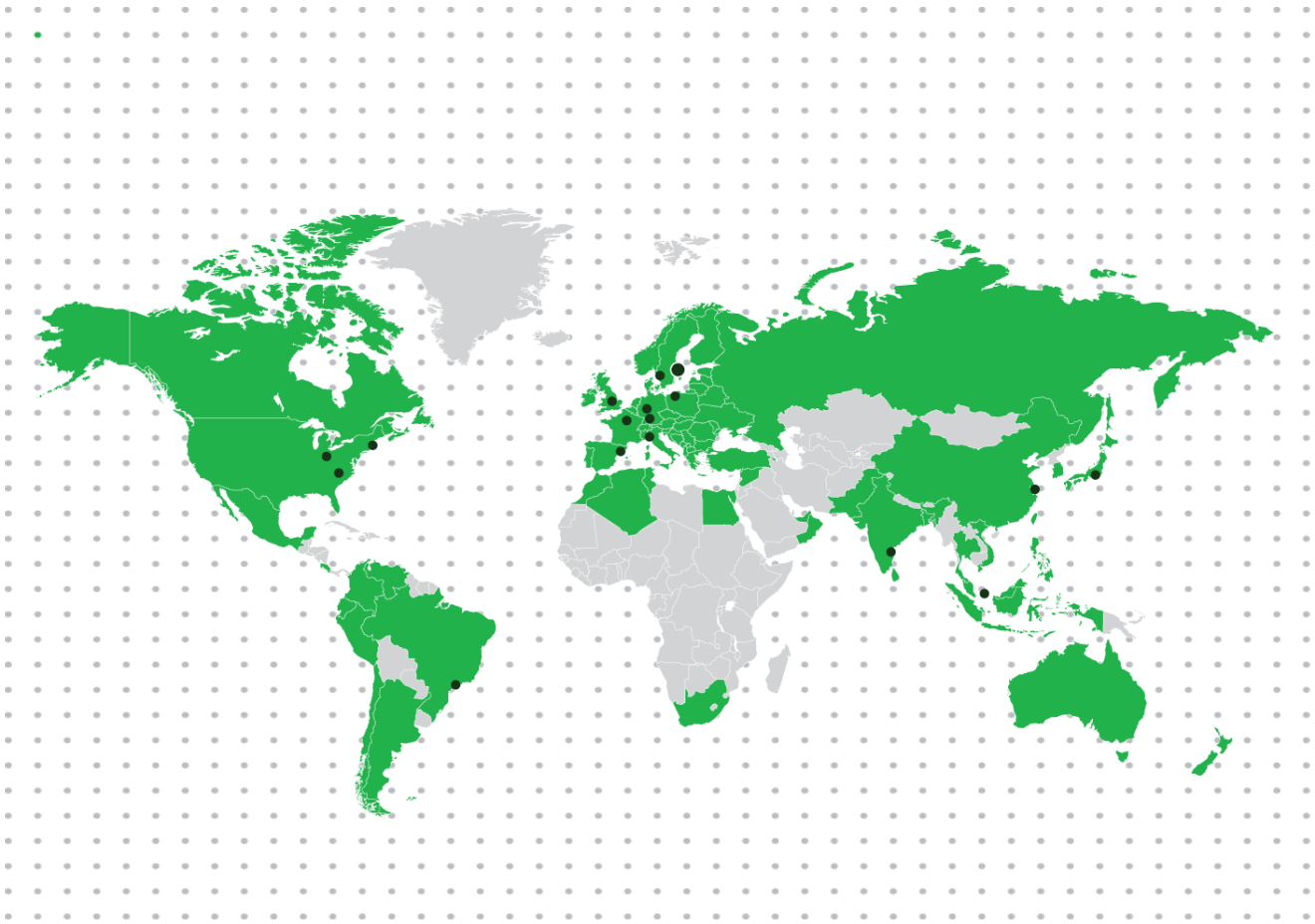


STEP 40 with 120 mm



14. WARRANTIES

- The Seller gives its Customers a one-year warranty from the receipt of the Products, accessories, control devices end Kenos products included.
- It is a duty of the Buyer to check the goods at the time of delivery at the agreed destination. Complaints relating to the state of the packaging, quantity, number or external characteristics of the products (apparent defects) must be reported to the seller, under penalty of forfeiture of the guarantee, by means of a reservation noted on the transport document upon receipt of the products; the transport document with the noted reservation must be forwarded to the Seller by fax, e-mail, registered mail with notice of collection, within 8 (eight) days of receipt of the goods.
- The warranty covers manufacture and materials defects in the Products and it also covers if the Products do not conform to the Product specification, excluding minor defects, if reasonably acceptable and that do not compromise efficiency in their use.
- The warranty does not apply to any Product (including any component or other parts in such Products (such as suction cups, filter elements, sealing's, hoses, foam, etc.) or to the software of any Products) that it was used other than the intended purpose, and: (a) has been subjected to abuse, misuse, negligence, improper storage, improper handling, improper use, improper installation, abnormal physical stress, abnormal environmental or working conditions, or use, application, installation, care, control or maintenance contrary to any applicable manual or instructions for the Products issued by the Seller or good trade practice regarding the same; or (b) has been reconstructed, repaired or altered by any persons or entities other than the Seller or its authorized representatives, or have a defect as a result of fair wear and tear or willful damage or caused by subsequent damages caused by other defective products.
- The product warranty set forth in this Section is the only warranty given by the Seller in relation to the Products. The Customer may not rely, and has not relied, on any other information, statement or warranty (express or implied), whether based on applicable law or otherwise. In any case, the compensation is limited to the price of the products agreed between the parties and is excluded for indirect damages.
- During the warranty period, the Seller shall replace or repair, at its own expense, faulty products determined by the Seller, in its sole discretion, to be covered by the warranty set out herein.
- It is at the Seller's discretion whether a faulty Product should be returned to the Seller for replacement or if it should be repaired by the Seller at the location of the Customer. Any replaced Products shall become the property of the Seller.
- The Seller is not responsible for the cost of fitting replacement parts or components of any Products in to any products or alike of the Customer.
- These Terms & Conditions shall apply to any repaired or replaced Products by the Seller.



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