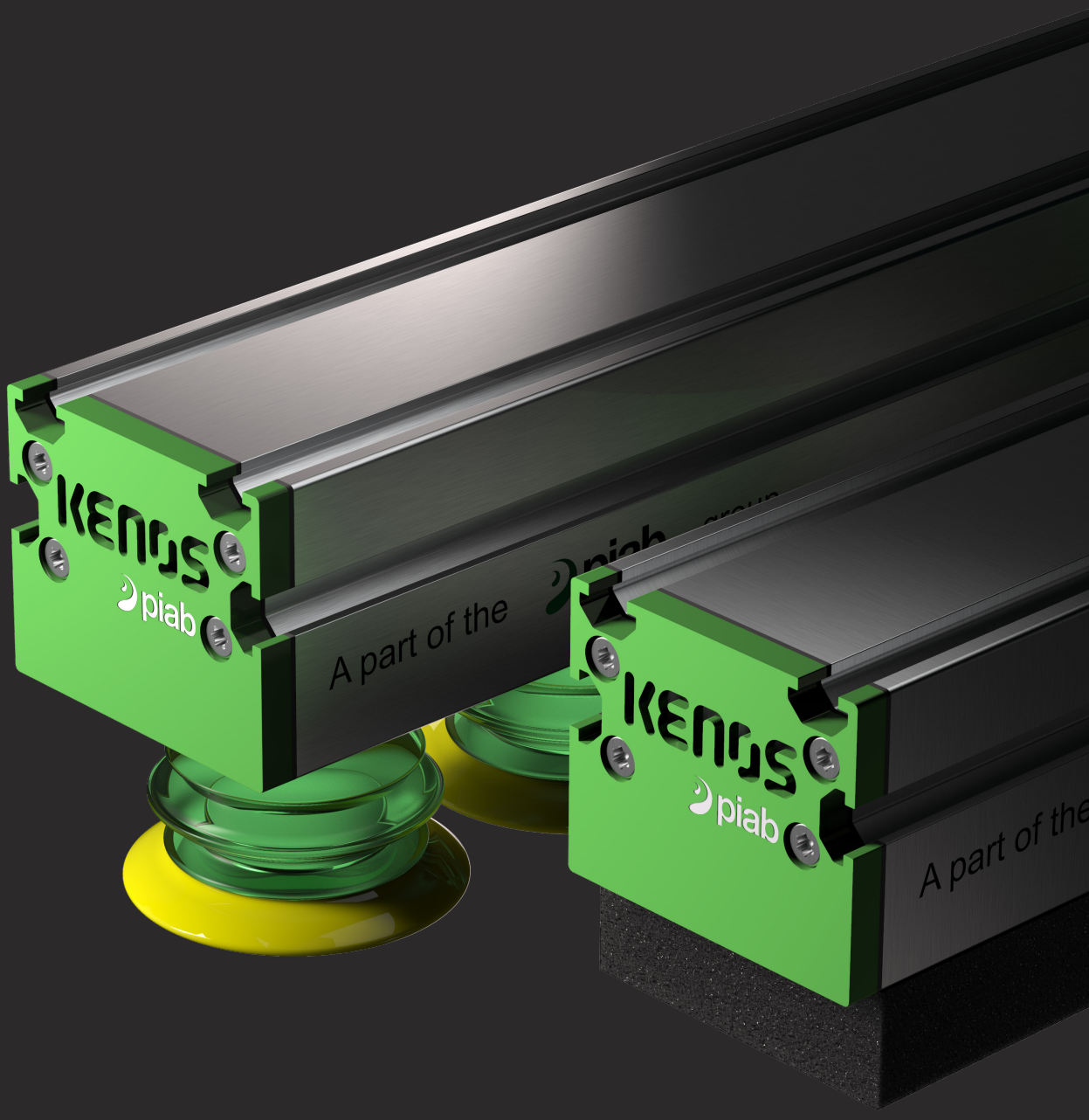
Manual

KVG60 Series

Kenos® vacuum gripper



KENOS

This manual is available in the following languages on piab.com:

 Chinese

 English

 French

 German

 Italian

 Japanese

 Korean

 Polish

 Portuguese

 Russian

 Spanish

 Swedish

Contents

1. Introduction to the manual

1.1 About the manual

- The responsible party for the production site must ensure that this manual will be read and understood.
- The section on safety should be studied extra carefully.
- The manual should be stored on a known and easily accessible place, which can be digital.
- A printed manual must accompany the product or equipment if the location is changed.
- When rebuilding or restructuring, a new risk analysis is required.
- All kinds of changes must be approved by machine owner.
- Carefully study the applicable parts of the manual before performing service and maintenance of the equipment.

1.2 Safety signs used in the manual

Take note of all Warning-, Mandatory and other signs in this manual. They have the following meaning:

1.2.1 Warning signs

Warning!
Breach of this information may result in death or serious injury!

Warning!
Vacuum force

Warning!
Exhaust

Warning!
Unrestricted exhaust

Warning!
Risk of crushing or entrapment of upper limbs

1.2.2 Mandatory signs

Note!
Information that needs extra attention!

Wear eye protection

Wear ear protection

1.2.3 Other signs

Operator
Generic operator with skills how to handle and operate the machine or production line.

Service and maintenance personnel
Qualified technician able to intervene on the mechanical parts to make the necessary adjustments, maintenance and repairs.

1.3 Target group

This manual, especially the section about safety, shall be read by all staff who will perform any type of work with the product or equipment:

- Operating personnel.
- Service and maintenance personnel.
- Cleaning staff (cleaning of equipment and the area around it).

2. Safety instruction

2.1 General safety

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

The correct use of the pneumatic equipment within a system is the responsibility of the system designer or person responsible for the technical specifications.

The machine owner will certify the final commissioning according to the regulations in force for each individual country.

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 *explosion* of closed containers, and vacuum may lead to the *implosion* of closed containers.

Consider the possibility of pressure drops in the pneumatic supply line. Provide for a safety system that prevents the risk of load being released, in order to prevent personnel injury or machine damages.

Consider the possibility of interrupted electrical or pneumatic supply, to protect persons and systems.

Consider the emergency stop when designing the system.

Warning!
Vacuum force

Warning!
The discharge air has a high output speed. Do not obstruct the discharge of the gripper module.

2.2 Safe usage

It is up to the manufacturer of machinery to assess and convey the Personal Protective Equipment (PPE) needed by the operators or other personnel accessing to the work area.

Wear ear protection
The vacuum generator, even if silenced, makes noise: if necessary, wear suitable protection.

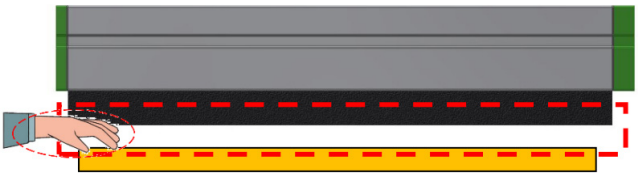
Wear eye protection

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.

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.

2.3 Dangerous areas

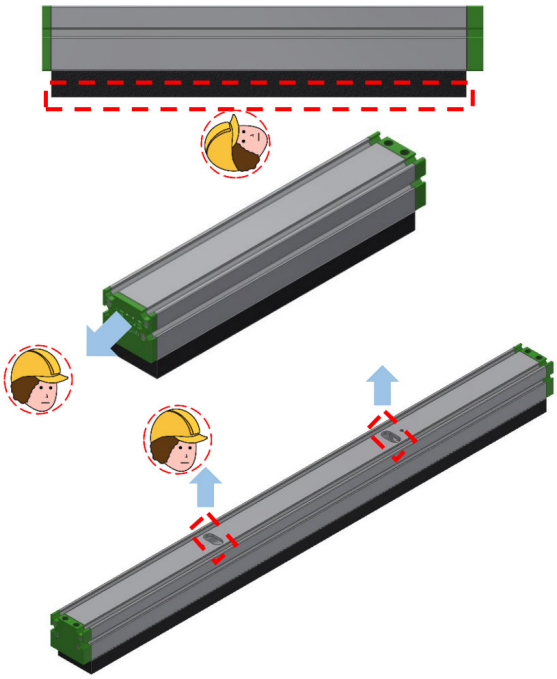
2.3.1 Areas with danger of crushing



Warning!

- 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 insert hands in cavities, holes or openings, for example air discharge, openings or holes under the foam etc.

2.3.2 Areas with danger of air ejection



Warning!

- Never look into in cavities, holes or openings, for example air discharge, openings or holes under the foam etc.
- 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.

3. Introduction to KVG gripping system

3.1 Manufacturer

Piab AB
P.O. Box 146
182 12 Danderyd
SWEDEN

3.1.1 Identification data

Each system is identified by a label with identification information, which is attached to the product.

Figure 1 *Example of identification label*

For any communication with Piab AB or service centers always refer to these references.

3.2 Compliance

Piab's vacuum gripping system KVG60 is in conformity with the EU requirements:

- DIRECTIVE 2006/42/CE of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC.

Note!
If the vacuum gripping system will be integrated and installed in another main system, a risk analysis needs to be carried out a for the system as a whole.

For more information see *Appendix A - Essential Health and Safety Requiremens - applied and respected.*

3.3 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 / Kenos will not be responsible for malfunction

3.4 Misuse

The gripper must not be used:

- For other use than those established by the machine owner 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

3.5 Overview and list of parts

3.5.1 Gripper (ejector version)

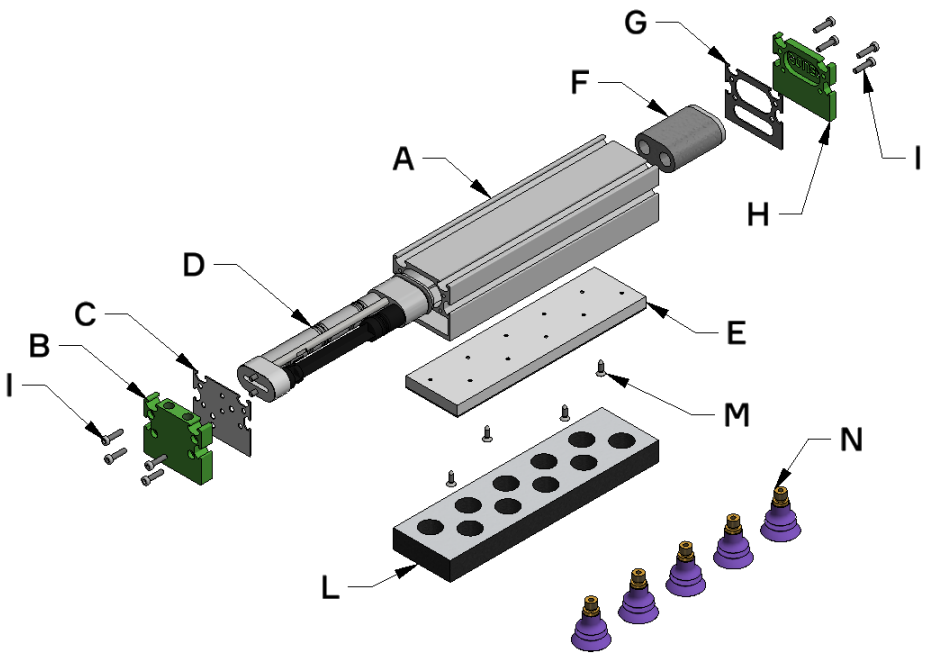


Figure 2 *Gripper (ejector version)*

- (A) Basic body
- (B) Supply cover
- (C) Supply cover seal
- (D) Push in ejector
- (E) Check valves module
- (F) Silencer
- (G) Exhaust cover seal
- (H) Exhaust cover
- (I) Close cover screws
- (L) Technical foam
- (M) Check valves module fixing screws
- (N) Suction Cups

Features:

- Basic body is an extruded aluminum section and is available in different lengths.
- Supply/exhaust cover are made of aluminium properly finished.
- Technical foam is made of EPDM FOAM.
- Push in ejector built of ONE or more multistage COAX® cartridge ejector.

3.5.2 Ejector body

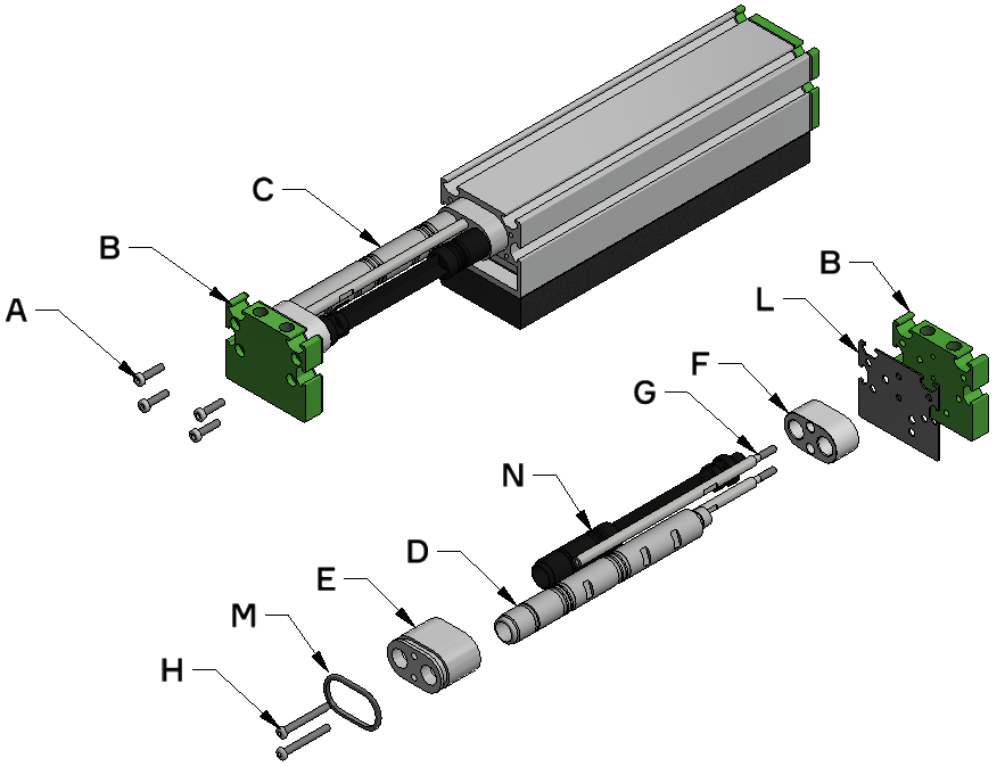


Figure 3 *Ejector body*

- (A) Cover fixing screws
- (B) Supply cover
- (C) Push in ejector
- (D) Multistage COAX® cartride
- (E) Posterior housing
- (F) Anterior housing
- (G) Tie-beam
- (H) Screws
- (L) Supply cover seal
- (M) O-ring
- (N) Blind Cartridge for Midi COAX®

3.5.3 Gripper (BL version)

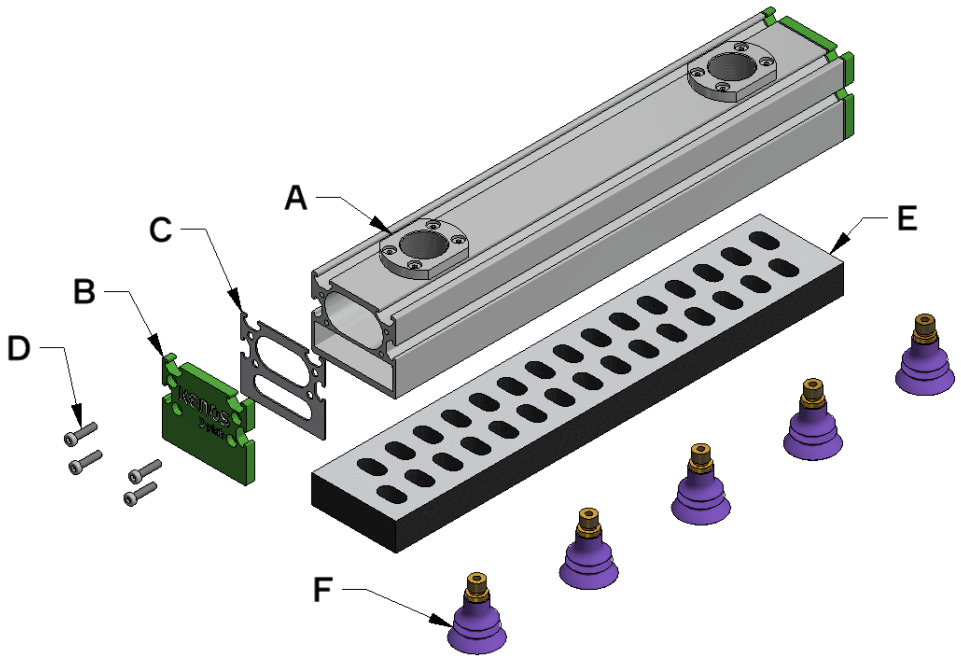


Figure 4 *Gripper (BL version)*

- (A) Vacuum connection G 3/4”
- (B) Close cover
- (C) Close cover seal
- (D) Close cover screws
- (E) Technical foam
- (F) Suction Cups

Features:

- Basic body is an extruded aluminium section and is available in different lengths.
- Close covers are made of aluminium properly finished.
- Technical foam is made of EPDM FOAM.

3.5.4 Gripper (PU version)

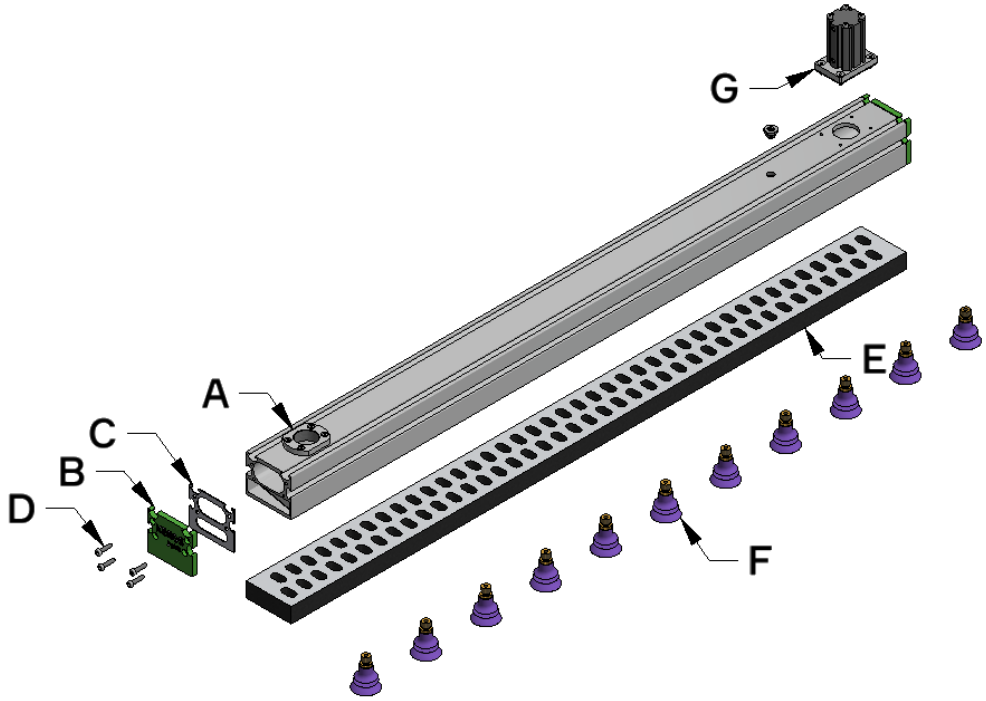


Figure 5 *Gripper (PU version)*

- (A) Vacuum connection G 3/4”
- (B) Close cover
- (C) Close cover seal
- (D) Close cover screws
- (E) Technical foam
- (F) Suction Cups
- (G) Grip/release switching cylinder

Features:

- Basic body is an extruded aluminium section and is available in different lengths.
- Close covers are made of aluminium properly finished.
- Technical foam is made of EPDM FOAM.

3.6 Technical data

3.6.1 Air consumption

Customer code	Unit	Air consumption at 6 bar [87.0 psi]
KVG.XXX.60.XXXX.CVX.S1.XX.XX	Nl/s [scfm]	1.75 [3.71]
KVG.XXX.60.XXXX.CVX.S2.XX.XX	Nl/s [scfm]	3.5 [7.42]
KVG.XXX.60.XXXX.CVX.S4.XX.XX	Nl/s [scfm]	7.0 [14.84]

3.6.2 Pneumatic technical information

Description	Unit	COAX® Si32-3 Si MIDI-cartridge (1-4 nozzles)
Feed pressure, optimal	MPa [psi]	0.6 [87]
Max vacuum at opt. pressure	-kPa [-inHg]	75 [22.1]
Air consumption at opt. pressure/nozzle	Nl/s [scfm]	1.75 [3.71]
Max vacuum flow at opt. pressure/nozzle	Nl/s [scfm]	6 [12.71]

3.6.3 Air

Description	Type
Supply air connection size	6.5mm internal diameter by up to 2 meters [6.5ft]
Air quality	DIN ISO 8573-1 class 4

3.6.4 Temperature

Description	Unit C [F]
Operating temperature environment	0-50° [32-122F]
Operating temperature workpiece	0-50° [32-122F]

4. Installation

Warning!

- 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.
- Handle the components with care.
- Modifying the components is prohibited.
- The electrical and pneumatic connections should be permanently connected to the component.
- Carefully follow the electrical wiring instructions, paying close attention to avoiding the short-circuiting of loads.
- Connect the cables separately from power or high voltage lines, avoiding parallel wiring or wiring in the same conduit of the same lines. Verify circuits including sensors and coils which may malfunction due to the noise from the other lines.
- Compressed air may be dangerous if used by unskilled personnel. Assembling should be carried out by experienced and specially trained personnel.
- For fastening and supplying, solely use the bores and methods provided by the manufacturer.

4.1 Mounting on the handling system

The gripping system is secured with the aid of slot nuts. Special slots for these nuts are provided in the basic body. The gripper can be mounted either directly, via a robot flange or via spring mountings. Information about the T-slot nuts are present in the section dedicated to the accessories.It is adviced to use an appropriate tightening torque for the fixing bolts / screws according to the applications, type of screws and to the regulations in force in each country.

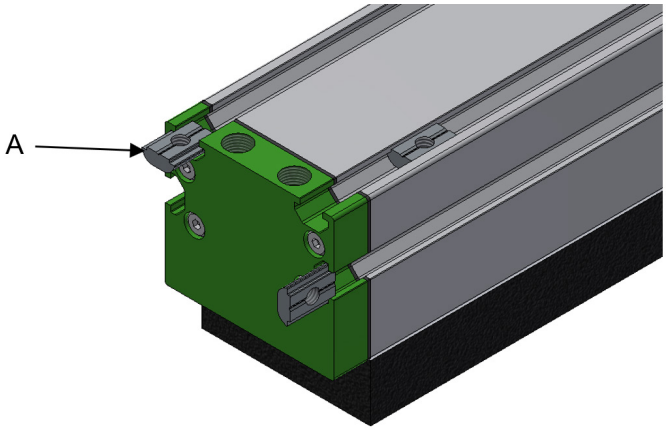


Figure 6 *Slot nuts on gripping system*

(A) T-slot nut

4.2 Pneumatic connection single ejector version

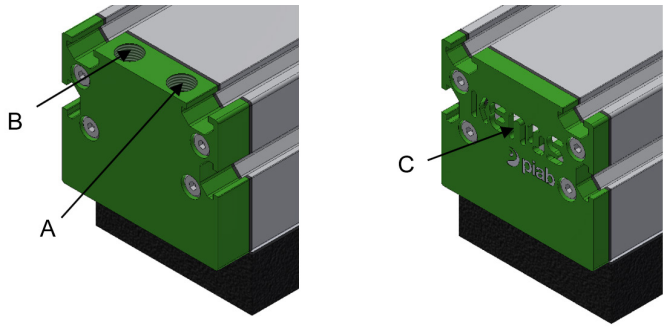


Figure 7 *Single ejector version*

- (A) Pneumatic supply G 1/8” connection (optimal pressure: 0.6 MPa)
- (B) Blow-off G 1/8” connection or vacuum monitoring
- (C) Inline ejector exhaust - DO NOT COVER. The aspirated air escapes from the exhaust cover through the written Kenos logo

Warning!
Ejector exhausts needs to be uncovered since the aspirated air escapes from the exhaust cover through the Kenos logo.

4.3 Pneumatic connection double ejector version

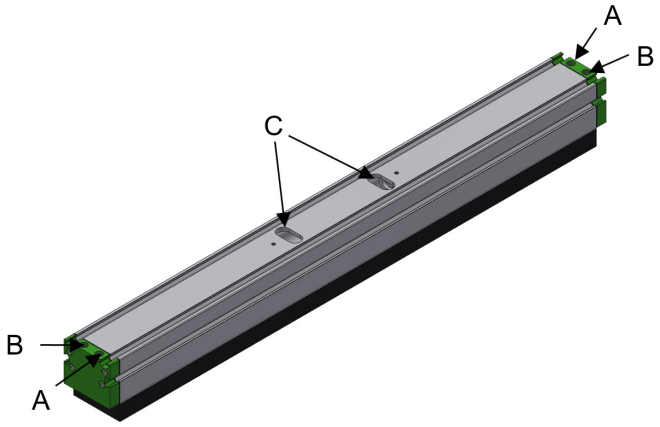


Figure 8 *Double ejector version*

- (A) Pneumatic supply G 1/8” connection (optimal pressure: 0.6 MPa)
- (B) Blow-off G 1/8” connection or vacuum monitoring
- (C) Ejector exhaust

Warning!
Ejector exhausts needs to be uncovered since the aspirated air escapes from the two exhaust slots.

4.4 Pneumatic connection BL version

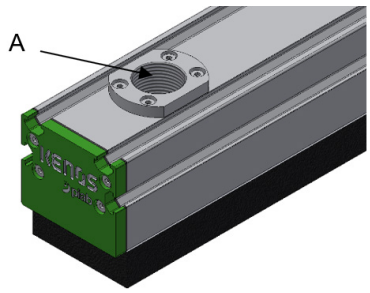


Figure 9 *BL version*

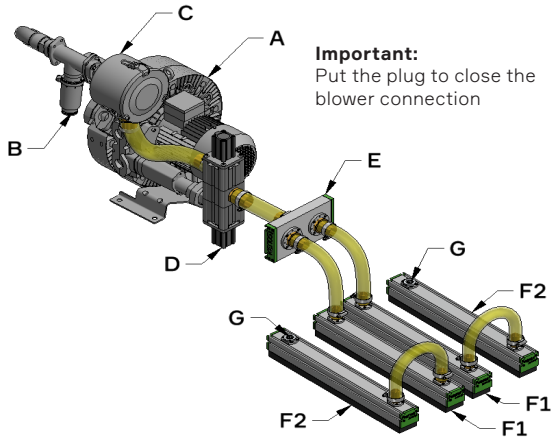
(A) Vacuum connection G 3/4”

4.4.1 Examples of connection (BL)

Below an example of connection for 4 KVG-BL with blower, vacuum relief valve, Kenos® reversing valve and filter.

In case of multiple modules with KVG-BL with FR, DM or piSAVE® sense version, they can be connected in parallel or in series.

In case of multiple modules with KVG-BL with CV version, it is suggested that they are connected in series, as in the picture, for energy saving.



Important:
Put the plug to close the blower connection

Figure 10 *Example BL version*

(A) Blower

(B) Vacuum relief valve

(C) Filter

(D) KRV Kenos reverse valve

(E) Vacuum distributor

(F) Kenos® vacuum gripper KVG-BL version

(G) Plug

Sequence of activation:

1. At the start-up the system is in stand-by condition, whereby the KRV (D) valve is at neutral position.
2. Activate the blower (A).
3. Switch KRV (D) valve on aspiration position.
4. Activation of vacuum from the first KVG-BL (F1) to the last one (in this case F2) in series way.
5. For blow-off of the product, switch KRV (D) on the blowing position.

Note!
See the “Pneumatic diagram” section where there is a pneumatic diagram for this example of connection and KRV settings.

4.5 Vacuum connection PU version

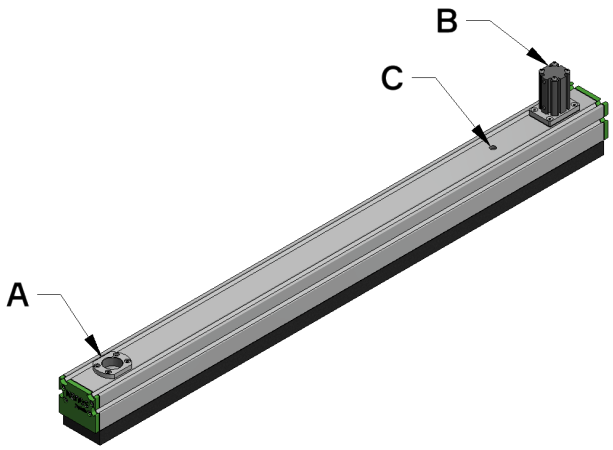


Figure 11 *PU version*

(A) Vacuum connection G 3/4”

(B) Grip/release switching cylinder with M5 threads

(C) G 1/8” vacuum monitoring connection

4.5.1 Examples of connection (PU)

Below an example of connection for 4 KVG-PU version with blower, vacuum relief valve, Kenos® reversing valve and filter.

In case of multiple modules with KVG-PU with FR, DM or piSAVE® sense version, they can be connected in parallel as in the picture.

In case of multiple modules with KVG-PU with CV version, it is suggested 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.

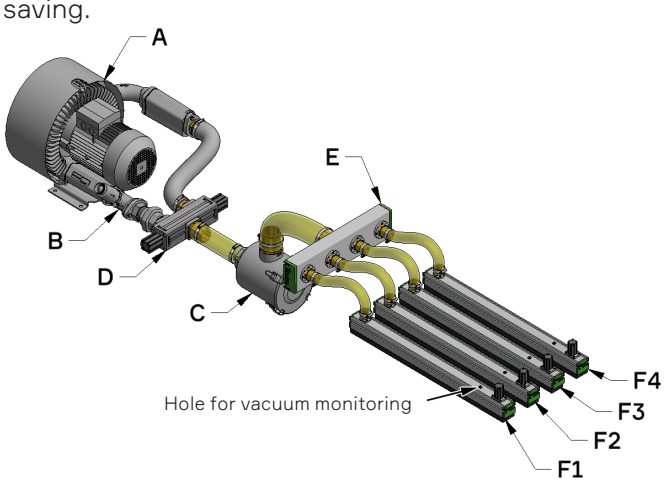


Figure 12 *Example PU version*

- (A) Blower
- (B) Vacuum relief valve
- (C) Filter
- (D) KRV Kenos reverse valve
- (E) Vacuum distributor
- (F) Kenos® vacuum gripper KVG-PU version

Sequence of activation:

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

Please find the pneumatic diagram for this example of connection and KRV settings in the “Pneumatic diagram” chapter in this manual.

4.6 Pneumatic diagrams

4.6.1 EJ version with foam and suction cups series

1a Pressure air supply for vacuum

1b Pressure air supply for blow-off

2 Vacuum

3 Exhaust

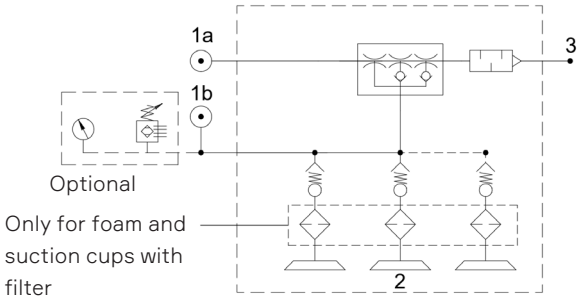


Figure 13 *Check valves version (CV).*

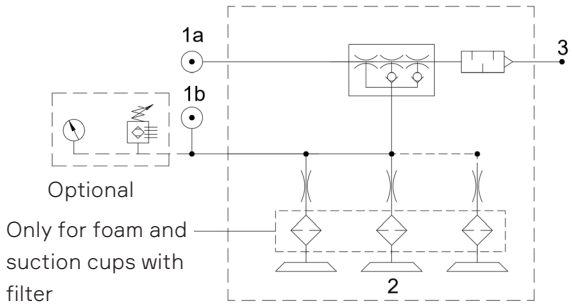


Figure 14 *Flow reduction version (FR)*

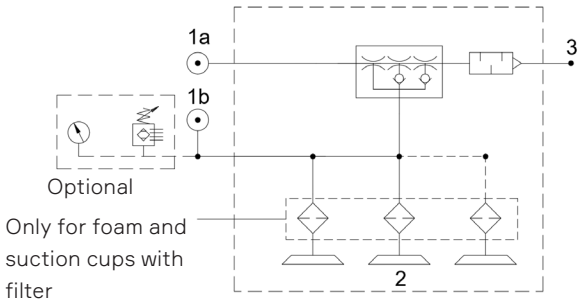


Figure 15 *Direct mounting version (DM)*

4.6.2 BL version with foam and suction cups series

2a Vacuum

2b Vacuum for blower

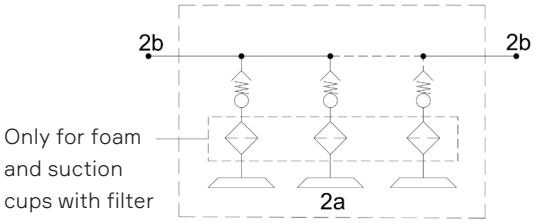


Figure 16 *Check valves version (CV)*

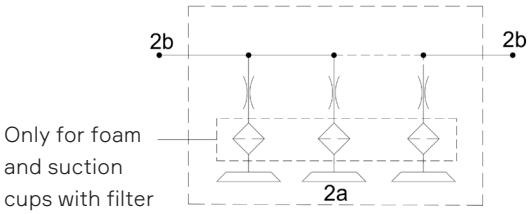


Figure 17 *Flow reduction version (FR)*

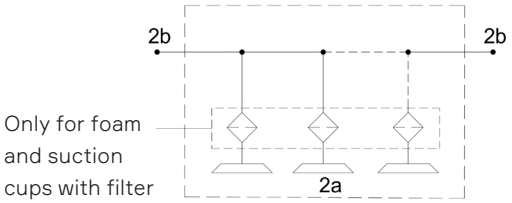


Figure 18 *Direct mounting version (DM)*

4.6.3 PU version with foam and suction cups series

- 1e Pressure air supply for cylinder control (PU)
- 1f Pressure air supply for cylinder control (PU)
- 2a Vacuum
- 2b Vacuum for blower

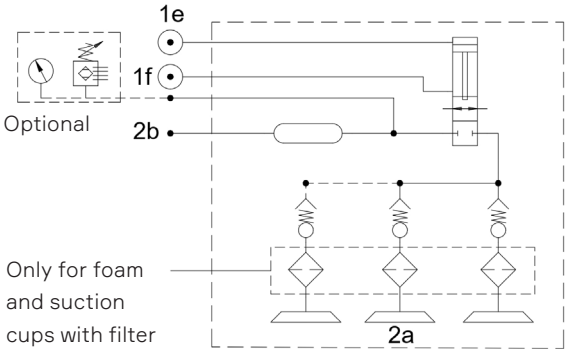


Figure 19 *Check valves version (CV)*

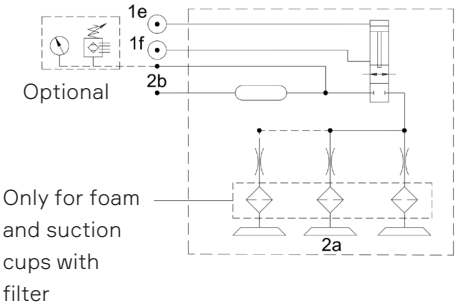


Figure 20 *Flow reduction version (FR)*

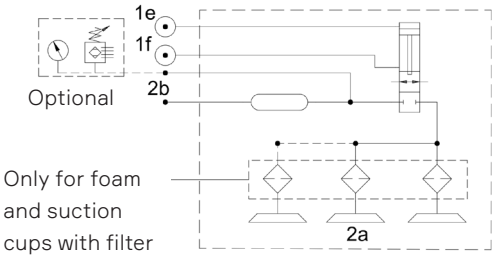


Figure 21 *Direct mounting version (DM)*

4.6.4 piSOFTGRIP® series

- 1a Pressure air supply for vacuum
- 1b Pressure air supply for blow-off
- 1e Pressure air supply for cylinder control (PU)
- 1f Pressure air supply for cylinder control (PU)
- 2b Vacuum for blower
- 3 Exhaust

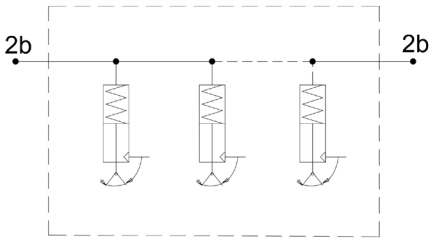


Figure 22 *BL version*

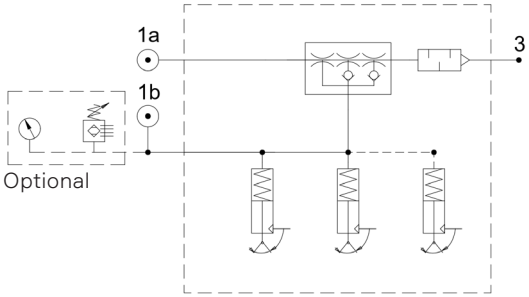


Figure 23 *EJ version*

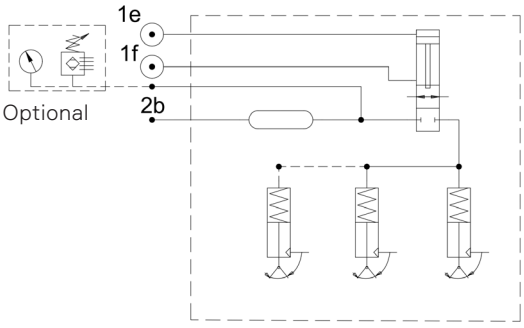


Figure 24 *PU version*

4.6.5 Pneumatic diagram for “Example of connection for BL version”

- (A) Blower
- (B) Vacuum relief valve
- (C) Filter
- (D) KRV Kenos reverse valve
- (E) Vacuum distributor
- (F) Kenos® vacuum gripper KVG-BL version
- (G) Plug

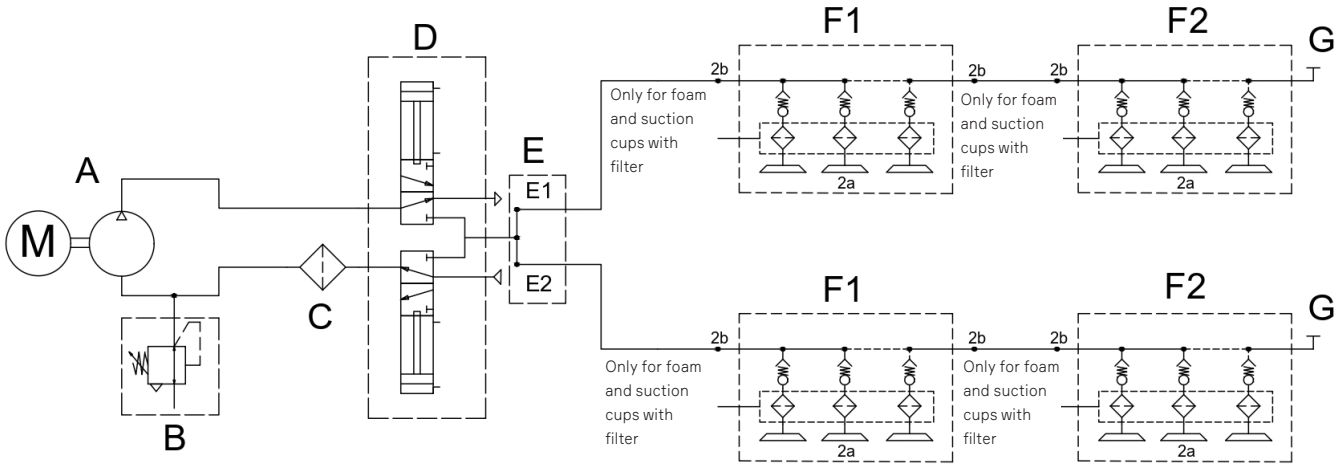


Figure 25 *KVG-BL check valves version (CV)*

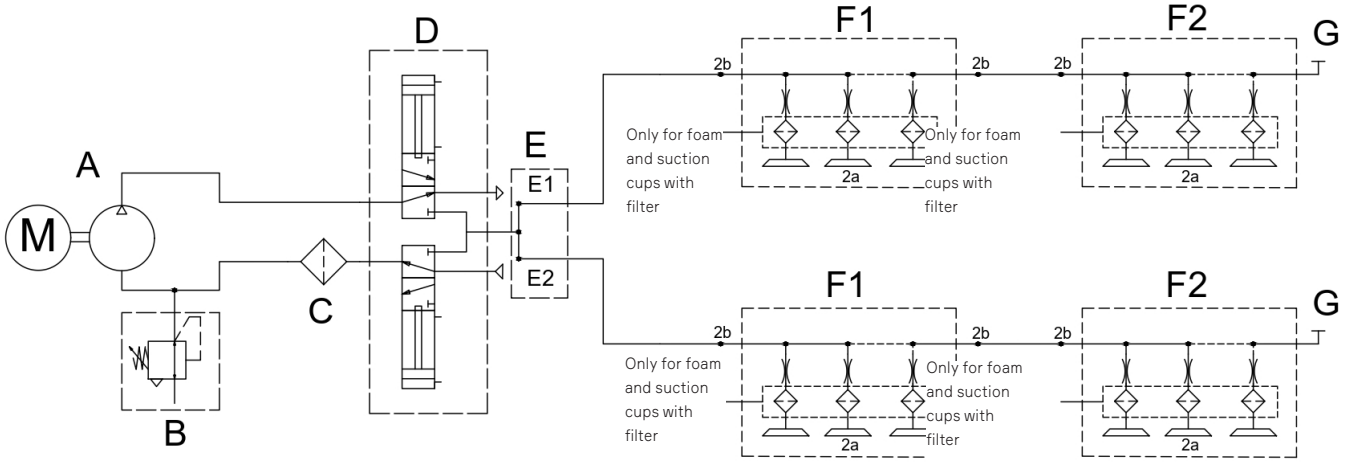


Figure 26 *KVG-BL flow reduction version (FR)*

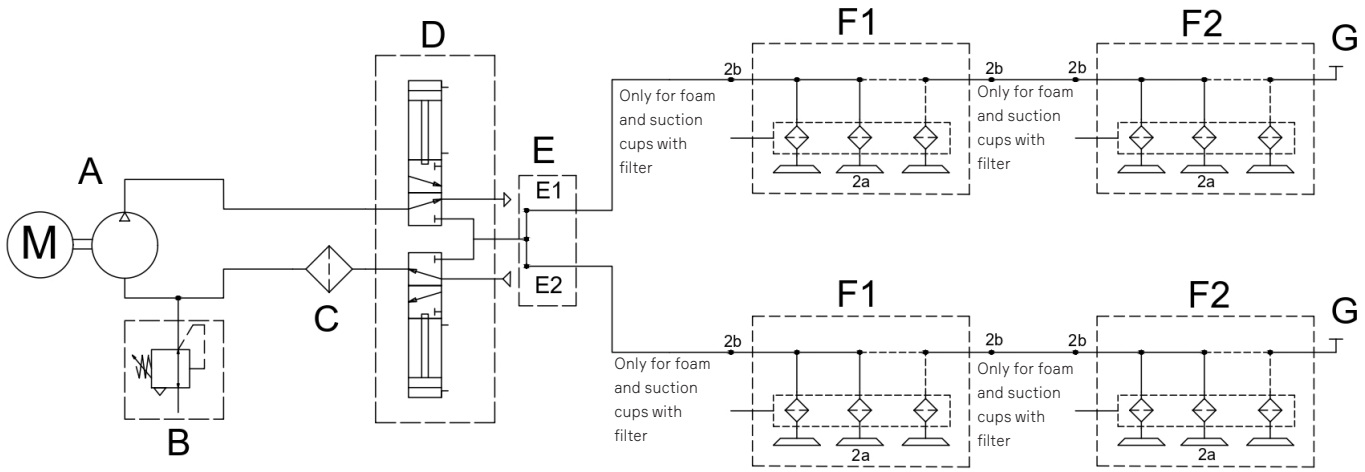


Figure 27 *KVG-BL direct mounting version (DM)*

4.6.6 Pneumatic diagram for “Example of connection for PU version”

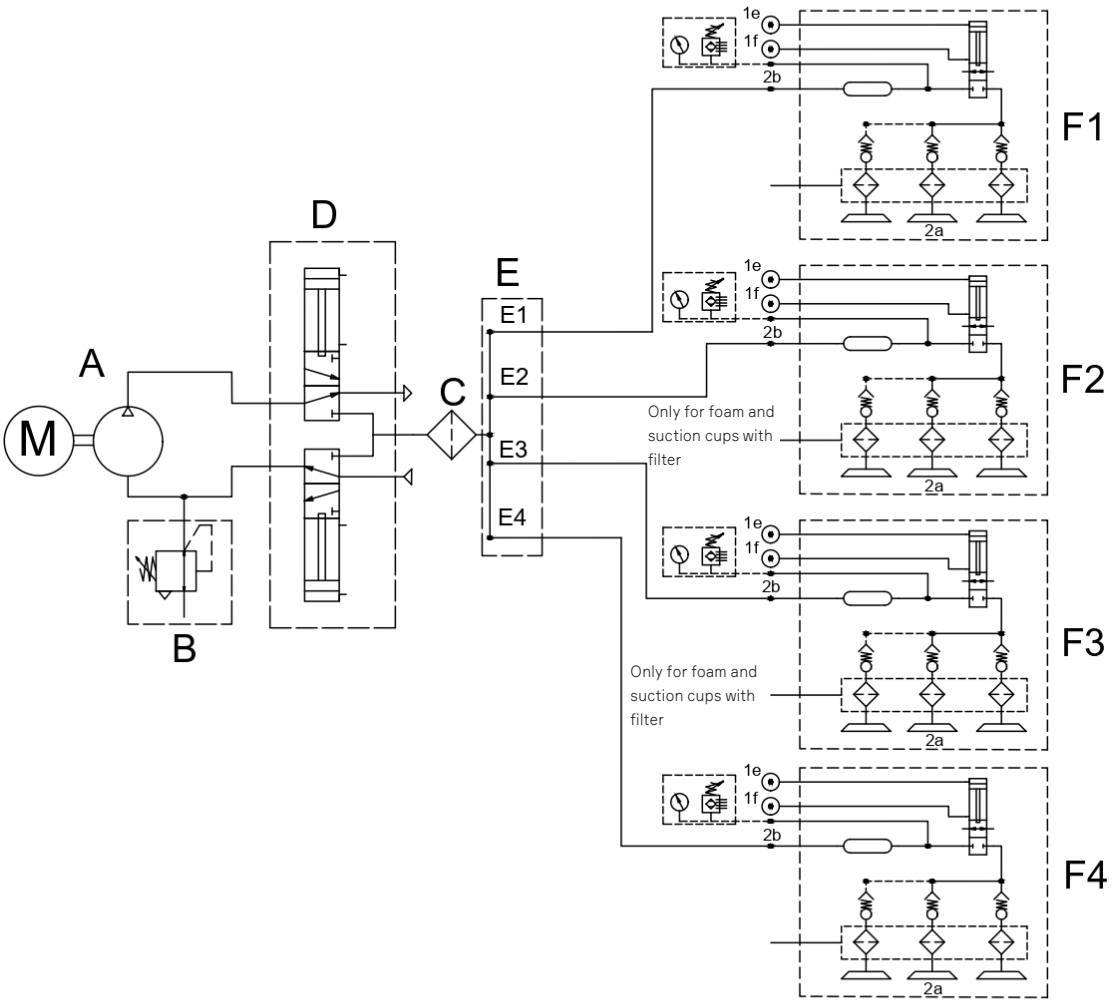


Figure 28 *KVG-PU check valves version (CV)*

- (A) Blower
- (B) Vacuum relief valve
- (C) Filter
- (D) KRV Kenos reverse valve
- (E) Vacuum distributor
- (F) Kenos® vacuum gripper KVG PU-version

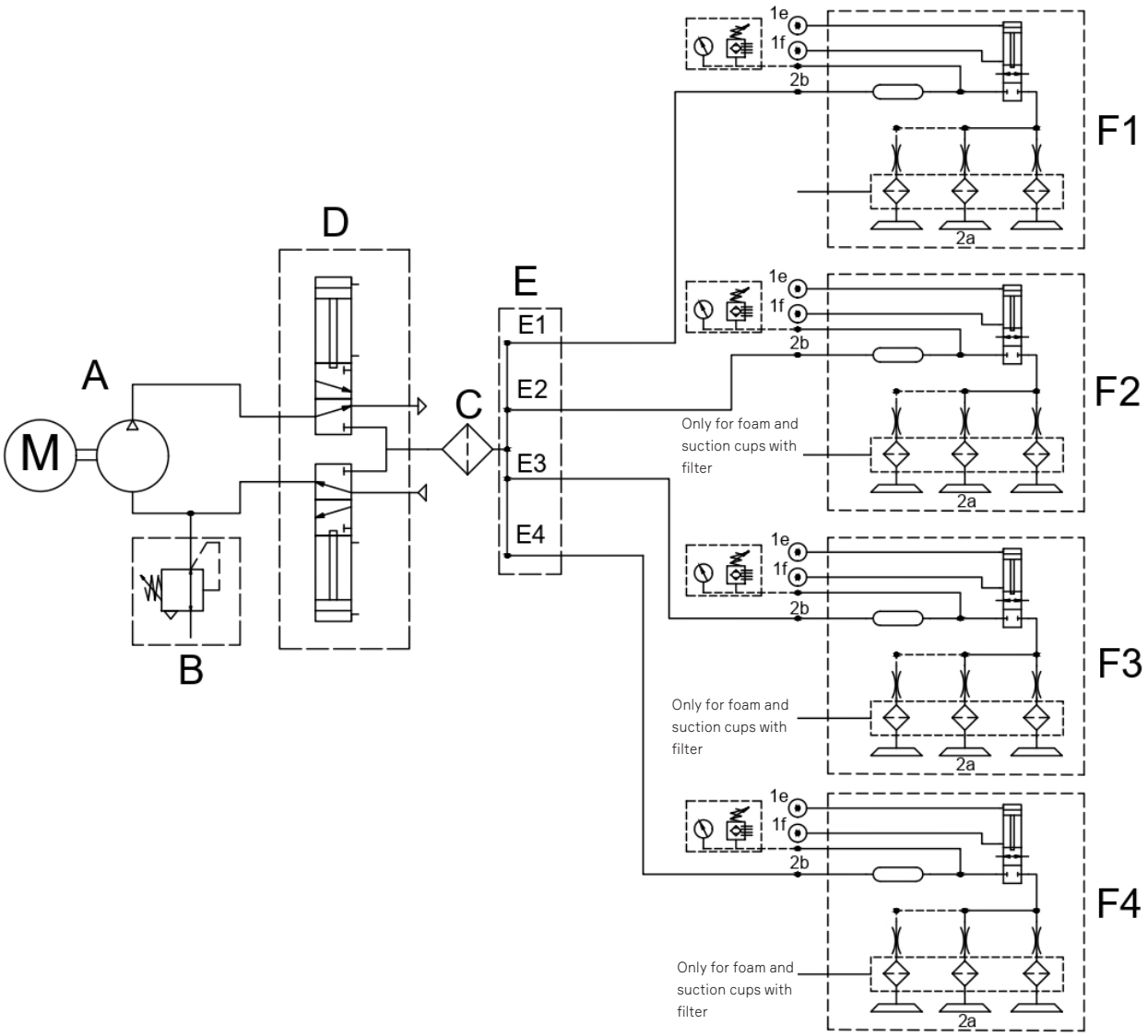


Figure 29 *KVG-PU flow reduction version (FR)*

- (A) Blower
- (B) Vacuum relief valve
- (C) Filter
- (D) KRV Kenos reverse valve
- (E) Vacuum distributor
- (F) Kenos® vacuum gripper KVG PU-version

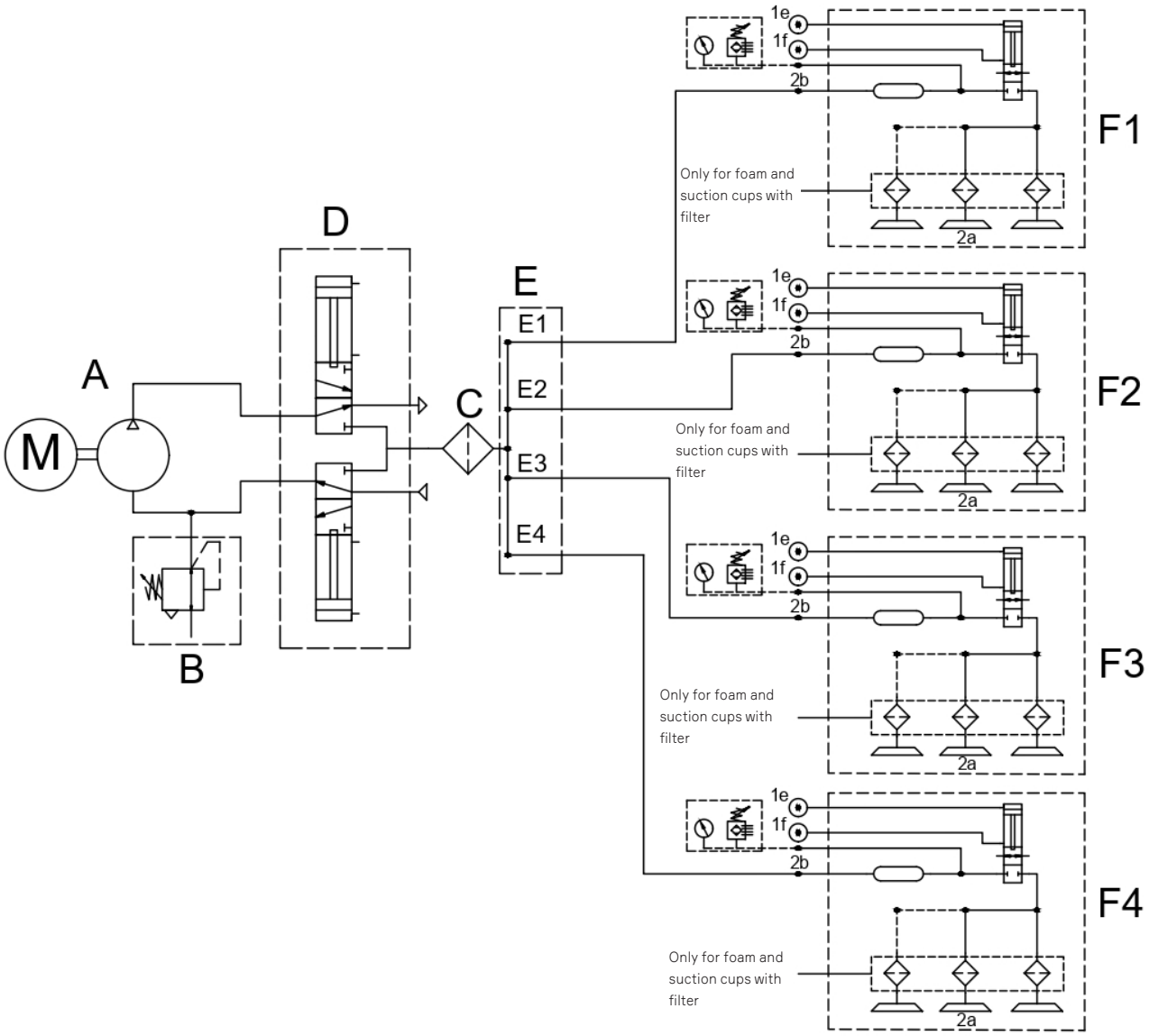


Figure 30 *KVG-PU direct mounting version (DM)*

- (A) Blower
- (B) Vacuum relief valve
- (C) Filter
- (D) KRV Kenos reverse valve
- (E) Vacuum distributor
- (F) Kenos® vacuum gripper KVG-PU version

4.7 Kenos® reversing valve settings

Color/Letter	Description
Blue	Sucked air
Yellow	Air discharged into environment or blowed in the head
Red	Compressed air for control of cylinders
A	Blower
B	Vacuum relief valve
C	KRV valve
D	Gripper
2a	Vacuum
2b	Vacuum for blower

4.7.1 KRV valve in suction position

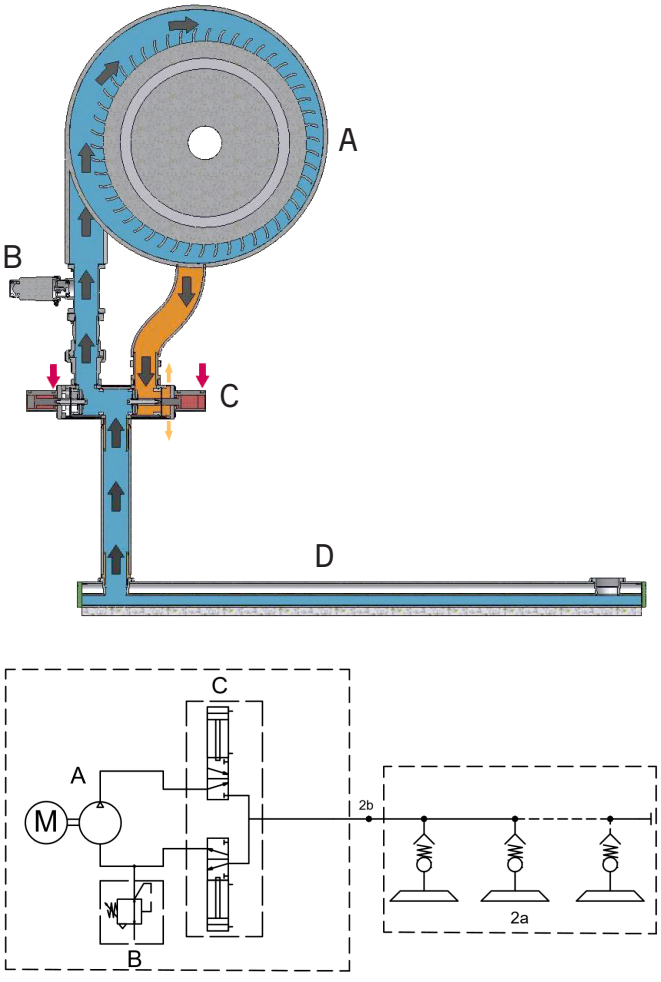


Figure 31 *Corresponding pneumatic diagram for suction position.*

4.7.2 KRV valve in blowing position

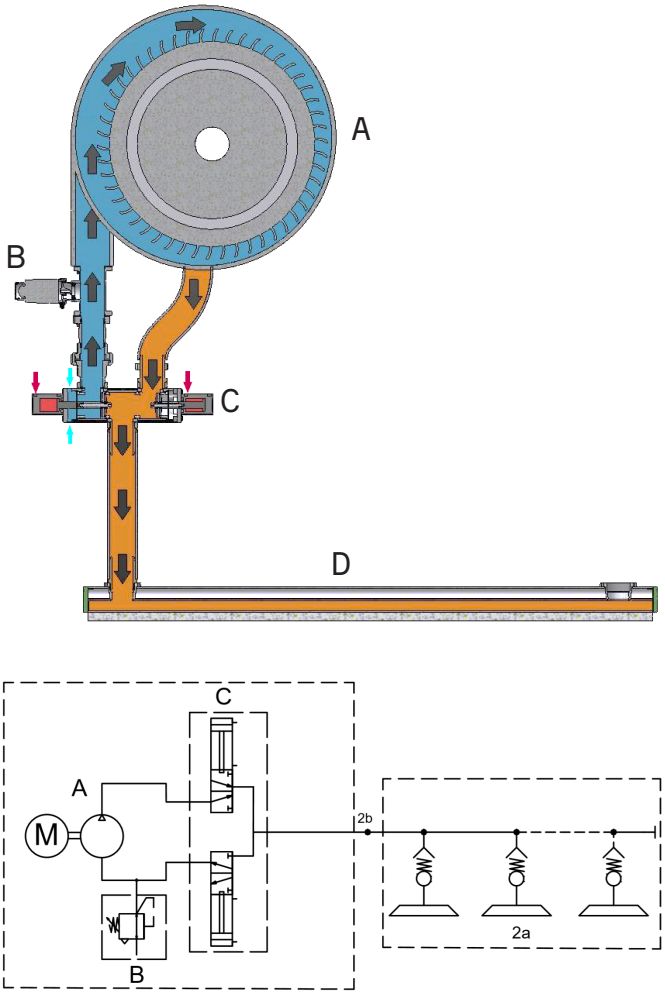


Figure 32 *Corresponding pneumatic diagram for blowing position.*

4.7.3 KRV valve in netural postion

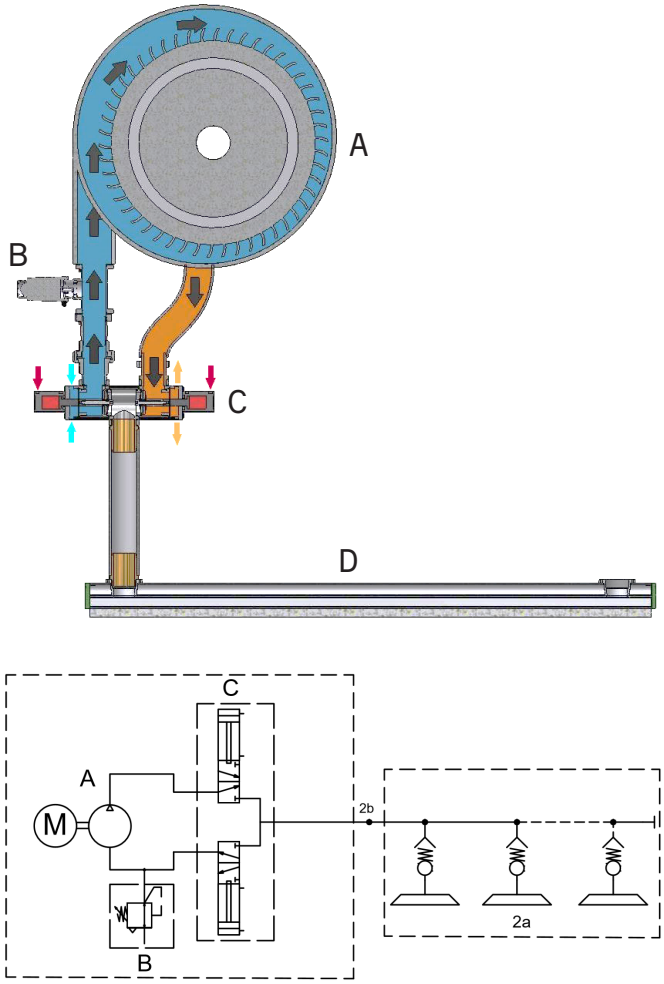


Figure 33 *Corresponding pneumatic diagram for neutral position*

4.7.4 KRV valve in ERROR position

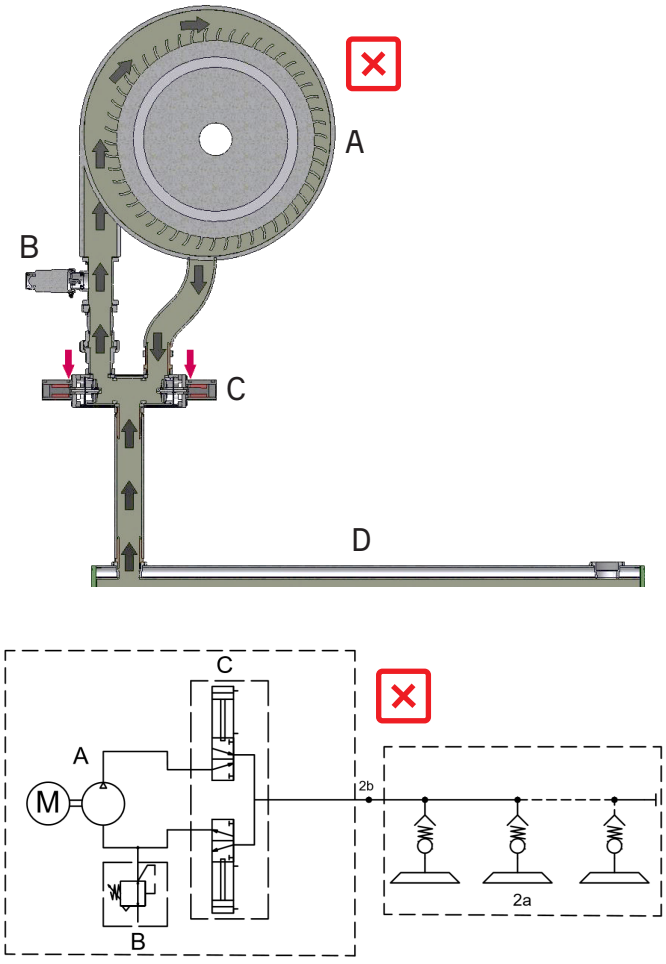


Figure 34 *Error position.*

5. Operation

Warning!

- The final evaluation of the safety system to be applied for starting up the system, after the assembly of the gripping module, is the task of the machine owner.
- Compressed air may be dangerous if used by unskilled personnel. Operating the system should solely be carried out by experienced and specially trained personnel.
- The supply pressure should not exceed the recommended one of 7 Bar [102 psi].
- 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 country.

Note!
It is recommended to always run preventative tests with original samples. Piab can assist with running such tests.

5.1 Start-up

5.1.1 Check valve balls (CVL/CVM/CVH) - foam version

Figure 35 *Check valve balls version*

Follow these steps:

1. Position the module at the object to handle with the grip pad parallel to the grip surface.
2. Lower the module until it has contact with the grip surface.
3. Activate vacuum.
4. Pick-up of object to handle.
5. Drop-off of object with removal of vacuum and blow-off, if necessary.

Warning!
Vacuum shall be activated after the KVG has contact with the workpiece, otherwise the workpiece will not be gripped since the check valves will close and not allow the handling.

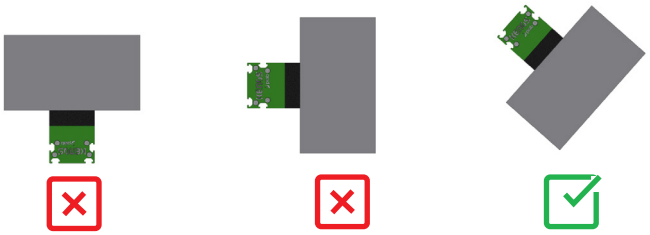


Figure 36 *Maximum tilt allowed is 45°*

Warning!

- The working area around the gripping module must be so generous that there is no risk of personal injury if the power or pneumatic supply fails and the load handled by the module is suddenly released.
- The KVG CVL/CVM/CVH 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°.
- The maximum vertical acceleration allowed is 5 m/s².
- The value measured through a vacuum switch in KVG module with check valves cannot be used as indication for a safe grip of the object. Due to the check valve, the vacuum level will be high even when the object is not present (check valve closed) since the vacuum level is detected inside the gripping module.

5.1.2 piSAVE® sense check valves (CV19) - foam version

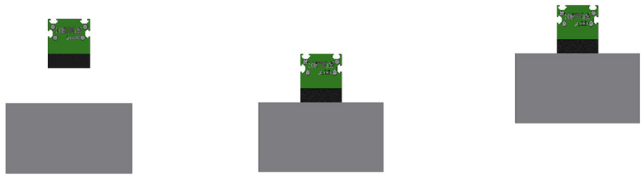


Figure 37 *piSAVE® sense version*

Follow these steps:

1. Position the module at the object to handle with the grip pad parallel to the grip surface.
2. Lower module until it has contact with grip surface (for fast cycle it is suggested to activate vacuum before it has contact with the object).
3. Pick-up of object to handle.
4. Drop-off the object with removal of vacuum and blow-off if necessary.

Note!
Activation of vacuum is possible either before or after contact with the workpiece for this configuration.

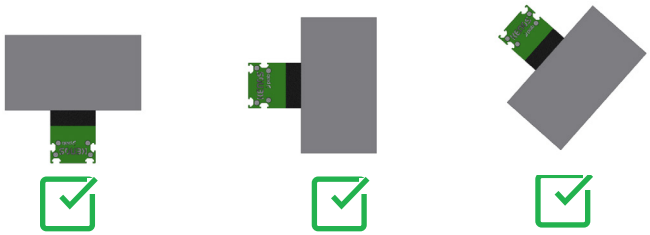


Figure 38 *No tilt restrctions for piSAVE® sense version*

Warning!

- The working area around the gripping module must be so generous that there is no risk of personal injury if the power or pneumatic supply fails and the load handled by the module is suddenly released.
- The value measured through a vacuum switch in KVG module with check valves cannot be used as indication for a safe grip of the object. Due to the check valve, the vacuum level will be high even when the object is not present (check valve closed) since the vacuum level is detected inside the gripping module.

5.1.3 Flow reduction (FR5/FR6/FR8/FR10) - foam version

Figure 39 *Flow reduction*

Follow these steps:

1. Position the module at the object to handle with the grip pad parallel to the grip surface.
2. Lower module until it has contact with grip surface (for fast cycle it is suggested to activate vacuum before it has contact with the object).
3. Pick-up the object.
4. Drop-off the object with removal of vacuum and blow-off if necessary.

Note!
Activation of vacuum is possible either before or after contact with the workpiece for this verion.

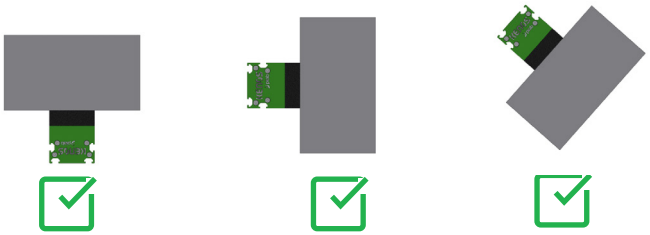


Figure 40 *No tilt restrictions for flow reduction*

Warning!

- The work area around the gripper module shall be so generous so there is no risk for injuries in case of electrical or pneumatic supply failure, and the load handled by the module is released.
- With the Flow reduction technology, the vacuum value in the gripper is the real vacuum level on the object, so in this case the vacuum switch can be used to check the grip.
- Take in consideration that the vacuum level is influenced by the degree of coverage on the gripper and the porosity of object.

Note!
It is recommended to always run preventative tests with original samples. Piab can assist with running such tests.

5.1.4 Cups version

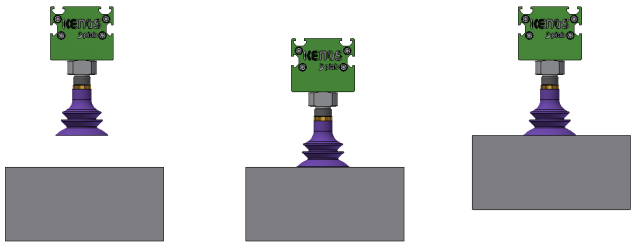


Figure 41 *Cups version*

Follow these steps:

1. Position the module at the object to handle with the grip pad parallel to the grip surface.
2. Lower the module until it has contact with the grip surface (for fast cycle it is suggested to activate vacuum before it has contact with the object).
3. Pick-up the object.
4. Drop-off the object with removal of vacuum and blow-off if necessary.

Note!
Activation of vacuum is possible either before or after contact with the workpiece for this version.

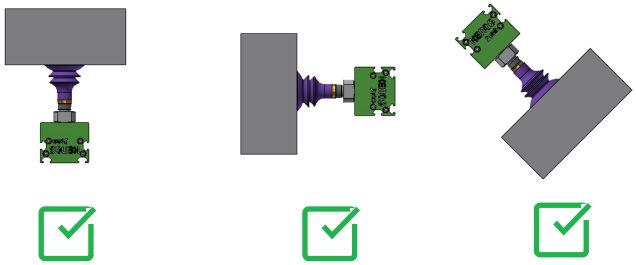


Figure 42 *No tilt restrictions for cups version*

Warning!

- The working area around the gripping module must be so generous that there is no risk of personal injury if the power or pneumatic supply fails and the load handled by the module is suddenly released.
- The vacuum switch can be used to check the grip in this case, since the vacuum value in the gripper shows the real vacuum level on the object, with direct mount and piSAVE® restrict technology.
- Take in consideration that the vacuum level is affected by the degree of coverage on the gripper and the porosity of object.
- With the piSAVE® sense technology the vacuum measured through a vacuum switch should not be used as an indication for a safe grip of the object, since the vacuum level inside the gripping module will be high even without any object present, thanks to the acting of the valves (valves will close).

5.1.5 piSOFTGRIP® version

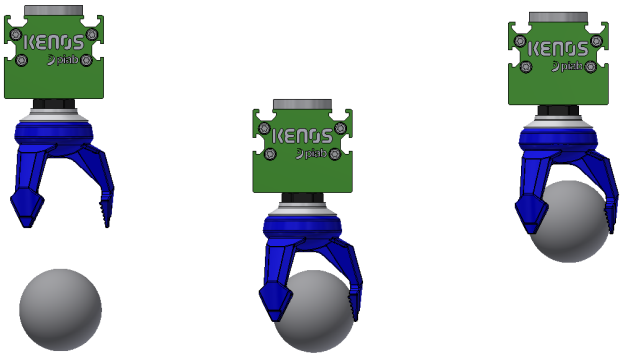


Figure 43 *piSOFTGRIP® version*

Follow these steps:

1. Position the module at the object to handle with the grip pad parallel to the grip surface.
2. Lower module until it reaches handling position.
3. Activate vacuum and pick-up the object.
4. Drop-off the object with removal of vacuum and blow-off if necessary.

Note!
If vacuum is activated before KVG is in contact with the workpiece, the workpiece will not be gripped since the piSOFTGRIP® will close and not allow the handling.

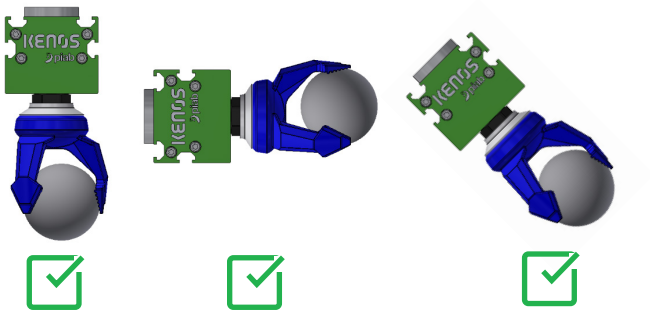


Figure 44 *No tilt restrictions for piSOFTGRIP® version*

Warning!

- The working area around the gripping module must be so generous that there is no risk of personal injury if the power or pneumatic supply fails and the load handled by the module is suddenly released.
- With the piSOFTGRIP® technology the vacuum measured through a vacuum switch should not be used as an indication for a safe grip of the object, since the vacuum level inside the gripping module will be high even without any object present.

Note!
It is recommend to always run preliminary tests with original samples. Kenos is able to perform these tests.

6. Service and maintenance

Warning!

- During installation and maintenance, cut off voltage and pressure.
- Compressed air may be dangerous if used by unskilled personnel. Maintaining systems should solely be carried out by experienced and specially trained personnel.
- 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.

6.1 Ejector (version from 19/10/2020)

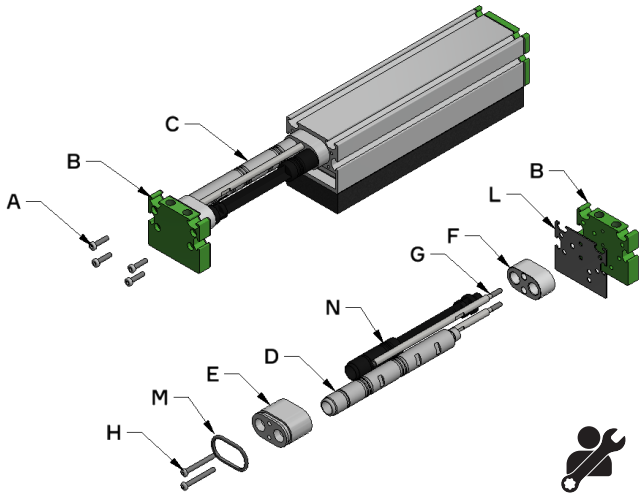


Figure 45 *Push in ejector (from 19/10 2020)*

For the maintenance of the push-in ejector follow these steps:

1. Loosen A closing screws of the supply cover and extract the complex B+C.
2. Blow and clean the ejectors with compressed air. Verify that the plastic body is intact.
3. Check the condition of the O-ring M, in case of damage it has to be replaced.
4. Push in the complex B+C and close with A screws.
5. Be careful to not cut the O-ring M, when re-inserting the ejector.

The push-in ejector is modular and therefore expandable. It is easy to increase the performance in this way.

Follow these steps:

1. Loosen H screws.
2. Slip off posterior housing E.
3. Remove blind cartridge N.
4. Insert a new cartridge in the free housing.
5. Assembly the posterior housing E.
6. Fix H screws.

6.2 Ejector (version until 18/10/2020)

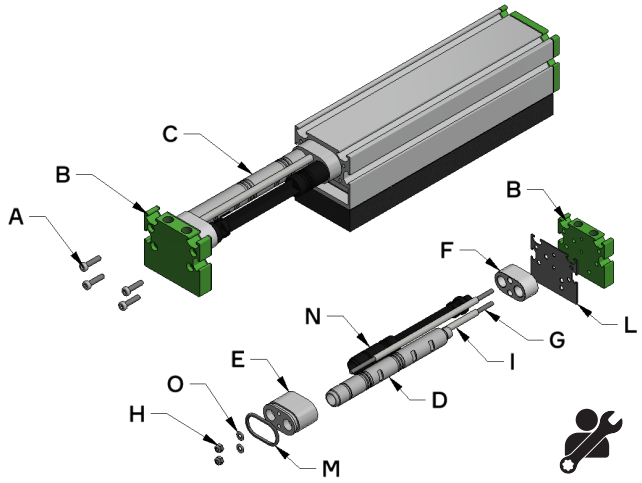


Figure 46 *Push in ejector (until 18/10 2020)*

For the maintenance of the push-in ejector follow these steps:

1. Loosen A closing screws of the supply cover and extract the complex B+C.
2. Blow and clean the ejectors with compressed air. Verify that the plastic body is intact.
3. Check the condition of the O-ring M, in case of damage it has to be replaced.
4. Push in the complex B+C and close with A screws.
5. Be careful to not cut the O-ring M, when re-inserting the ejector.

The push-in ejector is modular and therefore expandable. It is easy to increase the performance in this way.

Follow these steps:

1. Loosen H nuts
2. Slip off posterior housing E.
3. Loosen the tie-beam G.
4. Remove blind cartridge N.
5. Insert a new cartridge in the free housing.
6. Screw the assembly tie-beam to the supply cover B
7. Assembly the posterior housing E.
8. Fix the tie-beam with H nuts.

6.3 Silencer

Note!
The new silencer must be brought to the same extent as the previous silencer. If the old silencer is smaller than the new one, cut the new silencer as the old one.

With one or two cartridges:

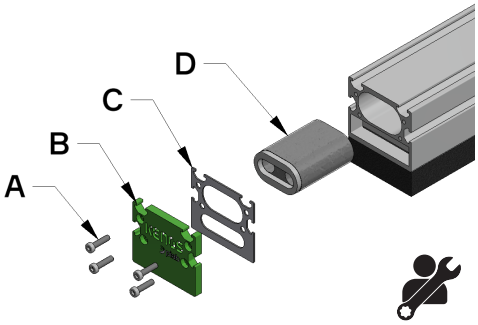


Figure 47 *Silencer with one or two cartridges*

For the maintenance of the silencer follow these steps:

1. Loosen A closing screws of the exhaust cover B and extract the silencer D.
2. Verify that the exhaust covers' gasket C is in good conditions, in case of damage it has to be replaced.
3. Push in the new silencer and close the exhaust cover B with A screws.

With four cartridges:

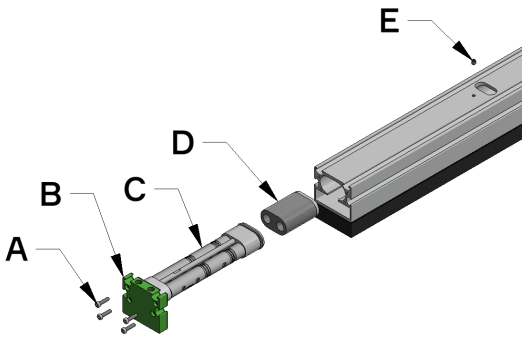


Figure 48 *Silencer with four cartridges*

For the maintenance of the silencer follow these steps:

1. Loosen A closing screws of the supply cover and extract the complex B+C.
2. Loosen E screw and extract the old silencer D.
3. Push in the new silencer and fix with E screw on the metal part of the silencer.
4. Push in the complex B+C and close with A screws.

For more information about the silencer please see the Spare parts section.

6.4 Check valves (CVL – CVM – CVH)

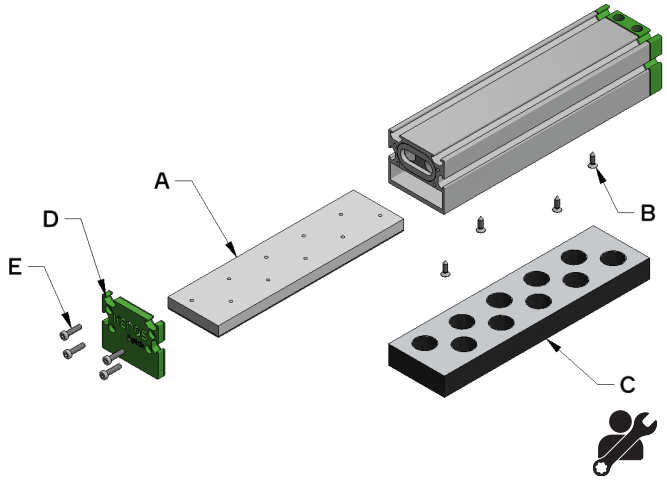


Figure 49 *Check valves*

- (A) Check valves module
- (B) Fixing screws check valves module
- (C) Technical foam
- (D) Exhaust cover
- (E) Cover closing screws

To access the check valves module, when cleaning it, keep the foam upwards to avoid the spheres falling down during operation.

Follow these steps:

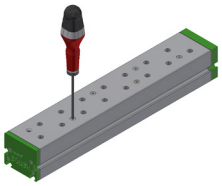
1. Loosen E screws and take down the cover D.
2. Loosen B screws.
3. Extract check valves module A.
4. Clean the check valve module A with compressed air.
5. Follow the same steps to assemble the gripping system.

Note!
With foam hole pitch type 1, 2 and 6, the foam needs to be removed from the aluminium profile before unscrewing the screws.

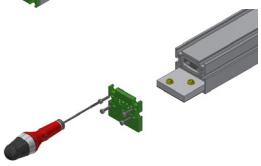
6.5 Check valves maintenance (CV19)

To access the check valves module, if it is necessary to replace the valves, follow these steps:

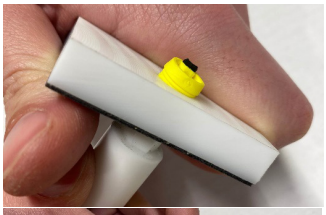
Remove the foam.



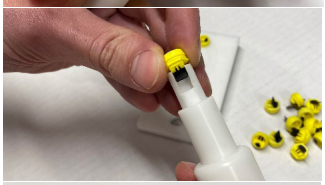
Loosen the screws on the profile.



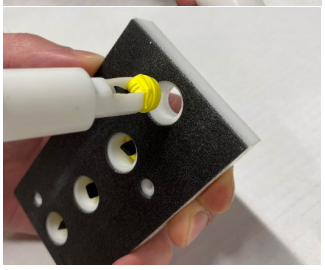
Loosen the screws. Take down the exhaust cover.



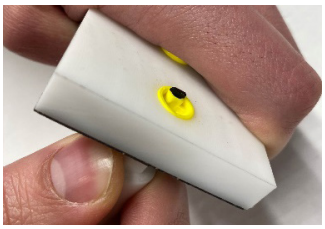
Remove the piSAVE valves using the special tool supplied by Piab®. Clean and check the condition of the valve seat.

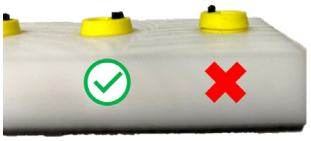


Insert the new piSAVE valves using the special tool supplied by Piab®.

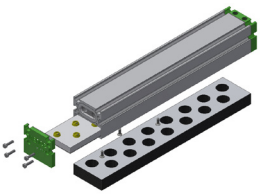


Insert the valve in the base of valves until there is a slight click.





Check the correct insertion of the valves in the seats like in the picture.



Follow back the same steps to assemble the gripping system.

Figure 50 *Images of piSAVE® sense valves replacement steps*

6.6 Foam

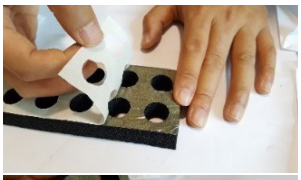
The foam that builds the gripping surface can be damaged during normal use. The medium lifetime depends on many factors:

- nature of the handled objects
- quality of the gripping surface
- work conditions
- cycle times etc

6.6.1 Replacement of foam

Remove the old foam.
If necessary, clean the aluminium profile from any adhesive and dust residues with solvent.

Note!
Check the holes are not obstructed by any kind of residue.



Remove the silicon paper from the new foam.

Align the holes on the aluminium profile and on the foam.
Fix the new foam on the aluminium profile.

Prevent formation of channels, which must be avoided.

Press the new foam.

Figure 51 *Images of foam replacement steps*

6.7 Suction cups

Suction cups that builds the gripping surface can be damaged during normal use, and the material degrades over time. The medium lifetime depends on many factors:

- nature of the handled objects
- quality of the gripping surface
- work conditions
- cycle times etc

For cleaning, use a mild detergent and lukewarm water.

6.7.1 Replacement of suction cups

When replacing a suction cup just remove the old one from the nipple, and insert a new suction cup.

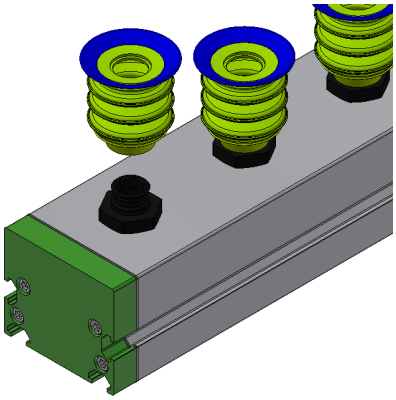


Figure 52 *Replacement of suction cup*

6.7.2 Replacement of nipple

When the nipple is damaged and needs to be replaced, unscrew it and replace it with a new nipple.

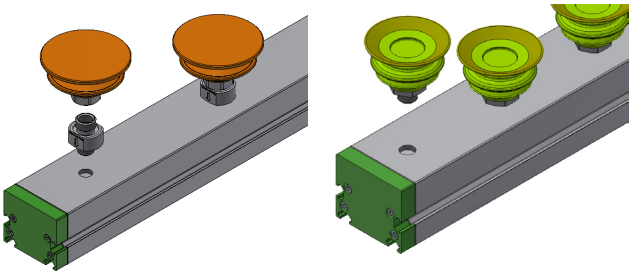


Figure 53 *Replacement of nipple.*

6.8 Storing

For a correct storage of the system or its spare parts, the following applies generally:

- 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 so that it has a stable base of support and make sure that there is no risk of unexpected movements.

6.8.1 Storing of foam

- Temperature 5-25° C and in a dry location
- Avoid direct sun- or artificial light
- Store in relaxed condition, free from tensions
- Store in a dustfree location
- Protect from chemical

6.8.2 Storing of suction cups

To obtain the expected functionality of the suction cups, long storage time should be avoided. It is recommended that the products are used within 24 months.

- Temperature 15-25° C and in a dry location
- Avoid direct sun- or artificial light
- Store in relaxed condition, free from tensions
- Store in a dustfree location
- Protect from chemical

6.9 Maintenance plan

Control step	Daily	Weekly	Monthly	Every 6 months	Every 12 months
Check max vacuum level		x			
Check the check valves / FR / piSAVE® valves			x		
Check the silencer			x		
Check tightening				x	
Check the foam / suction cups	x				
Check supply air pressure		x			
Check the air connection		x			
Check the general condition					x
Clean gripper exterior				x	

7. Spare parts and accessories

7.1 Spare parts

7.1.1 Specific spare parts

Article no	Description
0107053	COAX® cartridge MIDI Si32-3
0129339	piSAVE® restrict 0.7
0129340	piSAVE® restrict 1.0
0129341	piSAVE® restrict 1.3
0202396	piSAVE® sense Multiple port fitting 02/60 (yellow)
0128719	piSAVE® sense Multiple port fitting 03/60 (green)
0128731	piSAVE® sense Multiple port fitting 04/60 (blue)
0128733	piSAVE® sense Multiple port fitting 05/60 (red)
0224250	Spare parts kit balls Ø5,5 mm, 100 pcs
0230587	Spare parts kit balls Ø5,0 mm, 100 pcs
0224381	Spare parts kit balls Ø4,5 mm, 100 pcs
0210873	Silencer
0210871	Exhaust cover seal KVG60-50
0210872	Supply cover seal KVG60-50

7.2 Spare parts kit KVG60-50

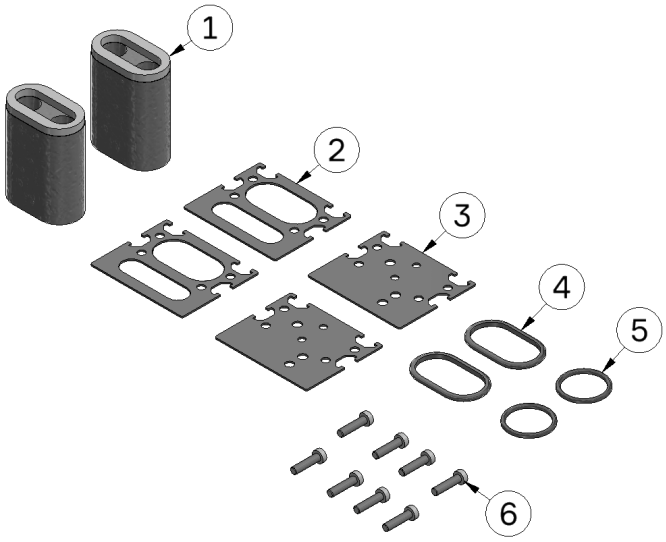


Figure 54 *Spare parts kit KVG60-50*

1. Silencer KVG60-50
2. Exhaust cover seal KVG60-50
3. Supply cover seal KVG60-50
4. O-ring NBR 30 x 2.5
5. O-ring NBR 29 x 2
6. KVG60-50 cover screw

Article no	Description
0210928	Spare parts kit KVG60-50: 2 x Exhaust cover seal KVG60-50 2 x Supply cover seal KVG60-50 2 x Silencer KVG60-50 2 x O-ring NBR 30 x 2.5 2 x O-ring NBR 29 x 2 8 x KVG60-50 cover screw

7.2.1 Foam spare parts

There are four different types of foam spare part available; Step 1, Step 2, Step 3 and Step 6.

Note!
Check the customer code of the configured KVG product to verify the type.

The first part of the customer code is the foam spare part code, when FOAM is put in front, see next.

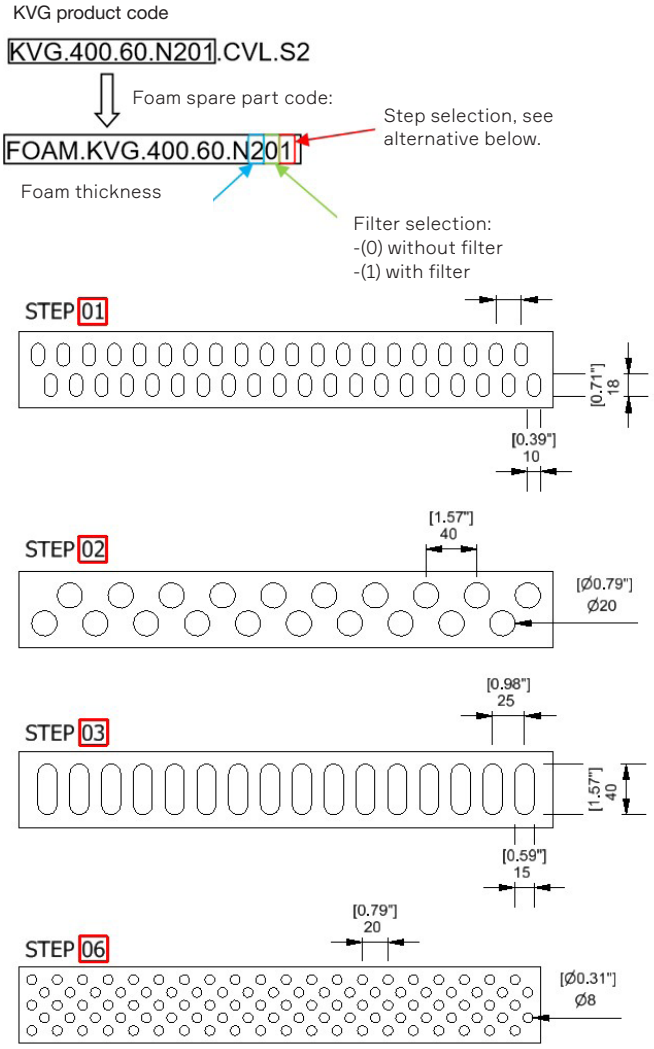


Figure 55 *Example 1 of KVG customer code.*

7.2.2 Suction cups spare parts

Note!
Check the customer code of the configured KVG product to verify the type.

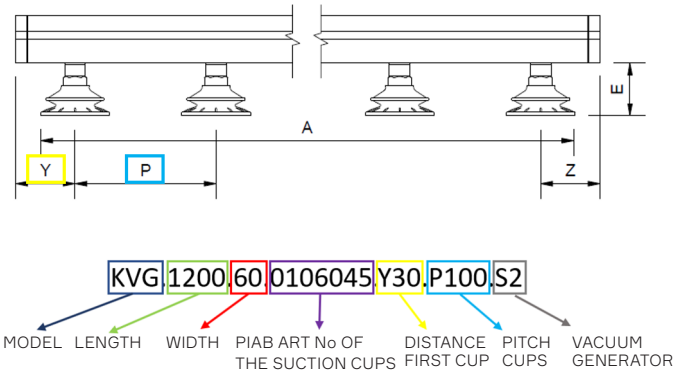


Figure 56 *Example 2 of KVG customer code*

Example: Piab article number 0106045 = BX52P Polyurethane 30/60 G1/4" male with mesh filter.

Figure 57 *BX52P Polyurethane 30/60*

7.3 Accessories

7.3.1 T-slot nut kits

Figure 58 *T-slot nut kit*

Article no	Description
0209851	T-slot nut kit 11071-M4-U8-4pcs
0209854	T-slot nut kit 11072-M5-U8-4pcs
0209858	T-slot nut kit 11073-M6-U8-4pcs
0209860	T-slot nut kit 11074-M8-U8-4pcs

7.3.2 Kit flange

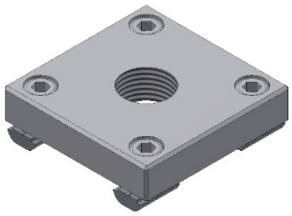


Figure 59 *Kit flange*

Article no	Description
0210847	KIT-FL-FX-KVG60-50-U8

7.3.3 Hose connectors

Figure 60 *Hose connectors*

Article no	Description
3107615	Hose connector R 3/4 “ tube 25 mm

7.3.4 Hose clamps

Figure 61 *Hose clamps*

Article no	Description
0208956	Hose clamp KB-27-40

7.3.5 Hoses

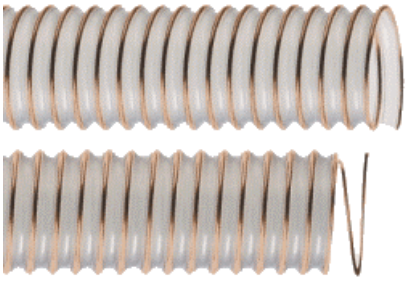


Figure 62 *Hoses*

Article no	Description
0210866	Hose PUR KTU-M-33-25-PU-10 m

7.3.6 Monitoring

Figure 63 *Monitoring*

Article no	Description
3101602	Vacuum gauge w. nut -100 kPa/-30inHg
0212040	Vacuum Switch 3-color Digital Display M8

8. Troubleshooting

Note!
It is recommended to always run preventative tests with original samples. Piab can assist with running such tests.

Type of trouble	Cause	Solution
Insufficient vacuum level or vacuum achieved too slowly	Operating pressure too low	Increase the pressure
	Internal diameter of pressure hose too small	Use hoses with larger internal diameter
	Damaged sealing	Check and replace if necessary
	Leak in pressure hose	Check hoses
	Dirty ejector	Clean
Object not gripped	Low vacuum level	See above
	Insufficient suction capacity	Insert one more cartridge ejector / Increase the suction capacity of blower
	Dirty check valves	Clean
	Lift is too fast	Slow down lift, avoid acceleration peaks
	Pieces not suitable for lift with this system	Replace grip solution
	Occluded foam / suction cup filter	Replace foam with filter / suction cups with filter
	Occluded silencer	Replace silencer
	Occluded micro holes	Clean
	Occluded piSAVE® valves	Clean / replace valve
Foam/suction cups wear very quickly	The system is not correct placed on the workpiece	The gripping system must be parallel to the workpiece surface

9. 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.

10. Recycling and disposal

Environmental aspects are considered in the development process of Piab's products to make sure that a minimal environmental footprint is used. Piab is certified against with ISO-14001, and also complies with REACH (EC 1907/2006).

The ways of handling recycling and disposals vary from country to country, and therefore this process needs to be in full compliance with each national regulation.

If possible, disassemble the product into its various components. Batteries, electrical and electronic equipment should be handed over to an authorized body for disposal, as well as the metal parts. All other parts can either be recycled or assorted as waste.

Appendix 1

Essential Health and Safety Requiremens - applied and respected

Essential Safety Requirements concerning machines, are contained in Annex I of the Machinery Directive 2006/42/EC. They are stringent and not modifiable but are still applicable only when they are relevant (i.e. when there is a danger).

Essential Health and Safety Requiremens		Compliance		
		Applicability	Conformity	Air Card Pass
1	**Essential safety and protection of health**			
1.1	*General considerations*			
1.1.1	*Definitions*	√	√	√
1.1.2	*Standard of safety integration*	√	√	
1.1.3	*Materials and products*	√	√	
1.1.4	*Lighting*			
1.1.5	*Machine design for handling purposes*	√	√	
1.1.6	*Ergonomics*			
1.1.7	*Jobs*			
1.1.8	*Seats*			
1.2	**Control systems**			
1.2.1	*Safety and reliability of control systems*			
1.2.2	*Command devices*			
1.2.3	*Starting*			
1.2.4	*Stop*			
1.2.4.1	*Normal shutdown*			
1.2.4.2	*Operational shutdown*			
1.2.4.3	*Emergency stop*			
1.2.4.4	*Machine assembly*			
1.2.5	*Selection of the control or operating mode*			
1.2.6	*Failure of the power supply circuit*			
1.3	**Protective measures against mechanical hazards**			
1.3.1	*Risk of loss of stability*			
1.3.2	*Risk of breakage during operation*	√	√	√
1.3.3	*Risks due to falling or protection objects*	√		
1.3.4	*Risks due to surfaces, edges or sharp corners*	√	√	√
1.3.5	*Risks due to combined machines*			
1.3.6	*Risks associated with changes in operating conditions*			
1.3.7	*Risks due to moving elements*	√		
1.3.8	*Choice of protection against risks due to moving elements*			
1.3.8.1	*Mobile transmission elements*			
1.3.8.2	*Mobile elements that participate in the processing*	√		
1.3.9	*Risks of uncontrolled movements*			
1.4	**Characteristics requiared for guards and protective equipment**			
1.4.1	*General requirement*			
1.4.2	*Particular requirements for guards*			
1.4.2.1	*Repair fixed*			

		Applicability	Conformity	Air Card Pass
1.4.2.2	*Interlocked mobile guards*			
1.4.2.3	*Adjustable guards that limit access*			
1.4.3	*Particular requirements for protective devices*			
1.5	**Risks due to other hazards**			
1.5.1	*Electricity*			
1.5.2	*Static energy*			
1.5.3	*Energy other than electricity*	√		
1.5.4	*Assembly errors*	√	√	√
1.5.5	*Extreme temperatures*			
1.5.6	*Fire*			
1.5.7	*Exposion*			
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 dangerous 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	**Maintenace**			
1.6.1	*Machine maintance*	√	√	
1.6.2	*Access to workplaces and intervention points used for the maintenance*			
1.6.3	*Isolation from energy supply sources*			
1.6.4	*Operator intervention*			
1.6.5	*Cleaning of internal parts*	√	√	√
1.7	**Information**			
1.7.1	*Machine information and warnings*			
1.7.1.1	*Information and information devices*	√	√	√
1.7.1.2	*Alarm devices*			
1.7.2	*Warning regarding residual risks*	√	√	
1.7.3	*Marking of machines (fabricant internal label)*	√	√	
1.7.4	*Instructions*			
1.7.4.1	*General drafting principles*	√	√	
1.7.4.2	*Contents of the instructions*	√	√	
1.7.4.3	*illustrative and promotional publications*			

Evolving around the world

EUROPE

France
Lagny sur Marne
+33 (0)16-430 82 67
info-france@piab.com

Germany
Butzbach
+49 (0)6033 7960 0
info-germany@piab.com

Italy
Torino
+39 (0)11-226 36 66
info-italy@piab.com

Poland
Gdansk
+48 58 785 08 50
info-poland@piab.com

Spain
Barcelona
+34 (0)93-633 38 76
info-spain@piab.com

Sweden
Danderyd (HQ)
+46 (0)8-630 25 00
info-sweden@piab.com

Mölndal
Ergonomic Handling
+46 (0)31-67 01 00
info-sweden@piab.com

United Kingdom
Loughborough
+44 (0)15-098 570 10
info-uk@piab.com

AMERICAS

Brazil
Sao Paulo
+55 (0)11-449 290 50
info-brasil@piab.com

Canada
Toronto (ON)
Ergonomic Handling
+1 905 881 1633
eh.ca.info@piab.com

Hingham (MA, US)
+1 800 321 7422
info-usa@piab.com

Mexico
Hingham MA (US)
+1 781 337 7309
info-mxca@piab.com

USA
Hingham (MA)
+1 800 321 7422
info-usa@piab.com

Xenia (OH)
Robotic Gripping
+1 888 727 3628
info-usa@piab.com

ASIA

China
Shanghai
+86 21 5237 6545
info-china@piab.com

India
Pune
+91 8939 15 11 69
info-india@piab.com

Japan
Tokyo
+81 3 6662 8118
info-japan@piab.com

Singapore
Singapore
+65 6455 7006
info-singapore@piab.com

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