

Manual

Kenos[®] Foam Grippers for piCOBOT[®] L



KENOS



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



Chinese



English



French



German



Italian



Japanese



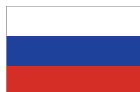
Korean



Polish



Portuguese (Brazil)



Russian



Spanish



Swedish

© Copyright protection

This manual has the Use and Maintenance instructions for the vacuum gripping system and as such it must be treated with the utmost confidentiality. It is intended exclusively for use by persons authorized in your company. The transfer to third parties can only take place with the prior written consent of Piab AB. All is protected under the copyright law. Transmission to third parties and reproduction of this documentation is prohibited.

Contents

1. Introduction to the manual	4	8. Spare parts	20
1.1 About the manual	4	8.1 How to order spare parts	20
1.2 Safety signs used in the manual	4	9. Troubleshooting	21
1.3 Target group	4	10. R.E.S.S. applied and respected	22
1.4 Values specified in manual	4	11. Warranties	24
2. Safety instruction	5	12. Recycling and disposal	25
2.1 General safety	5		
2.2 Safe usage	5		
2.3 Intended use	6		
2.4 Misuse	6		
3. Introduction to Foam grippers	7		
3.1 Manufacturer	7		
3.2 Dangerous areas	7		
3.3 Overview - Foam with Check Valves	8		
3.4 Overview - Foam with Flow Restriction	9		
4. Installation	10		
4.1 Mounting to Tool changer	10		
4.2 Mounting to piCOBOT® L	11		
4.3 Fixing hole positions	12		
5. Working cycle	13		
5.1 Check valves versions	13		
5.2 Flow reduction versions	14		
6. Technical data	16		
6.1 Temperature specifications	16		
6.2 Pneumatic diagrams	16		
7. Maintenance	17		
7.1 Foam maintenance	17		
7.2 Recommended conditions for the storage of foam	17		
7.3 Gasket with metal sheet maintenance	18		
7.4 Maintenance plan	19		

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 carefully.
- The manual should be stored on a known and easily accessible place, which can be digital.
- 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!

Failure to follow the instructions may result in death or serious injury!



Warning!

Vacuum force



Warning!

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



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 work 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, including:

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

1.4 Values specified in manual

The values specified in this manual were tested at:

- Room temperature (20°C [68°F] ± 3 °C [5.5°F]).
- Standard atmosphere (101,3 kPa [29.9 inHg] ± 1,0 kPa [0.3 inHg]).
- Relative humidity, 20-70%.

2. Safety instruction

2.1 General safety

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 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!

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.



Warning!

Exhaust.
The discharge air has a high output speed. Do not obstruct the discharge.



Warning!

Risk of crushing or entrapment of upper limbs.

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 eye protection

2.2.1 Starting and operating

The final evaluation of the safety systems to be applied for starting up the product, after the assembly, is the task of the final manufacturer of machinery. In addition, the same manufacturer will certify the final commissioning according to the regulations in force for each individual country.

2.2.2 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.

2.2.3 Safety instructions



Warning!

- Do not install or operate your product if it is damaged during transport, handling or use. Damage may result in bursting and cause personal injury or property damage.
- If the product is used for evacuating solid content, ensure that a filter is used for preventing ejected objects.

Handle the components with care.

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.

Use suitable, approved air filters to avoid possible intoxications. If dusts, oil mists, fumes, etc. are suctioned, these will be mixed with the discharge air of the vacuum generator and be expelled via the discharge conduit.

During installation and maintenance of a foam gripper that is attached to a vacuum pump, cut off voltage and pressure to the pump.

Follow the installation and commissioning instructions.

Modifying the components is prohibited.

2.2.4 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.

2.3 Intended use

- The gripper is intended exclusively for handling, lifting and storing products of appropriate size, as reported in the agreement.
- The lifting objects handled by this product must not be deformed and must 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.
- For professional use only.

2.4 Misuse

- The product is only cleared for operation under conditions and uses established by the manufacturer or reported in this manual.
- The product shall not be used in explosive atmospheres.
- The product shall not be used in direct contact with corrosive gases, chemical products, water, vapor or in environments with droplets or splashes of water, oil, etc.
- The product shall not be used in environments subject to strong vibrations and/or impacts.

3. Introduction to Foam grippers

3.1 Manufacturer

Piab AB
 P.O. Box 146
 SE-18212 DANDERYD
 SWEDEN

3.1.1 Identification data

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

For any communication with Piab AB or service centers always refer to the label information.

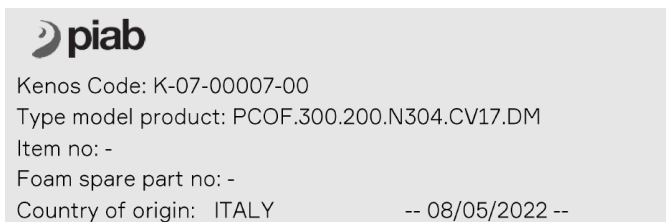


Figure 1 Identification label on foam gripper.



Note!

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

3.2 Dangerous areas



Warning!

Never insert hands in cavities, holes or openings, for example air discharge, openings/holes under the foam etc.



Warning!

Vacuum force



Warning!

Never look into in cavities, holes or openings, for example air discharge.



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.

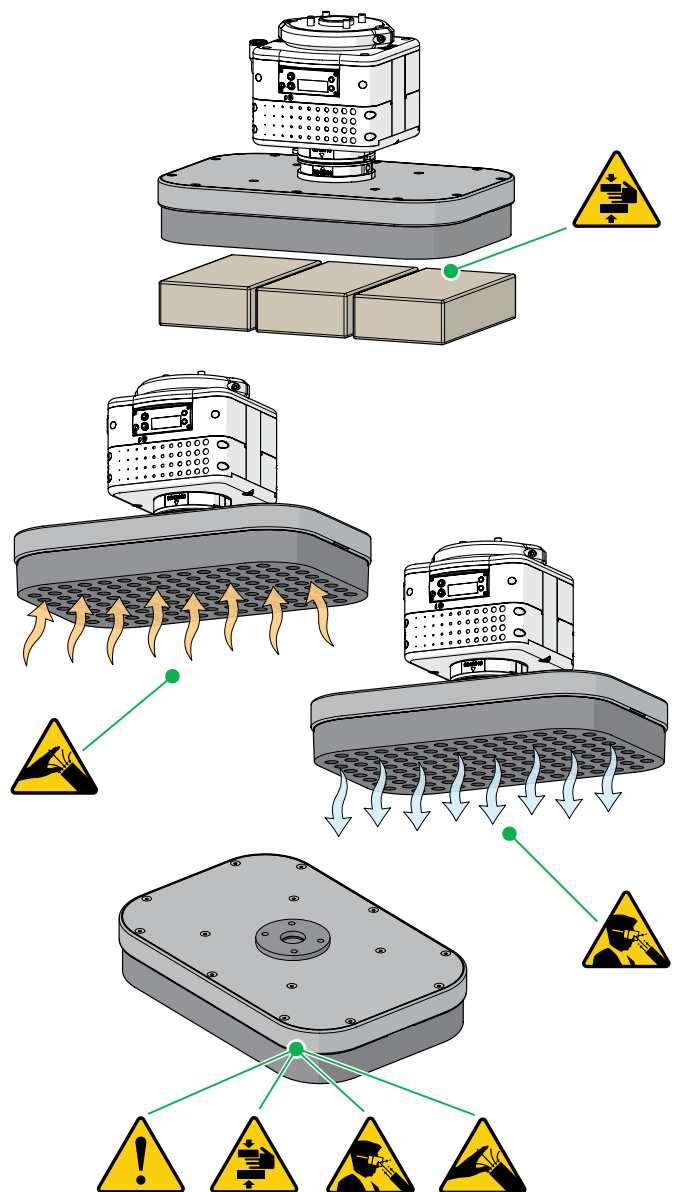


Figure 2 Dangerous areas.

3.3 Overview - Foam with Check Valves

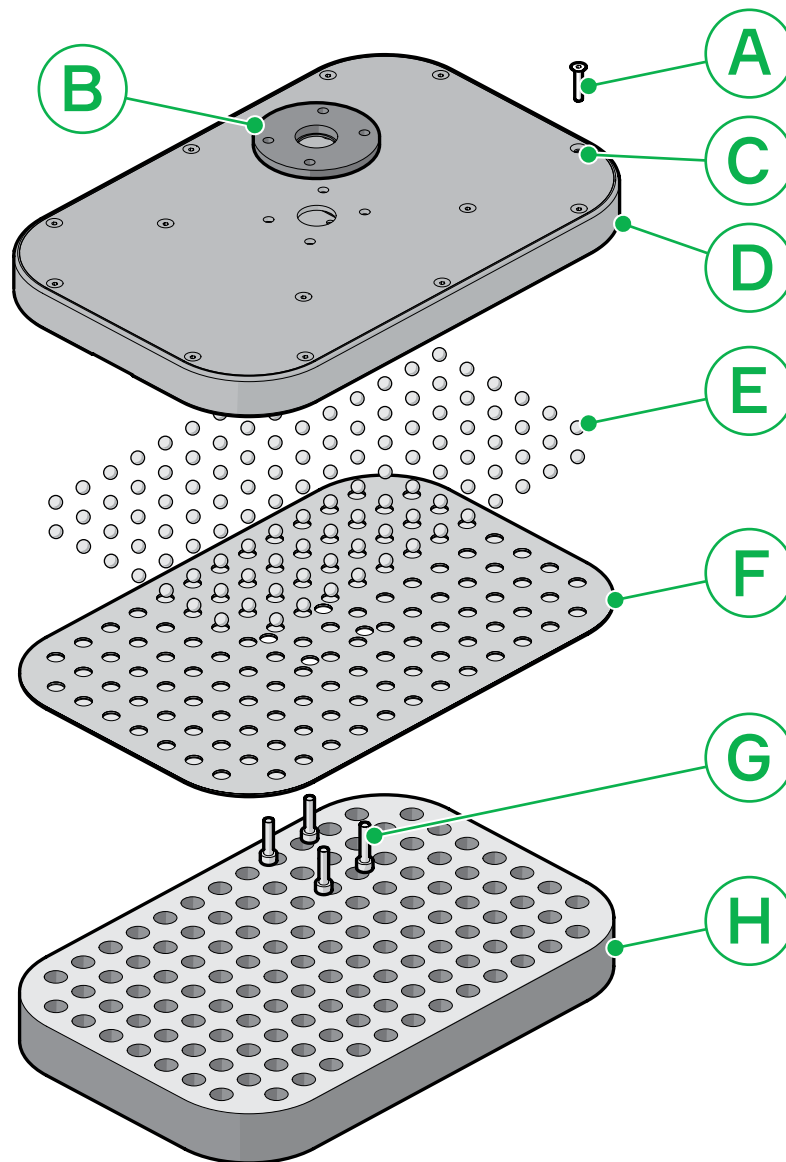


Figure 3 Foam gripper with check valves.

Position	Description
A	Screws
B	Gasket
C	Metal plate
D	Main body
E	Spheres
F	Aluminium sheet with filter
G	Screws
H	Foam

3.4 Overview - Foam with Flow Restriction

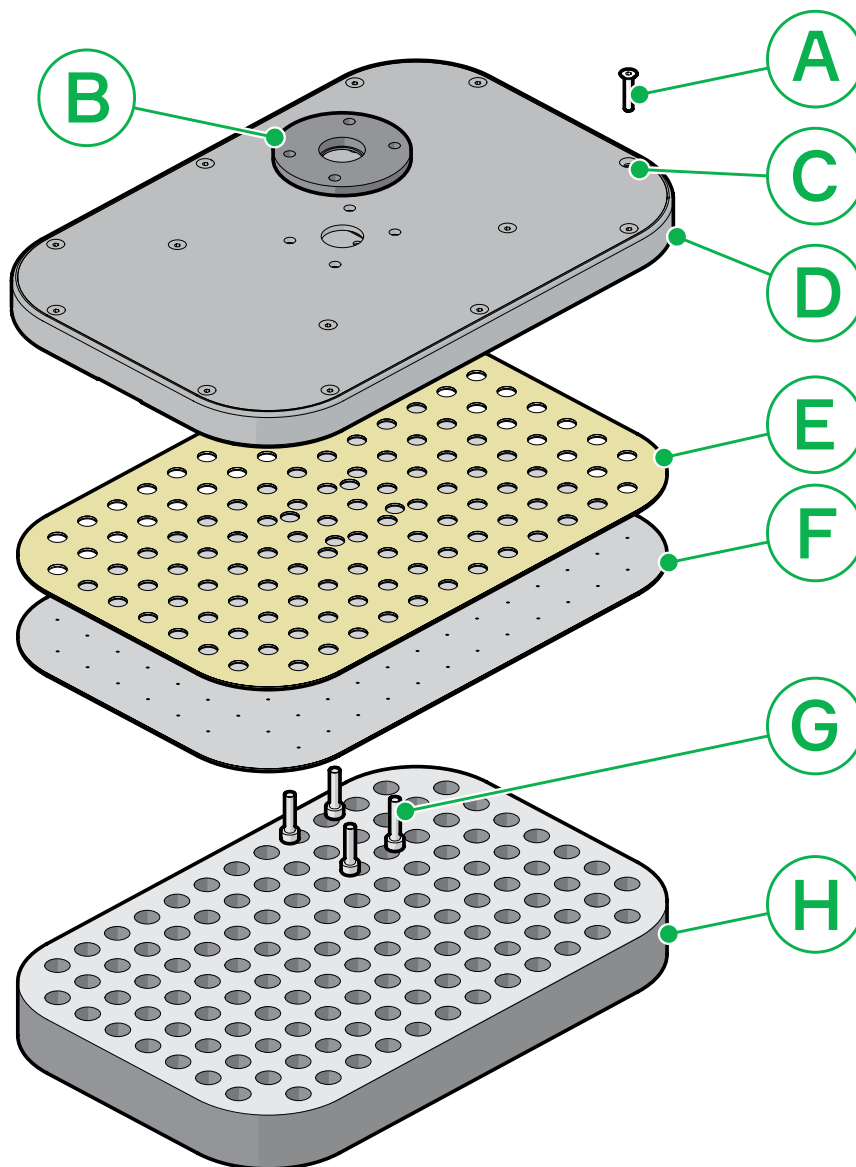


Figure 4 Foam gripper with flow reduction.

Position	Description
A	Screws
B	Gasket
C	Metal plate
D	Main body
E	Adhesive gasket
F	Aluminium sheet with micro holes
G	Screws
H	Foam

4. Installation

The foam gripper can be mounted to piCOBOT® L or another pump, either directly or via a tool changer.

4.1 Mounting to Tool changer

The piCOBOT® L pump unit and the foam gripper unit are connected via a tool changer system.

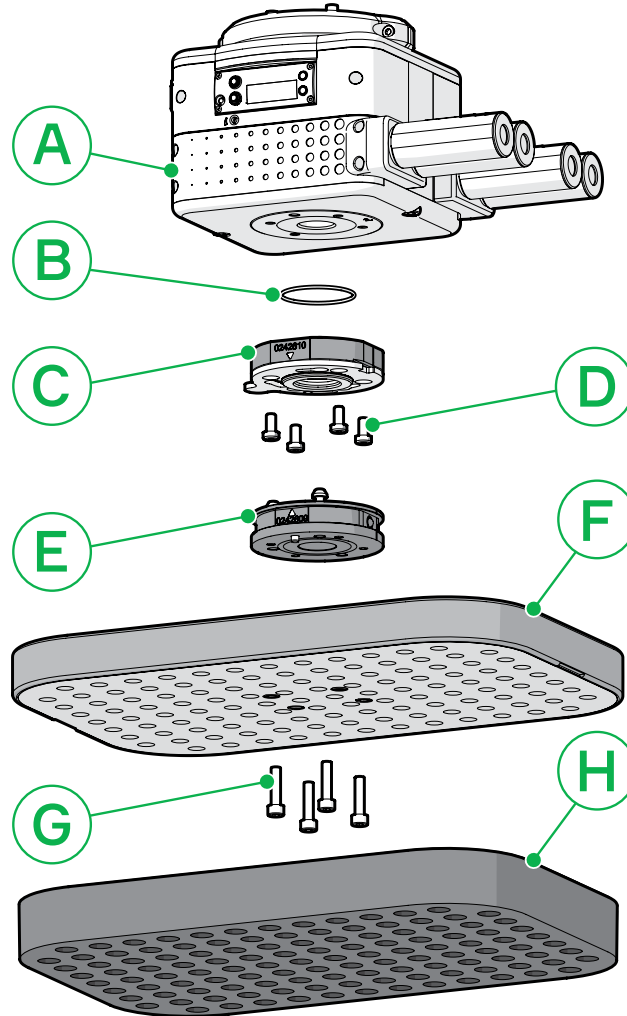


Figure 5 Mounting the foam gripper to a tool changer.

Position	Description
A	piCOBOT® L pump
B	O-ring
C	Tool changer upper flange
D	Screws
E	Tool changer lower flange
F	Foam gripper body
G	Screws
H	Foam

Mounting the foam gripper to the piCOBOT® L via a tool changer:

1. Place the O-ring (B) on the seat of the upper flange of the tool changer (C).
2. Fix the upper flange of the tool changer (C) to the piCOBOT® L pump unit (A) with the screws (D).
3. Fix the lower flange of the tool changer (E) to the foam gripper body (F) with the screws (G).
4. Remove the silicone paper from the foam (H) and fix it to foam gripper body (F). Follow the instructions in the section "foam maintenance". Pay attention to align the holes in the foam (H) with the holes in the foam gripper body (F) to avoid the formation of side air channels.

4.2 Mounting to piCOBOT® L

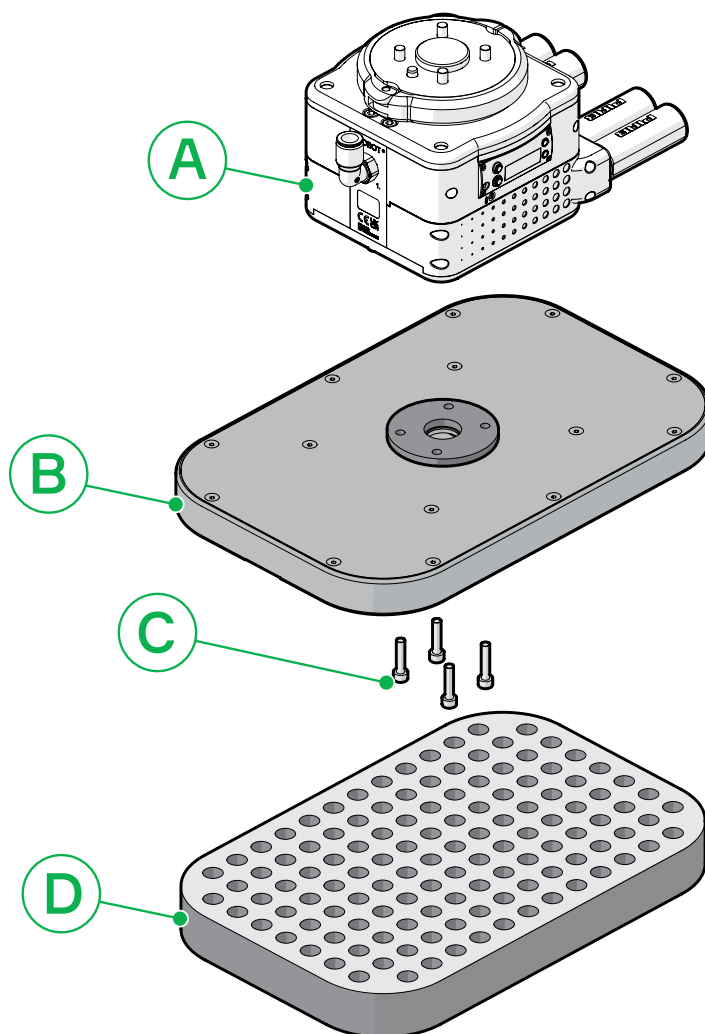


Figure 6 Mounting the foam gripper to a piCOBOT®L pump.

Position	Description
A	piCOBOT® L pump
B	Foam gripper body
C	Screws
D	Foam

Mounting the foam gripper to the piCOBOT® L (direct mounting):

1. Fix the foam gripper body (B) to the piCOBOT® L (A) with the specific screws (C) supplied.
2. Remove the silicone paper from the foam (D) and fix it to the foam gripper body (B). Follow the instructions in the section "foam maintenance". Pay attention to align the holes in the foam (D) with the holes in the foam gripper body (B) to avoid the formation of side air channels.

4.3 Fixing hole positions

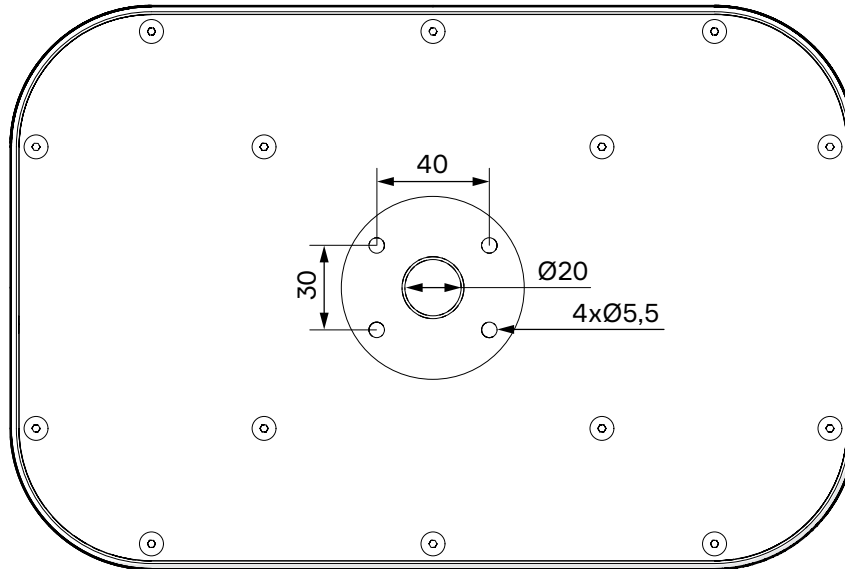


Figure 7 Positions of the fixing holes on the metal plate of the foam gripper. The measurements are in mm.

5. Working cycle



Attention!

It is recommend to run preliminary tests with original samples before real use. Piab/Kenos are available for running such tests.

5.1 Check valves versions

The working cycle for a piCOBOT® L gripping module follows these steps:

1. Position the foam gripper pad parallel to the grip surface of the object to be handled.
2. Lower the foam gripper until contact is made with the grip surface of the object.
3. Activate the vacuum and pick-up or lift the object to be handled.
4. Drop-off or release of the object by removing the vacuum and, if necessary, activating the blow-off flow.



Note!

If vacuum is activated before the foam gripper unit with check valve version is in contact with the workpiece, the workpiece will not be gripped because the check valves will be closed before reaching the workpiece.



Figure 8 The working cycle of piCOBOT® L with foam gripper unit with check valves.



Warning!

- The foam unit gripping module with check valve (CV) technology is designed for horizontal use; turning the module upside down by 180° or vertical grips are not possible. Maximum allowed tilt angle is 45°.
- 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.
- The maximum vertical acceleration allowed is 5 m/s².
- Note that when check valves are present in the module, the vacuum value measured through a vacuum switch cannot be used as indication for a safe grip of the object. The measured vacuum level inside the gripping module with check valves will be high even when the object is not present, the check valves will close.

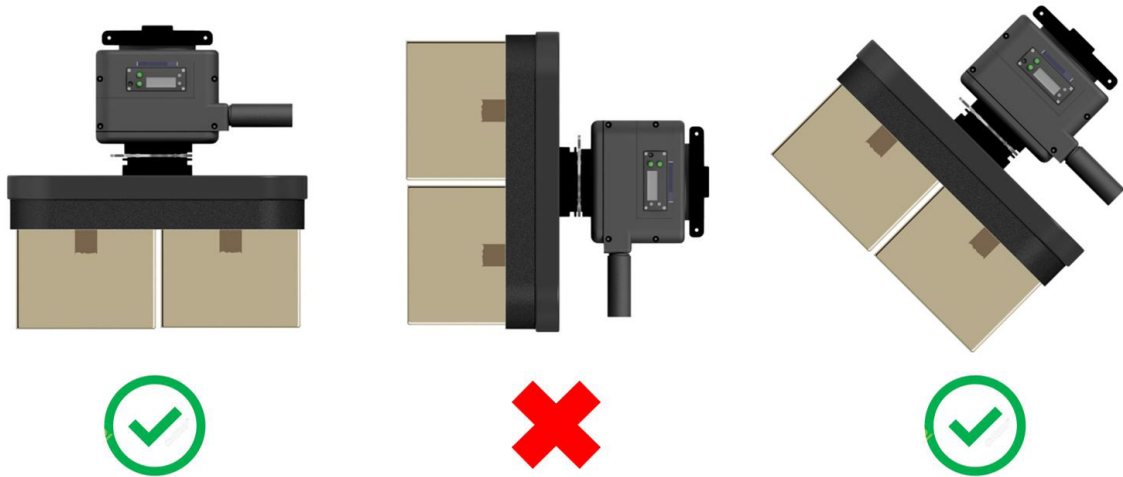


Figure 9 Maximum allowed tilt angle for lifts is 45° for foam grippers with check valves (CV).

5.2 Flow reduction versions

The working cycle for a piCOBOT® L gripping module follows these steps:

1. Position the foam gripper pad parallel to the grip surface of the object to be handled.
2. Lower the foam gripper until contact is made with the grip surface of the object. For fast cycles activate the vacuum before the gripper is in contact with the object.
3. Activate the vacuum and pick-up or lift the object to be handled.
4. Drop-off or release of the object by removing the vacuum and, if necessary, activating the blow-off flow.



Note!

The activation of vacuum can be done before or after the foam gripper unit with flow reduction version is in contact with the workpiece.



Figure 10 The working cycle of piCOBOT® L with foam gripper unit with flow reduction.

**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.
- With the Flow reduction technology, the vacuum value in the gripper is the real vacuum level exerted on the lifting object. Therefore the vacuum switch can be used to check the grip. Take into consideration that the vacuum level is influenced by the degree of coverage on the gripper and the porosity of the lifting object.

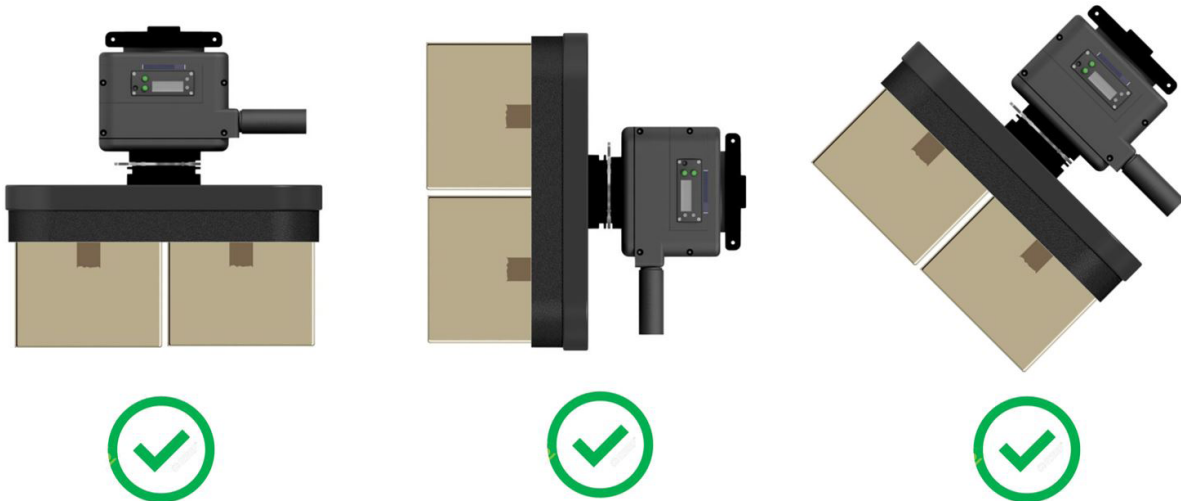


Figure 11 Allowed tilts for lifts with foam grippers with flow reduction (FR).

6. Technical data

6.1 Temperature specifications

Operating temperature	Value
Foam gripper environment	0-50 °C [32-122 °F]
Workpiece	0-50 °C [32-122 °F]

6.2 Pneumatic diagrams

- 2a Vacuum from piCOBOT® L
- 2b Vacuum
- * Only for foams equipped with filter

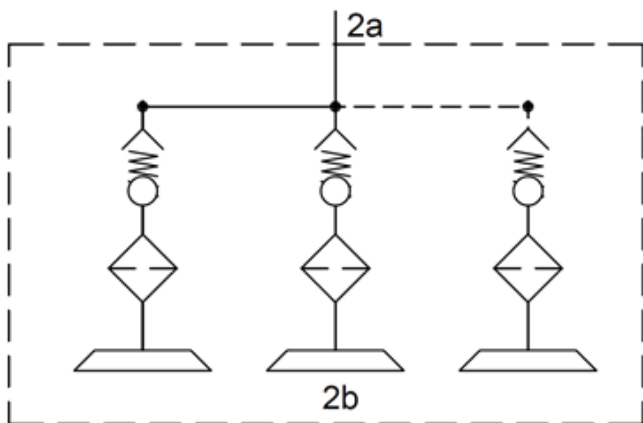


Figure 12 Check valve version of foam gripper.

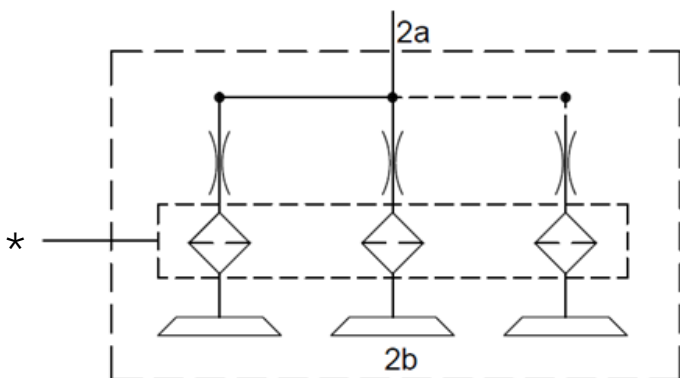


Figure 13 Flow reduction version of foam gripper.

7. Maintenance

7.1 Foam maintenance

The foam that builds the gripping surface can get worn and damaged during normal use. The lifetime depends on many factors, such as the nature of the handled objects, the quality of the gripping surface, work conditions, cycle times, etc.

How to replace an old foam with a new foam on a foam gripper system (where the letters refer to parts shown in figures 3 and 4):



- ① Remove the old foam (H) from the metal (aluminium) sheet (F). Clean the metal sheet surface from any rubber, adhesive or dust residues with solvent. The holes on the metal sheet must not be blocked by any kind of residue.
- ② Remove the silicone paper from the new foam to expose the surface with adhesive.
- ③ Align the holes on the metal sheet (F) with the holes in the foam (H).
- ④ Fix the new foam to the metal sheet. **Attention!** Prevent the formation of side air channels due to improper alignment of the holes in the metal sheet and in the foam when fixing them together.
- ⑤ Press the new foam against the metal sheet.

7.2 Recommended conditions for the storage of foam

- Temperature: 5 - 25 °C [41 - 77 °F]
- Not under direct sunlight
- Not exposed to dust or chemicals
- In a dry environment
- Free from tension or load.

7.3 Gasket with metal sheet maintenance

The micro holes on the metal sheet (for foam grippers with flow reduction) and the filters on the metal sheet (for foam grippers with check valves) can become obstructed with dirt, dust or other residues during normal use. The filters and micro holes can be cleaned with compressed air.





If necessary, the metal sheet with filter or with micro holes can be replaced with a new one, by following the steps below (where the letters refer to parts shown in figures 3 and 4):



- ① Remove the old foam (H) from the metal sheet (F).
- ② Insert a flat screwdriver into the slot between the plastic main body (D) and the old gasket (E) with metal sheet (F). Apply slight upward pressure to release the adhesive from the plastic main body.
- ③ Remove the old gasket (E) with metal sheet (F) from the plastic main body. Clean the plastic body from any adhesive and dust residues.
- ④ Remove the silicon paper from the gasket with metal sheet (E and F).
- ⑤ Align the holes on the new gasket with metal sheet (E and F) with the holes in the plastic main body (D).
- ⑥ Fix the new gasket with metal sheet on the plastic main body and press it to guarantee a correct adhesion.

- 7 Remove the silicone paper from the new foam to expose the surface with adhesive. Align the holes on the metal sheet (F) with the holes in the foam (H).
- 8 Fix the new foam to the metal sheet. **Attention!** Prevent the formation of side air channels due to improper alignment of the holes in the metal sheet and in the foam when fixing them together.
- 9 Press the new foam against the metal sheet.

7.4 Maintenance plan

Control step	Role *	Daily	Monthly	Every 6 months	Every 12 months
Check the foam		X			
Check the tightenings			X		
Clean the foam gripper exterior				X	
Check the general conditions					X

* See chapter 1 for explanations of the roles.

8. Spare parts

8.1 How to order spare parts

Check the product code of your configured piCOBOT® L with foam gripper (PCOF) unit. The first part of the product code on the foam gripper is reused in the foam gripper spare part product code, but with the added *FOAM* before *PCOF*.

The figure below shows the code of the configured product *FOAM.PCOF.300.200.N304*, a foam gripper 300x200x30mm with Check Valves (CV) and Direct Mounting (DM) to piCOBOT® L.

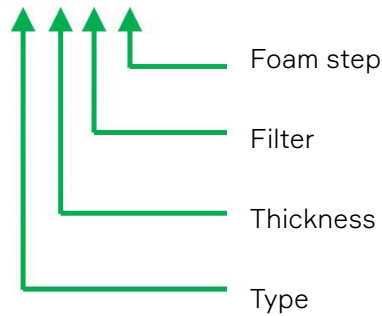
PCOF.300.200.N304.CV17.DM

Foam gripper unit product code



FOAM.PCOF.300.200.N304

Foam spare part product code



Type	Thickness	Filter	Step
N = EPDM foam	4 = Foam 40 mm	0 = No filter	4 = 20 x 20 mm
	3 = Foam 30 mm	1 = With filter	
	2 = Foam 20 mm		
	1 = Foam 10 mm		

9. Troubleshooting



Note!

It is recommended to always run preliminary tests with original samples. Kenos/Piab are available for running such tests.

Type of trouble	Cause	Solution
Insufficient vacuum level or vacuum achieved too slowly	Internal diameter of pressure hose too small	Use hoses with larger internal diameter
	Damaged sealing	Check and replace if necessary
	Leak in hoses	Check hoses
	Operating pressure too low	Increase the pressure
	Dirty ejector	Clean
Poor gripping	Low vacuum level	See above
	Dirty check valves	Clean
	Lift is too fast.	Slow down lift, avoid acceleration peaks (max 5 m/s ²)
	Workpiece different from original samples	Check workpiece
	Occluded filter	Clean / replace
	Occluded silencer	Replace silencer
	Occluded micro holes	Clean / replace
Foam wears very quickly	The system is not correctedly placed on the workpiece	Reduce wear by gripping parallel to the work piece surface.

10. R.E.S.S. applied and respected

Essential Health and Safety Requirements - R.E.S.S. applied and respected

1	Essential safety and protection of health	Compliance
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	Control systems	
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 failing 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	
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 temperature	
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	Maintenance of 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	Information	
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	

11. Warranties

The Seller gives its Customers a one-year warranty from the receipt of the Products, accessories, control devices and 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, sealings, 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 and Conditions shall apply to any repaired or replaced Products by the Seller.

12. 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.

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.

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 parts of the system are concerned, it is sufficient to subdivide the different materials for a correct recycling by casting.

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

Kungsbacka
Lifting Automation
+46 (0)300-185 00
eh.info@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)
Lifting Automation
+1 (0)905-881 16 33
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