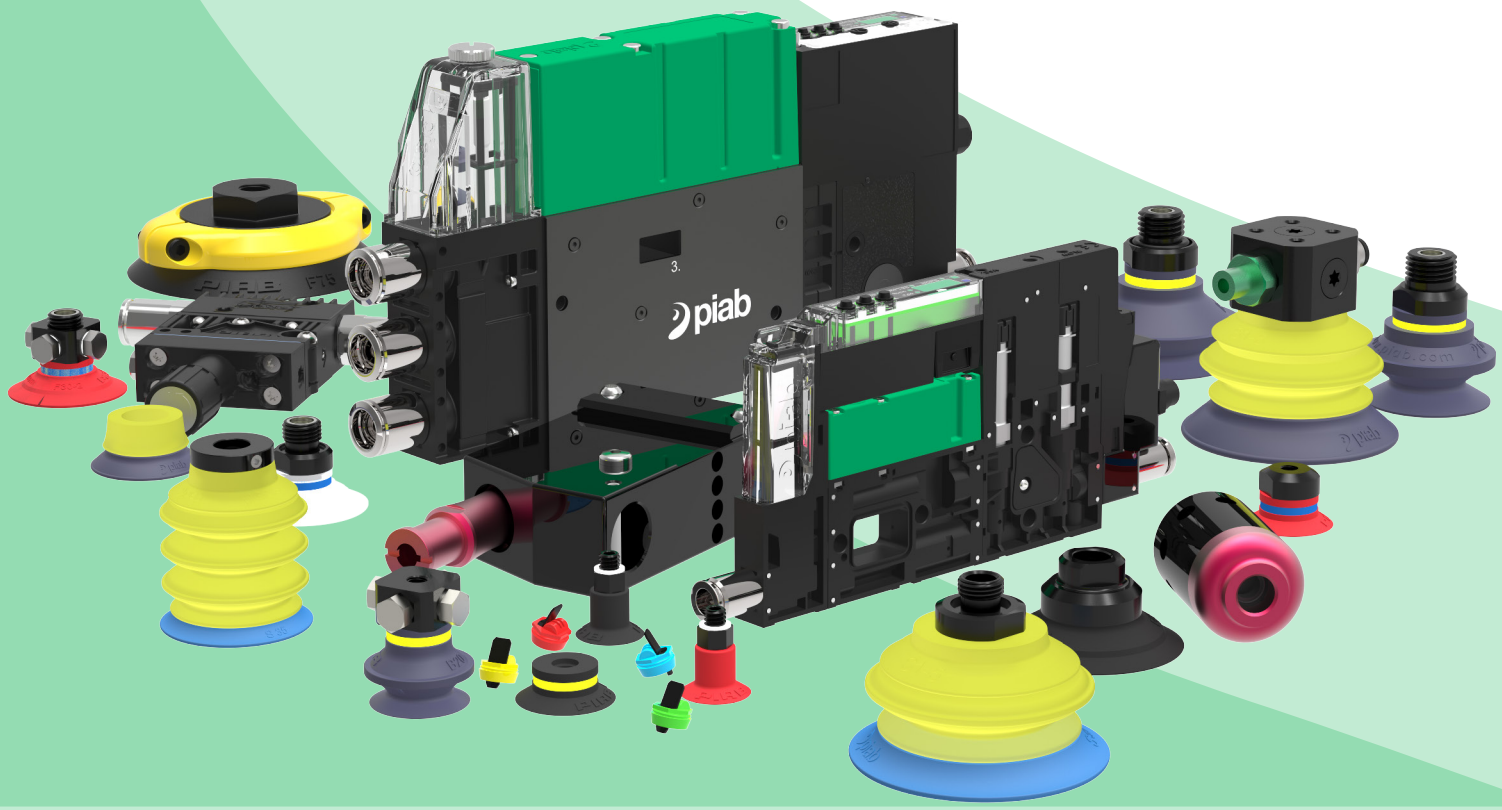
VACUUM AUTOMATION 5.0

Improve your productivity and energy efficiency



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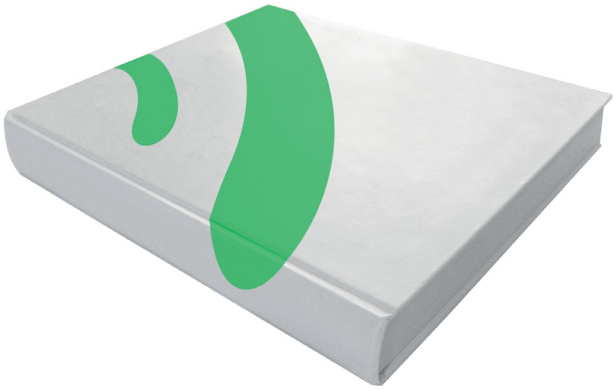
Our Mission

The Piab mission is to increase productivity for industrial customers and provide energy saving solutions by promoting our superior technology universally.

Index

Piab Vacuum Academy



1951

In 1951, the company took its name from its first product, an innovative compass that simplified the work for designers and draftsmen. Pi, π (=3.14) AB.

Piab Vacuum Academy

Introducing Piab

"The Piab mission is to increase productivity for industrial customers and provide energy saving solutions by promoting our superior technology universally."

Giving you the best solution possible

We share our knowledge and experience with our customers and offer the vacuum solution most suited to their particular situation, contributing to reduced energy consumption, increased productivity and improved working environment.

Through vacuum expertise and industry competence

Piab's groundbreaking work within vacuum technology is based on investments in R&D and experience working with a broad variety of manufacturing industries globally. Combining expertise with an understanding of many different industry settings enables us to provide customers with the best vacuum solutions on the market.

Past & Present

The history of Piab starts in 1951 when the inventive company was established. The first product, an innovative pair of compasses, gave Piab (π + AB) its name. In 1960, the first Piab vacuum product, the "Pneucette", was developed for the electronic industry. The foundation for today's compressed air driven vacuum system was laid in 1972 when the first multi-stage ejector was patented. Since then, Piab has continued to lead the way in the development of vacuum technology.

A powerful business partner

Piab's objective is to improve our customers' profitability and competitiveness. We strive to increase productivity, reinforcing their edge in the market. We also aim to contribute to our customers' reduced energy consumption and improve the work environment, aiding in their ability to attract and keep qualified personnel. Partnering with Piab means more than having a reliable vacuum solution supplier.

Technical leadership

We take pride in being the innovators in vacuum technology. Technical leadership means finding and developing solutions that have not yet been found. Our customers should feel confident in knowing that their relationship with us will keep them on the cutting edge.

Local presence and global competence

Being the global leader means designing, building and installing vacuum solutions in every corner of the world. Therefore, Piab has a worldwide organization with subsidiaries and distributors in more than 50 countries.

Contributing to a sustainable world

We believe strongly in taking responsibility for our shared environment. Therefore, we have developed an ambitious Environmental Policy and implemented an ISO 14001 certified Eco Management System. In addition, we always look for the most environmentally-friendly means of transportation for our products, and encourage our suppliers to research and develop materials that allow for sound manufacture, function and recycling. For our customers, our vacuum solutions are in themselves a mean to reduce energy and hence contribute to a better environment.

Piab focuses on developing systems that consume minimal energy and have minimal environmental impact, reducing the user's carbon footprint. Performance is never sacrificed, so productivity is consistently maximized. Contact Piab for information about our Energy Saving Innovations that will increase your productivity.

piab

COAX® technology

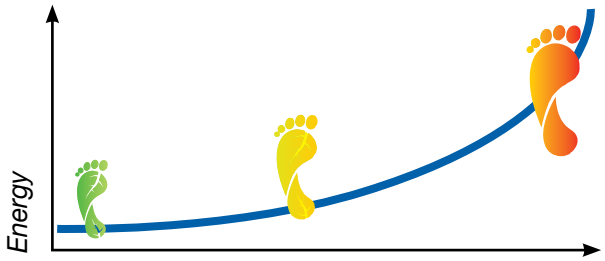
COAX® is an advanced solution for creating vacuum with compressed air. Based on Piab's multi-stage technology, COAX® cartridges are smaller, more efficient and more reliable than conventional ejectors, which allows for the design of a flexible, modular and efficient vacuum system.

A vacuum system based on COAX® technology can provide you with three times more vacuum flow than conventional systems, allowing you to increase speed with high reliability, while reducing energy consumption.

Environmental index

At the basis of the highest performing, energy-efficient production process is an optimised handling solution. By never using more energy than absolutely necessary, companies can reduce their carbon footprint as well as their costs. From the vacuum pump itself down to each and every control accessory, Piab can work with you to achieve the lowest possible energy consumption.

Your pump will require less compressed air when it is placed close to the point of suction, thus reducing CO_2-emissions and energy consumption. The graph below demonstrates the relationship between environmental impact and the distance of the pump from the point of suction.

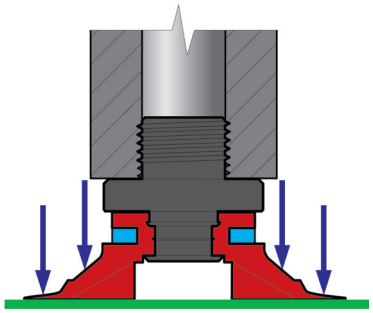


Vacuum theory

What is vacuum?

When using the terms "vacuum", "negative pressure", "suction", etc., we mean a pressure that is lower than the atmospheric pressure, which is the pressure of the weight of the air above us. At sea level it is usually 1,013 mbar = 101.3 kPa. 1 Pa equals 1 N/m^2 which means that a column of air with a cross-sectional area of 1 m^2 presses on the surface of the earth with a force of around 100,000 N. By reducing the pressure in a closed space the atmospheric pressure becomes a potential energy source.

A vacuum cleaner does not suck. Air and dust are pressed into the vacuum cleaner by the surrounding higher atmospheric pressure.

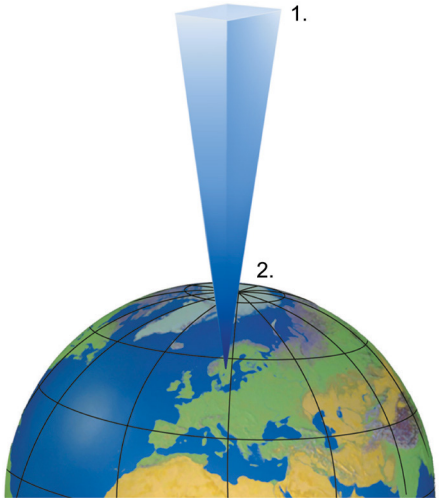


A suction cup adheres to a surface by the surrounding higher pressure.

Altitude above sea level

As the atmospheric pressure is the working force, the force will consequently change with the atmospheric pressure. This means that the present barometric pressure and the altitude above sea level must be taken into consideration. Up to 2,000 m, the pressure is reduced by around 1% per 100 m. An application which is dimensioned to hold 100 kg at sea level, can manage only 89 kg at an altitude of 1,000 m.

The chapter "Tables" shows the effect of the atmospheric pressure on the vacuum level.



1. Atmospheric pressure = 0 at an altitude of 1,000 km.
2. 1 bar (101.3 kPa) at sea level.

At the summit of Mount Everest (8,848 m) the atmospheric pressure is approximately 330 mbar (33 kPa).

A definition for vacuum is:

”A room without matter”. In everyday language; ”Air-free or almost air-free space”.

Source: Nationalencyklopedin, Bra Böcker, Höganäs, Sweden.

Expressions and units

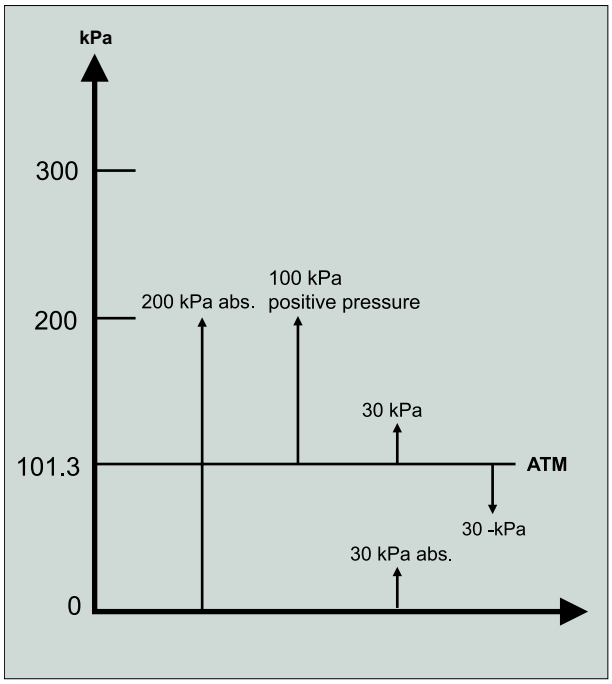
In everyday speech there are many different expressions and units for pressure below the atmospheric pressure. It is therefore important to relate to the same vocabulary in discussions. The adjoining table shows some common expressions and units used in connection with vacuum. For conversion tables between the different units, see tables No. 1, 2 and 3 in the “Tables” chapter.

Expressions
Under pressure
Absolute pressure
% vacuum (% of vacuum)
Negative pressure

Units	
-inHg	bar
-kPa	mm H_2O
mmHg	torr
hPa	mbar

Different terms for pressure in relation to ”absolute vacuum”

Physically there is only one kind of ”pressure” and that is the one that starts from ”0” or absolute vacuum. All above ”0” is pressure and correctly named absolute pressure. Normal atmospheric pressure (101.3 kPa is used as a reference, which is why the terms “positive pressure” or “negative pressure” are used. Earlier the term “% vacuum” was used, where 0% was atmospheric pressure and 100% absolute vacuum. Consequently, in industry -kPa is the unit used most often since it nearly corresponds to “% vacuum”. In the chemical branch of industry, and in deep vacuum, mbar is generally used. Thus, it is very important to be clear about which unit and reference point is meant. In this catalogue, -kPa is generally used (as in industry), and for laboratory pumps, mbar absolute is specifically used.



This diagram shows the relation between absolute, negative and positive pressures. It also illustrates the problem that may occur if the pressure is not clearly specified. 30 kPa can ”carelessly spoken” imply three different values.

Applied vacuum can normally be divided into three main categories

Blowers or low vacuum	0–20 -kPa	For ventilation, cooling, vacuum cleaning, ...
Industrial vacuum	20-99 -kPa	For picking, holding, automation, ...
Process vacuum	99 -kPa +	Deep vacuum for laboratories, manufacturing of microchips, plating, ...

Energy needs for different vacuum levels

The energy required to create vacuum increases asymptotically towards infinity with increased vacuum. To obtain optimum energy exchange it is very important to choose the least possible vacuum. To illustrate the energy needs, a cylinder with a piston (piston pump) is suitable.

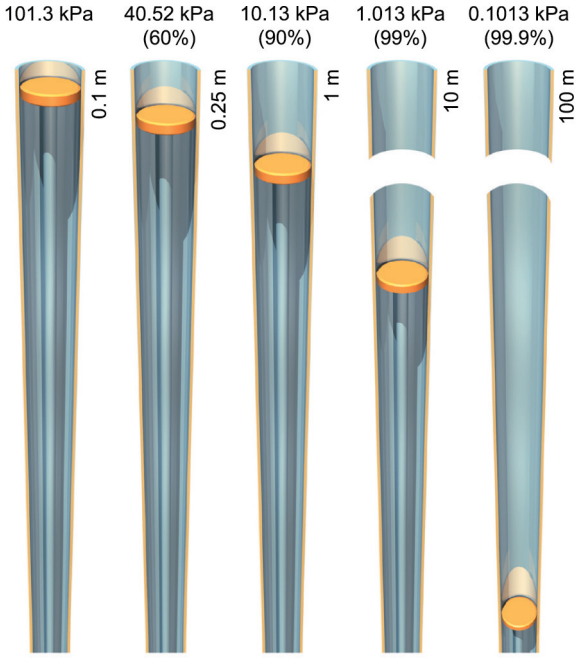
According to Boyle's Law the pressure (p) in a gas is inversely proportional to its volume (V) at constant temperature:
$P_1 \times V_1 = P_2 \times V_2$

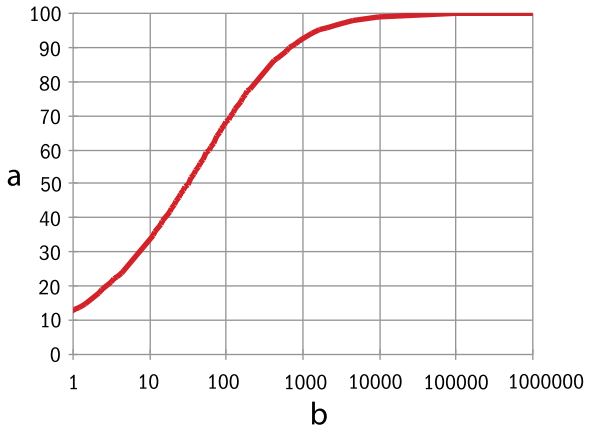
This means that increased volume gives a lower pressure.

By pulling the piston slowly, the distance extended will show the increased energy needs. The temperature is not constant in practice. However, at a slow operation the temperature effect is negligible.

Energy requirement at increased vacuum

The diagram illustrates the energy requirement at increased vacuum. As can be seen, the energy requirement increases drastically above 90 -kPa, which is why a vacuum level below this is always advisable.



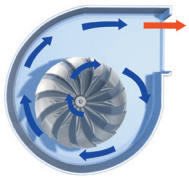
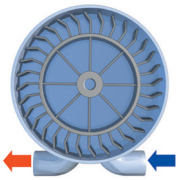


a) Pressure below atmospheric -kPa.
b) Energy factor.

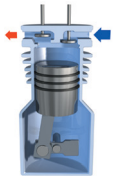
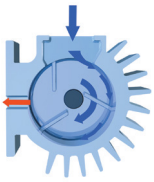
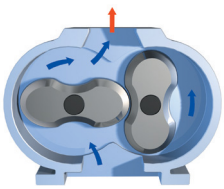
Vacuum pumps

Mechanical pumps

The main principle for all mechanical pumps is that they convey, in one way or another, a certain volume of air from the suction side (the vacuum side) to the exhaust side. In that way they create a vacuum. Mechanical pumps usually have an electric motor as power source, but it can also be an internal combustion engine, a hydraulic or a compressed air-driven pump.

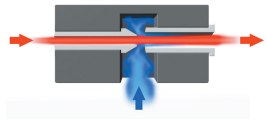
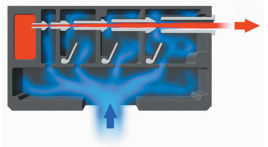
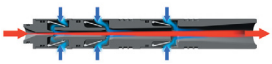
Fans		Advantages	Disadvantages
	Centrifugal blower	Few moving parts Large suction volumes Strong	Low maximum vacuum Slow start-up and long stop time High noise level
	Regenerative blower	Few moving parts Large suction volumes Low energy consumption	Low maximum vacuum Slow start-up and long stop time High noise level

Displacement pumps

Displacement pumps		Advantages	Disadvantages
	Piston pump	Relatively low price	High heat emission Low maximum vacuum
	Membrane pump	Few moving parts Compact Low price	Small suction volumes
	Vane pump	High vacuum and flow Relatively low noise level	Sensitive to contamination Relatively high price High service requirements High heat emission
	Roots pump	High flow Low service requirements	High price High heat emission High noise level

Compressed air-driven ejector pumps

All ejector pumps are driven with pressurised gas, usually compressed air. The compressed air flows into the ejector pump, where it expands in one or more ejector nozzles. When expanding, the stored energy (pressure and heat) is converted into motive energy. The speed of the compressed air jet increases rapidly, while the pressure and the temperature go down, attracting more air and thereby creating a vacuum on the suction side. Some ejector pumps may also be used to blow air.

Compressed air-driven ejector pumps		Advantages	Disadvantages
	Single-stage ejector	Low price No heat emission Compact	High noise level Gives either high flow or high vacuum Poor efficiency
	Multi-stage ejector	High efficiency Low energy consumption High reliability Low noise level No heat emission	
	COAX® technology	High efficiency Low energy consumption High reliability Low noise level No heat emission Operates even at low feed pressure Integrated features Modularly built Easy to supplement and upgrade later on Easy to clean	

Vacuum flow, how is it measured?

In order to obtain pressure lower than atmospheric pressure in a container, some of the air mass must be removed by a vacuum pump. For example, half the air mass must be removed to obtain a vacuum level of 50 -kPa. The air evacuated by the pump per unit of time is called the vacuum flow and is a measure of how quickly the pump can perform this function.

Many manufacturers of mechanical vacuum pumps state vacuum flow in terms of the pump's displacement volume. This flow is called "displacement flow" or "volume flow". Displacement flow equals the chamber volume times the number of revolutions per unit time. In mechanical pumps, this value is constant and can lead the observer to think, incorrectly, that the vacuum flow is constant during the entire evacuation process.

In the evacuation process the air actually becomes thinner and thinner for every stroke of the cylinder until the pump reaches the maximum vacuum level which is that point where the vacuum flow would then be zero. The pump is still pumping the same volume flow but the air mass is so thin that compared to air at normal atmospheric pressure it is as if there was no air.

To account for the change in air mass during the evacuation process Piab provides flow data in terms of normal litre per second (Nl/s). Also called free air flow, this method normalizes the flow to standard atmospheric conditions. As the vacuum becomes deeper and the air is thinner, a higher actual volume must be displaced to evacuate each normal litre. The table below lists one pump's performance in terms of displacement flow (l/s) and free air flow (Nl/s). At zero vacuum, the flows are equal. This is because the actual conditions are in fact standard conditions. But as the vacuum level increases, the values diverge. At 50 -kPa (50%) vacuum, the displacement flow figure is twice the free air flow figure. At deeper vacuum levels, the difference is even greater.

Displacement flow vs free air flow

		Vacuum level -kPa									
	Units	0	10	20	30	40	50	60	70	80	90
Displacement flow	l/s	10	10	10	10	10	10	10	10	10	10
	m^3/h	36	36	36	36	36	36	36	36	36	36
Free air flow	Nl/s	10	9	8	7	6	5	4	3	2	1
	Nm^3/h	36	32.4	28.8	25.2	21.6	18	14.4	10.8	7.2	3.6

Vacuum systems

When making a vacuum system/lifting device there are several different methods to increase safety and reliability. To give efficient operation and good economy it is important that the designed system is made for a specific application. In addition to the choice of suction cups with attachments, the type and size of vacuum pumps, accessories, safety level and type of system must also be decided upon.

Sealed systems

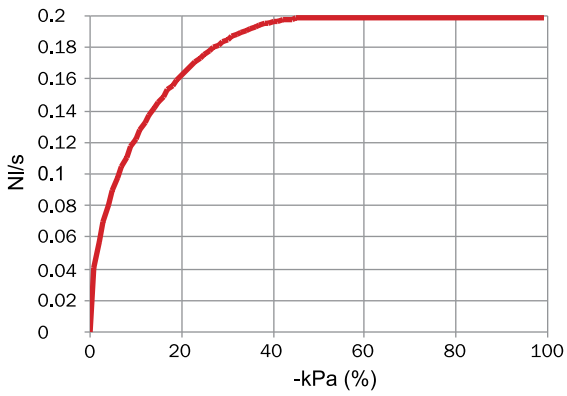
For sealed systems the capacity of the pump is determined by how fast the system can be evacuated to a certain vacuum level. This capacity is called the evacuation time of the pump and is normally specified in s/l. This value is multiplied by the volume of the system in order to obtain the evacuation time to the desired vacuum level.

Non-sealed systems

With non-sealed systems (lifting of porous materials) the case is different. To maintain the desired vacuum level the pump must have the capacity to pump away the air leaking in. Leakage can be due to, for example, porous material or that one is forced to lift over holes. By establishing the leaking flow, it is possible, by reading the pump data, to find the right pump for the application in question.

If the leakage occurs via a known aperture, the flow can be established according to the adjoining diagram. The diagram gives values for leakage flow when the leakage area is known. The leakage flow is valid when there is an opening of 1 mm^2 (normal atmospheric pressure at sea level). To obtain the total flow, the value is multiplied by the total leakage area.

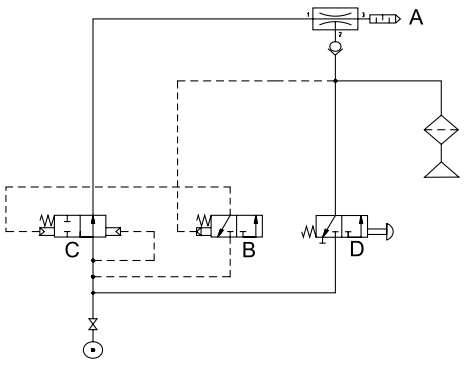
When the leakage occurs through a porous material or in an unknown way, the flow can be established by a test with a vacuum pump. The pump is connected to the system and the obtained vacuum level is read. (It should be at least 20 -kPa.) The flow that is pumped away at this vacuum level can be seen on the page of the particular pump. This flow roughly corresponds to the leaking flow.



At 47 -kPa the air reaches sonic velocity, and consequently the flow is constant.

Energy-saving systems

Electrically driven, mechanical vacuum pumps normally work during the whole operating cycle and the vacuum requirements are controlled by a valve on the vacuum side. In systems with compressed air-driven vacuum pumps it is often possible to save a lot of energy. As these pumps have a faster reaction time (fast start-up and stop time) the pump can be shut off when the vacuum is no longer needed. The principles of a simple energy-saving system are shown to the right. Many pumps can be delivered with an energy-saving system as standard.



A = Vacuum pump with non-return valve.
B = Vacuum control unit.
C = Feed valve for compressed air.
D = Release valve.

Vacuum system calculations

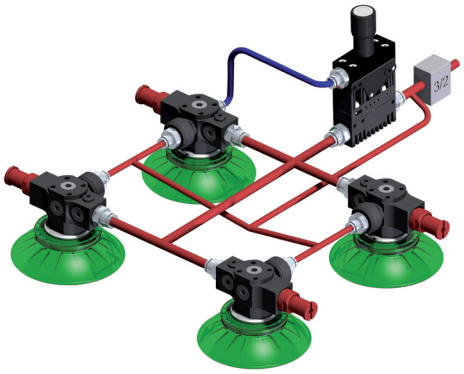
General input

Vacuum systems for material handling can be decentralized or centralized. A decentralized vacuum system is designed so that each suction cup has a dedicated, independent vacuum source. A centralized vacuum system is designed to have one vacuum source for multiple suction cups. Handling sheet metal is an example of a sealed system and handling cardboard is an example of a leaking system.

Those examples are calculated using the following general facts:

Initial flow required are for the sealed system examples is 0.7 Nl/s per suction cup FC75P, and the corresponding value is 1.2 Nl/s for the leaking system examples using the suction cup BX75P. CO_2-emission, world index: 0.019 kg CO_2 per produced m3 of compressed air and 0.19 kg CO_2 per kWh. Machine operating hours per year: 3.000 h.

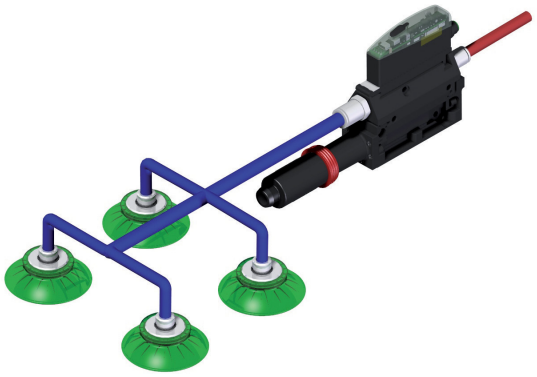
Sealed system/Handling non-porous material



System description:

Decentralized vacuum system using: Vacuum Gripper System VGS™3010 with suction cup FC75P and COAX® cartridge Xi10 2-stage vacuum pump with non return valve, AQR Atmospheric Quick Release, Vacustat and 3/2 on/off-valve.

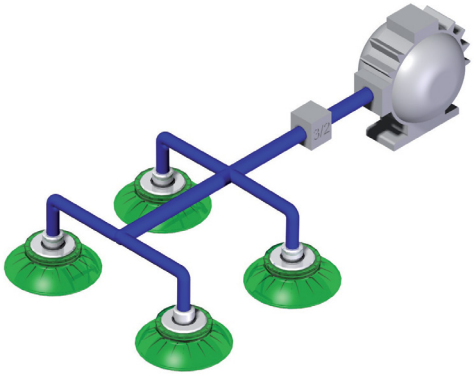
Annual Cost of Ownership: 188 €
Annual CO_2 emission: 13 kg
Annual energy usage: 17 kWh



System description:

Centralized vacuum system using: P5010 with AVM™ – Automatic Vacuum Management control, COAX® cartridge Xi40 3-stage vacuum pump with non return valve and suction cup FC75P.

Annual Cost of Ownership: 301 €
Annual CO_2 emission: 171 kg
Annual energy usage: 900 kWh



System description:

Centralized vacuum system using: 550W Electro mechanical vacuum pump with suction cup FC75P and vacuum on/off-valve.

Annual Cost of Ownership: 722 €
Annual CO_2 emission: 443 kg
Annual energy usage: 1656 kWh

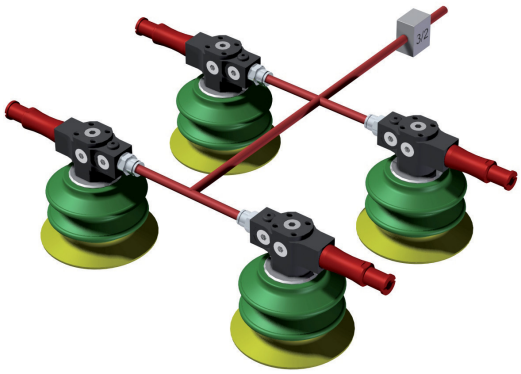
- Electric vane vacuum pumps are constantly running.
- Energy cost: 1.5 Euro-cent per produced 1 m^3 compressed air and 12 Euro-cent per kWh.
- Annual Cost of Ownership, including: energy costs, purchase price, annual cost, service and CO_2-emission tax 0.025 Euro per kg. Suction cups excluded.
- Capital interest rate: 5%.
- Pump life time: 5 years.

Red tubing = Compressed air
Blue tubing = Vacuum

Calculating carbon footprint:

Based on the world average of power generation, 1 Nl of compressed air will result in a 19 mg CO_2 emission footprint. To calculate your specific footprint, just multiply your air consumption (Nl/s) by 19. The result is your CO_2 emission footprint per second.

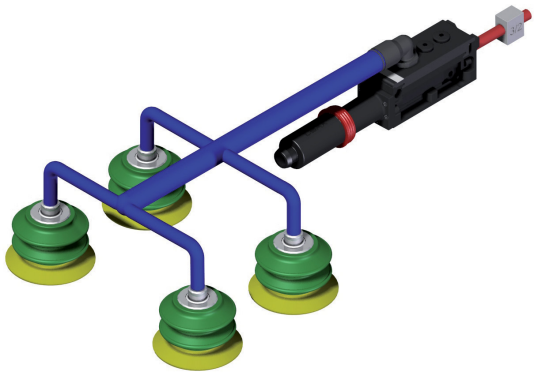
Leaking System/Handling porous material



System description:

Decentralized vacuum system using: Vacuum Gripper System VGS™3010 with suction cup BX75P and COAX® cartridge Si08 3-stage vacuum pump and 3/2 on/off-valve.

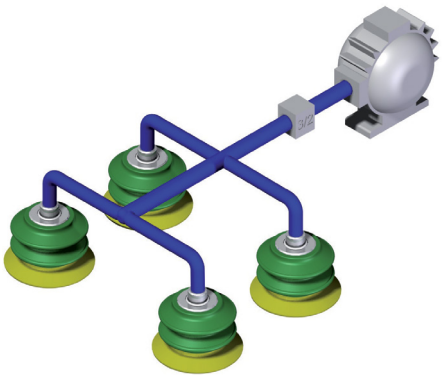
Annual Cost of Ownership: 249 €
Annual CO_2 emission: 145 kg
Annual energy usage: 762 kWh



System description:

Centralized vacuum system using: P5010 with COAX® cartridge Si32 3-stage vacuum pump, suction cup BX75P and 3/2 on/off valve.

Annual Cost of Ownership: 227 €
Annual CO_2 emission: 203 kg
Annual energy usage: 1067 kWh



System description:

Centralized vacuum system using: 750 W Electro mechanical vacuum pump with suction cup BX75P and vacuum on/off-valve.

Annual Cost of Ownership: 808 €
Annual CO_2 emission: 429 kg
Annual energy emission: 2258 kWh

Optimizing controls

Aside from placing the pump close to the point of suction, it is important to complete and optimize your vacuum system with control accessories that will limit the use of compressed air to the amount that the system requires. This way, you will have an efficient vacuum system with minimum usage of compressed air. Piab has a range of optimizing controls and this selection guide will help you to choose the one(s) optimal for your system.

Regulators

Energy saving can be achieved in many ways, but the most simple way is by using a pressure regulator to control your pump's optimum feed pressure.

piSAVE release

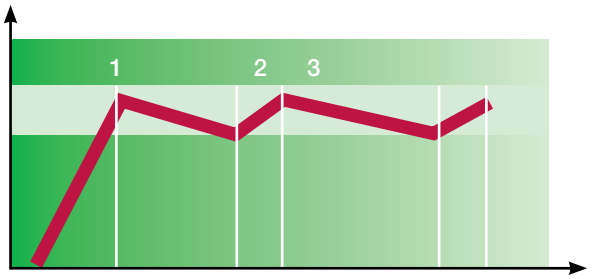
Instead of using compressed air to release objects you can use piSAVE release to provide a fast release. The piSAVE release is a valve that breaks vacuum seal in e.g. suction cups by equalizing pressure with atmospheric air and at the same time does not consume additional compressed air.

piSAVE optimize

The piSAVE optimize automatically regulates the feed pressure towards an optimal programmed vacuum level. Fluctuations in vacuum pressure caused by product variations or changes in cycle time allow the pump to only consume the amount of air that the optimized vacuum level requires.

piSAVE onoff

When handling sealed objects many times the vacuum pump can be turned off when not needed. The piSAVE onoff is a vacuum-controlled valve that shuts off the flow of compressed air to the pump when the pre-set vacuum level is reached (1). From micro leakage in the system, the vacuum level drops, and after a while the start-up level of the valve is reached (2). At this point, the pump will start and work until the shut-off level is reached again (3) etc.



AVM™ – Automatic vacuum management

Like the piSAVE onoff the AVM™ instantly shuts off the flow of compressed air when the preprogrammed vacuum level is reached and turns on again when the start-up level of the valve is reached. The AVM™ not only saves energy it also features a complete monitoring system with on/off valves and vacuum switches.

Contact Piab for information about our products that will increase your productivity and provide for energy savings.

Suction cups

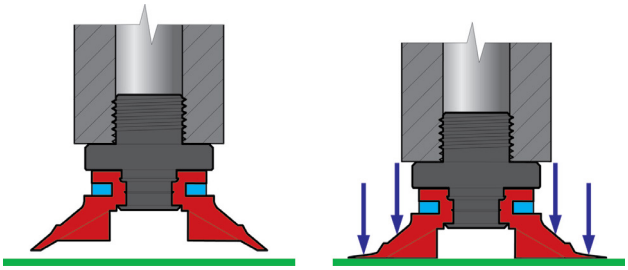
How does a suction cup work?

A suction cup adheres to a surface as the surrounding pressure (atmospheric pressure) is higher than the pressure between the suction cup and the surface. To create the low pressure in the suction cup it is connected to a vacuum pump. The lower the pressure (higher vacuum), the greater the force on the suction cup.

$$\Delta p = P_{AT} - P_1$$

Sizing suction cups

Suction cups have quite different capacities depending on the design. Please see the values in the tables for each respective suction cup.



Advantages and limitations of the suction cup

Material handling with suction cups is a simple, inexpensive and reliable technique. It is therefore a solution worth considering before going over to more complicated methods. Suction cups can lift, move and hold objects that weigh just a few grams up to several hundred kilograms.

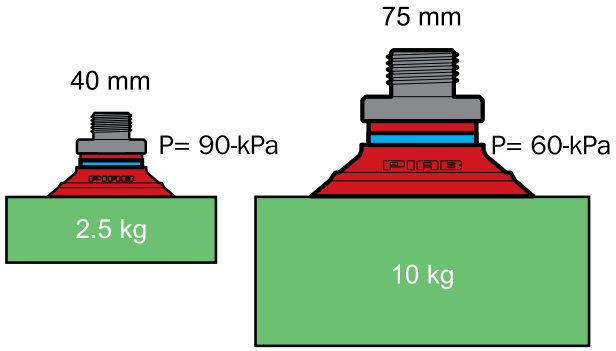
Advantages	Limitations
Easy installation	Limited force (atmospheric pressure)
Low service requirements	Positioning accuracy
Low price	
Does not damage the material handled	
Quick attachment and detachment	

Energy requirements at different vacuum levels

A deep vacuum means that the suction cup has to work harder and thus wears out quicker; also the energy requirements increase at higher vacuum levels. If the vacuum level increases from 60 to 90 -kPa, the lifting force increases by 1.5 times but with ten times the energy requirement. It is better to maintain a lower vacuum level and instead increase the suction cup area. In many applications, a good target for the vacuum level could be 60 -kPa; at this level you get a high lifting force with relatively low energy requirements.

Consider the height above sea level

Atmospheric pressure decreases with increased height. This means that the available force decreases at the same rate. An application designed for lifting 100 kg at sea level, can only manage to hold 89 kg at 1,000 metres. A vacuum gauge is normally calibrated with atmospheric pressure as a reference. This means that the gauge shows available vacuum levels at different heights



Lifting force in different directions

A suction cup can be used irrespective of whether the force is perpendicular or parallel to the surface. If the force is parallel, it is transferred through friction between the suction cup and the surface. A suction cup with cleats is most suitable in this case because it is rigid and provides high friction.

Thread systems

ISO thread:

- Cylindrical metric thread: designated with the letter M. Example M5.
- Cylindrical inch thread (also called Unified thread): designated with the letter UNF. Example 10-32UNF.

Dry seal thread (American system of pipe threads):

The dry seal system consists of cylindrical and conical pipe-threads. The threads have a 60° profile angle and are sealed without packing or seal rings (please note that when these are used in other combination of thread systems, that "sealing" is not applicable). The dimensions are given in inches and Piab´s catalog uses the letters NPT and NPSF:

- Conical thread is designated NPT. Example: 1/8"NPT.
- Cylindrical thread is noted as the letters NPSF: Example: 1/8"NPSF.

BSP thread (British system of pipe threads):

- The threads have a 55° profile angle and are dimensioned in inches.
- Cylindrical thread is designated with the letter G. Example: G1/8".

Compatibility of different thread systems

Please note that some thread size in different thread systems not always fit. See below table:

	M5 male	M5 female	G1/8" male	G1/8" female	G1/4" male	G1/4" female	G3/8" male	G3/8" female	G1/2" male	G1/2" female	G3/4" male	G3/4" female	G1" male	G1" female	G2" male	G2" female
10-32UNF female or male	●●	●●●														
1/8" NPSF female			●●●													
1/8"NPT female or male			●	●●												
1/4"NPSF female					●●											
1/4"NPT female or male					●	●										
3/8"NPSF female							●									
3/8"NPT female or male							●	●								
1/2"NPSF female									●●							
1/2"NPT female or male									●	●●●						
3/4'NPSF female											●●					
3/4"NPT female or male											●	●●●				
1"NPT female or male													●	●		
2"NPT female or male															●	●

●●● Fits, ●● Fits with short thread, ● Does not fit.

Tables

In everyday speech, many different expressions and units are used for both pressure and flow. It is important to agree on what is meant by them.

Pressure

P=F/A (Force/Area).
SI unit (Système International d'Unités): Pascal (Pa). 1 Pa = 1 N/m^2.
Common multiple units: MPa and kPa.

Pa (N/m^2)	bar	atm (kp/cm^2)	torr*	psi (lb/in^2)
1	0.00001	$10.1972x10^{-6}$	$7.50062x10^{-3}$	$0.145038x10^{-3}$
100 000	1	1.01972	750.062	14.5038
98 066.5	0.980665	1	735.559	14.2233
133.322	$1.33322x10^{-3}$	$1.35951x10^{-3}$	1	$19.3368x10^{-3}$
6 894.76	$68.9476x10^{-3}$	$0.145038x10^{-3}$	51.7149	1

* 1 torr = 1 mmHg à 0 °C, 1 mm column of water = 9.81 Pa.

Pressure above atmospheric

kPa	bar	psi	atm (kp/cm^2)
1013	10.13	146.9	10.3
1000	10	145	10.2
900	9	130.5	9.2
800	8	116	8.2
700	7	101.5	7.1
600	6	87	6.1
500	5	72.5	5.1
400	4	58	4.1
300	3	43.5	3.1
200	2	29	2
100	1	14.5	1
0	0	0	0

Pressure below atmospheric

	kPa	mbar	torr	-kPa	-mmHg	-inHg	% vacuum
Sea level	101.3	1013	760	0	0	0	0
	90	900	675	10	75	3	10
	80	800	600	20	150	6	20
	70	700	525	30	225	9	30
	60	600	450	40	300	12	40
	50	500	375	50	375	15	50
	40	400	300	60	450	18	60
	30	300	225	70	525	21	70
	20	200	150	80	600	24	80
	10	100	75	90	675	27	90
Absolute vacuum	0	0	0	101.3	760	30	100

Change in atmospheric pressure in relation to altitude (height above sea level)

A vacuum gauge is normally calibrated with normal atmospheric pressure at sea level as a reference, 1013.25 mbar, and is influenced by the surrounding atmospheric pressure in accordance with the table below. The vacuum gauge shows the differential pressure between atmospheric pressure and absolute pressure. This means that the gauge shows what vacuum level is available at different heights.

Atmospheric pressure

Barometric pressure			The reading on the vacuum gauge at 1013.25 mbar				
mmHg	mbar	Equiv. m above sea level*	60 -kPa	75 -kPa	85 -kPa	90 -kPa	99 -kPa
593	790.6	2000	37.7	52.7	62.7	67.7	76.7
671	894.6	1000	48.1	63.1	73.1	78.1	87.1
690	919.9	778	50.7	65.7	75.7	80.7	89.7
700	933.3	655	52.0	67.0	77.0	82.0	91.0
710	946.6	545	53.3	68.3	78.3	83.3	92.3
720	959.9	467	54.7	69.7	79.7	84.7	93.7
730	973.3	275	56.0	71.0	81.0	86.0	95.0
740	986.6	200	57.3	72.3	82.3	87.3	96.3
750	999.9	111	58.7	73.7	83.7	88.7	97.7
760	1013.25	0	60.0	75.0	85.0	90.0	99.0

* At normal barometric pressure.

Flows

Flows, volume per unit of time. Quantity designations: Q, q, = V/t (volume/time).
SI Unit: cubic meters per second (m^3/s).
Common multiple units: l/min, l/s, m^3/h.

m^3/s	m^3/h	l/min	l/s	ft^3/min (cfm)*
1	3600	60000	1000	2118.9
$0.28x10^{-3}$	1	16.6667	0.2778	0.5885
$16.67x10^{-6}$	0.06	1	0.0167	0.035
$1x10^{-3}$	3.6	60	1	2.1189
$0.472x10^{-3}$	1.6992	28.32	0.4720	1

* 1 ft » 0.305 m.

Leakage flows

The table below shows the leakage flow at different vacuum levels through an opening of 1 mm^2.

Vacuum level -kPa	Leakage flow l/s and mm^2
10	0.11
20	0.17
30	0.18
40	0.2*

* From about 47 to 100 -kPa the flow is constant.

Pressure drop in compressed air hoses

When installing compressed air hoses it is important that the dimension (diameter) and length do not lead to excessive pressure drops. Piab vacuum pumps are supplied with recommended hose dimensions that will not cause excessive pressure drops at lengths below 2 m.

In cases when the pressure drop has to be calculated, the formula below can be used.

ΔP	=	Pressure drop in kPa
qv	=	Flow in m^3/s
d	=	Inner diameter in mm.
L	=	Length of compressed air hoses in m
P1	=	Absolute starting pressure in kPa

$$\Delta P = \frac{6.82 \times 10^{-4} \times qv^{1.85} \times L}{d^5 \times P1}$$

$$d = \left(\frac{6.82 \times 10^{-4} \times qv^{1.85} \times L}{\Delta P \times P1}\right)^{0.2}$$

Material

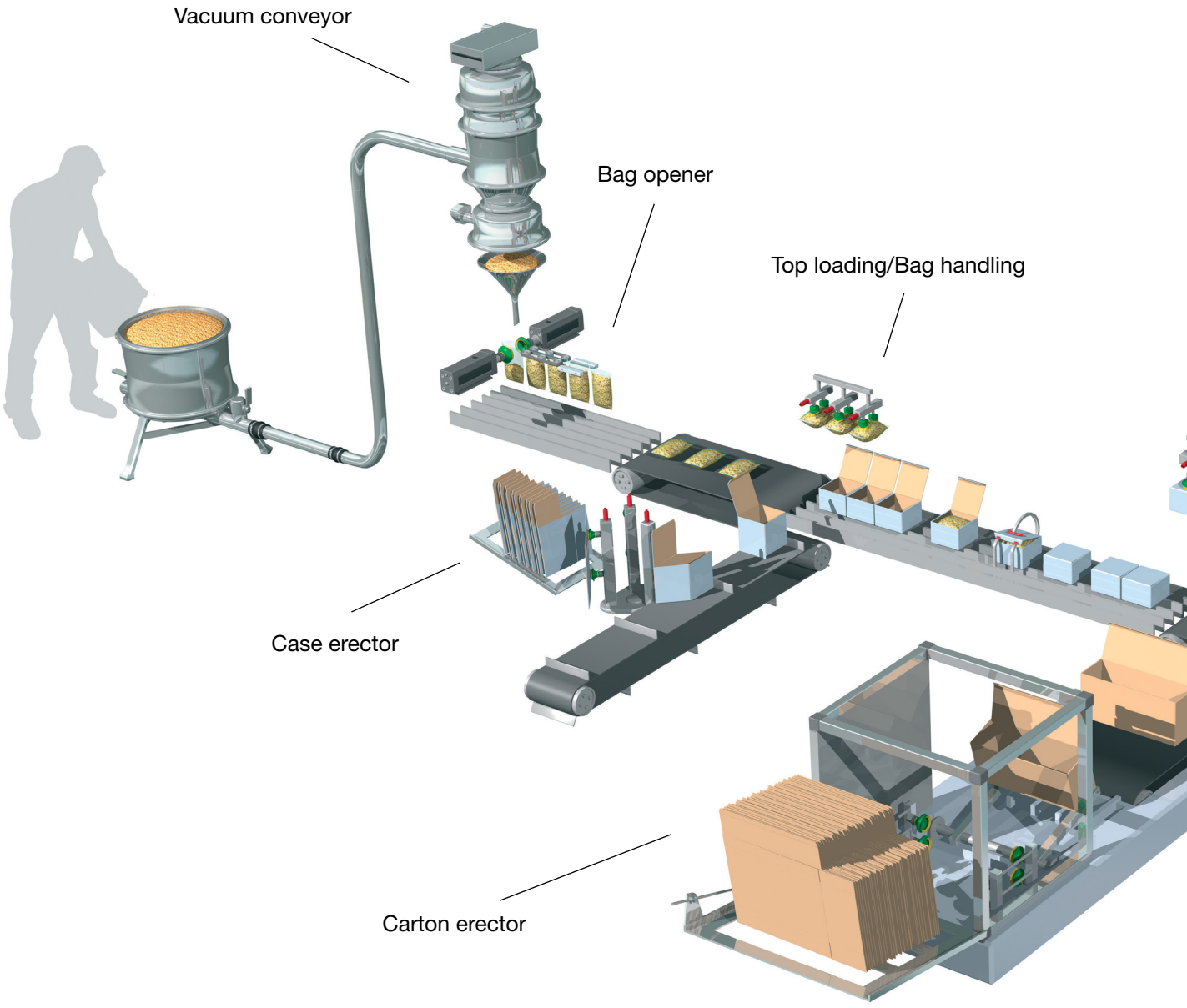
Name	Color	Hardness, Shore A°	Temperature, °C
Chloroprene (CR)	Black	50	-40–110
Conductive Silicone (CSIL)	Black	50	-55–230
Ethylene Propylene (EPDM)	Black	50	-40–120
HNBR	Blue	50	-30–140
Nitrile (NBR)	Black	50	-20–100
Nitrile-PVC (NPV)	Black	50	0–90
Polyurethane (PU30)	Yellow	30	10–50
Polyurethane (PU40)	Red transparent	40	10–50
Polyurethane (PU50)	Blue transparent	50	10–50
Polyurethane (PU55)	Orange	55	10–50
Polyurethane (PU60)	Green transparent	60	10–50
Polyurethane (PU70)	Black	70	10–50
Silicone (SIL)	Red	50	-40–200
Silicone (SIL)	White	30	-40–200
Silicone (SIL FDA)	Transparent	50	-40–200
Silicone (SIL FDA detectable)	Blue	40	-40–200
Silicone (SIL FDA detectable)	Transparent	40	-40–200
Thermoplastic Polyurethane (TPE-U)	White transparent	81	-20–80

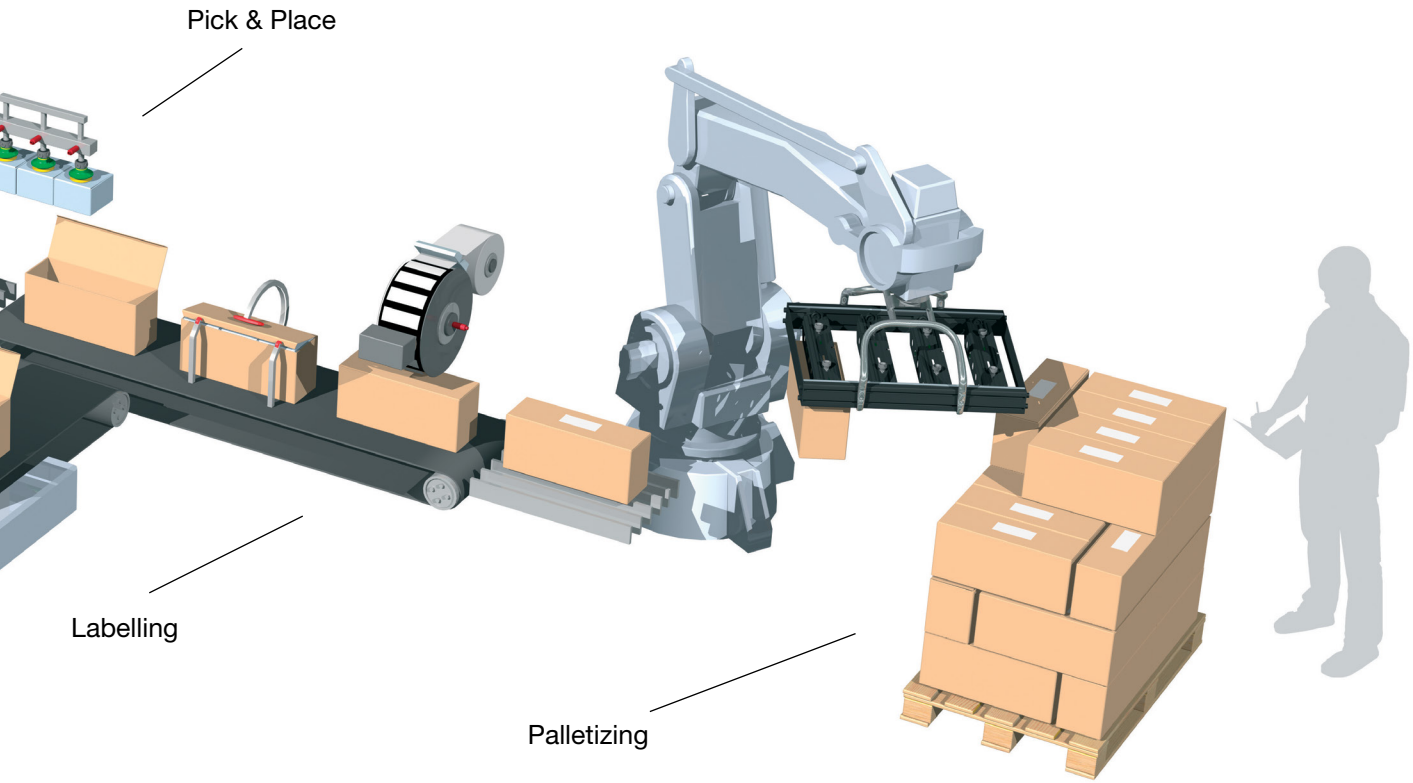
Material resistance

Name	Wear resistance	Oil	Weather and ozone	Hydrolysis	Gasoline	Concentrated acids	Alcohol	Oxidation
Chloroprene (CR)	●●●●	●●	●●●	●●●	●●	●	●●●	●●●
Conductive Silicone (CSIL)	●●●	●	●●●●	●●	●	●	●●●	●●●●
Ethylene Propylene (EPDM)	●●	●	●●●●	●●●	●	●	●●●●	●●●●
HNBR	●●●●	●●●●	●●●●	●●●	●●●●	●●	●●●	●●●●
Nitrile (NBR)	●●●●	●●●●	●●	●●●	●●●	●●	●●●	●●●
Nitrile-PVC (NPV)	●●●●	●●●●	●●●	●●●	●●●●	●●	●●●	●●●
Polyurethane (PU)	●●●●	●●●●	●●●●	●●	●●	●●	●●/●*	●
Silicone (SIL)	●●●	●	●●●●	●●	●	●	●●●	●●●●
Thermoplastic Polyurethane (TPE-U)	●●●●	●●●●	●●●●	●	●	●	●●●	●●●

●●●● Excellent, ●●● Good, ●● Fair, ● Poor, * Ethanol / methanol.

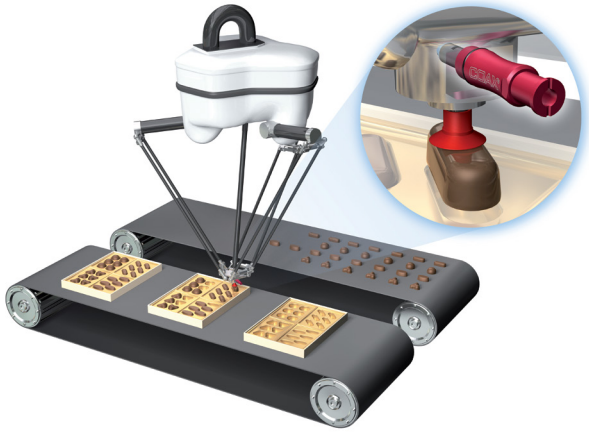
Applications and solutions



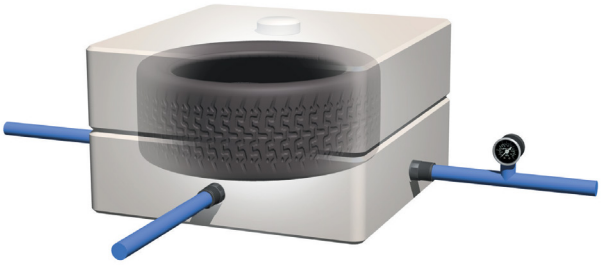

Pick & Place
Labelling
Palletizing

Applications and solutions

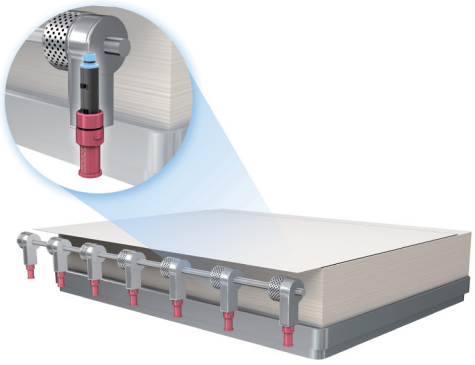
Injection molding



Pick-and-place



Vacuum molding tires



Sheet brake

Press to press transfer

Suction cups

piGRIP®

Thousands of suction cups ready to improve your machine

The piGRIP® is a unique configurable suction cup concept with individually optimized parts for gripping, lifting and height compensation. Also a large selection of fittings makes it ready to fit new machines and easy to retrofit existing cups. The fittings available are both threaded and push on fittings.

Fitting & Flow Restrictors

A large selection of fittings makes piGRIP® cups ready to fit new machines and easy to retrofit existing cups. Available are both threaded and push on fittings. There is also a fitting that has an ejector integrated, the COAX® in piGRIP® for creating a decentralized pump. piSAVE restrict and piSAVE sense are options that are suitable for handling different sized or a variable number of objects.

Filters

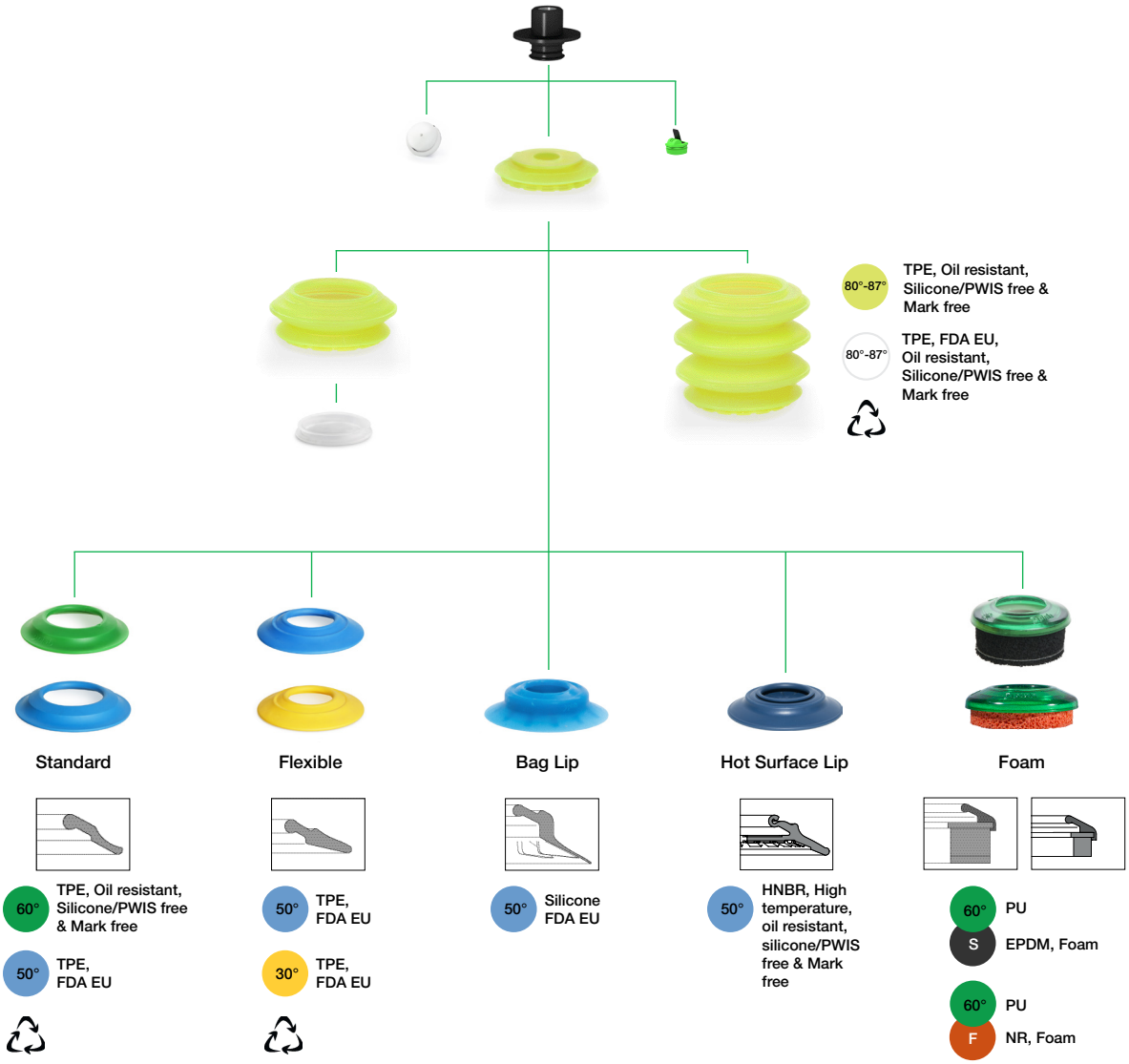
A low micron filter disc inside the bellows traps dust and particles increasing system reliability. A mesh filter is available in the fitting.

Bellows

Firm and Stable 1-, 3- and 6- folded bellows allows for faster machine speeds. Thin-wall design makes them faster to compress using less force and energy. The strength of the material increases lifting capacity between 30–50% compared to similar conventional cups. FDA-approved (EU 1935/2004) material available (transparent).

Lips

Get an excellent grip on almost anything with the right lip for your application. Choose standard lips from 60° shore to extremely flexible, soft lips in 30° shore.
Tailor-made Bag lips for handling bags and pouches. Foam lips for objects which are difficult to grip rough surfaces with traditional cups. High temperature lips are also available when so needed.


80°-87°
TPE, Oil resistant, Silicone/PWIS free & Mark free
80°-87°
TPE, FDA EU, Oil resistant, Silicone/PWIS free & Mark free
Standard
Flexible
Bag Lip
Hot Surface Lip
Foam
60°
TPE, Oil resistant, Silicone/PWIS free & Mark free
50°
TPE, FDA EU
50°
TPE, FDA EU
30°
TPE, FDA EU
50°
Silicone FDA EU
50°
HNBR, High temperature, oil resistant, silicone/PWIS free & Mark free
60°
PU
S
EPDM, Foam
60°
PU
F
NR, Foam

Product Group

piGRIP®

G

Lip

Dimension & Type		Material & Durometer	
S25	Ø 25 mm Standard lip	T60 T50	TPE 60° Shore A TPE 50° Shore A
S35	Ø 35 mm Standard lip		
S50	Ø 50 mm Standard lip		
S70	Ø 70 mm Standard lip		
FX28	Ø 28 mm Flexible lip	T50 T30	TPE 50° Shore A TPE 30° Shore A
FX39	Ø 39 mm Flexible lip		
FX55	Ø 55 mm Flexible lip		
FX77	Ø 77 mm Flexible lip		
FLI25S	Ø 25 mm Foam lip	S	Foam EPDM (soft)
FLI35S	Ø 35 mm Foam lip		
FLI50S	Ø 50 mm Foam lip		
FLI70S	Ø 70 mm Foam lip		
FLI25F	Ø 25 mm Foam lip	F	Foam NR (firm)
FLI35F	Ø 35 mm Foam lip		
FLI50F	Ø 50 mm Foam lip		
FLI70F	Ø 70 mm Foam lip		
BGI25	Ø 25 mm Bag lip with retainer	S50	Silicone 50° Shore A
BGI34	Ø 34 mm Bag lip with retainer		
BGI41	Ø 41 mm Bag lip with retainer		
BGI48	Ø 48 mm Bag lip with retainer		
BGI63	Ø 63 mm Bag lip with retainer		
BGI80	Ø 80 mm Bag lip with retainer		
HS29	Ø 29 mm HS29	HN50	HNBR 50° Shore A
HS39	Ø 39 mm HS39		
HS58	Ø 58 mm HS58		
HS79	Ø 79 mm HS79		

Lips are available as spare parts.

Bellows or Flat Cup

B1	1 bellows
B3	3 bellows
B6	6 bellows (3+3)
F	No bellows

Support

S1	Support type 1

G . S50T60 . B3 . S1 . G38M . 01 . ( )

Specifications subject to change without notice.

Fitting

Type		Size		Style	
G NT	G-Thread NPT-Thread	18	1/8"	M	Male
		14	1/4"		
		38	3/8"		
		12	1/2"		
GL NTL	G-Thread low NPT-Thread low	18	1/8"	M	Male
		14	1/4"		
		38	3/8"		
NS G	NPSF-Thread G-Thread	18	1/8"	F	Female
		14	1/4"		
		38	3/8"		
		12	1/2"		
		518	5x1/8"		
NT	NPT-Thread	14	1/4"	F	Female
		38	3/8"		
M	M-Thread	M6	M6*	M	Male
		MF8	M8x1*		
		M10	M10		
		M12	M12		
		MF14	M14x1		
		MF16	M16x1.5		
M	M-Thread	M5	M5	F	Female
		M6	M6		
		M8	M8		
		M10	M10		
		M12	M12		
		MF16	M16x1.5		
U	UNC-Thread	12	1/2"	F	Female
C	COAX® in piGRIP®	S	High flow	X	No style
		T	Extra high flow		
X	No type	X	No size	X	No style

* Steel material. Push-on fitting sold separately.

Option

00	No Filter
01	Filter mesh
02	Filter disc (only bellows cup)
03	piSAVE restrict Ø 0.7
04	piSAVE restrict Ø 1.0
05	piSAVE restrict Ø 1.3
06	piSAVE restrict Ø 0.7 and filter disc
07	piSAVE restrict Ø 1.0 and filter disc
08	piSAVE restrict Ø 1.3 and filter disc
13	piSAVE sense 03/60, C/M*-flow: 0,38/0,10 Nl/s
14	piSAVE sense 04/60, C/M*-flow: 0,53/0,17 Nl/s
15	piSAVE sense 05/60, C/M*-flow: 0,73/0,27 Nl/s
16	piSAVE sense 03/60, C/M*-flow: 0,38/0,10 Nl/s & filter disc
17	piSAVE sense 04/60, C/M*-flow: 0,53/0,17 Nl/s & filter disc
18	piSAVE sense 05/60, C/M*-flow: 0,73/0,27 Nl/s & filter disc

* C/M = Closing/Minimum.

FDA EU approved option includes material certificate

FDA	No*
	US Food and Drug Administration

* Leave blank for no certificate.

Lifting forces and general specifications – piGRIP® F

Lip	Lifting force vertical to the surface, N, at vacuum level		Lifting force parallel to the surface, N, at vacuum level		Outer diameter	Min. curve radius at 60 -kPa	Max vertical movement	Volume
	40 -kPa	60 -kPa	40 -kPa	60 -kPa	mm	mm	mm	cm^3
S25T50	11.4	17	5.7	8.5	25	25	2	0.8
S25T60	11.7	17.9	5.9	9	25	25	1.8	0.8
S35T50	24	34.5	12	17.2	35	40	2.8	1.4
S35T60	25	36	12.5	18	35	40	2.6	1.4
S50T50	50	71.8	25	35.9	50	75	4	4
S50T60	52.2	73.6	26.1	36.8	50	75	3.7	4
S70T50	101	145.6	50.5	72.8	70	80	5.6	11
S70T60	103.5	148	51.8	74	70	80	5.1	11
FX28T30	13.5	18.9	6.7	9.5	28	25	2.7	0.5
FX28T50	14.9	21.3	7.4	10.7	28	25	2.6	0.5
FX39T30	26.8	37.3	13.4	18.7	39	40	3.8	1.3
FX39T50	28.9	41	14.5	20.5	39	40	3.7	1.3
FX55T30	54.2	75	27.1	37.5	55	75	5.4	3.9
FX55T50	56.6	81.1	28.3	40.5	55	75	5.3	3.9
FX77T30	107	150.4	53.5	75.2	77	90	7.6	10.7
FX77T50	112	159	56	79.5	77	90	7.4	10.7
FLI25F	2.2	3.8	1.1	1.9	25.5	*	3.8	0.86
FLI25S	*	*	*	*	25.5	*	5	0.51
FLI35F	5.8	11	2.9	5.5	35.6	*	3.8	1.65
FLI35S	*	*	*	*	35.6	*	7.2	0.87
FLI50F	10	16	5	8	51	*	5.6	5.2
FLI50S	*	*	*	*	51	*	16.2	5.1
FLI70F	32	60	16	30	71	*	5.6	15.3
FLI70S	*	*	*	*	71	*	16.5	19.3
HS29HN50	15.9	23.3	13.5	19.8	29	18	2.3	0.9
HS39HN50	29.6	42.2	25.2	35.9	41	25	2.7	2.1
HS58HN50	65.8	94.5	55.9	80.3	59	38	4.9	7
HS79HN50	125.2	177.8	106.4	151.1	80	51	6.4	17.3

* Dependent on application.

Lifting forces and general specifications – piGRIP® B1

Lip	Lifting force vertical to the surface, N, at vacuum level		Lifting force parallel to the surface, N, at vacuum level		Outer diameter	Min. curve radius at 60 -kPa	Max vertical movement	Volume
	40 -kPa	60 -kPa	40 -kPa	60 -kPa	mm	mm	mm	cm^3
S25T50	11.4	17	5.7	8.5	25	12	5.1	2.1
S25T60	11.7	17.9	5.9	9	25	12	4.9	2.1
S35T50	24	34.5	12	17.2	35	17	7.2	5.4
S35T60	25	36	12.5	18	35	17	7	5.4
S50T50	50	71.8	25	35.9	50	30	10.2	15.7
S50T60	52.2	73.6	26.1	36.8	50	30	9.9	15.7
S70T50	101	145.6	50.5	72.8	70	50	14.3	43
S70T60	103.5	148	51.8	74	70	50	13.8	43
FX28T30	13.5	18.9	6.7	9.5	28	15	5.8	1.8
FX28T50	14.9	21.3	7.4	10.7	28	15	5.7	1.8
FX39T30	26.8	37.3	13.4	18.7	39	20	8.2	5.3
FX39T50	28.9	41	14.5	20.5	39	20	8.1	5.3
FX55T30	54.2	75	27.1	37.5	55	40	11.6	15.6
FX55T50	56.6	81.1	28.3	40.5	55	40	11.5	15.6
FX77T30	107	150.4	53.5	75.2	77	55	16.3	42.7
FX77T50	112	159	56	79.5	77	55	16.1	42.7
FLI25F	2.2	3.8	1.1	1.9	25.5	*	6.9	2.16
FLI25S	*	*	*	*	25.5	*	8.1	1.81
FLI35F	5.8	11	2.9	5.5	35.6	*	8.2	5.65
FLI35S	*	*	*	*	35.6	*	11.6	4.87
FLI50F	10	16	5	8	51	*	11.8	16.9
FLI50S	*	*	*	*	51	*	22.4	16.8
FLI70F	32	60	16	30	71	*	14.3	47.3
FLI70S	*	*	*	*	71	*	25.2	51.3
BGI25S50	5.1	7.4	2.6	3.7	25	11	4.2	2.2
BGI34S50	10.3	15	5.2	7.5	34	16	4.5	3.3
BGI41S50	16.1	23.5	8.1	11.8	41	19	5.7	7.9
BGI48S50	20.9	30.5	10.5	15.3	48	35	6.1	12.5
BGI63S50	39.9	58.2	20.0	29.1	63	39	7.8	26.9
BGI80S50	66.2	96.6	33.1	48.3	80	58	10	65.1
HS29HN50	15.9	23.3	13.5	19.8	29	15	5.4	2.2
HS39HN50	29.6	42.2	25.2	35.9	41	20	7.1	6.1
HS58HN50	65.8	94.5	55.9	80.3	59	27	11.1	18.7
HS79HN50	125.2	177.8	106.4	151.1	80	40	15.1	49.3

* Dependent on application.

Lifting forces and general specifications – piGRIP® B3

Lip	Lifting force vertical to the surface, N, at vacuum level		Lifting force parallel to the surface, N, at vacuum level		Outer diameter	Min. curve radius at 60 -kPa	Max vertical movement	Volume
	40 -kPa	60 -kPa	40 -kPa	60 -kPa	mm	mm	mm	cm^3
S25T50	11.4	17	5.7	8.5	25	12	13.7	5.2
S25T60	11.7	17.9	5.9	9	25	12	13.5	5.2
S35T50	24	34.5	12	17.2	35	17	19.2	14
S35T60	25	36	12.5	18	35	17	19	14
S50T50	50	71.8	25	35.9	50	30	27.4	40.6
S50T60	52.2	73.6	26.1	36.8	50	30	27.1	40.6
S70T50	101	145.6	50.5	72.8	70	50	38.4	111.3
S70T60	103.5	148	51.8	74	70	50	37.9	111.3
FX28T30	13.5	18.9	6.7	9.5	28	15	14.4	4.9
FX28T50	14.9	21.3	7.4	10.7	28	15	14.3	4.9
FX39T30	26.8	37.3	13.4	18.7	39	20	20.2	13.9
FX39T50	28.9	41	14.5	20.5	39	20	20.1	13.9
FX55T30	54.2	75	27.1	37.5	55	40	28.8	40.5
FX55T50	56.6	81.1	28.3	40.5	55	40	28.7	40.5
FX77T30	107	150.4	53.5	75.2	77	55	40.4	111
FX77T50	112	159	56	79.5	77	55	40.2	111
FLI25F	2.2	3.8	1.1	1.9	25.5	*	15.5	5.26
FLI25S	*	*	*	*	25.5	*	16.7	4.91
FLI35F	5.8	11	2.9	5.5	35.6	*	20.2	14.25
FLI35S	*	*	*	*	35.6	*	23.6	13.47
FLI50F	10	16	5	8	51	*	29	41.8
FLI50S	*	*	*	*	51	*	39.6	41.7
FLI70F	32	60	16	30	71	*	38.4	115.6
FLI70S	*	*	*	*	71	*	49.3	119.6
BGI25S50	5.1	7.4	2.6	3.7	25	11	12.8	5.3
BGI34S50	10.3	15	5.2	7.5	34	30	13.4	7.4
BGI41S50	16.1	23.5	8.1	11.8	41	19	17.7	16.5
BGI48S50	20.9	30.5	10.5	15.3	48	35	18.1	21.1
BGI63S50	39.9	58.2	20	29.1	63	39	25	51.8
BGI80S50	66.2	96.6	33.1	48.3	80	58	34.1	133.4
HS29HN50	15.9	23.3	13.5	19.8	29	15	14	5.3
HS39HN50	29.6	42.2	25.2	35.9	41	20	19.1	14.7
HS58HN50	65.8	94.5	55.9	80.3	59	27	28.3	43.6
HS79HN50	125.2	177.8	106.4	151.1	80	40	39.2	117.6

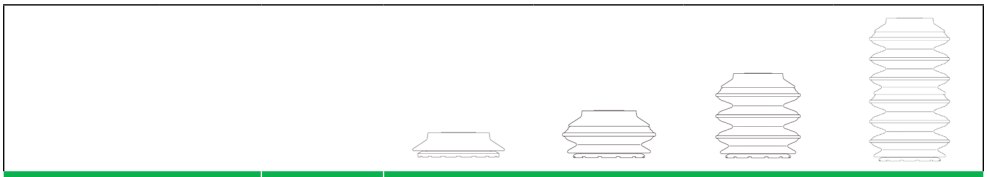
* Dependent on application.

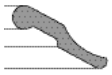
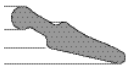
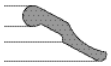
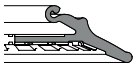
Lifting forces and general specifications – piGRIP® B6

Lip	Lifting force vertical to the surface, N, at vacuum level		Lifting force parallel to the surface, N, at vacuum level		Outer diameter	Min. curve radius at 60 -kPa	Max vertical movement	Volume
	40 -kPa	60 -kPa	40 -kPa	60 -kPa	mm	mm	mm	cm^3
S25T50	11.4	17	5.7	8.5	25	12	25.4	9.6
S25T60	11.7	17.9	5.9	9	25	12	25.2	9.6
S35T50	24	34.5	12	17.2	35	17	35.6	26.6
S35T60	25	36	12.5	18	35	17	35.4	26.6
S50T50	50	71.8	25	35.9	50	30	50.8	77.2
S50T60	52.2	73.6	26.1	36.8	50	30	50.5	77.2
S70T50	101	145.6	50.5	72.8	70	50	71.2	211.6
S70T60	103.5	148	51.8	74	70	50	70.7	211.6
FX28T30	13.5	18.9	6.7	9.5	28	15	26.1	9.3
FX28T50	14.9	21.3	7.4	10.7	28	15	26	9.3
FX39T30	26.8	37.3	13.4	18.7	39	20	36.6	26.5
FX39T50	28.9	41	14.5	20.5	39	20	36.5	26.5
FX55T30	54.2	75	27.1	37.5	55	40	52.2	77.1
FX55T50	56.6	81.1	28.3	40.5	55	40	52.1	77.1
FX77T30	107	150.4	53.5	75.2	77	55	73.2	211.3
FX77T50	112	159	56	79.5	77	55	73	211.3
FLI25F	2.2	3.8	1.1	1.9	25.5	*	27.2	9.66
FLI25S	*	*	*	*	25.5	*	28.4	9.31
FLI35F	5.8	11	2.9	5.5	35.6	*	36.6	26.85
FLI35S	*	*	*	*	35.6	*	40	26.07
FLI50F	10	16	5	8	51	*	52.4	78.4
FLI50S	*	*	*	*	51	*	63	78.3
FLI70F	32	60	16	30	71	*	71.2	215.9
FLI70S	*	*	*	*	71	*	82.1	219.9
BGI25S50	5.1	7.4	2.6	3.7	25	11	24.5	9.7
BGI34S50	10.3	15	5.2	7.5	34	30	25.1	11.8
BGI41S50	16.1	23.5	8.1	11.8	41	19	34.1	29.1
BGI48S50	20.9	30.5	10.5	15.3	48	35	34.5	33.7
BGI63S50	39.9	58.2	20	29.1	63	39	48.4	88.4
BGI80S50	66.2	96.6	33.1	48.3	80	58	66.9	233.7
HS29HN50	15.9	23.3	13.5	19.8	29	15	25.7	9.7
HS39HN50	29.6	42.2	25.2	35.9	41	20	35.5	27.3
HS58HN50	65.8	94.5	55.9	80.3	59	27	51.7	80.2
HS79HN50	125.2	177.8	106.4	151.1	80	40	72	217.9

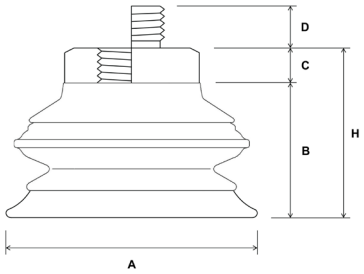
* Dependent on application.

Suction cup dimensions, mm



Lip type & size		Dim. A	Dim. B			
			F (Flat)	B-1 (1 Bellows)	B-3 (3 Bellows)	B-6 (3+3 Bellows)
	S25	25	10.9	18.7	29.8	48.7
	S35	35	12.4	23.3	38.8	65.2
	S50	50	14.7	30.3	52.4	90.1
	S70	70	17.8	39.6	70.6	123.4
	FX28	28	11.4	19.2	30.3	49.2
	FX39	38	13.1	24.0	39.5	65.9
	FX55	55	15.7	31.3	53.4	91.1
	FX77	77	19.2	41	72	124.8
	FLI25S	25	17.5	25.3	36.4	55.3
	FLI35S	35	21.5	32.4	47.9	74.3
	FLI50S	50	32.1	47.7	69.8	107.5
	FLI70S	70	34.1	55.9	86.9	139.7
	FLI25F	25	16	23.8	34.9	53.8
	FLI35F	35	17	27.9	43.4	69.8
	FLI50F	50	21.1	36.7	58.8	96.5
	FLI70F	70	23.1	44.9	75.9	128.7
	BGI25	25	—	22.7	33.8	52.7
	BGI34	34	—	24.8	35.9	54.8
	BGI41	41	—	29.5	45.0	71.4
	BGI48	48	—	30.9	46.4	72.8
	BGI63	63	—	39.9	62.0	99.7
	BGI80	80	—	49.4	80.4	133.2
	HS29	29	13.4	14.2	25.3	44.2
	HS39	39	15.6	19.5	35	61.4
	HS58	58	19.5	27.5	50.2	87.9
	HS79	79	24.3	39.1	70.1	122.9

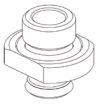
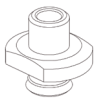
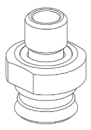
Build height:



B + C = H

Ex. 18.7 + 5 = 23.7

Fitting dimensions, mm

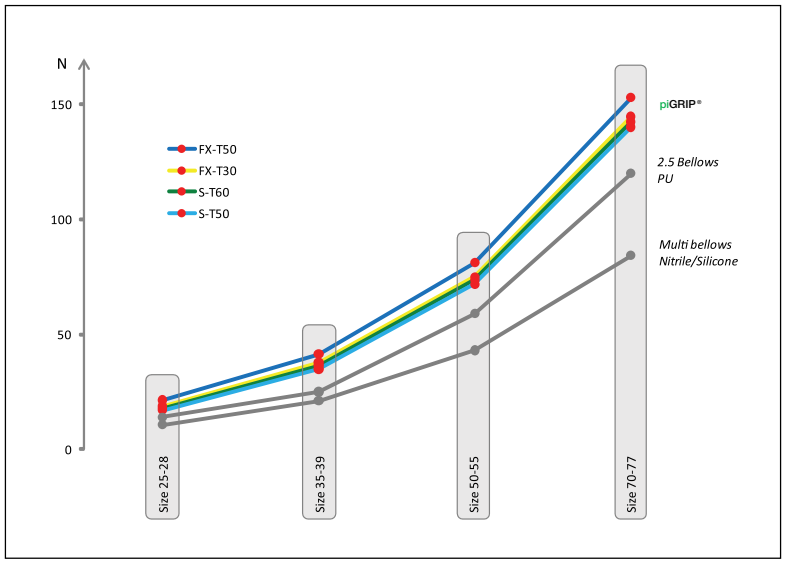
Type	Code	Dim. C	Dim. D	Description	Recommended fitting size for best performance* S25 FX28 FLI25 BGI25 BGI34 HS29	S35 FX39 FLI35 BGI41 BGI48 HS39	S50 FX55 FLI50 BGI63 HS58	S70 FX77 FLI70 HS79 BGI80
	G18M	5	6	Fitting G1/8" male	●	●	●	
	G14M	6	9	Fitting G1/4" male	●	●	●	●
	G38M	6	10	Fitting G3/8" male		●	●	●
	G12M	6	10	Fitting G1/2" male			●	●
	GL18M	1.5	6	Fitting G1/8" low male	●	●	●	
	GL14M	1.5	9	Fitting G1/4" low male	●	●	●	●
	GL38M	1.5	10	Fitting G3/8" low male		●	●	●
	NT18M	5	7	Fitting 1/8" NPT male	●	●	●	
	NT14M	6	11	Fitting 1/4" NPT male	●	●	●	●
	NT38M	6	11.5	Fitting 3/8" NPT male		●	●	●
	NT12M	6	15	Fitting 1/2" NPT male			●	●
	NTL18M	1.5	7	Fitting 1/8" NPT low male	●	●	●	
	NTL14M	1.5	11	Fitting 1/4" NPT low male	●	●	●	●
	NTL38M	1.5	11.5	Fitting 3/8" NPT low male		●	●	●
	MM6M	5	6	Fitting M6 male	●	●		
	MMF8M	5	6	Fitting M8 x 1 male	●	●	●	
	MM10M	6	10	Fitting M10 male	●	●	●	
	MM12M	6	10	Fitting M12 male	●	●	●	
	MMF14M	6	12	Fitting M14 x 1 male	●	●	●	●
	MMF16M	6	12	Fitting M16 x 1.5 male		●	●	●

Type	Code	Dim. C	Dim. D	Description	Recommended fitting size for best performance* S25 FX28 FLI25 BGI25 BGI34 HS29	S35 FX39 FLI35 BGI41 BGI48 HS39	S50 FX55 FLI50 BGI63 HS58	S70 FX77 FLI70 HS79 BGI80
	G14F	10	—	Fitting G1/4" fem	●	●	●	
	G38F	13	—	Fitting G3/8" fem		●	●	●
	G12F	14	—	Fitting G1/2" fem			●	●
	NS18F**	7	—	Fitting 1/8" NPSF fem	●	●	●	
	NS14F	10	—	Fitting 1/4" NPSF fem	●	●	●	●
	NS38F	13	—	Fitting 3/8" NPSF fem		●	●	●
	NS12F	14	—	Fitting 1/2" NPSF fem			●	●
	NS518F**	18	—	Fitting 5x1/8" NPSF fem	●	●	●	
	NT14F	12	—	Fitting 1/4" NPT fem	●	●	●	●
	NT38F	13	—	Fitting 3/8" NPT fem		●	●	●
	U12F	12	—	Fitting 1/2" UNC fem			●	●
	MM5F	6	—	Fitting M5 fem	●	●		
	MM6F	6	—	Fitting M6 fem	●	●		
	MM8F	7	—	Fitting M8 fem	●	●	●	
	MM10F	7	—	Fitting M10 fem	●	●	●	
	MM12F	12	—	Fitting M12 fem	●	●	●	
	MMF16F	13	—	Fitting M16 x 1.5 fem		●	●	●

* No flow restriction or excessive volume to evacuate, which will deteriorate the performance of the vacuum system. ** Fitting code G18F and

piGRIP® Material Data

Up to 50% improved lifting force with piGRIP®. Use fewer cups or smaller sizes. See suction cup selection guide on



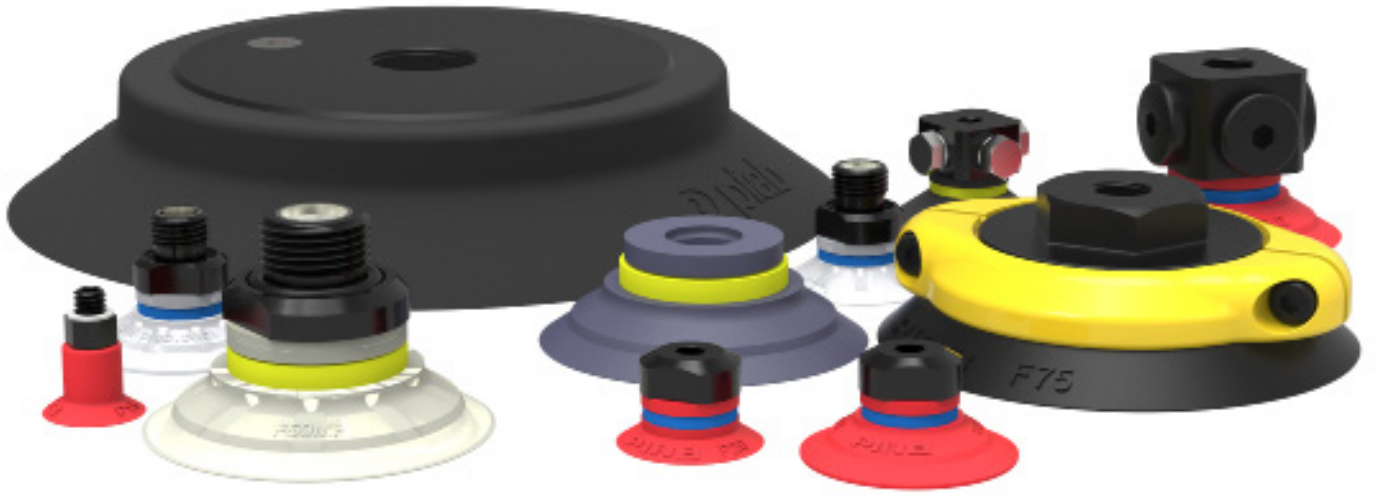
Proven function and lifting capacity within specified area of operation.

Material Specifications

Material	Hardness, Shore A °	Item(s)	Colour	Temp. range, °C	Special qualities
TPE	80–87	Support S1	Lime/Transparent	-20–60/100*	FDA EU**, silicone/PWIS free, mark free, oil resistant
TPE	87	Bellows	Lime/Transparent	-20–60/100*	FDA EU**, silicone/PWIS free, mark free, oil resistant
TPE	60	Standard Lip (S) T60	Green	-20–60/120*	Silicone/PWIS free, mark free, oil resistant
TPE	50	Standard Lip (S) T50	Blue	-40–60/120*	FDA EU
TPE	50	Flexible Lip (FX) T50	Blue	-40–60/120*	FDA EU
TPE	30	Flexible Lip (FX) T30	Yellow	-40–60/100*	FDA EU
EPDM	—	Foam Lip (FLI-S)	Green/Black	-20–80	Ultra soft cellular rubber
NR	—	Foam Lip (FLI-F)	Green/Orange	-20–80	Firm natural rubber
Silicone	50	Bag Lip (BGI)	Blue	-40–200	FDA EU
HNBR	50	Hot Surface Lip (HS)	Blue	-30–120/150*	PWIS free, mark free
PU	60	Foam Lip holder	Green	10–50	

* Max Temperature short term contact, <10 sec and 50% intermittence, ambient temperature 15-30 °C, mechanical properties will start to degrade.
** FDA EU approved option in transparent material.

Flat family (F)



There is a variety of cups in this family to suit a number of different flat surfaces, e.g. cardboard, glass and metal sheets. The cleats stop deformation by preventing suction of the object into the cup. The suction cup has good stability and very little movement. Also suitable when the lifting force is parallel to the surface as the cleats increase friction. There is also a variety in materials from mark-free to high temperature applications and FDA compliant material (FDA 21 CFR 177.2600) that meets EU's regulation EU 1935/2004.

Lifting forces

	Lifting force vertical to the surface, N, at vacuum level			Lifting force parallell to the surface, N, at vacuum level		
	20 -kPa	60 -kPa	90 -kPa	20 -kPa	60 -kPa	90 -kPa
F15	3.5	8.5	11	3.5	6.5	7.5
F20	6	14.5	19	5	8	8.5
F25	9	19.5	25	8	9	10
F30-2	12	25	31	11	16	20
F40-2	20	40	50	15	25	30
F50-2	36	74	96	24	40	50
F75	80	200	270	60	110	140
F110	140	420	560	140	250	300
F150	300	850	1100	250	600	800
F26 FDA	11	25	31	9	21	26
F33 FDA	16	38	49	13.5	32.5	41.5
F75P	70/82*	193/231*	273/330*	44/47*	176/113*	308/169*
F110P	167/191*	432/498*	591/705*	149/297*	441/523*	617/664*
F15MF	4	8	12	4.5	9	14.5
F20MF	3.6	14.5	22	8	14.5	21
F25MF	6.3	24.5	65.5	9	24.5	36.3
F30MF	11	34.5	48	13.6	28	42
F40MF	18	57	83	16	49	57
F50MF	24.5	92	141	31	82	107
XLF150	330/520**	500/770**	780/1130**	281	425	663
XLF200	760/1030**	1130/1510**	1720/2200**	646	961	1462

	Lifting force vertical to the surface, N, at vacuum level			Lifting force parallell to the surface, N, at vacuum level		
	20 -kPa	60 -kPa	90 -kPa	20 -kPa	60 -kPa	90 -kPa
XLF250	1310/1640**	1950/2460**	2870/3540**	1114	1658	2440
XLF300	2150/2620**	3200/3760**	4630/5450**	1828	2720	3936

* PU30°/PU60° / PU60°, **Inner/Outer lip.

General specifications

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm^3
F15	15.7	11	13	1	0.37
F20	22	8	18	1.5	1
F25	27	9	22	1.5	1.1
F30-2	32	10.4	25	2	2
F40-2	42	13	52	2.5	4.8
F50-2	53	17.5	55	3	10
F75	77	13	150	3	20
F110	112	20	250	4	70
F150	152	26.4	500	6	160
F26 FDA	26	23.5	25	1.5	1.6
F33 FDA	33	23.5	35	1.5	2.1
F75P	77	13	150	2	19
F110P	115	20	250	4	60
F15MF	16.5	11	17	1	0.37
F20MF	22	8	18	2	1
F25MF	27	9	23	1.5	1.1
F30MF	32	10	44	1.5	2
F40MF	42	13	60	2	4.8
F50MF	53	17.5	95	2	10
XLF150	153	27	500	8	145
XLF200	204	27	800	8	275
XLF250	250	27	1300	8	435
XLF300	304	27	1900	8	666

Available materials

	Chloroprene, CR	HNBR	Nitrile-PVC, NPV	PU30°/PU60°	PU60°	Silicone, SIL	Silicone FDA EU, SIL FDA	Thermoplastic Polyurethane, TPE-U
F15	●					●	●	
F20	●					●	●	
F25	●					●	●	
F75		●	●			●	●	
F110		●	●			●	●	
F150			●			●	●	
F26 FDA							●	

	Chloroprene, CR	HNBR	Nitrile-PVC, NPV	PU30°/PU60°	PU60°	Silicone, SIL	Silicone FDA EU, SIL FDA	Thermoplastic Polyurethane, TPE-U
F33 FDA							●	
F30-2	●					●	●	
F40-2			●			●	●	
F50-2		●	●			●	●	
F75P				●	●			
F110P				●	●			
F15MF								●
F20MF								●
F25MF								●
F30MF								●
F40MF								●
F50MF								●
XLF150			●					
XLF200			●					
XLF250			●					
XLF300			●					

Material resistance

For more material information go to page 23.

Applications

Table shows typical applications for the suction cup. For more detailed information,

	Dry sheet metal	Bag opening/ thin paper – slip sheets/ film	FDA EU-standard compliant	Glass handling	High/low temp cup (plastic)	Mark free	Plastic injection molded parts
F15	●		●				
F20	●		●				
F25	●		●				
F75	●		●	●	●	●	●
F110	●		●	●	●	●	●
F150	●		●				
F26 FDA		●	●				
F33 FDA		●	●				
F30-2	●		●				
F40-2	●		●				
F50-2	●		●	●	●	●	●
F75P	●					●	
F110P	●					●	
F15MF						●	

	Dry sheet metal	Bag opening/ thin paper – slip sheets/ film	FDA EU-standard compliant	Glass handling	High/low temp cup (plastic)	Mark free	Plastic injection molded parts
F20MF						●	
F25MF						●	
F30MF						●	
F40MF						●	
F50MF						●	
XLF150	●			●		●	
XLF200	●			●		●	
XLF250	●			●		●	
XLF300	●			●		●	

Fittings

For a table of possible fittings to use go to page 80, for technical information

Ordering information

For a complete list of available cups and combinations On our webpage you will also be able to find dimensional drawings, CAD-drawings and much more. Register to receive full access to all resources available.

Flat Concave family (FC)

The friction cups in flat concave shape and in the material DURAFLEX® suction cups have been developed to meet the strict demands of the automotive industry and designed for flat and curved surfaces. A typical application is the feeding of sheet metal into a press tool. The FCF-P design is especially suitable for oily surfaces, slightly domed and flat surfaces, e.g., such as those encountered when handling metal sheets in press lines. The suction cups have support cleats that prevent thin objects from being disfigured.

Lifting forces

	Lifting force vertical to the surface, N, at vacuum level			Lifting force parallell to the surface, N, at vacuum level		
	20 -kPa	60 -kPa	90 -kPa	20 -kPa	60 -kPa	90 -kPa
FC20P	4.5	12	16	4.5	9	12
FC25P	8	20	27	9	12	18
FC35P	11/11*	36/34*	51/49*	27/27*	51/41*	62/51*
FC50P	28/28**	77/77**	103/104**	49/52**	82/93**	100/111**
FC75P	73/73**	157/168**	215/225**	107/93**	200/225**	230/255**
FC100P	137/152**	284/328**	377/446**	176/112**	318/264**	420/382**
FC150P	274/284**	647/716**	922/932**	343/215**	765/568**	902/863**
FCF25P	–	19/19***	28/29***	–	7/5***	10/7.2***
FCF35P	–	42/34***	58/50***	–	30/26***	42/32***
FCF50P	–	78/72***	106/101***	–	77/52***	105/70***
FCF75P	–	171/163***	236/228***	–	166/104***	211/139***
FCF100P	–	347/236***	490/298***	–	337/139***	484/205***
FCF125P	–	475/405***	650/442***	–	445/194***	602/236***

* PU50°/PU60°, ** PU40°/PU60°, *** Dry metal sheet/Oily metal sheet.

General specifications

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm^3
FC20P	21.8	9.4	25	1.9	1
FC25P	28.5	11	45	4	3
FC35P	35	15	32	5.5	5

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm^3
FC50P	50	33.5	53	5	10
FC75P	75	24	78	6.5	30
FC100P	100	27	110	10.2	80
FC150P	150	40.5	165	14.2	250
FCF25P	25	28	27	–	5.5
FCF35P	35	29–47.8*	40	2	5
FCF50P	50	31–49.9*	50	3	10
FCF75P	75	31–41*	100	4	30
FCF100P	100	36–45*	150	6	70
FCF125P	126	42–51.2*	150	8	100

* Height range includes fittings.

Available materials

	PU40°	PU50°	PU55°/PU60°	PU60°
FC20P		●		
FC25P		●		
FC35P		●		●
FC50P	●			●
FC75P	●			●
FC100P	●			●
FC150P	●			●
FCF25P			●	
FCF35P			●	
FCF50P			●	
FCF75P			●	
FCF100P			●	
FCF125P			●	

Material resistance

For more material information go to page 23.

	Oily sheet metal	Dry sheet metal	Mark free
FC20P		●	●
FC25P		●	●
FC35P		●	●
FC50P		●	●
FC75P		●	●
FC100P		●	●

	Oily sheet metal	Dry sheet metal	Mark free
FC150P		●	●
FCF25P	●		
FCF35P	●		
FCF50P	●		
FCF75P	●		
FCF100P	●		
FCF125P	●		

Bellows family (B)

The bellows family is suitable for height differences and slightly uneven or curved surfaces. Several short bellows cups in one lifting device can handle objects with height differences and varying shapes. The bellows also provide a slight lifting movement to separate thin items. This family is available, among other material in FDA compliant material, or the durable DURAFLEX® as Mark Free or even for oily surfaces.

Lifting forces

	Lifting force vertical to the surface, N, at vacuum level			Lifting force parallell to the surface, N, at vacuum level		
	20 -kPa	60 -kPa	90 -kPa	20 -kPa	60 -kPa	90 -kPa
B5	0.3	0.8	1	–	–	–
B8	0.8	1.6	2.5	–	–	–
B10-2	1.5	3.4	4.9	–	–	–
B15-2	2.9	5.9	8.9	–	–	–
B20	5.9	9.8	14	–	–	–
B30	12	22	27	–	–	–
B30-2	12	22	27	–	–	–
B40	22	39	49	–	–	–
B50	33	65	82	–	–	–
B50-2	33	65	82	–	–	–
B75	74	167	226	–	–	–
B75-2	74	167	226	–	–	–
B110	137	343	461	–	–	–
B110-2	137	343	461	–	–	–
B150	294	686	883	–	–	–
B75P	61/83*	149/196*	202/255*	44/121*	96/229*	114/298*
B10XP	2.6/3.1*	3.8/4.6*	4.5/5.5*	1/1*	2/2.5*	2.5/3*
B15XP	5/6*	9/10*	11/12*	2.5/2.5*	5/5*	8/9*
B20XP	7.8/8.7*	15/19.7*	20/23*	3.5/7*	7/11*	10/15*
B25XP	9.7/12*	19/27*	22/30*	8/10*	12/13*	15/18*
B35XP	17/19*	39/48*	50/66*	15/17*	30/33*	40/50*
B52XP	36/42.5*	84/109*	102/150*	30/39*	60/70*	85/90*

	Lifting force vertical to the surface, N, at vacuum level			Lifting force parallell to the surface, N, at vacuum level		
	20 -kPa	60 -kPa	90 -kPa	20 -kPa	60 -kPa	90 -kPa
B75XP	75/86*	176/222*	228/307*	60/80*	150/200*	180/230*
B110XP	190/200*	380/440*	470/500*	170/190*	350/380*	430/460*
B15MF	4	8	12	4.5	7	10
B20MF	4.5	15.5	21	6.3	11	19
B30MF	12	40	54.5	14.5	32	41
B40MF	18	57	72	13.6	40	47
B50MF	30	93	136	23	63	97
BF80P	73/98**	157/225**	196/294**	54/68**	88/127**	117/166**
BF110P	128/161*	229/334*	225/293*	106/123*	210/231*	246/305*
BFF30P	–	24/23***	27/30***	–	11/5.5***	13.5/7.8***
BFF40P	–	43/45***	56/60***	–	60/35***	81/45***
BFF60P	–	77/82***	112/106***	–	90/76***	122/93***
BFF80P	–	176/174***	236/207***	–	201/110***	240/160***
BFF110P	–	279/284***	377/345***	–	298/235***	346/253***

* PU30°/PU60° / PU60°, ** PU30°/PU50° / PU60°, *** Dry metal sheet/Oily metal sheet.

General specifications

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm^3
B5	5.6	9.2	1.5	1.5	0.05
B8	8.8	11.9	1.9	3.5	0.15
B10-2	11	16.4	4	4.5	0.48
B15-2	15.7	19.8	5	6.5	1.1
B20	22	19	10	10	2.7
B30	34	26	15	15	10
B30-2	34	26.2	15	15	10
B40	43	28	20	12	15
B50	53	35.3	30	19	32
B50-2	53	35.4	30	19	32
B75	78	37.3	40	24	110
B75-2	78	37	40	24	110
B110	115	54.3	60	35	310
B110-2	115	54.3	60	35	310
B150	155	71.3	75	45	650
B75P	79	37.3	90	20	110
B10XP	11	13.9	4/6**	3	0.19
B15XP	16	14.8	5.5/10**	3.4	0.4
B20XP	21	10.4	5.5/9**	4.6	1.04
B25XP	26	13.5	11/9**	5.5	1.63
B35XP	37	18.6	17.5/16**	9.5	4.4
B52XP	53	27	29/25**	11.2	13.3
B75XP	77.5	34.3	60/50**	16	42.8
B110XP	113.7	48.5	90/80**	23.4	123

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm^3
B15MF	16	19.5	11	2	1.1
B20MF	23	19	11	8	3.7
B30MF	34	26	16.5	12	10
B40MF	43	28	22	11	15
B50MF	57	35	26	13	32
BF80P	84	44	50	15	40
BF110P	115	53	55/70*	24	110
BFF30P	30	30	15	5	5
BFF40P	45	32–51.5***	23	7	10
BFF60P	61	36–55.3***	35	10	20
BFF80P	85	46–55.8***	50	14	50
BFF110P	115	53-72.5***	95	21	110

* PU30° / PU30°/PU60°, ** PU30°/PU60° / PU60°, *** Height range includes fittings.

Available materials

	Chloroprene, CR	Conductive silicone, CSIL	HNBR	Nitrile-PVC, NPV	PU30°/PU50°	PU30°/PU60°	PU55°/PU60°	PU60°	Semi-conductive EPDM	Silicone, SIL	Silicone FDA EU, SIL FDA	TPE-U
B5	●	●	●						●	●	●	
B8	●	●	●							●	●	
B20			●								●	
B40			●								●	
B50			●								●	
B75			●	●						●	●	
B110			●	●						●	●	
B150				●						●	●	
B10-2	●		●							●	●	
B15-2	●		●							●	●	
B30-2			●								●	
B50-2											●	
B75-2				●						●	●	
B110-2				●						●	●	
B75P						●		●				
B10XP						●		●				
B15XP						●		●				
B20XP						●		●				
B25XP						●		●				
B35XP						●		●				
B52XP						●		●				
B75XP						●		●				

	Chloroprene, CR	Conductive silicone, CSIL	HNBR	Nitrile-PVC, NPV	PU30°/PU50°	PU30°/PU60°	PU55°/PU60°	PU60°	Semi-conductive EPDM	Silicone, SIL	Silicone FDA EU, SIL FDA	TPE-U
B110XP						●		●				
B15MF												●
B20MF												●
B30MF												●
B40MF												●
B50MF												●
BF80P					●			●				
BF110P						●		●				
BFF30P							●					
BFF40P							●					
BFF60P							●					
BFF80P							●					
BFF110P							●					

Material resistance

For more material information go to page 23.

	Oily sheet metal	Dry sheet metal	Corrugated / cardboard	FDA EU-standard compliant	Glass handling	Electronic / semi-conductor	High/low temp cup (plastic)	Mark Free	Plastic injection molded parts
B5		●		●	●	●	●	●	●
B8		●		●	●	●	●	●	●
B20		●		●	●		●	●	●
B30		●							●
B40		●		●	●		●	●	●
B50		●		●	●		●	●	●
B75		●		●	●		●	●	●
B110		●		●				●	
B150		●		●					●
B10-2		●		●	●		●	●	●
B15-2		●		●	●		●	●	●
B30-2		●		●	●		●	●	●
B50-2		●		●					●

	Oily sheet metal	Dry sheet metal	Corrugated / cardboard	FDA EU-standard compliant	Glass handling	Electronic / semi-conductor	High/low temp cup (plastic)	Mark Free	Plastic injection molded parts
B75-2		●		●					●
B110-2		●		●					●
B10XP		●	●		●				●
B15XP		●	●		●				●
B20XP		●	●		●				●
B25XP		●	●		●				●
B35XP		●	●		●				●
B52XP		●	●		●				●
B75XP		●	●		●				●
B110XP		●	●		●				●
B75P		●						●	●
B15MF								●	
B20MF								●	
B30MF								●	
B40MF								●	
B50MF								●	
BF80P		●			●			●	
BF110P		●			●			●	
BFF30P	●								
BFF40P	●								
BFF60P	●								
BFF80P	●								
BFF110P	●								

Multibellows family (BX/BL)

This family is designed for height differences, slightly curved planes and uneven surfaces. Applications such as bag handling, cardboard, high temperature or if the need is specifically to touch a food item as they are also available in material that complies with the FDA (FDA 21 CFR 177.2600) and meets EU's regulation EU 1935/2004.

Lifting forces

	Lifting force vertical to the surface, N, at vacuum level			Lifting force parallell to the surface, N, at vacuum level		
	20 -kPa	60 -kPa	90 -kPa	20 -kPa	60 -kPa	90 -kPa
BX10P	1	2.3	3.7	–	–	–
BX15P	2/3*	4/5*	4.5/6*	–	–	–
BX20P	4.5/4.8*	7/7*	9.5/11*	–	–	–
BX25P	8/9*	13/14*	17/18*	5/7*	10/11*	12/14*
BX35P	12/15*	20/25*	28/30*	11/14*	19/23*	26/28*
BX52P	32/35*	56/59*	75/80*	25/27*	44/49*	54/56*
BX75P	62/70*	110/120*	141/166*	39/50*	83/114*	116/150*
BX110P	158/181*	306/365*	346/424*	140/158*	230/244*	260/293*
BL20-2	0.32/3.2**	0.62/6.2**	–	–	–	–
BL30-2	0.64/6.4**	1.6/16**	–	–	–	–
BL40-2	1.1/11**	2.2/22**	–	–	–	–
BL50-2	1.7/17**	4.3/43**	–	–	–	–
BL30-3P	10	22	28	9	10	16
BL40-3P	20	43	55	13	24	36
BL50-3P	24	60	75	22	49	60
BL30-4	8***	–	–	–	–	–
BL40-4	10	15	22	9	16	26
BL50-4	8	25	–	–	–	–
BL30-5	8	9	–	–	–	–
BL40-5	13	15	–	–	–	–
BL50-5	8	25	–	–	–	–
B-BL40-2	1.1/11**	2.2/22**	–	–	–	–
B-BL40-2 FDA, detectable	15.6	34.1	45.2	–	–	–

* PU30°/PU60° / PU60°, ** With reinforcement ring, *** The suction cup is not intended for deeper vacuum levels than 20 -kPa.

General specifications

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm^3
BX10P	11	16.5	4/6*	4.5	0.56
BX15P	16	18.5	5.5/6*	5.5	0.92
BX20P	21	15.2	10/8.5*	7.5	1.16
BX25P	26	19	6/8*	8.5	3
BX35P	37	26.8	10	14	10
BX52P	53	39	32	19	30
BX75P	77.5	51.7	23	26	80
BX110P	113.7	74	55	39	230
BL20-2	20	22.9	4	13	4
BL30-2	30	32.5	8	20	10
BL40-2	40	42.4	11	33	27
BL50-2	50	53	13	34	53
BL30-3P	30	35.5	6	14	14
BL40-3P	40	42.4	13	21	27
BL50-3P	48	53	16	26	54
BL30-4	30.5	16.5	20	19	4.1
BL40-4	40.1	39.8	15	18	15
BL50-4	50.3	53	30	22	35
BL30-5	30.5	36.5	17	11	8.55
BL40-5	40	40	22	20	14
BL50-5	50	53	30	18	26
B-BL40-2	42.5	38	11	33	27
B-BL40-2 FDA, detectable	42.5	38	11	22	29

* PU30°/PU60° / PU60°.

Available materials

	Chloroprene, CR	HNBR	PU30°/PU60°	PU60°	PU30°/PU70°	Silicone, SIL	Silicone FDA EU, SIL FDA	Silicone FDA EU detecta-ble, SIL FDA DET
BX10P			●	●				
BX15P			●	●				
BX20P			●	●				
BX25P			●	●				
BX35P			●	●				
BX52P			●	●				
BX75P			●	●				
BX110P			●	●				
BL20-2	●	●				●	●	
BL30-2	●					●	●	
BL40-2	●					●	●	
BL50-2	●					●	●	
BL30-3P					●			

	Chloroprene, CR	HNBR	PU30°/PU60°	PU60°	PU30°/PU70°	Silicone, SIL	Silicone FDA EU, SIL FDA	Silicone FDA EU detecta-ble, SIL FDA DET
BL40-3P					●			
BL50-3P					●			
BL30-4						●	●	
BL40-4						●	●	
BL50-4						●	●	
BL30-5						●	●	
BL40-5						●	●	
BL50-5						●	●	
B-BL40-2							●	
B-BL40-2 FDA, detectable								●

Material resistance

For more material information go to page 23.

	Dry sheet metal	Bag handling	Corrugated / cardboard	FDA EU-standard compliant	FDA EU detectable	Mark Free	Plastic injec-tion molded parts
BX10P	●		●			●	●
BX15P	●		●			●	●
BX20P	●		●			●	●
BX25P	●		●			●	●
BX35P	●		●			●	●
BX52P	●		●			●	●
BX75P	●		●			●	●
BX110P	●		●			●	●
BL20-2		●		●		●	
BL30-2		●		●			
BL40-2		●		●			
BL50-2		●		●			
BL30-3P		●					
BL40-3P		●					
BL50-3P		●					
BL30-4		●		●			
BL40-4		●		●			
BL50-4		●		●			
BL30-5		●		●			
BL40-5		●		●			
BL50-5		●		●			

	Dry sheet metal	Bag handling	Corrugated / cardboard	FDA EU-standard compliant	FDA EU detectable	Mark Free	Plastic injection molded parts
B-BL40-2				●			
B-BL40-2 FDA, detectable					●		

Deep family (D)

This family is designed for curved and irregular surfaces. Can lift even over corners and edges. This product is also available in material that is compliant by FDA (FDA 21 CFR 177.2600) and meets EU's regulation EU 1935/2004.

Lifting forces

	Lifting force vertical to the surface, N, at vacuum level			Lifting force parallell to the surface, N, at vacuum level		
	20 -kPa	60 -kPa	90 -kPa	20 -kPa	60 -kPa	90 -kPa
D15-2	2.9	7.8	11	–	–	–
D20-2	5.9	15	18	–	–	–
D30-2	14	26	31	–	–	–
D50	36	78	98	–	–	–

General specifications

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm^3
D15-2	16	16.6	6	3	0.9
D20-2	22	13.2	8	4.5	2.5
D30-2	32	19.2	13	5	5
D50	53	31.5	25	10	15

Available materials

	Chloroprene, CR	Silicone, SIL	Silicone FDA EU, SIL FDA
D15-2	●	●	●
D20-2	●	●	●
D30-2	●	●	●
D50	●	●	●

Material resistance

For more material information go to page 23.

	Dry sheet metal	FDA EU-standard compliant	Plastic injection molded parts
D15-2	●	●	●
D20-2	●	●	●
D30-2	●	●	●
D50	●	●	●

Universal family (U)

This family is designed for flat or slightly curved surfaces. They are available in a number of different materials such as DURAFLEX® silicone and also a material that is compliant by FDA (FDA 21 CFR 177.2600) and meets EU's regulation EU 1935/2004.

Lifting forces

	Lifting force vertical to the surface, N, at vacuum level			Lifting force parallell to the surface, N, at vacuum level		
	20 -kPa	60 -kPa	90 -kPa	20 -kPa	60 -kPa	90 -kPa
U2	0.03	0.1	0.15	–	–	–
U3	0.09	0.42	0.65	–	–	–
U4	0.2	0.9	1.3	0.2	0.8	1
U6	0.5	1.7	2.5	0.5	1.5	2
U8	1	2.9	3.9	1	2.9	3.4
U10	1.5	4.4	6.9	1.5	4.4	4.9
U15	3.5	8.4	11	3.5	5.4	5.9
U20	5.9	12	16	5.9	8.8	9.8
U30	12	25	30	7.8	9.8	11
U40-2	20	39	49	14	22	27
U50-2	35	73	92	20	37	44
U15-3	3.5	8.4	11	3.5	5.4	5.9
U20-2P	3/3/3*	10.5/11.5/14*	14/15/21*	1.5/1.5/3*	3/3/6*	6/6/8*

* PU40° / PU50° / PU60°.

General specifications

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm^3
U2	2.6	3.5	4	0.1	0.003
U3	3.8	4.5	5	0.15	0.005
U4	5	6.1	3	0.2	0.03
U6	7	7	5	0.3	0.05

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm^3
U8	9	7	6	0.5	0.1
U10	11	10.5	8	0.5	0.18
U15	16.5	11.5	8	1.5	0.5
U20	22	8	13	2.5	1
U30	32	9.5	20	3.5	2
U40-2	41	13	30	4.5	5.5
U50-2	51.4	17.5	35	6	12
U15-3	16.5	11.5	8	1.5	0.5
U20-2P	8.7	14	9/9/12*	5	0.7

* PU40° / PU50° / PU60°.

Available materials

	Chloroprene, CR	Conductive Silicone, CSIL	HNBR	Nitrile-PVC, NPV	PU40°	PU50°	PU60°	Silicone, SIL	Silicone, SIL FDA EU
U2		●							
U3		●							
U4	●							●	●
U6	●		●					●	●
U8	●							●	●
U10	●		●					●	●
U15	●		●					●	●
U20	●		●					●	●
U30				●				●	●
U40-2				●				●	●
U50-2				●				●	●
U15-3								●	
U20-2P					●	●	●		

Material resistance

For more material information go to page 23.

	Dry sheet metal	FDA EU-standard compliant	Electronic / semicondu-ctor	Plastic injection molded parts	Mark Free	High/low temp cup (plastic)	Glass handling	Bag ope-ning/thin paper - slip sheets/film
U2			●					
U3			●					
U4	●	●		●				
U6	●	●		●	●			

piab

	Dry sheet metal	FDA EU-standard compliant	Electronic / semicondu-ctor	Plastic injection molded parts	Mark Free	High/low temp cup (plastic)	Glass handling	Bag ope-ning/thin paper - slip sheets/film
U8	●	●		●				
U10		●		●	●	●	●	
U15		●		●	●	●	●	
U20		●		●	●	●	●	
U30	●	●		●				
U40-2	●	●		●				
U50-2	●	●		●				
U15-3								●
U20-2P					●			●

Oval Bellows family (OB)

The oval suction cups are suitable for handling of long and narrow objects and surfaces when maximum lifting force is desired. Oval suction cups are specially suitable for irregular surfaces and when level compensation is desired. This program of oval suction cups has characteristics that are specially suited for handling of metal-sheet material.

Lifting forces

	Lifting force vertical to the surface, N, at vacuum level			Lifting force parallell to the surface, N, at vacuum level		
	20 -kPa	60 -kPa	90 -kPa	20 -kPa	60 -kPa	90 -kPa
OB20x60P	13	34	57	13	37	48
OB35x90P (PU30°/PU60°)	42	119	174	48	73	100
OB35x90P (PU60°)	42	117	185	32	85	111
OB50x140P (PU30°/PU60°)	58	235	366	110	260	349
OB50x140P (PU60°)	77	231	368	122	292	396
OB65x170P (PU30°/PU60°)	119	335	541	141	379	532
OB65x170P (PU60°)	130	310	533	170	440	600
OBF35x90P	–	140/108*	198/157*	–	125/105*	179/151*
OBF50x140P	–	325/246*	438/372*	–	328/271*	415/347*
OBF65x170P	–	397/403*	570/502*	–	437/538*	619/665*
OBL40x90P (PU60°)	44	105	160	40	87	121
OBL40x90P (PU70°)	49	117	178	45	97	135

* Dry metal sheet/Oily metal sheet.

General specifications

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm^3
OB20x60P	62×23.5	23.6	7	4.5	24
OB35x90P	95.6×42.4	27.2	30	10.5	38
OB50x140P	146×59	34.5	23/26**	11.3	95
OB65x170P	177×76	41.5	38	16	175
OBF35x90P	105×50	39–47.9*	30	11	36

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm³
OBF50x140P	157×67	47–55.8*	50	13	95
OBF65x170P	187×82	54–62.8*	50	15	200
OBL40x90P	92.6×45	63–73*	28	31	105

* Height range includes fittings, ** PU30°/PU60° / PU60°.

Available materials

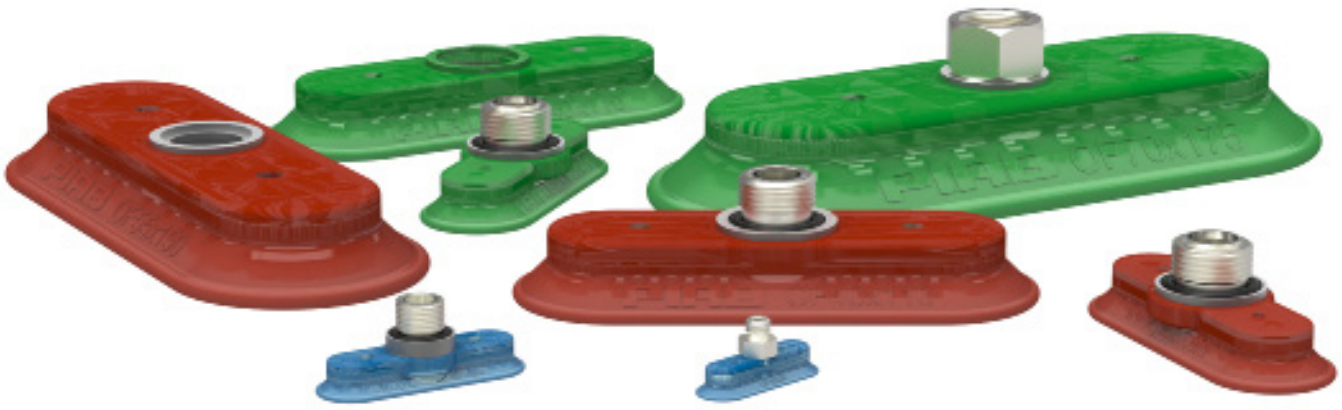
	PU30°/PU60°	PU55°/PU60°	PU60°	PU70°
OB20x60P			●	
OB35x90P	●		●	
OB50x140P	●		●	
OB65x170P	●		●	
OBF35x90P		●		
OBF50x140P		●		
OBF65x170P		●		
OBL40x90P			●	●

Material resistance

For more material information go to page 23.

	Oily sheet metal	Corrugated / cardboard	Glass handling	Mark Free
OB20x60P				●
OB35x90P		●		●
OB50x140P		●		●
OB65x170P		●		●
OBF35x90P	●			
OBF50x140P	●			
OBF65x170P	●			
OBL40x90P			●	●

Oval Flat family (OF)



Oval suction cups are specially suitable for long and narrow objects. This program of oval suction cups has characteristics that are specially suited for handling of metal-sheet material.

Lifting forces

	Lifting force vertical to the surface, N, at vacuum level			Lifting force parallell to the surface, N, at vacuum level		
	20 -kPa	60 -kPa	90 -kPa	20 -kPa	60 -kPa	90 -kPa
OF10x30P	4	11	17	6	12	17
OF15x45P	9	27	41	6	20	34
OF25x70P (PU40°)	24	66	107	46	90	105
OF25x70P (PU60°)	24	77	118	42	127	161
OF40x110P (PU40°)	69	203	293	120	230	296
OF40x110P (PU60°)	74	200	303	98	228	410
OF55x150P (PU40°)	131	366	527	155	350	455
OF55x150P (PU60°)	134	376	558	128	338	477
OF70x175P (PU40°)	190	530	785	170	440	630
OF70x175P (PU60°)	180	570	860	200	555	750

General specifications

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm^3
OF10x30P	30.8×10.8	14.6	15	1	0.5
OF15x45P	45×15	17.15	30	1	1
OF25x70P	72.3×27.3	23	50	1.9	6
OF40x110P	113×43	17.5	77	3.1	21
OF55x150P	154×59	21	150	3	37
OF70x175P	180×75	25	130	5.7	80

Available materials

	PU40°	PU50°	PU60°
OF10x30P		●	
OF15x45P		●	
OF25x70P	●		●
OF40x110P	●		●
OF55x150P	●		●
OF70x175P	●		●

Material resistance

For more material information go to page 23.

	Dry sheet metal	Corrugated / cardboard	Mark Free	Plastic injection molded parts
OF10x30P			●	
OF15x45P			●	
OF25x70P	●	●	●	●
OF40x110P	●	●	●	●
OF55x150P	●	●	●	●
OF70x175P	●	●	●	●

Oval Concave family (OC)

Suitable for handling long oblong objects with flat or curved surfaces with thick durable lip. Some of these cups have support cleats that prevent thin objects from being disfigured.

Lifting forces

	Lifting force vertical to the surface, N, at vacuum level			Lifting force parallell to the surface, N, at vacuum level		
	20 -kPa	60 -kPa	90 -kPa	20 -kPa	60 -kPa	90 -kPa
OC60x140	132	373	520	186	373	510
OC35x90P	49/49*	117/132*	171/171*	53/68*	112/161*	147/206*
OCF20x80P	—	75/82*	111/90*	—	78/35*	112/48*
OCF30X90P	—	111/115*	157/159*	—	107/51*	160/74*
OCF40X110P	—	178/185*	245/246*	—	167/54*	232/78*

* PU40° / PU60°.

General specifications

	Outer diameter, mm	Height, mm	Min. curve radius, mm	Max. vertical movement, mm	Volume, cm^3
OC60x140	138×61	30	200	7.5	52
OC35x90P	94×37	14.5	—	3	20
OCF20x80P	84×24	27–30.1*	20	3	15
OCF30X90P	92.5×32.5	29.5	25	4	17
OCF40X110P	113×43	32.5–35.5*	42	5	34

* Height range includes fittings.

Available materials

	Nitrile, NBR	PU40°	PU55°/PU60°	PU60°
OC60x140	●			
OC35x90P		●		●
OCF20x80P			●	
OCF30X90P			●	
OCF40X110P			●	

Material resistance

For more material information go to page 23.

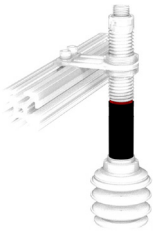
	Oily metal sheet	Dry metal sheet	Mark Free
OC60x140		●	
OC35x90P			●
OCF20x80P	●		
OCF30X90P	●		
OCF40X110P	●		

Suction cup accessories

Suction cup accessories	
	Mounting Elements
	Level compensators
	Ball joints
	Suction cup valves
	Fittings
	Other

Features and benefits
The mounting element programme consists of mounting brackets, height adjusters and suction cup extensions. The parts are designed to fit together for different sizes and applications. The parts are easily mounted on several standard extruded profile systems, not just suitable for one brand of profile. All parts of the same size-category fit perfectly together and thereby create an easy-to-use, compact and flexible/adjustable mounting “assembly kit” for cups.
Adjust differences in levels, for example on lifting devices with several suction cups. There is then less demand for exact positioning of vacuum handling device. Level compensators will also provide a certain degree of shock and vibration absorption.
To avoid bending stress, a suction cup can be fitted with a ball joint.
Valves to minimize the energy consumption. Gives a flexibility on number of objects to be handled.
A variety of fittings for suction cups.
Angle adaptors, t-slot adaptors etc.

Mounting Elements



Mounting bracket MB

- Mounting brackets suitable for extruded profile systems.
- Level compensators and height adjusters with external thread in sizes M12, M16, M20 and M25 are ideal for clamping on the mounting brackets.
- Facilitates the installation of a suction cup and positioning in X-direction.
- Long and short versions available.

Height adjuster HA

- Facilitates the positioning (y-direction) of a suction cup.
- Provides an adjustable height extension between a mounting bracket (MB) and a suction cup.
- Can be used with a suction cup / rod extension to further elongate the cup position.
- Key handle to avoid rotation when connecting vacuum ports.

Suction cup extension SE

- Solid rod extension with air/vacuum channel.
- For mounting a suction cup.
- Available in several sizes.
- Can be used with a height adjuster (HA) or level compensator (LC).

Technical Data

Description	Load, vertical, max.	Load, torque, max.	Load, horizontal, max.	Action range/ Stroke
Mounting bracket MB12S, MB16S, MB20S	200 N	7 Nm	–	–
Mounting bracket MB12L, MB16L, MB20L	200 N	7 Nm	–	–
Mounting bracket MB25S, MB25L	300 N	15 Nm	–	–
Height adjuster HA12	44 N	–	31 N	50 mm
Height adjuster HA16	87 N	–	61 N	50 mm
Height adjuster HA20	214 N	–	150 N	50 mm
Suction cup extension 50, G3/8” male x G3/8” female	700 N	–	400 N	–
Suction cup extension SE12	44 N	–	31 N	–
Suction cup extension SE16	87 N	–	61 N	–
Suction cup extension SE20	214 N	–	150 N	–

Level Compensators

Level compensator LC

- Adjust differences in levels, for example on lifting devices with several suction cups.
- Less demand for exact positioning of vacuum handling device.
- Provides a certain degree of shock and vibration absorption.
- Allows for soft placement of cups on sensitive or thin objects.
- Non-rotational design, suitable for use with oval suction cups.
- Wide range of thread connections and stroke lengths.

Level compensators

- Adjust differences in levels, for example on lifting devices with several suction cups on a frame.
- A level compensator is often advantageous since it places less demand on exact vertical positioning, for example on a handling robot.
- The level compensator provides a certain degree of shock absorbtion.
- Level Compensator G1/2” with stiffer spring is identical to standard level compensator G1/2” except for thicker spring material. Suits e.g. robot vision systems in applications such as auto-racking.

Level compensator LC30

- Tailor made for the Vacuum Gripper System, VGS™, but can also be used together with other Piab products.
- Developed for use with standard profile systems.
- Easy installation with the option of fine adjustments and positioning of the suction cup.
- Non-rotational for use with, for example, oval suction cups. Can easily be made rotational.
- Quiet and reliable level compensation with load protection and shock absorbtion.

Technical Data

Description	Load, vertical, max.	Spring force	Action range/ Stroke	Thread
Level compensator LC12-F0510 / LC12-M0510	–	1.9–4.1 N	10 mm	M5
Level compensator LC12-F0525 / LC12-M0525	–	2–5 N	25 mm	M5
Level compensator LC16-F1820 / LC16-M1820	–	3.6–9 N	20 mm	G1/8”
Level compensator LC16-F1835 / LC16-M1835	–	4.3–9.5 N	35 mm	G1/8”
Level compensator LC20-F1425 / LC20-M1425	–	4.1–11 N	25 mm	G1/4”
Level compensator LC20-F1450 / LC20-M1450	–	4.3–11.4 N	50 mm	G1/4”
Level compensator LC25-F3840 / LC25-M3840	–	5.6–16.5 N	40 mm	G3/8”
Level compensator LC25-F3880 / LC25-M3880	–	6–17 N	80 mm	G3/8”
Level compensator G1/2” with stiffer spring	490 N	90–150 N	15 mm	G1/2”
Level compensator M5	29.4 N	2–5 N	7 mm	M5
Level compensator G1/8”	245 N	3–9.4 N	20 mm	G1/8”
Level compensator G1/2”	490 N	24–37 N	15 mm	G1/2”
Level compensator LC30	700 N	5–42 N	30 mm	G3/8”

Level compensator LC30 EOAT

- Easy installation with the option of fine adjustments and positioning of the suction cup.
- Conical spring means very low total height in relation to stroke. For example, that can help increase cycle speed in sheet metal press-to-press stamping applications.
- Non-rotational for use with, for example, oval suction cups. Can easily be made rotational.
- Mounting interfaces for standard flexible end-of-arm-tooling (EOAT) systems.
- Developed for use with decentralized vacuum pump/generator units such as VGS™3010 and VGS™3040 or a centralized vacuum pump/generator.
- Quiet and reliable level compensation with load protection and shock absorption.

Level compensator – profile mount

- Compensates for differences in height.
- Provides certain degree of shock absorption.
- Fits on standard size extrusion.

Vactivator V18

- Actuated by vacuum only.
- Automatic extension and retraction.
- Self-adjusting stroke, the piston with a suction cup returns home as soon as it seals off the object.
- Suction cup ordered separately.
- Simple solution for high picking speed.
- Easy installation.
- Designed for millions of cycles under normal industrial conditions.

Technical Data

Description	Load, vertical, max.	Action range/Stroke	Thread
Level compensator LC30 EOAT	700 N	30 mm	G3/8” / 1/8”NPSF
Level compensator – profile mount	700 N	50 mm	G3/8” / 3/8” NPT
Vactivator V18/20	4.9 N	20 mm	G1/8”
Vactivator V18/40	4.9 N	40 mm	G1/8”

Ball Joints

Ball joints

- Ball joint fittings could be used when lifting sheet metal with a device using several suction cups.
- To avoid bending stress a suction cup can be fitted with a balljoint.

Ball joint fitting

- Fitted to a suction cup to avoid bending stress.
- Non-leaking design to work with Vacuum Check Valve and Vacustat.
- Available in a loose-fit, a locking version or one with 5° movement.

Technical Data

Description	Load, max.	Movement, angular
Ball joint G1/8”	25 kg	±12 °
Ball joint G1/2”	50 kg	±12 °
Ball joint G3/4”	150 kg	±12 °
Ball joint fitting G3/8”	–	±20 °
Ball joint fitting G3/8”, locking	–	±20 °
Ball joint fitting G3/8”, limited movement	–	±5 °

Suction Cup Valves

piSAVE sense

- Vacuum check valves which allows a few suction cups to miss the object(s) and still maintain enough vacuum level in the system with quick response and release times.
- The vacuum check valves shall be used in a centralized vacuum system, one for each suction cup.
- Designing with vacuum check valves will require a smaller vacuum pump and save energy.
- Suitable for handling different size or different number of leaking or sealed objects such as MDF boards, corrugated cardboards or metal sheets with a flexible handling device.
- Also suitable for objects with surface leakage around the lip of the suction cup.
- Available in four sizes with different flow performance/ characteristics to suit different degree of leakage on handled material and different size of cups.
- The smallest sizes are mainly suitable for sealed and smooth materials, such as metal and glass (02/06 for small cups and 03/60 for large cups).
- The valves are supplied separately for integration or mounted in an Al-fitting with female and male threaded connections to facilitate installation.

piSAVE restrict

- Vacuum flow restrictors which allows a few suction cups to miss the object(s) and still maintain enough vacuum level in the system.
- Suitable for handling different size sealed sheets/objects with the same flexible lifting device.
- The vacuum flow restrictors shall be used in a centralized vacuum system, one for each suction cup.
- Designing with flow restrictors will require a smaller vacuum pump and save energy.
- Available in three sizes with different flow performance/ characteristics to suit different size suction cups.
- The restrictors are integrated in an Al-fittng with female and male threaded connections to faciliate installation.

Technical Data

Description	Pump flow/cup min.	Pump flow/cup to close valve	Leakage flow, max.
piSAVE sense 02/60 (yellow)	0.001 (@ 45 -kPa) Nl/s	0.21 (@ 3 -kPa) Nl/s	–
piSAVE sense 03/60 (green)	0.06 (@ 45 -kPa) Nl/s	0.37 (@ 3 -kPa) Nl/s	–
piSAVE sense 04/60 (blue)	0.15 (@ 45 -kPa) Nl/s	0.55 (@ 7 -kPa) Nl/s	–
piSAVE sense 05/60 (red)	0.25 (@ 45 -kPa) Nl/s	0.72 (@ 11 -kPa) Nl/s	–
piSAVE restrict multiple port fitting 0.7	–	–	0.08 Nl/s
piSAVE restrict multiple port fitting 1.0	–	–	0.16 Nl/s
piSAVE restrict multiple port fitting 1.3	–	–	0.27 Nl/s

piSAVE release

- Equalises pressure in the suction cups to provide fast release of the product.
- Extra fast release by accumulating and utilising the feed-air pressure as a boost.
- ON/OFF activated simultaneously with the ejector.
- No additional controls required — use a single 3/2 control valve for the ejector and piSAVE release.

AQR (Atmospheric Quick-Release Valve)

- Equalises pressure in vacuum gripper systems to provide fast release of product.
- Consumes no additional compressed air.
- ON/OFF activated simultaneously with the ejector.
- No additional controls required — use a single 3/2 control valve for the pump and AQR.

Blow-off Check Valve G1/8”

- Prevents vacuum from being pulled through the blow-off lines, which means faster response time and completely independent vacuum units.
- Reliable quick-release function even in larger systems with several units, due to the very low feed pressure required to break away for blow-off.
- Suitable in applications where cleaning of the suction cup filters or cooling of the object to be picked is important.

Technical Data

Description	Flow, atmospheric	Flow rate
piSAVE release G1/8"	3.85 Nl/s	–
piSAVE release G1/4"	7.85 Nl/s	–
Atmospheric quick-release valve – AQR	3.3 Nl/s	–
Blow-off Check valve G1/8”	–	1.5–2.8 Nl/s (@ 0.3-0.7 MPa)

Suction Cup Fittings

Suction cup shape																	
F	FC	FCF	B	B-MF	BL-2	BX	BFF	D	U	OBF	BL-3P	BL-4	BL-5	BF-P	OB	OC	OCF	OF
									2–3									
15			5–15	15		10–15		15	4–15									
20–30	20–25		20	20	20	20–25		20–30	20–30									
						35												
40–50	35		30–50*	30–50	30–50*	52		50*	40–50*									
	50–75	25				75	30											
		35–125					40–110			All								
75	100		75															
110	150		110															
150			150															
XLF																		
						110												
																		10x30
												30	30					
											30–40	40	40					
											50	50	50					
															20x60			15x45
															OBL			25x70
														80		35x90		
														110	35x90–65x170			40x110–70x175
																60x140		
																	All	

M2,5 Male	M5 Male	M5 Female	5xM5 Female	M10x1,5 Male	G3/4" Female	G1/2" Female	G1/2" Male	G3/8" Female	G3/8" Male	G1/4" Male	G1/8" Male	G1/8" M. / M5 F.	3/8" NPSF Female	1/8" NPSF Female	5x1/8" NPSF F.	3/8" NPT Female	3/8" NPT Male	1/2" NPT Male	1/4" NPT Female	1/4" NPT Male	1/8" NPT Male	G3/8" M. / 1/8" NPSF F.
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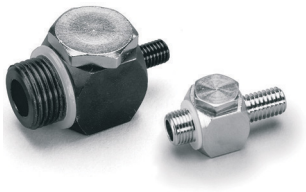
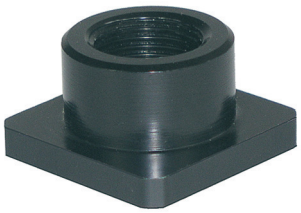
piab

Other



Angle Adaptors

- Angle adaptors facilitate vacuum connections when space and headroom are limited.
- Can also be used as T-connectors.



T-slot Adapters

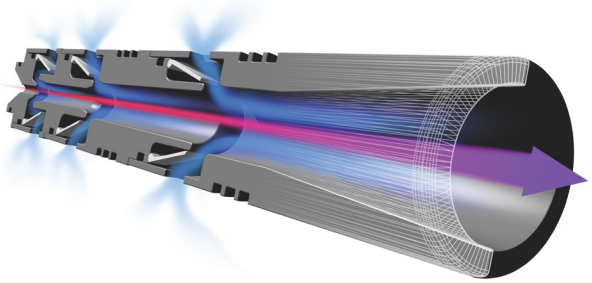
- The Piab T-slot adapter enables Piab suction cups to mount to existing boom assemblies and end-of-arm tooling used in the automotive industry. The T-slot adapter threads into the Piab cup fitting and can then be mounted accordingly.
- The suction cups can be changed quickly and with great ease.
- Non-rotating feature — good when using oval suction cups.

Vacuum pumps/generators

COAX® technology

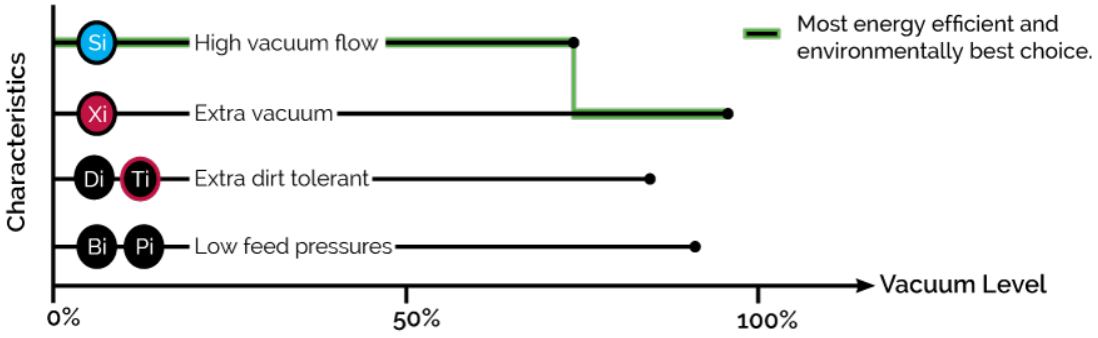
Piab vacuum pumps/generators are predominately based on the patented COAX® technology.

COAX® is an advanced solution for creating vacuum with compressed air. Based on Piab's multistage technology, COAX® cartridges are smaller, more efficient and more reliable than conventional ejectors, which allow for the design of a flexible, modular and efficient vacuum system. A vacuum system based on COAX® technology can provide you with three times more vacuum flow than conventional systems, allowing you to increase speed with high reliability while reducing energy consumption. COAX® cartridges exist in several sizes (MIDI, MINI & MICRO) and models (Bi, Pi, Si, Ti, Xi and Di), making them suitable for every application. The technology ensures excellent performance at both low and high feed pressures. Pumps based on COAX® technology can operate within the feed pressure range of 0.17 to 0.60 MPa.



Custom integration

- The two-stage COAX® cartridge MICRO is probably the world's smallest multistage vacuum ejector. Its low weight makes it suitable to integrate close to the suction point in high speed pick and-place applications of small objects.
- The two-stage COAX® cartridge MINI has small mounting dimensions and the three-stage COAX® cartridge MINI has high initial vacuum flow.
- The two-stage COAX® cartridge MIDI has small mounting dimensions and the three-stage COAX® cartridge MIDI has high initial vacuum flow. The MIDI cartridges are efficient generators of blow-air and are also suitable for fast evacuation of large volumes.



COAX® MICRO family

MICRO Bi03-2

MICRO Si02-2

MICRO Ti05-2

MICRO Xi2.5-2

The two-stage COAX® cartridge MICRO is probably the world's smallest multistage vacuum ejector. Its low weight makes it suitable to integrate close to the suction point in high speed pick-and-place applications of small objects.

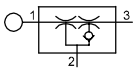
Vacuum flow

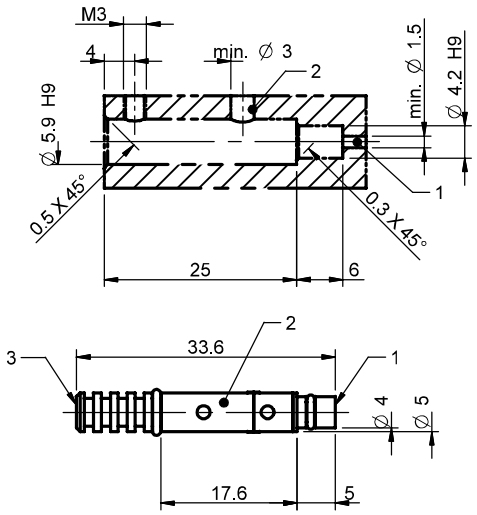
COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	-kPa
MICRO Bi03-2	0.18	0.14	0.23	0.15	0.06	0.04	0.035	0.023	0.013	0.006	–	83
MICRO Si02-2	0.6	0.12	0.28	0.21	0.12	0.08	0.07	0.06	0.04	0.02	–	75
MICRO Ti05-2	0.4	0.27	0.32	0.28	0.23	0.17	0.1	0.07	0.04	0.02	0.004	84
MICRO Xi2.5-2	0.5	0.13	0.24	0.17	0.1	0.06	0.04	0.03	0.02	0.01	0.01	92

Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	-kPa
MICRO Bi03-2	0.18	0.14	0.5	1.4	3.9	6.4	10	16	28	51	83
MICRO Si02-2	0.6	0.12	0.41	1.01	2.01	3.3	4.9	6.9	10.2	–	75
MICRO Ti05-2	0.4	0.27	0.33	0.73	1.2	2	3.1	5	8.3	16.6	84
MICRO Xi2.5-2	0.5	0.13	0.49	1.23	2.48	4.5	7.3	11.3	18	28	92

Dimensional drawing





Ordering information

COAX® MINI family

MINI Di16-2

MINI Pi12-2

MINI Pi12-3

MINI Pi12-3 FS

MINI Si08-2

MINI Si08-3 FS

MINI Si08-3

MINI Xi10-2

MINI Xi10-3

MINI Xi10-3 FS

The two-stage COAX® cartridge MINI has small mounting dimensions and the three-stage COAX® cartridge MINI has high initial vacuum flow.

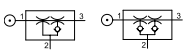
Vacuum flow

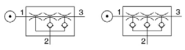
COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MINI Di16-2	0.6	0.75	0.64	0.57	0.49	0.41	0.35	0.29	0.18	0.04	–	–	73
MINI Pi12-2	0.32	0.44	0.68	0.6	0.44	0.27	0.19	0.14	0.1	0.06	0.03	–	90
MINI Pi12-3	0.32	0.44	1.4	0.6	0.44	0.27	0.19	0.14	0.1	0.06	0.03	–	90
MINI Pi12-3 FS	0.32	0.44	1.4	0.6	0.44	0.27	0.19	0.14	0.1	0.06	0.03	–	90
MINI Si08-2	0.6	0.44	0.77	0.67	0.51	0.33	0.23	0.16	0.12	0.08	–	–	75
MINI Si08-3	0.6	0.44	1.34	0.73	0.55	0.35	0.23	0.17	0.13	0.08	–	–	75
MINI Si08-3 FS	0.6	0.44	1.34	0.73	0.55	0.35	0.23	0.17	0.13	0.08	–	–	75
MINI Xi10-2	0.5	0.46	0.75	0.63	0.49	0.33	0.19	0.15	0.11	0.07	0.045	0.011	94
MINI Xi10-3	0.5	0.46	1.43	0.7	0.5	0.33	0.19	0.15	0.11	0.07	0.045	0.011	94
MINI Xi10-3 FS	0.5	0.46	1.43	0.7	0.5	0.33	0.19	0.15	0.11	0.07	0.045	0.011	94

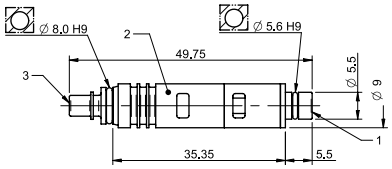
Evacuation times

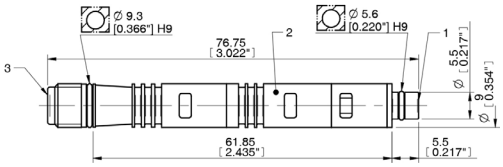
COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80		-kPa
MINI Di16-2	0.6	0.75	0.17	0.35	0.58	0.84	1.15	1.58	2.49	—	—	73
MINI Pi12-2	0.32	0.44	0.17	0.32	0.58	1.1	1.8	2.7	4	6.4	—	90
MINI Pi12-3	0.32	0.44	0.08	0.23	0.49	1	1.7	2.6	3.9	6.3	—	90
MINI Pi12-3 FS	0.32	0.44	0.08	0.23	0.49	1	1.7	2.6	3.9	6.3	—	90
MINI Si08-2	0.6	0.44	0.14	0.31	0.55	0.9	1.4	2.1	3.1	—	—	75
MINI Si08-3	0.6	0.44	0.1	0.25	0.48	0.8	1.3	2	2.9	—	—	75
MINI Si08-3 FS	0.6	0.44	0.1	0.25	0.48	0.8	1.3	2	2.9	—	—	75
MINI Xi10-2	0.5	0.46	0.14	0.3	0.6	1	1.6	2.3	3.5	5.3	8.9	94
MINI Xi10-3	0.5	0.46	0.09	0.26	0.5	0.9	1.5	2.2	3.4	5.2	8.8	94
MINI Xi10-3 FS	0.5	0.46	0.09	0.26	0.5	0.9	1.5	2.2	3.4	5.2	8.8	94

Dimensional drawing









Ordering information

COAX® MIDI family

MIDI Pi48-2 MIDI Pi48-3 MIDI Si32-2 MIDI Si32-3 MIDI Xi40-2 MIDI Xi40-3

The two-stage COAX® cartridge MIDI has small mounting dimensions and the three-stage COAX® cartridge MIDI has high initial vacuum flow. The MIDI cartridges are efficient generators of blow-air and are also suitable for fast evacuation of large volumes.

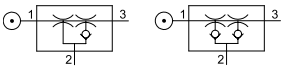
Vacuum flow

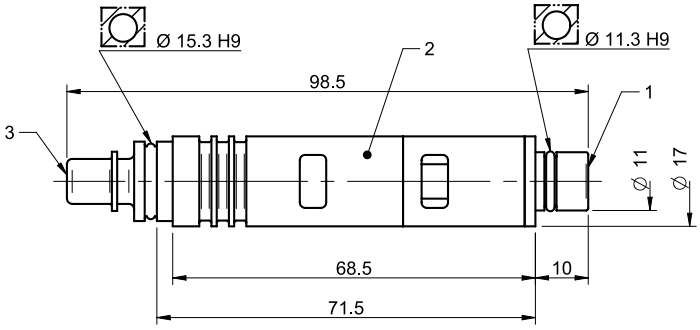
COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MIDI Pi48-2	0.31	2	2.8	2.5	1.8	1.1	0.65	0.5	0.35	0.25	0.1	–	90
MIDI Pi48-3	0.31	2.05	5.6	2.5	1.8	1.1	0.65	0.5	0.35	0.25	0.1	–	90
MIDI Si32-2	0.6	1.75	3.3	3	2.6	1.7	0.9	0.6	0.5	0.35	–	–	75
MIDI Si32-3	0.6	1.75	6	3.5	2.6	1.7	0.9	0.6	0.5	0.35	–	–	75
MIDI Xi40-2	0.45	1.83	2.8	2.3	1.6	1	0.73	0.58	0.43	0.32	0.18	0.03	95
MIDI Xi40-3	0.45	1.83	5.9	3	2	1.3	0.73	0.58	0.43	0.32	0.18	0.03	95

Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
MIDI Pi48-2	0.31	2	0.03	0.07	0.13	0.26	0.46	0.7	1	1.6	4	90
MIDI Pi48-3	0.31	2.05	0.02	0.06	0.12	0.25	0.45	0.7	1	1.6	4	90
MIDI Si32-2	0.6	1.75	0.03	0.07	0.1	0.18	0.33	0.53	0.8	–	–	75
MIDI Si32-3	0.6	1.75	0.02	0.05	0.1	0.18	0.33	0.53	0.8	–	–	75
MIDI Xi40-2	0.45	1.83	0.04	0.09	0.17	0.28	0.44	0.63	0.9	1.3	2.3	95
MIDI Xi40-3	0.45	1.83	0.022	0.062	0.12	0.22	0.37	0.57	0.84	1.2	2.2	95

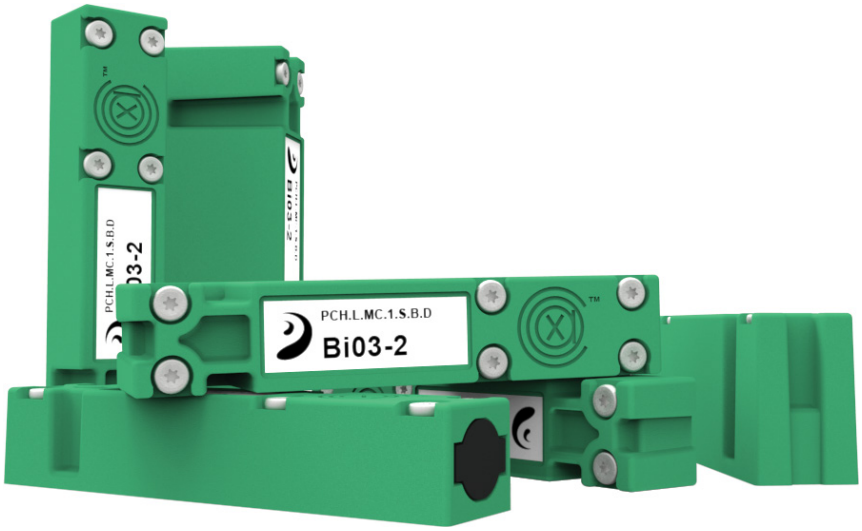
Dimensional drawing





Ordering information

piCHIP10X family



The lightweight piCHIP10X unit is a small vacuum pump which is optimized for integration. It is flexible enough to surface mount quickly on a variety of materials. With its almost silent operation, the piCHIP10X is ideal for clean room operations. Medical and electronic industries are best suited to use this product in their vacuum applications. Because COAX® cartridges are up to twice as fast as other cartridges and provide three times more flow than a conventional ejector with the same air consumption, the piCHIP10X is able to provide a high performance even at low or fluctuating feed pressures (0.1-0.6 MPa).

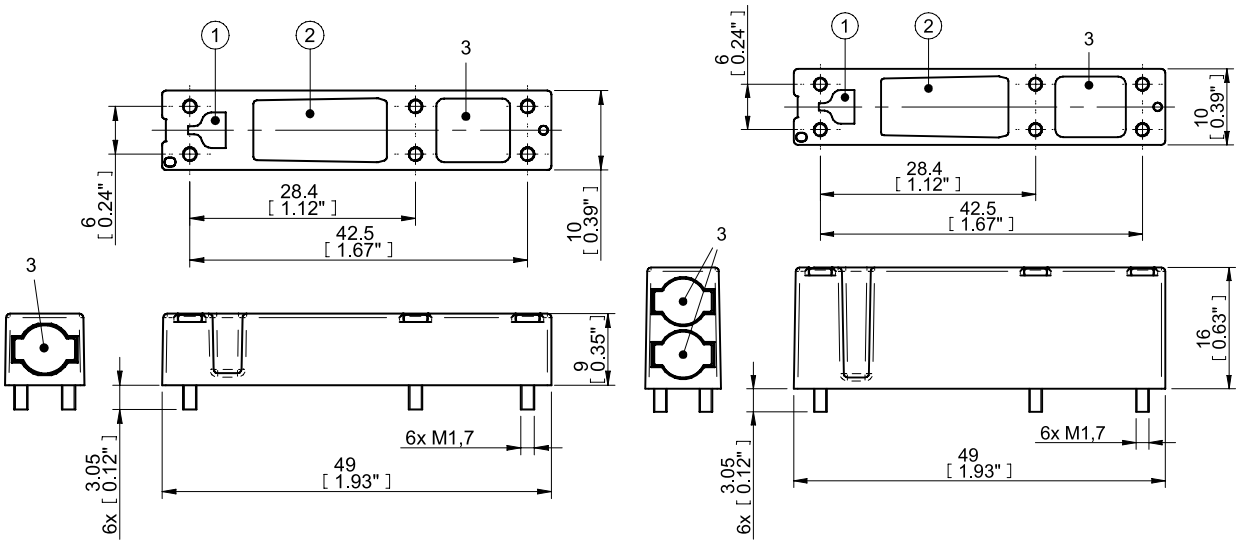
Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	-kPa
MICRO Bi03-2	0.18	0.14	0.23	0.15	0.06	0.04	0.035	0.023	0.013	0.006	–	83
MICRO Si02-2	0.6	0.12	0.28	0.21	0.12	0.08	0.07	0.06	0.04	0.02	–	75
MICRO Ti05-2	0.4	0.27	0.32	0.28	0.23	0.17	0.1	0.07	0.04	0.02	0.004	84
MICRO Xi2.5-2	0.5	0.13	0.24	0.17	0.1	0.06	0.04	0.03	0.02	0.01	0.01	92

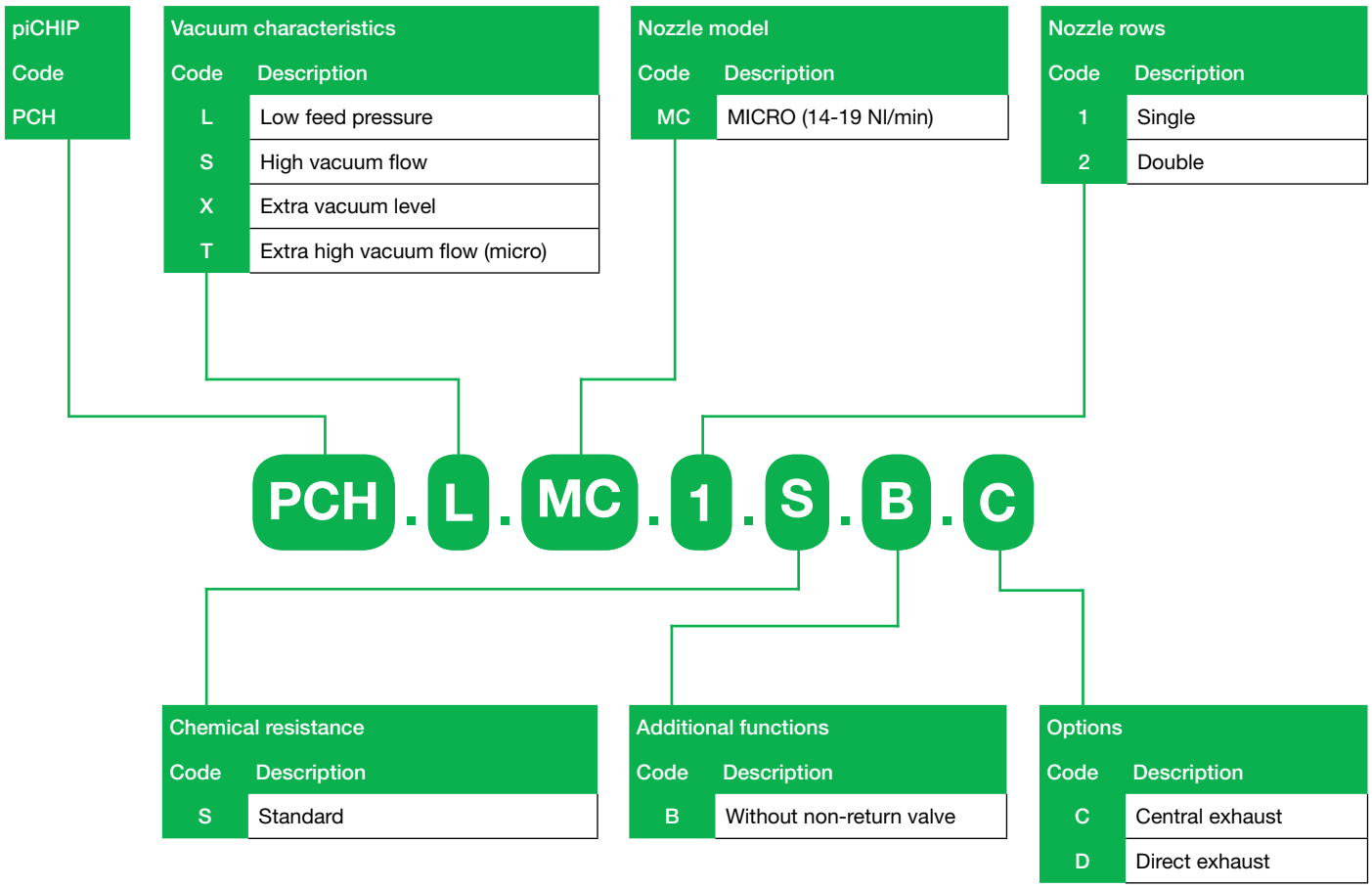
Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	-kPa
MICRO Bi03-2	0.18	0.14	0.5	1.4	3.9	6.4	10	16	28	51	83
MICRO Si02-2	0.6	0.12	0.41	1.01	2.01	3.3	4.9	6.9	10.2	–	75
MICRO Ti05-2	0.4	0.27	0.33	0.73	1.2	2	3.1	5	8.3	16.6	84
MICRO Xi2.5-2	0.5	0.13	0.49	1.23	2.48	4.5	7.3	11.3	18	28	92

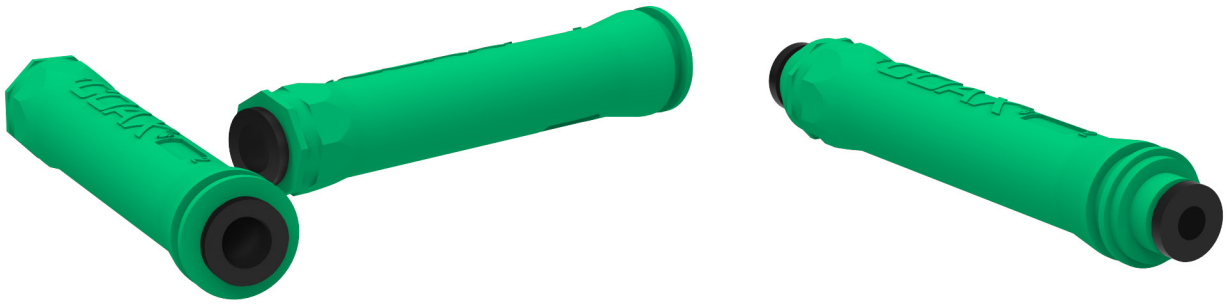
Dimensional drawing



piCHIP10X – Customer Code



piINLINE® MICRO family



piINLINE® are small lightweight inline ejectors that use the patented COAX® technology inside. They can be mounted directly on a hose close to the suction cup (or point of suction). Piab's piINLINE® ejector program offers much better performance with at least 40-50% lower energy consumption compared to competing inline single-stage ejectors in corresponding sizes. Inline vacuum generators are especially common in electronic/semiconductor pick-and-place applications, dedicated packaging equipment, injection-molding automation and unloading/loading metal forming machines (bending, punching and laser-cutting).

The COAX® Cartridge Si/Ti for extra vacuum flow, Bi cartridge for reliability at low feed pressures. And Ti/Xi cartridge when high flow and deep vacuum is needed.

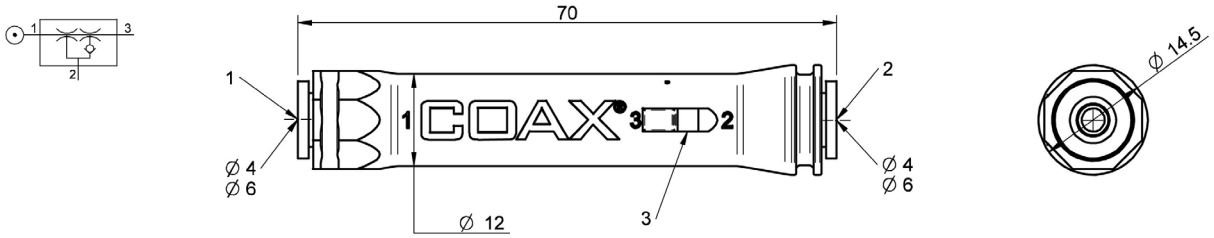
Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	-kPa
MICRO Bi03-2	0.18	0.14	0.23	0.15	0.06	0.04	0.035	0.023	0.013	0.006	–	83
MICRO Si02-2	0.6	0.12	0.28	0.21	0.12	0.08	0.07	0.06	0.04	0.02	–	75
MICRO Ti05-2	0.4	0.27	0.32	0.28	0.23	0.17	0.1	0.07	0.04	0.02	0.004	84
MICRO Ti05-2	0.6	0.37	0.31	0.27	0.24	0.2	0.15	0.09	0.04	0.01	–	75
MICRO Xi2.5-2	0.5	0.13	0.24	0.17	0.1	0.06	0.04	0.03	0.02	0.01	0.01	92

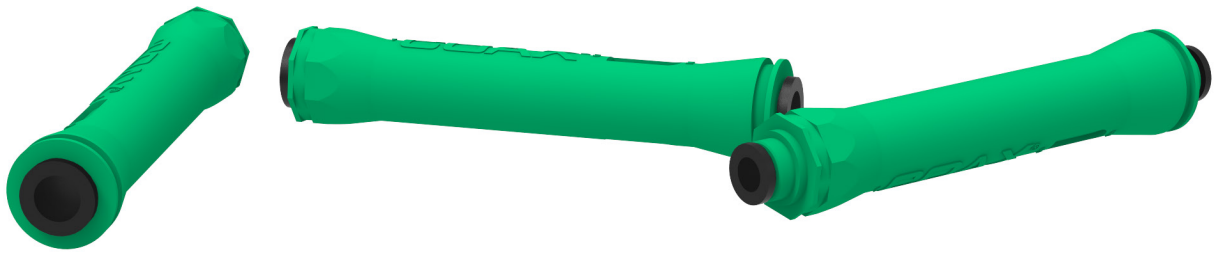
Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	-kPa
MICRO Bi03-2	0.18	0.14	0.5	1.4	3.9	6.4	10	16	28	51	83
MICRO Si02-2	0.6	0.12	0.41	1.01	2.01	3.3	4.9	6.9	10.2	–	75
MICRO Ti05-2	0.4	0.27	0.33	0.73	1.2	2	3.1	5	8.3	16.6	84
MICRO Ti05-2	0.6	0.37	0.3	0.7	1.2	1.8	2.6	4.2	8.43	–	75
MICRO Xi2.5-2	0.5	0.13	0.49	1.23	2.48	4.5	7.3	11.3	18	28	92

Dimensional drawing



piINLINE® MINI family



piINLINE® are small lightweight inline ejectors that use the patented COAX® technology inside. They can be mounted directly on a hose close to the suction cup (or point of suction). Piab's piINLINE® ejector program offers much better performance with at least 40-50% lower energy consumption compared to competing inline single-stage ejectors in corresponding sizes. Inline vacuum generators are especially common in electronic/semiconductor pick-and-place applications, dedicated packaging equipment, injection-molding automation and unloading/loading metal forming machines (bending, punching and laser-cutting).

The COAX® Cartridge Si cartridge for extra vacuum flow, the Pi cartridge for high performance at low feed pressures. And the Xi cartridge when high flow and deep vacuum is needed.

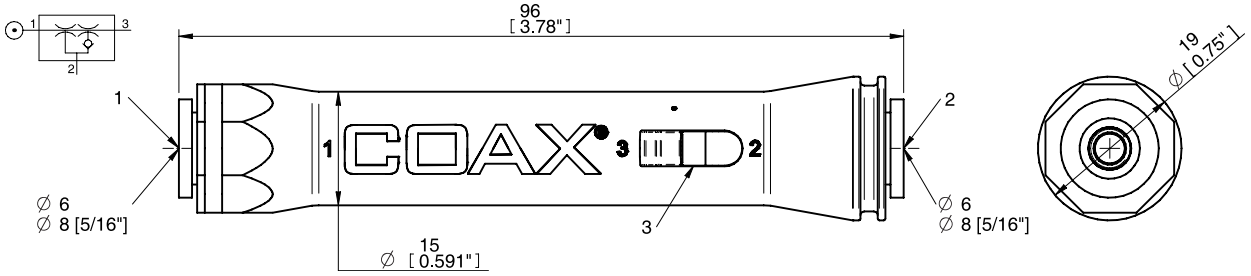
Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MINI Si08-2	0.6	0.44	0.69	0.55	0.42	0.28	0.23	0.16	0.12	0.08	—	—	75
MINI Pi12-2	0.32	0.44	0.57	0.44	0.31	0.23	0.19	0.14	0.1	0.06	0.03	—	90
MINI Xi10-2	0.5	0.46	0.62	0.5	0.37	0.27	0.19	0.15	0.11	0.07	0.045	0.011	94

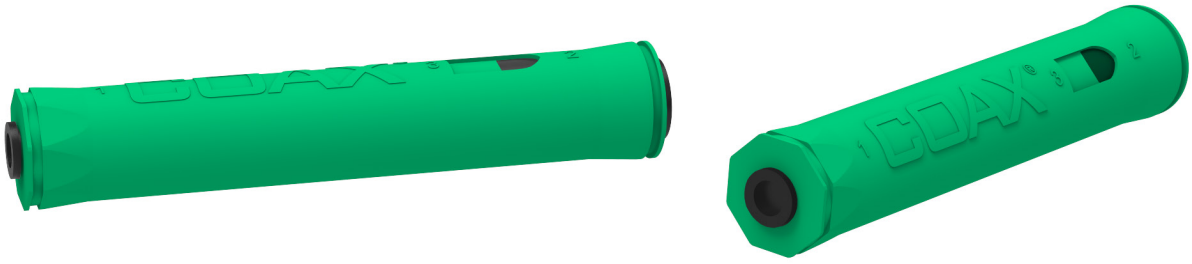
Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
MINI Si08-2	0.6	0.44	0.16	0.37	0.66	1.1	1.4	2.1	3.1	—	—	75
MINI Pi12-2	0.32	0.44	0.2	0.46	0.83	1.1	1.8	2.7	4	6.4	—	90
MINI Xi10-2	0.5	0.46	0.18	0.41	0.72	1	1.6	2.3	3.5	5.3	8.9	94

Dimensional drawing



piINLINE® MIDI family



piINLINE® are small lightweight inline ejectors that use the patented COAX® technology inside. They can be mounted directly on a hose close to the suction cup (or point of suction). Piab's piINLINE® ejector program offers much better performance with at least 40-50% lower energy consumption compared to competing inline single-stage ejectors in corresponding sizes. Inline vacuum generators are especially common in electronic/semiconductor pick-and-place applications, dedicated packaging equipment, injection-molding automation and unloading/loading metal forming machines (bending, punching and laser-cutting).

The COAX® Cartridge Si cartridge for extra vacuum flow the Pi cartridge for high performance at low feed pressures. And the Xi cartridge when high flow and deep vacuum is needed.

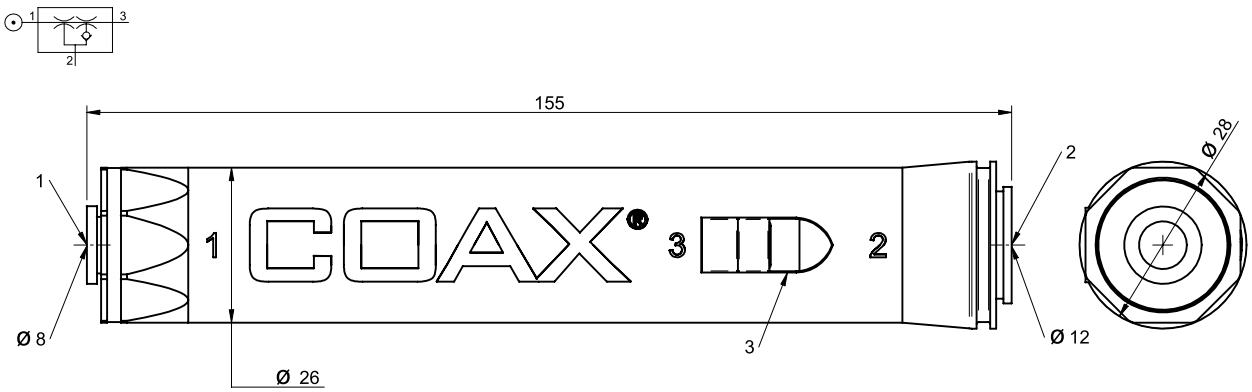
Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MIDI Si32-2	0.6	1.75	3.1	2.5	1.9	1.2	0.7	0.6	0.5	0.35	–	–	75
MIDI Pi48-2	0.31	2	2.7	2.2	1.5	0.93	0.65	0.5	0.35	0.25	0.1	–	90
MIDI Xi40-2	0.45	1.83	2.8	2.3	1.6	1	0.73	0.58	0.43	0.32	0.18	0.03	95

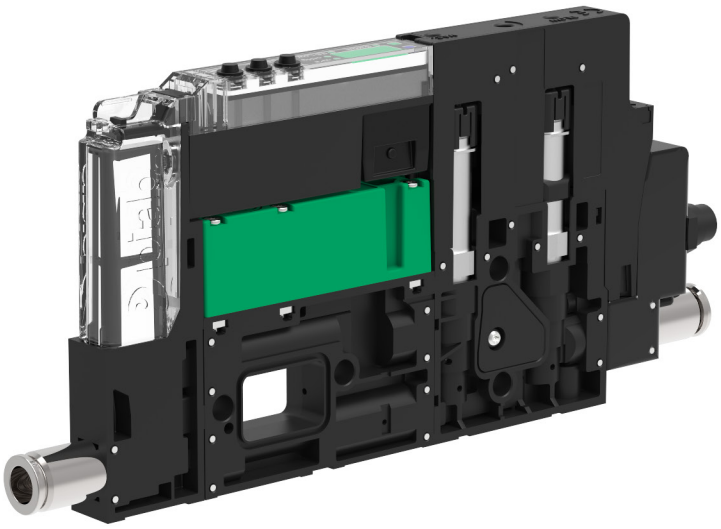
Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
MIDI Si32-2	0.6	1.75	3.1	2.5	1.9	1.2	0.7	0.6	0.5	0.35	–	75
MIDI Pi48-2	0.31	2	0.04	0.1	0.18	0.3	0.48	0.71	1.05	1.85	4	90
MIDI Xi40-2	0.45	1.83	0.04	0.09	0.17	0.28	0.44	0.63	0.9	1.3	2.3	95

Dimensional drawing



piCOMPACT®10X



piCOMPACT® is an ejector family with integrated controls, so called compact or ”all-in-one” ejector unit. It is a stackable platform with the possibility to mount several units in the same manifold and have common pneumatic and electrical connections. The focus during development has been on the most significant “key criteria” for these types of pumps, reliability and speed, as well as introducing some brand new attractive features/functions. That in combination with our state-of-the-art vacuum engine, COAX®, the product is outstanding. By working at low feed pressure and maximizing the utilization rate of the compressed air, the COAX® ejectors reduce energy consumption for manufacturers while increasing productivity and reliability. Its vacuum response to 50–60 -kPa is typically 30–50% faster compared to single stage technology. The piCOMPACT® is only 10 mm wide with a large 6 mm vacuum connection for maximum performance.

Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	-kPa
MICRO Bi03-2	0.22/0.2*	0.14	0.21	0.14	0.063	0.021	0.016	0.014	0.007	0.004	82
MICRO Si02-2	0.604/0.6*	0.11	0.26	0.18	0.095	0.053	0.045	0.038	0.027	0.019	75
MICRO Ti05-2	0.43/0.4*	0.23	0.31	0.28	0.22	0.16	0.088	0.063	0.045	0.023	84
MICRO Xi2.5-2	0.51/0.5*	0.13	0.23	0.15	0.079	0.044	0.036	0.03	0.023	0.013	91

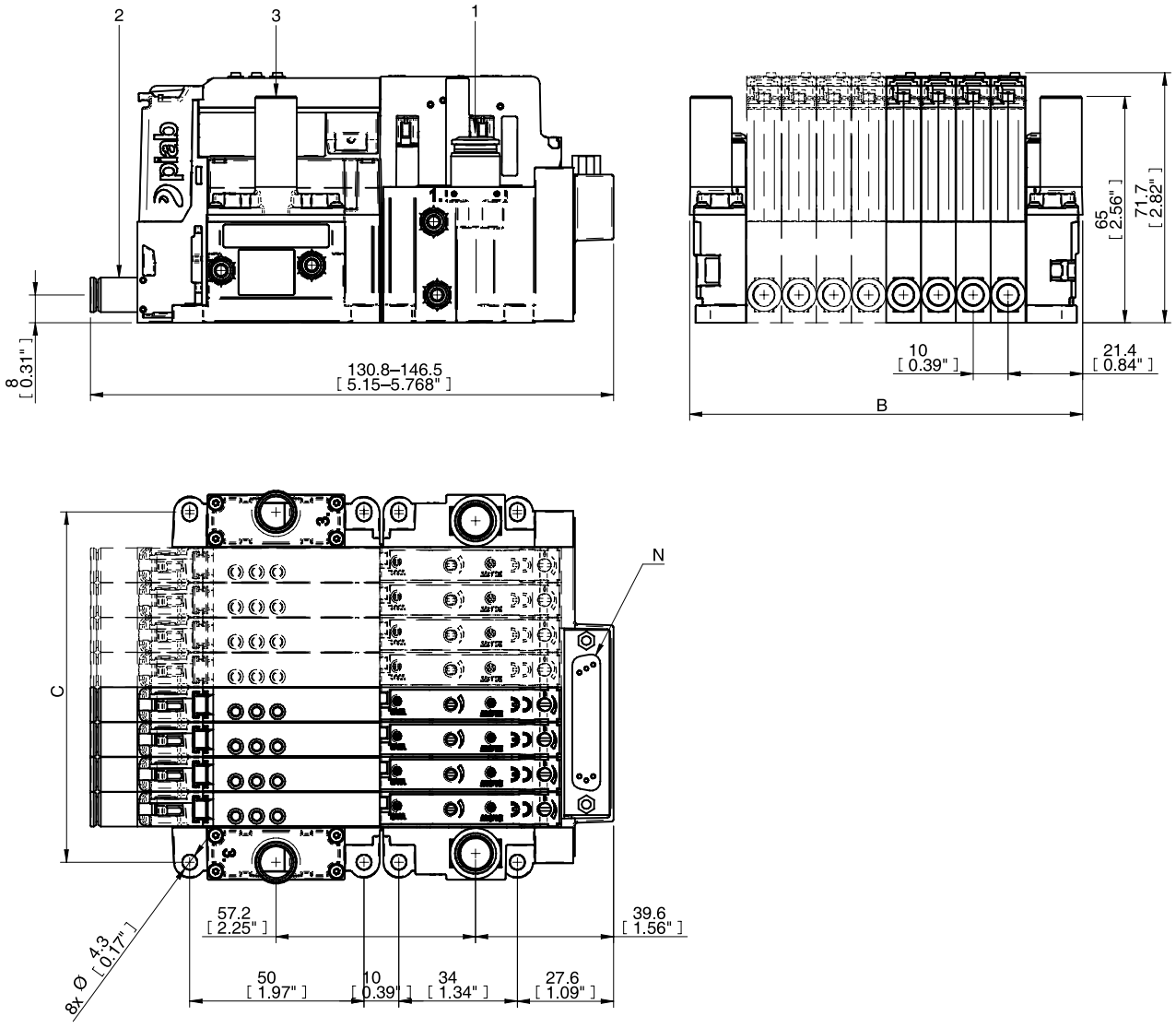
* Pump/nozzle.

Evacuation times

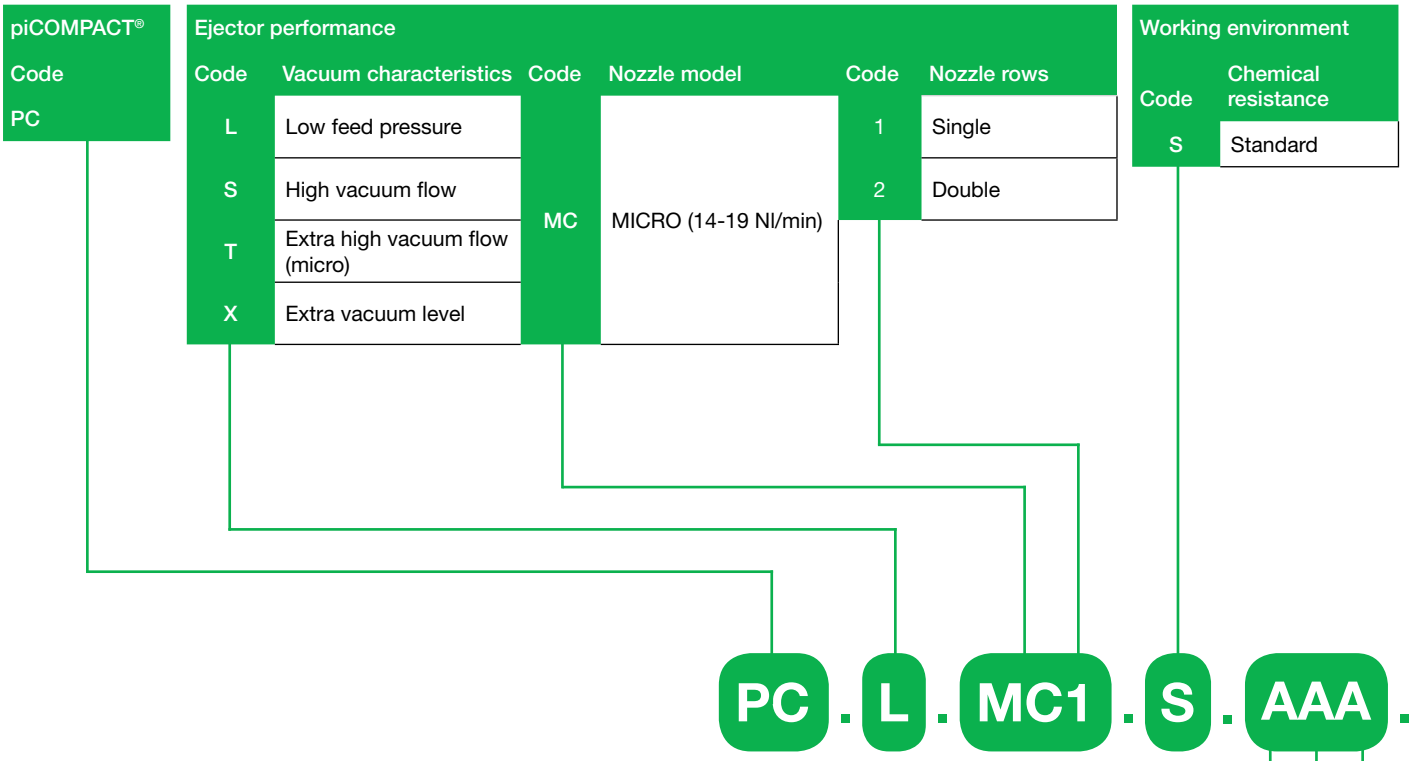
COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (ms) of 5 ml to reach different vacuum levels (-kPa)												Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	75	80	90	Max	-kPa
MICRO Bi03-2	0.22/0.2*	0.14	5	9.9	20.4	53	99	153	228	354	—	552	—	652**	82
MICRO Si02-2	0.604/0.6*	0.11	5	8.9	16.2	31	48	68	95	136	185	—	—	185**	75
MICRO Ti05-2	0.43/0.4*	0.23	5	6.7	10.2	14.8	23	35	50	70	—	114	—	159**	84
MICRO Xi2.5-2	0.51/0.5*	0.13	5.1	8.9	16.2	35	59	87	121	169	—	250	421	464**	91

* Pump/nozzle, ** Evacuation time (ms) at max vacuum level (-kPa).

Dimensional drawing



piCOMPACT®10X – Customer Code



Functionality					
Code	Control functions	Code	Non-return valve	Code	Vacuum sensing
A	Electrical ES, vac and blow off	A	With non-return valve	A	Display, analog and digital output
B	Electrical ES, vac and automatic blow off	B	Without non-return valve	X	No vacuum sensing
C	Vac and blow off				
D	Vac and automatic blow off				
E	Vacuum on/off (vac)				

Vacuum connection module

Code	Vacuum filter
S	Vacuum filter 50 µm
X	No vacuum filter

Code	Vacuum port(s)/ channel
1	1 vacuum port
2	2 vacuum ports
3	3 vacuum ports

Code	Vacuum connection(s)
4	ø4 (5/32") push-in connector(s)
6	ø6 push-in connector(s)
14	ø1/4" push-in connector(s)

Single unit or manifold mount

Number of channels	
Code	Description
1	1 channel
2	2 channels
3	3 channels
4	4 channels
5	5 channels
6	6 channels
7	7 channels
8	8 channels

Split control from vacuum	
Code	Description
X	No split
A	Split ø4
B	Split ø6
C	Split ø1/4"

S14 . 1X . 4EC . CCP6

Air supply and mounting

Code	Air connections
4	ø4 (5/32") push-in connector(s)
6	ø6 push-in connector(s)
14	ø1/4" push-in connector(s)
8	ø8(5/16") push-in connector(s)
26	2 x ø6 push-in connectors
214	2 x ø1/4" push-in connectors
28	2 x ø8 (5/16) push-in connectors

Code	Options
EC	Ejectors stacked with central exhaust
EN	Ejectors stacked with central silencer
EI	Ejector(s) for individual mounts

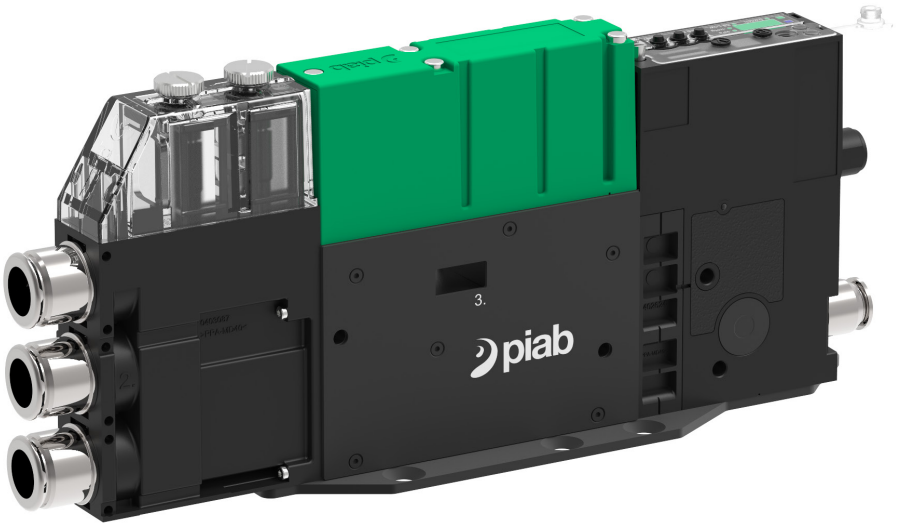
Electrical properties

Code	Valve configuration
CC	NC vacuum + NC blow off
OC	NO vacuum + NC blow off
RC	NC 2/2 vacuum + NC 2/2 blow off
C	NC vacuum
O	NO vacuum
R	NC 2/2 vacuum

Code	Electrical input/output
P	PNP
N	NPN

Code	Electrical interface
6	6p connector(s)
A	M8 6p connector(s)
44	HD D-sub 44p connector
26	HD D-sub 26p connector

piCOMPACT®23



piCOMPACT® is an ejector family with integrated controls, so called compact or ”all-in-one” ejector unit. It is a stackable platform with the possibility to mount several units in the same manifold and have common pneumatic and electrical connections. The focus during development has been on the most significant “key criteria” for these types of pumps, reliability and speed, as well as introducing some brand new attractive features/functions. That in combination with our state-of-the-art vacuum engine, COAX®, the product is outstanding. By working at low feed pressure and maximizing the utilization rate of the compressed air, the COAX® ejectors reduce energy consumption for manufacturers while increasing productivity and reliability.Its vacuum response to 50–60 -kPa is typically 30–50% faster compared to single stage technology.

Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	-kPa
SX12	0.504/0.5*	0.72	1.22	1.03	0.78	0.52	0.27	0.21	0.15	0.09	0.03	85
SX42	0.47/0.43*	2.21	3.46	3.02	2.41	1.7	1.02	0.61	0.47	0.28	0.1	90

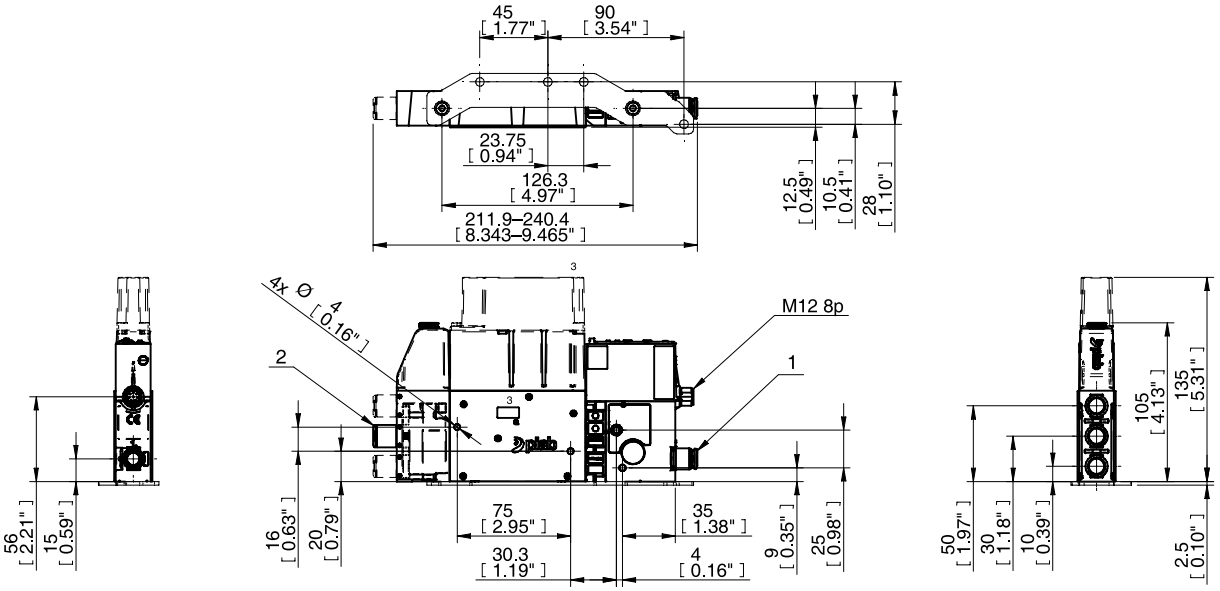
* Pump/nozzle.

Evacuation times

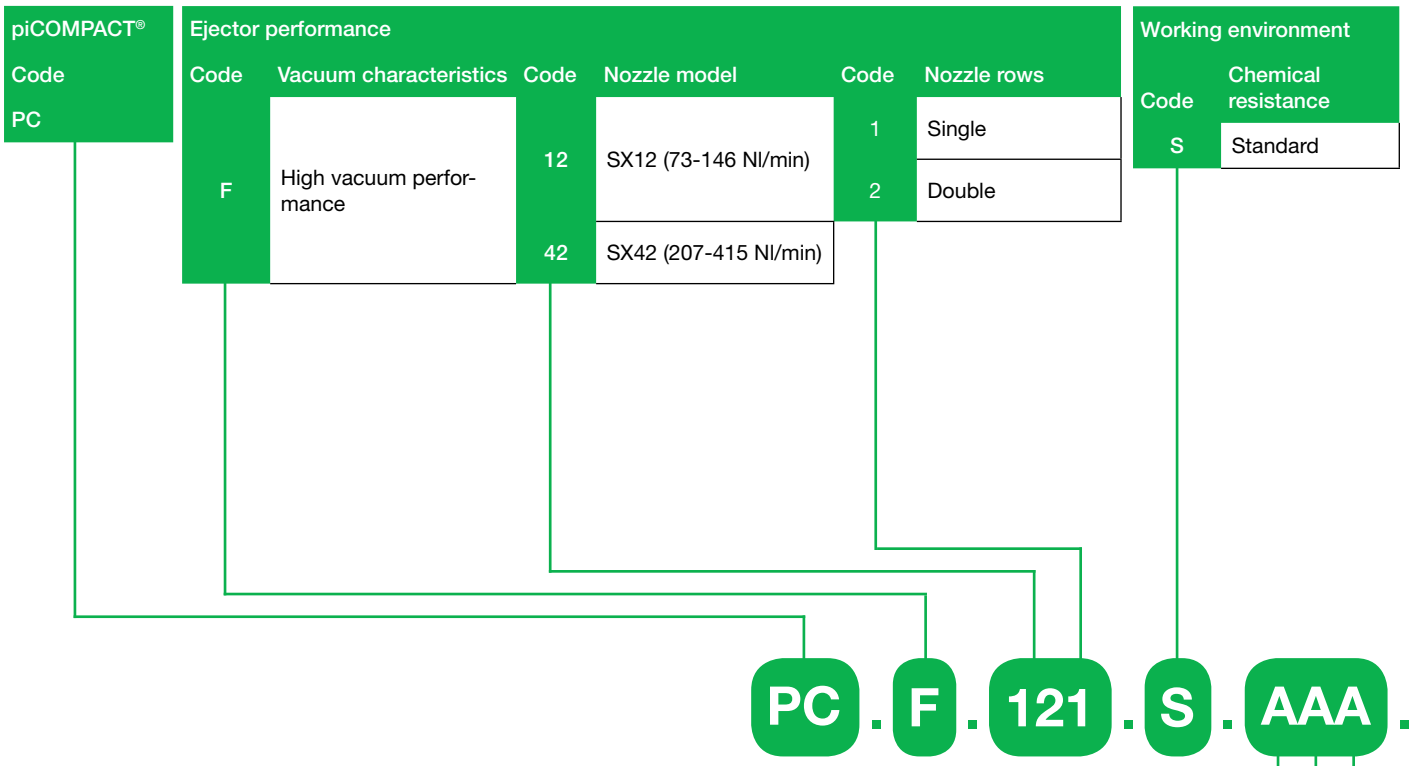
COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	-kPa
SX12	0.504/0.5*	0.72	0.082	0.201	0.374	0.674	1.216	1.914	2.978	6.187	85
SX42	0.47/0.43*	2.21	0.038	0.074	0.123	0.204	0.356	0.577	0.879	1.718	90

* Pump/nozzle.

Dimensional drawing



piCOMPACT®23 – Customer Code



piCOMPACT® Code	Ejector performance					Working environment	
	Code	Vacuum characteristics	Code	Nozzle model	Code	Nozzle rows	Code	Chemical resistance
PC	F	High vacuum performance	12	SX12 (73-146 Nl/min)	1	Single	S	Standard
					2	Double		
			42	SX42 (207-415 Nl/min)				

Functionality					
Code	Control functions	Code	Non-return valve	Code	Vacuum sensing
A	Electrical ES, vac and blow off	A	With non-return valve	A	Display, analog and digital outputs
B	Electrical ES, vac and automatic blow off	B	Without non-return valve	B	Display, 2x digital outputs
C	Vac and blow off			C	Display, leakage warning and digital outputs
D	Vac and automatic blow off			X	No vacuum sensing
E	Vacuum on/off (vac)				

Vacuum connection module

Code	Vacuum filter
S	Vacuum filter 50 µm
F	2x Vacuum filter 50 µm
X	No vacuum filter

Code	Vacuum port(s)/ channel
1	1 vacuum port
2	2 vacuum ports
3	3 vacuum ports

Code	Vacuum connection(s)
8	ø8 (5/16) push-in connector(s)
P1	ø10 push-in connector(s)
P2	ø3/8" push-in connector(s)
P3	ø12 push-in connector(s)
P4	ø1/2" push-in connector(s)
H1	12mm / 1/2" I.D. barb connector

Single unit or manifold mount

Code	Number of channels
1	1 channel

Code	Split control from vacuum
X	No split

S18 . 1X . 6 . EJ . CCAB

Air supply and mounting

Code	Air connections
6	ø6 push-in connector(s)
14	ø1/4" push-in connector(s)
8	ø8(5/16") push-in connector(s)
P1	ø10 push-in connector(s)
P2	ø3/8" push-in connector(s)

Code	Options
EJ	Ejector(s) for individual mounts, integrated silencer
EK	Ejector(s) for individual mounts, top mounted silencer

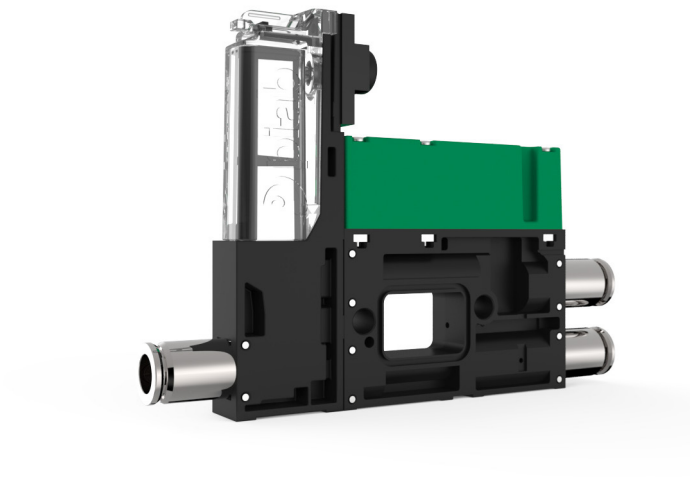
Electrical properties

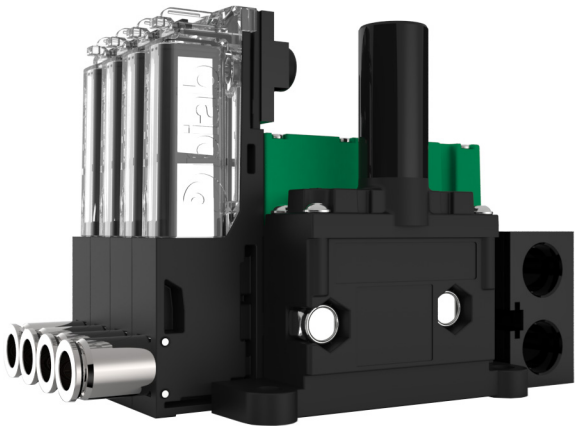
Code	Valve configuration
CC	NC vacuum + NC blow off
FC	NC vacuum (power off - NO) + NC blow off
OC	NO vacuum + NC blow off
C	NC vacuum
O	NO vacuum

Code	Electrical input/output
A	PNP/PNP or NPN/NPN
B	Mixed mode; PNP/ NPN or NPN/PNP

Code	Electrical interface
B	M12 8p connector(s)

piPUMP10X





Compact/stackable vacuum pumps are air-driven multistage ejector families, based on COAX® technology, It provides a high operational reliability, in case of fluctuating or low compressed-air pressure. Excellent performance when a quick response time when deep vacuum is needed. There is also a quick vacuum non-return valve as an option.

Vacuum flow

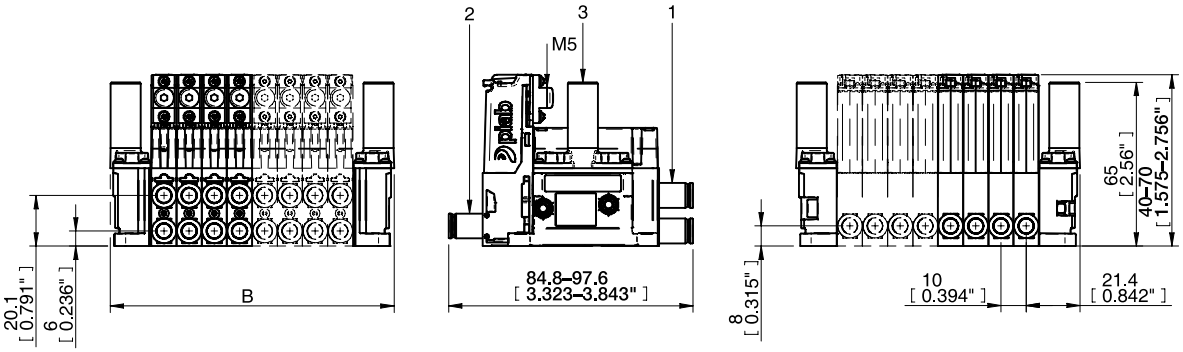
COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	-kPa
MICRO Bi03-2	0.2	0.14	0.21	0.14	0.063	0.021	0.016	0.014	0.007	0.004	82
MICRO Si02-2	0.6	0.11	0.26	0.18	0.095	0.053	0.045	0.038	0.027	0.019	75
MICRO Ti05-2	0.4	0.23	0.31	0.28	0.22	0.16	0.088	0.063	0.045	0.023	84
MICRO Xi2.5-2	0.5	0.13	0.23	0.15	0.079	0.044	0.036	0.03	0.023	0.013	91

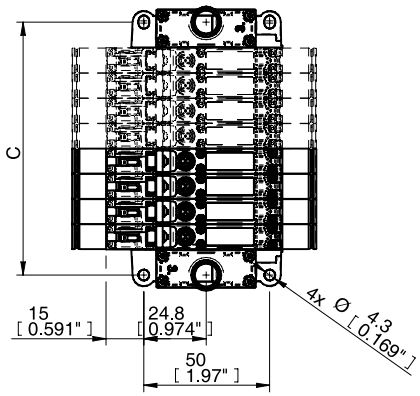
Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)											Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	Max	-kPa
MICRO Bi03-2	0.2	0.14	5	9.9	20.4	53	99	153	228	354	552	—	652*	82
MICRO Si02-2	0.6	0.11	5	8.9	16.2	31	48	68	95	136	—	—	185*	75
MICRO Ti05-2	0.4	0.23	5	6.7	10.2	14.8	23	35	50	70	114	—	159*	84
MICRO Xi2.5-2	0.5	0.13	5.1	8.9	16.2	35	59	87	121	169	250	421	464*	91

* Evacuation time (ms) at max vacuum level (-kPa).

Dimensional drawing





piPUMP10X – Customer Code

piPUMP®
Code
PP

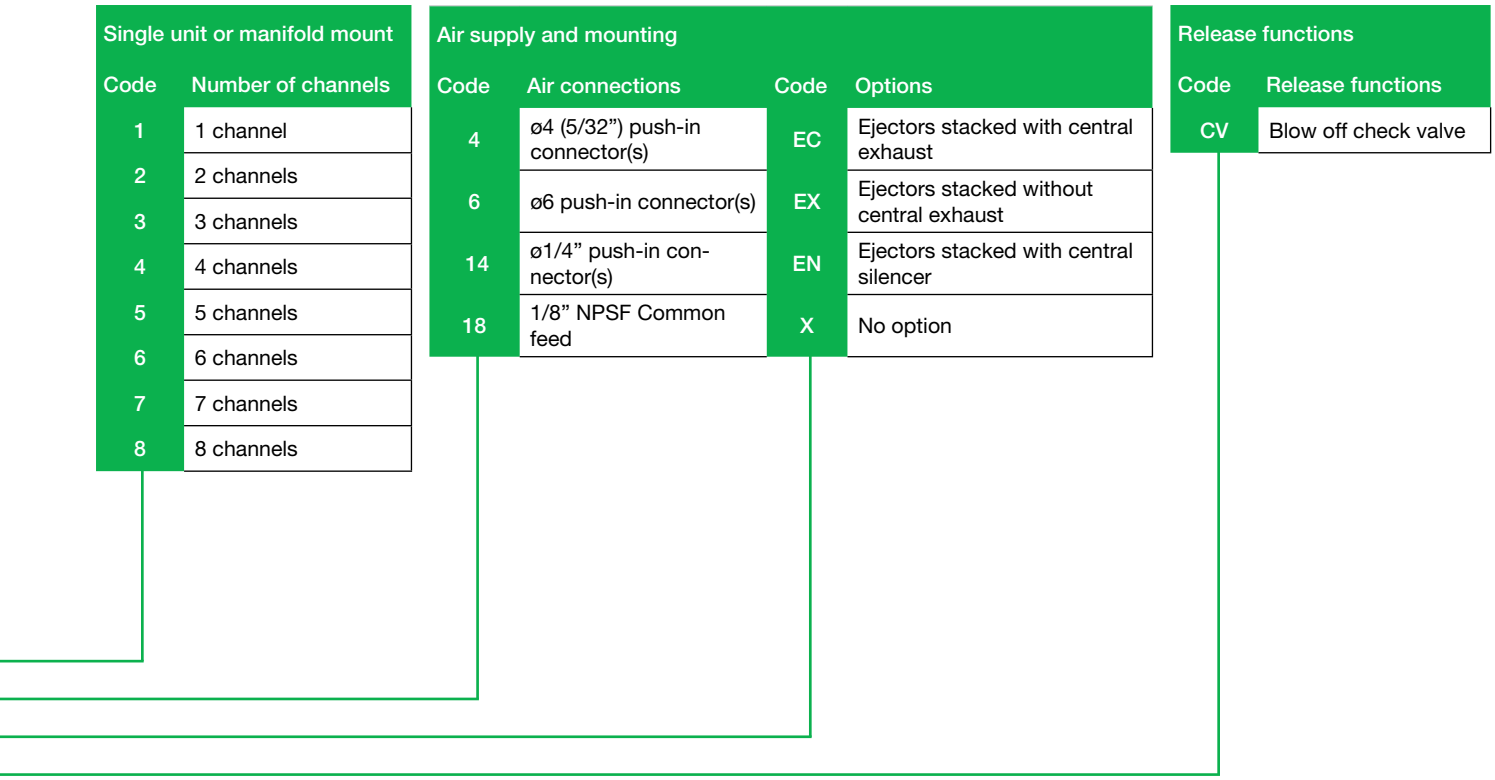
Ejector performance					
Code	Vacuum characteristics	Code	Nozzle model	Code	Nozzle rows
L	Low feed pressure	MC	MICRO (14-19 Nl/min)	1	Single
S	High vacuum flow			2	Double
X	Extra vacuum level				
T	Extra high vacuum flow (micro)				

Working environment	
Code	Chemical resistance
S	Standard

PP . L . MC1 . S . A . S14 . 1 . 4 . EC . CV

Functionality	
Additional function	
Code	Description
A	With non-return valve
B	Without non-return valve

Vacuum connection module					
Vacuum filter		Vacuum port(s)/channel		Vacuum connection(s)	
Code	Description	Code	Description	Code	Description
S	Vacuum filter 50 µm	1	1 vacuum port	4	ø4 (5/32") push-in connector(s)
X	No vacuum filter	2	2 vacuum ports	6	ø6 push-in connector(s)
		3	3 vacuum ports	14	ø1/4" push-in connector(s)



Single unit or manifold mount	
Code	Number of channels
1	1 channel
2	2 channels
3	3 channels
4	4 channels
5	5 channels
6	6 channels
7	7 channels
8	8 channels

Air supply and mounting			
Code	Air connections	Code	Options
4	ø4 (5/32”) push-in connector(s)	EC	Ejectors stacked with central exhaust
6	ø6 push-in connector(s)	EX	Ejectors stacked without central exhaust
14	ø1/4” push-in connector(s)	EN	Ejectors stacked with central silencer
18	1/8” NPSF Common feed	X	No option

Release functions	
Code	Release functions
CV	Blow off check valve

P3010 family

Compact/stackable vacuum pumps are air-driven multistage ejector families, based on COAX® technology, they are equipped with integrated controls and special functions, such as on/off valve, blow-off valve, vacuum switch, energy saving function etc. They are configurable platforms, making it easy to specify the exact control functions needed for the system.

It is available with three-stage COAX® cartridge MINI. Choose an Si cartridge for extra vacuum flow, a Pi cartridge for high performance at low feed pressure or an Xi cartridge when high flow and deep vacuum is needed. The P3010 includes a flow-through silencer and a built-in vacuum filter for harsh environments. It is suitable for fast and reliable evacuation in sealed systems

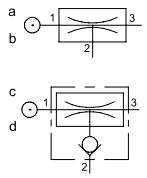
Vacuum flow

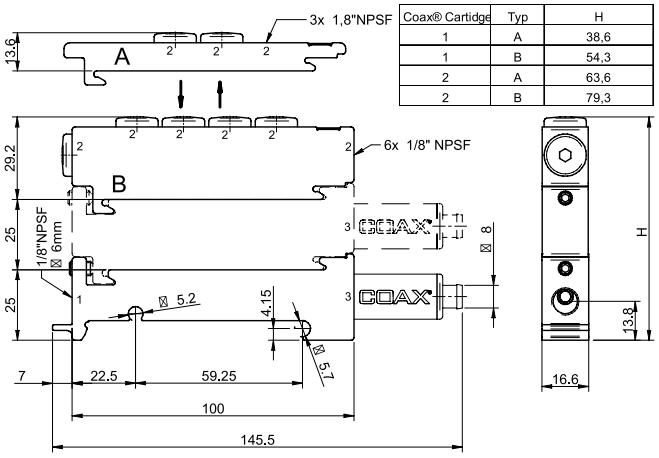
COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MINI Pi12-3	0.32	0.44	1.40	0.60	0.44	0.27	0.19	0.14	0.10	0.060	0.030	—	90
MINI Si08-3	0.6	0.44	1.34	0.73	0.55	0.35	0.23	0.17	0.13	0.08	—	—	75
MINI Xi10-3	0.5	0.46	1.43	0.70	0.50	0.33	0.19	0.15	0.11	0.07	0.045	0.011	94

Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
MINI Pi12-3	0.32	0.44	0.08	0.23	0.49	1.00	1.70	2.60	3.90	6.30	—	90
MINI Si08-3	0.6	0.44	0.10	0.25	0.48	0.80	1.30	2.30	4.60	—	—	75
MINI Xi10-3	0.5	0.46	0.09	0.26	0.50	0.90	1.5	2.2	3.4	5.2	8.8	94

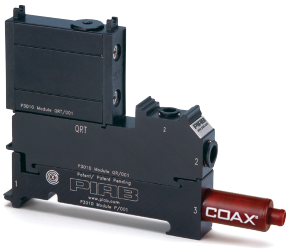
Dimensional drawing





Coax® Cartidge	Typ	H
1	A	38,6
1	B	54,3
2	A	63,6
2	B	79,3

Accessory descriptions

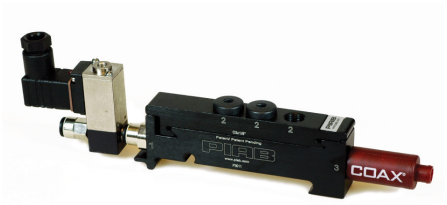


P3010 Quick release

The quick release function has a volume of 3–60 cm^3. Quick release is done by accumulating and utilising the feed-air pressure as a boost. The ON/OFF is activated simultaneously with the P3010

P3010 ES

The P3010 has an integrated air-saving function (piSAVE onoff) that minimises the air consumption by controlling the incoming air flow to the pump. Large hysteresis is recommended for sealed vacuum handling applications such as metal sheet, glass or plastic handling. And small hysteresis is recommended if a very accurate vacuum level has to be maintained in the process. It has an adjustable ES switch level and is a pneumatic function.



Solenoid Valve

The solenoid valve is an electric 3/2 valve with a possibility for manual override. As it has push in connections it is quick and easy to mount. The body has three M5 ports. It is suitable for compressed air with a filtration of 40 µm.

Vacuum switch

A vacuum switch can be used for many different applications. It converts a vacuum signal into a electric or pneumatic signal. Vacuum switches are available in many different versions, from very small electro-mechanicals with pre-set settings to pneumatics or programmable fully electronics. Some switches are design to fit directly into the P3010 with an Ø 6 mm push-in.

AVM™2

The AVM™2 unit has built-in control and monitoring functions. The integrated energy saving function (ES) minimises the air consumption in sealed systems. It has valves for vacuum on/off and blow-off with electrical power failsafe function. The AVM™ has digital outputs, 16 pre-set combinations of vacuum levels, digital vacuum level display and a mechanical valve for blow-off flow adjustment.

CU

The CU has electric valves for vacuum on/off and blow-off and a mechanical valve for blow-off flow adjustment. It also has a special M12 4-pin cable assembly with LED for status of valve signal.

P3010 – Customer Code

P3010
Code
P3010

Code	Connection interface
00	Housing connection Ø6 mm
01	Housing connection 1/8”

Code	COAX® Cartridge module
AA	COAX® Cartridge module Si08-3 FS x1
AB	COAX® Cartridge module Si08-3 AFS x1
AC	COAX® Cartridge module Si08-3 FS x2
AD	COAX® Cartridge module Si08-3 AFS x2
AE	COAX® Cartridge module Pi12-3 FS x1
AF	COAX® Cartridge module Pi12-3 AFS x1
AG	COAX® Cartridge module Pi12-3 FS x2
AH	COAX® Cartridge module Pi12-3 AFS x2
AI	COAX® Cartridge module Xi10-3 FS x1
AJ	COAX® Cartridge module Xi10-3 AFS x1
AK	COAX® Cartridge module Xi10-3 FS x2
AL	COAX® Cartridge module X10-3 AFS x2

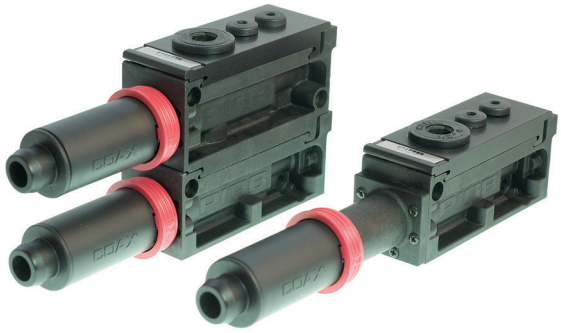
P3010 . 00 . AA . 01 . AA . 00

Code	Connection modules / function
01	Connection module high 6x1/8”
02	Connection module low 3x1/8”
04	Function Quick-release module 10/6 - 3
05	Function Quick-release module 8/6 - 30
06	Function Quick-release module 8/6 - 60
07	Function Quick-release module 10/6 - 30
08	Function Quick-release module 10/6 - 60
09	Function Quick-release module 1/4”/6 - 3 (NPSF)
10	Function Quick-release module 1/4”/6-30 (NPSF)
11	Function Quick-release module 1/4”/6-60 (NPSF)
12	Function Quick-release module 8/6-3
27	Function AVM™2 NO
28	Function AVM™2 NC (power off - NO)
29	Function CU NC
30	Function AVM™2 NO auto blow-off (1 sec)
31	Function AVM™2 NC auto blow-off (1 sec)
32	Function AVM™2 NC 2 (power off - NC)
33	Function CU NO

Code	Energy saving
AA	No energy saving (included in AVM2)
AB	Solenoid valve DS23
AC	piSAVE onoff 2/2 NO large hysteres
AD	piSAVE onoff 2/2 NO small hysteres

Code	Vacuum sensing
00	No vacuum sensing (included in AVM2)
01	Vacuum switch PNP NO MM8
02	Vacuum switch NPN NO MM8
05	Vacuum switch PNP NO LM8
09	Vacuum switch PNP NO DM8
10	Vacuum switch NPN NO DM8
11	Vacuum switch Inductive, adj. Knob
18	Vacuum switch VS4015 30 -kPa
19	Vacuum switch VS4015 50 -kPa
20	Vacuum switch VS4015 70 -kPa
21	Vacuum switch VS4016 30 -kPa
22	Vacuum switch VS4016 50 -kPa
23	Vacuum switch VS4016 70 -kPa

P5010 family



Compact/stackable vacuum pumps are air-driven multistage ejector families. based on COAX® technology. they are equipped with integrated controls and special functions. such as on/off valve. blow-off valve. vacuum switch. energy saving function etc. They are configurable platforms. making it easy to specify the exact control functions needed for the system.

It has a patented COAX® push-in technology that allows insertion and removal of the cartridge without tools. It is available two or three-stage COAX® cartridge MIDI. Choose an Si cartridge for extra vacuum flow. a Pi cartridge for high performance at low feed pressure or an Xi cartridge when high flow and deep vacuum is needed. The P5010 has an integrated flow-through silencer that is unaffected by dust and dirt. It provides substantially lower air-consumption as compared to conventional ejectors of similar sizes.

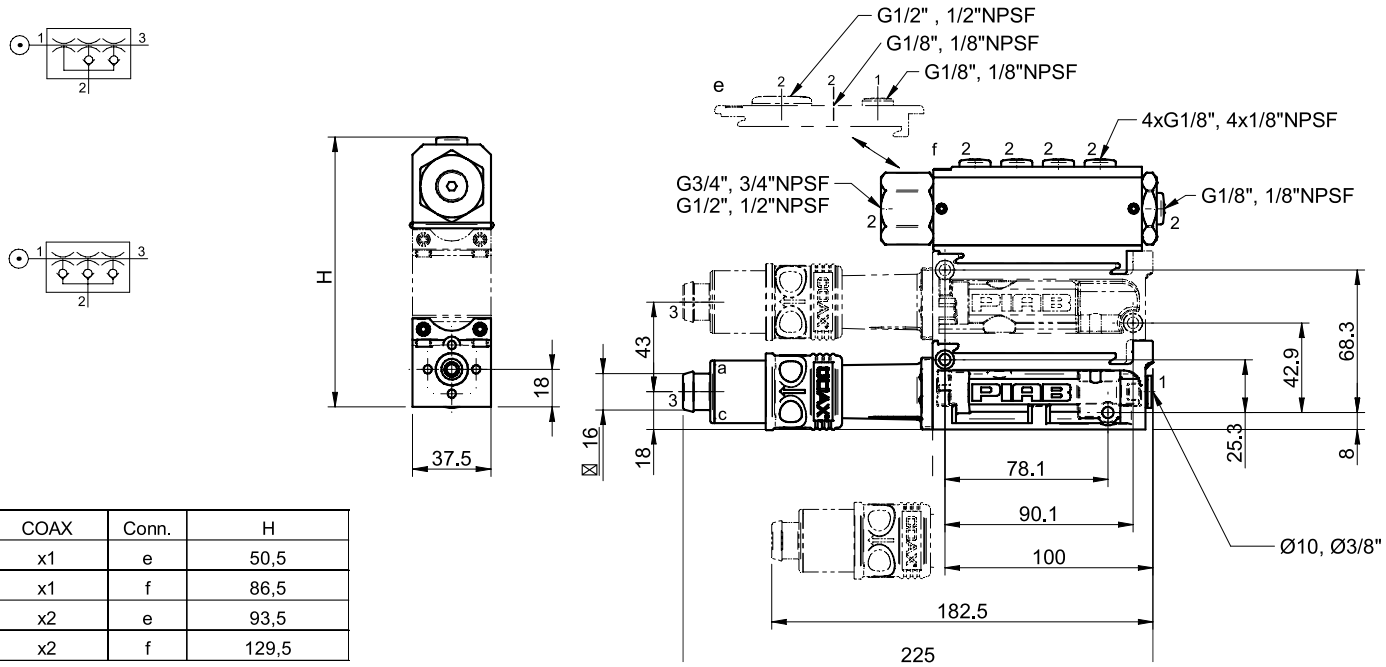
Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
Pi48-2	0.31	2	2.8	2.5	1.8	1.1	0.65	0.5	0.35	0.25	0.1	—	90
Pi48-3	0.31	2.05	5.6	2.5	1.8	1.1	0.65	0.5	0.35	0.25	0.1	—	90
Si32-2	0.6	1.75	3.3	3	2.6	1.7	0.9	0.6	0.5	0.35	—	—	75
Si32-3	0.6	1.75	6	3.5	2.6	1.7	0.9	0.6	0.5	0.35	—	—	75
Xi40-2	0.45	1.83	2.8	2.3	1.6	1	0.73	0.58	0.43	0.32	0.18	0.03	95
Xi40-3	0.45	1.83	5.9	3	2	1.3	0.73	0.58	0.43	0.32	0.18	0.03	95

Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
Pi48-2	0.31	2	0.03	0.07	0.13	0.26	0.46	0.7	1	1.6	4	90
Pi48-3	0.31	2.05	0.02	0.06	0.12	0.25	0.45	0.7	1	1.6	4	90
Si32-2	0.6	1.75	0.03	0.07	0.1	0.18	0.33	0.53	0.8	—	—	75
Si32-3	0.6	1.75	0.02	0.05	0.1	0.18	0.33	0.53	0.8	—	—	75
Xi40-2	0.45	1.83	0.04	0.09	0.17	0.28	0.44	0.63	0.9	1.3	2.3	95
Xi40-3	0.45	1.83	0.022	0.062	0.12	0.22	0.37	0.57	0.84	1.2	2.2	95

Dimensional drawing



COAX	Conn.	H
x1	e	50,5
x1	f	86,5
x2	e	93,5
x2	f	129,5

Accessory descriptions

AVM™2

The AVM™2 unit has built-in control and monitoring functions. The integrated energy saving function (ES) minimises the air consumption in sealed systems. It has valves for vacuum on/off and blow-off with electrical power failsafe function. The AVM™ has digital outputs, 16 pre-set combinations of vacuum levels, digital vacuum level display and a mechanical valve for blow-off flow adjustment.

CU

The CU has electric valves for vacuum on/off and blow-off and a mechanical valve for blow-off flow adjustment. It also has a special M12 4-pin cable assembly with LED for status of valve signal.

P5010 ES

The P5010 has an integrated air-saving function (piSAVE onoff) that minimises the air consumption by controlling the incoming air flow to the pump. Large hysteresis is recommended for sealed vacuum handling applications such as metal sheet, glass or plastic handling. And small hysteresis is recommended if a very accurate vacuum level has to be maintained in the process. It has an adjustable ES switch level and is a pneumatic function.

P5010 – Customer Code

P5010
Code
P5010

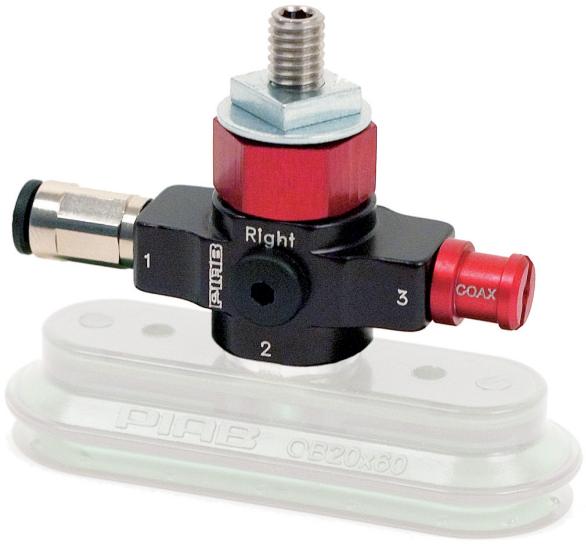
Connection interface	
Code	Description
00	Housing, connection Ø 10 mm
01	Housing, connection Ø 3/8"

P5010 . 00 . AA . 01

COAX® Push-in	
Code	Description
AA	COAX® push-in module Si32-2X1
AB	COAX® push-in module Si32-3X1
AC	COAX® push-in module Si32-2X1, non-return valve
AD	COAX® push-in module Si32-3X1, non-return valve
AE	COAX® push-in module Si32-2X2
AF	COAX® push-in module Si32-3X2
AG	COAX® push-in module Si32-2X2, non-return valve
AH	COAX® push-in module Si32-3X2, non-return valve
AI	COAX® push-in module Pi48-2X1
AJ	COAX® push-in module Pi48-3X1
AK	COAX® push-in module Pi48-2X1, non-return valve
AL	COAX® push-in module Pi48-3X1, non-return valve
AM	COAX® push-in module Pi48-2X2
AN	COAX® push-in module Pi48-3X2
AO	COAX® push-in module Pi48-2X2, non-return valve
AP	COAX® push-in module Pi48-3X2, non-return valve
AQ	COAX® push-in module Xi40-2X1
AR	COAX® push-in module Xi40-3X1
AS	COAX® push-in module Xi40-2X1, non-return valve
AT	COAX® push-in module Xi40-3X1, non-return valve
AU	COAX® push-in module Xi40-2X2
AV	COAX® push-in module Xi40-3X2
AW	COAX® push-in module Xi40-2X2, non-return valve
AX	COAX® push-in module Xi40-3X2, non-return valve

Connection modules/function	
Code	Description
01	Connection module low, G connection
02	Connection module high, G connection
03	Connection module low, NPSF connection
04	Connection module high, NPSF connection
05	Function AVM™2 NO, G connection
06	Function AVM™2 NC (power off - NO), G connection
07	Function AVM™2 NO, NPSF connection
08	Function AVM™2 NC (power off - NO), NPSF connection
09	Function CU NC, G connection
10	Function CU NC, NPSF connection
11	Function ES Vacustat 2/2 NO large hysteres
12	Function ES Vacustat 2/2 NO small hysteres
13	Function AVM™2 NO, automatic blow-off (1 sec), G connection
14	Function AVM™2 NC, automatic blow-off (1 sec), G connection
15	Function AVM™2 NC 2 (power off - NC), G connection
16	Function AVM™2 NO, automatic blow-off (1 sec), NPSF connection
17	Function AVM™2 NC, automatic blow-off (1 sec), NPSF connection
18	Function AVM™2 NC 2 (power off - NC), NPSF connection

VGS™2010 family



Piab VGS™ – A product design where different suction cups are integrated with vacuum cartridges based on the patented COAX® technology. The “vacuum gripper” makes selection, sizing and installation of a vacuum system easier. With a VGS™ you will enjoy the benefits of a more cost-efficient and reliable decentralized vacuum system. It has a low weight at 25–39 g.

It is available with a two-stage COAX® cartridge MICRO. Choose Bi for low feed pressure, Si for high vacuum flow, Xi for extra vacuum and Ti at 0,4/0,6 MPa for extra capacity/dirt tolerance. This VGS™ is compatible with any suction cup with G1/8” male fitting.

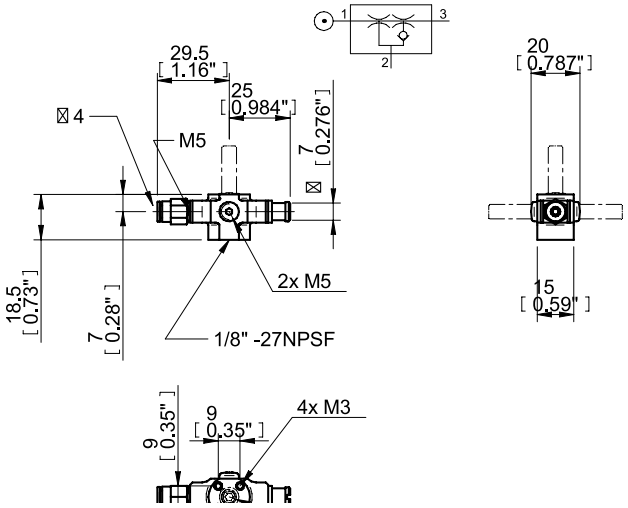
Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	-kPa
MICRO Bi03-2	0.4	0.09	0.25	0.15	0.08	0.07	0.05	0.03	–	–	60
MICRO Si02-2	0.5	0.10	0.27	0.19	0.09	0.08	0.07	0.05	0.02	–	70
MICRO Ti05-2	0.4	0.09	0.25	0.15	0.08	0.07	0.05	0.03	–	–	60
MICRO Ti05-2	0.5	0.10	0.27	0.19	0.09	0.08	0.07	0.05	0.02	–	70
MICRO Xi2.5-2	0.6	0.12	0.28	0.21	0.12	0.08	0.07	0.06	0.04	0.02	75

Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	-kPa
MICRO Bi03-2	0.4	0.09	0.25	0.15	0.08	0.07	0.05	0.03	–	–	60
MICRO Si02-2	0.5	0.10	0.27	0.19	0.09	0.08	0.07	0.05	0.02	–	70
MICRO Ti05-2	0.4	0.09	0.25	0.15	0.08	0.07	0.05	0.03	–	–	60
MICRO Ti05-2	0.5	0.10	0.27	0.19	0.09	0.08	0.07	0.05	0.02	–	70
MICRO Xi2.5-2	0.6	0.12	0.28	0.21	0.12	0.08	0.07	0.06	0.04	0.02	75

Dimensional drawing



VGS™ 2010 – Customer Code

Code	Housing
VGS2010	Housing

Code	COAX®
AA	No COAX® cartridge (slave unit)
AB	COAX® cartridge MICRO Bi03-2
AF	COAX® cartridge MICRO Si02-2
AJ	COAX® cartridge MICRO Xi2.5-2
AN	COAX® cartridge MICRO Ti05-2

VGS2010 . AB . 01 . BA

Code	Mounting orientation
00	4x M3 top, flush mount
01	M6 19 mm top, profile kit
02	M6 19 mm right, profile kit
03	M6 19 mm left, profile kit

Code	Suction cup
BA	No suction cup
DA	BX25P 30°/60° Shore A
DB	BX25P 60° Shore A
DC	FC20P 50° Shore A
DD	F25CP 50° Shore A
DE	OB20x60P 60° Shore A
DF	OF10x30P 50° Shore A
DG	OF15x45P 50° Shore A

VGS™3010 family

Piab VGS™ – A product design where different suction cups are integrated with vacuum cartridges based on the patented COAX® technology. The “vacuum gripper” makes selection, sizing and installation of a vacuum system easier. With a VGS™ you will enjoy the benefits of a more cost-efficient and reliable decentralized vacuum system. It has a low weight at 111–340 g.

It is available with two- or three-stage COAX® cartridge MINI. Choose a Di cartridge, for very harsh environments, combining high dust and high humidity levels, an Si cartridge for extra vacuum flow, a Pi cartridge for high performance at low feed pressure or an Xi cartridge when high flow and deep vacuum is needed. The three-stage cartridge will give extra high initial vacuum flow, which is suitable in high speed applications. The VGS™ is compatible with any suction cup with G3/8” male fitting.

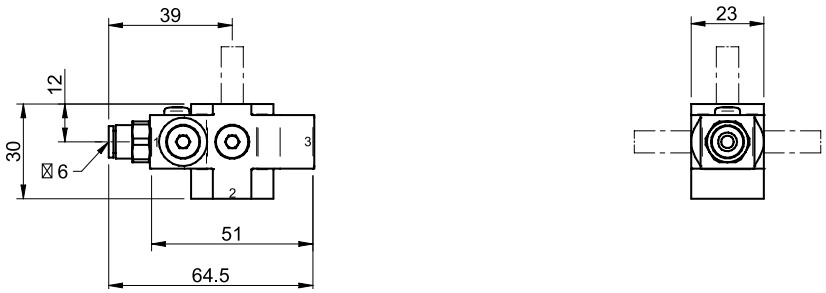
Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MINI Pi12-2	0.32	0.44	0.68	0.6	0.44	0.27	0.19	0.14	0.1	0.06	0.03	—	90
MINI Pi12-3	0.32	0.44	1.4	0.6	0.44	0.27	0.19	0.14	0.1	0.06	0.03	—	90
MINI Si08-2	0.6	0.44	0.77	0.67	0.51	0.33	0.23	0.16	0.12	0.08	—	—	75
MINI Si08-3	0.6	0.44	1.34	0.73	0.55	0.35	0.23	0.17	0.13	0.08	—	—	75
MINI Xi10-2	0.5	0.46	0.75	0.63	0.49	0.33	0.19	0.15	0.11	0.07	0.04	0.011	94
MINI Xi10-3	0.5	0.46	1.43	0.7	0.5	0.33	0.19	0.15	0.11	0.07	0.04	0.011	94
MINI Di16-2	0.6	0.75	0.64	0.57	0.49	0.41	0.35	0.29	0.18	0.04	—	—	73

Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
MINI Pi12-2	0.32	0.44	0.17	0.32	0.58	1.1	1.8	2.7	4.0	6.4	—	90
MINI Pi12-3	0.32	0.44	0.08	0.23	0.49	1	1.7	2.6	3.9	6.3	—	90
MINI Si08-2	0.6	0.44	0.14	0.31	0.55	0.9	1.4	2.1	3.1	—	—	75
MINI Si08-3	0.6	0.44	0.1	0.25	0.48	0.8	1.3	2	2.9	—	—	75
MINI Xi10-2	0.5	0.46	0.14	0.3	0.6	1	1.6	2.3	3.5	5.3	8.9	94
MINI Xi10-3	0.5	0.46	0.09	0.26	0.5	0.9	1.5	2.2	3.4	5.2	8.8	94
MINI Di16-2	0.6	0.75	0.17	0.35	0.58	0.84	1.15	1.58	2.49	—	—	73

Dimensional drawing



VGS™3010 – Customer Code

Code	Housing
VGS3010	Housing

Code	COAX®
AA	No COAX® cartridge (slave unit)
AB	MINI Pi12-2
AC	MINI Pi12-3
AD	MINI Pi12-2, non-return valve
AE	MINI Pi12-3, non-return valve
AF	MINI Si08-2
AG	MINI Si08-3
AH	MINI Si08-2, non-return valve
AI	MINI Si08-3, non-return valve
AJ	MINI Xi10-2
AK	MINI Xi10-3
AL	MINI Xi10-2, non-return valve
AM	MINI Xi10-3, non-return valve
AN	MINI Di16-2

Code	Mounting orientation
00	4x M4 top, flush mount
01	M8 16 mm top
02	M8 16 mm right
03	M8 16 mm left
04	M8 27 mm top, profile kit
05	M8 27 mm right, profile kit
06	M8 27 mm left, profile kit
07	M6 22 mm top, profile kit
08	M6 22 mm right, profile kit
09	M6 22 mm left, profile kit
11	Ball joint VGS™3010 right
12	Ball joint VGS™3010 left
13	Lock-pin VGS™3010 right
14	Lock-pin VGS™3010 left
15	Level compensator LC30

VGS3010 . AB . 01 . 38

VGS™3040 family

This is a product design where different suction cups can be integrated with vacuum cartridges based on the patented COAX® technology. The “vacuum gripper” makes selection, sizing and installation of a vacuum system easier. With a VGS™ you will enjoy the benefits of a more cost-efficient and reliable decentralized vacuum system. The VGS™ is compatible with any suction cup with G3/8” male fitting. It has a low weight at 204–340 g.

It is available with two- or three-stage COAX® cartridge MINI. Choose a Di cartridge, for very harsh environments, combining high dust and high humidity levels, an Si cartridge for extra vacuum flow, a Pi cartridge for high performance at low feed pressure or an Xi cartridge when high flow and deep vacuum is needed. The three-stage cartridge will give extra high initial vacuum flow, which is suitable in high speed applications.

It is available in lockpin 16, 19 or balljoint mountings, industry standard as well as level compensator to compensate for differences in level of object. It can also be fitted with different functions as energy saving, release or blow off.

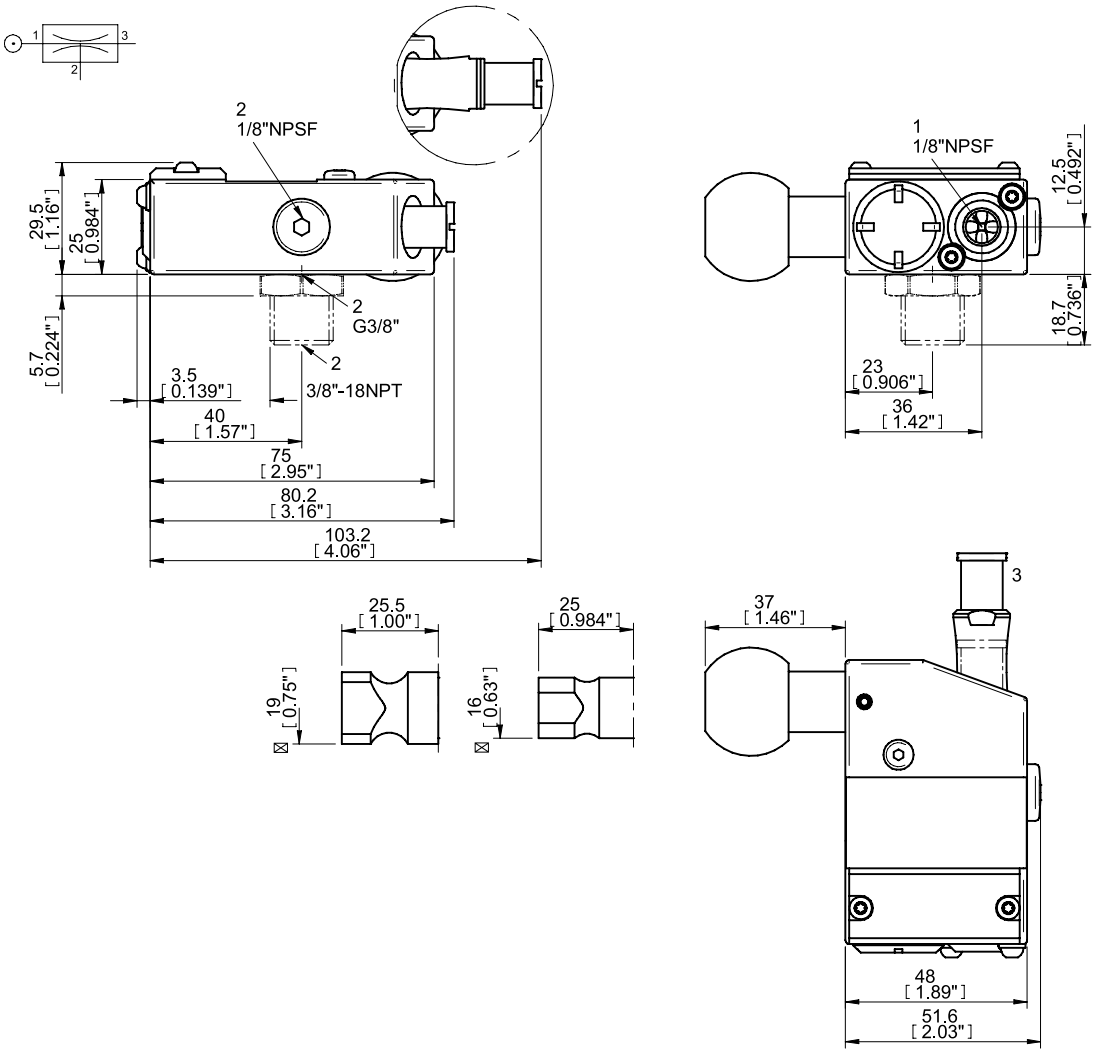
Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MINI Si08-2	0.6	0.44	0.77	0.67	0.51	0.33	0.23	0.16	0.12	0.08	—	—	75
MINI Si08-3	0.6	0.44	1.34	0.73	0.55	0.35	0.23	0.17	0.13	0.08	—	—	75
MINI Xi10-2	0.5	0.46	0.75	0.63	0.49	0.33	0.19	0.15	0.11	0.07	0.045	0.011	94
MINI Xi10-3	0.5	0.46	1.43	0.7	0.5	0.33	0.19	0.15	0.11	0.07	0.045	0.011	94
MINI Pi12-2	0.32	0.44	0.68	0.6	0.44	0.27	0.19	0.14	0.1	0.06	0.03	—	90
MINI Pi12-3	0.32	0.44	1.4	0.6	0.44	0.27	0.19	0.14	0.1	0.06	0.03	—	90

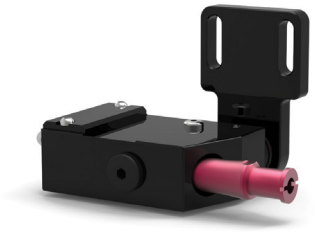
Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
MINI Si08-2	0.6	0.44	0.14	0.31	0.55	0.9	1.4	2.1	3.1	—	—	75
MINI Si08-3	0.6	0.44	0.1	0.25	0.48	0.8	1.3	2	2.9	—	—	75
MINI Xi10-2	0.5	0.46	0.14	0.3	0.6	1	1.6	2.3	3.5	5.3	8.9	94
MINI Xi10-3	0.5	0.46	0.09	0.26	0.5	0.9	1.5	2.2	3.4	5.2	8.8	94
MINI Pi12-2	0.32	0.44	0.17	0.32	0.58	1.1	1.8	2.7	4	6.4	—	90
MINI Pi12-3	0.32	0.44	0.08	0.23	0.49	1	1.7	2.6	3.9	6.3	—	90

Dimensional drawing

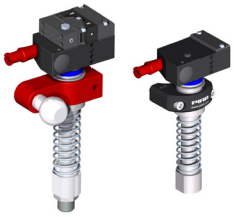


Accessory descriptions



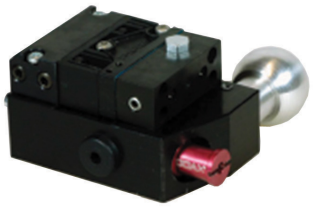
VGS™3040 with profile mount

It makes the attachment easy to a standard extrusion and profile systems with an adjustable position. This will give a quick setup and changeover.



VGS™3040 with level compensator

It is available with level compensator to compensate for differences in level of object.



VGS™3040 with piSAVE onoff

It has an integrated energy-saving device, piSAVE onoff, results in very low air consumption in sealed applications. The built-in blow off check valve will provide a fast release of the object It has an adjustable vacuum controlled 2/2 NO valve and is available with large hysteresis for object handling and small hysteresis for process applications.

VGS™3040 with piSAVE release

It has a built-in quick release for fast release of object. It works with an internal or separate feed of air. It equalises pressure in the suction cups to provide fast release of the product. The piSAVE release will provide an extra fast release by accumulating and utilising the feed-air pressure as a boost. It has an ON/OFF activated simultaneously with the ejector and no additional controls required — use a single 3/2 control valve for the ejector and piSAVE release.

VGS™3040 with blow off

It has a built-in blow off check valve for fast release of object. Prevents vacuum from being pulled through the blow-off lines, which means faster response time and completely independent vacuum units.

VGS™3040 – Customer Code

Code	Housing
VGS3040	Housing

Code	COAX® cartridge
AB	COAX® cartridge MINI Pi12-2
AC	COAX® cartridge MINI Pi12-3
AD	COAX® cartridge MINI Pi12-2, non-return valve
AE	COAX® cartridge MINI Pi12-3, non-return valve
AF	COAX® cartridge MINI Si08-2
AG	COAX® cartridge MINI Si08-3
AH	COAX® cartridge MINI Si08-2, non-return valve
AI	COAX® cartridge MINI Si08-3, non-return valve
AJ	COAX® cartridge MINI Xi10-2
AK	COAX® cartridge MINI Xi10-3
AL	COAX® cartridge MINI Xi10-2, non-return valve
AM	COAX® cartridge MINI Xi10-3, non-return valve

Code	Mounting style
00	No mounting style
01	Mounting Lock pin 16 mm
02	Mounting Lock pin 19 mm
03	Mounting Ball joint
04	Mounting Lock pin 16 mm level compensator
05	Mounting Lock pin 19 mm level compensator
06	Mounting Ball joint level compensator
07	Mounting Extrusion mount level compensator
08	Mounting Profile mount
09	Mounting Profile mount

VGS3040 . AB . 01 . AA . 01 . AA

Code	Energy saving
AA	No energy saving
AB	piSAVE onoff 65 -kPa
AC	piSAVE onoff, Adjustable (factory set at 45 -kPa)

Code	Release function
01	Release Blow-off
02	piSAVE release internal
03	piSAVE release external

Code	Vacuum connection
AA	G3/8" female
AB	G3/8" male - 3/8" NPT male adapter

VGS™5010 family

Piab VGS™ – A product design where different suction cups are integrated with vacuum cartridges based on the patented COAX® technology. The “vacuum gripper” makes selection, sizing and installation of a vacuum system easier. With a VGS™ you will enjoy the benefits of a more cost-efficient and reliable decentralized vacuum system. It has a low weight at 413–679 g.

The VGS™5010 is specially designed for handling larger parts, such as car body sheets as it is compatible with any suction cup with G1/2” male fitting. It is also available with a two or three-stage COAX® cartridge MIDI. Choose an Si cartridge for extra vacuum flow, a Pi cartridge for high performance at low feed pressure or an Xi cartridge when high flow and deep vacuum is needed. The three-stage cartridge will give extra high initial vacuum flow, suitable in high speed applications.

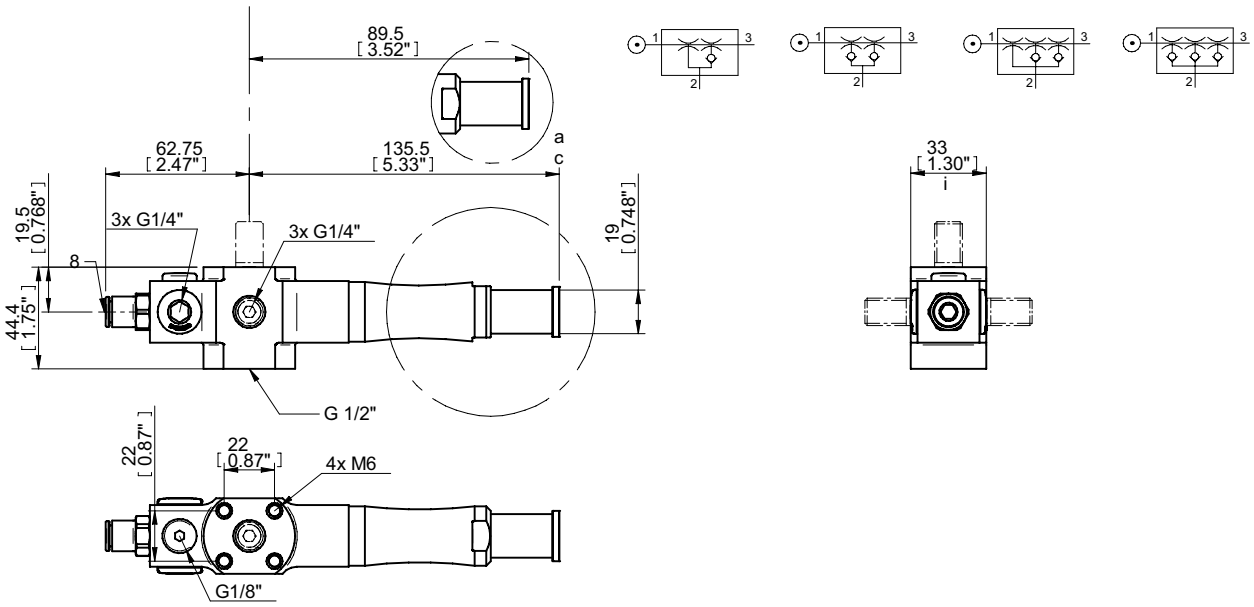
Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MIDI Pi48-2	0.31	2	2.8	2.5	1.8	1.1	0.65	0.5	0.35	0.25	0.1	—	90
MIDI Pi48-3	0.31	2.05	5.6	2.5	1.8	1.1	0.65	0.5	0.35	0.25	0.1	—	90
MIDI Si32-2	0.6	1.75	3.3	3	2.6	1.7	0.9	0.6	0.5	0.35	—	—	75
MIDI Si32-3	0.6	1.75	6	3.5	2.6	1.7	0.9	0.6	0.5	0.35	—	—	75
MIDI Xi40-2	0.45	1.83	2.8	2.3	1.6	1	0.73	0.58	0.43	0.32	0.18	0.03	95
MIDI Xi40-3	0.45	1.83	5.9	3	2	1.3	0.73	0.58	0.43	0.32	0.18	0.03	95

Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
MIDI Pi48-2	0.31	2	0.03	0.07	0.13	0.26	0.46	0.7	1	1.6	4	90
MIDI Pi48-3	0.31	2.05	0.02	0.06	0.12	0.25	0.45	0.7	1	1.6	4	90
MIDI Si32-2	0.6	1.75	0.03	0.07	0.1	0.18	0.33	0.53	0.8	—	—	75
MIDI Si32-3	0.6	1.75	0.02	0.05	0.1	0.18	0.33	0.53	0.8	—	—	75
MIDI Xi40-2	0.45	1.83	0.04	0.09	0.17	0.28	0.44	0.63	0.9	1.3	2.3	95
MIDI Xi40-3	0.45	1.83	0.022	0.062	0.12	0.22	0.37	0.57	0.84	1.2	2.2	95

Dimensional drawing



VGS™5010 – Customer Code

Code	Housing
VGS5010	Housing

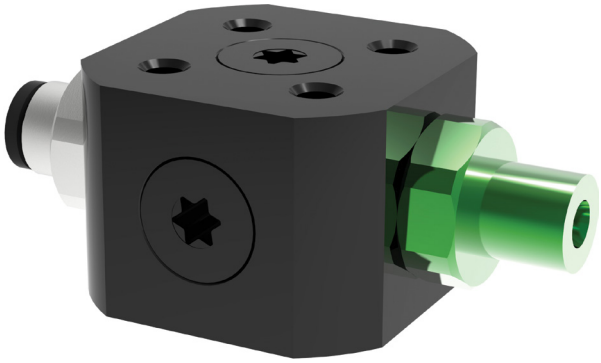
Code	COAX® cartridge
AA	No COAX® cartridge (slave unit)
AB	COAX® cartridge MIDI Pi48-2
AC	COAX® cartridge MIDI Pi48-3
AD	COAX® cartridge MIDI Pi48-2, non-return valve
AE	COAX® cartridge MIDI Pi48-3, non-return valve
AF	COAX® cartridge MIDI Si32-2
AG	COAX® cartridge MIDI Si32-3
AH	COAX® cartridge MIDI Si32-2, non-return valve
AI	COAX® cartridge MIDI Si32-3, non-return valve
AJ	COAX® cartridge MIDI Xi40-2
AK	COAX® cartridge MIDI Xi40-3
AL	COAX® cartridge MIDI Xi40-2, non-return valve
AM	COAX® cartridge MIDI Xi40-3, non-return valve

Code	Mounting style
00	4x M6 top, flush mount
01	4x M6 top, angle bracket
02	M12 20 mm top
03	M12 20 mm right
04	M12 20 mm left
05	M12 20 mm top, angle bracket
06	M12 20 mm right, angle bracket
07	M12 20 mm left, angle bracket

VGS5010 . AB . 00 . BA

Code	Suction cup
BA	No suction cup
CO	BF110P 30°/60° Shore A
CP	BF110P 60° Shore A
CQ	BX110P 30°/60° Shore A
CR	BX110P 60° Shore A
CS	F110P 30°/60° Shore A
CT	F110P 60° Shore A
CU	OB65x170P 30°/60° Shore A
CV	OB65x170P 60° Shore A
CX	BL50-3P 30°/70° Shore A
CY	BX75P 30°/60° Shore A
CZ	BX75P 60° Shore A

COAX® in piGRIP®



This is a fully decentralized vacuum unit based on patented COAX® technology. It provides the quickest response time and very high energy efficiency. The COAX® in piGRIP® is available with a variation of two stage COAX® MICRO cartridges. The COAX® in piGRIP® is compatible with any suction cup with G1/8" male fitting.

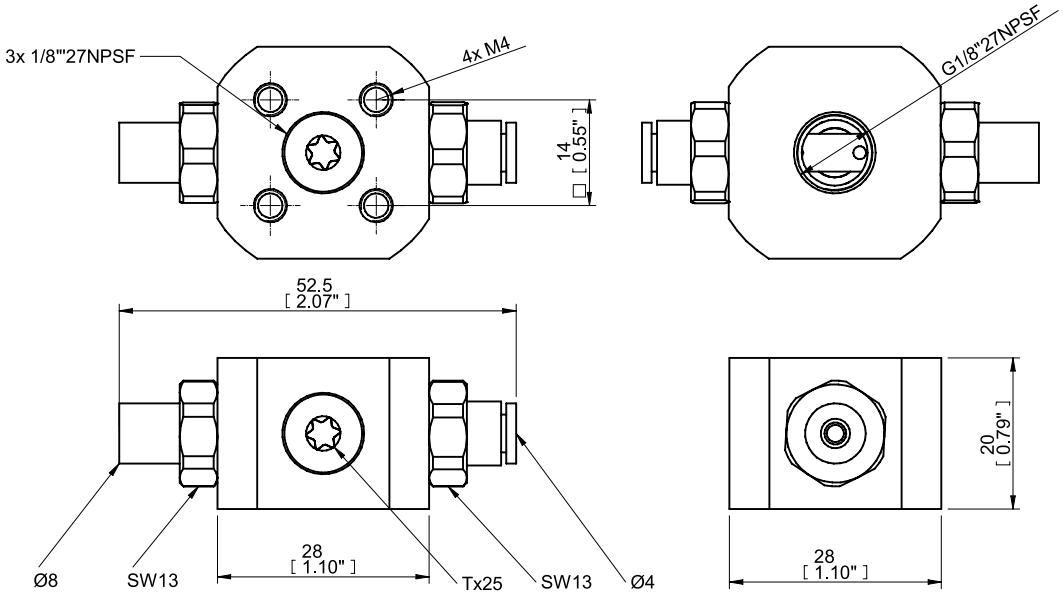
Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	-kPa
MICRO Bi03-2	0.18	0.14	0.23	0.15	0.06	0.04	0.035	0.023	0.013	0.006	–	83
MICRO Si02-2	0.6	0.12	0.28	0.21	0.12	0.08	0.07	0.06	0.04	0.02	–	75
MICRO Ti05-2	0.4	0.27	0.32	0.28	0.23	0.17	0.1	0.07	0.04	0.02	0.004	84
MICRO Xi2.5-2	0.5	0.13	0.24	0.17	0.1	0.06	0.04	0.03	0.02	0.01	0.01	92

Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	-kPa
MICRO Bi03-2	0.18	0.14	0.5	1.4	3.9	6.4	10	16	28	51	83
MICRO Si02-2	0.6	0.12	0.41	1.01	2.01	3.3	4.9	6.9	10.2	–	75
MICRO Ti05-2	0.4	0.27	0.33	0.73	1.2	2	3.1	5	8.3	16.6	84
MICRO Xi2.5-2	0.5	0.13	0.49	1.23	2.48	4.5	7.3	11.3	18	28	92

Dimensional drawing



piCLASSIC

It is available with a three-stage COAX® cartridge MIDI. Choose an Si cartridge for extra vacuum flow, a Pi cartridge for high performance at low feed pressure or an Xi cartridge when high flow and deep vacuum is needed. This pump has a substantially lower air consumption compare to competition, it is compact with no moving parts. It can be configured with 1–6 cartridges. This pump can easily be upgraded with more capacity if needed. And it is also easy to disassemble for maintenance.

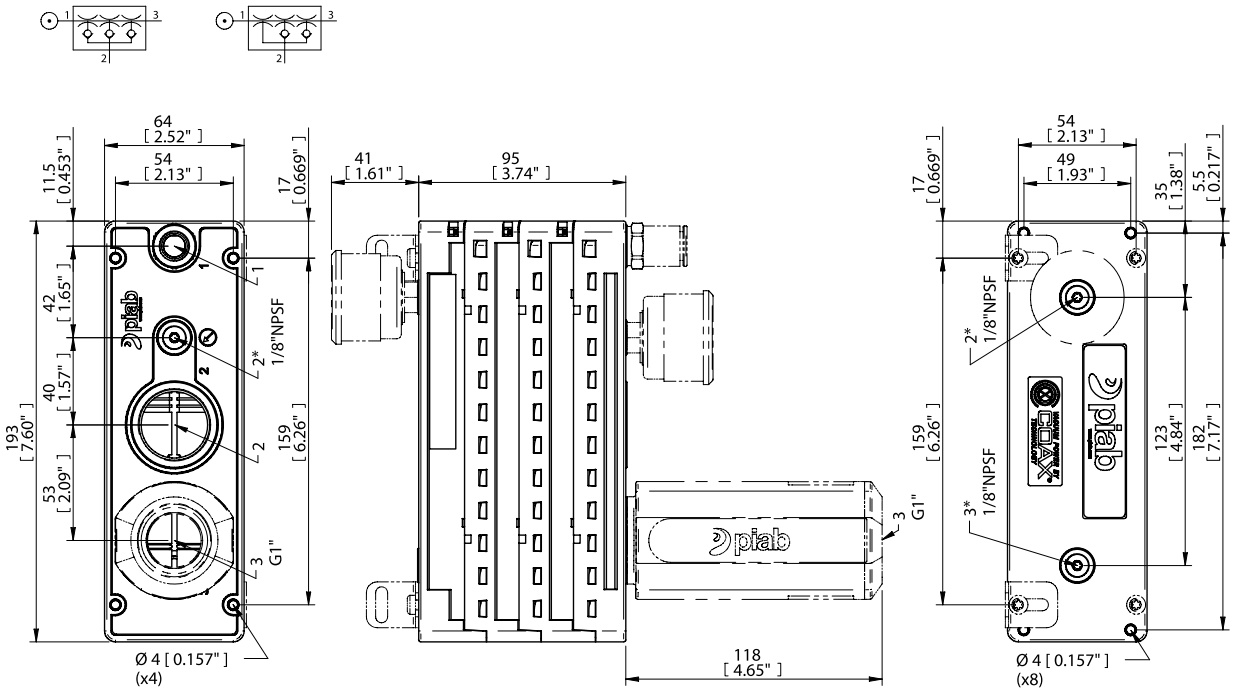
Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MIDI Si32-3 x1	0.6	1.75	6	3.5	2.6	1.7	0.9	0.6	0.5	0.35	—	—	75
MIDI Si32-3 x2	0.6	3.5	12	7	5.2	3.4	1.8	1.2	1	0.7	—	—	75
MIDI Si32-3 x3	0.6	5.25	18	10.5	7.8	5.1	2.7	1.8	1.5	1.1	—	—	75
MIDI Si32-3 x4	0.6	7	24	14	10.4	6.8	3.6	2.4	2	1.4	—	—	75
MIDI Si32-3 x5	0.6	8.75	25.5	15.8	12.4	8.5	4.5	3	2.5	2.1	—	—	75
MIDI Si32-3 x6	0.6	10.5	28.8	17.9	14.8	10.2	5.4	3.6	3	2.2	—	—	75
MIDI Pi48-3 x1	0.31	2.05	5.6	2.5	1.8	1.1	0.65	0.5	0.35	0.25	0.1	—	90
MIDI Pi48-3 x2	0.31	4	11.2	5	3.6	2.2	1.3	1	0.7	0.5	0.2	—	90
MIDI Pi48-3 x3	0.31	6	16.8	7.5	5.4	3.3	1.95	1.5	1.05	0.75	0.3	—	90
MIDI Pi48-3 x4	0.31	8	22.4	10	7.2	4.4	2.6	2	1.4	1	0.4	—	90
MIDI Pi48-3 x5	0.31	10	23.8	11.3	8.6	5.5	3.25	2.5	1.75	1.25	0.5	—	90
MIDI Pi48-3 x6	0.31	12	26.9	12.8	10.3	6.6	3.9	3	2.1	1.5	0.6	—	90
MIDI Xi40-3 x1	0.45	1.83	5.9	3	2	1.3	0.73	0.58	0.43	0.32	0.18	0.03	95
MIDI Xi40-3 x2	0.45	3.66	11.8	6	4	2.6	1.46	1.16	0.86	0.64	0.36	0.06	95
MIDI Xi40-3 x3	0.45	5.49	17.7	9	6	3.9	2.19	1.74	1.29	0.96	0.54	0.09	95
MIDI Xi40-3 x4	0.45	7.32	23.6	12	8	5.2	2.92	2.32	1.72	1.28	0.72	0.12	95
MIDI Xi40-3 x5	0.45	9.15	25.1	13.5	9.5	6.5	3.65	2.9	2.15	1.6	0.9	0.15	95
MIDI Xi40-3 x6	0.45	11	28.3	15.3	11.4	7.8	4.38	3.44	2.58	1.92	1.08	0.18	95

Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
MIDI Si32-3 x1	0.6	1.75	0.02	0.05	0.1	0.18	0.33	0.53	0.8	—	—	75
MIDI Si32-3 x2	0.6	3.5	0.01	0.025	0.05	0.09	0.17	0.27	0.4	—	—	75
MIDI Si32-3 x3	0.6	5.25	0.007	0.017	0.033	0.06	0.11	0.18	0.27	—	—	75
MIDI Si32-3 x4	0.6	7	0.005	0.013	0.025	0.045	0.083	0.13	0.2	—	—	75
MIDI Si32-3 x5	0.6	8.75	0.005	0.012	0.022	0.036	0.066	0.11	0.16	—	—	75
MIDI Si32-3 x6	0.6	10.5	0.004	0.01	0.018	0.03	0.055	0.09	0.13	—	—	75
MIDI Pi48-3 x1	0.31	2.05	0.02	0.06	0.12	0.25	0.45	0.7	1	1.6	4	90
MIDI Pi48-3 x2	0.31	4	0.01	0.03	0.06	0.13	0.23	0.35	0.5	0.8	2	90
MIDI Pi48-3 x3	0.31	6	0.007	0.02	0.04	0.08	0.15	0.23	0.33	0.53	1.33	90
MIDI Pi48-3 x4	0.31	8	0.005	0.015	0.03	0.06	0.11	0.18	0.25	0.4	1	90
MIDI Pi48-3 x5	0.31	10	0.005	0.014	0.028	0.05	0.09	0.14	0.2	0.32	0.8	90
MIDI Pi48-3 x6	0.31	12	0.004	0.013	0.025	0.04	0.08	0.12	0.17	0.27	0.67	90
MIDI Xi40-3 x1	0.45	1.83	0.022	0.062	0.12	0.22	0.37	0.57	0.84	1.2	2.2	95
MIDI Xi40-3 x2	0.45	3.66	0.011	0.031	0.06	0.11	0.19	0.29	0.42	0.6	1.1	95
MIDI Xi40-3 x3	0.45	5.49	0.007	0.021	0.04	0.07	0.12	0.19	0.28	0.4	0.73	95
MIDI Xi40-3 x4	0.45	7.32	0.006	0.016	0.03	0.055	0.09	0.14	0.21	0.3	0.55	95
MIDI Xi40-3 x5	0.45	9.15	0.005	0.014	0.026	0.044	0.07	0.11	0.17	0.24	0.44	95
MIDI Xi40-3 x6	0.45	11	0.005	0.012	0.022	0.04	0.06	0.1	0.14	0.2	0.37	95

Dimensional drawing



*) Sensing port

PCL.XXXX.S. AB

	1	2
AB	G1/4"	G1"
12B	Ø12	G1"

Accessory descriptions

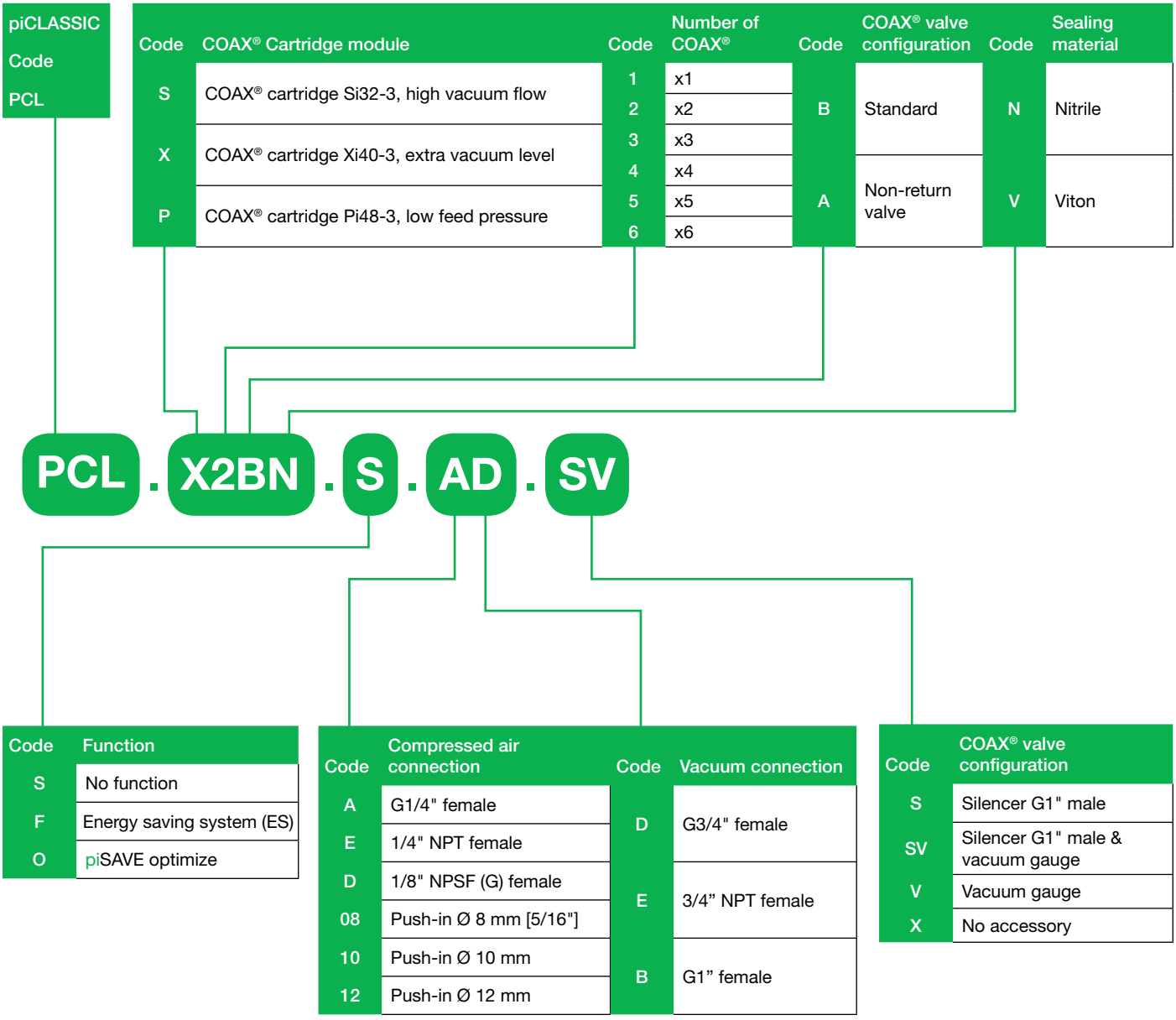
piCLASSIC Energy saving

piCLASSIC has an integrated air-saving function (piSAVE onoff) that minimises the air consumption by controlling the incoming air flow to the pump. Large hysteresis is recommended for sealed vacuum handling applications such as metal sheet, glass or plastic handling. And small hysteresis is recommended if a very accurate vacuum level has to be maintained in the process. It has an adjustable ES switch level and is a pneumatic function.

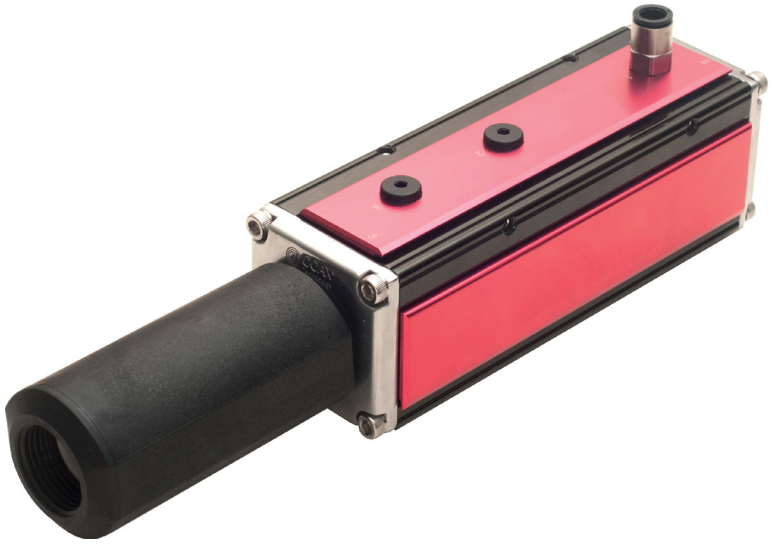
piCLASSIC piSAVE optimize

The piSAVE optimize is a vacuum controlled proportional pressure regulator, a fully pneumatic device suitable for air-driven ejectors/pumps. The feed pressure to the vacuum pump/ejector is automatically regulated and controlled to maintain the set vacuum level. Air/energy usage is kept to a minimum for the application (optimized). It is recommended for leaking and sealed applications to save energy and secure the right vacuum level.

piCLASSIC – Customer Code



P6010



As with the majority of our pumps, it is available with the patented COAX® technology and with a three-stage COAX® cartridge MIDI. Choose an Si cartridge for extra vacuum flow, a Pi cartridge for high performance at low feed pressure or an Xi cartridge when high flow and deep vacuum is needed. The P6010 consumes substantially less air compared to conventional ejectors. It also has quicker evacuation times and a low noise level. It is available with multiple connection alternatives. It can be configured with 1–4 cartridges.

Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
Pi48-3	0.31	2	5.6	2.5	1.8	1.1	0.65	0.5	0.35	0.25	0.1	–	90
Si32-3	0.6	1.75	6	3.5	2.6	1.7	0.9	0.6	0.5	0.35	–	–	75/52*
Xi40-3	0.45	1.83	5.9	3	2	1.3	0.73	0.58	0.43	0.32	0.18	0.03	95/51*
Pi48-3 x2	0.31	4	11.2	5	3.6	2.2	1.3	1	0.7	0.5	0.2	–	90
Si32-3 x2	0.6	3.5	12	7	5.2	3.4	1.8	1.2	1	0.7	–	–	75/52*
Xi40-3 x2	0.45	3.66	11.8	6	4	2.6	1.46	1.16	0.86	0.64	0.36	0.06	95/51*
Pi48-3 x3	0.31	6	16.8	7.5	5.4	3.3	1.95	1.5	1.05	0.75	0.3	–	90
Si32-3 x3	0.6	5.25	18	10.5	7.8	5.1	2.7	1.8	1.5	1.05	–	–	75/52*
Xi40-3 x3	0.45	5.49	17.7	9	6	3.9	2.19	1.74	1.29	0.96	0.54	0.09	95/51*
Pi48-3 x4	0.31	8	22.4	10	7.2	4.4	2.6	2	1.4	1	0.4	–	90
Si32-3 x4	0.6	7	24	14	10.4	6.8	3.6	2.4	2	1.4	–	–	75/52*
Xi40-3 x4	0.45	7.32	23.6	12	8	5.2	2.92	2.32	1.72	1.28	0.72	0.12	95/51*

* Without/with 1x flap valve.

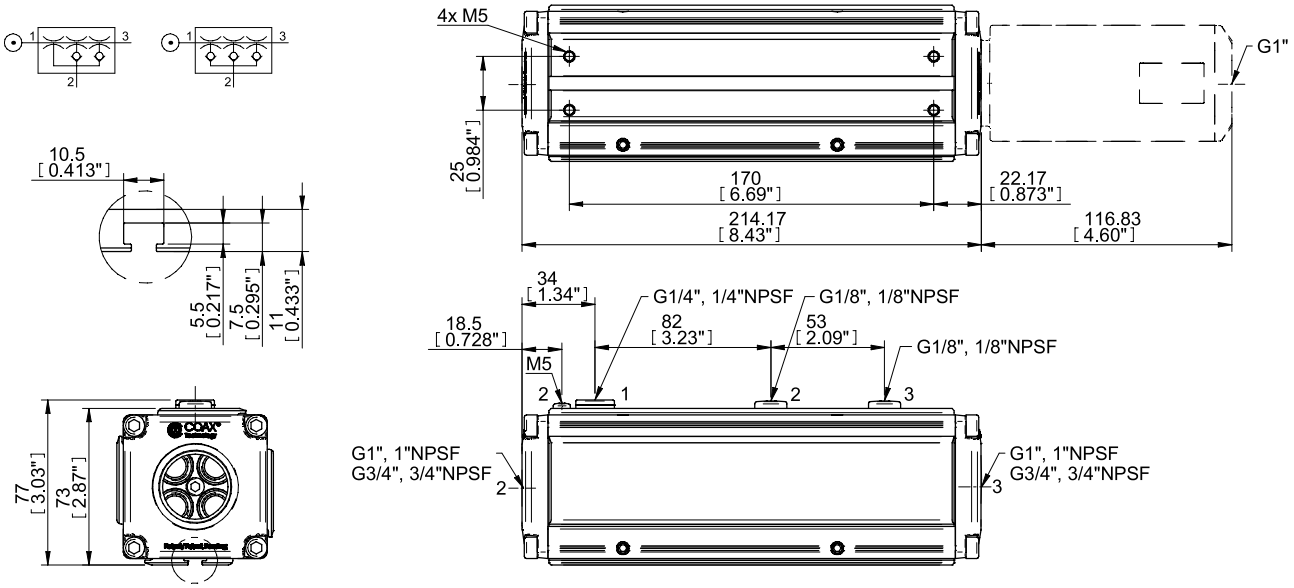
Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
Pi48-3	0.31	2	0.02	0.06	0.12	0.25	0.45	0.7	1	1.6	4	90
Si32-3	0.6	1.75	0.02	0.05	0.1	0.18	0.33	0.53	0.8	–	–	75/52*
Xi40-3	0.45	1.83	0.022	0.062	0.12	0.22	0.37	0.57	0.84	1.2	2.2	95/51*
Pi48-3 x2	0.31	4	0.01	0.03	0.06	0.125	0.23	0.35	0.5	0.8	2	90

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
Si32-3 x2	0.6	3.5	0.01	0.025	0.05	0.09	0.17	0.27	0.4	—	—	75/52*
Xi40-3 x2	0.45	3.66	0.011	0.031	0.06	0.11	0.19	0.29	0.42	0.6	1.1	95/51*
Pi48-3 x3	0.31	6	0.0067	0.02	0.04	0.083	0.15	0.23	0.33	0.53	1.33	90
Si32-3 x3	0.6	5.25	0.0067	0.017	0.033	0.06	0.11	0.17	0.27	—	—	75/52*
Xi40-3 x3	0.45	5.49	0.0073	0.021	0.04	0.073	0.12	0.19	0.28	0.4	0.73	95/51*
Pi48-3 x4	0.31	8	0.005	0.015	0.03	0.063	0.11	0.175	0.25	0.4	1	90
Si32-3 x4	0.6	7	0.005	0.0125	0.025	0.045	0.083	0.13	0.2	—	—	75/52*
Xi40-3 x4	0.45	7.32	0.0055	0.0155	0.03	0.055	0.093	0.14	0.21	0.3	0.55	95/51*

* Without/with 1x flap valve.

Dimensional drawing



Accessory descriptions

P6010 Classic

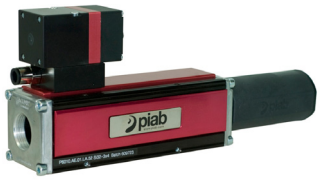
Very similar to the P6010 with the patented COAX® technology. The connections can be made on the long side of the ejector and is retro-compatible with Piab's Classic model in regard to mounting.

P6010 AVM™2

The AVM™2 unit has built-in control and monitoring functions. The integrated energy saving function (ES) minimises the air consumption in sealed systems. It has valves for vacuum on/off and blow-off with electrical power failsafe function. The AVM™ has digital outputs, 16 pre-set combinations of vacuum levels, digital vacuum level display and a mechanical valve for blow-off flow adjustment.

P6010 CU

The CU has electric valves for vacuum on/off and blow-off and a mechanical valve for blow-off flow adjustment. It also has a with special M12 4-pin cable assembly with LED for status of valve signal.



P6010 PCC

Different vacuum pumps need different feed pressure for optimum performance. The PCC is programmable for constant vacuum level, as the input signal regulates the feed pressure to maintain a constant vacuum level. It has an integrated analogue vacuum sensor.

P6010 – Customer Code

P6010
Code
P6010

Code	COAX® Cartridge module
AA	COAX® Cartridge module Blind x 4
AB	COAX® Cartridge module Si32-3x1
AC	COAX® Cartridge module Si32-3x2
AD	COAX® Cartridge module Si32-3x3
AE	COAX® Cartridge module Si32-3x4
AF	COAX® Cartridge module Si32-3x1, non-return valve
AG	COAX® Cartridge module Si32-3x2, non-return valve
AH	COAX® Cartridge module Si32-3x3, non-return valve
AI	COAX® Cartridge module Si32-3x4, non-return valve
AJ	COAX® Cartridge module Pi48-3x1
AK	COAX® Cartridge module Pi48-3x2
AL	COAX® Cartridge module Pi48-3x3
AM	COAX® Cartridge module Pi48-3x4
AN	COAX® Cartridge module Pi48-3x1, non-return valve
AO	COAX® Cartridge module Pi48-3x2, non-return valve
AP	COAX® Cartridge module Pi48-3x3, non-return valve
AQ	COAX® Cartridge module Pi48-3x4, non-return valve
AR	COAX® Cartridge module Xi40-3x1
AS	COAX® Cartridge module Xi40-3x2
AT	COAX® Cartridge module Xi40-3x3
AU	COAX® Cartridge module Xi40-3x4
AV	COAX® Cartridge module Xi40-3x1, non-return valve
AW	COAX® Cartridge module Xi40-3x2, non-return valve
AX	COAX® Cartridge module Xi40-3x3, non-return valve
AY	COAX® Cartridge module Xi40-3x4, non-return valve
BB	COAX® Cartridge module Si32-3x1, 1x flap valve
BC	COAX® Cartridge module Si32-3x2, 1x flap valve
BD	COAX® Cartridge module Si32-3x3, 1x flap valve
BE	COAX® Cartridge module Si32-3x4, 1x flap valve
BJ	COAX® Cartridge module Xi40-3x1, 1x flap valve
BK	COAX® Cartridge module Xi40-3x2, 1x flap valve
BL	COAX® Cartridge module Xi40-3x3, 1x flap valve
BM	COAX® Cartridge module Xi40-3x4, 1x flap valve

Code	Mounting
01	Mounting T-slot, Cover plate PIAB label

P6010 . AA . 01 . LA . 51

Code	Cover/Function plates
LA	Cover plate G thread connections, Cover plate plain
LB	Function PCC Vacuum, Cover plate G thread connections
LI	Cover plate Classic G thread connections, Cover plate plain
LJ	Cover plate NPSF thread connections, Cover plate plain
LK	Cover plate Classic NPSF thread connections, Cover plate plain
LT	Function PCC Vacuum, Cover plate NPSF thread connections
LU	Function AVM™2 NO, Cover plate G thread connections
LV	Function AVM™2 NC, Cover plate G thread connections
LW	Function AVM™2 NO, Cover plate NPSF thread connections
LX	Function AVM™2 NC, Cover plate NPSF thread connections
LY	Function CU NC, Cover plate G thread connections
LZ	Function CU NC, Cover plate NPSF thread connections
MA	Function AVM™2 NO, Cover plate G thread connections SB
MB	Function AVM™2 NC, Cover plate G thread connections SB
MC	Function AVM™2 N0, Cover plate NPSF thread connections SB
MD	Function AVM™2 NC, Cover plate NPSF thread connections SB
ME	Function CU NC, Cover plate G thread connections SB
MF	Function CU NC, Cover plate NPSF thread connections SB

Code	Cover/Function plates
51	Connections 2x G1"
52	Connections 2x G1", silencer 1"
53	Connections 2x G3/4"
54	Connections 2x G3/4", silencer 3/4"
55	Connections 2x 1" NPSF
56	Connections 2x 1" NPSF, silencer 1"
57	Connections 2x 3/4" NPSF
58	Connections 2x 3/4" NPSF, silencer 3/4"

P6040

The P6040 comes with the patented COAX® technology. It is available with a three-stage COAX® cartridge MIDI. Choose an Si cartridge for extra vacuum flow, a Pi cartridge for high performance at low feed pressure or an Xi cartridge when high flow and deep vacuum is needed. This pump has a substantially lower air consumption compare to competition, it is compact with no moving parts. It can be configured with 5–16 cartridges.

Vacuum flow

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MIDI Pi48-3 x5	0.3	10	28	12.5	9	5.5	3.25	2.5	1.75	1.25	0.5	–	90
MIDI Pi48-3 x6	0.3	12	33.6	15	10.8	6.6	3.9	3	2.1	1.5	0.6	–	90
MIDI Pi48-3 x7	0.3	14	39.2	17.5	12.6	7.7	4.55	3.5	2.45	1.75	0.7	–	90
MIDI Pi48-3 x8	0.3	16	44.8	20	14.4	8.8	5.2	4	2.8	2	0.8	–	90
MIDI Pi48-3 x9	0.3	18	50.4	22.5	16.2	9.9	5.85	4.5	3.15	2.25	0.9	–	90
MIDI Pi48-3 x10	0.3	20	56	25	18	11	6.5	5	3.5	2.5	1	–	90
MIDI Pi48-3 x11	0.3	22	61.6	27.5	19.8	12.1	7.15	5.5	3.85	2.75	1.1	–	90
MIDI Pi48-3 x12	0.3	24	67.2	30	21.6	13.2	7.8	6	4.2	3	1.2	–	90
MIDI Pi48-3 x13	0.3	26	72.8	32.5	23.4	14.3	8.45	6.5	4.55	3.25	1.3	–	90
MIDI Pi48-3 x14	0.3	28	78.4	35	25.2	15.4	9.1	7	4.9	3.5	1.4	–	90
MIDI Pi48-3 x15	0.3	30	84	37.5	27	16.5	9.75	7.5	5.25	3.75	1.5	–	90
MIDI Pi48-3 x16	0.3	32	89.6	40	28.8	17.6	10.4	8	5.6	4	1.6	–	90
MIDI Si32-3 x5	0.6	8.75	30	17.5	13	8.5	4.5	3	2.5	1.75	–	–	75/52*
MIDI Si32-3 x6	0.6	10.5	36	21	15.6	10.2	5.4	3.6	3	2.1	–	–	75/52*
MIDI Si32-3 x7	0.6	12.25	42	24.5	18.2	11.9	6.3	4.2	3.5	2.45	–	–	75/52*
MIDI Si32-3 x8	0.6	14	48	28	20.8	13.6	7.2	4.8	4	2.8	–	–	75/52*
MIDI Si32-3 x9	0.6	15.75	54	31.5	23.4	15.3	8.1	5.4	4.5	3.15	–	–	75/52*
MIDI Si32-3 x10	0.6	17.5	60	35	26	17	9	6	5	3.5	–	–	75/52*
MIDI Si32-3 x11	0.6	19.25	66	38.5	28.6	18.7	9.9	6.6	5.5	3.85	–	–	75/52*
MIDI Si32-3 x12	0.6	21	72	42	31.2	20.4	10.8	7.2	6	4.2	–	–	75/52*
MIDI Si32-3 x13	0.6	22.75	78	45.5	33.8	22.1	11.7	7.8	6.5	4.55	–	–	75/52*
MIDI Si32-3 x14	0.6	24.5	84	49	36.4	23.8	12.6	8.4	7	4.9	–	–	75/52*
MIDI Si32-3 x15	0.6	26.25	90	52.5	39	25.5	13.5	9	7.5	5.25	–	–	75/52*

COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MIDI Si32-3 x16	0.6	28	96	56	41.6	27.2	14.4	9.6	8	5.6	—	—	75/52*
MIDI Xi40-3 x5	0.45	9.15	29.5	15	10	6.5	3.65	2.9	2.15	1.6	0.9	0.15	95/51*
MIDI Xi40-3 x6	0.45	10.98	35.4	18	12	7.8	4.38	3.48	2.58	1.92	1.08	0.18	95/51*
MIDI Xi40-3 x7	0.45	12.81	41.3	21	14	9.1	5.11	4.06	3.01	2.24	1.26	0.21	95/51*
MIDI Xi40-3 x8	0.45	14.64	47.2	24	16	10.4	5.84	4.64	3.44	2.56	1.44	0.24	95/51*
MIDI Xi40-3 x9	0.45	16.47	53.1	27	18	11.7	6.57	5.22	3.87	2.88	1.62	0.27	95/51*
MIDI Xi40-3 x10	0.45	18.3	59	30	20	13	7.3	5.8	4.3	3.2	1.8	0.3	95/51*
MIDI Xi40-3 x11	0.45	20.13	64.9	33	22	14.3	8.03	6.38	4.73	3.52	1.98	0.33	95/51*
MIDI Xi40-3 x12	0.45	21.96	70.8	36	24	15.6	8.76	6.96	5.16	3.84	2.16	0.36	95/51*
MIDI Xi40-3 x13	0.45	23.79	76.7	39	26	16.9	9.49	7.54	5.59	4.16	2.34	0.39	95/51*
MIDI Xi40-3 x14	0.45	25.62	82.6	42	28	18.2	10.22	8.12	6.02	4.48	2.52	0.42	95/51*
MIDI Xi40-3 x15	0.45	27.45	88.5	45	30	19.5	10.95	8.7	6.45	4.8	2.7	0.45	95/51*
MIDI Xi40-3 x16	0.45	29.28	94.4	48	32	20.8	11.68	9.28	6.88	5.12	2.88	0.48	95/51*

* Without/with 1x flap valve.

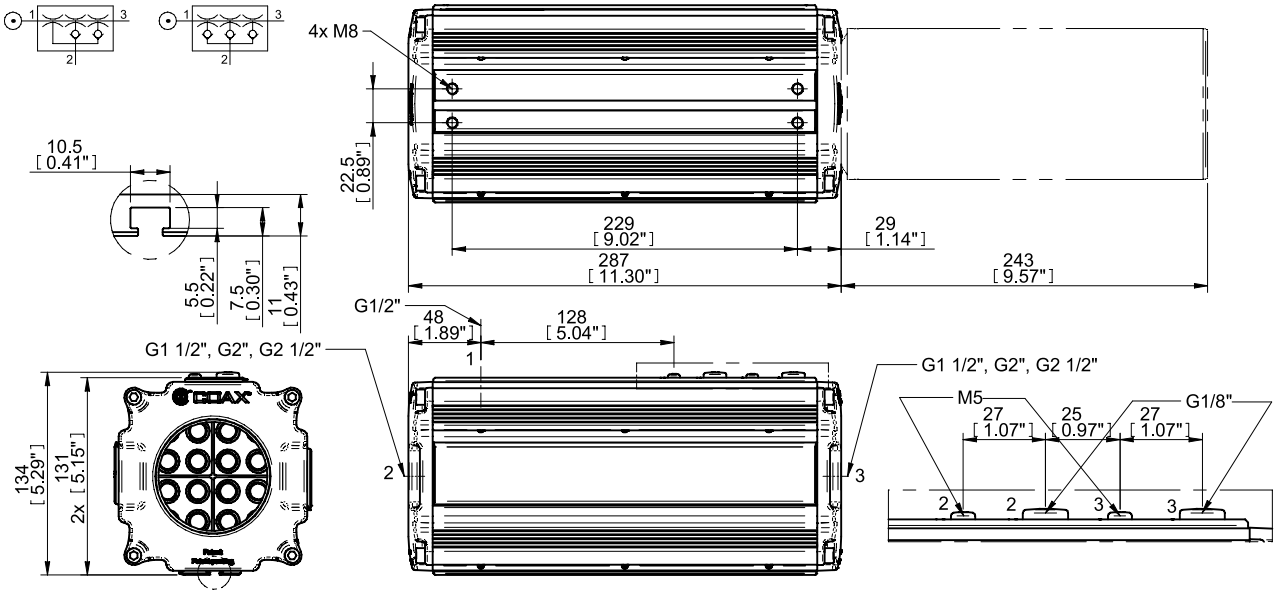
Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
MIDI Pi48-3 x5	0.3	10	0.004	0.012	0.024	0.05	0.09	0.14	0.2	0.32	0.8	90
MIDI Pi48-3 x6	0.3	12	0.0033	0.01	0.02	0.042	0.075	0.12	0.17	0.27	0.67	90
MIDI Pi48-3 x7	0.3	14	0.0029	0.0086	0.017	0.036	0.064	0.1	0.14	0.23	0.57	90
MIDI Pi48-3 x8	0.3	16	0.0025	0.0075	0.015	0.031	0.056	0.088	0.13	0.2	0.5	90
MIDI Pi48-3 x9	0.3	18	0.0022	0.0067	0.013	0.028	0.05	0.078	0.11	0.18	0.44	90
MIDI Pi48-3 x10	0.3	20	0.002	0.006	0.012	0.025	0.045	0.07	0.1	0.16	0.4	90
MIDI Pi48-3 x11	0.3	22	0.0018	0.0055	0.011	0.023	0.041	0.064	0.091	0.15	0.36	90
MIDI Pi48-3 x12	0.3	24	0.0017	0.005	0.01	0.021	0.038	0.058	0.083	0.13	0.33	90
MIDI Pi48-3 x13	0.3	26	0.0015	0.0046	0.0092	0.019	0.035	0.054	0.077	0.12	0.31	90
MIDI Pi48-3 x14	0.3	28	0.0014	0.0043	0.0086	0.018	0.032	0.05	0.071	0.11	0.29	90
MIDI Pi48-3 x15	0.3	30	0.0013	0.004	0.008	0.017	0.03	0.047	0.067	0.11	0.27	90
MIDI Pi48-3 x16	0.3	32	0.0013	0.0038	0.0075	0.016	0.029	0.044	0.063	0.1	0.25	90
MIDI Si32-3 x5	0.6	8.75	0.004	0.01	0.02	0.036	0.066	0.11	0.16	—	—	75/52*
MIDI Si32-3 x6	0.6	10.5	0.0033	0.0083	0.017	0.03	0.055	0.088	0.13	—	—	75/52*
MIDI Si32-3 x7	0.6	12.25	0.0029	0.0071	0.014	0.026	0.047	0.076	0.11	—	—	75/52*
MIDI Si32-3 x8	0.6	14	0.0025	0.0063	0.013	0.023	0.041	0.066	0.1	—	—	75/52*
MIDI Si32-3 x9	0.6	15.75	0.0022	0.0056	0.011	0.02	0.037	0.059	0.089	—	—	75/52*
MIDI Si32-3 x10	0.6	17.5	0.002	0.005	0.01	0.018	0.033	0.053	0.08	—	—	75/52*
MIDI Si32-3 x11	0.6	19.25	0.0018	0.0045	0.0091	0.016	0.03	0.048	0.073	—	—	75/52*
MIDI Si32-3 x12	0.6	21	0.0017	0.0042	0.0083	0.015	0.028	0.044	0.067	—	—	75/52*
MIDI Si32-3 x13	0.6	22.75	0.0015	0.0038	0.0077	0.014	0.025	0.041	0.062	—	—	75/52*
MIDI Si32-3 x14	0.6	24.5	0.0014	0.0036	0.0071	0.013	0.024	0.038	0.057	—	—	75/52*
MIDI Si32-3 x15	0.6	26.25	0.0013	0.0033	0.0067	0.012	0.022	0.035	0.053	—	—	75/52*
MIDI Si32-3 x16	0.6	28	0.0013	0.0031	0.0063	0.011	0.021	0.033	0.05	—	—	75/52*
MIDI Xi40-3 x5	0.45	9.15	0.0044	0.012	0.024	0.044	0.074	0.11	0.17	0.24	0.44	95/51*

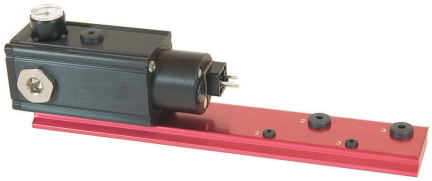
COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
MIDI Xi40-3 x6	0.45	10.98	0.0037	0.01	0.02	0.037	0.062	0.095	0.14	0.2	0.37	95/51*
MIDI Xi40-3 x7	0.45	12.81	0.0031	0.0089	0.017	0.031	0.053	0.081	0.12	0.17	0.31	95/51*
MIDI Xi40-3 x8	0.45	14.64	0.0028	0.0078	0.015	0.028	0.046	0.071	0.11	0.15	0.28	95/51*
MIDI Xi40-3 x9	0.45	16.47	0.0024	0.0069	0.013	0.024	0.041	0.063	0.093	0.13	0.24	95/51*
MIDI Xi40-3 x10	0.45	18.3	0.0022	0.0062	0.012	0.022	0.037	0.057	0.084	0.12	0.22	95/51*
MIDI Xi40-3 x11	0.45	20.13	0.002	0.0056	0.011	0.02	0.034	0.052	0.076	0.11	0.2	95/51*
MIDI Xi40-3 x12	0.45	21.96	0.0018	0.0052	0.01	0.018	0.031	0.048	0.07	0.1	0.18	95/51*
MIDI Xi40-3 x13	0.45	23.79	0.0017	0.0048	0.0092	0.017	0.029	0.044	0.065	0.092	0.17	95/51*
MIDI Xi40-3 x14	0.45	25.62	0.0016	0.0044	0.0086	0.016	0.027	0.041	0.06	0.086	0.16	95/51*
MIDI Xi40-3 x15	0.45	27.45	0.0015	0.0041	0.008	0.015	0.025	0.038	0.056	0.08	0.15	95/51*
MIDI Xi40-3 x16	0.45	29.28	0.0014	0.0039	0.0075	0.014	0.023	0.036	0.053	0.075	0.14	95/51*

* Without/with 1x flap valve.

Dimensional drawing

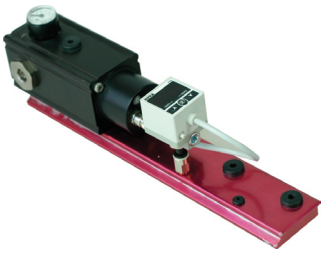


Accessory descriptions



P6040 V30

Piab P6040 multi stage ejector with Si, Pi or Xi COAX® technology. Modular design for flexible performance. Compact and durable with no moving parts. Electric 3/2 valve for on/off. Manometer for feed pressure control



P6040 ES Vacuum

Piab P6040 multi stage ejector with Si, Pi or Xi COAX® technology. Modular design for flexible performance. Compact and durable with no moving parts. Electrically operated air-saving device. Adjustable vacuum controlled 2/2 NO valve. Manometer for feed pressure control. Recommended for non-leaking system.

P6040 – Customer Code

P6040
Code
P6040

Code	Application type
V	Vacuum
B	Blow

Code	Mounting
00	Mounting T-slot

Code	Cover/Function plates
AA	Connection G1/2"
AB	Connection 4x G1/2"
AC	Function Valve v30
AD	Function ES-Vacuum
AE	Function ES-Blow

P6040 . V . AA . 00 . AA . 00

Code	Connections for vacuum and exhaust
00	Connections G 1 1/2"
01	Connections G 2"
02	Connections G 2 1/2"
03	Connection G 1 1/2", silencer
04	Connection G 2", silencer
05	Connection G 2 1/2", silencer
06	Connection G 1 1/2", inlet silencer
07	Connection G 2", inlet silencer
08	Connection G 2 1/2", inlet silencer

Code												COAX® Cartridge module
×5	×6	×7	×8	×9	×10	×11	×12	×13	×14	×15	×16	
AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	COAX® Cartridge module Pi48-3
AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	COAX® Cartridge module Pi48-3, non-return valve
AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	COAX® Cartridge module Pi48-3, 1x flap valve
BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV	COAX® Cartridge module Si32-3
BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	COAX® Cartridge module Si32-3, non-return valve
CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	COAX® Cartridge module Si32-3, 1x flap valve
CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	COAX® Cartridge module Xi40-3
DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP	DQ	DR	COAX® Cartridge module Xi40-3, non-return valve
DS	DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED	COAX® Cartridge module Xi40-3, 1x flap valve

Round pump

This round pump is available with the energy efficient COAX® cartridges. It designed for high vacuum flow with 6x COAX® Si MIDI cartridges. Still it is small, compact and lightweight (1.6 kg). Easy to mount and install with integrated hose connectors.

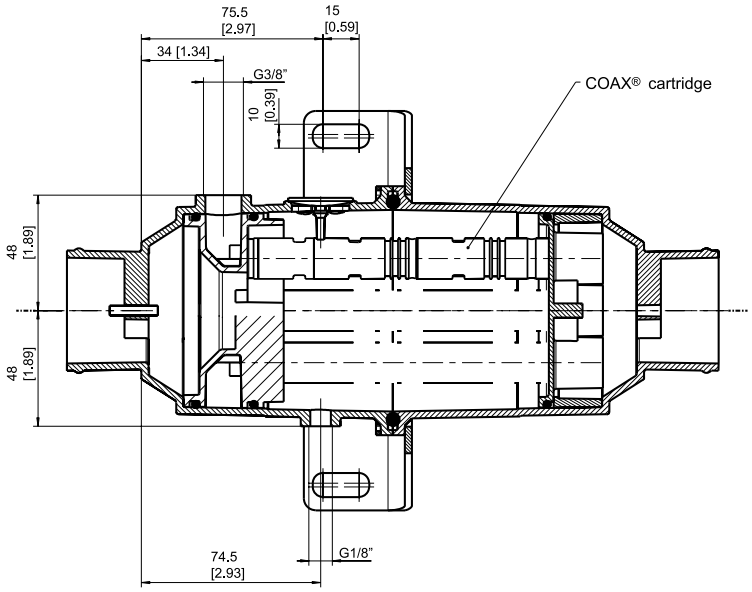
Vacuum flow

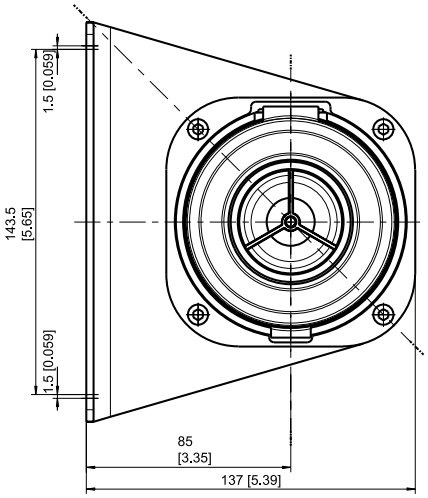
COAX® Cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	-kPa
MIDI Si32-3 x6	0.4	7.5	30	17.4	11.4	7.2	4.8	2.4	0.6	—	60
MIDI Si32-3 x6	0.5	9	34.2	19.8	13.2	8.4	5.1	3.72	2.1	1.08	70
MIDI Si32-3 x6	0.6	10.5	36	21	15.6	10.2	5.4	3.6	3	2.1	75

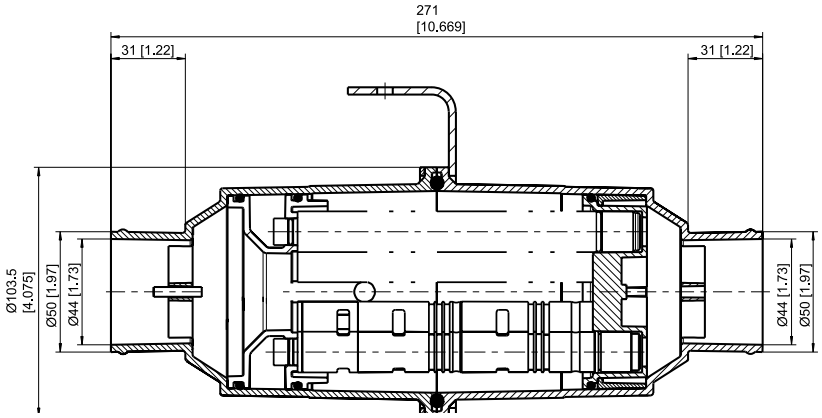
Evacuation times

COAX® Cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)							Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	-kPa
MIDI Si32-3 x6	0.4	7.5	0.005	0.012	0.023	0.04	0.07	0.167	—	60
MIDI Si32-3 x6	0.5	9	0.003	0.01	0.018	0.035	0.058	0.1	0.167	70
MIDI Si32-3 x6	0.6	10.5	0.003	0.008	0.017	0.03	0.055	0.088	0.133	75

Dimensional drawing







MINI L pumps family




This family of pumps provides a large vacuum flow even though they are very small in size and lightweight. Vacuum level to 75 -kPa. Some pumps in this family are available with connection plate in aluminium or composite PA. These are recommended to use when the handled product is made of porous material such as cardboard, wood or paper.

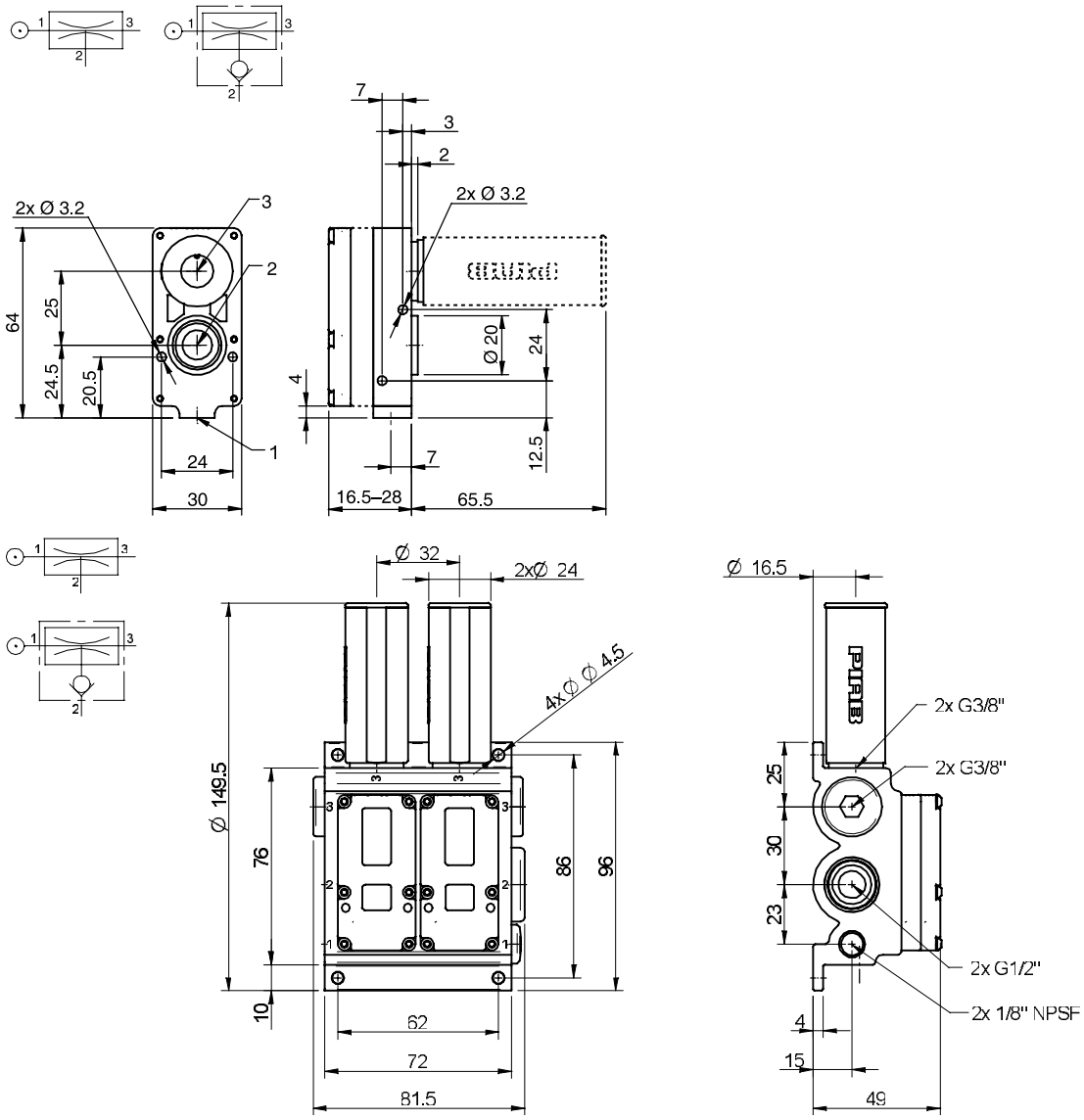
Vacuum flow

Pump name	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	-kPa
L7	0.6	0.49	0.72	0.49	0.29	0.25	0.2	0.16	0.1	0.067	75
L14	0.6	0.98	1.5	1	0.57	0.45	0.39	0.32	0.24	0.13	75
L28	0.6	2	2.6	1.7	1.1	0.89	0.74	0.55	0.36	0.17	75
L56	0.6	4	5.1	3.5	2	1.7	1.4	1.1	0.81	0.43	75

Evacuation times

Pump name	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)							Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	-kPa
L7	0.6	0.49	0.093	0.31	0.72	1.2	1.8	2.6	3.8	75
L14	0.6	0.98	0.064	0.17	0.36	0.59	0.88	1.3	1.8	75
L28	0.6	2	0.047	0.11	0.2	0.32	0.46	0.69	1.1	75
L56	0.6	4	0.023	0.053	0.1	0.16	0.23	0.33	0.5	75

Dimensional drawing



MINI M-L pumps family




This pump family with its very small size and low weight provide extra vacuum level to 84 -kPa. Some models are available with the connection plate in aluminium or composite PA. These are recommended to use when the handled product is made of a sealed material or a non-porous material such as plastic, metal or glass.

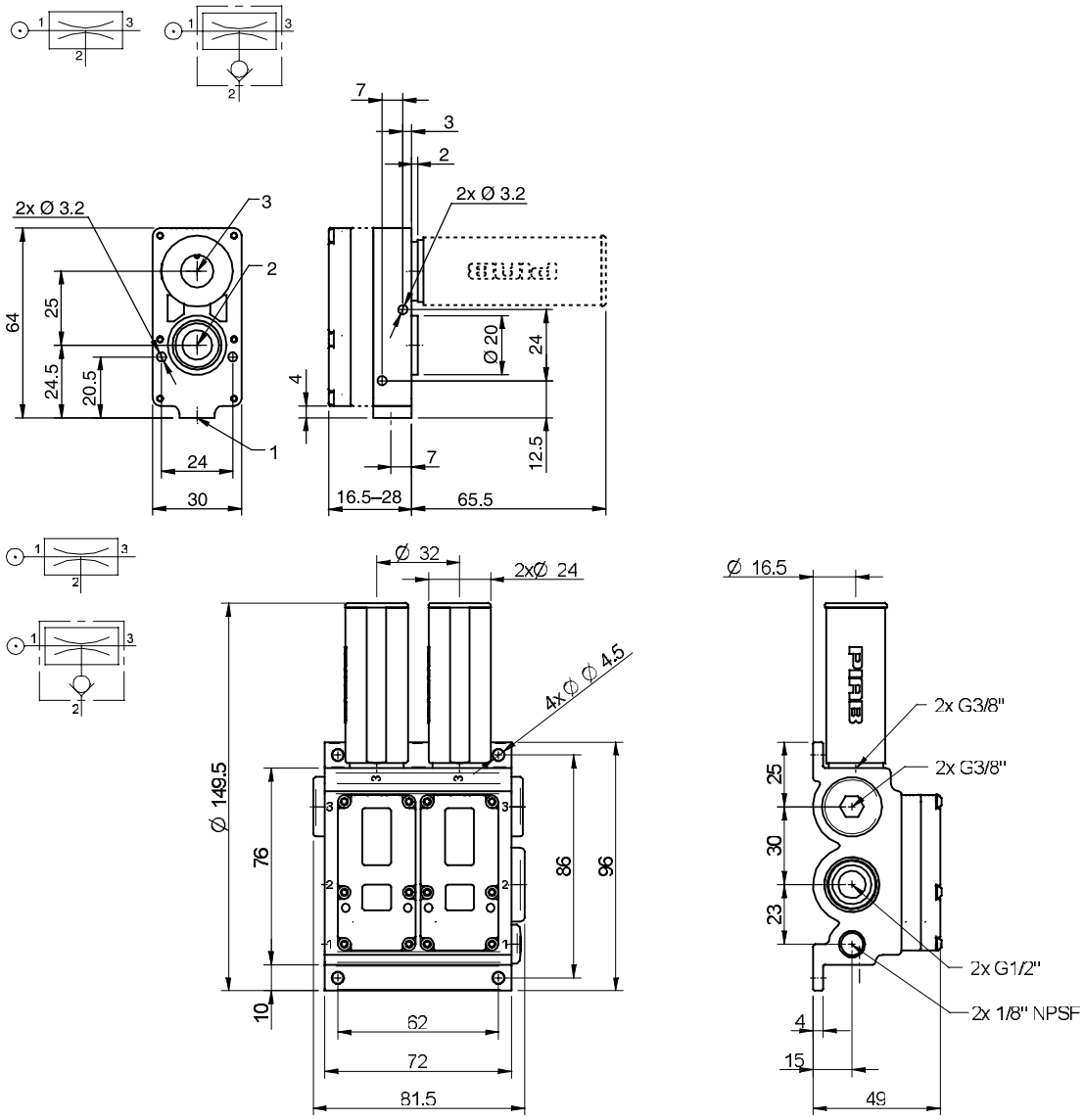
Vacuum flow

Pump name	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	-kPa
M5L	0.38	0.38	0.58	0.3	0.22	0.18	0.14	0.1	0.08	0.04	0.01	81
M5L	0.6	0.55	0.73	0.5	0.26	0.14	0.12	0.1	0.08	0.05	0.02	84
M10L	0.38	0.76	1.1	0.57	0.39	0.35	0.3	0.21	0.12	0.06	0.02	81
M10L	0.6	1.1	1.3	0.91	0.48	0.29	0.26	0.21	0.13	0.09	0.03	84
M20L	0.38	1.5	2	1.2	0.76	0.67	0.53	0.41	0.33	0.19	0.02	81
M20L	0.6	2.2	2.4	1.7	0.95	0.57	0.48	0.38	0.29	0.19	0.06	84
M40L	0.38	3	4	2.2	1.4	1.2	1	0.71	0.43	0.19	0.05	81
M40L	0.6	4.4	4.8	3.1	1.7	1.1	0.93	0.74	0.57	0.36	0.11	84

Evacuation times

Pump name	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	-kPa
M5L	0.38	0.38	0.2	0.61	1.2	1.8	2.6	3.8	5.9	11.1	81
M5L	0.6	0.55	0.13	0.36	1	1.8	2.8	4	5.7	9.4	84
M10L	0.38	0.76	0.13	0.31	0.57	0.9	1.3	2	3.2	7.1	81
M10L	0.6	1.1	0.079	0.2	0.5	0.92	1.4	2.1	3	5	84
M20L	0.38	1.5	0.052	0.14	0.26	0.42	0.64	1	1.7	3.7	81
M20L	0.6	2.2	0.038	0.1	0.24	0.43	0.68	1	1.5	2.5	84
M40L	0.38	3	0.03	0.074	0.13	0.21	0.32	0.5	0.95	1.6	81
M40L	0.6	4.4	0.031	0.064	0.13	0.22	0.34	0.5	0.7	1.3	84

Dimensional drawing



MINI X-L pumps family




This pump family with its very small size and low weight provide extra vacuum level to 93 -kPa. Some models are available with the connection plate in aluminium or composite PA. These are recommended to use when the handled product is made of a sealed material or a non-porous material such as plastic. metal or glass.

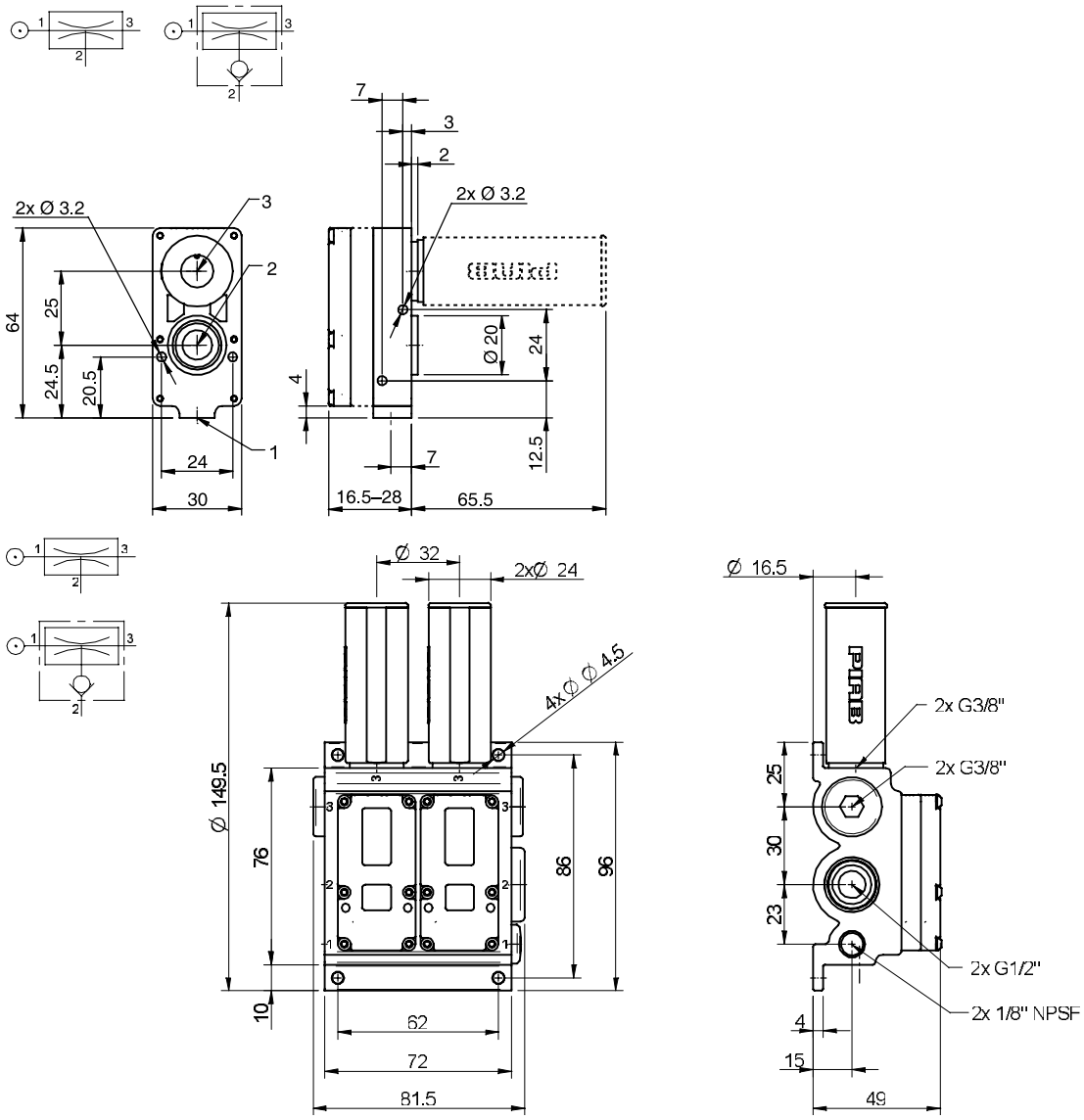
Vacuum flow

Pump name	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
X5L	0.4	0.39	0.48	0.24	0.12	0.11	0.1	0.086	0.071	0.057	0.03	0.006	93
X10L	0.4	0.79	0.76	0.35	0.24	0.21	0.16	0.13	0.1	0.07	0.04	0.01	93
X20L	0.4	1.6	1.9	1	0.5	0.44	0.38	0.3	0.25	0.17	0.1	0.02	93
X40L	0.4	3.1	3.2	1.5	1	0.9	0.7	0.6	0.5	0.4	0.17	0.038	93

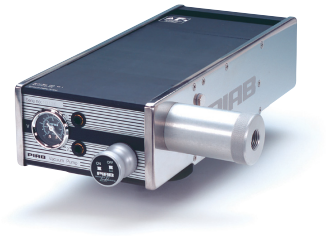
Evacuation times

Pump name	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
X5L	0.4	0.39	0.17	0.82	1.7	2.7	3.9	5.4	7.4	10.6	22.5	93
X10L	0.4	0.79	0.11	0.47	0.94	1.5	2.2	3.1	4.3	6.6	14	93
X20L	0.4	1.6	0.055	0.2	0.4	0.65	0.97	1.4	1.9	2.7	5.1	93
X40L	0.4	3.1	0.038	0.12	0.22	0.33	0.48	0.68	1.2	2.2	3.2	93

Dimensional drawing



MAXI MLL pumps family



MLL 200/400

MLL800

MLL1200

This is probably the largest compressed-air driven pump in the market. Some of the models have an optional energy saving feature.

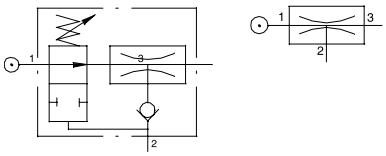
Vacuum flow

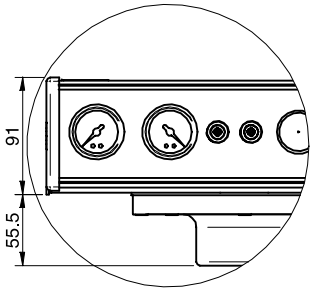
Pump name	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MLL200	0.6	14	48	27	18.1	9.5	4.8	3.3	2.4	1.1	0.48	0.01	91
MLL400	0.6	28	92	52	35	18.4	9.2	6.4	4.6	2.2	0.92	0.02	91
MLL800	0.6	56	176	99	67	35	17.6	12.3	8.8	4.2	1.8	0.04	91
MLL1200	0.6	84	255	143	97	51	26	17.9	12.8	6.1	2.6	0.05	91

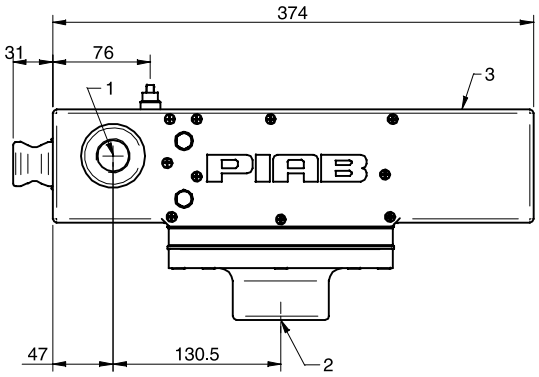
Evacuation times

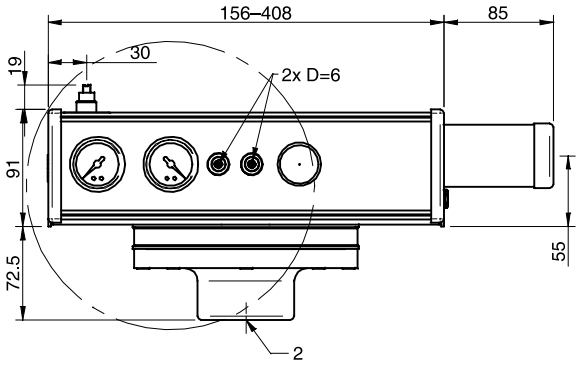
Pump name	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
MLL200	0.6	14	0.003	0.008	0.014	0.03	0.06	0.1	0.16	0.29	0.82	91
MLL400	0.6	28	0.0015	0.004	0.007	0.015	0.03	0.05	0.08	0.15	0.41	91
MLL800	0.6	56	0.0008	0.0018	0.0035	0.008	0.014	0.024	0.04	0.072	0.2	91
MLL1200	0.6	84	0.0005	0.0012	0.0023	0.0052	0.009	0.016	0.027	0.048	0.14	91

Dimensional drawing

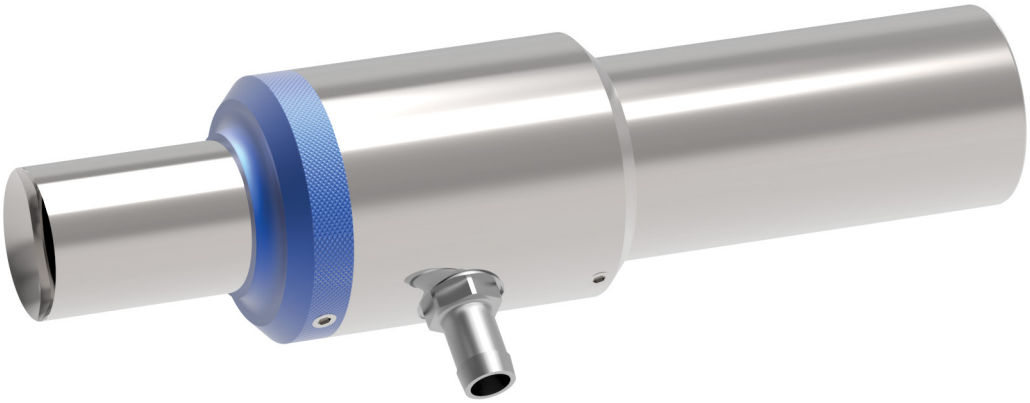








Ejector 300

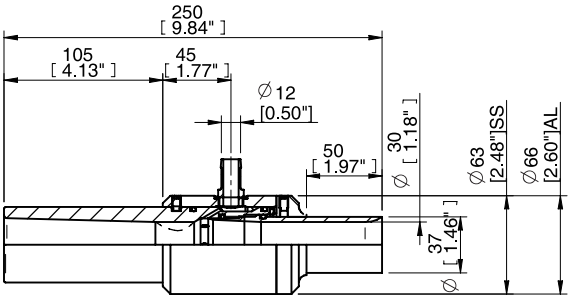


This is a compact ejector pump which is normally used when a large flow with low vacuum is desired. The air consumption and capacity can be adjusted. Small amounts of material and contaminants can be conveyed. This product is available in stainless steel or aluminium. When it is fitted with an insert, the ejector changes characteristics providing higher vacuum at lower flow. It is delivered with a 3/8” hose nipple for the compressed air connection.

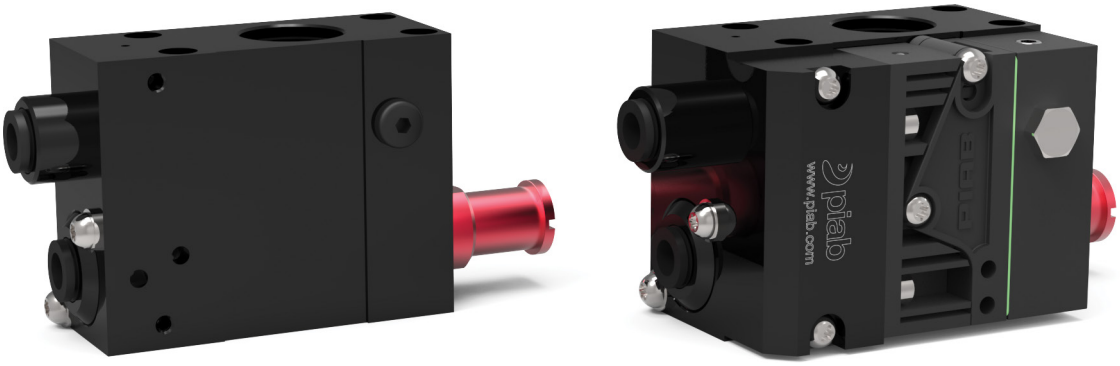
Vacuum flow

Feed pressure	Air consumption	Vacuum flow (Nl/s) at 0 -kPa		Max vacuum (-kPa)	
MPa	Nl/s	Ejector 300	With insert	Ejector 300	With insert
0.1	8.3	55	32	3.5	5
0.2	13.3	85	47	6	11
0.3	18.3	110	59	8	16
0.4	23.3	126	64	10.5	20
0.5	28.3	141	64	12	21.5
0.6	33.3	152	59	12.5	21.8

Dimensional drawing



piSECURE



This vacuum pump combines high security and the most energy-efficient solution for sealed material, COAX® technology with automatic air-saving function. It has a check valve that traps vacuum in sealed applications and an integrated energy saving device that results in virtually no energy consumption. It is an excellent product when working with vacuum handling devices that have to comply and fulfil legislated lifting norms for handling devices, for example (DIN/SS) – EN 13155, ASME Standard B30.20, etc.

As the piSECURE uses the two stage COAX® MINI Xi10-2 ejector it will provide a fast evacuation to 94 -kPa. It is suitable to use as decentralized (one per cup) for maximum safety. It also has an integrated blow-off release valve for fast and reliable release of object. The optional air saving function (piSECURE ES) can save up to 99% of consumption.

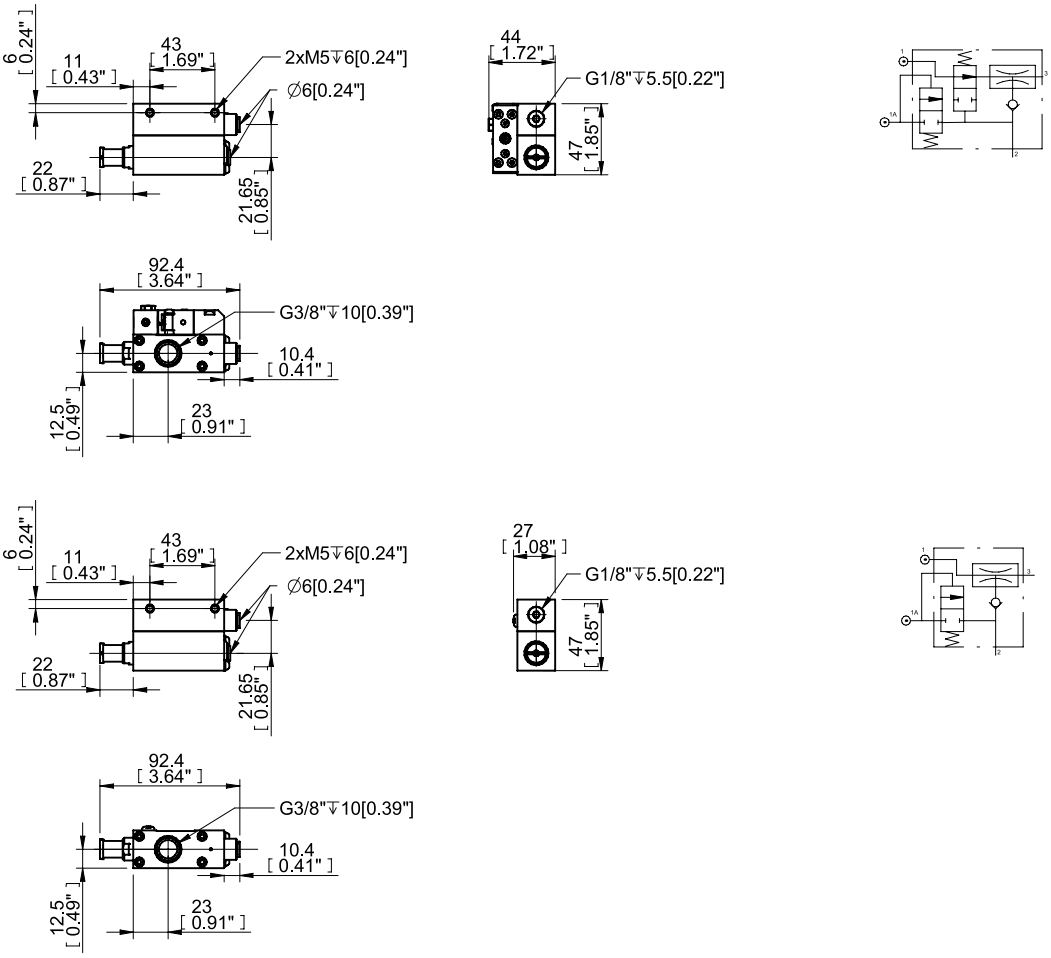
Vacuum flow

COAX® cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)										Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	-kPa
MINI Xi10-2	0.45	0.42	0.75	0.61	0.45	0.28	0.19	0.15	0.11	0.07	0.043	0.003	92
MINI Xi10-2	0.5	0.46	0.75	0.63	0.49	0.33	0.19	0.15	0.11	0.07	0.045	0.011	94
MINI Xi10-2	0.6	0.54	0.74	0.63	0.53	0.42	0.3	0.16	0.11	0.08	0.041	0.01	93

Evacuation times

COAX® cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	90	-kPa
MINI Xi10-2	0.45	0.42	0.15	0.3	0.6	1.1	1.6	2.3	3.5	5.3	9.6	92
MINI Xi10-2	0.5	0.46	0.14	0.3	0.6	1	1.6	2.3	3.5	5.3	8.9	94
MINI Xi10-2	0.6	0.54	0.15	0.3	0.5	0.8	1.3	2	3.1	4.8	8.7	93

Dimensional drawing



Vacuum Check Valve VT-1H with COAX®

This vacuum pump combines high security and the most energy-efficient solution for sealed material, COAX® technology with automatic air-saving function. It has a check valve that traps vacuum in sealed applications and an integrated energy saving device that results in virtually no energy consumption. It is an excellent product when working with vacuum handling devices that have to comply and fulfil legislated lifting norms for handling devices, for example (DIN/SS) – EN 13155, ASME Standard B30.20, etc.

It has the two-stage COAX® cartridge MINI Pi12-2 integrated and is available in lock pin 16, 19 or ball joint mountings, industry standard. It is also available with level compensator to compensate for differences in level of object.

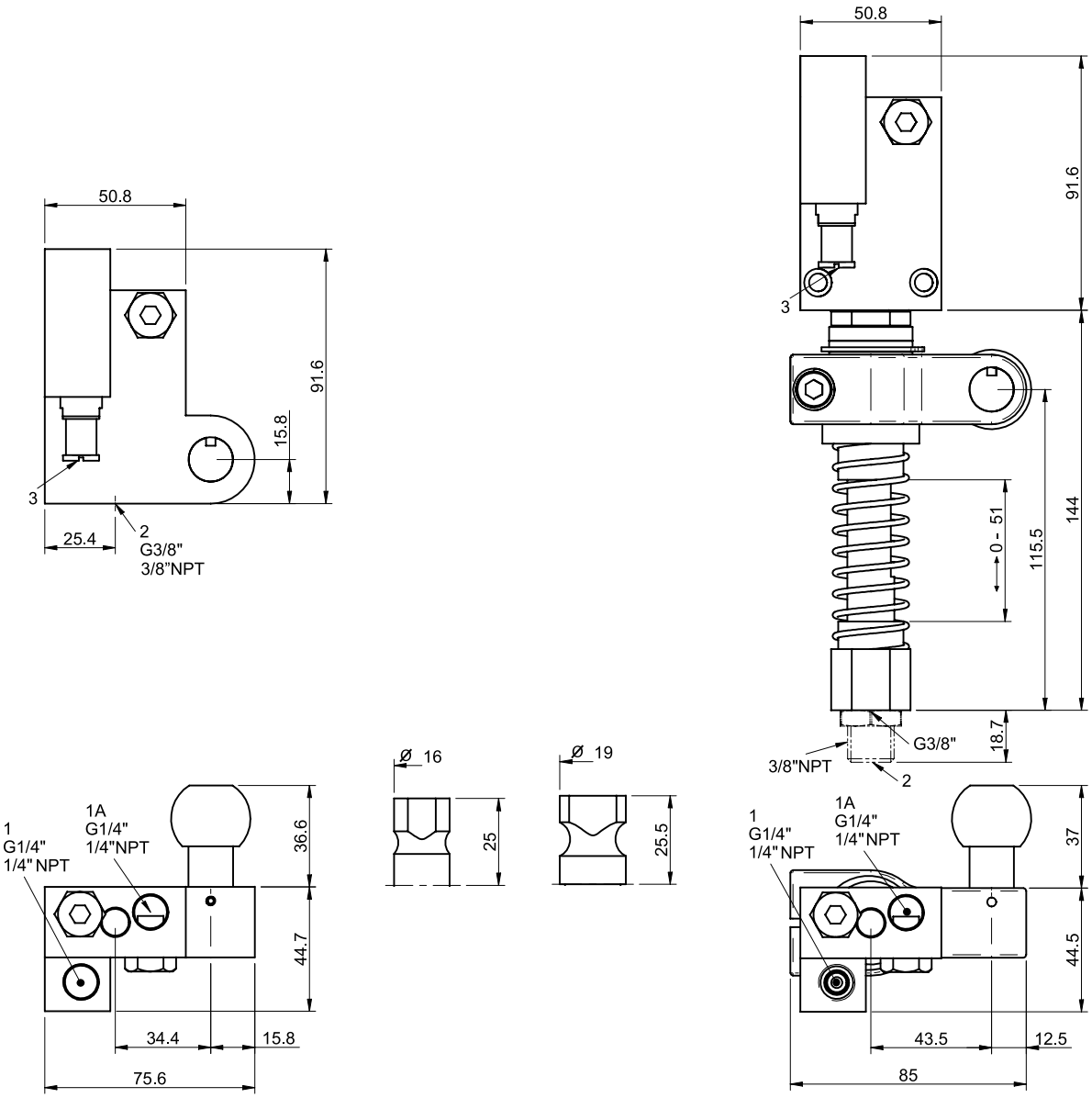
Vacuum flow

COAX® cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	-kPa
MINI Pi12-2	0.32	0.44	0.68	0.6	0.44	0.27	0.19	0.14	0.1	0.06	0.03	90

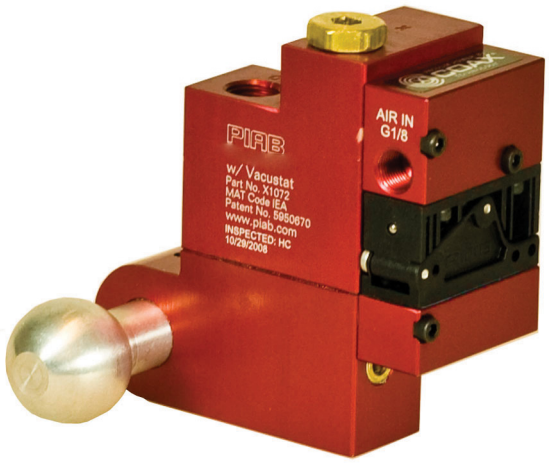
Evacuation times

COAX® cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	-kPa
MINI Pi12-2	0.32	0.44	0.17	0.32	0.58	1.1	1.8	2.7	4	6.4	90

Dimensional drawing



Vacuum Check Valve VT-1H Vacustat with COAX®



This vacuum pump combines high security and the most energy-efficient solution for sealed material, COAX® technology with automatic air-saving function. It has a check valve that traps vacuum in sealed applications and an integrated energy saving device that results in virtually no energy consumption. It is an excellent product when working with vacuum handling devices that have to comply and fulfil legislated lifting norms for handling devices, for example (DIN/SS) – EN 13155, ASME Standard B30.20, etc.

It has the two-stage COAX® cartridge MINI Pi12-2 integrated and is available in lock pin 16, 19 or ball joint mountings, industry standard. It is also available with level compensator to compensate for differences in level of object. This pump has an integrated energy-saving device, Vacustat that results in virtually no air consumption in sealed applications.

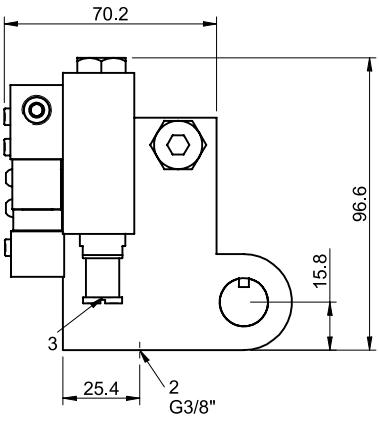
Vacuum flow

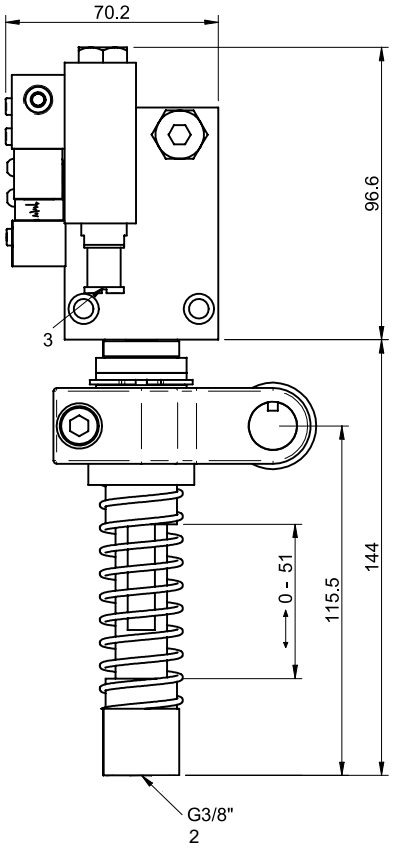
COAX® cartridge	Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)									Max vacuum
	MPa	Nl/s	0	10	20	30	40	50	60	70	80	-kPa
MINI Pi12-2	0.32	0.44	0.68	0.6	0.44	0.27	0.19	0.14	0.1	0.06	0.03	90

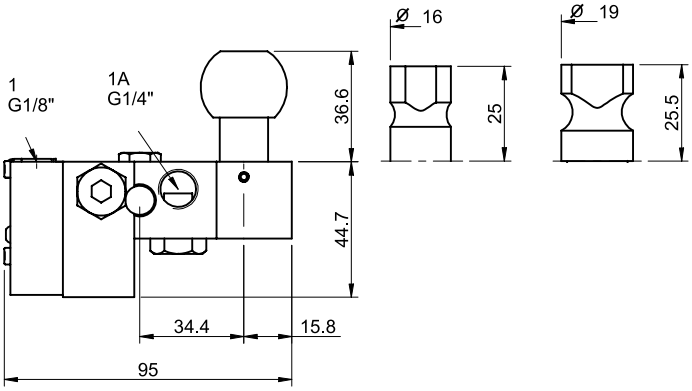
Evacuation times

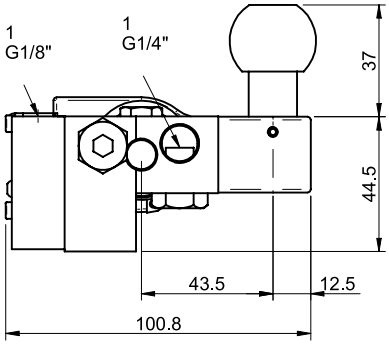
COAX® cartridge	Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)								Max vacuum
	MPa	Nl/s	10	20	30	40	50	60	70	80	-kPa
MINI Pi12-2	0.32	0.44	0.17	0.32	0.58	1.1	1.8	2.7	4	6.4	90

Dimensional drawing

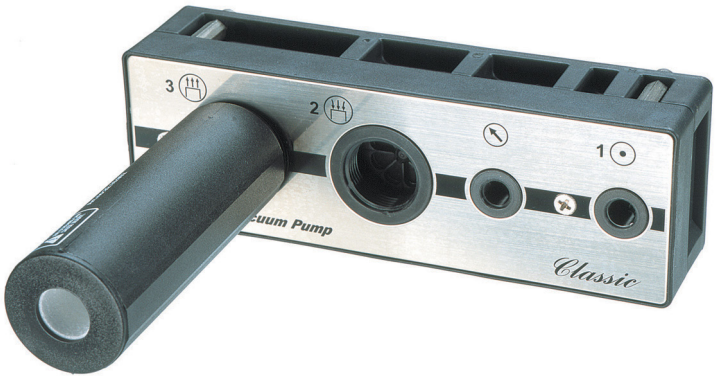








Classic H40



A traditional Piab vacuum pump developed to be used within the chemical industry or in chemically aggressive environments. It can achieve higher vacuum levels, even down to 99.8 -kPa. It is available with connection plate in composite PPS. We recommend it to be used with practically zero leakage present and in nonporous applications.

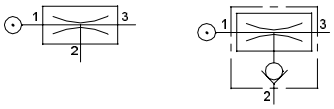
Vacuum flow

Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)												Max vacuum
MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	95	99	-kPa
0.6	2.6	2.8	2.1	1.5	0.9	0.4	0.3	0.2	0.14	0.1	0.095	0.019	0.005	99.8

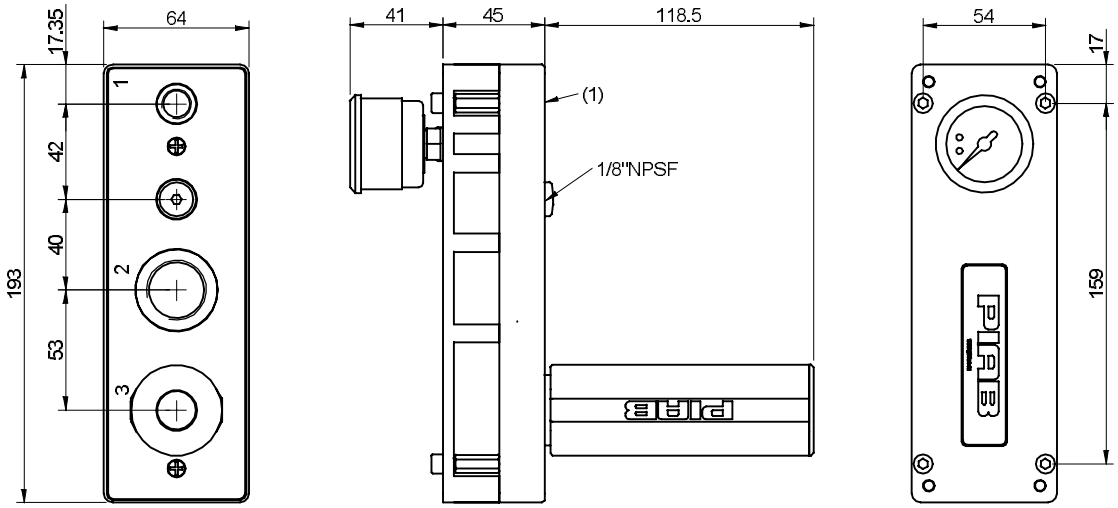
Evacuation times

Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)												Max vacuum
MPa	Nl/s	10	20	30	40	50	60	70	80	90	95	99	99,5	-kPa
0.6	2.6	0.032	0.075	0.15	0.32	0.64	1.1	1.7	2.6	3.9	5.5	9.8	12	99.8

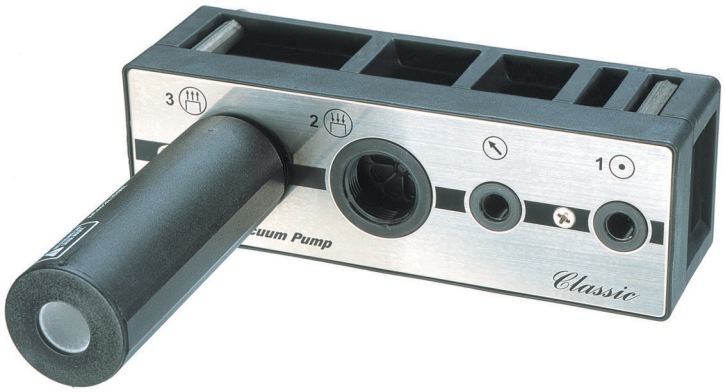
Dimensional drawing



	1	2	3
D	1/8"NPSF	G3/4"	G3/4"
AD	G1/4"	G3/4"	G3/4"
E	1/4"NPT	3/4"NPT	3/4"NPT



Classic H120



A traditional Piab vacuum pump developed to be used within the chemical industry or in chemically aggressive environments. It can achieve higher vacuum levels, even down to 100.8 -kPa. It is available with connection plate in composite PPS or aluminium. We recommend it to be used with practically zero leakage present and in nonporous applications.

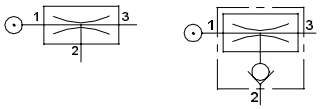
Vacuum flow

Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)												Max vacuum
MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	95	99	-kPa
0.6	7.6	8.4	6.6	4.7	2.7	1.5	1.2	0.86	0.62	0.43	0.1	0.05	0.01	100.8

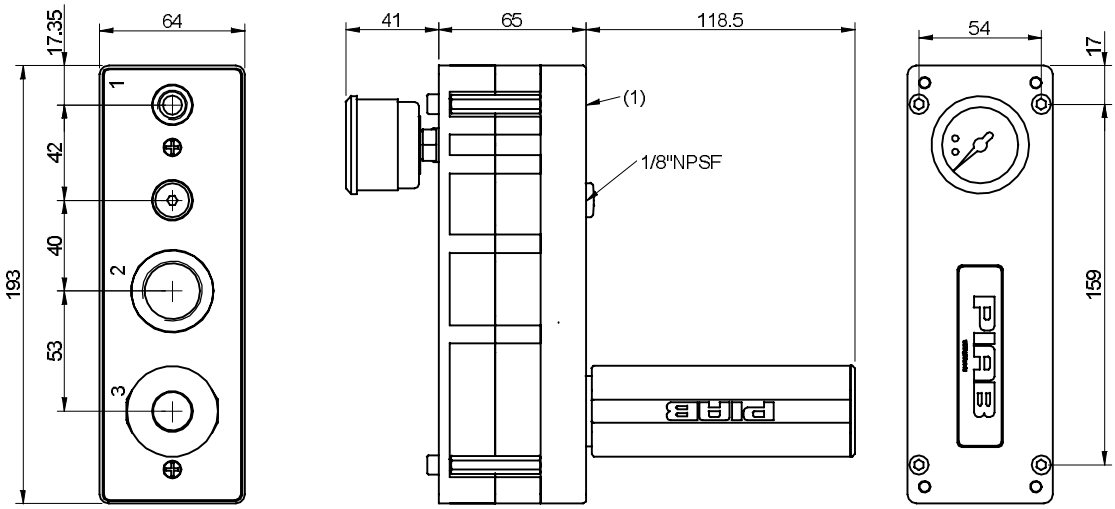
Evacuation times

Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)													Max vacuum
MPa	Nl/s	10	20	30	40	50	60	70	80	90	95	99	99,5	100,3	-kPa
0.6	7.6	0.018	0.033	0.06	0.11	0.18	0.27	0.42	0.62	1.3	2.1	4.2	5.4	8.3	100.8

Dimensional drawing



	1	2	3
D	1/8"NPSF	G3/4"	G3/4"
AD	G1/4"	G3/4"	G3/4"
E	1/4"NPT	3/4"NPT	3/4"NPT



Lab Vac LVH40

This vacuum pump is tailor-made for laboratory applications, such as degassing, vacuum filtering, gel drying and rotation evaporation. It can achieve high vacuum levels to 20 mbar abs. with a maximum vacuum flow of 9 m^3/h. There is no risk for “back draft” which can cause damaged test samples. Its low noise level, easy installation and maintenance is widely appreciated.

It has a high chemical resistance, with an option to have with Kalrez sealing material which normally makes the chemical resistance unsurpassed.

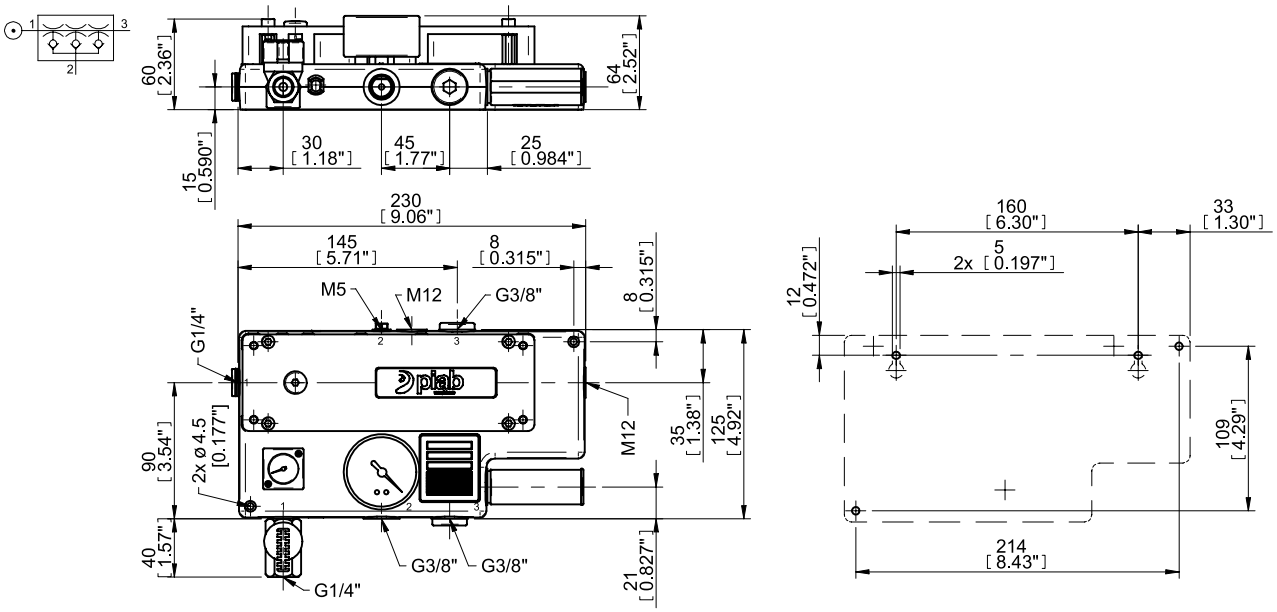
Vacuum flow

Feed pressure	Air consumption	Vacuum flow (Nl/s) at different vacuum levels (-kPa)											Max vacuum
MPa	Nl/s	0	10	20	30	40	50	60	70	80	90	95	-kPa
0.60	2.6	2.5	1.8	1.3	0.7	0.53	0.35	0.24	0.16	0.12	0.06	0.02	98

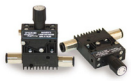
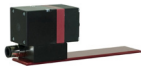
Evacuation times

Feed pressure	Air consumption	Evacuation time (s/l) to reach different vacuum levels (-kPa)										Max vacuum
MPa	Nl/s	10	20	30	40	50	60	70	80	90	95	-kPa
0.60	2.6	0.04	0.09	0.18	0.41	0.71	1.09	1.65	2.48	3.91	6.01	98

Dimensional drawing



Pump accessories

	Vacuum pump accessories	Features and benefits
1	 Vacuum switches	Our line includes inductive universal, electro-mechanical and pneumatic vacuum switches that are pre-set or adjustable.
2	 Valves	Choose between solenoid, electrically or vacuum-controlled valves. The vacuum controlled valve (Vacustat) shuts off the flow of compressed air to the pump when the pre-set level is reached, and consequently the consumption of compressed air is minimised.
3	 Regulators	Different vacuum pumps need different feed pressure for optimum performance. A filter regulator can easily be manually set to a desired pressure level, and be used to eliminate particles from the compressed air. A pilot regulator can be used to automatically set the feed pressure according to your needs.
4	 Silencers	Reduce noise from exhaust with a flow-through design.
5	 Vacuum filters	To filter dust and other small particles from the vacuum flow. Reduces the risk of operation breakdown or stoppage in the pump.
6	 Other	Body for COAX® cartridges, vacuum gauge, manometer etc.

Vacuum Pump Accessories

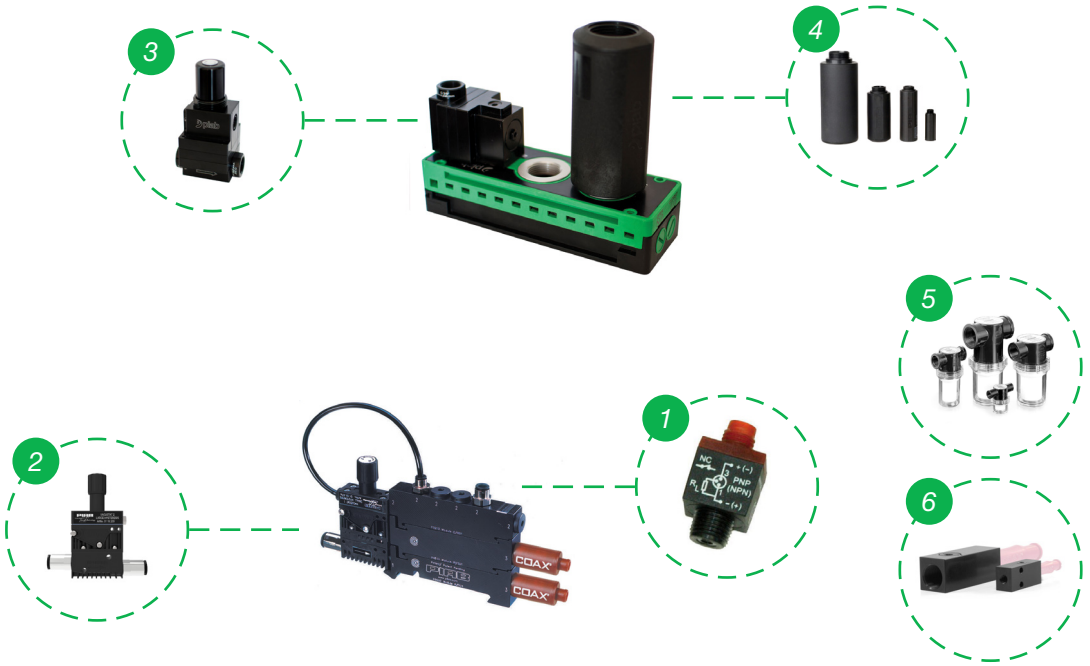
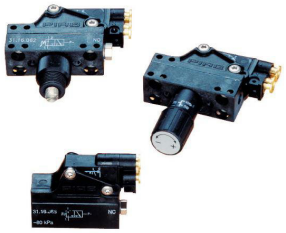


Image only to serve as an example.

1. *Vacuum switches*
2. *Valves*
3. *Regulators*
4. *Silencers*
5. *Vacuum filters*
6. *Other*

piab

Vacuum switches

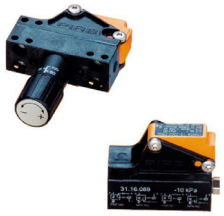


Vacuum switches, pneumatic

- Converts a vacuum level to a pneumatic signal.
- Vacuum-actuated membrane linked to a pneumatic switch.
- Available preset or with adjustable vacuum level.

Vacuum switches, electromechanical

- Converts a vacuum level to an electric signal, VAC or VDC.
- Vacuum-actuated membrane linked to an electro-mechanical switch.
- Integrated cable with open ends included.
- Available preset or with adjustable vacuum level.



Vacuum switches, inductive universal

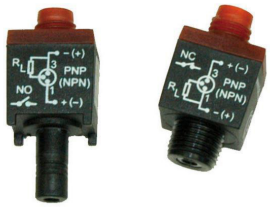
- Converts a vacuum level to a digital signal, 24 VDC.
- Vacuum-actuated membrane linked to a proximity-inductive universal switch.
- Integrated cable with open ends included.
- PNP NO/NC or NPN NO/NC output functions.
- The switch must be connected in series with the load.

Technical Data

Description	Hysteresis	Signal range
Vacuum switch, pneumatic, adjustable with screw and knob (NO)	3 kPa	10–95 -kPa
Vacuum switch, pneumatic, adjustable with screw and knob (NC)	12 kPa	15–95 -kPa
Vacuum switch, pneumatic, preset (NO 25 -kPa)	3 kPa	21–29 -kPa
Vacuum switch, pneumatic, preset (NO 65 -kPa)	3 kPa	57–73 -kPa
Vacuum switch, pneumatic, preset (NC 30 -kPa)	12 kPa	25–35 -kPa
Vacuum switch, pneumatic, preset (NC 70 -kPa)	12 kPa	60–80 -kPa
Vacuum switch, electro-mechanical, adjustable with screw & knob	10 kPa	15–95 -kPa
Vacuum switch, electro-mechanical, preset (Signal range 25 -kPa)	10 kPa	20–30 -kPa
Vacuum switch, inductive universal, adjustable with knob Ø6	2 kPa	10–95 -kPa
Vacuum switch, inductive universal, adjustable with knob	2 kPa	10–95 -kPa
Vacuum switch, inductive universal, preset (Signal range 10 -kPa)	2 kPa	9–11 -kPa
Vacuum switch, inductive universal, preset (Signal range 30 -kPa)	2 kPa	27–33 -kPa

Vacuum switches Mini VS4118/VS4128

- Pre-set vacuum switch with digital output.
- Durable and compact design with G1/8” 90° angle swivel connection for easy installation.
- VS4118 hardwired enables PNP NO/NC or NPN NO/NC functionality.
- VS4128 suitable for plug in I/Os. Available in PNP NO or NPN NO models.
- Possible to connect several units serially with T-connectors to provide a common output (VS4128 PNP).



Vacuum switches Mini VS4015/VS4016

- Pre-set vacuum switch with digital output.
- Very low weight and small format, push-in or thread connections.
- PNP NO/NC or NPN NO/NC output functions.

Technical Data

Description	Hysteresis	Signal range
Vacuum Switch VS4128 30 -kPa, M12 PNP NO	8 kPa	26–34 -kPa
Vacuum Switch VS4128 50 -kPa, M12 PNP NO	8 kPa	46–54 -kPa
Vacuum Switch VS4118 30 -kPa, M8 PNP/NPN NO/NC	8 kPa	26–34 -kPa
Vacuum Switch VS4118 50 -kPa, M8 PNP/NPN NO/NC	8 kPa	46–54 -kPa
Vacuum Switch VS4118 70 -kPa, M8 PNP/NPN NO/NC	8 kPa	66–74 -kPa
Vacuum Switch VS4128 50 -kPa, M12 NPN NO	8 kPa	46–54 -kPa
Vacuum switch VS4015, Ø6, 30 -kPa	5–7 kPa	27–35 -kPa
Vacuum switch VS4015, Ø6, 50 -kPa	5–7 kPa	47–55 -kPa
Vacuum switch VS4015, Ø6, 70 -kPa	5–7 kPa	67–75 -kPa
Vacuum switch VS4016, G1/8” male, 30 -kPa	5–7 kPa	27–35 -kPa
Vacuum switch VS4016, G1/8” male, 50 -kPa	5–7 kPa	47–55 -kPa
Vacuum switch VS4016, G1/8” male, 70 -kPa	5–7 kPa	67–75 -kPa

Vacuum switches

Vacuum switch 3-colour digital display M8

- 2 PNP outputs, NO or NC. Independently selectable for each output.
- 3-colour LCD display, easy readout.
- 7 programmable vacuum units, for example kPa, inHg, mmHg, etc.
- Dual display allows actual and set value to be displayed at the same time.
- Selectable ”Key-Lock mode” with display indicator to avoid unauthorized changes.
- Selectable ”Power-Save mode” with display indicator.
- Mounting brackets included.

Vacuum switch, MM8

- Converts vacuum to an analogue output signal and an adjusted vacuum level to a digital output.
- Adjustable hysteresis.
- Separate cable with open ends included.

Vacuum switch, DM8

- Converts adjusted vacuum levels to 2 separate digital outputs.
- Digital vacuum level display.
- Integrated cable with M8 connector included.

Technical Data

Description	Hysteresis	Signal range
Vacuum switch 3-colour digital display M8	Adjustable, 1–8 kPa	0–1013 -kPa
Vacuum switch, MM8	1–5 % F.S.	0–100 -kPa
Vacuum switch, DM8	2 % F.S.	0–100 -kPa

Vacuum switch, LM8

- Converts an adjusted vacuum level to a digital output.
- Very low weight and small format with push-in connection.
- Integrated cable with M8 connector included.

Vacuum switch, M5

- Converts an adjusted vacuum level to a digital output signal for pressure or vacuum.
- NC in vacuum range 0–100 -kPa. NO in pressure range 0–300 kPa.
- Very low weight and small format with M5 90° angle swivel connection.
- Integrated cable with open ends included.

Technical Data

Description	Hysteresis	Signal range
Vacuum switch, LM8	2 % F.S.	0–100 -kPa
Vacuum switch, M5	2 % F.S.	-100–300 -kPa

Valves

piSAVE release

- Equalises pressure in the suction cups to provide fast release of the product.
- Extra fast release by accumulating and utilising the feed-air pressure as a boost.
- ON/OFF activated simultaneously with the ejector.
- No additional controls required — use a single 3/2 control valve for the ejector and piSAVE release.

AQR

- Equalises pressure in vacuum gripper systems to provide fast release of product.
- Consumes no additional compressed air.
- ON/OFF activated simultaneously with the ejector.
- No additional controls required — use a single 3/2 control valve for the pump and AQR.

QR

- For vacuum pump P3010.
- Quick release by accumulating and utilising the feed-air pressure as a boost.
- ON/OFF activated simultaneously with the P3010
- Three sizes for optimising release volume with system volume.

Technical Data

Description	Flow, atmospheric	Volume (Quick-Release)
piSAVE release G1/8"	3.85 Nl/s	–
piSAVE release G1/4"	7.85 Nl/s	–
Atmospheric quick-release valve – AQR	3.3 Nl/s	–
Quick-Release module P3010	–	3 cm^3
Quick-Release tank module P3010	–	30 cm^3
Quick-Release tank module P3010	–	60 cm^3

piSAVE sense

- Vacuum check valves which allows a few suction cups to miss the object(s) and still maintain enough vacuum level in the system with quick response and release times.
- The vacuum check valves shall be used in a centralized vacuum system, one for each suction cup.
- Designing with vacuum check valves will require a smaller vacuum pump and save energy.
- Suitable for handling different size or different number of leaking or sealed objects such as MDF boards, corrugated cardboards or metal sheets with a flexible handling device.
- Also suitable for objects with surface leakage around the lip of the suction cup.
- Available in four sizes with different flow performance/ characteristics to suit different degree of leakage on handled material and different size of cups.
- The smallest sizes are mainly suitable for sealed and smooth materials, such as metal and glass (02/06 for small cups and 03/60 for large cups).
- The valves are supplied separately for integration or mounted in an Al-fitting with female and male threaded connections to facilitate installation.

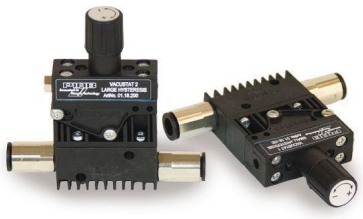
piSAVE restrict

- Vacuum flow restrictors which allows a few suction cups to miss the object(s) and still maintain enough vacuum level in the system.
- Suitable for handling different size sealed sheets/objects with the same flexible lifting device.
- The vacuum flow restrictors shall be used in a centralized vacuum system, one for each suction cup.
- Designing with flow restrictors will require a smaller vacuum pump and save energy.
- Available in three sizes with different flow performance/ characteristics to suit different size suction cups.
- The restrictors are integrated in an Al-fittng with female and male threaded connections to faciliate installation.

Technical Data

Description	Pump flow/cup min.	Pump flow/cup to close valve	Leakage flow, max.
piSAVE sense 02/60 (yellow)	0.001 (@ 45 -kPa) Nl/s	0.21 (@ 3 -kPa) Nl/s	–
piSAVE sense 03/60 (green)	0.06 (@ 45 -kPa) Nl/s	0.37 (@ 3 -kPa) Nl/s	–
piSAVE sense 04/60 (blue)	0.15 (@ 45 -kPa) Nl/s	0.55 (@ 7 -kPa) Nl/s	–
piSAVE sense 05/60 (red)	0.25 (@ 45 -kPa) Nl/s	0.72 (@ 11 -kPa) Nl/s	–
piSAVE restrict multiple port fitting 0.7	–	–	0.08 Nl/s
piSAVE restrict multiple port fitting 1.0	–	–	0.16 Nl/s
piSAVE restrict multiple port fitting 1.3	–	–	0.27 Nl/s

Valves



piSAVE onoff

- Independent pneumatic air-saving device for vacuum pumps.
- Adjustable vacuum controlled 2/2 NO valve.
- Available with large hysteresis for object handling and small hysteresis for process applications.
- The Vacustat is recommended for vacuum pumps in non-leaking systems.
- The vacuum pump must be fitted with a non-return valve.

Blow-off Check valve G1/8”

- Prevents vacuum from being pulled through the blow-off lines, which means faster response time and completely independent vacuum units.
- Reliable quick-release function even in larger systems with several units, due to the very low feed pressure required to break away for blow-off.
- Suitable in applications where cleaning of the suction cup filters or cooling of the object to be picked is important.

Technical Data

Description	Flow	Flow rate
piSAVE onoff	7.3 Nl/s (@ P1=6 bar & Δp=0.5 bar)	–
Blow-off Check valve	–	1.5–2.8 Nl/s (@ 0.3-0.7 MPa)

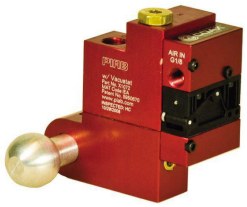
Valves – Vacuum check valves

Vacuum Check Valve VT-1H

- Check valve that traps vacuum in sealed applications for safe operation.
- Built-in blow off check valve for fast release of object.
- Available in lock pin 16, 19 or ball joint mountings, industry standard.
- Available with level compensator to compensate for differences in level of object.

Vacuum Check Valve VT-1H with COAX®

- Two-stage COAX® cartridge MINI Pi12-2 integrated.
- Check valve that traps vacuum in sealed applications for safe operation.
- Built-in blow off check valve for fast release of object.
- Available in lock pin 16, 19 or ball joint mountings, industry standard.
- Available with level compensator to compensate for differences in level of object.



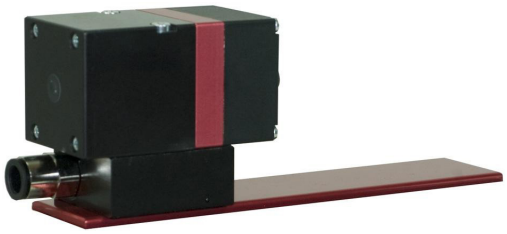
Vacuum Check Valve VT-1H Vacustat with COAX®

- Two-stage COAX® cartridge MINI Pi12-2 integrated.
- Check valve that traps vacuum in sealed applications for safe operation.
- Built-in blow off check valve for fast release of object.
- Integrated energy-saving device, Vacustat results in virtually no air consumption in sealed applications.
- Available in lock pin 16, 19 or ball joint mountings, industry standard.
- Available with level compensator to compensate for differences in level of object.

Technical Data

Description	Vacuum flow, max.
Vacuum Check Valve VT-1H	0.68 Nl/s
Vacuum Check Valve VT-1H with COAX®	0.68 Nl/s
Vacuum Check Valve VT-1H Vacustat with COAX®	0.68 Nl/s

Regulators



piSAVE optimize

- Vacuum controlled proportional pressure regulator, a fully pneumatic device suitable for air-driven ejectors/pumps.
- The feed pressure to the vacuum pump/ejector is automatically regulated and controlled to maintain the set vacuum level. Air/energy usage is kept to a minimum for the application (optimized).
- Recommended for leaking and sealed applications to save energy and secure the right vacuum level.
- Extra port for Vacuum gauge.
- Air ventilation port with filter.
- Swivel compressed air connections.
- piSAVE optimize gives maximum feed pressure/flow to vacuum pump/ejector until vacuum level starts to build up.
- Separate mounting bracket kit.
- Upgrade kit - available as an integrated module for piCLASSIC and Classic vacuum pumps.

PCC (Piab Cruise Control)

- For vacuum pump P6010.
- Programmable for constant vacuum level.
- The signal input regulates the feed pressure to maintain a constant vacuum level.
- Integrated analogue vacuum sensor.

Technical Data

Description	Vacuum flow
piSAVE optimize	1.67–15 Nl/s
PCC (Piab Cruise Control)	0–18.3 Nl/s

Pilot regulator

- Pilot-operated pressure regulator with secondary pressure relief and flow compensation.
- Suitable for remote control.

Regulator

- Regulator for optimising feed pressure to vacuum pumps or smaller vacuum systems.
- Manometer for feed pressure control.

Technical Data

Description	Flow
Pressure regulator, pilot operated, G1/4”	9 Nl/s (@ P1=0.7 & P2=0.6 MPa)
Regulator 1/4”, manometer	9 Nl/s (@ P1=0.8 & P2=0.7 MPa)

Silencers

Silencer MINI/MIDI

- Reduces noise from exhaust on MINI/MIDI piINLINE®.

Silencers

- Reduce noise from exhaust.
- Flow-through design.

Silencer COAX®

- Reduces noise from the exhaust.
- Compatible with aluminium holders for MINI and MIDI COAX® cartridges.
- Simple snap locking when mounting.
- Through-flow design that eliminates the risk of impaired performance due to clogging of the silencer.

Technical Data

Description	Noise level, reduction
Silencer piINLINE® MINI	10 dBA
Silencer piINLINE® MIDI	15 dBA
Silencer	10 dBA
Silencer COAX®	> 10 dBA

Vacuum Filters

Vacuum filters

- To filter dust and other small particles from the vacuum flow.
- Reduces the risk of operation breakdown or stoppage in the pump.
- Replaceable filter element.
- Available with special filter element with increased filter area.

Vacuum filters S

- To filter dust and other small particles from the vacuum flow.
- Reduces the risk of operation breakdown or stoppage in the pump.

In-line filters

- Translucent, inert polypropylene housing allows for visual inspection.
- These miniature filters can be used on compressed air lines or vacuum lines to protect vacuum pumps, vacuum switches and valves from contamination.
- Filter is constructed of chemically inert porous polyethylene and has a recommended working pressure up to 0.45 MPa.

Technical Data

Description	Pressure	Removal efficiency	Flow, nominal
Vacuum filter G1/2” (5 µm) & G3/4” (5 µm)	-0.1–0 MPa	5 µm	5.8 Nl/s
Vacuum filter G1½” (5 µm)	-0.1–0 MPa	5 µm	9 Nl/s
Vacuum filter G1/8”, 1/8” NPT & 1/4” NPT	-0.1–0 MPa	10 µm	1.4 Nl/s
Vacuum filter G3/8” & 3/8” NPT	-0.1–0 MPa	10 µm	2.5 Nl/s
Vacuum filter G1/2”, G3/4”, 1/2” NPT & 3/4” NPT	-0.1–0 MPa	10 µm	15 Nl/s
Vacuum filter G1”, G1½”, 1” NPT & 1 1/2” NPT	-0.1–0 MPa	10 µm	42 Nl/s
Vacuum filter 2 1/2”, steel	-0.1–0 MPa	5 µm	100 Nl/s
Vacuum filter 1 1/2”, steel	-0.1–0 MPa	5 µm	37.7 Nl/s
Vacuum filter 1”, steel	-0.1–0 MPa	5 µm	16.5 Nl/s
Vacuum filter 2”, steel	-0.1–0 MPa	5 µm	82.6 Nl/s
In-line filter	0.45 MPa (max)	25 µm	0.5 Nl/s

Other

Body for COAX® cartridge

- Aluminium bodies for COAX® MINI and MIDI cartridges.
- All 2-stage and 3-stage cartridges, equipped with a red aluminium holder, will fit.
- The mini body has a stackable design with extra port for sensing or blow-off.
- The midi body has a special vacuum-exhaust inline design, which minimizes the influence of dust on the cartridge.
- Cartridge has to be ordered separately.

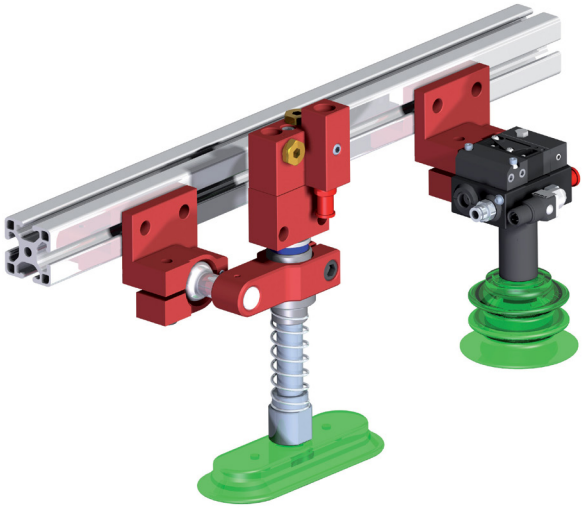
Vacuum gauge and manometers

- Analogue indicator, springjoint – lever system.
- The instruments include nut for installation on a panel.

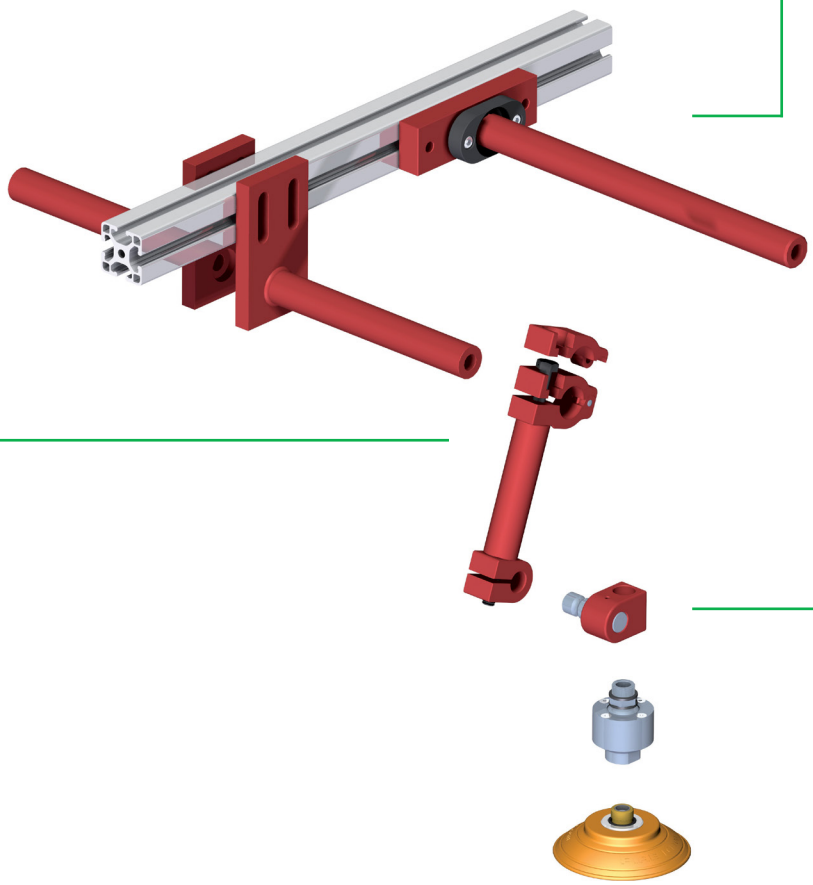
Technical Data

Description	Signal range
Vacuum gauge 100 -kPa, with nut / -30 inHg	0–100 -kPa
Manometer 250 kPa	0–250 -kPa
Manometer 1 MPa	0–1000 -kPa

PMAT – Piab Modular Automation Tooling



PMAT – Piab Modular Automation Tooling



Connections to main frame/ structure of the end-effector

Durable mounting bars, clamp blocks with tubes and special parts that will all fit to any type of welded frames or extrusions.

They form the structure of the PMAT end-effector and interfaces nicely with the swivel arms and in some cases directly with a function attachment.

Centralised vacuum connection

Connect your PMAT system to a centralised vacuum pump.

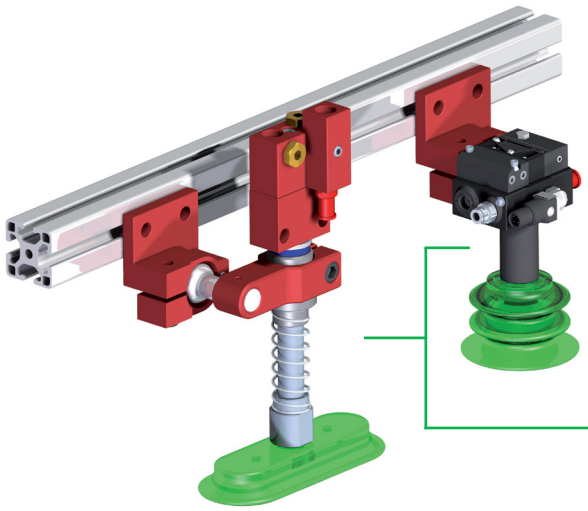
Ball joint

Swivel arms

The swivel arm is the part which allows for unlimited positioning of the suction cup. A single-bolt on the swivel arm will tighten the entire assembly of arm, function attachment and cup in the right position. Swivel arms are available in different lengths for increased flexibility and they can be mounted to a rod/bar by a slide-on function or be clamped to the rod/bar.

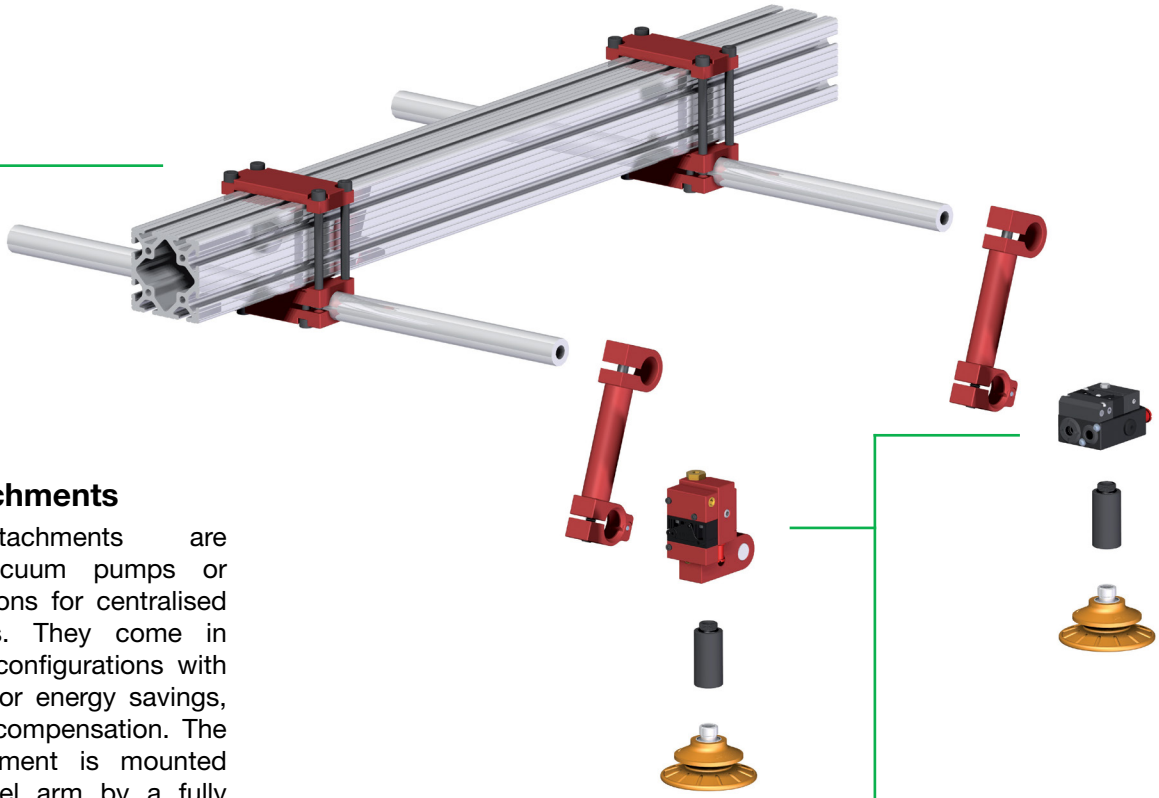
Piab suction cups

Piab suction cups are available in a variety of sizes and materials to efficiently handle your application. To prevent damage to the surface of metal sheets common in automotive and large appliance applications, Piab's DURAFLEX® cups feature a dual-hardness design and soft cup body. Lower vacuum force is needed to seal the cups to part surfaces for gentler handling. The soft lip of Piab's DURAFLEX® cups also molds easily to curved surfaces for less vacuum leakage and stronger grip.



Accessories for suction cups

The PMAT offers a wide range of suction cup accessories to optimize and facilitate the installation. For instance, the accessories can help to avoid bending stress on the suction cup when lifting heavy objects, extend the cup to reach areas in cramped spaces or simply height adjust the cup to the right level.



Function attachments

Functional attachments are decentralised vacuum pumps or vacuum connections for centralised vacuum systems. They come in several different configurations with special features for energy savings, safety and level compensation. The functional attachment is mounted to a PMAT swivel arm by a fully flexible ball joint or a more rigid and rotating lock-pin. The suction cup or the suction cup accessory have a matching interface for the function attachment.

Connections to main frame of the end-effector

Mounting bar – welded

- Rigid mounting with low deflection.
- Slotted mounting for adjustability.
- 100–600 mm (4”-24”) lengths.

Profile mount ball clamp

- Fits on standard size extrusion.
- Used with any Ball joint style function attachment.

Technical Data

Description	Torsional twist	Load, vertical, max.	Load, torque, max.
Mounting bar welded L=100	1 °	–	–
Mounting bar welded L=150	1.2 °	–	–
Mounting bar welded L=200	1.6 °	–	–
Mounting bar welded L=300	2.5 °	–	–
Mounting bar welded L=600	4.6 °	–	–
Profile mount ball clamp, left hand	–	800 N	40 Nm
Profile mount ball clamp, right hand	–	800 N	40 Nm

Swivel arms

Swivel arm – clamp on

- Standard mounting to 25 mm and 1” bars, easily removable connection.
- Easy single screw adjustment.
- Available in lock pin 16, 19 or ball joint mountings, industry standard.

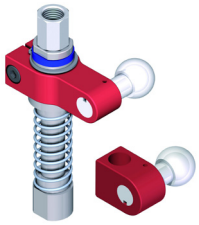
Swivel arm – slide on

- Standard mounting to 25 mm or 1” bars.
- Easy single screw adjustment.
- Available in lock pin 16, 19 or ball joint mountings, industry standard.

Technical Data

Description	Load, vertical, max.	Load, torque, max.
Swivel arm – clamp on	400 N	40 Nm
Swivel arm – slide on	400 N	40 Nm

Function attachments



Centralized vacuum connection

- Connects centralized vacuum to suction cup.
- Available in lock pin 16, 19 or ball joint mountings, industry standard.
- Available with level compensator to compensate for differences in level of object.

Vacuum Check Valve VT-1H

- Check valve that traps vacuum in sealed applications for safe operation.
- Built-in blow off check valve for fast release of object.
- Available in lock pin 16, 19 or ball joint mountings, industry standard.
- Available with level compensator to compensate for differences in level of object.

Vacuum Check Valve VT-1H with COAX®

- Two-stage COAX® cartridge MINI Pi12-2 integrated.
- Check valve that traps vacuum in sealed applications for safe operation.
- Built-in blow off check valve for fast release of object.
- Available in lock pin 16, 19 or ball joint mountings, industry standard.
- Available with level compensator to compensate for differences in level of object.

Vacuum Check Valve VT-1H Vacustat with COAX®

- Two-stage COAX® cartridge MINI Pi12-2 integrated.
- Check valve that traps vacuum in sealed applications for safe operation.
- Built-in blow off check valve for fast release of object.
- Integrated energy-saving device, Vacustat results in virtually no air consumption in sealed applications.
- Available in lock pin 16, 19 or ball joint mountings, industry standard.
- Available with level compensator to compensate for differences in level of object.

Technical Data

Description	Vacuum flow, max.
Vacuum Check Valve VT-1H	0.68 Nl/s
Vacuum Check Valve VT-1H with COAX®	0.68 Nl/s
Vacuum Check Valve VT-1H Vacustat with COAX®	0.68 Nl/s

Accessories

Cross connector

- Connects 25 mm bars at any angle.
- Can be used with a Suction cup extension.

Level compensator – profile mount

- Compensates for differences in height.
- Provides certain degree of shock absorption.
- Fits on standard size extrusion.

Proximity mounting bracket

- For mounting of sensors or visions systems.
- Multiple interfaces.

Technical Data

Description	Load, vertical, max.	Load, torque, max.	Load, horizontal, max.
Cross connector 25-25/65	400 N	120 Nm	–
Level compensator – profile mount	698 N	–	698 N

PMAT Configurable Products

Facilitate the selection of our great assortment of function attachments and swivel arm options by using the combined swivel arm and function attachment code configurator. Note that all function attachments are not presented in the code.

Select rod extension	PMAT code
Rod extension 50	AA
Rod extension 100	AB
Rod extension 150	AC

Bar mounting style	PMAT code
Bar clamp, clamp-on 25	00
Bar clamp, slide-on 25	01
Bar clamp, slide-on 1”, pin 16	02
Bar clamp, slide-on 1”, pin 19	14
Bar clamp, slide-on 1”, ball joint	04

Swivel style	PMAT code
Swivel style pin 16	P
Swivel style pin 19	C
Swivel style ball joint	I

Function attachment	PMAT code			
No attachment	00			
	Left hand		Right hand	
		LCS *		LCS *
Centralised vacuum connection, G	XX1	XX2	XX1RH	XX2RH
Centralised vacuum connection, NPT	X1	X2	X1RH	X2RH
Vacuum Check Valve VT-1H, G	XAB	XAM	XABRH	XAMRH
Vacuum Check Valve VT-1H, NPT	AB	AM	ABRH	AMRH
Vacuum Check Valve VT-1H COAX® cartridge MINI Pi12-2, G	XAA	XAL	XAARH	XALRH
Vacuum Check Valve VT-1H COAX® cartridge MINI Pi12-2, NPT	AA	AL	AARH	ALRH
Vacuum Check Valve VT-1H Vacustat COAX® cartridge MINI Pi12-2, G	XEA	XBTF	XEARH	XBTFRH
Vacuum Check Valve VT-1H Vacustat COAX® cartridge MINI Pi12-2, NPT	EA	BTF	EARH	BTFRH

* With level compensator, LCS.

Warranties

Piab offers a warranty to distributors, integrators and users of Piab products worldwide as per the following definitions:

- A five-year warranty is valid for vacuum pumps excluding accessories and controls.
- A one-year warranty is valid for other products if the failure has occurred within specified lifetime in terms of duty cycles.

General warranty principles:

- Piab guarantees against defects in the manufacture and materials by normal use in proper environment, when following the instructions for care, maintenance and control described in the appropriate Piab manual.
- Piab replaces or repairs, free of charge, faulty products provided that these are returned to Piab, and found to be covered by the warranty.
- It is at Piab's discretion whether a faulty product should be sent back to Piab for replacement or if the repair shall be made locally at Piab's expense.
- This warranty does not include wear parts such as suction cups, filter elements, sealings, hoses, etc.
- This warranty does not include subsequent damages caused by defective products.

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Астана (7172)727-132
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Барнаул (3852)73-04-60
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