

Manual

CPT

Cobot Palletizing Tool





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

The original manual is written in English.



中文



English



Français



Deutsch



Italiano



日本語



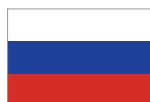
한국어



Polski



Português (Brasil)



Русский



Español



Svenska

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1. Introduction to the manual

1.1. About the manual

- The responsible party for the production site must ensure that this manual will be read and understood.
- The section on safety should be studied extra carefully.
- The manual should be stored in a known and easily accessible place, which can be digital.
- Before doing service and maintenance on the equipment, carefully study the applicable parts of the manual.

This manual (Art no. 0248098, Rev.03, en-GB, 2025-02) is for Cobot Palletizing Tool.

1.2. Safety signs used in the manual

Take note of all the warnings, mandatory, and other signs in this manual. They have the following meanings:

1.2.1. Warning signs



Warning

Vacuum force



Warning

Exhaust



Warning

Do not restrict exhaust

1.2.2. Mandatory signs



Notice

Information that needs extra attention!



Important

Wear eye protection



Important

Wear ear protection

1.3. Target group

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

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

1.4. Test conditions

Unless otherwise stated, the values specified in this manual are tested at:

- Room temperature: (20°C [68°F] ± 3°C [5.5°F])
- Standard atmosphere: (101.3 kPa [29.9 inHg] ± 1.0 kPa [0.3 inHg])
- Compressed air quality: DIN ISO 8573-1 class 4.

2. Safety instructions

2.1. Disclaimer

Piab AB is not responsible for installation and operation of CPT in a robot system. The required steps must be undertaken in supervision and approval by authorized integrators.

Piab AB is not responsible for safety of a complete robot system with CPT installed. The required steps must be undertaken in supervision and approval by authorized integrators.

The system integrators ensure observance of the applicable locational safety laws and regulations and that any significant hazards in the complete robot application are mitigated. This includes, but is not limited to:

- Performing a risk assessment for the complete robot system.
- Interfacing other machines and additional safety devices if defined by the risk assessment.
- Setting up the appropriate safety settings in the robot software.
- Ensuring that the user will not modify any safety settings.
- Validating that the complete robot system is designed and installed correctly.
- Specifying instructions for use.
- Marking the robot installation with relevant signs and contact information of the integrator.
- Collecting all documentation in a technical file, including the risk assessment and this manual.

2.2. General safety

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

Compressed air may lead to an explosion of closed containers, and vacuum may lead to the implosion of closed containers.

In case of evacuation of hazardous substances and/or gases the exhaust flow must be contained and properly treated.

Ensure that components are properly secured; regularly check that connections are in good working order, as high cycles or vibrations may cause them to loosen.

2.3. Safe usage

The product described in this manual is designed for implementation in industrial systems; therefore, it must not be used under conditions other than those specified herein.



Warning

Vacuum and exhaust air can cause severe injuries. Keep hands, legs, hair, and eyes away from vacuum inlets and exhausts.



Warning

Ensure that no foreign matters or objects enter the vacuum port or exhaust port, due to the risk of ejected objects and/or damage to the product.



Warning

- Ensure that the compressed air line is properly secured to avoid personal injury, equipment damage, and/or application failure.
- The use of a damaged product may result in bursting and cause injury or property damage.
- Irresponsible use of compressed air may cause injury. Compressed air must never be used for anything else than designated purposes.
- Risk of ejected objects, damage to the product, application failure, and/or personal injury if the vacuum and exhaust ports are simultaneously blocked while generating vacuum.



Important

Wear eye protection when installing, operating and maintaining CPT.



Important

Wear ear protection when installing, operating and maintaining CPT. Exhaust air can cause hearing impairment.

2.3.1. Installation

Compressed air may be dangerous if used by unskilled personnel. Installing, using, and maintaining the product should solely be carried out by experienced and specially trained personnel.

Prior to assembly and disassembly of the product, turn off electrical supply and compressed air supply. Install and maintain the product only after thoroughly reading and understanding this manual.

2.3.2. Maintenance



Warning

Prior to any maintenance work, turn off the compressed air supply and electrical supply, and discharge residual pressure.

Maintenance must only be carried out after thoroughly reading and understanding this manual.

2.4. Risk assessment

The CPT has been designed to minimize the consequences of an impact with a human body when operated in a collaborative environment (limited power, force, speed, and acceleration). However, due to the versatility of the CPT in different customer applications, a system integrator must perform a safety assessment before beginning operation.

The integrator must perform a risk assessment on the complete robot application. The CPT is only a component in a robot application thus the safe use of the CPT relies on the integrator's ability to design a safe robot application. The CPT is designed with features especially suitable for collaborative applications, such as:

- Compact design to minimize the footprint of the product in limited working spaces.
- Low weight to reduce the impact inertia.
- Large surface area-to-volume ratio, to reduce the impact inertia (pressure).

- Rounded edges.
- Sufficient number of fasteners for all attachment interfaces to ensure mechanical integrity.
- Swivelling air supply connection to avoid entanglement of the air hose.
- Velcro straps for compressed air tubing to avoid entanglement with other objects or robot body.
- LED lights on the product for indicating different operational states in different colors that allows for corrective actions being taken, away from the hazardous area.
- Exhaust air outlet direction designed to minimize the risk of blowing into the eyes of operator.

2.5. Intended use

- For professional use only.
- The product shall be used in environments within the product's specifications and certifications.
- The product shall be used to evacuate air (non-liquids) from a volume to create vacuum for gripping, holding, and lifting processes.
- The product shall be installed in accordance with installation instructions.
- The product shall be maintained in accordance with maintenance instructions.
- The CPT is an end-of-arm tooling on collaborative robots, used for gripping and holding objects. Typical applications are:
 - Palletizing
 - Depalletizing

2.6. Misuse

The product is only cleared for operation under the conditions stated in this manual and in the datasheets. Any use or application deviating from the intended use is deemed to be impermissible misuse. This includes, but is not limited to:

- Use of product that is damaged.
- Use of the product for evacuating liquids.
- Use of the product in a fully closed compartment, without ventilation and exhaust channeling.
- Use of compressed air pressure or electrical voltage outside specification. This can cause equipment damage and/or application failure.
- Use of the product as a standalone safety unit to fulfil international lifting standards.
- Use of the product if the compressed air line is not properly secured, as loose compressed air lines can cause severe injuries.
- Use of the product if the exhaust is restricted or blocked.
- Use of the product if the vacuum and exhaust port are simultaneously blocked when the unit is generating vacuum.
- Use of the product in direct contact with water spray or excessive amounts of water.
- Use of the product in submerged applications/environments.
- Use of the product in potentially explosive atmospheres.
- Use of the product in life-critical applications.
- Use of the product close to a human's head, face and eye area.
- Use of the product as a climbing aid.
- Use of the product as a lifting device by the ejector module mechanically.
- Use in welding applications.

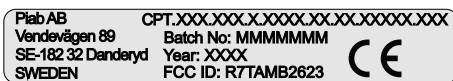
3. Introduction to the CPT

3.1. Manufacturer

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

3.2. Identification label

Each unit is identified by a label with identification information. For any communication with Piab AB or service centers always refer to the label information and state both the Product code and Batch number.



3.3. Compliance



European Directives, CE

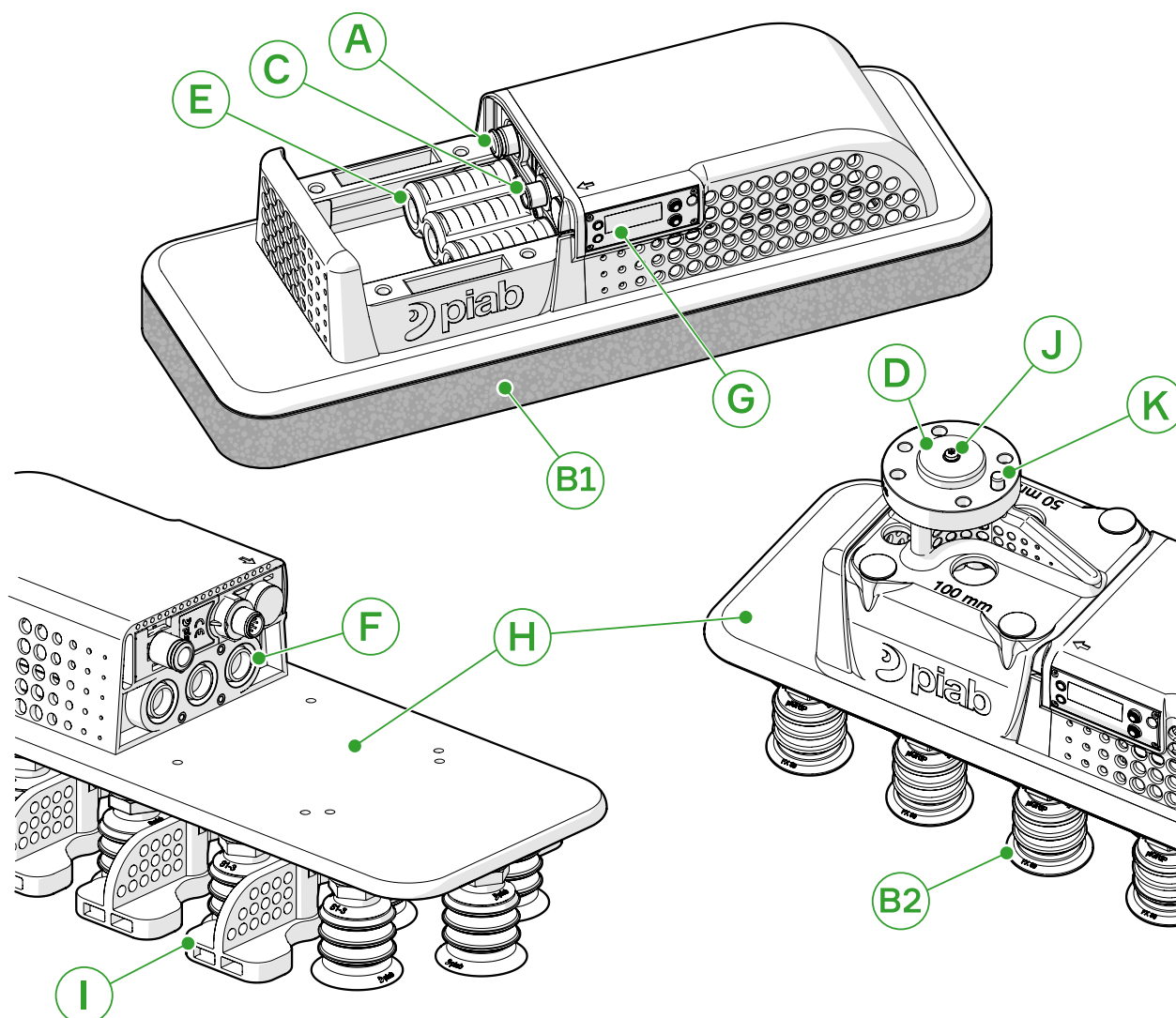
Directive	Standard and/or measurement reference
Electromagnetic Compatibility (EMC) Directive 2014/30/EU	EN/(IEC) 61000-6-2:2005 EN/(IEC) 61000-6-4:2007+A1
RoHS2 Directive (2011/65/EU)	Compliant



Federal Communications Commission, FCC

FCC ID	R7TAMB2623
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3.4. Overview



Position	Description	Note
A	Feed pressure inlet	ø8 mm push-in connection
B1	Foam Gripper	Version with Foam Gripper. The foam gripper is mounted on a foam gripper plate.
B2	Suction cup Gripper	Version with Suction cup Gripper is available with piGRIP® FX39 cups or without suction cups. Mounted on a suction cup plate.
C	Electrical connection	Connector M12 8-pin Male
D	Robot interface	ISO 9409-1-50-4-M6 or ISO 9409-1-80-4-M8
E	Silencer	3 x silencers
F	COAX® cartridge	3 x MIDI Si32-3 COAX®
G	OLED display and select buttons	See Interface section
H	Base plate	Attaches the CPT to a foam gripper plate or a suction cup plate.
I	Cup stabilizer	Optional accessory, ordered separately. Only for use with CPT with suction cup (piGRIP® FX39) gripper. Mounted with three M6x20mm screws.
J	Grounding	Spring-loaded screw on the CPT grounds towards the robot.

Position	Description	Note
K	Guiding pin	The guiding pin has two possible positions on the robot interface (D), deciding the CPT off-centre distance (50 mm or 100 mm).

3.5. Storage and transportation

Store the CPT in the original packaging, as delivered, at room temperature. The humidity should be 30–70%. Always keep the packaging dry!

When transporting the CPT, preferably keep it in the original packaging.

4. Installation



Warning

- Do not install or operate your CPT if damaged during transport, handling, or use. A damaged product may result in bursting and cause injury or property damage.
- Restricted or blocked exhaust, as well as not properly secured compressed air lines can damage the product and/or cause application failure.
- Before using the product, read the safety instructions to ensure a safe product operation.
- Maximum length of installation cables is 30 meters to avoid equipment damage and/or application failure.
- Do not use CPT with compressed air pressure and/or electrical voltage outside specification.
- The CPT has a Normally Closed (NC) vacuum valve. In case of loss of electrical power and/or compressed air feed, the CPT will stop generating vacuum.



Important

Wear safety glasses when installing and operating the CPT.



Important

Wear ear protection when installing and operating the CPT. Exhaust air can cause hearing impairment.

4.1. What's in the box

- Cobot Palletizing Tool (CPT) with foam gripper or suction cup gripper
- Straps for cables and tubing x 3 pcs
- Electrical cable:
 - Cable M12 8-pin female to M8 8-pin female angled (CPT for Universal Robots).
 - Cable M12 8-pin female to open end, length 5 m (General CPT).
- USB flash drive with URCap software (only for UR)
- CPT Safety instructions
- QR code with link to (this) manual
- Mounting kit CPT robot interface:

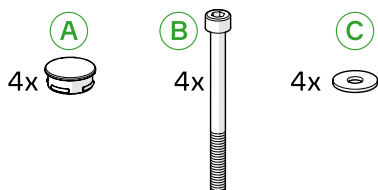


Figure 1. Mounting kit CPT robot interface.

- Screw plug M5 in TPU x 4 pcs (A)
- Screw MC6S M5x60-A4 x 4 pcs (B)

- Fender washer M5 15x5,3x1,2-DIN 9021 x 4 pcs (C).

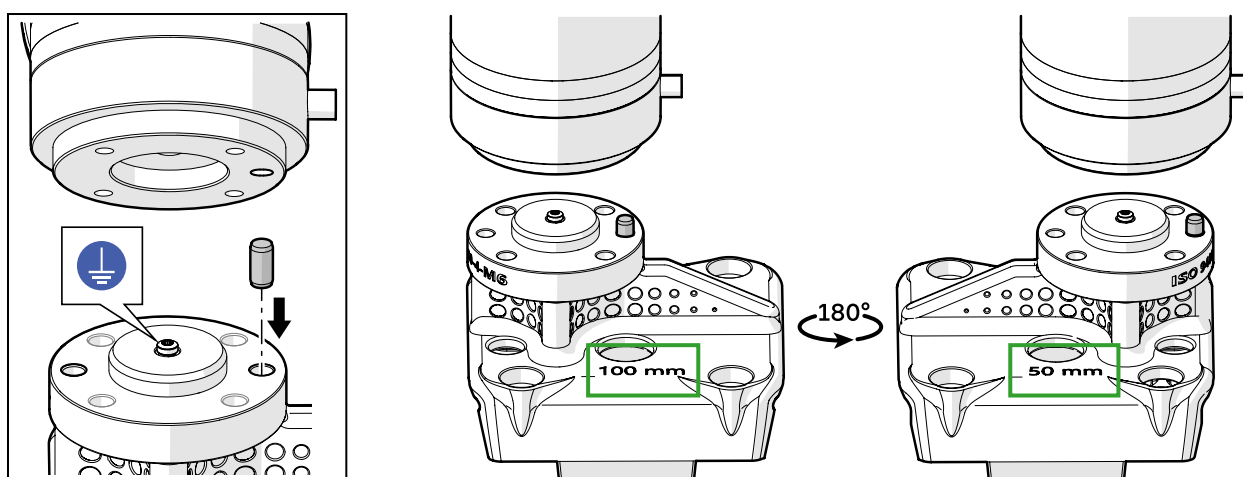
4.2. Mechanical installation



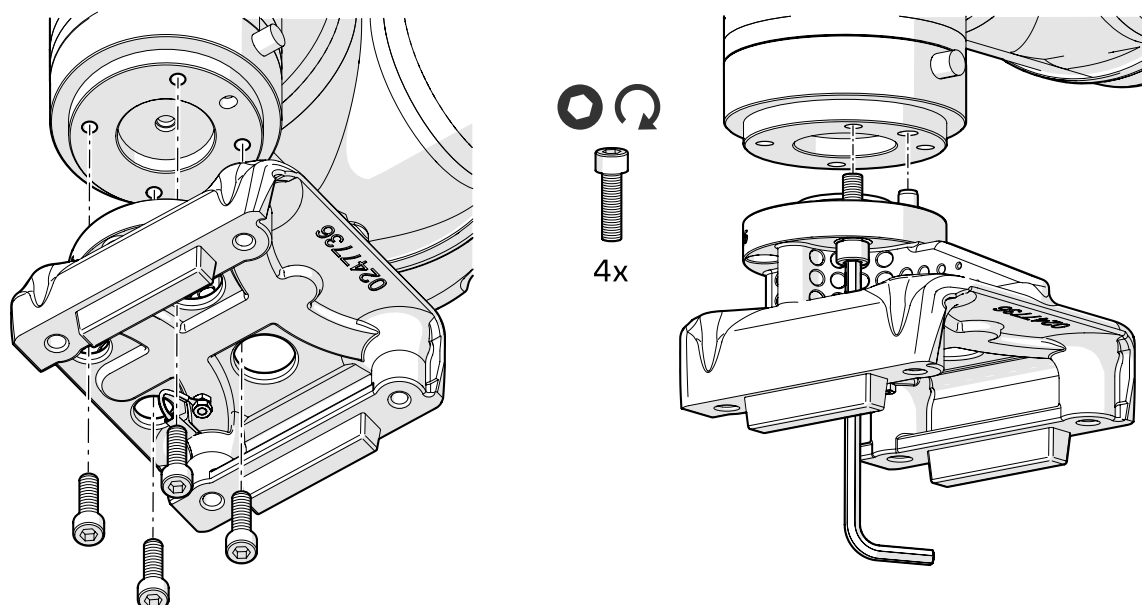
Tip

It is recommended that 2 persons work together when performing the installation.

1. Unpack the box.
2. Install the guiding pin (Mounting kit CPT robot interface) on the robot interface. There are two possible positions for the pin, deciding CPT the off-centre distance of 100 mm or 50 mm. Note that the screw head on the robot interface is a grounding point.

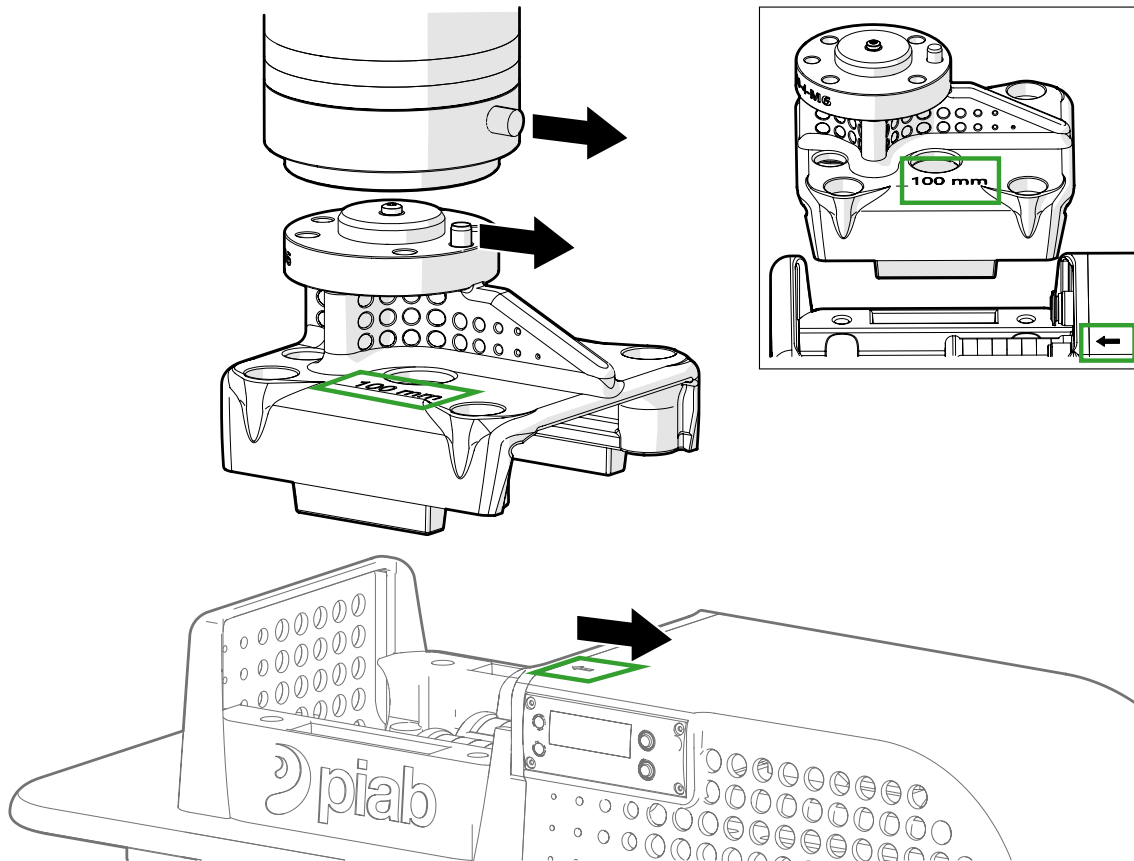


3. Attach the robot interface to the robot arm with the four M6x12mm (for ISO50 robot interface) or four M8x20mm (ISO80 robot interface) screws (included in Mounting kit CPT robot interface). Recommended torque is 2.25 Nm [1.66 lb ft].

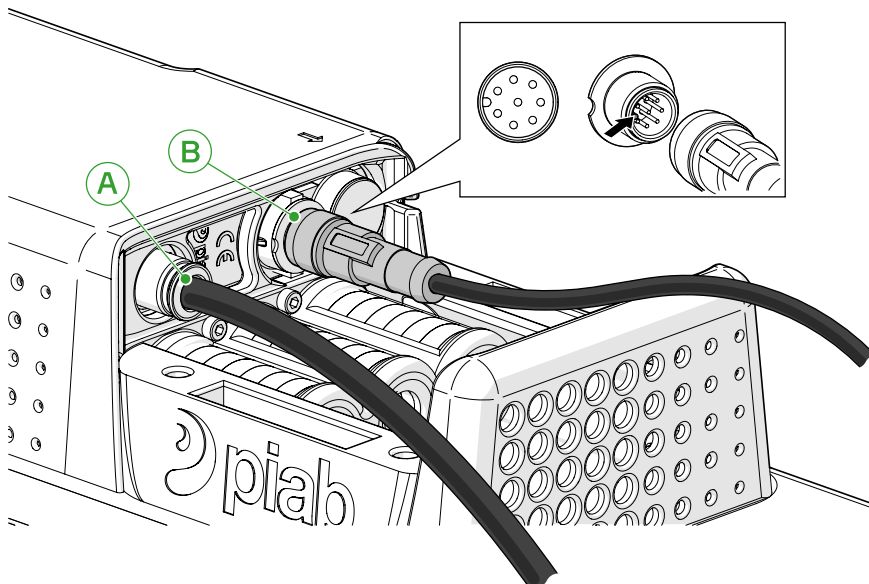


The CPT offers two options for off-centre distance, either 50 mm or 100 mm, as indicated on the robot interface base (highlighted in green in the figure below) on the side facing the arrow on the CPT pump

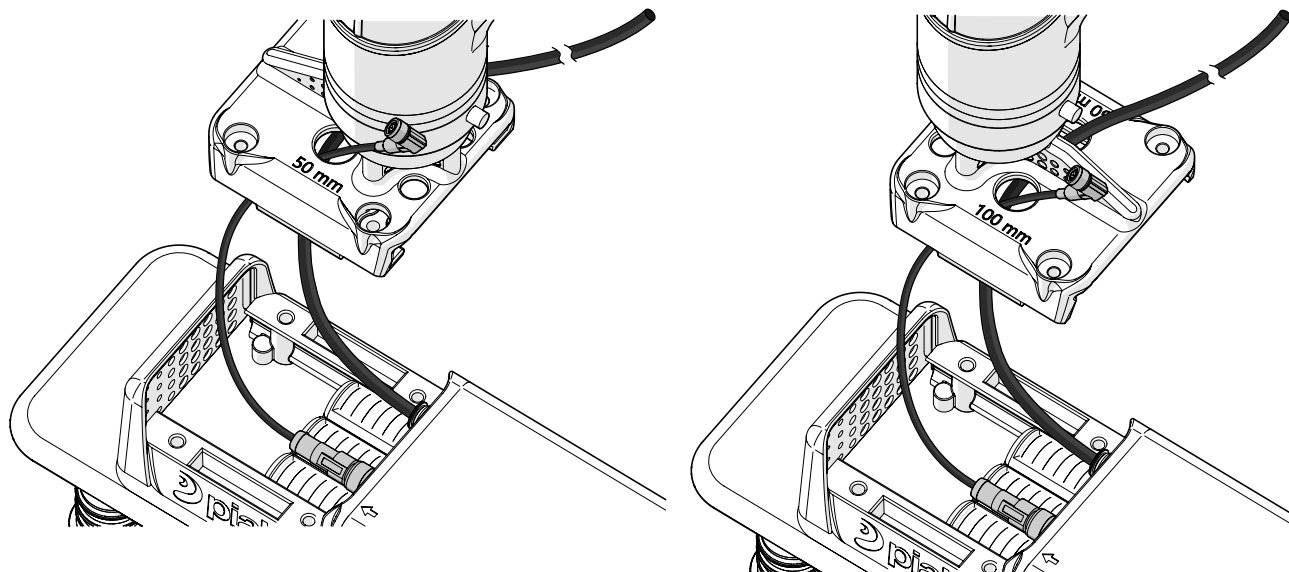
unit. The CPT front shall face the same direction as the robot electrical connection, the offset position is chosen by which of the two possible directions the robot interface is installed on the robot.



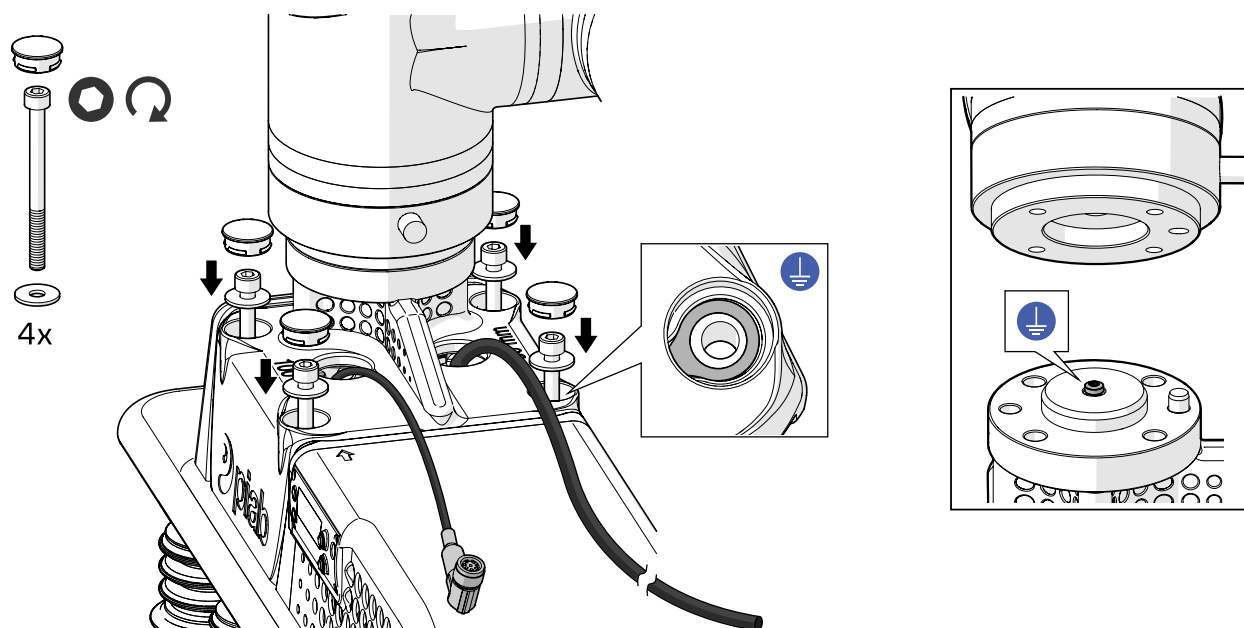
4. On the CPT, connect the compressed air tube (A) and the electrical cable (B). Observe the guide notch on the electrical connection of CPT.



5. Pull the compressed air tube and electrical cable through one hole each on the robot interface.



6. Attach the CPT pump unit to the robot interface with four M5x60mm screws and fender washer M5 (Mounting kit CPT robot interface). Recommended torque is 1.25 Nm [0.92 lb ft]. Note that the screw shall be inserted through the cable lug to secure proper grounding. Cover the four screw heads with screw plugs (Mounting kit CPT robot interface). Note also that the screw head on the robot interface is a grounding point.



4.3. Electrical installation

Mount the electrical cable on the connection on the robot arm, note the guide notches for the right direction.

4.3.1. Pin configuration

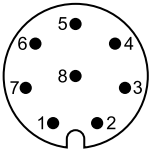


Figure 2. M12 8-pin male connection on CPT.

For UR robots there is a special adapter cable M12 8-pin female (CPT side) to M8 8-pin female 90° angled (UR robot side), art.No. 0242897.

4.3.1.1. Pin configuration Standard-IO (General CPT)

Standard pump setup (setup of pump at delivery) when using CPT with Standard-IO.

Pin no	Cable color	Name	Description	Value
1	White	V _{sys}	Supply voltage	-
2	Brown	GND	Common, 0 VDC (V-)	-
3	Green	V1	Digital input Valve 1 control or C2 control functions	*0 = Vacuum control 1 = Blow-Off control 2 = Disable Energy Saving (ES) 3 = Disable Automatic Blow-Off functions (ATBO or IBO) 4 = Disable Automatic Condition Monitoring (ACM) 5 = Process Data Out valid (PDO)
4	Yellow	V2	Digital input Valve 2 control or C2 control functions	0 = Vacuum control *1 = Blow-Off control 2 = Disable Energy Saving (ES) 3 = Disable Automatic Blow-Off functions (ATBO or IBO) 4 = Disable Automatic Condition Monitoring (ACM) 5 = Process Data Out valid (PDO)
5*	Grey	S1	Digital selectable functions (Max 80 mA**) Digital output. Signal 1**	0 = No function *1 = Part Present (PP) vacuum level achieved 2 = Energy Saving (ES) vacuum level achieved 3 = Leakage warning (LW) 4 = Blow-Off (BOC) complete
6*	Pink	S2	Digital or analog selectable functions (Max 80 mA**) Digital output. Signal 2**	0 = No function 1 = Energy Saving (ES) vacuum level achieved 2 = Part Present (PP) vacuum level achieved 3 = Leakage warning (LW) 4 = Blow-Off (BOC) complete *5 = Analog output, 1-5 VDC
7*	Blue	C1	Configuration 1 = Digital input (NPN only) (pump menu "Std-IO SELECT config (NPN only)"). See chapter 5.2 Digital input. Control 1.	0 = No function 1 = Inverts PNP/NPN interpretation of pump I/O
8*	Red	C2	Configuration 2 = Digital input (pump menu "Std-IO MODE config") Digital input. Control 1.	0 = No function *1 = Disable Energy Saving (ES) 2 = Disable Automatic Blow-Off functions (ATBO or IBO) 3 = Disable Automatic Condition Monitoring (ACM) 4 = Process Data Out valid (PDO)

* Standard connected function

** S1 and S2 can deliver 2x40mA or 1x80mA (Can be used with the same function as the other pin, except analog for S1).

4.3.1.2. Pin configuration IO-Link (General CPT)

Setup when using CPT with IO-Link.

Pin no	Name	Description
1	V _{sys}	Supply voltage
2	GND	Common, 0 VDC (V-)
3	V1	Not connected
4	V2	Not connected
5	S1	Not connected
6	S2	IO-Link
7	C1	Not connected
8	C2	Not connected

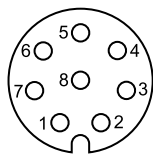
4.3.1.3. Pin configuration (CPT for Universal Robots)



Notice

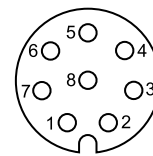
If using UR robot with a power cable other than the one provided by Piab on delivery of CPT: you must change to PNP on your tool 1 slot on the UR robot. See Instructions in “Changing the Tool digital output in UR PolyScope”.

M8 8-pin female angled connector (robot side of cable)



Pin no	Color	Type	Function
1	White	-	Analog out vacuum sensor
2	Brown	PNP	Blow-Off (not used)
3	Green	PNP	Digital Output Signal 1 Part Present
4	Yellow	-	Digital Output (not used)
5	Grey	-	Digital Output (not used)
6	Pink	PNP	Digital Input Vacuum ON/OFF
7	Blue	PNP	Digital Input Disable ES
8	Red	-	GND

M12 8-pin female straight connector (CPT side of cable)



Pin no	Color	Type	Function
6	Pink	-	Analog Output
4	Yellow	PNP	Not used
5	Grey	PNP	Part Present
7	Blue	-	Not used
1	White	-	Supply voltage 24V
3	Green	PNP	Vacuum ON
8	Red	PNP	Disable ES
2	Brown	-	GND

4.4. Pneumatic installation



Warning

Ensure that the compressed air line is properly secured to avoid personal injury, equipment damage, and/or application failure. Attach the compressed air hose on the robot joints using the included set of straps.

Ensure that the exhaust from the ejector is not blocked. When connecting compressed air to the unit, it is important to choose proper hose dimensions, if using other hose than included, to prevent pressure drop. Avoid restrictive inner diameters, long piping distances, sharp bends, and small sized connections.

Connect the compressed air hose (ø8 mm) to a supply of compressed air.

4.4.1. Pneumatic information

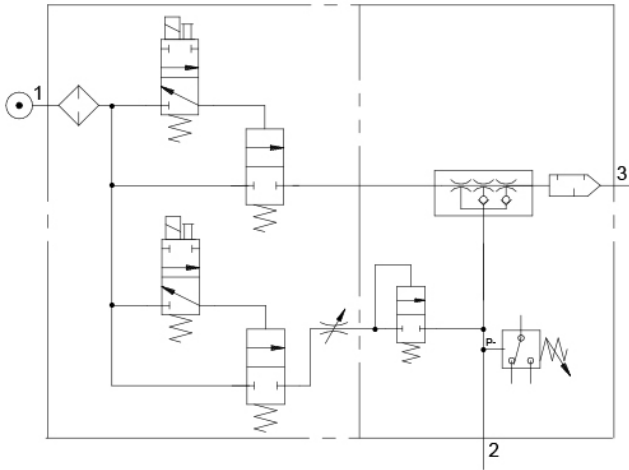
Description	Unit	Value
Feed pressure, maximum	MPa [psi]	0.7 [101.5]
Feed pressure, optimum	MPa [psi]	0.6 [87.0]
Maximum vacuum level, at optimum feed pressure	-kPa [-inHg]	70 [20.7]



Notice

The quality of the compressed air must fulfil the requirements in DIN ISO 8573-1 class 4, in order to ensure proper product operation and longevity.

4.4.2. Pneumatic diagram



1. Compressed air
2. Vacuum
3. Exhaust

Figure 3. Vacuum NC, Blow-Off NC with non-return valve.

4.5. Software Installation

See the separate URCap manual for how to install and use Piab's software plugin for UR robots.

5. Operation



Warning

- Gripping failure of the CPT can cause personal injury, equipment damage and/or application failure.
- Vacuum and exhaust air can cause severe injuries; keep hands, legs, hair and eyes away from vacuum inlets and exhaust.
- Ensure clearance for robot motions in extended position. If the CPT is unintentionally in extended position it can cause equipment damage and/or application failure.
- The CPT has a Normally Closed (NC) vacuum valve. In case of loss of electrical power and/or compressed air feed, the CPT will stop generating vacuum.

The LED screen will light up and show vacuum level when the CPT is ready for use.

Make sure that every tubing and cable is connected correctly. Next, turn on the compressed air slowly and listen for leakage. If there is no leakage, turn on the compressed air completely.

5.1. Operation with Piab URCap (CPT for Universal Robots)

To operate the pump, see the separate URCap manual.

5.2. Operation without Piab URCap (CPT for Universal Robots)



Notice

For use of CPT with UR cobots without Piab URCap, it is necessary to check that the CPT has the correct pin configuration.

Go to *Menu > Configuration > Vacuum ctrl type > Confirm* the NPN mode if it is not the pre-set value. The pre-set is marked with an asterisk * (NPN* must be shown).

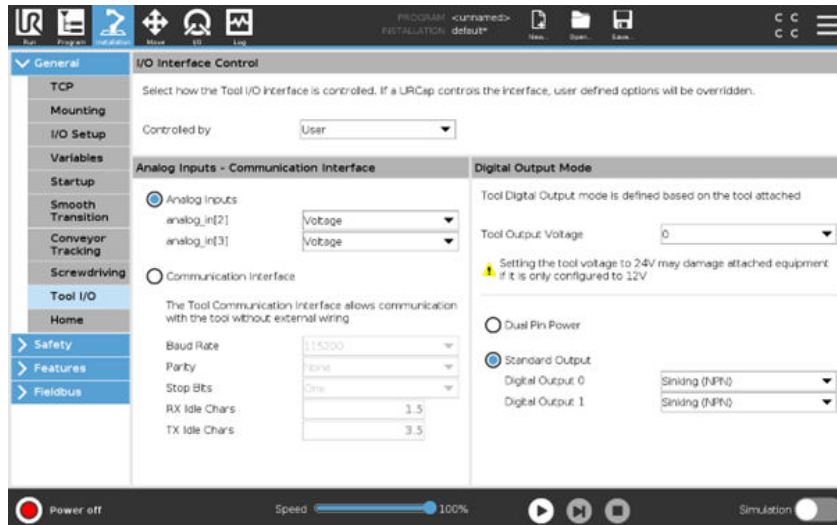
The Part Present setpoint value ("Part Pres setpoint" in the Parametrization menu, see chapter 5.5) must be set to at least 30 -kPa or deeper. The default value of Part Present setpoint is 40 -kPa.

5.2.1. Changing the Tool digital output in UR PolyScope

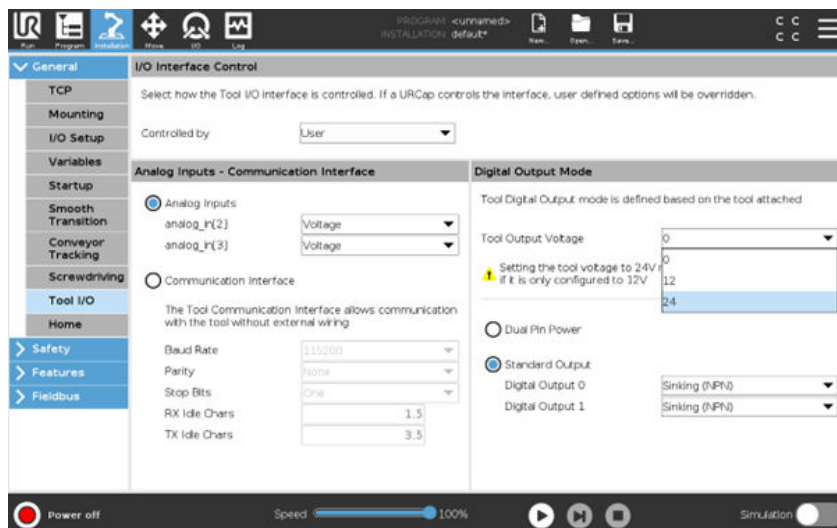
When using a UR cobot without the Piab URCap software, it is necessary to change the Tool output voltage and Standard digital output in PolyScope to turn on the CPT. Follow these steps:

1. Turn on the robot.
2. Select the *Installation* tab.

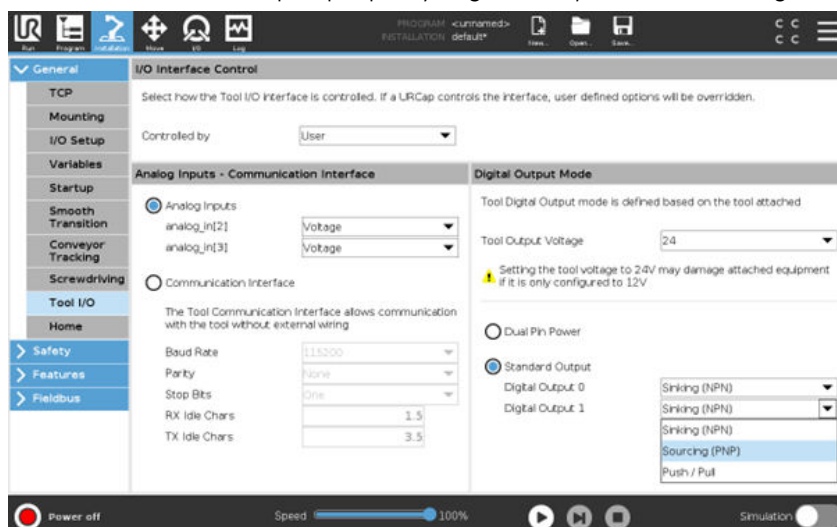
3. Select the *Tool I/O* under the *General* tab.



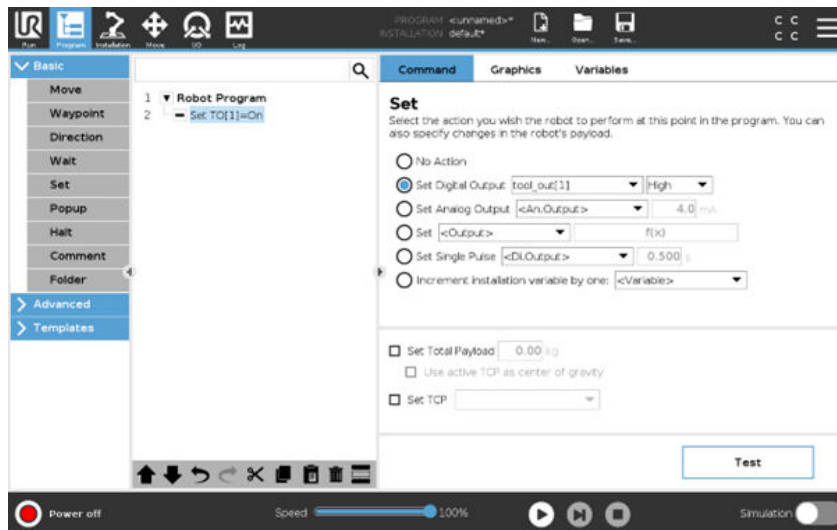
4. In the *Digital Output Mode* section, set the *Tool Output Voltage* to 24 V.



5. Set the Standard Output property *Digital Output 1* to *Sourcing (PNP)*.



6. Select the *Program* tab. Select *Set* under the *Basic* tab. Set the *Set Digital Output* to *tool_out[1]* and *High* to turn on the CPT.



5.3. Payload and off-centre distance

The CPT enables the user to change the off-centre distance of the robot interface. The possibilities are 50 mm offset distance, to pick up heavier loads, or 100 mm offset distance, to have a greater reach.

To change the offset distance:

1. Dismount the CPT pump unit from the robot interface.
2. Dismount the robot interface from the robot flange.
3. Rotate the robot interface 180 degrees horizontally.
4. Move the guiding pin to the hole on the opposite side of the robot interface.
5. Mount the robot interface on the robot flange.
6. Mount the CPT pump unit on the robot interface.

The off-centre distance in effect is marked on the robot interface (50 or 100 mm on the robot connection) facing the arrow on the CPT pump unit.

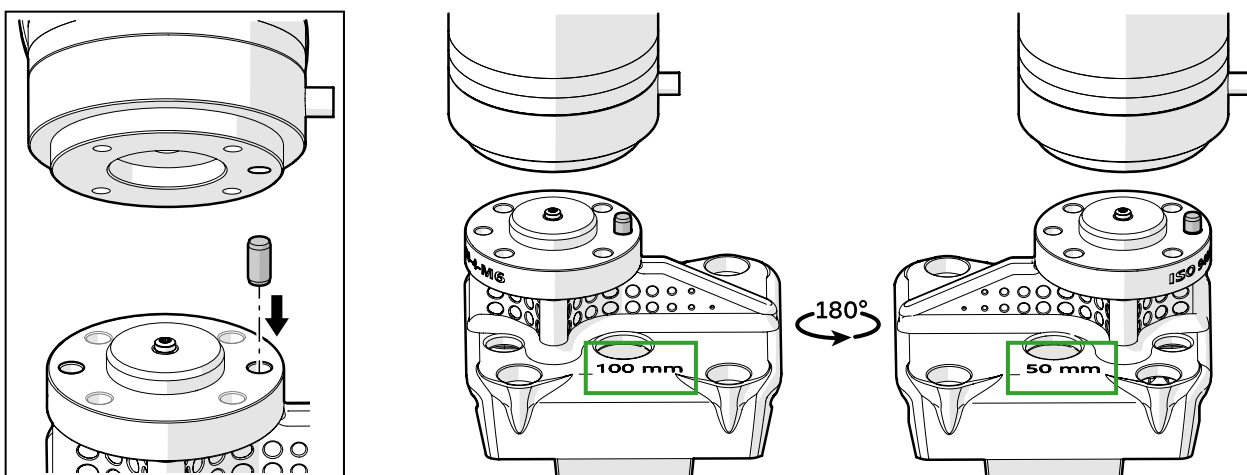


Figure 4. Off-centre distance options, 50 and 100 mm and the guiding pin (here shown for the ISO50 robot interface). The robot flange is seen in the top.

The table below lists the maximum allowed payloads (P) for each of the two off-centre distances, for each robot interface size (ISO50 and ISO80), for a CPT unit equipped with a foam gripper.



Notice

At least 25% of the gripping area of the payload must be covered for the foam gripper to work. The exact weight and position of a package can vary and needs to be verified by the operator.



Notice

The Maximum payload values in the table below only apply with at least 75% coverage of the CPT foam gripper area by the payload. The exact position of the package or packages (payload) can vary.

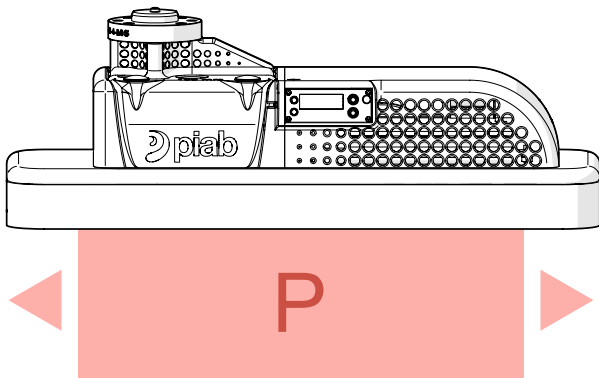


Figure 5. 100 mm off-centre mounting of CPT lifting payload P.

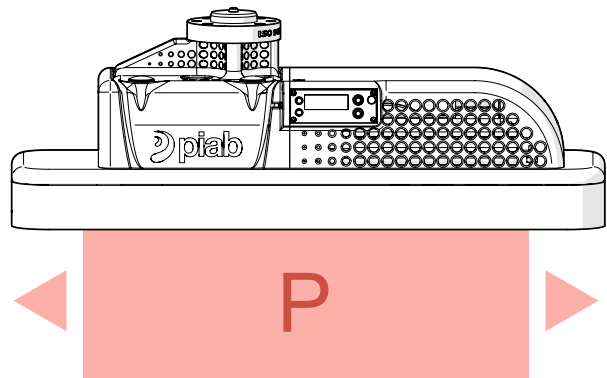
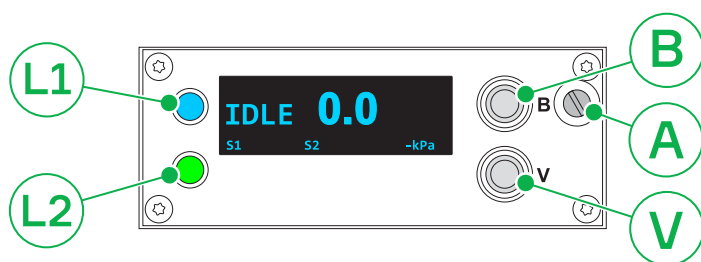


Figure 6. 50 mm off-centre mounting of CPT lifting payload P.

Robot interface	Off-centre distance	Maximum payload P (kg [lb])
ISO50	50 mm	15 [33]
	100 mm	10 [22]
ISO80	50 mm	20 [44]
	100 mm	15 [33]

5.4. Interface



Position	Description	Note
A	Flow setting of Blow-Off	-
B	Manual override of Blow-Off valve (requires power to unit to operate)	Push button to activate, push again to deactivate.
V	Manual override of Vacuum valve (requires power to unit to operate)	Push button to activate, push again to deactivate.
L1	Indicator LED - Blue, Vacuum valve	Lights only when activated from IO.
L2	Indicator LED - Green, Blow-Off valve	Lights only when activated from IO.

To enter the menu, press and hold both “V” and “B” buttons for 2 seconds. Wait for the time bar seen in the top of the display window to gradually go from left to right as both buttons are held down.



To navigate through the menu, use the “V” button to scroll down the list and “B” button to scroll up the list. One push will scroll one step up or down, hold down “V” or “B” to keep scrolling.



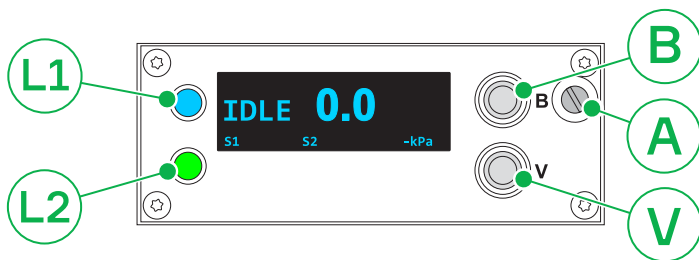
Press and hold both “V” and “B” buttons for 1 second to confirm the choice or parameter at the cursor position in the display. To choose parameter range or value, scroll to the value and select it by pressing “V” and “B” together for 1 second. Your choice is marked with an asterisk * and the OLED will quickly blink to confirm your setting.



You will automatically be stepped back to the previous menu level within 2 seconds. The menus also have a "Back" function at the bottom of different selections. The screen will automatically return to the main menu if you are inactive for 10 seconds. The OLED has a screensaver that will turn on after 5 minutes of inactivity.

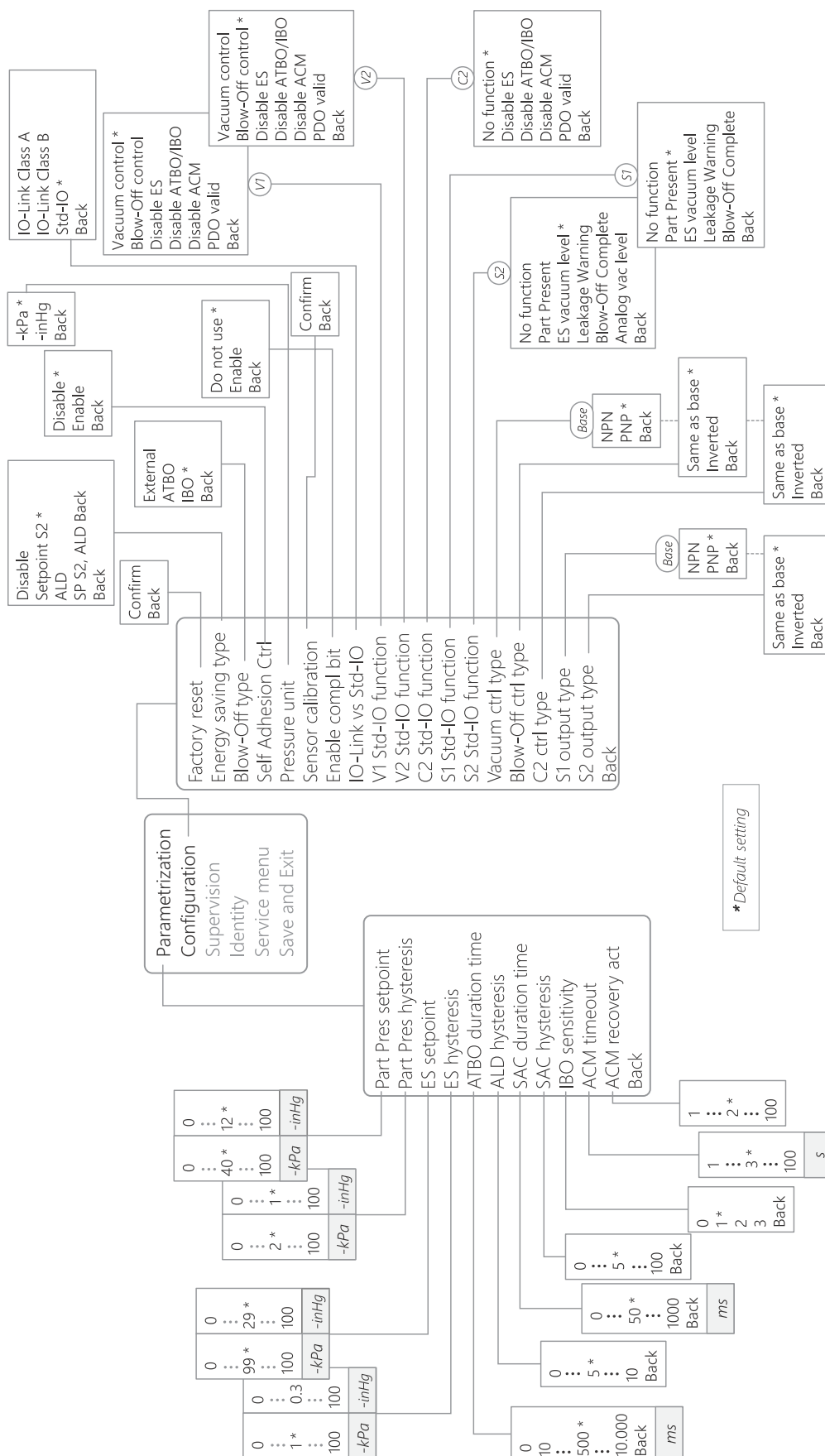
There are two buttons, one OLED screen and two LEDs in green and blue on the CPT. As soon as the CPT is turned on, the Piab logo is shown and shortly after the default screen (see picture below, showing the status IDLE with 0.0 -kPa vacuum). The real time vacuum level reading is displayed here when vacuum is achieved. The selected and active vacuum unit is shown in the bottom far-right corner. A screen saver is activated after 3 minutes if no signal in is present or when working in the menu settings.

The blue LED L1 will light and IDLE will switch to VAC in the display when an incoming signal for *Vacuum on* is achieved. Likewise, for a *Blow-Off on* signal but then the green LED L2 is lit and IDLE switches to BO in the display. It is also possible to manually operate *Vacuum on* or *Blow-Off on* with the buttons "V" (*Vacuum on*) and "B" (*Blow-Off on*) when the CPT is powered with 24V. Blow-Off on will always override Vacuum on.



The information in the bottom of the display shows, from left to right, the output signal status on S1, normally Part Present (PP); S2, normally Energy Saving (ES) level achieved; and the active vacuum unit. The top left section in the display will show status conditions, e.g. when and which ES-Energy Saving function or which Blow-Off type is active and in action. The output signals and status conditions can represent different selectable features, for more info see the Menu overview and Menu setting on the coming pages.

5.5. Menu overview CPT - IO-Link ready



5.6. Menu settings

Parametrization

Menu name	Preset value	Range	Unit	Comment
Part Present vacuum level setpoint	40 [12]	0...100	-kPa [-inHg]	Normally used as Part Present level
Part Present hysteresis	2 [1]	0...100	-kPa [-inHg]	-
Energy Saving (ES) vacuum level setpoint	99 [29]	0...100	-kPa [-inHg]	Normally used as Energy Saving trigger level
Energy Saving (ES) hysteresis	1 [0.3]	0...100	-kPa [-inHg]	-
ATBO duration time	500	10...10000	ms	Time set for Automatic Timer Blow-Off (ATBO)
ALD hysteresis	5	0...10	-	Automatic ES Level Determination (ALD) tuning
SAC duration time	50	10...1000	ms	Time set for Self Adhesion Control (SAC)
SAC hysteresis	5	0...100	-	SAC tuning
IBO sensitivity	1	0...3	-	0 = Small vacuum system 1 = Medium vacuum system 2 = Large vacuum system 3 = Large vacuum system - large pressure drops
ACM timeout	3	0...100	s	Time for all recovery actuations of ACM (Automatic ES Condition Monitoring)
ACM recovery actuations	2	0...100	-	Number of allowed recovery actuations

Configuration

Menu name	Configuration	Comment
Factory reset	Confirm	Returns unit back to factory set of parameterization and configuration values based on product CODE.
Energy Saving type	ES disabled ES on setpoint 2 ES with ALD ES on setpoint 2 - ALD backup	Preset depending on configuration. See corresponding chapter Function.
Blow-Off type	External ATBO IBO	Preset depending on configuration. See corresponding chapter Function.
Self Adhesion Control	SAC disabled SAC activated	Preset depending on configuration.
Pressure unit	-kPa -inHg	-
Sensor calibration	Confirm	Resets and calibrates the analog sensor.
Enable complement bit (IO-Link accessible)	Do not use Enable complement bit	See corresponding chapter in Function description.
IO-Link vs Standard-IO (IO-Link and IO-Link Ready accessible)	IO-Link Class A IO-Link Class B Std-IO	See corresponding chapter in Function description.
V1 Std-IO function (Std-IO accessible)	Vacuum control Blow-Off control Disable ES Disable ATBO/IBO Disable ACM PDO valid	V1, valve control is normally used and always preset to vacuum control. Preset depending on configuration. See corresponding chapter Function.
V2 Std-IO function (Std-IO accessible)	Vacuum control Blow-Off control Disable ES Disable ATBO/IBO Disable ACM PDO valid	V2, valve control is normally used and always preset to Blow-Off control. See corresponding chapter Function.
C2 Std-IO function (Std-IO accessible)	No function Disable ES Disable ATBO/IBO Disable ACM PDO valid	See corresponding chapter Function.
S1 Std-IO function (Std-IO accessible)	No function Part present vacuum level achieved (PP) Energy Saving vacuum level achieved (ES) Leakage Warning (LW) Blow-Off complete (BOC)	S1, feedback signal is normally used and preset to Part Present. See corresponding chapter Function.
S2 Std-IO function (Std-IO accessible)	No function	S2, feedback signal is normally used and preset to Energy Saving trigger depending

Menu name	Configuration	Comment
	Part present vacuum level achieved (PP) Energy Saving vacuum level achieved (ES) Leakage Warning (LW) Blow-Off complete (BOC) Analog vacuum level (1-5V)	on configuration. See corresponding chapter Function. Analogue signal is continuous from 1 to 5 V.
Vacuum control type	NPN PNP	Base input.
Blow-Off control type	Same as base Inverted from base	Follows the base Vacuum control type.
C2 control type	Same as base Inverted from base	Follows the base Vacuum control type.
S1 output type	NPN PNP	Base output.
S2 output type	Same as base Inverted from base	Follows the base S1 output type.

Supervision

Menu name	Function	Unit	Comment
Cycle counter	Cycle counter	Cycles	See corresponding chapter Function.
Cycle self check (IO-Link accessible)	Cycle self check	-	See corresponding chapter Function.
UVD counter	Under Voltage Detection (UVD) counter	pcs	See corresponding chapter Function.
MAX volt	Highest Voltage Detected (MVD)	V	See corresponding chapter Function.
MIN volt	Lowest Voltage Detected (LVD)	V	See corresponding chapter Function.
SYS volt	System Voltage	V	See corresponding chapter Function.
MAX Acc	Short Term Maximum Acceleration (STMA)	g x 10	See corresponding chapter Function.
MAX Acc 2	Life Term Maximum Acceleration (LTMA)	g x 10	See corresponding chapter Function.
SYS temp	System Temperature	°C	See corresponding chapter Function.
MAX temp	Maximum Temperature Detected (MTD)	°C	See corresponding chapter Function.
FTTH (IO-Link accessible)	First Time To Hit	ms	See corresponding chapter Function.
TTH (IO-Link accessible)	Time To Hit	ms	See corresponding chapter Function.
FFVL (IO-Link accessible)	Fresh Free-running Vacuum Level	-kPa [-inHg]	See Cycle self check in chapter Function.
FVL (IO-Link accessible)	(Current) Free-running Vacuum Level	-kPa [-inHg]	See Cycle self check in chapter Function.

Identity

Menu name	Comment
Vendor ID	PIAB VENDOR ID
Device ID	E.g. 314, see your pump for the correct value
Vendor	Piab AB
Product name	piCOMPACT®23 SMART
Serial number	E.g. 16Q001234, see your pump for the correct value
Hardware revision (HW)	E.g. R02, see your pump for the correct value
Firmware revision (FW)	E.g. revision 1.0
Application TAG	Application TAG Example
Production ordering CODE	PCS.F.305.S.KFAA.XXX.1X.8.XX.CCAB
Production date	E.g. 2024-02-20

Service menu

Menu name	Comment
Piab lock	For Piab developers only.

6. Functions

6.1. Vacuum control

Vacuum control is controlled either through Standard-IO input (PNP or NPN, configurable) or IO-link process data out (active high or active low). For a normally closed pump, vacuum is activated by an "active" input signal. For a normally open pump, vacuum is turned off by an "active" input signal.

You can set the PNP/NPN interpretation of pump I/O in the configuration menu by changing the control type and output types. You can also invert the interpretation, from PNP to NPN or from NPN to PNP, following the Base by connecting pin 7 to pin 2 (GND). See the electrical charts below and the chapter Operations.

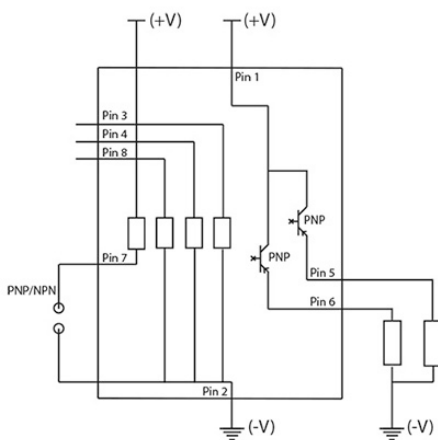


*Figure 7. PNP/PNP-mode.
Default mode in your selected
configuration.*

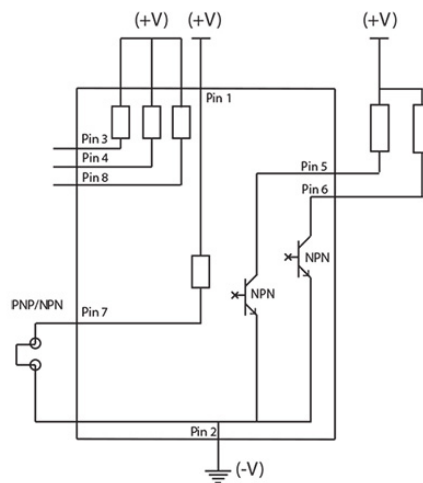


*Figure 8. NPN/NPN-mode.
Selectable using menu settings or
connect pin 7 to pin 2 (GND).*

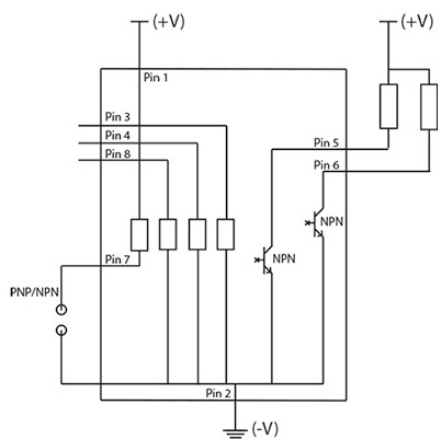


*Figure 9. Mixed mode PNP/NPN.
Selectable using menu settings in
your pump or connect pin 7 to pin 2
(GND).*

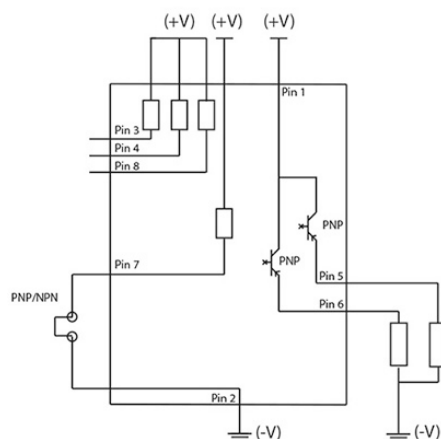


*Figure 10. Mixed mode NPN/PNP.
Selectable using menu settings in
your pump or connect pin 7 to pin 2
(GND).*

6.2. Parametrization

6.2.1. Part Present (PP)

Part Present (PP) is used as an indicator that the part was successfully picked. PP is set to value low when vacuum level drops below the value set for Part Present hysteresis.

6.2.2. Energy Saving (ES)

Energy Saving (ES) functions reduce energy consumption and noise levels whenever the application and conditions allow for it. User can set the target vacuum level and the product adjusts the flow capacity and minimizes the current consumption needed to reach and maintain that target vacuum level.

6.2.3. Energy Saving setpoint

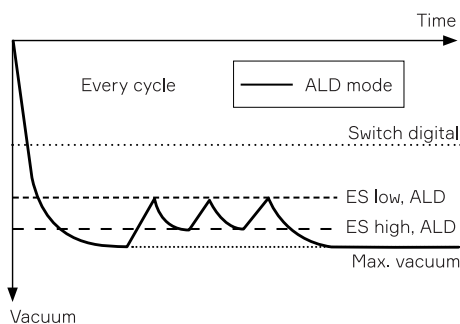
Energy Saving Setpoint is a pre-set threshold level for Energy Saving. ES setpoint is set to low when vacuum level drops below the ES setpoint hysteresis.

Design recommendation - Running with an unnecessarily deep ES setpoint level will force the ejector to operate much longer during the evacuation cycle than needed. Therefore, the setting of ES shall be done with the required vacuum level margins for PP and PS in mind.

6.2.4. Automatic ES Level Determination (ALD)

Automatic “ES” Level Determination (ALD) is optional only if ES mode is active and energy saving type ALD is selected. The unit will measure max achievable vacuum on the object every cycle and automatically set an optimized ES level and hysteresis. The calculation is redone every cycle to give the most reliable condition every time a new object is handled. The calculation is based on set part present signal level and max achievable vacuum measured by an analog sensor.

ALD can also be selected as a back-up for manually set ES (setpoint S2). In this case, ALD will be activated if S2 is not reached in order to always secure energy saving.



Parameter	Description
ALD hysteresis	Range 0 - 10 where 0 = small hysteresis and 10 = large hysteresis.

6.2.5. Energy Saving on setpoint S2 (Manual setting)

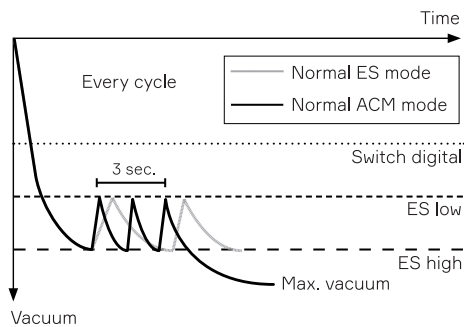
Energy Saving (ES) on setpoint S2 will operate the same way as Energy Saving ALD, with the only difference that the user needs to provide a value at which the unit will turn off, and a hysteresis (difference window) until the unit will turn vacuum on again. The value at which the unit will turn off vacuum generation is set in parameter S2 (ES setpoint). The difference (hysteresis) is set using parameter ES hysteresis. ES “low”, when unit turn vacuum on, is then internally calculated as ES setpoint – ES hysteresis.

Parameter	Description
ES setpoint	Range 0 - 100 -kPa. $S2 > S1$.
ES hysteresis	Range 0 - 100 -kPa. Ensure that $S2_setpoint - S2_hysteresis > S1$

6.2.6. Automatic ES Condition Monitoring (ACM)

Automatic Condition Monitoring (ACM) has the function of monitoring the Energy Saving function. If a substantial leakage occurs, it will trigger a valve protective function (Leakage Warning, LW) to avoid high speed repetitive activation of the valves. In addition, the function will disable the Energy Saving functionality for the current vacuum cycle. ACM is an option only if ES mode is active and works to protect the life span of the valves, an automatic override function is implemented. If the supply valve is restarted two times within 3 seconds, the ES function is deactivated for the rest of the cycle. This feature can be relevant if leakage occasionally occurs.

ACM has no particular use case as it is a fully automated function used to preserve valve lifetime. Leakage Warning can be used to monitor the health of the vacuum gripper in a sealed application. When cups get damaged or wear out, the first problem you usually see is that the gripper system starts to leak. This might not be easily detected as the application usually continues to function unless the damage is severe. The environment in which the application is located often is not easily observed due to ambient noise or simply the speed of motion. The leakage warning will indicate the leakage to the user and maintenance of the gripper system can be scheduled for the next planned maintenance occasion.



Parameter used	Parameter description
ACM Timeout	Range 1 - 100 seconds. The minimum time (default = 2 seconds) that must pass during which the ACM recovery actuations occur. If the time is longer for 2 (or whatever is set) actuations, the ACM function is not triggered. If the time is shorter, the ACM function is triggered.
ACM Recovery actuations	The number of recovery actuations (default = 2) that are allowed to occur during the ACM timeout without triggering the ACM function.

6.2.7. Leakage warning

See the section on Automatic Condition Monitoring (ACM) for a detailed description. The parameter is accessed through the process data. Every time ACM is triggered, this indicates a leakage which can be transmitted on the S1 or S2 signal port.

Use case - If a suction cup is worn or tears, the vacuum system will no longer be sealed enough for Energy Saving operation. This will trigger an LW signal. The signal is usually used either as an early indicator of that maintenance is needed or as an aid to troubleshooting a failing pick operation. Leakage warning has no parametrization of its own but is a co-dependent function of the ACM parameters.

The Leakage Warning counter is incremented for each leakage warning detected.

6.2.8. Blow-Off control

Blow-Off control is controlled either through Standard-IO input (PNP or NPN, configurable). Blow-Off (always pneumatically normally closed) is activated by an "active" input signal. Active Blow-Off control will always override Vacuum control, terminating the vacuum generation and starting the Blow-Off.

6.2.9. Blow-Off External control

External control means that compressed air release function will start by an "active" input signal. The Blow-Off signal will override the vacuum signal as well as ATBO or IBO when it's active.

6.2.10. Automatic Timer Blow-Off (ATBO)

Automatic Timer Blow-off (ATBO) means that the compressed air release function will start automatically after the vacuum valve is turned off. The Blow-Off duration is set with a timer. ATBO will save on I/Os needed to control CPT, this can be of great importance if several units are connected to one controller. ATBO makes programming easier and can be used to fine-tune Blow-Off duration to reduce cycles time.

Parameter	Description
ATBO Timer	Sets the duration of the Blow-Off in milliseconds. Range: 0 - 10 000 milliseconds.

6.2.11. Intelligent Blow-Off (IBO)

Intelligent Blow-Off (IBO) is an alternative to save compressed air for part release, in many vacuum applications the big air consumer. Intelligent blow-off will start automatically when the vacuum valve is turned off, and the duration of the blow-off is automatically adapted to the application. The blow-off duration is optimised, and blow-air will automatically stop when all vacuum is removed from the system. IBO is a self-learning function and only needs a few cycles to optimise blow-off duration for different system volumes. In the initial cycles, an extra blow-off puff can be presented to fully remove vacuum.

IBO-sensitivity can be used to tune the sensitivity for IBO depending on the size of the vacuum system.

Parameter	Description
IBO sensitivity	Low number = most energy efficient blow-off (suitable for small vacuum systems). The higher the number the larger or more flow-restricted the system. 0 = Small vacuum system 1 = Medium vacuum system 2 = Large vacuum system 3 = Large vacuum system - large pressure drops

6.2.12. Self Adhesion Control (SAC)

Self Adhesion Control (SAC) automatically removes "unwanted" vacuum with short blow-off puffs if the CPT vacuum control valve has not been activated.

Use case - Unwanted vacuum is typically created when a compressed suction cup is expanded by moving the gripper tool away from the handled object with vacuum turned off (during the placing of the object). SAC is activated if such unwanted vacuum is created, in order to break vacuum and avoid dragging the object with the motion of the gripper tool.

Parameter	Description
SAC duration	Time for one Blow-Off puff in milliseconds (range 10 - 10 000 ms). Default value = 50 ms.
SAC hysteresis	Low value = sensitive system for very light handled object, but at the risk of "ghost-puffs due to signal drift/disturbance. High value = robust but not as responsive system.

6.2.13. Blow-Off Complete (BOC)

An Output signal is activated when Blow-Off is complete, if either of the integrated automatic Blow-Off functions, ATBO or IBO, is activated. The trigger output data will make it easy to program for fastest possible cycle-time. Proper use of a parameter is to initiate part release by setting the vacuum control signal to "OFF", wait for BOC to turn "HIGH", indicating that part has been released.

Parameter	Description
The BOC signal is indirectly affected by the parameter IBO sensitivity. See chapter on Intelligent Blow-Off (IBO).	IBO sensitivity is described separately.

6.3. Configuration

6.3.1. Factory reset

Factory reset returns the product to the values set for parameterization and configuration parameters based on the product code.

6.3.2. Sensor calibration

Zero-point calibration of sensor procedure (pressure range 1 atm $\pm$ 10 kPa):

1. Make sure the pump is in an IDLE state.
2. Navigate on the display menu to Sensor calibration, located under Configuration.
3. Press Confirm. The sensor is now calibrated to zero.

Sensor data inaccuracies can usually be avoided with proper sensor calibration and using additional filtration in dusty environments.

6.3.3. Enable complement bit

Complement control is intended to be used in combination with bi-stable valve. During power-up the valve shall not be shifted until valid process data is received to the pump. During power-up of the complete system, Process Data Out (PDO) is normally 0 (low) until PLC/controller has booted. In order to then avoid involuntary stopping of vacuum, this complement control can be used. The process data output bit 7 according to the IODD is used as a complement for the vacuum_on bit (bit0).

Description Bit 0 Bit 7 Turn vacuum On 1 0 Turn vacuum Off 0 1 In order to use complement ctrl, this must be configured in ISDU index 81 according to IODD. Default setting of the pump is not to use complement control. (default value index 81 = 0) When disabled (not used) the setting of PDO bit 7 is disregarded.

Parameter	Description
Enable complement bit	Set parameter to 1 in order to enable complement control feature for vacuum control.

6.3.4. IO-Link vs Standard-IO

Parameter	Description
IO-Link Class A	Pump is configured to respond to IO-Link CQ process data only. Does not respond to Standard-IO inputs or transmit Standard-IO outputs.
IO-Link Class B	Pump is configured to respond to IO-Link CQ process data only. Does not respond to Standard-IO inputs or transmit Standard-IO outputs.
Standard-IO	Pump is configured to respond to Standard-IO inputs only. Does not connect on CQ (IO-Link).

6.3.5. V1 Standard-IO function

Selects how input mode on V1 Standard-IO-pin shall be interpreted.

Parameter	Description
Vacuum control	Vacuum control
Blow-Off control	Blow-Off control
Disable ES	Set pin to HIGH - Disables Energy Saving Function and its derivative function Leakage Warning.
Disable ATBO/IBO	Set pin to HIGH - Disables Automatic Timer Blow Off or Intelligent Blow-Off.
Disable ACM	Set pin to HIGH - Disables Automatic Condition Monitoring (the valve protection is disabled).
PDO Valid	Activate to indicate that control signals are valid. Useful for Standard-IO. Similar function as complement control status bit used in IO-link.

6.3.6. V2 Standard-IO function

Selects how input mode on V2 Standard-IO-pin shall be interpreted.

Parameter	Description
Vacuum control	Vacuum control
Blow-Off control	Blow-Off control
Disable ES	Set pin to HIGH - Disables Energy Saving Function and its derivative function Leakage Warning.
Disable ATBO/IBO	Set pin to HIGH - Disables Automatic Timer Blow Off or Intelligent Blow-Off.
Disable ACM	Set pin to HIGH - Disables Automatic Condition Monitoring (the valve protection is disabled).
PDO Valid	Activate to indicate that control signals are valid. Useful for Standard-IO. Similar function as complement control status bit used in IO-link.

6.3.7. C2 Standard-IO function

Selects how input mode on C2 Standard-IO-pin shall be interpreted.

Parameter	Description
No function	Default no function on pin.
Disable ES	Set pin to HIGH - Disables Energy Saving Function and its derivative function Leakage Warning.
Disable ATBO/IBO	Set pin to HIGH - Disables Automatic Timer Blow Off or Intelligent Blow-Off.
Disable ACM	Set pin to HIGH - Disables Automatic Condition Monitoring (the valve protection is disabled).
PDO Valid	Activate to indicate that control signals are valid. Useful for Standard-IO. Similar function as complement control status bit used in IO-link.

6.3.8. S1 Standard-IO function

Selects which state to transmit on Standard-IO output S1.

Parameter	Description
Part Present (PP)	Part Present vacuum level achieved. Vacuum Switch level S1 achieved.
Energy Saving vacuum level (ES)	Energy Saving vacuum level achieved. Vacuum Switch level S1 achieved.
Leakage Warning (LW)	Every time ACM is triggered, this indicates a leakage which can be transmitted on S1 signal port.
Blow-Off Complete (BOC)	Automatic Blow-Off sequence completed.

6.3.9. S2 Standard-IO function

Selects which state to transmit on Standard-IO output S2.

Parameter	Description
Part Present (PP)	Part Present vacuum level achieved. Vacuum Switch level S1 achieved.
Energy Saving vacuum level (ES)	Energy Saving vacuum level achieved. Vacuum Switch level S1 achieved.
Leakage Warning (LW)	Every time ACM is triggered, this indicates a leakage which can be transmitted on S1 signal port.
Blow-Off Complete (BOC)	Automatic Blow-Off sequence completed.
Analog vacuum level	0-5 Volt analog output. Gauge range is 1-5 V corresponding to 0-101.3 -kPa.

6.3.10. Vacuum control type

This setting is considered the base pump input type of the pump (PNP or NPN).

Parameter	Description
NPN	NPN function of Vacuum control input pin (and all other input pins unless specifically configured otherwise).
PNP	PNP function of Vacuum control input pin (and all other input pins unless specifically configured otherwise).

6.3.11. Blow-Off control type

Parameter	Description
Same as base input type	Sets the input type to operate PNP when base input type is PNP. NPN when base is NPN.
Input type inverted	Sets the input type to operate NPN when base input type is PNP. PNP when base is NPN. This function can be useful when configuring a system that should behave in a specific manner during power-up, for example.

6.3.12. C2 control type

Parameter	Description
Same as base input type	Sets the input type to operate PNP when base input type is PNP. NPN when base is NPN.
Input type inverted	Sets the input type to operate NPN when base input type is PNP. PNP when base is NPN. This function can be useful when configuring a system that should behave in a specific manner during power-up, for example.

6.3.13. S1 output type

S1 feedback signal. This setting is considered the base output type of the pump (PNP or NPN).

Parameter	Description
NPN	NPN function of S1 output signal pin (and all other output pins unless specifically configured otherwise).
PNP	PNP function of S1 output signal pin (and all other output pins unless specifically configured otherwise).

6.3.14. S2 output type

Parameter	Description
Same as base input type	Sets the output type to operate PNP when base input type is PNP. NPN when base is NPN.
Input type inverted	Sets the input type to operate NPN when base input type is PNP. PNP when base is NPN.

6.4. Supervision

6.4.1. Vacuum cycle counter

The Vacuum Cycle Counter is a simple counter of the number of times the device has received a “vacuum on” signal and thereby activated a vacuum cycle. The value is stored in a non-volatile memory every 30 minutes.

6.4.2. Cycle self check

A vacuum system self-check can be triggered by process data input (IO-link) or through the menu system “enable vacuum system self-check”.

During a self-check the gripper arrangement shall avoid contact with the handled object (robot/automation cell shall not be in pick or drop-off position). Vacuum system self-check is a sequence where:

1. Vacuum is activated for a 5 second duration
2. IBO is activated.

The system then calculates the Filter Performance Factor and stores the current free running vacuum level (and fresh free running vacuum level if it is the first time used since last reset.)

Parameter associated with the self-check	Description
Vacuum Cycle Counter since last self-check	A simple count of the number of times the vacuum has been turned on. The cycle counter is reset to 0 every time a self-check is performed.
Fresh Free-running Vacuum Level	The vacuum level recorded by the vacuum sensor during THE FIRST vacuum system self-check after a reset of the self-check parameter.
Current Free-running Vacuum Level	The vacuum level recorded by the vacuum sensor during THE LATEST vacuum system self-check.

6.4.3. Under-Voltage Detection (UVD) counter

Undervoltage detection is a parameter measured during vacuum on, storing the lowest voltage recorded in the first ten operating cycles after a power cycle. Every power cycle generates a new reading to be stored locally. Up to 100 readings are possible to store, then a first in first out (FIFO) principle of replacing readings is applied.

Undervoltage detection counter counts the number of instances the pump has detected an undervoltage situation and then returned to normal supply voltage range.

6.4.4. Maximum Voltage Detected (MVD)

Maximum Voltage Detected (MVD) is a reading of the maximum voltage measured by the vacuum ejector over the lifespan of the ejector. The reading is a single value representing the highest voltage recorded.

6.4.5. Lowest Voltage Detected (LVD)

LVD is a reading of the lowest voltage seen by the vacuum ejector over the lifespan of the ejector. The reading is a single value representing the lowest voltage recorded.

6.4.6. Current system voltage

Current System Voltage (CSV) is the latest reading of voltage. A new reading is read and made available every time the ejector returns to the IDLE state.

6.4.7. Short Term Maximum Acceleration (STMA)

The pump measures and provides the maximum value of the sum-acceleration from the last 5 minutes of operation.

6.4.8. Long Term Maximum Acceleration (LTMA)

The pump shall be able to measure and report maximum acceleration it has been submitted to (while under power) throughout its lifespan.

6.4.9. System Temperature

This is the latest reading of system temperature. A new value is made available every time the ejector returns to the IDLE state.

6.4.10. Maximum Temperature Detected (MTD)

MTD is a recording of the maximum temperature seen by the vacuum-ejector over its lifespan.

6.4.11. First Time To Hit (FTTH)

First Time To Hit (FTTH) is the time from when “Vacuum On” is turned on until the vacuum level has reached 20 -kPa below the free-running vacuum level of the system. The value can be used as a reference as to how fast the system was running when initially commissioned. The value can be reset to 0 using ISDU request or through the menu-system of the pump.

6.4.12. Time To Hit (TTH)

Current Time To Hit (CTTH) is the time from when “Vacuum On” is turned on until the vacuum level has reached 20 -kPa below the free-running vacuum level of the system. The value can be used to either to optimize air consumption in the process by tuning the automation cell timing of turning vacuum on to minimize the value, or it can be used to trend the value. If the value increases over time, service of the pump might be needed due to contamination in the ejector or vacuum tubing. If the value fluctuates greatly, the cause could be inconsistent feed pressure.

7. Maintenance



Warning

- Irresponsible use of compressed air may cause injury. Compressed air must never be used for anything else than designated purposes.
- Prior to any maintenance work, turn off the compressed air supply and electrical supply, and discharge residual pressure. After that cables and tubing may be safely disconnected from the CPT.



Important

Wear ear protection when conducting maintenance work.

The CPT has been designed to minimize the need of maintenance. To ensure safe operation the following actions are strongly recommended to take:

- Maintenance must be performed with a fixed period short enough, to ensure a firm grip at all times.
- An overall inspection of the CPT must be performed on a regular basis with a duration depending on the application characteristics.
- All maintenance must be performed in compliance with this manual, including safety instructions.
- Only authorized integrators, or Piab AB, shall perform repairs.
- Only use original spare parts.
- To prevent dust, dirt and larger particles jamming the ejector gripper unit and causing impaired performance, the CPT must only be powered on and energized when suction cups with filter meshes or foam are properly installed.
- The CPT may be cleaned using water and mild soaps. Do not use strong detergents!

7.1. Periodic preventive maintenance

The following periodic preventive maintenance actions are recommended to take:

Action	Frequency
Check visually for any signs of damage to the CPT	Daily
Listen for any noise indicating leakage	Daily
Check the silencer unit for dirt or deterioration	Weekly
Clean the COAX® cartridges	Depends on the pollution

7.2. Spare parts

Description	Item no
Spare part kit MIDI COAX®, Nitrile	0109531
Spare part kit MIDI COAX®, Viton	0124897
COAX® cartridge MIDI Si32-3	0107053
Robot Connection ISO 9409-1-50-4-M6	0242097
Robot Connection ISO 9409-1-80-4-M8	0246234
Screw Plug M5	0242349
FOAM.330.140.N30X.Z06368	0244612
FOAM.400.140.N30X.Z05542	0242398
FOAM.500.140.N30X.Z06369	0244613
Suction Cup complete G.FX39T30.B3.S1.G14M.13	9912119
Ø39 mm Flexible lip, TPE 30° Shore A (for FX39 cup on the line above)	0121992
CPT Suction Plate Cover Foam 300	0243007
CPT Suction Plate Cover Foam 400	0242095
CPT Suction Plate Cover Foam 500	0243012
CPT Suction Plate Cover Cups 300	0243009
CPT Suction Plate Cover Cups 400	0242098
CPT Suction Plate Cover Cups 500	0243013
CPT O-Ring Base Plate 300	0243020
CPT O-Ring Base Plate 400	0242099
CPT O-Ring Base Plate 500	0243021

7.3. Changing the suction cups

Unscrew the suction cup that is to be replaced. Do it by hand or use a wrench on the outside of the cup fitting. Mount the new suction cup, recommended tightening torque 0.5 Nm [0.37 lb ft]. Do not overtighten!



Notice

Do NOT use an Allen key or similar to mount suction cups with sense valves.

To change the suction cup plate, it is recommended to first dismount the CPT from the robot and lay it down on a table for better access.

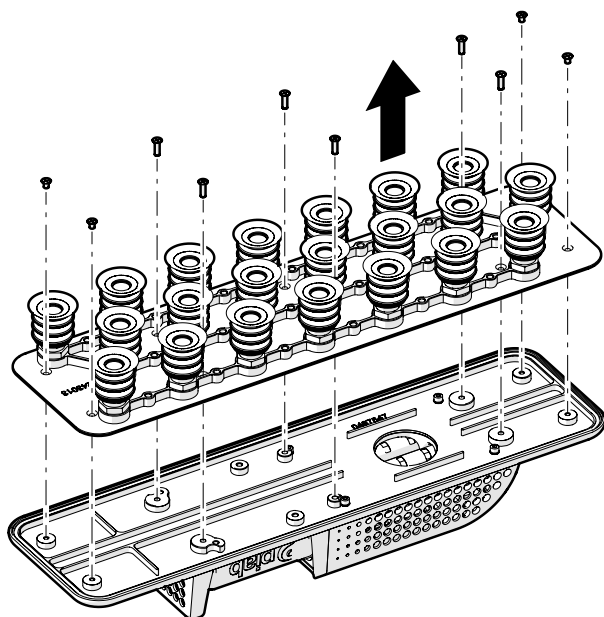


Figure 11. Removal of the suction cup plate from the CPT.

The suction cup plate is dismantled from the base plate by unscrewing the six screws M4x14mm (recommended torque 1 Nm [0.74 lb ft]) for CPT300 and CPT400, whereas CPT500 has six screws M4x14mm (1 Nm [0.74 lb ft]) and four screws M4x6mm (0.5 Nm [0.37 lb ft]) recommended torque).

7.4. Changing the foam gripper

To change the foam gripper pad, it is recommended to first dismount the CPT from the robot and lay it down on a table for better access.

Remove the old foam pad from the foam gripper plate, carefully remove any glue residue from the foam gripper plate.

Make sure that the foam gripper plate is mounted to the base plate of the CPT main unit before installing a new foam pad on the foam gripper plate.

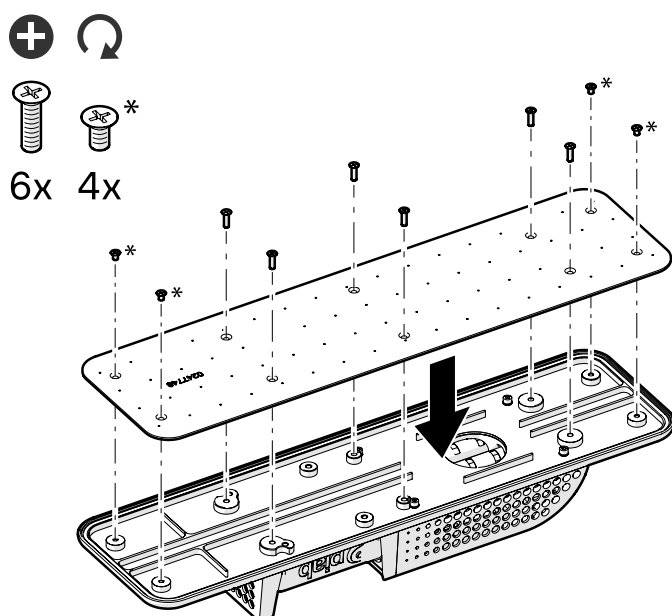


Figure 12. Mount the foam gripper plate to the CPT.

Remove the protective film from the new foam pad to expose the adhesive. Push the foam pad with the adhesive side down against the foam gripper plate. Pay attention to align the holes in the foam pad with the screws that mount the foam gripper plate to the base plate.

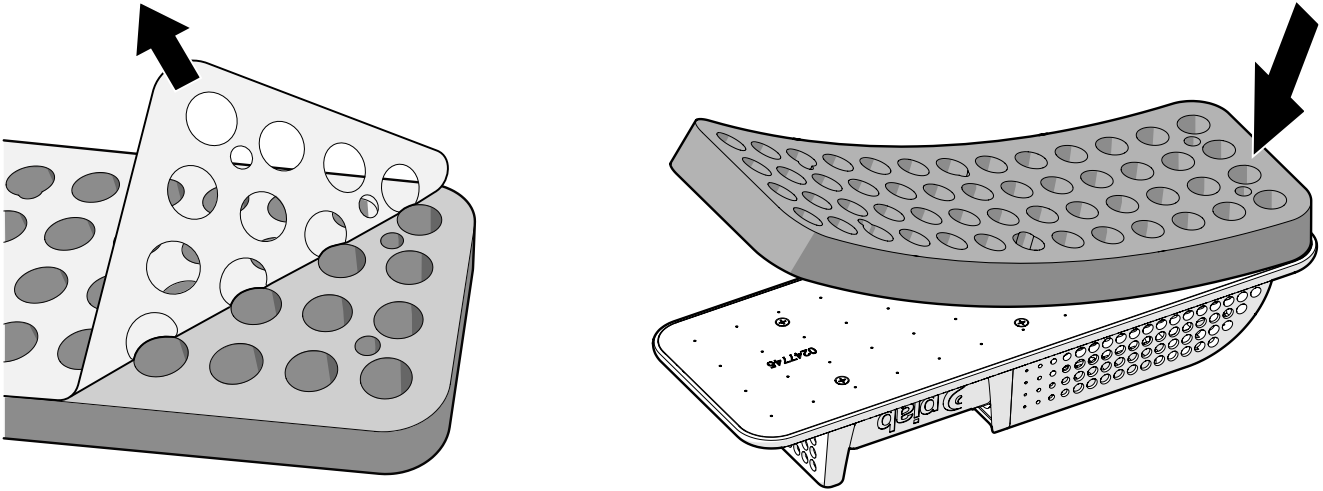
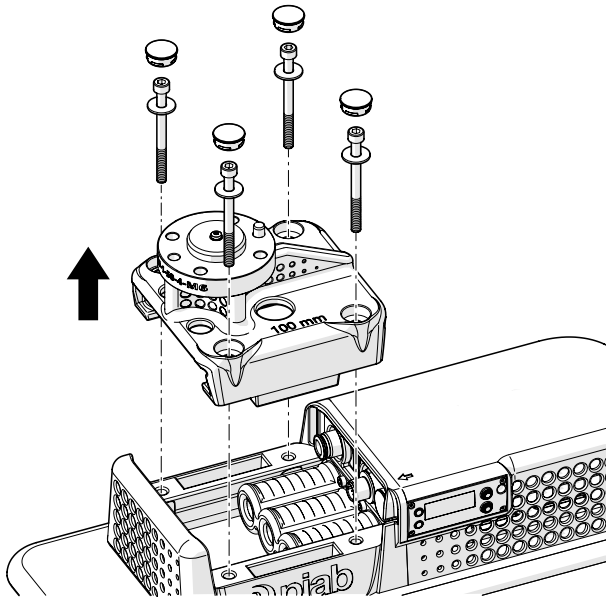


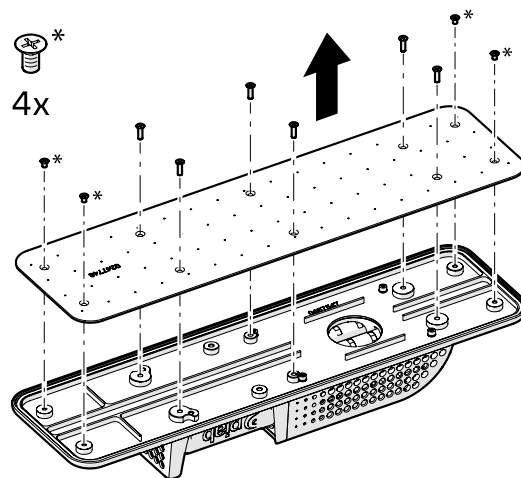
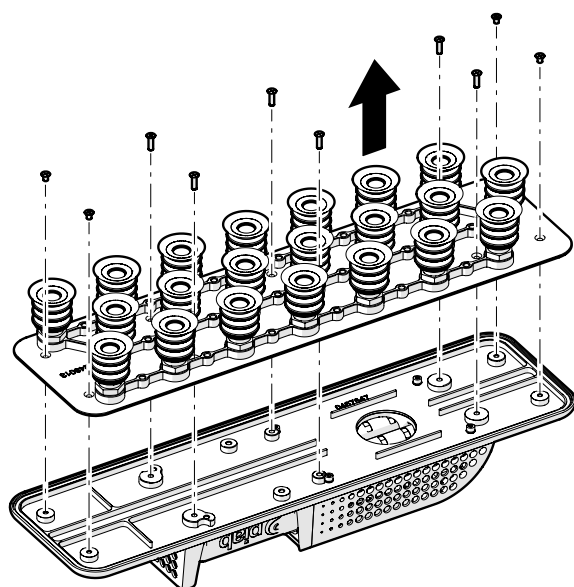
Figure 13. Installation of new foam pad on the CPT gripper.

7.5. Removing the COAX[®] cartridges

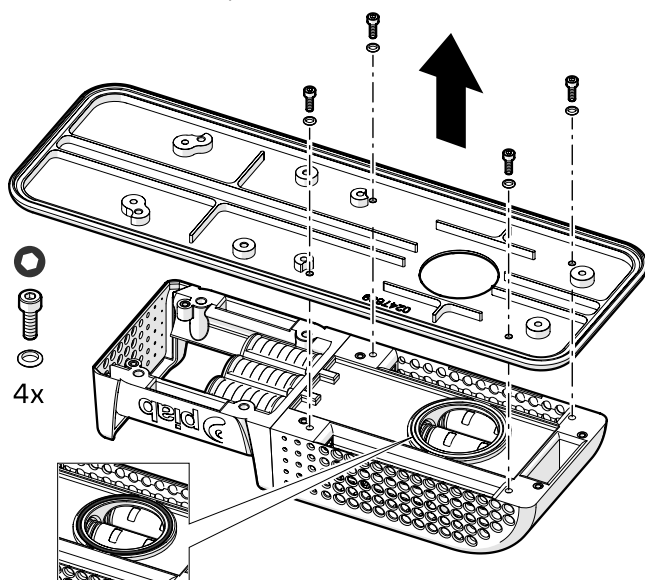
1. Remove the CPT from the robot.
2. Remove the CPT main unit from the robot interface.



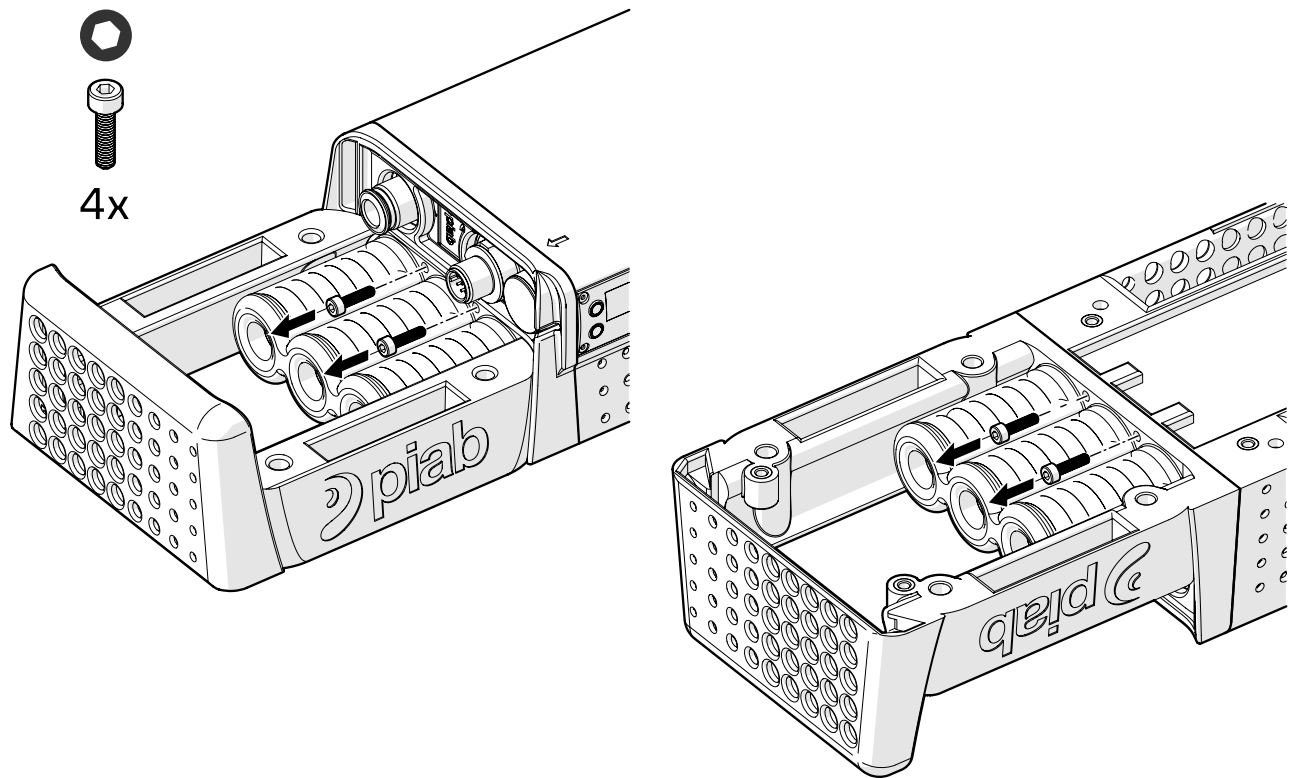
3. Remove the suction cup plate or foam plate from the base plate.



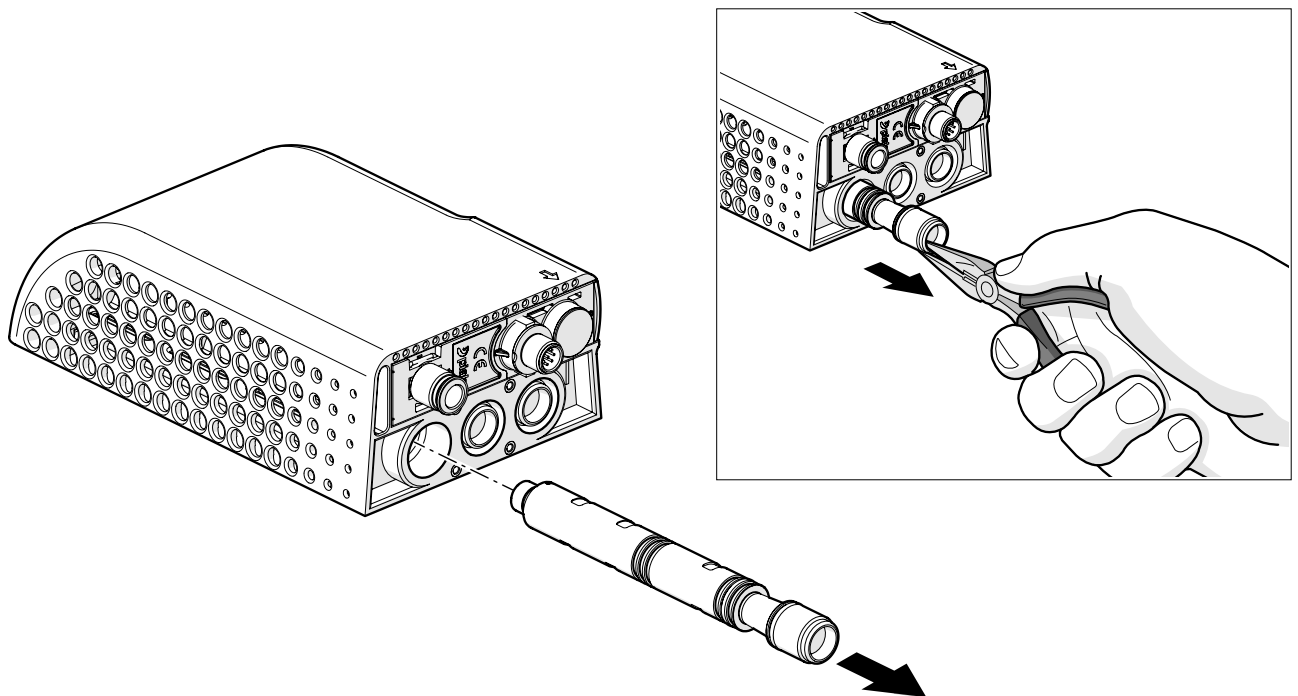
4. Remove the base plate.



5. Remove the silencer unit by unscrewing the four M3x12mm screws, two on top and two on the bottom side of the main unit.



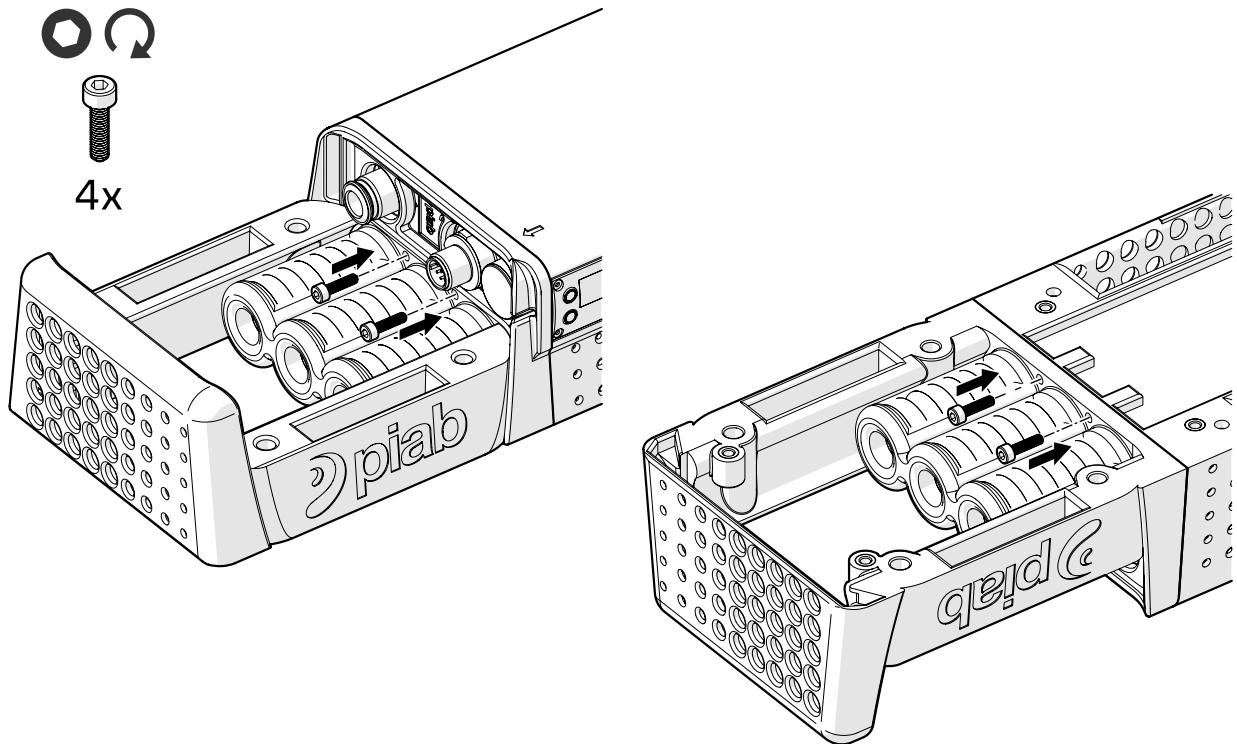
6. Pull out the COAX® cartridges with a pair of nose pliers.



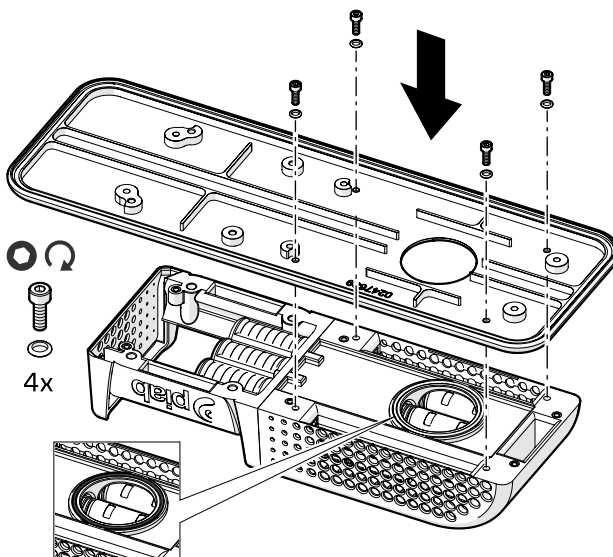
7. Replace with new COAX® cartridges, or clean the COAX® cartridges (See cleaning the COAX® cartridges chapter) and use new sealings and flap valves from the spare part kit.

8. Reverse the above steps.

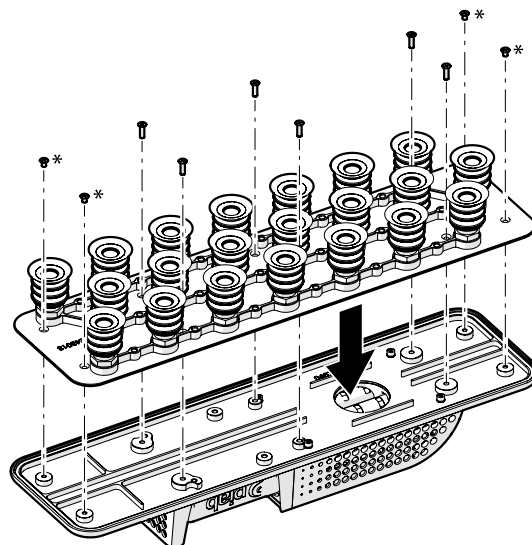
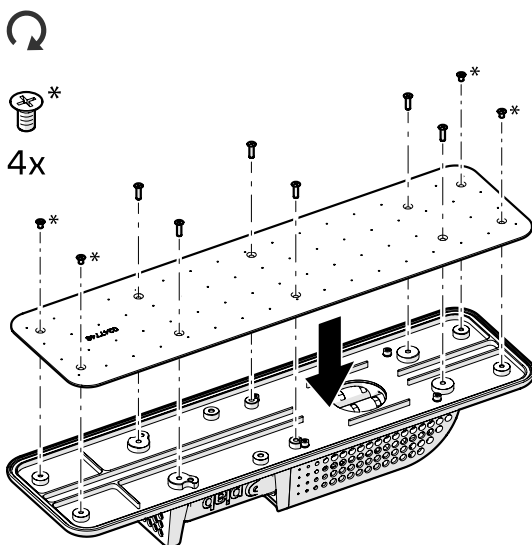
- a. Mount the silencer housing with four screws (M3x12mm, 0.4 Nm [0.30 lb ft] torque).



- b. Mount the base plate on the pump unit with six screws (M4x6mm, 0.5 Nm [0.37 lb ft] torque) and sealing washers. Make sure the sealing ring is in place when mounting the base plate.

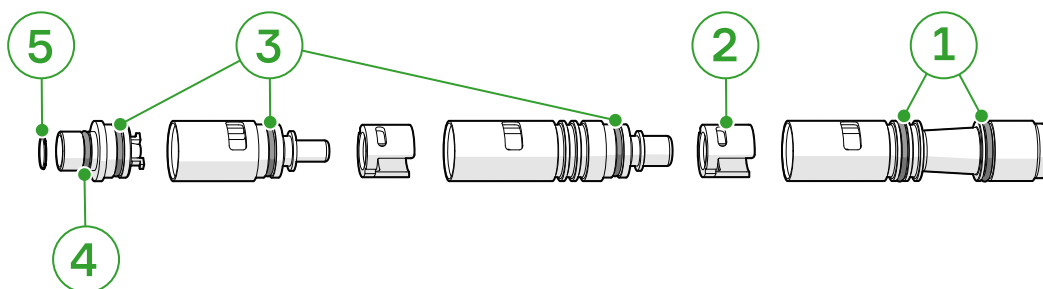


- c. Mount the suction cup plate or foam gripper plate on the base plate, with six screws (M4x14mm, 0.5 Nm [0.37 lb ft] torque) for CPT300 and CPT400, and for CPT500 four additional screws (M4x6mm, 0.5 Nm [0.37 lb ft]).



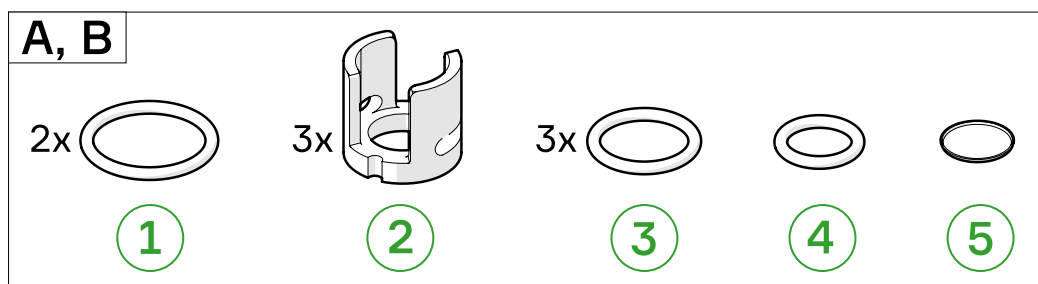
7.6. Cleaning the COAX® cartridge

Disassemble each COAX® cartridge into the following pieces:



Clean all plastic parts in an ultrasonic bath at 40°C [104 °F] for 1 hour.

Then reassemble the COAX® cartridge with new sealings (1, 3, 4, and 5) and flap valves (2) from the Spare part kit MIDI COAX®, available in Nitrile (A) and Viton (B). The spare part kits include the following items:



7.7. Troubleshooting

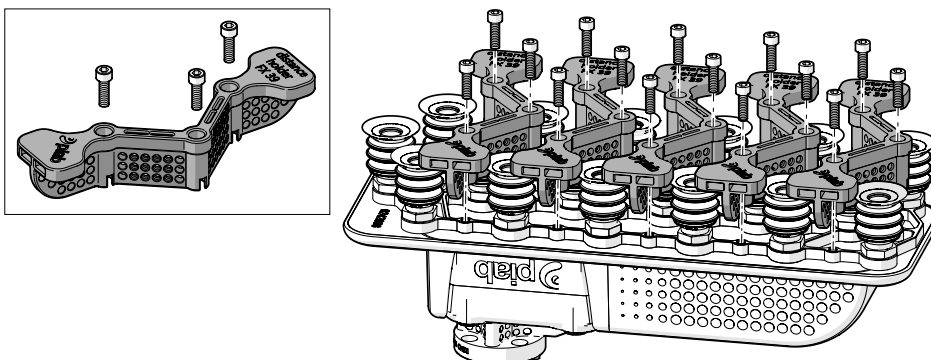
Observation or error	Root cause	Actions	Comment
No vacuum in system	Poor air supply	Inspect air supply connection	Make sure the air connections are tight.
	Poor air supply	Inspect feed pressure regulator	Make sure feed pressure is switched on and within operating limits at the gripper connection point.
	Poor electrical signal	Inspect electrical connection	Make sure the electrical connections are tight.
	Poor electrical signal	Inspect power supply	Power supply is monitored on the display and shall be within $24\text{ V} \pm 10\%$.
Poor vacuum in system	No or poor suction cup seal or foam seal	Check condition of suction cups or foam	Check condition of suction cups or foam
Dropped item	Low feed pressure	Make sure compressed air feed pressure is compliant with recommendation	Avoid under dimensioned hose inner diameter and too long hose length.
Item not picked	Pollution of COAX® cartridge	Clean COAX® cartridge	Ensure that the pick position is making contact to the object properly. Ensure all cups that are intended to make contact do so.
	Flap valves of COAX® cartridge is not in the correct position	Adjust flap valve position	-
	Sensor data inaccuracies caused by incorrect zero-point calibration	Perform zero-point calibration of sensor.	See chapter 6.3.2 for Sensor calibration instructions.
Other	Unknown	Contact Piab support	See last page of this manual for contact information.

7.8. Accessories

The cup stabilizer (also referred to as distance holder) is an accessory available for CPT when equipped with suction cup gripper. It is not incorporated in the product configurator of the CPT unit but needs to be ordered separately.

The cup stabilizer enhances the stability of the lifted object, especially in high-speed applications where the forces generated during acceleration can be significant.

Each cup stabilizer is mounted to the suction cup plate with three M6x20 mm screws, 1 Nm [0.74 lb ft] recommended torque. Up to 6 cup stabilizers can be mounted on a CPT unit (depending on the CPT size).



Item no	Description
0248141	Stabilizer cup CPT cpl

8. Technical Data

Description	Unit	Value
Installation		
Weight	kg [lb]	See the configurable datasheet, available on piab.com, for the value of the particular configuration.
Robot interface ISO50	-	ISO 9409-1-50-4-M6
Robot interface ISO80	-	ISO 9409-1-80-4-M8
Material	-	Al, SS, CuZn, PA, NBR, PU, Cu
Supply voltage	VDC	24 ± 10%
Connection, electrical	-	M12 8-pin Male
Typical current consumption	mA	200
Valve shift peak current	mA	425
In rush current	mA	<400
Feed pressure, max.	MPa [psi]	0.7 [101.5]
Feed pressure, optimum	MPa [psi]	0.6 [87.0]
Connection, compressed air	-	ø8 mm push-in
Environmental properties		
Safety classification	-	IP65
Temperature range	°C [°F]	0-40 [32-104]
Humidity	%RH	35-85
Noise level range at optimum (0.6 MPa [87 psi]) feed pressure	dBA	72-80
Compressed air quality	-	DIN ISO 8573-1 class 4
Operation		
Air consumption, max., at optimum (0.6 MPa [87 psi]) feed pressure	NI/s [scfm]	4.5 [9.5]
Maximum vacuum at optimum (0.6 MPa [87 psi]) feed pressure	-kPa [-inHg]	70 [20.7]
Max payload 50 mm off-centre distance	kg [lb]	Robot interface ISO50: 15 [33] Robot interface ISO80: 20 [44]
Max payload 100 mm off-centre distance	kg [lb]	Robot interface ISO50: 10 [22] Robot interface ISO80: 15 [33]
Vacuum flow	NI/s [scfm]	See the configurable datasheet
Evacuation time	s/l [s/cf]	See the configurable datasheet
Hysteresis	-	Adjustable
Function, Vacuum/Blow-Off	-	NC vacuum + NC Blow-Off
Adjustable Blow-Off flow	NI/s [scfm]	0-6.6 [0-14.0]
Display	-	OLED and gyro display
Electrical input/output		
Electrical input/output	VDC	CPT for Universal Robots: Robot specific. General CPT: PNP/PNP or NPN/NPN.
Analog output	V	1-5
Accuracy of full scale analogue output	-	±3%
Manual override, electrically activated	-	Yes, locking push style

Description	Unit	Value
Signal range (digital output)	kPa [inHg]	-101.3 - 140 [-29.92 - 41.34]
Valve response time	ms	50
Switch output S1/S2, max.	mA	2x40 simultaneously or 1x80 one at a time

9. Dimensions

9.1. CPT with Foam Gripper

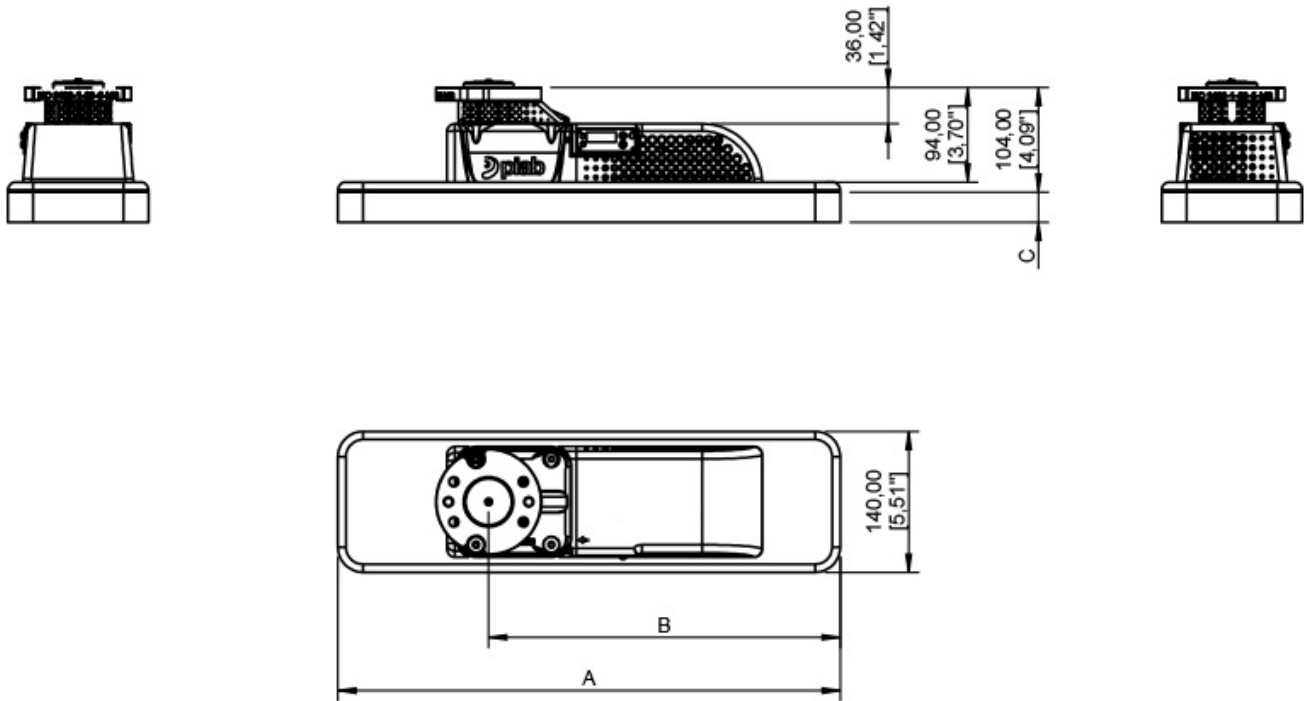


Figure 14. Dimensions of CPT equipped with foam gripper.

CPT size	A - mm [in]	Interface off-centre distance - mm	B - mm [in]
CPT300	330 [13.0]	50	230.5 [9.1]
		100	280.5 [11.0]
CPT400	400 [15.7]	50	250 [9.8]
		100	300 [11.8]
CPT500	500 [19.7]	50	300 [11.8]
		100	350 [13.8]

Foam	C - mm [in]
N30X	30 [1.2]

9.2. CPT with Suction cup Gripper

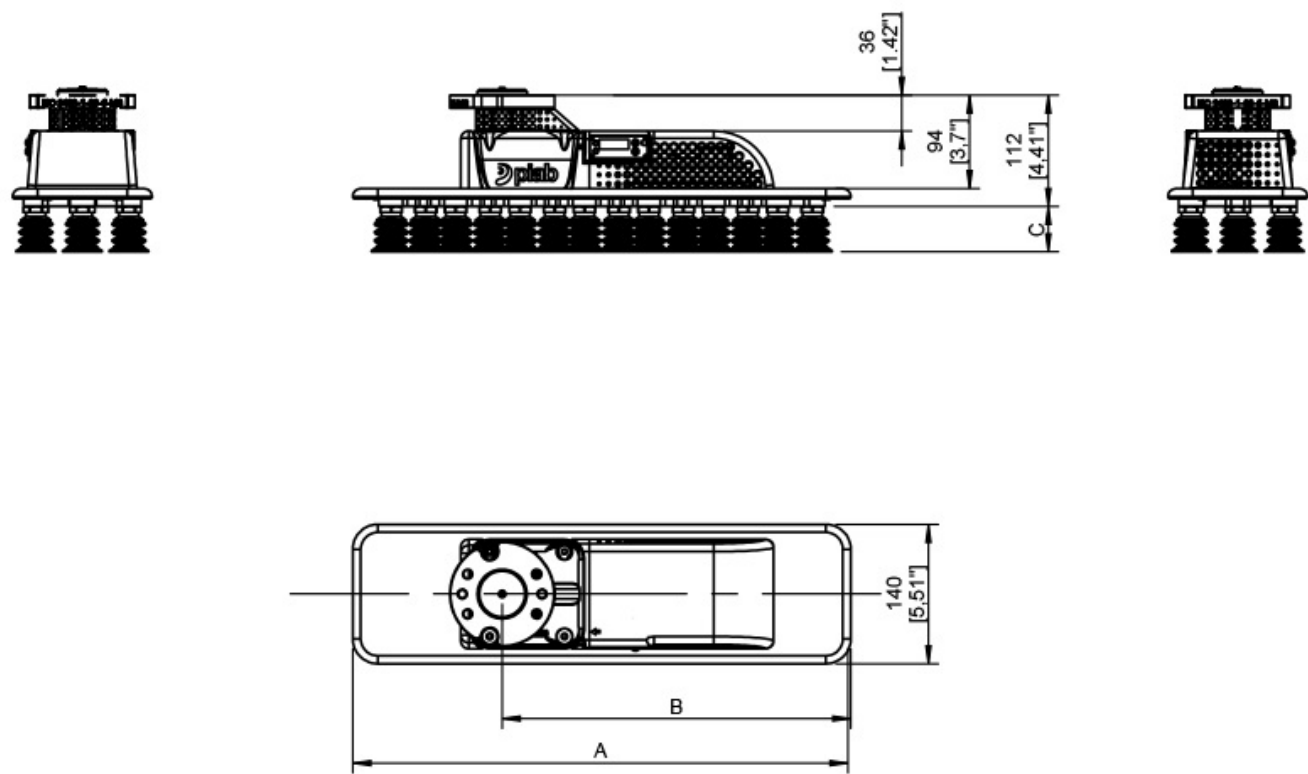


Figure 15. Dimensions of CPT equipped with suction cup gripper.

CPT size	A - mm [in]	Interface off-centre distance - mm	B - mm [in]
CPT300	330 [13.0]	50	230.5 [9.1]
		100	280.5 [11.0]
CPT400	400 [15.7]	50	250 [9.8]
		100	300 [11.8]
CPT500	500 [19.7]	50	300 [11.8]
		100	350 [13.8]

Suction cup	C - mm [in]
FX39 (piGRIP®)	45.4 [1.8]

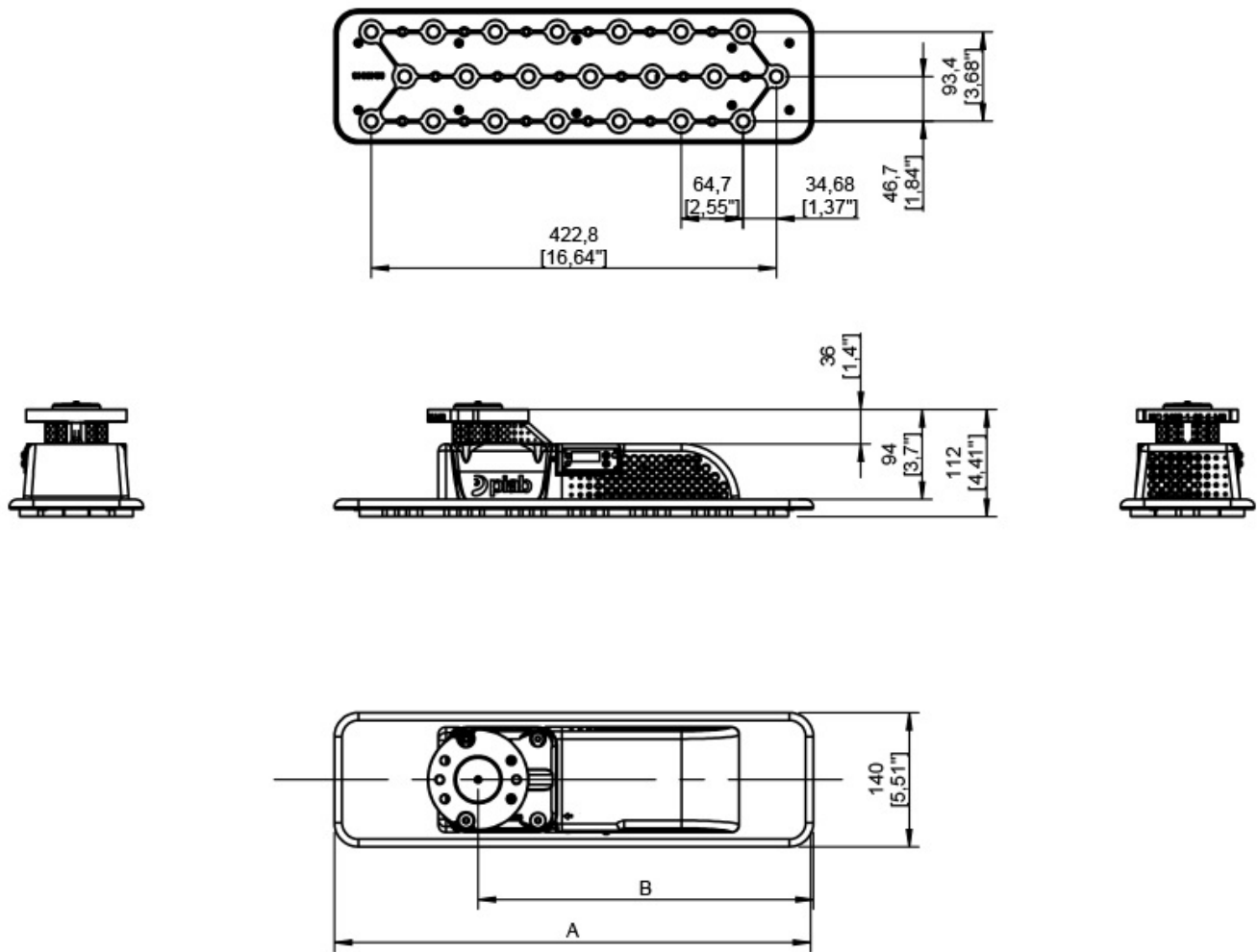


Figure 16. Dimensions of threads for CPT equipped with suction cup gripper but no cups installed.

9.3. CPT with Cup stabilizer

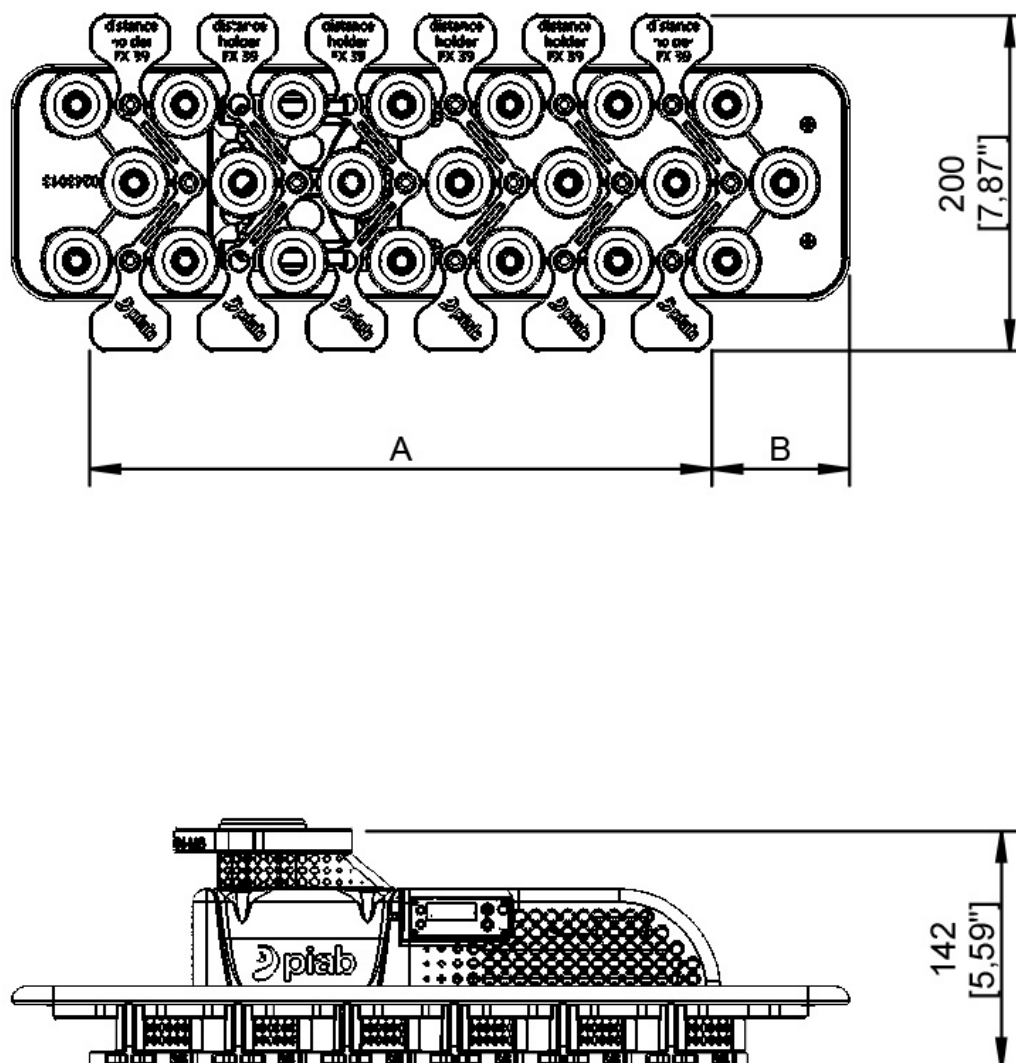


Figure 17. Dimensions of CPT equipped with cup stabilizer.

CPT size	A - mm [in]	B - mm [in]
CPT300	241.9 [9.52]	77.2 [3.04]
CPT400	306.9 [12.1]	32.1 [1.26]
CPT500	371.3 [14.62]	82.1 [3.23]

9.4. CPT Robot interfaces

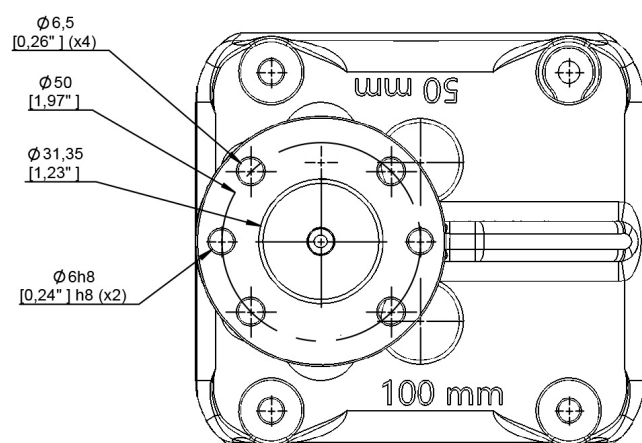


Figure 18. Dimensions of CPT Robot interface ISO50.

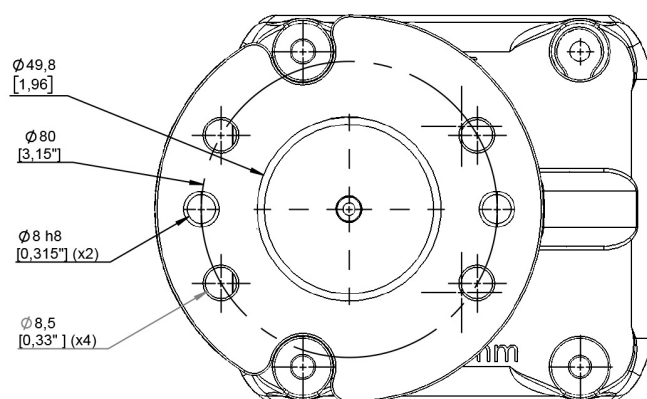


Figure 19. Dimensions of CPT Robot interface ISO80.

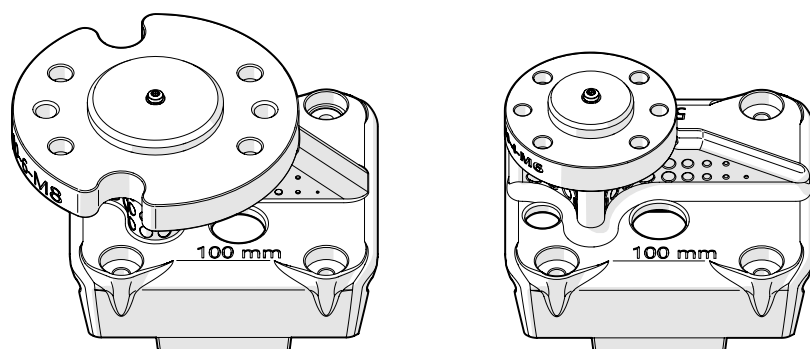


Figure 20. ISO80 and ISO50 robot interfaces.

10. Warranty

The Seller gives its Customers a five-year warranty from the receipt of the Products for vacuum pump Products (excluding vacuum pumps with electronics/controls, electro-mechanical vacuum pumps, accessories, and controls).

The Seller gives its Customers a one-year warranty from the receipt of the Products for all other Products (i.e. excluding vacuum pump Products but including vacuum pumps with electronics/controls, electro-mechanical vacuum pumps, accessories, and controls) if the failure has occurred within the specified lifetime in terms of duty cycles as set out in the Product specification (if any).

The warranty covers manufacture and materials defects in the Products and it also covers if the Products do not conform to the Product specification, excluding minor defects, if reasonably acceptable and that do not compromise efficiency in their use.

The warranty does not apply to any Product (including any component or other parts in such Products (such as suction cups, filter elements, sealings, hoses, foam, etc.) or to the software of any Products) that it was used other than the intended purpose, and: (a) has been subjected to abuse, misuse, negligence, improper storage, improper handling, improper use, improper installation, abnormal physical stress, abnormal environmental or working conditions, or use, application, installation, care, control or maintenance contrary to any applicable manual or instructions for the Products issued by the Seller or good trade practice regarding the same; or (b) has been reconstructed, repaired or altered by any persons or entities other than the Seller or its authorized representatives, or have a defect as a result of fair wear and tear or willful damage or caused by subsequent damages caused by other defective products.

The product warranty set forth in this Section is the only warranty given by the Seller in relation to the Products. The Customer may not rely and has not relied, on any other information, statement, or warranty (express or implied), whether based on applicable law or otherwise. In any case, the compensation is limited to the price of the products agreed between the parties and is excluded from indirect damages.

During the warranty period, the Seller shall replace or repair, at its own expense, faulty products determined by the Seller, in its sole discretion, to be covered by the warranty set out herein.

It is at the Seller's discretion whether a faulty Product should be returned to the Seller for replacement or if it should be repaired by the Seller at the location of the Customer. Any replaced Products shall become the property of the Seller.

The Seller is not responsible for the cost of fitting replacement parts or components of any Products into any products or alike of the Customer.

These Terms and Conditions shall apply to any repaired or replaced Products by the Seller.

11. Recycling and disposal



Environmental aspects are considered in the development process of Piab's products to make sure that a minimal environmental footprint is used.

Piab AB is certified with ISO-14001:2015.

Piab AB also complies with:

- RoHS2 (2011/65/EU)
- REACH (EC 1907/2006)

The ways of handling recycling and disposal vary from country to country, and therefore this process needs to be in full compliance with each national regulation. If possible, disassemble the product into its various components. Electrical and electronic equipment should be handed over to an authorized body for disposal, as well as the metal parts. All other parts can either be recycled or sorted as waste.

For further information regarding REACH, visit piab.com/resources/document-centre.







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