

Manual

# MFE

Multi Function Ejector





This manual is available in the following languages at [piab.com](https://piab.com)

The original manual is written in English.



中文



English



Français



Deutsch



Italiano



日本語



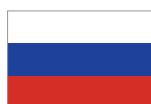
한국어



Polski



Português (Brasil)



Русский



Español



Svenska

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# 1. Introduction to the manual

## 1.1. About the manual

The manual is available for download at [piab.com](http://piab.com) in the languages shown on page 2. The original instructions are written in English.

- 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.

## 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 meaning:

### 1.2.1. Warning signs



#### Warning

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



#### Warning

Vacuum force



#### Warning

Exhaust



#### Warning

Unrestricted 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. Compliance



Table 1. 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

All components of the product are free from silicone.

## 2. Safety instruction

### 2.1. Disclaimer

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

The product is intended to be incorporated into machinery or to be assembled with other machinery to constitute machinery covered by Directive 2006/42/EC, as amended.

It is not allowed to put the machinery into service until the machinery into which it is to be incorporated or of which it is to be a component has been found and declared to be in conformity with the provision of Directive 2006/42/EC and with national implementing legislation, i.e. as a whole, including the machinery referred to in this declaration.

### 2.2. General safety

**Warning**

Vacuum force

**Warning**

Exhaust

**Warning**

Unrestricted exhaust

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

The use of safety guards is recommended to minimize the risk of injury to persons; pay close attention to the fact that compressed air may lead to an explosion of closed containers, and vacuum may lead to the implosion of closed containers.

In the event that, contrary to indications, dust, oil mists, fumes, etc. are suctioned, these will be mixed with the discharge air of the vacuum generator and expelled via the discharge conduit; use suitable, approved air filters to avoid possible intoxication.

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

### 2.3. Safe usage

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



### Warning

- Do not evacuate liquids to avoid product damage and application failure.
- Ensure that a filter is used for preventing ejected objects if the product is used for evacuating solid content.
- Ensure no foreign matters enter the exhaust port due to the risk of ejected objects and damage of the product.
- Do not restrict or block the exhaust, to avoid product damage and application failure.
- Ensure that the vacuum and exhaust ports are not simultaneously blocked when the unit is generating vacuum. This is to avoid ejected objects and damage of the product, and application failure.
- Vacuum and exhaust air can cause severe injuries. Keep hands, legs, hair, and eyes away from vacuum inlets and exhausts.
- Do not install or operate your product if it is damaged during transport, handling or use. Damage may result in bursting and and cause injury or property damage.
- To avoid personal injury, equipment damage, and application failure, ensure that the compressed air line is properly secured.

### 2.3.1. Assembly

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

Prior to assembly and disassembly of the components, cut off voltage and pressure. Install and maintain the components only after thoroughly reading and understanding this manual.

### 2.3.2. Maintenance



### Warning

Irresponsible use of supply air may cause injury. Supply air must never be used for anything else than designated purposes. Remember to always shut off the air supply when cleaning or servicing the modules.

Maintenance must be carried out in accordance with the instructions in this manual. Prior to any maintenance work, suspend the pneumatic/electrical supply, and discharge residual pressure.

## 2.4. Intended use

- For professional use only.
- The product shall be used to evacuate air (nonliquids) from a volume to create vacuum for gripping, holding, and processes.
- The product can be used to blow air for surface cleaning and to remove vacuum from a volume.
- The product can be used to detect and monitor vacuum.
- The product is used for creating vacuum or blow.
- The product shall be installed in accordance with installation instructions.
- The product shall be maintained in accordance with maintenance instructions.
- The product shall be used in environments within the product's specifications and certifications.
- Troubleshooting shall be conducted in accordance with the instructions in the manual.

## 2.5. Misuse

- Do not use the product if it is damaged.
- The product shall not be used to create vacuum or blow for other purposes than the intended use.
- Do not use the product for evacuating liquids.
- The product shall not be used in a fully closed compartment, without ventilation and exhaust channeling.
- Do not keep the valves activated when the product is not in operation for a prolonged time. The seals and lubrication will degrade.
- Do not use blow-off functions or ejector exhaust for pressurizing components such as cylinders and/or tank volumes.
- Do not use compressed air or electrical voltage outside the specification (operation voltage +/- 10%).
- Do not use the equipment as a standalone unit to fulfill international lifting standards.
- Do not use the product for evacuating hazardous substances and/or gases without containing and handling the exhaust flow in a proper way.
- The product shall not be used to evacuate solid content without the use of a filter.
- Do not use the product if the compressed air line is not properly secured, as loose compressed air lines can cause severe injuries.
- Do not use the product if the exhaust is restricted or blocked.
- Do not use the product if the vacuum and exhaust port are simultaneously blocked when the unit is generating vacuum.



## 3. Introduction to the MFE

### 3.1. Manufacturer

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

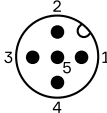
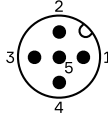
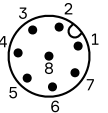
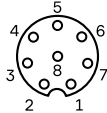
### 3.2. Identification label

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 Serial number.

### 3.3. Overview

The ejector is available with both integrated silencer and G1/2" port.

#### 3.3.1. Electrical connection

	Version C, M12 5-pin	Version D, M12 5-pin	Version S, M12 8-pin	Version R, M8 8-pin**
				
<b>Time set blow-off</b>	X	X	X	X
<b>Adaptive blow-off</b>	X	X	X	X
<b>Manual / External blow-off</b>	-	X	X	X
<b>Feedback, Vacuum OK / Blow-off OK</b>	X	X	X	X
<b>Feedback, Predictive Maintenance*</b>	X	-	X	X

\* Feedback when deviations in vacuum generation, e.g. when leakage occur.

\*\* The cable length for version R is 210 mm.

### 3.4. Technical data

Description	Symbol	Min.	Typ.	Max.	Unit	Comment
Supply voltage	$V_S$	19.2	24	26.4	VDC	Reverse polarity prot. <sup>1)</sup>
Rated current from $V_S$	$I_S$	-	-	100	mA	$V_S = 24V$ <sup>2)</sup>
Voltage output signals	$V_{Out}$	$V_S - 2$	-	$V_S$	VDC	
Current output signals	$I_{Out}$	-	-	100	mA	Short circuit prot. <sup>3)</sup>
Voltage input signals	$V_{In}$	15	-	$V_S$	VDC	Relative to $V_S GND$
Current input signals	$I_{In}$	-	5	-	mA	$V_S = 24V$
Storage temperature	-	-10	-	+60	°C	
Operating temperature	-	0	-	+50	°C	
Operating pressure	-	4	-	7	bar	
Recommended pressure	-	-	5	-	bar	
Degree of protection	-	-	-	IP65	-	With electrical connector connected
Humidity	-	10	-	90	% r.h.	Free from condensation
Operating medium	According to ISO 8573-1:2010 [3:4:1]					

1) Power supply must comply with EN60204.

2) Current consumption without external load.

3) Constant maximum external load on all output simultaneously in combination with high environment temperature might damage the ejector.

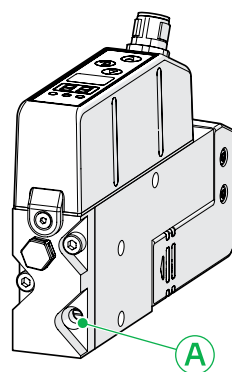
### 3.5. Materials

Part	Materials
Ejector housing	Black anodized aluminium
Nozzle	Brass
Cover and silencer	PC/ABS
Cable	PUR

### 3.6. Startup

As a recommendation, adjust the Blow-off to a minimum with the built-in throttle screw to avoid damages to the handled objects or the surroundings before the applications are up and running.

It is recommended to adjust the Blow-off to a minimum to minimize the air consumption.



**A:** Throttle screw

### 3.7. Choose the right size pipe and tube

Ejector size		Air supply			On the vacuum side			On the exhaust side		
Designation	Air consumption in	1 m	3 m	5 m	1 m	3 m	5 m	1 m	3 m	5 m
	NI/min	Internal diameter (mm)			Internal diameter (mm)			Internal diameter (mm)		
<b>MFE.050H.xxx</b>	53	4	4	4	6	9	9	6	6	6
<b>MFE.100H.xxx</b>	110	4	4	4	9	12	12	6	6	9
<b>MFE.200H.xxx</b>	200	4	4	4	12	12	12	9	9	9
<b>MFE.300H.xxx</b>	300	4	4	6	12	16	16	9	9	9
<b>MFE.400H.xxx</b>	430	4	6	8	16	16	16	12	12	16

### 3.8. Vacuum flow

Designation	Vacuum flow (NI/min) at different vacuum levels (-kPa)									Primary nozzle(s) ø (mm)
	0	10	20	30	40	50	60	70	80	
<b>MFE.050H.xxx</b>	43	40	36	30	22	16	13	6	2	1,0
<b>MFE.100H.xxx</b>	80	74	67	55	41	29	25	11	3	1,5
<b>MFE.200H.xxx</b>	145	130	113	91	66	48	36	20	5	2,0
<b>MFE.300H.xxx</b>	195	172	153	127	96	70	52	29	8	2,5
<b>MFE.400H.xxx</b>	245	220	195	165	128	101	77	43	11	3,0

### 3.9. Ordering key

<b>M</b>	<b>F</b>	<b>E</b>	<b>.</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>H</b>	<b>.</b>	<b>A</b>	<b>S</b>	<b>1</b>
----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------

Product series	Size	Vacuum level	Function	Electrical connection	Silencer
<b>MFE</b>	<b>200</b>	<b>H</b>	<b>A</b>	<b>S</b>	<b>1</b>
<b>MFE: AUTOVAC</b> MFE ejector	<b>50:</b> ø1 mm	<b>H:</b> High	<b>A:</b> NC	<b>C:</b> M12, 5-pin	<b>O:</b> Without
	<b>100:</b> ø1,5 mm		<b>B:</b> NO	<b>D:</b> M12, 5-pin	<b>1:</b> With
	<b>200:</b> ø2 mm			<b>S:</b> M12, 8-pin	
	<b>300:</b> ø2,5 mm			<b>R:</b> M8, 8-pin, cable	
	<b>400:</b> ø3 mm				

## 4. Installation

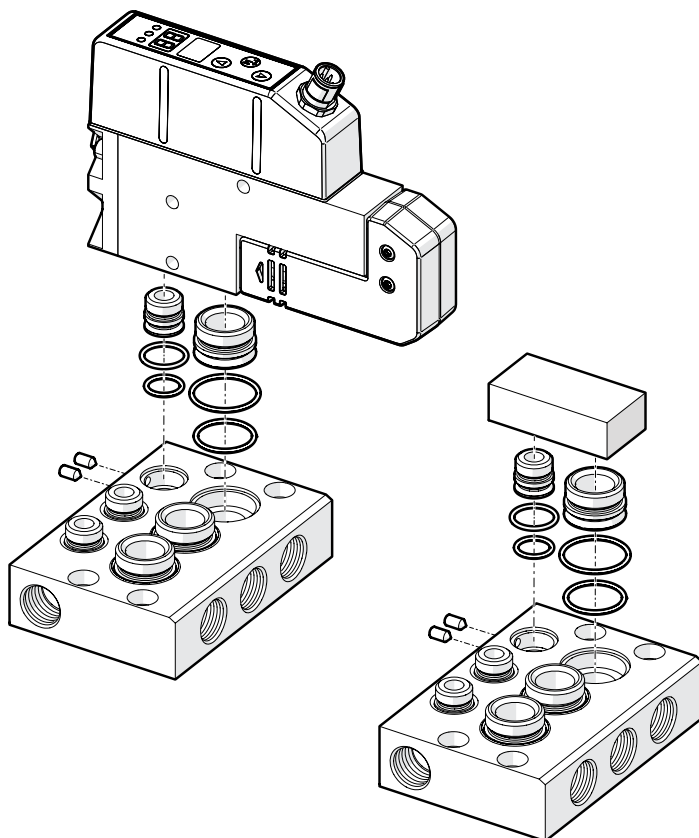
### 4.1. Multiple manifolds for MFE

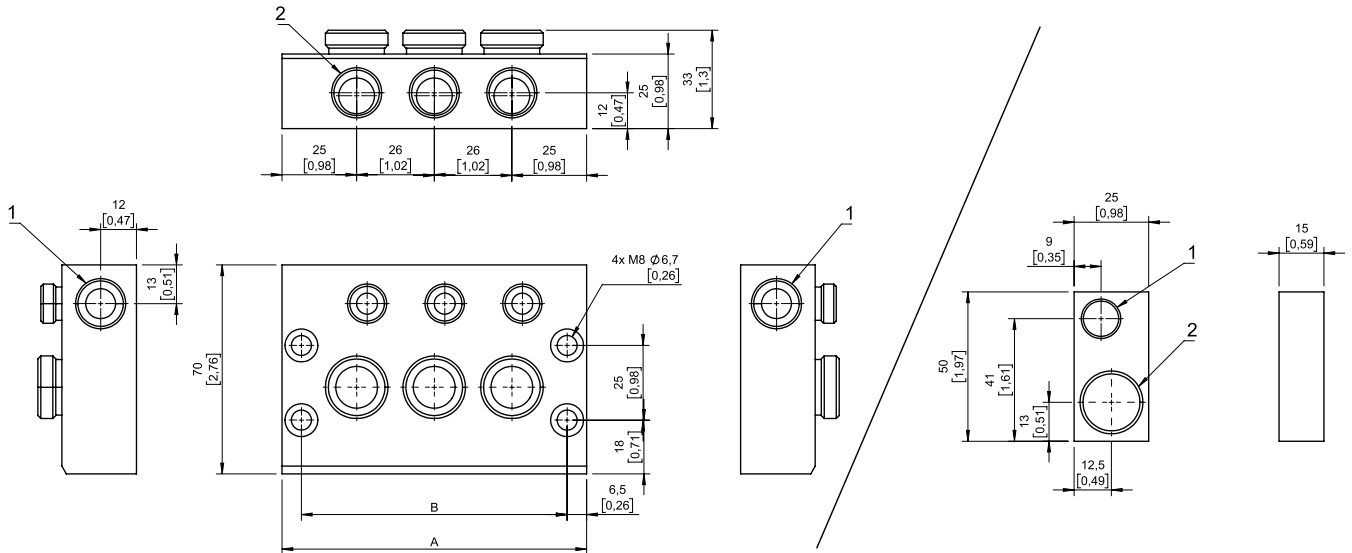
- Compact block mounting
- For all MFE sizes
- Excellent overview
- Easy exchange of units
- Easy installation
- To prepare for a potential increase in the number of ejectors on the multiple manifolds, a blind plate is available to reserve one position for this purpose.

The units can also be supplied manifold mounted with two to five ejectors in any size.

1. The ejector is easily mounted onto the manifold by first fastening the brass nipples gently into the ejector or blind plate connections.
2. Then place the attached O-rings in the manifold carefully and push the ejector/blind plate gently together with manifold without damaging the O-rings.
3. Thereafter, tighten the set screws (2 pcs per ejector) step by step while pressing down the ejector in its position.

The manifold can be connected to the air supply (G 3/8") on either side.



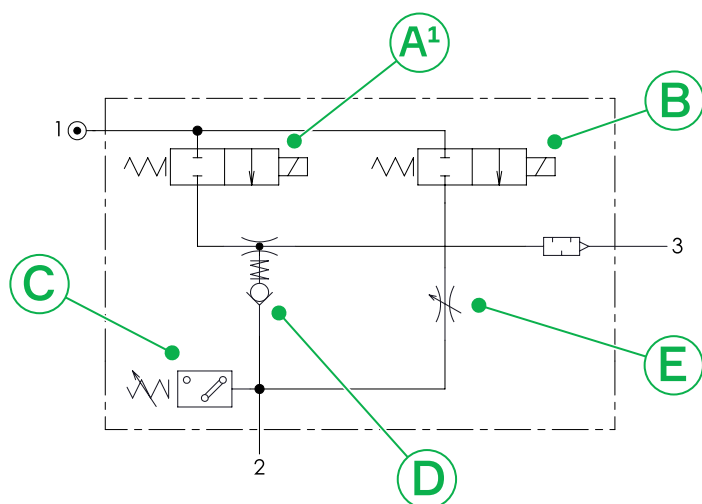


1 = Compressed air, 2 = Vacuum

Multiple manifold for MFE	A mm ["]	B mm ["]	Vacuum - connection (2)	Weight kg [lb]	Order no.
2	76 [3]	63 [2.5]	G 3/8" (x2)	0.325 [0.717]	0244553*
3	102 [4]	89 [3.5]	G 3/8" (x3)	0.445 [0.984]	0244554*
4	128 [5]	115 [4.5]	G 3/8" (x4)	0.560 [1.235]	0244555*
5	154 [6.1]	141 [5.6]	G 3/8" (x5)	0.680 [1.499]	0244556*
Blind plate	-	-	-	0.040 [0.088]	0244557

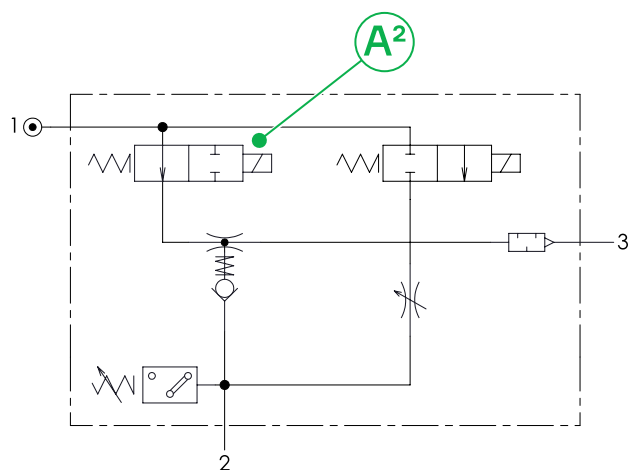
\* Screws and O-rings supplied

## 4.2. Function MFE - NC



- |                      |  |
|----------------------|--|
| <b>A<sup>1</sup></b> | <b>Solenoid valve (NC) for air supply.</b> Activated only when the vacuum level is too low. Makes considerable air savings possible. |
| <b>B</b>             | <b>Solenoid valve for blow-off.</b> For a quick and accurate blow-off.   |
| <b>C</b>             | <b>Built-in Vacuum sensor.</b>   |
| <b>D</b>             | <b>Vacuum safety valve.</b> Maintains the vacuum level when the ejector is not activated.  |
| <b>E</b>             | <b>Adjustable blow-off.</b> The flow is possible to adjust. Important when handling sensitive objects.                               |

## 4.3. Function MFE - NO



**A<sup>2</sup>: Solenoid valve (NO) for air supply.** Activated only when the required vacuum level is reached. This makes considerable air savings possible.



### Notice

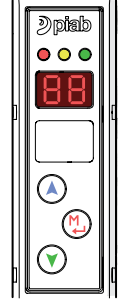
The safety holding valve cannot be regarded as a safety product, but to be considered as a possibility to extend the time until the object is dropped.

## 4.4. MFE ejector programming

### Function "AUTOVAC" (Selected with Parameter U)

#### Standard case

- Vacuum generation starts on input signal from an external system (+24V).
- As long as this signal is active, the ejector will maintain the vacuum levels automatically. For example: When the vacuum level is less than 65 -kPa (parameter C) vacuum is generated, and when reaching more than 70 -kPa (parameter E) the vacuum generation is stopped in order to save as much compressed air as possible.
- A signal is given to the external system (PNP, +24V) when the vacuum level reaches e.g. -kPa (Parameter A).
- A special function "Module save" is available to avoid continuous ejector valve switching.
- Relevant parameters for "AUTOVAC" are: **A, C, E, F, H, L, and P.**



### Function "MANUVAC" (Selected with Parameter U)

***This function is mainly used if a leakage is expected or lifting objects with leakage through materials to avoid continuous ejector valve switching.***

- Vacuum generation starts on input signal from an external system (+24V).
- As long as this signal is active, the ejector will generate vacuum.
- A signal is given to the external system (PNP, +24V) when the vacuum level reaches e.g. 60 -kPa (Parameter A).
- Relevant parameters for "MANUVAC" are: **A, F, J, and L.**

### Adaptive time and vacuum manage blow-off (Selected with Parameter U and adjusted with Parameter F)

- The ejector will automatically blow-off upon deactivation of the vacuum generation signal for a pre-set of time (default 0,5 sec.). The ejector will analyze if there is any remaining vacuum; If so, the ejector will blow-off until no vacuum remains. Following cycles the blow-off time will be further improved.
- The default blow-off time is adjustable with parameter F (value x 100ms).
- This function intention is primarily for static applications (no variations in vacuum volumes).

### Externally operated blow-off: Version D, S, and R

Blow-off on a signal from external system (+24V). (Manual blow-off is disabled if vacuum generation signal is active.)

### Module save (Selected with Parameter P)

- The purpose with this function is to minimize extensive valve switching caused by e.g. worn/damaged suction cups. If the module has reached a number of "re-fillings" within a cycle, the module will change behavior and generate vacuum continuously.
- The limit for number of allowed "re-fillings" is selected with parameter P. If this parameter is set to value "0", this function is disabled.

### Feedback Vacuum level

Vacuum level is always monitored and showed on the display, except when the module is in programming mode.

Feedback automatic blow-off done:

As the blow-off initiates by deactivating the vacuum generation meaning that vacuum level feedback is out of interest, the output signal for "Vacuum OK" changes to a "Blow-off OK" signal. (Signal is deactivated when blow-off done.)

Feedback "Predictive maintenance" for AUTOVAC, **version C, S, and R:**

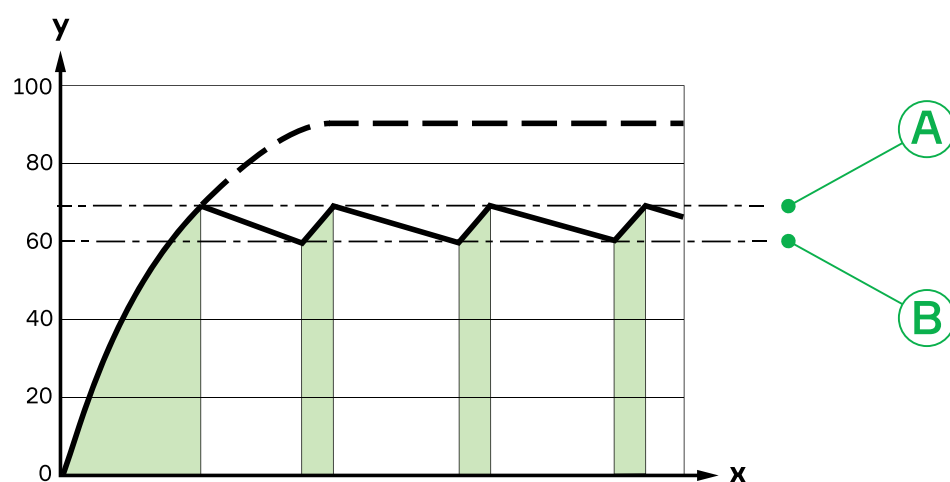
For Predictive maintenance there is an additional output signal available for the external system (PNP, +24V). This signal can have different behaviors depending on parameter L:

1. A signal while vacuum is generated. Time to reach e.g. 60 (parameter A) can then be measured. Also, if a "re-fill" of vacuum occurs, the time and number of "re-fills" can be measured and analyzed.
2. A signal when a predefined number e.g. 2 (parameter H) of "re-fills" has occurred within a cycle.



Feedback "Predictive maintenance" for MANUVAC, **version C, S, and R:**

For Predictive maintenance there is an additional output signal available for the external system (PNP, +24V). This signal can have different behaviors depending on parameter L: A signal when a predefined time defined by parameter J (value x 100 ms) has elapsed without reaching the set vacuum level (parameter A).

## 4.5. Potential energy savings and control of MFE



<b>x</b>	Ejector operating time
<b>y</b>	Vacuum (-kPa)
<b>A</b>	Upper breakpoint
<b>B</b>	Lower breakpoint

	<b>Ejector operating (air consumption)</b>
	<b>Ejector not operating (no air consumption)</b>

The air supply valve (2/2 NC) is activated and the ejector starts generating vacuum. The valve remains activated until the Upper breakpoint vacuum level has been reached. The vacuum sensor provides the controller with a signal to interrupt the air supply to the ejector. The vacuum level is maintained thanks to the integrated vacuum safety valve.

In all vacuum systems leakages occur in suction cups, connections, and tubes, which gradually decreases the vacuum level.

When the vacuum level reaches the preset minimum value, the vacuum sensor provides a signal to the controller to open the air supply again. When the maximum vacuum level is reached again, the valve is shut off and this procedure continues until the object shall be released.

The gap between the set maximum and the minimum vacuum level is the hysteresis. In most cases, the hysteresis of the vacuum sensor is adjustable which could make it possible to save more than 95% of the air consumption.



As the vacuum safety valve is maintaining the vacuum level, the solenoid valve for blow-off has to be activated to release the object rapidly and with accuracy.

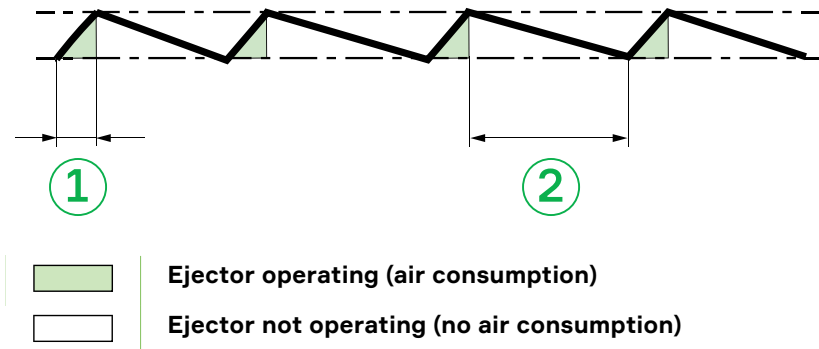


**Notice**

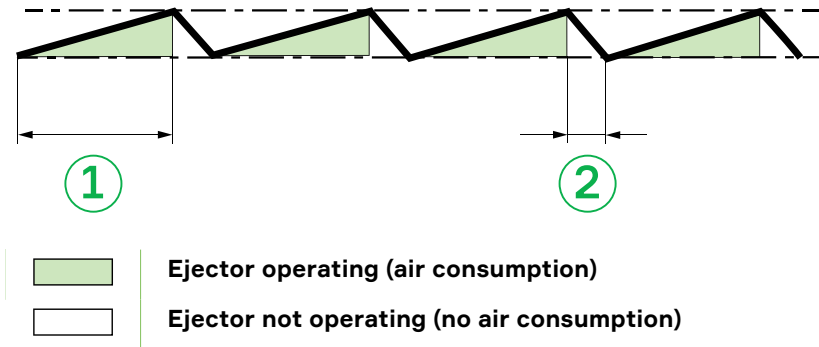
When selecting the MANUVAC function no air saving is available.

**4.5.1. Surveillance**

By adding a surveillance system it is possible to monitor the air tightness of the system. If the solenoid valve actuates too frequently, it is mostly due to a leakage in the system. Measures should be taken to overhaul the vacuum circuit.



- 1. Short activation = airtight system. Short gap from activation to non-activation of air supply, signifies an airtight system.
- 2. Long non-activation = airtight system. Long gap from activation to non-activation of air supply signifies an airtight system.

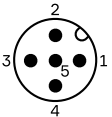
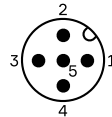
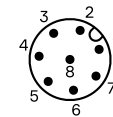
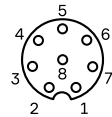


- 1. Long activation (air consumption). Long gap from activation to non-activation of air supply signifies a NOT airtight system that should be checked in order to avoid unnecessary air consumption.
- 2. Short non-activation = leaking system. Short gap from activation to non-activation of air supply signifies a NOT airtight system that should be checked in order to avoid unnecessary air consumption.

In the MFE **C**, **S**, and **R** versions, system leakage may be monitored and output signaled in the event of any faults.

# 5. Operation

## 5.1. Connectors





	<b>Version C, M12 5-pin</b>	<b>Version D, M12 5-pin</b>	<b>Version S, M12 8-pin</b>	<b>Version R, M8 8-pin**</b>
				
<b>Time set blow-off</b>	X	X	X	X
<b>Adaptive blow-off</b>	X	X	X	X
<b>Manual / External blow-off</b>	-	X	X	X
<b>Feedback, Vacuum OK / Blow-off OK</b>	X	X	X	X
<b>Feedback, Predictive Maintenance*</b>	X	-	X	X

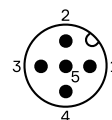
\* Feedback when deviations in vacuum generation, e.g. when leakage occur.

\*\* The cable length for version R is 210 mm.




The colours in the tables below refer to the graphs on the upcoming pages.

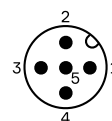
### M12 male connector, AVAC Ver. C

Pin 1 - Supply voltage	+24 VDC		
Pin 2 - Vacuum (Start)	Input 24 VDC PNP		
Pin 3 - Supply voltage	0 V (GND)		
Pin 4 - Vacuum/blow-off OK	Output +24 VDC		
Pin 5 - Predictive Maintenance	Output +24 VDC		








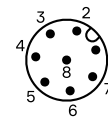
### M12 male connector, AVAC Ver. D

Pin 1 - Supply voltage	+24VDC		
Pin 2 - Vacuum (Start)	Input 24 VDC PNP		
Pin 3 - Supply voltage	0 V (GND)		
Pin 4 - Vacuum/blow-off OK	Output +24 VDC		
Pin 5 - Blow-off on	Input 24 VDC PNP		








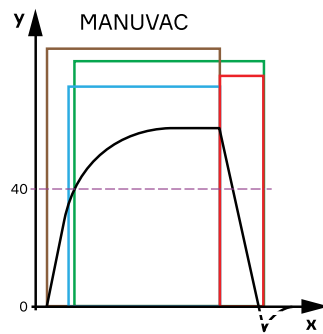
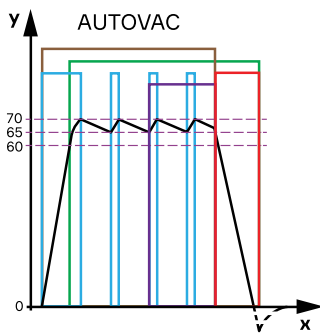
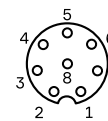
**M12 male connector, AVAC Ver. S**

Pin 1 - Vacuum/blow-off OK	Output +24VDC		
Pin 2 - Supply voltage	+24 VDC		
Pin 3 - Predictive Maintenance	Output +24 VDC		
Pin 4 - Vacuum (Start)	Input 24 VDC PNP		
Pin 5 -			
Pin 6 - Blow-off on	Input 24 VDC PNP		
Pin 7 - Supply voltage	0 V (GND)		
Pin 8 -			








**M8 female connector, AVAC Ver. R**

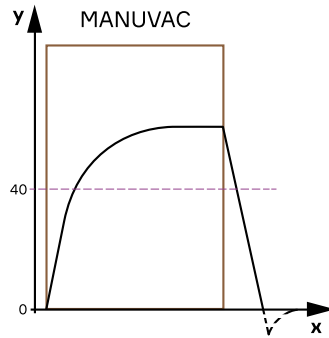
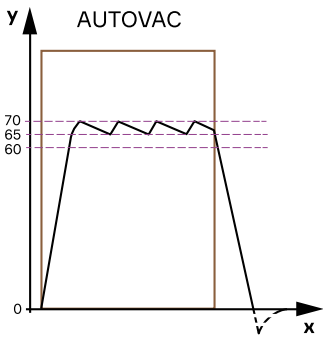
Pin 1 -			
Pin 2 -			
Pin 3 - Predictive Maintenance	Output +24 VDC		
Pin 4 - Vacuum/blow-off OK	Output +24 VDC		
Pin 5 - Supply voltage	+24 VDC		
Pin 6 - Blow-off on	Input 24 VDC PNP		
Pin 7 - Vacuum (Start)	Input 24 VDC PNP		
Pin 8 - Supply voltage	0 V (GND)		



Vacuum Level

- Input: Start 
- Output signal: Vacuum/blow-off OK 
- Output signal: "Predictive maintenance" option 1 
- Output signal: "Predictive maintenance" option 2 
- Input: Blow-off on 

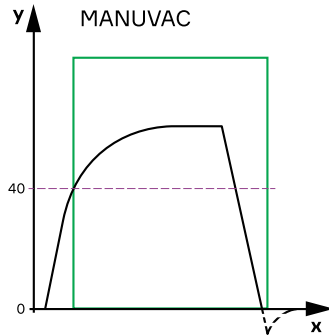
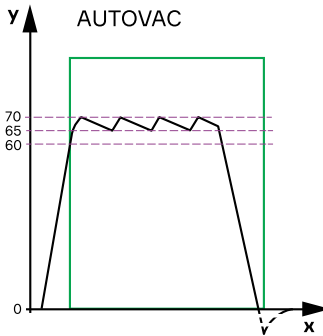
x: time, y: -kPa



Vacuum Level



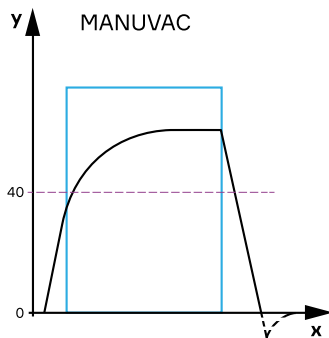
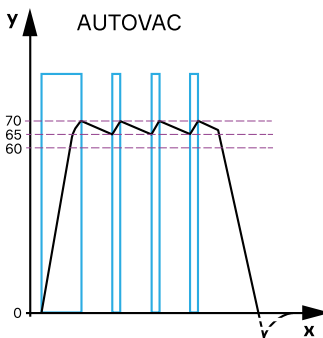
Input: Start



Vacuum Level



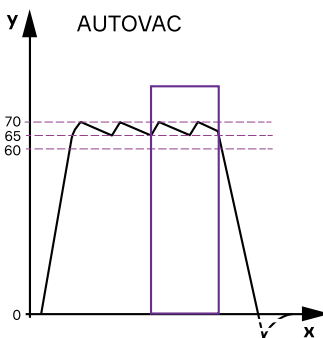
Output signal: Vacuum/  
blow-off OK



Vacuum Level



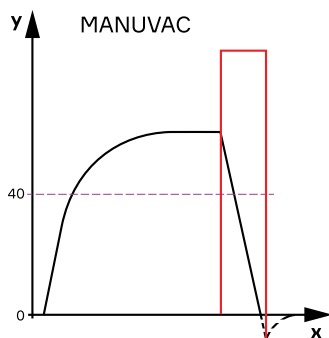
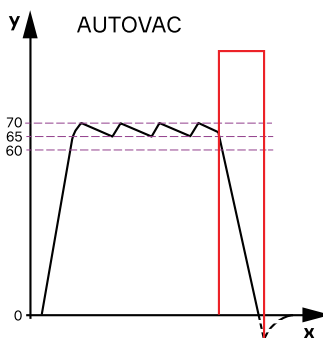
Output signal: "Predictive  
maintenance" option 1



Vacuum level



Output signal: "Predictive  
maintenance" option 2



Vacuum Level



Input: Blow-off on



x: time, y: -kPa

## 5.2. Parameter settings

Parameter name (Visible in display)	Parameter value	Parameter description
<b>A</b>	<b>60</b>	Vacuum level OK limit (default: 60 -kPa). AUTOVAC and MANUVAC.
<b>C</b>	<b>65</b>	Lower breakpoint (default: 65 -kPa). AUTOVAC.
<b>E</b>	<b>70</b>	Upper breakpoint (default: 70 -kPa). AUTOVAC.
<b>F</b>	<b>5</b>	Blow-off time (default: 500 ms. 100 ms / step).
<b>H</b>	<b>2</b>	Limit value for number of vacuum cycles (default: 2 pcs). AUTOVAC.
<b>J</b>	<b>20</b>	Limit to reach vacuum, parameter A (default: 2000 ms. 100 ms / step). MANUVAC.
<b>L</b>	<b>1</b>	Feedback mode (default: 1). AUTOVAC or MANUVAC.
<b>P</b>	<b>0</b>	Module save (default: 0. 0 = No, 1 - 99 = Yes). AUTOVAC.
<b>U</b>	<b>11</b>	See <i>Parameter description Parameter U</i> .

### Programming sequence (Changes to parameter "A")

Press and hold the button **M↵** for at least 3 seconds. Then release.

Display will initially show an "A" and then change to this parameter current value, and so on.

To change the value, press **▲** or **▼**. A short press < 1 sec. changes the value with +1 or -1. A long press > 1 sec. changes the value with +10 or -10. Please note, the new value is shown when releasing the button.

To save current parameter value, press and hold button **M↵** for at least 3 seconds, then release. To skip and jump to the next parameter, make a short press on button **M↵**. The display will now show the next parameter C.

Parameter "U" is the last one. It is the same procedure for all parameters, and you will leave programming mode.



#### Notice

AUTOVAC or MANUVAC has to be selected under Parameter U.

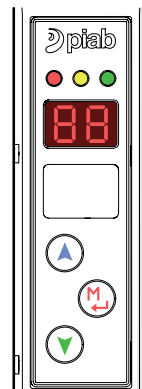
#### Programming buttons

##### Mode/Enter/Return (**M↵**)

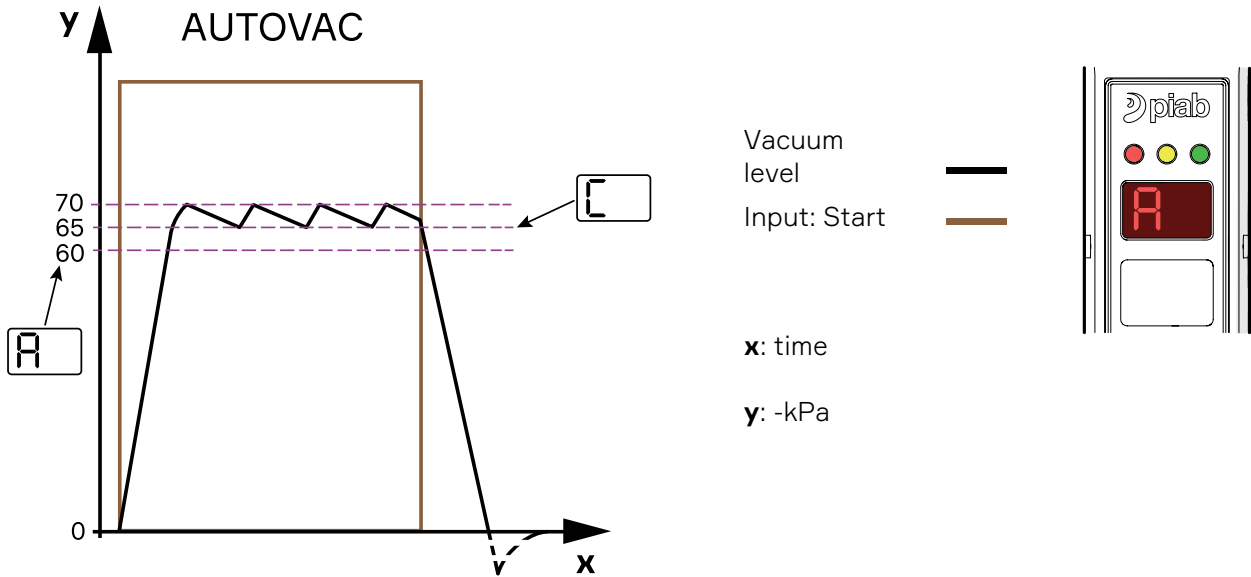
- Enter programming mode: Long press >3s (Yellow LED)
- Step to next parameter: Short press <3s (Green LED)
- Save parameter value: Long press >3s (Green LED)

##### Arrow Up & Down (**▲** & **▼**)

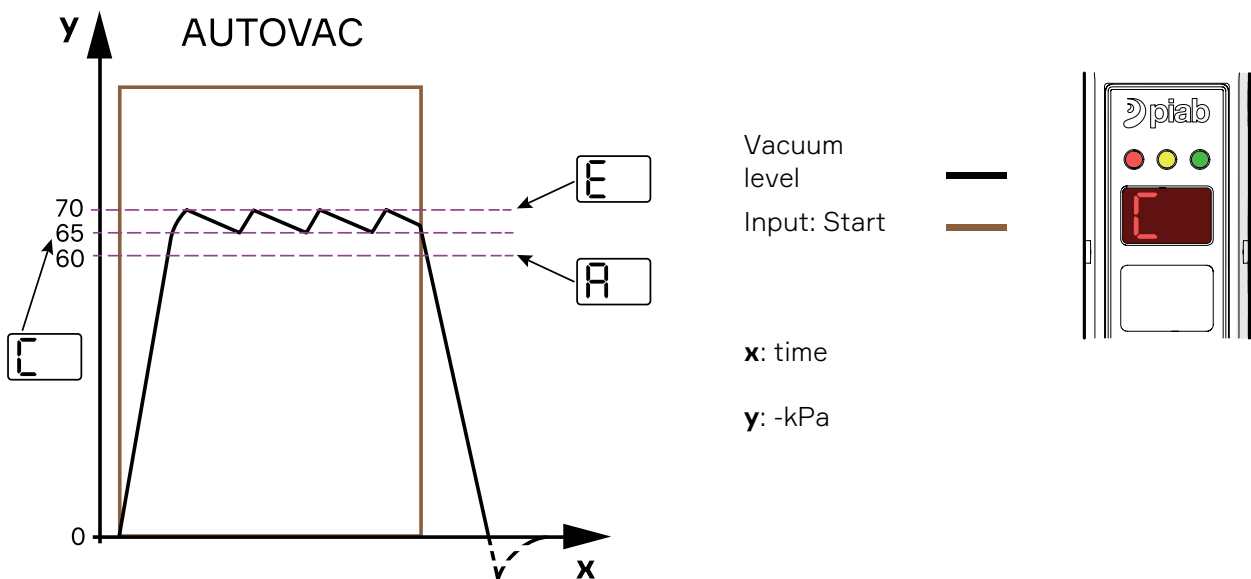
- Change parameter value ±1: Short press <1s (Green LED)
- Change parameter value ±10: Long press >1s (Yellow LED)



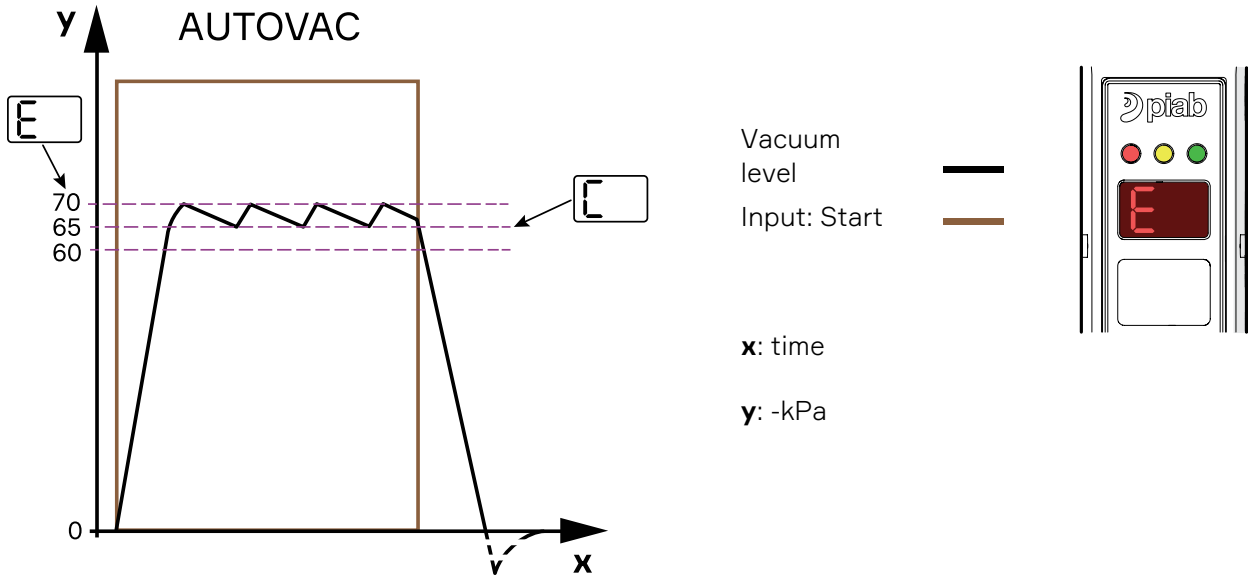
Parameter name (Visible in display)	Parameter description
<b>A</b>	<p><b>60: Limit for "Vacuum level OK" feedback</b> (default: 60 -kPa)</p> <p>When vacuum generation has reached this limit, a signal is given to the external system. This parameter value has to be lower than parameter <b>C</b>.</p>



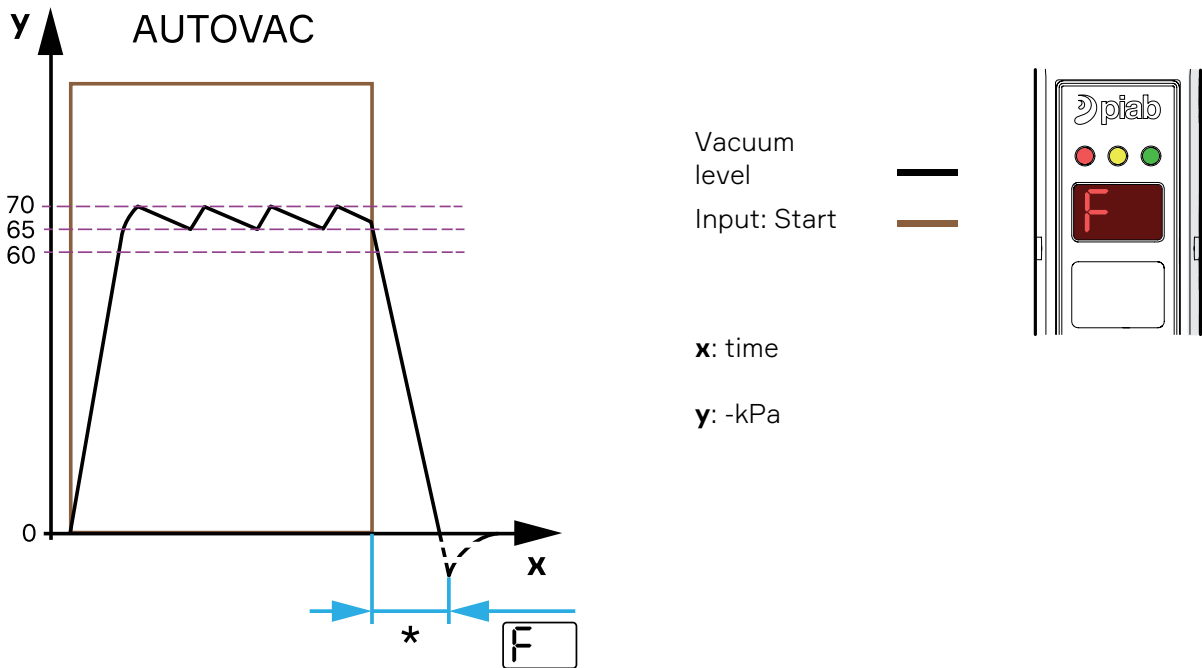
Parameter name (Visible in display)	Parameter description
<b>C</b>	<p><b>65: Limit for vacuum generation ON</b> (default: 65 -kPa)</p> <p>When vacuum level is below this value, vacuum generation restarts. This parameter value has to be lower than parameter <b>E</b> and greater than parameter <b>A</b>.</p>



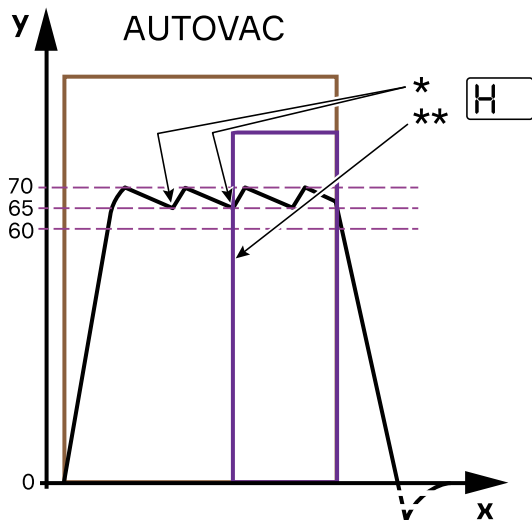
Parameter name (Visible in display)	Parameter description
<b>E</b>	<b>70: Limit for vacuum generation OFF</b> (default: 70 -kPa)  When vacuum level is above this value, vacuum generation stops. This parameter value has to be greater than parameter <b>C</b> .



Parameter name (Visible in display)	Parameter description
<b>F</b>	<b>5: * Blow-off time</b> (default: 500 ms, 100 ms/step).  Valid only for automatic blow-off (U=11 and U=14).



Parameter name (Visible in display)	Parameter description
<b>H</b>	<b>2: Limit for number of "Re-fills", AUTOVAC</b> (default: 2 times).  Valid only for versions D, S, and R when parameter L = 2.



**\*Number of "Re-fills"**  
(default 2 times)

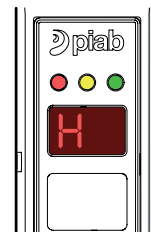
\*\*Signal when the limit for "Re-fills" is reached

Output signal: "Predictive maintenance" option 2

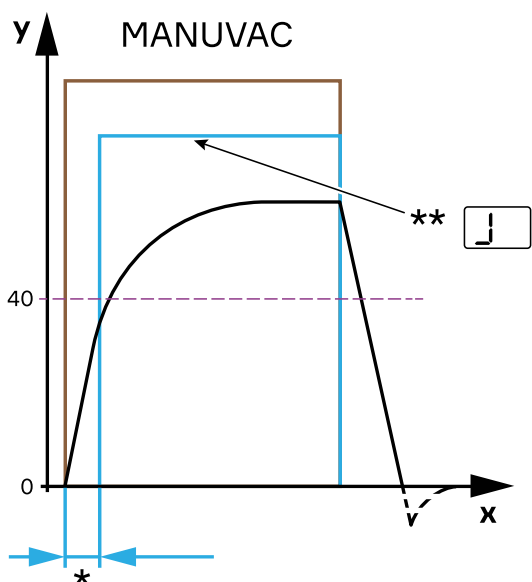
Vacuum level

Input: Start

**x:** time, **y:** -kPa



Parameter name (Visible in display)	Parameter description
<b>J</b>	<b>20: Limit for time to reach vacuum limit, MANUVAC</b> (default: 2000 ms, 100 ms/step).  Valid only for versions D, S, and R when parameter L = 1.



\* Time limit to reach vacuum

\*\* Signal when time limit is reached

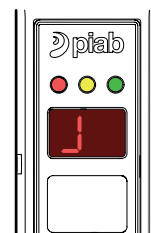
Output signal: "Predictive maintenance" option 1

Vacuum level

Input: Start

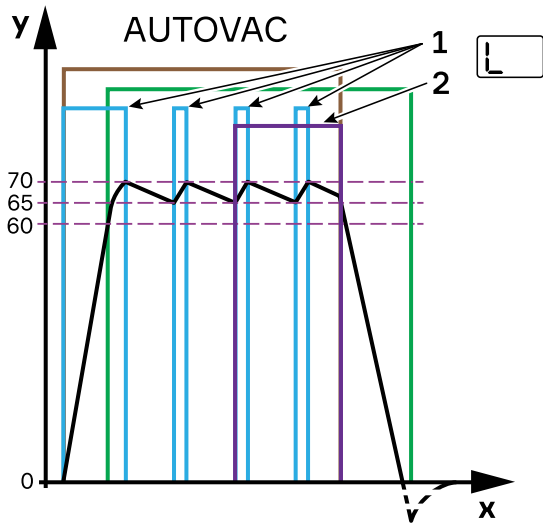
**x:** time

**y:** -kPa





Parameter name (Visible in display)	Parameter description
<b>L</b>	<p><b>1: Predictive Maintenance Feedback Mode</b> (default: 1)</p> <p>Valid only for versions C, S, and R when:                      MANUVAC: L = 1 (option 1)                      AUTOVAC: L = 1 (option 1) or L = 2 (option 2)</p>



x: time, y: -kPa

**1:** Output for Predictive maintenance option 1

**2:** Output for Predictive maintenance option 2

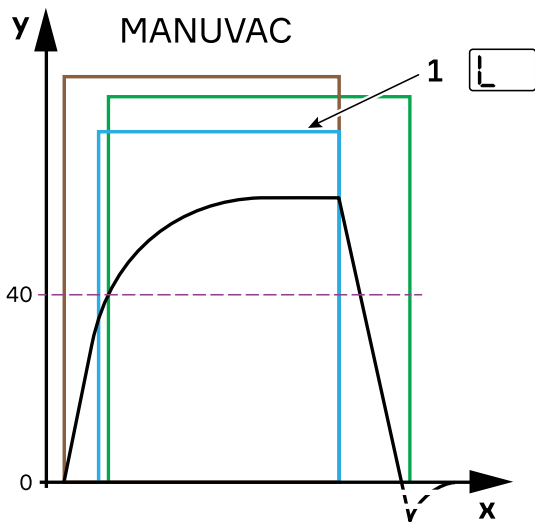
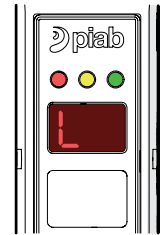
Output signal: Vacuum/blow-off OK

Output signal: "Predictive maintenance" option 1

Output signal: "Predictive maintenance" option 2

Vacuum level

Input: Start



x: time, y: -kPa

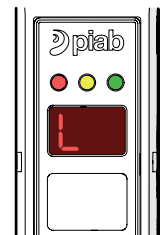
**1:** Output for Predictive maintenance option 1

Output signal: Vacuum/blow-off OK

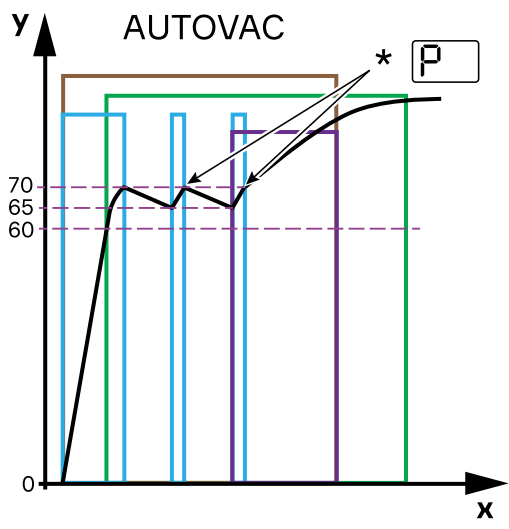
Output signal: "Predictive maintenance" option 1

Vacuum level

Input: Start



Parameter name (Visible in display)	Parameter description
<b>P</b>	<p><b>0: Module Save, AUTOVAC</b> (default: 0. 0 = OFF, 1...99 = ON)</p> <p>The purpose of this function is to minimize extensive valve switching caused by e.g. worn/damaged suction cups. If the module has reached a number of "re-fillings" within a cycle, the module will change behavior and generate vacuum continuously like MANUVAC. If the parameter is set to "0", this function is disabled.</p>



\*Number of re-fills

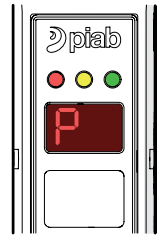
Output signal: Vacuum/blow-off OK

Output signal: "Predictive maintenance" option 1

Output signal: "Predictive maintenance" option 2

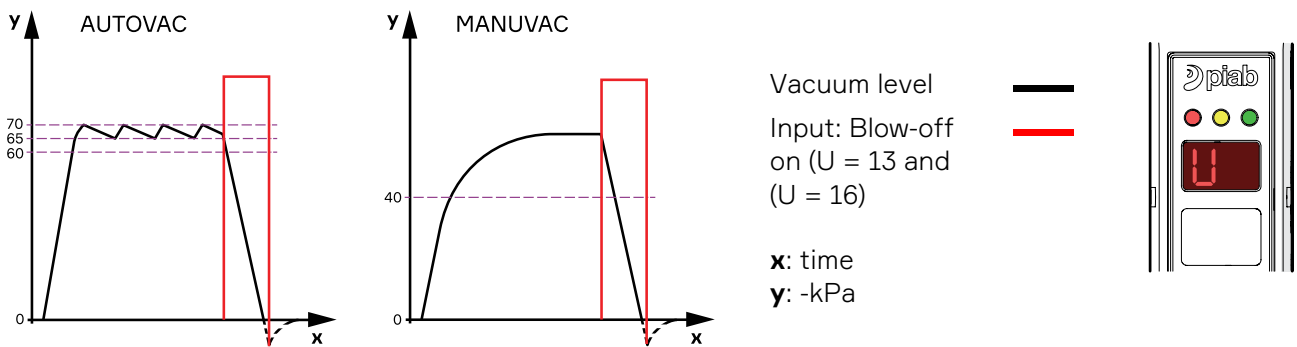
Vacuum level

Input: Start



x: time, y: -kPa

Parameter name (Visible in display)	Parameter description
<b>U</b>	<p><b>11:</b></p> <p><b>AUTOVAC</b> function with:</p> <ul style="list-style-type: none"> <li>• Adaptive time and vacuum manage blow-off (U = 11)</li> <li>• Time operated blow-off (U = 12)</li> <li>• Externally operated blow-off (U = 13). <b>Available only for version D, S, and R</b></li> </ul> <p><b>MANUVAC</b> function with:</p> <ul style="list-style-type: none"> <li>• Adaptive time and vacuum manage blow-off (U = 14)</li> <li>• Time operated blow-off (U = 15)</li> <li>• Externally operated blow-off (U = 16). <b>Available only for version D, S, and R</b></li> </ul> <p>Factory reset (U = 52)</p>



### 5.3. Manual operation of the ejector during testing and start up

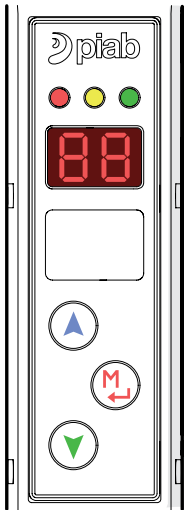
To test the ejector function, you can activate both blow-off and vacuum generation by using the ejector push buttons, including testing of current configuration.

This is achieved by pressing and holding the **M** button during power-up, and then releasing the button (only the power supply +24V/GND needed).

With this power-up method, the electrical inputs in the M12 connector become disabled and temporarily replaced by the arrow buttons **▲** and **▼**.

The arrow button **▲** corresponds to the input signal "Start" and **▼** corresponds to the input signal "Blow-off".

To switch back to normal operation just disconnect the power supply and power-up again.



In manual operation mode the Arrow button ▲ corresponds to Start input signal.

Manual operation is obtained by pressing and holding the M← button during ejector power-up (power only + 24 VDC / GND needed).

In manual operation mode the Arrow button ▼ corresponds to Blow-off input signal.

## 5.4. LED indications

### Operation information

- **Green LED:** Ejector active, i.e. vacuum generated/monitored or blow-off ongoing. Also used as a "time indication" during programming, e.g. "short press".
- **Yellow LED:** Vacuum level above minimum limit, i.e. "lift" may continue. Also used as a "time indication" during programming, e.g. "long press".
- **Red LED: Error.** See also the Troubleshooting chapter.

### Display error information

- Code E at power up: Supply voltage out of spec. or an internal power failure. This might be caused by an overheated module (restarted module). The module cannot start if this occurs.  
**Action:** Make sure that the module does not have any load on the outputs, let module cool down, and power up again.
- Code E during operation: Supply voltage out of spec. or an internal power failure due to excessive load, e.g. too high load on the outputs. Also, too high environment temperature might cause this event.  
**Action:** Make sure that the module does not have any load on the outputs, let module cool down, and power up again.
- Code P: Parameter settings inconsistent, **A equal to, or larger than, C** OR **C equal to, or larger than, E**.  
**Action:** Change the parameter/parameters causing this error; **A, C, and/or E**.

### Display value fault

- If the display does not show "0" while the module is inactive and vacuum port fully exhausted, you can adjust the vacuum sensor offset.
- To calibrate the sensor offset, make sure that the vacuum port has atmospheric pressure (U = 32).
- Factory reset (U = 52).

## 6. Service and maintenance

- Always remember to disconnect the power supply when cleaning or servicing the product.
- Make sure all components in the vacuum system are without electricity, compressed air and vacuum before service/repair is done. Disconnect electricity / compressed air / vacuum supply and blow compressed air into the vacuum safety valves so that no vacuum remains. Ensure that all parts are removed from the suction cups. Now that the system is safe service/repair may be done.

### 6.1. Maintenance

As a recommendation, clean the ejector externally and the silencer if used to obtain maximum performance. Upon clogged silencer a back pressure is generated which may cause reduced performance.

## 7. Troubleshooting

Fault	Check	Action
Display lit but no vacuum generation	Check air supply	Pressurize ejector
Display lit but limited vacuum generation	Check air supply pressure	Correct
	Check the vacuum port fittings, pipes, suction cups etc. for leakage	If necessary replace failing component/components.
	Check the ejector port filter and nozzles for particles	Clean
Display not lit, and no function	Check the electrical power supply	Correct
Red LED lit and "P" in the display	Parameter conflict (A, C and E)	Change conflicting parameter/parameters
Red LED lit and "E" in the display at power up	Electrical power supply or internal voltage out of spec.	See " <b>Display error information</b> " on previous page
Red LED lit and "E" in the display during operation	Electrical power supply or internal voltage out of spec. most likely due to high load on the outputs	See " <b>Display error information</b> " on previous page
Wrong value in the display	The sensor offset change due to external circumstances	See " <b>Display value fault</b> " on previous page
The Ejector generates vacuum On and Off rapidly	Check for system leakages	Eliminate leakages
	The operating range too small (Parameter C and E)	Increase the range
General error	-	See " <b>Factory reset</b> " on previous page

## 8. Recycling and disposal



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

Piab is certified with ISO-14001.

Piab also complies with:

- RoHS (2002/95/EC)
- 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](http://piab.com/resources/document-centre).

## 9. 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.











# Evolving around the world

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