Operating and maintenance instructions

MFE
Multi-Function vacuum ejectors

Content

TECHNICAL DATA

Operating the ejector outside of the specified values below may result in a damaged system and connected components.

Electrical Parameters

Parameter	Symbol	Limit values			Comment
		Min.	Typ	Max.	
Supply voltage [VDC]	V_S	19,2	24	26,4	Reverse polarity prot. [1]
Rated current from VS [mA]	I_S	--	--	100	VS = 24V [2]
Voltage output signals [VDC]	V_{Out}	V_S-2	--	V_S	
Current output signals [mA]	I_{Out}	--	--	100	Short circuit prot. [3]
Voltage input signals [VDC]	V_{In}	15	--	V_S	Relative to V_S GND
Current input signals [mA]	I_{In}	--	5	--	V_S = 24V

[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.

Mechanical Data

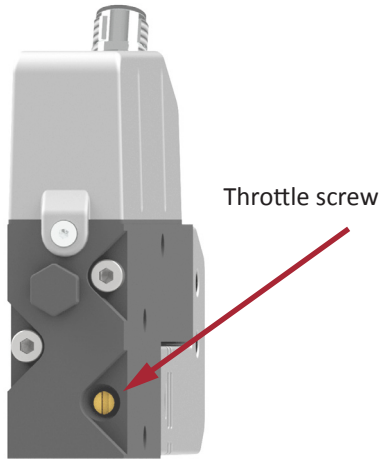
Parameter	Limit values			Comment
	Min.	Typ	Max.	
Storage temperature [°C]	-10	--	+60	
Operating temperature [°C]	0	--	+50	
Operating pressure [bar]	4	--	7	
Recommended pressure [bar]	--	5	--	
Protection class	--	--	IP65	with M12 male connector
Humidity [% r.h.]	10	--	90	free from condensation
Operating medium	According to ISO 8573-1:2010 [3:4:1]			

Part	Materials
Ejector housing	Black anodized aluminum
Nozzle	Brass
Cover and silencer	PC/ABS

Silencing
The silencer can be removed and the G1/2 exhaust port be used instead.

Startup
As a recommendation, adjust the Blow-off to a minimum with the built-in throttle screw to avoid damage to the handled objects or the surroundings before the application are up and running.
It's recommended to adjust the Blow-off to a minimum to minimize air consumption.

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



Choose the right size pipe and tube

		Air supply			on the vacuum side			on the exhaust side		
Item no.	**Air consumption [Nl/min]**	**1 m**	**3 m**	**5 m**	**1 m**	**3 m**	**5 m**	**1 m**	**3 m**	**5 m**
		Inner diameter [mm]			**Inner diameter [mm]**			**Inner diameter [mm]**		
MFE-100H	110	4	4	4	9	12	12	6	6	9
MFE-200H	200	4	4	4	12	12	12	9	9	9
MFE-300H	300	4	4	6	12	16	16	9	9	9
MFE-400H	430	4	6	8	16	16	16	12	12	16

Suction power against vacuum level [Nl/min]

Item no.	**0%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**Primary nozzle(s) Ø [mm]**
MFE-100H	80	74	67	55	41	29	25	11	3	1,5
MFE-200H	145	130	113	91	66	48	36	20	5	2,0
MFE-300H	195	172	153	127	96	70	52	29	8	2,5
MFE-400H	245	220	195	165	128	101	77	43	11	3,0

Ordering key (Model selection)

Series		**Saugleistung**		**Function**		**Electrical connection**		**Silencer**
MFE	**-**	**100H** = 80 Nl/min **200H** = 145 Nl/min **300H** = 195 Nl/min **400H** = 245 Nl/min	**-**	**A** = NC **B** = NO	**-**	**D** = 5-polig **S** = 8-polig	**-**	**S** = with Silencer

Example item no.: MFE-100H-A-S-S
= 65 Nl/min, Function NC, electrical connection M12 8-pin, with silencer

Installation with multiple manifolds

Compact block mounting

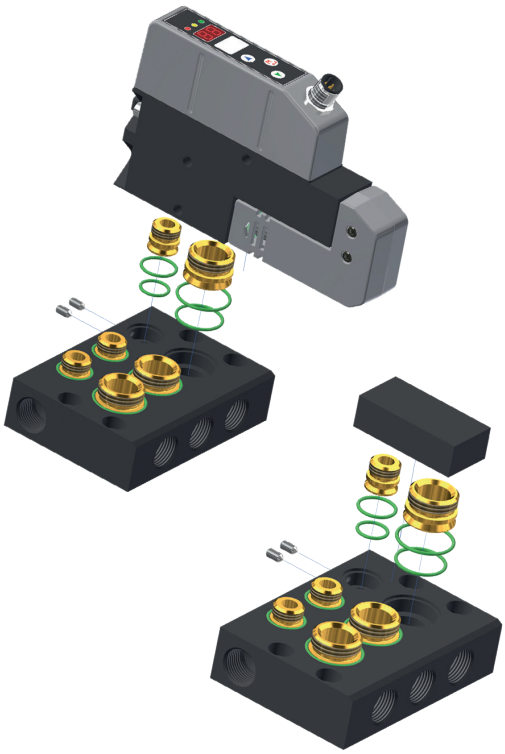
> For all AUTOVAC MFE sizes

> 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.

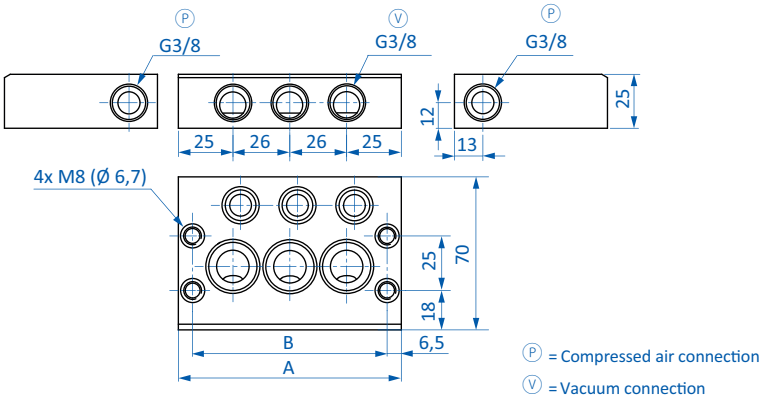


The units can also be supplied manifold mounted with two to five ejectors in any size.

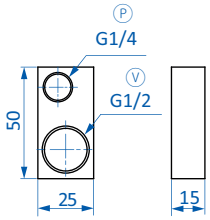
1. The ejector is easily mounted onto the manifold by first fastening the brass nipples gently into the ejector or blind plate connections.
2. Then place the attached O-rings in the manifold carefully and push the ejector/blind plate gently together with manifold without damaging the O-rings.
3. Thereafter,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

The manifold can be connected to the air supply (G3/8) on either side.

Manifolds



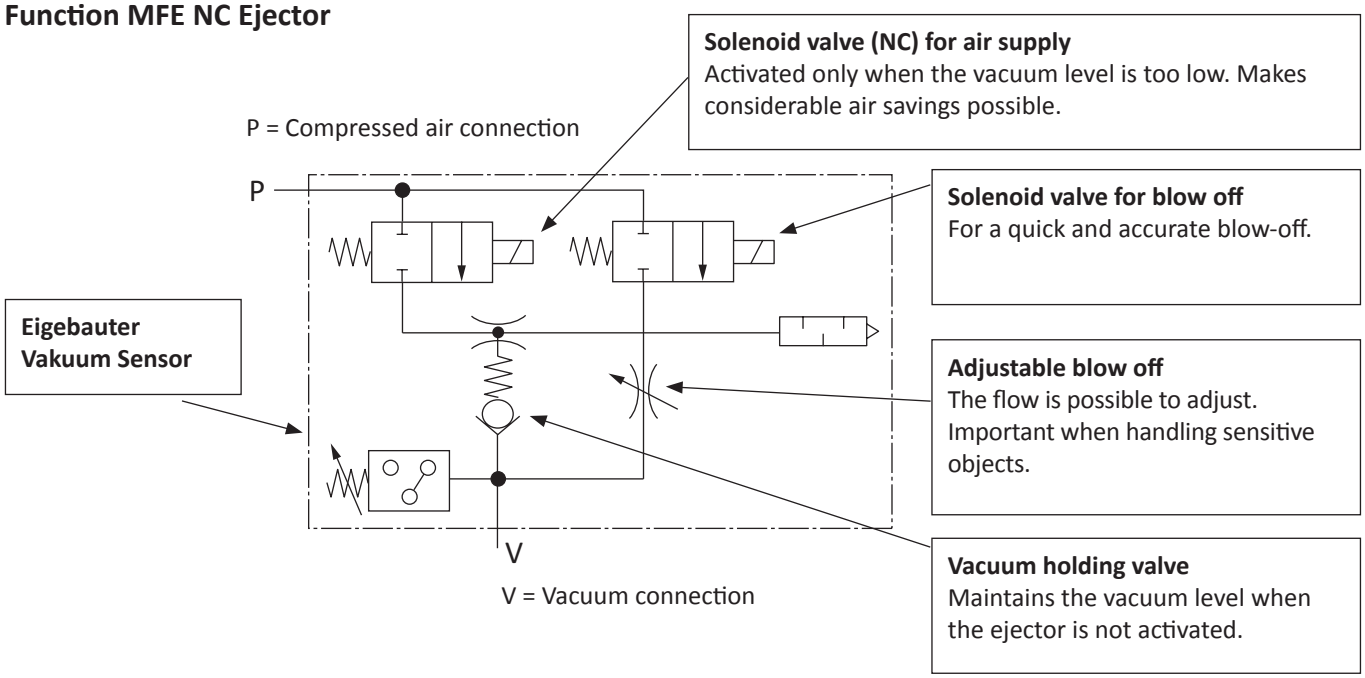
Blind plate



Item no.	Selection for MFE Ejectors	Number of Ejectors	Vacuum connection V	Weight [g]	A [mm]	B [mm]
MFE-MAN2	Manifold *	2	G3/8 (x2)	325	76	63
MFE-MAN3	Manifold *	3	G3/8 (x3)	445	102	89
MFE-MAN4	Manifold *	4	G3/8 (x4)	560	128	115
MFE-MAN5	Manifold *	5	G3/8 (x5)	680	154	141
MFE-MAN0	Blind plate for Manifold	--	--	40	--	--

* Screws and O-rings included in scope of delivery.

Function MFE NC Ejector



Solenoid valve (NC) for air supply
Activated only when the vacuum level is too low. Makes considerable air savings possible.

Solenoid valve for blow off
For a quick and accurate blow-off.

Eigebauter Vakuum Sensor

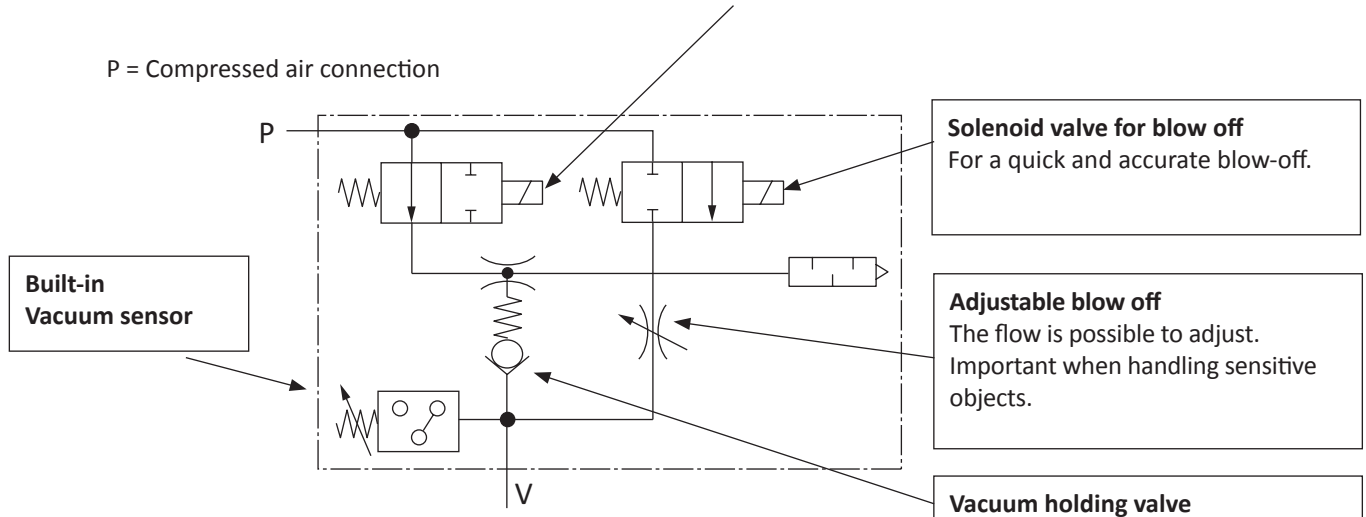
Adjustable blow off
The flow is possible to adjust. Important when handling sensitive objects.

Vacuum holding valve
Maintains the vacuum level when the ejector is not activated.

Function MFE NO Ejector

The normally open (NO) solenoid valve can increase the safety as the air supply opens in case of a power failure.

Solenoid valve (NO) for air supply
Activated only when the required vacuum level is reached. This makes considerable air savings possible.



Solenoid valve for blow off
For a quick and accurate blow-off.

Built-in Vacuum sensor

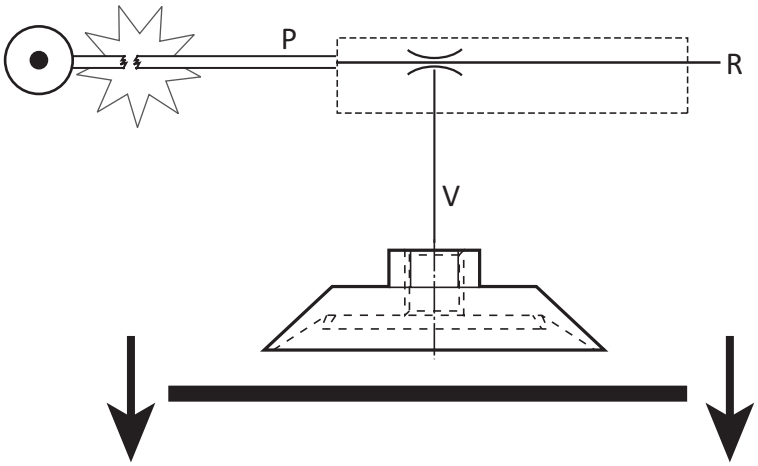
Adjustable blow off
The flow is possible to adjust. Important when handling sensitive objects.

Vacuum holding valve
Maintains the vacuum level when the ejector is not activated.

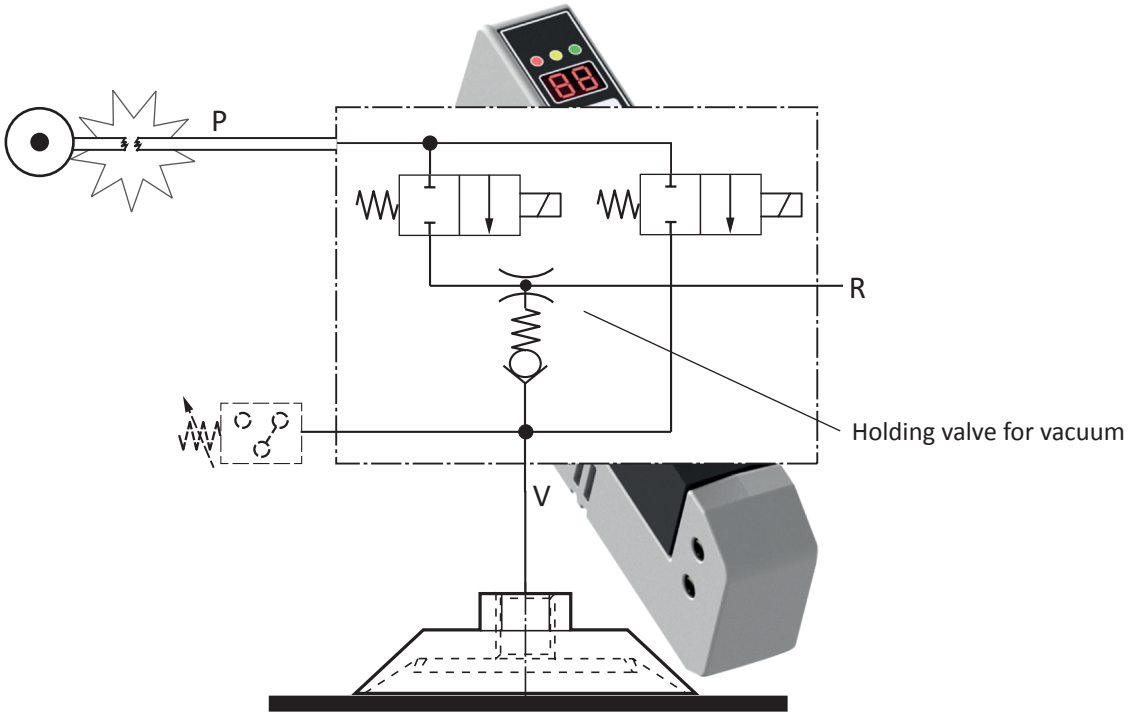
The MFE combined with a suitable external controller and a vacuum sensor, shuts off the air supply when the preset vacuum level has been reached. The built-in vacuum holding valve maintains the vacuum in the system. In a completely airtight system, the vacuum level would be maintained for a long period of time without any support from the ejector.
This makes considerable air savings possible.

Vacuum holding valve
The integrated holding valve offers an increased safety in case of a compressed air failure. The valve locks in the existing vacuum and the object will be held until the internal leakage has reduced the lifting force to a level below what is required. Safety Recommendation.

Holding valve means increased safety



Vacuum is generated when the ejector is supplied with air. If the air supply is interrupted by e.g., a compressor failure, a malfunctioning valve or a loose connection, the vacuum will not be maintained as atmospheric pressure leaks into the vacuum cup, causing an unforeseen drop of the object.

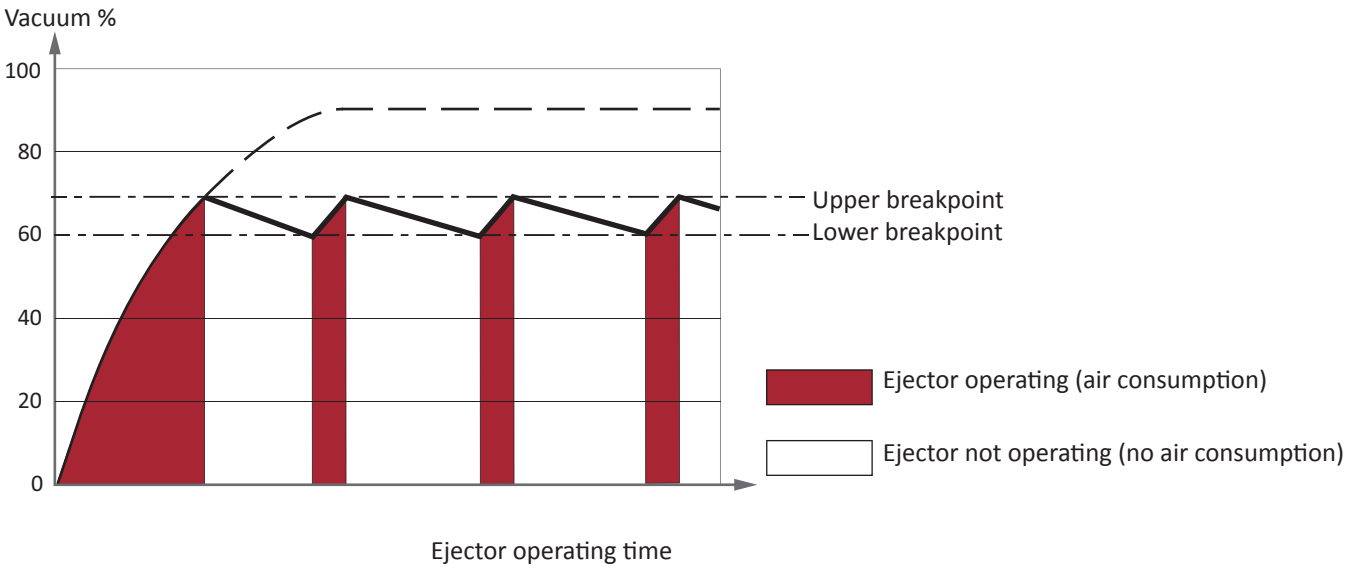


An ejector equipped with a holding valve prevents the atmospheric pressure from leaking through the vacuum port into the vacuum area.

This is how the holding valve works:
When the ejector is operating, the holding valve is opens and air can be evacuated from the vacuum cup.
When vacuum is not created, the valve is closed. The leakage in the vacuum circuit, reduces the vacuum level gradually. How long it will take until the object is dropped depends on the leakage flow.
The holding valve is mainly used in applications where air tight materials are handled e.g. plastic, metal or glass.
As the vacuum holding valve is maintaining the vacuum level, a blow-off function is required to release the object rapidly and with accuracy

	The 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.

POTENTIAL ENERGY SAVINGS AND CONTROL of AUTOVAC MFE Ejektor



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 holding valve.

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 again is reached, the valve is shut off and this procedure continues until the object is released.

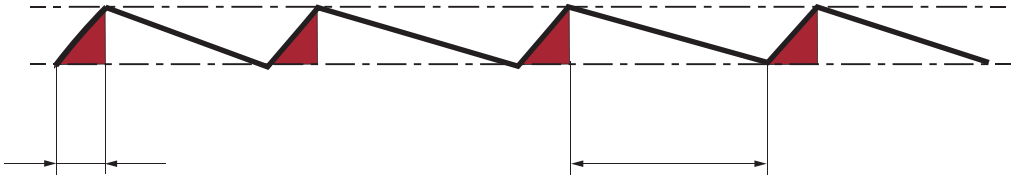
The gap between the set maximum and the minimum vacuum level is the hysteresis. In most cases the hysteresis of the vacuum sensor is adjustable in a way that will result in air consumption savings of 95%.

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

When selecting the MANUVAC function no air saving is available.

MONITORING

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.



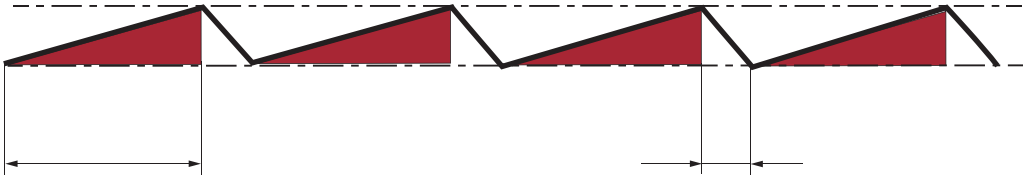
1. Short activation = airtight system

2. Long non-activation = airtight system

Ejector operating (air consumption)

Ejector not operating (no air consumption)

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



1. Long activation (air consumption)

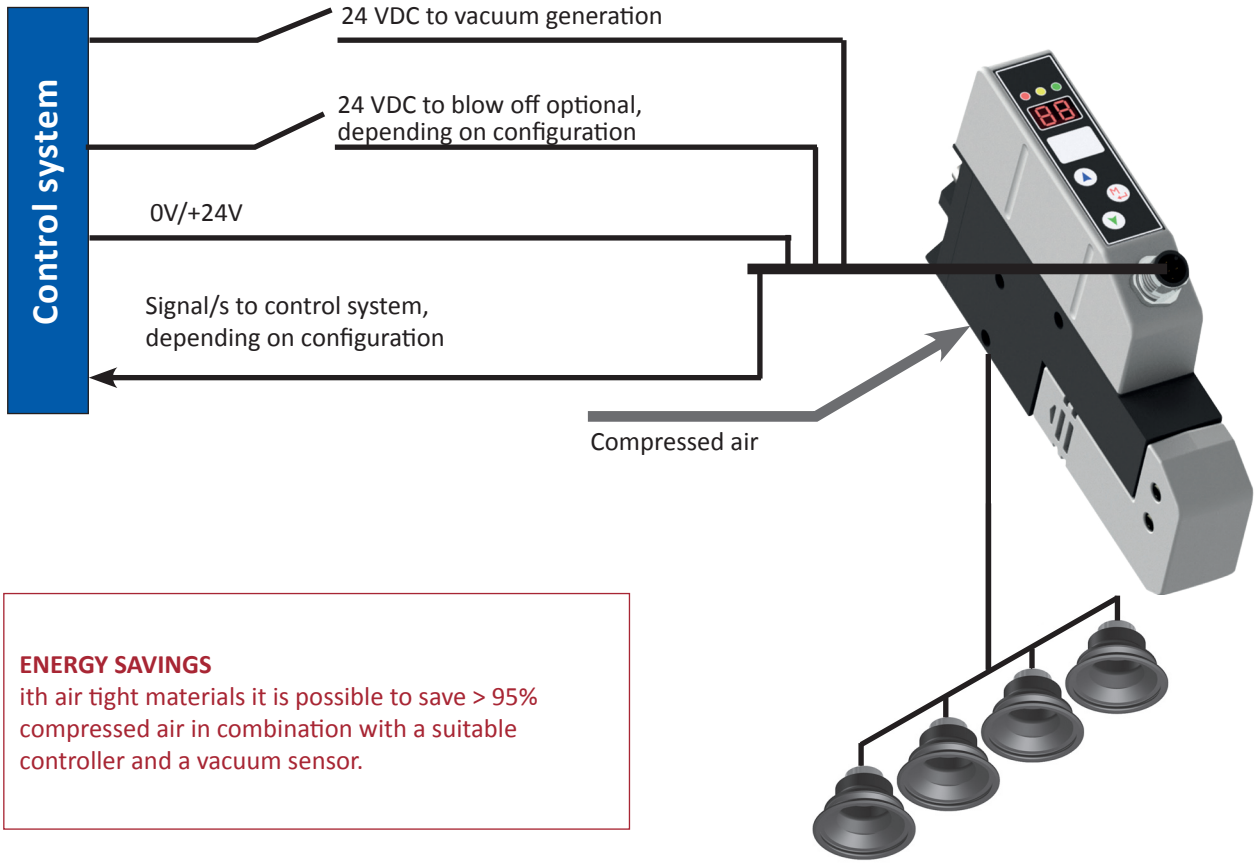
2. S hort non-activation = leaking system

Ejector operating (air consumption)

Ejector not operating (no air consumption)

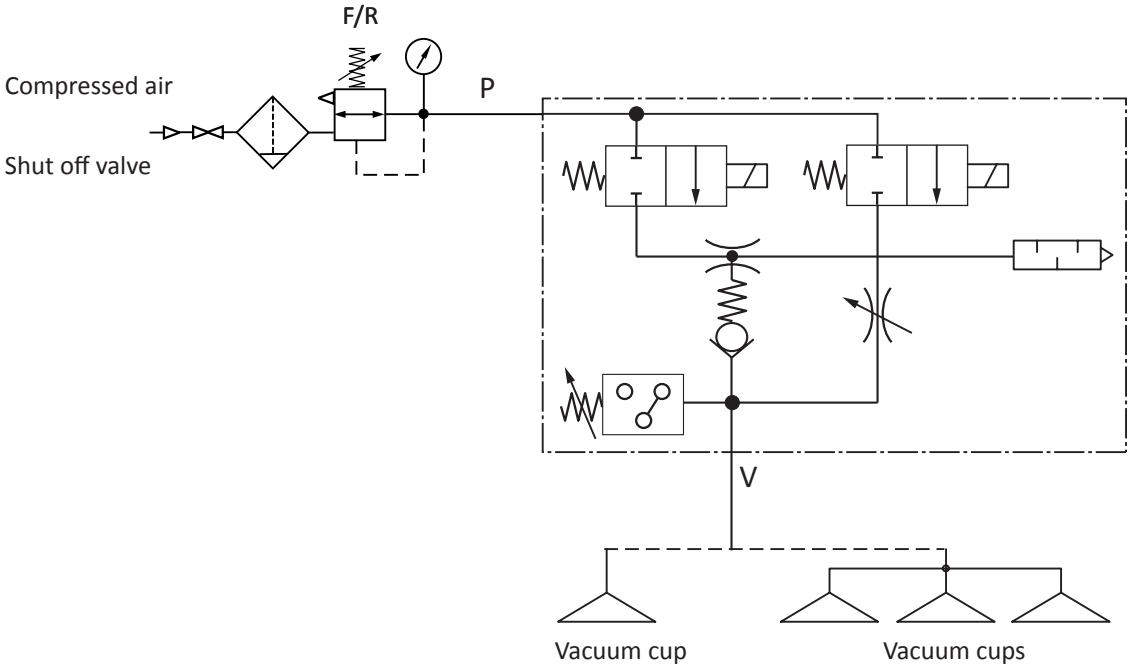
1. Long gap from activation to non-activation of air supply signifies a NOT airtight system that should be checked in order to avoid unnecessary air consumption.
2. Short gap from activation to non-activation of air supply signifies a NOT airtight system system that should be checked in order to avoid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

OPERATING PRINCIPLE - NC

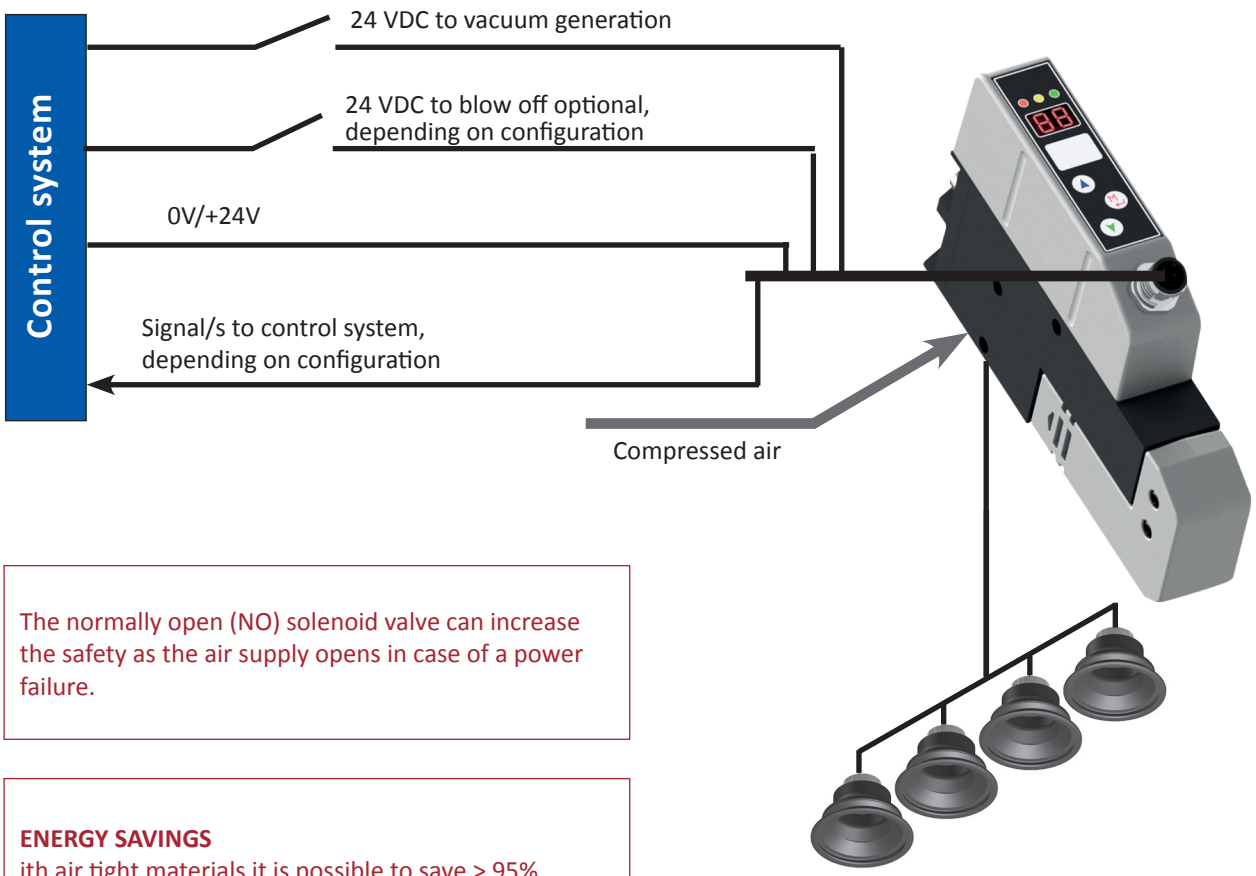


ENERGY SAVINGS
ith air tight materials it is possible to save > 95% compressed air in combination with a suitable controller and a vacuum sensor.

Wiring diagram - NC



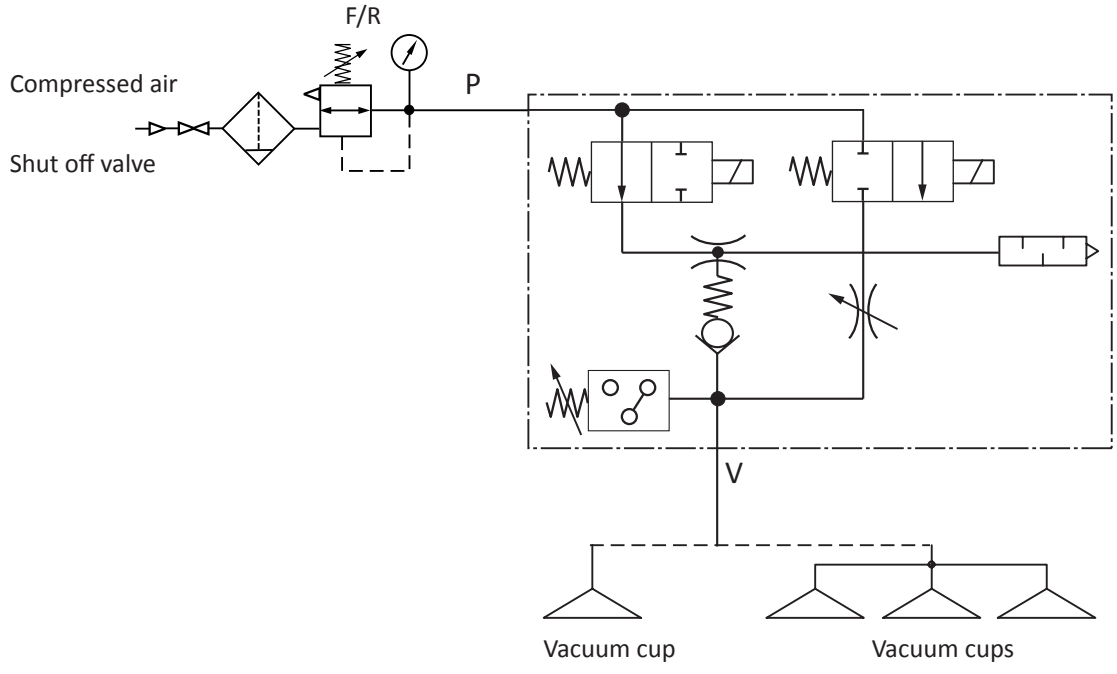
OPERATING PRINCIPLE - NO



The normally open (NO) solenoid valve can increase the safety as the air supply opens in case of a power failure.

ENERGY SAVINGS
ith air tight materials it is possible to save > 95% compressed air in combination with a suitable controller and a vacuum sensor.

Wiring diagram - NO



FUNCTION

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 will the ejector maintain the vacuum levels automatically, e.g. when the vacuum level is <65% (parameter **C**) vacuum is generated and when reaching >70% (parameter **E**) the vacuum generation is stopped, this 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. 60% (Parameter **A**)

> A special function “Module save” is available to avoid continuous ejector valve switching, see next page.

> Relevant parameters for “AUTOVAC” are: **A, C, E, F, H, L** and **P**.

Function ”MANUVAC” (Selected with Parameter **U**)
This function are mainly used if a larger leakage is expected or lifting objects with leakage though 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% (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-of time will be further improved.

> The default blow-off time is adjustable with parameter F (value x 100 ms)

> This function intention is primarily for dynamic applications (variations invacuum volumes) but may be used to save compressed air meaning, do not blow-off more than necessary.

Time operated 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 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:
Model D and S

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

Modul / Valve Saver: ((Selected with Parameter **P**)

> The purpose with this function is to minimize extensive valve switching caused by e.g. worn/damaged vacuum cups. If the module have 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-fills” is selected with parameter P. I this parameter is set to value “0” then 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)

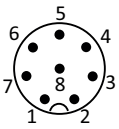
Feedback “Predictive maintenance” etc. for AUTOVAC
Model S
For Predictive maintenance there are an additional output signal available for the external system (PNP, +24V). This signal have can have different behavior depending on parameter **L**:

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 occur 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-rills” occurred within a cycle.

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

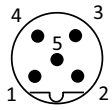
1. A signal when a predefined time defined by parameter **J** (value x 100 ms) has elapsed without reaching the set vacuum level (parameter **A**).

ELECTRIC CONNECTION

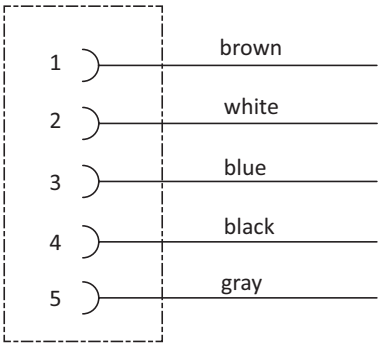
	Model D, M12 5-pin	Model S, M12 8-pin
		
Time set blow-off	✓	✓
Adaptive blow-off	✓	✓
Manual / External blow-off	✓	✓
Feedback, Vacuum OK/Blow-off OK	✓	✓
Feedback, Predictive Maintenance*	--	✓

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

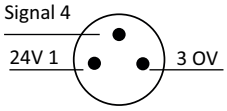
Model D M12 male connector — Cable 20.508 or 20.509: Wire colors



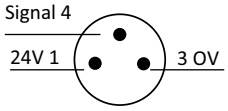
Pin 1 - Supply voltage	+24 VDC
Pin 2 - Input signal „vacuum on“	PNP input
Pin 3 - Ground	0 V (GND)
Pin 4 - Output signal „vacuum level ok“ (part present)	PNP output
Pin 5 - Blow-off on	PNP input



Model D with Adapter 20.554: Pin assignment

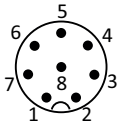


1 - +24 VDC
3 - 0V (GND)
4 - Vacuum on (Input)

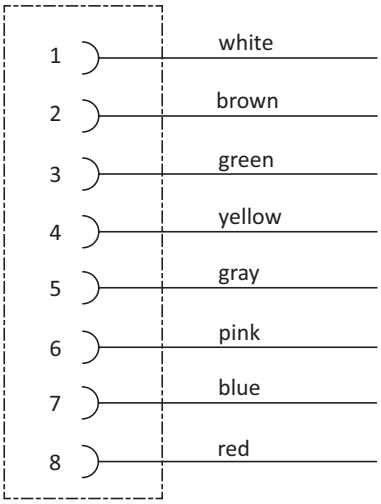


1 - +24 VDC
3 - 0V (GND)
4 - Vacuum/blow-off OK (Output) (part present)

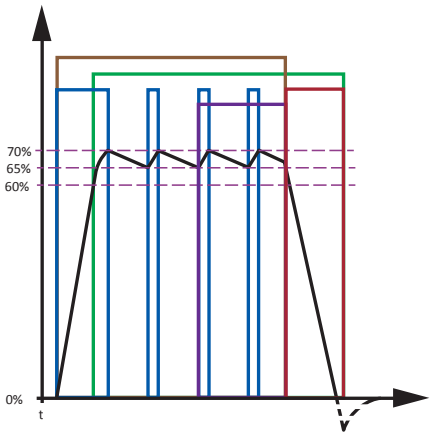
Model S M12 male connector — Cable 20.558: Wire colors

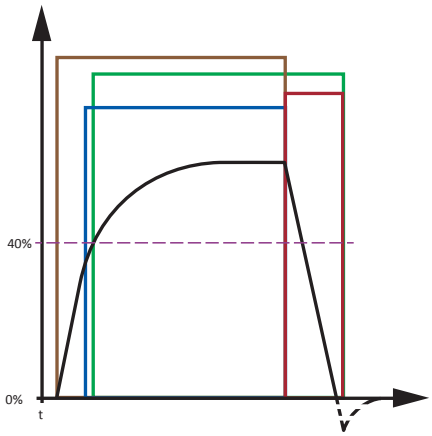


Pin 1 - Output signal „vacuum level ok“ (part present)	PNP output
Pin 2 - Supply voltage	+24 VDC
Pin 3 - Output signal predictive maintenance	PNP output
Pin 4 - Input signal „vacuum on“	PNP input
Pin 5 -	
Pin 6 - Input signal „blow-off on“ (when using external blow-off)	PNP input
Pin 7 - Ground	0 V (GND)
Pin 8 -	



AUTOVAC	MANUVAC





Vacuum Level

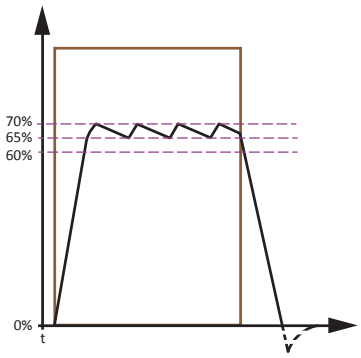
Input: Vacuum on

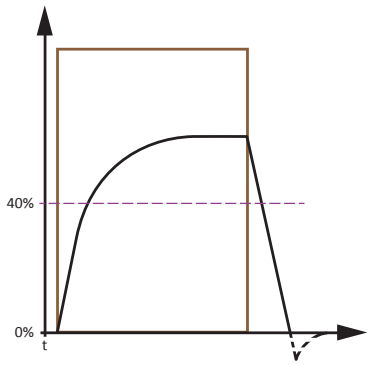
Output signal: Vacuum level ok

Output signal: "Predictive maintenance" Option 1

Output signal: "Predictive maintenance" Option 2

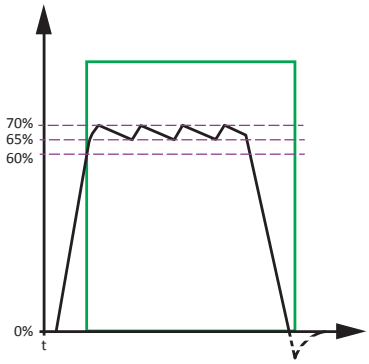
Input: Blow-off on

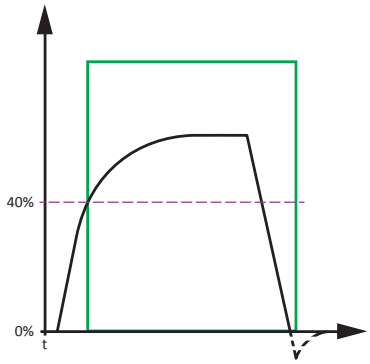




Vacuum Level

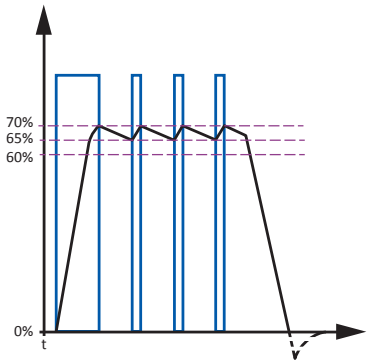
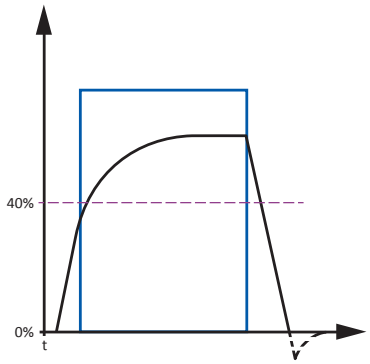
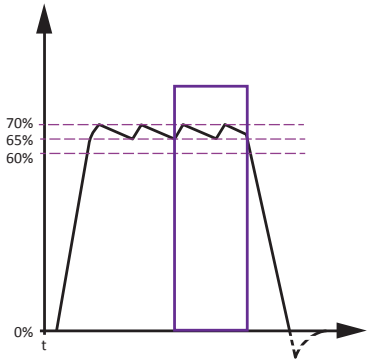
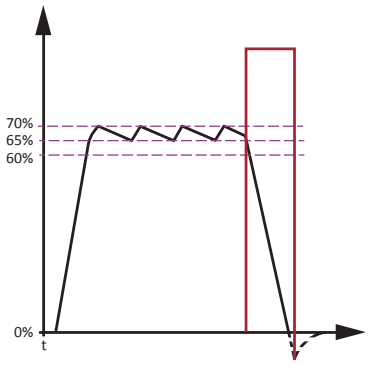
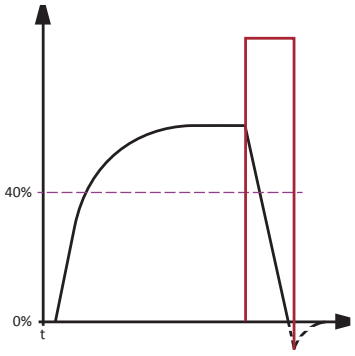
Input: Vacuum on





Vacuum Level

Output signal: Vacuum level ok

AUTOVAC	MANUVAC	
		**Vacuum Level** **Output signal: "Predictive maintenance" Option 1**
		**Vacuum Level** **Output signal: "Predictive maintenance" Option 2**
		**Vacuum Level** **Input: Blow-off on**

PROGRAMMING

Parametern name (Visible in display)	**Parameter value** (default setting)	**Parameter description**
A	60	Threshold for output signal „vacuum level ok“ (part present)
C	65	Lower threshold for air saving (AUTOVAC)
E	70	Upper threshold for air saving (AUTOVAC)
F	5	Blow-off time (for fixed duration blow-off)
H	2	Number of accepted re-evacuation cycles for predictive maintenance option 2 (parameter L)
J	20	Accepted duration for reaching vacuum level before triggering predictive mainenance option 1 (parameter L) when using MANUVAC (parameter U)
L	1	Option for predictive maintenance output signal
P	0	Accepted number of re-evacuation cycles before valve saver is activated (when using AUTOVAC)
U	11	Basic operation and blow-off modes 1. AUTOVAC (air saving)/MANUVAC 2. Blow-off a. Adaptive b. Fixed duration c. External control

Programming sequence: (Changes to parameter **A**)

Press and hold 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 ▲ oder ▼. A short press <1sec. changes the value with +1 or -1. A long press >1sec. changes the value with +1 or -1. Please note, the new value is show 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 next parameter, a short press on button M↵ .
The display will now show next parameter **C**.

Same procedure for all parameters, parameter "**U**" is the last and you will leave programming mode.

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)

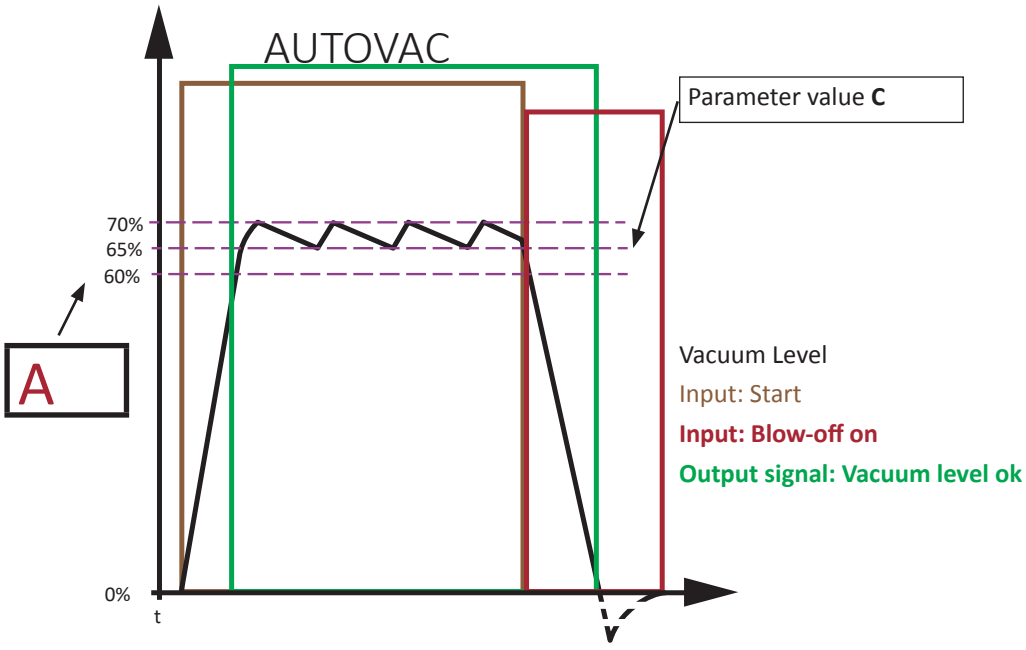
Parameter name (Visible in display)

A	60

Threshold for output signal „vacuum level ok“ (part present)
Default setting: 60 % vacuum level

When the vacuum level measured by the ejector reaches the set value, the output singal „vacuum level ok“ is activated. This is an indication, that the part has been gripped successfully and the handling process can be started. The output signal stays activated until blow-off is completed.

This value must be lower than the lower threshold for air saving (parameter C).



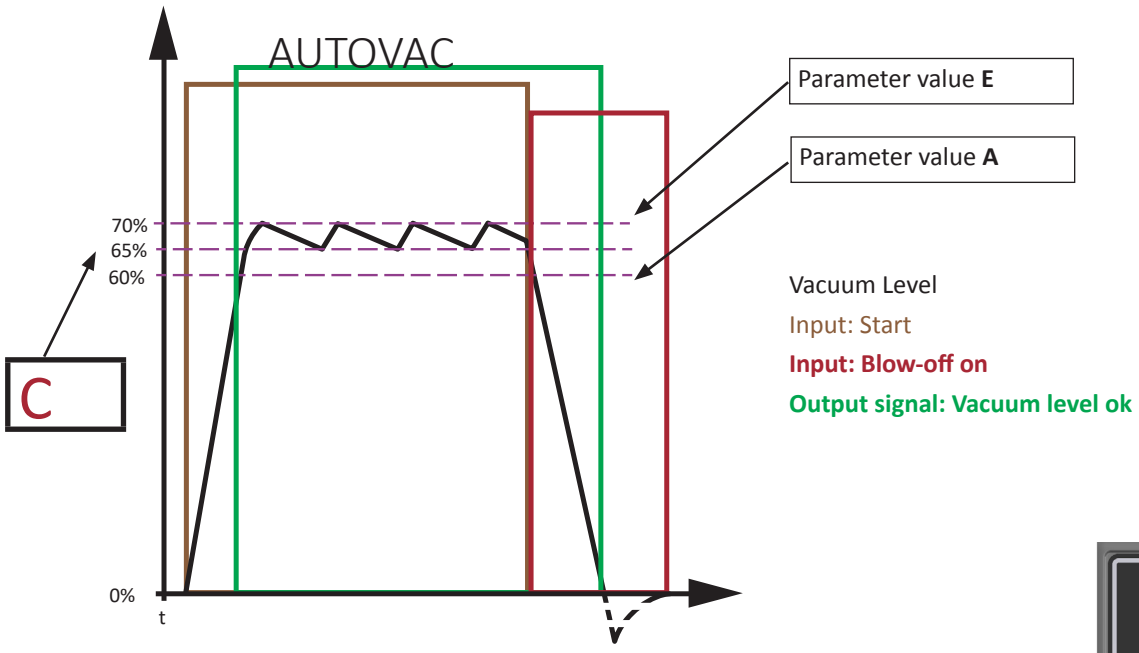
Parameter name (Visible in display)

C	65

Lower threshold for air saving (AUTOVAC)
Default setting: 65 % vacuum level

When the vacuum level falls below this value during air saving mode, the vacuum generation is activated (re-evacuation) in order to always provide sufficient gripping force. Set this value, so that the part can be reliably handled at this vacuum level.

This value must be lower than the upper threshold for air saving (parameter E) but lower than the threshold for output signal „vacuum level ok“ (parameter A)

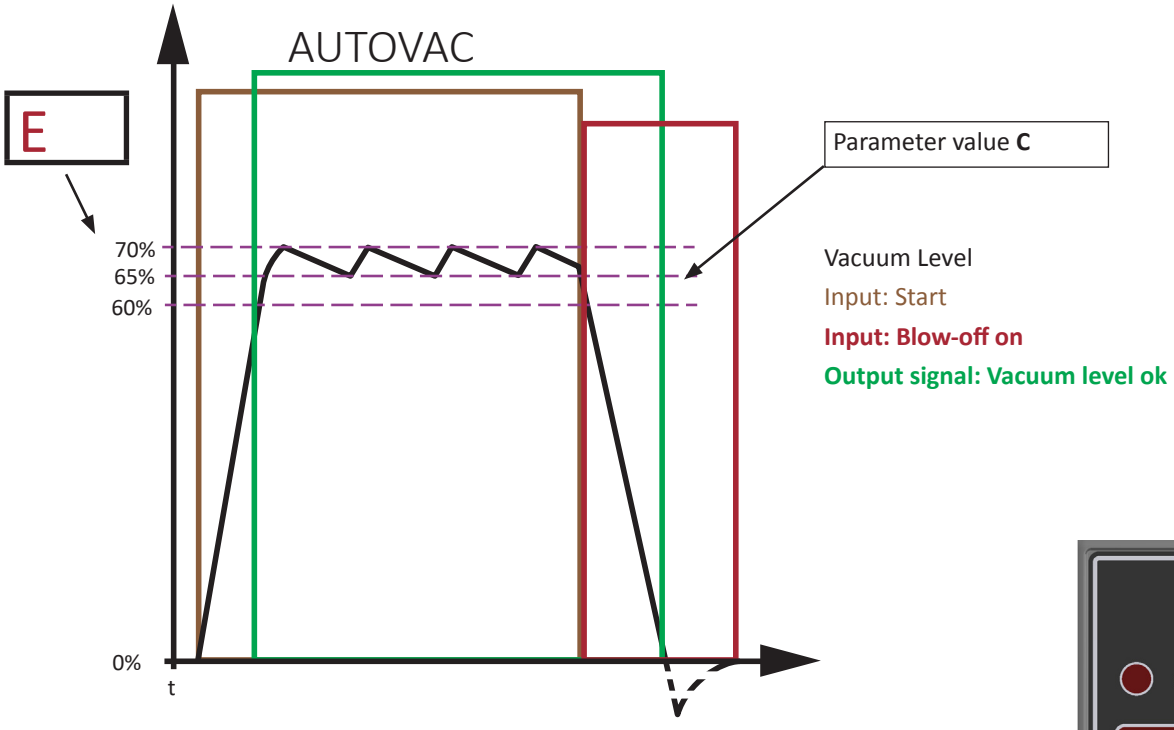


Parameter name (Visible in display)

Upper threshold for air saving (AUTOVAC)
Default setting: 70 % vacuum level

When reaching the set vacuum level, the vacuum generation is stopped in order to save compressed air. The built-in non-return valve keeps the existing vacuum between the ejector and the part.

This value must be higher than the lower threshold for air saving (parameter C).

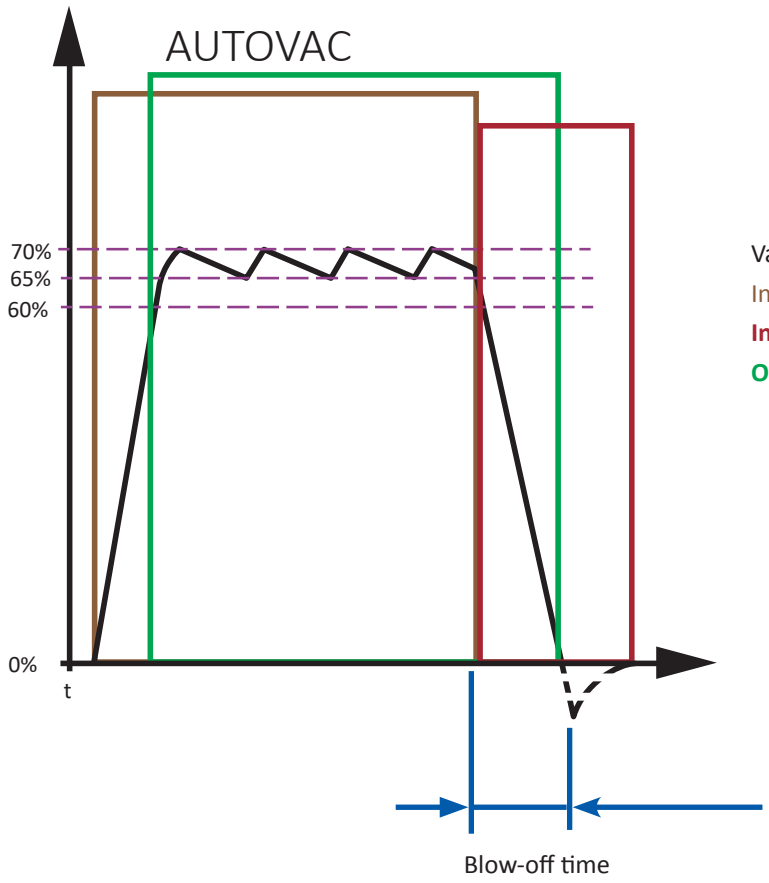


Parameter name (Visible in display)

F	5

Blow-off duration
Default setting: 5 = 500 milliseconds

When fixed duration blow-off is used (parameter U=11 or U=14)



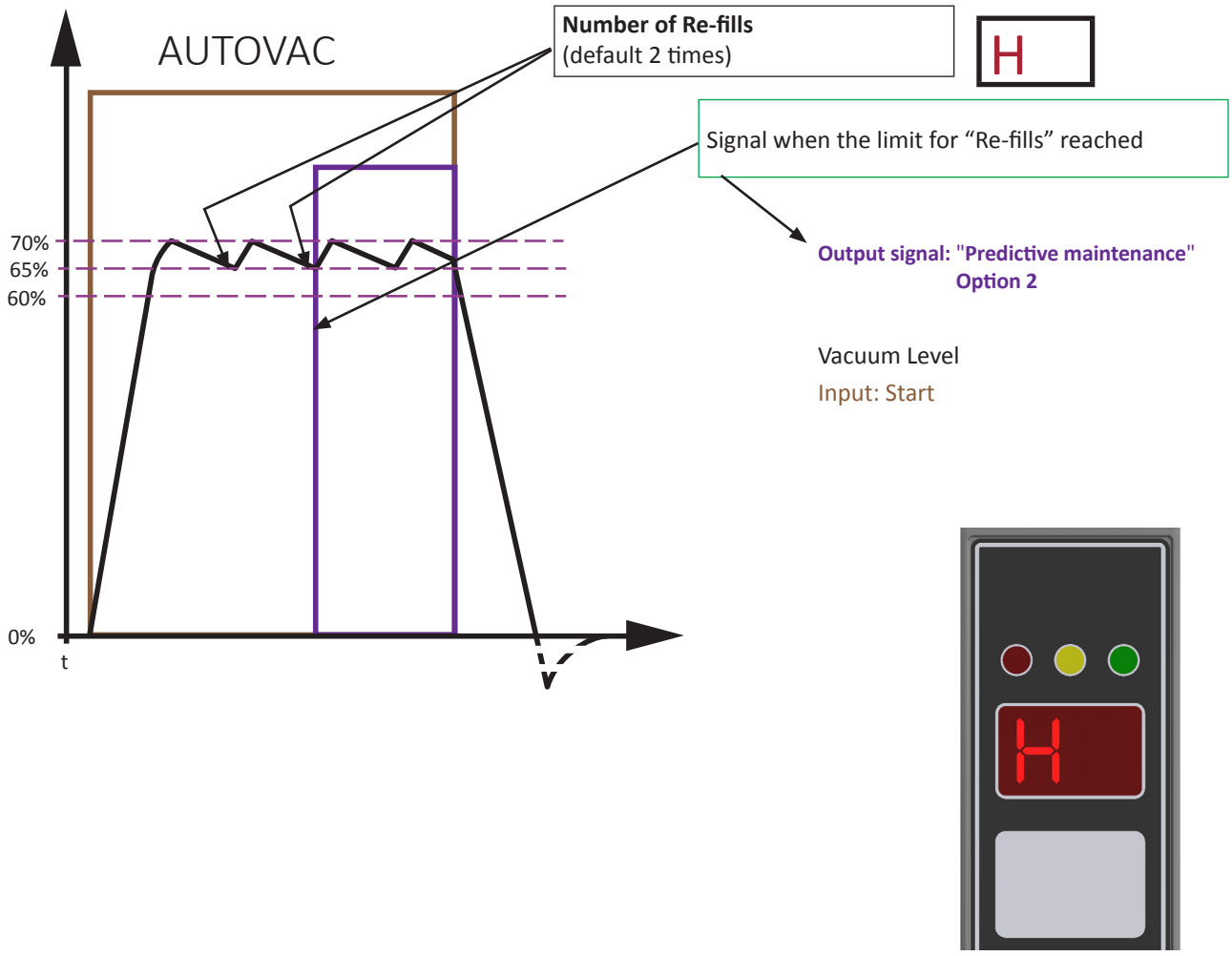
Vacuum Level
Input: Start
Input: Blow-off on
Output signal: Vacuum level ok

Parameter name (Visible in display)

H 2

Number of accepted re-evacuation cycles for predictive maintenance option 2
Default setting: 2

Defines the number of re-evacuation cycles (when using AUTOVAC air saving) that are accepted for any handling cycle. When this number is exceeded, the output signal is triggered as this indicates increased leakage.
Only valid for predictive maintenance option 2 (parameter L).

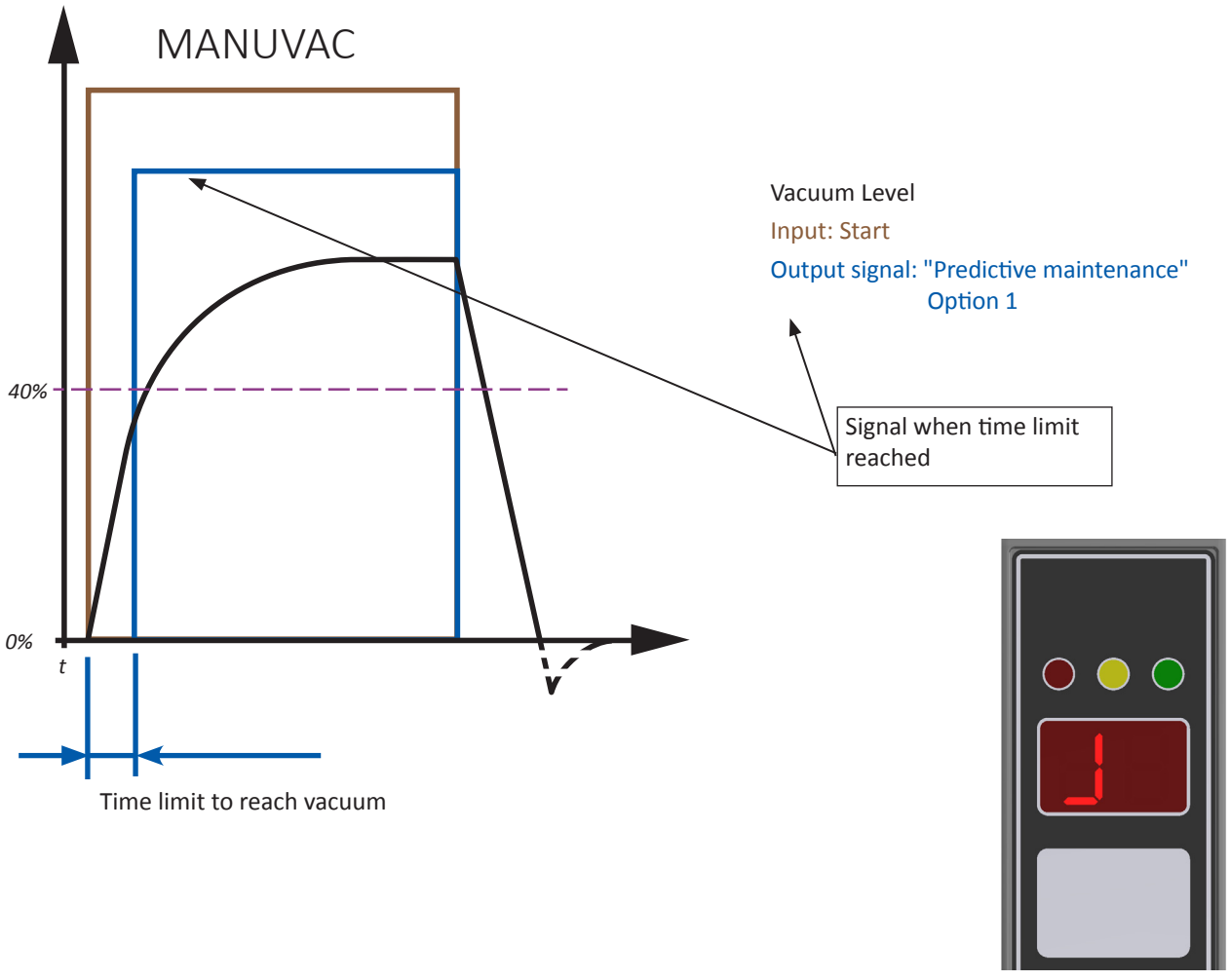


Parameter name (Visible in display)

J 20

Accepted duration for reaching vacuum level before triggering predictive mainenance
Default setting: 2 = 2000 milliseconds

Only applies when using predictive mainenance option 1 (parameter L) and MANUVAC (parameter U)



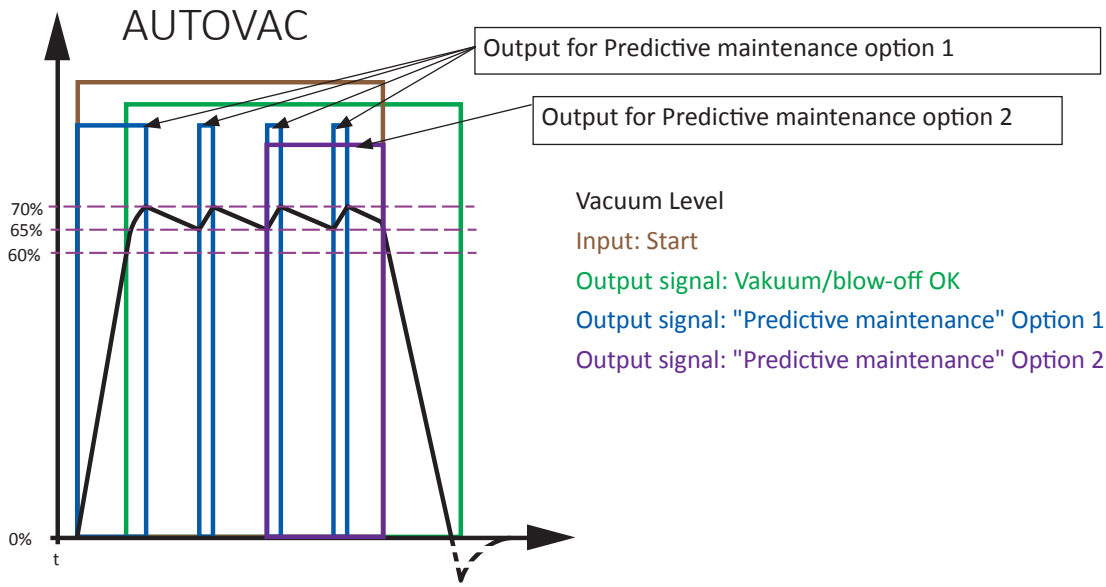
Parameter name (Visible in display)

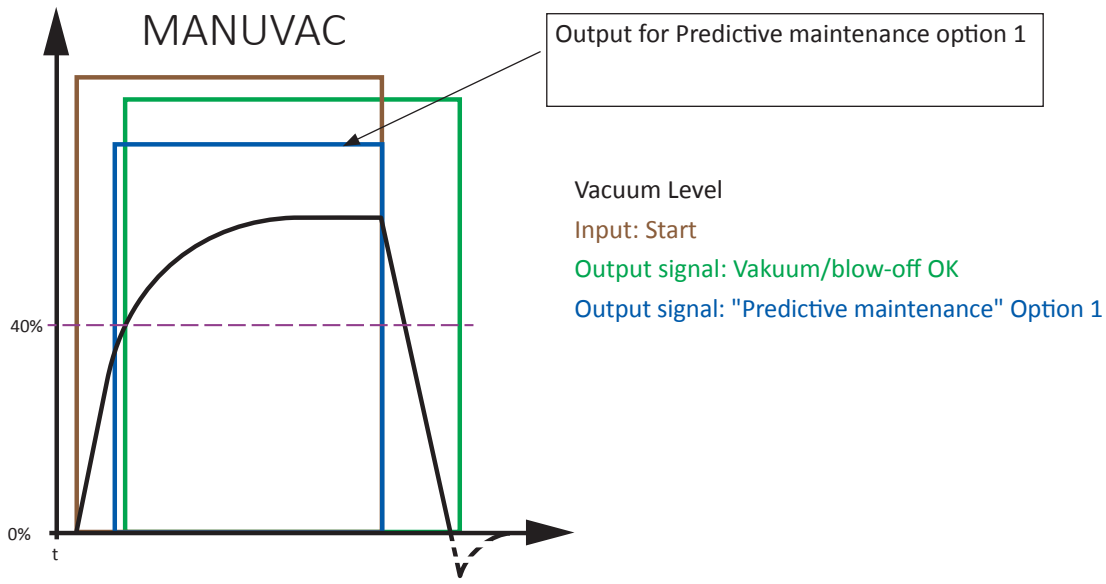
Option for predictive maintenance output signal
Default setting: 1

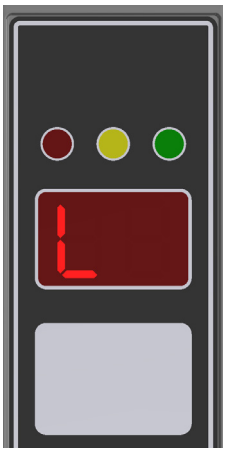
Detect increasing leakage (e.g. due to worn vacuum cups) before it causes interruptions in the process. Different options are available to realize different warning or analysis applications.

AUTOVAC
Option 1: The output signal is active whenever the vacuum generation is activated. The duration and number of evacuations can be analyzed in the control logic to analyze trends and external effects.
Option 2: When the set number of re-evacuations (parameter H) is exceeded during the cycle, the output signal will activate. The signal can be directly fed to the operator e.g. as a warning lamp.

MANUVAC
Option 1: The output signal is active whenever the set duration for reaching the vacuum level (parameter J) is exceeded during a cycle. The signal can be directly fed to the operator e.g. as a warning lamp.







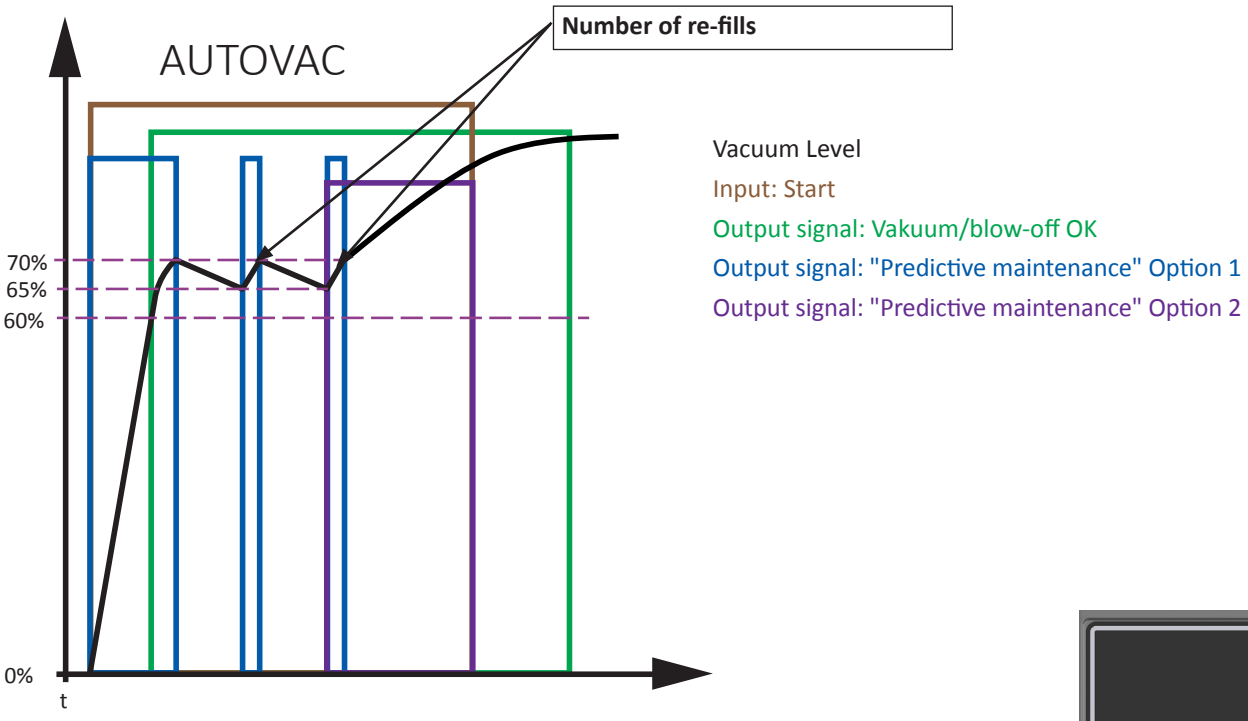
Parameter name (Visible in display)

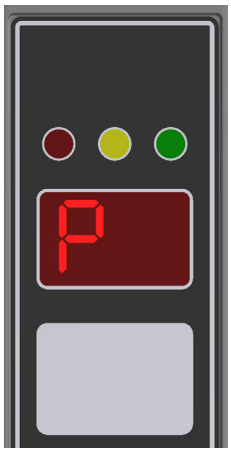
P	0

Valve saver
Default setting: 0

Accepted number of re-evacuation cycles per cycle before valve saver is activated (when using AUTOVAC).

0 = no valve saver





Parameter name (Visible in display)

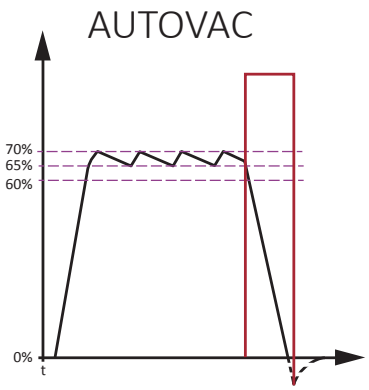
U 11

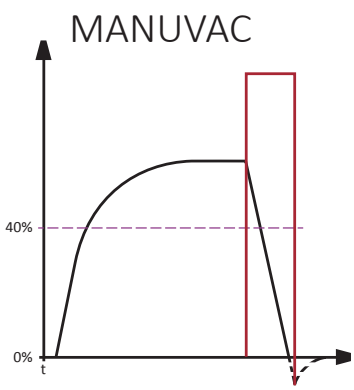
Basic operation and blow-off modes
Default setting: 11

AUTOVAC: Air-saving acitvated
MANUVAC: No air-saving

Blow-off options: see page 14

Blow-off function	AUTOVAC (air saving)	MANUVAC
Adaptive	11	14
Fixed duration	12	15
External control	13	16





Vacuum Level
Input: Blow-off on
(U=13 and U=16)

LED INDICATIONS

Operation information

> **Green LED** -> Ejector active, i.e. vacuum generated/monitored or blow-off on going. 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 fault finding

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. to 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** ≥ **C** OR **C** ≥ **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 have atmospheric pressure. (U = 32)

> Factory reset (U = 52)

MANUAL OPERATION OF THE EJECTOR

During testing and start up

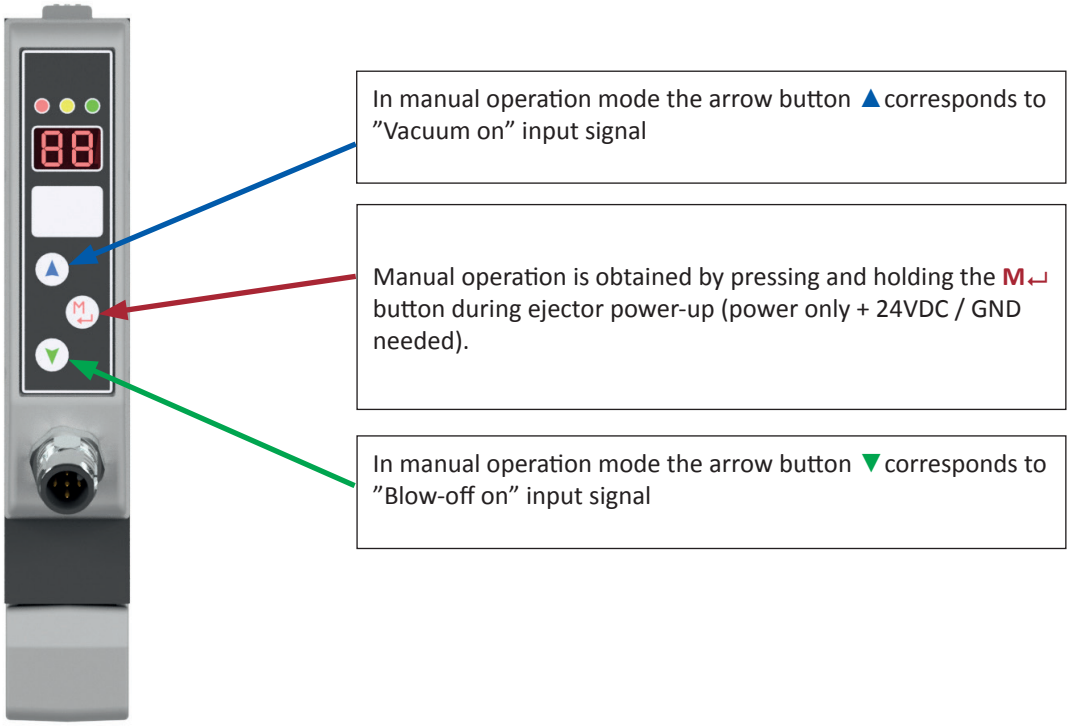
To test the ejector function, you can activate both blow-off and vacuum generation by using the ejector push buttons, including testing of current configuration.

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

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

> The Arrow button ▲ corresponds to the input signal ”Vacuum on” and ▼ current consumption to the input signal “Blow-off on”.

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



TROUBLESHOOTING

Failure	Check	Action
1. Display lit but no vacuum generation	Check air supply	Pressurize ejector
2. Display lit but limited vacuum generation	Check air supply pressure	Correct
	Check the vacuum port fittings, pipes, vacuum cups etc. for leakage	Check the vacuum port fittings, pipes, vacuum cups etc. for leakage
	Check the ejector port filter and nozzles for paricles	Clean
3. Display not lit, and no function	Check the electrical power supply	Correct
4. Red LED lit and **P** in the display	Parameter conflict (A, C, E)	Change conflicting parapeter/parameters
5. . Red LED lit and **E** in the display at power up	Electrical power supply or internal voltage out of spec.	See "**Display error information**" on previous page
6. 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 "**Display error information**" on previous page
7. Wrong value in the display	The sensor offset change due to external circumstances	See "**Display value fault**" on previous page
8. The Ejector generates vacuum On and Off rapidly	Check for system leakages	Systemdichtheit wieder herstellen
	The operating range to small (Parameter **C** and **E**)	Increase the range
9. General error		See "**Factory reset**" on previous page

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