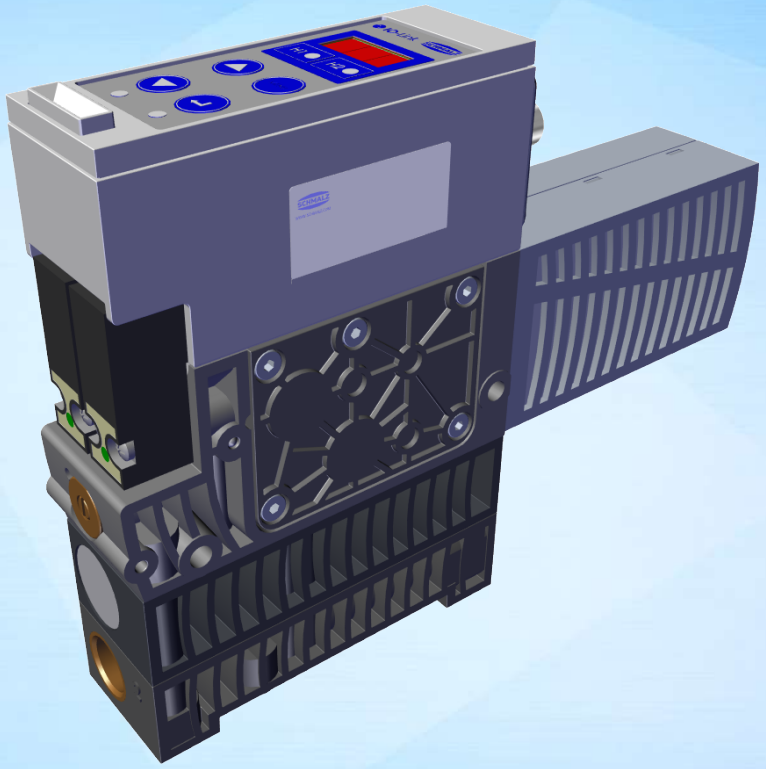

Operating instructions

X-Pump – SXPi/SXMPi

WWW.SCHMALZ.COM

EN-US · 30.30.01.00016 · 03 · 01/23

Note

The Operating instructions were originally written in German. Store in a safe place for future reference. Subject to technical changes without notice. No responsibility is taken for printing or other types of errors.

Published by

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www.schmalz.com/salesnetwork

Contents

1 Important Information

1.1 Note on Using this Document

J. Schmalz GmbH is generally referred to as Schmalz in this document.

The document contains important notes and information about the different operating phases of the product:

- Transport, storage, start of operations and decommissioning
- Safe operation, required maintenance, rectification of any faults

The document describes the product at the time of delivery by Schmalz and is aimed at:

- Installers who are trained in handling the product and can operate and install it
- Technically trained service personnel performing the maintenance work
- Technically trained persons who work on electrical equipment

1.2 The technical documentation is part of the product

1. For problem-free and safe operation, follow the instructions in the documents.
2. Keep the technical documentation in close proximity to the product. The documentation must be accessible to personnel at all times.
3. Pass on the technical documentation to subsequent users.

⇨ Failure to follow the instructions in these Operating instructions may result in injuries!

⇨ Schmalz is not liable for damage or malfunctions that result from failure to heed these instructions.

If you still have questions after reading the technical documentation, contact Schmalz Service at:
www.schmalz.com/services

1.3 Symbols

This symbol indicates useful and important information.

✓ This symbol represents a prerequisite that must be met prior to an operational step.

‣ This symbol represents an action to be performed.

⇨ This symbol represents the result of an action.

Actions that consist of more than one step are numbered:

1. First action to be performed.
2. Second action to be performed.

2 Fundamental Safety Instructions

2.1 Intended Use

The ejector is designed to generate a vacuum for gripping and transporting objects when used in conjunction with suction cups. It is operated by a controller with discrete signals or via IO-Link.

The product is built in accordance with the latest standards of technology and is delivered in a safe operating condition; however, hazards may arise during use.

The product is intended for industrial use.

Intended use includes observing the technical data and the installation and operating instructions in this manual.

2.2 Non-Intended Use

Schmalz accepts no liability for damages caused by non-intended usage of the ejector.

In particular, the following are considered non-intended use:

- In potentially explosive atmospheres
- Use for medical applications
- Filling pressurized containers, driving cylinders, valves or other pressure-operated functional elements

2.3 Personnel Qualification

Unqualified personnel cannot recognize dangers and are therefore exposed to higher risks!

The operating company must ensure the following points:

- The personnel must be commissioned for the activities described in these operating instructions.
- The staff must be at least 18 years of age and physically and mentally capable.
- The operating staff have been instructed in the operation of the product and have read and understood the operating instructions.
- Installation, maintenance, and repairs must be carried out only by specialists or by persons who can prove that they have undergone appropriate training.

Applicable for Germany:

A qualified employee is defined as an employee who has received technical training and has the knowledge and experience – including knowledge of applicable regulations – necessary to enable him or her to recognize possible dangers and implement the appropriate safety measures while performing tasks. Qualified employees must observe the relevant industry-specific rules and regulations.

2.4 Warnings in This Document

Warnings warn against hazards that may occur when handling the product. The signal word indicates the level of danger.

Signal word	Meaning
⚠ WARNING	Indicates a medium-risk hazard that could result in death or serious injury if not avoided.
⚠ CAUTION	Indicates a low-risk hazard that could result in minor or moderate injury if not avoided.
NOTE	Indicates a danger that leads to property damage.

2.5 Residual Risks

⚠ WARNING

Noise pollution due to the escape of compressed air

Hearing damage!

- Wear ear protectors.
- The ejector must only be operated with a silencer.

⚠ WARNING

Extraction of hazardous media, liquids or bulk material

Personal injury or damage to property!

- Do not extract harmful media such as dust, oil mists, vapors, aerosols etc.
- Do not extract aggressive gases or media such as acids, acid fumes, bases, biocides, disinfectants or detergents.
- Do not extract liquids or bulk materials, e.g. granulates.

⚠ CAUTION

Depending on the purity of the ambient air, the exhaust air can contain particles, which escape from the exhaust air outlet at high speed.

Eye injuries!

- Do not look into the exhaust air flow.
- Wear eye protection.

⚠ CAUTION

Vacuum close to the eye

Severe eye injury!

- Wear eye protection.
- Do not look into vacuum openings such as suction lines and hoses.

2.6 Modifications to the Product

Schmalz assumes no liability for consequences of modifications over which it has no control:

1. The product must be operated only in its original condition as delivered.
2. Use only original spare parts from Schmalz.
3. The product must be operated only in perfect condition.

3 Product Description

3.1 Applying Suction to the Workpiece/Part (Vacuum Generation)

⚠ WARNING

The Compressed Air Supply of the Vacuum Generator Fails During Operation.

Danger of falling parts because the vacuum for the vacuum gripper collapses quickly.

- Ensure that the compressed air supply does not fail during operation.
- Carry out a risk assessment for each application.

The ejector is designed for handling and holding workpieces by means of a vacuum in combination with suction systems. The vacuum is generated in a nozzle according to the venturi principle, using suction generated by the flow of accelerated compressed air. Compressed air is channeled into the ejector and flows through the nozzle. A vacuum is generated immediately downstream of the motive nozzle; this causes the air to be sucked through the vacuum connection. The air and compressed air that have been removed by the suction exit together via the silencer.

The venturi nozzle on the ejector is activated and deactivated using the suction command:

- In the NO (normally open) version, vacuum generation is deactivated when the suction signal is received.
  (This means that if the power fails or if no control signal is present, vacuum is constantly generated (continuous suction).)
- In the NC (normally closed) version, vacuum generation is activated when the suction signal is received.
  (This means that if the power fails or if no control signal is present, no vacuum is generated.)
- In the variant IMP, the venturi nozzle is actuated using the same principle as the variant NC. This means that the ejector switches to “suction” mode when a pulse with an interval of at least 50 ms is present.

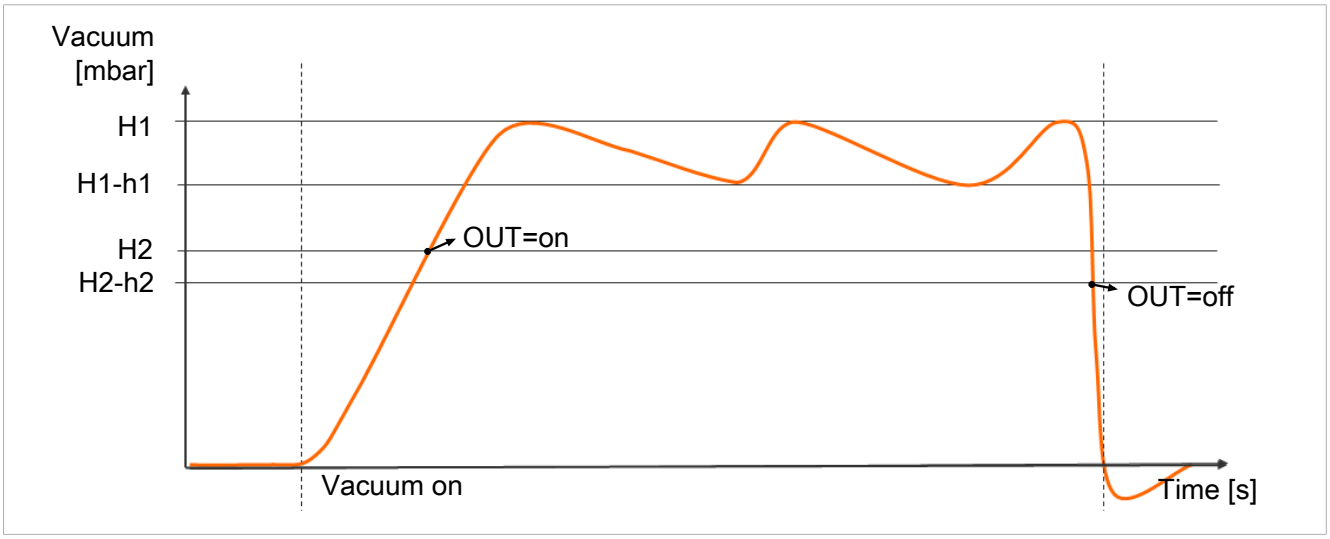
In the ejector variant IMP, the ejector remains in “Suction” mode if the power supply fails during automatic operation. This prevents objects that have been picked up from falling off the suction cup in the event of a power supply failure. This also applies when the ejector is in “venturi nozzle inactive” status with the air saving function activated. In this case, the ejector switches to “venturi nozzle active,” i.e., to continuous suction. When the power supply returns, the ejector remains in automatic operation with the air saving function activated. If the ejector is in “blow off” mode when the power supply fails, the blow off is stopped and the ejector is set to “pneumatically OFF” status. This prevents unnecessary consumption of compressed air, thus saving energy and additional costs. When the power supply returns, the ejector remains in “pneumatically OFF” status.

An integrated sensor records the vacuum generated by the venturi nozzle. The exact vacuum value:

- is shown on the display
- is evaluated by an electronics system and serves as the basis for displaying system statuses

With ejector variants NO and NC, the “suction” valve is also equipped with manual actuation. This can be used to actuate the valve manually without a power supply.

The diagram below shows the vacuum curve for when the air saving function is activated:



The ejector has an integrated air saving function and automatically regulates the vacuum in suction mode:

- The electronics switch the venturi nozzle off as soon as the set vacuum limit value (switching point H1) is reached.
- When objects with airtight surfaces are picked up, the integrated non-return valve prevents the vacuum from dropping quickly in the event of a power failure.
- If the system vacuum drops below the limit value switching point H1-h1 due to leaks, the venturi nozzle is switched back on.
- Depending on the vacuum, the H2 process data bit is set once a workpiece is picked up safely. This enables the further handling process.

If small volumes are to be evacuated, the set limit value H1 may be exceeded considerably before the vacuum is switched off. This system behavior does not constitute an error.

3.2 Depositing the Workpiece/Part (Blowing Off)

⚠ CAUTION

Operating the ejector with a closed vacuum connection

Personal injury or damage to the ejector may occur as a result

- Do not close the vacuum connection
- Wear eye protection.
- Do not look into the silencer air stream

In blow off mode, the vacuum circuit of the ejector is supplied with compressed air. This ensures that the vacuum drops quickly, allowing the workpiece/part to be deposited quickly.

"Blow off" mode can be controlled externally or internally:

- When controlled externally, "blow off" mode is activated by the "blow off" signal input.
- During internally controlled automatic blow off, the "blow off" valve is activated for a defined period after "suction" mode is exited. This function is not available for the ejector version IMP.

If the "Suction" signal input is still present in the pulse-controlled ejector variant (IMP) after "blow off", it is not evaluated. The ejector does not switch to "suction" status until another pulse is activated.

The "blow off" valve is also equipped with manual actuation. The valve can be switched to "blow off" status without a supply voltage using manual actuation.

The ejector also has a manual mode. In this mode, the ejector can be controlled using the buttons on the ejector's foil keypad. See the "Manual mode" section for more details.

The current process state is indicated by the LED status indicators.

During blow off, [-FF] is shown on the display.

3.3 Operating Modes

If the ejector is connected to the supply voltage, it is ready for operation. This is the normal operating mode, in which the ejector is operated by the system controller.

The ejector is parameterized via the available menus or via IO-Link.

The following operating modes are available during the setup process:

- Setting Mode
- Manual Mode

3.4 Ejector Variants

The breakdown of the item designation (e.g. SXMPi-20-NO-H-2xM12) is as follows:

Property	Variants
Type of ejector	SXPi SXMPi (M = with power blow-off module)
Nozzle size	1.5 mm 2.0 mm 2.5 mm and 3.0 mm
Control	Normally open (NO) Normally closed (NC) Bistable, switched with pulse, IMP
Pneumatic connection	Horizontal, H Quick change, Q
Additional function	Pressure control, PC
Electrical connection	1xM12 8-pin plug 2xM12 5-pin plug

Pneumatic connection via quick change (Q)

The Quick Change -Q- option can be ordered for all ejector variants. This version of the ejector comes with a special connection module for the pneumatic connections. The Quick Change system allows you to change ejectors quickly without removing the pneumatic connections.

Ejector variant PNP or NPN

The signal type, or the switching behavior (PNP or NPN) of the electrical signal inputs and the signal output, can be set on the device and therefore does not depend on the version.

You can switch this setting using the [ŁYP] menu item in the configuration menu or via IO-Link.

The ejector is factory set to PNP.

Additional pressure control function (PC)

The -PC- option can be ordered for all ejector types. In this version, an additional pressure sensor is integrated into the ejector.

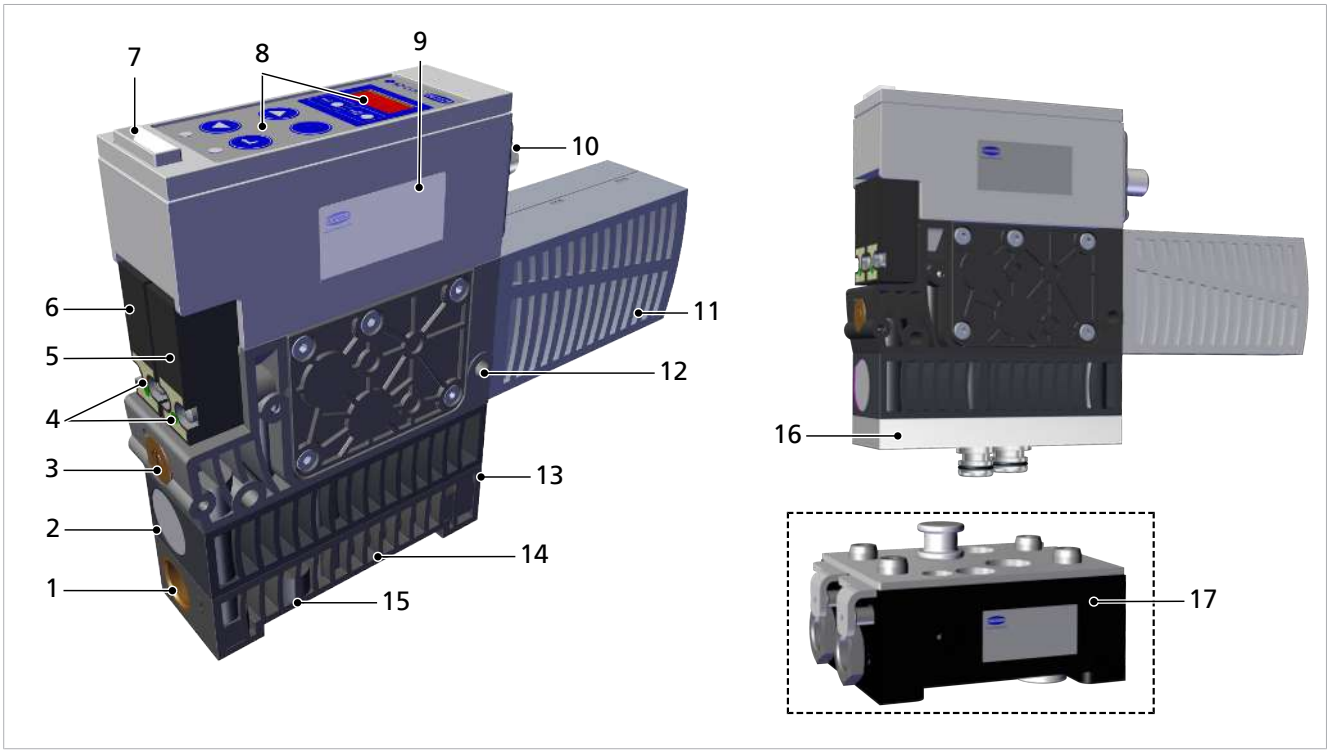
The following additional functions are available with it:

- Pressure indicator on the display
- Signal output for pressure control (freely adjustable)

Additionally via IO-Link:

- Current pressure value
- Advanced condition monitoring with:
  - Leakage measurement
  - Dynamic pressure measurement
  - Performance calculation
  - Quality assessment
- Advanced energy monitoring with:
  - Absolute air consumption measurement
  - Energy consumption measurement

3.5 Ejector Structure

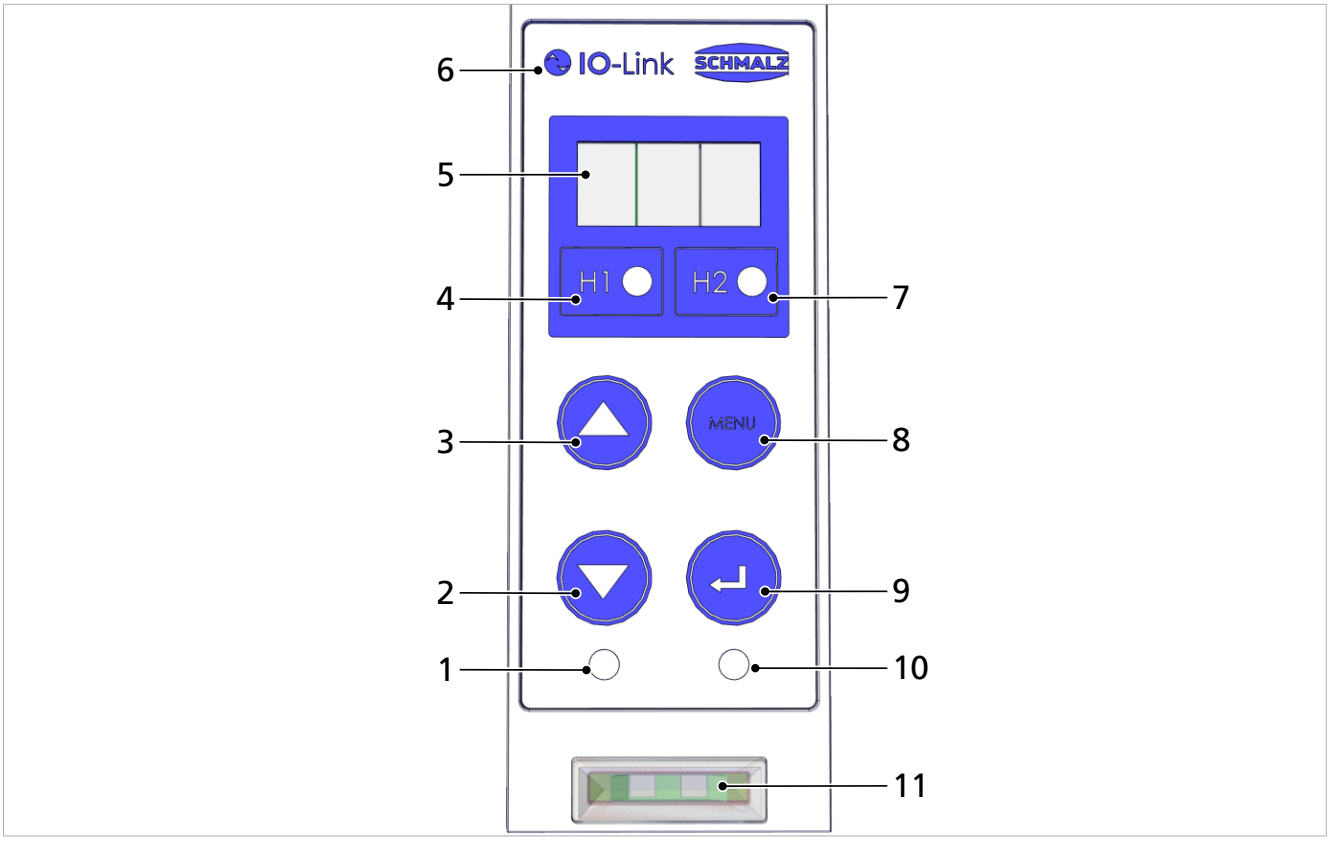


1	G3/8" vacuum connection in H version (label: 2 [V])	10	Electrical connection, 1xM12-8 or 2xM12-5
2	Power blow-off module	11	Silencer
3	Valve screw for blow off flow rate	12	Mounting holes (2x Ø 5.5 mm)
4	Manual actuation of pilot valves	13	G3/8" compressed air connection in H version (label: 1 [P])
5	“Suction” pilot valve – NO, NC or IMP (depending on version) (IMP variant without manual auxiliary actuation)	14	Horizontal pneumatic connection module (H) (1[P]= G3/8", 2[V]= G3/8")
6	“Blow-off” pilot valve – NC	15	2x M5 mounting threads
7	Condition monitoring	16	Quick Change module (Q)
8	Operating and display elements	17	Accessories: Quick change double block+++
9	Type plate	—	—

3.6 Controls and Displays in Detail

The ejector is fitted with the following elements to ensure simple operation:

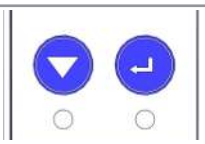
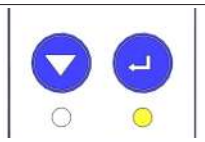
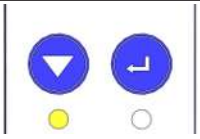
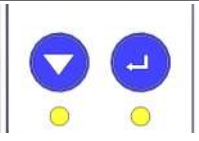
- Four buttons on the foil keypad
- The three-digit display
- 4 light-emitting diodes (LEDs) as status indicators
- The condition monitoring system



1	LED for "Blow-off" process state	7	H2 limit value LED
2	**DOWN BUTTON**	8	**MENU BUTTON**
3	**UP BUTTON**	9	**ENTER BUTTON**
4	H1 limit value LED	10	LED for "Suction" process state
5	Display	11	Condition monitoring state indicator
6	IO-Link symbol (product is equipped with an IO-Link interface)	—	—

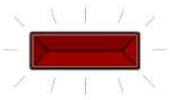
Definition of the LED indicators

The “suction” and “blow off” process states are each assigned an LED.

Valve LEDs		Ejector state
	LEDs are both OFF	NO: Suction from ejector NC: No suction from ejector IMP: No suction from ejector
	“Suction valve” LED lights up continuously	NO: No suction from ejector NC: Suction from ejector IMP: Suction from ejector
	“Blow-off valve” LED lights up continuously	NC: Ejector blows off IMP: Ejector blows off
	Both LEDs continuously lit	NO: Ejector blows off

Status display for system vacuum

During regular suction cycles, the status display is used to display the current system vacuum level in relation to switching points H1 and H2.
The status display turns off when a regular suction cycle ends.

Status indicator, pos. [11]		Vacuum level
	Display lights up RED	Rising vacuum: Vacuum < H2 Falling vacuum: Vacuum < (H2-h2)
	Display flashes RED	Rising vacuum: Vacuum > H2 and < H1 Falling vacuum: Vacuum > (H2-h2) and < (H1-h1)
	Display lights up GREEN	Rising vacuum: Vacuum > H1 Falling vacuum: Vacuum > (H1-h1)

When the condition monitoring function is activated, a different state indicator assignment applies.

LEDs for limit values H1 and H2

The LEDs for the limit values H1 and H2 indicate the current system vacuum level relative to the configured switching points.
Their display is independent of the switching function and assignment of the outputs (H1/HP1), and independent of whether the condition monitoring function is active.

Limit value LEDs		Ejector state
	LEDs are both off.	Rising vacuum: Vacuum < H2 Falling vacuum: Vacuum < (H2-h2)
	H2 LED lit steadily	Rising vacuum: Vacuum > H2 and < H1 Falling vacuum: Vacuum > (H2-h2) and < (H1-h1)
	Both LEDs light up continuously.	Rising vacuum: Vacuum > H1 Falling vacuum: Vacuum > (H1-h1)

4 Technical Data

4.1 Display Parameters

Parameter	Value	Unit	Comment
Display	3	digit	Red 7-segment LED display
Resolution	± 2	digit / mbar	Unit = mbar
Accuracy	± 3	% FS	T_{amb}= 25° C, based on FS (full-scale) final value
Linearity error	± 1	%	
Offset error	± 2	digit / mbar	After zero-point adjustment, without vacuum
Temperature influence	± 3	%	0° C < T_{amb} < 50° C
Display refresh rate	5	1/s	Only affects the red 7-segment display (for signal inputs and outputs see “Electrical Parameters”)
Idle time before the menu is exited	2	min	The display mode is accessed automatically when no settings are made in a menu

4.2 General Parameters

Parameter	Symbol	Limit value			Unit	Comment
		min.	typ.	max.		
Working temperature	T_{amb}	0	---	50	° C	---
Storage temperature	T_{Sto}	-10	---	60	° C	---
Humidity	H_{rel}	10	---	90	% r.h.	Free from condensation
Degree of protection	---	---	---	IP65	---	---
Operating pressure (flow pressure)	P	3	5	6	bar	---
Operating medium	Air or neutral gas, 40 µm filtered, with or without oil, class 7-4-4 compressed air quality in acc. with ISO 8573-1					

4.3 Electrical Parameters

Parameter	Symbol	Limit values			Unit	Comment
		min.	typ.	max.		
Power supply	U_{SA}	19.2	24	26.4	V_{DC}	PELV[1)]
SX(M)Pi – xx – NO/IMP – xx – 2xM12						
Power consumption from U_S [2)]	I_S	—	—	60	mA	
Power consumption from U_A	I_A	—	—	155 130 145	mA	U_S = 19.2V U_S = 24.0 V U_S = 26.4 V
SX(M)Pi – xx – NC – xx – 2xM12						
Power consumption from U_S [2)]	I_S	—	—	60	mA	
Power consumption from U_A	I_A	—	—	80 70 75	mA	U_S = 19.2 V U_S = 24.0 V U_S = 26.4 V

SX(M)Pi – xx – NO/IMP – xx – M12						
Power consumption from U_{SA} [2)]	I_{SA}	—	—	215 190 205	mA	U_S = 19.2 V U_S = 24.0 V U_S = 26.4 V
SX(M)Pi – xx – NC – xx – M12						
Power consumption from U_{SA} [2)]	I_{SA}	—	—	140 130 135	mA	U_S = 19.2 V U_S = 24.0 V U_S = 26.4 V
Voltage of signal output (PNP)	U_{OH}	$U_{S/SA}$-2	—	$V_{S/SA}$	V_{DC}	I_{OH} < 150 mA
Voltage of signal output (NPN)	U_{OL}	0	—	2	V_{DC}	I_{OL} < 150 mA
Current of signal output (PNP)	I_{OH}	—	—	150	mA	Short-circuit-proof [3)]
Current of signal output (NPN)	I_{OL}	—	—	-150	mA	Short-circuit-proof [3)]
Voltage of signal input (PNP)	U_{IH}	15	—	$U_{A/SA}$	V_{DC}	In reference to $Gnd_{A/SA}$
Voltage of signal input (NPN)	U_{IL}	0	—	9	V_{DC}	In reference to $U_{A/SA}$
Current of signal input (PNP)	I_{IH}	—	5	10	mA	
Current of signal input (NPN)	I_{IL}	—	-5	-10	mA	
Pulse duration for “suction” valve	t_P	50	—	—	ms	
Response time of signal inputs	t_I	—	10	—	ms	
Response time of signal output	t_O	1	—	200	ms	Adjustable

1) The power supply must correspond to the regulations in accordance with EN60204 (protected extra-low voltage). The power supply, signal inputs and outputs are all protected against reverse polarity.

2) Plus the output currents

3) The signal output is protected against short circuits. However, it is not protected against overloading. Constant load currents > 0.15 A may lead to impermissible heating and therefore the destruction of the product.

4.4 Mechanical Data

4.4.1 Performance Data

Type	SXPi15	SXPi20	SXPi25	SXMPi30
Nozzle size [mm]	1.5	2.0	2.5	3.0
Max. vacuum[1] [%]	85			
Suction rate[1] [l/min]	70	135	185	220
Max. blow off capacity [1] [l/min]	200		200	
Air consumption [1] [l/min]	115	180	290	380
Sound level[1], unobstructed suction [dBA]	63	65	67	72
Sound level[1], suction [dBA]		62	64	69
Weight [kg]	0.77		0.77	

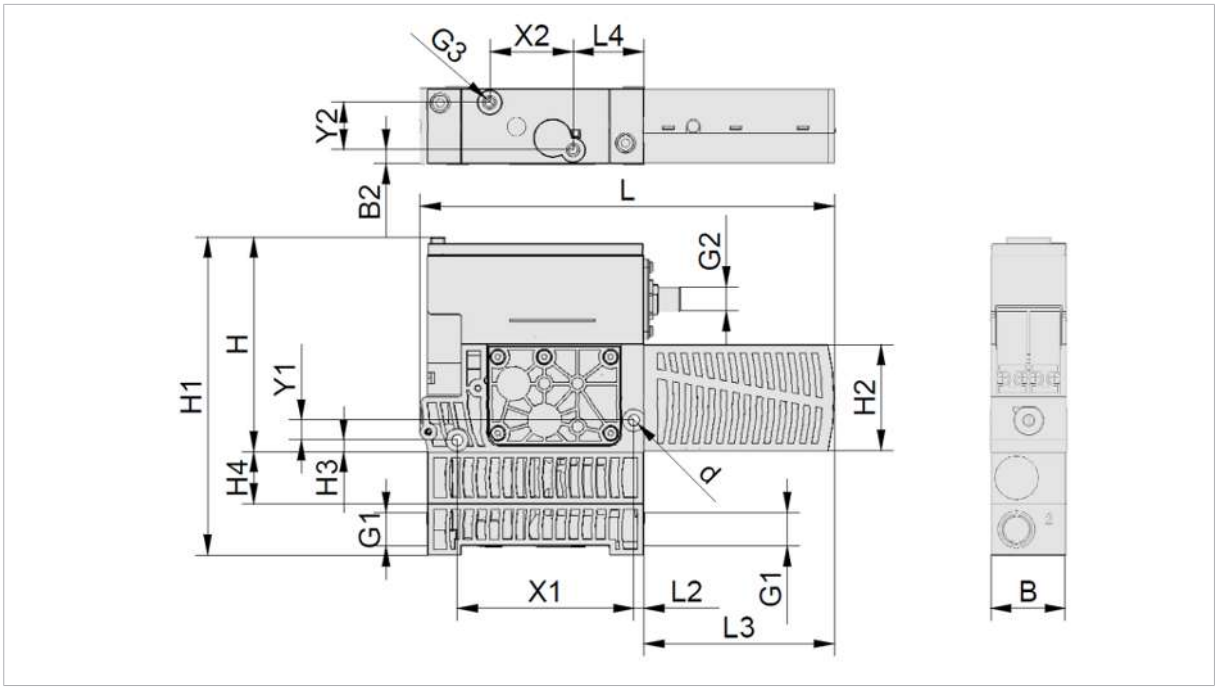
Type	SXMPi15	SXMPi20	SXMPi25	SXMPi30
Nozzle size [mm]	1.5	2.0	2.5	3.0
Max. vacuum[1] [%]	85			
Suction rate[1] [l/min]	70	135	185	220
Max. blow off capacity [1] [l/min]	320			
Air consumption [1] [l/min]	115	180	290	380
Sound level[1], unobstructed suction [dBA]	63	65	67	72
Sound level[1], suction [dBA]		62	64	69
Weight [kg]	0.91			

[1)] At 4.5 bar

4.4.2 Factory Settings

Code	Parameter	Value of the factory setting
H- 1	Limit value H1	750 mbar
h- 1	Hysteresis value h1	150 mbar
H-2	Limit value H2	550 mbar
h-2	Hysteresis value h2	10 mbar
HP 1	Limit value HP1	4.0 bar
hP 1	Hysteresis value hP1	0.2 bar
tbL	Blow off time	0.2 s
ctr	Control	Activated = on
dcS	Continuous suction	Deactivated = oFF
t- 1	Evacuation time	2 s
-L-	Leakage value	250 mbar/s
bLo	Blow off function	Externally controlled blow off = -E-
out	Configuration of outputs	no Normally open contact
tyP	Signal type	PNP switching PnP
un i	Vacuum unit	Vacuum unit in mbar = -bA
dLy	Switch-off delay	10 ms
Eco	Eco mode	Deactivated = oFF
P in	PIN code	User-defined 000

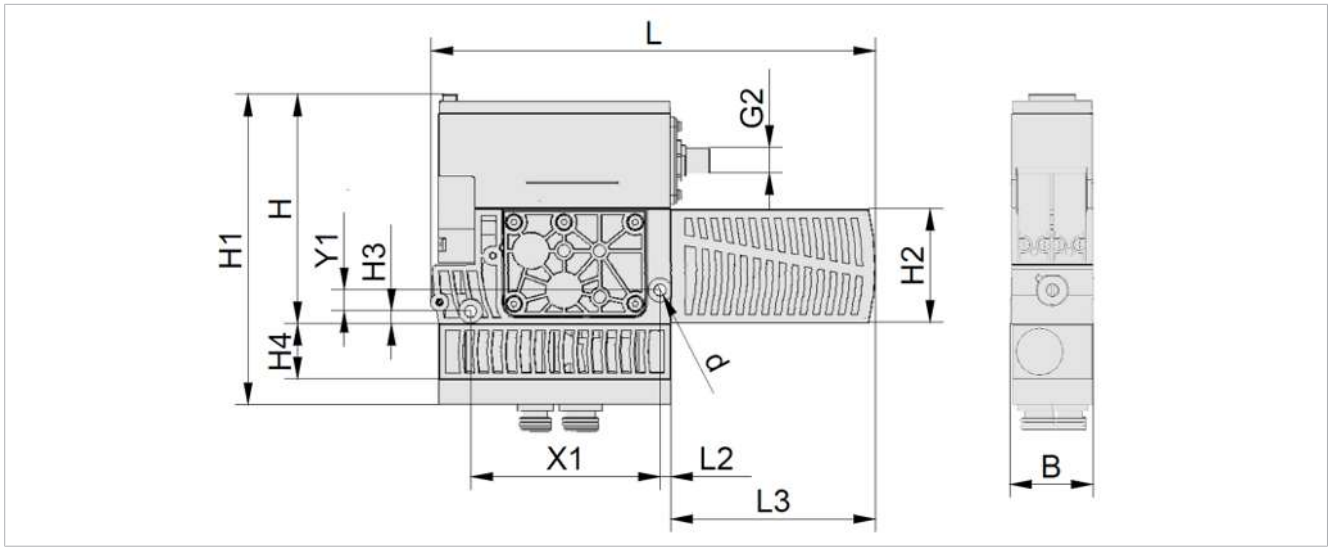
4.4.3 Dimensions



Variant	B	B2	G1	G2	G3	H	H1	H2	H3	H4
SXPi ...H	39	6.8	G3/8" internal thread	M12 external thread	M5-IG	108	134	54	6	—
SXMPi ...H	39	6.8	G3/8" internal thread	M12 external thread	M5-IG	108	160	54	6	26

Variant	L	L2	L3	L4	X1	X2	Y1	Y2	d
SXPi ...H	210	5	97	35.5	89	42	10	24	5.5
SXMPi ...H	210	5	97	35.5	89	42	10	24	5.5

All specifications are in mm

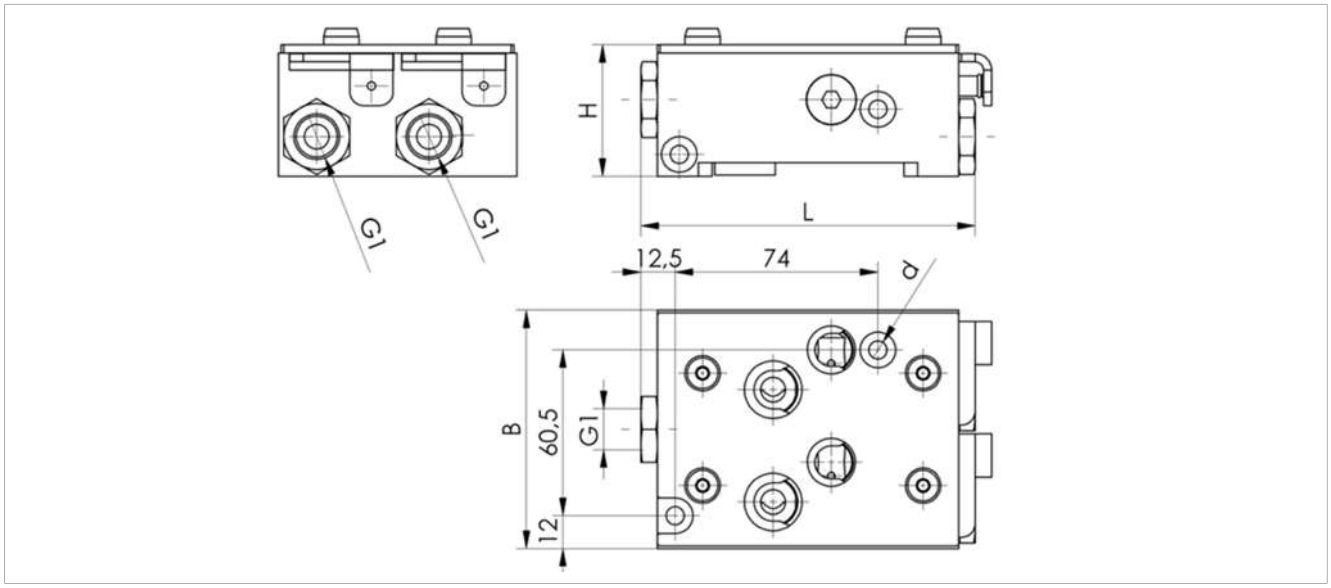


Variant	B	G2	H	H1	H2	H3	H4
SXPi ...Q	39	M12 external thread	108	121	54	6	—
SXMPi ...Q	39	M12 external thread	108	146	54	6	26

Variant	L	L2	L3	X1	Y1	d
SXPi ...Q	210	5	97	89	10	5.5
SXMPi ...Q	210	5	97	89	10	5.5

All specifications are in mm

GP2 base plate, "Quick Change Adapter"



B	d	G1	H	L
87	6.6	G3/8" internal thread	48	122

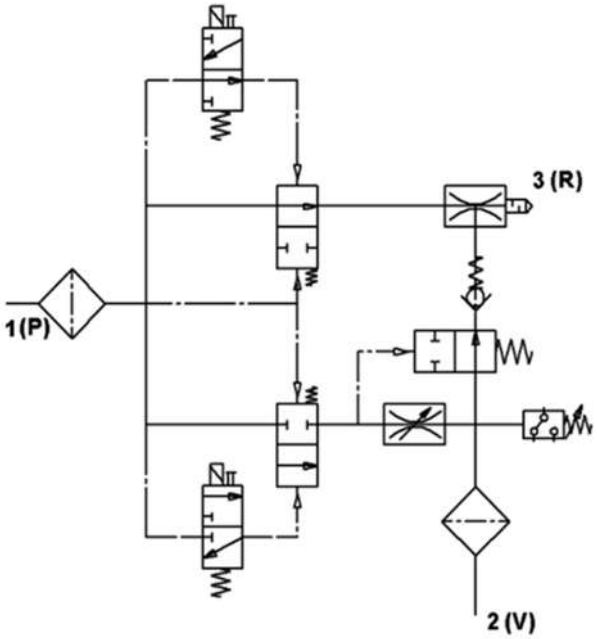
All specifications are in mm

4.4.4 Maximum Torque

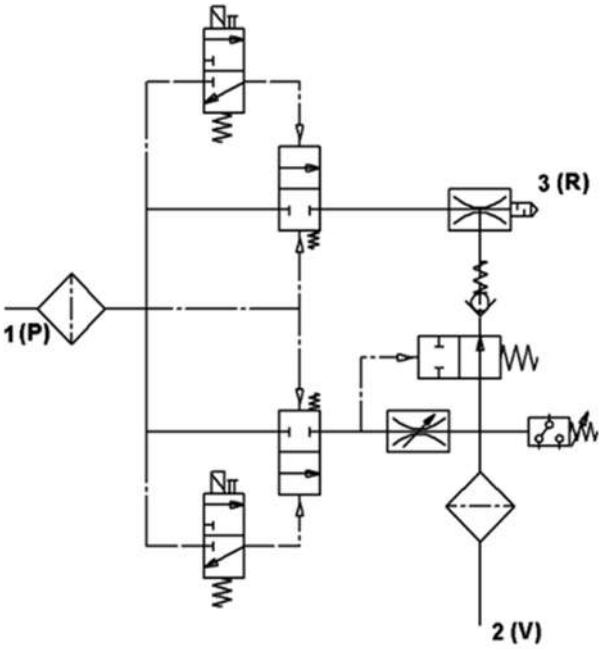
Connection	Max. torque
On ejector	
G3/8" vacuum connection (labeling 2 [V])	6 Nm
Mounting G3 (2xM5)	2 Nm
Mounting hole d	4 Nm
Pilot valves	0.5 Nm
Electrical connector M12	Hand-tight
Control	0.5 Nm
On base plate	
G1	6 Nm

4.4.5 Pneumatic circuit plans

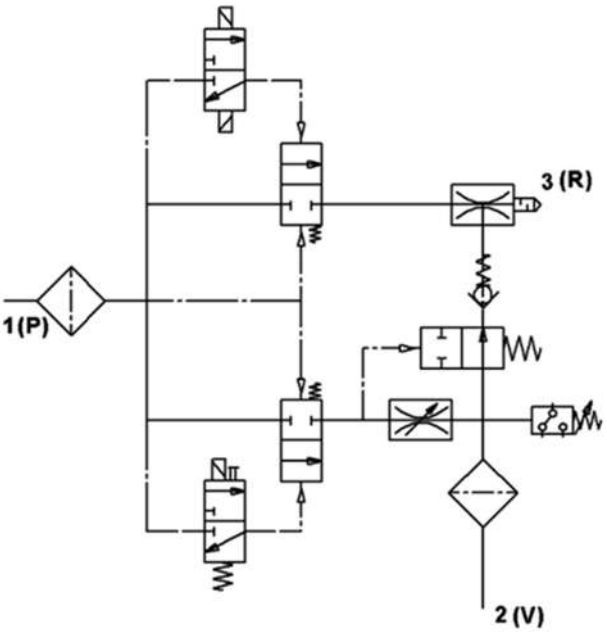
SXMPi ...NO...



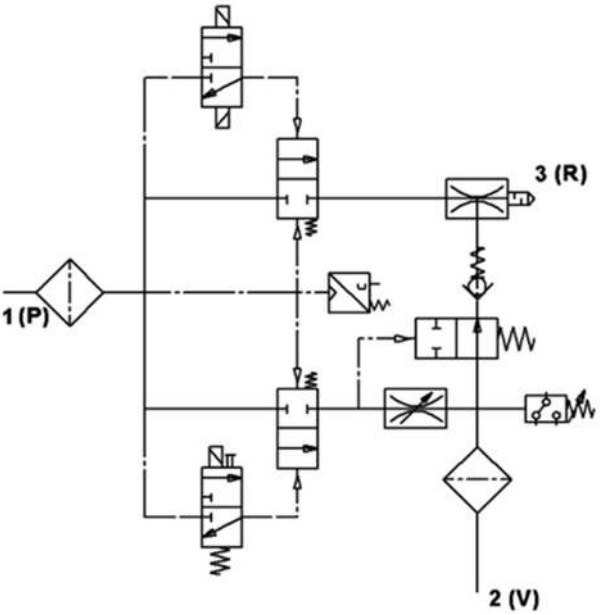
SXMPi ...NC...



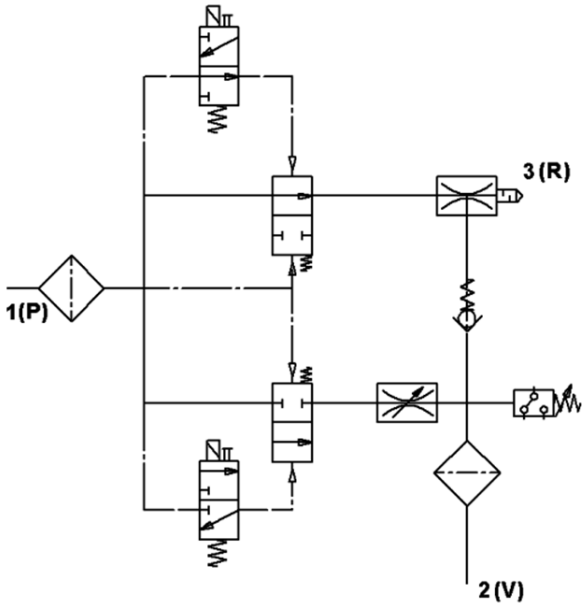
SXMPi ...IMP...



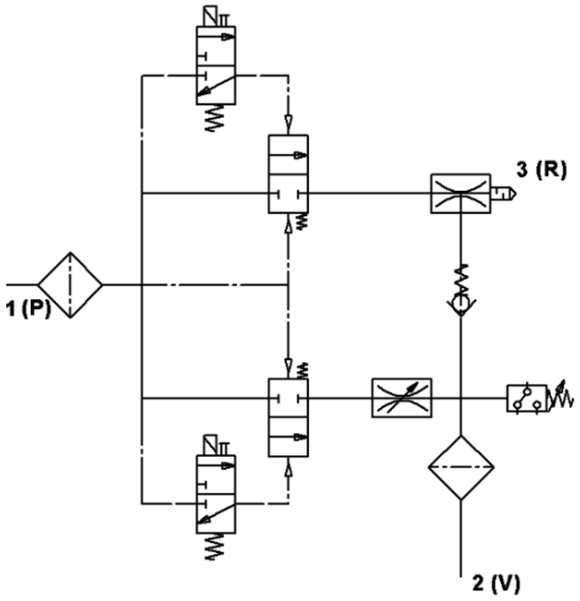
SXMPi ...IMP...PC



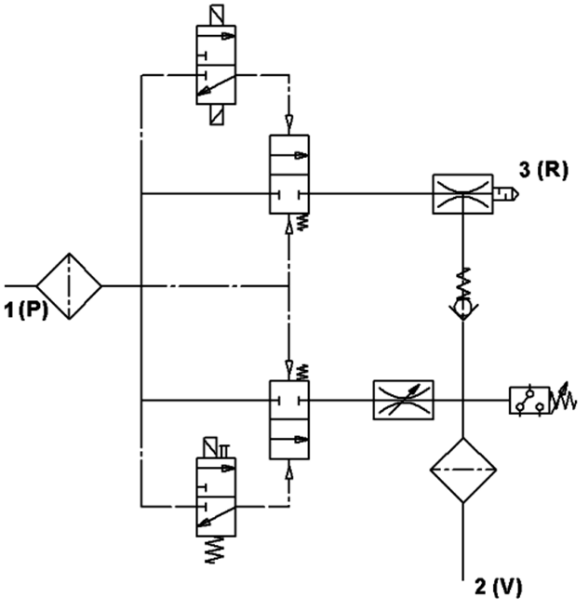
SXPi ...NO...



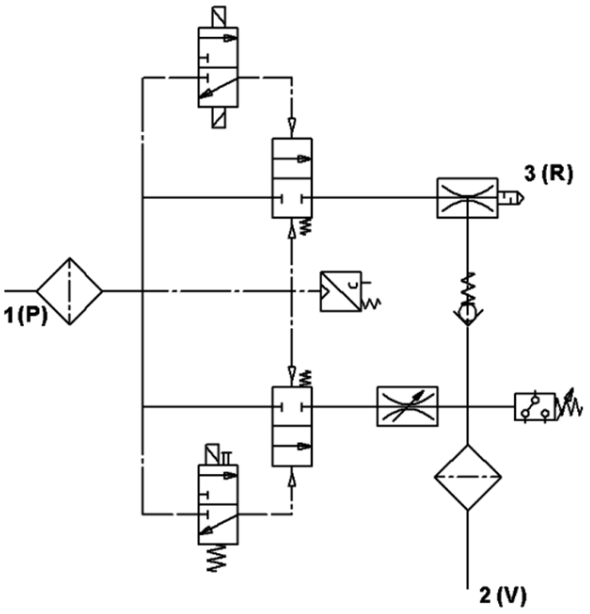
SXPi ...NC...



SXPi ...IMP...



SXPi ...IMP-PC



5 Operating and Menu Concepts

The ejector is operated using four buttons on the foil keypad:

	**MENU BUTTON**		**UP BUTTON**
	**ENTER BUTTON**		**DOWN BUTTON**

Settings are configured in software menus. The following menus are available:

- Main menu: For standard applications
- Configuration menu: For applications with special requirements
- System menu: For reading out system data such as counters, the software version, etc.

If settings are changed, undefined system states may occur for a short time (for approx. 50 ms).

The following information can be shown on the display:

- The current vacuum measurement value
- The selected menu item
- The settings
- Error messages in the form of error codes

The operating menu's home screen shows the currently measured vacuum level in the selected display unit. The available units are millibar, kilopascal, inHg and psi. The measured value is displayed as positive compared to the ambient air pressure.

After a parameter is set in the operating menu, the power supply of the switch must remain stable for at least 3 seconds. Otherwise, there may be a loss of data and the resulting error E01.

The menus will automatically close if no buttons are pressed for 1 minute.

The display also returns to the home screen when an error occurs so that the error code can be displayed. A menu can be called up and used again afterward.

5.1 Button Assignments in Display Mode

In display mode, a specific function is assigned to each key.

5.1.1 Opening the Menu

Press the **MENU BUTTON** to open the menus as follows:

- ▸ Press the MENU button briefly.
- ⇨ The current production setup profile is briefly displayed, and the main menu opens with the first parameter [H- 1].

- ▸ Press the MENU for about three seconds.
  - ⇨ The display flashes [-C-]
- ⇨ The configuration menu opens with the first parameter [cFG].

Starting the system menu:

- Press and simultaneously for about three seconds.
  - ⇨ The display flashes [-S-]
- ⇨ The system menu opens with the first parameter [cc 1].

5.1.2 Displaying the Operating Mode

- Press the key from the home screen.
- ⇨ The current operating mode (SIO or IOL) is displayed.

After three seconds, the screen returns to the vacuum display.

5.1.3 Displaying the Vacuum/Pressure Unit

- In display mode, press .
- ⇨ The current unit is displayed.

After about three seconds, the screen returns to the vacuum display.

5.1.4 Displaying the System Pressure

Only for variants with an integrated pressure sensor!

- Press the button to show the current system pressure.
- ⇨ The system pressure is displayed.

- Press the button to exit the system pressure display.

On the variant without a built-in pressure sensor, the values are specified via the IO-Link.

5.2 Main Menu

All settings for standard applications can be accessed and configured using the main menu.

5.2.1 Functions in the Main Menu

The following table shows an overview of the display codes and parameters in the main menu:

Display code	Parameter	Explanation
H- 1	Limit value H1	Deactivation value of control function (only active if [ctr] = [on])
h- 1	Hysteresis value h-1	Hysteresis value for the control function
H-2	Limit value H2	Switching value for the “Part Present” check signal
h-2	Hysteresis value h-2	Hysteresis value for the “Part Present” check signal
HP 1 [1)]	Limit value HP1	Switching value for the "Pressure control" signal
hP 1 [1)]	Hysteresis hP1	Hysteresis value for the "Pressure control" signal
tbL [1)]	Ventilation time	Blow-off time setting for time-controlled blow-off (only if [bLo] = [1-t] or [E-t] is active)
cAL	Zero-point adjustment (calibration)	Calibrate vacuum sensor, zero point = ambient pressure

[1)] The function is not available in all the variants, or is available only in a certain functional context.

5.2.2 Changing the Parameters of the Main menu

1. Press the MENU button briefly.
2. Use the ▲ or ▼ button to select the desired parameter.
3. Confirm using the ↵ button.
4. Use the ▲ or ▼ button to change the value.
5. If the menu is locked: Enter a valid PIN code.
6. Press the ↵ button to save the modified value.

⇨ The displayed value flashes to confirm.

⇨ The display automatically jumps to the next setting value.

Tips and Tricks for Parameter Setting

- By pressing the ▲ or ▼ button for approx. 3 seconds, the value to be changed is scrolled through quickly
- If you exit the modified value by briefly pressing MENU, the value will remain unchanged.

5.3 Configuration Menu

The configuration menu is available for applications with special requirements.

5.3.1 Functions in the Configuration Menu

The following table shows an overview of the display codes and parameters in the configuration menu:

Display code	Parameter	Possible settings	Explanation
ctr	Energy-saving function	oFF on onS	Control function off Control active Control with leak monitoring active
dcS	Deactivate auto. control shutoff	no YES	Suppresses the automatic valve protection function when set to YES. Cannot be activated when ctr = oFF .
t-1	Max. permissible evacuation time	configurable between 0.01 and 9.99 seconds in steps of 0.01 oFF	Permissible evacuation time; evaluation in IO-Link only No monitoring
-L-	Max. permissible leakage	Values configurable between 0 and 999	Menu item only displayed when ctr = onS Unit: millibar per second This value is used for onS and CM warnings. The adjustable leakage value can be used to judge the quality of the suction process. Evaluation in IO-Link only.
bLo	Blow off function	-E- J-t E-t	Externally controlled Internally controlled (triggered internally, time can be set) Externally controlled (triggered externally, time can be set)
o-1	Signal output OUT1	 no nc	Configure output 1 for normally open for normally closed
o-2	Signal output OUT2	 no nc	Configure output 2 for normally open for normally closed
o-3	Signal output OUT3	 no nc	Configure output 3 for normally open for normally closed
tYP	Signal type	 PnP nPn	Define a signal type
unit	Vacuum unit	 bAr -PA -inH	Define the displayed vacuum unit Vacuum level in mbar Vacuum level in kPa Vacuum level in inHg
dLY	Filtering of output signals	Values: 10, 50, 200 and oFF	Delays switching signals H1, HP1 and H2 Unit: milliseconds
Eco	Display in Eco mode	oFF on	Configure the display Eco mode is deactivated – the display remains on Eco mode activated – if no buttons are pressed, the display turns off after one minute.

Display code	Parameter	Possible settings	Explanation
P In	PIN code	Value from 001 to 999	Specify the PIN, lock the menus If the PIN is 000, then the device is not locked.
rES	Reset	rES	All parameter values are reset to factory settings.

The factory settings for the parameters are listed under Factory Settings in the Technical Data section.

5.3.2 Changing the Parameters of the Configuration Menu

1. Press the MENU button for at least three seconds.
2. Use the ▲ or ▼ button to select the desired parameter.
3. Confirm using the ↵ button.
4. Use the ▲ or ▼ button to change the value.
5. If the menu is locked: Enter a valid PIN.
6. To save the changed value, press the ↵ button (for more than three seconds in the case of the parameters rES and P in).
7. To exit the configuration menu, press the MENU button.

Tips and Tricks for Parameter Setting

- By pressing the ▲ or ▼ button for approx. 3 seconds, the value to be changed is scrolled through quickly
- If you exit the modified value by briefly pressing MENU, the value will remain unchanged.

5.4 System Menu

The system menu can be used to read out system data, such as counters, the software version, the part and serial numbers, etc.

5.4.1 Functions in the System Menu

The following table shows an overview of the display codes and parameters in the system menu:

Display code	Parameter	Explanation
cc 1	Counter 1	Counter for suction cycles (suction signal input)
cc2	Counter 2	Valve switching cycles
cc3	Counter 3	CM counter
ct 1	Erasable counter 1	Counter for suction cycles (suction signal input)
ct2	Erasable counter 2	Valve switching cycles
ct3	Erasable counter 3	CM counter
rct	Reset erasable counters	All erasable counters reset to zero
Soc	Software	Displays the current software version
Art	Part number	The part number is displayed

Display code	Parameter	Explanation
Snr	Serial number	The serial number is displayed

5.4.2 Viewing Data in the System Menu

- Press and hold the ▲ and MENU buttons simultaneously for at least three seconds.

1. Use the ▲ or ▼ button to select the parameter to be shown.
2. If the menu is locked: Enter a valid PIN.
3. Confirm using the ↵ button.
   ⇨ The last three decimal places of the parameter are displayed. The decimal point at the far right flashes. This corresponds to the least significant three digits.
4. Use the ▲ and ▼ buttons to display the remaining decimal places of the parameter. The decimal points show which three-digit block of digits is shown on the display.
5. To exit the system menu, press the MENU button.

5.4.3 Displaying the Part Number

The part number both appears on the label on the ejector, and is stored electronically.

✓ Open the system menu.

1. Use the ▲ or ▼ button to select the part number parameter [Art].
2. Confirm using the ↵ button.
   ⇨ The first two digits of the part number are displayed.
3. The remaining digits of the part number are displayed with the ▼ button. The displayed decimal points are part of the part number.

The part number consists of 4 number blocks with a total of 11 digits.

Displayed section	1	2	3	4
Digit block	10.	02.0	2.00	383

The part number in this example is 10.02.02.00383.

- To exit the function, press the MENU button.

5.4.4 Displaying the Serial Number

The serial number indicates the production period of the ejector.

✓ Open the system menu.

1. Use the ▲ or ▼ button to select the parameter [Snr].

2. Confirm using the button.
   ⇨ The first three decimal places of the serial number will be displayed (the digits x10^6). The decimal point at the far left lights up. This corresponds to the three-digit block with the highest perceived value.
3. Use the and buttons to display the remaining decimal places of the serial number.

The decimal points show which three-digit block of the serial number is shown in the display.

The serial number consists of 3 number blocks:

Displayed section	10^6	10^3	10^0
Digit block	048	618	593

The current serial number in this example is 48 618 593.

▸ To exit the function, press the button.

5.4.5 Counters

The ejector is equipped with six internal counters. Two counters are incremented in pairs, one of which is always to be cleared and the other cannot be cleared.

In addition to the totals counters [cc 1], [cc2] and [cc3], temporary counter readings [ct 1], [ct2] and [ct3] can also be read out over the service life of the ejector.

Counter 1 increases with each valid pulse at the “suction” signal input, thus counting the suction cycles during automatic operation. Counter 2 increases each time the “suction” valve is switched. As a result, the switching frequency of the air saving function can be determined based on the difference between counters 1 and 2. Counter 3 detects all the condition monitoring events that have occurred (when the diagnostics output is activated, counter 3 is also increased).

Designation	Display code or parameter	Description
Counter 1	cc 1	Counter for suction cycles (“Suction” signal input) (cannot be cleared)
Counter 2	cc2	Counter for valve switching frequency (cannot be cleared)
Counter 3	cc3	Condition monitoring counter (cannot be cleared)
Counter 4	ct 1	Counter for suction cycles (“Suction” signal input) (can be cleared)
Counter 4	ct2	Counter for valve switching frequency (can be cleared)
Counter 4	ct3	Condition monitoring counter (can be cleared)

Displaying a counter on the operating panel of the ejector:

✓ The system menu is selected.

✓ The required counter is selected.

▸ Confirm the counter by pressing the button.

⇨ The last three decimal places of the counter total are displayed. The decimal point at the far right lights up. This corresponds to the least significant three digits.

Use the and buttons to display the remaining decimal places of the counter total. The decimal points show which three-digit block of the counter total is shown in the display.

The counter total is comprised of the three digit blocks together as follows:

Displayed section	10^6	10^3	10^0
Digit block	0.48	6 18	593.

The current counter total in this example is 48 618 593.

Clearing counters

There are two different ways of resetting the erasable counters to 0:

- Using system commands via IO-Link
- Using the control panel

✓ The system menu is selected.

1. Use the button to select the parameter [rCt].
2. To clear the counters, press the button for more than three seconds.

⇨ Following the confirmation, the display flashes for three seconds and all the erasable counters are reset to 0.

5.4.6 Displaying the Software Version

The software version indicates the software currently running on the internal controller.

1. Press and hold the and buttons simultaneously for at least three seconds.
   ⇨ The device switches to the system menu.
2. Use the or button to select the parameter [Soc].
3. If the menu is locked: Enter a valid PIN.
4. Confirm using the button.
   ⇨ The software version is displayed.
5. To exit the system menu, press the button.

6 Interfaces

6.1 Basic Principles of IO-Link Communication

The ejector is operated in IO-Link mode to enable intelligent communication with a controller.

The IO-Link communication takes place using cyclical process data and acyclical ISDU parameters.

The ejector's parameters can be set remotely using IO-Link mode. In addition, the energy and process control (EPC) feature is available. The EPC is divided into 3 modules:

- Condition monitoring (CM): Condition monitoring to increase system availability
- Energy monitoring (EM): Energy monitoring to optimize the vacuum system's energy consumption
- Predictive maintenance (PM): Predictive maintenance to increase the performance and quality of the gripping systems

6.2 Process Data

The cyclical process data is used to control the ejectors and receive current information reported from the ejector. There is a difference between the input data (Process Data In) and the controlling output data (Process Data Out):

The input data Process Data In is used to report the following information cyclically:

- Limit values H1 and H2
- Limit value HP1
- Status indicator green
- Status indicator red
- Status indicator flashes
- Condition monitoring event (see parameter index 0x0092)
- Error event (see parameter index 0x0082)

The output data Process Data Out is used to control the ejector cyclically:

- The ejector is controlled using the suction and blow-off commands.
- Setting mode ON/OFF

The exact meaning of the data and functions is described in more detail in the chapter Description of Functions. A detailed description of the process data can be found in the data dictionary.

The corresponding device description file (IODD) is available for integration into a higher-level control unit.

6.3 ISDU Parameter Data

The acyclical communication channel can be used to retrieve what are known as ISDU (Index Service Data Unit) parameters, which contain further information on the system status.

The ISDU channel can also be used to read or overwrite all the settings, e.g. the limit values, additional leakage, etc. Further information on the identity of the product, such as the part number and serial number, can be retrieved using the IO-Link. The product also provides space for saving user-specific information here, such as the installation and storage location.

The exact meaning of the data and functions is described in more detail in the "Description of Functions" chapter.

You can find a detailed diagram of the process data in the data dictionary and IODD.

In order for a control unit to access the ISDU parameters, the necessary system functions must be purchased from the manufacturer of the control unit and used.

7 Description of Functions

7.1 Operating Modes

7.1.1 Automatic Operation

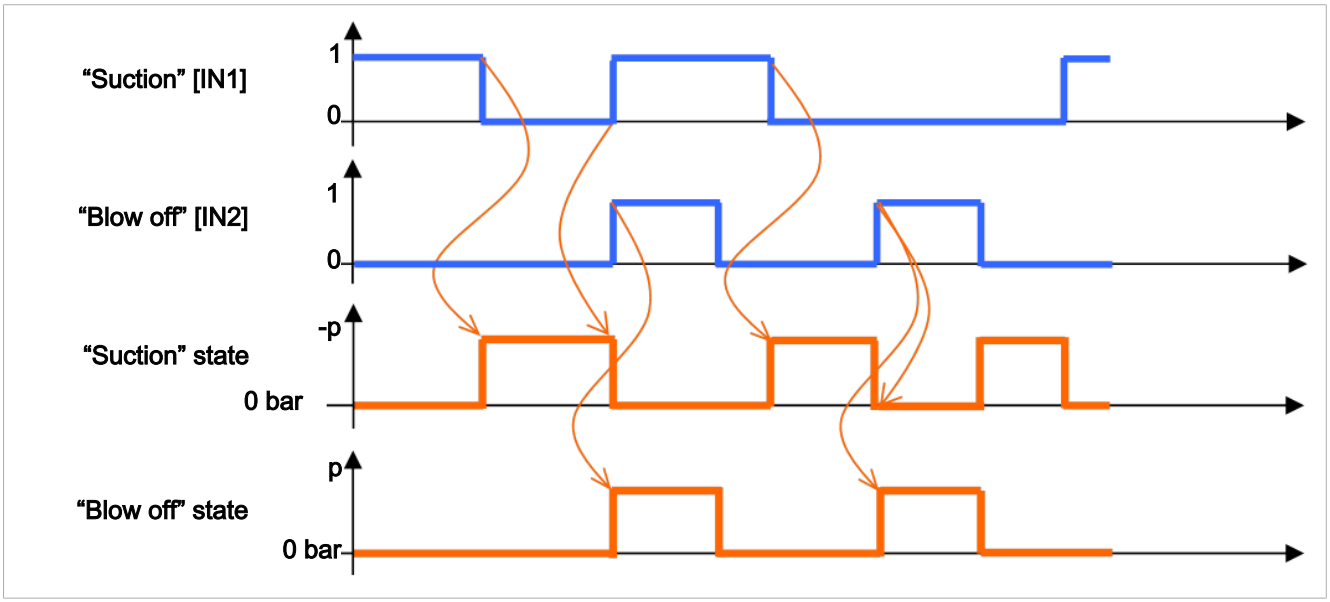
Once the product is connected to the power supply, it is ready for operation and enters automatic mode. This is the normal operating mode, in which the product is operated by the system control unit.

A differentiation is made between SIO mode and IO-Link mode.

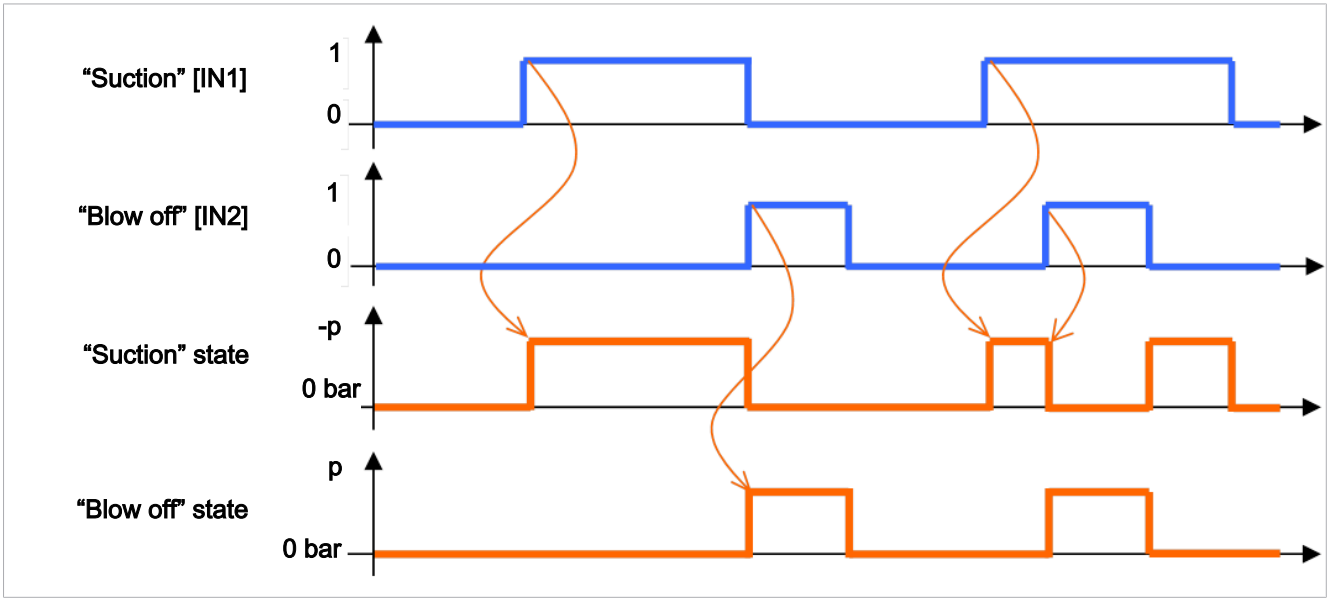
The operating mode may be changed from automatic operation to manual operation using the buttons.

The ejector is always parameterized in automatic mode.

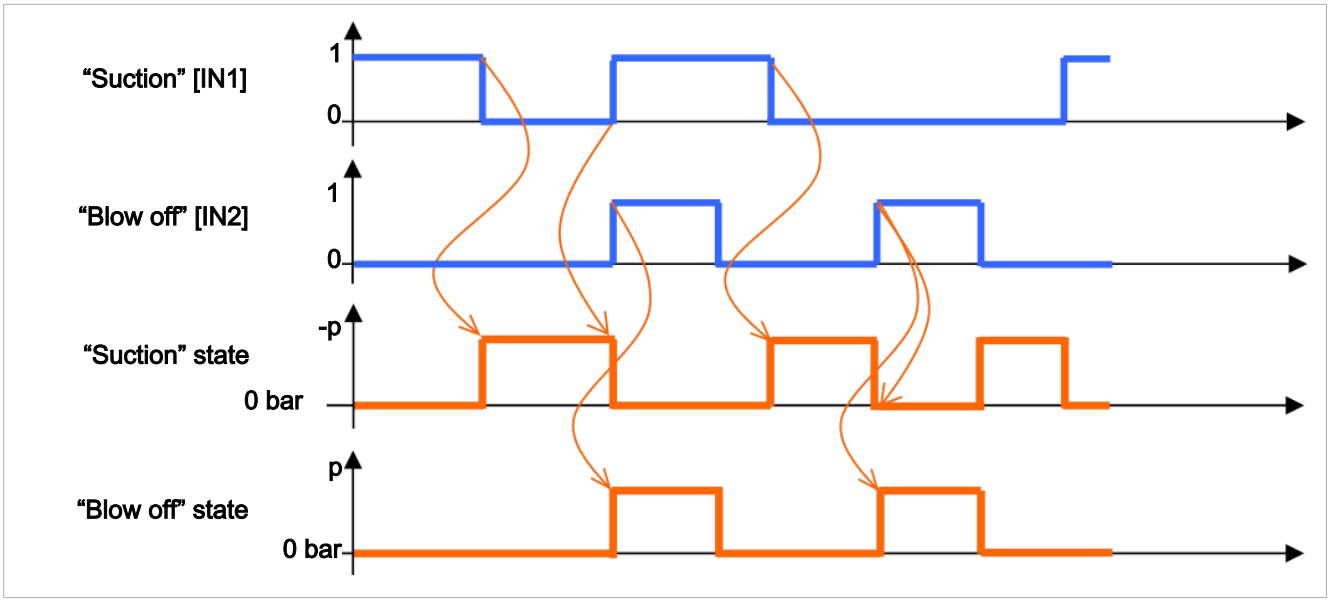
7.1.2 Control Concept for NO Ejectors



7.1.3 Control Concept for NC Ejectors



7.1.4 Control Concept for IMP Ejector Variant



On delivery, the ejector variant IMP is set to “pneumatically OFF.” The ejector only produces suction after a valid pulse has been applied at the “suction” signal input.

7.1.5 Manual Mode

NOTE

Change the output signals in manual mode

Personal injury or damage to property

- Electrical connection may be performed only by specialists who can evaluate the effects of signal changes on the overall system.

In manual mode, the “Suction” and “Blow-off” ejector functions can be controlled independently of the higher-level controller using the buttons on the foil keypad of the operating element. Because the valve protection function is deactivated in this mode, this function is used to locate and rectify leakages in the vacuum circuit.

In this operating mode, the “H1” and “H2” LEDs both flash.

Activating Manual Mode

NOTE

Manual mode modified by external signals

Personal injury or damage to property due to unpredictable work steps

- Ensure that the danger zone of the system is clear of people during operation.

- Press and hold the and buttons simultaneously for at least three seconds.

⇨ Meanwhile, the display shows [−⊓−].

⇨ The "H1" and "H2" LEDs flash.

Deactivating Manual Mode

✓ The ejector is in "manual mode".

▸ Press the MENU button.

⇨ The H1 and H2 LEDs cease to flash.

The device also exits manual mode when the status of the external signals changes.
When the ejector receives an external signal, it switches to automatic mode.

Activating and Deactivating Manual Suction

Activating manual suction

✓ The ejector is in “manual mode”. The "H1" and "H2" LEDs flash.

▸ Press the ▲ button to activate “suction” mode.

⇨ The suction LED lights up.

⇨ The ejector begins to suck.

Deactivating manual suction

✓ The ejector is in “suction” mode.

▸ Press the ▲ button again or press the ▼ button to deactivate "Suction" mode once more.

⇨ The suction process is deactivated.

If the controller is on [ctr] = [on] or [ctr] = [onS], it is also activated based on the set limit values in “manual” mode.
The valve protection function is not active in manual mode.

Activating and Deactivating Manual Blow-off

✓ The ejector is in "manual mode".

▸ Press and hold the ▼ button.

⇨ The blow-off LED lights up.

⇨ The ejector blows off as long as the button is held.

▸ Release the button on the ejector to end the blow-off.

⇨ The blow-off process is deactivated.

7.1.6 Setup Mode

Setting mode is used for locating and eliminating leakages in the vacuum circuit. Since the valve protection function is deactivated and the control is not deactivated, even at increased control frequencies.
In this operating mode, the “H1” and “H2” LEDs both flash.

Setting Mode Activated and Deactivated

- Set the corresponding value using bit 2 in the output process data byte (PDO).

A change to bit 0 or bit 1 (suction or blow off) in the PDO also causes the ejector to exit setting mode.

This function is only available in IO-Link mode.

7.1.7 Restricted Mode

The supply voltage is monitored by the electronics system. If the supply voltage falls below approx. 19.2 V, this is indicated by an error message. It cannot be guaranteed that the ejector will operate as intended below this voltage threshold.

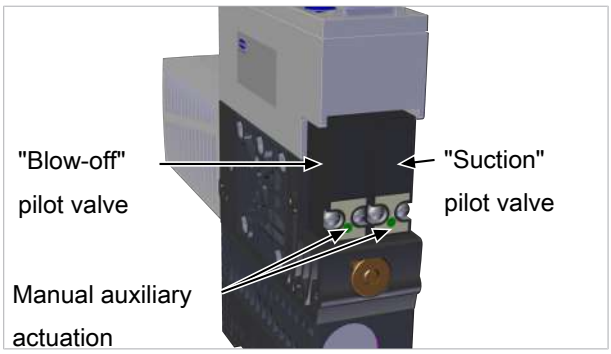
However, operation in "restricted mode" is still possible.

On ejector variants NO and NC, the "blow-off" and "suction" pilot valves are equipped with manual auxiliary actuation; on eject variant IMP, only the "blow-off" pilot valve is equipped with manual auxiliary actuation.

This can be used to actuate the valve manually without a power supply.

✓ The compressed air supply is connected.

- To activate the valve in question, trigger the manual auxiliary actuation using an implement such as a ballpoint pen.



The valves can be operated manually in "restricted mode" using the manual auxiliary actuation without a power supply.

7.2 Monitoring the System Vacuum and Pressure and Defining Limit Values

The ejector has built-in sensors for vacuum measurement and compressed air measurement (-PC- variant only).

The current vacuum and pressure levels are shown on the display and can be read out via IO-Link.

The limit values and hysteresis can be adjusted in the menu items [H- 1], [h- 1], [H-2], [h-2], [HP 1] and [hP 1], or via IO-Link.

Limit values H-1 and h-1 are used for control purposes in the control function.

There is also a "part deposited" limit value, H3 [PDIN0], which cannot be adjusted in the main menu. This value is fixed at 20 mbar. If the system reaches a vacuum of < 20 mbar (once H2 has been reached), the ejector issues signal H3. This tells the controller that the part has been deposited successfully. The signal is reset by issuing a new Suction ON command.

Overview of vacuum and pressure limit values:

Limit value parameter	Description
H1	Vacuum control value
h1	Vacuum hysteresis
H2	Activation value of “part present” check signal output
h2	Hysteresis of “part present” check signal output
H3	Part deposited; 20 mbar
HP1	Pressure activation value
hP1	Hysteresis pressure

7.3 Calibrating the Sensors

Since the sensors installed in the ejector are subject to variation due to the manufacturing process, we recommend calibrating the sensors after installation. In order to calibrate the ejector, the system’s pneumatic circuits must be open to the atmosphere.

A zero offset is only possible in the range of ±3 percent of the end value of the measuring range.

When the permissible limit is violated by ±3 percent, error code [E03] appears on the display and the IO-Link.

The function for zero-point adjustment of the sensors is executed in the main menu using the parameter [cAL] or via IO-Link.

Calibrating from the main menu:

1. To set the zero point of the integrated sensors, press the MENU button.
2. Press the ▲ or ▼ button until [cAL] appears on the display.
3. Confirm using the ↵ button.
4. Press ▲ or ▼ to choose between [no], [UAc] (vacuum sensor calibration) and [Pr5] (pressure sensor calibration; -PC- variant only).
5. If the menu is locked: Enter a valid PIN.
6. Confirm using the ↵ button.

⇨ The selected sensor is calibrated.

7.4 Control Function

The ejector allows you to conserve compressed air or prevent an excessive vacuum from being generated. Vacuum generation is interrupted when the set limit value H1 is reached. If leakage causes the vacuum to fall below the hysteresis limit value (H1-h1), vacuum generation resumes.

The following operating modes can be set for the control function in the configuration menu under the [ctr] menu item or via IO-Link.

7.4.1 No Control (Continuous Suction)

The ejector produces continuous suction with maximum power. This setting is recommended for very porous workpieces, which would otherwise cause the vacuum generator to switch on and off continuously due to the high rate of leakage.

In this mode, the control function is set to [oFF].

This setting can only be adjusted when the control shutoff is deactivated [dc5] = [no].

7.4.2 Control

The ejector switches off vacuum generation when the switching point H1 is reached and switches it back on when the vacuum falls below the hysteresis point (H1-h1). The switch point evaluation for H1 follows the control function. This setting is particularly recommended for airtight workpieces.

In this mode, the control function is set to [□∩].

To protect the ejector, valve switching frequency monitoring is activated in this operating mode.

If the readjustment is too fast, the control function is deactivated and the device switches to continuous suction.

7.4.3 Control with Leak Monitoring

This operating mode is the same as the previous mode, with the addition that the leakage rate within the system is measured and compared to the configurable limit value for permissible leakage -L-.

If the actual leakage rate exceeds the limit value more than twice in succession, the control function is then deactivated and the ejector switches to continuous suction.

In this mode, the control function is set to [□∩S].

7.4.4 Control Shutoff

This function deactivates the automatic control shutoff.

The function can be set using the parameter [dcS] in the configuration menu or via IO-Link.

If the [∩□] setting is selected using the [dcS] parameter, the ejector will switch to "continuous suction" mode in case of excessive leakage and a valve switching frequency >6/3 seconds.

If the [YES] setting is selected using the [dcS] parameter, continuous suction will be deactivated and the ejector will continue control, even in case of excessive leakage or if the valve switching frequency reaches >6/3 seconds. Continuous suction will not be activated if the valve frequency is exceeded.

Depending on the ejector variant in question (NO/NC/IMP), the ejector will respond to undervoltage and power failures by switching to “Continuous suction”, even when continuous suction has been deactivated by the [dcS] = [YES] setting.

7.5 Blow-off Modes

The following three blow-off modes are available. The function can be set with the parameter [bL□] in the configuration menu or via IO-Link.

7.5.1 Externally controlled blow-off

The “blow-off” valve is controlled directly by the “blow off” command. The ejector switches to blow-off mode for as long as the "Blow-off" signal is present.

In this mode, the blow-off function is set to [-E-].

7.5.2 Internally Time-Controlled Blow-Off

The “blow-off” valve is automatically activated for the time period configured in the parameter [tbL] as soon as the ejector leaves “suction” mode.

This function makes it possible to save an output on the control unit.

In this mode, the blow-off function is set to [I-t].

The blow-off time can be set with the parameter [tbL] in the main menu. The parameter [tbL] is suppressed in the main menu if the operating mode [-E-] is active.

The [I-t] function is not available for the ejector variant with the impulse valve. When using the [I-t] function, the “blow-off” signal input is not evaluated.

7.5.3 Externally Time-Controlled Blow-Off

The blow-off pulse is triggered externally by the “blow-off” signal. The “blow-off” valve is activated for the time set in the parameter [tbL]. A longer input signal does not increase the blow-off duration.

In this mode, the blow-off function is set to [E-t].

The blow-off time can be set with the parameter [tbL] in the main menu. The parameter [tbL] is suppressed in the main menu if the operating mode [-E-] is active.

7.5.4 Setting the Blow-off Time

If the blow-off function of the ejector is set to internally time-controlled [bLo] = [I-t] or externally time-controlled [bLo] = [E-t] “blow-off”, then you can set the blow-off time [tbL].

The value displayed indicates the blow-off time in seconds. The time set can range from 0.10 to 9.99 seconds.

The parameter [tbL] is suppressed in the basic menu if the operating mode [-E-] is activated.

7.6 Signal Outputs

The ejector has three signal outputs. The signal outputs can be configured via the corresponding menu items.

7.6.1 Setting the Output Function

The signal outputs can be switched between [no] (normally open) and [nc] (normally closed) contact.

Each signal output is switched; the switchover is set using the [o- 1], [o-2] and [o-3] menu items in the configuration or via IO-Link.

7.6.2 Setting the Output Type

The output type can be used to switch the signal outputs between PNP and NPN.

All three signal outputs are switched over together. The signal inputs are also configured with this function.

You can switch this setting using the [tyP] menu item in the configuration menu or via IO-Link.

7.6.3 Function Assignment for the Signal Outputs

Output	Associated function	
	SX(M)Pi – xx	SX(M)Pi – xx – PC
OUT1	Switching threshold H1 / h1	Switching threshold HP1 / hp1
OUT2	Switching threshold H2 / h2 (“Part Present” check)	
OUT3	Diagnostics (condition monitoring functions)	

The signal outputs OUT1 and OUT2 are switched on or off when the system vacuum or system pressure exceeds or falls below the relevant threshold values.

The diagnostics output OUT3 is activated by condition monitoring functions and remains valid until the start of the next suction cycle.

When the diagnostics analysis function (DAF) is activated, a different functional assignment applies for the signal outputs.

7.6.4 Switch-off Delay for Signal Outputs

This function can be used to set the switch-off delay for the output signals. This function delays the switch-off of the ejector signal outputs OUT1 and OUT2. This can be used to hide short drops in the pressure or vacuum circuit.

The duration of the switch-off delay can be set for both signals together under [d IY] in the configuration menu or via IO-Link. Values of 10, 50 or 200 milliseconds can be selected. To deactivate this function, enter the value 0 (= off).

7.7 Selecting the Vacuum and Pressure Unit for the Display

The unit of the displayed vacuum and pressure level can be selected using this function.

The function is configured using the parameter [uni] in the configuration menu or via IO-Link.

The following units are available:

Unit	Explanation
bar	The vacuum level is displayed in mbar. The pressure level is displayed in bar. The setting for this unit is [-bA].
Pascal	The vacuum level is displayed in kPa. The pressure level is displayed in MPa. The setting for this unit is [-PA].
Inch of Hg	The vacuum and pressure levels are displayed in inHg. The setting for this unit is [- iH].

The pressure display is available only for ejectors with a pressure sensor (SX(M)Pi – xx – PC – xx)

Selection of the unit only affects the display. The units of the parameters that can be accessed via IO-Link are not affected by this setting.

7.8 Setting ECO Mode

The ejector offers the option to switch off the display to save energy. If ECO mode is activated, the display is switched off and the system power consumption is reduced after two minutes if no buttons are pressed.

A red dot in the lower right corner of the display indicates that the display has been switched off.

The display is reactivated by pressing any button or by an error message.

ECO mode can be activated and deactivated under the [Eco] menu item in the configuration menu or via IO-Link.

7.9 PIN Code for Write Protection

A PIN code can protect all the parameters from write access. The current settings are still displayed. The PIN is set to 000 on delivery, meaning access to the parameters is **not** locked. A valid PIN between 001 and 999 must be entered to activate write protection.

If write protection is activated with a customer-specific PIN, the desired parameters can be changed within two minutes after the correct code is entered. If no changes are made within two minutes, write protection is automatically reactivated.

The PIN must be reset to 000 to permanently deactivate the lock.

Full access to the ejector is still possible via IO-Link even if a PIN is enabled. The current PIN can also be read out and changed/deleted (PIN = 000) via IO-Link.

You enter the PIN using the P in parameter in the configuration menu or via IO-Link.

A PIN is recommended because carrying out parameterization while the device is in operation can change the status of signal inputs and outputs.

7.10 Reset to Factory Settings

This function resets the device to its delivered condition.

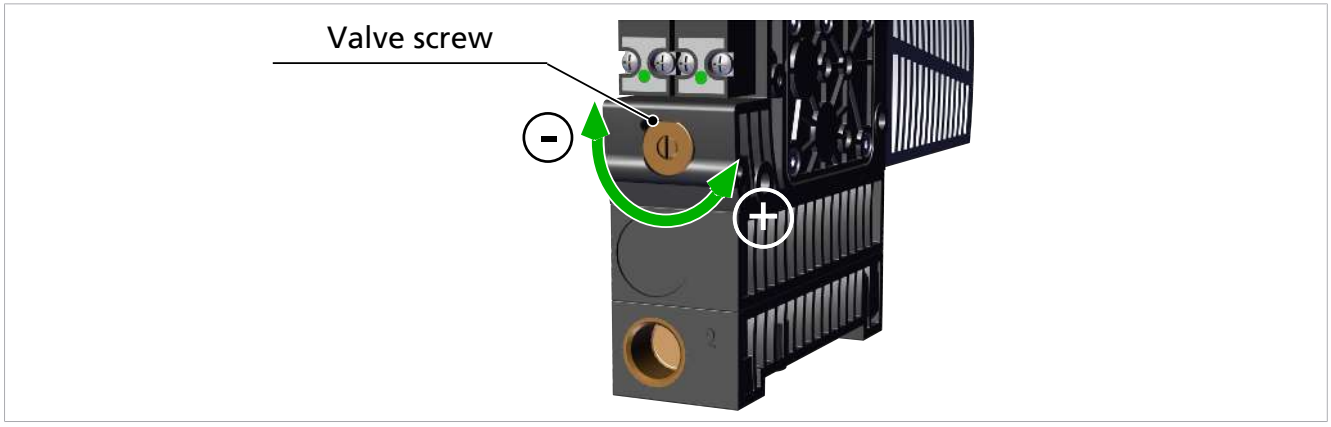
All the switching points and configurations are reset to their factory setting (> See ch. 4.4.2 Factory Settings, p. 17)>.

Counter readings and sensor zero-point adjustment are not affected by this function.

The function is performed using the [rES] menu item in the configuration menu or via IO-Link.

7.11 Changing the Blow-Off Flow Rate on the Ejector

Do not overwind the stop on the valve screw. A minimum flow rate of approx. 20 % is always necessary for technical reasons. The blow-off volume flow can be set between 20 % and 100 %.



There is a valve screw below the pilot valve that can be used to adjust the blow-off flow rate. The valve screw is equipped with a stop on both sides.

1. Turn the valve screw clockwise to reduce the flow rate.
2. Turn the valve screw counterclockwise to increase the flow rate.

7.12 Energy and Process Control (EPC)

In IO-Link mode, the energy and process control (EPC) function is available. It is subdivided into three modules:

- Condition monitoring (CM): Condition monitoring to increase system availability
- Energy monitoring (EM): Energy monitoring to optimize the vacuum system's energy consumption
- Predictive maintenance (PM): Predictive maintenance to increase the performance and quality of the gripping systems.

7.12.1 Condition Monitoring (CM)

Monitor Valve Switching Frequency

When the air saving function is activated [ctr = on] or [ctr = onS] and there is a high leakage level in the gripping system, the ejector switches between the Suction and Suction off states very frequently. The number of valve switching operations therefore increases rapidly within a short period of time.

To protect the ejector and increase its service life, the ejector automatically deactivates the air saving function and switches to continuous suction if the switching frequency > 6/3 s (more than 6 switching operations within 3 seconds). In this case the ejector remains in the Suction state.

Additionally:

- Diagnostics output OUT3 is set
- The status indicator flashes green until the next suction cycle
- Bit 0 is set in the IO-Link parameter 0x0092
- In addition, a condition monitoring event is signaled by bit 6 in the process data input byte.

The setting [dcS = YES] suppresses continuous suction.

Control Threshold Monitoring

If the switching point H1 is never reached within the suction cycle, this function is activated.

- The diagnostics output OUT3 is set.
- The status indicator flashes red until the next suction cycle.
- In the IO-Link parameter 0x0092, bit 3 is set. In addition, a condition monitoring event is signaled by bit 6 in the process data input byte.

Evacuation Time Monitoring

If the measured evacuation time t1 (from H2 to H1) exceeds the default value [t– I], this function is activated.

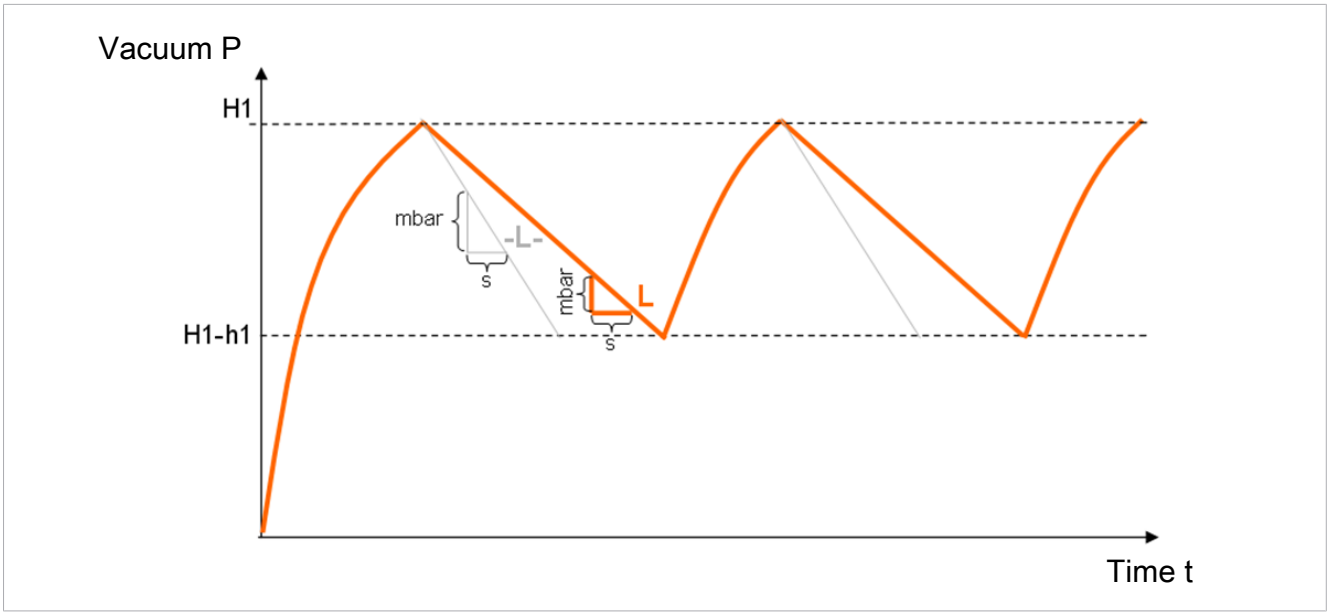
- The diagnostics output OUT3 is set.
- The status indicator flashes red until the next suction cycle.
- In the IO-Link parameter 0x0092, bit 1 is set. In addition, a condition monitoring event is signaled by bit 6 in the process data input byte.

To deactivate this function, set the value 0 (= off) for the permissible evacuation time. The maximum permitted evacuation time setting is 9.99 seconds. The specified value for the max. permitted evacuation time is set under the menu item [t– I] in the configuration menu or via IO-Link.

Monitor Leakage

In control mode, the loss of vacuum/leakage rate (L) within a certain period is monitored (mbar/s). There are two possible statuses.

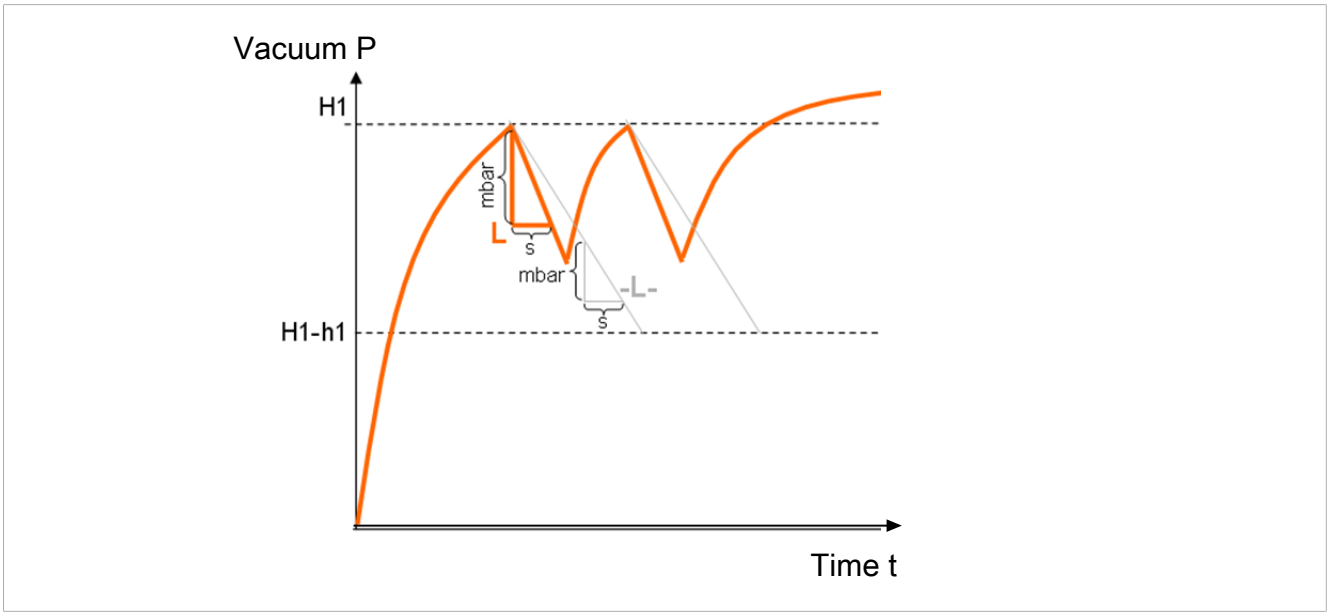
Leakage L < permitted value [-L-]



If the leakage is lower than the set value, the vacuum continues to fall until it reaches the switching point H1-h1. The ejector begins to suck again (normal control mode).

The condition monitoring warning is not activated and there is no effect on the system status light.

Leakage L > permitted value [-L-]



If the leakage is higher than the value, the ejector readjusts immediately. After the permissible leakage is exceeded twice: . The condition monitoring warning is activated and the system status light switches to yellow.

- The ejector switches to continuous suction
- The diagnostics output OUT3 is set

- The status indicator flashes green until the next suction cycle

When the function is activated, bit 2 is set in the IO-Link parameter 0x0092. In addition, a condition monitoring event is signaled by bit 6 in the process data input byte. Monitoring is carried out during each control cycle.

The specified value for the max. permitted leakage (L) is set under the menu item [⁻L⁻] in the configuration menu or via IO-Link. Values of 4, 11, 25, 50, 100, 150 or 250 mbar/s can be set.

Operating Pressure Monitoring

The system pressure of the ejector is continuously measured by the internal pressure sensor and compared with the permissible operating pressure limits.

A warning message is issued if the pressure is exceeded or fallen below.

- In the IO-Link parameter 0x0092, bit 7 is set. In addition, a condition monitoring event is signaled by bit 6 in the process data input byte.

Monitor Dynamic Pressure

If possible, a dynamic pressure measurement is taken at the start of every suction cycle (vacuum during unobstructed suction). The result of this measurement is compared to the limit values set for H1 and H2.

If the dynamic pressure is greater than (H2 – h2) but less than H1, the corresponding condition monitoring warning is triggered.

- In the IO-Link parameter 0x0092, bit 4 is set. In addition, a condition monitoring event is signaled by bit 6 in the process data input byte.

The two operating pressure and dynamic pressure condition monitoring functions have no influence on the status indicator and the diagnostics output. The information is transmitted exclusively via IO-Link.

The two operating pressure and dynamic pressure condition monitoring functions are available only for ejectors with an integrated pressure sensor (SX(M)Pi – xx – PC).

Diagnostics Output

The diagnostic output OUT3 is activated by one of the four condition monitoring functions:

- Control threshold monitoring
- Evacuation time monitoring
- Leakage monitoring
- Valve switching frequency monitoring

It remains valid until the start of the next suction cycle.

Status Indicator when the Condition Monitoring Function is Activated

The ejector has a status indicator for the system vacuum or for monitoring functions (pos. (7)). The system statuses are displayed in RED or GREEN.

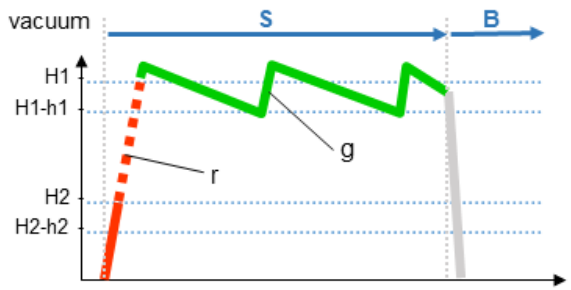
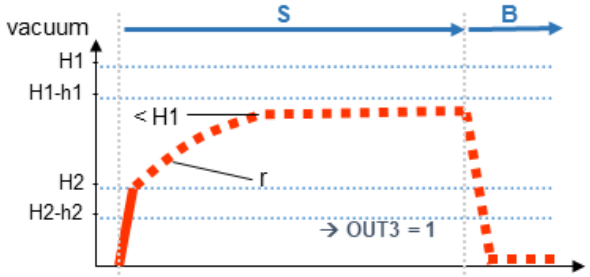
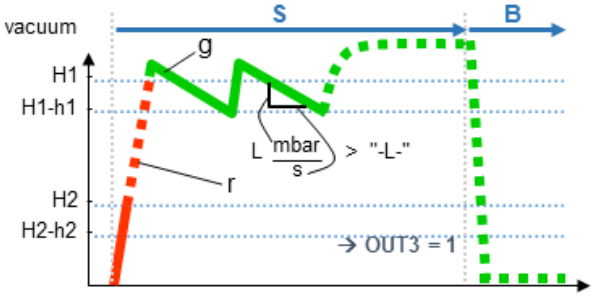
When the condition monitoring function is activated, the status indicator provides the following information:

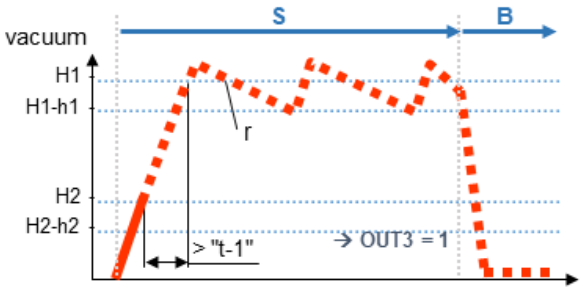
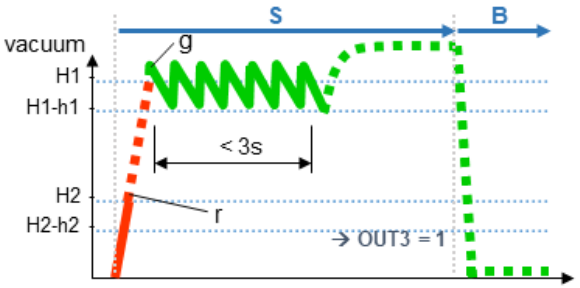
Status indicator		Behavior	Condition monitoring function	Ejector response
	Green	Flashing	Leakage (greater than -L-)	Continuous suction
			Valve switching frequency (greater than 6/3s)	Continuous suction
	Red	Flashing	Control threshold (H1 not reached)	—
			Evacuation time (t-1 exceeded)	—

If the vacuum drops below the threshold values of H1 and/or H2 during the active suction cycle, the status indicator displays the level of the current vacuum again, based on the overview for the system vacuum status indicator.

After the end of the suction cycle, the result of the condition monitoring function is displayed. This result is then retained until the beginning of the next suction cycle.

Status Indicator Examples

System operation	Status indicator	Description
Normal operation Air saving function Suction cycle with vacuum control [ctr=on]		Status indicator shows the system vacuum level
CM “control threshold” function		• Flashing red • OUT3
CM “leakage” function		• Control Shutoff • Flashing green • OUT3

System operation	Status indicator	Description
CM “evacuation time” function		• Flashing red • OUT3
Suction cycle with vacuum control, during which the valve protection function is triggered [ctr=on]		• Control Shutoff • Flashing green • OUT3

Key:

S: Suction ON
B: Suction OFF, blow off ON
r: RED
g: GREEN

H1: Deactivation value of control function
H1-h1: Activation value of control function
h1: Hysteresis of control function
H2: Activation value of “part present” check signal output
H2-h2: Deactivation value of “part present” check signal output
h2: Hysteresis of “part present” check signal output

Diagnostics Analysis Function

The device performs a vacuum system leakage measurement during each suction cycle. In this case, it measures the vacuum drop per unit of time. This function provides a way to evaluate the tightness of the entire system. The measured leakage level is classified in one of four leakage ranges (see the table).

The result is mapped to the outputs OUT1 and OUT3 via the “DAF” signal input IN3. The mean value of the leakage measurements from the last 16 suction cycles is always used in this case.

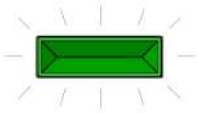
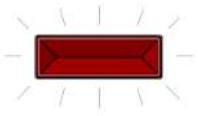
Conditions for Leakage Measurement

- A leakage measurement is taken automatically during each complete suction cycle
- If the switching threshold H1 is not reached, a leakage measurement cannot be completed; the system is evaluated as untight
- If the hysteresis value of the automatic air-saving function h1 is set to a value < 22 mbar, the DAF is deactivated because no leak measurement is taken. (In this case, the system status is evaluated as tight)

Leakage measurement evaluation via DAF

- An impulse > 50 ms at the “DAF” signal input IN3 starts the evaluation (only in idle state)
- The “DAF1” signal output OUT1 and “DAF2” signal output OUT3 are switched on and off according to the calculated average leakage (see table); the settings for the outputs (NO/NC), which are otherwise valid, are overridden during the evaluation

- The DAF status is displayed via the diagnostics display
- The display shows [d iA] during the evaluation
- The evaluation is ended once suction/blow-off recommences

System status	Leakage	Diagnostics display		OUT1*	OUT3*
TIGHT	< 67 mbar/s	Green		1	1
MINOR LEAKAGE	67 to 133 mbar/s	Flashing green		1	0
SEVERE LEAKAGE	133 to 200 mbar/s	Flashing red		0	1
UNTIGHT	> 200 mbar/s	Red		0	0

The four leakage ranges are fixed values and cannot be changed.

Leakage Level Evaluation

Similar to the diagnostics analysis function (DAF), this parameter is used to output the average leakage range from the last suction cycle. The parameter has no effect on the status indicator and outputs.

The value is made available via IO-Link at the start of the next suction cycle.

Evacuation Time t0 Measurement

The evacuation time t_0 (in milliseconds) from the start of a suction cycle, which is started by the "Suction ON" command, until switching threshold H2 is reached is measured. The parameter has no effect on the status indicator and outputs.

The value is made available via IO-Link at the start of the next suction cycle.

Evacuation Time t1 Measurement

The evacuation time t_1 (in milliseconds) from when the switching threshold H2 is reached until when the switching threshold H1 is reached is measured. The parameter has no effect on the status indicator and outputs.

The value is made available via IO-Link at the start of the next suction cycle.

7.12.2 Energy Monitoring (EM)

To optimize the energy efficiency of the vacuum gripping systems, the ejector provides functions for measuring and displaying energy consumption.

The ejector is not a calibrated measuring device. However, the values may be used as a reference and for comparison measurements.

Percentage-based air consumption measurement:

The ejector calculates the air consumption from the last suction cycle as a percentage. This value corresponds to the ratio for the full duration of the suction cycle and the active suction and blow-off times.

Absolute air consumption volume:

Ejectors with an integrated pressure sensor offer an absolute air consumption measurement in addition to the percentage-based air consumption measurement.

The actual air consumption in a suction cycle is calculated taking the system pressure and nozzle size into account.

The measured value for the absolute air consumption (air consumption per cycle) is reset at the start of the suction cycle and then continuously updated during the cycle. It can continue to change until after the end of blow-off.

Energy consumption measurement:

The ejector determines the electrical energy consumed during a suction cycle, including the energy it consumes itself and the energy consumed by the valve coils.

To determine the values for the air consumption as a percentage and the electrical energy consumption, the neutral phase of the suction cycle must also be taken into account. Therefore, the measured values can only ever be updated when the next suction cycle begins. Throughout the cycle, the measured values displayed then represent the results from the previous cycle.

7.12.3 Predictive Maintenance (PM)

Measurement of Leakage

The control function interrupts suction as soon as it reaches the limit value H1. Then the leakage is measured as the vacuum decrease over time (in mbar/s).

The value is made available via IO-Link at the start of the next suction cycle.

Dynamic Pressure Measurement

This measures the system vacuum achieved during unobstructed suction. The duration of the measurement is approx. one second. Therefore, to evaluate a valid dynamic pressure, uninterrupted suction is required for at least one second after starting the suction, i.e. the suction point must not be covered by a part.

Measured values above the threshold value H1 are output with a value of 0 mbar as an indication that a valid dynamic pressure measurement could not be carried out.

Measured values above the threshold value (H2-h2) but simultaneously lower than threshold value H1 result in a condition monitoring event.

The value is made available via IO-Link at the start of the next suction cycle.

Quality assessment

To evaluate the entire gripping system, the device calculates a quality rating based on the measured system leakage.

The greater the leakage in the system, the worse the quality rating of the gripping system. Conversely, low leakage results in a high quality rating.

The value is made available via IO-Link at the start of the next suction cycle.

Performance calculation

The performance calculation helps in evaluating the system status. The performance of the gripping system can be assessed based on the measurement of the dynamic pressure.

Optimal configuration of gripping systems leads to low dynamic pressure and thus to high performance. Conversely, badly configured systems achieve low performance.

Dynamic pressure events that exceed the limit value (H2 – h2) always result in a performance rating of zero percent. A dynamic pressure value of 0 mbar (which indicates that no valid measurement value could be obtained) also results in a performance rating of zero percent.

The value is made available via IO-Link at the start of the next suction cycle.

8 Checking the Delivery

The scope of delivery can be found in the order confirmation. The weights and dimensions are listed in the delivery notes.

1. Compare the entire delivery with the supplied delivery notes to make sure nothing is missing.
2. Damage caused by defective packaging or occurring in transit must be reported immediately to the carrier and J. Schmalz GmbH.

9 Installation

9.1 Installation Instructions

⚠ CAUTION

Improper installation or maintenance

Personal injury or damage to property

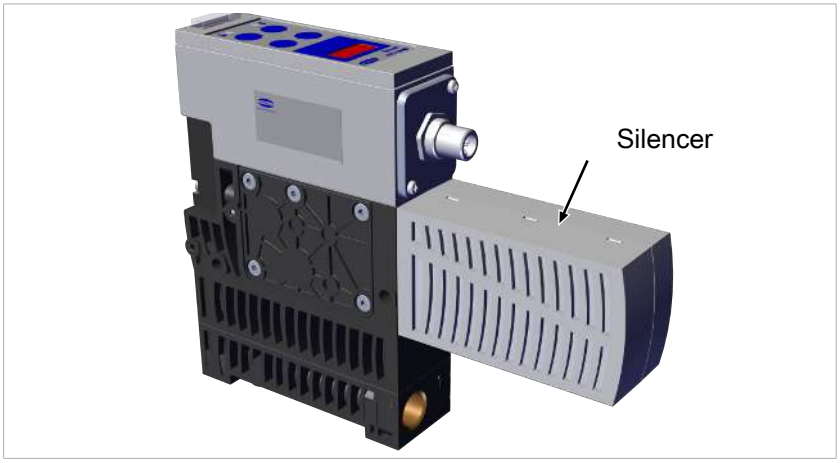
- During installation and maintenance, make sure that the product is disconnected and depressurized and that it cannot be switched on again without authorization.

For safe installation, the following instructions must be observed:

- Use only the connectors, mounting holes and attachment materials that have been provided.
- Mounting and removal must be performed only when the device is unpressurized and disconnected from the mains.
- Pneumatic and electrical line connections must be securely connected and attached to the product.

9.2 Installation

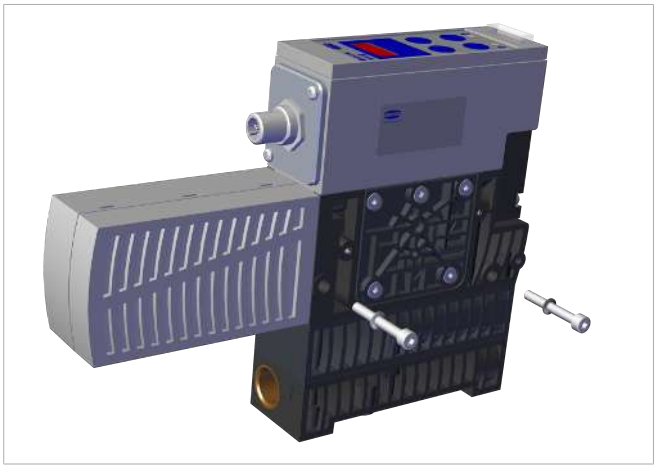
The ejector can be installed in any position.



When installing the ejector, make sure that the area around the silencer remains free to ensure the unimpeded discharge of the escaping air.

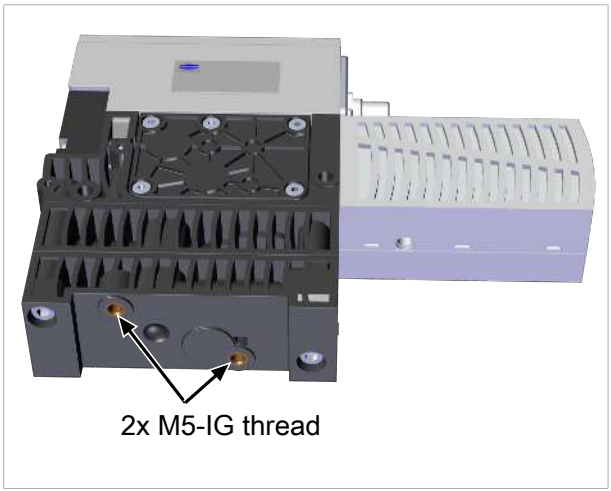
The ejector can be mounted in a number of different ways:

1.) Side mounting



- There are two 5.5 mm through-holes for mounting the ejector. Use screws at least 50 mm in length. Use washers if you are using fastening screws M4 for the mounting process. The ejector must be attached using at least 2 screws; the maximum tightening torque is 4 Nm.

2.) Underside mounting

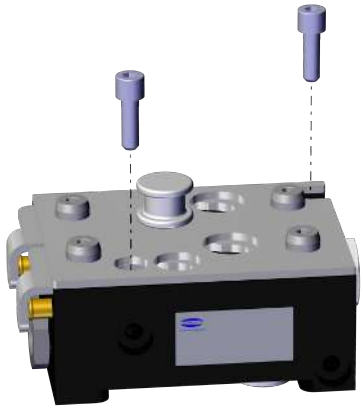


- Use the two M5-IG threads on the underside of the ejector for mounting. The maximum tightening torque is 2 Nm.

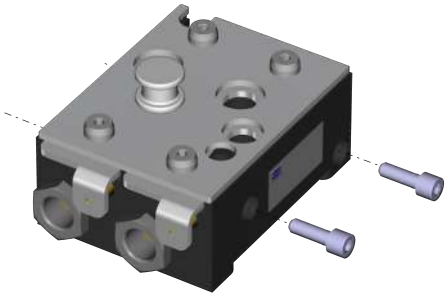
3.) Mounting using the Quick Change adapter

The ejector system must only be put into operation when the release lever is fully extended and the ejector is properly engaged.

Operate the Release Lever for the Quick-change System only when the Unit is Unpressurized!



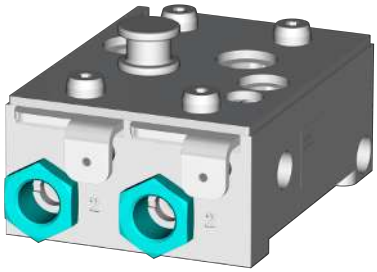
a) Top attachment



b) Side attachment

✓ Mount the quick change adapter mechanically using two M6 Allen screws (ISO 4762).

Compressed air at 1

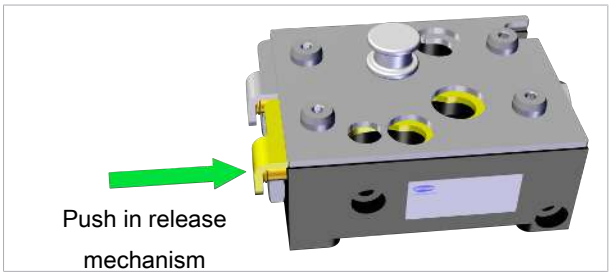


Vacuum at 2

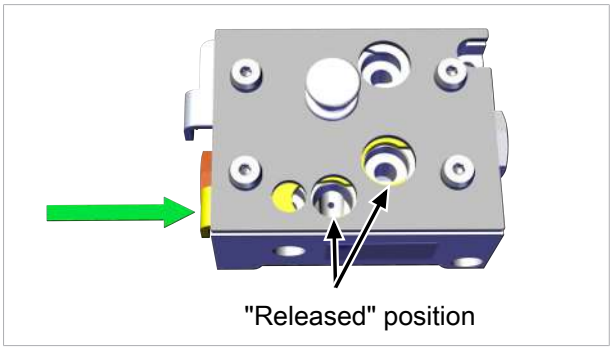
✓ Connect the pneumatic systems: compressed air to the connection marked 1 (G3/8"); vacuum to the connection marked 2 (G3/8").

✓ Ensure that the pneumatic systems are depressurized.

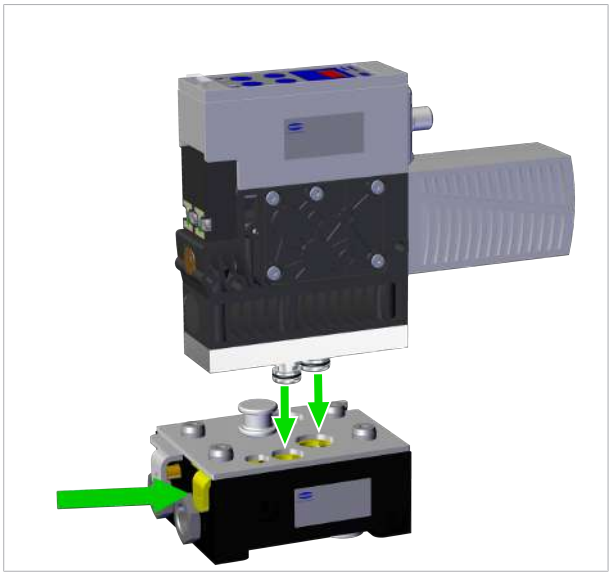
1. Push the release level in as far as it will go and hold it in this position.



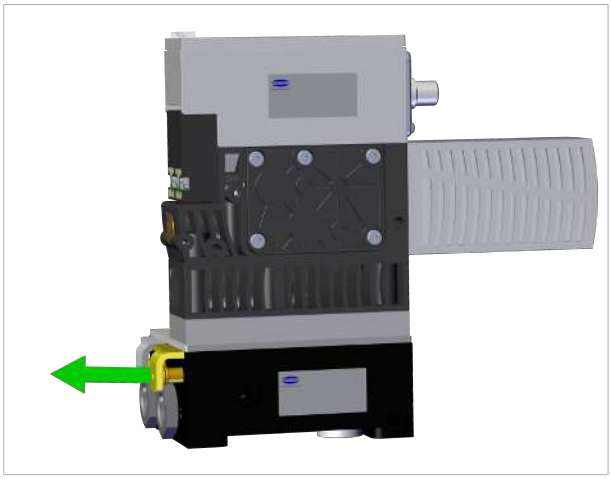
⇨ "Released" position



2. Ensuring that the centering pins are aligned correctly, place the ejector on the Quick Change adapter and push it down as far as it will go.



3. Allow the release lever to extend back to its original position.



⇨ The ejector is now attached to the Quick Change adapter and connected to the pneumatic systems.

For start of operations, the ejector must be connected to the controller via the connection plug with a connection cable. The compressed air must be supplied by the higher-level machine.

The installation process is described and explained in detail below.

9.3 Pneumatic Connection

⚠ CAUTION

Compressed air or vacuum in direct contact with the eye

Severe eye injury

- Wear eye protection
- Do not look into compressed air openings
- Do not look into the silencer air stream
- Do not look into vacuum openings, e.g. suction cups

⚠ CAUTION

Noise pollution due to incorrect installation of the pressure and vacuum connections

Hearing damage

- Correct installation.
- Wear ear protectors.

9.3.1 Connecting the Compressed Air and Vacuum

To ensure problem-free operation and a long service life for the product, only use adequately maintained compressed air and take the following requirements into account:

- Use of air or neutral gas in accordance with EN 983, filtered 40 µm, oiled or unoiled.
- Dirt particles or foreign bodies in the product connections, hoses or pipelines can lead to partial or complete malfunction.

1. Shorten the hoses and pipelines as much as possible.
2. Keep hose lines free of bends and crimps.
3. Only use a hose or pipe with the recommended internal diameter to connect the product; otherwise, use the next largest diameter.
   - On the compressed air side, ensure that the internal diameter has the dimensions required for the product to achieve its performance data.
   - On the vacuum side, ensure that the internal diameters have the necessary dimensions for preventing high flow resistance. If the selected internal diameter is too small, the flow restrictor and the evacuation times increase and the blow off times are extended.

Recommended cable cross sections (internal diameters)

SXPi/SXMPi performance class	Cable cross-section (internal diameter) [mm] [1)]	
	Compressed air side	Vacuum side
15	6	6
20	6	8
25	8	9
30	8	9

1) based on a maximum hose length of 2 m. For larger hose lengths, larger cross sections are to be chosen accordingly!

How to Perform Pneumatic Connection for Ejector Variant H

Only screw unions with cylindrical G-threads are permitted to be used for the connections!

1	Compressed air connection	2	Vacuum connection

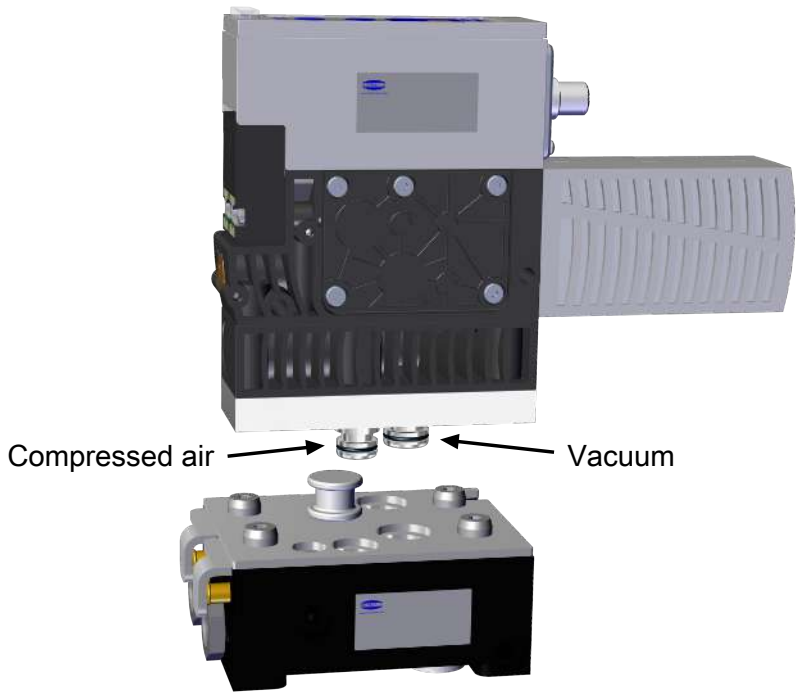
The compressed air connection G3/8" is marked with the number 1 on the ejector.

- Connect compressed air hose. The max. tightening torque is 6 Nm.

The G3/8" thread vacuum connection is marked with the number 2 on the ejector.

- Connect the vacuum hose. The max. tightening torque is 6 Nm.

How to Perform Pneumatic Connection for Ejector Variant Q



- The pneumatic connection is performed by connecting the ejector plug to the Quick Change adapter.

9.4 Electrical Connection

NOTE

Change of output signals when product is switched on or plug is connected

Personal injury or damage to property

- Electrical connection may be performed only by specialists who can evaluate the effects of signal changes on the overall system.

NOTE

Incorrect power supply

Destruction of the integrated electronics

- Operate the product using a power supply unit with protected extra-low voltage (PELV).
- The system must incorporate safe electrical cut-off of the power supply in compliance with EN60204.
- Do not connect or disconnect the connector under tension and/or when voltage is applied.

The supply voltage is monitored by the electronics system. If the supply voltage falls below approx. 19.2 V, this is indicated by an error message. It cannot be guaranteed that the ejector will operate as intended below this voltage threshold.

For the electrical connection, there are different versions with:

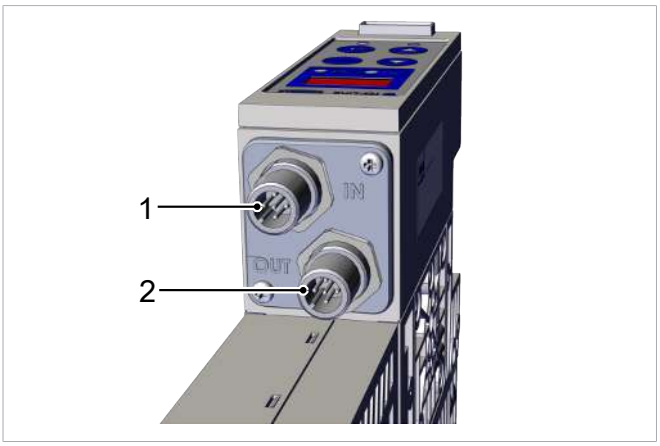
- One M12 8-pin plug
- Two 5-pins M12 plugs

Both variants each have three input and three output signals, as well as pins for the supply voltage.
In the version with an 8-pin plug, the whole ejector is supplied with only one voltage (U_{SA}).
In contrast, the version with two 5-pin plugs requires two voltages (U_S and U_A) to separately supply the ejector sensor system and actuator system, thus ensuring galvanic separation between the voltage circuits.

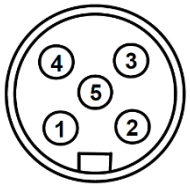
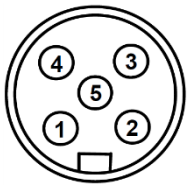
Establish the Electrical Connection for the Ejector Variant with Two Plugs Using the Plug Connections Shown in the Figure.

✓ Prepare two M12 5-pin connection cables with a socket (provided by the customer).

1. Attach the connecting cable to plug position (1) that is marked with **IN** (maximum tightening torque = hand-tight).
2. Attach the connecting cable to plug position (2) that is marked with **OUT** (maximum tightening torque = hand-tight).

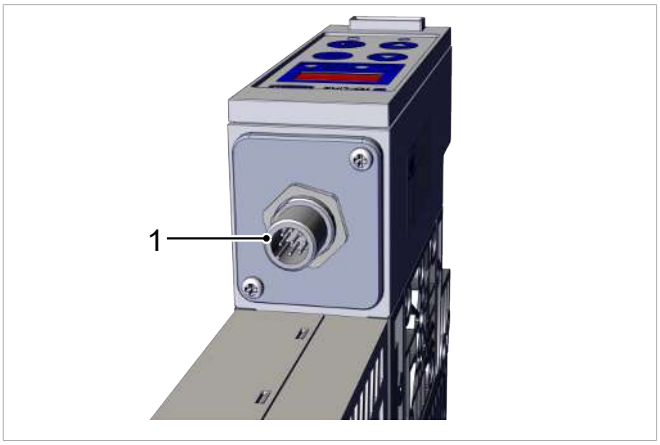


PIN assignment with 2x 5-pin M12 plug

Plug	Pin	Wire color [1]	Symbol	Function	
				SIO operation	**IO-Link operation**
 IN	1	Brown	U_A	Supply voltage for actuator	Supply voltage for actuator
	2	White	IN2	"Blow off" signal input	—
	3	Blue	Gnd_A	Actuator ground	Actuator ground
	4	Black	IN1	"Suction" signal input	—
	5	Gray	IN3	"DAF" signal input [3]	—
 OUT	1	Brown	U_S	Supply voltage for sensor	Supply voltage for sensor
	2	White	OUT2	"Part present" check signal output (H2/h2)	—
	3	Blue	Gnd_S	Sensor ground	Sensor ground
	4	Black	OUT1 / C/Q	"Air saving function" or pressure signal input (H1 or HP1)	IO-Link communication line
	5	Gray	OUT3	"Diagnostics" signal output	—

Establish the electrical connection for the ejector variant using the plug connector shown in the figure.

- ✓ Prepare one M12 8-pin connection cable with a socket (provided by the customer).
- ▸ Attach the connection cable to plug position (1); maximum tightening torque = hand-tight.



PIN assignment with 1x 8-pin M12 plug

Plug	Pin	Wire color [2]	Symbol	Function	
				SIO operation	**IO-Link operation**
	1	White	OUT2 / —	"Part present" check signal output (H2/h2)	—
	2	Brown	U_{SA}	Supply voltage for sensors/actuators	Supply voltage for sensors/actuators
	3	Green	OUT3 / —	"Diagnostics" signal output	—
	4	Yellow	IN1 / —	"Suction" signal input	—
	5	Gray	OUT1 / C/Q	"Automatic air-saving function" or "Pressure" signal input (H1 or HP1)	IO-Link communication line

Plug	Pin	Wire color [2]	Symbol	Function	
	6	Pink	IN2 / —	“Blow off” signal input	—
	7	Blue	Gnd_{SA}	Ground for sensors/actuators	Ground for sensors/actuators
	8	Red	IN3 / —	“DAF” signal input [3]	—

[1] When Schmalz connection line part no. 21.04.05.00080 is used

[2] When Schmalz connection line part no. 21.04.05.00079

[3] DAF analysis function

Observe the following connection instructions:

- The maximum cable length is 30 m in SIO operation and 20 m in IO-Link operation.

Notes on the electrical connection when operating the device in SIO mode

To operate the device, all the process signals must be wired in parallel. For each ejector, six lines are therefore required for the process signals.

Process data INPUT

Signal	Symbol	Parameter
0	OUT1	Switching point H1/HP1
1	OUT2	Switching point H2 (“part present” check)
2	OUT3	Diagnostics

Process data OUTPUT

Signal	Symbol	Parameter
0	IN 1	Suction ON/OFF
1	IN 2	Blow off ON/OFF
2	IN 3	Diagnostics analysis function ON

10 Operation

10.1 General Preparations

⚠ WARNING

Extraction of hazardous media, liquids or bulk material

Personal injury or damage to property!

- Do not extract harmful media such as dust, oil mists, vapors, aerosols etc.
- Do not extract aggressive gases or media such as acids, acid fumes, bases, biocides, disinfectants or detergents.
- Do not extract liquids or bulk materials, e.g. granulates.

Always carry out the following tasks before activating the system:

1. Before each start of operations, check that the safety features are in perfect condition.
2. Check the product for visible damage and deal with any problems immediately (or notify the supervisor).
3. Ensure that only authorized personnel are present in the working area of the machine or system and that no other personnel are put in danger by switching on the machine.

During automatic operation, there must be no people in the system danger area.

10.2 Operating Mode

The device can be operated in two modes. Users can choose between a direct connection to inputs and outputs (serial I/O = SIO mode) or a connection through the communication line (IO-Link).

By default, the ejector always runs in SIO mode, but it can be switched in and out of IO-Link mode by the connected IO-Link master at any time.

10.2.1 SIO Operating Mode

In SIO mode, all input and output signals are connected to a controller, either directly or using intelligent terminal boxes. For this purpose, in addition to the supply voltage, three input signals and three output signals have to be connected to allow the ejector to communicate with the controller.

The following basic ejector functions are used:

- Inputs
  - Suction ON/OFF
  - Blow off ON/OFF
  - Diagnostics analysis function
- Outputs
  - Feedback H1/HP1
  - H2 (“part present” check) feedback
  - Diagnostics message for condition monitoring functions

The parameters are set and the internal counters are read out using the operating and display elements.

The energy and process control functions are unavailable in SIO mode.

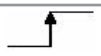
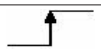
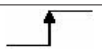
All the process signals must be wired in parallel to operate the ejector in SIO mode. For each ejector, six lines are therefore required for the process signals.

Start of operations

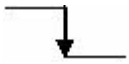
A typical handling cycle is divided into the following three phases:

- Phase 1: Suction, switching steps 1 and 2
- Phase 2: Deposit, switching steps 3 and 4
- Phase 3: Idle state, switching steps 5 and 6

To check whether sufficient vacuum has built up, the limit value H2 is monitored by an integrated vacuum sensor during suction and output to the higher-level controller via OUT.

Switching step	Variant NC			Variant NO			Variant IMP		
	Signal		Status	Signal		Status	Signal		Status
1		IN1	Suction ON		IN1	Suction ON		IN1	Suction ON
2		OUT2	Vacuum > H2		OUT2	Vacuum > H2		OUT2	Vacuum > H2
3		IN1	Suction OFF		IN1	Suction OFF		IN2	Blow off ON
4		IN2	Blow off ON		IN2	Blow off ON		IN2	Blow off OFF
5		IN2	Blow off OFF		IN2	Blow off OFF		OUT2	Vacuum < (H2-h2)
6		OUT2	Vacuum < (H2-h2)		OUT2	Vacuum < (H2-h2)	Blow off ON = suction OFF [1]		

 Signal status changes from inactive to active

 Signal status changes from active to inactive

[1] With the IMP variant, the “suction OFF” state can only be reached by activating “blow off ON”.

10.2.2 IO-Link Operating Mode

By default (after the supply voltage has been applied), the product always runs in digital I/O mode or SIO mode, but can be switched to IO-Link mode at any time by an IO-Link master.

When operating the product in IO-Link mode (digital communication), the supply voltage, the ground and the communication line are connected to a controller, either directly or using intelligent terminal boxes. The communication line for IO-Link (C/Q line) is always connected with an IO-Link master port (point-to-point connection). It is not possible to connect multiple C/Q lines to a single IO-Link master port.

Connecting the device via the IO-Link provides access to a number of additional functions (depending on the variant) alongside the basic functions such as suction, blow off, feedback, etc.:

- The current vacuum and pressure levels
- Condition monitoring events
- Error
- System status indicator
- Access to all parameters
- Counter(s)
- Energy and process control (EPC) functions

This allows all the modifiable parameters to be read, modified and written back to the device directly via the higher-level controller.

Evaluation of the condition monitoring and energy monitoring results allows you to draw direct conclusions regarding the current handling cycle and perform trend analyses.

The device supports IO-Link revision 1.1 with fifteen bytes of input data and four bytes of output data. It is also compatible with IO-Link masters that use revision 1.0 and above. In this case, one byte of input data and one byte of output data are supported.

The process data is exchanged cyclically between the IO-Link master and the product (max. data transmission rate with COM2 = 38.4 kilobauds).

ISDU parameter data (acyclical data) is exchanged only on request. It is exchanged by the user program in the control unit using communication modules, for example.

Detailed information about the IO-Link functions is described in the attached data dictionary.

Start of operations

Once the supply voltage is applied, the device is always in SIO mode. IO-Link communication is only established by a wake-up signal from the master.

A prerequisite for the IO-Link master to establish communication is that the output OUT1 is inactive and the ejector signal type is PNP.

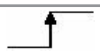
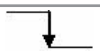
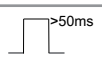
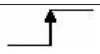
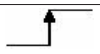
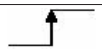
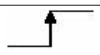
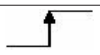
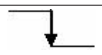
The communication LED on the IO-Link master port lights up to indicate that the IO-Link communication has been established correctly.

You can display the ejector operating mode on the ejector by pressing the **DOWN** button.

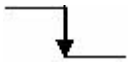
A typical handling cycle is divided into the following three phases:

- Phase 1: Suction, switching steps 1 and 2
- Phase 2: Deposit, switching steps 3 and 4
- Phase 3: Idle state, switching steps 5 and 6

To check whether sufficient vacuum has built up, the limit value H2 is monitored by an integrated vacuum sensor during suction and output to the higher-level controller via OUT.

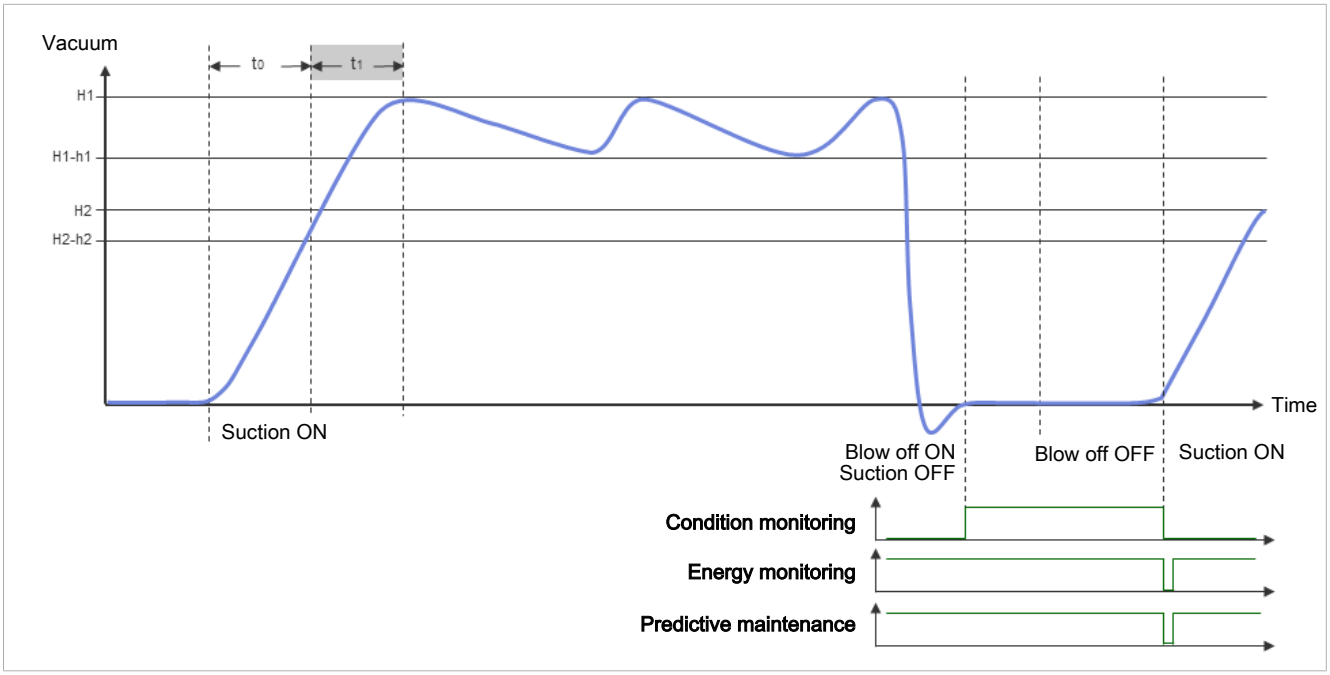
Switching step	Variant NC			Variant NO			Variant IMP		
	Signal		Status	Signal		Status	Signal		Status
1		PDO|0	Suction ON		PDO|0	Suction ON		PDO|0	Suction ON
2		PDI|0	Vacuum > H2		PDI|0	Vacuum > H2		PDI|0	Vacuum > H2
3		PDO|0	Suction OFF		PDO|0	Suction OFF		PDO|1	Blow off ON
4		PDO|1	Blow off ON		PDO|1	Blow off ON		PDO|1	Blow off OFF
5		PDO|1	Blow off OFF		PDO|1	Blow off OFF		PDI|0	Vacuum < (H2-h2)
6		PDI|0	Vacuum < (H2-h2)		PDI|0	Vacuum < (H2-h2)	Blow off ON = suction OFF		

Signal state change from LOW to HIGH



Signal state change from HIGH to LOW

[1] With the IMP variant, the “suction OFF” state can only be reached by activating “blow off ON”.



Condition monitoring [CM]

Condition monitoring events that occur are immediately signaled by the associated bit in the process data byte during the suction cycle.

The triggering event can be identified by reading the CM byte. To read out all the available CM events that occurred in the suction cycle, the CM byte must be read out after the “suction OFF” or “blow off ON” command. The CM byte is valid until the start of a new suction cycle.

The current t0 and t1 CM values and the leakage range of the active suction cycle are also available after the “suction OFF” or “blow off ON” command until the start of the next suction cycle.

Energy monitoring [EM]

All the EM values for the previous suction cycle are available after the beginning of the next suction cycle and therefore have to be read out after each “Suction ON”.

Predictive maintenance [PM]

All the PM values for the previous suction cycle are available after the beginning of the next suction cycle and therefore have to be read out after each “Suction ON”.

11 Troubleshooting

11.1 Help with Malfunctions

Fault	Possible cause	Solution
No communication	Incorrect electrical connection	▸ Check electrical connection and pin assignment
	Higher-level controller not correctly configured	▸ Check the controller configuration
	IODD connection does not work	▸ Check for the appropriate IODD
Ejector does not respond	No actuator supply voltage	▸ Check electrical connection and pin assignment
	No compressed air supply	▸ Check the compressed air supply
Vacuum level is not reached or vacuum is built up too slowly	Press-in screen is contaminated	▸ Replace screen
	Silencer is dirty	▸ Replace the silencer
	Leakage in hose line	▸ Check hose connections
	Leakage at suction cup	▸ Check suction cup
	Operating pressure too low	▸ Increase operating pressure. Note the maximum limits!
	Internal diameter of hose line too small	▸ Observe recommendations for hose diameter
Load cannot be held	Vacuum level too low	▸ Increase the control range for the air saving function
	Suction cup too small	▸ Select a larger suction cup
No display on the screen	ECO mode activated	▸ Press any button or deactivate ECO mode
	Incorrect electrical connection	▸ Check electrical connection and pin assignment
Display shows error code	See the “Error codes” table	▸ See "Error Codes" table in the following chapter
IO-Link warning message “Leakage too high” although handling cycle is working optimally	Limit value -L- (permissible leakage per second) set too low	▸ Determine typical leakage values in a good handling cycle and set as limit value
	Limit values H1 and h1 for leakage measurement set too low	▸ Set limit values in such a way that there is a clear differentiation between the neutral and suction system states.
IO-Link warning message “Leakage too high” does not appear although there is high leakage in the system	Limit value -L- (permissible leakage per second) set too high	▸ Determine typical leakage values in a good handling cycle and set as limit value
	Limit values H1 and h1 for leakage measurement set too high	▸ Set limit values in such a way that there is a clear differentiation between the neutral and suction system states.

11.2 Warnings and Error Messages in SIO Mode

Warnings

Condition monitoring function events that enable you to draw conclusions regarding the process are output via ejector output 3.
For more information, see the chapter “Condition Monitoring”.

Errors

In SIO mode, the error messages are shown on the display.

Code displayed	Explanation
E01	Electronics error – internal data management, EEPROM
E03	Zero-point adjustment for vacuum/pressure sensor is outside of the tolerance ±3% FS
E05	Actuator supply voltage U_A too low or not available (display alternates with current vacuum value)
E06	Manual operation not possible in "blow off" mode
E07	Sensor supply voltage U_S too low
E 11	Short circuit at OUT1
E 12	Short circuit at OUT2
E 13	Short circuit at OUT3
FFF	Present vacuum or pressure exceeds the measurement range
-FF	Overpressure in the vacuum circuit or vacuum in the pressure circuit

The error E01 remains in the display after being shown once.

- Clear the error by restoring the factory setting with the [rES] function or parameter in the configuration menu.

If the error E01 occurs again after the power supply is switched back on, then the device must be replaced.

11.3 Warnings and Error Messages in IO-Link Mode

Warnings

Warnings, particularly as results of the condition monitoring functions, provide conclusions about the vacuum system and the current handling cycle. For more information, see the chapter "Condition Monitoring".

Condition monitoring events that occur in the device are signaled via bit 6 in the process data byte input (PDI). The parameter 0x0092 can be read out for an exact error analysis. The corresponding condition monitoring event code is transmitted here.

If several condition monitoring events occur within a suction cycle, each code is added accordingly.

Code	Description
0	No condition monitoring event
1	Valve protection function activated
2	Set limit value t-1 for evacuation time exceeded
4	Set leakage limit value -L- exceeded
8	Threshold H1 was not reached
16	Dynamic pressure > (H2 - h2) and < H1
128	System pressure outside the operating range

Error messages

Errors that occur in the device are signaled via bit 7 in the process data byte input (PDI). The parameter 0x0082 can be read out for an exact error analysis. The corresponding error code is transmitted here.

Code	Description
1	Electronics fault
3	Zero-point adjustment for vacuum/pressure sensor outside ±3% FS
5	Actuator supply undervoltage
6	Manual operation not possible in “blow off” mode
7	Sensor supply undervoltage

In addition, the error code is shown on the ejector display, as is the case in SIO mode.

12 Maintenance

12.1 Safety Instructions

Maintenance work may only be carried out by qualified personnel.

- Create atmospheric pressure in the ejector's compressed air circuit before working on the system!

⚠ WARNING

Failure to follow the instructions in these Operating instructions **may result in injuries!**

- Read the Operating instructions carefully and observe the contents.

⚠ WARNING

Risk of injury due to incorrect maintenance or troubleshooting

- Check the proper functioning of the product, especially the safety features, after every maintenance or troubleshooting operation.

NOTE

Incorrect maintenance work

Damage to the ejector!

- Always switch off the supply voltage before carrying out maintenance work.
- Secure it so that it cannot be switched back on.
- The ejector must be operated only with a silencer and press-in screen(s).

12.2 Cleaning the Ejector

1. For cleaning, do not use aggressive cleaning agents such as industrial alcohol, white spirit or thinners. Only use cleaning agents with pH 7–12.
2. Remove dirt on the exterior of the device with a soft cloth and soap suds at a maximum temperature of 60° C. Make sure that the silencer is not soaked in soapy water.
3. Ensure that no moisture can reach the electrical connection or other electrical components.

12.3 Replacing the Silencer

Heavy infiltration of dust, oil, etc. may contaminate the silencer and reduce the suction capacity. Cleaning the silencer is not recommended due to the capillary effect of the porous material.

If the suction capacity decreases, replace the silencer.

✓ Deactivate the ejector and depressurize the pneumatic systems.

- Detach and replace the silencer.

12.4 Cleaning or Replacing Screens

The vacuum and compressed air connections contain screw-in or press-in screens. Dust, chippings and other solid materials may be deposited in the screens over time.

- If there is a noticeable reduction in performance, simply screw off the screens and clean or replace them.

13 Warranty

This system is guaranteed in accordance with our general terms of trade and delivery. The same applies to spare parts, provided that these are original parts supplied by us.

We are not liable for any damage resulting from the use of non-original spare parts or accessories.

The exclusive use of original spare parts is a prerequisite for the proper functioning of the ejector and for the validity of the warranty.

Wearing parts are not covered by the warranty.

Opening the ejector will damage the “tested” labels. This voids the warranty.

14 Spare and Wearing Parts, Accessories

14.1 Spare and Wearing Parts

Maintenance work may only be carried out by qualified personnel.

⚠ WARNING

Risk of injury due to incorrect maintenance or troubleshooting

- Check the proper functioning of the product, especially the safety features, after every maintenance or troubleshooting operation.

The following list contains the most important spare and wearing parts.

Designation	Part no.	Type
Silencer	10.02.02.02124	Wearing part
Screw-in screen, G3/8", for base plate GP2	10.05.03.00013	Spare part
Screen, 17.5x2 for variant H	10.02.02.03378	Spare part
Suction valve for NO ejector (NO valve)	10.05.01.00278	Spare part
Suction valve for NC ejector (NC valve)	10.05.01.00277	Spare part
Suction valve for IMP ejector (pulse valve)	10.05.01.00280	Spare part
Blow off valve (NC valve)	10.05.01.00277	Spare part
Wearing part set for ejector with silencer VST SXPi-25-30-SD	10.02.02.04283	Wearing part

When tightening the fastening screws on the valves, observe the maximum tightening torque of 0.5 Nm.

14.2 Accessories

Designation	Part no.	Note
Connection cable, ASK B-M12-8 5000 K-8P	21.04.05.00079	Connection cable with socket, M12, 8-pin, open-ended, length: 5 m, material: PUR cable
Connection cable, ASK B-M12-5 5000 K-5P	21.04.05.00080	Connection cable with socket, M12, 5-pin, open-ended, length: 5 m
Connection cable, ASK B-M12-5 1000 S-M12-5	21.04.05.00158	Connection cable with socket, M12, 5-pin, for 5-pin M12 plug, length: 1 m
Connection distributor (IN), M12 5-pin to 2xM12 4-pin	10.02.02.02824	
Connection distributor (OUT), M12 5-pin to 2xM12 4-pin	10.02.02.02921	
2x base plate with quick change connection	10.02.02.02154	Base plate for mounting ejector blocks GPQ2 122x87x48
Base plate GPQ1 122x46x43 SXPi/SXMPi	10.02.02.02473	Base plate for mounting ejector blocks

15 Decommissioning and Recycling

15.1 Disposing of the Product

1. Dispose of the product properly after replacement or decommissioning.
2. Observe the country-specific guidelines and legal obligations for waste prevention and disposal.

15.2 Materials Used

Component	Material
Housing	PA6-GF
Inner components	Aluminum alloy, anodized aluminum alloy, brass, galvanized steel, stainless-steel, PU, POM
Controller housing	PC, PMMA
Pneumatic connection adapter Q	Aluminum alloy, anodized, nickel-plated steel
Pneumatic connection adapter H	PA6-GF
Silencer housing	ABS
Silencer insert	Porous PE
Screws	Galvanized steel
Sealing	Nitrile rubber (NBR)
Lubrication	Silicone-free

16 Overview of Display Codes

Display code	Parameter	Comment
H- 1	Limit value H1	Switch-off value for air-saving function/control
h- 1	Hysteresis value h1	Hysteresis of control
H-2	Limit value H2	Activation value of “part present” check signal output
h-2	Hysteresis value h2	Hysteresis of “part present” check signal output
HP 1	Limit value HP1	Compressed air limit value
hP 1	Hysteresis value hP1	Hysteresis of the compressed air value
tbL	Blow off time	Setting for the blow-off time for time-controlled blow-off (time blow off)
cAL	Zero-point adjustment	Selection of the function for pressure or vacuum sensor
UAc	Zero-point adjustment of the vacuum sensor	Adjustment of the zero point for the vacuum sensor
PrS	Zero-point adjustment of the pressure sensor	Adjustment of the zero point for the pressure sensor
ct 1	Counter 1	Erasable counter for suction cycles ("Suction" signal input)
ct2	Counter 2	Erasable counter for valve switching frequency
ct3	Counter 3	Erasable counter for condition monitoring events
rct	Clearing counters	Erases counters ct1, ct2 and ct3
cc 1	Total counter 1	Counter for suction cycles (“suction” signal input)
cc2	Total counter 2	Counter for valve switching frequency
cc3	Total counter 3	Counter for condition monitoring events
Soc	Software function	Displays the current software version
Snr	Serial number	Displays the serial number of the ejector
Art	Part number	Displays the part number of the ejector
un i	Vacuum unit	Vacuum unit in which the measurement and setting values are displayed
-bA	Vacuum level in mbar	The displayed vacuum and pressure levels are shown in mbar.
-PA	Vacuum level in kPa	The displayed vacuum and pressure levels are shown in kPa.
- iH	Vacuum level in inHg	The displayed vacuum and pressure levels are shown in inches of Hg.
t- 1	Evacuation time	Set the maximum permitted evacuation time
-L-	Leakage value	Set the maximum permissible leakage in mbar/s
dLy	Switch-off delay	Switch-off delay setting for H1, HP1 and H2 (delay)
Eco	Eco mode	Setting for the ECO mode display
tyP	Signal type configuration	Menu for configuration of the signal type (NPN/PNP)
PnP	PNP signal type	All input and output signals switch according to PNP (input / output on = 24 V)
nPn	NPN signal type	All input and output signals switch according to NPN (input / output on = 0V)
out	Signal output configuration	Menu for configuring the signal output
no	Normally open contact (normally open)	Signal output setting as normally open contact

Display code	Parameter	Comment
nc	Normally closed contact (normally closed)	Signal output setting as normally closed contact
ctr	Control	Set the air saving function (control function)
on	Air saving function on	The air saving function is activated
onS	Control function on with leakage monitoring	Switches on the air saving function with leakage monitoring
oFF	Air saving function off	The air saving function is deactivated
dcS	Continuous suction is deactivated	The automatic valve protection function is suppressed
YES	Continuous suction is deactivated	Selection of continuous suction is deactivated
NO	Continuous suction is activated	Selection of continuous suction is activated
bLo	Blow off function	Parameter for configuring the blow-off function (blow off)
-E-	“External” blow-off	Selection of externally controlled blow off
I-t	“Internally time-controlled” blow-off	Selection of internally controlled blow-off (triggered internally; time-adjustable)
E-t	"Externally time-controlled" blow-off	Selection of externally controlled blow-off (triggered externally; time-adjustable
P in	PIN code	Entry of the PIN code for unlocking the menu
rES	Reset	All adjustable values are reset to the factory settings.
Loc	Input locked	Parameter modification is locked (lock).
Unc	Input enabled	The buttons and menus are unlocked (unlock).

17 Declarations of Conformity

17.1 EC Declaration of Conformity

EC Declaration of Conformity

The manufacturer Schmalz confirms that the product Ejector described in these operating instructions fulfills the following applicable EC directives:

2014/30/EU	Electromagnetic Compatibility
2011/65/EU	RoHS Directive

The following harmonized standards were applied:

EN ISO 12100	Safety of machinery — General principles for design — Risk assessment and risk reduction
EN 61000-6-2+AC	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-3+A1+AC	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
EN ISO 4414	Pneumatic fluid power – General rules and safety requirements for systems and their components
EN IEC 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

The EU Declaration of Conformity valid at the time of product delivery is delivered with product or made available online. The standards and directives cited here reflect the status at the time of publication of the operating and assembly instructions.

17.2 UKCA Conformity

The manufacturer Schmalz confirms that the product described in these operating instructions fulfills the following applicable UK regulations:

2016	Electromagnetic Compatibility Regulations
2012	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations

The following designated standards were applied:

EN ISO 12100	Safety of machinery — General principles for design — Risk assessment and risk reduction
EN ISO 4414	Pneumatic fluid power – General rules and safety requirements for systems and their components
EN 61000-6-2+AC	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-3+A1+AC	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
EN IEC 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

The Declaration of Conformity (UKCA) valid at the time of product delivery is delivered with the product or made available online. The standards and directives cited here reflect the status at the time of publication of the operating and assembly instructions.

IO-Link

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IO-Link

SIO-Mode	Yes
Frame-Typ	2.5
Baudrate	38,4 kBd
Minimum cycle time	3,0 ms
Processdata input	1 byte
Processdata output	1 byte

Process Data

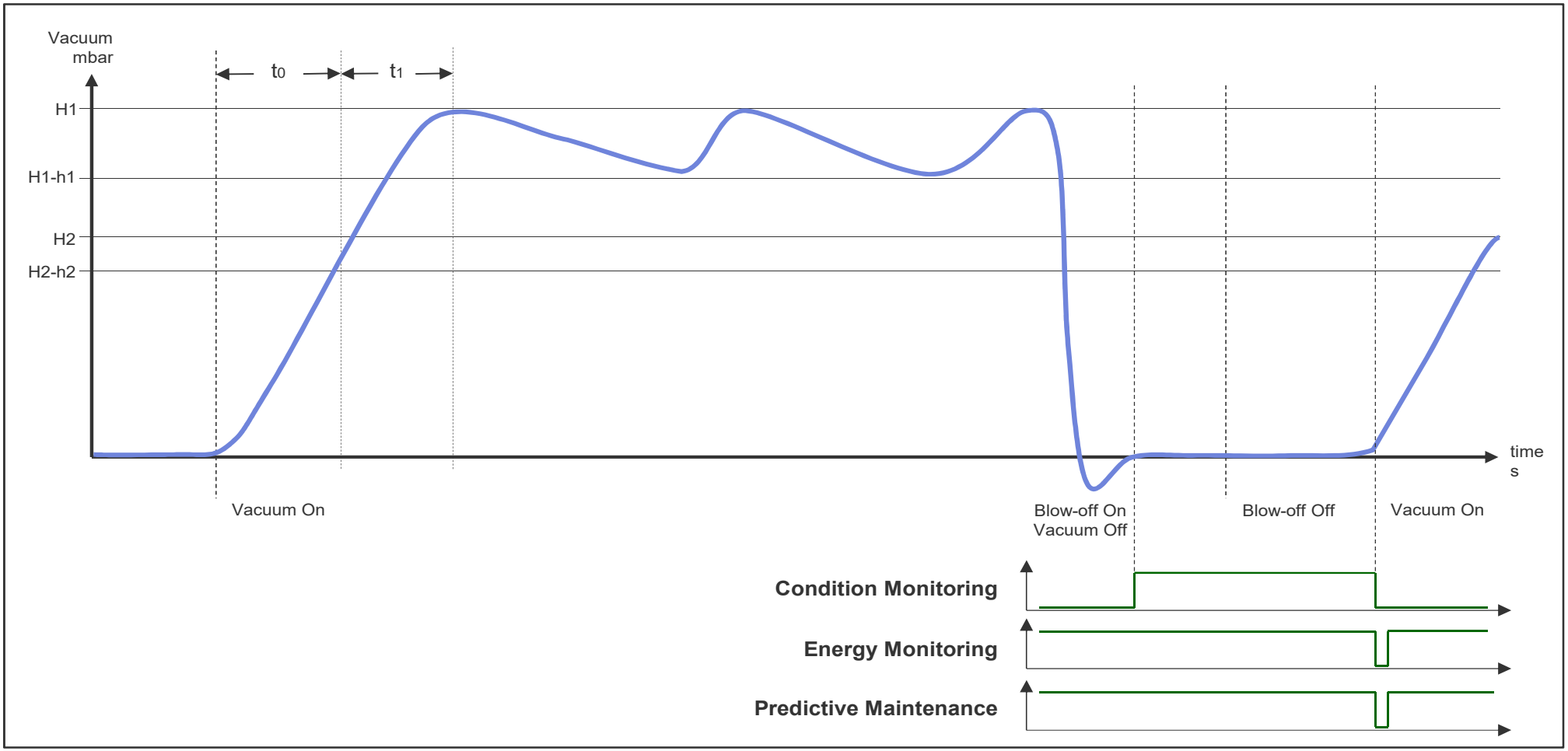
	Parameter	Bit		Access		Remark
Input Data Byte	Part present (H2)	0		ro		Vacuum is over H2 & not yet under H2-h2
	Air saving function (H1)	1		ro		Vacuum is over H1 & not yet under H1-h1
	-	2		ro		Not used
	Status LED - green	3		ro		Status LED green on
	Status LED - red	4		ro		Status LED red on
	Status LED - flashing	5		ro		Status LED is flashing
	Condition Monitoring Event	6		ro		Details see Index 0x0092
	Error Event	7		ro		Error code see Index 0x0082
Output Data Byte	Vacuum	0		wo		Vacuum on/off
	Blow-off	1		wo		Blow-off on/off
	Setting mode	2		wo		Vacuum on/off without valve-protection
	-	3		wo		Not used
	-	4		wo		Not used
	-	5		wo		Not used
	-	6		wo		Not used
	-	7		wo		Not used

Parameter

SPDU Index dec	SPDU Index hex		Parameter	Data width	Value range	Access	Default value	Remark
			Identification					
7	0x07		Vendor ID	2 bytes		ro	0x00	0x00EA = 234 = J. Schmalz GmbH
8	0x08						0xEA	
9	0x09		Device ID	3 bytes		ro	0x01	Internal code number
10	0x0A						0x87	
11	0x0B						0x72	
16	0x0010		Vendor name	15 bytes		ro	J. Schmalz GmbH	Manufacturer designation
17	0x0011		Vendor text	15 bytes		ro	www.schmalz.com	Internet address
18	0x0012		Product name	32 bytes		ro	SXPi	General product name
19	0x0013		Product ID	17 bytes		ro	10.02.02.00000/00	Order-Nr.
20	0x0014		Product text	30 bytes		ro	SXMPi 00 IMP Q 2xM12	Order-Code
21	0x0015		Serial number	9 bytes		ro	000000002	Serial number
22	0x0016		Hardware revision	3 bytes		ro		Hardware revison
23	0x0017		Firmware revision	3 bytes		ro		Firmware revision
			Online					
64	0x0040		System vacuum	2 bytes	0 - 999	ro	0	Unit: mbar
			Initial Setup					
68	0x0044	ctr	Air saving function	1 byte	0 - 2	rw	1	0 = not active (off) 1 = active (on) 2 = active with supervision (onS)
69	0x0045	bLo	Blow-off mode	1 byte	0 - 2	rw	0	0 = Externally controlled blow-off (-E-) 1 = Internally controlled blow-off – time-dependent (I-t) 2 = Externally controlled blow-off – time-dependent (E-t)
70	0x0046	o-1	Output 1 function	1 byte	0 - 1	rw	0	0 = NO 1 = NC
71	0x0047	o-2	Output 2 function	1 byte	0 - 1	rw	0	0 = NO 1 = NC
72	0x0048	o-3	Output 3 function	1 byte	0 - 1	rw	0	0 = NO 1 = NC
73	0x0049	tyP	Signal type	1 byte	0 - 1	rw	0 / 1	0 = PNP 1 = NPN
74	0x004A	uni	Vacuum display unit	1 byte	0 - 2	rw	0	0 = mbar 1 = kPa 2 = inHg
75	0x004B	dLY	Output filter	1 byte	0 - 3	rw	1	0 = Off 1 = 10ms 2 = 50ms 3 =200ms

76	0x004C	Eco	Eco-Mode	1 byte	0 - 1	rw	0	0 = Eco OFF 1 = Eco ON
77	0x004D	Pin	PIN code	2 bytes	0 - 999	rw	0	0 = unlocked >0 = locked
78	0x004E	dCS	disable continuous sucking	1 byte	0 - 1	rw	0	0 = NO 1 = YES
		Production Setup						
100	0x0064	H-1	Setpoint H1	2 bytes	H1 =< 998 & H1 > (H2+h1)	rw	750	Unit: mbar
101	0x0065	h-1	Hysteresis h1	2 bytes	h1 < (H1-H2) & h1 >= 10	rw	150	Unit: mbar
102	0x0066	H-2	Setpoint H2	2 bytes	H2 < (H1-h1) & H2 > h2+2	rw	550	Unit: mbar
103	0x0067	h-2	Hysteresis h2	2 bytes	h2 < H2-2 & h2 >= 10	rw	10	Unit: mbar
106	0x006A	tbL	Duration automatic blow	2 bytes	10 - 999	rw	20	Unit: 1 ms x 10
107	0x006B	t-1	Permissible evacuation time	2 bytes	0 - 999	rw	200	Unit: 1 ms x 10
108	0x006C	-L-	Permissible leakage value	1 byte	0 - 6	rw	6	0 = 4mbar/s 1 = 11mbar/s 2 = 25mbar/s 3 = 50mbar/s 4 = 100mbar/s 5 = 150mbar/s 6 = 250mbar/s
		Calibration						
120	0x0078	UAC	Vacuum sensor offset Cal	1 byte	0 - 1	wo	0	0 = Nothing 1 = Zero offset; After calibrating 0
122	0x007A	rct	Reset erasable counters	1 byte	0 - 1	wo	0	0 = Nothing 1 = Reset erasable counters
123	0x007B	rES	Factory defaults	1 byte	0 - 1	wo	0	0 = Nothing 1 = Restore; After restoring 0
Diagnose								
		Error						
130	0x0082	Exx	Error-Code	1 byte	0-255	ro	0	1-99 = Error-code 100 - 199 = Internal error code

		Counter						
140	0x008C	cc1	Vacuum-on counter	4 bytes	0 - 999 mio	ro	0	Not erasable
141	0x008D	cc2	Valve operating counter	4 bytes	0 - 999 mio	ro	0	Not erasable
142	0x008E	cc3	Condition monitoring counter	4 bytes	0 - 999 mio	ro	0	Not erasable
143	0x008F	ct1	Erasable vacuum-on counter	4 bytes	0 - 999 mio	ro	0	To reset this counter must "1" be sent to Index 0x007A
144	0x0090	ct2	Erasable valve operating counter	4 bytes	0 - 999 mio	ro	0	To reset this counter must "1" be sent to Index 0x007A
145	0x0091	ct3	Erasable Condition monitoring counter	4 bytes	0 - 999 mio	ro	0	To reset this counter must "1" be sent to Index 0x007A
		Condition Monitoring [CM]						
146	0x0092		Condition monitoring	1 byte	0 - 255	ro	0	0 = no warning 1 =Valve protection aktiv 2 =Evacuation time longer than t-1 4 = Leakage rate higher than -L- 8 = H1 in gripping cycle
147	0x0093		Leakage area	1 byte	0 - 255	ro	0	0 = no actual value 1 = Leakage of last sucking cycle is >200mbar/s 2 = Leakage of last sucking cycle is between 133 … 200mbar/s 4 = Leakage of last sucking cycle is between 67 ... 133mbar/s 8 = Leakage of last sucking cycle is <67mbar/s
148	0x0094		Evacuation time t_0	2 bytes	0 - 65.535	ro	0	Time from start of sucking to H2 [ms]
149	0x0095		Evacuation time t_1	2 bytes	0 - 65.535	ro	0	Time from H2 to H1 [ms]
		Energy Monitoring [EM]						
155	0x009B		Air consumption per cycle in percent	1 byte	0 - 100	ro	0	Air consumption of last sucking cycle [%]


Vacuum
mbar
t0
t1
H1
H1-h1
H2
H2-h2
time
s
Vacuum On
Blow-off On
Vacuum Off
Blow-off Off
Vacuum On
Condition Monitoring
Energy Monitoring
Predictive Maintenance

IO-Link

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IO-Link

SIO-Mode	Yes
Frame-Typ	2.5
Baudrate	38,4 kBd
Minimum cycle time	3,0 ms
Processdata input	1 byte
Processdata output	1 byte

Process Data

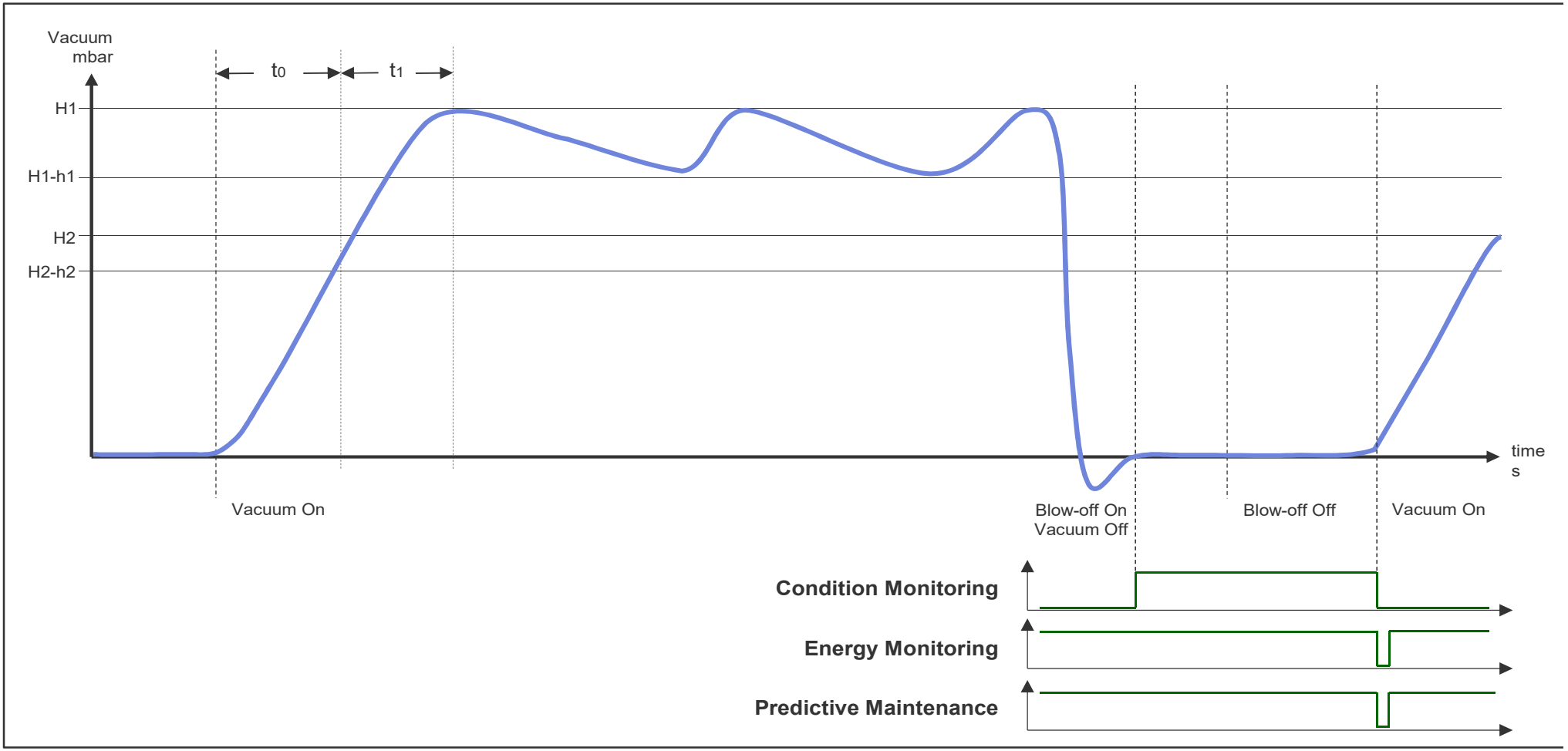
	Parameter	Bit		Access		Remark
Input Data Byte	Part present (H2)	0		ro		Vacuum is over H2 & not yet under H2-h2
	Air saving function (H1)	1		ro		Vacuum is over H1 & not yet under H1-h1
	System pressure OK (HP1)	2		ro		Pressure is over HP1 & not yet under HP1 - hP1
	Status LED - green	3		ro		Status LED green on
	Status LED - red	4		ro		Status LED red on
	Status LED - flashing	5		ro		Status LED is flashing
	Condition Monitoring Event	6		ro		Details see Index 0x0092
	Error Event	7		ro		Error code see Index 0x0082
Output Data Byte	Vacuum	0		wo		Vacuum on/off
	Blow-off	1		wo		Blow-off on/off
	Setting mode	2		wo		Vacuum on/off without valve-protection
	-	3		wo		Not used
	-	4		wo		Not used
	-	5		wo		Not used
	-	6		wo		Not used
	-	7		wo		Not used

Parameter

SPDU Index dec	SPDU Index hex		Parameter	Data width	Value range	Access	Default value	Remark
			Identification					
7	0x07		Vendor ID	2 bytes		ro	0x00	0x00EA = 234 = J. Schmalz GmbH
8	0x08						0xEA	
9	0x09		Device ID	3 bytes		ro	0x01	Internal code number
10	0x0A						0x87	
11	0x0B						0x73	
16	0x0010		Vendor name	15 bytes		ro	J. Schmalz GmbH	Manufacturer designation
17	0x0011		Vendor text	15 bytes		ro	www.schmalz.com	Internet address
18	0x0012		Product name	32 bytes		ro	SXPi_PC	General product name
19	0x0013		Product ID	17 bytes		ro	10.02.02.00000/00	Order-Nr.
20	0x0014		Product text	30 bytes		ro	SXMPi 00 IMP Q PC 2xM12	Order-Code
21	0x0015		Serial number	9 bytes		ro	000000002	Serial number
22	0x0016		Hardware revision	3 bytes		ro		Hardware revison
23	0x0017		Firmware revision	3 bytes		ro		Firmware revision
			Online					
64	0x0040		System vacuum	2 bytes	0 - 999	ro	0	Unit: mbar
65	0x0041		System pressure	2 bytes	0 - 999	ro	0	Unit: 1 mbar x 10
			Initial Setup					
68	0x0044	ctr	Air saving function	1 byte	0 - 2	rw	1	0 = not active (off) 1 = active (on) 2 = active with supervision (onS)
69	0x0045	bLo	Blow-off mode	1 byte	0 - 2	rw	0	0 = Externally controlled blow-off (-E-) 1 = Internally controlled blow-off – time-dependent (I-t) 2 = Externally controlled blow-off – time-dependent (E-t)
70	0x0046	o-1	Output 1 function	1 byte	0 - 1	rw	0	0 = NO 1 = NC
71	0x0047	o-2	Output 2 function	1 byte	0 - 1	rw	0	0 = NO 1 = NC
72	0x0048	o-3	Output 3 function	1 byte	0 - 1	rw	0	0 = NO 1 = NC
73	0x0049	tyP	Signal type	1 byte	0 - 1	rw	0 / 1	0 = PNP 1 = NPN
74	0x004A	uni	Vacuum display unit	1 byte	0 - 2	rw	0	0 = mbar 1 = kPa 2 = inHg
75	0x004B	dLY	Output filter	1 byte	0 - 3	rw	1	0 = Off 1 = 10ms 2 = 50ms 3 =200ms

76	0x004C	Eco	Eco-Mode	1 byte	0 - 1	rw	0	0 = Eco OFF 1 = Eco ON
77	0x004D	Pin	PIN code	2 bytes	0 - 999	rw	0	0 = unlocked >0 = locked
78	0x004E	dCS	disable continuous sucking	1 byte	0 - 1	rw	0	0 = NO 1 = YES
		Production Setup						
100	0x0064	H-1	Setpoint H1	2 bytes	H1 =< 998 & H1 > (H2+h1)	rw	750	Unit: mbar
101	0x0065	h-1	Hysteresis h1	2 bytes	h1 < (H1-H2) & h1 >= 10	rw	150	Unit: mbar
102	0x0066	H-2	Setpoint H2	2 bytes	H2 < (H1-h1) & H2 > h2+2	rw	550	Unit: mbar
103	0x0067	h-2	Hysteresis h2	2 bytes	h2 < H2-2 & h2 >= 10	rw	10	Unit: mbar
104	0x0068	HP1	Setpoint HP1	2 bytes	HP1 < 9.900 & HP1 > hP1	rw	40	Unit: 1 bar x 0,1
105	0x0069	hP1	Hysteresis hP1	2 bytes	hP1 < HP1 & hP1 > 100	rw	2	Unit: 1 bar x 0,1
106	0x006A	tbL	Duration automatic blow	2 bytes	10 - 999	rw	20	Unit: 1 ms x 10
107	0x006B	t-1	Permissible evacuation time	2 bytes	0 - 999	rw	200	Unit: 1 ms x 10
108	0x006C	-L-	Permissible leakage value	1 byte	0 - 6	rw	6	0 = 4mbar/s 1 = 11mbar/s 2 = 25mbar/s 3 = 50mbar/s 4 = 100mbar/s 5 = 150mbar/s 6 = 250mbar/s
		Calibration						
120	0x0078	UAC	Vacuum sensor offset Cal	1 byte	0 - 1	wo	0	0 = Nothing 1 = Zero offset; After calibrating 0
121	0x0079	PrS	Pressure sensor offset Cal	1 byte	0 - 1	wo	0	0 = Nothing 1 = Zero offset; After calibrating 0
122	0x007A	rct	Reset erasable counters	1 byte	0 - 1	wo	0	0 = Nothing 1 = Reset erasable counters
123	0x007B	rES	Factory defaults	1 byte	0 - 1	wo	0	0 = Nothing 1 = Restore; After restoring 0

⊞ Diagnose								
	⊞ Error							
130	0x0082	Exx	Error-Code	1 byte	0-255	ro	0	1-99 = Error-code 100 - 199 = Internal error code
	⊞ Counter							
140	0x008C	cc1	Vacuum-on counter	4 bytes	0 - 999 mio	ro	0	Not erasable
141	0x008D	cc2	Valve operating counter	4 bytes	0 - 999 mio	ro	0	Not erasable
142	0x008E	cc3	Condition monitoring counter	4 bytes	0 - 999 mio	ro	0	Not erasable
143	0x008F	ct1	Erasable vacuum-on counter	4 bytes	0 - 999 mio	ro	0	To reset this counter must "1" be sent to Index 0x007A
144	0x0090	ct2	Erasable valve operating counter	4 bytes	0 - 999 mio	ro	0	To reset this counter must "1" be sent to Index 0x007A
145	0x0091	ct3	Erasable Condition monitoring counter	4 bytes	0 - 999 mio	ro	0	To reset this counter must "1" be sent to Index 0x007A
	⊞ Condition Monitoring [CM]							
146	0x0092		Condition monitoring	1 byte	0 - 255	ro	0	0 = no warning 1 =Valve protection aktiv 2 =Evacuation time longer than t-1 4 = Leakage rate higher than -L- 8 = H1 in gripping cycle 16 =Dynamic pressure > (H2-h2) but < H1 128 = System pressure outside of operating range
147	0x0093		Leakage area	1 byte	0 - 255	ro	0	0 = no actual value 1 = Leakage of last sucking cycle is >200mbar/s 2 = Leakage of last sucking cycle is between 133 … 200mbar/s 4 = Leakage of last sucking cycle is between 67 ... 133mbar/s 8 = Leakage of last sucking cycle is <67mbar/s
148	0x0094		Evacuation time t_0	2 bytes	0 - 65.535	ro	0	Time from start of sucking to H2 [ms]
149	0x0095		Evacuation time t_1	2 bytes	0 - 65.535	ro	0	Time from H2 to H1 [ms]
	⊞ Energy Monitoring [EM]							
155	0x009B		Air consumption per cycle in percent	1 byte	0 - 100	ro	0	Air consumption of last sucking cycle [%]
156	0x009C		Air consumption per cycle	2 byte	0 - 65.535	ro	0	Air consumption of last sucking cycle [Nl x 0,1]
157	0x009D		Energy consumption per cycle	2 byte	0 - 65.535	ro	0	Energy consumption of last sucking cycle [Ws]
	⊞ Predictive Maintenance [PM]							
160	0x00A0		Leakage	2 bytes	0 - 8.000	ro	0	Leakage of last sucking cycle [mbar/s]
161	0x00A1		Dynamic pressure	2 bytes	0 - 999	ro	0	Dynamic pressure of last sucking cycle [mbar]
162	0x00A2		Quality	1 bytes	0 - 100	ro	0	Quality of last sucking cycle [%]
163	0x00A3		Performance	1 bytes	0 -100	ro	0	Performance of last sucking cycle [%]


Vacuum
mbar
t0
t1
H1
H1-h1
H2
H2-h2
time
s
Vacuum On
Blow-off On
Vacuum Off
Blow-off Off
Vacuum On
Condition Monitoring
Energy Monitoring
Predictive Maintenance

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