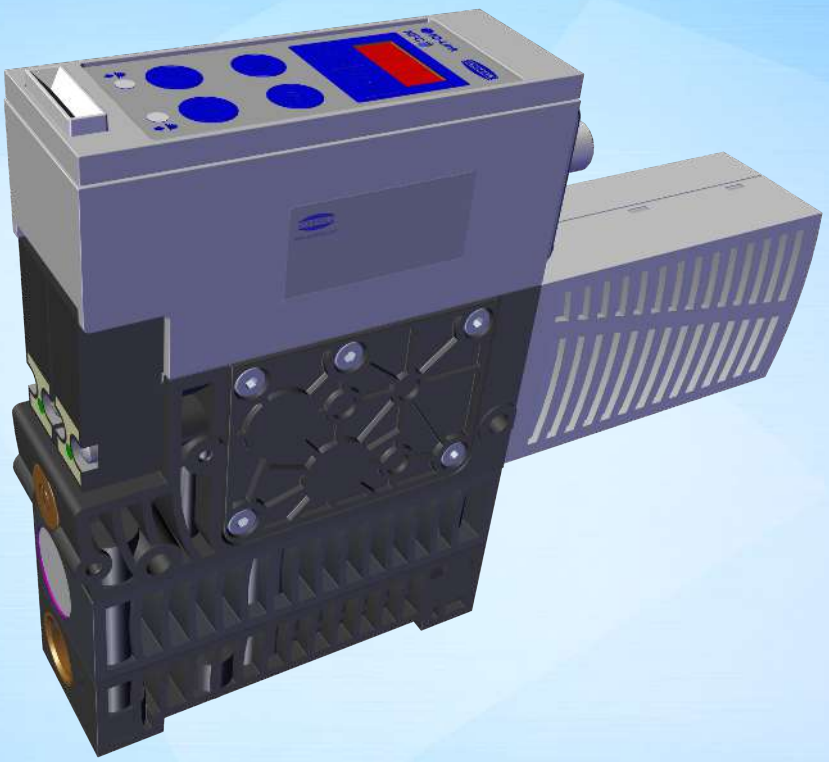

Operating instructions

SXMPi IO-Link Class B

WWW.SCHMALZ.COM

EN-US · 30.30.01.01721 · 02 · 10/22

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 life-threatening 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 Symbol

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. Operation is via a controller using IO-Link class B.

Neutral gases are approved as evacuation media. Neutral gases include air, nitrogen and inert gases (e.g. argon, xenon and neon).

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:

- Use in potentially explosive atmospheres
- Use in medical applications
- Evacuation of objects that are in danger of imploding

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.
- Work on electrical equipment must be carried out only by qualified electrical specialists.
- Installation, maintenance, and repairs must be carried out only by specialists or by persons who can prove that they have undergone appropriate training.

Valid 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 personnel must observe the pertinent 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
⚠ DANGER	Indicates a high-risk hazard that will result in death or serious injury if not avoided.
⚠ 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)

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.
- In the NC (normally closed) version, vacuum generation is activated when the suction signal is received.
- 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.

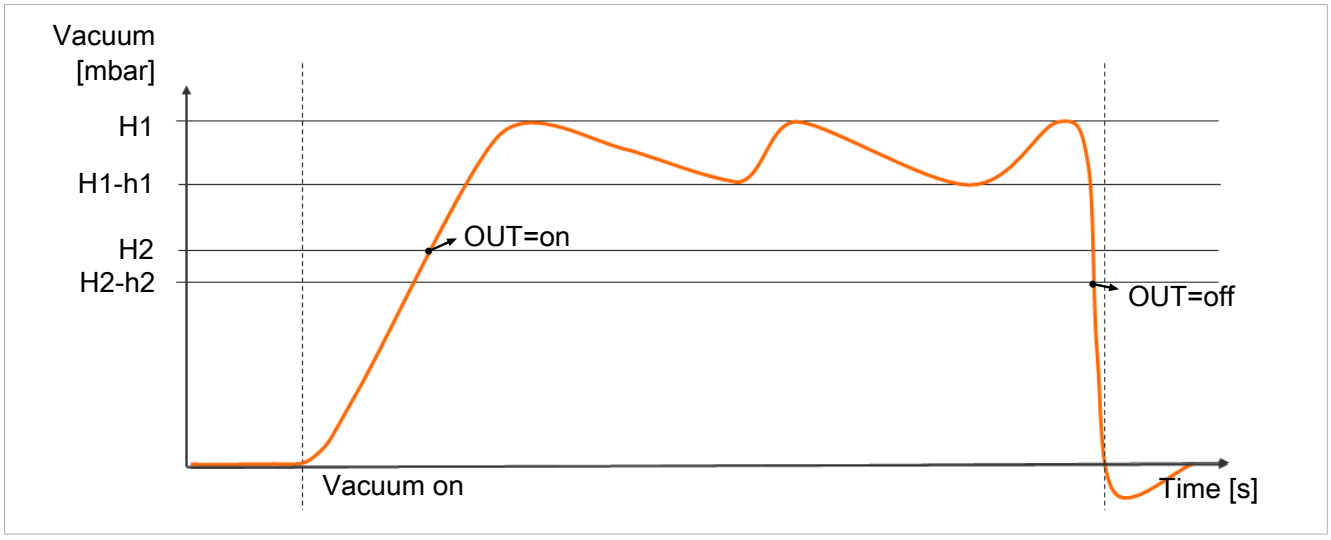
In the ejector variant IMP, the ejector remains in “Suction” mode if the power supply fails during automatic operation. This prevents objects that have been picked up from falling off the suction cup in the event of a power supply failure. This also applies when the ejector is in “venturi nozzle inactive” 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.
- 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.

3.2 Depositing the Workpiece/Part (Blowing Off)

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.

The ejector provides three blow-off modes for selection:

- Externally controlled blow off
- Internally time-controlled blow-off
- Externally time-controlled blow off

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

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

3.3 Product Highlights

The current vacuum level can be shown on a three-digit display. LEDs are used to indicate switching points H1 and H2 and the current process status ("Suction" or "Blow-off"). There are also four buttons for operation.

Monitoring the system pressure: The ejector with the built-in pressure sensor (-PC- variant) monitors the system pressure in addition to the system vacuum.

It has an IO-Link class B interface; this will be referred to as the "IO-Link" for the remainder of this document.

In IO-Link mode, the ejector has an energy and process control (EPC) for monitoring the vacuum circuit.

All of the settings, parameters and measurement and analysis data are made available centrally via IO-Link.

Additionally, much of the information and the status reports for the ejector can be accessed using wireless communication with NFC (Near Field Communication).

3.4 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

3.5 Ejector Designation

The breakdown of the item designation (e.g. SXMPi-25-NO-H-M12-5) is as follows:

Property	Variants
Type of ejector	SXMPi (M = with power blow-off module)
Nozzle size	2.0, 2.5 and 3.0 mm
Controller	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, 5-pin plug

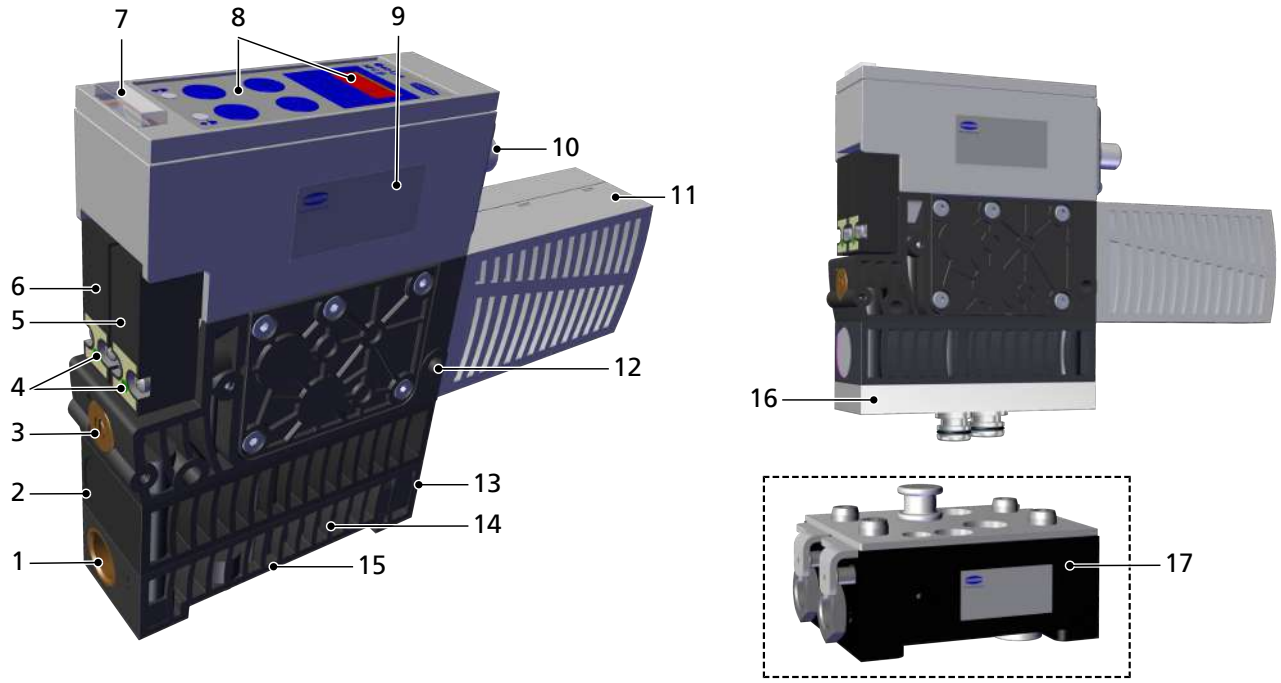
Pneumatic Connection via Quick Change (Q)

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.

Additional Pressure Control Function

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

3.6 Ejector Structure

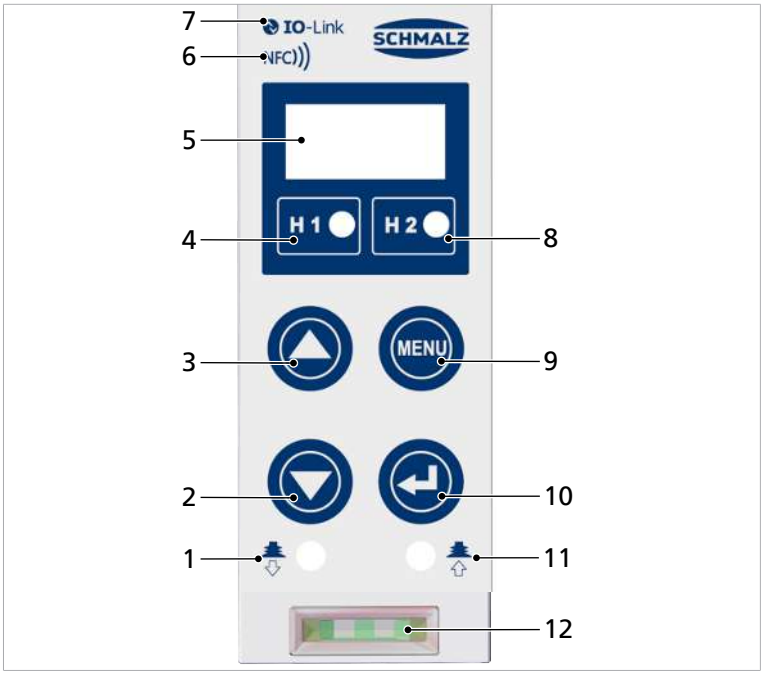


1	G3/8" vacuum connection in H version (label: 2 [V])	2	Power blow-off module
3	Valve screw for blow-off volume flow	4	Manual auxiliary actuation for pilot valves
5	“Suction” pilot valve – NO, NC or IMP (depending on version) (IMP variant without manual auxiliary actuation)	6	“Blow-off” pilot valve – NC
7	Condition monitoring	8	Operating and display elements
9	Type plate	10	M12-5 electrical connection
11	Silencer	12	Mounting holes (2x Ø 5.5 mm)
13	G3/8" compressed air connection in H version (label: 1 [P])	14	Horizontal pneumatic connection (H) (1[P]= G3/8", 2[V]= G3/8")
15	2x M5 mounting threads	16	Quick Change module (Q)
17	Accessories: Quick change double block+++		

3.7 Controls and Displays in Detail

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

- 4 keys 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	2	Down button
3	Up button	4	H1 limit value LED
5	Display	6	NFC symbol (product is equipped with an NFC interface)
7	IO-Link symbol (product is equipped with an IO-Link interface)	8	H2 limit value LED
9	Menu button	10	Enter button
11	LED for "Suction" process state	12	Condition monitoring system

Definition of the LED Indicators

The “Suction” and “Blow-off” process states are each assigned an LED.

Item	Meaning	Status	Description
1*)	Blow-off LED	OFF	Ejector not blowing off
		Lit up	Ejector blowing off
11*)	Suction LED	OFF	No suction from ejector
		Lit up	Suction from ejector
1 and 11	Manual Mode	Manual control of the suction and blow-off ejector functions (both the suction and blow-off LEDs flash). (> See ch. 7.2.2 Manual Mode, p. 29)	

*) The suction and blow-off LEDs are activated only when there is actuator supply voltage.

The LEDs for the H1 and H2 limit values indicate the current level of the system vacuum relative to the configured limit values. Their display behavior is independent of the switching functions or assignment of the output bit; it is also independent of whether the condition monitoring function is active.

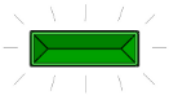
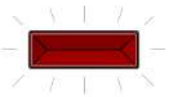
The table below explains the meaning of the LEDs.

	Limit value LEDs	Ejector status
	LEDs 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 lit steadily	Rising vacuum: Vacuum > H1
		Falling vacuum: Vacuum > (H1-h1)

Condition monitoring system

In parallel with the IO-Link, the overall status of the ejector system is displayed as a traffic light by the condition monitoring system [12]. The results of the condition monitoring are used to determine the status. This basic display provides immediate information about the status of the ejector.

The table below explains the meaning of the condition monitoring display.

Condition monitoring system [12]		Meaning
	Display lights up green	The ejector is working perfectly with optimum operating parameters.
	Display flashing green	The ejector is working, but there are warnings.
	Display flashing red	The ejector is working, but maintenance is required.
	Display lights up red	Error – Safe operation of the ejector within the operating limits is not guaranteed (error code is available in the error parameter).

4 Technical Data

4.1 Display Parameters

Parameter	Value	Comment
Display	3-digit	Red 7-segment LED display
Resolution	±1 mbar	—
Accuracy	±3% FS	T_{amb}= 25° C, based on FS (full-scale) final value
Display refresh rate	5 1/s	Only affects the 7-segment display
Idle time before the menu is exited	1 min	The display mode is accessed automatically when no settings are made in a menu.

4.2 General Parameters

Parameter	Symbol	Limit value			Unit	Note
		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	4	5	7	bar	---
Operating medium	Air or neutral gas, 5 µm filtered, with or without oil, class 7-4-4 compressed air quality in acc. with ISO 8573-1					

4.3 Electrical Parameters

Power supply for sensor	24 V -20 to +10% VDC (PELV[1)])	
Power supply for actuator	24 V -20 to +10% VDC (PELV[1)])	
Sensor power consumption [2)] (at 24 V)		60 mA
Actuator power consumption [2)] (at 24 V)	SX(M)Pi – xx – NO/IMP	130 mA
	SX(M)Pi – xx – NC – xx	70 mA
Polarity reversal protection	Yes, all M12 connector connections	
NFC	NFC Forum Tag type 4	
IO-Link	IO-Link 1.1 Baud rate COM2 (38.4 Kbits/s)	

[1)] The supply voltages must correspond to the regulations in accordance with EN60204 (protected extra-low voltage).

[2)] Typical power consumption

4.4 Mechanical Data

4.4.1 Performance Data

Type	SXMPi20	SXMPi25	SXMPi30
Nozzle size [mm]	2.0	2.5	3.0
Max. vacuum[1] [%]		85	
Suction rate[1] [l/min]	135	185	220

Type	SXMPi20	SXMPi25	SXMPi30
Max. blow off capacity [1] [l/min]		320	
Air consumption [1] [l/min]	180	290	380
Sound level[1], unobstructed suction [dBA]	65	67	72
Sound level[1], suction [dBA]	62	64	69
Weight [kg]		0.91	

[1)] at 4.5 bar

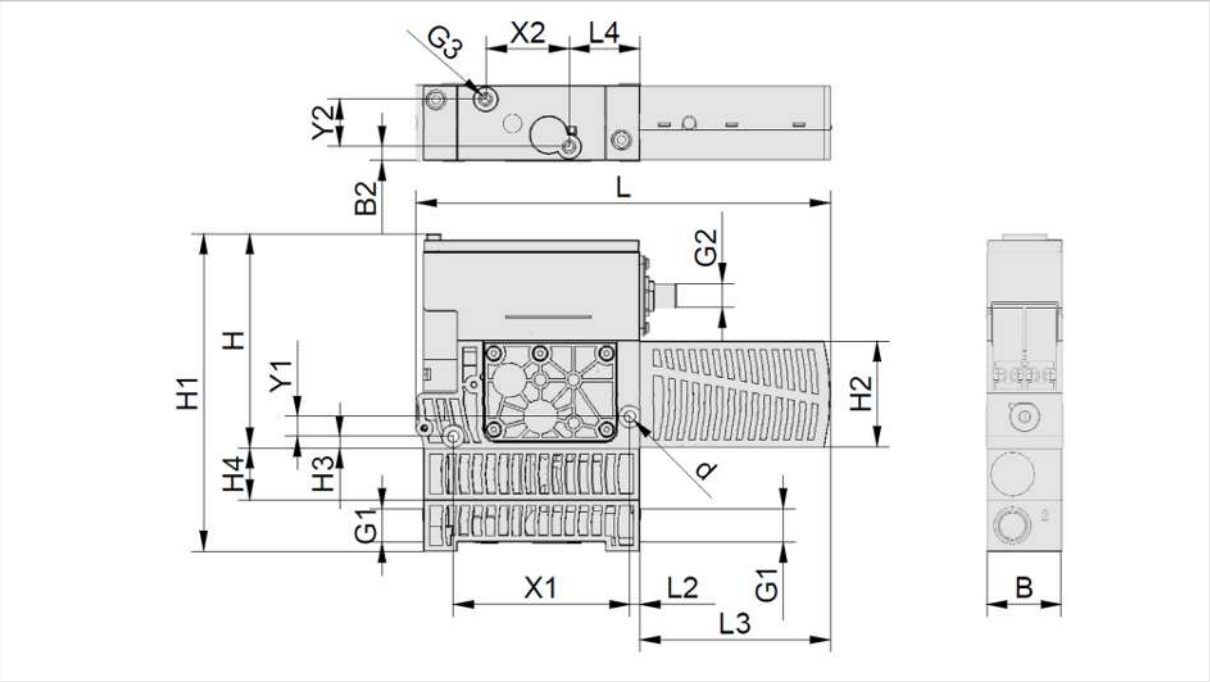
4.4.2 Factory Settings

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 H1	4.0 bar
hP 1	Hysteresis value hP1	0.2 bar
tbL	Blow-off time	0.2 s
ctr	Control	Activated = on
dcS	Sustained suction	Deactivated = oFF
t- 1	Evacuation time	2 s
-L-	Leakage value	250 mbar/s
bLo	Blow-off function	Externally controlled blow-off = -E-
un i	Vacuum unit	Vacuum unit in mbar = -bA
dLy	Switch-off delay	10 ms
dPy	Display rotation	Standard = Std
Eco	ECO mode	Deactivated = oFF
P in	PIN code	User-defined 000

The production setup profiles P-1 to P-3 are factory-set to have the exact same data set as the default data set P-0.

4.4.3 Dimensions

Variant SXMPi ...H...

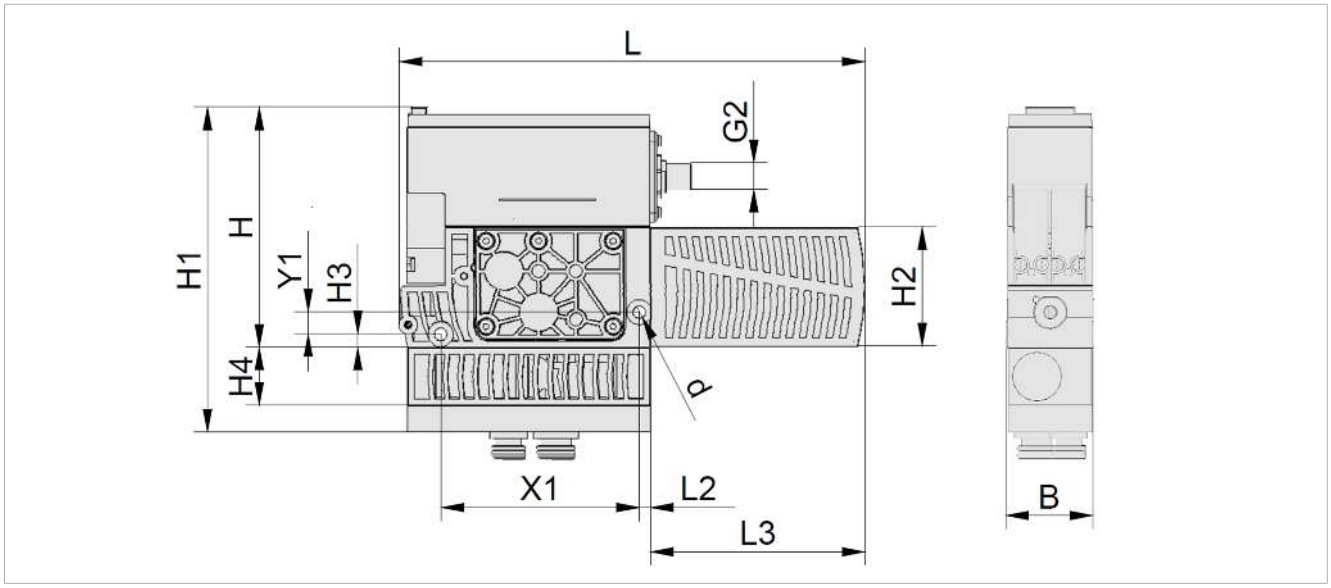


B	B2	d	G1	G2	G3	H	H1	H2	H3	H4
39	6.8	5.5	G3/8"-IG	M12-AG	M5-IG	108	160	54	6	26

L	L2	L3	L4	X1	X2	Y1	Y2	H5
210	5	97	35.5	89	42	10	24	5.5

All specifications are in mm

Variant SXMPi ...Q...

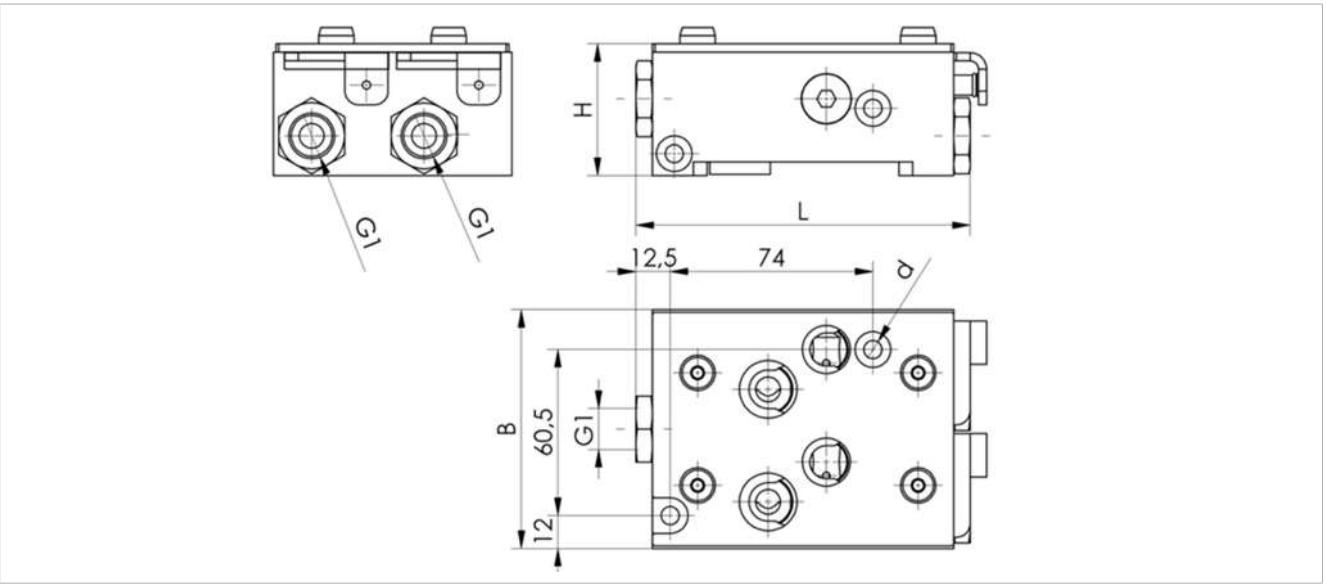


B	d	G2	H	H1	H2	H3	H4
39	5.5	M12-AG	108	146	54	6	26

L	L2	L3	X1	Y1	H5
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"-IG	48	122

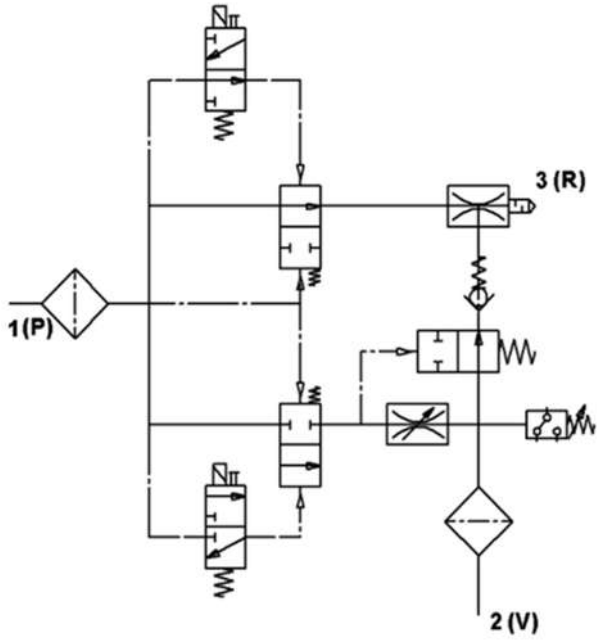
All specifications are in mm

4.4.4 Maximum Torque

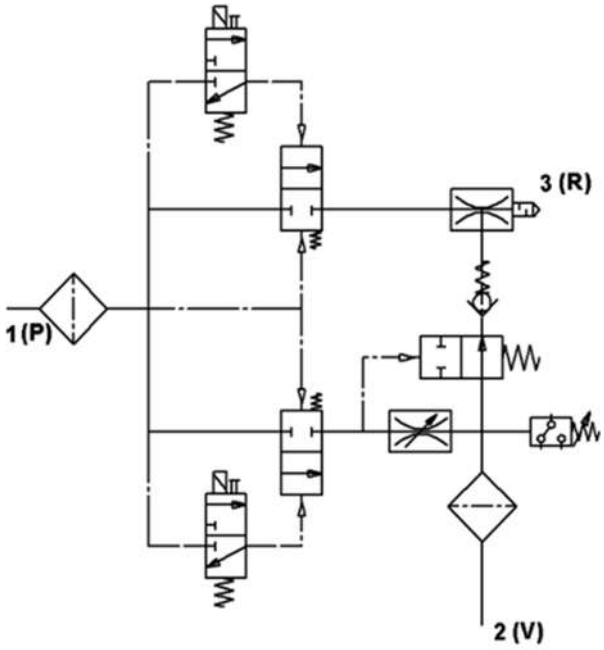
Connection	Max. torque
On ejector	
Thread G1	6 Nm
Mounting G3 (2xM5)	2 Nm
Mounting hole d	4 Nm
Pilot valves	0.7 Nm
Thread G2	Hand-tight
Controller	0.5 Nm
On base plate	
G1	6 Nm

4.4.5 Pneumatic circuit plans

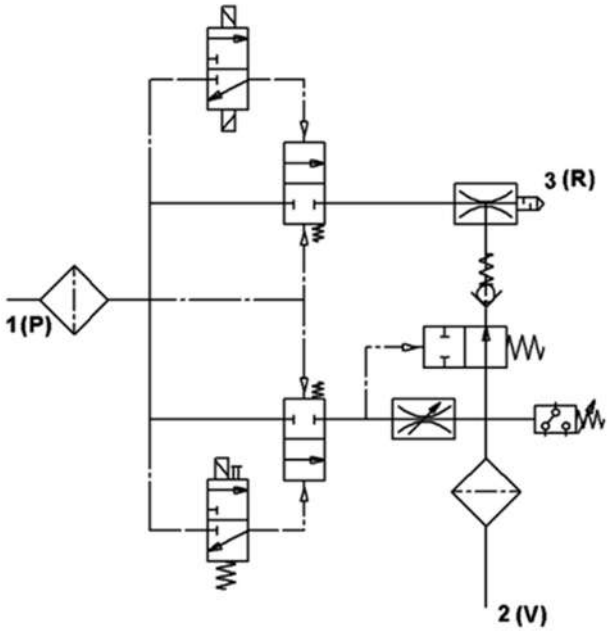
SXMPi ...NO...



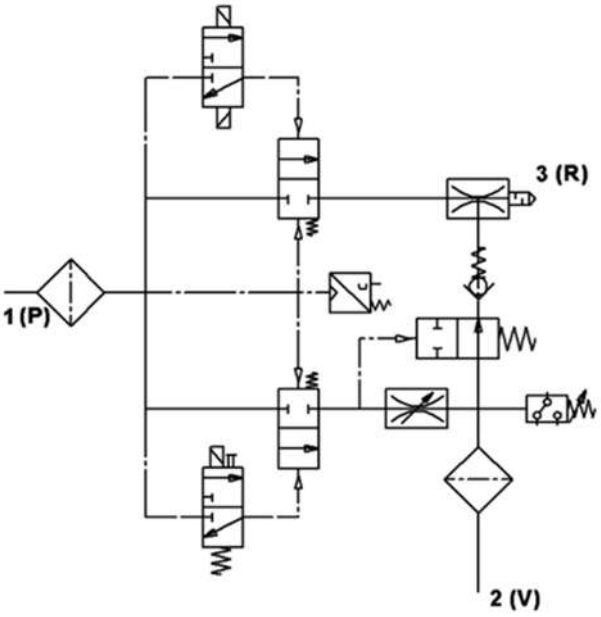
SXMPi ...NC...



SXMPi ...IMP...



SXMPi ...IMP...PC



5 Operating and Menu Concepts

The ejector 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 states of the system 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

In the basic operating menu state, the actual measurement value of the vacuum is displayed on the basis of the chosen display unit. All units are available in millibar, kilo pascal, inch-hg and PSi. The measured value is displayed as a 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 E0 1.

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

The display also returns to the basic status when an error status 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- I].

- Press the MENU for about three seconds.
  - ⇨ The display flashes [-C-]

⇨ The configuration menu opens with the first parameter [⊏⊢⌐].

Starting the system menu:

- Press ▲ and MENU simultaneously for about three seconds.
  - ⇨ The display flashes [-5-]

⇨ The system menu opens with the first parameter [⊏⊏ I].

5.1.2 Displaying the Operating Mode and Supply Voltages (Slide Show)

When you press the ▼ button in the basic operating state, the following parameters are automatically displayed one after the other on the display (slide show):

- The current operating mode (5 IO or IOL)
- The supply voltages U_S and U_A

The display cycle returns to the vacuum display after a complete cycle or can be canceled at any time by pressing any button.

5.1.3 Displaying the System Pressure

- Press the ▲ button to show the current system pressure.

⇨ The system pressure is displayed.

- Press the MENU button to exit the system pressure display.

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

5.1.4 Displaying the vacuum/pressure unit

- Press the ↵ button to display the set vacuum/pressure unit.

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

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 if [ctr] = [on] is active)
h- 1	Hysteresis value h-1	Hysteresis value for the control function
H-2	Limit value H2	Switching value for the "Parts control" signal
h-2	Hysteresis value h-2	Hysteresis value for the "Parts control" signal
HP 1	Limit value H1	Switching value for the "Pressure control" signal
hP 1	Hysteresis hP1	Hysteresis value for the "Pressure control" signal
tbL	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

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- I	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- I-t E-t	Externally controlled Internally controlled (triggered internally, time can be set) Externally controlled (triggered externally, time can be set)
dLY	Switching signal delay	Values: 10, 50, 200 and oFF	Delays switching signals H I, HP I and H2 Unit: milliseconds
un i	Vacuum unit	 bAr PSi inHG kPA	Define the displayed vacuum unit Vacuum in mbar Vacuum in psi Vacuum in inHg Vacuum in kPa
dPY	Display rotation	 Std rEd	Display configuration Standard rotated 180°
Eco	Display in ECO mode	oFF Lo on	Configure the display ECO mode is deactivated – the display remains on The brightness is reduced by 50 percent. Eco mode activated – if no buttons are pressed, the display turns off after one minute
P In	PIN code	Value from 001 to 999	Specify the PIN code, lock the menus If the PIN code is 000, then the device is not locked.
nFc	NFC lock	 on dIS Loc	NFC lock: NFC active Completely switched off Write-protected
rES	Reset	YES	All parameter values are reset to factory settings.

The factory settings for the parameters are listed under (> See ch. 4.4.2 Factory Settings, p. 16) 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.
   ⇨ The display will flash [-C-] during this process.
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.
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
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.
  ⇨ Meanwhile the display flashes [-S-].

1. Use the ▲ or ▼ button to select the parameter to be shown.
2. If the menu is locked: Enter a valid PIN code.
3. Confirm using the ↵ button.
   ⇨ The value is displayed.
4. To exit the system menu, press the MENU 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:

- The ejector device status in the form of a status traffic light
- EPC data
- Ejector errors and warnings
- Sensor and actuator supply voltage
- Air consumption
- Parameter data, e.g. vacuum data, pressure value (PC variant only), counters, evacuation time, dynamic pressure and air consumption.
- Limit values H1 and H2

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

- EPC Select is used to define which data is sent.
- To determine the air consumption, the system pressure can be preset.
- The ejector is controlled using the suction and blow-off commands.

The exact meaning of the data and functions is described in more detail in the (> See ch. 7 Description of Functions, p. 28) chapter. 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 controller.

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.

See also

Description of Functions [} 28]

6.4 Near Field Communication (NFC)

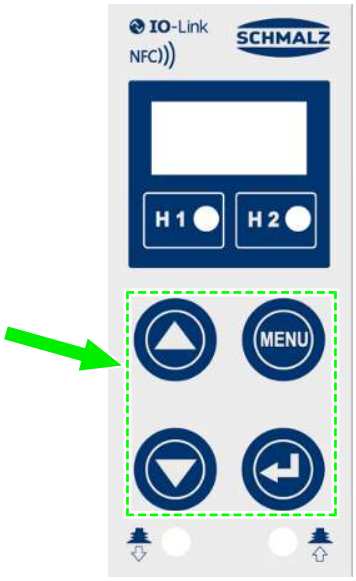
NFC (Near Field Communication) refers to a standard for wireless data transfer between different devices over short distances.

The ejector functions as a passive NFC tag that can be read or written by a read or write device which has NFC activated, such as a smartphone or tablet. Access to the ejector parameters via NFC also works when the supply voltage is not connected.

There are two options for communicating via NFC:

- Read access only can be obtained via a website viewed in a browser. For this, no additional app is needed. It requires only that NFC and the Internet connection are enabled.
- Another option for communication is the "Schmalz ControlRoom" control and service app. This permits not only read access, but also active reconfiguration of the parameters via NFC. The Schmalz ControlRoom app is available at the Google Play Store.

For the best data connection, set the reading device on the middle of the ejector keyboard.



The reading distance is very short for NFC applications. Determine the position of the NFC antenna in the reading device used. If parameters of the device are modified via IO-Link or NFC, then the power supply must subsequently remain stable for at least three seconds to prevent data loss (error E01).

7 Description of Functions

7.1 Overview of Functions

Description	See section
Operating modes	(> See ch. 7.2 Operating Modes, p. 29) Automatic mode, manual mode, setting mode and restricted mode
Switching point setting	(> See ch. 7.3 Monitoring the System Vacuum and Pressure and Defining Limit Values, p. 31)
Zero point calibration	(> See ch. 7.4 Calibrating the Sensors [0x0002], p. 32)
Energy-saving function, control function	(> See ch. 7.5 Control Functions [P-0: 0x0044], p. 32)
Blow-off function	(> See ch. 7.6 Blow-Off modes [0x0045], p. 33)
Defining blow-off time	(> See ch. 7.6.4 Setting the Blow-Off time [P-0: 0x006A], p. 34)
Display unit	(> See ch. 7.7 Selecting a Display Unit [0x004A], p. 34)
Switch-off delay	(> See ch. 7.8 Switch-Off Delay [0x004B], p. 34)
Display alignment	(> See ch. 7.9 Rotating the Display [0x004F], p. 35)
Eco mode	(> See ch. 7.10 ECO Mode [0x004C], p. 35)
PIN code, access authorizations	(> See ch. 7.11 Locking and Unlocking the Menus, p. 35)
IO-Link device access locks	(> See ch. 7.11.3 Restricting Access Using Device Access Locks [0x000C], p. 37)
IO-Link extended device access locks	(> See ch. 7.11.4 Restricting Access with Extended Device Access Locks [0x005A], p. 37)
Reset to factory settings	(> See ch. 7.12 Resetting to Factory Settings (Clear All) [0x0002], p. 37)
Counter	(> See ch. 7.13 Counters, p. 38)
Software version	(> See ch. 7.14 Displaying the Software Version [0x0017], p. 39)
Article number	(> See ch. 7.15 Displaying the Serial Number [0x0015], p. 39)
Serial number	(> See ch. 7.16 Displaying the Part Number [0x00FA], p. 39)
Production setup profiles	(> See ch. 7.17 Production setup profiles, p. 40)
Energy and Process Control (EPC): Condition monitoring (CM) Energy monitoring (EM) Predictive maintenance (PM)	(> See ch. 7.18 Energy and Process Control (EPC), p. 40)
Voltage measurement	(> See ch. 5.1.2 Displaying the Operating Mode and Supply Voltages (Slide Show), p. 21)
Warnings and errors	(> See ch. 11 Troubleshooting, p. 56)

7.2 Operating Modes

7.2.1 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.

7.2.2 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.

NOTE

It is not possible to activate manual mode.

Access to manual mode is locked by the controller. This status is indicated by the code E90 on the display.

- Unlock manual mode using the controller.

- 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.

When the controller is on [ctr] = [on] it uses the configured limit values in "Manual" mode as well.
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.

7.2.3 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.

7.2.4 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.

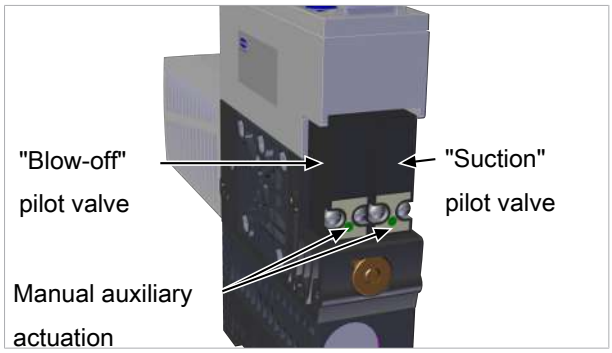
However, operation in "restricted mode" is still possible.

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.

7.3 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:

ISDU [Hex]	Limit value parameter	Description
P-0: 0x0064	H1	Vacuum control value
P-0: 0x0065	h1	Vacuum hysteresis
P-0: 0x0066	H2	Activation value of “Parts control” signal output
P-0: 0x0067	h2	Hysteresis of “Parts control” signal output
—	H3	Part deposited; 20 mbar
P-0: 0x0068	HP1	Pressure activation value
P-0: 0x0069	hP1	Hysteresis pressure

7.4 Calibrating the Sensors [0x0002]

Since the sensors installed in the ejector are subject to variants based on 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 exceeded by ±3 percent, error codes [E03] and [E04] will appear 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 the 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 in 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 code.
6. Confirm using the ↵ button.

⇨ The selected sensor is calibrated.

7.5 Control Functions [P-0: 0x0044]

The ejector allows you to save compressed air or prevent a too powerful vacuum from being generated. Vacuum generation is interrupted once the configured switching point H1 is reached. If leakage causes the vacuum to fall below the hysteresis switching point (H1-h1), vacuum generation resumes.

The **permissible leakage** [P-0: 0x006C] is set in the Configuration menu using the [-L-] parameter, and mbar as the unit of measurement. The leakage is measured after the control function has interrupted suction once switching point H1 is reached.

The following operating modes can be set for the controller function in the Configuration menu using the [ctr] parameter or via IO-Link.

7.5.1 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].

7.5.2 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.

7.5.3 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].

7.5.4 Control Shutoff [P-0: 0x004E]

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.

When the control shutoff is deactivated, the suction valve makes frequent adjustments. This can destroy the ejector.

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.

7.6 Blow-Off modes [0x0045]

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.

7.6.1 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. The "Blow-off" signal is given priority over the "Suction" signal.

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

7.6.2 Internally Time-Controlled Blow-Off

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

The “Blow-off” valve is automatically activated for the time period set as soon as the ejector leaves the “Suction” mode. 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 "Blow-off" signal overrides the "Suction" signal, even if the specified blow-off time is very long.

7.6.3 Externally Time-Controlled Blow-Off

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

The blow-off pulse is triggered externally by the "Blow-off" signal/command. The "Blow-off" valve is activated for the specified time [tbL]. A longer input signal does not increase the blow-off duration.

The "Blow-off" signal overrides the "Suction" signal, even if the specified blow-off time is very long.

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.

7.6.4 Setting the Blow-Off time [P-0: 0x006A]

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 the blow-off time [tbL] may be specified.

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

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

7.7 Selecting a Display Unit [0x004A]

The unit of the displayed vacuum or pressure level can be set using this function.

The function can be configured with the parameter [un i] 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 [bAr].
Pascal	The vacuum/pressure values are displayed in kPa. The setting for this unit is [kPA].
Inch of Hg	The vacuum/pressure values are displayed in inHg. The setting for this unit is [inHG].
psi	The vacuum/pressure values are displayed in psi. The setting for this unit is [PSI].

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 Switch-Off Delay [0x004B]

You can use this function to set a switch-off delay for the H1, H2 and HP1 signals. 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 all three signals using the parameter [dLY] in the configuration menu, or via IO-Link. Selectable values are 10, 50 and 200 ms. To deactivate this function, enter the value [000] (= off).

The switch-off delay affects the process data bits in IO-Link and the H1 and H2 status indicators.

7.9 Rotating the Display [0x004F]

To allow different installation positions, the orientation of the display can be rotated by 180° by changing the parameter [dPY] in the configuration menu or via IO-Link.

The factory setting is [Std]. This corresponds to the standard configuration.

To rotate the display by 180°, select the parameter setting [rot].

With the display rotated, the and buttons switch functions. The Down button becomes the Up button.

The decimal points of the display are shown on the top edge of the screen.

When the display is rotated, the decimal point on the far right is no longer displayed and is therefore missing from the display of the counters and serial numbers.

7.10 ECO Mode [0x004C]

The ejector offers the option of switching off the display or dimming it to save energy. If ECO mode is activated, the display is switched off to reduce system power consumption after 1 minute if no buttons are pressed.

ECO mode can be enabled and disabled with the parameter [Eco] in the configuration menu or via IO-Link.

Three different settings are available:

- [oFF]: Energy-saving mode is disabled.
- [Lo]: The brightness of the display is reduced by 50 percent after 1 minute.
- [on]: The display switches off after one minute of inactivity.

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

If you activate ECO mode using IO-Link, the display will immediately enter energy-saving mode.

7.11 Locking and Unlocking the Menus

The menus can be protected from unwanted access by means of a PIN code [P In] or in the IO-Link using Device Access Locks. The current settings are still displayed.

The PIN is set to 000 on delivery. The menus are not protected.

A PIN is recommended because carrying out parameterization while the device is in operation can change the status of signals.

7.11.1 PIN Code [0x004D]

To enable the lock, a valid PIN code between 001 and 999 must be entered in parameter [P In] in the configuration menu or via IO-Link.

When the lock is active, [Loc] flashes in the display or the PIN code is requested.

The following describes how to set a PIN Code using the operating and display element.

1. Press the MENU button for at least three seconds.
   ⇨ The display will flash [–C–] during this process.
   ⇨ The configuration menu opens.
2. Use the ▲ or ▼ button to select the parameter [P in].
3. Confirm using the ↵ button.
4. Use the ▲ or ▼ button to enter the first digit of the PIN code
5. Confirm using the ↵ button.
6. Enter the remaining digits in the same way.
7. Press the ↵ button to save the PIN code.

⇨ The menus are now locked.

The PIN code “000” must be set for permanent deactivation of the lock.

Full access to the device 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.

7.11.2 Unlocking the Menus

Menus can be protected against unauthorized access by defining a PIN code [P in] in the configuration menu. When the lock is active, [Loc] flashes in the display or the PIN code is requested.

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.

The menus can be unlocked as follows:

1. Press the MENU button.
2. Use the ▲ or ▼ button to enter the first digit of the PIN code
3. Confirm using the ↵ button.
4. Enter the remaining digits in the same way.
5. Press the ↵ button to unlock the menu.

⇨ When a valid PIN is entered, the message [Unc] is displayed.

⇨ When an invalid PIN is entered, the message [Loc] is displayed and the menus remain locked.

The lock is automatically activated once more when the selected menu is closed or the desired function has been completed. The PIN code 000 must be set for permanent deactivation of the lock.

The PIN is set to 000 on delivery. The menus are not protected.

If you cannot remember the correct PIN code, read or reset the PIN code from the IO-Link, or use NFC to reset to factory settings.

7.11.3 Restricting Access Using Device Access Locks [0x000C]

In IO-Link mode, the "Device Access Locks" default parameter is available to prevent changes to parameter values using the operating element of the ejector.

A menu lock using the Device access locks parameter has a higher priority than the menu PIN. In other words, this lock cannot be bypassed by entering a PIN, and remains in place.

It can only be canceled using IO-Link, not on the ejector itself.

7.11.4 Restricting Access with Extended Device Access Locks [0x005A]

The Extended Device Access Locks gives you the following options:

- Block all NFC access or restrict it to read-only functions. The NFC lock using the extended device access locks parameter has a higher priority than the NFC PIN. That means that this lock also cannot be bypassed by entering a PIN.
- Block the use of manual mode.
- Block the transmission of IO-Link events.

7.12 Resetting to Factory Settings (Clear All) [0x0002]

This function is used to reset the following configurations to their factory settings:

- The configuration of the ejector
- The initial setup
- The production setup profile settings
- The IO-Link parameter "Application specific tag"

This function is executed using the parameter [rES] in the configuration menu or via IO-Link.

The factory settings for the ejector are listed under (> See ch. 4.4.2 Factory Settings, p. 16) in the Technical Data section.

⚠ WARNING

By activating/deactivating the product, output signals lead to an action in the production process!

Personal injury

- ▸ Avoid possible danger zone.
- ▸ Remain vigilant.

A description of how to reset the ejector to factory settings using the display and operating element follows:

1. Press the MENU button for at least three seconds.
2. Use the ▲ or ▼ button to select the parameter [rES].
3. Confirm using the ↵ button.
4. Use ▲ or ▼ to select the required setting parameter [YES].
5. If the menu is locked: Enter a valid PIN code.
6. Confirm using the ↵ button.

⇨ The ejector is reset to the factory settings.

The reset to factory settings function does not affect the following elements:

- The counter readings
- The zero-point adjustment of the sensors

7.13 Counters

The ejector has three internal, non-erasable counters and three erasable counters.

Counters 1 [cc 1] and [ct 1] increase with every valid "Suction" signal pulse, and thus count the ejector's suction cycles.

Counters 2 [cc2] and [ct2] count the suction valve's switching cycles, and counters 3 [cc3] and [ct3] count the CM events.

ISDU [Hex]	Display code	Function	Description
0x008C	cc 1	Counter 1	Counter for suction cycles (suction signal)
0x008D	cc2	Counter 2	Counter for suction valve switching frequency
0x008E	cc3	Counter 3	Counter for condition monitoring events
0x008F	ct 1	Counter 1, erasable	Counter for suction cycles (Suction signal) – erasable
0x0090	ct2	Counter 2, erasable	Counter for suction valve switching frequency – erasable
0x0091	ct3	Counter 3, erasable	Counter for condition monitoring events, erasable

The counters can be displayed or read out from the system menu using the parameters listed in the table, or via IO-Link.

Displaying a Counter on the Operating Panel of the Ejector:

✓ The required counter is selected in the system menu.

▸ 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	048	618	593.

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

Erasing Counters [0x0002]

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], then press to confirm.
2. Use the or button to select [YES], then press to confirm.

⇨ All the erasable counters are reset to 0.

7.14 Displaying the Software Version [0x0017]

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

The system firmware can be updated using the "Firmware Update" profile defined by IO-Link. If necessary, this will also update the firmware for the valve module. The PD bit In Byte 1.2 signals when a more recent version is available in the supply module.

7.15 Displaying the Serial Number [0x0015]

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	0.48	6 18	593.

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

▸ To exit the function, press the button.

7.16 Displaying the Part Number [0x00FA]

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.

7.17 Production setup profiles

In IO-Link mode, the ejector can store up to four different production setup profiles (P-0 to P-3). All important parameter data for workpiece handling is stored in these profiles. The profile is selected by means of the process data byte PDO byte 0. Thus parameters can be adjusted to suit differing process conditions.

The currently selected data set is displayed in the parameter data under "Production Setup". This data set corresponds to the current parameters the ejector is working with, which can be viewed using the menu.

Displaying the parameter data set (P-0 to P-3) currently in use during IO-Link operation:

- Select the main menu using the MENU button.
- ⇨ The parameter data set (P-0 to P-3) currently in use is briefly shown in the display.

In the default setting, the P-0 production setup profile is selected.

Then menus can only be used to adjust the profile that is currently selected via IO-Link.

7.18 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.

7.18.1 Condition Monitoring (CM)

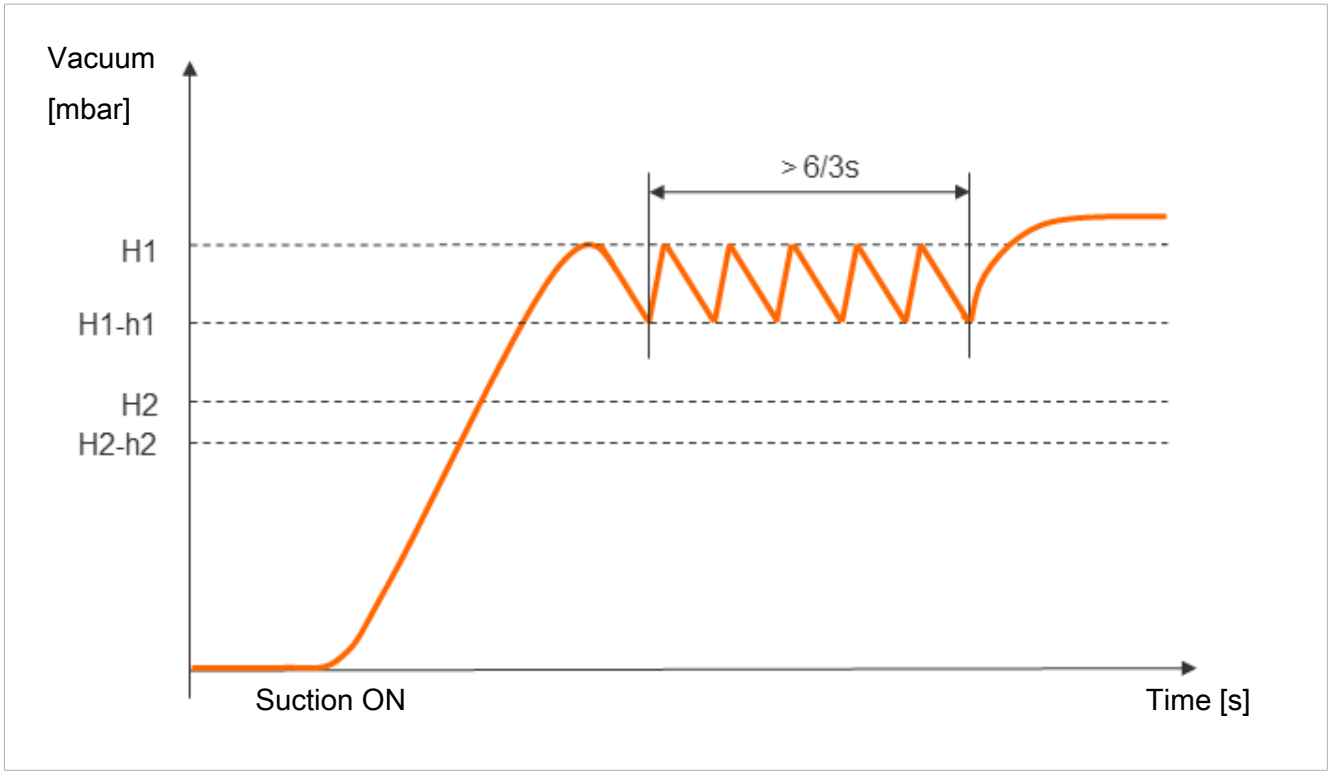
Monitor Valve Switching Frequency

When the air saving function is activated 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 procedures thus increases rapidly within a short 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.

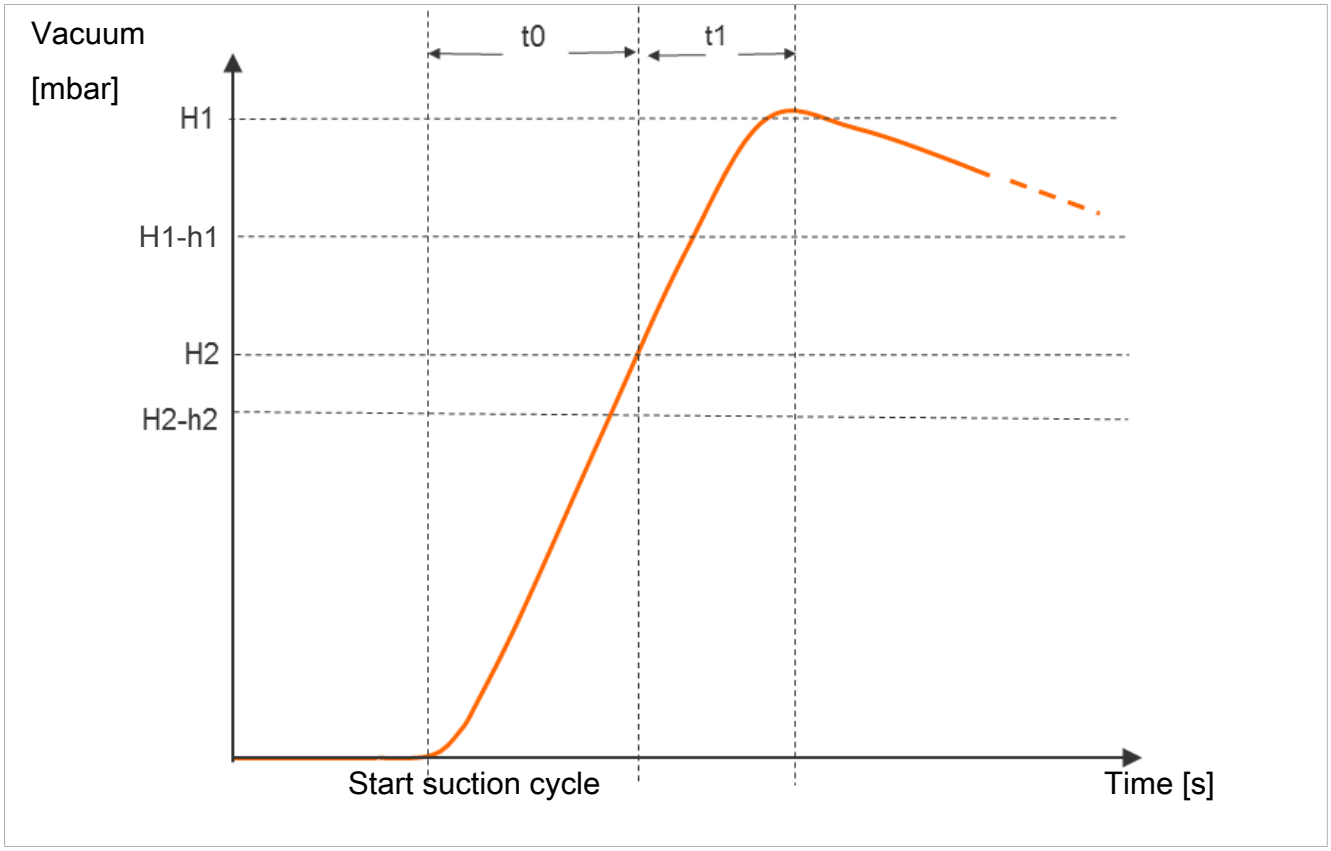
It also issues and warning and sets the corresponding condition monitoring bit.

Diagram of Valve Switching Frequency



Evacuation Time Monitoring

If the measured evacuation time t1 (from H2 to H1) exceeds the specified value, the “Evacuation time longer than t-1” condition monitoring warning is triggered and the system status light switches to yellow.



The specified value for the max. permitted evacuation time can be set in the configuration menu with the parameter [t– I] or via IO-Link [0x006B]. Setting the value to [000] (= off) deactivates monitoring. The maximum permitted evacuation time setting is 9.99 s.

Measuring the Evacuation Time t0 and t1

Measuring the evacuation time t0:

The time is measured (in ms) from the beginning of the suction cycle to the time when the limit value H2 is reached (“Evacuation time t0” parameter [0x0094]).

Measuring the evacuation time t1:

The interval between reaching the limit values H2 and H1 is measured (in ms) (“Evacuation time t1” parameter [0x0095]).

Measuring Leakage

In control mode ([ctr] = [on5] or [on]), the vacuum drop/leakage over a certain period of time is measured (as vacuum drop per time unit in mbar/s) after the air saving function has interrupted suction because switching point H1 has been reached. The measured leakage value "L" in mbar/s can be queried via IO-Link.

Leakage Monitoring and Evaluation

In control mode ([ctr] = [on]), the loss of vacuum within a certain period is monitored (mbar/s).

The evaluation of the leakage level differentiates between two statuses:

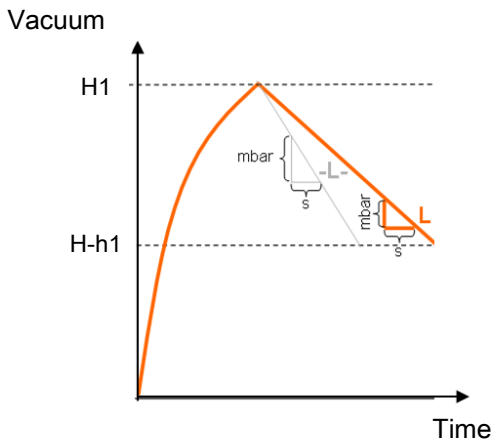
Leakage L < permitted value -L-

If the leakage L is less than the set value -L-,

- the vacuum continues dropping until the reset point rP1 is reached.
- The ejector begins to suck again (normal control mode)

Leakage L > permitted value -L-

If the leakage L is greater than the set value -L-, the display will alternately show the parameter –L– and the vacuum level.



The permitted leakage value -L- can be set in the Extended Functions menu with the parameter [–L–].

Control Threshold Monitoring

If the vacuum limit value H1 is never reached during the suction cycle, the “H1 not reached” condition monitoring warning is triggered and the system status light switches to yellow.

This warning is available at the end of the current suction phase and remains active until the next suction cycle.

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 and the status light switches to yellow.

Monitoring the Supply Voltages

The ejector is not a voltage meter! However, the measured values and the system responses derived from them provide a helpful diagnostics tool for condition monitoring.

The ejector measures the level of the U_S and U_A supply voltages. The measured values can be read from the parameter data.

If the voltages are outside the valid range, the following status messages change:

- Device status
- Condition monitoring parameter
- An IO-Link event is generated

In case of undervoltage, the valves are no longer activated and the ejector returns to its basic setting:

- The NO ejector switches to Suction mode.
- The NC ejector switches to Pneumatically OFF mode.
- The IMP ejector remains in its current mode ("Suction" or "Pneumatically OFF").

If the ejector is in manual mode, it exits manual mode.

A condition monitoring event is also generated If there is an overvoltage.

Condition Monitoring Events and Status Display [0x0092]

Any condition monitoring events that occur during the suction cycle cause the system status indicator light to immediately switch from green to yellow. The event that caused this switch can be seen in the “Condition monitoring” IO-Link parameter.

The table below explains the coding of the condition monitoring warnings:

Bit	Event	Update
0	Valve protection function activated	Cyclic
1	Set limit value t-1 for evacuation time exceeded	Cyclic
2	Set leakage limit value -L- exceeded	Cyclic
3	Limit value H1 was not reached	Cyclic
4	Dynamic pressure > (H2 - h2) and < H1	As soon as a corresponding dynamic pressure value has been determined
5	Supply voltage U_S outside the operating range	Constant
6	Supply voltage U_A outside the operating range	Constant
7	Specified system pressure during suction process too low	Constant
8	Preset system pressure outside the operating range	Constant

Bits 0 to 3 describe events that can only occur once per suction cycle. They are reset at the start of every suction cycle and remain stable until it has ended.

Bit number 4, which describes dynamic overpressure, is initially deleted when the device is switched on and is updated when a dynamic pressure value is detected.

Bits 5 to 8 are regularly updated independently of the suction cycle, and reflect the current values for the supply voltage and system pressure.

The values measured by the condition monitoring system, namely the evacuation times t_0 and t_1 and the leakage value L, are reset at the beginning of the suction process and updated once they have been measured.

7.18.2 Energy Monitoring (EM) [0x009B, 0x009C, 0x009D]

In order to optimize the efficiency of vacuum gripping systems, the ejector provides a function for measuring and displaying the energy and air consumption.

When measuring air consumption as a percentage, the ejector calculated 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.

The -PC- measures the operating pressure directly.

In variants without a pressure sensor, an externally recorded pressure value can be supplied using the IO-Link process data. If this value is available, absolute air consumption measurement can be performed in addition to the percentage-based air consumption measurement. The actual air consumption of a suction cycle is calculated taking the system pressure and nozzle size into account, and specified in standard liters [NL]. The measured value is reset at the beginning of the suction cycle and constantly updated during the running cycle. As such, no further changes can occur once blow-off is complete.

The electrical energy consumed by the device and by the valve coils during a suction cycle is measured and given in watt-seconds (Ws).

For determining the electrical energy consumption, the neutral phase of the suction cycle must also be considered. Therefore the measured values can be updated only when the next suction cycle begins. During the entire cycle, they represent the results from the previous cycle.

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

7.18.3 Predictive Maintenance (PM)

Overview of Predictive Maintenance (PM)

In order to allow early detection of wear and other impairments to the vacuum gripping system, the ejector provides functions for recognizing trends in the quality and performance of the system. This is accomplished using the measured values for leakage and dynamic pressure.

The measurement value for the leakage rate and the related quality assessment in percent are reset at the start of every suction cycle and constantly updated during the cycle as moving averages. The values therefore remain stable until after the suction cycle is complete.

Measurement of Leakage

The control function interrupts suction as soon as it reaches the limit value SP1. Then the leakage is measured as the vacuum decrease over time (in mbar/s).

Dynamic Pressure Measurement

This measures the system vacuum achieved during unobstructed suction. The measurement length is approx. 1 s. Thus evaluation of a valid dynamic pressure value requires at least one second of unobstructed suction after the suction cycle has commenced. The suction point must not be occupied by a component at this time.

Measured values below 5 mbar or above the limit value H1 are not regarded as valid dynamic pressure measurements and are discarded. The result of the last valid measurement is retained.

Measured values that are below the limit value H1 but simultaneously above the limit value H2 – h2 result in a condition monitoring event.

The dynamic pressure and the percentage performance value based on it are initially unknown when the ejector is switched on. As soon as a dynamic pressure measurement can be performed, the dynamic pressure and the performance evaluation are updated and retain their values until the next dynamic pressure measurement.

Quality Assessment [0x00A2]

In order to evaluate the entire gripping system, the ejector 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.

Performance Calculation [0x00A3]

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.

7.18.4 Reading the EPC Values

The results of the condition monitoring function are also available in the ejector's process input data. However, to ensure that the different pairs of values can be read using a controller program, the EPC-Select acknowledged bit is provided in the process input data.

Proceed as follows to read the EPC values:

1. Start with EPC-Select = 00.
2. Create the selection for the next value pair you require, e.g. EPC-Select = 01.
3. Wait until the EPC-Select acknowledged bit changes from 0 to 1.
   ⇨ The transmitted values correspond to the selection you have created, and can be adopted by the control system.
4. Switch back to EPC-Select = 00.
5. Wait until the EPC-Select acknowledged bit is reset to 0.
6. Repeat the same procedure for the next value pair, e.g. EPC-Select = 10.

8 Transport and Storage

8.1 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

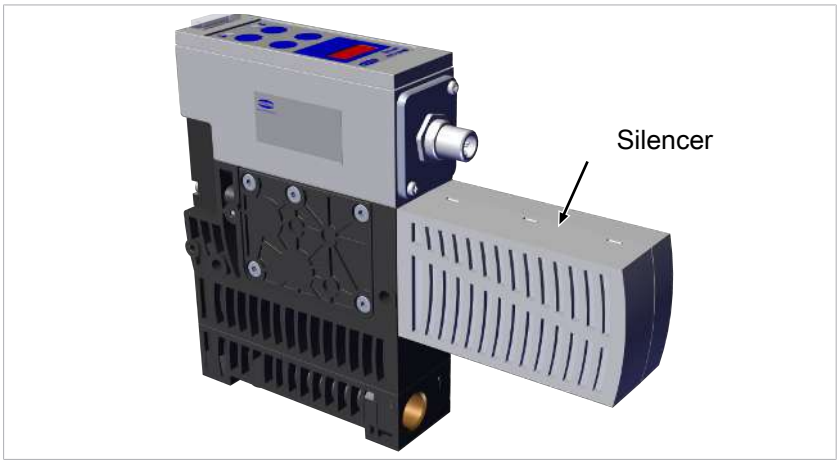
- During installation and maintenance, make sure that the product is disconnected and depressurized and that it cannot be switched on again without authorization.

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

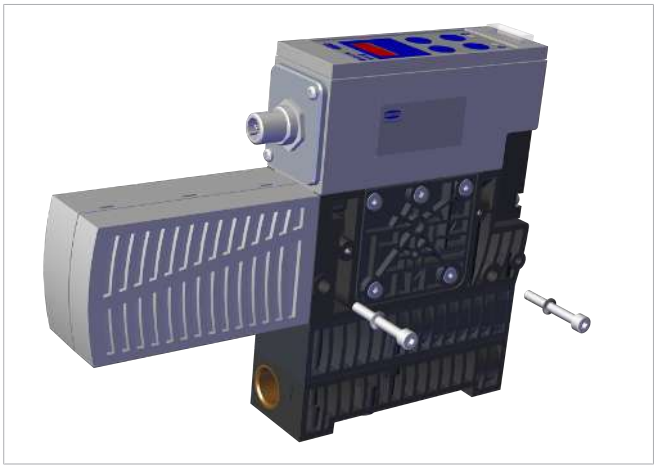
The ejector may be installed in any position.



When installing the ejector, make sure that the area around the silencer remains free, so that unimpeded discharge of the escaping air is ensured.

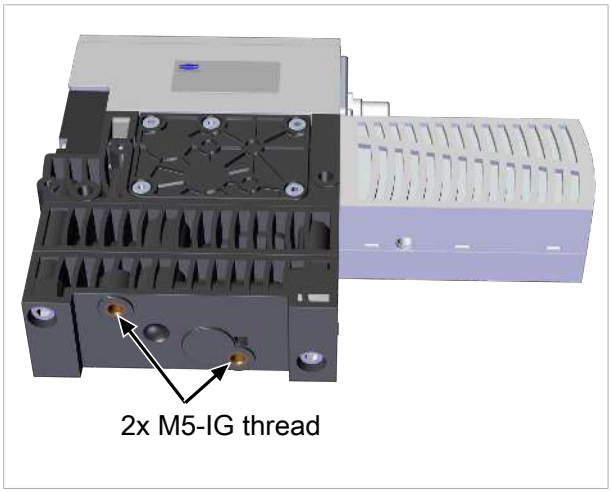
The ejector can be mounted in a number of different ways:

1.) Side mounting



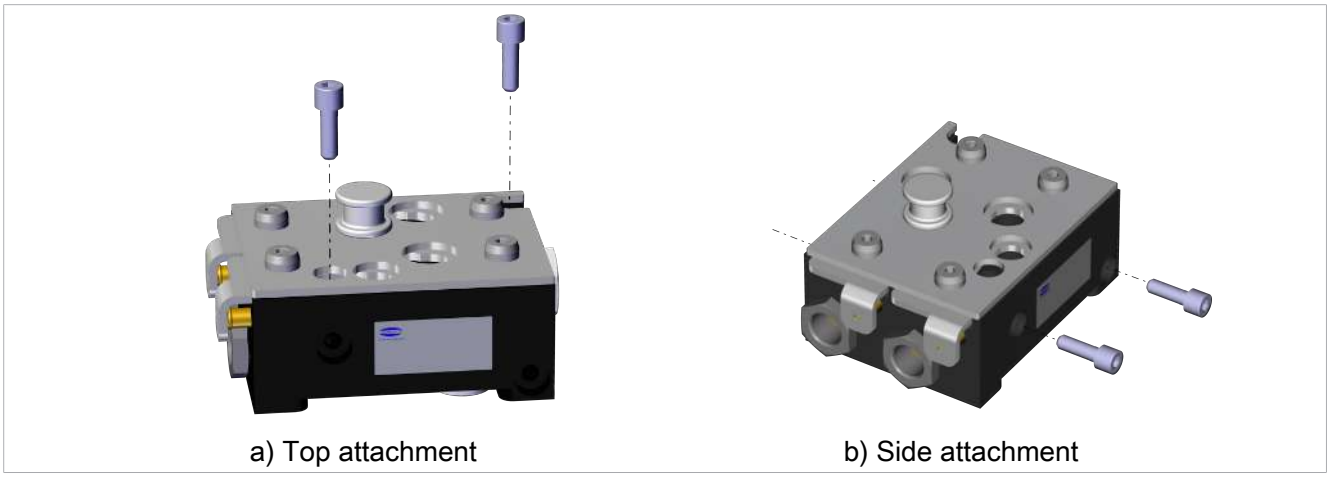
- There are two 5.5 mm through-holes for mounting the ejector. Use screws at least 50 mm in length. Use washers if you are using M4 fastening screws for the mounting process. The ejector is to be fixed with at least 2 screws, the maximum tightening torque is 4 Nm.

2.) Underside mounting



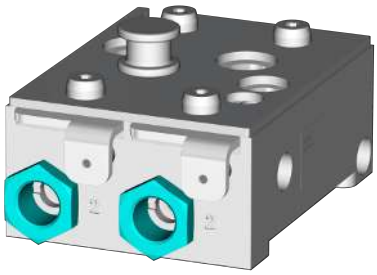
- Use the two M5-IG threads on the underside of the ejector for mounting. The maximum tightening torque is 2 Nm.

3.) Mounting using the Quick Change adapter



✓ Mount the Quick Change adapter mechanically using two M6 Allen screws (ISO 4762).

Compressed air at 1

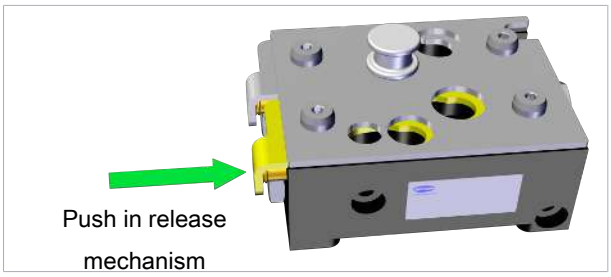


Vacuum at 2

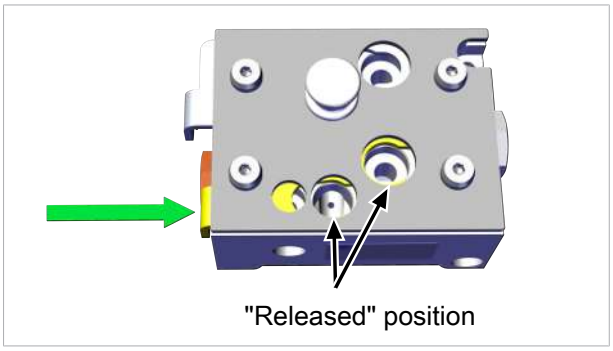
✓ Connect the pneumatic systems: compressed air to the connection marked 1 (G3/8"); vacuum to the connection marked 2 (G3/8").

✓ Ensure that the pneumatic systems are depressurized.

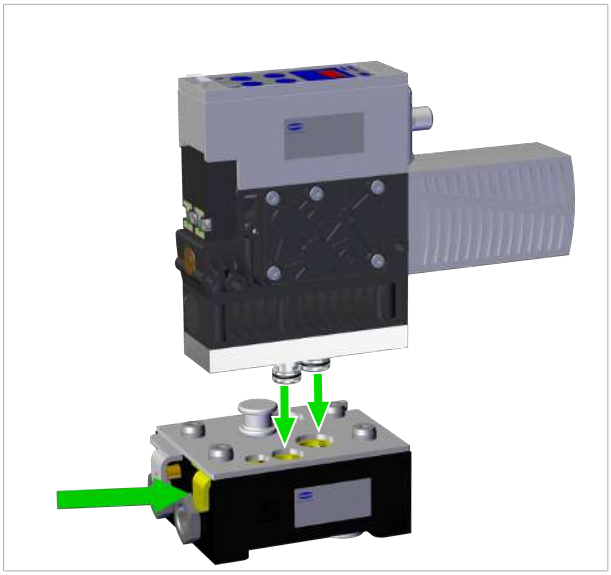
1. Push the release level in as far as it will go and hold it in this position.



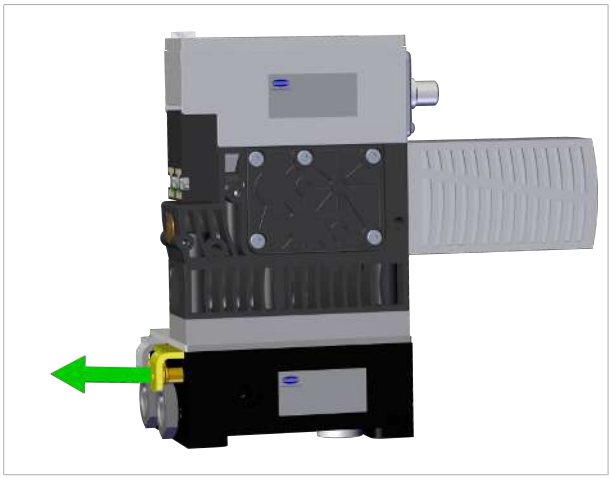
⇨ "Released" position



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 supply 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

How to Perform Pneumatic Connection for Ejector Variant H

1	Compressed air connection	2	Vacuum connection

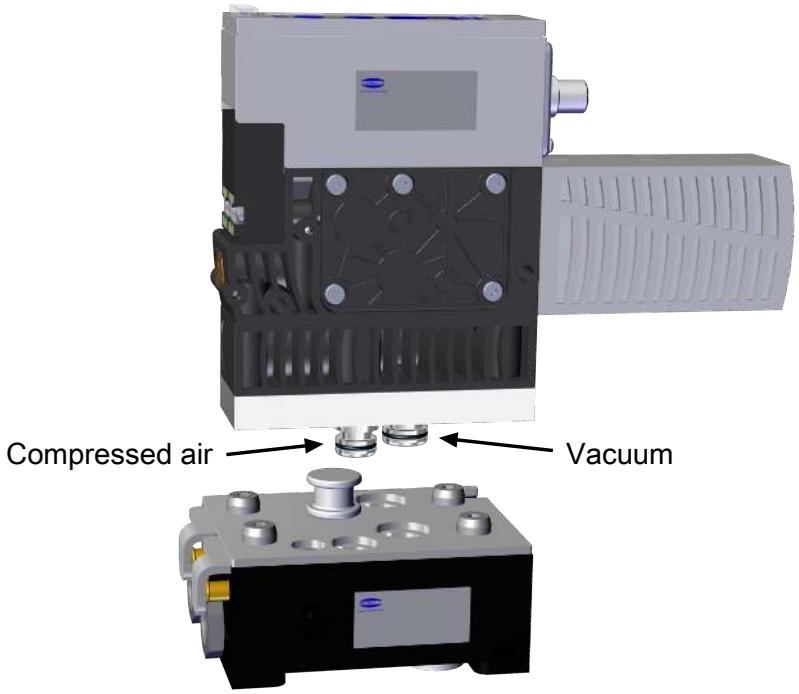
The compressed air connection G3/8" is marked with the number 1 on the ejector.

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

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

- Connect 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.

9.3.2 Instructions for the Pneumatic Connection

Use only screw unions with cylindrical G-threads for the compressed air and vacuum connection!

To ensure problem-free operation and a long service life of the ejector, only use adequately maintained compressed air and consider the following requirements:

- Use of air or neutral gas in accordance with EN 983, filtered 5 µm, oiled or unoiled.
- Dirt particles or foreign bodies in the ejector connections, hoses or pipelines can lead to partial or complete ejector 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 ejector, otherwise use the next largest diameter.
   On the compressed air side, ensure that the internal diameter is wide enough for the ejector to achieves its performance data (8 mm).
   On the vacuum side, ensure that the internal diameter is wide enough to avoid high flow resistance (9 mm). If the internal diameter is too small, the flow resistance and the evacuation times increase and the blow off times are extended.

Internal diameters based on a maximum hose length of 2 m.

- For longer hose lengths, the cross-sections must also be larger.

9.4 Operation Using IO-Link Class B

When the ejector is operated in IO-Link mode (digital communication), the supply voltages, the ground and the communication cable for the IO-Link (C/Q cable) are connected directly to the IO-Link class B master (point-to-point connection). Several C/Q wires cannot be connected to just a single IO-Link master port.

Connecting the ejector via the IO-Link provides access to a number of additional ejector functions alongside the basic functions of suction, blow-off, feedback, etc. These additional functions are:

- The current vacuum level
- Selection of four production profiles
- Errors and warnings
- Ejector system status display
- Access to all parameters
- Functions for energy and process control

So that all the modifiable parameters can be read directly via the higher-level controller, modified and written back to the ejector.

Evaluation of the condition monitoring and energy monitoring results allows you to draw direct conclusions regarding the current handling cycle and perform trend analysis. The ejector supports the IO-Link revision 1.1 with four bytes of input data and two bytes of output data. It is also compatible with IO-Link masters that use the 1.0 revision. In this case, one byte of input data and one byte of output data are supported. The exchange of process data between the IO-Link master and the ejector is cyclical. Parameter data (acyclical data) is exchanged by the user program in the controller using communication modules.

9.5 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

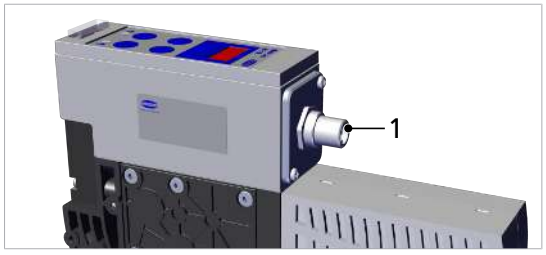
Destruction of the integrated electronics

- 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 electrical connection is established using a 5-pin M12 connector that supplies the ejector with voltage and communicates via IO-Link. The pin assignment of the M12 connector corresponds to the IO-Link class B specification.

Connecting the Ejector Electrically Using Plug Connection 1 as Shown in the Figure

✓ Prepare an M12 5-pin connection cable with a socket (customer's responsibility).



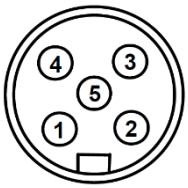
- Attach the connection cable to the ejector, maximum tightening torque = hand-tight.

Observe the following connection instructions:

- The ejector has potential separation between the sensor supply and the actuator supply.
- The maximum length of the electrical supply line is 20 meters in accordance with the IO-Link specification.

9.5.1 Pin Assignment of M12 Connector for IO-Link Class B

Electrical interface 1x M12 – A-coded pin assignment according to IO-Link class B.

M12 connector	PIN	Symbol	Wire color [1]	Function
	1	U_s	Brown	Supply voltage for sensor
	2	U_A	White	Supply voltage for actuator
	3	GND_s	Blue	Sensor ground
	4	C/Q	Black	IO-Link
	5	GND_A	Gray	Actuator ground

[1] When using a Schmalz connection cable (see “Accessories”)

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.

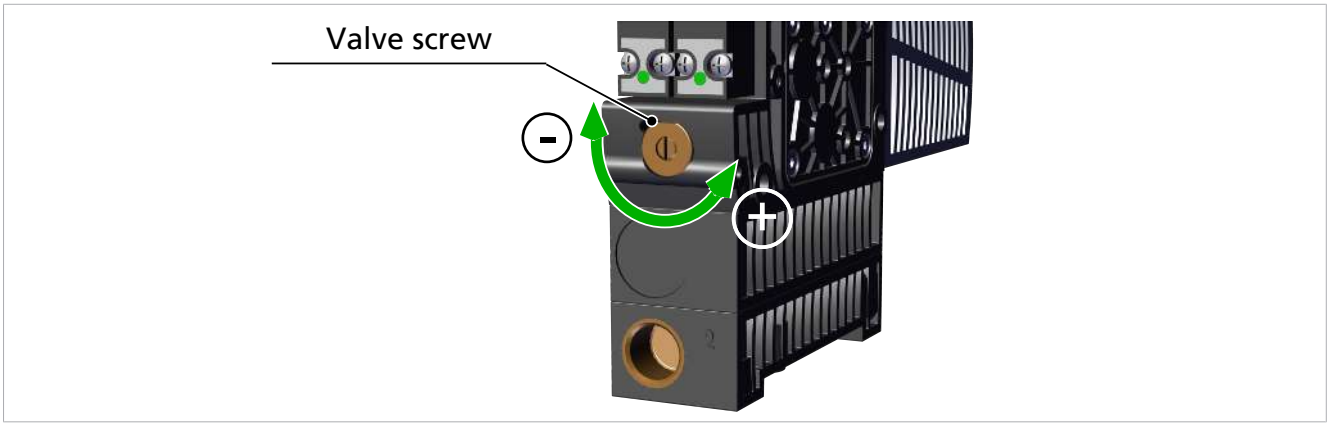
Always carry out the following tasks before activating the system:

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 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.

11 Troubleshooting

11.1 Help with Malfunctions

Error	Possible cause	Solution
Master or peripheral power supply disturbed	Connection to IO-Link master with IO-Link class-A port	▸ Connection to IO-Link class B port
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
No NFC communication	NFC connection between ejector and reader (e.g. smartphone) not correct	▸ Hold the reader at the intended position on the ejector
	NFC function on reader (e.g. smartphone) not activated	▸ Activate NFC function on reader
	NFC deactivated on ejector	▸ Activate NFC function on ejector
	Write operation canceled	▸ Hold the reader at the intended position on the ejector
No parameters can be changed using NFC	PIN code for NFC write protection activated	▸ Enable NFC write permissions
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 soiled	▸ Replacing 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 "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 statuses

Error	Possible cause	Solution
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 statuses

11.2 Error Codes, Causes and Solutions

The condition monitoring functions output events that can be used to draw conclusions with regard to the process. If a known error occurs, it is transmitted via the IO-Link ISDU parameter [0x0082] in the form of an error number.

The system status is automatically refreshed on the NFC tag every 5 minutes at the latest. That means that an error may be displayed via NFC even though it has already disappeared.

Error code/ Display code	Fault	Possible cause	Solution
E01	Internal error Electronics	Operating voltage was disconnected too quickly after a parameter change, saving process was not complete.	1. Clear the error by restoring the factory setting with the [rES] function or parameter. 2. Use engineering tool to import a valid dataset. 3. If error [E01] occurs again after restarting the supply voltages: Replacement by Schmalz required
E03	Zero-point error/ calibration error on vacuum sensor	Zero-point adjustment for vacuum sensor is outside of the tolerance 3% FS. Calibration was canceled when measurement value was too high or too low.	1. Ventilate the vacuum circuit. 2. Perform calibration.
E04	Zero point error/ calibration error on compressed air sensor	Zero-point adjustment for compressed air sensor is outside of the tolerance 3% FS. Calibration was canceled when measurement value was too high or too low.	1. Depressurize the system. 2. Perform calibration.
E05	Undervoltage U_A	Actuator supply voltage U_A too low or not present	1. Check power supply unit and power load. 2. Increase supply voltage
E07	Undervoltage U_S	Sensor supply voltage is too low.	1. Check power supply unit and power load 2. Increase supply voltage
E08	IO-Link error	Connection to master interrupted.	1. Check connection line. 2. Repeat the power up process.
E 15	Overvoltage U_A	Actuator supply voltage is too high.	1. Check power supply unit. 2. Reduce supply voltage

Error code/ Display code	Fault	Possible cause	Solution
E 17	Overvoltage U_s	Sensor supply voltage is too high.	1. Check power supply unit. 2. Reduce supply voltage
FFF	Vacuum range	Measured vacuum level too high, sensor defective	1. Check and adjust supply pressure. 2. Replacement by Schmalz required
-FF	Overpressure in vacuum system	Ejector in "Blow-off" mode	No error! Overpressure display
E90	Manual mode	Manual mode locked by IO-Link.	▸ If necessary, use IO-Link to enable manual mode.

11.3 System condition monitoring (CM)

The overall status of the ejector system is displayed as a status traffic light using 2 bits of process data input byte 0. All warnings and errors are taken into account when defining the status of the display.

This basic display provides immediate information about the status of the ejector.

The table below shows and explains the various status traffic light patterns:

Displayed system status	Description of operation modes
Green	System is working perfectly with optimal operating parameters
Yellow	Warning – Condition monitoring warnings in place; ejector system not functioning perfectly Check operating parameters
Orange	Warning – Serious condition monitoring warnings in place; ejector system not functioning perfectly Check operating parameters
rot	Error – Error code provided in parameter error; safe operation of the ejector within the operating limits is no longer ensured • Cease operation • Check the system

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 Replacing the Press-In Screens

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

- If you notice that the performance of the ejectors has declined, replace the screens.

12.5 Replacement of the Device with a Parameterization Server

The IO-Link protocol provides an automated process for transferring data when a device is replaced. For this Data storage mechanism, the IO-Link master mirrors all setting parameters for the device in a separate non-volatile memory. When a device is swapped for a new one of the same type, the setting parameters for the old device are automatically saved in the new device by the master.

- ✓ The device is operated on a master with IO-Link revision 1.1 or higher.
- ✓ The Data storage feature in the configuration of the IO-Link port is activated.
- Ensure that the new device is restored to the factory settings **before** it is connected to the IO-Link master. If necessary, reset the device to factory settings, e.g. via the operating element.
- ⇨ The device parameters are automatically mirrored in the master when the device is configured using an IO-Link configuration tool.
- ⇨ Changes to the parameters made in the user menu on the device or via NFC are mirrored in the master.

Changes to the parameters made by a PLC program using a function module are **not** automatically mirrored in the master.

- Manually mirroring data: After changing all the required parameters, execute ISDU write access to the System Command parameter [0x0002] using the Force upload of parameter data into the master command (numerical value 0x05) (see Data Dictionary).

Use the Parameterization server function of the IO-Link master to ensure that no data is lost when switching the device.

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 primary spare and wearing parts.

Designation	Part no.	Type
Silencer	10.02.02.02124	W
Screw-in filter 3/8" thread *For base plate GP2*	10.05.03.00013	S
Screen 17.5x2	10.02.02.03378	S
Suction valve for NO ejector (NO valve)	10.05.01.00278	S
Suction valve for NC ejector (NC valve)	10.05.01.00277	S
Suction valve for IMP ejector (pulse valve)	10.05.01.00280	S
Blow-off valve (NC valve)	10.05.01.00277	S

Legend:	S …	Spare part
	W …	Wearing part

When tightening the fastening screws on the valves, observe the maximum tightening torque of 0.7 Nm.

14.2 Accessories

Designation	Part no.	Note
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
2x base plate with Quick Change connection	10.02.02.02154	Base plate for mounting ejector blocks GPQ2 122x87x48

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 Attachment

16.1 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 "Parts control" signal output
h-2	Hysteresis value h2	Hysteresis of "Parts control" signal output
HP 1	Limit value H1	Compressed air limit value
hP 1	Hysteresis value hP1	Hysteresis of the compressed air value
tbL	Blow-off time	Setting of the blow-off time for time-controlled 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	Erase 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
bAr	Vacuum level in mbar/ bar	The displayed vacuum is shown in mbar. The displayed pressure level is shown in bar.
PSi	Vacuum level in psi	The displayed vacuum and pressure levels are shown in psi.
- iH	Vacuum in inHg	The displayed vacuum and pressure levels are shown in inches of Hg.
kPA	Vacuum level in kPa	The displayed vacuum and pressure levels are shown in kPa.
t- 1	Evacuation time	Setting for the maximum permitted evacuation time
-L-	Leakage value	Setting for 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 display ECO mode
ctr	Control	Setting for the air saving function (control function)
onS	Control function on with leakage monitoring	Switches on the air saving function with leakage monitoring
dcS	Deactivate auto. control shutoff	Suppresses the automatic valve protection function when set to YES.

Display code	Parameter	Comment
bLo	Blow-off function	Parameter for configuring the blow-off function
-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
Loc	Input locked	Parameter modification locked.
Unc	Input enabled	The buttons and menus are unlocked.
dPY	Display rotation	Setting the display position (rotation)
Std	Default display	Display is not rotated
rEd	Rotated display	Display is rotated by 180°
rES	Reset	All values are reset to the factory settings.
nFC	NFC lock	on --> Input and output enabled d IS --> Completely switched off LoC --> Write-protected

16.2 Declarations of Conformity

16.2.1 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.

16.2.2 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.

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