



# Operating Instructions

## Compact Ejector SCPI / SMPi

**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.

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# Contents

<b>1 Important Information</b>	<b>5</b>
1.1 Note on Using this Document	5
1.2 The technical documentation is part of the product	5
1.3 Type Plate	5
1.4 Symbols	6
<b>2 Fundamental Safety Instructions</b>	<b>7</b>
2.1 Intended Use	7
2.2 Non-Intended Use	7
2.3 Personnel Qualification	7
2.4 Warnings in This Document	8
2.5 Residual Risks	8
2.6 Modifications to the Product	9
<b>3 Product Description</b>	<b>10</b>
3.1 Ejector Designation	10
3.2 Ejector Structure	11
3.3 Controls and Displays in Detail	12
<b>4 Technical Data</b>	<b>16</b>
4.1 Display Parameters	16
4.2 Electrical Parameters	16
4.3 General Parameters	17
4.4 Performance Data	17
4.5 Dimensions	18
4.6 Maximum Torque	18
4.7 Factory Settings	19
4.8 Pneumatic Circuit Diagram	19
<b>5 Operating and Menu Concepts</b>	<b>21</b>
5.1 Unlocking the Menus	21
5.2 Main Menu	22
5.3 Configuration Menu	23
5.4 System Menu	24
5.5 Locking Menus Using the PIN	24
<b>6 General Description of Functions</b>	<b>25</b>
6.1 Applying Suction to the Workpiece/Part (Vacuum Generation)	25
6.2 Control Function	26
6.3 Depositing the Workpiece/Part (Blowing Off)	28
6.4 Blow off Functions	29
6.5 Changing the Blow-Off Flow Rate on the Ejector	30
6.6 Operating Modes	30
6.7 Vacuum unit	32
6.8 Signal output	32
6.9 Rotating the Display	33
6.10 PIN Code for Write Protection	33
6.11 Zero-Point Adjustment (Calibration)	33

6.12	Resetting the Device to the Factory Settings .....	33
6.13	Counters .....	34
6.14	Displaying the Software Version .....	35
6.15	Displaying the serial number .....	35
6.16	Error messages .....	35
<b>7</b>	<b>Transportation and Storage</b> .....	<b>36</b>
7.1	Checking the Delivery .....	36
7.2	Removing the Packaging .....	36
<b>8</b>	<b>Installation</b> .....	<b>37</b>
8.1	Installation Instructions .....	37
8.2	Mounting .....	37
8.3	Pneumatic Connection .....	38
8.4	Electrical Connection .....	40
<b>9</b>	<b>Operation</b> .....	<b>43</b>
9.1	General Preparations .....	43
<b>10</b>	<b>Help with Faults</b> .....	<b>44</b>
<b>11</b>	<b>Maintenance</b> .....	<b>45</b>
11.1	Safety Instructions .....	45
11.2	Cleaning the Product .....	45
11.3	Replacing the Silencer .....	46
<b>12</b>	<b>Warranty</b> .....	<b>47</b>
<b>13</b>	<b>Spare and Wearing Parts</b> .....	<b>48</b>
<b>14</b>	<b>Accessories</b> .....	<b>49</b>
<b>15</b>	<b>Decommissioning and Disposal</b> .....	<b>50</b>
15.1	Disposing of the Product .....	50
15.2	Materials Used .....	50
<b>16</b>	<b>Declarations of Conformity</b> .....	<b>51</b>
16.1	EC Conformity .....	51
16.2	UKCA Conformity .....	51
<b>17</b>	<b>Attachment</b> .....	<b>52</b>
17.1	Overview of the Display Codes .....	52
17.2	Accessories Design Data .....	53
17.3	SCPi_SMPi IO-Link Data Dictionary 21.10.01.00063_00 2013-01-15.PDF .....	56

# 1 Important Information

## 1.1 Note on Using this Document

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

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

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

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

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

## 1.2 The technical documentation is part of the product

1. For problem-free and safe operation, follow the instructions in the documents.
  2. Keep the technical documentation in close proximity to the product. The documentation must be accessible to personnel at all times.
  3. Pass on the technical documentation to subsequent users.
- ⇒ Failure to follow the instructions in these Operating instructions may result in injuries!
- ⇒ Schmalz is not liable for damage or malfunctions that result from failure to heed these instructions.

If you still have questions after reading the technical documentation, contact Schmalz Service at:

[www.schmalz.com/services](http://www.schmalz.com/services)

## 1.3 Type Plate

The type plate (1) is permanently attached to the product on both sides at the location shown and must always be clearly legible.

It contains important information about the product:

- IO-Link symbol
- EAC label
- CE label
- Part sales designation/type
- Part number
- Pressure Range
- Voltage range
- Serial number
- Coded date of manufacture
- QR code
- Pneumatic symbol



Please specify all the information above when ordering replacement parts, making warranty claims or for any other inquiries.

## 1.4 Symbols



This symbol indicates useful and important information.

- ✓ This symbol represents a prerequisite that must be met before an action is performed.
- ▶ 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. The ejector is operated with discrete control signals.

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 for medical applications
- Evacuation of objects that are in danger of imploding
- Filling pressurized containers, driving cylinders, valves or other pressure-operated functional elements

### 2.3 Personnel Qualification

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

The operating company must ensure the following points:



- The personnel must be commissioned for the activities described in these operating instructions.
- The staff must be at least 18 years of age and physically and mentally capable.
- The operating staff have been instructed in the operation of the product and have read and understood the operating instructions.
- 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.

Applicable for Germany:

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

## 2.4 Warnings in This Document

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

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

## 2.5 Residual Risks



### **CAUTION**

#### **Falling product**

Risk of injury

- ▶ Securely attach the product at the site of operation.
- ▶ Wear safety shoes (S1) and safety glasses when handling and mounting/dismounting the product.



### **CAUTION**

#### **Unexpected movement of the handling system or dropping the lifted payload when the device is active**

Risk of injury (trapping or impact) due to collision or the release of a payload

- ▶ Do not sit or stand in the transport area of the lifted payload.
- ▶ Wear protective work shoes and gloves.



### **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.



**⚠ WARNING**

**Uncontrolled movements of system components or falling objects caused by incorrect activation and switching of the device while persons are in the plant (safety door opened and actuator circuit switched off)**

Serious injury

- ▶ Ensure that the components are enabled via the actuator voltage by installing a potential separation between the sensor and actuator voltage.
- ▶ Wear the required personal protective equipment (PPE) when working in the danger zone.

**⚠ 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

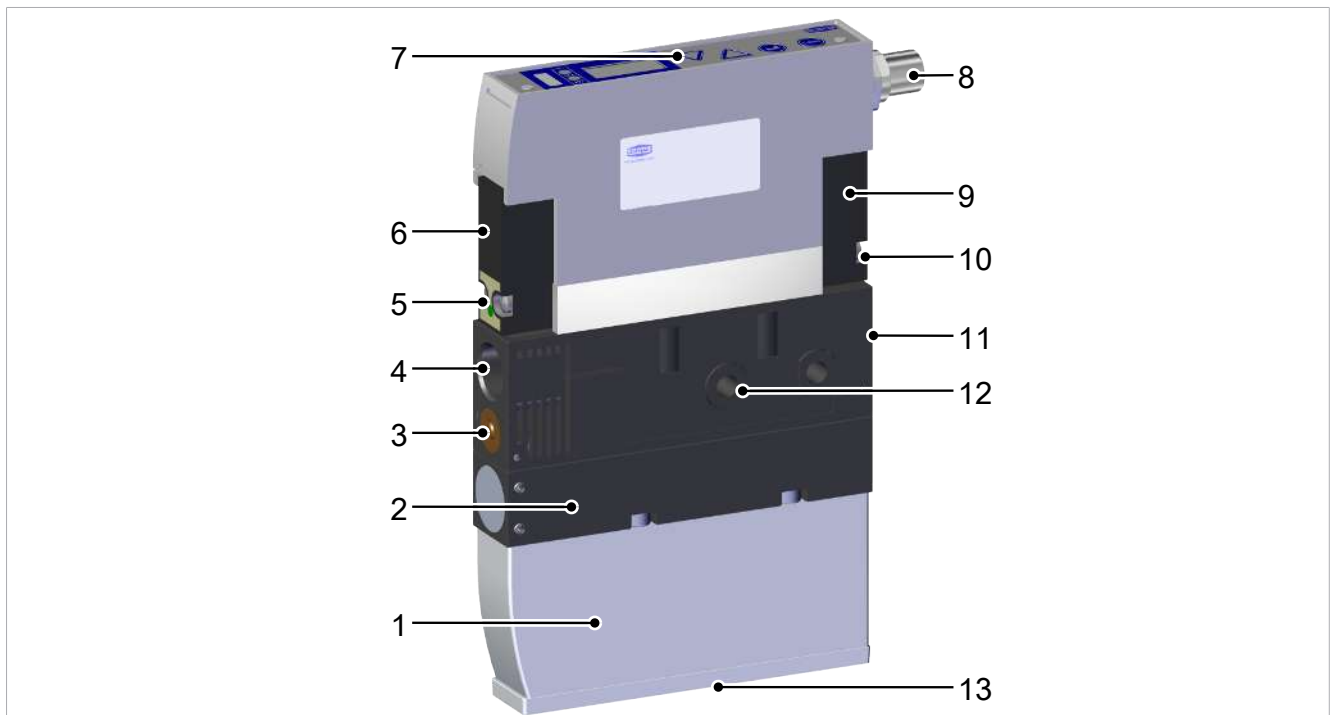
### 3.1 Ejector Designation

The ejector is available in different variants.

Each variant is defined by its item designation. The breakdown of the item designation is as follows:

Type of ejector	Performance class	Control	System monitoring	Electrical connection	Potential separation
<b>SCPi</b> without power blow off	<b>15</b> 1.5 mm	<b>NO</b> Normally open	<b>VD</b> Digital vacuum switch	<b>M12-5</b> 1xM12, 5-pin	<b>-</b> Without poten- tial separation
	<b>20</b> 2.0 mm	<b>NC</b> Normally closed		<b>M12-8</b> 1xM12, 8-pin	
	<b>25</b> 2.5 mm	<b>IMP</b> Bistable, switched with pulse			
<b>SMPi</b> with power blow off			<b>RD</b> Digital vacuum switch and inte- grated control function		<b>PT</b> With potential separation

## 3.2 Ejector Structure



1	Silencer	8	M12 5-pin electrical connection plug or M12 8-pin (thread G3)
2	Optional: integrated power blow off module for maximum blow off flow rate (SMPi only)	9	"Suction" valve <sup>2)</sup>
3	Valve screw for blow off flow rate	10	Button for actuating the "suction" valve manually <sup>3)</sup>
4	3/8" vacuum connection (thread G2)	11	1/4" compressed air connection (thread G1)
5	Button for actuating the "blow off" valve manually	12	2 x mounting holes
6	"Blow off" valve <sup>1)</sup>	13	Fastening screw for silencer
7	Operating and display elements	—	—

<sup>1)</sup> "Blow off" valve: All ejector variants with NC function (with pilot valve NO)

<sup>2)</sup> "Suction" valve:

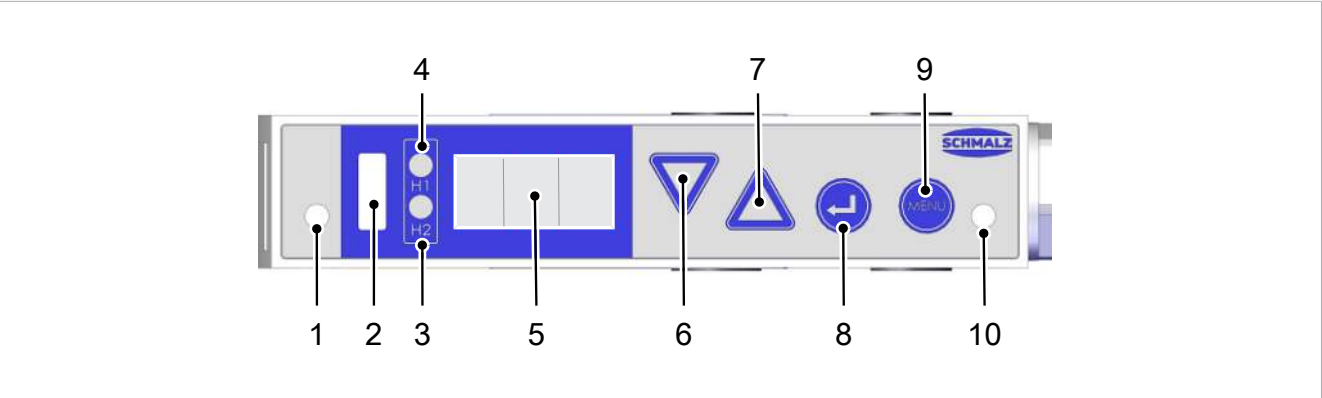
- Ejector variant NO: Pilot valve NC
- Ejector variant NC: Pilot valve NO
- Ejector variant IMP: Pulse pilot valve

<sup>3)</sup> The button for manual operation of the "suction" valve can only be actuated with ejector variants NO and NC.

3.3 Controls and Displays in Detail

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

- Four buttons on the foil keypad
- The three-digit display
- Four LEDs
- A light field for status information





1	"Blow off" valve LED	6	DOWN BUTTON
2	Status display for system vacuum	7	UP BUTTON
3	"H2" LED ("Part Present" check signal output)	8	ENTER BUTTON
4	"H1" LED (control function)	9	MENU BUTTON
5	Display (3-digit, 7-segment display)	10	"Suction" valve LED

3.3.1 Status Display for System Vacuum

The ejector has a status display for the system vacuum (2) or for monitoring functions. The system statuses are displayed in RED or GREEN. The status display is updated during every suction cycle that was activated or deactivated by the "suction" signal input.

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

Vacuum monitoring


Item	LED color		Behavior	Vacuum monitoring status
2		Green	Lit up	Rising vacuum: Vacuum ≥ H1 Falling vacuum: Vacuum ≥ H1-h1
		Red	Lit up	Rising vacuum < H1 Vacuum < H1

### Monitoring functions

If switching point H1 is never reached within a suction cycle, the status display remains RED even after the suction cycle has ended and the "diagnostics" signal output is set.

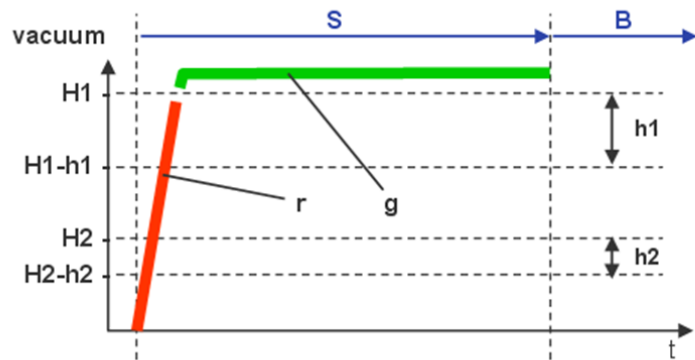
The ejector variant with control function (RD) has a valve protection function. When the control function is activated [ $\square \bar{A} \bar{r} = \square \bar{r}$ ] and at the same time there is a high level of leakage in the gripping system, the ejector often switches between the "venturi nozzle active" and "venturi nozzle inactive" statuses. The number of valve switching procedures thus increases rapidly within a short time. To protect the ejector and increase its service life, the ejector switches the air saving function off automatically if there are more than 6 valve switching procedures in 3 seconds and activates continuous suction (i.e. the ejector then remains in suction status).

The status display remains RED until the next suction cycle and the "diagnostics" signal output is set.

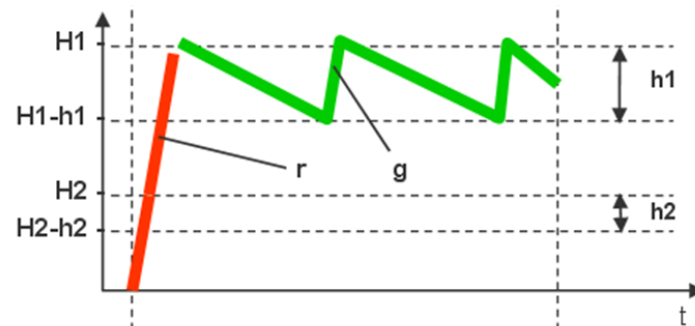
Item	LED color		Monitoring function	Ejector response
2		Red Lit up	H1 is never exceeded in the suction cycle	—
		Red Lit up	Suction valve switches more than 6 times in 3 s	Ejector switches to continuous suction, i.e. it remains in "venturi nozzle active" status (valve protection function)

## Status display overview

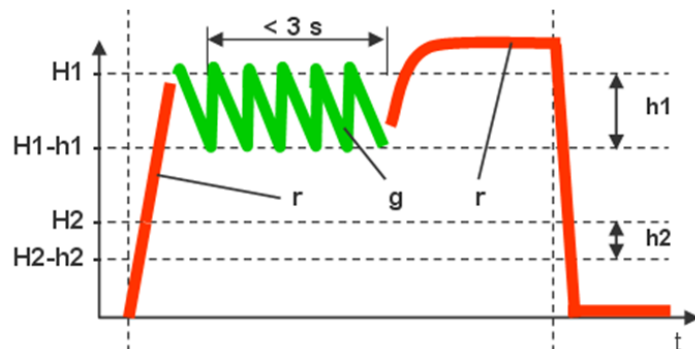
Suction cycle during which H1 is reached  
[ctr=on] and no leakage or  
[ctr=off]



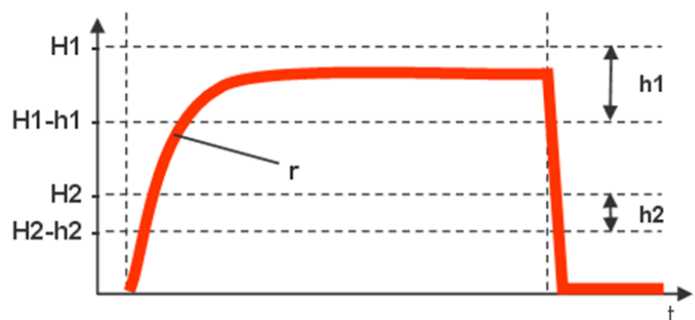
Air saving function  
Suction cycle with vacuum control  
[ctr=on]



Suction cycle with vacuum control,  
during which the valve protection func-  
tion is triggered  
[ctr=on]



Suction cycle during which H1 is never ex-  
ceeded



### Key:

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

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

H2-h2: Deactivation value of "part present" check signal output

h2: Hysteresis of "part present" check signal output

### 3.3.2 LED Display for Valves

The "suction" and "blow off" process statuses are each assigned an LED.

Item	Meaning	Status	Description
1	Blow off LED B	OFF	Ejector not blowing off
		Lit up	Ejector blowing off
10	Suction LED S	OFF	No suction from ejector
		Lit up	With NO: No suction from ejector With NC: Suction from ejector With IMP: Suction from ejector

## 4 Technical Data

### 4.1 Display Parameters

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

### 4.2 Electrical Parameters

Parameter	Symbol	Limit values			Unit	Comment
		min.	typ.	max.		
Supply voltage (M12-5)	$U_{SA}$	19.2	24	26.4	V DC	PELV <sup>1)</sup>
Sensor supply voltage (M12-8-PT)	$U_S$	19.2	24	26.4	V DC	PELV <sup>1)</sup>
Actuator supply voltage (M12-8-PT)	$U_A$	19.2	24	26.4	V DC	PELV <sup>1)</sup>
Rated current for NO (M12-5)	$I_{S/A}$	—	155	—	mA	Plus output signal current
Rated current for NC (M12-5)	$I_{S/A}$	—	113	—	mA	Plus output signal current
Rated current for IMP (M12-5)	$I_{S/A}$	—	123	209 <sup>2)</sup>	mA	Plus output signal current
Rated current for sensor NO/NC (M12-8-PT)	$I_S$	—	155	—	mA	Plus output signal current
Rated current for sensor IMP 1 W (M12-8-PT)	$I_S$	—	76	113 <sup>2)</sup>	mA	Plus output signal current
Rated current for sensor IMP 2.3 W (M12-8-PT)	$I_S$	—	81	167 <sup>2)</sup>	mA	Plus output signal current
Rated current for actuator NO (M12-8-PT)	$I_A$	—	108	—	mA	—
Rated current for actuator NC (M12-8-PT)	$I_A$	—	66	—	mA	—
Rated current for actuator IMP (M12-8-PT)	$I_A$	—	76	162 <sup>2)</sup>	mA	—
Voltage of signal output (PNP)	$U_{OH}$	$U_{S/SA} - 2$	—	$U_{S/SA}$	V <sub>DC</sub>	$I_{OH} < 150 \text{ mA}$
Voltage of signal output (NPN)	$U_{OL}$	0	—	2	V <sub>DC</sub>	$I_{OL} < 150 \text{ mA}$



Parameter	Symbol	Limit values			Unit	Comment
Power consumption of signal output (PNP)	$I_{OH}$	---	---	150	mA	Short-circuit-proof <sup>3)</sup>
Power consumption of signal output (NPN)	$I_{OL}$	---	---	-150	mA	Short-circuit-proof <sup>3)</sup>
Voltage of signal input (PNP)	$U_{IH}$	15	---	$U_{A/SA}$	$V_{DC}$	In reference to $Gnd_s$
Voltage of signal input (NPN)	$U_{IL}$	0	---	9	$V_{DC}$	In reference to $U_s$
Current of signal input (PNP)	$I_{IH}$	---	5	10	mA	---
Current of signal input (NPN)	$I_{IL}$	---	-5	-10	mA	---
Pulse duration for "suction" valve	$t_p$	50	---	---	ms	---
Response time of signal inputs	$t_i$	---	15	---	ms	---
Response time of signal outputs	$t_o$	---	2	---	ms	---

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

The signal inputs and outputs are all protected against reverse polarity.

2) Periodic peak current for 60 ms, refresh rate 560 ms.

3) The signal output is protected against short circuits. However, the signal output is not protected against overloading.

Constant load currents > 0.15 A may lead to impermissible heating and therefore the destruction of the ejector.

### 4.3 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 $\mu$ m filtered, with or without oil, class 7-4-4 compressed air quality in acc. with ISO 8573-1					

### 4.4 Performance Data

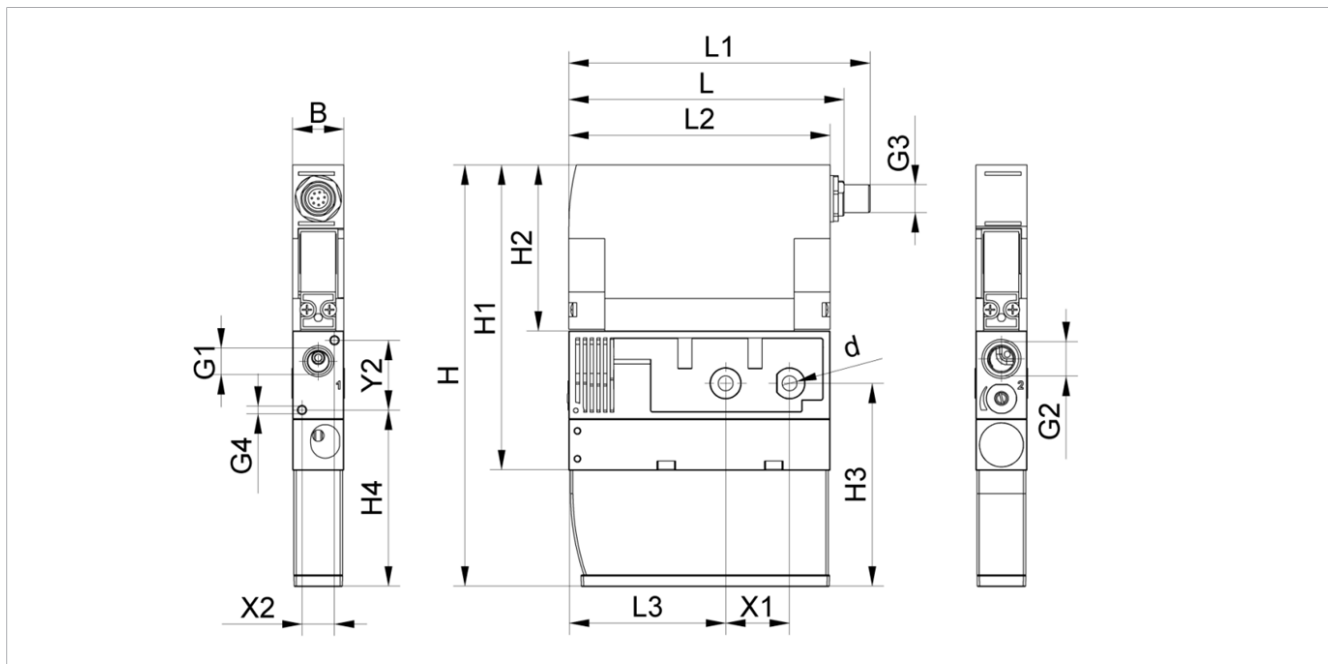
Variant	SCPi-15	SCPi-20	SCPi-25	SMPI-15	SMPI-20	SMPI-25
Nozzle size	1.5 mm	2.0 mm	2.5 mm	1.5 mm	2.0 mm	2.5 mm
Max. vacuum <sup>1)</sup>	85%					
Suction rate <sup>1)</sup>	75 l/min	140 l/min	195 l/min	75 l/min	135 l/min	185 l/min
Air consumption <sup>1)</sup>	115 l/min	180 l/min	290 l/min	115 l/min	180 l/min	290 l/min
Blow off air consumption <sup>1)</sup>			200 l/min			
Sound level <sup>1+2)</sup>	70 dBA	65 dBA	75 dBA	74 dBA	70 dBA	77 dBA
Weight			0.56 kg			

<sup>1)</sup> At 4.5 bar

<sup>2)</sup> When picked up

All values at ambient conditions of  $T = 20^\circ \text{C}$  and 1000 mbar ambient pressure

## 4.5 Dimensions



B	d	G1	G2	G3	G4	H	H1	H2
22	6.6	1/4" internal thread	3/8" internal thread	M12x1 external thread or M8x1 external thread	M4 internal thread	181.5	131.5	71.5
H3	H4	L	L1	L2	L3	X1	X2	Y2
87.5	76	118.5	129.7	112.5	67.5	27.5	14	30

All specifications are in mm

## 4.6 Maximum Torque

Connection	Max. torque
Thread G1	10 Nm
Thread G2	10 Nm
Thread G3 Electrical connection plug	Hand-tight
Thread G4	5 Nm
Mounting hole d (use U-washer)	2 Nm
Pilot valves	0.75 Nm
Fastening screw for silencer	1 Nm

## 4.7 Factory Settings

The following table shows the factory settings of the ejector:

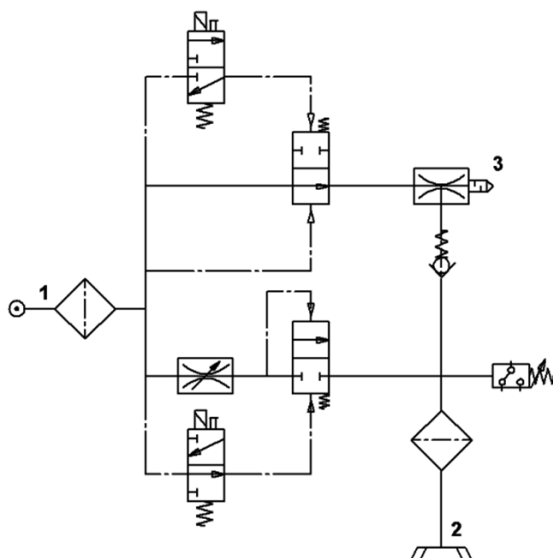
Code	Parameter	Value of the factory setting
H-1	Limit value H1	750 mbar
h-1	Hysteresis value h1	150 mbar
H-2	Limit value H2	550 mbar
h-2	Hysteresis value h2	10 mbar
t <sub>bl</sub>	Blow off time	0.2 s
un	Vacuum unit	Vacuum unit in mbar = -bA
tYP	Signal type	PNP switching = PNP
out	Signal output	"Normally open" contact = NO
ctr	Control	Ejector with control function: =ON Ejector without control function: =OFF
blo	Blow off function	Externally controlled blow off = -E-
dPY	Display rotation	Display screen not rotated = UPS
P <sub>in</sub>	PIN	User-defined 000

## 4.8 Pneumatic Circuit Diagram

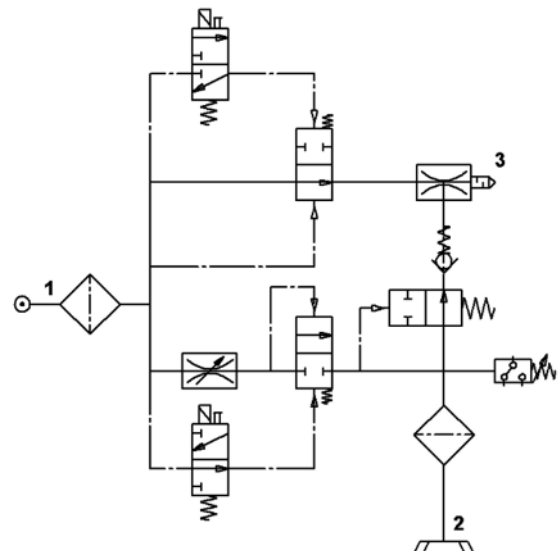
Legend:

NC	Normally closed
NO	Normally open
1	Compressed air connection
2	Vacuum connection
3	Exhaust outlet

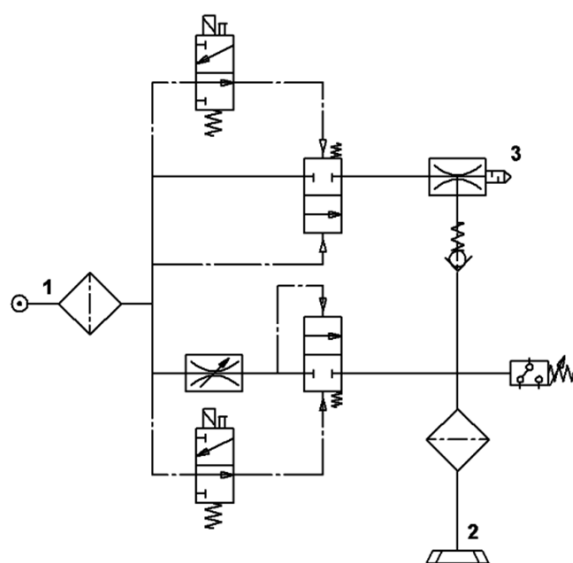
SCPi\_NO



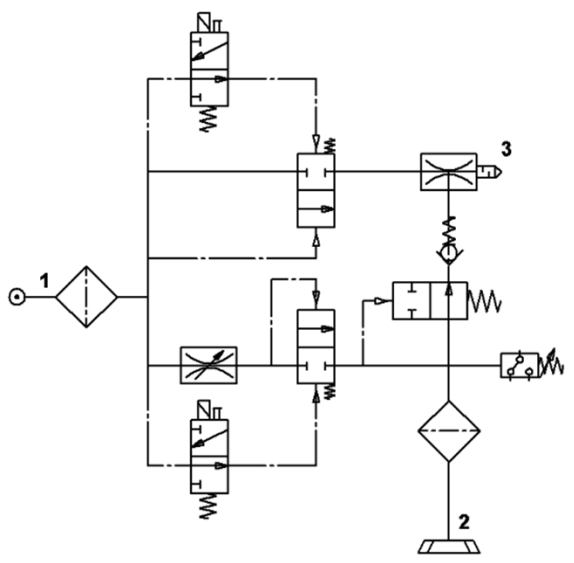
SMPI\_NO



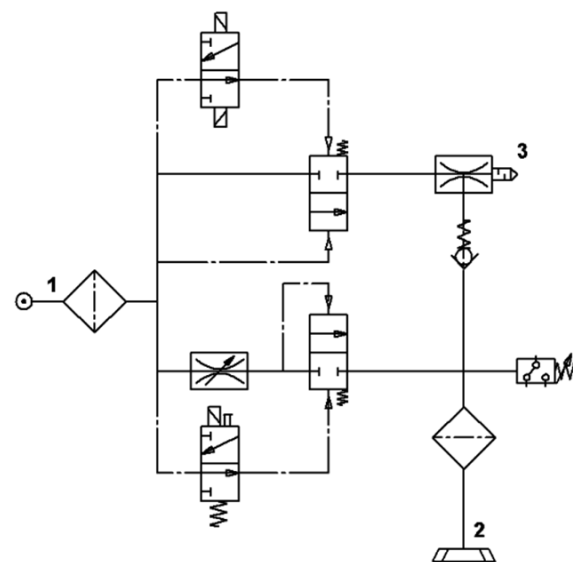
SCPi\_NC



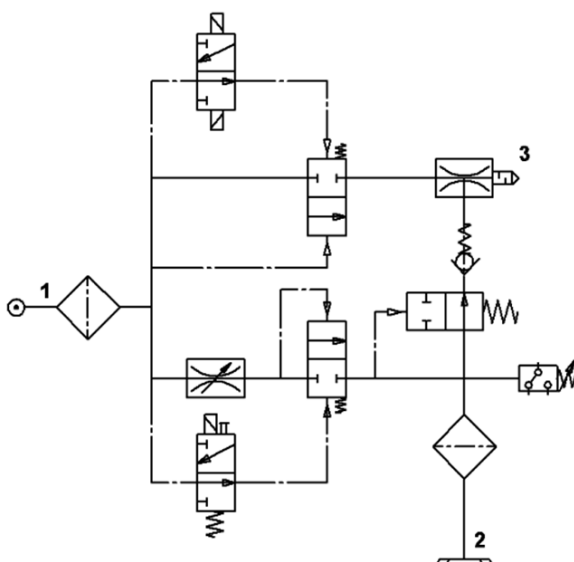
SMPi\_NC



SCPi\_IMP







SMPi\_IMP



## 5 Operating and Menu Concepts

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

	<b>MENU BUTTON</b>		<b>UP BUTTON</b>
	<b>ENTER BUTTON</b>		<b>DOWN BUTTON</b>

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.

The following information can be shown on the display:

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

The operating menu's home screen shows the currently measured vacuum level in the selected display unit. Pressing the **ENTER** button displays the unit of the currently displayed vacuum.

### 5.1 Unlocking the Menus

Menus can be protected against unauthorized access by defining a PIN [ $\overline{P}$  00] in the configuration menu. When the lock is active, [ $\overline{L}$  00] flashes in the display or the PIN is requested.

The menus can be unlocked as follows:

1. Press the **MENU** button
  2. Use the **UP** or **DOWN** button to enter the first digit of the PIN
  3. Confirm with the **ENTER** button
  4. Enter the two remaining digits in the same way
  5. Press the **ENTER** button to unlock the menu
- ⇒ When a valid PIN is entered, the message [ $\overline{U}$  00] is displayed.
- ⇒ When an invalid PIN is entered, the message [ $\overline{L}$  00] 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 000 must be set for permanent deactivation of the lock.

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

## 5.2 Main Menu

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

### 5.2.1 Functions in the Main Menu

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

Display code	Parameter	Explanation
H-1	Limit value H1	Deactivation value of control function (only active if [cbr] = [on])
h-1	Hysteresis value h-1	Hysteresis value for the control function
H-2	Limit value H2	Switching value for the "Part Present" check signal
h-2	Hysteresis value h-2	Hysteresis value for the "Part Present" check signal
tbl	Ventilation time	Blow off time setting for time-controlled blow off (only active if [blo] = [j-t])
cAL	Zero-point adjustment (calibration)	Calibrate vacuum sensor, zero point = ambient pressure

### 5.2.2 Changing the Parameters of the Main menu

✓ The ejector is shown on the measurement screen.

1. Press the **MENU** button
  2. Enter a valid PIN if the menu is locked
  3. Use the **UP** or **DOWN** button to select the desired parameter
  4. Confirm with the **ENTER** button
  5. Use the **UP** or **DOWN** button to change the value
  6. To save the changed value, press the **ENTER** button
- ⇒ The display automatically jumps to the next setting value.



#### Tips and tricks for parameter setting

- Pressing the **UP** or **DOWN** button for approx. 3 seconds scrolls quickly through the value to be changed.
- If you exit the changed value using the **MENU** button, the change will not be applied.

## 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 in the configuration menu:

Display code	Parameter	Possible settings	Explanation
u n i	Vacuum unit	-bA -PA -iH	Define the displayed vacuum unit Vacuum level in millibar [mbar] Vacuum level in kilopascal [kPa] Vacuum value in inches of mercury [inHg]
tYP	Output type	PnP nPN	Output PNP switch NPN switch
oUt	Output function	no nc	Normally open contact [no] Normally closed contact [nc]
cEr	Energy-saving function	oFF on	Control function off Control active
dCS	Deactivate auto. control shutoff	YES no	Suppresses the automatic valve protection function when set to YES. Cannot be activated when cEr = oFF.
blO	Blow off function	-E- J-E	Externally controlled Internally controlled (triggered internally, time can be set)
dPY		uPS dnS	Display configuration Standard Rotated 180°
P In	PIN	Value from 001 to 999	Specify the PIN, lock the menus If the PIN is 000, then the device is not locked.
rES	Reset	rES	Reset parameter values to factory settings

### 5.3.2 Changing the Parameters of the Configuration Menu

1. Press the **MENU** button for at least three seconds.
2. If the menu is locked: Enter a valid PIN.
3. Use the **UP** or **DOWN** button to select the desired parameter.
4. Confirm using the **ENTER** button.
5. Use the **UP** or **DOWN** button to change the value.
6. Press the **ENTER** button to save the modified value.
7. To exit the configuration menu, press the **MENU** button.



#### Tips and tricks for parameter setting

- Pressing the **UP** or **DOWN** button for approx. 3 seconds scrolls quickly through the value to be changed.
- If you exit the changed value using the **MENU** button, the change will not be applied.

## 5.4 System Menu

A special menu is available for reading out system data such as counters, the software version, part numbers and serial numbers.

### 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
c <sub>1</sub> 1	Counter 1	Suction cycles
c <sub>1</sub> 2	Counter 2	Number of valve switches
S <sub>0</sub> c	Software function	Software on the internal controller
S <sub>0</sub> r	Serial number	Provides information about the production period

### 5.4.2 Displaying Data in the System Menu

1. Open the system menu by pressing the **MENU** and **UP** buttons simultaneously (for at least 3 seconds)
  2. Enter a valid PIN if the menu is locked
  3. Use the **UP** or **DOWN** button to select the desired parameter
  4. Confirm with the **ENTER** button
- ⇒ The value is displayed.
- If necessary, use the **UP** or **DOWN** button to display the remaining decimal places of the total value. The decimal points show which three-digit block of the complete value is shown on the display.

## 5.5 Locking Menus Using the PIN

The menus can be protected against unintentional access with a PIN [<sub>0</sub> 10].

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

To activate the lock, a valid PIN between 001 and 999 must be entered in parameter [<sub>0</sub> 10] in the configuration menu:

1. Press the **MENU** button for at least three seconds
  2. When the menu is locked, enter the valid PIN
  3. Use the **UP** or **DOWN** button to select the parameter [<sub>0</sub> 10]
  4. Confirm with the **ENTER** button
  5. Use the **UP** or **DOWN** button to enter the first digit of the PIN
  6. Confirm with the **ENTER** button
  7. Enter the two remaining digits in the same way
  8. To save the PIN, press the **ENTER** button for at least three seconds
- ⇒ The display flashes [<sub>0</sub> 10] and the configuration menu closes. The menus are now locked.

The status of signal inputs and signal outputs can be changed in parameterization mode. This may result in unintentional startup of the machine/system.

Define a PIN [<sub>0</sub> 10] to use the lock function.



## 6 General Description of Functions

### 6.1 Applying Suction to the Workpiece/Part (Vacuum Generation)



#### **WARNING**

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

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

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

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

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

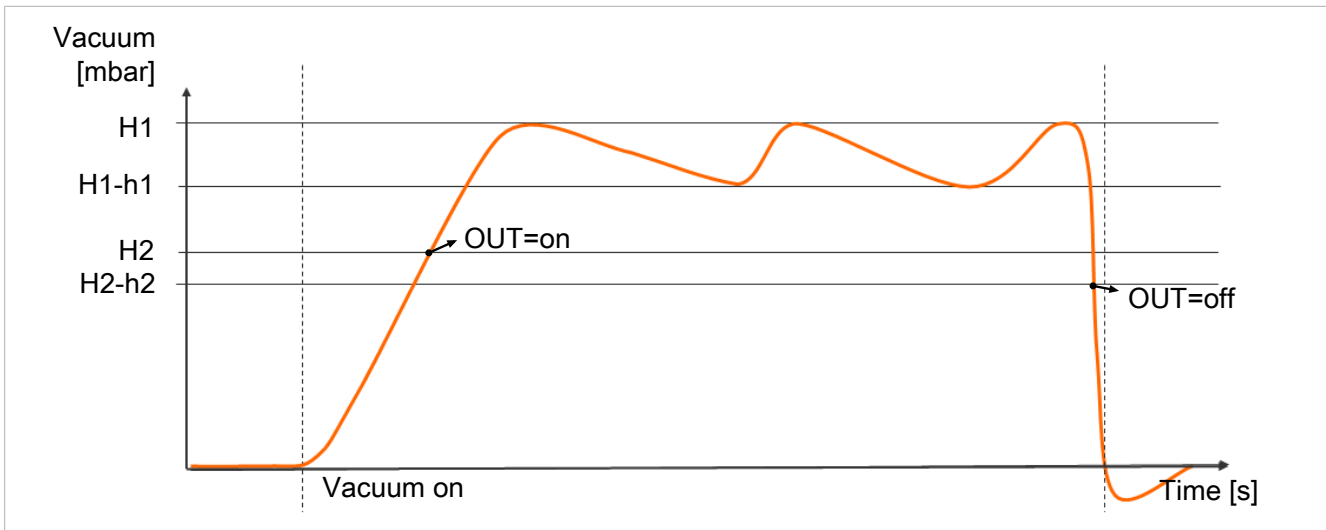
- In the NO (normally open) version, vacuum generation is deactivated when the suction signal is received.  
(This means that if the power fails or if no control signal is present, vacuum is constantly generated (continuous suction).)
- In the NC (normally closed) version, vacuum generation is activated when the suction signal is received.  
(This means that if the power fails or if no control signal is present, no vacuum is generated.)
- In the variant IMP, the venturi nozzle is controlled in the same way as in the variant NC. That is, the ejector switches to "suction" operating mode when the "suction" signal is present.  
In the event of a power failure, the last state is retained. (If the suction signal is present when the power fails but the ejector is currently in control mode, the ejector is switched to continuous suction.)

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

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



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

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



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

## 6.2 Control Function

### Only for ejector variant RD

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



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

When objects with airtight surfaces are picked up, the integrated non-return valve prevents the vacuum from dropping.

The operating modes can be set for the control function in the configuration menu under the [cEr] parameter.

Operating mode	Explanation
No control/continuous suction, H1 in hysteresis mode [cEr] => [oFF]	The ejector produces continuous suction with maximum power. This setting is recommended for very porous workpieces, which would otherwise cause vacuum generation to switch on and off continuously due to the high rate of leakage. The limit value evaluation for H1 is operated in hysteresis mode. Can only be adjusted if the valve protection function is deactivated ([dCS] => [oFF])
Control function activated [cEr] => [oN]	The ejector switches off vacuum generation when the vacuum limit value H1 is reached. It switches it back on when the vacuum falls below the hysteresis limit value (H1-h1). The limit value evaluation for H1 follows the control function. 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.

Available control function operating modes

The supply voltage is monitored by the electronics system. If the supply voltage falls below approx. 21 V, the control function is deactivated. The "suction" and "blow off" signal inputs are no longer processed.

### 6.2.1 Valve Protection Function

#### Only for ejector variant RD

The ejector has a valve protection function.

When the control function is activated and there is a high leakage level in the gripping system, the ejector switches between the "venturi nozzle active" and "venturi nozzle inactive" statuses very frequently. The number of valve switching procedures thus increases rapidly within a short time.

If the "suction" valve is activated more than six times by the control function within three seconds, the ejector switches to continuous suction mode, i.e. it remains in suction status. The status display turns RED. This is the valve protection function. The status remains the same until the next suction cycle starts.

The valve protection function can deactivate the automatic control shutoff.

You can set the function using the [dCS] parameter in the configuration menu:

- If the function [dCS = oN] is selected, the ejector automatically deactivates the air saving function if the leakage level is too high and if the valve switches more than 6 times in 3 seconds, and the ejector switches to continuous suction, i.e. the ejector then remains in suction status.
- With the [dCS = YES] setting, continuous suction is deactivated, and the ejector continues in control mode despite a high leakage rate or control frequency greater than 6 times per 3 seconds.

The setting [dCS = YES] can only be adjusted if the control function [cEr = oN] is activated.

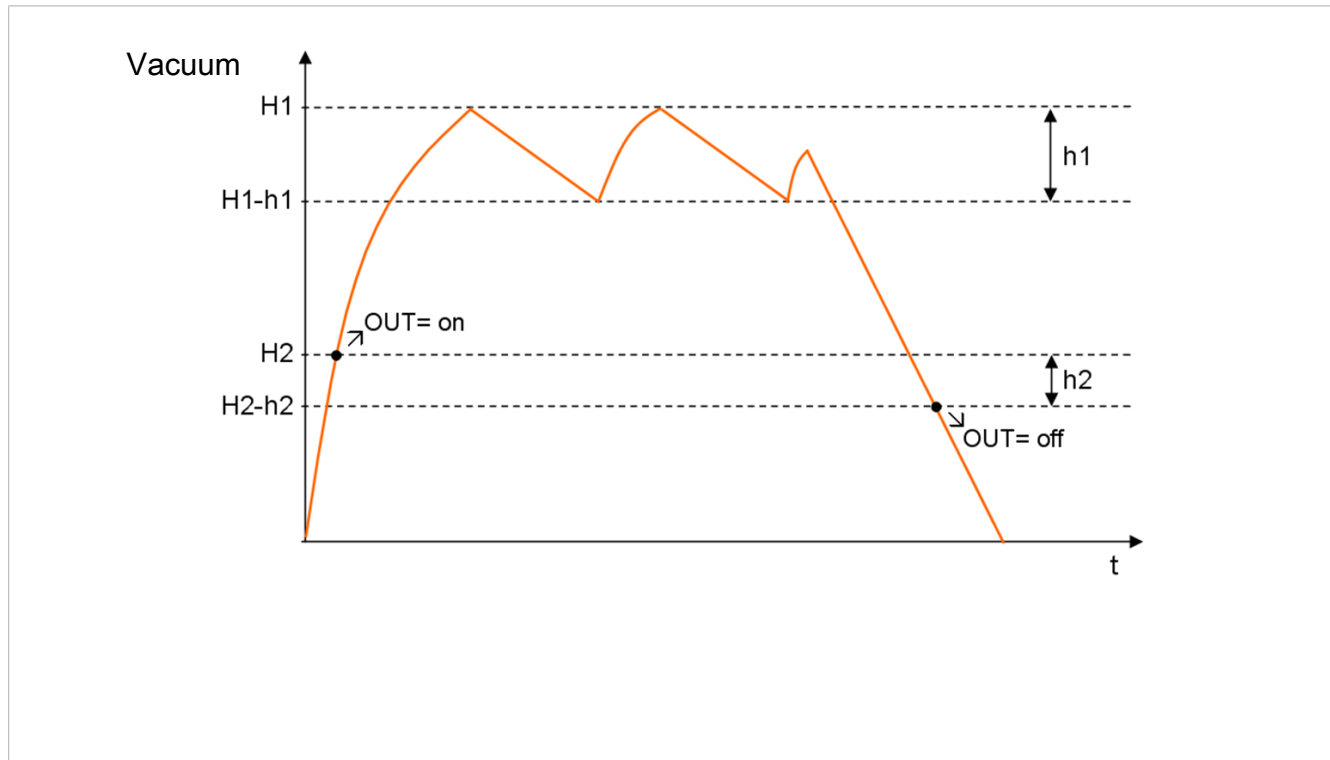
Depending on the ejector variant in question, the ejector will respond to undervoltage and power failures by switching to "continuous suction", even when continuous suction has been deactivated by the [dCS] = [YES] setting.



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

### 6.2.2 Overview of the Limit Values

The ejector variant with air saving function or control function (RD) is shown.



Parameter	Description
H1	Deactivation value of control function
h1	Hysteresis of control function
H1 - h1	Activation value of control function
H2	Activation value of "Part Present" check <sup>1)</sup> signal output
h2	Hysteresis of "Part Present" check signal output
H2 - h2	Deactivation value of "Part Present" check <sup>1)</sup> signal output

<sup>1)</sup> Display when output is configured [NO].

The control function is activated in the configuration menu using [cEr] = [ON] and deactivated using [cEr] = [OFF].

### 6.3 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.

Blow off mode can be controlled externally or internally.

- When controlled externally, "blow off" mode is activated by the "blow off" signal input.
- During internally controlled automatic blow off, the "blow off" valve is activated for a defined period after "suction" mode is exited.
- When controlled externally, "blow off" mode is activated by the "blow off" signal input.

- During internally controlled automatic blow off, the “blow off” valve is activated for a defined period after “suction” mode is exited. This function is not available for the ejector version IMP.

“Suction” mode is also deactivated as a result of the “blow off” signal input.

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

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



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

## 6.4 Blow off Functions

This function can be used to choose between two blow off functions. You can set the function using the [bL□] parameter in the configuration menu.

Explanation of the blow off functions:

Description	Explanation
Externally controlled blow off [bL□] => [-E-]	The ejector switches to blow off mode for as long as the blow off signal is present.
Internally time-controlled blow off [bL□] => [J-E]	After the suction signal is switched off, the ejector switches to blow off mode automatically for the set time (which can be adjusted using [E bL]). With this function, the blow off signal does not have to be additionally controlled. The [J-E] function is not available for ejector variant IMP.

The length of the blow off time [E bL] is set in the main menu. This menu item is suppressed in operating mode [-E-].

The number displayed indicates the blow off time in seconds. Blow off times from 0.10 seconds to 9.99 seconds can be set.

This Setting Has No Effect for Ejector Variant IMP.

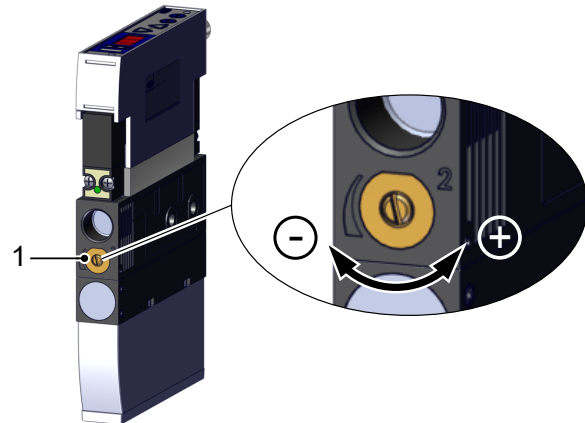
## 6.5 Changing the Blow-Off Flow Rate on the Ejector



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 %.

The figure shows the position of the valve screw (1) for adjusting the blow off flow rate. The valve screw is equipped with a stop on both sides.

- Rotate the valve screw (1) clockwise to reduce the flow rate.
- Rotate the valve screw (1) counterclockwise to increase the flow rate.



## 6.6 Operating Modes

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.

In addition to automatic operation, you can also use the keys on the ejector to change the operating state and switch to manual mode.

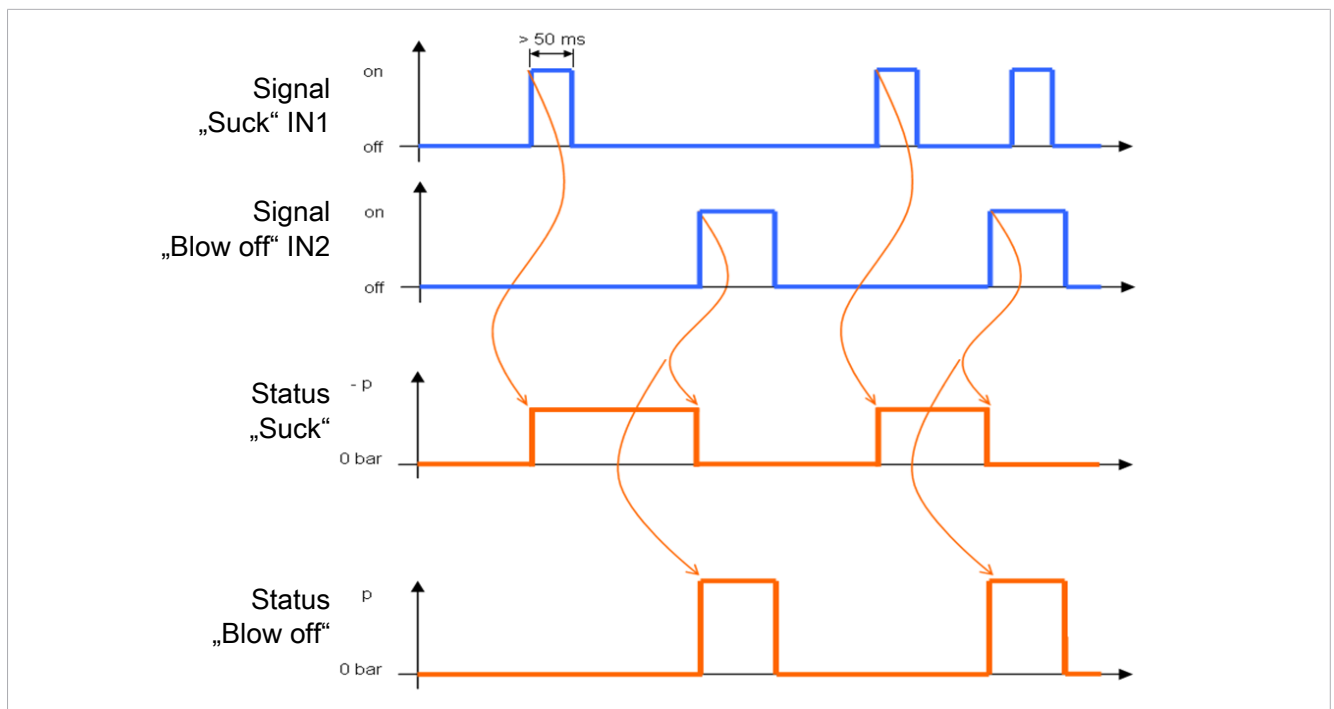
The ejector is always parameterized in automatic mode.

### 6.6.1 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.

The operating mode may be changed from automatic operation to manual operation using the buttons. Parameterization always takes place in automatic operation.

### 6.6.2 Control Concept for Ejector Variant IMP



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

### 6.6.3 Manual Operating Mode



#### **WARNING**

Through an external signal, manual operation is exited, external signals are evaluated and system parts move.

Personal injury or damage to property due to collisions

- ▶ Ensure that the danger zone of the system is clear of people during operation.
- ▶ Wear the required personal protective equipment (PPE) when working in the danger zone.



#### **WARNING**

**Falling objects due to incorrect operation in manual mode**

Risk of injury

- ▶ Higher level of attention
- ▶ Ensure that there are no persons within the danger zones of the machine/system

In manual mode, a higher level of attention is advisable because incorrect operation may cause gripped parts to fall, resulting in injuries.

In manual mode, the “suction” and “blow off” ejector functions can be controlled independently of the higher-level controller using the buttons on the operating panel. In this operating mode, the “H1” and “H2” LEDs both flash. Because the valve protection function is deactivated in manual mode, this function can be used to locate and rectify leakages in the vacuum circuit.

### Activating the operating mode

- ▶ Press and hold the **UP** and **DOWN** button for more than 3 seconds.

“Manual mode” can be used even when there is no actuator voltage (emergency stop, setup mode).

#### Manual suction

1. The **UP** button activates “suction” on the ejector.
2. Press the **DOWN** or **UP** button to exit “suction” mode again.

When the control function [C E F = 00] (only ejector variant RD) is activated, it is also active in “manual mode.” This applies even if there is no actuator voltage. The current vacuum level is displayed instead of the error code [E05].

#### Manual blow off

- ▶ The **DOWN** button activates “blow off” on the ejector for as long as the button is pressed.

If there is no actuator voltage, “manual blow off” mode is not available. The error code [E05] is displayed.

### Deactivating the operating mode

- ▶ Press the **MENU** button to exit “manual mode” from the “pneumatically OFF” idle position.

The device also exits “manual mode” when the status of the external signal inputs changes. The ejector automatically switches to “automatic mode.”



The valve protection function is not active in manual mode.

## 6.7 Vacuum unit

You can choose between the following three units for the displayed vacuum level under the [00 1] parameter in the configuration menu.

Unit	Setting parameter	Display unit
Bar	[ - b A ]	mbar
Pascal	[ - P A ]	kPa
InchHg	[ - i H ]	inHg

## 6.8 Signal output

The ejector has a signal output.

The signal output can be configured using the two corresponding menu items.

### 6.8.1 Setting the Signal Type

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

This setting can be switched using the [E 4 P] parameter in the configuration menu.

The ejector is factory set to PNP.



### 6.8.2 Output Function

The signal output can be switched between [NO] (normally open) and [NC] (normally closed) contact.

To switch this setting, use the [OUT] parameter in the configuration menu.

The function of the limit value H2 / h2 ("Part Present" check) is assigned to the signal output OUT.

### 6.9 Rotating the Display

To allow different installation positions, the orientation of the display can be rotated by 180° by changing the parameter [DPY] in the configuration menu.

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

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



With the display rotated, the **UP** and **DOWN** buttons switch functions.

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

### 6.10 PIN Code for Write Protection

A PIN can be used to prevent the parameters from being changed via the user menu.

The current settings are still displayed. The PIN is set to 000 on delivery, meaning access to the parameters is not locked. A valid PIN between 001 and 999 must be entered to activate write protection. If write protection is activated with a customer-specific PIN, the desired parameters can be changed within one minute after the correct code is entered. If no changes are made within one minute, write protection is automatically reactivated. The PIN must be reset to 000 to permanently deactivate the lock.

Enter the PIN using the PIN parameter in the configuration menu.

When the PIN is activated, [LOCK] flashes on the display for write access.



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

### 6.11 Zero-Point Adjustment (Calibration)

Since the production conditions for the integrated vacuum sensor can vary, we recommend calibrating the sensor once it is installed. To calibrate the vacuum sensor, the system's vacuum circuit must be open to the atmosphere.

The zero-point adjustment function of the sensor is executed in the main menu using the [CAL] parameter.

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

If the permissible limit of  $\pm 3\%$  is exceeded, error code [E03] will appear on the display.

### 6.12 Resetting the Device to the Factory Settings

All adjustable parameters for the vacuum switch are reset to factory settings using this function.



#### **WARNING**

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

Personal injury

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

This function is executed using the  $\text{rES}$  parameter in the configuration menu:

1. Press the **MENU** button for at least three seconds  
⇒ When the menu is locked, enter the valid PIN
2. Use the **UP** or **DOWN** button to select the menu item  $\text{rES}$
3. To reset to factory settings, press the **ENTER** button for at least three seconds  
⇒ After confirmation, the display flashes for a few seconds and then returns automatically to display mode.

Resetting to factory settings will change the switching points and the configuration of the signal output. Counter readings are not affected by this function. The status of the ejector system may change as a result.

The zero-point adjustment is also reset. The zero point may have to be reset  $[\text{cAL}]$ .

### 6.13 Counters

The ejector has two internal counters,  $[\text{cE1}]$  and  $[\text{cE2}]$ :

Counter 1 increases with each valid pulse at the "suction" signal input, meaning that it counts all the suction cycles during the ejector's service life.

Counter 2 increases each time the "suction" valve is switched on.

As a result, the average switching frequency of the air saving function can be determined using the difference between counters 1 and 2.

Designation	Display parameter	Description
Counter 1	$[\text{cE1}]$	Counter for suction cycles ("suction" signal input)
Counter 2	$[\text{cE2}]$	Counter for valve switching frequency

#### Displaying a counter on the operating panel of the ejector:

- ✓ The desired counter is selected in the system menu  $\text{cE1}$  or  $\text{cE2}$ .
- 1. Confirm the counter by pressing the **MENU** button.  
⇒ The last three decimal places of the counter total are displayed (the digits  $\times 10^0$ ). The decimal point at the far right flashes. This corresponds to the least significant three digits.
- 2. Use the **UP** or **DOWN** button to display the remaining decimal places of the counter total. The decimal points show which three-digit block of the complete counter value is shown on the display.

The counter total is comprised of the 3 number blocks together:

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

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

- Exit the counter function by pressing the **MENU** button.

## 6.14 Displaying the Software Version

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

1. Press the **MENU** and **UP** buttons for at least three seconds at the same time
  2. If the menu is locked: Enter a valid PIN
  3. Use the **UP** or **DOWN** button to select the [ $\square\square\square$ ] parameter
  4. Confirm with the **ENTER** button
    - ⇒ The value is displayed.
- To exit the function, press the **MENU** button

## 6.15 Displaying the serial number

The serial number indicates the production period of the ejector.

- ✓ In the system menu, select the [ $\square\square\square$ ] parameter.
1. Confirm using the **MENU** button.
    - ⇒ The last three decimal places of the serial number are displayed (the digits x  $10^0$ ). The decimal point at the far right flashes. This corresponds to the least significant three digits.
  2. You can press the **DOWN** or **UP** button to display the remaining decimal places in the serial number. The decimal points show which three-digit block of the serial number is shown on 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 serial number in this example is 48 618 593.

- To exit the function, press the **MENU** button.

## 6.16 Error messages

If an error occurs, it appears on the display in the form of an error code ("E number"). The ejector's response to an error depends on the type of error.

Display code	Error description
E01	Electronics fault
E03	Zero-point adjustment outside $\pm 3\%$ FS (full scale)
E05	Actuator supply undervoltage (display will alternately show the current vacuum value)
E06	Manual operation not possible in "blow off" mode
E07	Actuator/sensor supply undervoltage
E12	Short circuit of signal output OUT
FFF	Present vacuum exceeds the measurement range
-FF	Overpressure in vacuum circuit

Any operation being performed in the menu will be interrupted if an error occurs.

The error [E01] remains in the display after being shown once. Delete the error by switching off the power supply. If this error occurs again after the power supply is switched back on, then the device must be replaced.

## 7 Transportation and Storage

### 7.1 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.

### 7.2 Removing the Packaging

The device is delivered packaged in a cardboard box.



#### NOTE

##### Sharp knives or blades

Damage to components!

- ▶ Ensure that no components are damaged while opening the packaging.

1. Carefully open the packaging.
2. Dispose of the packaging material in accordance with the national laws and guidelines.

## 8 Installation

### 8.1 Installation Instructions



#### CAUTION

##### Improper installation or maintenance

Injury to persons 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.

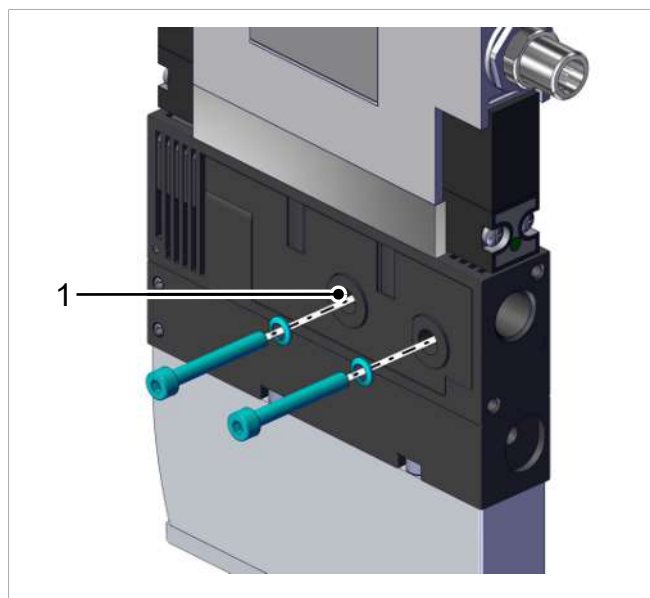
To ensure safe installation, the following instructions must be observed:

- 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.
- Note the connection symbols and designations on the device.

### 8.2 Mounting

The ejector can be installed in any position.

There are two 6.6 mm mounting holes (1) for mounting the ejector on a level compensator.



- ▶ Secure the ejector with at least two screws using washers. The maximum tightening torque is 2 Nm.

### 8.3 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 such as suction cups, suction lines and hoses.



#### **⚠ CAUTION**

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

Hearing damage!

- ▶ Correct installation.
- ▶ Wear ear protectors.

#### 8.3.1 Instructions for the Pneumatic Connection

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

- Use of air or neutral gas in accordance with EN 983, filtered 5 µm, oiled or unoled
  - Dirt particles or foreign bodies in the product connections, hoses or pipe-lines can lead to partial or complete malfunction
1. Keep the hoses and pipelines as short as possible
  2. Keep the hose lines free of bends and crimps
  3. Only use a hose or pipe with the recommended internal diameter to connect the product; otherwise, use the next largest diameter:
    - On the compressed air side, ensure that the internal diameter has the dimensions required for the product to achieve its performance data.
    - On the vacuum side, ensure that the internal diameters have the necessary dimensions for preventing high flow resistance. If the selected internal diameter is too small, the flow restrictor and the evacuation times increase and the blow off times are extended.

The following table shows the recommended line cross-sections (internal diameter):

Performance class	Line cross-section (internal diameter) in mm <sup>1)</sup>	
	Pressure side	Vacuum side
15	6	6
20	6	8
25	8	9

<sup>1)</sup>Based on a maximum hose length of 2 m.

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

### 8.3.2 Connecting the Compressed Air and Vacuum



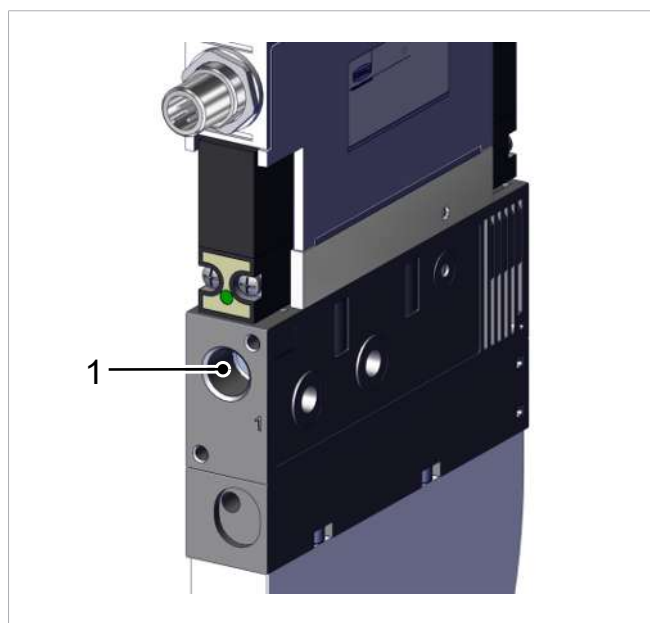
#### **CAUTION**

##### **Operating the ejector variant SMPi with a closed vacuum connection**

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

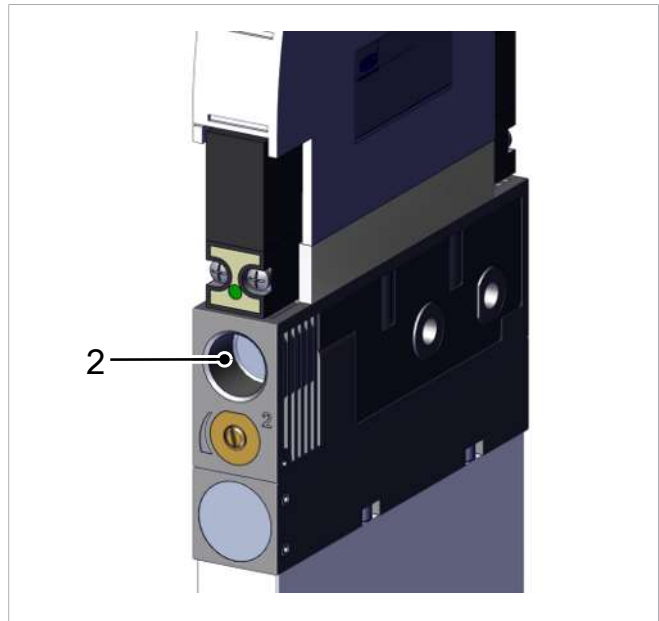
- ▶ Do not close the vacuum connection
- ▶ Wear eye protection.
- ▶ Do not look into the silencer air stream

The 1/4" internal thread compressed air connection is marked with the number 1 on the ejector.



- ▶ Connect the compressed air hose. The max. tightening torque is 10 Nm.

The 3/8" internal thread vacuum connection is marked with the number 2 on the ejector.



- ▶ Connect the vacuum hose. The max. tightening torque is 10 Nm.

## 8.4 Electrical Connection



### **WARNING**

#### **Electric shock**

Risk of injury

- ▶ Operate the product using a power supply unit with protected extra-low voltage (PELV).



### **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 product is designed to supply sensors and actuators with potential separation.

Do not connect or disconnect the connector cable under tension and/or when voltage is applied.



### 8.4.1 Mounting the Connection Cable



#### **CAUTION**

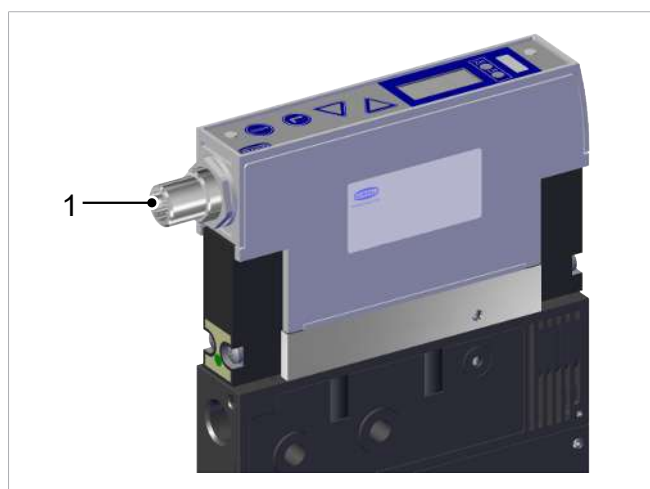
#### **Changing output signals when the product is switched on or plug is connected**

Personal injury or damage to property!

- ▶ The electrical connection must be performed only by specialists who can evaluate the effects of signal changes on the overall system.

The ejector is connected to the electrical supply using an M12 connector:

- ✓ The connection cable with socket is provided by the customer. The maximum length of the cable in SIO mode is 30 m.
- ✓ Ensure that no electrical voltage is applied to the device.



- ▶ Attach the connection cable to the electrical connection (1) (max. tightening torque = hand-tight).

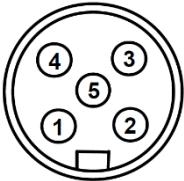
#### **Direct connection to the control of the higher-level machine**

For example, a Schmalz connection cable can be used to connect the ejector directly to the controller:

- Ejector with M12, 5-pin connector: M12-5 connection cable with open end, 5 m, part no. 21.04.05.00080
- Ejector with M12, 8-pin connector: M12-8 connection cable with open end, 5 m, part no. 21.04.05.00079

Additional connection cables or connection distributors are available on request.

### 8.4.2 PIN Assignment of M12, 5-Pin Connection Plug

Plug	PIN	Wire color <sup>1)</sup>	Symbol	Function
	1	Brown	$U_{S/A}$	Supply voltage for sensors/actuators
	2	White	IN1	"Suction" signal input <sup>2)</sup>
	3	Blue	$Gnd_{S/A}$	Ground for sensors/actuators
	4	Black	OUT	"Part present" signal output (H2/h2)
	5	Gray	IN2	"Blow off" signal input <sup>3)</sup>


<sup>1)</sup> When using a Schmalz connection cable, part no. 21.04.05.00080

<sup>2)</sup> NO version: Suction OFF, NC version: Suck ON, IMP version: suction ON only

<sup>3)</sup> NO/NC version: Blow off ON/OFF, IMP version: Suction OFF and blow off ON/OFF

### 8.4.3 PIN Assignment of M12, 8-Pin Connection Plug

M12 plug connector 8-pin for variant with potential separation (PT) between  $U_S$  and  $U_A$

Plug	PIN	Wire color <sup>1)</sup>	Symbol	Function
	1	White	OUT1	"Diagnostics" signal output <sup>2)</sup>
	2	Brown	$U_S$	Supply voltage for sensor
	3	Green	$Gnd_A$	Actuator ground
	4	Yellow	IN1	"Suction" signal input <sup>2)</sup>
	5	Gray	OUT2	"Part present" signal output <sup>2)</sup>
	6	Pink	IN2	"Blow off" signal input <sup>3)</sup>
	7	Blue	$Gnd_S$	Sensor ground
	8	Red	—	Not connected

<sup>1)</sup> When using a Schmalz connection cable, part no. 21.04.05.00079

<sup>2)</sup> refers to sensor ground  $GND_S$

<sup>3)</sup> refers to actuator ground  $GND_A$

## 9 Operation

### 9.1 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 Help with Faults

Fault	Cause	Solution
Ejector does not respond	No actuator supply voltage	▶ Check electrical connection and pin assignment
	No compressed air supply	▶ Check the compressed air supply.
	Ejector is faulty.	▶ Check the ejector and contact Schmalz Service if necessary.
Vacuum level is not reached or vacuum is created too slowly	Dirty screen	▶ Clean or replace the screen
	Silencer is dirty	▶ Replace the silencer insert
	Hose or screw unions are leaking	▶ Replace or seal components
	Leakage at suction cup	▶ Eliminate leakage from suction cup
	Operating pressure too low	▶ Increase operating pressure, observe maximum limits
	Internal diameter of hose line too small	▶ Observe recommendations for hose diameter
Display shows error code	See "Error codes" table	▶ See the "Error codes" table.
Load cannot be held	Vacuum level too low	<ol style="list-style-type: none"> <li>1. Increase the control range for the air saving function</li> <li>2. Check system for leakage and eliminate leakage</li> <li>3. Increase vacuum level</li> <li>4. Increase operating pressure, observe maximum limits</li> </ol>
	Suction cup too small	▶ Select a larger suction cup

## 11 Maintenance

### 11.1 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).

### 11.2 Cleaning the Product

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.

### 11.3 Replacing the Silencer



#### **WARNING**

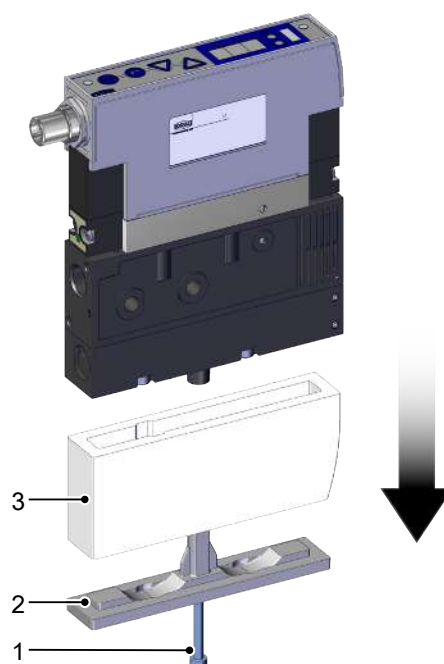
#### **Noise pollution due to the escape of compressed air**

Hearing damage!

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

- ✓ A new silencer is available as a replacement
1. Unscrew the fastening screw on the silencer (1) and cover (2) – retain the screw and O-ring (1) for reuse
  2. Remove the silencer (3) and cover (2)
  3. Attach the new silencer (3) and the cover (2)
  4. Screw the fastening screw back in with the O-ring (1) and tighten it with a maximum tightening torque of 1 Nm



## 12 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.

## 13 Spare and Wearing Parts

Maintenance work may only be carried out by qualified personnel.



### **⚠ WARNING**

#### **Risk of injury due to incorrect maintenance or troubleshooting**

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

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

Part no.	Designation	Key
10.02.02.03381	Silencer insert	Wearing part
10.05.01.00277	Suction valve for ejector NO (valve NC)	Spare part
10.05.01.00278	Suction valve for ejector NC (valve NO) Blow off valve (valve NO)	Spare part
10.05.01.00280	Suction valve for ejector IMP (pulse valve) 1 W	Spare part
10.05.01.00279	Suction valve for ejector IMP (pulse valve) 2.3 W	Spare part

- ▶ Tighten the fastening screws on the valves with a maximum tightening torque of 0.75 Nm.



## 14 Accessories

Part no.	Designation	Note
21.04.05.00079	Connection cable	M12 socket, 8-pin, 5 m, 8-pin cable, open Max. tightening torque = hand-tight
21.04.05.00080	Connection cable	M12, 5-pin, with open end, 5 m Max. tightening torque = hand-tight
10.02.02.00917	Compressed air distributor GP2	Max. tightening torque = 5 Nm
10.02.02.00918	Compressed air distributor GP3	Max. tightening torque = 5 Nm
10.02.02.00919	Compressed air distributor GP4	Max. tightening torque = 5 Nm
10.02.02.00920	Compressed air distributor GP5	Max. tightening torque = 5 Nm
10.02.02.00921	Compressed air distributor GP6	Max. tightening torque = 5 Nm
10.02.02.00728	Ejector blanking plate <sup>1)</sup>	Max. tightening torque = 5 Nm
10.02.02.03463	Quick change connector <sup>2)</sup>	Max. tightening torque = 10 Nm

<sup>1)</sup> Dummy plate for covering uncovered connections when using compressed air distributors.

<sup>2)</sup> For additional quick mounting function (tool-free replacement of ejectors). Order one for each ejector when using compressed air distributors

## 15 Decommissioning and Disposal

### 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

The table below shows the materials used:

Component	Material
Housing	PA6-GF
Inner components	Aluminum alloy, anodized aluminum alloy, brass, galvanized steel, stainless-steel, PU, POM
Screws	Galvanized steel
Silencer cover	PA
Silencer insert	Porous PE
Sealing	Nitrile rubber (NBR)
Lubrication	Silicone-free

## 16 Declarations of Conformity

### 16.1 EC Conformity

#### EU Declaration of Conformity

The manufacturer Schmalz confirms that the product Ejector described in these Operating instructions fulfills the following applicable EU 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 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 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 61000-6-3+A1+AC	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
EN 61000-6-2+AC	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for 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.

## 17 Attachment

### See also

SCPi\_SMPi IO-Link Data Dictionary 21.10.01.00063\_00 2013-01-15.PDF [► 56]

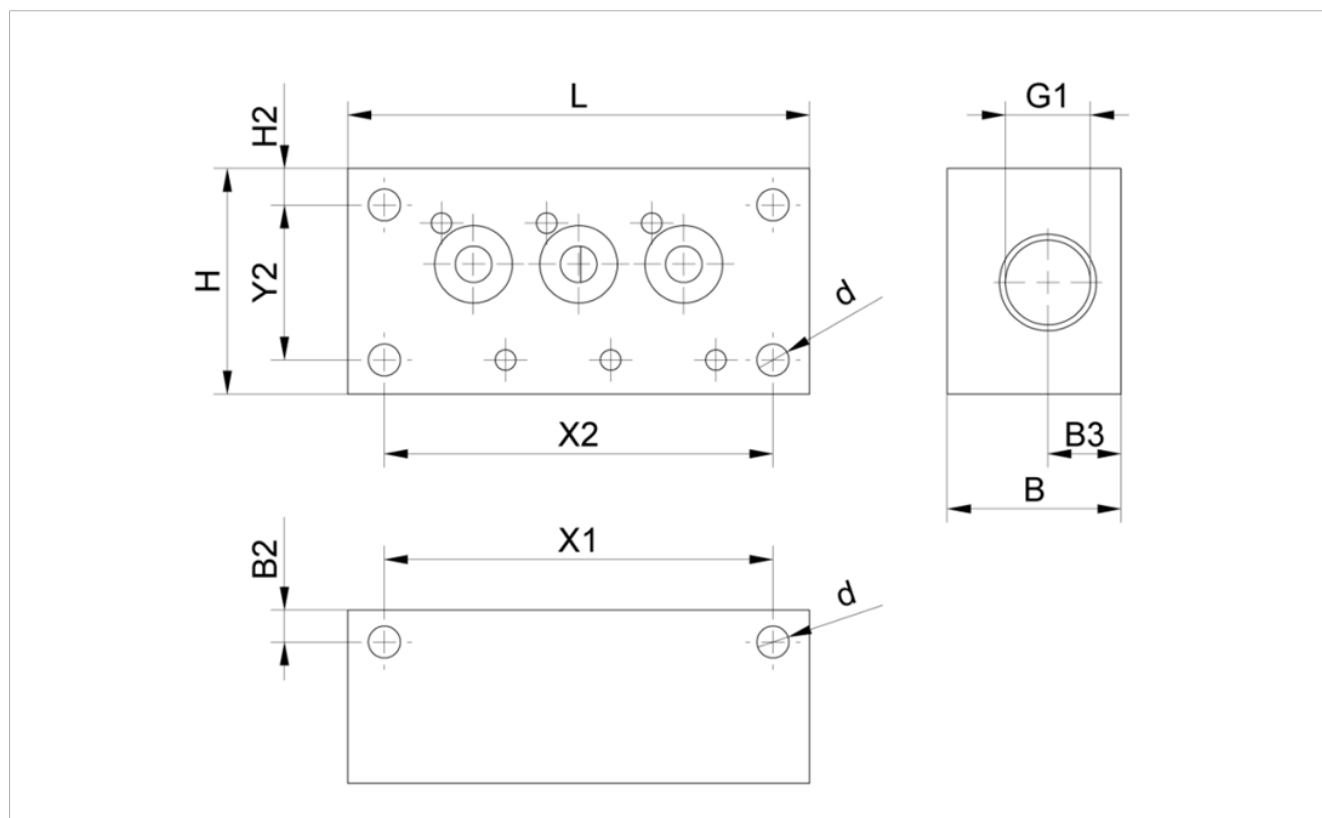
### 17.1 Overview of the Display Codes

Code	Parameter	Comment
H-1	Limit value H1	Deactivation value of air saving function/control
h-1	Hysteresis value h1	Hysteresis of control
H-2	Limit value H2	Activation value of "Part Present" check signal output (when the output NO is configured)
h-2	Hysteresis value h2	Hysteresis of "Part Present" check signal output
tBL	Blow off time	Sets the blow off time for time-controlled blow off
cAL	Zero-point adjustment	Calibrates the vacuum sensor
cE1	Counter 1	Counter for suction cycles ("suction" signal input)
cE2	Counter 2	Counter for valve switching frequency
SoC	Software function	Displays the current software version
Snr	Serial number	Displays the serial number of the ejector
cEr	Air saving function (control)	Sets the control function
dCS	Deactivates auto. control shutoff	Suppresses the automatic valve protection function when set to YES. Cannot be activated when cEr = OFF.
BL0	Blow off function	Menu for configuring the blow off function
-E-	"External" blow off	Selects externally controlled blow off
I-E	"Internal" blow off	Selects internally controlled blow off (triggered internally, time can be adjusted using tBL)
OUT	Signal output	Menu for configuring the signal output
NO	Normally open contact	Configures the signal output as a normally open contact
NC	Normally closed contact	Configures the signal output as a normally closed contact
LYP	Signal type	Menu for configuration of the signal type (NPN/PNP)
PNP	PNP signal type	All input and output signals switch according to PNP (input / output on = 24 V)
NPN	NPN signal type	All input and output signals switch according to NPN (input / output on = 0 V)
UN1	Vacuum unit	Sets the vacuum unit
-bA	Vacuum level in mbar	The displayed vacuum level is shown in mbar
-PA	Vacuum level in kPa	The displayed vacuum level is shown in kPa
-iH	Vacuum level in inHg	The displayed vacuum level is shown in inches of Hg
dPY	Display rotation	Sets the display position (rotation)
UPS	Display top	Display screen not rotated
dNS	Rotated display	Display screen rotated by 180°
P_in	PIN	Entry of the PIN for unlocking the menu
Loc	Menu locked	Parameter modification locked
Unc	Menu unlocked	The buttons and menus are unlocked

Code	Parameter	Comment
rES	"Clear all" (reset)	All values are reset to the factory settings

## 17.2 Accessories Design Data

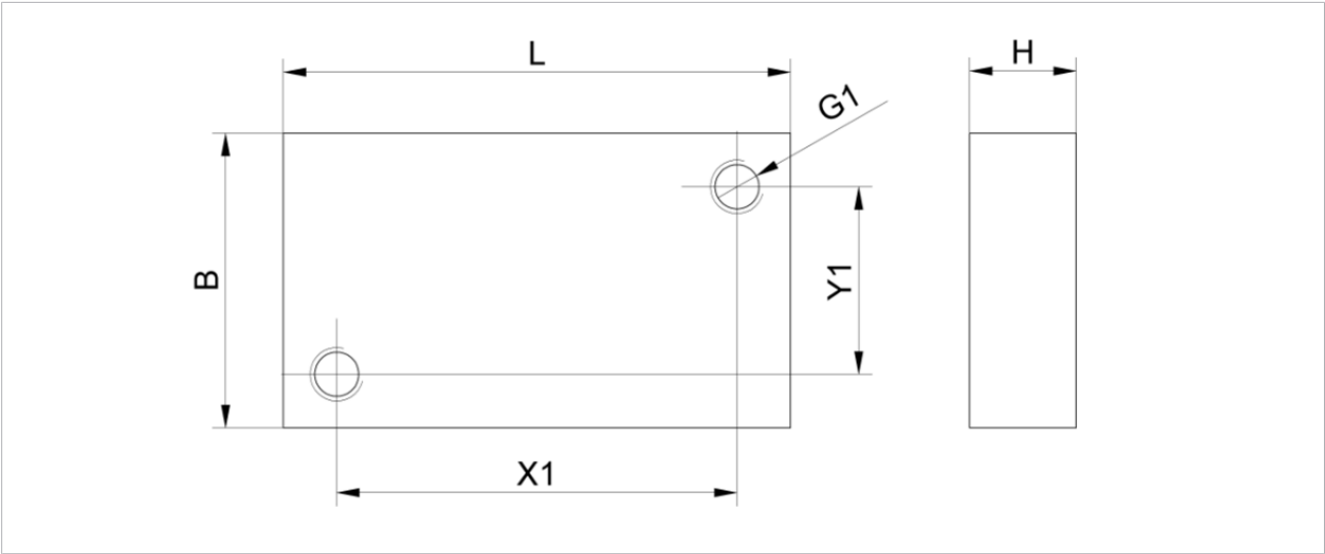
### 17.2.1 Pressure Connection Plate GP ...



Type	Number of outputs	X1	X2	L	Y2	B	B2	B3	d	G1	H	H2
GP2	2	62	78									
GP3	3	85	101									
GP4	4	108	124		34	38	7	16	7	1/2" internal thread	49.5	8
GP5	5	131	147									
GP6	6	154	170									

All specifications are in mm.

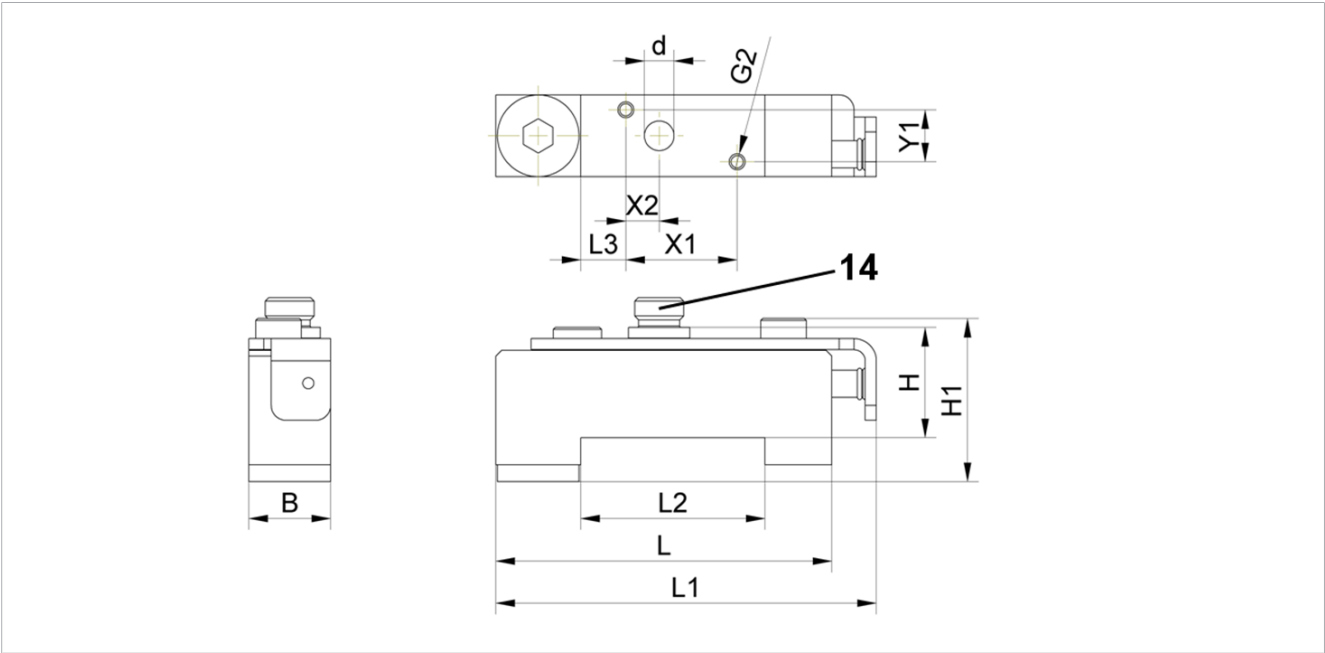
17.2.2 Ejector Blanking Plate EJEK-PL ...



Type	B	G1	H	X1	Y1	L
EJEK-PL	22	M4 internal thread	8	30	14	38

All specifications are in mm.

17.2.3 Quick Change Connector ADP-Q1 ...

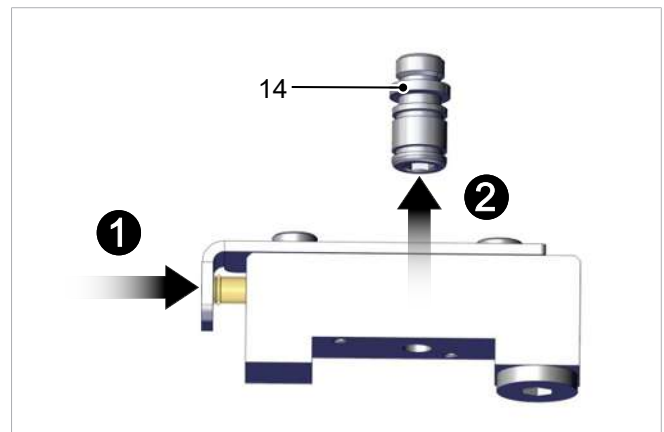


Number of outputs	B	d	G2	H	H1	X1	X2	Y1	L	L1	L2	L3
1	22	8	M5 internal thread	29.7	43.9	30	9	14	90.5	102.5	49.6	12.1

All specifications are in mm.

## Mounting the quick change connector

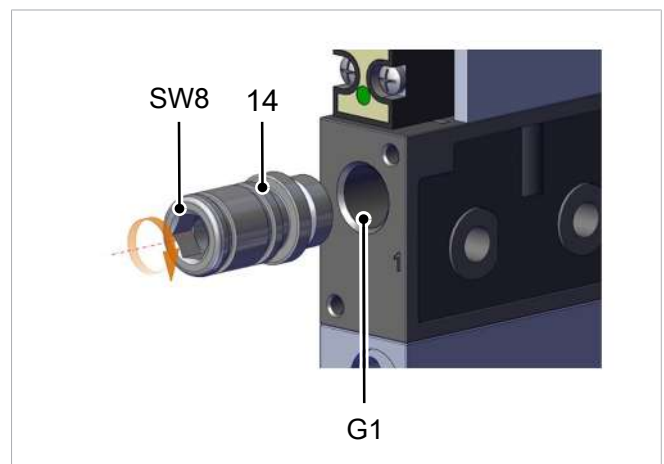
1. Remove the 1/4" latching bolt (14) from the quick change connector



2. Coat the 1/4" latching bolt (14) with medium-strength threadlocking adhesive



3. Screw the 1/4" latching bolt (14) into the compressed air connector G1 on the ejector. Maximum tightening torque 10 Nm. Observe the minimum drying time of the threadlocking adhesive



4. Snap the ejector onto the quick-change connector



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

Process Data					
	Parameter	Bit		Access	Remark
Input Data Byte	Part present (H2)	0		ro	Vacuum is over H2 & not yet under H2-h2
	Air saving function (H1)	1		ro	Vacuum is over H1 & not yet under H1-h1
	-	2		ro	Not used
	Status LED - green	3		ro	Status LED green on
	Status LED - red	4		ro	Status LED red on
	-	5		ro	Not used
	Condition Monitoring Event	6		ro	Details see Index 0x0092
	Error Event	7		ro	Error, code see Index 0x0082
Output Data Byte	Vacuum On	0		wo	Vacuum on/off
	Blow Off	1		wo	Blow off on/off
	-	2		wo	Not used
	-	3		wo	Not used
	-	4		wo	Not used
	-	5		wo	Not used
	-	6		wo	Not used
	-	7		wo	Not used

Parameter								
SPDU Index dec      hex		Parameter	Data width	Value range	Access	Default value	Remark	
Identification								
7	0x07	Vendor ID	2 bytes		ro	0x00	0x00EA = 234 = J. Schmalz GmbH	
8	0x08					0xEA		
9	0x09					0x01		
10	0x0A	Device ID	3 bytes		ro	0x87	Internal code number	
11	0x0B					0x86		
16	0x010	Vendor name	15 bytes		ro	J. Schmalz GmbH	Manufacturer designation	
17	0x011	Vendor text	15 bytes		ro	www.schmalz.com	Internet address	
18	0x012	Product name	32 bytes		ro	SCPI_SMPi	General product name	
19	0x013	Product ID	17 bytes		ro	10.02.02.00000/00	Order-Nr.	
20	0x014	Product text	30 bytes		ro	SCPI 00 IMP	Order-Code	
21	0x015	Serial number	9 bytes		ro	000000002	Serial number	
22	0x016	Hardware revision	3 bytes		ro		Hardware revision	
23	0x017	Firmware revision	3 bytes		ro		firmware revision	
Online								
64	0x040	System vacuum	2 bytes	0 - 999	ro	0	Unit: mbar	
Initial Setup								
68	0x044	ctr	Air saving function	1 byte	0 - 1	rw	1	0 = not active (off) 1 = active (on) [only available in version ...RD]
69	0x045	blo	Blow-off mode	1 byte	0 - 1	rw	0	0 = Externally controlled blow-off (-E-) 1 = Internally controlled blow-off – time-dependent (-I)
71	0x047	out	Output function	1 byte	0 - 1	rw	0	0 = NO 1 = NC
73	0x049	tyP	Signal type	1 byte	0 - 1	rw	0 / 1	0 = PNP 1 = NPN
74	0x04A	uni	Vacuum display unit	1 byte	0 - 2	rw	0	0 = mbar 1 = kPa 2 = inHg
77	0x04D	Pin	PIN code	2 bytes	0 - 999	rw	0	0 = unlocked >0 = locked
78	0x04E	dCS	disable continuous sucking	1 byte	0 - 1	rw	0	0 = NO 1 = YES
79	0x04F	dPY	Display rotate	1 byte	0 - 1	rw	0	0 = not rotated 1 = rotated
Production Setup								
100	0x064	H-1	Setpoint H1	2 bytes	H1 =< 998 & H1 > (H2+h1)	rw	750	Unit: mbar
101	0x065	h-1	Hysteresis h1	2 bytes	h1 < (H1-H2) & h1 >= 10	rw	150	Unit: mbar
102	0x066	H-2	Setpoint H2	2 bytes	H2 < (H1-h1) & H2 > h2+2	rw	550	Unit: mbar
103	0x067	h-2	Hysteresis h2	2 bytes	h2 < H2-2 & h2 >= 10	rw	10	Unit: mbar
106	0x06A	tbl	Duration automatic blow	2 bytes	10 - 999	rw	20	Unit: 1 ms x 10
Calibration								
120	0x078	UAC	Vacuum sensor offset Cal	1 byte	0 - 1	wo	0	0 = Nothing 1 = Zero offset; After calibrating 0
123	0x07B	rES	Factory defaults	1 byte	0 - 1	wo	0	0 = Nothing 1 = Restore; After restoring 0
Diagnose								
Error								
130	0x082	Exx	Error-Code	1 byte	0-255	ro	0	1-99 = Error-code 100-199 = Internal error code
Counter								
140	0x08C	cc1	Vacuum-on counter	4 bytes	0 - 999 mio	ro	0	Not erasable
141	0x08D	cc2	Valve operating counter	4 bytes	0 - 999 mio	ro	0	Not erasable
Condition Monitoring [CM]								
146	0x092		Condition monitoring	1 byte	0 - 255	ro	0	0 = no warning 1 = Valve protection aktiv 8 = H1 in gripping cycle





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