

Operating instructions

Compact Ejector SCPS-L

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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1 Important Information

1.1 Note on Using this Document

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

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

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

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

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

1.2 The technical documentation is part of the product

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

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

1.3 Type Plate

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

The type plate contains the following information:

- Pneumatic symbol
- QR code
- Part sales designation/type
- Part number
- Manufacturing date
- Serial number
- Permitted pressure range
- Operating voltage



1.4 Symbols



This symbol indicates useful and important information.

- ✓ This symbol represents a prerequisite that must be met prior to an operational step.
- ▶ This symbol represents an action to be performed.
- ⇒ This symbol represents the result of an action.

Actions that consist of more than one step are numbered:

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

2 Fundamental Safety Instructions

2.1 Intended Use

The ejector is designed to generate a vacuum for gripping and transporting objects when used in conjunction with suction cups. The ejector is operated with discrete control signals.

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 Qualifications

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

1. Task only qualified personnel to perform the tasks described in these Operating instructions.
2. The product must be operated only by persons who have undergone appropriate training.

These Operating instructions are intended for fitters who are trained in handling the product and who can operate and install it.

2.4 Residual Risks

The ejector emits noise due to its use of compressed air.



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.

2.5 Warnings in This Document

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

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

2.6 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

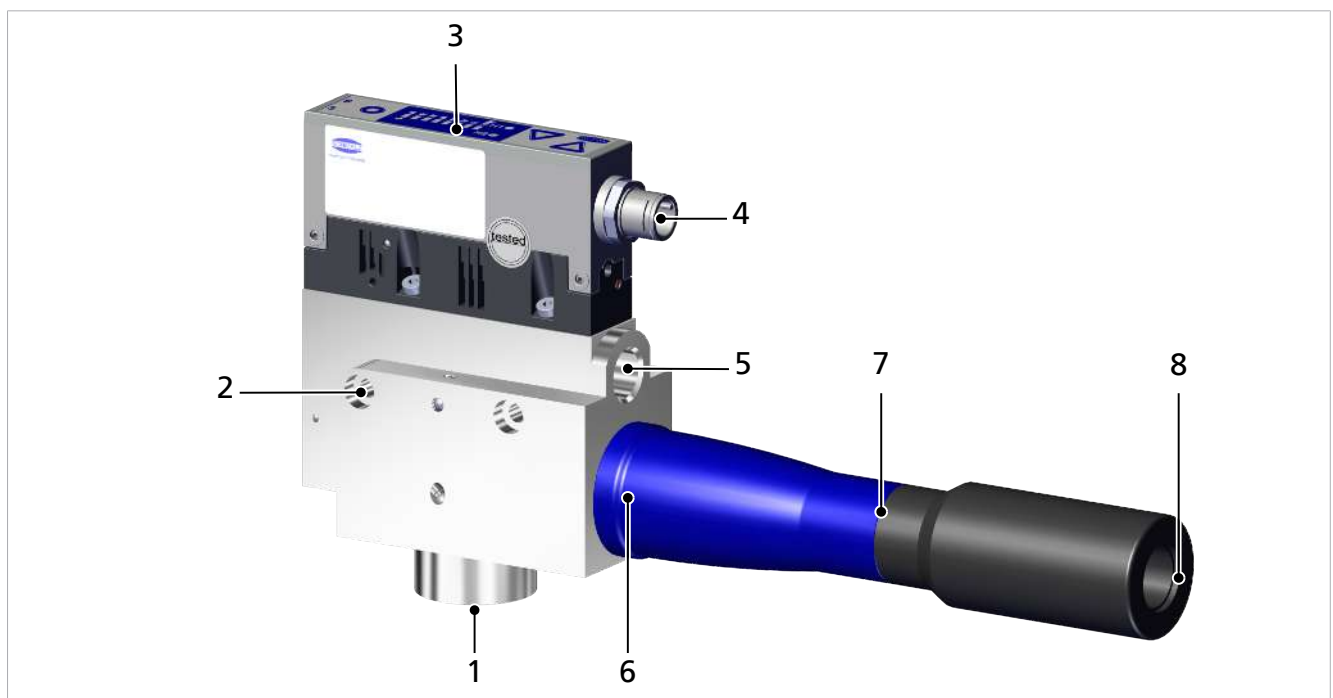
The breakdown of the item designation (e.g. SCPSi-L HF 3-16 NC RD M12-5 PNP) is as follows:

Property	Variants
Type of ejector	SCPSi-L, version with display SCPS-L, version with bar display
Shape	HF for "High Flow" HV for "High Vacuum"
Nozzle size	2-07 / 2-09 / 2-13 / 2-16 / 3-13 / 3-16 / 3-18 ²⁾ / 3-20
Controller	NO for "normally open" NC for "normally closed"
Control ¹⁾	RD for "with digital control" No specification for "without control"
Electrical connection	M12-5 connector
Signal type for signal inputs and outputs	NPN PNP

¹⁾ In the case of ejectors without the RD designation (digital control), vacuum control and the associated functions are not available.

²⁾ Black HF edition

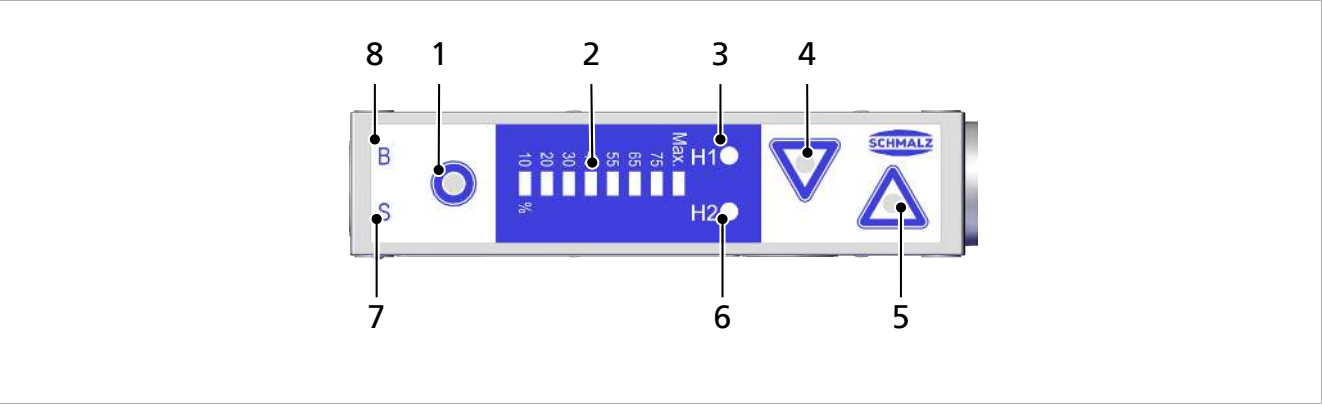
3.2 Ejector Structure



1	1/2" vacuum connection	2	Mounting hole (2x)
3	Display and control element	4	M12 electrical connection
5	1/4" compressed air connection	6	Ejector nozzle (covered)
7	Silencer with thread and snap closure	8	Exhaust outlet

3.3 Display and Operating Element in Detail

Simple ejector operation is ensured with 3 buttons, the bar display and 4 LEDs for status information. The current system vacuum is always displayed in the 8-digit LED bar display.



1	MENU BUTTON	5	UP BUTTON
2	LED bar display	6	H2 limit value LED
3	H1 limit value LED	7	LED process state "suction"
4	DOWN BUTTON	8	LED process state "blow off"

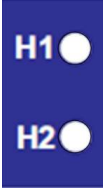
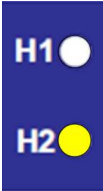
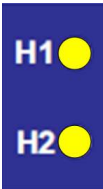
Definition of the LED indicators

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

Display		Ejector state
<div><div>B</div><div>S</div></div>	LEDs are both off	No suction from ejector
<div><div>B</div><div>S</div></div>	LED for the suction function is constantly lit	Ejector sucks or is under control
<div><div>B</div><div>S</div></div>	LED for the blow off function is constantly lit	Ejector blowing off

Meaning of the Vacuum Limit Value LEDs

The LEDs for the vacuum limit values H1 and H2 indicate the current level of the system vacuum relative to the configured limit values. The display is independent of the switching function and the assignment of the output.

Display		Ejector state
	LEDs are both off	Rising vacuum: $\text{Vacuum} < \text{H2}$ Falling vacuum: $\text{Vacuum} < (\text{H2}-\text{h2})$
	H2 LED lit steadily	Rising vacuum: $\text{Vacuum} > \text{H2}$ and $< \text{H1}$ Falling vacuum: $\text{Vacuum} > (\text{H2}-\text{h2})$ and $< (\text{H1}-\text{h1})$
	Both LEDs continuously lit	Rising vacuum: $\text{Vacuum} > \text{H1}$ Falling vacuum: $\text{Vacuum} > (\text{H1}-\text{h1})$

Additional Display Functions on the LED Bar Display

The current system vacuum is always displayed in the 8-digit LED bar display.

LED bar display	Meaning
Max. LED lights up briefly	Supply pressure present, otherwise no LED is active
Entire LED bar lights up Max. LED flashes rapidly	$\text{Vacuum} > \text{permitted range}$
Max. LED flashes rapidly	Voltage supply $> \text{permitted range}$
10% LED flashes rapidly	$\text{Vacuum} < \text{permitted range}$ (for example, during blow off)

4 Technical Data

4.1 General Parameters

Parameter	Symbol	Limit value			Unit	Comment
		min.	typ.	max.		
Working temperature	T _{amb}	0	---	50	° C	---
Storage temperature	T _{sto}	-10	---	60	° C	---
Humidity	H _{rel}	10	---	90	% r.h.	Free from condensation
Degree of protection	---	---	---	IP65	---	---
Operating pressure (flow pressure)	P	3	4.2	6	bar	---
Max. vacuum	p	---	---	-910	mbar	---
Precision of vacuum sensor	---					± 3% FS (full scale)
Operating medium	Air or neutral gas, 5 µm filtered, with or without oil, class 3-3-3 compressed air quality in acc. with ISO 8573-1					

4.2 Electrical Parameters

Parameter	Symbol	Limit values			Unit	Comment
		min.	typ.	max.		
Supply voltage	U_{SA}	22.8	24	26.4	V DC	PELV ¹⁾
Power consumption from $U_{S/A}$ ²⁾ with NO variant	$I_{S/A}$	---	50 ⁴⁾	120	mA	$U_{S/A} = 24.0$ V
Power consumption from $U_{S/A}$ ²⁾ with NC variant	$I_{S/A}$	---	40 ⁴⁾	70	mA	$U_{S/A} = 24.0$ V
Voltage of signal output (PNP)	U_{OH}	$U_{S/SA} - 2$	—	$V_{S/SA}$	V_{DC}	$I_{OH} < 140$ mA
Voltage of signal output (NPN)	U_{OL}	0	—	2	V_{DC}	$I_{OL} < 140$ mA
Power consumption of signal output (PNP)	I_{OH}	---	—	140	mA	Short-circuit-proof ³⁾
Power consumption of signal output (NPN)	I_{OL}	---	—	-140	mA	Short-circuit-proof ³⁾
Voltage of signal input (PNP)	U_{IH}	15	—	$U_{A/SA}$	V_{DC}	In reference to $Gnd_{A/SA}$
Voltage of signal input (NPN)	U_{IL}	0	—	9	V_{DC}	In reference to $U_{A/SA}$
Current of signal input (PNP)	I_{IH}	—	5	—	mA	—
Current of signal input (NPN)	I_{IL}	—	-5	—	mA	—
Reaction time of signal inputs	t_i	—	3	—	ms	—
Reaction time of signal outputs	t_o	1	—	200	ms	Adjustable

1) The power supply 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) Plus the output currents

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) Mean value

4.3 Factory Settings

Parameter	Value of the factory setting
Limit value H1	Max. RD variant: 750 mbar
Hysteresis value h1	Max. RD variant: 150 mbar
Control (RD variant only)	Activated
Limit value H2	550 mbar
Hysteresis value h2	10 mbar
Permanent suction	Deactivated
Blow off function	Externally controlled blow off
Vacuum unit	Vacuum unit in mbar
Signal output	"Normally open" contact = no

4.4 Performance Data

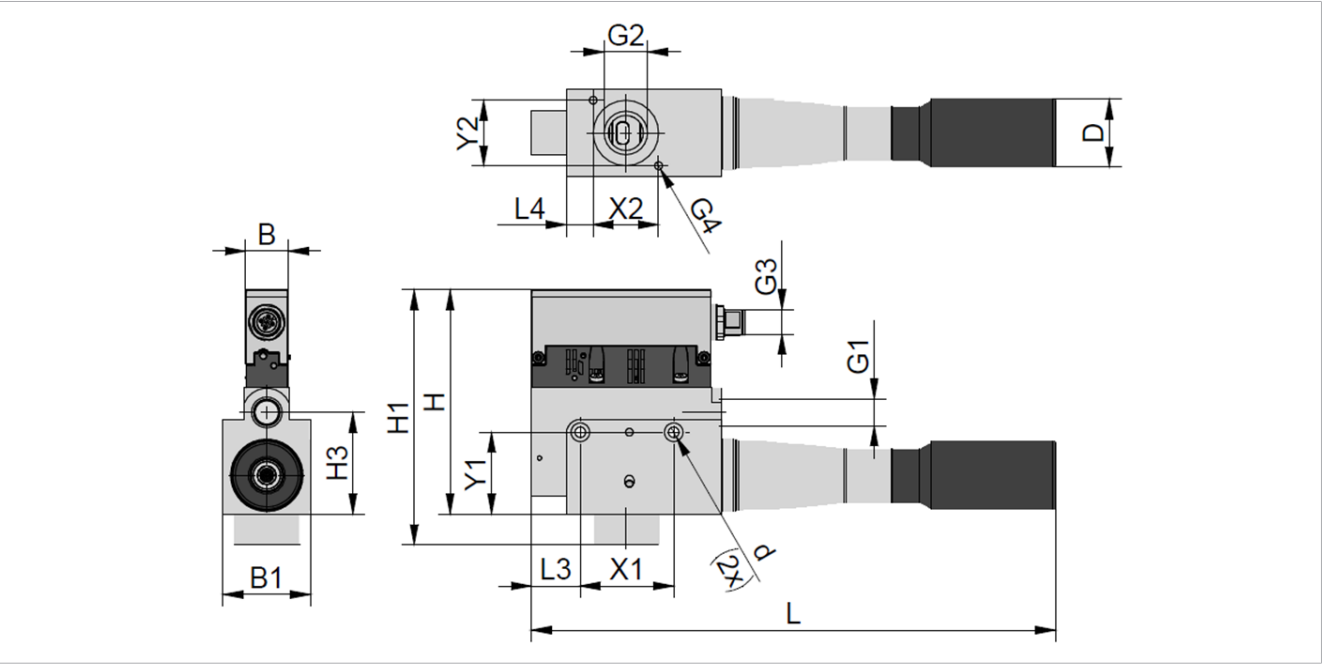
Type	SCPS-L- 2-07 HV	SCPS-L- 2-09 HV	SCPS-L- 2-13 HF	SCPS-L- 2-16 HV
Nozzle size [mm]	0.7	0.9	1.3	1.6
Max. vacuum ¹ [%]	85		61	90
Suction rate ¹ [l/min]	37	70	145	129
Air consumption ¹ (suction) [l/min]	22	45	71	98
Sound level ¹ , unobstructed suction [dBA]	74	77	76	77
Sound level ¹ , suction [dBA]	62		63	
Max. blow off capacity ¹ [l/min]	130			
Weight [kg]	0.5			

Type	SCPS-L- 3-13 HF	SCPS-L- 3-16 HV	SCPS-L- 3-18 HF ²⁾	SCPS-L- 3-20 HV
Nozzle size [mm]	1.3	1.6	1.8	2.0
Max. vacuum ¹ [%]	61	90	65	90
Suction rate ¹ [l/min]	232	227	320	323
Air consumption ¹ (suction) [l/min]	71	102	130	172
Sound level ¹ , unobstructed suction [dBA]	69	80	69	81
Sound level ¹ , suction [dBA]	61	72	61	77
Max. blow off capacity ¹ [l/min]	130			
Weight [kg]	0.5			

¹⁾ at 4.5 bar

²⁾ Black HF edition

4.5 Dimensions

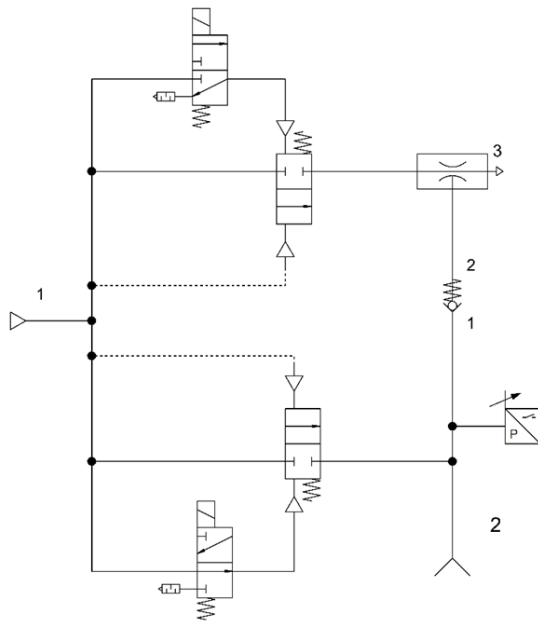


B	B1	H	H1	H3	Y1	Y2	X1	X2
17.6	37.5	95.75	109	56.5	35	28	40	28
G1	G2	G3	G4	L	L3	L4	D	d
1/4" internal thread	1/2" internal thread	M12x1 external thread, 5-pin	M4 internal thread	Max. 230	21	11.5	29	4.5

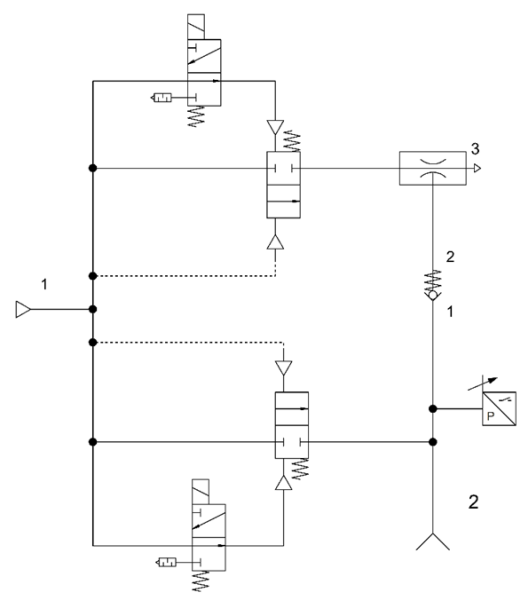
All specifications are in mm

4.6 Pneumatic Circuit Plans

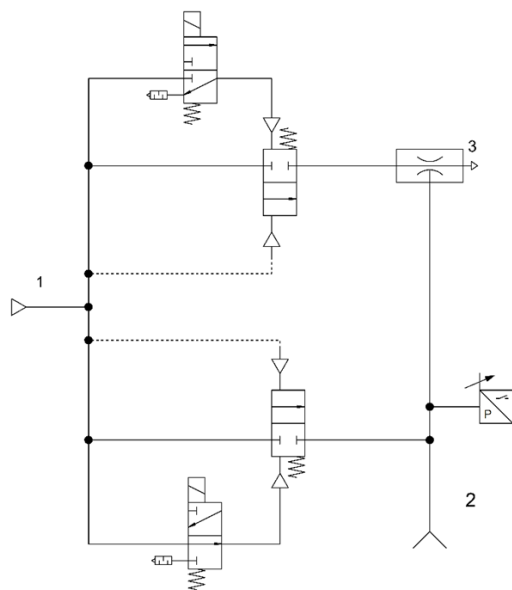
SCPS-L...NO... RD



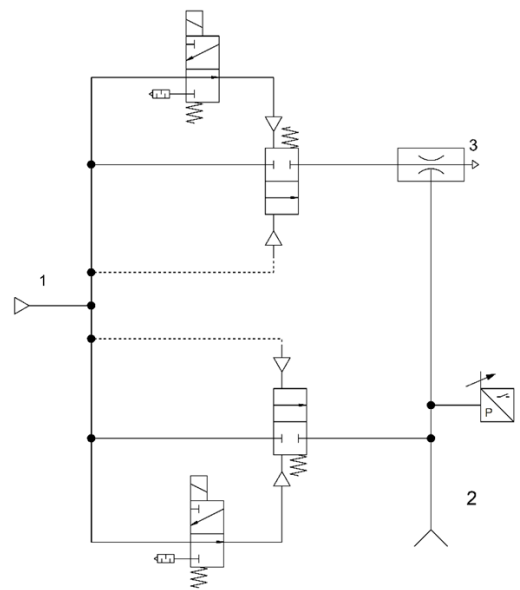
SCPS-L...NC...RD



SCPS-L...NO...



SCPS-L...NC...



5 General Description of Functions

5.1 Picking up the Workpiece (Vacuum Generation)

The ejector is designed for vacuum handling of airtight parts 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 or exhaust air channel.

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

- In the NO (normally open) variant, the venturi nozzle is deactivated when the suction signal is received.
- In the NC (normally closed) variant, the venturi nozzle is activated when the suction signal is received.

An integrated sensor records the vacuum generated by the venturi nozzle. This is evaluated by an electronics system and serves as the basis for displaying the system states and switching the output. The vacuum level is shown in the bar display.

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

- The electronics switch off the venturi nozzle as soon as the set vacuum limit value 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 H1-h1 due to leakages, the venturi nozzle is switched back on.



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.

5.2 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 to be deposited quickly.

The ejector provides two blow off modes for selection:

- **Externally controlled blow off:** The “blow off” valve is controlled directly by the “blow off” signal input. The ejector switches to blow off mode for as long as the signal is present.
 - **Internally time-controlled blow off:** The “blow off” valve is automatically activated for the configured time period as soon as the ejector leaves “suction” mode. This function makes it possible to save an output on the controller.
- The internal time-controlled blow off is activated by setting a value greater than zero for the blow off time.



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.

5.3 Operating Modes

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

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.

5.3.1 Operation and Settings

The three keys on the foil keypad are used for operation and setting the parameters. If no parameters are set, the ejector is in display mode. The current vacuum is displayed.

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

5.3.2 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.

Activating the operating mode

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

Manual suction

1. Press the **UP** button to activate "suction" on the ejector.
2. The **DOWN** or **UP** button exits "suction" mode again.

When the air saving function is switched on, it is also active in the "Manual Operation" operating mode.

Manual blow off

- ▶ Press the **DOWN** button to activate "blow off" on the ejector for as long as the button is pressed.
- ⇒ The H1 and H2 LEDs light up simultaneously.

Deactivating the operating mode

- By pressing the **MENU** button or through an external state change by signal inputs.

5.4 Viewing and Setting Parameters

The following ejector parameters can be set depending on the ejector variant:

Ejector variant	Standard	RD
Vacuum limit value H1 for the control	✗	✓
Vacuum limit value H2 for the signal output	✓	✓
Blow off duration for time-controlled blow off	✓	✓

The hystereses associated with the vacuum limit values are fixed. The hysteresis h2 is always 10 mbar.

The following tables show the various setting options with the corresponding parameter sets. A parameter set is selected using the ejector buttons and is described in the next section.

Parameter sets for the RD ejector variant:

For H1, the hysteresis h1 is always 20% of the H1 value.

LED bar display	H1	h1	H2	h2	Blow off time
0%	—	—	—	—	External
10%	—	—	100 mbar	10 mbar	20 ms
20%	200 mbar	40 mbar	200 mbar	10 mbar	50 ms
30%	300 mbar	60 mbar	300 mbar	10 mbar	100 ms
40%	400 mbar	80 mbar	400 mbar	10 mbar	250 ms
55%	550 mbar	110 mbar	550 mbar	10 mbar	500 ms
65%	650 mbar	130/75 mbar ¹⁾	650 mbar	10 mbar	750 ms
75%	750 mbar	150/75 mbar ¹⁾	750 mbar	10 mbar	1000 ms
Max.	Control function deactivated		—	—	1500 ms

¹⁾ If a value > (H1-h1) is selected for H2, the hysteresis h1 is dynamically adjusted so that (H1-h1) is 25 mbar above H2.

With manual setting, the value set for H1 must always be greater than the value set for H2. Only settings that meet this specification can be made.

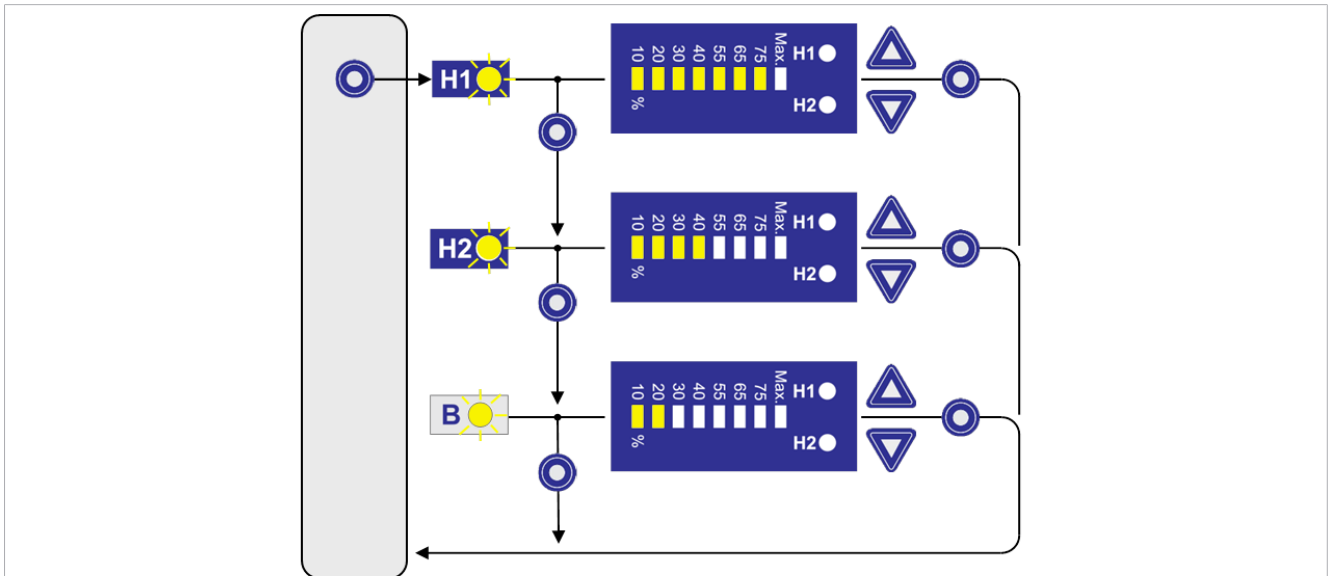
Parameter sets for the standard ejector variant

LED bar display	H1	H2	h2	Blow off time
0%	—	—	—	External
10%		100 mbar	10 mbar	20 ms
20%	Max. mbar	200 mbar	10 mbar	50 ms
30%	Max. mbar	300 mbar	10 mbar	100 ms
40%	Max. mbar	400 mbar	10 mbar	250 ms
55%	Max. mbar	550 mbar	10 mbar	500 ms
65%	Max. mbar	650 mbar	10 mbar	750 ms
75%	Max. mbar	750 mbar	10 mbar	1000 ms
Max.	Max. mbar	—	—	1500 ms

Setting Parameters

The LEDs assigned to the parameters flash to indicate which value is currently being displayed or changed.

Operating structure overview



1. Press the button to select the parameter to be changed:
 Press once => first parameter "Vacuum limit value H1"
 Press twice => second parameter "Vacuum limit value H2"
 Press three times => third parameter "Blow off time"
 ⇒ The LED for the selected parameter flashes.
2. Change the selected parameter by pressing the or button.
 ⇒ The bar display LED increases or decreases.
3. Press the button to leave adjustment mode.
 ⇒ The value will flash briefly to indicate that a changed parameter is being applied.

5.5 Locking the Keypad

- ✓ The ejector is not in any menu.
- ▶ Pressing the **MENU** and **DOWN** buttons at the same time locks the buttons.
- ▶ Pressing both buttons again unlocks the keypad.

5.6 Vacuum Monitoring

The ejector has an integrated sensor for monitoring the current system vacuum. The vacuum level provides information about the process and has an effect on the following signals and parameters:

- The limit value LED H1
- The limit value LED H2
- The signal output H2

5.7 Signal Output

The ejector has a signal output.

The signal output is a normally open (NO) contact and cannot be changed.

The signal output is switched on or off when the system vacuum is higher or lower than the relevant limit value.

5.8 Control function (only with RD variant)

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

The control function can be deactivated by setting the limit value for H1 to "Max."

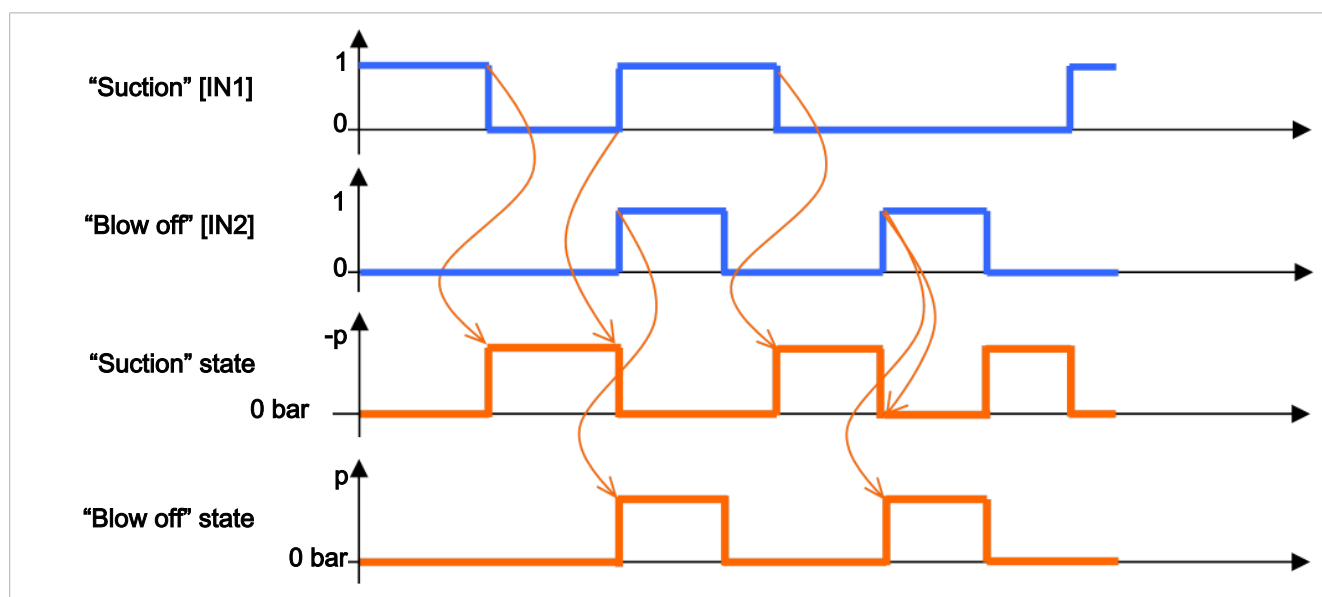
5.9 Supply Voltage Display

In operating modes in which no LEDs are activated, the "Max" LED lights up briefly. This indicates a supply voltage.

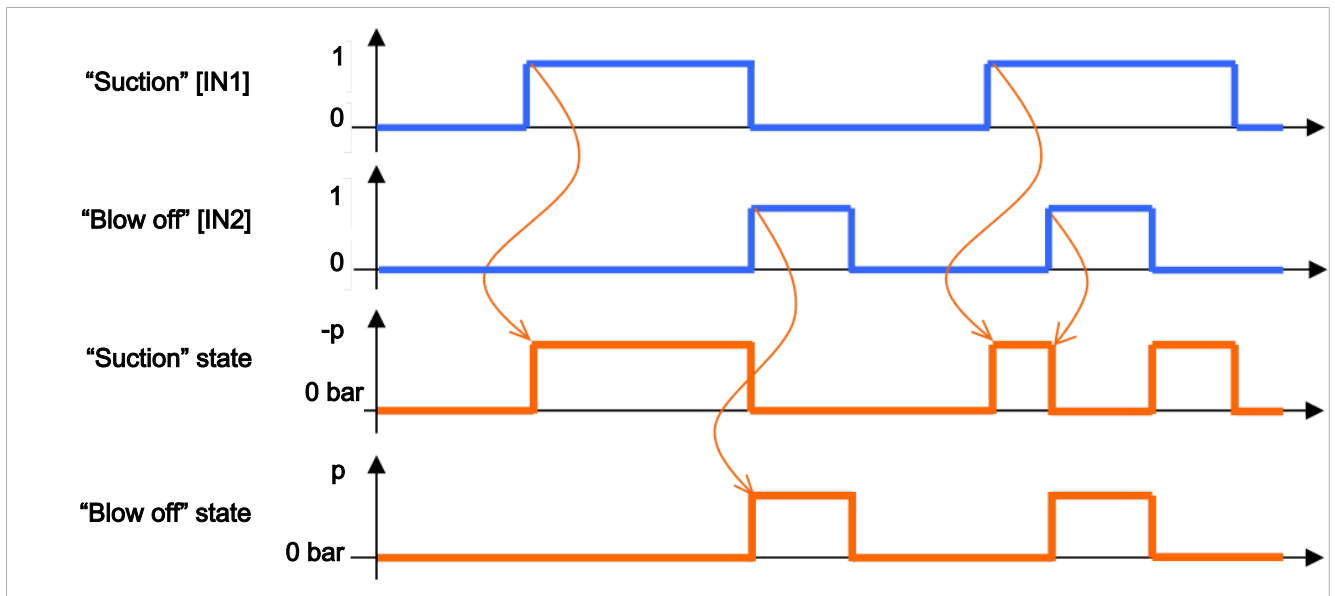
5.10 Signal Type

The signal type, or the ejector switching behavior (PNP or NPN) of the electrical signal inputs and the signal output, is permanently set on the device and is therefore dependent on the ejector version.

5.11 Control Concept for NO Ejectors



5.12 Control Concept for NC Ejectors



5.13 Vacuum unit

The vacuum level in the LED bar is shown as a percentage of the maximum possible vacuum.

If the vacuum is outside the permitted range, the LED next to this bar flashes rapidly. That means the LED flashes "10%" when overpressure is applied.

6 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 Installation

7.1 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.

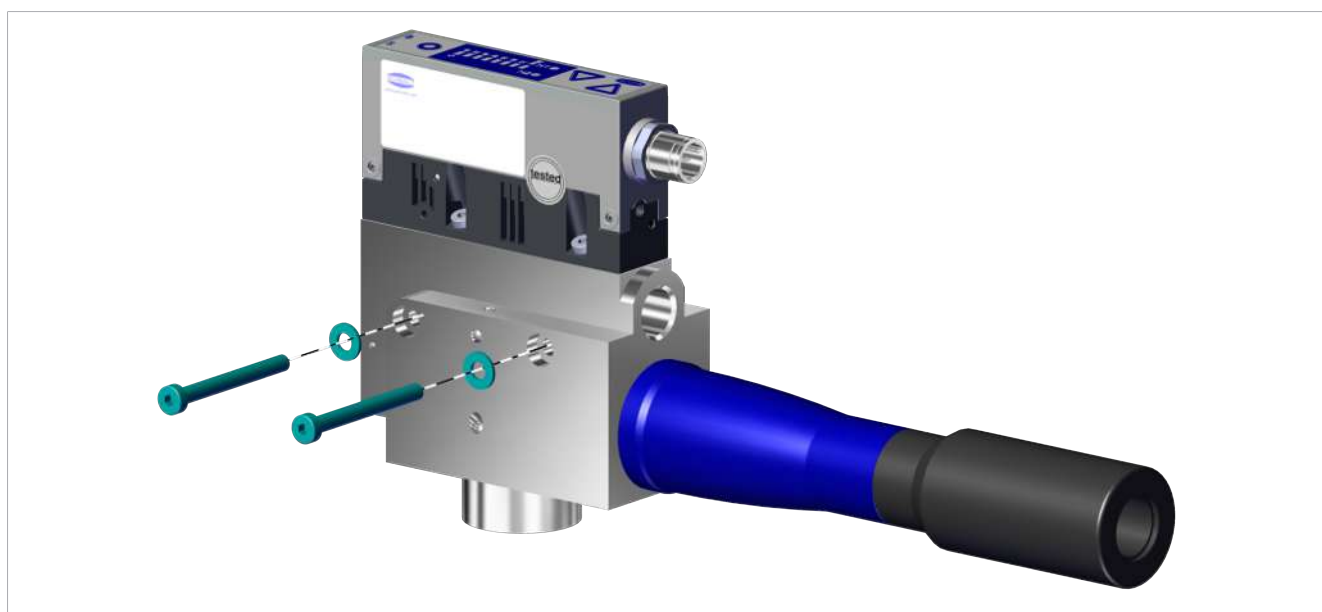
For safe installation, the following instructions must be observed:

- 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.

7.2 Mounting

The ejector may be installed in any position.

There are two 4.3 mm mounting holes for mounting the ejector.



When mounting with fastening screws, use M4 washers (2 Nm max. tightening torque).

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

The vacuum circuit is connected to the vacuum connection.

The installation process is described and explained in detail below.

7.3 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



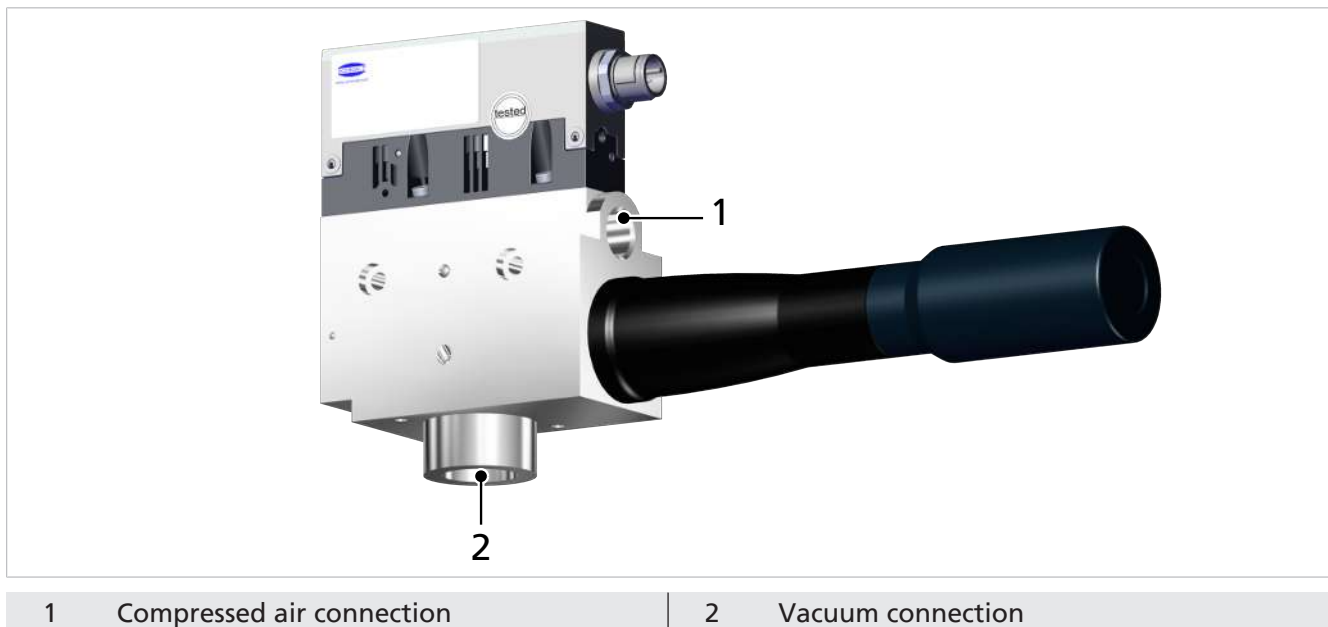
⚠ CAUTION

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

Hearing damage

- ▶ Correct installation.
- ▶ Wear ear protectors.

7.3.1 Connecting the Compressed Air and Vacuum



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

- ▶ Connect the compressed air hose. The max. tightening torque is 4 Nm.

The 1/2" thread vacuum connection is marked with the number 2 on the ejector.

- ▶ Connect the vacuum hose. The max. tightening torque is 4 Nm.

7.3.2 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 unoled.
 - 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 has the dimensions required for the ejector 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 resistance 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 ¹⁾	
	pressure side	Vacuum side
SCPS-L 2-07	4	4
SCPS-L 2-09	4	6
SCPS-L 2-13	4	9
SCPS-L 2-16	6	9
SCPS-L 3-13	6	12
SCPS-L 3-16	6	11
SCPS-L 3-18 ²⁾	6	14
SCPS-L 3-20	6	12

¹⁾ Based on a maximum hose length of 2 m.

²⁾ Black edition

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

7.4 Electrical connection



WARNING

Electric shock

Risk of injury

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

**⚠ WARNING**

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

Personal injury

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

**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.

**NOTE****Power load too high**

Destruction of the vacuum switch, as there is no protection against overloading!

- ▶ Prevent constant load currents > 0.1 A.

The electrical connection is established using a 5-pin M12 connector that supplies the device with voltage, and contains the two input signals and the output signal. The inputs and outputs are not electrically isolated from one another.

The ejector can:

- be connected directly to the controller, for example, using connection cable part no. 21.04.05.00080, or
- use an IN/OUT box.

The maximum permitted cable length for the supply voltage, the signal inputs and the signal output is 30 m.

Establish the ejector's electrical connection using plug connector 1 as shown in the figure.



1 Electrical connection plug, M12, 5-pin

- ✓ Prepare a connection cable with an M12 5-pin connector (supplied by the customer).
- ▶ Attach the connection cable to the electrical connection (1) on the ejector (max. tightening torque = hand-tight).

7.4.1 PIN Assignment

PIN assignment, M12 5-pin connector

M12 connector	Pin	Wire color ¹⁾	Symbol	Function
	1	Brown	$U_{S/A}$	Supply voltage for sensors/actuators
	2	White	IN1	"Suction" signal input
	3	Blue	$GND_{S/A}$	Ground for sensors/actuators
	4	Black	OUT	"Part Present" check signal output (H2/h2)
	5	Gray	IN2	"Blow off" signal input

¹⁾ When using Schmalz connection cable part no. 21.04.05.00080

7.5 Process Data

During operation of the ejector, all input and output signals are connected to a controller, either directly or using intelligent terminal boxes.

For this purpose, not only the supply voltage but also two input signals and one output signal should be connected to allow the ejector to communicate with the controller.

The basic ejector functions such as suction, blow off and feedback are used with these signals.

In detail, they are:

Process data INPUT

Signal	Symbol	Parameter
0	OUT 1	Vacuum limit value H2 ("Part Present" check)





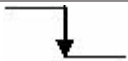



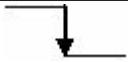
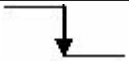
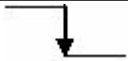
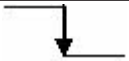
Process data OUTPUT

Signal	Symbol	Parameter
0	IN 1	Suction ON/OFF
1	IN 2	Blow off ON/OFF

7.6 Start of Operations

A typical handling cycle is divided into the following three phases: pickup, blowoff and idle.

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

Phase	Switching step	NC version			NO version		
		Signal		Status	Signal		Status
1	1		IN1	Suction ON		IN1	Suction ON
	2		OUT	Vacuum > H2		OUT	Vacuum > H2
2	3		IN1	Suction OFF		IN1	Suction OFF
	4		IN2	Blow off ON		IN2	Blow off ON
3	5		OUT	Vacuum < (H2-h2)		OUT	Vacuum < (H2-h2)
	6		IN2	Blow off OFF		IN2	Blow off OFF



Signal status changes from inactive to active.



Signal status changes from active to inactive.

8 Operation

8.1 Safety Instructions for Operation



⚠ WARNING

Suspended load

Risk of serious injury

- ▶ Do not walk, stand or work under suspended loads.



⚠ WARNING

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

Risk of injury to persons and damage to property due to uncontrolled movements of the higher-level machine/system!

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



⚠ 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.



CAUTION

When the system is started in automatic operation, components move without advanced warning.

Risk of injury

- ▶ Ensure that the danger zone of the machine or system is free of persons during automatic operation.
-

8.2 General Preparations

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 ejector for visible damage and deal with any problems immediately (or notify your 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.

There must be no people in the system danger area while it is in operation.

9 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	Press-in screen in contaminated	▶ Replace screen
	Silencer is dirty	▶ Replace 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
Load cannot be held	Vacuum level too low	1. Increase the control range for the air saving function 2. Increase operating pressure, observe maximum limits
	Suction cup too small	▶ Select a larger suction cup

10 Maintenance

10.1 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!

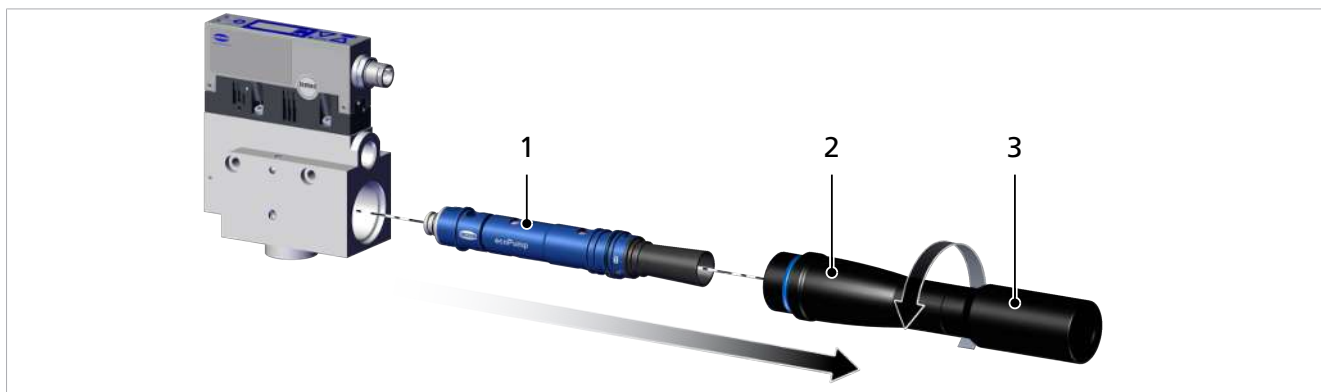
- ▶ Always switch off the supply voltage before carrying out maintenance work.
- ▶ Secure it so that it cannot be switched back on.
- ▶ The ejector must be operated only with a silencer and press-in screen(s).

10.2 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.

10.3 Removing the Ejector Module

The ejector module (1) is fixed in the main body by the screwed-in holder cap (2).



- ▶ Loosen holder cap (2) and pull out ejector module (1).
(The silencer (3) remains on the holder cap.)

10.4 Replacing the Silencer

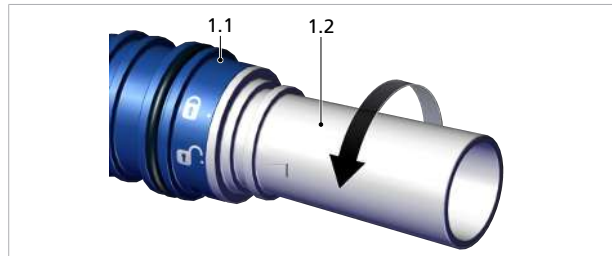
Heavy infiltration of dust, oil, and so on, may contaminate the silencer (3) and reduce the suction capacity. Cleaning the silencer is not recommended due to the capillary effect of the porous material.

If the suction capacity decreases, replace the silencer:

- ▶ Remove the silencer (3) from the holder cap (2) through a pulling and turning motion

10.5 Opening and Cleaning the Ejector Module

- ▶ Turn the nozzle fitting (1.2) to the "unlocked" position relative to the main body (1.1)



1. Pull the nozzle fitting out of the main body using only axial forces



2. Blow off with compressed air or clean under running water

For more information about cleaning, see the "Cleaning the Ejector" section.

10.6 Mounting the Ejector Module and Silencer

Reinstall the parts following cleaning or replacement:

1. Carefully push the nozzle fitting (1.2) into the main body (1.1).
Turn the nozzle fitting to the "locked" position relative to the main body
2. Clip the silencer (3) onto the holder cap (2).
There must not be any remaining gap.
3. Push the ejector module into the main body of the ejector.
4. Screw on the holder cap and tighten it with a tightening torque of 0.5 Nm.

10.7 Cleaning the Press-in Screen

There is a press-in screen in the compressed air connection of the ejector. Dust, shavings and other solid materials may accumulate in the screen over time.

- ▶ If the performance drops noticeably, clean the sieve with a paintbrush.

If it is heavily soiled, you can send the ejector to Schmalz for repair (soiled sieves are replaced) subject to a fee.

11 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.

12 Spare and Wearing Parts, Accessories

12.1 Spare and wearing parts

Maintenance work may only be carried out by qualified personnel.

- ▶ **WARNING! Risk of injury due to improper maintenance!** After performing any maintenance or repair work, check that the system is functioning correctly, particularly the safety features.



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).

The following list contains the primary spare and wearing parts.

Part no.	Designation	Legend
10.02.01.01450	ERS-SET SEP-22 6xRUE-KLAP Only for SEP with outer Ø 22 2-13, 2-16, 3-16, 3-20 / not for nozzles 2-07 and 2-09	S
10.02.01.01517	Silencer (round) SD 29x70 SHC 22	W
10.02.01.01831	Silencer (round) SD 29x121.5 SHC Only for SEP with outer Ø 22, 2-13, 2-16, 3-16, 3-20 / not for nozzles 2-07 and 2-09	W

Legend:

- Wearing part = **W**
 - Spare part = **S**
- ▶ When tightening the fastening screws on the silencer module, observe the maximum tightening torque of 0.5 Nm.

When you replace the silencer insert, we recommend that you also replace the insulating plate.

12.2 Accessories

Part no.	Designation	Note
21.04.05.00211	Connection cable	M12, 5-pin socket, to 5-pin M12 connector, 2 m
21.04.05.00080	Connection cable	M12, 5-pin, with open end, 5 m
21.04.05.00207	Connection cable	WB-M12-5 5000 K-5P, PUR, angled
21.04.05.00158	Connection cable	B-M12-5 1000 S-M12-5, 1 m
10.02.02.03490	Connection distributor	M12, 5-pin, to 2xM12, 4-pin
10.02.01.01397	SEP HV 3 16 22	Ejector module, multi-stage nozzle, for SCPS...3-16
10.02.01.01631	SEP HV 3 20 22	Ejector module, multi-stage nozzle, for SCPS...3-20
10.02.01.01514	SHC 3 22	Holder cap for SCPS...3-16
10.02.01.01810	SHC 3 22	Holder cap for SCPS (not 3-16)
10.08.02.00300	STV-GE, 1/2" external thread, 14	Plug-in screw union, straight, for SCPS...3-16
10.08.03.00162	ST, 1/2" external thread, 13 MS-V	Hose sleeve, for SCPS...3-20
10.07.01.00126	VFT, 1/2" internal thread, 100	Vacuum cup filter, replaceable filter

13 Decommissioning and Recycling

13.1 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.

13.2 Materials Used

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

14 Declarations of Conformity

14.1 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.

14.2 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.

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