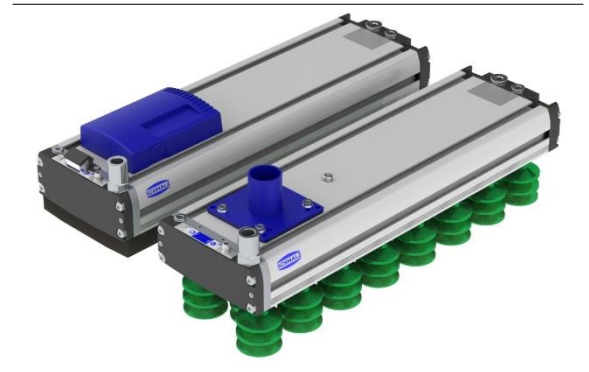




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Area gripper FXP-i/FMP-i

Operating Instructions

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 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. It must be accessible to the user at all times.
3. Pass on the technical documentation to subsequent users.
 - ⇒ Failure to follow the information in these operating instructions may result in life-threatening injuries.
 - ⇒ Schmalz is not liable for damage or malfunctions that result from failure to heed these instructions.

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

www.schmalz.com/services

1.2 Note on Using these Operating Instructions

The product FXP-i/FMP-i is generally referred to as the area gripper or gripper.

J. Schmalz GmbH is generally referred to as Schmalz in these operating instructions.

These operating instructions contain important notes and information about the different operating phases of the lifting device:

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

The operating instructions describe the area gripper at the time of delivery by Schmalz.

1.3 Warnings in This Document

Warnings warn against hazards that may occur when handling the product. There are four levels of danger that you can recognize by the signal word.

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

1.4 Symbol



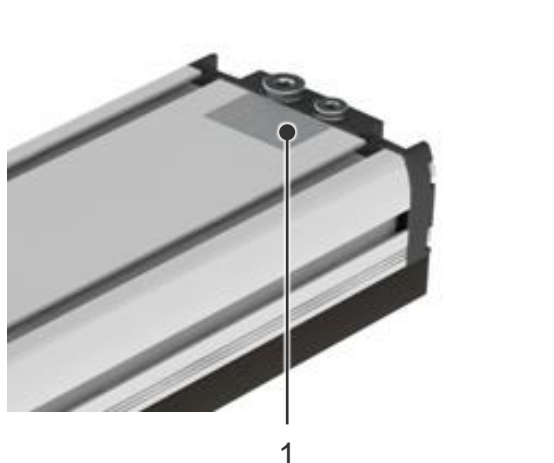
This symbol indicates useful and important information.

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

Actions that consist of more than one step are numbered:

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

1.5 Type Plate



The type plate is permanently attached to the product and must always be clearly legible.

The type plate contains the following data:

- Type
- Part number
- Serial number
- CE label
- Manufacturer and address
- Manufacturing date
- Weight
- Permitted pressure range

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

2 Fundamental Safety Instructions

2.1 Intended Use

The area gripper is used for gripping and transporting loads made of materials that allow suction.

The area gripper is intended exclusively for commercial or industrial use indoors. The order confirmation describes specifically how the area gripper is to be used. All other types of use are considered non-intended use.

Neutral gases in accordance with EN 983 are approved as evacuation media. Neutral gases include air, nitrogen and inert gases. The gripper is designed for automatic operation and not for manual handling. Operations using the device must take place in a secure area where no people are allowed to enter. The device is mounted on the load suspension provided by the customer using the T-slots designated for this purpose. The customer also provides a control device.

The area gripper is built in accordance with the latest standards of technology and is delivered in a safe operating condition. However, hazards can arise during use.

Before handling unfamiliar loads, ensure that the loads to be lifted are sufficiently rigid that they cannot be not damaged during handling. Perform tests to establish this where necessary.

2.2 Non-Intended Use

Schmalz accepts no liability for damages caused by the use of the area gripper for purposes other than those described under intended use. The use of the area gripper for loads that are not specified in the order confirmation or have different physical properties than those specified in the order confirmation shall be considered non-intended use. In particular, the following are considered non-intended use:

- Use as a climbing aid
- Lifting people or animals
- Storing loads while picked up
- Supporting the lifting process by applying external forces
- Picking up building components, equipment or supporting surfaces
- Picking up bulk materials (e.g. granulates) or liquids
- Picking up hazardous media such as dust, oil mists, vapors, aerosols or similar material.
- Picking up aggressive gases or media such as acids, acid fumes, bases, biocides, disinfectants or detergents.
- Evacuating objects that are in danger of imploding
- Applying suction to building components or equipment
- Use in potentially explosive atmospheres
- Use in medical applications
- Use in the food industry
- Use over 1600 m above sea level (The required operating vacuum cannot be achieved.)

2.3 Danger Zone

Persons in the working area of the area gripper may suffer life-threatening injuries.

The danger zone of the gripper is exclusively determined by the automatic system, such as the robot, handling system or gantry, and must be secured by the customer. It includes the following areas:

- The area above and below the gripper or above and below the load
- The area immediately surrounding the gripper and load
- The working area of the system on which the gripper is installed

Measures for avoiding accidents:

- Ensure that no persons are present in the danger zone. The danger zone must be secured by the integrator.
- Ensure that collisions with the surrounding environment and objects are avoided to prevent the load from breaking off.

2.4 Personnel Qualifications

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

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

- Only instruct qualified personnel to perform the tasks described in these operating instructions.
- The product must only be operated by persons who have undergone appropriate training.
- Assembly and adjustment work must only be carried out by qualified personnel.
 - Trained personnel with industrial training and product-specific instruction.
 - Electrical work and installations must only be carried out by qualified electrical specialists.

2.5 Personal Protective Equipment

To avoid injury, always use appropriate protective equipment that is suitable for the situation. The protective equipment must meet the following standards:

- Protective work shoes in safety class S1 or higher
- Ear protectors
- Safety goggles, where applicable
- Safety helmet, where applicable
- Gloves, where applicable
- Fall protection personal protective equipment (fall protection PPE), where applicable

2.6 Technical Condition

The safety and functionality will be impaired if the product is operated in a defective state. Schmalz assumes no liability for consequences of modifications over which it has no control.

1. The product must only be operated when in perfect technical working order – i.e., in its original condition.
2. Follow the maintenance schedule.
3. Only use original spare parts.
4. If the operating behavior should change, check the product for faults. Rectify faults immediately.
5. Unauthorized conversion or modification of the product is prohibited.
6. Safety features must not be disabled under any circumstances.

2.7 Responsibility of the Operating Company

The operating company is also responsible for third parties in the working area of the area gripper. The operating company must ensure that they have the appropriate qualifications and skills. Operation of the product by unauthorized or untrained persons is strictly prohibited. You must never stand in the working area of the product.

1. Ensure that the area gripper cannot be used during maintenance or maintenance work.
2. Clearly define the responsibilities for the various activities performed with the system.
3. Ensure that these responsibilities are adhered to.
4. When handling unfamiliar loads, carry out tests where necessary to ensure safe operation:
 - ⇒ The load is sufficiently rigid that it cannot be damaged during handling.
 - ⇒ The load has sufficient dimensions, is sufficiently airtight and can be lifted safely.

2.8 Country-Specific Regulations for the Operating Company

1. Observe the country-specific regulations regarding accident prevention, safety testing and environmental protection.
2. Only use the area gripper once you have verified that the system employed complies with the country-specific rules and safety regulations.

3 Product Description

3.1 Operating Principle of The Area Gripper

The area gripper is usually connected to a gantry or robot, which makes it possible to lift and move loads.

FXP-i Version

The integrated ejector generates the vacuum required for this purpose. The vacuum keeps the load attached to the area gripper.

FMP-i Version

On the version for external vacuum generators, the vacuum, which is provided by a blower, is switched on and off as required by the integrated valve.

3.2 Picking up the Load

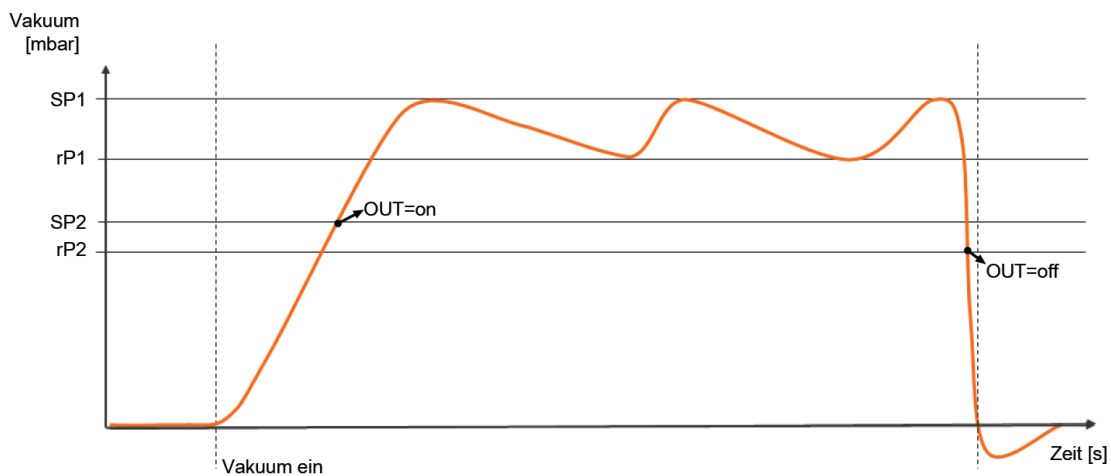
FXP-i Version

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. The exact vacuum level is shown on the display and can be read from the IO-Link process data.

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



The integrated ejector has an air saving function and can control the vacuum automatically when the control function is activated in suction mode:

- The electronics switch the venturi nozzle off as soon as the vacuum limit value set for switching point SP1 is reached.
- When objects with airtight surfaces are picked up, the integrated non-return valve prevents the vacuum from dropping.
- If leakages cause the system vacuum to drop below the limit value configured for the switching point rP1, the venturi nozzle is switched back on.
- The OUT output is set once a workpiece is picked up securely, based on the vacuum value. This enables the further handling process.

FMP-i Version

On the version for external vacuum generators, the valve is opened using the suction command. This ensures that the vacuum reaches the inside of the gripper so that products can be lifted.

- In the NO (normally open) variant, the valve is closed when the suction signal is received.
- In the NC (normally closed) variant, the valve is opened when the suction signal is received.

An integrated sensor measures the vacuum. The exact vacuum level is shown on the display and can be read from the IO-Link process data.

The air saving function is not available for the FMP-i version. The valve is controlled exclusively via signals.

3.2.1 Setting Down the Load

In blow-off mode, the ejector is deactivated and the valve is closed, and the inside of the gripper is supplied with compressed air. This ensures that the vacuum drops quickly, thereby depositing the workpiece quickly.

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

The gripper provides three blow off modes for selection:

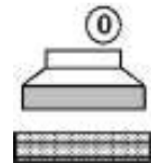
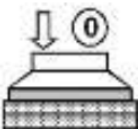
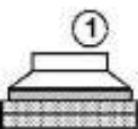

- Externally controlled blow off
- Internally time-controlled blow off
- Externally time-controlled blow off
- Optional: external blow off

3.2.2 Description of Functions: Valve Technology SVK**NOTE****Tilting the area gripper with SVK technology**

Limitations of the functionality

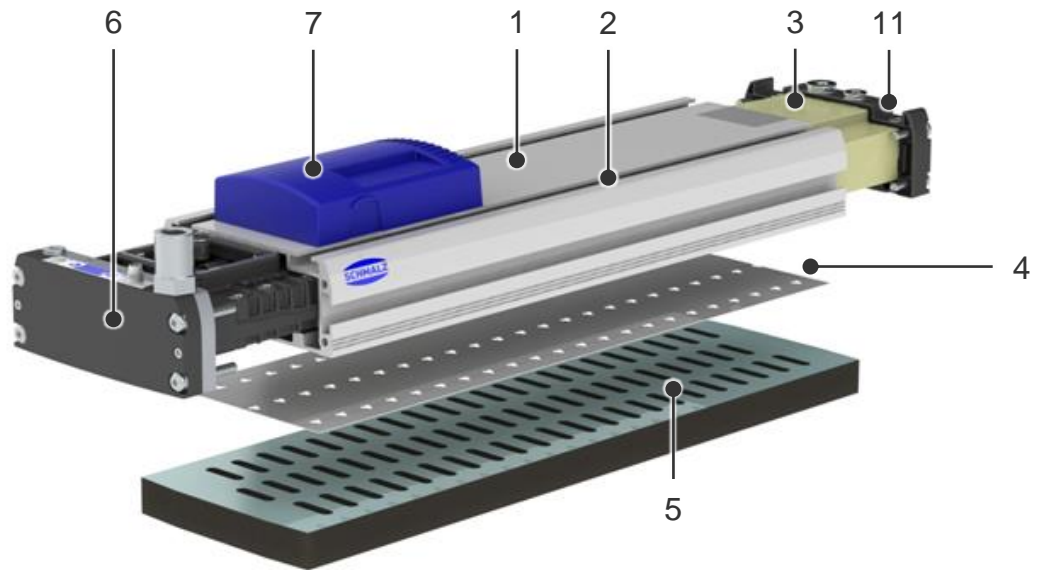
The valve technology SVK functions optimally when the gripper is used exclusively horizontally.

- Maximum permitted swivel angle relative to the horizontal: 60°.
 - Maximum permitted acceleration in the vertical direction: 5 m/s².
 - It is not possible to provide additional suction or pick up other products later.
-

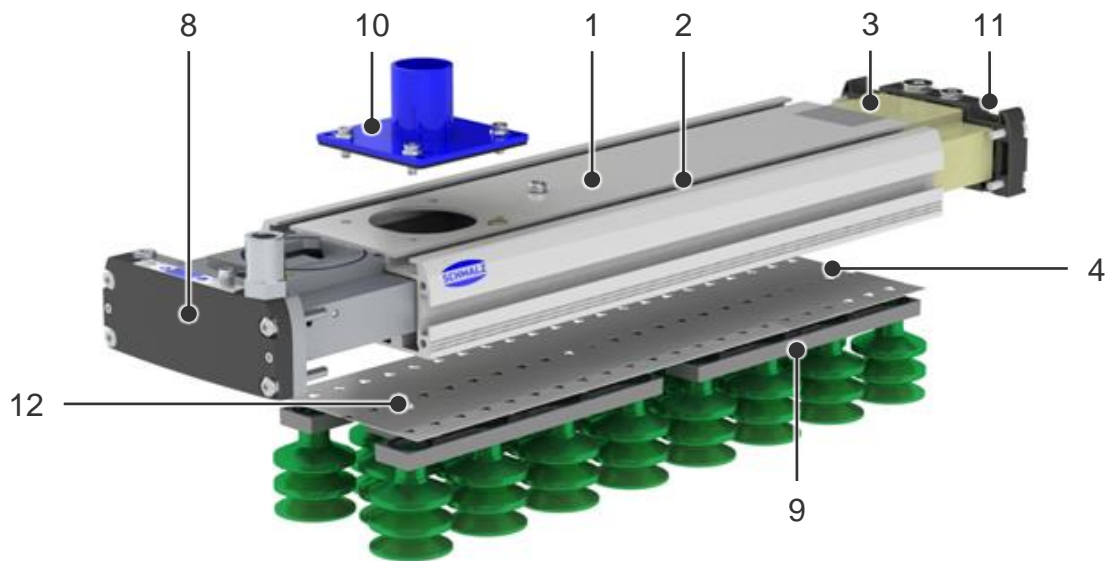
Step	Sketch	Description
1		<p>There is no vacuum at the suction cells. The vacuum generator is switched off or separated from the suction cells in another way.</p>
2		<p>Position the area gripper on the load – compress the sealing plate or suction cup according to the specifications.</p>
3		<p>Switch on the vacuum. The valves under which there is no product are closed. The valves of fully covered suction cells remain open.</p>
4		<p>The workpiece can be lifted using the vacuum.</p>

3.3 Area gripper design

Area gripper FXP-i



Area gripper FMP-i



1	Main body	2	Sliding block strips
3	Insert element for optimizing the flow	4	Valve film
5	Sealing plate	6	Ejector assembly FXP-i (functional unit)
7	Silencer FXP-i	8	Valve assembly FMP-i (functional unit)
9	Suction cup connection strip with suction cups	10	Hose connector FMP-i
11	End cover	12	Balls for SVK technology (not for SW)

3.3.1 Main body

The main body consists of a length-adjustable extrusion-molded aluminum section with an integrated compressed air duct for the optional separation function (see “Special Model with the Separation Function”).

3.3.2 Sliding block strips

The t-slots are used for flexible mechanical attachment of the gripper using the sliding blocks. Suitable attachment kits are listed in the "Accessories" section. The t-slots on the side offer the option of connecting sensors and additional components.

3.3.3 Insert Element

The insert element was developed to optimize the flow and must not be removed, particularly when using the SVK valve technology.

3.3.4 Valve film

The valve film is available as an SW film or an SVK film, each of which is available in suction row types 3R and 5R. This plastic film allows the gripper to be quickly converted from the SW technology to the SVK technology.

The SVK valve technology is used for applications with very fast cycle times (e.g. benchmark for depositing of workpieces with active blow-off pulse: approx. 0.3 sec.) The suction properties are also optimized for rough and textured surfaces.

3.3.5 Area Gripper with Sealing Plate

The sealing plate is made of technical foam. The grid is available in 3R LL-20x7 (workpieces that are 25 mm or wider) and 5R LL-12x5 (workpieces that are 20 mm or wider). The sealing plate has asymmetric holes and is designed for fast replacement. An optional sealing plate with filter screen mat is available. This reduces the penetration of dirt and extends the maintenance intervals.

Note on properties of sealing plates:

The technical properties and appearance of sealing plates may vary due to production conditions. The user is responsible for testing whether a sealing plate is suitable for a specific application. We would be happy to assist you in placing your first order by performing grip tests at our premises if you provide us with your original workpieces.

As the sealing plate height is also subject to tolerances, it is recommended that you check the height setting of the gripper every time that the foam is replaced (50% foam compression before the workpiece is picked up is optimal). This ensures that the gripper functions optimally and that the service life of the foam is not reduced.

This flexing makes the sealing plate more permeable to air. When a high number of working cycles is reached, it may be necessary to replace the foam, even if there is no visible indication of wear. The sealing plate must not be cleaned with the compressed air gun, as this will damage it.

3.3.6 Area Gripper with Suction Cups

Suction cup connection strip with plug-in suction cups

The main application of the area gripper with suction cups is picking up parts that are not rigid, such as some cardboard boxes or bags. The strips with the suction cups are screwed to the main body. The suction cups are available in diameters of 20 and 40 mm with 2.5 folds. An optional integrated filter plate is also available. The suction cups can be replaced individually without tools.

Suction cup connection strip for screw-in suction cups

Optional suction cups with 1/8" connection nipples can be used for special applications.

3.3.7 End cover

The end cover has 1/8" female threaded connections. These allow an additional vacuum gauge or a vacuum switch to be connected and a compressed air pulse to be supplied for blow-off and separation.
(The compressed air supply for separation can only be attached on the side with the marking holes.)

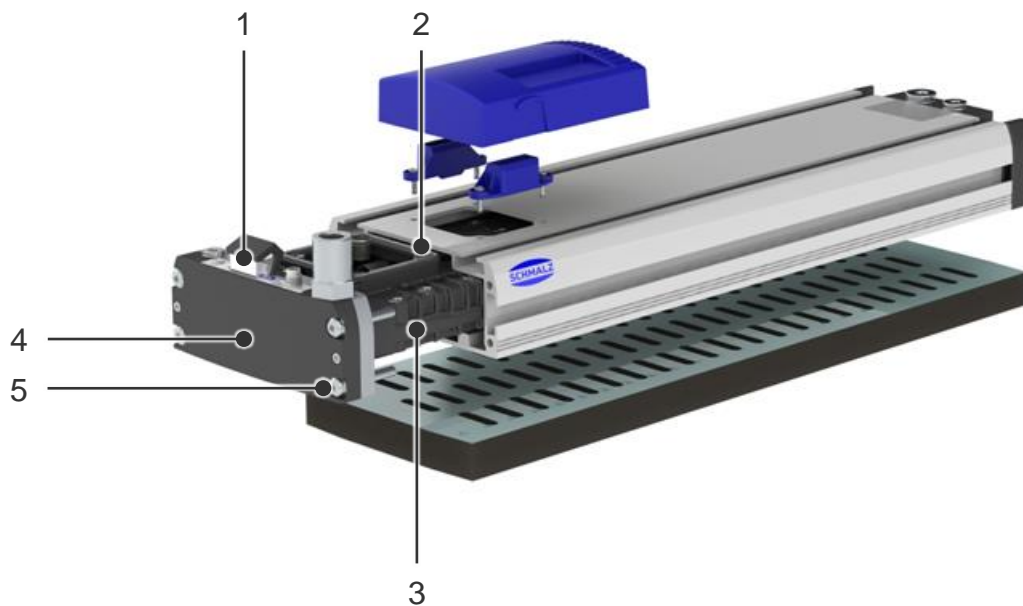
3.4 Function Unit

Both gripper types (FMP-i for an external vacuum generator and FXP-i with integrated vacuum generator) feature a functional unit that also includes the controller. On grippers of type FXP-i, the plug-in ejector is connected to the end cover with the control unit; on grippers of type FMP-i, the vacuum valve is connected.

3.4.1 Ejector Assembly

The ejector assembly for grippers FXP-i comprises the control unit and the vacuum generator. The two integrated control valves are used to divert the compressed air according to the electrical signals. If necessary, the complete assembly can be removed for maintenance purposes or replaced if faulty.

In this case, the information on the separately attached nameplate is required. Please specify when ordering replacement parts, making warranty claims or for any other inquiries. The type plate is permanently attached to the assembly and must not be removed.

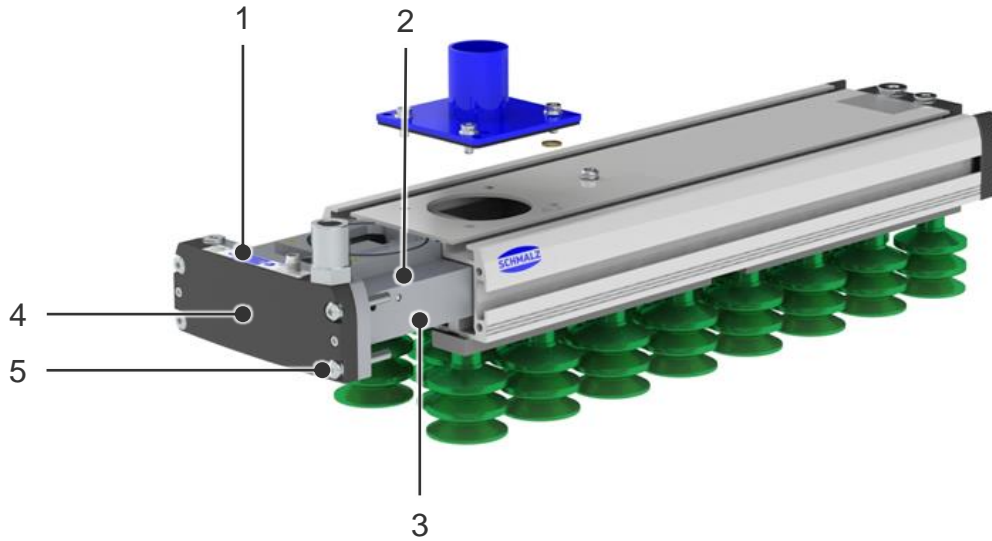


1	Control and display unit (figure with optional pentaprism)	2	Nameplate with QR code (not visible)
3	Plug-in ejector	4	End cover with control unit
5	Self-tapping fastening screws (4x)		

3.4.2 Valve Assembly

The valve assembly for grippers FMP-i comprises the control unit and the vacuum valve. The two integrated control valves are used to divert the compressed air according to the electrical signals. If necessary, the complete assembly can be removed for maintenance purposes or replaced if faulty.

In this case, the information on the separately attached nameplate is required. Please specify when ordering replacement parts, making warranty claims or for any other inquiries. The type plate is permanently attached to the assembly and must not be removed.

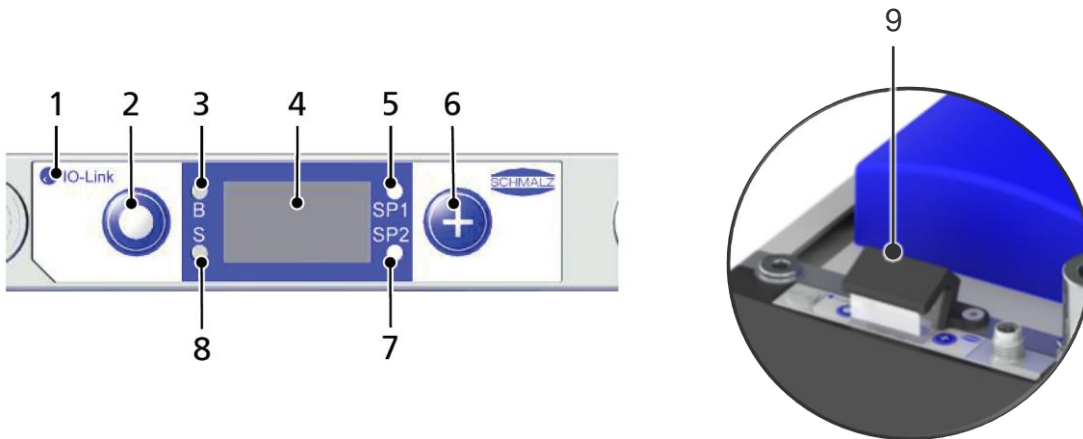


1	Control and display unit	2	Nameplate with QR code
3	Vacuum valve	4	End cover with control unit
5	Self-tapping fastening screws (4x)		

3.4.3 Controls and Displays in Detail

Simple operation of the controller is ensured by:





- 2 buttons on the foil keypad
- A three-digit display
- 4 light-emitting diodes (LEDs) as status indicators



1	IO-Link symbol (product is equipped with an IO-Link interface)	2	MENU BUTTON
3	LED B for blow off state	4	Display
5	LED for switching point limit value SP1	6	PLUS BUTTON
7	LED for switching point limit value SP2	8	LED S for suction state
9	Pentaprism		





Definition of the LED displays

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

Item	Meaning	Status	Application area
3	Blow off LED B	 OFF	Gripper does not blow off
		 illuminated	Gripper blows off
8	Suction LED S	 OFF	No suction from gripper
		 illuminated	Suction from gripper

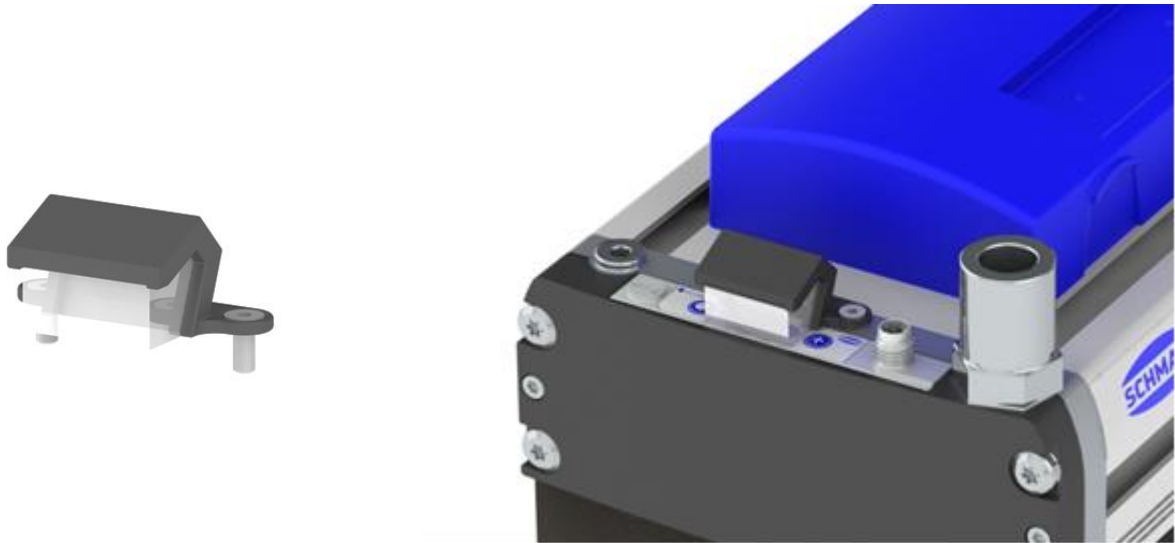
The LEDs for the switching points SP1 and SP2 (limit values) indicate the current level of the system vacuum relative to the configured limit values. Their behavior is independent of the control function and the assignment of the output.

The table below explains the meaning of the LEDs:

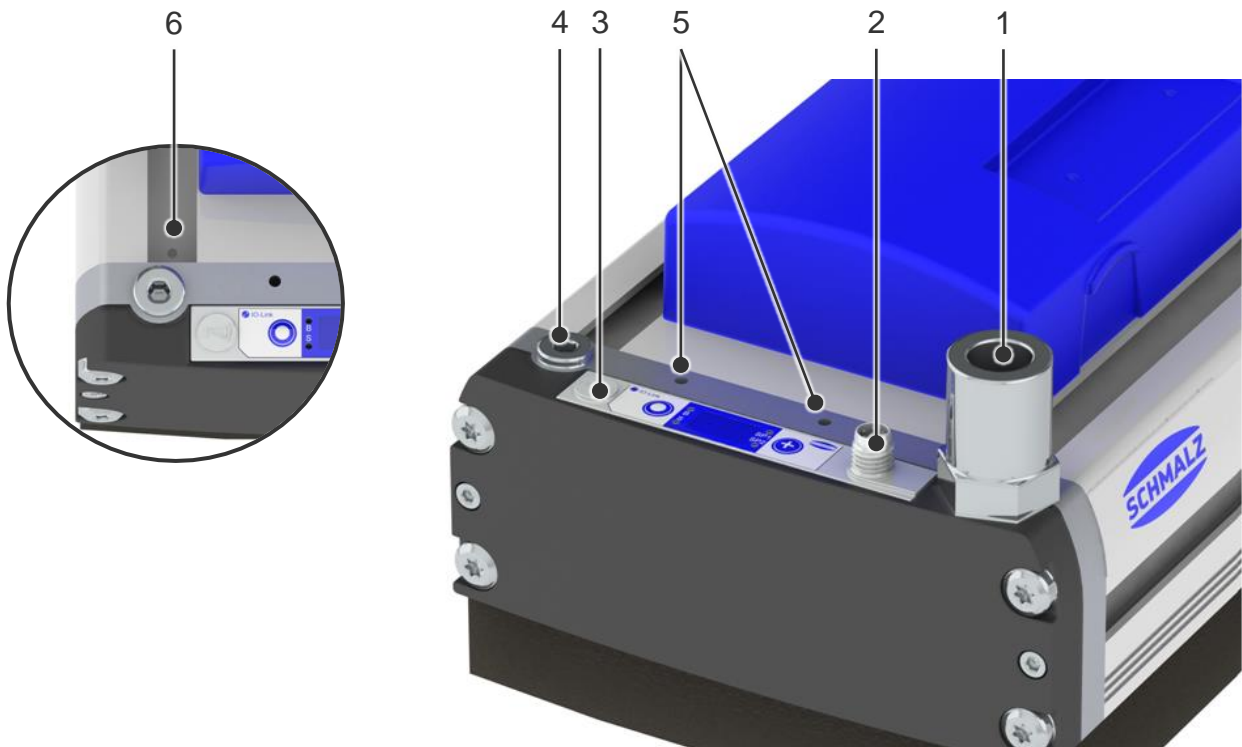
Item	Limit value LEDs		Ejector state
5 and 7		LEDs are both off	Rising vacuum: vacuum < SP2
			Falling vacuum: vacuum < rP2
5 and 7		SP2 LED lit steadily	Rising vacuum: vacuum > SP2 and < SP1
			Falling vacuum: vacuum > rP2 and < rP1
5 and 7		Both LEDs continuously lit	Rising vacuum: vacuum > SP1
			Falling vacuum: vacuum > rP1
5 and 7		Both LEDs are flashing	Manual control of the suction and blow-off functions. The gripper is in manual mode or in setup mode.

Pentaprism

An optional pentaprism can be fitted, which redirects the display and displays it on the front side. The current values can be read more easily from the front. The pentaprism can be attached subsequently using the two supplied screws.



3.4.4 Connections



1	Compressed air connection	2	M8 electrical connection, 6-pole
3	NFC area	4	Connection for separation function
5	Mounting holes for pentaprism	6	Marking

Compressed air connection

The compressed air is connected via a ¼" plug-in screw union for a compressed air hose with an outside diameter of 12 mm for FXP-i and 8 mm for FMP-i. Use a PU hose to connect the compressed air. We recommend using compressed air supply lines with the max. possible internal diameter whenever possible. If a hose with an insufficient internal diameter is used on the compressed air side, the ejector/valve will not receive enough compressed air to operate at optimal capacity. For grippers FXP-i that are longer than 838 mm, a compressed air connection is provided on both end covers because two vacuum generators are used here.

Compressed air connection for separation (optional)

The 1/8" connection (4) for the optional separation pulse is located in the end cover. When the product is delivered, the end cover is closed with a plug.

The compressed air connection (4) for separation should only be connected on the side with the markings (6) of the sliding block strip. The markings are on either end of the section. The amount of compressed air can be set to the customer's requirements using the valve screw.

The separation pulse is needed when two or more air-permeable sheets are picked up during suction. The briefly applied compressed air pulse separates the second sheet from the first. The valve screw setting can vary according to the properties of the workpieces.



The separation function can only be connected if there is a marking hole at the end of the section! If you wish to retrofit this function, please contact Schmalz to obtain the conversion measures.

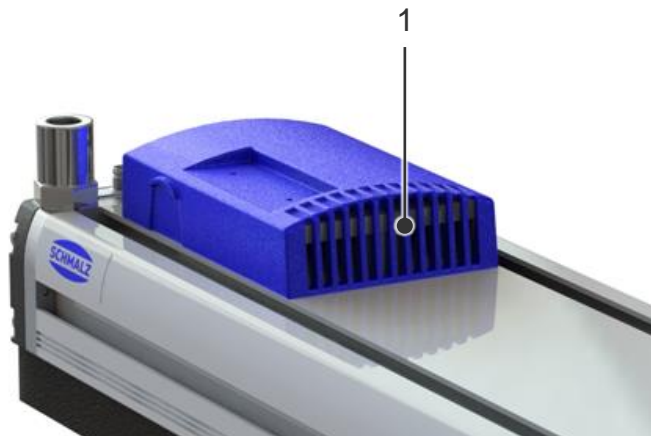
Electrical connection

The electrical connection is designed as a 6-pin M8 connector. It supplies the gripper with voltage and communicates with the controller.

3.4.5 Silencer on Grippers FXP-i**NOTE****Closing the exhaust air outlet (1)**

Increase in the internal pressure in the ejector

The exhaust air outlet on the silencer housing must not be closed. If the exhaust air outlet is closed, the internal pressure in the ejector and in the valves will continue to rise until it exceeds the maximum permitted operating pressure. This can result in damage to the ejector and/or injuries.



The silencer housing is lined with sound-dampening material and serves to reduce the exhaust noise. For cleaning, the housing can be quickly unscrewed and the dampening material can be cleaned with compressed air.

3.4.6 Ejector on Grippers FXP-i

⚠ CAUTION



Noise pollution due to the escape of compressed air and exhaust air

Hearing damage!

Wear ear protectors.

The area gripper must only be operated with a silencer.

The plug-in ejector has a lightweight design and is easy to replace. It is equipped with 1–4 ejector chains depending on the size to enable optimum performance adjustment. The connection is designed for an 12/9 hose. For lengths longer than 2 m, a hose with a larger internal diameter must be selected. The flowing compressed air pressure directly in front of the ejector must not exceed or fall below the values listed in the technical data. We recommend monitoring the pressure using a pressure gauge.

3.4.7 Hose Connector on Grippers FMP-i

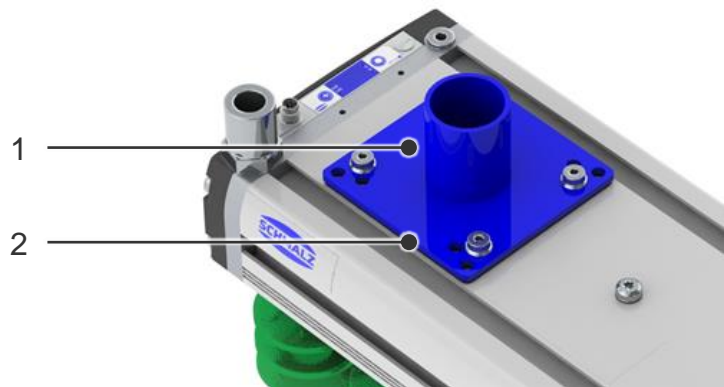
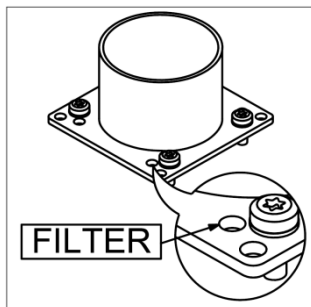
NOTE



Closing the ventilation opening (2)

Increase in the internal pressure in the valve

Do not close the ventilation opening (filter). When the ventilation opening/exhaust air outlet opening is closed, the valve may malfunction or become damaged and there is a risk of injury.



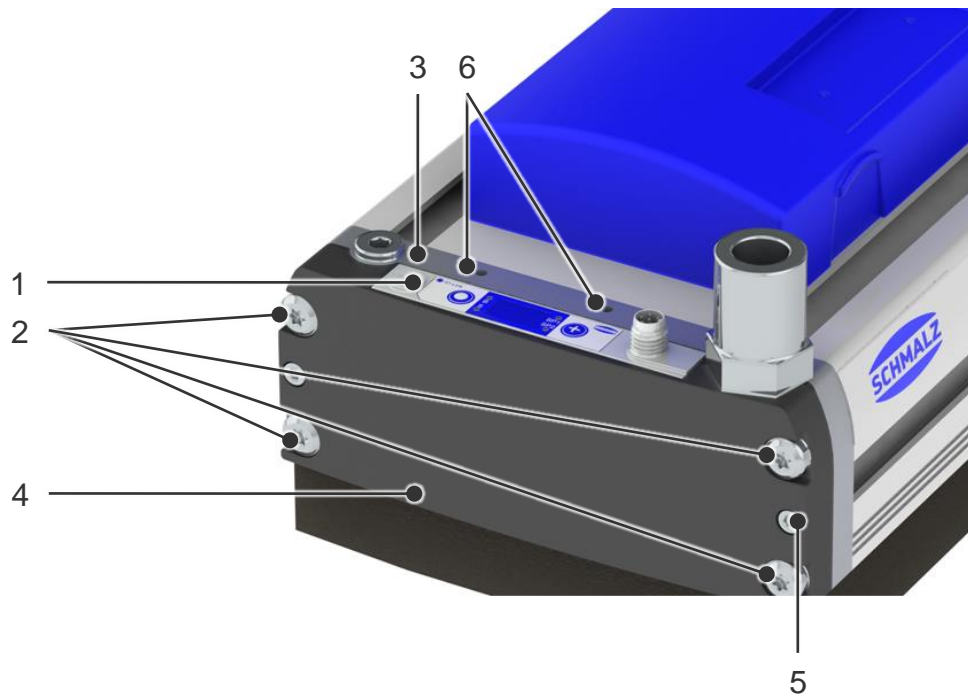
1	Vacuum hose connection	2	Ventilation opening
---	------------------------	---	---------------------

The vacuum supply from the vacuum generator installed by the customer is applied through a vacuum hose. The hose is connected using the hose connector.

3.4.8 Valve for Grippers FMP-i

The valve is available in two sizes. The smaller version is designed for an internal hose diameter of 32 mm, the larger version for 60 mm. The connection is designed for an 12/9 hose. For lengths longer than 2 m, a hose with a larger internal diameter may need to be selected. The flowing compressed air pressure directly in front of the valve must not exceed or fall below the values listed in the technical data. We recommend monitoring the pressure using a pressure gauge.

3.4.9 Housing cover



1	Control unit	2	Fastening screws for ejector assembly
3	Main body	4	Plastic protective cap
5	Machine screws for plastic cap	6	Mounting holes for pentaprism

The housing cover is permanently attached to the ejector/valve and contains all the components and connections required for the controller. On the face end, it is protected by a plastic cover that can be replaced if damaged. The cover must not be disconnected from the ejector valve. In the event of problems with this assembly, please contact the Schmalz service department. A pentaprism for redirecting the digital display to the front can be installed at any time using the mounting holes.

4 Technical Data

4.1 Display Parameters

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

4.2 General Parameters

Parameter	Symbol	Limit value			Unit	Note
		Min.	Typ.	Max.		
Working temperature	T _{amb}	0	-	50	° C	-
Storage temperature	T _{Sto}	-10	—	60	° C	-
Humidity	H _{rel}	10	—	85	% r.h.	Free from condensation
Degree of protection	-	-	—	IP40	-	—
Operating pressure (flow pressure)	P	4	5.8	7	bar	-
Operating medium	Air or neutral gas, filtered to 5 µm, without oil, class 3-3-3 compressed air quality in acc. with ISO 8573-1					

4.3 Electrical Parameters

Supply voltage	DC 24 V ± 10% (PELV ¹⁾)		
Polarity reversal protection			
Current consumption (at 24 V)	-	Typical current consumption	Max. current consumption
	FXP-i – xx – NC	50 mA	70 mA
	FMP-i – xx – NO	75 mA	115 mA
NFC	NFC Forum Tag type 4		
IO-Link	IO-Link 1.1 Baud rate COM2 (38.4 Kbits/s)		

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

4.4 Mechanical data

4.4.1 FXP-i Performance Data

Type	Value
Maximum degree of evacuation [%]	55
Maximum sound level [dB(A)]	74

Flow rates

Type	Compressed air connection [mm]	Max. suction rate [NI/min]	Air consumption [NI/min]*	Type of ejector
FXP-i-SW-442	12/9	1030	250	1xSEM-P 50
FXP-i-SW-640	12/9	1350	375	1xSEM-P 75
FXP-i-SW-838	12/9	1600	500	1xSEM-P 100
FXP-i-SW-1234	2x12/9	2940	875	1xSEM-P 75 1x SEM-P 100
FXP-i-SW-1432	2x12/9	3180	1000	2xSEM-P 100

* Air consumption: at the optimum operating pressure of 5.8 bar

4.4.2 FMP-i Performance Data

Type	Value
Maximum degree of evacuation [%]	85
Air consumption for blow-off [NI/min]*	800

*at 7 bar

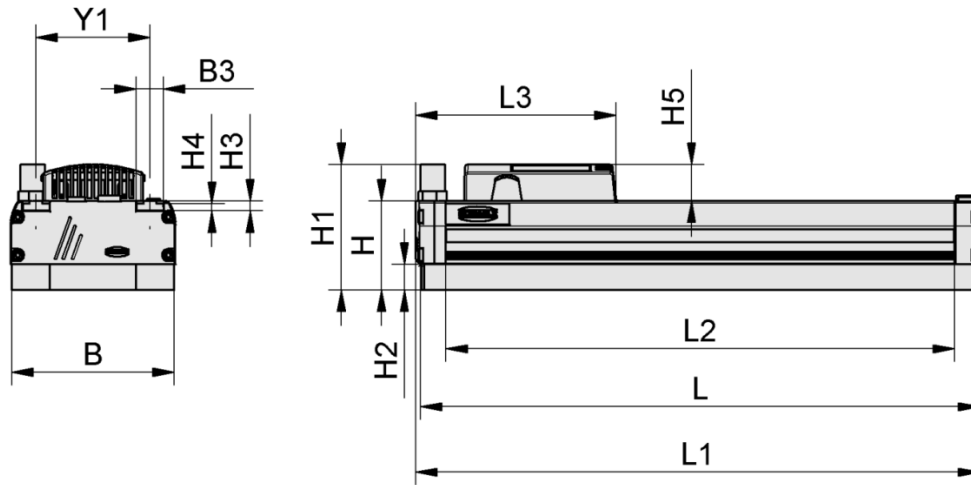
4.4.3 Overview of Variants**FXP/FXP-S with sealing plate**

Valve technology	Length of the gripper [mm]	Number of suction rows	Hole spacing [mm]
SW	442 ... 1432	3R = 3 suction rows	18
SVK		5R = 5 suction rows	18

FXP/FXP-S with suction cups

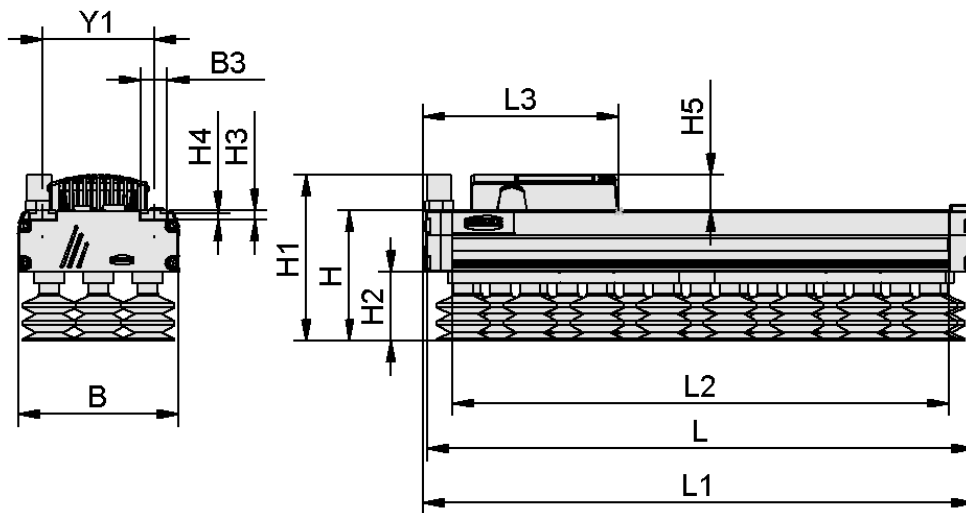
Valve technology	Length of the gripper [mm]	Number of suction rows	Hole spacing [mm]	Suction cup types and number of folds	Suction cup diameter [mm] and connection type
SW	442 to 1432	3R = 3 suction rows	54	SPB2 = SPB2 type with 2.5 folds	40 P = 40 mm diameter with push-in head
SVK		5R = 5 suction rows	36	SPB2 = SPB2 type with 2.5 folds	20 P = 20 mm diameter with push-in head

4.4.4 Dimensions of Area Gripper FXP-i



Type	Dimensions [mm]													Weight [kg]
	B	B3	H	H1	H2*	H3	H4	H5	L	L1	L2	L3	Y1	
FXP-i-SVK 442 3R18	130	21.6	70	99	20	7.7	5.5	28	442	446	402	158.4	90	2.8
FXP-i-SVK 1234 3R18	130	21.6	70	99	20	7.7	5.5	28	1234	1242	1194	158.4	90	6.1

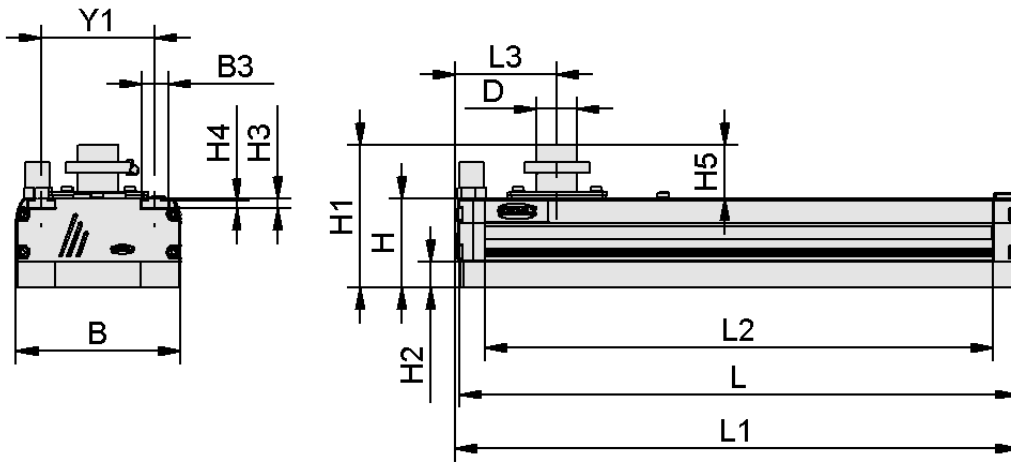
*Other foam heights and foam types available on request



Type	Dimensions [mm]													Weight [kg]
	B	B3	H	H1	H2*	H3	H4	H5	L	L1	L2	L3	Y1	
FXP-i-SVK 442 3R18	130	21.6	105	134	55	7.3	5.5	28	442	446	402	158.4	90	3.1
FXP-i-SVK 1234 3R18	130	21.6	105	134	55	7.3	5.5	28	1234	1242	1194	158.4	90	8.0

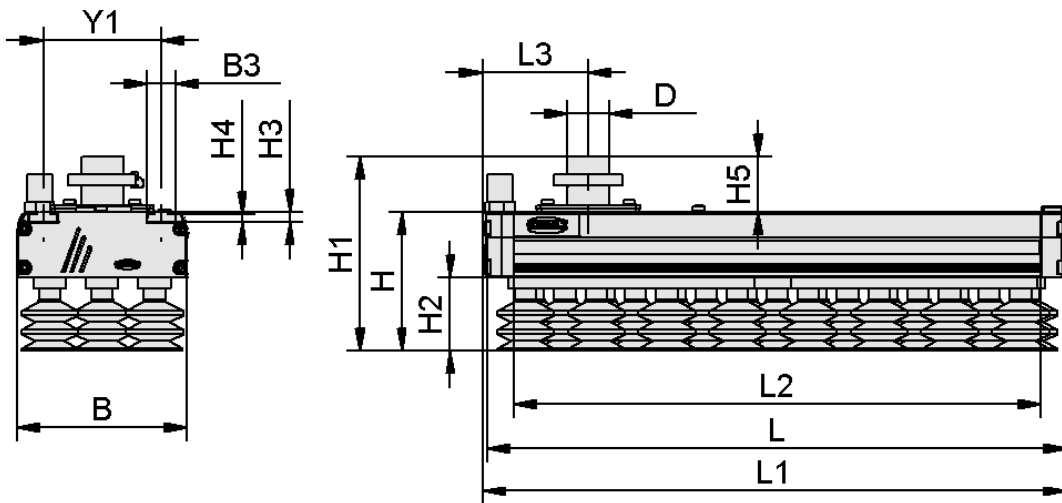
*Other suction cup types available on request

4.4.5 Dimensions of Area Gripper FMP-i



Type	Dimensions [mm]													Weight [kg]
	B	B3	H	H1	H2*	H3	H4	H5	L	L1	L2	L3	Y1	
FMP-i-SVK 442 3R18	130	21.6	70	112	20	7.7	5.5	42	442	446	402	80.9	90	2.8
FMP-i-SVK 1234 3R18	130	21.6	70	112	20	7.7	5.5	42	1234	1238	1194	80.9	90	5.8

*Other foam heights and foam types available on request

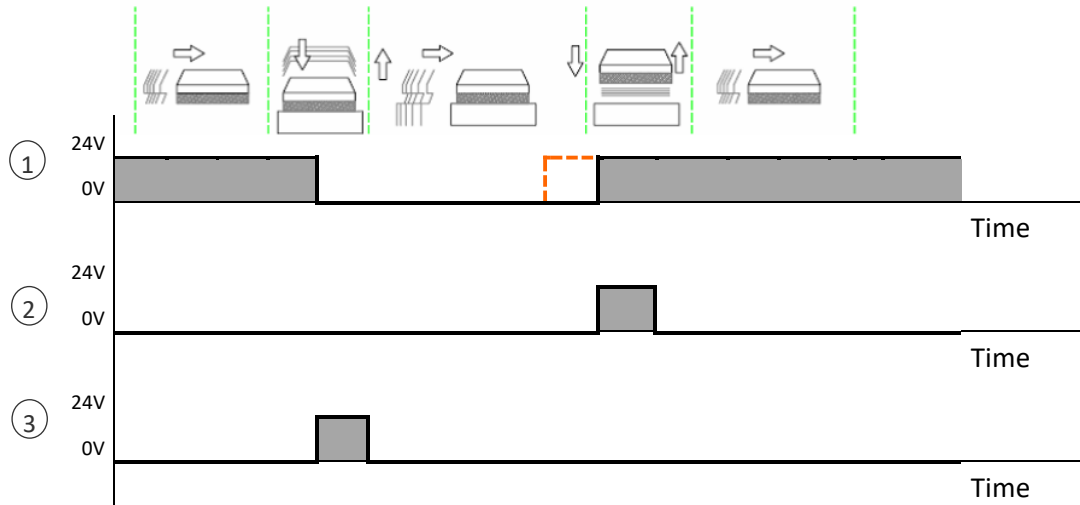


Type	Dimensions [mm]													Weight [kg]
	B	B3	H	H1	H2*	H3	H4	H5	L	L1	L2	L3	Y1	
FMP-i-SVK 442 3R54	130	21.6	105	174.9	55	7.3	5.5	42	442	446	402	80.9	90	3.4
FMP-i-SVK 1234 3R54	130	21.6	105	174.9	55	7.3	5.5	42	1234	1238	1194	80.9	90	7.0

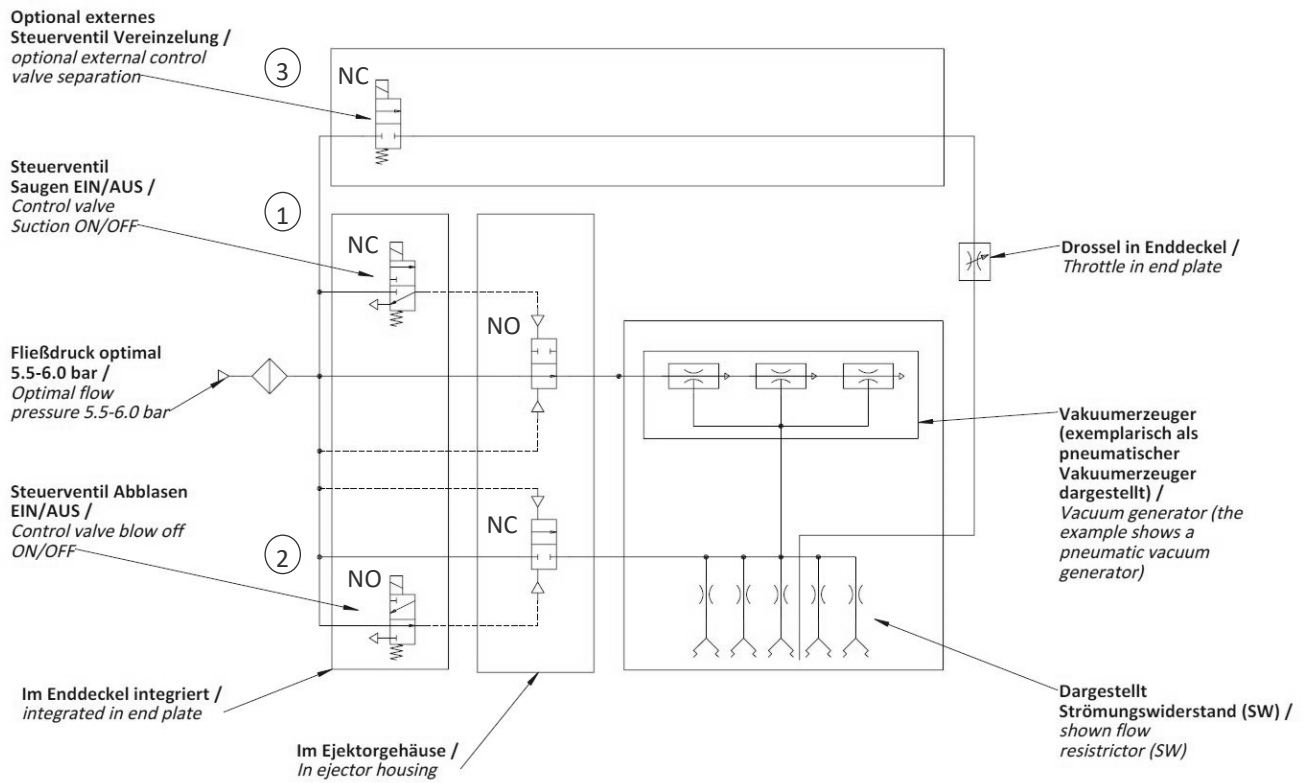
*Other suction cup types available on request

4.4.6 Pneumatic Circuit Diagram and Time Diagram for NO Version

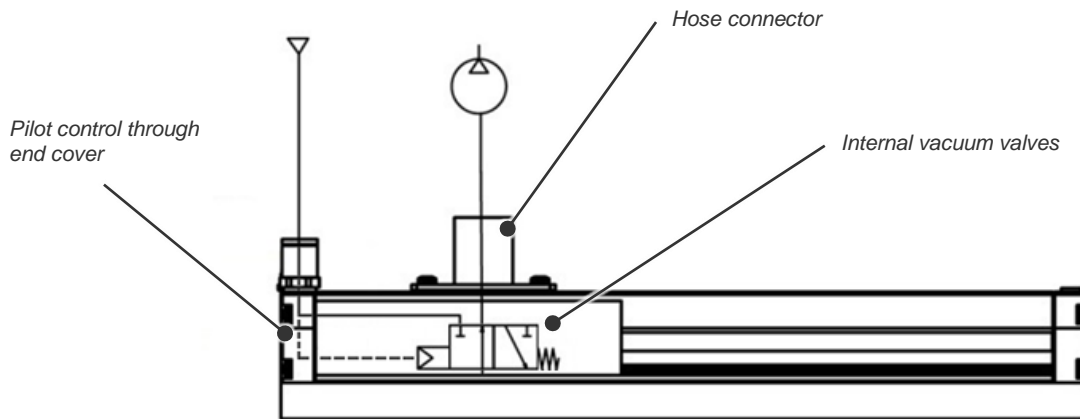
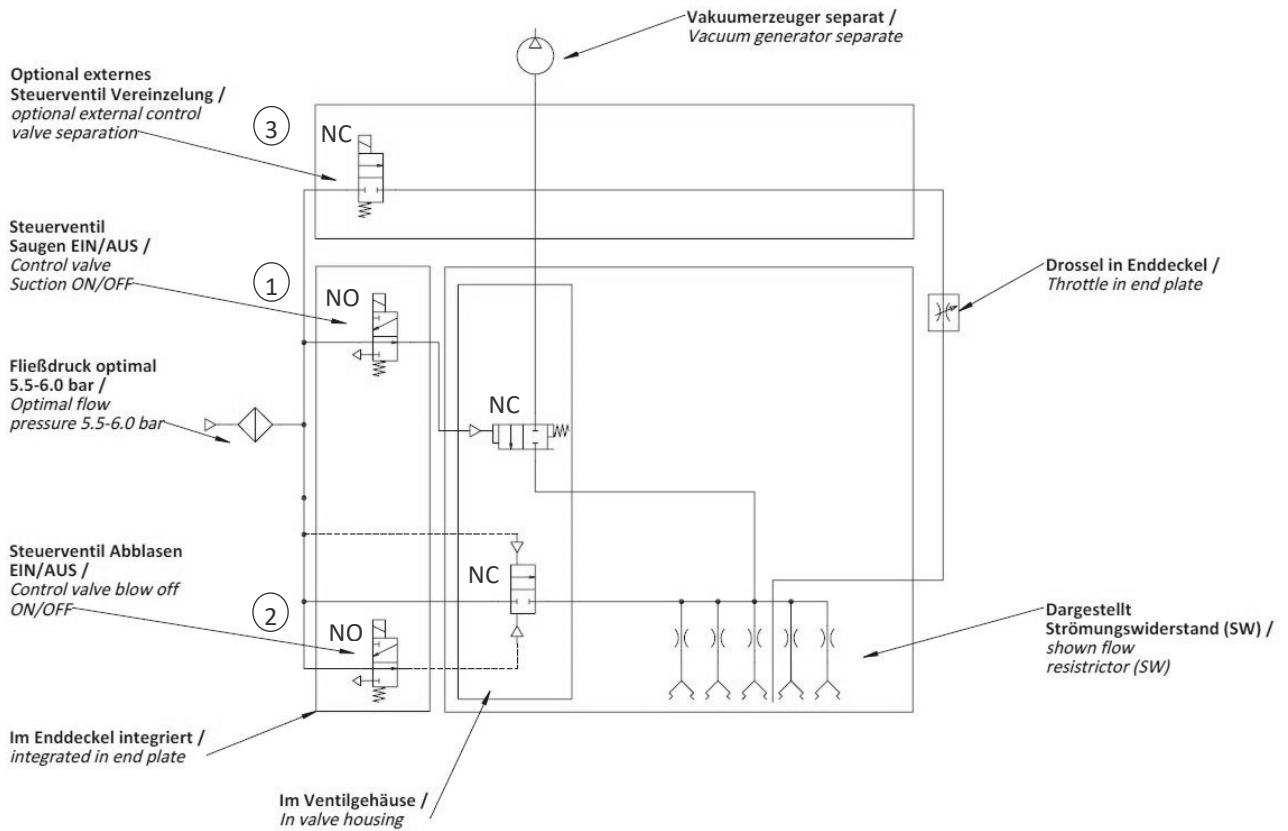
Time diagram for FXP-i and FMP-i NO



Pneumatic circuit diagram for FXP-i NO



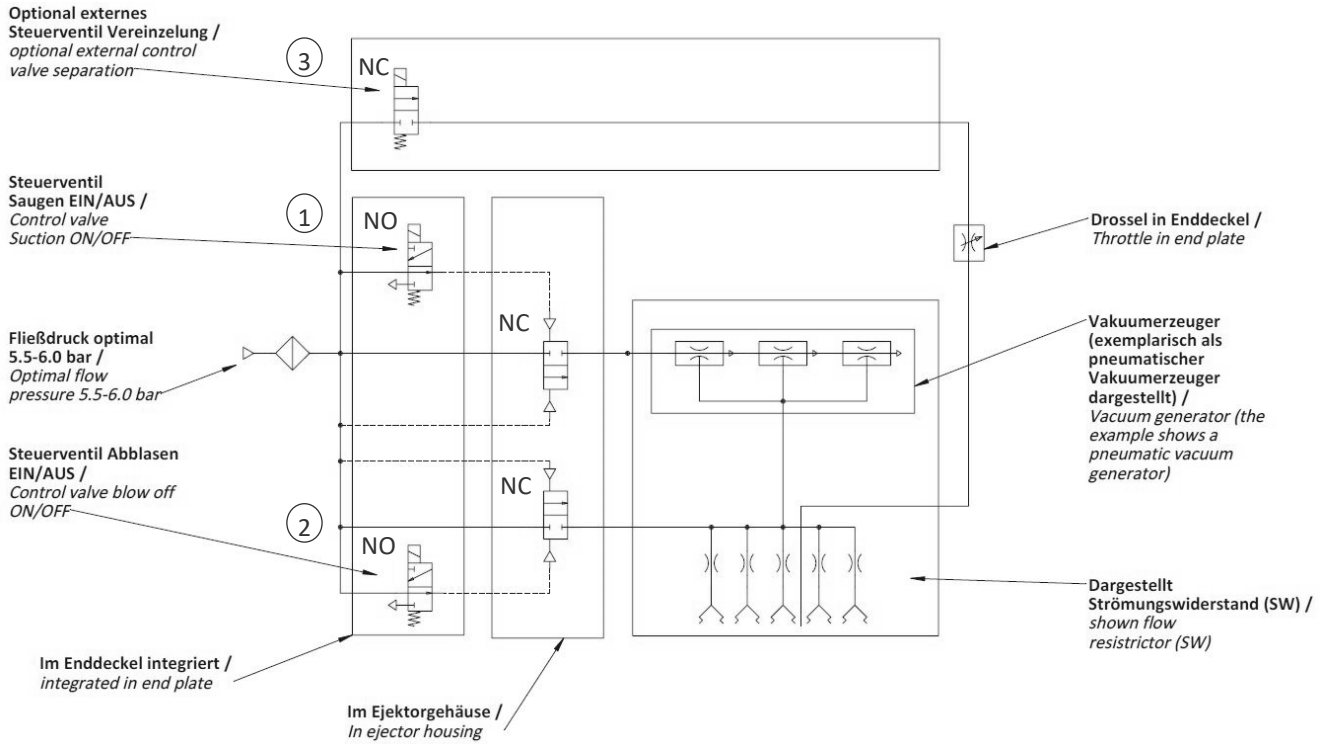
Pneumatic circuit diagram for FMP-i NO



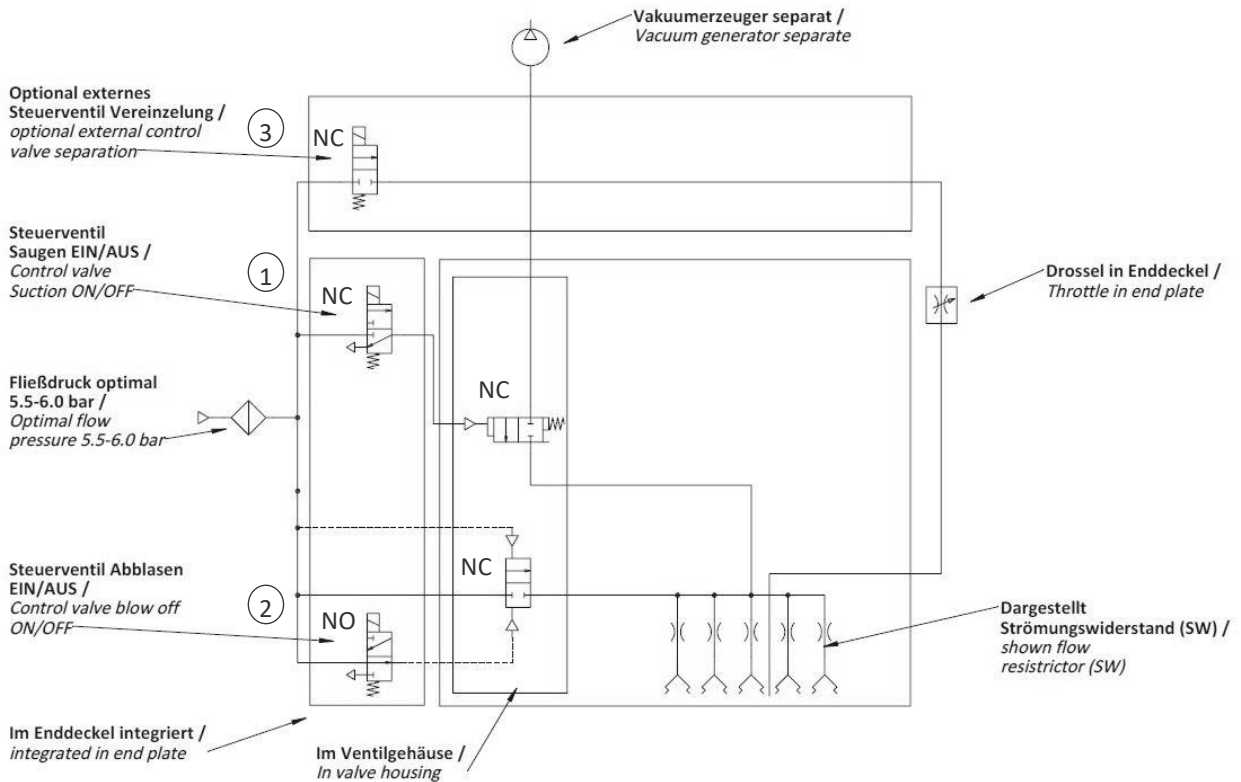
It is not possible to retrofit an internal vacuum valve in an area gripper FMP.

4.4.7 Pneumatic Circuit Diagram and Time Diagram for NC Version

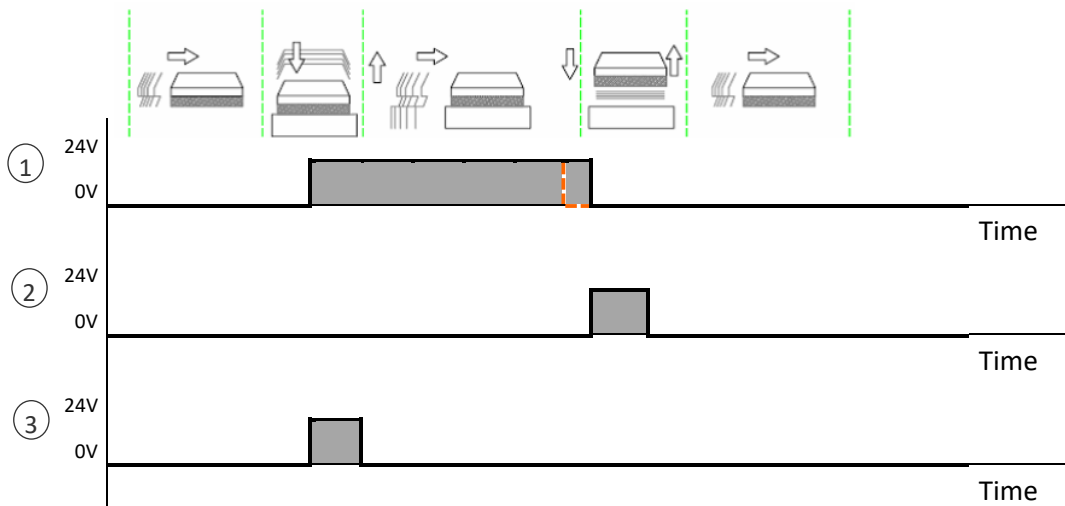
Pneumatic circuit diagram for FXP-i NC



Pneumatic circuit diagram for FMP-i NC



Time diagram for FXP-i and FMP-i NC



With the area grippers for external vacuum generators FMP-i, the time that the gripper requires to deposit a workpiece can be reduced. To do so, the signal for closing the vacuum valve is provided earlier while the gripper is still moving (orange dotted line). The time is dependent on the installation conditions for the grippers (guide value: 0.3 to 0.5 seconds).

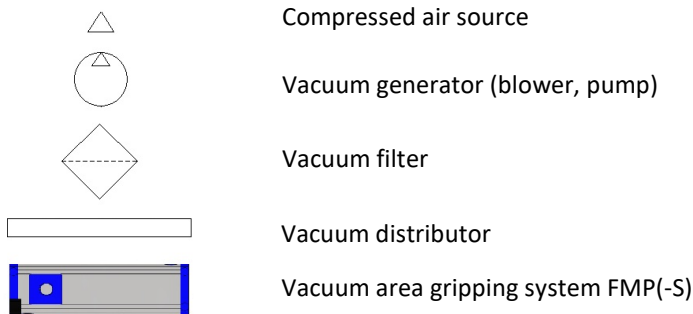
4.4.8 Pneumatic Circuit for Several Grippers FMP-i

For grippers of type FMP-i, the external vacuum valve (parallel and serial connection) is replaced with the vacuum valve that is integrated in the gripper.

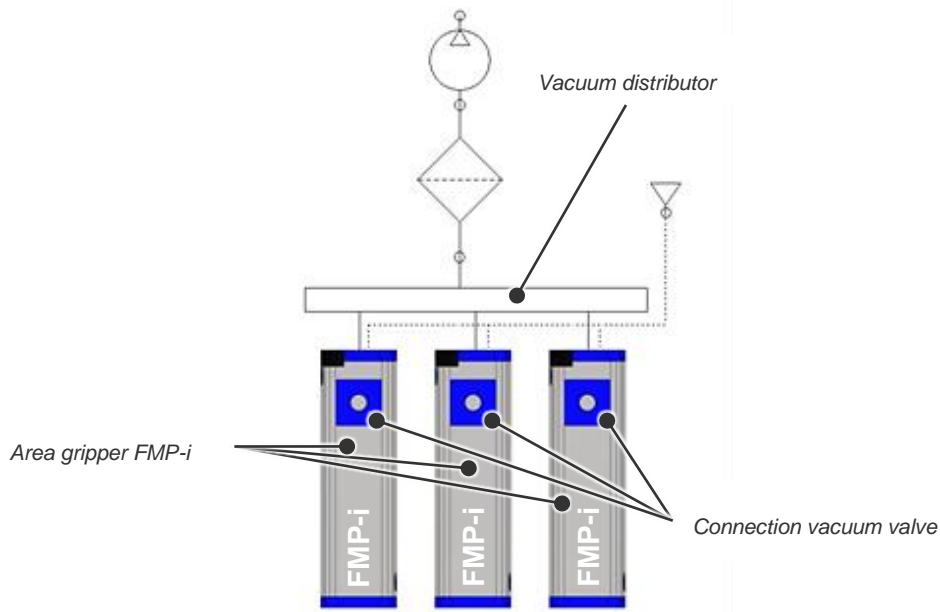
For the parallel connection of the area grippers FMP, each gripper on the hose connector requires an integrated vacuum valve (→ FMP-i).

For the series connection of the area grippers FMP, only the first gripper (→ FMP-i) on the inlet hose connector requires an integrated vacuum valve; all the others can be designed as FMP grippers.

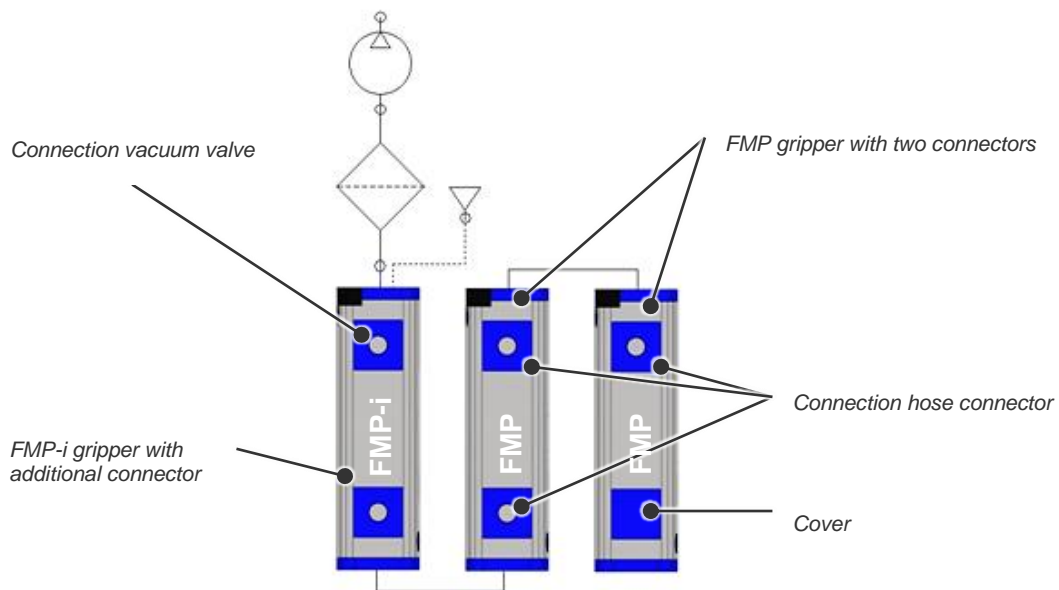
Legend:



Pneumatic circuit for FMP-i-SW* version (parallel circuit)



Pneumatic circuit for FMP-i-SVK version (series circuit)**



* SW stands for "Strömungswiderstandstechnik" (flow resistor technology)

** SVK stands for "Strömungsventiltechnik" (check valve technology) (see section entitled "Description of Functions: Valve Technology SVK")

4.4.9 Factory Settings

Code	Parameter	Value of the factory setting	
		FMP-i	FXP-i
SP 1	Switching point SP1	400 mbar	500 mbar
rP 1	Reset point rP1	350 mbar	300 mbar
SP2	Switching point SP2	300 mbar	250 mbar
rP2	Reset point rP2	250 mbar	200 mbar
tBL	Blow off time	0.20 s	
cBr	Control	Activated = on	
dcS	Continuous suction	Deactivated = off	
t- 1	Evacuation time	2.00 s	
-L-	Leakage value	250 mbar/s	
bLo	Blow off function	Externally controlled blow off = -E-	
Qu2	Output function	Switching logic – output 2 = NO	
P-n	Signal type	Output level = PNP	
un i	Vacuum unit	Vacuum unit in mbar = bar	
dLY	Switch-off delay	10 ms	
dPY	Display rotation	Standard = Std	
Eco	ECO mode	Deactivated = oFF	
P In	PIN code	User-defined 000	

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

5 Operating and Menu Concept

The area gripper is operated using two buttons on the foil keypad.



MENU BUTTON



PLUS BUTTON

Navigation is divided into three menus:

- The main menu: for standard applications
- The Extended Functions (EF) menu: for applications with special requirements
- The Info menu (INF): for reading out system data such as counters, the software version, etc.

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

The following information can be shown on the display:

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

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

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


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

5.1 Button Assignments in Display Mode



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

5.1.1 Opening the Menu



Press the PLUS BUTTON opens the following menus:

- ▶ Press the  button briefly.
 - ⇒ The main menu opens with the first parameter [SP I].


Opening the EF menu for extended functions:

1. Press the  button several times until the parameter EF appears on the display.
2. Press the  button to switch to the EF submenu for extended functions.
 - ⇒ The EF menu opens with the first parameter [cEr].

Opening the INF menu:

1. Press the  button several times until parameter **INF** appears on the display.
2. Press the  button to switch to the INF submenu for information.
 - ⇒ The INF menu opens with the first parameter [cc 1].

5.1.2 Displaying the Basic Settings (Slide Show)

When you press the  button from the home screen, the following parameters are automatically displayed one after the other on the display (slide show):

- The vacuum unit
- The current operating mode (S IQ or IQL)
- The currently activated production setup profile (P-0 to P-3)
- The value of switching point SP1
- The value of reset point rP1
- The value of switching point SP2
- The value of reset point rP2
- The supply voltage US

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

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
SP 1	Switching point 1	Value at which the control function deactivates (Only active when [cbr] = [on])
rP 1	Reset point 1	Reset value 1 for the control function
SP2	Switching point 2	Switching value for the "Parts control" signal
rP2	Reset point 2	Reset value 2 for the "Parts control" signal
tBL	Blow off time	Setting of the blow off time for time-controlled blow off
cAL	Zero-point adjustment (calibration)	Calibrate vacuum sensor, zero point = ambient pressure
EF	Extended functions	Open the "Extended Functions" submenu
INF	Information	Open the "Information" submenu
INC	Incorrect	The entered value is not within the permissible value range. This is an informational message that appears if incorrect information is entered.

5.2.2 Changing the Parameters of the Main menu

If you wish to change values, e.g. the switching points, you have to enter the new value digit by digit.

1. Use the  button to select the desired parameter.
2. Confirm using the  button.
⇒ The currently set value is displayed and the first digit flashes.
3. Use the  button to change the value. The value increases by 1 each time the button is pressed. After 9, the counter goes back to 0 when the  button is pressed.
4. Press the  button to save the modified value.
⇒ The first digit is accepted and the second digit flashes.
5. Use the  button to select the second digit.
6. Press the  button to save the modified value.
⇒ The second digit is accepted and the third digit flashes.
7. Use the  button to select the third digit.
8. Press the  button to save the modified value.
⇒ If the value entered lies within the permissible value range, it is accepted and the modified parameter is displayed.
⇒ If the value entered is not within the permitted value range, this is indicated briefly by the display [] and the new value is not applied.

If input is interrupted for longer than 1 minute or if no input is made, the display automatically switches to the measurement display.

5.3 Extended Functions [EF] Menu

An “Extended Functions” menu (EF) is available for applications with special requirements.

5.3.1 Functions in the Extended Functions [EF] Menu

The following table shows an overview of the display codes and parameters in the “Extended Functions” menu:










Display code	Parameter	Possible settings	Explanation
ctr	Energy-saving function	off on onS	Control function off Control active Control with leak monitoring active
dcs	Deactivate auto. control shutoff	no yes	Suppresses the automatic valve protection function when set to YES. Cannot be switched on when ctr = off.
t-1	Max. permissible evacuation time	configurable between 0.01 and 9.99 seconds in steps of 0.01	Permitted evacuation time

Operating and Menu Concept

Display code	Parameter	Possible settings	Explanation
		oFF	No monitoring
-L-	Max. permissible leakage	Values from 0 to 999 can be set	Permitted leakage Unit: millibar per second
blO	Blow off function	-E- I-t E-t	Externally controlled Internally controlled (triggered internally, time can be set) Externally controlled (triggered externally, time can be set)
Qu2	Output function	no nc	[no] Normally open contact [nc] Normally closed contact
P-n	Output type	PnP nPN	Output PNP switch NPN switch
dLY	Switching signal delay	Value from 0 to 999 can be set	Delay between switching signals SP1 and SP2 in milliseconds
un i	Vacuum unit	mBar kPa inHg PSI	Define the displayed vacuum unit Vacuum level in millibar [mbar] Vacuum level in kilopascal [kPa] Vacuum value in inch of mercury [inHg] Vacuum value in pound-force per square inch [psi]
d IS	Display rotation	Std rot	Display configuration Standard rotated 180°
Eco	Display in ECO mode	oFF Lo on	Set the display ECO mode is deactivated – the display remains on The brightness is reduced by 50 percent. Eco mode activated – if no buttons are pressed, the display turns off after one minute
P In	PIN code	Value from 00 1 to 999	Specify the PIN code, lock the menus If the PIN code is 000 the device is not locked.
nFc	NFC lock	on d IS Loc	NFC lock: NFC active Completely switched off Write-protected
rES	Reset	YES	The values remain unchanged Reset parameter values to factory settings





5.3.2 Changing parameters in the Extended Functions menu

Depending on the parameter, there are two different methods for entering values in the EF menu. When entering numerical values, you enter them digit by digit as in the main menu:

1. Use the  button to select the desired parameter.
2. Confirm using the  button.
⇒ The currently set value is displayed and the first digit flashes.
3. Use the  button to change the value. The value increases by 1 each time the button is pressed. After 9, the counter goes back to 0 when the  button is pressed.
4. Press the  button to save the modified value.
⇒ The first digit is accepted and the second digit flashes.
5. Use the  button to select the second digit.
6. Press the  button to save the modified value.
⇒ The second digit is accepted and the third digit flashes.
7. Use the  button to select the third digit.
8. Press the  button to save the modified value.
⇒ The value is accepted and the modified parameter is displayed.

If input is interrupted for longer than 1 minute or if no input is made, the display automatically switches to the measurement display.

For other parameters, you can select from predefined settings:

1. Use the  button to select the desired parameter.
2. Confirm using the  button.
⇒ The current setting is displayed and flashes.
3. Use the  button to switch to the next setting.
4. Press the  button to save the desired setting.
⇒ The selected setting is briefly shown on the display.
⇒ The display then automatically jumps to the parameter that was just set.

5.4 Info menu [INF]

The “Info” [INF] 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 Info menu


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




Display code	Parameter	Explanation
cc1	Counter 1	Counter for suction cycles (suction signal input)
cc2	Counter 2	Valve switching cycles
cc3	Counter 3	CM counter
ct1	Erasable counter 1	Counter for suction cycles (suction signal input)
ct2	Erasable counter 2	Valve switching cycles
ct3	Erasable counter 3	CM counter
rcct	Reset erasable counters	All erasable counters reset to zero
SoC	Software	Indicates the software version
Part	Part number	Part number displayed
Snr	Serial number	Serial no. displayed, provides information about the production period

5.4.2 How Data is Displayed in the Info Menu

Counter values or numbers with more than 3 digits are displayed in a special manner.

Counter values and serial numbers are 9-digit whole numbers. These numbers are divided into 3 blocks of 3 numbers when shown on the display. Each time a decimal point is displayed to indicate if it is the highest, middle or lowest

block. The display starts with the 3 highest-value digits and can be scrolled through using the  button.

1. Use the  button to select the desired parameter.
2. Confirm using the  button.
3. Use the  button to display or scroll through the blocks that make up the value.

6 Interfaces

6.1 Basic Principles of IO-Link Communication

The area gripper is operated in IO-Link mode to enable intelligent communication with a controller. The IO-Link communication takes place using cyclical process data and acyclical ISDU parameters. The ejector's parameters can be set remotely using IO-Link mode. In addition, the energy and process control (EPC) feature is available. The EPC is divided into 3 modules:

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

6.2 Process Data

The cyclical process data is used to control the area gripper and receive current information reported from the area gripper. A distinction is made between the input data (Process Data In) and the output data for control (Process Data Out).

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

- The limit values SP1 and SP2
- The status of SP3
- Device status of the area gripper in the form of a status traffic light
- EPC data
- Warnings from the area gripper
- Sensor supply voltage
- Air consumption

The output data Process Data Out is used to control the area gripper cyclically: EPC Select is used to define which data is sent.

- To determine the air consumption, the system pressure can be preset.
- The area gripper is controlled using the suction and blow-off commands.

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

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

6.3 ISDU Parameter Data

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

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

The exact meaning of the data and functions is described in more detail in the "Description of Functions" chapter. You can find a detailed diagram of the process data in the data dictionary and IODD. In order for a control unit to access the ISDU parameters, the necessary system functions must be purchased from the manufacturer of the control unit and used.

6.4 Near Field Communication (NFC)

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

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

There are two options for communicating via NFC:

- Read access only can be obtained via a website viewed in a browser. For this, no additional app is needed. The read device only needs to have NFC active and Internet access.
- Another option for communication is the “Schmalz ControlRoom” control and service app. This permits not only read access, but also active reconfiguration of the parameters via NFC. The Schmalz ControlRoom app is available at the Google Play Store.

For the best data connection, hold the reading device centered over the NFC symbol on the control unit.



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

7 Description of Functions

7.1 Operating Modes

7.1.1 Automatic Operation

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

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

The gripper is always parameterized in automatic mode.

7.1.2 Manual Mode

NOTE



Changing the output signals in manual mode

Personal injury or damage to property

Electrical connection must be performed only by a qualified specialist who can predict the effects that signal changes will have on the entire system.

In manual mode, the “suction” and “blow off” gripper functions can be controlled independently of the higher-level controller using the buttons on the foil keypad of the operating element. This function is used, among other things, to detect and eliminate leaks in the vacuum circuit.

In this operating mode, the “SP1” and “SP2” LEDs both flash.

Activating Manual Mode

NOTE



External signals may change manual mode

Personal injury or damage to property due to unpredictable work steps

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

NOTE





It is not possible to activate manual mode.



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

Unlock manual mode using the controller.

- ✓ The area gripper is on the measurement screen.


- ▶ Press and hold the  and  buttons simultaneously for at least 3 seconds.
 - ⇒ The “SP1” and “SP2” LEDs flash.

Deactivating Manual Mode



- ✓ The area gripper is in manual mode.
- ▶ Briefly press the  and  buttons at the same time.
 - ⇒ The SP1 and SP2 LEDs cease to flash.

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

Activating manual suction

- ✓ The area gripper is in manual mode. The SP1 and SP2 LEDs flash.
- ▶ Press the  button to activate “suction” mode.
 - ⇒ The suction LED S lights up.
 - ⇒ The area gripper begins to apply suction.



Deactivating manual suction

- ✓ The area gripper is in suction mode.
- ▶ Press the  button again.
 - ⇒ The suction process is deactivated.
- ▶ Alternatively, press the  button.
 - ⇒ The area gripper changes to the “blow-off” state for as long as the button is pressed.



If the controller is on $[cbr] = [on]$, it uses the configured limit values in “manual” mode as well.

Activating and deactivating manual blow-off

- ✓ The area gripper is in manual mode.
- ▶ Press and hold the  button.
 - ⇒ The blow off LED B lights up.
 - ⇒ The area gripper blows off as long as the button is pressed.
- ▶ Release the  button to end the blow off.
 - ⇒ The blow off process is deactivated.
 - ⇒ The blow off LED B is no longer lit.

7.1.3 Setting Mode

Setting mode is used for locating and eliminating leakages in the vacuum circuit. Since the valve protection function is deactivated and the control is not deactivated, even at increased control frequencies.

In this operating mode, the “SP1” and “SP2” LEDs both flash.

Setting Mode Activated and Deactivated

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

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

This function is only available in IO-Link mode.

7.2 Monitoring the System Vacuum and Defining Limit Values

The area gripper has integrated sensors for measuring the vacuum.

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

The limit values are set in the main menu using the parameters [SP1], [rP1], [SP2] and [rP2] or via IO-Link.

Limit values SP1 and rP1 are used by the control function to control the vacuum.

Limit value SP3, “Part deposited” [PDIN0] cannot be set using the main menu. It is fixed at 20 mbar. Signal SP3 is issued when the vacuum reaches < 20 mbar (providing the vacuum has already reached SP2 once). By issuing this signal, the area gripper tells the control system that the part has been deposited successfully. The signal is reset by issuing a new Suction ON command.

Overview of the limit values:

ISDU [Hex]	Limit value parameter	Description
P-0: 0x0064	SP1	Vacuum control value Vacuum switching point
P-0: 0x0065	rP1	Vacuum hysteresis Vacuum reset point
P-0: 0x0066	SP2	Activation value of “Part Present” signal output
P-0: 0x0067	rP2	Deactivation value of “Part Present” signal output
—	SP3	Part deposited (vacuum < 20 mbar)

7.3 Calibrating the Vacuum Sensor [0x0002]





Since the sensor integrated in the area gripper is subject to variation due to the manufacturing process, we recommend calibrating the sensor after installation. To calibrate the sensor, the system’s pneumatic circuits must be open to the atmosphere.

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

If the permitted limit is exceeded by $\pm 3\%$, error code [E03] appears on the display.

The function for zero-point adjustment of the sensor is performed in the main menu under the parameter [cAL] or via IO-Link.

Calibrating from the main menu:

1. To adjust the zero point, press the  button several times until [cAL] appears on the display.
2. Confirm using the  button.
3. Use the  button to choose between [n0] and [YES] (vacuum sensor calibration).
4. Confirm using the  button.

⇒ The sensor is calibrated.

7.4 Control Functions [P-0: 0x0044]

The area gripper FXP-i enables you to conserve compressed air or prevent an excessive vacuum from being generated. Vacuum generation is interrupted once the configured switching point SP1 is reached. If leakage causes the vacuum to fall below the reset point rP1, vacuum generation resumes.

The **permitted leakage** can be set in mbar/s using the [-L-] parameter in the Extended Functions menu. The leakage is measured from the point when the control function interrupts suction after reaching switching point SP1.

This function is deactivated in the default setting. This function is not available on grippers of type FMP-i.

The following operating modes can be set for the controller function in the EF menu using the [cEr] parameter or via IO-Link:

7.4.1 No Control (Continuous Suction)

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

In this mode, the control function is set to [cEr] = [0FF].

This setting is only possible when the control shutoff is deactivated [dcS] = [n0].

7.4.2 Control

The area gripper switches off vacuum generation when the switching point SP1 is reached and switches it back on when the vacuum falls below the reset point rP1. The switching point evaluation for SP1 follows the control function. This setting is particularly recommended for airtight workpieces.

In this mode, the control function is set to [cEr] = [0n].

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

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

7.4.3 Control with Leak Monitoring

This operating mode is the same as the previous mode, with the addition that the leakage rate within the system is measured and

to the configurable limit value for permissible leakage [-L-].

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

In this mode, the control function is set to [0nS].

7.4.4 Control Shutoff [P-0: 0x004E]

This function deactivates the automatic control shutoff.

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

Parameter	Setting value	Explanation
dcS	[n0]	If excessive leakage is detected and the valve is switching too often (> 6 times in 3 seconds), the area gripper switches to "continuous suction" mode
	[YES]	Continuous suction is deactivated and the area gripper continues controlling in spite of the high leakage or having a switching frequency of > 6 times in 3 seconds. Continuous suction will not be activated if the valve frequency is exceeded.



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

7.5 Blow-Off Modes [0x0045]

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

7.5.1 Externally controlled blow off

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

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

7.5.2 Internally Time-Controlled Blow-Off

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

The “blow off” valve is automatically activated for the configured time period as soon as the ejector leaves “suction” mode. The blow-off time can be set with the [t b L] parameter in the main menu.

The “blow off” signal overrides the “suction” signal, even if the specified blow off time is very long.

7.5.3 Externally Time-Controlled Blow-Off

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

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

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

The blow-off time can be set with the [t b L] parameter in the main menu.

7.5.4 Setting the Blow-off Time [P-0: 0x006A]

If the blow-off function of the area gripper is set to internally time-controlled [bL□] = [I - E] or externally time-controlled [bL□] = [E - E] “Blow-off”, then the blow-off time [t b L] may be specified.

The blow-off time can be using the [t b L] parameter in the main menu.

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

7.6 Output function [0x0047]

The signal output can be switched between [r □] (normally open) and [r □] (normally closed) contact.

To switch this setting, use the [□ u 2] menu item in the extended functions menu, or IO-Link.

The function of the switching threshold SP2/rp2 (component check) is assigned to the Ou2 signal output.

7.7 Output type [0x0049]

The output type can be used to switch between PNP and NPN. To switch this setting, use the [P - r] menu item in the EF menu, or IO-Link.

7.8 Selecting a Display Unit [0x004A]

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

The function can be configured using the [UN I] parameter or via IO-Link.

The following units are available:

Unit	Explanation
bar	The vacuum level is displayed in mbar. The setting for this unit is [bAR].
Pascal	The vacuum level is displayed in kPa. The setting for this unit is [kPA].
Inch of Hg	The vacuum level is displayed in inHg. The setting for this unit is [iHG].
psi	The vacuum level is displayed in psi. The setting for this unit is [PSI].



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

7.9 Switch-Off Delay [0x004B]

You can use this function to set a switch-off delay for the SP1 and SP2 signals. This can be used to handle short drops in the vacuum circuit.

The duration of the switch-off delay can be set with the parameter [dLY] in the EF menu or via IO-Link. Select a value in the range from 0 to 999 ms. To deactivate this function, enter the value [000] (= off).

The switch-off delay affects the process data bits in IO-Link and the SP1 and SP2 status indicators.



7.10 Rotating the Display [0x004F]

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

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

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



The  and  still work as usual when the display has been rotated.
The decimal points of the display are shown on the top edge of the screen.

7.11 ECO Mode [0x004C]

The area gripper provides the option to switch off or dim the display to save energy. If ECO mode is activated, the display is switched off to reduce system power consumption after 1 minute if no buttons are pressed.

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

Three different settings are available:

- [OFF]: Energy-saving mode is disabled.
- [L0]: The brightness of the display is reduced by 50 percent after 1 minute.
- [00]: The display switches off after 1 minute of inactivity.

In order to signal that the area gripper is working properly, the left-hand decimal point is still displayed when the display is switched off.

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



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

7.12 Locking and Unlocking the Menus

The menus can be protected from unwanted access by means of a PIN code [P1n] or in the IO-Link using “Device Access Locks”. The current settings are still displayed.

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



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

7.12.1 PIN Code [0x004D]





To enable the lock, a valid PIN code between 001 and 999 must be entered in parameter [P 1n] in the EF menu or via IO-Link.

If you attempt to alter a parameter while the lock is active, [L □ □] will flash on the display and or you will be asked to enter your PIN code.

The PIN code can be enabled and disabled with the parameter [P 1n] in the EF menu or via IO-Link (value > 000).

Below is a description of how to set a PIN code using the operating and display element.

- ✓ In the EF menu, select the parameter [P 1n].

1. Press the  button.
 - ⇒ The current PIN code will be displayed, and the digit on the right will flash.
2. Use the  button to select the first digit of the PIN code.
3. Use the  to confirm and go to entry of the second digit.
4. Enter the remaining digits in the same way.
5. Press the  button to save the PIN code.
 - ⇒ The menus are now locked.

If write protection is activated, 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 code “000” must be set for permanent deactivation of the lock.

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

7.12.2 Unlocking the Menus

Menus can be protected against unauthorized access by defining a PIN code [P 1n] in the EF menu. If you attempt to alter a parameter while the lock is active, [L □ □] will flash on the display and or you will be asked to enter your PIN code.

The menus can be unlocked as follows:

1. Use the  button to enter the first digit of the PIN code.
 2. Use the  to confirm the first digit and go to entry of the second digit.
 3. Repeat this process to enter all the digits of the PIN code.
- ⇒ When a valid PIN is entered, the message [VnC] is displayed.
 - ⇒ When an invalid PIN is entered, the message [Loc] is displayed and the menus remain locked.
 - ⇒ Once the PIN has been entered successfully, you will have one minute to edit the parameter in question.

The PIN code in the [P l_n] parameter must be set to 000 in order to permanently deactivate the lock.

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



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

7.13 Restricting Access Using Device Access Locks [0x000C]

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

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

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

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

The Extended Device Access Locks gives you the following options:

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

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

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

- The configuration of the area gripper
- The initial setup
- The production setup profile settings
- The IO-Link parameter “Application specific tag”

This function is executed using the parameter [r^{ES}] in the EF menu or via IO-Link.

The factory settings for the area gripper are listed in the Technical Data section.





⚠ WARNING



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

- Personal injury
- Avoid possible danger zone.
- Remain vigilant.

Below is a description of how to reset the area gripper to its factory settings using the display and operating element:

- ✓ The EF menu is open.
 1. Use the  button to select the parameter [rES].
 2. Confirm using the  button.
 3. Use the  button to select the setting parameter [YES].
 4. Confirm using the  button.
- ⇒ The area gripper is reset to the factory settings.

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

- The counter readings
- The zero-point adjustment of the sensor.

7.16 Counters

The area gripper has three internal, non-erasable counters and three erasable counters.

Counters 1 [cc 1] and [ct 1] increase with every valid “Suction” signal pulse, and thus count the area gripper’s suction cycles.

Counters 2 [cc 2] and [ct 2] count the suction valve’s switching cycles, and counters 3 [cc 3] and [ct 3] count the CM events.


The average switching frequency can be determined using the difference between counters 1 and 2.


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

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

Calling up the Counter Values

- ✓ Select the counter you wish to see in the [INF] menu.

- ▶ Confirm the parameter by pressing the  button.
 - ⇒ The first three decimal places of the counter total are displayed (the digits x 106). This corresponds to the three-digit block with the highest value.

Use the  button to display the remaining decimal places of the counter total, in order of descending value. The decimal points show which 3-digit block of the counter total is shown in the display. The counter total is comprised of the 3-digit blocks taken 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.



Non-erasable counter readings are saved only every 1000 steps. That means that when the operating voltage is switched off, up to 999 counter steps are lost.

Erasing counters [0x0002]

There are two different ways of resetting the erasable counters Ct1, Ct2 and Ct3 to 0:





- Using system commands via IO-Link
- Using the control panel:
 - ✓ The [] menu is open.
 1. Use the  button to select the parameter [].
 2. Confirm using the  button.
 3. Use the  button to select the setting parameter [].
 4. Confirm using the  button.
 - ⇒ The erasable counters Ct1, Ct2 and Ct3 are set to 0.

7.17 Displaying the Software Version

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




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


Using the control panel:

- ✓ The Info menu is open.
 1. Use the  button to select the parameter [].
 2. Confirm using the  button.
 - ⇒ The software ID is displayed.
 - ▶ To exit the function, press the  button.

7.18 Displaying the Part Number [0x00FA]

The part number of the functional module (ejector or valve assembly) is printed on the inside label and also saved electronically.


- ✓ The area gripper is available in the [INF] menu.
 1. Use the  button to select the part number parameter $P_{r}t$.
 2. Use the  button to confirm the part number parameter $P_{r}t$.
 - ⇒ The first two digits of the part number are displayed.
 3. Press the  button again several times.
 - ⇒ The remaining digits of the part number are displayed. The decimal points shown are part of the part number.

 In the first block displayed, the point on the far right (after the second digit), which is part of the part number, is not displayed for technical reasons.

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




Displayed section	1	2	3	4
Digit block	10	020	200	383

The part number in this example is 10.02.02.00383.

- ▶ To exit the function, press the  button.

7.19 Displaying the Serial Number [0x0015]


The serial number indicates the production period of the functional module.

- ✓ The area gripper is available in the Info menu [INF].
 1. Use the  button to select the serial number parameter $S_{n}r$.
 2. Use the  button to confirm the serial number parameter $S_{n}r$.
 - ⇒ The first three decimal places of the serial number are displayed (the digits x 106). This corresponds to the three-digit block with the highest value.
 3. Press the  button again several times.
 - ⇒ The remaining digits of the serial number are displayed. The decimal points show which 3-digit block of the serial number is shown in the display.

The serial number consists of 3 blocks with a total of 9 digits:

Displayed section	10^6	10^3	10^0
Digit block	900	000	000

In this example, the serial number is: 900000000

- ▶ To exit the Info menu, press the  button.

7.20 Device Data

The functional module provides a range of identification data that can be used to uniquely identify a device.

The following parameters can be queried via IO-Link or NFC:

- Manufacturer's name and website
- Supplier text
- Product name and product text
- Serial number
- Version status of the hardware and firmware
- User ID
- Unique device ID and device characteristics
- Part number and development status
- Manufacture and installation date
- Location ID
- System Configuration
- Device ID
- Web link for NFC app and device description file
- Storage ID

7.21 User-Specific Localization

The following parameters are available for saving application-specific information in the area gripper:

- Equipment labeling from the circuit diagram
- Geo-location
- IODD web link
- NFC web link
- Installation date
- Identification of the storage location
- Identification of the installation location

The parameters are ASCII character strings with the maximum length given in the data dictionary. The addresses can also be used for other purposes if necessary.

The NFC web link parameter is a special case. This parameter must include a valid web address beginning with <http://> or <https://> and is automatically used as a web address for NFC read accesses. As a result, read access operations from smartphones or tablets are rerouted e.g. to an address in the company's own intranet or on a local server.

7.22 Process Data Monitoring

IO-Link provides the current measurements for the following parameters, plus the lowest and highest values measured since switching on:

- For the vacuum [0x0040]
- For the compressed air supply [0x0041]
- For the supply voltage [0x0042]

The maximum and minimum values can be reset using the appropriate system command [0x0002].




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

7.23 Production Setup Profiles

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

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

You can view the parameter data set (P-0 to P-3) that is currently in use in the slide show by pressing the  button. In the default setting, the P-0 production setup profile is selected.

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

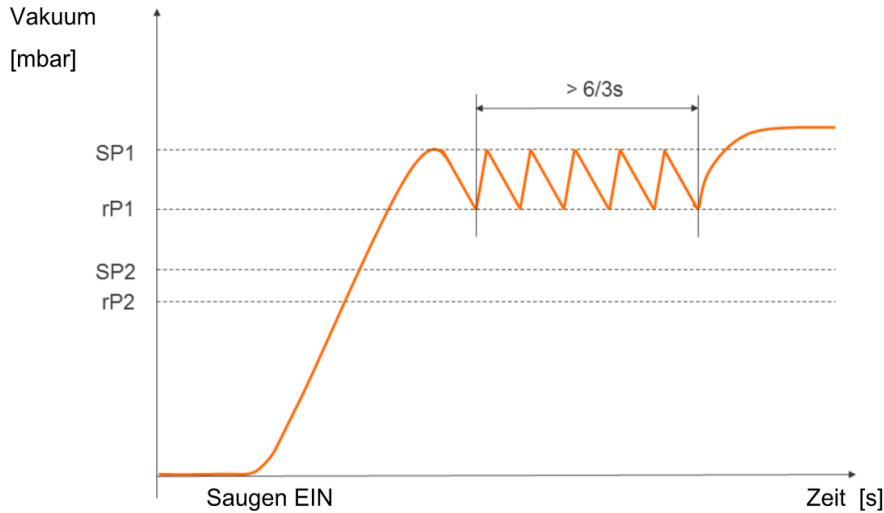
7.24 Energy and Process Control (EPC)

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

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

7.25 Condition Monitoring (CM) [0x0092]

Monitoring valve switching frequency for grippers FXP-i



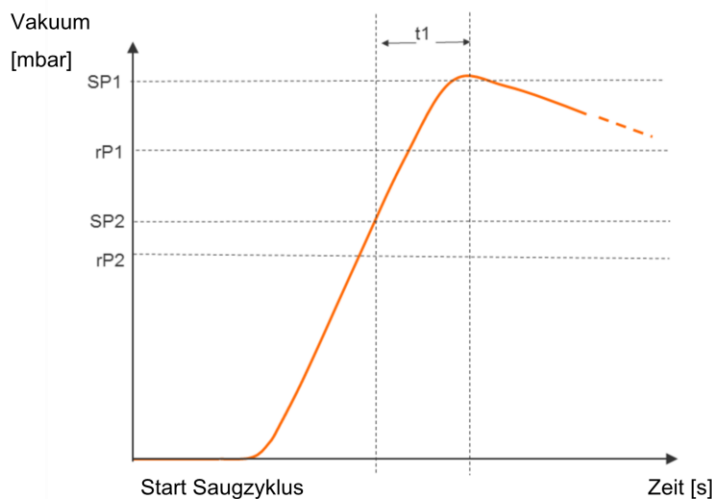
When the air saving function is activated and there is a high leakage level in the gripping system, the area gripper FXP-i switches between the suction and suction-off states very frequently. The number of valve switching procedures thus increases rapidly within a short time.

To protect the area gripper and increase its service life, the area gripper automatically deactivates the air saving function and switches to continuous suction if the switching frequency $> 6/3$ s (more than 6 switching operations within 3 seconds). The area gripper then remains in suction mode.

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

This function is deactivated for grippers of type FMP-i.

Monitoring evacuation time



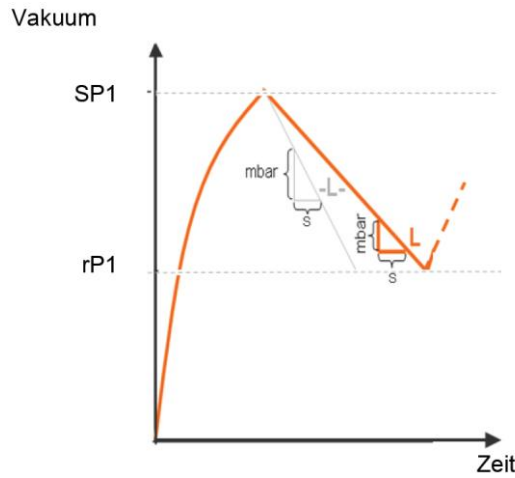
Measuring the evacuation time t_1 :

The interval between reaching the switching points SP2 and SP1 is measured (in ms).

If the measured evacuation time t_1 (from SP2 to SP1) exceeds the specified value, the "Evacuation time longer than t_1 " condition monitoring warning is triggered and the system status light switches to yellow.

The specified value for the max. permitted evacuation time t_1 can be set in the EF menu with the parameter [L-] or via IO-Link [0x006B]. Setting the value to [] (= off) deactivates monitoring. The maximum permitted evacuation time setting is 9.99 s.

Monitoring leakage



Measuring the leakage:

In control mode ([cbr] = [on] or [on]), the vacuum drop/leakage over a certain period of time is measured (as vacuum drop per unit time in mbar/s) from the point when the air saving function interrupts suction after reaching switching point SP1.

The measured leakage value "L" in mbar/s can be queried via IO-Link.

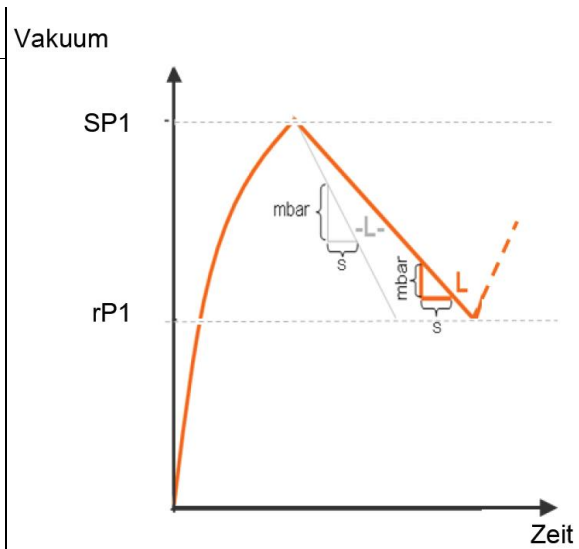
Evaluating the leakage level

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

When evaluating the leakage level, a differentiation is made between two statuses:

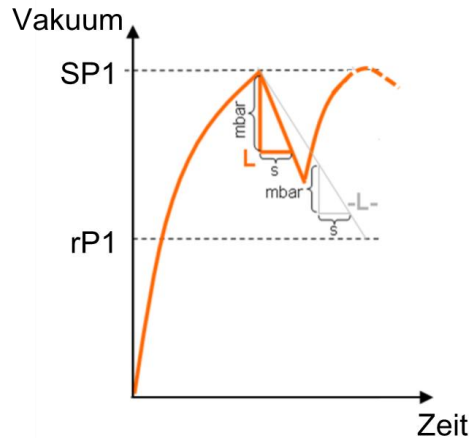
Leakage L < permitted value -L-

- The vacuum continues to decrease until it reaches the reset point rP1
- The area gripper begins to suck again (normal control mode)



Leakage L > permitted value -L-

- The area gripper immediately begins to correct it
- A condition monitoring warning is activated
- The system status indicator light turns yellow



The specified value for the maximum permitted leakage -L- can be set in the EF menu with the parameter [-L-] or via IO-Link [0x006C]. The maximum leakage that can be set is 999 mbar/second.

Monitoring the control threshold

If the switching point SP1 is never reached during the suction cycle, the “SP1 not reached” condition monitoring warning is triggered and the system status light switches to yellow.

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

Monitor Dynamic Pressure

If possible, a dynamic pressure measurement is taken at the start of every suction cycle (vacuum during unobstructed suction). The result of this measurement is compared to the limit values set for SP1 and SP2.

If the dynamic pressure is greater than (SP2 – rP2) but less than SP1, the corresponding condition monitoring warning is triggered and the status light switches to yellow.

Monitoring the Supply Voltages



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

The area gripper measures the supply voltages U_s . The measured value can be read from the parameter data.

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

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

Condition Monitoring Events and Status Display [0x0092]

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

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

Bit	Event	Update
0	Valve protection function activated	Cyclic
1	Set limit value t-1 for evacuation time exceeded	Cyclic
2	Set leakage limit value -L- exceeded	Cyclic
3	Limit value SP1 was not reached	Cyclic
4	Dynamic pressure > (SP2-rP2) and < SP1	As soon as a corresponding dynamic pressure value has been determined
5	Supply voltage US outside the operating range	Constant
8	Input pressure outside operating range	Constant

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

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

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

The values measured by the condition monitoring system, namely the evacuation times t0 and t1 and the leakage value L, are reset at the beginning of every suction process and updated once they have been measured.

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

In order to optimize the energy efficiency of vacuum gripping systems, the area gripper FXP-i provides a function for measuring and displaying energy and air consumption.

When measuring air consumption as a percentage, the area gripper calculates the air consumption from the last suction cycle as a percentage. This value corresponds to the ratio for the full duration of the suction cycle and the active suction and blow-off times.

An externally recorded pressure value can be supplied using the IO-Link process data. If this value is available, absolute air consumption measurement can be performed in addition to the percentage-based air consumption measurement. The actual air consumption of a suction cycle is calculated taking the system pressure and nozzle size into account, and specified in standard liters [NL]. The measured value is reset at the beginning of the suction cycle and constantly updated during the running cycle. As such, no further changes can occur once blow-off is complete.

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

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



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



The area gripper is not a calibrated measuring device. However, the values may be used as a reference and for comparison measurements. For the area gripper FMP-1, only the electrical consumption of the valves is specified.

7.25.2 Predictive Maintenance (PM)

Overview of Predictive Maintenance (PM)

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

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

Measurement of Leakage

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

Dynamic Pressure Measurement

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

Measured values below 5 mbar or above the limit value SP1 are not regarded as valid dynamic pressure measurements and are discarded. The result of the last valid measurement is retained.

Measured values that are below the limit value SP1 but simultaneously above the limit value SP2 – rP2 result in a condition monitoring event.

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

Quality Assessment [0x00A2]

In order to evaluate the entire gripping system, the gripper calculates a quality rating based on the measured system leakage.

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

Performance Calculation [0x00A3]

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

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

Dynamic pressure events that exceed the limit value (SP2 – rP2) always result in a performance rating of zero percent. A dynamic pressure value of 0 mbar (which indicates that no valid measurement value could be obtained) also results in a performance rating of zero percent.

7.25.3 Reading the EPC Values

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

Proceed as follows to read the EPC values:

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

8 Transportation and Storage

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. Report any damage caused by defective packaging or that has occurred in transit to the carrier and to Schmalz immediately.

Removing the packaging

1. Remove labeled transport aids and securing devices.
2. Dispose of the packaging material in accordance with the applicable national laws and guidelines.

NOTE



Sharp knives or blades

Damage to components!

Ensure that no components are damaged while opening the packaging.

NOTE



The effects of ozone, light (especially UV), heat, oxygen, humidity as well as mechanical influences can reduce the service life of rubber products.

Damage to the suction plates due to incorrect storage of the lifting device!

Rubber parts, such as suction cups and suction plates, must be stored in a cool location (0° C to +15° C, max. 25° C) that is dark, dry, low in dust and offers protection from the weather, ozone and drafts.

9 Installation

9.1 Installation Instructions

CAUTION



Improper installation or maintenance

Personal injury or damage to property!

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

For safe installation, the following instructions must be observed:

1. Use only the connections, mounting holes and attachment materials that have been provided.
2. Carry out mounting and removal only when the device is in an idle, depressurized state.
3. Pneumatic and electrical line connections must be securely connected and attached to the area gripper.

9.2 Mounting the Area Gripper

CAUTION



Compressed air or vacuum in direct contact with the eye

Serious eye injuries!

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.

Area grippers equipped with SVK technology have a maximum swivel angle relative to the horizontal of 60°. If this angle is exceeded, the functionality of the grippers may be restricted.

Area grippers with SW technology can be used in any mounting position.

The area gripper is attached using sliding blocks. Special sliding block strips for holding the sliding blocks are integrated into the main body. The system can be adapted directly using the sliding block strip, a robot flange or a spring-mounted suspension eye.



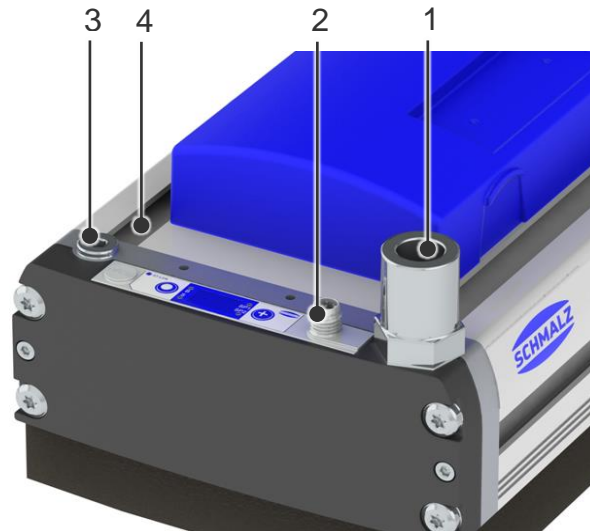
When mounting the gripper with an integrated ejector, make sure that the area around the silencer remains free to ensure unhindered discharge of the escaping air.

For the start of operations, the area gripper must be connected to the controller via the connection plug with a connection cable.

Grippers with an integrated ejector must be supplied with compressed air via the plug-in screw union.

If the separation function is used, a throttle non-return valve is used at the corresponding connection.

Grippers of type FMP-i with a hose connector for connection to an external vacuum generator must be connected to this before operation using a hose that is suitable for vacuum applications.



1	Compressed air connection	2	M8 electrical connection, 6-pole
3	Connection for separation function	4	Sliding block strip

9.3 Mounting the Sealing Plate

Removing the old sealing plate

1. Remove the sealing plate (valve film remains on the gripper section).
2. Remove any adhesive residues or dirt.
3. The SW bores in the valve film must not become blocked. Clean them if necessary! (Visual inspection against a light source)



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dichtschaum-wechseln](http://www.schmalz.com/dichtschaum-wechseln)



When replacing the sealing plate, make sure you do not remove the valve film. To avoid this, always start to remove the sealing plate using its outermost corner.

Mounting a new sealing plate

1. Note the installation instructions on the replaceable sealing plate.
2. Note: The surface must be free of: dust, oil, oxides and adhesive residues
3. Remove the protective film
4. Openings in the sealing plate and holes in the main body must line up.
5. Press the sealing plate firmly onto the entire surface without any wrinkles.
6. Apply a pressure of approx. 20 N/cm². Press with a roller if needed.



Processing temperature: A range of +10° C to +40° C is recommended for the object temperature and the ambient temperature.



Note: After you have glued on the foam, it should not be used for at least one hour so that the adhesive has time to set completely.



The sealing plate is asymmetrical. Make sure that it is correctly aligned.

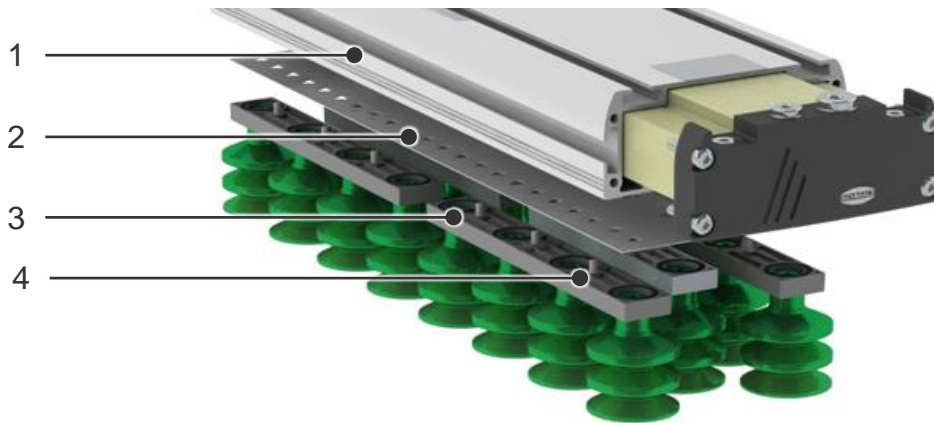
⇒ We also offer oil-resistant and temperature-resistant foams (temperature > 60° C) for special applications.

9.4 Mounting the Suction Cup Connection Strips

The suction cup connection strips are usually each equipped with four suction cups with a diameter of 40 mm or six suction cups with a diameter of 20 mm.

When removing the strips, we recommend marking the positions in which shorter strips were mounted. This will ensure that the suction cup connection strips are screwed back on in the correct order.

The torque is 2 Nm.



1	Main body	2	Valve film
3	Suction cup connection strips	4	M4 screws for suction cup connection strip

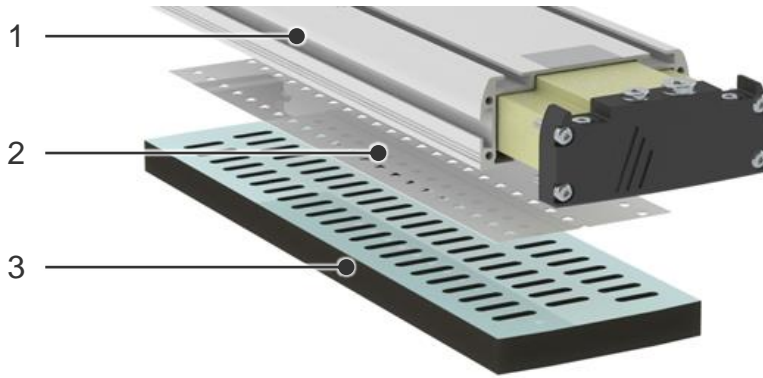
9.5 Mounting the Valve Film / Masking Film

When replacing the valve film (also referred to as masking film) on area grippers with suction cups, all suction cup connection strips must first be unscrewed.

The valve film can be reused if the adhesive layer is still good enough and is not soiled. The valve film can be reused around 4–6 times. It is therefore important to protect the adhesive side of the valve film from dust after it has been removed.

The same sealing plate grid can be used to glue the valve film SW and the valve film SVK to the main body. When switching from valve type SW to valve type SVK, you must first insert the ball valves specified by the manufacturer into the opening in the main body. Small recesses in the cover make it easy to pull off the valve film.

Installation



1	Main body	2	Valve film
3	Sealing plate		

Mounting the new valve film

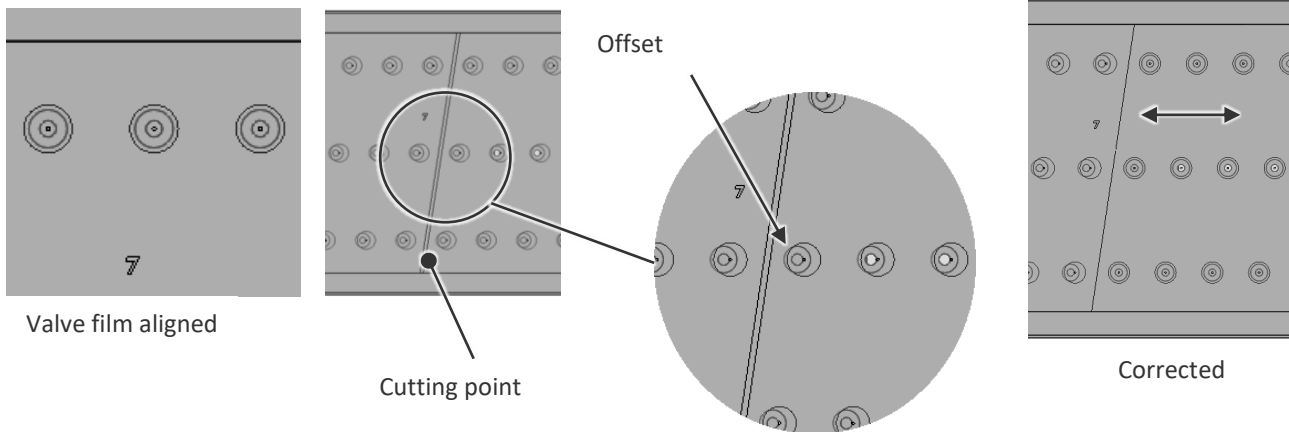


Before applying the valve film, ensure that the surface of the main body is free of any residue and grease.



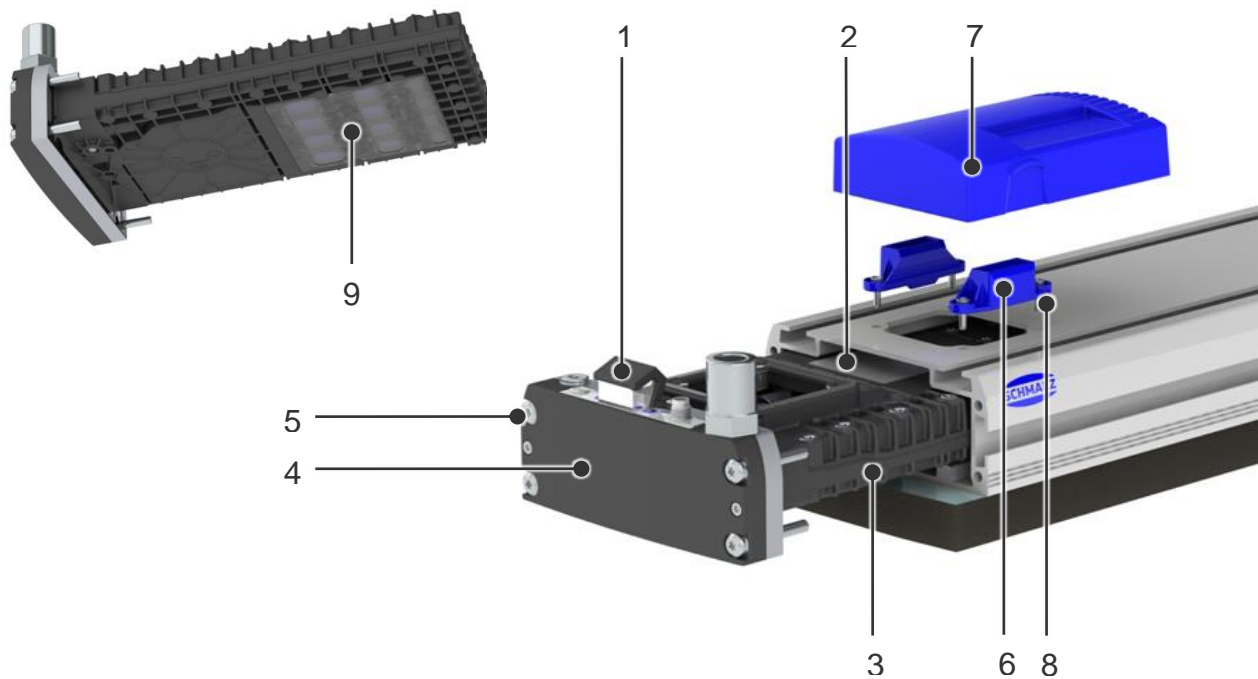
For grippers with SVK technology, never remove the valve film above head height, otherwise the valve bodies will fall out. The gripper must be removed and rotated 180° before the film is removed.

- When replacing masking film, it must be ensured that the suction holes (SW and SVK) are affixed centrally to the holes in the section. (Fig. 9.1)
- Longer masking films can become misaligned despite the fact that they were initially aligned centrally.
 - ⇒ In this case, cut the masking film (before attaching) using a steel rule and a sharp knife at the cutting points shown.
 - ⇒ The masking film can then be pushed together or pulled apart and the offsetting is corrected.



9.6 Mounting the Ejector Assembly

To make it easier to perform maintenance work, the plug-in ejector that is integrated in the area gripper can be removed.



1	Control and display unit (figure with optional pentaprism)	2	Nameplate with QR code
3	Plug-in ejector	4	End cover with control unit
5	Self-tapping fastening screws (4x)	6	Silencer mounting clips
7	Silencer housing	8	Machine screws for retaining clips (4x)
9	Filter		

Removing the assembly

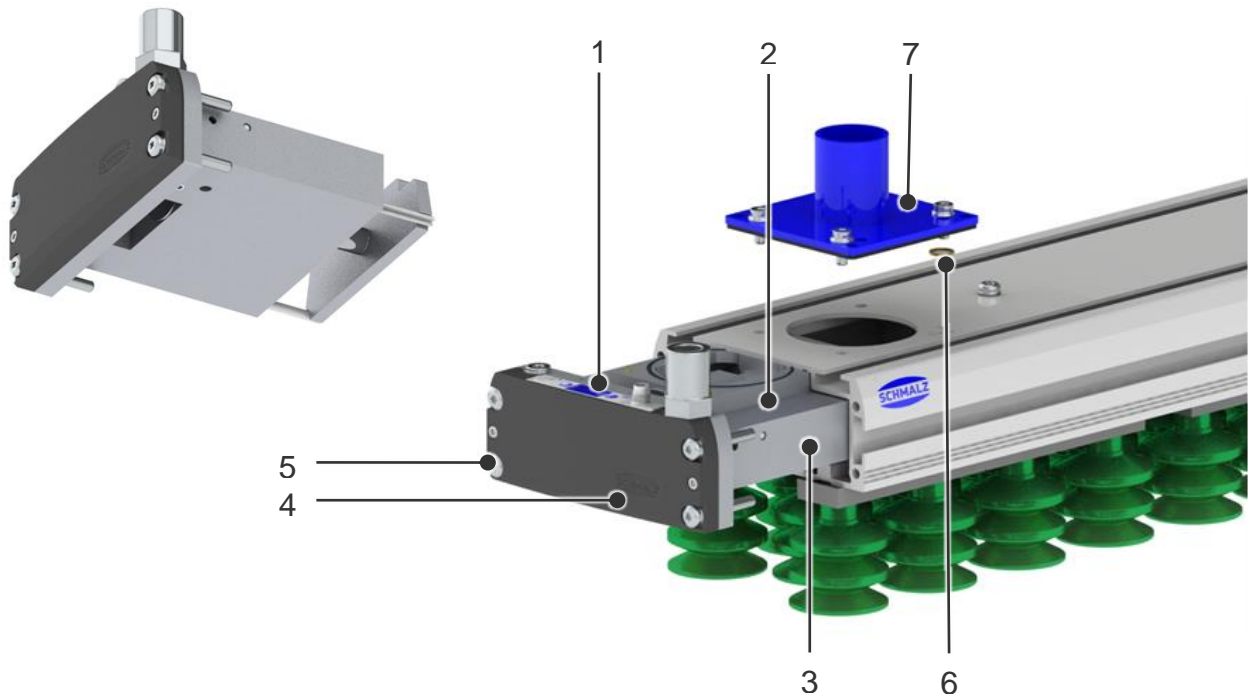
1. Remove the silencer (7).
 2. Loosen the four machine screws (8) with which the retaining clips are mounted.
 3. Loosen the four self-tapping screws (5) on the front.
 4. If necessary, loosen the foam on the underside of the housing cover.
- ⇒ The assembly can be removed.

Installing the assembly

1. Push the functional module into the main body.
2. Gently tighten the four screws (8) for attaching the retaining clips for the silencers to the top of the area gripper (1 Nm) until the screws (5) can be easily inserted on the ejector cover.
3. Tighten the four fastening screws (5) on the end cover (4) (4 Nm).
4. Tighten the fastening screw (8) at the top of the area gripper (1.2 Nm).
5. Clip in the silencer housing.

9.7 Mounting the Valve Assembly

To make it easier to perform maintenance work, the valve that is integrated in the area gripper can be removed.



1	Control and display unit	2	Nameplate with QR code (not shown)
3	Vacuum valve	4	End cover with control unit
5	Self-tapping fastening screws (4x)	6	Filter screen
7	Hose connector		

Removing the assembly

1. Remove the four retaining screws (5) from the end cover and hose connector (7).
 2. Check the filter screen (6) and clean if necessary.
 3. If necessary, loosen the foam on the underside of the housing cover.
- ⇒ The assembly can be removed.

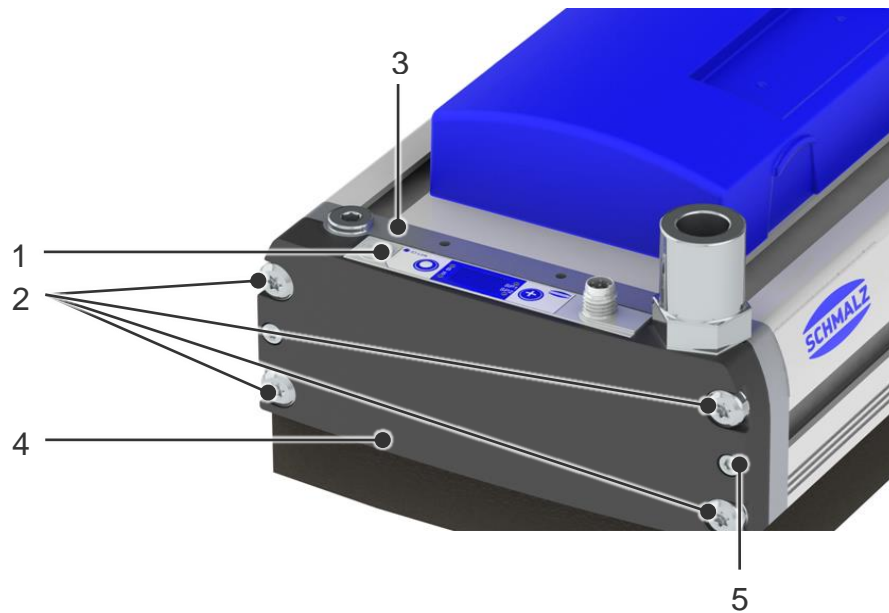
Installing the assembly

1. Push the functional module into the main body.
2. Insert the filter screen (6) into the milled recess in the gripper section.
3. Gently tighten the four screws for attaching the hose connector to the top of the area gripper (1 Nm).
4. Tighten the four fastening screws (5) on the end cover (4) (4 Nm).
5. Tighten the fastening screws for the hose connector (7) on the top of the area gripper (2.7 Nm).



The vacuum valve (3) must not be opened or disconnected from the functional end cover (4). If faults occur, replace it completely or send it to Schmalz for maintenance. For more information about your assembly, refer to the nameplate.

9.8 Mounting the Plastic Protective Cap



1	Control unit	2	Fastening screws for ejector assembly
3	Main body	4	Plastic protective cap
5	Machine screws for plastic cap		

The plastic protective cap can be replaced if it is damaged. You must loosen the four fastening screws (2) to replace it. You must also remove the two machine screws (5). The cap can then be removed. Mount the new cap in the reverse order.

9.9 Mounting the Electrical Connection

NOTE



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

Personal injury or damage to property

- ▶ Electrical connection must be performed only by a qualified specialist who can predict the effects that signal changes will have on the entire system.

NOTE



Incorrect power supply

Destruction of the integrated electronics

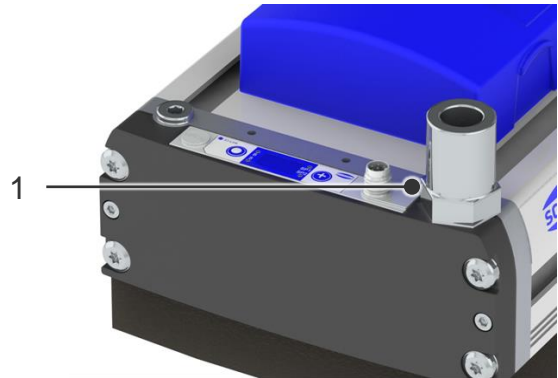
- ▶ Operate the product using a power supply unit with protected extra-low voltage (PELV).
- ▶ The system must incorporate safe electrical cut-off of the power supply in compliance with EN60204.
- ▶ Do not connect or disconnect the connector under tension and/or when voltage is applied.

The electrical connection supplies the area gripper with power and communicates with the controller of the higher-level machine using defined outputs or via IO-Link.

- ✓ Provide a connection cable with an M8 6-pole socket (customer's responsibility).

- ▶ Attach the connection cable to the area gripper at the electrical connection (1).

Maximum tightening torque = hand-tight.



Ensure that the electrical cable does not exceed the maximum length of 20 meters.

9.9.1 Pin Assignments

M8 plug	PIN	Symbol	Wire color ¹⁾	Function
	1	US	Brown	24 V power supply
	2	IN1	White	"Suction" signal input
	3	GND	Blue	Ground
	4	OUT / CQ	Black	"Parts control" output (SP2) or IO-Link
	5	IN2	Gray	"Blow-off" signal input
	6	—	Pink	Not used

¹⁾ When using a Schmalz connection cable, part no. 21.04.05.00488 (see accessories)

9.10 Special Model with the Separation Function

This section describes the special model of the gripper FXP/FXP-i with separation function.

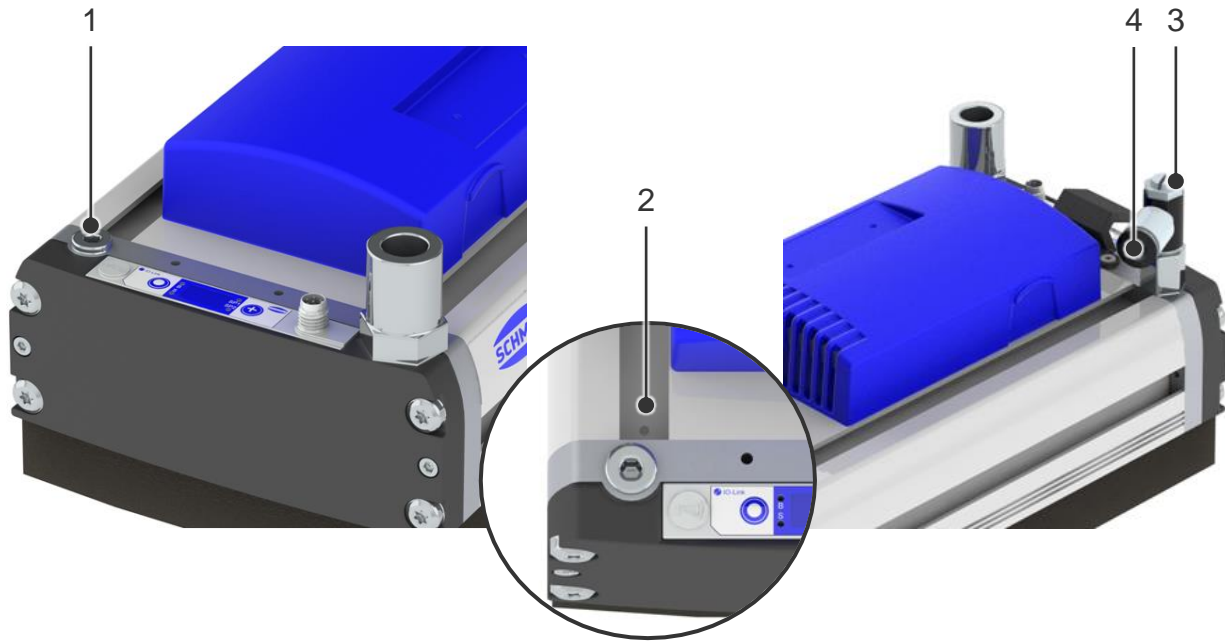
The separation pulse is needed when two or more air-permeable sheets are picked up during suction. The briefly applied compressed air pulse separates the second sheet from the first. The valve screw setting can vary according to the properties of the workpieces.

When the product is delivered, the connection for separation (1) is closed with a plug.

The compressed air connection for separation should only be connected on the side with the marking (2) in the sliding block strip. The markings are on either end of the section. The amount of compressed air can be set to the customer's requirements using the valve screw.



The separation function can only be connected if there is a marking hole at the end of the section! If you wish to retrofit this function, please contact Schmalz to obtain the conversion measures.



1	Connection for separation function	2	Marking
3	Valve screw	4	Compressed air connection

Compressed air connection

The compressed air is controlled using connection (4). The compressed air is switched using a 3/2-way valve. This valve is not included in the equipment delivered with the gripper.

The separation function is started up as follows:

Start of operations

1. Remove the plug on the connection (1)
2. Connect the supplied throttle return valve to the connection using an extension.
3. Tighten valve screw (1) using a flathead screwdriver (clockwise direction).
4. Apply the compressed air using connection (2) (8/6 hose).
5. Slowly loosen valve screw (1) until you have achieved the necessary separation effect.



This setting cannot be made at the factory because it must be adapted to the individual materials being lifted.

Description of the Separation Function

1. Place the gripper on the product. Sealing plates should be compressed by at least 40%.
2. Switch on the suction pulse. After an evacuation time of approx. 0.5 to 1.0 seconds, lift a few millimeters.
3. Start the separation pulse. Continue lifting during the separation period.
4. Switch off the separation pulse just after the 2nd layer is separated. The separation pulse can only run for a very brief period; otherwise there is a risk of destroying the sealing plate.



If necessary, you can also use two valve screws per gripper.
The separation function is available for the valve technology SVK and SW.

10 Operation

Always carry out the following tasks before activating the system:

1. Before each use, check that the safety features are in perfect condition.
2. Check the area gripper 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's danger area while it is in operation.

10.1 Safety

NOTE



Incorrect control when depositing products

The product cannot be released from the gripper. Increased wear on the sealing elements.

The dynamic pressure in the gripper must not be more than 0.2 bar during blow-off.

Before initiating the blow-off pulse, ensure that the gripper (with attached workpiece) is not pressed against a solid surface. The workpiece must be able to freely detach from the gripper.

NOTE



Risk of implosion with closed containers

Containers such as cups can implode if the vacuum is too high. Possibility that contents will leak out.

Carry out tests in advance and adjust the maximum vacuum.

NOTE



Noise pollution due to the escape of compressed air / exhaust air

Discomfort

The system must only be operated with a silencer.

Wear ear protectors.

Regular maintenance and inspection of all components.

NOTE



Limitation of the function due to moisture

The area gripper is only protected against moisture to a limited extent.

Avoid use in damp conditions.

Shorten maintenance intervals.



⚠ CAUTION

Risk of crushing injuries

Serious injury!

Do not enter or reach into the secured danger zone.



⚠ CAUTION

Risk of injury due to exposed suction points and compressed air lines

Do not place eyes, ears or hands into suction points and compressed air lines.

Do not bring exposed suction points and compressed air lines close to eyes or body orifices.

Do not place suction plates on the human body.



⚠ CAUTION

Sharp objects

Damage to vacuum hoses from sharp objects

Always ensure that vacuum hoses cannot be damaged by sharp objects.



⚠ CAUTION

The gripper is not attached correctly.

Serious injury due to falling parts!

Ensure that the gripper is securely attached.



⚠ WARNING

Persons in the working area of the area gripper may suffer life-threatening injuries.

Serious injury or death!

The danger zone of the gripper is exclusively determined by the automatic system, such as the robot, handling system or gantry, and must be secured by the customer.

Ensure that no persons or animals are present in the danger zone at any time. The danger zone must be secured by the integrator.

Ensure that collisions with the surrounding environment and objects are avoided to prevent the load from breaking off.



⚠ WARNING

Falling objects

Serious injury or death!

Various causes: disruption to the energy supply, incorrect design of the holding force, wear, etc.

Do not enter the danger zone.

10.2 Operation via IO-Link

When the area gripper is operated in IO-Link mode (digital communication), the supply voltages, ground and communication line for IO-Link (C/Q line) are directly connected to the IO-Link master (point-to-point connection). It is not possible to connect multiple C/Q lines to a single IO-Link master port.

Connecting the area gripper via IO-Link provides access to a number of additional functions alongside the basic functions of area gripper, such as suction, blow off and feedback. These additional functions are:

- Device data
- Device status
- The current vacuum level
- Choice of four production profiles (production setup profiles P0 to P3)
- Errors and warnings
- Status indicator of the area gripper
- Access to all parameters
- Functions for energy and process control

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

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

11 Troubleshooting

11.1 Safety

Faults with the area gripping system must be corrected only by qualified electrical and mechanical specialists.

Personnel must have read and understood the Operating Instructions.

Personal protective equipment must be worn for installation, troubleshooting and maintenance work.

⚠ WARNING

Risk of injury due to switching on the system during troubleshooting



It is essential to set down lifted loads before entering the danger areas.

Before troubleshooting, make sure that the electrical components are not live and that the system is depressurized.

Switch off the power switch, compressed air and vacuum, if applicable, and secure against unauthorized restart.

It must be ensured that safe working in the secure area is possible at all times.

⚠ 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.

11.2 Help with Faults

If the load cannot be lifted, work through the following list to identify and rectify the fault:

Fault	Cause	Measure
Vacuum level is not reached or vacuum is created too slowly	Leakage in hose line	Check hose connections
	Leakage or wear on the sealing plate or suction cups	Check the sealing plate or suction cup and replace if necessary <div style="text-align: center;"> <p>Video</p>  <p>www.schmalz.com/replacing-sealing-foam</p> </div>
	Operating pressure too low	Increase operating pressure
	Internal diameter of the compressed air lines too small	Use hose lines with a larger internal diameter
Load cannot be held	Vacuum level too low	See above for possible causes
	Suction force not suitable for load	Connect an additional FXP module

Troubleshooting

Fault	Cause	Measure
	Check valves and flow restrictors contaminated	Remove the valve film and clean the gripper; replace the valve film if necessary. Use a sealing plate with integrated filter screen.
	Filter screen in front of the plug-in ejector closed with dust (FXP-i)	Take out the plug-in ejector and remove the dirt. Use a sealing plate with integrated filter screen.
	Build-up of dust in the filter screen on the suction connection (FMP-i)	Screw off the suction connection, take out the filter screen and remove the dirt.
	The area gripper is not pressed firmly enough onto the workpieces to be lifted	Press more firmly (the sealing plate/suction cup should be compressed by at least 40%; this applies especially for suction cups) 
	Too short retention time for the area gripper when picking up the workpiece	Extend the retention time
	Too fast or jerky lifting of workpieces	Optimize the motion. Avoid acceleration peaks (especially when lifting the workpieces)
	The workpieces to be lifted are not suitable for an area gripper with sealing plate (e.g. thin cardboard boxes, goods wrapped with thin film, etc.)	Use a different gripping system, e.g. an area gripper with suction cups.
Sealing plate wears out very quickly	It is set down on the workpiece at an angle or is dragged across the workpiece	Set it down vertically on the workpiece to be lifted
Power supply disrupted	Electrical connection	Make sure device is properly connected to power
No communication	Incorrect electrical connection	Check electrical connection and pin assignment
	Higher-level controller not correctly configured	Check the controller configuration
	IODD connection does not work	Check the IODD
No NFC communication	NFC connection between area gripper and reader (e.g. smartphone) not correct	Hold the reader at the intended position on the area gripper
	NFC function on reader (e.g. smartphone) not activated	Activate NFC function on reader
	NFC deactivated on area gripper	Activate NFC function on the area gripper
	Write operation canceled	Hold the reader at the intended position on the area gripper
No parameters can be changed using NFC	PIN code for NFC write protection activated	Enable NFC write permissions
Area gripper is not responding	No power supply	Check electrical connection and pin assignment

Fault	Cause	Measure
	No compressed air supply	Check the compressed air supply
Vacuum level is not reached or vacuum is built up too slowly	Silencer is dirty	Clean the silencer
	Leakage in hose line	Check hose connections
	Leakage at the suction element	Check suction cup or sealing plate
	Operating pressure too low	Increase operating pressure. Note the maximum limits!
	Internal diameter of hose line too small	Observe recommendations for hose diameter
Load cannot be held	Vacuum level too low	Increase the control range for the air saving function
	Suction force too low	Use larger area grippers or additional area grippers
No display on the screen	ECO mode activated	Press any button or deactivate ECO mode
	Faulty electrical connection	Check electrical connection and pin assignment
Display shows error code	See "Error codes" table	See "Error codes" table in the following chapter
Warning message/IO-Link warning message "Leakage too high" although handling cycle is working optimally	Limit value -L- (permissible leakage per second) set too low	Determine typical leakage values in a good handling cycle and set as limit value
	Limit values SP1 and rP1 for leakage measurement set too low	Set limit values in such a way that there is a clear differentiation between the neutral and suction system states.
Warning message/IO-Link warning message "Leakage too high" does not appear although there is high leakage in the system	Limit value -L- (permissible leakage per second) set too high	Determine typical leakage values in a good handling cycle and set as limit value
	Limit values SP1 and rP1 for leakage measurement set too high.	Set limit values in such a way that there is a clear differentiation between the neutral and suction system states.



We recommend always performing tests with original sample workpieces. We would be happy to help you with testing.

11.3 Error Codes, Causes and Solutions

The condition monitoring functions output events that can be used to draw conclusions with regard to the process. If a known error occurs, it is transmitted via the IO-Link ISDU parameter [0x0082] in the form of an error number. The system status is automatically refreshed on the NFC tag every 5 minutes at the latest. That means that an error may be displayed via NFC even though it has already disappeared.

Error code	Fault	Possible cause	Solution
E01	Internal error Electronics	Operating voltage was disconnected too quickly after a parameter change, saving process was not complete.	Clear the error by restoring the factory setting with the [rE5] function or parameter. Use engineering tool to import a valid dataset. If error [E01] occurs again after restarting the supply voltages: Replacement by Schmalz required
E03	Zero-point error/calibration error on vacuum sensor	Zero-point adjustment for vacuum sensor is outside of the tolerance 3% FS. Calibration was canceled when measurement value was too high or too low.	Ventilate the vacuum circuit. Perform calibration.
E07	Under voltage US	Sensor supply voltage is too low.	Check power supply unit and power load Increase supply voltage
E08	IO-Link error	Connection to master interrupted.	Check connection line. Repeat the power up process.
E17	Over voltage US	Sensor supply voltage is too high.	Check power supply unit. Reduce supply voltage
FFF	Vacuum range	Measured vacuum level too high, sensor defective	Check and adjust supply pressure. Replacement by Schmalz required
-FF	Overpressure in vacuum system	Area gripper in "blow-off" mode	No error! Overpressure display
E90	Manual mode	Manual mode locked by IO-Link.	If necessary, use IO-Link to enable manual mode.

11.4 System condition monitoring (CM)

The overall status of the system is displayed as a status traffic light using 2 bits of process data input byte 0. All warnings and errors are taken into account when defining the status of the display. This basic display provides immediate information about the status of the area gripper.

The table below shows and the various status traffic light colors and explains what they mean:

System status displayed	Description of the status
Green	System is working perfectly with optimal operating parameters
Yellow	Warning – Condition monitoring warnings are present; gripping system not functioning perfectly Check operating parameters
Orange	Warning – Serious condition monitoring warnings are present; gripping system not functioning perfectly Check operating parameters
Red	Error – Error code available in the error parameter, safe operation of the gripper within the operating limits is no longer ensured <ul style="list-style-type: none"> • Cease operation • Check the system

11.5 Warnings and Error Messages in IO-Link Mode

In IO-Link mode, status information is available in addition to the error messages displayed in SIO mode. More details on this can be found in the final section of the enclosed data dictionary, “Coding of Extended Device Status (ISDU 138) and IO-Link Events.”

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

12 Maintenance

12.1 Safety

Faults with the area gripping system must be corrected only by qualified electrical and mechanical specialists.

Personnel must have read and understood the Operating Instructions.

Personal protective equipment must be worn for installation, troubleshooting and maintenance work.

WARNING

Risk of injury due to switching on the system during troubleshooting



It is essential to set down lifted loads before entering the danger areas.

Before troubleshooting, make sure that the electrical components are not live and that the system is depressurized.

Switch off the power switch, compressed air and vacuum, if applicable, and secure against unauthorized restart.

It must be ensured that safe working in the secure area is possible at all times.

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.

12.2 Maintenance

Remove any dirt on the exterior of the gripper with a soft cloth and soap suds (max. 60 °C).

Operation of the area gripper can draw in dust from the environment. This dust collects at a particular contamination point within the area gripper (e.g. the filter before the plug-in ejector). These screens must be cleaned regularly, depending on the amount of dust sucked in.

The necessary maintenance intervals can be increased considerably by taking the following measures.

12.2.1 Optimized control



Only turn on the suction when workpieces are being lifted. Otherwise, additional dust from the environment is drawn in, which shortens the necessary maintenance intervals.

12.2.2 Use of sealing plates with integrated filter fleece

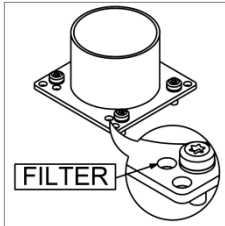
A filter fleece prevents dust from being drawn into the area gripper. Because the filter fleece makes the flexing movements along with the sealing plate in each working cycle, the filter fleece is self-cleaning.

12.2.3 Use of suction cups with integrated filter plate


A filter plate prevents dust from being drawn into the area gripper. We recommend that you regularly clean the filter plate with compressed air.

-  Generally, no other maintenance work is necessary. Heavy contamination can cause malfunctions. We recommend overhaul by J. Schmalz GmbH in this case. The replaceable sealing plates are described in the “Spare Parts and Wearing Parts” section.
-  If the sealing plate shows mechanical damage, it can be repaired up to a certain point using standard vulcanizing adhesive (e.g. adhesive for repairing the inner tubes of bicycles).

12.2.4 Functional Check of the Vacuum Valve (Gripper FMP-i)




On area grippers FMP-i, dirt may accumulate in the bore hole in the hose connector (on the filter) shown in the diagram. The filter must be cleaned regularly based on the amount of dirt. Dismantle and clean separately as described in the section entitled “Mounting the Valve Assembly”.

-  Note: Do not blow in with compressed air when assembled.

Functional test

To test the functions of the integrated vacuum valve, you must operate the vacuum valve while the suction points are free (without a workpiece).
 If the vacuum valve is closed (suction off) during operation (while the vacuum generator is running), then the applied vacuum level in the gripper should drop to the ambient pressure after a short time. The blow-off function can also be tested. Here, an audible noise can be heard from the compressed air that flows out when “Suction” is ON.
 If the vacuum valve is opened during operation (“Suction” ON and “Blow off” OFF), then an appropriate vacuum should build up in the area gripper FMP-S. If the vacuum level does not build up or drop correctly, replace the vacuum valve completely or send it to Schmalz for maintenance.

12.3 Maintenance Schedule

-  Schmalz stipulates the following checks and inspection intervals. The operator must comply with the legal regulations and safety regulations applicable at the location of use. These intervals apply to single-shift operation. For heavier use, such as multi-shift operation, the intervals must be shortened accordingly.

	Interval				
	Daily	Weekly	Monthly	Every six months	Annual inspection
Check all load-bearing parts (e.g. suspension) for deformation, wear or other damage			X		X
Check the sealing plates or suction cups for wear, cracks and leaks; replace if necessary		X			X
Check whether the optional filter fleece is dirty		X			X
Check whether the optional suction cup filter plate is dirty		X			X

Video

www.schmalz.com/dichtschaum-wechseln

Maintenance

	Interval				
	Daily	Weekly	Monthly	Every six months	Annual inspection
General condition of the device					X
Leak test FXP-i When the ejector is switched on and the smooth, non-permeable surface of a workpiece (e.g. a metal plate) is fully picked up, the system vacuum must indicate a vacuum that is no more than 20% lower than the maximum possible vacuum of the ejector used. Example: Ejector reaches max. -0.55 bar. A vacuum between -0.45 and -0.55 bar must be shown on the display.			X		X
Leak test FMP-i When the vacuum generation is running and the smooth, non-permeable surface of a workpiece (e.g. a metal plate) is fully picked up, the system vacuum must indicate a vacuum that is no more than 10% lower than the maximum possible vacuum of the vacuum generator used. Example: Vacuum generator reaches max. -0.5 bar. A vacuum between -0.45 and -0.5 bar must be shown on the display.			X		X
Vacuum test for FXP-i When the ejector is switched on and no workpiece is picked up, the system vacuum must be between -0.20 and -0.4 bar. For the area gripper FXP with SVK valve technology, between 0.35 and 0.5 bar			X		X
Vacuum test for FMP-i When vacuum generation is running and no workpiece is picked up, the system vacuum at the vacuum gauge must indicate a vacuum between -0.2 and -0.5 bar. For the area gripper FMP with SVK valve technology, between 0.35 and 0.5 bar			X		X
Visual inspection of the check valves and flow restrictors to see whether they are contaminated		X			X
Has the dust filter been cleaned?		X			X
Are the compressed air hoses in good condition (not brittle, not kinked, no worn sections and no leaks)?			X		X
Is the type plate still on the device?					X
Are the operating instructions still available and are workers familiar with them?					X

	Interval				
	Daily	Weekly	Monthly	Every six months	Annual inspection
Clean the sealing plate with a soft brush and a vacuum cleaner, and remove wood chips, dust, etc. Do not blow off with compressed air. The force of the stream of compressed air would destroy the structure of the foam	X				
Check and adjust connections, screws, etc.			X		
Check pressure lines and connections for leakage			X		
Functional check of the vacuum valve on the FXP-i			X		X

Note: The suspension, vacuum generation, vacuum hoses, compressed air hoses and dust filters are not included with the device.

NOTE



Aggressive cleaning agents

Damage to the sealing materials and vacuum hoses.

Do not use aggressive cleaning agents such as cold cleaners, carbon tetrachloride, hydrocarbons or vinegar-based cleaning products.

Do not use sharp-edged objects (wire brushes, sandpaper, etc.).

13 Spare and Wearing Parts, Accessories

We guarantee this device pursuant to our General Terms and Conditions of Sale 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. Wearing parts are not covered by the warranty.

ERS = spare part

VST = wearing part



When ordering, always provide the part number of the entire gripping system as a reference.

13.1 Spare and Wearing Parts

Designation	Part no.	Note	Legend
Sliding block	25.09.06.00012	20 x 20 mm / M8 female thread	ERS
Silencer	10.01.38.01607	Incl. mounting clips and insulating foam	ERS

Sealing plates

Designation	Part no.	Part no. With filter screen	Note	Legend
Sealing plate	10.01.38.07232	10.01.38.07248	For grippers L = 442 mm/ grid: 3R18/ material: O20	VST
Sealing plate	10.01.38.07309	10.01.38.07313	For grippers L = 640 mm/ grid: 3R18/ material: O20	VST
Sealing plate	10.01.38.07310	10.01.38.07316	For grippers L = 838 mm/ grid: 3R18/ material: O20	VST
Sealing plate	10.01.38.07241	10.01.38.07319	For grippers L = 1234 mm/ grid: 3R18/ material: O20	VST
Sealing plate	10.01.38.07312	10.01.38.07322	For grippers L = 1432 mm/ grid: 3R18/ material: O20	VST
Sealing plate	10.01.38.07276	10.01.38.07266	For grippers L = 442 mm/ grid: 5R18/ material: O10O10	VST
Sealing plate	10.01.38.07333	10.01.38.07332	For grippers L = 640 mm/ grid: 5R18/ material: O10O10	VST
Sealing plate	10.01.38.07337	10.01.38.07336	For grippers L = 838 mm/ grid: 5R18/ material: O10O10	VST
Sealing plate	10.01.38.07341	10.01.38.07340	For grippers L = 1234 mm/ grid: 5R18/ material: O10O10	VST
Sealing plate	10.01.38.07345	10.01.38.07344	For grippers L = 1432 mm/ grid: 5R18/ material: O10O10	VST

Grippers with suction strips can be converted to sealing plates.

Replacement suction cups

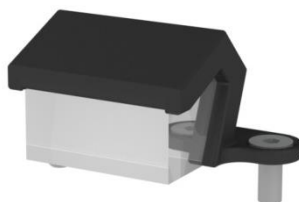
Designation	Part no.	Note	Legend
SPB2-40 P	10.01.06.03126	Plug-in suction cup type SPB with 2.5 folds / 40 mm diameter	VST
SPB2-40 P with filter screen	10.01.38.00452	Additionally with filter screen	VST
SPB2-20 P	10.01.06.03125	Plug-in suction cup type SPB with 2.5 folds / 20 mm diameter	VST
SPB2-20 P with filter screen	10.01.38.00465	Additionally with filter screen	VST

Masking film (spare part)

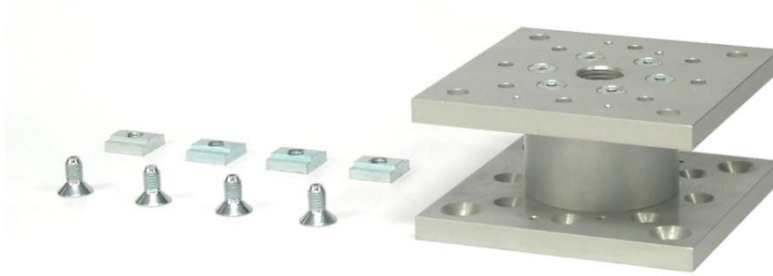
Grid		Gripper length				
		442	640	838	1234	1432
MASK-FOL 3R18	SVK	10.01.38.07230	10.01.38.07325	10.01.38.07326	10.01.38.07242	10.01.38.07327
	SW	10.01.38.07258	10.01.38.07328	10.01.38.07329	10.01.38.07330	10.01.38.07331
MASK-FOL 5R18	SVK	10.01.38.07256	10.01.38.07348	10.01.38.07349	10.01.38.07350	10.01.38.07351
	SW	10.01.38.07265	10.01.38.07352	10.01.38.07353	10.01.38.07354	10.01.38.07355
MASK-FOL 3R54	SVK	10.01.38.07233	10.01.38.00497	10.01.38.07356	10.01.38.00499	10.01.38.07357
	SW	10.01.38.07259	10.01.38.00539	10.01.38.07358	10.01.38.00541	10.01.38.07359
MASK-FOL 5R36	SVK	10.01.38.07282	10.01.38.07364	10.01.38.07365	10.01.38.07366	10.01.38.07367
	SW	10.01.38.07257	10.01.38.07360	10.01.38.07361	10.01.38.07362	10.01.38.07363

13.2 Accessories

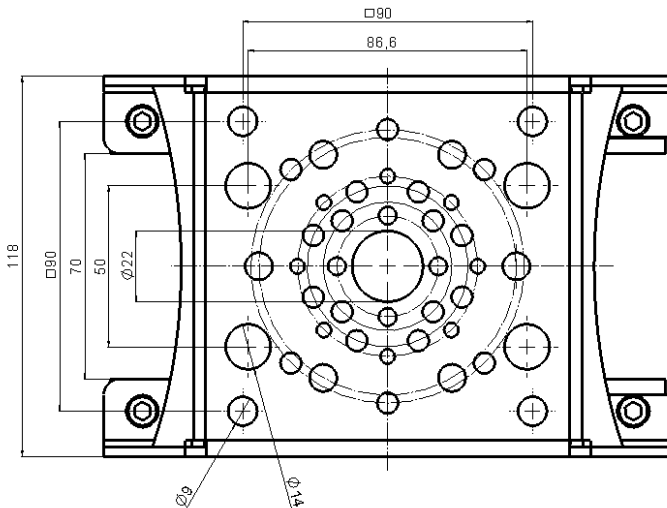
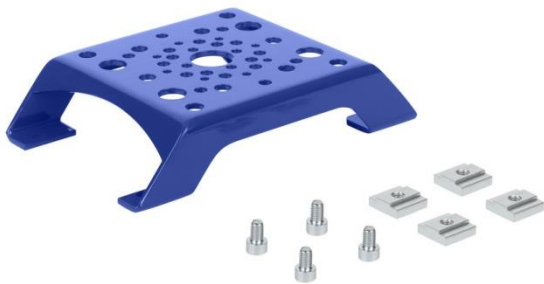
Designation	Part no.	Note
Attachment kit	10.01.21.00243	4 x sliding blocks M8 incl. screws, washers
Compressed air hose	10.07.09.00037	L = 1000 mm, PU; diameter = 12/9 mm
Cover strip	26.07.03.00002	for T-slot L = 2000 mm
Connection cable	21.04.05.00255	M8 socket, 6-pole; length: 5000 mm; cable end open, 6-pole
Connection cable	21.04.05.01015	M8 socket, 6-pole; cable length: 2000 mm; M12 connector, 5-pole, straight
Pentaprism	10.01.38.06443	incl. fastening screws



Designation	Part no.	Note
Attachment kit robot flange	10.01.21.00244	8 mounting holes for TK \varnothing 85 mm 4 mounting holes for FXP module incl. sliding blocks, screws

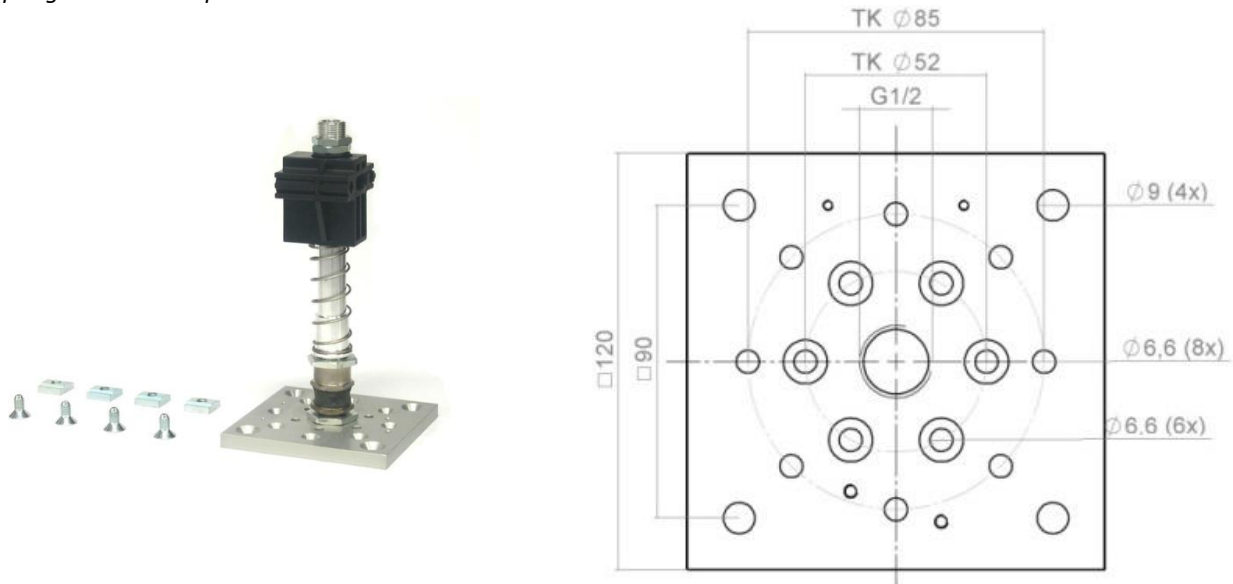


Designation	Part no.	Note
Attachment kit robot flange	10.01.38.01722	Various robot hole patterns 4 mounting holes for FXP module incl. sliding blocks, screws



Designation	Part no.	Note
Attachment kit spring-mounted suspension	10.01.21.02407	Spring plunger FSTF...VG with 1/2" threaded connection incl. flange plate, sliding blocks, screws 4 mounting holes for FXP module
Contains:		
Flange plate	10.01.21.00313	See figure for the hole patterns

Spring-mounted suspension:



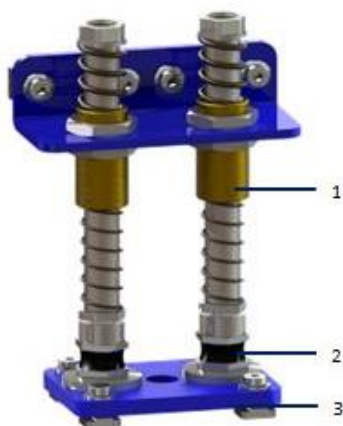
For applications in which the gripper is positioned at large angles, we recommend using the FST-FLEX-type spring plunger.

Spare and Wearing Parts, Accessories

Designation	Part no.	Note
Suspension kit FST-STARR 25-2	10.01.10.05806	Spring plunger 25 mm stroke
Suspension kit FST-STARR 50-2	10.01.10.05805	Spring plunger 50 mm stroke
Suspension kit FST-STARR 75-2	10.01.10.05803	Spring plunger 75 mm stroke

Contains:

Flexolink (2)	10.01.03.00175	FLK, 1/2" internal thread, 1/2" external thread
Flexolink, reinforced design (2)	10.01.03.00207	FLK G1/2-IG G1/2-AG V
Flange plate (3)	10.01.10.05701	

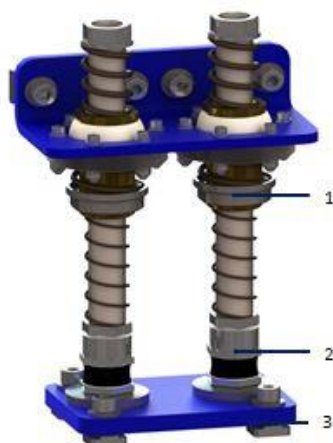


*For more information, see the FST STARR/FLEX product information

Designation	Part no.	Note
Suspension kit FST-FLEX 25-2	10.01.10.05695	Flexible spring plunger 25 mm stroke
Suspension kit FST-FLEX 50-2	10.01.10.05168	Flexible spring plunger 50 mm stroke
Suspension kit FST-FLEX 75-2	10.01.10.05695	Flexible spring plunger 75 mm stroke

Contains:

Flexolink (2)	10.01.03.00175	FLK, 1/2" internal thread, 1/2" external thread
Flexolink, reinforced design (2)	10.01.03.00207	FLK G1/2-IG G1/2-AG V
Flange plate (3)	10.01.10.05701	



* You must consult the manufacturer if you intend to use the FST FLEX only.
For more information, see the FST STARR/FLEX product information

Number of suction cups	Suction cup connection strip incl. suction cup type SPB1-40-ED-1/8-AG		Suction cup connection strip incl. suction cup type FSG 20 SI-1/8-AG	
	Without filter screen	With filter screen	Without filter screen	With filter screen
6 suction cups	-	-	10.01.38.01043	10.01.38.01044
5 suction cups	-	-	10.01.38.01045	10.01.38.01046
4 suction cups	10.01.38.01011	10.01.38.01012	10.01.38.01047	10.01.38.01048
3 suction cups	10.01.38.01013	10.01.38.01014	10.01.38.01049	10.01.38.01050
2 suction cups	10.01.38.01015	10.01.38.01016	-	-



Material: ED



Material: Silicone

A gripper with a sealing plate can be retrofitted to a suction cup strip only on request.

14 Decommissioning and Recycling

The tube lifter must be decommissioned and prepared for disposal only by qualified specialists.

For disposal, the country-specific guidelines and legal obligations for waste prevention and disposal must be observed.

Dispose of the product properly.



For proper disposal, please contact a company specializing in the disposal of technical goods and instruct the company to observe the applicable disposal and environmental regulations. Schmalz is happy assist you in finding a suitable company.

15 EU Declaration of Conformity

The manufacturer Schmalz confirms that the product large-area suction pads FXP-i and FMP-i described in these operating instructions comply with the following relevant EU directives:

2014/30/EU Electromagnetic Compatibility

2011/65/EU RoHS Directive

The following harmonised standards have been applied:

EN ISO 12100:2010 Safety of machinery - Basic concepts, general principles for design - Risk assessment.

EN ISO 13849-1:2015 Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design

EN 61000-6-2:2005 +AC:2005 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments

EN 61000-6-3:2007 +A1:2011 +AC:2012 Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission for residential, commercial and light-industrial environments

EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronic equipment with regard to the restriction of hazardous substances.



The EU Declaration of Conformity valid at the time of product delivery is provided online. The standards and directives cited here reflect the status at the time of publication of the operating instructions.

16 Declaration of incorporation

The manufacturer Schmalz confirms that the product large-area suction pads FXP-i and FMP-i described in these operating instructions comply with the following relevant EU directives:

2006/42/EC Machinery Directive

The designated product is intended exclusively for installation in a complete system indoors. Commissioning is prohibited until the conformity of the final product with Directive 2006/42/EC has been established.

The manufacturer undertakes to send the special documents relating to the partly completed machinery electronically to national authorities on request. The special technical documents belonging to the machine according to Annex VII Part B have been drawn up.

The following harmonised standards have been applied:

EN ISO 12100:2010	Safety of machinery - Basic concepts, general principles for design - Risk assessment
EN ISO 13849-1:2015	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN 61000-6-2:2005 +AC:2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-3:2007 +A1:2011 +AC:2012	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission for residential, commercial and light-industrial environments
EN IEC 63000:2018	Technical documentation for the assessment of electrical and electronic equipment with regard to the restriction of hazardous substances



The Declaration of Incorporation valid at the time of product delivery is made available online. The standards and directives cited here reflect the status at the time of publication of the operating instructions

17 Appendix



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 info@schmalz.de



IO-Link implementation		
Vendor ID		234 (0x00EA)
Device ID		100140 (0x01872C)
SIO mode		Yes
IO-Link revision		1.1 (compatible with 1.0)
IO-Link bitrate		38.4 kBit/sec (COM2)
Minimum cycle time		3.4 ms
Process data input		4 bytes
Process data output		2 bytes

Process data						
Process data input	Name	Bits	Data type	Access	Special values	Remarks
PD In Byte 0	SP2 signal (part present)	0	Boolean	ro		Vacuum is over SP2 & not yet under rP2
	SP1 signal (air saving function)	1	Boolean	ro		Vacuum is over SP1 & not yet under rP1
	Reserved	2	Boolean	ro		Not used
	CM-Autoset acknowledged	3	Boolean	ro		Acknowledge that the Autoset function has been completed
	EPC-Select acknowledged	4	Boolean	ro		Acknowledge that EPC values 1 and 2 have been switched according to EPC-Select: 0 - EPC-Select = 00 1 - otherwise
	SP3 signal (part detached)	5	Boolean	ro		The part has been detached after a suction cycle
	Device status	7 ... 6	2-bit integer	ro		00 - [green] Device is working optimally 01 - [yellow] Device is working but there are warnings 10 - [orange] Device is working but there are severe warnings 11 - [red] Device is not working properly
PD In Byte 1	EPC value 1	7...0	8-bit integer	ro		EPC value 1 (byte) Holds 8-bit value as selected by EPC-Select 0/1 00 - Input pressure (0.1 bar) 01 - CM warnings (ISDU 146, bits 0-7) 10 - Leakage of last suction cycle (mbar/sec) 11 - Primary supply voltage (Volt)
PD In Byte 2	EPC value 2, high-byte	7...0	16-bit integer	ro		EPC value 2 (word) Holds 16-bit value as selected by EPC-Select 0/1 00 - System vacuum (mbar) 01 - Evacuation time t1 (msec) 10 - Last measured free-flow vacuum (mbar) 11 - Air consumption of last suction cycle (0.1 NL)
PD In Byte 3	EPC value 2, low-byte	7...0				
Process data out	Name	Bit	Access	Availability	Special values	Remarks
PD Out Byte 0	Vacuum	0	Boolean	wo		Vacuum on/off
	Blow-off	1	Boolean	wo		Activate blow-off
	Setting mode	2	Boolean	wo		Vacuum on/off with continuous suction disabled (regardless of dCS parameter)

	CM Autoset	3	Boolean	wo		Perform CM Autoset function (teach permissible leakage and permissible evacuation time)
	EPC-Select 0	4	Boolean	wo		Select the function of EPC values 1 and 2 (2-bit binary coded) (see PD In Byte 1 to 3)
	EPC-Select 1	5	Boolean	wo		
	Profile-Set 0	6	Boolean	wo		Select production profile (2-bit binary coded) (see ISDU parameter areas P0 to P3)
	Profile-Set 1	7	Boolean	wo		
PD Out Byte 1	Input pressure	7...0	8-bit integer	wo		Pressure value from external sensor (unit: 0.1 bar)

ISDU parameters									
ISDU index	Subindex	Display appearance	Parameter	Size	Value range	Access	Default value / Example	Remarks	
									dec
⊕ Identification									
⊕ Device Management									
16	0x0010	0	Vendor Name	1 to 32 bytes		ro	J. Schmalz GmbH	Manufacturer designation	
17	0x0011	0	Vendor text	1 to 32 bytes		ro	www.schmalz.com	Internet address	
18	0x0012	0	Product Name	1 to 32 bytes		ro	FXP-i/FMP-i	General product name	
19	0x0013	0	Product ID	1 to 32 bytes		ro	FXP-i/FMP-i	Product variant name	
20	0x0014	0	Product text	1 to 32 bytes		ro	EJEK-BG FXP-i 75-HV NC/VENT-BGR FMP-i-32 NC	Order code	
21	0x0015	0	Sno. Serial Number	9 bytes		ro	00000001	Serial number	
22	0x0016	0	Hardware Revision	2 bytes		ro	03	Hardware revision	
23	0x0017	0	SoC Firmware Revision	4 bytes		ro	Mar. 01	Firmware revision	
240	0x00F0	0	Unique ID	20 bytes		ro		Unique device identification number	
241	0x00F1	0	Device Features	11 bytes		ro		Type code of device features (see IODD)	
250	0x00FA	0	Art Article Number	14 bytes		ro	10.01.38.*	Order number	
251	0x00FB	0	Article Revision	2 bytes		ro	00	Article revision	
252	0x00FC	0	Production Date	3 bytes		ro	D21	Date code of production (month+year, month is letter coded, e.g. D21 = April 2021)	
254	0x00FE	0	Detailed product text	1 to 64 bytes		ro	EJEK-BG FXP-i 75-HV NC/VENT-BGR FMP-i-32 NC	Detailed type description of the device	
⊕ Device Localization									
24	0x0018	0	Application Specific Tag	1 to 32 bytes		rw	***	User string to store location or tooling information	
242	0x00F2	0	Equipment Identification	1 to 64 bytes		rw	***	User string to store identification name from schematic	
246	0x00F6	0	Geolocation	1 to 64 bytes		rw	***	User string to store geolocation from handheld device	
247	0x00F7	0	IODD Web Link	1 to 64 bytes		rw	***	User string to store web link to IODD file	
248	0x00F8	0	NFC Web Link	1 to 64 bytes	http://... https://...	rw	https://myproduct.schmalz.com/#/	Web link to NFC app (base URL for NFC tag)	
249	0x00F9	0	Storage Location	1 to 32 bytes		rw	***	User string to store storage location	
253	0x00FD	0	Installation Date	1 to 16 bytes		rw	***	User string to store date of installation	
⊕ Parameter									
□ ⊕ Device Settings									
□ □ ⊕ Commands									
2	0x0002	0	System Command	1 byte	5, 130, 165, 167, 168, 169	wo		0x05 (dec 5): Force upload of parameter data into the master 0x82 (dec 130): Restore device parameters to factory defaults 0xA5 (dec 165): Calibrate vacuum sensor 0xA7 (dec 167): Reset erasable counters ct1, ct2, ct3 0xA8 (dec 168): Reset voltages HI/LO 0xA9 (dec 169): Reset vacuum/pressure HI/LO	
□ □ ⊕ Access Control									
12	0x000C	0	Device Access Locks	2 bytes	0, 4	rw	0	Bit 0-1: reserved Bit 2: Local parameterization	

Appendix

									lock (lock menu editing) Bit 3–15: reserved
90	0x005A	0	nFc	Extended Device Access Locks	1 byte		rw	0	Bit 0: NFC write lock Bit 1: NFC disable Bit 2: Not used Bit 3: local user interface locked (manual mode locked) Bit 4: IO-Link event lock (suppress sending IO-Link events) Bit 5–7: Not used
77	0x004D	0	Pin	Menu PIN code	2 bytes	0–999	rw	0	0 = Menu editing unlocked >0 = Menu editing locked with pin-code
91	0x005B	0		NFC PIN code	2 bytes	0–999	rw	0	PIN for writing data from NFC app
☐ ☐ ⌘ Initial Settings									
69	0x0045	0	bLo	Blow-off mode	1 byte	0–2	rw	0	0 = Externally controlled blow-off (-E-) 1 = Internally controlled blow-off – time-dependent (I-t) 2 = Externally controlled blow-off – time-dependent (E-t)
71	0x0047	0	Ou2	Output 2 function	1 byte	0–1	rw	0	0 = NO 1 = NC
73	0x0049	0	P-n	Signal Type	1 byte	0–1	rw	0	0 = PNP 1 = NPN
74	0x004A	0	uni	Display Unit	1 byte	0–3	rw	0	0 = mbar 1 = kPa 2 = inHg 3 = psi
75	0x004B	0	dLY	Output filter	2 bytes	0–999	rw	10	Unit: 1 ms
76	0x004C	0	Eco	Eco mode	1 byte	0–2	rw	0	0 = off 1 = on (full eco mode with display switching off completely) 2 = Lo (medium eco mode with display dimmed to 50%)
79	0x004F	0	dIS	Display rotation	1 byte	0–1	rw	0	0 = Standard 1 = Rotated
☐ ⌘ Process Settings									
275	0x0113		P-n	Number of active profile	1 byte		ro		Number of the active profile: 0–3
☐ ☐ ⌘ Production Setup - Profile P0									
68	0x0044	0	Ctr	Air saving function	1 byte	0–2	rw	1	0 = not active (off) 1 = active (on) 2 = active with supervision (onS)
78	0x004E	0	dCS	Disable continuous suction	1 byte	0–1	rw	0	0 = off 1 = on
100	0x0064	0	SP1	Switch Point 1	2 bytes	999 > SP1 > rP1	rw	750	Unit: 1 mbar
101	0x0065	0	rP1	Reset Point 1	2 bytes	SP1 > rP1 > SP2	rw	600	Unit: 1 mbar
102	0x0066	0	SP2	Switch Point 2	2 bytes	rP1 > SP2 > rP2	rw	550	Unit: 1 mbar
103	0x0067	0	rP2	Reset Point 2	2 bytes	SP2 > rP2 >= 10	rw	540	Unit: 1 mbar
106	0x006A	0	tbl	Duration automatic blow	2 bytes	10–9999	rw	200	Unit: 1 ms
107	0x006B	0	t-1	Permissible evacuation time	2 bytes	0–9999	rw	2000	Unit: 1 ms. No t-1 Warning if set to 0
108	0x006C	0	-L-	Permissible leakage rate	2 bytes	0–999	rw	250	Unit: 1 mbar/sec. No -L- Warning if set to 0
119	0x0077	0		Profile name	1 to 32 bytes		rw	***	
☐ ☐ ⌘ Production Setup - Profile P1									
180	0x00B4	0		Air saving function	1 byte	0–2	rw	1	Profile P-1 (selected by PD Out 0 - Profile-Set = 1)
181	0x00B5	0		Disable continuous suction	1 byte	0–1	rw	0	
182	0x00B6	0		Switch Point 1	2 bytes	999 > SP1 > rP1	rw	750	
183	0x00B7	0		Reset Point 1	2 bytes	SP1 > rP1 > SP2	rw	600	
184	0x00B8	0		Switch Point 2	2 bytes	rP1 > SP2 > rP2	rw	550	
185	0x00B9	0		Reset Point 2	2 bytes	SP2 > rP2 >= 10	rw	540	
186	0x00BA	0		Duration automatic blow	2 bytes	10–9999	rw	200	
187	0x00BB	0		Permissible evacuation time	2 bytes	0–9999	rw	2000	
188	0x00BC	0		Permissible leakage rate	2 bytes	0–999	rw	250	
189	0x00C7	0		Profile name	1 to 32 bytes		rw	***	
☐ ☐ ⌘ Production Setup - Profile P2									
200	0x00C8	0		Air saving function	1 byte	0–2	rw	1	

201	0x00C9	0		Disable continuous suction	1 byte	0-1	rw	0	Profile P-2 (selected by PD Out 0 - Profile-Set = 2)
202	0x00CA	0		Switch Point 1	2 bytes	999 > SP1 > rP1	rw	750	
203	0x00CB	0		Reset Point 1	2 bytes	SP1 > rP1 > SP2	rw	600	
204	0x00CC	0		Switch Point 2	2 bytes	rP1 > SP2 > rP2	rw	550	
205	0x00CD	0		Reset Point 2	2 bytes	SP2 > rP2 >= 10	rw	540	
206	0x00CE	0		Duration automatic blow	2 bytes	10-9999	rw	200	
207	0x00CF	0		Permissible evacuation time	2 bytes	0-9999	rw	2000	
208	0x00D0	0		Permissible leakage rate	2 bytes	0-999	rw	250	
219	0x00DB	0		Profile name	1 to 32 bytes		rw	***	
☐ ☐ # Production Setup - Profile P3									
220	0x00DC	0		Air saving function	1 byte	0-2	rw	1	Profile P-3 (selected by PD Out 0 - Profile-Set = 3)
221	0x00DD	0		Disable continuous suction	1 byte	0-1	rw	0	
222	0x00DE	0		Switch Point 1	2 bytes	999 > SP1 > rP1	rw	750	
223	0x00DF	0		Reset Point 1	2 bytes	SP1 > rP1 > SP2	rw	600	
224	0x00E0	0		Switch Point 2	2 bytes	rP1 > SP2 > rP2	rw	550	
225	0x00E1	0		Reset Point 2	2 bytes	SP2 > rP2 >= 10	rw	540	
226	0x00E2	0		Duration automatic blow	2 bytes	10-9999	rw	200	
227	0x00E3	0		Permissible evacuation time	2 bytes	0-9999	rw	2000	
228	0x00E4	0		Permissible leakage rate	2 bytes	0-999	rw	250	
239	0x00EF	0		Profile name	1 to 32 bytes		rw	***	
# Observation									
☐ # Monitoring									
☐ ☐ # Process data									
40	0x0028	0		Process Data In Copy	4 bytes		ro		Copy of currently active process data input
41	0x0029	0		Process Data Out Copy	2 bytes		ro		Copy of currently active process data output
64	0x0040	1		Vacuum Value	2 bytes		ro		Current vacuum value
64	0x0040	2		Vacuum Value LO	2 bytes		ro		Lowest measured vacuum value since power-up
64	0x0040	3		Vacuum Value HI	2 bytes		ro		Highest measured vacuum value since power-up
65	0x0041	1		Pressure Value	2 bytes		ro		Current pressure value (unit: 1 mbar)
65	0x0041	2		Pressure Value LO	2 bytes		ro		Lowest measured pressure value since power-up
65	0x0041	3		Pressure Value HI	2 bytes		ro		Highest measured pressure value since power-up
66	0x0042	1		Supply Voltage	2 bytes		ro		Supply voltage (unit: 0.1 Volt)
66	0x0042	2		Supply Voltage LO	2 bytes		ro		Lowest measured supply voltage since power-up
66	0x0042	3		Supply Voltage HI	2 bytes		ro		Highest measured supply voltage since power-up
148	0x0094	0		Evacuation time t ₀	2 bytes		ro		Time from start of suction to SP2 (unit: 1 ms)
149	0x0095	0		Evacuation time t ₁	2 bytes		ro		Time from SP2 to SP1 (unit: 1 ms)
160	0x00A0	0		Leakage rate	2 bytes		ro		Leakage of last suction cycle (unit: 1 mbar/sec)
161	0x00A1	0		Free-flow vacuum	2 bytes		ro		Last measured free-flow vacuum (unit: 1 mbar)
164	0x00A4	0		Max. vacuum reached in load cycle	2 bytes		ro		Maximum vacuum value of last suction cycle
165	0x00A5	0		Min. pressure during last cycle	2 bytes		ro		Minimum input pressure during suction phase of last cycle
☐ ☐ # Communication Mode									
564	0x0234	0		Communication Mode	1 byte		ro		0x00 = SIO mode 0x10 = IO-Link revision 1.0 (set by master) 0x11 = IO-Link revision 1.1 (set by master)
☐ ☐ # Counters									
140	0x008C	0	cc1	Vacuum-on counter	4 bytes		ro		Not erasable (stored every 1000 counts)

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141	0x008D	0	cc2	Valve operating counter	4 bytes		ro		Not erasable (stored every 1000 counts)
142	0x008E	0	cc3	Condition monitoring counter	4 bytes		ro		Not erasable (stored every 1000 counts)
143	0x008F	0	ct1	Erasable vacuum-on counter	4 bytes		ro		Can be reset by system command "Reset erasable counters" (stored every 1000 counts)
144	0x0090	0	ct2	Erasable valve operating counter	4 bytes		ro		Can be reset by system command "Reset erasable counters" (stored every 1000 counts)
145	0x0091	0	ct3	Erasable condition monitoring counter	4 bytes		ro		Can be reset by system command "Reset erasable counters" (stored every 1000 counts)
⊕ Diagnosis									
□ ⊕ Device status									
32	0x0020	0		Error Count	2 bytes		ro		Number of errors since last power-up
36	0x0024	0		IO-Link Device Status	1 byte		ro		0 = Device is operating properly 1 = Maintenance required 2 = Out of specification 3 = Functional check 4 = Failure
37	0x0025	0		Detailed Device Status	96 bytes		ro		Information about currently pending events Fixed-length array format according to IO-Link specification V1.1
130	0x0082	0		Active Errors	2 bytes		ro		Bit 00: Internal error: data corruption (E01) Bit 01: Reserved Bit 02: Primary voltage too low (E07) Bit 03: Primary voltage too high (E17) Bit 04–07: Reserved Bit 08: Short circuit at OUT2 (E12) Bit 09–10: Reserved Bit 11: Measurement range overrun (FFF) Bit 12–14: Reserved Bit 15: IO-Link communication interruption (E08)
138	0x008A	1		Extended Device Status - Type	1 byte		ro		Type code of active device status (see below)
138	0x008A	2		Extended Device Status - ID	2 bytes		ro		ID code of active device status (see below, corresponds to IO-Link events)
139	0x008B	0		NFC Status	1 byte		ro		Result of recent NFC activity: 0x00 Data valid, write finished successfully 0x23: Write failed: Write access locked 0x30: Write failed: parameter(s) out of range 0x31: Write failed: parameter value too high 0x32: Write failed: parameter value too low 0x41: Write failed: parameter set inconsistent 0xA1: Write failed: invalid authorization 0xA2: NFC not available 0xA3: Write failed: invalid data structure 0xA5: Write pending 0xA6: NFC internal error
□ ⊕ Condition Monitoring [CM]									
146	0x0092	0		Condition monitoring	2 bytes		ro		Bit 0: Valve protection active Bit 1: Evacuation time t1 above limit [t-1] Bit 2: Leakage rate above limit [-L-] Bit 3: SP1 not reached in suction cycle Bit 4: Free-flow vacuum > rP2 but < SP1 Bit 5: Primary voltage US outside of optimal range Bit 6: Reserved Bit 7: Reserved Bit 8: Input pressure outside of operating range Bit 9–15: Reserved
□ ⊕ Energy Monitoring [EM]									
155	0x009B	0		Air consumption per cycle in percent	1 byte		ro		Air consumption of last suction cycle (unit: 1%)

156	0x009C	0		Air consumption per cycle	2 bytes		ro		Air consumption of last suction cycle (unit: 0.1 Nl)
157	0x009D	0		Energy consumption per cycle	2 bytes		ro		Energy consumption of last suction cycle (unit: 1 Ws)
<div style="border: 1px solid black; padding: 2px;"> ⊕ Predictive Maintenance [PM] </div>									
162	0x00A2	0		Quality	1 byte		ro		Quality of last suction cycle (unit: 1%)
163	0x00A3	0		Performance	1 byte		ro		Last measured performance level (unit: 1%)

Coding of extended device status (ISDU 138) and IO-Link events									
Extended device status ID (= IO-Link event code)		Extended device status type		IO-Link		Event name	Remarks		
dec	hex	hex	Meaning	Event type	Display code				
0	0x0000	0x10	Everything OK	(no IOL event)		Everything OK	Device is working optimally		
6161	0x1811	0x82	Defect/fault, high	Error	E01	Data corruption	Internal error, user data corrupted		
35872	0x8C20	0x81	Defect/fault, lower	Error	FFF	Measurement range overrun	Measured vacuum value too high, sensor fault		
2457	0x0999	0x81	Defect/fault, lower	(no IOL event)	E08	IO-Link communication interruption	IO-Link communication is interrupted (readable via NFC)		
20736	0x5100	0x42	Critical condition, high	Error	E07	General power supply fault	Primary supply voltage (US) too low		
20752	0x5110	0x42	Critical condition, high	Warning	E17	Primary supply voltage over-run	Primary supply voltage (US) too high		
6146	0x1802	0x42	Critical condition, high	Warning		Supply pressure fault	Input pressure too high or too low		
6156	0x180C	0x22	Warning, high	Warning		Primary supply voltage out of optimal range	Condition monitoring: primary supply voltage US outside of operating range		
6151	0x1807	0x22	Warning, high	Warning		CM: Valve protection active	Condition monitoring: valve has switched too fast, continuous suction activated		
6152	0x1808	0x21	Warning, low	Warning		CM: Evacuation time above limit	Condition monitoring: evacuation time t1 is above limit [t-1]		
6153	0x1809	0x21	Warning, low	Warning		CM: Leakage rate above limit	Condition monitoring: leakage rate is above limit [-L]		
6154	0x180A	0x22	Warning, high	Warning		CM: SP1 not reached	Condition monitoring: vacuum level SP1 was never reached during suction cycle		
6155	0x180B	0x21	Warning, low	Warning		CM: Free-flow vacuum too high	Condition monitoring: free-flow vacuum above SP2		
35841	0x8C01	0x21	Warning, low	Warning		Simulation active	Manual mode is active		
6144	0x1800	-	(IOL event only)	Notification		Vacuum calibration OK	Calibration offset 0 set successful		
6145	0x1801	0x22	Warning, high	Notification	E03	Vacuum calibration failed	Sensor value too high or too low, offset not changed		
6167	0x1817	-	(IOL event only)	Notification		Autoset completed successfully	Permissible leakage and permissible evacuation time have been set automatically for the active profile		
6168	0x1818	-	(IOL event only)	Notification		Handling cycle completed	Handling of the part is complete (neutral state of vacuum system reached or new suction phase begun)		
30480	0x7710	0x41	Critical condition, low	Error	E12	Short circuit at OUT2	Output is connected with counterpotential		



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