Operating instructions

Ejector Module RECBi

Note

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

Published by

Contact

Contents

1 Important Information

1.1 Note on Using this Document

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

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

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

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

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

1.2 The technical documentation is part of the product

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

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

www.schmalz.com/services

1.3 Type Plate

The type plate is permanently attached to the product and must always be clearly legible.
It contains product identification data and important technical information.

- ‣ For spare parts orders, warranty claims or other inquiries, have the information on the type plate to hand.

The type plate (1) contains important information about the product:

- Part sales designation/type
- Part number
- Serial number
- Coded date of manufacture
- CE label
- QR code

1.4 Symbols

ⓘ This symbol indicates useful and important information.

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

Actions that consist of more than one step are numbered:

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

2 Fundamental Safety Instructions

2.1 Intended Use

The RECBi is designed to generate a pneumatic vacuum for gripping and transporting objects when used in conjunction with vacuum grippers.

The goods to be lifted must be dry, airtight, rigid and have a smooth surface. Non-airtight or unstable objects must be tested for suitability before they are handled with a vacuum.

Neutral gases in accordance with EN 983 are approved as evacuation media. Neutral gases include air, nitrogen and inert gases (e.g. argon, xenon and neon).

The intended use of the product is for time-limited gripping, handling and holding in enclosed spaces. It must always be mounted on heat-dissipating materials.

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

The product is intended for industrial use.

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

The product may only be used with robot systems that comply with the provisions of DIN ISO/TS 15066, DIN EN ISO 10218-1 and DIN EN ISO 10218-2.

Operation as part of a collaborative system is only permitted when the entire system meets the corresponding legal requirements for collaborative robot systems. The system integrator is responsible for ensuring that these requirements are complied with.

2.2 Non-Intended Use

Schmalz does not accept any liability for any direct or indirect losses or damages that result from using the product. This applies, in particular, to any use of the product that is not in accordance with the intended purpose and to any use that is not described or mentioned in this documentation.

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

1. Use in potentially explosive atmospheres
2. Direct contact with perishable goods/food products

2.3 Personnel Qualification

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

The operating company must ensure the following points:

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

Applicable for Germany:

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

2.4   Warnings in This Document

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

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

2.5   Residual Risks

⚠ **WARNING**

Noise pollution due to the escape of compressed air

Hearing damage!

‣ Wear ear protectors.

‣ The ejector must only be operated with a silencer.

⚠ **WARNING**

Extraction of hazardous media, liquids or bulk material

Personal injury or damage to property!

‣ Do not extract harmful media such as dust, oil mists, vapors, aerosols etc.

‣ Do not extract aggressive gases or media such as acids, acid fumes, bases, biocides, disinfectants or detergents.

‣ Do not extract liquids or bulk materials, e.g. granulates.

⚠ **WARNING**

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

Serious injury

‣ Ensure that the components are enabled via the actuator voltage by installing a potential separation between the sensor and actuator voltage.

‣ Wear the required personal protective equipment (PPE) when working in the danger zone.

⚠ CAUTION

Compressed air or vacuum in direct contact with the eye

Severe eye injury

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

⚠ CAUTION

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

Eye injuries!

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

⚠ WARNING

Serious injuries due to improper mounting!

▸ Carry out mounting and removal only when the device is in an idle, depressurized state.
▸ Use only the connectors, mounting holes and attachment materials that have been provided.

⚠ WARNING

Suspended load

Risk of serious injury

▸ Do not walk, stand or work under suspended loads.

2.6 Modifications to the Product

Schmalz assumes no liability for consequences of modifications over which it has no control:
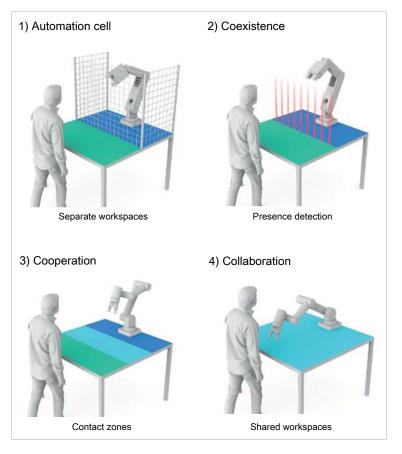
1. The product must be operated only in its original condition as delivered.
2. Use only original spare parts from Schmalz.
3. The product must be operated only in perfect condition.

2.7   Criteria for Use in Collaborative Applications

The following criteria justify the suit-
ability of the gripper for use in collabo-
rative applications:
See the adjacent image, Figure 3) and
4).
The gripper has an inherently safe de-
sign and rounded edges and shapes
that prevent hazards.

1) Automation cell

Separate workspaces

2) Coexistence

Presence detection

3) Cooperation

Contact zones

4) Collaboration

Shared workspaces

3 Product description

3.1 Product Description

The products differ with regard to the basic position of the ejector module in the de-energized state NO (normally open) and NC (normally closed).
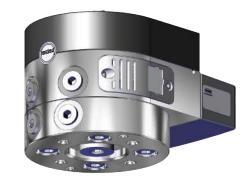
The product is designed with an integrated ejector module and is marked "1C" in the type key.

Depending on the variant, the product has a different design for the interface to the vacuum gripper.

Gripper design and preparation

Identified by **UNI** in the type key. Universal flange plate for: - Central suction cup connection - Mounting threads for customer-specific grippers	
Identified by **PXRi** in the type key. Version PXRi for arranging suction cups in a line - Vacuum supply via the connections on the ejector module - Arrangement of suction cups in a line	
Identified by **PXRx** in the type key. Version PXRx for connecting 4 suction cups, for example - Vacuum supply via the connections on the ejector module - Arrangement of suction cups for workpieces with surfaces on one level	
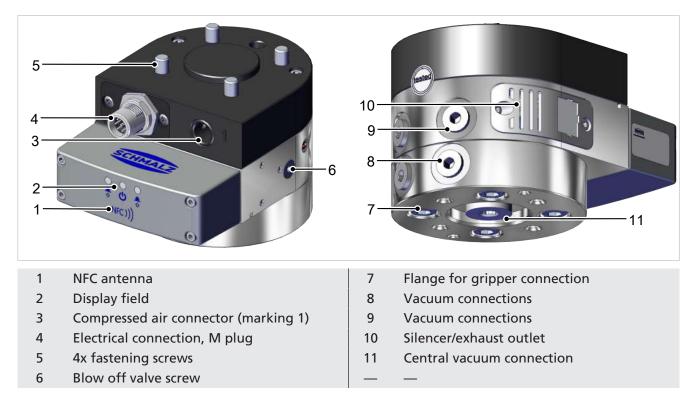
3.2 Part Table

Schmalz part no.	Version
10.02.03.00434	Digital I/O + IO-Link RECBi 24V-DC NC UNI 1C
10.02.03.00437	Digital I/O + IO-Link RECBi 24V-DC NO UNI 1C
10.02.03.00443	Digital I/O + IO-Link RECBi 24V-DC NC PXR-I 1C
10.02.03.00444	Digital I/O + IO-Link RECBi 24V-DC NO PXR-I 1C
10.02.03.00446	Digital I/O + IO-Link RECBi 24V-DC NC PXR-X 1C
10.02.03.00447	Digital I/O + IO-Link RECBi 24V-DC NO PXR-X 1C

3.3 Product Design

1	NFC antenna		7	Flange for gripper connection
2	Display field		8	Vacuum connections
3	Compressed air connector (marking 1)		9	Vacuum connections
4	Electrical connection, M plug		10	Silencer/exhaust outlet
5	4x fastening screws		11	Central vacuum connection
6	Blow off valve screw		—	—

3.4 Description of Functions

The product is designed for use with suction cups and generates a vacuum for gripping and transporting objects that require a powerful vacuum or high vacuum flow rate due to their features.

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

The venturi nozzle on the ejector is activated and deactivated using the suction command:
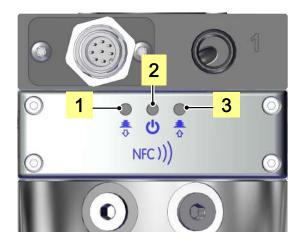
- In the NO (normally open) version, vacuum generation is deactivated when the suction signal is received.
  (This means that if the power fails or if no control signal is present, vacuum is constantly generated (continuous suction).)
- In the NC (normally closed) version, vacuum generation is activated when the suction signal is received.
  (This means that if the power fails or if no control signal is present, no vacuum is generated.)

When objects with airtight surfaces are picked up, the integrated non-return valve prevents the vacuum from dropping quickly (a vacuum drop can never be ruled out. The condition of the system, such as a contaminated check valve, for example, has a considerable influence in this regard).

3.5 LED Display

The product has 3 LEDs for status information.
The table below describes the possible states on the LED displays.

LED display	LED color		Behavior	SCHMALZ IO-Link product status
1 "Blow-off"	—	None	Off	RECBi does not blow off
	Orange	Orange	Continuous light	RECBi blows off
2 "State"	—	None	Off	No power supply
	Blue	Blue	Continuous light	Default status: gripper has voltage and is "ready for operation" (vacuum < SP2)
			Flashing	RECBi is in **setting mode** Default status: gripper has voltage and is "ready for operation" (vacuum < SP2)
	Green	Green	Continuous light	Workpiece picked up (vacuum ≥ SP2)
			Flashing	RECBi is in **setting mode** Workpiece picked up (vacuum ≥ SP2)
	Orange	Orange	Continuous light	Warning
			Flashing	RECBi is in **setting mode** Warning
	Red	Red	Continuous light	Error
			Flashing	RECBi is in **setting mode** Error
3	—	None	Off	No suction from RECBi

LED display	LED color		Behavior	SCHMALZ IO-Link product status
"Pick up"	 	Orange	Continuous light	Suction from RECBi

3.6 NFC Interface

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

Web link **https://myproduct.schmalz.com/#/**

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 reading device requires only that NFC and the Internet connection are enabled.

- Another option for communication is the "Schmalz ControlRoom" control and service app. In addition to pure read access, the app allows you to actively write the parameters of the device via NFC.
  The "Schmalz ControlRoom" app is available in the Google Play Store or Apple App Store.

Process control via NFC is not possible.

For the best data connection, set the reading device on the middle of the control and display element.

The values from "production setup profile P0 are the decisive values in digital I/O mode and SIO mode. These values can be adapted or set via NFC, for instance.

ℹ️ 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 NFC, then the power supply must subsequently remain stable for at least three seconds to prevent data loss (error E01).

3.7 Basic Principles of IO-Link Communication

The product is operated in IO-Link mode to enable intelligent communication with a control unit.

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

The product's parameters can be set remotely using IO-Link mode.

In addition, the energy and process control (EPC) feature is available.

4   IO-Link Operating Mode

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

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

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

They include:

- The current vacuum level
- Choice of four production profiles (production setup profiles)
- Errors and warnings
- System status indicator
- Access to all parameters
- Energy and process control (EPC) functions

This allows all modifiable parameters to be read, modified and written back to the RECBi 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 product supports IO-Link revision 1.1 with fifteen bytes of input data and four bytes of output data. It is also compatible with IO-Link masters that use revision 1.0 and above. In this case, one byte of input data and one byte of output data are supported.

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

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

4.1   ISDU Parameter Data

In addition to the process data that is exchanged cyclically and therefore automatically, the IO-Link protocol provides an acyclical data channel for identification data, setting parameters or general feedback from the device.

An overview of all the device data can be found in the "Data Dictionary".

With IO-Link, the data objects from the device data are referred to as the ISDU (index service data unit) and have to be uniquely addressed within a device through their index and subindex.

The device data includes:

- Identification data such as the part number, serial number, user-specific information (e.g. installation and storage location), and so on
- Setting parameters such as limit values, permissible leakage values, and so on
- Device feedback

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

Controller manufacturers usually provide a specialized function module – e.g. the "IOL_CALL" module for Siemens controllers – to enable these ISDU parameters to be accessed from a control program. These control unit-specific modules must be obtained directly from the control unit manufacturer.

The acyclical data channel can be used to retrieve ISDU parameters with further information about the system status.

4.2 Process Data

The cyclical process data is used to control the product and receive current information reported from the component.

There is a distinction between the:

- Input data (Process Data In) and
- Output data for the control (Process data out)

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

- The switching points SP1 (control switching point) and SP2 (switching point for "parts present" check)
- The status of switching point SP3 (part deposited)
- The product device status in the form of a status traffic light
- Module status of the individual module in the form of a status traffic light
- Feedback about executed condition monitoring autoset function for automatically determining individual condition monitoring parameters
- Warnings
- Error codes (active errors)
- Vacuum value

The output data (Process Data Out) is used to control the product cyclically:

- The product is controlled using the suction and blow-off commands.
- The desired operating mode is specified via setting mode (continuous suction or control)
- The condition monitoring parameters can be specified automatically using the condition monitoring autoset function.
- Activation of predetermined parameter profiles (production setup profiles)
- Default connection pressure (compressed air)

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.

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

5 Description of Functions

5.1 Monitoring the System Vacuum and Defining Switching Points

The product has integrated sensors for measuring the vacuum.

The current vacuum value and current pressure values can be retrieved via IO-Link.

Two independent switching points (SP1 and SP2) can be set. Each switching point has an activation point and a corresponding hysteresis (RP1 and RP2). The system vacuum is constantly compared to the set values for the switching points during operation.

The switching points are set via IO-Link.

A "Status" LED displays when the switching point for SP2 is reached (> See ch. 3.5 LED Display, p. 13).

The set values for SP2 must be lower than the values for SP1. The exact conditions for the settings are provided in the data dictionary.

The control function uses switching points SP1 and RP1 for regulation. Switching point SP3 "(> See ch. part detached)" cannot be adjusted. It is fixed at 20 mbar. Signal SP3 is issued when the vacuum reaches < 20 mbar (provided that the vacuum has already reached SP2 once). By issuing this signal, the ejector module tells the control that the part has been deposited successfully. The signal is reset by issuing a new suction command.

Parameter	Description
SP1	Vacuum control value
RP1	Vacuum reset point
SP2	Switching point for part present
RP2	Reset point for part present
SP3	Part deposited (vacuum < 20 mbar)

System vacuum evaluation:

Once the system vacuum reaches the value for SP2, the following responses are triggered:

- The process data bit for SP2 is set (see Data Dictionary).
- The state of LED 2 changes from a blue light to a green light (if there is no active error or warning (condition monitoring))
- In SIO mode, the SIO output OUT2 (part present) is activated according to the PNP/NPN configuration in parameter "Signal type: SIO outputs of the device" parameter 0x0049

Once the system vacuum reaches the value for SP1, the following responses are triggered:

- When the control function is activated, vacuum generation is interrupted
- The process data bit for SP1 is set (see Data Dictionary).

Overview of switching points P0; the specified parameters apply to production setup profile P0. For other profiles, the data can be taken from the data dictionary.

ISDU [hex]	Limit value parameter	Description	Factory
P0: 0x0064	SP1	Vacuum control value Vacuum switching point	750 mbar
P0: 0x0065	RP1	Vacuum hysteresis Vacuum reset point	600 mbar
P0: 0x0066	SP2	Activation value of "part present" check signal output	550 mbar
P0: 0x0067	RP2	Deactivation value of "part present" check signal output	540 mbar

5.2 Production Setup Profiles

In IO-Link mode, the product can store up to four different production setup profiles (P0 to P3). I.e. the process parameters can be adapted to different application conditions.

The following process parameters are stored:

- Control function (air-saving function)
- Disable continuous suction
- Switching point 1 (SP1)
- Reset point (RP1)
- Switching point 2 (SP2)
- Reset point (RP2)
- Duration of automatic drop-off
- Permitted evacuation time
- Permitted leakage rate
- Profile name (can only be defined via IO-Link)

See Data Dictionary in the appendix.

The respective profile is selected using the output process data byte 0 or the parameter "Active profile" 0x0113.

Production setup profile P0 is selected as the basic setting and in SIO mode, i.e. the settings that are valid for SIO mode are determined by profile P0.

In the "Profile name" parameter 0x0077, you can provide a user-specific name for each section.

5.3 Control Functions (Air-Saving Function)

The product allows you to conserve compressed air or prevent an excessive vacuum from being generated. Vacuum generation is interrupted when the set vacuum limit value SP1 is reached. If leakage causes the vacuum to fall below the limit value (RP1), vacuum generation resumes.

Either continuous suction mode or control mode can generally be used to lift the workpiece.

In SIO mode, the "Air-saving function" [0x0044] in production setup profile P0 is definitive.

SP1 can be specified using the appropriate "Switchpoint 1 (SP1)" parameter in the profile ("production setup profiles P0 to P3"). In SIO mode, SP1 is determined using the "Switchpoint SP1" parameter 0x0064 in the production setup profile P0.

The following control function operating modes can be chosen:

ISDU (hex)	Parameter	Value Hex	Description
0x0044	Ejector module control mode	0x00	No control
		0x01	Control function activated
		0x02	Control activated, with supervision (onS)

Description	Description of control functions
No control (continuous suction)	The ejector produces continuous suction with maximum power. If SP1 is exceeded, this is reported back through "SP1 ejector" in the input process data.
Control function activated	The ejector switches off vacuum generation when the switching point SP1 is reached and switches it back on when the vacuum falls below the hysteresis point RP1. The switching point evaluation for SP1 follows the control function. To protect the ejector, valve switching frequency monitoring is activated in this operating mode. If the readjustment is too fast (valve switching frequency > 6/3 seconds), the control function is deactivated and the device switches to continuous suction. The "Disable continuous sucking" parameter 0x004E can be used to disable monitoring of the valve switching frequency.
Control function activated, no continuous suction [1]	Corresponds to the operating mode: Control function activated. However, continuous suction is not activated if the valve frequency (> 6/3 seconds) is exceeded. The control function remains active.
Control function activated, leakage measurement activated, no continuous suction[1]	Corresponds to the operating mode: Control function activated. Leakage monitoring is also activated, but the device does not switch to continuous suction when the permitted leakage is exceeded or when the valve switching frequency is exceeded.

[1] When the control shutoff is deactivated, the suction valve makes frequent adjustments. The product may be destroyed.
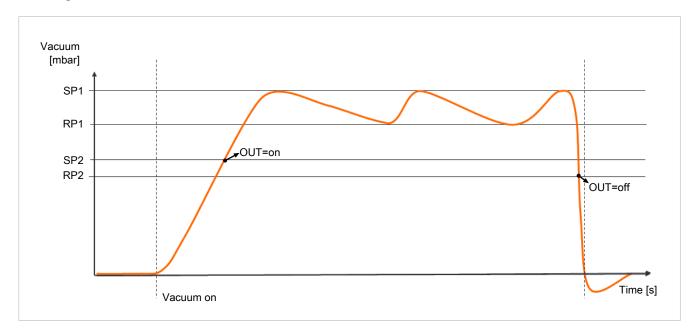
5.4 Applying Suction to the Workpiece/Part (Vacuum Generation)

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

Vacuum generation on the ejector is activated or deactivated via the "Suction" signal input in SIO mode or via the "Suction" command in IO-Link mode ("Vacuum ejector" output process data):

- In the NO (normally open) version, vacuum generation is deactivated when the suction signal is received.
  (This means that if the power fails or if no control signal is present, vacuum is constantly generated (continuous suction).)
- In the NC (normally closed) version, vacuum generation is activated when the suction signal is received.
  (This means that if the power fails or if no control signal is present, no vacuum is generated.)

An integrated sensor measures the generated vacuum level. The exact vacuum value can be read out via the IO-Link "Vacuum ejector" output process data (see Data Dictionary).

The diagram below shows the vacuum curve when the control function is activated:

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

- The electronics switch vacuum generation 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 quickly.
- If leakages cause the system vacuum to drop below the limit value configured for the switching point RP1 (= reset point), vacuum generation is reactivated.
- Based on the vacuum level, the "part present" signal output in the SIO version or the bit "SP2 part present" in IO-Link mode is set when a workpiece is securely picked up. This enables the further handling process.

5.5 Depositing the Workpiece/Part (Blowing Off)

The operating state and thus the "Blow-off" valve are directly controlled by the "Blow-off" signal input. In IO-Link mode, the device switches to "Blow-off" mode through the "Blow-off Ejector" output process data bit.

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

Info: In IO-Link mode, the set input process data bit "SP3 Ejector" (part detached) provides you with information about whether a picked-up part has been deposited (see also "Monitoring System Vacuum and Defining Switching Points").

The RECBi provides three blow-off modes that can be selected using the "Blow-off mode" parameter 0x0045:

- Externally controlled blow-off
- Internally controlled blow-off – time-dependent
- Externally controlled blow-off – time-dependent

The blow-off signal is given priority over the suction signal. This applies even when the set blow-off time is very long.

5.5.1 Externally Controlled Blow-Off

The ejector switches to blow-off mode for as long as the signal for "Blow-off" mode is present.

5.5.2 Internally Time-Controlled Blow-Off

After the suction signal is switched off, the ejector switches to blow-off mode automatically for the set time. With this function, the blow-off signal does not have to be additionally controlled.

5.5.3 Externally Time-Controlled Blow-Off

The blow-off starts with the blow-off signal and is performed for the set time period. Applying the blow-off signal for a longer time does not lead to a longer blow-off period.

5.5.4 Setting the Blow-off Time

The drop-off time can be set for internally and externally controlled time-dependent drop-off via the IO-Link parameter "Duration automatic drop off" for each production setup (e.g. for production setup P0 in 0x006A).

The value displayed indicates the blow-off time in seconds. The time can range from 10 to 9999 milliseconds.

Set the time for time-controlled blow off (only active if value > 0). If you set the value to 0, the ejector is automatically in "Externally controlled blow off" mode.

5.6 Automatic Operation

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

5.7 Setting Mode

The setting mode is used to detect and eliminate leakages in the vacuum circuit, because the valve protection function is deactivated and the control is not deactivated even at increased control frequencies.

In this operating mode, the "Status" LED flashes (in the applicable device status color) (> See ch. 3.5 LED Display, p. 13).

Setting mode activated and deactivated

▸ Use the "Setting mode ejector x" output process data byte to set the desired value according to the Data Dictionary.

A change in bit 0 or bit 1 (suction or blow-off) in the process data also causes the device to exit setting mode.

This function is only available in IO-Link mode.

5.8 System Commands

System commands are predefined processes for triggering specific functions and are described below. They are controlled by writing parameter "System command" 0x0002 with a predefined value.

5.8.1 Resetting the Application

Only the technology-specific application parameters are reset by this function.

System command "Reset application" 0x81 is used to reset all the parameters except the device localization parameters (see "Data Dictionary") to their factory settings.

Any IO-Link communication is not stopped in doing so.

The device must be restarted by interrupting the supply voltage.

5.8.2 Reset to Factory Settings

The system command "Back to box" 0x83 is used to reset all the setting parameters to their factory settings.

Any IO-Link communication is stopped in doing so.

The device must be restarted by interrupting the supply voltage.

Counter statuses, the zero-point adjustment of the sensor and the maximum and minimum values of the measurements are not affected by this function.

5.8.3 Calibrating the Vacuum Sensor

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

Via IO-Link, the sensor zero-point adjustment command is executed using the parameter "System command" 0x0002 with the value 0xA5 for Calibrate vacuum sensor.

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

The violation of the upper permissible limits are reported by the relevant parameter (see the data dictionary).

5.8.4 Resetting Counters

Via IO-Link, the system command to delete the two counters is executed via the parameter "System command" 0x0002 with the value 0xA7 "Reset erasable counters".

5.8.5 Resetting Maximum and Minimum Values for the Supply Voltage

System command 0xA8 "Reset voltages min/max" is used to delete the minimum and maximum values for the sensor supply voltage.

5.8.6 Resetting Maximum and Minimum Values for the Vacuum

System command 0xA9 "Reset vacuum min/max" is used to delete the minimum and maximum values for the vacuum.

5.9 Access Control

The device functions can be protected against unauthorized access using the parameter "Extended device access locks" 0x005A. For this purpose, a PIN for NFC access must be assigned using the parameter "PIN code NFC" 0x005B.

5.9.1 Restricting Extended Access

Extended device functions can be disabled via the parameter "Extended device access locks" 0x005A.

Bit	Meaning
0	NFC write lock (Parameter changes via NFC are blocked)
1	NFC disable (NFC deactivated. The device cannot be recognized by an NFC reader.)
4	IO-Link event lock (IO-Link events are disabled in IO-Link mode)

5.9.2 NFC PIN Code

Parameterization via NFC can be protected against unintentional access by means of a PIN code.

The PIN code can be set with the ControlRoom app under Device settings > PIN code for NFC or via the IO-Link parameter "PIN code NFC" 0x005B.

When delivered, the PIN code is **000** and a lock is therefore not active.

The NFC PIN code can be changed only using this parameter.

When a PIN code is set between 001 and 999, the valid PIN must be entered for every subsequent write process using a mobile NFC device so that the device accepts the changes.

For more detailed information, see the data dictionary attached.

5.10 Device Data

The device provides a range of identification data that can be used to uniquely identify a specific device. All of these parameters are ASCII character strings that adapt their length to the relevant content.

The following parameters can be called up:

- Manufacturer name and web address of the manufacturer (Vendor name 0x0010 / Vendor text 0x0011)
- Product name and product text (Product name 0x0012 / Product text 0x0014)
- Product ID (0x0013)
- Serial number (Serial number 0x0015)
- Version status of the hardware and firmware (Hardware revision 0x0016 / Firmware revision 0x0017)
- Part number (Article number 0x00FA)
- Unique device ID and device properties (Unique device ID 0x00F0)
- Production date (Production date 0x00FC)
- Device ID (Application specific tag 0x0018, Function tag 0x0019, Location tag 0x001A)
- Equipment identification (Equipment identification 0x00F2)
- Web link for NFC app and device description file (NFC web link 0x00F8)

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

5.11 User-Specific Localization

The following parameters are available when saving user-specific information:

- Identifier of the installation location (Geolocation 0x00F6)
- Identifier of the storage location (Storage location 0x00F9)
- Installation date (Installation date 0x00FD)

The parameters are ASCII character strings with the maximum length given in the Data Dictionary. They can also be used for other purposes if necessary.

5.12 Output and Input Signals

RECBi variants with an ejector module have signal outputs and inputs and are designed with SIO as well as IO-Link.

In SIO mode, all input and output signals are connected to the higher-level control unit (e.g. a robot) directly or via IO fieldbus boxes.

For this purpose, in addition to the power supply lines, one input signal and two output signals must be connected. The product communicates with the control unit via these signals.

The signal type for the digital inputs and outputs can switch between PNP and NPN with the parameters "Signal type: SIO outputs of the device" 0x0049, subindex 01 and "Signal type: SIO inputs of the device" parameters 0x0049, subindex 02.

5.13 Switch-Off Delay

You can use this function to set a switch-off delay for the SP2 "part present" check signal. This can be used to mask short-term fluctuations in the vacuum level of the vacuum system.

The switch-off delay affects the discrete output OUT2, the process data bit in IO-Link and the status display.

The duration of the switch-off delay is set in IO-Link via the parameter "Output filter" 0x004B.

Values from 1 to 999 ms can be set. To deactivate this function, enter the value "off" (0 = off).

> ℹ️ If the output is configured as a normally open contact [NO], there is an electrical switch-off delay. On the other hand, if it is configured as a normally closed contact [NC], there will be an equivalent switch-on delay.

5.14 Set Permissible Evacuation Time t1 (0x006B)

The permissible evacuation time t1 is set for each production setup profile (e.g. for production setup profile P0 in 0x006B) using the parameter "Permissible evacuation time". The measurement starts when the switching threshold SP2 is reached and ends when the switching threshold SP1 is exceeded.

If set to 0 ms, monitoring is disabled and no warning is displayed.

Parameter	Description
Permissible evacuation time	Time from SP2 to SP1 [ms]

5.15 Setting the Permissible Leakage

The permissible leakage is set for each production setup profile (e.g. for production setup profile P0 in 0x006C) using the parameter "Permissible leakage rate". The leakage is measured after the air saving function has interrupted suction once switching point SP1 is reached.

If set to 0 ms, monitoring is disabled and no warning is displayed.

Parameter	Description
Permissible leakage	Leakage after reaching SP1 [mbar/s]
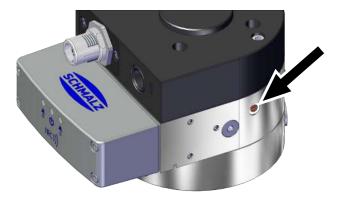
5.16 Changing the Blow-Off Flow Rate on the Ejector

ℹ️ Do not overwind past the stop on the valve screw. The blow off flow rate can be adjusted within the range between 0% and 100%.

A valve screw (see the figure below) is located on the side of the ejector module. This valve screw can be used to manually adjust the blow-off flow rate.

1. Turn the valve screw clockwise to reduce the flow rate.

2. Turn the valve screw counterclockwise to increase the flow rate.

5.17 Counters

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

Parameter address	Description
0x008C	Counter for suction cycles (suction signal) (Vacuum on counter)
0x008D	Counter for suction valve switching frequency (Valve operating counter)
0x008E	Counter for condition monitoring (Condition monitoring counter)
0x008F	Counter for suction cycles (suction signal) (Vacuum on counter) – erasable
0x0090	Counter for suction valve switching frequency (Valve operating counter) – erasable
0x0091	Counter for condition monitoring (Condition monitoring counter) – erasable

The erasable counters can be reset to 0 using the appropriate system commands.

5.18 Device Status

In IO-Link mode, further status information is available in addition to the error messages displayed in SIO mode.

- Device status (0x0024) (parameter data)) in the form of a status traffic light
- Detailed device status (0x0025), event list
- Active errors Ejector (0x0082)
- NFC status (0x008B)
- 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 IO-Link parameter "Condition monitoring" 0x0092.

Device status parameter 0x0024

The device status provides basic status information for the device in the form of a status traffic light:

Parameter 0x0024	Status	Description
Device status	Green (0)	Device is operating without any errors (Device is operating properly)
	Yellow (1)	Maintenance or adaptation of settings required (Maintenance required)
	Orange (2)	Device is operating outside the permissible specification (Out of Spec)
	Red (4)	Error – safe operation within the operating limits is no longer ensured (Error)

Warnings from condition monitoring events generally lead to a yellow or orange status and are additionally indicated by the "Status" LED display with orange = warning.

Errors from active errors generally lead to a red status and are indicated by the "Status" LED display with red = error.

5.18.1 Error Codes

The active error codes are displayed through the individual bits using the parameter "Active Errors" 0x0082. In addition, the errors are transmitted in the process data (Errors Ejector x High-Byte and Errors Ejector x Low-Byte).

The following errors are displayed:

- IO setup communication error (IO-Link startup check: data corruption)
- Supply voltage sensor too low (Primary voltage too low)
- Supply voltage sensor too high (Primary voltage too high)
- Supply voltage actuator too low (Auxiliary voltage too low)
- Short circuit at OUT2 (Short circuit at OUT2)
- Internal IO-Link communication interrupted (IO-Link communication interruption)
- Measurement range of vacuum sensor exceeded (Measurement range overrun)
- IO-Link communication interrupted (IO-Link communication interruption)

5.18.2 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 system vacuum, System vacuum live Ejector / System vacuum min Ejector / System vacuum max Ejector 0x0040
- For the supply voltage, Primary supply voltage, live / Primary supply voltage, min / Primary supply voltage, max 0x0042

The maximum and minimum values can be reset through the appropriate system command 0x0002 with the command 0xA7.

5.19 Active Profile

The "Active profile" parameter 0x0113 can be used to read out the current active profile (production setup profiles) that was selected via the output process data (profile set).

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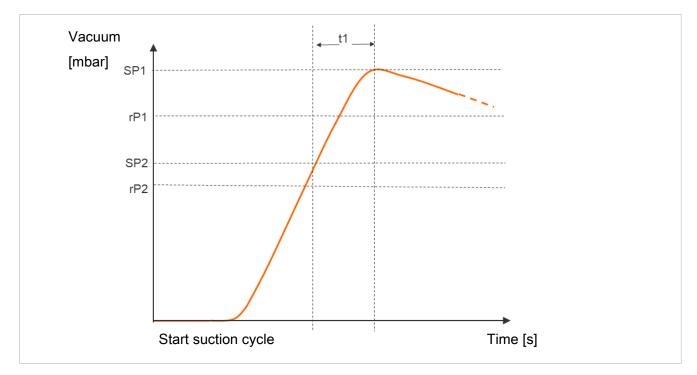
In IO-Link mode, the energy and process control (EPC) function is available. It is subdivided into three modules:

- 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 system

5.20.1   Condition Monitoring [CM]

The active warnings are displayed via individual bits in the parameter "Condition monitoring" 0x0092. You can find a detailed description in the Data Dictionary. In addition, the warnings are transmitted in the process data:

- Valve protection active
- Evacuation time above limit
- Leakage rate exceeded (Leakage rate above limit)
- Switching point SP1 not reached during the suction cycle (SP1 not reached in suction cycle)
- Dynamic pressure greater than SP2 (Free flow vacuum over SP2)
- Supply voltage sensor out of range (Primary Voltage US out of operating range)
- Specified input pressure out of range (Input pressure out of operating range)

5.20.2   Timing
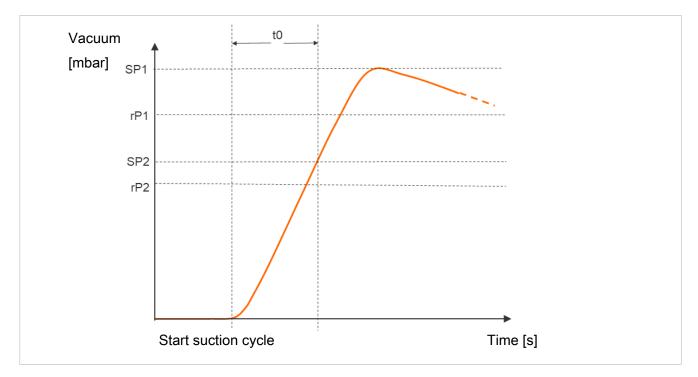
Measure the evacuation time t1 (parameter "Evacuation time t1 of last suction cycle" 0x0095):

The evacuation time t1 is defined as the time (in ms) from when switching point SP2 is reached until switching point SP1 is reached.

If the measured evacuation time t1 (from SP2 to SP1) exceeds the specified value, the "Evacuation time above limit" condition monitoring warning is triggered and the system status light switches to yellow.

Setting the value to zero (= off) deactivates monitoring. The maximum permitted evacuation time setting is 9999 milliseconds [ms].

The maximum permitted evacuation time t1 is set via IO-Link using the parameter "Permissible evacuation time" for each production setup profile (for P0 using 0x006B).

Measure the evacuation time t0 (parameter "Evacuation time t0 of last suction cycle" 0x0094):

The evacuation time t0 is defined as the time (in ms) from the start of a suction cycle, which is started by the "Suction ON" command, until switching point SP2 is reached.

Measure the total cycle time, parameter "Total cycle time of last cycle" 0x00A6:

The time of the entire suction cycle (in ms) is measured.

5.20.3 Condition Monitoring Autoset

The "CM Autoset" process data function allows the condition monitoring parameters for the maximum permitted leakage "Permissible leakage rate" and the evacuation time (t-1) "Permissible evacuation time" to be determined automatically.

The actual values from the last suction cycle are combined with an additional tolerance and stored in the parameter data of production setup P0.

Feedback about the completed "CM Autoset" function is displayed via input process data byte 0 "CM Autoset acknowledged."

5.20.4 Energy Monitoring (EM)

To optimize the energy efficiency of vacuum gripping systems, the device provides a function for measuring and displaying the energy and air consumption.

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

Parameter "Air Consumption of Last Suction Cycle" 0x009B

When measuring air consumption as a percentage, the product 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.

Parameter "Air Consumption of Last Suction Cycle" 0x009C

The IO-Link process data can be used to supply an externally detected pressure value (Input pressure Ejector) in the output process data. If this value is available, an 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.

Parameter "Energy Consumption of Last Suction Cycle" 0x009D

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.

5.20.5 Predictive Maintenance (PM)

Overview of Predictive Maintenance (PM)

To allow early detection of wear and other impairments to the vacuum gripping system, the product 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 only remain stable after the end of suction and can be read from the "Quality" parameter 0x00A2.

Measuring Leakage (Leakage Rate of Last Suction Cycle Ejector x)

This function measures the leakage with the parameter "Leakage rate of last suction cycle" 0x00A0 (represented as the vacuum drop per time unit in mbar/s) after the air saving function interrupts the suction because switching point SP1 was reached.

Measuring Dynamic Pressure

The system vacuum achieved during unobstructed suction is measured using parameter "Free-flow vacuum" 0x00A1. The duration of the measurement is approx. 1 second. 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 vacuum 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 vacuum limit value SP1 but simultaneously above the vacuum limit value SP2 result in a condition monitoring event.

The dynamic pressure and the percentage performance value based on it are initially unknown when the product 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. The value can be read from the parameter "Free-flow vacuum" 0x00A1.

Quality Assessment

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

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

The quality evaluation can be read out using the parameter "Quality of last suction cycle" 0x00A2. The value indicates the quality relative to a leakage-free system in %.

Performance Calculation

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

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

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

The value can be read out using the parameter "Performance of last suction cycle" 0x00A3.

Maximum Vacuum Reached (Max Reached Vacuum of Last Cycle)

In each suction cycle, the maximum system vacuum level reached is determined and made available as the parameter "Max reached vacuum of last cycle" 0x00A4.

Minimum Input Pressure Reached from the Last Cycle (Min Reached Input Pressure of Last Cycle)

In each suction cycle, the minimum compressed supply air level reached is determined and made available as the parameter "Min reached input pressure of last cycle" 0x00A5.

5.21 IO-Link Events

The RECBi indicates when specific "events" occur. As a result, these events do not have to be queried using a parameter. These are error messages and warnings. For more information, see the Data Dictionary.

6 Technical Data

6.1 General Parameters

Parameter	Symbol	Limit value			Unit	Comment
		min.	typ.	max.		
Working temperature	T_{amb}	0	---	50	° C	---
Storage temperature	T_{Sto}	-10	---	60	° C	---
Humidity	H_{rel}	10	---	90	% r.h.	Free from condensation
Degree of protection	---	---	---	IP40	---	---
Operating pressure (flow pressure)	P	3	4.5	6	bar	---
Max. vacuum	p	---	---	-850	mbar	---
Operating medium	Air or neutral gas, 5 µm filtered, with or without oil, class 3-3-3 compressed air quality in acc. with ISO 8573-1					

6.2 Performance Data

	10.02.03.00434 10.02.03.00443 10.02.03.00446	10.02.03.00437 10.02.03.00444 10.02.03.00447
Control	NC, normally closed	NO, normally open
Max. suction rate per vacuum duct	52.5 l/min	
Suction air consumption	89 l/min	
Blow-off air consumption	60 l/min	
Number of vacuum ducts	1	
Operation	SIO/IO-Link	
Sound pressure during suction	73 db	
Sound pressure when free	78 db	
Pneumatic energy transmission	Compressed air connection	
Status display	Yes	

	10.02.03.00434 10.02.03.00437	10.02.03.00443 10.02.03.00444	10.02.03.00446 10.02.03.00447
Mass	800 g	1,315 g	1,037 g

6.3 Electrical Specifications

Power Supply	24 V -13%/+10% V DC (PELV) [1]		
Polarity reversal protection	Yes		
Current consumption (at 24 V)	—	Typical current consumption	Max. current consumption
	RECBi 1C – NC	45 mA	45 mA
	RECBi 1C – NO	65 mA	65 mA
NFC	NFC Forum Tag type 4 f = 13.56 MHz		
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).

6.4 Maximum Forces

The holding force of the different grippers is limited; that is, the absorption of load forces and torques is limited. To prevent the load from shifting or even coming loose during the handling process, the operator of the respective gripper is therefore obliged to determine the optimum settings for the permitted process parameters for the handling process (load, acceleration, vacuum level, and so on) by performing testing and carefully increasing the load.

Gripper version **UNI**
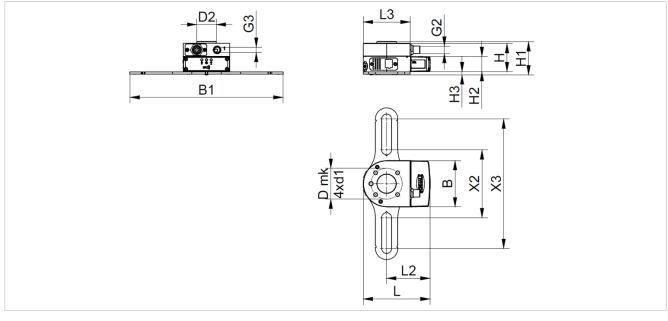
Load	Maximum permitted value
Static load, vertical, Fa (incl. configured gripper)	500 N

Gripper version **PXR**

Load		Maximum permitted value
Static load, vertical, Fa (incl. configured gripper)		100 N
Dynamic load:		
	At: 10 m/s²	20 N
	At: 5 m/s²	27 N
	At: 2.5 m/s²	32 N
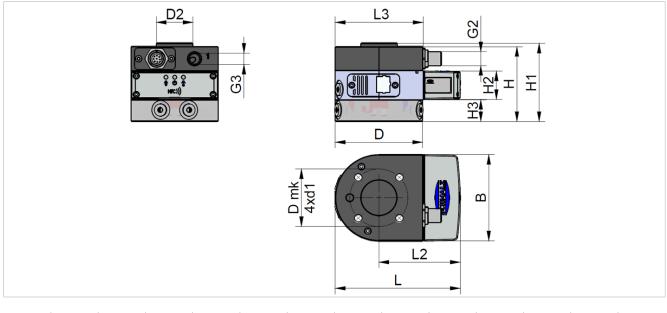
6.5 Dimensions

Version PXRi
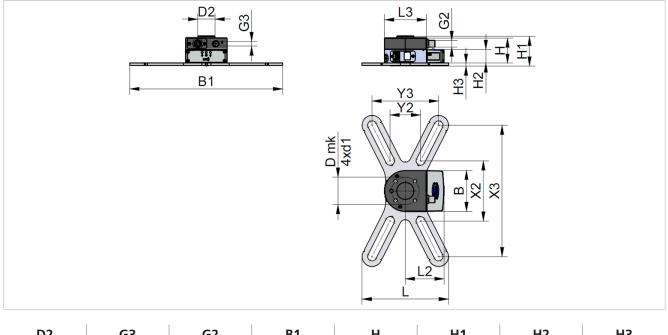
D2	G3	G2	B1	H	H1	H2	H3
31.5	1/8" internal thread	M12 external thread	246	46	54	25	5.1

Dmk	d1	B	L	L2	L3	X2	X3
50	6.4	75	107.5	70	75.5	110	210

Version UNI

D	D2	Dmk	d1	B	L	L2	L3	H	H1	H2	H3	G2	G3
75	31.5	50	6.4	75	107.5	70	75.5	65	68	25	19	M12 external thread	1/8" internal thread

Version PXRx

D2	G3	G2	B1	H	H1	H2	H3
31.5	1/8" internal thread	M12 external thread	276	46	54	25	5.1

Dmk	d1	B	L	L2	L3	X2	X3	Y2	Y3
50	6.4	75	156	70	75.5	110	240	55	120

All length dimensions given in millimeters [mm].

6.6 Factory Settings
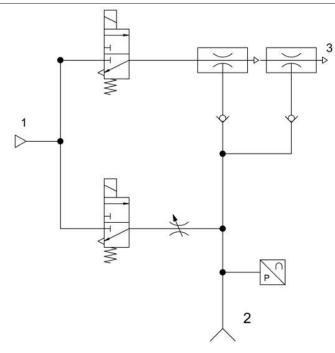
Parameter	Value of the factory setting
Limit value SP1	750 mbar
Reset value RP1	600 mbar
Limit value SP2	550 mbar
Reset value RP2	540 mbar
Blow off time	0.2 s
Air saving	Activated
Continuous suction	Deactivated
Evacuation time	2 s
Leakage value	250 mbar/s
Blow off function	Externally controlled blow off
Vacuum unit	Vacuum unit in mbar
Signal type	PNP switching
Switch-off delay	10 ms
Signal output	"Normally open" contact = no

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.
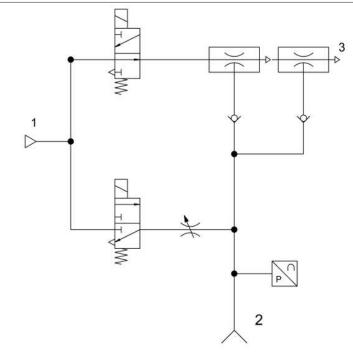
6.7 Pneumatic Circuit Plans

Key:

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

NC

NO

7 Transportation and Storage

7.1 Checking the Delivery

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

1. Compare the entire delivery with the supplied delivery notes to make sure nothing is missing.

2. Damage caused by defective packaging or occurring in transit must be reported immediately to the carrier and J. Schmalz GmbH.

7.2 Unpacking the Device

Remove product packaging only to the extent required for further internal transport.

> **NOTE**
>
> **Improper unpacking**
>
> Improper handling results in product failure.
>
> ‣ Avoid dirt on and damage to the pin contacts.
>
> ‣ Do not touch the pin contacts without suitable ESD protection.

7.3 Transport / Storage / Preservation

> **NOTE**
>
> **Dropping the product or subjecting it to impacts**
>
> Damage to the product and/or malfunctions
>
> ‣ Do not drop the product or subject it to impacts.

- The product must always be transported and stored in its original packaging.
- Make sure that no undesired movements can take place during transport if the product is already mounted on the higher-level machine unit.
- Before starting operations and after transport, check all energy, communication and mechanical connections.
- Follow the steps below when the product is stored over a longer period of time:
  – Keep the storage location dry and free from dust to the greatest extent possible.
  – Maintain the temperature range of 5° to 50° C and avoid temperature fluctuations.
  – Avoid wind, drafts and condensation.
  – Seal off the product from dust with a weather and tear-resistant film.
  – Avoid direct sunlight.
- Clean all components. All dirt must be removed from the components.
- Visually inspect all components.
- Remove foreign bodies.
- Close electrical connections using suitable covers.

8 Installation

8.1 Mechanical Attachment

⚠ **CAUTION**

Risk of getting caught by the connection cable and compressed air hose, especially when the collaborative robot moves.

Injury due to limbs or hair getting caught.

‣ The connection cable and compressed air hose should be laid close to the contour and as close as possible to the robot arm.

‣ Avoid the danger zone.

The RECBi may be installed in any position.

The RECBi is adapted directly to a handling system or robot. A positioning pin on the housing is used to align the display and suction cup.

🛈 The illustrations shown below may deviate from the customer's version because they serve as examples of different versions of the product.

‣ Position the RECBi on the handling system/robot using the positioning pin and secure it with the 4x M6 cylinder head screws and locking washers.
Observe the permissible tightening torques for the threads on the handling system/robot.

8.2 Connecting Compressed Air

✓ The hose attachment adapter (provided by the customer) is fitted.

▸ Connect the compressed air hose for supplying the integrated vacuum generation via the compressed air connection (1) (marked with 1). Use a maximum tightening torque of 2.5 Nm.

Information about pneumatic connections

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

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

- Use of air or neutral gas in accordance with EN 983, filtered 5 µm, oiled or unoiled.
- Dirt particles or foreign bodies in the device connections, hoses or pipelines can lead to partial or complete device malfunction.

1. Shorten the hoses and pipelines as much as possible.

2. Keep hose lines free of bends and crimps.

3. Only use a hose or pipe with the recommended internal diameter to connect the device; otherwise, use the next largest diameter.
   - On the compressed air side, ensure that the internal diameter is wide enough for the device to achieve its performance data (4 mm).
   - On the vacuum side, ensure that the internal diameter is wide enough to avoid high flow resistance (6 mm). If the internal diameter is too small, the flow resistance and the evacuation times increase and the blow off times are extended.

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

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

8.3 Electrical Connection

> ⚠ **CAUTION**
>
> **Changing output signals when the product is switched on or plug is connected**
>
> Personal injury or damage to property!
>
> ▸ The electrical connection must be performed only by specialists who can evaluate the effects of signal changes on the overall system.

> ⚠ **WARNING**
>
> **Electric shock**
>
> Risk of injury
>
> ▸ Operate the product using a power supply unit with protected extra-low voltage (PELV).

The electrical connection is established using an 8-pin M12 connector that supplies the product with voltage and communicates via IO-Link.

Establishing the electrical connection for the product

✓ Prepare an M12 8-pin connection cable with a socket (customer's responsibility).

▸ Attach the connection cable to the plug (1) (maximum tightening torque = hand-tight).

Observe the following connection instructions:

- The product has potential separation between the sensor supply and the actuator supply.
- The maximum length of the electrical supply line is 20 meters in accordance with the IO-Link specification.
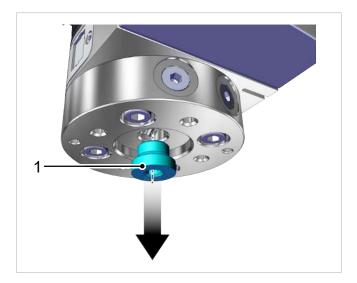
The table below shows the pin assignment of the electrical connection options in the operating modes SIO and IO-Link:

8-pin M12 connector (A-coded)	Pin	Symbol	Function with SIO	Function with IO-Link
	1	U_A	Supply voltage for actuator	
	2	U_S	Supply voltage for sensor	
	3	GND_A	Actuator ground	
	4	IN_1	"Suction" signal input	—
	5	OUT_2	"Parts control" signal output (SP2)	IO-Link communication
	6	IN_2	IN2 "Blow off" signal input	—
	7	GND_S	Sensor ground	
	8	—	—	

8.4   Assembling the Vacuum Gripping System

The UNI interface offers two options for connecting vacuum suction cups.

Gripper version UNI: Central vacuum connection

1.   Remove the screw (1).

2.   ⚠ Ensure that the O-ring is fitted. Install the vacuum suction cup (a bellows suction cup is shown as an example here) via the central vacuum connection (1) with a ¼-inch female thread with a max. tightening torque of 2.0 Nm.

Mounting thread

1. Use the universal flange pattern and 4x M6 female thread (1) to install a customer-specific gripping system with a max. tightening torque of 4 Nm.

2. Connect the vacuum gripping system to the vacuum supply. Remove the selected screw for the vacuum supply and install a suitable hose connection.

A total of five vacuum connections are available for the vacuum supply.
The same suction circuit can be tapped at all the five connections 1, 2, 3, 4 (size 1/8") and 5 (size 1/4").

Variants with interface PXR:

ℹ️ The illustrations shown below may deviate from the customer's version because they serve as examples of different versions of the product.
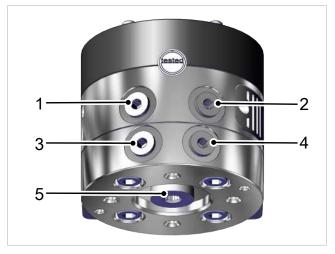
The interface PXR has a sheet metal structure for positioning and attaching suction cups. The vacuum line can be established only via hose connections.

The sheet metal structure is available in two versions:

- With 2 in-line mounting options (PXRi)
- with 4 cross-wise mounting options (PXRx)

Examples:

PXRi	PXRx
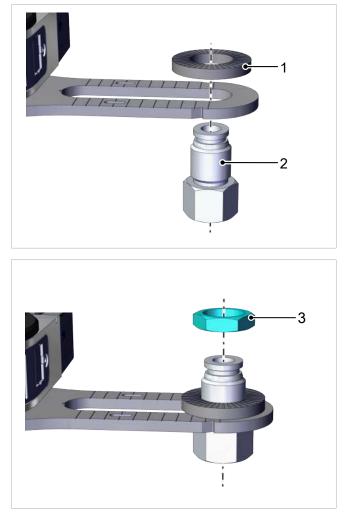
The vacuum supply for the individual suction cups is established via the vacuum connections of the ejector module using hoses.

Installing vacuum suction cups

✓ The required accessories are available.

1. Position the washer (1) and the hollow bolt (2) on the RECB holder.

2. Fasten by hand with the nut (3).
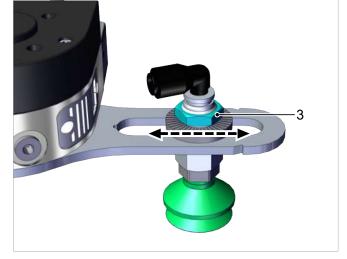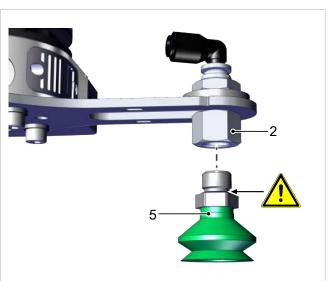
3. Insert the plug connector (4) into the hose connection of the hollow bolt (2) until it stops.
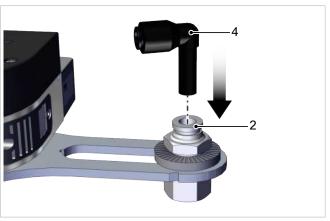
4. Ensure that the O-ring is mounted on the vacuum suction cup (5). Screw the vacuum suction cup (5) onto the hollow screw (2) and fasten with a tightening torque of 2.5 Nm.

5. Position the suction cup assembly in the RECBi holder and secure with a tightening torque of 9 Nm using the nut (3).
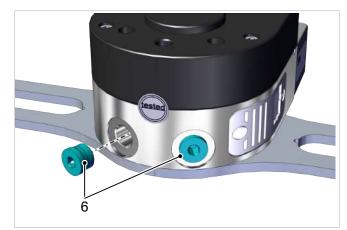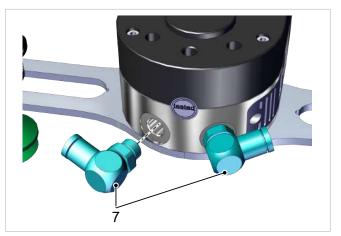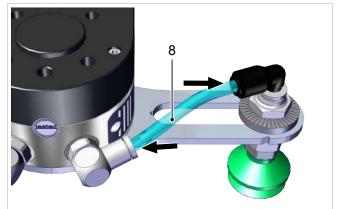
6. Remove the required number of plugs (6) from the ejector module.
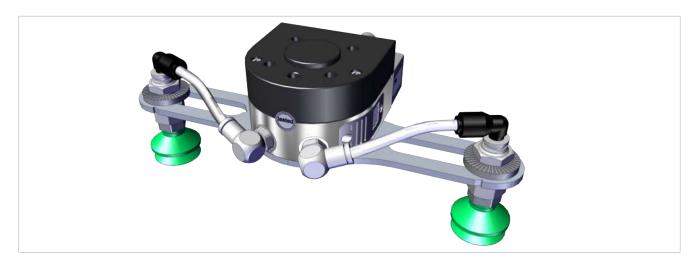
7. Screw the plug-in screw unions (7) into the free vacuum connections and fasten them with a tightening torque of 2.5 Nm.

8. Cut the vacuum hose (8) to length and insert it into the hose connections.

⇨ Example of a fitted RECBi PXR-i with vacuum gripping system

9 Operation

9.1 Safety Instructions for Operation

⚠ WARNING

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

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

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

⚠ WARNING

Extraction of hazardous media, liquids or bulk material

Personal injury or damage to property!

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

⚠ CAUTION

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

Eye injuries!

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

⚠ CAUTION

Vacuum close to the eye

Severe eye injury!

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

⚠ CAUTION

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

Risk of injury

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

9.2 Checking for Correct Installation and Function

Before starting the handling process, check for proper installation and function.

9.3 Setting Process Parameters

⚠ WARNING

Falling load – improper use of the gripper

Serious injury due to falling load!

▶ Conduct tests and carefully increase the load to determine the optimum settings for the process parameters required for the handling process (load, acceleration, vacuum level, and so on).

The holding force of the different grippers is limited; that is, the absorption of load forces and torques is limited. To prevent the load from shifting or even coming loose during the handling process, the operator of the respective gripper is therefore obliged to determine the optimum settings for the permitted process parameters for the handling process (load, acceleration, vacuum level, and so on) by performing testing and carefully increasing the load.

Schmalz assumes no liability for damages resulting from slippage or the release of the load due to the incorrect adjustment of process parameters.

10 Help with Malfunctions

Error	Cause	Measure
Master or peripheral power supply disturbed	Connection to IO-Link master with IO-Link class-B port	▸ Connection to IO-Link class A port
No output signal or device does not respond to digital I/O signals from the controller	Incorrect electrical connection	▸ Check electrical connection and pin assignment
	Input and output logic (PNP/NPN) of the RECBi does not match the input and output logic of the control (PNP/NPN); unsuitable application	▸ Adjust the input and output logic (PNP/NPN) to the device's electrics
No IO-Link communication	Incorrect electrical connection	▸ Check electrical connection and pin assignment
	Master not correctly configured	▸ Check configuration of the master to see whether the port is set to IO-Link
	IODD connection does not work	▸ Check for the appropriate IODD ⇨ Different IODDs are required for single and double modules
Ejector does not respond	No compressed air supply	▸ Check the compressed air supply
Vacuum level is not reached or vacuum is built up too slowly	Press-in screen is contaminated	▸ Replace screen
	Silencer is dirty	▸ Replace the silencer insert
	Leakage in hose line	▸ Eliminate leakage from hose connections
	Leakage at suction cup	▸ Eliminate leakage from suction cup
	Operating pressure too low	▸ Increase operating pressure, observe maximum limits
	Internal diameter of hose line too small	▸ Observe recommendations for hose diameter
Load cannot be held	Vacuum level too low	▸ Increase the control range for the air saving function
	Suction cup too small	▸ Select a larger suction cup
IO-Link warning message "Leakage too high" although handling cycle is working optimally	Limit value L-x (permissible leakage per second) set too low	▸ Determine typical leakage values in a good handling cycle and set as limit value
	Limit values SPx and RPx for leakage measurement set too low	▸ Set limit values in such a way that there is a clear differentiation between the neutral and suction system states.
IO-Link warning message "Leakage too high" does not appear although there is high leakage in the system	Limit value L-x (permissible leakage per second) set too high	▸ Determine typical leakage values in a good handling cycle and set as limit value
	Limit values SPx and RPx for leakage measurement set too high.	▸ Set limit values in such a way that there is a clear differentiation between the neutral and suction system states.

11 Maintenance and Cleaning

11.1 Safety Instructions for Maintenance

⚠️ **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.

⚠️ **CAUTION**

Blowing off or cleaning the product with compressed air

Risk of injury and damage to the product

▶ Never blow off the product with compressed air.

⚠️ **CAUTION**

Use of Cleaners Containing Solvents

Damage to the product (seals, insulation, coatings and other surfaces may be damaged by cleaners that contain solvents) and potentially damage to health

▶ Use a chemically and biologically neutral cleaning agent.

▶ Use cleaning agent that is rated as non-harmful to health.

▶ The use of the following cleaning agents is strictly prohibited:
  — Acetone
  — white spirit
  — cellulose thinner/turpentine oil (solvents)

11.2 Maintenance

The product must be checked regularly for possible corrosion, damage and contamination by means of a visual inspection.

We recommend commissioning Schmalz customer service to perform maintenance.

Unauthorized disassembly and assembly of the product can lead to complications, as special assembly devices are sometimes required.

🛈 Schmalz stipulates the following checks and check 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.

Maintenance task	When starting work	Weekly	As required	Every six months
Visually inspecting the product and its surroundings	X			
Check electrical contacts/electrical connections/connection cables for damage and function		X		
Check the locking device		X		
Clean the product			X	
Maintain the locking device for and positioning of the loose member				X
The operating instructions are available, legible and can be accessed by personnel				X

The visual inspection covers only the components and their function. If you identify irregularities or damage during the visual inspection, you must carry out a more detailed check of the components.

11.3 Cleaning

⚠ **CAUTION**

Use of Cleaners Containing Solvents

Damage to the product (seals, insulation, coatings and other surfaces may be damaged by cleaners that contain solvents) and potentially damage to health

‣ Use a chemically and biologically neutral cleaning agent.

‣ Use cleaning agent that is rated as non-harmful to health.

‣ The use of the following cleaning agents is <u>strictly prohibited</u>:
— Acetone
— white spirit
— cellulose thinner/turpentine oil (solvents)

11.4 Replacing the Silencer

⚠ **WARNING**

Noise pollution due to the escape of compressed air

Hearing damage!

‣ Wear ear protectors.

‣ The ejector must only be operated with a silencer.

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

If the suction capacity decreases, replace the silencer:
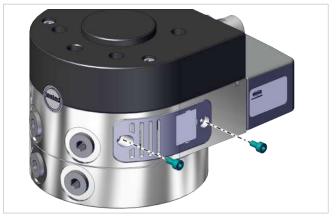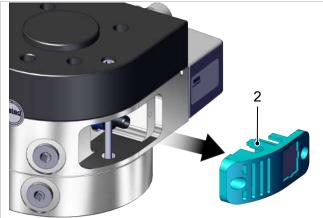
ℹ️ The illustrations shown below may deviate from the customer's version because they serve as examples of different versions of the product.
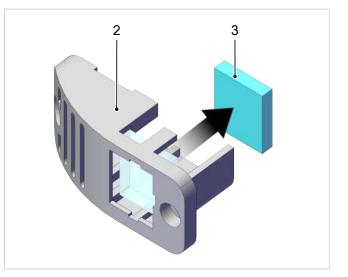
✓ Deactivate the device and depressurize the pneumatic systems.
✓ A new silencer spare part set with part no. 10.02.03.00422 or 10.02.03.00441 is available as a replacement.

1. Release the two fastening screws on the silencer housing.

2. Remove the silencer housing (2).

3. Push the silencer (3) out of the silencer housing (2).

4. Push the new silencer (3) into the silencer housing (2).
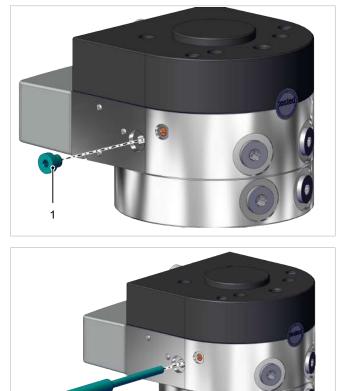
5. Push the silencer housing (2) into the ejector module and secure with two screws (tightening torque 0.7 Nm).

11.5   Replacing the Nozzle
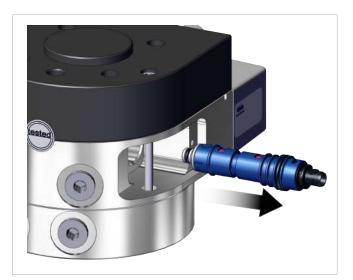
✓   Deactivate the device and depressurize the pneumatic systems.

✓   The new nozzle is ready for mounting. See accessories.

1. Remove the silencer housing.
    To do this, perform steps 1 and 2 in ().

2. Remove the screw (1).

3. Carefully push the nozzle out of the bore with a mandrel or Allen key.
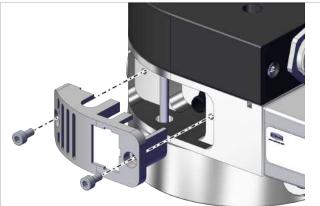
⇨ Remove the nozzle from the ejector module.
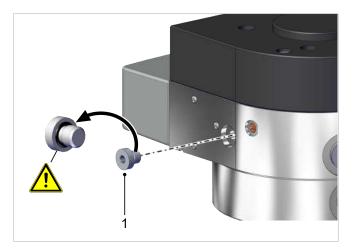
4. Check that all O-rings and flaps are present, correctly mounted and lightly greased. Push the new nozzle into the ejector module in the correct position.

5. Push the silencer housing (2) into the ejector module and secure with two screws (tightening torque 0.7 Nm).

6. Ensure that the O-ring is fitted on the screw (1) and is lightly greased. Mount the screw (1) and tighten with a torque of 1.5 Nm.

12 Spare and Wearing Parts

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

Part no.	Designation	Part type
10.02.03.00422	Silencer spare parts set ERS RECBi SD	Spare part
10.02.01.01449	Spare parts set, size: 13 contains: 6x non-return valve ERS SEP-13 6xRUE-KLAP	Spare part
10.02.01.01493	Ejector module SEP HV 2 14 13 S	Spare part
10.07.08.00090	O-RING 10.3x2.4 NBR-70	Spare part
10.01.06.04530	Bellows suction cup (round) for particularly uneven workpieces SPB1 30 ED-65 1/4" external thread	Wearing part

13 Accessories

Part no.	Designation	Note
10.02.03.00441	SD 66.7x24.4x24.5 RECBi	Silencer
10.02.03.00453	ZUB RECBi-UNI SCHRAUBEN	for universal flange
10.02.03.00454	ZUB RECBi-PXR-I SCHRAUBEN	for PXR-I or PXR-X
10.02.03.00412	ZUB RECBi-UNI	for universal flange
10.02.03.00413	ZUB RECBi-PXR-I	for PXR-I
10.02.03.00414	ZUB RECBi-PXR-X	for PXR-X
10.08.09.00032	VENT-BGR EMVP-5 3/2 NC 24V-DC	Valve assembly for controlling the vacuum and compressed air

14   Taking the Product Out of Operation and Disposal

If the product reaches the end of the utilization phase, it may be fully disassembled and disposed of. Only qualified specialist staff may prepare the product for disposal.

1. Fully disconnect the product from the power supply.
2. Dispose of the components properly based on their material groups.

For proper disposal, contact a company specializing in the disposal of technical goods and instruct the company to observe the applicable disposal and environmental regulations.

15 Declarations of Conformity

15.1 EC Conformity

EU Declaration of Conformity

The manufacturer Schmalz confirms that the product with the name "pneumatic end-of-arm vacuum generator RECBi" that is described in these operating instructions complies with the following applicable EC directives:

2011/65/EU	RoHS Directive
2014/53/EU	Harmonization of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC

The following harmonized standards were applied:

EN ISO 12100	Safety of machinery — General principles for design — Risk assessment and risk reduction
EN ISO 4414	Pneumatic fluid power – General rules and safety requirements for systems and their components
EN 61000-6-2+AC	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-3+A1+AC	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
EN 300 330	Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz
EN IEC 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Additional technical standards and specifications were applied:

EN ISO 9409-1	Manipulating industrial robots – Mechanical interfaces – Part 1: Plates
ISO TS 15066	Human-robot collaboration
EN 301 489-1	Electromagnetic compatibility for radio equipment and services; Part 1: Common technical requirements

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

15.2 UKCA Conformity

Declaration of Conformity (UKCA)

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

2012	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations
2017	Radio Equipment Regulations

The following designated standards were applied:

EN ISO 12100	Safety of machinery — General principles for design — Risk assessment and risk reduction
EN ISO 4414	Pneumatic fluid power – General rules and safety requirements for systems and their components
EN 61000-6-2+AC	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-3+A1+AC	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
EN 300 330	Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz
EN IEC 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

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IO-Link

SCHMALZ

IO-Link Implementation

Vendor ID	234 (0xEA)
Device ID	100282 (0x0187BA)
SIO-Mode	yes
IO-Link Revision	1.1 (compatible with 1.0)
IO-Link Bitrate	38.4 kBit/sec (COM2)
Minimum Cycle Time	7 ms
Process Data Input	16 bytes
Process Data Output	4 bytes

Process Data

	Process data In	Bits	Access	Remark
PD in byte 0	Reserved	0…3	ro	Reserved
	Reserved	4..5	ro	Reserved
	Device Status	6..7	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	SP2 (part present)	0	ro	Vacuum is above SP2 & not yet below rP2
	SP1 (air saving function)	1	ro	Vacuum is above SP1 & not yet below rP1
	SP3 (part detached)	2	ro	The part has been detached after a suction cycle
	CM-Autoset	3	ro	Acknowledge that the Autoset function has been completed
	Reserved	4..7	ro	not used
PD in byte 2	Errors High-Byte	0..7	ro	Bit 0 = Short circuit at OUT2 Bit 1 = reserved Bit 2 = reserved Bit 3 = Measurement range overrun Bit 4 = reserved Bit 5 = reserved Bit 6 = reserved Bit 7 = IO-Link communication interruption
PD in byte 3	Errors Low-Byte	0..7	ro	Bit 0 = IO-Link startup check: data corruption Bit 1 = reserved Bit 2 = Primary voltage too low Bit 3 = Primary voltage too high Bit 4 = Auxiliary voltage too low Bit 5 = reserved Bit 6 = reserved Bit 7 = reserved
PD in byte 4	Warnings High-Byte	0..7	ro	Bit 0 = General input pressure out of operating range Bit 1 = reserved Bit 2 = reserved Bit 3 = reserved Bit 4 = reserved Bit 5 = reserved Bit 6 = reserved Bit 7 = reserved
PD in byte 5	Warnings Low-Byte	0..7	ro	Bit 0 = Valve protection Bit 1 = Evacuation time above limit Bit 2 = Leakage rate above limit Bit 3 = SP1 not reached in suction cycle Bit 4 = Free Flow Vacuum over SP2 Bit 5 = Primary Voltage US out of operating range Bit 6 = reserved Bit 7 = reserved
PD in byte 6	Vacuum High-Byte	0..7	ro	System vacuum [mbar]
PD in byte 7	Vacuum Low-Byte	0..7	ro	
PD in byte 8	Reserved	0..7	ro	not used
PD in byte 9	Reserved	0..7	ro	not used
PD in byte 10	Reserved	0..7	ro	not used
PD in byte 11	Reserved	0..7	ro	not used
PD in byte 12	Reserved	0..7	ro	not used
PD in byte 13	Reserved	0..7	ro	not used
PD in byte 14	Reserved	0..7	ro	not used
PD in byte 15	Reserved	0..7	ro	not used
	Process data Out	**Bits**	**Access**	**Remark**
PD out byte 0	Vacuum	0	wo	Vacuum on/off
	Blow-off	1	wo	Activate Blow-off
	Setting Mode	2	wo	Vacuum on/off with continuous suction disabled (regardless of dCS parameter)
	CM-Autoset	3	wo	Perform CM Autoset function (teach permissible leakage and permissible evacuation time)
	Reserved	4..7	wo	not used
PD out byte 1	Input Pressure	0..7	wo	Pressure value from external sensor [0.1 bar]
PD out byte 2	Reserved	0..7	wo	not used
PD out byte 3	Profile Set	0..1	wo	Profile selection
	Reserved	2..7	wo	not used

ISDU Parameters

ISDU Index dec	ISDU Index hex	Subindex dec	Parameter	Size	Value Range	Access	Default Value	Remark
⊞			Identification					
	⊞		Device Management					
16	0x0010	0	Vendor name	0…32 bytes	-	ro	J. Schmalz GmbH	Manufacturer designation
17	0x0011	0	Vendor text	0…32 bytes	-	ro	Innovative Vacuum Solutions	Internet address
18	0x0012	0	Product name	0…32 bytes	-	ro	RECBi_1C	Product name
19	0x0013	0	Product ID	0…32 bytes	-	ro	'RECBi_1C	Product variant name
20	0x0014	0	Product text	0…32 bytes	-	ro	RECBi 24V-DC 1-C	Order-code
21	0x0015	0	Serial number	9 bytes	-	ro	000000001	Serial number
22	0x0016	0	Hardware revision	2 bytes	-	ro	00	Hardware revision
23	0x0017	0	Firmware revision	4 bytes	-	ro	1.0	Firmware revision
240	0x00F0	0	Unique device identification	9 bytes	-	ro	-	Unique ID
250	0x00FA	0	Article number	14 bytes	-	ro	10.02.03.00394	Order-number
252	0x00FC	0	Production date	3 bytes	-	ro	C22	Date code of production (month and year, month is letter coded)
	⊞		Device Localization					
24	0x0018	0	Application specific tag	1…32 bytes	-	rw	***	User string to store location or tooling information

25	0x0019	0	Function tag	1…32	bytes	-	rw	***	User string to store location or tooling information
26	0x001A	0	Location tag	1…32	bytes	-	rw	***	User string to store location or tooling information
242	0x00F2	0	Equipment identification	1…64	bytes	-	rw	***	User string to store identification name from schematic
246	0x00F6	0	Geolocation	1…64	bytes	-	rw	***	User string to store geolocation from handheld device
248	0x00F8	0	NFC web link	1…64	bytes	http://… https://…	rw	https://myproduct.schmatz.com/#/	Web link to NFC app (base URL for NFC tag)
249	0x00F9	0	Storage location	1…32	bytes	-	rw	***	User string to store storage location
253	0x00FD	0	Installation date	1…16	bytes	-	rw	***	User string to store date of installation
⊞	Parameter								
	⊞	Device Settings							
		⊞	Commands						
2	0x0002	0	System command	1	byte	5, 129, 131, 165, 167, 168, 169	wo	-	0x81 (dec 129): Reset application 0x83 (dec 131): Back to box (IO-Link-Communciation will be stopped, restart by power cycle is needed) 0xA5 (dec 165): Calibrate vacuum sensor 0xA7 (dec 167): Reset erasable counters 0xA8 (dec 168): Reset voltages min/max 0xA9 (dec 169): Reset vacuum min/max
		⊞	Access Control						
90	0x005A	0	Extended device access locks	1	byte	0-255	rw	0	Bit 0: NFC write lock Bit 1: NFC disable Bit 2: Not used Bit 3: reserved Bit 4: IO-Link event lock (suppress sending IO-Link events) Bit 5-7: Not used
91	0x005B	0	Pin-Code NFC	2	bytes	0-999	ro	0	Pin-Code for NFC write
		⊞	Initial Settings						
69	0x0045	0	Blow-Off mode	1	byte	0-2	rw	0	0 = Externally controlled drop-off 1 = Internally controlled drop-off – time-dependent 2 = Externally controlled drop-off – time-dependent
73	0x0049	1	Signal type: SIO outputs of the device	1	byte	0-1	rw	0	0 = PNP, 1 = NPN
73	0x0049	2	Signal type: SIO inputs of the device	1	byte	0-1	rw	0	0 = PNP, 1 = NPN
75	0x004B	0	Output filter, switch-off delay for SP2 and SP1	2	bytes	0-999	rw	10	Unit: 1ms
		⊞	Process Settings						
			⊞	Production Setup - Profile P0					
68	0x0044	0	Air-Saving function	1	byte	0-2	rw	1	0 = not active (off) 1 = active (on) 2 = active with supervision (onS)
78	0x004E	0	Disable continous sucking	1	byte	0-1	rw	0	0 = off, 1 = on
100	0x0064	0	Switchpoint 1 (SP1)	2	bytes	999 > SP1 > rP1	rw	750	Unit: 1mbar
101	0x0065	0	Resetpoint 1 (rP1)	2	bytes	SP1 > rP1 > SP2	rw	600	Unit: 1mbar
102	0x0066	0	Switchpoint 2 (SP2)	2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar
103	0x0067	0	Resetpoint 2 (rP2)	2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar
106	0x006A	0	Duration automatic blow	2	bytes	10-9999	rw	200	Unit: 1ms
107	0x006B	0	Permissable evacuation time	2	bytes	0-9999	rw	2000	Unit: 1ms no evacuation time warning if set to 0
108	0x006C	0	Permissable leakage rate	2	bytes	0-999	rw	250	Unit: 1mbar/s no leakage rate warning if set to 0
119	0x0077	0	Profile name	0…16	bytes	-	rw	***	Name of profile
			⊞	Production Setup - Profile P1					
180	0x00B4	0	Air-Saving function	1	byte	0-2	rw	0	0 = not active (off) 1 = active (on) 2 = active with supervision (onS
181	0x00B5	0	Disable continous sucking	1	byte	0-1	rw	0	0 = off, 1 = on
182	0x00B6	0	Switchpoint 1 (SP1)	2	bytes	999 > SP1 > rP1	rw	750	Unit: 1mbar
183	0x00B7	0	Resetpoint 1 (rp1)	2	bytes	SP1 > rP1 > SP2	rw	600	Unit: 1mbar
184	0x00B8	0	Switchpoint 2 (SP2)	2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar
185	0x00B9	0	Resetpoint 2 (rp2)	2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar
186	0x00BA	0	Duration automatic blow	2	bytes	10-9999	rw	200	Unit: 1ms
187	0x00BB	0	Permissable evacuation time	2	bytes	0-9999	rw	2000	Unit: 1ms, no evacuation time warning if set to 0
188	0x00BC	0	Permissable leakage rate	2	bytes	0-999	rw	250	Unit: 1ms, no leakage rate warning if set to 0
199	0x00C7	0	Profile name	0…16	bytes	-	rw	***	Name of profile
			⊞	Production Setup - Profile P2					
200	0x00C8	0	Air-Saving function	1	byte	0-2	rw	0	0 = not active (off) 1 = active (on) 2 = active with supervision (onS)
201	0x00C9	0	Disable continous sucking	1	byte	0-1	rw	0	0 = off, 1 = on
202	0x00CA	0	Switchpoint 1 (SP1)	2	bytes	999 > SP1 > rP1	rw	750	Unit: 1mbar
203	0x00CB	0	Resetpoint 1 (rp1)	2	bytes	SP1 > rP1 > SP2	rw	600	Unit: 1mbar
204	0x00CC	0	Switchpoint 2 (SP2)	2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar
205	0x00CD	0	Resetpoint 2 (rp2)	2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar
206	0x00CE	0	Duration automatic blow	2	bytes	10-9999	rw	200	Unit: 1ms
207	0x00CF	0	Permissable evacuation time	2	bytes	0-9999	rw	2000	Unit: 1ms, no evacuation time warning if set to 0
208	0x00D0	0	Permissable leakage rate	2	bytes	0-999	rw	250	Unit: 1ms, no leakage rate warning if set to 0
219	0x00DB	0	Profile name	0…16	bytes	-	rw	***	Name of profile
			⊞	Production Setup - Profile P3					
220	0x00DC	0	Air-Saving function	1	byte	0-2	rw	0	0 = not active (off) 1 = active (on) 2 = active with supervision (onS)
221	0x00DD	0	Disable continous sucking	1	byte	0-1	rw	0	0 = off 1 = on
222	0x00DE	0	Switchpoint 1 (SP1)	2	bytes	999 > SP1 > rP1	rw	750	Unit: 1mbar
223	0x00DF	0	Resetpoint 1 (rp1)	2	bytes	SP1 > rP1 > SP2	rw	600	Unit: 1mbar
224	0x00E0	0	Switchpoint 2 (SP2)	2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar
225	0x00E1	0	Resetpoint 2 (rp2)	2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar
226	0x00E2	0	Duration automatic blow	2	bytes	10-9999	rw	200	Unit: 1ms
227	0x00E3	0	Permissable evacuation time	2	bytes	0-9999	rw	2000	Unit: 1ms no evacuation time warning if set to 0

dec	hex	sub	Name	Length		Range	Access	Default	Description
228	0x00E4	0	Permissable leakage rate	2	bytes	0-999	rw	250	Unit: 1ms no leakage rate warning if set to 0
239	0x00EF	0	Profile name	0…16	bytes	-	rw	***	Name of profile

⊞ Observation

⊞ Monitoring

dec	hex	sub	Name	Length		Range	Access	Default	Description
64	0x0040	1	System vacuum live	2	bytes		ro		Unit: 1mbar
		2	System vacuum min	2	bytes	-	ro	-	Unit: 1mbar
		3	System vacuum max	2	bytes		ro		Unit: 1mbar
66	0x0042	1	Primary supply voltage live	2	bytes		ro		Unit: 0.1V
		2	Primary supply voltage min	2	bytes	-	ro	-	Unit: 0.1V
		3	Primary supply voltage max	2	bytes		ro		Unit: 0.1V
275	0x0113	0	Active profile	1	byte	0-3	ro	-	Number of active profile

⊞ Communication Mode

dec	hex	sub	Name	Length		Range	Access	Default	Description
564	0x0234	0	Communication mode	1	byte	-	ro	-	0x00 = SIO mode 0x11 = IO-Link revision 1.1

⊞ Diagnosis

⊞ Device Status

dec	hex	sub	Name	Length		Range	Access	Default	Description
36	0x0024	0	Device status	1	byte	-	ro	-	0 = Device is operating properly (= Green) 1 = Maintenance required (= Yellow) 2 = Out of Spec (= Orange) 3 = unused 4 = Failure (= Red)
37	0x0025	0	Detailed device status	1	byte	-	ro	-	Information about currently pending events (Event-List)
130	0x0082	0	Active errors	2	bytes	-	ro	-	Bit 0 = IO-Link startup check: data corruption Bit 1 = reserved Bit 2 = Primary voltage too low Bit 3 = Primary voltage too high Bit 4 = Auxiliary voltage too low Bit 5 = reserved Bit 6 = reserved Bit 7 = reserved Bit 8 = Short circuit at OUT2 Bit 9 = reserved Bit 10 = reserved Bit 11 = Measurement range overrun Bit 12 = reserved Bit 13 = reserved Bit 14 = reserved Bit 15 = IO-Link communication interruption

⊞ Condition Monitoring [CM]

dec	hex	sub	Name	Length		Range	Access	Default	Description
146	0x0092	0	Condition monitoring	2	bytes	-	ro	-	Bit 0 = Valve protection Bit 1 = Evacuation time above limit Bit 2 = Leakage rate above limit Bit 3 = SP1 not reached in suction cycle Bit 4 = Free Flow Vacuum over SP2 Bit 5 = Primary Voltage US out of operating range Bit 6 = reserved Bit 7 = reserved Bit 8 = General input pressure out of operating range Bit 9-15 = reserved

⊞ Counters

dec	hex	sub	Name	Length		Range	Access	Default	Description
140	0x008C	0	Vacuum on counter	4	bytes	-	ro	-	Counter for Vacuum on (non-erasable)
141	0x008D	0	Valve operating counter	4	bytes	-	ro	-	Counter for valve operating (non-erasable)
142	0x008E	0	Condition monitoring counter	4	bytes	-	ro	-	Counter for condition monitorings (non-erasable)
143	0x008F	0	Vacuum on counter	4	bytes	-	ro	-	Counter for Vacuum on (erasable)
144	0x0090	0	Valve operating counter	4	bytes	-	ro	-	Counter for valve operating (erasable)
145	0x0091	0	Condition monitoring counter	4	bytes	-	ro	-	Counter for condition monitorings (erasable)

⊞ Timing

dec	hex	sub	Name	Length		Range	Access	Default	Description
148	0x0094	0	Evacuation time t0 of last suction-cycle	2	bytes	-	ro	-	Unit: 1ms Time from suction start to reaching SP2
149	0x0095	0	Evacuation time t1 of last suction-cycle	2	bytes	-	ro	-	Unit: 1ms Time from reaching SP2 to reaching SP1
166	0x00A6	0	Total cycle time of last cycle	4	bytes	-	ro	-	Unit: 1ms

⊞ Energy Monitoring [EM]

dec	hex	sub	Name	Length		Range	Access	Default	Description
155	0x009B	0	Air-Consumption of last suction-cycle	1	byte	-	ro	-	Unit: 1%
156	0x009C	0	Air-Consumption of last suction-cycle	2	bytes	-	ro	-	Unit: 0.1 L std.
157	0x009D	0	Energy-Consumption of last suction-cycle	2	bytes	-	ro	-	Unit: 1Ws

⊞ Predictive Maintenance [PM]

dec	hex	sub	Name	Length		Range	Access	Default	Description
160	0x00A0	0	Leakage rate of last suction-cycle	2	bytes	-	ro	-	Unit: 1mbar/s
161	0x00A1	0	Free-Flow vacuum	2	bytes	-	ro	-	Unit: 1mbar/s
162	0x00A2	0	Quality of last suction-cycle	1	byte	-	ro	-	Unit: 1%
163	0x00A3	0	Performance of last suction-cycle	1	byte	-	ro	-	Unit: 1%
164	0x00A4	0	Max reached vacuum of last cycle	2	bytes	-	ro	-	Unit: 1mbar
165	0x00A5	0	Min reached input pressure of last cycle	2	bytes	-	ro	-	Unit: 1mbar

Coding of IO-Link Events

Extended Device Status ID (= IO-Link Event Code)		Extended Device Status Type			IO-Link Event Type	Event name	Remark
dec	hex	hex		Meaning			
0	0x0000	0x10		Everything OK	(no IOL event)	Everything OK	Device is working optimally
20736	0x5100	0x42		Critical condition	Error	General power supply fault	Primary supply voltage (US) too low
20752	0x5110	0x42		Critical condition	Warning	Primary supply voltage over-run	Primary supply voltage (US) too high
20754	0x5112	0x42		Critical condition	Warning	Secondary supply voltage fault	Secondary supply voltage (UA) too low
4096	0x1000	0x42		Defect/fault	Error	General malfunction	Internal error, Bus fault
6156	0x180C	0x22		Warning, high	Warning	Primary supply voltage out of optimal range	Condition Monitoring: primary supply voltage US outside of operating range
36096	0x8D00			Defect/fault, low	Error	Measurement range overrun	Vacuum value > 999 mbar in Ejector
36112	0x8D10			Warning, high	Warning	Valve protection active	
36128	0x8D20			Warning, low	Warning	Evacuation time t1 is greater than limit,	
36144	0x8D30			Warning, low	Warning	Leakage rate is greater than limit	
36160	0x8D40			Warning, low	Warning	SP1 was not reached	
36176	0x8D50			Warning, low	Warning	Free-flow vacuum level too high	
36192	0x8D60			Warning, low	Notification	Vacuum calibration OK	Calibration offset 0 set successfully
36208	0x8D70			Warning, low	Notification	Vacuum calibration failed	Sensor value too high or too low, offset not changed
36224	0x8D80			Defect/fault, high	Error	Data Corruption (EEPROM)	Internal error, user data corrupted
36240	0x8D90			Critical condiction, high	Warning	Supply pressure fault	Input pressure too high or too low
36272	0x8DB0				Warning	CM Autoset completed	

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