Operating instructions

Ejector Module RECBi | End-of-Arm Ecosystem MATCH

WWW.SCHMALZ.COM

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Note

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

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Contents

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 Other Applicable Documents

When using the RECBi MATCH, the following technical documents must also be observed:

Technical documentation	Part number
Operating Instructions for the Quick-Change Module RMQC End-of-Arm Ecosystem MATCH	30.30.01.02732
PXT assembly instructions	30.30.01.02710
Assembly Instructions for the Storage Station MATCH	30.30.01.02781
Operating Instructions for the SCM Module	30.30.01.02782

1.4 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

1.5 Symbols

This symbol indicates useful and important information.

✓ This symbol represents a prerequisite that must be met before an action is performed.

- This symbol represents an action to be performed.

⇨ This symbol represents the result of an action.

Actions that consist of more than one step are numbered:

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

2 Fundamental Safety Instructions

2.1 Intended Use

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

The product has been specially developed for (cooperative/collaborative) use on robot systems in combination with the quick-change system MATCH.

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 such as suction cups, suction lines and hoses.

⚠ 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.

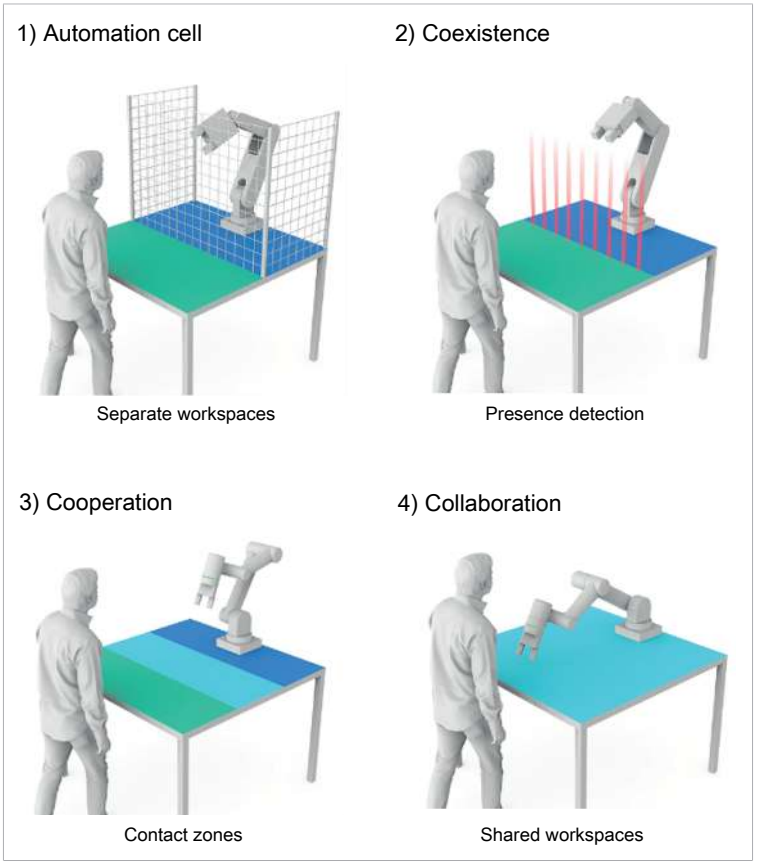
2.6 Modifications to the Product

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 suitability of the gripper for use in collaborative applications:
See the adjacent image, Figure 3) and 4).
The gripper has an inherently safe design and rounded edges and shapes that prevent hazards.



3 Product description

3.1 Product Variants

Versions of the RECBi MATCH:

The products differ in the following features:

- Control interface
- The basic position of the ejectors in the de-energized state NO (normally open) and NC (normally closed)
- One or two integrated ejector modules
- Gripper design and preparation

3.1.1 Application Requirement for the Quick-Change Module RMQC

The product has been specially developed for (cooperative/collaborative) use on robot systems in combination with the quick-change system MATCH.

That means that a quick-change module RMQC (fixed member) is required in order for the product to function, and the electrical and pneumatic connections are established via the fixed member.

3.1.2 Control Interface

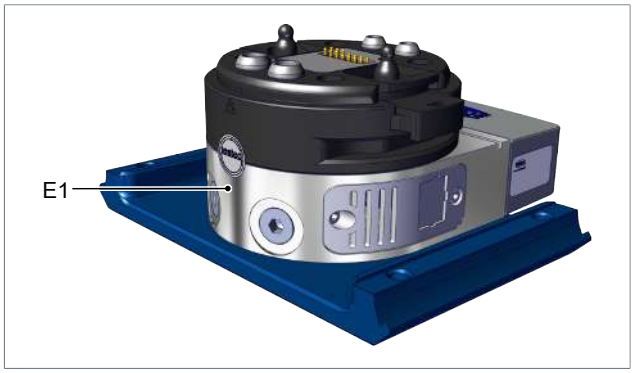
The versions differ based on whether they can be controlled with digital I/O + IO-Link or can only be controlled via IO-Link.

Versions with one ejector module (see “Number of Ejector Modules”) are generally operated with both digital I/O and IO-Link, while variants with two ejector modules can be controlled only via IO-Link ((> See ch. 3.1.5 Part Table, p. 14)).

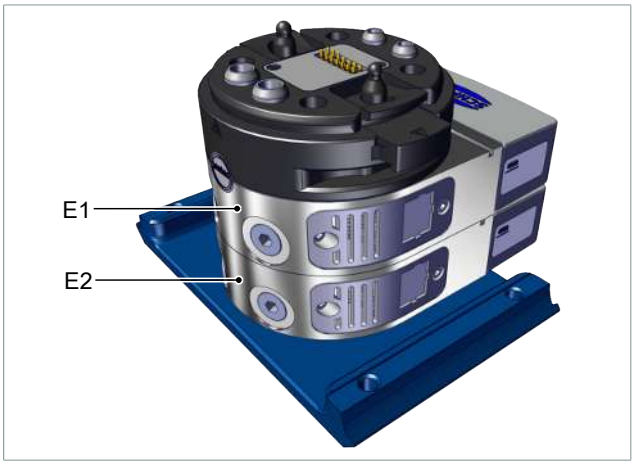
3.1.3 Number of Ejector Modules

There are variants with one integrated ejector module or with two integrated ejector modules; they are shown here using the example of the RECBi MATCH for the version PXT2:

Version with one ejector module (E1)



Version with two ejector modules (E1 and E2)



Products with one ejector module are marked with “1C” in the type key and products with two ejector modules are marked with “2C”.

With the version with two ejector modules, the vacuum ducts can be controlled separately.

3.1.4 Gripper design and preparation

UNI
Universal flange plate for:
- Central suction cup connection
- Mounting threads for customer-specific grippers

PXT1
For connecting a gripper from the modular system PXT to **one** beam
- Central vacuum supply or
- Vacuum supply via the connections on the ejector module

PXT2
For connecting a gripper from the modular system PXT to **two** beams
- Vacuum supply via the connections on the ejector module

PXRi
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

PXRx
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

3.1.5 Part Table

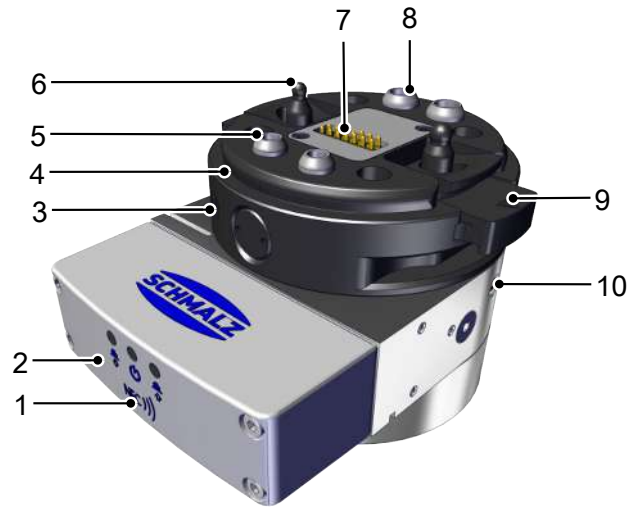
Schmalz part no.	Version
10.02.03.00394	Digital I/O + IO-Link RECBi 24V-DC NC MATCH-PXT1 1C
10.02.03.00395	Digital I/O + IO-Link RECBi 24V-DC NC MATCH-PXT2 1C
10.02.03.00397	Digital I/O + IO-Link RECBi 24V-DC NO MATCH-PXT1 1C
10.02.03.00398	Digital I/O + IO-Link RECBi 24V-DC NO MATCH-PXT2 1C
10.02.03.00400	IO-Link RECBi 24V-DC NC MATCH-PXT2 2C
10.02.03.00405	IO-Link RECBi 24V-DC NO MATCH-PXT2 2C
10.02.03.00401	Digital I/O + IO-Link RECBi 24V-DC NC MATCH-UNI 1C
10.02.03.00402	Digital I/O + IO-Link RECBi 24V-DC NO MATCH-UNI 1C
10.02.03.00403	IO-Link RECBi 24V-DC NC MATCH-UNI 2C
10.02.03.00404	IO-Link RECBi 24V-DC NO MATCH-UNI 2C
10.02.03.00375	Digital I/O + IO-Link RECBi 24V-DC NO MATCH-PXRi 1C
10.02.03.00379	IO-Link RECBi 24V-DC NO MATCH-PXRi 2C
10.02.03.00377	Digital I/O + IO-Link RECBi 24V-DC NC MATCH-PXRi 1C
10.02.03.00408	IO-Link RECBi 24V-DC NC MATCH-PXRi 2C
10.02.03.00376	Digital I/O + IO-Link RECBi 24V-DC NO MATCH-PXRx 1C
10.02.03.00407	IO-Link RECBi 24V-DC NO MATCH-PXRx 2C
10.02.03.00378	Digital I/O + IO-Link RECBi 24V-DC NC MATCH-PXRx 1C
10.02.03.00409	IO-Link RECBi 24V-DC NC MATCH-PXRx 2C

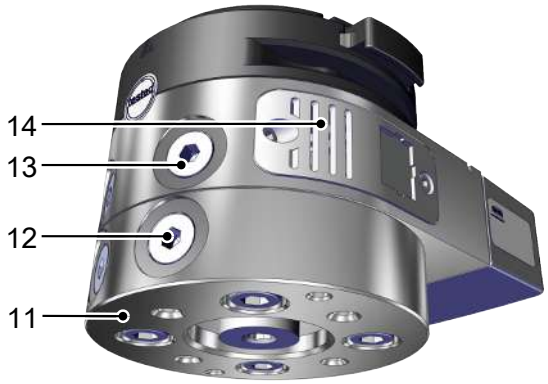
Schmalz offers a wide range of quick-change modules (RMQC) especially for connecting the product to the standard robot systems available on the market:

1. https://www.schmalz.com

2. Alternatively, search for “quick-change module RMQC” on the Schmalz homepage.

3.2 Product Design





1	NFC antenna	8	Vacuum duct, 2x
2	Display field	9	Locking device
3	Grounding	10	Blow off valve screw
4	Quick-change system RMQC MATCH loose member	11	Gripper connection
5	Compressed air duct, 2x	12	Vacuum connections
6	Anti-rotation guard / torque absorption (poka-yoke)	13	Vacuum connections
7	Electrical interface	14	Silencer/exhaust outlet

3.3 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).

Depending on the version, the vacuum is available in one or two separate suction circuits.

The product is mounted on a handling system (robot) via the preinstalled quick-change module RMQC MATCH (fixed member).

The RECBi MATCH interlocks itself as it automatically extends from the storage station; alternatively, the RECBi MATCH can be attached to the product manually. There is a connect signal between the fixed member and the RECBi MATCH.

When the fixed member and the RECBi MATCH are moved together and connected, the internal spring pin contacts make contact to transmit a signal. The connect LED then changes color from red to green and (depending on the variant) a connect signal is transmitted to the higher-level controller.

The RECBi MATCH is compatible with a variety of fixed members.

Since the centering bolts and markings on the fixed member come in different sizes, the RECBi MATCH cannot be mounted the other way around.

The fixed member is hot-plug capable, which means a loose member can be changed even when an electrical voltage is present.

The RECBi MATCH is designed to prevent incorrect insertion into the storage station.

3.4 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	Continuous light	RECBi blows off
2 “State”	—	None	Off	No power supply
		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	Continuous light	Workpiece picked up (vacuum ≥ SP2)
			Flashing	RECBi is in **setting mode** Workpiece picked up (vacuum ≥ SP2)
		Orange	Continuous light	Warning
			Flashing	RECBi is in **setting mode** Warning
		Red	Continuous light	Error
			Flashing	RECBi is in **setting mode** Error
3 “Pick up”	—	None	Off	No suction from RECBi
		Orange	Continuous light	Suction from RECBi

3.5 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.

When using a combination of two ejector modules (item marking C), only the NFC interface of the upper module is activated. All the parameters of the upper and lower modules are parameterized via this NFC interface.

Important:

If an SCM module from Schmalz is used to operate the RECBi MATCH, writing via NFC is blocked.

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.

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).

3.6 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. The EPC is divided into 3 modules:

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

3.7 Storage Station (Accessories)

The storage station (> See ch. 13 Accessories, p. 69) with part number 10.08.09.00013 is used to store the gripper with the loose member MATCH for automatic changeover to another gripper in the station.

The storage station can be used with or without sensors (for position and safety monitoring).

3.7.1 Function of the Sensors

The figure below shows an example of a combination consisting of a fixed member, loose member with gripper and storage station.

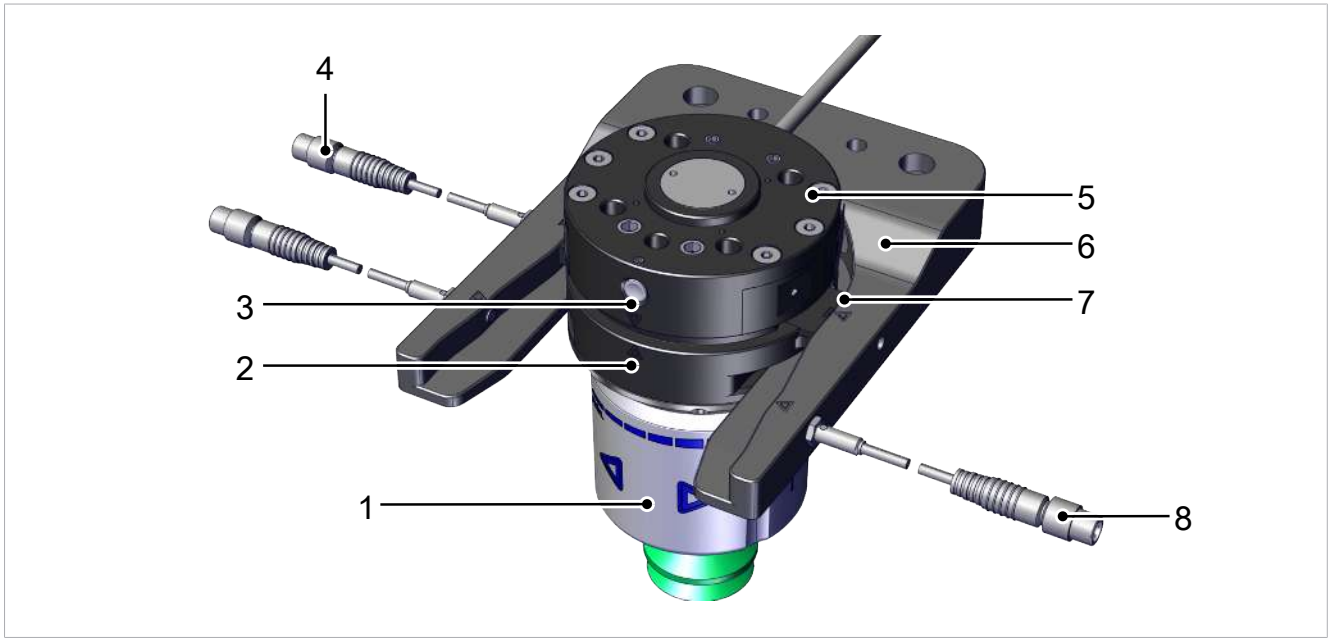
When the sensor system is used, it checks whether the loose member is present in the storage station.

The fixed member is then moved onto the loose member from above. The centering pins on the loose member help with insertion. Along with the fixed member and loose member, the robot moves to the “test position” sensor in the storage station.

The two sensors in the test position (test channel) respond when the locking mechanisms are lowered and are in contact with the fixed member.

When the fixed and loose members are joined together, the internal spring-pin contacts are connected for signal transmission.

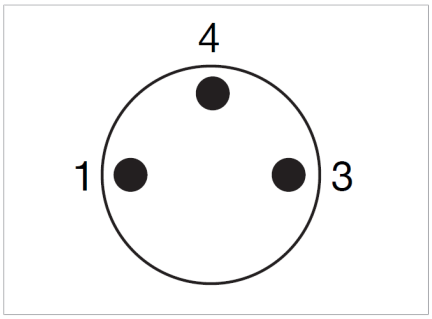
As a result, the connect LED (3) changes color from red to green and a connect signal (depending on the variant) is transferred to the higher-level controller.



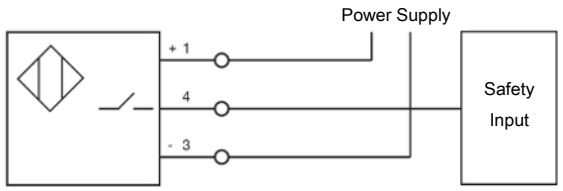
1	Gripper	5	Quick-change system RMQC MATCH fixed member
2	Quick-change system RMQC MATCH loose member	6	Storage station MATCH
3	Connect LED	7	Locking device
4	Storage position sensor (loose member present), optional	8	Sensor test position (locking mechanism lowered), 2x, optional

3.7.2 Circuit Diagram for Sensor System

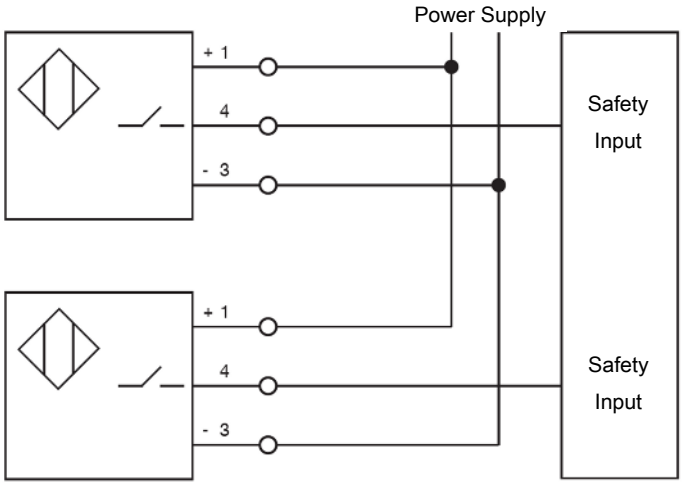
Connection of the M8 3-Pin Sensor Connector:



Circuit symbol for sensor in storage position



Series connection of two sensors in test position



3.7.3 Configuration of “Test Position” Sensor

1. With the loose member connected to the fixed member, bring the markings on the locking elements into line with the front markings on the storage station.
2. Screw in the sensors (8) until they emit a signal.
3. Fasten the sensors (8) in this position.
4. Coat the sensors (8) with sealing wax (recommended).

3.7.4 Configuration of “Storage Position” Sensor

1. Place a loose member in the storage station.
2. Screw in the sensor (4) until it emits a signal.
3. Fasten the sensor (4) in this position.
4. Coat the sensor (4) with sealing wax (recommended).

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 (data transmission rate with COM2 = 38.4 kBit/sec.).

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.

For products with two ejector modules (marked with 2C), the “data storage” functionality is unavailable; that is, parameter data cannot be automatically uploaded to the IO-Link master so that it can be automatically downloaded to a new device when the device is replaced.

However, all the parameter data can be uploaded and downloaded manually using the “block parameter” functionality.

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 “(> See ch. 5 Description of Functions, p. 23)” 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.

There are two device description files for the single and double modules (IODD) for integration into a higher-level control.

5 Description of Functions

5.1 Monitoring the System Vacuum and Defining Switching Points (P-0: 0x0064 to 0x0067)

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 for each ejector module. 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. 3.4 LED Display, p. 16).

The set values for SP2 must be lower than the values for SP1. The exact configuration conditions are available 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 digital I/O mode, the digital I/O output OUT2 (part present) is enabled based on the PNP/NPN configuration in the “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 the switching points P-0; the specified parameters apply to production setup profile P0 for ejector module 1 (for other profiles or ejector module 2, the data can be taken from the data dictionary):

ISDU [hex]	Limit value parameter	Description	Factory
P-0: 0x0064	SP1	Vacuum control value Vacuum switching point	750 mbar
P-0: 0x0065	rP1	Vacuum hysteresis Vacuum reset point	600 mbar
P-0: 0x0066	SP2	Activation value of “Part Present” check signal output	550 mbar
P-0: 0x0067	rP2	Deactivation value of “Part Present” check signal output	540 mbar

5.2 Production Setup Profiles

In IO-Link mode, each ejector module can store up to four different production setup profiles (P-0 to P-3). All the important parameter data for workpiece handling is stored in these profiles.

- Control function (air-saving function)
- Disable continuous suction
- Switching point 1 (SP1)
- Reset point 1 (rP1)
- Switching point 2 (SP2)
- Reset point 2 (rP2)
- Duration automatic blow
- Permissible evacuation time
- Permissible leakage rate
- Profile name

The respective profile is selected using the “Profile Set Ejector x” output process data byte for the applicable ejector module. Thus parameters can be adjusted to suit differing process conditions.

As the default setting and in digital I/O mode, production setup profile P-0 is selected; this means that the settings that should apply to digital I/O mode are specified using profile P-0.

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

5.3 Control Scheme

The controls of the RECBi are defined in such a way that, if both inputs are activated at the same time, drop-off has priority over suction.

The values from “production setup profile P0” are the decisive values in digital I/O mode and SIO mode. This also applies to control using the module SCM (product for controlling and parameterizing intelligent IO-Link grippers via 24 V digital I/O (> See ch. 13 Accessories, p. 69)); in addition, newly set values are only written to profile P0.

5.4 Control Functions (Air-Saving Function)

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

In digital I/O mode, the “air-saving function” [0x0044] is definitive in production setup profile P0.

SP1 can be specified using the appropriate “Switchpoint 1 (SP1)” parameter in the profile (“production setup profiles P0 to P3”) for the relevant ejector. (Info: The active profile is selected using the “Profile Set Ejector x” output data byte.) In SIO mode, SP1 is defined using the “Switchpoint 1 (SP1)” parameter 0x0064 for ejector 1 and 0x012E for ejector 2 in production setup profile P0.

The RECBi allows you to conserve compressed air or prevent an excessive vacuum from being generated. Vacuum generation is interrupted once the configured switching point SP1 is reached. If leakage causes the vacuum to fall below the hysteresis switching point rP1, vacuum generation resumes.

The following control function operating modes can be chosen:

ISDU (hex)	Parameter	Value Hex	Description
0x0044 or 0x012C	Control mode for ejector module 1 or 2	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 x” 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 for ejector 1 and 0x012D for ejector 2) 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.

5.5 Picking up the Workpiece (Vacuum Generation)

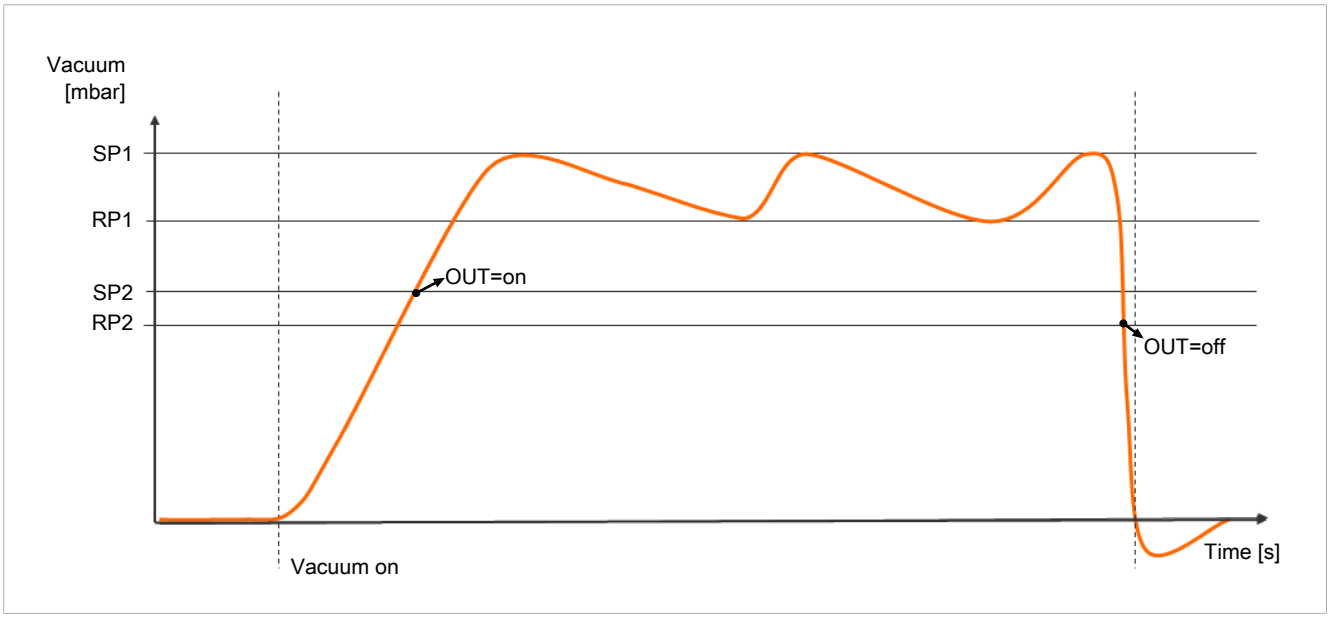
The ejector is designed for vacuum handling of airtight parts in combination with suction systems. The vacuum is generated in a nozzle according to the Venturi principle, using suction generated by the flow of accelerated compressed air. Compressed air is channeled into the ejector and flows through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

Vacuum generation on the ejector is activated or deactivated via the “Suction” signal input in digital I/O mode or via the “Suction” command in IO-Link mode (“Vacuum ejector x” output process data):

- In the NO (normally open) version, vacuum generation is deactivated when the suction signal is received.
- In the NC (normally closed) version, vacuum generation is activated when the suction signal is received.

An integrated sensor measures the generated vacuum level. The exact vacuum value can be read out via the “Vacuum ejector x high-byte and vacuum ejector x low-byte” IO-Link 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 digital I/O 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.

5.6 Depositing the Workpiece/Part (Blow-Off Mode)

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 x” 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 x” (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 for selection (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.

5.6.1 Externally Controlled Blow-Off

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

5.6.2 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.

5.6.3 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.

5.6.4 Setting the Blow-off Time (P-0: 0x006A)

If the blow-off function of the ejector is set to internally time-controlled or externally time-controlled “Blow-off”, then the blow-off time may be specified. The default value for the blow-off time is 200 ms.

The time can range from 0.10 to 9.99 seconds.

5.7 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.

5.8 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. 3.4 LED Display, p. 16).

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.

5.9 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.

5.9.1 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.

5.9.2 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.

5.9.3 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.

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).

5.9.4 Resetting Counters (Reset Erasable Counters)

System command 0xA7 is used to delete the two erasable counters in each ejector.

5.9.5 Resetting Maximum and Minimum Values for the Supply Voltages (Reset Voltages Min/Max)

System command 0xA8 is used to delete the minimum and maximum values for the sensor supply voltages.

5.9.6 Resetting Maximum and Minimum Values for the Vacuum (Reset Vacuum Min/Max)

System command 0xA9 deletes the minimum and maximum values for the vacuum.

5.10 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.

5.10.1 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)

5.10.2 Access Rights: PIN Code for NFC Write Protection

The writing of changed parameters via NFC can be controlled using a separate “PIN code NFC” 0x005B. When delivered, the PIN code is **000** and a lock is therefore not active.

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

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

5.11 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.

5.12 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.

5.13 Output and Input Signals

RECBi versions with one ejector module (> See ch. 3.1.3 Number of Ejector Modules, p. 12) have signal outputs and inputs.

RECBi versions with one ejector module are generally operated with both digital I/O and IO-Link, while RECBi versions with two ejector modules can be controlled only via IO-Link.

In digital I/O 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 and “Signal type: SIO inputs of the device” 0x004B.

5.14 Shutdown Delay (0x004B) (Output Filter Ejector)

You can use this function to set a switch-off delay for signals SP1 and SP2 for each individual ejector module. This can be used to mask short-term fluctuations in the vacuum level of the vacuum system. The duration of the switch-off delay is set in IO-Link via the "Output filter" parameter (0x004B). Values from 1 to 999 ms can be set. To deactivate this function, enter the value "off" (0 = off).

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

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.

5.15 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]

5.16 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.

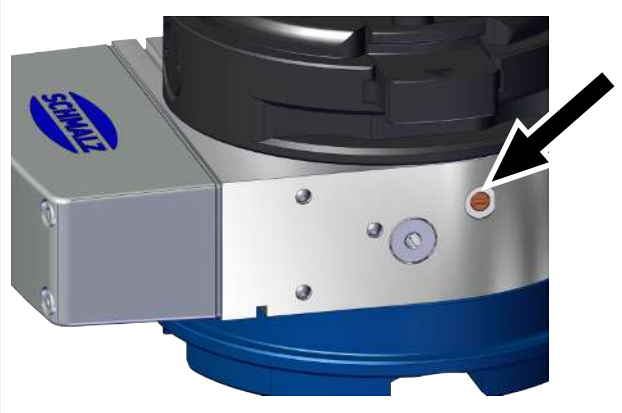
Parameter	Description
Permissible leakage	Leakage after reaching SP1 [mbar/s]

5.17 Changing the Blow-Off Flow Rate on the Ejector

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.



5.18 Counters

Each 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 Ejector x)
0x008D	Counter for suction valve switching frequency (Valve operating counter Ejector x)
0x008E	Counter for condition monitoring (Condition monitoring counter Ejector x)
0x008F	Counter for suction cycles (suction signal) (Vacuum on counter Ejector x) – erasable
0x0090	Counter for suction valve switching frequency (Valve operating counter Ejector x) – erasable
0x0091	Counter for condition monitoring (Condition monitoring counter Ejector x) – erasable

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

The non-volatile storage of the counter statuses only occurs every 256 steps. When the operating voltage is switched off, up to 255 steps of the counter are lost.

5.19 Device Status

In IO-Link mode, further status information is available in addition to the error messages displayed in digital I/O mode:

- Device Status Overall (process data) in the form of a status traffic light
- Device Status Ejector x (process data) in the form of a status traffic light
- Device Status 0x0024 (parameter data)
- Detailed device status 0x0025, event list
- Active errors Ejector 0x0082
- Extended device status 0x008A(type + ID)
- 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

The parameter “Device Status” 0x0024 provides basic status information for the device in the form of a status traffic light:

- Device is working properly Device is operating properly = green
- Maintenance or adaptation of settings is required (Maintenance required) = yellow
- Device out of specification (Out of spec) = orange
- Error (Error) = red

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.

When using an RECBi with two ejector modules (version C2), the status of the respective ejector modules can be read out via the “Device Status Ejector x” input process data, while “Device Status Overall” reflects the status of the entire product.

A warning or fault within an RECBi with two ejector modules (version C2) thus leads to a warning or failure for the overall device.

“Device Status Overall” is unavailable in an RECBi with one ejector module (version C1).

More details on this can be found in the final section of the enclosed Data Dictionary.

5.19.1 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)

5.19.2 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.

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

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:

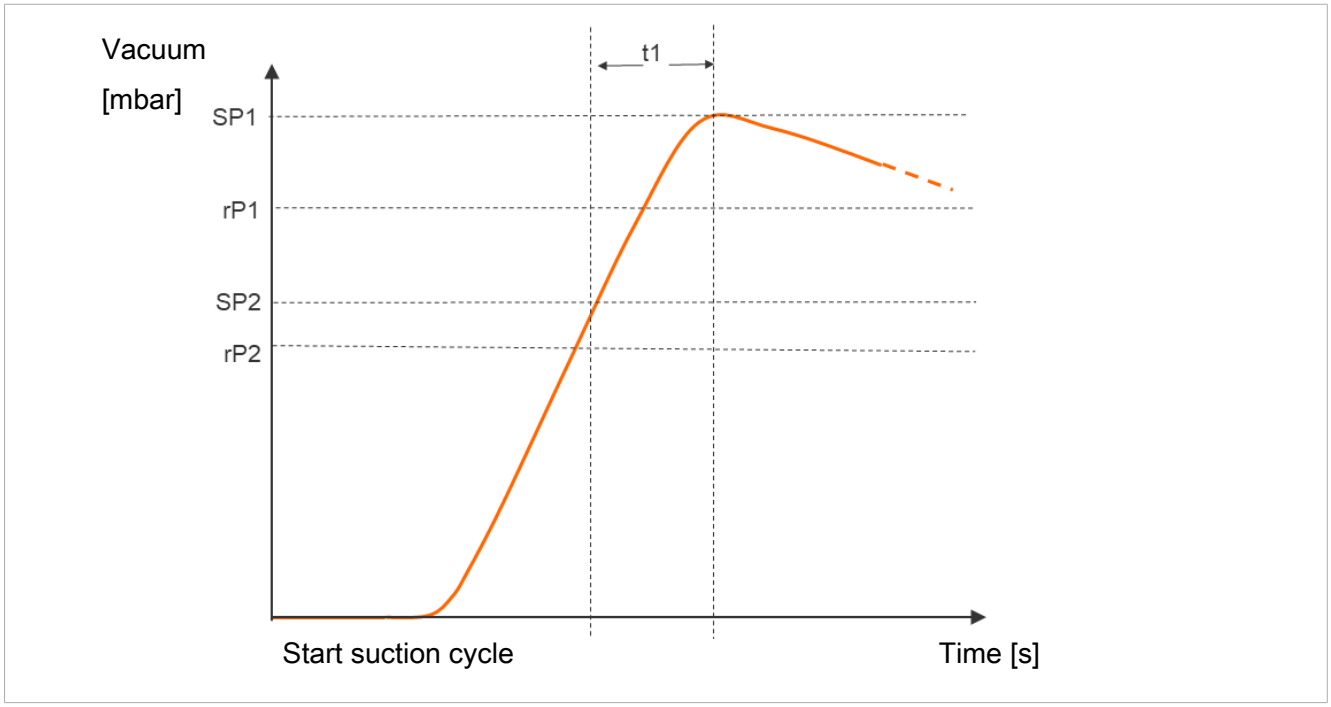
- Condition monitoring (CM): Condition monitoring to increase system availability
- Energy monitoring (EM): Energy monitoring to optimize the vacuum system’s energy consumption
- Predictive maintenance [PM]: Predictive maintenance to increase the performance and quality of the gripping system

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



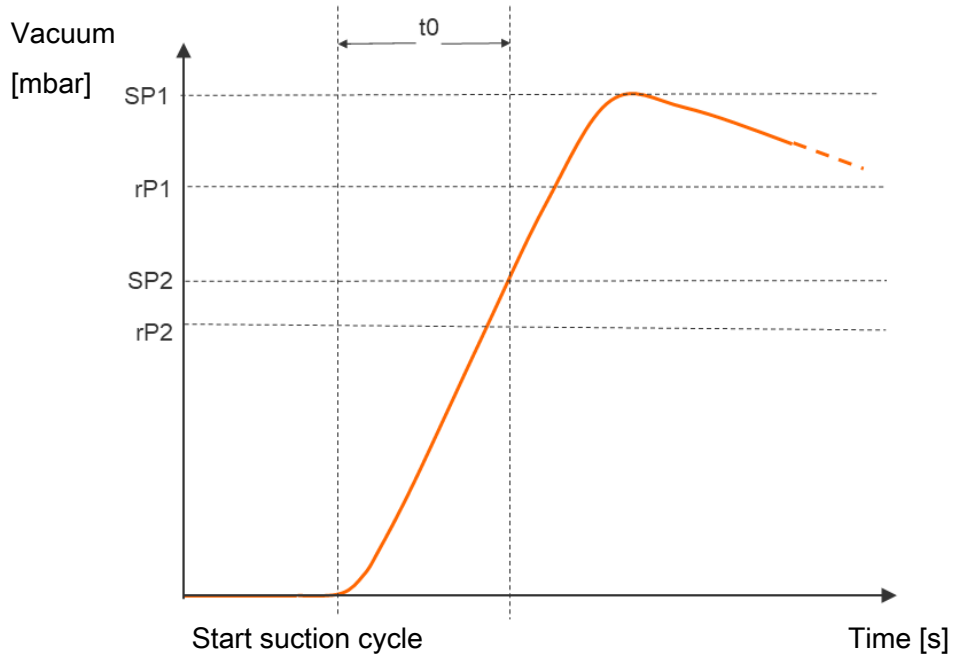
Measure the evacuation time t1 (parameter “Evacuation time t1 of last suction cycle” 0x0095):

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 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.

5.20.4 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. Therefore, to evaluate a valid dynamic pressure, uninterrupted suction is required for at least 1 second after starting the suction, i.e. the suction point must not be covered by a part.

Measured values below 5 mbar or above the switching point SP1 are not regarded as valid dynamic pressure measurements and are rejected. 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.

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.

5.22 Active Profile (Active Profile Ejector x)

The parameter “Active profile Ejector x” 0x0113 can be used to read out the current active profile (production profiles) that was selected via the output process data (Profile Set Ejector x).

5.23 Condition Monitoring Autoset

The “CM Autoset Ejector x” output process data function = condition monitoring autoset can be used to automatically determine the condition monitoring parameters for the maximum permissible leakage rate “Permissible leakage rate Ejector x” and the evacuation time (t-1) “Evacuation time t1 of last suction-cycle Ejector x”.

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

Feedback about the completed “CM Autoset Ejector x” function is displayed via the “CM-Autoset Ejector x” input process data byte.

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 Tool-Changer-Specific Data

Electrical energy transmission	Integrated
Interlocking hub	1 mm
Repeatability in X, Y	0.05 mm
Repeatability in Z	0.05 mm
Tightening force	50 N
Releasing force	0 N
Max. axis offset during coupling in X, Y	1.0 mm

6.3 Performance Data

Version **UNI** (universal)

	10.02.03.00401	**10.02.03.00402**	**10.02.03.00403**	**10.02.03.00404**
Control unit	NC, normally closed	NO, normally open	NC, normally closed	NO, normally open
Max. suction rate per vacuum duct	52.5 l/min			
Suction air consumption	89 l/min		178 l/min	
Blow-off air consumption	60 l/min		120 l/min	
Number of vacuum ducts	1		2	
Operation	DIO/IO-Link		IO-Link	
Sound pressure during suction	73 db			
Sound pressure when free	78 db			
Pneumatic energy transmission	Integrated			
Status display	Yes			
Mass	850 g	850 g	1160 g	1160 g

Version **PXT**

	10.02.03.00 394	**10.02.03.00 395**	**10.02.03.00 397**	**10.02.03.00 398**	**10.02.03.00 400**	**10.02.03.00 405**
Control unit	NC, normally closed	NC, normally closed	NO, normally open	NO, normally open	NC, normally closed	NO, normally open
Max. suction rate per vacuum duct	52.5 l/min					
Suction air consumption	89 l/min				178 l/min	
Blow-off air consumption	60 l/min				120 l/min	
Number of vacuum ducts	1	1	1	1	2	2
Number of possible beams	1	2	1	2	2	2
Operation	DIO/IO-Link				IO-Link	
Sound pressure during suction	73 db					
Sound pressure when free	78 db					
Pneumatic energy transmission	Integrated					
Status display	Yes					
Mass	810 g	835 g	810 g	835 g	1175 g	1175 g

Version **PXRi**

	10.02.03.00375	**10.02.03.00379**	**10.02.03.00377**	**10.02.03.00408**
Control unit	NO, normally open	NO, normally open	NC, normally closed	NC, normally closed
Max. suction rate per vacuum duct	52.5 l/min			
Suction air consumption	89 l/min	178 l/min	89 l/min	178 l/min
Blow-off air consumption	60 l/min	120 l/min	60 l/min	120 l/min
Number of vacuum ducts	1	2	1	2
Operation	DIO/IO-Link	IO-Link	DIO/IO-Link	IO-Link
Sound pressure during suction	73 db			
Sound pressure when free	78 db			
Pneumatic energy transmission	Integrated			

	10.02.03.00375	10.02.03.00379	10.02.03.00377	10.02.03.00408
Status display	Yes			
Mass	715 g	1055 g	715 g	1055 g

Version **PXRx**

	10.02.03.00376	10.02.03.00407	10.02.03.00378	10.02.03.00409
Control unit	NO, normally open	NO, normally open	NC, normally closed	NC, normally closed
Max. suction rate per vacuum duct	52.5 l/min			
Suction air consumption	89 l/min	178 l/min	89 l/min	178 l/min
Blow-off air consumption	60 l/min	120 l/min	60 l/min	120 l/min
Number of vacuum ducts	1	2	1	2
Operation	DIO/IO-Link	IO-Link	DIO/IO-Link	IO-Link
Sound pressure during suction	73 db			
Sound pressure when free	78 db			
Pneumatic energy transmission	Integrated			
Status display	Yes			
Mass	790 g	1030 g	790 g	1030 g

6.4 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 2C – NC	90 mA	90 mA
	RECBi 1C – NO	65 mA	65 mA
	RECBi 2C – NO	130 mA	130 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).

When connecting the RECBi via an RMQC MATCH fixed member, the max. cable length is 20 m.

6.5 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, force a (incl. configured gripper)	500 N

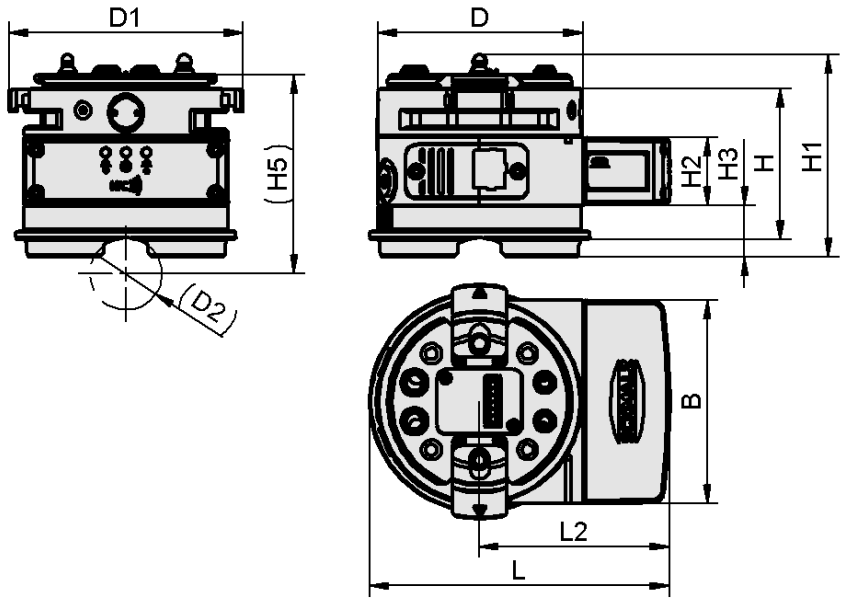
Gripper version **PXT**

Load	Maximum permitted value
Static load vertical, force a (incl. configured gripper)	250 N

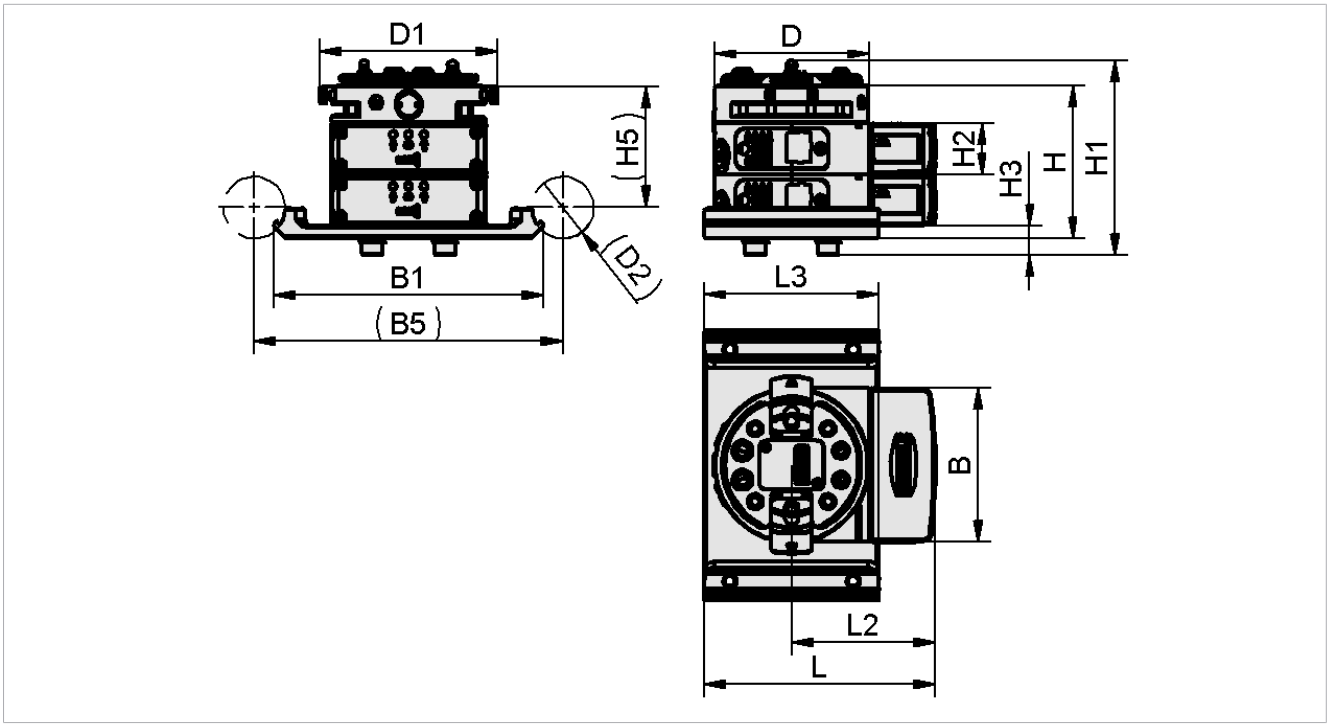
Gripper version **PXR**

Load	Maximum permitted value
Static load vertical, force a (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

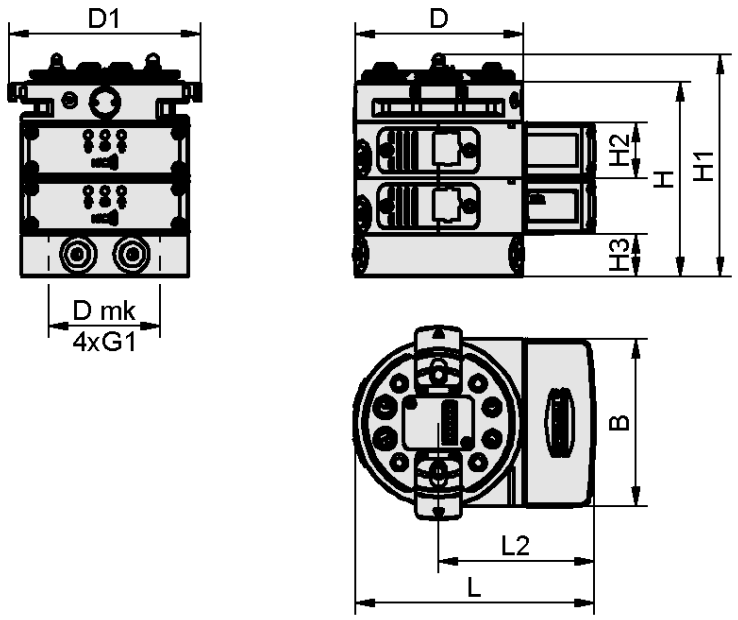
6.6 Dimensions



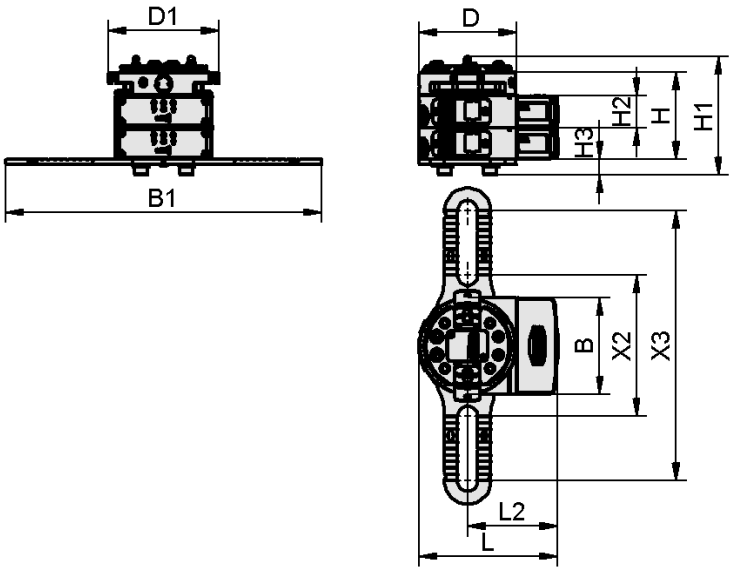
Part no.	D	D1	H	H1	H2	H3	B	L	L2
10.02.03.00394	75.5	86.2	55.5	74.5	25	19	75	110.5	70
10.02.03.00397									



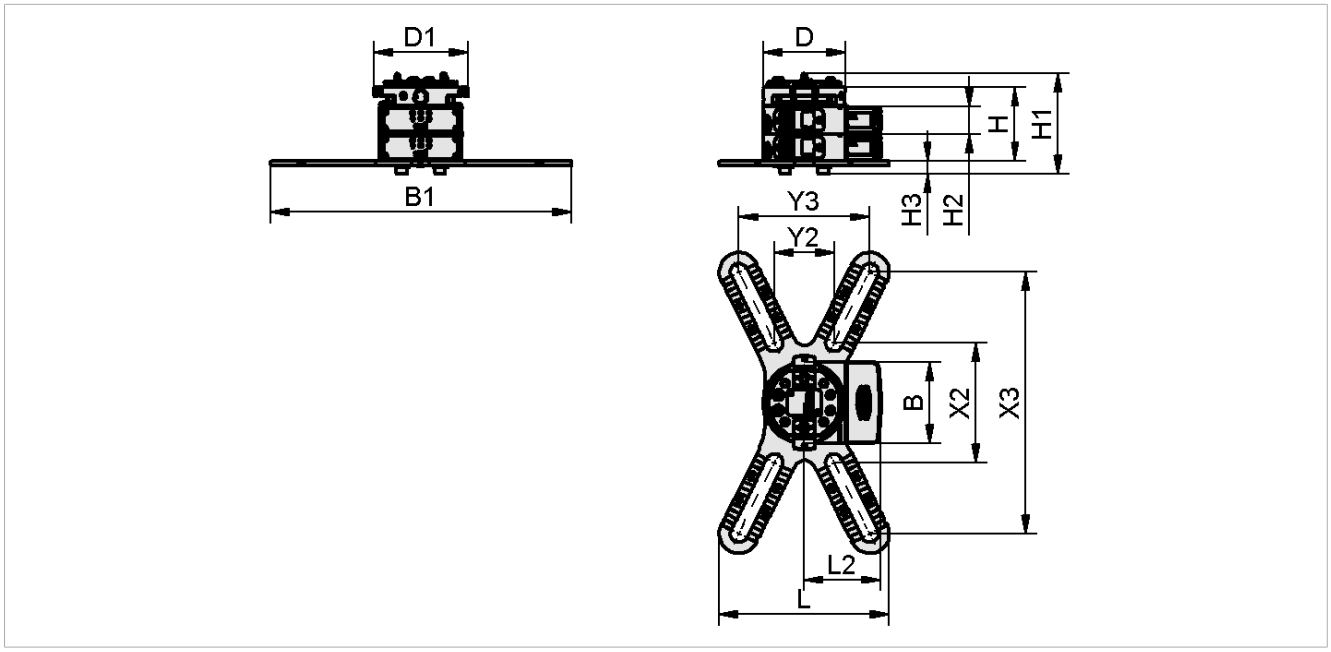
Part no.	D	D1	H	H1	H2	H3	B	B1	B5	L	L2	L3
10.02.03.00395	75.5	86.2	49	69.5	25	14	75	131	150	112.5	70	85
10.02.03.00398												
10.02.03.00400			74	94.5								
10.02.03.00405												



Part no.	D	D1	Dmk	G1	H	H1	H2	H3	B	L	L2
10.02.03.00401	75.5	86.2	50	M6 internal thread	62	74.5	25	19	75	107.5	70
10.02.03.00402											
10.02.03.00403					87	99.5					
10.02.03.00404											



Part no.	D	D1	H	H1	H2	H3	B	B1	L	L2	X2	X3
10.02.03.00375	75.5	86.2	43	67.5	25	12	75	246	107.5	70	110	210
10.02.03.00379			68	92.5								
10.02.03.00377			43	67.5								
10.02.03.00408			68	92.5								



Part no.	D	D1	H	H1	H2	H3	B	B1	L	L2	X2	X3	Y2	Y3
10.02.03.00376	75.5	86.2	43	67.5	25	12	75	276	156	70	110	240	55	120
10.02.03.00407			68	92.5										
10.02.03.00378			43	67.5										
10.02.03.00409			68	92.5										

All dimensions given in millimeters [mm].

6.7 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

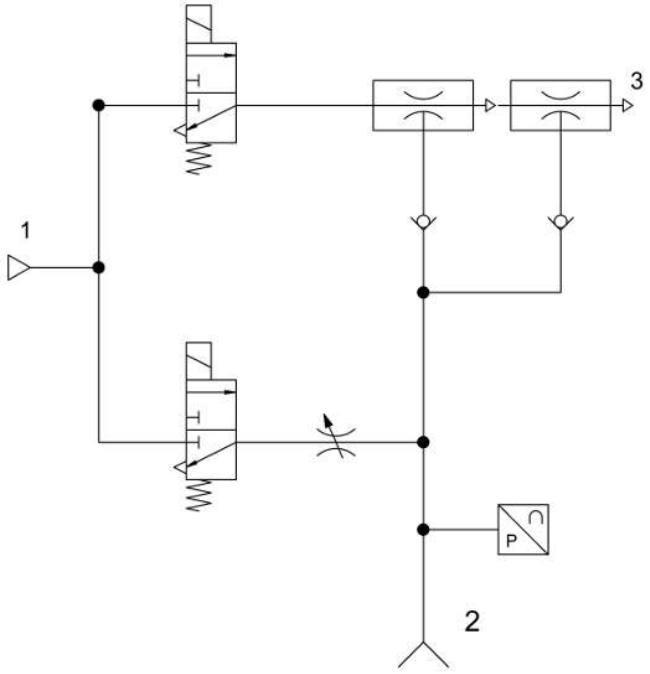
The production setup profiles P-1 to P-3 are factory-set to have the exact same data set as the default data set P-0.

6.8 Pneumatic Circuit Plans

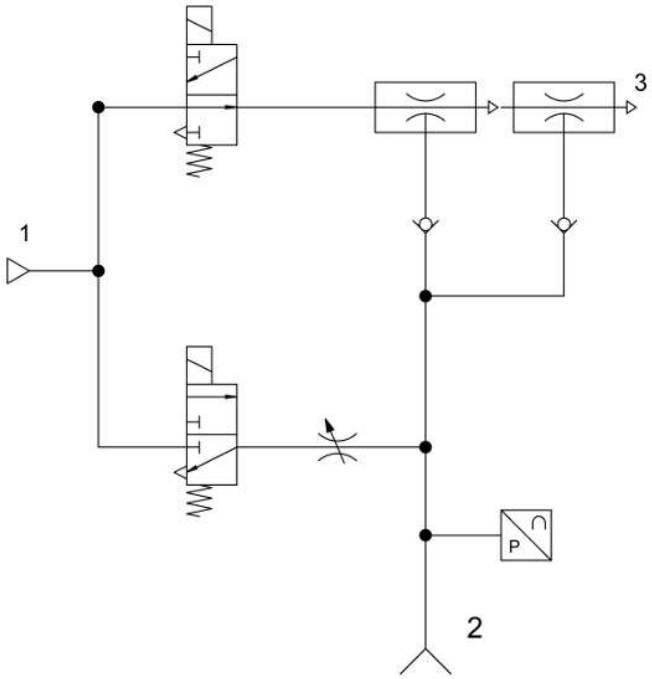
Key:	
NC	Normally closed
NO	Normally open
1	Compressed air connection
2	Vacuum connection
3	Exhaust outlet

RECBi MATCH with **one** ejector module

NC

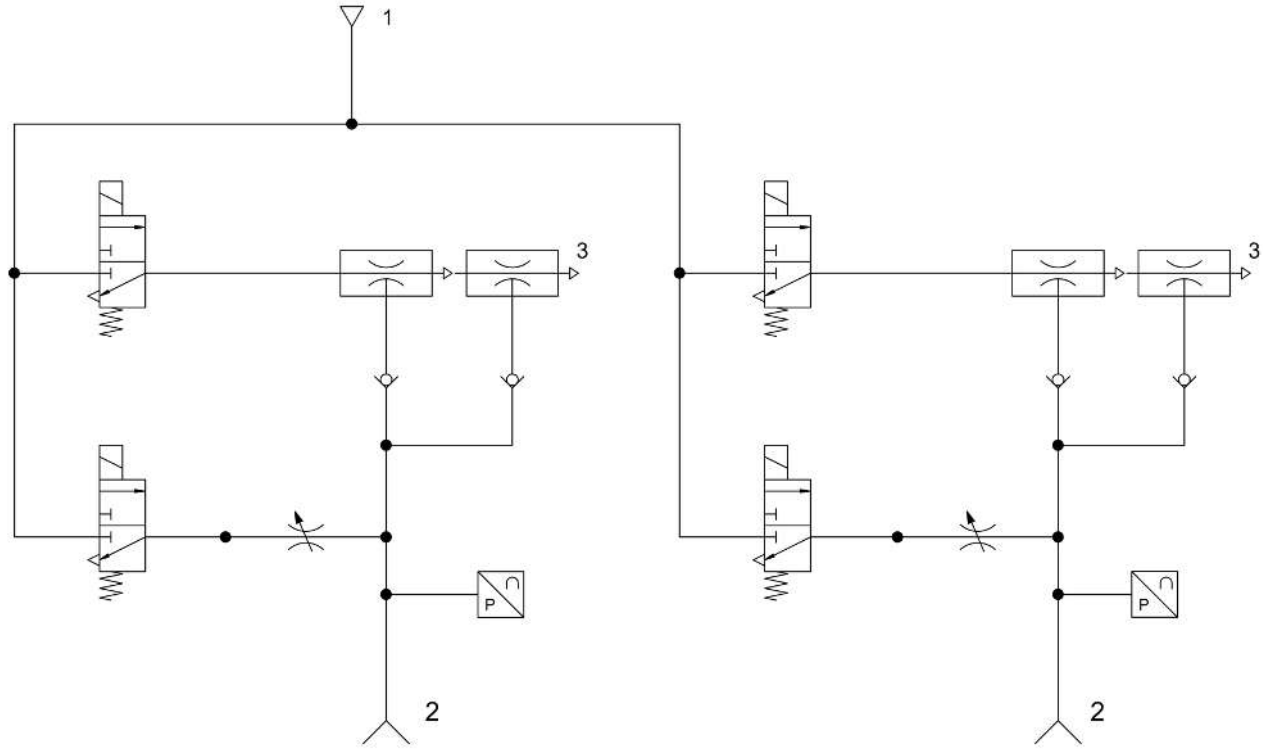


NO

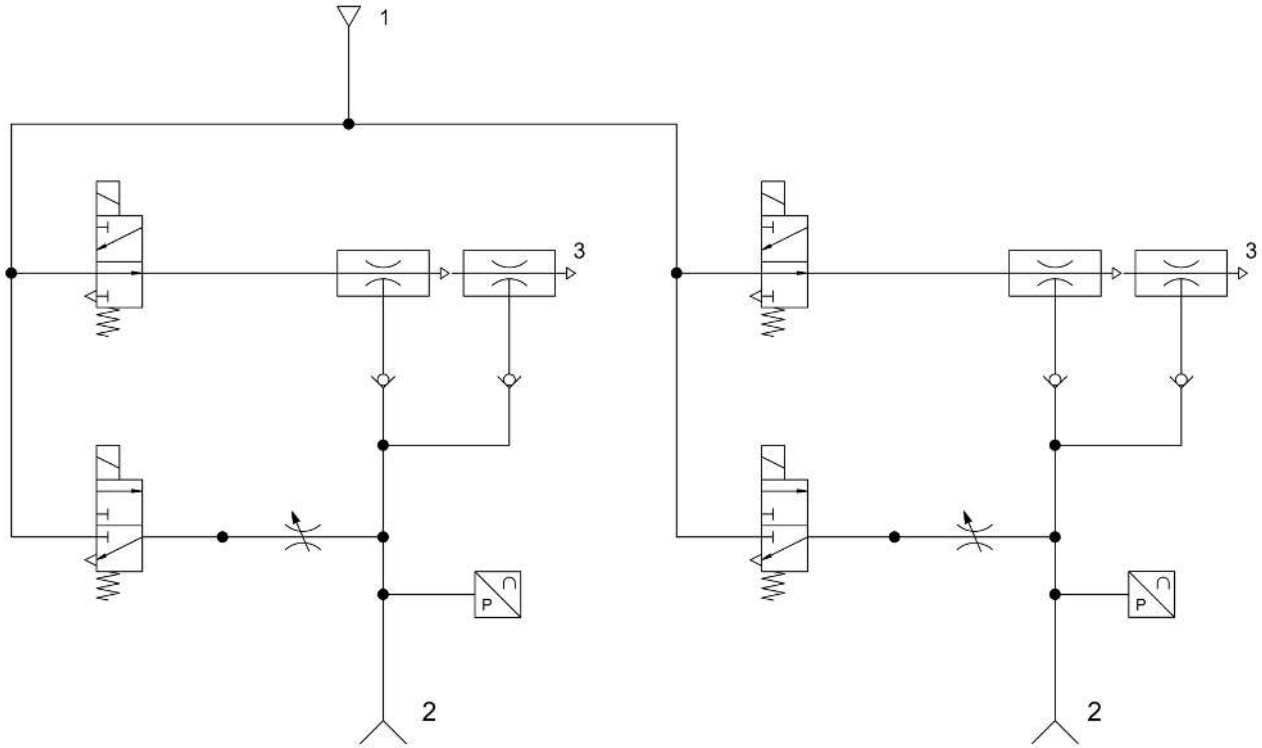


RECBi MATCH with **two** ejector modules

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 General Mounting Information

⚠ CAUTION

During assembly/disassembly, the loose member is accelerated by the applied compressed air and flies around uncontrolled.

Risk of injury

- During installation or replacement, deactivate the compressed air supply via the robot
- Wear protective glasses or face protection.

⚠ WARNING

Risk of injury due to the unexpected movement of the plant or machine in which the product is to be installed.

Risk of injury

- Switch off the machine's power supply before performing any work.
- Secure the machine against unintentional activation.
- Check the machine for possible residual energy.

⚠ CAUTION

Risk of injury due to the unexpected movement of the product while connecting the power supply.

Risk of injury

- Switch off the product's power supply before performing any work.
- Secure the power supply against unintentional activation.
- Check the product for possible residual energy.

8.2 Mounting of Fixed Member RMQC and Loose Member RECBi MATCH

Anti-rotation guard (poka-yoke connection):

The different sized bolts (1) on the loose member RECBi MATCH and a marking (2) on the loose member RECBi MATCH and on the fixed member RMQC ensure safe mounting.

Manual gripper change:

- Manually actuate (press) the locking mechanism on both sides of the loose member RECBi MATCH. Connect the loose member RECBi MATCH with the fixed member RMQC. The two markings (triangles) must point to each other. Then release the locking mechanism.

⇨ The fixed and loose members are locked together.

Automatic gripper change:

In order to perform an automatic gripper change, the optionally available storage station is required.

- The quick-change module RMQC fixed member (on the robot arm) is moved onto the loose member RECBi MATCH in the storage station and automatically locked when it moves out of the storage position.

The fixed member RMQC is also separated from the loose member RECBi MATCH in the storage station.

Corresponding recesses (grooves) are provided in the loose member RECBi MATCH, which engage with the fork arms of the storage station. Due to the different heights of the grooves and fork arms, the loose member RECBi MATCH can only be moved into the storage station from one side; failure to do so may damage the storage station.

8.3 Electrical Connection

⚠ WARNING

Electric shock

Risk of injury

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

The electrical connection of the product is internal. The device has an integrated electrical interface with spring contacts. All signals are transmitted via these contacts.

The electrical contacts must always be dry, clean and undamaged. Damage to the contacts can cause the product to malfunction.

The electrical connection for the fixed member must not be established and the fixed member must not be put into operation until the entire gripper has been completely installed.

8.4 Static Electricity

NOTE

Static Electricity

Failure to comply may result in damage to property

- If ESD-sensitive parts come into contact with the product, you must ensure that the product is grounded.

- Connect the vacuum gripper via the mounting option for ESD dissipation (grounding).

8.5 Assembling the Vacuum Gripping System

The RECBi MATCH does not include any suction cups.

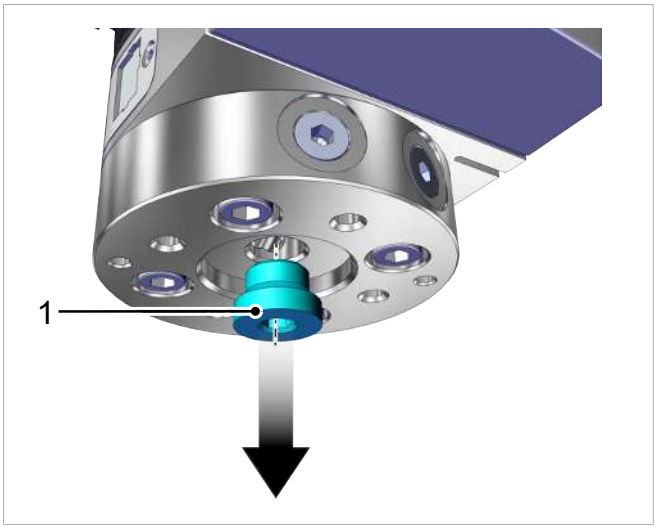
Different vacuum gripping systems can be mounted depending on the version.

8.5.1 Assembling the Vacuum Gripping System

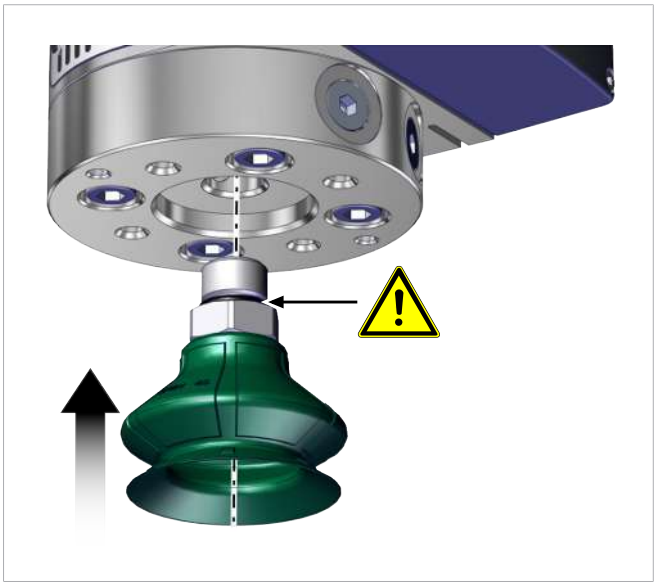
This interface offers two options for connecting vacuum suction cups.

Central vacuum connection

1. Remove the screw (1).

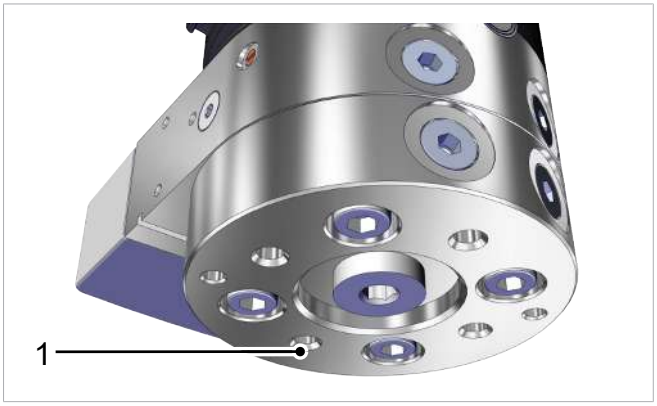


2. ⚠ Ensure that the O-ring is fitted. Install the vacuum suction cup (a bellows suction cup is shown as an example here) via the central vacuum connection (1) with a ¼-inch female thread with a max. tightening torque of 2.0 Nm.



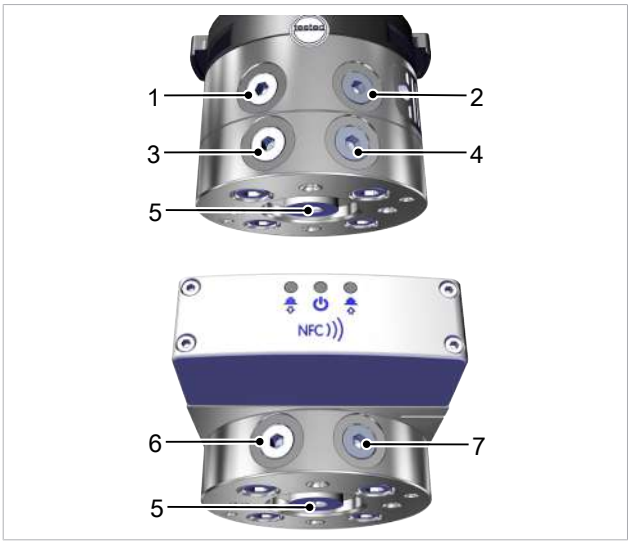
Mounting thread

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.

In the version with **one ejector module**, a total of five vacuum connections are available for the vacuum supply. The same suction circuit can be tapped at all five connections 1, 2, 3, 4 (size 1/8") and 5 (size 1/4").
The compressed air supply can be tapped at connections 6 and 7 (size 1/8").



In the version with **two ejector modules**, a total of six vacuum connections are available for the vacuum supply.
The vacuum generated by the lower ejector module can be tapped at connections 1, 3 and 5 (size 1/8").
The vacuum generated by the upper ejector module can be tapped at connections 2, 4 and 6 (size 1/8").
The compressed air supply can be tapped at connections 7 and 8.

8.5.2 Interface PXT

The interface PXT is used to receive a vacuum gripper based on the modular gripping system PXT from Schmalz.

The modular system PXT includes the following versions that differ with respect to the gripper features:

- Vacuum line on the gripper is established
  - internally
  - through hoses
- The gripper has
  - one main beam (PXT1)
  - two main beams (PXT2)

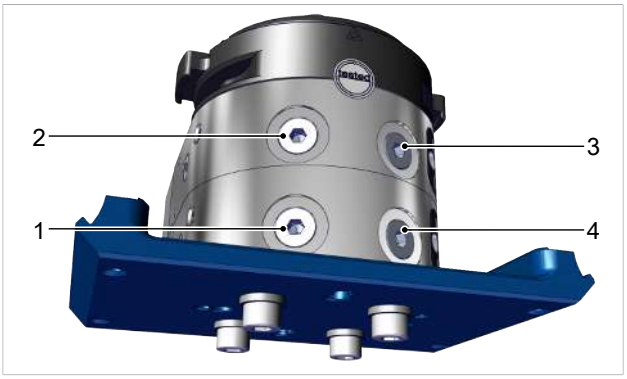
Examples:

RECBi MATCH with gripper PXT1 (version with one ejector module)	RECBi MATCH with gripper PXT2 (version with two ejector modules)
	

The vacuum supply for the gripper system or the individual suction cups is established via the vacuum connections of the ejector module or modules using hoses.

In the version with **one ejector module**, two vacuum connections are available for the vacuum supply.
In addition, with the version PXT1, the central vacuum connection on the RECBi MATCH can also be used for the gripping system vacuum supply.

In the version with **two ejector modules**, four vacuum connectors are available for the vacuum supply.
In addition, with the version PXT1, the central vacuum connection on the RECBi MATCH can also be used for the gripping system vacuum supply.



Detailed information about the modular system PXT and a description of the assembly can be found in the assembly instructions part no. 30.30.01.02710).

Request the instructions from the Schmalz Service department at: www.schmalz.com/services.

8.5.3 Interface PXR

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

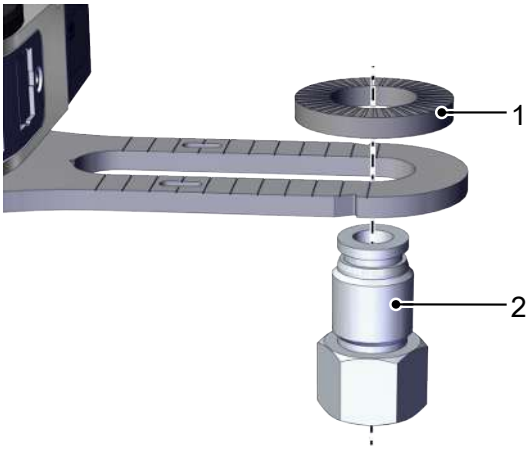
The vacuum supply for the individual suction cups is established via the vacuum connections of the ejector module or ejector modules using hoses.

- In the version with **one ejector module**, two vacuum connections are available for the vacuum supply.
- In the version with **two ejector modules**, four vacuum connectors are available for the vacuum supply.

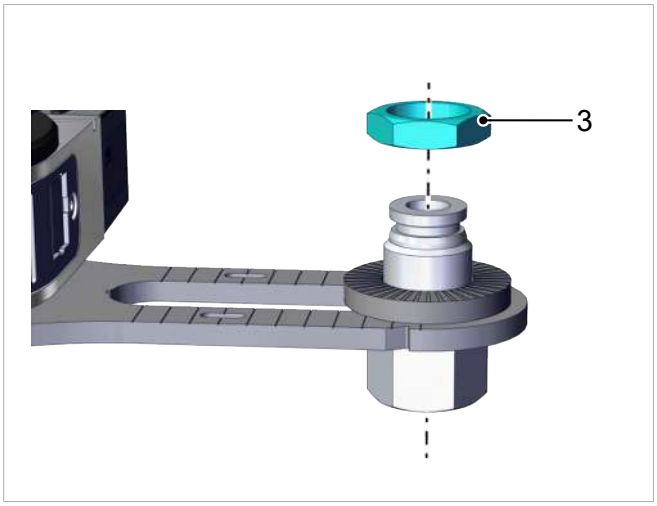
Installing vacuum suction cups

✓ The required accessories are available.

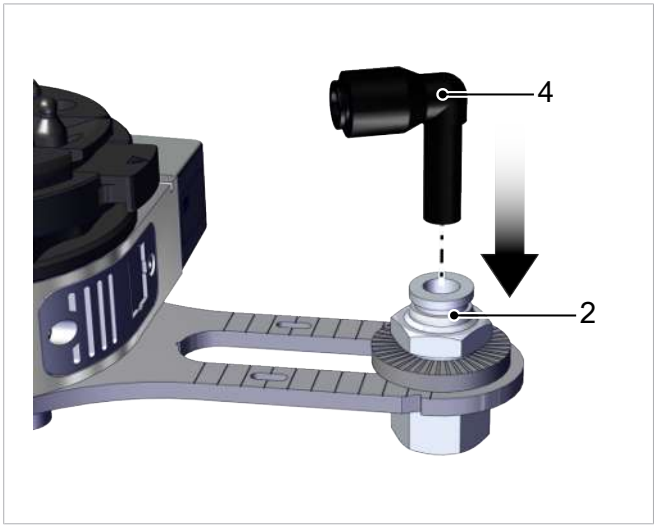
1. Position the washer (1) and the hollow bolt (2) on the RECBi MATCH holder.



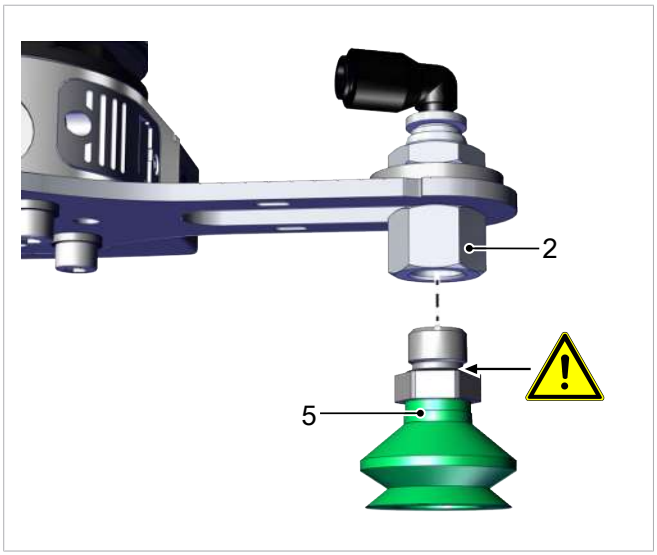
2. Fasten by hand with the nut (3).



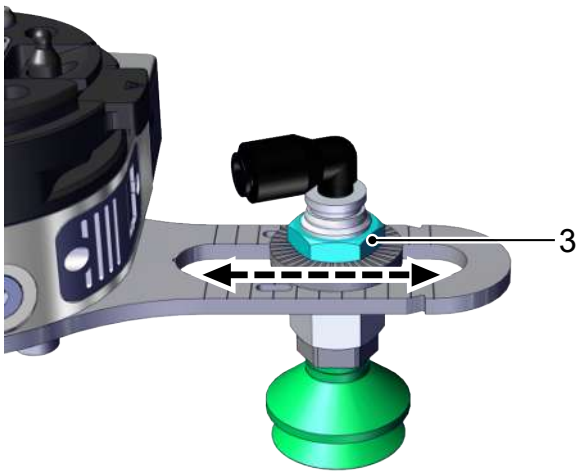
3. Insert the plug connector (4) into the hose connection of the hollow bolt (2) until it stops.



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.

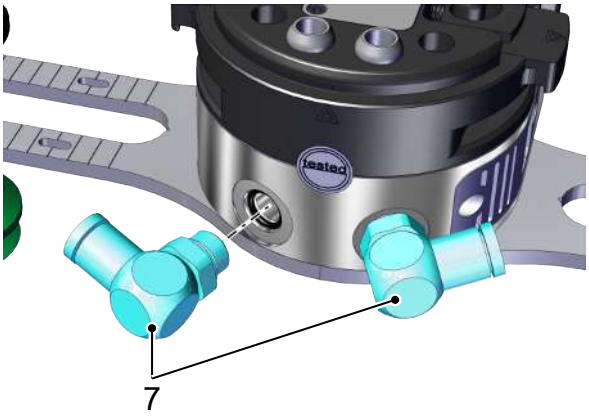


5. Position the suction cup assembly in the RECBi MATCH holder and secure with a tightening torque of 9 Nm using the nut (3).

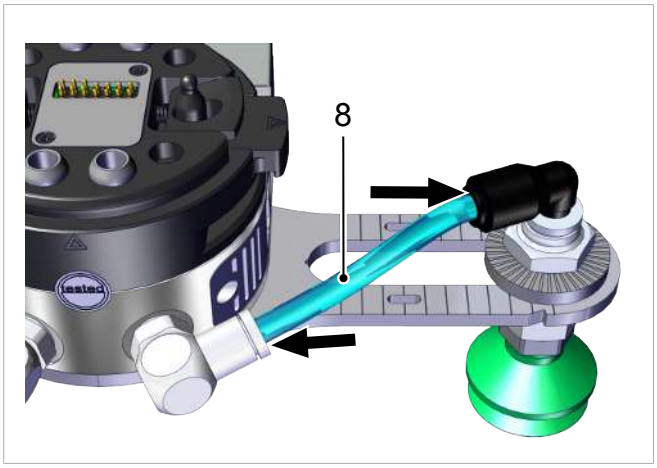


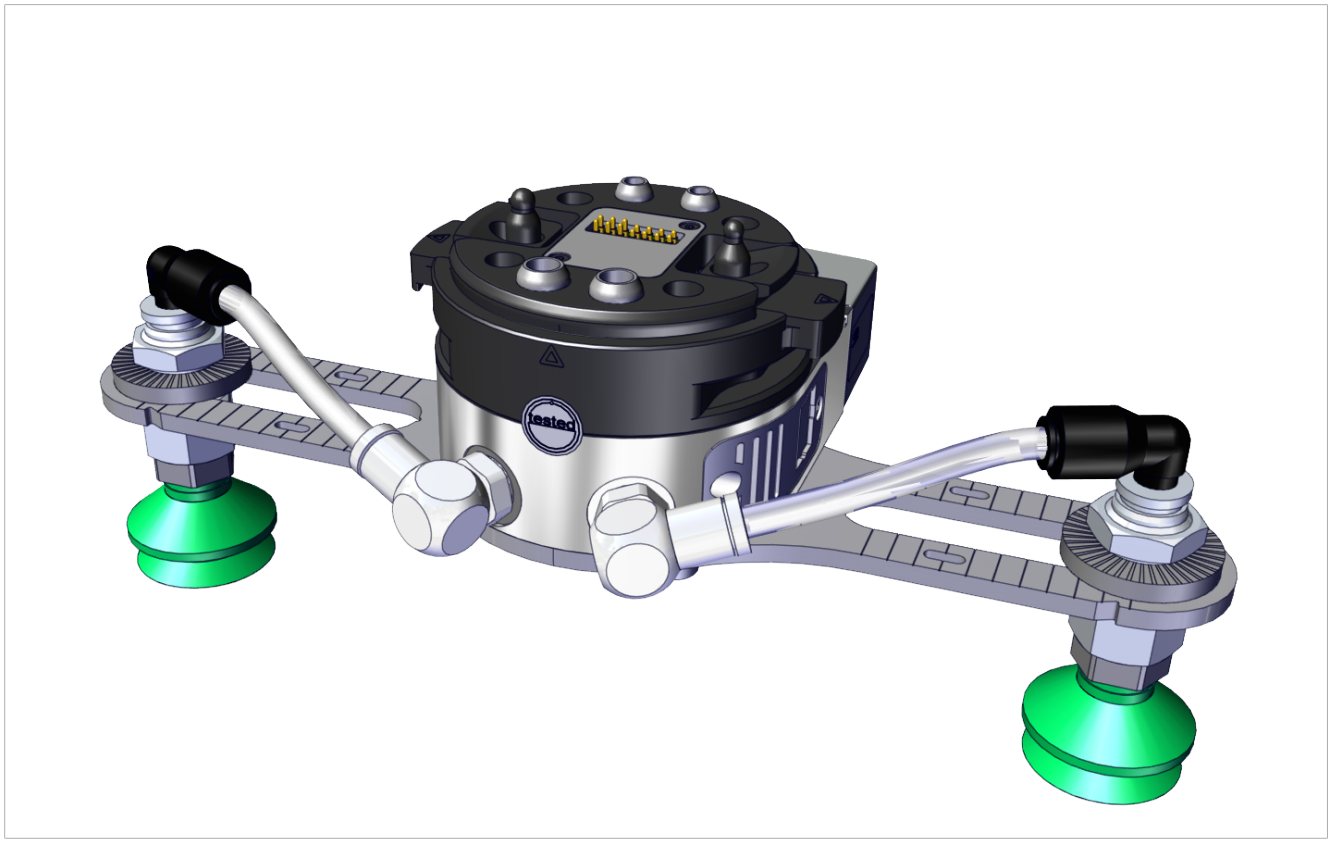
6. Remove the required number of plugs (6) from the ejector module.

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 MATCH 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		

Maintenance task	When starting work	Weekly	As required	Every six months
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 strictly prohibited:
  — 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.

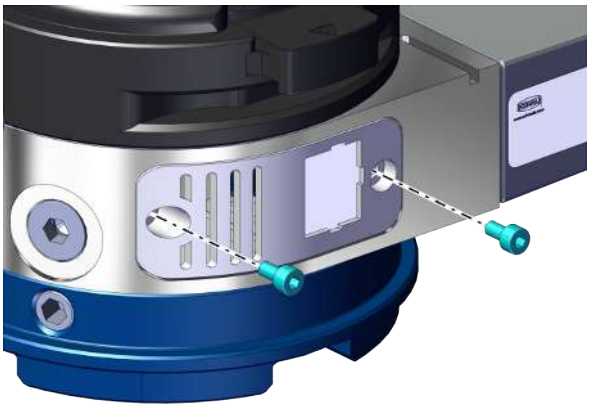
Heavy infiltration of dust, oil, etc. may contaminate the silencer and reduce the suction capacity. Cleaning the silencer is not recommended due to the capillary effect of the porous material.

If the suction capacity decreases, replace the silencer:

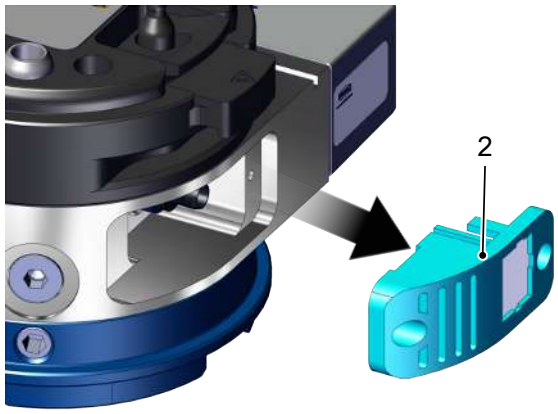
The illustrations shown below may deviate from the customer's version because they serve as examples of different versions of the product.

- ✓ 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.

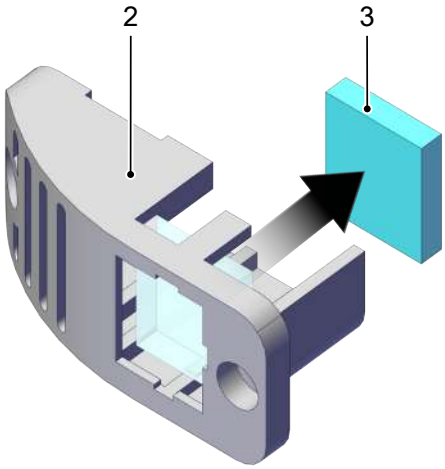
1. Release the two fastening screws on the silencer housing.



2. Remove the silencer housing (2).

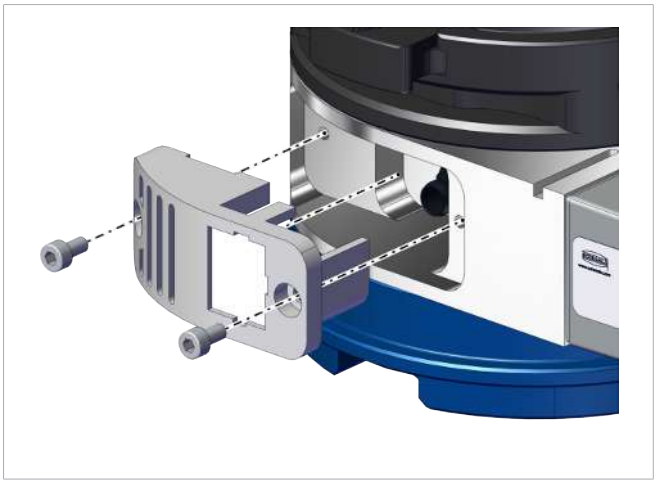


3. Push the silencer (3) out of the silencer housing (2).



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.

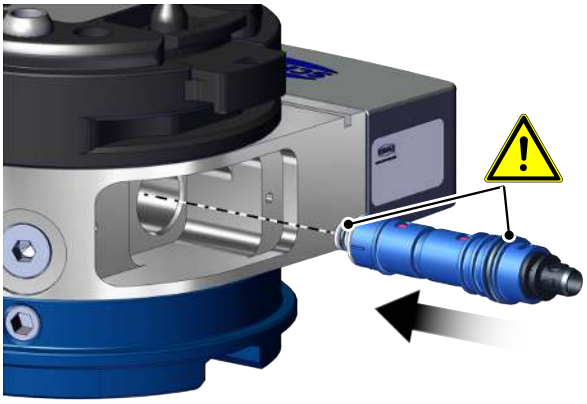
1. Remove the silencer housing.
   To do this, perform steps 1 and 2 in (> See ch. 11.4 Replacing the Silencer, p. 63).

2. Remove the screw (1).

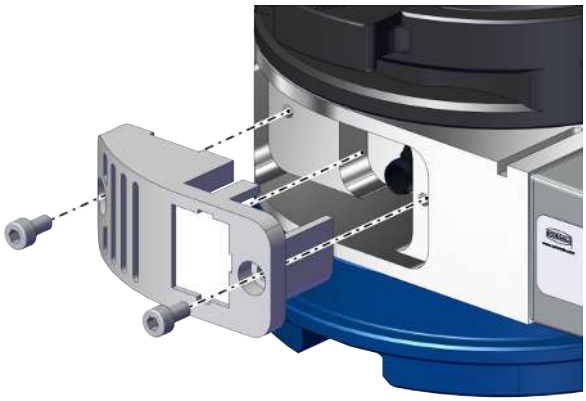
3. Carefully push the nozzle out of the bore with a mandrel or Allen key.

⇨ 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

The function of the product cannot be guaranteed if you use accessories that are not sold or authorized **by Schmalz or the Zimmer Group**.

Schmalz accessories are tailored especially to the individual products. You can find optional accessories and the accessories included in delivery in the table below and at www.schmalz.com.

Schmalz offers a wide range of quick-change modules (RMQC) especially for connecting the product to the standard robot systems available on the market:

1. https://www.schmalz.com

2. Alternatively, search for “quick-change module RMQC” on the Schmalz homepage.

Designation	Part no.
SCM module SCM DIO 24V-DC MATCH	10.08.09.00014
Storage station STATION 150x110x22 MATCH	10.08.09.00013
ZUB RECBi-PXT-1 MATCH	10.02.03.00410
ZUB RECBi-PXT-2 MATCH	10.02.03.00411
ZUB RECBi-UNI MATCH	10.02.03.00412
ZUB RECBi-PXR-I MATCH	10.02.03.00413
ZUB RECBi-PXR-X MATCH	10.02.03.00414
VENT-BGR EMVP-5 3/2 NC 24V-DC	10.08.09.00032

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 "ejector module RECBi MATCH" 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
EN 301 489-1	Electromagnetic compatibility for radio equipment and services; Part 1: Common technical requirements

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

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
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Additional technical standards and specifications were applied:

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ISO TS 15066	Human-robot collaboration

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15.3 EU Declaration of Incorporation

Declaration of Incorporation

The manufacturer Schmalz confirms that the product with the name "ejector module RECBi MATCH" that is described in these operating instructions complies with the following applicable EC directives:

The product specified is solely intended for installation indoors in a complete system. Startup is prohibited until the end product has been declared to comply with the Directive 2006/42/EC.

The manufacturer commits to provide special documentation of the partly completed machinery to national authorities in electronic form if requested. The special technical documentation belong to the machine as per Annex VII Part B has been created.

2006/42/EC	Machinery Directive

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
EN 301 489-1	Electromagnetic compatibility for radio equipment and services; Part 1: Common technical requirements

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

The Declaration of Incorporation 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.

15.4 UKCA Conformity

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

The product specified is solely intended for installation indoors in a complete system. The start of operations shall be prohibited until the conformity of the final product with the "Supply of Machinery (Safety) Regulations 2008" has been established.

The manufacturer commits to provide special documentation of the partly completed machinery to national authorities in electronic form if requested. The special technical documentation belonging to the machine as per Annex VII Part B has been created.

2008	Supply of Machinery (Safety) 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
EN 301 489-1	Electromagnetic compatibility for radio equipment and services; Part 1: Common technical requirements

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

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

16 Attachment

See also

- Data_Dictionary_RECBi_MATCH_1C.pdf [} 76]
- Data_Dictionary_RECBi_MATCH_2C.pdf [} 79]

IO-Link

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Fax: +49(0)7443/2403-259
info@schmalz.de

IO-Link Implementation

Vendor ID	234 (0xEA)
Device ID	100280 (0x0187B8)
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	Vendor text
18	0x0012	0	Product name	0…32	bytes	-	ro	RECBi_MATCH_1C	Product name
19	0x0013	0	Product ID	0…32	bytes	-	ro	'RECBi_MATCH_1C	Product variant name
20	0x0014	0	Product text	0…32	bytes	-	ro	RECBi 24V-DC MATCH 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	M22	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.schmalz.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 all 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	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	1	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	1	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	1	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
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								
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								
564	0x0234	0	Communication mode	1	byte	-	ro	-	0x00 = SIO mode 0x11 = IO-Link revision 1.1
Diagnosis									
	Device Status								
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]								
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								
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								
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]								
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]								
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 name	Remark
dec	hex	hex	Meaning	Event Type		
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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IO-Link Implementation

Vendor ID	234 (0xEA)
Device ID	100281 (0x0187B9)
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	Reserviert
	Device Status Overall	4..5	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
	Device Status Ejector 1	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) Ejector 1	0	ro	Vacuum is above SP2 & not yet below rP2
	SP1 (air saving function) Ejector 1	1	ro	Vacuum is above SP1 & not yet below rP1
	SP3 (part detached) Ejector 1	2	ro	The part has been detached after a suction cycle
	CM-Autoset Ejector 1	3	ro	Acknowledge that the Autoset function has been completed
	Reserved	4..7	ro	not used
PD in byte 2	Errors Ejector 1 High-Byte	0..7	ro	Bit 0 = Short circuit at OUT2 Bit 1 = reserved Bit 2 = Internal IO-Link communication interruption 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 Ejector 1 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 Ejector 1 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 Ejector 1 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 Ejector 1 High-Byte	0..7	ro	System vacuum [mbar]
PD in byte 7	Vacuum Ejector 1 Low-Byte	0..7	ro	
PD in byte 8	Reserved	0…5	ro	not used
	Device Status Ejector 2	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 9	SP2 Ejector 2	0	ro	Vacuum is above SP2 & not yet below rP2
	SP1 Ejector 2	1	ro	Vacuum is above SP1 & not yet below rP1
	SP3 Ejector 2	2	ro	The part has been detached after a suction cycle
	CM-Autoset Ejector 2	3	ro	Acknowledge that the Autoset function has been completed
	Reserved	4..7	ro	not used
PD in byte 10	Errors Ejector 2 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 11	Errors Ejector 2 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 12	Warnings Ejector 2 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 13	Warnings Ejector 2 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 14	Vacuum Ejector 2 High-Byte	0..7	ro	System vacuum [mbar]
PD in byte 15	Vakuum Ejector 2 Low-Byte	0..7	ro	

Process data Out		Bits	Access	Remark
PD out byte 0	Vacuum Ejector 1	0	wo	Vacuum on/off
	Blow-off Ejector 1	1	wo	Activate Blow-off
	Setting Mode Ejector 1	2	wo	Vacuum on/off with continuous suction disabled (regardless of dCS parameter)
	CM-Autoset Ejector 1	3	wo	Perform CM Autoset function (teach permissible leakage and permissible evacuation time)
	Vacuum Ejector 2	4	wo	Vacuum on/off
	Blow-off Ejector 2	5	wo	Activate Blow-off

	Setting Mode Ejector 2	6	wo	Vacuum on/off with continuous suction disabled (regardless of dCS parameter)
	CM-Autoset Ejector 2	7	wo	Perform CM Autoset function (teach permissible leakage and permissible evacuation time)
PD out byte 1	Input Pressure Ejector 1	0..7	wo	Pressure value from external sensor [0.1 bar]
PD out byte 2	Input Pressure Ejector 2	0..7	wo	Pressure value from external sensor [0.1 bar]
PD out byte 3	Profile Set Ejector 1	0..1	wo	Profile selection Ejector 1
	Profile Set Ejector 2	2..3	wo	Profile selection Ejector 2
	Reserved	4..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	Vendor text
18	0x0012	0	Product name	0…32	bytes	-	ro	RECBi_MATCH_2C	Product name
19	0x0013	0	Product ID	0…32	bytes	-	ro	RECBi_MATCH_2C	Product variant name
20	0x0014	0	Product text	0…32	bytes	-	ro	RECBi 24V-DC MATCH 2-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	1	Firmware revision Ejector 1	4	bytes	-	ro	1.0	Firmware revision
23	0x0017	2	Firmware revision Ejector 2	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	M22	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.schmalz.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 all 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	1	Blow-Off mode Ejector 1	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
69	0x0045	2	Blow-Off mode Ejector 2	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
75	0x004B	1	Output filter Ejector 1, switch-off delay for SP2	2	bytes	0-999	rw	10	Unit: 1ms
75	0x004B	2	Output filter Ejector 2, switch-off delay for SP2	2	bytes	0-999	rw	10	Unit: 1ms
			Process Settings Ejector 1						
			Production Setup - Profile P0 Ejector 1						
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	100-9999	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 Ejector 1						
180	0x00B4	0	Air-Saving function	1	byte	0-2	rw	1	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 Ejector 1						
200	0x00C8	0	Air-Saving function	1	byte	0-2	rw	1	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 Ejector 1						
220	0x00DC	0	Air-Saving function	1	byte	0-2	rw	1	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
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
	⌖	Process Settings Ejector 2							
		⌖	Production Setup - Profile P0 Ejector 2						
300	0x012C	0	Air-Saving function	1	byte	0-2	rw	1	0 = not active (off) 1 = active (on) 2 = active with supervision (onS)
301	0x012D	0	Disable continous sucking	1	byte	0-1	rw	0	0 = off, 1 = on
302	0x012E	0	Switchpoint 1 (SP1)	2	bytes	999 > SP1 > rP1	rw	750	Unit: 1mbar
303	0x012F	0	Resetpoint 1 (rP1)	2	bytes	SP1 > rP1 > SP2	rw	600	Unit: 1mbar
304	0x0130	0	Switchpoint 2 (SP2)	2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar
305	0x0131	0	Resetpoint 2 (rP2)	2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar
306	0x0132	0	Duration automatic blow	2	bytes	10-9999	rw	200	Unit: 1ms
307	0x0133	0	Permissable evacuation time	2	bytes	0-9999	rw	2000	Unit: 1ms, no evacuation time warning if set to 0
308	0x0134	0	Permissable leakage rate	2	bytes	0-999	rw	250	Unit: 1ms, no leakage rate warning if set to 0
319	0x013F	0	Profile name	0…16	bytes	-	rw	***	Name of profile
		⌖	Production Setup - Profile P1 Ejector 2						
320	0x0140	0	Air-Saving function	1	byte	0-2	rw	1	0 = not active (off) 1 = active (on) 2 = active with supervision (onS)
321	0x0141	0	Disable continous sucking	1	byte	0-1	rw	0	0 = off 1 = on
322	0x0142	0	Switchpoint 1 (SP1)	2	bytes	999 > SP1 > rP1	rw	750	Unit: 1mbar
323	0x0143	0	Resetpoint 1 (rP1)	2	bytes	SP1 > rP1 > SP2	rw	600	Unit: 1mbar
324	0x0144	0	Switchpoint 2 (SP2)	2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar
325	0x0145	0	Resetpoint 2 (rP2)	2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar
326	0x0146	0	Duration automatic blow	2	bytes	10-9999	rw	200	Unit: 1ms
327	0x0147	0	Permissable evacuation time	2	bytes	0-9999	rw	2000	Unit: 1ms no evacuation time warning if set to 0
328	0x0148	0	Permissable leakage rate	2	bytes	0-999	rw	250	Unit: 1ms no leakage rate warning if set to 0
339	0x0153	0	Profile name	0…16	bytes	-	rw	***	Name of profile
		⌖	Production Setup - Profile P2 Ejector 2						
340	0x0154	0	Air-Saving function	1	byte	0-2	rw	1	0 = not active (off) 1 = active (on) 2 = active with supervision (onS)
341	0x0155	0	Disable continous sucking	1	byte	0-1	rw	0	0 = off 1 = on
342	0x0156	0	Switchpoint 1 (SP1)	2	bytes	999 > SP1 > rP1	rw	750	Unit: 1mbar
343	0x0157	0	Resetpoint 1 (rP1)	2	bytes	SP1 > rP1 > SP2	rw	600	Unit: 1mbar
344	0x0158	0	Switchpoint 2 (SP2)	2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar
345	0x0159	0	Resetpoint 2 (rP2)	2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar
346	0x015A	0	Duration automatic blow	2	bytes	10-9999	rw	200	Unit: 1ms
347	0x015B	0	Permissable evacuation time	2	bytes	0-9999	rw	2000	Unit: 1ms no evacuation time warning if set to 0
348	0x015C	0	Permissable leakage rate	2	bytes	0-999	rw	250	Unit: 1ms no leakage rate warning if set to 0
359	0x0167	0	Profile name	0…16	bytes	-	rw	***	Name of profile
		⌖	Production Setup - Profile P3 Ejector 2						
360	0x0168	0	Air-Saving function	1	byte	0-2	rw	1	0 = not active (off) 1 = active (on) 2 = active with supervision (onS)
361	0x0169	0	Disable continous sucking	1	byte	0-1	rw	0	0 = off, 1 = on
362	0x016A	0	Switchpoint 1 (SP1)	2	bytes	999 > SP1 > rP1	rw	750	Unit: 1mbar
363	0x016B	0	Resetpoint 1 (rP1)	2	bytes	SP1 > rP1 > SP2	rw	600	Unit: 1mbar
364	0x016C	0	Switchpoint 2 (SP2)	2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar

365	0x016D	0	Resetpoint 2 (rP2)	2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar
366	0x016E	0	Duration automatic blow	2	bytes	10-9999	rw	200	Unit: 1ms
367	0x016F	0	Permissable evacuation time	2	bytes	0-9999	rw	2000	Unit: 1ms, no evacuation time warning if set to 0
368	0x0170	0	Permissable leakage rate	2	bytes	0-999	rw	250	Unit: 1ms, no leakage rate warning if set to 0
379	0x017B	0	Profile name	0…16	bytes	-	rw	***	Name of profile
⌖ Observation									
	⌖ Monitoring								
64	0x0040	1 2 3	System vacuum live Ejector 1 System vacuum min Ejector 1 System vacuum max Ejector 1	2 2 2	bytes bytes bytes	-	ro ro ro	-	Unit: 1mbar Unit: 1mbar Unit: 1mbar
64	0x0040	4 5 6	System vacuum live Ejector 2 System vacuum min Ejector 2 System vacuum max Ejector 2	2 2 2	bytes bytes bytes	-	ro ro ro	-	Unit: 1mbar Unit: 1mbar Unit: 1mbar
66	0x0042	1 2 3	Primary supply voltage live Primary supply voltage min Primary supply voltage max	2 2 2	bytes bytes bytes	-	ro ro ro	-	Unit: 0.1V Unit: 0.1V Unit: 0.1V
275	0x0113	1	Active profile Ejector 1	1	byte	0-3	ro	-	Number of active profile
275	0x0113	2	Active profile Ejector 2	1	byte	0-3	ro	-	Number of active profile
564	0x0234	0	Communication mode	1	byte	-	ro	-	0x00 = SIO mode 0x11 = IO-Link revision 1.1
⌖ Diagnosis									
	⌖ Device Status								
36	0x0024	0	Device status overall	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	87	bytes	-	ro	-	Information about currently pending events (Event-List). For structure please see IO-Link-Spec 1.1.3 chapter B.2.21. Every Error-Warning consist of 1 byte EventQualifier and 2 bytes EventCode
130	0x0082	1	Active errors Ejector 1	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 = Internal IO-Link communication interruption Bit 11 = Measurement range overrun Bit 12 = reserved Bit 13 = reserved Bit 14 = reserved Bit 15 = IO-Link communication interruption
130	0x0082	2	Active errors Ejector 2	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]								
146	0x0092	1	Condition monitoring Ejector 1	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
146	0x0092	2	Condition monitoring Ejector 2	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								
140	0x008C	1	Vacuum on counter Ejector 1	4	bytes	-	ro	-	Counter for Vacuum on (non-erasable)
140	0x008C	2	Vacuum on counter Ejector 2	4	bytes	-	ro	-	Counter for Vacuum on (non-erasable)
141	0x008D	1	Valve operating counter Ejector 1	4	bytes	-	ro	-	Counter for valve operating (non-erasable)
141	0x008D	2	Valve operating counter Ejector 2	4	bytes	-	ro	-	Counter for valve operating (non-erasable)
142	0x008E	1	Condition monitoring counter Ejector 1	4	bytes	-	ro	-	Counter for condition monitorings (non-erasable)
142	0x008E	2	Condition monitoring counter Ejector 2	4	bytes	-	ro	-	Counter for condition monitorings (non-erasable)
143	0x008F	1	Vacuum on counter Ejector 1	4	bytes	-	ro	-	Counter for Vacuum on (erasable)
143	0x008F	2	Vacuum on counter Ejector 2	4	bytes	-	ro	-	Counter for Vacuum on (erasable)
144	0x0090	1	Valve operating counter Ejector 1	4	bytes	-	ro	-	Counter for valve operating (erasable)
144	0x0090	2	Valve operating counter Ejector 2	4	bytes	-	ro	-	Counter for valve operating (erasable)
145	0x0091	1	Condition monitoring counter Ejector 1	4	bytes	-	ro	-	Counter for condition monitorings (erasable)
145	0x0091	2	Condition monitoring counter Ejector 2	4	bytes	-	ro	-	Counter for condition monitorings (erasable)
	⌖ Timing								
148	0x0094	1	Evacuation time t0 of last suction-cycle Ejector 1	2	bytes	-	ro	-	Unit: 1ms Time from suction start to reaching SP2
148	0x0094	2	Evacuation time t0 of last suction-cycle Ejector 2	2	bytes	-	ro	-	Unit: 1ms Time from suction start to reaching SP2
149	0x0095	1	Evacuation time t1 of last suction-cycle Ejector 1	2	bytes	-	ro	-	Unit: 1ms Time from reaching SP2 to reaching SP1
149	0x0095	2	Evacuation time t1 of last suction-cycle Ejector 2	2	bytes	-	ro	-	Unit: 1ms Time from reaching SP2 to reaching SP1
166	0x00A6	1	Total cycle time of last cycle Ejector 1	4	bytes	-	ro	-	Unit: 1ms
166	0x00A6	2	Total cycle time of last cycle Ejector 2	4	bytes	-	ro	-	Unit: 1ms

		Energy Monitoring [EM]							
155	0x009B	1	Air-Consumption of last suction-cycle Ejector 1	1	byte	-	ro	-	Unit: 1%
155	0x009B	2	Air-Consumption of last suction-cycle Ejector 2	1	byte	-	ro	-	Unit: 1%
156	0x009C	1	Air-Consumption of last suction-cycle Ejector 1	2	bytes	-	ro	-	Unit: 0.1 L std.
156	0x009C	2	Air-Consumption of last suction-cycle Ejector 2	2	bytes	-	ro	-	Unit: 0.1 L std.
157	0x009D	1	Energy-Consumption of last suction-cycle Ejector 1	2	bytes	-	ro	-	Unit: 1Ws
157	0x009D	2	Energy-Consumption of last suction-cycle Ejector 2	2	bytes	-	ro	-	Unit: 1Ws
		Predictive Maintenance [PM]							
160	0x00A0	1	Leakage rate of last suction-cycle Ejector 1	2	bytes	-	ro	-	Unit: 1mbar/s
160	0x00A0	2	Leakage rate of last suction-cycle Ejector 2	2	bytes	-	ro	-	Unit: 1mbar/s
161	0x00A1	1	Free-Flow vacuum Ejector 1	2	bytes	-	ro	-	Unit: 1mbar
161	0x00A1	2	Free-Flow vacuum Ejector 2	2	bytes	-	ro	-	Unit: 1mbar
162	0x00A2	1	Quality of last suction-cycle Ejector 1	1	byte	-	ro	-	Unit: 1%
162	0x00A2	2	Quality of last suction-cycle Ejector 2	1	byte	-	ro	-	Unit: 1%
163	0x00A3	1	Performance of last suction-cycle Ejector 1	1	byte	-	ro	-	Unit: 1%
163	0x00A3	2	Performance of last suction-cycle Ejector 2	1	byte	-	ro	-	Unit: 1%
164	0x00A4	1	Max reached vacuum of last cycle Ejector 1	2	bytes	-	ro	-	Unit: 1mbar
164	0x00A4	2	Max reached vacuum of last cycle Ejector 2	2	bytes	-	ro	-	Unit: 1mbar
165	0x00A5	1	Min reached input pressure of last cycle Ejector 1	2	bytes	-	ro	-	Unit: 1mbar
165	0x00A5	2	Min reached input pressure of last cycle Ejector 2	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 name	Remark
dec	hex	hex	Meaning	Event Type		
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, Ejector 1	Vacuum value > 999 mbar in Ejector 1
36097	0x8D01		Defect/fault, low	Error	Measurement range overrun, Ejector 2	Vacuum value > 999 mbar in Ejector 2
36112	0x8D10		Warning, high	Warning	Valve protection active, Ejector 1	
36113	0x8D11		Warning, high	Warning	Valve protection active, Ejector 2	
36128	0x8D20		Warning, low	Warning	Evacuation time t1 is greater than limit, Ejector 1	
36129	0x8D21		Warning, low	Warning	Evacuation time t1 is greater than limit, Ejector 2	
36144	0x8D30		Warning, low	Warning	Leakage rate is greater than limit, Ejector 1	
36145	0x8D31		Warning, low	Warning	Leakage rate is greater than limit, Ejector 2	
36160	0x8D40		Warning, low	Warning	SP1 was not reached, Ejector 1	
36161	0x8D41		Warning, low	Warning	SP1 was not reached, Ejector 2	
36176	0x8D50		Warning, low	Warning	Free-flow vacuum level too high, Ejector 1	
36177	0x8D51		Warning, low	Warning	Free-flow vacuum level too high, Ejector 2	
36192	0x8D60		Warning, low	Notification	Vacuum calibration OK, Ejector 1	Calibration offset 0 set successfully
36193	0x8D61		Warning, low	Notification	Vacuum calibration OK, Ejector 2	Calibration offset 0 set successfully
36208	0x8D70		Warning, low	Notification	Vacuum calibration failed, Ejector 1	Sensor value too high or too low, offset not changed
36209	0x8D71		Warning, low	Notification	Vacuum calibration failed, Ejector 2	Sensor value too high or too low, offset not changed
36224	0x8D80		Defect/fault, high	Error	Data Corruption (EEPROM), Ejector 1	Internal error, user data corrupted
36225	0x8D81		Defect/fault, high	Error	Data Corruption (EEPROM), Ejector 2	Internal error, user data corrupted
36240	0x8D90		Critical condiction, high	Warning	Supply pressure fault, Ejector 1	Input pressure too high or too low
36241	0x8D91		Critical condiction, high	Warning	Supply pressure fault, Ejector 2	Input pressure too high or too low
36272	0x8DB0			Warning	CM Autoset completed, Ejector 1	
36273	0x8DB1			Warning	CM Autoset completed, Ejector 2	

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