## Operating instructions

# Compact Terminal SCTSi IOL

WWW.SCHMALZ.COM

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Translation of the original operating instructions

**Note**

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

**Published by**



**Contact**

J. Schmalz GmbH

Johannes-Schmalz-Str. 1

72293 Glatten, Germany

T: +49 (0) 7443 2403-0

schmalz@schmalz.de

www.schmalz.com

Contact information for Schmalz companies and trade partners worldwide can be found at:

www.schmalz.com/salesnetwork

# 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 intended for:

- 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

The displayed figures are only examples. Depending on the particular design, they can differ from the product.

## 1.2 The technical documentation is part of the product

1. For problem-free and safe operation, follow the instructions in the documents.
2. Keep the technical documentation in close proximity to the product. The documentation must be accessible to personnel at all times.
3. Pass on the technical documentation to subsequent users.

⇨ Failure to follow the instructions in these Operating instructions may result in injuries!

⇨ Schmalz is not liable for damage or malfunctions that result from failure to heed these instructions.

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

www.schmalz.com/services

## 1.3 Type Plate

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

The QR code enables access to the digital technical documentation for the product.

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

## 1.4 Symbols

This symbol indicates useful and important information.

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

▸ This symbol represents an action to be performed.

⇨ This symbol represents the result of an action.

Actions that consist of more than one step are numbered:

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

## 1.5 Trademark

IO-Link is the standard IEC 61131-9:2013 and provides the specifications for digital point-to-point communication interface technology for SDCI small sensors and actuators (commonly known as IO-Link).

# 2 Fundamental Safety Instructions

## 2.1 Intended Use

The compact terminal SCTSi is designed to generate a vacuum for gripping and transporting objects when used in conjunction with suction cups.

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 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.

Any other use is considered improper by the manufacturer and is deemed as contrary to the designated use.

## 2.2 Non-Intended Use

Schmalz accepts no liability for damages caused by non-intended usage of the Terminal.

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

- Use in potentially explosive atmospheres
- Use in medical applications
- Lifting people or animals
- Evacuation of objects that are in danger of imploding

## 2.3 Personnel Qualifications

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

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

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

## 2.4 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

The system integrator must carry out a risk assessment of the entire system for all operating modes and define the danger zone precisely. In doing so, country-specific provisions and regulations must be observed.

### ⚠ CAUTION

**Falling product**

Risk of injury

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

### ⚠ CAUTION

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

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

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

### ⚠ WARNING

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

Hearing damage!

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

### ⚠ WARNING

**Extraction of hazardous media, liquids or bulk material**

Personal injury or damage to property!

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

**⚠ WARNING**

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

Serious injury

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

**⚠ CAUTION**

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

Eye injuries!

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

**⚠ CAUTION**

**Vacuum close to the eye**

Severe eye injury!

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

## 2.6 Modifications to the Product

Schmalz assumes no liability for consequences of modifications over which it has no control:

1. The product must be operated only in its original condition as delivered.
2. Use only original spare parts from Schmalz.
3. The product must be operated only in perfect condition.

# 3 Product Description

## 3.1 Compact Terminal Description

Example: Compact terminal with 6 ejectors

The SchmalzCompact terminal SCTSi (SCTSi for short) is a compact unit consisting of individual discs:

- Multiple vacuum generators (“ejectors”)
- The bus module as an IO-Link Class B device.

Thanks to its modular design, up to 16 individual ejectors can be controlled and configured independently. It can be used to handle different parts simultaneously and independently using just one vacuum system.

The Compact terminal SCTSi has an IO-Link class B interface, referred to as “IO-Link” for short.

The compressed air supply can be connected centrally for all ejectors. As an alternative, it can also be connected separately for each ejector.

Each ejector has an autonomous energy and process control for monitoring the vacuum circuit.

All of the settings, parameters and measurement and analysis data are made available centrally via IO-Link.

Additionally, much of the information and status reports for the Compact terminal SCTSi can be accessed using wireless communication with NFC (near-field communication).

## 3.2 Variants and Product Keys

### 3.2.1 Compact Terminal Designation

The breakdown of the item designation (e.g. SCTSi-IOL-E16-ABC00234C) is as follows:

| Property | Variants | Examples |
|---|---|---|
| Type | SCTSi (compact terminal) | — |
| Bus module | **IOL** = IO-Link | — |
| Number of ejectors | **EX** = X ejectors | **E2** = 2 ejectors, |
| Individual configuration code | Unique 9-digit code | SCTSi-IOL-E2-**ABC00235M** |

**Important notes:**

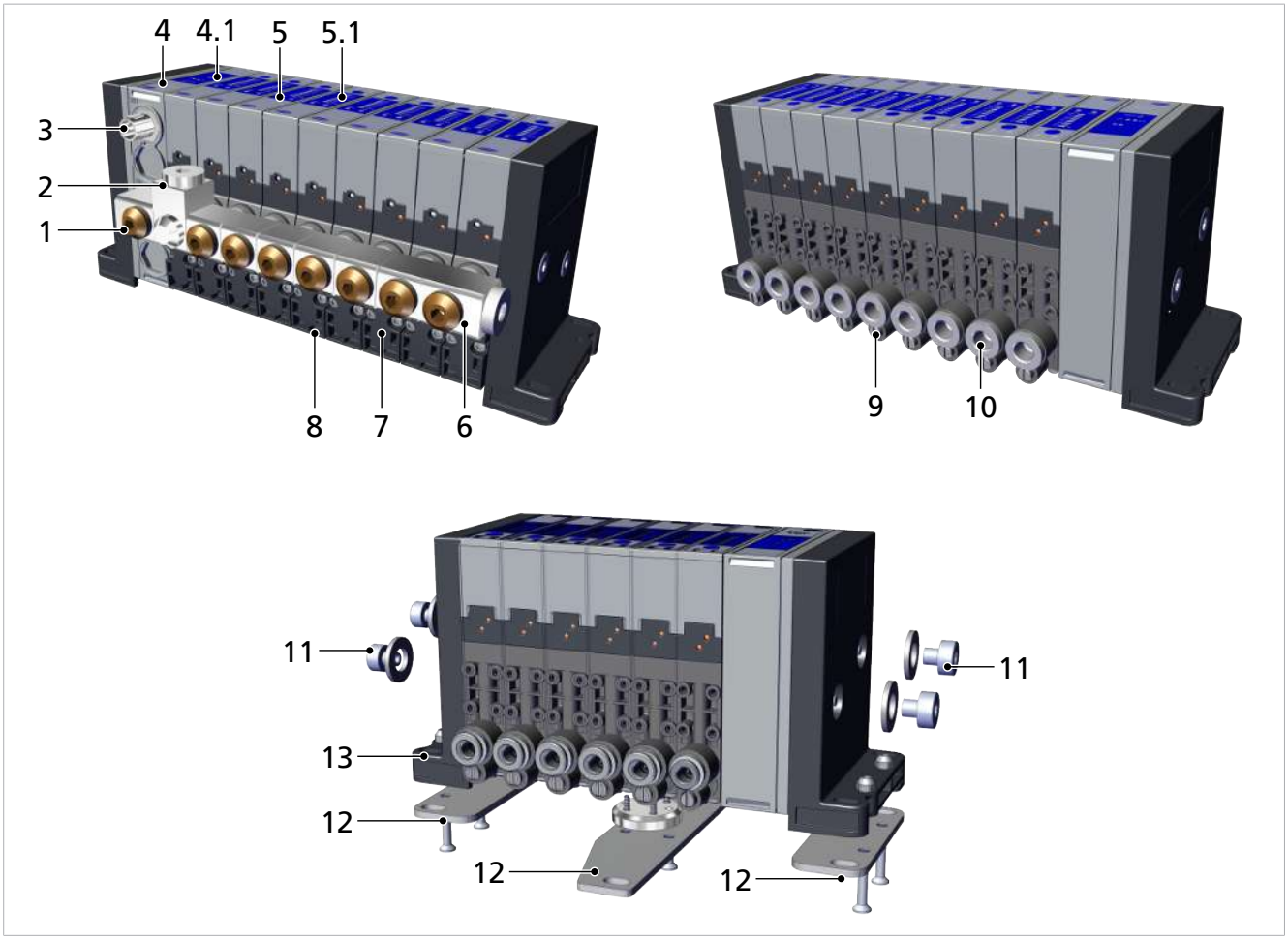
- A terminal always consists of a bus module and individual discs (ejectors).
- A maximum of four ejector individual discs can be used.
- Identical individual discs must be installed grouped together as blocks.
- The ejectors differ in nozzle size, vacuum connection and the NO, NC or IMP variant.

### 3.2.2 Ejector Designation

The breakdown of the item designation (e.g. SCPSt 10 G02 NC C7D) is as follows:

| Property | Variants |
|---|---|
| Type | SCPSt |
| Nozzle size | 0.7, 1.0, 2-07,... |
| Additional functions | **M**; Power blow off<br>**EA**; Exhaust duct<br>**LS**; High suction flow rate / Low max. vacuum value<br>**M-EA**; Power blow off and exhaust duct |
| Fluid connectors | Coding of the fluid connectors |
| Suction valve control | **NO** (normally open), sucks when no voltage is applied<br>**NC** (normally closed), does not suck when no voltage is applied<br>**IMP** (pulse variant) |
| Individual configuration code<br>(parameter 254 / 0x00FE) | 3-digit code **"AAA"**<br>It clearly describes an ejector disc. |

## 3.3 Components of the Compact Terminal




| | | | |
|---|---|---|---|
| 1 | Compressed-air distributor with 1/4"-thread compressed air connection | 7 | Exhaust outlet |
| 2 | Compressed-air distributor with additional 1/4"-thread compressed air connection | 8 | Silencer cover |
| 3 | M12 plug electrical connection for IO-Link class B | 9 | Blow off valve screw |
| 4 | IO-Link bus module | 10 | 1/8" vacuum connection |
| 4.1 | IO-Link display element | 11 | Connectors |
| 5 | Ejector SCPSt (2 to 16 pcs.) | 12 | Stabilization components, for 6 ejectors or more |
| 5.1 | Ejector SCPSt display/operating element | 13 | End plate with mounting possibilities for M5 screws 2x |
| 6 | Compressed-air distributor with additional 1/4"-thread compressed air connection | — | — |

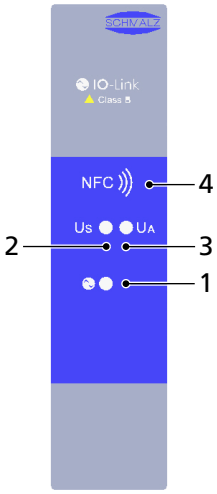
## 3.4 Bus Module Description

### 3.4.1 Description

The bus module ensures communication with the controller.

### 3.4.2 Bus Module Displays

| Bus module section | Symbol | Meaning | Description |
|---|---|---|---|
|  | **NFC** | Position of the NFC antenna | Optimum position for connection to an NFC transponder |

| Bus module | Item | Meaning | State | Description |
|---|---|---|---|---|
|  | 1 | "IO-Link" LED | Off | No communication |
| | | | Flashing green | IOL communication okay |
| | 2 | "Sensor voltage" LED | Off | No sensor voltage |
| | | | Green | Voltage okay |
| | | | Flashing green | Voltage not okay |
| | 3 | "Actuator voltage" LED | Off | No actuator voltage |
| | | | Green | Voltage okay |
| | | | Flashing green | Voltage not okay |
| | 4 | Position of the NFC antenna | Optimum position for connection to an NFC transponder | |

## 3.5 Description of the Ejector

The compact ejectors of the terminal are supplied with electrical voltage by internal transmission. The same bus interface is used for communication with the control unit of the higher-level machine. The electrical connection is made centrally via the bus module.

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

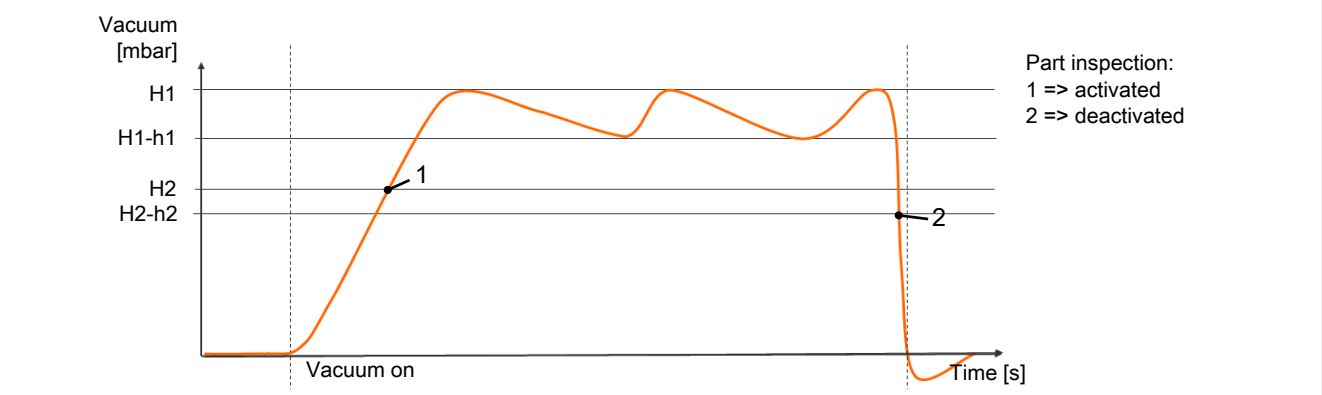
The compressed air supply can be connected centrally for all ejectors. As an alternative, there can also be a compressed air supply for each ejector.

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 there is a power failure or if there is no control signal, no vacuum is generated.)
- In the variant IMP, the venturi nozzle is controlled in the same way as in the variant NC. That is, the ejector switches to “suction” operating mode when the “suction” signal is present.
  In the event of a power failure, the last state is retained. (If the suction signal is present when the power fails but the ejector is currently in control mode, the ejector is switched to continuous suction.)

An integrated sensor records the vacuum generated by the venturi nozzle. The vacuum value is displayed via the LED bar and can be read out via the process data.

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




The ejector also has a button that can be used for manual operation.

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

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

### 3.5.1 Ejector Variants

#### Information Relating to Switching Logic

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

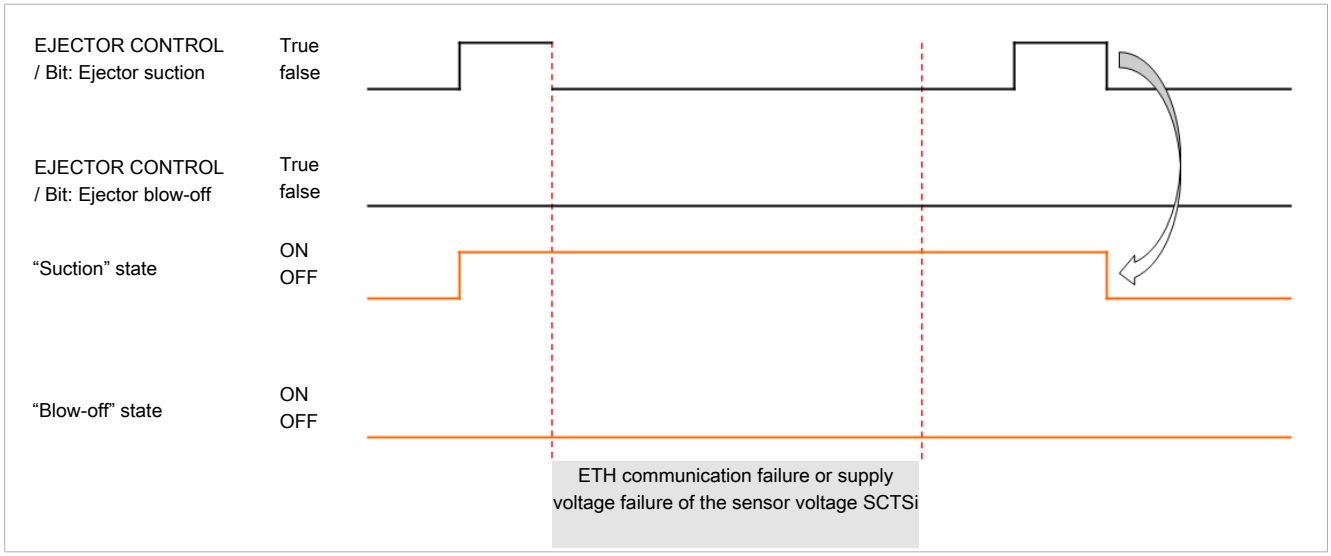
- In the (normally open) variant NO, the venturi nozzle is deactivated when the suction signal is received.
- In the (normally closed) variant NC, the venturi nozzle is activated.
- In the variant IMP, the venturi nozzle is controlled in the same way as in the variant NC. It is therefore not necessary to trigger pulses using the Suction command. Transmission in pulses is carried out internally in the ejector depending on the requested Suction command.

#### Power failure or communication failure with the ejector variant IMP

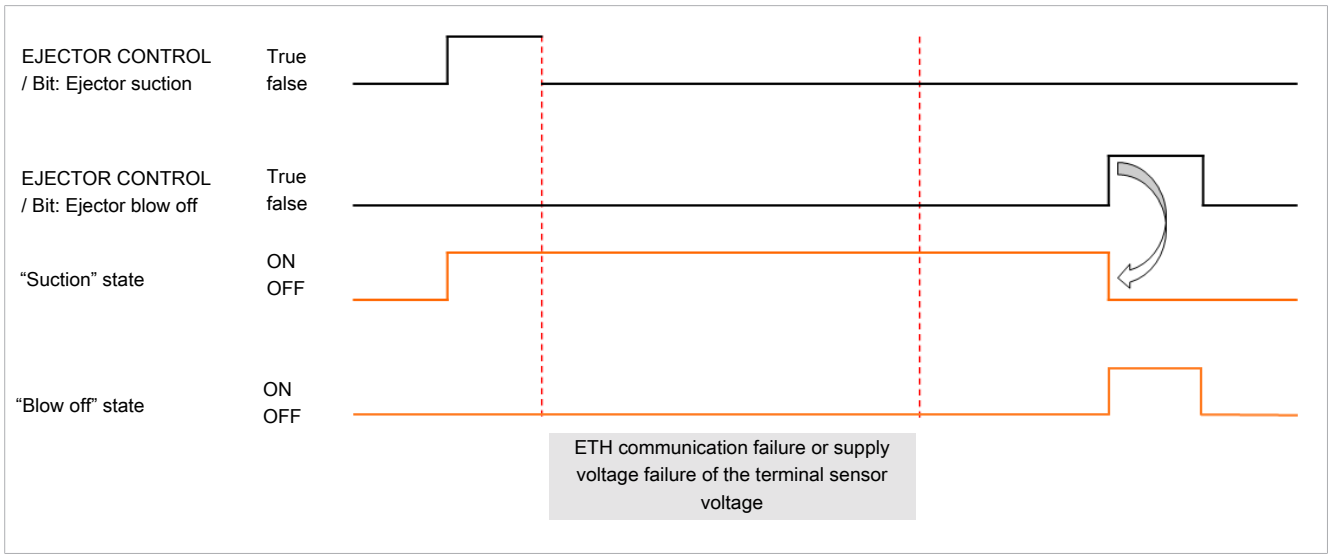
In the ejector variant IMP, the ejector remains in “Suction” mode if the power supply fails during automatic operation. This prevents the object being gripped from falling from the suction cup in the event of a power failure (or failure of the control unit or its communication). This also applies when the ejector is in “venturi nozzle inactive” status with the air saving function activated. In this case, the ejector switches to “venturi nozzle active,” i.e., to continuous suction. When the actuator supply voltage returns, the ejector remains in automatic mode with the air saving function activated.

If the pulse ejector is in the “Suction” operating state when the terminal is restarted or communication is re-established (after a communication interruption with the control unit), it can only be reset to the “No suction” operating state either by a falling edge of the suction command (option 1) or by a rising edge of the blow off command (option 2).

**Option 1:** SUCTION = OFF after a communication failure or restart of the SCTSi via falling edge at bit: Ejector suction

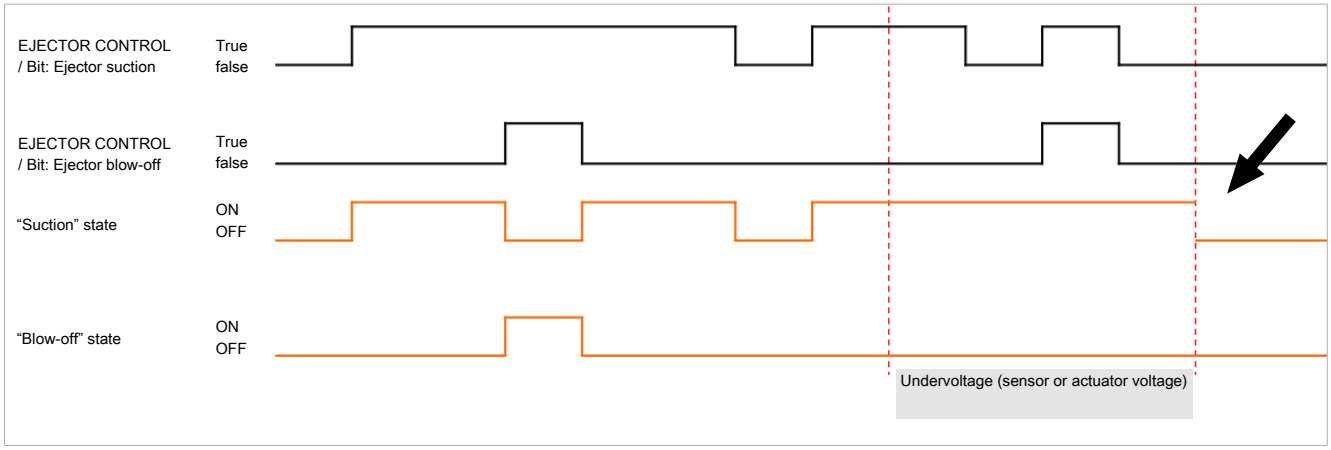



**Option 2:** SUCTION = OFF after a communication failure or restart of the SCTSi via rising edge at bit: Ejector blow off



### Undervoltage for ejector variant IMP

In contrast to a power failure or communication interruption, the suction command is reset in the event of undervoltage (without restarting the terminal) as soon as the supply voltage is in the permissible range again and Bit = false is present on the suction ejector.



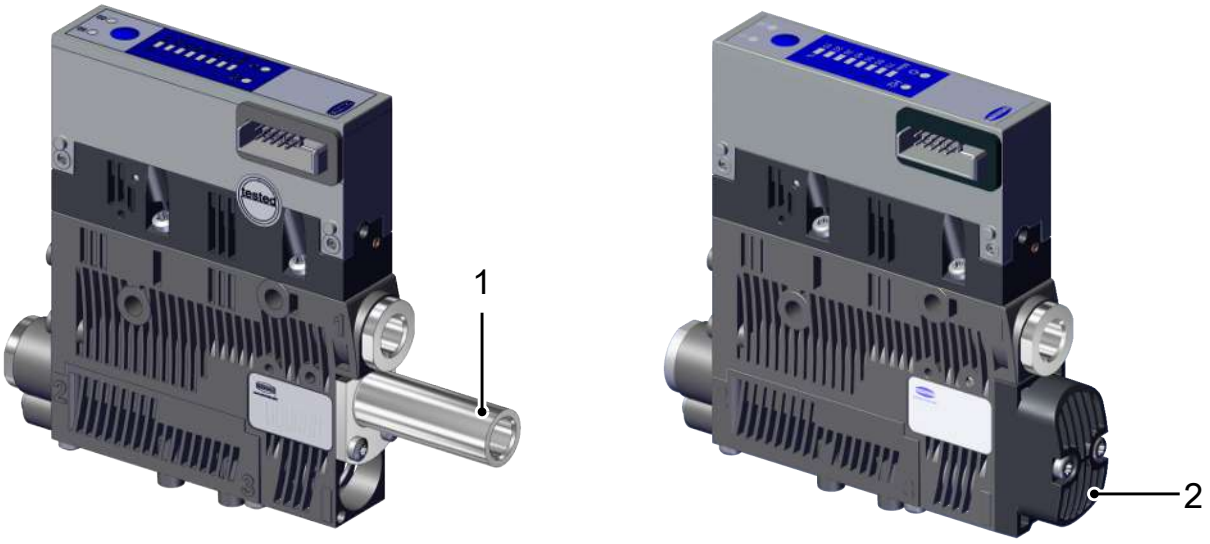

The blow off valve on the ejector is activated and deactivated using the blow off command. The valve is always designed as an NC (normally closed) variant and switches the air pressure channel to the vacuum connection for the duration of activation. If both suction and blow off are activated, blow off is given higher priority and the venturi nozzle is not activated.

If the ejector is in “blow off” mode when the power supply fails, the blow off is stopped and the ejector is set to “pneumatically OFF” status. This prevents unnecessary consumption of compressed air, thus saving energy and additional costs. When the power supply returns, the ejector remains in “pneumatically OFF” status.

If communication of the higher-level bus system (Profinet, Ethernet/IP, EtherCAT) is interrupted, the ejectors retain their last activated state of suction, the neutral position or blow-off.

### Information Relating to the Exhaust Duct

The exhaust duct is marked with the number 3 on the ejector.




| | | | |
|---|---|---|---|
| 1 | Variant with exhaust outlet with **exhaust duct** | 2 | Variant with exhaust outlet with **integrated silencer** |

**CAUTION! Hearing damage caused by the operation of the ejector without silencer or without exhaust air hose!** In the variant with exhaust duct (1), one of the following system expansions must be added to ensure the safe operation of the ejector by the operator:

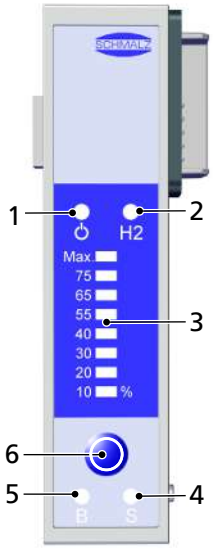
- Mounting of a silencer
- Mounting of an exhaust air hose

on all ejectors via the thread G... (1/8" internal thread).

### 3.5.2 Ejector Displays and Operating Elements

The **MANUAL MODE** button (6) switches the ejector to manual mode.

An LED bar and 4 LEDs are used to indicate the following information:

| Ejector | Item | Meaning | State | Description |
|---|---|---|---|---|
|  | 1 | Operating mode LED | Green | In operation |
| | | | Flashing green | 1 Hz: Connection error<br>2 Hz: local firmware update |
| | 2 | Limit value H2 LED | Yellow | Switching point H2 reached |
| | | | Off | Switching point H2 not reached |
| | 3 | LED bar | Off | Vacuum < 10% |
| | | | Yellow | Current vacuum level |
| | | | Flashing yellow | Vacuum outside of measurement range (10% blow-off, for example) |
| | 4*) | Suction LED S | Off | No suction from ejector |
| | | | Yellow | Suction from ejector |
| | 5*) | Blow-off LED B | Off | Ejector not blowing off |
| | | | Yellow | Ejector blowing off |
| | 6 | **MANUAL MODE** button | Manual control of the suction and blow-off ejector functions (both the suction and blow-off LEDs flash).<br>Refer to the “Manual Operation of the Ejectors” chapter. | |

*) The suction and blow-off LEDs are activated only when there is actuator supply voltage.

# 4 Technical Data

## 4.1 Operation and Storage Conditions

| | |
|---|---|
| **Operating medium** | Air or neutral gas, filtered to 5 µm, oiled or not oiled<br>Class 3-3-3 compressed air quality acc. to ISO 8573-1 |
| **Max. dynamic pressure** | 6.8 bar |
| **Working temperature** | 0 to 50° C |
| **Storage temperature** | -10 to 60° C |
| **Permitted air humidity** | 10 to 85% RH (free from condensation) |
| **Environmental conditions** | Do not use outdoors and do not permanently expose to direct sunlight |
| **Precision of vacuum sensor** | ± 3% FS (full scale) |
| **Operating pressure (flow pressure)** | See chapter on performance data |

## 4.2 Electrical and Technical Parameters

| | | | |
|---|---|---|---|
| **Supply voltage for sensor** | 24 V -20 to +10% VDC (PELV[1)]) | — | |
| **Supply voltage for actuator** | 24 V -20 to +10% VDC (PELV[1)]) | — | |
| | | Typ. | Max. every 500 ms for 25 ms |
| **Power consumption, sensor supply voltage (at 24 V)** | Bus module | 100 mA | — |
| | 1 x NC ejector | 10 mA | — |
| | 1 x NO ejector | 10 mA | — |
| | 1 x IMP ejector | 10 mA | — |
| **Power consumption, actuator supply voltage (at 24 V)** | Bus module | 10 mA | — |
| | 1 x NC ejector (suction and release) | 20 mA | 30 mA |
| | 1 x NO ejector (no suction / release) | 20 mA / 30 mA | 40 mA / 60 mA |
| | 1 x IMP ejector (no suction / release) | 10 mA / 30 mA | 10 mA / 40 mA |
| **Polarity reversal protection** | Yes, all M12 connector connections | | |
| **Degree of protection** | IP 65 | | |
| **NFC** | NFC Forum Tag type 4 | | |

[1)] The power supply must correspond to the regulations in accordance with EN60204 (protected extra-low voltage). In addition, the voltage must be electrically isolated from the sensor supply voltage while taking the basic insulation into account (in accordance with IEC 61010-1, secondary circuit with maximum 30 V DC derived from the mains circuit up to 300 V of overvoltage category II).

## 4.3 IO link process data

| Connected ejectors Quantity | Maximum cycle time ms | Process data input [bytes] | Output process data [bytes] |
|---|---|---|---|
| 2 to 4 | 4.0 | 5 | 3 |
| 5 to 8 | 4.8 | 6 | 4 |
| 9 to 12 | 5.4 | 7 | 5 |
| 13 to 16 | 6.0 | 8 | 6 |

## 4.4 Tested IO-Link master

| Manufacturer | Type | Index |
|---|---|---|
| Phoenix | axl-e-pn-iol-m12-6p | HW/FW: 02/200 |
| Balluff [1)] | BNI PNT508-105-Z015 | H01 S1.0 |
| Siemens | 6ES7148 6JD00-0AB0 | V 1.0.1 |
| Beckhoff | EL6224 | Rev.no.: 0020 |

1) If necessary, the actuator voltage must be supplied to the IO-Link terminal via a Y cable.

The compatibility test was performed using an SCTSi with 8 NO and 8 NC ejectors.

## 4.5 Mechanical Data

### 4.5.1 Performance Data

All data is based on the ejector SCPSt:

| Type | Nozzle size mm | Max. vacuum[1)] % | Suction rate[1)] l/min | Blow-off air consumption[1)] l/min | Air consumption[1)] l/min |
|---|---|---|---|---|---|
| SCPS-07 | 0.7 | 85 | 16 | 120 | 22 |
| SCPS-10 | 1.0 | 85 | 36 | 120 | 46 |
| SCPS-15 | 1.5 | 85 | 65.5 | 120 | 98 |
| SCPS-2-07 | 0.7 | 85 | 37 | 120 | 22 |
| SCPS-2-09 | 0.9 | 85 | 49.5 | 120 | 40.5 |
| SCPS-2-14 | 1.4 | 85 | 71.5 | 120 | 82 |

[1)] at 4 bar

| Type | | Sound level[1)], unobstructed suction dBA | Sound level[1)] with workpiece picked up dBA |
|---|---|---|---|
| SCTSi with 2 ejectors | (07 … 15) | 75 … 82 | 66 … 77 |
| SCTSi with 4 ejectors | (07 … 15) | 77 … 84 | 68 … 79 |
| SCTSi with 8 ejectors | (07 … 15) | 78 … 85 | 70 … 81 |
| SCTSi with 16 ejectors | (07 … 15) | 81 … 83 | 70 … 78 |
| Individual ejector SCPS-07 | | 63 | 58 |
| Individual ejector SCPS-10 | | 73 | 60 |

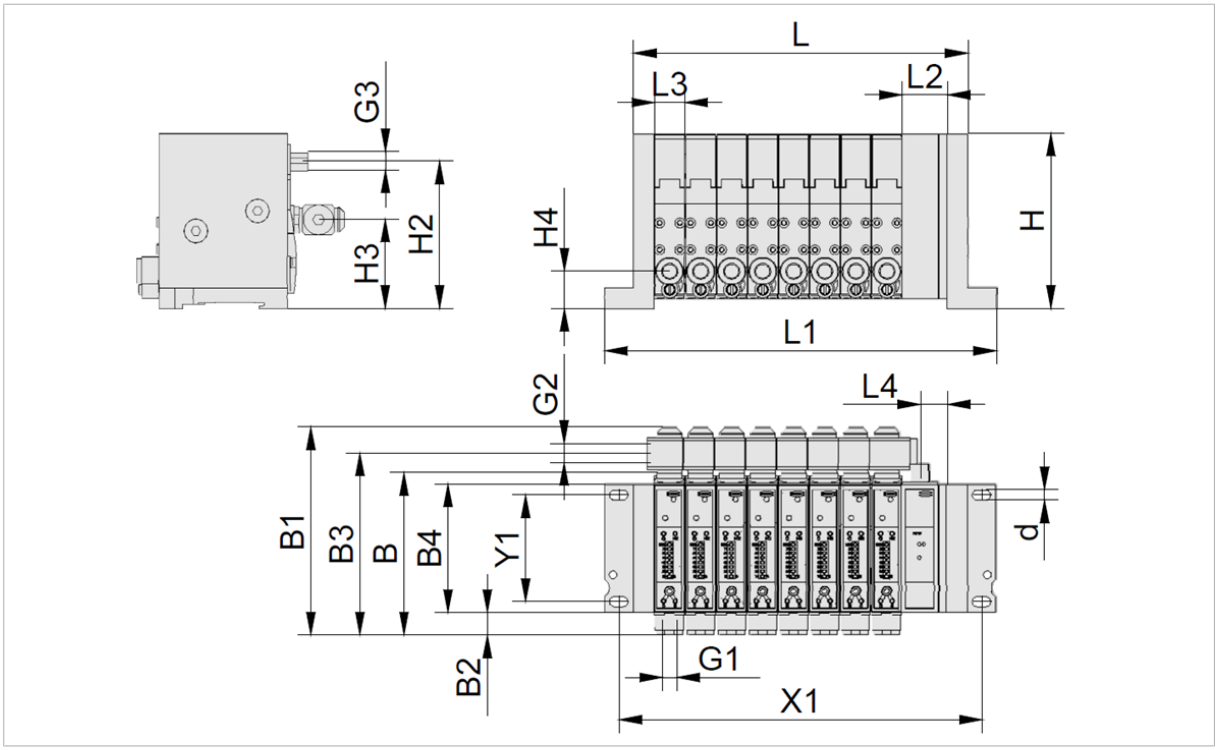
| Type | Sound level[1], unobstructed suction<br>dBA | Sound level[1] with workpiece picked up<br>dBA |
|---|---|---|
| Individual ejector SCPS-15 | 73 | 65 |
| Individual ejector SCPS-2-07 | 63 | 58 |
| Individual ejector SCPS-2-09 | 73 | 60 |
| Individual ejector SCPS-2-14 | 75 | 65 |

[1] at 4 bar

### 4.5.2 Dimensions

**Table of dimensions with formulas**

When using terminal variants with power blow off or an exhaust air pipe, see the parameter drawings for the ejector disc further below for differing dimensions.

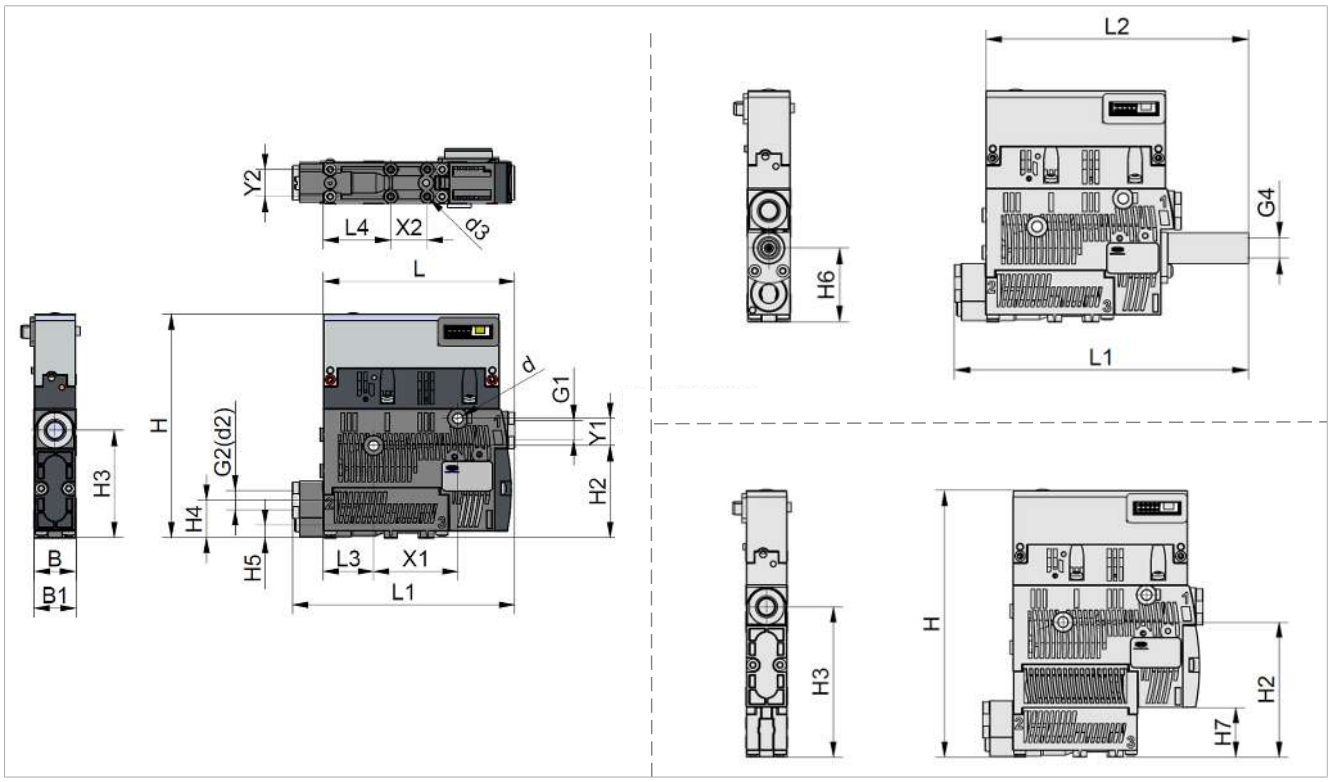



| L | L1 | L2 | L3 | L4 | B | B1 | B2 | B3 | B4 |
|---|---|---|---|---|---|---|---|---|---|
| 25.2+L2+(n*L3) | 59.2+L2+(n*L3) | 27 | 18.5 | 16 | 97.5 | 125 | 13.5 | 109 | 77 |

| H | H2 | H3 | H4 | d | X1 | Y1 | G1 | G2 | G3 |
|---|---|---|---|---|---|---|---|---|---|
| 105 | 89 | 54 | 22.5 | 5.5 | 44+L2+(n*L3) | 64 | 1/8" internal thread | 1/4" internal thread | M12x1 external thread |

The letter “n” stands for the number of ejector discs installed in the terminal.

## Ejector dimensions




| B | B1 | H | H2 | H3 | H4 | H5 | G1 | G2 |
|---|---|---|---|---|---|---|---|---|
| 18 | 18.6 | 99 | 40.8 | 47.5 | 16.5 | 5.5 | 1/8" internal thread | 1/8" internal thread |

| L | L1 | L2 | L3 | L4 | X1 | X2 | Y1 | Y2 | d | d3 |
|---|---|---|---|---|---|---|---|---|---|---|
| 83.8 | 107 | 92.5 | 22 | 29.5 | 36.9 | 16 | 12 | 12 | 4.4 | 2.6 |

### Different dimensions for the variant with power blow off module

| H | H2 | H3 | H7 |
|---|---|---|---|
| 118 | 59.8 | 66.5 | 22 |

### Different dimensions for the variant with exhaust pipe

| H6 | L1 | L2 | G4 |
|---|---|---|---|
| 31.5 | 126 | 112.5 | 1/8" internal thread |

All dimensions given in millimeters [mm].

### 4.5.3 Terminal Mass

The mass of a terminal is determined by the masses of the individual components:

| Individual components | Mass [g] |
|---|---|
| IO-Link class B bus system | 150 |
| Ejector disc | 240 |
| Cover and clamping elements for 1 to 9 ejector discs | Approx. 230 |
| Cover and clamping elements for 10 to 16 ejector discs | Approx. 350 |

The approximate mass of one terminal amounts to:

- with up to 9 ejector discs
  m = approx. 230 g + 150 g + (n*240) g
- with 10 to 16 ejector discs
  m = ca. 350 g + 150 g + (n*240) g

The letter “n” stands for the number of ejector discs installed in the terminal.

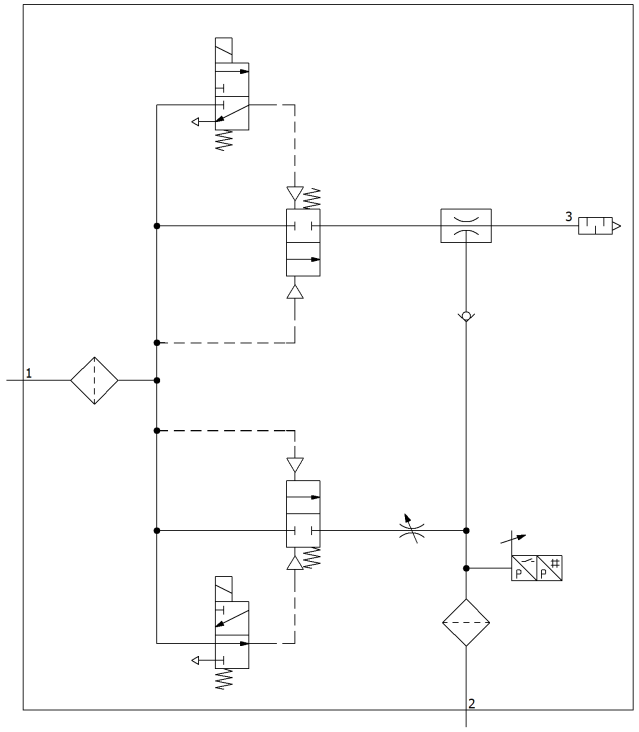
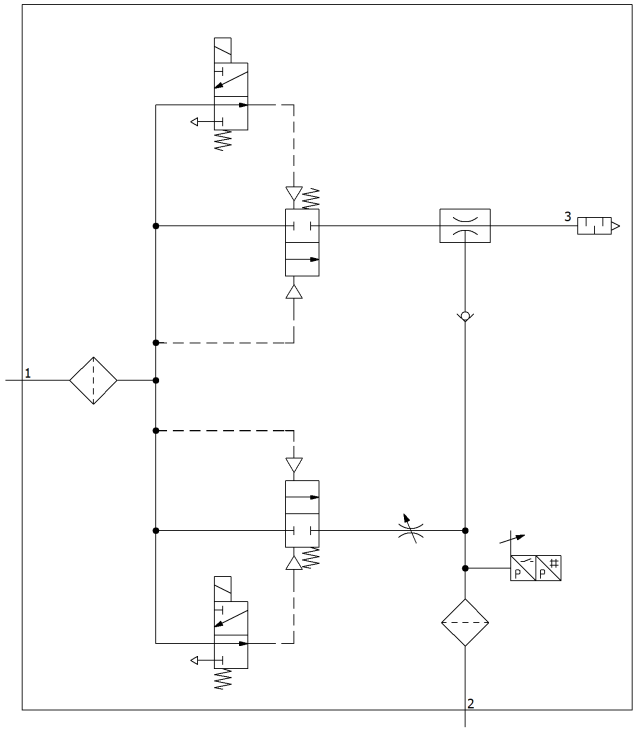
The order confirmation indicates the exact mass of the respective terminal.

### 4.5.4 Pneumatic circuit plans

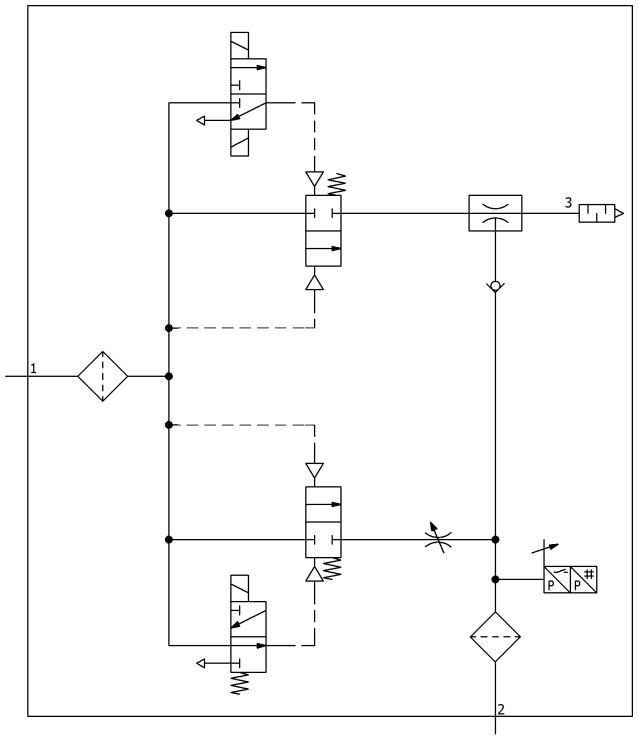
The illustrated pneumatic circuit diagrams show the product in an unpressurized state in accordance with the standard DIN ISO 1219-1.

| **Key:** | |
|---|---|
| NC | Normally closed |
| NO | Normally open |
| IMP | Bistable, pulse-controlled |
| M | Power blow off |
| 1 | Compressed air connection |
| 2 | Vacuum connection |
| 3 | Exhaust outlet |

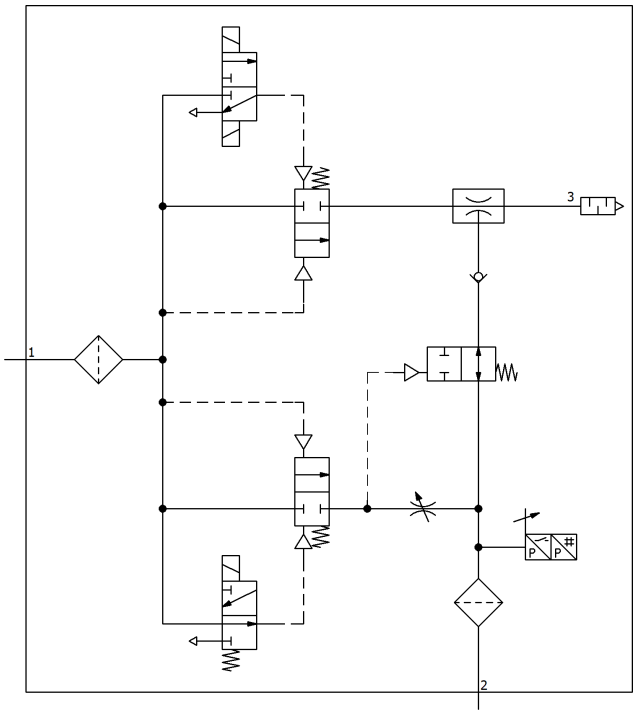
**Pneumatic circuit diagrams for the standard single-stage version**

| ...NO... | ...NC... |
|---|---|
|  |  |

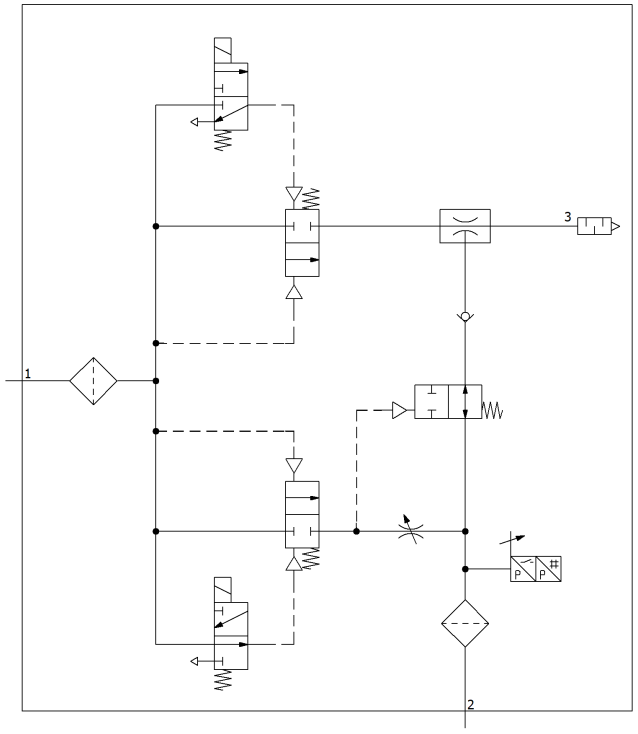
**...IMP**



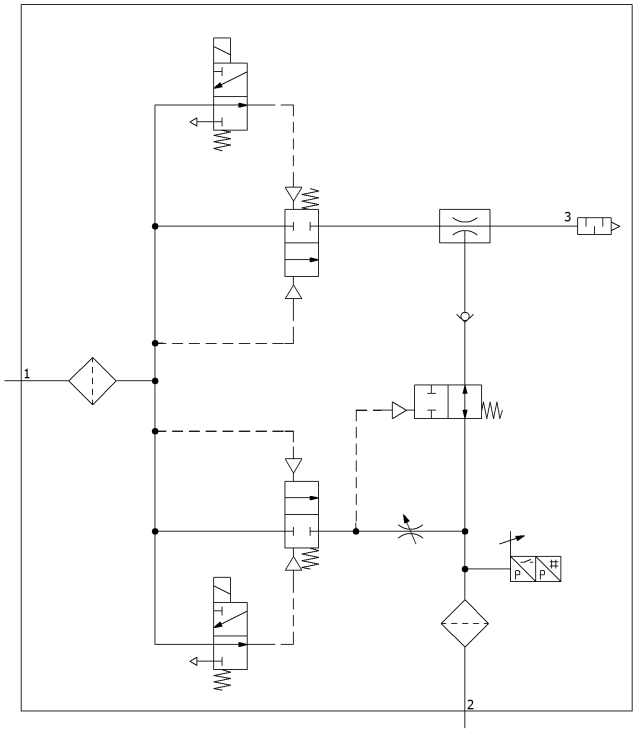

**...IMP_M**



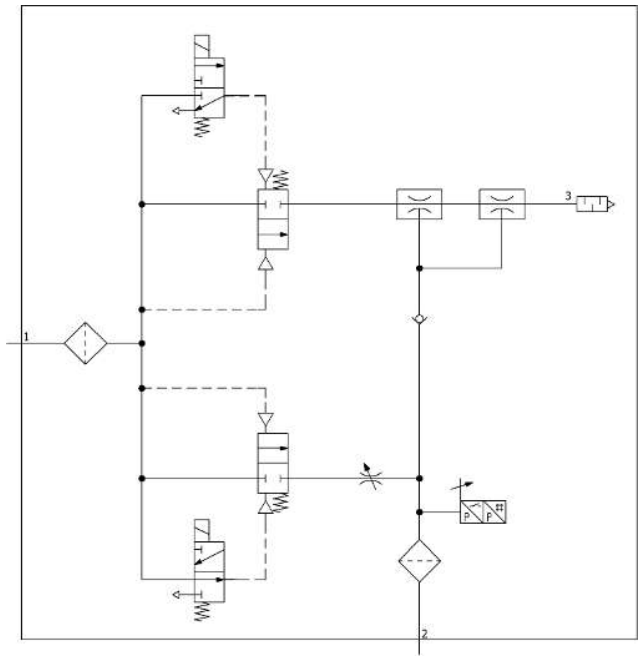
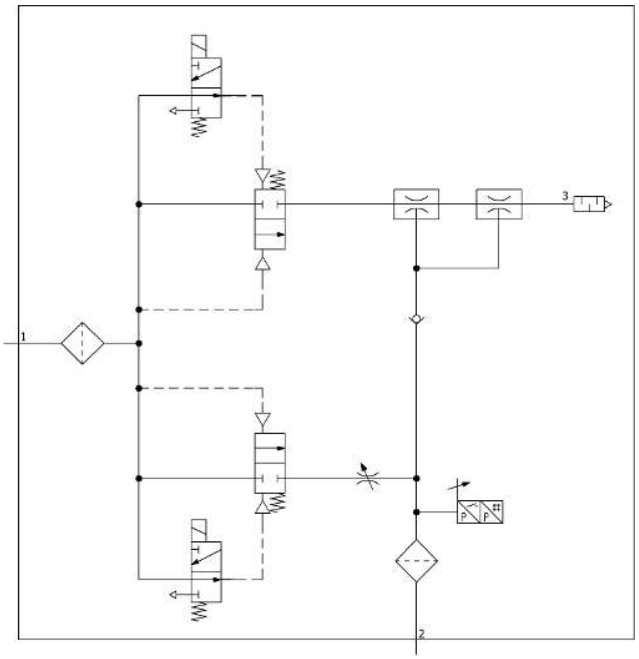
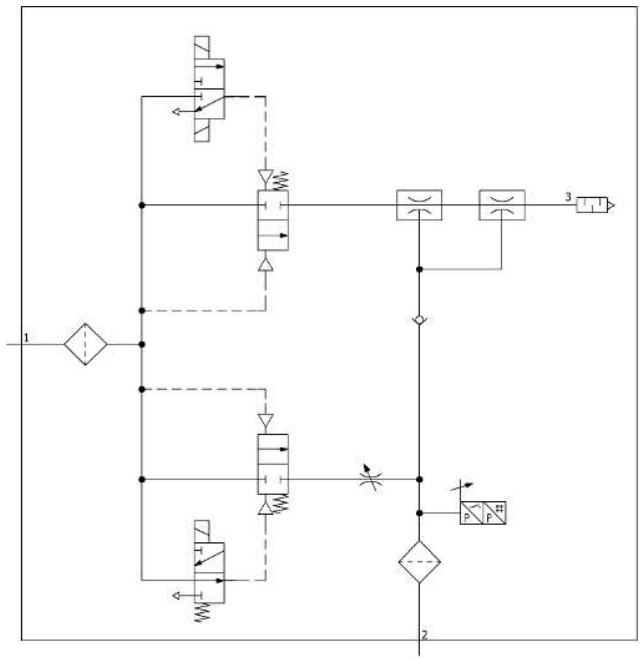
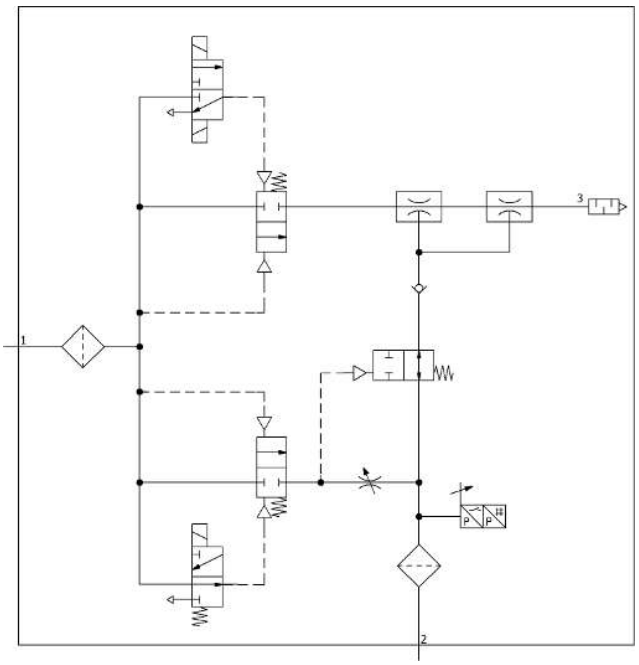

**...NO... M**

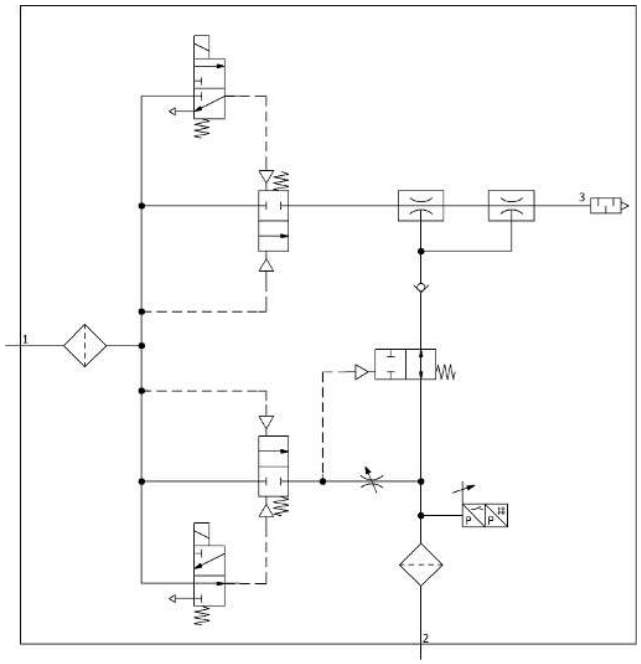
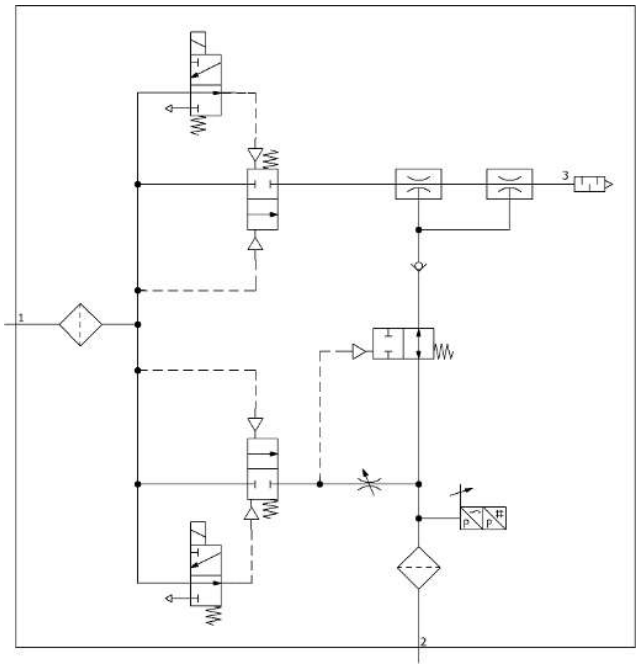



**...NC...M**



## Pneumatic circuit diagrams for the two-stage version

| ... NO... | ...NC... |
| --- | --- |
|  |  |
| **...IMP...** | **...IMP_M** |
|  |  |

| ... NO...M | ... NC...M |
|---|---|
|  |  |

### 4.5.5 Factory Settings

The factory settings relate to the particular ejector of the Compact terminal SCTSi.

| Parameter | (dec) | (hex) | Value | Description |
|---|---|---|---|---|
| Limit value switching point H1 | 100 | 0x0064 | –750 mbar | — |
| Hysteresis h1 | 101 | 0x0065 | 150 mbar | — |
| Limit value switching point H2 | 102 | 0x0066 | –550 mbar | — |
| Hysteresis h2 | 103 | 0x0067 | 10 mbar | — |
| Blow-off pulse duration | 106 | 0x006A | 200 ms | — |
| Permitted evacuation time | 107 | 0x006B | 2000 ms | — |
| Permitted leakage | 108 | 0x006C | 250 mbar/s | — |
| Air saving function | 109 | 0x006D | 0x02 | Control active |
| Blow-off mode | 110 | 0x006E | 0x00 | Externally controlled |

# 5 Control Interfaces

## 5.1 Basic Principles of IO-Link Communication

The ejector can be operated in IO-Link mode to enable intelligent communication with a controller.

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

The ejector's parameters can be set remotely using IO-Link mode. In addition, the energy and process control (EPC) feature is available. The EPC is divided into 3 modules:

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

## 5.2 Process Data

The cyclical process data is used to control the ejectors and receive current information reported from the Compact terminal SCTSi. From the perspective of the higher-level PLC, there is a difference between input process data (data from the Compact terminal SCTSi) and output process data (data to the Compact terminal SCTSi):

Device description files are available for integration into a higher-level controller.

The input data Process Data Out provides cyclical reporting of a range of information relating to the device and the individual ejectors:

- Device Select is used to select who is to send the EPC data.
- EPC Select is used to define which data is sent.
- To determine the air consumption, the system pressure can be preset.
- All of the ejectors are controlled using the Suction and Blow-off commands.

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

- The device status in the form of a status traffic light
- EPC data
- Errors and warnings for the overall system and the individual ejectors
- Supply voltage of sensors and actuators
- Total air consumption
- Information for individual ejectors such as the vacuum, evacuation time, dynamic pressure and air consumption of an ejector
- The switching values H1 and H2 for the connected ejectors

The exact meaning of the data and functions is described in more detail in the "Description of Functions" chapter. You can find a detailed diagram of the process data in the data dictionary and IODD.

## 5.3 Retrievable Information via the ISDU Parameter

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

The ISDU channel can also be used to read or overwrite all the device settings (e.g. control thresholds, switching points, permitted leakage, etc). Further information about the identity of the device, such as the part number and serial number, can be retrieved via IO-Link. The device also provides space for saving user-specific information here, such as the installation and storage location.

The exact meaning of the data and functions is described in chapter 5 “Functions of the Compact Terminal and Ejectors/Valves”.

You can find a detailed diagram of the parameter and process data in the Data Dictionary and IODD.

## 5.4 Interface NFC

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

The device functions as a passive NFC tag that can be read or written to by a reading device such as a smartphone or tablet with NFC activated. Read access to the device via NFC is also possible when the supply voltage is not connected.

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.

# 6 Functions of the Compact Terminal and Ejectors/Valves

## 6.1 Overview of Functions

The Compact terminal SCTSi primarily consists of the IO-Link bus module and between 2 and 16 ejectors. A function therefore refers to either the IO-Link bus module or an ejector.

**Device status of the overall terminal**

Many parameters and values are measured with Compact terminal SCTSi monitoring and diagnostic functions. These values are made available via the process data and parameter data and are used for further diagnostics.

**Device Monitoring (Determination of the Required System Parameters)**

- Current terminal operating voltages
- Ejector evacuation times
- Ejector air consumption data
- Ejector leakage data
- Ejector dynamic pressure data (free-flow vacuum)
- Ejector vacuum data (maximum or current)

**Device Diagnostics:**

- Terminal status via status traffic light (device status)
- Terminal status via extended status signals (extended device status)
- Condition diagnostics of the bus module and ejectors (condition monitoring control unit/condition monitoring ejector)
- Error status of the bus module and ejectors (CU active errors/ejector errors)
- Provision of IO-Link events

**Bus Module Functions (Control Unit)**

The IO-Link bus module has the following general functions:

Device data:

- Device identification
- System commands
- Access rights
- User-specific localization

**Ejector Functions**

Functions of the ejectors SCPStc:

- Switching points for control and component checks
- Air saving functions
- Blow-off functions
- Setting for the permitted evacuation time t1
- Setting for the permitted leakage
- Permanent and erasable counters for the suction cycles and switching frequency of the valves
- Manual mode[1)]

- Ejector control (suction and release)

- Display of the ejector status (status of the vacuum level)

The functions relate to an ejector Compact terminal SCTSi and apply to each individual ejector, regardless of the number of installed ejectors.

[1)] The Manual Mode function of the ejectors is described in the "Operation" section.

Note about replacing the device: All modifiable parameter data (e.g. switching point settings) is saved in the bus module. When replacing an ejector, the previous data is loaded to the new ejector.

## 6.2 Device Identification

The IO-Link protocol provides a range of identification data for compliant devices that can be used to uniquely identify a particular device. This product contains even more advanced identification parameters.

The parameters are ASCII character strings that adapt their length to the relevant content.

The following parameters can be called up:

- Device vendor name and web address
- Vendor text
- Product name and product text
- Serial number
- Version status of the hardware and firmware (hardware and firmware revision)
- Unique device ID and device properties
- Article number and development status (article number, article revision)
- Production date
- System configuration
- Device ID

## 6.3 User-Specific Localization

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

- Application-specific tag
- Geolocation
- Storage location
- Equipment identification
- Installation date
- Web link for NFC app and device description file (GSD web link, NFC web link)

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.

## 6.4 System Commands

System commands are processes predefined by IO-Link to trigger specific functions. They are controlled using write access with a predefined value.

| ISDU (dec) | Parameter | Value (hex) | Description |
|---|---|---|---|
| 2 | System command | 0x05 | Parameter upload to the IO-Link master |
| | | 0x82 | Reset to factory settings |
| | | 0xA5 | Calibration of the sensors of the ejectors |
| | | 0xA7 | Reset counters |
| | | 0xA8 | Reset min./max. supply voltages |

| Description | Explanation of system commands |
|---|---|
| Parameter upload to the IO-Link master | All SCTSi setting parameters are loaded in the IO-Link master and saved there. |
| Resetting to factory settings | All setting parameters for the ejectors are reset to the factory settings. Counter statuses, the zero-point adjustment of the sensor and the maximum and minimum values of the measurements are not affected by this function. |
| Calibration of the sensors of the ejectors | The sensors for all ejectors are calibrated. Since the sensors installed in the ejectors are subject to variations due to the manufacturing process, it is recommended to calibrate the sensors after the SCTSi is installed. The vacuum connections of all of the ejectors must be ventilated to the atmospheric pressure before a zero-point adjustment can be made to the sensors.<br>A zero offset is only possible by a maximum of ± 3% (FS) around the theoretical zero position.<br>The result of the calibration is reported by an IO-Link event. |
| Reset counters | The two deletable counters (ISDU parameters 143 and 144) are deleted in each ejector. |
| Reset of min/max supply voltages | The minimum and maximum values of the two supply voltages for the sensor and actuator are deleted. |

## 6.5 Access Rights: PIN code for NFC write protection

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

The NFC PIN code can be changed only in the parameter 0x005B using IO-Link.

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 for the device to accept the changes.

| ISDU (dec) | Parameter | Bit | Description |
|---|---|---|---|
| 91 | PIN code | 0 | PIN code for NFC write protection |

## 6.6 Restricting Access with Extended Device Access Locks

In the Extended Device Access Locks parameter, there is an option to completely prevent NFC access or limit it to read-only function.

The NFC lock using the Extended Device Access Locks parameter has a higher priority than the NFC PIN. That means that this lock also cannot be bypassed by entering a PIN.

The firmware of the ejectors at the time of delivery is stored on the bus module. When the device is switched on, the existing ejector firmware is updated by the bus module if the ejector firmware corresponds to an older version (local firmware update). This update can be disabled via the Extended Device Locks parameter.

| ISDU | Parameter | Bit | Description |
|---|---|---|---|
| 90 | Extended Device Access Locks | 0 | Parameters cannot be changed via NFC |
| | | 1 | NFC tag completely switched off |
| | | 2 | Firmware update for the ejectors is prevented |
| | | 3 | Manual mode locked for the ejectors |
| | | 4 | Prevention of creation of IO-Link events |

## 6.7 Diagnostics and Monitoring Functions of the Compact Terminal

The monitoring functions of the Compact terminal SCTSi measure many parameters and values. The values are made available via the process data and ISDU parameters and are used for further diagnostics:

- Determination of the required system parameters
- Display of the device status through messages and system status traffic lights
- Provision of EPC data using the process data
- Condition monitoring
- Provision of IO-Link events

### 6.7.1 Determining SCTSi System Parameters

The following parameters are used for the system monitoring functions and are made available to the user as ISDU parameters. The values for the individual ejectors are constantly redetermined for each suction cycle.

| ISDU (dec) | Monitoring function |
|---|---|
| 66 | Sensor voltage: current level, minimum and maximum level |
| 67 | Actuator voltage: current level, minimum and maximum level |
| 148 | Evacuation time t0 for ejector 1 to 16 |
| 149 | Evacuation time t1 for ejector 1 to 16 |
| 156 | Air consumption per cycle for ejector 1 to 16 |
| 160 | Leakage for ejector 1 to 16 |
| 161 | Dynamic pressure for ejector 1 to 16 |
| 164 | Maximum vacuum reached per suction cycle for ejector 1 to 16 |

#### Current Operating Voltage

The operating voltages $U_S$ and $U_A$ that are currently applied on the device are measured.

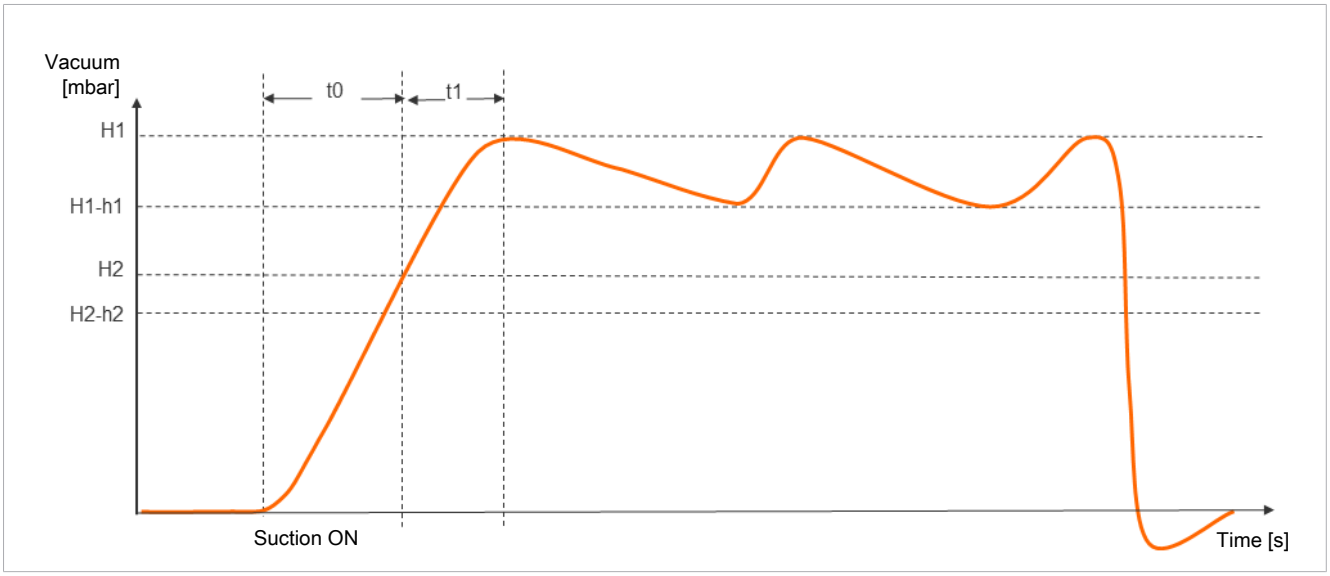
| ***Parameter offset*** | **66 (0x0042)** | **67 (0x0043)** |
|---|---|---|
| ***Description*** | Primary supply voltage (supply voltage for sensor) | Auxiliary supply voltage (supply voltage for actuator) |
| ***Index*** | 0: actual value as measured by the device<br>1: min. value since last power-up<br>2: max. value since last power-up | |
| ***Data type*** | uint16 | |
| ***Length*** | 6 byte | |
| ***Access*** | read only | |
| ***Default value*** | - | |

| | |
|---|---|
| ***Unit*** | 0.1 V |
| ***EEPROM*** | no |

In addition, the maximum and minimum values for the $U_S$ and $U_A$ operating voltages that were measured since the last activation are logged.

The maximum and minimum values can be reset during operation using the appropriate system command.

### Measuring the Evacuation Time t0 and t1




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 threshold H2 is reached.

The evacuation time t1 is defined as the time (in ms) from when switching threshold H2 is reached until switching threshold H1 is reached.

| **Offset parameter** | **148 (0x0094)** | **149 (0x0095)** |
|---|---|---|
| **Description** | Evacuation time t0 for ejectors | Evacuation time t1 for ejectors |
| **Index** | Index 0 to 15 corresponds to ejector #1 to #16 | |
| **Data type** | uint16 | |
| **Length** | 32 bytes | |
| **Access** | Read only | |
| **Value range** | 0 … 65535 | |
| **Default value** | - | |
| **Unit** | ms | |
| **EEPROM** | No | |

### Measuring the Air Consumption

The actual air consumption of a suction cycle is calculated taking the system pressure and nozzle size into account.

The supply pressure process data can be used to notify the ejector of the actual system pressure. If it is not explicitly defined (values > 0 mbar), a measurement result is not provided.

| Offset parameter | 156 (0x009C) |
|---|---|
| Description | Air consumption per cycle for ejectors |
| Index | 0 to 15: Air consumption per cycle for ejectors #1 to #16<br>16: Air consumption per cycle of all ejectors |
| Data type | uint32 |
| Length | 68 bytes |
| Access | Read only |
| Value range | 0 to 15: 0 to 65535<br>16: 0 to 1048560 |
| Default value | - |
| Unit | 0.1 Nl |
| EEPROM | No |

### Measuring Leakage

This function measures the leakage “Leakage rate for ejectors” 0x00A0 (represented as the vacuum drop per time unit in mbar/s) after the air saving function interrupts the suction because switching point H1 was reached.

| Offset parameter | 160 (0x00A0) |
|---|---|
| Description | Leakage rate for ejectors |
| Index | Index 0 to 15 corresponds to ejector #1 to #16 |
| Data type | uint16 |
| Length | 32 bytes |
| Access | Read only |
| Value range | 0 … 8000 |
| Default value | - |
| Unit | mbar/s |
| EEPROM | No |

### Measuring Dynamic Pressure

The system vacuum achieved during unobstructed suction is measured using parameter “Free-flow vacuum” 0x00A1. The duration of the measurement is approx. 1 second. Thus evaluation of a valid dynamic pressure value requires at least one second of unobstructed suction after the suction cycle has commenced. The suction point must not be occupied by a component at this time.

Measured values below 5 mbar or above the switching point H1 are not regarded as valid dynamic pressure measurements and are rejected. The result of the last valid measurement is retained.

Measured values above the switching point (H2 - h2) but simultaneously lower than switching point H1 result in a condition monitoring event.

| Offset parameter | 161 (0x00A1) |
|---|---|
| Description | Free-flow vacuum for ejectors |
| Index | Index 0 to 15 corresponds to ejector #1 to #16 |
| Data type | uint16 |
| Length | 32 bytes |

| | |
|---|---|
| **Access** | Read only |
| **Value range** | 0 … 999 |
| **Default value** | - |
| **Unit** | mbar |
| **EEPROM** | No |

#### Maximum Vacuum Reached

In each suction cycle, the maximum system vacuum level reached is determined and made available as the parameter “Max. reached vacuum in cycle for ejector” 0x00A4.

| | |
|---|---|
| **Offset parameter** | **164 (0x00A4)** |
| **Description** | Max. vacuum reached in cycle for ejector |
| **Index** | Index 0 to 15 corresponds to ejector #1 to #16 |
| **Data type** | uint16 |
| **Length** | 32 bytes |
| **Access** | Read only |
| **Value range** | 0 … 999 |
| **Default value** | - |
| **Unit** | mbar |
| **EEPROM** | No |

### 6.7.2 Device Diagnostics

#### Device status (process data)

The overall status of the ejector system is displayed as a traffic light in “Process Data In” byte 0. All warnings and errors are used to determine the status shown here.

This basic display provides immediate information about the status of the ejector with all its input and output parameters.

| State | Description |
|---|---|
| 00 (green) | System is working perfectly with optimal operating parameters |
| 01 (yellow) | The ejectors are working but maintenance is required |
| 10 (orange) | SCTSi is working but there are warnings |
| 11 (red) | Error – Safe operation of the SCTSi within the operating limits is no longer ensured (error code is available in the error parameter) |

### IO-Link device status

The ISDU parameters provide additional status traffic lights. The state of the SCTSi is displayed in 5 levels.

| ISDU (dec) | Parameter | State | Description |
|---|---|---|---|
| 36 | IO-Link device status | 0 (green) | System is working correctly |
| | | 1 (yellow) | Maintenance of ejectors is required |
| | | 2 (orange) | SCTSi is working outside the permitted specifications |
| | | 3 (orange) | Functional check of the SCTSi is required |
| | | 4 (red) | Error – Safe operation of the ejector within the operating limits is no longer ensured |

### Extended Device Status (0x008A)

The category of the pending event code and the current event code (IO-Link event) itself are shown via the ISDU parameter 138 “Extended Device Status.”

**Extended Device Status Event Category**

| ***Parameter*** | **138 (0x008A)** |
|---|---|
| ***Description*** | Extended device status – event category |
| ***Byte*** | 1+2: Event category of current device status |
| ***Access*** | Read only |
| ***Value range*** | 0x10: Device is operating properly<br>0x21: Warning, low<br>0x22: Warning, high<br>0x41: Critical condition, low<br>0x42: Critical condition, high<br>0x81: Defect/fault, low<br>0x82: Defect/fault, high |

For more information, see the chapter “IO-Link Events.” There is also a detailed display in the IODD.

More detailed error code descriptions, causes and remedies can be found in chapter 11.2.

### NFC Status (0x008B)

This parameter is used to determine the current status of the NFC data transfer.

| | |
|---|---|
| ***Offset parameter*** | **139 (0x008B)** |
| ***Description*** | NFC status |
| ***Index*** | - |
| ***Data type*** | uint8 |
| ***Length*** | 1 bytes |
| ***Access*** | Read only |
| ***Value range*** | 0x00: data valid, write finished successfully<br>0x23: write failed: write access locked<br>0x30: write failed: parameter(s) out of range<br>0x41: write failed: parameter set inconsistent<br>0xA1: write failed: invalid authorization<br>0xA2: NFC not available<br>0xA3: write failed: invalid data structure<br>0xA5: write pending<br>0xA6: NFC internal error |
| ***Default value*** | - |
| ***Unit*** | - |
| ***EEPROM*** | no |

### Error Codes (0x0082) (CU Active Errors)

The active error codes for the SCTSi (CU Active Errors) are displayed using individual bits.

| | |
|---|---|
| ***Parameter*** | **130 (0x0082) + process data** |
| ***Description*** | Active errors of the control unit |
| ***Index*** | 16 |
| ***Data type*** | uint8 |
| ***Length*** | 1 byte |
| ***Access*** | Read only |
| ***Value range*** | Bit 0 = internal error: data corruption<br>Bit 1 = Internal error: bus fault<br>Bit 2 = Primary voltage too low<br>Bit 3 = Primary voltage too high<br>Bit 4 = Secondary voltage too low<br>Bit 5 = Secondary voltage too high<br>Bit 6 = Supply pressure too low or too high<br>Bit 7 = reserved |
| ***Default value*** | 0 |
| ***Unit*** | - |
| ***EEPROM*** | No |

The active error codes for the ejectors (“Errors of Ejectors”) are displayed using individual bits.

| | |
|---|---|
| ***Parameter*** | **130 (0x0082)** |
| ***Description*** | Errors in ejector |
| ***Index*** | Index 0 to 15 corresponds to ejector #1 to #16 |
| ***Data type*** | uint8 |
| ***Length*** | 16 bytes |
| ***Access*** | Read only |
| ***Value range*** | Bit 0 = Measurement range overrun |
| ***Default value*** | 0 |
| ***Unit*** | - |
| ***EEPROM*** | No |

Also see the “Troubleshooting” chapter.

## 6.7.3 Condition Monitoring [CM] (0x0092)

Condition monitoring events that occur during the suction cycle cause the system status indicator light to immediately switch from green to yellow. The specific event that caused this switch can be seen in the Condition Monitoring parameter.

Condition monitoring for the ejectors describes events that only occur once per suction cycle. They are reset at the start of every suction cycle and remain stable until after suctioning has finished. Bit number 4, which describes excessive dynamic pressure, is initially deleted when the device is switched on and is updated when a dynamic pressure value is detected again.

The condition monitoring events for the bus module are constantly updated independently of the suction cycle and reflect the current values for the supply voltages and system pressure.

The measurement values for condition monitoring – the evacuation times t0 and t1 as well as the leakage range – are reset at the start of the suction cycle and updated at the point in time when they can be measured.

**CM of the Control Unit**

| | |
|---|---|
| ***Parameter*** | **146 (0x0092)** |
| ***Description*** | Condition monitoring of control unit |
| ***Index*** | 16 |
| ***Data type*** | uint8 |
| ***Length*** | 1 bytes |
| ***Access*** | Read only |
| ***Value range*** | Bit 0 = Primary voltage limit<br>Bit 1 = Secondary voltage limit<br>Bit 2 = Input pressure limit (3.5 to 5 bar)<br>Bit 3 = Warning in one or more ejectors |
| ***Default value*** | 0 |
| ***Unit*** | – |
| ***EEPROM*** | no |

**CM of the Ejectors**

| | |
|---|---|
| ***Parameter*** | **146 (0x0092)** |
| ***Description*** | Condition monitoring of ejector |
| ***Index*** | Index 0 to 15 corresponds to ejector #1 to #16 |
| ***Data type*** | uint8 |
| ***Length*** | 16 bytes |
| ***Access*** | Read only |
| ***Value range*** | Bit 0 = Valve protection active<br>Bit 1 = Evacuation time greater than limit<br>Bit 2 = Leakage rate greater than limit<br>Bit 3 = H1 not reached in suction cycle<br>Bit 4 = Free flow vacuum too high<br>Bit 5 = Manual mode active |
| ***Default value*** | 0 |
| ***Unit*** | – |
| ***EEPROM*** | no |

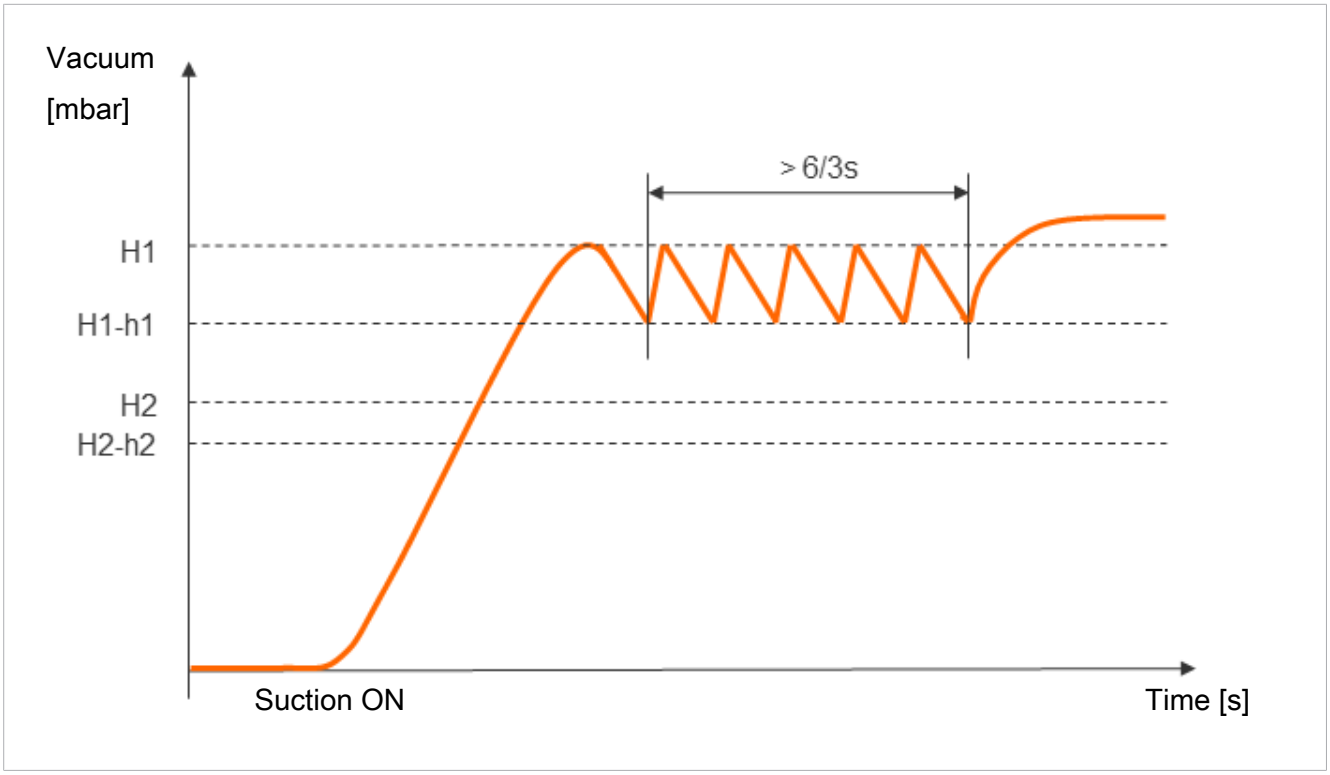
The CM data is displayed by EPC events in the process data.

### Monitor Valve Switching Frequency

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

To protect the ejector and increase its service life, the ejector automatically deactivates the air saving function and switches to continuous suction if the switching frequency > 6/3 s (more than 6 switching operations within 3 seconds). In this case the ejector remains in the Suction state.

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



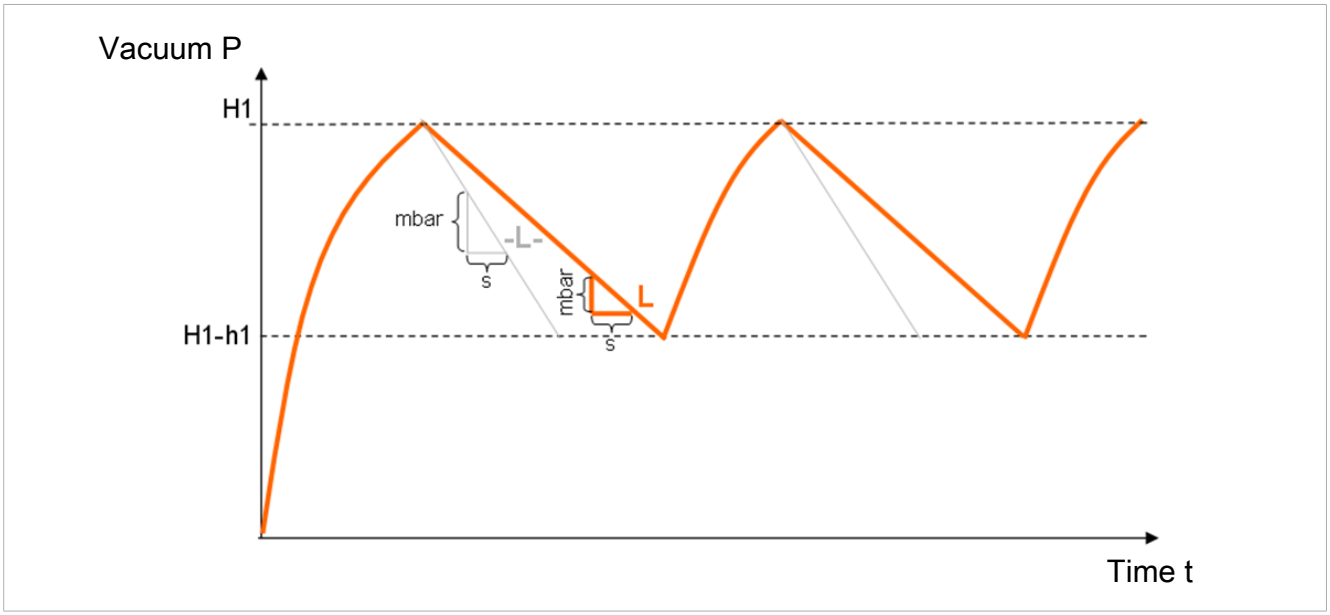

### Monitor Evacuation Time

If the measured evacuation time t1 (from H2 to H1) exceeds the specified value, the Evacuation time longer than t-1 condition monitoring warning is triggered and the system status light switches to yellow.

### Monitor Leakage

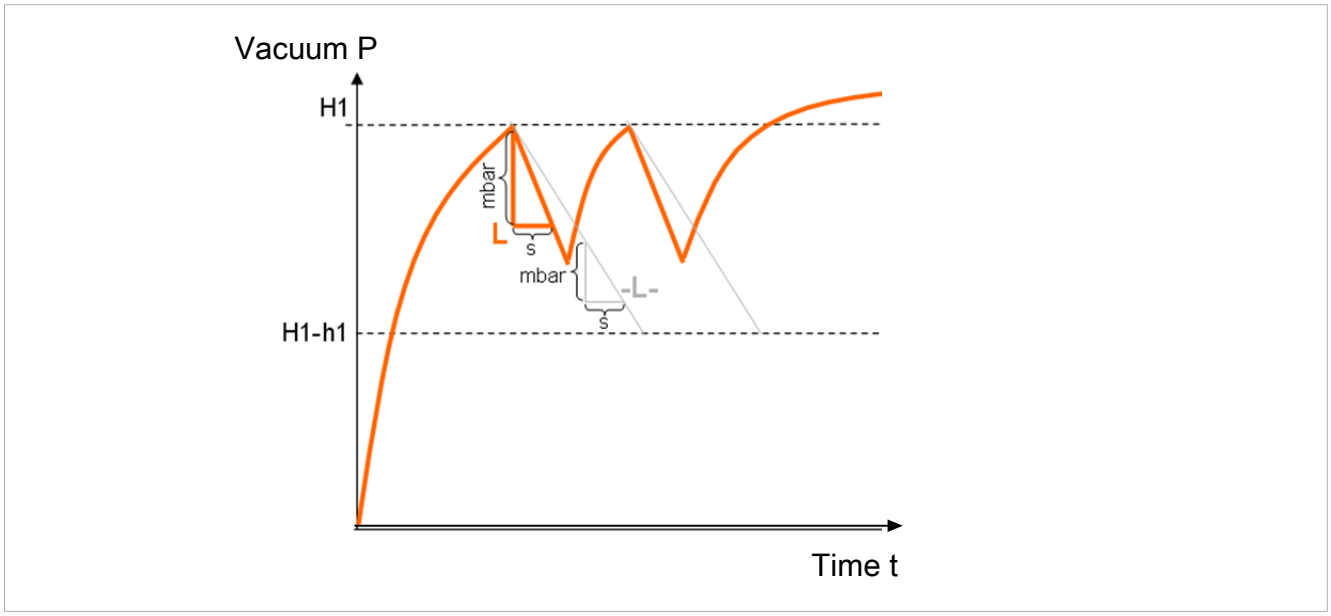
In control mode, the loss of vacuum within a certain period is monitored (mbar/s). There are two possible statuses.

**Leakage L < Permitted Value**



If the leakage is lower than the set value, the vacuum continues to fall until it reaches the switching point H1-h1. The ejector begins to suck again (normal control mode). The condition monitoring warning is not activated and there is no effect on the system status light.

**Leakage L > Permitted Value**




If the leakage is higher than the value, the ejector readjusts immediately. If the permitted leakage is exceeded twice, the ejector switches to continuous suction. The condition monitoring warning is activated and the system status light switches to yellow.

### Monitor Control Threshold

If the switching point H1 is never reached during the suction cycle, the “H1 not reached” condition monitoring warning is triggered and the system status light switches to yellow.

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

### Monitor Dynamic Pressure

If possible, a dynamic pressure measurement is taken at the start of every suction cycle (vacuum during unobstructed suction). The result of this measurement is compared to the limit values set for H1 and H2.

If the dynamic pressure is greater than (H2 – h2) but less than H1, the corresponding condition monitoring warning is triggered and the status light switches to yellow.

### Monitor Supply Voltages

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.

The device measures the level of the $U_S$ and $U_A$ supply voltages. The measured value can be read from the parameter data.

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

- Device status
- Condition monitoring parameter

- Bus module LED flashes

If there are undervoltages, the valves are no longer activated and the ejectors return to their basic setting:

- NO ejectors switch to Suction mode.
- NC ejectors switch to Pneumatically OFF mode.

If the ejector is in manual mode, it exits manual mode.

A condition monitoring event is also generated If there is an overvoltage.

#### Evaluate System Pressure

The internal analysis functions on the device sometimes require the system pressure with which the components are operated. To make the results more precise, the actual pressure level can be communicated to the compact terminal via the process data. If no level is specified, the optimum operating pressure is assumed for the calculations.

### 6.7.4 EPC values in the process data

To quickly and conveniently capture the most important results from condition monitoring, they are also made available via the process input data of the SCTSi. The top three bytes of the process input data are also configured as a multifunctional data range, consisting of an 8 bit value EPC Value 1 and a 16 bit value EPC Value 2.

You use the Process Data Out Device Select to choose whether data for the SCTSi bus head (0) or the individual ejectors (1 to 16) is to be displayed. The content of this data that is currently supplied can be changed via the Process Data Out using the 2 EPC Select bits.

**EPC value 1**

| PD Out<br>Device Select | PD Out<br>EPC-Select | PD In Byte 1<br>EPC Value 1 | EPC-Select Acknowledge |
|---|---|---|---|
| 0 | 00 | Error (ISDU 130) | 0 |
| 0 | 01 | Warnings (ISDU 146) | 1 |
| 1 to 16 | 00 | Error (ISDU 130) for the selected ejector | 0 |
| 1 to 16 | 01 | Warnings (ISDU 146) for the selected ejector | 1 |
| 1 to 16 | 11 | Leakage in the last cycle for the selected ejector | 1 |

**EPC value 2**

| PD Out<br>Device Select | PD Out<br>EPC-Select | PD In Byte 2 and 3<br>EPC Value 2 | EPC-Select Acknowledge |
|---|---|---|---|
| 0 | 00 | Current supply voltage for sensor $U_S$ | 0 |
| 0 | 01 | Current supply voltage for actuator $U_A$ | 1 |
| 0 | 11 | Total air consumption in the last cycle | 1 |
| 1 to 16 | 00 | Vacuum of the selected ejector | 0 |
| 1 to 16 | 01 | Evacuation time t1 for the selected ejector | 1 |
| 1 to 16 | 10 | Last dynamic pressure for the selected ejector | 1 |
| 1 to 16 | 11 | Air consumption in the last cycle for the selected ejector | 1 |

The switch is made depending on the structure of the automation system with some time delay. However, to ensure that the different pairs of values can be read efficiently through a controller program, the bit EPC-Select-Acknowledge is provided in the process input data. The bit always accepts the values shown in the table. All EPC value readings are described in the "**Operation**" chapter.

### 6.7.5 IO-Link events

In accordance with the IO-Link specification, a variety of IO-Link events are provided by default.

These events include, for example:

- General system errors
- Voltage supply errors
- etc.

The SCTSi also generates system-specific IO-Link events such as:

- Vacuum calibration successful or failed
- Valve protection function activated
- H1 not reached
- Manual mode activated
- Various condition monitoring events
- etc.

The generated IO-Link events also correspond to the ID codes generated as Extended Device Status to a great extent.

A detailed description of all the IO-Link events can be found in the data dictionary, which can be downloaded together with the IODD as a ZIP archive from www.schmalz.com.

## 6.8 Ejector/Vacuum Valve Functions

- Switching points for control and "parts present" checks
- Air saving functions
- Blow off Functions
- Setting for the permitted evacuation time t1
- Setting for the permitted leakage
- Permanent and erasable counters for the suction cycles and switching frequency of the pilot valves
- Control (suction and release)

- Display of the status (status of the vacuum level)

The functions relate to a mini compact terminal component and apply to each individual component, regardless of the number of installed components.

### 6.8.1 Control Functions (0x006D)

The ejector allows you to conserve compressed air or prevent a too powerful vacuum from being generated. Vacuum generation is interrupted once the configured switching point H1 is reached. If leakage causes the vacuum to fall below the hysteresis switching point (H1-h1), vacuum generation resumes.

| ***Offset parameter*** | **109 (0x006D)** |
|---|---|
| ***Description*** | Control mode for ejectors |
| ***Index*** | Index 0 to 15 corresponds to ejector #1 to #16 |
| ***Data type*** | uint8 |
| ***Length*** | 16 bytes |
| ***Access*** | Read/write |
| ***Value range*** | 0x00 = control is not active, H1 in hysteresis mode<br>0x01 = control is not active, H1 in comparator mode<br>0x02 = control is active<br>0x03 = control is active with monitoring of leakage<br>0x04 = control is active, continuous sucking disabled<br>0x05 = control is active with monitoring of leakage, continuous sucking disabled |
| ***Default value*** | 0x02 = control is active |
| ***Unit*** | - |
| ***EEPROM*** | Yes |

The following control function operating modes can be chosen:

#### No Control (Continuous Suction), H1 in Hysteresis Mode

The ejector produces continuous suction with maximum power.

The switch point evaluation for H1 is operated in hysteresis mode (two-point mode).

The hysteresis mode is a threshold switch with hysteresis. When the measurement value increases, the switching point will be active when the switch-on threshold H1 is reached and remains on until it falls below the reset threshold H1 – h1. The following must always apply for switching thresholds and reset thresholds: H1 > h1. The hysteresis is therefore defined by the difference |H1 – h1|.

#### No Control (Continuous Suction), H1 in Comparator Mode

The ejector produces continuous suction with maximum power.

The switch point evaluation for H1 is operated in comparator mode (window mode).

In comparator mode, the switching point is active when the measurement value is between the upper window point H1 and the lower window point h1. Outside this window, the switching point is inactive. If necessary, a common switching hysteresis Hyx can be set, which symmetrically applies to both window points. For the parameters “Upper window point H1” and “Lower window point h1”, the following must always apply: H1 > h1.

#### Control

The ejector switches off vacuum generation when the switching point H1 is reached and switches it back on when the vacuum falls below the hysteresis point (H1-h1). The switch point evaluation for H1 follows the control function.

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

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

#### Control with Leak Monitoring

This operating mode is the same as the previous mode, with the addition that the leakage rate within the system is measured and compared to the configurable limit value.

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

#### Control without Continuous Suction

This operating mode is the same as the "Control" operating mode but it does not switch to continuous suction when the valve switching frequency is exceeded (parameter value 0x04).

When the control shutoff is deactivated, the suction valve makes frequent adjustments. The component can be destroyed.

#### Control with Leakage Monitoring, without Continuous Suction

This operating mode is the same as the "Control function with leakage monitoring" operating mode, but the device does not switch to continuous suction when the permitted leakage is exceeded or when the valve switching frequency is exceeded (parameter value 0x05).

When the control shutoff is deactivated, the suction valve makes frequent adjustments. The component can be destroyed.

### 6.8.2 Blow-off Function

| ***Parameter offset*** | **110 (0x006E)** |
|---|---|
| ***Description*** | Blow mode for ejectors |
| ***Index*** | Ejectors 1 to 16 |
| ***Data type*** | uint8 |
| ***Length*** | 16 byte |
| ***Access*** | Read/write |
| ***Value range*** | 0x00 = externally controlled blow-off<br>0x01 = internally controlled blow-off – time-dependent<br>0x02 = externally controlled blow-off – time-dependent |
| ***Default value*** | 0 |
| ***Unit*** | — |
| ***EEPROM*** | Yes |

The following three blow-off modes are available:

#### Externally Controlled Blow-Off

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

#### 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 also have to be activated.

The internal time-controlled blow-off should not be used in conjunction with pulse ejectors (IMP variant).
This variant cannot blow off with pulse control. Therefore the suction state can no longer be left after it has been activated.

#### 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.

#### Setting the Blow-off Time (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 time set can range from 0.10 to 9.99 seconds.

The default value for the blow-off time is 200 milliseconds.

### 6.8.3 Set Permitted Evacuation Time t1 (0x006B)

The permitted evacuation time t1 is specified in milliseconds. The measurement starts when the switching threshold H2 is reached and ends when the switching threshold H1 is fallen below.

| Parameter | Description |
|---|---|
| Permitted evacuation time | Time from H2 to H1 |

| ***Offset parameter*** | **107 (0x006B)** |
|---|---|
| ***Description*** | Permissible evacuation time t1 for ejectors |
| ***Index*** | Index 0 to 15 corresponds to ejector #1 to #16 |
| ***Data type*** | uint16 |
| ***Length*** | 32 bytes |
| ***Access*** | Read/write |
| ***Value range*** | 0 … 9999 |
| ***Default value*** | 2000 |
| ***Unit*** | ms |
| ***EEPROM*** | Yes |

### 6.8.4 Set Permitted Leakage (0x006C)

The permitted leakage is set in mbar/s. The leakage is measured after the air saving function has interrupted suction once switching point H1 is reached.

| Parameter | Description |
|---|---|
| Permitted leakage | Leakage after reaching H1 |

| ***Offset parameter*** | **108 (0x006C)** |
|---|---|
| ***Description*** | Permissible leakage rate for ejectors |
| ***Index*** | Index 0 to 15 corresponds to ejector #1 to #16 |
| ***Data type*** | uint16 |
| ***Length*** | 32 bytes |
| ***Access*** | Read/write |
| ***Value range*** | 0 … 999 |
| ***Default value*** | 250 |
| ***Unit*** | mbar/s |
| ***EEPROM*** | Yes |

### 6.8.5 Counters

Each ejector has two internal non-erasable counters and two erasable counters.

| Parameter address | Description |
|---|---|
| 0x008C | Counter for suction cycles (Suction signal) |
| 0x008D | Counter for suction valve switching frequency |
| 0x008F | Counter for suction cycles (Suction signal) – erasable |
| 0x0090 | Counter for suction valve switching frequency – 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.

| ***Offset parameter*** | **140 (0x008C)** | **141 (0x008D)** |
|---|---|---|
| ***Description*** | Vacuum-on counter for ejector | Valve operating counter for ejector |
| ***Index*** | Index 0 to 15 corresponds to ejector #1 to #16 | |
| ***Data type*** | uint32 | |
| ***Length*** | 64 bytes | |
| ***Access*** | Read only | |
| ***Value range*** | 0 … 999,999,999 | |
| ***Default value*** | - | |
| ***Unit*** | - | |
| ***EEPROM*** | Yes | |

| *Offset parameter* | **143 (0x008F)** | **144 (0x0090)** |
|---|---|---|
| ***Description*** | Erasable vacuum-on counter for ejector | Erasable valve operating counter for ejector |
| ***Index*** | Index 0 to 15 corresponds to ejector #1 to #16 | |
| ***Data type*** | uint32 | |
| ***Length*** | 64 bytes | |
| ***Access*** | Read only | |
| ***Value range*** | 0 … 999,999,999 | |
| ***Default value*** | - | |
| ***Unit*** | - | |
| ***EEPROM*** | Yes | |

### 6.8.6 Manual Operation of the Ejectors

**⚠ CAUTION**

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

Personal injury or damage to property!

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

**⚠ CAUTION**

**External signals may change manual mode**

Personal injury or property damage due to unforeseen work steps!

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

In manual mode, the suction and blow-off ejector functions can be controlled independently of the higher-level controller using the **MANUAL MODE** button on the operating panel.

Because the valve protection function is deactivated in manual mode, this function can be used to locate and rectify leaks in the vacuum circuit.

**Activating Manual Mode:**

- ✓ The ejector is in the Pneumatically OFF state.
- ▸ Press the **MANUAL MODE** button on the ejector for at least 3 seconds.
- ⇨ The Suction and Blow-off LEDs flash.
- ⇨ The ejector is in the Pneumatically OFF position.

Activating suction in manual mode:

✓ The Suction and Blow-off LEDs flash.

▸ Press the **MANUAL MODE** button on the ejector.

⇨ The ejector begins to suck.

⇨ The Suction LED is on and the Blow-Off LED flashes.

Activating blow-off in manual mode:

✓ The Suction LED is on and the Blow-Off LED flashes.

1. Press and hold the **MANUAL MODE** button on the ejector.
   ⇨ The Suction LED flashes and the Blow-off LED is on.
   ⇨ The ejector blows off as long as the button is held.
2. Release the **MANUAL MODE** button on the ejector to end the blow-off.
   ⇨ The ejector is in Pneumatically OFF mode.
3. Press the **MANUAL MODE** button again to reactivate suction.

**Exiting manual mode:**

✓ The ejector is in manual mode.

▸ Press the **MANUAL MODE** button on the ejector for at least 3 seconds.

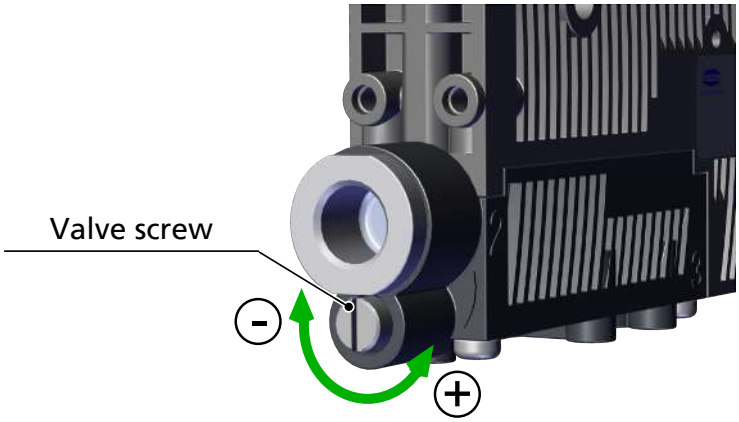
⇨ The Suction and Blow-off LEDs cease to flash.

⇨ The ejector is in the Pneumatically OFF position.

A signal change (suction, blow-off) also ends manual mode.

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

There is a valve screw below the vacuum connection that can be used to adjust the blow-off flow rate. The valve screw is equipped with a stop on both sides.




1. Turn the valve screw clockwise to reduce the flow rate.
2. Turn the valve screw counterclockwise to increase the flow rate.

# 7 Transportation and Storage

## 7.1 Checking the Delivery

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

1. Compare the entire delivery with the supplied delivery notes to make sure nothing is missing.
2. Damage caused by defective packaging or occurring in transit must be reported immediately to the carrier and J. Schmalz GmbH.

## 7.2 Removing the Packaging

The device is delivered packaged in a cardboard box.

**NOTE**

**Sharp knives or blades**

Damage to components!

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

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

## 7.3 Reusing the Packaging

The product is delivered in cardboard packaging. The packaging should be reused to safely transport the product at a later stage.

Keep the packaging for future transport or storage.

# 8 Installation

## 8.1 Installation Instructions

**⚠ CAUTION**

**Improper installation or maintenance**

Personal injury or damage to property

- Prior to installation and before maintenance work, the product must be disconnected from the power supply and secured against unauthorized restart.

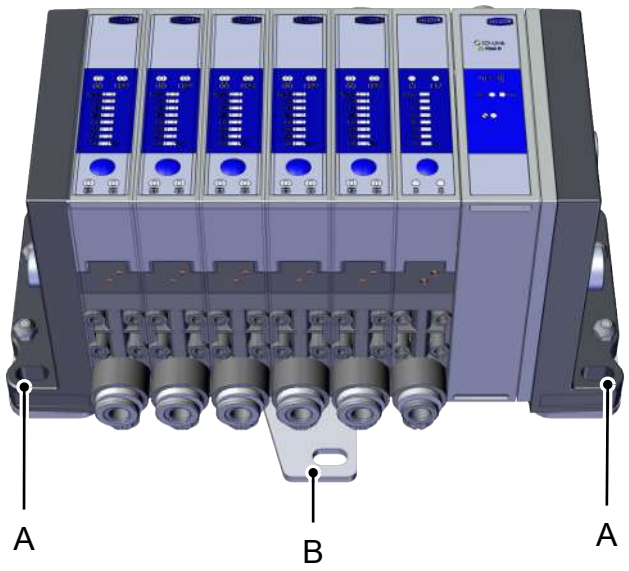
For safe installation, the following instructions must be observed:

1. Use only the connectors, mounting holes and attachment materials that have been provided.
2. Firmly connect and secure pneumatic and electrical line connections to the compact terminal.
3. Ensure that there is adequate installation space in the area where the product will be installed.

## 8.2 Mounting

The compact terminal may be installed in any position.

The way in which the compact terminal is attached depends on the number of ejector discs mounted:

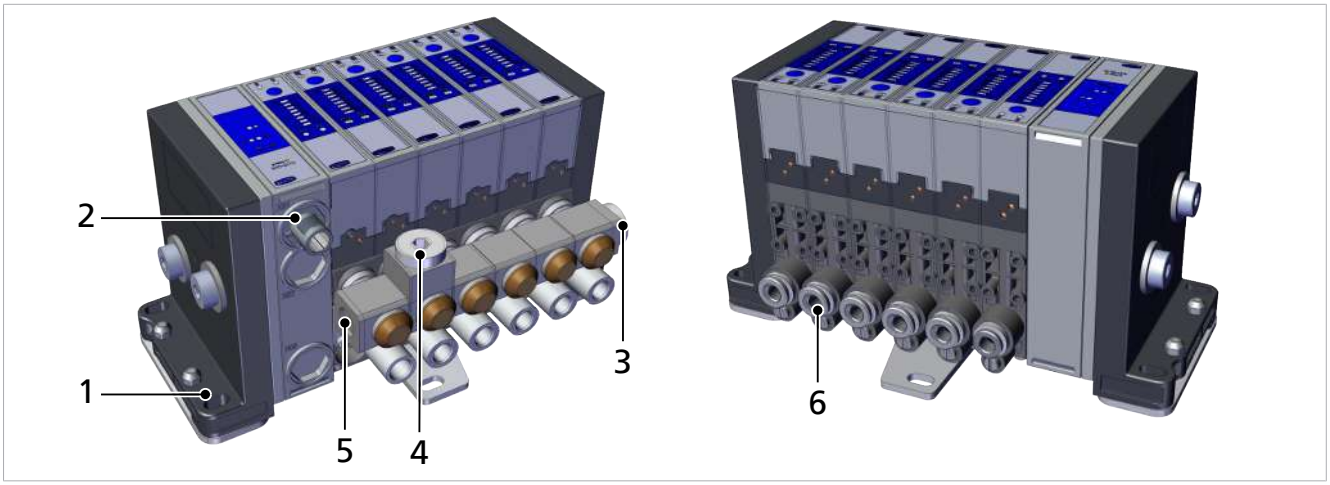



**Up to five mounted ejector discs**

- Attach the compact terminal at the end plates (A) using two M5 screws and washers each. The recommended tightening torque is 4 Nm.

**With six or more ejector discs, additional reinforcing plates are mounted on the compact terminal**

- Attach the compact terminal at the end plates (A) as well as at the center reinforcing plates (B) using two M5 screws and washers each. The recommended tightening torque is 4 Nm.




| Position | Description | Max. tightening torque |
|---|---|---|
| 1 | End plate with two mounting holes | 4 Nm |
| 2 | M12 electrical connection | Hand-tight |
| 3 | Alternative compressed air connection, 1/4" thread | 2 Nm |
| 4 | Alternative compressed air connection, 1/4" thread | 2 Nm |
| 5 | Compressed air connection, 1/4" thread | 2 Nm |
| 6 | 1/8" vacuum connection | 2 Nm |

## 8.3 Instructions for the Pneumatic Connection

**⚠ CAUTION**

**Compressed air or vacuum in direct contact with the eye**

Severe eye injury

- Wear eye protection
- Do not look into compressed air openings
- Do not look into the silencer air stream
- Do not look into vacuum openings such as suction cups, suction lines and hoses.

**⚠ CAUTION**

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

Hearing damage!

- Correct installation.
- Wear ear protectors.

To ensure problem-free operation and a long service life of the compact terminal's ejectors, only use adequately maintained compressed air and consider the following requirements:

- Air or neutral gas filtered to 5 µm, oiled or not oiled.
- Dirt particles or foreign bodies in the ejector connections, hoses or pipelines can lead to partial or complete ejector malfunction.

1. Shorten the hoses and pipelines as much as possible.
2. Keep hose lines free of bends and crimps.
3. Only use a hose or pipe with the recommended internal diameter to connect the compact terminal, otherwise use the next largest diameter.
4. On the compressed air side, ensure that the internal diameter is adequate for the ejectors to achieve their performance data.
5. On the vacuum side, ensure that the internal diameter is adequate for preventing high flow resistance. Suction capacity and evacuation times will increase, and blow off times will be longer.
6. Plug any unused vacuum connections to reduce noise and prevent foreign bodies from being sucked in.

## 8.4 Recommended Line Cross Sections (Internal Diameters) in mm

| SCPS performance class | Cross section, compressed air-side<br>For 2 to 8 ejectors[1)] | Cross section, compressed air-side<br>For 9 to 16 ejectors[1)] | Cross section, vacuum side[1)] |
|---|---|---|---|
| 07 | 7 | 9 | 4 |
| 10 | 7 | 9 | 4 |
| 15 | 7 | 9 | 6 |
| 2-07 | 7 | 9 | 4 |
| 2-09 | 7 | 9 | 4 |
| 2-14 | 7 | 9 | 6 |

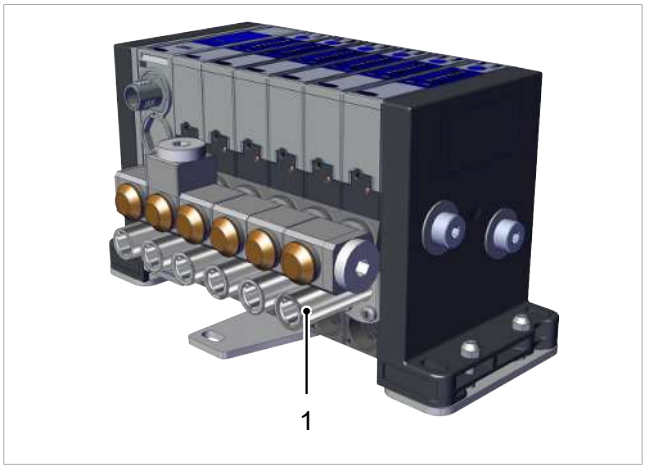
[1)] Specifications based on a maximum hose length of 2 m.

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

If the recommended line cross section is too large due to how the line is routed (e.g. an energy chain or robot flange), the alternative compressed air connections can be used to provide additional compressed air.

## 8.5 Connecting Variant with Exhaust Duct, Silencer or Hose

For ejectors without a silencer, the variant with exhaust duct is supplied with pipe extensions (1) for the removal of the exhaust air.



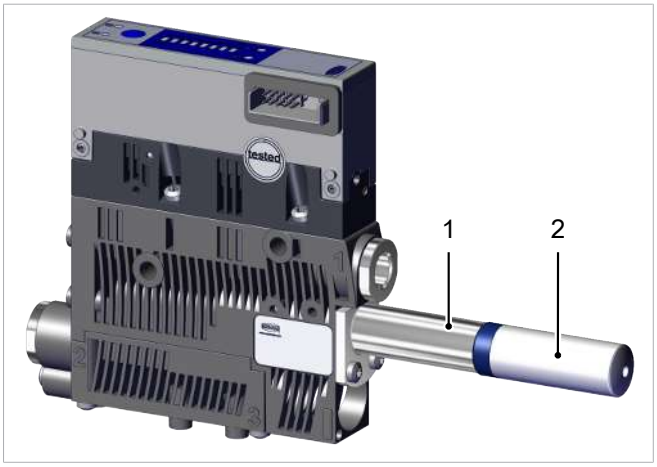
**CAUTION! Hearing damage caused by the operation of the ejector without silencer or without exhaust air hose!** In the variant with exhaust duct, one of the following system expansions must be added to ensure the safe operation of the ejector by the operator:

- Mounting of a silencer
- Mounting of an exhaust air hose

This must be done on each ejector, via thread G4 (1/8" internal thread).

✓ A suitable silencer Accessories or the attachment parts for the solution with exhaust hose are provided by the customer.

▸ To remove the exhaust air, connect a silencer (2) or a hose to the thread (1/8" internal thread) of the pipe extension (1).
Max. tightening torque for the mounting of the silencer = hand tight.
The maximum tightening torque for mounting a hose connection depends on the selected hose connection.




## 8.6 Electrical Connection

**NOTE**

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

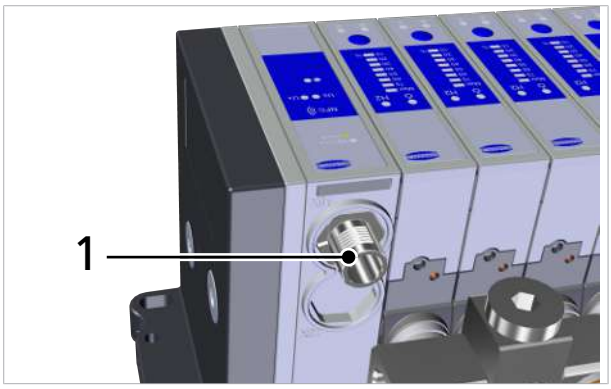
Personal injury or damage to property

▸ Electrical connection may be performed only by specialists who can evaluate the effects of signal changes on the overall system.

The electrical connection supplies the ejector with power and communicates with the control system of the higher-level machine using defined outputs.

**Establish the compact terminal's electrical connection using plug connector 1 as shown in the figure.**

✓ Prepare an M12 5-pin connection cable with a socket (customer's responsibility).

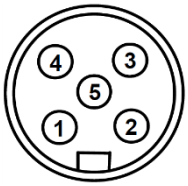



▸ Attach the connection cable to the compact terminal (maximum tightening torque = hand-tight).

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

### 8.6.1 Pin Assignment of M12 Connector for IO-Link Class B

Electrical interface 1x M12 – A-coded pin assignment according to IO-Link class B.

| M12 plug | PIN | Symbol | Wire color [1)] | Function |
|---|---|---|---|---|
|  | 1 | $U_s$ | Brown | Supply voltage for sensor |
| | 2 | $U_A$ | White | Supply voltage for actuator |
| | 3 | $GND_s$ | Blue | Sensor ground |
| | 4 | C/Q | Black | IO-Link |
| | 5 | $GND_A$ | Gray | Actuator ground |



[1)] When using a Schmalz connection cable (see "Accessories")

## 8.7 Instructions for Start of Operations

When connecting the Compact terminal SCTSi, the supply voltage $U_S$ for the sensors and the C/Q communication cable must be directly connected to the connections of an IO-Link master. A separate port on the master must be used for each SCTSi. It is not possible to connect multiple C/Q lines to a single IO-Link master port.

The supply voltage for the actuators can also be supplied separately.

Using an IO-Link class B master enables the one-to-one connection of the master port and SCTSi with a single 5-pin connection cable.

The IO-Link master must be connected in the configuration of the automation system in the same way as other fieldbus components. The required device description file (IO-Link data dictionary; abbreviated "IODD") of the SCTSi can be downloaded at www.schmalz.com.

The process data width changes depending on the number of SCTSi ejectors. There is a suitable IODD for up to 4, 8, 12 or 16 ejectors for each implementation.

# 9 Operation

## 9.1 Safety Instructions for Operation

**⚠ WARNING**

**Suspended load**

Risk of serious injury

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

**⚠ WARNING**

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

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

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

**⚠ WARNING**

**Extraction of hazardous media, liquids or bulk material**

Personal injury or damage to property!

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

**⚠ CAUTION**

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

Eye injuries!

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

**⚠ CAUTION**

**Vacuum close to the eye**

Severe eye injury!

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

**⚠ CAUTION**

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

Risk of injury!

- Ensure that the danger zone of the machine or system is free of persons during automatic operation (for example, protective barriers or sensor systems).

## 9.2 Checking for Correct Installation and Function

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

## 9.3 Calibrating the Vacuum Sensors

Since the vacuum sensors installed in the ejectors are subject to variations due to the manufacturing process, we recommend calibrating the sensors after the device is installed. The vacuum connections of all the ejectors must be vented to the atmosphere before the sensors can be calibrated.

Via IO-Link, the command to simultaneously calibrate all the sensors is executed using the parameter “System command” 0x0002 with the value 0xA5 for Calibrate vacuum sensor.
This system command is also performed when an ejector is replaced.

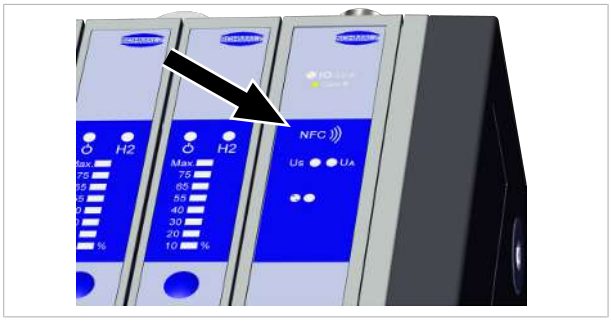
A zero offset is only possible in the range of ±3 percent of the end value of the measuring range.

If the permitted limit of ± 3% is exceeded, this is reported for each ejector via parameter 0x0082.

## 9.4 Transferring Device Data with NFC

The reading distance is very short for NFC applications. If necessary, find the position of the NFC antenna in the reading device used.

✓ Use a suitable read/write device with activated NFC, such as a smartphone or tablet.




1. Align the read device as parallel to the top of the SCTSi as possible.
2. Position the antenna of the read device in the center of the SCTSi’s antenna.

After setting a parameter via the operating menu, the power supply of the switch must remain stable for at least 3 seconds, otherwise there may be a loss of data.

Access to the SCTSi parameters via NFC also works when the supply voltage is not connected.

## 9.5 Reading the EPC Values

The results of the condition monitoring function are also available in the device's process input data. However, to ensure that the different pairs of values can be read using a controller program, the "EPC-Select-Acknowledge" bit is provided in the process input data. The bit always accepts the values shown in the table.

Proceed as follows to read the EPC values:

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

# 10 Maintenance

## 10.1 Safety Instructions

Maintenance work may only be carried out by qualified personnel.

**⚠ WARNING**

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

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

**⚠ CAUTION**

**Damage due to flying parts**

Risk of injury or damage to property!

- Wear eye protection
- Before performing maintenance, make sure that the vacuum and compressed air system is at atmospheric pressure.

**NOTE**

**Improper maintenance**

Damage to the compact terminal and the ejectors!

- Switch off the supply voltage before any maintenance.
- Secure it so that it cannot be switched back on.
- The compact terminal must only be operated with a silencer and press-in screens.

Maintenance work or repairs that go beyond the activities described here may not be carried out by the operator of the product without consulting Schmalz.

## 10.2 Replacing the Silencer

When the silencer is open, a heavy infiltration of dust, oil, and so on, may contaminate it and reduce the suction capacity. We do not recommend cleaning the silencer because of capillary action in the porous material.

- If the suction capacity decreases, replace the silencer.

## 10.3 Replacing the Press-In Screens

The vacuum and compressed air connections of the ejectors contain press-in screens. Dust, chippings and other solid materials may be deposited in the screens over time.

- If you notice that the performance of the ejectors has declined, replace the screens.

## 10.4 Cleaning the Compact Terminal

1. For cleaning, do not use aggressive cleaning agents such as industrial alcohol, white spirit or thinners. Only use cleaning agents with pH 7–12.
2. Remove dirt on the exterior of the device with a soft cloth and soap suds at a maximum temperature of 60° C. Make sure that the compact terminal is not soaked in soapy water.
3. Ensure that no moisture gets into the electrical connection.

## 10.5 Replacement of the Device with a Parameterization Server

The IO-Link protocol provides an automated process for transferring data when a device is replaced. For this Data storage mechanism, the IO-Link master mirrors all setting parameters for the device in a separate non-volatile memory. When a device is swapped for a new one of the same type, the setting parameters for the old device are automatically saved in the new device by the master.

✓ The device is operated on a master with IO-Link version 1.1 or higher.

✓ The Data storage feature in the configuration of the IO-Link port is activated.

▸ Ensure that the new device is restored to the factory settings **before** it is connected to the IO-Link master. If necessary, reset the device to the factory settings.

⇨ The device parameters are automatically mirrored in the master when the device is configured using an IO-Link configuration tool.

⇨ Changes to the parameters made in the user menu on the device or via NFC are mirrored in the master.

Changes to the parameters made by a PLC program using a function module are **not** automatically mirrored in the master.

▸ Manually mirroring data: After changing all the required parameters, execute ISDU write access to the “System Command” parameter [0x0002] using the command “Force upload of parameter data into the master” (numerical value 0x05) (see Data Dictionary).

Use the Parameterization server function of the IO-Link master to ensure that no data is lost when switching the device.

# 11 Warranty

This system is guaranteed in accordance with our general terms of trade and delivery. The same applies to spare parts, provided that these are original parts supplied by us.

We are not liable for any damage resulting from the use of non-original spare parts or accessories.

The exclusive use of original spare parts is a prerequisite for the proper functioning of the system and for the validity of the warranty.

Wearing parts are not covered by the warranty.

# 12 Spare and Wearing Parts, Accessories

## 12.1 Spare and Wearing Parts

Maintenance work may only be carried out by qualified personnel.

**⚠ WARNING**

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

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

**NOTE**

**Improper maintenance**

Damage to the compact terminal and the ejectors!

- Switch off the supply voltage before any maintenance.
- Secure it so that it cannot be switched back on.
- The compact terminal must only be operated with a silencer and press-in screens.

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

| Part no. | Designation | Type |
|---|---|---|
| 10.02.02.04141 | Silencer insert | Wearing part |
| 10.02.02.03376 | Screen | Spare part |
| 10.02.02.04152 | Insulating plate | Wearing part |
| 10.02.01.00540 | Silencer (round) for variant with exhaust duct, SD 1/8" external thread 14x40 | Wearing part |
| 10.02.02.04737 | Ejector wear part set SCPS **single stage** SD, contains: filters/silencers/non-return valves, piston/springs/O-rings | Wearing part |
| 10.02.02.04738 | Ejector wear parts set SCPS-**two-stage** SD, contains: filters/silencers/non-return valves, piston/springs/O-rings | Wearing part |

- When tightening the fastening screws on the silencer module, observe the maximum tightening torque of 0.5 Nm.

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

## 12.2 Accessories

| Part no. | Designation | Note |
|---|---|---|
| 21.04.05.00158 | Connection cable | 5-pin M12 to 5-pin M12 connector, 1 m |
| 21.04.05.00080 | Connection cable | 5-pin M12, straight cable outlet, with PUR cable 5 x 0.34 mm, 5 m |

# 13 Troubleshooting

## 13.1 Troubleshooting

| Fault | Possible cause | Solution |
|---|---|---|
| No IO-Link communication | Incorrect electrical connection. | ▸ Check electrical connection and pin assignment. |
| | Master not correctly configured. | ▸ Check configuration of the master. The port must be set to IO-Link. |
| | IODD connection does not work. | ▸ Check for the appropriate IODD. The IODD is dependent on the number of ejectors. |
| No NFC communication | NFC connection between SCTSi and reader (e.g. smartphone) not correct. | ▸ Hold the reader at the intended position on the switch. |
| | NFC function on reader (e.g. smartphone) not activated. | ▸ Activate NFC function on reader. |
| | NFC via IO-Link deactivated. | ▸ Activate NFC function on reader. |
| | Write operation canceled. | ▸ Hold the reader at the intended position on the switch for longer. |
| No parameters can be changed using NFC | PIN for NFC write protection activated via IO-Link. | ▸ Enable the NFC write permissions via IO-Link. |
| Ejectors are not responding | No supply voltage for the actuator. | ▸ Check electrical connection and pin assignment. |
| | No compressed air supply. | ▸ Check the compressed air supply. |
| Vacuum level is not reached or vacuum is created too slowly | Press-in screen is contaminated. | ▸ Replace screen. |
| | Silencer is dirty. | ▸ Replace the silencer. |
| | Leakage in hose line. | ▸ Check hose connections. |
| | Leakage at suction cup. | ▸ Check suction cup |
| | Operating pressure too low. | ▸ Increase operating pressure. Note the maximum limits. |
| | Internal diameter of hose line too small. | ▸ Observe recommendations for hose diameter. |
| Load cannot be held. | Vacuum level too low. | ▸ Increase the control range for the air saving function. |
| | Suction cup too small. | ▸ Select a larger suction cup. |

## 13.2 Error Codes, Causes and Solutions

If a known error occurs, it is transmitted via parameter 0x0082 in the form of an error number.

The system status is automatically refreshed on the NFC tag every 5 minutes at the latest. That means that an error may be displayed via NFC even though it has already disappeared.

**Control unit error code:**

| Error code | Fault | Possible cause | Solution |
|---|---|---|---|
| Bit 0 | Internal EEPROM error | Operating voltage was disconnected too quickly after a parameter change, saving process was not complete. | 1. Reset to factory settings.<br>2. Use engineering tool to import a valid dataset. |
| Bit 1 | Internal bus error | Internal bus was interrupted. | ▸ Perform Power On again. |
| Bit 2 | Undervoltage $U_S$ | Sensor supply voltage too low and outside the permitted range | 1. Check power supply unit and power load<br>2. Increase supply voltage |
| Bit 3 | Overvoltage $U_S$ | Sensor supply voltage too high and outside the permitted range | 1. Check power supply unit.<br>2. Reduce supply voltage |
| Bit 4 | Undervoltage $U_A$ | Actuator supply voltage is too low. (Outside the permitted range.) | 1. Check power supply unit and power load.<br>2. Increase supply voltage |
| Bit 5 | Overvoltage $U_A$ | Actuator supply voltage is too high. (Outside the permitted range.) | 1. Check power supply unit.<br>2. Reduce supply voltage |
| Bit 6 | Supply pressure | System pressure outside the permitted range. | ▸ Check and adjust supply pressure. |

**Ejector error code:**

| Error code | Fault | Possible cause | Solution |
|---|---|---|---|
| Bit 0 | Measurement range exceeded | The measurement range of at least one ejector was exceeded. | ▸ Check the pressure and vacuum sections of the system. |

You can find more detailed information in the **Device Status** section.

# 14 Decommissioning and Disposal

## 14.1 Disposing of the Compact Terminal

1. Dispose of the product properly after replacement or decommissioning.
2. Observe the country-specific guidelines and legal obligations for waste prevention and disposal.

## 14.2 Materials Used

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

# 15 Declarations of Conformity

## 15.1 EU Declaration of Conformity

The manufacturer Schmalz confirms that the product described in these instructions fulfills the following applicable EU directives:

| | |
|---|---|
| 2014/30/EU | Electromagnetic Compatibility |
| 2011/65/EU | RoHS Directive |

The following harmonized standards were applied:

| | |
|---|---|
| EN ISO 12100 | Safety of machinery — General principles for design — Risk assessment and risk reduction |
| EN 61000-6-2+AC | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments |
| EN 61000-6-4+A1 | Electromagnetic compatibility - Part 6-4: Generic standards - Emission standard for industrial environments |
| EN IEC 63000 | Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances |

The 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

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

| | |
|---|---|
| 2016 | Electromagnetic Compatibility Regulations |
| 2012 | The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations |

The following designated standards were applied:

| | |
|---|---|
| EN ISO 12100 | Safety of machinery — General principles for design — Risk assessment and risk reduction |
| EN 61000-6-2+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 50581 | Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances |

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

# 16 Attachment

**See also**

SCTSi Data Dictionary 21.10.01.00077_05.PDF [▶ 71]

IO-Link

J. Schmalz GmbH
Johannes-Schmalz-Str.1
D 72293 Glatten
Tel.: +49(0)7443/2403-0
Fax: +49(0)7443/2403-259
schmalz@schmalz.de

SCHMALZ

## IO-Link Implementation

| | | IO-Link Version 1.0 | IO-Link Version 1.1 |
|---|---|---|---|
| Vendor ID | | 234 (0x00EA) | |
| Device ID | SCTSi with up to 4 ejectors | 100265 (0x0187A9) | 100261 (0x0187A5) |
| | SCTSi with up to 8 ejectors | 100266 (0x0187AA) | 100262 (0x0187A6) |
| | SCTSi with up to 12 ejectors | 100267 (0x0187AB) | 100263 (0x0187A7) |
| | SCTSi with up to 16 ejectors | 100268 (0x0187AC) | 100264 (0x0187A8) |
| SIO-Mode | | no | |
| Baudrate | | 38.4 kBd (COM2) | |
| Minimum cycle time | SCTSi with up to 4 ejectors | 4.2 ms | |
| | SCTSi with up to 8 ejectors | 4.8 ms | |
| | SCTSi with up to 12 ejectors | 5.4 ms | |
| | SCTSi with up to 16 ejectors | 6.0 ms | |
| Processdata input | SCTSi with up to 4 ejectors | 5 byte | |
| | SCTSi with up to 8 ejectors | 6 byte | |
| | SCTSi with up to 12 ejectors | 7 byte | |
| | SCTSi with up to 16 ejectors | 8 byte | |
| Processdata output | SCTSi with up to 4 ejectors | 3 byte | |
| | SCTSi with up to 8 ejectors | 4 byte | |
| | SCTSi with up to 12 ejectors | 5 byte | |
| | SCTSi with up to 16 ejectors | 6 byte | |

## Process Data

| Process Data In | Name | Bit | | Access | | Remark |
|---|---|---|---|---|---|---|
| PD In Byte 0 | Number of device which generatetd a condition monitoring or error event | 4 … 0 | | ro | | number of device which generated a warning or error<br>0: no warning or error<br>1 … 16: number of SCPS ejector<br>17: Contol-Unit<br>18 … 31: reserved |
| | EPC-Select acknowledged | 5 | | ro | | Acknowledge that EPC values 1 and 2 have been switched according to EPC-Select:<br>0 - EPC-Select = 00<br>1 - otherwise |
| | Device status | 7 … 6 | | ro | | 00 - [ green] Device is working optimally<br>01 - [yellow] Device is working, maintenance necessary<br>10 - [orange] Device is working, but there are warnings in the Control-Unit<br>11 - [red] Device is not working properly, there are errors in the Control-Unit |
| PD In Byte 1 | EPC value 1 | 7…0 | | ro | | EPC value 1 (byte) - holds 8bit value as selected by EPC-Select 0/1<br>For Device-Select 00:<br>00 - Error-Byte [ISDU 130.17]<br>01 - Warning-Byte [ISDU 146.17]<br>10 - reserved<br>11 - reserved<br>For Device-Select 01 … 16:<br>00 - Error-Byte [ISDU 130.#]<br>01 - Warning-Byte [ISDU 146.#]<br>10 - reserved<br>11 - Leakage of last cycle (mbar/sec) |
| PD In Byte 2 | EPC value 2, high-byte | 7…0 | | ro | | For Device-Select 00:<br>00 - Primary supply voltage (0.1 Volt)<br>01 - Auxiliary supply voltage (0.1 Volt)<br>10 - reserved<br>11 - Total Air cons. of last cycle (0.1 NL)<br>For Device-Select 01 … 16:<br>00 - System vacuum (mbar)<br>01 - Evacuation time t1 (msec)<br>10 - Last free-flow vacuum (mbar)<br>11 - Air consump of last cycle (0.1 NL) |
| PD In Byte 3 | EPC value 2, low-byte | 7…0 | | ro | | |
| PD In Byte 4 | Air saving function (H1) Ejector #1 | 0 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #1 | 1 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| | Air saving function (H1) Ejector #2 | 2 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #2 | 3 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| | Air saving function (H1) Ejector #3 | 4 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #3 | 5 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| | Air saving function (H1) Ejector #4 | 6 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #4 | 7 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| PD In Byte 5<br>(if available - see PD-In length)<br>(for up to 8 ejectors) | Air saving function (H1) Ejector #5 | 0 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #5 | 1 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| | Air saving function (H1) Ejector #6 | 2 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #6 | 3 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| | Air saving function (H1) Ejector #7 | 4 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #7 | 5 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| | Air saving function (H1) Ejector #8 | 6 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #8 | 7 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| PD In Byte 6<br>(if available - see PD-In length)<br>(for up to 12 ejectors) | Air saving function (H1) Ejector #9 | 0 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #9 | 1 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| | Air saving function (H1) Ejector #10 | 2 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #10 | 3 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| | Air saving function (H1) Ejector #11 | 4 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #11 | 5 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| | Air saving function (H1) Ejector #12 | 6 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #12 | 7 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| PD In Byte 7 | Air saving function (H1) Ejector #13 | 0 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #13 | 1 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| | Air saving function (H1) Ejector #14 | 2 | | ro | | Vacuum is over H1 & not yet under H1-h1 |

J. Schmalz GmbH
Johannes-Schmalz-Str.1
D 72293 Glatten
Tel.: +49(0)7443/2403-0
Fax: +49(0)7443/2403-259
schmalz@schmalz.de

| | | | | | | |
|---|---|---|---|---|---|---|
| (if available - see PD-In length) (for up to 16 ejectors) | Part present (H2) Ejector #14 | 3 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| | Air saving function (H1) Ejector #15 | 4 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #15 | 5 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| | Air saving function (H1) Ejector #16 | 6 | | ro | | Vacuum is over H1 & not yet under H1-h1 |
| | Part present (H2) Ejector #16 | 7 | | ro | | Vacuum is over H2 & not yet under H2-h2 |
| **Process Data Out** | **Name** | **Bit** | | **Access** | | **Remark** |
| PD Out Byte 0 | Device-Select | 4 … 0 | | wo | | number of device which will send EPC Data<br>0: Contol-Unit<br>1 … 16: number of SCPS ejector<br>17 … 31: reserved |
| | - | 5 | | wo | | reserved |
| | EPC-Select 0 | 6 | | wo | | function of EPC values 1 and 2 (see PD In Byte 1…3) for selected device |
| | EPC-Select 1 | 7 | | wo | | |
| PD Out Byte 1 | Input pressure | 7…0 | | wo | | Pressure value from external sensor (unit: 0.1 bar) |
| PD Out Byte 2 | Vacuum Ejector #1 | 0 | | wo | | Vacuum on/off |
| | Blow-off Ejector #1 | 1 | | wo | | Activate Blow-off |
| | Vacuum Ejector #2 | 2 | | wo | | Vacuum on/off |
| | Blow-off Ejector #2 | 3 | | wo | | Activate Blow-off |
| | Vacuum Ejector #3 | 4 | | wo | | Vacuum on/off |
| | Blow-off Ejector #3 | 5 | | wo | | Activate Blow-off |
| | Vacuum Ejector #4 | 6 | | wo | | Vacuum on/off |
| | Blow-off Ejector #4 | 7 | | wo | | Activate Blow-off |
| PD Out Byte 3 (if available - see PD Out length) (for up to 8 ejectors) | Vacuum Ejector #5 | 0 | | wo | | Vacuum on/off |
| | Blow-off Ejector #5 | 1 | | wo | | Activate Blow-off |
| | Vacuum Ejector #6 | 2 | | wo | | Vacuum on/off |
| | Blow-off Ejector #6 | 3 | | wo | | Activate Blow-off |
| | Vacuum Ejector #7 | 4 | | wo | | Vacuum on/off |
| | Blow-off Ejector #7 | 5 | | wo | | Activate Blow-off |
| | Vacuum Ejector #8 | 6 | | wo | | Vacuum on/off |
| | Blow-off Ejector #8 | 7 | | wo | | Activate Blow-off |
| PD Out Byte 4 (if available - see PD Out length) (for up to 12 ejectors) | Vacuum Ejector #9 | 0 | | wo | | Vacuum on/off |
| | Blow-off Ejector #9 | 1 | | wo | | Activate Blow-off |
| | Vacuum Ejector #10 | 2 | | wo | | Vacuum on/off |
| | Blow-off Ejector #10 | 3 | | wo | | Activate Blow-off |
| | Vacuum Ejector #11 | 4 | | wo | | Vacuum on/off |
| | Blow-off Ejector #11 | 5 | | wo | | Activate Blow-off |
| | Vacuum Ejector #12 | 6 | | wo | | Vacuum on/off |
| | Blow-off Ejector #12 | 7 | | wo | | Activate Blow-off |
| PD Out Byte 5 (if available - see PD Out length) (for up to 16 ejectors) | Vacuum Ejector #13 | 0 | | wo | | Vacuum on/off |
| | Blow-off Ejector #13 | 1 | | wo | | Activate Blow-off |
| | Vacuum Ejector #14 | 2 | | wo | | Vacuum on/off |
| | Blow-off Ejector #14 | 3 | | wo | | Activate Blow-off |
| | Vacuum Ejector #15 | 4 | | wo | | Vacuum on/off |
| | Blow-off Ejector #15 | 5 | | wo | | Activate Blow-off |
| | Vacuum Ejector #16 | 6 | | wo | | Vacuum on/off |
| | Blow-off Ejector #16 | 7 | | wo | | Activate Blow-off |

## ISDU Parameters

| ISDU Index dec | ISDU Index hex | Subindex dec | Parameter | Data width | Value range | Access | Default value | Remark |
|---|---|---|---|---|---|---|---|---|
| **Identification** | | | | | | | | |
| **Device Management** | | | | | | | | |
| 16 | 0x0010 | 0 | Vendor name | 15 bytes | | ro | J. Schmalz GmbH | Manufacturer designation |
| 17 | 0x0011 | 0 | Vendor text | 15 bytes | | ro | www.schmalz.com | Internet address |
| 18 | 0x0012 | 0 | Product name | 32 bytes | | ro | SCTSi-IOL | General product name |
| 19 | 0x0013 | 0 | Product ID | 1...32 bytes | | ro | SCTSi-IOL | Product variant name |
| 20 | 0x0014 | 0 | Product text | 30 bytes | | ro | SCTSi-IOL | Order-Code (partial); for complete Order-Code read Index 0xFE |
| 21 | 0x0015 | 0 | Serial number | 9 bytes | | ro | 000000001 | Serial number |
| 22 | 0x0016 | 0 | Hardware revision | 2 bytes | | ro | 04 | Hardware revison |
| 23 | 0x0017 | 0 | Firmware revision | 4 bytes | | ro | 1.07 | Firmware revision |
| 240 | 0x00F0 | 0 | Unique ID | 20 bytes | | ro | | unique device identification number |
| 241 | 0x00F1 | 0 | Device type and features | 11 bytes | | ro | | type code of device features |
| 250 | 0x00FA | 0 | Article number | 14 bytes | | ro | 10.02.02.* | Order-Nr. |
| 251 | 0x00FB | 0 | Article revision | 2 bytes | | ro | 00 | Article revision |
| 252 | 0x00FC | 0 | Production date | 10 bytes | | ro | G16 | Date of production |
| 254 | 0x00FE | 0 | Product text (detailed) | 1….64 bytes | | ro | SCTSi-IOL-14-AB-4D01… | Detailed type description of the device |
| 354 | 0x0162 | 0 | Product Configuration (detailed) | 1….67 bytes | | ro | D00-D01-D02-D03-D04… | Detailed configuration of the device |
| **Device Localization** | | | | | | | | |

J. Schmalz GmbH
Johannes-Schmalz-Str.1
D 72293 Glatten
Tel.: +49(0)7443/2403-0
Fax: +49(0)7443/2403-259
schmalz@schmalz.de

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|---|---|---|---|---|---|---|---|---|
| 24 | 0x0018 | 0 | Application specific tag | 1 … 32 bytes | | rw | *** | Asset-ID |
| 242 | 0x00F2 | 0 | Equipment identification | 1…64 bytes | | rw | *** | User string to store e.g. identification name from schematic |
| 246 | 0x00F6 | 0 | Geolocation | 1…64 bytes | | rw | *** | User string to store geolocation from handheld device |
| 247 | 0x00F7 | 0 | IODD Web Link | 1…64 bytes | | rw | *** | User string to store web link to IODD file |
| 248 | 0x00F8 | 0 | NFC Web Link | 1…64 bytes | | 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 | | System command | 1 byte | 5, 130, 165, 167, 168 | wo | 0x82 | 0x05 (dec 5): Force upload of parameter data into the master<br>0x82 (dec 130): Reset device parameters to factory defaults<br>0xA5 (dec 165): Calibrate vacuum sensor of all ejectors<br>0xA7 (dec 167): Reset erasable counters in all ejectors<br>0xA8 (dec 168): Reset voltage min/max |
| **Access Control** | | | | | | | | |
| 90 | 0x005A | 0 | Extended device locks | 1 byte | 0 - 3 | rw | 0 | Bit 0: NFC write lock<br>Bit 1: NFC disable<br>Bit 2: local Firmware update (Firmware update locked)<br>Bit 3: local user interface locked (manual mode in ejectors locked)<br>Bit 4: IO-Link event lock (suppress sending io-link events) |
| 91 | 0x005B | 0 | PIN code | 2 bytes | 0-999 | rw | 0 | Pass code for writing data from NFC app |
| **Initial Settings** | | | | | | | | |
| 110 | 0x006E | 1…16 | Blow-mode for ejectors #1-#16 | 16x 1 byte | 0 - 2 | rw | 0 | Blow mode setting for each ejector<br>subindex corresponds to ejector number<br>subindex 0 for access to full array (16 bytes)<br><br>0x00 = Externally controlled blow-off<br>0x01 = Internally controlled blow-off – time-dependent<br>0x02 = Externally controlled blow-off – time-dependent |
| **Process Settings** | | | | | | | | |
| 100 | 0x0064 | 1…16 | Setpoint H1 for ejectors #1-#16 | 16x 2 bytes | 998 >= H1 >= (H2+h1) | rw | 750 | Unit: 1 mbar. Subindex corresponds to ejector number |
| 101 | 0x0065 | 1…16 | Hysteresis h1 for ejectors #1-#16 | 16x 2 bytes | (H1-H2) >= h1 > 10 | rw | 150 | Unit: 1 mbar. Subindex corresponds to ejector number |
| 102 | 0x0066 | 1…16 | Setpoint H2 for ejectors #1-#16 | 16x 2 bytes | (H1-h1 >= H2 >= (h2+2) | rw | 550 | Unit: 1 mbar. Subindex corresponds to ejector number |
| 103 | 0x0067 | 1…16 | Hysteresis h2 for ejectors #1-#16 | 16x 2 bytes | (H2-2) >= h2 >= 10 | rw | 10 | Unit: 1 mbar. Subindex corresponds to ejector number |
| 106 | 0x006A | 1…16 | Duration automatic blow for ejectors #1 - #16 | 16x 2 bytes | 0 - 9999 | rw | 200 | Unit: 1 ms. Subindex corresponds to ejector number |
| 107 | 0x006B | 1…16 | Permissible evacuation time for ejectors #1 - #16 | 16x 2 bytes | 0 - 9999 | rw | 2000 | Unit: 1 ms. Subindex corresponds to ejector number |
| 108 | 0x006C | 1…16 | Permissible leakage rate for ejectors #1 - #16 | 16x 2 bytes | 0 - 999 | rw | 250 | Unit: 1 mbar/sec. Subindex corresponds to ejector number |
| 109 | 0x006D | 1…16 | Control-mode for ejector #1 - #16 | 16x 1 byte | 0 - 5 | rw | 0x0002 | Control mode settings for each ejector<br>Subindex corresponds to ejector number<br>subindex 0 for access to full array (16 bytes)<br><br>0x00 = control is not active, H1 in hysteresis mode<br>0x01 = control is not active, H1 in comparator mode<br>0x02 = control is active<br>0x03 = control is active with supervision of leakage<br>0x04 = control is active, continuous succing disabled<br>0x05 = control is active with supervision of leakage, continuous succing disabled |
| **Observation** | | | | | | | | |
| **Monitoring** | | | | | | | | |
| **Process Data** | | | | | | | | |
| 40 | 0x0028 | 0 | Process Data In Copy | see PD in | | ro | - | Copy of currently active process data input (length see above) |
| 41 | 0x0029 | 0 | Process Data Out Copy | see PD out | | ro | - | Copy of currently active process data output (length see above) |
| 66 | 0x0042 | 0 | Primary supply voltage | 6 bytes | | ro | - | subindex 0 for access to all primary supply voltage values |
| 66 | 0x0042 | 1 | Primary supply voltage, live | 2 bytes | | ro | - | Primary supply voltage (US) as measured by the device (unit: 0.1 Volt) |
| 66 | 0x0042 | 2 | Primary supply voltage, min | 2 bytes | | ro | - | min. value of primary supply voltage (unit: 0.1 Volt) - rest by ISDU 0x0002 |
| 66 | 0x0042 | 3 | Primary supply voltage, max | 2 bytes | | ro | - | max. value of primary supply voltage (unit: 0.1 Volt) - rest by ISDU 0x0002 |
| 67 | 0x0043 | 0 | Auxiliary supply voltage | 6 bytes | | ro | - | subindex 0 for access to all auxiliary supply voltage values |
| 67 | 0x0043 | 1 | Auxiliary supply voltage, live | 2 bytes | | ro | - | Auxiliary supply voltage (UA) as measured by the device (unit: 0.1 Volt) |
| 67 | 0x0043 | 2 | Auxiliary supply voltage, min | 2 bytes | | ro | - | min. value of auxiliary supply voltage (unit: 0.1 Volt) - rest by ISDU 0x0002 |
| 67 | 0x0043 | 3 | Auxiliary supply voltage, max | 2 bytes | | ro | - | max. value of auxiliary supply voltage (unit: 0.1 Volt) - rest by ISDU 0x0002 |
| 148 | 0x0094 | 0 | Evacuation time t0 | 32 bytes | | ro | | subindex 0 for access to all ejectors |
| 148 | 0x0094 | 1 | Evacuation time t0 for ejector #1 | 2 bytes | 0 - 65.535 | ro | 0 | Time from start of suction to H2 (unit: 1 ms) |
| 148 | 0x0094 | 2 | Evacuation time t0 for ejector #2 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 3 | Evacuation time t0 for ejector #3 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 4 | Evacuation time t0 for ejector #4 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 5 | Evacuation time t0 for ejector #5 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 6 | Evacuation time t0 for ejector #6 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 7 | Evacuation time t0 for ejector #7 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 8 | Evacuation time t0 for ejector #8 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 9 | Evacuation time t0 for ejector #9 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 10 | Evacuation time t0 for ejector #10 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 11 | Evacuation time t0 for ejector #11 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 12 | Evacuation time t0 for ejector #12 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 13 | Evacuation time t0 for ejector #13 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 14 | Evacuation time t0 for ejector #14 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 148 | 0x0094 | 15 | Evacuation time t0 for ejector #15 | 2 bytes | 0 - 65.535 | ro | 0 | |

J. Schmalz GmbH
Johannes-Schmalz-Str.1
D 72293 Glatten
Tel.: +49(0)7443/2403-0
Fax: +49(0)7443/2403-259
schmalz@schmalz.de

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|---|---|---|---|---|---|---|---|---|
| 148 | 0x0094 | 16 | Evacuation time t0 for ejector #16 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 0 | Evacuation time t1 | 32 bytes | | ro | | subindex 0 for access to all ejectors |
| 149 | 0x0095 | 1 | Evacuation time t1 for ejector #1 | 2 bytes | 0 - 65.535 | ro | 0 | Time from start of suction to H2 (unit: 1 ms) |
| 149 | 0x0095 | 2 | Evacuation time t1 for ejector #2 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 3 | Evacuation time t1 for ejector #3 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 4 | Evacuation time t1 for ejector #4 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 5 | Evacuation time t1 for ejector #5 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 6 | Evacuation time t1 for ejector #6 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 7 | Evacuation time t1 for ejector #7 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 8 | Evacuation time t1 for ejector #8 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 9 | Evacuation time t1 for ejector #9 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 10 | Evacuation time t1 for ejector #10 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 11 | Evacuation time t1 for ejector #11 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 12 | Evacuation time t1 for ejector #12 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 13 | Evacuation time t1 for ejector #13 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 14 | Evacuation time t1 for ejector #14 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 15 | Evacuation time t1 for ejector #15 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 149 | 0x0095 | 16 | Evacuation time t1 for ejector #16 | 2 bytes | 0 - 65.535 | ro | 0 | |
| 156 | 0x009C | 0 | Air consumption per cycle | 32 bytes | | ro | | subindex 0 for access to all ejectors |
| 156 | 0x009C | 1 | Air consumption per cycle for ejector #1 | 2 bytes | 0 - 65535 | ro | 0 | Air consumption of last suction cycle (unit: 0.1 Nl) |
| 156 | 0x009C | 2 | Air consumption per cycle for ejector #2 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 3 | Air consumption per cycle for ejector #3 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 4 | Air consumption per cycle for ejector #4 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 5 | Air consumption per cycle for ejector #5 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 6 | Air consumption per cycle for ejector #6 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 7 | Air consumption per cycle for ejector #7 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 8 | Air consumption per cycle for ejector #8 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 9 | Air consumption per cycle for ejector #9 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 10 | Air consumption per cycle for ejector #10 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 11 | Air consumption per cycle for ejector #11 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 12 | Air consumption per cycle for ejector #12 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 13 | Air consumption per cycle for ejector #13 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 14 | Air consumption per cycle for ejector #14 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 15 | Air consumption per cycle for ejector #15 | 2 bytes | 0 - 65535 | ro | 0 | |
| 156 | 0x009C | 16 | Air consumption per cycle for ejector #16 | 2 bytes | 0 - 65535 | ro | 0 | |
| 160 | 0x00A0 | 0 | Leakage rate | 32 bytes | | ro | | subindex 0 for access to all ejectors |
| 160 | 0x00A0 | 1 | Leakage rate for ejector #1 | 2 bytes | 0 - 8000 | ro | 0 | Leakage of last suction cycle (unit: 1 mbar/sec) |
| 160 | 0x00A0 | 2 | Leakage rate for ejector #2 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 3 | Leakage rate for ejector #3 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 4 | Leakage rate for ejector #4 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 5 | Leakage rate for ejector #5 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 6 | Leakage rate for ejector #6 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 7 | Leakage rate for ejector #7 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 8 | Leakage rate for ejector #8 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 9 | Leakage rate for ejector #9 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 10 | Leakage rate for ejector #10 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 11 | Leakage rate for ejector #11 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 12 | Leakage rate for ejector #12 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 13 | Leakage rate for ejector #13 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 14 | Leakage rate for ejector #14 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 15 | Leakage rate for ejector #15 | 2 bytes | 0 - 8000 | ro | 0 | |
| 160 | 0x00A0 | 16 | Leakage rate for ejector #16 | 2 bytes | 0 - 8000 | ro | 0 | |
| 161 | 0x00A1 | 0 | Free-flow vacuum | 32 bytes | | ro | | subindex 0 for access to all ejectors |
| 161 | 0x00A1 | 1 | Free-flow vacuum for ejector #1 | 2 bytes | 0 - 999 | ro | 0 | Last measured free-flow vacuum (unit: 1 mbar) |
| 161 | 0x00A1 | 2 | Free-flow vacuum for ejector #2 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 3 | Free-flow vacuum for ejector #3 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 4 | Free-flow vacuum for ejector #4 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 5 | Free-flow vacuum for ejector #5 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 6 | Free-flow vacuum for ejector #6 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 7 | Free-flow vacuum for ejector #7 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 8 | Free-flow vacuum for ejector #8 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 9 | Free-flow vacuum for ejector #9 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 10 | Free-flow vacuum for ejector #10 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 11 | Free-flow vacuum for ejector #11 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 12 | Free-flow vacuum for ejector #12 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 13 | Free-flow vacuum for ejector #13 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 14 | Free-flow vacuum for ejector #14 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 15 | Free-flow vacuum for ejector #15 | 2 bytes | 0 - 999 | ro | 0 | |
| 161 | 0x00A1 | 16 | Free-flow vacuum for ejector #16 | 2 bytes | 0 - 999 | ro | 0 | |

IO-Link

J. Schmalz GmbH
Johannes-Schmalz-Str.1
D 72293 Glatten
Tel.: +49(0)7443/2403-0
Fax: +49(0)7443/2403-259
schmalz@schmalz.de

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|---|---|---|---|---|---|---|---|---|
| 164 | 0x00A4 | 0 | max. reached vacuum in cycle | 32 bytes | | ro | | subindex 0 for access to all ejectors |
| 164 | 0x00A4 | 1 | max. reached vacuum in cycle for ejector #1 | 2 bytes | 0 - 999 | ro | 0 | will only be measured with control-mode (ISDU 0x006D) = 1 |
| 164 | 0x00A4 | 2 | max. reached vacuum in cycle for ejector #2 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 3 | max. reached vacuum in cycle for ejector #3 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 4 | max. reached vacuum in cycle for ejector #4 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 5 | max. reached vacuum in cycle for ejector #5 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 6 | max. reached vacuum in cycle for ejector #6 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 7 | max. reached vacuum in cycle for ejector #7 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 8 | max. reached vacuum in cycle for ejector #8 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 9 | max. reached vacuum in cycle for ejector #9 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 10 | max. reached vacuum in cycle for ejector #10 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 11 | max. reached vacuum in cycle for ejector #11 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 12 | max. reached vacuum in cycle for ejector #12 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 13 | max. reached vacuum in cycle for ejector #13 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 14 | max. reached vacuum in cycle for ejector #14 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 15 | max. reached vacuum in cycle for ejector #15 | 2 bytes | 0 - 999 | ro | 0 | |
| 164 | 0x00A4 | 16 | max. reached vacuum in cycle for ejector #16 | 2 bytes | 0 - 999 | ro | 0 | |
| | | | **Communication Mode** | | | | | |
| 564 | 0x0234 | 0 | Communication Mode | 1 byte | | ro | | Currently active communication mode:<br>0x10 = IO-Link Revision 1.0 (set by master)<br>0x11 = IO-Link Revision 1.1 (set by master) |
| | | | **Counters** | | | | | |
| 140 | 0x008C | 0 | Ejectors vacuum-on counter | 64 bytes | | ro | | subindex 0 for access to all ejectors |
| 140 | 0x008C | 1 | vacuum-on counter for ejector #1 | 4 bytes | 0 - 999 mio | ro | 0 | Total number of suction cycles |
| 140 | 0x008C | 2 | vacuum-on counter for ejector #2 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 3 | vacuum-on counter for ejector #3 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 4 | vacuum-on counter for ejector #4 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 5 | vacuum-on counter for ejector #5 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 6 | vacuum-on counter for ejector #6 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 7 | vacuum-on counter for ejector #7 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 8 | vacuum-on counter for ejector #8 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 9 | vacuum-on counter for ejector #9 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 10 | vacuum-on counter for ejector #10 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 11 | vacuum-on counter for ejector #11 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 12 | vacuum-on counter for ejector #12 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 13 | vacuum-on counter for ejector #13 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 14 | vacuum-on counter for ejector #14 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 15 | vacuum-on counter for ejector #15 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 140 | 0x008C | 16 | vacuum-on counter for ejector #16 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 0 | Ejectors valve operating counter | 64 bytes | | ro | | subindex 0 for access to all ejectors |
| 141 | 0x008D | 1 | valve operating counter for ejector #1 | 4 bytes | 0 - 999 mio | ro | 0 | Total number of times the suction valve has been switched on |
| 141 | 0x008D | 2 | valve operating counter for ejector #2 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 3 | valve operating counter for ejector #3 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 4 | valve operating counter for ejector #4 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 5 | valve operating counter for ejector #5 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 6 | valve operating counter for ejector #6 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 7 | valve operating counter for ejector #7 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 8 | valve operating counter for ejector #8 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 9 | valve operating counter for ejector #9 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 10 | valve operating counter for ejector #10 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 11 | valve operating counter for ejector #11 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 12 | valve operating counter for ejector #12 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 13 | valve operating counter for ejector #13 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 14 | valve operating counter for ejector #14 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 15 | valve operating counter for ejector #15 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 141 | 0x008D | 16 | valve operating counter for ejector #16 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 0 | Ejectors vacuum-on counter (erasable) | 64 bytes | | ro | | subindex 0 for access to all ejectors |
| 143 | 0x008F | 1 | erasable vacuum-on counter for ejector #1 | 4 bytes | 0 - 999 mio | ro | 0 | number of suction cycles<br>(since latest erasing) |
| 143 | 0x008F | 2 | erasable vacuum-on counter for ejector #2 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 3 | erasable vacuum-on counter for ejector #3 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 4 | erasable vacuum-on counter for ejector #4 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 5 | erasable vacuum-on counter for ejector #5 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 6 | erasable vacuum-on counter for ejector #6 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 7 | erasable vacuum-on counter for ejector #7 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 8 | erasable vacuum-on counter for ejector #8 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 9 | erasable vacuum-on counter for ejector #9 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 10 | erasable vacuum-on counter for ejector #10 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 11 | erasable vacuum-on counter for ejector #11 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 12 | erasable vacuum-on counter for ejector #12 | 4 bytes | 0 - 999 mio | ro | 0 | |

J. Schmalz GmbH
Johannes-Schmalz-Str.1
D 72293 Glatten
Tel.: +49(0)7443/2403-0
Fax: +49(0)7443/2403-259
schmalz@schmalz.de

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 143 | 0x008F | 13 | erasable vacuum-on counter for ejector #13 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 14 | erasable vacuum-on counter for ejector #14 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 15 | erasable vacuum-on counter for ejector #15 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 143 | 0x008F | 16 | erasable vacuum-on counter for ejector #16 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 0 | Ejectors valve operating counter (erasable) | 64 bytes | | ro | | subindex 0 for access to all ejectors |
| 144 | 0x0090 | 1 | erasable valve operating counter for ejector #1 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 2 | erasable valve operating counter for ejector #2 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 3 | erasable valve operating counter for ejector #3 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 4 | erasable valve operating counter for ejector #4 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 5 | erasable valve operating counter for ejector #5 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 6 | erasable valve operating counter for ejector #6 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 7 | erasable valve operating counter for ejector #7 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 8 | erasable valve operating counter for ejector #8 | 4 bytes | 0 - 999 mio | ro | 0 | number of suction cycles (since latest erasing) |
| 144 | 0x0090 | 9 | erasable valve operating counter for ejector #9 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 10 | erasable valve operating counter for ejector #10 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 11 | erasable valve operating counter for ejector #11 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 12 | erasable valve operating counter for ejector #12 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 13 | erasable valve operating counter for ejector #13 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 14 | erasable valve operating counter for ejector #14 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 15 | erasable valve operating counter for ejector #15 | 4 bytes | 0 - 999 mio | ro | 0 | |
| 144 | 0x0090 | 16 | erasable valve operating counter for ejector #16 | 4 bytes | 0 - 999 mio | ro | 0 | |
| **Diagnosis** | | | | | | | | |
| **Device Status** | | | | | | | | |
| 32 | 0x0020 | 0 | Error count | 2 bytes | | ro | | Number of errors since last power-up |
| 36 | 0x0024 | 0 | IO-Link Device Status | 1 byte | | ro | | Status codes according to IO-Link specification V1.1:<br>0 = device is operating properly<br>1 = maintenance required<br>2 = out of specification<br>3 = functional check<br>4 = failure |
| 138 | 0x008A | 1 | Extended Device Status - Event Category | 1 byte | | ro | | Categorisation of current device status:<br>0x10: Device is operation properly<br>0x21: Warning, low<br>0x22: Warning, high<br>0x41: Critical condition, low<br>0x42: Critical condition, high<br>0x81: Defect/fault, low<br>0x82: Defect/fault, high |
| 138 | 0x008A | 2 | Extended Device Status - Event Code | 2 bytes | | ro | | Event Code of current device status (see table below) |
| 139 | 0x008B | 0 | NFC Status | 1 byte | | ro | 0 | Result of last NFC activity:<br>0x00: data valid, write finished successfully<br>0x23: write failed: write access locked<br>0x30: write failed: parameter(s) out of range<br>0x41: write failed: parameter set inconsistent<br>0xA1: write failed:invalid authorisation<br>0xA2: NFC not available<br>0xA3: write failed: invalid data structure<br>0xA5: write pending<br>0xA6: NFC internal error |
| 130 | 0x0082 | 1 | Errors of ejector #1 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 2 | Errors of ejector #2 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 3 | Errors of ejector #3 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 4 | Errors of ejector #4 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 5 | Errors of ejector #5 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 6 | Errors of ejector #6 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 7 | Errors of ejector #7 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 8 | Errors of ejector #8 | 2 byte | | ro | 0 | For each ejector:<br>Bit 00: Measurement range overrun |
| 130 | 0x0082 | 9 | Errors of ejector #9 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 10 | Errors of ejector #10 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 11 | Errors of ejector #11 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 12 | Errors of ejector #12 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 13 | Errors of ejector #13 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 14 | Errors of ejector #14 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 15 | Errors of ejector #15 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 16 | Errors of ejector #16 | 2 byte | | ro | 0 | |
| 130 | 0x0082 | 17 | Errors of Control-Unit | 2 bytes | | ro | 0 | Bit 00: Internal error: data corruption<br>Bit 01: Internal error: bus fault<br>Bit 02: Primary voltage too low<br>Bit 03: Primary voltage too high<br>Bit 04: Secondary voltage too low<br>Bit 05: Secondary voltage too high<br>Bit 06: Supply pressure too low or too high<br>Bit 07-15: reserved |
| **Condition Monitoring [CM]** | | | | | | | | |
| 146 | 0x0092 | 0 | Condition Monitoring of the system | 17 bytes | | ro | | subindex 0 for access to all ejectors and the Control-Unit |
| 146 | 0x0092 | 1 | Condition Monitoring ejector #1 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 2 | Condition Monitoring ejector #2 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 3 | Condition Monitoring ejector #3 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 4 | Condition Monitoring ejector #4 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 5 | Condition Monitoring ejector #5 | 1byte | 0-99 | ro | 0 | |

J. Schmalz GmbH
Johannes-Schmalz-Str.1
D 72293 Glatten
Tel.: +49(0)7443/2403-0
Fax: +49(0)7443/2403-259
schmalz@schmalz.de

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|---|---|---|---|---|---|---|---|---|
| 146 | 0x0092 | 6 | Condition Monitoring ejector #6 | 1byte | 0-99 | ro | 0 | Bit 0 = valve protection active<br>Bit 1 = Evacuation time greater than limit<br>Bit 2 = Lekeage rate greater than limit<br>Bit 3 = H1 not reached in suction cycle<br>Bit 4 = Free flow vacuum too high<br>Bit 5 = Manual Mode Active |
| 146 | 0x0092 | 7 | Condition Monitoring ejector #7 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 8 | Condition Monitoring ejector #8 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 9 | Condition Monitoring ejector #9 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 10 | Condition Monitoring ejector #10 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 11 | Condition Monitoring ejector #11 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 12 | Condition Monitoring ejector #12 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 13 | Condition Monitoring ejector #13 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 14 | Condition Monitoring ejector #14 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 15 | Condition Monitoring ejector #15 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 16 | Condition Monitoring ejector #16 | 1byte | 0-99 | ro | 0 | |
| 146 | 0x0092 | 17 | Condition Monitoring of Control-Unit | 1byte | 0-99 | ro | 0 | Bit 0 = Primary Voltage limit<br>Bit 1 = Secondary voltage limit<br>Bit 2 = Input pressure limit (3,5 … 5bar) |

## Event Codes of IO-Link Events and ISDU 138 (Extended Device Status)

| Event code | Event name | IO-Link Event Type | Extended Device Status Category | Remark |
|---|---|---|---|---|
| Control-Unit | | | | |
| 0x5100 | General power supply fault | Error | Critical condiction, high | Primary supply voltage (US) too low |
| 0x5110 | Primary supply voltage over-run | Warning | Critical condiction, high | Primary supply voltage (US) too high |
| 0x5112 | Secondary supply voltage fault | Warning | Critical condiction, high | Secondary supply voltage (UA) too low |
| 0x1812 | Secondary supply voltage over-run | Warning | Critical condiction, high | Secondary supply voltage (UA) too high |
| 0x1802 | Supply pressure fault | Warning | Critical condiction, high | Input pressure too high or too low |
| 0x1811 | Data Corruption | Error | Defect/fault, high | Internal error, user data corrupted |
| 0x1000 | General malfunction | Error | Defect/fault, high | Internal error, Bus fault |
| 0x1800 | Vacuum calibration OK | Notification | - | Calibration offset 0 set successfully |
| 0x1801 | Vacuum calibration failed | Notification | - | Sensor value too high or too low, offset not changed |
| 0x8C01 | Simulation active | Warning | Warning, low | Manual mode is active in at least one ejector |
| 0x180C | Primary supply voltage out of optimal range | Warning | Warning, high | Condition Monitoring: primary supply voltage US outside of operating range |
| 0x180D | Secondary supply voltage out of optimal range | Warning | Warning, high | Condition Monitoring: secondary supply voltage outside of operating range |
| 0x180E | Supply pressure out of optimal range | Warning | Warning, high | Condition Monitoring: supply pressure outside of operating range |
| Ejectors | | | | |
| 0x8D00 | Measurement range overrun, Ejector #1 | Error | Defect/fault, low | Vacuum value > 999 mbar in Ejector #1 |
| … | | | | |
| 0x8D0F | Measurement range overrun, Ejector #16 | Error | Defect/fault, low | Vacuum value > 999 mbar in Ejector #16 |
| 0x8D10 | Valve protection active, Ejector #1 | Warning | Warning, high | |
| … | | | | |
| 0x8D1F | Valve protection active, Ejector #16 | Warning | Warning, high | |
| 0x8D20 | Evacuation time t1 is greater than limit, Ejector #1 | Warning | Warning, low | |
| … | | | | |
| 0x8D2F | Evacuation time t1 is greater than limit, Ejector #16 | Warning | Warning, low | |
| 0x8D30 | Leakage rate is greater than limit, Ejector #1 | Warning | Warning, low | |
| … | | | | |
| 0x8D3F | Leakage rate is greater than limit, Ejector #16 | Warning | Warning, low | |
| 0x8D40 | H1 was not reached, Ejector #1 | Warning | Warning, high | |
| … | | | | |
| 0x8D4F | H1 was not reached, Ejector #16 | Warning | Warning, high | |
| 0x8D50 | Free-flow vacuum level too high, Ejector #1 | Warning | Warning, low | |
| … | | | | |
| 0x8D5F | Free-flow vacuum level too high, Ejector #16 | Warning | Warning, low | |

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**J. Schmalz GmbH**
Johannes-Schmalz-Str. 1
72293 Glatten, Germany
T: +49 (0) 7443 2403-0
schmalz@schmalz.de
WWW.SCHMALZ.COM