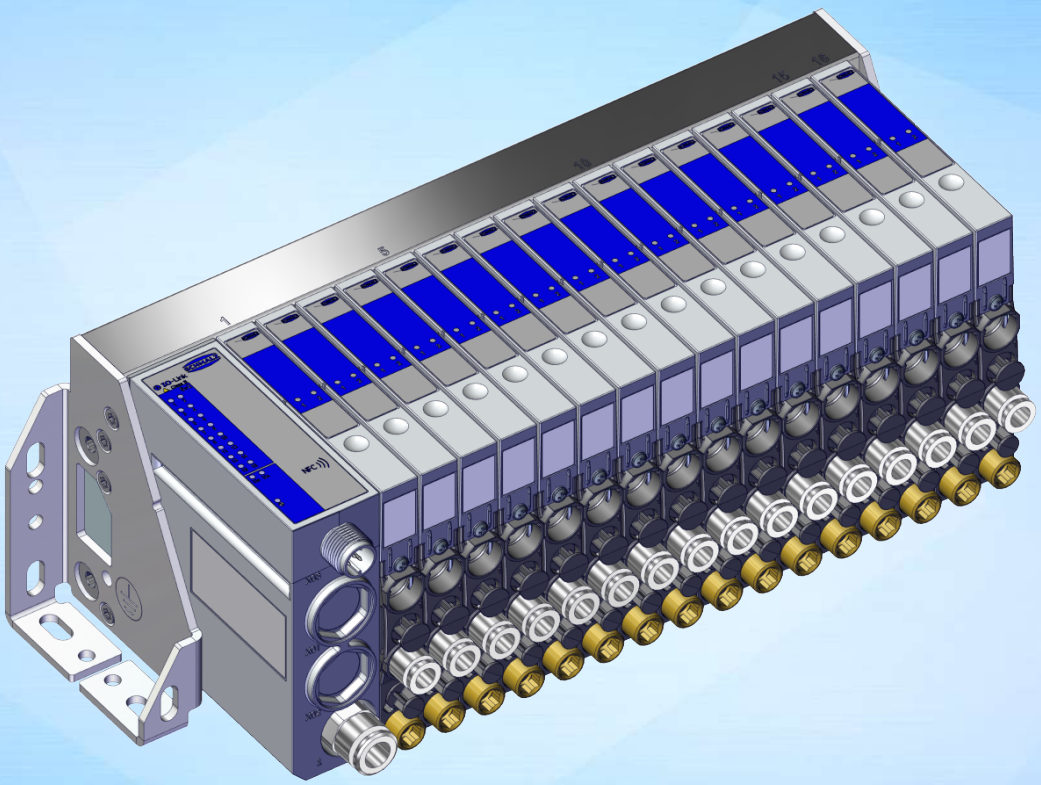


Operating instructions

Mini Compact Terminal SCTMi IOL

WWW.SCHMALZ.COM

EN-US · 30.30.01.03722 · 02 · 08/24
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 aimed at:

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

1.2 The technical documentation is part of the product

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

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

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

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

www.schmalz.com/services

1.3 Type Plate

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

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 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).

1.5 Symbols

This symbol indicates useful and important information.

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

▸ This symbol represents an action to be performed.

⇨ This symbol represents the result of an action.

Actions that consist of more than one step are numbered:

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

Indication of correct / incorrect action:

 Correct action

 Incorrect action

2 Fundamental Safety Instructions

2.1 Intended Use

The mini compact terminal (SCTMi IOL) is designed to generate a vacuum (ejector) or to switch the vacuum on and off (EV) for gripping and transporting objects when used in conjunction with suction cups. The electrical control signals are transmitted through corresponding IO-Link communication lines.

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.

2.2 Non-Intended Use

Schmalz accepts no liability for damages caused by non-intended use of the product.

In particular, the following types of use 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 Qualification

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

The operating company must ensure the following points:

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

Applicable for Germany:

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

2.4 Warnings in This Document

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

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

2.5 Residual Risks

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 Product Name

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

Property	Variants
Type	SCTMi (mini compact terminal)
Bus module	**IOL** = IO-Link **EIP** = EtherNetIP **ECT** = EtherCat **PNT** = ProfiNet
Number of ejectors (**E**) [1)] Number of vacuum valves (**V**) [1)]	**E2** = 2 ejectors, **V4** = 4 vacuum valves,
Individual configuration code	Unique 9-digit code

[1)] Either only ejectors (E) or only valves (V) are installed in a mini compact terminal.

This manual only describes terminals with an IO-Link bus module.

3.2 Mini compact terminal

3.2.1 Description of the Mini Compact Terminal

1	Terminal with 16 ejectors	2	Terminal with 4 vacuum valves

The mini compact terminal SCTMi (or SCTMi for short) described in this document is a compact unit comprised of multiple vacuum generators, ejectors or vacuum valves and a bus module.
In the course of the document, the terms ejector and vacuum valve are also referred to as components.

Thanks to its modular design, up to 16 ejectors/valves can be controlled and configured independently. It can be used to handle different parts simultaneously and independently using just one vacuum system. The terminal is available in the following backplate variants: 2x, 4x, 6x, 8x, 12x and 16x (number of installed components: ejector/valve plus blind plug if required).

The counting method for the components starts with component 1 next to the bus module (shown from left to right in the figure). Correspondingly, the LED indicators apply to the limit SP2 on the bus module.

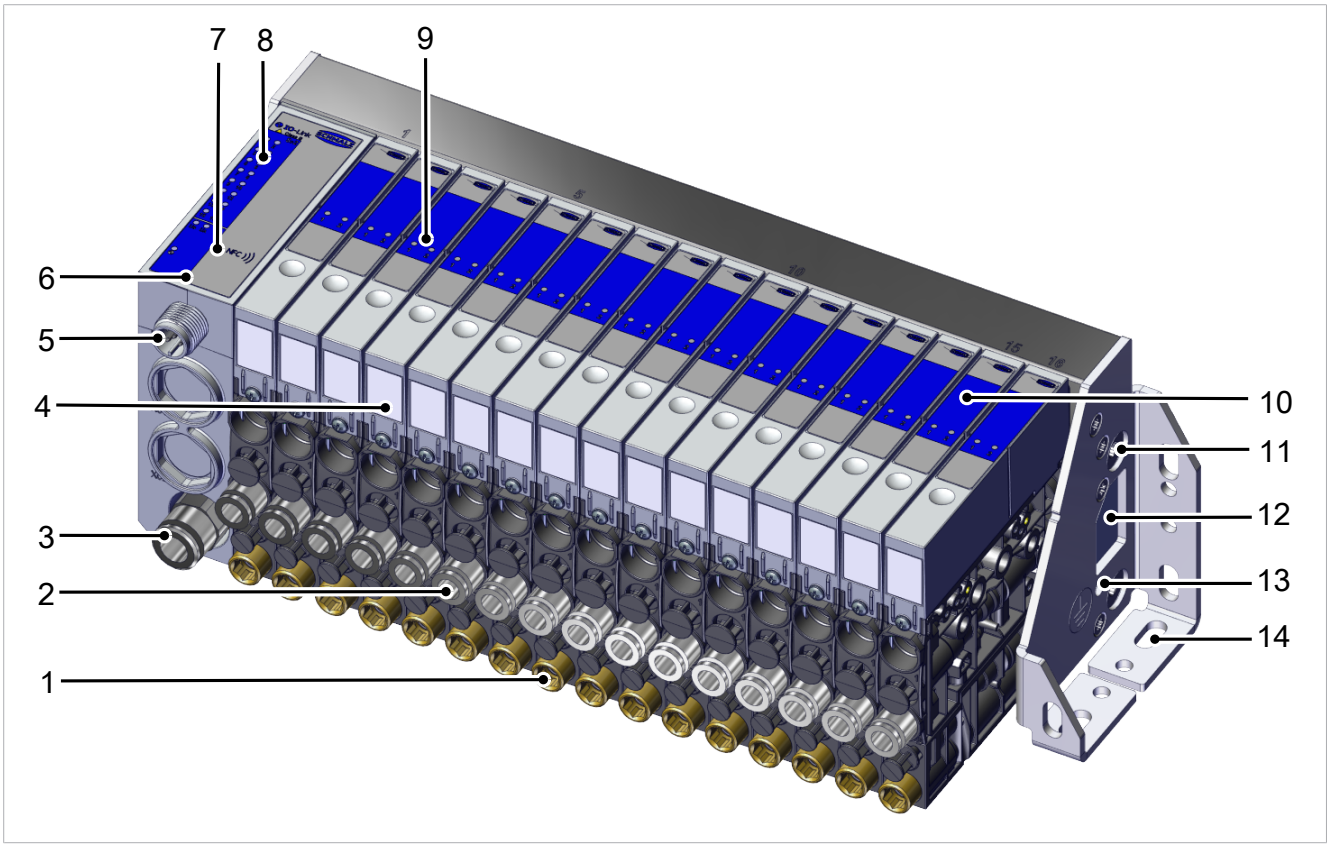
The product has an IO-Link class B interface, referred to as “IO-Link” for short.

All the settings, parameters and measurement and analysis data are made available centrally via IO-Link. Additionally, much of the information and status reports can be accessed using wireless communication with NFC (near-field communication).

The electrical connection and compressed air supply are connected centrally for all the ejectors via the bus module.
In the variant with vacuum valves (EV), the electrical connection, the external vacuum supply and the compressed air supply for all vacuum valves are connected centrally.

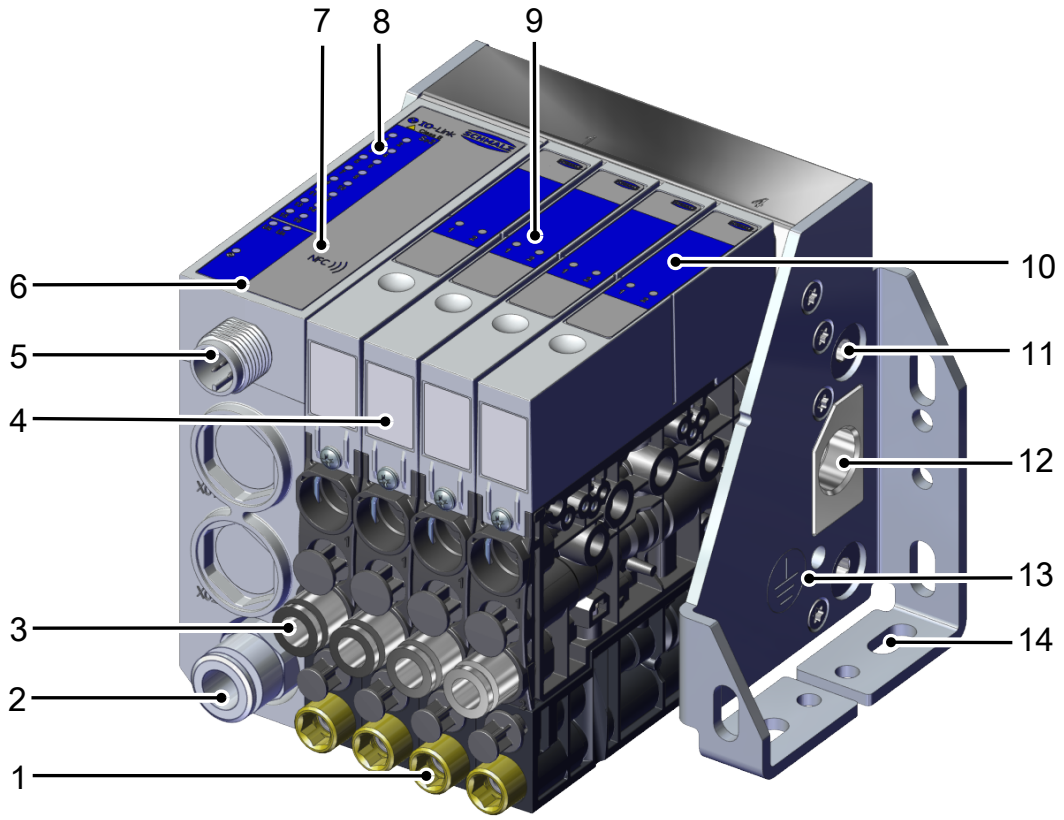
3.2.2 Components of the Mini Compact Terminal

Variant with compact ejectors



1	Blow off valve screw and attachment for ejector	8	Bus module LED indicator
2	Vacuum connection (VSL 6/4 or 4/2)	9	Ejector LED indicator
3	Compressed air connection (VSL 8/6)	10	Compact ejector SCPMt (1 to 16 pcs.)
4	Data matrix code (ejector nozzle size and control type)	11	Auxiliary compressed air supply, 2x (both sides)
5	M12x1 plug electrical connection for IO-Link class B	12	Exhaust outlet with silencer (both sides)
6	IO-Link bus module	13	M4 grounding (both sides)
7	NFC interface	14	Mounting bracket (both sides)

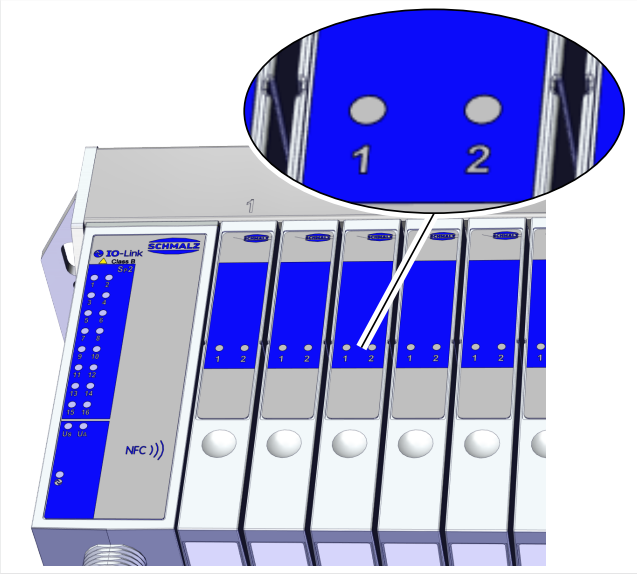
Variant with vacuum valves (EV)



1	Blow off valve screw and attachment for valve	8	Bus module LED indicator
2	Compressed air connection (VSL 8/6)	9	Valve LED indicator
3	Vacuum connection for each vacuum valve (VSL 6/4)	10	Vacuum valve SCPMt (1 to 16 pcs.)
4	Data matrix code (control type)	11	Auxiliary compressed air supply, 2x (both sides)
5	M12x1 plug electrical connection for IO-Link class B	12	Connection of external vacuum supply e.g. vacuum pump (both sides)
6	IO-Link bus module	13	M4 grounding (both sides)
7	NFC interface	14	Mounting bracket (both sides)

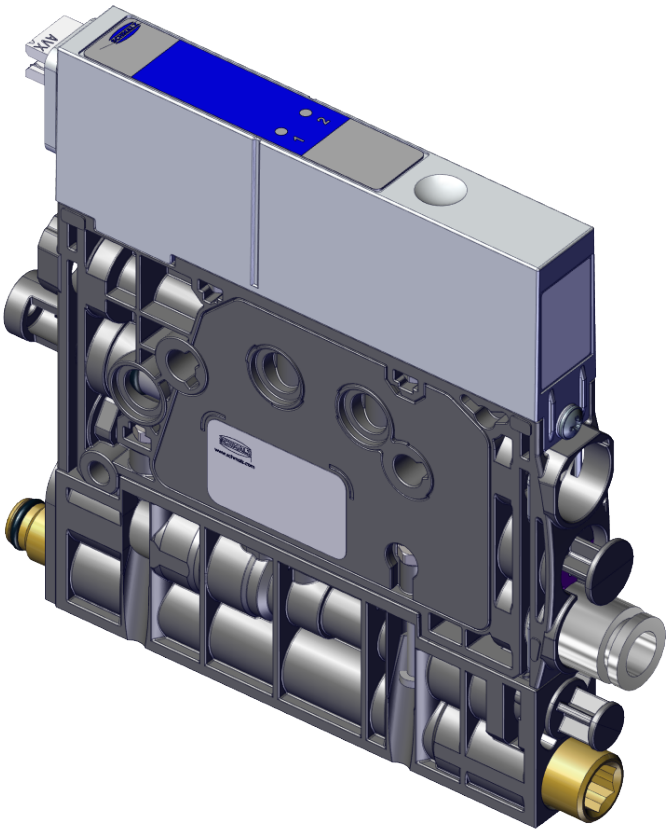
3.2.3 LED indicators

The LEDs (1) and (2) indicate the status of the pilot valves for each ejector/vacuum valve.
In the variant with IMP control, the LED (2) is not active.
If the pilot valve is activated, the corresponding LED lights up orange. If the pilot valve is not activated, the corresponding LED is switched off.



Indicator	NC ejector/vacuum valve state	NO ejector/vacuum valve state	IMP ejector state
LED (2) lights up orange	Apply suction	Do not apply suction and do not blow off = Neutral	State unavailable
Both LEDs off	Do not apply suction and do not blow off = Neutral	Apply suction	- Apply suction - Do not apply suction and do not blow off = Neutral
LED (1) lights up orange	Blow off	State unavailable	Blow off
Both LEDs light up orange	State unavailable	Blow off	State unavailable

3.2.4 Description of Compact Ejector



The electrical power supply to the compact ejectors is provided by internal transmission within the terminal.
The electrical connection is used for communication with the control unit of the higher-level machine.
The electrical connection and compressed air supply are provided centrally for all the ejectors via the bus module.

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

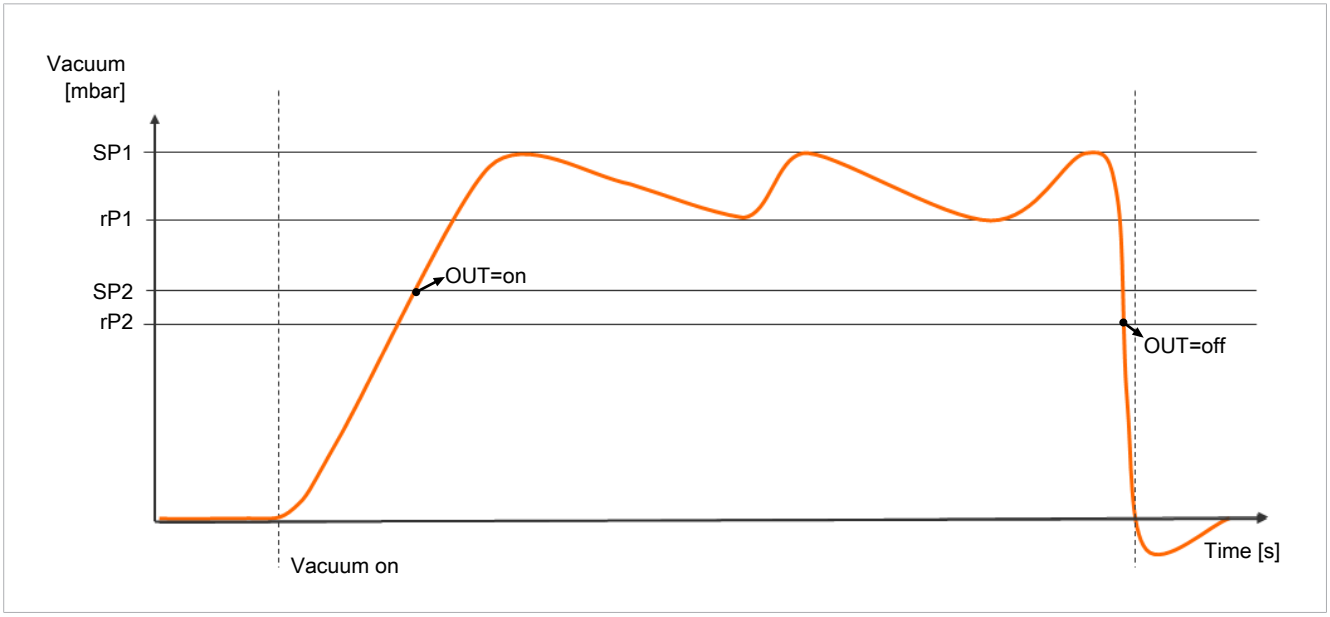
The venturi nozzle on the ejector is activated and deactivated using the suction command:

- In the NO (normally open) 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.)

In the ejector variant IMP, the ejector remains in “Suction” mode if the power supply fails during automatic operation. This prevents objects that have been picked up from falling off the suction cup in the event of a power supply failure. 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 power supply returns, the ejector remains in automatic operation with the air saving function 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.

An integrated sensor records the vacuum generated by the venturi nozzle. The LED indicator on the bus module indicates that the limit value SP2 has been reached.

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



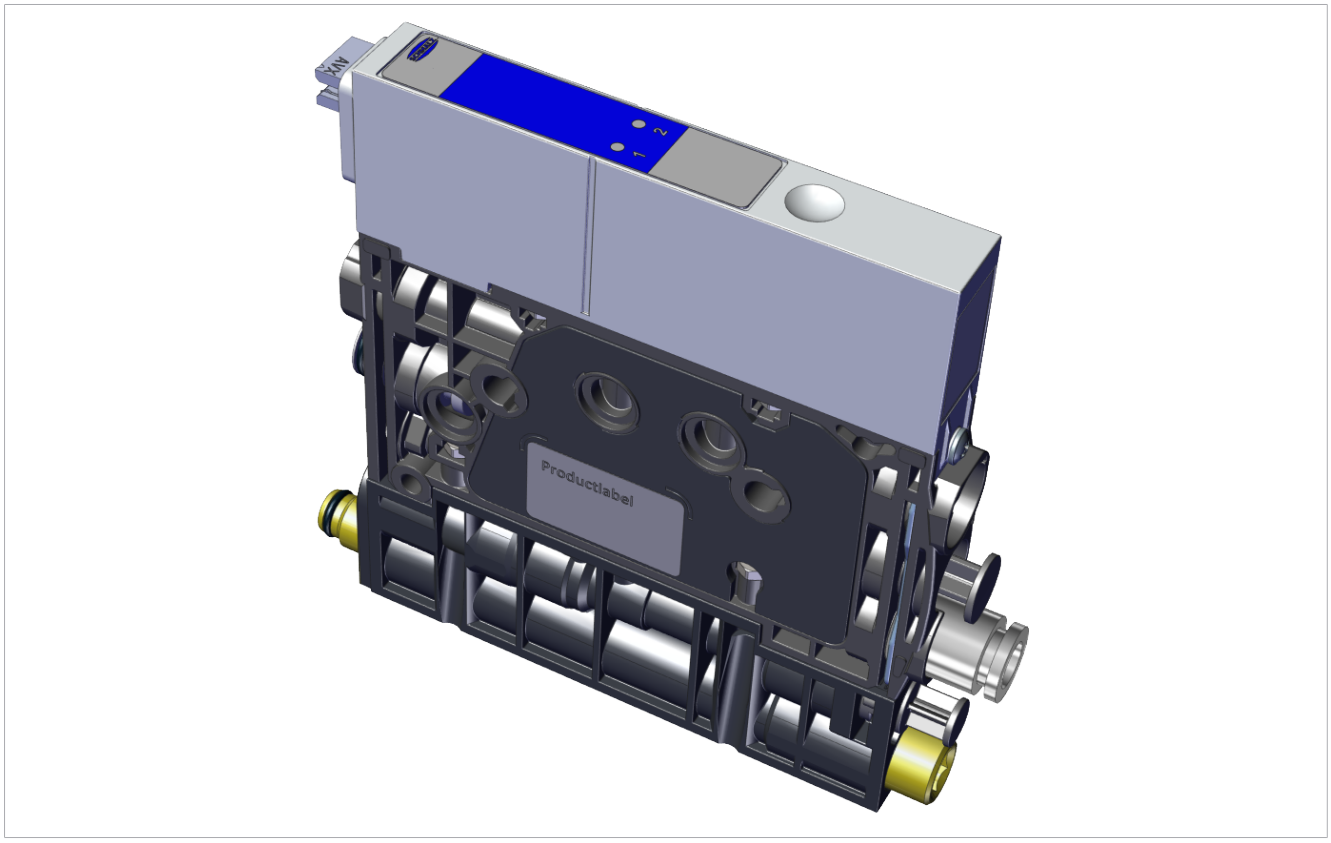
The ejector has an integrated air saving function and automatically regulates the vacuum in suction mode:

- The electronics switch the venturi nozzle off (“Venturi nozzle inactive”) as soon as the set vacuum limit value (switching point SP1) is reached.
- When objects with airtight surfaces are picked up, the integrated non-return valve prevents the vacuum from dropping.
- The venturi nozzle is switched on again as soon as the system vacuum falls below the limit value (switching point SP1-rP1) due to leakage.
- Depending on the vacuum, the SP2 process data bit is set once a workpiece is picked up safely (vacuum value ≥ switching point SP2). This enables the further handling process.

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

For more information about the blow-off function (> See ch. 5.10.3 Blow-off Function, p. 41).

3.2.5 Description of the Vacuum Valve



The electrical power supply to the vacuum valves is provided by internal transmission within the terminal. The electrical connection is used for communication with the control unit of the higher-level machine.

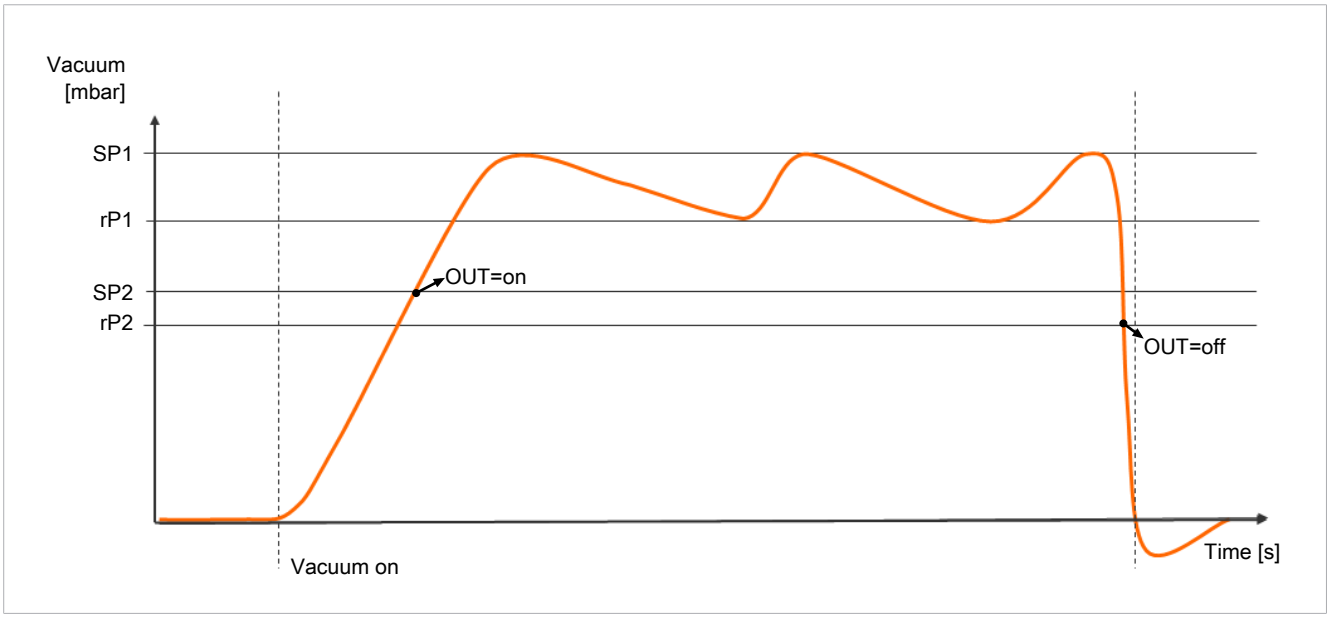
In the EV variant (with vacuum valves), the electrical connection and the compressed air supply for all vacuum valves are provided centrally via the bus module. The external vacuum supply is connected to the side of the section for all vacuum valves.
In this terminal variant, the compressed air connection is used to supply the “Blow off” function and the pilot valves.

The pilot valve is activated and deactivated using the suction command:

- In the NO (normally open) version, the vacuum supply 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 conducted => continuous suction.)
- In the NC (normally closed) version, the vacuum supply 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 conducted.)

An integrated sensor measures the vacuum. The LED indicator on the bus module indicates that the limit value SP2 has been reached.

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



The vacuum valve has an integrated control function and automatically regulates the vacuum in Suction mode:

- The electronics switch the vacuum supply off as soon as the vacuum limit value set for switching point SP1 is reached.
- When objects with airtight surfaces are picked up, the integrated non-return valve prevents the vacuum from dropping.
- The vacuum supply is opened again as soon as the system vacuum falls below the limit value (switching point SP1-rP1) due to leakage.
- Depending on the vacuum, the SP2 process data bit is set once a workpiece is picked up safely (vacuum value ≥ switching point SP2). This enables the further handling process.

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

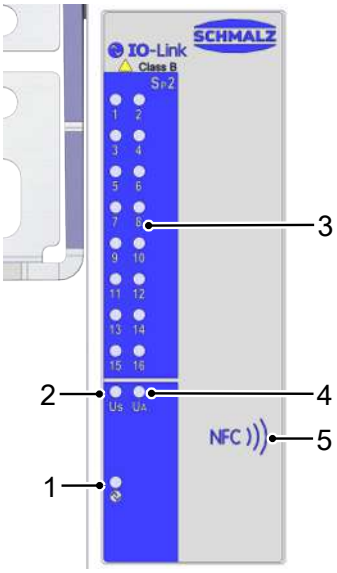
For more information about the blow-off function (> See ch. 5.10.3 Blow-off Function, p. 41).

3.3 Bus Module Description

3.3.1 Description

The bus module ensures communication with the controller.

3.3.2 Bus Module Displays

Bus module	Item	Meaning	Status	Description
	1	"IO-Link" LED	Off	No communication
			Flashing green	IOL communication okay
	2	"Sensor voltage" LED	Off	No sensor supply voltage
			Green	Voltage okay
			Flashing green	Voltage not okay
	3	LED switching point for individual ejectors/valves	Off	Switching point SP2 not reached
			Orange	Switching point SP2 reached
			Flashing orange	Status not in accordance with configuration [1]
	4	"Actuator voltage" LED	Off	No actuator supply voltage
			Green	Voltage okay
			Flashing green	Voltage not okay
	5	Position of the NFC antenna	Optimum position for connection to an NFC transponder	

[1] Incorrect component or configuration (dummy plate or ejector/valve)

3.3.3 Control Interfaces

Basic Principles of IO-Link Communication

Abbreviations:

ISDU: Indexed service data unit, parameter data acyclically queried between the controller and the IO-Link device

IODD: IO Device Description, device description file

The component is operated via IO-Link to enable intelligent communication with a controller.

IO-Link is a communication system for connecting intelligent sensors and actuators to an automation system and is described in the standard IEC 61131-9. The standard contains both the electrical connection data as well as a digital communication protocol via which sensors and actuators exchange data with the automation system.

An IO-Link system consists of an IO-Link master and one or more IO-Link enabled sensors or actuators. The IO-Link master provides the interface to the higher level controller (PLC) and controls the communication with the connected IO-Link devices. An IO-Link master can have one or more IO-Link ports, however only one IO-Link device can be connected to each port.

IO-Link devices have parameters that can be read or written via the IO-Link protocol. Parameters can therefore be changed by the higher-level controller during operation. Since the sensor and actuator parameters are device-specific, parameter information is available for each device in the form of an IODD (IO Device Description).

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

IO-Link mode allows the product to be parameterized remotely via the controller of the higher-level machine (not externally).

Process Data

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

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/valves:

- To determine the air consumption, the input pressure can be preset.
- All the ejectors/valves 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
- Confirm the device selection (Device Select Acknowledge)
- Errors and warnings for the overall system and the individual ejectors/valves
- Vacuum value
- Information about the individual ejectors/valves such as:
  - Air saving function (SP1)
  - “Parts present” check (SP2)
  - Part set down (SP3)
  - Active condition monitoring messages (CM)

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 (> See ch. 15 SCTMi_Data_Dictionary_20231107.PDF, p. 78) and in the IODD.

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 “(> See ch. 5 Functions of the Compact Terminal and Ejectors/Valves, p. 32)”.

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

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.

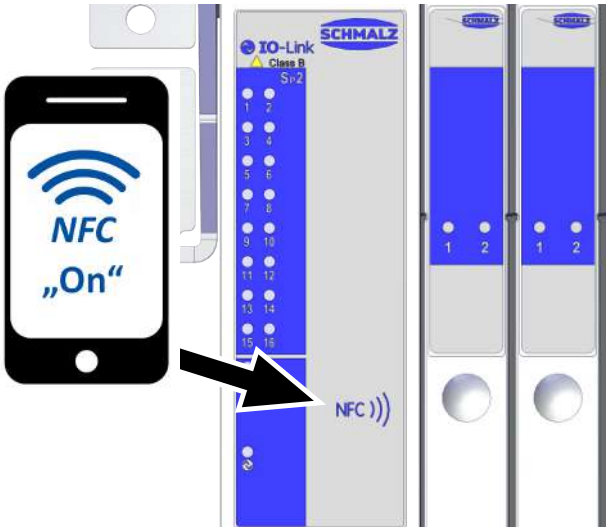
Web link **https://myproduct.schmalz.com/#/**

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.

Process control via NFC is not possible.

For the best data connection, position the reading device at the attached NFC symbol.



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

4 Technical Data

4.1 Operation and Storage Conditions

Operating medium	Air or neutral gas, filtered to 5 µm, oiled or not oiled 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 -12 to +10% V DC (PELV[1)])		
Supply voltage for actuator	24 V -12 to +10% V DC (PELV[1)])		
Power consumption, sensor supply voltage (at 24 V)	< 80 mA for 1 to 16 ejectors/vacuum valves		
		Typ. at 24 V incl. valve activation	Pulse current at 24 V for max. 20 ms
Power consumption, actuator supply voltage (at 24 V)	Bus module	10 mA	—
	1 x NC pilot valve (Suction/release)	15 mA	50 mA
	1 x NO pilot valve (No suction/release)	15 mA / 30 mA	50 mA / 100 mA
	1 x IMP pilot valve	15 mA	70 mA
Polarity reversal protection	Yes		
Degree of protection	IP 54 [2)]		
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).

[2)] In the standard installation position

4.3 Performance Data for Compact Ejectors

Ejector	Nozzle 03	Nozzle 05	Nozzle 07	Nozzle 10	Nozzle 12
Nozzle size [mm]	0.3	0.5	0.7	1.0	1.2
Degree of evacuation [mbar]	870				920
Max. suction rate [l/min] [1]	2.2	7.5	15	28	30
Air consumption for suction [l/min]	5	12	30	58	76
Air consumption for blow off at 5 bar [l/min]	60				
Blow-off flow rate at 5 bar [l/min]	60				
Sound pressure level, unobstructed suction [dB(A)] [1]	57	67	74	75	85
Sound pressure level, suction [dB(A)]	52	64	74	77	84
Pressure range [bar]	2 to 6	4 to 6			
Rec. diameter of vacuum hose [mm] [2]	2			4	
Rec. diameter of compressed air hose [mm] [2]	6			6	

[1] At optimum operating pressure (SCPM...03/05/07: 4 bar; SCPM...10/12: 4.5 bar)
[2] For max. length of 2 m

The values specified apply to each ejector. The values for terminals vary according to the number of ejectors installed.

4.4 Performance Data for Vacuum Valve

Parameter	EV variant
Degree of evacuation [mbar]	Depending on the external vacuum generation
Max. suction rate [l/min] [1]	34
Air consumption for suction [l/min]	—
Air consumption for blow off at 5 bar [l/min]	60
Blow-off flow rate at 5 bar [l/min]	60
Sound pressure level during blow off [dB(A)] [1]	69.5
Sound pressure level during suction [dB(A)]	Depending on the vacuum generation used
Pressure range [bar]	4.5 to 6
Rec. Hose internal diameter on vacuum side [mm] [1]	4
Rec. Hose internal diameter on compressed air side [mm] [1]	6
Nominal diameter of the valve [mm]	1.8

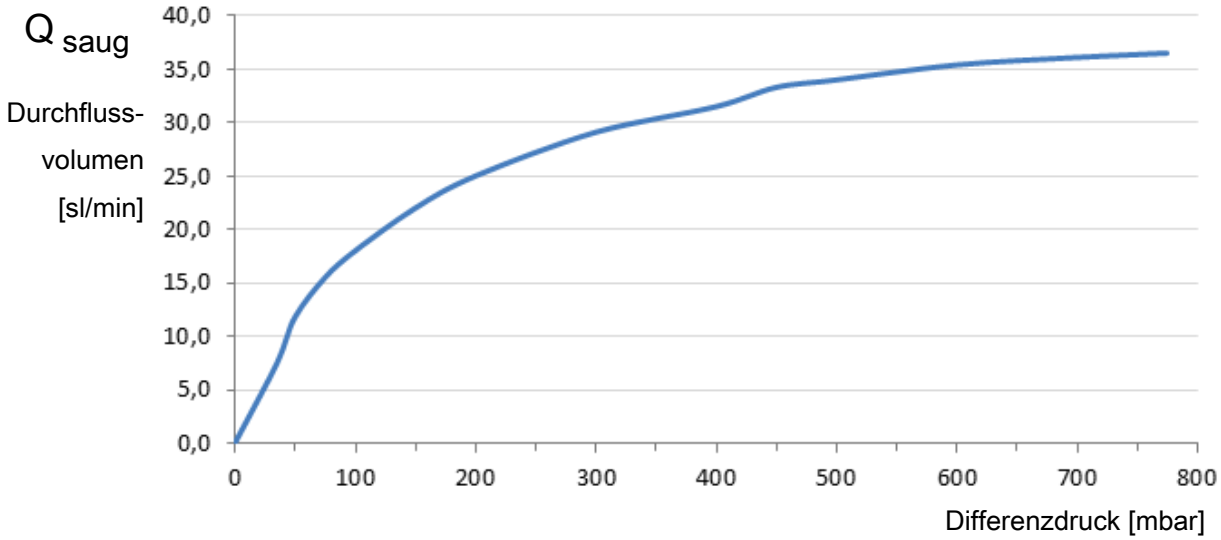
[1] For max. length of 0.2 m

The values specified apply to each vacuum valve. The values for terminals vary according to the number of valves installed.

4.5 Vacuum Valve Max. Flow Capacity

The max. flow volume of the vacuum valve depends on:

- The rated power of the externally connected vacuum generator
- The number of valves to be supplied
- Hose length
- The ambient conditions (air pressure and temperature)
- The dimension of the hose connection



Required differential pressure	Maximum flow volume
-500 mbar	34 sl/min [1]

[1] If several valves are used in the terminal, the maximum flow volume per additional open suction circuit is reduced by approx. 5%.

Dimensioning aid for the dimension of the required vacuum connection depending on the number of vacuum valves installed in the terminal

		Open suction points															
Hose outer diameter		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Ø8 mm	single-sided	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
	both sides	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Ø10 mm	single-sided	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
	both sides	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗
Ø12 mm	single-sided	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	both sides	not required															

The recommended rated power per “open” suction point. This means that for **n** “open” suction points, the rated power must be multiplied by **n**:

Application	Meaning (pressure loss at the valve)	Recommended rated power per vacuum valve
Normal dynamic pressure permissible	approx. 10% (corresponds to approx. 100 mbar)	1.15 x $Q_{suction}$* (design)
High dynamic pressure permissible	approx. 25% (corresponds to approx. 250 mbar)	2.2 x $Q_{suction}$* (design)

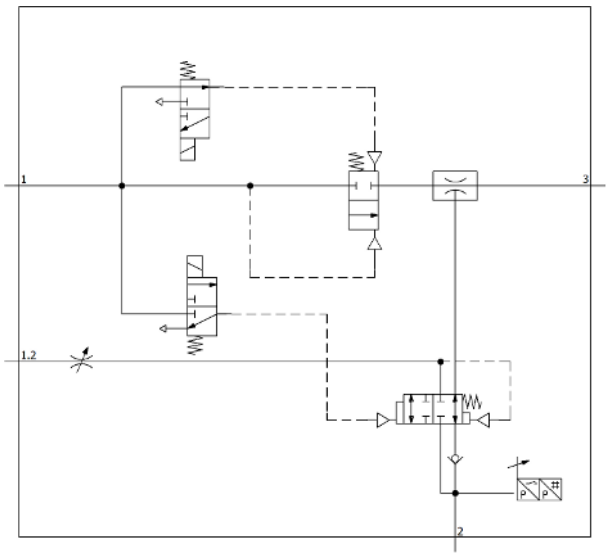
* from chart

4.6 Pneumatic Circuit Plans

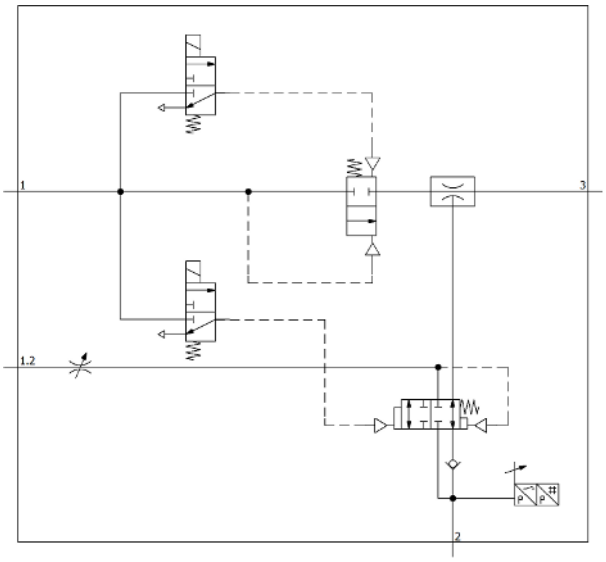
The pneumatic circuit diagrams are shown in simplified form.

Key:	
NC	Normaly closed
NO	Normaly open
IMP	Pulse
1; 1.2	Compressed air connection
1.4	External vacuum connection
2	Vacuum connection
3	Ejector exhaust outlet

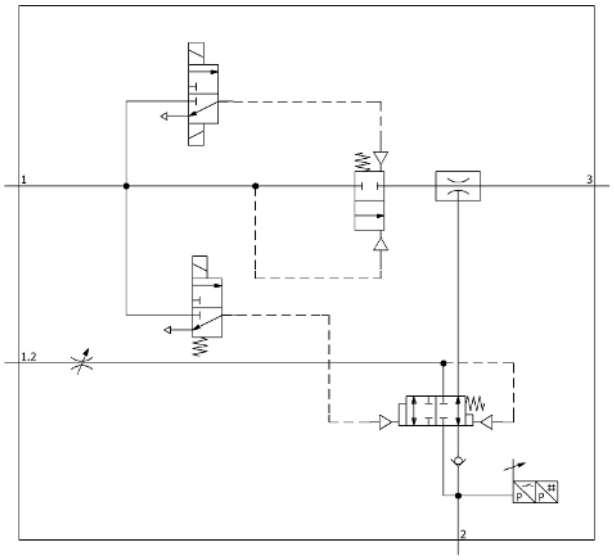
NC ejector variant



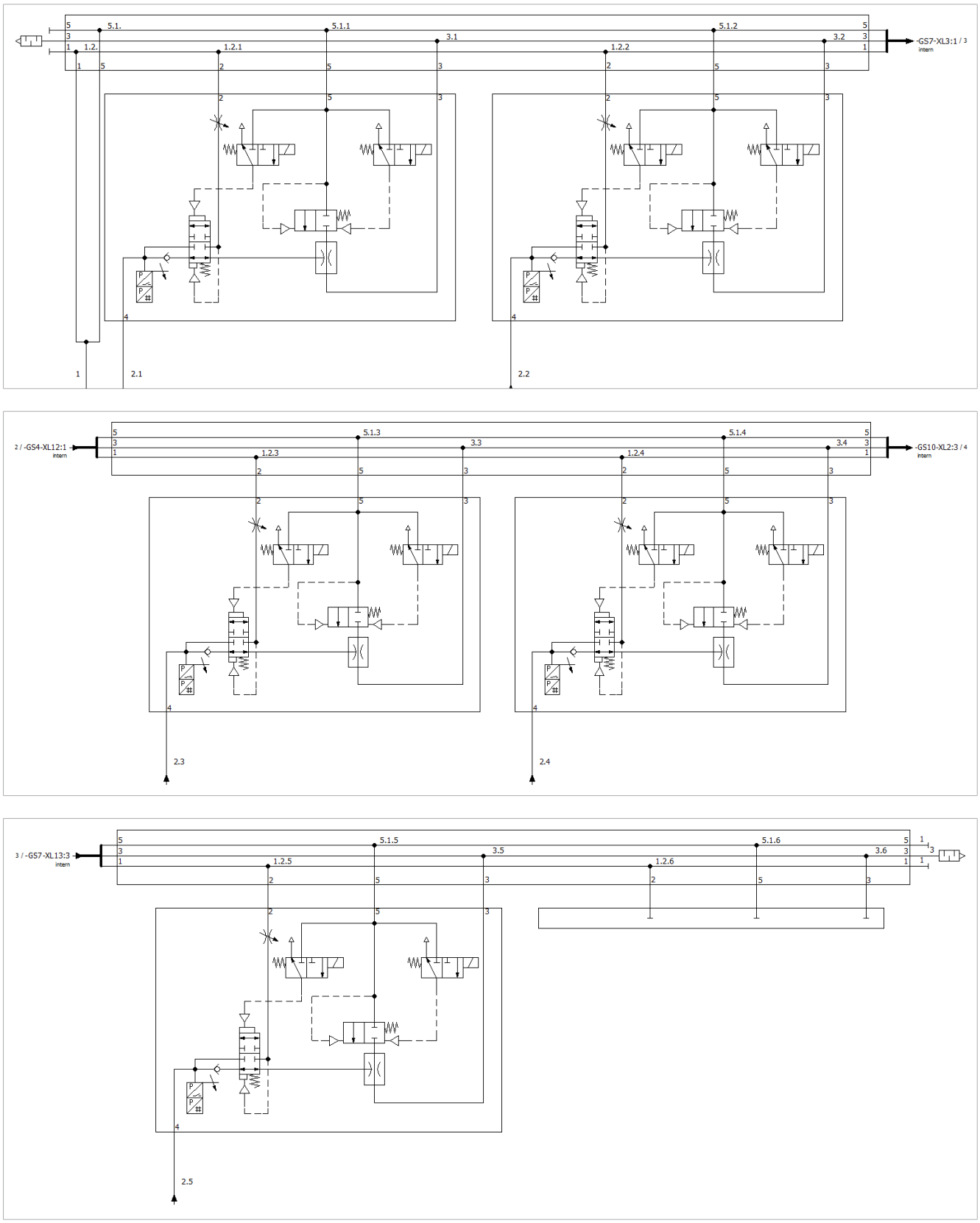
NO ejector variant



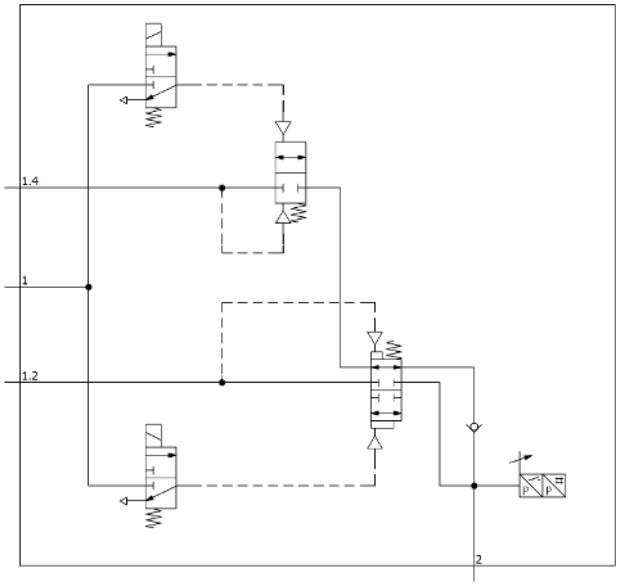
IMP ejector variant



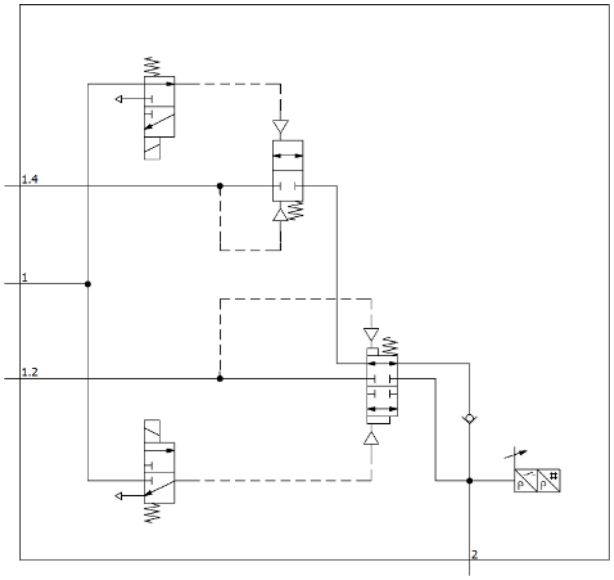
Example of a terminal, in this case with 5 IMP ejectors and a sealing plate



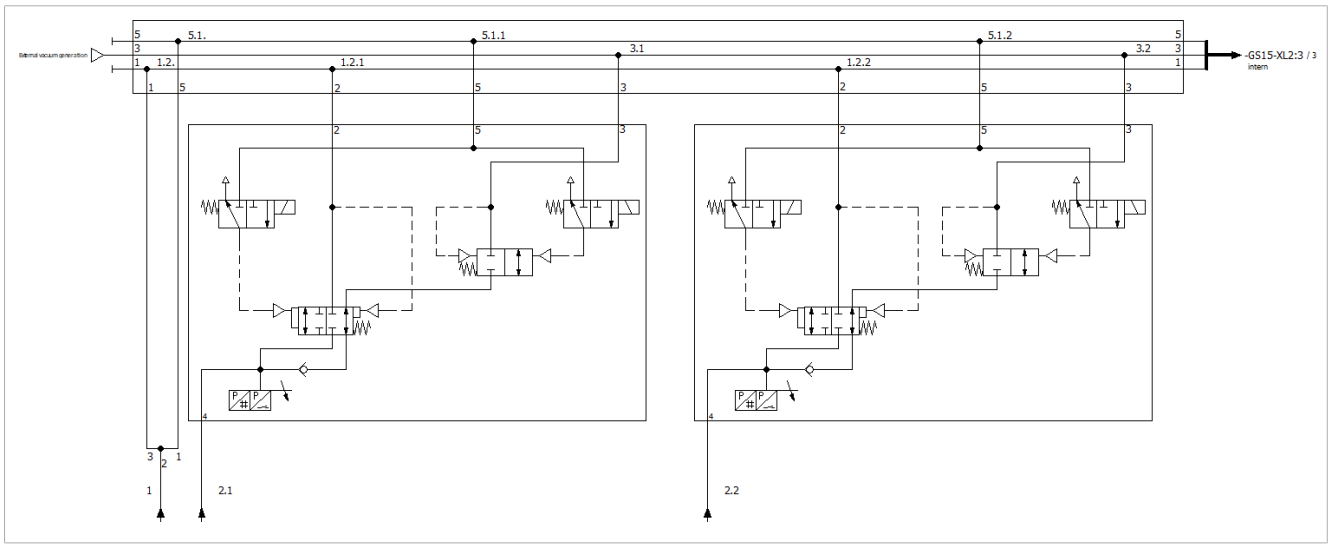
NC vacuum valve (EV) variant

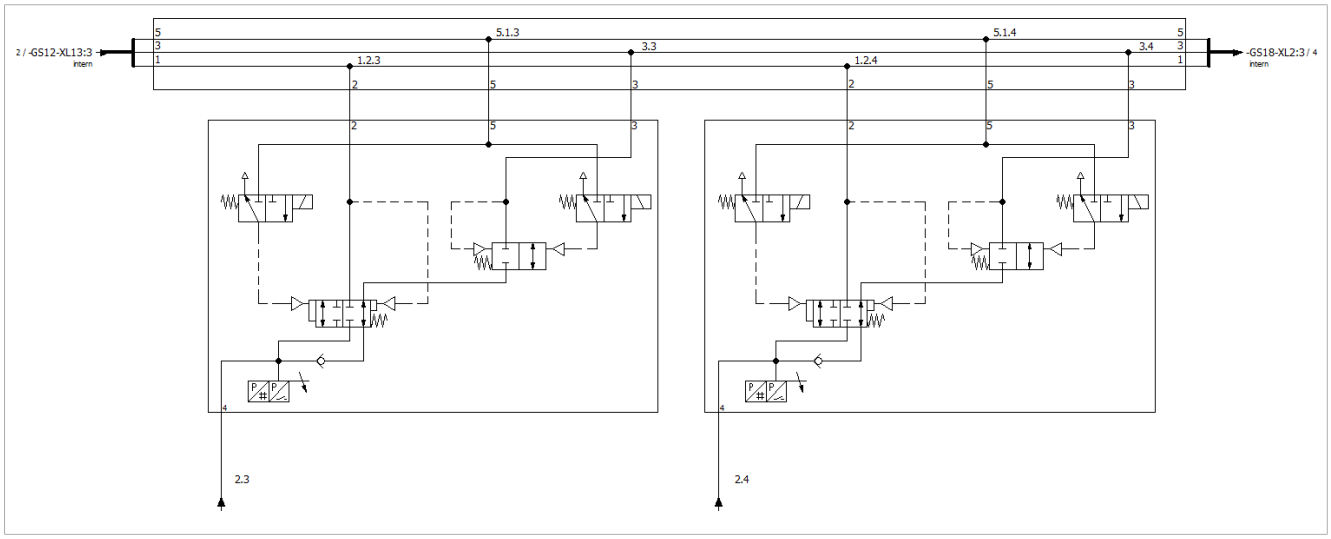


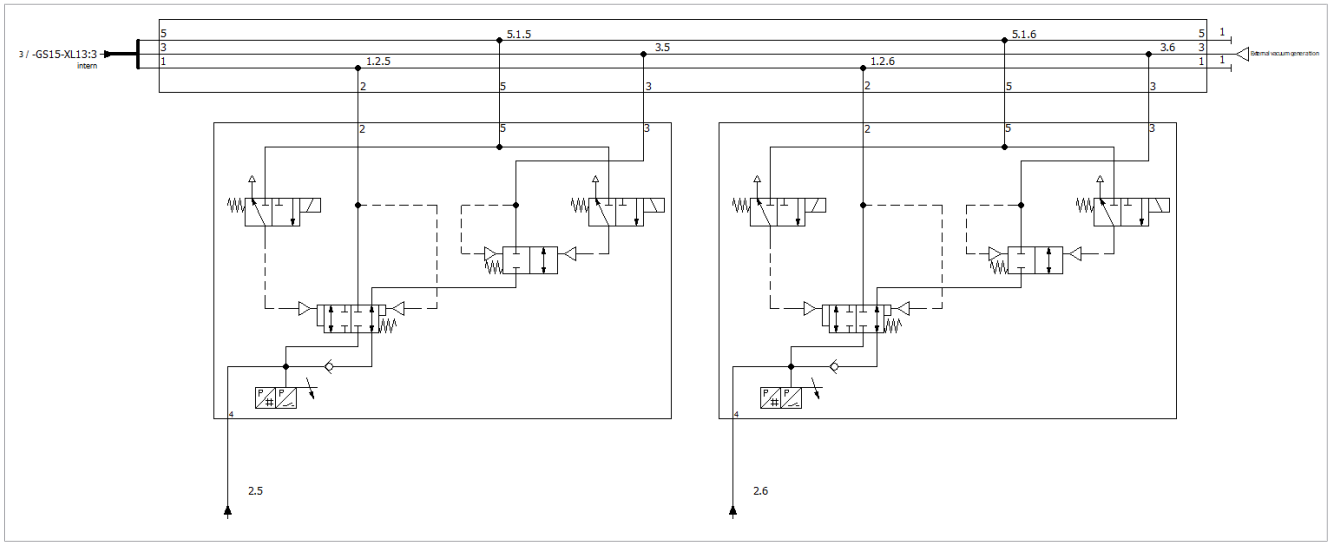
NO vacuum valve (EV) variant



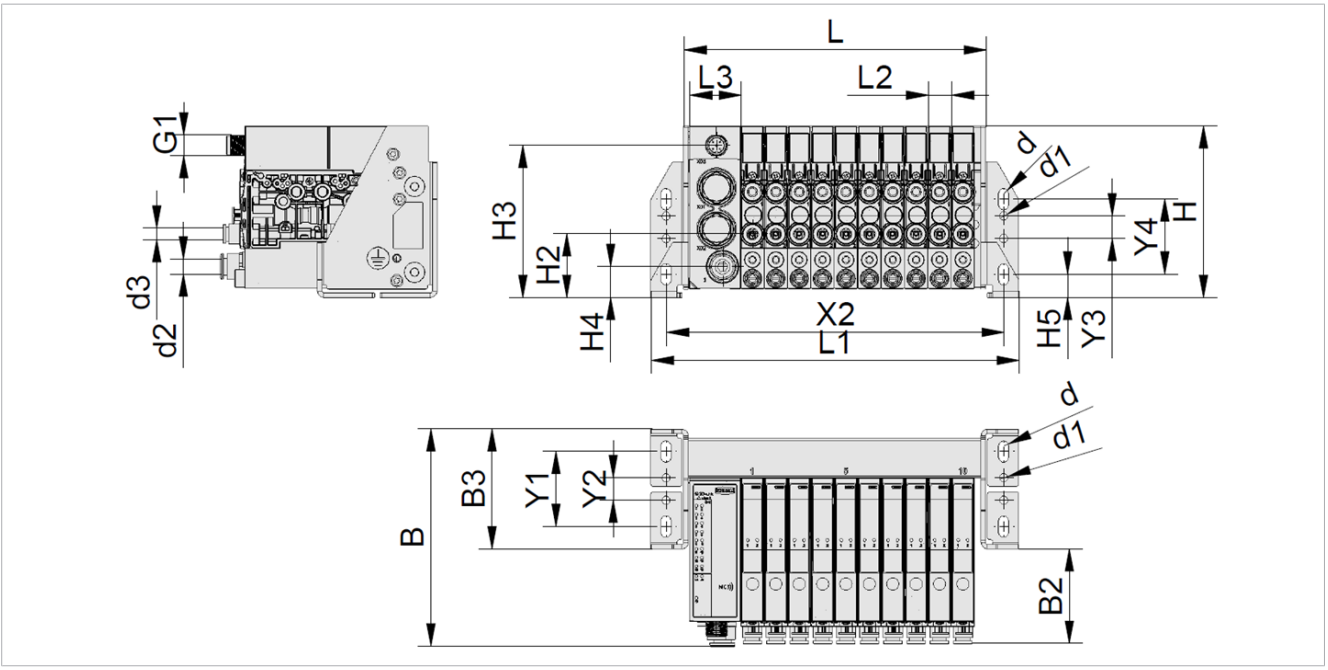
Example of a terminal, in this case with 6 NC vacuum valves







4.7 Dimensions



d	d1	H	H5	H4	Y3	Y4	B	B2	B3	Y1	Y2
5.5	4.5	91.5	12.5	16.5	12	40	115.8	51.8	64	40	12

Variant	d2	d3	G1	H2	H3	L	L1	L2	L3	X2
SCTMi..2	8	4 or 6 depending on the ejector/ valve	M12x1 external thread	34	81.2	61.5	96.5	12.5	27.5	80.5
SCTMi..4						86.5	121.5			105.5
SCTMi..6						111.5	146.5			130.5
SCTMi..8						136.5	171.5			155.5
SCTMi..12						186.5	221.5			205.5
SCTMi..16						236.5	271.5			255.5

4.8 Weight

The following values are based on terminals that are fully equipped with ejectors/valves (no dummy plate).

Variant	Weight
Terminal with ejectors	
SCTMi IOL-B E2	0.7 kg
SCTMi IOL-B E4	1.0 kg
SCTMi IOL-B E6	1.4 kg
SCTMi IOL-B E8	1.8 kg
SCTMi IOL-B E12	2.5 kg
SCTMi IOL-B E16	3.2 kg
Terminal with vacuum valves	
SCTMi IOL-B V2	0.7 kg
SCTMi IOL-B V4	1.0 kg
SCTMi IOL-B V6	1.4 kg
SCTMi IOL-B V8	1.8 kg
SCTMi IOL-B V12	2.5 kg
SCTMi IOL-B V16	3.2 kg

5 Functions of the Compact Terminal and Ejectors/Valves

5.1 Overview of Functions

The SCTMi primarily consists of the IO-Link bus module and 2, 4, 6, 8, 12 or 16 ejectors/vacuum valves. A function therefore refers to either the IO-Link bus module or an ejector/vacuum valve.

Device status of the overall terminal

Many parameters and values are measured with monitoring and diagnostic functions of the SCTMi. 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/valve evacuation times
- Ejector/valve air consumption data
- Ejector/valve leakage data
- Ejector/valve dynamic pressure data (free-flow vacuum)
- Ejector/valve 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/valves (condition monitoring control unit/condition monitoring ejector)
- Error status of the bus module and ejectors/valves (CU active errors/ejector errors)
- Provision of IO-Link events

Functions

The terminal has the following general functions:

- Device identification
- System Commands
- Access Rights
- User-Specific Localization
- 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
- Ejector/valve control (suction and release)
- Display of the ejector/valve status (status of the vacuum level)

Note about replacing the device:

All the modifiable parameter data (e.g. switching point settings) is saved in the bus module for each slot. When an ejector/valve is replaced, the previous data from each slot is applied for the new component. The data for each slot remains unchanged even when the component is replaced.

When

- Replacing a component,
- Changing the position of components within the terminal or
- Replacing a component with a dummy plate,

all the sensors must be re-calibrated (> See ch. 5.5.3 Calibrating the Vacuum Sensor, p. 36). The activation type (NO/NC) and nozzle size may also have to be adapted.

Replacing an NO or NC ejector with an IMP ejector (and vice versa) is not possible. IMP ejectors cannot be operated together with NO or NC ejectors within one terminal.

5.2 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:

- Vendor name
- Vendor text
- Product name and product text
- Product ID
- Serial number
- Version status of the hardware and firmware (hardware and firmware revision)
- Article number
- Production date
- Product text (detailed)
- Product configuration (detailed)

5.3 User-Specific Localization

The following parameters for saving application-specific information are available:

- Application-specific tag
- Function tag
- Location tag
- Equipment identification from the circuit diagram
- Geolocation
- Web link for NFC app (NFC web link)
- Storage location
- Installation date

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

5.4 Configuration

NOTE

Incorrect configuration

Device damage due to incorrect configuration

- Ensure the device is configured correctly.

The following information about the device configuration is available:

- The parameter “Read valve type for ejectors 1 to 16” 0x0235 provides information about the valve type of the respective ejector/vacuum valve (0=NC, 1=NO, 3=IMP and 255=Not connected).
- In the parameter “Write valve type for ejectors 1 to 16” 0x0236, you can change the valve type of the respective ejector/vacuum valve (0=NC, 1=NO, 3=IMP, 254=Not written and 255=Not connected). The configuration must be confirmed using the system command 0x0002 (0xAA); the new configuration is not written to the controller until then.
- The parameter “Read nozzle type for ejectors 1 to 16” 0x0237 provides information about the nozzle size of the respective ejector or, with value 0, about a vacuum valve (0=EV, 1=03, 2=05, 3=07, 4=10, 5=12 and 255=Not connected).
- In the parameter “Write nozzle type for ejectors 1 to 16” 0x0238, you can change the nozzle size of the respective ejector or set to a vacuum valve with value 0 (0=EV, 1=03, 2=05, 3=07, 4=10, 5=12, 254=Not written, 255=Not connected).
  The configuration must be confirmed using the system command 0x0002 (0xAA); the new configuration is not written to the controller until then.

System command 0x0002 (0xA5) is used to calibrate the vacuum sensors (> See ch. 5.5.3 Calibrating the Vacuum Sensor, p. 36).

If the “SP2” LED on the bus module is flashing, a component is expected but not detected (> See ch. 9.1 Troubleshooting, p. 65).

For more information about the configuration (> See ch. 5.5 System Commands, p. 35).

5.5 System Commands

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

Offset parameter	**2 (0x0002)**
Description	System command – triggers special features of the device
Index	-
Data type	uint8
Length	1 byte
Access	Write only
Value range	0x81: Reset application 0x83: Back to box 0xA5: Calibrate vacuum sensor 0xA7: Reset erasable counters 0xA8: Reset voltage min./max. 0xAA: Write configuration (valve and nozzle type) 0xAB: Reset configuration to factory defaults (valve and nozzle type)
Default value	-
Unit	-
EEPROM	No

5.5.1 Resetting the Application

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

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

Except for:

- “Device Localization Parameter”
- Counter readings
- The maximum and minimum values of the measurements
- “Device access locks” and “Extended device access locks”
- The zero-point adjustment of the sensor

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

The device must be restarted by interrupting the supply voltage.

5.5.2 Reset to Factory Settings

The “Back to box” system command 0x83 resets all the setting parameters (such as SP1, SP2, and so on) to their delivered condition, but not the valve type or the nozzle size.

Any IO-Link communication is stopped in doing so.

The device must be restarted by interrupting the supply voltage.

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

See also

Resetting the Configuration to the Factory Setting [▶ 36]

5.5.3 Calibrating the Vacuum Sensor

Since the production conditions for the integrated vacuum sensors can vary, we recommend calibrating the sensors once they are installed.
To calibrate all the vacuum sensors at the same time, all the vacuum circuits must be open to the atmosphere.

Using IO-Link, the zero-point adjustment command for the sensors is executed using the value 0xA5 for "Calibrate vacuum sensor".

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

Calibrate all the vacuum sensors if an ejector/valve is installed in a different slot on the same terminal or replaced with a new ejector or a dummy plate.

Any violation of the permissible limit is reported through an event (see Data Dictionary).

5.5.4 Resetting Counters

Via IO-Link, the system command to delete the two counters is executed using the value 0xA7 "Reset erasable counters".

5.5.5 Resetting Maximum and Minimum Values for the Supply Voltage

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

5.5.6 Writing the Configuration

The system command "Write configuration (valve and nozzle type)" 0xAA transfers the valve type "Valve types" 0x0236 and nozzle type "Nozzle types" 0x0238 in the parameter for each component (with vacuum valve = 0).
Attention: These values should be set appropriately in advance.

The device must be restarted by interrupting the supply voltage.

5.5.7 Resetting the Configuration to the Factory Setting

The system command "Reset configuration to factory defaults (valve and nozzle type)" 0xAB resets **only** the settings for the valve type and nozzle type to their delivered condition for each component.

The device must be restarted by interrupting the supply voltage.

5.6 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

5.7 Extended Device Status

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”.

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

5.8 NFC Status

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 byte
Access	Read only
Value range	0x00: data, write finished successfully 0x23: write failed: write access locked 0x30: write failed: parameter(s) out of range 0x31: Write failed: parameter value too high 0x31: Write failed: parameter value too low 0x41: write failed: parameter set inconsistent 0xA1: write failed: invalid authorization 0xA2: NFC not available 0xA3: write failed: invalid data structure 0xA5: write pending 0xA6: NFC internal error
Default value	-
Unit	-
EEPROM	No

5.9 Restricting Extended Access

Extended device functions can be disabled via the parameter “Extended device access locks” 0x005A. For example, there is an option to completely restrict NFC access or limit it to a read-only function.

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

The NFC lock using the “Extended device access locks” parameter has a higher priority than the NFC PIN. That means that this lock cannot be bypassed by entering a PIN.

For more detailed information, see the data dictionary attached.

5.10 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.

5.10.1 Defining Switching Points

Two separate switching points can be set for each ejector or vacuum valve. Each switching point has an activation point and a corresponding reset point. The system vacuum is constantly compared to the set values for the switching points during operation.

An LED also indicates when the switching point for SP2 is reached on the bus module.

The set values for SP2 must be lower than the values for SP1. The exact configuration conditions can be found in the parameter descriptions.

Parameter	Description
SP1 ejector/valve 1 ... 16	Control switching point
rP1 ejector/valve 1 ... 16	Control reset point
SP2 ejector/valve 1 ... 16	Switching point for “parts present” check
rP2 ejector/valve 1 ... 16	“Parts present” check reset point

Parameter offset	**100 (0x0064)**	**101 (0x0065)**
Description	Switch point 1 (SP1) for ejectors	Reset point 1 (rP1) for ejectors
Index	Ejectors 1 to 16	
Data type	uint16	
Length	32 byte	
Access	Read/write	
Value range	999 > SP1 > rP1	SP1 > rP1 > rP2
Default value	750	600
Unit	mbar	
EEPROM	Yes	

Parameter offset	**102 (0x0066)**	**103 (0x0067)**
Description	Switching point 2 (SP2) for ejectors	Reset point 2 (rP2) for ejectors
Index	Ejectors 1 to 16	
Data type	uint16	
Length	32 byte	

Access	Read/write	
Value range	rP1 > SP2 > rP2	SP2 > rP2 >= 10
Default value	550	540
Unit	mbar	
EEPROM	Yes	

System vacuum evaluation:

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

- The process data bit for SP2 is set.
- The SP2 LED on the bus module display lights up.

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

- Depending on whether the air saving function is selected, vacuum generation or vacuum supply is interrupted.
- The process data bit for SP1 is set.

5.10.2 Control Functions

Each ejector/vacuum valve allows you to conserve compressed air or prevent a vacuum that is too powerful from being generated. Vacuum generation or vacuum supply is interrupted once the configured switching point SP1 is reached. If leakage causes the vacuum to fall below the reset point rP1, vacuum generation or vacuum supply resumes.

Parameter offset	**109 (0x006D)**
Description	Control mode for ejectors 1 to 16
Index	Subindex corresponds to ejectors 1 to 16
Data type	uint8
Length	16 byte
Access	Read/write
Value range	0x00 = control is not active, SP1 in hysteresis mode 0x01 = control is not active, SP1 in comparator mode 0x02 = control is active 0x03 = control is active with monitoring of leakage 0x04 = control is active, continuous sucking disabled 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), SP1 in Hysteresis Mode

The component produces continuous suction with maximum power (parameter value 0x00).

The switching point evaluation for SP1 is operated in hysteresis mode (two-point mode).

The hysteresis mode is a threshold switch with hysteresis. As the measured value increases, the switching point becomes active when the switch-on threshold SP1 is reached and remains on until it falls below the reset threshold rP1. The following must always apply for switching thresholds and reset thresholds: SP1 > rP1. The hysteresis is therefore defined by the difference |SP1– rP1|.

No Control (Continuous Suction), SP1 in Comparator Mode

The component produces continuous suction with maximum power.

The switch point evaluation for SP1 is operated in comparator mode (window mode) (parameter value 0x01).

In comparator mode, the switching point is active when the measurement value is between the upper window point SP1 and the lower window point rP1. Outside this window, the switching point is inactive. For the parameters “Upper window point SP1” and “Lower window point rP1”, the following must always apply: SP1 > rP1.

Control Active

The component switches off the vacuum generation or vacuum supply when the switching point SP1 is reached and switches it back on when the vacuum falls below the reset point (rP1) (parameter value 0x02).

The switching point evaluation for SP1 follows the control function.

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

If the readjustment is too fast (valve switching frequency > 6/3 seconds), the control function is deactivated and the device switches to continuous suction.

Control with Leak Monitoring

This operating mode is the same as the previous mode; in addition, however, the leakage rate within the system is measured and compared to the configurable limit value (parameter value 0x03).

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.

5.10.3 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 0x01 = internally controlled blow-off – time-dependent 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

The drop-off time can be entered for internal and external time-controlled drop-off via the IO-Link "Duration automatic blow for ejector 1-16" parameter 0x006A.

The time set can range from 0.10 to 9.99 seconds.

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

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

5.10.4 Setting the Permissible Evacuation Time t1 (0x006B)

The permissible evacuation time t1 is set in milliseconds [ms] in the "Permissible evacuation time for ejectors 1 to 16" parameter 0x006B. The measurement starts when the switching point SP2 is reached and ends when the switching point SP1 is exceeded.

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

Parameter	Description
Permissible evacuation time	Time from SP2 to SP1

Offset parameter	**107 (0x006B)**
Description	Permissible evacuation time for ejectors 1 to 16
Index	Ejectors 1 to 16
Data type	uint16
Length	32 byte
Access	Read/write
Value range	0 to 9999
Default value	2000
Unit	ms
EEPROM	Yes

5.10.5 Setting the Permissible Leakage

The permissible leakage rate is set in millibars per second [mbar/s] in the "Permissible leakage rate for ejectors 1 to 16" parameter 0x006C. The leakage is measured after the air saving function has interrupted suction once switching point SP1 is reached.

Parameter	Description
Permissible leakage	Leakage after reaching SP1

Offset parameter	**108 (0x006C)**
Description	Permissible leakage rate for ejectors
Index	Ejectors 1 to 16
Data type	uint16
Length	32 byte
Access	Read/write
Value range	10 to 999
Default value	250
Unit	mbar/s
EEPROM	Yes

5.10.6 Counters

Each ejector/vacuum valve 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 results are saved every 200 cycles or when the power is shut down.

Offset parameter	**140 (0x008C)**	**141 (0x008D)**
Description	Vacuum-on counter for ejector	Valve operating counter for ejector
Index	Indexes 1 to 16 correspond to ejectors 1 to 16	
Data type	uint32	
Length	64 byte	
Access	Read only	
Value range	0 to 999999999	
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	Indexes 1 to 16 correspond to ejectors 1 to 16	
Data type	uint32	
Length	64 byte	
Access	Read only	
Value range	0 to 999999999	
Default value	-	
Unit	-	
EEPROM	Yes	

5.10.7 Changing the Blow-Off Flow Rate on the Ejector/Valve

NOTE

An excessive tightening torque on the valve screw overtightens the stop

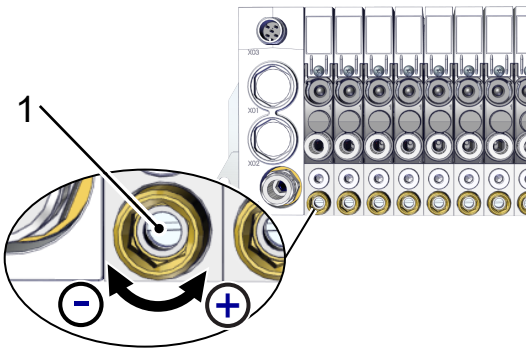
Product damage and malfunction

- If the blow-off flow rate increases and the resistance increases slightly, stop the rotational movement immediately.
- Check that the blow-off flow rate is at the desired setting.

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

The figure shows the position of the valve screw (1) for adjusting the blow off flow rate. The valve screw is equipped with a stop on both sides.

- Rotate the valve screw (1) clockwise to reduce the flow rate.
- Rotate the valve screw (1) counterclockwise to increase the flow rate.



The blow-off flow rate is set to 100% (opened 2 turns) when delivered.

Setting the Blow-off Flow Rate

1. To change the blow-off flow rate, turn the valve screw (1) clockwise until it stops; this corresponds to a blow-off flow rate of 0%.
2. To increase the blow-off flow rate, turn the valve screw (1) counterclockwise. The maximum blow-off flow rate of 100% is achieved after two full turns of the screw.

If the valve screw is turned counterclockwise by more than two turns, the blow-off flow rate remains unchanged; after a further two turns, a slight increase in the torque is noticeable.
NOTE! This is a stop, which is destroyed if the screw is now turned any further.

5.11 Diagnostics and Monitoring Functions of the Compact Terminal

The monitoring functions of the SCTMi 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

5.11.1 Determining the 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/vacuum valves are constantly redetermined for each suction cycle.

ISDU (hex)	Monitoring function
0x0040	Vacuum value for each ejector/vacuum valve
0x0041	Input pressure: current level, minimum level and maximum level
0x0042	Sensor voltage: current level, minimum and maximum level
0x0043	Actuator voltage: current level, minimum and maximum level
0x00A6	Total cycle time of the last cycle for ejectors/vacuum valves 1 to 16
0x0094	Evacuation time t0 for ejectors/valves 1 to 16
0x0095	Evacuation time t1 for ejectors/valves 1 to 16
0x00AA	Holding time t2 of the last suction cycle for ejectors/valves 1 to 16
0x00AA	Blow-off time t3 of the last suction cycle for ejectors/valves 1 to 16
0x009C	Air consumption per cycle for ejectors/valves 1 to 16
0x00A0	Leakage for ejectors/valves 1 to 16
0x00A1	Dynamic pressure of ejectors/valves 1 to 16 (Vacuum freeflow)
0x00A4	Maximum vacuum reached per suction cycle for ejectors/valves 1 to 16
0x00A2	Quality of the last suction cycle for the last cycle for ejectors/valves 1 to 16
0x00A3	Performance of the last suction cycle for the last cycle for ejectors/valves 1 to 16

Vacuum value of the ejectors/vacuum valves

Each ejector/vacuum valve has an integrated sensor for monitoring the current system vacuum. The vacuum level provides information about the process and has an effect on various signals and parameters.

The “Vacuum for ejectors 1 – 16” parameter 0x0040 is used to display the vacuum currently applied for the individual components.

Parameter offset	**64 (0x0040)**
Description	Vacuum for ejectors 1 – 16
Index	Ejectors 1 to 16
Data type	uint16
Length	32 byte
Access	Read only
Value range	0 to 999
Default value	-
Unit	mbar
EEPROM	no

Input pressure

For the calculation of the air consumption, the input pressure that is currently present at the mini compact terminal is measured.

Parameter offset	**65 (0x0041)**
Description	Input pressure (input pressure)
Index	1: Input pressure live 2: Input pressure min. 3: Input pressure live max.
Data type	uint16
Length	6 byte
Access	Read only
Default value	-
Unit	1 mbar
EEPROM	no

In addition, the maximum and minimum values for the input pressure that were measured since the last activation are logged.

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 1: min. value since last power-up 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.

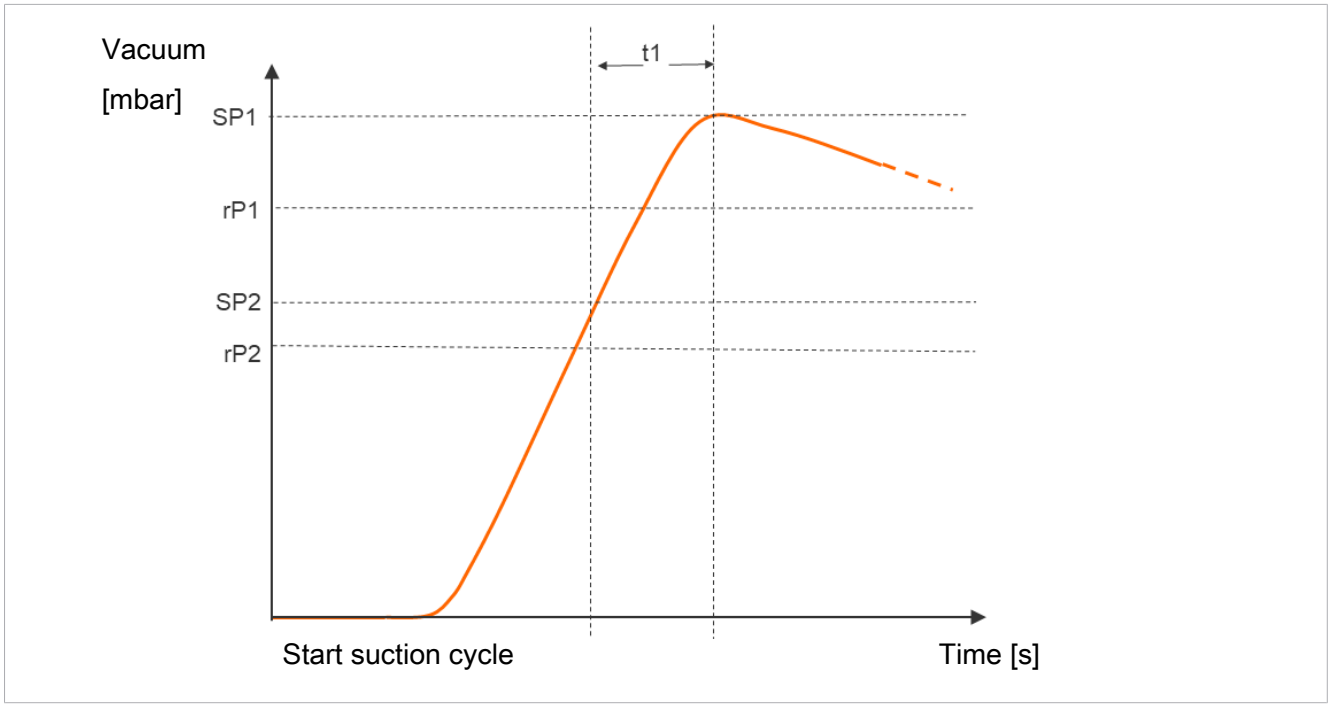
The maximum and minimum values can be reset during operation using the appropriate system command.

Timing

The device determines the following process times for each ejector/vacuum valve:

- Evacuation time t1 of last suction cycle [ms]
  ("Evacuation time t1 of last suction-cycle", 0x0095)
- Evacuation time t0 of last suction cycle [ms]
  ("Evacuation time t0 of last suction-cycle", 0x0094)
- Total cycle time of last cycle [ms]
  ("Total cycle time of last cycle", 0x00A6)
- Holding time t2 of the last suction cycle [ms]
  ("Holding time t2 of last suction-cycle", 0x00AA)
- Drop-off time t3 [ms]
  ("Drop-off time t3 of last suction-cycle", 0x00AB)

The above parameters can be called up via IO-Link (see Data Dictionary in the appendix).



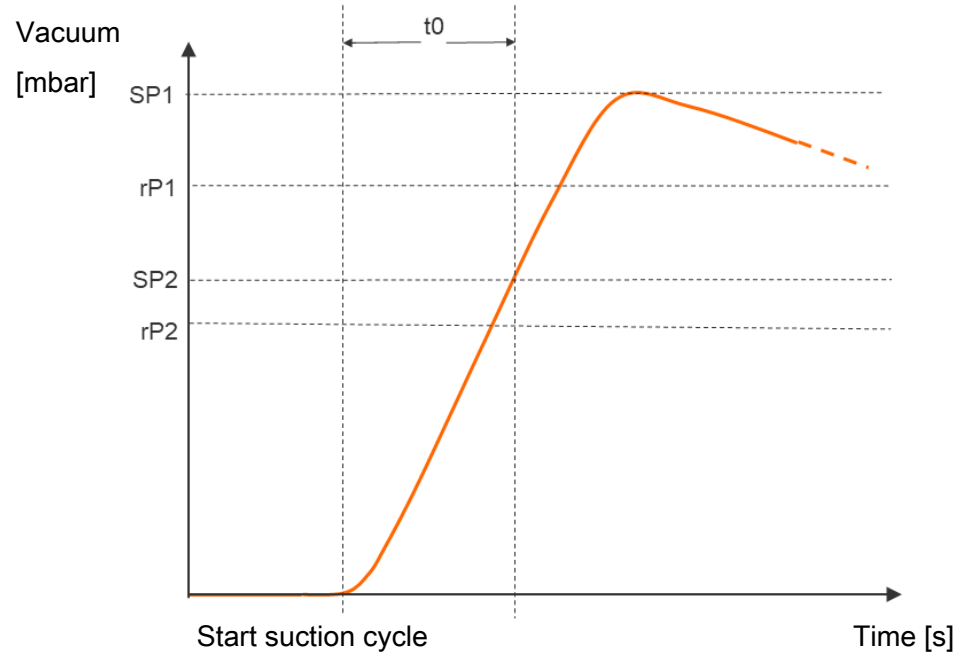
The measured evacuation time t1 can be read out using the "Evacuation time t1 for ejectors" parameter 0x0095.

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

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

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

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



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

The measured evacuation time t0 can be read out using the “Evacuation time t0 for ejectors” parameter 0x0094.

Parameter offset	**148 (0x0094)**	**149 (0x0095)**
Description	Evacuation time t0 for ejectors	Evacuation time t1 for ejectors
Index	ejector 1 to 16	
Data type	uint16	
Length	32 byte	
Access	Read only	
Value range	0 to 65535	
Default value	-	
Unit	ms	
EEPROM	no	

The measured total cycle time can be read out from the “Total cycle time of last cycle” parameter 0x00A6.

The measured holding time t2 (time from reaching SP1 until suction stops) can be read out using the “Holding time t2 of last suction cycle for ejectors 1 to 16” parameter 0x00AA.

The measured blow off time t3 (time from the start of the blow-off to the end of the blow-off) can be read out using the “Blow-off time t3 of last suction cycle for ejectors 1 to 16” parameter 0x00AB.

Measuring the Air Consumption

The actual air consumption in a suction cycle is calculated taking the system pressure and nozzle size into account. The air consumption from the suction ON signal to the next suction ON signal is determined in the process.

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

Parameter offset	**156 (0x009C)**
Description	Air consumption of last suction cycle for ejectors
Index	1 to 16: Air consumption of last suction cycle for ejectors 1 to 16
Data type	uint32
Length	68 byte
Access	Read only
Value range	
Default value	-
Unit	0.1 Ls (standard liter)
EEPROM	no

Measuring Leakage

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

Measuring Dynamic Pressure

The system vacuum achieved during unobstructed suction is measured using the “Free-flow vacuum” parameter 0x00A1. The duration of the measurement is approx. 1 second. Therefore, to evaluate a valid dynamic pressure, uninterrupted suction is required for at least 1 second after starting the suction, i.e. the suction point must not be covered by a part.

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

Measured values that are below the vacuum limit value SP1 but simultaneously above the vacuum limit value SP2 result in a condition monitoring event (> See ch. 5.11.3 Condition Monitoring [CM], p. 50).

Maximum Vacuum Reached (Max Reached Vacuum of Last Cycle)

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

5.11.2 Device Diagnostics

Device Status

The overall status of the system is displayed as a traffic light in the ISDU parameters. All warnings and errors are used to determine the status shown here. The status of the device is displayed in 4 levels.

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

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

Any condition monitoring events that occur during the suction cycle cause the system status light to immediately switch from green to yellow/orange. The specific event that caused this switch can be seen in the IO-Link parameter "Condition monitoring" 0x0092.

Other error message parameters for evaluating the status of the device are available.

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

- Device status (process data)
- Device status 0x0024 and Detailed device status 0x0025 (parameter data)
- IO-Link Events

Error Codes

The active error codes for the device are displayed using individual bits in the "Active errors" parameter 0x0082.

Parameter	130 (0x0082)
Description	Active errors of the control unit + process data
Index	16
Data type	uint8
Length	1 byte
Access	Read only
Value range	Bit 0 = Internal error: data corruption Bit 1 = Configuration error Bit 2 = Primary voltage too low Bit 3 = Primary voltage too high Bit 4 = Secondary voltage too low Bit 5 = Secondary voltage too high Bit 6 = Supply pressure too low (<2.8 bar) or too high (>6.2 bar) Bits 7 to 15 = Reserved
Default value	0
Unit	-
EEPROM	no

5.11.3 Condition Monitoring [CM]

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
Subindex	17
Data type	uint8
Length	1 byte
Access	Read only
Value range	Bit 0 = Primary voltage limit Bit 1 = Secondary voltage limit Bit 2 = Input pressure limit
Default value	0
Unit	-
EEPROM	no

CM of the ejectors

Parameter	**146 (0x0092)**
Description	Condition monitoring of ejector
Index	Index 1 to 16 corresponds to ejector 1 to 16
Subindex	1 to 16
Data type	uint8
Length	16 byte
Access	Read only
Value range	Bit 0 = Valve protection active Bit 1 = Evacuation time greater than limit Bit 2 = Leakage rate greater than limit Bit 3 = SP1 not reached in suction cycle Bit 4 = Free flow vacuum too high Bits 5 to 15 = Reserved
Default value	0
Unit	-
EEPROM	no

Monitoring the System Vacuum and Defining Limit Values

Each ejector/valve has an integrated sensor for measuring the vacuum.

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

The limit values are set via IO-Link.

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

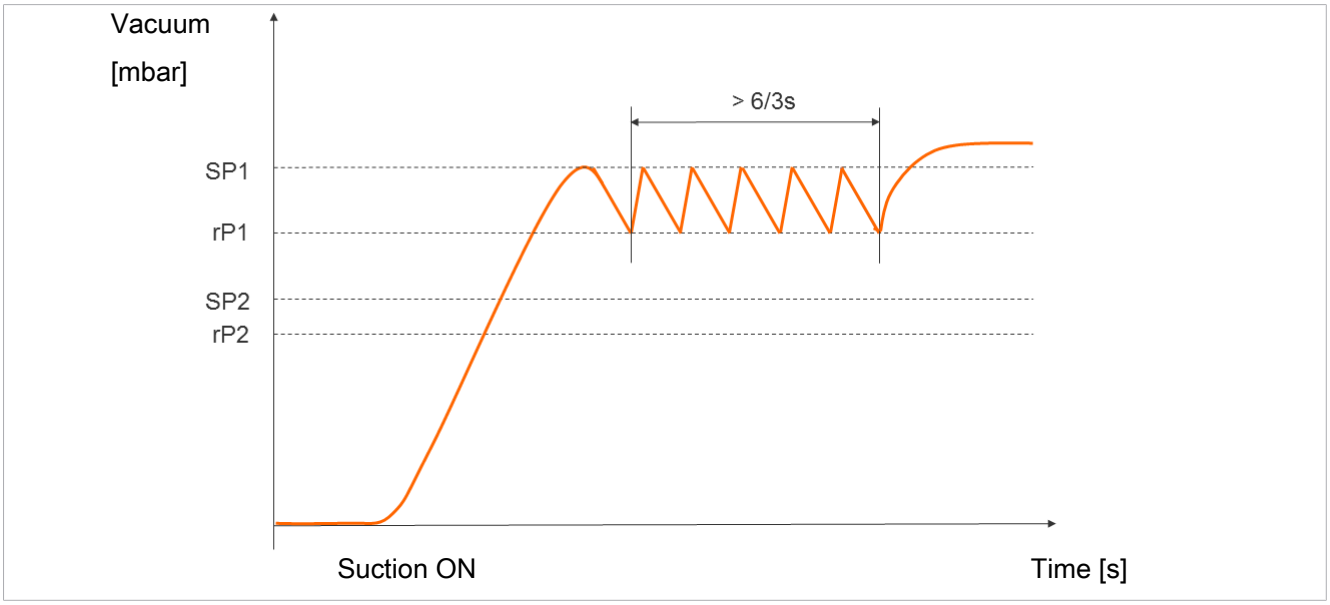
If the switching point SP1 is never reached during the suction cycle, the “SP1 not reached in suction cycle” condition monitoring warning is triggered and the system status light switches to yellow.
This warning is available at the end of the current suction phase and remains active until the next suction cycle.

Overview of the limit values:

Parameter ISDU [Hex]	Limit value parameter	Description
0x0064	Switch point 1 (SP1) for ejectors 1 to 16	Vacuum control value Vacuum switching point
0x0065	rP1	Vacuum hysteresis Vacuum reset point
0x0066	SP2	Activation value of “part present” check signal output
0x0067	rP2	Deactivation value of “part present” check signal output
—	SP3	Part deposited (vacuum < 20 mbar)
0x006D	Control mode for ejectors 1 to 16 Control mode settings for each ejector subindex corresponds to ejector number Subindex 0 for access to full array (16 byte) 0x00 = control is not active, SP1 in hysteresis mode 0x01 = control is not active, SP1 in comparator mode 0x02 = control is active 0x03 = control is active with monitoring of leakage 0x04 = control is active, continuous sucking disabled 0x05 = control is active with monitoring of leakage, continuous sucking disabled	Default value = 2

The limit value SP3 “Part deposited” [PDIN0] is fixed at 20 mbar for each ejector/valve.
Signal SP3 is issued when the vacuum reaches < 20 mbar (providing the vacuum has already reached SP2 once).
By issuing this signal, the ejector/valve tells the control that the part has been deposited successfully.
The signal is reset by issuing a new Suction ON command.

Monitoring the Valve Switching Frequency



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

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

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

Monitor Evacuation Time

If the measured evacuation time t1 (from SP2 to SP1) exceeds the specified value, the Evacuation time longer than t-1 condition monitoring warning is triggered and the system status light switches to yellow.

Leakage Monitoring and Evaluation

The device leakage is measured and monitored in control mode. The calculated value L can be read as a volume flow rate using the parameter “Leakage rate” 0x00A0 or alternatively using the process data (EPC select) in ml/min.

The evaluation of the leakage level differentiates between two statuses:

Leakage L < permitted value -L-

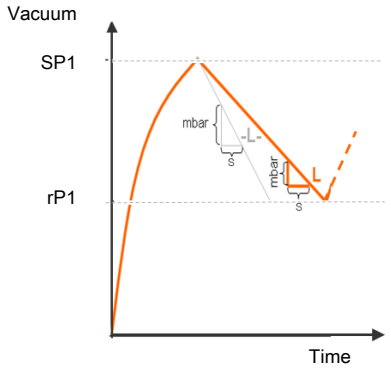
If the leakage L is less than the set value “Permissible leakage rate”,

- the vacuum continues dropping until the reset point rP1 is reached.
- The condition monitoring warning is not activated
- The system status indicator light does not change
- The component begins suction again (normal control mode)

Leakage L > permitted value -L-

If the leakage L is greater than the set value “Permissible leakage rate”,

- The condition monitoring warning is activated
- The system status indicator light turns yellow



The permissible leakage rate can be set from 1 to 9999 milliseconds [ms] for each component using the “Permissible leakage rate” parameter 0x006C. The value zero does not display a warning.

Monitor Dynamic Pressure

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

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

Monitoring of the Supply Voltages

The device has an internal voltage monitor. It requires a power supply of 24 V. If the voltage deviates outside a certain tolerance range, the device enters an error state.

The device measures the sensor supply voltage U_S (“Primary supply voltage” 0x0042) and the actuator supply voltage U_A (“Auxiliary supply voltage” 0x0043).

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

- Device status
- Condition monitoring parameter
- IO-Link event is generated
- Error is displayed

For more detailed information, see the data dictionary attached.

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.

5.11.4 IO-Link Events

The device signals “IO-Link events” when certain events occur. As a result, these events do not have to be queried using a parameter. These are error messages and warnings.

For more information, see the Data Dictionary.

5.11.5 Predictive Maintenance (PM)

Overview of Predictive Maintenance (PM)

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

The measurement value for the leakage rate and the related quality assessment in percent are reset at the start of every suction cycle and constantly updated during the cycle as moving averages. The values therefore only remain stable after the end of suction and can be read from the “Quality” parameter 0x00A2.

Quality Assessment

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

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

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

Performance Calculation

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

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

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

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

6 Transportation and Storage

6.1 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.

6.2 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.

6.3 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.

7 Installation

7.1 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.

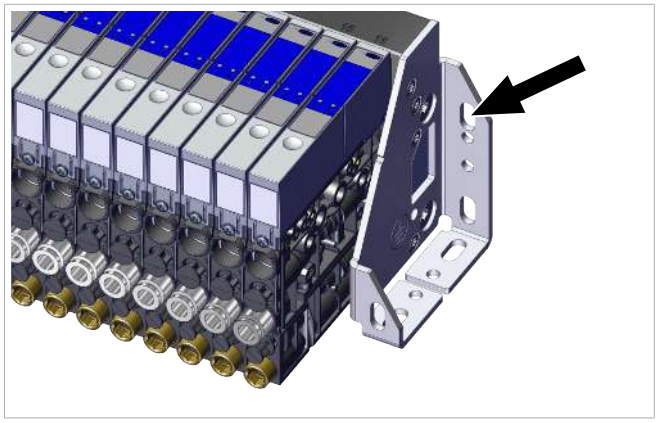
For safe installation, the following instructions must be observed:

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.

7.2 Mounting

The product can be mounted in any position.

The mounting brackets on both sides of the device are for mounting with slots.



- Secure the device on both sides with at least 2 screws (tightening torque at least 4 Nm).

7.3 Pneumatic Connection

7.3.1 Instructions for the Pneumatic Connection

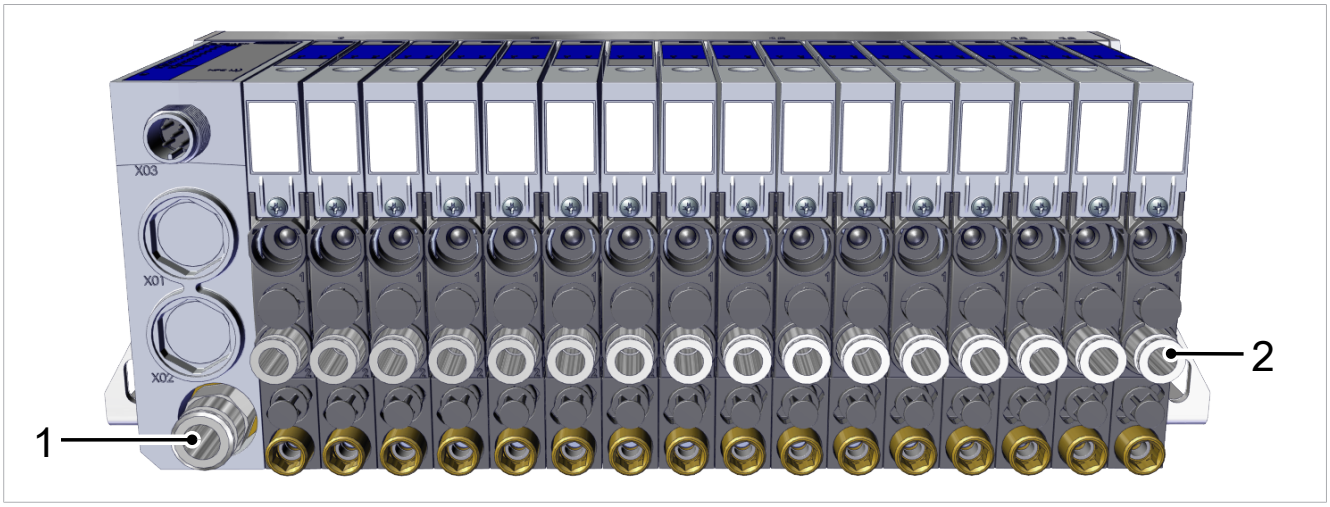
To ensure problem-free operation and a long service life for the product, only use adequately maintained compressed air and take the following requirements into account:

- Use of air or neutral gas in accordance with EN 983, filtered 5 µm, oiled or unoiled.
- Dirt particles or foreign bodies in the product connections, hoses or pipelines can lead to partial or complete 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 product; otherwise, use the next largest diameter.
   - On the compressed air side, ensure that the internal diameter has the dimensions required for the product to achieve its performance data.
   - On the vacuum side, ensure that the internal diameters have the necessary dimensions for preventing high flow resistance. If the selected internal diameter is too small, the flow restrictor and the evacuation times increase and the blow off times are extended.

7.3.2 Connect terminal with ejectors, compressed air and vacuum



The compressed air connection (1) with plug connector for VSL 8/6 is marked with the number 1.

- Connect the compressed air hose to the connection (1).

The vacuum plug connection (2) with plug connector for VSL 4/2 or 6/4 is established for each ejector.

- Connect the vacuum hose for each ejector to the connection (2).

The Auxiliary Supply for Additional Compressed Air

In a terminal with:

- at least 8 ejectors with a nozzle size of 1.2 mm or
- at least 12 ejectors with a nozzle size of 1.0 mm

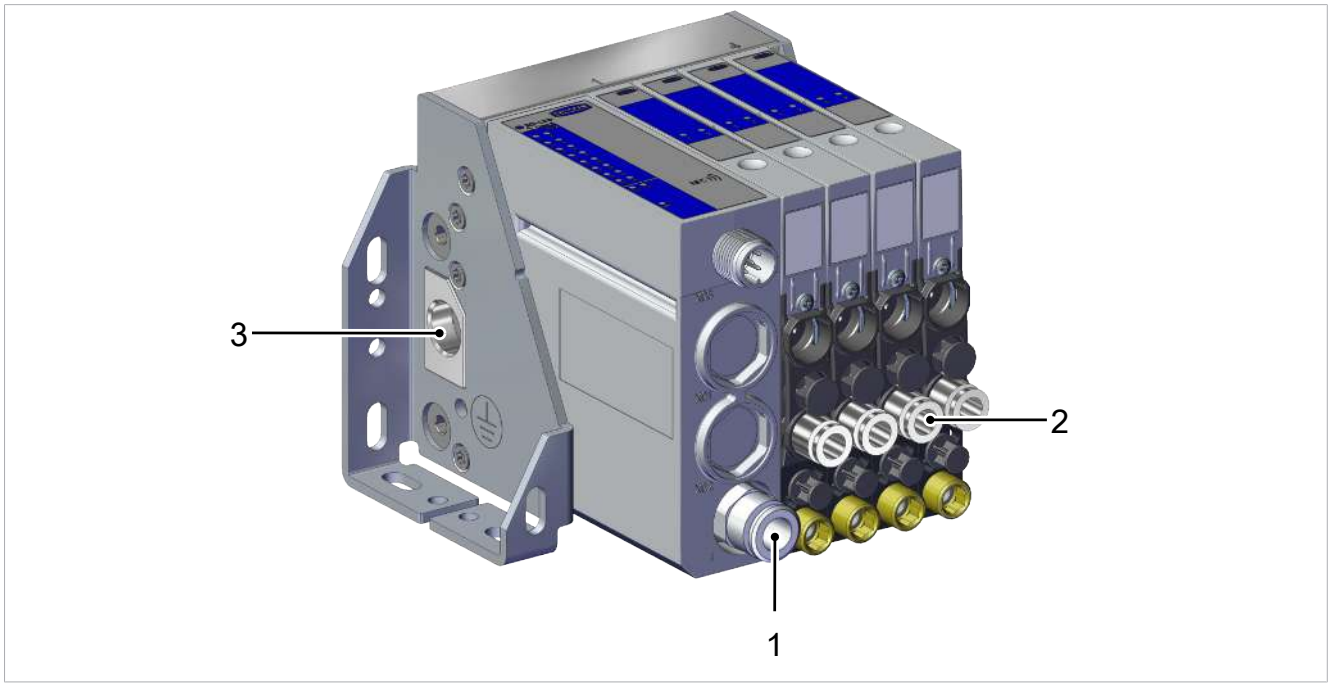
a correspondingly high compressed air flow rate is required to ensure safe operation.
With such terminals, Schmalz recommends the use of the auxiliary supply to provide additional compressed air.

The auxiliary supply (3) can be on both ends of the terminal; Schmalz recommends connecting the supply on the upper connection on the right.

1. Remove the size 4 screw in the auxiliary supply (3).

2. Install the mounting element with the 1/8" internal thread (e.g. plug connection) for the compressed air hose.
3. Connect the compressed air hose.

7.3.3 Connect terminal with valves, compressed air and vacuum



The compressed air connection (1) with plug connector for VSL 8/6 is marked with the number 1.

- Connect the compressed air hose (outer hose diameter 8 mm) to the plug connector marked with number 1 for the “blow-off” function.

The vacuum connection (2) with plug connector for VSL 6/4 is established for each valve.

- Connect the vacuum hose (suction cup) (outer hose diameter 6 mm) to the plug connection marked with number 2 for each valve.

The connection for supplying the external vacuum is located on the end faces of the terminal and is marked 3.

1. Install the connection provided by the customer on the thread (3).
2. Depending on the number of vacuum valves (open suction points) installed in the terminal and the dimensions of the selected vacuum connection, a second connection may be required (> See ch. 4.5 Vacuum Valve Max. Flow Capacity, p. 24).

		Open suction points															
Hose outer diameter		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Ø8 mm	single-sided	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
	both sides	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Ø10 mm	single-sided	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
	both sides	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗
Ø12 mm	single-sided	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	both sides	not required															

7.4 Electrical Connection

⚠ WARNING

Electric shock

Risk of injury

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

NOTE

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

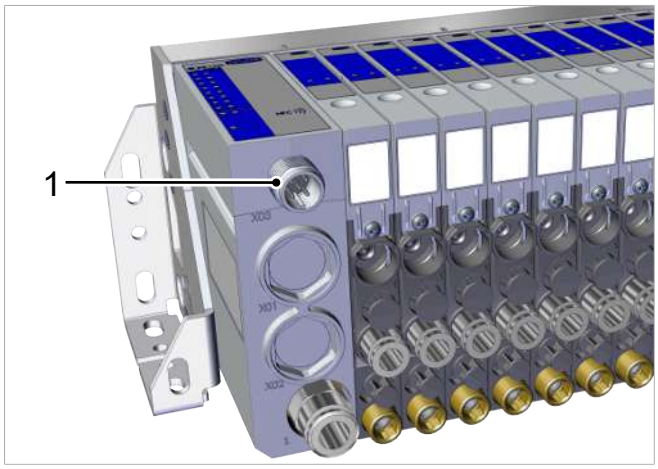
Personal injury or damage to property

- 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 device with power and communicates with the controller of the higher-level machine using defined outputs.

Establish the Electrical Connection for the Device Using Plug Connector 1 as Shown in the Figure.

✓ Prepare an M12 5-pin connection cable with a socket (supplied by the customer).



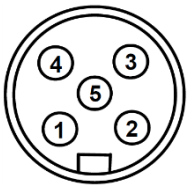
▸ Attach the connection cable to the thread marked with X03 (1) and secure it to the device (maximum tightening torque = hand-tight).

Ensure that:

- The electrical supply cable does not exceed the maximum length of 20 meters and
- the connection cable does not exert any force on the connection.

7.4.1 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”)

Static Electricity

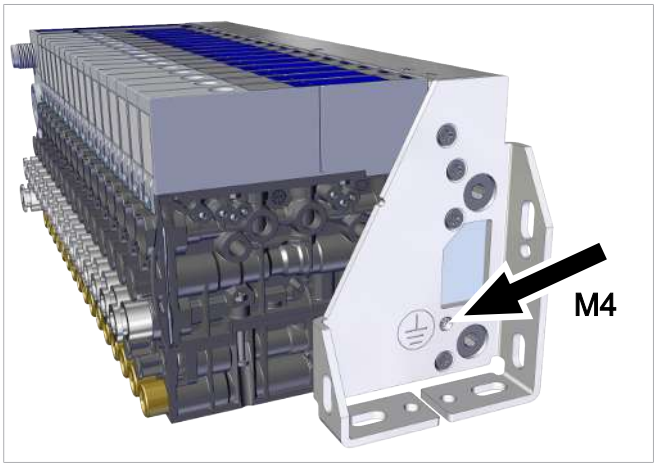
NOTE

Static Electricity

Failure to comply may result in damage to property

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

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



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

7.5 Instructions for Start of Operations

When connecting the device, the supply voltage U_S for the sensors and the C/Q communication line must be directly connected to the connections of an IO-Link master. A separate port on the master must be used for each device. 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 device 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.

To integrate the device into a higher-level controller, a device description file (IODD = IO Device Description) is available. The IODD is available at www.schmalz.com.

When integrating the device with the device description file, the IO-Link Master can occasionally fail to establish communication with the device. To work around this problem, the process data format can be set to octet-string in the IO-Link port setting. This process data format is also recommended when using product-specific function blocks.

8 Operation

8.1 Safety Instructions for Operation

⚠ WARNING

Suspended load

Risk of serious injury

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

⚠ WARNING

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

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

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

⚠ WARNING

Extraction of hazardous media, liquids or bulk material

Personal injury or damage to property!

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

⚠ CAUTION

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

Eye injuries!

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

⚠ CAUTION

Vacuum close to the eye

Severe eye injury!

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

⚠ CAUTION

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

Risk of injury!

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

8.2 Disable the compressed air supply during breaks

NOTE

The product has been idle for an extended period of time (>1 day) under pressure.

Due to the prevailing pressure, the installed elastomer seals are subject to settling phenomena, with the result that faults occur during restart.

- If possible, switch off the input pressure via the control (electrical) before longer system downtimes or breaks in operation, or alternatively switch off manually.
- If the above-mentioned fault occurs, briefly increase the inlet pressure to > 6.0 bar and then control the valve disks.

8.3 Checking for Correct Installation and Function

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

9 Troubleshooting

9.1 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 slots.
No NFC communication	NFC connection between terminal and reader (e.g. smartphone) not correct.	▸ Hold the reader at the intended position on the bus module.
	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	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.
The 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.
On the bus module, the SP2 LED flashes for one or more slots.	At the respective slots, the control expects an ejector/valve or a dummy plate; however, a dummy plate or an ejector/valve is installed.	▸ Install the ejector/valve or dummy plate or adapt the configuration for the affected slots.
	The connection between the ejector/valve and backplane is incorrect.	▸ Check whether the connector plug between the ejector/valve and backplane is incorrectly fitted or damaged.

9.2 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. 2. Use engineering tool to import a valid dataset.
Bit 1	Configuration error	The control detects more ejectors, fewer ejectors or other ejectors than installed.	▸ Adapt the configuration in the control.
Bit 2	Undervoltage U_S	Sensor supply voltage too low and outside the permitted range	1. Check power supply unit and power load 2. Increase supply voltage
Bit 3	Overvoltage U_S	Sensor supply voltage too high and outside the permitted range	1. Check power supply unit. 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. 2. Increase supply voltage
Bit 5	Overvoltage U_A	Actuator supply voltage is too high. (Outside the permitted range.)	1. Check power supply unit. 2. Reduce supply voltage
Bit 6	Supply pressure	System pressure outside the permitted range.	▸ Check and adjust supply pressure.

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

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 Cleaning the Device

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 product is not soaked in soapy water.
3. Ensure that no moisture gets into the electrical connection.

10.3 Terminal with ejectors: Replace the silencer

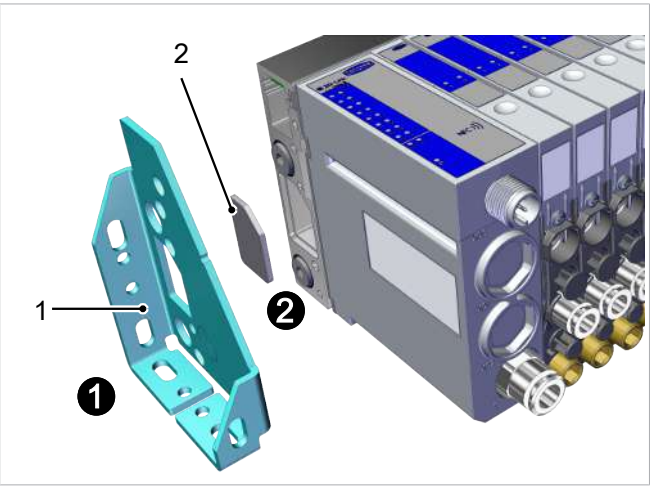
The open silencers installed on both sides may become dirty due to the heavy infiltration of dust, oil, and so on, which may reduce the suction capacity. We do not recommend cleaning the silencers because of capillary action in the porous material.

- If the suction capacity decreases, replace both silencers.

✓ The device has been disconnected from all supply lines.
✓ The device is removed from the location of use.
✓ The customer has provided the new silencers (> See ch. 12 Spare and Wearing Parts, Accessories, p. 74).

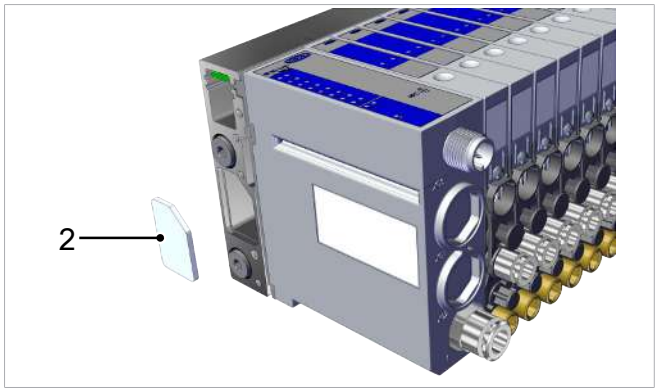
1. Loosen and remove the screws on the side.

2. Remove the mounting bracket (1) ❶ and remove the silencer (2) ❷.

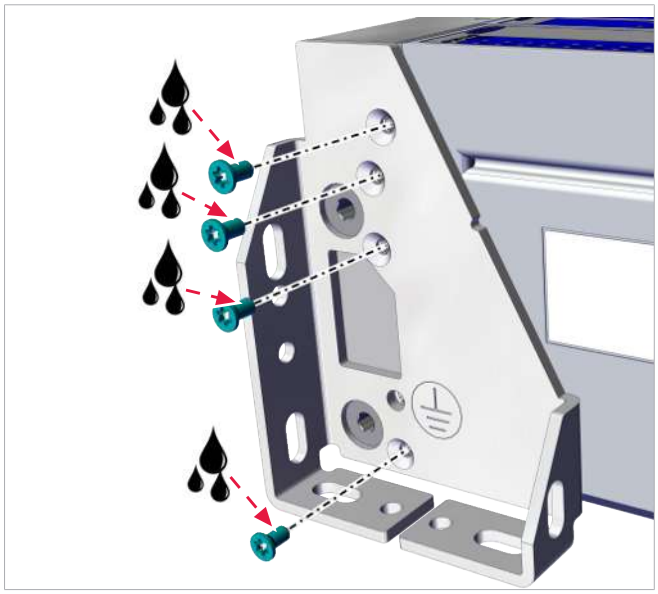


3. Clean the contact surfaces of the mounting bracket and terminal (including the extract air channel if necessary).

4. Install the new silencer (2) in the correct position in the recess on the terminal.



5. Fasten the mounting bracket to the terminal in the correct position using all the screws. Coat the screws with a light-duty thread locking compound and tighten with a torque of 1 Nm.



6. Repeat the work steps above on the other side.
7. Install the device at the location of use and connect the supply lines.
8. Before starting the handling process, check to ensure the device is installed and functioning correctly.

10.4 Replacing the Ejector/Valve

The figures in this document may differ from the delivered product.

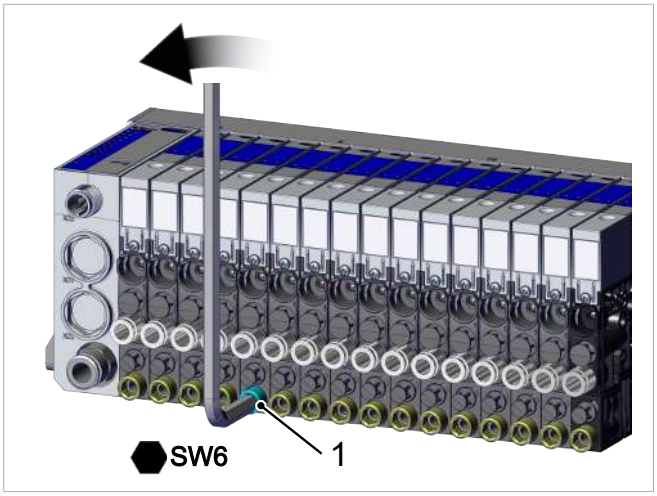
Either only ejectors (E) or only valves (V) are installed in a mini compact terminal.

Replacing an NO or NC ejector with an IMP ejector (and vice versa) is not possible. IMP ejectors cannot be operated together with NO or NC ejectors within one terminal.

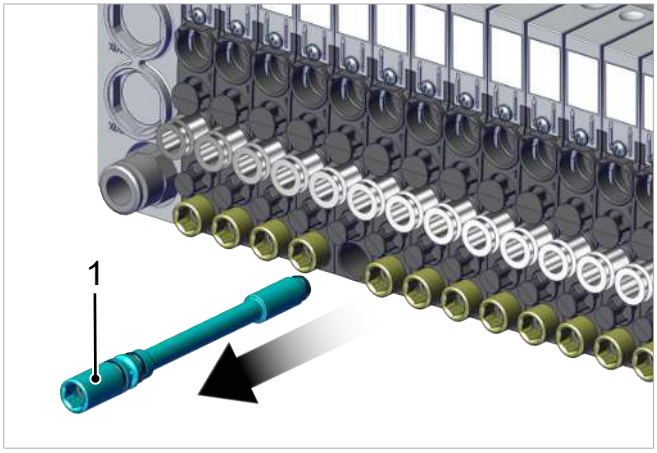
The following description uses a middle ejector/valve as an example.

- ✓ The terminal is disconnected from the compressed air supply and the power supply.
- ✓ The vacuum and compressed air system is vented to atmospheric pressure.

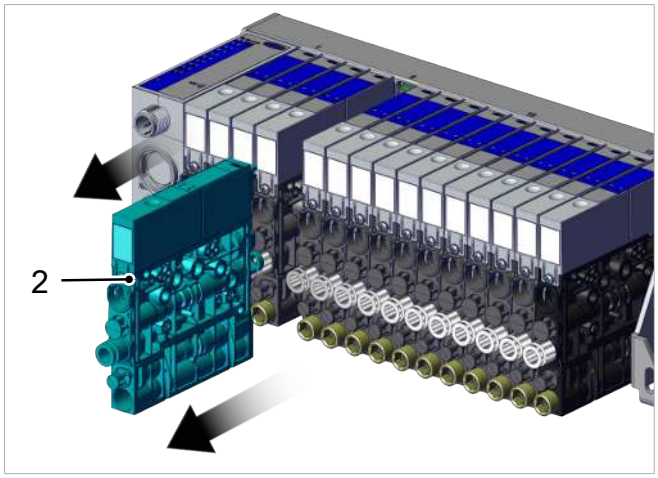
1. Loosen the hex socket head screw (1).



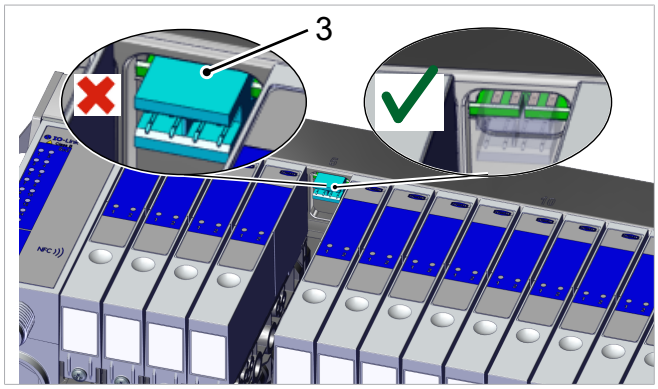
2. Remove the hex socket head screw (1).



3. Carefully pull the ejector/valve (2) out of the bracket in the direction of the removed screw.

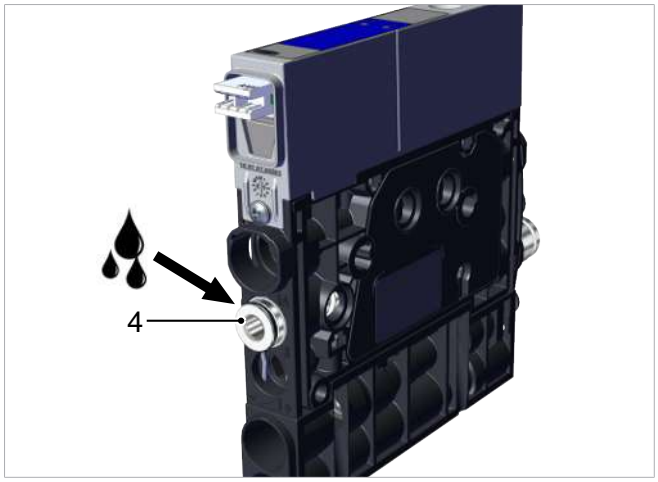


4. If the printed-circuit board adapter (3) is still on the terminal side, carefully remove it.

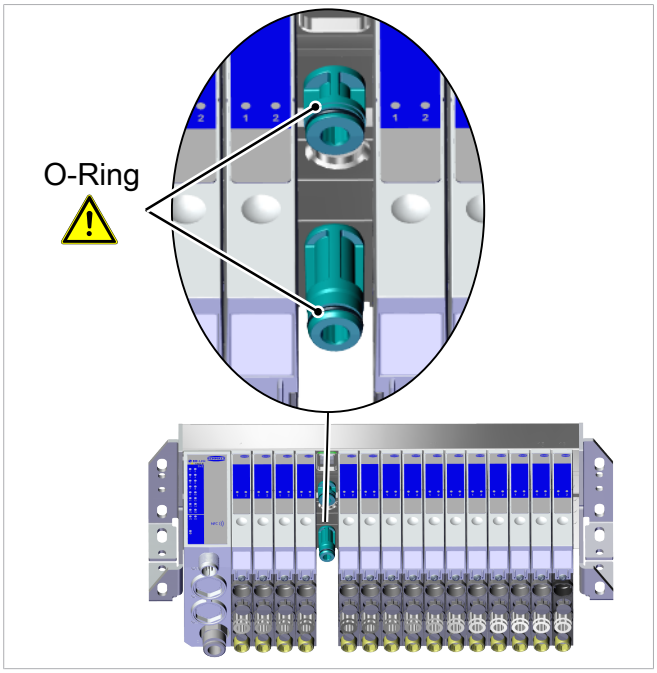


5. For a terminal with ejectors, continue with step 7.
   For a terminal with valves, continue with step 6.

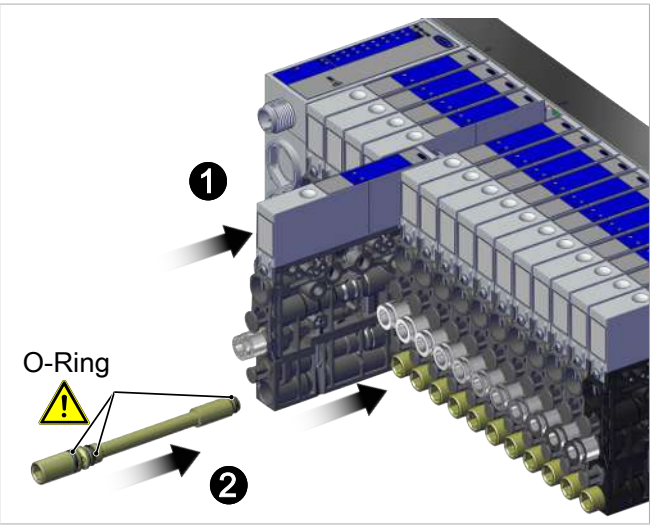
6. Lightly grease the area around the vacuum port (4) with pneumatic grease on the new vacuum valve.



7. Before mounting the ejector/valve or dummy plate, check the position and condition of the O-rings.



8. Carefully press in the new ejector or valve (2) and printed-circuit board adapter (3) correctly at the free position by hand until they stop flush ❶.
   Check that the three O-rings are positioned correctly and tighten the hex socket head screw (1) with a maximum tightening torque of 2 Nm ❷.



9. Calibrating thevacuum sensors (> See ch. 5.5.3 Calibrating the Vacuum Sensor, p. 36).
10. Before starting the handling process, check to ensure the device is installed and functioning correctly.

If the new ejector or valve has a different drive type and/or nozzle size, the configuration in the bus module must be adapted accordingly (> See ch. 5.5.6 Writing the Configuration, p. 36).

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 ejectors!

- Switch off the supply voltage before any maintenance.
- Ensure that it cannot be switched back on.
- The mini compact terminal (version with ejectors) must always be operated with a silencer.

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

Part no.	Description	Type
10.02.02.07341	Silencer set	Wearing part
10.02.02.07190	Individual ejector disk without screw, 03 NC	Spare part
10.02.02.07189	Individual ejector disk without screw, 03 NO	Spare part
10.02.02.07432	Individual ejector disk without screw, 03 IMP	Spare part
10.02.02.07018	Individual ejector disk without screw, 05 NC	Spare part
10.02.02.07017	Individual ejector disk without screw, 05 NO	Spare part
10.02.02.07436	Individual ejector disk without screw, 05 IMP	Spare part
10.02.02.06909	Individual ejector disk without screw, 07 NC	Spare part
10.02.02.06938	Individual ejector disk without screw, 07 NO	Spare part
10.02.02.07236	Individual ejector disk without screw, 07 IMP	Spare part
10.02.02.06946	Individual ejector disk without screw, 10 NC	Spare part
10.02.02.06945	Individual ejector disk without screw, 10 NO	Spare part
10.02.02.07438	Individual ejector disk without screw, 10 IMP	Spare part
10.02.02.06940	Individual ejector disk without screw, 12 NO	Spare part
10.02.02.07013	Individual ejector disk without screw, 12 NC	Spare part
10.02.02.07363	Individual ejector disk without screw, 12 IMP	Spare part
10.02.02.07460	Single valve disk without screw, NO	Spare part
10.02.02.07277	Single valve disk without screw, NC	Spare part
10.02.02.06730	Bus module without screw, IOL	Spare part
10.02.02.07132	Bus module without screw, PNT	Spare part
10.02.02.07131	Bus module without screw, EIP	Spare part
10.02.02.07130	Bus module without screw, ECT	Spare part
10.02.02.07263	Dummy plate with screw for ejectors	Spare part

Part no.	Description	Type
10.02.02.07664	Dummy plate with screw for vacuum valves	Spare part
10.02.02.06948	Fastening screw for ejector	Spare part
10.02.02.06966	Fastening screw for bus module	Spare part

12.2 Accessories

Part no.	Description	Note
21.04.05.00158	Connection cable	M12, 5-pin to M12, 5-pin connector, 1 m, A-coded
21.04.05.00211	Connection cable	M12, 5-pin, straight cable outlet, with PUR cable, 2 m, A-coded
21.04.05.00266	Connection cable	M12-5 connection 1: 5-pin M12 socket; cable length: 5 m; connector 2: M12, 5-pin plug; PUR cable; A-coded
10.07.01.00241	Vacuum filter	VFi 6/4 50
21.10.02.00069	Schmalz Connect Suite SCS HW	SCS hardware (software tool for digital connection of IO-Link products)
21.10.02.00017	SDI Smart Device Interface	SDI IOL M12-5 24V-DC 24V-DC

13 Decommissioning and Disposal

13.1 Disposing of the Product

The components may only be prepared for disposal by qualified specialists.

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

13.2 Materials Used

Component	Material
Housing	PA6-GF, PC-ABS, PA12
Inner components	Aluminum alloy, anodized aluminum alloy, brass, galvanized steel, stainless-steel, PU, POM
Screws	Galvanized steel
Silencer insert	Porous PE
Sealing	Nitrile rubber (NBR)
Lubrication	Silicone-free

14 Declarations of Conformity

14.1 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	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment

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

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

14.2 UKCA Conformity

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

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

The following designated standards were applied:

EN ISO 12100	Safety of machinery — General principles for design — Risk assessment and risk reduction
EN 61000-6-2+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

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.

15 Data Dictionary

See also

SCTMi_Data_Dictionary_20240405.pdf [▶ 79]

IO-Link Data Dictionary

SCTMi

21.10.01.00245

12.04.2024

IO-Link

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

SCHMALZ

IO-Link Implementation

Vendor ID	234 (0xEA)	
Device ID	100272 (0x0187B0)	
SIO-Mode	no	
IO-Link Revision	1.1	
IO-Link Bitrate	38.4 kBit/sec (COM2)	
Minimum Cycle Time	8,00	ms
Process Data Input	14	bytes
Process Data Output	6	bytes

Process Data

Process data In		Bits	Access	Remark
PD in byte 0	reserved	5…0	ro	reserved
	Device status	7…6	ro	00 - [green] Device is working optimally 01 - [yellow] Device is working, maintenance necessary 10 - [orange] Device is working, but there are warnings in the Control-Unit 11 - [red] Device is not working properly, there are errors in the Control-Unit
PD in byte 1	Device Select Acknowledge	7…0	ro	Device selected in PD Out byte 1 0xFF - invalid device selected
PD in byte 2	Errors	7…0	ro	Errors: bits equate ISDU 130 bits 7 … 0
PD in byte 3	Warnings	7…0	ro	Warnings Device selected 0 = Control-Unit: bits equate ISDU 146 subindex 17 bits 7 … 0 Device selected 1-16 = Ejector: bits quate ISDU 146 subindex 1-16 bits 7 …0 Hint: if selected device is invalid, all bits will be set to 1
PD in byte 4	Vacuum	7…0	ro	Vacuum Unit: 1 mbar Device selected 0 = reserved, Device selected 1-16 = Ejector, bytes equate ISDU 64 subindex 1 - 16
PD in byte 5		7…0		
PD in byte 6	Air saving function (SP1) Ejector #1	0	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #1	1	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #1	2	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #1	3	ro	Condition Monitoring active
	Air saving function (SP1) Ejector #2	4	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #2	5	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #2	6	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #2	7	ro	Condition Monitoring active
PD in byte 7	Air saving function (SP1) Ejector #3	0	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #3	1	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #3	2	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #3	3	ro	Condition Monitoring active
	Air saving function (SP1) Ejector #4	4	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #4	5	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #4	6	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #4	7	ro	Condition Monitoring active
PD in byte 8	Air saving function (SP1) Ejector #5	0	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #5	1	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #5	2	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #5	3	ro	Condition Monitoring active
	Air saving function (SP1) Ejector #6	4	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #6	5	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #6	6	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #6	7	ro	Condition Monitoring active
PD in byte 9	Air saving function (SP1) Ejector #7	0	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #7	1	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #7	2	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #7	3	ro	Condition Monitoring active
	Air saving function (SP1) Ejector #8	4	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #8	5	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #8	6	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #8	7	ro	Condition Monitoring active
PD in byte 10	Air saving function (SP1) Ejector #9	0	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #9	1	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #9	2	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #9	3	ro	Condition Monitoring active
	Air saving function (SP1) Ejector #10	4	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #10	5	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #10	6	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #10	7	ro	Condition Monitoring active
PD in byte 11	Air saving function (SP1) Ejector #11	0	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #11	1	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #11	2	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #11	3	ro	Condition Monitoring active
	Air saving function (SP1) Ejector #12	4	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #12	5	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #12	6	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #12	7	ro	Condition Monitoring active
PD in byte 12	Air saving function (SP1) Ejector #13	0	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #13	1	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #13	2	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #13	3	ro	Condition Monitoring active
	Air saving function (SP1) Ejector #14	4	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #14	5	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #14	6	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #14	7	ro	Condition Monitoring active
PD in byte 13	Air saving function (SP1) Ejector #15	0	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #15	1	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #15	2	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #15	3	ro	Condition Monitoring active
	Air saving function (SP1) Ejector #16	4	ro	Vacuum is over SP1 and not yet under rP1
	Part present (SP2) Ejector #16	5	ro	Vacuum is over SP2 and not yet under rP2
	Part discarded (SP3) Ejector #16	6	ro	Vacuum is under SP3 (20mbar)
	CM active in Ejector #16	7	ro	Condition Monitoring active

Process data Out		Bits	Access	Remark	
PD out byte 0	Input Pressure	7…0	wo	Input Pressure	
PD out byte 1	Device Select	7…0	wo	Device Select Device selected 0 = Control-Unit Device selected 1-16 = Ejector 1 - 16	
PD out byte 2	Vacuum Ejector #1	7…0	wo	Suction Control	**Suction Control** NC ejectors Suction on: 1 Suction off: 0 NO ejectors Suction on: 0 Suction off: 1 IMP ejectors Suction on: 0 -> 1 (Transition) Suction off: Blow-off active **Blow-off Control (externally controlled blow off)** Blow-off active: 1 Blow-off inactive: 0 Hint: While blow-off is active, suction is always disabled
	Blow-off Ejector #1			Blow-off Control	
	Vacuum Ejector #2			Suction Control	
	Blow-off Ejector #2			Blow-off Control	
	Vacuum Ejector #3			Suction Control	
	Blow-off Ejector #3			Blow-off Control	
	Vacuum Ejector #4			Suction Control	
	Blow-off Ejector #4			Blow-off Control	
PD out byte 3	Vacuum Ejector #5	7…0	wo	Suction Control	
	Blow-off Ejector #5			Blow-off Control	
	Vacuum Ejector #6			Suction Control	
	Blow-off Ejector #6			Blow-off Control	
	Vacuum Ejector #7			Suction Control	
	Blow-off Ejector #7			Blow-off Control	
	Vacuum Ejector #8			Suction Control	
	Blow-off Ejector #8			Blow-off Control	
PD out byte 4	Vacuum Ejector #9	7…0	wo	Suction Control	
	Blow-off Ejector #9			Blow-off Control	
	Vacuum Ejector #10			Suction Control	
	Blow-off Ejector #10			Blow-off Control	
	Vacuum Ejector #11			Suction Control	
	Blow-off Ejector #11			Blow-off Control	
	Vacuum Ejector #12			Suction Control	
	Blow-off Ejector #12			Blow-off Control	
PD out byte 5	Vacuum Ejector #13	7…0	wo	Suction Control	
	Blow-off Ejector #13			Blow-off Control	
	Vacuum Ejector #14			Suction Control	
	Blow-off Ejector #14			Blow-off Control	
	Vacuum Ejector #15			Suction Control	
	Blow-off Ejector #15			Blow-off Control	
	Vacuum Ejector #16			Suction Control	
	Blow-off Ejector #16			Blow-off Control	

ISDU Parameters

ISDU Index dec	ISDU Index hex	Subindex dec	Parameter	Size	Value Range	Access	Default Value	Remark
Identification								
Device Management								
16	0x0010	0	Vendor name	0…32 bytes	-	ro	J. Schmalz GmbH	Manufacturer designation
17	0x0011	0	Vendor text	0…32 bytes	-	ro	Innovative Vacuum Solutions	Vendor text
18	0x0012	0	Product name	0…32 bytes	-	ro	-	Product name
19	0x0013	0	Product ID	0…32 bytes	-	ro	-	Product variant name, e.g.: SCTMi
20	0x0014	0	Product text	0…32 bytes	-	ro	-	Order-code, e.g.: SCTMi
21	0x0015	0	Serial number	9 bytes	-	ro	-	Serial number, e.g.: 999000101
22	0x0016	0	Hardware revision	2 bytes	-	ro	-	Hardware revision, e.g.: 00
23	0x0017	0	Firmware revision	4 bytes	-	ro	-	Firmware revision, e.g.: S1.01A1.01
250	0x00FA	0	Article number	14 bytes	-	ro	-	Order-number, e.g.: 10.03.01.00500
252	0x00FC	0	Production date	3 bytes	-	ro	-	Date code of production (month and year, month is letter coded, e.g.: I19
254	0x00FE	0	Product text (detailed)	1…64 bytes	-	ro	-	Detailed type description of the device
354	0x0162	0	Product configuration (detailed)	1…67 bytes	-	ro	-	Detailed description of the device
Device Localization								
24	0x0018	0	Application specific tag	1…32 bytes	-	rw	***	User string to store location or tooling information
25	0x0019	0	Function tag	1…32 bytes	-	rw	***	User string to store location or tooling information
26	0x001A	0	Location tag	1…32 bytes	-	rw	***	User string to store location or tooling information
242	0x00F2	0	Equipment identification	1…64 bytes	-	rw	***	User string to store identification name from schematic
246	0x00F6	0	Geolocation	1…64 bytes	-	rw	***	User string to store geolocation from handheld device
248	0x00F8	0	NFC web link	1…64 bytes	http://… https://…	rw	https://myproduct.schmalz.com/#/	Web link to NFC app (base URL for NFC tag)
249	0x00F9	0	Storage location	1…32 bytes	-	rw	***	User string to store storage location
253	0x00FD	0	Installation date	1…16 bytes	-	rw	***	User string to store date of installation
Parameter								
Device Settings								
Commands								
2	0x0002	0	System command	1 byte	129, 131, 165, 167, 168, 170, 171	wo	-	0x81 (dec 129): Reset application 0x83 (dec 131): Back to box (valve and nozzle type excluded - manual restart required) 0xA5 (dec 165): Calibrate vacuum sensor 0xA7 (dec 167): Reset erasable counters 0xA8 (dec 168): Reset voltages min/max 0xAA (dec 170): Write configuration (valve and nozzle type - manual restart required) 0xAB (dec 171): Reset configuration to factory defaults (valve and nozzle type - manual restart required)
Access Control								
90	0x005A	0	Extended device access locks	1 byte	0-255	rw	0	Bit 0: NFC write lock Bit 1: NFC disable Bit 2: Not used Bit 3: Not used Bit 4: IO-Link event lock (suppress sending IO-Link events) Bit 5-7: Not used
91	0x005B	0	Pin-Code NFC	2 bytes	0-999	rw	0	Pin-Code for NFC write
Initial Settings								
110	0x006E	1…16	Blow mode for ejektors #1 - #16	16x1 bytes	0-2	rw	0	Blow mode setting for each ejector subindex corresponds to ejector number 0x00 = Externally controlled blow-off 0x01 = Internally controlled blow-off – time-dependent 0x02 = Externally controlled blow-off – time-dependent

Configuration								
565	0x0235	1…16	Read Valvetype for ejektors #1 - #16	16x1	bytes	0,1,3,255	ro	-	0 = NC, 1 = NO, 3 = IMP, 255 = not connected Subindex corresponds to ejector number
566	0x0236	1…16	Write Valvetype for ejektors #1 - #16 (only valid after system command 170 is written)	16x1	bytes	0,1,3, 254, 255	rw	-	0 = NC, 1 = NO, 3 = IMP, 254 = not written, 255 = not connected
567	0x0237	1…16	Read Nozzletype for ejektors #1 - #16	16x1	bytes	0-5, 255	ro	-	0 = EV, 1 = 03, 2 = 05, 3 = 07, 4 = 10, 5 = 12, 255 = not connected Subindex corresponds to ejector number
568	0x0238	1…16	Write Nozzletype for ejektors #1 - #16 (only valid after system command 170 is written)	16x1	bytes	0-5, 254, 255	rw	-	0 = EV, 1 = 03, 2 = 05, 3 = 07, 4 = 10, 5 = 12, 254 = not written, 255 = not connected
Process Settings								
100	0x0064	1…16	Switchpoint 1 (SP1) for ejectors #1 - #16	16x2	bytes	999 > SP1 > rP1	rw	750	Unit: 1mbar, Subindex corresponds to ejector number
101	0x0065	1…16	Resetpoint 1 (rP1) for ejectors #1 - #16	16x2	bytes	SP1 > rP1 > SP2	rw	600	Unit: 1mbar, Subindex corresponds to ejector number
102	0x0066	1…16	Switchpoint 2 (SP2) for ejectors #1 - #16	16x2	bytes	rP1 > SP2 > rP2	rw	550	Unit: 1mbar, Subindex corresponds to ejector number
103	0x0067	1…16	Resetpoint 2 (rP2) for ejectors #1 - #16	16x2	bytes	SP2 > rP2 >= 10	rw	540	Unit: 1mbar, Subindex corresponds to ejector number
106	0x006A	1…16	Duration automatic blow for ejectors #1 - #16	16x2	bytes	10-9999	rw	200	Unit: 1ms, Subindex corresponds to ejector number
107	0x006B	1…16	Permissable evacuation time for ejectors #1 - #16	16x2	bytes	0-9999	rw	2000	Unit: 1ms, Subindex corresponds to ejector number
108	0x006C	1…16	Permissable leakage rate for ejectors #1 - #16	16x2	bytes	10-999	rw	250	Unit: 1mbar/s, Subindex corresponds to ejector number
109	0x006D	1…16	Control-mode for ejectors #1 - #16	16x1	bytes	0-5	rw	2	Control mode settings for each ejector Subindex corresponds to ejector number subindex 0 for access to full array (16 bytes) 0x00 = control is not active, SP1 in hysteresis mode 0x01 = control is not active, SP1 in comparator mode 0x02 = control is active 0x03 = control is active with supervision of leakage 0x04 = control is active, continuous succing disabled 0x05 = control is active with supervision of leakage, continuous succing disabled
Observation								
Monitoring								
40	0x0028	0	Process data in copy	see Pd in		-	ro	-	see PD in
41	0x0029	0	Process data out copy	see Pd out		-	ro	-	see PD out
64	0x0040	1…16	Vacuum for ejectors #1 - #16	16x2	bytes	-	ro	-	Unit: 1mbar, Subindex corresponds to ejector number
65	0x0041	1 2 3	Input pressure live Input pressure min Input pressure max	2 2 2	bytes bytes bytes	-	ro ro ro	-	Unit: 1mbar Unit: 1mbar Unit: 1mbar
66	0x0042	1 2 3	Primary supply voltage live Primary supply voltage min Primary supply voltage max	2 2 2	bytes bytes bytes	-	ro ro ro	-	Unit: 0.1V Unit: 0.1V Unit: 0.1V
67	0x0043	1 2 3	Auxiliary supply voltage live Auxiliary supply voltage min Auxiliary supply voltage max	2 2 2	bytes bytes bytes	-	ro ro ro	-	Unit: 0.1V Unit: 0.1V Unit: 0.1V
Diagnosis								
Device Status								
32	0x0020	0	Error count	2	bytes	-	ro	-	Number of errors since last power-up
36	0x0024	0	Device status	1	byte	-	ro	-	0 = Device is operating properly 1 = Maintenance required 2 = Out of Spec 3 = unused 4 = Failure
37	0x0025	0	Detailed device status	96	bytes	-	ro	-	Information about currently pending events (Event-List) Byte 0 = Type of Event 1 Byte 1…2 = ID of Event 1 Byte 3 = Type of Event 2 Byte 4…5 = ID of Event 2 etc.
130	0x0082	0	Active errors	17	bytes	-	ro	-	Byte 0 bis Byte 15 (Subindex 1-16): For each ejector Bit 0 = Measurement range overrun Bit 1 = Vacuum calibration failed Bit 2 = Configuration Error Byte 16 (Subindex 17): Control-Unit: Bit 0: Internal error: data corruption Bit 1: Configuration Error Bit 2: Primary voltage too low Bit 3: Primary voltage too high Bit 4: Secondary voltage too low Bit 5: Secondary voltage too high Bit 6: Supply pressure too low or too high Bit 7: reserved
138	0x008A	1 2	Extended Device Status - Type Extended Device Status - ID	1 2	byte bytes	-	ro ro	-	Extended Device Status - Type (see below) 0x10: Device operation properly Event Code of current device status (see table below)
139	0x008B	0	NFC status	1	byte	-	ro	-	Result of recent NFC activity: 0x00: Data valid, write finished successfully 0x23: Write failed: Write access locked 0x30: Write failed: parameter(s) out of range 0x31: Write failed: parameter value too high 0x32: Write failed: parameter value too low 0x41: Write failed: parameter set inconsistent 0xA1: Write failed :invalid authorisation 0xA2: NFC not available 0xA3: Write failed: invalid data structure 0xA5: Write pending 0xA6: NFC internal error
Condition Monitoring [CM]								
146	0x0092	1…17	Condition monitoring	17x2	bytes	-	ro	-	Subindex 1…16: for each ejector: Bit 0: valve protection active Bit 1: Evacuation time greater than limit Bit 2: Leakage rate greater than limit Bit 3: SP1 not reached in suction cycle Bit 4: Free flow vacuum too high Bit 5-15: reserved Subindex 17: for Control-Unit: Bit 0: Primary Voltage limit Bit 1: Secondary voltage limit Bit 2: Input pressure limit
Counters								
140	0x008C	1…16	Vacuum on counter for ejectors #1 - #16	16x4	bytes	-	ro	-	Counter for Vacuum on (non-erasable, saved every 256 cycles) Subindex corresponds to ejector number
141	0x008D	1…16	Valve operating counter for ejectors #1 - #16	16x4	bytes	-	ro	-	Counter for valve operating (non-erasable, saved every 256 cycles) Subindex corresponds to ejector number
143	0x008F	1…16	Vacuum on counter for ejectors #1 - #16	16x4	bytes	-	ro	-	Counter for Vacuum on (erasable, saved every 256 cycles) Subindex corresponds to ejector number
144	0x0090	1…16	Valve operating counter for ejectors #1 - #16	16x4	bytes	-	ro	-	Counter for valve operating (erasable, saved every 256 cycles) Subindex corresponds to ejector number

		Timing						
166	0x00A6	1…16	Total cycle time of last cycle for ejectors #1 - #16	16x4 bytes	-	ro	-	Unit: 1ms Subindex corresponds to ejector number
148	0x0094	1…16	Evacuation time t0 of last suction-cycle for ejectors #1 - #16	16x2 bytes	-	ro	-	Unit: 1ms Time from suction start to reaching SP2 Subindex corresponds to ejector number
149	0x0095	1…16	Evacuation time t1 of last suction-cycle for ejectors #1 - #16	16x2 bytes	-	ro	-	Unit: 1ms Time from reaching SP2 to reaching SP1 Subindex corresponds to ejector number
170	0x00AA	1…16	Holding time t2 of last suction-cycle for ejectors #1 - #16	16x2 bytes	-	ro	-	Unit: 1ms Time from reaching SP1 to suction stop Subindex corresponds to ejector number
171	0x00AB	1…16	Blow-off time t3 of last suction-cycle for ejectors #1 - #16	16x2 bytes	-	ro	-	Unit: 1ms Time from start blowing to stop blowing Subindex corresponds to ejector number
		Predictive Maintenance						
156	0x009C	1…17	Air-Consumption of last suction-cycle for ejectors #1 - #16	17x4 bytes	-	ro	-	Unit: 0.1L std. Subindex 1-16 corresponds to ejector number Subindex 17: air consumption of all ejectors
160	0x00A0	1…16	Leakage rate of last suction-cycle for ejectors #1 - #16	16x2 bytes	-	ro	-	Unit: 1mbar Subindex corresponds to ejector number
161	0x00A1	1…16	Free-Flow vacuum of last suction-cycle for ejectors #1 - #16	16x2 bytes	-	ro	-	Unit: 1mbar Subindex corresponds to ejector number
164	0x00A4	1…16	Max reached vacuum of last cycle for ejectors #1 - #16	16x2 bytes	-	ro	-	Unit: 1mbar Subindex corresponds to ejector number
162	0x00A2	1…16	Quality of last suction-cycle of last cycle for ejectors #1 - #16	16x1 bytes	-	ro	-	Unit: 1% Subindex corresponds to ejector number
163	0x00A3	1…16	Performance of last suction-cycle of last cycle for ejectors #1 - #16	16x1 bytes	-	ro	-	Unit: 1% Subindex corresponds to ejector number

Coding of IO-Link Events

Extended Device Status ID (= IO-Link Event Code)		Extended Device Status Type		IO-Link	Event name	Remark
dec	hex	hex	Meaning	Event Type		
Control Unit						
0	0x0000	0x10	Everything OK	(no IOL event)	Everything OK	Device is working optimally
20736	0x5100	0x42	Critical condition	Warning	General power supply fault	Primary supply voltage (US) too low
20752	0x5110	0x42	Critical condition	Warning	Primary supply voltage over-run	Primary supply voltage (US) too high
20754	0x5112	0x42	Critical condition	Warning	General power supply fault	Auxiliary supply voltage (UA) too low
6162	0x1812	0x42	Critical condition	Error	General power supply fault	Auxiliary supply voltage (UA) too high
6146	0x1802	0x42	Critical condition	Warning	Supply pressure fault	Input pressure too high or too low
6161	0x1811	0x82	Defect/fault	Error	Data corruption	Internal error, user data corrupted
6164	0x1814	0x82	Defect/fault	Error	Configuration error	Configuration wrong
6156	0x180C	0x22	Warning	Warning	CM: Primary supply voltage out of optimal range	Condition Monitoring: primary supply voltage US outside of operating range
6157	0x180D	0x22	Warning	Warning	CM: Secondary supply voltage out of optimal range	Condition Monitoring: secondary supply voltage out of optimal range
6158	0x180E	0x22	Warning	Warning	CM: Supply pressure out of optimal range	Condition Monitoring: supply pressure out of optimal range
Ejectors						
36112	0x8D10	0x22	Warning	Warning	Valve protection active for Ejector #1	
…						
36127	0x8D1F	0x22	Warning	Warning	Valve protection active for Ejector #16	
36128	0x8D20	0x22	Warning	Warning	Evacuation time t1 is greater than limit for Ejector #1	
…						
36143	0x8D2F	0x22	Warning	Warning	Evacuation time t1 is greater than limit for Ejector #16	
36144	0x8D30	0x22	Warning	Warning	Leakage rate is greater than limit for Ejector #1	
…						
36159	0x8D3F	0x22	Warning	Warning	Leakage rate is greater than limit for Ejector #16	
36160	0x8D40	0x22	Warning	Warning	SP1 was not reached for Ejector #1	
…						
36175	0x8D4F	0x22	Warning	Warning	SP1 was not reached for Ejector #16	
36176	0x8D50	0x22	Warning	Warning	Free-flow vacuum level too high for Ejector #1	
…						
36191	0x8D5F	0x22	Warning	Warning	Free-flow vacuum level too high for Ejector #16	
36192	0x8D60	0x22	(IOL event only)	Notification	Vacuum calibration OK for Ejector #1	Calibration offset 0 set successfully
…						
36207	0x8D6F	0x22	(IOL event only)	Notification	Vacuum calibration OK for Ejector #16	Calibration offset 0 set successfully
36208	0x8D70	0x22	(IOL event only)	Notification	Vacuum calibration failed for Ejector #1	Sensor value too high or too low, offset not changed
…						
36223	0x8D7F	0x22	(IOL event only)	Notification	Vacuum calibration failed for Ejector #16	Sensor value too high or too low, offset not changed

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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