Operating Instructions

Compact Terminal SCTMi (PROFINET, EtherNet/IP, EtherCAT)

WWW.SCHMALZ.COM

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Note

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

Published by

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Contents

1 Important Information

1.1 Note on Using this Document

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

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

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

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

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

1.2 The technical documentation is part of the product

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

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

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

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

www.schmalz.com/services

1.3 Symbols

This symbol indicates useful and important information.

✓ This symbol represents a prerequisite that must be met prior to an operational step.

‣ This symbol represents an action to be performed.

⇨ This symbol represents the result of an action.

Actions that consist of more than one step are numbered:

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

1.4 Trademark

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

PROFINET® is a registered trademark of PROFIBUS and PROFINET International (PI).

EtherNet/IP is a trademark of ODVA, Inc.

2 Fundamental Safety Instructions

2.1 Intended Use

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

Neutral gases are approved as evacuation media. Neutral gases include air, nitrogen and inert gases (e.g. argon, xenon and neon). For further information, see (> See ch. Technical Data).

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

The product is intended for industrial use.

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

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

2.2 Non-Intended Use

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

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

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

2.3 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.

2.4 Residual Risks

⚠ WARNING

Noise pollution due to the escape of compressed air

Hearing damage!

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

⚠ WARNING

Extraction of hazardous media, liquids or bulk material

Personal injury or damage to property!

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

⚠ WARNING

Uncontrolled movements of system components or falling objects caused by incorrect activation and switching of the 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.

2.5 Personnel Qualification

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

The operating company must ensure the following points:

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

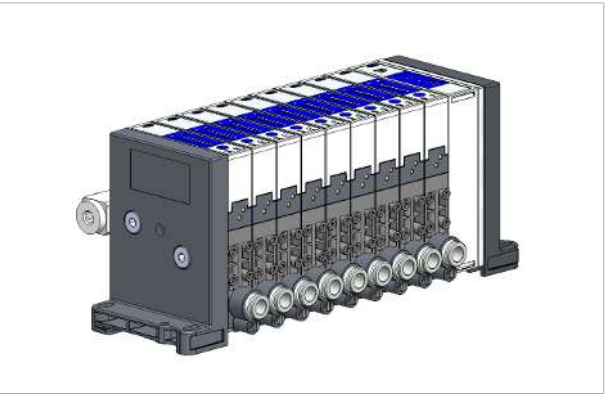
Applicable for Germany:

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

3 Product Description

3.1 Compact Terminal Description

Example with 9 ejectors

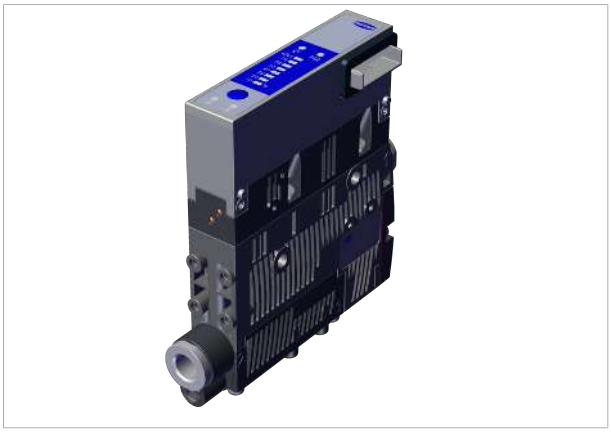


The Schmalz compact terminal SCTMi is a compact unit of multiple vacuum generators known as ejectors. Thanks to its modular design, up to 16 individual ejectors can be controlled and configured independently. It can be used to handle different parts simultaneously and independently using just one vacuum system.

The SCTMi has an industrial Ethernet interface. The compressed air supply can be connected centrally for all ejectors. As an alternative, it can also be connected separately for each ejector. Each ejector has an autonomous energy and process control for monitoring the vacuum circuit.

All settings, parameters and measurement and analysis data are made available centrally via the interface. Additionally, much of the information and status reports for the SCTMi can be accessed using wireless communication with NFC (Near Field Communication).

3.2 Description of the Ejector



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

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

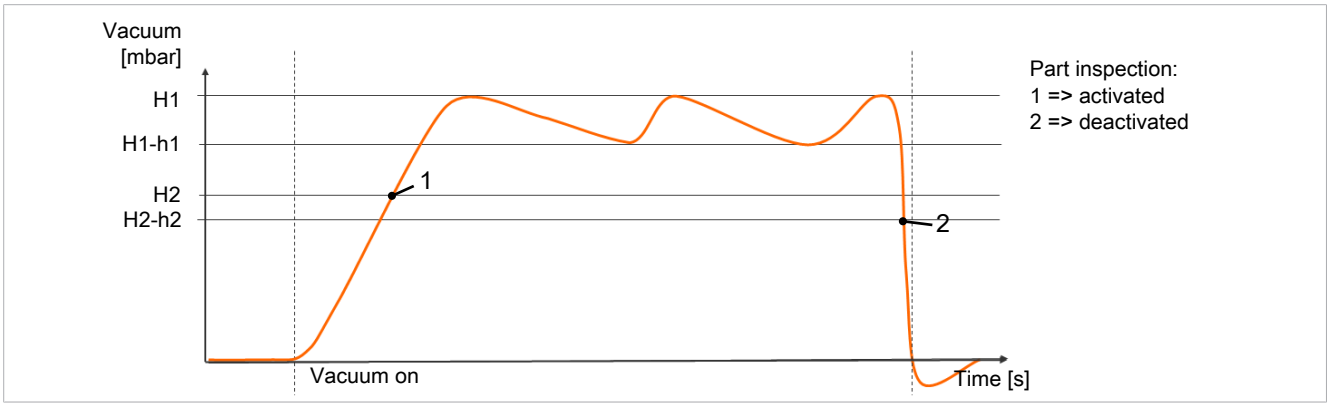
The compressed air supply can be connected centrally for all ejectors. As an alternative, there can also be a compressed air supply for each ejector.

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

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

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

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



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

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

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

3.3 Variants and Type Key

The item designation of the compact terminal SCTMi is composed of a type key, which indicates the number of ejectors installed and their exact properties. The digits given in the type key for each ejector correspond to the code of the SCPSt ejector types used and their position in the module.

The SCTMi type key (system configuration), for example SCTMi-EIP-11112222-33334444-P-0-VI00, is composed as follows:

Bus module	Ejectors 1 to 8	Ejectors 9 to 16	With or without collective pneumatic connection	Additional modules	Internal code
SCTMi-EIP SCTMi-PNT SCTMi-ECT	12345678	12345678	P or X	0	VI00

Bus module variants

Initials	Bus module
EIP	EtherNet/IP
PNT	PROFINET
ECT	EtherCAT

The ejectors differ in nozzle size, pneumatic connection and the NO or NC variant.
Codes for the different SCPSt ejector types:

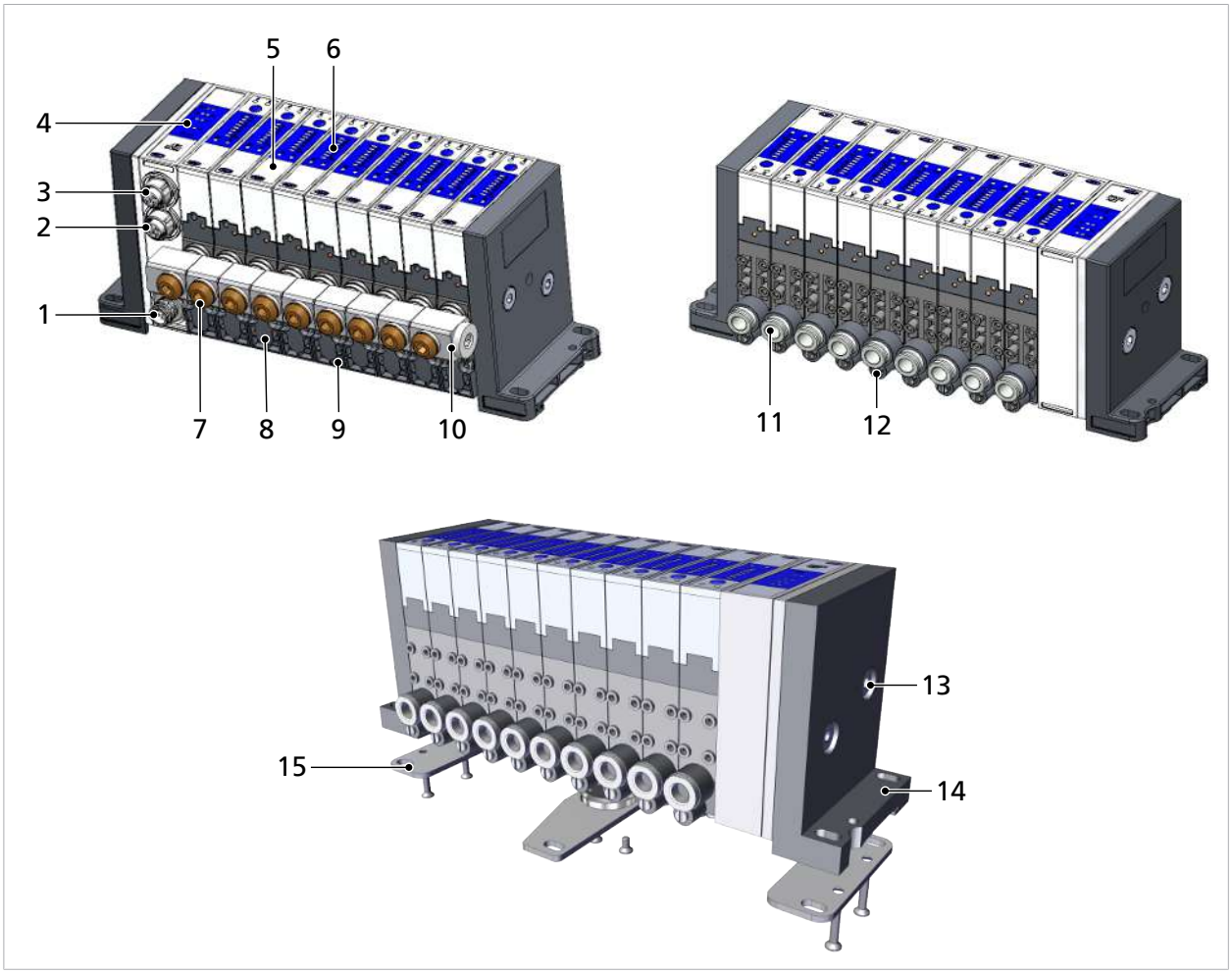
Code	Type of ejector
0	No ejector
1	SCPSt 07 G02 NO
2	SCPSt 10 G02 NO
3	SCPSt 15 G02 NO
4	SCPSt 07 G02 NC
5	SCPSt 10 G02 NC
6	SCPSt 15 G02 NC
7	SCPSt 2-07 G02 NO
8	SCPSt 2-09 G02 NO
9	SCPSt 2-14 G02 NO
A	SCPSt 2-07 G02 NC
B	SCPSt 2-09 G02 NC
C	SCPSt 2-14 G02 NC

The type key for SCPSt ejectors is generated as follows:

Type of ejector	Nozzle size	Pneumatic connection	Ejector variant
SCPSt	07	G02 (2xG1/8")	NO (normally open)
	10		
	15		
	2-07		NC (normally closed)
	2-09		
	2-14		

- P = with collective pneumatic connection
- X = without collective pneumatic connection

3.4 Compact Terminal Components



1	Electrical connection: M12 connector for voltage supply (port X03)	2	Electrical connection: M12-D socket for Ethernet (port X02)
3	Electrical connection: M12-D socket for Ethernet (port X01)	4	Bus module with display
5	Ejector SCPSt (2 to 16 pcs.)	6	Ejector SCPSt display/operating element
7	Pressure distributor with 1/4"-thread compressed air connection	8	Silencer cover
9	Exhaust outlet	10	Pressure distributor with additional 1/4"-thread compressed air connection
11	1/8" vacuum connection	12	Blow off valve screw
13	Connectors	14	End plate with mounting possibility for M5 screws
15	Stabilization components, for 6 ejectors or more	—	—

3.5 Bus Module Displays

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

Bus module PROFINET	LED	Meaning	State	Description
	**U_S**	Sensor voltage	Off	No sensor voltage
			Green	Sensor voltage OK
			Flashing green	Sensor voltage not OK
	U_A	Actuator voltage	Off	No actuator voltage
			Green	Actuator voltage OK
			Flashing green	Actuator voltage not OK
	L1 and **L2**	Link Port X01 and Port X02	Off	No PROFINET connection
			Green	PROFINET connection established
			Flashing green	PROFINET connection with data transfer
	NS	Network status	Off	No connection to PROFINET IO controller
			Green	Online (RUN)
			Green, 1 flash	Online (STOP) I/O controller stopped or faulty I/O data
			Red	Severe internal error
			Red, 1 flash	Station name error
			Red, 2 flashes	IP address error
			Red, 3 flashes	Configuration error
	SF	System error	Off	No error in system design
			Red	Error in system design
	CM	Condition monitoring	Off	No CM information available
			Yellow	CM information available

Bus module EtherNet/IP	LED	Meaning	State	Description
	U_S	Sensor voltage	Off	No sensor voltage
			Green	Sensor voltage OK
			Flashing green	Sensor voltage not OK
	U_A	Actuator voltage	Off	No actuator voltage
			Green	Actuator voltage OK
			Flashing green	Actuator voltage not OK
	L1 and **L2**	Link Port X01 and Port X02	Off	No EtherNet/IP connection
			Green	EtherNet/IP connection established
			Flashing green	EtherNet/IP connection with data transfer
	NS	Network status	Off	No voltage or no IP address

Bus module EtherNet/IP	LED	Meaning	State	Description
			Green	Online, one or more connections established (CIP class 1 or 3)
			Flashing green	Online, no connections established
			Red	Duplicate IP address, severe error
			Flashing red	One or more connections interrupted due to timeout (CIP class 1 or 3)
	SF	System error	Off	No error in system design
			Red	Error in system design
	MS	Network status	Off	No voltage
			Green	Connected to a scanner in run state
			Flashing green	Not configured or scanner in idle state
			Red	Major error (e.g. EXCEPTION state)
			Flashing red	Parameter deviation
	CM	Condition monitoring	Off	No CM information available
			Yellow	CM information available

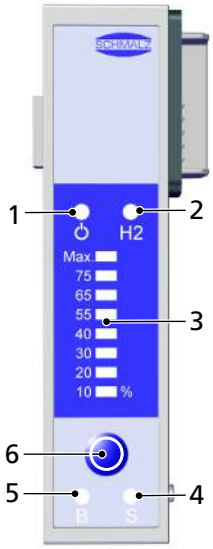
Bus module EtherCAT	LED	Meaning	State	Description
	**U_S**	Sensor voltage	Off	No sensor voltage
			Green	Sensor voltage OK
			Flashing green	Sensor voltage not OK
	U_A	Actuator voltage	Off	No actuator voltage
			Green	Actuator voltage OK
			Flashing green	Actuator voltage not OK
	L1 and **L2**	Link Port X01 and Port X02	Off	No EtherCAT connection
			Green	EtherCAT connection established
			Flashing green	EtherCAT connection with data transfer
	RUN	Network status	Off	EtherCAT device is in “INIT” state (or no voltage)
			Green	EtherCAT device is in “OPERATIONAL” state
			Flashing green	EtherCAT device is in “PRE-OPERATIONAL” state
			Green, 1 flash	EtherCAT device is in “SAFE-OPERATIONAL” state
			Flickering green	EtherCAT device is in “BOOT” state
	SF	System error	Off	No error in system design
			Red	Error in system design
	ERR	Error	Off	No errors in EtherCAT communication (or no voltage)

Bus module EtherCAT	LED	Meaning	State	Description
			Flashing red	Incorrect EtherCAT configuration
			Red, 1 flash	Slave changed EtherCAT status independently
			Red, 2 flashes	Watchdog timeout for the application
			Red	Application controller failed
			Flickering red	Boot error detected
	CM	Condition monitoring	Off	No CM information available
			Yellow	CM information available

3.6 Ejector Displays and Operating Elements

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

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

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

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

4 Technical Data

4.1 Operation and Storage Conditions

Operating medium	Air or neutral gas 5 µm filtered Oiled or unoiled Class 3-3-3 compressed air quality acc. to ISO 8573-1
Operating pressure (flow pressure)	3 to 6 bar (optimally 4 to 5 bar)
Max. dynamic pressure	6.8 bar
Working temperature	0 to 50° C
Storage temperature	–10 to 60° C
Permitted air humidity	10 to 90% RH (free from condensation)
Precision of vacuum sensor	± 3% FS (full scale)

4.2 Electrical Data

Supply voltage for sensor	24V -20 to +10% VDC (PELV[1)])	
Supply voltage for actuator	24V -20 to +10% VDC (PELV[1)])	
Sensor power consumption [2)] (at 24V)	SCTMi with 4 NC ejectors	66 mA
	SCTMi with 8 NC ejectors	118 mA
	SCTMi with 16 NC ejectors	219 mA
	SCTMi with 4 NO ejectors	70 mA
	SCTMi with 8 NO ejectors	128 mA
	SCTMi with 16 NO ejectors	244 mA
Actuator power consumption [2)] (at 24V)	SCTMi with 4 NC ejectors	83 mA
	SCTMi with 8 NC ejectors	157 mA
	SCTMi with 16 NC ejectors	293 mA
	SCTMi with 4 NO ejectors	158 mA
	SCTMi with 8 NO ejectors	298 mA
	SCTMi with 16 NO ejectors	586 mA
Polarity reversal protection	Yes, all M12 connector connections	
Degree of protection	IP 65	
NFC	NFC Forum Tag type 4	
IO-Link	IO-Link 1.1 Baud rate COM2 (38.4 Kbits/s)	

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

[2)] Typical power consumption

4.3 Mechanical Data

4.3.1 Performance Data

All data is based on the ejector SCPSt:

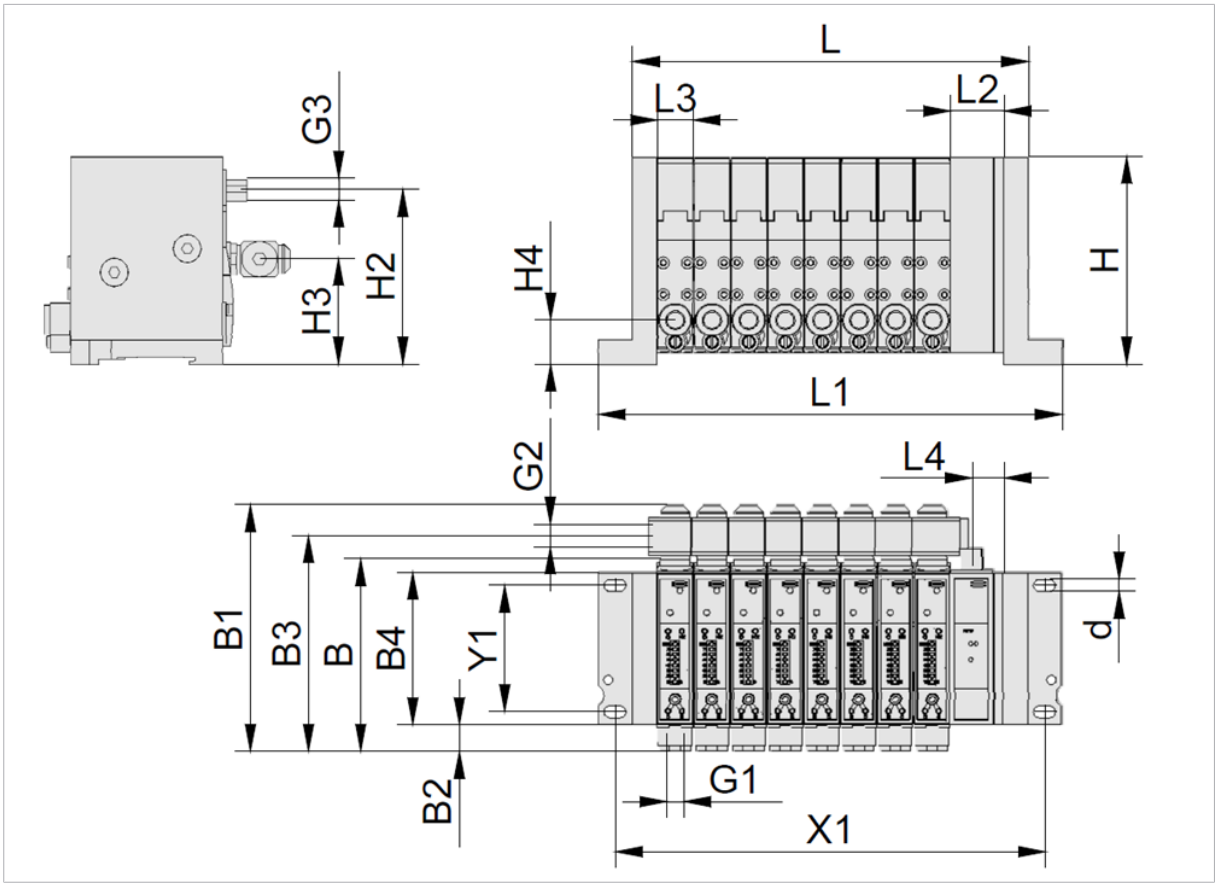
Type	Nozzle size mm	Max. vacuum[1] %	Suction rate[1] l/min	Blow-off air consumption[1] l/min	Air consumption[1] l/min
SCPS-07	0.7	85	16	120	22
SCPS-10	1.0	85	36	120	46
SCPS-15	1.5	85	65.5	120	98
SCPS-2-07	0.7	85	37	120	22
SCPS-2-09	0.9	85	49.5	120	40.5
SCPS-2-14	1.4	85	71.5	120	82

[1] At 4 bar

Type		Sound level[1], unobstructed suction dBA	Sound level[1] with workpiece picked up dBA
SCTMi with 2 ejectors	(07 to 15)	75 to 82	66 to 77
SCTMi with 4 ejectors	(07 to 15)	77 to 84	68 … 79
SCTMi with 8 ejectors	(07 to 15)	78 to 85	70 … 81
SCTMi with 16 ejectors	(07 to 15)	81 to 83	70 … 78
Individual ejector SCPS-07		63	58
Individual ejector SCPS-10		73	60
Individual ejector SCPS-15		73	65
Individual ejector SCPS-2-07		63	58
Individual ejector SCPS-2-09		73	60
Individual ejector SCPS-2-14		75	65

[1] At 4 bar

4.3.2 Dimensions



Type[1)]	L	L1	L2	L3	L4	B	B1	B2	B3	B4	H
SCTMi (2)	89.2	123.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (3)	107.7	141.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (4)	126.2	160.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (5)	144.7	178.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (6)	163.2	197.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (7)	181.7	215.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (8)	200.2	234.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (9)	218.7	252.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (10)	237.2	271.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (11)	255.7	289.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (12)	274.2	308.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (13)	292.7	326.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (14)	311.2	345.2	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (15)	329.7	363.7	27	18.5	16	97.5	125	13.5	109	77	105
SCTMi (16)	348.2	382.2	27	18.5	16	97.5	125	13.5	109	77	105

Type[1)]	H2	H3	H4	d	X1	Y1	G1	G2	G3	m(g)[2]
SCTMi (2)	89	54	22.5	5.5	108	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	700

Type[1)]	H2	H3	H4	d	X1	Y1	G1	G2	G3	m(g)[2]
SCTMi (3)	89	54	22.5	5.5	125	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	910
SCTMi (4)	89	54	22.5	5.5	143	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	1120
SCTMi (5)	89	54	22.5	5.5	162	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	1330
SCTMi (6)	89	54	22.5	5.5	180	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	1540
SCTMi (7)	89	54	22.5	5.5	199	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	1750
SCTMi (8)	89	54	22.5	5.5	217	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	1960
SCTMi (9)	89	54	22.5	5.5	236	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	2170
SCTMi (10)	89	54	22.5	5.5	254	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	2380
SCTMi (11)	89	54	22.5	5.5	273	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	2590
SCTMi (12)	89	54	22.5	5.5	291	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	2800
SCTMi (13)	89	54	22.5	5.5	310	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	3010
SCTMi (14)	89	54	22.5	5.5	328	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	3220
SCTMi (15)	89	54	22.5	5.5	347	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	3430
SCTMi (16)	89	54	22.5	5.5	365	64	1/8" internal thread	1/4" internal thread	M12x1 internal thread	3640

All specifications are in mm

[1)](2 to 16) Digits correspond to the number of ejectors installed.

[2)] With compressed air connection plate

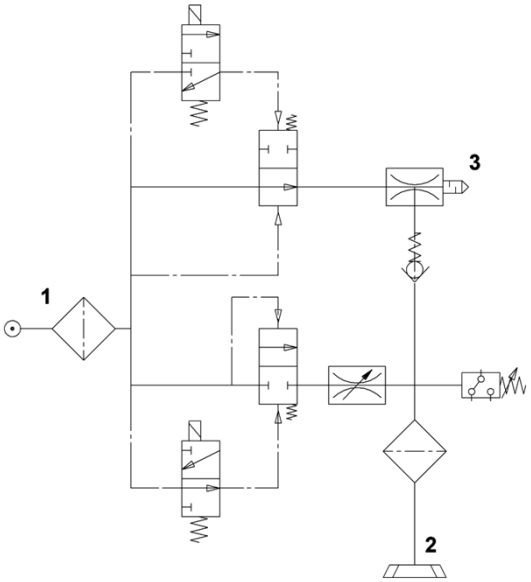
4.3.3 Factory Settings

The factory settings relate to the particular ejector of the SCTMi.

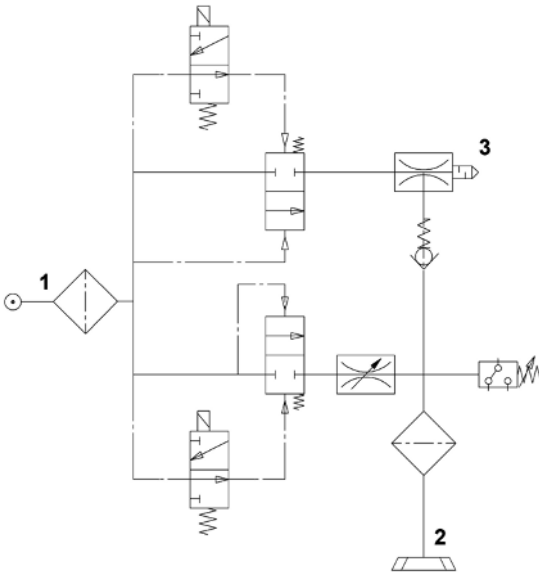
Parameter	(dec)	(hex)	Value	Description
Limit value switching point H1	100	0x0064	-750 mbar	—
Hysteresis h1	101	0x0065	150 mbar	—
Limit value for switching point H2	102	0x0066	-550 mbar	—
Hysteresis h2	103	0x0067	10 mbar	—
Blow-off pulse duration	106	0x006A	200 ms	—
Permissible evacuation time	107	0x006B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

4.3.4 Pneumatic circuit plans

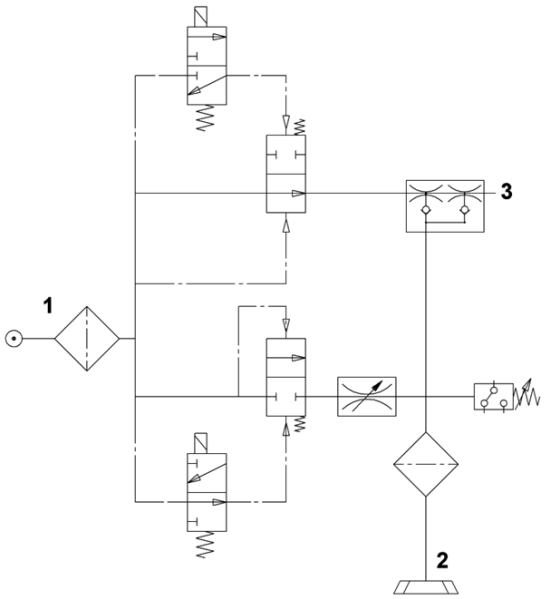
SCPSt...NO...



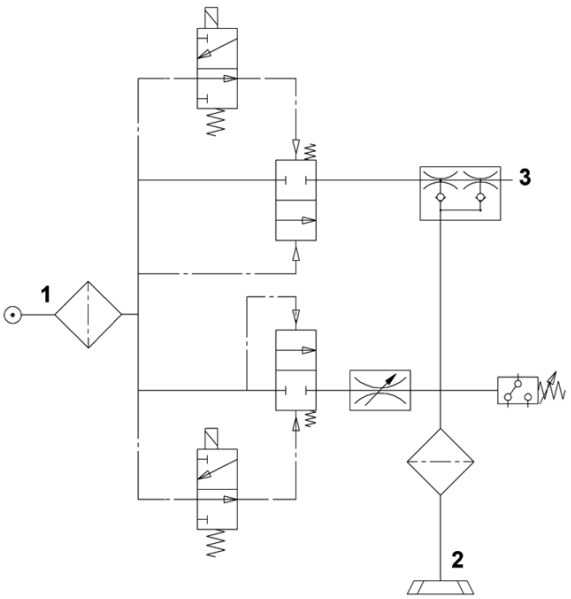
SCPSt...NC...



SCPSt 2...NO...



SCPSt 2...NC...



5 Interfaces

5.1 Industrial Ethernet

The industrial Ethernet interface is used to control the entire SCTMi, set all of the parameters and provide a wide variety of measurement and analysis data.

The PROFINET, EtherNet/IP or EtherCAT protocol is supported, depending on the design.

5.2 Process Data

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

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

The process data width is always the same, regardless of how many ejectors are actually on the terminal.

5.2.1 Input Process Data

The input data provides cyclical reporting of a range of information relating to the SCTMi and the individual ejectors:

- The device status in the form of a status traffic light
- The switching values H1 and H2 for the connected ejectors
- Error messages from the control unit
- Condition Monitoring events from the control unit and the individual ejectors

The input process data is 23 bytes long.

Possible Access Types of the Parameters

Access type	Abbreviation
Read only	ro
Write only	wo
Read and write	rw

DEVICE STATUS [ro]

BYTE [0]

DS		**res**					
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 5:0	**res:**	Reserved
Bit 7:6	**DS:**	Device status 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 [orange] Device is working, but there are warnings in the control unit

Errors in the Control Unit [ro]

BYTE [1]

Control Unit Error							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 0	Internal error: data corruption
Bit 1	Internal error: bus fault
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 (< 1.9 bar) or too high (> 6.3 bar)
Bit 7	Error in one or more ejectors

Condition Monitoring of Control Unit [ro]

BYTE [2]

res				**Control Unit CM**			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 0:3	**Control Unit CM:**	Condition monitoring of control unit [ro] Bit 0 = Primary voltage limit Bit 1 = Secondary voltage limit Bit 2 = Input pressure limit (3.5 to 5 bar) (hysteresis = 0.2 bar) Bit 3 = Warning in one or more ejectors
Bit 4:7	**res:**	Reserved

EJECTOR STATUS [ro]

BYTE [3] (Ejectors 1 to 4)

PP04	**AS04**	**PP03**	**AS03**	**PP02**	**AS02**	**PP01**	**AS01**
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 0	**AS01:**	H1 level reached (air saving function) in ejector #1
Bit 1	**PP01:**	H2 level reached (part present) in ejector #1
Bit 2	**AS02:**	H1 level reached (air saving function) in ejector #2
Bit 3	**PP02:**	H2 level reached (part present) in ejector #2
Bit 4	**AS03:**	H1 level reached (air saving function) in ejector #3
Bit 5	**PP03:**	H2 level reached (part present) in ejector #3
Bit 6	**AS04:**	H1 level reached (air saving function) in ejector #4
Bit 7	**PP04:**	H2 level reached (part present) in ejector #4

BYTE [4] (Ejectors 5 to 8)

PP08	**AS08**	**PP07**	**AS07**	**PP06**	**AS06**	**PP05**	**AS05**
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

BYTE [5] (Ejectors 9 to 12)

PP12	AS12	PP11	AS11	PP10	AS10	PP09	AS09
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

BYTE [6] (Ejectors 13 to 16)

PP16	AS16	PP15	AS15	PP14	AS14	PP13	AS13
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

As described for byte 1; consecutive numbering.

Condition Monitoring of Ejectors [ro]

BYTE [7] to BYTE [22] (Ejector #1 to #16)

res				Ejector CM			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 0:5	**Ejector CM:**	Condition monitoring of ejectors Bit 0 = Valve protection active Bit 1 = Evacuation time greater than limit Bit 2 = Leakage rate greater than limit Bit 3 = H1 not reached in suction cycle Bit 4 = Free flow vacuum too high Bit 5 = Manual mode active
Bit 6:7	**res:**	Reserved

The precise meanings of the data and functions are further explained in the section “Functions of the Compact Terminal and the Ejectors.”

5.2.2 Output Process Data

The output process data is used to control the SCTMi and the individual ejectors cyclically:

- To determine the air consumption, the system pressure can be preset
- All of the ejectors are controlled using the suction and blow-off commands

The output process data is 5 bytes long.

SUPPLY PRESSURE [rw]

BYTE [0]

Supply pressure							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 7:0	**Supply pressure:**	Specify the pressure value in 0.1 bar steps

EJECTOR CONTROL [rw]

BYTE [1] (Ejectors 1 to 4)

B04	S04	B03	S03	B02	S02	B01	S01
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 0	**S01:**	Ejector #1 suction
Bit 1	**B01:**	Ejector #1 blow-off
Bit 2	**S02:**	Ejector #2 suction
Bit 3	**B02:**	Ejector #2 blow-off
Bit 4	**S03:**	Ejector #3 suction
Bit 5	**B03:**	Ejector #3 blow-off
Bit 6	**S04:**	Ejector #4 suction
Bit 7	**B04:**	Ejector #4 blow-off

BYTE [2] (Ejectors 5 to 8)

B08	**S08**	**B07**	**S07**	**B06**	**S06**	**B05**	**S05**
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

BYTE [3] (Ejectors 9 to 12)

B12	**S12**	**B11**	**S11**	**B10**	**S10**	**B09**	**S09**
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

BYTE [4] (Ejectors 13 to 16)

B16	**S16**	**B15**	**S15**	**B14**	**S14**	**B13**	**S13**
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

As described for byte 1; consecutive numbering.

The precise meanings of the data and functions are further explained in the section “Functions of the Compact Terminal and the Ejectors.”

5.3 Parameter data

More precise information regarding the system status can also be retrieved using the acyclical communication channel.

All of the settings (e.g. control thresholds, switching points, permitted leakage, and so on) for the device can also be read or modified. You can access additional identifying information, such as the part number and serial number, and save user-specific information such as the installation or storage location.

The precise meanings of the data and functions are further explained in the section “Functions of the Compact Terminal and the Ejectors.”

For the PROFINET and EtherCAT communication protocols, the following start addresses apply for the parameter data:

Variant	**Start address**
PROFINET	0x0000
EtherCAT	0x2000
Ethernet/IP	See below

Parameters marked with the addition [*part of processdata*] are also automatically included in the cyclical exchange of process data.

To access the parameter data via Ethernet/IP, an object (also known as a class), an instance and an attribute must be specified in the object-based “Common Industrial Protocol” (CIP).

The object 0xA2 can be used to read—and write, depending on access rights—all parameter data with the following services:

- 0x0E: Get_Attribute_Single
- 0x10: Set_Attribute_Single

The instance corresponds to the offset from the parameter data table.

The following attributes are available:

#	Name	Access	Type	Description
1	Name	Get	SHORT_STRING	Parameter name
2	Data type	Get	Array of USINT	BOOL (0), SINT8 (1), SINT16 (2), SINT32 (3), UINT8 (4), UINT16 (5), UINT32 (6), CHAR (7), ENUM (8), BITS8 (9), BITS16 (10), BITS32 (11), OCTET (12)
3	Number of elements	Get	USINT	Number of elements of the specified data type
4	Access rights of the instance	Get	Array of USINT	Specifies the access rights for the instance: Bit 0: 1=read rights Bit 1: 1=write rights
5	Value	Get/ Set	Determined by attributes #2, #3 and #9	Instance value
6	Max. value	Get	Determined by attributes #2, #3 and #9	Maximum value permitted
7	Min. value	Get	Determined by attributes #2, #3 and #9	Minimum value permitted
8	Default value	Get	Determined by attributes #2, #3 and #9	Default parameter value
9	Number of sub-elements	Get	Array of UINT8	Number of sub-elements, default value is 1

Attribute 5 causes the values of the parameter data to be read or, if permission is granted, written as well.

Process Parameters

Offset		*Index*	*Description*	*Type*	*Length [bytes]*	*R/W*
(Dec)	*(Hex)*					
10	0x000A	0	Device status [*part of processdata*]	uint8	1	ro
11	0x000B	0	Ejectors status [*part of processdata*]	uint8	4	ro
12	0x000C	0	Supply pressure [*part of processdata*]	uint8	1	rw
13	0x000D	0	Ejectors control [*part of processdata*]	uint8	4	rw
130	0x0082	16	Error in control unit [*part of processdata*]	uint8	1	ro
146	0x0092	16	Condition monitoring of control unit [*part of processdata*]	uint8	1	ro
146	0x0092	0 to 15	Condition monitoring of ejectors [*part of processdata*]	uint8	16	ro

Device Data

Offset		*Index*	*Description*	*Type*	*Length [bytes]*	*R/W*
(Dec)	*(Hex)*					
16	0x0010	0	Device vendor name	char	32	ro
17	0x0011	0	Vendor text	char	32	ro
18	0x0012	0	Product name	char	32	ro
20	0x0014	0	Product text	char	32	ro
21	0x0015	0	Serial number	char	9	ro
22	0x0016	0	HW revision	char	3	ro
23	0x0017	0	FW revision	char	5	ro
24	0x0018	0	Application-specific tag	char	1 … 32	rw
240	0x00F0	0	Unique device ID	uint8	20	ro
241	0x00F1	0	Device features	uint8	11	ro
242	0x00F2	0	Equipment identification	char	1 to 64	rw
246	0x00F6	0	Geolocation	char	1 to 64	rw
247	0x00F7	0	GSD web link	char	1 to 64	rw
248	0x00F8	0	NFC web link	char	1 to 64	rw
249	0x00F9	0	Storage location	char	1 to 32	rw
250	0x00FA	0	Article number	char	14	ro
251	0x00FB	0	Article revision	char	2	ro
252	0x00FC	0	Production date	char	10	ro
253	0x00FD	0	Installation date	char	1 to 16	rw
254	0x00FE	0	System configuration	uint8	64	ro

Device Settings

Offset		*Index*	*Description*	*Type*	*Length [bytes]*	*R/W*
(Dec)	*(Hex)*					
2	0x0002	0	System command	uint8	1	wo
90	0x005A	0	Extended device locks	uint8	1	wr
91	0x005B	0	PIN code	uint16	1	rw
100	0x0064	0 … 15	Setpoint H1 for ejectors #1 to #16	uint16	16 x 2	rw
101	0x0065	0 … 15	Hysteresis h1 for ejectors #1 to #16	uint16	16 x 2	rw
102	0x0066	0 … 15	Setpoint H2 for ejectors #1 to #16	uint16	16 x 2	rw
103	0x0067	0 … 15	Hysteresis h2 for ejectors #1 to #16	uint16	16 x 2	rw
106	0x006A	0 … 15	Duration automatic blow for ejectors #1 to #16	uint16	16 x 2	rw
107	0x006B	0 … 15	Permissible evacuation time for ejectors #1 to #16	uint16	16 x 2	rw
108	0x006C	0 … 15	Permissible leakage rate for ejectors #1 to #16	uint16	16 x 2	rw
109	0x006D	0 … 15	Control mode for ejectors #1 to #16	uint8	16 x 1	rw
110	0x006E	0 … 15	Blow mode for ejectors #1 to #16	uint8	16 x 1	rw

Device Monitoring

Offset		*Index*	*Description*	*Type*	*Length [bytes]*	*R/W*
(Dec)	*(Hex)*					
66	0x0042	0	Primary supply voltage	uint16	2	ro
66	0x0042	1	Primary supply voltage, min.	uint16	2	ro
66	0x0042	2	Primary supply voltage, max.	uint16	2	ro
67	0x0043	0	Auxiliary supply voltage	uint16	2	ro
67	0x0043	1	Auxiliary supply voltage, min.	uint16	2	ro
67	0x0043	2	Auxiliary supply voltage, max.	uint16	2	ro
148	0x0094	0 … 15	Evacuation time t0 for ejectors #1 to #16	uint16	16 x 2	ro
149	0x0095	0 … 15	Evacuation time t1 for ejectors #1 to #16	uint16	16 x 2	ro
156	0x009C	0 … 15	Air consumption per cycle for ejectors #1 to #16	uint32	16 x 4	ro
156	0x009C	16	Air consumption per cycle of all ejectors	uint32	4	ro
160	0x00A0	0 … 15	Leakage rate for ejectors #1 to #16	uint16	16 x 2	ro
161	0x00A1	0 … 15	Free-flow vacuum for ejectors #1 to #16	uint16	16 x 2	ro
164	0x00A4	0 … 15	Max. vacuum reached in cycle for ejectors #1 to #16	uint16	16 x 2	ro
515	0x0203	0 … 15	System vacuum for ejectors #1 to #16	uint16	16 x 2	ro

Device Diagnostics

Offset		*Index*	*Description*	*Type*	*Length [bytes]*	*R/W*
(Dec)	*(Hex)*					
130	0x0082	0 … 15	Errors in ejectors #1 to #16	uint8	16 x 1	ro
130	0x0082	16	Errors in the control unit	uint8	1	ro
138	0x008A	0	Extended device status – event category	uint16	1	ro
138	0x008A	1	Extended device status – event code	uint16	1	ro
139	0x008B	0	NFC status	uint8	1	ro
140	0x008C	0 … 15	Vacuum-on counter for ejectors #1 to #16	uint32	16 x 4	ro
141	0x008D	0 … 15	Valve operating counter for ejectors #1 to #16	uint32	16 x 4	ro
143	0x008F	0 … 15	Erasable vacuum-on counter for ejectors #1 to #16	uint32	16 x 4	ro
144	0x0090	0 … 15	Erasable valve operating counter for ejectors #1 to #16	uint32	16 x 4	ro
146	0x0092	0 … 15	Condition monitoring of ejectors #1 to #16	uint8	16 x 1	ro
146	0x0092	16	Condition monitoring of control unit	uint8	1	ro

See also

Parameter data [▷ 24]

5.4 Interface NFC

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

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

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

There are two options for communicating via NFC:

- Read access only can be obtained via a website viewed in a browser. For this, no additional app is needed. The reading device requires only that NFC and the Internet connection are enabled.
- Another option for communication is the “Schmalz ControlRoom” control and service app. In addition to pure read access, the app allows you to actively write the parameters of the device via NFC.
  The “Schmalz ControlRoom” app is available in the Google Play Store or Apple App Store.

6 Functions of the Compact Terminal and Ejectors

6.1 Overview of Functions

The device primarily consists of the bus module and between 1 and 16 ejectors. The various functions refer to either the bus module or the individual ejector, depending on the function.

The bus module has the following general functions, independent of the ejectors:

- Device identification
- System commands
- Access rights

Diagnostics and monitoring functions of the:

The device provides a variety of diagnostics and monitoring functions:

- Determination of the required system parameters
- Display of the device status through messages and system status traffic lights
- Condition monitoring

Ejector functions

Functions of the ejectors:

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

The functions relate to a compact terminal ejector and apply to each individual ejector, regardless of the number of installed ejectors.

[1)] The manual mode function of the ejectors is described in the “Operation” section.

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

6.2 Device Identification

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

The following parameters can be called up:

- Device vendor name and web address (Device vendor name)
- Vendor text (Vendor text)
- Product name and product text (Product name / Product text)
- Serial number (Serial number)
- Version status of the hardware and firmware (Hardware revision)

- Unique device ID and device properties (Unique device ID)
- Article number and development status (Article number, Article revision)
- Production date (Production date)
- System configuration (System Configuration)
- Device ID
- Equipment identification (Equipment identification)
- Web link for NFC app and device description file (GSD web link, NFC web link)

Offset parameter	**16 (0x0010)**	**17 (0x0011)**	**18 (0x0012)**
Description	Device vendor name	Vendor text	Product name
Index	-	-	-
Data type	char		
Length	32 bytes		
Access	Read only		
Value range	-		
Default value	-		
Unit	-		
EEPROM	Yes		

Offset parameter	**20 (0x0014)**	**21 (0x0015)**	**22 (0x0016)**
Description	Product text	Device serial number	HW revision
Index	-		
Data type	char		
Length	32 bytes	9 bytes	3 bytes
Access	Read only		
Value range	-		
Default value	-		
Unit	-		
EEPROM	Yes		

Offset parameter	**250 (0x00FA)**	**251 (0x00FB)**	**252 (0x00FC)**
Description	Article number	Article revision	Production date
Index	-		
Data type	char		
Length	14 bytes	2 bytes	10 bytes
Access	Read only		
Value range	-		
Default value	-		
Unit	-		
EEPROM	Yes		

Offset parameter	**23 (0x0017)**	**24 (0x0018)**	**240 (0x00F0)**
Description	FW revision	Application-specific tag	Unique device ID
Index	-		
Data type	char	char	uint8
Length	5 bytes	32 bytes	20 bytes
Access	Read only	Read/write	Read only
Value range	-		
Default value	-	***	-
Unit	-		
EEPROM	Yes		

Offset parameter	**241 (0x00F1)**	**242 (0x00F2)**	**354 (0x0162)**
Description	Device Features	Equipment identification	Current system configuration
Index	-		
Data type	uint8	char	
Length	11 bytes	64 bytes	128 bytes
Access	Read only	Read/write	Read only
Value range	-		String #1: Bus module; Strings #2 – #17: Ejectors; Strings #18 – #23: IOL master and DI module
Default value	-	***	-
Unit	-		
EEPROM	Yes		-

Offset parameter	**247 (0x00F7)**	**248 (0x00F8)**	**254 (0x00FE)**
Description	GSD web link	NFC web link	System configuration (at delivery)
Index	-		
Data type	char		uint8
Length	64 bytes		
Access	Read/write		Read only
Value range	-		See 3.1.1 “Ejector Designation”
Default value	***	https://myproduct.schmalz.com/#/	-
Unit	-		
EEPROM	Yes		

6.3 User-Specific Localization

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

- Identification of the installation location
- Identification of the storage location
- Equipment labeling from the circuit diagram
- Installation date
- Geo-location

The parameters are ASCII character strings with the maximum length given in section 5.3. Parameter data. They can also be used for other purposes if necessary.

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

Offset parameter	**249 (0x00F9)**	**253 (0x00FD)**	**247 (0x00F7)**
Description	Storage location	Installation date	GSD web link
Index	-		
Data type	char		
Length	32 bytes	16 bytes	64 bytes
Access	Read/write		
Value range	-		
Default value	***		
Unit	-		
EEPROM	Yes		

Offset parameter	**246 (0x00F6)**	**241 (0x00F1)**	**242 (0x00F2)**
Description	Geo-location	Device Features	Equipment identification
Index	-		
Data type	char	uint8	char
Length	64 bytes	11 bytes	64 bytes
Access	Read/write	Read only	Read/write
Value range	-		
Default value	***	-	***
Unit	-		
EEPROM	Yes		

6.4 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 bytes
Access	Write only
Value range	0x82: Reset device parameters to factory defaults 0xA5: Calibrate vacuum sensors of all ejectors 0xA7: Reset erasable counters in all ejectors 0xA8: Reset voltage min./max.
Default value	-
Unit	-
EEPROM	No

6.4.1 Reset to Factory Settings

The system command “Reset device parameters to factory defaults” 0x82 is used to reset all the setting parameters to their factory settings.

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

6.4.2 Calibrating the Vacuum Sensor

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

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

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

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

6.4.3 Resetting Counters (Reset Erasable Counters)

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

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

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

6.5 Preventing NFC Access

In the parameter “Extended device access locks” 0x005A, there is an option to completely prevent NFC access or limit it to read-only function.

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

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

Offset parameter	**90 (0x005A)**
Description	Extended device locks
Index	-
Data type	uint8
Length	1 bytes
Access	Read/write
Value range	Bit 0: NFC write lock Bit 1: NFC disable Bit 2: local ejector firmware update locked Bit 3: local user interface locked (manual mode in ejectors locked)
Default value	-
Unit	-
EEPROM	Yes

6.6 Access Rights: PIN Code for NFC Write Protection

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

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

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

6.7 Compact Terminal Device Status

Many parameters and values are measured with the monitoring and diagnostic functions of the compact terminal (bus module and additional modules). These values are made available via the process data and parameter data and are used for further diagnostics.

Device monitoring (determination of the required system parameters):

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

Device Diagnostics:

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

The data collected using this function can be used for energy and process control (EPC) of the system. Energy and process control (EPC) is divided into three process-oriented modules:

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

6.7.1 Device Monitoring (Determination of the Required System Parameters)

The following system parameters are used for the system monitoring functions and are made available to the user.

The values for the individual ejectors are constantly redetermined for each suction cycle.

Current Operating Voltage

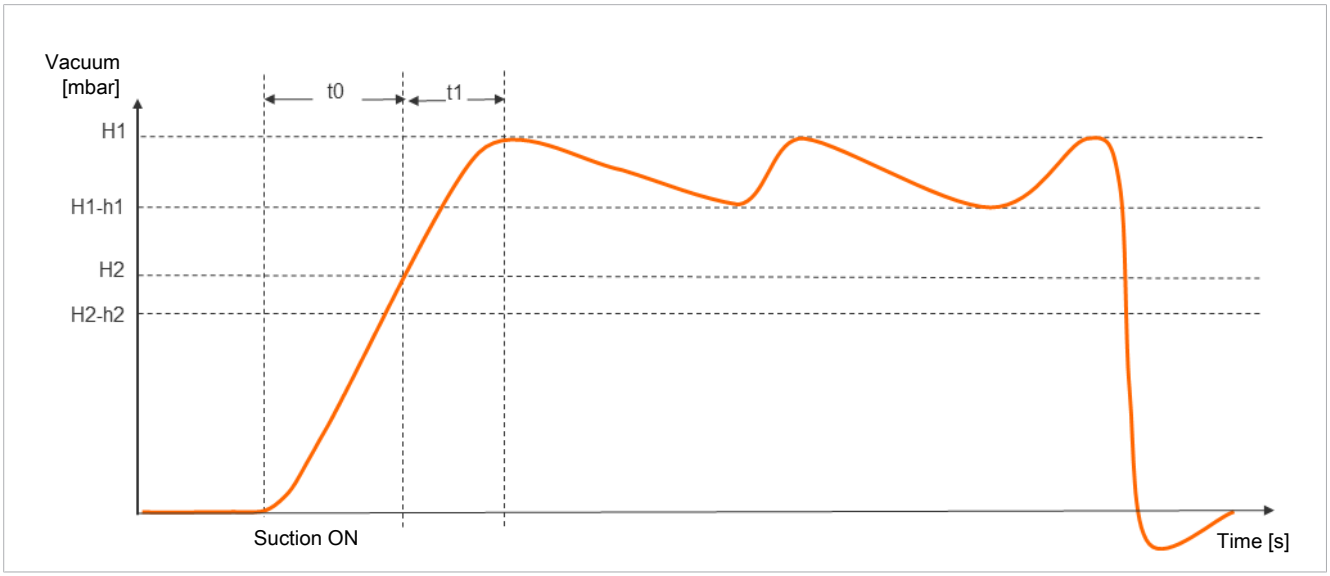
The U_S and U_A operating voltages that are currently applied on the compact terminal are measured.

Offset parameter	**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 bytes	
Access	Read only	
Value range	-	
Default value	-	
Unit	0.1 V	
EEPROM	No	

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

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

Measuring the Evacuation Time t0 and t1



The evacuation time t0 is defined as the time (in ms) from the start of a suction cycle, which is started by the “Suction ON” command, until switching threshold H2 is reached.

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

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

Measuring the Air Consumption

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

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

Offset parameter	**156 (0x009C)**
Description	Air consumption per cycle for ejectors
Index	0 to 15: Air consumption per cycle for ejectors #1 to #16 16: Air consumption per cycle of all ejectors
Data type	uint32
Length	68 bytes
Access	Read only
Value range	0 to 15: 0 to 65535 16: 0 to 1048560

Default value	-
Unit	0.1 Nl
EEPROM	No

Measuring Leakage

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

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

Measuring Dynamic Pressure

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

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

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

Offset parameter	**161 (0x00A1)**
Description	Free-flow vacuum for ejectors
Index	Index 0 to 15 corresponds to ejector #1 to #16
Data type	uint16
Length	32 bytes
Access	Read only
Value range	0 … 999
Default value	-
Unit	mbar
EEPROM	No

Vacuum Value of the Ejectors

The parameter "System vacuum for ejectors" 0x0203 is used to display the vacuum currently applied for the individual ejectors.

Offset parameter	**515 (0x0203)**
Description	System vacuum for ejectors

Index	Index 0 to 15 corresponds to ejector #1 to #16
Data type	uint16
Length	32 bytes
Access	Read only
Value range	0 … 999
Default value	-
Unit	mbar
EEPROM	No

Maximum Vacuum Reached

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

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

6.7.2 Device Diagnostics

Device Status (Process Data)

The overall status of the 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 0x000A	Status	Description
Device status	00 (green)	Device is operating without any errors (Device is operating properly)
	01 (yellow)	Maintenance or adaptation of settings required (Maintenance required)
	10 (orange)	Device is operating outside the permissible specification (Out of Spec)
	11 (red)	Error – safe operation within the operating limits is no longer ensured (Error)

Extended System Status

The category of the pending event code and the current event code itself is displayed.

Extended device status 0x008A, event category

Parameter	**138 (0x008A)**
Description	Extended device status – event category

Byte	1+2: Event category of current device status
Access	Read only
Value range	0x10: Device is operating properly 0x21: Warning, low 0x22: Warning, high 0x41: Critical condition, low 0x42: Critical condition, high 0x81: Defect/fault, low 0x82: Defect/fault, high

Extended device status 0x008A, event code

Parameter	**138 ()**		
Description	Extended Device Status – Event code		
Byte	3+4: Event category of current device status		
Data type	uint16		
Length	2 bytes		
Access	Read only		
Value range	**Event Code**	**Event Name**	**Status Category**
	0x5100	Primary supply voltage (US) too low	Critical condition, high
	0x5110	Primary supply voltage (US) too high	Critical condition, high
	0x5112	Secondary supply voltage (UA) too low	Critical condition, high
	0x1812	Secondary supply voltage (UA) too high	Critical condition, high
	0x1802	Input pressure too high (> 6.3 bar) or too low (< 1.9 bar)	Critical condition, high
	0x1811	Internal error, user data corrupted	Defect/fault, high
	0x1000	Internal error, bus fault	Defect/fault, high
	0x8C01	Manual mode is active in at least one ejector	Warning, low
	0x180C	Condition monitoring: primary supply voltage US outside of operating range	Warning, high
	0x180D	Condition monitoring: secondary supply voltage outside of operating range	Warning, high
	0x180E	Condition Monitoring: supply pressure outside of operating range (3.5 to 5 bar)	Warning, high
	0x8C20 to 8C2F	Calibration fail, ejectors #1 to #16	Defect/fault, low
	0x8D00 to 8D0F	Measurement range overrun, ejectors #1 to #16	Defect/fault, low Warning, high
	0x8D10 to 8D1F	Valve protection active, ejectors #1 to #16	Warning, low
	0x8D20 to 8D2F	Evacuation time t1 is greater than limit, ejectors #1 to #16	Warning, low
	0x8D30 to 8D3F	Leakage rate is greater than limit, ejectors #1 to #16	Warning, high
	0x8D40 to 8D4F	H1 was not reached, ejector #1 to #16	Warning, low
	0x8D50 to 8D5F	Free-flow vacuum level too high, ejector #1 to #16	
Default value	-		
Unit	-		
EEPROM	No		

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

NFC Status (0x008B)

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

Offset parameter	**139 (0x008B)**
Description	NFC status
Index	-
Data type	uint8
Length	1 bytes
Access	Read only
Value range	0x00: data valid, write finished successfully 0x23: write failed: write access locked 0x30: write failed: parameter(s) out of range 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

Ejector Error Codes

The active error codes for the compact terminal and ejectors are displayed using individual bits in the parameter "Errors of ejector" 0x0082.

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

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

6.7.3 Condition Monitoring [CM] (0x0092)

Any condition monitoring events that occur during the suction cycle cause the system status 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 can 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 only 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 pressures.

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

CM of the Control Unit

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

CM of the Ejectors

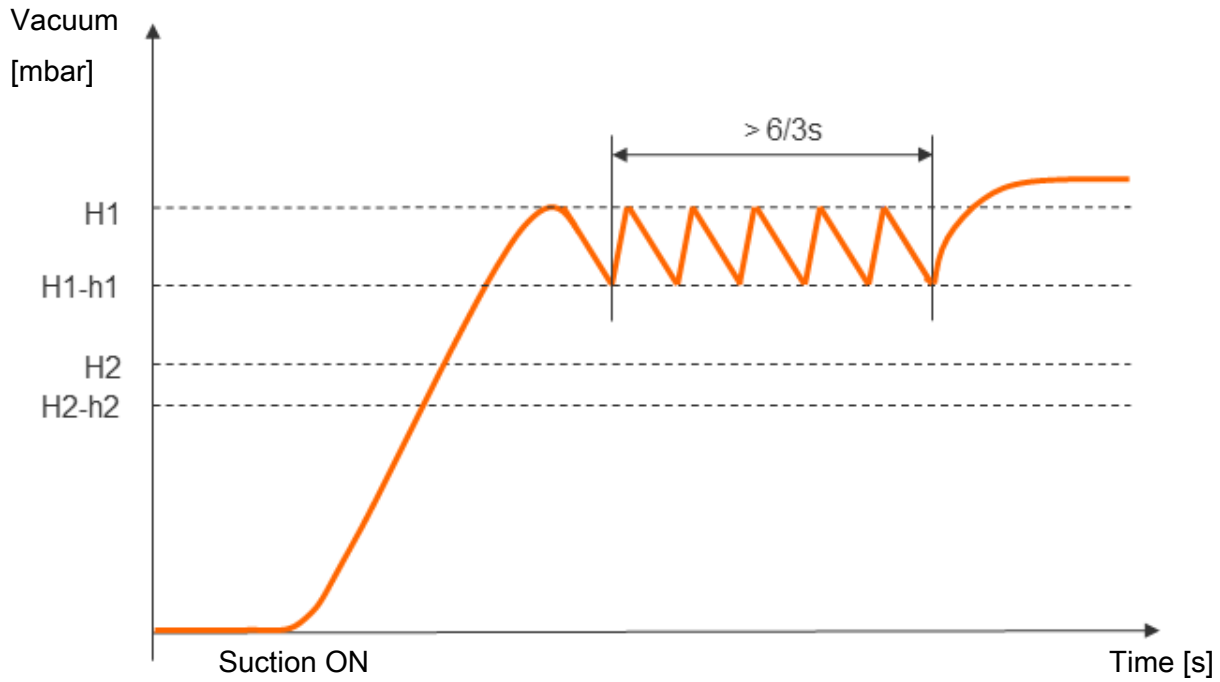
Parameter	**146 (0x0092)**
Description	Condition monitoring of ejector
Index	Index 0 to 15 corresponds to ejector #1 to #16
Data type	uint8
Length	16 bytes
Access	Read only
Value range	Bit 0 = Valve protection active Bit 1 = Evacuation time greater than limit Bit 2 = Leakage rate greater than limit Bit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

Monitor Valve Switching Frequency

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

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

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



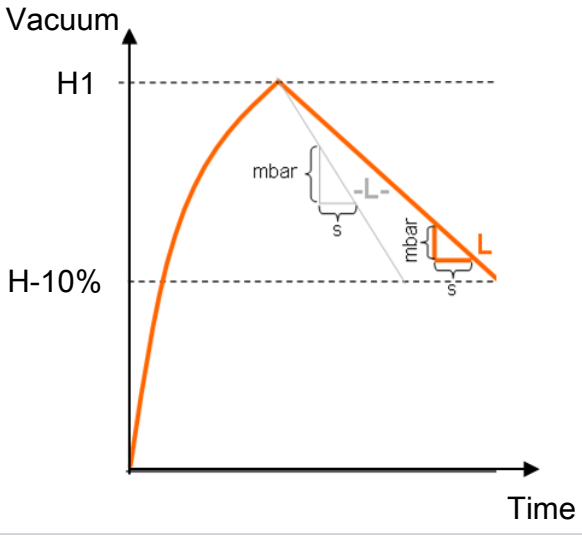
Monitor Evacuation Time

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

Monitor Leakage

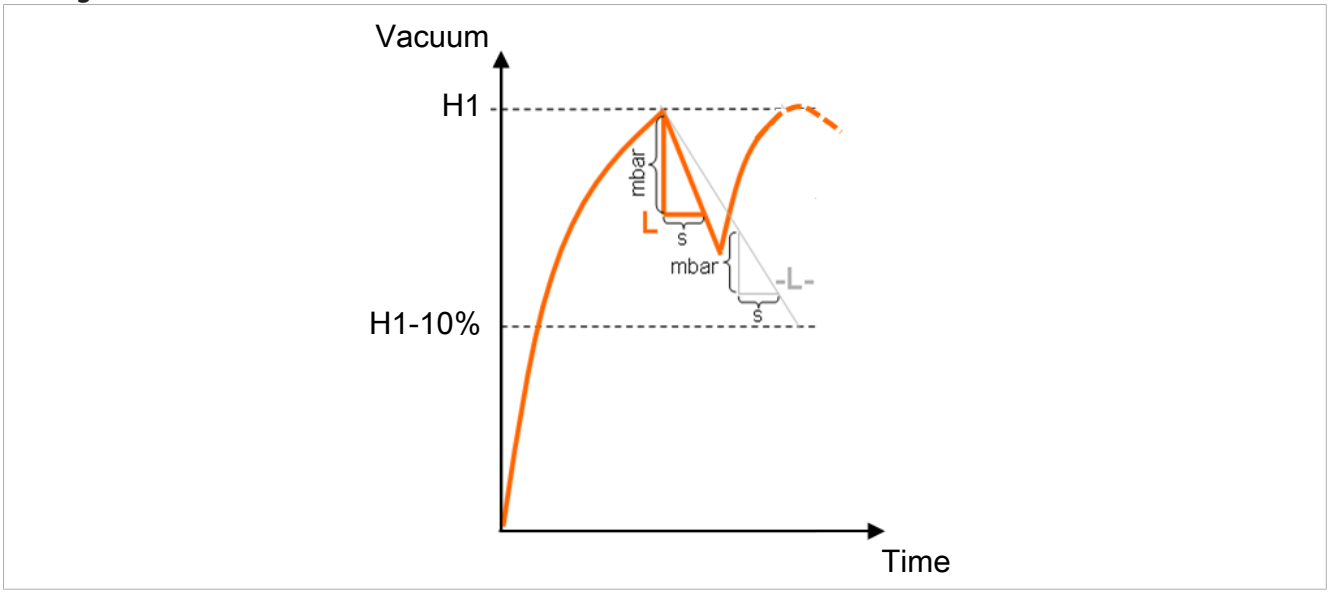
In control mode, the loss of vacuum within a certain period is monitored (mbar/s). There are two possible statuses.

Leakage L < Permitted Value



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

Leakage L > Permitted Value



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

Monitor Control Threshold

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

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

Monitor Dynamic Pressure

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

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

Monitor Supply Voltages

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

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

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

- Device status
- Condition monitoring parameter
- Bus module LED flashes

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

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

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

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

Evaluate System Pressure

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

6.8 Ejector SCPSt Functions

Functions of the ejectors SCPSt:

- Switching points for control and component checks
- Air saving functions
- Blow-off functions
- Setting for the permitted evacuation time t1
- Setting for the permitted leakage
- Permanent and erasable counters for the suction cycles and switching frequency of the valves
- Manual operation
- Ejector control (suction and release)
- Display of the ejector status (status of the vacuum level)

The functions relate to a compact terminal ejector and apply to each individual ejector, regardless of the number of installed ejectors discs.

6.8.1 Switching Points (0x0064 to 0x0067)

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

An LED displays when the switching point for H2 is reached.

The set values for H2 must be lower than the values for H1. The exact configuration conditions can be found in the parameter descriptions.

Parameter	Description
H1 for ejector 1 ... 16	Control switching point
h1 for ejector 1 ... 16	Hysteresis of control switching point
H2 for ejector 1 ... 16	Switching point for component check
h2 for ejector 1 ... 16	Hysteresis of switching point for component check

Offset parameter	**100 (0x0064)**	**101 (0x0065)**
Description	Setpoint H1 for ejectors	Hysteresis h1 for ejectors
Index	Index 0 to 15 corresponds to ejector #1 to #16	
Data type	uint16	
Length	32 bytes	
Access	Read/write	
Value range	998 >= H1 >= (H2+h1)	(H1-H2) >= h1 > 10
Default value	750	150
Unit	mbar	
EEPROM	Yes	

Offset parameter	**102 (0x0066)**	**103 (0x0067)**
Description	Setpoint H2 for ejectors	Hysteresis h2 for ejectors
Index	Index 0 to 15 corresponds to ejector #1 to #16	
Data type	uint16	
Length	32 bytes	
Access	Read/write	
Value range	(H1-h1) >= H2 >= (h2+2)	(H2-2) >= h2 >= 10
Default value	550	10
Unit	mbar	
EEPROM	Yes	

System vacuum evaluation:

Once the system vacuum reaches the value for H2, the following responses are triggered:

- The process data bit for H2 is set.
- The H2 LED on the ejector's display illuminates.

Once the system vacuum reaches the value for H1, the following responses are triggered:

- Depending on whether the air saving function is selected, vacuum generation is interrupted.
- The process data bit for H1 is set.

6.8.2 Control Functions (0x006D)

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

Offset parameter	**109 (0x006D)**
Description	Control mode for ejectors
Index	Index 0 to 15 corresponds to ejector #1 to #16
Data type	uint8
Length	16 bytes
Access	Read/write
Value range	0x00 = control is not active, H1 in hysteresis mode 0x01 = control is not active, H1 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), H1 in Hysteresis Mode

The ejector produces continuous suction with maximum power.

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

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

No Control (Continuous Suction), H1 in Comparator Mode

The ejector produces continuous suction with maximum power.

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

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

Control

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

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

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

Control with Leak Monitoring

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

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

Control without Continuous Suction

This operating mode is the same as the “Control” operating mode but it does not switch to continuous suction when the valve switching frequency is exceeded.

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

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.

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

6.8.3 Blow-Off Function (0x006E)

Offset parameter	**110 (0x006E)**
Description	Blow mode for ejectors
Index	Index 0 to 15 corresponds to ejector #1 to #16
Data type	uint8
Length	16 bytes
Access	Read/write
Value range	0x00 = externally controlled blow-off 0x01 = internally controlled blow-off – time-dependent 0x02 = externally controlled blow-off – time-dependent
Default value	0
Unit	—
EEPROM	Yes

Each ejector offers three blow-off modes for selection:

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 have to be additionally controlled.

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.

6.8.4 Set Permitted Evacuation Time t1 (0x006B)

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

Parameter	**Description**
Permitted evacuation time	Time from H2 to H1

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

6.8.5 Set Permitted Leakage (0x006C)

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

Parameter	Description
Permitted leakage	Leakage after reaching H1

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

6.8.6 Counters

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

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

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

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

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

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

6.8.7 Manual Mode

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

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

Further information about the ejectors’ manual mode is found in the “Operation” section.

7 Transportation and Storage

7.1 Checking the Delivery

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

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

7.2 Reusing the Packaging

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

Keep the packaging for future transport or storage.

8 Installation

8.1 Installation Instructions

⚠ CAUTION

Improper installation or maintenance

Personal injury or damage to property

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

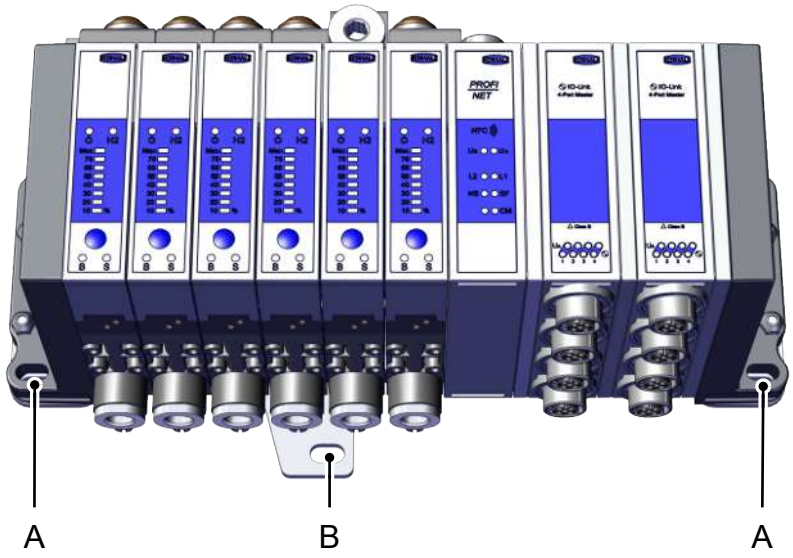
For safe installation, the following instructions must be observed:

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

8.2 Mounting

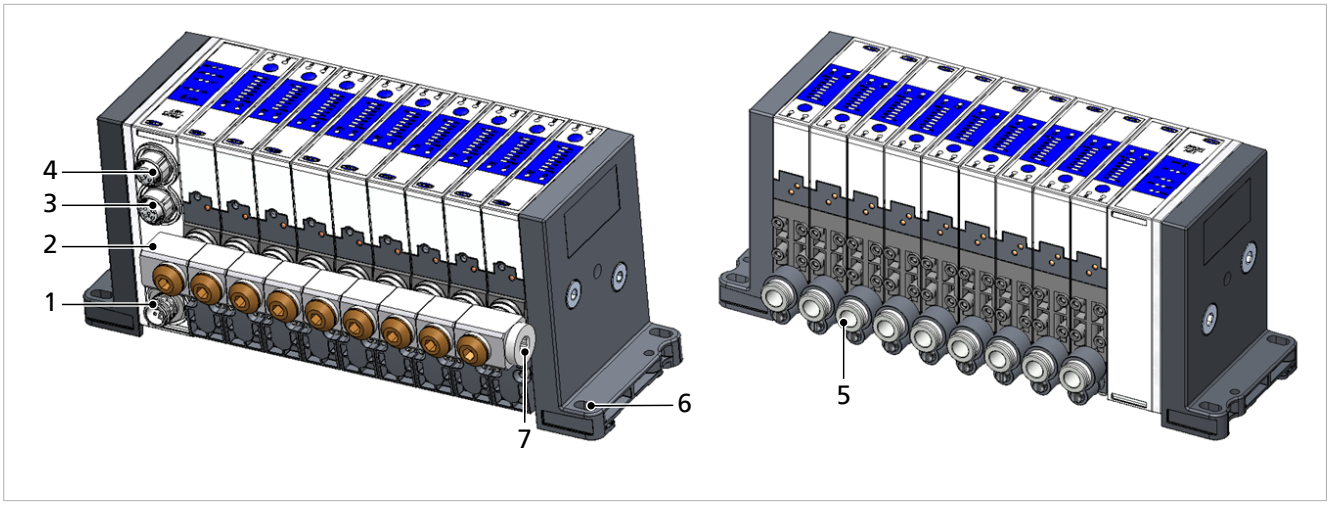
The compact terminal may be installed in any position.

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



The figure shown here is an example. Your version may differ.

Up to five mounted ejector discs	With six or more ejector discs, additional reinforcing plates are mounted on the compact terminal
▸ Attach the compact terminal at the end plates (A) using two M5 screws and washers each. The maximum recommended tightening torque is 4 Nm.	▸ Attach the compact terminal at the end plates (A) as well as at the center reinforcing plates (B) using two M5 screws and washers each. The maximum recommended tightening torque is 4 Nm.



Position	Description	Max. tightening torque
1	M12-L electrical connection for voltage supply. Labeled with X03 on bus module.	Hand-tight
2	Compressed air connection, 1/4" thread	2 Nm
3	M12-D electrical connection for Ethernet port X02 (straight [1:1])	Hand-tight
4	M12-D electrical connection for Ethernet port X01 (crossover [x])	Hand-tight
5	1/8" vacuum connection	2 Nm
6	End plate with two mounting holes	4 Nm
7	Alternative compressed air connection, 1/4" thread	2 Nm

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

8.3 Instructions for the Pneumatic Connection

⚠ CAUTION

Compressed air or vacuum in direct contact with the eye

Severe eye injury

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

⚠ CAUTION

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

Hearing damage

- Correct installation.
- Wear ear protectors.

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

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

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

8.4 Recommended Line Cross Sections (Internal Diameters) in mm

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

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

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

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

8.5 Electrical Connection

NOTE

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

Personal injury or damage to property

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

NOTE

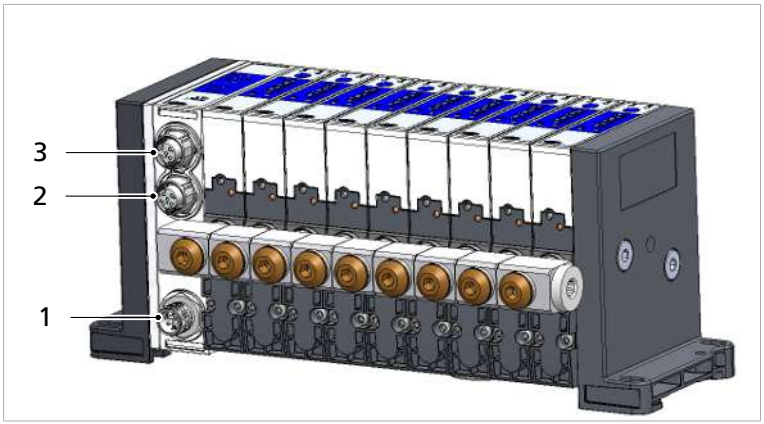
Incorrect power supply

Destruction of the integrated electronics

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

During the electrical connection, observe the applicable norms, guidelines, regulations and technical standards.

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



1	M12-L electrical connection for voltage supply Labeled with X03 on bus module
2	M12-D connection for Ethernet port X02 (straight [1:1]) Labeled with X02 on bus module
3	M12-D connection for Ethernet port X01 (crossover [x]) Labeled with X01 on bus module

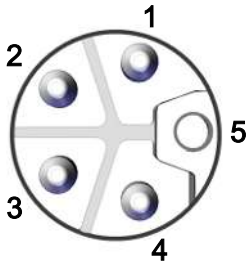
✓ Prepare the connection cable.

1. Attach the connection cable to the electrical connection (1); max. tightening torque = hand-tight
2. At least one Ethernet cable also needs to be connected to the D-coded M12 sockets at connection (2) or (3).

Observe the following connection instructions:

- The device can be operated only via Ethernet communication. This requires corresponding hardware components (master).
- The data cable must be shielded. The cable shield must be equipotentially bonded.
- The functional ground of the voltage supply cable must be equipotentially bonded.
- The device is designed to supply sensors and actuators with potential separation.
- It has a 5-pin M12 connector with L-coded design for electrical connection.

8.6 Pin Assignments, L-coded M12 Connector for Voltage Supply

M12-L connector	PIN	Symbol	Wire color [1]	Function
	1	U_s	Brown	Supply voltage for sensor
	2	GND_A	White	Actuator ground
	3	GND_s	Blue	Sensor ground
	4	U_A	Black	Supply voltage for actuator
	5	FE	Gray	Functional ground (earth)

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

8.7 Pin Assignments, D-coded M12 Socket for Industrial Ethernet

M12-D socket	PIN	Symbol
	1	TX+
	2	RX+
	3	TX-
	4	RX-
	Thread	FE

8.8 Instructions for Start of Operations

To operate the compact terminal, the supply voltage and at least one communication line must be connected.

The integrated switch can be used to loop through the communication line.

The supply voltage for the sensors (U_S) and the supply voltage for the actuators (U_A) are electrically isolated and can come from different sources.

9 Operation

9.1 Calibrating the Vacuum Sensor

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

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

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

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

9.2 Manual Operation of the Ejectors

⚠ CAUTION

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

Personal injury or damage to property!

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

⚠ CAUTION

External signals may change manual mode

Personal injury or property damage due to unforeseen work steps!

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

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

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

Activating Manual Mode:

✓ The ejector is in the Pneumatically OFF state.

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

⇨ The Suction and Blow-off LEDs flash.

⇨ The ejector is in the Pneumatically OFF position.

Activating suction in manual mode:

✓ The Suction and Blow-off LEDs flash.

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

⇨ The ejector begins to suck.

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

Activating blow-off in manual mode:

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

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

Exiting manual mode:

✓ The ejector is in manual mode.

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

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

⇨ The ejector is in the Pneumatically OFF position.

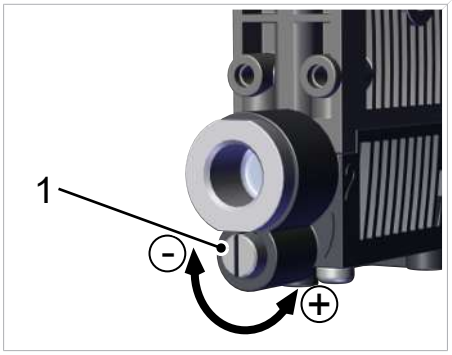
A signal change (suction, blow-off) also ends manual mode.

9.3 Changing the Blow-Off Flow Rate on the Ejector

Do not overwind past the stop on the valve screw. A minimum flow rate of approx. 10% is always necessary for technical reasons. The blow off volume flow can be set between 10% 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.

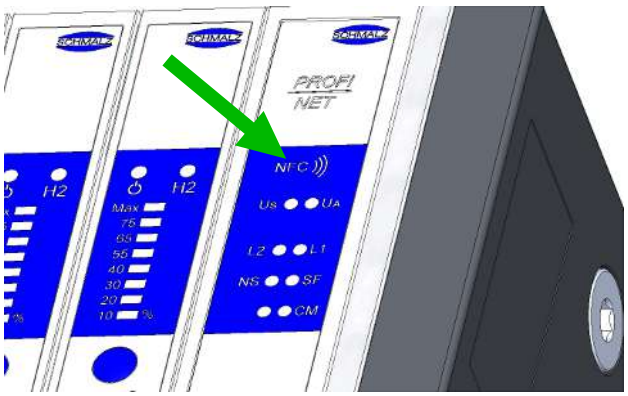


9.4 Transferring Device Data with NFC

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

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

1. Align the read device as parallel to the top of the compact terminal as possible.
2. Position the antenna of the read device in the center of the compact terminal's antenna.



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

The device parameters can be accessed via NFC even when the supply voltage is not connected.

10 Maintenance

10.1 Safety Instructions

Maintenance work may only be carried out by qualified personnel.

⚠ WARNING

Risk of injury due to incorrect maintenance or troubleshooting

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

⚠ CAUTION

Damage due to flying parts

Risk of injury or damage to property!

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

NOTE

Improper maintenance

Damage to the compact terminal and the ejectors!

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

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

10.2 Replacing the Silencer

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

- If the suction capacity decreases, replace the silencer.

10.3 Replacing the Press-In Screens

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

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

10.4 Cleaning the Compact Terminal

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

11 Spare and Wearing Parts, Accessories

11.1 Spare and Wearing Parts

Maintenance work may only be carried out by qualified personnel.

⚠ WARNING

Risk of injury due to incorrect maintenance or troubleshooting

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

NOTE

Improper maintenance

Damage to the compact terminal and the ejectors!

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

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

Part no.	Designation	Legend
10.02.02.04141	Silencer insert	Wearing part
10.02.02.03376	Screen	Spare part
10.02.02.04152	Insulating plate	Wearing part

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

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

11.2 Accessories

Part no.	Designation	Note
21.04.05.00351	Connection cable	M12 5-pin socket [L] with open cable end | 1.5 m
21.04.05.00352	Connection cable	M12 5-pin socket [L] with open cable end | 5 m
21.04.05.00353	Connection cable	M12 4-pin connector [D] to M12 4-pin connector [D] | 1 m
21.04.05.00354	Connection cable	M12 4-pin connector [D] to M12 4-pin connector [D] | 5 m
21.04.05.00355	Connection cable	M12 4-pin connector [D] to RJ45 connector | 1 m
21.04.05.00356	Connection cable	M12 4-pin connector [D] to RJ45 connector | 5 m

12 Troubleshooting

12.1 Help with Malfunctions

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

12.2 Error Codes, Causes and Solutions (0x0082)

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	Malfunction	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	Internal bus error	Internal bus was interrupted.	▸ Perform Power On again.
Bit 2	Undervoltage U_S	Sensor supply voltage is too low.	1. Check power supply unit and power load

Error code	Malfunction	Possible cause	Solution
			2. Increase supply voltage
Bit 3	Overvoltage U_S	Sensor supply voltage is too high.	1. Check power supply unit. 2. Reduce supply voltage
Bit 4	Undervoltage U_A	Actuator supply voltage is too low.	1. Check power supply unit and power load. 2. Increase supply voltage
Bit 5	Overvoltage U_A	Actuator supply voltage is too high.	1. Check power supply unit. 2. Reduce supply voltage
Bit 6	Supply pressure	System pressure outside the permitted range.	▸ Check and adjust supply pressure.

Ejector error code:

Error code	Malfunction	Possible cause	Solution
Bit 0	Measurement range exceeded	The measurement range of at least one ejector was exceeded.	▸ Check the pressure and vacuum sections of the system.
Bit 1	Calibration error	Calibration was canceled when measurement value was too high or too low.	1. Ventilate the vacuum circuit. 2. Perform calibration.

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

13 Decommissioning and Recycling

13.1 Disposing of the Compact Terminal

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

13.2 Materials Used

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

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	RoHS Directive

The following harmonized standards were applied:

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

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

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
EN IEC 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

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

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