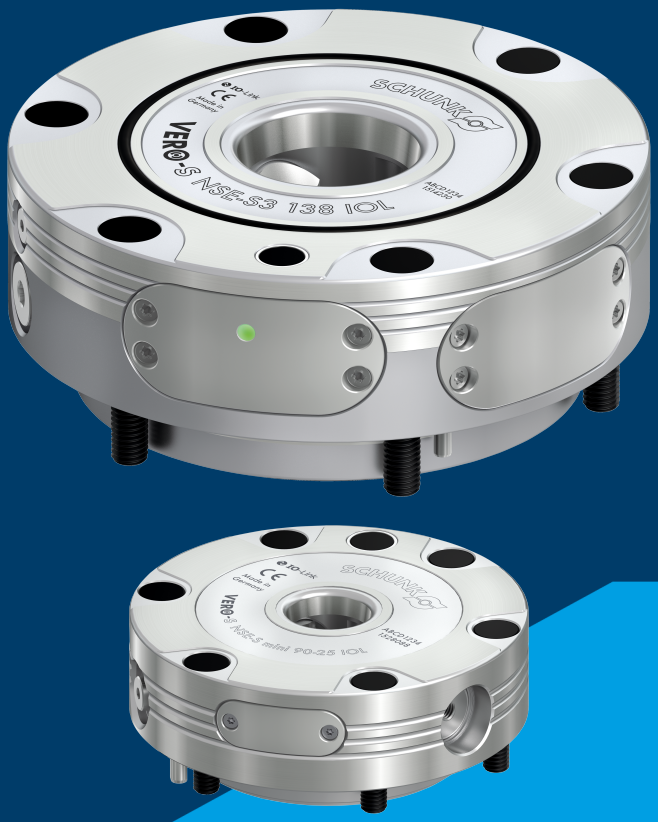

Quick-change pallet system VERO-S NSE-S3 138 IOL & VERO-S NSE-S mini 90-25 IOL

Software manual

Hand in hand for tomorrow

Imprint

Technical changes:
We reserve the right to make alterations for the purpose of technical improvement.

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Dear Customer,

Thank you for trusting our products and our family-owned company, the leading technology supplier of robots and production machines.

Our team is always available to answer any questions on this product and other solutions. Ask us questions and challenge us. We will find a solution!

Best regards,

Your SCHUNK team

Customer Management

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Please read the software manual in full and keep it close to the product.

Table of Contents

1 General

1.1 Validity

This version of the software manual for the VERO-S NSE-S3 138 IOL and VERO-S NSE-S mini 90-25 IOL describes the functions for the firmware versions with the main version number 1.0.0. The firmware version can be read out. Information on the corresponding parameter can be found in the chapter ▶ 3.1 [🗋 10].

The compliance with the following specifications is fulfilled:

1. IO-Link Interface and System Specification, V1.1.4
2. IO Device Description, V1.1.3

1.2 Applicable documents

- General Terms and Conditions
- Operating manual of the products used
- IO-Link Device Description (IODD)

The documents can be downloaded from **www.schunk.com**.

1.3 IO-Link Basics

Fieldbus-independent interface

IO-Link is a point-to-point interface for connecting a SCHUNK product (IO-Link device) to a control system (IO-Link master). Via this interface it is possible to transfer parameters, process data and diagnostic data. Parameter data are transfered to the IO-Link device from the master (actuator or sensors). In the opposite direction, the master receives cyclical process data and, if required, service and diagnostic data.

Further information on IO-Link can be found at **www.io-link.com**.

1.4 Data exchange

Cyclical data exchange

To exchange cyclic process data between an IO-Link device and a controller, the IO-Link data is transferred from the IO-Link master to the previously set address ranges. The user program of the controller accesses the process values via these addresses and processes them. Conversely, the cyclic data exchange is performed from the controller to the IO-Link device.

Acyclical data exchange

The exchange of acyclic data, such as parameters or events, takes place over a specified index and sub-index range. Using the index and sub-index range, targeted access of the device data is possible (e.g. for reparameterization of the device or master during ongoing operation).

1.5 Data types

The data types mentioned in this version of the software manual are designated according to the "IO-Link Interface and System Specification", Annex F, Version 1.1.9, which is available at **www.io-link.com**. The corresponding designation according to IEC 61131-3 (PLC standard) can be found in the following table:

Description	IO-Link standard	PLC standard IEC 61131-3	Bit length
Logical value	BooleanT	BOOL	1 bit
Integer	IntegerT8	SINT	8 bit
	IntegerT16	INT	16 bit
	IntegerT32	DINT	32 bit
	IntegerT64	LINT	64 bit
Natural number	UIntegerT8	USINT	8 bit
	UIntegerT16	UINT	16 bit
	UIntegerT32	UDINT	32 bit
	UIntegerT64	ULINT	64 bit
Floating-point numbers	Float32T	REAL	32 bit
	Float64T	LREAL	64 bit
Characters	StringT (x)	STRING	x bit

⚠ WARNING

Changes to parameters outside the permitted ranges and manipulation of non-visible and therefore protected parameters can cause damage to the quick-change pallet system or misinterpretation of states and thus lead to an unwanted hazard.

2 Incoming process data (status word)

To determine the current device status and clamping status, as well as the current circuit board temperature of the device and sensor values, the following incoming cyclical data is made available:

Byte	Bit *	Bit offset	Sub index	Data type	[Values]: Description
0	7	159	1	BooleanT	[true]: Ready for operation; [false]: otherwise
	6	158	2	BooleanT	[true]: Teaching procedure active; [false]: otherwise
	5	157			
	4	156	4	BooleanT	[true]: Closed without clamping pin; [false]: otherwise
	3	155	5	BooleanT	[true]: Clamped with clamping pin; [false]: otherwise
	2	154	6	BooleanT	[true]: Open; [false]: otherwise
	1	153	7	BooleanT	[true]: Turbo pressure detected; [false]: otherwise
	0	152	8	BooleanT	[true]: Presence detected; [false]: otherwise
1	7	151			
	6	150			
	5	149			
	4	148			
	3	147			
	2	146	14	BooleanT	[true]: Info; [false]: otherwise
	1	145	15	BooleanT	[true]: Warning; [false]: otherwise
	0	144	16	BooleanT	[true]: Error; [false]: otherwise
2–3	–	128	17	Integer T16	Eventcode
4–7	–	96	18	Float32T	Temperature (°C)
8–11	–	64	19	Float32T	Presence sensor raw value (MHz)
12–15	–	32	20	Float32T	Clamping slide sensor raw value (MHz)
16–19	–	0	21	Float32T	Pressure sensor value (bar)

* Bit 7 has the function of the **M**ost **S**ignificant **B**it (**MSB**) and bit 0 that of the **L**east **S**ignificant **B**it (**LSB**).

Further information is provided via the acyclic device data ▸ 3 [🗋 10].

2.1 Status – Byte 0

The current status of the device and the status of the quick-change pallet system is displayed:

Bit	Bit offset	Sub index	Data type	Values: Description
7	159	1	BooleanT	[true]: Ready for operation; [false]: otherwise
6	158	2	BooleanT	[true]: Teaching procedure active; [false]: otherwise
5	157			
4	156	4	BooleanT	[true]: Closed without clamping pin; [false]: otherwise
3	155	5	BooleanT	[true]: Clamped with clamping pin; [false]: otherwise
2	154	6	BooleanT	[true]: Open; [false]: otherwise
1	153	7	BooleanT	[true]: Turbo pressure detected; [false]: otherwise
0	152	8	BooleanT	[true]: Presence detected; [false]: otherwise

The internal sensor system of the quick-change pallet system detects the clamping slide position and the pneumatic pressure in the turbo chamber, as well as the presence of a pallet. The clamping state of the quick-change pallet system is determined from this and output via the corresponding status bits.

The operational status of the device is indicated by the Boolean value of bit 7 "Ready for operation". The prerequisite is:

- the 24 V supply voltage L+ is present
- Internal sensors provide valid signals

Bit 6 ''Teaching procedure active'' indicates an active and uncompleted teaching procedure for the presence or clamping slide sensor.

Bit 4 "Closed without clamping pin" indicates that the clamping slide position "Clamped with clamping pin" has been overrun during the clamping process. Reason: no clamping pin or a too small clamping pin inserted. Prerequisites for the value [true] are:

- The clamping slide sensor raw value is smaller than the clamping slide sensor threshold value 3 (parameter index 113), ▶ 3.2 [🗋 11]
- No clamping slide movement is detected
- The previous clamping status was "Open" or "Closed without clamping pin"

The clamped status of the quick-change pallet system is indicated by the Boolean value of bit 3 “Clamped with clamping pin”. The prerequisites for the value [true] are:

- The clamping slide sensor raw value is between clamping slide sensor threshold value 2 (parameter index 112) and threshold value 3 (parameter index 113)
- No clamping slide movement is detected
- The previous clamping status was "Open" or "Clamped with clamping pin"

Bit 2 “Open” indicates that the clamping slide has reached the open position. The prerequisites for the value [true] are:

- The clamping slide sensor raw value is greater than the clamping slide sensor threshold value 1 (parameter index 111)
- No clamping slide movement is detected

Note:
If the clamping module is in an undefined clamping status and no clamping slide movement is detected, a warning is signalled after 15 seconds via exception bit 1 together with an event code, ▸ 2.2 [🗋 8].

Bit 1 “Turbo pressure detected” indicates that the turbo pressure has been detected. Prerequisite for the value [true] is:

- The pressure sensor value exceeds the pressure sensor threshold value (parameter index 139), ▸ 3.2 [🗋 11].

The Boolean value of bit 0 “Presence detected” indicates the detection of the presence of a previously taught workpiece or a pallet. The prerequisite for the value [true] is:

- The presence sensor raw value exceeds the presence sensor threshold value (▸ 3.2 [🗋 11], index 101)

2.2 Exception – Byte 1

The occurrence of exception events in the form ofinformation, warnings and errors are displayed:

Bit	Bit offset	Sub index	Data type	Values: Description
2	146	14	BooleanT	[true]: Info; [false]: otherwise
1	145	15	BooleanT	[true]: Warning; [false]: otherwise
0	144	16	BooleanT	[true]: Error; [false]: otherwise

Errors can be deleted by resolving the cause and rebooting the device.

2.3 Event code – Byte 2–3

Event codes are indicated by a specific code in combination with the occurrence of a warning (byte 1 bit 1 "Warning" [true]):

Bit offset	Sub index	Data type	Values: Description
128	17	IntegerT16	[0x0001]: Timeout (15 s) exceeded for undefined status

2.4 Temperature – Byte 4–7

The circuit board temperature is displayed in units of (°C).

Bit offset	Sub index	Data type	Values: Description
96	18	Float32T	[–]: Temperature (°C)

2.5 Presence sensor raw value – Byte 8–11

The current raw value of the presence sensor is displayed in units of (MHz).

Bit offset	Sub index	Data type	Values: Description
64	19	Float32T	[–]: Presence sensor raw value (MHz)

2.6 Clamping slide sensor raw value – Byte 12–15

The current raw value of the clamping slide sensor is displayed in units of (MHz).

Bit offset	Sub index	Data type	Values: Description
32	20	Float32T	[–]: Clamping slide sensor raw value (MHz)

2.7 Pressure sensor value – Byte 16–19

The current value of the pressure sensor is displayed in units of (bar).

Bit offset	Sub index	Data type	Values: Description
0	21	Float32T	[–]: Pressure sensor value (bar)

NOTICE

Bit values of unassigned bits are always set as 0: [false].

3 Acyclical data

Identification data, monitoring values, parameters and diagnostic information including events and error messages are transmitted acyclically from the IO-Link master on request and can be changed depending on the applicable access rights.

3.1 Identification data

The following acyclic data is provided for identification:

Index	Name	Data type	Access rights *	[Values] description
16	Vendor name	StringT (64)	ro	[SCHUNK SE & Co. KG]
17	Vendor text	StringT (64)	ro	[Hand in hand for tomorrow]
18	Product name	StringT (64)	ro	{Produkt name e.g.: VERO-S NSE-S3 138 IOL}
19	Product ID	StringT (64)	ro	{ID number}
20	Product text	StringT (64)	ro	[Sensory quick-change pallet system]
21	Serial number	StringT (16)	ro	{Alphanumeric serial number}
22	Hardware revison	StringT (64)	ro	[HW-V{Version}] (Electronics)
23	Firmware revision	StringT (64)	ro	[HW-V{Version}]
24	Application-specific Tag	StringT (32)	rw	{empty textfield for application-specific identification}
25	Function Tag	StringT (32)	rw	{empty textfield for function identification}
26	Location Tag	StringT (32)	rw	{empty textfield for location identification}
17342	Hardware Identification Key	StringT (32)	ro	[INN-1]

* ro (read only), rw (read and write)

3.2 Parameters

The following acyclical data is provided for setting communication and sensor parameters:

Index	Name	Data type	Access rights *	[Values] description
100	Presence sensor raw value (MHz)	Float32T	ro	Raw value of the presence sensor in MHz
101	Presence sensor threshold value (MHz)	Float32T	rw	Threshold value determined during teaching of the presence sensor for status bit 0 "Presence detected" in MHz, ▶ 5.1 [🗋 14].
102	Presence sensor threshold value factory setting (MHz)	Float32T	ro	Factory setting for index 101 in MHz
103	Presence sensor teach command	UIntegerT8	wo	[0]: No command [1]: Start teaching process: pallet absent [2]: Start teaching process: pallet present [255]: Set factory setting
104	Presence sensor teach response	UIntegerT8	ro	[0]: No message [1]: Teaching active [3]: Teaching successful [4]: Error
110	Clamping slide sensor raw value (MHz)	Float32T	ro	Raw value of the clamping slide sensor in MHz
111	Clamping slide sensor threshold value 1	Float32T	rw	Threshold value 1 for status bit 2 "Open" in units of MHz determined when teaching the clamping slide sensor, ▶ 5.2 [🗋 15].
112	Clamping slide sensor threshold value 2	Float32T	rw	Threshold value 2 for status bit 3 "Clamped with clamping pin" in units of MHz determined when teaching the clamping slide sensor, ▶ 5.2 [🗋 15].
113	Clamping slide sensor threshold value 3	Float32T	rw	Threshold value 3 for status bit 4 "Closed without clamping pin" in units of MHz determined when teaching the clamping slide sensor, ▶ 5.2 [🗋 15].
115	Clamping slide sensor threshold value 1 factory setting	Float32T	ro	Factory setting for index 111 in MHz

Index	Name	Data type	Access rights *	[Values] description
116	Clamping slide sensor threshold value 2 factory setting	Float32T	ro	Factory setting for index 112 in MHz
117	Clamping slide sensor threshold value 3 factory setting	Float32T	ro	Factory setting for index 113 in MHz
119	Clamping slide sensor teach command	UIntegerT8	wo	[0]: No command [1]: Start teaching process: Opened [3]: Start teaching process: Clamped with clamping pin [4]: Start teaching process: Closed without clamping pin [255]: Set factory setting
120	Clamping slide sensor teach response	UIntegerT8	ro	[0]: No message [1]: Teaching active [3]: Teaching successful [4]: Error
136	Pressure sensor raw value (bar)	Float32T	ro	Raw value of the pressure sensor in bar
137	Pressure sensor tare command	UIntegerT8	wo	[0]: No command [1]: Start taring process [255]: Set factory setting
138	Pressure sensor tare response	UIntegerT8	ro	[0]: No message [1]: Taring active [3]: Taring successful [4]: Error
139	Pressure sensor threshold value (bar)	Float32T	rw	Threshold value for status bit 1 "Turbo pressure detected" in bar
360	Clamping cycle counter	IntegerT32	rw	Total amount of clamping operations performed “Clamped with clamping pin”.

* ro (read only), rw (read and write), wo (write only)

There are additional parameters not shown here. It is not necessary to change these settings for normal operation.

⚠ WARNING

Changes to parameters outside the permitted ranges and manipulation of not displayed or protected parameters can cause damage to the quick-change pallet system or misinterpretation of states and thus lead to an unwanted hazard.

4 LED status

In addition to the parameters described regarding device status and clamping status, the LED on the side of the quick-change pallet system indicates the following clamping statuses and device statuses by lighting up accordingly:

LED	Clamping slide	Presence	Pressure in turbo-chamber
green	clamped with clamping pin	detected	not detected
flashing green	clamped with clamping pin	detected	detected
red	clamped with clamping pin	not detected	any
red	closed without clamping pin	any	any
red	undefined	any	any
no signal	opened	any	any
1x red and 1x green flashing	boot procedure	Boot procedure	Boot procedure
flashing red	device error or warning / connection setup / no IO-Link connection		

5 Teaching in the sensors

The integrated sensors are taught to a sample pallet ex works. Acyclical parameters and threshold values have been determined accordingly and these have already been described at the factory.

Due to increased wear or special operating conditions, it is possible that sensors may need to be taught in again. The following sensors can be taught in again:

- Teaching presence sensor system on a clamping pallet ▸ 5.1 [🗋 14]
- Teaching clamping slide sensor system to a clamping pin ▸ 5.2 [🗋 15]
- Tare pressure sensors for the turbo chamber ▸ 5.3 [🗋 16]

5.1 Teaching presence sensor system

The quick-change pallet system has an automated teach-in routine that can be used to determine a threshold value for the presence sensor and thus overwrite the acyclical parameter value (index 101). The material and position-dependent presence sensor can thus be taught to a specific pallet.

The following procedure must be carried out for successful teaching:

- Set the pallet to the absent state
- Set the presence sensor teach command by writing the acyclic parameter to index 103 with the value:
  - [1]: Start teach process: pallet absent
- Set the pallet to the present state andclamp
- Set presence sensor teach command by writing the acyclic parameter to index 103 with the value:
  - [2]: Start teach process: Pallet present

In the process data, status bit 6 "Teach process active" indicates an active and incomplete teach-in process.

The status of the teach process can aditionally be queried via the acyclical parameter “Presence sensor teach response” on index 104. In the case of an error, the described procedure must be repeated in full.

Load factory settings:

The value stored as the “Presence sensor threshold value factory setting” parameter at index 102 can be set with the presence sensor teach command:

- [255]: Set factory settings

can be described as the new threshold value of the presence sensor.

NOTICE

The raw value signal of the presence sensor and therefore the detection distance depend on the material. When using different target materials (e.g. aluminum and steel pallets), it is therefore important to ensure that the material with the smallest raw value signal is taught in. This ensures that the other pallet materials are also detected when approaching.

5.2 Teach clamping slide sensor system

The quick-change pallet system has an automated teach-in routine that can be used to determine the clamping slide sensor threshold values i (MHz) for i = 1...3 and thus overwrite the corresponding acyclic parameter values (index 111, index 112 and index 113).The following procedure must be carried out for successful teach-in:

- Bring the clamping module into the open state
- Set clamping slide sensor Teach command by writing the value to the acyclic parameter from index 119:
  - [1]: Start teaching process: Open
- Bring the clamping module **without turbo function!** into the clamped state with clamping pin
- Set clamping slide sensor Teach command by writing the value to the acyclic parameter from index 119:
  - [3]: Start teaching process: Clamped with clamping pin
- Set the clamping module to the closed state without clamping pin
- Set clamping slide Teach command by writing the value to the acyclic parameter from index 119:
  - [4]: Start teaching process: Closed without clamping pin

In the process data, status bit 6 ''Teach-in procedure active'' indicates an active and incomplete teach-in procedure.

The status of the teach-in process can also be queried via the acyclical parameter ''Clamping slide sensor teach response'' at index 120. In the event of an error, the described procedure must be repeated in full.

Load factory settings:

The values saved as the ''Clamping slide sensor threshold value i factory setting'' parameter for i = 1...3 (index 115, index 116 and index 117) can be described as new threshold values for the clamping slide sensor using the " Clamping slide sensor teach command":

- [255]: Set factory setting

NOTICE

For successful teach-in and reliable detection of theclamping state detection, a minimum distance between the "Clamped with clamping pin" and "Closed without clamping pin" teach points is required. The required minimum distance is set at the factory. If the distance falls below this value, the teach-in process is cancelled and an error message is issued via the acyclical parameter ''Clamping slide sensor teach response''. Reasons for falling below the minimum distance are

- Wrong teach-in procedure (e.g. with turbo function)
- High wear or soiling on the clamping pin or clamping slide

5.3 Tare pressure sensors

The pressure sensor value can be tared. The following procedure must be carried out for successful taring:

- Fully vent the turbo chamber of the quick-change pallet system
- Set pressure sensor tare command by writing the value to the acyclic parameter at index 137:
  - Start taring process

The status of the taring process can be queried via the acyclic parameter 'Pressure sensor tare response' at index 138. In the case of an error, the described procedure must be repeated in full.

Reset to factory settings:

The pressure sensor tare value can be reset to the factory tare using the 'Pressure sensor tare command'

- [255]: Set factory setting.

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