Assembly and Operating Manual

WSG 25

Servo-electric 2-finger parallel gripper

Superior Clamping and Gripping

SCHUNK®

Imprint

Copyright:

Technical changes:

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

Document number: 389684

Version: 05.00 | 25/06/2019 | en

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

Table of contents

1 General

1.1 About this manual

This manual contains important information for a safe and appropriate use of the product.

This manual is an integral part of the product and must be kept accessible for the personnel at all times.

Before starting work, the personnel must have read and understood this operating manual. Prerequisite for safe working is the observance of all safety instructions in this manual.

Illustrations in this manual are provided for basic understanding and may differ from the actual product design.

In addition to these instructions, the documents listed under Applicable documents [▶ 6] are applicable.

1.1.1 Presentation of Warning Labels

To make risks clear, the following signal words and symbols are used for safety notes.

⚠ **DANGER**

Danger for persons!
Non-observance will inevitably cause irreversible injury or death.

⚠ **WARNING**

Dangers for persons!
Non-observance can lead to irreversible injury and even death.

⚠ **CAUTION**

Dangers for persons!
Non-observance can cause minor injuries.

NOTICE

Material damage!
Information about avoiding material damage.

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1.1.2 Applicable documents

- General terms of business*
- Catalog data sheet of the purchased product *
- Assembly and operating manuals of the accessories *
- WSG command set reference - description of the command protocol (TCP/IP) *

The documents marked with an asterisk (*) can be downloaded on our homepage **schunk.com**

1.2 Warranty

If the product is used as intended, the warranty is valid for 24 months from the ex-works delivery date under the following conditions:

- Observe the specified maintenance and lubrication intervals
- Observe the ambient conditions and operating conditions

Parts touching the workpiece and wear parts are not included in the warranty.

The product is considered defective if its basic function "gripping" is no longer given.

1.3 Scope of delivery

The scope of delivery includes

- Servo-electric 2-finger parallel gripper WSG 25 in the version ordered
- CD with documentation and firmware

1.4 Accessories

The following accessories, which must be ordered separately, are required for the product:

- 5 m data and supply cable, M8 socket, 6-pin, straight to RJ-45 and free cable end power supply, for WSG 25

2 Basic safety notes

2.1 Intended use

The product is designed exclusively for gripping and temporarily holding workpieces or objects.

- The product may only be used within the scope of its technical data, Technical data [▶ 13].
- When implementing and operating components in safety-related parts of the control systems, the basic safety principles in accordance with DIN EN ISO 13849-2 apply. The proven safety principles in accordance with DIN EN ISO 13849-2 also apply to categories 1, 2, 3 and 4.
- The product is intended for installation in a machine/system. The applicable guidelines must be observed and complied with.
- The product is intended for industrial and industry-oriented use.
- Appropriate use of the product includes compliance with all instructions in this manual.

2.2 Not intended use

It is not intended use if the product is used, for example, as a pressing tool, stamping tool, lifting gear, guide for tools, cutting tool, clamping device or a drilling tool.

- Any utilization that exceeds or differs from the appropriate use is regarded as misuse.

2.3 Constructional changes

Implementation of structural changes

By conversions, changes, and reworking, e.g. additional threads, holes, or safety devices can impair the functioning or safety of the product or damage it.

- Structural changes should only be made with the written approval of SCHUNK.

2.4 Special standards

The following standards are met:
- Fast transients on supply and I/O lines (burst) to IEC / EN 61000-4-4
- HF power supply to IEC/EN 61000-4-6
- HF radiation according to IEC/EN 61000-4-3
- Emissions according to EN 55011:2009 Class A (corresponds to EN 61000-6-4:2007)
- Magnetic field with energy technical frequency according to EN 61000-4-8

2.5 Spare parts

Use of unauthorized spare parts

Using unauthorized spare parts can endanger personnel and damage the product or cause it to malfunction.
- Use only original spare parts or spares authorized by SCHUNK.

2.6 Gripper fingers

Requirements for the gripper fingers

Stored energy within the product creates the risk of serious injuries and significant property damage.
- Arrange the gripper fingers in a way that the product reaches either the position "open" or "closed" in a de-energized state.
- Only exchange the gripper fingers when no residual energy remains in the product.
- Make sure that the product and the top jaws are a sufficient size for the application.

2.7 Environmental and operating conditions

Required ambient conditions and operating conditions

Incorrect ambient and operating conditions can make the product unsafe, leading to the risk of serious injuries, considerable material damage and/or a significant reduction to the product's life span.
- Make sure that the product is used only in the context of its defined application parameters, Technical data [▶ 13].
- Observe Maintenance intervals, Maintenance and cleaning [▶ 50].
- Make sure that the environment is clean and the ambient temperature corresponds to the specifications per the catalog.

2.8 Personnel qualification

Inadequate qualifications of the personnel

If the personnel working with the product is not sufficiently qualified, the result may be serious injuries and significant property damage.

• All work may only be performed by qualified personnel.
• Before working with the product, the personnel must have read and understood the complete assembly and operating manual.
• Observe the national safety regulations and rules and general safety instructions.

The following personal qualifications are necessary for the various activities related to the product:

Trained electrician   Due to their technical training, knowledge and experience, trained electricians are able to work on electrical systems, recognize and avoid possible dangers and know the relevant standards and regulations.

Qualified personnel   Due to its technical training, knowledge and experience, qualified personnel is able to perform the delegated tasks, recognize and avoid possible dangers and knows the relevant standards and regulations.

Instructed person   Instructed persons were instructed by the operator about the delegated tasks and possible dangers due to improper behaviour.

Service personnel of the manufacturer   Due to its technical training, knowledge and experience, service personnel of the manufacturer is able to perform the delegated tasks and to recognize and avoid possible dangers.

2.9 Personal protective equipment

Use of personal protective equipment

Personal protective equipment serves to protect staff against danger which may interfere with their health or safety at work.

• When working on and with the product, observe the occupational health and safety regulations and wear the required personal protective equipment.
• Observe the valid safety and accident prevention regulations.
• Wear protective gloves to guard against sharp edges and corners or rough surfaces.
• Wear heat-resistant protective gloves when handling hot surfaces.
• Wear protective gloves and safety goggles when handling hazardous substances.
• Wear close-fitting protective clothing and also wear long hair in a hairnet when dealing with moving components.

2.10 Notes on safe operation

Incorrect handling of the personnel

Incorrect handling and assembly may impair the product's safety and cause serious injuries and considerable material damage.

- Avoid any manner of working that may interfere with the function and operational safety of the product.
- Use the product as intended.
- Observe the safety notes and assembly instructions.
- Do not expose the product to any corrosive media. This does not apply to products that are designed for special environments.
- Eliminate any malfunction immediately.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention and environmental protection regulations regarding the product's application field.

2.11 Transport

Handling during transport

Incorrect handling during transport may impair the product's safety and cause serious injuries and considerable material damage.

- When handling heavy weights, use lifting equipment to lift the product and transport it by appropriate means.
- Secure the product against falling during transportation and handling.
- Stand clear of suspended loads.

2.12 Malfunctions

Behavior in case of malfunctions

- Immediately remove the product from operation and report the malfunction to the responsible departments/persons.
- Order appropriately trained personnel to rectify the malfunction.
- Do not recommission the product until the malfunction has been rectified.
- Test the product after a malfunction to establish whether it still functions properly and no increased risks have arisen.

2.13 Disposal

Handling of disposal

The incorrect handling of disposal may impair the product's safety and cause serious injuries as well as considerable material and environmental harm.

- Follow local regulations on dispatching product components for recycling or proper disposal.

2.14 Fundamental dangers

General

- Observe safety distances.
- Never deactivate safety devices.
- Before commissioning the product, take appropriate protective measures to secure the danger zone.
- Disconnect power sources before installation, modification, maintenance, or calibration. Ensure that no residual energy remains in the system.
- If the energy supply is connected, do not move any parts by hand.
- Do not reach into the open mechanism or movement area of the product during operation.

2.15 Notes on particular risks

⚠ WARNING

Risk of injury from objects falling and being ejected!

Falling and ejected objects during operation can lead to serious injury or death.

- Take appropriate protective measures to secure the danger zone.

⚠ WARNING

Risk of injury from crushing and impacts!

Serious injury could occur during the base jaw procedure and when breaking or loosening the gripper fingers.

- Wear suitable protective equipment.
- Do not reach into the open mechanism or the movement area of the product.

⚠ WARNING

Risk of injury due to unexpected movements!

If the power supply is switched on or residual energy remains in the system, components can move unexpectedly and cause serious injuries.

- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.

3 Technical data

3.1 Outer dimensions
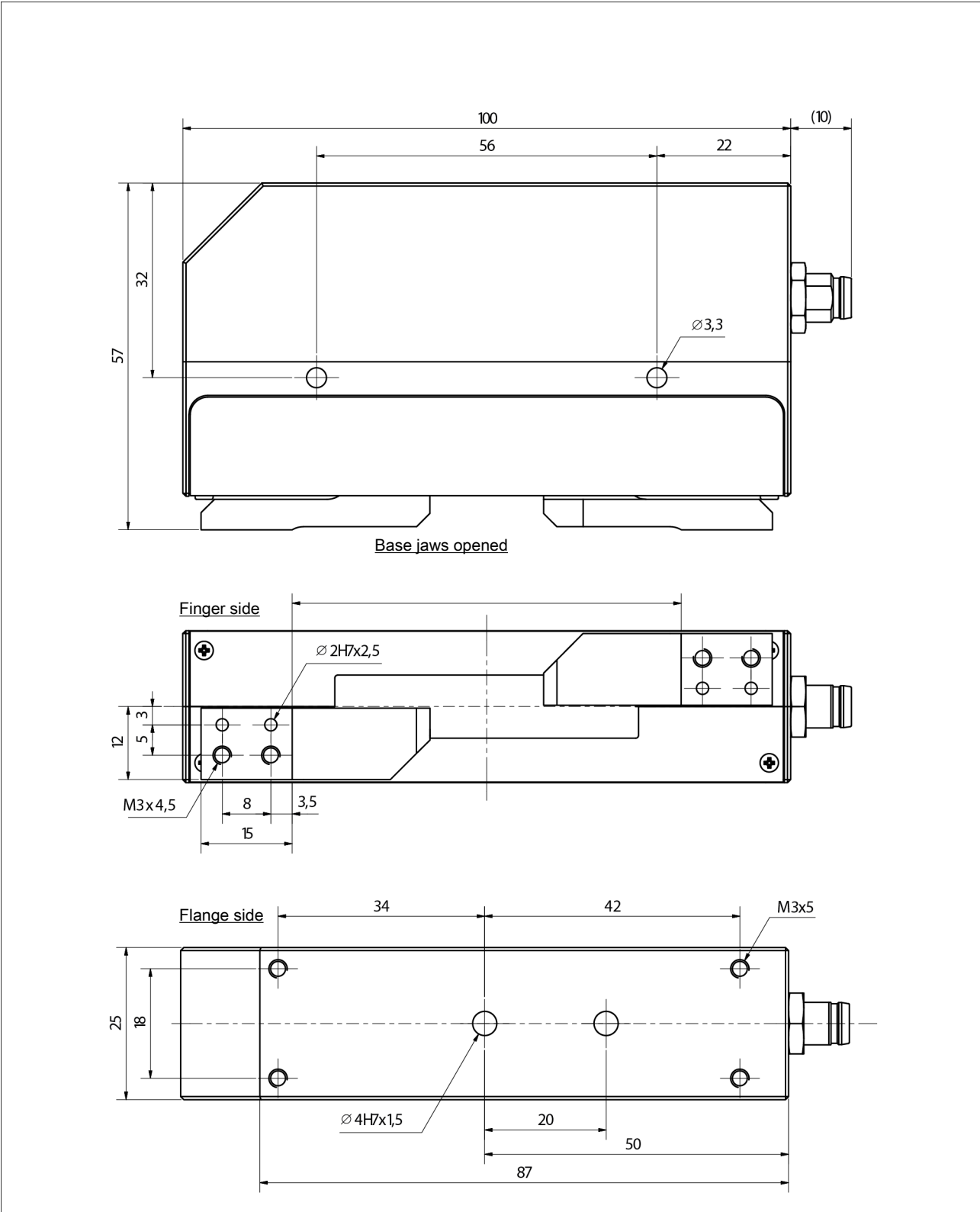
Outer dimensions

3.2 Nominal mechanical data

NOTICE

Exceeding the specified nominal data can damage the product.
- If in doubt, please discuss your application with SCHUNK.

Mechanical operating data	Value	Note
Stroke per finger [mm]	32	
Nominal gripping force [N]	20	
Min. Gripping force [N]	5	gripping speed 5 mm/s, finger length 40 mm, steel on steel
Max. Gripping force [N]	20	gripping speed 50 mm/s, finger length 40 mm, steel on steel
Weight [kg]	0.32	
Recommended workpiece weight [kg]	0.2	
Max. permissible finger length [mm]	50	At nominal force, definition finger length see following figure "Determining the clamping height"
Max. permitted weight per finger [kg]	0.022	
IP rating	40	DIN EN 60529
Ambient temperature [°C] Min. Max.	 5 50	
Air humidity [%] Min. Max.	 0 90	non condensing
Repeatability [mm]	±0.03	3σ-deviation
Gripping speed [mm/s] Min. Max.	 5 300	
Finger acceleration [mm/s^2] Min. Max.	 100 5000	

Determining the clamping height

Acceleration performance at gripping force 20 N and finger mass 2x22g

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3.2.1 Permitted finger load

The following table shows the permitted load of the finger. The specified load may be applied simultaneously and in addition to the gripping force.

Mechanical Load	Value
Fz [N], max.	30
Mx [Nm], max.	0.55
My [N], max.	0.55
Mz [N], max.	0.3
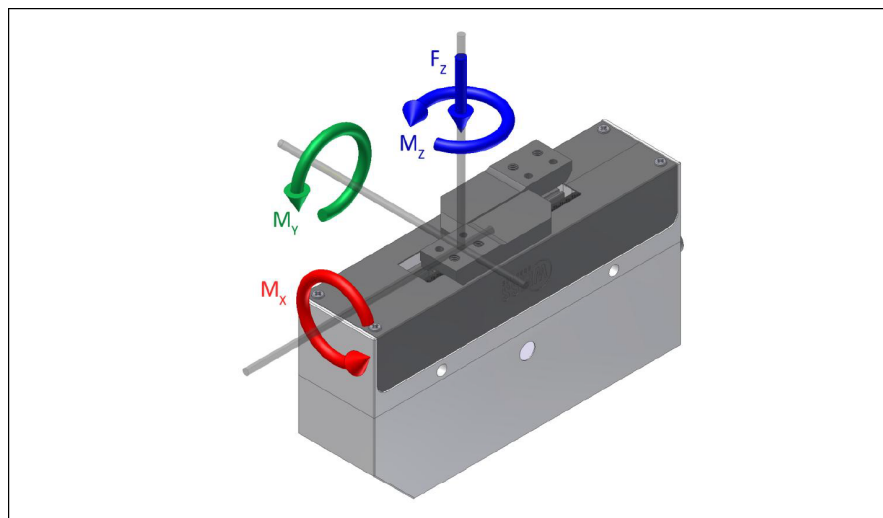
Finger load

3.2.2 Gripping force

The gripping force of the product is factory calibrated. The actual gripping force depends on the gripping speed and the finger length.

NOTE

Depending on stroke and speed of the gripping procedure, the maximum permitted gripping force may exceed the force which is actually achievable.
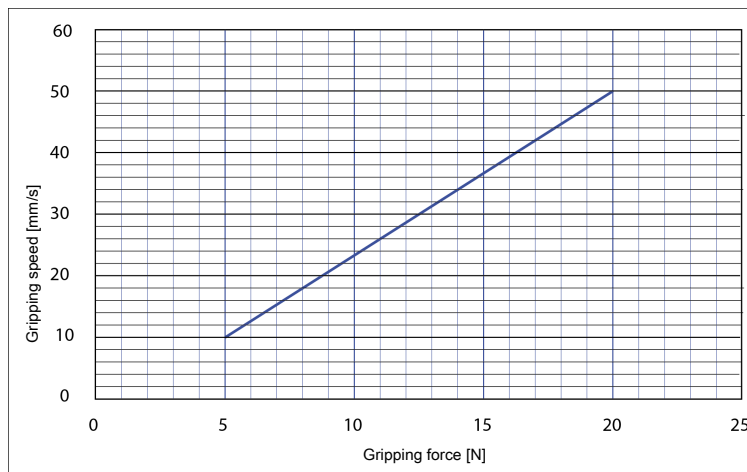
Recommended gripping speed (steel on steel, finger length: 40 mm)
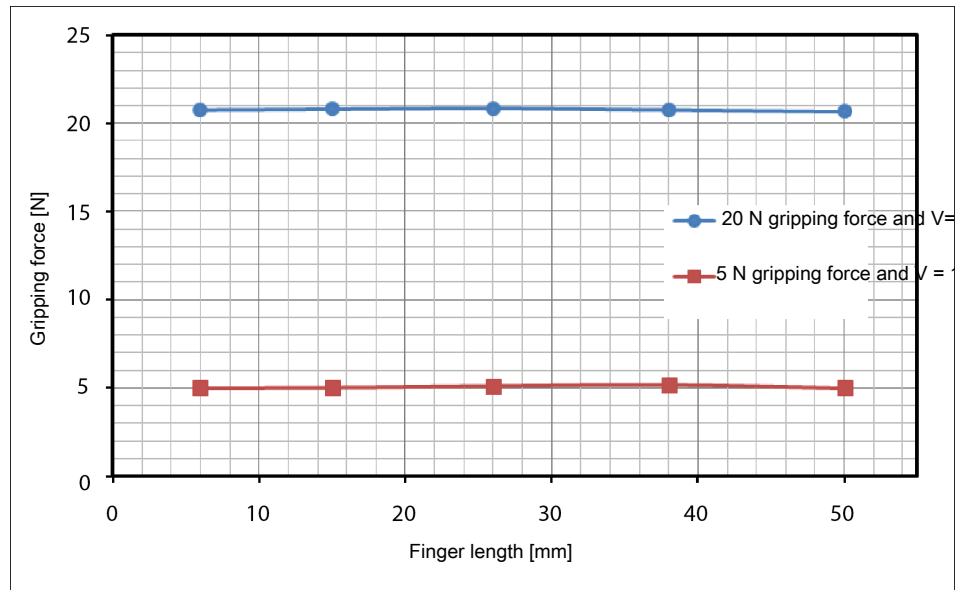
Gripping force in dependency of the finger length (exemple)

Definition of the nominal gripping force
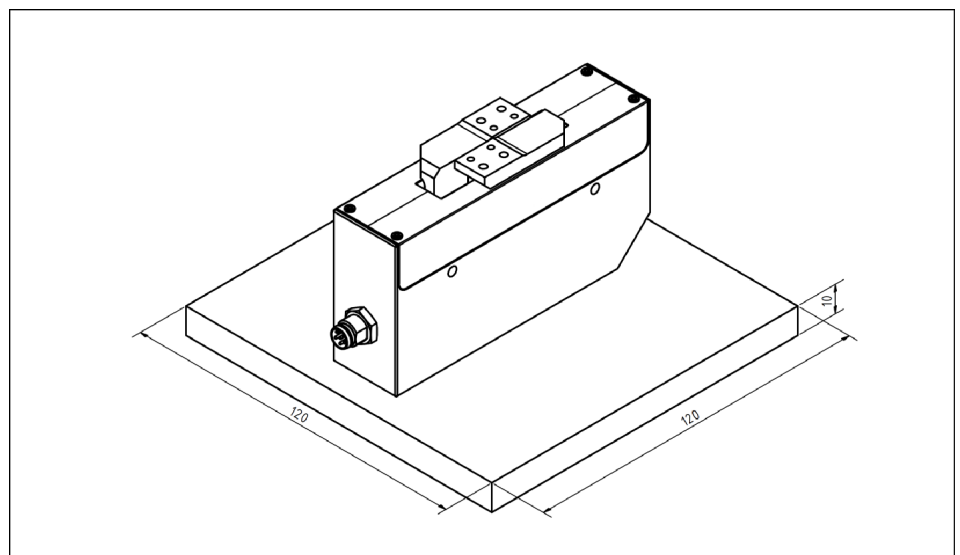
Arrangement for ascertaining the nominal gripping force

To determine the nominal gripping force, the product is non-positively mounted to an aluminum plate, see following figure. The plate itself is thermally insulated from the underlying surface. With an ambient temperature of 22° C the product can hold with the nominal gripping force for at least 5 hours.

NOTICE

Damage to the product is possible!

For high gripping forces or long holding cycles, make sure that heat is well dissipated via the screw contact surface.
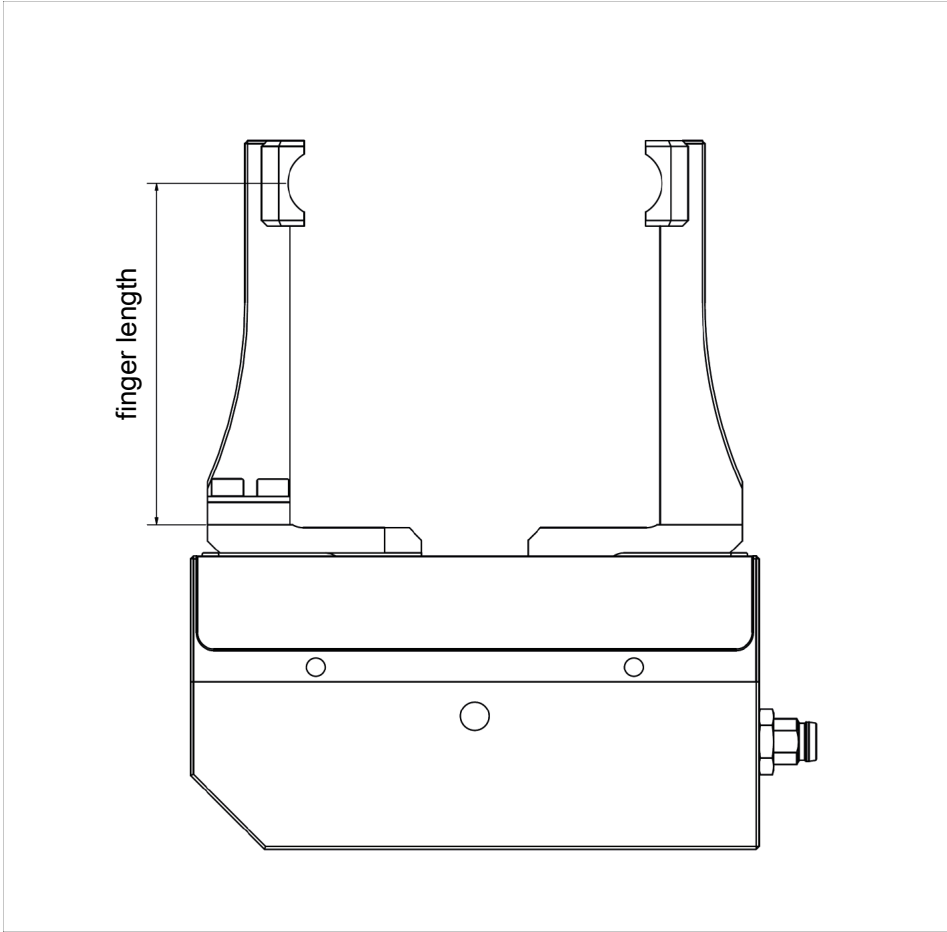
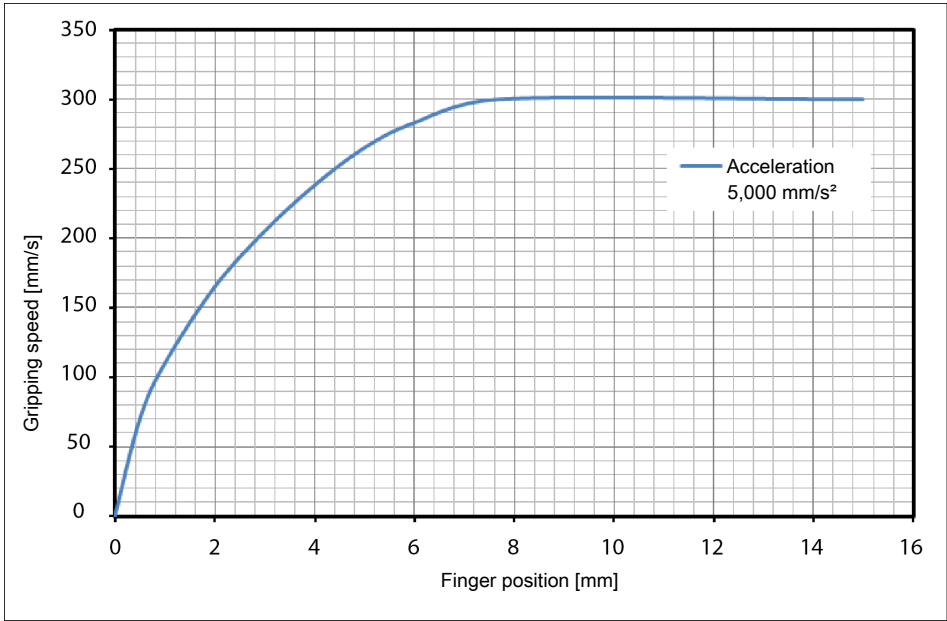### 3.3 Nominal electrical data

> **NOTICE**
>
> **Exceeding the specified nominal data can damage the product.**
> - If in doubt, please discuss your application with SCHUNK.

Electrical operating data	Value	Note
Clamping voltage [V DC]		
Min.	22	
Typ.	24	
Max.	28	
Current drawn when idled [A]	0.1	
Current drawn when holding [A]	0.4	Gripping force=20N
Positioning resolution [µm]	1.09	
Controller	integrated	
Field bus interface	Ethernet TCP/IP	
	Ethernet UDP/IP	
Configuration interface	web based	

3.3.1 Fuse

The product has an integrated fuse to protect against short circuits and incorrect polarity.
To have the fuse changed, please contact SCHUNK (Tel. +49 7133-103-2333).

3.4 Interfaces and connections

The product has an Ethernet-interface for controll. The selection of the communication protocol as well as the configuration of the IP-addresses an ports is effected by the web interface, Configuration and diagnosis via the web interface [▶ 45].

3.4.1 Power supply and Ethernet

The power supply is effected via a 6-way M8 connector on the housing of the product, which carries also the Ethernet interface. This is used both for commanding the product as well as the web-based configuration and diagnosics. The Ehternet interface is galvanically isolated.

Plug position	Wire strand	Signal
1	Brown	+24 V
2	White	GND
3	Blue	ENET-TD+
4	Black	ENET-RD-
5	Gray	ENET-TD-
6	Pink	ENET-RD+
Shielding plate	Shield	

View of device connection plug
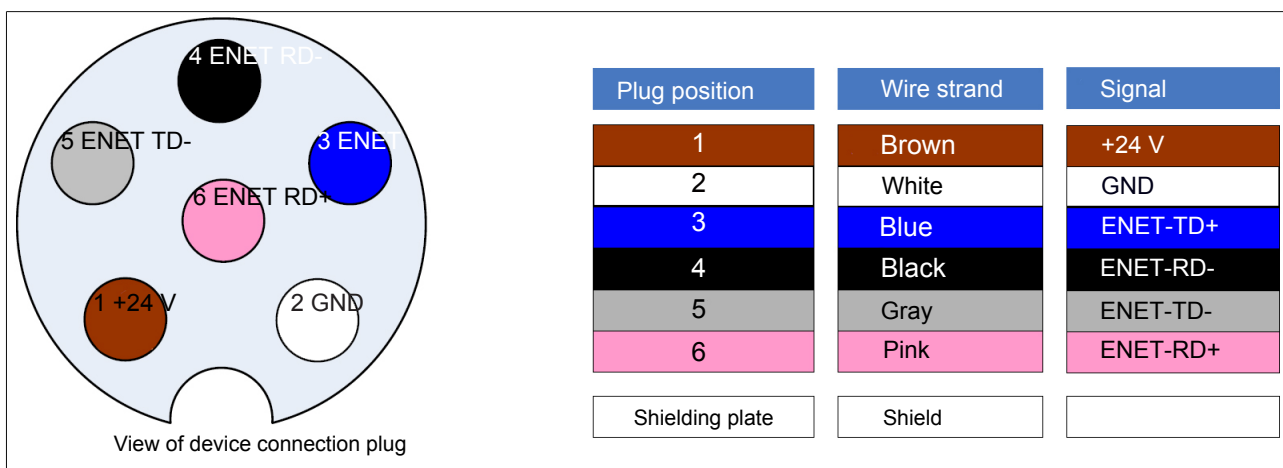
Terminal assignment of the connector

Requirement for the power supply:

- Power supply: 24 V DC ±10%
- Ripple < 150 mV_{SS}
- Available output current: at least 1.5 A

The following cables from SCHUNK are suitable to connect the Ethernet interface:

- Type: KA GLN-0806-PG-0500-R (M8 straight on RJ-45, cable length: 5 m)

NOTICE

Malfunction of the gripper if the cable is manipulated!

Changes to the cable may cause malfunction or failure of the gripper.

- No changes may be made to the cable!

Commands are sent to the product via TCP/IP connections, using the TCP or UDP protocol. For further information, please see the "WSG Command Set Reference Manual" (on the accompanying CD or can be called up via the web interface).

The product currently also supports the following network services:
– DHCP (dynamic IP addresses),
– SNTP (network time),
– HTTP (web user interface) and
– DNS (resolution of host names).

Interface specification:

Parameter	Value	Note
Transmission standard	IEEE 802.3	
Communication standard	TCP/IP (IPv4)	
Transmission speed [MBit/s]	10; 100	Auto-Negotiated
Transmission type	Half duplex	
Auto-MDIX	yes	

3.5 Name plate

The name plate is on the narrow side of the product above the connector. It shows the type and the serial number of the product.

4 Design and description

4.1 Design
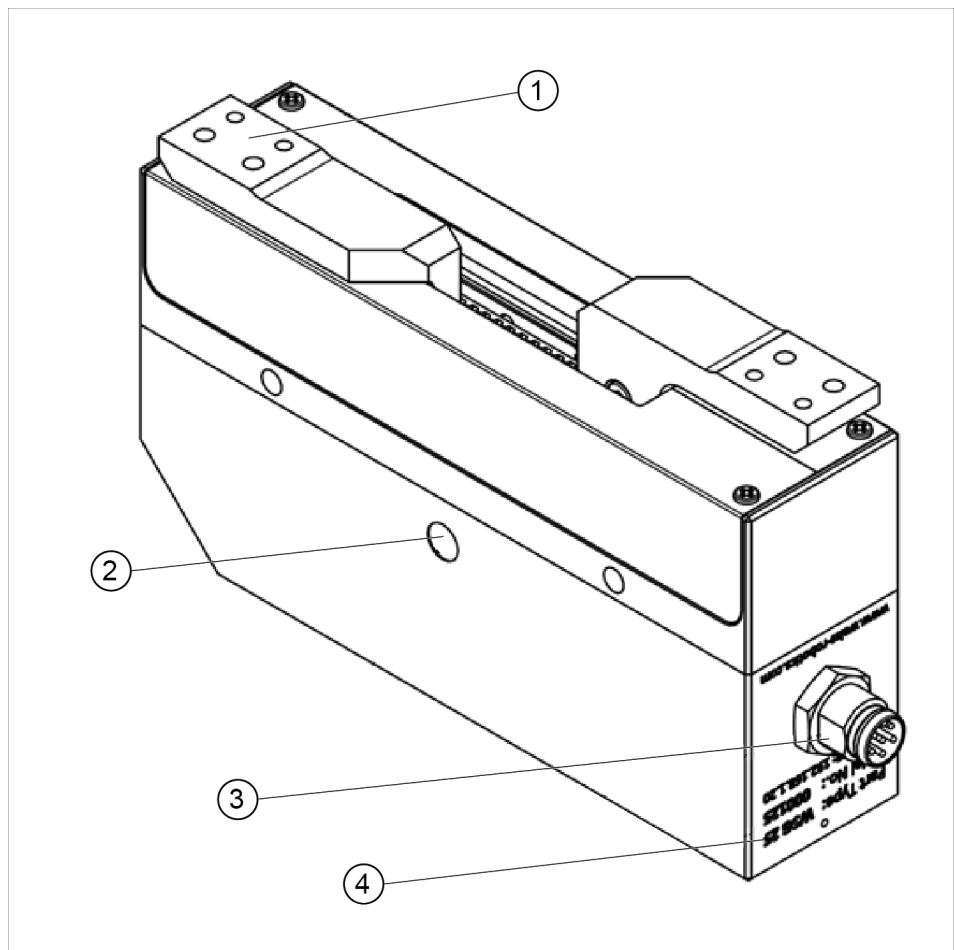
Components and connections WSG 25

Item	Designation
1	Base jaw
2	Display of operating condition
3	Plug connector for power supply an Ethernet
4	Name plate

4.2 Description

The product is a servo-elelctric gripper for small components. It has an integrated control unit supporting the Interfaces: Ethernet TCP/IP. Previous figure shows the connectors and components of the product. The configuration of the product is done via a Web-Interface supporting almost every common web browser.

5 Assembly

5.1 Safety notes

⚠ DANGER

Risk of fatal injury due to electric current!

Touching live parts poses an immediate risk of fatal injury by electrocution.

- Only allow a qualified electrician to perform work on electrical components.
- Prior to commencing work on electric components, restore to a de-energized state.
- In case of damage to the insulation, switch off the power supply immediately and arrange for a repair.
- Keep humidity away from live parts.

⚠ WARNING

Risk of injury due to unexpected movements!

If the power supply is switched on or residual energy remains in the system, components can move unexpectedly and cause serious injuries.

- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.

⚠ WARNING

Risk of burns through contact with hot surfaces!

Surfaces of components can heat up severely during operation. Skin contact with hot surfaces causes severe burns to the skin.

- For all work in the vicinity of hot surfaces, wear safety gloves.
- Before carrying out any work, make sure that all surfaces have cooled down to the ambient temperature.

5.2 Mechanical connection

The threads and centering holes which can be used to mount the product are shown in the following figure.

The product has M3 threads for fixing on the rear of its housing as well as Ø 4 mm centering holes. Additionally the product can be mounted at its side by two through-holes. When in holding mode, the product constantly adjusts the gripping force, to ensure a constant gripping force. The surfaces which are screwed together must be capable of dissipating the resulting heat.

> ### *NOTICE*
>
> **Risk of overheating!**
>
> - Please ensure that the thermal coupling is good, especially if the product is to apply high gripping forces over longer periods of time.
> - Prevent exposure to external sources of heat, such as from your robot's pan-tilt unit, as this can reduce the product's performance.
> - Poor dissipation of heat or exposure to additional heat will require the gripping force to be reduced.

NOTE

To ensure fault-free operation and to minimize the radiation of electromagnetic interference (EMC) the product's housing must be properly earthed.
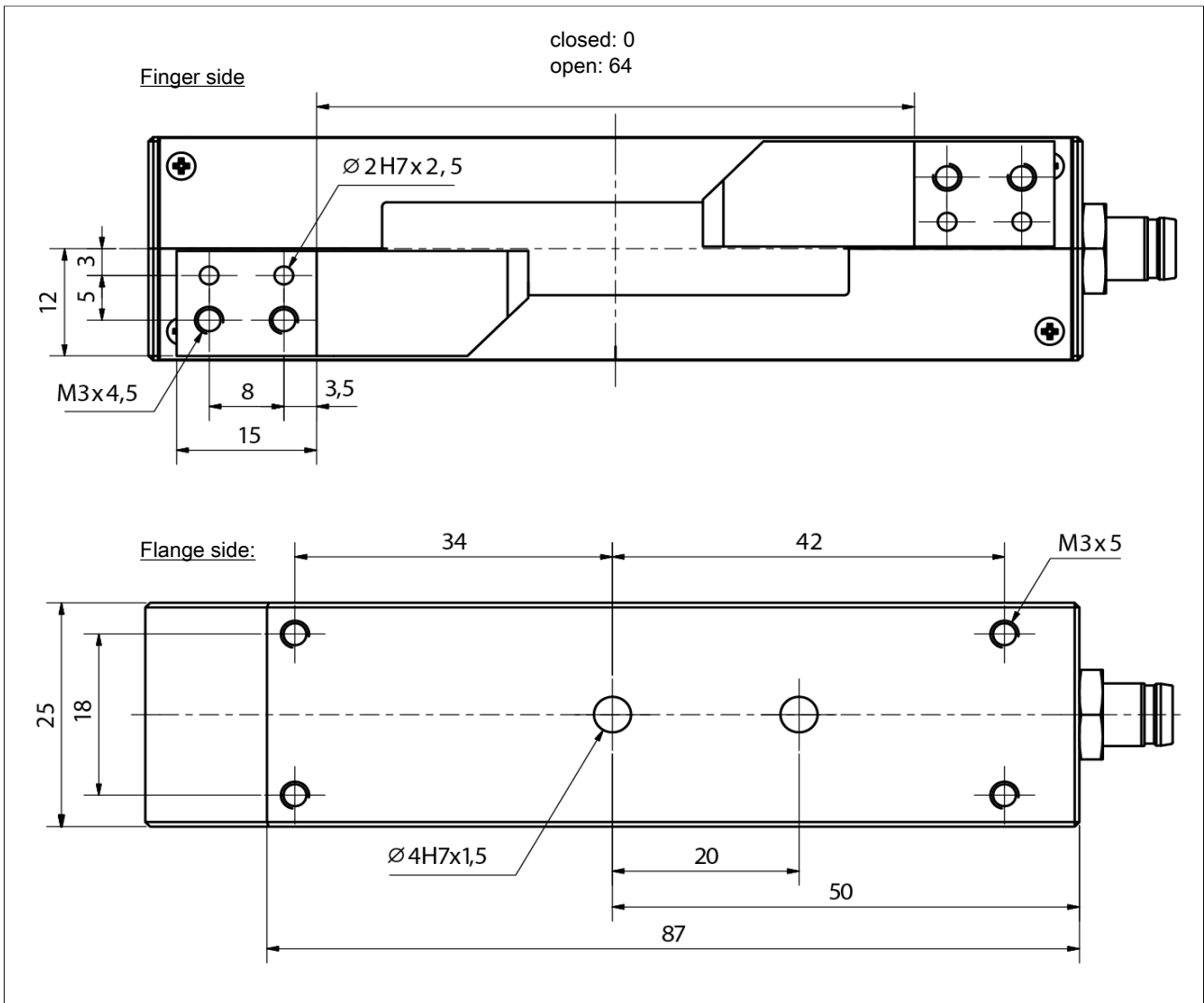
NOTICE

Material damage due to inadmissible tightening torque!

Observe the maximum tightening torque:
– Screw M3: 0.8 Nm

5.3 Installation of the fingers

To install fingers, use two cylinder head screws M3. The lower end of the screw mustn't reach out of the base jaw to prevent damage to the housing. Pins can be used to determine the exact position and orientation.
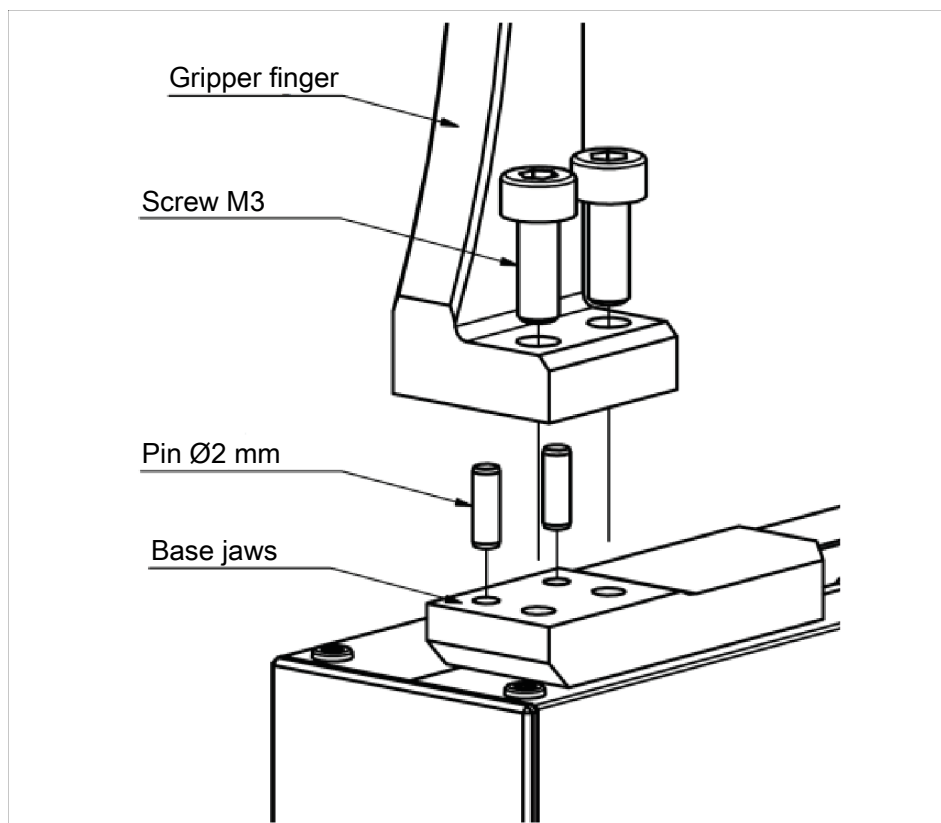
Installation of the fingers

NOTICE

Material damage due to inadmissible tightening torque!

Observe the maximum tightening torque:
– Screw M3: 1.0 Nm

6 Start-up

6.1 Initial commissioning

NOTE

To ensure fault-free operation and to minimize the radiation of electromagnetic interference (EMC) the product's housing must be properly earthed.

When starting up the product for the first time, please follow the steps below:

➢ Using the Ethernet/Power cable, connect the product to the existing Ethernet network of alternatively to the network card in your PC or laptop.

NOTE

- The product's IP address is factory-set to a static value of 192.168.1.20. Should you wish to operate several products in the same network and/or if this address is already in use, then you will have to change the product's IP address accordingly (e.g. set the 2nd product's IP address to 192.168.1.21). To do that, first connect the product directly to computer's network connection, to avoid address conflicts in the network. For more information about changing the IP address: Changing the IP address and using DHCP [▶ 29]
- To directly operate the product on your computer's network connection, you may have to alter your computer's network configuration. If in doubt, contact your system administrator.

➢ Connect your product with the power supply (24 V, 1,5 A).

    ✓ The product will now start up. The indicator for the operating state will light up blue and after about 5 seconds it will start flashing quickly blue. This signals that the product is booting.

    ✓ After about 15 seconds the indicator will slowly flash white. The product is ready for use

➢ On your computer, open the Internet browser and enter the address http://192.168.1.20.

    ✓ You will be presented with the product's configuration interface
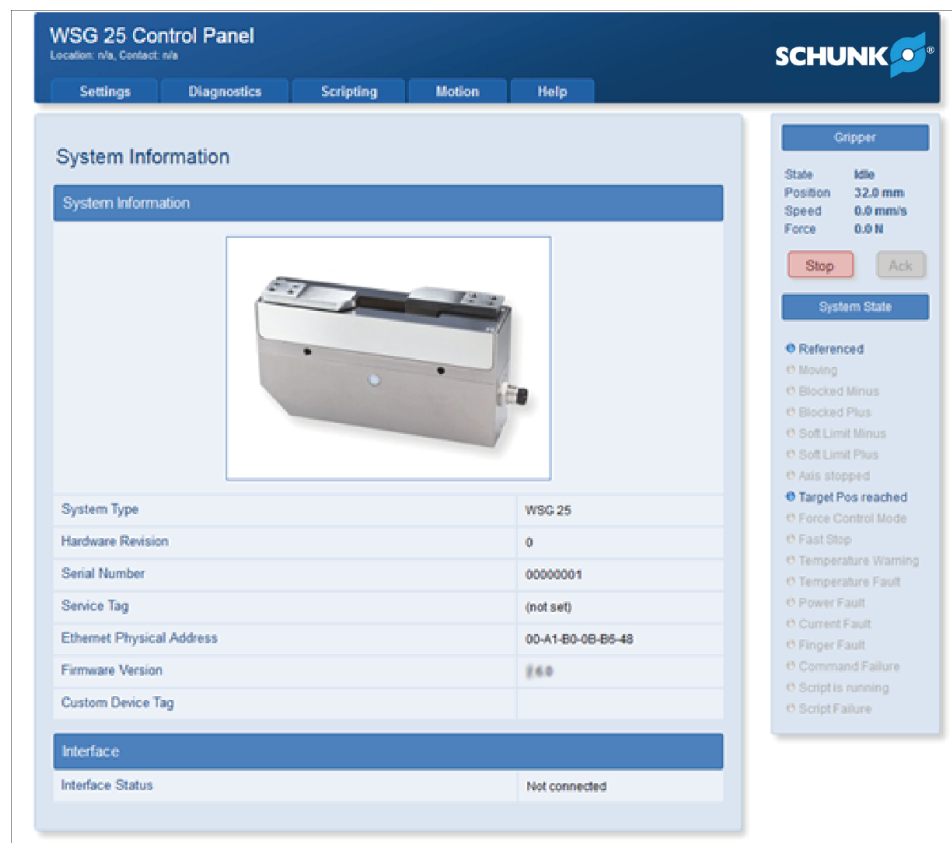
The starting page of the web-based interface

➢ From the menu, select the *Motion -> Manual Control* option and click on the "Home" button

    ✓ The product will now zero itself.
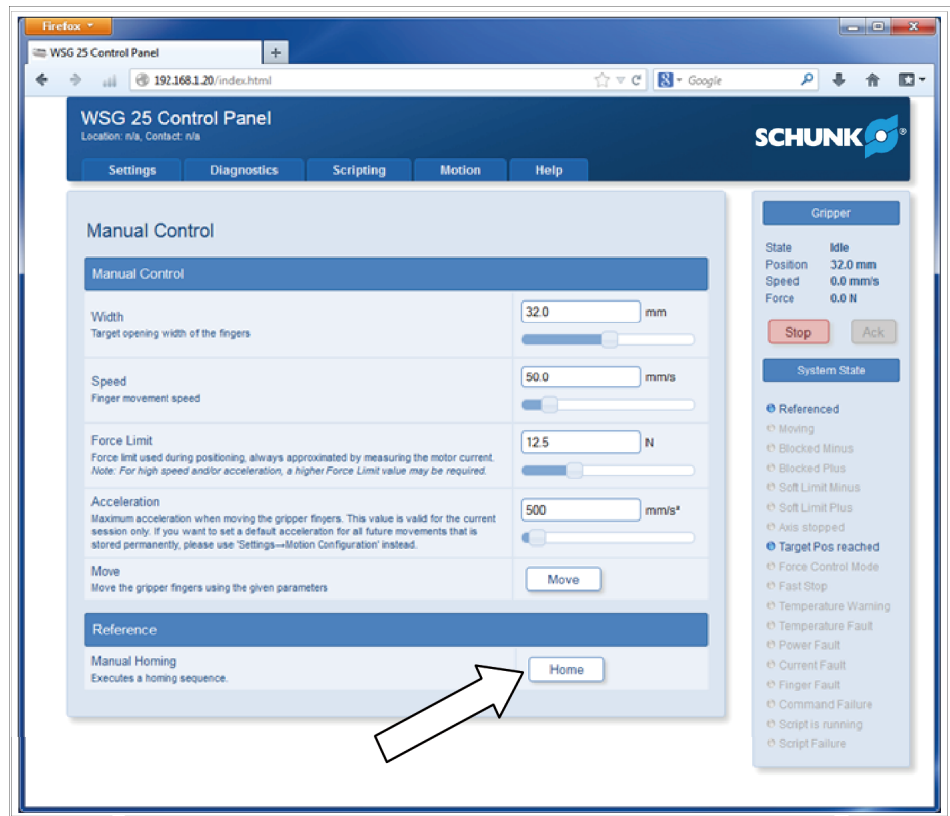
"Manual Control" configuration page

➢ Once the homing sequence has been finished, for test purposes, you can move the product via the web interface. For this, select the movement parameters about the adjuster and then click on the "Move" button.
Important: The product must have been zeroed to be able to execute movement commands.

Other steps which you should take during the commissioning:

➢ Call up the *Diagnostics -> System State* page, to check the product's supply voltage.

➢ On the *Settings -> Command Interface* page, select the protocol on which your product is to be operated.

➢ If necessary, on the *Settings -> Motion Configuration* page enable automatic homing during startup („Homing on Startup")

➢ On the *Settings -> System* page, create a user with corresponding rights and activate the web interface's security function, to prevent changes to your setting by unauthorized persons.

6.2 Changing the IP address and using DHCP

To change the product's IP address, in the web interface, select the *Settings -> Network* option menu. Adjust the IP address, subnet masks and any gateway or DNS server addresses for your local network and confirm the changes by clicking on the "Apply" button.

NOTE

After changing the network configuration you will have to restart the product.

To use addresses dynamically assigned via DHCP, check the corresponding box. In this case the product will automatically take its network configuration from a DHCP server.

NOTE

Please note that if you use DHCP to dynamically allocate IP addresses, there is no integrated way of finding out what IP address has been allocated. This is why the DHCP server should be config-ured so that the product is issued with an IP address which is known in advance
For further information, please contact your network administrator.

7 Operation

7.1 Operating software

The software needed to operate the product is already installed in the unit.

NOTE

- To guarantee proper operation, the latest version of firmware should always be installed in the product.
- ⇨ The latest firmware can be obtained from the SCHUNK.

7.2 Integrated memory

The product's gripper control system has an integrated, non-volatile data memory. This cannot be changed by the user.

The memory chip contains the following data:

- The software needed to operate the product
- Configuration data
- Documentation and software tools (can be called up via the web interface)

7.3 The boot process

The product has a boot loader, which loads and runs the unit's software from the internal storage when the unit is powered up. The indicator for the operating state will light up blue during this. If there is an error, the indicator will light up red for 5 seconds. After that the boot loader will automatically be restarted. This will continue until firmware can be loaded correctly.

7.4 Display of operating state

The product has a multi-colored indicator for the operating state. The current operating state is shown by both the color of the indicator as well as by the flash rate.
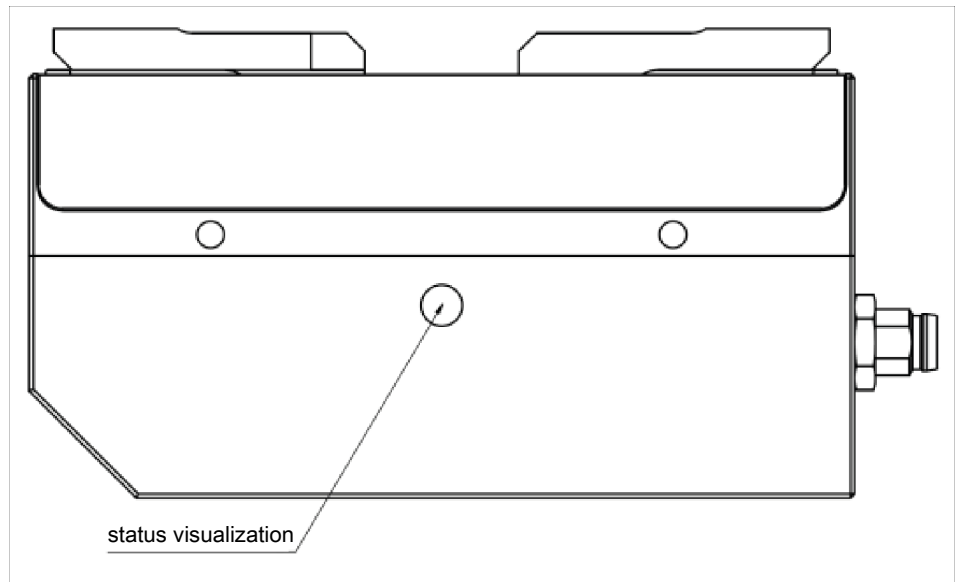
Display of operating state

The following operating states are indicated:

Status	Display
Loading the operating software The product loads the firmware and prepares for the launch.	Blue, constantly on
There was an error loading the operating software The boot process is automatically restarted.	Red for about 5 seconds, then blue again
Boot process for the operating software The operating software will be started and the control system will be configured.	Blue, flashing
Wait state The product is ready for operation and waiting for a command.	White, slowly pulsating
Busy The product is in the initialization phase or is executing a command.	White, quickly pulsating
Not available	Green, quickly pulsating

Status	Display
Warning One or more parameters have reached warning limits. Check the system's status via the web interface.	Yellow, quickly pulsating
Command received with no errors The product has received an error-free command.	Green, pulses once
Error carrying out a command An error has occurred while receiving or executing a command.	Red, pulses once
Critical fault An error has occurred (e.g. excess temperature, loss of communication, etc.) The error must be acknowledged before the product can process new motion commands.	Red, pulses quickly
Critical software fault A serious exception error has occurred and the execution of the software in the device has been stopped. The product starts again after a short period of time.	Red, flash code: 2x short, long break

7.5 Status word and gripper state

The product's current state can be called up at any time via the status word and the gripper state.

7.5.1 Status word

The current status of the product is summarized in a so-called status word. This can be read out via the command interface (command "Get System State", 40h) or the web interface. The following illustration shows the display of the status word via the side bar of the web interface. The status word contains both pure status messages (e.g. referenced etc.) as well as warnings and errors (e.g. temperature warning, power failure, etc.).

NOTE

The documentation for the status word can be found in the manual "WSG command set reference".

Web interface: side bar with system status

7.5.2 Gripper state

The gripper state reflects the current state of the gripper and is used to control the process of gripping. It can take the following states:

State	Description
IDLE	**The gripper is in its idle state**
	No gripping process is currently in progress
GRIPPING	**The gripper is closing**
	A part is being gripped, the fingers are moving towards the part. The detection of gripped items is active.
HOLDING	**A part is being held**
	A part is being held with the configured force. The monitoring of the gripped part has been activated.
PART LOST	**A part has been lost**
	The pre-configured gripping force can no longer be applied, presumably because the part to be gripped has been lost.
NO PART FOUND	**No part has been found**
	When closing the gripper at the configured position, no part was found to be gripped.
RELEASING	**The gripper is opening**
	The gripped part is being released, the fingers are moving.
POSITIONING	**Pre-positioning**
	The gripper is being pre-positioned and the fingers are moving.
ERROR	**Error**
	An error occurred carrying out the last command. For errors which require acknowledgment, the SF_FAST_STOP flag is also set in the system status word.
	After any acknowledgment required, the movement can be restarted.

The gripper's state is shown like the status word in the side bar of the web interface. The following diagram shows the possible transitions between the gripper's states.
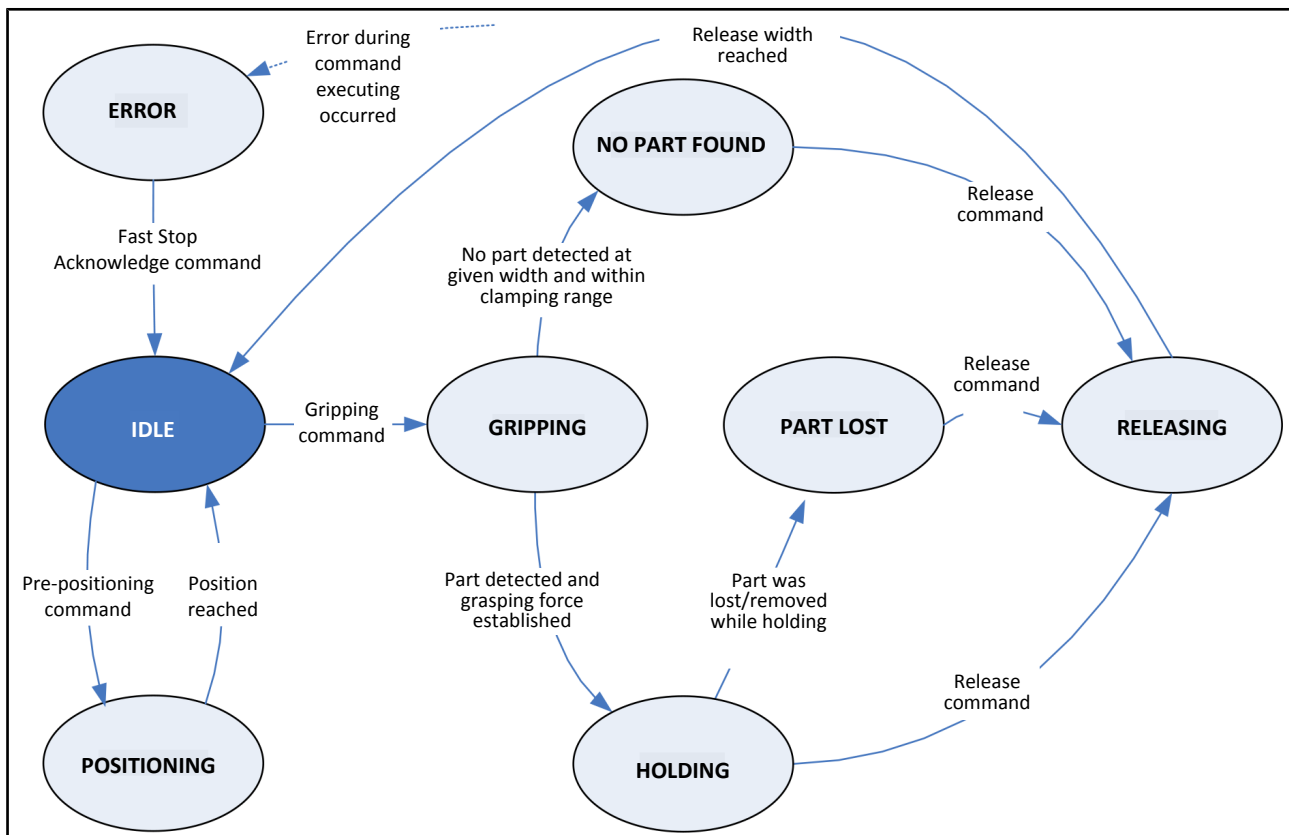
Transitions between the gripping states

Stop command: Issuing a Stop command in any state (except ERROR) will abort the current action and immediately return to IDLE state.

7.6 Homing the product

For position detection, the product is equipped with a measuring system that can detect the finger position with high spatial resolution. Due to the incremental functional principle, the product has to be referenced before motion commands can be executed. The product has a special command for referencing which can be executed via the command interface or manually via the web interface. The product moves its fingers to the block and saves the measured position as a reference value. To offer maximum flexibility, a reference run both inwards and outwards is possible. In the latter case, a factory-calibrated value is used to shift the reference position, so that both variants end up with the same direction and origin of the axis system.

NOTE

- Make sure that the fingers can actually move freely in the respective referencing direction up to the product's mechanical end stop.
- This reference run should always be carried out in the direction of the required positioning accuracy.
- To automatically reference the product on startup, activate the "Homing on Startup" option via the web interface (menu item *Settings -> Motion Configuration*).

7.7 Gripping, detecting parts to be gripped and monitoring the gripping

The product is equipped with an integrated detector for parts to be gripped and a grip monitor, which allows reliable handling even for difficult parts without the use of external sensors. To configure these functions, the following parameters are available on the web interface *Settings -> Motion Configuration*:

Parameter	Description
Part Width Tolerance **("Part Width Tolerance")**	The tolerance of the specified nominal gripper width which is sent to the product with the grasp command. This is measured as the relative gap between two fingers moving towards one another.
Clamping travel **("Clamping Travel")**	If a part to be gripped has been detected, the product will attempt to apply the required gripping force by moving the fingers within this range. This is measured as the relative gap between two fingers moving towards one another.
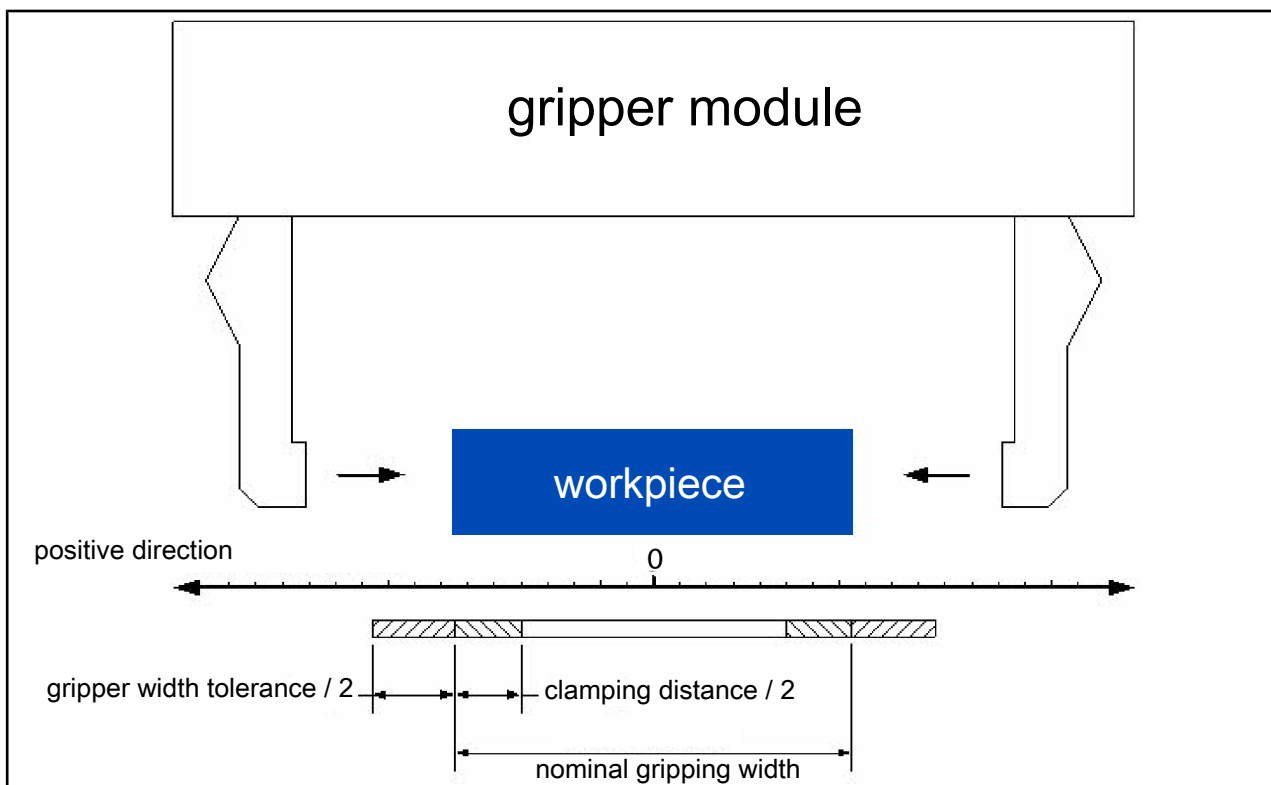
Parameters defining a grip

The figure clarifies the function of these two parameters. A grip is only valid (which means it doesn't create an error) if the detected width of the part lies within the hatched area consisting of the part width tolerance and the clamping travel. If no part is detected, then the gripper state will change to "NO PART FOUND". If a contact is detected outside of the defined range, this will be detected as an axis block and the gripper's state will change to "ERROR".

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NOTE

The detector of parts to be gripped and the grip monitoring are not running in pre-position mode ("Pre-position" command).

NOTICE

Material damage due to insufficient lubrication!

In the case of long-term short travel, it is possible to dry the product.

- Every 1000 movements or at least once per day the product should be moved through its full range of travel.

NOTE

- For soft parts to be gripped, it may be necessary to increase the clamping travel.
- Setting the part width tolerance to the full range of movement of the product (maximum settings) will deactivate the detection of axis blocking when gripping.

7.8 Software limit switch

The traverse path of the product can be limited via the software limit switches. There is one limit switch for an inner range ("MINUS") and one for an outer range ("PLUS"). If the software limit switches have been activated, then positioning commands to move fingers into this range will return a range error and the command will not be executed. There is also protection against exceeding the range limits. The monitoring triggers a fast stop requiring acknowledgment should the fingers move into these areas.

gripper module

prohibited area

working range

prohibited area

working range

prohibited area

software limit switch MINUS

software limit switch PLUS
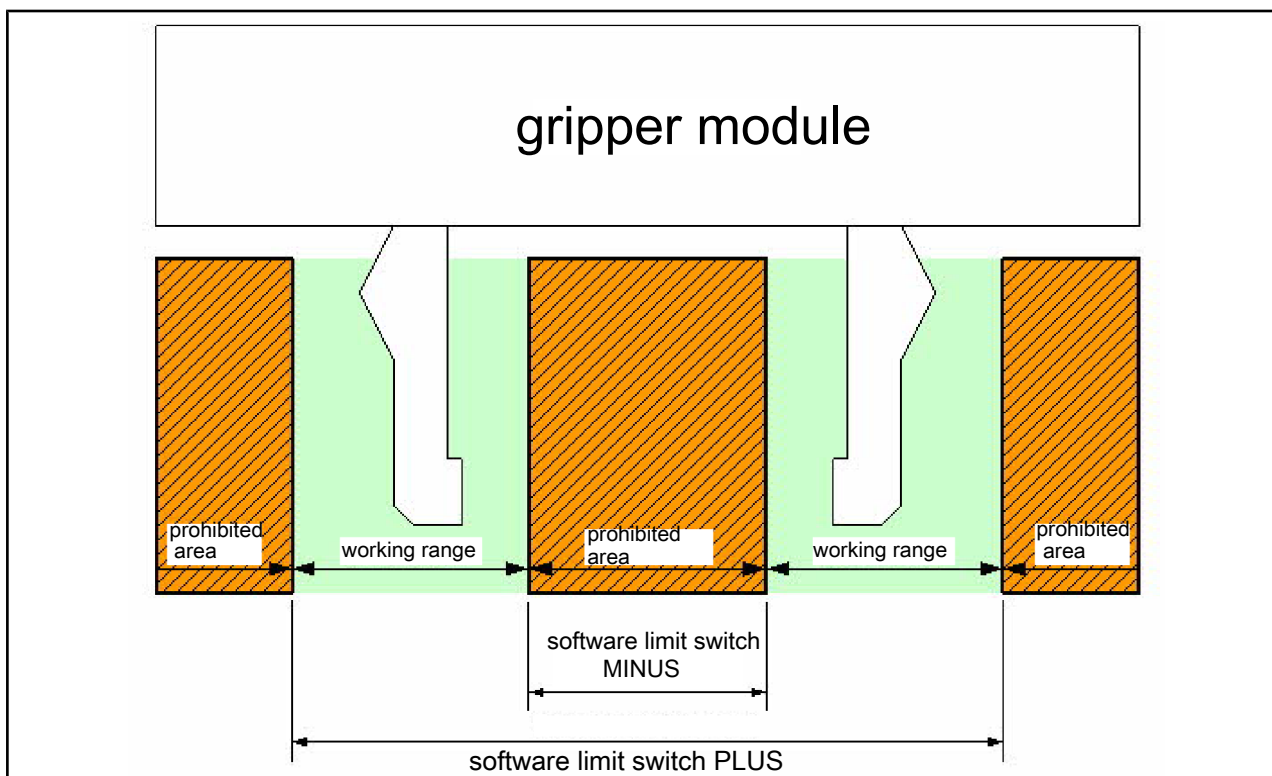
Software limit switch

The software limit switches can be set via the command interface or manually via the web interface (menu item *Settings -> Motion Configuration*).

⚠ WARNING

These software limit switches do not represent a safety function as understood by the machine directive.

NOTICE

The software limit switches always refer to the reference position on the base jaws. Attachments on the base jaws or on the gripper are not taken into account.

NOTE
- If the fingers are within the forbidden area when the software limit switches are activated, then only movements to leave this area will be possible.
- Further information on this topic can be found in the manual "WSG command set reference".

7.9 Fast stops requiring acknowledgment

The product makes a fast stop available, which requires acknowledgment, to put the product into a defined state in case of an error or malfunction. Fast stops are displayed by setting the SF_FAST_STOP flag in the status word. If a fast stop is triggered, for example, due to an undervoltage error, then all motion commands will be deactivated until the error is acknowledged and the fault has been rectified, with corresponding error codes being returned (access denied). If the product performs a fast stop, the drive is switched to a de-energized state and the referencing is preserved. The acknowledgment can be made both via the command interface (command: Acknowledging a FASTSTOP or Fault Condition, 24h) and manually by clicking the "ACK" button in the side bar of the web interface Status word [▶ 33]. Fast stops are recorded in the product's event log Log memory [▶ 42].

> ⚠ **WARNING**
>
> **Loss of gripping power when there is a fast stop.**
>
> Workpieces may fall down and cause severe injuries.
> The fast stop does not represent a safety function as understood by the machine directive.

NOTE

- A fast stop can also be triggered via the command interface or manually via the web interface.
- Further information on this topic can be found in the manual "WSG command set reference".

7.10 Log memory

The product has a non-volatile log memory in which important events can be recorded. The events can be saved with a timestamp and they are sorted in chronological order. If no time of day is available via the network, then the time in milliseconds since the system was started will be used. When the memory is full, the oldest events will be overwritten. The log memory can be read out via the web interface (*Diagnostics ->System State*).

7.11 Thermal monitoring

To protect the product from overheating, its housing is constantly monitored during operation. The current housing temperature can be checked both via the web interface as well as the command interface.

If the temperature measured exceeds the limit of 65 °C, then a temperature warning will be issued. From a housing temperature of 70 °C the product will change into temperature error mode and will switch the power output stage off via a fast stop. This temperature error must be acknowledged via the "Fast Stop Acknowledge" command.

Temperature warnings and errors are recorded in the product's event log memory Log memory [▶ 42].

> ⚠ **WARNING**
>
> **Loss of gripping force on temperature error!**
> Workpieces can fall down and cause serious injury.

NOTE
- This error can only be acknowledged if there is no longer a temperature error.
- The command to read out the current housing temperature and the command to acknowledge the Fast Stop via the command interface are documented in the "WSG Command Set Reference Manual".

7.12 Monitoring the motor current

The drive current is continuously measured and monitored during operation. An integrated motor model is used to check whether the drive is being overloaded or not. In this case, the power output stage will be switched off via a fast stop and a "current fault" will be displayed. The current error must be acknowledged. This can either be done via the web interface or via the command interface using the "Fast Stop Acknowledge" command.

Current errors are recorded in the product's event log Log memory [▶ 42].

⚠ WARNING

Loss of gripping force when there is a current error!

Workpieces can fall down and cause serious injury.

NOTE

• This error can only be acknowledged if there is no longer a current error.
• For the documentation of the command to acknowledge the "Fast Stop" via the command inter-face, see the "WSG Command Set Reference Manual".

7.13 Monitoring the supply voltage

To ensure the correct functioning of the product, the supply voltage to its power section is continuously monitored. If this is outside a defined range, a warning or an error will be issued. The following limits apply:

Threshold	Consequence
V_{DRIVE} <= 20 V	**Low voltage fault** SF_POWER_FAULT will be set in the system's status word and the status indicator will show the error state.
V_{DRIVE} <= 22 V	**Low voltage warning** SF_POWER_WARNING will be set in the system's status word and the status indicator will show the warning state.
V_{DRIVE} >= 26 V	**Excess voltage warning** SF_POWER_WARNING will be set in the system's status word and the status indicator will show the warning state.
V_{DRIVE} >= 28 V	**Excess voltage error** SF_POWER_FAULT will be set in the system's status word and the status indicator will show the error state.

Hysteresis is used to prevent the states chattering to and fro. If there is a voltage error, the power output stage will be switched off using a fast stop and a voltage error will be indicated. This must be acknowledged, but will only be possible when the operating voltage is back in its permissible range. You can do this either via the web interface or via the command interface via the "Fast Stop Acknowledge" command.

⚠ WARNING

Loss of gripper power following an error due to the voltage being too high or too low!

Workpieces can fall down and cause serious injury.

NOTE

• The low voltage fault will also be triggered if the power supply is interrupted when switching the force off, e.g. via an emergency stop relay.
• This error can only be acknowledged when there is no longer a high/low voltage error.
• Futher information of the system status word and of the command to acknowledge the "Fast Stop" via the command interface, see the "WSG Command Set Reference Manual".

7.14 Configuration and diagnosis via the web interface

The product has an integrated web server, with an user interface for configuration and diagnosis. To use this, the product must be connected via Ethernet. To get to the configuration user interface, open a browser and enter the product's IP address (on delivery this is 192.168.1.20) into the browser's address line:
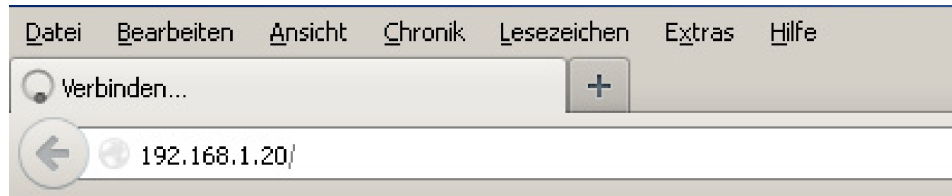
Entering the IP address to start web-based configuration

The following browsers have been tested and support the product's web interface:

- Mozilla Firefox 16 and above
- Google Chrome 23 and above
- Apple Safari 5 and above
- Mobile Safari (iOS 4.3 and above)
- Internet Explorer 8 and above

NOTE

To display the web user interface, JavaScript must be enabled in your browser.
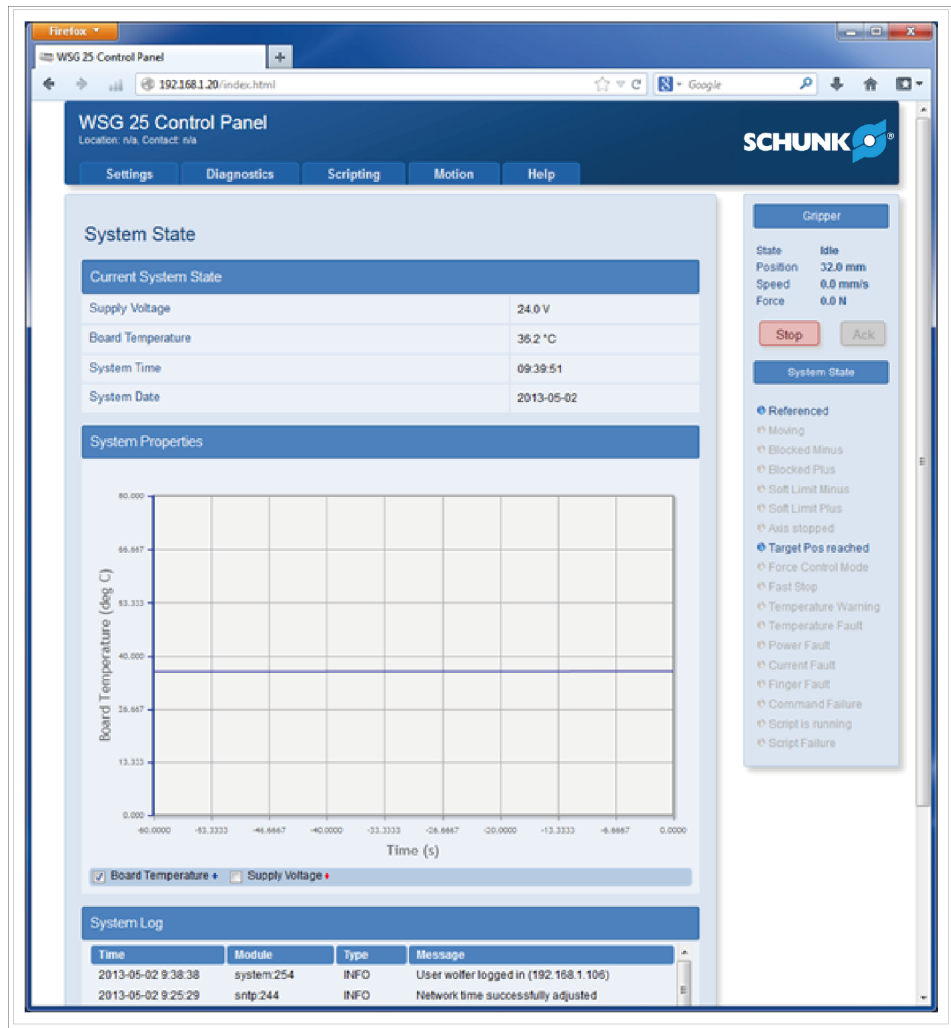
Web interface for configuration and diagnosis

Via integrated help texts, the product's web interface is intuitive to use. In the upper area you will find a menu bar via which the individual pages can be called up.

7.14.1 Access restrictions for the web user interface

Depending on the network configuration, the product will be visible to everyone in the entire network and the configuration can thus be altered unchecked.

To restrict access to the product's web interface, under *Settings -> System Configuration* you can activate access restrictions for the interface and create users with differing access rights.
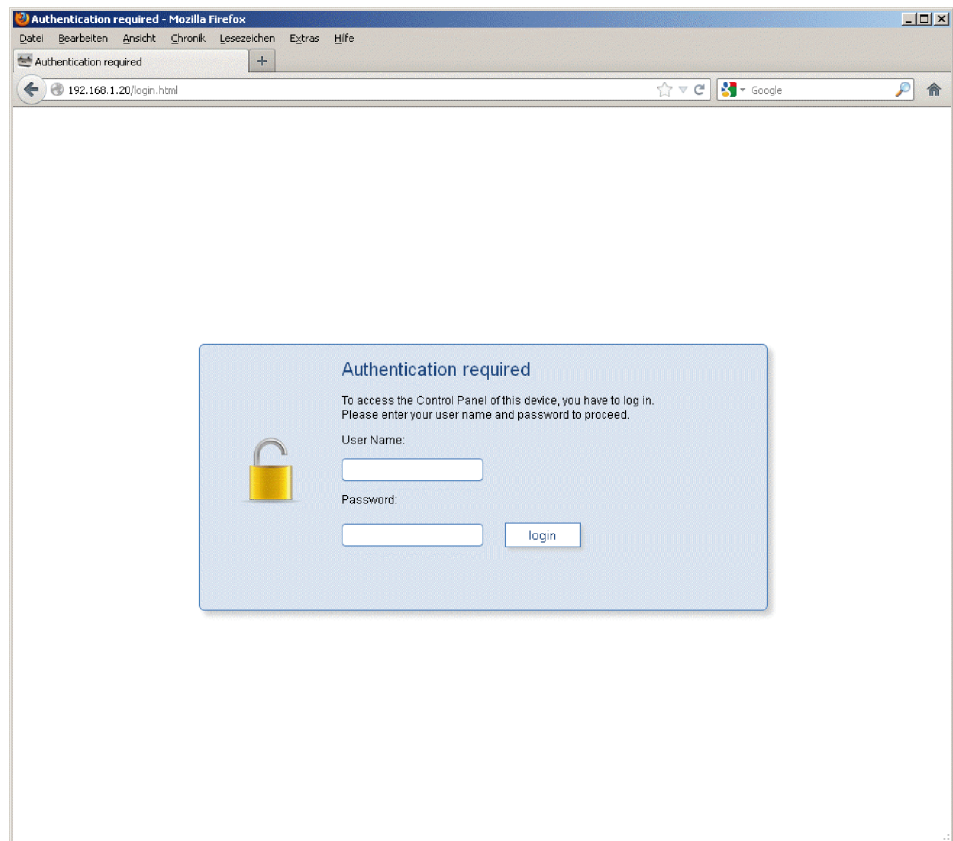
Login screen

If this is activated, each user must be identified with a login name and personal password.

Every user is assigned to one of the following user groups:

- **User**

  Standard user: Cannot adjust settings, but can only access the pages under the menu options "Diagnostics" and "Help".

- **Administrator**

  Administrator: Can adjust all of the product's settings without restriction.

NOTE

If access restrictions have been activated, then the product will record which user logs in and when.

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7.15 Command interface

The product supports control via Ethernet TCP/IP and UDP/IP. Both support a binary communications protocol, which is described in detail in the document "WSG Command Set Reference Manual". The command interface is selected and configured via the product's web interface, via the menu option *Settings -> Command Interface*.

7.16 Resetting the configuration

Via the *Settings -> System* page, the product's configuration can be reset to its state on delivery. Should the configuration interface no longer be accessible, for example if the network configuration is faulty, or if you have forgotten your password, please contact SCHUNK technical support.

7.17 Implementing the gripping process

In the following section, the steps are described which are needed for a simple handling cycle (preposition - grip - release). The specified commands relate to the command interface. You will find a detailed description of the commands and parameters in the "WSG Command Set Reference Manual".

Preparatory work:

➢ **Adjust the "Clamping Travel" and "Part Width Tolerance" to the application.**
Description: Gripping, detecting parts to be gripped and monitoring the gripping [▶ 37]

➢ **Perform a test grip.**
You can do this for example via the web interface, menu option *Motion -> Grasping*

Executing the gripping cycle:

➢ **Check whether the gripper has been zeroed (optional)**
If not, run the command "Homing (20h)" and wait until SF_REFERENCED is set in the status word. Request the status word with the command "Get System State (40h)". Error? then error handling.

➢ **Pre-position finger**
Execute the command "Pre-Position Fingers (21h)". Parameters: Opening width and speed. The gripper state changes to "POSITIONING". Wait until the gripper state is "IDLE". Request the gripper state with the command "Get Gripping State (41h)".

➢ **Execute the grip**
Command "Grasp Part (25h)". Parameters: Nominal gripping width, gripping speed, gripping force. The gripper state changes to "GRIPPING". Wait until the gripper state is "HOLDING". Deal with errors if gripper state is "NO PART FOUND" or "ERROR".

➢ **Handling the part**
Periodically request the gripper state and check whether it is still "HOLDING". Deal with errors for "PART LOST" or "ERROR". The periodical requests will not be required if spontaneous messages (see "WSG Command Set Reference Manual") have been activated.

➢ **Releasing the part**
Command "Release Part (26h)". Parameters: Opening width, speed. The gripper state changes to "RELEASING". Wait until the gripper state is "IDLE". Deal with errors on "ERROR".

➢ **Start again at 2.**

Dealing with errors

What to do in case of an error actually depends a lot on the application, but in general requires the user to do something. The following section gives some hints:

➢ **Does the returned status code differ from E_SUCCESS?**
Evaluate the returned status code and eventually request user intervention.

➢ **Gripper status „ERROR"**
Request user intervention. Also: Test whether SF_FAST_STOP is set in the status word. If it is, then request acknowledgment.

➢ **Gripper status „NO PART FOUND"**
Depending on the task, jump over the processing and fetch a new part.

➢ **Gripper status „PART LOST"**
Part lost. If necessary, abort processing and fetch new part or request user intervention.

NOTICE

Material damage due to insufficient lubrication!

In the case of long-term short travel, it is possible to dry the product.

- Every 1000 movements or at least once per day the product should be moved through its full range of travel.

8 Maintenance and cleaning

The maintenance and lubrication intervals must be adapted to the ambient and operating conditions. The following factors should be taken into account here:

- Extreme operating temperatures
- The effects of condensation
- High vibration loading
- Use in a vacuum
- Very dynamic operation
- The effect of foreign substances (e.g. steam, acids, etc.)

Clean the product at regular intervals with a dry cloth to remove all soiling and metal chips. These typically collect in the depressions, on the linear guides for the base jaws and on the edges of the housing.

> ## NOTICE
>
> **Material damage due to insufficient lubrication!**
>
> In the case of long-term short travel, it is possible to dry the product.
>
> - Every 1000 movements or at least once per day the product should be moved through its full range of travel.

9 Troubleshooting

9.1 The gripper jaws don't move

Possible cause	Corrective action
Base jaws jam in housing, e.g. mounting surface is not sufficiently even.	Check the evenness of the mounting surface.
	Loosen the mounting screws of the product and actuate the product again.
A component is broken e.g. due to overloading.	Replace component or send it to SCHUNK for repair.
	Make sure that the product was only used in the context of its defined application parameters.
Operating voltage is not sufficient.	Check the power supply.
	Check requirements on power supply.
Communication not possible.	Check the connections and communications cables.
	Check interface addressing. (e.g. IP address and Port settings).
	Check the connection parameters.
Error message in the system (LEDs on the product are lamping yellow or red).	Check operating state of the product.

9.2 Gripper stops abruptly

Possible cause	Corrective action
Supply voltage is not connected.	Check the power supply.
Communication not possible.	Check the connections and communications cables.
Fast stop	Check the status of the gripper control system.
	Determine the cause of the fast stop and remedy if necessary.
	Acknowledge the fast stop, Fast stops requiring acknowledgment
Error message in the system (the operating state indicators of the product illuminate yellow or red)	Check operating state of the product.

9.3   No connection to the web interface

Possible cause	Corrective action
Supply voltage is not connected.	Check the power supply.
Communication not possible.	Check the connections and communications cables.
	Check network settings on the product.
	Check network settings on the computer.

10 Translation of original declaration of incorporation

in terms of the Directive 2006/42/EG, Annex II, Part 1.B of the European Parliament and of the Council on machinery.

Manufacturer/	SCHUNK GmbH & Co. KG Spann- und Greiftechnik
Distributor	Bahnhofstr. 106 – 134
	D-74348 Lauffen/Neckar

We hereby declare that on the date of the declaration the following partly completed machine complied with all basic safety and health regulations found in the directive 2006/42/EC of the European Parliament and of the Council on machinery. The declaration is rendered invalid if modifications are made to the product.

| Product designation: | Servo-electric 2-finger parallel gripper / WSG 25 / electric |
| ID number | 0306170 |

The partly completed machine may not be put into operation until conformity of the machine into which the partly completed machine is to be installed with the provisions of the Machinery Directive (2006/42/EC) is confirmed.

Applied harmonized standards, especially:

| EN ISO 12100:2010 | Safety of machinery - General principles for design - |
| | Risk assessment and risk reduction |

The manufacturer agrees to forward on demand the relevant technical documentation for the partly completed machinery in electronic form to national authorities.

The relevant technical documentation according to Annex VII, Part B, belonging to the partly completed machinery, has been created.

Person authorized to compile the technical documentation:
Robert Leuthner, Address: see manufacturer's address

Signature: see original declaration

Lauffen/Neckar, June 2019

p.p. Ralf Winkler,
Manager for development
of gripping system components

10.1 Annex to Declaration of Incorporation

according 2006/42/EG, Annex II, No. 1 B

1.Description of the essential health and safety requirements pursuant to 2006/42/EC, Annex I that are applicable and that have been fulfilled with:

Product designation	Servo-electric 2-finger parallel gripper
Type designation	WSG 25
ID number	0306170

To be provided by the System Integrator for the overall machine ⇓			
Fulfilled for the scope of the partly completed machine ⇓			
Not relevant ⇓			

1.1	**Essential Requirements**			
1.1.1	Definitions		X	
1.1.2	Principles of safety integration		X	
1.1.3	Materials and products		X	
1.1.4	Lighting		X	
1.1.5	Design of machinery to facilitate its handling		X	
1.1.6	Ergonomics		X	
1.1.7	Operating positions			X
1.1.8	Seating			X

1.2	**Control Systems**			
1.2.1	Safety and reliability of control systems		X	
1.2.2	Control devices		X	
1.2.3	Starting		X	
1.2.4	Stopping		X	
1.2.4.1	Normal stop		X	
1.2.4.2	Operational stop		X	
1.2.4.3	Emergency stop		X	
1.2.4.4	Assembly of machinery		X	
1.2.5	Selection of control or operating modes		X	
1.2.6	Failure of the power supply			X

1.3	**Protection against mechanical hazards**			
1.3.1	Risk of loss of stability			X
1.3.2	Risk of break-up during operation			X
1.3.3	Risks due to falling or ejected objects			X
1.3.4	Risks due to surfaces, edges or angles		X	
1.3.5	Risks related to combined machinery			X
1.3.6	Risks related to variations in operating conditions			X

1.3	**Protection against mechanical hazards**			
1.3.7	Risks related to moving parts		X	
1.3.8	Choice of protection against risks arising from moving parts			X
1.3.8.1	Moving transmission parts		X	
1.3.8.2	Moving parts involved in the process			X
1.3.9	Risks of uncontrolled movements			X

1.4	**Required characteristics of guards and protective devices**			
1.4.1	General requirements			X
1.4.2	Special requirements for guards			X
1.4.2.1	Fixed guards			X
1.4.2.2	Interlocking movable guards			X
1.4.2.3	Adjustable guards restricting access			X
1.4.3	Special requirements for protective devices			X

1.5	**Risks due to other hazards**			
1.5.1	Electricity supply		X	
1.5.2	Static electricity		X	
1.5.3	Energy supply other than electricity		X	
1.5.4	Errors of fitting		X	
1.5.5	Extreme temperatures			X
1.5.6	Fire			X
1.5.7	Explosion			X
1.5.8	Noise			X
1.5.9	Vibrations			X
1.5.10	Radiation	X		
1.5.11	External radiation	X		
1.5.12	Laser radiation	X		
1.5.13	Emissions of hazardous materials and substances			X
1.5.14	Risk of being trapped in a machine	X		
1.5.15	Risk of slipping, tripping or falling	X		
1.5.16	Lightning			X

1.6	**Maintenance**			
1.6.1	Machinery maintenance		X	
1.6.2	Access to operating positions and servicing points		X	
1.6.3	Isolation of energy sources		X	
1.6.4	Operator intervention		X	
1.6.5	Cleaning of internal parts		X	

1.7	Information			
1.7.1	Information and warnings on the machinery		X	
1.7.1.1	Information and information devices		X	
1.7.1.2	Warning devices		X	
1.7.2	Warning of residual risks		X	
1.7.3	Marking of machinery	X		
1.7.4	Instructions	X		
1.7.4.1	General principles for the drafting of instructions	X		
1.7.4.2	Contents of the instructions	X		
1.7.4.3	Sales literature	X		

	The classification from Annex 1 is to be supplemented from here forward.			
2	Supplementary essential health and safety requirements for certain categories of machinery			X
2.1	Foodstuffs machinery and machinery for cosmetics or pharmaceutical products			X
2.2	Portable hand-held and/or guided machinery			X
2.2.1	Portable fixing and other impact machinery			X
2.3	Machinery for working wood and material with similar physical characteristics			X
3	Supplementary essential health and safety requirements to offset hazards due to the mobility of machinery		X	
4	Supplementary essential health and safety requirements to offset hazards due to lifting operations		X	
5	Supplementary essential health and safety requirements for machinery intended for underground work			X
6	Supplementary essential health and safety requirements for machinery presenting particular hazards due to the lifting of persons		X	