5-Finger Hand
SVH

Assembly and Operating Manual

Imprint

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

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Dear customer,

congratulations on choosing a SCHUNK product. By choosing SCHUNK, you have opted for the highest precision, top quality and best service.

You are going to increase the process reliability of your production and achieve best machining results – to the customer's complete satisfaction.

SCHUNK products are inspiring.

Our detailed assembly and operation manual will support you.

Do you have further questions? You may contact us at any time – even after purchase.

Kindest Regards

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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 (☞ 1.1.2, Page 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.

1.1.2 Applicable documents

- General terms of business *
- Mecovis protocol description/interface description
- Instructions for GUI diagnostics
- SVH_Protocoll_Specification_v0 4

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

Additional information is available on the enclosed CD.

1.1.3 Variants

This operating manual applies to the following variations:

- SVH right
- SVH left

1.2 Warranty

If the product is used as intended, the warranty is valid for 12 months from the ex-works delivery date under the following conditions:

- Intended use in 1-shift operation (200 working days at 8 operating hours, max. 1600 operating hours)
- Observe the specified maintenance intervals, (☞ 8, Page 31)
- Observe the ambient conditions and operating conditions (☞ 2.3, Page 9)

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

After the warranty period has expired, SCHUNK can no longer guarantee safety features without first performing a maintenance service.

1.3 Scope of delivery

The scope of delivery includes

- Servo-electric 5-Finger Gripping Hand SVH in the version ordered
- Operating manual
- Mecovis parameter set
- Assembly board (integrated: BananaPI, USB Isolator, Brainbox, FWK-ISO 115, var. cables)
- Power supply unit and cable
- Zarges boxes (packaging material)
- CD (software)

The enclosed CD contains:

Directory	Contents
Brainbox	• Manufacturer documents (software and documentation) for Brainbox (RS485/USB interface converter)
Mecovis software	• Installation files for the Mecovis software
SVH_Manuals	• BananaPI user interface • Instructions for Interactive Diagnosis and Control GUI for SCHUNK SVH • Protocol specification for SCHUNK Five Finger Hand • Mecovis S5FH-controller user's guide • DOF Diagram/range of movement/joint torque • Schunk Readme

CD content may change in line with technological developments.

2 Basic safety notes

2.1 Intended use

The product features a multi-functional design intended for gripping objects ranging from 1-850 g.
It is important to ensure that no fragile, sharp or sharp-edged objects, or objects with an edge length of over 50 cm are handled.

- Gripping objects of a higher weight is only permitted after consultation with the manufacturer.
- The product is intended for installation in a machine. The requirements of the applicable guidelines and standards must be observed and complied with. If applicable, it may be required to provide proof of safety for the machine to be used. The safety features of this product were established/certified only for use as described in this operating manual.
- The safety-related information contained in the "Electrical equipment of machines" standard (DIN EN 60204) must be observed. Commissioning is only permitted in compliance with EMC directives (2014/30/EU).
- The product may be used only in the context of its defined application parameters (☞ 3, Page 14).
- The product may only be used within the scope of its technical data, (☞ 3, Page 14).
- The product is intended for industrial use.
- For appropriate use of this unit, it is essential to observe the technical data and assembly and operation notes in this manual and to comply with the maintenance intervals.

2.2 Consequences of inappropriate use

The safety of the product cannot be guaranteed in the event of inappropriate use (i.e. actions carried out in a manner that is not compliant with this operating manual). It is possible for the safety of this product to be permanently impaired/damaged as the result of one single inappropriate use.

Examples of inappropriate use include the product being used as a press tool, being overloaded, or being used in an environment that is not low-dust/dry.

2.3 Ambient conditions 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 has a sufficient size for the application.
- Make sure that the environment is free from splash water and vapors as well as from abrasion or processing dust. Exceptions are products that are designed especially for contaminated environments.

2.4 Product safety

Dangers arise from the product, if:

- the product is not used in accordance with its intended purpose.
- the product is not installed or maintained properly.
- the safety and installation notes are not observed.

Avoid any manner of working that may interfere with the function and operational safety of the product.

Wear protective equipment.

NOTE
More information is contained in the relevant chapters.

NOTE
The availability of the safety functions is ensured only after a full system start.

2.4.1 Protective equipment

Provide protective equipment per EC Machinery Directive.

2.4.2 Structural changes, attachments and modifications

Making constructional changes

Modifications, constructional changes and subsequent work, e.g. additional threads, drill holes and safety devices may impair the operation and safety or damage the product.

- Constructional changes may only be done with SCHUNK's permission.

2.5 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.

Pneumatics specialist Pneumatics specialists have been trained for this particular area of responsibility and know the relevant standards and regulations.

Hydraulic specialist Hydraulic specialists have been trained for this particular area of responsibility and knows 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.

2.6 Personal protective equipment

Using personal protective equipment

Not wearing personal protective equipment while working with the product, may result in dangers that impact the personnel's safety and health.

- While working with the product, observe the health and safety regulations and wear the required personal safety equipment.
- Observe the valid safety and accident prevention regulations.
- In case of sharp edges and corners and rough surfaces, wear pro-tection gloves.
- In case of hot surfaces, wear heat-resistant protection gloves.
- When dealing with hazardous substances, wear protection gloves and goggles.
- In case of moving parts, wear tight protection clothes.

2.7 Notes on particular risks

Generally valid:

- Remove the energy supplies before installation, modification, maintenance, or adjustment work.
- Make sure that no residual energy remains in the system.
- Do not move parts by hand when the energy supply is connected.
- Do not reach into the open mechanism or the movement area of the unit.
- Perform maintenance, modifications, and additions outside the danger zone.
- Secure the product during all operations against uncontrolled activation.
- Take a precautionary approach by maintenance and disassembly.
- Only specially trained staff should disassemble the product.
- Pay attention to the medical fitness levels of the specialist per-sonnel.

⚠ WARNING

Risk of injury due to unexpected movement of the machine/system!

⚠ WARNING

Risk of injury due to hot surfaces!
In high ambient temperatures, it is possible for the product to be exposed to excessive heat, causing the surfaces to become hot.

- Wear protective gloves.
- Allow the product to cool to at least 40°C before touching it.

⚠ WARNING

Risk of injury due to sudden movements in case of EMC malfunctions!
If the EMC directive is not observed when connecting the product, malfunctions in the control units and drives can cause unexpected machine movements.

- Observe the EMC directive when connecting the product.

⚠ WARNING

In case of overload, risk of injury due to sudden movements!
If the product is overloaded, the integrated brake will no longer function properly. This may result in sudden machine movements.

- Operate the product within the specifications defined at all times.

⚠ WARNING

In case of product malfunction, risk of injury due to sudden movements!
Electrical devices are not generally protected against failure.

- Therefore, the user is responsible for ensuring that the machine is brought into a safe state in case of product malfunction.

⚠ WARNING

Risk of injury due to sudden movements in case of electrical malfunctions!
Electrical malfunctions can lead to sudden movements in the machine.

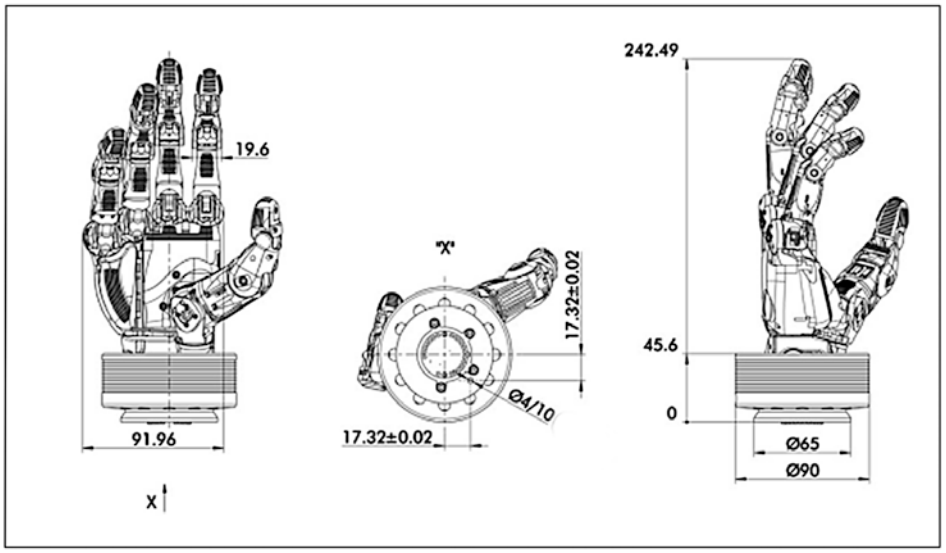
- During transport and handling, do not bend any of the components or change the insulation clearance.
- To avoid damage due to electrostatic charges, do not touch the electrical components.
- Properly execute all grounding, fastening and cabling work in accordance with applicable regulations.

2.8 Notes for integrators

- The integrator must verify that the safety-related parts of the control units meet PL "d" with category 3 structure, as long as a different classification has not emerged from the risk analysis performed by the integrator.
- If the gripper is used on a robot with removable devices and collaborative operation (e.g. wireless emergency stop), the requirements for this must be verified by the integrator.
- The integrator must verify that the static and dynamic forces that are produced jointly by the load and the end effectors are within the robot's bearing load capacity and dynamic performance levels.
- The settings for commissioning the robot must be specified/factored in by the integrator.
- The trade association requirements for hazard and injury prevention in workplaces using collaborative robots must be factored in and verified by the integrator.
- The trade association requirements for the medical fitness and professional qualifications of operating personnel for collaborative robots must be considered and verified by the integrator.
- The MRK robot is to be checked for correct installation after any dangerous collisions. Dangerous collisions means those that are not covered under normal conditions of use (e.g. if the user actively collides with or presses against the gripper contrary to the instructions for use)
- The integrator is to equip the MRK robot system with a category 0 emergency stop pursuant to IEC 60204 -1, which also disables the gripper.

3 Technical data

3.1 Outer dimensions



Dimensions

The right and left hands are laterally inverted. The dimensions are identical.

3.2 Basic data

Designation	SVH	
	Right	Left
ID number	0306456	0306457
Overall length [mm]	242.5	
Hand width [mm]	92	
Max. finger width [mm]	19.6	
Weight [kg]	1.3	
IP rating	20	
Min. ambient temperature [°C]	10	
Max. ambient temperature [°C]	40	
Noise emission [dB(A)]	< 60	
Number of joints	20	

3.3 Electrical operating data

Designation	SVH
Power supply	24 V DC ±5%
Max. current input	3.5 A
Sensor system	-
Interfaces	• FWA115 flat change system • RS 485

3.4 Data assembly board

Designation	Value
ID number	5524201
Dimensions L x B x H [mm]	300 x 300 x 85
Supply voltage [VDC]	24 ± 5%
Max. Power consumption [A]	3.75
Operating elements	• Illuminated ON/OFF push buttons • USB/Ethernet toggle switch
Weight [kg]	2.7
Single-board computer	BananaPI with SD slot
Interfaces	• Flat change system • Socket for external power supply unit • USB socket • Ethernet socket

3.5 Name plate

The name plate is placed in the interior on the heat sink.

4 Design and description

The 5-finger gripping hand SVH comes with an assembly board for demonstration and testing purposes.

4.1 5-Finger Gripping Hand

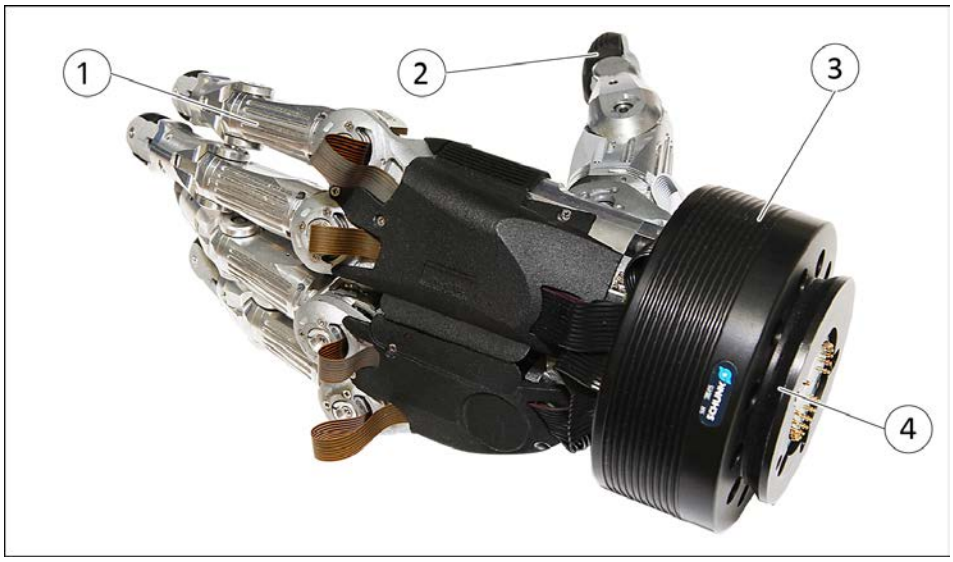
The 5-finger gripping hand SVH is a servo-electric gripping module with integrated control and regulation electronics that is largely a recreation of the human hand.

The 5-finger gripping hand was designed SVH to be attached to a standard LWA 4P or LWA 4D lightweight arm.

The defined mechanical and electrical interface also makes it possible to attach it to other commercially available industrial and lightweight robots.

In this case, the 5-finger gripping hand SVH must always be operated within its technical specifications, (☞ 3, Page 14).

The 5-finger gripping hand SVH is available in two designs, corresponding to the right and left human hands. The dimensions and operating data are identical for both designs.



Overall View of the 5-Finger Hand SVH

1	Fingers	3	Wrist
2	Thumbs	4	Flat change system

The 5-finger gripping hand SVH is suitable for mobile applications thanks to its design and low power consumption; also with accumulator power supply.
Possible movements include:

- Bending and extending the fingers
- Spreading out the hand
- Pivoting and bending the thumb

A slip-resistant, elastic gripping surface on the fingers and thumbs allow objects to be gripped securely.

A total of 9 drive motors control the movements of the 5-finger gripping hand's fingers and thumb. SVH.

The control, regulation and power electronics are integrated into the wrist of the 5-finger gripping hand SVH .

Attaching it to a lightweight arm or to another application is possible via the SCHUNK flat change system.

The power supply and control lines for the 5-finger gripping hand SVH are connected to the flat exchange system's adapter boards with spring contacts.

The 5-finger gripping hand SVH can either operate on the assembly board included or on another piece of equipment (connection via the FWK115-ISO flat change system), (☞ 5, Page 19).

4.2 Assembly board

For initial commissioning, demonstrations, test runs or software development, the 5-finger gripping hand SVH can be mounted and operated on the assembly board included.

A toggle switch switches between the USB and Ethernet interfaces.

Firstly, the 5-finger gripping can be controlled via the USB interface. In this case, the Mecovis company software provided is used. This software is only intended for demonstration purposes, not for use with products in continuous operation.

The software is not supported by SCHUNK.

When controlling the 5-finger gripping hand via the Ethernet interface, the SCHUNK diagnostics and control GUI is used.

Assembly board with operating and control panels

1	FWK-ISO 115 flat change system	4	Ethernet connection
2	Connection for the "Power IN 24 VDC" network device	5	USB/Ethernet toggle switch
3	Illuminated ON/OFF push buttons	6	USB connection

The assembly board is basically comprised of:

- the operating and control panels
- BananaPI (single-board computer)
- RS485/USB interface converter
- USB Isolator
- FWK115-ISO flat change system

5 Assembly and installation

⚠ WARNING

Risk of injury when the machine/system moves unexpectedly!
Switch off power supply.

NOTE
Depending on the application, it can be useful to perform basic configuration steps before the mechanical installation.

Recommended tool: hexagon socket wrench, size 5

NOTICE

Risk of damage when using screws that are too long!

- Observe the maximum depth of engagement permitted for the mounting screws.

NOTICE

Risk of damage when using unsuitable connecting elements!

- SCHUNK recommends using SCHUNK connecting elements.

Check the flatness of the bolting surface

The values refer to the entire bolting surface.

NOTICE

Risk of operational malfunction due to torn or pinched lines!
If electrical lines are too short or installed incorrectly, they may become pinched or torn by the movement of the module.

- Factor in operating movements when connecting the module.

NOTICE

Risk of operational malfunction due to short circuit or incorrect connections!

- Before connecting, ensure that the electrical lines are de-energized.
- Be sure to distribute the clamps correctly.

NOTICE

Permanent damage to the electronics possible!

- If the power supply is separated, carry out potential equalization between the two supply voltages (join the grounds).
- Only the positive pole may be switched off; the GND motor cable must always remain connected.

NOTE

In order to supply the hand with energy, a power supply unit must be used that is able to supply sufficient power for the hand. Make sure the dimensions of the cable cross-section are adequate when cabling.

The assembly and installation of the SVH 5-finger gripping hand are different for the configurations listed below.

Operating on the assembly board

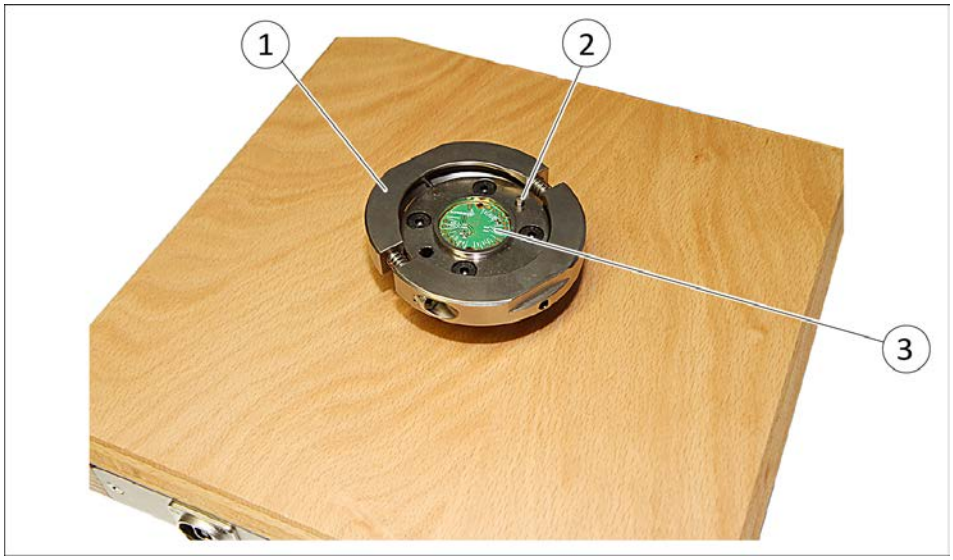
- Demonstration mode with SCHUNK Diagnostics and Control GUI
- Extended use on assembly board
- Free programming using the Mecovis software, for further information see enclosed CD.

Operating on an external robot arm

- Mounting with the FWK11-ISO flat change system
- Free programming
- The operator is responsible for the mechanical connection, electrical connection and software used.

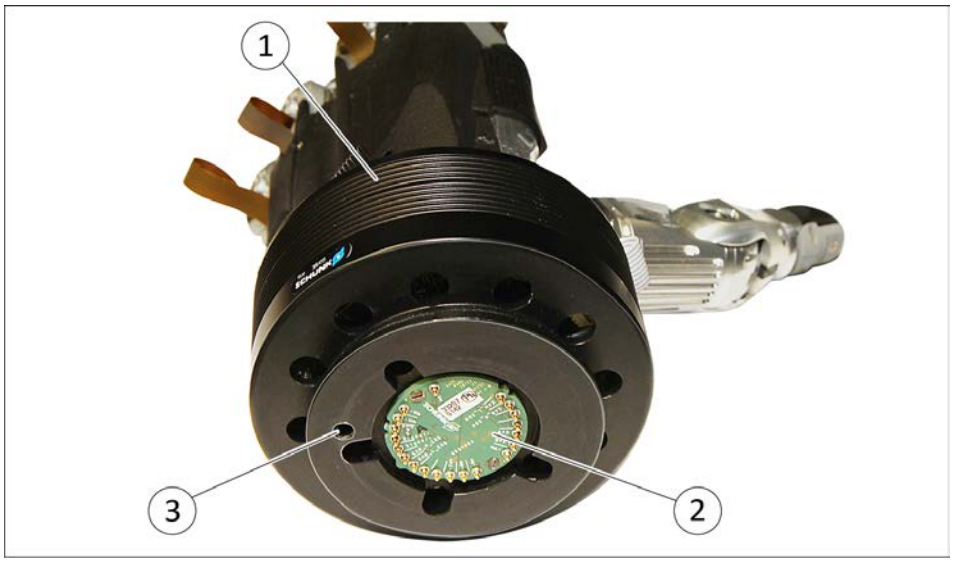
5.1 Assembly and installation on an assembly board

Commissioning via a network connection and the SCHUNK Diagnostics and Control GUI is described below.



Flat change system on an assembly board

1	Clamping ring with clamping screws	3	Adapter board
2	Centering pin		



Connection to the 5-finger gripping hand SVH

1	Flange with seal for mechanical mounting	3	Bore hole for centering pin
2	Adapter board		

1 Disconnect the connection plug of the external network device.

2 Open the clamping ring on the flat changing system on the assembly board.

3 Place the wrist of the 5-finger gripping hand in the flat changing system so that the centering pin aligns with the bore hole.
4 Tighten the clamping screws on the clamping ring.
5 Plug the network cable of the external computer into the Ethernet interface on the assembly board.
6 Switch the toggle switch on the assembly board to the "Ethernet" position.
7 Plug the external network device into the connection on the assembly board.
8 Make sure that the 5-finger gripping hand can move freely.
9 Switch the illuminated ON/OFF push button to "ON".
⇨ The single-board computer in the assembly board starts up. The 5-finger gripping hand performs a reset cycle to detect the end stops for the fingers.

Powering down

1 Switch the illuminated ON/OFF push button to "OFF".

5.2 Starting SCHUNK GUI Diagnostics

SCHUNK GUI Diagnostics is implemented as a website independent of any operating system and can be used with the browser of your choice.

NOTE
The software has been tested by SCHUNK with Firefox (Mozilla) and Chrome (Google).
For additional information, see the file "Instructions_for_GUI-Diagnostics.pdf" on the CD enclosed.

5.3 Extended use on assembly board

1 Switch the illuminated ON/OFF push button to "OFF".
2 Plug the USB cable of the external computer into the USB interface on the assembly board.
3 Switch the toggle switch on the assembly board to the "USB" position.
4 Make sure that the 5-finger gripping had can move freely.
5 Switch the illuminated ON/OFF push button to "ON".

This bypasses the single-board computer in the assembly board. The 5-finger hand can be controlled with an external software via the USB interface.

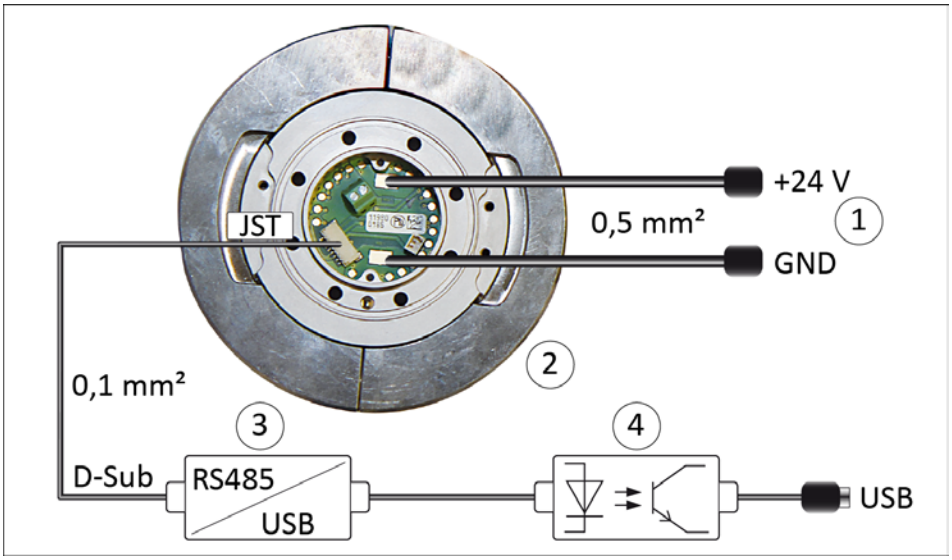
Further information about the SCHUNK ROS driver at http://wiki.ros.org/schunk_svh_driver.

5.4 Mounting to a robot or moving unit

	**⚠ CAUTION** **Risk of injury due to the workpiece falling!** In the event of a power failure or incorrect gripping process, the gripped workpiece may fall. • Ensure that the gripping process is performed correctly with a suitable gripping force. • Keep distance.

	**⚠ CAUTION** **Risk of injury if the 5-finger gripping hand is torn from the robot arm or moving unit!** If the mounting process has not been performed properly, the 5-finger gripping hand may come loose from the robot arm. • Mount the flat change system properly. • Tighten the lateral cylindrical screw to the clamping ring with a spanner wrench.

Using the flat change system, the 5-finger gripping hand can be mounted on an external robot arm.



Connection to the flat change system

1	Supply voltage 24VDC on soldering surfaces	3	RS485/USB interface converter ("Brainbox")
2	Flat change system	4	USB isolator
JST	JST plug connector		

The FWK115-ISO flat change system is comprised of the following components:

- Clamping ring
- Flange
- Adapter board
- Centering pin
- Seal, Screws

NOTE

M3 mounting screw and O-ring are attached to the flat change system.

Mount the FWK115-ISO flat change system on the external robot arm as follows:

1 Ensure that the interface is de-energized.

2 Align the flange with the centering pin and place on the centering pin.

3 Fasten the flange with 6 M3 screws.

4 Place the wrist of the 5-finger gripping hand in the flat changing system so that the centering pin aligns with the bore hole.

5 Tighten the clamping screw on the clamping ring.

6 Secure the clamping ring with the lateral cylindrical screw.

⚠ WARNING

Risk of injury due to incorrect electrical connection!
If the electrical connection is not performed properly, a malfunction or short circuit may occur.

- The operator is responsible for executing the electrical connection correctly.
- Provide galvanic isolation of the USB signal (USB isolator).
- Ventilate the room adequately in case of a short circuit.

Electrical connection is made at the adapter board of the FWK115-ISO flat change system.

1 Solder on the marked area of the soldering surfaces on the input side of the 24 V DC and GND power supply lines.

2 Plug the JST connector of the signal lines in the JST adapter board socket.

3 Connect the JST connector to the D-Sub connection of the RS485/USB interface converter ("Brainbox").

Pin allocation for D-Sub to JST plug connection

D-Sub pin	Wire color	Recommended cable cross-section [mm²]	JST pin
1	White	0.1	4
2	Green	0.1	3
6	Brown	0.1	2
7	Yellow	0.1	1

Soldering surfaces

Designation	Assignment	Recommended cable cross-section [mm²]	Recommended wire color
+UM	+24 V DC supply	0.5	Red
-UM	GND supply	0.5	Black

NOTE
The clamps and the two-pronged sockets on the adapter board are not used.

5.5 System requirements for commissioning

- Electrical connection to the RS485/USB interface converter ("Brainbox") and USB isolator
- USB cable between the USB isolator and PC
- PC (laptop, etc.)
- Control software

Commissioning is dependent on the control software installed. The operator is responsible for complying with the technical specifications of the 5-finger gripping hand SVH, see (☞ 3, Page 14).

6 Operation

The following considerations generally apply to operations:

- When the 5-finger gripping hand SVH is mounted on an external device (e.g. external robot arm), the operator is responsible for ensuring the operational safety of this equipment.
- The fingers (excluding the thumb) can be carefully moved manually in the event of a failure of the power supply. This will not damage the drive. The thumb drives are self-locking in a de-energized state and cannot be manually moved.
- It is possible for the fingers to collide if controlled accordingly. Collisions will not cause damage, but the movement will be interrupted.

When developing a customized control program for the 5-finger gripping hand, SVH the following information applies.

Note: English is the standard language in the field of software development. For this reason, English-language terms have been used in the following:

6.1 Homing

Homing is required after each startup of the SVH due to the relative angle measurement of the joints.

For homing, SCHUNK recommends using a software end stop just before the mechanical end stop.

The table below contains the following values:

- direction of homing
- recommended software end stop
- total steps of each movement
- recommended power limit
- recommended movement speed

JOINT	HOMING DIRECTION	DISTANCE FROM HARD STOP [°]	RANGE OF MOVEMENT [°]	HOMING CURRENT [mA]	HOMING SPEED
THUMB FLEXION	Stretch	5,000	170,000	50	100 rpm
THUMB OPPOSITION	Stretch	5,000	100,000	100	100 rpm
SPREAD	Close	2,000	25,000	500	100 rpm
INDEX FINGER PROXI	Stretch	2,000	40,000	200	500 rpm
INDEX FINGER DISTAL	Stretch	2,000	45,000	100	500 rpm
MIDDLE FINGER PROXI	Stretch	2,000	40,000	200	500 rpm
MIDDLE FINGER DISTAL	Stretch	2,000	45,000	100	500 rpm
RING FINGER	Stretch	2,000	45,000	100	500 rpm
LITTLE FINGER	Stretch	2,000	45,000	100	500 rpm

The following table contains the drive motor data. The maximum values specified must not be exceeded when developing customizations.

JOINT	NOM. CURRENT [mA]	MAX. PEAK CURRENT [mA]	TEMP. CURRENT [mA]	MAX RPM	MOTOR VOLTAGE [V]
THUMB FLEXION	191	605	500	10000	24
THUMB OPPOSITION	191	605	500	10000	24
SPREAD	169	688	350	13600	24
INDEX FINGER PROXI	169	688	350	13600	24
INDEX FINGER DISTAL	176	360	350	11250	12
MIDDLE FINGER PROXI	196	688	350	13600	24
MIDDLE FINGER DISTAL	176	360	350	12500	12
RING FINGER	176	360	350	12500	12
LITTLE FINGER	176	360	350	12500	12

6.2 Operation

The 5-finger gripping hand SVH does not have any operable elements.

Operating and running the 5-finger gripping hand SVH is dependent on the software installed.

The 5-finger gripping hand SVH can be operated via the assembly board, (☞ 5.1, Page 21).

7 Troubleshooting

7.1 Communication via USB interrupted

Possible cause	Corrective action
Connection cable defective	Switch the toggle switch to the "Ethernet" position
Signal path interrupted	Check plug connector, cables and electrical components

7.2 Communication via Ethernet interrupted

Possible cause	Corrective action
The toggle switch on the assembly board in the wrong position	Switch the toggle switch to the "Ethernet" position
Signal path interrupted	Check plug connector, cables and electrical components
Error while configuring network address	Network address of the computer connected: 192.168.1.2 --- 192.168.1.255 Subnet mask: 255.255.255.0 URL in browser: 192.168.1.1

7.3 Fingers are colliding

Possible cause	Corrective action
The power supply for the drive or the electronic control unit has malfunctioned	Check the power supply
Communication has been connected incorrectly	Check the signal cable connection
Supply cable is defective	Check supply cables for damage; replace if necessary

7.4 SVH is not reacting, not moving or stops suddenly

Possible cause	Corrective action
The power supply for the drive or the electronic control unit has malfunctioned	Check the power supply
Communication has been connected incorrectly	Check the signal cable connection
Supply cable is defective	Check supply cables for damage; replace if necessary

7.5 Unusual noise during operation

Possible cause	Corrective action
Mechanical damage	Send the product to SCHUNK for repair

8 Maintenance

1 Screw the 5-finger gripping hand to the supplied assembly board.

2 Start the diagnostic software and compare nominal and actual currents.

3 For fingers that show a difference in nominal currents: clean the bearings in the joints and relubricate.

Clean

1 Gently clean with clean-room swabs and non-flammable cleaning agents.

2 Apply a thin layer of oil with new clean-room swabs. Use oil labeled "Shell AF2".

3 If necessary, clean fingertips with isopropyl.

The general rule is:

- Only use solvent-free, water-based cleaning agents.
- Do not use steam, coolant or high-pressure cleaners.
- Do not allow cleaning agents to penetrate into electrical or mechanical equipment.

Repair

NOTICE

The product may only be disassembled by SCHUNK, otherwise the mechanics or the internal electronics could become damaged!

The components of the 5-finger gripping hand are adapted to each other. Repairs are only possible at the manufacturer.

1 For repair or replacement, send the product repair order to SCHUNK with a repair order.