Assembly and operating manual Gripping force tester

SCHUNK IFT

Superior Clamping and Gripping

SCHUNK®

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 operating manual in full and keep it close to the product.

Table of Contents

1 General instructions

1.1 Information about this manual

This manual contains important information for the safe, correct use of the product.
The manual is an integral part of the product and must be kept accessible for personnel at all times.
Personnel must have read and understood this manual before beginning any work. The observance of all safety notes in this manual is the precondition for safe working. The illustrations in this manual are intended to provide a basic understanding and may deviate from the actual version.
Besides this manual, other documents which apply are those listed under (1.1.2)

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 *
- Catalog data sheet of the purchased product *

The documents labeled with an asterisk (*) can be downloaded from **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 applicable documents, ▸ 1.1 [🗋 5]
- Observe the ambient conditions and operating conditions
- Observance of the specified calibration intervals.

Parts touching the workpiece and wearing parts are not part of the warranty.

1.3 Scope of delivery

1 Tablet incl. APP
1 Measuring head
6 Spacers for Ø72
6 Spacers for Ø96
6 Spacers for Ø136
1 Insertion aid
1 Stand for speed measurement
1 Charging adapter for tablet and measuring head
1 USB charging cable
1 Torx wrench
8 Screws for spacer

2 Basic safety notes

Risks to persons and property may arise from incorrect handling of this product if these instructions are disregarded.

Report any damage and defects immediately and repair without delay to keep the extent of the damage to a minimum and avoid compromising the safety of the product.

Only original SCHUNK spare parts may be used!

2.1 Intended use

The product is used for measuring clamping force on clamping devices in a machine tool. The measurement can be static (clamping force without speed of rotation) and dynamic (clamping force with speed of rotation).

- For dynamic measurement, the axis of rotation of the measuring head must always lie on the axis of rotation of the machine spindle.
- The product may only be used within the scope of its technical data.
- 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

The product is used inappropriately if, for example:

- the product is used with machines or clamping devices that are not designed to be used with it.
- the specified technical data for use of the product are exceeded.
- the product is used in working environments that are not permissible.
- the product is operated without protective equipment (only with dynamic measurement).
- system changes or external influence of the tablet by the operator.

2.3 Structural changes

Implementation of structural changes

Modifications, changes or reworking, e.g. additional threads, holes, or safety devices, can damage the product or impair its functionality or safety.

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

2.4 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 and spares authorized by SCHUNK.

2.5 Ambient conditions and operating conditions

Requirements for ambient 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 only used within its defined application parameters.
- The measuring head must have reached room temperature before measurement.

2.6 Personnel qualification

Inadequate qualification of personnel

Work on and with the product by inadequately qualified personnel can lead to serious injuries and considerable material damage.

- Order all work to be performed only by appropriately qualified personnel.
- Personnel must have read and understood the complete operating manual before beginning any work on the product.
- Observe national accident prevention regulations and the general safety notes.

The following personnel qualifications are required for the various types of work on the product:

Specialist personnel:

Specialist personnel have the specialized training, knowledge, and experience to perform the tasks entrusted to them, to recognize and avoid potential dangers, and know the relevant standards and regulations.

Instructed personnel:

Instructed persons have been instructed by the user regarding the tasks entrusted to them and the potential dangers of inappropriate behavior.

Manufacturer service personnel:

The manufacturer's service personnel have the specialized training, knowledge, and experience to perform the work entrusted to them and to recognize and avoid potential dangers.

2.7 Personal protective equipment

Use of personal protective equipment

Personal protective equipment serves to protect staff in the event of a danger that 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 close-fitting protective clothing and place a hairnet over long hair when dealing with moving components.

2.8 Instructions for safe operation

Working in an incorrect manner

An incorrect manner of working can make the product unsafe and risk the danger of serious injuries and considerable material damages.

- 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. Products for special ambient conditions are excluded.
- Rectify malfunctions as soon as they occur.
- Observe the calibration intervals.
- Observe the current safety, accident prevention, and environmental protection regulations for the application field of the product.

2.8.1 Constructional changes, attachments, or modifications

Additional threads, bore holes or attachments which are not supplied as accessories by SCHUNK may affect safety. They may only be applied after obtaining the prior consent of SCHUNK.

2.9 Transport

The transport is performed exclusively in the original, specially adapted transport case.

2.10 Malfunctions

Behavior in case of malfunctions

- Immediately remove the product from operation and report the malfunction to the responsible departments/persons.
- Have appropriately trained personnel 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.

2.11 Disposal

Conduct during disposal

Incorrect handling during disposal can make the product unsafe and risks serious injuries and considerable material and environmental harm.

- Follow local regulations on dispatching product components for recycling or proper disposal.
- Batteries and rechargeable batteries are subject to hazardous waste treatment and may only be disposed of by authorized specialist companies.

2.12 Fundamental dangers

General:

- Do not reach into the open mechanism or movement area of the product during operation.
- Never deactivate safety installations.
- Before commissioning the product, take appropriate protective measures to secure the danger zone.
- Technical data of the machine or the clamping device must not exceed the maximum permissible data of the measuring head.

2.12.1 Notes on particular risks

⚠ WARNING

Crushing!

- Do not reach between moving parts (measuring head and jaw).
- Use an insertion aid for protection!

⚠ WARNING

Rotating parts!

When measuring during speed of rotation, the insertion aid must be removed before switching on the machine!

⚠ WARNING

Rotating parts!

When measuring during speed of rotation, the measuring head must be clamped firmly and plane-parallel to the axis of rotation.

3 Technical Data

3.1 Tablet technical data:

Designation		Handset/tablet/APP
Display size		8"
Operating system		Android
Charger connection		USB micro
Operating temperature	[°C]	0...40
Protection class		IP67
Transmitting/receiving frequency	[GHz]	2.4
Data exchange		MicroSD; USB micro

3.2 Measuring head technical data

Designation		Measuring head
Voltage supply		Internal energy accumulator
Energy accumulator capacity		approx. 1.5 h @ 100% d.c
Charging process		< 3 minutes
Charger connection		USB mini
Number of jaws		2, 3 or 6 jaws can be set
Force range of measurement	[kN]	0...180 kN (2-jaws) 0...270 kN (3-jaws) 0...540 kN (6-jaws)
Force measurement accuracy		< 3% fsr
Speed of rotation measurement	[min^{-1}]	approx. 200...6000
Speed of rotation measurement accuracy		< 1% fsr
Clamping range	[mm]	Ø72, Ø96, Ø136
Measured value transmission rate		500 ms
Dimensions	[mm]	Ø68 / 58 x 63
Weight	[g]	700 (without extensions)
Operating temperature	[°C]	0...40
Protection class		IP67
Transmission frequency	[GHz]	2.4
Handset/measuring head distance		< 10 m (depending on ambient conditions)

4 Functional description and operation

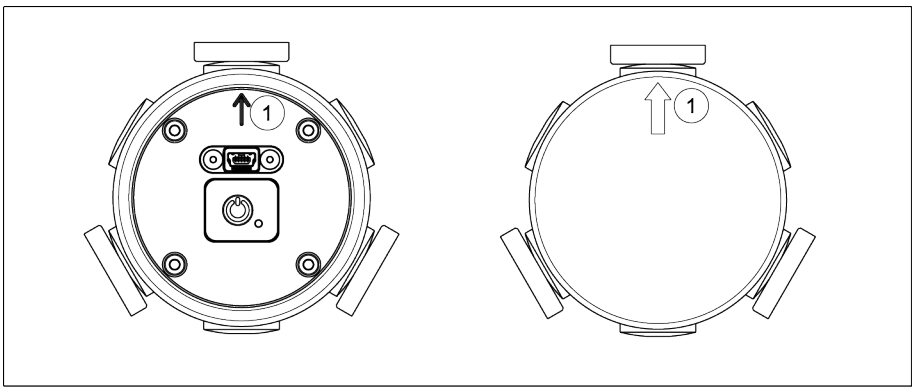
4.1 Overview

The operating principle of the measuring head is based on several internal strain gauges. The applied clamping force is converted into an electrical signal and evaluated by the electronics. A wireless data link transmits the data from the measuring head to the tablet and visualizes the measured values in the APP.

4.2 Measuring head

4.2.1 General

The measuring head consists of the base body with integrated sensor system and electronic processor, as well as the respective intermediate pieces for the clamping diameters Ø72 mm, Ø96 mm and Ø136 mm. The arrow on the cover and also on the bottom of the measuring head symbolizes the measuring jaw, which must always rest on a jaw of the clamping device to be measured.



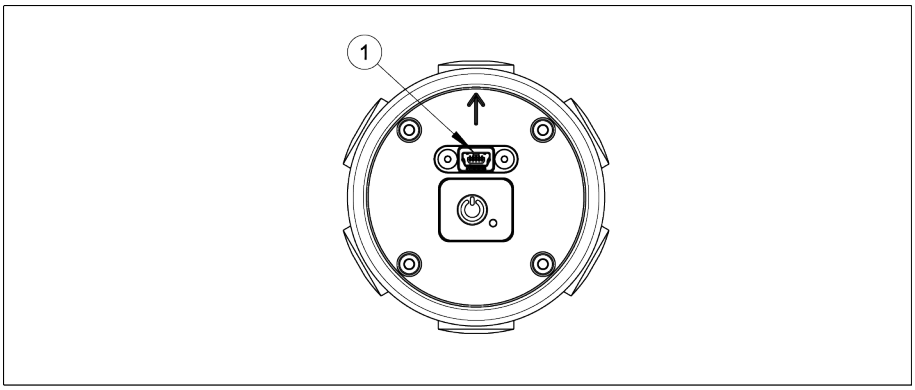
1 measuring jaw with indicator arrows

NOTICE

Measuring jaw always in force flow!
Otherwise the measured values are not meaningful.

4.2.2 Charging process / state of charge

A USB mini jack is located in the lid of the measuring head. This is used in conjunction with the USB mini cable supplied and charging adapter to charge the measuring head.



1 USB-mini measuring head charging socket

NOTICE

Danger of confusion!

Charging the tablet: USB micro
Charging the measuring head: USB mini

⚠ WARNING

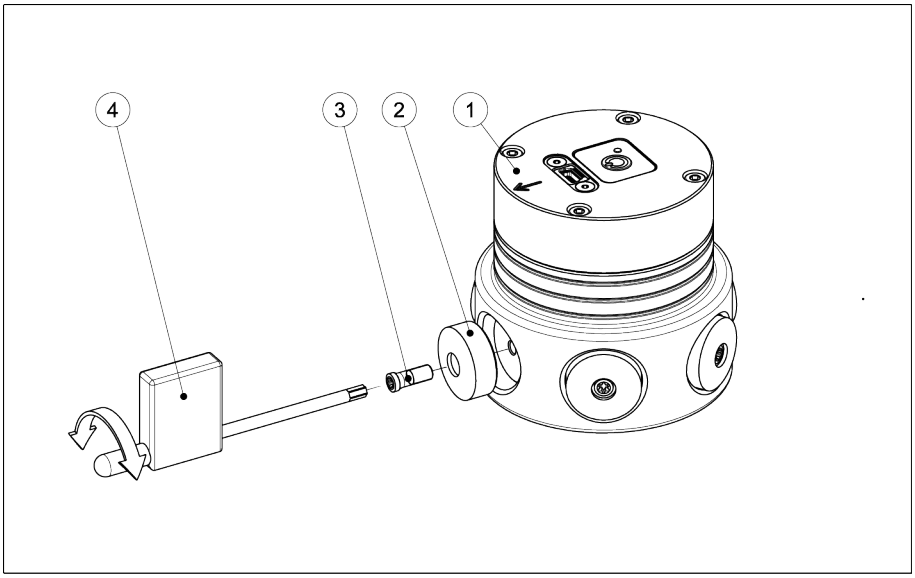
Damage by liquid!

The charging socket must be dry and free of dirt during the charging process.

The charging status is indicated by the LED integrated in the lid and within the APP. If the charge level is less than 15%, the LED on the measuring head flashes.

4.2.3 Changing the clamping inserts

The clamping inserts can be changed with the assembly key supplied. The clamping inserts for the clamping diameters Ø72 mm, Ø96 mm and Ø136 mm are supplied.



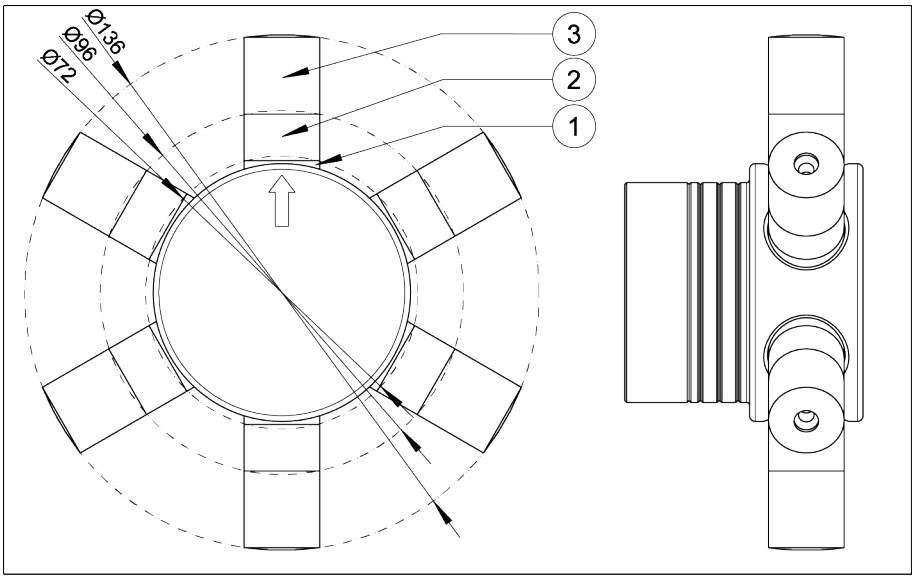
1	Measuring head
2	Clamping insert
3	Fastening screw
4	Torx assembly key

⚠ WARNING

Imbalance!

Only clamping inserts of the same length may be installed on the clamping force meter.

The clamping inserts must be arranged symmetrically.
(2 pieces at 180°; 3 pieces at 120°; 6 pieces at 60°)



1	Extension for Ø72
2	Extension for Ø96
3	Extension for Ø136

4.3 Tablet and APP

⚠ WARNING

Lithium-ion battery!

The product is equipped with a lithium-ion battery.

- Do not disassemble.
- Keep away from heat sources.
- Do not use in areas of increased radiation.

4.3.1 Functional description of the tablet

The supplied tablet is connected to the measuring head via the internal Bluetooth interface. The evaluation of the measured values is done with the pre-installed APP.

The tablet is charged using the charging adapter and the USB micro cable supplied.

NOTICE

Danger of confusion!

Charging the tablet: USB micro.
Charging the measuring head: USB mini.

⚠ WARNING

Damage by liquid!

The charging socket must be dry and free of dirt during the charging process.

1	USB-mini jack (charging)
2	ON key
3	External memory card slot

4.3.2 Operating the APP

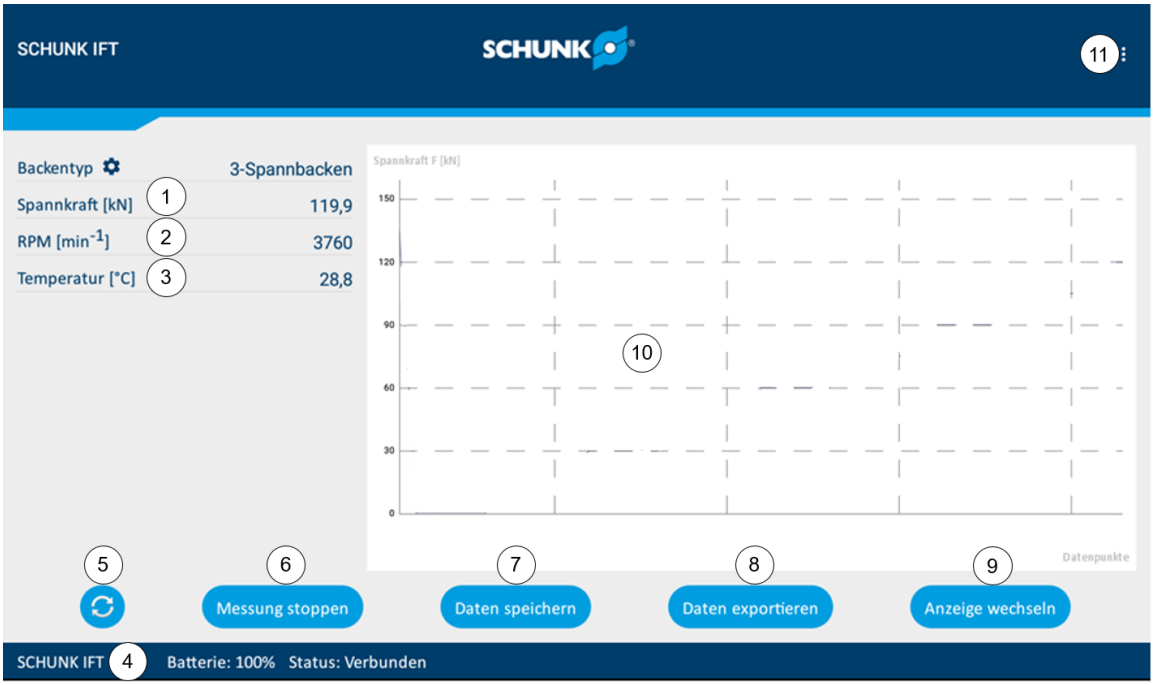
The pre-installed APP is used to visualize the values of the measuring head.

4.3.2.1 Starting the APP

The APP for the clamping force meter is started via the APP-ICON  on the start page.

4.3.3 Main screen

All relevant data can be visualized and edited on the main screen. You can change the display based on the respective situation by clicking on Change display. The display with a diagram of the clamping force data points, showing all data points sent by the sensor head over time is defined as the standard.



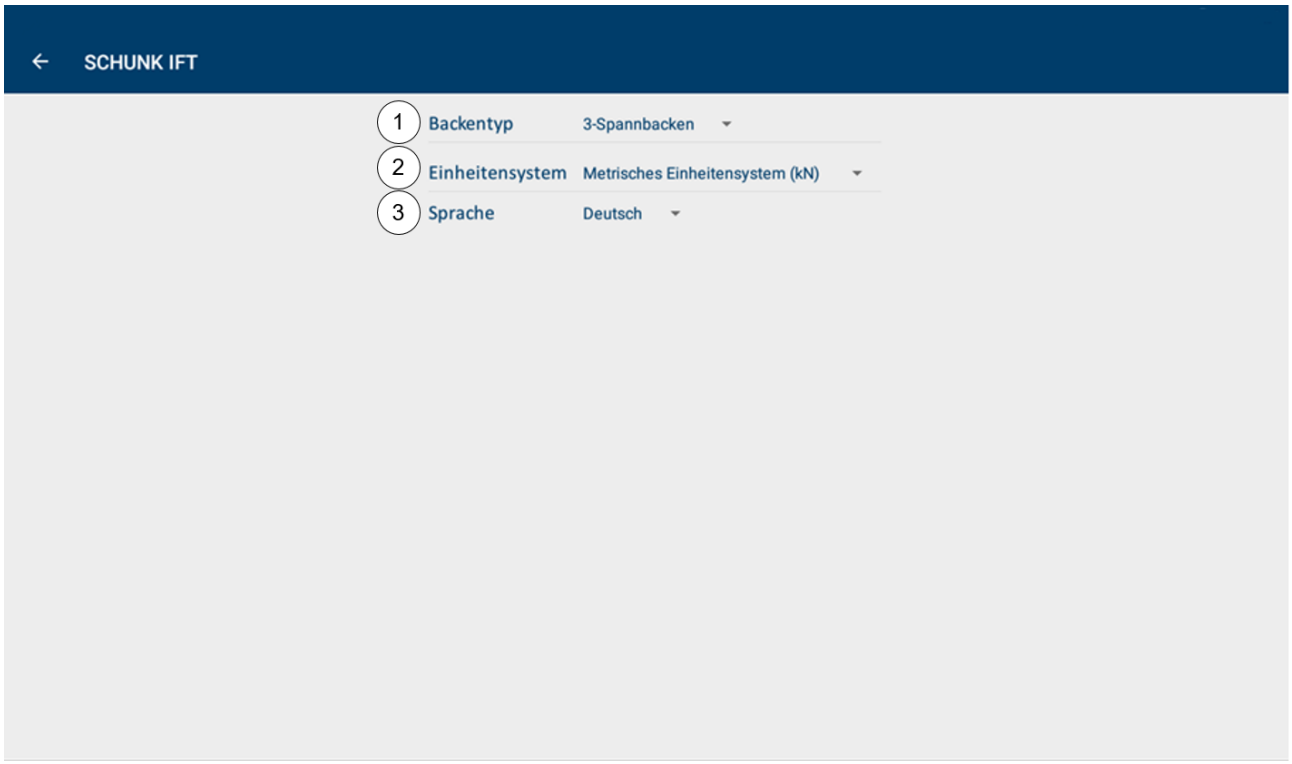
1	Current value of the clamping force
2	Current speed of rotation of the sensor head
3	Temperature at sensor head
4	Characteristics of sensor head (designation/charge status/ connection status)
5	Updating the display
6	Start/stop measurement
7	Save data (in history)
8	Export data
9	Change display
10	Diagram (clamping force data points/clamping force speed of rotation)
11	Advanced menu (Settings/History/Parameters/Tare/ Connect other sensor)

4.3.3.1 Connecting to the measuring head

The sensor head has a unique serial number on the bottom. This is also the designation in the radio network. The sensor head can be selected and connected via *Advanced menu → Connect other sensor*. As soon as the sensor head is connected, it is displayed on the main screen.

4.3.3.2 Settings

The APP can be customized via the settings.



1	Selection of the clamping method (2/3/4/6-jaws)
2	Selection of the unit system (metric (kN/°C)/American (lbs/°F))
3	Language

NOTICE

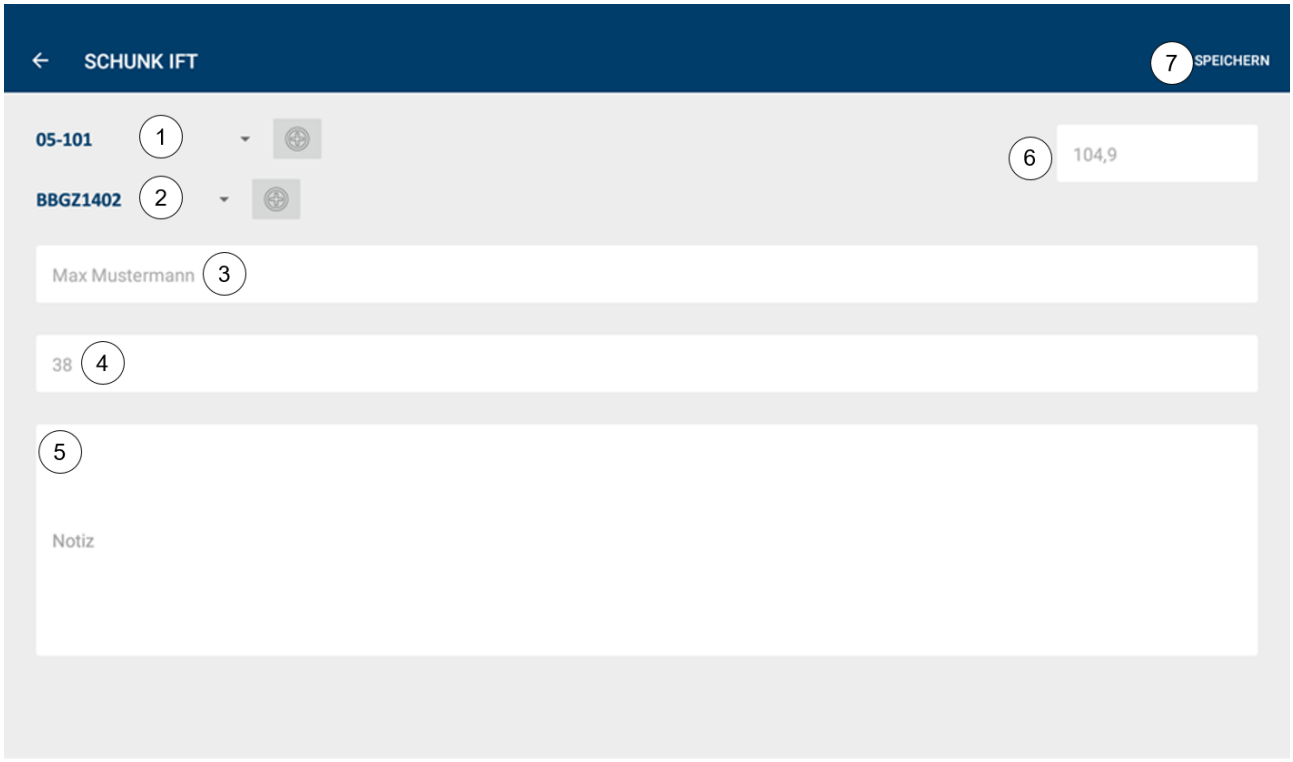
Ensure correct clamping method!

Correct entry of the clamping method must be checked. Incorrect input leads to incorrect display values of the force value.

4.3.3.3 History

Values for machines and their clamping devices can be stored and archived in the history. The history of the measured values can be called up.

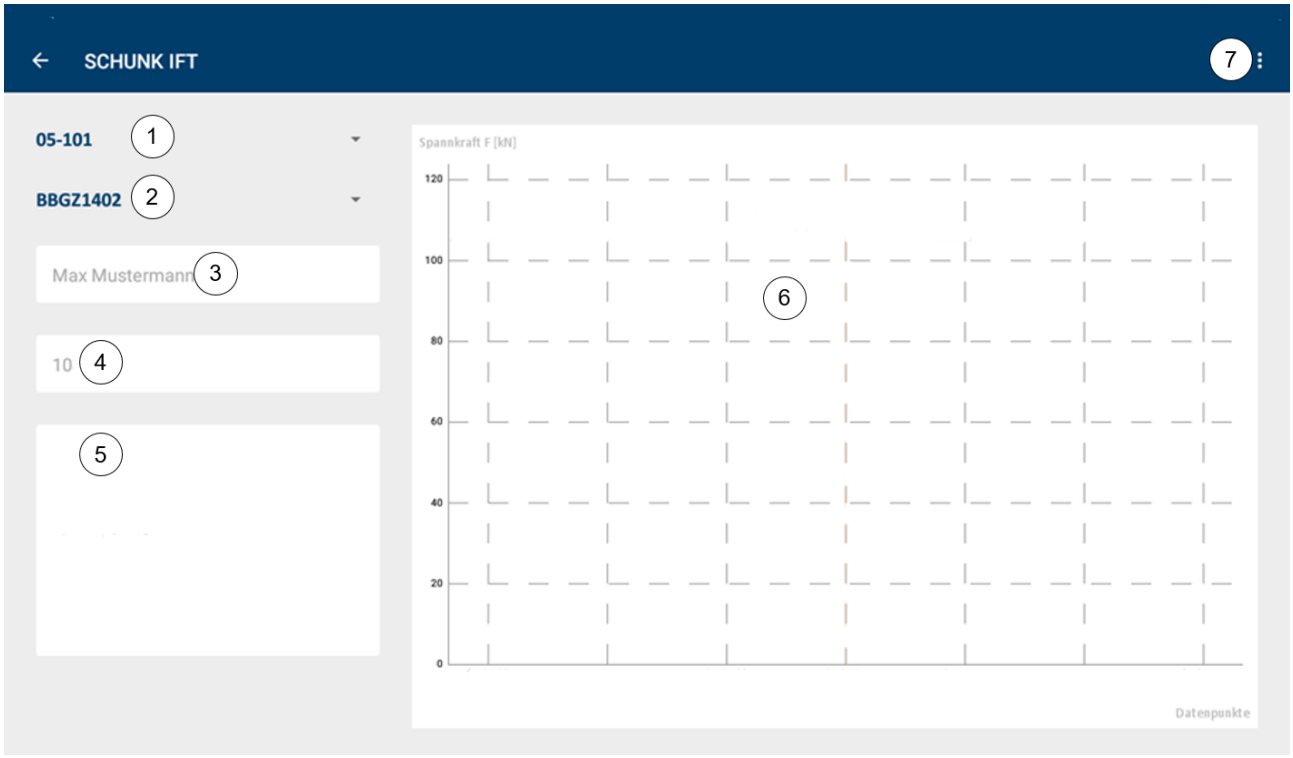
Save data:
The current value at the sensor head is saved via *Save data*. Machines and clamping devices can be selected or newly added. The mandatory fields "Editor" and "Actuating force" must be filled. In addition, a note can be saved with them. The entry is saved in the history with "SAVE" (POS. 7).



1	Select or add a new machine
2	Select or add new clamping device
3	Editor
4	Actuating force/actuating moment
5	Note
6	Clamping force value
7	Save entry

Read history

For stored clamping devices, the previously archived measured values can be called up and visualized via *Advanced menu/History*. For this purpose the respective machine and the clamping device must be selected. The saved entries can be selected in the history entries diagram. The stored data for the entry is displayed, the measured clamping force is shown in the diagram (POS. 6).



1	Select machine
2	Select clamping device
3	Editor
4	Actuating force/actuating moment
5	Note
6	Diagram of the history entries
7	Advanced menu (Export database, Delete machine/clamping device/entry; Display and change machine/clamping device)

Display and change machines and clamping devices

Parameters for already created machines and clamping devices can be displayed and changed afterwards. For this purpose, the corresponding machine or clamping device must be selected in the history, the parameters can be displayed, changed and saved via the advanced menu.

4.3.3.4 Exporting measurement data

For data backup, the current measurement data can be exported from the tablet. The measurement data file must be stored on a suitable external RAM data carrier. In addition to the measured values (clamping force/speed of rotation/temperature), the parameters chuck type and serial number as well as other optional parameters are also saved.
The parameters can be entered under *Advanced menu/ Parameters*. During the export process, the parameters are displayed and can be edited.

4.3.3.5 Tare function

Non-homogeneous temperature influences can cause the zero point to move. Within certain limits the zero point can be re-tared by the user. The following should be noted before doing so:

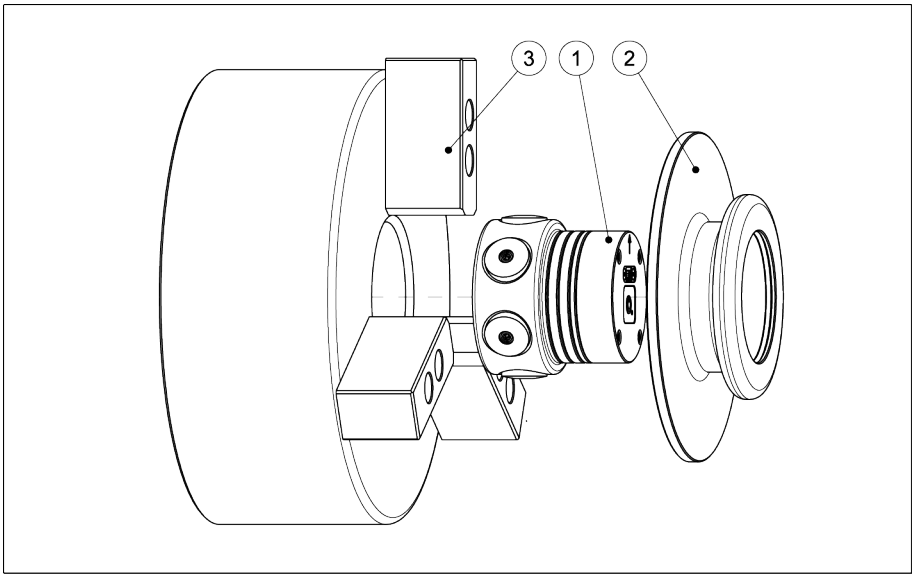
- Measuring head must be adjusted to room temperature
- Measuring head must not be loaded

The tare function can be called up under *Advanced Menu → Tare*.

4.3.4 Measuring procedure

4.3.4.1 Clamping force measurement without speed of rotation measurement

The clamping force can be determined with the measuring head for 2, 3, and 6-jaw chucks (more with optional accessories). The sequence is explained using the example of a 3-jaw chuck and can similarly be applied to other lathe chucks. The insertion aid serves as a flat work surface on the jaws of the clamping device and protects the operator from injuries caused by crushing. When the clamping device is clamped, the insertion aid can be removed.



1	Measuring head
2	Insertion aid
3	Clamping devices

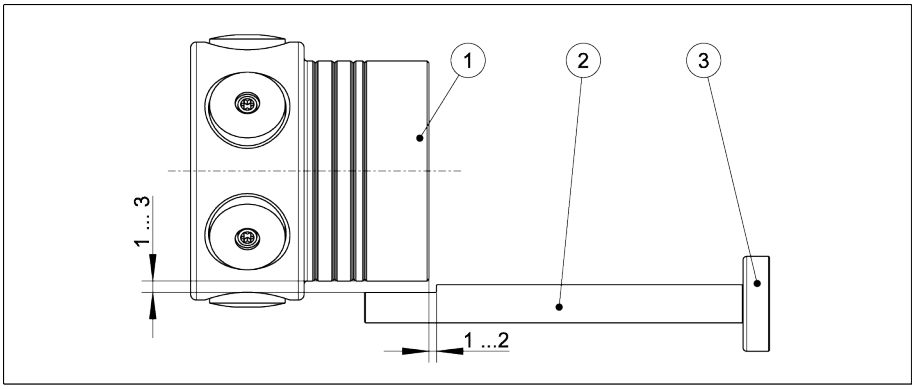
⚠ WARNING

Crushing!

- Do not reach between moving parts (measuring head and jaw).
- Use an insertion aid for protection.

4.3.4.2 Clamping force measurement with speed of rotation measurement

For clamping force measurement with speed of rotation measurement, the additional stand is necessary. This must be fitted close to the chuck head and secured to a fixed component of the machine during speed of rotation measurement. The stand has a magnetic base for mounting. The distances between stand and measuring head are shown in the illustration.



1	Measuring head
2	Stand
3	Magnetic base

⚠ WARNING

Rotating parts!

When measuring during speed of rotation, the insertion aid must be removed before switching on the machine!

⚠ WARNING

Rotating parts!

When measuring during speed of rotation, the measuring head must be clamped firmly and plane-parallel to the axis of rotation.

⚠ WARNING

Rotating parts!

The charging cable must be removed from the measuring head during the measurement!

5 Calibration and recalibration

Before delivery the measuring head is carefully checked and calibrated at the factory. A calibration certificate is enclosed with the measuring instrument.

To ensure the measuring accuracy, the measuring head must be recalibrated annually. For this, the measuring head must be sent to SCHUNK with the tablet and case.

In case of strong zero drift due to material fatigue or overload, recalibration is necessary.

NOTICE

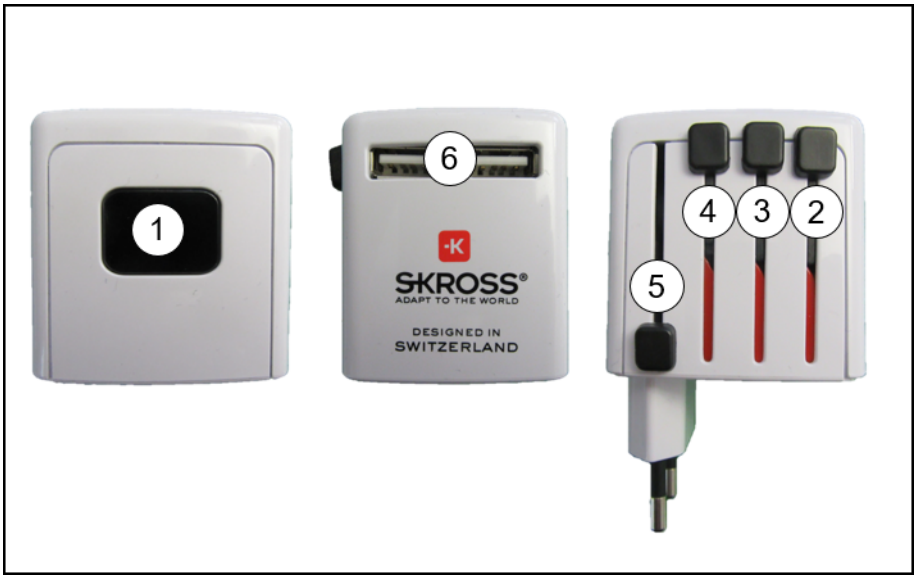
The SCHUNK IFT clamping force tester may not be serviced by the customer!

6 Charging adapter

With the "World USB Charger" charging adapter, the measuring head and the tablet can be charged in over 220 countries around the world.

Application:

- Before use, press the release button and push the desired slide (2-5) forward until it snaps in (click).
- Connect the USB device to the charger.
- Connect the charger to the mains.
- After use, press the release button and move the slide fully to its initial position.



1	Unlock button
2	Slide for country-specific plugs –USA, Japan
3	Slide for country-specific plugs – Australia, China
4	Slide for country-specific plugs – UK
5	Slide for country-specific plugs – Euro
6	Dual USB output

Technical data:

Input voltage	100 V - 250 V
Protection class II	
Output	5V / 2400 mA, 2x USB, shared

⚠ WARNING

Charger for temporary use!

Disconnect from the power supply after use.

⚠ WARNING

Do not expose the charger to liquids or humidity!

⚠ WARNING

Do not use with damaged housing!

7 Accessories

7.1 Measuring on compensating 4-jaw clamping devices

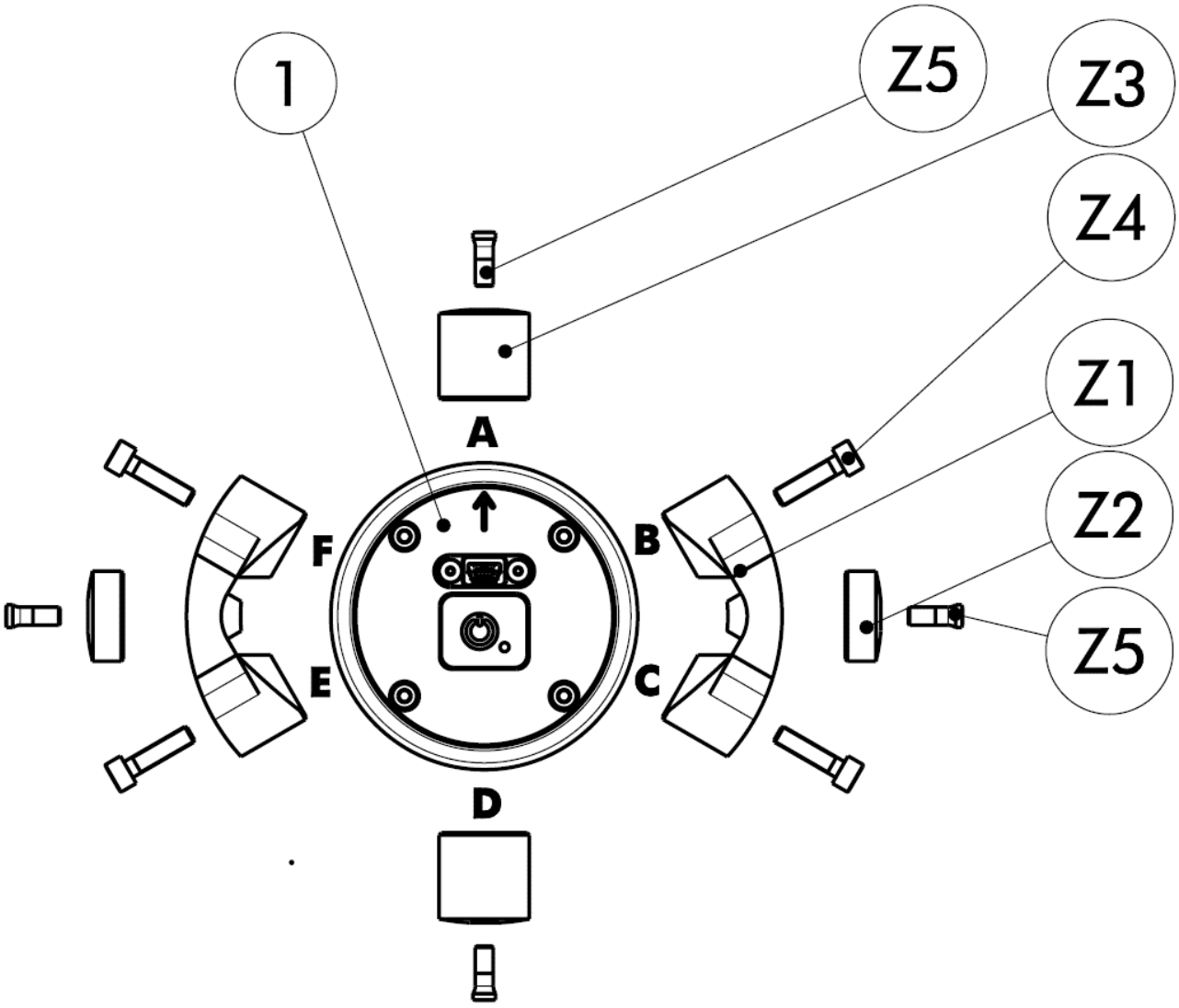
The standard measuring head covers the measurement on clamping devices with 2, 3, and 6 jaws. Measuring on compensating clamping devices with 4 jaws (e.g. ROTA-M flex 2+2) can be done using the optionally available set (mat. no. 1452686). To do so, the standard measuring head is used without intermediate stops.

⚠ WARNING

Use only possible with compensating clamping devices (e.g. ROTA-M flex 2+2). Measuring on clamping devices with 4 jaws without integrated compensation leads to inconsistent results.

7.1.1 Scope of delivery

Position	Description	Number of units
Z1	Bridge element	2
Z2	Adapter Ø20, long	2
Z3	Adapter Ø20, short	2
Z4	Screws for bridge element	4
Z5	Screws for adapter	4



7.1.2 Assembly

- Disassembly of the standard intermediate stops at the end points.
- Assembly of the adapter (pos. Z3) at end point "A" with screw (pos. Z5).

NOTICE

No bridge element may be screwed on at end point "A" ("arrow" mark, see ▶ 4.2.1 [🗋 13]).

- Assembly of the adapter (pos. Z3) at end point "D2" with screw (pos. Z5).
- Assembly of the bridge elements (pos. Z1) at end point "B" - "C" and "E" - "F" with screws (pos. Z4).
- Assembly of the adapter (pos. Z2) in the center of the bridge element with screw (pos. Z5).

7.1.3 Clamping force measurement

Clamping force measurement is done identically to measuring the clamping force on 2, 3, and 6-jaw chucks ▶ 4.3.4 [🗋 22]. Select the "4-jaw" clamping method in the *settings* ▶ 4.3.3.2 [🗋 18] to correctly calculate the overall clamping force. The diameter for clamping force measurement is Ø96 mm.

7.2 Extension set for large clamping diameters for 2-/3-/6-jaws

The standard measuring head covers the measurement of clamping diameters Ø72 / Ø96 / Ø136. For larger clamping diameters, the extension set (mat. no.: 1498512) must be used.

⚠ WARNING

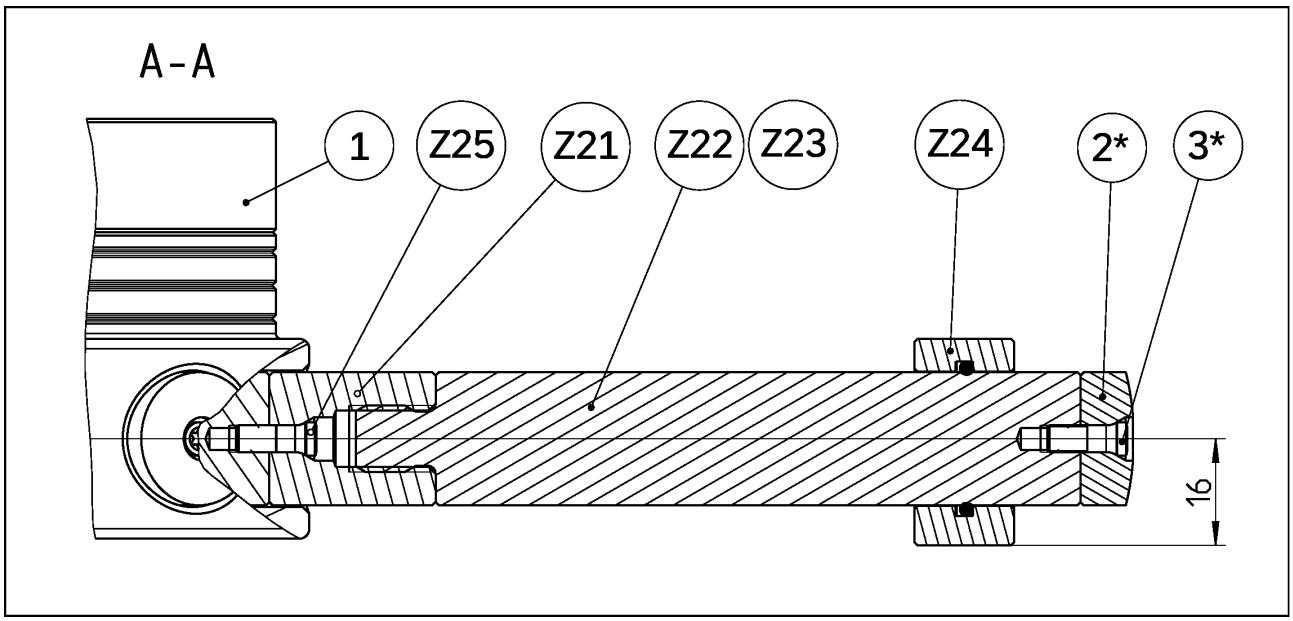
The maximum clamping forces indicated on the measuring head must not be exceeded.

⚠ WARNING

Only static clamping force measurement is allowed! During measurement with the extension set, the chuck must not be operated under speed.

7.2.1 Scope of delivery

Position	Designation	Number of units
1*	IFT measuring head	0 (1)
Z21	Adapter	6
Z22	Extension 1 / 2	6 / 6
Z23	Spacer	3
2*	Clamping insert	0 (6)
3*	Screw	0 (6)
Z24	Screw	6
* marked items are not included in the scope of delivery of the extension set. These can be found in the standard IFT.		



7.2.2 Assembly

- Disassembly of the standard clamping inserts at the end stops
- Mounting the adapters (Item Z21) with screw (Item Z24). The number must be adapted to the respective clamping device (2-/3-/6-jaws)
- Mounting of extensions (Item Z22) (possible clamping diameters see table)

⚠ WARNING

The extensions (Item Z22) must be screwed onto the adapter (Item Z21) as far as the stop.

Risk of damage in case of non-compliance!

- Mounting of the standard clamping inserts (Item 2) with the screws (item 3) (for possible clamping diameters see table).
- Positioning of the spacer (2x180° / 3x120°) on the extensions Item Z22).

Clamping diameter

	V I	V II
A1	53 mm	53 mm
A2	97 mm	47 mm
A3 I	8 mm	8 mm
A3 II	20 mm	20 mm
A3 III	40 mm	40 mm
Measuring diameter I	316 mm	216 mm
Measuring diameter II	340 mm	240 mm
Measuring diameter III	380 mm	280 mm

7.2.3 Clamping force measurement

Clamping force measurement is performed identically to measuring the clamping force on 2, 3, and 6-jaw chucks (see chap. 4.3.4).

⚠ WARNING

Maximum clamping force of IFT measuring head must not be exceeded!

Risk of damage in case of non-compliance!

⚠ WARNING

Only static clamping force measurement is allowed! During measurement with the extension set, the chuck must not be operated under speed.

- Insert the clamping force measuring device plane-parallel to the chuck face. To do this, place the magnetic spacers on the chuck face (2x180° / 3x120°)
- The radial position of the magnetic spacers can be varied
- Align the clamping points of the measuring head centrically to the jaws
- Take the measurement according to chap. 4.3.4

8 EU Declaration of Conformity

in accordance with Directive 2014/30/EU (electromagnetic compatibility), Annex IV of the European Parliament and Council of 26 February 2014.
The manufacturer bears sole responsibility for issuing this EU declaration of conformity.

Manufacturer/ Distributor	H.-D. SCHUNK GmbH & Co. Spanntechnik KG Lothringer Str. 23 D-88512 Mengen

We hereby declare that the product described below is in conformity with the essential health and safety requirements of Directive 2014/30/EU in its design and construction and in the version placed on the market by us at the time of this declaration. The declaration is rendered invalid if modifications are made to the product.

Product designation	SCHUNK IFT / Gripping force tester
ID number	1404235
	The subject of the declaration described above complies with the following harmonization legislation:
2011/65/EU	RoHS Directive

European harmonized standards applied:

EN 61000-6-2: 2016-05	Electromagnetic compatibility (EMC) - Generic standards - Immunity for industrial environments
EN 61000-3-3: 2011-09	Electromagnetic compatibility (EMC) - Generic standards- Interference emissions in residential, commercial, industrial and light industrial environments

Person authorized to compile the technical documentation:
Philipp Schräder, Address: see manufacturer's address

Signature: see original declaration

Mengen, October 2022 p.p. Philipp Schräder; Head of Engineering Design

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