Assembly and Operating Manual

FT-AXIA

Force/torque sensor

Translation of Original Operating Manual

Hand in hand for tomorrow

Imprint

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

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Dear Customer,

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

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

Best regards,

Your SCHUNK team

Customer Management
Tel. +49-7133-103-2503
Fax +49-7133-103-2189
cmg@de.schunk.com

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

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.

In addition to these instructions, the documents listed under ▸ 1.1.2 [🗋 5] are applicable.

NOTE: The illustrations in this manual are intended to provide a basic understanding and may deviate from the actual version.

1.1.1 Presentation of Warning Labels

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

⚠ DANGER

Dangers 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.

CAUTION

Material damage!

Information about avoiding material damage.

1.1.2 Applicable documents

- General terms of business *
- Catalog data sheet of the purchased product *
- Commissioning instructions for the force-torque-sensor system

The documents labeled with an asterisk (*) can be downloaded from **schunk.com/downloads**.

1.1.3 Variants

This operating manual applies to the following variations:

- Force/torque sensor FT-AXIA with FTN-interface
- Force/torque sensor FT-AXIA with FTE-interface
- Force/torque sensor FT-AXIA with FTRS-interface

1.1.4 Sizes

This operating manual applies to the following sizes:

- FT-AXIA80
- FT-AXIA90
- FT-AXIA130

1.1.5 Calibration variants

The sensors are available in different calibration variants, which can be recognized by the number of grooves (1) on the outer housing.

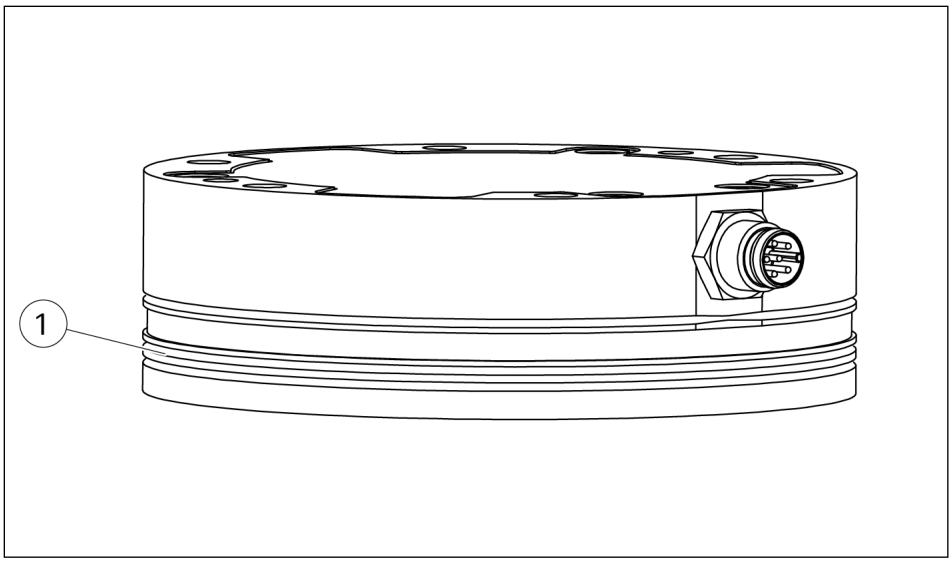


Illustration shown as an example on FT-AXIA80-DUAL SI-75-4/SI-150-8

Designation	Number of grooves
FT-AXIA80-DUAL SI-75-4/SI-150-8	3
FT-AXIA80-DUAL SI-200-8/SI-500-20	0
FT-AXIA80-DUAL SI-480-20/SI-1200-50	2
FT-AXIA90-SI-1000-50	0
FT-AXIA130-SI-2000-125	1
FT-AXIA130-SI-4000-300	2

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:

- Observe the ambient conditions and operating conditions, ▸ 2.5 [🗋 9]
- Observe the specified maintenance intervals, ▸ 7 [🗋 38]

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

1.3 Scope of delivery

The scope of delivery includes

- Force/torque sensor FT-AXIA in the version ordered
- Connection cable
- Assembly and Operating Manual

1.4 Accessories

A wide range of accessories are available for this product

For information regarding which accessory articles can be used with the corresponding product variants, see catalog data sheet.

2 Basic safety notes

2.1 Intended use

The product is a machine component designed for measuring forces and moments (FT=force torque) in six directions. The product converts the mechanically acting forces into electrical measured values and can transmit these to a customer PC or control system via various interfaces.

- The product may only be used within the scope of its technical data, ▶ 3 [🗋 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/automated system. The applicable guidelines for the machine/automated system 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

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

2.3 Constructional 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 or spares authorized by SCHUNK.

2.5 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 is used only in the context of its defined application parameters, ▶ 3 [🗋 13].
- Ensure that the outer sheath of the sensor cable is intact to prevent damage to the sensor.

2.6 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.

2.7 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.

2.8 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.

2.9 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.

2.10 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.

2.11 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.

2.11.1 Protection during handling and assembly

Incorrect handling and assembly

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

- Have all work carried out by appropriately qualified personnel.
- For all work, secure the product against accidental operation.
- Observe the relevant accident prevention rules.
- Use suitable assembly and transport equipment and take precautions to prevent jamming and crushing.

Incorrect lifting of loads

Falling loads may cause serious injuries and even death.

- Stand clear of suspended loads and do not step into their swiveling range.
- Never move loads without supervision.
- Do not leave suspended loads unattended.

2.11.2 Protection during commissioning and operation

Falling or violently ejected components

Falling and violently ejected components can cause serious injuries and even death.

- Take appropriate protective measures to secure the danger zone.
- Never step into the danger zone during operation.

CAUTION

Material damage due to incorrect grounding!

Damage to the sensor due to electrostatic discharge possible.

- Make sure that all components are properly grounded.

3 Technical data

3.1 Basic data

Designation	FT-AXIA80		
	-DUAL SI-75-4/ SI-150-8	-DUAL SI-200-8/ SI-500-20	-DUAL SI-480-20/ SI-1200-50
Weight [kg]	0.28		0.68
Material	Aluminum		Stainless steel
Height [mm]	25.4		
Diameter [mm]	82		
Supply voltage [VDC]	12-30		
Max. Power consumption [W]	1.5		
Stiffness (calculated)			
X-axis & Y-axis forces (Kx, Ky) [N/m]	2.7×10^7		
Z-axis forces (Kz) [N/m]	4.1×10^7		
X-axis & Y-axis torques (Ktx, Kty) [Nm/rad]	2.4×10^4		
Z-axis torques (Ktz) [Nm/rad]	4.8×10^4		
Single axis overload*			
Fxy [N]	±750	±2,500	±6,000
Fz [N]	±2,300	±4,500	±10,000
Mxy [Nm]	±40	±100	±210
Mz [Nm]	±40	±100	±250
Resonant frequency			
Fx, Fy, Fz [Hz]	2,200		
Mx, My, Mz [Hz]	2,600		

* **Caution:** The overload values apply when loading in one relevant axis direction, not when there is an overlap of forces and torques in several axis directions! ▶ 3.4 [🗋 18]

Designation	FT-AXIA90-SI-1000-50
Weight [kg]	0.74
Material	Aluminum
Height [mm]	26.9
Diameter [mm]	89.9
Supply voltage [VDC]	12-30
Max. Power consumption [W]	1.5
Stiffness (calculated)	
X-axis & Y-axis forces (Kx, Ky) [N/m]	6.3×10^7
Z-axis forces (Kz) [N/m]	1.4×10^8
X-axis & Y-axis torques (Ktx, Kty) [Nm/rad]	9.6×10^4
Z-axis torques (Ktz) [Nm/rad]	1.7×10^5
Single axis overload*	
Fxy [N]	±5,000
Fz [N]	±10,000
Mxy [Nm]	±250
Mz [Nm]	±250
Resonant frequency	
Fx, Fy, Fz [Hz]	2,300
Mx, My, Mz [Hz]	2,900

* **Caution:** The overload values apply when loading in one relevant axis direction, not when there is an overlap of forces and torques in several axis directions! ▶ 3.4 [🗋 18]

Designation	FT-AXIA130	
	-SI-2000-125	-SI-4000-300
Weight [kg]	0.86	1.88
Material	Aluminum	Stainless steel
Height [mm]	39.2	
Diameter [mm]	130	
Supply voltage [VDC]	12-30	
Max. Power consumption [W]	1.5	
Stiffness (calculated)		
X-axis & Y-axis forces (Kx, Ky) [N/m]	5.8×10^7	1.5×10^8
Z-axis forces (Kz) [N/m]	8.6×10^7	2.2×10^8
X-axis & Y-axis torques (Ktx, Kty) [Nm/rad]	1.1×10^5	2.8×10^5
Z-axis torques (Ktz) [Nm/rad]	2.1×10^5	6×10^5
Single axis overload*		
Fxy [N]	±10,000	±20,000
Fz [N]	±20,000	±30,000
Mxy [Nm]	±620	±1,500
Mz [Nm]	±620	±1,500
Resonant frequency		
Fx, Fy, Fz [Hz]	2,500	2,450
Mx, My, Mz [Hz]	4,000	2,900

* **Caution:** The overload values apply when loading in one relevant axis direction, not when there is an overlap of forces and torques in several axis directions! ▶ 3.4 [🗋 18]

More technical data is included in the catalog data sheet. Whichever is the latest version.

3.2 Ambient conditions and operating conditions

Designation	FT-AXIA		
	80	90	130
Storage temperature [°C]			
Min.	-20		-45
Max.	+85		+85
Operating temperature [°C]			
Min.	0		-20
Max.	+65		+70
Relative air humidity [%]	<95, non-condensing		
IP rating	64	67	

The catalog data sheet contains more information.

3.3 Standard peak values

NOTE

When switched on, the sensor records the peak values loaded on each individual axis. The following values are the factory default values programmed during calibration. If the sensor displays peak values that are higher than these default values, the sensor has been loaded beyond the intended calibrated detection range.

Designation	Fxy [N]	Fz [N]	Mxy [Nm]
FT-AXIA80-DUAL SI-75-4/SI-150-8			
Positive default value	2.25×10^8	7.05×10^8	1.2×10^7
Negative default value	-2.25×10^8	-7.05×10^8	-1.2×10^7
FT-AXIA80-DUAL SI-200-8/SI-500-20			
Positive default value	7.5×10^8	1.35×10^9	3.0×10^7
Negative default value	-7.5×10^8	-1.35×10^9	-3.0×10^7
FT-AXIA80-DUAL SI-480-20/SI-1200-50			
Positive default value	7.499988×10^8	1.249998×10^9	3.123995×10^7
Negative default value	-7.499988×10^8	-1.249998×10^9	-3.123995×10^7
FT-AXIA90-SI-1000-50			
Positive default value	6.24999×10^8	1.249998×10^9	3.124995×10^7
Negative default value	-6.24999×10^8	-1.249998×10^9	-3.124995×10^7
FT-AXIA130-SI-2000-125			
Positive default value	2.25×10^8	7.05×10^8	1.2×10^7
Negative default value	-2.25×10^8	-7.05×10^8	-1.2×10^7
FT-AXIA130-SI-4000-300			
Positive default value	8.4×10^8	1.26×10^9	6.3×10^7
Negative default value	-8.4×10^8	-1.26×10^9	-6.3×10^7

3.4 Maximum permissible load

The force/torque sensors have 3 different indicators that a sensor is being used outside of its calibrated range:

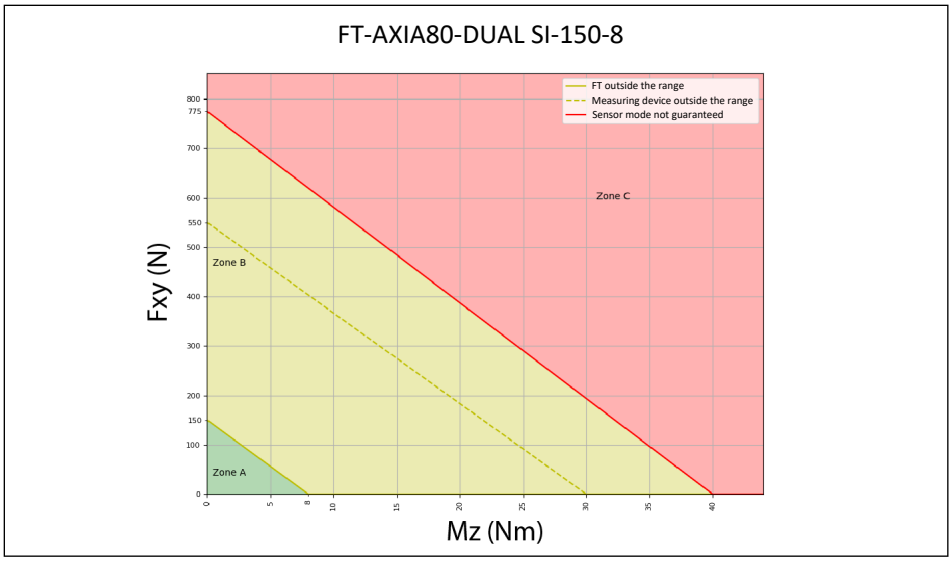
- FT-AXIA outside the range
  - This error is activated when a combination of Fxy/Mz or Fz/Mxy applied to the sensor exceeds the calibrated range of the sensor.
  - This limit is shown as part of Zone B in the following graphics.
- Measuring device outside the range
  - This error is activated when a single measuring device is stimulated beyond the range it experienced during calibration.
  - This error depends on the sum of all force and torque axes and is displayed as part of Zone B.
- Sensor mode not guaranteed
  - The sensor may no longer measure an increase in applied load in its output if load continues to be applied to the sensor.
  - This limit is shown in Zone C in the diagrams below.

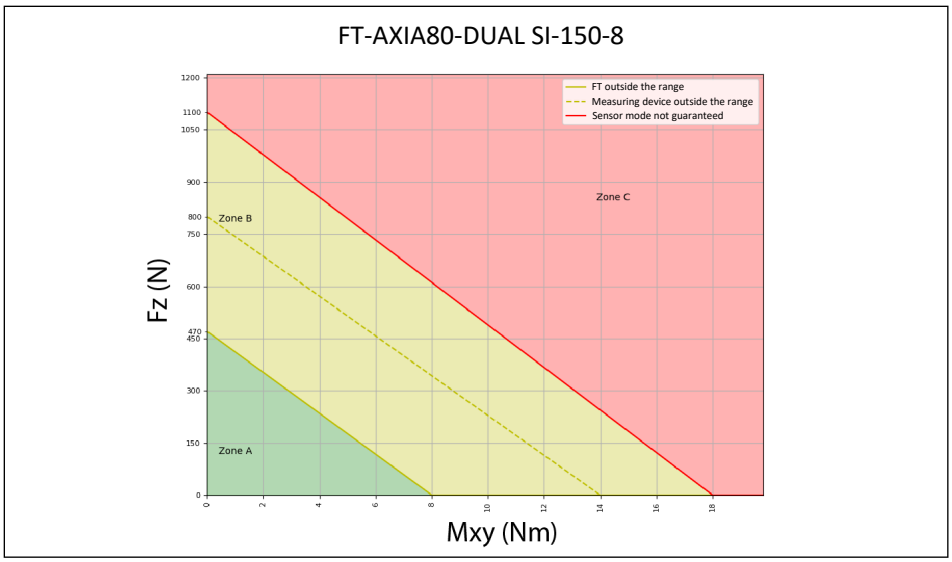
The following diagrams show the maximum permissible load under which the force/torque sensor may be used and when it can lead to damage. The upper diagram shows the interplay of forces in the X or Y direction in combination with torques in the Z direction. The lower diagram shows the interplay of forces in the Z direction in combination with torques in the X or Y direction. Each diagram includes an SI calibration.

A	In this range, the force-torque sensor functions perfectly.
B	In this range, the force-torque sensor still functions perfectly, but the measured values may deviate.
C	In this range, the strain gauges are in saturation, and the force-torque sensor may get damaged.

Calibration	F_x/F_y [N]	F_z [N]	$M_{x/y/z}$ [Nmm]
SI-150-8	150	470	8

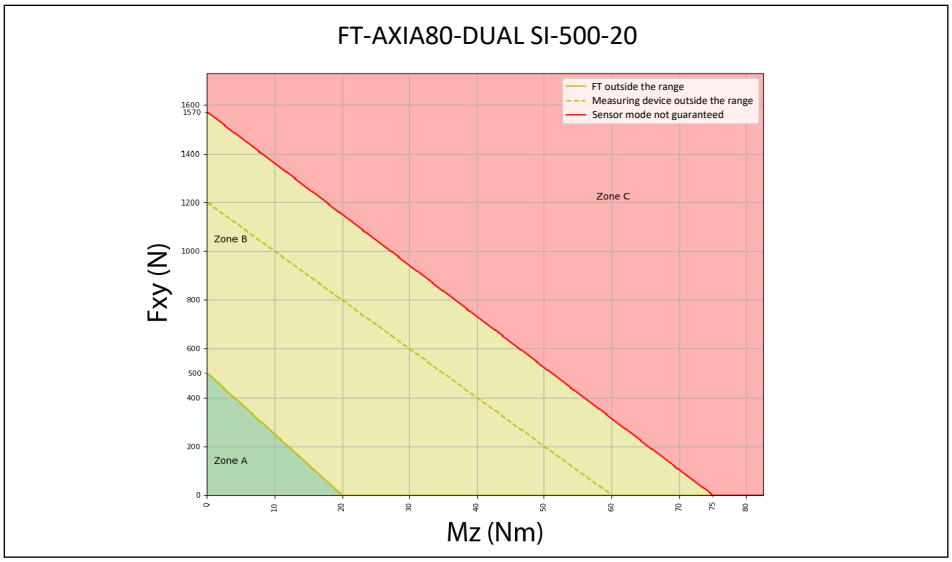
Tab.: FT-AXIA80

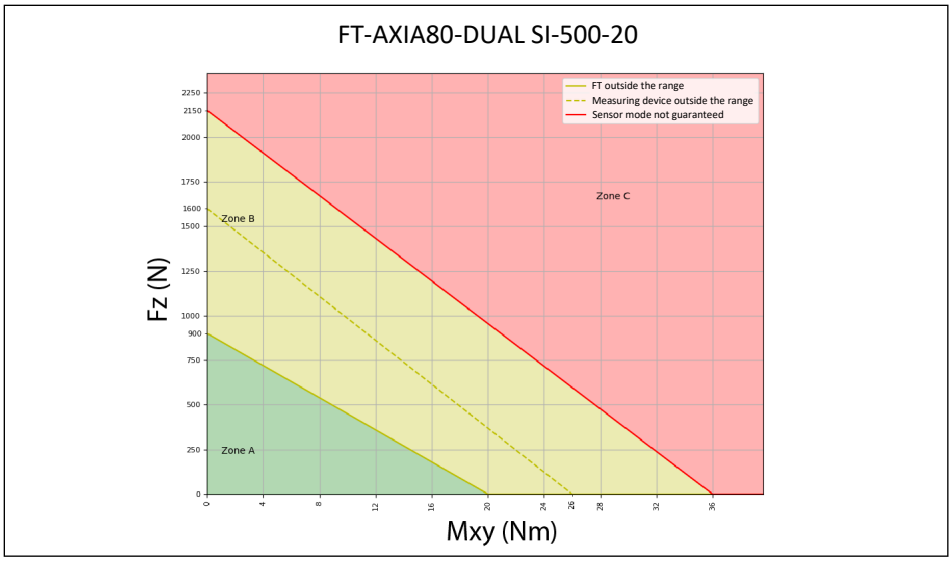

FT-AXIA80-DUAL SI-150-8
FT outside the range
Measuring device outside the range
Sensor mode not guaranteed
Zone C
Zone B
Zone A
Fxy (N)
Mz (Nm)


FT-AXIA80-DUAL SI-150-8
FT outside the range
Measuring device outside the range
Sensor mode not guaranteed
Zone C
Zone B
Zone A
Fz (N)
Mxy (Nm)

Calibration	F_x/F_y [N]	F_z [N]	$M_{x/y/z}$ [Nmm]
SI-500-20	500	900	20

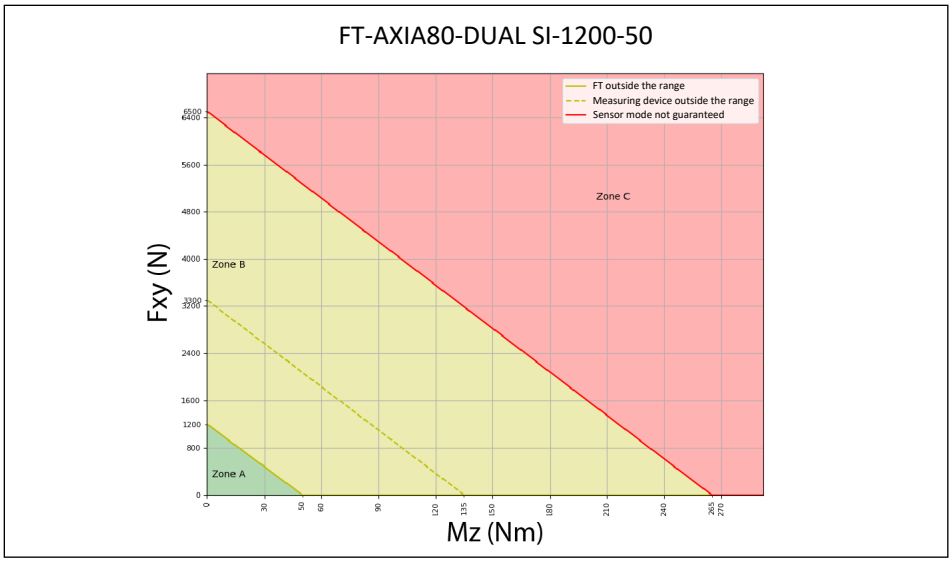
Tab.: FT-AXIA80

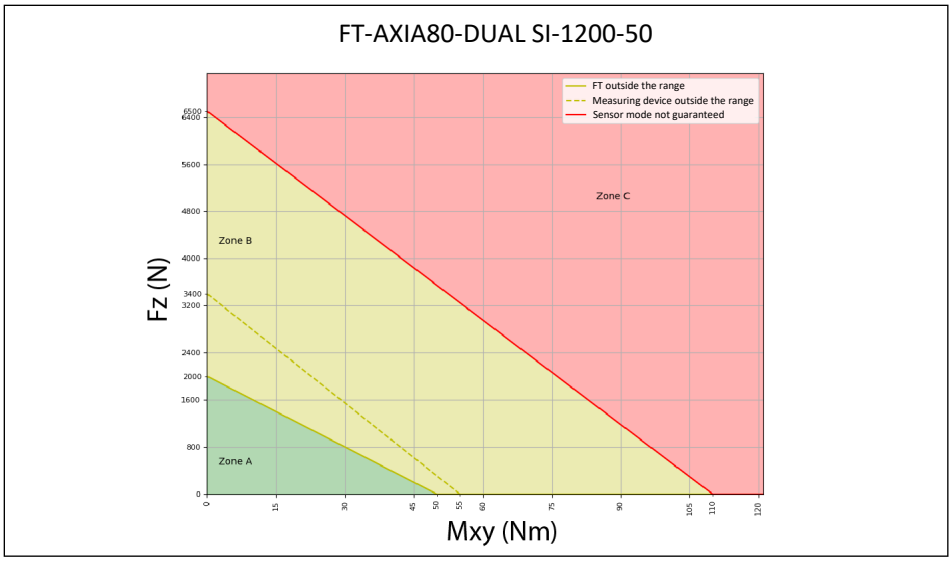




Calibration	F_x/F_y [N]	F_z [N]	$M_{x/y/z}$ [Nmm]
SI-1200-50	1,200	2,000	50

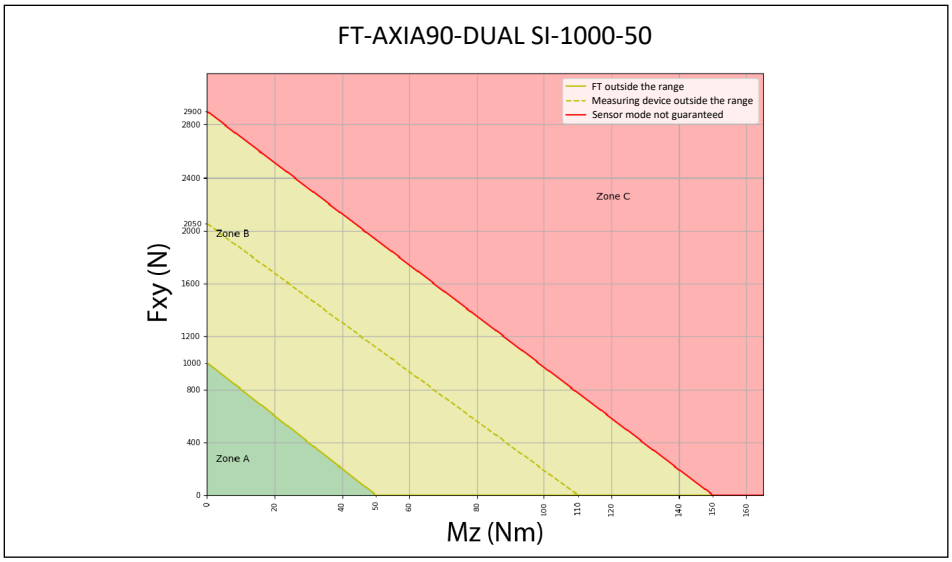
Tab.: FT-AXIA80

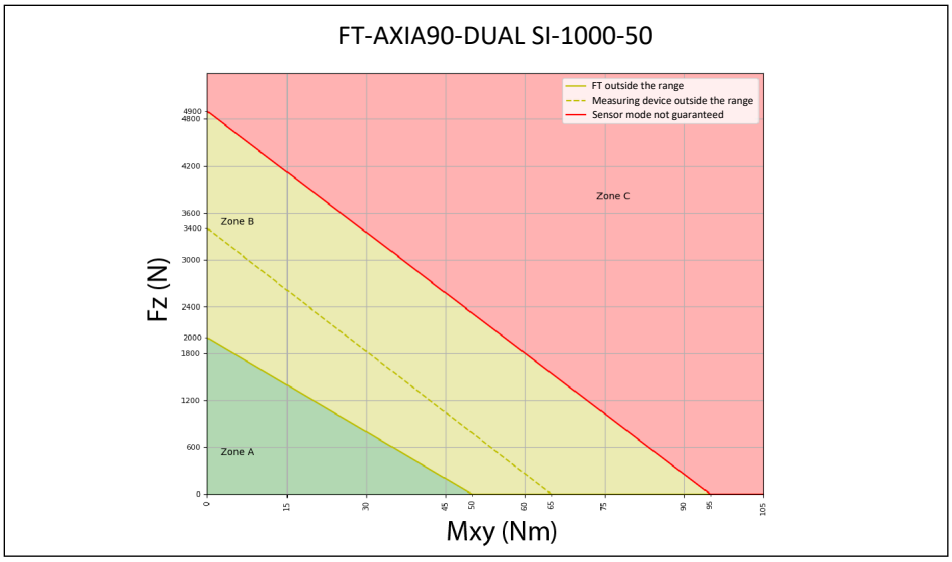




Calibration	F_x/F_y [N]	F_z [N]	$M_{x/y/z}$ [Nmm]
SI-1000-50	1,000	2,000	50

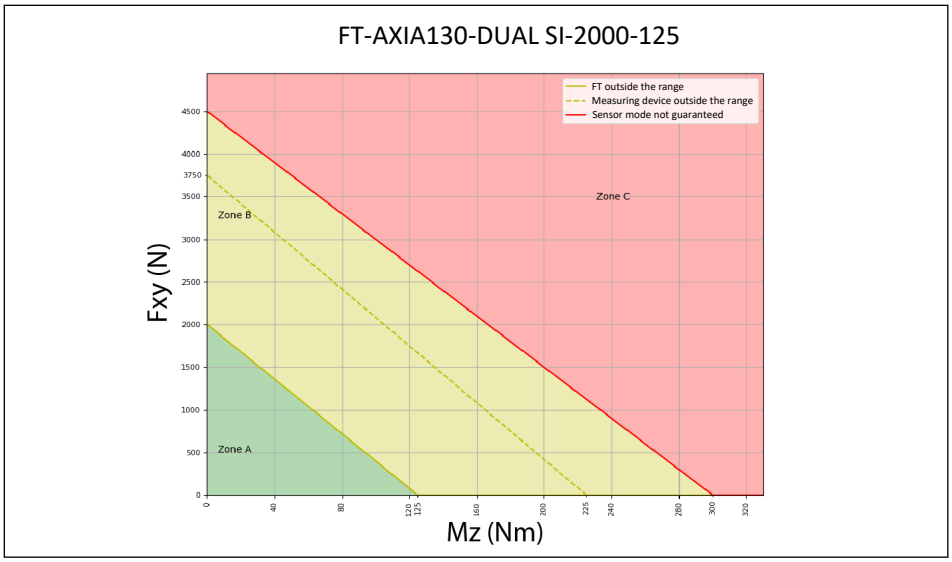
Tab.: FT-AXIA90

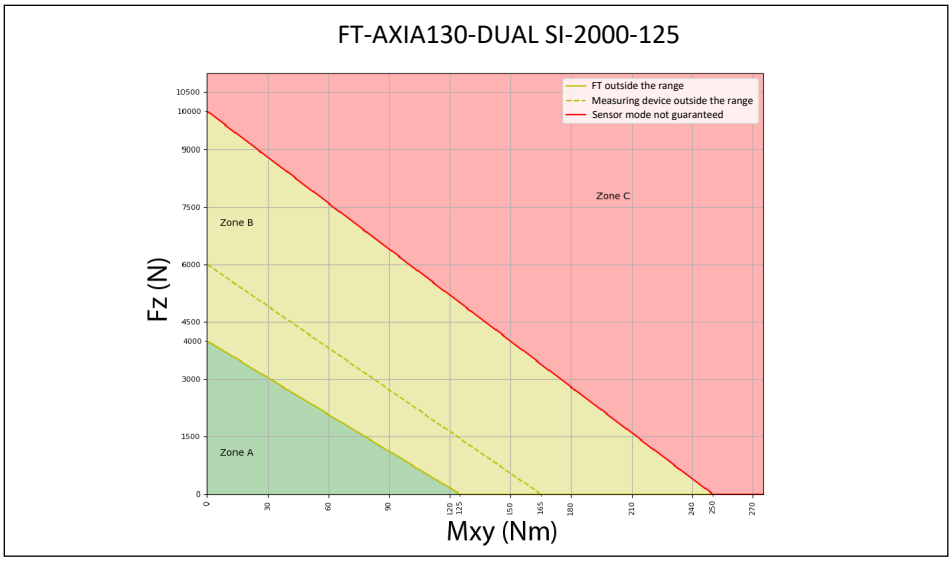




Calibration	F_x/F_y [N]	F_z [N]	$M_{x/y/z}$ [Nmm]
SI-2000-125	2,000	4,000	125

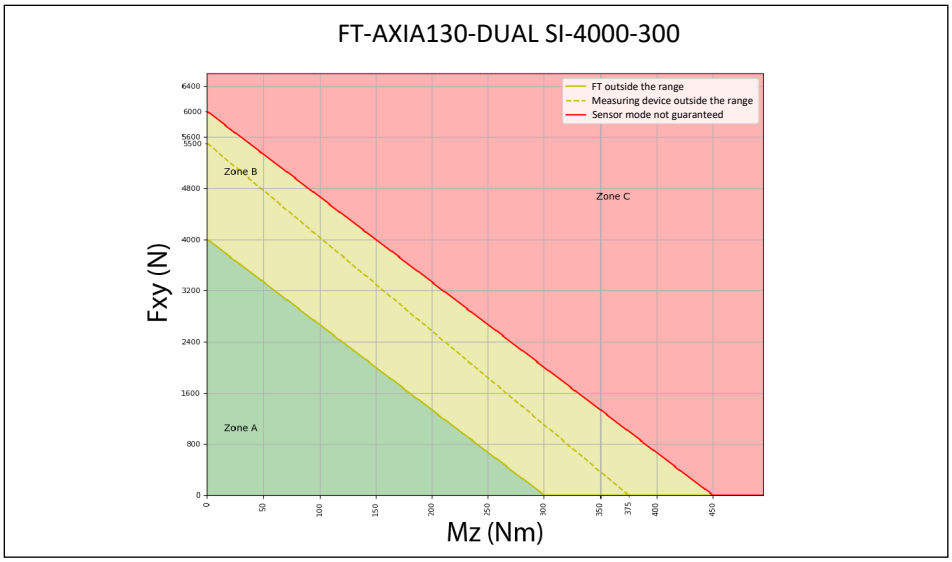
Tab.: FT-AXIA130

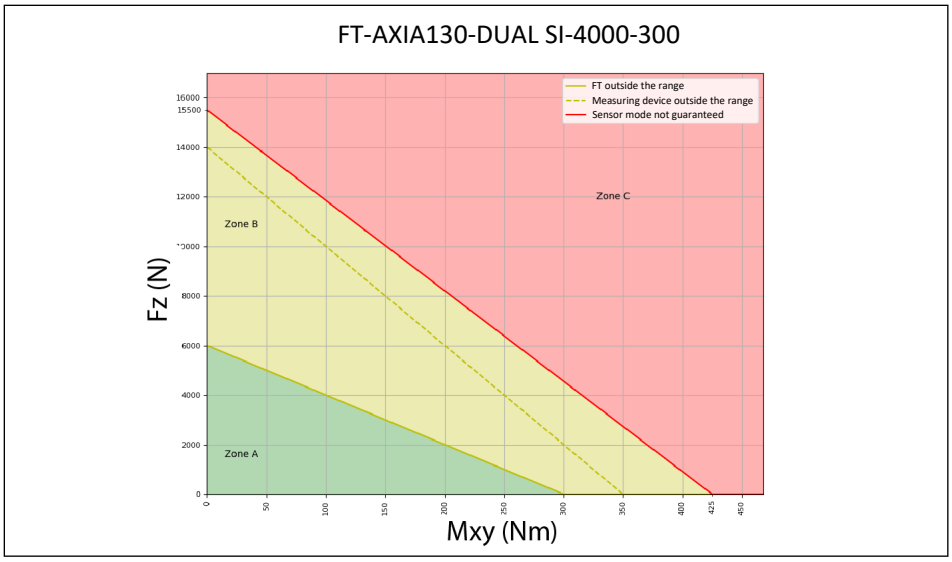




Calibration	F_x/F_y [N]	F_z [N]	$M_{x/y/z}$ [Nmm]
SI-4000-300	4,000	6,000	300

Tab.: FT-AXIA130

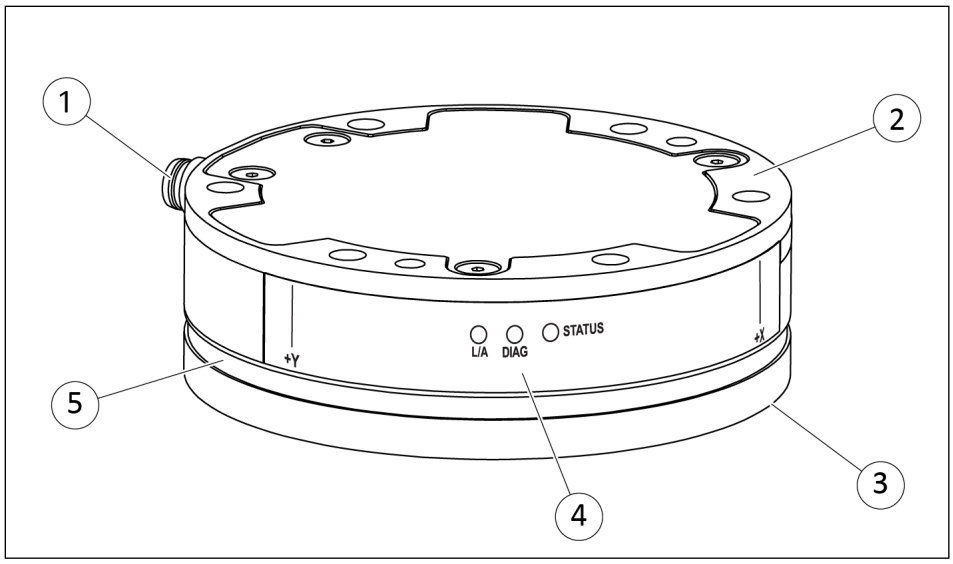




4 Design and description

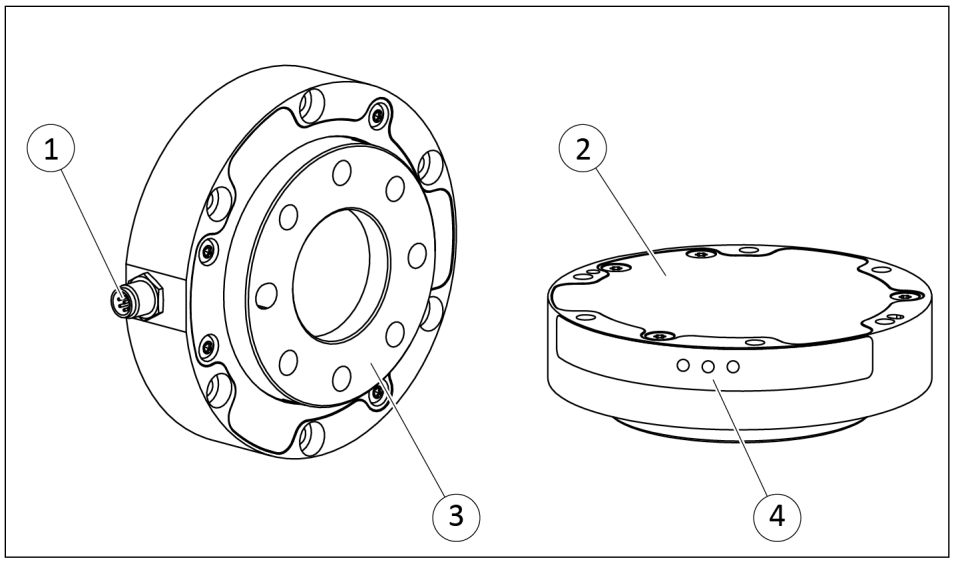
4.1 Design

FT-AXIA80



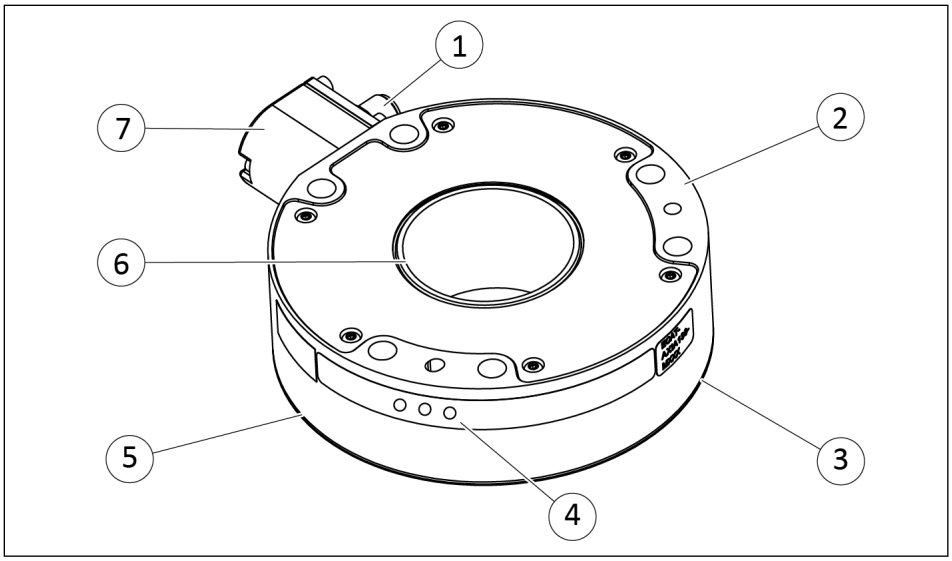
1	Plug connection with fitting for power and signal cable, 6-pin, M8
2	Robot side (for adapter plate or robot)
3	Tool side (for customer tool or end effector)
4	Communication and status LEDs
5	Seal for protection class IP64

FT-AXIA90



1	Plug connection with fitting for power and signal cable, 8-pin, M8
2	Robot side (for adapter plate or robot)
3	Tool side (for customer tool or end effector)
4	Communication and status LEDs

FT-AXIA130



1	Plug connection with fitting for power and signal cable, 8-pin, M12
2	Robot side (for adapter plate or robot)
3	Tool side (for customer tool or end effector)
4	Communication and status LEDs
5	Identification groove
6	Through-hole with 50 mm diameter
7	Terminal block with adjustable alignment

4.2 Description

Rigid 6-axis force-torque-sensor for precise measuring in all six degrees of freedom

5 Assembly

5.1 Assembly and connection

⚠ 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.

1. Commission the associated interface, ▸ 1.1.2 [🗋 5].
2. Check the evenness of the mounting surface, ▸ 5.3.1 [🗋 30].
3. Screw the product to the machine/system, ▸ 5.3.1 [🗋 30].
   ⇨ If necessary, use appropriate connection elements (adapter plates).
4. Connect and lay the sensor cable, ▸ 5.3.2 [🗋 34].

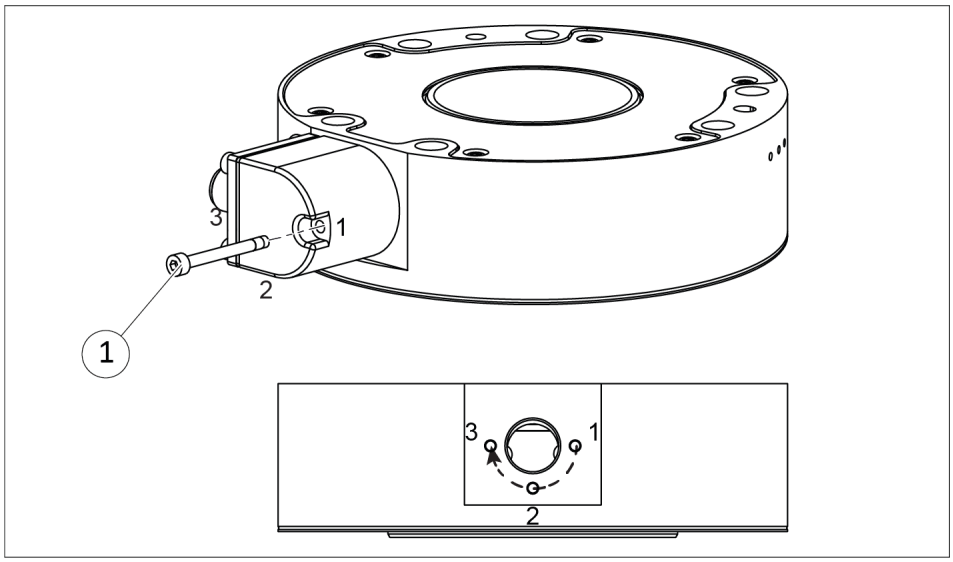
5.2 Adjusting the alignment of the terminal block

⚠ WARNING

Risk of damage to the sensor!

Only align the terminal block when the sensor is switched off and completely dry.

Terminal block FT-AXIA130



NOTE

The standard alignment of the terminal block is position 1.

1. Remove the mounting screw (1).
2. Turn the terminal block in one of the 90° steps shown in the illustration.
3. Apply Loctite® 222 threadlocker to the thread of the screw (1).
4. Tighten the screw (1) with a tightening torque of 0.9 Nm.

5.3 Connections

5.3.1 Mechanical connection

Evenness of the mounting surface

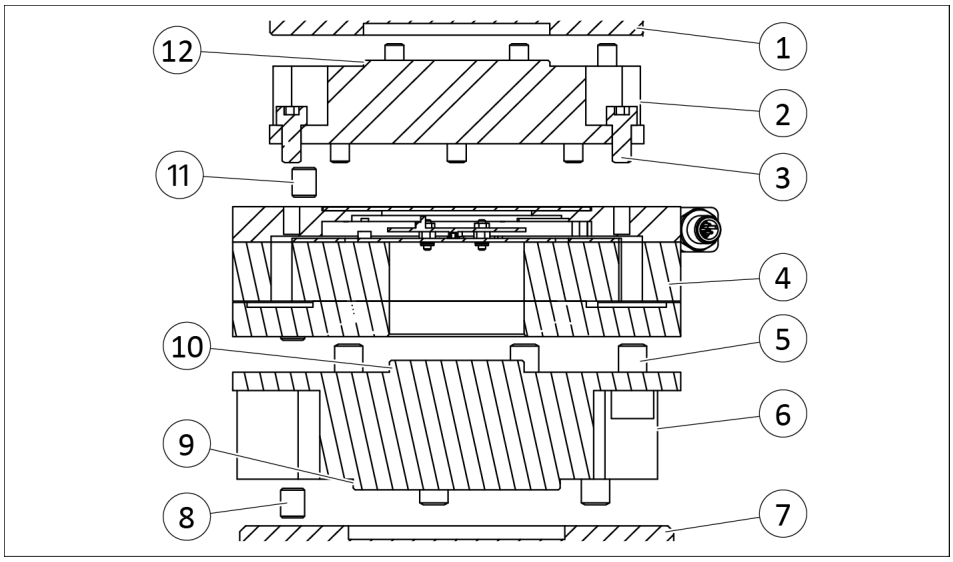
The values apply to the whole mounting surface to which the product is mounted.

Edge length	Permissible unevenness
< 100	< 0.02
> 100	< 0.05

Tab.: Requirements for evenness of the mounting surface (Dimensions in mm)

Adapter plate requirements

Adapter plates can be inserted between the robot and the force-torque-sensor or between the force-torque-sensor and the tool. An adapter plate is necessary if the screw connection diagram of the force-torque-sensor has to be adapted to the customer's equipment (robot flange, end effector). **IMPORTANT! Only use adapter plates if they have bore holes and recesses that match the product exactly. Precise assembly is a prerequisite for proper functioning.**



Adapter plate for robot flange and adapter plate for tool side

1	Robot
2	Adapter plate for robot flange
3/5	Mounting screws
4	Force-torque-sensor
6	Adapter plate for tool side
7	End effector
8/11	Alignment pin
9/10/12	Centering collar

The adapter plate must meet the following requirements:

- For precise assembly, the adapter plate requires precisely measured bore holes for the mounting screws, the alignment pins and the centering collar
- The bore holes in the adapter plate should not all be aligned centrally. A larger bolt pitch circle ensures more accurate measured values because less bending occurs in the plate.
- To guarantee the necessary tightening torque, the adapter plate must have a sufficient height.
- The mounting screws must not be too long in order to prevent damage to the internal electronics of the force-torque-sensor.

  The adapter plate must have an even and stable surface running parallel to the force-torque-sensor to prevent distortion during operation.

The catalog data sheet contains detailed information and precise manufacturing instructions for possible adapter plate design, ▸ 1.1.2 [🗋 5].

CAUTION

Risk of damage to the sensor!

The sensor can get damaged if the specified range of measurement is exceeded.

- Only mount the sensor if the corresponding interface has been put into operation to check the saturation.
- If an error occurs during assembly, wait until the error disappears.

CAUTION

Incorrect assembly will cause material damage!

The drilling patterns on the robot and tool side of the product are identical but the screw depths differ! The screws for the robot side can cause damage to the product on the tool side.

- Take care not to mix up the robot and tool side of the product.

CAUTION

Risk of material damage if alignment pins are too long!

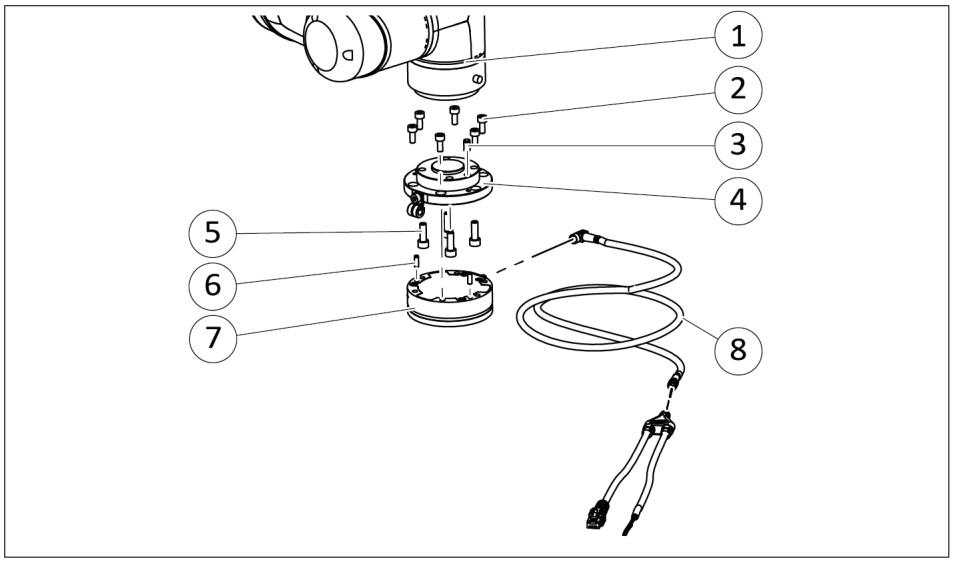
Using alignment pins that are too long creates a gap between the adapter plate and the product and can damage the product.

- Use alignment pins of the correct length.
- Make sure the adapter plate and product are flush.

NOTE

- Secure all screws with Loctite® 242. To do this, apply adhesive to the exposed screw threads.
- Use adhesive only once. Always apply new adhesive if reusing fastening elements.

FT-AXIA80

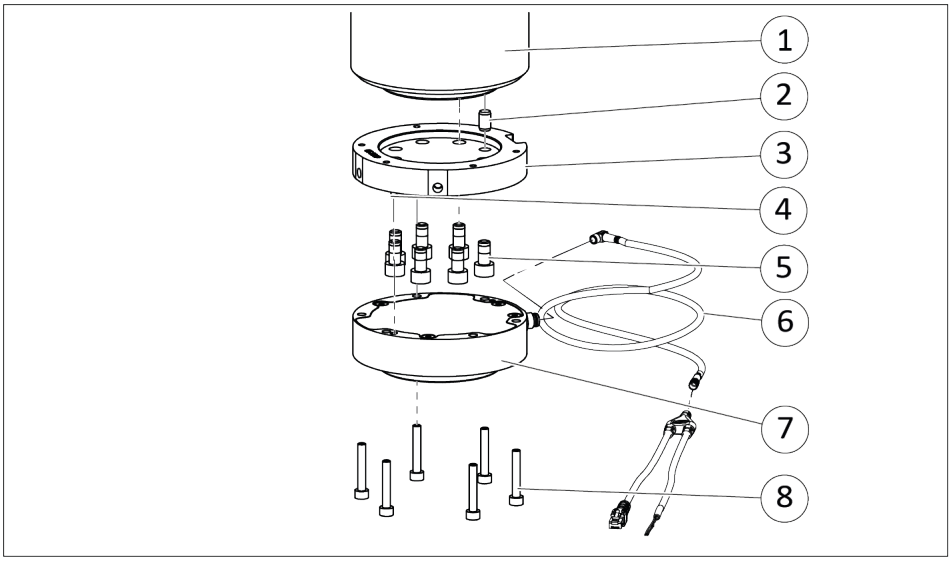


1. Clean the mounting surfaces.
2. Mount the adapter plate (4) on the robot (1) with mounting screws (5) and cylindrical pin (3).**IMPORTANT! The screws must have a minimum screw-in length of 4.5 mm.**
   IMPORTANT! Apply Loctite 242 threadlocker to the mounting screws (2).
3. Fasten the force/torque sensor (7) to the adapter plate (4) with mounting screws (2) and cylindrical pin (6).
   ⇨ Observe the tightening torque.
4. Fasten the end effector to the force/torque sensor with mounting screws (7).**IMPORTANT! The tool must not touch any part of the sensor other than the tool side, otherwise the load will not be detected correctly.**
5. Connect the sensor cable (8) to the force/torque sensor (7) and customer application.

Designation	FT-AXIA80		
	-DUAL SI-75-4/ SI-150-8	-DUAL SI-200-8/ SI-500-20	-DUAL SI-480-20/ SI-1200-50
Tightening torque	5.88		8.47
Mounting screw	M5		
Strength class	12.9		

Tab.: Tightening torque

FT-AXIA90

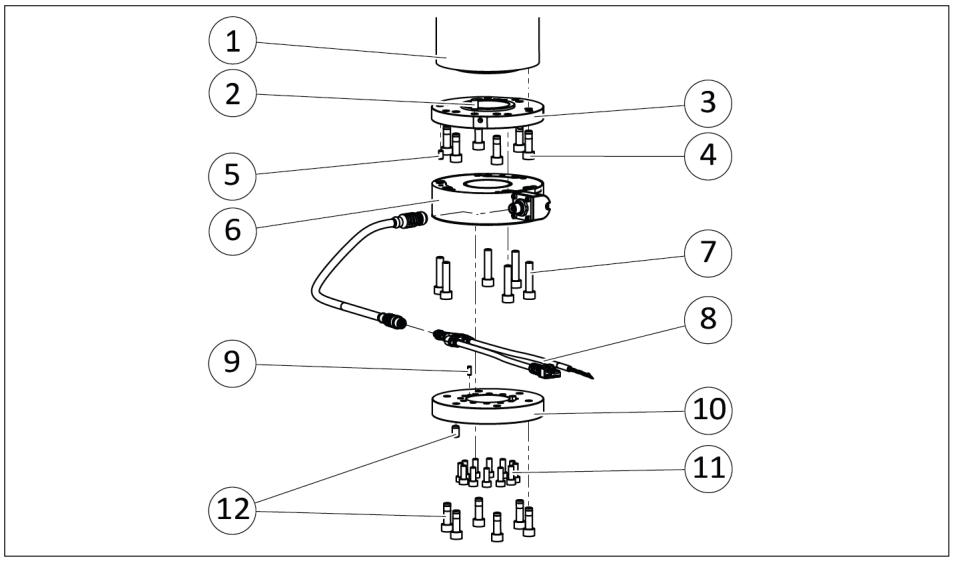


1. Clean the mounting surfaces.
2. Mount the adapter plate (3) on the robot (1) with mounting screws (5) and cylindrical pin (2).**IMPORTANT! The screws must have a minimum screw-in length of 4.5 mm.**
   IMPORTANT! Apply Loctite 242 threadlocker to the mounting screws (2).
3. Fasten the force/torque sensor (7) to the adapter plate (3) with mounting screws (8) and cylindrical pins (4).
   ⇨ Observe the tightening torque.
4. Fasten the end effector to the force/torque sensor with mounting screws (7).**IMPORTANT! The tool must not touch any part of the sensor other than the tool side, otherwise the load will not be detected correctly.**
5. Connect the sensor cable (6) to the force/torque sensor (7) and customer application.

Designation	FT-AXIA90-SI-1000-50
Tightening torque	5.08
Mounting screw	M4
Strength class	12.9

Tab.: Tightening torque

FT-AXIA130



1. Clean the mounting surfaces.
2. Mount the adapter plate (3) on the robot (1) with mounting screws (4) and cylindrical pin (2).
   IMPORTANT! The screws must have a minimum screw-in length of 8 mm.
   IMPORTANT! Apply Loctite 242 threadlocker to the mounting screws (2).
3. Fasten the force/torque sensor (6) to the adapter plate (3) with mounting screws (7) and cylindrical pin (5).
   ⇨ Observe the tightening torque.
4. If required, fasten the adapter plate (10) to the force/torque sensor (6) with mounting screws (11) and alignment pin (9).
   ⇨ Observe the tightening torque, depth of engagement and strength class, if required.
   ⇨ Observe the notes on the version of the adapter plate, .
5. Fasten the end effector to the adapter plate (10) / force/torque sensor (7) with mounting screws and cylindrical pin (12).
   IMPORTANT! The tool must not touch any part of the sensor other than the tool side, otherwise the load will not be detected correctly.
6. Connect the sensor cable (8) to the force/torque sensor (6) and customer application.

Designation	FT-AXIA130	
	-SI-2000-125	-SI-4000-300
Tightening torque	21.5	
Mounting screw	M8; M6 for tool side adapter plate	
Strength class	12.9	

Tab.: Tightening torque

5.3.2 Electrical connection

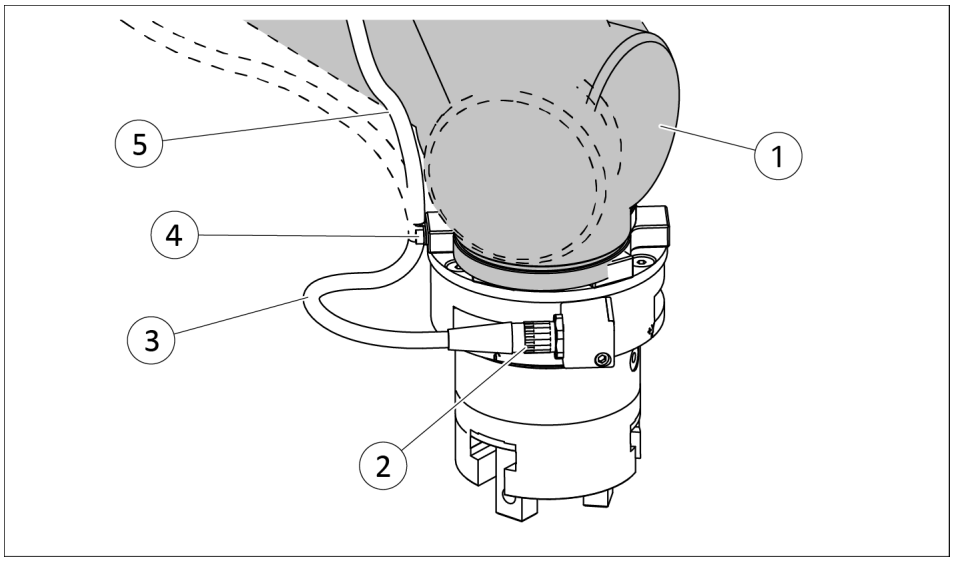
CAUTION

Risk of damage to the sensor cable!

The sensor cable can get damaged in moving applications.

- Observe the bending radius of the cable.
- Secure the cable close to the connector.
- Leave enough clearance to allow the robot to move.

Material number	Designation	Diameter [mm]	Bending radius [mm]	
			static	dynamic
FT-AXIA80				
1329258	FTN-CKIT-ZC22-ZC28-4	6	25	50
1370864	FTN-C-ZC33-ZC34-1	6.2	31	62
FT-AXIA90				
1512851	FTN-CKIT-ZC27-ZC28-4	7	35	70
FT-AXIA130				
1512893	FTN-CKIT-ZC28-ZC28-5	7.65	31	80
FT-AXIA80/90/130				
1329260	FTN-C-ZC28-U-RJ45S-4	6	25	50



1. Connect the plug (2) to the cable outlet.
2. Observe the static bending radius (3) and fasten the sensor cable close to the connector (4).
3. Observe the dynamic bending radius (5) so that the robot (1) can move.

6 Start-up

6.1 Tool conversion

The tool conversion enables forces and torques to be measured at a reference point other than the sensor's point of origin.

CAUTION

Overload during tool conversion

The forces and torques applied to the travel paths need to be observed to prevent the product getting damaged.

If a reference point is set at the same place a force is applied, no torque is transmitted to the sensor.

- When entering the rotation and offset, apply the tolerances for measurement deviations so as not to overload the product.
- Use the sensor's point of origin as the reference point when evaluating overload conditions.

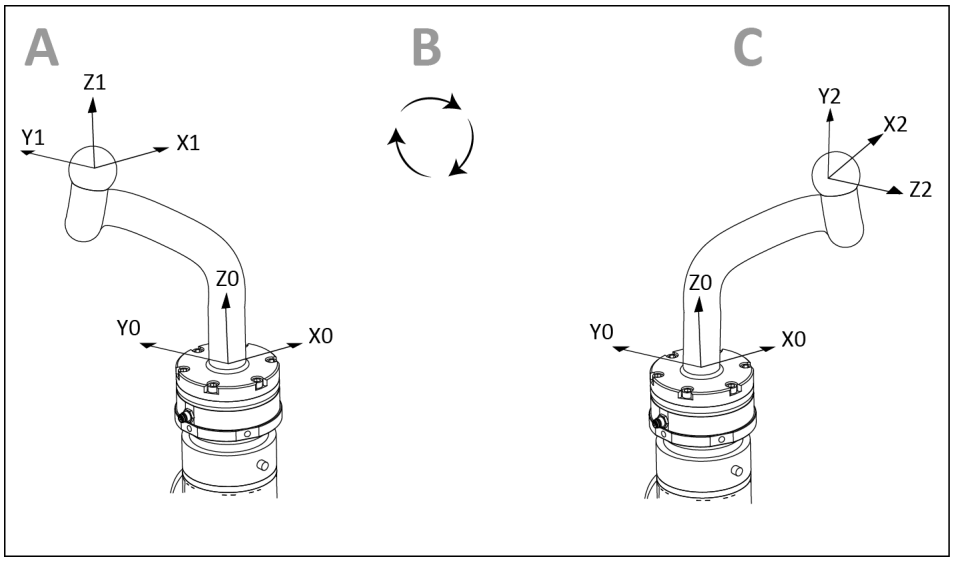
By entering a set of parameters, a reference point is defined, which consists of a series of displacements ($D_X/D_Y/D_Z$) and rotations ($R_x\backslash R_y\backslash R_z$).

If zeros are entered for one of the parameter set values, the tool conversion will not be performed for this particular parameter. Entering zeros for all parameters turns off the tool conversion. Once a new parameter set has been entered and saved, the previously entered parameter sets are no longer effective.

■ After entering a parameter set, the reference point is defined in the following sequence:

1. The displacements are carried out.
2. The first rotation is around the X-axis.
3. The second rotation is around the Y-axis.
4. The third and last rotation is around the Z-axis.

⇨ The final user reference frame of the origin is set



Tool conversion example sketch

With this example, the rotation about the Z-axis results only from the rotations about the X and Y-axis; the tool does not turn about the Z-axis itself in this application.

7 Maintenance

CAUTION

Material damage due to improper disassembly!

Incorrect works can cause damage to the mechanics and internal electronics.

- Disassembly or opening of the product is not permitted.
- Only allow SCHUNK to repair the product.

This product must not be disassembled for maintenance. Have all repair work on the product carried out only by SCHUNK.

7.1 Maintenance intervals

Maintenance interval	Maintenance work
weekly	Inspect the product for damage
annual	Send the product to SCHUNK for calibration. (Recommendation)
as required	Check functionality, ▶ 7.2 [🗋 38].
	Send damaged products to SCHUNK for repair.

7.2 Checking the measured data

To check the functionality of a force-torque-sensor, known loads can be applied to the force-torque-sensor. If the outputted values correspond to the known loads, the force-torque-sensor is working.

1. Position the robot arm so that the force-torque-sensor is loaded in as many axes as possible.
2. Record the measured output value.
3. Position the robot arm so that an additional load is applied.
4. Record the measured output value again.
5. Determine the differences between the two measured output values and use them as the accuracy deviation.

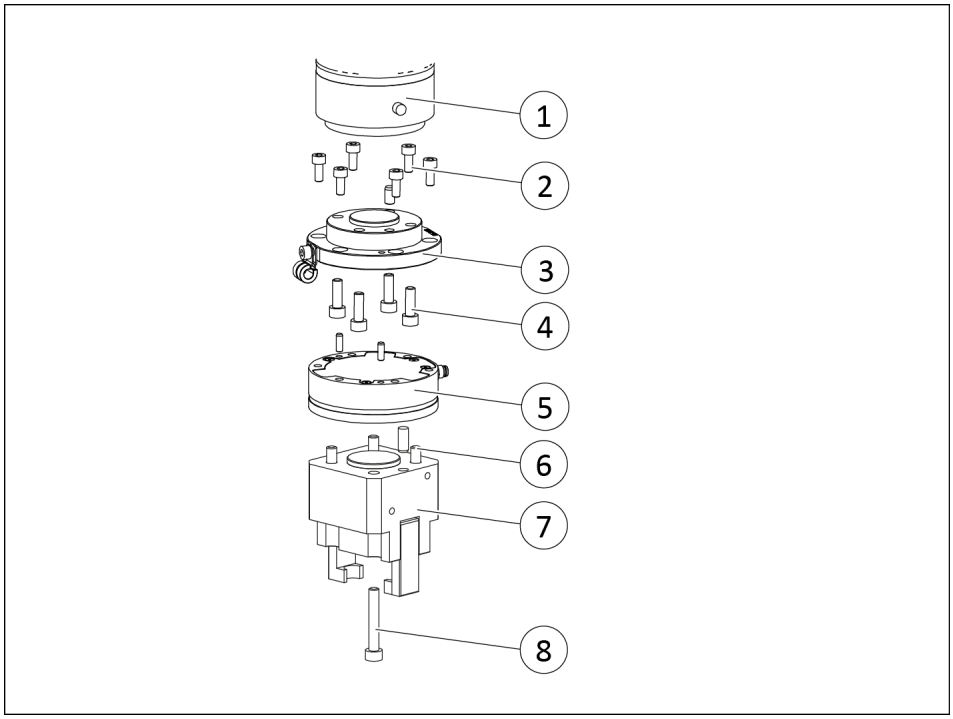
7.3 Removing the product from the robot arm

⚠ WARNING

Risk of injury due to sudden movements!

If the energy supply is switched on or if residual energy is still present in the system, this can cause components to move unexpectedly, which may result in serious injuries and material damage.

- Before starting any work on the product: Switch off the energy supply and secure against re-connection.
- Ensure that no residual energy remains in the system.
- Secure components from falling down or over.



Disassembling the product

1. Switch off and deactivate all activated supply circuits (e. g. electrics, air, water, etc).
2. Loosen the screws (6) and (8) and remove the end effector (7).
3. Loosen the screws (4) and remove the end effector (4).
4. Support the product (5) and use a hexagon socket wrench to loosen the secured screws (2) and (4) that fasten the product to the robot (1) or adapter plate (3).
5. Remove the product (5).

8 EU Declaration of Conformity

Manufacturer/ Distributor	SCHUNK SE & Co. KG Spanntechnik | Greiftechnik | Automatisierungstechnik Bahnhofstr. 106 – 134 D-74348 Lauffen/Neckar

We hereby declare on our sole authority that the product meets the requirements of the following directives at the time of the declaration.
The declaration is rendered invalid if modifications are made to the product.

Product designation:	Force/torque sensor FT-AXIA This declaration of conformity is valid for all variants mentioned in the appendix.

- **Electromagnetic compatibility (EMC directive) 2014/30/EU**

Applied harmonized standards, especially:

EN 61326-2-3:2013	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning. (IEC 61326-2-3:2012)
EN ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction

All related technical documentation has been prepared in electronic form according to Directive 2014/30/EU and will be made available to national authorities on demand. The signatory is resident at the manufacturer's address and is authorized to compile this documentation.

Signed for and on behalf of: SCHUNK SE & Co. KG

Lauffen/Neckar, July 2024

Signature: see original declaration

Dr.-Ing. Manuel Baumeister,
Technology & Innovation

9 UKCA Declaration of Conformity

Manufacturer/ Distributor	SCHUNK Intec Limited Clamping and gripping technology 3 Drakes Mews, Crownhill MK8 0ER Milton Keynes

We hereby declare on our sole authority that the product meets the requirements of the following directives at the time of the declaration.
The declaration is rendered invalid if modifications are made to the product.

Product designation:	Force/torque sensor FT-AXIA
ID number	

- **Electromagnetic Compatibility Regulations 2016**

Applied harmonized standards, especially:

EN 61326-2-3:2013	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning. (IEC 61326-2-3:2012)
EN ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction

Person authorized to compile the technical documentation:
Marcel Machado, address: refer to manufacturer's address

Signed for and on behalf of: SCHUNK SE & Co. KG

Lauffen/Neckar, July 2024

Dr.-Ing. Manuel Baumeister,
Head of Systems Engineering,
Technology & Innovation

10 Information on the RoHS Directive, REACH Regulation and Substances of Very High Concern (SVHC)

RoHS Directive

SCHUNK products are classified as "large-scale stationary installations" or as "large-scale stationary industrial tools" within the meaning of Directive 2011/65/EU and its extension 2015/863/EU "on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)", or fulfill their intended function only as part of one. Therefore products from SCHUNK do not fall within the scope of the directive at this time.

REACH Regulation

Products from SCHUNK fully comply with the regulations of Regulation (EC) No. 1907/2006 "concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)" and its amendment 2022/477. SCHUNK attaches great importance to completely avoiding chemicals of concern to humans and the environment wherever possible.

Only in rare exceptional cases do SCHUNK products contain SVHC substances on the candidate list with a mass content above 0.1%. In accordance with Article. 33 (1) of Regulation (EC) No. 1907/2006, SCHUNK complies with its duty to "communicate information on substances in articles" and lists the components concerned and the substances used in an overview that can be viewed at **schunk.com\SVHC**.

Signature: see original declaration

Lauffen/Neckar, July 2024

Dr.-Ing. Manuel Baumeister,
Head of Systems Engineering,
Technology & Innovation

SCHUNK SE & Co. KG
Spanntechnik | Greiftechnik | Automatisierungstechnik

Bahnhofstr. 106 – 134
D-74348 Lauffen/Neckar
Tel. +49-7133-103-0
info@de.schunk.com
schunk.com

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