

# Instruction Manual

**KiTorq Stator Torque  
Evaluation Unit  
Type 4542A...**

CE

# KISTLER

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## Instruction Manual



**KiTorq Stator Torque  
Evaluation Unit  
Type 4542A...**

CE

Part 2  
002-617-2e-08.14



## Foreword

This instruction manual applies to the Type 4542A... KiTorq Stator torque evaluation unit.

Keep this instruction manual for future reference. It should be available at the point of use.

Information in this instruction manual is subject to change at any time, without notice. Kistler reserves the right to improve and modify its products in the course of technical advancement, without any obligation to inform any persons or organizations of such changes.

Original language of this instruction manual: German

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## 1. Introduction

Thank you for choosing a quality product from Kistler. Please read this instruction manual carefully, so that you can put the many properties of your product to optimal use.

Kistler declines any liability, to the extent permissible by law, if action is taken contrary to this instruction manual, or other products are used than those listed as accessories.

Kistler provides a wide range of metrology products and overall solutions:

- Piezoelectric sensors for measuring pressure, force, torque, strain, acceleration, shock, and vibration
- Strain gage sensor systems for measuring force and torque
- Piezoresistive pressure sensors and transmitters, with corresponding measuring amplifiers
- Corresponding measuring amplifiers (charge amplifiers, piezoresistive amplifiers, etc.), display units, and charge calibrators
- Electronic control, monitoring, and evaluation units, and application-specific metrological software
- Data transmission modules (telemetry)
- Electromechanical NC joining modules and load-displacement monitors
- Test bench systems for electric motors and gears in the lab, in production, and for quality assurance

Kistler also develops concepts for entire measurement systems for special uses, such as in the automotive industry, plastic processing, and biomechanics.

Our full catalog provides an overview of our product line. Detailed data sheets are available for practically all of our products.

For assistance with any special questions remaining after studying these instructions, Kistler customer service is available around the world with expert advice for application-specific problems.

## 2. Important Notes

Strictly comply with the instructions specified in the documentation. This is for your personal safety when working with the Type 4542A... KiTorq Stator torque evaluation unit, and ensures long, trouble-free operation.

### 2.1 For your Safety

The Type 4542A... KiTorq Stator torque evaluation unit left the factory in error free condition with respect to safety. In order to maintain this condition, and ensure hazard-free operation, follow the notes and warnings in this instruction manual and on the unit.

Follow all local safety laws and regulations governing the use of electrical and electronic devices.

If it can be assumed that hazard-free operation of the torque evaluation unit is no longer possible, then remove it from operation and secure it against unintended use.



#### **Hazard-free operation is no longer possible**

- if the evaluation unit has visible damage
  - if the evaluation unit does not function correctly
  - after a long storage period under unfavorable conditions
  - after severe shipping stress
- 

If hazard-free operation can no longer be ensured, due to one of the above conditions, then the torque evaluation unit must be shipped to the responsible Kistler sales office or representative immediately for repair.

### 2.2 Electromagnetic Compatibility (EMC)

The Type 4542A... torque evaluation unit (stator) is designed to conform to **CE** and meets all technical safety requirements with respect to electromagnetic compatibility according to EN 61000-6-2 (interference resistance) and EN 61000-6-4 (industrial interference resistance).

The associated declaration of conformity is attached to the instruction manual.



## 2.3 Tips for Using the Instruction Manual



Report any shipping damage immediately to the freight carrier and to Kistler Lorch GmbH.



We recommend reading the entire instruction manual thoroughly.

Keep this instruction manual in a safe location, where it is always accessible. If the manual is lost, please contact the responsible Kistler sales office or representative, and ask for a replacement.



Modifications to the device (alterations, upgrades, etc.) generally also lead to changes in the assembly manual. In this case, contact the responsible Kistler sales office or representative about ways to update your documentation.

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## 2.4 Note on the Disposal of Electronic Devices



Waste electronic equipment may not be disposed of in household trash or residual waste. Please bring the unserviceable device to the nearest electronic disposal site, or contact your Kistler sales office.

### 3. Typical Properties of the Torque Evaluation Unit



- Combinations of various rotors and stators
- High precision
- Low installation height
- Digital interface for measurement data capture and parameterization
- Freely scalable voltage and frequency outputs

#### 3.1 Functional Overview

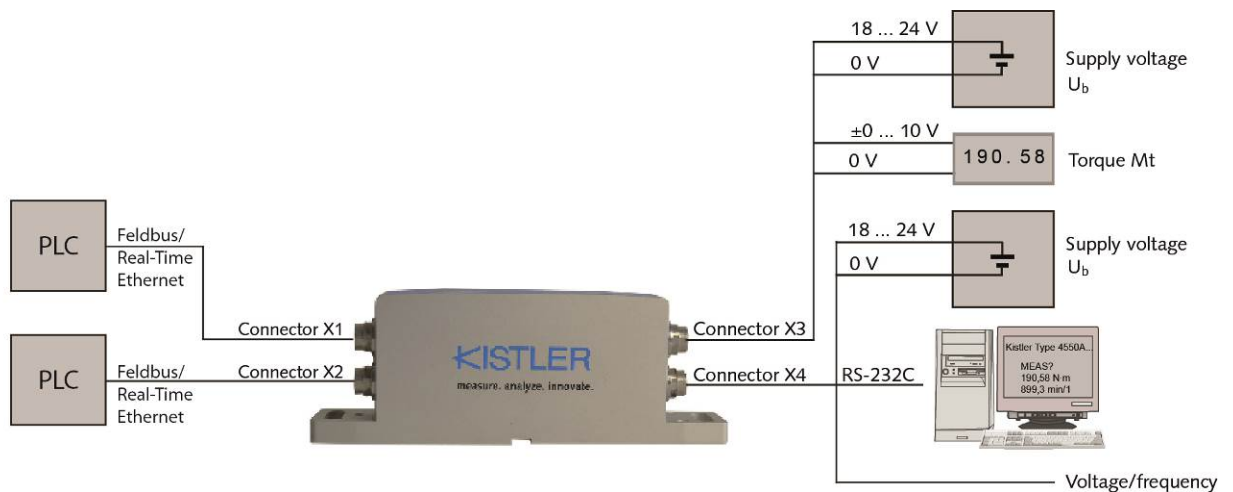


Fig. 1: Functional overview of the KiTorq Stator

### 3.2 Overview of Signal Processing

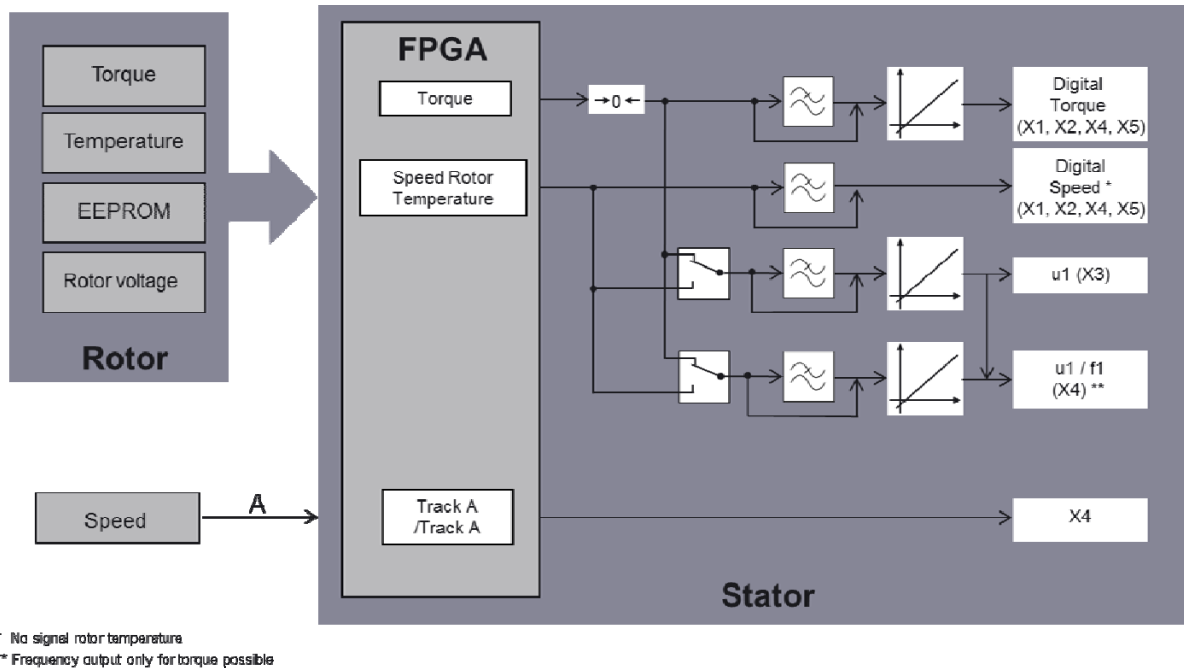


Fig. 2: Overview of signal processing and outputs of the torque evaluation unit

## 4. Assembly Manual and Alignment

In order to ensure the function of the measuring flange, care must be taken to provide ideal alignment between the Type 4542A... torque evaluation unit and the Type 455xA... KiTorq Rotor torque measuring unit. This can be done as shown in the following illustration.



Metal or magnetic objects on the top side (blue) of the torque evaluation unit can cause damage to it or a rapid increase in power during operation.

Therefore, always be sure that the torque measuring flange **is not** in operation during alignment.



### Radial alignment:

In the radial direction, the distance between the torque evaluation unit (stator) and the torque measuring unit (rotor) can be up to 1,5 mm without affecting the sensor function. A feeler gage can be used to determine the air gap. If there is no other requirement, a gap of 1 mm is recommended.

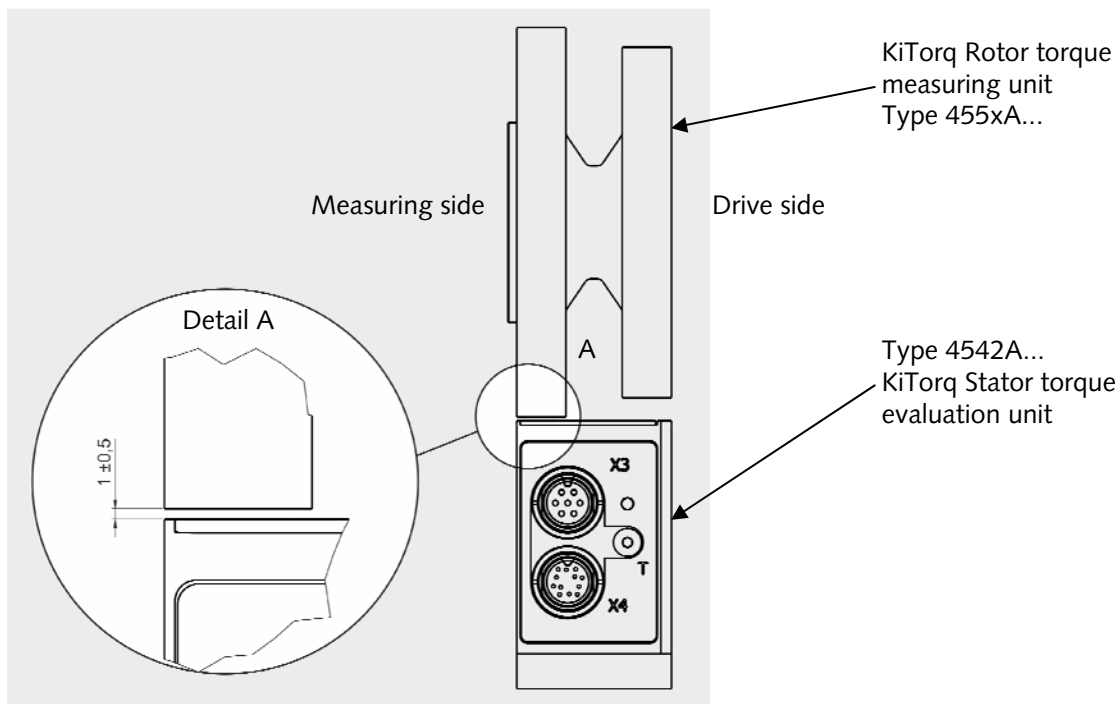


Fig. 3: Side view of the torque evaluation unit and torque measuring unit for radial alignment



**Axial alignment:**

There is a white line on the top side of the torque evaluation unit to help the user with the axial alignment of the torque evaluation unit. The line has a width of 2 mm, which represents an axial tolerance of  $\pm 1$  mm. The inside edge of the measuring side (torque measuring unit) should be within the tolerance range (the white line). The center position, which allows coupling diameters greater than the measuring unit, is optional.

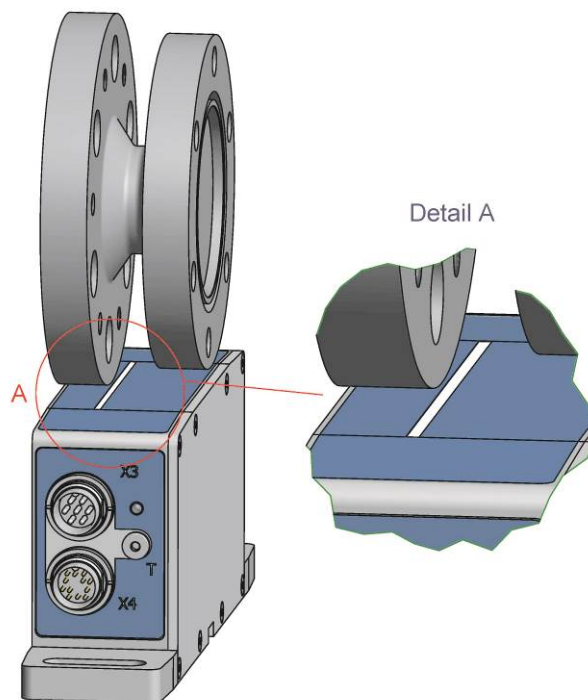


Fig. 4: Side view for aligning the torque evaluation unit in the axial direction

**4.1 Mounting**



Two tabs with elongated holes are provided for mounting the torque evaluation unit on its base. They can be secured with two M8x25 Allen screws. The maximum tightening torque is 8 N·m.

Fig. 5: Tab with elongated hole for assembling the measuring flange

## 4.2 Metal-Free Room

Please note that there should be no piece of metal inside the „metal-free room“. Any metal could disturb the energy transmission between rotor and stator and could lead into signal disturbance.

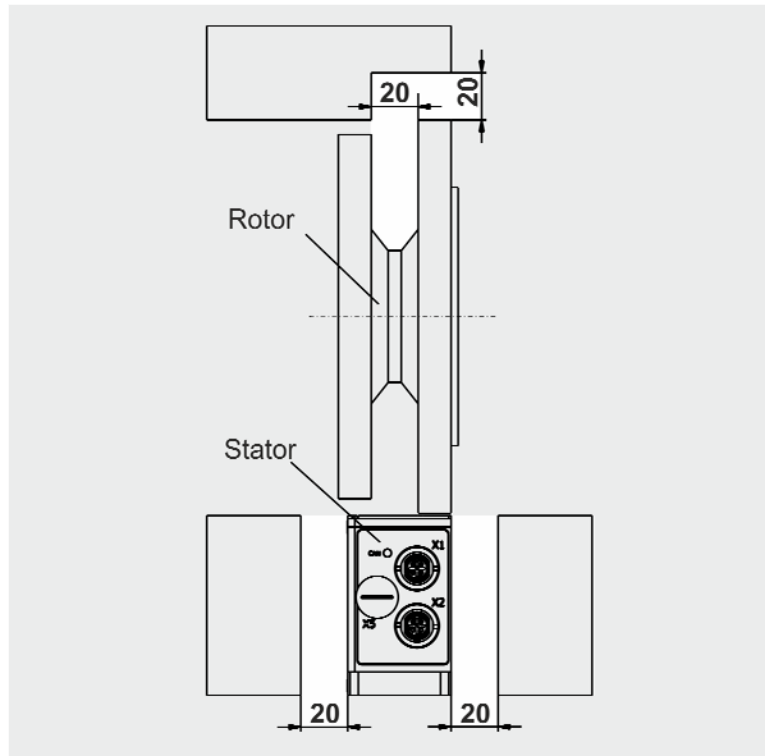
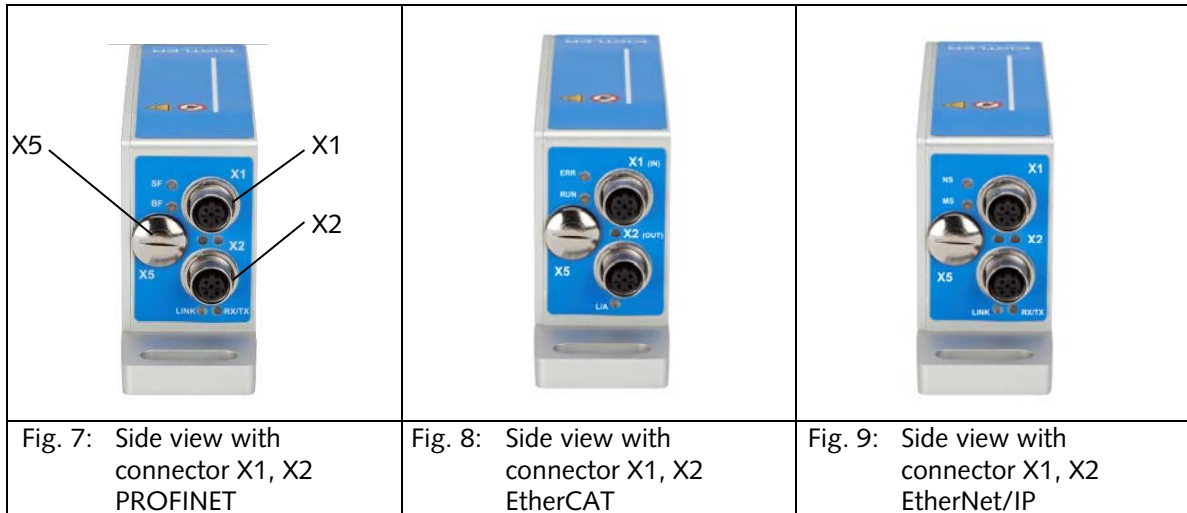


Fig. 6: Metal-free room

## 5. Plug Connection

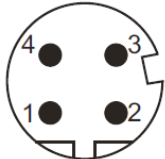
### 5.1 Connector X1 and X2 (PROFINET, EtherCAT, EtherNet/IP)



X1 and X2 represent Ethernet-based communications interfaces, and include the following functions:

- Transmission of measured values
- Tare function
- Switching the measuring range
- Low-pass filter definition
- Self-test (control)

The specific properties of the data structure are explained in detail in the communication manual.

	Function	PIN	Description	
	Digital Interface PROFIBUS, EtherCAT, EtherNet/IP	1	TX+	Transmission cable
		2	RX+	Reception cable
		3	TX-	Transmission cable
4		RX-	Reception cable	

Plug connection X1 and X2

## 5.2 Connector X1 and X2 (PROFIBUS)



Fig. 10: Side view with connector X1, X2 PROFIBUS

X1 and X2 represent fieldbus-based communications interfaces, and include the following functions:

- Transmission of measured values
- Tare function
- Switching the measuring range
- Low-pass filter definition
- Self-test (control)

The specific functions of the data structure are explained in detail in the communication manual.

	Function	PIN	Description	
	Connector 5 pin M12 B-Encoding	1	+5 V_BUS	+5 V for bus termination
		2	RX/TX-	Sending/reception cable
		3	GND_BUS	Mass
		4	RX/TX+	Sending /reception cable
5		n.c.	Not connected	

Plug connection X1

	Function	PIN	Description	
	Flange bushing 5 pin M12 B-Encoding	1	+5 V_BUS	+5 V for bus termination
		2	RX/TX-	Sending/reception cable
		3	GND_BUS	Mass
		4	RX/TX+	Sending /reception cable
5		n.c.	Not connected	

Plug connection X2



### 5.3 Connector X1 and X2 (CANopen)



X1 and X2 represent fieldbus-based communications interfaces, and include the following functions:

- Transmission of measured values
- Tare function
- Switching the measuring range
- Low-pass filter definition
- Self-test (control)

The specific functions of the data structure are explained in detail in the communication manual.

	Function	PIN	Description	
	Connector 5 pin M12 A-Encoding	1	SHIELD	In the sensor, on the housing
		2	n.c.	Not connected
		3	GND_BUS	Mass
		4	CAN_H	Sending/reception cable
5		CAN_L	Sending/reception cable	

Plug connection X1

	Function	PIN	Description	
	Connector 5 pin M12 A-Encoding	1	SHIELD	In the sensor, on the housing
		2	n.c.	Not connected
		3	GND_BUS	Mass
		4	CAN_H	Sending/reception cable
5		CAN_L	Sending/reception cable	

Plug connection X2

### 5.4 Connector X3

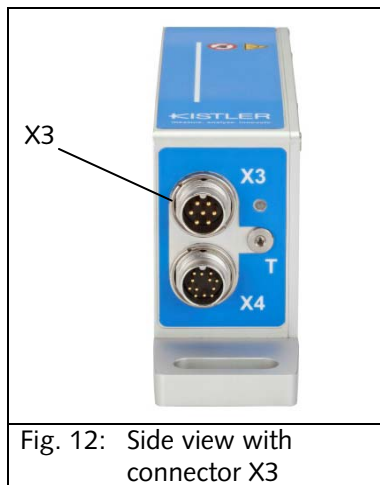
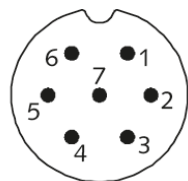


Fig. 12: Side view with connector X3

The X3 connector includes the following functions:

- Sensor supply
- Analog output signal for torque
- Self-test (control)

Function	PIN	Description	
		3	+U <sub>B</sub>
Power supply	2	GND	Ground for +U <sub>B</sub>
Torque output	4	U <sub>A</sub>	Voltage output ±10 VDC at ±M <sub>Nom</sub> an >2 kΩ 10 VDC at control signal activation R <sub>i,c.</sub> = 10 Ω, output short circuit proof
	1	AGND	Ground for U <sub>A</sub>
	5	n.c.	Not connected
100 % control (Floating input)	6	Control	Off: 0 ... 2 VDC On: 3,5 ... 30 VDC
	7	GND	Opto isolated ground for control



7 pin connector X3, Pin assignment

## 5.5 Connector X4

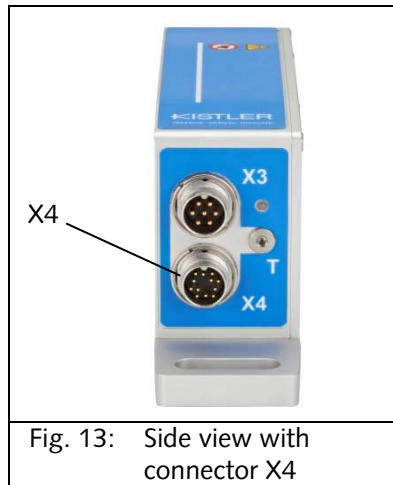


Fig. 13: Side view with connector X4

The X4 connector includes the following functions:

- Sensor supply
- Analog or frequency-based output signal for torque
- Self-test (control)
- Speed output
- RS-232C interface

Function	PIN	Description
Supply	F	+U <sub>B</sub>
	A	GND
Shield	M	In the sensor, on the housing
Torque output	C	U <sub>A</sub>
	F <sub>A</sub>	Frequency output Frequency signal
	D	AGND
		AGND
Speed pulses	H	Track A
	G	n.c.
	J	n.c.
Input 100 % control	K	Control
RS-232C interface to the CoMo Torque	B	TXD
	L	RXD
Digital mass potential	E	DGND

12 pin Connector X4, Pin assignment

## 5.6 USB Interface



Fig. 14: Side view with USB interface X5

The USB interface is located below the seal screw with the designation X5. This screw can be easily removed with a screwdriver or a coin. After that, the USB interface is accessible; this is used to:

- Parameterization
- Service purposes

To ensure the tightness of the stator, it is recommended to screw the sealing screw again after using the USB Interface until the rubber seal engages reliably.

## 5.7 Tare Button



Fig. 15: View page with power LED and tare button T

With the tare button, it is possible to tare the instantaneous torque signal in the stator to 0 N·m (to zero). After pressing, the power LED briefly lights up in orange. After that, the tare is permanently stored in the stator. This it is retained when you switch the sensor again.

The tare button is located below the sealing screw; it is marked with the letter "T". The sealing screw can be easily removed with an Allen key. The tare button is visible then; it can be operated for example with the same Allen key.

To ensure the tightness of the stator, it is recommended to screw the sealing screw again after tarring until the rubber seal engages reliably.

## 5.8 Power LED



The power LED is located on the side with the X3 and X4 plug connectors; it displays the operating states of the stator. Detailed description can be found in Chapter 8, "Electrical and mechanical commissioning".

### 5.9 Communication LEDs PROFINET



Fig. 17: View page with LEDs for PROFINET

LED	Color	State	Description
SF	–	Off	No defect
	● (red)	On	Internal error (switch the Type 4542A... on again after wiring).
	● (red)	Cycling flashing at 2 Hz, 3 s long	DCP signal service is initiated via the bus.
BF	–	Off	No defect
	● (red)	On	No configuration (internal error), slow physical connection or no physical connection.
	● (red)	Cycling flashing at 2 Hz	No data exchange
LINK	● (yellow)	On	There is an Ethernet connection.
	–	Off	There is no Ethernet connection.
RX/TX	● (green)	Flashes	The communications interface sends / receives Ethernet frames.

## 5.10 Communication LEDs EtherCAT



Fig. 18: View page with LEDs for EtherCAT

LED	Color	State	Description
ERR	–	Off	<b>No error:</b> The EtherCAT communication of the Type 4542A...is in operation.
	● (red)	Flashing	<b>Invalid configuration:</b> General configuration error Possible cause: A status change, given by the master, is not possible due to register or object settings.
	● (red)	Single flash	<b>Local error:</b> The Type 4542A...has changed the EtherCAT state autonomously. Possible cause 1: Synchronization error, the Type 4542A...automatically switches after safe-operational. Possible cause 2: Internal error.
	● (red)	Double flash	<b>Process data watchdog timeout:</b> A process data watchdog timeout has occurred. Possible cause: Sync Manager watchdog timeout
RUN	–	Off	<b>INIT:</b> The Type 4542A...is in INIT status.
	● (green)	Flashing	<b>PRE-OPERATIONAL:</b> The Type 4542A...is in the PRE-OPERATIONAL state.
	● (green)	Single flash	<b>SAFE-OPERATIONAL:</b> The Type 4542A...is in the SAFE-OPERATIONAL state.
	● (green)	On	<b>OPERATIONAL:</b> The Type 4542A... is in the OPERATIONAL state.
L/A	● (yellow)	On	A connection has been established.
	● (yellow)	Flicker	The Type 4542A...sends / receives Ethernet frames.
	–	Off	There is no EtherCAT communication connection.

Definitions of LED statuses for EtherCAT:

LED statuses	Description
On	The LED is constantly on.
Off	The LED is not on.
Flashing	The LED is turned on and off in phases and flickers with a frequency of 2.5 Hz: On for 200 ms, followed by off for 200 ms.
Flicker	The LED is turned on and off in phases and flickers with a frequency of 10 Hz: On for 50 ms, followed by off for 50 ms.
Single flash	The LED shows one short flash (200 ms) followed by a long off phase (1000 ms).
Double flash	The LED shows a sequence of two short flashes (200 ms each), interrupted by a short off phase (200 ms). The sequence is finished with a long off phase (1000 ms).

### 5.11 Communication LEDs EtherNet/IP



Fig. 19: View page with LEDs for EtherNet/IP

LED	Color	State	Description
NS	● (green)	On	<b>Connected:</b> If the Type 4542A...has at least one established connection (also to the message router), the network status indicator is steady green.
	● (green)	Flashes	<b>No Connections:</b> If the Type 4542A...has no established connections, but it has an IP address, the network status indicator flashes green.
	● (red)	On	<b>Double IP:</b> If the Type 4542A...has detected that its IP address is already in use, the network status indicator is steady red.
	● (red)	Flashes	<b>Connection time-out:</b> If one or more of the connections to the Type 4542A...is in time-out, the network status indicator flashes red. This status is not complete until all time-out connections have been re-established, or until the Type 4542A...has been reset (if necessary after switching on again).
	● (orange)	Flashes	<b>Self test:</b> While the Type 4542A...is performing its power-on self test, the network status indicator flashes green / red.
	–	Off	<b>Not switched on, no IP address:</b> If the Type 4542A...does not have a valid IP address (or is powered off), the network status indicator does not light up.



MS	● (green)	On	<b>Type 4542A...operational:</b> If the Type 4542A...is operating and functions properly, the network status indicator is steady green.
	● (green)	Flashes	<b>Standby:</b> When the Type 4542A...is not configured, the module status indicator flashes green.
	● (red)	On	<b>Fatal Error:</b> If the Type 4542A...has detected a non-recoverable major error, the module status indicator is steady red.
	● (red)	Flashes	<b>Minor fault:</b> If the Type 4542A...has detected a recoverable minor error, the module status indicator flashes red. NOTE: An incorrect or inconsistent configuration, e.g., is considered a minor error.
	● (orange)	Flashes	<b>Self test:</b> While the Type 4542A... is performing its power-on self test, the module status indicator flashes green / red.
	–	Off	<b>Not switched on:</b> If the Type 4542A...is not turned on, the module status indicator does not light.
LINK	● (yellow)	On	There is an Ethernet connection.
	–	Off	The Type 4542A... has no Ethernet connection.
RX/TX	● (green)	Flashes	The Type 4542A... sends / receives Ethernet frames.

## 5.12 Communication LEDs PROFIBUS



Fig. 20: View page with LEDs for PROFIBUS

LED	Farbe	State	Description
COM	● (green)	On	<b>RUN:</b> Cyclic communication.
	● (red)	Cyclic flashing	<b>STOP:</b> No communication, connection error.
	● (red)	Non-cyclic flashing	Not configured (internal error).

### 5.13 Communication LEDs CANopen



Fig. 21: View page with LEDs for CANopen

LED	Color	State	Description
CAN	–	Off	<b>RESET:</b> The Type 4542A... conducts a reset.
	● (green)	Single flash	<b>STOPPED:</b> The Type 4542A... is in the STOPPED state (suspended).
	● (green)	Flashing	<b>PRE-OPERATIONAL:</b> The Type 4542A... is in the PRE-OPERATIONAL state (before operation).
	● (green)	On	<b>OPERATIONAL:</b> The Type 4542A... is in the OPERATIONAL state (it is operational).
	●● (red/green)	Flickering (alternating red / green)	<b>Auto baud rate detection:</b> The Type 4542A... is in the auto baud rate detection state.
	● (red)	Single flash	At least one error counter in the Type 4542A... has reached or exceeded the warning level (too many error frames).
	● (red)	Double flash	A monitoring event (NMT slave or NMT master) or a heartbeat event (heartbeat consumer) has occurred.
	● (red)	On	<b>BUS OFF:</b> The Type 4542A... is in the BUS OFF state (no bus operation).

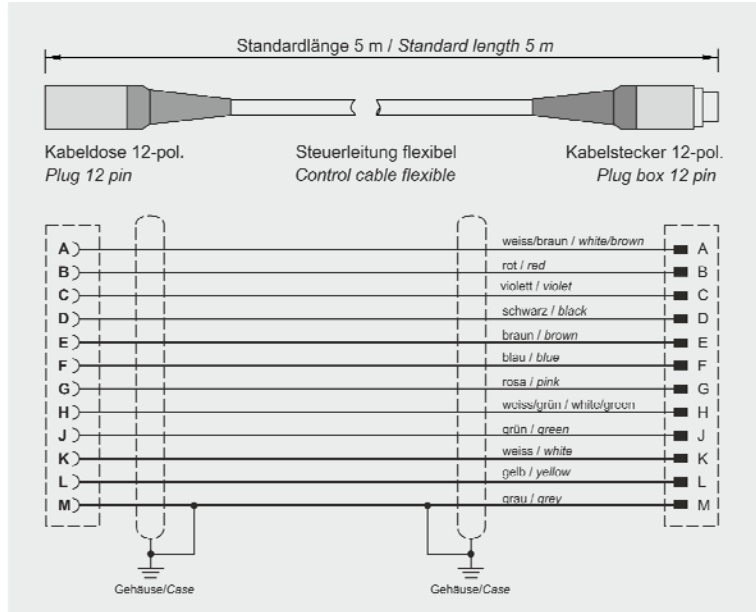
Definitions of LED statuses for CANopen:

LED statuses	Description
On	The LED is constantly on.
Off	The LED is not on.
Flashing	The LED is turned on and off in phases and flickers with a frequency of 2.5 Hz: On for 200 ms, followed by off for 200 ms.
Flicker	The LED is turned on and off in phases and flickers with a frequency of 10 Hz: On for 50 ms, followed by off for 50 ms.
Single flash	The LED shows one short flash (200 ms) followed by a long off phase (1000 ms).
Double flash	The LED shows a sequence of two short flashes (200 ms each), interrupted by a short off phase (200 ms). The sequence is finished with a long off phase (1000 ms).

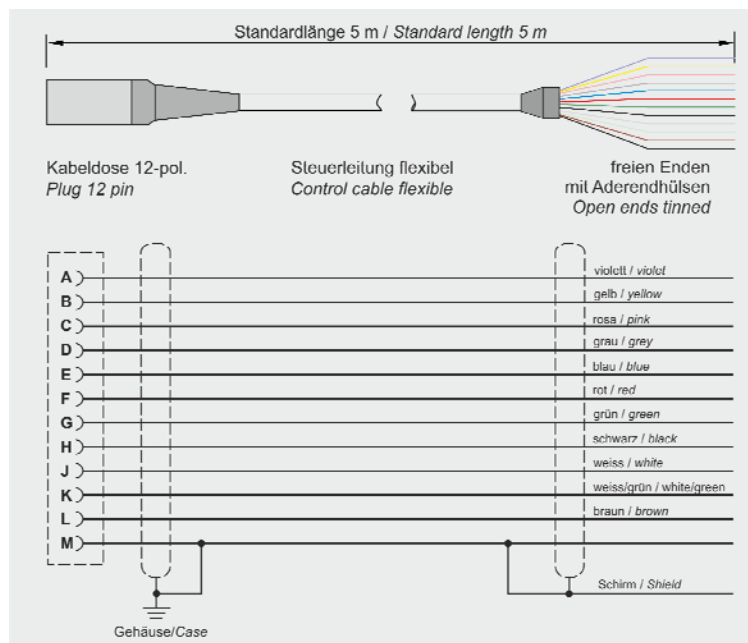
## 6. Connection Cable



Technical Data		Type KSM072030-5 MAT No. 18008935
Connection		12 pin neg. – 12 pin pos.
Length	m	5 (other lengths on request)
Diameter	mm	6
Protection class IEC/EN 60529		IP40
Document No.:		200.007.855

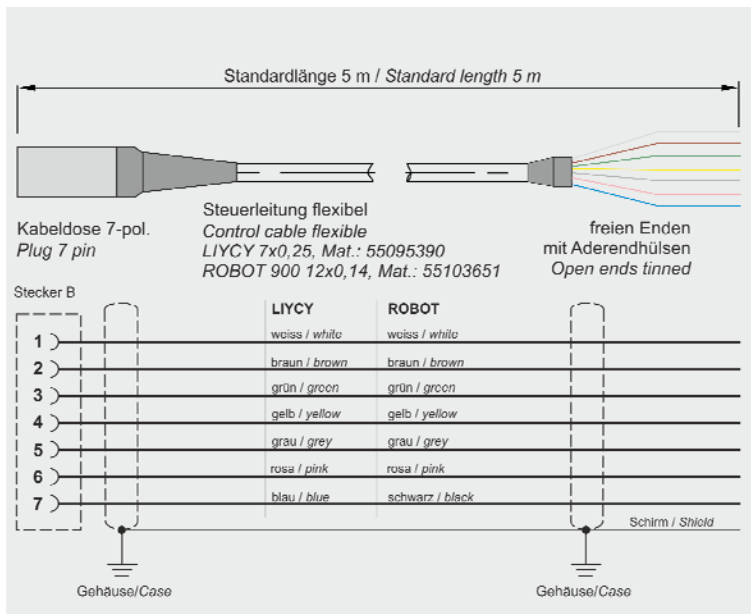


Technical Data		Type KSM124970-5 MAT No. 18008943
Connection		12 pin neg. – open
Length	m	5 (other lengths on request)
Diameter	mm	6
Protection class IEC/EN 60529		IP40
Document No.:		200.007.855





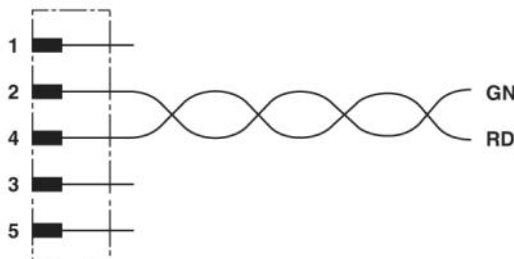
Technical Data		Type KSM219710-5 / Mat. No. 18008996
Connection		7 pin neg. – open
Length	m	5 (other lengths on request)
Diameter	mm	6
Protection class IEC/EN 60529		IP40
Document-No.:		200.008.338



## 7. Further Connection Cable



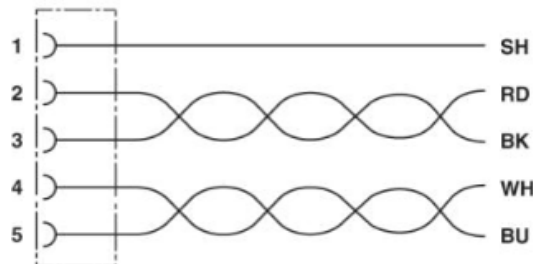
Technical Data		Type 18029811 (2 m) / Type 55117502 (5 m)
Connection		PROFIBUS, M12 B-coded, bush to the free end
Length	m	2/5 (other lengths on request)
Diameter	mm	7,8
Protection class IEC/EN 60529		IP65



Pole = Wire colour (signal) = Pole (optional)	
	2 (Connector) = GN (A line)
	4 (Connector) = RD (B line)



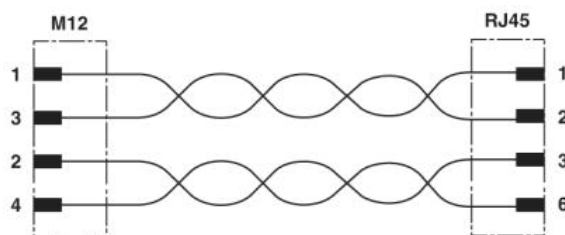
Technical Data		Type 55117499 (2 m) / Type 55117388 (5 m)
Connection		CANopen, M12 A-coded, bush to the free end
Length	m	2/5 (other lengths on request)
Diameter	mm	6,7
Protection class IEC/EN 60529		IP65



Pole = Wire colour (signal) = Pole (optional)	
1 (bush)	= SR (Shield)
2 (bush)	= RD (V+)
3 (bush)	= RD (V+)
4 (bush)	= WH (CAN_H)
5 (bush)	= BU (CAN_L)

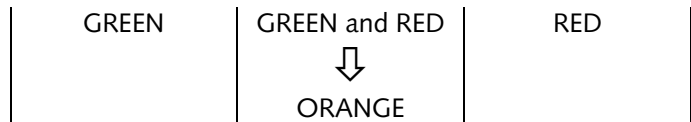


Technical Data		Type 55117503 (2 m) / Type 55117504 (5 m)
Connection		Ethernet, EtherCAT, EtherNet/IP, 4 pin M12 D-coded, bush to RJ45
Length	m	2/5 (other lengths on request)
Diameter		M12x1
Protection class IEC/EN 60529		IP20 / IP65



## 8. Electrical and Mechanical Commissioning

A light-emitting diode (LED) on the side (Plug X3, X4) shows the operational state. The LED can light up in three different ways:



### Activation

The LED flashes green when powering up (operating voltage applied). This is followed by a brief communication with the torque measuring unit, which makes the LED flash orange. Shortly thereafter, the LED lights up green, which shows that the torque evaluation unit is ready for operation. This procedure can take a total of about 5 seconds.

### Communication PC ↔ torque evaluation unit

If the torque evaluation unit is communicating with the PC via the RS-232C or USB interface, the LED lights up orange.

### Torque overload

If the Type 4550A... torque measuring flange is mechanically overloaded (nominal torque +10 % = maximum operating torque), then the LED lights up red. If the Type 4550A... torque measuring flange is mechanically overloaded (nominal torque +10 % = maximum operating torque), then the LED lights up red. This reverts to the green state again when the torque measuring unit is back within the nominal torque range.

### Faulty behavior of the torque measuring unit/torque evaluation unit

If the evaluation or measuring unit electronics are not functioning properly, then the LED flashes red. If the same behavior persists when the torque evaluation unit is switched on again, then the torque measuring flange must be sent back to the factory.

GREEN	GREEN flashing	ORANGE	RED	RED flashing	COffe
	✓				Powering up
✓					Torque measuring flange ready for operation
		✓			Communication between Stator ↔ Rotor Requester (PC) ↔ sensor
			☹		Sensor is mechanically overloaded
				☹	Electronic system of the torque measuring flange

#### Taring

The user has more options for taring:

##### Mechanically, by pressing a button

The locking screw T can be removed using a size 2,5 Allen wrench. Pushing the internal button then tares all outputs of the sensor.

##### Digitally via RS-232C or USB

Taring can be initiated by means of the included Type 4706A Sensor Tool software, or by setting up a HyperTerminal® connection.

If taring by means of RS-232C, this can be done via plugs X4. In order to be able to tare via USB (plug X5), the locking screw must be removed.

##### Digital via field bus or industrial Ethernet

There is the option to perform taring using the cyclical data to the sensor. Alternatively this can be done via TCP/IP (acyclic data, e.g., with PROFINET)

## 9. Calibration

### 9.1 Torque Evaluation Unit (Stator)

The Type 4542A... torque evaluation unit has a common analog output (X3 or X4) and one frequency output (X4). The following table shows the potential outputs. The values in parentheses are adjustable, and the values without parentheses show the standard setting.

Potential Outputs for Type 4542A...

Connector	Frequency in kHz			Voltage in volts
X3	–	–	–	0 ±10
X4	(240 ±120)	(100 ±40)	(60 ±20)	0 ±10

Each torque evaluation unit is shipped with two calibration certificates. The independent voltage outputs X3 and X4 are calibrated. Calibration of the frequency output is not necessary, due to the high frequency stability and the direct display of the frequency from the digital word of the rotor. Every output can be calibrated as a measuring linkage, together with a rotor (torque measuring unit).

### 9.2 Generating the System Certificate from the Individual Certificates

The torque captured by the rotor is directly converted to a digital value in N·m. These values can be found on the rotor certificate. The stator certificate has the percentage loading as the input variable, and the voltage at the first output as the output variable.

In order to calculate the output, the torque measured by the rotor must be expressed as a percentage of the nominal torque.

The output voltage of the stator can then be calculated from the certificate, using this percentage value. A line can be created for any two measuring points.



The following applies for determining the torque value, as a percentage:

$$x'_i = \frac{b_i}{a_n} \cdot 100$$

Values from the Rotor Certificate

Applied torque in N·m	Torque as read in N·m
a <sub>1</sub>	b <sub>1</sub>
a <sub>2</sub>	b <sub>2</sub>
.	.
.	.
a <sub>n</sub>	b <sub>n</sub>

The output signal can now be calculated, with

$$y'_1 = \frac{y_2 - y_1}{x_2 - x_1} x'_1 + y_1 - \frac{y_2 - y_1}{x_2 - x_1} x_1$$

for the first point and

$$y'_2 = \frac{y_2 - y_1}{x_2 - x_1} x'_2 + y_1 - \frac{y_2 - y_1}{x_2 - x_1} x_1$$

for the second point, and

$$y'_i = \frac{y_{i+1} - y_i}{x_{i+1} - x_i} x'_i + y_i - \frac{y_{i+1} - y_i}{x_{i+1} - x_i} x_i$$

for  $i > 2$ , and for the values from the stator certificate.

Values from the Stator Certificate

Input in %	Output voltage in volts
x <sub>1</sub>	y <sub>1</sub>
x <sub>2</sub>	y <sub>2</sub>
.	.
.	.
x <sub>n</sub>	y <sub>n</sub>

The same method can be used to calculate the frequency output signals. In this case, the values for the stator are calculated simply by multiplying the desired percentage level and the frequency swing.

## 10. General Technical Data

### General Technical Data

The accuracy class is determined by the KiTorq Rotor 455xA...

Linearity error	% FSO	0,01
Temperature influence on the zero point TK0	% FSO/10 K	0,01
Temperature influence on the nominal value TKC	% FSO/10 K	0,01
Rel. standard deviation of repeatability	% FSO	0,003
Zero point stability (48 h)	% FSO	0,003
Limit frequency -3 dB	kHz	10
Operating temperature range (Rated temperature range)	°C	10 ... 60
Service temperature range	°C	0 ... 70
Storage temperature range	°C	-25 ... 80
Protection class		IP54

### 10.1 Technical Data

#### Noise Immunity (EN 61326-1, Table 2)

Electromagnetic field (AM)	V/m	10
Magnetic field	A/m	100
Electrostatic discharge (ESD)		
Contact discharge	kV	8
Air discharge	kV	4
Fast transients (burst)	kV	1
Impulse voltage (surge)	kV	1
Conducted emissions (AM)	V	10

#### Mechanical Shock (EN 60068-2-27)

Quantity	n	1 000
Duration	ms	3
Acceleration	m/s <sup>2</sup>	650

#### Vibrational Loads in 3 Directions (EN 60068-2-6)

Frequency range	Hz	10 ... 2 000
Duration	h	2,5
Acceleration (amplitude)	m/s <sup>2</sup>	200

#### Speed Measuring

Pulses/revolution		1x60
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#### Industrial Ethernet-Interface PROFINET

Sampling rate (values/s)	s	max. 1 000
Baud rate	Mbit/s	100
Connector		4 pin M12
Encoding		D
Max. cable length (X1, X2)	m	100

## 10.2 Dimensions Torque Evaluation Unit (Stator) Type 4542A...

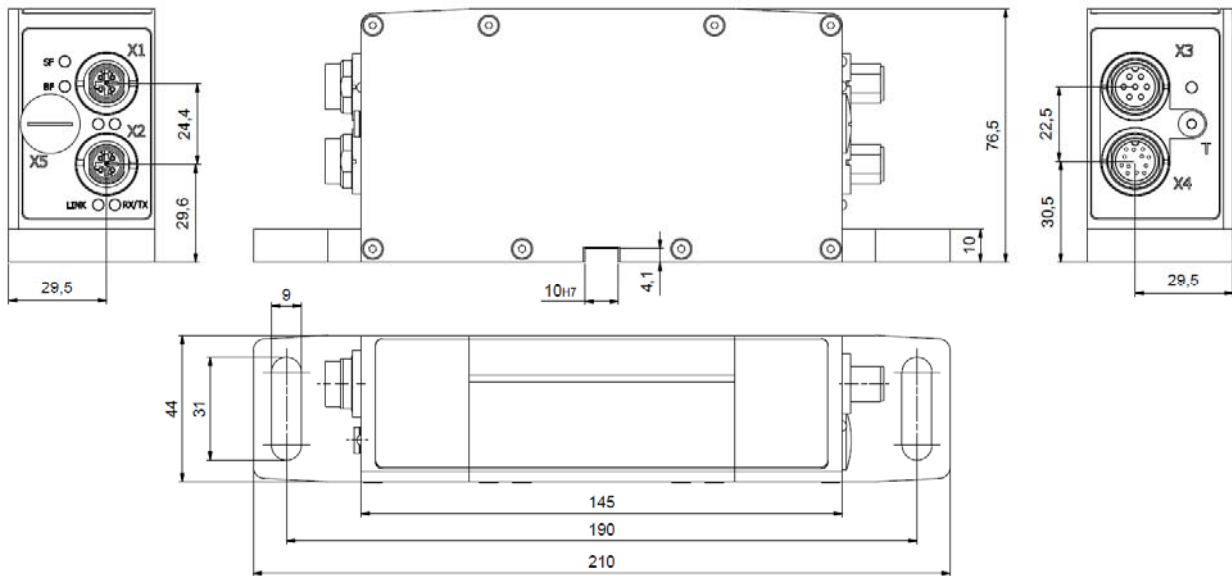
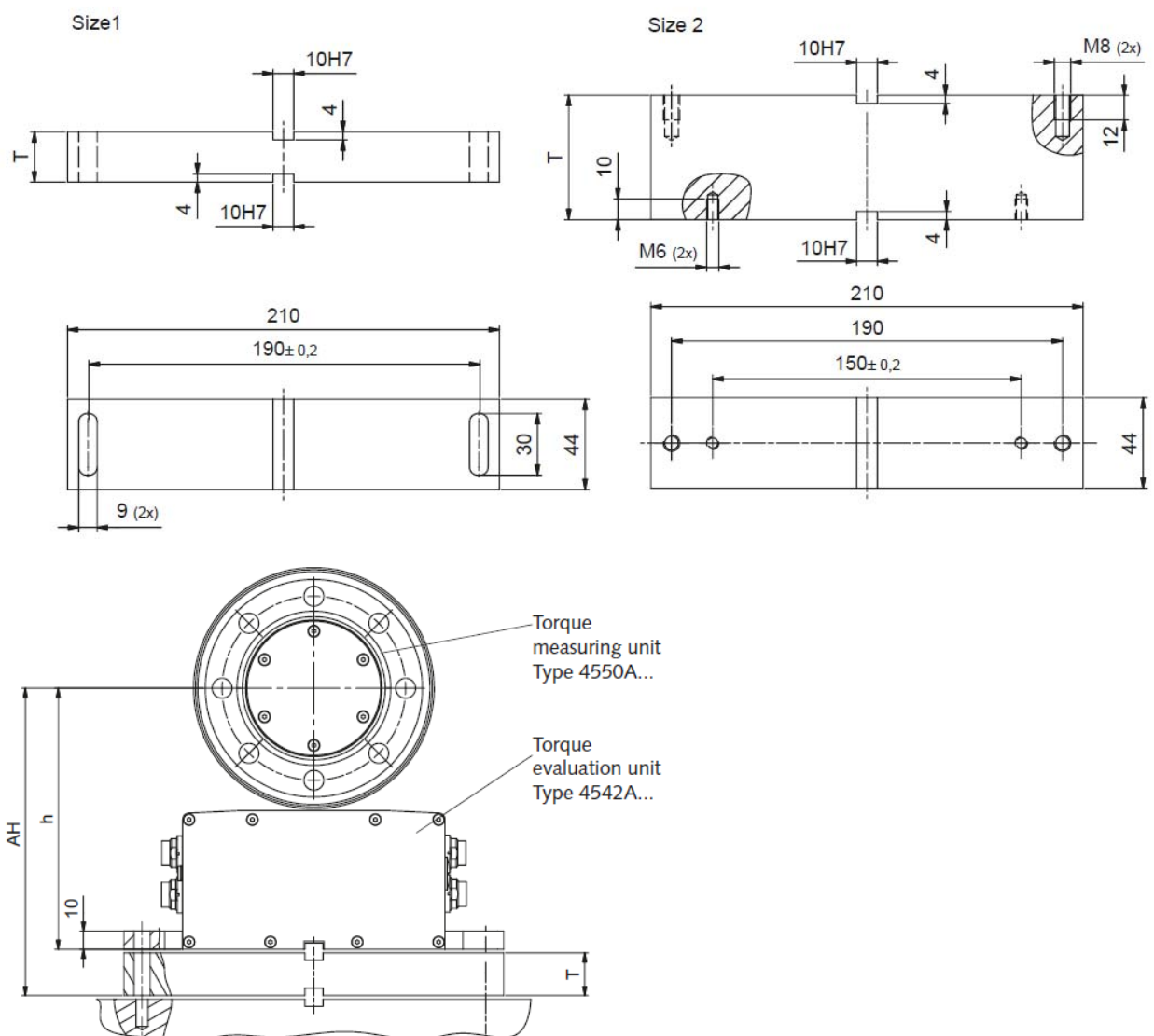


Fig. 22: Mechanical Dimensions of Type 4542A...  
KiTorq Stator torque evaluation unit (stator)  
(dimensions in mm) with version PROFINET

### 10.3 Dimensions of the Spacer Plate

Spacer Axis height	100 N-m/ 200 N-m h= 133 mm	Size	500 N-m/ 1 000 N-m h= 144 mm	Size	2 000 N-m/ 3 000 N-m h= 161 mm	Size	5 000 N-m h= 175,5 mm	Size				
AH	Mat. No.	T [mm]	Size	Mat. No.	T [mm]	Size	Mat. No.	T [mm]	Size	Mat. No.	T [mm]	Size
157,5	18024999	24,5	1									
167,5				55114700	23,5	1						
185,5				55114702	41,5	1	18024999	24,5	1			
194,5	18024998	61,5	2									
202,5							55114702	41,5	1	55116668	27	1
204,5				55114704	60,5	2						
222,5							18024998	61,5	2			
226,5												
239,5										55116667	64	2
263,5												



Dimensions of Type 4542A... with spacer plate (total axis height AH)

## 11. Ordering Key and Accessories

### Included Accessories

	Type/Art. No.
• Calibration certificate	
• Ferrule resistor PROFIBUS M12 for Type 4542A... with PROFIBUS (4542AN1B)	55117425
• Ferrule resistor CANopen M12 for Type 4542A... with CANopen (4542AN1C)	5511742

### Optional Accessories

	Type/Art. No.
• Connection cable, length 5 m, 7 pin – open ends	18008996
• Connection cable, length 5 m, 12 pin – open ends	18008943
• Connection cable, length 2,5 m, 12 pin – to CoMo Torque	18008967
• Connection cable Ethernet, length 2 m, water blue, M12 D-encoding of RJ45	55117503
• Connection cable Ethernet, length 5 m, water blue, M12 D-encoding of RJ45	55117504
• Connection cable Ethernet, length 10 m, water blue, M12 D-encoding of RJ45	18026867
• Extension cable PROFIBUS, length 2 m, violet, M12 B-encoding, female connector to connector 1:1	55117321
• Extension cable PROFIBUS, length 5 m, violet, M12 B-encoding, female connector to connector 1:1	55117500
• Connection cable PROFIBUS, length 2 m, violet, M12 B-encoding, female connector to open ends	18029811
• Connection cable PROFIBUS, length 5 m, violet, M12 B-encoding, female connector to open ends	55117502
• Extension cable CANopen, length 2 m, M12 A-encoding, female connector to connector 1:1	18029812
• Extension cable CANopen, length 5 m, M12 A-encoding, female connector to connector 1:1	55117501
• Connection cable CANopen, length 2 m, M12 A-encoding, female connector to open ends	55117499
• Connection cable CANopen, length 5 m, M12 A-encoding, female connector to open ends	55117388
• Cable socket 7 pin (plug X3)	18008363
• Cable socket 12 pin (plug X4)	18008371

### Optional Accessories

	Type/Art. No.
• Spacer plate 24,5 mm, AH 157,5/185,5	18024999
• Spacer plate 61,5 mm, AH 194,5/222,5	18024998
• Spacer plate 23,5 mm, AH 167,5	55114700
• Spacer plate 60,5 mm, AH 204,5	55114704
• Spacer plate 41,5 mm, AH 185,5/202,5	55114702
• Spacer plate 27 mm, AH 202,5	55116668
• Spacer plate 64 mm, AH 239,5	55116667
• ControlMonitor CoMo Torque Evaluation instrument for torque sensors	4700B...
• Adapter flanges (on request)	2305A...
• Couplings (on request)	2305A...
• SensorTool	4706...

### Ordering Key

Speed		Type 4542A	
Speed measuring with 1x60 Imp./Rev.	N1	<input type="checkbox"/>	<input type="checkbox"/>
Interface			
PROFINET	A		
PROFIBUS	B		
CANopen	C		
EtherCAT	D		
EtherNet/IP	E		

### Order Example: Type 4542AN1A

Torque evaluation unit Type **4542A**, speed measuring 60 impulses/revolution: **N1**, Interface PROFINET: **A**

## 12. Declaration of Conformity



### EC Declaration of Conformity EG-Konformitätserklärung Déclaration de conformité CE

Manufacturer Hersteller Fabricant	Kistler Lorch GmbH 73547 Lorch Germany
---	--

declares that the product/erklärt, dass das Produkt/déclare que le produit

Name/Name/Nom	<b>KiTorq Torque Evaluation Unit (Stator) / KiTorq Drehmoment-Auswerteeinheit (Stator) / KiTorq Torque unité d'évaluation (Stator)</b>
Type/Typ/Type	<b>4542A...</b>
Modules/Module/Modules	-
Options/Optionen/Options	<b>all/alle/toutes</b>

relates with the following standards/mit den folgenden Normen übereinstimmt/  
est conforme aux normes suivantes

EMC Emission EMV Störaussendung Emission EMC	<b>EN 61000-6-4:2011-09</b>	<b>(Class A)</b>
EMC Immunity EMV Störfestigkeit Immunité EMC	<b>EN 61000-6-2:2006-03</b>	

Following the provisions of directive/Gemäss den Bestimmungen der Richtlinie/Conformément  
aux dispositions de directive

<b>2004/108/EG</b>	<b>(EMC / EMV / EMC)</b>
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Lorch, January 2014


  
 Franz Winter  
 General Manager

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