

## Clamping force/thread torque sensor for coefficient of friction testing of bolts and nuts

Type 5413-196xA...

The clamping force/thread torque sensors operate according to the strain gauge principle and supply an analog output signal in mV/V.

- Sensor used to measure clamping force and thread torque on separate measuring channels
- Measuring range of 5 kN to 500 kN (clamping force)
- Measuring range of 10 N·m to 1 kN·m (thread torque)
- AUTOCODE identification
- Mechanical adaptations for different thread dimensions

### Description

The measuring bodies of the clamping force/thread torque sensor Type 5413-196xA... are equipped with strain gauges and protected by a stainless steel housing.

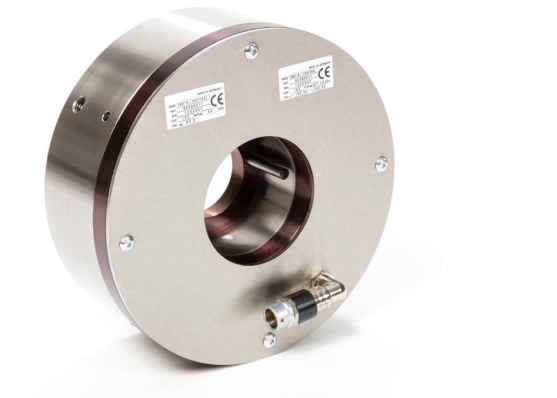
The test items are adapted by means of mechanical adaptations in the corresponding thread sizes (optional) on the clamping force/thread torque sensor, whereby mechanical adaptations via integrated centering aids ensure a centric force and torque application of the test items in the measuring body.

The contact surfaces required for testing can be realized via optional washer sledges as specified by standards, which are captively secured to the retaining plate by an optional holder to prevent rotation.

The integrated AUTOCODE system enables the sensor to be automatically detected and calibrated when it is connected to appropriately equipped measuring systems.

The clamping force/thread torque sensors are delivered with a quality certificate.

Upon request, the clamping force/thread torque sensors are calibrated in our calibration lab.



### Application

Particularly in combination with the Analyse systems, the clamping force/thread torque sensors are suitable for determining the total and partial coefficients of friction  $\mu_{tot}$ ,  $\mu_{th}$ , and  $\mu_b$  of bolts and nuts in accordance with various requirements of the standards.

The most important variable in the assembly process for a bolted joint is the clamping force, that is, the force with which the bolt holds the assembled parts together.

Only a sufficiently high clamping force ensures that the bolted parts do not move against one another and the bolted joint does not come loose, even under operating loads.

However, the clamping force is not measured directly during production, but indirectly via the torque. The friction between the connection partners has considerable influence on the interplay between torque and clamping force. This relationship is called the coefficient of friction.

With the clamping force/thread torque sensor Type 5413-196xA... all measurands required to determine the total coefficient of friction and the partial coefficients of friction (thread and bearing surface coefficient of friction separately) are acquired at the same time the torque and angle of rotation are measured, and the coefficients of friction are determined.

Application Areas for the Sensors:

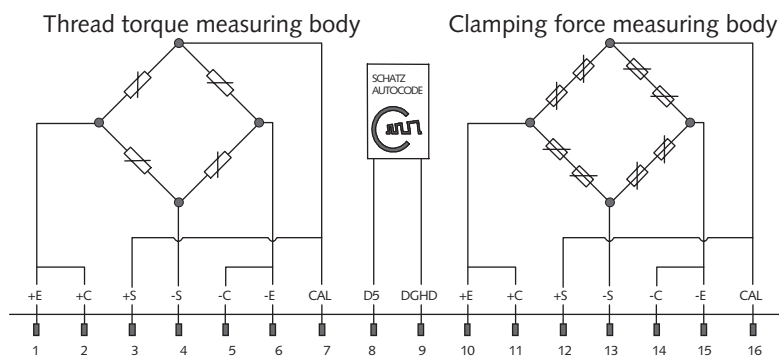
- Coefficient of friction determination of bolts and nuts
- Determining the clamping force
- Determining the thread torque

### Technical data

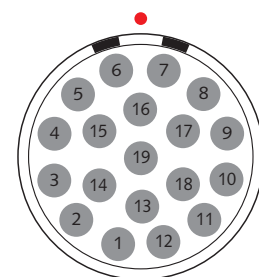
#### Basic mechanical/electrical data for the sensors

Maximum service force/	1.2 x nominal force (20% overload)
Service torque	1.2 x nominal torque (20% overload)
Maximum permissible force/	1.5 x nominal force (50% overload)
Permissible torque	1.5 x nominal torque (50% overload)
Attainable measurement uncertainty acc. to DIN EN ISO 51309	$\leq 2\%$
Bridge resistance	700 $\Omega$
Calibration resistance	87.15 k $\Omega$ or 40 k $\Omega$ (+/- 0.1%) depending on type
Nominal characteristic value	1 mV/V or 2 mV/V depending on type
Nominal supply voltage	5 V
Supply voltage service range	2.5 ... 10 V
Operating temperature range (nominal temperature range)	10 ... 40 °C
Service temperature range	0 ... 50 °C
Storage temperature range	-20 ... 70 °C
Air humidity	max. 70%, non-condensing
Housing material	Stainless steel
Degree of protection	IP 40
Weight	approx. 12 kg (depending on type)
<b>Electrical connection</b>	
Connection bushing	ODU: Type GH2 LCC-P19PFG9-0000

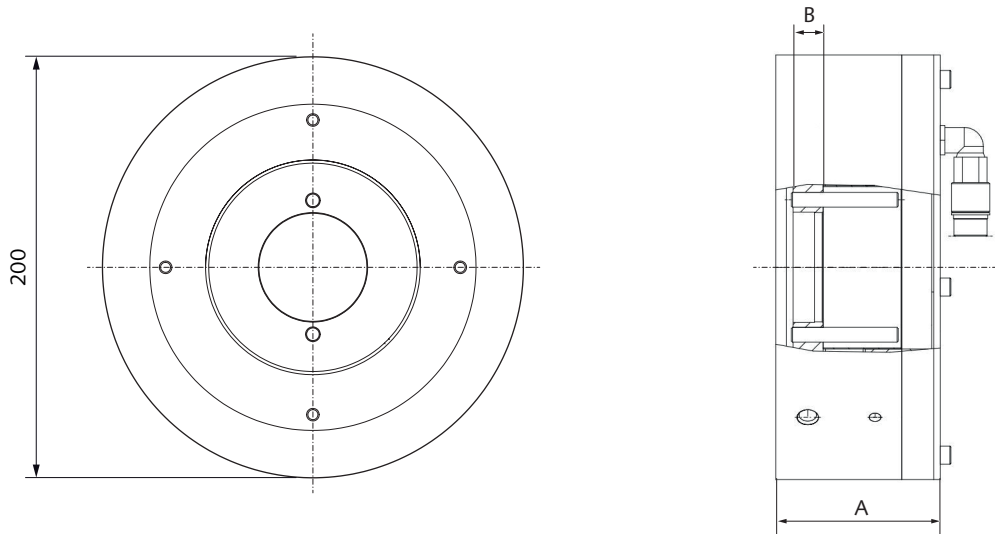
### Measuring bridges of clamping force/thread torque sensors



### ODU bushing assignment



**Technical data and dimensions**



Type 5413-...	1960A (25/50)	1961A (100/150)	1962A (200/350)	1962A (300/350)	1962A (300/500)	1963A (500/500)	1963A (500/1000)	
<b>Clamping force</b>								
Nominal value	25 kN	100 kN	200 kN	300 kN	300 kN	500 kN	500 kN	
Calibration resistance	87.15 kΩ ± 0.1%		40 kΩ ± 0.1%					
Nominal characteristic value	1 mV/V		2 mV/V					
<b>Thread torque</b>								
Nominal value	50 N·m	150 N·m	350 N·m	350 N·m	500 N·m	500 N·m	1 kN·m	
Calibration resistance	87.15 kΩ ± 0.1%							
Nominal characteristic value	1 mV/V							
<b>Dimensions</b>								
A	77 mm						90 mm	
B	17 mm						19 mm	

Additional types available per customer specification.

Optional accessories	Type
Sensor cable, 5 m	18035671
Holder for washer sledge	18035613
Mechanical adaptations for different thread dimensions	

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