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Quartz Force Sensor

Type 9203

–5 .... 5 N up to –500 ... 500 N

This slender sensor is designed for dynamic and quasistatic tensile and compression forces up to 500 N. The high sensitivity of the integral measuring element and special design of the force application configuration achieve a sensor threshold of less than one millinewton.

- Extremely low threshold <1 mN
- High sensitivity of 45 pC/N
- Wide measuring range with single sensor
- Overload factor of up to 100 possible
- Slender design for close sensor spacing
- Arrays of sensors can be set up for parallel measurement

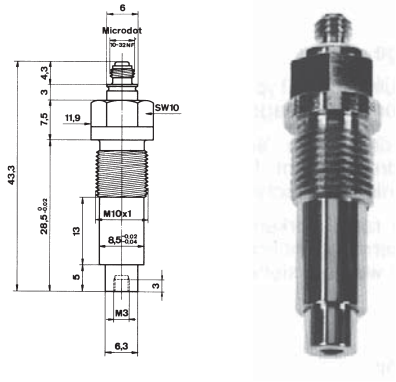
Description

The sensor is based on the piezoelectric measuring principle. The force acting on the built-in quartz element generates at the output of the sensor a proportional charge, which is converted by a series-connected measuring amplifier (such as the ICAM Type 5073A...) into a process signal suitable for evaluation (for example 0 ... 10 V). The slender pencil-like shape of the body of the sensor and application of force by means of the threaded axial hole are valued features.

Applications

The slim profile of the sensor makes it particularly suitable for confined spaces, for example for simultaneous measurement on closely positioned objects. Compact arrays of sensors then make it possible to access a large number of measuring points in a single cycle. This significantly improves the throughput rate and cost-effectiveness of a measuring station.

The piezoelectric measuring element's special characteristic of approximately constant measuring accuracy over a substantial range allows one and the same sensor to be used for a wide spectrum of forces. The feasibility of switching measuring range when using suitable amplifiers (such as the ICAM Type 5073A...) bolsters this advantage while, most notably, accommodating the demand for measuring stations to handle a greater variety of parts. However, the "wide-range measuring chain" also offers crucial advantages in laboratory applications, where frequent changes of sensor are the order of the day. The extremely high overload factor also obviates the need for involved protective measures when using lower measuring ranges.



Technical Data

Range F_z, max.	N	–500 ... 500
Range, calibrated		
100 %	N	0 ... ±500
10 %	N	0 ... ±50
1 %	N	0 ... 5
Overload	N	–600/600
Threshold	mN	0,01
Sensitivity	pC/N	–45
Linearity [1]	%FSO	≤±0,5
Hysterisis [1]	%FSO	≤0,5
Torque M_z, max	N·m	4,2
Temperature coefficient of sensitivity, dynamic	mN/°C	–4
Bending moment $M_{x,y}$, max.	N·m	0,59
Shear force $F_{x,y}$, max. [2]	N	25
Rigidity c_z	N/µm	≈40
Natural frequency	kHz	27
Operating temperature range	°C	–150 ... 240
Connector, electrical		KIAG 10-32 neg.
Degree of protection [3]	EN60529	IP54
Case material	DIN	1.4542

[1] Relating to FSO of the respective calibrated (!) measuring range
[2] Corresponds to shear force in the plane of separation
[3] With cable connected

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Application Example

Evaluation of forces involved in inserting and withdrawing airbag connectors

- 100 % quality test
- Force measured with sensor Type 9203
- Force-time curve monitored with CoMo ControlMonitor
- Insertion force must enter and leave Box 1 from below
- Withdrawal force must enter and leave Box 2 from above
- OK signal set if force curve OK

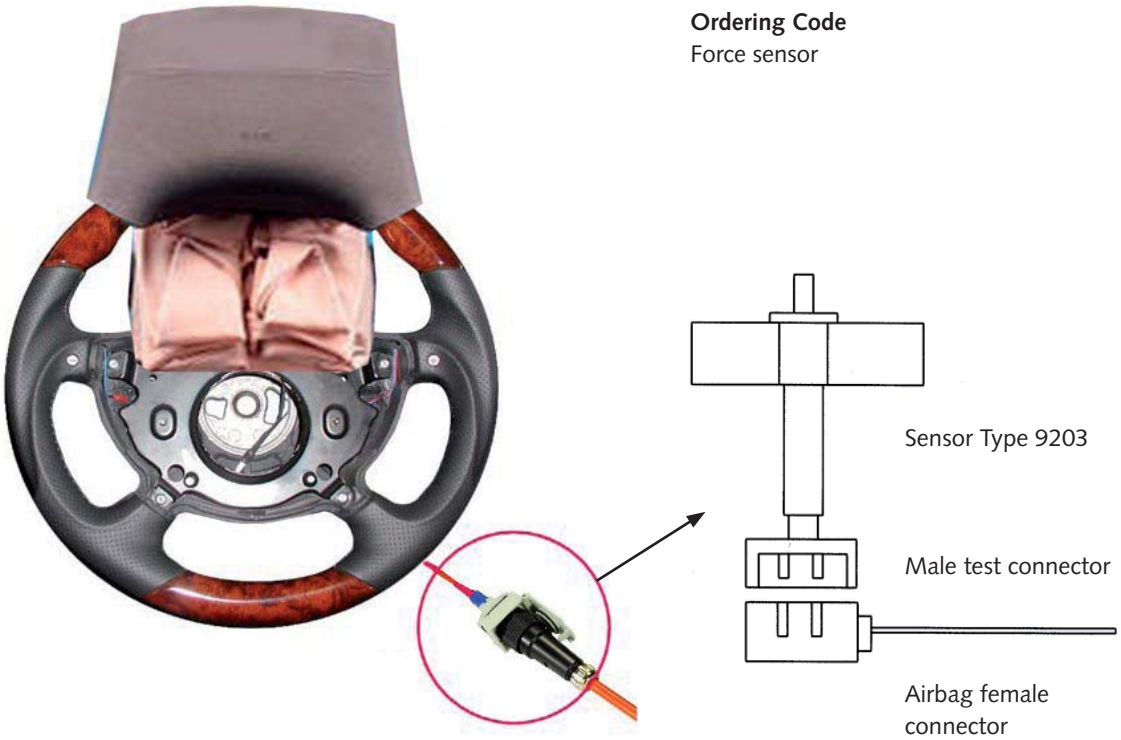

Fig. 1: Measuring forces involved in inserting and withdrawing airbag connectors with a male test connector, which transmits the forces directly to the sensor Type 9203.

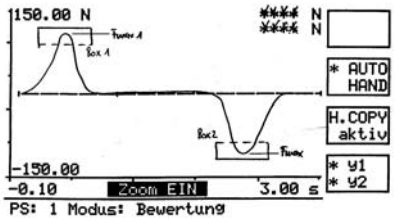

Fig. 2: Curve of compression and tensile force during insertion and withdrawal must reach the relevant tolerance box. CoMo® ControlMonitor is used for evaluation.

Mounting

- Mounted with M10x1 thread
- Force applied by means of M3 thread
- Max. torque allowed in tightening force application adapter 0,5 N·m
- Avoid lateral impact load on force application adapter

Accessories

- Connecting cable see data sheet 1631C_000-346

Ordering Code	Type
Force sensor	**9203**

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