

Subminiature Load Cell

MODEL 8413, MODEL 8414 with overload protection



Model 8414 with overload protection

Highlights

- Measuring ranges from 0 ... 5 N up to 0 ... 5 kN
0 ... 1.1 lbs up to 0 ... 1124.0 lbs
- Especially flat design from 3.3 mm
- Non-linearity 0.25 % F.S.
- Made of high quality stainless steel

Options

- Extended temperature compensated range -55 °C ... +120 °C
- burster TEDS
- Various cable lengths available
- Standardized output signal 1.0 mV/V

Applications

- Adjustment of gauges
- Force measurements on the inside of precision tools
- Monitoring of control elements
- Regulation of forces in medical technology
- Control instruments in precision machinery
- Adjustment and pre-load of devices

Product description

This miniature force sensor was optimised with respect to its height and is, at only 3.4 mm, the lowest known sensor with strain gage technology. Hardly higher than the diameter of its connection cable, it can also be housed in conditions where space is limited. Along with its minimal geometry, the force sensor is also particularly light. It has a high resonance frequency to follow quickly changing load alternations. Despite its extreme miniaturisation, in its application it remains completely robust and suitable for industry, not only with regard to the highly flexible cable connections or the full welding of sensors for the measurement ranges $\geq 0 \dots 10 \text{ N}$.

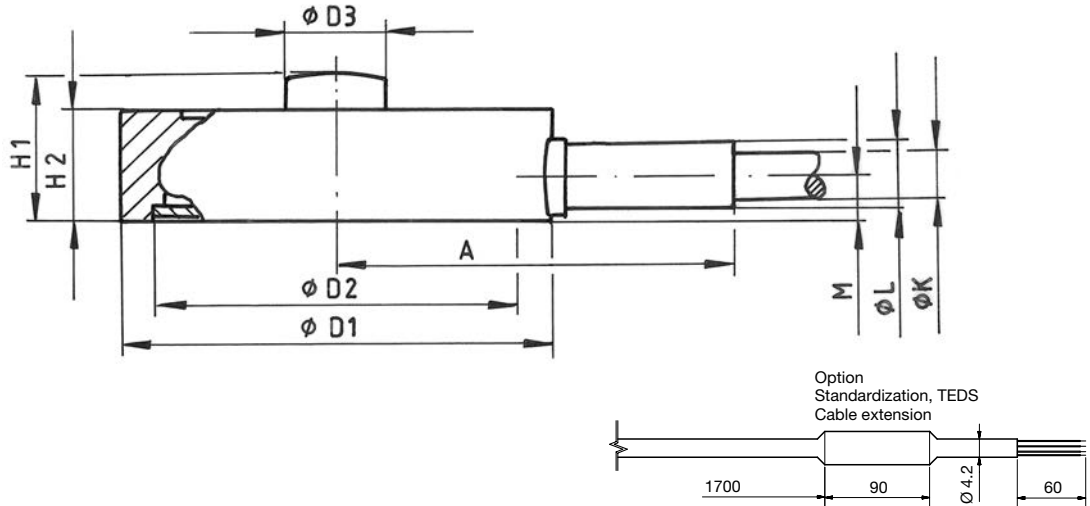
The miniature compression force sensors are flat, cylindrical discs with covered bottoms. The central load application button for taking on compression forces is an integrated part of the top, which is the sensor's membrane. On its bottom, the strain gages are fixed on the inside of the housing and interconnected with a full Wheatstone bridge. This passes on, for force applications, an output voltage which is directly proportional to the size of the measurement.

The connection cable exits radially from the sensor housing and is additionally stabilised by a case for measurement ranges $\geq 0 \dots 10 \text{ N}$. The support area of the bottom of the sensor is annular, however arranged as a circular area for measurement range $0 \dots 5 \text{ N}$.

Technical Data

8413	-	5005	5010	5020	5050	5100	5200	5500	6001	6002	6005
8414 with overload protection	-	5005	5010	5020	5050	5100					
Measuring range calibrated in N and kN from 0 ...		5 N 1.1 lbs	10 N 2.2 lbs	20 N 4.5 lbs	50 N 11.2 lbs	100 N 22.5 lbs	200 N 45.0 lbs	500 N 112.4 lbs	1000 N 225.0 lbs	2000 N 450.0 lbs	5000 N 1124.0 lbs
Accuracy											
Relative non-linearity*		≤ ±0.25 % F.S.									
Characteristic curve deviation*		≤ ±0.25 % F.S.			≤ ±0.5 % F.S.						
Relative hysteresis		≤ ±0.5 % F.S.									
Temperature effect on zero output		≤ ±0.2 % F.S./10 K									
Temperature effect on nominal sensitivity		≤ ±0.2 % F.S./10 K									
Electrical value											
Sensitivity nominal		15 mV/V	1 mV/V				2 mV/V				
Measurement direction		compression direction									
Standardization		-	1.0 mV/V (± 0.25 %) realized on board in connection cable, 1.7 m from sensor housing or 0.3 m from cable end								
Bridge resistance		500 Ω nominal (semiconductor strain gauge)	350 Ω nominal (foil strain gauge) deviations are possible								
Excitation		max. 5 V DC or AC									
Insulation resistance		> 30 MΩ at 45 V									
Environmental conditions											
Nominal temperature range		+15 °C ... +70 °C									
Operating temperature range		-55 °C ... +120 °C									
Mechanical values											
Deflection full scale		13 μm ... 38 μm	25 μm ... 50 μm								
Maximum operating force		Model 8413: 150 % of capacity									
Maximum static overload stop		Model 8414: 500 % of capacity									
Overload burst		Model 8413: > 250 % of capacity									
Dynamic performance		recommended: 70 % maximum: 100 % (of capacity)									
Protection class		IP54									
Other		5005	5010	5020	5050	5100	5200	5500	6001	6002	6005
Material		stainless steel 1.4542									
Natural frequency	[kHz]	4	4	6	12	15	15	16	20	13	15
Mass without cable model 8413	[g]	1.2	1.5			2.0		3.0	3.0	10.0	10.0
Mass without cable model 8414	[g]	3.8	4.0			-		-	-	-	-

* The data in the area 20 % - 100 % of rated load F

Dimensional drawing **Model 8413 / Model 8414**

8413	-	5005	5010	5020	5050	5100	5200	5500	6001	6002	6005
Measuring range from 0 ...		5 N	10 N	20 N	50 N	100 N	200 N	500 N	100 N	2000 N	5000 N
Geometry											
Ø D1	[mm]	9.7						12.2	19.1		
Ø D2	[mm]	.*	8.3			10.0			16.0		
Ø D3	[mm]	2.3	2.2			3.0			6.4		
H 1	[mm]	3.3	3.4			3.8			6.4		
H 2	[mm]	2.6			3.3			5.7			
A	[mm]	11.0**	9.0			10.5			13.7		
M	[mm]	1.2	1.0			1.5					
Ø L	[mm]	-	1.6			1.0					
Ø K	[mm]	1.2	1.0								

8414 with overload protection	-	5005	5010	5020	5050	5100
Measuring range from 0 ...		5 N	10 N	20 N	50 N	100 N
Geometrie						
Ø D1	[mm]	9.4	9.7			
Ø D2	[mm]	.*	7.0			
Ø D3	[mm]	2.3	2.2			
H 1	[mm]	6.4				
H 2	[mm]	5.8	5.6			
A	[mm]	11.0**	9.0			
M	[mm]	4.2	4.0			
Ø L	[mm]	-	1.6			
Ø K	[mm]	1.2	1.0			
General tolerance of dimension		ISO 2768f				

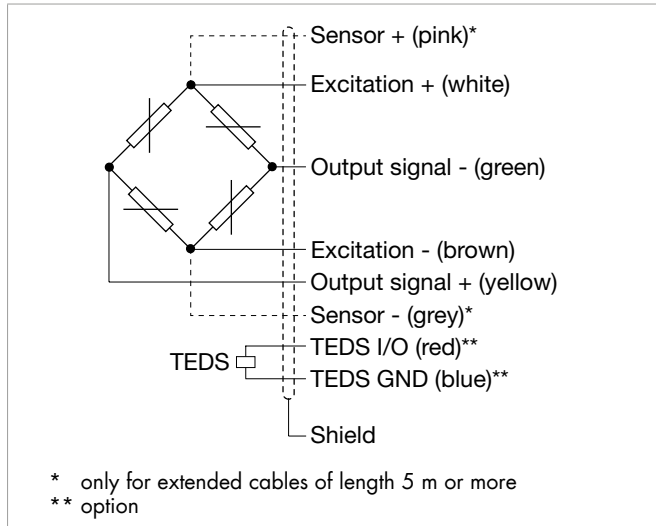
* Measuring range 0 ... 5 N with circular contact surfaces on the bottom with Ø 8,5 mm

** Cable at this length rigid but without a slave

Electrical termination

Output signal

burster load cells are based on a strain-gage Wheatstone bridge. This measurement principle means that the output voltage mV/V is highly dependent on the sensor supply voltage. Our website contains details of suitable instrumentation amplifiers, indicator and display devices and process instruments.



8413	-	5005	5010	5020	5050	5100	5200	5500	6001	6002	6005
Measuring range from 0 ...		5 N	10 N	20 N	50 N	100 N	200 N	500 N	100 N	2000 N	5000 N
Electrical termination											
Specifications		5 N: highly flexible teflon isolated with open ends for soldering, cable length 1.5 m ≥ 10 N: shielded, highly flexible, teflon-insulated cable, cable length 1.7 m, drag chain qualified									
Cable fastening		5 N: epoxide resin; shed ≥ 10 N: cable cover; crimped									
Bending protection		without									
Bending radius		static: ≥ 10 mm dynamic ≥ 15 mm									

Accessories

Connectors and units

Order code

Connectors

9941	Connectors 12 pin, suitable to all burster desktop units
9900-V209	Connectors 9 pin, suitable to SENSORMASTER, DIGIFORCE® and TRANS CAL
9900-V229	Connectors 9 pin with TEDS
9900-V245	Connectors 8 pin, suitable to ForceMaster

Units

7281-V0001	Mobile measuring device with strain gage simulator and sensor test (R_r , R_g , Shunt, R_{ISO})
refer to section 9	Sensor electronics, amplifier and process control units like digital indicator model 9180, model 9163, modular amplifier model 9250 or DIGIFORCE® model 9307



Calibration

Test and calibration certificate	
Included in scope of delivery of sensor	Amongst other data, includes figures for zero point, full-scale output and calibration offset
Standard factory calibration certificate for load cells or measurement chains (WKS)	
Optionally available	Our standard factory calibration certificate includes 11 measurement points, starting at zero, spread evenly in 20% steps over the full measuring range, for increasing and decreasing load under the same installation conditions.
Special factory calibration certificate for load cells or measurement chains (WKS)	
On request	We are happy to calibrate sensors and measurement chains to the customer's specification.
German-accredited DAkkS calibration certificate for sensors and measurement chains (DKD)	
Optionally available	Our DAkkS-certified calibration laboratory provides calibration certificates to DIN EN ISO 376. The calibration certificate includes 21 measurement points, starting at zero, spread evenly in 10% steps over the measuring range, for increasing and decreasing load under various installation conditions. DAkkS calibrations can be performed in the compression and/or tension direction depending on the sensor type.



Order Code

Measuring range	Code				Measuring range
0 ... 5 N	5	0	0	5	0 ... 1.1 lbs
0 ... 10 N	5	0	1	0	0 ... 2.2 lbs
0 ... 20 N	5	0	2	0	0 ... 4.5 lbs
0 ... 50 N	5	0	5	0	0 ... 11.2 lbs
0 ... 100 N	5	1	0	0	0 ... 22.5 lbs
0 ... 200 N	5	2	0	0	0 ... 45.0 lbs
0 ... 500 N	5	5	0	0	0 ... 112.4 lbs
0 ... 1000 N	6	0	0	1	0 ... 225.0 lbs
0 ... 2000 N	6	0	0	2	0 ... 450.0 lbs
0 ... 5000 N	6	0	0	5	0 ... 1124.0 lbs

										Delivery ex stock at short notice										
										N	0	0	0	S	0	0	0			
8	4	1	3	-					-				0	S	0	0				
<ul style="list-style-type: none"> Nominal sensitivity/not standardized Standardization at 1.0 mV/V 										N										
<ul style="list-style-type: none"> Connection cable 1.7 m (with standardization in the cable 2 m) Connection cable 3 m Connection cable 5 m Connection cable 3 m, extended by a circuit board at 1,7 m * Connection cable 5 m extended * 										0	F	G	L	M						
* shortened delivery time compared with cable length 3 m and 5 m in one piece																				
<ul style="list-style-type: none"> Open cable ends + 6 cm single strands 9 pins Sub-D connector model 9900-V209 9 pins Sub-D connector model 9900-V209 for 9163-V3xxxx 12 pins round connector model 9941 for burster desktop devices 9 pins Sub-D connector with burster TEDS model 9900-V229 										0	B	E	F	T						
<ul style="list-style-type: none"> Non-linearity according to specification * 															S					
* The data in the area 20 % - 100 % of rated load F																				
<ul style="list-style-type: none"> Nominal temperature range +15 °C ... +70 °C Extended nominal temperature range for measuring ranges -55 °C ... 120 °C 																			0	B

