



Baumer

Passion for Sensors

Force and strain sensors.

Measure. Test. Control.

Edition 2016



Force and strain sensors
by Baumer combine
tried and tested
technology
and sophisticated
innovations.



Contents.

Introduction	1
Product key	1.2
Summary Force and Strain Sensors	1.4

Load Cells DLRx	2
Product key	2.2
Summary Load Cells	2.3

Strain Rings DSRC	3
Product key	3.2
Summary Strain Rings	3.3

Strain Probes DSRH	4
Product key	4.2
Summary Strain Probes	4.3

Strain Links DSRT	5
Product key	5.2
Summary Strain Links	5.3

Bridge Amplifiers DABx	6
Product key	6.2
Summary Bridge Amplifiers	6.3

Display Boxes DDBF	7
Product key	7.2
Summary Display Boxes	7.3

Piezo Electric Sensors	8
Product key	8.2
Summary Force and Strain Sensors	8.3
Product key	8.8
Summary Cavity Pressure Sensors	8.9

Charge Amplifiers DACx	9
Product key	9.2
Summary Charge Amplifiers	9.3

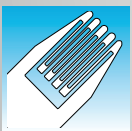
Supplementary Informations	10
General	10.2

Glossary and Explanations	11
General	11.2

Force and strain sensors – measuring testing and monitoring



Our product range embraces the entire field of force and strain sensors to meet a wide range of requirements and specific applications. It includes every component of efficient sensors and intelligent evaluation and application systems. Baumer supplies a complete range of sensors from a single source – universality that pays off. The question of the respective technology does not depend on the product range, but wholly and solely on the nature of the technical problem involved. Whether this calls for a bonded S/G, our patented press-fitted S/G or a high-resolution Piezo system, we are experts in all three.



Sensors with S/G technology

Strain gauges are used for measurements of physical values on structures, for example weight and strain.

- Strain measurement on tie bars and columns
- Strain measurement on platen and rigid structures
- Static and cyclic strain and force measurement
- 2x1/4 bridge or full bridge
- Bridge amplifier
- Display box incl. analysing software



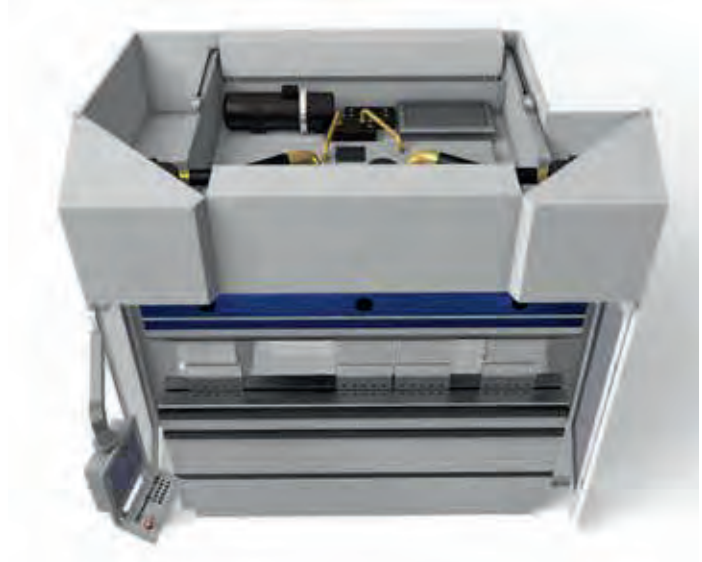
Sensors with Piezo technology

Quartz crystals and polarised ceramic materials are used where fast response time and a high signal to noise ratio are important.

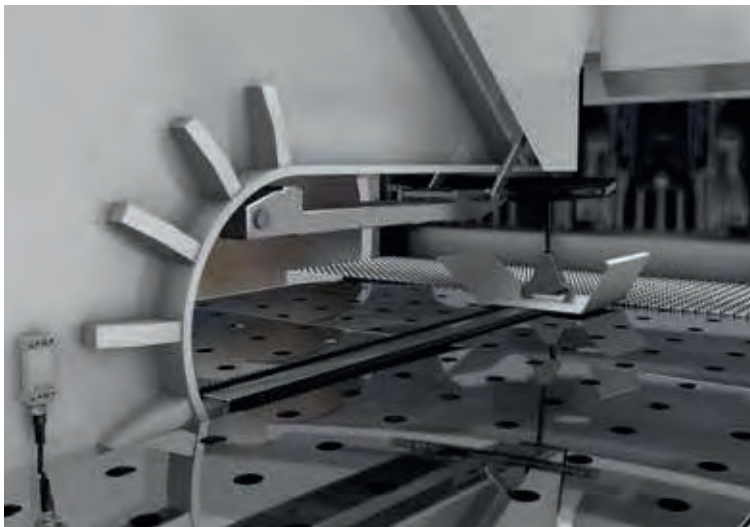
- Force sensors for dynamic measurement
- High resolution strain measurement on rigid structures
- Pooling and crash detection
- Cavity pressure measurement
- Direct and indirect measurement
- Industrial multi range charge amplifier

Sheet thickness control

Through sensors in the machine, the actual sheet thickness can be detected and the plunging depth of the upper tool automatically corrected. In this way, the machine achieves an angle quality independent of sheet thickness and with no loss of productivity or need for calibration.



1



Holding force control

Holding the sheet with needed force to make sure the sheet can be moved as fast as possible without any slip or marks apply on the sheet.

Force control at joining process

In order to maintain best possible quality of the joining process, it's elementary to control the control the force during the joining process.





Product Summary

Force Sensors



Strain Sensors

DLRx	DSRC	DSRH	DSRT
			
Load Cell	Strain Ring	Strain Probe	Strain Links
Static and dynamic force measurement	Strain measurement on tie bars and shafts	Strain measurement in holes	Strain measurement on rigid structures
Measuring range 0,5...100 kN	Measuring range $\pm 1000 \mu\epsilon$	Measuring range $\pm 1000 \mu\epsilon$	Measuring range $\pm 750 \mu\epsilon$
Characteristic curve deviation < 0,3% FS	Characteristic curve deviation < 1% FS	Characteristic curve deviation < 1%FS	Characteristic curve deviation < 0,8% FS
Page 2.3	Page 3.3	Page 4.3	Page 5.3

Piezo Electric Sensors




DLPP	DPPC
	
Piezo electric force sensor	Cavity pressure sensor
Measurement of dynamic forces	Direct and indirect cavity pressure measurement
Measuring range from 2,5 to 30 kN	Measuring range 2000 bar
Linearity < 1% FS	Linearity < 1% FS
Page 8.3	Page 8.9

Analysis Devices

DABx	DDBF
	
Bridge amplifier	Display box
Analysis of S/G bridges	Signal analysis of strain rings, strain probes and extensometers
2 x 1/4 bridge or full bridge	Display range $\pm 1999 \mu\epsilon$
Current or voltage output	2 or 4 channels
1 channel	
Page 6.3	Page 7.3

Accessories

Analysis Devices

DZPC	DZCC	DACx
		
Accessories	Coaxial Cable	Industrial multi range charge amplifier
Variety of mounting accessories for piezo electric sensors and cables	Sensor and connecting cables for piezo electric sensors	Analysis of piezo electric sensors
	Temperature range up to +220 °C	Measuring range from 100 pC to 1'000'000 pC
		Characteristic curve deviation < 1% FS
		1 channel
Page 9.19	Page 9.20	Page 10.3

Strain Probes



Baumer Sensordyne
CH-8501 Frauentfeld
DSRH
U16 - 0320M
SN: 110101 2
MPL

Baumer Sensordyne
DSRH
U16 - 0320M

Product Key

Strain Probes DSRH



The correct order code must be taken from the corresponding data sheet.

DSRH U16-0400M/CM

Product Description

DS = Strain sensor

Method

R = Resistive

Series

H = Series H (Strain probes)

Type

I = With integrated amplifier, output signal 4 - 20 mA

U = With integrated amplifier, output signal 0 - 10 V

Nominal Size (mm) (tip diameter)

16 = 16 mm

20 = 20 mm

Measurement Depth (mm)

Example

0400 = 400 mm

1930 = 1930 mm

Metric

M = Metric

Option

/CM = 4 pin connector male installed (only for type P)

/CN = 6 pin cable connector installed (only for type P)

/CL10 = cable length 10 m (only for type P)

Combinations are possible: example **CL10CN**

Note the following important points

When applying the strain probe:

- The strain probes are not suitable for static applications. Reset measuring chain before each cycle.
- The sensor tip is equipped with two exactly diametrically opposed strain gages.
- Excessive removal and installation can damage the tip. Under normal circumstances this does not compromise the measurement accuracy as long as the gages remain properly aligned. When the probe is installed and removed on a regular basis, the resilient steel tip option is recommended. The surface of the bore does not have to be very smooth but it should be free of grooves and must be clean.

Summary

Strain Probes DSRH



Type 16/20



- Strain probe with integrated amplifier
- Simple strain measurements in deep holes
- Characteristic curve deviation < 1%
- For cyclical applications only
- Integrated amplifier with voltage or current output

Page 4.4

With the strain probes it is possible for the first time to measure strain in deep, previously inaccessible holes. A strain probe which is equipped with two diametrically opposed strain gages at the tip is inserted into a hole and clamped. By bracing the gages against the wall of the bore hole the strain is transmitted by friction contact. The bracing element serves as mounting element as well.

Since the clamping mechanism is acting only locally in the area of the gages, the probes measure the strain with high accuracy. The strain probes are based on the proven STRAIN-MATE™ technology with strain gages.

Strain probes are used in general mechanical engineering applications as well as in the laboratory. Simple installation combined with high accuracy makes the strain probe a versatile measurement tool for calibration and monitoring tasks.

Strain Probe with Integrated Amplifier DSRH x16/x20

Features

- Simple strain measurements in deep holes
- Characteristic curve deviation < 1%
- For cyclical applications only
- Integrated amplifier with voltage or current output



Electrical Data	DSRH U	DSRH I
Measuring range	$\pm 1000 \mu\epsilon$	0 - 1000 $\mu\epsilon$
Strain gage type	Foil gages	
S/G circuit	2 x 1/4 bridge bending compensated	
Output signal	± 10 V calibrated (max. ± 12 V)	4 - 20 mA max. load 500 Ω
Combined error	< 1% FS	
Linearity	< 0,5% FS	
Hysteresis	< 0,5% FS	
Supply voltage range	18 - 36 VDC	
Current draw	< 30 mA	< 45 mA
Output impedance	50 Ω	-
Zero reset active	< ± 10 mV	< $\pm 20 \mu\text{A}$
Reset input galvanically isolated	15 - 45 VDC	
Reset/operate offset	< ± 4 mV	< $\pm 10 \mu\text{A}$
Reset pulse (t1)	> 1 ms	
Reset settle time (t2)	≈ 60 ms	
Frequency range (3 dB)	120 Hz	
Rise time 10 - 90%	< 3 ms	
Signal polarity tensile load	positive	positive (only tensile load possible)

Mechanical Data

Connection	7 pin male (Series 680/SGR 70)
Material	
- Amplifier enclosure	Aluminum anodized
- Tube	Stainless steel
- Support ring (Type 20)	Aluminum anodized
Hexagon socket	6 mm
Installation torque	3 Nm

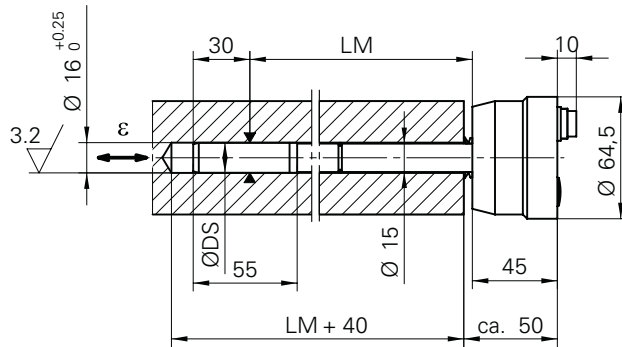
Environmental Conditions

Surface installation spot	Ra 3.2 (N8) or better
Operating temp. range	-5...+60 °C non condensing
Storage temperature	-20...+80 °C
Protection class	IP 54

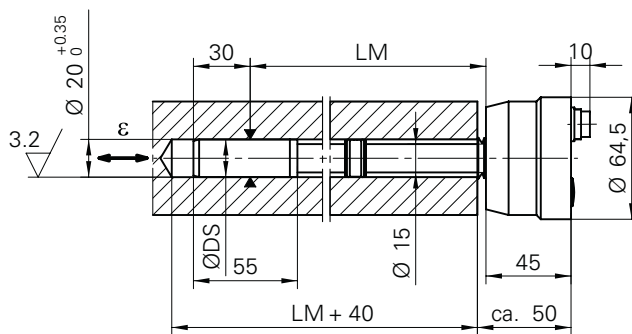


Dimensions (mm)

Type 16



Type 20

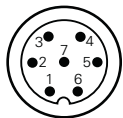


- $\varnothing DS$ = Tip diameter
- LM = Measurement depth
- ϵ = Strain
- ▲ = Gage location

Strain Probe with Integrated Amplifier DSRH x16/x20

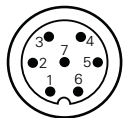
Electrical Connections

Current Output



Pin	Signal
1	+Vs (18 - 35 VDC)
2	Test _{OUT}
3	Reset (bipolar)
4	Reset (bipolar)
5	+I _{OUT} (4 - 20 mA)
6	-I _{OUT}
7	GND

Voltage Output



Pin	Signal
1	+Vs (18 - 35 VDC)
2	Test _{OUT}
3	Reset (bipolar)
4	Reset (bipolar)
5	+V _{OUT} (±10 V)
6	-V _{OUT}
7	GND

Order Code

DSRH - M

Tip diameter (Ø DS) - Length (LM)

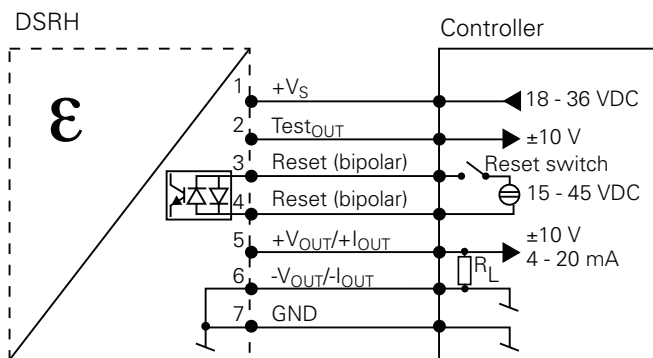
16-0200	20-0200
16-0240	20-0240
16-0320	20-0320
16-0400	20-0400
16-0500	20-0500
16-0600	20-0600
16-0760	20-0760
16-0800	20-0800
16-0900	20-0900
16-1050	20-1050
16-1300	20-1300
16-1400	20-1400

Output signal

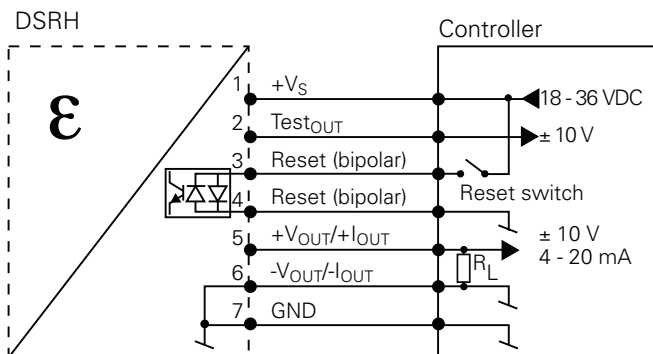
- U** Voltage output ±10 V
±1000 µε = ±10 V
- I** Current output 4 - 20 mA
±1000 µε = 20 mA

Control

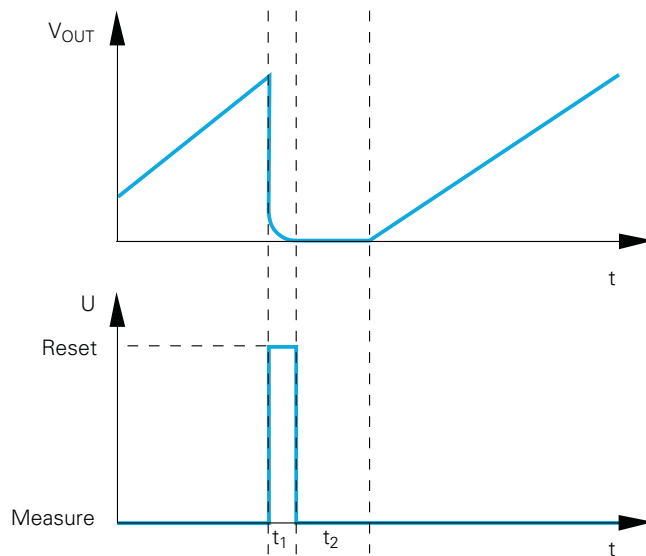
Reset galvanically isolated



Reset not galvanically isolated



Reset Function

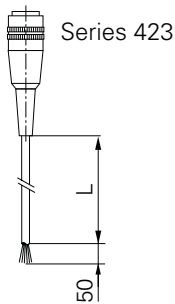


V/I _{OUT}	Output signal
Reset	Reset input (active high)
t ₁	Reset pulse (> 1 ms)
t ₂	Reset settle time after reset pulse (≈ 60 ms)

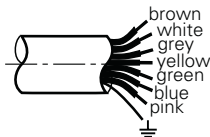


Accessories and Control Elements

Connecting Cable with Flying Leads

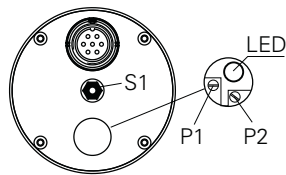


Length	Order Code
5 m	DZCS 05/404155
10 m	DZCS 10/404155



Color	Signal
white	+Vs (18 - 35 VDC)
brown	Testout
green	Reset (bipolar)
yellow	Reset (bipolar)
grey	+Iout / +Vout
blue	-Iout / -Vout
pink	GND

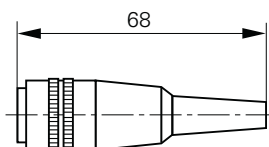
Control Elements



P1	Adjustment Testout
P2	Adjustment Gain (factory set)
LED	Control-LED for Testout
S1	Mounting screw with 6 mm hex

Straight Connector

Series 423



Part No. 10146423

Torque Wrench



Order code: DZMT TW-A1-6
adjustable from 1 - 6 Nm
Part No. 11034496

Order code: DZMT TW-F3
preset fix to 3 Nm
Part No. 11034494