



**Baumer**

Passion for Sensors

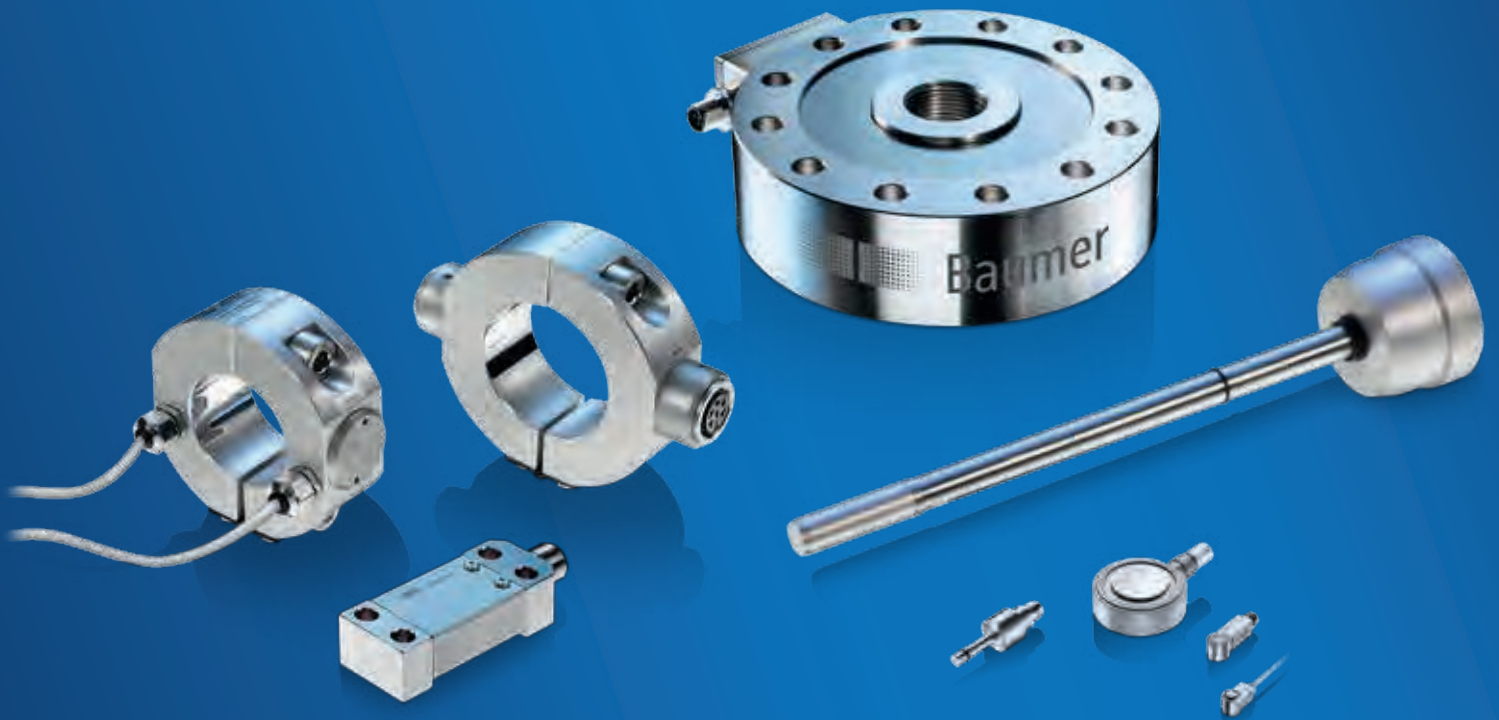
# Force and strain sensors.

Measure. Test. Control.

Edition 2016



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



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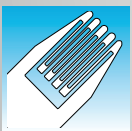
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# Force and strain sensors – measuring testing and monitoring



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

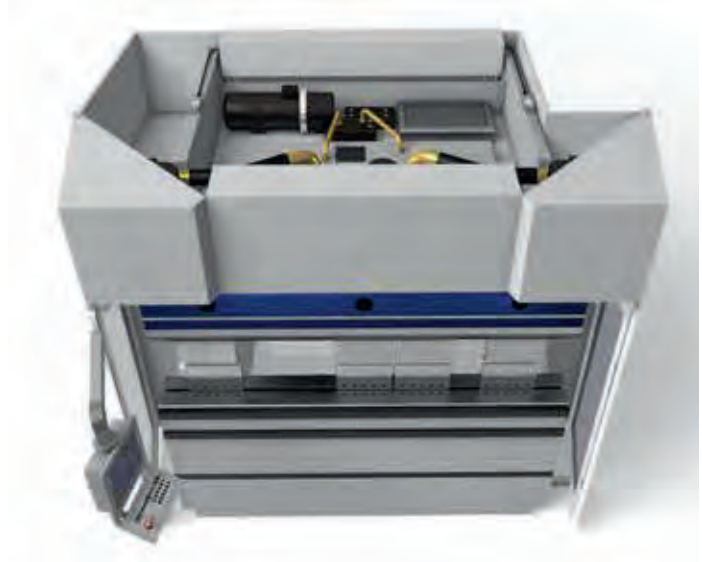
Quartz crystals and polarised ceramic materials are used where fast response time and a high signal to noise ratio are important.

- 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

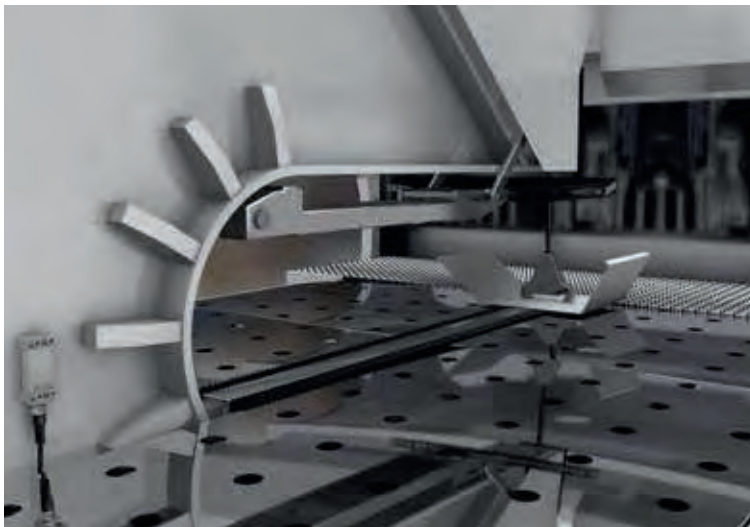


## Sheet thickness control

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

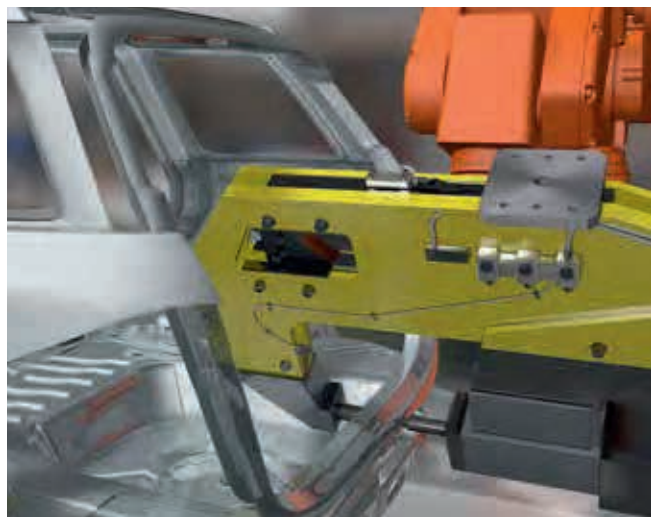


## Holding force control

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
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## 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
<b>Page 8.3</b>	<b>Page 8.9</b>

## Analysis Devices

<b>DABx</b>	<b>DDBF</b>
	
<b>Bridge amplifier</b>	<b>Display box</b>
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	
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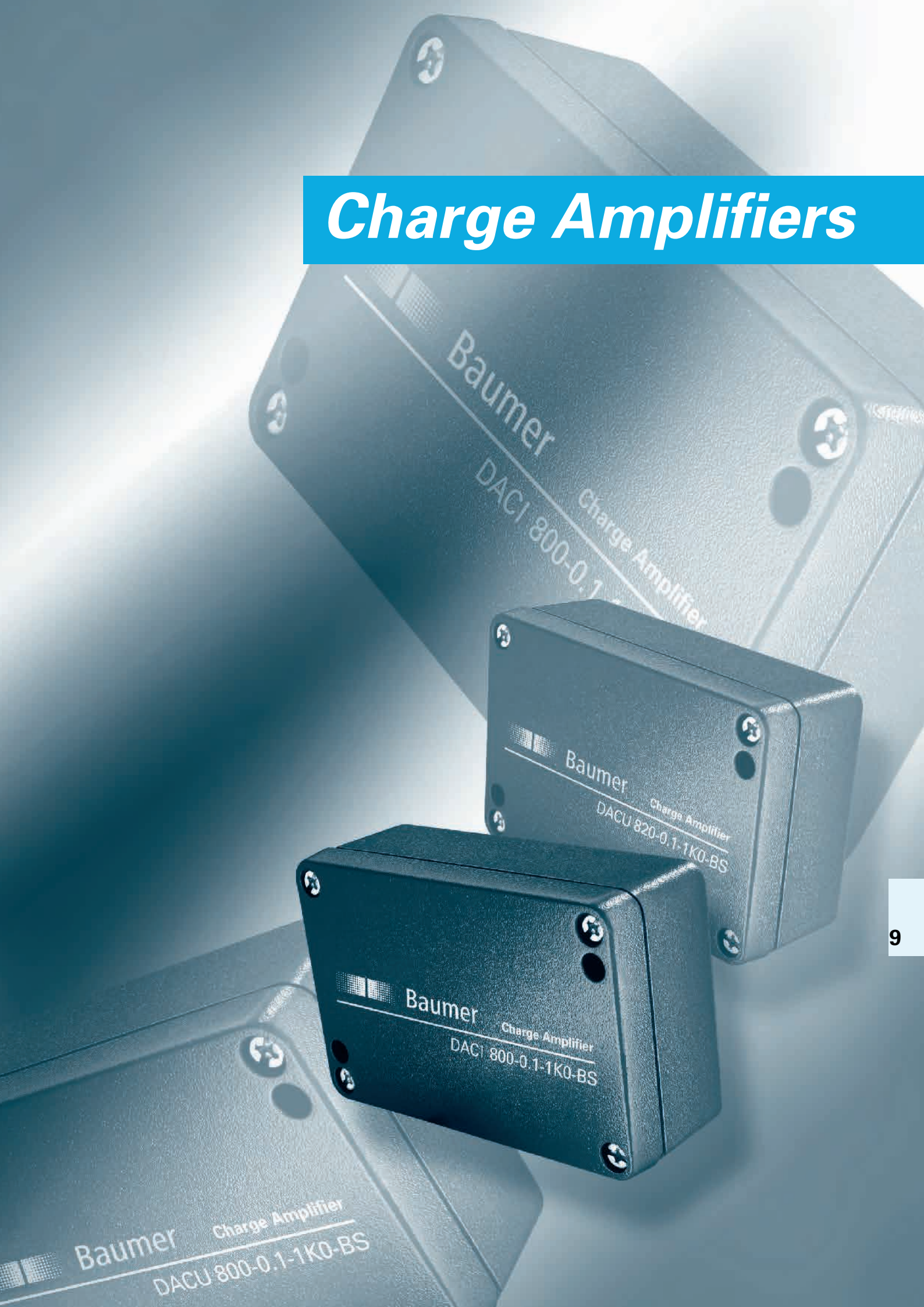
## Accessories

## Analysis Devices

<b>DZPC</b>	<b>DZCC</b>	<b>DACx</b>
		
<b>Accessories</b>	<b>Coaxial Cable</b>	<b>Industrial multi range charge amplifier</b>
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
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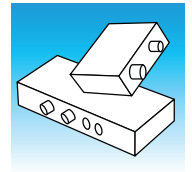


# Charge Amplifiers





# Product Key Charge Amplifiers



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

## Charge Amplifiers

**DACU 800-0.1-1K0BS**

### Product Description

DAC = Charge Amplifier

### Output

U = Voltage output  $\pm 10$  V

### Series

800 = 1 Analog output, 14 ranges

820 = 2 Analog outputs, 4 ranges every

### Smallest measuring range

Example:

0.1 = 100 pC / 10 V

### Largest measuring range

Example:

1K0 = 1'000'000 pC / 10 V

### Input Connection

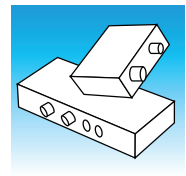
B = BNC

### Output Connection

S = 25 Pin D-Sub

# Summary

## Charge Amplifiers



### DACU 800



- Charge amplifier for piezo electric sensors
- 14 selectable ranges
- Peak value
- 2 limit switches with switching outputs
- RS 232 interface

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### DACU 820



- Charge amplifier for piezo electric strain sensors
- 2 analogue outputs
- 4 selectable ranges
- Peak value storage
- 2 limit switches with switching output
- RS 232 interface

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Charge amplifiers convert the electrical charges (pC), which are emitted by piezo electric sensors, into a proportional output voltage. This output signal can then be further processed.

# Charge Amplifier DACU 800

## Features

- Multi-range charge amplifier for industrial application
- 14 selectable ranges
- 13 fixed ranges 100 pC - 1'000'000 pC
- 1 variable range 100 pC - 1'000'000 pC
- Adjustable limit value with switching output
- Peak value
- RS 232 serial interface

## Electrical Data

Voltage supply	15...35 VDC
Current draw	< 70 mA
Measuring range	$\pm 100 \dots 1'000'000$ pC
Output signal	$\pm 10$ V
Characteristic curve deviation	< 1% FS
Linearity	< 0,02% FS
Output offset	< $\pm 5$ mV
Noise voltage	< 5 mVpp (0,1 Hz... 100 kHz) < 30 mVpp at 100 pC range
Output impedance	10 $\Omega$
Reset operate offset	electronically compensated
Drift	< 0,03 pC/s <sup>(2)</sup>
Frequency range (-3 dB)	0...20 kHz <sup>(1)</sup>
Control input	$\pm 5$ V... $\pm 45$ V, galv. separated
Switching output	max. 45 V, max. 100 mA galv. separated

<sup>(1)</sup> @ 100 pC...1'000'000 pC; > 2 kHz @ 1'000'000 pC

<sup>(2)</sup> DACU at least 30 min. attached to operational voltage

All specifications at ambient temperature (23°C  $\pm$ 2°C)

## Mechanical Data

Control connection	25 pin D-Sub
Sensor connection	BNC male
Enclosure material	Aluminum die cast

## Environmental Conditions

Operating temp. range	-5...+60 °C
Storage temperature	-20...+80 °C
Protection class	IP 40
EMC	EN 61000-6-2 immunity EN 61000-6-4 emission



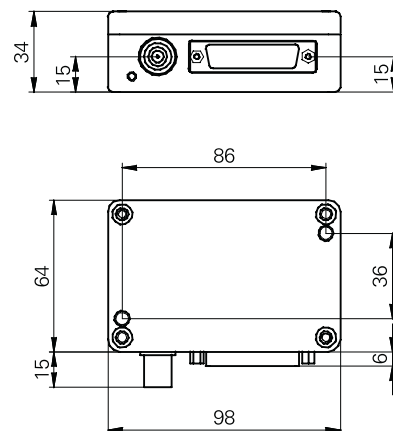
## Order Code

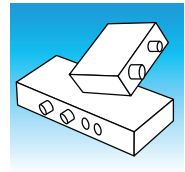
**DACU 800-0.1-1K0BS**

## Included

- Mounting screws 2 pcs. M4 x 16

## Dimensions (mm)

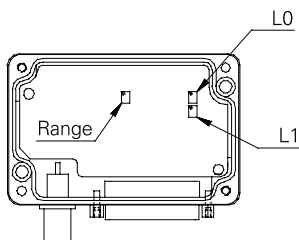




**Electrical Connections D-Sub 25**

Pin	Function
1	Signal out
2	Peak out
3	Level 1 (In or Out)
4	Level 0 (In or Out)
5	Range 3
6	Range 2
7	Range 1
8	Range 0
9	Supply GND
10	+Supply
11	Code 2
12	Code 0
13	Code Supply +
14	Signal GND
15	Alarm 1
16	Alarm 0
17	RX
18	TX
19	Com Logic Input
20	Operate
21	80% Test
22	Supply GND
23	NC
24	Code 1
25	Com Logic Output (Alarm)

**Control Elements**



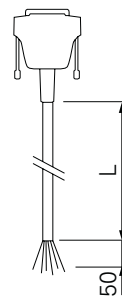
Range	Adjustment of variable range
L0	Adjustment of value 1. The limit switch voltage can be set with the potentiometer and has to be measured at pin 4. Alternatively a voltage can be supplied as well.
L1	Adjustment limit value 2. ditto, pin 3 only

**Measuring Range Selection**

Range				Measuring range
3	2	1	0	pC/10V
0	0	0	0	1'000'000
0	0	0	1	500'000
0	0	1	0	200'000
0	0	1	1	100'000
0	1	0	0	50'000
0	1	0	1	20'000
0	1	1	0	10'000
0	1	1	1	5'000
1	0	0	0	2'000
1	0	0	1	1'000
1	0	1	0	500
1	0	1	1	200
1	1	0	0	100
1	1	0	1	100'000...1'000'000
1	1	1	0	10'000...100'000
1	1	1	1	100...10'000

**Accessories**

Connecting cable with open end



Length(L)	Order code
5 m	<b>DZCS 05/DACU 8</b>



# Charge Amplifier DACU 820

## Features

- Multi-range charge amplifier for industrial application
- 4 selectable ranges channel 1  
3 fixed ranges 100'000 pC - 500'000 pC  
1 variable range 100'000 pC - 500'000 pC
- 4 fixed ranges channel 2  
4 fixed ranges 2'000 pC - 20'000 pC
- Adjustable limit value with switching output
- Peak value and test function
- Serial RS 232 interface

## Electrical Data

Voltage supply	10...40 VDC
Capacity draw	< 1,5 W <sup>(1)</sup>
Measuring range channel 1	$\pm 100'000...500'000$ pC
Measuring range channel 2	$\pm 2'000...20'000$ pC
Output signal	$\pm 10$ V
Characteristic curve deviation	< 1% FS
Linearity	< 0,02%FS
Output offset	< $\pm 5$ mV
Noise voltage	< 5 mVpp (0,1 Hz... 100 kHz) <sup>(2)</sup>
Output impedance	10 $\Omega$
Reset operate offset	< $\pm 10$ mV
Drift	< 0,03 pC/s at 23 °C <sup>(3)</sup>
Frequency range (-3 dB)	0...20 kHz <sup>(4)</sup>
Control input	$\pm 5$ V... $\pm 45$ V, galv. separated
Switching output	max. 45 V, max. 100 mA galv. separated

<sup>(1)</sup> < 55 mA at 24 V

<sup>(2)</sup> < 20 mVpp in the 2000 pC range

<sup>(3)</sup> DACU at least 30 min attached to operational voltage

<sup>(4)</sup> @ 2'000 pC...100'000 pC; > 2 kHz @ 500'000 pC

All specifications at ambient temperature (23°C  $\pm 2^\circ\text{C}$ )

## Mechanical Data

Control connection	25 pin D-Sub
Sensor connection	BNC male
Enclosure material	Aluminum die cast

## Environmental Conditions

Operating temp. range	-5...+60 °C
Storage temperature	-20...+80 °C
Protection class	IP 40
EMC	EN 61000-6-2 immunity EN 61000-6-4 emission



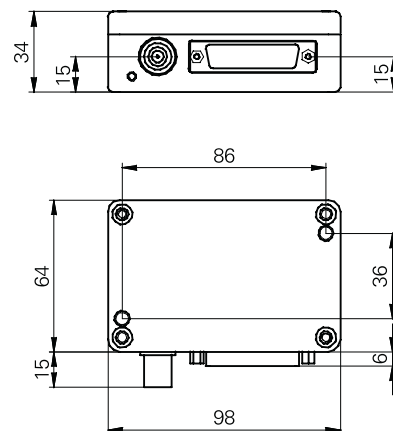
## Order Code

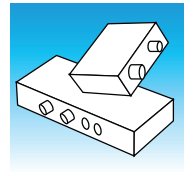
**DACU 820-2.0-500BS**

## Included

- Mounting screws 2 pcs. M4 x 16

## Dimensions (mm)





**Electrical Connections D-Sub 25**

Pin	Function
1	Signal out CH1
2	Peak out
3	Level 1 (In or Out)
4	Level 0 (In or Out)
5	Range B1 (CH2)
6	Range B0 (CH2)
7	Range A1 (CH1)
8	Range A0 (CH1)
9	Supply GND
10	+Supply
11	Code 2
12	Code 0
13	Code Supply +
14	Signal GND
15	Alarm 1 (CH1)
16	Alarm 0 (CH1)
17	RX
18	TX
19	Com Logic Input
20	Operate
21	80% Test
22	Supply GND
23	Signal out CH2
24	Code 1
25	Com Logic Output (Alarm)

**Measuring Range Selection**

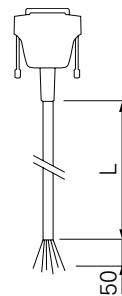
Range CH1		Measuring Range
A1	A0	pC/10V
0	0	500'000
0	1	200'000
1	0	100'000
1	1	100'000...500'000

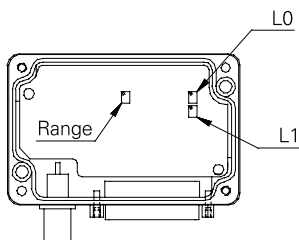
Range CH2		Measuring Range
B1	B0	
0	0	20'000
0	1	10'000
1	0	5'000
1	1	2'000

**Accessories**

Connecting cable with open end



**Control Elements**



Range	Adjustment of variable range
L0	Adjustment of value 1. The limit switch voltage can be set with the potentiometer and has to be measured at pin 4. Alternatively a voltage can be supplied as well.
L1	Adjustment limit value 2. ditto, pin 3 only

Length (L)	Order code
5 m	<b>DZCS 05/DACU 8</b>