

Strain Gage Bridge Amplifier BSCI-HD

User's Manual
BSC1-HD-OEM, BSC1-HD-ND,
BSC1-HD, BSC1-HD-PM,
BSC1-HD-DT

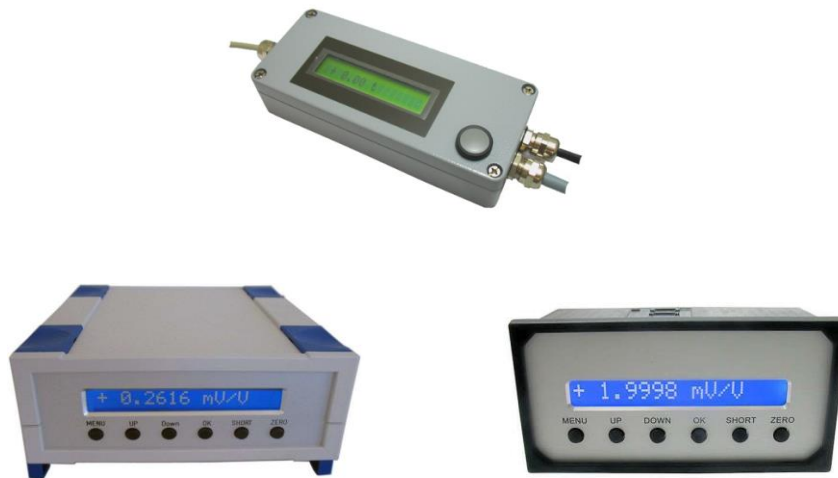


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Description

The BSC1-HD is a strain Gage measuring amplifier with a serial output signal. Depending on the type, the following interfaces are available: RS232, RS422, USB, CANbus / CANopen, Ethernet.

The measuring amplifier BSC1-HD is available in different housing models and equipment variants:

- BSC1-HD-DT: Desktop housing with display, USB, RS232, and integrated, rechargeable battery
- BSC1-HD-ND, BSC1-HD: Aluminum housing with RS232, RS422, CANbus, display
- BSC1-HD-PM: front panel mounting with display, RS232, RS422, CANbus
- The model BSC1-HD-DT with display, USB, integrated rechargeable battery and SD memory card (data logger function) is especially suitable for mobile use.

The compact dimensions of the BSC1-HD-DT and the 9330 fit into any briefcase. With the built-in rechargeable battery 14.8V, 2.8Ah with this model, an operating time of at least 8 hours is possible.

Strain gage sensors can be connected either via screw terminals or a 15-pin Sub-D connector.

The keyboard can be used to recall presetting's of up to 6 sensors. In addition to the menu-driven adjustment of sensor data, the BSC1-HD-DT and 9330 allow you to configure the display for strain gage stress analysis.

The setting of the display during stress analysis with strain gages is menu driven. Strain gage quarter bridges, half bridges and full bridges can be connected. The amplifier has built-in bridge complements for 120 ohms, 350 ohms and 1000 ohm strain Gages.

Pin Configuration

15-pin terminal block for the sensor connection

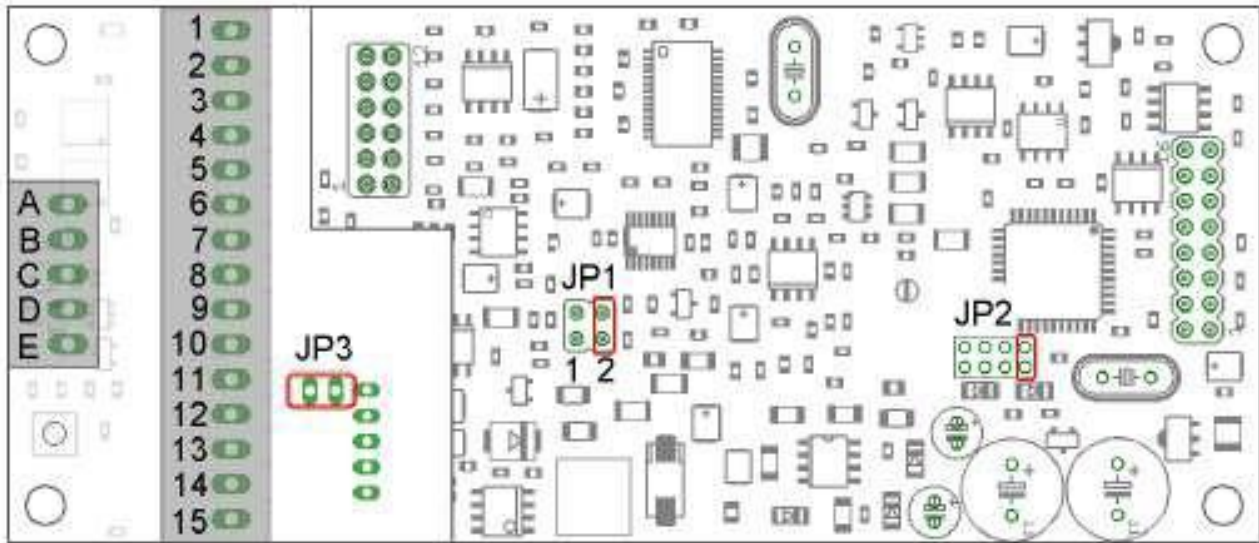


Figure 1: Terminal block 15pole and 5 pole in BSCI-HD-OEM, BSCI-HD-ND, BSCI-HD and BSCI-HD-PM

Pin	Name	Description	Tip
1	GNDB	Supply ground	Connection for cable shield
2	+Us	Positive bridge sensor supply	The signals at terminals 2..7 are recorded by software in channel 0. Connection of sensors in 4- or 6-wire technology. Bridging between +Us and +UF as well as between -Us and -UF are not necessary.
3	+UF	Positive sense for 6-wire technology	
4	+UD	Positive differential input	
5	-UD	Negative differential input	
6	-UF	Negative sense for 6-wire technology	
7	-Us	Negative bridge sensor supply	
8	UE	Analog Input 0..10V	
9	UA	Analog Output ± 5 V / option. 4...20mA	
10	GNDA	Ground analog In/Output	
11	SW1 ²	Threshold output No. 1	Open Collector (Open Emitter alternatively), galvanically isolated
12	Tara ¹	Tare input	Affects digital serial and Analog output
13	SW2 ²	Threshold output No. 2	See Tip for SW1
14	UB	Supply voltage 12..24 VDC	Connection for supply voltage
15	GNDB	Supply ground	

Table 1: 15pole terminal block in BSCI-HD-OEM, BSCI-HD-ND, BSCI-HD and BSCI-HD-PM

¹ In case of voltages above 3.4 V at this terminal, a tare adjustment is initiated. Offset adjustment is then done in the analog part of the BSCI-HD. In addition, the digital output is also set to zero.

² Threshold values are programmed via the RS 232 port.

5-pin terminal block for RS232 / RS422

Pin	Standard	CAN/CANopen	Description	
A	GNDC	GNDC	Ground RS232 / RS422 Interface	
B	RX / RX-	Rx	Data connection Rx for RS232 / Rx- for RS422	
C	TX / TX-	Tx	Data connection Tx for RS232 / Tx- for RS422	
D	Rx+	CAN_GND	Rx+ for RS422	Ground CAN bus
E	TX+	CAN_L	Tx+ for RS422	CAN low
F	n.a.	CAN_H	n.c.	CAN high

Backplate of the table case (BSC I-HD-DT)

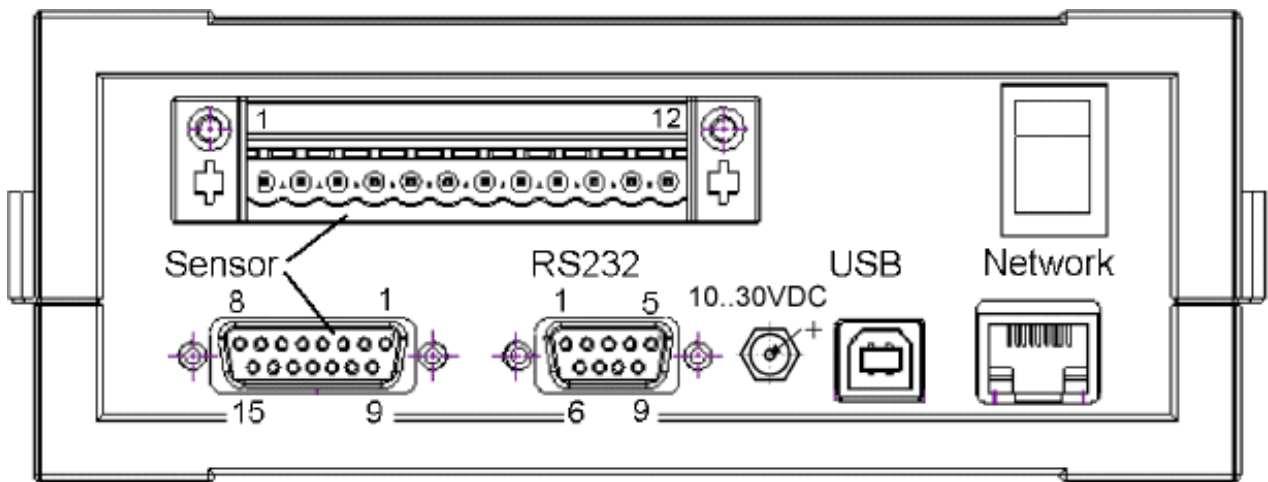


Figure 2: Backplate BSC I-HD-DT

M8 plug connector for BSC1-HD-DT CANopen

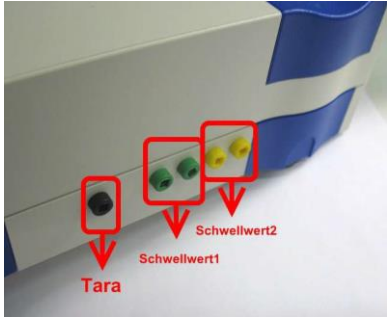
In the version with CANopen Interface there are two additional M8 male / female connectors on the backplate.

Pin	Function	Wire color
1	CAN-H	brown
3	CAN-L	blue
4	GND	black

the CAN-Interface is galvanically isolated.

Side panel BSC1-HD-DT

Five 2mm plugs are arranged at the side panel. Two isolated threshold outputs and one input for the tare / set zero functions are available.

	black	Set zero input	Input voltage 9 .. 30 Volts
	green	Threshold 1	CMOS relay outputs, isolated, 60 VDC, 40 VAC
	yellow	Threshold 2	CMOS relay outputs, isolated, 60 VDC, 40 VAC

12-pin terminal block BSC1-HD-DT

Pin	Name	Description	Tip
1	Shielding	Shield and GNDB	Connect the cable shield here
2	+Us	Positive bridge sensor supply	The signals at terminals 2..7 are acquired by software. Connection of sensors in 4- or 6-wire technology. Bridging between +Us and +UF as well as between -Us and -UF are not necessary.
3	+UF	Positive sense for 6-wire technology	
4	+UD	Positive differential input	
5	-UD	Negative differential input	
6	-UF	Negative sense for 6-wire technology	
7	-Us	Negative bridge sensor supply (GND)	
8	-UD2	Negative differential input 2	
9	HB	Completion for half bridge	For connection of quarter bridge, 120, 350 or 1000 Ohms.
10	QB120	Completion quarter bridge 120 Ohms	
11	QB350	Completion quarter bridge 350 Ohms	
12	QB1000	Completion quarter bridge 1000 Ohms	

Table 2: Connection of 12-pole terminal block BSC1-HD-DT

Connection scheme 12-pin terminal block

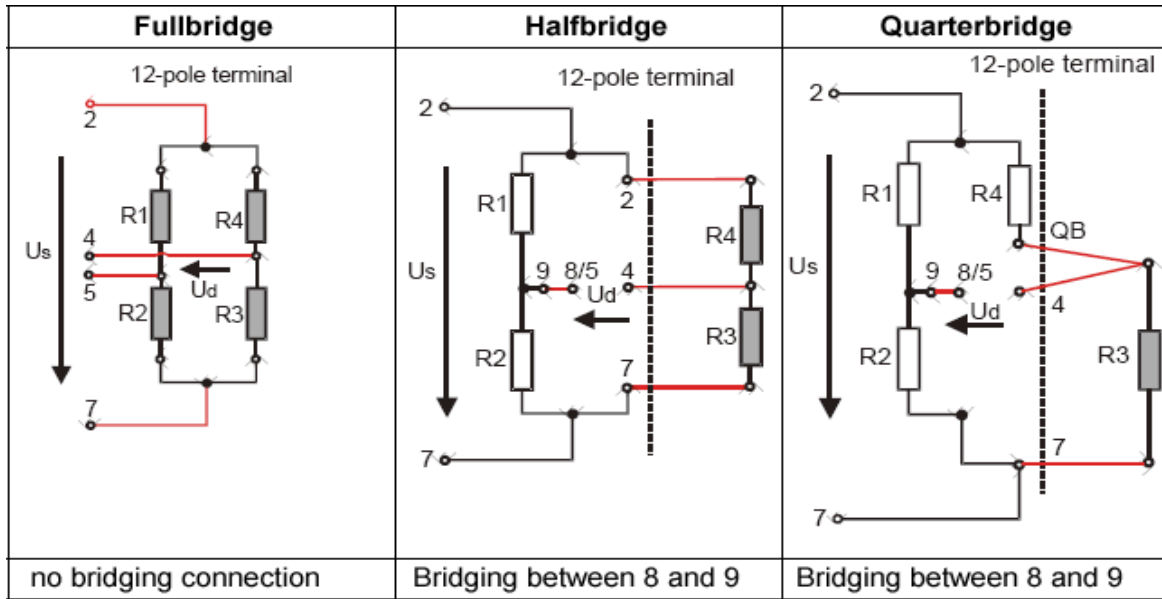
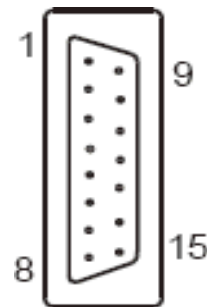


Figure 3: Connection of Full-, Half- and Quarter bridge sensors to the 12-pole terminal block

15-pin SUB-D connector of the BSCI-HD-DT

Pin	Name	Description
1	Shielding	Cable shield
2	GNDA	Analog input ground
7	Tare	Tare input / Trigger input
9	UE	Analog input
10	UA	Analog output
6	+Us	Positive bridge sensor supply
5	-Us	Negative bridge sensor supply
8	+UD	Positive differential input
15	-UD	Negative differential input
13	+UF	Positive sense for 6-wire technology
12	-UF	Negative sense for 6-wire technology
14	HB	Completion for half bridge
11	QB120	Completion quarter bridge 120 Ohms
3	QB350	Completion quarter bridge 350 Ohms
4	QB1000	Completion quarter bridge 1000 Ohms



To connect half- and quarter bridges, pin 14 and pin 15 must be connected together. Quarter bridges are connected in 3-wire technology at pins 5, 8 and QB (3, 11 or 4).

Table 4: Connection of SUB-D 15 plug

Connection diagram 15-pin D - SUB connector

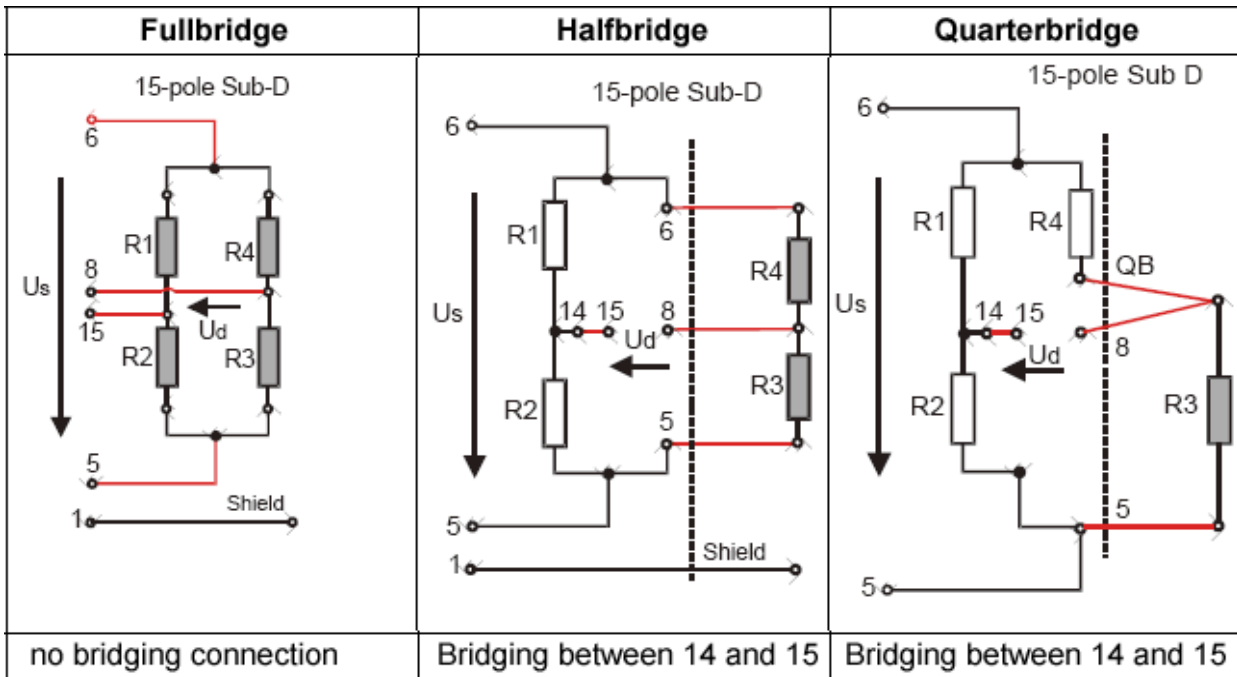


Table 5: Connection of Full-, Half- and Quarter bridge sensors to the 15-pole SUB-D connector

All ground connections are individually protected by interference suppressor inductors in the BSC1-HD. Terminals GNDB are connected to the housing via interference suppression inductor. Currents above 1A between the terminals and the housing result in damage to the interference suppression inductor. Before connecting, please check whether housing, supply ground, the ground of your data acquisition system and your port are at the same potential.

Connection and start-up

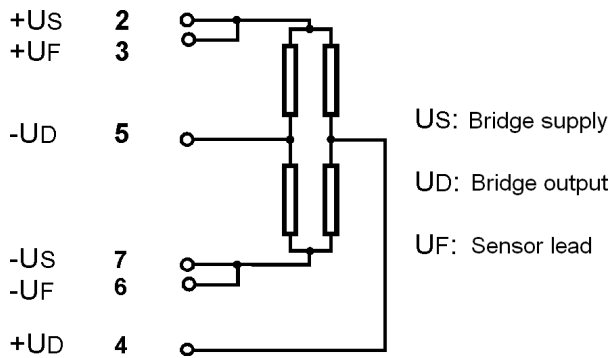
Charging the integrated battery

The integrated rechargeable battery of the BSC1-HD-DT is charged via the DC socket 2.1 x 5.5 mm at the back of the device. The state of charge is indicated by the LED on the back of the device. When the battery is fully charged, the LED goes out or the brightness is reduced. The charging time is about 8 ... 12 hours.

Connecting the sensor

A strain gage full bridge or a load cell is connected to the amplifier's terminal block as shown below:

4- Wire technology		6-Wire technology ¹⁾ :	
Sensor supply +	PIN 2	Sensor supply +	PIN 2
Sensor supply -	PIN 7	Sensor supply -	PIN 7
Sensor signal +	PIN 4	Sensor signal +	PIN 4
Sensor signal -	PIN 5	Sensor signal -	PIN 5
		Sense wire +	PIN 3
		Sense wire -	PIN 6



All cable shields should be connected to the metal of the cable entrance or to GND.

The supply voltage must be connected to the PINs 14 (+) and 15 (GND) of the BSC1-HD-OEM, BSC1-HD-ND, BSC1-HD and the BSC1-HD-PM.

The Analog output transmits a signal which is proportional to the measured force. We offer the BSC1-HD with the following options: ± 5 V, 0...10 V, or 4...20 mA current output. The output signal is present at the PINs 9 and 10 (Ground).

The sensitivity of the amplifier can be changed by removing the Jumper „JP1“ from 2 mV/V) to 1 mV/V. The jumper „JP1“ is located on the circuit board, for more detailed information have a look at page 64.

Connecting the PINs 12 and 13 triggers a zero-point adjustment at the analog and digital outputs. The analog output delivers a voltage from 0 V or a current of 4mA. The system is then ready for measurements.

1) At the analog output the benefits of the 6-conductor technology are not supported.

Connecting the serial interface

If an RS 232 or RS422 port is used, the following connections should be set up to the PC:

BSCI-HD PIN		Cable type	9-pin Sub-D-Pin (PC-side)	
A	GND	Interface ground	GND	5
B	RX(-)	Data wire	TX	3
C	TX(-)	Data wire	RX	2
D (RS 422 only)	TX+	Data wire	TX+	
E (RS 422 only)	RX+	Data wire	RX+	

The data cables RX and TX between the amplifier and the PC are crossed at the SUB-D connector of the BSC1-HD-PM.

The measuring values will be displayed on the PC while starting the supplied configuration program.

The measuring amplifier BSCI-HD-DT needs a fully connected null modem cable, which means crossing of RxD with TxD, RTS with CTS, and DCD+DSR with DTR also GND with

GND (2 with 3, 7 with 8, 1+6 with 4 as well as 5 with 5).

Commissioning devices with CANopen interface

For devices with CANopen interface the changing of settings via USB port or via RS232 interface is blocked. These settings via USB or RS232 will be however possible only with the switch off of the CANopen interface.

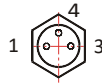
To ensure the conformity with the CANopen protocol, the CANopen interface must be switched on in the factory state.

The switch off of the CANopen interface is possible with the program "GSV-Term".

You can find the corresponding point to switch-off the CANbus under this path: "2" (for the second side) --> "b" (for baud rate / CAN) --> "c" (for CANbus) --> "1" (for switch on/off).

Please note the instructions ba-BSC1-HD CanOpen.pdf.

3 pin connector plug / socket M8

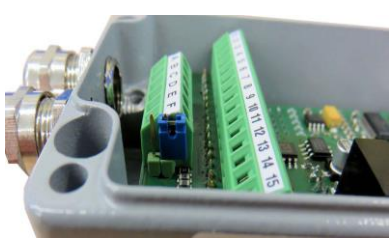



Connector plug and socket are 1:1 connected.

Pin	Function	BSCI-CAN	Wire color
1	Transmit Data TxD / CAN_H	I3	brown
3	Receive Date RxD / CAN_L	I2	blue
4	GND	I1	black

Jumper for terminating resistor 120 Ohm

The photos show the position for the jumper. For closed jumper the terminating resistor of 120 Ohm is activated.

	
Jumper for terminating resistor for BSCI-HD-ND	Jumper for terminating resistor for BSCI-HD-DT

Setting the input sensitivity

In the default configuration, the measurement amplifier's input sensitivity is ± 2 mV/V.

At this input sensitivity the measurement amplifier works with a bridge excitation voltage of 2.5V.

For specific applications it may be necessary to adjust the measurement amplifier's input sensitivity.

a) Enlargement of the input sensitivity and thus the measurement range to 3-5 mV/V, e.g., for using sensors with an output signal of 3.0 mV/V (mV output voltage per volt bridge excitation voltage).

b) Reduction of the input sensitivity to 1 mV/V with a bridge excitation voltage of 5.0 V, e.g., if an especially high resolution is to be achieved.

a) The enlargement of the measurement range from 2.0 mV/V to 3.5 mV/V can be performed with the help of the gsvterm.exe configuration software. Further information is to be found in ba-gsvterm.pdf, the instruction manual.

b) The bridge excitation voltage can be converted from 2.5V to 5.0V by relocating a jumper. Jumper JP1 must be relocated in position 1 for 5.0 V (page 13, BSC1-HD circuit board).

The input sensitivity is reduced to 1 mV/V with this measure. Jumper JP1 is located in position 2 in the original delivery status.

Please note: after a change in the bridge excitation voltage, an automatic calibration must be triggered with the BSCI-HD Control software. Further instructions are to be found in ba-

A sensor with a specific value of 1 mV/V supplies an analog output signal of 5 V or 10 V. or 20 mA in position 1 at nominal load, depending on the option ordered.

A sensor with a specific value of 2 mV/V then supplies 100% of the output signal at half the nominal load.

Null-balance calibration

The amplifier's calibration range is $\pm 120\%$ of the measurement range which means that unsymmetric measuring bridges can also be calibrated.

The BSC1-HD's operating system performs a null-balance calibration if a level of over 3.4 V is present at input T relative to GND. It is permissible to connect input T with the operating voltage of 12V or 24V to perform a null-balance calibration. This voltage must be present for at least 8 ms to trigger the calibration.

A voltage level at input T triggers a combination of an offset calibration and a compensation of the digital output value to 0 in devices with a serial interface. The offset calibration can be triggered, and the output value set to 0 separately via the serial interface.

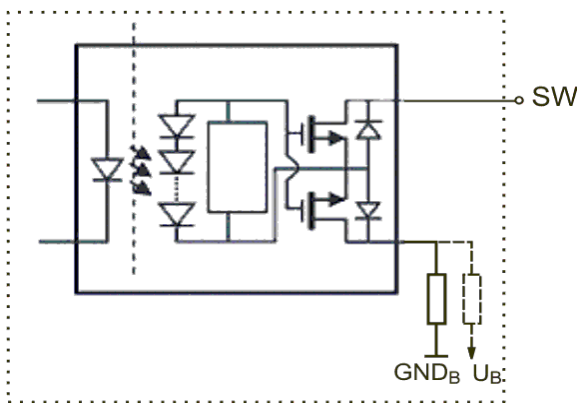
The null-balance calibration lasts approx. 0.12 s for devices with a 250 Hz Analog filter and a set transmission rate f of 10Hz.

During the calibration, there is no valid signal at the Analog output. Serial data transmission and control of the thresholds is deactivated for the duration of the calibration.

Please note: if the so-called Logger Mode is activated via the configuration software, no null-balance calibration is performed with a high level at input measurement value is sent via the serial interface instead.

Using switching output

The BSC1-HD has two opto-decoupled, digital outputs (terminals 11 and 13). In the standard version, these outputs are configured as Open Collector outputs. The coil of a relay can be switched between output SW1 or SW2 and supply voltage U_B . The relay is activated if the threshold is exceeded. The level at SW1 or SW2 then changes from High to Low.



By changing resistances on the circuit board, SW1 and SW2 can also be used as Open Emitter outputs. The logic is inverted compared to configuration with an Open Collector output.

The switching thresholds are calibrated via the serial interface.

The switching outputs can be configured via software either as a threshold switch or as a window comparer.

The hysteresis of the threshold switch can be adjusted by assigning the switch-on and switch-off thresholds their own values.

The switch-on threshold must be assigned a larger value than the switch-off threshold.

Usage of the keyboard and the menu

Menu entry level 1	Menu entry level 2	Menu entry level 3
Sensor config.	<ul style="list-style-type: none"> →unit →Sensor capacity →Rated output 	<p>Select the unit¹</p> <p>Setting the physical nominal value of the sensor.²</p> <p>Setting the electrical rated output of the sensor.²</p>
Strain analysis	<ul style="list-style-type: none"> →Set gage factor →Set bridge type 	<ul style="list-style-type: none"> →Setting the gage factor between 0,2 and 258³ →Full bridge: Full bridge circuit with 4 single

1 Changing the unit doesn't change the measuring value's scaling!

2 Changing the sensor capacity or the rated output changes the measuring value's scaling.


3 Changing the strain gage parameters of the strain analysis changes the measuring value's scaling and the unit.

Menu entry level 1	Menu entry level 2	Menu entry level 3
		<p>→ strain Gages, all in longitudinal direction.³</p> <p>→ Half bridge: Half bridge circuit with 2 single strain Gages, both in longitudinal direction.³</p> <p>→ Quarter bridge: Quarter bridge circuit with one single strain Gage.³</p> <p>→ PR.full bridge: Full bridge circuit with 4 single strain Gages, 2 in longitudinal and 2 in lateral direction.³</p> <p>→ PR.half bridge: Half bridge circuit with 2 single strain Gages, 1 in longitudinal and 1 in lateral direction.³</p>
		<p>Menu entry level 4</p> <p>Set Poissons ratio (only if PRfull or PR.half bridge was selected in level 3). Number value from 0 to 0,5.³</p>
Load settings	<p>→ Default: Factory settings, i.e. restoring the BSCI-HD parameters of the initial delivery state.</p> <p>→ User 1: User configurable parameter record No.1, i.e. loading values that were previously saved in “User 1” with Save settings.</p> <p>→ ...and so on, to User 6 like 1, but record No 6</p>	
Save settings	Storing the actual parameter configuration in User 1 to User 6	
Scaling	Number value between 0,15 and 1580000	
Data acquisition	<p>→ Data frequency</p> <p>→ Data period</p>	<p>Number value for measuring values per second [Hz]</p> <p>Number value for data period in seconds</p>

Menu entry level 1	Menu entry level 2	Menu entry level 3
Options	<ul style="list-style-type: none"> →Set channel →Set threshold →Offset value →Language² →CAN settings² 	<ul style="list-style-type: none"> Number value 0 or 1 →on-threshold 1 / 2 Number value of the on-threshold No. 1 or 2 →off-threshold 1 / 2 Number value of the off-threshold No. 1 or 2 → Number value that will be added to every measuring value →German or English →CAN Node-ID →CAN-Baudrate →CAN on/off

- By pressing the Menu-key the upper menu level will be re-entered.
- By pressing the OK-key an input will be confirmed or the next menu level will be entered.
- If any setting is selected, the message “OK to confirm” appears, which can be confirmed with the OK key or cancelled with MENU.

Advice

- The symbol  on the right side of the display means that this setting is enabled.
- The entry into the menu is blocked if a communication via the serial interface is active (if megsv.dll is used). In this case the display shows “Menu blocked”.

Description of the keys

Key	Function
MODE	Switch on and off or enter the logger-menu
MENU (LEFT)	Enter into main menu or cancel an input. Move to upper menu level. If changing number: Move cursor left
UP	Browsing the menu entries or augment a number / digit value.
DOWN	Browsing the menu entry or reduce a number / digit value.
OK (RIGHT)	Confirm an input or change into a sub menu. If changing number: Move cursor right.
SHORT	Connecting the inputs +Ud and -Ud (Short-circuit the sensor signal)
ZERO	Triggering an automatic zero-adjustment

² Only if CAN-Bus available.

Number format

To set the number value and the date or the time move with a short press of OK the cursor to the right and with MENU the cursor to the left. The number above the cursor is blinking and can be increased or reduced with UP / DOWN buttons.

In order for the setting to take effect, the OK button must be kept pressing until the whole number flashes.

Then release the OK button, it appears "OK to set". Confirm this with pressing on OK. To cancel the time setting press the MENU button long time.

Settings of the measuring value display (scaling factor)

scaling factor = Input sensitivity / Nominal excitation * Nominal load

Input sensitivity of the measuring amplifier	e.g. 3,5 mV/V
Measuring range of the sensor	20 kN
Nominal excitation of the sensor	1,9998 mV/V at 20 kN

This example results in an scaling factor of 35,004.

RS 232/422 Protocol of the BSC1-HD Strain Gage Bridge Amplifier

Data output

By default setting, the BSC1-HD operates with a communication bit rate of 38400 Baud³, 1 Start bit, 8 data bits, no Parity and 1 stop bit (8N1).

There are two types of data frames for the communication of the measuring values:

1. Binary format
2. Text format

The settings of the data formats may be changed with the software BSC1-HD Control.

In the normal mode, the BSC1-HD transmits its measuring values to the serial interface permanently. In the binary format the BSC1-HD transmits 5 bytes for every single measuring value (frame size is 5 Bytes):

, (ASCII: 44d)	Status	Hbyte (MSB)	MByte	Lbyte (LSB)
----------------	--------	-------------	-------	-------------

The first byte is used for synchronization.

³ 1) The baud rate can be changed , SetBaud Section of Manual

From Firmware-Version 1.3.06 on, the status-byte contains in bits 3 and 4 information about the state of the threshold switches SW1 and SW2.

Bit 7	Bit 6	Bit 5	Bit 4	Bit3	Bit 2	Bit 1	Bit 0
Res.	Res.	Res.	SW 1	SW 2	Res.	Res.	Res.

Res.: reserved

SW1, SW2: State of the threshold switches SW1 and SW2

1: threshold switch is on, 0: threshold switch is off

After that there are the three data bytes, starting with the-most significant byte (MSByte), followed by the Mbyte, until the least significant byte, so that 24 Bits are transmitted. In the unipolar mode the measuring value zero is equal the data value zero (0x000000). In the bipolar mode the measuring value zero corresponds to the data value 0x800000 as a hexadecimal value.

At an amplification of 1 mV/V you will get the following raw data:

Measuring value (hexadecimal)	Unipolar	Bipolar
00 00 00	0,0 mV/V	-1,05 mV/V
80 00 00	0,525 mV/V	0,0 mV/V
FF FF FF	1,05 mV/V	1,05 mV/V

If another amplification is used, it is necessary to multiply it with the corresponding factor of proportionality.

The full range of 1,05 mV/V was chosen to be able to measure measuring values which are a bit greater than 1,0 mV/V. See also p.59

If desired, you can switch the data output to the ASCII Format using the configuration program GSV.EXE or with the Windows-DLL (or with the firmware-command Set Mode, 38d) . The ASCII output corresponds to the values displayed in the LCD and it also can be shown with a terminal program.

In the default settings the data format of the ASCII frame is:

sign, 6 numbers, decimal point, free space, unit, CR, LF

for example

+1.2345 kgCRLF

Attention: If the unit is switched off (with the command number 15, Set unit, code 7), the output frame ends with „space“ and CRLF: **+1.2345 CRLF**

Display settings

With the binary coded data protocol the measured values are transmitted standardized to ± 1 .

The values shown in the LC display and in the program are a result of the scaling factor multiplied by the measured value. This scaling factor can be set by the command “Set Norm“ or with the configuration program.

This is the formula to calculate the scaling factor :

scaling factor = input sensitivity / rated output * normal load.

Example:

normal load of the load cell: 100kg

rated output of the load cell: 2 mV/V

Input sensitivity of the strain gage amplifier: 2 mV/V

==> scaling factor = 100

Output of the register data

After requesting the data, the answer frame sent begins with a semicolon as a prefix. From 2 up to 8 data bytes are getting transmitted in the frame depending on the size of the register. You receive the following format:

for 3 Bytes:	; (ASCII: 59d)	HByte	MByte	LByte
for 2 Bytes:	; (ASCII: 59d)	HByte	LByte	

Commands to the BSCI-HD

Commands to the BSCI-HD have the following format:

Command number	P1	P2	P3	P4
----------------	----	----	----	----

The Command number may be followed by up to four parameters P1...P4, depending on the command (see the commands description below).

Table of commands

Note: the command number must be sent as Byte to BSCI, followed by parameter-bytes. (the command consist of 1 byte, followed by parameter-bytes).

Command No.	Command No. (Hexadecimal)	Command name	Number of parameters	Number of data bytes send by the BSCI-HD
0	0	reset status	0	0
1	1	read scale	0	3
2	2	read zero	0	3
3	3	read control	0	3
4	4	read offset	0	2
5	5	write scale	3	0
6	6	write zero	3	0
7	7	write control	3	0
8	8	write offset	2	0
9	9	get all	1	0
10	A	save all	1	0
11	B	set cal	0	0
12	C	set zero	0	0
13	D	set scale	0	0
14	E	set offset	0	0
15	F	set unit	1	0
16	10	set norm	3	0
17	11	set dpoint	1	0
18	12	set frequency	2	0
19	13	set gain	1	0
20	14	set bipolar	0	0
21	15	set unipolar	0	0
22	16	Read frequency	0	3
23	17	Manufacturer setting		
24	18	Manufacturer setting		
25	19	Manufacturer setting		
26	1A	get norm	0	3
27	1B	get unit	0	1
28	1C	get dpoint	0	1
29	1D	switch	1	0
30	1E	Manufacturer setting		
31	1F	get serial number	0	8
32	20	set threshold I	4	0
33	21	get threshold I	0	4
34	22	set channel	1	0
35	23	stop transmission	0	0
36	24	start transmission	0	0
37	25	clear buffer	0	0
38	26	set mode	1	0
39	27	get mode	0	1
40	28	Manufacturer setting		
41	29	get equipment	0	1
42	2A	Manufacturer setting		
43	2B	firmware version	0	2
44	2C	set Gage factor	2	0
45	2D	get Gage factor	0	2
46	2E	set poisson	1	0

Command No.	Command No. (Hexadecimal)	Command name	Number of parameters	Number of data bytes send by the BSCI-HD
47	2F	get poisson	0	1
48	30	set bridge type	1	0
49	31	get bridge type	0	1
50	32	Set Range	1	0
51	33	get range	0	1
52	34	reserved		
53	35	get offset wait	0	1
54	36	get options	0	3
55	37	reserved		
56	38	reserved		
57	39	reserved		
58	3A	reserved		
59	3B	get value	0	5 ⁴
60	3C	clear maximum value	0	0
61	3D	set Digits	1	0
62	3E	get Digits	0	1
63	3F	reserved		
64	40	reserved		
65	41	Get Channel	0	1
66	42	Get Last Error	0	1
67	43	Set Second Threshold	4	0
68	44	Get Second Threshold	0	4
69	45	Get Device Type	0	1
70	46	calc norm	0	0
128	80	Set TX mode	1	0
129	81	Get TXmode	0	1
130	82	Set Baud ⁵	1	0
131	83	Get Baud	0	1
132	84	reserved		
133	85	reserved		
134	86	Set Slow Rate	2	0
135	87	Get Slow Rate	0	2
136	88	Set Special Mode	2	0
137	89	Get Special Mode	0	2
138	8A	Write Sampling Rate	3	0
139	8B	Read Sampling Rate	0	3
140	8C	Set CAN setting	3	0
141	8D	Get CAN setting	1	2
142	8E	reserved		
143	8F	reserved		
144	90	Set Analog Filter	2	0
145	91	Get Analog Filter	0	2
146	92	Switch Blocking	3	0
147	93	Get Command Available	2	1
148	94	Set Noise-Cut Threshold ⁶	3	0
149	95	Get Noise-Cut Threshold ⁶	0	3
150	96	Set Auto-Zero Counter ⁶	2	0

4 At a normal version with binary output

5 This command can only be executed with the configuration jumper set

6 If function exists (see command description)

Command No.	Command No. (Hexadecimal)	Command name	Number of parameters	Number of data bytes send by the BSC I-HD
I51	97	Get Auto-Zero Counter ¹	0	2
I52	98	Set User-Text Char I)	2	0
I53	99	<i>reserved</i>		
I54	9A	Set User Offset Value ³	3	0
I55	9B	Get User Offset Value ³	0	3
I56	9C	<i>reserved</i>		
I57	9D	<i>reserved</i>		
I58	9E	SetAdaptFilterMask ³	3	0
I59	9F	GetAdaptFilterMask ³	0	3
I60	A0	SetAdaptFilterOptimize ³	2	0
I61	A1	GetAdaptFilterOptimize ³	0	2
I62	A2	Read Ranges ⁷	1	4
I63	A3	<i>reserved</i>		
I64	A4	Get Sensor Capacity ⁸	0	4
I65	A5	Set Sensor Capacity ¹⁰	4	0
I66	A6	Get Rated Output ¹⁰	0	4
I67	A7	Set Rated Output ¹⁰	4	0

¹ If function existent (s. command description)

³ Existent from firmware-version 1.3 on

⁷ From firmware version 1.3.07 on

⁸ From firmware version 1.5.06 on

Description of the commands

Comment: For most of the commands described in this chapter there are public dll functions with almost the same name within a Windows-DLL named megsv.dll (they are described in the programming manual). Below there are useful tips to understand the direct RS 232-commands.

reset status

Command number: 0
number of parameters: 0
Bytes sent by the BSC1: 0

Reset status: resets the amplifier status and the error code (status=0).
Possible error codes: 0x00

read scale

Command number: 1 Number of
parameters: 0 Bytes sent by the
BSC1: 3

Read scale determines the content of the scale-registers of the BSC1-HD. You can save the value read on your PC and you can restore it with *write scale*.
Possible error codes: 0xA0, 0x91

Read zero

Command number: 2
number of parameters: 0
Bytes sent by the BSC1: 3

Read zero determines the content of the zero-registers of the BSC1-HD. You can save the value read on your PC and restore it with *write zero*
possible error codes: 0xA0, 0x91

Read control

Command number: 3 number of
the parameters: 0 Bytes sent by
the BSC1: 3

Read control determines some of the current configuration settings of the BSC1-HD. The bytes returned consists of coded channel, data rate, kind of operation, polarity as well as amplification of the AD-converter. The received value can be sent back with *write control*.

Possible error codes: 0xA0, 0x91

Read offset

Command number: 4
number of parameters: 0
Bytes sent by the BSC1: 2

Read offset determines the offset setting of the analog front end of the amplifier. The value received can be send back with *write offset* .

Possible error codes: 0xA0, 0x91

Write scale

Command number: 5
number of parameters: 3
Bytes sent by the BSC1: 0

Write scale sets the input sensitivity of the AD converter. The 3 bytes sent should contain a value which was recently determined with *read scale*.

Affected register: Scale.
Value Range: 0x20.00.00..0xFF.FF.FF
possible error codes: 0xA0, 0x55,0x71

Write zero

Command number 6 number
of parameters: 3 Bytes sent
by the BSC1: 0

Write zero sets the zero adjustment of the AD converter. The 3 bytes sent should contain a value which was recently determined with *read zero*.

Affected register: Zero.
Value range: 0x00.00.00..0xFF.FF.FF
possible error codes: 0xA0,0x71

Write control

Command number: 7
Number of parameters: 3
Bytes sent by the BSC1: 0

Write control resets the configuration which was determined with *read control* before. The type of operation, polarity, amplification, and Notch-frequency (data frequency) are set.

Affected register: Channel, frequency, gain, polarity.

Value Range: 0x00.00.00..0xFE.76.FF

possible error codes: 0xA0,0x53,0x54,0x58,0x71

write offset

Command number: 8

Number of parameters: 2

Bytes sent by the BSC1: 0

Write offset sets the Offset configuration of the preamplifier. The bytes sent should contain a value which was recently determined with *read offset*.

Remarks: Only the commands *write offset* and *set offset* affect the analog output.

Affected register: Offset.

Value Range: 0x00.00..0x0F.FF

possible error codes: 0xA0,0x54,0x71

Get all

Command number: 9

Number of parameters: 1

Bytes sent by the BSC1: 0

Get all restores a set of configurations, (some might be stored previously with *Save All*), chosen by the parameter:

0: : Restore Setting before the last power on cycle.

1: : Restore Manufacturer Settings

2...7 : Restore configurations saved at dataset 1...6

Affected registers: channel, gain, frequency, offset, zero, scale, threshold.

Value Range: 0x00..0x07

possible error codes: 0xA1,0x54,0x80,0x71

Save all

Command number: 10

Number of parameters: 1

Bytes sent by the BSC1: 0

Save all saves all relevant registers of the BSC1 to a configuration set in an internal memory. This data remains even when the device is turned off. It is possible to save different configuration sets. After turning on the amplifier up to 64 memory procedures are possible. The parameter indicates the number of the configuration set in the memory.

Parameters= 2 to 7: : configuration set 1 to 6, saved by the user.

The positions 0 and 1 can not be programmed by the user. On the position 0 the current

configuration of the BSC1 is automatically saved.

You can restore the configuration set with *get all*.

Value Range: 0x02..0x07

Possible error codes: 0xA0,0x54,0x55,0x74,0x71

Set cal

Command number: 11

Number of parameters: 0

Bytes sent by the BSC1: 0

Set cal accomplishes an internal sensitivity calibration of the AD converter. After this calibration you are operating with the amplification selected by *set gain*.

Attention: The previous content of the ADCs calibration register is getting lost. The analog output is not affected.

Remark: After sending this command, the BSC1 is not sending data for a small period of time.

Affected registers: Scale.

Possible error codes: 0xA0,0x82

Set zero

Command number: 12

Number of parameters: 0

Bytes sent by the BSC1: 0

Set zero accomplishes a zero-point adjustment of the connected sensor. The analog output is not affected.

Remark: After sending this command the BSC1 is not sending data for a small period of time. For this purpose all data loggers have to be deleted. If Log- and maximum value mode (have a look at *set mode*) is active, the latest maximum value is transmitted once.

Affected register: Zero.

Possible error codes: 0xA0

Set scale

Command number: 13

Number of parameters: 0

Number of parameters: 0

Set scale accomplishes a full sensitivity calibration of the AD converter. In contrast to

set cal, the sensitivity of the entire system including the connected sensor is getting

updated. After a zero-point adjustment with *set zero* this operation is able to calibrate the amplifier to the full load of the sensor, so the sensor must be loaded with its nominal load, while executing *Set Scale*. This command has no effect on the analog output.

Attention: Don't accomplish *Set scale* (with a normal load) if no zero-point calibration with *set zero* (without load) was done before.

Remark: After sending this command the BSC1 is not sending data for a small period of time. For this purpose all data loggers have to be deleted.

Affected register: Scale.

Possible error codes: 0xA0,0x81,0x83,0x71

Set offset

Command number: 14

Number of parameters: 0

Bytes sent by the BSC1: 0

Set offset accomplishes an offset adjustment of the input stage of the BSC1. In contrast to *set zero*, this adjustment does affect the analog output of the BSC1.

Remark:

While adjusting the BSC1 is not sending any values.

The time needed to accomplish offset adjustment can be read with *get offset wait* or you may get it from the description of the technical data (below) as well.

Affected register: Offset.

Possible error codes: 0xA0,0x83

Set unit

Command number: 15

Number of parameters: 1

Bytes sent by the BSC1: 0

Set unit sets the desired unit shown on the LC-display and the ASCII measuring value frame. Changing the unit hasn't any influence on the scaling, i.e. the scaling has eventually to be adapted manually.

0:	mV/V	22:	oztr
1:	kg	23:	dwt
2:	g	24:	kNm
3:	N	25:	%
4:	cN	26:	0/00
5:	V	27:	W

6:	µm/m	28:	kW
7:	(keine)	29:	rpm
8:	t	30:	bar
9:	kN	31:	Pa

10:	lb	32:	hPa
11:	oz	33:	MPa
12:	kp	34:	N/mm ²
13:	lbf	35:	°
14:	pdl	36:	Hz
15:	mm	37:	m/s
16:	m	38:	km/h
17:	cNm	39:	m ³ /h
18:	Nm	40:	mA
19:	°C	41:	A
20:	°F	42:	m/s ²
21:	K		

Value range: 0x00..0x2A

Possible error code: 0xA0,0x54,0x71

Set norm

Command number: 16

Number of parameters: 3

Bytes sent by the BSC1: 0

Set norm sets the scaling factor for the measuring values shown in the LC display, see chapter “Display settings” before. The decimal point has to be set separately with *Set dpoint*.

To calculate the parameter value for *set norm* the intermediate value dp for the decimal point has to be calculated first. To do so, the logarithm to the base of 10 of the desired scaling factor has to get calculated and rounded off to an integer value.

Then the desired scaling factor is divided by 10 to the power of dp.

If the result is greater than 1,6666/1,05 then it has to get divided by 10 again.

And you have to add 1 to the dp value.

The value calculated by this method is multiplied by 5250020 and then rounded to the next integer value. This value will be transmitted to the BSC1 in the order High byte (MSB), Mid byte, Low byte (LSB).

Value Range: 0x10.05.94..0x7F.26.E8

Possible error codes 0xA0,0x54,0x55,0x71

Set dpoint

Command number: 17

Number of parameters: 1

Bytes sent by the BSC1: 0

Set dpoint sets the decimal point in the LC-Display to its desired position. To calculate the parameter value on the basis of a desired scaling factor the calculated value of dp from the

formula for *set norm* (described there) is used, increased by one. That parameter value is only accepted within its nominal range from 1 to <number of digits>, which means it cannot be greater than the number of digits displayed in the LC display, see *Set/Get digits* below.

Absolute Value Range: 0x01..0x08 Possible

error codes 0xA0,0x55,0x56,0x71

Set frequency

Command number: 18

Number of parameters: 2

Bytes sent by the BSC1: 0

With *Set frequency* the measuring data rate of the BSC1 can be set. Frequencies between 0,3125 Hz and 2000Hz can be selected. For example: At a data range of 100 Hz, 100 values per second will be sent via the serial interface. The bandwidth of the digitized sensor signal depends on this data rate and on the settings of the analog and the digital filter.

The transmitted register value *N* does not consist the data rate itself. You can get the data rate parameter *N* using the following formula:

$$f_{Data} = \frac{10^7}{512N} \quad N = \frac{19531.25}{fData}$$

N

Attention: After a change of the data rate a calibration with *set cal* and *set zero* is necessary.

Affected register: Frequency

With the BSC1 (new version, SerNo >=06xxxxxx), the data rate cannot be set continuously. Instead, a combination of the ADC conversion rate and an internal averaging factor will be selected by the BSC1, whose combination results in the real data rate, which is closest to the desired value transmitted as parameter.

Absolute Value Range: 0x00.00..0xFA.12

The allowed value range of the data rate depends on the baud rate and on the data output format.

The following maximum values apply for:

Baud rate (default value: 38400 Bits/s)	Maximum data rate Binary output (5 Bytes/measuring value) in Hz	Maximum data rate ASCII-output in Hz
4800	90,9	25
9600	181,8	50
19200	333,3	100
38400	625	200
57600	1071	285,7
115200	2000	666,7

Possible error codes 0xA0,0x54,0x58,(0x80),0x71

Set gain

Command number: 19
Number of parameters: 1
Bytes sent by the BSC1: 0

Set gain sets the amplification of the AD-converter of the BSC1 as shown in the following table, which indicates the resulting value of the input sensitivity of the bridge input. The Gain-Parameter 2 is the normal-input sensitivity, it means that the amplification of the AD-converter is 1. The gain register has no effect on the analog output.

Gain Parameter	Amplification of the AD converter	JP1 setting 1	JP1-setting 2 with Input Sens= 2mV/V ²	JP1-setting 2 with Input Sens= 3,5mV/V ₂
0 ¹	0,25	4 mV/V	8 mV/V	14 mV/V
1	0,5	2 mV/V	4 mV/V	7 mV/V
2	1	1 mV/V	2 mV/V	3,5 mV/V
3	2	0,5 mV/V	1 mV/V	1,75 mV/V
4	4	0,25 mV/V	0,5 mV/V	0,875 mV/V
5	8	0,125 mV/V	0,25 mV/V	0,4375 mV/V
6	16	0,0625 mV/V	0,125 mV/V	0,21875 mV/V

Attention: After a change of the amplification a calibration with *set cal* and *set zero* is necessary.

Affected register: Gain.

Value Range: 0x00..0x06

Possible error codes 0xA0,0x54,0x71

Set bipolar

Command number: 20
Number of parameters: 0
Bytes sent by the BSC1: 0

Set bipolar sets the BSC1 in the bipolar mode. Zero corresponds to the data value 0x800000 hexadecimal.

Possible error codes 0xA0,0x71

² Have a look at Set/Get Range

¹ The final value of the input sensitivity cannot be reached, because a digital over flow would occur.

Set unipolar

Command number: 21
Number of parameters: 0
Bytes sent by the BSC1: 0

Set unipolar sets the BSC1 in the unipolar mode (the measured value 0 corresponds to the data value 0).

Possible error codes 0xA0,0x71

Read Frequency

Command number: 22
Number of parameters: 0
Bytes sent by the BSC1: 3

The 3 parameter bytes returned from the command ReadFrequency are coding the measuring data rate.

With the BSC1, the data range is not continuously settable (look at *Set Frequency*). That's why the decoded data rate read with Read Frequency may vary a little bit from the value settled before (e.g., with *Set Frequency*).

The decoding formula for the command 22 is:

Data rate = 5000000 / (16777216 – register value read)

Possible error codes 0xA0,0x91,(0x81)

Get norm

Command number: 26
Number of parameters: 0
Bytes sent by the BSC1: 3

Get norm determines the scaling factor register value, as described in *set norm* (without the related decimal point setting).

Possible error codes 0xA0,0x91

Get unit

Command number: 27
Number of parameters: 0
Bytes sent by the BSC1: 1

Get unit determines the unit register, as described in *set unit* (look at the list of unit codes).

Possible error codes 0xA0,0x91

Get dpoint

Command number: 28
Number of parameters: 0
Bytes sent by the BSC1: 1

Get dpoint determines the decimal point, as described in *set dpoint*.
Possible error codes 0xA0,0x91

Switch

Command number: 29
Number of parameters: 1
Bytes sent by the BSC1: 0

Switch switches the switch output corresponding to the parameter byte, which is either on (1) or off (0). The state of the switch output only remains if the measured value is within the switch thresholds (with window comparator turned off). The thresholds can be set with *set threshold*. Thresholds at the measuring range end deactivate the threshold switch, so that the switch command should have effect regardless of the thresholds.

Value Range: 0x00..0x01
Possible error codes 0xA0,0x71

Get serial number

Command number: 31
Number of parameters: 0
Bytes sent by the BSC1: 8

Get serial number determines the serial number of the amplifier as an ASCII character string.

Possible error codes 0xA0,0x91

Set threshold 1

Command number: 32
Number of parameters: 4
Bytes sent by the BSC1: 0

Set threshold 1 set the threshold of the amplifiers first threshold switch (terminal No 11). The first two parameter bytes are the switch on threshold, the next two bytes are the switch off threshold, both with the MSByte first. The switch on threshold always needs to be bigger than the turn off threshold. You can change the threshold functionality between hysteresis switch and window comparator. In the latter case, the values are to be interpreted as upper and lower switch thresholds.

Value Range: 0x00.01.00.00..0xFF.FF.FF.FE
Possible error codes 0xA0,0x56,0x71

Get threshold1

Command number: 33
Number of parameters: 0
Bytes sent by the BSC1: 4

Get threshold determines the thresholds of the first threshold switch, as described in *set threshold*.

Possible error codes 0xA0,0x91

Set channel

Command number: 34

Number of parameters: 1

Bytes sent by the BSC1: 0

Set channel Sets the Analog input channel of the AD- Converter and restores the operating parameters previously stored for this channel.

Channel=0 : bridge input (terminals 2..7)

Channel=1 : analog-measuring input (terminals 8 and 10) Value Range: 0x00..0x01

Possible error codes 0xA1,0x54,0x71

Stop transmission

Command number: 35

Number of parameters: 0

Bytes sent by the BSC1: 0

Stop transmission stops the serial transmission of the measuring values. The serial transmit buffer of the BSC1 will be emptied. This operation status will get lost after turning off the amplifier.

Possible error codes 0xA0,0x71

Start transmission

Command number: 36

Number of parameters: 0

Bytes sent by the BSC1: 0

Start transmission starts the serial transmission of the measuring values, if they have been stopped with „stop transmission“ before.

Possible error codes 0xA0

Clear buffer

Command number: 37

Number of parameters: 0

Bytes sent by the BSC1: 0

Clear buffer deletes the output buffer of the BSC1.

Possible error codes 0xA0

Set mode

Command number: 38

Number of parameters: 1

Bytes sent by the BSC1: 0

Set mode configures the BSC1 for different modes of operation. As with most of the

operating parameters, this mode remains as it is even after turning the amplifier off. Before you change particular bits of the mode-register you should read it with *get mode*, change the bits as desired and write the byte back (read-modify-write). You can only change bits 1.5. Description of the mode-variable:

MSB	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	LSB
blocking	x	AV-Filter	Window c. mode	Log-Mode	Max-Mode	Text-Mode	reserved

- Text-mode = 1: measuring value transmission in ASCII-Format is active
- Max-Modus = 1: maximum value transmission is active
- Log-Modus = 1: transmission of measuring values on request only is active
- Window-Modus = 1: threshold switch works as window comparator
- AV-Filter = 1: Adaptive averaging filter is on. Can only be enabled, if SpecialMode,FIR =0
- Block: = 1: Blocking-State: All Set- Write-commands will be rejected (see Switch Blocking) Read only
- x: do not change because of upwards compatibility (read GSV mode before)

Value Range: 0x00..0x1E

Functionalities of activating the tare line (Input "T")

	Sending of measuring value	Sending of maximum value	zero adjustment	Reset Maximum value
Log-Mode= off Max-Mode = off	No (is permanently sending measuring values)	no	yes	no (irrelevant)
Log-Mode = off Max-Mode = on	no	no (is sending permanently max-values)	yes	yes
Log-Mode = on Max-Mode = off	yes	no	no	no (irrelevant)
Log-Mode = on Max-Mode = on	no	yes	yes	yes

Possible error codes 0xA0,0x56,0x59,0x71

Get mode

Command number: 39
Number of parameters: 0
Bytes sent by the BSC1: 1

Get mode reads the operation mode of the BSC1, see *set mode*.

Possible error codes 0xA0,0x91

Get equipment

Command number: 41
Number of parameters: 0
Bytes sent by the BSC1: 1

Get equipment reads information about the hardware configuration of the BSC1. Description of the equipment-variable:

MSB	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	LSB
x	x	AnaFilt	x	SI	x	ADC	LCD

LCD = 1: Liquid Crystal Display installed
 ADC = 1: Analog-Digital-Converter (always) existing
 SI = 1: BSC1 is intended for use as strain indicator
 AnaFilt: = 1: Switchable Analog input filter available
 x: reserved, not defined
 Possible error codes 0xA0,0x91

Firmware version

Command number: 43
 Number of parameters: 0
 Bytes sent by the BSC1: 2

Firmware version reads the version-number of the BSC1s firmware. The first Byte is the version-number multiplied by ten. The second byte contains the revision number. Possible error codes 0xA0,0x91

Set gage factor

Command number: 44
 Number of parameters: 2
 Bytes sent by the BSC1: 0

Set gage factor sets the gage factor. When using the BSC1 as a strain indicator, the display scaling factor can be recalculated by the command *Calc Norm*, using the gage-factor, the bridge type and the poissons ratio stored (the latter only if applicable). The gage-factor register is transmitted as an integer value, as the real gage-Factor multiplied by 100, with the MSByte first.
 Value Range: 0x00.09..0x7F.BC (corresponding K-Factor= 0,09 to 327,00). Possible error codes 0xA0,0x54,0x55,0x71

Get gage factor

Command number: 45
 Number of parameters: 0
 Bytes sent by the BSC1: 2

Get gage factor reads the gage-factor in the format described in *Set Gage factor*. Possible error codes 0xA0,0x91

Set poisson

Command number: 46
 Number of parameters: 1
 Bytes sent by the BSC1: 0

Set poisson sets the poissons ratio μ . The poisson is important when calculating strain gage bridge types with one or two measuring grids which are aligned crosswise. The poisson register is transmitted as a whole byte, which is the poissons ratio multiplied by 500.

Value Range: 0x00..0xFA (correspondingly 0,000 to 0,500).

Possible error codes 0xA0,0x54,0x71

Get poisson

Command number: 47

Number of parameters: 0

Bytes sent by the BSC1: 1

Get poisson reads the poissons ratio as described in *Set Poisson*.

Possible error codes 0xA0,0x91

Set bridge type

Command number: 48

Number of parameters: 1

Bytes sent by the BSC1: 0

Set bridge type sets the bridge type of the strain gage sensor, with which the display scaling factor can be recalculated by *Calc Norm*.

0: Full Bridge

1: Half Bridge

2: Quarter Bridge

3: Half Bridge with transverse contraction 4:

Full Bridge with transverse contraction

Value Range: 0x00..0x04

Possible error codes 0xA0,0x54,0x71

Get bridge type

Command number: 49

Number of parameters: 0

Bytes sent by the BSC1: 1

Get bridge type reads the bridge type with the coding described before. Possible error codes 0xA0,0x91

Set range

Command number: 50

Number of parameters: 1

Bytes sent by the BSC1: 0

If the Jumper JP1 (see p.64) on the circuit board is in position 2, that means if the supply voltage of the sensor bridge is =2,5V, you can choose the input sensitivity of the analog

front end of the amplifier with *Set Range*. The range register transmitted is the real input range multiplied by ten. Valid values are 20d and 35d; corresponding to 2mV/V or 3,5mV/V. Value Range: 2 reliable values: 0x14 and 0x23

Possible error codes 0xA0,0x50,0x56,0x71

Get range

Command number: 51
Number of parameters: 0
Bytes sent by the BSC1: 1

Get range reads the input sensitivity of the analog input stage of the BSC1, that means that the position of the jumper JP1 can be determined, too. The range register value is also relevant for the automatic calculation of the display scaling factor used by the command *Calc norm*. The *Range* register is 10 times of the full-scale input sensitivity value in mV/V: 10 = 1 mV/V (Jumper position 1); 20 = 2 mV/V; 35 = 3,5 mV/V (both jp. pos. 2)

Possible error codes 0xA0,0x91

Get offset wait

Command number: 53
Number of parameters: 0
Bytes sent by the BSC1: 1

Get offset wait determines the time, which the command *set offset* needs for execution. The value read has to be multiplied by 0,0062 to get the wait time in seconds.

Possible error codes 0xA0,0x91

Get options

Command number: 54
Number of parameters: 0
Bytes sent by the BSC1: 3

Get options Determines information about the range of the instruction set and about special characteristics of the firmware as a 24 bit value. With the BSC1 bit 6 and bit 8 are always set. The lower 6 bit value is to be interpreted as a whole number within the range from 0..63 and contains the identification of a possible special application. If this identification is different from zero you may have to expect restrictions of the firmware functionalities.

Possible error codes 0xA0,0x91

Get value

Command number: 59
Number of parameters: 0
Bytes sent by the BSC1: 5 (at a binary data transmission)

Get value triggers the transmission of a measuring value.

Normally the device transmits measuring values permanently, so this command is of special interest if that transmission was stopped by *stop transmission* (command 35) or if the logger mode is active; see *set mode*. The data format of the value returned by the BSC1 corresponds to the data format of the permanent transmission (binary or ASCII), as described in the chapter Data format (page 8).

Possible error codes 0xA0,0x91

Clear maximum value

Command number: 60
Number of parameters: 0
Bytes sent by the BSC1: 0

Clear maximum value resets the actual maximum value, if the maximum mode is active (look at *set mode*), so that a new maximum value can be generated.
Possible error codes 0xA0,0x71

Set Digits

Command number: 61
Number of parameters: 1
Bytes sent by the BSC1: 0

Set Digits sets the number of the digits shown in the LC-Display. If the ASCII-data output is active (by *Set Mode*), the number of the transmitted digit bytes is set as well. The allowed value range of the digits is decimal point to 8, that means the number of digits is not allowed to be smaller than the decimal point position (look at *Set Dpoint*).
Absolute Value Range: 0x01..0x08
Possible error codes 0xA0,0x54,0x71

Get Digits

Command number: 62
Number of parameters: 0
Bytes sent by the BSC1: 1

Get Digits determines the number of digits shown in the LC-Display.
Possible error codes 0xA0,0x54

Get Channel

Command number: 65
Number of parameters: 0
Bytes sent by the BSC1: 1

Get Channel reads the the active analog input channel. In the standard version there are two inputs available, the bridge input (channel 0) and the channel 1, which has an input voltage range from 0 to 10V.

Possible error codes 0xA0,0x91

Get Last Error

Command number: 66

Number of parameters: 0

Bytes sent by the BSC1: 1

With get last error the error status of the last command given can be determined. Every command – with the exception of *Get last error* itself – overwrites the error register. That is useful to determine the reason for the rejection of a write command. The command *Reset status* (No. 0) resets the error register to 0.

The following error codes are actually defined:

Default: (no command given or error code cleared):	0x00
No Error (OK), no additional parameter changes made:	0xA0
No Error (OK), but* additional parameter changes made:	0xA1

From here on: command given was rejected because:	
Command number not existent:	0x40
Command No existent but not implemented in this Firmware:	0x41

Access denied (unspecified):	0x70
Access denied, because "Blocking" is active:	0x71
Access denied, because password not given or incorrect:	0x72
Access denied, because configuration jumper is not set:	0x73
Access denied, because number of allowed executions is too high:	0x74
Access denied, because Set/Write prohibited at this port:	0x75

wrong parameter, (unspecified):	0x50
wrong parameter, (partly) wrong bits:	0x53
wrong parameter, parameter absolutely too big:	0x54
wrong parameter, parameter absolutely too small:	0x55
wrong parameter, invalid parameter combination:	0x56
wrong parameter, parameter relatively** too big:	0x57
wrong parameter, parameter relatively** too small:	0x58
wrong parameter, functionality not implemented in this FW:	0x59 Not
enough parameters or parameter timeout:	0x5A

Sending of parameters was impossible (unspecified):	0x90	(reserved)
Sending of parameters was impossible because tx-buffer was full:	0x91	
Sending of parameters was impossible because (CAN-)Bus busy:	0x92	
Execution was impossible because the receive buffer is full:	0x99	

From this point: former command was eventually accomplished but:	
Internal error (unspecified):	0x80
Intern arithmetical error:	0x81
Error at AD-converter settings	0x82

Error: measuring value unsuitable for desired action 0x83
EEPROM-Error (FW-Version 1.2.00 and above only) 0x84

* possibly; mainly additional parameters were loaded, that are not directly associated to this command. Also, no additional parameters may have changed because the former settings and the loaded settings are similar.

** because of prohibited setting combinations

Set second threshold

Command number: 67
Number of parameters: 4

Bytes sent by the BSC1: 0

Set second threshold set the threshold of the amplifiers second threshold switch (terminal No 13). The first two parameter bytes are the switch on threshold, the next two bytes are the switch off threshold, both with the MSByte first. The switch on threshold always needs to be bigger than the turn off threshold. You can change the threshold functionality between hysteresis switch and window comparator. In the latter case, the values are to be interpreted as upper and lower switch thresholds.

Value Range: 0x00.01.00.00..0xFF.FF.FF.FE

Possible error codes 0xA0,0x56,0x71

Get second threshold

Command number: 68
Number of parameters: 0
Bytes sent by the BSC1: 4

Get second threshold determines the thresholds of the second threshold switch, as described in *set second threshold*.

Possible error codes 0xA0,0x91

Get device Type

Command number: 69
Number of parameters: 0
Bytes sent by the BSC1: 1
Get device Type reads the type number of the BSC1
Possible error codes 0xA0,0x91

calc norm

Command number: 70
Number of parameters: 0
Bytes sent by the BSC1: 0

Calc norm triggers the calculation of the display scaling factor according to the strain indicator functionality. Hereby the K-factor, the bridgetype, the input sensitivity and - depending on the bridgetype - the poissons ratio will be considered. At the same time channel 0 will be settled, as well as the amplification of the AD-converter settled to one and the unit shown to $\mu\text{m}/\text{m}$.

Possible error codes 0xA1,0x81,0x71

Set TXmode

Command number: 128

Number of parameters: 1 Bytes

sent by the BSC1: 0

With Set TX mode changes can be done to the serial data protocol. This command can only be executed if the configuration jumper JP2 is set, see **Set Baud** (next page), the changing procedure is also described there. With Bit 7 of the parameter byte the hardware-handshaking can be enabled, with bit 3 the size of the measuring data frame can be changed from 5 Bytes (bit 3 =1, default setting) to 3 bytes (bit 3 =0). The 3-byte-

protocol has 0xA5 as the prefix byte, then follows the measuring value as 16 bit value with the MSByte first. Higher data rates are possible with this protocol.

Hardware Handshake may be better – in some cases even necessary – if the BSC1s serial port is connected to a bus-system or a wireless transmitter.

MSB	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	LSB
Is H.sh.	x	x	x	Is 5 Byte	x	x	x

Is 5 Byte =1: if the binary transmission protocol is active (see Set Mode), the measuring value frame consists of 5 bytes.

Is H.Sh. =1: Hardware handshake (RTS/CTS) enabled. Only possible with HW-Handshake special version. X: Reserved. Do not change.

GetTXmode

Command number: 129

Number of parameters: 0 Bytes

sent by the BSC1: 1

With **GetTXmode** you can read flags about the features of the measuring value transmission protocol.

MSB	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	LSB
Is H.sh.	x	x	WRacc	Is 5 Byte	x	x	Configuration

Configuration: If =1, the jumper JP2 for the configuration mode id set. Read Only!

Is 5 Byte =1: If the binary transmission protocol is active (see Set Mode), the measuring value frame consists of 5 bytes.

Wracc =0: RS232 serial port has write access. =1: All Write Commands blocked. Read Only!

Is H.Sh. =1: Hardware handshake (RTS/CTS) enabled. Only possible with HW-Handshake special version.

X: Reserved. Do not change. Possible error codes 0xA0,0x91

SetBaud

Command number: 130

Number of parameters: 1 Bytes

sent by the BSC1: 0

With **SetBaud** you can determine the bitrate of the serial communication. The bitrate can only be changed if the jumper for the configuration mode JP2 is set, see p.64. The procedure to change the bitrate is: turn off – set the jumper – turn on- open serial interface with 38400 bps – program desired new bitrate with **SetBaud** – turn off – remove JP2 – turn on. Then the new bitrate should be activated.

The bitrates are coded as follows:

Parameter / Register	Baudrate
0	4800
1	9600

2	19200
3	38400
4	57600
5	115200
6	250000
7	625000
8	1,25M
9 (only Firmware-Version 1.3.06 and above)	230400
10 (only Firmware-Version 1.3.06 and above)	460800
11 (only Firmware-Version 1.3.06 and above)	921600

The command execution will be denied if the actual data rate is too high for the desired bit

rate.

If the jumper JP2 is set to the configuration mode, the communication bitrate is always 38400 bits/s, independently of the baud register value. The bitrate in the baud register applies only when jumper JP2 is removed.

Possible error codes 0xA0,0x54,0x58,0x73,0x71

GetBaud

Command number: 131

Number of parameters: 0 Bytes

sent by the BSC1: 1

With GetBaud you can read the baud register as described before.

Possible error codes 0xA0,0x91

Set Slow Rate

Command number: 134

Number of parameters: 2 Bytes

sent by the BSC1: 0

If the Slow-flag in the SpecialMode register its set (see **Set Special mode**), measuring values will be transmitted with the data period in seconds, that you can set with this command. The slow mode data period is transmitted with the MSByte first, the value range is from 1 s to 65535 s.

Possible error codes 0xA0,0x71,0x55,0x5A

Get Slow Rate

Command number: 135

Number of parameters: 0 Bytes

sent by the BSC1: 2

With Get Slow rate the data period of the slow mode can be read.

Possible error codes 0xA0,0x91

SetSpecialMode

Command number: 136

Number of parameters: 2 Bytes

sent by the BSC1: 0

With the Special-Mode-Register some special features of the BSC1 can be set. The content of high byte is shown in the following table:

MSB	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
-----	--------	--------	--------	--------	--------	-------	-------

NoiseCut	AutoZero	x	x	x	AbsMax	LngEn	Storing Behavior
----------	----------	---	---	---	--------	-------	------------------

Storing Behavior: If =1, all changes of all operating parameters are stored in the nonvolatile EEPROM memory immediately after changing them. If =0, most operating parameters are stored after the device is switched off. If power-on-cycles (switching on and off) are done more often than changing of values will be done, setting of this flag is recommended. If changing of values is done more often, leave it =0 (default setting).

LngEn: =1: Display menu language is English. =0: Display menu language is German

AbsMax: If Max-mode also set (s. SetMode): =1: The maximum of the absolute value of the measuring value is transmitted

AutoZero: (only if available, see *GetCommandAvailable*, otherwise X): =1: Automatic periodical zero-point adjustment enabled, see *SetAutoZeroCounter*, command 150.

NoiseCut: (only if available, see GetCommandAvailable, otherwise X): =1: Noise Supression enabled, see SetNoiseCutThreshold, command 148.

The content of the low byte is shown in the table below:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	LSB
Unipolar-Mode	x	FIR_N5	AutoFilt	Select.TX	FIR-Filter	MW-Filter	Slow

Slow: =1: Slow mode enabled. In this mode, measuring values are transmitted with data periods ≥ 1 s. This period is communicated with the commands 134 / 135. The data rate communicated with commands 138/139, 3/7 and 18/22 is not valid in this mode.

MW-Filter: Read-Only Flag: Is =1, if Mwsum is >1 (see commands 138, 139)

FIR-Filter: =1: Turns on FIR-Filter; a digital low pass filter, which takes place after the firmware-internal decimating average filter. Its cut-off frequency depends on the measuring data rate.

Select.TX: Selective Transmission: If this flag is =1 and the maximum value mode is enabled (see command **Set Mode**), only new maximum values will be transmitted, in order to avoid redundancy transmission. **AutoFilt:** if =1 (default setting), the Analog pre filter will be set automatically according to the datarate Fdata.

In this case the cut-off frequency fg of the Analog filter will be set as follows:

	switches fg = 3,5 Hz	switches fg = 260 Hz	switches fg = 1,7 kHz
FIR-Filter off	if Fdata $\leq 7,14/s$	if $7,14/s < Fdata < 625/s$	if Fdata $\geq 625/s$
FIR-Filter on	if Fdata $\leq 15/s$	if $15/s < Fdata < 1071/s$	if Fdata $\geq 1071/s$

FIR_N5: Defines the characteristic of the digital FIR-filter, if the FIR-Filter is on (Bit 2=1). If the FIR_N5 is =0, it is a second order FIR filter, its -3dB-cut-off frequency is = Datarate * 0,18 and its transfer function is gentle, without overshoot in the step response its operating time is only 3 measuring values. If FIR_N5 =1, it's a 5th order FIR filter. Its cut-off frequency is = datarate * 0,25 and its transfer function is much steeper in the attenuating band, but with 6% overshoot in the step response; and the operating time takes 6 measuring values. That's why the FIR-Filter 5. order is more recommendable at higher data rates, if (for example for vibration analysis) a quite linear frequency response in the transmission range and a steep tapered is desired in the attenuating band.

Unipolar-Mode: Read-Only Flag. Shows if the unipolar- or bipolar-Mode is set, see commands 20/21.

x: Reserved, do not change; should be the same as the value read, see GetSpecialMode. Possible error codes 0xA0,0x53,0x59,0x71

GetSpecialMode

Command number: 137

Number of parameters: 0 Bytes

sent by the BSC1: 2

With **GetSpecialMode** you can read the register described before.

Possible error codes 0xA0,0x91

WriteSamplingRate

Command number: 138

Number of parameters: 3 Bytes

sent by the BSC1: 0

This command sets the sampling rate of the AD converter and the number of summands of the decimating average filter and as such also the resulting data rate.

The sampling rate determines how many Analog-digital conversions the AD-converter does per second.

The relation between measuring data range and sampling rate is as follows:

measured data range = sample rate / averaging summand amount The value range of the averaging summand is from 1 to 11.

Parameter 1: Number of averaging summands Parameter 2: High byte of the Sampling-Rate-Register Parameter 2: Low byte of the Sampling-Rate-Register

Parameter 1:

Bits 6 und 7 must be =1. Examples:

0xC1 means that the decimating average filter is disabled. 0xCB means that the averaging filter decimates over 11 values.

Parameter 2 and 3:

the computation formula for the Sampling-Rate-Register (second and third Parameter) of command 138/139 is:

Registervalue = sample rate * 2

Der AD-converter of the BSC1 supports the following discrete sampling rates:

2.5, 5, 10, 15, 25, 30, 50, 60, 100, 500, 1000, 2000, 3750, 7500 and 15000 samples per second. If the value coded by parameter 2 and 3 differs from these values, the closest available sampling rate will be set. If the resulting measuring data rate would be too high (see table in the **Set frequency** description) or too low (below 0.3125/s), the command is rejected.

Absolute Value Range: 0xC8.00.05..0xC1.75.30

Possible error codes 0xA0,0x53,0x54,0x55,0x57,0x58,(0x80),0x71

ReadSamplingRate

Command number: 139

Number of parameters: 0 Bytes

sent by the BSC1: 3

With **ReadSamplingRate** the sampling rate and the number of the averaging values can be read, as described in **WriteSamplingRate**:

Byte 1: Number of the average values in Bits <5:0>, Bits 6 and 7 =1 Byte 2:

Highbyte of the Sampling-Rate-Register

Byte 2: Lowbyte of the Sampling-Rate-Register Whereby:

sampling rate = Sampling-Rate-Register / 2 Possible error codes

0xA0,0x91

Set CAN Setting (Only existent with BSC1-CANopen)

Command number: 140

Number of parameters: 3 Bytes

sent by the BSC1: 0

With Set CAN Setting fundamental properties of the CANopen-Interface can be changed. The parameter to change (CAN-Flags, CAN-Bitrate and CAN-Node-ID) is selected with an index byte, which is passed as the first parameter. Then a WORD-sized data parameter follows. The parameters are passed in the order: <Index, DataHiByte, DataLoByte>. The following indices are writable:

Index 0x7F: CAN-Flags: Data-Bits <15:8> (HiByte) are reserved and have to match – as the Data-Bits<7:2> of the LoByte - the value read before with Get CAN Setting at Index

0x7F. Bits<7:0> (LoByte) are defined as follows:

MSB	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	LSB
x	x	x	x	x	x	CANon	HasCAN =1

CANon =1: CAN-Interface enabled. The CAN-Interface can be switched on and off with this. When switched on, (CANon before =0), the CAN-Interface is „bootet“, which is signaled to the CANbus by putting the bootup-frame (TX-NMT) on the bus.

CANon =0: Switched off. When switching off the CANbus (CANon before =1) waiting CAN-Messages are aborted and the device disappears from the CAN-Bus, i.e. after switching off it is no CAN-device anymore!

HasCAN: With CANopen devices always =1, i.e. bit 0 of the passed value must be set (read-only)

x: reserved, has to match the reading value

Possible error codes: 0xA0, 0x71, 0x51, 0x52, 0x5A

Index 0x7E: CAN-Bitrate: With this the bitrate of the CAN interface can be set. The bitrate is coded as follows:

Data parameter	CAN-Bitrate
0x0001	50 kBits/s
0x0005	125 kBits/s
0x0006	250 kBits/s
0x0007	500 kBits/s
0x0008	1 MBit/s

The CAN-Bitrate can only be altered, if the RS232-Interface has write permission. Write permission is signaled by cleared “WRacc”-Bit in the TxMode value, see GetTXmode (that is the case, if the CAN-Interface is either off or on, but in the CANopen-State “Stopped”). Also, the configuration jumper JP2 must be set (see Set Baud).

After changing, the new CAN-Bitrate will be valid only after a Bootup-cycle (switch on and off) or after a reset cycle by CANopen network management, if the CAN-Interface is on. If it's off, the new CAN-Bitrate will be valid when switching on the CAN interface, see CAN-Flags.

Possible error codes: 0xA0, 0x71, 0x73, 0x75, 0x51, 0x52, 0x54, 0x58, 0x5A

Index 0x7D: CAN-Node-ID: With this, the Node-ID of the BSC1-CANopen (the “Node”) can be altered: Data parameter = desired Node-ID. This must be in the range from 0x0001 bis 0x007F. The Node-ID the node ID can only be changed if the RS232-Interface has write access. Write permission is indicated by the delete “WRacc”-Bit in the Txmode- value, see. GetTXmode (this is the case when the CAN interface is either off or on, but in the CANopen state “Stopped”). After a change, the new node ID only comes into effect after a bootup (switching off and on again) or a reset cycle via CANopen network management,

if the CAN interface is on. If it is off, the new node ID takes effect when the CAN interface is switched on, see CAN flags. Possible error codes: 0xA0, 0x71, 0x75, 0x51, 0x54, 0x55, 0x5A

Get CAN Setting

Command number: 141 Number of parameters: 1

Bytes sent by the BSC1: 2

With Get CAN Setting settings of the CAN interface can be read. The setting parameters are selected via an index byte, which is transferred as a parameter. The BSC1 always responds with 2 data bytes with the sequence <HiByte,LoByte>; also, in the event of an error (see GetLastError), then the data bytes are =0. With the indices, a distinction is made between currently set values (index range 0x5A..0x5F) and those that only come into effect during the next bootup or reset cycle (index range 0x7A..0x7F). With the CAN bit rate (index 7E) and CAN node ID (index 7D) settings, these values are after a change with Set CAN Settings possibly different in each case; the success of SetCANSetting can be determined from the corresponding indices 0x7D..0x7F.

Index Currently valid value	Index Value after next BootUp / Reset	Data Content	Associated CANopen-Object
0x5F	0x7F	CAN-Flags, s. Set CAN Settings	-
0x5E	0x7E	CAN-Bitrate, s. Set CAN Settings	-
0x5D	0x7D	CAN-Node-ID	(1200h/1800.1h)
0x5C	0x7C	Producer Heartbeat-Time, in ms	1017h
0x5B	0x7B	Event-Timer-Period, in ms	1800.5h
0x5A	0x7A	Inhibit-Time, in 100us	1800.3h

With Get CAN Setting it can also be determined whether a CAN interface is available: Read at index 0x7F and evaluate bit 0: =1: CAN available; =0: CAN not available. In the latter case, the error code is =0x41 at each index; Data content =0.

Possible error codes: 0xA0, 0x51, 0x91, 0x41, 0x5A

Set Analog filter

Command number: 144

Number of parameters: 2 Bytes

sent by the BSC1: 0

With Set Analog filter the cut-off frequency of the prefilter can be changed, if the AutoFilter-Flag of the Special-Mode-Registers is =0, see Set/Get special Mode. This low pass filter is before the AD-converter, and it is able to improve the signal to noise ratio both of the digital and the Analog output.

The Standard version has 3 limit frequencies:

1. 3,5Hz, 1.order; from 260Hz on: 2.order
2. 260Hz, 1. order; from 1,7kHz on: 2. order
3. 1,7kHz 1. order

The parameter (1. parameter: Highbyte, 2. parameter: Lowbyte) is twice the amount of the desired cut-off frequency. The cut-off frequency closest to the parameters will be selected and settled.

Value Range: 0x00.07..0x0D.FF

Possible error codes 0xA0,0x54,0x55,0x56,0x71

Get Analog filter

Command number: 145

Number of parameters: 0 Bytes

sent by the BSC1: 2

Get Analog filter delivers twice the amount of the cut-off frequency of the Analog prefilter.

Possible return-values in standard version are:

0x00.07: limitfrequency = 3,5 Hz

0x02.08: limitfrequency = 260 Hz

0x0D.48: limitfrequency = 1,7 kHz Possible

error codes 0xA0,0x91

Switch Blocking

Command number: 146

Number of parameters: 3 Bytes

sent by the BSC1: 0

With Switch Blocking the BSC1 can be protected against unintentional changes of the operation parameters. If the blocking status is enabled, every set and write commands will be refused, the error-code for this case is 0x71. This status can be identified with Get Mode (Bit 7, read only).

Because the BSC1 commands consist of only one byte, there could be an accidentally call of commands by the device connected to the serial port (PC, SPS or other). This may happen because of using a wrong port number or a wrong program and so on. The blocking status is controlled by two constant ASCII-strings as a parameter for this command:

Enable blocking: **Parameter = "e3F"**, that is Param.1=0x65, Param.2=0x33, Param.3=0x46

Disable Blocking: **Parameter = "k7B"**, that is Param.1=0x6B, Param.2=0x37, Param.3=0x42

Attention: Every other parameter will be interpreted as a wrong blocking-password and after 3 trials with wrong parameters the command will always be denied (independent of the parameter), the error code in this case is 0x74. After a restart this status will be reset.

Possible error codes 0xA0,0x70,0x74

Get Command Available

Command number: 147

Number of parameters: 2

Bytes sent by the BSC1: 1

With Get Command Available it can be examined if commands and their corresponding functionality are existent with the device connected. Hereby the upper command number of the command range to be checked will be transmitted first and the lower command number as the second parameter. Both command numbers may be equal (then only this command will be checked), but the first parameter should not be smaller than the second, otherwise the returned byte is an errorcode=0x56 (then similar to LastError).

If all commands in the range to be checked are existent, the byte returned is =0xA0. Otherwise – if at least one command within the range is not existent - the byte returned is =0x41.

So, with Get Command Available it can also be examined, if functionalities corresponding to certain commands are existent (especially with commands $\geq 128d$), for example:

To examine whether the automatic zero tracking is existent, give command 147 with the parameters 151d, 150d. These correspond to the command numbers for Get/SetAutoZeroCounter. If the answer is 0xA0, the automatic zero tracking is existent, otherwise it's not.

Like this, you may for instance check the CAN-Interface (Parameters 140d, 140d), the noise-suppression „Noise-Cut“ (Parameters 149d, 148d) or the User-Display-functionality (Parameter 152d, 152d) or Handshake (Parameter 128d, 128d) and others for their existence. Advice: The property of existence will never change with the same device exemplar. (except maybe after a firmware update by Interface Inc.).

Possible error codes 0xA0, 0x56, 0x5A

Set NoiseCut Threshold (only if NoiseCut existent)

Command number: 148
Number of parameters: 3 Bytes
sent by the BSC1: 0

With SetNoiseCutThreshold the threshold for the NoiseCut noise suppression can be set. If this noise suppression is set (see SetSpecialMode, Bit 15), the measuring value output will be set constantly to zero if the input measuring value is below this threshold (bipolar: if $\text{abs}(\text{Reading}) < \text{threshold}$ or $-\text{threshold} < \text{measuring value} < \text{threshold}$). The number format of the NoiseCut threshold is the same as the one of the measuring values, see p.17 and 59. By using this, it can be achieved that the measuring value around zero is absolutely „quiet“, that means free of noise.

Example (bipolar):

Shall NoiseCut-Threshold be = 0x810000; then all measuring values, that are between 0x810000 and 0x7F0000, set to 0x800000 exactly.

Value range: bipolar: 0x800000..0xFFFFF; unipolar: 0x000000..0x7FFFF

possible error codes: 0xA0, 0x71, 0x75, 0x54, 0x55, 0x84, 0x41

Get NoiseCut Threshold (only if NoiseCut existent)

Command number: 149
Number of parameters: 0
Bytes sent by the BSC1: 3

With **GetNoiseCutThreshold** you can read the register described before.

Possible error codes 0xA0,0x91, 0x41

Set AutoZero Counter (only if AutoZero existent)

Command number: 150

Number of parameters: 2 Bytes

sent by the BSC1: 0

With Set AutoZero Counter the counter for the automatic periodic tare-function can be set. If this AutoZero function is enabled (see SetSpecialMode, Bit 14), after <AutoZero- Counter> number of measuring values a zero-point adjustment will be executed automatically, if the threshold switch 1 „SW1“ is off (meaning the measuring value is below this threshold). The measuring values are only counted, if the threshold switch 1 „SW1“ is off. By using this function, an eventual drift of the measuring value (e.g., because of temperature drift of the sensor) can be compensated. So, the time-period of this automatic zero-setting depends on the AutoZero counter and the data rate.

Example (bipolar):

Shall the upper threshold 1 be =0x810000, the data rate = 10/s and the AutoZero-Counter =100. Then every 10 seconds a zero-point adjustment will be executed automatically, if all measuring values within this period of time were below 0x810000.

Value range: 0x0001..0xFFFF

Possible error codes: 0xA0, 0x71,0x75, 0x55, 0x84, 0x41

Get AutoZero Counter (only if AutoZero existent)

Command number: 151

Number of parameters: 0 Bytes

sent by the BSC1: 2

With **GetAutoZeroCounter** you can read the register described before.

Possible error codes 0xA0,0x91, **0x41**

Set UserTextChar (devices with LC-Display only)

Command number: 152

Number of parameters: 2 Bytes

sent by the BSC1: 0

With **Set UserTextChar** a user defined text can be displayed in the LCD. The first parameter is the address, that means the position of the character in the display. A text of up to 16 characters can be displayed, so the value range of this address is from 0 (left side of LCD) to 0x0F (right side of LCD); at address 0x10 a 0x00 for termination can be transmitted. The second parameter is the character itself, whereby the range of 0x20 ' ' to 0x7D '}' is ASCII-conform (exception: 0x5D is not '\').

To display a text array, please follow these steps:

The characters are transmitted to the BSC1 in a descending order, whereby they are copied to the device's RAM first. If the text array is shorter than 16 characters, a 0x00 as

data for termination must be transmitted first with the address <text length>. Then the last character of the text at address < text length - 1> and so on until the first character of the text at address 0. In case the text should begin shifted to the right, please fill up with blanks (0x20), so that at address 0 there's a value of > 0x1F. Because that's the signal to display the text in the LCD (whole text copied from RAM to LCD if data>0x1F at address 0x00).

Example:

Text = " Txt0" (length =5)

Complete byte sequence transmitted to the BSC1

(Form: 0x<BefehlsNo>.<Adresse>.<Data>):

0x98.05.00 0x98.04.30 0x98.03.74 0x98.02.78 0x98.01.54 0x98.00.20

To switch off the displaying of that text, so that the measuring value appears again, you only have to transmit a 0x00 at address 0: 0x98.00.00. The text remains in RAM – except the first character - as long as the power supply is connected.

To display the same text (stored in RAM) again, you only have to transmit the first character (>0x1F) again.

Value range:

1. Parameter (address): 0x00..0x10
2. Parameter (Ascii-character): 0x00, 0x20..0x7F

Possible error codes: 0xA0, 0x71, 0x51, 0x52, 0x41

SetUserOffsetValue

Command number: 154

Number of parameters: 3 Bytes

sent by the BSC1: 0

With SetUserOffsetValue a summand can be passed to the device, that will be added to every measuring value. The number-representation is the same as with measuring values, see p. 17 and 59. The UserOffsetValue may be negative in bipolar mode. (0x400000..0x7FFFFFFF).

Value range: bipolar: 0x400000..0xBFFFFFFF unipolar: 0x000000..0x7FFFFFFF

Possible error codes: 0xA0, 0x71, 0x75, 0x54, 0x55

GetUserOffsetValue

Command number: 155

Number of parameters: 0 Bytes

sent by the BSC1: 3

With **GetUserOffsetValue** you can read the register described before.

Possible error codes: 0xA0, 0x91

SetAdaptFilterMask

Command number: 158

Number of parameters: 3 Bytes

sent by the BSC1: 0

With SetAdaptFilterMask the comparison mask of the adaptive averaging filter can be set.

This special digital filter can be enabled or disabled with SetMode (Bit 5). It combines a moving average filter over up to 32 values with a quick step response of the measuring signal. „Moving average filter“ means that the filter is non-decimating, so the output data rate is equal to the input data rate. The filter distinguishes the wanted signal transient from a noise signal transient by bitwise comparison of this bitmask with the difference of a measuring value and its predecessor. If the absolute value of the difference of a measuring value X_k and its predecessor X_{k-1} $abs(X_k - X_{k-1})$ is within this comparison mask ($abs(X_k - X_{k-1}) \leq AdaptFilterMask$), this measuring value X_k will be transmitted directly; otherwise the actual mean value will be transmitted. The comparison mask must have the following form:

$0xFF.xx.00$, whereby in the middle byte („xx“) all more significant bits must be =1 and the least significant bits =0 (example: $0xFF.F0.00$).

Value range: $0xFF0000..0xFFFF00$

Possible error codes: $0xA0, 0x71, 0x75, 0x53$

GetAdaptFilterMask

Command number: 159

Number of parameters: 0 Bytes

sent by the BSC1: 3

With GetAdaptFilterMask the compare mask of the adaptive averaging filter can be set, see SetAdaptFilterMask and SetAdaptFilterOptimize.

Possible error codes: $0xA0, 0x91$

SetAdaptFilterOptimize

Command number: 160

Number of parameters: 2 Bytes

sent by the BSC1: 0

With SetAdaptFilterOptimize the optimum compare mask of the adaptive averaging filter (see above) can be determined automatically. The number of measuring values, that are included into this automatic detection, will be transmitted to the BSC1 by using this command. Then this „self-learning period“ starts and during this period the BSC1 is calculating the peak-to-peak noise and after this number of measuring values has finished, the comparison mask is calculated, which can then be read with GetAdaptFilterMask. The adaptive averaging filter must be enabled during this period (SetMode, Bit 5). During this self-learning period the **wanted signal should not change**, since only the peak-to-peak noise should be taken into account.

Examples:

A typical application of this functionality is the so-called „cattle balance“. Let's assume you have one or more load cells with cattle on top of it, connected to our BSC1 and now you want to attenuate the stamping of the cattle on the balance (that's the noise signal) with the adaptive averaging filter. Then you would follow these steps:

The adaptive averaging filter must be enabled. Now let some animals go onto the balance and give then SetAdaptFilterOptimize e.g. with Parameter =200. Then the self-learning period lasts 20 seconds at a data rate of 10/s. After these 20 seconds the animals may leave the balance; the „stamping“, that is the noise signal should now be attenuated, so theoretically reduced by the factor $1/\sqrt{32}$, which is about 1/5.

With the adaptive averaging filter any noise signal, e.g. present in an environment with harsh electromagnetic interference can be filtered, that means attenuated. Start the self-learning phase with `SetAdaptFilterOptimize` with the filter enabled, while the noise signal is strong, but the wanted signal doesn't change significantly.

A special functionality of `SetAdaptFilterOptimize` can be triggered with parameter `=0x0000`. Then the comparison mask will not be determined automatically, but it will be selected from 4 constant values considering the data rate. Using this special function is recommended after changing the data rate, provided the noise signal level at the BSC1s input hasn't changed significantly. Otherwise `SetAdaptFilterOptimize` with Parameter `>4` (self-learning) should be done as described, if the data rate has changed.

The following special modes must be disabled in order to execute `SetAdaptFilterOptimize`; otherwise the command will be rejected with error code `=0x56`: maximum value mode, Slow-mode, NoiseCut, AutoZero.

Value range: `0x0000, 0x0004..0xFFFF`

Possible error codes: `0xA0, 0x71, 0x75, 0x55, 0x56`

GetAdaptFilterOptimize

Command number: 161
Number of parameters: 0 Bytes
sent by the BSC1: 2

With GetAdaptFilterOptimize the number of remaining measuring values during the self-learning phase (as described above) can be read, until the self-learning phase is finished. This is useful to determine when that phase will be finished. As the self-learning is finished (or wasn't ever started), the answer to GetAdaptFilterOptimize is =0x0000; then the measuring system can be used again normally.

Possible error codes: 0xA0,0x91

Read Ranges

Command number: 162
Number of parameters: 1 Bytes
sent by the BSC1: 4

With Read Ranges all configurable input sensitivities can be determined, this means even those, who are currently not configured. The transfer parameter indicates which of possible input sensitivities should be read. Here is High-Nibble (bits <7:4>) the channel coded, which may be only 0 (bit 4 = 0) or 1 (bit 4=1). The lower nibble (bits <3:0>) indicates whether the currently configured input sensitivity should be read (bits <3:0> =0) or which of 3 existing input sensitivities levels. These may deviate from standard variant (1 /2 /3,5 mV/V) depending on the option of hardware.

The first byte of return is the so called „Jumper-Group-ID“, which indicates (Bit4) =0 on the channel nibble , for which jumper position applies the returned input sensitivity value.

The return value (bytes 2...4, High-endian) indicates the 100 time the input sensitivity in mV (mV/V), which means it must be divided by 100, to get mV/V, or by 100000 to get Volt.

Transfer parameter

Value (Hex)	Meaning	Value at standard-version (decoded, dec.)
0x00	Currently configured input sensitivity	1 / 2 / 3,5 mV/V / 10V
0x01	First input sensitivity for setting 1 of JPI (s.S.Error: reference not found)	1 mV/V
0x02	First input sensitivity for setting 2 of JPI	2 mV/V
0x03	Second input sensitivity for setting 2 of JPI	3,5 mV/V
0x10	Input sensitivity of channel 1 (if it is now activ)	10 V
0x11	Input sensitivity of channel 1	10 V

Meaning of the Jumper-Group-ID bytes of answer:

Value (Hex)	Meaning
0x01	Jumper 1: position 1. if transfer param. =0: Jumper is in position 1
0x02	Jumper 1: position 2. if transfer param. =0: Jumper is in position 2
0x03	Channel 1
0xFF	Error

Possible error codes: 0xA0,0x59,0x91

Get Sensor Capacity

Command number: 164

Number of parameters: 0 Bytes

sent by the BSC1: 4

With Get Sensor Capacity the previously saved physical characteristic value of the connected sensor can be read. The return parameter is encoded as floating-point number to basic 10, whereby the first byte indicates exponent +1 and the bytes 2 to 4 the mantissa in High-endian order. The returned mantissa is the 1000000 time mantissa in point presentation. Example:

The return is 0x04, 0x26.25.A0

The decimal exponent is then $0x04 - 1 = 3$.

Mantissa must be divided by 10^6 , in this example: $2\ 500\ 000 / 10^6 = 2,5$ The characteristic value is then: $2,5 * 10^3 = 2500$.

possible error code: 0xA0,0x91

Set Sensor Capacity

Command number: 165

Number of parameters: 4 Bytes

sent by the BSC1: 0

With Set Sensor Capacity the physical value of the connected sensor can be saved. The transfer parameter is thereby as floating point number to basic 10 coded, whereby the first byte indicates exponent +1 and the bytes 2 to 4 the mantissa in High-endian order. The transferred mantissa is the 1000000 time mantissa in point presentation. Example:

Shall the characteristic value be 150, this means $1,5 * 10^2$ (1,5E2) The exponent byte is then 0x03 (2 +1).

The mantissa must be multiplied by 10^6 , in this example: $1,5 * 10^6 = 1.500.000$ value range unencoded: 0,01 bis 9.999.999

value range exponent byte: 0x00 bis 0x07 value

range mantissa: 0x0186A0 bis 0x98967F possible

error code: 0xA0,0x54,0x55

Get Rated Output

Command number: 166
Number of parameters: 0 Bytes
sent by the BSC1: 4

With Get Rated Output previously saved electrical characteristic value of the connected sensor can be read. The return parameter is thereby coded as floating-point number to basic 10, whereby the first byte indicates exponent +1 and the bytes 2 to 4 the mantissa in High-endian order. The returned mantissa is the 1000000 time the mantissa in point presentation. Example:

Shall the return be 0x01, 0x35.67.E0

The decimal exponent is then $0x01 - 1 = 0$.

The mantissa must be divided by 10^6 , in this example: $3.500.000 / 10^6 = 3,5$ The electrical characteristic value is then: $3,5 * 10^0 = 3,5$.

possible error code: 0xA0,0x91

Set Rated Output

Command number: 167
Number of parameters: 4 Bytes
sent by the BSC1: 0

With Set Rated Output the electrical characteristic value of the connected sensor can be saved. The return parameter is thereby coded as floating-point number to basic 10, whereby the first byte indicates exponent +1 and the bytes 2 to 4 the mantissa in High- endian order. The returned mantissa is the 1000000 time the mantissa in point presentation.

The transferred exponent depends thereby on the input sensitivity:

Input sensitivities Channel 0	Exponents byte	Value range (decimal, uncoded)
0,1 / 0,2 / 0,35 mV/V	0x00	0,001 to 0,9999999 mV/V
1 / 2 / 3,5 mV/V	0x01	0,01 to 9,999999 mV/V
10 / 20 / 35 mV/V	0x02	0,1 to 99,99999 mV/V
100 / 200 / 350 mV/V	0x03	1 to 999,9999 mV/V

The input sensitivity should have been determined before with Read Ranges. Example:

Shall the electrical characteristic value be 2,123456 mV/V Shall

the input characteristic value be 3,5 mV/V

The exponent byte is then 0x01

The mantissa must be multiplied by 10^6 , in this example: $2,123456 * 10^6 = 2.123.456$ Bytes to be transferred are then: 0x01, 0x20, 0x66, 0xC0

Value range exponent byte: 0x00 bis 0x03, defined with input sensitivity Value

range mantissa: 0x002710 bis 0x98967F

possible error code: 0xA0,0x54,0x55,0x56

Get SensorText Assign

Command number: 168

Number of parameters: 0 Bytes

sent by the BSC1: 2

With Get SensorText Assign information about the assignment of settings to the saved sensors and their names defined by user can be read.

The answer contains two parameters, each is 1 byte big. The first byte is the assignment number. If it is =0, then there is no sensor(text) assigned to the settings. Otherwise it describes the number (1 to 6) of user data record, in which the copy of the settings belonging to sensor is taken (see Cmd 9/10: Get All / Save All).

The second byte contains flags about the presence of sensortext, s. table. If the bit is set, there is a valid text, otherwise the bit is =0.

See also the next chapter "Using and managing of the user data record assigned text".

Data record-Nr. (frist byte of answer)	Address range of sensor text (s. Cmd. 56/57), Hex	Address range of sensor text (s. Cmd. 56/57), Dec	Bit-Nr. Second byte of answer. Bit = 1: text available
1	0x300...0x30D	768...781	Bit 0
2	0x310...0x31D	784...797	Bit 1
3	0x320...0x32D	800...813	Bit 2
4	0x330...0x33D	816...829	Bit 3
5	0x340...0x34D	832...845	Bit 4
6	0x350...0x35D	848...861	Bit 5

CANbus / CANOpen protocol of the BSC1-HD CANOpen

Conformity: CiA 301 (communication) and CiA 404 (application)

Connecting the CAN-Bus wires

The CAN-Bus wires are connected to the terminals D, E and F:

Terminal	Description
D	CAN-GND
E	CAN-L
F	CAN-H

The CAN-Interface is galvanically isolated.

Bus-termination

Just behind the 15-pin terminal block there's a 2-pole pin-connector for the bus-termination. By closing these 2 pins with a jumper (1/10" spacing) the bus-termination is enabled.

Supported services

- 5 different mandatory RX-NMT objects for the state-management (see CiA 301)
- Heartbeat-producing with indication of the actual state and bootup-frame
- 1 Tx-PDO for measuring values
- 37 different SDOs in the Object dictionary, two of them manufacturer-defined, see EDS

Interpretation of the 1st Tx-PDO

After Bootup the device is in the Preoperational state. In order to let the device send the 1st Tx-PDO, the „Enter Operational state NMT“ must be transmitted to the device. If all other send-conditions are met (see below), the following PDO-frames are sent, in time-order from left to the right:

Analog Input Process Value				A.Input Status	Alarm Status
LSByte	Byte 1	Byte 2	MSByte	Byte	Byte

In the default configuration, the Analog Input Process Value is a Signed-Integer 32 number, which must be interpreted as following, to get scaled measuring-values:

$$\text{Measuring value} = \text{Analog_Input_Process_Value_Raw_Value} / (10^{\text{Analog_Input_Decimal_Digits}})$$

So, for interpretation the object 6132h (Analog_Input_Decimal_Digits) must be read once and the A.I.Process_Value_Raw_Value must then be divided by the power of the Analog_Input_Decimal_Digits to the base of 10.

With the object 6126h the Analog Input Process Value can be scaled, to customize it to the application requirements. By writing to 6126h the Analog_Input_Decimal_Digits may get altered in the background, so after writing to 6126h the object 6132h should be read again.

Changing the Physical Units (Object 6131h) hasn't any influence on 6126h and on 6132h.

Future versions (from firmware version 1.4 on) will be able to transmit the Analog Input Process Value as a float, scaled directly to physical units, so that this lavish interpretation won't be necessary anymore.

The Analog Input Status Byte contains the following flags:

Bit 0 (LSBit): (still reserved, =0; future versions: sensor broken)

Bit1: Positive overflow of the measuring value

Bit2: Negative overflow (=underflow) of the measuring value

Bits 3..7: =0

With the BSC1 CANOpen, the Alarm Block is implemented as the threshold switch, whereby the measuring value is compared to a threshold and the threshold switching output is set on or off. The status of these switches are part of the Alarm Status.

The Alarm Status Byte contains the following flags:

Bit 0 (LSBit): Threshold switch 1 activated

Bit 1: Threshold switch 2 activated

Bits 2..7: =0

Send-conditions for the 1st Tx-PDO

- State = operational AND
- PDO = valid (Object 1800.1 Data-Bit 31 =0)
AND if Transmission-Type (1800.2) = 255 (default setting):
- Event-Timer (1800.5) ready OR
- Changing of measuring value \geq Analog Input Delta Transmission Value (6133h),
if 6133.1 > 0

If the Transmission-Type is = 254, the Event-Timer is ignored.

If the Inhibit-Time (1800.3) is >0 and not expired yet, no further PDO will be transmitted.

Default settings:

CAN-Bitrate	500kBits/s
Node-ID	0x40
Transmission-Type (Obj. 1800.2)	255
Inhibit-Time (Obj. 1800.3)	0, that means disabled
Event-Timer (Obj. 1800.5)	0x03E8, that means 1 PDO /s
Analog Input Delta Transmission Value (Obj. 6133.1)	0, that means Delta-Interrupt-function disabled

Producer Heartbeat Time (Obj. 1017)	0, that means Heartbeat disabled. The Bootup-frame will be sent once after power-up or after reset.
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General advice and Tips

The command number is transmitted as a single byte to the measuring amplifier.

The command parameters and the return parameters are binary bytes and not numerical (ASCII-) values (e.g., the parameter „01“ means 0x01 and not 0x31).

A Windows dynamic-link-library (MEGSV.DLL) to access all the features of the measuring amplifier is available, also a LabView example VI with dll-function wrapper-VIs.

For direct programming via RS232 it is sometimes easier to use the text format for measuring values, provided that the scaling factor was calculated correctly, according to the application requirements, since in text format the BSC1 itself does the multiplication of the raw values with the scaling factor.

Otherwise, in the binary format every measuring value needs to be multiplied with the scaling factor, in order to show physical measurement values (for example $\pm 2\text{mV/V}$). To calculate measuring values scaled in physical units please calculate as follows:

1. Without using the Windows-DLL, Mode „bipolar“:
 $\text{Measuring value} = ((\text{Raw binary} - 8388608) / 8388607) * 1,05 * \text{scaling factor}^9$
2. If using the Windows-DLL:
 $\text{Measuring value} = \text{GSVread_pointer-content} * \text{scaling factor}$

The setting of the datarate and the scale factor is by using direct programming via RS232 is a little bit difficult – see above descriptions of Set Scale, Set Dpoint and WriteSamplingFrequency.

You can save up to 6 different configurations in the EEPROM of the BSC1 (by using the configuration program GSV.EXE) and restore them with the command „GetAll“.

In the text format there's always one blank character (0x20) between the numerical value and the CR/LF (even if the unit was turned off by unit-code 0x07).

Attention: After every replacement of the jumper JPI, after every change of the datarate or changing the amplification or using other commands which affects the Analog-digital conversion, the command „Set Cal“ must be applied.

The configuration software GSV.EXE gives the command Set Cal automatically under the conditions mentioned.

It is recommended to use the bipolar mode rather than unipolar.

⁹ If you use the mode „unipolar“:
 $\text{Measuring value} = (\text{Raw binary} / 16777215) * 1,05 * \text{scaling factor}$

Technical Data

(At $U_b = 12...26V$ DC in the nominal temperature range)

Model	BSCI-HD/ OEM /ND	BSCI-HD / PM /DT	Unit / remarks
Accuracy class			
analog	0.1	0.1	
digital	0.1	0.1	
Measuring ranges			
Analog output	± 1 (JP1 set to pos.1, 5V Sensor Power) ± 2 or ± 3.5 (by software and JP1 to pos.2, 2.5V sensor supply)		mV/V mV/V
Display / serial output	0.125, 0.25, 0.50, 1.00, 2.00, 3.50 (by software)		mV/V
Connectable full bridges*	4 x 350	4 x 350	Ohms
Bridge sensor supply	2,5 / 5	2,5 / 5	V
Input impedance	>20 / 300pF	>20 / 300pF	MOhms
Common mode rejection ratio			
DC	>120	>120	dB
100Hz	>100	>100	dB
Non-linearity	<0,02	<0,02	% o.up.rang
Temperature influence on the zero point per 10K	Measuring Range 1mV/V: Measuring Range 2mV/V:	<0.4 typ. 0.2 <0.2 typ. 0.1	% o.up.rang % o.up.rang
Temperature influence on the measuring sensitivity per 10K referred to the measured value			
Analog output	< 0.1; typ. 0.05	< 0.1; typ. 0.05	%
Display / digital	<0.01; typ. 0.005	<0.01; typ. 0.005	%
Output filter Analog output			
3dB cutoff frequency analog, Bessel, 2 nd order	3.5, 260, 1700 (by softw.)	3.5, 260, 1700 (by softw.)	Hz
Output filter digital			
3dB cutoff frequency,	0.06..1700	0.06..1700	Hz
Data rate digital	0.3125..2000	0.3125..2000	Hz
Resolution Peak-to-peak RMS	>30000 counts >150000 counts	>30000 counts >150000 counts	-->See p.62
Analog output			
Usable output range at:			
- Nominal range 0...10V	-10 ...+11		V
- Nominal range $\pm 5V$	-5.5...+5.5		V
Output resistance	47		Ohms
Minimum load resistance	8		kOhms
Analog input (Channel 1)			
Input voltage range	0...10	0...10	V
Input resistance	56	56	kOhms
Control wires			
Zero-point adjustment	Low level: <1.4 High level: >3.4 (active high)		V
Switching output			

Model	BSC1-HD/ OEM /ND	BSC1-HD / PM /DT	Unit / remarks
of threshold switch	200mA / 30V	200mA / 30V	
Saturation voltage	<1.0	<1.0	V DC
maximum voltage (switch off)	60	60	V
maximum current (switch on)	1	1	A
On resistance DC	0.12	0.12	Ohms
Off resistance	10	10	TeraOhms
insulation strength	250	250	V
Digital serial interface	RS 232/RS422	RS 232/RS422	
Bit rate (dafault state)	38400 (8N1)	38400 (8N1)	Bits/s
Supply voltage			
Nominal range	9.8...30	9.8..30	V DC
Operating range ²⁾	9.8...36	10...36	V DC
Supply current	<120	<120	mA
With display		<180	mA
Parameter memory	Last settings, manufacturer settings, 6 user-records		
Other functions of the serial interface	<ul style="list-style-type: none"> - Programmable threshold with hysteresis - Programmable gain - Programmable calibration of the final value (scaling function) - Programmable zero adjustment 		
Nominal temperature range	-10...+65	0...+50 ³⁾	°C
Storage temperature range	-40...+85	-20...+70	°C
Dimensions (L x W x H)			
Print board (BSC1-OEM)	125 x 53 x 30		mm
Housing (BSC1-HD/ND)	180 x 65 x 36	180 x 65 x 40	mm
Protection degree of enclosure (DIN 40 050/IEC50(426))	IP66	IP40	

1) For version OEM and ND further control wires optionally available

2) Temperature range and accuracy may be reduced

3) LCD with extended temperature range optionally available

Absolute maximum values

(all voltages with reference to the supply ground)

Operating voltage: -5...+42V

Single pulse 200ms: +100V

Differential input:	-4...+12V
Sense inputs:	-4...+12V
Control wires:	-30...+30V
Analog input:	-20...+20V

CANbus Interface

The bus voltages are expected to be in the range from 0.5 to 4.5V (Common mode);
Withstand voltage: 0..+26V referred to CAN-GND.

CANOpen Vendor-ID

31	24	23	0
department	company		
00	00	02	70

Resolution

By changing the data rate (amount of measuring values transmitted per second) the Analog filter is changed automatically by default, as well as the filter properties of the delta sigma A/D Converter.

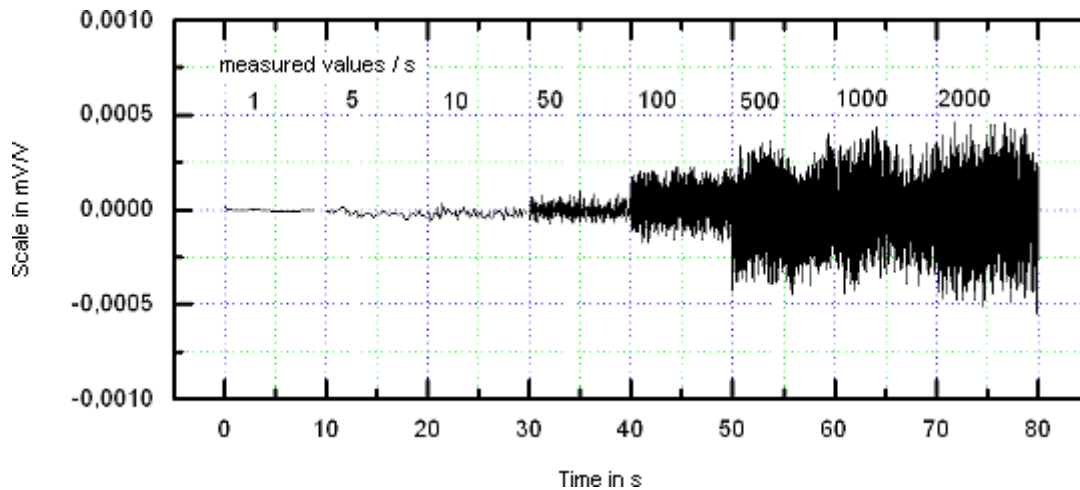
Because of the internal oversampling and filtering, normally the user doesn't need to perform extra filtering and averaging.

The charts below show measuring values with a shielded sensor cable of 1 meter, and twisted pairs of wires, shield connected to GND. The lower the data rate is, the better is the resolution.

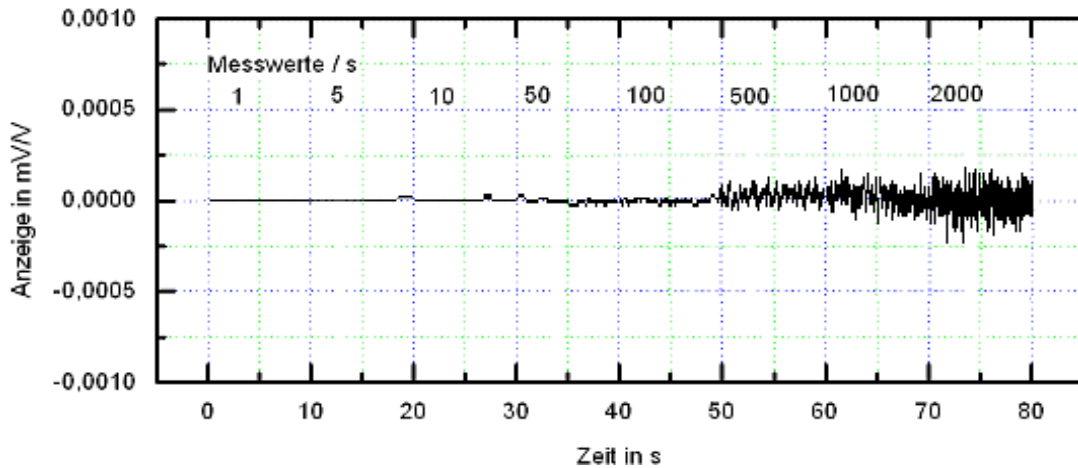
Comparable results can be obtained in practice also with cable lengths of 50 meters, if the control and the sensor-cables are installed separately and a good electromagnetic shielding is provided.

The shielding of the RS232-interface cable should be connected to the grounding-plug of the housing.

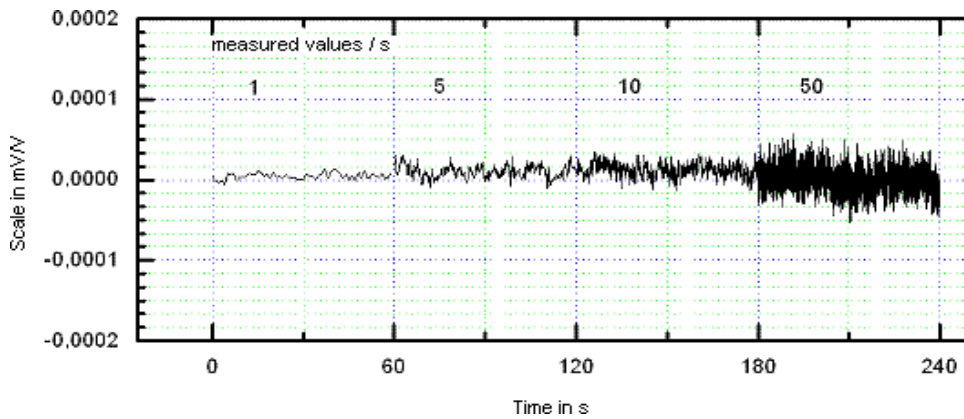
Resolution in the measuring range „2 mV/V“ (2.5V supply voltage, JP1 in position 2)



As above, but with adaptive averaging filter enabled, see p.42



Resolution in the measuring range „1mV/V“ (5V supply voltage, JP1 in position 1)



The peak-to-peak resolution at a data rate of 10/s is at least 30,000 counts, without additional digital filter, if this resolution is defined as the ratio of the measuring range to the amplitude of the peak-to-peak values, with sensor input shorted (Measuring range / peak-to- peak deviation).

The effective resolution at a data rate of 10/s is at least 150,000 counts (measuring range / standard-deviation).

With the adaptive averaging filter these values increase to better results by the factor 5 – e.g. 150,000 counts peak-to-peak resolution at 10Hz. This is valid with suitably adjusted filter only (see p.42).

More information <http://www.interfaceforce.com>

Description of the jumpers / selectors

JP1: Changing the bridge supply voltage:

position 1 (left): bridge supply voltage = 5V, input sensitivity = 1mV/V

position 2 (right): bridge supply voltage = 2.5V, input sensitivity = 2 or 3.5mV/V
(see Set/Get Range) Attention: the jumper has to be plugged!

JP2: Configuration mode for baudrate and protocol settings

Set: Configuration mode is enabled, Baudrate is fixed to 38400 Bits/s

Not set: Configuration mode is disabled, the baudrate of the baudrate-register is valid (see Set /Get Baud)

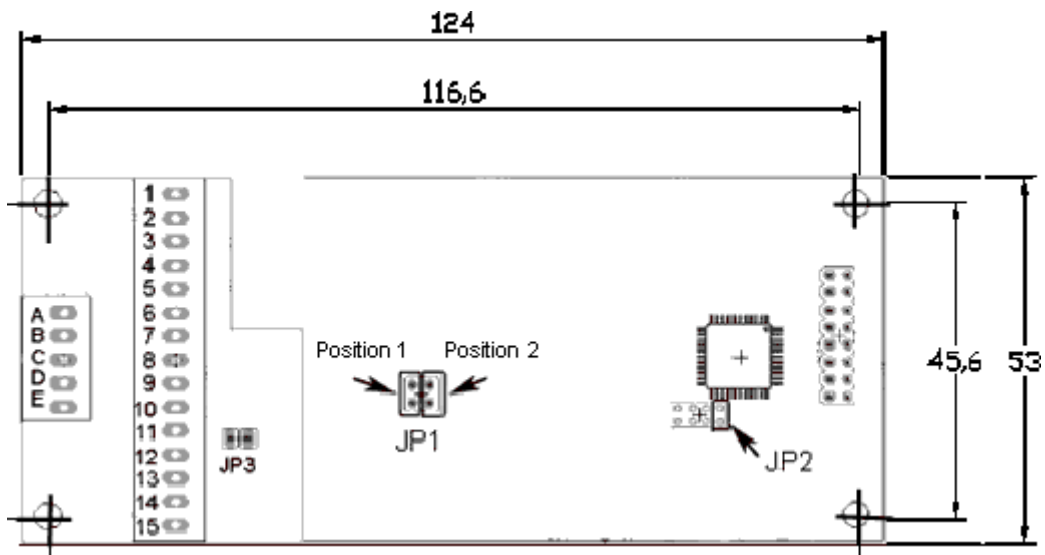
JP3: Change the serial interface from RS232 (V24) to RS422:

set: RS422 (4 wires). Not set: RS232 (V24), state at delivery

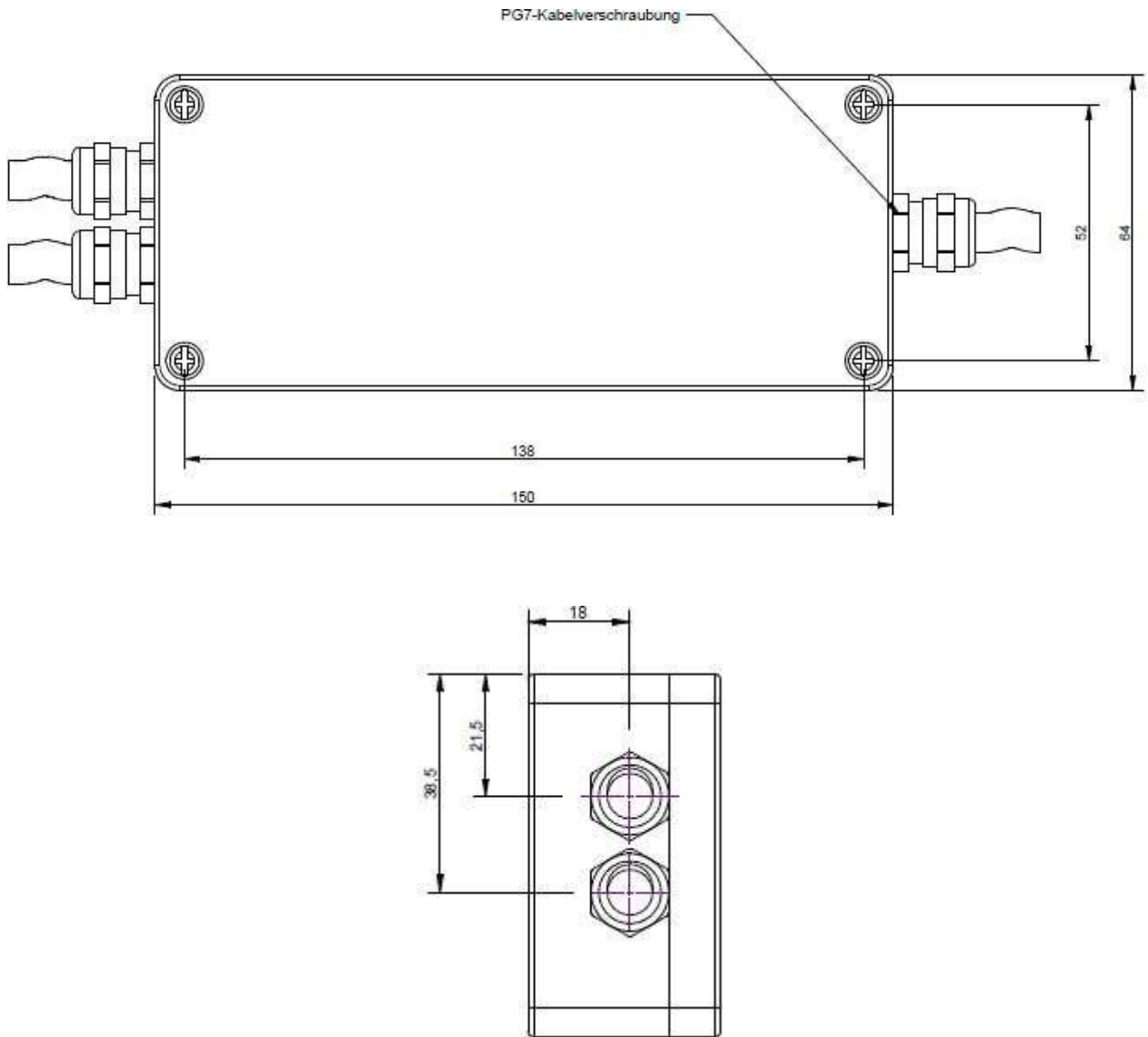
Connector pin assignment RS232: A: GND, B: RX, C: TX

Connector pin assignment RS422: A: GND, B: RX-, C: TX-, D: RX+, E: TX+

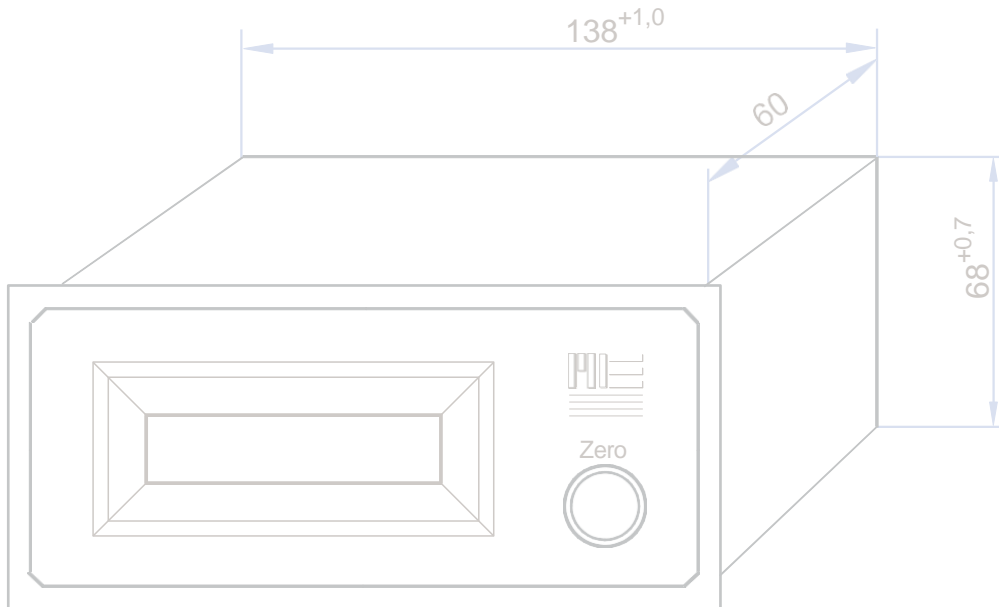
Dimensions of the circuit board BSC1-HD-OEM



Dimensions of the aluminum housing of the BSC1-HD-ND and BSC1-HD-ASD



Front panel cut out and housing of the BSC1-HD-PM



Dimensions of the BSC1-HD-DT

L x B x H: 200 x 175 x 75 mm

Warranty

All instrument products from Interface Inc., ('Interface') are warranted against defective material and workmanship for a period of (1) one year from the date of dispatch. If the 'Interface' product you purchase appears to have a defect in material or workmanship or fails during normal use within the period, please contact your Distributor, who will assist you in resolving the problem. If it is necessary to return the product to 'Interface' please include a note stating name, company, address, phone number and a detailed description of the problem. Also, please indicate if it is a warranty repair. The sender is responsible for shipping charges, freight insurance and proper packaging to prevent breakage in transit. 'Interface' warranty does not apply to defects resulting from action of the buyer such as mishandling, improper interfacing, operation outside of design limits, improper repair or unauthorized modification. No other warranties are expressed or implied. 'Interface' specifically disclaims any implied warranties of merchantability or fitness for a specific purpose. The remedies outlined above are the buyer's only remedies. 'Interface' will not be liable for direct, indirect, special, incidental or consequential damages whether based on the contract, tort or other legal theory. Any corrective maintenance required after the warranty period should be performed by 'Interface' approved personnel only.