Data Sheet

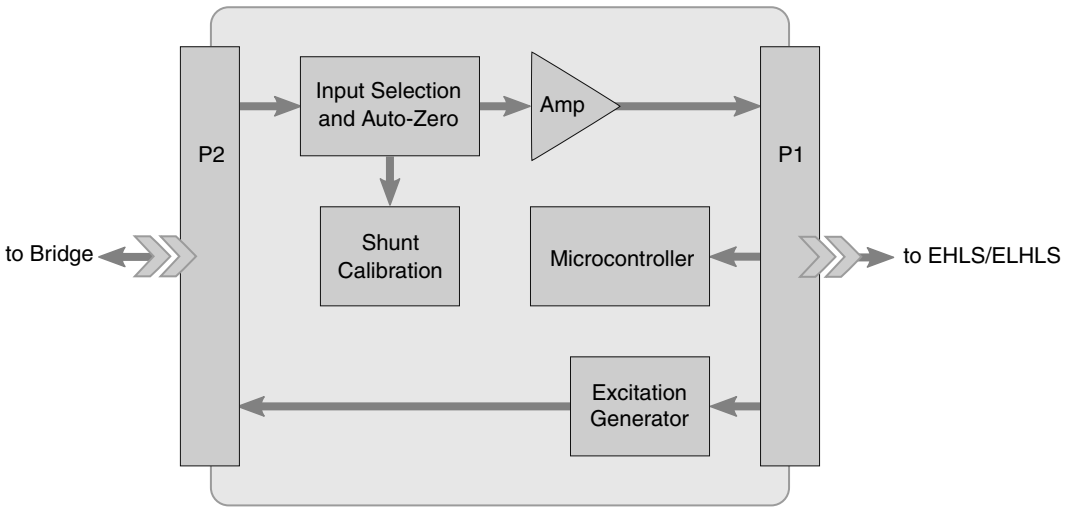
SMSTRB

Strain SMART Module

Special Features

- **Conditions and amplifies output to a high level signal for use with the SoMat EHLS or ELHLS**
- **Strain gage conditioning with support for 1/4-, 1/2- and full-bridges**
- **Ability to store transducer calibration information for automatic identification in TCE**

Block Diagram



Detailed Description

The SoMat SMSTRB Strain SMART Module is a part of a family of SoMat signal conditioners for the eDAQ EHLS and the eDAQ*lite* ELHLS layers. The SMSTRB provides excellent strain gage with support for quarter-, half- and full-bridge configurations. As an external module, the SMSTRB is like taking a piece of the eDAQ hardware and placing it next to the application. A digital line communicates with the eDAQ or eDAQ*lite* for setup and calibration and the module conditions and amplifies the output to a high level signal. Sending a high level signal has several advantages, including the elemination of lead wire resistance and protection of the signal integrity from noise. These benefits are numerous across many applications from bridge monitoring with 50-meter leads over a structure to heavy equipment with long leads in a noisy environment. The SMSTRB also provides two shunt calibration resistors per channel with software selectable shunt direction for either upscale (-Sig to -Ex) or downscale (-Sig to +Ex) calibrations.

Additionally, as a SMART Module, the SMSTRB can be programmed to store transducer identification and calibration information. An eDAQ hardware query automatically identifies the module and loads the channel and its calibration in TCE (Test Control Environment). The module also contains a partition in its flash memory for storing pass-through information such as physical location or associated vehicle for the transducer. The external LED allows for easy module identification when queried from the software.

The SMSTRB module includes a male and female M8 connector. Use of the module requires an Extension Cable.

Ordering Options

Order No.	Description
1-SMSTRB4-120-2	Strain SMART Module - 120-Ohm Completion
1-SMSTRB4-350-2	Strain SMART Module - 350-Ohm Completion

Cables (Order Separately)

Order No.	Description
1-SAC-TRAN-MP-2-2	Transducer Cable - Male/Pigtail - 2 Meters Length
1-SAC-TRAN-MP-10-2	Transducer Cable - Male/Pigtail - 10 Meters Length
1-SAC-EXT-MF-0.4-2	Extension Cable - Male/Female Connectors - 0.4 Meters Length
1-SAC-EXT-MF-2-2	Extension Cable - Male/Female Connectors - 2 Meters Length
1-SAC-EXT-MF-5-2	Extension Cable - Male/Female Connectors - 5 Meters Length
1-SAC-EXT-MF-10-2	Extension Cable - Male/Female Connectors - 10 Meters Length
1-SAC-EXT-MF-15-2	Extension Cable - Male/Female Connectors - 15 Meters Length

Specifications

Parameter	Units	Value
Module dimensions		
width	mm	31.9
length	mm	76.9
height	mm	19.3
Module weight	g	69.2
Temperature range	°C	-20 ... 65
Relative humidity range, non-condensing	%	0 ... 90
Excitation voltage (V_{ex}) [1]		
< 350-Ω bridge resistance	V	5
≥ 350-Ω bridge resistance	V	5 or 10
initial accuracy	%	0.05
ripple	mV	< 1
maximum change over temperature (3σ)	ppm/°C	15
Excitation current (I_{ex})		
short circuit limiting	mA	46
short circuit duration (at 25 °C)	s	5
Module power consumption		
5-volt excitation	W	I_{ex}*2.65[V]+0.234[W]
10-volt excitation	W	I_{ex}*2.65[V]+0.144[W]
Quarter-bridge completion resistance		
resistance (specified at production)	kΩ	120 or 350
accuracy	%	0.01
change over temperature (3σ)	ppm/°C	±1
Half-bridge completion resistance		
internal resistance	kΩ	12.5 (50-kΩ split)
accuracy	%	0.05
change over temperature (3σ)	ppm/°C	±2
Shunt calibration resistance		
resistance	kΩ	49.9 or 100
accuracy	%	0.1
maximum change over temperature (3σ)	ppm/°C	±10
Amplifier gain		
gain, G		10 or 100
initial accuracy (on calibration)	% of full scale	±0.1
typical drift over temperature	ppm/°C	-1
maximum drift over temperature	ppm/°C	±5
Maximum amplifier input voltage	V	33

[1] Excitation voltage can be set at zero volts.

Specifications (continued)

Parameter	Units	Value
Amplifier input current		
range	nA	0.5 ... 1.5
typical input offset change over temperature [1]	pA/°C	0.3
maximum input offset change over temperature [1]	pA/°C	1.5
input protection resistance (in series)	kΩ	10
Amplifier input-referred voltage		
typical offset (G=10)	µV	±50
maximum offset (G=10)	µV	±150
typical offset (G=100)	µV	±25
maximum offset (G=100)	µV	±50
typical drift over temperature (G=10) [2]	µV/°C	±0.6
maximum drift over temperature (G=10) [2]	µV/°C	±1.5
typical drift over temperature (G=100) [2]	µV/°C	±0.1
maximum drift over temperature (G=100) [2]	µV/°C	±0.6
Bandwidth		
ultra-flat bandwidth	kHz	70
3-dB bandwidth (G=10)	kHz	800
3-dB bandwidth (G=100)	kHz	200
Output noise, N		
G=10 (to 25 kHz)	µV	36.4
G=10 (with filter cutoff of *x* kHz) [3]	µV	$36.4\ (x/25)^{1/2}$
G=100 (to 25 kHz)	µV	333
G=100 (with filter cutoff of *x* kHz)[4]	µV	$333\ (x/25)^{1/2}$
Input referred noise	µV	N/G
Signal to noise ratio, SNR [5]		$20\log(V_{in,max}/\text{InputReferredNoise})$
Common mode input range		
minimum	V	Ground + 2.1
maximum (5-volt excitation)	V	6.6
maximum (10-volt excitation)	V	11.6
Maximum input signal range [6]		
5-volt excitation (G=10)	V	-0.24 ... 0.25
5-volt excitation (G=100)	V	-0.024 ... 0.025
10-volt excitation (G=10)	V	-0.49 ... 0.35
10-volt excitation (G=100)	V	-0.049 ... 0.035
Initial accuracy in conjuction with the EHLS or ELHLS	%	0.1

[1] Use change over temperature to calculate the offset voltage over temperature to the EHLS/ELHLS layer. Offset voltage [V] = current change over temperature [pA/°C] x change in temperature [Δ°C] x input resistance [10 kΩ].

[2] The total input referred voltage drift is a combination of drift over temperature at the gain setting [µV/°C] and the drift due to the input current change over temperature (discussed in [1])

[3] The filter can be either analog or digital and has a maximum cutoff frequency of 976 kHz. Note that when selecting the sampling rate in TCE, the cutoff frequency of the selected filter is one third of the sampling rate.

[4] The filter can be either analog or digital and has a maximum cutoff frequency of 244 kHz. Note that when selecting the sampling rate in TCE, the cutoff frequency of the selected filter is one third of the sampling rate.

[5] $V_{in,max}$ is set by TCE when used with an EHLS or ELHLS layer.

[6] The maximum input range is irrespective of the EHLS/ELHLS gain settings and reflect the output saturation of the SMSTRB module or the input saturation of the EHLS/ELHLS layer.

Connector Pin Outs

Pin	P1 (to EHLS/ELHLS Channel)
1	reserved
2	+ Signal Input
3	Shield to PCB Ground
4	PCB Ground
5	Power
6	- Signal Input

Pin	P2 (to Bridge)
1	1/4-Bridge Completion Resistor
2	+ Signal Input
3	Open
4	- Excitation [1]
5	+ Excitation
6	- Signal Input

[1] The negative excitation on pin 4 of P2 is the ground on pin 4 of P1.

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B2951-2.0 en SoMat P/N DOC-0031-01

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