Data sheet

1-ELHLS-2

1-EXRL-HLS-2

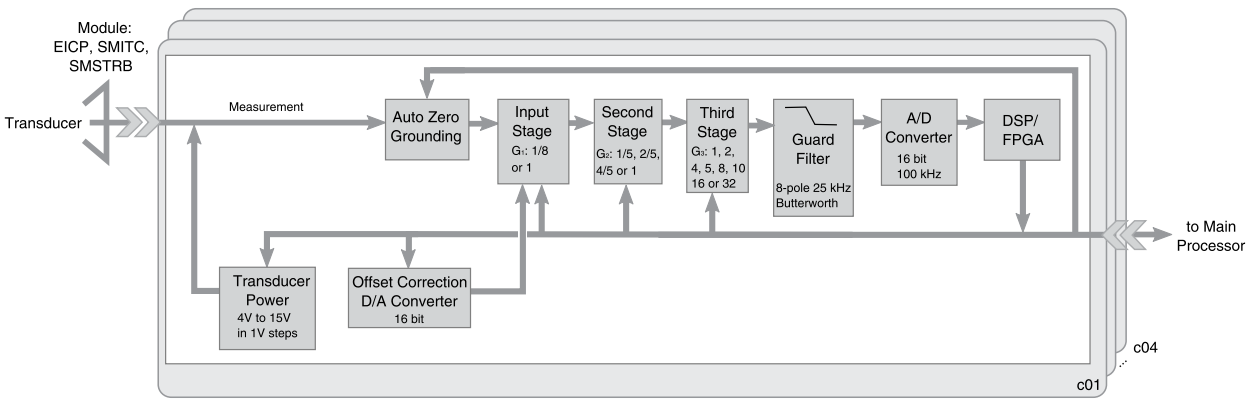
ELHLS/EXRL-HLS

eDAQ-lite or eDAQXR-lite High Level Analog Layer

Special Features

- **4 simultaneously-sampled, high-level differential analog inputs from ±0.0625 to ±74.9 V**
- **64 automatic gain states ensuring use of the fullest possible A/D converter range**
- **Sampling rates up to 100 kHz**
- **16-bit A/D converter per channel across full-scale range**
- **25 kHz, 8-pole analog Butterworth low-pass filter**
- **Software selectable sample rates, transducer power and digital filtering**
- **Supports EICP, SMITC and SMSTRB modules**

Block diagram



NOTE

A double-arrowhead symbol in the diagram represents male and female connectors only, not power polarity or input/output direction.

Detailed Description

The High Level Simultaneously-Sampled Analog Layer offers four simultaneously sampled high-level differential analog inputs through independent connectors. The layer can inherently handle any analog input from ±74.9 volts and, together with the Somat SMART conditioning modules, constitutes a real multi-purpose layer. The layer is compatible with practically any input including thermocouples, strain gages, accelerometers, microphones and amplified and un-amplified transducers. Software selectable sample rates, transducer power and digital filtering simplify the set-up of any channel. There are also several calibration options including defined value, external value and multipoint calibrations.
The New-design ring (1-EXRL-HLS-2) and captive screws provide an improved seal with the eDAQXR-lite CPU. If legacy and New-design layer rings are in an eDAQXR-lite stack, the IP rating for the devices may be impacted. Always install standoffs when using legacy layers (1-ELHLS-2).

Ordering Options

Order No.	Description
1-ELHLS-2	ELHLS High Level Analog Layer Inputs: 4-channels, +/-74.9V differential analog, simultaneous sampling, 16-bit resolution. With the addition of SMART Conditioning Modules this layer can also be used to measure strain gage based transducers, thermocouples and ICP devices. Includes: (4) 1-SAC-TRAN-MP-2-2 cables and (4) standoffs.
1-EXRL-HLS-2	ELHLS High-level Analog Layer - Includes: (4) 1-SAC-TRAN-MP-2-2 Transducer Cables, (4) captive layer screws and (4) standoffs. The New-design ring (1-EXRL-HLS-2) and captive screws provide an improved seal with the eDAQXR-lite CPU.

Cables and Accessories (Order Separately)

Order No.	Description	Order No.	Description
1-HDW-0034-00-2	M8 Hex Nut Wrench	1-SAC-EXT-MF-2-2	Extension Cable - Male/Female Connectors - 2 Meters Length
1-SAC-TRAN-MP-2-2	Transducer Cable - Male/Pigtail - 2 Meters Length	1-SAC-EXT-MF-5-2	Extension Cable - Male/Female Connectors - 5 Meters Length
1-SAC-TRAN-MP-10-2	Transducer Cable - Male/Pigtail - 10 Meters Length	1-SAC-EXT-MF-10-2	Extension Cable - Male/Female Connectors - 10 Meters Length
1-SAC-EXT-MF-0.4-2	Extension Cable - Male/Female Connectors - 0.4 Meters Length	1-SAC-EXT-MF-15-2	Extension Cable - Male/Female Connectors - 15 Meters Length
1-EICP-B-2	ICP-Type Conditioning Module - BNC Connector In-line signal conditioning module for ELHLS. For 2-port current-fed transducers (takes 24V; provides 4mA). Inputs: IEPE (Integrated Electronics Piezoelectric) Transducers. Requires (1) Extension Cable (1-SAC-EXT-MF-X-2)	1-EICP-M-2	ICP-Type Conditioning Module - Microdot Connector In-line signal conditioning module for ELHLS. For 2-port current-fed transducers (takes 24V; provides 4mA). Inputs: IEPE (Integrated Electronics Piezoelectric) Transducers. Requires (1) Extension Cable (1-SAC-EXT-MF-X-2)
1-SMSTRB4-120-2	Strain SMART Module - 120-Ohm Completion In-line signal strain gage conditioning module for ELHLS. Integrated 120-Ohm, 1/4-bridge completion resistor. Requires (1) Extension Cable (1-SAC-EXT-MF-X-2)	1-SMSTRB4-350-2	Strain SMART Module - 350-Ohm Completion In-line signal strain gage conditioning module for ELHLS. Integrated 350-Ohm, 1/4-bridge completion resistor. Requires (1) Extension Cable (1-SAC-EXT-MF-X-2)
1-SMITC-2	Thermocouple SMART Module In-line signal conditioning module for ELHLS. Inputs: Isolated Thermocouple, 500-V Isolation, Software selectable J, K, T and E Thermocouples		

Specifications

Parameter	Unit	Value
Dimensions: width x length x height	mm	176 x 1117.6 x 17.6; new-design 152.25 x 107.5 x 18.6
Weight	kg	0.42; new-design 0.30
Temperature range	°C [°F]	-20 ... +65 [-4 ... +149]
Relative humidity range, non-condensing	%	0 ... 90
Initial accuracy	% of full scale	±0.1
Common mode range plus signal G_1 = 1/8 G_1 = 1	- V V	- ±74.9 ±10
Analog inputs surviving over voltage	V	±125
Transducer power supply voltage range no adapter with IEPE adapter	- V V	- 4 ... 15 in 1 V steps 24
Transducer power supply output power	mW	400
Transducer power supply voltage change over temperature	%	±1
Voltage regulation 4 V out, 2 mA to 150 mA 10 V out, 2 mA to 60 mA 15 V out, 2 mA to 40 mA 24 V out, 2 mA to 25 mA	- mV mV mV mV	- 10 5 5 10
Voltage regulation efficiency 4 V out, 2 mA to 150 mA 10 V out, 2 mA to 60 mA 15 V out, 2 mA to 40 mA 24 V out, 2 mA to 25 mA	- % % % %	- 67 78 80 82
Ripple (4 V out) 1.4 MHz at 2 mA 1.4 MHz at 60 mA	- mV mV	- 5 18.5
Ripple (10 V out) 1.4 MHz at 2 mA 1.4 MHz at 60 mA	- mV mV	- 5 14
Ripple (15 V out) 1.4 MHz at 2 mA 1.4 MHz at 40 mA 3.4 kHz at 2 mA	- mV mV mV	- 2 12 7
Ripple (24 V out) 1.4 MHz at 2 mA 1.4 MHz at 25 mA 10.5 MHz at 2 mA	- mV mV mV	- 2 10 9

Parameter	Unit	Value
Power consumption[1]	-	-
no load	W	3.3
SBSTRB4-120, quarter bridge or half bridge (5 V out)	W	4.26
SBSTRB4-120, full bridge (5 V out)	W	5.14
SMSTRB4-350, quarter bridge or half bridge (5 V out)	W	3.52
SBSTRB4-350, full bridge (5 V out)	W	3.62
SMSTRB4-350, quarter bridge or half bridge (10 V out)	W	5.36
SMSTRB4-350, full bridge (10 V out)	W	5.74
SMITC	W	3.96
IEPE plus accelerometer	W	4.5
40 mA load (12 V out)	W	5.6
Minimum input resistance	-	-
$G_1 = 1$	GΩ	2
$G_1 = 1/8$	kΩ	108

[1] Power consumption measurements are taken with the stated load on all four channels and include the efficiency of the power supply.

Standards

Category	Standard	Description
Shock	MIL-STD-810F	Method 516.5, Section 2.2.2 Functional Shock - ground vehicle
Vibration	MIL-STD-202G	Method 204D, Test condition C (10 *g* swept sine tested from 5 Hz to 2000 Hz)
EMC requirements -	EN 61326-1:2006 EN 61326-1:2012	Before July 2018, CE conformity per EN 61326-1:2006 After June 2018, CE conformity per EN 61326-1:2012

Selected gain settings

NOTE

This table is a representative list only and does not show all available gain settings. To check the gain settings for a defined channel, click the Ampl button in the TCE transducer setup window. “Gain 1” is the input stage gain, “Atten2” is the second stage gain and “Gain2” is the third stage gain.

Desired Input Range [2] (V_{pp})	Input Stage Gain, G_1 (1/8 or 1)	Second Stage Gain, G_2 (1/5, 2/5, 4/5 or 1)	Third Stage Gain, G_3 (1, 2, 4, 5, 8, 10, 16 or 32)	Overall Gain
149.8	1/8	1/5	1	0.025
80	1/8	2/5	1	0.05
40	1/8	4/5	1	0.1
32	1/8	1	1	0.125
20	1	4/5	2	0.2
10	1/8	4/5	4	0.4
5	1/8	4/5	8	0.8
4	1/8	1	8	1
2	1/8	1	16	2
1	1/8	1	32	4
0.5	1	1	8	8
0.25	1	1	16	16
0.125	1	1	32	32

[2] The maximum A/D converter input, which is the product of the input stage and the overall gain, is 4.096 V_{pp}.

Channel Noise Characteristics

The input-referred noise and the signal to noise ratio (SNR) are defined by the following two equations:

$$\text{Input Referred Noise} = \frac{N}{G_O} \qquad \text{SNR} = 20_{\log}\left(\frac{4.096}{N}\right)$$

where G_O is the overall gain setting and N is the noise at the input of the A/D converter, defined by the following equation:

$$N = \sqrt{\left(17.6[\text{microV}]G_g G_s\sqrt{\frac{x_1}{24[\text{kHz}]}}\right)^2 + \left(37[\text{microV}]G_s\sqrt{\frac{x_1}{24[\text{kHz}]}}\right)^2 + \left(45[\text{microV}]G_s\sqrt{\frac{x_2}{13[\text{kHz}]}}\right)^2 + \left(4.5[\text{microV}]G_s\sqrt{\ln\left(\frac{x_1}{0.1[\text{Hz}]}\right)}\right)^2 + 83[\text{microV}^2]}$$

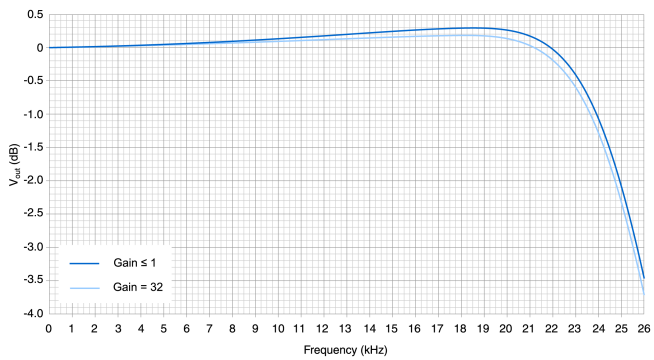
and where x_n is the cutoff frequency of the digital or analog filter to the specified maximum value.

x_n	Maximum Value	Cause
x_1	24 kHz	analog filter cutoff
x_2	13 kHz	secondary filter cutoff

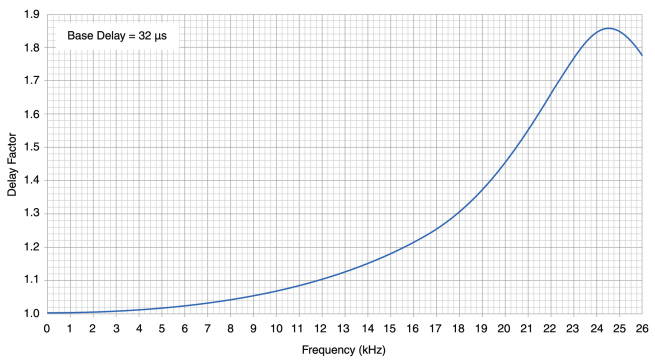
NOTE

When selecting the sampling rate in the TCE or web interface, the cutoff frequency of the selected filter is one third of the sampling rate.

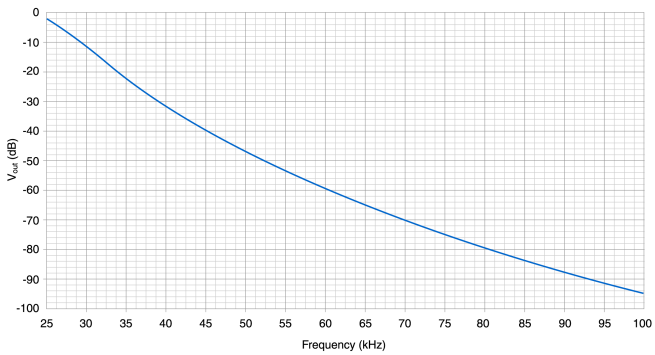
Input Filter Pass Band Frequency Response



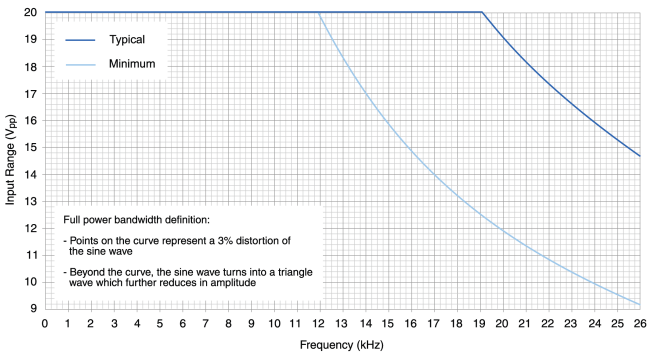
Input Filter Delay Factor



Input Filter Cut-Off Region



Full Power Bandwidth



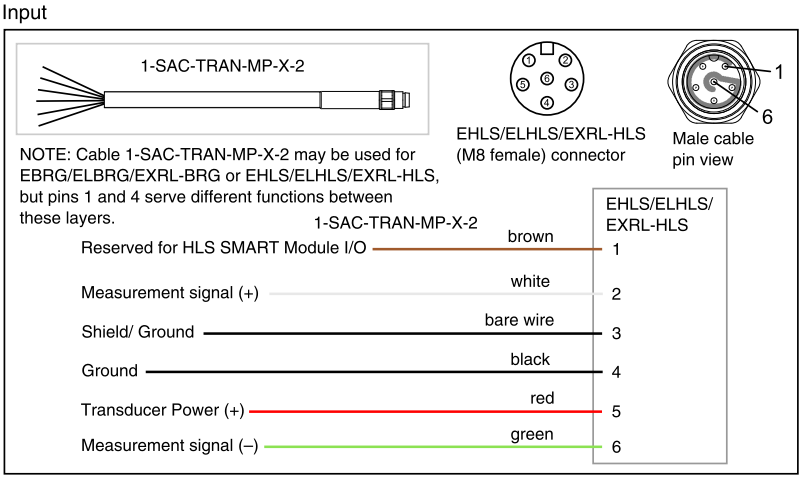
NOTE

The plot shows full power bandwidth for an overall gain of 0.2 or a 20 V_{pp} input range.

Input connectors

The diagram shows the M8 connectors on the ELHLS or EXRL-HLS layer.

Input



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