

SIRIUS®

 DEWESoft®

TECHNICAL REFERENCE MANUAL

SIRIUS® V25-1



4.2. Enclosure Overview

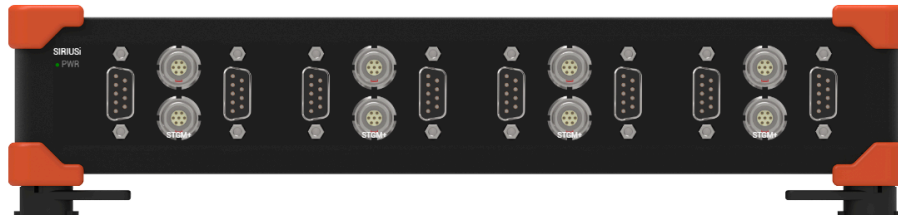
SIRIUS® systems are available in different enclosure types. The following list provides a short high-level overview and the following sub-chapters cover the details.

- **Modular Solution:** Rugged slices with up to 8 measurement modules. This solution is very flexible because you can use each slice independently or combine multiple slices for a single measurement.
- **Compact Systems:** A compact box that can contain up to 4 measurement slices and an optional SBOX slice. This solution is more compact than using 4 single slices and also more convenient because all the slices are wired together internally: you don't need to interconnect the slices with external USB / Sync / Power / GND cables.
- **Rack:** A rugged solution for up to 8 measurement slices with integrated SBOX: This solution has all the advantages of the Boxed Solution, but double the channel count. Moreover, there are versions with integrated display and batteries available.
- **Instruments:** A rugged and portable solution including SBOX, display and optional batteries with 1 or 2 measurement slices.

Enclosure	Modular solution	Compact Systems				High-channel rack mountable systems			Portable all-in-one systems		Lab system
	SIRIUS	R4 / R4 HUB	R2 / R2 HUB	R2rt / R4rt	R1B / R2B	R8	R8D	R8DB	R2DB	R1DB	R3
Input type	ch-ch isolated (SIRIUSi), pair isolated (SIRIUSi HD) or differential slices (SIRIUS)										
Max SIRIUS slices	Flexible	4	2	2 / 4	1 / 2	8			2	1	3
Max DualCore/HS channels	8 per slice	32	16	16 / 32	8 / 16	64			16	8	24
Max HD channels (no counters possible)	16 per slice	64	32	16 / 32	16 / 32	128			32	16	48
Max counters	8 per slice	32				64			16	8	24
Max digital input/digital outputs	24 DI / 8 DO	96 DI / 32 DO				192 DI / 64 DO			48 DI / 16 DO	24 DI / 8 DO	72 DI / 24 DO
Analog out	Only USB with fan	Yes	Yes		No	Yes	No		No		Yes
Max CAN ports	1	4	2		1	8			2	1	
Computer system	Optional SBOXe, SBOXfe	Integrated SBOXse				Integrated SBOXre			Integrated SBOXse		Standard PC
Display	External (MOB DISP 12)		External			External	Integrated 17" Full-HD		Integrated 12" Full-HD		External
Batteries	External BP2i, BP4i	External BP2i, BP4i				External BP2i, BP4i		Integrated	Integrated		-
Power Supply	9-36 V DC	12-36 V DC	12-36 V DC	12-36 V DC	12-36 V DC	12-36 V DC	12-36 V DC	18-24 V DC	9-36 V DC	9-36 V DC	110 V / 220 V AC

4.2.1. Modular solution

A single SIRIUS® slice can have up to 8 measurement modules. Each measurement module typically has one analog channel. Some modules also have an optional counter channel (e.g. ACC+). HD modules have 2 analog channels.



SIRIUSi-8xSTGM+

We offer several standard chassis with predefined modules, but you can also choose a customized slice with any combination of the SIRIUS® measurement modules.

You can choose between 2 different data-transfer options:

- USB
- EtherCAT®



Hint

You can use your SIRIUS® slices independently or combine them to a single fully-synchronized multi-channel measurement system with the clever click mechanism.

4.2.1.1. Single slice: USB

This chapter describes the SIRIUS® USB single slice enclosure.



Important

The LED indicator on the front side shows system status.

LED status	Description
 Green	Power is connected, system self-test PASSED.
 Red Blinking	Power is connected, system self-test error! - RAM - I2C bus (PLL, Temperature) - CAN (optional) - EtherCAT (optional)
 Green Blinking	“Easy device identification” feature. When selected in the setup, the corresponding SIRIUS Green LED indicator is blinking.

4.2.1.2. Single slice: Rear side

The SIRIUS® USB chassis has following connectors at the rear side:



SIRIUS rear side

Name	Description
CAN	CAN bus DSUB-9 male connector
SYNC	Two 4-pin LEMO female sync connectors
USB	USB-mini to transfer the data to the SBOX or PC
GND	Protective Ground banana plug and M4 screw insert.
POWER IN	2-pin LEMO male connector
POWER OUT	2-pin LEMO female connector

Analog-out connectors

The optional analog output version of the SIRIUS Single Slice has 8 additional BNC connectors for the analog output channels on the rear side (for detailed information see chapter: Analog out option).



Rear side connectors of the analog-out version

5. SIRIUS® measurement modules

5.1. Data transfer overview

Dewesoft offers SIRIUS® slices that can use different data-transfer technologies:

- USB
 - high data-throughput allows for high sampling rates (up to 1 MS/s)
 - extra connectors for power and synchronisation required
 - direct connection to USB ports on the PC
- Standard EtherCAT®
 - only one single cable needed for data, synchronisation and power
 - Data-throughput allows for sampling rates up to 20 kS/s
 - direct connection to standard Ethernet port on the PC possible
- DS-EtherCAT+
 - this is a Dewesoft enhancement to the EtherCAT® standard, so that we can combine the advantages of Standard Ethernet and USB data-transfer

5.1.1. USB data transfer

USB is a high speed data bus being able to transmit full speed data for all channels to the measurement PC. The SIRIUS® USB slices allow sampling rates of up to 1 MHz (high-speed) and can be directly connected to native USB ports on the measurement PC (or SBOX). In comparison to the EtherCAT® version, the SIRIUS®-USB slices need extra connectors for power supply and synchronisation.

5.1.2. EtherCAT® data transfer

EtherCAT® - Ethernet for Control Automation Technology - is a 100 Mbit/s Ethernet-based fieldbus system. The protocol is standardized in IEC 61158 and is suitable for both hard and soft real-time requirements. EtherCAT® can be used for applications that require short data update times with low communication jitter (for precise synchronisation purposes).



Important

When connecting EtherCAT® devices to the computer please make sure that you connect the EtherCAT® cable directly to the Ethernet card of your PC without the use of network switches or hubs.



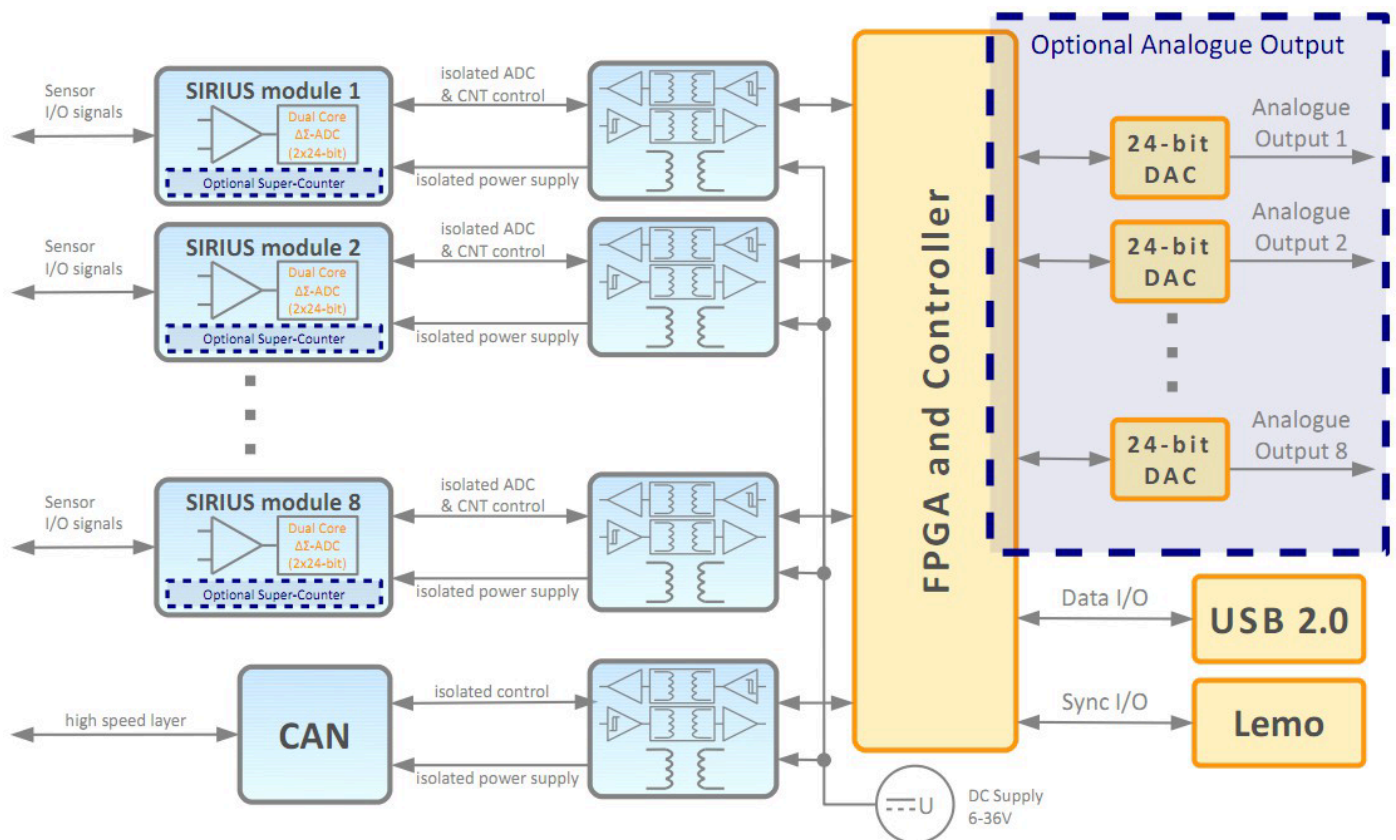
Important

The EtherCAT version of SIRIUS works with a range of 9 - 36V, and not up to 48V, even though the range is up to 48V for other product lines with EtherCAT.

5.2.5. Isolated version: USB

The (standard) SIRIUSi modules are isolated between each other and the main board. Some modules generate power for electronics and for external pins: this power supply is again isolated against other modules, the main board and the housing.

Inside of one module, the power supply pins, counter and analog inputs are not isolated between themselves (they have the same ground) that is available on the GND connector pin (e.g. The analog input and the counter of one ACC+ module share the same GND).



Isolated motherboard



Warning

Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.

5.4. SIRIUS® Dual Core specifications

	UNI	STG	STGM	MULTI	ACC
Connectors	DSUB-9, L2B10f	DSUB-9, L2B7f, L2B10f	DSUB-9, L2B7f, L2B10f	DSUB-15, L2B16f	BNC, TNC
Counter version	✓	✓	✓	✓	✓
Isolated version	✓	✓	✓	✓	✓
Differential version	✓	✓	✓	✓	✓
EtherCAT version	✓	✓	✓	✓	✓
Rack version	✓	✓	✓	✓	✓
Fanless version	✗	✗	✓	✗	✓
Channels per slice	8	8	8	8	8
Data rate / channel	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT
Resolution	24-bit dual core	24-bit dual core	24-bit dual core	24-bit dual core	24-bit dual core
Bandwidth	70 kHz	70 kHz	70 kHz	70 kHz	70 kHz
Voltage ranges	±100 V, ±10 V, ±1 V, ±100 mV, ±10 mV	±50 V, ±10 V, ±1 V, ±100 mV	±10 V, ±1 V, ±100 mV, ±10 mV	±10 V, ±1 V, ±100 mV, ±50 mV	±10 V, ±500 mV
Input coupling	DC, AC 0.3 Hz / 0.16 Hz (1, 3, 5, 10, 20 Hz SW)	DC, AC 1 Hz (3, 10 Hz SW)	DC	DC	DC, AC 0.1 Hz, 1 Hz
Sensor excitation	0..20 V max. 0.8 W, 0..60 mA max 0.5 W, IEPE 2..20 mA	0..20 V max. 0.8 W, 0..60 mA max 0.5 W	0..15 V max. 44 mA	0..12 V max. 44 mA	IEPE 2, 4, 8, 12, 16, 20 mA
Bridge connection	Full, ½, ¼ 350 Ω, ¼ 120 Ω 3, 4 wire	Full, ½, ¼ 350 Ω, ¼ 120 Ω 3, 4 wire	Full, ½, ¼ 350 Ω, ¼ 120 Ω 3 wire	Full, ½, ¼ 350 Ω, ¼ 120 Ω 3 wire	✗
Programmable shunt	59.88 kΩ, 175 kΩ bipolar	59.88 kΩ, 175 kΩ bipolar	100 kΩ bipolar	59.88 kΩ	✗
IEPE input	✓	DSI-ACC	DSI-ACC	DSI-ACC	✓
Resistance	✓	✓	✗	✗	✗
Temperature (PTx)	✓	✓	DSI-RTD	DSI-RTD	✗
Thermocouple	DSI-TH	DSI-TH	DSI-TH	DSI-TH	✗
Current	ext. shunt, DSI	ext. shunt, DSI	ext. shunt, DSI	ext. shunt, DSI	ext. shunt
Potentiometer	✓	✓	✓	✓	✗
LVDT	DSI-LVDT	DSI-LVDT	DSI-LVDT	DSI-LVDT	✗
Charge	DSI-CHG	DSI-CHG	DSI-CHG	DSI-CHG	✗
TEDS	✓	✓	✓	✓	✓
Isolation voltage	1000 V	1000 V	1000 V	1000 V	1000 V
Power consumption per channel	2 W/ch	2 W/ch	1.3 W/ch	1.3 W/ch	1 W/ch
Advanced functions	Supports all strain types, IEPE sensors and high input range	Supports all strain types and high input range	Low power, sensor and amplifier balance, bipolar shunt	Analog Output, Low power, sensor and amplifier balance	Sensor error detection, high dynamic range
(I) Fanless operation only for BNC or Banana version (without excitation)					

	MIC200	CHG	HV	LV
Connectors	L1B7f	BNC, TNC	BANANA	DSUB-9, BNC, BANANA
Counter version	✗	✓	✗	✓
Isolated version	✓	✓	✓	✓
Differential version	✗	✗	✗	✓
EtherCAT version	✓	✓	✓	✓
Rack version	✓	✓	✓	✓
Fanless version	✓	✗	✓	✓ (see 1)
Channels per slice	8	8	8	8
Data rate / channel	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT
Resolution	24-bit dual core	24-bit dual core	24-bit dual core	24-bit dual core
Bandwidth	70 kHz	70 kHz	70 kHz	70 kHz
Voltage ranges	±10 V, ±500 mV	±10 V, ±500 mV	±1200 V, ±50 V	±200 V, ±10 V, ±1 V, ±100 mV
Input coupling	AC 0.35 Hz (3, 10 Hz SW)	DC, AC 0.1 Hz, 1 Hz, 10 Hz, 100 Hz	DC	DC, AC 1 Hz (3, 10 Hz SW)
Sensor excitation	14 V bipolar, 200 V polarization	IEPE 4, 8, 12 mA	✗	2..30 V bipolar, 0..24 V unipolar, max. 0.2 A / 2 W
Bridge connection	✗	✗	✗	Full
Programmable shunt	✗	✗	✗	✗
IEPE input	✗	✓	✗	DSI-ACC
Resistance	✗	✗	✗	✗
Temperature (PTx)	✗	✗	✗	DSI-RTD
Thermocouple	✗	✗	✗	DSI-TH
Current	ext. shunt	ext. shunt	✗	ext. shunt, DSI
Potentiometer	✗	✗	✗	✗
LVDT	✗	✗	✗	DSI-LVDT
Charge	✗	100 k, 10 k pC	✗	DSI-CHG
TEDS	✓	✓	✗	✓
Isolation voltage	1000 V	1000 V	CAT II 1000 V	1000 V
Power consumption per channel	1.1 W/ch	1.2 W/ch	1 W/ch	1.2 W/ch
Advanced functions	Supports polarized condenser microphones	Sensor error detection in IEPE and CHG mode (injection)	High voltage, high isolation	High sensor power and multi range
(1) Fanless operation only for BNC or Banana version (without excitation)				

5.7. General specification

The general specifications apply to all SIRIUS® measurement slices unless otherwise noted at the specific measurement slice.

Power	
Power Supply	9 - 36 V DC
Power consumption	Typ. 15 - 35 W
Environmental	
Operating Temperature	-10 to 50 °C (40 °C for fanless series)
Storage Temperature	-40 to 85 °C
Humidity	5 to 95 % RH non condensing @ 60 °C
IP rating	IP20 (IP50 for fanless series)
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
Dimensions	266 mm x 149 mm x 55 mm 266 mm x 149 mm x 69 mm (extended slice)
Acquisition rate	
Time base accuracy	Typical 5 ppm, Max: 20 ppm
Synchronisation	
Delay between slices	50 nsec
Max. Sync-cable length	100 m (Master/Slave), 200 m (IRIG)
EtherCAT®: Max. cable length	100 m
Sync Input / Output	
Level (Input/Output)	TTL compatible
Max. Output Current	±24 mA (±50 mA for 1 sec)

5.12. LV / LV+

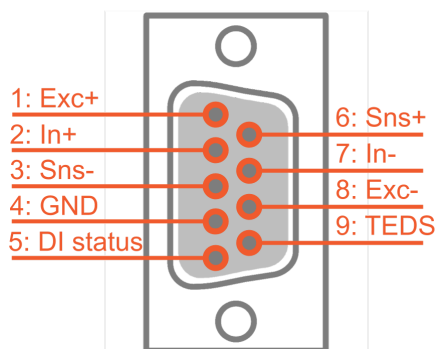
The LV modules are perfect for low voltage and current measurements in combination with current clamps.

5.12.1. LVv2: Specifications

Inputs				
Input types	Voltage Full bridge strain Current (ext. Shunt)			
ADC Type	24-bit delta-sigma dual core with anti-aliasing filter			
Sampling Rate	Simultaneous 200 kS/s			
Voltage Mode				
Dual Core Ranges (Low Range)	±200 V (10 V)	±10 V (500 mV)	±1 V (50 mV)	±100 mV (5 mV)
Gain accuracy	±0.05 % of reading			
Offset accuracy (Dual Core)	±40 (20) mV	±2 (1) mV	±0.2 (0.2) mV	±0.1 (0.1) mV
Offset accuracy after Balance Amplifier	2 mV	0.1 mV	0.02 mV	0.01 mV
Typ. Dynamic Range @ 10 kS/s (Dual Core)	-136 dB (-146 dB)	-137 dB (-152 dB)	-137 dB (-147 dB)	-130 dB (-132 dB)
Typ. Noise floor @ 10 kS/s (Dual Core)	-109 dB (-118 dB)	-109 dB (-126 dB)	-109 dB (-116 dB)	-97 dB (-97 dB)
Typ. CMR @ 50 Hz / 400 Hz / 1 kHz / 10 kHz	70 / 70 / 60 / 55 dB	95 / 95 / 89 / 84 dB	105 / 105 / 100 / 95 dB	115 / 112 / 107 / 102 dB
Gain Drift	Typical 10 ppm/K, max. 30 ppm/K			
Offset Drift	Typical 0.3 µV/K + 5 ppm of range/K, max: 2 µV/k + 10 ppm of range/K			
Gain Linearity	<0.02 %			
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/s and 10 V range)			
Channel Crosstalk	-120 dB @ 10 kHz (range ≤10 V); -95 dB @ 10 kHz (range = 100 V)			
Input Coupling (see 1)	DC, AC 1 Hz (3 Hz, 10 Hz per SW)			
Input Impedance	200 V Range: 1 MΩ; all other ranges 10 MΩ between IN+ or IN- against GND			
Max. common mode voltage	Isolated version ±500 V Differential version: 200 V range: ±200 V; all other Ranges: ±12 V			
Overvoltage Protection	200 V Range: 300 V; all other ranges: 100 V (250 V peak for 10 ms)			
Excitation Voltage				
Excitation voltage	Unipolar or Bipolar Software selectable (programmable with 16-bit DAC)			
Excitation Level unipolar	0...24 Volt; Predefined levels: 1, 2.5, 5, 10, 12, 15 and 24 VDC			
Excitation Level bipolar	2...30 Volt; Predefined levels: 2.5, 5, 10, 12, 15, 24 and 30 VDC			
Accuracy	±0.1 % ±5 mV			
Drift	±50 ppm/K ±100 µV/K			
Stability	10 % to 90 % load (bipolar) <0.01 %			
Current limit	200 mA (2 W max. per channel, 12 W max. per Slice)			

Protection	Continuous short to ground
Bridge connection types	
Bridge type	Full bridge
Ranges @ 10 Vexc(low range)	2 mV/V...1000 mV/V free programmable with Dual Core
Input short, Sensor offset adjust	Software selectable
Counters (only on LV+ type)	
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data Alarm output
Counter modes	Counting, waveform timing, encoder, tacho, gear-tooth sensor
General Counter Specifications	See "SIRIUS counter specifications"
Additional Specifications	
Misc function	Excitation control monitoring, Amplifier Short, Single Ended/Differential
Input connector	DSUB-9, BNC, Banana (others on request)
TEDS support	Standard + DSI® adapters
1) In- must be within ± 10 V referred to GND (iso); for Ranges >10 V the DC value of In- is not rejected	

5.12.2. LV



LV connector: pin-out (DSUB-9 female)



SIRIUSi-8xLV



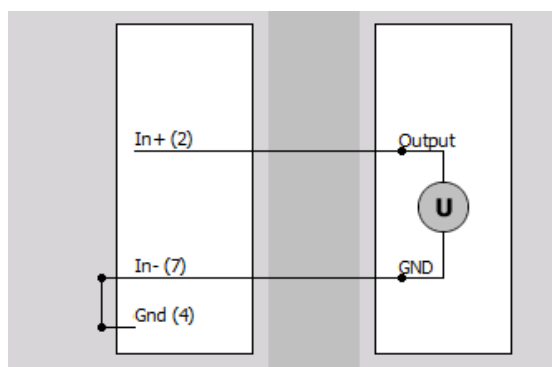
Important

Digital status input

Pin 5: DI Status is used for digital status input: i.e. show alarm status in DewesoftX® when a current clamp is open. See [Current transducers manual](#).

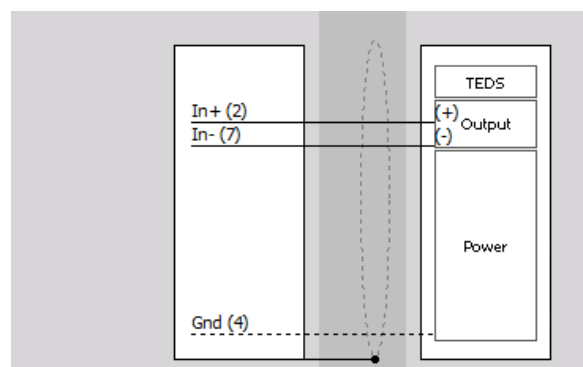
5.12.2.1. LV: Voltage

Voltage - Single ended



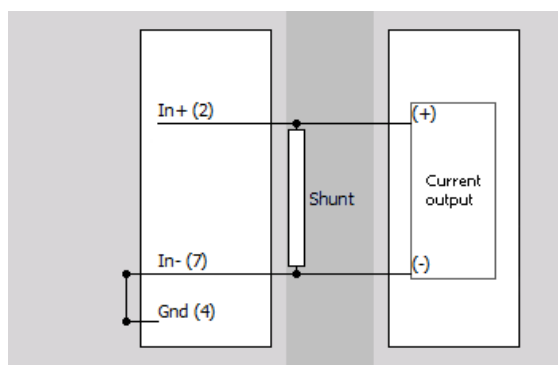
Voltage – Differential

Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.

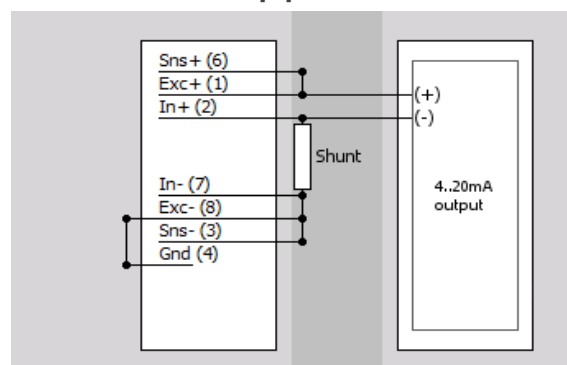


5.12.2.2. LV: Current

External direct shunt

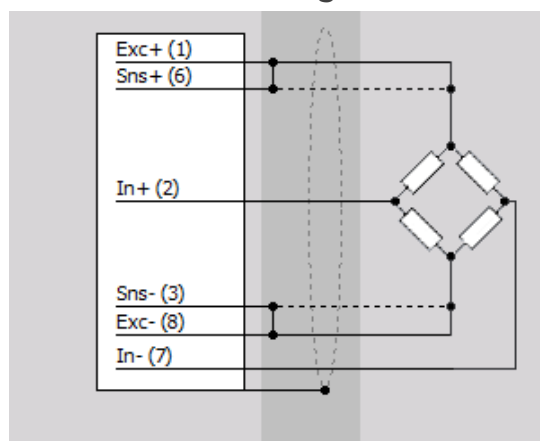


External loop powered shunt



5.12.2.3. LV: Bridge

Full Bridge



5.12.2.3.1. LV: Bridge

Bridge range	Set excitation	Accuracy
2 mV/V	2 V	0.074 % of reading + 50 μ V/V
20 mV/V	2 V	0.22 % of reading + 50 μ V/V
200 mV/V	2 V	0.32 % of reading + 100 μ V/V
1000 mV/V	2 V	0.32 % of reading + 500 μ V/V
2 mV/V	2.5 V	0.072 % of reading + 40 μ V/V
20 mV/V	2.5 V	0.2 % of reading + 40 μ V/V
200 mV/V	2.5 V	0.28 % of reading + 80 μ V/V
1000 mV/V	2.5 V	0.28 % of reading + 400 μ V/V
2 mV/V	5 V	0.069 % of reading + 20 μ V/V
20 mV/V	5 V	0.15 % of reading + 20 μ V/V
200 mV/V	5 V	0.2 % of reading + 40 μ V/V
1000 mV/V	5 V	0.2 % of reading + 200 μ V/V
2 mV/V	10 V	0.071 % of reading + 10 μ V/V
20 mV/V	10 V	0.12 % of reading + 20 μ V/V
200 mV/V	10 V	0.13 % of reading + 100 μ V/V
1000 mV/V	10 V	0.16 % of reading + 100 μ V/V
2 mV/V	15 V	0.073 % of reading + 6.7 μ V/V
20 mV/V	15 V	0.12 % of reading + 14 μ V/V
200 mV/V	15 V	0.13 % of reading + 67 μ V/V
1000 mV/V	15 V	0.14 % of reading + 67 μ V/V
2 mV/V	20 V	0.075 % of reading + 5.0 μ V/V
20 mV/V	20 V	0.11 % of reading + 10 μ V/V
200 mV/V	20 V	0.13 % of reading + 50 μ V/V
1000 mV/V	20 V	0.14 % of reading + 50 μ V/V

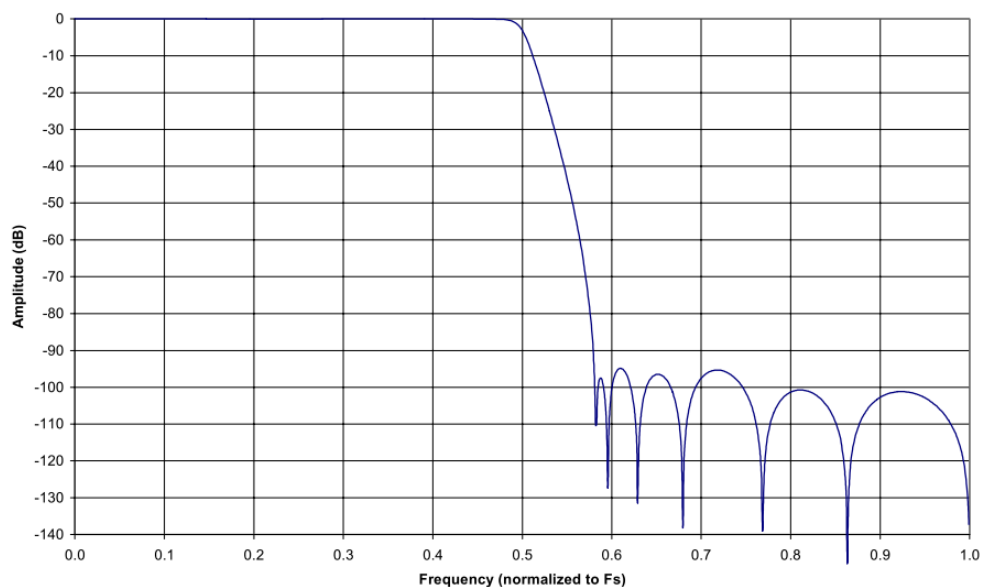
6.1.5.2. ADC digital filter and oversampling

SIRIUS® will automatically adjust the oversampling depending on the sample rate.

The digital filter cut off frequency is automatically set to half of the sample rate and the internal sampling frequency is up to 256 times higher than the output rate:

Digital Filter (vs. Sample Rate)	0.1 ... 51.2 kS/s	51.2 ... 102.4 kS/s	102.4 ... 204.8 kS/s
Bandwidth (-3 dB)	DC to 0.494 fs	DC to 0.49 fs	DC to 0.38 fs
Passband (-0.1 dB)	DC to 0.47 fs	DC to 0.45 fs	DC to 0.24 fs
Passband Ripple	-0.035 to +0.01 dB	-0.035 to +0.01 dB	-0.035 to +0.01 dB
Alias-free Bandwidth	DC to 0.42 fs	DC to 0.32 fs	DC to 0.22 fs
Alias Rejection	-95 dB	-92 dB	-97 dB
Delay through ADC	12 / fs	9 / fs	5 / fs
Oversampling	256	128	64

The filter characteristics of the digital ADC filter will also change automatically depending on the sample rate.



Sample rate 100 Hz to 51.2 kHz stopband rejection