

SIRIUS®

 **DEWESoft®**

TECHNICAL REFERENCE MANUAL

SIRIUS® V25-1



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

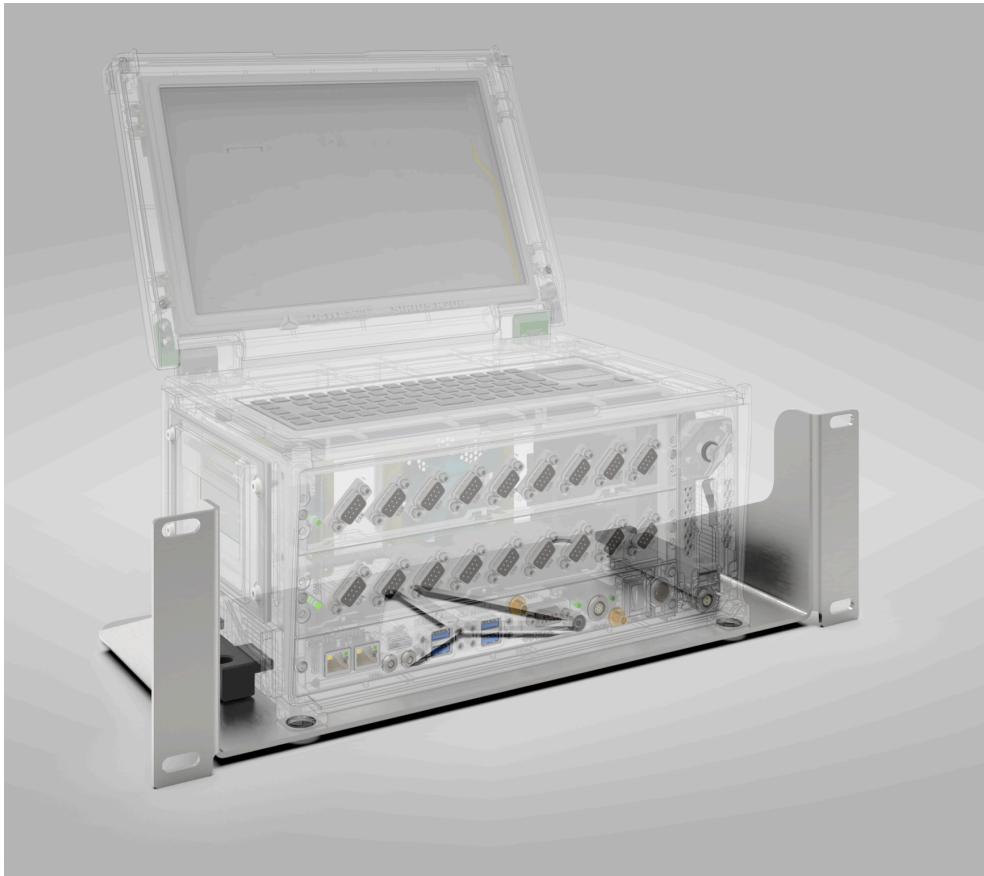
The optional analog output version of the SIRIUS Single Slice has 8 additional BNC connectors for the analog output channels on the rear side (for detailed information see chapter: Analog out option).



Rear side connectors of the analog-out version

4.3.3. 19" Mounting Kit for SIRIUS R1x, R2x

We have a mounting kit available and it fits R1DB, R1B, R2DB, R2B, R2D.



R2DB mounted on 19" mounting kit

4.3.4. USB hubs vs. native ports

USB, short for Universal Serial Bus, is an industry standard that defines the cables, connectors and communications protocols.

USB 2.0 has a theoretical maximum bandwidth of 480 Mbit/s (High Speed or High Bandwidth). Due to bus access constraints, the effective throughput of the High Speed signalling rate is limited to about 30 MB/s.

The SIRIUS slices use the USB 2.0 protocol for communication to the PC/SBOX and they have USB Type A receptacles. This is enough, even for 8 SIRIUS high-speed channels @ 1MS/s.

USB 3.0 a new SuperSpeed transfer mode, with associated new backwards-compatible plugs, receptacles, and cables. The SuperSpeed plugs and receptacles have blue inserts (in comparison to the black ones of USB 2.0). The theoretical maximum data signalling rate of the new SuperSpeed mode is 5.0 Gbit/s. However the specification considers it reasonable to achieve only around 3.2 Gbit/s (0.4 GB/s or 400 MB/s).

4.4. Connectors

4.4.1. General

4.4.1.1. USB Connector

USB connectors are used by:

- SIRIUS® measurement slices to transfer the measurement data to the SBOX (or PC)
- SIRIUS® SBOX: to connect SIRIUS® USB slices or other USB devices. The USB connector can transfer data and provide power to connected devices (5 VDC)

SIRIUS® SBOX: to connect SIRIUS® USB slices or other USB devices. The USB connector can transfer data and provide power to connected devices (5 VDC)

USB 2.0 has a maximum signaling rate of 480 Mbit/s (High Speed or High Bandwidth).
The below Illustrations show Mini and Standard size USB 2.0 sockets.



USB 2.0 Mini



2x USB 2.0

USB 3.0 "SuperSpeed" has backwards-compatible plugs, receptacles, and cables. SuperSpeed plugs and receptacles are identified with a distinct logo and blue inserts in standard format receptacles.



Hint

DewesoftX® USB cables have thumb screws to the right and left of the connector so that you can firmly secure the USB cable.



2x USB 3.0

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).



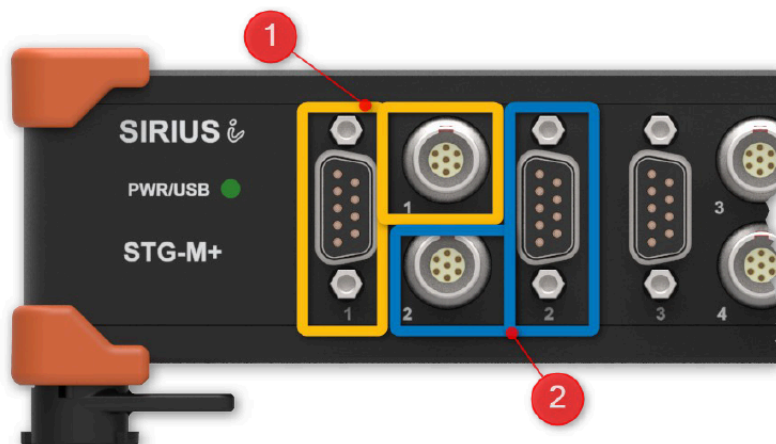
Important

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

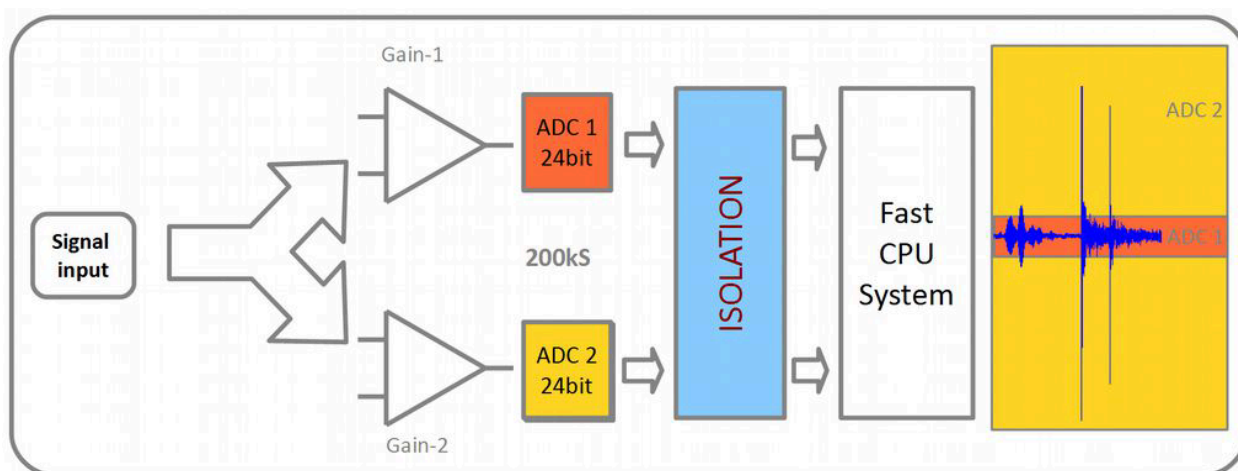
The EtherCAT version of SIRIUS works with a range of 9 - 36V, and not up to 48V, even though the range is up to 48V for other product lines with EtherCAT.



SIRIUSi-STGM+ module

5.2.1. SIRIUS® DUAL CORE series: high dynamic (up to 160 dB)

This new technology solves the often faced problem, that the signal is just much higher than expected and therefore clipped. Dewesoft DUAL CORE ADC technology always gives you the full possible measuring range, because the signal is measured with a high and a low gain at the same time.

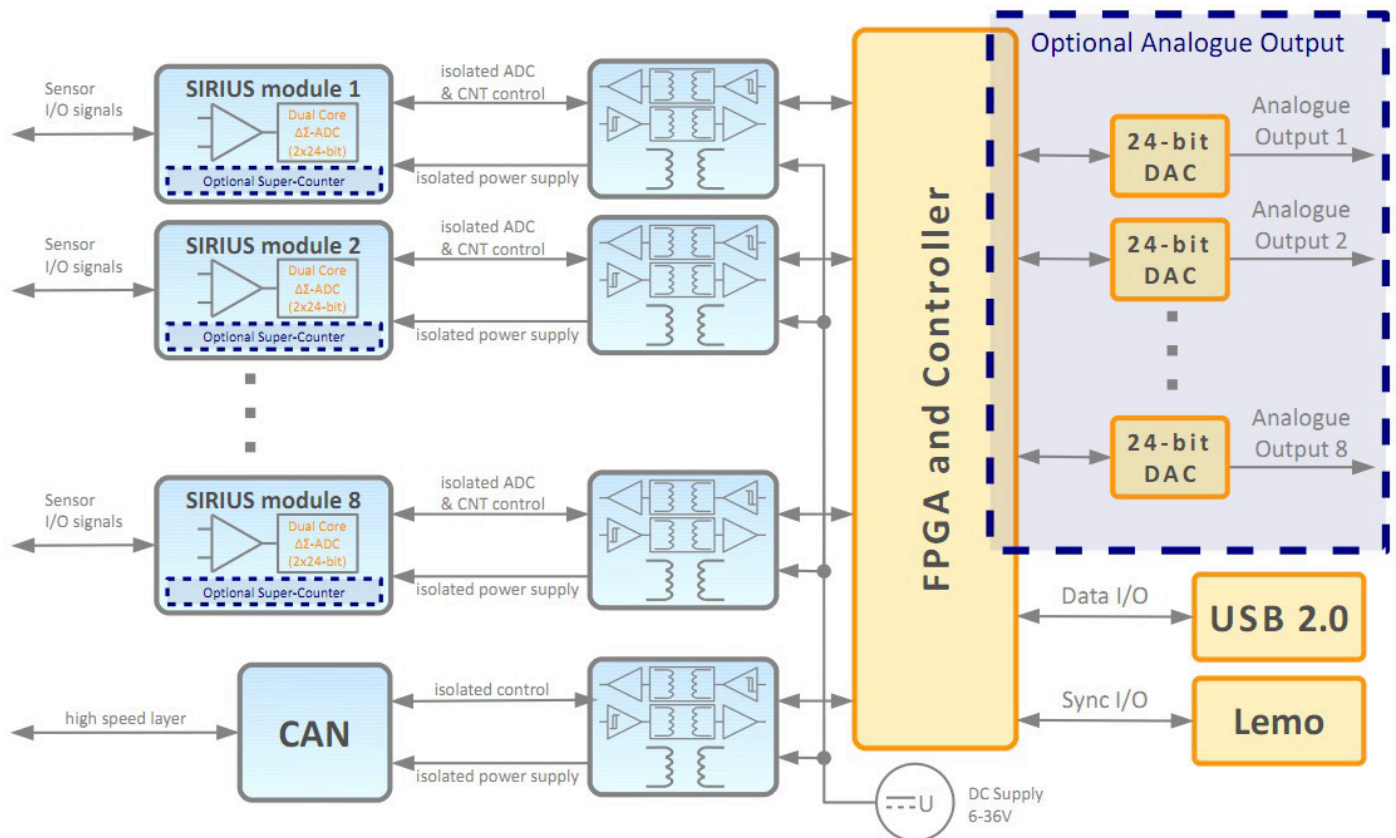


SIRIUS Dual Core

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.

5.3. SIRIUS® slice configuration

SIRIUS is available in different versions and enclosures: as a standalone single slice or integrated in a Boxed Solution, Rack, etc.

5.3.1. Standard slice

5.3.1.1. SIRIUSi 8xACC



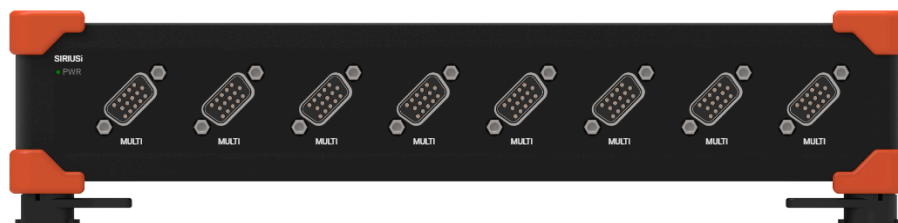
SIRIUSi-8xACC

5.3.1.2. SIRIUSi 6xACC, 2xACC+



SIRIUSi-6xACC-2xACC+

5.3.1.3. SIRIUSi 8xMULTI



SIRIUSi-8xMULTI

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)					

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)

5.13. MULTI

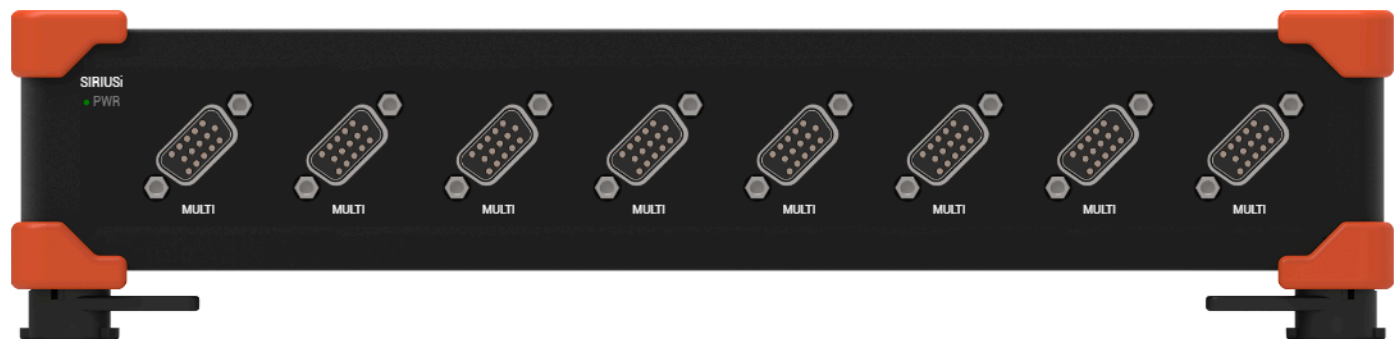
The MULTI modules are perfect for multi-purpose analog in/out and digital/counters.

5.13.1. MULTI: Specifications

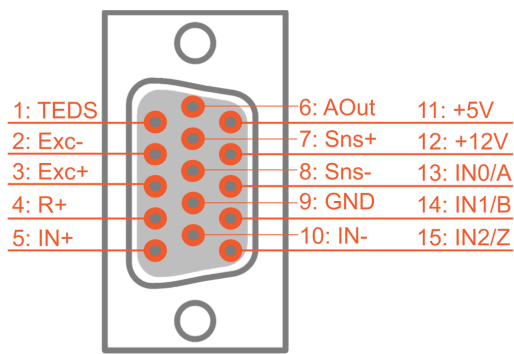
Inputs				
Input types	Voltage Full / Half / Quarter bridge strain (120 Ω and 350 Ω)			
ADC Type	24-bit delta-sigma dual core with anti-aliasing filter			
Sampling Rate	Simultaneous 200 kS/s			
Voltage Mode				
Dual Core Ranges (Low range)	±10 V (±500 mV)	±1 V (50 mV)	±100 mV (±5 mV)	±50 mV (±2.5 mV)
Gain accuracy	±0.05 % of reading			
Offset accuracy (Dual Core)	±10 (5) mV	±1 (0.5) mV	±0.2 (0.2) mV	±0.2 (0.2) mV
Offset accuracy after Balance Amplifier	0.2 mV	0.02 mV	0.02 mV	0.02 mV
Typ. Dynamic Range @ 10 kS/s (Dual Core)	-137 dB (-152 dB)	-137 dB (-147 dB)	-135 dB (-137 dB)	-133 dB (-133 dB)
Typ. Noise floor @ 10 kS/s (Dual Core)	-105 dB (-121 dB)	-104 dB (-111 dB)	-100 dB (-101 dB)	-95 dB (-95 dB)
Typ. CMR @ 400 Hz / 1 kHz	86 / 84 dB	96 / 95 dB	112 / 102 dB	112 / 102 dB
Gain Drift	Typical 10 ppm/K, max. 40 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)			
Channel Crosstalk	-120 dB @ 10 kHz			
Input Coupling	DC			
Input Impedance	10 MΩ			
Max. Common Mode Voltage	Isolated version: ±500 V Differential version: ±12 V			
Overvoltage Protection	In+ to In-: 50 V continuous; 200 V peak (10 ms)			
Excitation Voltage				
Excitation Voltage	Free programmable (16-bit DAC)			
Predefined levels	0, 1, 2.5, 5, 10 and 12 VDC			
Accuracy	±0.1 % ±10 mV			
Drift	±50 ppm/K ±100 μV/K			
Load stability	0 % to 100 % load <0.01 %			
Current limit	45 mA (max. 400 mW)			
Protection	Continuous short to ground			
Additional Fixed Excitations	DSUB-15: 12 V (max. 50 mA); 5 V (max. 100 mA) Accuracy 5 % 16-pin LEMO-2B: +/- 14.5 V (max. 50 mA); 5 V (max. 100 mA) Accuracy 5 %			
Bridge Connection Types				

Bridge Types	Full / Half / Quarter bridge (3-wire)
Ranges	2 mV/V...1000 mV/V free programmable with Dual Core
Internal Bridge Completion	½ bridge 1 kΩ and ¼ bridge 120 Ω and 350 Ω
Typ. Bridge Completion Accuracy	0.05 %; TCR: 5 ppm/K (others on request)
Internal Shunt Resistor	59.88 kΩ, software selectable (others on request)
Typ. Shunt Resistor Accuracy	0.05 %; TCR: 10 ppm/K (others on request)
Input Short, Sensor Offset Adjust	Software selectable
Counters	
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data
Counter Modes	counting, waveform timing, encoder, tacho, gear-tooth sensor
Input Level Compatibility	CMOS, LVTTTL (protected up to ±25 Volt continuous)
Analog Out	
Overall information	1 channel, 24-bit sigma delta 200 kHz, ±10 V
Accuracy	±0.1 % of reading ±0.02 V
Analogue out bandwidth	40 kHz
Temperature Drift	±50 ppm/K of reading ± 200 μV/K
Output Impedance	<10 Ω
Maximum Output Current / Load	20 mA / >1000 Ω
Output Protection	Continuous short to ground
Additional Specifications	
Input connector	DSUB-15, 16-pin LEMO-2B (others on request)
TEDS support	Standard + DSI® adapters

5.13.2. MULTI



SIRIUSi-8xMULTI



MULTI connector: pin-out (DSUB-15)

Pin	Name	Description
1	TEDS	TEDS
2	Exc-	Excitation -
3	Exc +	Excitation +
4	R+	¼ Bridge/Shunt
5	In+	Input +
6	Aout	analog output
7	Sns+	Sense +
8	Sns-	Sense -
9	GND	Ground
10	In-	Input -
11	+5V	+5V supply
12	+12V	+12V supply
13	IN0/A	Counter input IN0/A
14	IN1/B	Counter input IN1/B
15	IN2/Z	Counter input IN2/Z

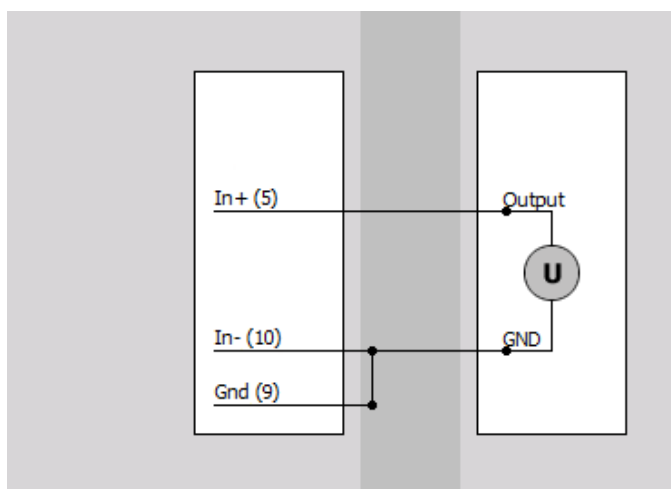


Hint

You can use the analog input, analog output and counters at the same time.

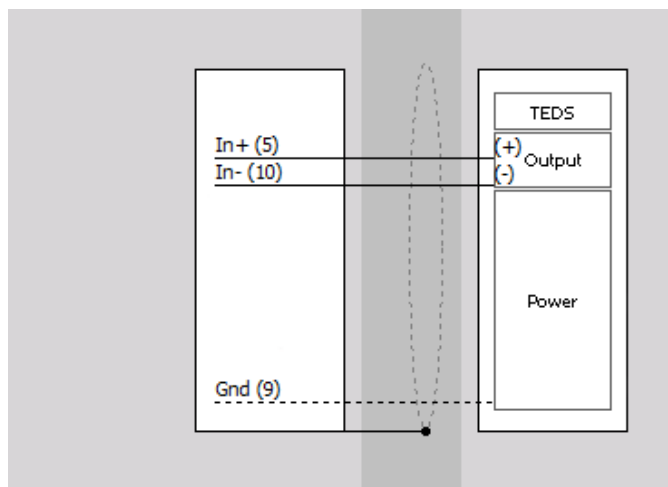
5.13.2.1. MULTI: Voltage

Voltage - Single ended



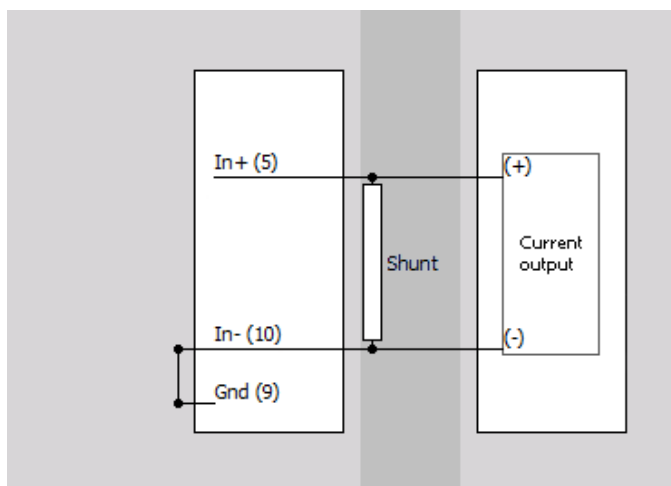
Voltage - Differential

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

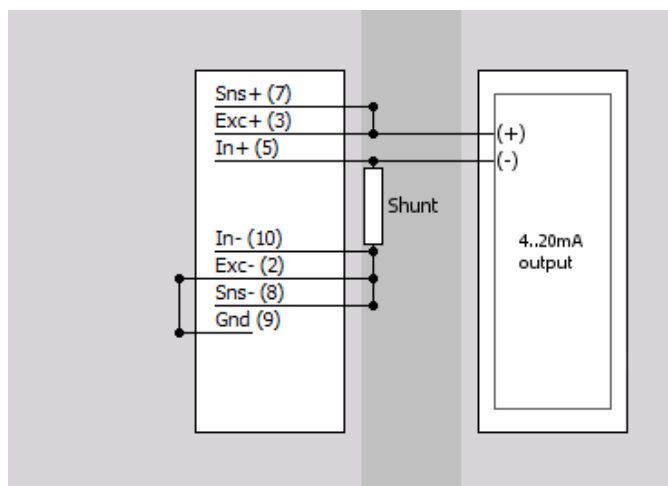


5.13.2.2. MULTI: Current

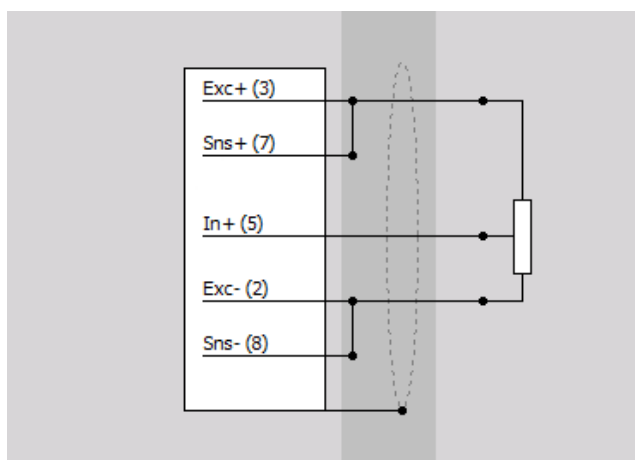
External direct shunt



External loop powered shunt

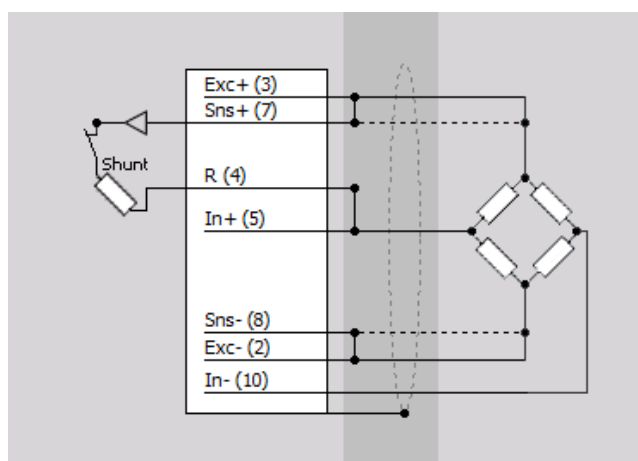


5.13.2.3. MULTI: Potentiometer

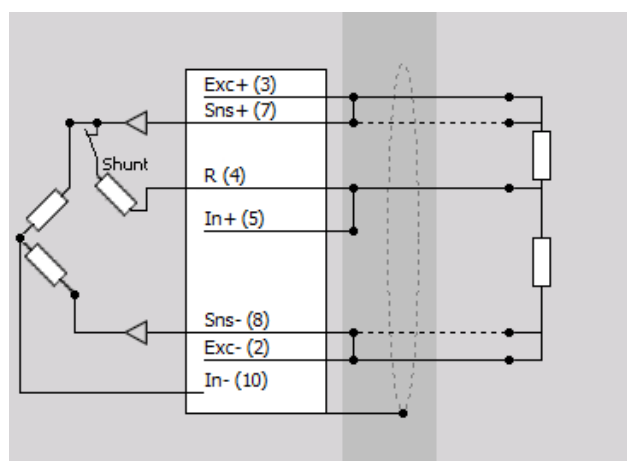


5.13.2.4. MULTI: Bridge

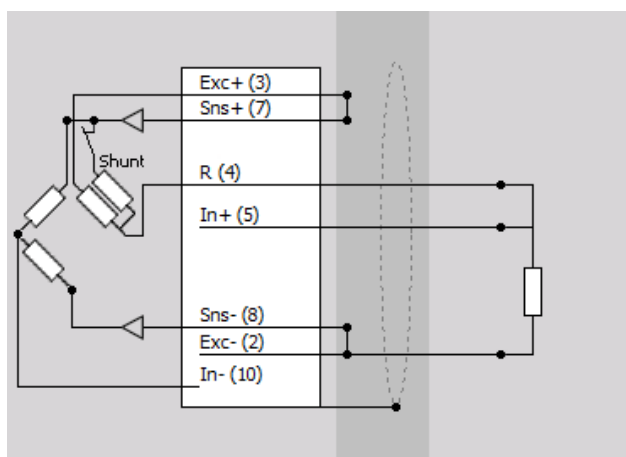
Full bridge



Half bridge



Quarter bridge – 3 wire



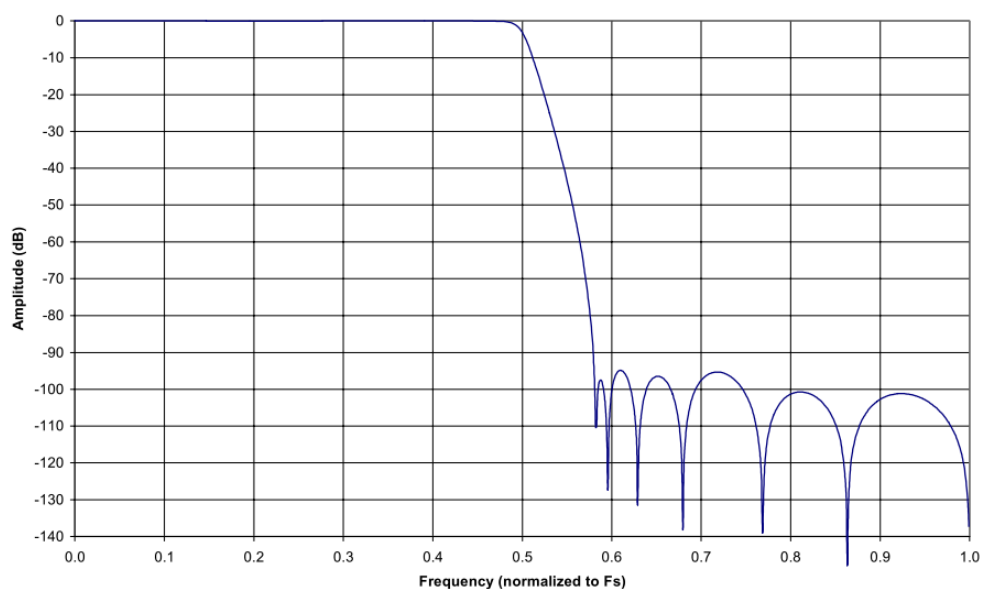
6.1.5.2. ADC digital filter and oversampling

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

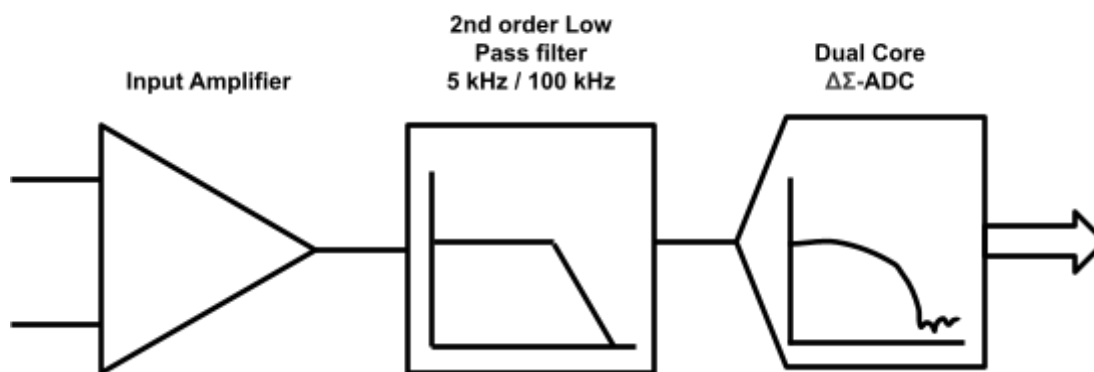
The filter characteristics of the digital ADC filter will also change automatically depending on the sample rate.



Sample rate 100 Hz to 51.2 kHz stopband rejection

6.1.5.3. Overall alias free bandwidth

Alias Free analog measurement bandwidth or combined filter response from Analog filter and ADC filter response is again presented in illustration below "Filtering components in SIRIUS® DualCore and HD modules".



Filtering components in SIRIUS® DualCore and HD modules



Important

Analog filter (-3 dB):

- 5 kHz up to 2 kS/s
- 100 kHz from 2 kS/s up to 204.8 kS/s

Digital filter (-3 dB):

- 0.494 fs up to 51.2 kS/s
- 0.49 fs from 51.2 kS/s up to 102.4 kS/s
- 0.38 fs from 102.4 kS/s up to 204.8 kS/s