

SIRIUS®

 **DEWEsoft®**

TECHNICAL REFERENCE MANUAL

SIRIUS® V25-1



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.



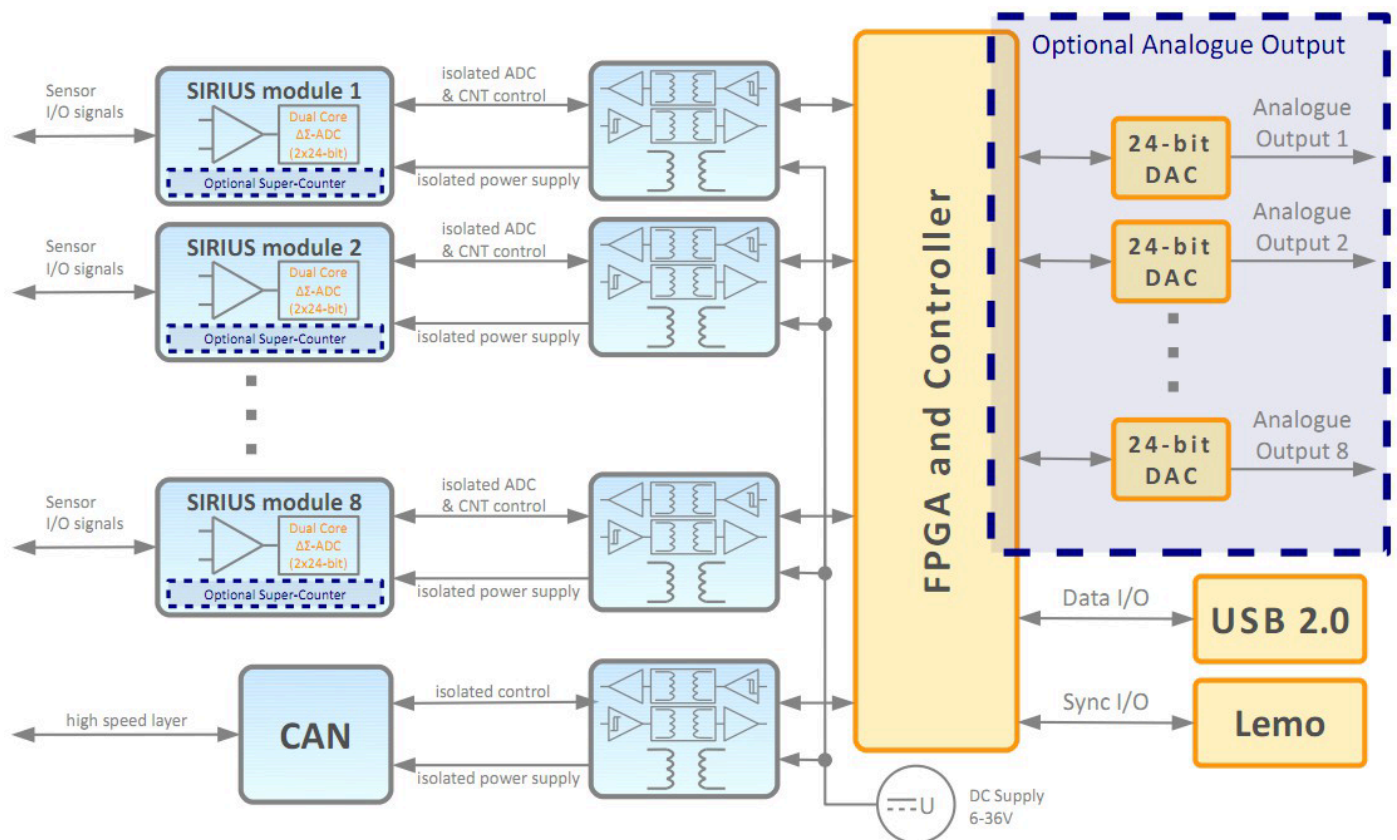
Important

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.

	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)

5.10. CHG / CHG+

The CHG modules are perfect for charge measurements and also sound and vibration IEPE channels.

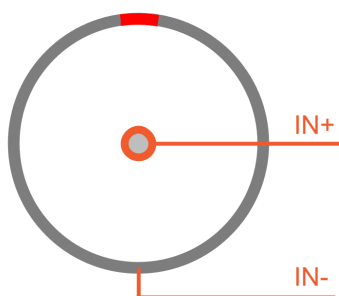
5.10.1. CHG: Specifications

Inputs		
Input types	Voltage IEPE Charge	
ADC Type	24-bit delta-sigma dual core with anti-aliasing filter	
Sampling Rate	Simultaneous 200 kS/s	
Voltage Mode		
Ranges (Dual Core Low Range)	±10 V (500 mV)	±500 mV (NA)
Input Accuracy (Dual Core)	±0.05 % of reading ±5 (0.5) mV	±0.05 % of reading ±0.5 mV
Typ. Dynamic Range @ 10kS/s (Dual Core)	-140 dB (-155 dB)	-130 dB (NA)
Typ. Noise floor @ 50 kS/s (Dual Core)	-107 dB (-124 dB)	-98 dB (NA)
Typ. CMR @ 50 Hz / 1 kHz	140 dB / 120 dB	140 dB / 120 dB
Gain Drift	Typical 10 ppm/K, max. 30 ppm/K	
Offset Drift	Typical 1 µV/K + 5 ppm of range/K, max 5 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	-180 dB @ 50 Hz; -160 dB @ 1 kHz	
Input Coupling	DC, AC (0.1 Hz, 1 Hz, 10 Hz or 100 Hz)	
Input Impedance	1 MΩ in parallel with 100 pF	
Overvoltage Protection	In+ to In-: 50 V continuous; 200 V peak (10 ms)	
IEPE Mode		
Excitation	4, 8 or 12 mA	
Compliance voltage	25 Volt	
Output Impedance	>100 kΩ	
Sensor detection	Shortcut: <4 Volt; Open: >19 Volt	
Input Coupling	0.01 Hz, 0.03 Hz, 0.1 Hz, 0.5 Hz, 1 Hz, 10 Hz or 100 Hz	
Charge Mode		
Charge ranges (Low Range)	±100 000 pC (5000 pC)	±10 000 pC (500 pC)
Input accuracy (HPF 0.1 Hz)	±0.5 % of reading ±20 pC	±0.5 % of reading ±5 pC
Typ. Dynamic Range @ 10 kS/s (Dual Core)	-130 dB (-150 dB)	-120 dB (-140 dB)
Typ. Noise floor @ 50 kS/s (Dual Core)	107 dB (120 dB)	105 dB (118 dB)
Input coupling	0.01 Hz, 0.03 Hz, 0.1 Hz, 0.5 Hz, 1 Hz, 10 Hz or 100 Hz	
Charge injection	1 Vrms, 20 Hz, 0.5 % accuracy	
Counters (only in CHG+ type)		
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data	
Counter modes	counting, waveform timing, encoder, tachometer, gear-tooth sensor	
General counter specifications	See "SIRIUS counter specifications"	

Additional specifications

Input connector	BNC or TNC (others on request)
TEDS support	IEPE mode only

5.10.2. CHG



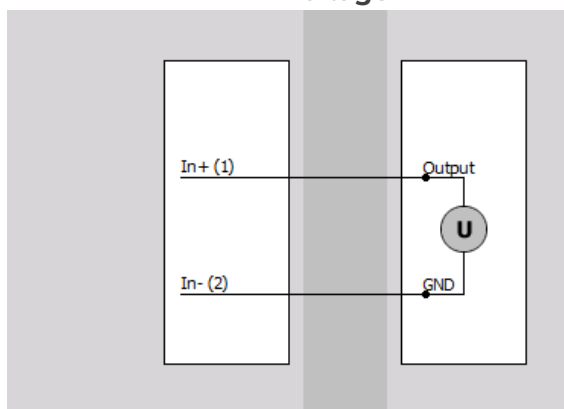
CHG connector: pin-out (BNC)



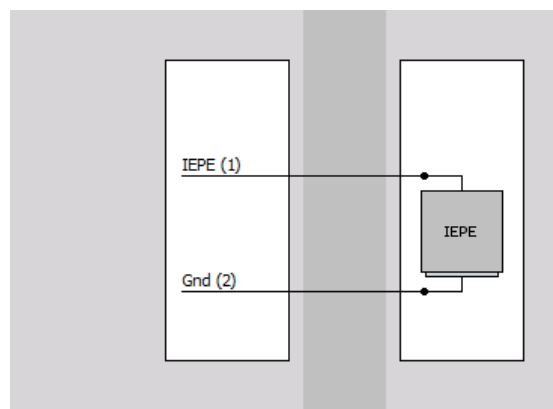
SIRIUSi-8xCHG

5.10.2.1. CHG: Voltage, IEPE, Charge

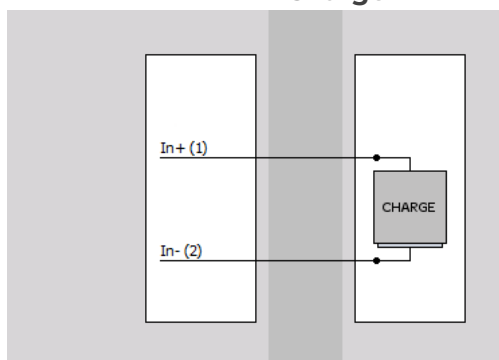
Voltage



IEPE



Charge



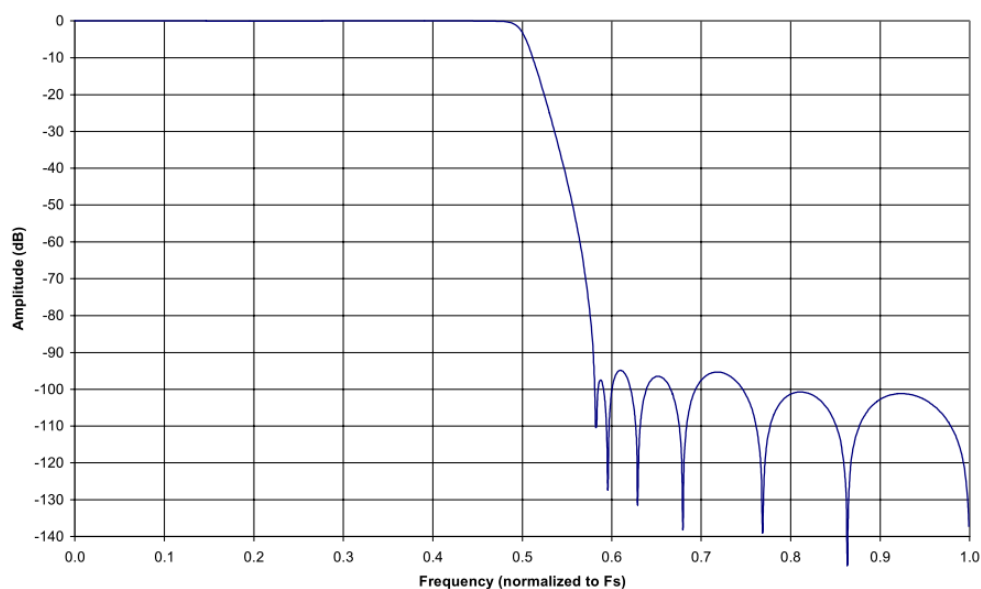
6.1.5.2. ADC digital filter and oversampling

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