DIGITAL INDUSTRIES SOFTWARE

Simcenter SCADAS Mobile Eight-channel Durability Input Module

Simcenter/DB8III & DB8IIIc/2406/20240625

Product Information Sheet

Summary

In a single Simcenter SCADAS Mobile slot, the eight-channel DB8III(c) supports multiple signal conditioning, A/D conversion and signal processing offering a unique combination of strain, vibration, displacement, pressure measurements and so on in one single module. DB8III(c) is the most versatile solution for multi-physics measurement campaigns.

Supported transducers

Typical applications

BENEFITS

- Multiple signal conditioners per channel allow assigning each input channel to support a variety of sensors
- Continuous ICP & bridge cable monitoring and detection for open loop and short circuit

FEATURES

- AC, DC and ICP coupled voltage input
- ICP® input such as accelerometers, load cells
- DC bridge supporting Wheatstone bridge type sensors such as strain gages in full, half and quarter bridge configurations, DC accelerometer / pressure transducers
- Carrier frequency (AC bridge) supporting strain gages in full, half and quarter bridge configurations and inductive half bridge

Signal conditioning
Multiple signal conditioners per channel allow assigning each input channel to support a variety of sensors.

- DC coupled voltage input
- ICP® input such as accelerometers, load cells, strain gauges
- DC bridge supporting Wheatstone bridge type sensors such as strain gauges in full, half and quarter bridge configurations, DC accelerometer/pressure transducers
- Carrier frequency (AC bridge) supporting strain gages in full, half and quarter bridge configurations and inductive half bridge
- Active sensors such as MEMS or variable capacitance
- LVDT sensors to measure displacement or rotation
- Potentiometers to measure linear displacement
- 4-20 mA transmitters for measuring pressure or temperature (SCX-CAS10 cable requires)
- TEDS class 1 (ICP sensors) and TEDS class 2 (DC sensors) is supported according to IEEE 1451.4 standard.

Analog to digital conversion
The DB8III(c) employs low-power high performance 24-bit sigma-delta analog to digital converters with a maximum bandwidth of 5 kHz. A four-pole analog anti-alias filter precedes each ADC. A selectable range of 150 dB/oct. digital decimation filters reduce the bandwidth in steps of 2 and 2.5, providing a guaranteed alias suppression of 100 dB in all measurement bandwidths.

Signal processing
The DB8III(c) is equipped with a low-power high-performance DSP and integrated memory for decimation, on-line calibration and online broadband RMS calculation, independent of the number of channels.

Anomaly detection & indication
Overload and underload will be detected on digital data sampled at ADC sampling rate prior to decimation; the input signals are band limited by nature (strain gauges or DC accelerometers). Channel and module power consumption are checked for bridge-based sensors and active sensors. In case available budgets are exceeded, either the channel or module power overload is indicated through the channel LED's.

Product Information Sheet

General information	DB8III and DB8IIIc specifications
Product name	SCM-DB8III, SCM-DB8IIIc
Description	LMS SCADAS 8 channel V/ICP and Bridge Input Module
Inputs	Eight (8) time-sychronous bridge or V/ICP inputs
Input ranges differential input	±10V, ±3.16V, ±1V, ±0.316V, ±0.1V, ±0.0316V
Input ranges V/ICP input	±10V, ±3.16V, ±1V, ±0.316V
Digital interface	-
Outputs	-
Transducer connector	Eight (8) 7 pin LEMO 0B connector
Supported transducers	
	Full, half and quarter bridge strain gauge configurations Bridge based transducers (force, pressure, torque, acceleration) AC or DC coupled sensors Voltage ICP AC-LVDT Active sensor 4-20 mA transmitter (requires SCX-CAS10 cable) Potentiometers
A/D Converter	
Max. sampling rate	DB8III: 102.4 kHz, can be downsampled in steps of 2 and 2.5 DB8IIIc: 51.2 kHz, can be downsampled in steps of 2 and 2.5
Max. bandwidth (filter off, -3 dB)	DB8III: 5 kHz; DB8IIIc: 5 kHz (fixed lowpass filter of type Bessel or Butterworth, order 2, 4, 6, 8 or 10)
ADC Architecture	24 bit Sigma Delta ADC
Coupling	DC, AC, ICP
Filter	
High Pass Filter	Software selectable high pass filter with 0.5 Hz cut off frequency
AC Coupling	Hardware AC coupling 0.48 Hz ±3%
Decimation filter	Reduces bandwidth prior to signal processing; bandwidth can be down-sampled in steps of 2 and 2.5.
Analog anti-alias filter	4-pole Equal Time Delay filter with 164 kHz cut-off frequency and 0.01 dB flatness, 150 dB/oct digital filter with 100 dB alias protection provides an alias free bandwidth of 5 kHz
Transducer identification	

TEDS	TEDS class 1 (ICP sensors) and TEDS class 2 (Bridge sensors) supported according to IEEE 1451.4 (with reversed polarity) Maximum TEDS length is 80 m
Power	
Power consumption/power budget	7 W available for the module and the sensors (during normal operation, no overload and ICP supply switched on). **Note:** Due to the power budget required by the DB8III module, it is not possible to use more than 8x DB8III modules in a single 9-slots SCM2E09 or SCR2E09 frame with a SCM-MS module. The remaining slot should be left empty. On all other frame types (SCM2E01, SCM2E02, SCM2E05, SCR2E01, SCR2E02, SCR2E05 and secondary frames SCM03S, SCM06S, SCM10S there is no limitation on the number of DB8III modules). LED on the module front panel, providing information on connection, power status and any sensor supply overload/underload. During system booting and startup, the LED on channel 1 will be used to indicate module status (active) using a different LED color and/or blinking pattern.
Power feedback	LED on the module front panel, providing information on connection, power status and any sensor supply overload/underload. During system booting and startup, the LED on channel 1 will be used to indicate module status (active) using a different LED color and/or blinking pattern.
Bridge DC supply	±1.25 V, ±2.5 V or ±5 V
Bridge current supply	The maximum bridge supply current is 21 mA supporting the following bridge configurations: **±1.25 V:** 120 Ω or 350 Ω full, half or quarter bridge **±2.5 V:** 350 Ω full, half or quarter bridge, 120 Ω half bridge or quarter bridge **±5 V:** 350 Ω half or quarter bridge
Bridge AC supply	Carrier frequency supply: Symmetrical sine-wave drive voltage of 1Vrms or 2.5Vrms & carrier frequency of 3.2 kHz and band width of 800Hz, fully synchronized drive signals
ICP sensor supply	3.5 mA better than from 28 V source
Active sensor supply	+14V DC; maximum current is 20 mA per channel or 80 mA for three triax sensor
Activated channels 1 2 3 4	On all other frame types (SCM2E01, SCM2E02, SCM2E05, SCR2E01, SCR2E02, SCR2E05 and secondary frames SCM03S, SCM06S, SCM10S there is no limitation on the number of DB8III modules).
Input impedance	
Single ended mode	1 MΩ / 220pF
ICP mode (AC)	523 KΩ / 220 pF
Bridge mode (DC)	50 MΩ / 500 pF

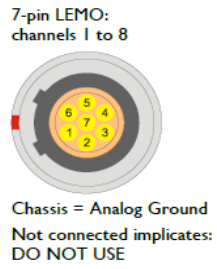
Slew rate		
V/ICP (single ended)	20V/µs	
Differential input	2V/µs	
Noise and distortion - better than		
Peak-to-peak noise (1/f)	Better than 0.5 µV (typical 0.3µV) between 0.1Hz and 10Hz in ±100 mV input range	
Signal to noise ratio (SNR)	**Differential input (typical)**	**Single ended input (typical)**
±10 V	110 dB	110 dB
±3.16 V	105 dB	110 dB
±1 V	105 dB	110 dB
±0.316 V	100 dB	105 dB
±0.1 V	90 dB	-
±31.6 mV	80 dB	-
	Measured between 100Hz to 20KHz, with 51k block size, 16 averages	
Common mode rejection (CMMR)	**Differential input (typical)**	**Single ended input (typical)**
±10 V	95 dB	-
±3.16 V	95 dB	-
±1 V	110 dB	-
±0.316 V	110 dB	-
±0.1 V	120 dB	-
±31.6 mV	120 dB	-
Spurious Free Dynamic Range (SFDR)	**Differential input (typical)**	**Single ended input (typical)**
±10 V	150 dB	150 dB
±3.16 V	145 dB	150 dB
±1 V	145 dB	150 dB
±0.316 V	135 dB	145 dB
±0.1 V	130 dB	-
±31.6 mV	120 dB	-
	Between 20Hz and 20kHz, measured with block size of 51200 and 1Hz bins, Auto Power Spectrum after 16 averages	
Crosstalk	**Differential input (typical)**	**Single ended input (typical)**
±10 V	125 dB	115 dB
±3.16 V	125 dB	115dB
±1 V	130 dB	115 dB
±0.316 V	130 dB	115 dB
±0.1 V	130 dB	-

±31.6 mV	130 dB	-
	Measured at 1.5 kHz between any two channels	
Total Harmonic Distortion (THD)	**Differential input (typical)**	**Single ended input (typical)**
±10 V	80 dB	110 dB
±3.16 V	85 dB	105 dB
±1 V	105 dB	105 dB
±0.316 V	100 dB	100 dB
±0.1 V	105 dB	-
±31.6 mV	105 dB	-
Amplitude accuracy	**Differential input (typical)**	**Single ended input (typical)**
	At 1 kHz better than +/- 0.1% at 23 °C	
Residual offset	**Differential input (typical)**	**Single ended input (typical)**
	Better than 0.1% at 22°C ± 2°C	
Gain drift at SCADAS operating temperature range	**Differential input (typical)**	**Single ended input (typical)**
±10 V, ±3.16 V, ±1 V, ±0.316 V	10 ppm/°C	8 ppm/°C
±0.1 V, ±31.6 mV	20 ppm/°C	-
Bridge supply drift	**Differential input (typical)**	**Single ended input (typical)**
1 V (±0.5 V)	7 ppm/°C	25 ppm/°C
2.5 V (±1.25 V), 5 V (±2.5 V), 10 V (±5 V)	7 ppm/°C	15 ppm/°C
Bridge supply accuracy	0.1%	
Offset drift	**Differential input (typical)**	**Single ended input (typical)**
±10 V	5 µV/°C	5 µV/°C
±3.16 V	2 µV/°C	2 µV/°C
±1 V	0.5 µV/°C	0.5 µV/°C
±0.316 V	0.3 µV/°C	0.2 µV/°C
±0.1 V	0.1 µV/°C	-
±31.6 mV	0.1 µV/°C	-
Phase match between any two channels (at 1 kHz, without low pass filter delay)	**Differential input (better than)**	**Single ended input (better than)**
±10 V, ±3.16 V, ±1 V, ±0.316 V	0.05°	0.03°
±0.1 V, ±31.6 mV	0.3°	-
Strain gauge and Wheatstone bridge conditioning		

Conditioning	Full bridge (4 and 6 wires), half bridge (3 and 5 wires) and quarter bridge (3 and 4 wires). The 4 wire quarter bridge mode supports multicore cable lead wire compensation with excitation tracking.		
Internal completion resistors	120 Ω±0.02 % and 350 Ω±0.02 % (with 2 ppm/k) for quarter bridges; for half bridges the completion resistors above 2 kΩ		
Shunt calibration	By 2 resistors between the positive or negative supply sense line and the +Input or -Input; shunt calibration resistors are available in 50 kΩ and 100 kΩ (±0.12 %).		
DC bridge mode	**Full (1/1) bridge**	**Half (1/2) bridge**	**Quarter (1/4) bridge**
Selectable supply with 120 Ω	0 V 1 V (±0.5 V) 2.5 V (±1.25 V) -	0 V 1 V (±0.5 V) 2.5 V (±1.25 V) 5 V (±2.5 V)	0 V 1 V (±0.5 V) 2.5 V (±1.25 V) 5 V (±2.5 V)
Selectable supply with 350 Ω	0 V 1 V (±0.5 V) 2.5 V (±1.25 V) 5 V (±2.5 V) -	0 V 1 V (±0.5 V) 2.5 V (±1.25 V) 5 V (±2.5 V) 10 V (±5 V)	0 V 1 V (±0.5 V) 2.5 V (±1.25 V) 5 V (±2.5 V) 10 V (±5 V)
Protection			
Input protection	All input pins are protected against ±40 V peak (28V RMS) overvoltage (without damage). Other pins (supply, sense) are not protected against overvoltage.		
Sensor check	Detection threshold depends on bridge supply voltage (AC or DC), quantization errors and tolerances on electronic components. The combination of supply voltage and resistance requires a current which is above the detection threshold of 0.4 mA.		
	Overload (prior to decimation)		
	Under load (currents below 1mA) on full, half and quarter bridges		
	Power overload: channel power exceeded (per channel), module power exceeded (all channels exceeding module power)		
ESD protection	According to EN61000-4-2, level 2 and ISO10605		
EMC protection	Comply with CE-EMC directive, when installed in a SCADAS Mobile frame		
Overload detection and indication	Analog overload detection at the input is combined with digital overload detection after the ADC; overloads are indicated on the front panel LED and transmitted to the host.		
Error detection methods	**Error**	**LED**	**Effect on the module**
	Signal overload	RED	N/A
	ICP broken cable	RED/YELLOW	N/A
	ICP short circuit	RED/YELLOW	N/A
	Bridge or active sensor broken cable	RED/YELLOW	N/A

	Bridge/Active Sensor power overload	RED/YELLOW	Bridge supply or active sensor supply is switched off
	Module power overload	WHITE (*) *Note: in case of power overload, the first channel causing the overload and all subsequent channels will have the same LED indication	Bridge supply or active sensor supply is switched off
Shock protection	MIL-STD-810G 60 gpk applying an 11 ms saw tooth shock pulse, three shock per direction;		
Vibration protection	MIL-STD-810G (2-2000Hz random, 7.7grms)		
Ambient operating temperature range	-20 ºC to +55 ºC		
Storage temperature range	-20 °C to +70 °C		
Housing			
Dimensions	1 LMS SCADAS slot (129.1x20.10x2.75mm)		
Connector and pinning layout			

Pin layout



Connector type:

LEMO-EGB.0B.307

Mating connector:

LEMO-FGB.0B.307.CLADxx

Pin details:

1) +V supply

2) +V sense

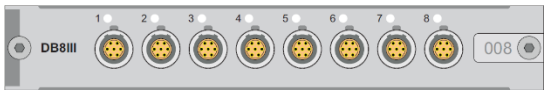
3) +V IN

4) -V IN

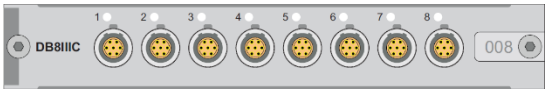
5) -V sense

6) -V supply

7) ICP / TEDS



SCM-DB8III



SCM-DB8IIIc

restricted in specific Simcenter Testlab application workbooks.

Ordering information

Support of Simcenter SCADAS Frames and Modules may be

Please check with your local representative for full details.

SCM-DB8III: Simcenter SCADAS Mobile eight-channel Durability input module with 102.4 kHz sampling rate (includes eight (8) pieces of LEMO to pigtail cables)

SCM-DB8IIIc: Simcenter SCADAS Mobile eight-channel Durability input module with 51.2 kHz sampling rate (includes eight (8) pieces of LEMO to pigtail cables)

Optional accessories

SCX-CAS03: Simcenter SCADAS LEMO to BNC adapter cable

SCX-CAS04: Simcenter SCADAS LEMO to pigtail adapter cable

SCX-CAS10: Simcenter SCADAS 4-20mA adapter cable