

DIGITAL INDUSTRIES SOFTWARE

Simcenter SCADAS Mobile and Lab Eight-channel Universal Input Module

Simcenter/VB8III-RT/2406/20240625

Product Information Sheet

Summary

In a single Simcenter SCADAS Mobile or Lab slot, the eight-channel VB8III-RT supports multiple signal conditioning, high-bandwidth A/D conversion and signal processing offering a unique combination of strain, vibration, displacement, pressure measurements and so on in one single module. VB8III-RT 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
- EtherCAT support with ESO64 module

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.

Analogue to digital conversion

The VB8III-RT employs low-power high performance 24-bit sigma-delta analog to digital converters with a maximum bandwidth of 88 kHz and selectable low-pass Bessel or Butterworth filter of 5kHz. 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 VB8III-RT is equipped with a low-power high-performance DSP and 32-bit memory for decimation, on-line calibration and on-line 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.

EtherCAT digital networks

EtherCAT is a real-time network used in test benches or automation applications which require short data update times (low latency) with ultra-low communication jitter for synchronization purposes.

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General information		VB8III-RT specifications
Product name	SCM-VB8III-RT, SCL-VB8III-RT,	
Description	LMS SCADAS 8 channel V/ICP and Bridge Input Module with Ethercat support	
Inputs	Eight (8) time-synchronous bridge or V/ICP inputs	
Input ranges differential input	$\pm 10V$, $\pm 3.16V$, $\pm 1V$, $\pm 0.316V$, $\pm 0.1V$, $\pm 0.0316V$	
Input ranges V/ICP input	$\pm 10V$, $\pm 3.16V$, $\pm 1V$, $\pm 0.316V$	
Digital interface	EtherCAT write, (requires ESO64 module)	
Outputs	-	
Transducer connector	Eight (8) 7 pin LEMO 0B connector	
Supported transducers		
	<p>Full, half and quarter bridge strain gauge configurations</p> <p>Bridge based transducers (force, pressure, torque, acceleration)</p> <p>AC or DC coupled sensors</p> <p>Voltage</p> <p>ICP</p> <p>AC-LVDT</p> <p>Active sensor</p> <p>4-20 mA transmitter (requires SCX-CAS10 cable)</p> <p>Potentiometers</p>	
A/D Converter		
Max. sampling rate	204.8 kHz; can be downsampled in steps of 2 and 2.5	
Max. bandwidth (filter off, -3 dB)	88 kHz	
Selectable low-pass filter (-3 dB)	5 kHz (fixed Bessel or Butterworth, order 2, 4, 6, 8 or 10)	
ADC Architecture	24-bit Sigma Delta ADC with alias free bandwidth of 88 kHz	
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 $\pm 3\%$	
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.	
Transducer identification		
TEDS	<p>TEDS class 1 (ICP sensors) and TEDS class 2 (Bridge sensors) supported according to IEEE 1451.4 (with reversed polarity)</p> <p>Maximum TEDS length is 80 m</p>	

Power	
Power consumption/power budget	<p>7 W available for the module and the sensors (during normal operation, no overload and ICP supply switched on).</p> <p>Note: Due to the power budget required by the VB8III module, it is not possible to use more than 8x VB8III modules in a single 9-slots SCM2E09 or SCR2E09 frame with a SCM-MS module. The remaining slot should be left empty.</p> <p>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 VB8III 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.</p>
Power feedback	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 supply	±1.25 V, ±2.5 V or ±5 V
Bridge current supply	<p>The maximum bridge supply current is 21 mA supporting the following bridge configurations:</p> <p>±1.25 V: 120 Ω or 350 Ω full, half or quarter bridge</p> <p>±2.5 V: 350 Ω full, half or quarter bridge, 120 Ω half bridge or quarter bridge</p> <p>±5 V: 350 Ω half or quarter bridge</p>
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 triax sensor channel configuration
Activated channels	<p>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 VB8III modules).</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p>
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

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Noise and distortion - better than		
Peak-to-peak noise (1/f)	Better than 0.5 μ V (typical 0.3 μ V) between 0.1Hz and 10Hz in \pm 100 mV input range	
Signal to noise ratio (SNR)	Differential input (typical)	Single ended input (typical)
\pm 10 V	110 dB	110 dB
\pm 3.16 V, \pm 1 V	105 dB	
\pm 0.316 V	100 dB	105 dB
\pm 0.1 V	90 dB	-
\pm 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)
\pm 10 V, \pm 3.16 V	95 dB	-
\pm 1 V, \pm 0.316 V	110 dB	
\pm 0.1 V, \pm 31.6 mV	120 dB	
Spurious Free Dynamic Range (SFDR)	Differential input (typical)	Single ended input (typical)
\pm 10 V	150 dB	150 dB
\pm 3.16 V, \pm 1 V	145 dB	
\pm 0.316 V,	140 dB	145 dB
\pm 0.1 V	130 dB	-
\pm 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)
\pm 10 V	125 dB	115 dB
\pm 3.16 V		
\pm 1 V	130 dB	-
\pm 0.316 V		
\pm 0.1 V		
\pm 31.6 mV		
Measured at 1.5 kHz between any two channels		
Total Harmonic Distortion (THD)	Differential input (typical)	Single ended input (typical)
\pm 10 V	80 dB	110 dB
\pm 3.16 V	85 dB	105 dB

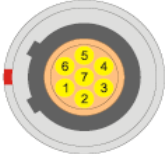
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	±1 V	105 dB	105 dB
	±0.316 V	100 dB	100 dB
	±0.1 V	105 dB	-
	±31.6 mV	105 dB	-
Amplitude accuracy		Differential input (typical)	Single ended input (typical)
	At 1 kHz better than +/- 0.1% at 23 °C		
Residual offset		Differential input (typical)	Single 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)		15 ppm/°C
	5 V (±2.5 V)		
	10 V (±5 V)		
	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 10 kHz)		Differential input (better than)	Single ended input (better than)
	±10 V, ±3.16 V, ±1 V, ±0.316 V	0.45°	0.25°
	±0.1 V, ±31.6 mV	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 leadwire 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	

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Shunt calibration	Internal shunt resistors between the positive or negative supply sense line and the +Input or -Input; shunt calibration resistors are available in 50 k Ω and 100 k Ω ($\pm 0.12\%$).		
DC bridge mode	Full (1/1) bridge	Half (1/2) bridge	Quarter (1/4) bridge
Selectable supply with 120 Ω	0 V	0 V	0 V
	1 V (± 0.5 V)	1 V (± 0.5 V)	1 V (± 0.5 V)
	2.5 V (± 1.25 V)	2.5 V (± 1.25 V)	2.5 V (± 1.25 V)
	-	5 V (± 2.5 V)	5 V (± 2.5 V)
Selectable supply with 350 Ω	0 V	0 V	0 V
	1 V (± 0.5 V)	1 V (± 0.5 V)	1 V (± 0.5 V)
	2.5 V (± 1.25 V)	2.5 V (± 1.25 V)	2.5 V (± 1.25 V)
	5 V (± 2.5 V)	5 V (± 2.5 V)	5 V (± 2.5 V)
-	10 V (± 5 V)	10 V (± 5 V)	
Protection			
Input protection	Channel 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 (*)	

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		*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 °C to +55 °C		
Storage temperature range	-20 °C to +70 °C		
Housing			
Dimensions	1 Simcenter SCADAS slot		
Connector and pinning layout			
Pin layout	<p>7-pin LEMO: channels 1 to 8</p>  <p>Chassis = Analog Ground Not connected implicates: DO NOT USE</p>	<p>Connector type: LEMO-EGB.0B.307</p> <p>Mating connector: LEMO-FGB.0B.307.CLADxx</p>	<p>Pin details:</p> <ol style="list-style-type: none"> 1) +V supply 2) +V sense 3) +V IN 4) -V IN 5) -V sense 6) -V supply 7) ICP / TEDS

Ordering information

Support of Simcenter SCADAS Frames and Modules may be restricted in specific Simcenter Testlab application workbooks.

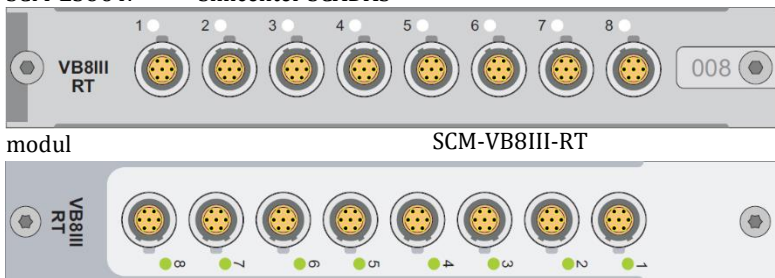
Please check with your local representative for full details.

SCM-VB8III-RT: Simcenter SCADAS Mobile 8-channel Bridge/ICP/TEDS input module with EtherCAT support (includes eight (8) pieces of LEMO to pigtail and eight (8) pieces of LEMO to BNC cables)

SCL-VB8III-RT: Simcenter SCADAS Lab 8-channel Bridge/ICP/TEDS input module with EtherCAT support (includes eight (8) pieces of LEMO to pigtail and eight (8) pieces of LEMO to BNC cables)

SCM-ESO64: Simcenter SCADAS

SCX-CAS04: Simcenter SCADAS LEMO to pigtail adapter cable
SCX-CAS10: Simcenter SCADAS 4-20mA adapter cable



SCL-VB8III-RT