DIGITAL INDUSTRIES SOFTWARE

Simcenter SCADAS RS 12 channel Universal Unit Extended Bandwidth

Simcenter/SCRS-U12-E/2024/20240610

Product Information Sheet

Summary

Simcenter SCADAS RS

12 channel Universal Unit Extended Bandwidth

The SCRS U12-E is part of the Simcenter SCADAS RS data acquisition units. It combines 12 channels of universal signal conditioning with extended bandwidth in a single unit.

BENEFITS

- 12 channel inputs with multiple conditioning options selectable per channel
- Channel to Unit supply isolation up to 100 V
- Inter channel isolation up to 100 V
- 576 kSamples/s combined throughput
- Up to 51.2 kHz sample rate and 22.1 kHz bandwidth at 24 bits
- Wide temperature range from -40 °C (-40 °F) to +85 °C (185 °F)
- On-board Simcenter SCADAS RS Configuration App

FEATURES

- Easy mounting and instrumentation
- Easy stacking of units without tools
- Centralized and distributed configurations
- Daisy chaining with single cable for power and data
- Low power
- 100 g Shock and 10 g vibration resistance
- Water and dust tight IP66/IP67 certified
- Standardized connector for analog inputs
- Use with Simcenter Testlab or with the on board App (accessible through any web browser)

Simcenter SCADAS RS

Product Family

Simcenter SCADAS RS is part of the Simcenter SCADAS signal conditioning and data acquisition systems and is designed for demanding test conditions.

Units connect in daisy chain to a Recorder unit for autonomous operation or in combination with a PC, tablet, or smartphone.

Use Simcenter Testlab or the on board Simcenter SCADAS RS Configuration or Recorder App for instrumentation, channel setup, calibration, sensor validation, measurement control, data viewing on-line and after a measurement.

Units are powered from an Uninterruptable Power Supply Unit (UPS) with flexible power distribution across multiple units.

Typical Sensors

Accelerometers, force cells, torque cells, fluid pressure sensors, strain gauge bridges, displacement sensors, tacho sensors, temperature sensors.

Conditioning Options

• Piezo electric ICP® sensors

• Voltage inputs up to 60 V

• Sensors with external supply

• Quarter bridge (3 and 4 wire) internal 350 Ω and 120 Ω completion

• Half bridge (3 and 5 wire)

• Full bridge (4 and 6 wire)

• Piezo resistive and capacitive sensors

• Potentiometers

• Inductive sensors (AC supplied LVDT, RVDT)

• RTD sensors

• 0/4 20 mA transmitters (over shunt)

• Analog tacho (variable reluctance up to 400 Vpp)

General	
Product code	SCRS-U12-E
Description	Simcenter SCADAS RS 12-channel Universal Unit Extended Bandwidth
Inputs	12 analog inputs, input 12 can be switched to analog tacho
Other connections	2x daisy chain (power and data)
Dimensions	W255 mm x H85 mm x D90 mm (W10" x H3.34" x D3.54")
Weight	1.8 kg (4 lb) (approximately, without cables)
Power consumption	Up to 19 W (loaded with 12x mixed channel supplies). Up to 13.5 W (loaded with 12x ICP® channels).
Power input	From daisy chain, UPS or Siemens certified AC/DC adapter
Unit Feedback	
Sensor anomalies	Following sensor information is reported via LED and in the user interface: • Overloads (analog and digital overloads up to the maximum bandwidth) • Open circuits (for piezo-electric ICP® sensors) • Short Circuits (for piezo-electric ICP® sensors) • Open and short detection (up to total bridge resistance of 1250 Ω at ±0.5 V supply) • Power overloads of sensor supplies and excitation voltage (power supply of the channel will be disabled automatically for protection)
Unit information	Following unit information is reported via LED and to the user interface • Unit status (booting, upgrading, identification, internal error, active) • Channel enabled, channel supply overload, shunt active
Unit Mounting	
Mounting options	Units can be mounted individually (mounting holes available). Units can be stacked (no tools required). Units can be mounted with tie-down straps using mounting clamp (optional).
Maximum distance	Up to 50 m between two units. Extra UPS units may be required, depending on required sensor power and distance between units. It is recommended to add a UPS at the long end of a 50 m cable.
Activation	
Boot time	< 40 s when a REC unit is present in the system

General Signal Conditioning Specifications	
Sampling	Sample rate grids: up to 48 kHz (decimal) and up to 51.2 kHz (binary), with decimation filters. Sample rate independently selectable per channel, for all channels.
Measurement bandwidth at -3 dB	Up to 20.7 kHz (decimal grid) and up to 22.1 kHz (binary grid)
Alias protection	In-band alias rejection is guaranteed by anti-aliasing, decimation and shaping filter stages: • Maximum sample rate (48 kHz): better than 145 dB • Other sample rates: (see Shaping Filters section)
Digital low-pass filters	Freely selectable low pass shaping filters and cut-off frequencies (-3 dB) from 20.7 kHz down to 0.01 Hz allowing oversampling factors from 1 up to 50 (besides 1/3 FIR and Sharp FIR), per channel and independently from selected sample rate: • Bessel (4th order): overshoot < 1 % when oversampling with factor ≥ 4 • Butterworth (4th order), overshoot < 11 % when oversampling with factor ≥ 4 • Gaussian: no overshoot • 1/3 FIR: overshoot < 7.7 % when oversampling with factor ≥ 1.5 • Sharp FIR: overshoot <13% Delays are automatically compensated: Accuracy better than 1 ° for Bessel when oversampling with factor > 2, and exactly 0 ° for Gaussian and 1/3 FIR in any case. Pass-band ripple: ±0.005 dB. Ratio bandwidth -1 dB to -3 dB: Bessel (60 %), Butterworth (86 %), Gaussian (60 %), 1/3 FIR (87 %), Sharp FIR (97.5 %)
Throughput	576 kSamples/s (12ch@48 kHz)
Grounding and isolation	Units have a provision for grounding. Supplies and input channel signal grounds: • Isolated from unit supply • Isolated from chassis • Isolated from each other
Isolation voltage	Isolation voltage: ±100 V (Class II)
Crosstalk (all channels at 1 kHz full scale)	Range ±60 V: < -84 dB Other ranges: < -100 dB
Phase accuracy (± 2σ)	• Intra-unit < 0.37 ° at 10 kHz (104 ns) • Inter-unit < 0.48 ° at 10 kHz (134 ns) Guaranteed for: • All ranges, mixed or not • All delivered units, from the same RS sytem or not

Bridge Signal Conditioning Specifications

Supported sensors/signals

Full bridge (4 or 6 wire)
Half bridge (3 or 5 wire)
Quarter bridge (3 wire, or 4 wire with tracking supply)
Piezo-resistive sensors
Potentiometers (impedance ≤ 50 kΩ, better than 99.9 % accuracy)
Inductive sensors (type LVDT, RVDT)
RTD sensors (PT100, PT200, PT1000)

Completion resistors

120 Ω and 350 Ω (±0.02 %) for quarter bridge, selectable per channel

Shunt resistors

50 kΩ and 100 kΩ ±0.05 % over any bridge arm

Bridge Input connection

Differential.
Slew rate protected.

Bridge supply voltages

Accuracy better than ±0.2 %

	DC bipolar supply			AC supply		
	1 V (±0.5 V)	**3 V (±1.5 V)**	**10 V (±5 V)**	**0.6 Vrms**	**2 Vrms**	**6 Vrms**
Drift [ppm/°C]	< 25	< 16	< 15	< 15		

Gage resistance [Ω]:

Full	≥ 70	≥ 350	≥ 630	≥ 70	≥ 350	≥ 630
Half	≥ 40	≥ 120	≥ 350	≥ 40	≥ 120	≥ 350
Quarter	120/350	120/350	350	120/350	120/350	350

Supply power

Up to 16 mA bridge supply current per channel (18 mA before overload).
Supply voltage limitations apply depending on total bridge resistance and maximum power consumption of this unit.
Open detection: < 0.8 mA (1 VDC, 1250 Ω load).

Inrush current limits

When supply is turned on, possible inrush currents for bridge conditioning up to 60 mA are supported during 50 ms.

AC supply voltages

2.5 Vrms at 3 kHz (carrier sine wave) and 600 Hz demodulation bandwidth

Bridge Input ranges

DC bipolar:	**1 V (±0.5 V)**	**3 V (±1.5 V)**	**10 V (±5 V)**
AC:	**0.6 Vrms**	**2 Vrms**	**6 Vrms**
±3 mV/V	-	-	✓
±10 mV/V	-	✓	✓
±30 mV/V	✓	✓	✓
±100 mV/V	✓	✓	✓
±300 mV/V	✓	✓	✓
±1000 mV/V	✓	✓	✓
±3000 mV/V	✓	✓	-
±10000 mV/V	✓	-	-

Bridge Input noise level measurements

20.7 kHz band limited diff. input noise (21 °C, 2x100 Ω resistors, 1 s)						
Range:	**±30 mV**	**±100 mV**	**±300 mV**	**±1 V**	**±3 V**	**±10 V**
±3σ < [µVpp]	24	24	36	42	190	290
[dB]	< -77.5	< -88.0	< -94.0	< -103.1	< -99.5	< -106.3

Bridge Input drift measurements

Gain drift: < 50 ppm/˚C
Offset drift: < 30 ppm/˚C (of the range)
Quarter bridge (350 Ω, 3 V supply, 2 m cable, 30 mV/V range):
< 15 µε (10 µε typ.) from 15 min after power on (internal heating)
< 1.45 µε/˚C change in ambient temperature

Bridge Input accuracy (at 21 °C)

- Linearity better than 0.01 % at 95 % range span
- Gain accuracy better than 0.1 %

- Offset accuracy better than 0.1 %

Gain and offset can be set respectively to the desired values by sensitivity calibration (or shunt calibration) and balancing operation in software.

Bridge Input impedance: 100 MΩ ±1 % and < 400 pF

Sensor Signal Conditioning Specifications

Supported sensors/signals:
Piezo-electric ICP® sensors
Voltage inputs up to ±60 V
Sensors with external supply
Current loops (using shunt)

Voltage Input connection:
Single Ended and Differential.
Slew rate protected.

Sensor supply voltage:
DC unipolar: 14.1 V ± 5 %
DC bipolar: 1 V (±0.5 V), 3 V (±1.5 V), 10 V (±5 V)
Supply voltage of 5 V is also available from the DC bipolar supply:
- Between positive supply pin and GND pin
- Negative pin is also active: If accidentally shorted, positive supply pin will also be disabled

AC: 0.6 Vrms, 2 Vrms, 6 Vrms

Supply power:
DC unipolar 14.1V: Up to 21 mA supply current per channel (22 mA before overload).
Others: Up to 16 mA supply current per channel (18 mA before overload).

Inrush current limits:
When supply is turned on, possible inrush currents for DC unipolar 14.1V up to 60 mA are supported during 190 ms

ICP Supply:
4.1 mA (± 14 % at full temperature range) from a 24 VDC (± 1 %) supply.
Detection thresholds:
- Supply short < 2 V
- Supply open > 20 V

Blanking times:
- Boot: 5 s
- Enabling channel: 190 ms

Voltage Input ranges:

Range:	±31.6 mV	±100 mV	±316 mV	±1 V	±3.16 V	±10 V	±60 V
Single ended	-	-	✓	✓	✓	✓	✓
Differential	✓	✓	✓	✓	✓	✓	-
ICP®	-	-	✓	✓	✓	✓	-

Measurement maximum voltage: ±60 V (single ended), ±10 V (differential, |Vcm|< 2.5 V).
Maximum voltage without damage: ±65 V (single ended), ±40 V (differential pins referred to signal ground).

AC coupling: 0.48 Hz ±6 %

Voltage Input noise level measurements:

20.7 kHz band limited SE input noise (21 °C, 100 Ω resistor, 1 s)					
Range:	**±316 mV**	**±1 V**	**±3.16 V**	**±10 V**	**±60 V**
±3σ < [µVpp]	26	34	78	232	1640
[dB]	< -96.8	< -104.9	< -107.3	< -108.3	< -106.8
ICP® at ±316 mV range: < 50 µVpp (-91.1 dB)					
ICP® at ±10 V range: < 240 µVpp (-108 dB)					

Range diff: (see Bridge Signal Conditioning Specifications)

Voltage Input drift measurements

Gain drift: < 50 ppm/˚C
Offset drift: < 30 ppm/˚C (of the range)
Both for single ended and differential inputs.

Common Mode Rejection Ratio measurements

Range:	±31.6 mV	±100 mV	±316 mV	±1 V	±3.16 V	±10 V
56Hz [dB]	< -104		< -101		< -90	
DC [dB]	N/S					< -90

Isolated Mode Rejection Ratio measurements

Range:	±100 mV	±316 mV	±1 V	±3.16 V	±10 V	±60 V
56Hz [dB]	< -95					< -79
DC [dB]	< -100					< -84
(Same values for single ended and differential inputs)						

Total Harmonic Distortion (1 kHz full range span sine measurements)

SE: < -90 dB
Diff: < -68 dB

Spurious Free Floor measurements

62 Hz to full band FFT (21 °C, 100 Ω)							
Range diff:	±31.6 mV	±100 mV	±316 mV	±1 V	±3.16 V	±10 V	-
[dB]	> 107	> 117	> 120	> 130	> 127	> 130	-
Range SE:	-		±316 mV	±1 V	±3.16 V	±10 V	±60 V
[dB]	-		> 124	> 130			

Voltage Input accuracy

Both for single ended and differential inputs:
- Linearity better than 0.01 % at 95 % range span
- Gain accuracy better than 0.1 % (1kHz full range at ambient temperature, all ranges)
- Offset accuracy better than 0.1 %

Gain and offset can be set respectively to the desired values by sensitivity calibration and balancing operation in software.

Voltage Input impedance

Single ended:
> 1 MΩ for voltage input
> 100 kΩ for ICP® input
< 300 pF
Differential:
20 MΩ and < 400 pF

Pulse Signal Conditioning Specifications

Pulse Input description

Channel 12 can be switched to Pulse Input (through separate connector).

Supported sensors/signals

Analog tacho (variable reluctance up to 400 Vpp)

Signal conversion

Pulse signals can be converted to:
- Frequency (RPM, speed, fuel flow ...)
- Counter value up/down (distance, angle ...)

Input coupling

Differential

Input range

±20 V

Pulse speed

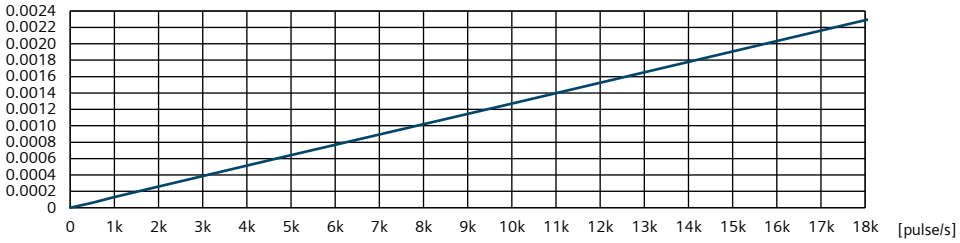
Up to 18.000 pulses/s

Oversampling factor

5 or more

Output format

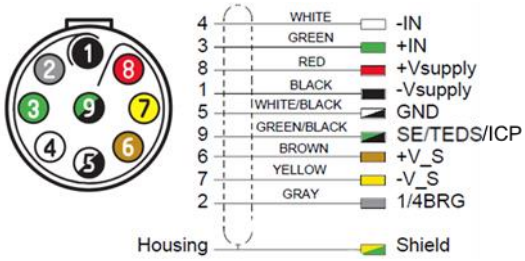
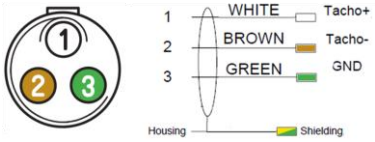
Count and rate converted signals are made available with next selectable sample rates up to 3000 Hz (decimal grid), or 2560 Hz (binary grid).

Rate resolution [%]	
Pulse Input isolation	Pulse inputs are isolated from chassis. Isolation voltage: ±100 V (Class II)
Pulse Input impedance	25 kΩ ± 20 %

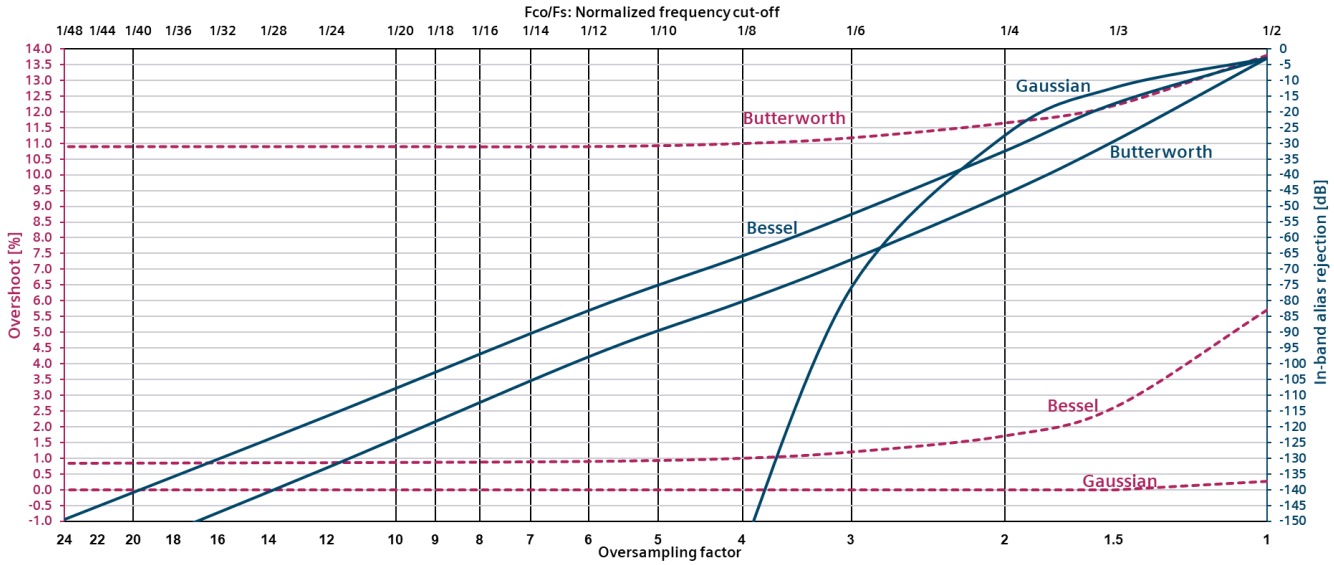
Environmental Certification

Temperature range	Operating: -40 °C to +85 °C (-40 °F to 185 °F) Storage: -40 °C to +85 °C (-40 °F to 185 °F) Because of internal heating, please exercise caution when touching the housing and connectors and attached accessories at ambient temperatures higher than 40 °C. Ensure proper protection (i.e., gloves) against burns or other injuries.
Ambient pressure	0.5 bar to 1.3 bar. Altitude: -2000 m (mining) to 5000 m (mountains).
Water and dust protection	IP66/IP67
Humidity	Fully protected against humidity. Feet vents equalize internal and external pressure and allow an outgoing path for humidity and moisture, being expulsed during warming up and cooling down during normal usage.
Vibration	MIL-STD-810G, method 514.6, procedure I, category 24, 20-2000 Hz, random vibration 10 g (rms), 1 h per axis. NOTE: Tested against more severe conditions than required by MIL-STD-810G (10 instead of 7.7 grms).
Shock	MIL-STD-810G, method 516.6, procedure I, trapezoidal shock, 100 g (peak), 11 ms, three shocks per direction
Drop	MIL-STD-810G method 516.6, Procedure IV – Transit Drop (26 drops from a height of 122 cm on each surface, edge and corner)
Salt protection	Salt spray test according to ISO 12944-2, ISO 12944-2, class C5I, exterior applications, average lifetime (720 h test corresponding to 10 years life)
ESD	EN61000-4-2 level 4 ISO10605
EMC requirements	IEC 61326-1
Calibration	Compliant with ISO17025. Calibration formally traceable to international measurement standards from our accredited ISO17025:2017 fully compliant laboratory.
Certifications	CE, FCC

Connectors and Pinout

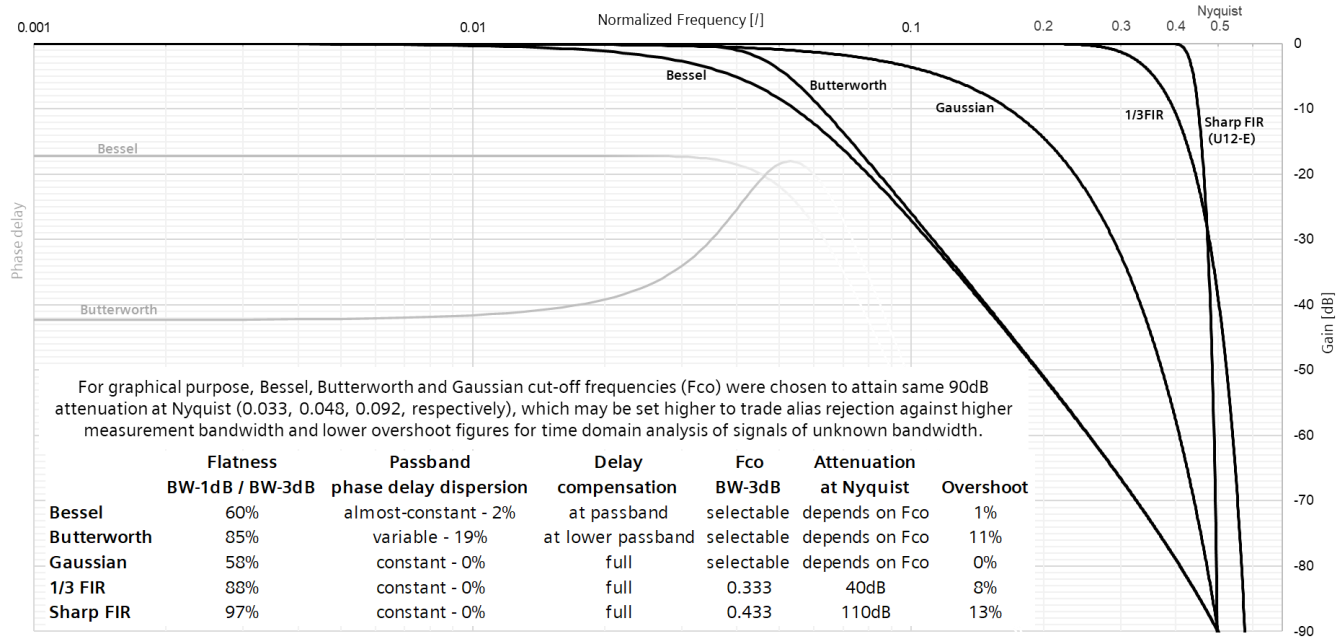
Analog Input connector chassis type	YCP-TIA09BCG-09FPCY-18708
Analog Input connector plug type	YCP-TPR09BCX-09MSCBX-051X 5.1 mm max collet (YCP-ABR09BT051X bend relief)
Analog Input connector pinout	 0 V supply selection renders Vsupply floating (high impedance). Potentiometer conditioning: Vin- pin is brought to GND. Full/half bridge conditioning: 1/4BRG pin is disconnected internally (high impedance).
Analog Pulse Input connector chassis type	YCP-TIA12BCG-03FPKZX-000X
Analog Pulse Input connector plug type	YCP-TPR12BCX-03MSKFX-056X
Analog Pulse Input connector pinout	
Daisy Chain connector chassis type	YCP-TIA12FCG-08FPEZX-000X
Daisy Chain connector plug type	YCP-TPR12FCX-08MSEEX-065X

Shaping Filters: Bessel, Butterworth, Gaussian



Notes For Fs = 48 kHz, alias rejection is better than 110 dB in any case

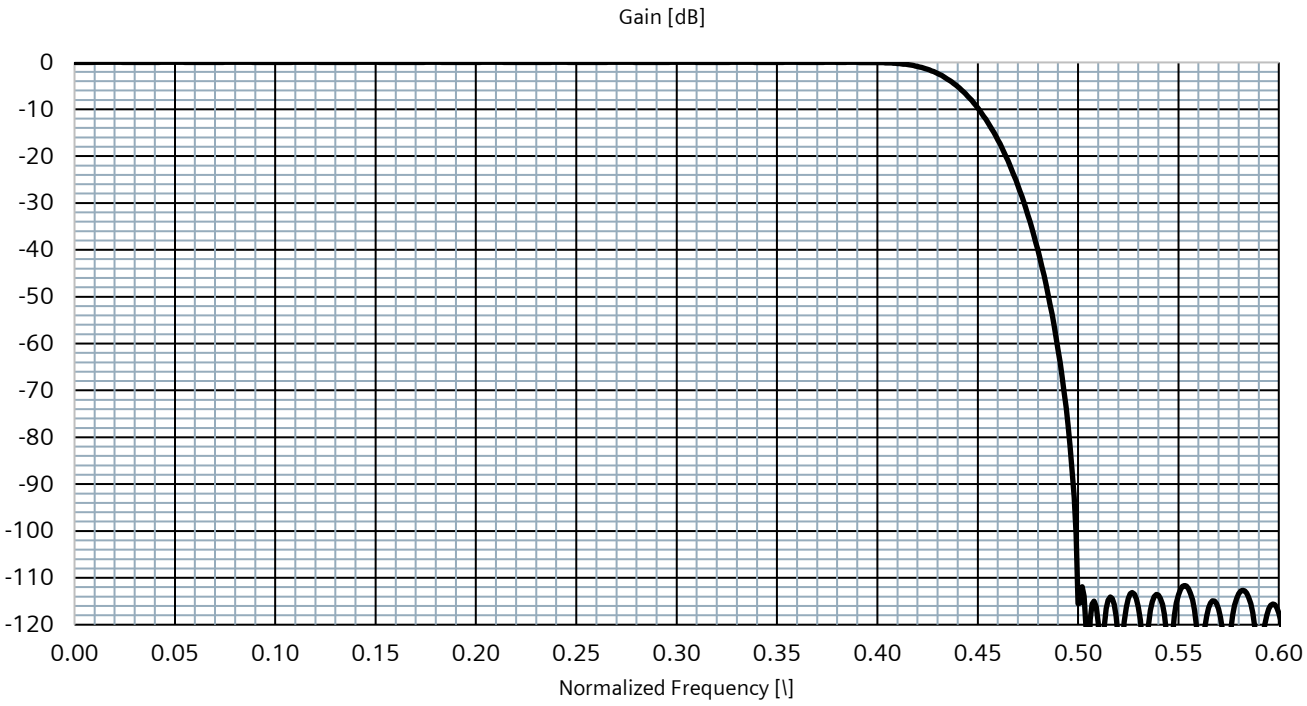
Filter overview



For graphical purpose, Bessel, Butterworth and Gaussian cut-off frequencies (Fco) were chosen to attain same 90dB attenuation at Nyquist (0.033, 0.048, 0.092, respectively), which may be set higher to trade alias rejection against higher measurement bandwidth and lower overshoot figures for time domain analysis of signals of unknown bandwidth.

	Flatness BW-1dB / BW-3dB	Passband phase delay dispersion	Delay compensation	Fco BW-3dB	Attenuation at Nyquist	Overshoot
Bessel	60%	almost-constant - 2%	at passband	selectable	depends on Fco	1%
Butterworth	85%	variable - 19%	at lower passband	selectable	depends on Fco	11%
Gaussian	58%	constant - 0%	full	selectable	depends on Fco	0%
1/3 FIR	88%	constant - 0%	full	0.333	40dB	8%
Sharp FIR	97%	constant - 0%	full	0.433	110dB	13%

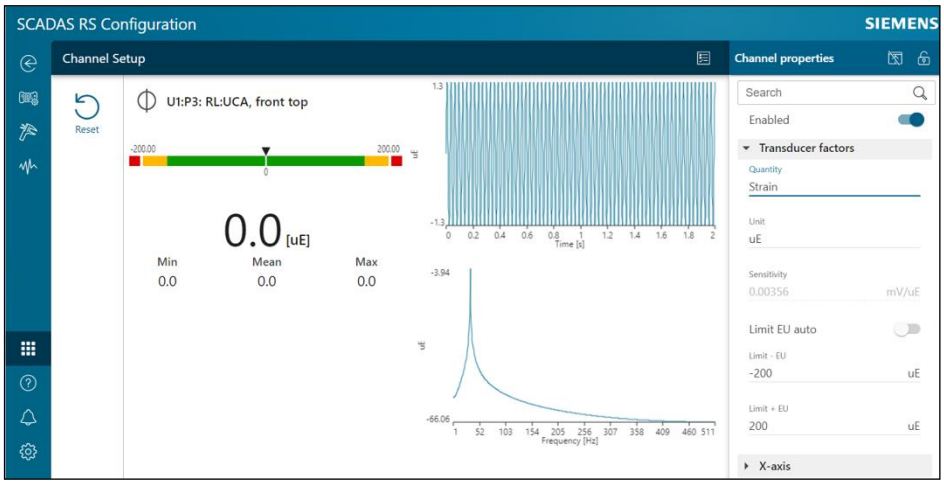
Sharp FIR



Notes Alias rejection always better than 110 dB

On-board Simcenter SCADAS RS Configuration App

General	License-free software embedded on the SCADAS RS unit. Accessible through any web browser via UTP connection.
Instrumentation	• Single channel setup • Channel list (grid and card views) • Persist settings on unit
Calibration & checks	• DC calibration • Shunt calibration • Offset balancing • Shunt, offset and headroom checks
Monitoring	• Status info: health status, warnings and alarms • Statistics: overall and instantaneous • Time data • Frequency data (FFT) • Variety of customizable displays: digital, analog, strip chart, XY, 2D



Detailed Info	See Simcenter SCADAS RS Configuration App

Ordering Information

SCRS-U12-E	Simcenter SCADAS RS 12-channel Universal Unit Extended Bandwidth

Options and Accessories

Connectivity	SCRSA-CABD01	Daisy chain cable, 0.4 m
	SCRSA-CABD02	Daisy chain cable, 1 m
	SCRSA-CABD03	Daisy chain cable, 5 m
	SCRSA-CABD04	Daisy chain cable, 10 m
	SCRSA-CABD05	Daisy chain cable, 50 m
	SCRSA-CABN01	Daisy chain cable to RJ45, 5 m
	SCRSA-CAB-ADP2	UTP to USB Ethernet adapter for PC
Measurement	SCRSA-CABA01	Analog input cable pigtail, 3 m
	SCRSA-CABA02	Analog input cable BNC, 1 m
	SCRSA-CABA03	Analog input cable with resistor, 3 m
	SCRSA-CABA04	Tacho input cable, 3 m
	SCRSA-CABS01	Analog input cable to LEMO 0B, 30cm
	SCRSA-CABS02	1/4 BRG analog input to LEMO 0B, 30cm
	SCRSA-CAB019	Analog input cable push-lock 5-pin, QB 2 wire
	SCRSA-CAB020	Analog input cable push-lock 5-pin, QB 3 wire
	SCRSA-CAB021	Analog input cable to M8 6-pin
Mechanic	SCRSA-CAB001	Grounding cable, 3 m
	SCRSA-CASE01	Travel case single unit
	SCRSA-CASE02	Travel case 6 units
	SCRSA-ACC-001	Side clamps (set of 2)
	SCRSA-ACC-002	Brackets (set of 2)
	SCRSA-ACC-005	Stacking tools (set of 4)
	SCRSA-CAP002	Protective caps CU 12 connectors
Power	SCRSA-ACDC-01	AC/DC adapter unit