

# Instrument Specifications

## 04

### 4 Channels USB Compact Analyzer



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## General description

The following specifications concern the O4 USB compact analyzer. O4 consists of a 4 channels instrument controlled by a PC running the NVGate software for real-time analysis.

### Modules

The following tables detail the complete capacity of O4 hardware. Optional or standard modules may fill the described slots.

<b>Front-end</b>	Dynamic analog inputs	4 inputs (BNC)
	Dynamic analog outputs	1 output (mini Lemo), delivered with mini-Lemo to BNC adaptor
	External syncs.	2 trigger/tachometer inputs (BNC)

## Case

### Mechanicals

<b>Weight</b>	534 g (1.17 lb)	
<b>Dimensions</b>	Overall (L.W.H.)	185 mm x 110 mm x 35 mm ( 7.3 in x 4.3 in. x 1.4 in )

### Power supply

<b>Power</b>	< 8 W	
<b>From PC</b>	Port format	Port 1, USB 3.0 Type C
	USB-PD 3.0 technology compliant	5 V
<b>From main</b>	Voltage	Port 2, AC to USB-PD 3.0 tech compliant
	Power	< 8 W
<b>USB Port</b>	USB-C x 2	Port 1 for data and power supply, Port 2 for power supply only

### PC requirements

<b>Minimum</b>	1 GB <sup>1</sup> of RAM / 250 MB free on HD + storage for measurements and signals / 1024 x 768 display	
<b>Recommended</b>	Quad core processor (e.g.: Intel Core i5) / 6 GB of RAM / GPU / 1920 x 1080 display / 1 GB free on SSD + storage for signals	
<b>Connections</b>	USB 3.0 for data & Power > 7 watts	
<b>Operating systems</b>	Windows 10 / Windows 11 / MS Office: 32 bits only	

## Environmental / Compliance with standards

<b>CE</b>	Indicates compliance with:	EMC Directive <b>2014/30/EU</b>
<b>EMC</b>	IEC 61326-1:2013	Electrical equipment for measurement, control and laboratory use - EMC requirements
<b>Materials</b>	ROHS	<b>2011/65/EU</b>
	WEEE	<b>2012/19/EU</b>
<b>Humidity</b>	Max 93 % RH at 40°C non-condensing	

<sup>1</sup>) Waterfall depth depends on available memory.

<b>Temperature</b>	Operating	0 °C to 40 °C (32 °F to 104 °F)
	Storage	-20 °C to 65 °C (-4 °F to 149 °F)
	Absolute maximum rating	-35 °C to 70 °C (-31 °F to 158 °F)
<b>Shocks &amp; bump</b>	Operating	40 g (6 ms, ½ sine, 3 chocks, all axes, <b>IEC 60068-2-27</b> )
		60 g (3 ms, ½ sine, 3 chocks, all axes, <b>IEC 60068-2-27</b> )
	Storage	40 g (6 ms, ½ sine, 1000 shocks, <b>IEC 60068-2-29</b> )
		60 g (11 ms sawtooth, 3 shocks 3 axes <b>MIL-STD-810F 516.5</b> )
<b>Vibrations</b>	Operating	2.5 g (sine, 15-500 Hz, all axes, <b>IEC 60068-2-6</b> )
		5 mm (sine, 5-15 Hz, all axes, <b>IEC 60068-2-6</b> )
		7.7 grms (random, 20-2k Hz, 30 min, <b>MIL-STD-810F 514.5</b> )
<b>Altitude</b>	Operating, non-tested above	≤ 2000 m (6562 feet)
<b>Enclosure</b>		<b>IP 30</b>

## Front-end

### Dynamic inputs

<b>Sampling</b>	Sampling frequencies (Additional decimators allow analysis bandwidth down to 0.8 Hz)	256 kHz, 204.8 kHz, 131.072 kHz, 102.4 kHz, 65.536 kHz, 51.2 kHz, 37.768 kHz, 25.6 kHz, 16.384 kHz, 12.8 kHz, 8.192 kHz, 6.4 kHz, 5.12 kHz, 4.096 kHz, 3.2 kHz, 2.048 kHz
	Converters	One 24 bit sigma-delta ADC for each input
	Frequency relative precision	0.5 10 <sup>-4</sup> (typical 1 10 <sup>-5</sup> )
	Synchronization	All inputs synchronized on the same sampling clock
<b>Anti-aliasing filter</b>	Type	Over-sampled digital filters
	Slope	> 400 dB/octave
	Pass band ripple	< ± 0.005 dB
	Rejection of parasites bands	> 100 dB (@ frequency > 0.57 x FS)
	Effective bandwidth	0.45 x FS (ex: 23.4 kHz @ 51.2 kS/s)
<b>Range (peak)</b>	With amplifier (included)	±100 mV, ±300 mV, ±1 V
	Direct	±10 V
	With attenuator (included)	±40 V
<b>Absolute accuracy</b>	Resolution	24 bits (144 dB)
	All input ranges at 1 kHz	±0.05 dB (typical ±0.015 dB)
	Temperature drift	< 0.002 dB / 10 °C
<b>DC offset</b>	±100 mV, ±300 mV and ±1 V ranges	< ± 100 µV
	±10 V range	< ± 1 mV
	±40 V range	< ± 2 mV
<b>Frequency flatness and phase response<sup>2</sup></b>	±10 V range, DC to 20 kHz	< ±0.02 dB / < ±0.02 °
	±10 V range, 20 kHz to 40 kHz	< ±0.05 dB / < ±0.05 °
	±10 V range, 40 kHz to 100 kHz	< ±0.05 dB / < ±0.08 °
	±0.3 V, ±1 V ranges, DC - 20 kHz	< ±0.02 dB / < ±0.1 °
	±0.3 V, ±1 V ranges, 20 kHz - 100 kHz	< ±0.05 dB / < ±0.2 °
	±0.1 V range, DC to 20 kHz	< ±0.02 dB / < ±0.4 °
	±0.1 V range, 20 kHz to 40 kHz	< ±0.1 dB / < ±0.6 °
	±0.1 V range, 40 kHz to 100 kHz	< ±0.15 dB / < ±0.8 °
	±40 V range, DC - 20 kHz	< ±0.1 dB / < ±0.4 °
	±40 V range, 20 kHz - 40 kHz	< ±0.1 dB / < ±0.6 °
±40 V range, 40 kHz - 100 kHz	< ±0.15 dB / < ±0.8 °	
<b>Cross-talk</b>	Between N (N is odd) and N+1 inputs: @ 1 kHz: < -120 dB, @ 20 kHz: < -96 dB, @ 40 kHz: < -90 dB	
	Between any inputs excluding: N (N is odd) and N+1 inputs: @ 1 kHz: < -140 dB, @ 20 kHz: < -114 dB, @ 40 kHz: < -108 dB	

<sup>2</sup>) Includes channel to channel match with different ranges

<b>Signal to noise ratio</b>	<i>With 50 Ω terminators:</i>	
	±10 V range, 100 kHz bandwidth: > 100 dB, spurious lines < -115 dB of full scale ±10 V range, 20 kHz bandwidth: > 104 dB, spurious lines < -125 dB of full scale	
<b>Input noise</b>	<i>With 50 Ω terminators:</i>	
	±100 mV range	20 kHz BW < 3.5 μV rms, 80 kHz BW < 5 μV rms, 100 kHz BW < 6 μV rms
<b>Impedance</b>		1 MΩ ±1 %, < 100 pF
<b>Protection</b>	Overvoltage	±60 V peak without damage - On any input <sup>i</sup>
<b>Dynamic</b>	Spectral domain	> 140 dB <sup>3</sup>
<b>Coupling</b>	AC	Cut-off frequency 1.13 Hz ±10% (analog filter)
	DC	
	ICP	2 mA or 4 mA power supply with AC coupling (±10%)
	ICP + TEDS	ICP + reverse current on TEDS reading operations
	GND	Shortcut to ground - Automatic current limitation to 50 mA
<b>Floating</b>	Coupling	AC or DC / All ranges / Overall voltage < ±40 V
	Standards	<b>IEEE 1451.4 2001</b> revision 1
<b>TEDS</b>	Supported templates	Accelerometer/Force meter (25) Microphones (27, 28 and 29)

## Dynamic outputs

<b>Sampling</b>	Converters	One 24 bit DAC for each output
	Synchronization	Same sampling clock as the dynamic inputs
<b>Range</b>	Direct	±10 V peak
	With attenuator (included)	±1 V peak
	Clipping	User selectable in the output range
	Digital gain	From 10 <sup>-5</sup> to 10 <sup>3</sup>
<b>Absolute accuracy</b>	Resolution	24 bits (144 dB)
	All output ranges at 1 kHz	±0.05 dB
	Temperature variability	< 0.1 dB / 10 °C
<b>Frequency response</b>	<i>Variation relative to 0 dB @ 1kHz</i>	
	All ranges, at 10 kHz	< ±0.05 dB
	All ranges, at 20 kHz	< ±0.15 dB
	All ranges, at 40 kHz	< ±0.8 dB
	All ranges, at 80 kHz	< ±2 dB
	All ranges, at 100 kHz	< ±3 dB
<b>Noise floor level</b>	10 V range, 20 kHz bandwidth	-110 dB of full scale, spurious lines < -125 dB of full scale
	10 V range, 100 kHz bandwidth	-105 dB of full scale, spurious lines < -125 dB of full scale
	1 V range, 20 kHz bandwidth	-99 dB of full scale, spurious lines < -110 dB of full scale
	1 V range, 40 kHz bandwidth	-94 dB of full scale, spurious lines < -110 dB of full scale
	1 V range, 100 kHz bandwidth	-90 dB of full scale, spurious lines < -107 dB of full scale
<b>Impedance</b>	User selectable	50 Ω or Grounded
<b>Current</b>	Max	±10 mA
<b>Protection</b>	Sum of injected + generated voltages	±15 V peak, On any output <sup>i</sup> Permanent short circuit supported
<b>Total harmonic distortion</b>	THD @ 1 kHz	< 0.002% or -94dB at 20 kHz BW
	THD @ 5 kHz	< 0.005% or -86dB at 20 kHz BW
<b>Cross-talk</b>	Output 0 dBV to 50 Ω terminated input	Lower than measurable noise

<sup>3</sup>) 25601 lines / 30 sec. averaging

## External sync

<b>Sampling</b>	Frequencies	128 times over-sampling of the current input sampling (up to 32.8 MHz)
	Converters	High speed voltage comparator and time counter
<b>Range (peak)</b>	Direct	$\pm 300$ mV, $\pm 1$ V, $\pm 3$ V, $\pm 10$ V, $\pm 40$ V
<b>threshold</b>	Amplitude precision	$\pm 1$ % of range
<b>Setting</b>	Hysteresis	1% (of input range) to input range
	Hold off	0 s to 500 s
	Slope	Rise or fall
	Hardwired pre-divider	From 1 to 255
<b>Time resolution</b>		> 30 ns (0.03° at 1kHz and 0.6° at 20kHz)
<b>Pulse rate</b>	Max	375k pulse/s
<b>Coupling</b>	AC	Cut-off frequency 1.15 Hz $\pm 10\%$ (analog filter)
	DC	
<b>Impedance</b>		1 M $\Omega$ , < 100 pF
<b>Protection</b>	on any external sync <sup>i</sup>	$\pm 60$ V peak without damage

## Notes

The above specifications describe all the guaranteed capacities and performances of the instrument and are applicable to an O4 hardware, powered through USB port, at a stabilized room temperature of 23°C  $\pm 5$ °C and calibrated since less than one year.

The adapted control software NVGate is described separately.

<sup>i</sup> Exceeding absolute maximum ratings damages the system and voids guarantee.



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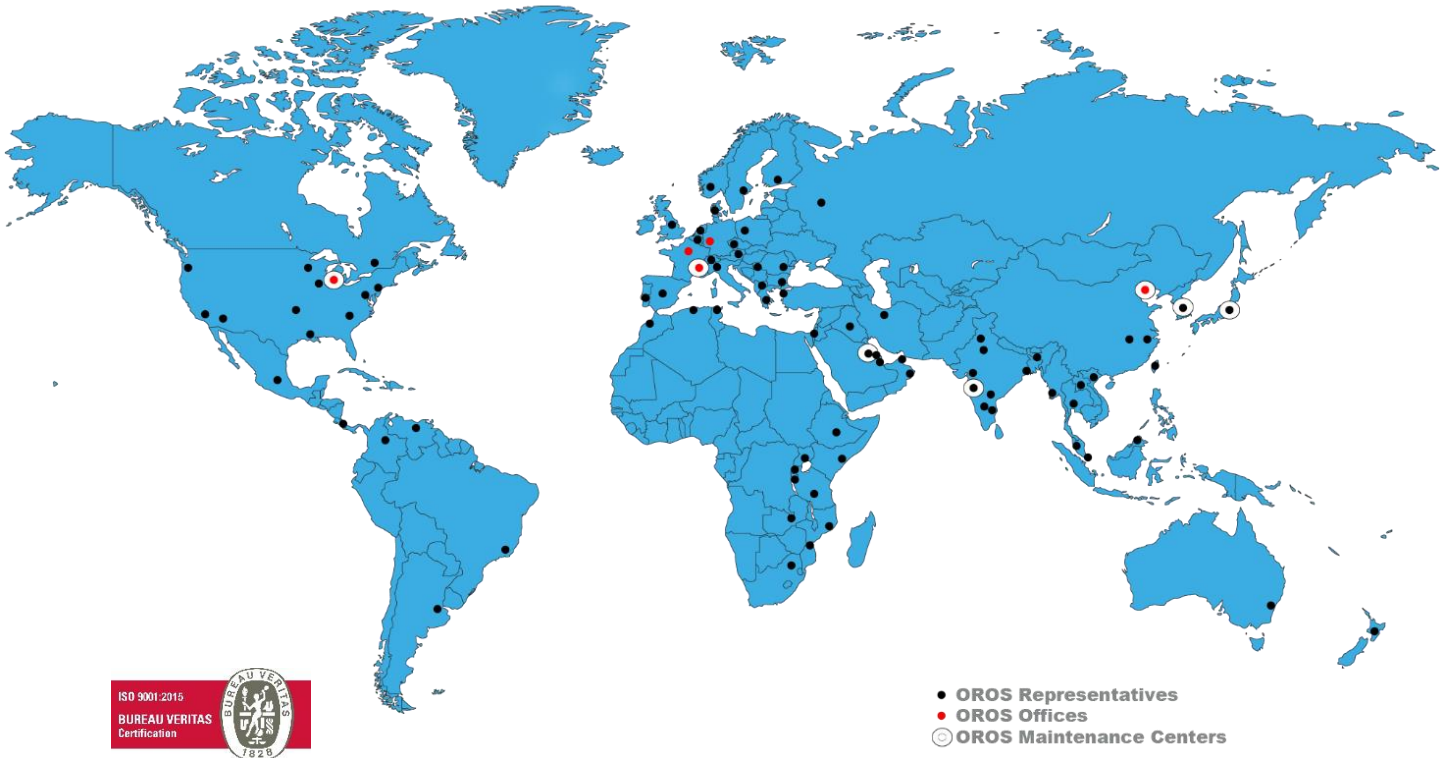
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