HongKe 虹科

PULSE RIDER >>

PG-1500 SERIES
Technical Datasheet

Time to Reinvent the Pulse Generation

- Single and Double Channels System

- Up to **50 Vpp** into 50 Ohm

- **400 ps** Edge time

- *SimpleRider*™ touch User Interface

- Minimum Pulse Width less than **1ns**

The **Pulse Rider Series** offers premium signal integrity with the easiest to use touch screen display interface (*SimpleRider*™).
The Generation of pulses requires only a few screen touches.
The output Voltage can be adjusted up to **50 Volts** pk-pk in a window of **±25 Volts** with **400 ps** edge rate (based on *RiderEdge*™ technology).
Its innovative hardware architecture provides the possibility to generate multiple pulse sequences, such as **double, triple** or **quad pulses**, with fully independent timing parameters.
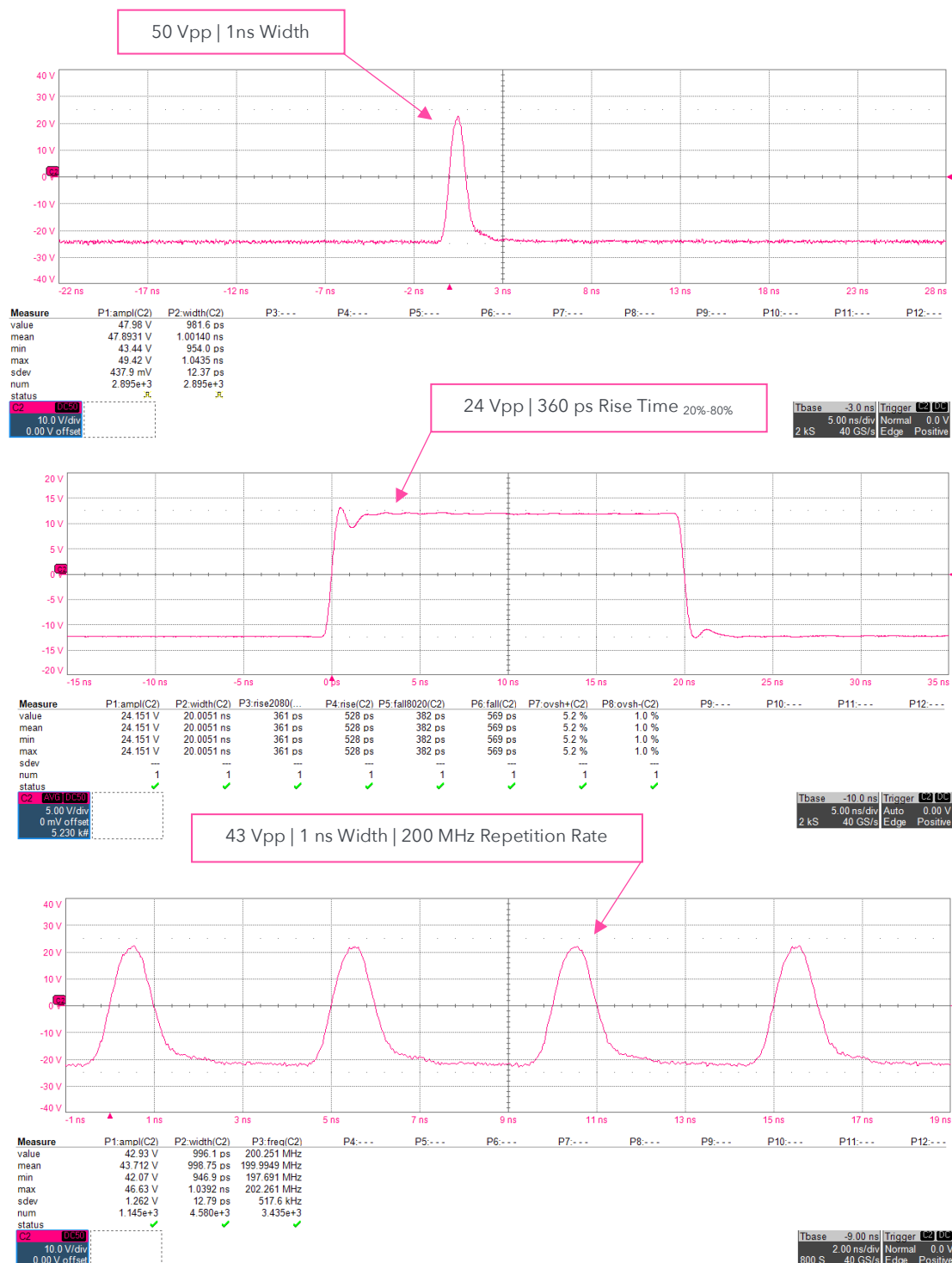
Technology
Re-**Inventing** the **Pulse Generation**

Rider FastEdge ™

First to market low-cost Analog edge converter with the ability to reach less 400 ps edge (20-80%) up to 50 V*pp* @ 50 ohms with fully adjustable output voltage.

FastEdge technology is lower in cost of any competitive solution and well prepared to be combined with more innovations in terms of edge variability and dynamic range expansion for specific applications.

FastEdge technology is patented and it will boost **Active Technologies** leadership in signal generation providing an excellent platform of components for todays and future market of Modern Pulse and Signal Generators.

50 Vpp | 1ns Width

Measure	P1:ampl(C2)	P2:width(C2)	P3:---	P4:---	P5:---	P6:---	P7:---	P8:---	P9:---	P10:---	P11:---	P12:---
value	47.98 V	981.6 ps										
mean	47.8931 V	1.00140 ns										
min	43.44 V	954.0 ps										
max	49.42 V	1.0435 ns										
sdev	437.9 mV	12.37 ps										
num	2.895e+3	2.895e+3										
status												

C2 DC50 10.0 V/div 0.00 V offset

24 Vpp | 360 ps Rise Time 20%-80%

Tbase -3.0 ns Trigger C2 DC
5.00 ns/div Normal 0.0 V
2 kS 40 GS/s Edge Positive

Measure	P1:ampl(C2)	P2:width(C2)	P3:rise2080(...	P4:rise(C2)	P5:fall8020(C2)	P6:fall(C2)	P7:ovsh+(C2)	P8:ovsh-(C2)	P9:---	P10:---	P11:---	P12:---
value	24.151 V	20.0051 ns	361 ps	528 ps	382 ps	569 ps	5.2 %	1.0 %				
mean	24.151 V	20.0051 ns	361 ps	528 ps	382 ps	569 ps	5.2 %	1.0 %				
min	24.151 V	20.0051 ns	361 ps	528 ps	382 ps	569 ps	5.2 %	1.0 %				
max	24.151 V	20.0051 ns	361 ps	528 ps	382 ps	569 ps	5.2 %	1.0 %				
sdev	---	---	---	---	---	---	---	---				
num	1	1	1	1	1	1	1	1				
status												

C2 AVG DC50 5.00 V/div 0 mV offset 5.230 k#

Tbase -10.0 ns Trigger C2 DC
5.00 ns/div Auto 0.00 V
2 kS 40 GS/s Edge Positive

43 Vpp | 1 ns Width | 200 MHz Repetition Rate

Measure	P1:ampl(C2)	P2:width(C2)	P3:freq(C2)	P4:---	P5:---	P6:---	P7:---	P8:---	P9:---	P10:---	P11:---	P12:---
value	42.93 V	996.1 ps	200.251 MHz									
mean	43.712 V	998.75 ps	199.9949 MHz									
min	42.07 V	946.9 ps	197.691 MHz									
max	46.63 V	1.0392 ns	202.261 MHz									
sdev	1.262 V	12.79 ps	517.6 kHz									
num	1.145e+3	4.580e+3	3.435e+3									
status												

C2 DC0 10.0 V/div 0.00 V offset

Tbase -9.00 ns Trigger C2 DC
2.00 ns/div Normal 0.00 V
800 S 40 GS/s Edge Positive

Simple Rider ™

Simple Rider UI is designed for touch to drive simplicity in operating with a pulse generator, by optimizing today's modern technique, used on Tablets or smartphones, of capacitive touch screen display.
All important instrument controls and settings are always one touch away: swipe gesture to change the channel, pulse selection and have access to its main parameters, generate multiple pulses easily, use the touch-friendly virtual numeric keyboard to change parameter values on the fly.

Finally, a display interface is offered that will become familiar in less than a minute: the pulses will be generated quickly, adjustments can be done lively, set-up are at one touch.

AWG, AFG and Pulse Rider Series products are equipped with the same Simple Rider UI to share the same benefits with different users and applications.
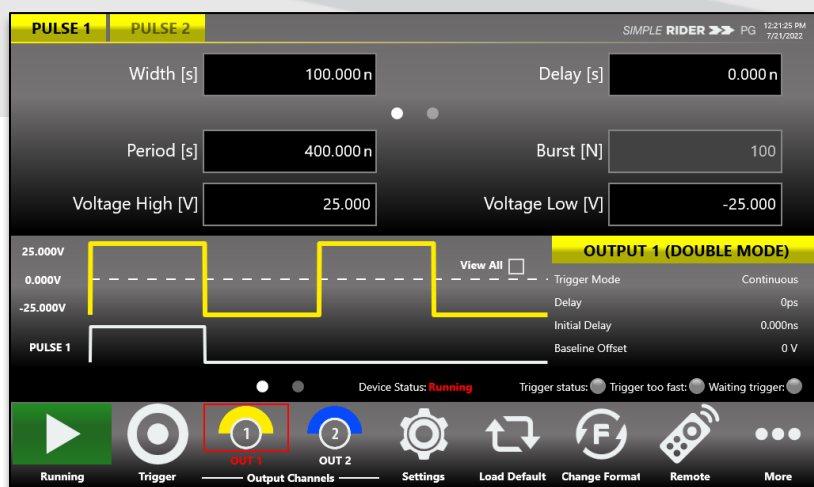
SimpleRider™ *Pulse Rider User Interface*
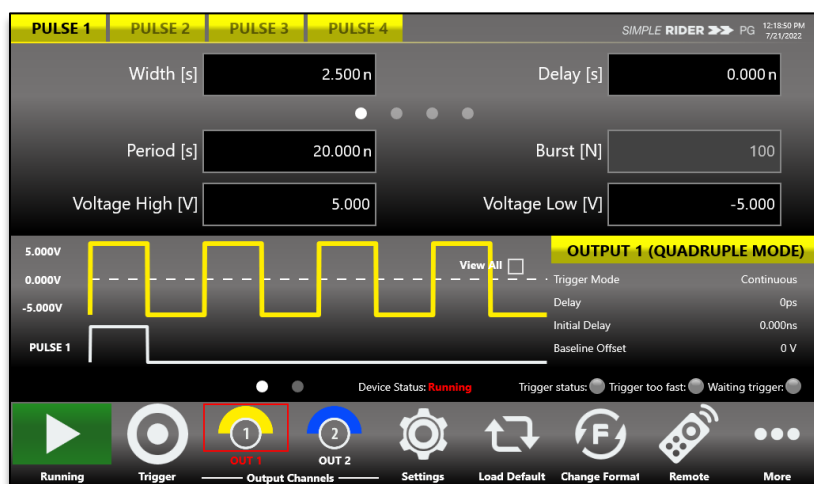
SimpleRider™ *Quadruple Pulse Mode*

Application AREAS

Big Physics Applications

Physics applications have a perfect match with the Rider generator series and in particular with the Pulse Rider Generator.
The combination of fast edge generation, excellent dynamic range and easy to use user interface go perfectly on large experiments areas such Experiments colliders, Lasers modulation, detectors and strips silicon emulation.
High Energy/Voltage Semiconductors system for collider's applications can be modulated and tested thanks to the Pulse Rider patterns. There are several large experiments where Pulse Rider can be the perfect solution to combine high-speed transition time with high channels density (2 channel in just 3U – 19" rackmount).
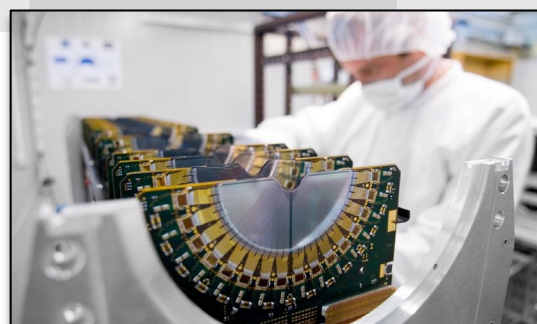
## Military Radar and Sonar Applications

Army/Navy may also require fast pulse generation for testing or emulation.
Radar or Sonar systems perfectly match with these generators to better test and prove complex detection systems.
Pulse Rider is a good fit for areas where a large amount of channels is required and the cost of DAC solutions is too high and too complex to be managed.

ATI Electromagnetic systems largely used in military applications may be tested by Rider Series Generators.
Pulses may be easily generated for applications such Pulse Electron Beam or X Ray Sources, Flash X-ray Radiography, Lighting pulse simulators, high Power Microwave modulators.
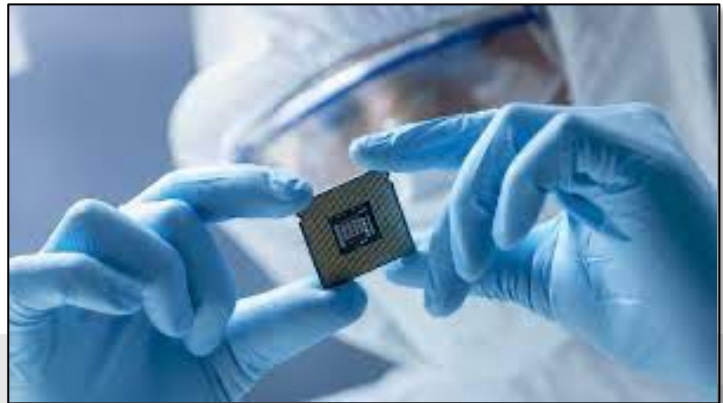
Semiconductor Test

The speed of modern Silicon is imposing high quality and high fidelity test systems.
Today's patterns generators offer a good combination of performance but are limited in edge speed and dynamic range.
Pulse Rider, for the first time, offers both high speed and high dynamic range, combined with an easy-to-use interface and pulse mixing capabilities in one or multiple channels.
This is excellent to test components and provide the right performance to test and prove specs to validate integrated circuits.
DTG functionality may be created by synchronizing one or more Pulse Riders units (4 Channels each).
The Rider series offers also, in the AWGs, digital outputs to be used for digital pattern generation.simulators, high Power Microwave modulators.

EASE of use combined
with POWERFUL performance

1 **Touch Screen display and Soft Keyboard**

The new Rider Series delivers 7" capacitive touch screen display to the mainstream waveform generator market for the first time.

The touch-screen-friendly **SimpleRider™** software allows users to generate pulses quickly by a few screen touches.

The UI ergonomic approach is well balanced to offer multiple ways to operate the instrument by offering a complimentary soft keyboard and a useful central knob for fine-tuning and adjustments during the setup operation.

Standard configurations may be stored on the system memory for easy configuration recalls.

2 **SimpleRider Pulse Touch User Interface**

Simple Rider UI is designed for touch and it has been developed to put all the capabilities of the modern Pulse and Waveform Generators

All instrument controls and parameters are accessed through an intuitive UI that recalls the simplicity of Tablets and modern smart phones: touch features and gestures are available to engineers and scientists to create single or multiple pulses in few touches.

3 **1-2 Channels Pulse Generator**

Multiple pulses generation is always available with the basic **Single Channel** version or with the **Dual Channel** version.

Touch Gesture

4 **Trigger, view, generate and sync**
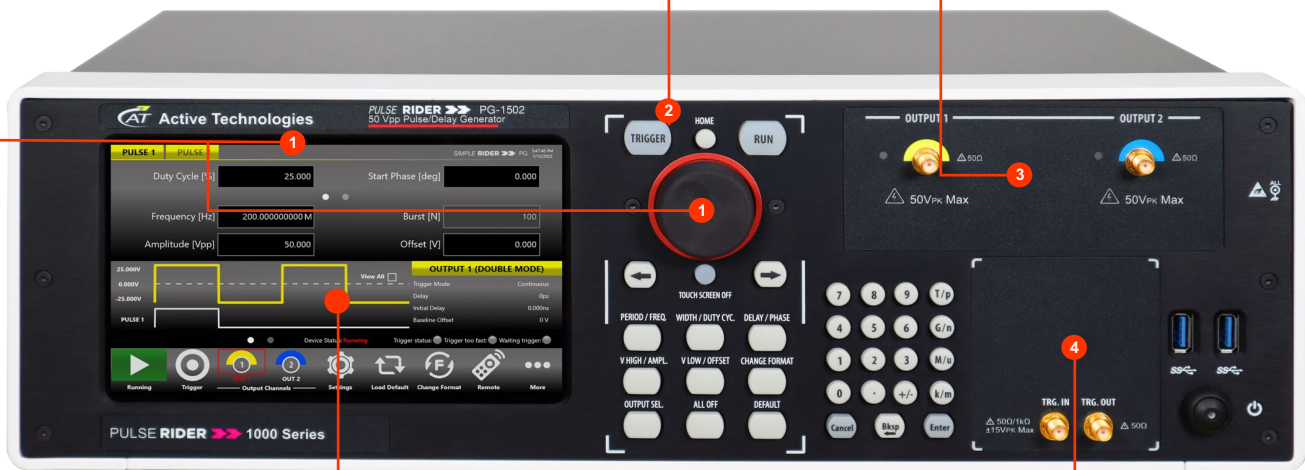
Trigger events may be generated internally or captured by an external trigger source or remotely from Ethernet or GBIP connections.
Trigger in and Trigger out may be used to synchronize multiple units to obtain several pulses and to provide a perfect solution for specific Big Physics or Military applications.

PULSE RIDER >>> PG-1500
SPECIFICATION

Definitions

Specification (spec.)

The warranted performance of a calibrated instrument that has been stored for a minimum of 2 hours within the operating temperature range of 5 °C to 40 °C and after a 45-minute warm up period. Within ± 10 °C after autocal. Data published in this document are specifications (spec) only where specifically indicated.

Typical (typ.)

The characteristic performance, which 80% or more of manufactured instruments will meet. This data is not warranted, does not include measurement uncertainty, and is valid only at room temperature (approximately 23 °C).
Some specifications on this document refer to the available models and options that can be found in the table at the end of this document.

	Pulse Rider PG - 1501	Pulse Rider PG - 1502
Number of Analog Channels	1	2
Timing specifications		
Pulse Period		
Range (spec.)	5 ns to 8 sec.	
Resolution (spec.)	10 ps	
RMS jitter [1]	15 ps	
Pulse Frequency		
Range (spec.)	0.125 Hz to 200 MHz (Single pulse mode)	
	0.25 Hz to 400 MHz (Double, Triple and Quadruple pulse mode)	
Accuracy	± 2 ppm max	

Pulse Width	
Range (spec.)	1 ns to (period – 1 ns)
Resolution (spec.)	10 ps
Accuracy (Offset = 0V)	$\pm (1\% + 100\ \text{ps})^2$
RMS jitter [1]	< 10 ps
Pulse Delay (single/double/triple/quadruple)	
Range (spec.)	0 ps to period
Resolution (spec.)	10 ps
Accuracy	$\pm (0.1\% + 100\ \text{ps})$
Output specifications (50 Ohm load)	
Impedance	50 Ohm nominal
Amplitude	
Range pk-pk (spec.)	100 mVpp to 50 Vpp
Absolute accuracy (spec.)	$\pm$ (2% of amplitude pk-pk + 2% of |DC Offset| + 200 mV)
Resolution (spec.)	10 mV
DC Offset	
Range (spec.)	0V or $\pm$ 25V adjustable
Resolution (spec.)	10 mV
Baseline Offset	
Range (spec.)	-25V, -12,5V, 0V, +12,5V, +25 V (software selectable)
Resolution (spec.)	12.5V
Rise Time (20% to 80%, Offset=0V)	< 380 ps (up to 25Vpp amplitude) < 400 ps (up to 50Vpp amplitude)
Rise Time (10% to 90%, Offset=0V)	< 560 ps (up to 25Vpp amplitude) < 600 ps (up to 50Vpp amplitude)

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[1] All channels at the same frequency in Single Pulse mode and Continuous mode
[2] With Offset $\neq$ 0V the width can deviate from this specification depending on the Offset voltage and other parameters

Fall Time (20% to 80%, Offset=0V)	< 380 ps (up to 25Vpp amplitude)
	< 490 ps (up to 50Vpp amplitude)
Fall Time (10% to 90%, Offset=0V)	< 560 ps (up to 25Vpp amplitude)
	< 800 ps (up to 50Vpp amplitude)
Overshoot	< 8 % (up to 25Vpp amplitude)
	< 5 % (from 25Vpp to 50Vpp amplitude)
Channel to Channel RMS Jitter [1]	< 15 ps
Initial delay	0s to 8s (retriggerable delay off)
	0s to 2.5us (retriggerable delay on)

Trigger input specifications	
Impedance	50 Ohm or 1K Ohm programmable
Range (spec.)	± 3.5 V (50 Ohm input impedance)
	± 10 V (1K Ohm input impedance)
Minimum detectable amplitude (spec.)	< 50 mVpp
Threshold	
Range (spec.)	± 8V
Resolution (spec.)	10 mV
Accuracy	± 100 mV
Max. input frequency (spec.)	40 MHz
Min. pulse width (spec.)	1 ns
Max. external width mode input frequency (spec., duty cycle = 50%)	400 MHz
Edge selection	Positive, negative, both
Prescaler (for every channel)	0 to 65535

Trigger output specifications	
Impedance	50 Ohm nominal
Amplitude (open load)	
Range (spec.)	1.8V to 3.3V adjustable
Resolution (spec.)	1 mV
Accuracy	± 1%
Delay (trigger in to trigger out)	< 100 ns
RMS jitter (trigger in to output or trigger out)	< 30 ps (Trigger IN Frequency ≤ 15 MHz)
Width	10 ns (single, burst mode) Period/2 (continuous mode)
Initial delay	0s to 8s (continuous mode) 0s to 2.5us (single, burst,gated mode)
Internal timer	
Time range (Frequency range)	25ns to 42.9 sec (40Mhz to 23.3 mHz)
Time resolution	1 ps
Frequency accuracy	± 2ppm max
External Clock IN	
Connector type	SMA on rear panel
Input Impedance	50 Ω,AC Coupled
Input voltage range	-5 dBm to 4 dBm sine or square wave (rise time T10-90 <1 ns and duty cycle from 40% to 60%)
Damage level	+8 dBm or ±15 VDC Max
Frequency range	10 MHz to 100 MHz

External Clock OUT	
Connector type	SMA on rear panel
Output Impedance	50 Ω,DC Coupled
Frequency	10 MHz or External Clock IN Frequency
Accuracy	± 2ppm max
Aging	± 1.0 ppm/year max
Amplitude	Square wave: 0V to 1.25 V into 50 Ω, 0V to 2.5 V into High Z
Programmability	
Trigger modes	Single, continuous, burst, gated
Multiple pulse modes	Single, double, triple, quadruple, external width
Power	
Voltage range **Frequency range** **Max. power consumption**	100-240 VAC ±10% 47-63 Hz 300 W
Environmental characteristics	
Temperature (operating)	+5 °C to +40 °C (+41°F to 104 °F)
Temperature (non-operating)	-20 °C to +60 °C (-4 °F to 140 °F)
Humidity (operating)	5 % to 80 % relative humidity with a maximum wet bulb temperature of 29 °C at or below +40 °C, (upper limit de-rates to 20.6 % relative humidity at +40 °C . Non-condensing.
Humidity (non-operating)	5 % to 95 % relative humidity with a maximum wet bulb temperature of 40 °C at or below

	+60 °C, (upper limit de-rates to 29.8 % relative humidity at +60 °C. Non-condensing.
Altitude (operating)	3,000 meters (9,842 feet) maximum at or below 25°
Altitude (non-operating)	12,000 meters (39,370 feet) maximum
EMC and safety	
Safety	EN61010-1
Main Standards	EN 61326-1:2013 – Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
Immunity	EN 61326-1:2013
General characteristics	
Display	7 inch, 1024x600, capacitive touch LCD
Operative System	Windows 10
External Dimensions	W 445 mm – H 135 mm – D 320 mm (3U 19" rackmount)
Weight	21.4 lbs (9.7 Kg)
Front panel connectors	OUTPUT1 (SMA) TRG.IN (SMA) TRG.OUT (SMA) 2 USB 3.0 ports	OUTPUT1 (SMA) OUTPUT2 (SMA) TRG.IN (SMA) TRG.OUT (SMA) 2 USB 3.0 ports
Rear panel connectors	External Monitor ports (HDMI, VGA) 2 USB 2.0 ports 2 USB 3.0 ports 3 COM ports 2 Ethernet ports (10/100/1000BaseT Ethernet, RJ45 port) Audio In/Out ports

	2 PS/2 keyboard and mouse ports
	External Clock IN (SMA)
	External Clock OUT (SMA)
Hard Disk	128 GB SSD
Processor	Intel® Celeron J1900, 2 GHz (or better)
Processor Memory	8 GB