ACTIVE TECHNOLOGIES

RIDER

Time to Reinvent advance signal generation

ARB Rider 4022
Technical Datasheet

Function Generator, Arb Generator and Digital Pattern Generator all in one.

- 2,5 Gs,s 14 Bit Resolution
- 5Vpp into 50 ohm
- Up to 64 Ms/s per Channel
- Rise and fall time less than 350 ps (direct DAC)
- 16-32 Digital Channels in synchronous with analog Generation
- SimpleRider™ Wizard users Interface

Key performance specifications

- Basic mode (AFG)
  - Two analog channels
  - 600 MHz sine waveforms
  - 2.5 GS/s, 14-bit, 16 kpts arbitrary waveforms
  - Amplitude up to 5 V_{p-p} into 50 Ω load
  - +/- 2.5V programmable offset
- Advanced mode (AWG)
  - Two analog channels
  - 16/32-bit digital channels (optional)
  - 1/16/32/64 Mpts per channel arbitrary waveform memory (optional)
  - Up to 1 GHz bandwidth
  - SFDR < -60 dBc
  -

Features & benefits

- Sample rate can be programmed in from 100 S/s to 2.5 GS/s, with 14-bit vertical resolution, ensures signal integrity
- Optional arbitrary waveform memory up to 64 Mpts for each analog channel and 32 Mbit for each digital channel for long waveforms
- Optional 16-32 channel digital outputs. Purchasing SW option includes the shipment of digital probe accessory.
- Two operation modes – Basic (DDS AFG mode) and advanced (arbitrary AWG mode)
- Dual analog channels and up to 32-bit digital channels, for mixed signal generation
- Dedicated bus to synchronize up to 4 unit and create a real **8 channel waveform generator**
- Digital outputs provide up to 1.25 Gb/s data rate in LVDS format. LVDS to LVTTL converters are available
- One marker output for each analog channel for triggering and synchronization
- Three software-configurable output paths to cover all applications:
  - Direct DAC mode: > 1 GHz bandwidth with differential output
  - AC coupled mode: > 1 GHz bandwidth with 10dBm output power for RF applications
  - Amplified mode: 5 V_{p-p} amplitude 600 MHz bandwidth with differential output
- Full functional sequence with up to 16384 user defined waveforms provides the possibility of generating complex signals with the best memory usage, in the form of loops, jumps, and conditional branches
- Both channels (together with the corresponding digital output channels) can work independently on different sampling clocks and sequences

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- Windows based platform with 7in touch screen, front panel buttons and knob
- Compact form factor, convenient for bench top and fully fit with 3U – 19" rackmount standard
- Removable hard disk guarantees the security of confidential data
- LAN interfaces for remote control

Applications areas

IoT and Ind 4.0 perfect RF Modulator

Arb and Function Riders will be the iconic instrument for this applications. The possibility to emulate complex RF I/Q modulation for simulation and Test vs wireless devices or working on Internet of things of industry 4.0 applications. Each engineer may use the possibility to import waveform to emulate devices under test, impose distortion on waveform (such noise) to test the ability of devices to be compliant to the standards.

Research Applications

Research centers and Universities, are key users of have Rider generator's series.
Complex waveform and/or sophisticated Pulses emulation based variable or multilevel edges could be perfectly created. The combination of fast edge generation, excellent dynamic range and easy to use user interface meet perfectly scientists and engineers working on large experiments such Accelerators, Tokamak or synchrotrons to emulate signals without creating specifics test boards. There are several large experiments where Riders can be the perfect solution to combine high-speed transition time with high channels density.

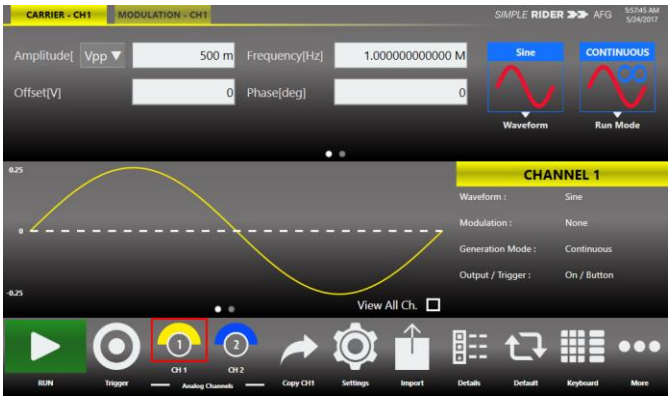
Army applications

Electronics warfare signals driven by Radar or Sonar systems perfectly match with these generators. Large BW Riders can be used on digital modulation systems for Radio Applications or others I/Q signal modulation. 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.

Semiconductors Test

Emulation of complex signals generated with inclusion of noise or distortions may became an excellent way to provide Compliance Components Test to help semiconductors engineers. The fast edges and pulse generation can be used to provide characterization in fast power devices.

SimpleRider: AFG, AWG and Pulse Wizard Interface



Simple Rider UI is designed for touch and it has been developed to put all the capabilities of modern Waveform Generators right at your fingertips. 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 advanced waveforms or digital patterns in few touches.

- The swipe gesture gives easy access to the output waveform parameters
- A touch-friendly virtual numeric keypad has been designed to improve the user experience on entering the data.
- Time saving shortcuts and intuitive icons simplify the instrument setup.

Arb Rider supports the most common interfaces for remote control (Ethernet) for easy customized instrument programming. **SimpleRider** Touch UI is available on all the instruments of the Rider Series product family.

In Advanced mode, users can define complex waveforms with up to 16,384 entries of analog waveforms and digital patterns in a sequence, in terms of loops, jumps, and conditional branches.

In the Multi-sequence mode, two sequences can be defined to control Channel 1 and Channel 2 (and the corresponding digital channels) separately as two units of generator.

Best in class performance in its price range

The AWG4022 gives users access to the best-in-class DAC technology at an affordable price. Up-to 2.5 GS/s sampling rate and 14-bit vertical resolution help users generate ultra wideband communication signals with 1GHz modulation bandwidth (2GHz in I/Q modulation) and < -60 dBc SFDR across each channel. The analog channels can be configured to output as differential, single ended, or AC coupled, eliminating the needs of balloons or hybrids in the test path.

Mixed-signal generation

The AWG4022 has optional 16/32-bit digital outputs, synchronized with the corresponding analog channels in two 16-bit groups. Each group can be configured as 8-bit full speed (bit rate at half the sampling rate) or 16-bit low speed (bit rate at 1/4 of the sampling rate). The mixed signal generation is a great solution for digital designs and validation, system synchronization and DAC/ADC tests.

The digital output pin are native LVDS standard and digital cable to SMA adapter is available

For slower speed application, LVDS to LVTTL converters are available as well.

System extension with multi-unit synchronization

Up to four instruments can be synchronized together in order to build a real 8 channel waveform generator system, which is extremely useful in the applications where multiple channels are needed, like MIMO.

AWG-4022 - Technical Specifications

Document name AWG-4022 - Technical Specifications Last Date update : 02/09/2019

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 0 °C to 55 °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).

Specifications	AWG-4022
Number of Channels	
Analog	2
Digital	0/16/32 – optional
Markers	2
Basic Operation Mode	DDS mode
Standard Waveforms	Sine, Square, Pulse, Ramp, more (Noise, DC, Sin(x)/x, Gaussian, Lorentz, Exponential Rise, Exponential Decay, Haversine
Run Modes	Continuous, modulation, sweep, burst
Arbitrary Waveforms	Sampling clock: 2.5 GS/s, fixed Vertical resolution: 14-bit Waveform length: 16,384 points
Advanced Operation Mode	
Run Modes	Continuous, sequencer, triggered, gated
Vertical Resolution	14 bit
Waveform Length	64 to 64 M points (1 M = 2^{20}) in multiple of 64 points for length < 320 points, in multiple of 16 points for length ≥ 320 points Standard: 1 M points; Optional: 16 M, 32 M, 64 M points
General characteristics – Basic mode	
Output Channels	
Connectors	SMAs for DC AMP on front panel

Output type	Single-ended or differential
Output Impedance	50 Ω (Single-ended) or 100 Ω (differential)
Frequency Range	
Sine	1 µHz to 600 MHz
Square, Pulse	1 µHz to 330 MHz
Ramp, Exponential Rise, Exponential Decay	1 µHz to 30 MHz
Sin(x)/X, Gausian, Lorentz, Haversine	1 µHz to 60 MHz
Arbitrary	1 µHz to 400 MHz
Frequency Resolution	
sine, square, pulse, arbitrary	1 µHz or 15 digits)
amp, Sin(x)/X, Gausian, Lorentz, Exponential Rise, Exponential Decay, Haversine	1 µHz or 14 digits
Frequency Accurancy	
Non-ARB	$\pm 10^{-6}$ of setting
ARB	$\pm 10^{-6}$ of setting ±1 µHz
Sine Waves	
Flatness (1 V_{p-p}, relative to 1 kHz, typical)	DC to 600 MHz : ±0.5 dB
Harmonic Distortion (1 V_{p-p})	1 µHz to ≤ 10 MHz: < -60 dBc > 10 MHz to ≤ 50 MHz: < -55 dBc > 50 MHz to ≤ 200 MHz: < -40 dBc > 200 MHz to ≤ 600 MHz: < -28 dBc
Total Harmonic Distortion (1 V_{p-p}, typical)	10 Hz to 20 kHz: < 0.1%
Spurious (1 V_{p-p})	1 µHz to ≤ 10 MHz: < -65 dBc >10 MHz to ≤ 330 MHz: < -55 dBc > 330 MHz to ≤ 500 MHz: < -50 dBc > 500 MHz to ≤ 600 MHz: < -40 dBc
Phase Noise (1 V_{p-p}, 10 kHz offset, typical)	1MHZ: < -115 dBc/Hz

	10 MHZ: < -110 dBc/Hz 100 MHZ: < -105 dBc/Hz 600 MHZ: < -90 dBc/Hz
Square waves	
Rise/fall time (typical)	1 ns
Overshoot (1 V_{p-p}, typical)	< 2%
Jitter (rms, typical)	<10 ps
Pulse waves	
Pulse width	1 ns to (Period - 1 ns)
Resolution	10 ps or 15 digits
Pulse duty	0.1% to 99.9% (limitations of pulse width apply)
Leading/trailing edge transition time	800 ps to 1000 s
Resolution	1 ps or 15 digits
Overshoot (1 V_{p-p}, typical)	< 2%
Jitter (rms, typical)	<10 ps with leading/trailing edge transition time ≥1 ns
Ramp waves	
Linearity (< 10 kHz, 1 V_{p-p}, 100% Symmetry, typical)	≤ 0.1%
Symmetry	0% to 100%
Other waves	
Noise bandwidth (-3 dB, typical)	400 MHz
Noise add	When activated, output signal amplitude is reduced to 50%
Level	0.0% to 50% of amplitude (V_{p-p}) setting
Resolution	0.1%
Arbitrary	
Number of Samples	2 to 16,384
Analog Bandwidth (-3 dB, typical)	400 MHz
Rise/fall time (typical)	<=800ps
jitter (rms, typical)	400 ps
DC	
Range (50 Ω, single-ended)	-2.5 V to 2.5 V
Accuracy	±(1% of |setting| + 5 mV)
Amplitude	
Range (50 Ω, single-ended)	1μHz ~ 350 MHz: 5 mV_{p-p} to 5 V_{p-p}

Range (100 Ω, differential)	350 MHz ~ 550 MHz: 5 mV_{p-p} to 3 V_{p-p} 550 MHz ~ 600 MHz: 5 mV_{p-p} to 2 V_{p-p} 1 µHz ~ 350 MHz: 10 mV_{p-p} to 10 V_{p-p} 350 MHz ~ 550 MHz: 10 mV_{p-p} to 6 V_{p-p} 550 MHz ~ 600 MHz: 10 mV_{p-p} to 4 V_{p-p}
Amplitude Accuracy (1 kHz sine wave, 0 V offset, > 5 mV_{p-p} amplitude, 50 Ω load)	±(1% of setting + 5 mV)
Resolution	1 mV_{p-p} or 4 digits
Output impedance	Single-ended: 50 Ω, Differential: 100 Ω
Vocm	
Range (50 Ω load, single-ended)	-2.5 V to +2.5 V
Range (High Z load, single-ended)	-5 V to +5 V
Accuracy (50 Ω load, single-ended)	±(1% of |setting| ±5 mV)
Resolution	1 mV or 4 digits
Offset	
Range (50 Ω load, singleended)	±(2.5 Vpk - Amplitude ÷ 2)
Range (High Z load, singleended)	±(5 Vpk - Amplitude ÷ 2)
Accuracy (50 Ω load, singleended)	±(1% of |setting| + 5 mV)
Resolution	1 mV or 4 digits
Window	
Range (50 Ω load, single-ended)	1 µHz ~ 350 MHz: -5 V to +5 V 350 MHz ~ 550 MHz: -4 V to +4 V 550 MHz ~ 600 MHz: -3.5 V to +3.5 V
Range (100 Ω, differential)	1 µHz ~ 350 MHz: -10 V to +10 V 350 MHz ~ 550 MHz: -8 V to +8 V 550 MHz ~ 600 MHz: -7 V to +7 V
Range (High Z, single-ended)	1 µHz ~ 350 MHz: -10 V to +10 V 350 MHz ~ 550 MHz: -8 V to +8 V 550 MHz ~ 600 MHz: -7 V to +7 V
Amplitude Modulation (AM)	

Carrier waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Modulation source	Internal or external
Internal modulating waveforms	Sine, Square, Ramp, Noise, ARB
Modulating frequency	Internal: 500 µHz to 50 MHz, External: 10 MHz maximum
Depth	0.00% to 120.00%
Frequency Modulation (FM)	
Carrier waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Modulation source	Internal or external
Internal modulating waveforms	Sine, Square, Ramp, Noise, ARB
Modulating frequency	Internal: 500 µHz to 50 MHz, External: 10 MHz maximum
Peak deviation	DC to 300 MHz
Phase Modulation (PM)	
Carrier waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Modulation source	Internal or external
Internal modulating waveforms	Sine, Square, Ramp, Noise, ARB
Modulating frequency	Internal: 500 µHz to 50 MHz, External: 10 MHz maximum
Phase deviation range	0° to 360°
Frequency Shift Keying (FSK)	
Carrier waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Modulation source	Internal or external
Internal modulating waveforms	Square
Key rate	Internal: 500 µHz to 50 MHz, External: 10 MHz maximum
Hop frequency	1 µHz to 600 MHz
Numer of keys	2
Phase Shift Keying (PSK)	
Carrier waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Modulation source	Internal or external
Internal modulating waveforms	Square
Key rate	Internal: 500 µHz to 50 MHz, External: 10 MHz maximum
Hop phase	0° to +360°
Numer of keys	2
Pulse Width Modulation (PWM)	
Carrier waveforms	Pulse
Modulation source	Internal or external

Internal modulating waveforms	Sine, Square, Ramp, Noise, ARB
Modulating frequency	Internal: 500 µHz to 50 MHz, External: 10 MHz maximum
Deviation range	0% to 50% of pulse period
Sweep	
Type	Linear, Logarithmic, staircase, and user defined
Waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Sweep time	50 µs to 2000 s
Hold/return times	0 to (2000 s - 50 µs)
Sweep/hold/return time resolution	20 ns or 12 digits
Total sweep time accuracy (typical)	≤ 0.4%
Start/stop frequency range	Sine: 1 µHz to 600 MHz, Square: 1 µHz to 300 MHz
Trigger source	Internal/External/Manual
Burst	
Waveforms	Standard waveforms (except DC and Noise), ARB
Type	Trigger or gated
Burst count	1 to 1,000,000 cycles or Infinite
Internal trigger delay	0 to 100 s
Internal trigger delay accuracy (typical)	±(0.1% setting + 5 ps)
Internal trigger rate	0 to 500 s
Internal trigger interval range	1 µs to 500 s
Internal trigger resolution	2 ns or 12 digits
General characteristics – Advanced mode	
Output Channels	
Connectors	SMAs for AMP, DAC, and AC modes on front panel
Output type	AMP and DAC modes: single-ended or differential, AC mode: single-ended
Output Impedance	50 Ω single-ended, 100 Ω differential
Channels skew	
Skew between positive and negative outputs (typical)	≤ 20 ps
Skew control (between channels) – Range	0 to 240,000 ps
Skew control (between channels) – Resolution	

Skew control (between channels) – Accuracy	10 ps
Initial skew	±(10% of setting + 20 ps) < 200 ps from 1.25 GS/s to 2.5 GS/s, < 1 ns below 1.25 GS/s
Marker skew	
Range	0 to 101,790 ps
Resolution	78 ps
Accuracy (typical)	±(10% of setting + 140 ps)
Initial skew	< 1.4 ns from 1.25 GS/s to 2.5 GS/s < 2 ns from 100 MS/s to 1.25 GS/s < 4.5 ns below 100 MS/s
Calculated bandwidth (0.35 / rise or fall time, typical)	
AMP	460 MHz
DAC	1 GHz
AC	1 GHz
Amplitude Range (single-ended, 50 Ω load)	
AMP	0 to 5 V_{p-p} (doubled in case of differential or High Z load)
DAC	0 to 0.8 V_{p-p} (doubled in case of differential or High Z load)
AC	0 to 2 V_{p-p} (doubled in case of High Z load)
Amplitude accuracy	
AMP DAC (1 kHz sine, offset 0 V)	±(1% of setting + 5 mV_{p-p})
AC (100 MHz sine, offset 0 V, typical)	±(2% of setting + 5 mV_{p-p}) - 0.1% of |setting| x temperature deviation
Amplitude resolution	
AMP, DAC, and AC	0.1 mV or 5 digits
Offset range (single-ended, 50 Ω load)	
AMP	-2.5 V to +2.5 V (doubled in case of differential or High Z load)
DAC	-0.35 V to +0.35 V (doubled in case of differential or High Z load)
Offset accuracy	
AMP, DAC	±(1% of |setting| + 5 mV)
Offset resolution	
AMP, DAC	10 mV or 3 digits

Vocm range (single-ended, 50 Ω load)	
AMP	-2.5 V to +2.5 V (doubled in case of differential or High Z load)
DAC	-0.35 V to +0.35 V (doubled in case of differential or High Z load)
Vocm accuracy	
AMP	±(1% of setting + 5 mV)
DAC	±(6% of Vocm range + 5 mV)
Vocm resolution	
AMP, DAC	10 mV or 3 digits
Voltage window Range (single-ended, 50 Ω load)	
AMP	1 µHz to 300 MHz: -5 V to 5 V > 300 MHz to 550 MHz: -4 V to 4 V > 550 MHz to 600 MHz: -3.5 V to 3.5 V (doubled in case of differential or High Z load)
DAC	-0.4 V to 0.4 V (doubled in case of differential or High Z load)
AC	-1 V to 1 V (doubled in case of High Z load)
Harmonic distortion (Sine wave 32 points at 2.5 GS/s, 78.125 MHz, typical)	
AMP (1 V_{p-p} single-ended)	< -56 dBc (single-ended or differential)
DAC (0.5 V_{p-p} single-ended)	< -60 dBc (single-ended or differential)
AC (1 V_{p-p} single-ended)	< -56 dBc
Spurious (Sine wave 32 points at 2.5 GS/s, 78.125 MHz, typical)	
AMP (1 V_{p-p} single-ended)	< -62 dBc (single-ended or differential)
DAC (0.5 V_{p-p} single-ended)	< -62 dBc (single-ended or differential)
AC (1 V_{p-p} single-ended)	< -55 dBc
SFDR (Sine wave 32 points at 2.5 GS/s, 78.125 MHz, typical)	
AMP (1 V_{p-p} single-ended)	< -56 dBc (single-ended or differential)

DAC (0.5 V_{p-p} single-ended)	< -60 dBc (single-ended or differential)		
AC (1 V_{p-p} single-ended)	< -55 dBc		
Rise/fall time (10% to 90%, typical)			
AMP (1 V_{p-p} single-ended)	< 800 ps		
DAC (0.5 V_{p-p} single-ended)	< 350 ps		
AC (1 V_{p-p} single-ended)	< 350 ps		
Overshoot (typical)			
AMP (1 V_{p-p} single-ended)	< 2%	800 ps	
DAC (0.5 V_{p-p} single-ended)	< 1%	450 ps	
AC (1 V_{p-p} single-ended)	< 2%	450 ps	

Timing and Clock	
Random jitter on clock pattern (rms, typical) AMP, DAC	< 5 ps
Total jitter on random pattern (peak-to-peak at 625 Mb/s, PRBS 15 data pattern, typical) AMP, DAC	< 150 ps
Digital outputs (Optional)	
Output Channels Connectors Number of connectors Number of outputs	 Mini-SAS HD connector on front panel 2 32-bits (16-bits x 2 groups)
Output impedance	100 Ω differential
Output type	LVDS
Rise/fall time (10% to 90%, typical)	600 ps
Initial skew between digital outputs (typical)	< 500 ps between group A and B
Jitter (peak-to-peak, 2.5 GS/s, 1.25 Gb/s, PN15 pattern, BER = 1e-12)	150 ps
Maximum update rate	1.25 Gbps (full speed mode, maximum 16-bit) 625 Mbps (low speed mode, maximum 32-bit)
Memory depth (optional)	Half of analog waveform length (full speed mode), One fourth of analog waveform length (low speed mode)
8 bit LVDS to LVTTL Converter Probe (Optional AT-DLL8)	
Output connector	20 position 2.54 mm 2 Row IDC Header
Output type	LVTTL
Output impedance	50 Ω nominal
Output voltage	0.8V to 3.8V programmable in group of 16 bits
Maximum Update Rate	125 Mbps@0.8V and 400 Mbps@3.6V

Dimensions	W 52 mm – H 22 mm – D 76 mm
Input Connector	Proprietary standard
Cable Length	1 meter
Cable Type	Proprietary standard
Proprietary Mini SAS HD to SMA cable (Optional)	
Output connector	SMA
Output type	LVDS
Number of SMA	16 (8 bits)
Cable type	Proprietary standard
Cable Length	1 meter
Auxiliary input and output characteristics (Marker out)	
Connector type	SMA on front panel
Number of connectors	two, one for each analog output
Output impedance	50 Ω
Output level (into 50 Ω)	1 V to 2.5 V
Resolution	10 mV
Accuracy (typical)	±(2% setting + 10 mV)
Variable delay control	0 to 60606 ps
Resolution	78 ps
Accuracy (typical)	±(10% of setting + 140 ps)
Rise/fall time (10% to 90%, 2.5 V, typical)	800 ps
Total jitter on random pattern (peak-to-peak, 2.5 GS/s, 1.25 Gb/s, PN15 pattern, output level 2.5 V, BER = 1e-12)	155 ps
Trigger/Gate input	
Connector	SMA on the Front Panel
Input impedance	1.1 kΩ
Slope/Polarity	Positive or negative selectable
Input damage level	< -15 V or > +15 V

Threshold control level	-10 V to 10 V
Resolution	50 mv
Threshold control accuracy (typical)	±(10% of |setting| + 0.2 V)
Input voltage swing	0.5 V_{p-p} minimum
Minimum pulse width	12 ns
Initial trigger/gate delay to Analog Output	Basic mode: 384.6 ns ± 50 ps Advanced mode: 20 ns + 2288 sampling clock cycles ±1 sampling clock cycle
Trigger In to output jitter (typical)	< 50 ps
Auxiliary input and output characteristics	
Sync in/out	
Connector type	Infiniband 4X connector on rear panel
Master to Slave delay (typical)	48.6 ns
Reference clock input	
Connector type	SMA on rear panel
Input impedance	50 Ω, AC coupled
input voltage range	-5 dBm to 4 dBm sine or square wave
Damage level	+8 dBm or ±15 V_{DC} Max
Variable Input Frequency range	10 MHz to 80 MHz
Reference clock output	
Connector type	SMA on rear panel
Output impedance	50 Ω, AC coupled
Frequency	10 MHz
Accuracy	± 1.0 x 10^{-6}
Aging	± 1.0 x 10^{-6}/year
Amplitude (typical)	1.6 V_{p-p} into 50 Ω, 3.2 V_{p-p} into High Z
Jitter (rms, typical)	11.5 ps
External Sampling Clock input	
Connector type	SMA on rear panel
Input impedance	50 Ω, AC coupled
Number of inputs	Two, one for each channel
Frequency range	1.25 GHz to 2.5 GHz
Input voltage range	-5 dBm to 4 dBm
Damage level	+8 dBm or ±15 V_{DC} Max

External Modulation input	
Connector type	SMA on rear panel
Input impedance	10 KΩ
Number of inputs	Two, one for each channel
Bandwidth (typical)	10 MHz with 50 MS/s sampling rate
Input voltage range	-1 V to +1 V (except FSK, PSK) FSK, PSK: 3.3 V
Vertical resolution	14-bit
Power	
Voltage range	100-240 VAC ±10%
Frequency range	47-63 Hz
Max. power consumption	120 W
Environmental characteristics	
Temperature (operating)	+0 ºC to +50 ºC (+32 ºF to 122 ºF)
Temperature (non-operating)	-20 ºC to +85 ºC (-4 ºF to 185 ºF)
Humidity (operating)	8% to 90% relative humidity with a maximum wet bulb temperature of 29°C at or below +50°C, (upper limit de–rates to 20.6% relative humidity at +50°C). Non-condensing.
Humidity (non-operating)	5% to 98% 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)	3,048 meters (10,000 feet) maximum
Altitude (non-operating)	12,000 meters (39,370 feet) maximum
EMC and safety	
Safety	UL61010-1, CAN/CSA C22.2 No.61010-1, EN61010-1, IEC61010-1
Emissions	CISPR 11, Class A, EN61000-3-2:2006, EN 61000-3-3:1995
Immunity	EN 61326-1:2006, IEC 61000-4-2:2001, IEC 61000-4-3:2002, IEC 61000-4-4:2004, IEC 61000-4-5:2001, IEC 61000-4-6:2003, IEC 61000-4-11:2004
Regional certifications	
European union	EN61326-1
Autralia/New Xealand	CISPR 11:2003

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	CH1 OUTPUT+ (SMA) CH1 OUTPUT- (SMA) CH1 AC (SMA) CH2 OUTPUT+ (SMA) CH2 OUTPUT- (SMA) CH2 AC (SMA) MARKER OUT 1 (SMA) MARKER OUT 2 (SMA) TRG.IN (SMA) DIGITAL POD A[7..0] DIGITAL POD B[7..0] DIGITAL POD C[7..0] DIGITAL POD D[7..0] 2 USB 3.0 ports
Rear panel connectors	Ref. Clk. IN (SMA) Ext.Clk.In Ch1 (SMA) Ext.Clk.In Ch2 (SMA) Ext.Mod.In Ch1 (SMA) Ext.Mod.In Ch2 (SMA) Ref.Clk.Out (SMA) Sync. Out (Infiniband 4X) Sync. In (Infiniband 4X) Pattern Jump In (DSUB-15) External Monitor ports (DVI, VGA) 4 USB 2.0 ports 2 USB 3.0 ports Ethernet port (10/100/1000BaseT Ethernet, RJ45 port) Audio In/Out ports 2 PS/2 keyboard and mouse ports

Hard Disk	256 GB SSD
Processor	Intel® I3-4170, 3.7 Ghz (or better)
Processor Memory	8 GB