ACTIVE TECHNOLOGIES

RIDER

Time to Reinvent advance signal generation

ARB Rider 5062 / 5064 /5068 Technical Datasheet

2 / 4 / 8 CHANNELS – ALL IN ONE: Function Generator, Arb Generator and Digital Pattern Generator.

- 2, 4 or 8 Analog Channels
- 6.16 GS/s 16 Bit Vertical Resolution
- 2 GHz Bandwidth
- Up to 5 V_{p-p} Output Voltage and ± 2.5V Hardware Offset into 50 Ohm
  Total Output Voltage Window ±5V (10 V_{p-p}) into 50 Ohm
- Up to 4 Gpts Waveform Memory per Channel
- Up to 32 Digital Channels in synchronous with analog Generation
- Simple Rider™ UI: designed for touch AWG/AFG user interfaces.
- Multi-Instrument Synchronization (AWG5068 only): **up to 32 analog** and **128 digital channels**

Key performance specifications

- AWG Mode
  - 6.16 GS/s Variable Clock, 16-bit vertical resolution
  - 8bit,16bit or 32 bit digital channels
  - Up to 4 Gpts Waveform Memory per Channel
  - 2 GHz Bandwidth, 110ps Rise/fall time
  - Amplitude up to 5 V_{p-p} into 50 Ω load
  - Programmable hardware offset: ± 2.5V into 50 Ω

- AFG Mode
  - 2 GHz Sine Waveforms
  - 6.16 GS/s fixed, 16-bit vertical resolution
  - Amplitude up to 5 V_{p-p} into 50 Ω load
  - Programmable hardware offset: ± 2.5V into 50 Ω
  - Improved DDS based technology

Features & Benefits

- Sample rate can be programmed in from 1 S/s to 6.16 GS/s, with 16-bit vertical resolution, ensures exceptional signal integrity
- Arbitrary waveform memory up to 4 Gpts for each analog channel
- Mixed Signal Generation – 2, 4 or 8 Analog channels with 8, 16 or 32 synchronized Digital Channels for debugging and validating digital design
- Two operation modes – Simple Rider AFG (DDS AFG mode) and True Arb (variable clock Arbitrary AWG mode)
- Digital outputs provide up to 1.54 Gb/s data rate in LVDS format. LVDS to LVTTL adapter is available
- Advance sequencer with up to 16384 user defined waveforms provides the possibility of generating complex signal scenarios with the most efficient memory usage
- 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
- LAN interfaces for remote control

Active Technologies

www.activetechnologies.it

SPECIFICATIONS

Applications areas

Automotive

Today's cars are including a lot of highly sophisticated electronic control unit with very sensitive electronic components.
The Arb Rider 5062/5064/5068 combining 6.16 GS/s with 16 vertical resolution, represents an ideal tool for successfully addressing the new testing challenges in automotive.

- EMI debugging, troubleshooting and testing
- Electrical standards emulation up to 5V

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 Arb Rider generator's series.
Complex waveform and/or sophisticated Pulses emulation based on variable edges or multilevel 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 Quantum Research or on large experiments such Accelerators, Tokamak or synchrotrons to emulate signals without creating specifics test boards.

- Emulation of detectors
- Emulation of signal sources adding noise
- Generation/playback of real-world signals
- Emulation of long PRBS sequences
- Modulating and driving laser diode

Aerospace and Defense applications

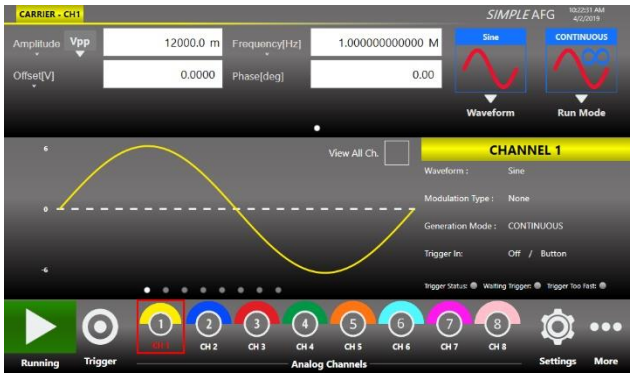
Electronic warfare signals driven by Radar or Sonar systems perfectly match with these generators. Large BW Riders can be used on digital modulation systems for Radio Applications or others I/Q signal modulation.
Pulses may be easily generated for applications such Pulse Electron Beam or X Ray Sources, Flash X-ray Radiography, Lighting pulse simulators, high Power Microwave modulators.

- Frequency response, intermodulation distortion and noise-figure measurements
- Phase Locked Loop (PLL) pull-in and hold range characterization
- Radar base-band signals emulation

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.

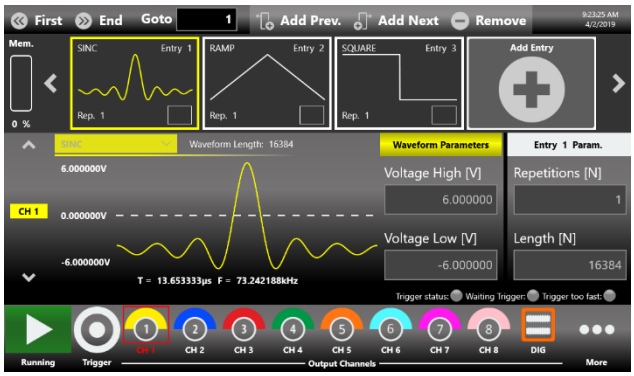
Simple Rider AFG: Function Generator Mode Interface



Simple Rider AFG 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.

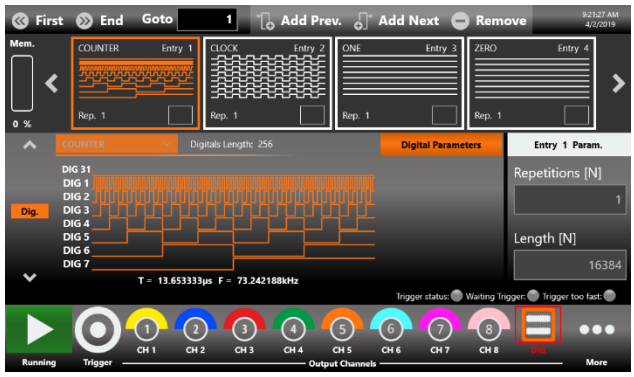
- The swipe gesture gives easy access to the output waveform parameters
- A touch-friendly virtual numeric keypad has been designed to improve the user experience on entering the data.
- Time saving shortcuts and intuitive icons simplify the instrument setup.

Simple Rider TrueArb: AWG and DPG Mode Interface



In **Simple Rider True-Arb** interface, the users can define complex waveforms with up to 16,384 sequence entries of analog waveforms and digital patterns, define their execution flow by means of loops, jumps and conditional branches.

Digital output combined and synchronized with analog output signals represent an ideal tool to troubleshoot and validate digital design.
The waveform memory length of up to 4 GSamples on each channel combined with up to 16,384 and up to 4,294,967,294 repetitions, make the Arb-Rider 5062/5064/5068 the ideal generator for the most demanding technical applications.



Thanks to the intuitive and easy waveform sequencer user interface, the most complex waveform scenarios can be created with just few screen touches.

Up to 4 instrument can be synchronized together in order to obtain a 32 analog – 128 digital channel generator. A dedicated synchronization bus guarantees the intra-chassis synchronization. This feature is available on AWG5068 model only

Arb Rider supports the standard Ethernet interface for remote control and easy customized instrument programming.

Document name **AWG-5062/5064/5068 - Technical Specifications** Last Date Update: 07/09/2020

All specifications are typical unless noted otherwise. The guaranteed performances are referred to 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 auto-calibration.

General Specifications			
	AWG-5062	**AWG-5064**	**AWG-5068**
Number of Channels			
Analog	2	4	8
Digital	0/8 opt.	0/8/16 opt.	0/8/16/24/32 opt.
Markers	1	2	4
Operating Mode	AFG Mode True Arb Mode		
Amplitude			
Range (50 Ω into 50 Ω)	0 to 5Vpp		
Accuracy (1 kHz sine wave,0 V offset, > 5 mV_{p-p} amplitude, 50 Ω load) (guaranteed)	±(1% of setting [Vpp] + 5 mV)		
Resolution	<0.2 mV_{p-p} or 5 digits		
Output impedance	Single-ended: 50 Ω		
Baseline Offset			
Range (50 Ω into 50 Ω)	-2.5 V to +2.5 V		
Range (50 Ω into High Z load)	-2.5 V to +2.5 V		
Accuracy (50 Ω into 50 Ω) (guaranteed)	±(1% of |setting| ±5 mV)		
Resolution	<4 mV or 4 digits		
DC			
Amplitude range (50 Ω, single-ended)	-2.5 V to +2.5 V		
Amplitude accuracy (guaranteed)	±(1% of |setting| + 10 mV)		

True Arb mode specifications	
Output Channels	
Connectors	SMA on front panel
Output type	Single-ended DC coupled
Output Impedance	50 Ω
General specifications	
Operating Mode	Variable clock (True Arbitrary)
Run Modes	Continuous, Triggered Continuous, Single/Burst, Stepped, Advanced
Vertical Resolution	16 bit
Waveform Length	128 to 2G samples per channel (up to 4G samples optional)
Waveform Granularity	1 if the entry length is > 416 samples 32 if entry length is ≥ 128 and ≤ 416 samples
Sequence Length	1 to 16384
Sequence Repeat Counter	1 to 4294967294 or infinite
Timer	
Range	20 ns to 1.39 seconds
Resolution	± 1 sampling clock cycle
Analog Channel to Channels skew	
Range	0 to 2.65 us
Resolution	≤ 100 fs
Accuracy	±(1% of setting + 20 ps)
Initial skew	< 20 ps
Calculated bandwidth (0.35 / rise or fall time)	≥ 2 GHz
Harmonic distortion (Sine wave 128 points,1Vpp)	< -70 dBc (48.125MHz@ 6.16 GS/s)
Spurious (Sine wave 128 points, 1Vpp)	< -70 dBc (48.125MHz @ 6.16 GS/s)
SFDR (Sine wave 128 points, 1Vpp)	< -70 dBc (48.125MHz @ 6.16 GS/s)
Rise/fall time (1 V_{p-p} single-ended 10% to 90%)	≤ 175 ps

Rise/fall time (1 V_{p-p} single-ended 20% to 80%)	≤ 110 ps
Overshoot (1 V_{p-p} single-ended)	<5%
Random jitter on clock pattern (rms, typical)	< 2 ps

AFG Mode Specifications	
Output Channels	
Connectors	SMA on front panel
Output type	Single-ended
Output Impedance	50 Ω
General Specifications	
Operating 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	Vertical resolution: 16-bit Waveform length: 16,384 points
Internal Trigger Timer	
Range	10.4 ns to 88 s
Resolution	80 ps
Accuracy	±(0.1% setting + 5 ps)
Sine Waves	
Frequency Range Sine (50 Ω into 50 Ω)1	1 µHz to ≤1 GHz: 5Vpp 1 GHz to ≤2 GHz: 4Vpp
Flatness (1 Vp-p, relative to 1 kHz)	DC to 2 GHz : ±0.5 dB
Harmonic Distortion (1 V_{p-p})	1 µHz to ≤ 20 kHz: < -75 dBc

[1] Amplitude doubles on HiZ load

	> 20 kHz to ≤ 400 MHz: < -70 dBc > 400 MHz to ≤ 1 GHz<: < -60 dBc > 1 GHz to ≤ 2 GHz: < -55 dBc
Total Harmonic Distortion (1 V_{p-p})	10 Hz to 20 kHz: < 0.05% TBC
Spurious (1 Vp-p) (measured across DC to Fs/2)	1 µHz to ≤ 1.5 GHz: < -65 dBc 1.5 GHz to ≤ 1.7 GHz: < -55 dBc 1.7 GHz to ≤ 2 GHz: < -50 dBc
Phase Noise (1 V_{p-p}, 10 kHz offset)	20 MHz: < -127 dBc/Hz typ. 100 MHz: < -123 dBc/Hz typ. 1 GHz: < -105 dBc/Hz typ.
Square Waves	
Frequency Range	1 µHz to ≤ 770 MHz: 5Vpp
Rise/fall time (10% to 90%)	400 ps
Rise/fall time (20% to 80%)	300 ps
Overshoot (1 V_{p-p})	<2%
Jitter (rms)	<2 ps
Pulse Waves	
Frequency Range	1µHz to ≤770 MHz: 5Vpp
Pulse width	500 ps to (Period – 500 ps)[2]
Pulse width Resolution	20 ps or 15 digits
Pulse duty	0.1% to 99.9% (limitations of pulse width apply)
Leading/trailing edge transition time (10% to 90%)	400 ps to 1000 s
Leading/trailing edge transition time (20% to 80%)	300 ps to 1000 s
Transition time Resolution	2 ps or 15 digits

[2] Below 500 ps width, the pulse amplitude will have some reduction respect to the set value

Overshoot (1 V_{p-p})	< 2%
Jitter (rms, with rise and fall time ≥ 400ps)	<2 ps
Double Pulse Waves	
Frequency Range	1µHz to ≤ 385 MHz: 10Vpp Where Vpp=|Vpp1|+|Vpp2|
Other Pulse Parameters	Same as Pulse Waves
Ramp Waves	
Frequency Range	1 µHz to 75 MHz
Linearity (< 10 kHz, 1 V_{p-p}, 100%)	≤ 0.1%
Symmetry	0% to 100%
Other Waves	
Frequency Range	
Exponential Rise, Exponential Decay	1 µHz to 75 MHz
(Sin(x)/X, Gaussian, Lorentz, Haversine	1 µHz to 150 MHz
Additive Noise	
Bandwidth (-3 dB)	2 GHz
Level	0 V to 2.5 V – | carrier max value [V_{pk}] |
Resolution	1 mV
Arbitrary	
Number of Samples	2 to 16384
Frequency range	1 µHz to ≤ 770 MHz
Analog Bandwidth (-3 dB)	950 MHz
Rise/fall time (10% to 90%)	400 ps
Rise/fall time (20% to 80%)	300 ps
Jitter (rms)	< 2 ps

Frequency Resolution	
Sine, square, pulse, arbitrary, Sin(x)/X	1 µHz or 15 digits
Gaussian, Lorentz, Exponential Rise, Exponential Decay, Haversine	1 µHz or 14 digits
Frequency Accuracy	
Non-ARB	± 2.0 ppm of setting | ± 500 ppb of setting (Opt.)
ARB	± 2.0 ppm of setting ±1 µHz | ± 500 ppb of setting ±1 µHz(Opt.)
Modulations	
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 61 MHz, External: 10 MHz max.
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 61 MHz, External: 10 MHz max.
Peak deviation	DC to 2 GHz
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 61 MHz, External: 10 MHz max.
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 61 MHz, External: 10 MHz max.
Hop frequency	1 µHz to 2 GHz
Number 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 61 MHz, External: 10 MHz max.
Hop phase	0° to +360°
Number 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 61 MHz, External: 10 MHz max.
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	30 ns to 2000 s
Hold/return times	0 to (2000 s – 30 ns)
Sweep/hold/return time resolution	15 ns or 12 digits
Total sweep time accuracy	≤ 0.4%
Start/stop frequency range	Sine: 1 µHz to 2 GHz, Square: 1 µHz to 770 MHz
Trigger source	Internal/External/Manual
Burst	
Waveforms	Standard waveforms (except DC and Noise), ARB
Type	Trigger or gated
Burst count	1 to 4,294,967,295 cycles or Infinite

Timing and Clock	
Sampling Rate Range Resolution Accuracy	 1 S/s to 6.16 GS/s 32 Hz ± 2.0 ppm | ± 500 ppb (Opt.)
Digital outputs (Optional)	
Output Channels Connectors Number of connectors Number of outputs	 Mini-SAS HD connector on rear panel (custom pin-out) 1,2,4 8-bits,16-bits,32-bits
Output impedance	100 Ω differential
Output type	LVDS
Rise/fall time (10% to 90%)	< 1 ns
Jitter (rms)	20 ps
Maximum update rate	1.54 Gbps per channel
Memory depth	512M Samples per digital channel (up to 1G optional)
8 bit LVDS to LVTTL Converter Probe (Optional AT-DTLL8)	
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 8 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	
Sync in/out	
Connector type	Infiniband 4X connector on rear panel (custom pinout)
Master to Slave delay (typical)	TBD
Marker Output	
Connector type	SMA on front panel
Number of connectors	1|2|4
Output impedance	50 Ω
Output level (into 50 Ω)	
Voltage Window	-0.5V to 1.65V
Amplitude	100 mVpp to 2.15 Vpp
Resolution	1 mV
Accuracy	±(5% setting + 25 mV)
Max Update Rate	True Arb Mode: 6.16 Gbit, AFG Mode: 96,5 MHz (continuous mode)

Rise/fall time (10% to 90%, 2 Vpp)	<150 ps
Jitter (rms)	<10 ps
Marker out to analog channel skew Range Resolution Accuracy Initial skew	 True Arb Mode:0 to 2.3µs AFG Mode:0 to 11 sec. in Contin. Mode, 0 to 2.3 µs in Trig. Mode True Arb Mode:1/64 of DAC sampling period, AFG Mode:5 ps ±(1% of setting + 5 ps) < 20 ps
Trigger/Event Inputs	
Connector	SMA on the Front Panel
Number of Trigger Inputs	2 (Trig.in 1, Trig.in 2)
Input impedance	50Ω/1 kΩ
Slope/Polarity	Positive or negative or both
Input damage level	< -15 V or > +15 V
Threshold control level	-10 V to 10 V
Resolution	50 mV
Threshold control accuracy	±(10% of |setting| + 0.2 V)
Input voltage swing	0.5 V_{p-p} minimum
Minimum pulse width (1 V_{p-p}**)**	3 ns
Trigger/gate input to Analog Output delay	**Slow (synchronous) trigger** AFG mode: < 355 ns (< 405 ns in triggered sweep mode) True Arb mode: <1550 * DAC clock period(ns) + 10 ns **Fast (asynchronous) trigger** AFG mode: < 335 ns (< 385 ns in triggered sweep mode) True Arb mode: <1360 * DAC clock period(ns) + 27 ns
Trigger In to output jitter (rms)	AFG mode: < 20 ps True Arb mode: 0.29*Dac clock period

Trigger In programmable delay range	0ps to 2418ps
Trigger In programmable delay resolution	78ps
Maximum Frequency	AFG: 65 MTps on Rising/Falling Edge, 80 MTps on Both Edges True Arb mode: 1/ (Period of the Analog Waveform + 48 DAC Clock period) MTps = Mega Transitions per second
Reference clock input	
Connector type	SMA on rear panel
Input impedance	50 Ω, AC coupled
Input voltage range	0.2Vpp to 2Vpp
Damage level	Maximum Input voltage: -0.3V to 3.6V Maximum input power: 30 dBm (50 Ω)
Frequency range	5 MHz to 200 MHz
Frequency Resolution	1 Hz
Reference clock output	
Connector type	SMA on rear panel
Output impedance	50 Ω, AC coupled
Frequency	10 MHz TCXO | 100 MHz VCOCXO (Optional)
Initial accuracy @ 25 °C	± 1.0 ppm | ± 500 ppb (Opt.)
Aging	± 1.0 ppm/year | ± 500 ppb/year (Opt.)
Stability vs. temperature	± 1 ppm | ± 50 ppb(Opt.)
Amplitude	1.65 Vpp
Phase Noise @ 20 MHz carrier	-120 dBc/Hz at 100 Hz ; -140 dBc/Hz at 1KHz;-150 dBc/Hz at 10 KHz
Phase Noise @ 100 MHz carrier(Opt.)	-120 dBc/Hz at 100 Hz ; -145 dBc/Hz at 1KHz;-150 dBc/Hz at 10 KHz
External Clock Input	
Connector type	SMA on rear panel
Input impedance	50 Ω, AC coupled
	True Arb: SampleRate / N where:

Frequency[3]	N = 4, 8, 16, 32 for SampleRate = 3.08÷6.16 GHz N = 2, 4, 8, 16, 32 for SampleRate = 3.08÷5.0 GHz AFG: 192.5 MHz, 385 MHz, 770 MHz or 1540 MHz (selectable)
Input Power Range	+0 dBm to +10 dBm
Damage Level	15 dBm
Sync Clk Out	
Connector type	SMA on rear panel
Output impedance	50 Ω, AC coupled
Frequency	AFG Mode: 6.16Ghz / N where N=16, 32, 64, …, 2048 AWG Mode: 6.16Ghz/16 to 6.16Ghz/4096
Amplitude	1Vpp into 50 Ohm
External Modulation input	
Connector type	SMA on rear panel
Input impedance	10 KΩ
Number of inputs	1
Bandwidth	10 MHz with 50 MS/s sampling rate
Input voltage range	-1 V to +1 V (except FSK, PSK). FSK, PSK: 0V÷3.3V with 1.65V fixed threshold
Vertical resolution	14-bit
Pattern Jump In (optional)	
Connector type	DSUB15
Input signals	DATA[0..7] + Data_Select + Load
Internal Data Width	14 bit, multiplexed using Data_Select
Number of addressable entries	16384
Data Rate	DC to 1 MHz
Input Range	VIL = 0V to 0.8V / VIH= 2V to 3.3V
Impedance	Internal 1kΩ pull-up resistor to Vcc (3.3V)

[3] When using the External Clock Input the SampleRate must be in the range 3.08÷6.16 GHz

Power	
Source Voltage and Frequency **Max. power consumption**	100 to 240 VAC ±10% @ 45-66 Hz Max. 185W
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°C
Altitude (non-operating)	12,000 meters (39,370 feet) maximum
EMC and safety	CE compliant
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

System specifications	
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	26.45 lbs (12 Kg) TBC
Front panel connectors	CH N OUTPUT (SMA) where N=2,4,8 depending on the model MARKER N OUT (SMA) where N=1,2,4 depending on the model TRG IN N(SMA) where N =1,2 2 USB 3.0 ports
Rear panel connectors	Ref. Clk. IN (SMA) Ref. Clk. Out (SMA) Ext. Mod. IN (SMA) Sync Clk Out (SMA) Ext Clk IN(SMA) Sync IN (Infiniband 4X) (for 8 channel model only) Sync OUT (Infiniband 4X) (for 8 channel model only) Pattern Jump In (DSUB15) (Optional) POD X[7..0] where X=A,B,C,D depending on the model (Customized Mini SAS HD) External Monitor ports (one or more) 2 USB 2.0 ports or more 4 USB 3.0 ports Ethernet port (10/100/1000BaseT Ethernet, RJ45 port) 2 PS/2 keyboard and mouse ports 2 DPI ports 1 DVI port
Hard Disk	250 GB SSD or better
Processor	Intel® Pentium 3.7 GHz (or better)
Processor Memory	8 GB or better