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## **Analog Arts**

**SG985**

**SG884**

**SG834**

**SG814**

## **Product Specifications [1]**

1. These models include: an oscilloscope, a spectrum analyzer, a data recorder, a frequency & phase meter, and an arbitrary waveform/ function generator.

# Oscilloscope/ Spectrum Analyzer/ Data Recorder

Model	SG985	SG884	SG834	SG814
<b>Oscilloscope (Typical)</b>				
<b>Bandwidth (Max at probe tip) [2]</b>				
@ 500 mV/ Div with 10X probe	1 GHz	500 MHz	300 MHz	100 MHz
@ 50 mV/ Div with 1X probe	1 GHz	500 MHz	300 MHz	100 MHz
@ 1 V/ Div with 10X probe	500 MHz	400 MHz	200 MHz	75 MHz
@ 100 mV/ Div with 1X probe	500 MHz	400 MHz	200 MHz	75 MHz
@ 2 V/ Div with 10X probe	250 MHz	200 MHz	100 MHz	50 MHz
@ 200 mV/ Div with 1X probe	250 MHz	200 MHz	100 MHz	50 MHz
@ 5 V/ Div with 10X probe	250 MHz	200 MHz	100 MHz	50 MHz
@ 500 mV/ Div with 1X probe	250 MHz	200 MHz	100 MHz	50 MHz
@ 20 V/ Div with 10X probe	200 MHz	200 MHz	100 MHz	50 MHz
@ 2 V/ Div with 1X probe	200 MHz	200 MHz	100 MHz	50 MHz
<b>Rise time</b>	0.5 nS	1.0 nS	2.5 nS	5.0 nS
<b>Input channels</b>	2			
<b>Vertical resolution</b>	8 bits			
<b>DC accuracy</b>	< ±3%			
<b>Input characteristics</b>	1 MΩ in parallel with 5 pF			
<b>CMRR (Common Mode Rejection Ratio)</b>	> 70 dB (@ 100 MHz)			
<b>Channel-to-Channel Crosstalk</b>	< -70 dB			
<b>Input type</b>	Single-ended, BNC connector			
<b>Input coupling</b>	Software selectable AC/DC			
<b>Input ranges (full scale)</b> 10x probe 1x probe	±80 mV to ±80 V in 10 ranges ±8 mV to ±8 V in 10 ranges			
<b>Overload protection</b>	±150 V (DC+AC peak)			
<b>Sampling rate (each channel)</b> Real / per channel Effective / per channel	125 MHz 100 GHz			100 MHz 25 GHz
<b>Vertical Sensitivity</b> 1x probe 10x probe	2 mV - 2 V / DIV 20 mV - 20 V / DIV			

<b>Buffer memory size</b> One channel in use Two channels in use	1024 KB 512 KB			
<b>Time ranges</b>	1 ns/div to 100 ms/div			5 ns/div to 100 ms/div
<b>Time ranges (Data Recorder)</b>	500 nS to 365 days with data recorder			
<b>Timing accuracy [3]</b>	50 ppm	100 ppm	200 ppm	
<b>Trigger modes</b>	Normal, auto, one shot, single, Ch1, CH2			
<b>Trigger threshold</b> Internal External	Adjustable, $\pm$ range setting (variable) 8 bits 1.2 Volts			
<b>Basic triggers</b>	External/ CH1/ CH2/ Alternative Rising edge/ Falling edge/ Auto/ Normal/ Single			
<b>External trigger bandwidth</b>	1 GHz	500 MHz	300 MHz	100 MHz

Notes:

2. The bandwidth indicates the highest frequency at which a sine wave can be represented by the oscilloscope with a 10 dB loss. This also applies for narrow band signals. For non-periodical wide band signals the bandwidth is limited by the Nyquist criteria. For the specified real time sampling rate of 120 MHz, the bandwidth is limited to about 50 MHz.
3. For a better performance, please contact the factory.

<b>Model</b>	<b>SG985</b>	<b>SG884</b>	<b>SG834</b>	<b>SG814</b>
<b>Spectrum Analyzer (Typical) [4]</b>				
Common features between the oscilloscope and the spectrum analyzer have the same specifications.				
<b>Frequency Bandwidth [5]</b>	1 GHz	500 MHz	300 MHz	100 MHz
<b>Display Span (Default)</b>	204.8 KHz to 60 MHz			
<b>Minimum Span (at selected Display Bandwidth)</b>	100 KHz (display bandwidth of 51.2 MHz) 5 KHz (display bandwidth of 2.56 MHz) 400 Hz (display bandwidth of 204.8 MHz)			
<b>Resolution</b>	( Span / $2^{18}$ )      0.78 Hz to 195 Hz			
<b>Spectrum Flatness</b>	1 dB			
<b>Frequency Error [6]</b>	50 ppm	100 ppm	200 ppm	
<b>Relative Frequency Accuracy</b>	> 1 ppm			
<b>Maximum number of bins</b>	1M			
<b>Dynamic Range</b>	8 bits (< 65 dB)			
<b>Spurious Free Range</b>	< 70 dB (@ 10 MHz, 2 V range)			
<b>Frequency Response</b>	$\pm 0.5$ dB			
<b>Reference Levels (10 ranges)</b>  1x Probe 10x Probe	- 35 dBV to 25 dBV (0.6 to 5.623 VRMS) - 25 dBV to 35 dBV (0.06 to 56.23 VRMS)			
<b>Display modes</b>	Sampling, peak hold, average, history			
<b>Windowing types</b>	Rectangular, Bartlett, Gaussian (2.5, 3.5, 4.5), Triangular, Blackman, Blackman–Harris, Hamming, Hanning, Welch, Kaiser Bessel, Flat Top,			

Model	SG985	SG884	SG834	SG814
<b>Frequency Analyzer ( All Models, Typical) [4]</b>				
The same specifications apply to the common features of the oscilloscope and the frequency and phase analyzer in the model.				
<b>Bandwidth [5]</b>	1 GHz	500 MHz	300 MHz	100 MHz
<b>Resolution</b>	0.1 Hz			
<b>Tolerance [6]</b>	50 ppm	100 ppm	200 ppm	
<b>Relative Tolerance</b>	0.01 ppm	0.1 ppm	1 ppm	

<b>Data Recorder (All Models, Typical) [4]</b>				
The same specifications apply to the common features of the oscilloscope and the data recorder in the model.				
<b>Sampling Interval</b>	102 MHz to 10 pHz			
<b>Time ranges</b>	500 nS to 365 days			
<b>Timing Accuracy [6]</b>	50 ppm	100 ppm	200 ppm	

Notes:

4. The relevant specifications for the oscilloscope also apply to the spectrum analyzer, frequency analyzer, and data recorder of the corresponding model.
5. The bandwidth indicates the highest frequency at which a sine wave can be represented by the instrument with a 10 dB loss. This also applies for narrow band signals. For non-periodical wide band signals the bandwidth is limited by the Nyquist criteria. For the specified real time sampling rate of 120 MHz, the bandwidth is limited to about 50 MHz.
6. For a better performance, please contact the factory.

# Arbitrary Waveform Generator

General ( Typical )				
Specifications	SG985	SG884	SG834	SG814
Arbitrary waveform length	2 to 64K adjustable			
Ram (Memory)	64K (Optional: Bigger Memory [7])			
Amplitude resolution	12-bits (with 14-bits optional)			
Sample rate (sine wave)	400 MHz	300 MHz	200 MHz	100 MHz
Sample rate	100 MHz			50 MHz
Sample rate (Arbitrary)	1 MHz to 100 MHz			1 MHz to 50 MHz
Frequency adjustment resolution	10 mHz (with 1 $\mu$ Hz optional)			
Standard waveforms	<p>DC, Sine, square, pulse, triangle, rising ramp, falling ramp, noise, rising exponent, falling exponent, sinc, cardiac, gated burst, single burst, log continuous sweep, linear continuous sweep, gated ASK, gated FSK, gated PSK</p> <p><i>AM (modulating signals; pulse, square, rising ramp, falling ramp, triangle, sinc, cardiac, rising exponent, falling exponent, noise, edited waveforms)</i></p> <p><i>FM (modulating signals; pulse, square, rising ramp, falling ramp, triangle, sinc, cardiac, rising exponent, falling exponent, noise, edited waveforms)</i></p> <p><i>burst (carrier signals; pulse, square, rising ramp, falling ramp, triangle, sinc, cardiac, rising exponent, falling exponent, noise, edited waveforms)</i></p>			

<p><b>Output Amplitude</b>  <b>(Frequencies &lt; 5MHz)</b>  Open circuit  50 Ω</p> <p><b>(5MHz &gt; Freq. &lt; 15MHz)</b>  Open circuit  50 Ω</p> <p><b>(15MHz &gt; Freq. &lt; 50MHz)</b>  Open circuit  50 Ω</p> <p><b>(50MHz &gt; Freq. &lt; 100MHz)</b>  Open circuit  50 Ω</p> <p><b>(100MHz &gt; Freq. &lt; 150MHz)</b>  Open circuit  50 Ω</p> <p>Accuracy (up to 100 kHz)  Adjustment resolution</p>	<p>0 to ±3.5V(7 Vpp)  0 to ±1.75V(3.5 Vpp)</p> <p>0 to ±3.0V(6 Vpp)  0 to ±1.5V(3.0 Vpp)</p> <p>0 to ±2.0V(4 Vpp)  0 to ±1.0V(2.0 Vpp)</p> <p>0 to ±1.5V(3 Vpp)  0 to ±0.75V(1.5 Vpp)</p> <p>0 to ±1.0V(2 Vpp)  0 to ± 0.5V(1.0 Vpp)</p> <p>.1% of the specified output  ± 5mV 3 digits (1mv)</p>
<p><b>Output Offset</b>  Open circuit  50 Ω  Accuracy  Adjustment resolution</p>	<p>0 to ± 2.2V(7 Vpp)  0 to ± 2.2V(3.5 Vpp)  2% ± 5mV (0.1% Optional)  3 digits(1mv)</p>
<p><b>Output impedance</b></p>	<p>50 Ω (Optional: 0 to 75 Ω)</p>
<p><b>Output Current</b></p>	<p>60 mA ( With the standard 50 Ω impedance )</p>
<p><b>Sync</b></p>	<p>TTL compatible</p>

## Frequencies Ranges

Sine Wave	10 mHz to 150 MHz	10 mHz to 100 MHz	10 mHz to 50 MHz	10 mHz to 10 MHz
<b>Square</b> <b>Pulse</b> <b>Triangle</b> <b>Ramp</b> <b>Sinc</b> <b>Noise (White) Bandwidth</b> <b>AM (Carrier)</b> <b>FM (Carrier)</b> <b>Sweep</b> <b>Burst (Burst Rate)</b> <b>Digital (shift keying rate)</b> <b>Exponent</b> <b>Cardiac</b>	10 mHz to 15 MHz (to 50MHz for SG985) 10 mHz to 15 MHz 10 mHz to 100 KHz 10 mHz to 100 KHz 1 Hz to 5 MHz 25 MHz 1 Hz to 5 MHz 1 Hz to 5 MHz DC to 15 MHz (start & stop frequency) 100 Hz to 2 MHz 1 kHz to 2 MHz 1 Hz to 5 MHz 1 Hz to 1 MHz	10 mHz to 5 MHz 10 mHz to 5 MHz 10 mHz to 100 KHz 10 mHz to 100 KHz 1 Hz to 1 MHz 10 MHz 1 Hz to 1 MHz 1 Hz to 1 MHz DC to 5 MHz 100 Hz to 1 MHz 1 kHz to 1 MHz 1 Hz to 1 MHz 1 Hz to 1 MHz		
<b>Resolution</b>	10 mHz (1 $\mu$ Hz optional)			
<b>Accuracy</b>	2% $\pm$ 5mV (.1% optional) At room temperature			
<b>Temp Coefficient</b>	20 ppm/ $^{\circ}$ C			
<b>Aging</b>	10 ppm/yr			



## Waveform Characteristics - 50 $\Omega$ Termination

<p><b>Sine Wave Output Flatness</b></p> <p>&lt; 1 MHz &lt; 10 MHz &lt; 150 MHz</p>	<p>0.1 dB 0.5 dB 1 dB</p>	<p>0.1 dB 0.2 dB -</p>
<p><b>Sine Wave (2Vpp) Adjustment resolution</b></p> <p><b>Harmonic Distortion</b> Dc to 100 kHz 100 kHz to 1 MHz 1 MHz to 10 MHz 10 MHz to 50 MHz 50 MHz to 100 MHz 100 MHz to 150 MHz</p> <p><b>Spurious</b> Dc to 100 kHz 100 kHz to 1 MHz 1 MHz to 10 MHz 10 MHz to 50 MHz 50 MHz to 100 MHz 100 MHz to 150 MHz</p> <p><b>Noise</b> Dc to 100 kHz 100 kHz to 1 MHz 1 MHz to 10 MHz 10 MHz to 50 MHz 50 MHz to 100 MHz 100 MHz to 150 MHz</p> <p><b>Phase noise</b></p>	<p>10 mHz (1 <math>\mu</math>Hz optional)</p> <p>-70 dBc -65 dBc -60 dBc -55 dBc (when applicable) -50 dBc (when applicable) -45 dBc (when applicable)</p> <p>-70 dBc -60 dBc -60 dBc -55 dBc (when applicable) -55 dBc (when applicable) -50 dBc (when applicable)</p> <p>-60 dBc -60 dBc -55 dBc -50 dBc (when applicable) -40 dBc (when applicable) -35 dBc (when applicable)</p> <p>&lt; -60 dBc in a 50 kHz band</p>	
<p><b>Square Wave (2Vpp)</b></p> <p>Frequency Adjustment resolution Rise/ Fall time Overshoot Settling time Asymmetry Duty cycle adjustment resolution Jitter</p>	<p>10 mHz - 15 MHz 10 mHz (1 <math>\mu</math>Hz optional) &lt; 4 nS 1% 10 nS to .5% of final value &lt; 2 nS 5% to 95% (1MHz) 10nS &lt; 10pS (rms)</p>	<p>10 mHz - 5 MHz</p>

<b>Triangle, Ramp (2Vpp)</b> Frequency Adjustment resolution Linearity Asymmetry Duty cycle Adjustment resolution Jitter	10 mHz- 15 MHz 10 mHz (1 $\mu$ Hz optional) .1% of peak output < 2 nS 5% to 95% 10nS < 10pS (rms)	10 mHz- 5 MHz
<b>Exponential (2Vpp)</b> Frequency Adjustment resolution Rise/ Fall time Damping factor Jitter	10 mHz- 5 MHz 10 mHz (1 $\mu$ Hz optional) < 4 nS -1,000 to 1,000 < 10pS (rms)	10 mHz- 1 MHz
<b>Sinc (sin(x)/x) (2Vpp)</b> Frequency Adjustment resolution Zero crossings	10 mHz- 5 MHz 10 mHz (1 $\mu$ Hz optional) 2 to 1,000	10 mHz- 1 MHz
<b>Cardiac (2Vpp)</b> Frequency Adjustment resolution Zero crossings	10 mHz- 1 MHz 10 mHz (1 $\mu$ Hz optional) 2 to 1,000	
<b>Noise</b> Type Bandwidth	White 50 MHz	White 20 MHz
<b>AM (2Vpp)</b> Carrier (-3dB) Modulating signal Frequency Modulation depth Source	10 mHz to 5 MHz any internal waveform including Arb 10 mHz to 1MHz 0% to 150% internal (external optional)	10 mHz- 1 MHz
<b>External AM modulation</b>	Optional	
<b>FM (2Vpp)</b> Carrier (-3dB) Modulating signal Frequency Modulation depth Source	10 mHz to 5 MHz any internal waveform including Arb 10 mHz to 1 MHz 0% to 100% internal (external optional)	10 mHz- 1 MHz
<b>External FM modulation</b>	Optional	

<b>ASK (2Vpp)</b> Frequency Modulating signal Frequency Gating signal	10 mHz to 5 MHz any internal waveform including Arb 10 mHz to 5 MHz 5 (TTL, CMOS) to 1.2 V (CMOS, TTL, LVTTTL)	10 mHz - 1 MHz 10 mHz - 1 MHz
<b>FSK (2Vpp)</b> Frequency Modulating signal Frequency Gating signal	10 mHz to 5 MHz any internal waveform including Arb 10 mHz to 5 MHz 5 (TTL, CMOS) to 1.2 V (CMOS, TTL, LVTTTL)	10 mHz - 1 MHz 10 mHz - 1 MHz
<b>PSK (2Vpp)</b> Frequency Modulating signal Frequency Gating signal	10 mHz to 5 MHz any internal waveform including Arb 10 mHz to 5 MHz 5 (TTL, CMOS) to 1.2 V (CMOS, TTL, LVTTTL)	10 mHz - 1 MHz 10 mHz - 1 MHz
<b>Burst (2Vpp)</b> Carrier (-3dB) Source Rate Count Gate source Trigger	10 mHz 5 MHz any internal waveform including Arb 100 Hz to 2 MHz variable internal (external optional) single, internal rate, external(optional)	10 mHz - 1 MHz 10 mHz - 1 MHz
<b>Sweep</b> Type Direction Start frequency Stop frequency Sweep time	linear or log (exponential) up or down 0 to 15MHz 0 to 15MHz 1 uS to 1 mS	0 to 1 MHz 0 to 1 MHz 1 uS to 1 mS

## Editing tools

<b>Signal processing</b>	
Math operation	addition, subtraction, multiplication, gain, clip, absolute, resize, invert, mirror, expand to fit
Filtering	smoothing, ideal low pass, first order low pass
Windowing	Gaussians, Blackman, Blackman-Harris, Cosine, Hanning, Hamming, Flat-Top, Kaiser-Bessel, Welch, Triangular
<b>Signal library</b>	sine, square, triangle, falling ramp, rising ramp, rising exponent, falling exponent, sinc, cardiac, noise
<b>GUI Editors</b>	pen, line, manual, insert
<b>Options</b>	save / recall in .txt & .csv format
<b>Units</b>	
Frequency	Hz, kHz, MHz
Amplitude	mVpp, Vpp
Offset	mV, V
<b>Protection</b>	short circuit
<b>Configuration time</b>	
Arbitrary save	10 mS
Arbitrary Recall	100 mS
Setting save	10 mS
Setting Recall	100 mS
Function	100 mS

7. For a bigger memory size, please contact the factory.

## Physical Properties

<b>Dimensions</b>	128.0 x 77.0 x 31.6 (mm), 5.0 x 3.0 x 1.2 (inches)
<b>Weight</b>	310 grams, 11 Ounces
<b>Other</b>	
<b>PC Requirements</b> Recommended	Operating system: 32/ 64-bit edition of Microsoft Windows XP (SP3), Vista, Windows 7/ Windows 8/ Windows 10 Ports: USB 2.0/ 3.0 compliant port
<b>Environmental</b> Operating environment Temperature range Humidity <b>Storage environment</b> Temperature range Humidity	0 °C to 40 °C for normal operation 15 °C to 32 °C for quoted accuracy 5% to 80% RH, non-condensing  -20 °C to +60 °C 5% to 95% RH, non-condensing
<b>Software</b>	Save setting, recall setting, save plot, recall/print plot, zoom in vertical, zoom in horizontal, pen editor, line editor, DSP, variable sampling rate