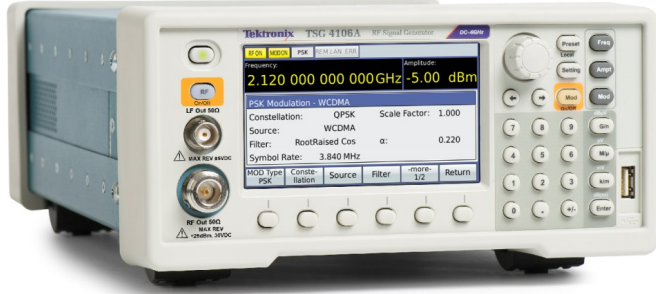


RF 벡터 신호 발생기

TSG4100A 시리즈



TSG4100A 시리즈 RF 벡터 신호 발생기는 보급형 RF 신호 발생기 가격으로 미드 레인지 성능과 최대 200MHz 변조 대역폭을 제공합니다. 새로운 기술을 사용하여 낮은 위상 노이즈 (1 GHz 반송파에서 20 kHz 오프셋에서 -113 dBc/Hz) 및 탁월한 주파수 분해능 (모든 주파수에서 1μHz)으로 스퓨리어스 없는 출력을 제공합니다.

TSG4100A 시리즈에는 아날로그 변조가 표준으로 제공됩니다. 편리한 현장 소프트웨어 업그레이드로 아날로그에서 고급 벡터 및 디지털 변조 기능으로 쉽게 전환 할 수 있어 가장 유연한 구성과 최고의 CAPEX 보호 기능을 제공합니다. 이 계측기는 USB 기반 RSA306 스펙트럼 분석기, MDO4000B 및 MDO3000 혼합 도메인 오실로스코프와 같은 Tektronix의 기타 주요 미드 레인지 RF 테스트 솔루션을 보완합니다.

TSG4100A 시리즈 계측기는 오븐 화 된 SC 컷 발진기 (TSG410xA-M00 또는 E1 모델) 타임베이스를 사용하여 A를 사용하는 계측기와 비교하여 안정성을 100 배 개선하고 (닫는 위상 노이즈를 100 배 줄입니다) TCXO 타임베이스.

주요 특징들

- 아날로그 및 벡터 / 디지털 신호 생성 기능
- 듀얼 베이스 밴드 ARB 생성기
- 아날로그 변조 표준
- 매우 저렴한 비용으로 벡터 / 디지털 변조로 소프트 키 업그레이드
- GSM, EDGE, W-CDMA, APCO-25, DECT, NADC, PDC 및
- TETRA를 위한 디지털 변조 애플리케이션
- USB, GPIB, RS-232 및 LAN 인터페이스 12 파운드 (5.6 kg)
- 2U 높이 및 반 표준 랙 너비

핵심 성능 사양

- 아날로그 및 벡터/디지털 신호 생성을 모두 지원하는 True DC-2 GHz, 4 GHz 또는 6 GHz
- 10 MHz ~ 6 GHz의 일반적인 $\leq \pm 0.30$ dB 진폭 정확도 (22°C에서 0 dBm CW 신호)
- I/Q 변조 입력 (400MHz RF 대역폭)
- ASK, FSK, MSK, PSK, QAM, VSB 및 맞춤형 I / Q

아날로그 변조

Tektronix TSG4100A 시리즈 RF 벡터 신호 발생기는 다양한 변조 기능을 제공합니다. 모드에는 진폭 변조 (AM), 주파수 변조 (FM), 위상 변조 (ΦM) 및 펄스 변조가 있습니다. 내부 변조 소스와 외부 변조 입력이 있습니다. 내부 변조 소스는 사인, 램프, 톱니바퀴형, 사각형 및 노이즈 파형을 생성합니다. 후면 패널 변조 입력에는 외부 변조 신호가 인가 될 수 있습니다. 내부 변조 발생기는 후면 패널의 출력으로 사용할 수 있습니다.

벡터 변조

TSG4100A 시리즈는 400MHz와 6.0GHz 사이의 RF 반송파 에서 벡터 신호 변조를 완벽하게 지원하여 이 성능을 기반으로 합니다. 베이스 밴드 신호 생성을 위해 125MHz에서 작동하는 이중 임의 파형 발생기가 특징입니다. 이 생성기는 ASK, QPSK, DQPSK, $\pi / 4$ DQPSK, 8PSK, FSK, CPM, QAM (4 ~ 256), 8VSB 및 16VSB와 같은 가장 일반적인 벡터 변조 방식을 기본적으로 지원합니다. 또한 디지털 통신에 사용되는 모든 표준 펄스 성형 필터에 대한 지원 기능이 포함되어 있습니다 : 상승 코사인, 근사 코사인, 가우시안, 직사각형, 삼각형 등. 마지막으로 AWGN (additive white Gaussian noise) 을 신호 경로로 제어 주입 할 수 있도록 직접 지원합니다.

내부베이스 밴드 생성기

I/Q 변조에 새로운 아키텍처를 사용하는 TSG4100A 시리즈는 빠르고 사용자 친화적인 파형 생성을 제공합니다. 베이스 밴드 생성기는 순수한 디지털 데이터의 재생을 지원합니다. 디지털 심볼을 최대 6MHz의 심볼 속도로 선택된 I/Q 성상 도로 자동 매핑하고 결과를 선택한 펄스 정형 필터를 통과하여 125MHz에서 실시간으로 업데이트된 최종 파형을 생성합니다. 이베이스 밴드 신호는 표준 IQ 변조 기술을 사용하여 RF 반송파로 변조됩니다.

디지털 통신 프로토콜 (GSM, GSM EDGE, W-CDMA, APCO-25, DECT, NADC, PDC 및 TETRA)은 신호 발생기를 올바른 변조 유형, 기호 데이터 속도, TDMA 듀티 사이클 및 디지털 파형 필터로 신속하게 구성합니다. 사전 설정 프로토콜은 후면 패널 TDMA, START of FRAME 및 SYMBOL CLOCK 디지털 출력도 구성합니다. 베이스 밴드 생성기는 외부 컴퓨터 나 타사 소프트웨어를 사용하지 않고 이러한 프로토콜에 맞게 구성 할 수 있습니다.

I/Q 파형은 실시간으로 계산됩니다. 듀얼 14 비트 DAC를 통해 I/Q 변조기를 구동하기 위해 심볼이 별자리에 매핑되고 디지털 필터링되며 125Msps로 업 샘플링 됩니다. 이 심볼은 고정 패턴, 내부 소스의 PRBS 데이터 또는 최대 16Mbit의 다운로드 된 사용자 목록에서 가져올 수 있습니다. 별자리 매핑은 사용자가 수정할 수 있습니다.

디지털 필터에는 올림 코사인, 루트 올림 코사인, 가우시안, 직사각형, 선형, sinc 및 사용자 정의 FIR이 포함됩니다.

외부 IQ 변조

후면 패널 BNC I/Q 변조 입력 및 출력은 외부 소스를 통해 임의의 벡터 변조를 가능하게 합니다. 외부 신호 경로는 ±0.5V의 전체 범위와 50Ω 입력 임피던스로 최대 400 MHz의 RF 대역폭을 지원합니다.

전력 대 주파수

모든 TSG4100A 시리즈 모델에는 계단식 증폭기 및 디지털 감쇠기가 있어 RF 출력을 구동합니다. 5 단계는 156 개의 디지털 제어 단계에서 최대 +25 dB의 이득을 -130dB의 감쇠로 제공 할 수 있습니다. 공장 교정 동안, 출력 전력은 약 4,000 개의 요소로 메모리 매트릭스를 채우기 위해 156 개의 감쇠기 단계 각각에 대해 옥타브 당 32 주파수로 측정됩니다. 특정 주파수 및 전력으로 설정하면 계측기는 이러한 매트릭스 요소 사이를 보간하여 최상의 감쇠기 설정을 결정합니다. 아날로그 감쇠기는 매트릭스 요소간에 0.01dB 분해능을 제공하고 잔류 열 효과를 보상하는 데 사용됩니다.

OCXO 타임베이스

이 계측기는 오븐 제어 수정 발진기 (OCXO) 타임베이스를 제공합니다. 타임베이스는 자동 온도 조절 식 오븐에서 3 중음 스트레스 보상 10MHz 공진기를 사용합니다. 타임베이스는 매우 낮은 위상 노이즈와 매우 낮은 에이징을 제공합니다.

간편한 원격 통신

RS-232, LAN 및 GPIB 인터페이스를 통한 원격 작동이 지원됩니다. 모든 기기 기능을 모든 인터페이스에서 제어하고 읽을 수 있습니다. 비 휘발성 메모리에 최대 9 개의 기기 구성을 저장할 수 있습니다.

명세서

별도로 명시되지 않는 한 모든 사양이 보장됩니다. 별도 명시되지 않는 한 모든 사양은 모든 모델에 적용됩니다.

Frequency

BNC output, all models	DC to 62.5 MHz
N-type outputs	
TSG4102A	950 kHz to 2.0 GHz
TSG4104A	950 kHz to 4.0 GHz
TSG4106A	950 kHz to 6.0 GHz
Frequency resolution	1 μ Hz at any frequency
Switching speed	<8 ms (to within 1 ppm)
Frequency error	<(10 ⁻¹⁸ + time-base error) \times fc
Frequency stability	1 \times 10 ⁻¹¹ (1 s Allan variance)

Front panel BNC output

Frequency range	DC to 62.5 MHz
Amplitude	1.00 V _{RMS} to 0.001 V _{RMS} (-47 dBm to +14.96 dBm)
Offset	\pm 1.5 VDC
Offset resolution	5 mV
Maximum excursion	1.817 V (amplitude + offset)
Amplitude resolution	<1 %
Amplitude accuracy	\pm 0.7 dB
Harmonics, typical	<-40 dBc
Spurious, typical	<-65 dBc
Output coupling	DC, 50 Ω \pm 2%
Impedance	50 Ω
Reverse protection	\pm 5 VDC
VSWR, typical	< 1.6 :1

Front panel N-type output

Power output

TSG4102A	+16.5 dBm to -110 dBm
TSG4104A	+16.5 dBm to -110 dBm (<3 GHz)
TSG4106A	+16.5 dBm to -110 dBm (<4 GHz)
	+10 dBm to -110 dBm (4-6 GHz)

Voltage output

TSG4102A	1.5 V _{RMS} to 0.7V _{RMS}
TSG4104A	1.5 V _{RMS} to 0.7 μV _{RMS} (<3 GHz)
TSG4106A	1.5 V _{RMS} to 0.7 μV _{RMS} (<4 GHz)

Amplitude resolution 0.01 dBm

Amplitude accuracy

CW, 50 Ω load (dB, typical)	CW, 18 °C to 28 °C	>10 dBm	10 to -30 dBm	-30 to -60 dBm	-60 to -100 dBm	<-100 dBm
	10 MHz to 0.1 GHz	±0.2	±0.25	±0.35	±0.45	±0.6
	0.1 GHz to 2 GHz	±0.15	±0.15	±0.25	±0.35	±0.6
	2 GHz to 4 GHz	±0.3	±0.2	±0.35	±0.6	±0.8
	4 GHz to 6 GHz	NA	±0.3	±0.4	±0.75	±1.25

CW, 50 Ω load (dB, max)	Level range:	+5 to -30 dBm (max)		+5 to -30 dBm (typical)
	Temperature:	18 °C to 28 °C	5 °C to 40 °C	5 °C to 40 °C
	10 MHz to 0.1 GHz	±0.6	±1.0	±0.7
	0.1 GHz to 2 GHz	±0.6	±1.0	±0.6
	2 GHz to 4 GHz	±0.6	±1.0	±0.7
	4 GHz to 6 GHz	±1	±1.5	±0.9

Impedance 50 Ω

Output coupling AC, 50 Ω

VSWR, typical
 <1.5 (2 MHz to 2 GHz)
 <1.8 (2 GHz to 6 GHz)

Reverse protection 30 VDC, +25 dBm

IQ modulation output level accuracy
 Output amplitude is -5 dBm.

Temperature:	18 °C to 28 °C		5 °C to 40 °C
Fc:	Typical (dB)	Max (dB)	Typical (dB)
<2 GHz	±0.1	±0.4	±0.4
2 GHz to 4 GHz	±0.2	±0.6	±0.4
4 GHz to 6 GHz	±0.4	±0.8	±0.7

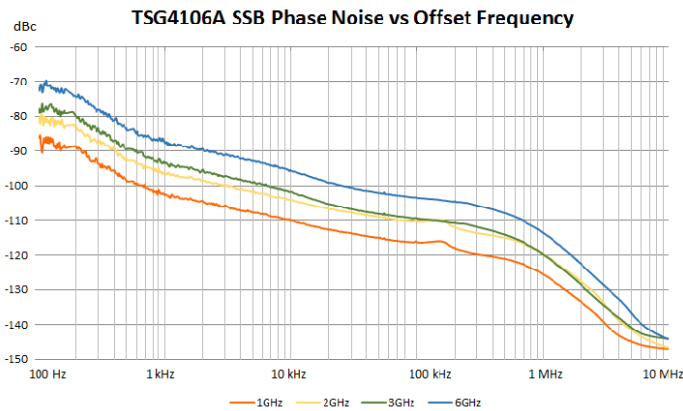
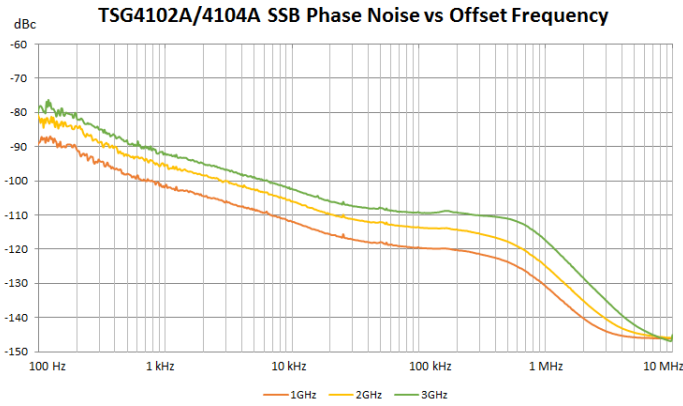
Spectral purity of the RF output

Subharmonics	None																													
Harmonics, maximum	Output level <0 dBm, 1 GHz CW signal																													
TSG4102A and TSG4104A	< -38 dBc																													
TSG4106A	< -30 dBc																													
Harmonics, typical (output level < 0 dBm)	< -35 dBc, CW , Fc < 2 GHz																													
Spurious (typical)	Output level -10 dBm, CW																													
< -68 dBc	>10 kHz from carrier in 950 kHz to 1 GHz																													
< -60 dBc	>10 kHz from carrier in 1 GHz to 2 GHz																													
< -55 dBc	>10 kHz from carrier in 2 GHz to 4 GHz																													
< -55 dBc	>10 kHz from carrier in 4 GHz to 6 GHz																													
Residual FM, typical	1 Hz rms (300 Hz to 3 kHz bandwidth)																													
Residual AM, typical	0.006 % rms (300 Hz to 3 kHz bandwidth)																													
SSB phase noise	Output level is +5 dBm at 18 °C to 28 °C.																													
	<table border="1"> <thead> <tr> <th rowspan="2">Carrier</th> <th colspan="4">Offset from carrier, typical (dBc/Hz)</th> </tr> <tr> <th>1 kHz</th> <th>10 kHz</th> <th>20 kHz</th> <th>1 MHz</th> </tr> </thead> <tbody> <tr> <td>1 GHz</td> <td>-102</td> <td>-110</td> <td>-113</td> <td>-124</td> </tr> <tr> <td>2 GHz</td> <td>-96</td> <td>-104</td> <td>-107</td> <td>-118</td> </tr> <tr> <td>3 GHz</td> <td>-93</td> <td>-102</td> <td>-105</td> <td>-120</td> </tr> <tr> <td>6 GHz</td> <td>-87</td> <td>-96</td> <td>-99</td> <td>-114</td> </tr> </tbody> </table>	Carrier	Offset from carrier, typical (dBc/Hz)				1 kHz	10 kHz	20 kHz	1 MHz	1 GHz	-102	-110	-113	-124	2 GHz	-96	-104	-107	-118	3 GHz	-93	-102	-105	-120	6 GHz	-87	-96	-99	-114
Carrier	Offset from carrier, typical (dBc/Hz)																													
	1 kHz	10 kHz	20 kHz	1 MHz																										
1 GHz	-102	-110	-113	-124																										
2 GHz	-96	-104	-107	-118																										
3 GHz	-93	-102	-105	-120																										
6 GHz	-87	-96	-99	-114																										

SSB phase noise at 1 GHz carrier, maximum (output level +5 dBm, 5 °C to 40 °C)

1 kHz offset	-95 dBc/Hz
10 kHz offset	-106 dBc/Hz
20 kHz offset	-107 dBc/Hz
1 MHz offset	-120 dBc/Hz
2 GHz offset	-118 dBc/Hz
>3 GHz offset	-120 dBc/Hz

Spectral purity of the RF output



Phase setting (front panel outputs)

Maximum phase step	$\pm 360^\circ$
Phase resolution	0.01° (DC to 100 MHz) 0.1° (100 MHz to 1 GHz) 1.0° (1 GHz to 6 GHz)

OCXO time-base (Option M00 or Option E1)

Oscillator type	Oven-controlled, 3rd OT, SC-cut crystal
Initial accuracy at calibration (20 minute warm-up, at 18 °C to 28 °C)	$< \pm 0.02$ ppm
Temperature drift (0 °C to 40 °C)	$< \pm 0.003$ ppm
Aging	$< \pm 0.05$ ppm/year

VCXO time base (Option M01)

Initial accuracy at calibration (20 minute warm-up, at 18 °C to 28 °C)	<±0.5 ppm
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Temperature drift (0 °C to 40 °C)	<±5.0 ppm
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Aging	<±3.0 ppm/year
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Time-base input

Frequency	10 MHz, ±2 ppm
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Amplitude	0.5 V _{P,P} to 4 V _{P,P} (-2 dBm to +16 dBm)
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Input impedance	50 Ω, AC coupled
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Time-base output

Frequency	10 MHz, sine
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Source	50 Ω, DC transformer coupled
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Amplitude	>7.5 dBm
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Internal modulation source

Waveforms	Sine, ramp, saw, square, pulse, noise
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Sine THD	-74 dBc (typical at 20 kHz)
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Ramp linearity	<0.05 % (1 kHz)
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Rate

TSG4102A and TSG4104A	1 μHz to 500 kHz: < 62.5 MHz CF
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	1 μHz to 50 kHz: ≥62.5 MHz
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TSG4106A	1 μHz to 500 kHz: < 93.75 MHz CF
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	1 μHz to 50 kHz: ≥93.75 MHz
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Rate resolution	1 μHz
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Rate error	1:2 ³¹ + time-base error
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Noise function	White Gaussian noise (rms = dev / 5)
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Noise bandwidth	1 μHz < ENBW < 50 kHz
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Pulse generator period	1 μs to 10 s
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Pulse generator width	100 ns to 9999.9999 ms
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Pulse timing resolution	5 ns
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Pulse noise function	Length 2 ^N -1 PRBS 5 ≤ N ≤ 32, bit period 100 nS to 10 S
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Analog modulation output

Connector type	BNC (rear panel)
Impedance	50 Ω
Function	AM, FM, Φ M, Pulse
Scale factor	± 1 V for \pm full deviation
Pulse/Blank	Low = 0 V Hi = 3.3 V

External analog modulation input

Connector type	BNC (rear panel)
Impedance	100 k Ω
Function	AM, FM, Φ M, Pulse
Scale factor	± 1 V for \pm full deviation
Pulse/Blank	Low = 0 V Hi = 3.3 V
Input coupling	DC or 4 Hz High-pass
Pulse Threshold	+1 VDC
Input Offset	< 500 μ V

Amplitude modulation

Range	0 to 100% (decreases above +7 dBm)
Resolution	0.1%
Modulation source	Internal or external
Modulation distortion, typical	
BNC output	<1 % ($f_c < 62.5$ MHz, $f_m = 1$ kHz)
N-type output	<3 % ($f_c > 62.5$ MHz, $f_m = 1$ kHz)
Modulation bandwidth (external)	>100 kHz

Frequency modulation

Minimum frequency deviation 0.01 Hz

Maximum frequency deviation

TSG4102A and TSG4104A

Smaller of f_c and 64 MHz – f_c . In 0 to 62.5 MHz

Frequency range	Maximum deviation
62.5 MHz < f_c ≤ 126.5625 MHz	1 MHz
126.5625 MHz < f_c ≤ 253.1250 MHz	2 MHz
253.1250 MHz < f_c ≤ 506.25 MHz	4 MHz
506.25 MHz < f_c ≤ 1.0125 GHz	8 MHz
1.0125 GHz < f_c ≤ 2.0 GHz	16 MHz
2.025 GHz < f_c ≤ 4.0 GHz (TSG4104A)	32 MHz

TSG4106A

Smaller of f_c and 96 MHz – f_c . In 0 to 93.75 MHz

Frequency range	Maximum deviation
93.75 MHz < f_c ≤ 189.84375 MHz	1 MHz
189.84375 MHz < f_c ≤ 379.6875 MHz	2 MHz
379.6875 MHz < f_c ≤ 759.375 MHz	4 MHz
759.375 MHz < f_c ≤ 1.51875 GHz	8 MHz
1.51875 GHz < f_c ≤ 3.0375 GHz	16 MHz
3.0375 GHz < f_c ≤ 6.0 GHz	32 MHz

Deviation resolution 0.1 Hz

Deviation accuracy, typical

TSG4102A and TSG4104A

< 0.1% of selected deviation + 5 Hz (f_c < 62.5 MHz)

< 2% of selected deviation + 20 Hz (f_c > 62.5 MHz)

TSG4106A

< 0.1% of selected deviation + 5 Hz (f_c < 93.75 MHz)

< 2% of selected deviation + 20 Hz (f_c > 93.75 MHz)

Modulation source Internal or external

Modulation distortion, typical < -60 dB ($f_c=100$ MHz, $f_m=1$ KHz, $f_d= 3$ KHz)

External FM carrier offset, typical < ±0.001 X FM deviation

Modulation bandwidth, typical

TSG4102A and TSG4104A

500 kHz (f_c < 62.5 MHz)

100 kHz (f_c > 62.5 MHz)

TSG4106A

500 kHz (f_c < 93.75 MHz)

100 kHz (f_c > 93.75 MHz)

Phase modulation

Deviation	0° to 360°
Deviation resolution, typical	0.01° (DC to 100 MHz) 0.1° (100 MHz to 1 GHz) 1° (1 GHz and above)
Deviation accuracy, typical	
TSG4102A and TSG4104A	2% (fc < 62.5 MHz) 3% (fc > 62.5 MHz)
TSG4106A	2% (fc < 93.75 MHz) 3% (fc > 93.75 MHz)
Modulation source	Internal or external
Modulation distortion, typical	< -60 dB (fc = 100 MHz, fm = 1 kHz, $\Phi D = 50^\circ$)
Modulation bandwidth, typical	
TSG4102A and TSG4104A	500 kHz (fc < 62.5 MHz) 100 kHz (fc > 62.5 MHz)
TSG4106A	500 kHz (fc < 93.75 MHz) 100 kHz (fc > 93.75 MHz)

Pulse modulation

Pulse mode	Logic High turns RF output ON
On-Off ratio, typical	
BNC output	> 70 dB
Type-N output	> 57 dB (fc < 1.0 GHz) > 40 dB (1.0 GHz ≤ fc < 4.0 GHz) > 35 dB (4.0 GHz ≤ fc < 6.0 GHz)
Pulse feed-through, typical	10% of carrier for 20 ns at turn on
Turn On-Off delay	60 ns
RF Rise-Fall time, typical	20 ns
Modulation source	Internal or external pulse

Interface connectors

USB	USB 2.0, host
Ethernet (LAN)	10/100 Base-T.TCP/IP and DHCP default
GPIB	IEEE488.2
RS-232	4800 to 115,200 baud, RTS/CTS flow

External I/Q modulation (Option EIQ)

Carrier frequency range	400 MHz to 2.0 GHz (TSG4102A)
	400 MHz to 4.0 GHz (TSG4104A)
	400 MHz to 6.0 GHz (TSG4106A)
I/Q inputs (rear panel)	50 Ω, ±0.5 V
I/Q full scale input	$(I^2 + Q^2)^{1/2} = 0.5 \text{ V}$
Modulation bandwidth	max 400 MHz RF bandwidth
I or Q input offset	<500 μV
Carrier suppression	> -45 dBc for $f_c \leq 3 \text{ GHz}$
	> -40 dBc for $3 \text{ GHz} < f_c \leq 5 \text{ GHz}$
	> -35 dBc for $f_c > 5 \text{ GHz}$
I and Q baseband modulation bandwidth (3 dB from f_c)	> 200 MHz ($f_c < 2.5 \text{ GHz}$, RF BW >400 MHz)
	> 150 MHz ($f_c > 2.5 \text{ GHz}$, RF BW >300 MHz)

Dual baseband generator (Option VM00)

Channels	2 (I and Q)
DAC data format	Dual 14-bit at 125 MS/s
Reconstruction filter	10 MHz, 3rd order Bessel LPF
Arbitrary symbol memory	Up to 16 Mbits
Symbol rate	1 Hz to 6 MHz (1 μHz resolution)
Symbol length	1 to 9 bits (maps to constellation)
Symbol mapping	Default or user-defined constellation
Symbol source (User-defined symbols, built-in PRBS generator, or settable pattern generator)	
PRBS length	$2n - 1$ ($5 < n < 32$; 31 to about 4.3×10^9 symbols)
Pattern generator	16 bits

Dual baseband generator (Option VM00)

Digital filtering

Filter type	Raised Cosine, Root Raised Cosine, Gaussian, Rectangular, Linear, Sinc, linearized Gaussian, C4FM, customized FIR
Filter length	24 symbols

Noise impairments

Additive noise	White, Gaussian
Level	-70 dBc to -10 dBc

Basic vector modulation formats (Option VM00)

Formats by bit

Constellation	1-bit	2-bit	3-bit	4-bit	5-bit	6-bit	8-bit
ASK	2ASK	4ASK	8ASK	16ASK			
FSK	BFSK	4FSK	8FSK	16FSK			
PSK	BPSK	QPSK	8PSK	16PSK			
QAM	n/a	4QAM	n/a	16QAM	32QAM	64QAM	256QAM
CPM	BCPM	4CPM	8CPM	16CPM			
VSB	n/a	n/a	8VSB	16VSB			

Others

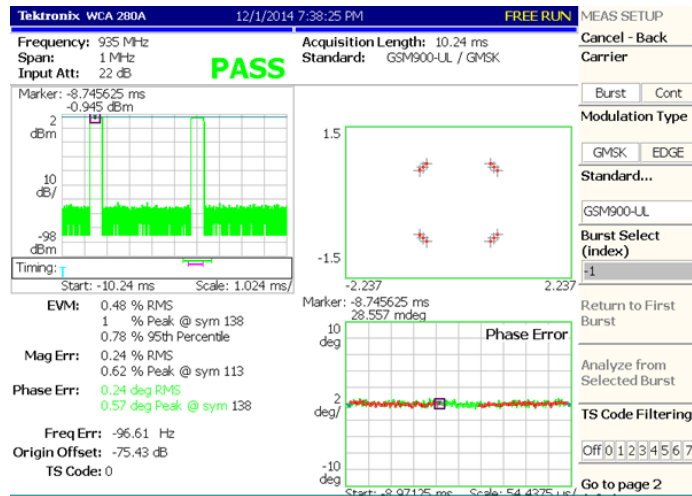
OQPSK, DQPSK, $\pi/4$ DQPSK, $3\pi/8$ PSK

Digital modulation applications (typical)

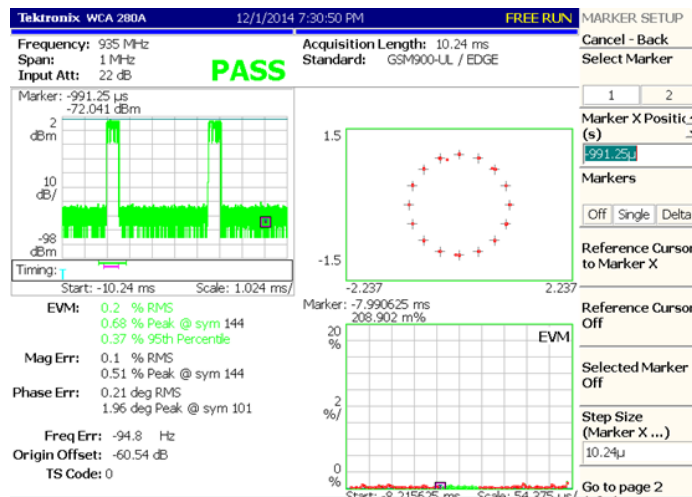
Digital modulation applications options

Option	Application
VM01	GSM
VM02	GSM-EDGE
VM03	W-CDMA
VM04	APCO-25 Phase 1
VM05	DECT
VM06	NADC
VM07	PDC
VM08	TETRA
VM10	Audio clip (analog AM and FM)

Option VM01 GSM, (GMSK, 270.833 kS/s, 935 MHz, 0 dBm), RMS EVM: 0.6%

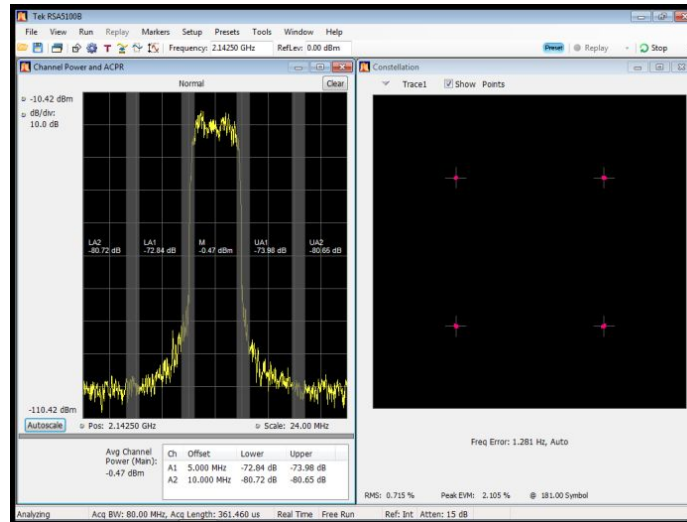
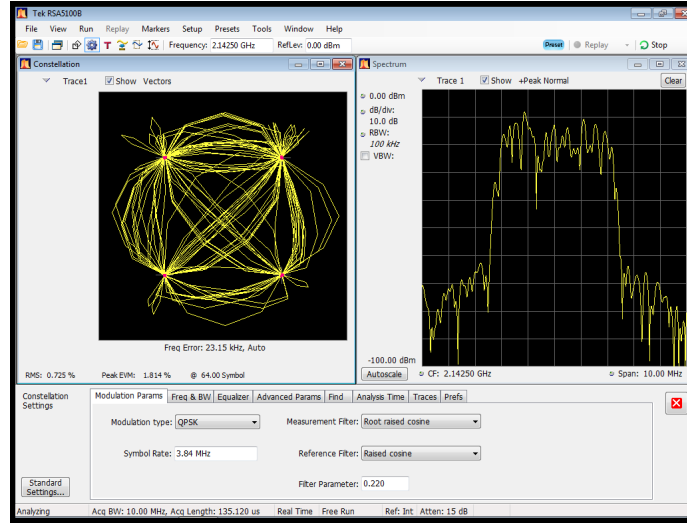


Option VM02 GSM-EDGE, (3π/8 8PSK, 270.833 kS/s, 935 MHz, 0 dBm), RMS EVM: 0.30%



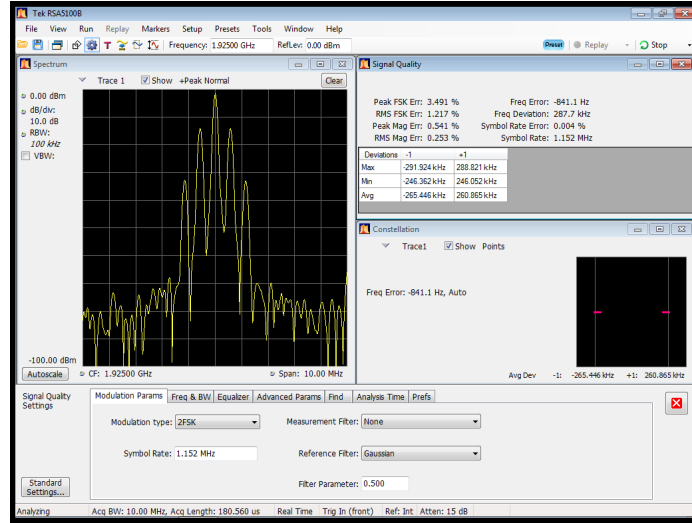
Digital modulation applications (typical)

Option VM03 W-CDMA, (QPSK,3.840Mcps, 2.1425GHz, 0dBm), RMS EVM: 1.7%

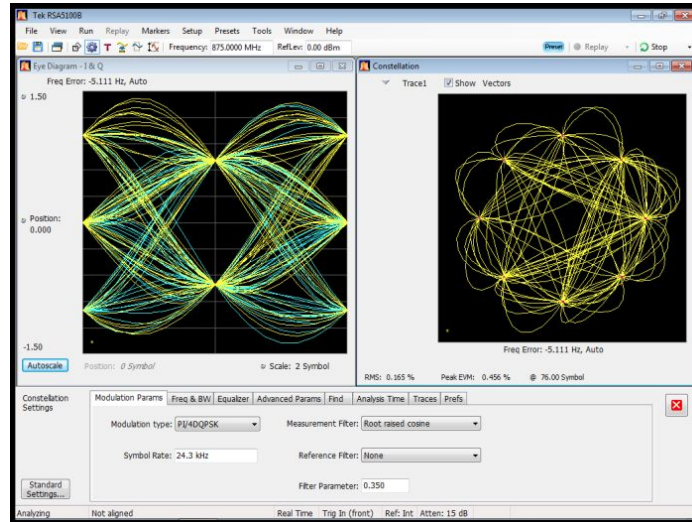


Digital modulation applications (typical)

Option VM05 DECT, (2FSK 1.152 Mbps, 1.925 GHz, 0 dBm), RMS FSK Err: 1.5%

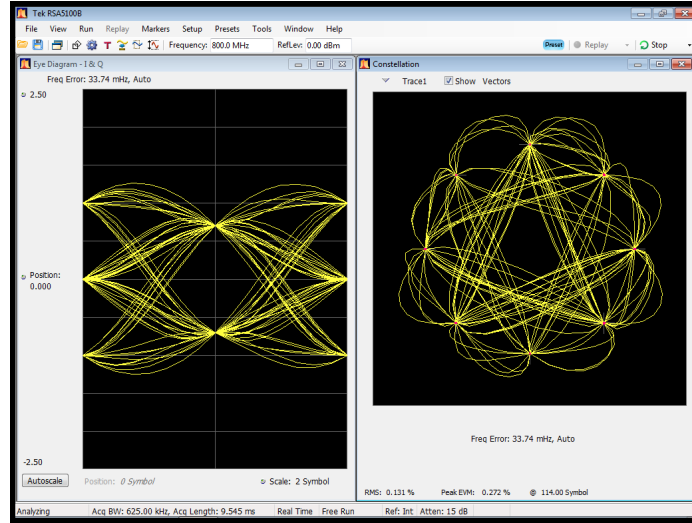


Option VM06 NADC, ($\pi/4$ DQPSK, 24.3 kS/s, 875 MHz, 0 dBm), RMS EVM: 0.3%

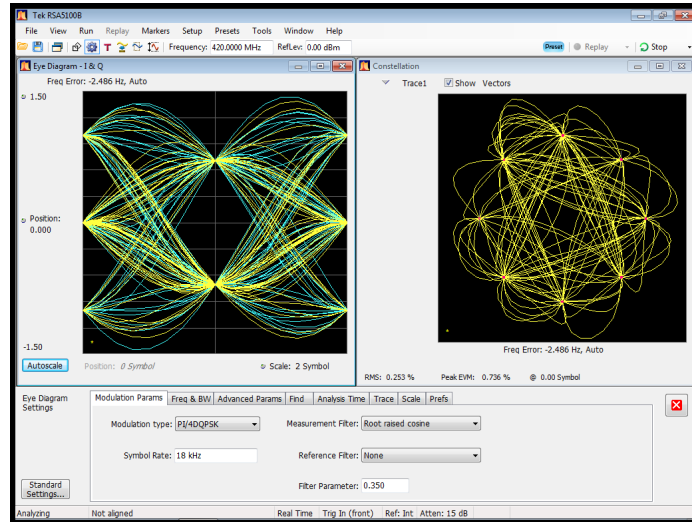


Digital modulation applications (typical)

Option VM07 PDC, ($\pi/4$ DQPSK, 21 kS/s, 800 MHz, 0 dBm), RMS EVM: 0.6%

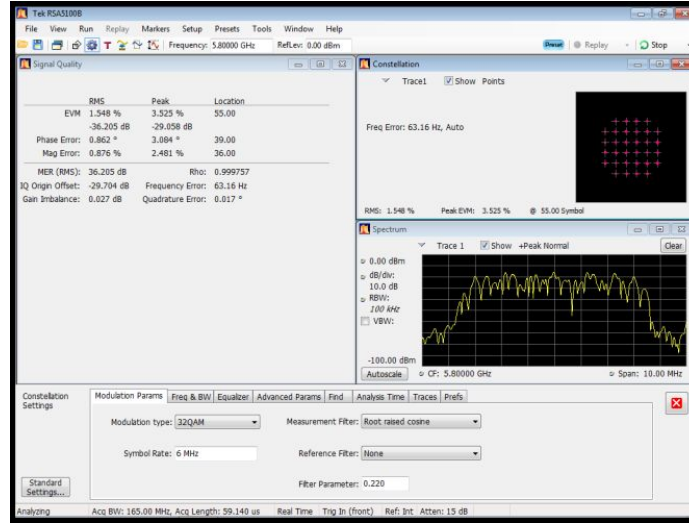


Option VM08 TETRA, ($\pi/4$ DQPSK, 18 kS/s, 420 MHz, 0 dBm), RMS EVM: 0.7%

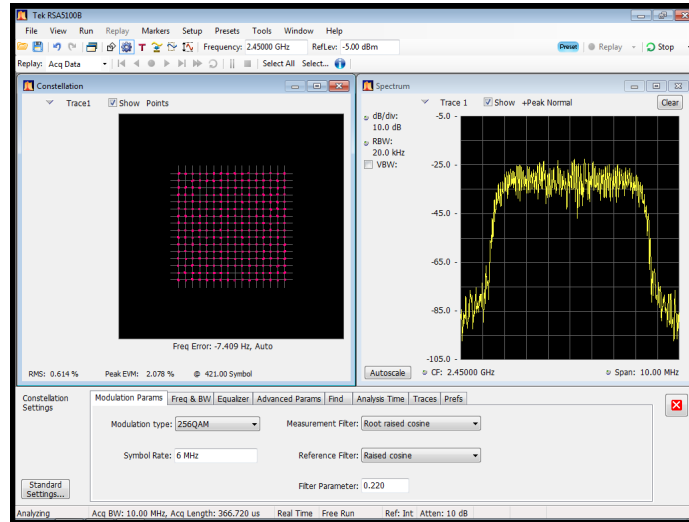


Digital modulation applications (typical)

32QAM, (6 MS/s, 5.8 GHz, Root raised cosine filter, 0 dBm), RMS EVM: 1.6%



256QAM, (6 MS/s, 2.45 GHz, Root raised cosine filter, 0 dBm), RMS EVM: 1.1%



TSG4100A-ATT Option

Nominal impedance	50 Ω
Nominal attenuation	30 dB
Frequency range	DC to 6 GHz
Attenuation deviation	±0.75 dB (DC to 6 GHz)
Maximum VSWR	1.15 (DC to 4 GHz) 1.2 (4 GHz to 6 GHz)
Power rating	5 Watt average power up to 25 °C ambient temperature, linearly derated to 1 Watt at 125 °C ambient temperature.
Weight	0.052 kg

TSG4100A-ATT Option

Operating temperature	-65 °C to 125 °C
Compliance	2011/65/EU (RoHS) compliant

Rear-panel markers

Type	Symbol Clock, Data Frame, TDMA, and user-defined
Amplitude	0.5 to 4 V _{pp} (-2 dBm to +16 dBm)
Output impedance	50 Ω, AC coupled

Physical characteristics

Dimensions	
Height	114 mm (4.5 in)
Width	216 mm (8.5 in)
Depth	347 mm (13.7 in)
Weight	
	5.4 kg (12 lbs)

Operating characteristics

Temperature	
Operating	+5 °C to +40 °C
Non-operating	-20 °C to +60 °C

Humidity	Operating	Non-operating
	5% to 95% relative humidity (%RH) at up to +30 °C	5% to 95% RH (Relative Humidity) at up to +30 °C
	5% to 45% RH above +30 °C up to +40 °C, non-condensing	5% to 45% RH above +30 °C up to +40 °C, non-condensing

Altitude	
Operating	Up to 3,000 m
Non-operating	Up to 12,000 m

Line power	<90 W, 90 to 264 VAC, 47 to 63 Hz with PFC
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Vibration and shock

Random vibration	Operating	Non-operating
	0.27 GRMS, 5 500 Hz, 10 minutes per axis, 3 axes (30 minutes total for Option M01)	2.28 GRMS, 5 500 Hz, 10 minutes per axis, 3 axes (30 minutes total for Option M01)
	0.22 GRMS, 5 500 Hz, 10 minutes per axis, 3 axes (30 minutes total for Options M00 or E1)	2.13 GRMS, 5 500 Hz, 10 minutes per axis, 3 axes (30 minutes total for Options M00 or E1)
Mechanical shock	Non-operating	
	Half-sine mechanical shocks, 50 g peak amplitude, 11 msec duration, 3 drops in each direction of each axis (18 total for Option M01)	
	Half-sine mechanical shocks, 30 g peak amplitude, 11 msec duration, 3 drops in each direction of each axis (18 total for Options M00 or E1)	

Regulatory information

EC Declaration of Conformity - EMC

EMC Directive 2004/108/EC	EN 61326-1
Radiated and Conducted emissions	Class A
Australia/New Zealand	Australia Radio Communications Act 1992
Korea	KCC

Safety

Third Party Certification Standards	UL 61010; CSA C22.2 No. 61010-1
EC Declaration of Conformity - Low Voltage	Low Voltage Directive 2006/95/EC; EN61010-1

Safety Certification Compliance

Equipment type:	Test and measuring
Safety class:	Class 1 - grounded product
Pollution degree:	2 (as defined in IEC61010-1)
Rated for indoor use only.	

Ordering information

Models

For each of the basic models, there are three required but exclusive model options that need to be specified at the time of order: M00, M01, and E1. Pricing varies based on chosen option. See the Instrument Options section for details.

TSG4102A	Analog signal generator with 2 GHz frequency coverage, basic model
TSG4104A	Analog signal generator with 4 GHz frequency coverage, basic model
TSG4106A	Analog signal generator with 6 GHz frequency coverage, basic model

Standard accessories

Accessory	Description
RF cable	1 meter, N-type to N-type RF cable
Documentation CD	All instrument models ship with a CD containing PDF files of user manuals in all available languages.
Installation and Safety Instructions	All instrument models ship with a printed Installation and Safety Instructions manual (multi-language: English and Russian).
Calibration	Statement of Calibration
Power cord	Country specific (see Power cord options)

Warranty

Three years

Instrument options

Hardware options (All regions except North America)

Options M00 or M01 must be specified at the time of instrument order.

M00	Instrument with oven-controlled crystal oscillator (OCXO)
M01	Instrument with voltage-controlled crystal oscillator (VCXO)
GPIB	Adds GPIB interface

Hardware options (North America only)

Option E1 must be specified at the time of instrument order.

E1	Instrument with oven-controlled crystal oscillator (OCXO) time-base and GPIB interface
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Hardware options (All regions)

TSG4100A-RM1	Single rack mount kit (can be ordered separately)
TSG4100A-RM2	Dual rack mount kit (can be ordered separately)
TSG4100A-ATT	30 dB, 5 W RF attenuator up to 6 GHz
D1	A list of performance verification test results

Software options

To upgrade to vector/digital modulation capability and/or add more modulation options after initial purchase, order "TSG4100A-UP + VM xx" instead of "TSG410xA VMxx".

VM00	Basic vector modulation package with internal 6 MHz modulation bandwidth
VM01	GSM modulation (requires Option VM00)
VM02	GSM EDGE modulation (requires Option VM00)
VM03	W-CDMA modulation (requires Option VM00)
VM04	APCO-25 modulation (requires Option VM00)
VM05	DECT modulation (requires Option VM00)
VM06	NADC modulation (requires Option VM00)
VM07	PDC modulation (requires Option VM00)
VM08	TETRA modulation (requires Option VM00)
VM10	Audio Clip (analog AM and FM)
EIQ	External 200 MHz modulation bandwidth (requires Option VM00)

Power plug options

Opt. A0	North America power plug (115 V, 60 Hz)
Opt. A1	Universal Euro power plug (220 V, 50 Hz)
Opt. A2	United Kingdom power plug (240 V, 50 Hz)
Opt. A3	Australia power plug (240 V, 50 Hz)
Opt. A5	Switzerland power plug (220 V, 50 Hz)
Opt. A6	Japan power plug (100 V, 50/60 Hz)
Opt. A10	China power plug (50 Hz)
Opt. A11	India power plug (50 Hz)
Opt. A12	Brazil power plug (60 Hz)
Opt. A99	No power cord

Language options

Request the option below if you would like to order a printed version of the English User Manual. (An electronic version of this manual is provided as a PDF on the CD that shipped with your instrument and is also available for download from the Tektronix Web site.)

Opt. L0	English manual
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Service options

Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. D1	Calibration Data Report
Opt. D3	Calibration Data Report 3 Years (with Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. R5	Repair Service 5 Years (including warranty)



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.



Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.



Product Area Assessed: The planning, design/development and manufacture of electronic Test and Measurement instruments.

TSG4100A Series RF Vector Signal Generator

ASEAN / Australasia (65) 6356 3900
Belgium 00800 2255 4835*
Central East Europe and the Baltics +41 52 675 3777
Finland +41 52 675 3777
Hong Kong 400 820 5835
Japan 81 (3) 6714 3086
Middle East, Asia, and North Africa +41 52 675 3777
People's Republic of China 400 820 5835
Republic of Korea +822 6917 5084, 822 6917 5080
Spain 00800 2255 4835*
Taiwan 886 (2) 2656 6688

Austria 00800 2255 4835*
Brazil +55 (11) 3759 7627
Central Europe & Greece +41 52 675 3777
France 00800 2255 4835*
India 000 800 650 1835
Luxembourg +41 52 675 3777
The Netherlands 00800 2255 4835*
Poland +41 52 675 3777
Russia & CIS +7 (495) 6647564
Sweden 00800 2255 4835*
United Kingdom & Ireland 00800 2255 4835*

Balkans, Israel, South Africa and other ISE Countries +41 52 675 3777
Canada 1 800 833 9200
Denmark +45 80 88 1401
Germany 00800 2255 4835*
Italy 00800 2255 4835*
Mexico, Central/South America & Caribbean 52 (55) 56 04 50 90
Norway 800 16098
Portugal 80 08 12370
South Africa +41 52 675 3777
Switzerland 00800 2255 4835*
USA 1 800 833 9200

* European toll-free number. If not accessible, call: +41 52 675 3777

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(주)누비콤

서울본사 서울특별시 영등포구 경인로 775(문래동 3가, 에이스하이테크시티 3동 2층 201호)
TEL: 070-7872-0701 FAX: 02-2167-3801 E-mail: sales@nubicom.co.kr

대전지사 대전광역시 유성구 덕명동로 22번길 10
TEL: 070-7872-0712 FAX: 02-2167-3801 E-mail: jbkim@nubicom.co.kr