SA/NX
PRODUCT MANUAL

USB/NETWORKED REAL-TIME SPECTRUM ANALYZER

SAN/SAM/NXN/NXM Series
4.5/6.3/8.5/40 GHz

V1.8
2026/03/13

AROGIC

SAN/SAM/NXN/NXM Series Overview

WELL-BALANCED PERFORMANCE, COST, AND SIZE

SAN, SAM, NXN and NXM series products features a compact design that delivers excellent RF performance while maintaining cost efficiency. Their outstanding miniaturization allows easy integration into various automated test systems, ensuring RF performance such as spectrum purity while significantly reducing deployment and operational costs—making them particularly suitable for space- and cost-constrained applications.

USB AND ETHERNET PORTS

The SAN and SAM series features USB connectivity supporting USB 3.0 and 2.0 interfaces, while the NXN and NXM series offers Ethernet connectivity compatible with 1000M/100M networks.

A WIDE RANGE OF MODELS

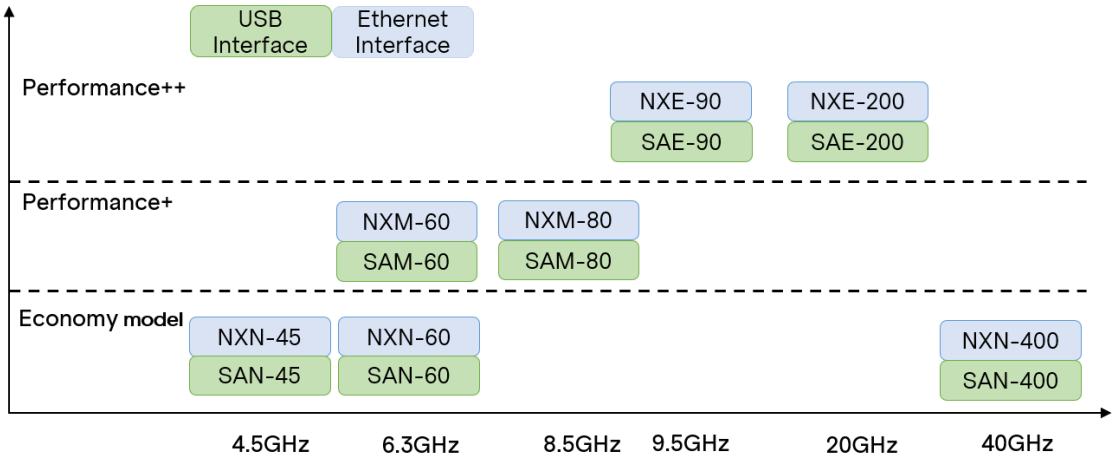
The SAN and NXN series focus on cost efficiency, offering three frequency options—4.5, 6.3, and 40 GHz. The SAM and NXM series prioritize performance, providing 6.3 and 8.5 GHz options. The combination of interface types, frequency ranges, and cost considerations delivers fully optimized choices for a wide variety of applications.

UNIFIED API

All series and models employ a consistent API interface, enabling seamless hardware migration without code modifications. Support is provided for development environments including C/C++, C#, Python, MATLAB, QT, and LabVIEW, compatible with both Windows and Linux operating systems.

RICH STANDARD MEASUREMENT FUNCTIONS

A rich set of advanced measurement capabilities comes standard, including channel power, occupied bandwidth, X dB, harmonic measurement, SEM, AM/FM demodulation, and automatic phase noise analysis.



Overview USB/Ethernet Spectrum Analyzer Family

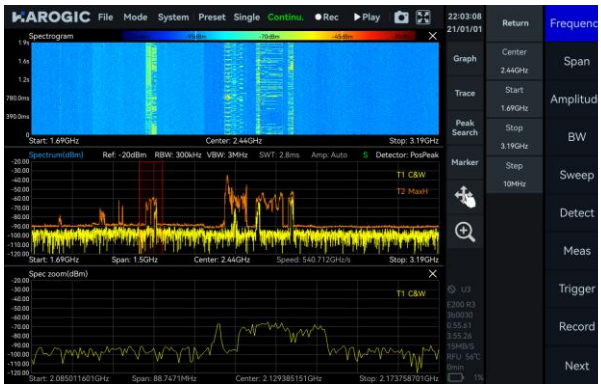
Main Operating Modes Overview

Offer seven main operating modes including: Standard Spectrum Analysis mode, IQ Streaming mode, Power Detection Analysis mode, Real-time Spectrum Analysis mode, Phase Noise Measurement mode, Digital Demodulation mode (option), and Harmonics Analysis mode.

SAStudio4 Main Operating Modes Description

■ Standard Spectrum Analysis Mode

This mode provides a wide range of measurement functions, including full-span spectrum sweep, channel power, OBW, ACPR, IM3 and SEM. It also supports spectrum recording and playback. Combined with auxiliary tools such as signal tracking, peak table, and amplitude correction, it delivers a one-stop platform for comprehensive spectrum check.



■ IQ Streaming Mode

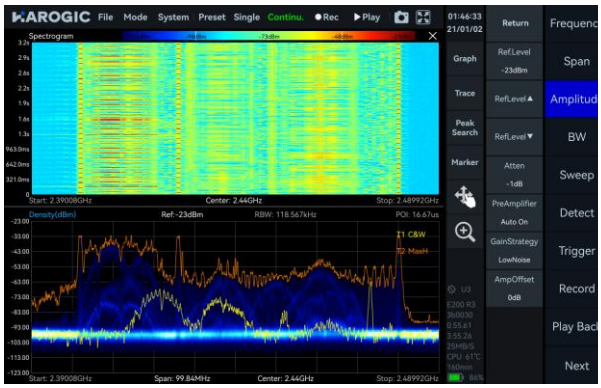
This mode supports up to 100 MHz analysis bandwidth and allows IQ data acquisition through multiple trigger methods. It provides IQ time-domain waveform display, spectrum and spectrogram views, AM/FM demodulation, and digital down conversion (DDC).

■ Power Detection Analysis Mode

This mode enables detection and analysis of time-domain signals within the analysis bandwidth, making it suitable for applications focused on in-band power-versus-time relationships, such as pulse signal measurements.

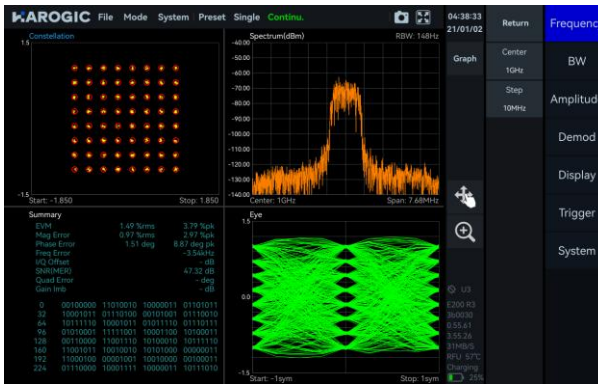
Real-time Spectrum Analysis Mode

This mode is powered by a high-speed FPGA-based FFT engine, featuring with strictly gapless and overlap-free FFT, achieving true real-time monitoring across the full bandwidth.



Digital Demodulation Mode (option)

This mode supports 2ASK, 2FSK, 4FSK, GMSK, BPSK, QPSK, 8PSK, 16QAM, 64QAM, 128QAM, and 256QAM signals.

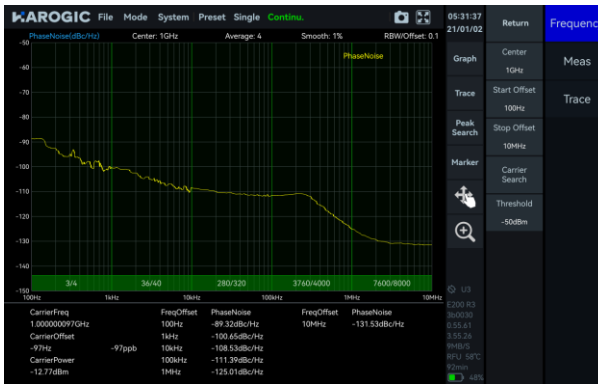


Harmonics Analysis Mode

This mode supports detection and measurement of up to 10 harmonic components, including harmonic peaks, harmonic channel power, and total harmonic distortion.

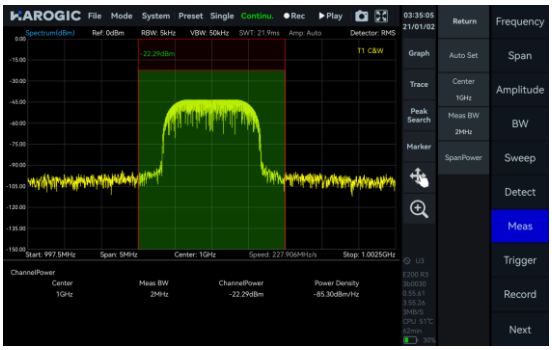
Phase Noise Measurement Mode

This mode supports offset ranges from 1 Hz to 10 MHz for evaluating carrier phase stability. With the built-in automatic carrier search function, the software can quickly locate the target carrier without manual adjustment.



Main Functions Overview

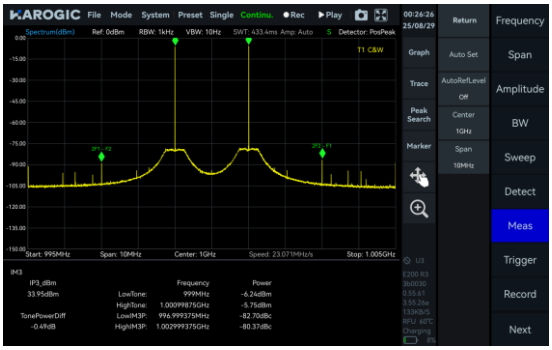
Channel Power



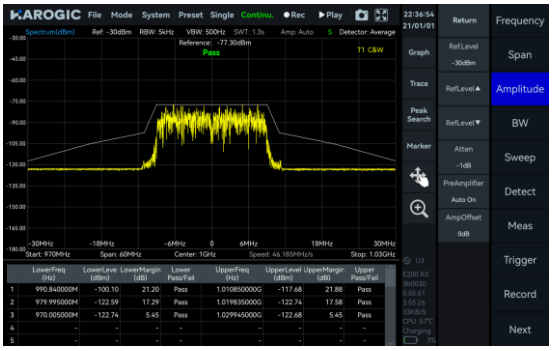
OBW

ACPR

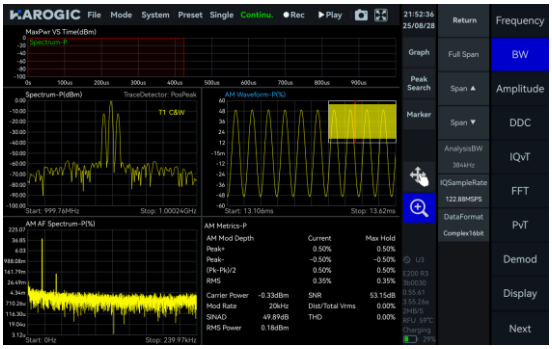
IM3



SEM



AM Demodulation



FM Demodulation

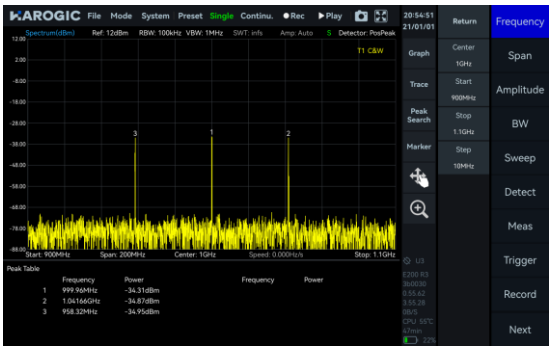
Pulse Detection (option)

Antenna Factor

Amplitude Offset

Signal Track

Peak Table



Data Record and Playback

Multiple Unit Display

Specifications*

FREQUENCY

Model	Frequency range
SAN-45/NXN-45	9 kHz to 4.5 GHz
SAN-60/NXN-60	9 kHz to 6.3 GHz
SAM-60/NXM-60	9 kHz to 6.3 GHz
SAM-80/NXM-80	9 kHz to 8.5 GHz
SAN-400/NXN-400	9 kHz to 40 GHz
Reference clock	Internal or external

Frequency accuracy	TCXO (std.)	<1 ppm, manual correction is available
	OCXO (opt01)	<1 ppm, manual correction is available
	GNSS disciplined OCXO (opt 23/06)	<0.05 ppm, when locked to GNSS
Aging and temperature stability	TCXO (std.)	<1 ppm/year, <1 ppm
	OCXO (opt01)	<1 ppm/year, <0.15 ppm
	GNSS disciplined OCXO (opt 23/06)	<1 ppm/year, <0.05 ppm

SPECTRUM PURITY

SSB phase noise (dBc/Hz)

	SAN-45 NXN-45		SAN-60 NXN-60		SAM-60 NXM-60		SAM-80 NXM-80		SAN-400 NXN-400	
Carrier frequency	1 GHz	4.5 GHz	1 GHz	6.3 GHz	1 GHz	6.3GHz	1 GHz	8.5 GHz	1 GHz	40 GHz
1 kHz	-103.4	-93.5	-105.2	-91.2	-107.5	-92.7	-110.3	-93.5	-99.0	-78.4
10 kHz	-111.3	-100.3	-110.4	-99.3	-114.2	-99.7	-120.0	-100.5	-107.5	-85.7
100 kHz	-109.3	-98.5	-110.5	-97.4	-112.5	-98.6	-120.1	-100.8	-107.7	-85.1
1 MHz	-129.5	-121.9	-130.1	-119.9	-132.8	-120.1	-131.4	-116.9	-122.7	-100.8

Residual response (dBm)
RBW = 1 kHz PosPeak detector

	SAN-45 NXN-45		SAN-60 NXN-60		SAM-60 NXM-60		SAM-80 NXM-80		SAN-400 NXN-400	
Spur reject function	enhanced		enhanced		enhanced		enhanced		bypass	
Reference level (R.L.)	0 dBm	-50 dBm	0 dBm	-50 dBm	0 dBm	-50 dBm	0 dBm	-50 dBm	0 dBm	-50 dBm
100 kHz to 100 MHz	-85	-110	-90	-110	-101	-123	-99	-122	-72	-103

100 MHz to 4.5 GHz	-85	-110	-90	-110	-87	-116	-88	-119	-72	-103
4.5 GHz to 6.3 GHz	-	-	-90	-110	-87	-116	-88	-119	-72	-103
6.3 GHz to 8.5 GHz	-	-	-	-	-	-	-84	-113	-72	-103
8.5 GHz to 10 GHz	-	-	-	-	-	-	-	-	-72	-103
10 GHz to 20 GHz	-	-	-	-	-	-	-	-	-91	-115
10 GHz to 40 GHz	-	-	-	-	-	-	-	-	-85	-105

Image rejection (dBc)	Typical			
	SAN-45/NXN-45 SAM-60/NXM-60	SAN-60/NXN-60 SAM-80/NXM-80	SAN-400 NXN-400	
Spur reject function	standard	bypass	standard	bypass
90 MHz to 4.5/6.3/8.5GHz	>90	>35	>90	>80
8.5 GHz to 33 GHz	-	-	>90	No rejection
33 GHz to 40 GHz	-	-	>58	No rejection

IF rejection (dBc)	Typical			
	SAN-45/NXN-45 SAM-60/NXM-60	SAN-60/NXN-60 SAM-80/NXM-80	SAN-400 NXN-400	
	Low IF architecture		8.2 to 21.75 GHz > 68 Other bands > 90	
Local oscillator related spurious	<-65 dBc Center frequency ± (N/M) × 125 MHz, N, M = 1, 2, 3, 4, 5...			

IIP3/IIP2 (dBm)

	Carrier frequency	R.L. = 20 dBm	R.L. = 0 dBm	R.L. = -20 dBm
SAN-45/NXN-45	1 GHz	47.4 / 85.8	35.1 / 85.5	10.0 / 66.3
	4.5 GHz	45.6 / 98.0	26.1 / 91.6	6.9 / 19.4
SAN-60/NXN-60	1 GHz	46.6 / 86.0	29.6 / 85.8	10.5 / 67.3
	6.3 GHz	42.9 / 109.5	24.6 / 98.5	3.9 / 17.1
SAM-60/NXM-60	1 GHz	51.0 / 84.9	40.1 / 85.1	10.0 / 66.4
	6.3 GHz	43.4 / 65.9	25.3 / 94.6	4.7 / 17.7
SAM-80/NXM-80	1 GHz	49.6 / 87.5	35.6 / 84.3	11.5 / 67.4
	8.5 GHz	41.0 / 57.4	25.5 / 44.8	2.4 / 34.2
SAN-400/NXN-400	1 GHz	40.3 / 75.5	27.4 / 45.3	8.7 / 25.2
	40 GHz	31.7 / 88.6	10.3 / 86.1	4.8 / 66.6

AMPLITUDE

	SAN-45/NXN-45 SAN-60/NXN-60 SAM-60/NXM-60 SAM-80/NXM-80	SAN-400 NXN-400
Display range	DANL to 23 dBm	DANL to 20 dBm
Reference level (R.L.)	-50 dBm to +23 dBm	-50 dBm to +20 dBm
Amplitude accuracy	9kHz to 4.5/6.3/8.5 GHz: ±2.0 dB	9kHz to 9.5GHz: ±2.0 dB 9.5GHz to 40GHz: ±3.0 dB
Max. input power (CW)	23 dBm 30 MHz to 4.5/6.3/8.5 GHz and the preamplifier is off 10 dBm 9 kHz to 30 MHz or preamplifier is on	23 dBm 50 MHz to 40 GHz and the preamplifier is off 10 dBm 9 kHz to 50 MHz or preamplifier is on
VSWR	30MHz to 4.5/6.3/8.5 GHz: <2.5:1	90 MHz to 16 GHz: <2.0:1 16 GHz to 40 GHz: <3.0:1
Max. DC voltage	±10 VDC	
IF in-band flatness	±2.0 dB	
RF preamplifiers	Automatically turn on or forcibly turn off	

Display average noise level (DANL) dBm/Hz
RBW=1 kHz

	SAN-45 NXN-45		SAN-60 NXN-60		SAM-60 NXM-60		SAM-80 NXM-80		SAN-400 NXN-400	
Reference level (R.L.)	-20 dBm	-50 dBm	-20dBm	-50 dBm	-20 dBm	-50 dBm	-20 dBm	-50 dBm	-20 dBm	-50 dBm
9 kHz to 1 MHz	-134.6	-150.3	-136.4	-147.9	-135.9	-148.5	-141.4	-151.7	-136.0	-145.8
1 MHz to 30 MHz	-140.2	-162.6	-139.7	-162.3	-140.7	-162.8	-154.2	-161.6	-153.7	-158.0
30 MHz to 3.0 GHz	-153.2	-163.5	-152.7	-164.8	-152.1	-163.9	-150.8	-167.1	-153.7	-158.0
3.0 GHz to 4.5 GHz	-155.2	-162.7	-157.1	-163.5	-151.3	-162.0	-155.6	-164.7	-154.1	-159.9
4.5 GHz to 6.3 GHz	-	-	-151.9	-160.4	-151.3	-162.0	-155.6	-164.7	-154.1	-159.9
6.3 GHz to 8.5 GHz	-	-	-	-	-	-	-144.0	-157.2	-154.1	-159.9
8.5 GHz to 19 GHz	-	-	-	-	-	-	-	-	-154.1	-159.9
19 GHz to 40 GHz	-	-	-	-	-	-	-	-	-145.2	-149.3

STANDARD SPECTRUM ANALYSIS

	SAN-45/NXN-45 SAN-60/NXN-60	SAM-60/NXM-60 SAM-80/NXM-80 SAN-400/NXN-400
RBW	0.1 Hz to 2.5 MHz	0.1 Hz to 10 MHz
VBW	0.1 Hz to 10 MHz	0.1 Hz to 10 MHz
Detector	PosPeak, NegPeak, Sample, Average, RMS, MaxPower	
Data chart	SAStudio4 software provides spectrum, spectrogram, and historical trace	
Measurements	Channel power, OBW, X dB bandwidth, Adjacent channel power ratio, IM3	

Sweep Speed

	RBW = 250 kHz FPGA spur reject = bypass	RBW = 250 kHz FPGA spur reject = standard	RBW = 50 kHz FPGA spur reject = bypass	RBW = 1 kHz CPU spur reject=bypass
SAN-45	186.0 GHz/s	86.9 GHz/s	79.0 GHz/s	5.7 GHz/s
NXN-45	152.5 GHz/s	73.8 GHz/s	70.8 GHz/s	3.5 GHz/s
SAN-60	444.5 GHz/s	209.4 GHz/s	157.3 GHz/s	6.2 GHz/s
NXN-60	285.7 GHz/s	132.3 GHz/s	132.9 GHz/s	3.5 GHz/s
SAM-60	793.3 GHz/s	382.7 GHz/s	242.2 GHz/s	5.9 GHz/s
NXM-60	354.4 GHz/s	178.2 GHz/s	178.2 GHz/s	3.5 GHz/s
SAM-80	822.1 GHz/s	359.2 GHz/s	230.8 GHz/s	5.8 GHz/s
NXM-80	355.8 GHz/s	178.2 GHz/s	178.2 GHz/s	3.5 GHz/s
SAN-400	1.1 THz/s	584.6 GHz/s	215.6 GHz/s	4.3 GHz/s
NXN-400	657.4 GHz/s	330.8 GHz/s	166.3 GHz/s	3.4 GHz/s

IQ RECORDING

	SAN-45 NXN-45	SAN-60 NXN-60	SAM-60/NXM-60 SAM-80/NXM-80 SAN-400/NXN-400
IQ sample rate	Maximum: 7.8125 MSPS	Maximum: 31.25 MSPS	Maximum: 125 MSPS
	Support decimation factor		
	2^n (n = 0 to 8)	2^n (n = 0 to 10)	2^n (n = 0 to 12)
Burst recording bandwidth	Maximum: 6.25 MHz	Maximum: 25 MHz	Maximum: 100 MHz
	The built-in memory depth is 128 Mbytes		

	SAN-60	SAM-60 SAM-80 SAN-400	SAN-45/NXN-45 NXM-60/NXM-80 NXN-60/NXN-400
Continuous recording bandwidth	Maximum: 25 MHz	Maximum: 50 MHz	Maximum: 6.25 MHz
External trigger response	Maximum frequency response: 500 times/sec		

DETECTION ANAYLSYS

	SAN-45 NXN-45	SAN-60 NXN-60	SAM-60/NXM-60 SAM-80/NXM-80 SAN-400/NXN-400
Lowest time resolution	128 ns	32 ns	8 ns
Max. analysis bandwidth	6.25 MHz	25 MHz	100 MHz
Detector	PosPeak, NegPeak, Sample, Average, RMS, MaxPower		

REAL TIME SPECTRUM ANALYSIS

	SAN-45 NXN-45	SAN-60 NXN-60	SAM-60/NXM-60 SAM-80/NXM-80 SAN-400/NXN-400
FFT analysis	FFT engine is implemented in FPGA. Frame compression and trace detection are supported. No missing samples between FFT frames FFT frame update rate=10 ^ 9 ns / (N × D × Lowest time resolution) POI = 2 × N × D × Lowest time resolution N for FFT points (2048, 1024, 512, 256, 128, 64, 32) D for decimate factor (1, 2, 4, 8...)		
POI			
N = 2048, D = 1	524.288 us	131.072 us	32.768 us
N = 32, D = 1	8.192 us	2.048 us	0.512 us
FFT refresh rate			
N = 2048, D = 1	3,814 times/sec	15,258 times/sec	61,035 times/sec
N = 32, D = 1	244,140 times/sec	976,562 times/sec	3,906,250 times/sec
Max. analysis bandwidth	6.25 MHz	25 MHz	100 MHz

RBW

	SAN-45 NXN-45	SAN-60 NXN-60	SAM-60/NXM-60 SAM-80/NXM-80 SAN-400/NXN-400
Flat-top window	920 kHz to 3.59 kHz	3.68 MHz to 3.59 kHz	14.73 MHz to 3.59 kHz
B-Nuttall window	488 kHz to 1.90 kHz	1.95 MHz to 1.90 kHz	7.81 MHz to 1.90 kHz
Window type	9 grades	11 grades	13 grades
Window function	B-Nuttall, Flat-top, LowSideLobe		
Amplitude resolution	0.75 dB		

GENERAL

	SAN-45 SAN-60 SAN-400 SAM-60 SAM-80	NXN-45 NXN-60 NXN-400 NXM-60 NXM-80
Power	Type-C, 5V 2A supply capacity voltage range 4.75 to 5.25 V ripple less than 200 mVpp	Type-C, 12V 2A supply capacity voltage range 9 to 12 V ripple less than 200 mVpp
Data	Type-C, USB3.0 (USB2.0 bandwidth limited) Requires 5V 0.9A power supply	RJ45 1000 Mbps * 1, 100 Mbps * 1
GNSS type	External	Internal
GNSS 1PPS Synchronization Accuracy	Opt21, ±100 ns Opt22, ±75 ns opt23, ±50 ns	Std., ±100 ns Opt05, ±75 ns Opt06, ±50 ns
Packaging and accessories	Flash disk * 1, USB 3.0 cable * 2, Power adapter * 1	Flash disk * 1, USB 2.0 cable * 1, Power adapter * 1
System requirements	Windows 11/10/8/7 (x86,x64,AArch64), only NX series support AArch64 Debian 12/11/10 (x64,AArch64) Ubuntu 24.04/22.04/20.04/18.04 (x64,AArch64)	
Operating/Storage temperature (Ambient)	T0 class (std.) T1 class (opt40) T2 class (opt41)	0 to 50 °C / -20 to +70 °C -20 to +65 °C / -40 to +85 °C -40 to +65 °C / -40 to +85 °C
Operating Relative Humidity	Ambient Temp.: 0 to 40 °C Ambient Temp.: > 40 °C	5 to 75% 5 to 45%

Input and output

	SAN-45 SAN-60 SAM-60 SAM-80	NXN-45 NXN-60 NXN-400 NXM-60 NXM-80	SAN-400
External trigger input	Type-C 3.3VCMOS high impedance	MMCX(F) 3.3VCMOS high impedance	Integrated in AUXIO 3.3VCMOS high impedance
Trigger output	Type-C, 3.3VCMOS	MMCX(F), 3.3VCMOS	Integrated in AUXIO 3.3VCMOS

	SAN-45/NXN-45 SAM-60/NXM-60	SAN-60/NXN-60 SAM-80/NXM-80	SAN-400 NXN-400
RF input	SMA(F), Impedance 50 Ω		2.92mm(F), Impedance 50 Ω
RF output	SMA(F), Impedance 50 Ω		-
Reference clock input	MCX (F), amplitude ≥ 1.5 Vpp impedance 330 Ω		MMCX (F), amplitude ≥ 1.5 Vpp impedance 330 Ω
Reference clock output	Unavailable		Integrated in AUXIO, 3.3 V CMOS programmable on/off
IF output	Unavailable		MMCX (F) maximum output power -25 dBm impedance 50 Ω, 307.2 MHz ± 50 MHz

Size, Weight, Power consumption

SAN-400	139x68x31 mm, <420g, 10 to 14W
SAN-45/SAN-60 SAM-60/SAM-80	156x62x22 mm, <305 g, 9 to 12W
NXN-45/NXN-60/NXN-400 NXM-60/NXM-80	167x117x30 mm, <665 g, 13 to 16W

*Specification applies under the following conditions:
(1) Start up and warm up for 10 minutes
(2) Ambient temperature 25 °C (core temperature 50 °C)
(3) Standard spectrum analysis mode-spurious rejection standard on.
(4) Necessary heat dissipation is provided to ensure the ambient and core temperature within the rated range at the same time
(5) Sweep speed and display average noise level test conditions: MCU:0.55.57, FPGA:0.55.22, API:0.55.61

OPTIONS

Code		
01	Built-in OCXO reference clock	built-in hardware
02	Built-in signal generator	built-in hardware
05	Internal high precision GNSS	built-in hardware
06	Build-in GNSS disciplined reference clock	built-in hardware
20	AUXIO IO Expansion board	accessory
21	External GNSS	accessory
22	External high precision GNSS	accessory
23	External GNSS disciplined OCXO reference clock	accessory
34	External omnidirectional antenna, 400MHz to 8000MHz, Gain<2dBi	accessory
35	External active directional antenna, frequency range: 0.5 to 10 GHz Gain: < 5 dBi (amp off); < 25 dBi(amp on)	accessory
40	T1 temperature class	built-in hardware
41	T2 temperature class, only available for core	built-in hardware
71	Basic digital demodulation	software
72	Pulse detection	software

BUILT-IN SIGNAL GENERATOR (opt02)

Model	SAN-45/NXN-45	SAN-60/NXN-60	SAM-60/NXM-60	SAM-80/NXM-80
Frequency range	100 kHz to 6.3 GHz, step 10 Hz			
Power range	-50 dBm to 0 dBm, step 0.25 dB			
VSWR	30 MHz to 6.3 GHz		<2.0:1	
Non-harmonic spurs	<-50 dBc			

Harmonics

Frequency range	Second harmonic	Third harmonic and above
100 kHz to 30 MHz	<-10 dBc	<-10 dBc
30 MHz to 1.6 GHz	<-10 dBc	<-10 dBc
1.6 GHz to 3 GHz	<-20 dBc	<-20 dBc
3 GHz to 3.2 GHz	<-20 dBc	<-20 dBc
3.2 GHz to 6.3 GHz	<-20 dBc	<-20 dBc

Leakage to receiver

100 kHz to 30 MHz	>90 dBc
30 MHz to 3 GHz	>80 dBc
3 GHz to 6.3 GHz	>70 dBc

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