

Chapter 5 Specifications

Specifications are valid under the following conditions: the instrument is within the calibration period, is stored for at least two hours at 0°C to 50°C temperature and is warmed up for 40 minutes. Unless otherwise noted, the specifications in the manual include the measurement uncertainty.

Typical (typ.): characteristic performance, which 80 percent of the measurement results will meet at room temperature (approximately 25°C). This data is not warranted and does not include the measurement uncertainty.

Nominal (nom.): the expected mean or average performance or a designed attribute (such as the 50Ω connector). This data is not warranted and is measured at room temperature (approximately 25°C).

Measured (meas.): an attribute measured during the design phase which can be compared to the expected performance, such as the amplitude drift variation with time. This data is not warranted and is measured at room temperature (approximately 25°C).

Note: All charts in this manual are the measurement results of multiple instruments at room temperature unless otherwise noted.

Technical Specifications*

Frequency

Frequency	
	DSA832E
Frequency range	9 kHz to 3.2 GHz
Frequency resolution	1 Hz

Internal Reference Frequency	
Reference frequency	10 MHz
Accuracy	$\pm [(\text{time since last calibration} \times \text{aging rate}) + \text{temperature stability} + \text{calibration accuracy}]$
Initial calibration accuracy	<1 ppm
Temperature stability	0°C to 50°C, reference to 25°C
	<1 ppm
Aging rate	<2 ppm/year

Frequency Readout Accuracy	
Marker resolution	span/ (number of sweep points - 1)
Marker uncertainty	$\pm (\text{frequency indication} \times \text{reference frequency accuracy} + 1\% \times \text{span} + 10\% \times \text{resolution bandwidth} + \text{marker resolution})$

Frequency Counter	
Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz
Uncertainty	$\pm (\text{frequency indication} \times \text{reference frequency accuracy} + \text{counter resolution})$

Frequency Span	
Range	0 Hz, 100 Hz to maximum frequency of instrument
Uncertainty	$\pm \text{span/ (number of sweep points - 1)}$

Note: *The specifications (except the TG specifications) listed in this manual are those when the tracking generator is off.

SSB Phase Noise		
	20°C to 30°C, $f_c = 1$ GHz	
Carrier offset	10 kHz offset	< -90 dBc/Hz

Residual FM	
	20°C to 30°C, RBW = VBW = 1 kHz
Residual FM	< 20 Hz (nom.)

Bandwidths	
	Set "Auto SWT" to "Accy"
Resolution bandwidth (-3 dB)	10 Hz to 1 MHz, in 1-3-10 sequence
RBW uncertainty	< 5% (nom.)
Resolution filter shape factor (60 dB : 3 dB)	< 5 (nom.)
Video bandwidth (-3 dB)	1 Hz to 3 MHz, in 1-3-10 sequence
Resolution bandwidth (-6 dB) (EMI-DSA800 option)	200 Hz, 9 kHz, 120 kHz

Amplitude

Measurement Range	
Range	$f_c \geq 10$ MHz
	DANL to +20 dBm

Maximum Input Level	
DC voltage	50 V
CW RF power	attenuation = 30 dB
	+20 dBm (100 mW)
Max. damage level*	+30 dBm (1 W)

Note: *When $f_c \geq 10$ MHz, input level > +25 dBm and PA is Off, the protection switch will be on.

Displayed Average Noise Level (DANL)		
	attenuation = 0 dB, RBW = VBW = 10 Hz, sample detector, trace average ≥ 50 , tracking generator off, 20°C to 30°C, input impedance = 50 Ω	
PA off	9 kHz to 100 kHz	<-110 dBm (typ.)
	100 kHz to 5 MHz	<-122 dBm, <-125 dBm (typ.)
	5 MHz to 3.2 GHz	<-127 dBm, <-130 dBm (typ.)
PA on	100 kHz to 1 MHz	<-142 dBm (typ.)
	1 MHz to 5 MHz	<-140 dBm, <-143 dBm (typ.)
	5 MHz to 3.2 GHz	<-145 dBm, <-148 dBm (typ.)

Level Display	
Logarithmic level axis	1 dB to 200 dB
Linear level axis	0 to reference level
Number of display points	601
Number of traces	3 + math trace
Trace detectors	normal, positive-peak, negative-peak, sample, RMS, voltage average quasi-peak (with EMI-DSA800 option)
Trace functions	clear write, max hold, min hold, average, view, blank
Units of level axis	dBm, dBmV, dB μ V, nV, μ V, mV, V, nW, μ W, mW, W

Frequency Response		
	$f_c \geq 100$ kHz, attenuation = 10 dB, relative to 50 MHz, 20°C to 30°C	
PA off	100 kHz to 3.2 GHz	<0.7 dB
	$f_c \geq 1$ MHz, attenuation = 10 dB, relative to 50 MHz, 20°C to 30°C	
PA on	100 kHz to 3.2 GHz	<1.0 dB

Input Attenuation Switching Uncertainty	
Setting range	0 dB to 30 dB, in 1 dB step
Switching uncertainty	$f_c = 50$ MHz, relative to 10 dB, 20°C to 30°C
	<0.3 dB

Absolute Amplitude Uncertainty	
Uncertainty	$f_c = 50$ MHz, peak detector, preamplifier off, attenuation = 10 dB, input signal level = -10 dBm, 20°C to 30°C
	<0.3 dB

RBW Switching Uncertainty	
Uncertainty	relative to 1 kHz RBW
	<0.1 dB

Reference Level		
Range	-100 dBm to +20 dBm, in 1 dB step	
Resolution	log scale	0.01 dB
	linear scale	4 digits

Preamplifier		
	PA-DSA832 (option)	
Gain	100 kHz to 3.2 GHz	17 dB (nom.)

Level Measurement Uncertainty	
	95% confidence level, S/N > 20 dB, RBW = VBW = 1 kHz, preamplifier off, attenuation = 10 dB, -50 dBm < input level ≤ 0 dBm, $f_c > 10$ MHz, 20°C to 30°C
Level measurement uncertainty	<1.0 dB (nom.)

RF Input VSWR		
	attenuation ≥ 10 dB	
VSWR	300 kHz to 3.2 GHz	<1.5 (nom.)

Distortion

Second Harmonic Intercept	
Second harmonic intercept (SHI)	$f_c \geq 50$ MHz, input signal level = -20 dBm, attenuation = 10 dB
	+40 dBm

Third-order Intercept	
Third-order intercept (TOI)	$f_c \geq 50$ MHz, two -20 dBm tones at input mixer spaced by 200 kHz, attenuation = 10 dB
	+7 dBm

1dB Gain Compression	
1dB compression of input mixer (P_{1dB})	$f_c \geq 50$ MHz, attenuation = 0 dB
	>0 dBm

Spurious Response	
Spurious response, inherent	input terminated 50 Ω , attenuation = 0 dB, 20°C to 30°C
	<-90 dBm*, <-100 dBm (typ.)
Intermediate frequency	<-60 dBc
System related sidebands	referenced to local oscillators, referenced to A/D conversion, referenced to subharmonic of first LO, referenced to harmonic of first LO
	<-60 dBc
Input related spurious	mixer level = -30 dBm
	<-60 dBc

Note: * Except the internal local oscillator (1820 MHz) and its harmonics.

Sweep

Sweep		
Sweep time	span \geq 100 Hz	1 ms to 3200 s
	zero span	20 μ s to 3200 s
Sweep time uncertainty	span \geq 100 Hz	5% (nom.)
	zero span (sweep time setting value > 1 ms)	5% (nom.)
Sweep mode		continuous, single

Tracking Generator (Option)

TG Output	
Frequency range	100 kHz to 3.2 GHz
Output level range	-40 dBm to 0 dBm
Output level resolution	1 dB
Output flatness	relative to 50 MHz
	\pm 3 dB (nom.)

Trigger

Trigger	
Trigger source	free run, video, external
External trigger level	5 V TTL level

Input /Output

Front Panel Connectors		
RF input	impedance	50 Ω (nom.)
	connector	N female
Tracking generator output	impedance	50 Ω (nom.)
	connector	N female

Internal/ External Reference		
Internal reference	frequency	10 MHz
	output level	+3 dBm to +10 dBm, +8 dBm (typ.)
	impedance	50 Ω (nom.)
	connector	BNC female
External reference	frequency	10 MHz \pm 5 ppm
	input level	0 dBm to +10 dBm
	impedance	50 Ω (nom.)
	connector	BNC female

External Trigger Input		
External trigger input	impedance	1 k Ω (nom.)
	connector	BNC female

Communication Interface		
USB host	connector	A plug
	protocol	version2.0
USB device	connector	B plug
	protocol	version2.0
LAN	LXI core 2011 device	10/100Base, RJ-45
IEC/IEEE (GPIB) bus (USB-GPIB option)		IEEE488.2

General Specifications

Display	
Type	TFT LCD
Resolution	800 x 480 pixels
Size	8 inch
Colors	64k

Printer Supported	
Protocol	PictBridge

Mass Memory	
Mass memory	flash disk (internal), USB storage device (not supplied)

Power Supply	
Input voltage range, AC	100 V to 240 V (nom.)
AC supply frequency	45 Hz to 440 Hz
Power consumption	35 W (typ.), max. 50 W with all options

Environmental		
Temperature	operating temperature range	0°C to 50°C
	storage temperature range	-20°C to 70°C
Humidity	0°C to 30°C	≤ 95% rel. humidity
	30°C to 40°C	≤ 75% rel. humidity
Altitude	operating height	up to 3,000m

Electromagnetic Compatibility and Safety		
EMC	in line with EN61326-1:2006	
	IEC 61000-4-2:2001	±4.0 kV (contact discharge), ±4.0 kV (air discharge)
	IEC 61000-4-3:2002	3 V/m (80 MHz to 1 GHz), 3 V/m (1.4 GHz to 2 GHz), 1 V/m (2.0 GHz to 2.7 GHz)
	IEC 61000-4-4:2004	1 kV power lines

	IEC 61000-4-5:2001	0.5 kV (phase to neutral), 0.5 kV (phase to PE), 1 kV (neutral to PE)
	IEC 61000-4-6:2003	3 V, 0.15 to 80 MHz
	IEC 61000-4-11:2004	voltage dip: 0% UT during half cycle, 0% UT during 1 cycle, 70% UT during 25 cycles short interruption: 0% UT during 250 cycles
Electrical safety		in line with UL 61010-1:2012, CAN/CSA-C22.2 No. 61010-1-12, EN 61010-1:2010

Dimensions	
(W × H × D)	361.6 mm × 178.8 mm × 128 mm (14.2 in × 7.0 in × 5.0 in)

Weight	
Standard	4.55 kg (10.0 lb)
With tracking generator	5.15 kg (11.4 lb)

Calibration Interval	
Recommended calibration interval	1 year