

Anritsu envision : ensure

Microwave CW USB Power Sensors

Low Cost, Compact, and Highly Accurate Power Sensors
for RF and Microwave Applications

MA24330A

10 MHz to 33 GHz

MA24340A

10 MHz to 40 GHz

MA24350A

10 MHz to 50 GHz



Introduction

The MA243x0A series Microwave CW USB Power Sensors employ a single-path diode architecture to provide fast, accurate average power measurements from 10 MHz up to 50 GHz with 90 dB of dynamic range.

Features and Benefits

- Broad Frequency Range (10 MHz up to 50 GHz): Ideal for general purpose, aerospace and defense, satellite and wireless communications applications
- Accurate Power Measurements with over 90 dB Dynamic Range
- Best-in-Class Damage Protection (+26 dBm CW, +32 dBm peak < 10 μ s): Protects instrumentation investment
- No Zeroing Required (for signals > -50 dBm) and Elimination of 1 mW Reference Calibration: Reduces test time and handling in production while maintaining absolute accuracy
- Advanced Trigger Capabilities: Facilitates time dependent power measurements
- NIST Traceable Calibration: Provides high-accuracy measurements and ensures absolute accuracy
- Calibration Traceable to SI Units via National Metrology Institutes
- Easy to Use with PC or Select Anritsu Handheld Instruments: No benchtop power meter unit needed
- Silicone Protective Covering (removable): Provides additional field durability
- External Trigger Latching: For pulses as narrow as 20 ns



MA243x0A Series Microwave CW USB Power Sensors

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Definitions

	All specifications and characteristics apply under the following conditions, unless otherwise stated:
Warm-Up Time	60 minutes
Operating Temperature Range	0 °C to 50 °C
Characteristic Performance	Characteristic specifications are not tested and are not warranted.
ISO GUM Measurement Uncertainty	Zero and Noise uncertainty expressed with coverage factor of k=3. Average and Relative Power uncertainty expressed with coverage factor of k=2.
Calibration Cycle	Anritsu recommended calibration interval is 12 months. All specifications subject to change without notice. For the most current data sheet, please visit the Anritsu web site: www.anritsu.com
Notes	Sensors may have degraded performance when dropped without the removable protective covering. This cover is required for warranted operation.

Sensor Specifications

Frequency		MA24330A	10 MHz to 33 GHz, K(m) Connector							
		MA24340A	10 MHz to 40 GHz, K(m) Connector							
		MA24350A	10 MHz to 50 GHz, V(m) Connector							
Power Measurement										
			<50 MHz	50 to 150 MHz	>0.15 to 2 GHz	>2 to 6 GHz	>6 to 18 GHz	>18 to 33 GHz	>33 to 40 GHz	>40 to 50 GHz
	VSWR		1.9:1	1.17:1	1.08:1	1.16:1	1.21:1	1.29:1	1.44:1	1.5:1
	Dynamic Range		-70 dBm to +20 dBm							
	Damage Levels at RF Port		+26 dBm, ±20 V DC (+32 dBm peak <10 µs pulse and 10 % duty cycle), minimum							
Response										
	Signal Channel Rise Time		8 µs characteristic							
	Sampling Rate		140 kS/s							
Trigger										
	Source ¹		Bus, Continuous, Internal, External							
	Arm Type (for Internal/External)		Auto, Single, Multiple, Standby							
Internal Trigger										
	Dynamic Range		-35 dBm to +20 dBm							
	Level Accuracy		±0.5 dB characteristic							
	Slope		Positive or Negative							
	Delay Range		-5 ms to +10 s							
	Delay Resolution		10 µs							
	Hysteresis		0 dB to 10 dB, with 0.1 dB resolution							
	Trigger Hold Off		0 s to 10 s, with 0.01 ms resolution							
External Trigger										
	External Trigger Input		MCX (female), 5.5 V maximum							
	Input Impedance		4 kΩ nominal							
	Type		TTL/CMOS							
	Slope		Positive or Negative							
	Delay Range		-5 ms to +10 s							
	Delay Resolution		10 µs							
	High Level Input Voltage		2.3 V min, 3.0 V max							
	Low Level Input Voltage		1.3 V min, 1.6 V max							
	Latency ²		7.1 µs max							
	Trigger Pulse Width		20 ns min							
	Trigger Repetition Period		7.1 µs min							
	Trigger Holdoff		0 s to 10 s with 0.01 ms resolution							

1. Bus trigger is not available in PowerXpert application.

2. Latency is defined as the time delay between the defined edge of the applied trigger and the sensor switching into the triggered state.

Measurement Uncertainty

Average Power (dB) ³	25 °C to 35 °C:				
	Range (dBm)	≤18 GHz	>18 GHz to 40 GHz	>40 GHz to 50 GHz	
	-70 to <+15	0.11	0.13	0.19	
	+15 to +20	0.14	0.17	0.23	
	0 °C to 50 °C:				
	Range (dBm)	≤18 GHz	>18 GHz to 40 GHz	>40 GHz to 50 GHz	
	-70 to <+15	0.14	0.17	0.25	
	+15 to +20	0.18	0.21	0.29	
	Zero ⁴	Set			Drift
		Range (dBm)	Watt	dBm	Watt
-70 to -20		9.68E-11	-70.14	8.90E-11	-70.50
>-20 to 0		4.95E-09	-53.05	4.14E-09	-53.83
>0 to +20		1.56E-08	-48.08	1.72E-08	-47.65
Noise ⁵		Range (dBm)	Watt	dBm	
	-70 to -20	3.53E-11	-74.52		
	>-20 to 0	6.51E-11	-71.86		
	>0 to +20	6.30E-10	-62.01		

- Power uncertainty expressed with coverage factor of k=2 for CW measurement after zero operation. Includes calibration factor and linearity over temperature uncertainties, but not the effects of mismatch, zero set and drift, or noise.
- Zero uncertainty expressed with coverage factor of k=3. One hour warm-up followed by a Zero operation. Measured with 256 averages and 40 ms aperture and with the temperature kept within ±1 °C.
Zero Set: Average of the reported power over one hour.
Zero Drift: Two sigma value of the reported power over one hour.
Specified Zero Set, Drift and Noise are valid at 30 °C ± 5 °C.
- Two sigma noise at 10.2 seconds of integration time (integration time = aperture time x averaging number). Effect of noise can be reduced by increasing the number of averages and/or increasing the aperture time. Noise is inversely proportional to the square root of number of ADC samples used per measurement; the number of ADC samples per measurement is the product of the sample rate, aperture time, and number of averages used. Noise uncertainty is expressed with coverage factor of k=3.

PowerXpert™**PC Requirements** (version 3.0 or greater)

Processor and RAM	Minimum: Equivalent to Intel® Pentium® III with 1 GB RAM or Intel® Pentium® IV with 512 MB RAM Recommended: Equivalent to Intel® Pentium® IV with 1 GB RAM
Operating System	Microsoft® Windows® 8, Windows® 7, and Windows® XP
Hard-Disk Free Space	100 MB minimum
Display Resolution	1024 × 768 minimum
Interface	USB 2.0 high speed

System

Measurand	Average power
Measurement Resolution	0.01 dB max via PowerXpert™, 0.001 dB max via remote command
Offset Correction ⁶	–100 dB to +150 dB
Averaging	Auto, Manual
Type	Moving, Repeat
Number of Averages (Manual) ⁷	1 to 65,536
Auto Average Resolution ⁸	1 dB, 0.1 dB, 0.01 dB
Auto Average Source	Scope Data Point Number: 1 to 16,384

Continuous Average Mode

Duty Cycle Correction	0.01 % to 100 %
Aperture Time	0.01 ms to 1 s
Measurement Time ⁹	$N \times (\text{aperture time} \times C_t) + T_{com}$ Continuous: >2,100 readings/s (minimum aperture, one average) Buffered: >5,600 readings/s (minimum aperture, one average)
Buffer Size	8192

Scope Mode

Capture Time	0.01 ms to 1 s
Data Points	1 to 16,384
Resolution	0.01 ms max
Measurement Time ¹⁰	$N \times (\text{capture time} \times C_t) + (P_n \times 0.038 \text{ ms}) + T_{com}$

List Mode

Number of Measurements	1 to 1000
Input Parameters	Frequency (GHz), aperture time (ms), averages

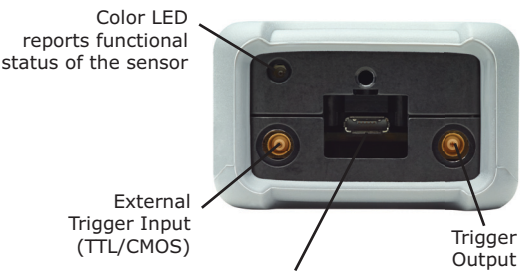
6. Offset correction feature is available only through the PowerXpert application. There is no remote command for it in the sensor firmware.
7. Maximum number of averages allowed in Continuous Average mode is 65,536. In Scope mode, the maximum number of averages is equal to 16,777,216 divided by the number of data points.
8. Averaging resolution of 0.001 dB is not available with the PowerXpert application. It is defined as the place after the decimal to which the reading becomes stable. For example, if 0.01 is selected, then the reading will typically be stable within ± 0.01 dB. Please refer to the remote operation chapter in the user guide for information regarding access to this feature.
9. Speed is defined as the data throughput at the “A” end of the USB A to Micro-B Cable (p/n 2000-1816-R), where:
Number of Repeat Averages = N ($N = 1$ for moving average mode)
Capture Time Coefficient = $C_t = 8.238$
Command Processing Time = $T_{com} = 0.347$ ms
Speed may vary depending on the speed of and load on the CPU controlling the sensor. Specified results obtained with Intel® Core™ i5-3550 CPU running at 3.30 GHz
10. Speed is defined as the data throughput at the “A” end of the USB A to Micro-B Cable (p/n 2000-1816-R), where:
Number of Repeat Averages = N ($N = 1$ for moving average mode)
Capture Time Coefficient = $C_t = 8.238$
Number of Points = P_n
Command Processing Time = $T_{com} = 0.289$ ms

General

RF Connector	K male (MA24330A, MA24340A) V male (MA24350A)
Interface to Host	USB 2.0 high speed
Current Consumption	410 mA to 450 mA characteristic (20 °C to 30 °C)
Size	110 mm x 46 mm x 25.6 mm, excluding K or V connector and silicone protective covering
Weight	397 g (0.88 lb)
Warranty	1 year



K and V Type connectors designed for use with a torque wrench ensuring repeatable connections



Color LED reports functional status of the sensor
USB Micro-B port for connectivity to host (PC or Anritsu handheld instrument)

Operational Requirements

Tests were performed per MIL-PRF-28800F (Class 3).

Operating Temperature Range	0 °C to 50 °C
Storage Temperature Range	-40 °C to +71 °C
Humidity	45 % relative humidity at 50 °C (non-condensing) 75 % relative humidity at 40 °C (non-condensing) 95 % relative humidity at 30 °C (non-condensing)
Altitude	4600 m operational max
Shock	30 g _n half-sine, 11 ms duration
Vibration	Sinusoidal: 5 Hz to 55 Hz, 3 g max Random: 10 Hz to 500 Hz Power Spectral Density: 0.03 g ² / Hz

Regulatory Compliance

European Union	EMC 2014/30/EU, EN 61326:2013, CISPR 11/EN 55011, IEC/EN 61000-4-2/3/4/5/6/8/11 Low Voltage Directive 2014/35/EU Safety EN 61010-1:2010 RoHS Directive 2011/65/EU
Australia and New Zealand	RCM AS/NZS 4417:2012
South Korea	KCC-REM-A21-0004

Ordering Information

Available Models		
MA24330A	33 GHz USB Power Sensor	
MA24340A	40 GHz USB Power Sensor	
MA24350A	50 GHz USB Power Sensor	
Included Accessories		
10585-00021	Quick Start Guide	
2000-1605-R	1.5 m BNC(m) to MCX(m) cable	
2000-1816-R	1.8 m USB A to Micro-B cable	
Available Options		
MA24330A-097	Option 97: ISO/IEC 17025 and ANSI/NCSL Z540-1 or ANSI/NCSLI Z540.3 (includes test report, uncertainty data, and accreditation symbol)	
MA24340A-097		
MA24330A-098	Option 98: Standard calibration ISO/IEC 17025 and ANSI/NCSL Z540-1	
MA24340A-098		
MA24350A-098		
MA24330A-099	Option 99: Premium calibration ISO/IEC 17025 and ANSI/NCSL Z540-1 (includes test report and uncertainty data)	
MA24340A-099		
MA24350A-099		

Optional Accessories

Calibrated Torque Wrenches		
01-201	Calibrated torque wrench for K and V connectors	

Precision Fixed Attenuators		
41KB-3	DC to 26.5 GHz, 3 dB, 50 Ω, K(m) to K(f)	
41KB-6	DC to 26.5 GHz, 6 dB, 50 Ω, K(m) to K(f)	
41KB-10	DC to 26.5 GHz, 10 dB, 50 Ω, K(m) to K(f)	
41KB-20	DC to 26.5 GHz, 20 dB, 50 Ω, K(m) to K(f)	
41KC-3	DC to 40 GHz, 3 dB, 50 Ω, K(m) to K(f)	
41KC-6	DC to 40 GHz, 6 dB, 50 Ω, K(m) to K(f)	
41KC-10	DC to 40 GHz, 10 dB, 50 Ω, K(m) to K(f)	
41KC-20	DC to 40 GHz, 20 dB, 50 Ω, K(m) to K(f)	
41V-3	DC to 60 GHz, 3 dB, 50 Ω, V(m) to V(f)	
41V-6	DC to 60 GHz, 6 dB, 50 Ω, V(m) to V(f)	
41V-10	DC to 60 GHz, 10 dB, 50 Ω, V(m) to V(f)	
41V-20	DC to 60 GHz, 20 dB, 50 Ω, V(m) to V(f)	
43KB-3	DC to 26.5 GHz, 3 dB, 50 Ω, K(m) to K(f)	
43KB-6	DC to 26.5 GHz, 6 dB, 50 Ω, K(m) to K(f)	
43KB-10	DC to 26.5 GHz, 10 dB, 50 Ω, K(m) to K(f)	
43KB-20	DC to 26.5 GHz, 20 dB, 50 Ω, K(m) to K(f)	
43KC-3	DC to 40 GHz, 3 dB, 50 Ω, K(m) to K(f)	
43KC-6	DC to 40 GHz, 6 dB, 50 Ω, K(m) to K(f)	
43KC-10	DC to 40 GHz, 10 dB, 50 Ω, K(m) to K(f)	
43KC-20	DC to 40 GHz, 20 dB, 50 Ω, K(m) to K(f)	

Precision Coaxial Adapters		
33KFKF50B	DC to 40 GHz, 50 Ω, K(f) to K(f)	
33KKF50B	DC to 40 GHz, 50 Ω, K(m) to K(f)	
33VVF50C	DC to 70 GHz, 50 Ω, V(f) to V(f)	
33VVF50C	DC to 70 GHz, 50 Ω, V(m) to V(f)	
34NKF50	DC to 18 GHz, 50 Ω, N(m) to K(f)	
34NFKF50	DC to 18 GHz, 50 Ω, N(f) to K(f)	

Training at Anritsu

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