Anritsu envision : ensure

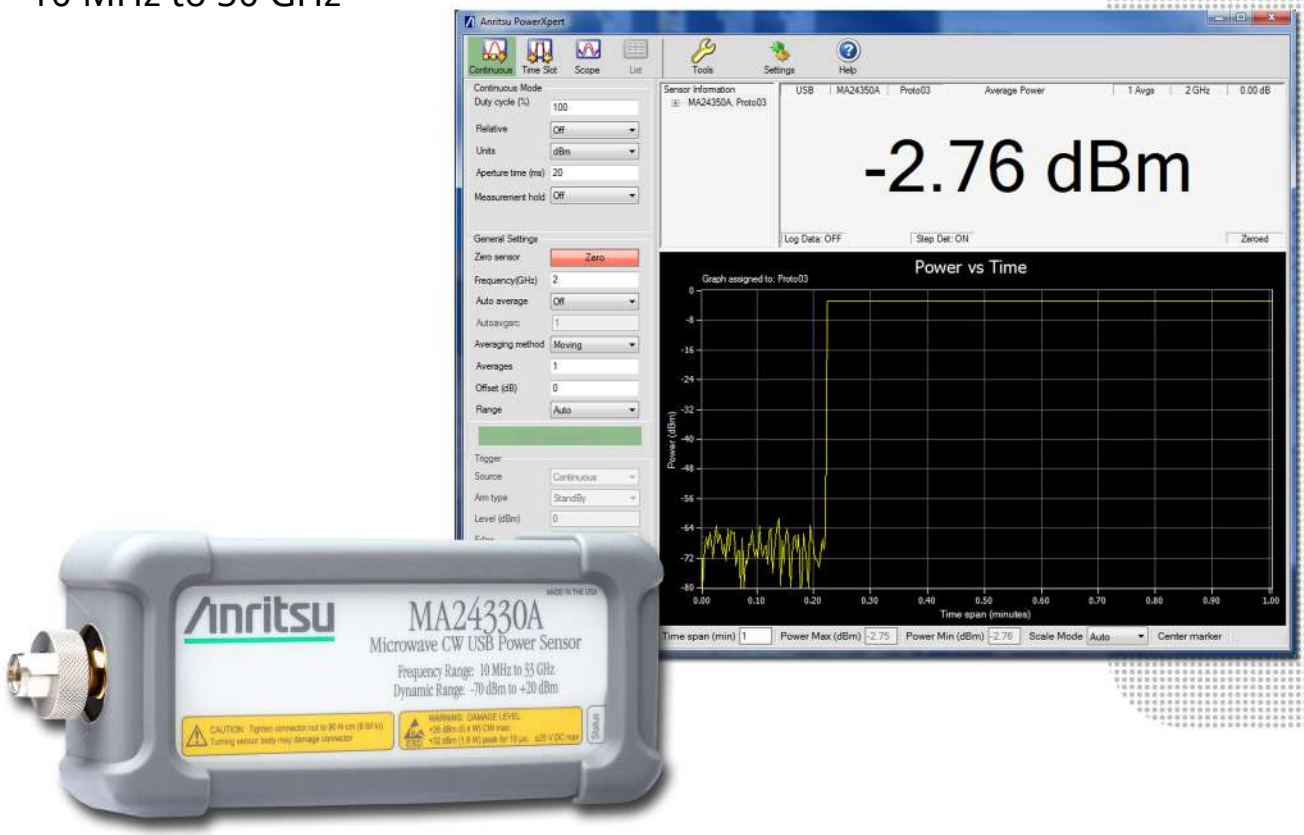
Microwave CW USB Power Sensors

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 µs): 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

Table of Contents

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	dBm
–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

3. 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.
4. 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.
5. 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 x (aperture time x 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 x (capture time x C_t) + (P_n x 0.038 ms) + T_{com}

List Mode

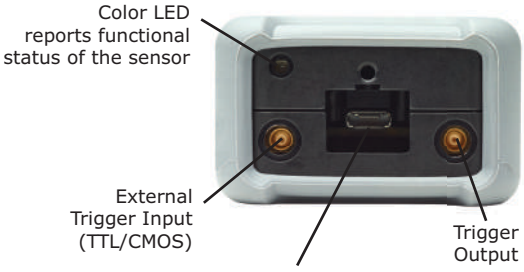
Number of Measurements	1 to 1000
Input Parameters	Frequency (GHz), aperture time (ms), averages

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



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 MA24340A-097	Option 97: ISO/IEC 17025 and ANSI/NCSL Z540-1 or ANSI/NCSLI Z540.3 (includes test report, uncertainty data, and accreditation symbol)
MA24330A-098 MA24340A-098 MA24350A-098	Option 98: Standard calibration ISO/IEC 17025 and ANSI/NCSL Z540-1
MA24330A-099 MA24340A-099 MA24350A-099	Option 99: Premium calibration ISO/IEC 17025 and ANSI/NCSL Z540-1 (includes test report and uncertainty data)

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)
33VFVF50C	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)

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