

## KEYSIGHT TECHNOLOGIES (AGILENT HP)

# 84904K

The Keysight 84904K is a programmable coaxial step attenuator designed for high-frequency testing up to 26.5 GHz. It offers exceptional attenuation repeatability of better than 0.03 dB and an outstanding operating life of over 5 million switching cycles per section. Using tantalum nitride thin-film attenuation cards on sapphire substrates, it achieves high attenuation accuracy and low SWR across its entire frequency range, making it highly suitable for integration into automatic test equipment (ATE) and precision RF systems.

## SPECIFICATIONS

### General

|            |                                     |
|------------|-------------------------------------|
| Interfaces | 10-pin socket programming connector |
|------------|-------------------------------------|

### Physical

|                       |                                                                                            |
|-----------------------|--------------------------------------------------------------------------------------------|
| Power Supply          | Solenoid: 24 V nominal (Option 024) / 15 V nominal (Option 015) / 5 V nominal (Option 011) |
| Operating Temperature | 0 to +55 °C °C                                                                             |
| Dimensions (W×H×D)    | 36.5 mm × 32.2 mm × 114.3 mm (excluding connectors and brackets) mm                        |
| Weight                | 0.229 kg                                                                                   |
| Mounting Hole Thread  | M3 × 0.5 (4.8 mm deep) and 4-40 UNC (4.8 mm deep)                                          |

## RF Performance Specifications

|                                                     |                      |
|-----------------------------------------------------|----------------------|
| Frequency Range                                     | DC to 26.5 GHz       |
| Attenuation Range                                   | 0 to 11 dB           |
| Step Size                                           | 1 dB                 |
| Nominal Impedance                                   | 50 $\Omega$          |
| Insertion Loss (0 dB) Formula                       | 0.8 dB + 0.04 dB/GHz |
| Insertion Loss (0 dB) at 26.5 GHz                   | < 1.86 dB            |
| Maximum VSWR (DC to 12.4 GHz)                       | 1.30                 |
| Maximum VSWR (12.4 to 26.5 GHz)                     | 1.70                 |
| Maximum Input Power (Average)                       | 1 W                  |
| Maximum Input Power (Peak)                          | 100 W                |
| Maximum Peak Power Pulse Width                      | 10 $\mu$ s           |
| Maximum Peak Power Duty Cycle                       | 0.001                |
| RF Repeatability                                    | 0.03 dB (maximum)    |
| Switching Life (Cycles per Section)                 | 5 million            |
| Number of Attenuator Sections                       | 4                    |
| Section Attenuation Values                          | 1, 2, 4, 4 dB        |
| Attenuation Accuracy (1 to 2 dB, DC to 12.4 GHz)    | $\pm 0.3$ dB         |
| Attenuation Accuracy (1 to 2 dB, 12.4 to 26.5 GHz)  | $\pm 0.5$ dB         |
| Attenuation Accuracy (3 to 4 dB, DC to 12.4 GHz)    | $\pm 0.4$ dB         |
| Attenuation Accuracy (3 to 4 dB, 12.4 to 26.5 GHz)  | $\pm 0.6$ dB         |
| Attenuation Accuracy (5 to 6 dB, DC to 12.4 GHz)    | $\pm 0.5$ dB         |
| Attenuation Accuracy (5 to 6 dB, 12.4 to 26.5 GHz)  | $\pm 0.7$ dB         |
| Attenuation Accuracy (7 to 8 dB, DC to 12.4 GHz)    | $\pm 0.6$ dB         |
| Attenuation Accuracy (7 to 8 dB, 12.4 to 26.5 GHz)  | $\pm 0.8$ dB         |
| Attenuation Accuracy (9 to 10 dB, DC to 12.4 GHz)   | $\pm 0.7$ dB         |
| Attenuation Accuracy (9 to 10 dB, 12.4 to 26.5 GHz) | $\pm 0.9$ dB         |
| Attenuation Accuracy (11 dB, DC to 12.4 GHz)        | $\pm 0.8$ dB         |
| Attenuation Accuracy (11 dB, 12.4 to 26.5 GHz)      | $\pm 1.0$ dB         |

## Electrical & Solenoid Control Specifications

|                                                |                                                          |
|------------------------------------------------|----------------------------------------------------------|
| Solenoid Nominal Operating Voltage             | 24 V (Option 024) / 15 V (Option 015) / 5 V (Option 011) |
| Solenoid Operating Voltage Range (24 V Option) | 20 to 30 V                                               |
| Solenoid Operating Voltage Range (15 V Option) | 13 to 22 V                                               |
| Solenoid Operating Voltage Range (5 V Option)  | 4.5 to 7 V                                               |
| Solenoid Switching Current (24 V Option)       | 125 mA (per section)                                     |
| Solenoid Switching Current (15 V Option)       | 188 mA (per section)                                     |
| Solenoid Switching Current (5 V Option)        | 325 mA (per section)                                     |
| Coil Resistance (24 V Option)                  | 190 $\Omega$                                             |
| Coil Resistance (15 V Option)                  | 80 $\Omega$                                              |
| Coil Resistance (5 V Option)                   | 17 $\Omega$                                              |
| Switching Speed (Maximum)                      | 20 ms                                                    |
| Recommended Drive Pulse Width                  | 20 to 30 ms (nominal 20 ms)                              |
| Solenoid Common Terminal Configuration         | Common Pin 1 (plus 4 section lines & 4 indicator lines)  |
| Control Interface Connector Type               | 10-pin socket                                            |

## Mechanical & Physical Specifications

|                                 |                                                |
|---------------------------------|------------------------------------------------|
| RF Connector Type (Standard)    | 3.5 mm female (both ports)                     |
| RF Connector Option 101         | 3.5 mm male on port 1, 3.5 mm female on port 2 |
| Control Connector Pin Count     | 10-pin                                         |
| Mounting Position / Orientation | Any                                            |
| Recommended RF Connector Torque | 0.9 N·m (8 in-lb)                              |

## Environmental Specifications

|                                           |                                  |
|-------------------------------------------|----------------------------------|
| Non-Operating (Storage) Temperature Range | -40 to +75 °C                    |
| Relative Humidity (Operating)             | 95% RH at 40 °C (non-condensing) |
| Operating Altitude                        | 4,600 m (15,000 ft)              |
| Non-Operating Altitude                    | 15,300 m (50,000 ft)             |
| Shock Survival (Non-Operating)            | 100 G, 6 ms                      |

## Ordering Information & Factory Options

|                                                |                                          |
|------------------------------------------------|------------------------------------------|
| Operating Voltage Option 024                   | 24 V solenoid operating voltage          |
| Operating Voltage Option 011                   | 5 V solenoid operating voltage           |
| Operating Voltage Option 015                   | 15 V solenoid operating voltage          |
| Connector Option 100                           | 3.5 mm female RF connectors on both ends |
| Compatible Electronic Attenuator Driver Models | Keysight 11713B, Keysight 11713C         |

## Performance

|                                                   |                   |
|---------------------------------------------------|-------------------|
| Maximum Insertion Loss (0 dB, DC to 12.4 GHz)     | 0.8 dB            |
| Maximum Insertion Loss (0 dB, 12.4 to 18 GHz)     | 1.1 dB            |
| Maximum Insertion Loss (0 dB, 18 to 26.5 GHz)     | 1.5 dB            |
| Maximum VSWR (12.4 to 18 GHz)                     | 1.7               |
| Maximum VSWR (18 to 26.5 GHz)                     | 1.8               |
| Attenuation Accuracy (1 to 2 dB, 12.4 to 18 GHz)  | ±0.4 dB           |
| Attenuation Accuracy (1 to 2 dB, 18 to 26.5 GHz)  | ±0.5 dB           |
| Attenuation Accuracy (3 to 4 dB, 12.4 to 18 GHz)  | ±0.5 dB           |
| Attenuation Accuracy (3 to 4 dB, 18 to 26.5 GHz)  | ±0.6 dB           |
| Attenuation Accuracy (5 to 6 dB, 12.4 to 18 GHz)  | ±0.6 dB           |
| Attenuation Accuracy (5 to 6 dB, 18 to 26.5 GHz)  | ±0.7 dB           |
| Attenuation Accuracy (7 to 8 dB, 12.4 to 18 GHz)  | ±0.7 dB           |
| Attenuation Accuracy (7 to 8 dB, 18 to 26.5 GHz)  | ±0.8 dB           |
| Attenuation Accuracy (9 to 10 dB, 12.4 to 18 GHz) | ±0.8 dB           |
| Attenuation Accuracy (9 to 10 dB, 18 to 26.5 GHz) | ±0.9 dB           |
| Attenuation Accuracy (11 dB, 12.4 to 18 GHz)      | ±0.9 dB           |
| Attenuation Accuracy (11 dB, 18 to 26.5 GHz)      | ±1.0 dB           |
| Attenuation Temperature Coefficient               | < 0.0001 dB/dB/°C |

## Options

|                              |                                           |
|------------------------------|-------------------------------------------|
| RF Connector Option 004      | 3.5 mm female                             |
| Control Interface Option 008 | 8-inch ribbon cable with 14-pin DIP plug  |
| Control Interface Option 016 | 16-inch ribbon cable with 14-pin DIP plug |

## Environmental

|                                   |                             |
|-----------------------------------|-----------------------------|
| Operating Shock Survival          | 8 g (11 ms, half-sine)      |
| Operating Vibration Survival      | 0.5 g (50 Hz to 2000 Hz)    |
| Non-Operating Temperature Cycling | -55 °C to +85 °C (5 cycles) |
| Non-Operating Relative Humidity   | 95% RH @ 40 °C (for 5 days) |

**Power & Control**

|                      |                   |
|----------------------|-------------------|
| Solenoid Drive Style | Latching (pulsed) |
| Solenoid Latching    | Magnetic latching |

**Inputs & Outputs**

|                     |                     |
|---------------------|---------------------|
| RF Connector Gender | Female (both ports) |
|---------------------|---------------------|

**TECHNOLOGY**

Tantalum nitride thin-film on sapphire substrate

**APPLICATIONS**

RF & microwave signal level control, receiver calibration, and integration into automated test equipment (ATE)

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