

# Programmable Attenuator – 0.1 to 30 GHz, 31.5 dB

USB, PARALLEL, I2C, SPI & UART Control Modes



## Features

- Low insertion loss 1.7 dB up to 6 GHz & 4.3 dB up to 30 GHz
- High CW power handling +28 dBm
- Excellent solid-state repeatability and performance
- Uninterrupted RF when changing attenuation values
- Extremely fast attenuation switching and very fine attenuation step resolution

## Application

- Ideal for Automated Test Equipment (ATE)
- 2G/3G/4G LTE/5G fading simulators

- MIMO, WiMAX, WiFi
- engineering/production test lab environments

## Description

API Weinschel's new 4209-30-31.5-1 Solid-State Programmable Attenuators operate over the 0.1 to 30 GHz frequency range and are available in an attenuation range of 0 to 31.5 dB in 0.5 dB steps. These units can be controlled using parallel (TTL compatible), I2C, SPI, UART, or USB interfaces.

## Control Configuration

Units are supplied with both an AUX connector for operation in either a parallel (TTL compatible) mode or I2C, SPI, UART modes and a USB connector (Mini-B) for USB 2.0 operation. The main mode of operation is determined internally by the source of DC power to the unit.

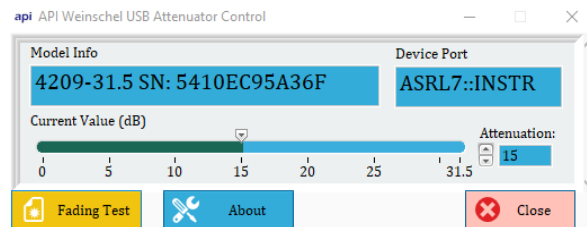
**USING AUX CONTROL:** Each unit is supplied with a mating 10 pin connector (Amp 746285-1). Refer to the table in page 5 for mating connector pin/wiring details. There are four user-selectable digital interface AUX modes: PIO, I2C, SPI, and UART. In addition there are three AUX application modes (PIOSW, PULSE, and FADE) that allow the generation of RF patterns when operating standalone. The AUX mode selection is done via USB command (see SET AUX) and is stored in non-volatile memory (NVM) so that changes to the mode will be automatically applied at startup. Additional information is presented in the Operating & Installation Manual, IM-672.

**USING USB CONFIGURATION:** In USB mode the attenuator is controlled and powered via a standard USB 2.0 connection to a USB host. The 4209 series operates as a USB CDC device (USB VID=25EA, PID=106D), so it may be controlled via any software that can communicate to a standard virtual COM port. Programming is done via simple ASCII text-based message strings to control the device.

## Additional Features

Attenuation Range	31.5 dB in 0.5 dB steps
Switching Speed	+35 NanoSec. (10% RF to 90% RF)
Control Logic	PARALLEL, I2C, SPI, UART or USB
Operating Voltage	+3.3 to +16 VDC @ 25 mA
Temperature Range	-20° C to +85° C
RF Connectors	2.92 mm Female
Control Connectors	The AUX control connector is an AMP-Latch 10-pin ribbon cable connector that mates with AMP P/N 746285-1 (supplied with each unit). The USB connector is a standard USB Mini-B.
Weight	83 g (2.92 oz.)
Test Data	Test data available upon request

## Control Software Included



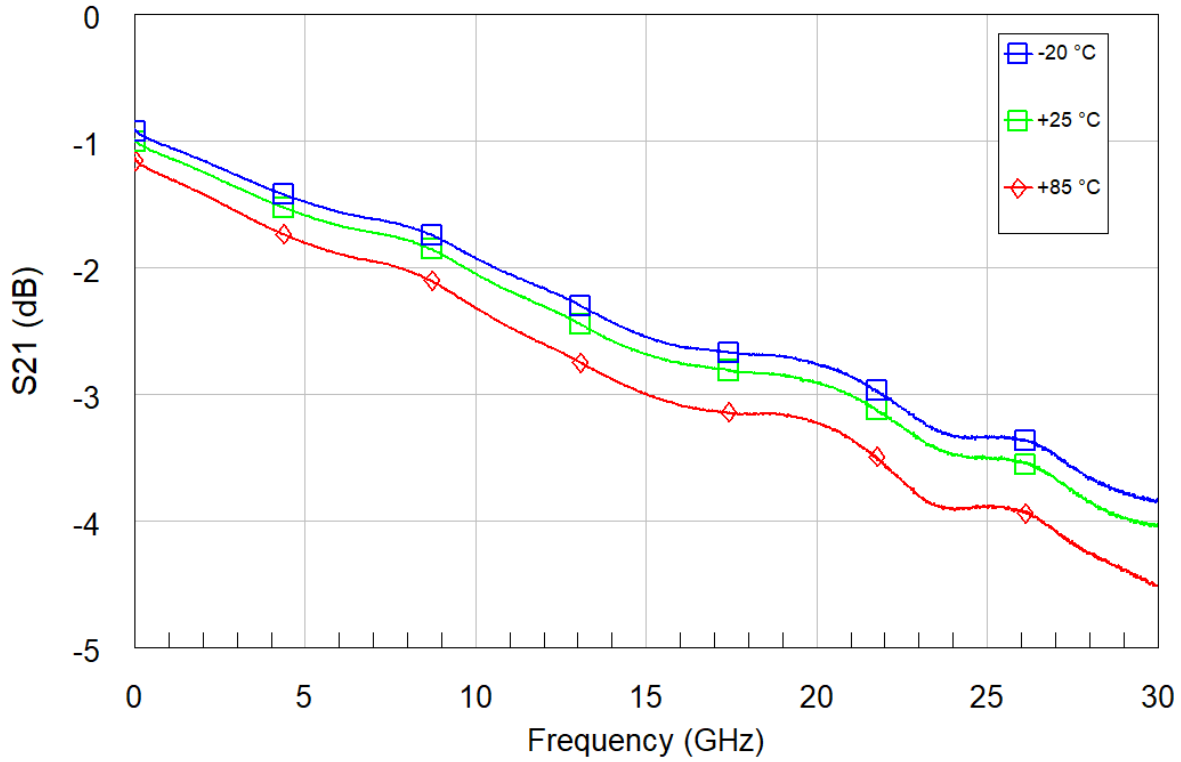
API Weinschel's LabView based USB Control Center Software (AUCS) can also be used in the operation of this series of digital attenuators. The AUCS will allow the user to setup, control, and perform test and measurements over a standard USB 2.0 communication interface. Additional information is available in the Operating & Installation Manual, IM-611.

## Electrical & Environmental Specifications

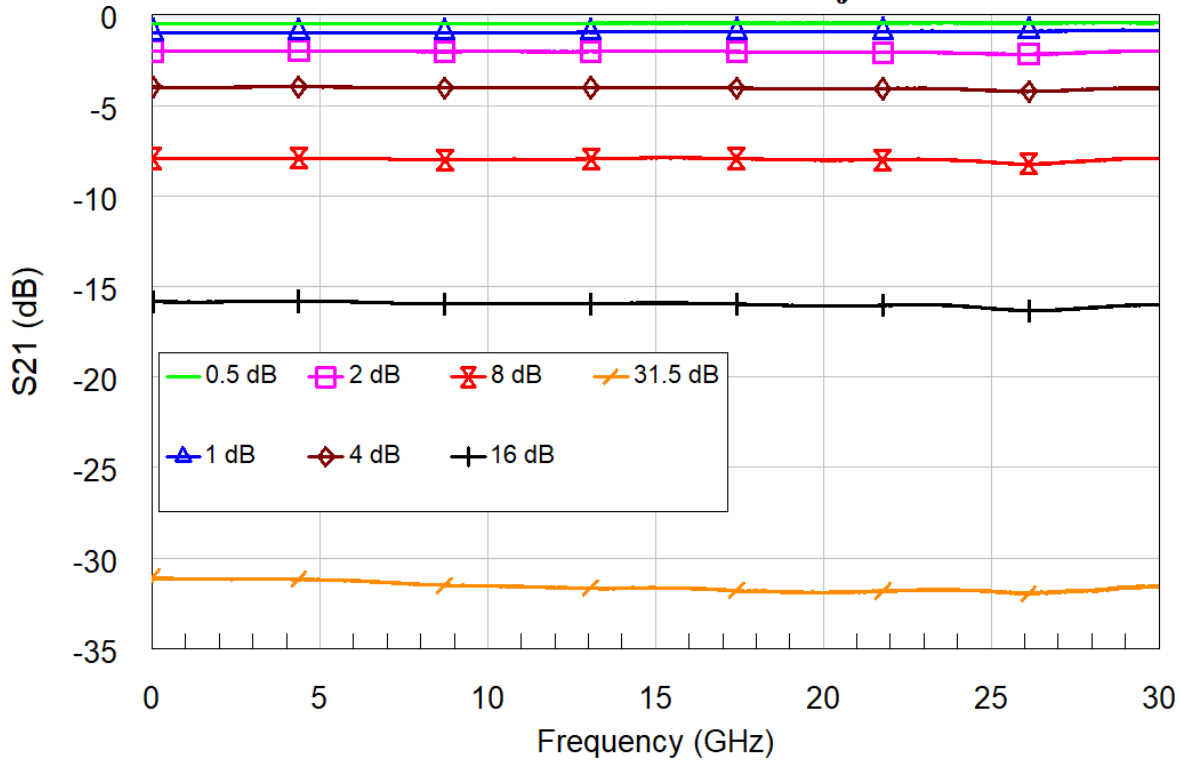
Parameter	Frequency Range	Condition	Minimum	Typical	Maximum	Units
Operating Frequency	-	-	0.1	-	30	GHz
Nominal Impedance	0.1 – 30 GHz	-	-	50		Ohm
Attenuation Range	0.1 – 30 GHz	0.5 dB Steps	0	-	31.5	dB
Insertion Loss	0.1 – 6 GHz	@ 0dB	-	1.7	2.1	dB
	6 – 12 GHz		-	2.4	2.8	
	12 – 24 GHz		-	3.6	4.1	
	24 – 30 GHz		-	4.3	4.8	
VSWR (All Ports)	0.1 – 10 GHz	0 – 31.5 dB	-	1.4:1	1.8:1	-
	10 – 30 GHz		-	1.7:1	2.1:1	
Attenuation Accuracy <sup>1</sup>	0.1 – 30 GHz	0 – 31.5 dB		± (0.35+2.0%)	± (0.5+2.5%)	dB
Monotonicity	-	0 – 31.5 dB	-	0.1 – 30.0	-	GHz
J1 (RF Input Power, CW)	0.1 – 30 GHz	Steady State	-	-	28	dBm
		Hot Switching	-	-	25	
J2 (RF Input Power, CW)	0.1 – 30 GHz	Steady State	-	-	19	dBm
		Hot Switching	-	-	16	
Input IP3	-	0 – 31.5 dB	-	50		dBm
Switching Time	0.1 – 30 GHz	RF Trise/Tfall (10%/90%)	-	0.035	0.05	Micro Sec.
		50% PIO CTRL to 90% RF	-	5	6	
Supply Voltage (VDC)	-	10 Pin Aux	+3.5	3.3 to +5	+16	Volt
	-	USB	+4.4	+5	+5.25	
Digital input low voltage	-	VDC = 3.3V to 4.5V	-0.3	-	0.15VDC	Volt
	-	VDC = 4.5V to 16V	-0.3	-	0.8	
Digital input High voltage	-	VDC = 3.3V to 4.5V	2	-	VDC+0.3	Volt
	-	VDC = 4.5V to 16V	2	-	5	
Supply Current	-	-	-	15	25	mA
Operating Temperature	0.1 – 30 GHz	-	-20	-	85	°C
Storage Temperature	-	-	-55	-	125	°C

1. X% is the percentage of the nominal attenuation setting. For example the accuracy of 30 dB @ 28 GHz is ± (0.35+0.02x30) dB. This equates to ± 0.95 dB which means when setting the attenuator at 30 dB, the actual measured normalized value could be between 29.05 dB and 30.95 dB.
2. Measured with two tones at +14 dBm, 1 MHz spacing.
3. The values in the table apply at room temperature unless otherwise specified.
4. DC blocking is required when the RF input or output DC line potential is not 0 V.

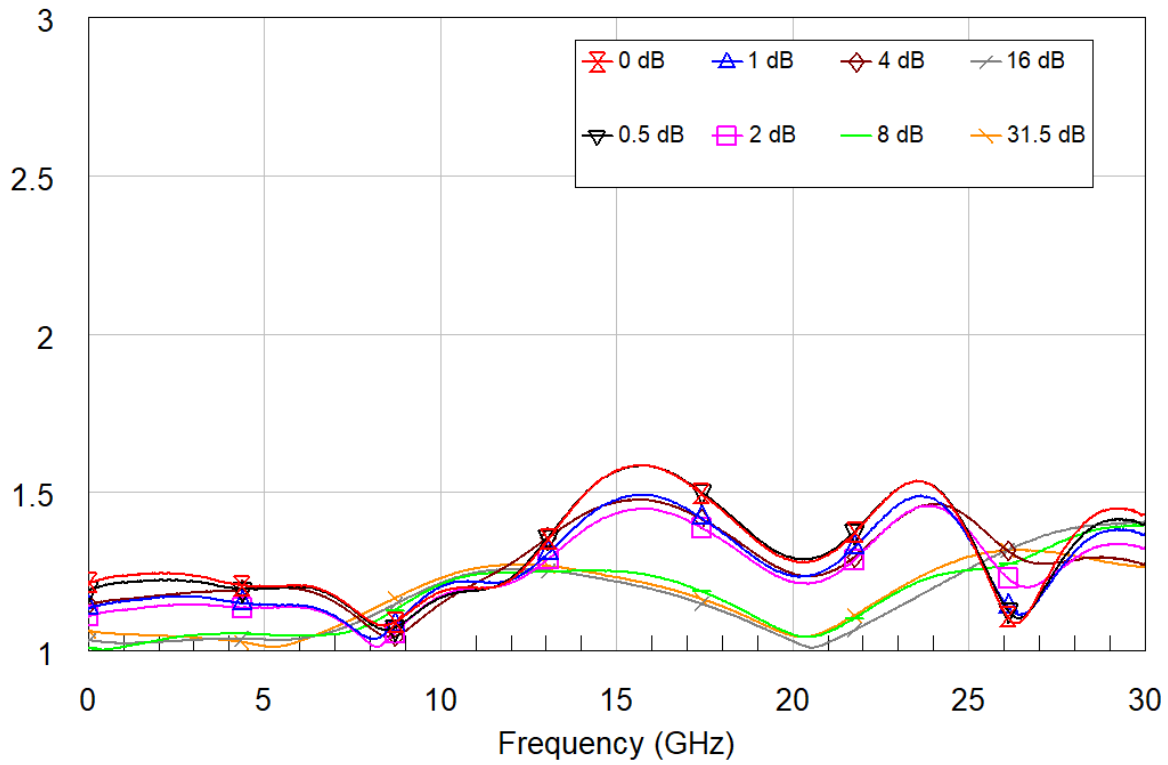
### Insertion Loss



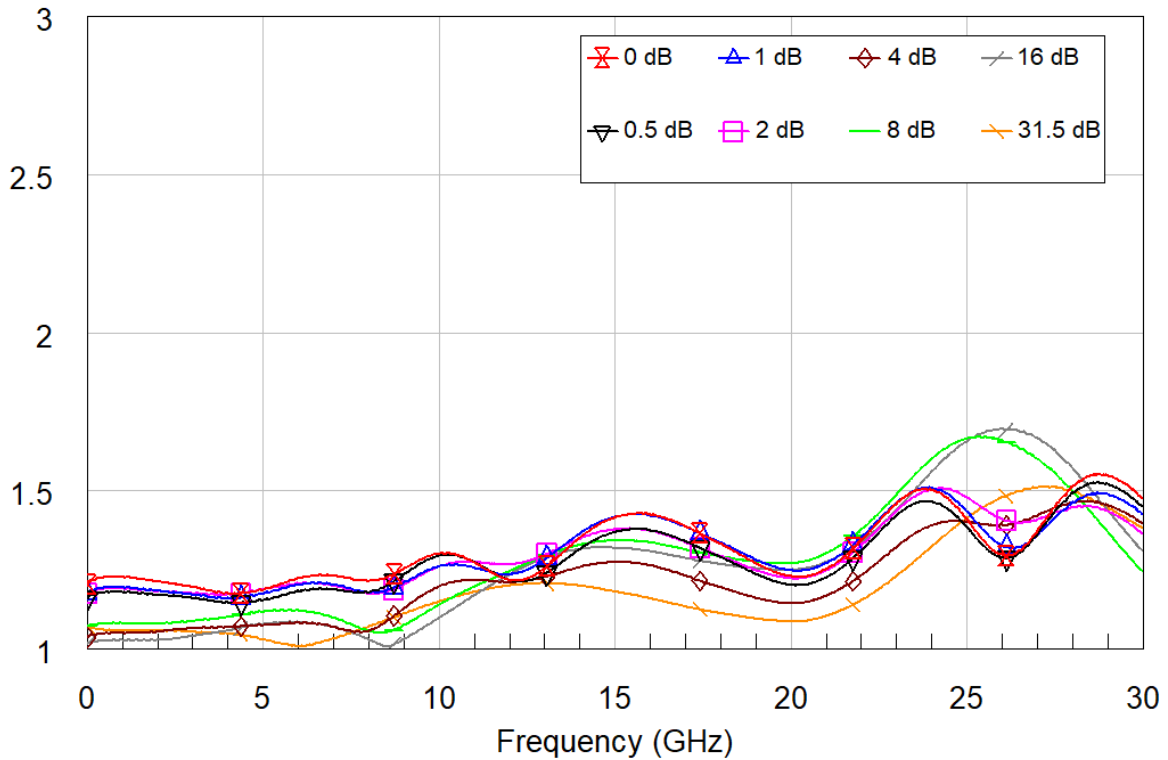
### Normalized Attenuation of Major State



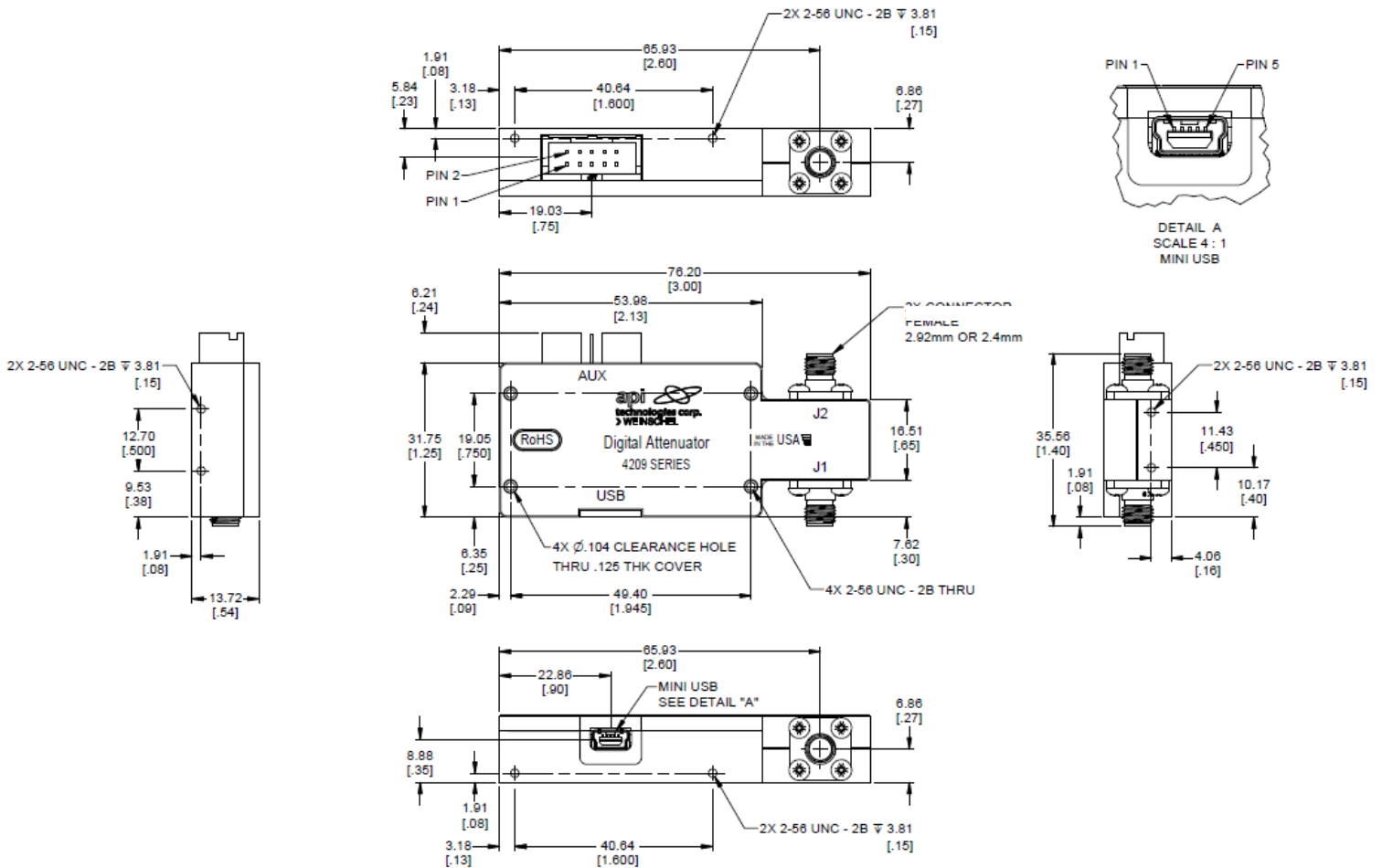
### VSWR at Port J1



### VSWR at Port J2



**Mechanical Dimensions**



**NOTES:**

1. ALL DIMENSIONS ARE GIVEN IN MM [INCH].
2. ALL MATERIALS AND PROCESSES ARE TO BE IN COMPLIANCE WITH THE EUROPEAN DIRECTIVE RESTRICTION OF HAZARDOUS SUBSTANCES (RoHS) (REF: WEINSCHTEL 080-838).
3. CONTROL CONNECTORS:

- A** AMP LATCH 10 PIN RIBBON CABLE CONN  
MATES WITH AMP P/N 746285-1  
SUPPLIED WITH EACH UNIT
- B** USB - MINI B

**10 PIN Aux Control Connector:**

PIN#	POI <sup>5</sup>	IC2	SPI	UART
1	0.5 dB Digital Input	A0	NC	NC
2	1.0 dB Digital Input	A1	NC	NC
3	2.0 dB Digital Input	A2	NC	RXD
4	4.0 dB Digital Input	A3	NC	TXD
5	8.0 dB Digital Input	TRIG	SCLK	NC
6	16 dB Digital Input	RESETN	SDI	NC
7	NC	SCL	NC	NC
8	NC	SDA	NC	NC
9	Supply Voltage (VDC)			
10	Ground			

**5. Parallel Input Mode:**

Digital input Low turns OFF desired attenuator bit  
Digital input High turns ON desired attenuator bit