Agilent Power Sensor Modules
Agilent Optical Heads
Agilent Return Loss Modules

Technical Specifications

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Specification: describes a guaranteed product performance that is valid under the specified conditions. Specifications are based on a coverage factor of 2 (unless otherwise stated), corresponding to a level of confidence of >95%.
Typical value: a characteristic, describes the product performance that is usually met but not guaranteed.

Generally, specifications are valid after warm-up, after zeroing, in auto-range mode (if not differently stated) and at the stated operating conditions and measurement settings.

Power sensor module specifications

	Agilent 81635A	**Agilent 81634B**
Sensor element	InGaAs (dual)	InGaAs
Wavelength range	800 nm to 1650 nm	800 nm to 1700 nm
Power range	–80 dBm to +10 dBm	–110 dBm to +10 dBm
Applicable fiber type	Standard SM and MM up to 62.5 μm core size, NA ≤ 0.24	Standard SM and MM up to 100 μm core size, NA ≤ 0.3
Uncertainty (accuracy) at reference conditions [1]	typ. < ± 3,5 % [10] (800 nm to 1200 nm) ± 3 % (1200 nm to 1630 nm)	± 2.5 % (1000 nm to 1630 nm)
Total uncertainty [2]	typ. ± 5,5 % ± 200 pW [9] [11] (800 nm to 1200 nm) ±5 % ± 20 pW [8],[9] (1200 nm to 1630 nm)	± 4.5 % ± 0.5 pW (1000 nm to 1630 nm)
Relative uncertainty: - due to polarization [3] - spectral ripple (due to interference) [4]	 typ. < ± 0.015 dB typ. < ± 0.015 dB	 < ± 0.005 dB < ± 0.005 dB
Linearity (power): [5] - at 23°C ± 5°C - at operating temp. range	CW –60 dBm to +10 dBm typ. < ± 0.02 dB [9] (800 nm to 1200 nm) < ± 0.02 dB [9] (1200 nm to 1630 nm) typ. < ± 0.06 dB [9] (800 nm to 1200 nm) < ± 0.06 dB [9] (1200 nm to 1630 nm)	CW –90 dBm to +10 dBm < ± 0.015 dB (1000 nm to 1630 nm) < ± 0.05 dB (1000 nm to 1630 nm)
Return loss [7]	> 40 dB	> 55 dB
Noise (peak to peak) [6]	typ. < 200 pW (800 nm to 1200 nm) < 20 pW (1200 nm to 1630 nm)	< 0.2 pW (1200 nm to 1630 nm)
Averaging time (minimal)	100 μs	100 μs
Analog Output	None	included
Dimensions (H x W x D)	75 mm x 32 mm x 335 mm (2.8" x 1.3" x 13.2")	75mm x 32mm x 335mm (2.8"x 1.3"x 13.2")
Weight	0.5 kg	0.5 kg
Recommended recalibration period	2 years	2 years
Operating temperature	+10°C to +40°C	0°C to +45°C
Humidity	Non-condensing	Non-condensing
Warm-up time	20 min	20 min

[1] Reference Conditions:
- Power level 10 μW (-20 dBm), continuous wave (CW)
- Fiber 50 μm graded-index, NA=0.2
- Ambient temperature 23°C ± 5°C
- On day of calibration (add ± 0.3 % for aging over one year, add ± 0.6 % over two years)
- Spectral width of source < 10nm (FWHM)
- Wavelength setting at power sensor must correspond to source wavelength ± 0.4 nm

[2] Operating Conditions:
- Fiber ≤ 50 μm, NA ≤ 0.2
- Averaging time 1s
- Only Agilent 81635A: For fiber 62.5 μm graded-index (NA=0.24): add ± 2 %
- Within one year after calibration, add 0.3 % for second year
- Add ± 1% for Biconic connector
- Operating temperature range as specified humidity: none condensing

[3] All states of polarization at constant wavelength (1550 nm ± 30 nm) and constant power, straight connector, T = 23°C ± 5°. For angled connector (8°) add ± 0.01 dB typ.

[4] Conditions:
- Wavelength 1550 nm ± 30 nm, fixed state of polarization, constant power
- Temperature 23°C ± 5°C
- Linewidth of source 100 MHz,
- Angled connector 8°.

[5] Does not include noise

[6] Averaging time 1s, T = 23°C ± 5°C, ΔT ± 1°C, observation time 300 s.

[7] Conditions:
- Wavelengths 1310nm ± 30 nm and 1550nm ± 30 nm
- Standard single mode fiber, angled connector min 8°
- T = 23°C ± 5°C

[8] For wavelengths > 1600 nm add ± 0.06%/nm.

[9] For input power > 2 mW add ± 0.02 dB.

[10] add ± 1% for wavelength 900 nm to 950 nm.

[11] add ± 3.5% for wavelength 900 nm to 950 nm.

High power sensor module specifications

	Agilent 81630B
Sensor element	InGaAs
Wavelength range	970 nm to 1650 nm
Power range	–70 dBm to +28 dBm
Applicable fiber type	Standard SM and MM up to 100 μm core size, NA ≤ 0.3
Uncertainty (accuracy) at reference conditions [1]	± 3.0 % for 1255 nm to 1630 nm at 980 nm ± 3.5 % (add ± 0.5 % per nm if 980 nm is not the center wavelength) at 1060 nm ± 4.0 % (add ± 0.6 % per nm if 1060 nm is not the center wavelength),
Total uncertainty [2] [8]	± 5 % ± 1.2 nW (1255 nm to 1630 nm) at 980 nm ± 5.5 % ± 1.2 nW (add ± 0.5 % per nm if 980 nm is not the center wavelength) at 1060 nm ± 6.0 % ± 1.2 nW (add ± 0.6 % per nm if 1060 nm is not the center wavelength)
Relative uncertainty: - due to polarization [3] - spectral ripple (due to interference) [4]	 < ± 0.01 dB < ± 0.005 dB
Linearity (power): [5] - at 23°C ± 5°C - at operating temp. range	CW – 50 dBm to + 28 dBm (970 nm – 1630 nm) ≤ ± 0.05 dB [8] ≤ ± 0.15 dB [8]
Return loss [7]	> 55 dB
Noise (peak to peak) [6]	< 1.2 nW (1255 nm – 1630 nm)
Averaging time (minimal)	100 μs
Analog Output	Included
Dimensions (H x W x D)	75 mm x 32 mm x 335 mm (2.8" x 1.3" x 13.2")
Weight	0.6 kg
Recommended recalibration period	2 years
Operating temperature	0°C to +35°C
Humidity	Non-condensing
Warm-up time	20 min

[1] Reference Conditions:
- Power level 80 μW, continuous wave (CW)
- SM Fiber; 9 μm; NA = 0.1
- Ambient temperature 23°C ± 5°C
  On day of calibration (add ± 0.3 % for aging over one year, add ± 0.6 % over two years)
- Spectral width of source < 10 nm (FWHM)
- Wavelength setting at power sensor must correspond to source wavelength ± 0.4 nm

[2] Operating Conditions:
- Fiber ≤ 50 μm, NA ≤ 0.2
- Averaging time 1s
- Within one year after calibration, add 0.3 % for second year
- Add ± 1% for Biconic connector
- Operating temperature range as specified, humidity: non-condensing

[3] All states of polarization at constant wavelength
(1550 nm ± 30 nm) and constant power, straight connector,
T = 23°C ± 5°.
For angled connector (8°) add ± 0.01 dB typ.

[4] Conditions:
- Wavelength 1550 nm ± 30 nm, fixed state of polarization, constant power, Temperature 23°C ± 5°C
- Linewidth of source ≥ 100 MHz
- Angled connector 8°

[5] Does not include noise

[6] Averaging time 1s, T = 23°C ± 5°C, ΔT ± 1°C, observation time 300 s.

[7] Conditions:
- Wavelengths 1310nm ± 30 nm and 1550nm ± 30 nm
- Standard single mode fiber
- Angled connector min 8°
- T = 23°C ± 5°C

[8] For input power > +10 mW add:
typ. ± 0.0012 dB/mW
In case of negative power change > 50dB allow additional recovery time of 3 min

[9] 30°C for > +20 dBm input power

Fast power sensor module specifications

	Agilent 81636B
Sensor element	InGaAs
Wavelength range	1250 nm to 1640 nm
Power range	–80 dBm to +10 dBm
Applicable fiber type	Standard SM and MM up to 62.5 μm core size, NA ≤ 0.24
Uncertainty (accuracy) at reference conditions [1]	± 3 % (1260 nm to 1630 nm)
Total uncertainty [2] [9]	± 5 % ± 20 pW [8] (1260 nm to 1630 nm)
Relative uncertainty: - due to polarization [3] - spectral ripple (due to interference) [4]	 typ. ± 0.015 dB typ. ± 0.015 dB
Linearity (power) [5] [9] - at 23°C ± 5°C - at operating temperature range	CW –60 to +10 dBm, (1260 nm to 1630 nm) < ± 0.02 dB < ± 0.06 dB
Return loss [7]	>40 dB
Noise (peak to peak) [6]	< 20 pW (1260 nm – 1630nm)
Averaging time (minimal)	25 μs
Dynamic Range at manual range mode [5], [10] - at +10dBm-range - at ± 0dBm-range - at –10dBm-range - at –20dBm-range	 typ. >55dB typ. >55dB typ. >52dB typ. >45dB
Noise at manual range mode (peak to peak): [10] - at +10dBm-range - at ± 0dBm-range - at –10dBm-range - at –20dBm-range	CW –60 to +10 dBm, 1260 nm to 1630 nm < 50 nW < 5 nW < 1 nW < 500 pW
Analog Output	Included
Dimensions (H x W x D)	75 mm x 32 mm x 335 mm (2.8" x 1.3" x 13.2")
Weight	0.5 kg
Recommended recalibration period	2 years
Operating temperature	+10°C to +40°C
Humidity	Non-condensing
Warm-up time	20 min

[1] Reference Conditions:
- Power level 10 μW (-20 dBm), continuous wave (CW)
- Fiber 50 μm graded-index, NA=0.2
- Ambient temperature 23°C ± 5°C
- On day of calibration (add ± 0.3 % for aging over one year, add ± 0.6 % over two years)
- Spectral width of source < 10nm (FWHM)
- Wavelength setting at power sensor must correspond to source wavelength ± 0.4 nm

[2] Operating Conditions:
- Fiber ≤ 50 μm, NA ≤ 0.2
- Averaging time 1s
- Within one year after calibration, add 0.3 % for second year
- Add ± 1% for Biconic connector
- Operating temperature range as specified humidity: non-condensing

[3] All states of polarization at constant wavelength (1550 nm ± 30 nm) and constant power, straight connector, T = 23°C ± 5°. For angled connector (8°) add ± 0.01 dB typ.

[4] Conditions:
- Wavelength 1550 nm ± 30 nm, fixed state of polarization, constant power
- Temperature 23°C ± 5°C
- Linewidth of source ≥ 100 MHz
- Angled connector 8°

[5] Does not include noise

[6] Averaging time 1s, T = 23°C ± 5°C, ΔT ± 1°C, observation time 300 s.

[7] Conditions:
- Wavelengths 1310nm ± 30 nm and 1550nm ± 30 nm
- Standard single mode fiber
- Angled connector min 8°. T = 23°C ± 5°C

[8] For wavelengths >1600 nm add ± 0.06%/nm

[9] For input power >2 mW add ± 0.02 dB

[10] Conditions:
Averaging time 25μs, T = 23°C ± 5, Observation time 2.5 s

Optical head specifications

All optical heads have to be operated with the single (Agilent 81618A) or dual (Agilent 81619A) Interface Modules.

	Agilent 81623B	**Agilent 81623B Calibration option C85 / C86**	**Agilent 81623B Calibration option C01 / C02**
Sensor element	Ge, ∅ 5 mm		
Wavelength range	750 nm to 1800 nm		
Power range	– 80 dBm to +10 dBm		
Applicable fiber type Open beam	Standard SM and MM max 100 µm core size, NA ≤ 0.3 Parallel beam max ∅ 4 mm		
Uncertainty at reference conditions [1]	± 2.2 % (1000 nm to 1650 nm) ± 3.0 % typ. (800 nm to 1000 nm)	± 2.2 % (1000 nm to 1650 nm) ± 2.5 % (800 nm to 1000 nm)	± 1.7 % (1000 nm to 1650 nm) ± 3.0 % typ. (800 nm to 1000 nm)
Total uncertainty [2], [9]	± 3.5 % ± 100 pW (1000 nm to 1650 nm) ± 4.0 % typ. ± 250 pW (800 nm to 1000 nm)	± 3.5 % ± 100 pW (1000 nm to 1650 nm) ± 3.5 % ± 250 pW (800 nm to 1000 nm)	± 3.0 % ± 100 pW (1000 nm to 1650 nm) ± 4.0 % typ. ± 250 pW (800 nm to 1000 nm)
Relative uncertainty: - due to polarization [3] - spectral ripple (due to interference) [4]	< ± 0.01 dB [10] (typ. < ± 0.005 dB) < ± 0.006 dB (typ. < ± 0.003 dB)		
Linearity (power): [5] at 23°C ± 5°C at operating temp. range	(CW – 60 dBm to +10 dBm) [9] < ± 0.025 dB < ± 0.05 dB		
Return loss [7]	> 50 dB, typ. > 55 dB [8]		> 56 dB
Noise (peak to peak) [6]	< 100 pW (1200 nm to 1630 nm) < 400 pW (800 nm to 1200 nm)		
Averaging time (minimal)	100 µs		
Analog Output	included		
Dimensions	57 mm x 66 mm x 156 mm		
Weight	0.5 kg		
Recommended recalibration period	2 years		
Operating temperature	0°C to 40°C		
Humidity	Non-condensing		
Warm-up time	40 min		

[1] Reference conditions:
- Power level 10 µW (-20 dBm), continuous wave (CW)
- Parallel beam, 3 mm spot diameter on the center of the detector.
- Ambient temperature 23°C ± 5°C
- On day of calibration (add ± 0.3% for aging over one year, add ± 0.6% over two years)
- Spectral width of source < 10 nm (FWHM)
- Wavelength setting at power sensor corresponding to source wavelength ± 0.4nm

[2] Operating Conditions:
- Parallel beam, 3mm spot diameter on the center of the detector or connectorized fiber with NA ≤ 0.2 (straight connector, options C01 / C02 also with angled connector ≤ 8°)
- For NA > 0.2 add 1%
- Averaging time 1s
- Within one year after calibration, add 0.3 % for second year.
- Spectral width of source < 10 nm (FWHM)
- Wavelength setting at power sensor corresponding to source wavelength ± 0.4nm

[3] All states of polarization at constant wavelength (1550 nm ± 30 nm) and straight connector, T = 23°C ± 5°C.
For angled connector (8°) add 0.01 dB typ.

[4] Conditions:
- Wavelength 1550 nm ± 30 nm, fixed state of polarization
- Temperature 23°C± 5°C
- Linewidth of source ≥ 100 MHz
- Angled connector 8°

[5] Does not include noise;
for wavelength < 1000 nm
applies for – 50 dBm to + 10 dBm

[6] Averaging time 1 s, T = 23°C ± 5°C,
ΔT ± 1°C, observation time 300 s

[7] Conditions:
Wavelengths 1550nm ± 30 nm.
Standard single mode fiber, angled connector min 8°

[8] With D-shape adapter 81001xx
return loss > 60 dB typical

[9] For input power > 2 mW
add ± 0.004 dB/mW (not for C01 / C02);
zeroing required

[10] Specification valid for optical heads with S/N starting with "DE413..."
(shipping began April 1, 2001)

High power optical head specifications

All optical heads have to be operated with the single (Agilent 81618A) or dual (Agilent 81619A) Interface Modules

	Agilent 81624B	Agilent 81624B Calibration option C01 / C02	Agilent 81626B	Agilent 81626B Calibration option C01 / C02
Sensor element	InGaAs, ∅ 5 mm		InGaAs, ∅ 5mm	
Wavelength range	800 nm to 1700 nm		850 nm to 1650nm	
Power range	–90 dBm to +10 dBm		–70 to +27 dBm (1250 nm to 1650 nm) –70 to +23 dBm (850 nm to 1650 nm)	
Applicable fiber type Open beam	Standard SM and MM max 100 µm core size, NA ≤ 0.3 Parallel beam max ∅ 4 mm		Standard SM and MM max 100 µm core size, NA ≤ 0.3 Parallel beam max ∅ 4 mm	
Uncertainty at reference conditions [1]	± 2.2 % (1000nm to 1630 nm)	± 1.5 % (970 nm to 1630 nm)	± 3.0 % (950 nm to 1630 nm)	± 2.5 % (950 nm to 1630 nm)
Total uncertainty [2]	± 3.5 % ± 5 pW (1000nm to 1630 nm)	± 2.8 % ± 5 pW (970 nm to 1630 nm)	± 5.0 % ± 500 pW [8] (950 nm to 1630 nm)	± 4.5 % ± 500 pW [8] (950 to 1250 nm max 23 dBm) (1250 to 1630 nm max 27 dBm)
Relative uncertainty: [7] - due to polarization [3] - spectral ripple (due to interference) [4]	≤ ± 0.005 dB (typ. ± 0.002 dB) ≤ ± 0.005 dB (typ < ± 0.002 dB)		≤ ± 0.005 dB (typ. ± 0.002 dB) ≤ ± 0.005 dB (typ. < ± 0.002 dB)	
Linearity (power): [5] - at 23°C ± 5°C - at operat. temp. range	CW –70 dBm to +10 dBm, 1000 nm to 1630 nm < ± 0.02 dB < ± 0.05 dB		CW – 50 dBm to + 27dBm, 950 nm to 1630 nm < ± 0.04 dB [8] < ± 0.15 dB [8]	
Return loss	typ. 60 dB [7]		> 45 dB	> 47 dB
Noise (peak to peak) [6]	< 5 pW		< 500 pW	
Averaging time (min.)	100 µs		100 µs	
Analog Output	Included		Included	
Dimensions	57 mm x 66 mm x 156 mm		57 mm x 66 mm x 156 mm	
Weight	0.5 kg		0.5 kg	
Recommended recalibration period	2 years		2 years	
Operating temperature	0°C to 40°C		0°C to +35°C[9]	
Humidity	Non-condensing		Non-condensing	
Warm-up time	40 min		40 min	

[1] Reference conditions:
- Power level 10 µW (-20 dBm), continuous wave (CW)
- Parallel beam, 3 mm spot diameter on the center of the detector
- Ambient temperature 23°C ± 5°C
- On day of calibration (add ± 0.3% for aging over one year, add ± 0.6% over two years)
- Spectral width of source ≤ 10 nm (FWHM)
- Wavelength setting at power sensor corresponding to source wavelength ± 0.4nm

[2] Operating Conditions:
- Parallel beam, 3mm spot diameter on the center of the detector or connectorized fiber with NA ≤ 0.2 (straight connector, options C01 / C02 also with angled connector ≤ 8°)
- For NA > 0.2 add 1%.
- Averaging time 1s
- Within one year after calibration, add 0.3 % for second year
- Zeroing required

[3] All states of polarization at constant wavelength (1550 nm ± 30 nm), straight connector, T = 23°C ± 5°C. For angled connector (8°) add 0.01 dB typ.

[4] Conditions:
- Wavelength 1550 nm ± 30 nm, fixed state of polarization
- Temperature 23°C ± 5°C
- Linewidth of source ≥100 MHz
- Angled connector 8°

[5] Does not include noise; zeroing required

[6] Averaging time 1s, T = 23°C ± 5°C, ΔT ± 1°C, observation time 300 s. Wavelength range 1200 nm to 1630nm

[7] Conditions:
- Wavelengths 1550nm ± 30 nm
- Standard single mode fiber, angled connector min 8°
- With D-shape adapter 81001xx return loss > 60 dB typical

[8] For input power > + 10 mW:
- Add typ. ± 0.0016 dB/mW, or in case of options C01 / C02 for wavelength ≤1550 nm add ± 0.0006 dB/mW (guaranteed) using adaptor Agilent 81000AF.
- In case of decreasing power, allow time for stabilization of the reading (about 5 s per dB change).
- In case of decreasing power by more than 50 dB, allow recovery time of 3 minutes.

[9] Max 30°C above + 20 dBm input power

High power optical head specifications

All optical heads have to be operated with the single (Agilent 81618A) or dual (Agilent 81619A) Interface Modules.

	Agilent 81628B with integrating sphere
Sensor element	InGaAs
Wavelength range	800 nm to 1700 nm
Power range	–60 dBm to +40 dBm (800 nm to 1700 nm) For operation higher than 34 dBm see safety note
Damage Power	40.5 dBm
Applicable fiber type Open beam	Single mode NA ≤ 0.2, Multimode NA ≤ 0.4 ∅ ≤ 3mm center of sphere
Uncertainty at reference conditions [1] [8]	± 3.0 % (970 nm to 1630nm)
Total uncertainty [2] [8] ≤ 10 dBm >10 dBm to ≤20 dBm >20 dBm to ≤38 dBm	(970 nm to 1630nm) ± 4.0 % ± 5 nW ± 4.5 % ± 5 %
Relative uncertainty: - due to polarization [3] - due to speckle noise at source linewidth: [4] 0.1pm to 100pm >100pm	 typ. ≤ ± 0.006 dB typ. ≤ ± 0.02 dB typ. ≤ ± 0.002 dB
Linearity (power): [5] [8] ≤ 10 dBm >10 dBm to ≤20 dBm >20 dBm to ≤37 dBm >37 dBm to ≤38 dBm	(CW –40 dBm to + 38 dBm), (970 nm to 1630 nm) ≤ ± 0.03 dB ≤ ± 0.06 dB ≤ ± 0.09 dB ≤ ± 0.10 dB at 23°C ± 5°C, for operating temperature range add ±0.03 dB
Return loss	typ. > 75 dB
Noise (peak to peak) [6]	< 5 nW
Averaging time (minimal)	100 µs
Analog Output	Included
Dimensions	55mm x 80 mm x 250 mm
Weight	0.9 kg (without heat sink)
Recommended Recalibration period	2 years
Operating temperature [7]	0°C to +40°C
Humidity	Non-condensing
Warm-up time	40 min

[1] Reference conditions:
- Power level 10 µW (-20 dBm), continuous wave (CW)
- Averaging time 1s
- Parallel beam, 3 mm, center of sphere input
- Ambient temperature 23 °C ± 5 °C
- On day of calibration (add ± 0.3 % for aging over one year, add ± 0.6 % over two years)
- Spectral width of source <10 nm (FWHM)
- Wavelength setting at power sensor must correspond to source wavelength ± 0.4 nm
- Humidity 50 % ± 10 %

[2] Operating Conditions:
- Parallel beam, ∅ 3mm , center of sphere input, or connectorized fiber with NA ≤0.2 (straight connector)
- For NA > 0.2: add 1%
- Within one year after calibration, add ± 0.3% for second year
- Operating temperature range as specified, humidity <80% and non-condensing
- Zeroing required

[3] All states of polarization at constant wavelength (1550 nm ± 30 nm) and constant power

[4] Conditions:
- Wavelength 1550 nm ± 30 nm, fixed state of polarization, constant power
- Temperature 23°C ± 5°C
  Measurement time ≤ 3 min

[5] Does not include noise; zeroing required

[6] Averaging time 1s, T = 23°C ± 5 °C, ΔT ± 1°C, observation time 300 s, wavelength range 970 nm to 1630 nm

Thermal drift at 38 dBm, exposure time 30 min:
Recovery time 10 min: ≤ 30nW
30 min: ≤ 10nW

[7] For optical power > 30 dBm the maximal operating temperature is limited to 35°C

[8] Wavelength must not be equal to any water absorption line

Safety Note:

For optical power higher than 34 dBm the attached heat sink **MUST** be used!
For continuous optical power or average optical power higher than 38 dBm the connector adapters will get warmer than permitted according to the safety standard IEC 61010-1.
The 81628B Optical Head can handle optical power up to 40 dBm, however, operation above 38 dBm is at the operators own risk. Agilent Technologies Deutschland GmbH will not be liable for any damages caused by an operation above 38 dBm.

Return loss module specifications

All modules require angled contact (8°) at input and output connectors

	81610A	
Source	external input only [1]	
Sensor element	InGaAs	
Fiber type	Standard single-mode 9 / 125 μm	
External input	max input power: 10 dBm min input power: 0 dBm damage input power: **16 dBm**	
Wavelength range for external input	1250 nm to 1640 nm	
Dynamic range	70 dB	
Relative uncertainty of [2] Return Loss (RL)	with broadband source	with Agilent FP sources
RL ≤ 55 dB	< ± 0.25 dB	typ. < ± 0.5 dB
RL ≤ 60 dB	< ± 0.3 dB	typ. < ± 1.0 dB
RL ≤ 65 dB	< ± 0.65 dB	typ. < ± 2.0 dB
RL ≤ 70 dB	< ± 1.7 dB	
Total uncertainty	add ± 0.2 dB	add typ. ± 0.2 dB
Dimensions (H x W x D)	75 mm x 32 mm x 335 mm (2.8" x 1.3" x 13.2")	
Weight	0.6 kg	
Recommended Recalibration period	2 years	
Operating temperature	10 to 40°C	
Humidity	Non-condensing	
Warm-up time [3]	20 minutes	

[1] Insertion Loss is in the range of 7 dB.

[2] Averaging time 1 s,
calibration prior to measurement,
constant temperature,
broadband source: Agilent 83438A
FP Sources: Agilent 81650A, 81651A, 81654A with active Coherence Control.
Reference Cable 81610CC used for total uncertainty
Length of measurement patch cord ≤ 2m, angled connector in optimal optical conditions

[3] Warm-up time 60 min, if previously not stored at the same temperature.

Reference Cable Specification

To connect to Return Loss Modules the cable requires connector Interface 81000SI DIN47256/4108

	81610CC Reference cable
Return loss	as printed on cable
Return loss uncertainty	± 0.2 dB [1]
Wavelengths	1310 nm and 1550 nm ± 15 nm

[1] Clean reference reflector in perfect optical condition
(Do not use with contact-type connectors)

Return loss module specifications with internal source

(When used with external sources the specifications of 81610A return loss module apply)

All modules require angled contact (8°) at input and output connectors

	81613A	
Source	Fabry-Perot Laser (internal)	
Output Power	typ. – 4 dBm ± 1.0 dB typ.	
Center wavelength [1]	1310 nm /1550 nm ± 20 nm typ.	
Sensor Element	InGaAs	
Fiber Type	Standard single-mode 9 / 125 µm	
Dynamic Range	75 dB	
Relative uncertainty of Return Loss (RL)	User calibration [2]	Plug and play [3]
RL ≤ 55 dB	< ± 0.5 dB (typ. < ± 0.3 dB)	typ. < ± 0.6 dB
RL ≤ 60 dB	< ± 0.6 dB (typ. < ± 0.4 dB)	typ. < ± 1.5 dB
RL ≤ 65 dB	< ± 0.8 dB (typ. < ± 0.5 dB)	
RL ≤ 70 dB	< ± 1.9 dB (typ. < ± 0.8 dB) [4]	
RL ≤ 75 dB	typ. < ± 2.0 dB [4]	
Total uncertainty	add ± 0.2 dB	add typ. ± 0.2 dB
Dimensions (H x W x D)	75 mm x 32 mm x 335 mm (2.8" x 1.3" x 13.2")	
Weight	0.6 kg	
Recommended Recalibration period	2 years	
Operating temperature	10 to 40°C	
Humidity	Non-condensing	
Warm-up time [5]	20 minutes	

[1] At 25°C constant temperature,
coherence control on,
warm-up time after laser turn on > 5 min.

[2] Averaging time 1 s,
calibration prior to measurement,
constant temperature,
coherence control on,
warm-up time after laser turn on > 5 min,
length of measurement patch cord ≤ 2 m,
angled connector in optimal optical condition.
Reference cable 81610CC used for total uncertainty.

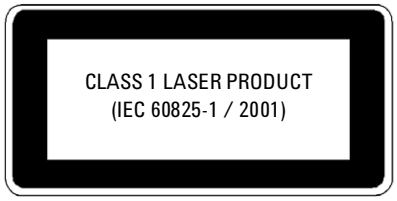
[3] Use defaults settings (no user calibration necessary):
length of measurement patch cord ≤ 2 m,
return loss of connectors ≥ 70 dB.

[4] For measurements performed immediately after calibration.

[5] Warm-uptime 60 min, if previously not stored at the same temperature.

Laser Safety Information

The above products are classified as Class 1 according to IEC 60825-1 (2001).
All laser sources comply with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated 2001-July-26.



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