

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, Ø 5 mm		
Wavelength range	750 nm to 1800 nm		
Power range	– 80 dBm to +10 dBm		
Applicable fiber type	Standard SM and MM max 100 µm core size, NA ≤ 0.3		
Open beam	Parallel beam max Ø 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

- Spectral width of source < 10 nm (FWHM)
- Wavelength setting at power sensor corresponding to source wavelength ± 0.4nm

^[7] Conditions:

Wavelengths 1550nm ± 30 nm.
Standard single mode fiber, angled connector min 8°

- ^[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.

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

^[4] Conditions:

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

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

^[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.

^[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

^[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, Ø 5 mm		InGaAs, Ø 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	Standard SM and MM max 100 µm core size, NA ≤ 0.3		Standard SM and MM max 100 µm core size, NA ≤ 0.3	
Open beam	Parallel beam max Ø 4 mm		Parallel beam max Ø 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	Single mode NA ≤ 0.2, Multimode NA ≤ 0.4
Open beam	∅ ≤ 3mm center of sphere
Uncertainty at reference conditions ^{[1][8]}	± 3.0 % (970 nm to 1630nm)
Total uncertainty ^{[2][8]}	(970 nm to 1630nm)
≤ 10 dBm	± 4.0 % ± 5 nW
>10 dBm to ≤20 dBm	± 4.5 %
>20 dBm to ≤38 dBm	± 5 %
Relative uncertainty:	
- due to polarization ^[3]	typ. ≤ ± 0.006 dB
- due to speckle noise at source linewidth: ^[4] 0.1pm to 100pm >100pm	typ. ≤ ± 0.02 dB typ. ≤ ± 0.002 dB
Linearity (power): ^{[5][8]}	(CW -40 dBm to + 38 dBm), (970 nm to 1630 nm)
≤ 10 dBm	≤ ± 0.03 dB
>10 dBm to ≤20 dBm	≤ ± 0.06 dB
>20 dBm to ≤37 dBm	≤ ± 0.09 dB
>37 dBm to ≤38 dBm	≤ ± 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.

Optical head specifications (Aurorance mode)

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

	Agilent 81623B	Agilent 81624B	Agilent 81627B
Sensor element	Ge, \varnothing 5 mm	InGaAs, \varnothing 5 mm	InGaAs, \varnothing 3mm
Wavelength range	750 – 1800 nm	800 – 1700 nm	800 – 1700 nm
Power range	+ 10 to –80 dBm	+ 10 to –90 dBm	+ 10 to –90 dBm
Applicable fiber type	Standard SM (max 100 μ m core size), NA \leq 0.3 Standard MM max 100 μ m core size, NA \leq 0.3		Standard SM (max 10 μ m core size), NA \leq 0.11 (straight and angled connector) Standard MM (max 62.5 μ m core size), NA \leq 0.22 (straight connector)
Open beam	Parallel beam max \varnothing 4 mm		Parallel beam max \varnothing 2.5 mm
Uncertainty at reference conditions ^[1]	\pm 2.2 % (1000 – 1650 nm)	\pm 2.2 % (1000 – 1630 nm)	\pm 2.5 % (1000 – 1630 nm)
Total uncertainty ^[2]	\pm 3.5 % \pm 100 pW ^[8] (1000 – 1650 nm)	\pm 3.5 % \pm 5 pW (1000 – 1630 nm)	\pm 4.0 % \pm 5 pW (1000 – 1630 nm)
Relative uncertainty: ^[7] - due to polarization ^[3] - spectral ripple (due to interference) ^[4]	\leq \pm 0.01 dB ^[9] (typ. \pm 0.005 dB) \leq \pm 0.006 dB (typ \pm 0.003 dB)	\leq \pm 0.005 dB (typ. \pm 0.002 dB) \leq \pm 0.005 dB (typ \pm 0.002 dB)	\leq \pm 0.005 dB (typ. \pm 0.002 dB) \leq \pm 0.005 dB (typ \pm 0.002 dB)
Linearity (power): ^[5] - at 23°C \pm 5°C - at operating temp. range	(CW + 10 to –60 dBm) (1000 – 1650 nm) $< \pm$ 0.025 dB \pm 100 pW ^[8] $< \pm$ 0.05 dB \pm 100 pW ^[8]	(CW + 10 to –70 dBm) (1000 – 1630 nm) $< \pm$ 0.02 dB \pm 5 pW $< \pm$ 0.05 dB \pm 5 pW	(CW + 10 to –70 dBm) (1000 – 1630 nm) $< \pm$ 0.02 dB \pm 5 pW $< \pm$ 0.05 dB \pm 5 pW
Return loss ^[7]	$>$ 50 dB typ. $>$ 55 dB	typ. 60 dB	$>$ 60 dB
Noise (peak to peak) ^[5] ^[6]	$<$ 100 pW	$<$ 5 pW	$<$ 5 pW
Averaging time (minmal)	100 μ s	100 μ s	100 μ s
Analog Output	included		
Dimensions	57 mm x 66 mm x 156 mm		
Weight	0.5 kg		
Recalibration period	2 years		
Operating temperature	0°C to 40°C	0°C to 40°C	0°C to +40°C
Humidity	Non-condensing	Non-condensing	Non-condensing
Warm-up time	40 min		

^[1] Reference conditions:

- Power level 10 μ W (-20 dBm), continuous wave (CW)
- Parallel beam, 3 mm spot diameter on the center of the detector; for 81627B 2mm spot diameter
- Ambient temperature 23°C \pm 5°C
- On day of calibration (add \pm 0.3% for aging over one year, add \pm 0.6% over two years)
- Spectral width of source $<$ 10 nm (FWHM)
- Wavelength setting at powermeter must correspond to source wavelength \pm 0.4nm

^[2] Operating Conditions:

- Parallel beam, 3mm spot diameter on the center of the detector or connectorized fiber with NA \leq 0.2 (straight connector); for 81627B 2mm spot diameter
- For NA $>$ 0.2: add 1%

- For 81627B and MM fiber add 1%
- Within one year after calibration, add 0.3 % for second year.

Operating temperature range as specified
humidity: non-condensing

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

^[4] Conditions:
Wavelength 1550 nm \pm 30 nm, fixed state of polarization, constant power, Temperature 23°C \pm 5°C
Linewidth of source \geq 100 MHz, angled connector 8°.

^[5] At const. temperature (Δ T = \pm 1 °C)
Zeroing required

^[6] Averaging time 1s, T = 23°C \pm 5°C, observation time 300 s.
Wavelength range 1200-1630nm

^[7] Conditions:

- Wavelengths 1550nm \pm 30 nm.
- Standard singlemode fiber, angled connector min 8°

^[8] For input power $>$ 2 mW
add \pm 0.004 dB / mW

^[9] Specification valid for optical heads with S/N started with "DE413..." or higher (shipping started April 1, 2001)

High power optical head specifications (Autorange mode)

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

	Agilent 81622B	Agilent 81626B
Sensor element	Ge, Ø 5mm	InGaAs, Ø 5mm
Wavelength range	850-1650nm	850-1650nm
Power range	+27 to -55 dBm (1250-1650nm) +23 to -55 dBm (850-1650 nm)	+27 to -70 dBm (1250-1650 nm) +23 to -70 dBm (850-1650 nm)
Applicable fiber type Open beam	Standard SM and MM max 100 µm core size, NA ≤0.3 Parallel beam max Ø 4 mm	
Uncertainty at reference conditions ^[1]	±3.0 % (950-1630 nm)	±3.0 % (950 - 1630 nm)
Total uncertainty ^[2]	±5 % ±40 nW ^[10] (950-1630 nm)	±5.0% ± 500 pW ^[10] (950-1630 nm)
Relative uncertainty: ^[7] - due to polarization ^[3] - spectral ripple (due to interference) ^[4]	≤±0.01 dB (typ. ±0.005 dB) ≤±0.006 dB (typ ±0.003 dB)	≤±0.005 dB (typ.±0.002 dB) ≤±0.005 dB (typ. ±0.002 dB)
Linearity (power): ^[5] - at 23°C ±5°C - at operating temp. range	(CW +27 to -40 dBm) (950 - 1630 nm) < ±0.05 dB ±40 nW ^[10] < ±0.15 dB ±40 nW ^[10]	(CW +27 to -50 dBm) (950 - 1630 nm) ≤±0.04 dB ± 500 pW ^[10] ≤±0.15 dB ± 500 pW ^[10]
Return loss ^[7]	>45 dB	>45 dB
Noise (peak to peak) ^{[5] [6]}	< 40 nW	<500 pW
Averaging time (minmal)	100 µs	100 µs
Analog Output	included	
Dimensions	57 mm x 66 mm x 156 mm	
Weight	0.5 kg	
Recalibration period	2 years	
Operating temperature	0°C to +35°C ^[9]	0°C to +35°C ^[9]
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% foraging over one year, add ±0.6% over two years)
- Spectral width of source < 10 nm (FWHM)
- Wavelength setting at powermeter must correspond 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 connetor)
- For NA >0.2: add 1%.
- Within one year after calibration, add 0.3 % for second year.

Operating temperature range as specified
humidity: none-ondensing

^[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] At const. temperature (ΔT = ± 1 °C)
Zeroing required

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

^[7] Conditions:

- Wavelengths 1550nm ± 30 nm.
- Standard singlemode fiber, angled connector min 8°

^[8] For input power > 2 mW
add ± 0.004 dB / mW

^[9] 30°C for > +20dBm input power

^[10] For input power > +10 mW add:
typ. ± 0.0016 dB/mW without Agilent 81000FA
or add: ±0.0008dB/mW with Agilent 81000AF (direct coupled)
In case of negative power change > 50dB allow additional recovery time of 3 min