Specifications

Optical Sensors and Sensor Blocks (Option)

Model	Q82014A		TQ82015		Q82017A		Q82018A	
Wavelength range	0.4 µm to 1.1µm		0.8µm to 1.6 µm		0.4 µm to 1.1µm		0.8 µm to 1.65µm	
Photoreceptor element	Si photodiode		Ge photodiode		Si photodiode		InGaAs PIN photodiode	
Photoreceptor area	Approx. 8mmΦ		Approx. 5mmΦ		Approx. 10 × 10mm□		—	
Unit of measurement	dBm	W	dBm	W	dBm	W	dBm	W
*1 Power range	−60dBm to + 17dBm	1nW to 50mW	−40dBm to + 10dBm	0.1 µW to 10mW	−60dBm to + 17dBm	1nW to 50mW	−60dBm to 0dBm	1nW to 1mW
Measurement ranges	8 ranges in 10dB steps		5 ranges in 10dB steps		8 ranges in 10dB steps		6 ranges in 10dB steps	
Measurement accuracy	±0.25dB at 0.85µm, −20dBm	±5% at 0.85µm, 10µW	±0.25dB at 1.30 µm, −20dBm	±5% at 1.30 µm, 10µW	±0.25dB at 0.85µm, −20dBm	±5% at 0.85µm, 10µW	±0.25dB at 1.30 µm, −20dBm	±5% at 1.30 µm, 10µW
Resolution	0.01dB	0.1% to 0.005% (0.3% to 0.015% in 20mW and 200mW ranges)	0.01dB	0.1% to 0.005% (0.3% to 0.015% in 20mW ranges)	0.01dB	0.1% to 0.005% (0.3% to 0.015% in 20mW and 200mW ranges)	0.01dB	0.1% to 0.005%

Model		Q82021A	
Wavelength range		0.4µ to 1.1µm	
Photoreceptor element		Si photodiode	
Input connector or aperture		Approx. 10 × 10mm□	
Unit of measurement		dBm	W
Average power	Power range	−60dBm to + 17dBm	1nW to 50mW
	Measurement ranges	8 ranges in 10 dB steps	
	Measurement accuracy	±0.25dB at 0.85µm, −20dB	±5% at 0.85µm, 10µW
	Resolution	0.01dB	0.1% to 0.005% (0.3% to 0.015% in 20mW and 200mW ranges)
Peak power	Ranges	+13dBm	20mW
	Power range	+10dBm to 0dBm	10mW to 1mW
	Measurement accuracy	±1.5dB	±30%
	Minimum pulse width	50ns	
	Minimum repeating frequency	100Hz	

Monitor characteristics (in peak power measurement)

Model		Q82021A
Ranges		20mW (+13dBm)
Sensitivity		50mV/mW
Light input range	Maximum *2	10mW (+10dBm)
	Minimum *2	0.2mW (−7dBm)
Demodulation band (at 100kHz)		$^{+1}_{-1}$dBopt $^{+1}_{-3}$dBopt DC to 30MHz to 50MHz
Output impedance		50Ω ±5Ω (BNC connector)

*1 Maximum level is when the entire sensor surface is illuminated. *2 The maximum limit is the maximum at which the response is linear. The minimum limit is the rms signal level at which the noise peak-to-peak value is the same (TSS sensitivity).

General Optical Measurement Specifications

Absolute Accuracy of A/D converter: ±0.1%(included sensor measurement accuracy)

dBr Function: Measured value relative to a measured reference value

AVR/PEAK function: Available in the Q82021A

AVG measures average power.

PEAK measures peak power and enables waveform monitoring.

CF (calibration factor) setting to compensate for sensor sensitivity:

Mode 1 (CFnm): An internal calibration factor (standard data) is applied automatically according to the wavelength.

The calibration factor is in dB for dBm measurement, and is a linear factor for watt measurement.

Mode 2 (CFMPY····· CF multiply): The calibration factor can be set manually from the front panel. The calibration factor is in dB for dBm measurement, and is a linear factor for Watt measurement. It is backed up when power is off.

DC Voltage Measurement

Ranges	19.999mV	199.99mV	1999.9mV	19.999V	199.99V
Resolution	1µV	10µV	100 µV	1mV	10mV
Measurement accuracy(*)	±0.06%±8d	±0.06%±3d	±0.06%±2d		
Input impedance	1000MΩ or greater			10MΩ ±1%	
Maximum allowable input voltage	220VDC, 220VACrms continuously				

* Measurement accuracy is indicated as ± percentage of reading ± digits. Accuracy is guaranteed for six months at 23°C ±5°C, 85% RH.

Resistance Measurement

Ranges	199.99Ω	1999.9Ω	19.999kΩ	199.99kΩ	1999.9kΩ
Resolution	10mΩ	100mΩ	1Ω	10Ω	100Ω
Current applied for measurement	1mA		100µA	10µA	1µA
Measurement voltage	0.2V	2V			
Measurement accuracy(*)	±0.06%±14d	±0.06%±2d			±0.12%±6d

* Measurement accuracy is indicated as ± percentage of reading ± digits. Accuracy is guaranteed for six months at 23°C ±5°C and 85% RH with zero adjustment.

Temperature Measurement

Thermocouple type(*1)	Measurement range	Resolution	Measurement accuracy(*2)
T(CC)	−270°C to −250°C	0.1°C	±0.06% of rdg±5°C
	−250°C to −180°C		±0.06% of rdg±2°C
	−180°C to +400°C		±0.06% of rdg±0.5°C
J(IC)	−210°C to 0°C	0.1°C	±0.06% of rdg±1°C
	0°C to +1200°C		±0.06% of rdg±0.5°C
E(CRC)	−270°C to −250°C	0.1°C	±0.06% of rdg±3°C
	−250°C to −200°C		±0.06% of rdg±1°C
	−200°C to +1000°C		±0.06% of rdg±0.5°C
K(CA)	−270°C to −250°C	0.1°C	±0.06% of rdg±5°C
	−250°C to −200°C		±0.06% of rdg±1.5°C
	−200°C to +1372°C		±0.06% of rdg±0.5°C
S(PR10)	−50°C to 0°C	0.1°C	±0.06% of rdg±4°C
	0°C to +1769°C		±0.06% of rdg±1.5°C
R(PR13)	−50°C to 0°C	0.1°C	±0.06% of rdg±4°C
	0°C to +350°C		±0.06% of rdg±2°C
	+350°C to +1769°C		±0.06% of rdg±1°C
B(PR30)	+100°C to +500°C	0.1°C	±0.06% of rdg±6°C
	+500°C to +1820°C		±0.06% of rdg±2°C

*1 T, J, E, K, S, R and B are calibrated according to Japanese Industrial Standard (JIS) C1602-1981.
*2 This accuracy is guaranteed for six months at 23°C ±5°C, 85% RH. It does not include the accuracy tolerance of the reference contact compensation.

Unit of measurement: °C, °F or K (selectable)
Reference contact compensation:
Internal Compensation accuracy is ±1.6°C (This value should be added to the measurement accuracy value.)
External Freezing point of water 0°C (273.2K), boiling point of liquid nitrogen −195.9°C (77.3K), boiling point of liquid helium −269.0°C (4.2K), or any temperature T°C set by the user.

DC Current Measurement

Range: 200mA
Resolution: 10μA
Measurement accuracy: ±0.6% of reading ±3 digits (guaranteed for six months at 23°C±5°C, 85% RH)
Input impedance: 3Ωmax
Maximum allowable input current: 0.25A (fuse protected)

Calculation Functions

Scaling: $R=\frac{X-Z}{Y}$

Percent deviation: $R=\frac{X-Z}{Y}\times 100(\%)$

Comparator: R(Hi) : X>Y
R(Lo) : X<Z
R(Go) : Y≧X≧Z

R: Result of calculation
X: Measured value
Y: Constant (value set from the front panel, or a measured value)
Z: Constant (value set from the front panel, or a measured value)

Average (*): R (Ave): $R=X/Y=\overline{X}$
Maximum (*): R (Max)
Minimum (*): R (Min)
} Average, maximum, and minimum over a span of Y measurements

* When Y is 1 to 100, the result is displayed with data and analog output every Y measurements. When Y is 101 or greater, the average for each 100-measurement span is output, but maximum and minimum are for the time since the setting was made.

Other Functions

Filter function: Digital smoothing is performed. The smoothing count can be set anywhere from 2 to 100.
Analog output: D-A converted output is isolated from the measurement system.
Output data Measured value, calculation results, recorder calibration output (0V,1V)
Converted output 3 digits, 000 to 999 (0V to 0.999V)
Digit selection 19999, 19999, 19999, or 19999
Output offset 50% offset may be selected.
Output with offset 500→0V,000→0.5V,499→0.999V
Connector BNC, floating

General Specifications

Excessive input: OVER is displayed if the input exceeds the measurement limit.
Low battery indicator: BATT is displayed if the battery or AC supply voltage falls below the necessary level.
Range switching: Automatic or manual
Measurement speeds:
FAST 10 to 12 times/s (DC voltage, DC current, or temperature measurement)
5 to 6 times/s (resistance measurement)
9 to 12 times/s (optical power measurement)
SLOW 1/2, 1/5, 1/10, 1/20, 1/50 or 1/100 of the FAST speed (selectable)
Ambient conditions: 0°C to 40°C, maximum 85% RH
Power requirements: 100VAC, 50/60Hz, or TR15802 battery unit
Options: Specify when ordering.

Option No.	Standard	32	42	44
Supply voltage (V)	90 to 110	103 to 132	198 to 242	207 to 250

Power Consumption:
TQ8215+TQ82010: 13VA max
With TQ13216: Additional 1.5VA (Approx.)
Other configurations: Same as TQ8215+TQ82010
Dimensions: Approx. 240(W)×88(H)×310(D)mm
Weight: 3.7kg max

Standard Accessories

Description	Model	Quantity
Power cable	A01402	1
Input cable	A01007	1
Optical sensor block	TQ82010	

Separately Sold Accessories

TR15802 Battery Unit
Internal battery: 4V to 6V NiCd rechargeable battery
Continuous operation: 2.0 hours min. (with Q82014A) (at 23°C ±5°C)
Charging time: 15 hours after the CHARGE switch is set to FULL
Charging power: Supplied from the TQ8215 mainframe
Weight: 370g max

TQ13216 GPIB Adaptor Unit
Electrical specifications: Conform to IEEE 488-1978 and IEC 625-1
Mechanical specifications: Conform to IEEE 488-1978 (24-pin Amphenol-type connector)
Interface functions: SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0, E2