HIOKI

RGB LASER METER TM6102
RGB LASER LUMINANCE METER TM6103
OPTICAL POWER METER TM6104

Definitively Measure the White
in Laser Displays

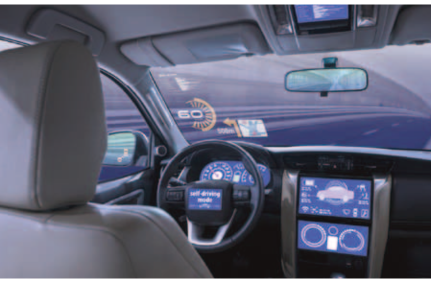
Specially Designed for RGB Lasers

Cut Adjustment Time in Half with
White Balance Navigation

CE

3 year Warranty

Built-in
Discrete Centroid Wavelength Method



Made for RGB Lasers

Redefining World Standards

Resolve Laser Photometry Issues to Get the Most Out of Laser Displays

RGB LASER METER TM6102

RGB LASER LUMINANCE METER TM6103

OPTICAL POWER METER TM6104

Advanced Proprietary Technology to Definitively Measure the Color and Brightness of Laser Lights

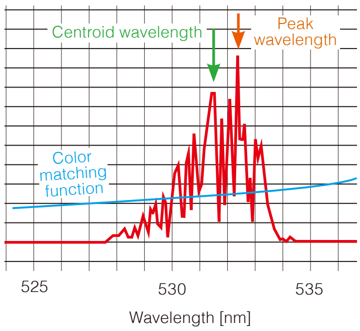
Discrete Centroid Wavelength Method

Combining the centroid wavelength measurement performance of an optical spectrum analyzer with the ease of use of a colorimeter

Notes on Laser Photometry

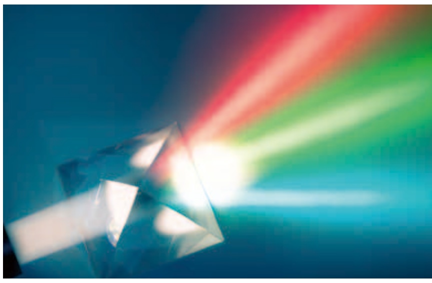
Multiple Peaks in the Laser Spectrum

Compared to the wavelength range of visible light from 400 nm to 700 nm, laser light has an extremely narrow spectrum. However, when only the wavelength range of a monochrome laser is measured, a complex spectrum is often generated (see figure to right).As you can see, there is a significant difference between the centroid wavelength and the maximum peak wavelength, either of which is needed to calculate chromaticity. Since the spectrum of laser light in particular fluctuates greatly due to temperature, it is necessary not only to take measurements with high accuracy that can normally only be accomplished with an instrument such as an optical spectrum analyzer, but also to measure the centroid wavelength that tracks such fluctuations.



Accurately Measure Centroid Wavelength and Optical Power

RGB Centroid Wavelength Measurement Resolution: 0.01 nm
Chromaticity (x, y) Coordinate Output Resolution: 0.00001

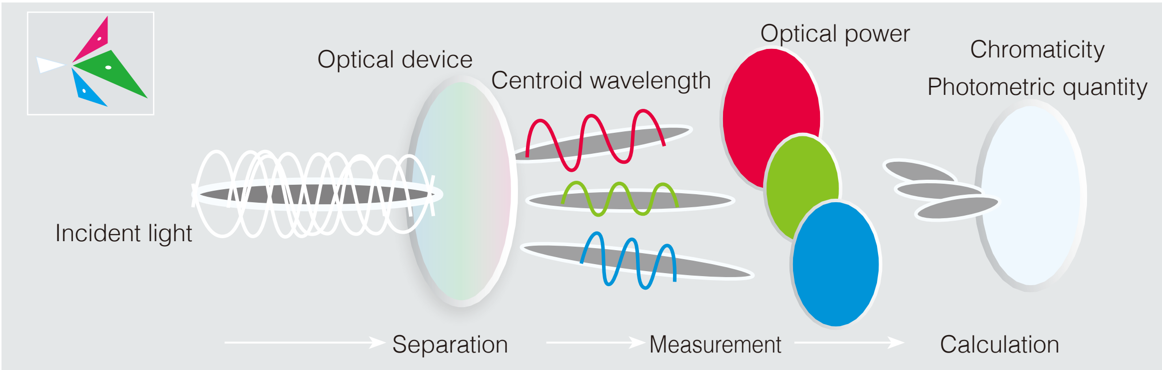


The Ultimate Solution for Lasers

The Discrete Centroid Wavelength Method for Laser Photometry

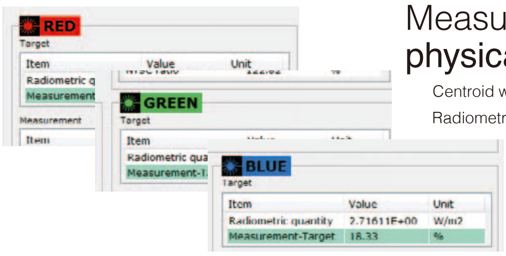
Achieve accurate laser photometry with real-time measurement of centroid wavelength and optical power.

1. Separate incident light into each RGB wavelength using optical devices
2. Simultaneously measure centroid wavelength (minimum resolution: 0.01 nm) and optical power (radiometric quantity) for RGB wavelengths
3. Calculate chromaticity and photometric quantity using color matching functions (2°, 10°)
4. Simultaneously output a total of 11 optical properties



Discrete Centroid Wavelength Method

A Completely New Method for Accurate Color Measurement of Laser Light Sources



Measure the physical quantity

Centroid wavelength (R/G/B)
Radiometric quantity (R/G/B)

Select color matching function: 2°/10°

Calculate optical properties with theoretical calculation

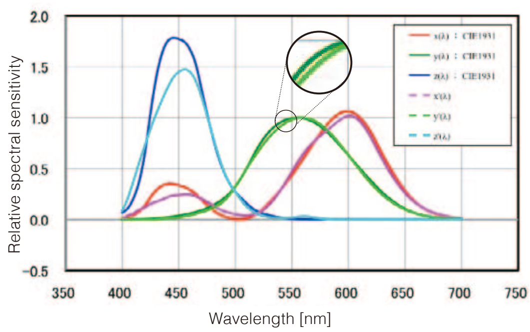
Chromaticity, photometric quantity, radiometric quantity
Tristimulus values, correlated color temperature, deviation
Dominant wavelength, NTSC ratio

Barriers to Laser Photometry

Approximation Limit for Color Matching Functions

Normally, tristimulus and other colorimeters use a combination of optical filters to approximate color matching functions. However, there are limitations to the degree to which optical filters (physical filters) can approximate color matching functions.

Since the spectral width of a monochromatic laser is extremely narrow, both the approximation error for the color matching function and the variability inherent in the filter (individual differences) appear as differences in the measured values.



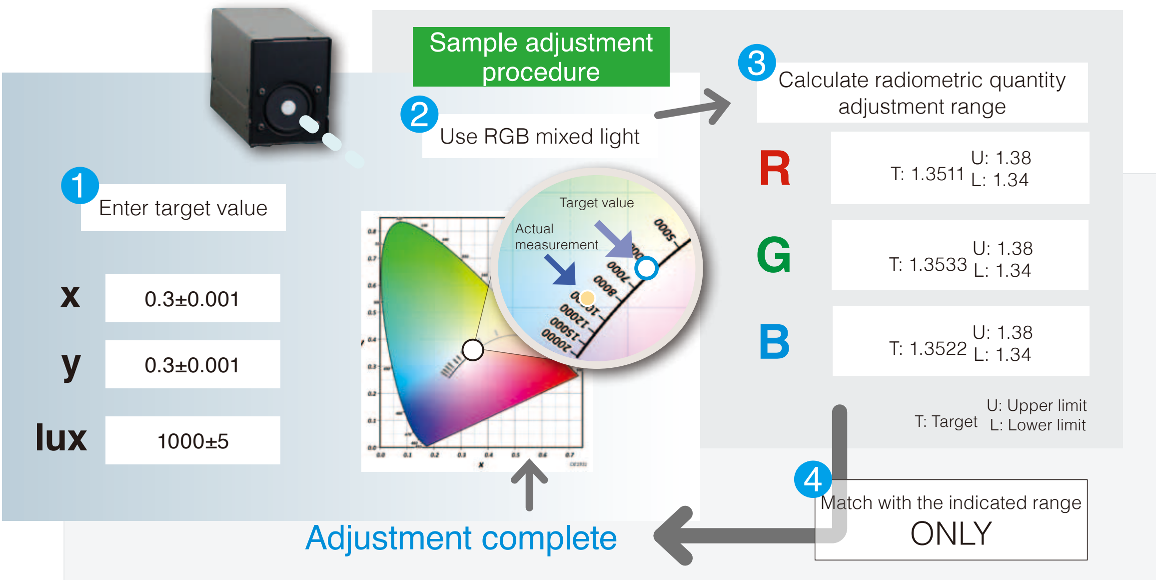
White Balance Navigation for Lasers

Navigate White Balance Adjustments with RGB Radiometric Quantities

Cut Work by 50% by Eliminating Rework & **Cut Work by 50% with RGB Mixed Light Input**

White Balance Adjustment Assistance Function Indicates the Optimum Route

Make adjustments to the target color (chromaticity) and brightness (photometric quantity) simply by matching the radiometric quantities for RGB with the specified ranges. Simultaneously adjusting chromaticity and photometric quantity, which is difficult with the conventional tristimulus method, greatly reduces balance adjustment work. This unique adjustment navigation function from HIOKI links with target values within tolerance (upper and lower limits) to automatically set the adjustment range.



Built-in Physical Quantity Correction Function to Minimize Differences between Instruments

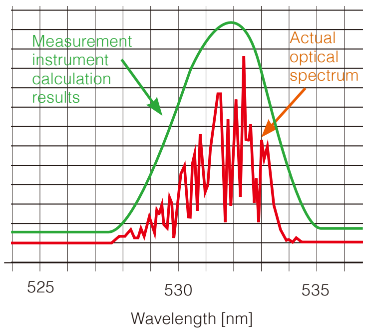
Two physical quantity correction functions are built in: centroid wavelength offset correction and radiometric quantity gain correction. Correction is applied according to the user's standard light source, minimizing any differences between instruments when multiple units are used. This is one of the major features of the discrete centroid wavelength method, which is not influenced by optical filters. This function is indispensable when making white balance adjustments in demanding conditions.

Mysteries of Laser Photometry

Why Do Some Colors Look Different Even When They Have the Same Chromaticity Values?

Why does measuring laser light sources result in values that are different from the actual colors, unlike measuring conventional LED or light bulbs? And when this occurs, do you simply make visual adjustments to the white balance for lack of a more quantitative method to correct for the discrepancy?

Wavelength measurement performance is important in order to get Δxy to the 0.001 level, as with the white balance in a television with a wide color gamut. For lasers with a spectral width of several nm, it is not possible to correctly calculate the centroid wavelength with a measuring instrument that has an insufficient spectral wavelength width measuring.



Uniformity Evaluation

Delivering the Measurement Reliability Required for Uniform Evaluations

Reliable Traceability

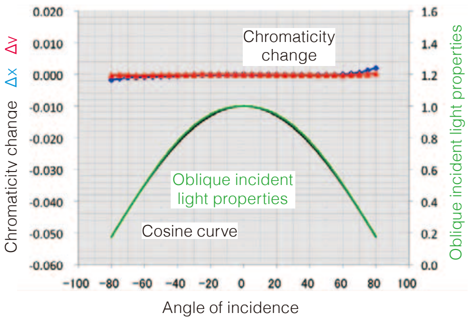
Precise Irradiance Evaluation Using Laser Light Sources

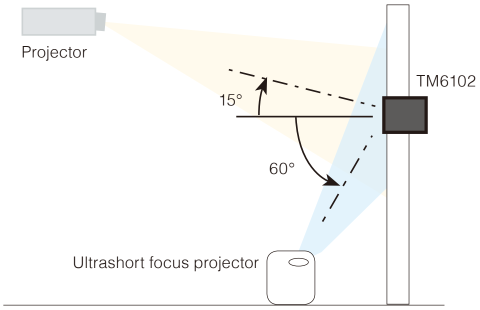
An all-new calibration environment was developed for this new RGB laser optical measurement instrument. This allows highly precise evaluations of RGB lasers with not only optical power meters but also illuminometers and luminance meters.
Accurate laser measurement is guaranteed, providing highly reliable measurements that can be traced to national standards.

Reliable Incident Light Properties *TM6102

Low Incidence Angle Dependence Essential for Ultrashort Focus Projector Evaluation

Chromaticity measurement that is not affected by angle of incidence is required to measure the illuminance of a projector. Low dependency on the angle of incidence is an important property in order to evaluate products with a large angle of incidence in particular, such as ultrashort focus projectors.
Further, since the oblique incident light properties of the RGB LASER METER TM6102 are similar to the cosine law for angle of incidence, it can be used in the same manner as a conventional illuminometer.





Optimum Optical Parts

Low Reflection Paint to Minimize the Influence of Irregular Reflections

All parts around the light entrance are coated in a special low reflection paint so that measurements will not be affected by light reflecting off of the instrument. This keeps reflected light to a minimum and improves the instrument's reliability.

Laser Photometry Basics

World's First: Using a Monochromatic Irradiance Evaluation Device with a Laser

Photometric instruments that are calibrated with a standard light bulb that has a wide range of wavelengths are not optimized for a single wavelength light source such as laser light, so unexpected results may occur.
In order to solve this problem, we have established with the technical support of the National Institute of Advanced Industrial Science and Technology (JAPAN) an evaluation system that can calibrate monochromatic irradiance using a laser. The result is an in-house system that can evaluate irradiance with high precision.

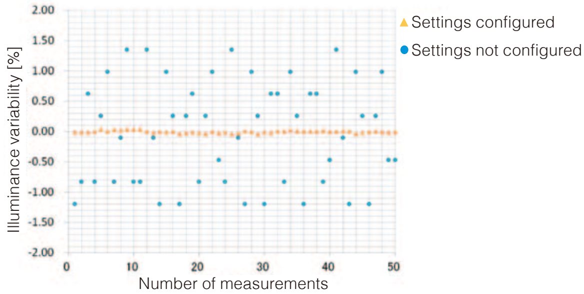
Display Solution

Laser Display Evaluation

Improved Production Efficiency

Max. 300Hz Modulated Light Function for Displays with a Wide Color Gamut

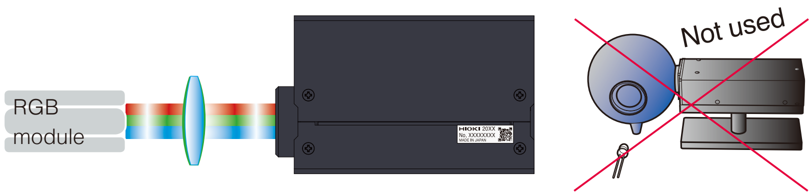
A modulated light function that takes stable measurements by adjusting the measurement timing to the modulation frequency of the display is built in. This makes average processing unnecessary, and the testing time can be shortened. Settings from 10 Hz to 300 Hz are possible for compatibility with the high-speed refresh rates of wide color gamut 4K and 8K displays and head-mounted displays (HMD) that support 3D. The actual operating frequency can also be confirmed with the synchronization signal measurement function.



Reduced Capital Investment

RGB Laser Module Evaluation

Since RGB mixed light can be input directly, the optical properties of RGB laser modules can be evaluated easily with a single measuring instrument. Conventional equipment in combination with an optical power meter or spectrometer are no longer needed.
These products can be used for a wide variety of applications, such as evaluating optical devices, by taking measurements at the front and back of lenses and MEMS mirrors.

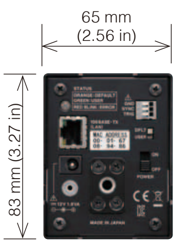


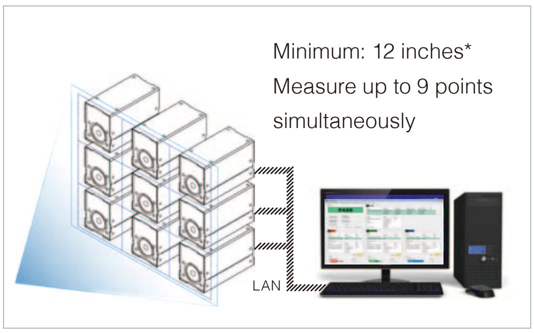
Turnkey Solution

Multipoint Measurements for Laser Displays and Laser Projectors

In order to evaluate displays for ANSI lumen and other characteristics, it is necessary to test with multiple illuminometers and luminance meters. To accommodate multi-unit configurations, the products feature a display-free design with all controls located on the rear panel, minimizing the amount of space needed on the workbench.

The LAN interface ideal for building multipoint measurement systems also makes it easy to connect the meters to existing production systems.





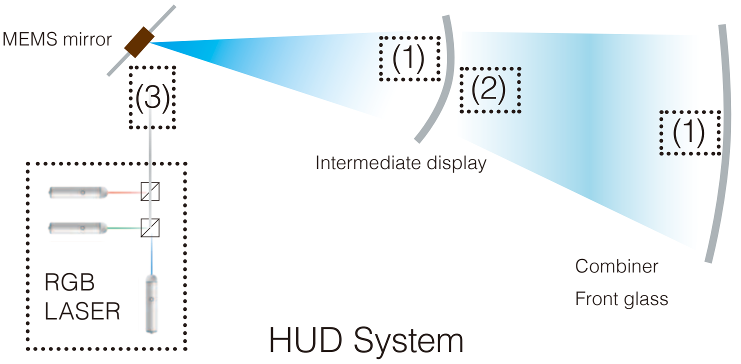
*12 inches: 4:3 250 mm × 180 mm (9.84 in x 7.09 in)

Lineup

Convenient Features and Applications

Applicable in Any Measurement Scenario

Choose from three models to measure any display unit, including the latest HUDs (heads-up displays).



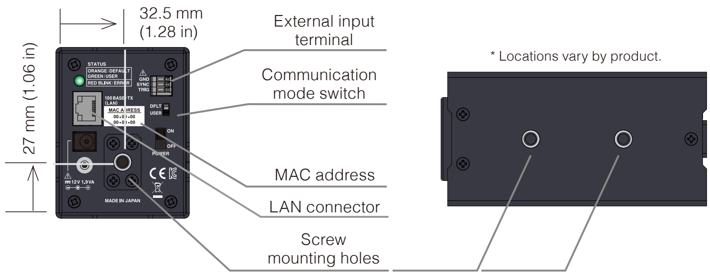
(1) Measurement of projection surfaces, such as combiners: RGB LASER METER TM6102

(2) Screens, backlights: RGB LASER LUMINANCE METER TM6103

(3) Evaluation of optical modules: OPTICAL POWER METER TM6104

Screw Mounting Holes on Bottom and Rear Surfaces

All three meters use the same small casing, with screw mounting holes on the bottom and rear surfaces for building systems with multiple units.
(1/4-20UNC Depth: 7.5 mm (0.3 in))



Applications

Monitoring Application: RGB Laser Utility

Use the control commands that have been released for TM6102/TM6103/TM6104 to build a system tailored to your own advanced control and production lines.
In addition, use the included RGB Laser Utility application for monitoring measured values to measure standard values such as the white balance assistance function.

Applicable models
TM6102/TM6103/TM6104
Operating system
Windows 7 (32 bit/64 bit), Windows 8 (32 bit/64 bit),
Windows 10 (32 bit/64 bit)

Specifications

(Accuracy guaranteed for 1 year; Post-adjustment accuracy guaranteed for 1 year)

RGB Laser Measuring Instruments		RGB LASER METER TM6102	RGB LASER LUMINANCE METER TM6103	OPTICAL POWER METER TM6104
External Appearance				
Accuracy — Accuracy is guaranteed with a laser light source. Accuracy is not guaranteed with standard illuminant A (light bulb).				
Accuracy guarantee temperature and humidity range		Temperature: 23°C ±5°C (73°F ±9°F), Humidity: 80% RH or less (Warm-up: 30 minutes or longer)		
Radiometric quantity	Relative accuracy	±4.6% rdg. (473 nm, 40 μW) Standard (532 nm, 60 μW) ±4.6% rdg. (633 nm, 80 μW)	±4.6% rdg. (473 nm, 40 μW) Standard (532 nm, 60 μW) ±4.6% rdg. (633 nm, 80 μW)	---
	Accuracy	±6.5% rdg. (532 nm, 9 mW/m²)	±8% rdg. (532 nm, 3 W/sr m²)	±4.2% rdg. (473 nm, 0.1 mW) ±4.2% rdg. (532 nm, 0.1 mW) ±4.2% rdg. (632.8 nm, 0.1 mW)
Centroid wavelength	Blue	±0.5 nm (435.8 nm mercury lamp)		
	Green	±0.5 nm (546.1 nm mercury lamp)		
	Red	±0.5 nm (632.8 nm, 0.1 mW)		
Basic Specifications				
Radiometric quantity	Measurement parameter	Irradiance	Radiance	Radiant flux (Optical power)
	Measurement range	0.0002 to 200 [W/m²]	0.002 to 600 [W/sr m²]	0.00001 to 130 [mW]
Centroid wavelength measurement range	Blue	435 nm to 477 nm		
	Green	505 nm to 550 nm		
	Red	615 nm to 665 nm		
Photometric quantity	Measurement parameter	Illuminance	Luminance	Luminous flux
	Measurement range	0.2 to 110 000 [lx]	2 to 300 000 [cd/m²]	10 μlm to 60 lm
	Specified conditions	Centroid wavelength: 473 nm, 532 nm, 632.8 nm/RGB radiometric quantity output ratio: Ratio based on D65 chromaticity If the radiometric quantity is less than 10% of the range full scale, use of centroid wavelength input mode (fixed) is recommended.		
Measured field diameter		---	Close contact: Approx. ϕ12 mm (0.47 in) 5 mm (0.20 in): Approx. ϕ14 mm (0.55 in) 10 mm (0.39 in): Approx. ϕ16 mm (0.63 in)	---
Measured field angle		---	Approx. 22° *1	---
Oblique incident light properties		Cosine law approximation	---	---
Light receiving diameter		ϕ11.3 mm ±0.1 mm (0.44 in ±0.0039 in)	---	ϕ11.3 mm ±0.1 mm (0.44 in ±0.0039 in)
Measurement time		15 ms to 460 ms		
Correction function		Centroid wavelength input mode, centroid wavelength offset, radiometric quantity gain, chromaticity value xy offset, photometric quantity gain		
Dark measurement		Judgment of dark measurement result, averaging, dark estimation		
Other Measurement parameters		Tristimulus values XYZ, chromaticity (xy, u'v'), correlated color temperature, Delta uv, dominant wavelength, NTSC ratio, white balance target value of radiometric quantity		
White balance adjustment support functions		Parameters: Target value of photometric quantity, tolerance of photometric quantity, target value of chromaticity (x, y), tolerance of chromaticity (x, y)		
Modulated light function		Modulation frequency setting range: 10 Hz to 300 Hz, Modulation frequency measurement range: 10 Hz to 300 Hz		
Interface		LAN (TCP/IP) * A display is not available on the unit.		
Dimensions		65 mm (2.56 in) W x 83 mm (3.27 in) H x 126 mm (4.96 in) D	65 mm (2.56 in) W x 83 mm (3.27 in) H x 175.7 mm (6.92 in) D	65 mm (2.56 in) W x 83 mm (3.27 in) H x 135.5 mm (5.33 in) D
Mass		700 g (24.7 oz)	790 g (27.9 oz)	720 g (25.4 oz)
Compliance standards		Safety EN61010 / EMC EN61326		
Power supply		AC ADAPTER: Z1008 (100 V AC to 240 V AC, 9.5 VA)		
Accessories		AC ADAPTER: Z1008, power cord, light shielding cap, LAN cable (3 m (9.84 ft)), instruction manual, application disk (CD-R), RGB Laser Utility application program		

*1 When measuring directional light sources, please note that the difference in measurement field angles will affect radiance.

Model : RGB LASER METER TM6102

Model No. (Order Code)	(Note)
TM6102	(Illuminance)

Model : RGB LASER LUMINANCE METER TM6103

Model No. (Order Code)	(Note)
TM6103	(Luminance)

Model : OPTICAL POWER METER TM6104

Model No. (Order Code)	(Note)
TM6104	(Optical power)

HIOKI E. E. CORPORATION

HEADQUARTERS
81 Koizumi
Ueda, Nagano 386-1192 Japan
www.hioki.com

HIOKI USA CORPORATION
TEL +1-609-409-9109 FAX +1-609-409-9108
hioki@hiokiusa.com / www.hiokiusa.com

HIOKI (Shanghai) SALES & TRADING CO., LTD.
TEL +86-21-6391-0090/0092 FAX +86-21-6391-0360
info@hioki.com.cn / www.hioki.cn

HIOKI SINGAPORE PTE.LTD.
TEL +65-6634-7677 FAX +65-6634-7477
info-sg@hioki.com.sg / www.hioki.com.sg

HIOKI KOREA CO., LTD.
TEL +82-2-2183-8847 FAX +82-2-2183-3360
info-kr@hioki.co.jp / www.hiokikorea.com

HIOKI EUROPE GmbH
TEL +49-6173-31856-0 FAX +49-6173-31856-25
hioki@hioki.eu / www.hioki.com

DISTRIBUTED BY

All information correct as of Oct. 1, 2018. All specifications are subject to change without notice.
TM610x_E3-8XB Printed in Japan