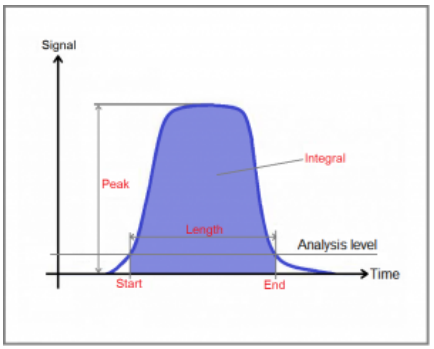
TR-9600

https://www.gigahertz-optik.com/en-us/product/tr-9600/

Product tags: Dosimeter

Description



Pulse Analysis

High Speed Digital Data Sampler for Light Pulse Form Analysis

The TR-9600 optometers are designed for pulse locus analysis of frequency modulated and single pulse flashing light sources.

Complete Analysis of Pulse Form and Pulse Data

- **pulse locus shape**
- **peak power in absolute light measurement units**
- **pulse width and pulse half width**
- **single pulse energy**
- **pulse repetition rate**

100 ns or 1 µs rise time amplifier

The TR-9600 analog signal amplifier offers a rise time of 1 µs (TR-9600-1) or 100 ns (TR-9600-2 *). The gain of the current to voltage amplifier is in ten steps for best adjustable signal to noise ratio.

10 mega sample / second ADC

A high speed analog to digital converter (ADC) digitizes the analog signal with up to a 10Msample/s sample rate for high time resolution measurements. Its 12 Bit resolution is higher than that 8Bit of typical digital oscilloscopes.

High-speed transient recorder with 100 ns sampling rate and pre-trigger function

The digital data is stored in a high-speed storage medium which is designed as transient recorder allowing a sampling rate of up to 10 Mega samples per second or one sample every 100 ns. The pre-trigger function of the transient recorder enables measurement data to be stored before the triggered event. Two million of samples can be stored in memory.

Remote operation via RS232 or IEEE488 and trigger I/O interface

The unit is capable of remote control operation via RS232 and IEEE488 interface. BNC connectors are available for trigger signal input and output or for use with external devices with TTL signal capability.

Software

Windows based software is supplied with the TR-9600 which provides all necessary functions to do remote control pulse-shape measurements and analysis via RS232 or IEEE488 interface.

Measurement Range Specifications with Light Detectors

The measurement range of the TR-9600 optometer combined with light detector is calculated by the measurement range specification of the optometer and the responsivity of the detector head as follows:

Example: Irradiance detector with typical responsivity of 3 nA/(W/cm^2):

- *Maximal measurable irradiance (Range 0): 2 mA / 3 nA/(W/cm^2) = 6,666,666 W/cm^2 ***
- *Noise equivalent irradiance (Range 9): 10 mV = 0.3 nA = 10 W/cm^2*
- *Minimal measurable irradiance (Range 0): 10 W/cm² * 50 (by user specified signal to noise ration) = 500 W/cm²*

Limited Dynamic Range and Capacitance Limitation

Because of the wide bandwidth of the TR-9600 devices the noise level is higher than that of standard optometers which limits the dynamic range of the instrument. As a result TR-9600 detectors must be carefully selected according to the signal intensity to be measured.

The detector capacitance effected by the photodiode and the cable must be considered to avoid distortion of the pulse locus. To reduce these effects the recommended cable length for large size detectors for use with TR-9600 is 0.2 meters. This is even a greater concern with the TR-9600-2. Please consult the factory for technical support.

* *The TR-9600-2 with 100 ns rise amplifier limits the freedom in selecting of the light detector*

because of capacitance matching as well as in the available dynamic range because of increased noise level by the wide bandwidth. Please contact therefore the factory to discuss your application.

** *The maximum measurable irradiation value may also be limited by thermal radiation, intense UV radiation or other application dependent parameters which must be considered by the end-user.*

Specifications

General

Short description	The TR-9600 Optometer has been specially developed as a data collector for the analysis of single pulses, pulse cycles or frequency modulated signals.
Typical applications	Pulse locus analysis of frequency modulated and single pulse flashing light sources
Calibration	Calibration and comparison of the current responsivity in each of amplifier range.
Measurement range	1 µs rise time amplifier: 10 (1 mA/V – 30 nA/V) 100 ns rise time amplifier: 4 (300 µA/V – 10 µA/V)
Main features	pulse locus shape, peak power in absolute light measurement units (depending on the detector), pulse width and pulse half width, single pulse energy, pulse repetition rate

Specification

Display	LEDs: POWER: Device switched on, DC-power supply existing CONNECTED: Remote-Commands received ERROR: Error, DC-power supply low
Analog input	BNC-Socket (max. ± 5 mA, max. ± 5 V)
Bias	-12 V to + 12 V, 10 mA, Shielding BNC-Socket
Trigger	External trigger Input (TTL/CMOS, positive edge or level)
Trigger	Trigger Output (CMOS, 4 mA)
Trigger	Trigger Hysterese: ca. 50 mV
Measurement range	10 (three-step,1 mA/V – 30 nA/V)
ADC	12 Bit, max. 10 M Samples/s
Sampling rate	5 Ranges (10 M Samples/s – 1 k Sample/s)
Data logger	2 M Samples (4 MByte)
Range Specifications	TR-9600-1: 10 (2.000 mA to 3.000 nA) manual or autorange

Range nr.	Gain	Max. Range	Rise Time (10% – 90%)	Bandwidth
AR0	1 mA/V	± 2 mA	1 µs	333 kHz
AR1	300 µA/V	± 600 µA	1 µs	333 kHz
AR2	100 µA/V	± 200 µA	1 µs	333 kHz
AR3	30 µA/V	± 60 µA	1 µs	333 kHz
AR4	10 µA/V	± 20 µA	1 µs	333 kHz
AR5	3 µA/V	± 6 µA	1 µs	333 kHz
AR6	1 µA/V	± 2 µA	3 µs	111 kHz
AR7	300 nA/V	± 600 nA	3 µs	111 kHz
AR8	100 nA/V	± 200 nA	30 µs	11 kHz
AR9	30 nA/V	± 60 nA	30 µs	11 kHz

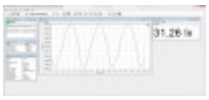
Version	TR-9600-1	1 µs version
	TR-9600-2	100 ns version

Miscellaneous	
Power Supply	(6 - 8) V / 1.2 A, DC power plug 5.5 mm / 2.5 mm / 10 mm AC/DC power supply (7V/1.5 A)
Temperature range	(5 – 40) °C
Interface	RS232 (75 - 57600Baud, 8 Data-Bit's, 1 Stop-Bit, no Parity) DSUB9-Socket: PIN 2: TxD PIN 3: RxD PIN 5: GND PIN 1,4,6 connected PIN 7,8 connected IEEE488 (488-1978, AH1, SH1, L4, T4)
Dimensions	w = 28,0 cm d = 25,2 cm h = 7,8 cm
Weight	2000 g (without battery)
Warranty	12 months
Humidity	<80%, non-condensing
Info	Regular recalibration of the current calibration is recommended. Especially when very small measurement currents have to be measured. In the case of very high humidity, fault currents of the radiometer are possible at low measuring currents and should be taken into account.

Configurable with

Product Name	Product Image	Description	Go to product
VL-3701		Detector head for the measurement of photopic illuminance in Lux [lx]	https://www.gigahertz-optik.com/en-us/product/vl-3701/
VL-3702		Detector head for the measurement of photopic illuminance in Lux [lx]. Class B, f1 ≤ 6 %	https://www.gigahertz-optik.com/en-us/product/vl-3702/
VL-3704		Detector head for the measurement of photopic illuminance in Lux [lx]	https://www.gigahertz-optik.com/en-us/product/vl-3704/
VL-3705		Detector head for the measurement of scotopic illuminance in Lux [lx]	https://www.gigahertz-optik.com/en-us/product/vl-3705/

Product Name	Product Image	Description	Go to product
PD-9310A		High sensitive detector head for the measurement of photopic illuminance in Lux [lx]. Features: f1 ≤ 3 %, 2.8nA/lx, 20mm diffuser, for the usage with optometers and amplifiers, calibration certificate	https://www.gigahertz-optik.com/en-us/product/pd-9310a/
PD-9310B		High sensitive detector head for the measurement of photopic illuminance in Lux [lx]. Features: f1 ≤ 6 %, 2.8nA/lx, 20mm diffuser, for the usage with optometers and amplifiers, calibration	https://www.gigahertz-optik.com/en-us/product/pd-9310b/
PD-9310B-N		Very high sensitive detector head for the measurement of photopic illuminance in Lux [lx]. Features: f1 ≤ 3 %, 28nA/lx, no diffuser, for the usage with optometers and amplifiers, calibration	https://www.gigahertz-optik.com/en-us/product/pd-9310b-n/
LP-9901		Detector head to measure Laser radiant power in W and Laser irradiance in W/m²	https://www.gigahertz-optik.com/en-us/product/lp-9901/
VL-3701 with SRT-M37-L		Detector head to measure the photopic illuminance in lx and the luminance in cd/m²	https://www.gigahertz-optik.com/en-us/product/vl-3701 with srt-m37-l/
LDM-9810		Detector head to measure the photopic spot luminance in cd/m². Features: selectable 20', 1° and 6° viewing angles, view finder, focus able achromatic lens, for the usage with Optometers and amplifiers, calibration certificate.	https://www.gigahertz-optik.com/en-us/product/ldm-9810/
VL-1101		Photometric detector head with VL-11 mount. Features: modular detector for use with integrating spheres, front lenses etc. For use with optometers and signal amplifiers	https://www.gigahertz-optik.com/en-us/product/vl-1101/
LDM-9901		Detector head to measure the photopic spot luminance in cd/m²	https://www.gigahertz-optik.com/en-us/product/ldm-9901/
S-SDK-TR9600		Software Development Kit for TR9600 variants.	https://www.gigahertz-optik.com/en-us/product/s-sdk-tr9600/

Product Name	Product Image	Description	Go to product
S-TR9600		Application software for the TR9600 variants.	https://www.gigahertz-optik.com/en-us/product/s-tr9600/
ISD-0.8-SiLP		Integrating sphere detector with short rise time for Laser power in W	https://www.gigahertz-optik.com/en-us/product/isd-0.8-silp/
VL-1101 + UMPA-0.5-11-RD Detector head		Module detector head for the measurement of photopic illuminance in Lux [lx]. Features: UMPA adapter for usage with integrating spheres, for the usage with optometers and amplifiers, calibration certificate	https://www.gigahertz-optik.com/en-us/product/vl-1101uumpa-05-11-rd/
ISD-5-VL		Integrating sphere detector for luminous flux (lm) of 2π spot sources	https://www.gigahertz-optik.com/en-us/product/isd-5-vl/
ISD-10-VL		Integrating sphere detector for luminous flux (lm) of 2π spot sources	https://www.gigahertz-optik.com/en-us/product/isd-10-vl/
ISD-15P-VL		Integrating sphere detector for luminous flux (lm) of 2π sources	https://www.gigahertz-optik.com/en-us/product/isd-15p-vl/
TD-11VL01		Photometric, temperature stabilized detector with DP-11 mount	https://www.gigahertz-optik.com/en-us/product/td-11vl01/
RW-3701		Detector head for the measurement of irradiance in W/m²	https://www.gigahertz-optik.com/en-us/product/rw-3701/
RW-3702		Detector head for the measurement of irradiance in W/m²	https://www.gigahertz-optik.com/en-us/product/rw-3702/
RW-3703		Detector head for the measurement of irradiance in W/m²	https://www.gigahertz-optik.com/en-us/product/rw-3703/

Product Name	Product Image	Description	Go to product
RW-3704		Detector head for the measurement of irradiance in W/m²	https://www.gigahertz-optik.com/en-us/product/rw-3704/
RW-3705		Detector head for the measurement of irradiance in W/m²	https://www.gigahertz-optik.com/en-us/product/rw-3705/
RW-3708		Detector head for the measurement of irradiance in W/m²	https://www.gigahertz-optik.com/en-us/product/rw-3708/
UV-3701		Detector head for the measurement of irradiance of UV radiation in W/m². Features: spectral responsivity from 315-400 nm (UV-A), cosine field-of-view, for the usage with optometers and amplifiers, calibration certificate.	https://www.gigahertz-optik.com/en-us/product/uv-3701/
UV-3702		Detector head for the measurement of irradiance of UV radiation in W/m². Features: spectral responsivity from 280-315 nm (UV-B), cosine field-of-view, for the usage with optometers and amplifiers, calibration certificate.	https://www.gigahertz-optik.com/en-us/product/uv-3702/
UV-3703		Detector head for the measurement of irradiance of UV radiation in W/m². Features: spectral responsivity from 200/250-280 nm (UV-C), cosine field-of-view, for the usage with optometers and amplifiers, calibration certificate.	https://www.gigahertz-optik.com/en-us/product/uv-3703/
UV-3710		Detector head for the measurement of irradiance of UV radiation in W/m². Features: spectral responsivity from 320-400 nm (UV-A), cosine field-of-view, for the usage with optometers and amplifiers, calibration certificate.	https://www.gigahertz-optik.com/en-us/product/uv-3710/
UV-3711		Detector head for the measurement of irradiance of UV radiation in W/m². Features: spectral responsivity from 280-320 nm (UV-B), cosine field-of-view, for the usage with optometers and amplifiers, calibration certificate.	https://www.gigahertz-optik.com/en-us/product/uv-3711/
UV-3716		Detector head for the measurement of irradiance of UV radiation in W/m². Features: spectral responsivity from 305-400nm (UV-A), cosine field-of-view, for the usage with optometers and amplifiers, calibration certificate.	https://www.gigahertz-optik.com/en-us/product/uv-3716/
UV-3717		Detector head for the measurement of irradiance of UV radiation in W/m²	https://www.gigahertz-optik.com/en-us/product/uv-3717/
UV-3719		Detector head for the measurement of irradiance of UV radiation in W/m². Features: spectral responsivity from 250-400 nm (UV), cosine field-of-view, for the usage with optometers and amplifiers, calibration certificate.	https://www.gigahertz-optik.com/en-us/product/uv-3719/

Product Name	Product Image	Description	Go to product
UV-3720		Detector head for the measurement of irradiance of UV radiation in W/m². Features: spectral responsivity from 240-320nm (UV), cosine field-of-view, for the usage with optometers and amplifiers, calibration certificate.	https://www.gigahertz-optik.com/en-us/product/uv-3720/
UV-3721		Detector head for the measurement of irradiance of UV radiation in W/m². Features: spectral responsivity from 350-400nm (UV-A), cosine field-of-view, for the usage with optometers and amplifiers, calibration certificate.	https://www.gigahertz-optik.com/en-us/product/uv-3721/
UV-3718		Detector head for the measurement of high irradiance of UV-C 254 nm radiation in W/m²	https://www.gigahertz-optik.com/en-us/product/uv-3718/
ISD-5-VISNIR		Integrating sphere detector for radiant power in W of 2π sources	https://www.gigahertz-optik.com/en-us/product/isd-5-visnir/
ISD-3P-Si		Integrating sphere detector for Laser power in W	https://www.gigahertz-optik.com/en-us/product/isd-3p-si/
UV-3706		Detector head to measure irradiance W/m² in Bilirubin phototherapy. Features: Bilirubin actinic responsivity, cosine field-of-view, for usewith optometers, calibration certificate.	https://www.gigahertz-optik.com/en-us/product/uv-3706/
UV-3709		Detector for Blue-light hazard measurements. Features: Single-cell detector, BLH actinic irradiance, for the use with optometer, calibration certificate	https://www.gigahertz-optik.com/en-us/product/uv-3709/
ISD-3P-IGA		Integrating sphere detector with InGaAs photodiode and 30 mm sphere for Laser power in W.	https://www.gigahertz-optik.com/en-us/product/isd-3p-iga-2/
UV-37 with SRT-M37-L-UV		Detector heads to measure the UV irradiance in W/m² and the UV-radiance in W/(m²sr)	https://www.gigahertz-optik.com/en-us/product/uv-37usrt-m37-l-uv/
UV-3725		Detector for the measurement of UV-C 254 nm irradiance in air disinfection applications	https://www.gigahertz-optik.com/en-us/product/uv-3725/
UV-3711-308		Detector head for the measurement of irradiance of 308 nm Eximer Lasers in W/m². Features: flat spectral responsivity besite 308 nm. cosine field-of-view, dose measurement in conjuntion with P-9710 optometer, calibration certificate	https://www.gigahertz-optik.com/en-us/product/uv-3711-2/

Product Name	Product Image	Description	Go to product
RCH-102		Detector head for high intensity irradiation in UVA and blue light curing processes with rigid fiber	https://www.gigahertz-optik.com/en-us/product/rch-1/

Purchasing information

Article-Nr	Modell	Description
Product		
15295243	TR-9600-1	Meter, with power supply, software and manual
15295277	TR-9600-2	Meter, with power supply software and manual
Options		
-	Light Detectors	Please check the light detector datasheets or the tab configurable with for specification and purchasing information
Software		
15298648	S-SDK-TR9600	Software Development Kit for the implementation of the TR9600 or variants into custom made software
15298646	S-TR9600	User software for TR9600 and variants.
Accessories		
15295220	BHO-02	Hard case for meter and accessories

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- After-Sales Support
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- Repairs & Updates
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Send us your inquiry or contact us by phone or e-mail. We would welcome your feedback too or review us on Google.

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