

## TL-1000

timing stabilization units



### Overview

GIGAOPTICS offers the timing stabilization units TL-1000 and TL-1000-ASOPS as accessories to the GIGAJET SERIES high-speed femtosecond oscillators. TL-1000 allows to tightly phase-lock the oscillator repetition rate to an external reference, a synthesizer or another modelocked laser, with a residual timing jitter below 100 fs. TL-1000-ASOPS enables a repetition rate offset-lock between two femtosecond oscillators (e.g. contained in a GIGAJET TWIN) at a repetition rate difference between 2 kHz and 20 kHz. System parameters are accessible via touchscreen and USB port.

### Applications

Repetition rate stabilization is essential for applications requiring a well-defined timing relation between a femtosecond oscillator and a reference signal. Such applications are for example two-color pump-probe spectroscopy using two synchronized modelocked lasers, optical experiments synchronized to a pulsed electron source, or highspeed asynchronous optical sampling (ASOPS) experiments. ASOPS is an ultra-rapid and precise time-domain spectroscopy technique pioneered by Gigaoptics out-performing classical approaches by orders of magnitude in measurement speed and noise performance.

TL-1000 and TL-1000-ASOPS are specifically designed to serve these applications. Repetition rate fluctuations of a free-running oscillator are efficiently suppressed with a residual timing jitter below 100 fs. TL-1000-ASOPS permits high-speed ASOPS based ultrafast time-domain spectroscopy using two femtosecond oscillators with better than 60 fs time-delay resolution.

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### Optional Features

**Low timing jitter option** - This option is available for the TL-1000 timing stabilization unit to suppress timing jitter to typically below 10 fs (0.1 Hz to 100 kHz). A suitable 10 GHz reference synthesizer must be provided by the customer. Stabilization is performed at higher repetition rate harmonic.

**ASOPS experiment support** - TL-1000-ASOPS is capable of driving and monitoring a PRI30 photoreceiver, an OT-1000 two-photon detector for optical trigger generation, and a Tera-SED THz emitter element via its umbilical port. This feature is beneficial for high-speed ASOPS experiments.



TL-1000-ASOPS control unit.

### Specifications

#### TL-1000

repetition rate range	0.333 to 1.0 GHz
timing jitter	$\leq 100$ fs (0.1 Hz to 100 kHz) <sup>*1,*2</sup>
power requirement	110/220 VAC (60/50 Hz)

#### TL-1000-ASOPS option

repetition rate <sup>*3</sup>	332 - 334 MHz 498 - 502 MHz 0.996 - 1.004 GHz
repetition rate offset	2 - 20 kHz
time-resolution in high-speed ASOPS	<60 fs
trigger signal	TTL level at offset frequency, $\leq 10$ ns rise time
power requirement	110/220 VAC (60/50 Hz)

<sup>\*1</sup>relative to customer provided reference signal at +7 dBm, 50 Ohm with <-125 dBc/Hz phase-noise above 10 kHz offset from carrier

<sup>\*2</sup>if used with a femtosecond oscillator of the GIGAJET series and suitable built-in piezo-backed cavity mirror(s)

<sup>\*3</sup>range must be selected upon order

### contact information

GIGAOPTICS GmbH  
Blarerstraße 56

D-78462 Konstanz | Germany  
phone +49 7531 368371  
fax +49 7531 368372  
e-mail: info@gigaoptics.com  
www.gigaoptics.com

Japan Electronics Optics Research, Ltd.  
www.eor.jp

JTEKK, Ltd.  
www.j-tekk.co.jp

Korea Jinsung Laser  
www.jinsunglaser.com