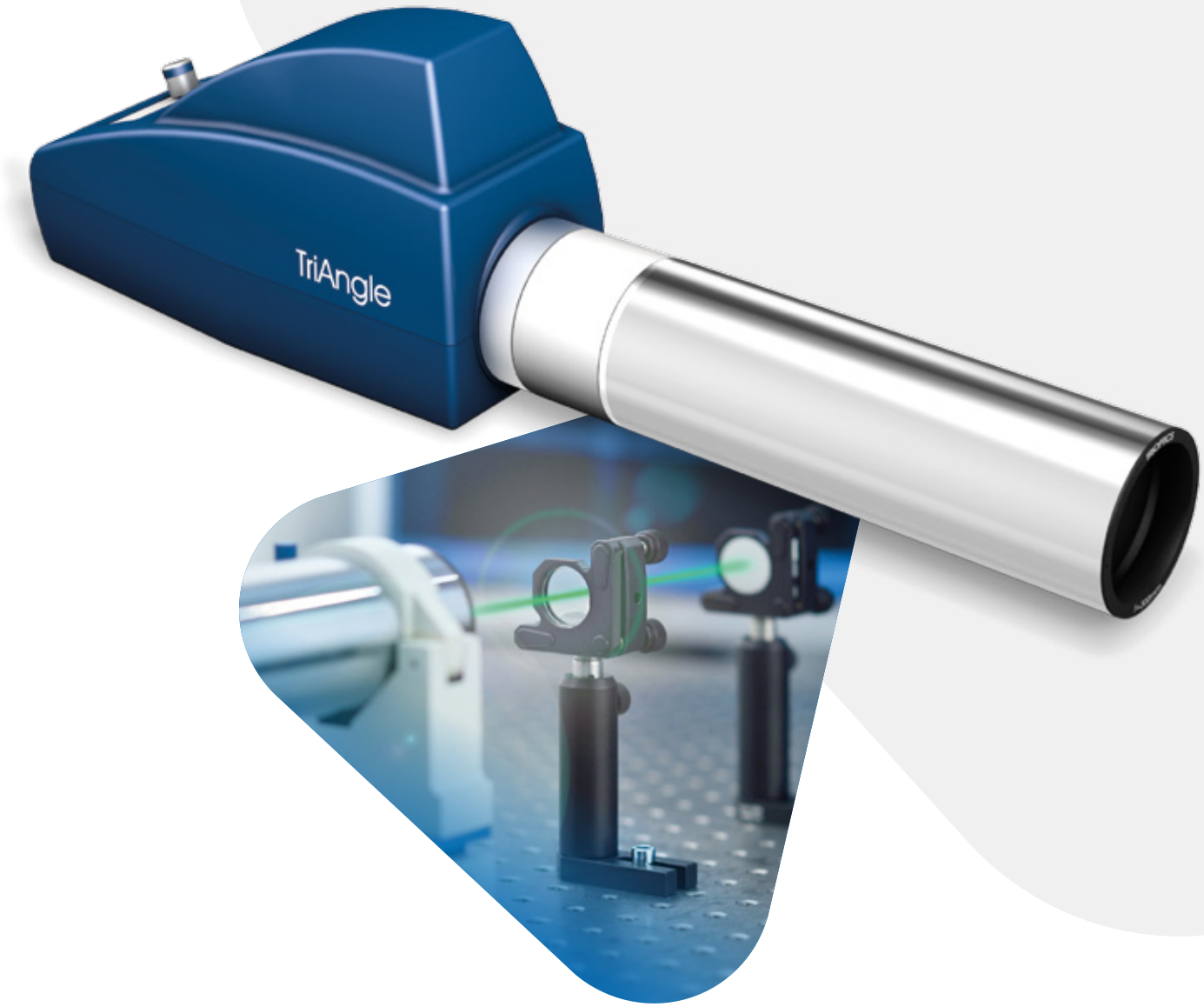
TRIOPTICS

See the Difference.

TriAngle

Electronic Autocollimator for
Precise Angle Measurement



LEADING TO THE FUTURE OF OPTICS

Optical systems have changed the world.
And they will continue to do so.

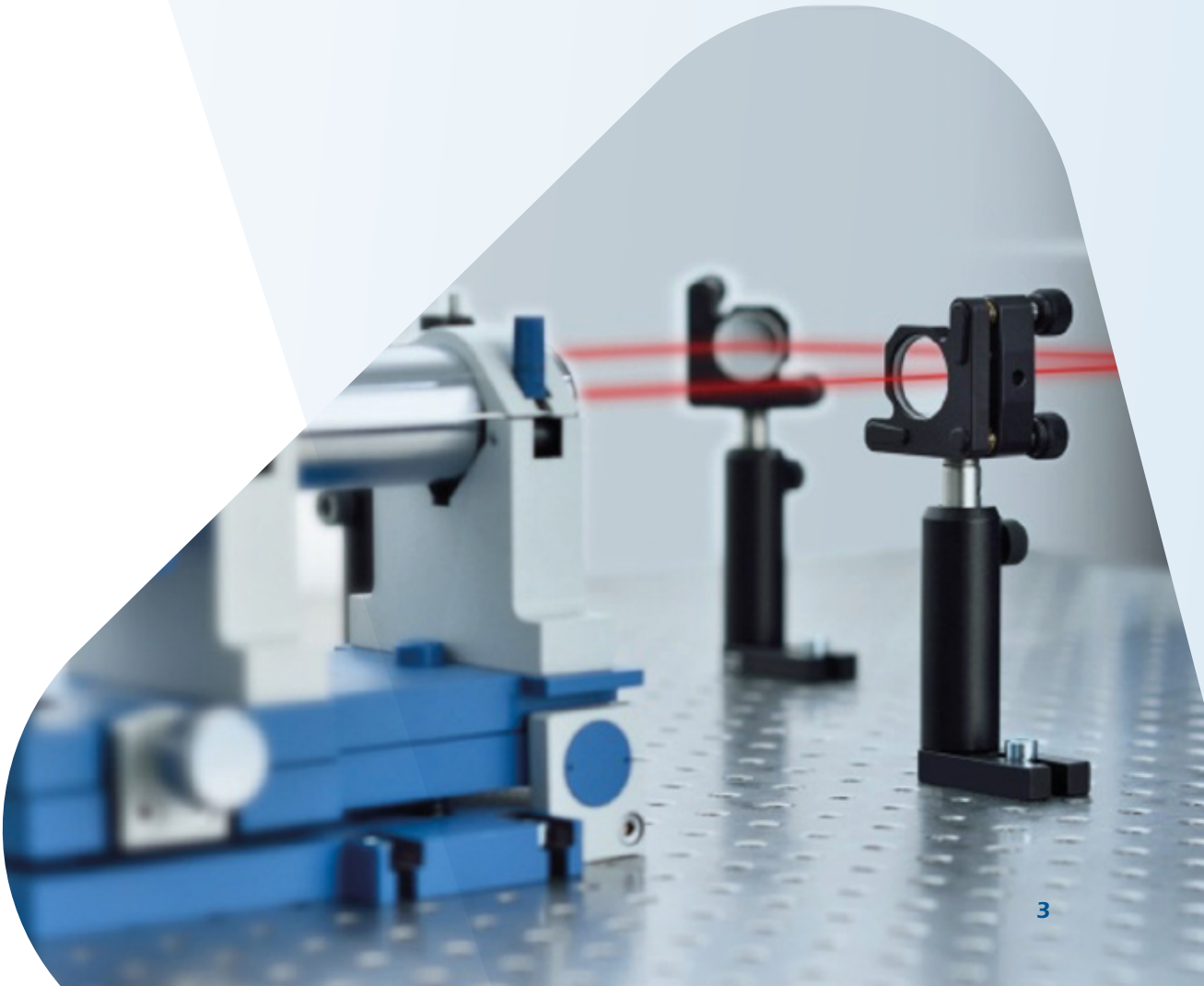
TRIOPTICS is significantly involved in this process.
We see ourselves as a solution provider for optical measurement and manufacturing systems and offer our customers the right system for their current and future applications.

www.trioptics.com



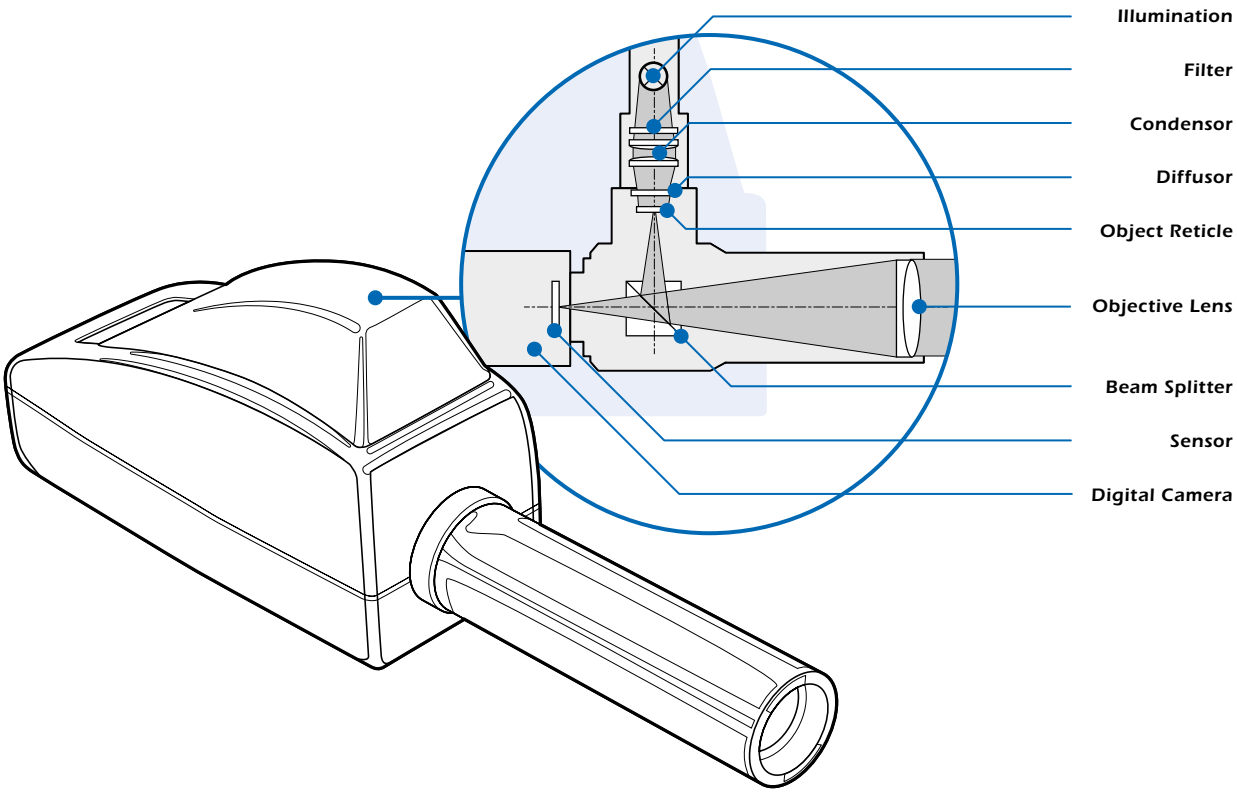
Key Features
TriAngle Electronic Autocollimators

- Electronic Autocollimators for Optical Angle Measurement
- Measurement of angular displacements with highest accuracy
- Wide range of application specific variants with a modular design
- Effective focal lengths from 100 – 1000 mm
- Different sensors, reticles and light sources available
- Accuracy performance up to 0.05 arcseconds
- OptiAngle Software package for angle measurements



Principle of an Electronic Autocollimator

The autocollimator combines both optical tools, the collimator and the telescope into one instrument using a single objective lens. Both beam paths are seperated by using a beam splitter. The autocollimator is a very sensitive angle measuring device and is thus used for the precise angular adjustment of optical or machine components. Due to the collimated beam (infinity adjustment) the measurement results are independent from the distance to the object under test.

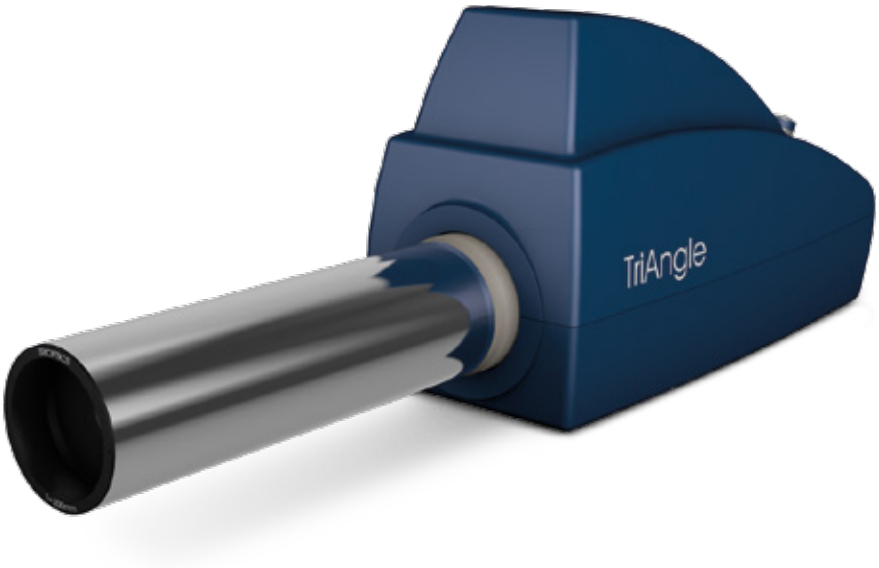


In an electronic autocollimator the eyepiece is replaced by an electronic camera with discrete sensor pixels (e.g. CCD or CMOS sensor type). It can be of a 2D frame type allowing angular measurements in two directions, or a 1D line scan sensor for single axis measurements. The digital camera is usually connected to a PC which calculates the measured angle from the image by using image analysis software. The high resolution of electronic autocollimators is due to the evaluation of gray scale levels in the image which allows for sub pixel interpolation of the image position. Depending on the focal length of the objective lens and the stability of the setup, angular resolutions of 1/100 up to 1/1000 arcsecs can be achieved.

TriAngle Electronic Autocollimator

The TriAngle electronic autocollimators are non-contact optical test tools for the high-precision measurement of angular displacements of specular reflective surfaces and the accurate angular alignment of optical or mechanical parts.

TriAngle autocollimators have a versatile modular design which allows them to be fitted with a wide selection of objective tubes, different sensors, reticles and light sources. With objective tubes of different focal lengths and apertures, the optimum measurement solution regarding angle resolution and measurement range is easily found.



TriAngle autocollimators are available in different application-specific variants:



TriAngle



TriAngle UltraSpec



TriAngle Focus



TriAngle HighSpeed



TriAngle NIR



TriAngle UV



TriAngle Laser



TriAngle Large Field

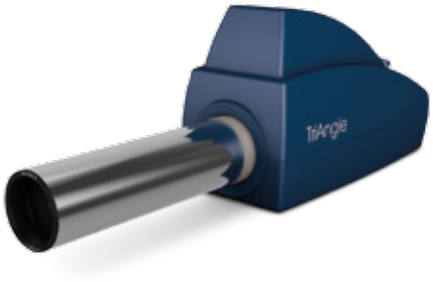


TriAngle Vacuum

Productgroup overview

TriAngle

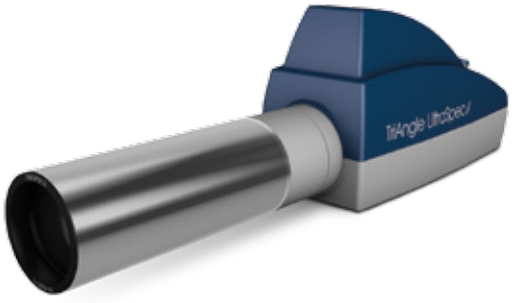
The standard instrument offering a maximum set of measurement functions.



- LED light source of 525 nm
- High resolution camera
- Focal lengths ranging from 100 mm to 1000 mm
- Accuracy performance of up to 0.2 arcsec

TriAngle UltraSpec

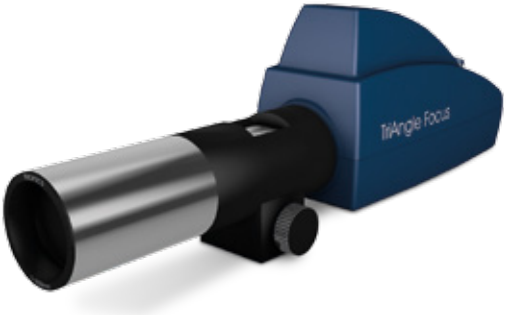
For highest demands on angle resolution and measurement accuracy.



- LED light source of 525 nm
- High resolution camera with extremely low sensor noise
- Objective lens of minimum distortion
- Thermally and mechanically optimized design
- Focal lengths 300 mm or 500 mm
- Accuracy performance of up to 0.05 arcsec
- Calibrated with PTB angle standards

TriAngle Focus

For the measurement of slightly spherical surfaces.

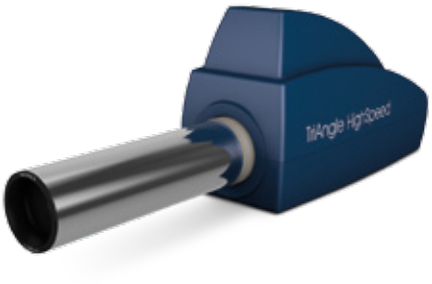


- LED light source of 525 nm
- Focusing objective tubes
- Focal lengths ranging from 100 mm to 1000 mm
- Accuracy performance of up to 0.2 arcsec (higher resolution on demand)

TriAngle HighSpeed

Ideal for vibration measurements or rapidly moving samples.

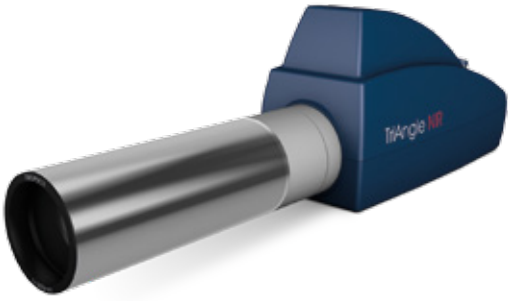
- Laser illumination of 635 nm allows the measurement of very small and low reflective surfaces
- High bandwith position-sensitive photo detector for angle measurement rates up to 10 kHz
- The position sensitive detector emits almost no heat
- Focal lengths ranging from 100 mm to 1000 mm



TriAngle NIR

For applications that require measurement at the design wavelengths in the NIR.

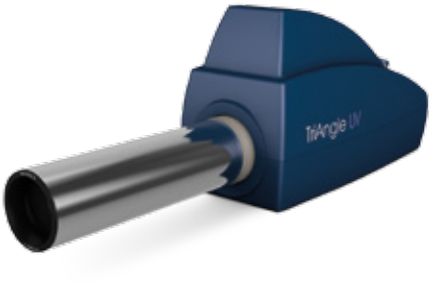
- Light source with 1064 nm (other wavelengths available on request)
- Focal lengths ranging from 100 mm to 1000 mm
- Accuracy performance of up to 0.2 arcsec



TriAngle UV

For applications that require measurement at the design wavelengths in the UV.

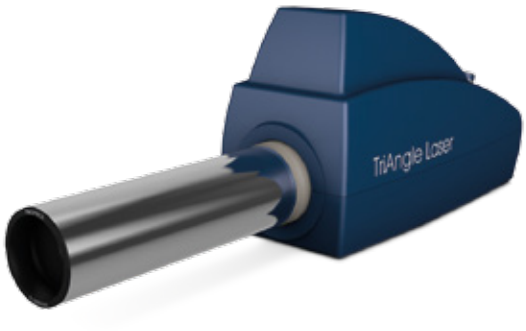
- Light source with 365 nm (other wavelengths available on request)
- Focal lengths ranging from 100 mm to 1000 mm
- Accuracy performance of up to 0.2 arcsec



TriAngle Laser

Ideal for the measurement of small optical components, surfaces of low reflectivity or long distance measurements.

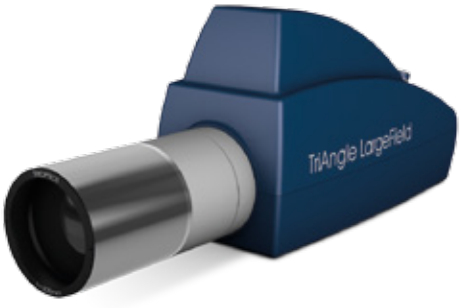
- Laser illumination with wavelengths of 635 nm
- Focal lengths ranging from 100 mm to 1000 mm
- Accuracy performance of up to 0.25 arcsec



TriAngle Large Field

For applications requiring a large measuring range without compromising the measurement accuracy and resolution.

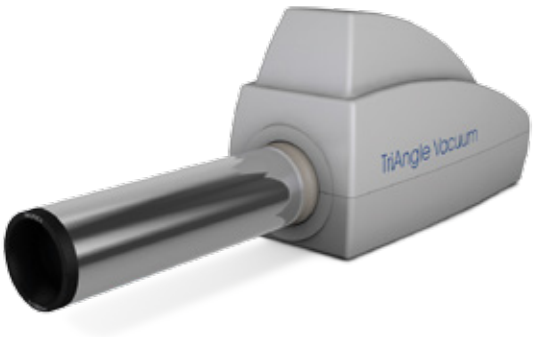
- LED light source of 525 nm
- Specially calibrated large field sensor and optimized imaging optics
- Available with a focal range of 100 mm
- Accuracy +/- 1" within 80 % measuring range



TriAngle Vacuum

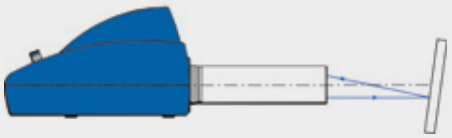
The right choice for special applications in space science and high-energy physics.

- Vaccuum compatible from rough to high vacuum

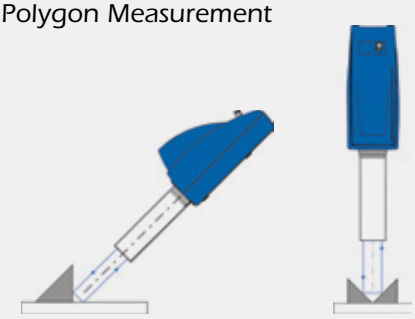


Typical TriAngle Application

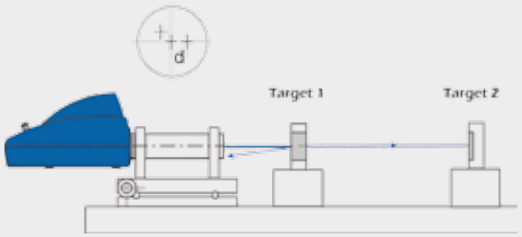
Tilt Angle Measurement



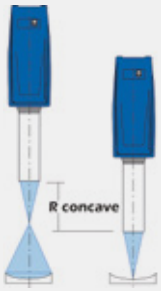
Prism & Polygon Measurement



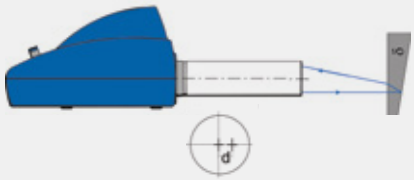
Alignment of Optical Components



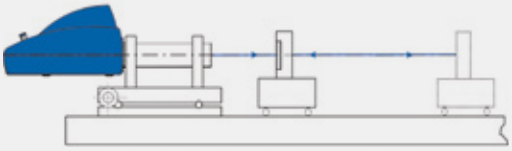
Measurement of
Slightly Curved Surfaces



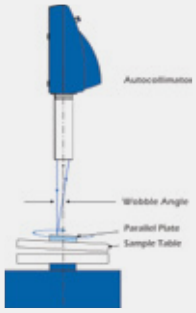
Wedge Angle Measurement
in Reflection / Double Pass



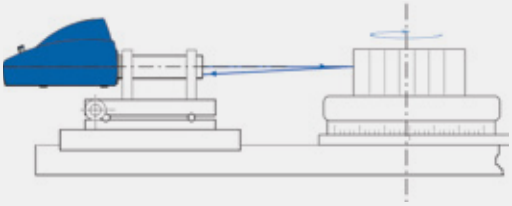
Measurement of
Flatness / Straightness / Parallelism



Wobble & Vibration
Measurement



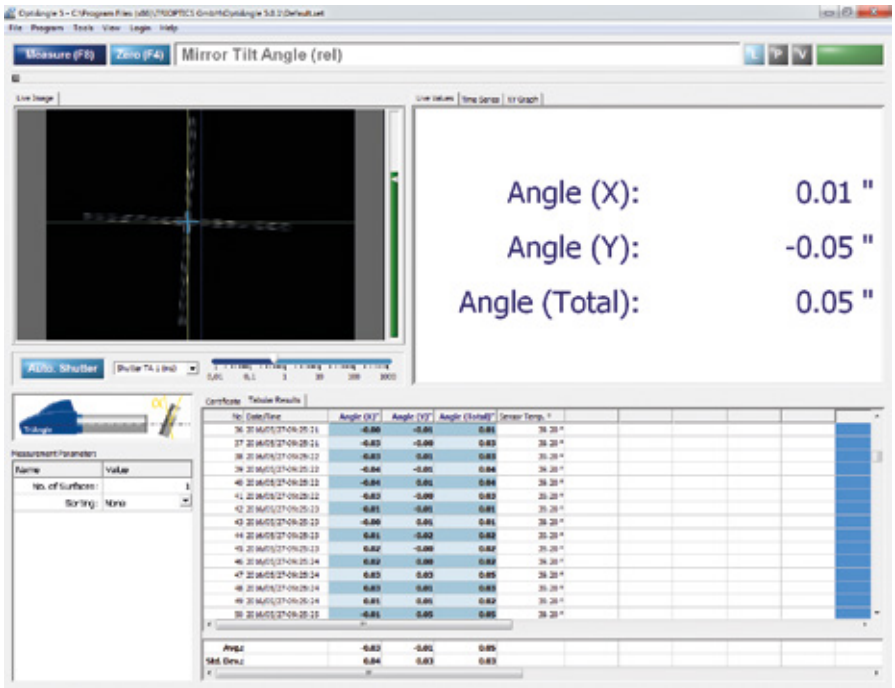
Rotary Table Calibration



Software

OptiAngle®: The Complete Software Package for Angle Measurement

The OptiAngle® software is a powerful tool covering all aspects of accurate angle measurement with the TriAngle electronic autocollimators in terms of measurement, control and analysis of the angular data. The well organized and modern menuguided user interface assists even the inexperienced operator to perform accurate measurements and to obtain repeatable results. A large set of predefined standard measurement applications is integrated into OptiAngle which cover all established measurement techniques in optical and mechanical industry. In addition, customized measurement routines can be easily developed and embedded either by TRIOPTICS or the experienced end user. All OptiAngle® measurement functions can be further used in other common applications like Lab-View or Visual Basic (Excel).

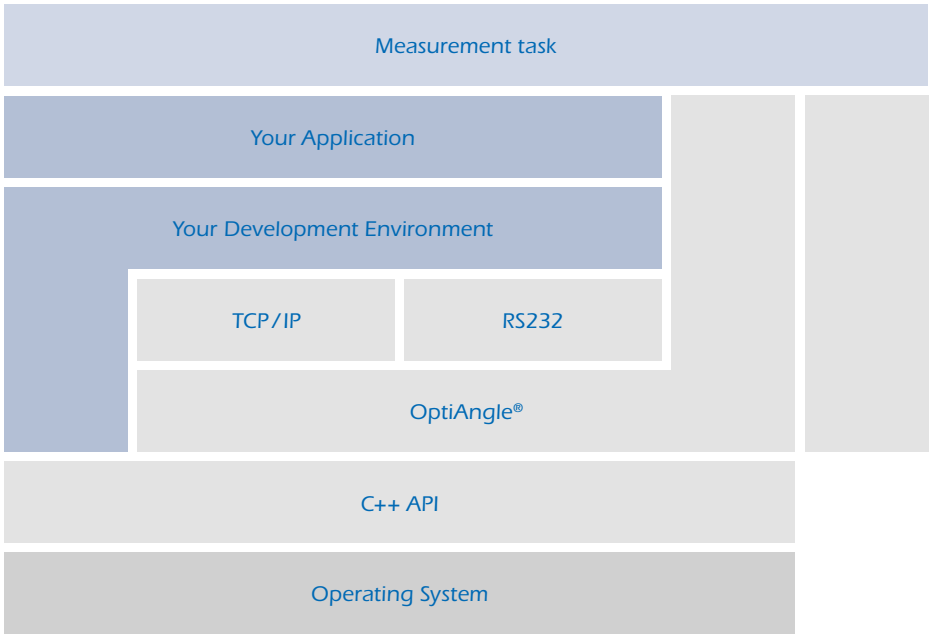


OptiAngle® software for electronic autocollimators

Software Features and Functions

The TriAngle software provides many features to simplify the daily use of TriAngle autocollimators whether in the laboratory or in the production environment.

- Real-time camera display
- Numerical and graphical display of measurement data
- Optional full screen camera window (visual alignment mode)
- User defined graphical scales or indicators inside the camera window
- Simultaneous measurement with multiple (up to 12) autocollimators
- Simultaneous measurement of multiple surface reflections (up to 12)
- Comprehensive data reporting functions
- ASCII (CSV) data export
- Selectable angle units for screen display and measurement certificate
- Software remote control by host computer via RS232 interface and TCP/IP
- Plug-in mechanism for customized measurement programs
- User defined measurement certificate layout
- Demo programming examples for Excel, LabView, VBA
- Multiple camera interface technology for USB, IEEE 1394 (Firewire), Gigabit Ethernet, CameraLink or Analog Video Camera
- Production mode for batch/lot sample identification and result reporting



TriAngle modular software concept

Accessories

In addition to the TriAngle electronic autocollimator series, TRIOPTICS offers a large range of opto-mechanical accessories, often required for certain standard applications.

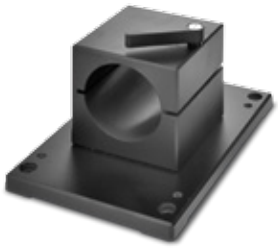
Holders

Clamp Fixture

Adjustable Holders

Stands

- Manual Stand
- 2-axes vertical mount D38, D57
- Fixture for wedge measurement
- Tripod



Clamp fixture



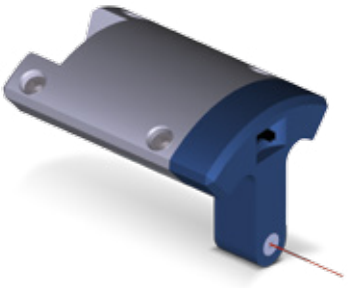
Adjustable holder

Alignment Tools

Laser Prealignment Tool

View Finder Prism

- View Finder Prism

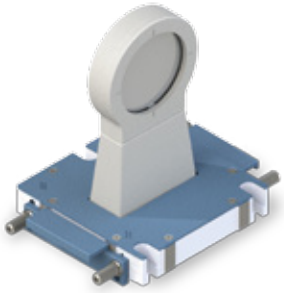


Laser PreAlignment Tool

Mirrors

Mirrors

- Mirror in mount
- Adjustable mirrors



Mirror in mount

Redirecting Mirrors

- 45° redirecting mirror for D38, D57, D115
- Penta Prism



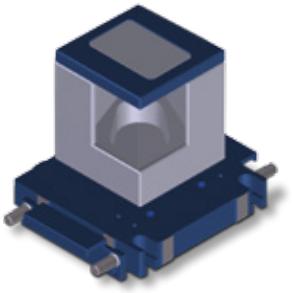
Redirecting mirror

Calibration Tools

90° Reference Prism in Mount

Polygons

- Polygon 12 sides in holder



Penta Prism in holder

Calibration Wedges



Polygon

Product overview TriAngle

	Effective Focal length	Clear Aperture	Accuracy	Field of View		Measurement Frequency	
Product	mm	mm	arc sec	arc sec		Hz	
TriAngle TA				USB 3.0	Firewire	USB 3.0	Firewire
TA 100-38	100	26	2.5	6170x4940	6600x4900	30 Hz (up to 50 Hz depending on the setting)	30 Hz (up to 60 Hz depending on the setting)
TA 150-38	150	30	1.7	4120x3300	4400x3250		
TA 200-38	200	30	1.3	3090x2470	3300x2450		
TA 300-38	300	30	0.75	2060x1650	2200x1600		
TA 300-57	300	50	0.75	2060x1650	2200x1600		
TA 500-57	500	50	0.4	1240x980	1300x950		
TA 1000-115	1000	100	0.2	610x 490	650x480		
TA 1000-140	1000	125	0.2	610x490	650x480		
TriAngle Focus				USB 3.0	Firewire	USB 3.0	Firewire
TA F 100-38 +/-10	100	26	2.5	6170x4940	6600x4900	30 Hz (up to 50 Hz depending on the setting)	30 Hz (up to 60 Hz depending on the setting)
TA F 150-38 +/-10	150	30	1.7	4120x3300	4400x3250		
TA F 200-38 +/-10	200	30	1.3	3090x2470	3300x2450		
TA F 300-57 +/-25	300	50	0.75	2060x1650	2200x1600		
TA F 500-57 +/-25	500	50	0.75	1240x980	1300x950		
TA F 1000-115 +/-50	1000	100	0.4	610x490	650x480		
TA F 1000-140 +/-50	1000	125	0.2	610x490	650x480		
TriAngle UltraSpec				USB 3.0	Firewire	USB 3.0	Firewire
TA US 300-57	300	45	+/- 0.05 over total range of 10 arc sec	3000x1920	3010x2230	>15 Hz	>15 Hz
TA US 500-57	500	45		1800x1150	1800x1340		
TriAngle Large Field						USB 3.0	Firewire
TA LF 100-38	100	26	1.0	3°x3°		>10 Hz	>10 Hz
TriAngle TA, Focus, UltraSpec, LargeField – Illumination: high power LED at 525 nm						(High Speed camera with 120 Hz measuring rate available with different values for field of view and accuracy)	

TriAngle Laser				USB 3.0	Firewire	USB 3.0	Firewire
TA L 100-38	100	26	2.5	6170x4940	6600x4900	30 Hz (up to 50 Hz depending on the setting)	30 Hz (up to 60 Hz depending on the setting)
TA L 150-38	150	30	1.7	4120x3300	4400x3250		
TA L 200-38	200	30	1.20	3090x2470	3300x2450		
TA L 300-38	300	30	0.80	2060x1650	2200x1600		
TA L 300-57	300	50	0.80	2060x1650	2200x1600		
TA L 500-57	500	50	0.50	1240x980	1300x950		
TA L 1000-115	1000	100	0.25	610x 490	650x480		
TA L 1000-140	1000	125	0.25	610x490	650x480		
Illumination: Laser diode at 635 nm						(High Speed camera with 120 Hz measuring rate available with different values for field of view and accuracy)	

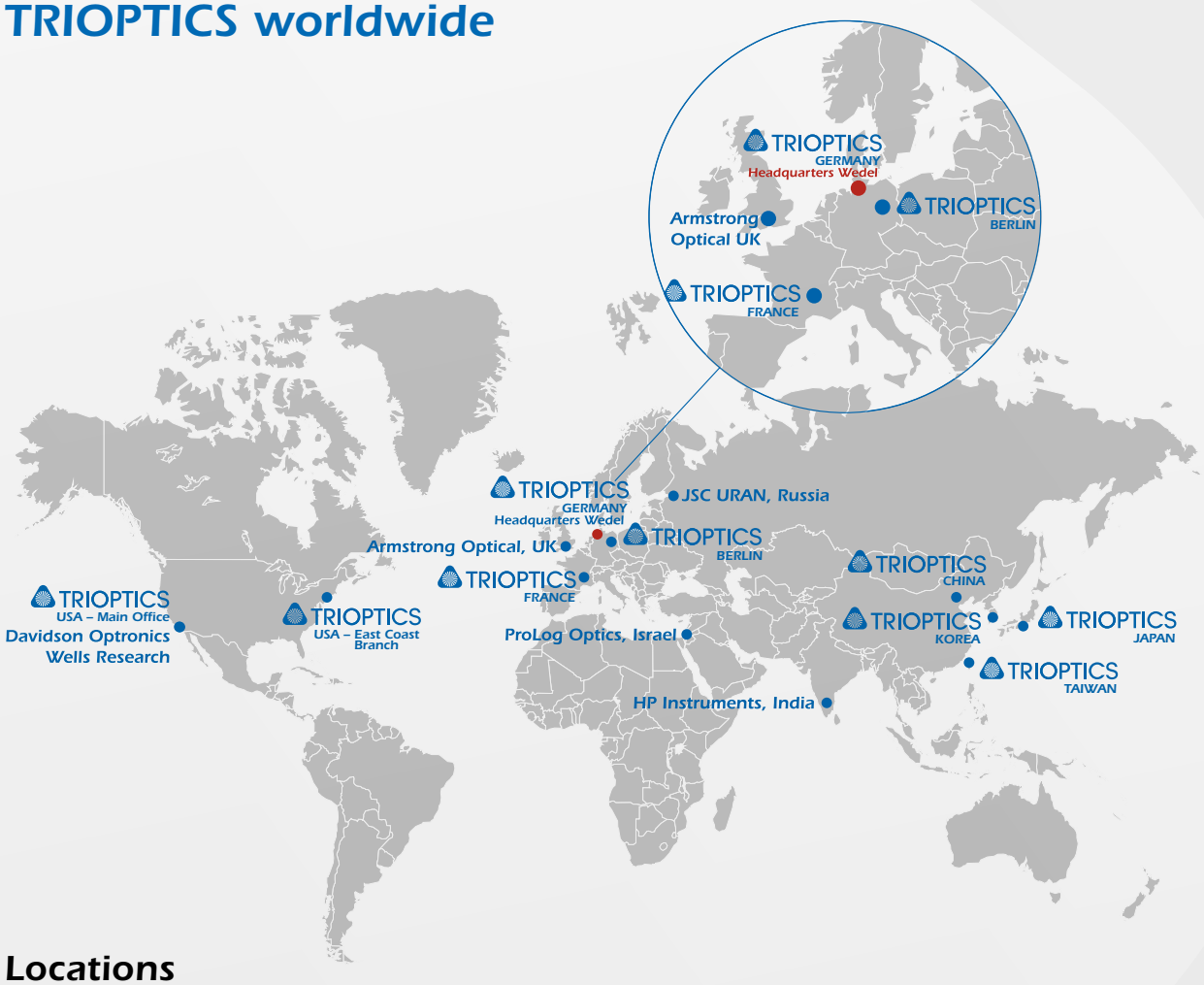
	Effective Focal length	Clear Aperture	Accuracy	Field of View	Measurement Frequency
Product	mm	mm	arc sec	arc sec	Hz
TriAngle High Speed				USB 2.0	
TA HS 100-38	100	26	+/- 0.8% (within 80% field of view)	4000x4000	10 KHz
TA HS 150-38	150	30		2650x2650	
TA HS 200-38	200	30		2000x2000	
TA HS 300-38	300	30		1300x1300	
TA HS 300-57	300	50		1300x1300	
TA HS 500-57	500	50		800x800	
TA HS 1000-115	1000	100		400x400	
TA HS 1000-140	1000	125		400x400	
Illumination: Laser diode at 635 nm					

TriAngle UV						
TA 300-57 UV	300	50	0.75	2200x1600		30 Hz
Illumination: high power LED at 365 nm					(High Speed camera with 120 Hz measuring rate available with different values for field of view and accuracy)	

TriAngle NIR				USB 3.0	Firewire	USB 3.0	Firewire
TA NIR 100-38	100	26	2.5	6170x4940	6600x4900	30 Hz (up to 50 Hz depending on the setting)	30 Hz (up to 60 Hz depending on the setting)
TA NIR 150-38	150	30	1.7	4120x3300	4400x3250		
TA NIR 200-38	200	30	1.3	3090x2470	3300x2450		
TA NIR 300-38	300	30	0.75	2060x1650	2200x1600		
TA NIR 300-57	300	50	0.75	2060x1650	2200x1600		
TA NIR 500-57	500	50	0.4	1240x980	1300x950		
TA NIR 1000-115	1000	100	0.2	610x 490	650x480		
TA NIR 1000-140	1000	125	0.2	610x490	650x480		
Illumination: high power LED at 780-1064 nm						(High Speed camera with 120 Hz measuring rate available with different values for field of view and accuracy)	

93-015-100EN Version2

TRIOPTICS worldwide



Locations

Germany

TRIOPTICS GmbH
Hafenstrasse 35-39
22880 Wedel
Tel.: +49 4103 18006 0
sales@trioptics.com
www.trioptics.com

TRIOPTICS Berlin GmbH
Tel.: +49 30 6392 3456
support@trioptics-berlin.com
www.trioptics.com

USA

TRIOPTICS, Inc.
Tel.: +1 626 962 5181
sales@trioptics-usa.com
www.trioptics-usa.com

Japan

TRIOPTICS Japan Co., Ltd.
Tel.: +81 54 203 4555
info@trioptics.jp
www.trioptics.jp

France

TRIOPTICS France
Tel.: +33 4 72 44 02 03
info@trioptics.com
www.trioptics.com

Taiwan

TRIOPTICS Taiwan Ltd.
Tel.: +886 3 4620405
info@trioptics.tw
www.trioptics.com.tw

China

TRIOPTICS China
Tel.: +86 010 84566186
info@trioptics-china.com
www.trioptics-china.com

India

HP Instruments
Tel.: +91 80 25521990
hpi@airtelmail.in
www.hpinstruments.com

Israel

Prolog Optics Ltd.
Tel.: +972 3536 4011
info@prologltd.com
www.prologoptics.com

Korea

TRIOTPICS Korea Co., Ltd.
Tel.: +82 31 695 7450
info@trioptics.co.kr
www.trioptics.co.kr

Russia

JSC URAN
Tel.: +7 812 335 0975
info@uran-spb.ru
www.uran-spb.ru

UK

Armstrong Optical Ltd
Tel.: +44 1604 654220
info@armstrongoptical.co.uk
www.armstrongoptical.co.uk