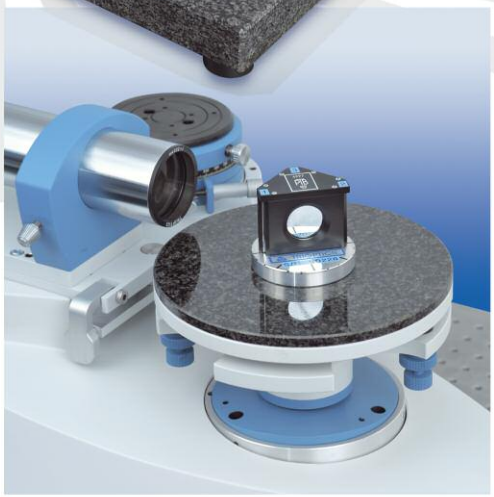
TRIOPTICS

TRIOPTICS GMBH · OPTICAL TEST EQUIPMENT

PrismMaster®

Ultra Accurate and Fully Automated Prisms and Polygons Measurement



PrismMaster

Absolut Line

Compact Line

Comparison Line

PrismMaster®

Precision Goniometer for Angular Measurements of Optical Prisms and Polygons

For years, the PrismMaster® Series has been one of the most accurate and versatile product lines on the market dedicated to angular measurements of prisms, polygons, and many other optical components.

This innovative concept is based on our firm belief that angular measurements of prisms, wedge plates, and polygons can be much simpler and more efficient and that the potential for significant improvements in the measurement accuracy is far from being exhausted.

Already in 1997, TRIOPTICS replaced visual measurement with more objective and precise electronic measurement for the first time in the optical industry. Therefore, the visual autocollimators were replaced with electronic autocollimators in all PrismMaster® instruments.

Another highlight of the concept was simple, like any great innovation: the classical, but complicated rotation of the measuring head, tiresome and difficult for the operator, was eliminated. It was an obvious and simple idea to replace it by the rotation of the sample table which can be easily automated using a motorized drive and appropriate software.

The advantages of the new concept in terms of accuracy and handling quickly convinced our customers:

- Significant increase in measurement accuracy due to the use of electronic autocolli mators
- Elimination of subjective operator error during the the visual adjustment of the test sample
- Very short measurement times and simple operation (no rotation of the measurement head under continuous operator monitoring)
- Simple automation of measurement processes

PrismMaster® MOT

PrismMaster® COMPACT

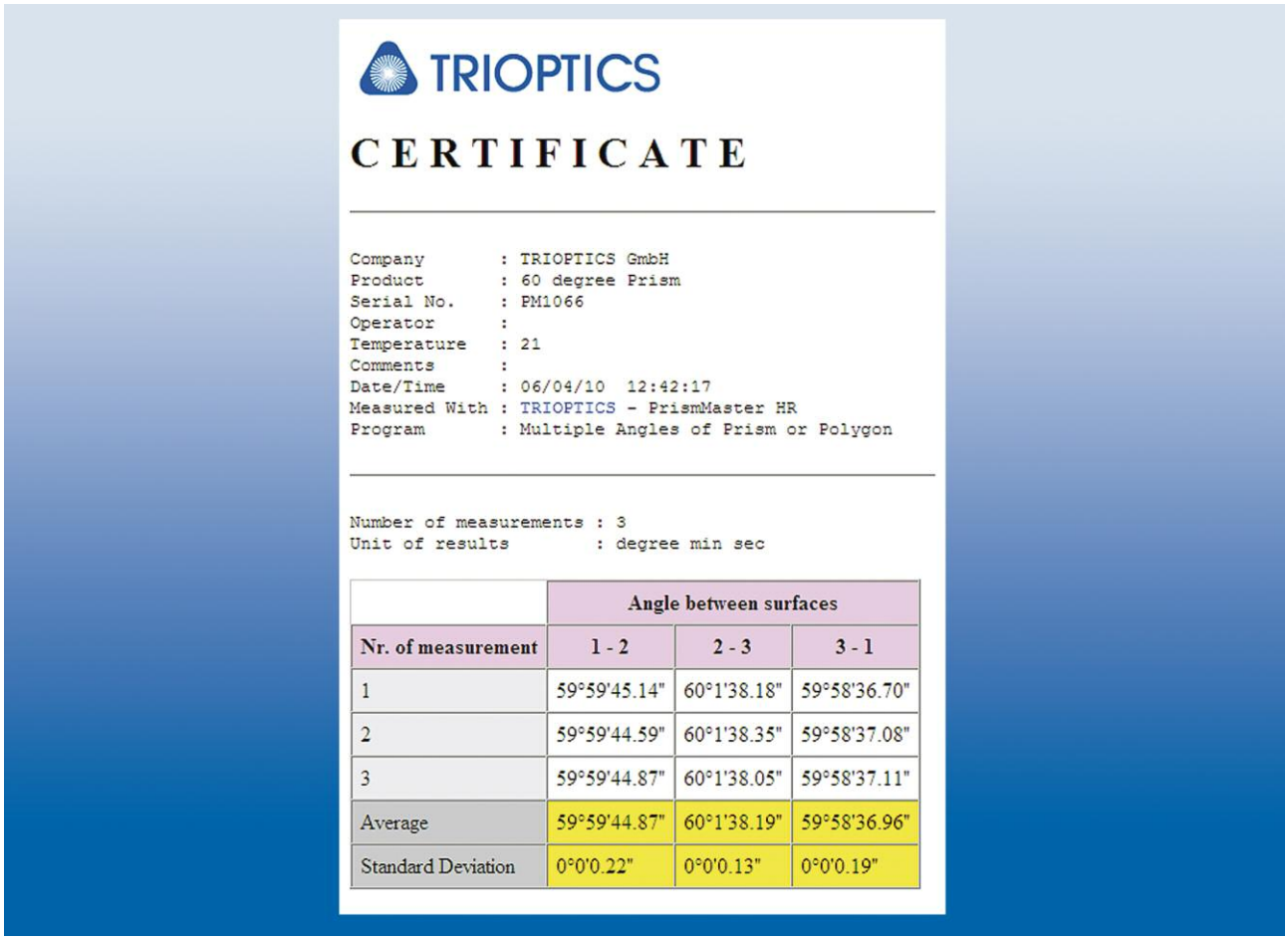
These basic components of the new concept were complemented by a comprehensive but clearly designed new software package. This allowed TRIOPTICS to pursue the ambitious goal of replacing the complicated adjustment and measurement steps, which only professional operators were able to control by a simple and automated procedure.

Already with the first version of the software (over 10 years ago), the most important goals were consistently achieved.

- The precise, time-consuming alignment of the prism surfaces toward the axis of the autocollimator was eliminated. This did not just save a work-intensive measurement step, but meant that measurement accuracy no longer depended on that alignment and the operator's qualification.
- The precise tilt adjustment of the test sample to the autocollimator was no longer necessary: the tilt of the test sample was automatically measured and automatically compensated by the software. The tiltable table is now needed only for the alignment of test samples with extremely slanted surfaces.
- Pyramidal errors can be measured quickly and accurately without laborious adjustment of the surfaces of the prism.

Building on the extensive TRIOPTICS experience in this field, taking in consideration new impulses and many ideas of our customers, the PrismMaster® software was further developed and equipped with new and unique features.

The latest generation of the software, PrismMaster® 3, combines unique special knowledge of angular and refraction index measurements with modern software architecture. We provide every customer a solution custom-tailored to their specific needs that contributes to the optimization of the measurement procedure.



TRIOPTICS

CERTIFICATE

Company : TRIOPTICS GmbH
Product : 60 degree Prism
Serial No. : PM1066
Operator :
Temperature : 21
Comments :
Date/Time : 06/04/10 12:42:17
Measured With : TRIOPTICS - PrismMaster HR
Program : Multiple Angles of Prism or Polygon

Number of measurements : 3
Unit of results : degree min sec

	Angle between surfaces		
Nr. of measurement	1 - 2	2 - 3	3 - 1
1	59°59'45.14"	60°1'38.18"	59°58'36.70"
2	59°59'44.59"	60°1'38.35"	59°58'37.08"
3	59°59'44.87"	60°1'38.05"	59°58'37.11"
Average	59°59'44.87"	60°1'38.19"	59°58'36.96"
Standard Deviation	0°0'0.22"	0°0'0.13"	0°0'0.19"

PrismMaster® Software Certificate

Analyzing the development of the market for angular measurements on optical components over the past few years, it is clear that the PrismMaster® product series and the modern product concept behind it are an overwhelming success: The PrismMaster® series is the first of its class anywhere in the world, and the product name PrismMaster® has become a synonym for precision goniometers.

Product Overview

The Appropriate Measurement System for Every Customer

No other product group offers more precision and variety. Tough testing on the world market and close cooperation with our customers have led to the development of a versatile, application-based product line perfectly covering both a wide variety of application fields and different precision classes.

PrismMaster®

The PrismMaster® product variant is the core of the product group. The outstanding feature of this variant is the air bearing of the test sample table. The ultra-precision air bearing

used has negligibly small radial and axial errors of less than 50 nm, permitting extremely precise, stable measurement values. In addition, the high run out axial accuracy of the air bearing leads to a significant increase of precision during measurement of pyramidal error.

The devices are equipped with incremental angular measurement systems that have an angular resolution of 0.36 arcseconds and an absolute accuracy of less than 0.5 arcseconds.

The electronic autocollimators used by PrismMaster® are characterized by extremely high resolution (0.01 arcsec) and accuracy (0.05 arcsec).

The test sample table is turned manually, with an additional fine adjustment enabling fast and precise positioning of the table.

These instruments are very flexible and are preferably used in the laboratory or quality assurance for single measurements.

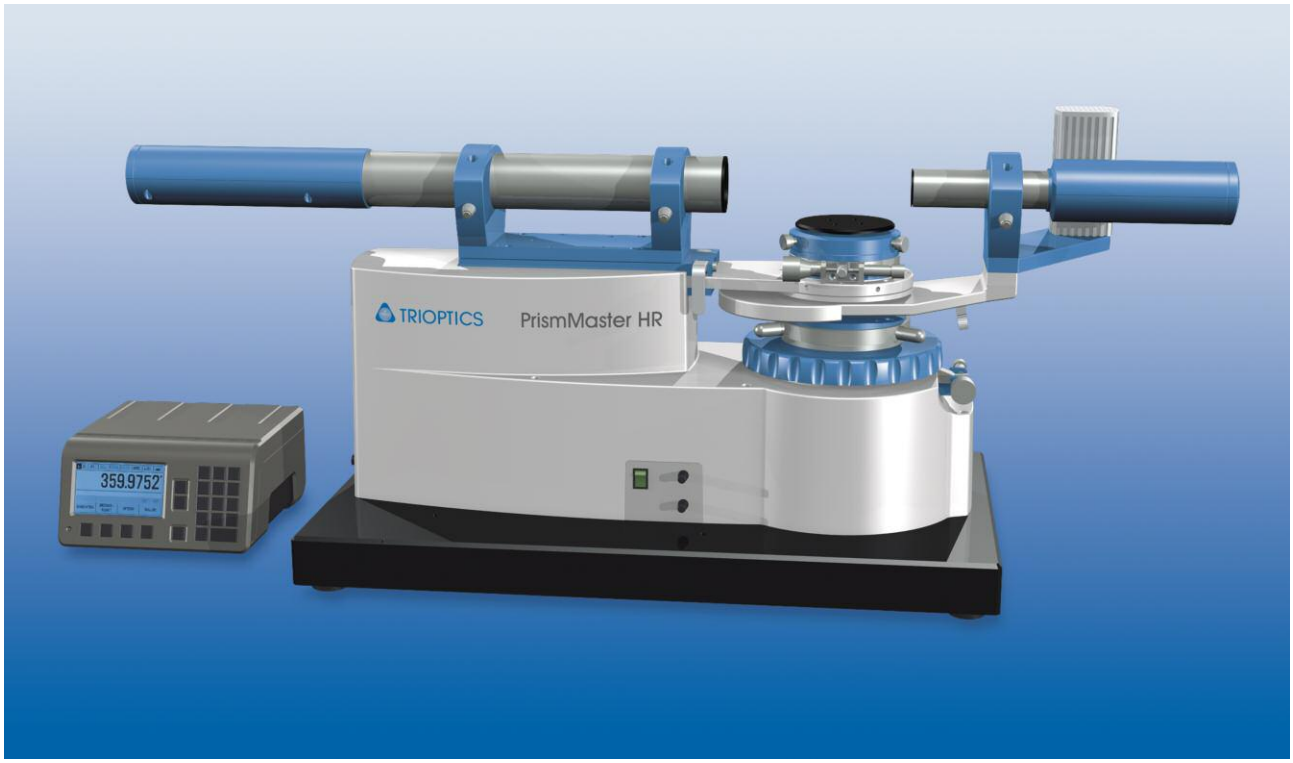
PrismMaster® goniometers are also offered in an ultra- precision class under the designation HR line. PrismMaster® HR goniometers achieve the highest accuracy in the world for angular measurements, with less than 0.2 arcseconds accuracy over 360 degrees.

PrismMaster® MOT

The PrismMaster® MOT is equipped with a motorized test sample table which is moved to the required angular positions automatically. In this way, measurement procedures can be fully automated. After the input of the design data for prisms and polygons or after obtaining the process parameters using a "teach-in" process, the subsequent measurement process is fully controlled by the software that monitors all functions.

PrismMaster® PRO

PrismMaster® PRO has especially been developed for measurement tasks in production. The instruments comprise of a ball bearing table which is moved manually and a com-



PrismMaster® HR with extension modul for the measurement of the refractive index

PrismMaster® PRO

pact electronic autocollimator. The design is very stable and at the same time very compact thus ideally for production purposes. The instruments can be employed everywhere in the production, air pressure is not required. In general the PrismMaster PRO has the same features like PrismMaster®.

PrismMaster® COMPACT

PrismMaster® COMPACT is a compact, cost-effective alternative, even for mobile use. If test objects must be measured manually or automatically with an accuracy of up to 1.5-2.0 arcseconds, the PrismMaster® COMPACT is the right choice.

Perfect in Function and Design

Principle of the Setup

Even though every PrismMaster® is adapted to specific accuracy and application requirements, the principles of the setup and function are the same for all of them.

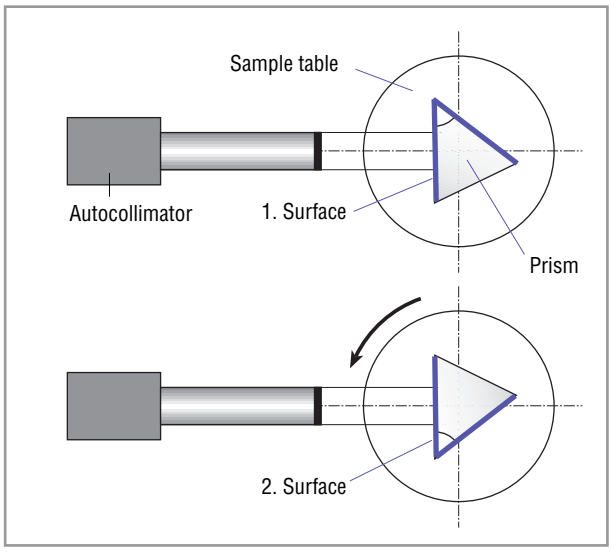
The main components of PrismMaster® instruments are: a high-precision rotary table, an angular sensor (encoder), the measuring head with an electronic autocollimator, a CCD camera, and light source and of course the software.

The sample table is mounted on a ball bearing or air bearing and is moved into the exact position needed either manually or by a motorized drive. In particular for the exact determination of pyramidal errors, the units with air bearings are the optimum choice.

PrismMaster® MOT, measurement of a prism in transmission

Measurement in Reflection

- The test sample is positioned on the rotary table in such a way that one of its surfaces is roughly at right angles to the optical axis of the autocollimator.
- The software saves this position as a reference, (Fig. 1, Image 1).
- The next surface of the test sample is turned towards the autocollimator, either manually or using the motorized drive.
- The reflection angle is measured either automatically (motorized versions) or by pushing a button.



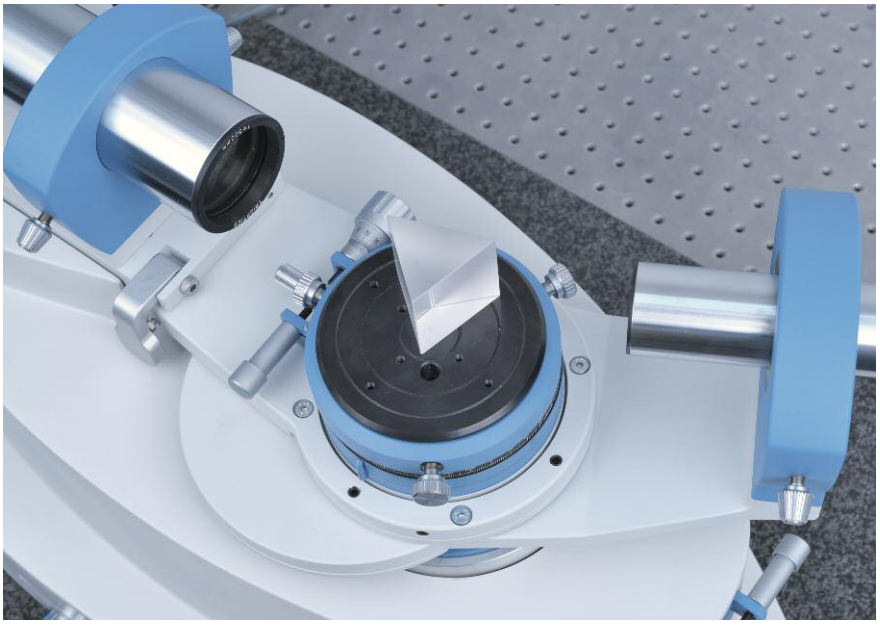
Measurement in reflection

Measurement in the Transmission

With the PrismMaster® and PrismMaster® MOT, the angle of deflection of optical components is measured in transmission. For this purpose, a product version with an additional collimator is required.

Measuring the Index of Refraction

To measure the index of refraction of glass, the PrismMaster® and PrismMaster® MOT instruments have an extension module with a collimator and spectral light source.



PrismMaster® measurement in transmission

Typical Applications

Typical applications refer to measurement of a diversity of plano optical components and optical parameters:

- Angles of polygons and prisms
- Surface tilt errors of prism and polygons
- Wedge errors, parallelism of optical windows
- Deflection angle measured in transmission
- Index of refraction of optical glasses
- Angles of microprisms
- Pyramidal errors
- Angular gauge blocks

Software

Modern Software with Extensive Functionality

The PrismMaster® software offers an outstanding range of features and contributes significantly to the success of our product line:

- Proven, innovative algorithms allow for angle measurements with unrivalled accuracy (< 0.2 seconds of arc over 360°).
- Absolute measurement of polygons using the rosette technique, with subsequent calibration of rotary tables, rotary encoders, and other rotating systems.
- Fast detection of reflection images, sorting of distorting images, selection of the right images.

In addition to angular measurement, the software also calculates and analyses the individual measurement results and uses the data to optimize the measurement process. This eliminates, for example, the time-consuming alignment of prism surfaces to the autocollimator axis.

The distinctive feature of the software is its intuitive, menu-controlled user interface and a variety of functions helping to simplify the measurement:

- Preconfigured measurement procedures for polygons, prisms, and other optical components
- Adaptation of measurement procedure to the type of test object: special settings for very small prisms and prisms with anti-reflection coatings
- Compensation for even the smallest inaccuracies in positioning of the test object to the optical axis of the autocollimator (horizon determination)
- Calculation of pyramidal errors in different modes
- Tilt error determination of individual surfaces relative to the surface of the rotation table

Menu-driven, modular PrismMaster® Software

- Calculation of the transmission angle after measuring all angles in reflection (the refractive index of the test sample material must be known)

- Easy conversion of the software to a simplified Production Mode
- Automated measurement process with tolerance input and sorting function
- For high-precision measurements: the calibration curve of the encoder is used for correction of the measurement results

Accessories

Viewfinder

The viewfinder is a tool for the quick, simple, perpendicular alignment of test sample surfaces vertically to the optical axis. The field of the viewfinder is significantly larger than that of the autocollimator.

Plane Parallel Plate in the Mount

For determination of the position of the optical axis relative to the axis of rotation (horizon determination). This plate is part of the standard delivery package and can be ordered as a spare part.

45°- Mirror in Mount

The 45°-mirror in mount is used to align the rotation table perpendicular to the axis of rotation of the bearing. It is required for the measurement of surface tilt error relative to the base surface. The 45° mounted mirror is not needed for the determination of pyramidal errors.

Goniometer-Spectrometer for the measurement of the refractive index

Technical Data for the PrismMaster® Instruments

Standard ■
Option □

	PrismMaster®	PrismMaster® HR	PrismMaster® MOT	PrismMaster® MOT HR	PrismMaster® PRO	PrismMaster® Compact	PrismMaster® Compact MOT
Electronic autocollimator							
EFL 500 mm, Diameter 57 mm	■	■	■	■			
EFL 300 mm, Diameter 57 mm					■		
EFL 150/200 mm, Diameter 30 mm						■	■
Accuracy of the autocollimator							
Resolution 0,01; repeatability ± 0,05	■	■	■	■			
Resolution 0,01; repeatability ± 0,1					■		
Resolution 0,01; repeatability ± 0,5						■	■
Bearing of the rotation table							
Ball bearing					■	■	■
Air bearing	■	■	■	■			
Accuracy of the encoder (in arcseconds)							
0,36 / absolut 0,5	■		■		■		
0,036 / absolut 0,2		■		■			
0,36 / absolut 2,5						■	■
Rotation of the table							
Manual	■	■			■	■	
Automatically			■	■			■
System accuracy (in arcseconds)							
Single measurement 0,75 / multiple measurement 0,5	■		■				
Single measurement 0,5 / multiple measurement 0,2		■		■			
Single measurement 1,5 / multiple measurement 0,6					■		
Single measurement 2,5 / multiple measurement 1,5						■	■
Measurement Procedure							
Reflection	■	■	■	■	■	■	■
Transmission	□	□	□	□			
Refractive Index	□	□	□	□			

Order Information

Instrument	Order Numbers
PrismMaster®	5-100-00
PrismMaster® HR	5-100-01
PrismMaster® MOT	5-101-00
PrismMaster® MOT HR	5-101-01
PrismMaster® PRO	5-100-05
PrismMaster® Compact	5-106-00
PrismMaster® Compact MOT	5-106-01
Extension Module for measurements in transmission	5-200-15
Extension Module for measurements of the refractive index	5-200-22

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