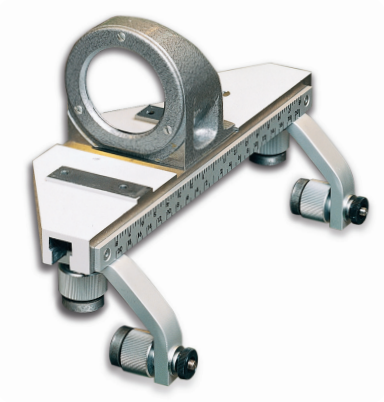
Ultra Autocollimator

# Simultaneous 2-axis straightness and twist measurement using the wide range, high accuracy Ultra Autocollimator



Among the large number of applications possible with the Taylor Hobson Autocollimator, the most common is the simultaneous two axis straightness measurement of machine tool slideways.

Measurements are automatically taken for both X and Y directions at each measuring position along the slideway. Typically a ten metre slide can be checked in a few minutes – a considerable reduction in the amount of time taken compared with more conventional methods. With the addition of the Talyvel electronic level, twist or roll can also be measured.

Instrument control is via a touch screen PC which is readable from several metres.

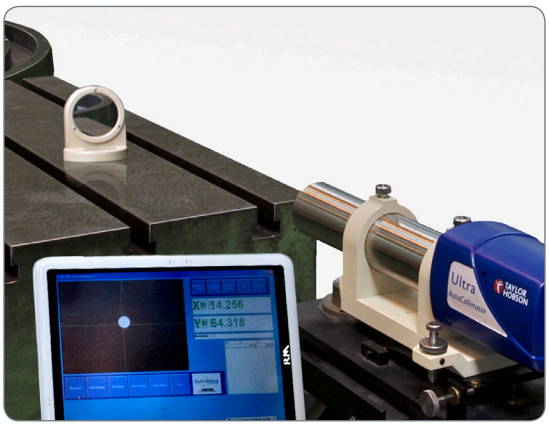
## Measuring procedure

Due to the high sensitivity of the autocollimator and the high accuracy with which measurements are made, it is preferable to mount the autocollimator directly onto the machine slideway. This is best accomplished using a bracket, rigidly bolted to the end of the slide. If this is not possible the autocollimator can be placed directly on the slide.

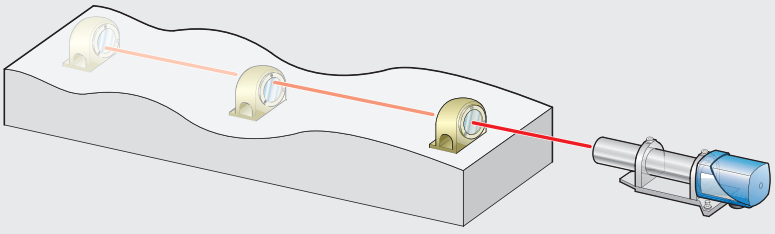
However, this method will occupy approximately 300 mm of the slideway, which hence cannot be measured.

When small slideways are to be measured and no attachment holes are available, the autocollimator can be mounted on a separate stand or tripod. In this case, considerable care must be taken to ensure that no relative movement occurs between the autocollimator and the slideway.

The reflector to be used in conjunction with the autocollimator must be mounted onto a carriage, specifically designed for dual axis measurement.



> “Ten-metre slides can be checked in a few minutes, with automatic measurements taken at X and Y directions along the slideway.”

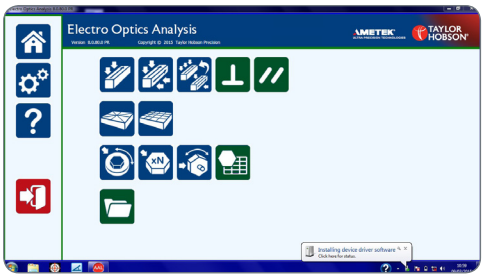


## Measuring procedure (continued)

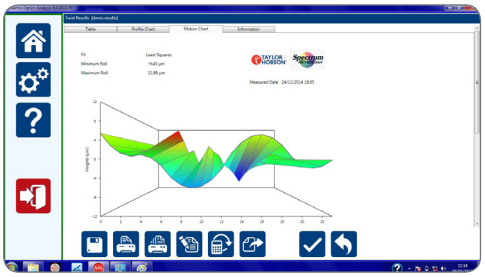
All steps must be of equal distance; the number of steps will therefore depend on the base length of the reflector carriage. Alternatively the base length of the reflector carriage can be established by division of the slide length to be measured by the number of measuring steps required. When slideways of different lengths are to be measured, the provision of an adjustable length base is advised.

Once the step length has been established it is good practice to mark the slideway accordingly.

The reflector carriage is now moved along the slideway in equidistant steps. Any out-of-straightness in either of the two surfaces (side and top of the slide) will cause the carriage to change angle with respect to the autocollimator, and it is these changes which are measured and computed to determine the error in straightness. Data at each step is entered into the computer via keyboard or remote switch.




Communication between the system and operator on the tablet PC is icon driven, enabling inexperienced personnel to carry out measurements. Each stage of measurement to be carried out is prompted by the PC display, which also indicates when any error of operation has occurred. For two axes checking, the PC will automatically switch axes to measure both X and Y deviations of the reflector (ie top and side surface deviations).

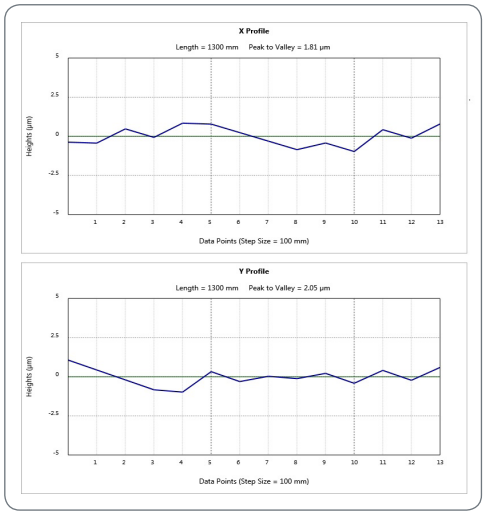


The results are displayed in tabulated form. Deviations from straightness in both axes are given as maximum peak and minimum valley values, and the appropriate step number indicated. The out of straightness is the maximum peak to valley and can be calculated using either the ends zero or least squares method.

In addition, the slope of the slideway with respect to the autocollimator line of sight is displayed as a gradient (ie mm per m or 0.01 in per inch). This is derived from a least squares mean line calculated from the data.

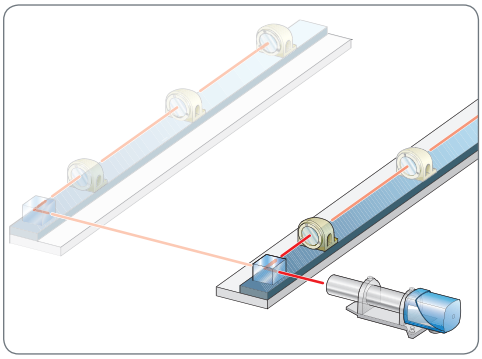
This slope can be particularly valuable when measuring parallelism and squareness between slideways.

The results display also offers the operator the option to graphically display plots of dual axis measurement.




A Talyvel electronic level is used in conjunction with the autocollimator to measure the twist or roll of the slideway.

The autocollimator can also be used in conjunction with an optical square or mirror to measure parallelism (see illustration below).



This application note demonstrates just one of the applications for the Taylor Hobson electro-optical metrology range.

Contact Spectrum Metrology to discuss your own measurement requirements.

**Spectrum Metrology Ltd**
Unit 8 Ireton Avenue
Leicester, LE4 9EU

Tel: (44)(0)116 276 6262,
Fax (44)(0)116 276 6868
Email: sales@spectrum-metrology.co.uk
www.spectrum-metrology.co.uk

**Taylor Hobson UK**
(Global Headquarters)
PO Box 36, 2 New Star Road
Leicester, LE4 9JD, England
Tel: +44 116 276 3771
taylor-hobson.sales@ametek.com

**Taylor Hobson France**
Tel: +33 130 68 89 30
taylor-hobson.france@ametek.com

**Taylor Hobson Germany**
Tel: +49 611 973040
taylor-hobson.germany@ametek.com

**Taylor Hobson India**
Tel: +91 80 67823200
taylor-hobson.india@ametek.com

**Taylor Hobson Italy**
Tel: +39 02 946 93401
taylor-hobson.italy@ametek.com

**Taylor Hobson Japan**
Tel: +81 36809 2406
taylor-hobson.japan@ametek.com

**Taylor Hobson Korea**
Tel: +82 31 888 5255
taylor-hobson.korea@ametek.com

**Taylor Hobson China** Beijing Office
Tel: +86 10 8526 2111
taylor-hobson.beijing@ametek.com

**Taylor Hobson China** Shanghai Office
Tel: +86 21 58685111-110
taylor-hobson.shanghai@ametek.com

**Taylor Hobson Singapore**
Tel: +65 6484 2388 Ext 120
taylor-hobson.singapore@ametek.com

**Taylor Hobson USA**
Tel: +1 630 621 3099
taylor-hobson.usa@ametek.com