

Talyvel

# Flatness checks on granite and cast iron surface tables with the Talyvel Electronic Level

Conformance to specified tolerances, particularly where national and defence standards are concerned, demands more frequent checking of surface tables than has been customary in the past.



The Talyvel electronic level is widely used for checking flatness and straightness, but whereas its accuracy is well-proven, the manual recording of readings and subsequent graphing can be tedious and time-consuming.

Most manufacturers and users of surface tables require a faster method of assessment, as well as a method that eliminates the danger of human error in readings and calculation. Printed hard copies of calibration certificates are also a requirement.



Figure 1

The Talyvel and its software reduces the calibration time for a typical 1600 x 1000 mm (63 x 39 in) surface table to less than 20 minutes compared with a time of over two hours taken by a skilled operator using unaided methods.

## System description

A standard Talyvel electronic level, mounted on a base having bearing pads with an adjustable separation, is used to check tilts at predetermined points over the surface being measured (see Figure 1). The Talyvel unit links directly to a computer. Readings from the Talyvel are entered by means of a push-button or the keyboard of the computer; however when large tables are to be checked, a remote push button lead can be supplied for the convenient entry of measurement results.

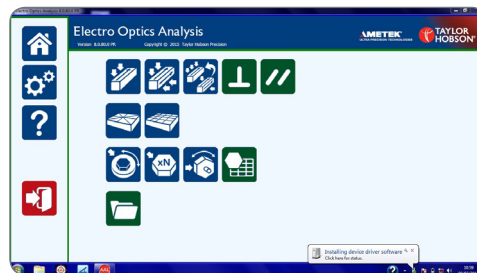


Figure 2: Surface plate generators (picture from software measurement screen for Union Jack)

checks without difficulty. Each stage of measurement to be carried out is prompted by a message on the computer screen, which also indicates when any error of operation has occurred.

In accordance with these instructions, the operator inputs the length and width of the table to be checked. (The computer calculates the length of diagonal). The number of measuring steps to be taken over each generator is then selected. The computer then calculates and displays step intervals in mm or inches over the length, width and diagonal of the table.

A guide line for the Talyvel unit can now be marked out with these step intervals on the table along each generator, or alternatively a similarly marked straight edge can be used. The adjustable base for Talyvel is then set to the appropriate step interval length.

To measure the table, the Talyvel level unit is stepped along each generator line at the predetermined points and the measurements automatically entered into the computer via the entry key on the keyboard (or via the remote control). The computer will prompt the operator to change the step length, as necessary, before each generator is entered.

With the standard Taylor Hobson application software, calibration results are presented on the printer in tabular form as a certificate and as an isometric diagram.

Calibration values can be in units of 0.001 mm or 0.0001 in as required.

## Measurement procedure

Communication between computer and operator is in simple conversational language, enabling even inexperienced personnel to carry out surface table



Figure 3 – Isometric plot

The computer retains the Talyvel readings in its memory, and when all the generators are complete calculates the departure from flatness. The individual values are printed out initially as arc seconds and then converted to the deviation from straightness in units of 0.001 mm or 0.0001 in. In addition, the printout gives the maximum deviation from flatness over the entire surface, and the closure errors over generators HF and EG. The closure errors indicate the validity of measurements taken (ie they are an indication of the accuracy of measurement) and if these lie outside an acceptable maximum, measurements are normally required to be repeated.

The measurement results are also graphed as an isometric diagram or a certificate (see Figure 3).

## Grid measurement

The grid method of flatness checking can be used to measure interrupted surfaces by choosing the generators spacing as required, or by using a number of generators to give a more detailed analysis of a surface. Flatness measurements may be made using only the four outside generators.



Figure 5 – Graph from computerised straightness check

Gravity is used as a reference against which all measurements are made. Routines are provided in the program to set up this reference and to facilitate subsequent checking and resetting if necessary (note: this means that autocollimators cannot be used for grid measurement).

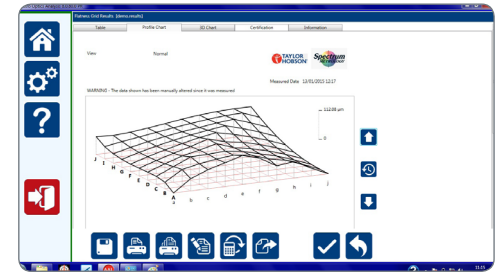


Figure 4 – 3D grid

Surface plate generators are arranged as shown in figure 4. Measurement points are identified by upper case and lower case letters (starting at point A,a).

Generators may be measured in any order of sequence and in either direction.

## Straightness measurement

With the standard software package, straightness measurement on machine tool slideways, shafting etc is also available. The results are again presented in tabular form, and as a straightness graph by the printer (see Figure 5).

These measurements can also be performed using autocollimators (with the exception of grid).

This application notes 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@ametec.com



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



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



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



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



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



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



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



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



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



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