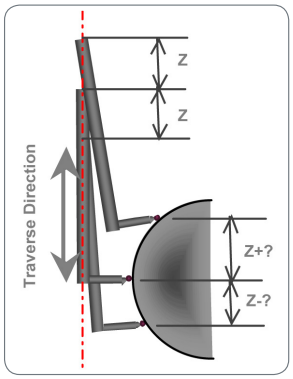
Talyrond Arcuate Correction

Taylor Hobson's patented algorithm Arcuate Correction, currently used by the FormTalysurf and surface form analyses, has now been developed for use in the Talyrond 5xx instrument range.

Greg Roper, Applications Engineer

What is Arcuate Correction?



This is the correction applied to the measured data to compensate for the fact that the stylus (whose arm is pivoted) moves in an arc rather than in a true linear motion. As the stylus pivots the effective beam length of the stylus is changed giving rise to arcuate errors.

These errors can be corrected by using a set of Calibration Constants that compensate for arcuate motion and other non-linearity errors.

Use of appropriate constants will correct for all the main non-linearity in the system providing the instrument has been correctly calibrated.

Arcuate Effect on Radius Measurement?

When taking a straightness measurement over a ball, the uncorrected measurement will include arcuate errors. If this measurement is not corrected then the form of the ball will appear distorted (see Fig. 1). If the LS arc form is removed an s shape result will appear (see Fig 2) if we now apply corrections to the measured data to account for arcuate motion we now get a true form error from an LS arc, the peak to valley and radius for this result will be good (Fig. 3/4).

The results output from a Talyrond/TalyMaster Instrument calibration gives the user confidence that the future measurements are correct. The residual profile from the graphical display indicates that:

- The stylus tip is not damaged
- The correct radius has been entered
- Arcuate correction and tip correction have been applied correctly
- There is no damage to the calibration artefact or the gauge

Prior to Calibration it is imperative to accurately crest the stylus i.e. ensure the measurement direction passes through the spindle axis; use of the cresting gauge should be employed prior to the ball calibration.

For the Talyrond 5XX range a calibration ball is now placed on the instrument table and centred to a target eccentricity according to the instrument type.

In the Talymaster format the calibration ball is located outside of the table measurement area to avoid taken up space allocated for parts, cresting is done using the Y stage of the instrument.

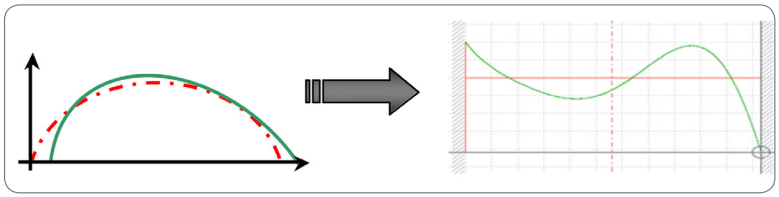


Fig. 1: Uncorrected measurement

Fig. 2: Uncorrected ball analysis

Fig. 5: TR 5xx Arcuate Calibration Artifact

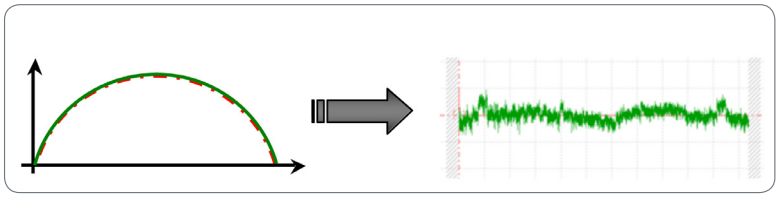


Fig. 3: Corrected measurement

Fig. 4: Arcuate corrected ball analysis

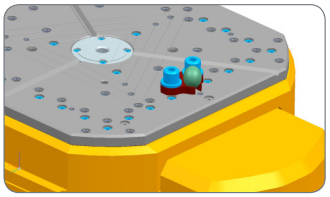


Fig. 6: Talymaster Arcuate Calibration Artifact

Accessing Arcuate Correction

Arcuate Correction is an Ultra Licensed option, once accessed the operator simply right mouse clicks on the gauge icon > Calibrate > New and selects the appropriate ball standard (or creates one). The "Perform Calibration" menu is then displayed and is the same format as the Form Talysurf; the only difference is that the Talyrond will perform a vertical calibration where as a Form Talysurf will perform a horizontal calibration.

Notes:

- Recommended calibration speed is 0.5mm/s
- For miniature bore and other special styli the "Use Existing Measurement" function is also available
- Crutch angle should also be set prior to these setups and again not changed during the measurement loop.

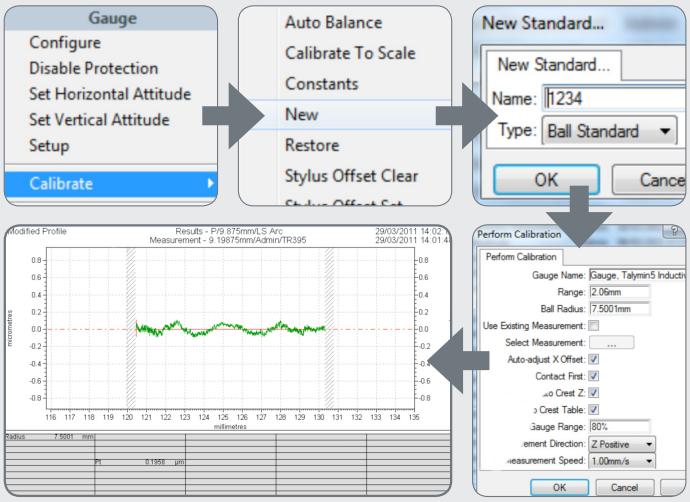


Fig. 7: Accessing Arc Corr Flowchart

Making the measurement

Once the calibration is complete measurements can be carried out, a key feature of the roundness instrument is the ability to measure a profile with respect to a datum axis, this is carried out as follows:

- Measure the datum roundness
- Measure seat surface
- Analyse datum cylinder and set as datum
- Convert seat measurement to linear – RMC on profile "Convert to Linear"
- Ensure "Stylus Tip Correction" and "Apply Arcuate Correction" is selected
- Ensure "Datum" is selected on "Datum Tab"

This function allows the end user to be able to measure form over the calibrated gauge range. Features such as radii and angles can be analysed accurately.

Shown below is the effect arcuate correction has on a measurement (in this circumstance an injector nozzle).

Fig. 9 shows an uncorrected measurement which shows a large curved shape – this radius is a direct influence from the gauge and is not in the component, the angle is also compromised because of the LS line fit on a curved surface.

Fig. 10 shows the same profile which has had arcuate correction applied, the form depicts a shape with no curvature and also the angle is now more accurate due to the fit of the LS line.

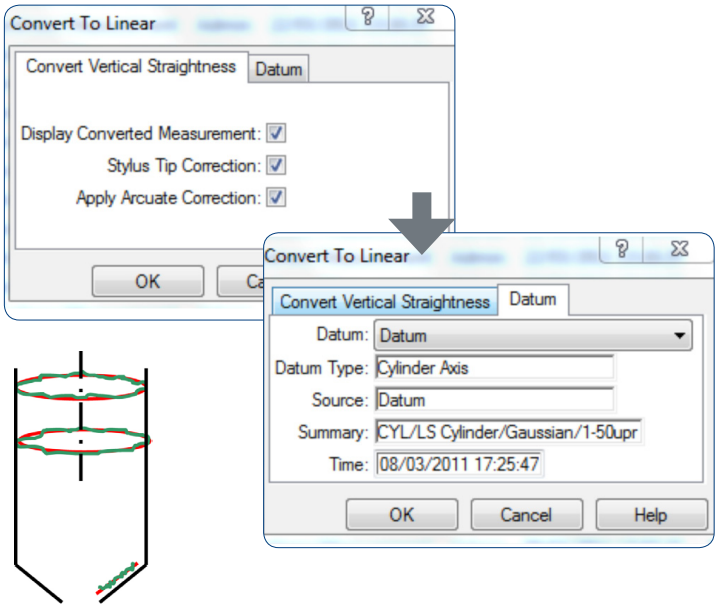


Fig. 8: Convert to Linear WRT Datum

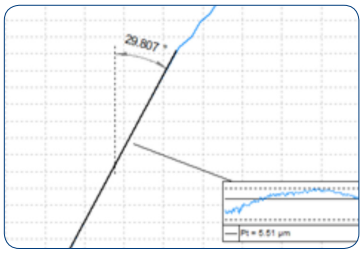


Fig. 9 Uncorrected result

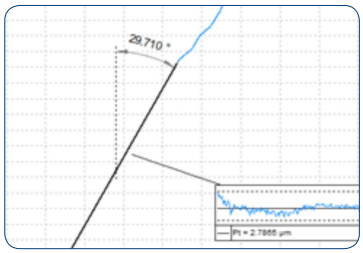


Fig. 10 Corrected result

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