

Technical note T126: Software correction for column alignment

Talyrond 500 Series

Column alignment for precise parallelism results

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“Accurate column alignment is crucial for accurate parallelism results; the software correction ensures the best accuracy for component parallelism.”

Introduction

To ensure that each Talyrond meets its parallelism specifications, each column is mechanically aligned to the measuring plane and the orthogonal plane. This is completed by centring and levelling a cylinder and measuring the radii differences at 0 mm to the top of the cylinder (dependant on column length). If column to spindle axis parallelism is out of specification then adjustments are made by the precision ground wedges located at the column base which will then tilt the column until the specification is obtained.

Once mechanically aligned column corrections are applied to all Talyrond instruments over the full length of the column, whether it be a 300 mm, 500 mm or 900 mm column length.

The column corrections are applied by completing a reversal technique measurement where an offset cylinder is used to map the column straightness. The cylinder straightness is then removed from the measurement so the column straightness can be evaluated, saved and then used as the column straightness correction file. Any subsequent straightness measurements taken within the correction

volume will have the column residue removed and the operator is left with pure component straightness.

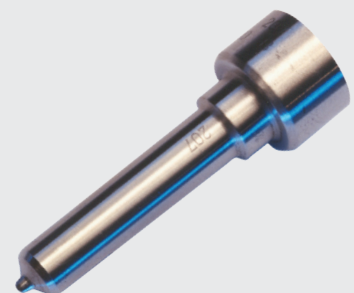
However, the corrections have been made over the full length of the column, whereas some manufacturers of precision components are only using the first 100 mm of the column length. When evaluating the parallelism over this length it is sometimes in need of being optimised to ensure the true parallelism of the components is calculated. Some end users also have a 'golden part' to which the parallelism may be checked against.

Optimising this column parallelism would need to be addressed mechanically and could be very involved and time-consuming to set up correctly.

Using the 100 mm Taylor Hobson Precision Cylinder the new software function allows the service engineer to quickly adjust the parallelism angle to correct the angle to the cylinder calibrated parallelism value, therefore giving the end user a more accurate component parallelism.

Applications

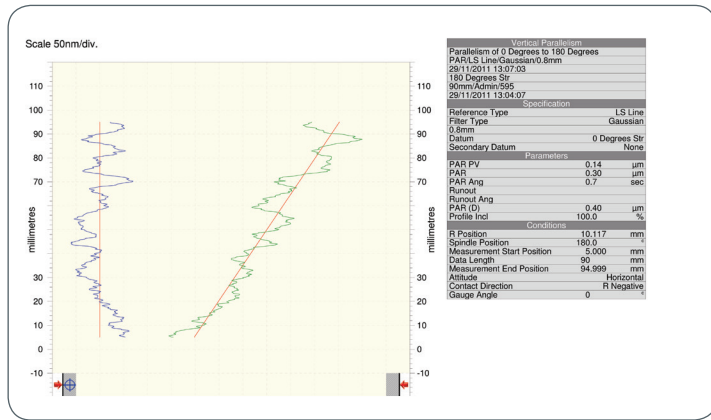
Parallelism is checked on numerous components but has shown to be particularly important in the injector market. These components, typically 60 mm in length, have tight constraints for roundness, concentricity and parallelism.



Accessing the Software

Once the opposed straightness traces have been measured, complete the parallelism analysis as normal.

Figure 1: Showing a Parallelism result of 0.3µm



Using the formula:

$$\text{Axis Datum Tilt Correction} = (\text{Parallelism} / \text{Length}) / 2 *$$

In this instance; $(0.3 \mu\text{m} / 90 \text{mm}) / 2$
 $= 1.66 \text{ nm}$

This value has to be entered into the software to activate the correction. If -ve value, then enter -ve value into 'Axis Datum Corrections'.

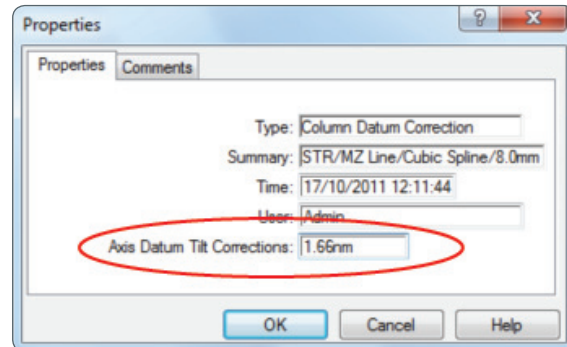
Select 'View > Instrument'

Locate the column correction file and RMC on the properties.

* The value used for the Axis Datum Tilt Correction must be set to return a parallelism value that is the same as detailed on the TH Precision Cylinder UKAS certificate

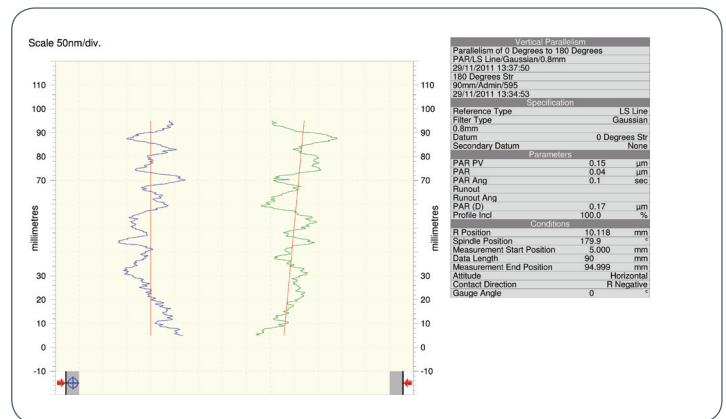
Enter the calculated value (1.66 nm in this instance) in to the Axis Datum Tilt Correction.

Figure 2: Properties dialogue box



Any subsequent parallelism measurements will now be corrected and will give you more accurate parallelism analyses.

Figure 3: Re-measured parallelism; 0.04 µm*



Conclusions

Accurate column alignment and correction is important so the end user can obtain accurate parallelism results, this software correction gives the user the flexibility to align the correction file to return the most accurate column parallelism and not influence the end users components.



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