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Squareness measurement using the XK20 pentaprism optic

Introduction

A squareness measurement is carried out by using the launch unit and M unit. The launch unit is placed at the intersection of two axes and uses its built-in pentaprism optic to flip the beam between its two beam paths.

- The fixed beam measures the reference axis.
- The sweeping beam measures the secondary axis.

For many applications, this offers a suitable solution to measure squareness. There are, however, some applications where alternative solutions or flexibility is required to measure squareness.

During squareness measurement, the launch unit should be placed at the intersection between the reference rail and the secondary rail. After the reference rail data is captured, the launch unit must remain stationary in order to maintain a reference.

A limitation of this method is that the entire length of the reference rail cannot be captured, as illustrated by the red zone in Figure 1.

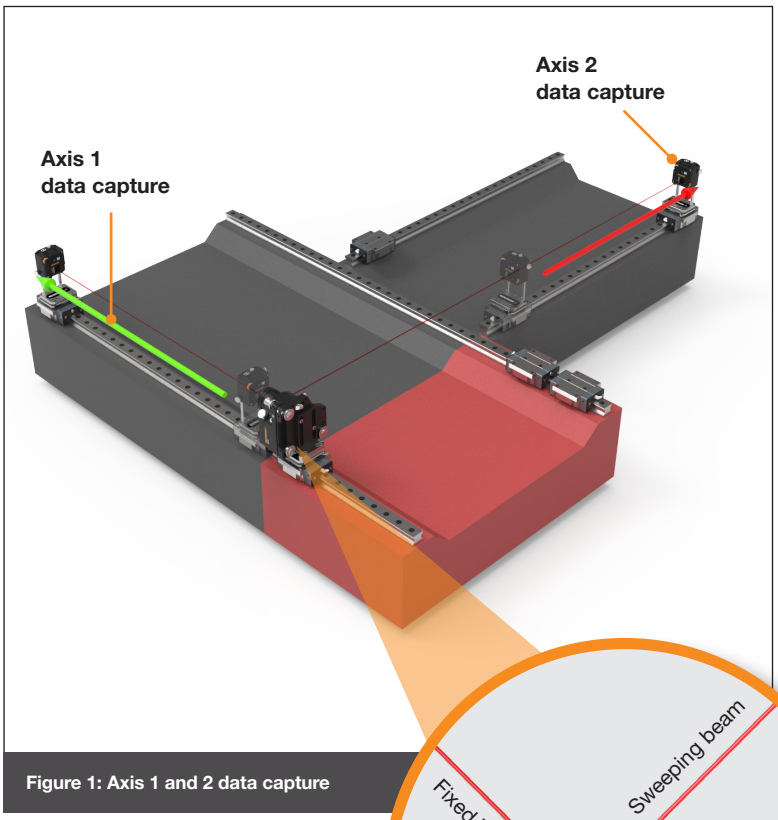
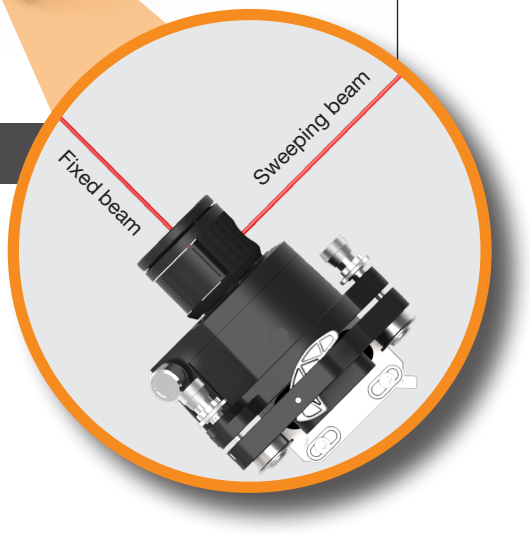


Figure 1: Axis 1 and 2 data capture



Using the pentaprism optic to measure squareness

The pentaprism optic turns the beam through 90 degrees for the secondary axis rather than using the optic within the launch unit.

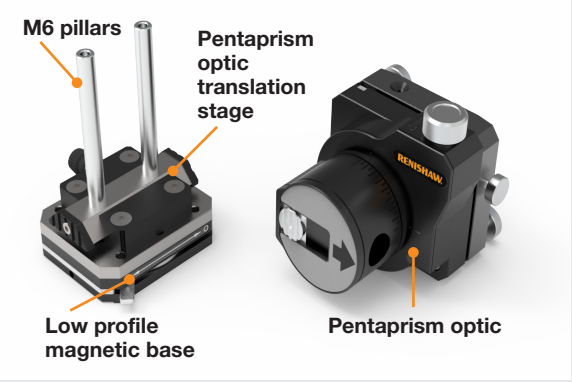
This method ensures:

- The full length of both axes is measured for reliable squareness data.
- Flexibility to measure squareness at the point of interest.
- More options for hardware set-up on complex machine applications.

Hardware requirements

Squareness requires extra hardware components in addition to the launch unit and M unit:

- Low profile magnetic base
- M6 Pillars
- Pentaprism optic translation stage
- Pentaprism optic



Measurement process

The measurement principle is the same; measure the straightness of the reference and secondary axis. The main difference is that the XK20 pentaprism optic is used to reflect the beam through 90 degrees when measuring the secondary axis. This requires extra steps to ensure that the pentaprism optic is aligned to both axes.

For more information about this topic, refer to the Squareness measurement using the XK20 pentaprism optic quick guide (Renishaw part no. H-9971-9054).

Applications

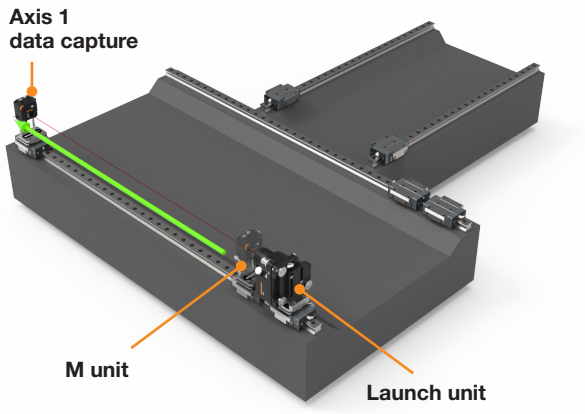


Figure 2a: T-shaped casting (axis 1)

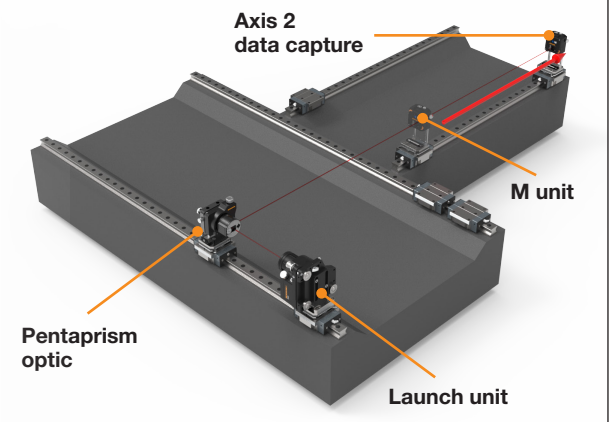


Figure 2b: T-shaped casting (axis 2)

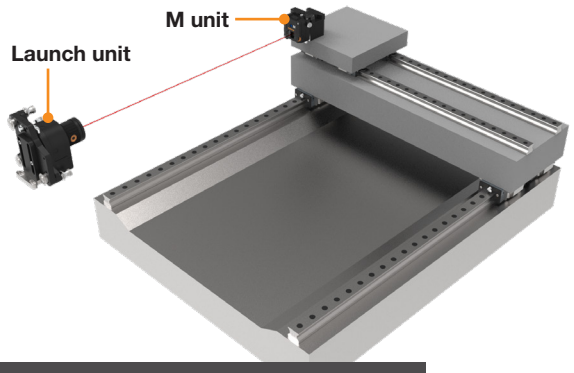


Figure 3a: XY stage/moving bed (axis 1)

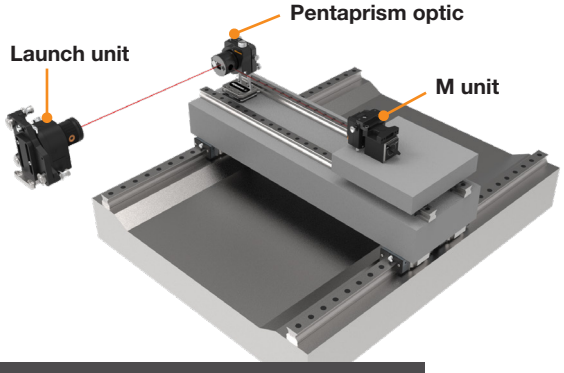


Figure 3a: XY stage/moving bed (axis 2)

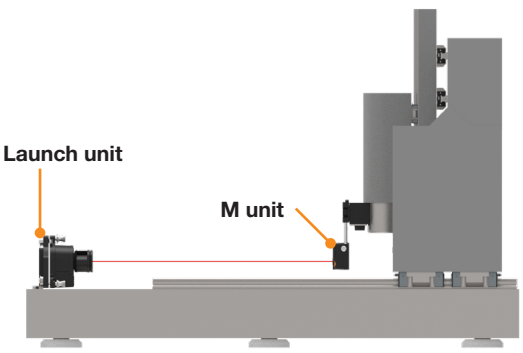


Figure 4a: Moving head (axis 1)

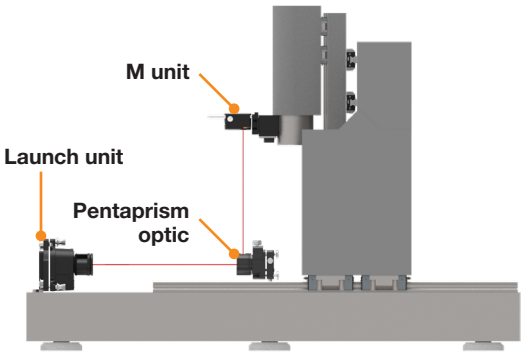


Figure 4b: Moving head (axis 2)

Summary

The XK20 pentaprism optic enables squareness measurements in applications where the launch unit cannot be used.

It provides flexibility for measurements to be taken directly at the point of interest along a reference rail.

It also helps users to visualise the impact of angular error on squareness measurements. If the reference rail has an angular error, the squareness angle will vary depending on the pentaprism's position when measuring the secondary axis. Taking measurements with the pentaprism at multiple positions along the reference rail reveals variations in squareness error on the secondary axis.

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