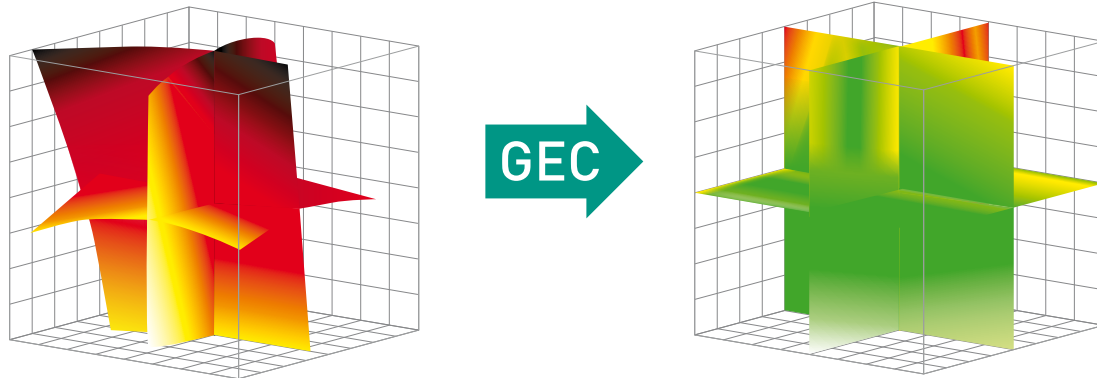


GEC

Geometric Error Compensation

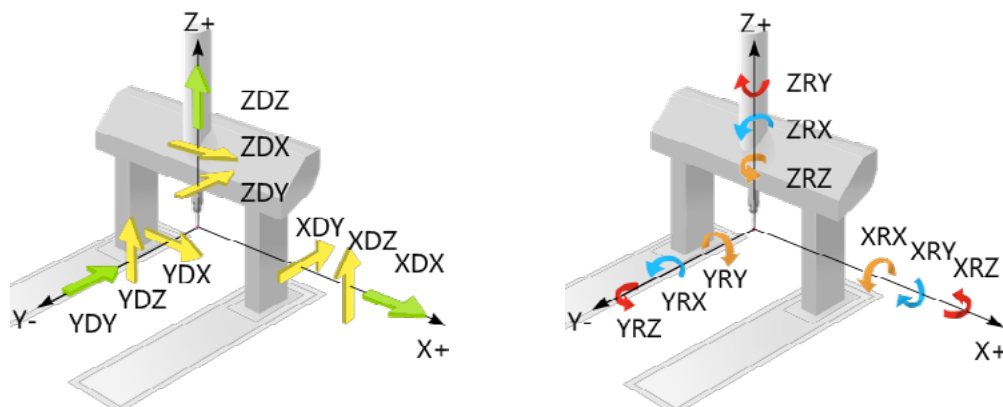
Geometric Error Compensation

Geometric Error Compensation (GEC) is a key technology in operating Coordinate Measurement Machines (CMMs). GEC ensures a high accuracy of measurements with compensation of inherent geometric and thermally induced errors in CMMs.



GEOMETRIC ERROR MODEL

For 3 axis CMMs, a commonly used model is the 21-parameter error model with 9 translational, 9 rotational and 3 squareness errors:



9 translational and 9 rotational errors

SUPPORTED CMM TYPES

The GEC algorithm notes the layout of CMMs (moving bridge, moving horizontal arm ...) to prevent errors in measurement influenced by the kinematic chain on axes. Pantec's GEC supports the following machine layouts:

- Moving bridge, with axes sequences: Y-X-Z, X-Y-Z, or X-Z-Y
- Moving horizontal arm, with axes sequences: Y-X-Z, X-Y-Z, or X-Z-Y

GEC OPTIONS FOR EAGLE™ CONTROLLERS

Full variant (21 compensation parameters + 3 linear thermal expansion coefficients)

Our driver-based solution provides a full 21-parameter error model (including roll, pitch and yaw errors) that ensures high accuracy. The controller is connected to the measurement software via an ethernet channel and a Pantec driver.

Basic variant (linearity, squareness error and linear thermal expansion)

The basic variant is a great choice for equipping a controller with GEC, if the measurement software does not support the full variant. Integrated dynamic temperature monitoring and compensation, linearity and squareness correction are performed inside the EAGLE™ controller. The axis temperatures are automatically updated by T-Bus sensors.

GEC OPTIONS FOR EAGLE™ R6 CONTROLLERS

Full and Basic GEC variants are directly available within the newest controller generation EAGLE™ R6. It allows easy handling of files without having to store them on a host PC. Data from EAGLE™ Full and Basic variants can be transferred to the EAGLE™ R6. The GEC feature is activated via softkey.

TEMPERATURE COMPENSATION – DIRECT INTERFACE TO PANTEC T-BUS SENSORS

A first order correction model is used to compensate the effects of thermal expansion. Each scale attached to the CMM has a dedicated linear thermal expansion coefficient defined. If a Pantec T-Bus is connected, the current temperature data is given by the available sensors. Each temperature sensor is associated to the corresponding axis. It is also possible to assign two separate sensors for each axis. The temperature is interpolated with the actual and sensor positions. Our software interface also allows you to use other types of temperature sensors.

GEC SETUP AND CONFIGURATION WITH PANTEC SUPPORT TOOL

For convenience and ease of use, the entire compensation procedure for both GEC variants is done with Pantec's Support Tool tuning and analysis software. The GEC Wizard automizes geometric error capture for both laser interferometers and CMMs.

Pantec Support Tool GEC Features:

- Setup of the GEC configuration
- Schematic mirror setups for each measurement
- Assistance in laser alignment
- Automatic or manual capturing of laser and machine position
- Management of correction parameters (stretch, zero offset, shift data)
- Automatic slope correction for straightness data
- Error parameters can be enabled/disabled separately
- Compensation projects can be stored in a file and recovered

SUPPORT TOOL INTERFACES TO MEASUREMENT HARDWARE

The API XD Laser Interferometer and the Renishaw Laser Interferometers XL-80 and ML10 (including their respective environmental measurement stations) are supported.

Angular errors must be handled with other tools and devices. The machines are moved along a predefined grid, with measurements performed externally. Deviations of the coordinates are entered into the Support Tool. It is also possible to load external data, scale it, and store new data for later use.

Measurement of squareness errors is done using gauges. The GEC Wizard immediately calculates the compensation parameter based on the values for nominal and measured distances.



Pantec Metrology, located in Ruggell, Liechtenstein, develops technologies that make CMM and vision systems more competitive. With an installed base of more than 15,000 CMM controllers worldwide, the company plays a leading role in the field of CMM machine control. Pantec Metrology is a Business Unit of Pantec Engineering AG.

Pantec Engineering AG provides solutions in automation and mechatronics for the mechanical engineering and medical device industries worldwide. Through its rigorous focus on niche strategies and high degree of service orientation, the company has become a world leader in its five primary markets.

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