

CLAIMS

1. A non-contact optical measurement device for detecting or measuring different geometric workpiece features based on configurable light-propagation paths of light emitted from a light source and reflected by a workpiece surface for incidence upon a spectral sensor, the non-contact optical measurement device comprising:

a collimator configured to collimate the light emitted from the light source so as to establish collimated light directed along an optical axis;

a rotational motion stage configured to engender rotational motion about the optical axis;

a rotational motion sensor configured to track a controllable amount of rotation imparted by the rotational motion stage; and

a mounting apparatus acting as a common interface for detachably mounting any selected member of a set of exchangeable optical probes to the rotational motion stage and thereby configurably direct the collimated light along a corresponding propagation path as the controllable amount of rotation is imparted to a probe optic configuration of the selected member such that a reflected portion of the collimated light is directed toward the spectral sensor.

2. The non-contact optical measurement device of claim 1, further comprising the set of exchangeable optical probes, each member of the set including a corresponding probe optic configuration that is different from those of other members of the set.

3. The non-contact optical measurement device of claim 1, in which the spectral sensor is non-rotatable in response to the controllable amount of rotation imparted by the rotational motion stage.

4. The non-contact optical measurement device of claim 1, in which the controllable amount of rotation includes 360° or more of free rotation.

5. The non-contact optical measurement device of claim 1, further comprising a processing device to generate an image or point cloud of a geometric surface based on position information from the rotational motion sensor and spectral information from the spectral sensor.

6. The non-contact optical measurement device of claim 5, in which the rotational and spectral information is acquired using, in seriatim, different members of the set of exchangeable optical probes.

7. The non-contact optical measurement device of claim 1, in which the mounting apparatus comprises a kinematic mount.
8. The non-contact optical measurement device of claim 1, in which the mounting apparatus comprises magnetic, mechanical, or vacuum coupling.
9. The non-contact optical measurement device of claim 1, further comprising a member of the set of exchangeable optical probes having an axially aligned probe optics configuration in which the collimated light and the reflected portion share a propagation path aligned along the optical axis.
10. The non-contact optical measurement device of claim 1, further comprising a member of the set of exchangeable optical probes having a mirror to direct the collimated light at an angle relative to the optical axis.
11. The non-contact optical measurement device of claim 10, further comprising an f-theta lens configured to measure planar surface geometry in response to linear scanning of a probe measurement spot and linear motion of the workpiece surface to be measured.
12. The non-contact optical measurement device of claim 1, further comprising a member of the set of exchangeable optical probes having a laterally offset probe optics configuration such that propagation paths of the collimated light and the reflected portions are laterally offset from each other.
13. The non-contact optical measurement device of claim 12, in which the laterally offset probe optics configuration includes two successive 90° reflections configured to measure planar surface geometry in response to coordinated circular scanning of a probe measurement spot and linear motion of the workpiece surface to be measured.
14. The non-contact optical measurement device of claim 12, further comprising a mirror to direct the collimated light at an angle relative to the optical axis, and in which the member of the set of exchangeable optical probes is configured to measure cylindrical surface geometry in response to coordinated circular scanning of a probe measurement spot and linear motion of the workpiece surface to be measured.
15. The non-contact optical measurement device of claim 10 or 14, in which the angle is 90°.
16. The non-contact optical measurement device of claim 1, in which the rotational motion stage includes an air bearing.

17. The non-contact optical measurement device of claim 1, in which the rotational motion sensor includes an optical encoder.