CLAIMS:

1. Apparatus for inspection of a surface of a device, comprising:

a projection module operative to project a pattern along a projection axis of the projection module onto the device;

an imaging module operative to receive an image of the pattern reflected from the device along an imaging axis of the imaging module onto an image sensor; and

a lens comprised in the imaging module having a first magnification in a first direction orthogonal to the imaging axis and a second magnification different from the first magnification in a second direction orthogonal to both the first direction and the imaging axis.

2. Apparatus as claimed in claim 1, wherein the projection module for producing the pattern further comprises a grating having a pitch direction comprising periodic patterns spaced from one another and a fringe direction orthogonal to the pitch direction.

3. Apparatus as claimed in claim 2, wherein the lens comprised in the imaging module is configured such that its magnification in a direction parallel to the pitch direction is higher than its magnification in a direction parallel to the fringe direction.

4. Apparatus as claimed in claim 1, wherein the lens comprised in the imaging module is a bi-magnification lens.

5. Apparatus as claimed in claim 4, wherein the lens is a cylindrical lens.

6. Apparatus as claimed in claim 1, wherein the different magnifications in the first and second directions result in an inconsistent magnifications in the first

and second directions in a image received by an image sensor, as well as different fields of view of the image sensor in the first and second directions.

7. Apparatus as claimed in claim 1, wherein resolutions of the image received on the image sensor are different in the first and second directions.

8. Apparatus as claimed in claim 1, further comprising an asymmetric aperture stop in the projection module having a first numerical aperture in a third direction orthogonal to the projection axis and a second numerical aperture different from the first numerical aperture in a fourth direction orthogonal to both the third direction and the projection axis.

9. Apparatus as claimed in claim 8, wherein the asymmetric aperture stop is incorporated in the projection module.

10. Apparatus as claimed in claim 8, wherein the asymmetric aperture stop comprised in the projection module provides a higher lighting energy utilization in the third direction and a pattern with an image having sufficient sharpness for height measurement in the fourth direction.

11. Apparatus as claimed in claim 8, wherein the projection module for producing the pattern further comprises a grating having a pitch direction comprising periodic patterns spaced from one another and a fringe direction orthogonal to the pitch direction, and an asymmetric aperture stop comprised in the projection module is configured such that its numerical aperture in a direction parallel to the fringe direction is higher than its numerical aperture in a direction parallel to the pitch direction.

12. Apparatus for inspection of a surface of a device, comprising:

a projection module operative to project a pattern along a projection axis of the projection module onto the device;

an asymmetric aperture stop comprised in the projection module having a first numerical aperture in a first direction orthogonal to the projection axis and a second numerical aperture different from the first numerical aperture in a second direction orthogonal to both the first direction and the projection axis; and

an imaging module operative to receive an image of the pattern reflected from the device along an imaging axis of the imaging module onto an image sensor.

13. Apparatus as claimed in claim 12, further comprising a lens comprised in the imaging module having a first magnification in a third direction orthogonal to the imaging axis and a second magnification different from the first magnification in a fourth direction orthogonal to both the third direction and the imaging axis

14. Apparatus as claimed in claim 12, wherein the projection module includes a cylindrical lens.

15. Apparatus as claimed in claim 12, wherein the aperture stop comprised in the projection module provides a higher lighting energy utilization in the first direction and a pattern with a fringe image having sufficient sharpness for height measurement in the second direction.

16. Apparatus as claimed in claim 12, wherein the projection module for producing the pattern further comprises a grating having a pitch direction comprising periodic patterns spaced from one another and a fringe direction orthogonal to the pitch direction, and an asymmetric stop comprised in the projection module is configured such that its numerical aperture in a direction parallel to the fringe direction is higher than its numerical aperture in a direction parallel to the pitch direction.

17. Apparatus as claimed in claim 12, wherein the projection module for producing the pattern further comprises a grating having a pitch direction

comprising periodic patterns spaced from one another and a fringe direction orthogonal to the pitch direction and a lens comprised in the imaging module is configured such that its magnification in a direction parallel to the pitch direction is higher than its magnification in a direction parallel to the fringe direction.

18. Apparatus as claimed in claim 17, wherein the lens comprised in the imaging module is a cylindrical lens.

19. Apparatus as claimed in claim 17, wherein the different magnifications in the third and fourth directions result in an inconsistent magnifications in the first and second directions in an image received by an image sensor size, as well as different fields of view of the image sensor in the first and second directions.

20. Apparatus as claimed in claim 17, wherein resolutions of the image received on the image sensor are different in the third and fourth directions.

CLAIMS

1. Apparatus for inspection of a surface of a device, comprising:

a projection module operative to project a pattern along a projection axis of the projection module onto the device;

an imaging module operative to receive an image of the pattern reflected from the device along an imaging axis of the imaging module onto an image sensor; and

a lens comprised in the imaging module having a first magnification in a first direction orthogonal to the imaging axis and a second magnification different from the first magnification in a second direction orthogonal to both the first direction and the imaging axis,

wherein the first magnification in the first direction of the lens is larger than the second magnification in the second direction, so as to achieve an asymmetric magnification of the image of the pattern that is reflected from the device, whereby magnification of the image of the pattern is larger in the first direction than in the second direction.

2. Apparatus as claimed in claim 1, wherein the projection module for producing the pattern further comprises a grating having a pitch direction comprising periodic patterns spaced from one another and a fringe direction orthogonal to the pitch direction.

3. Apparatus as claimed in claim 2, wherein the lens comprised in the imaging module is configured such that its magnification in a direction parallel to the pitch direction is higher than its magnification in a direction parallel to the fringe direction.

4. Apparatus as claimed in any one of the preceding claims, wherein the lens comprised in the imaging module is a bi-magnification lens.

5. Apparatus as claimed in claim 4, wherein the lens is a cylindrical lens.

6. Apparatus as claimed in any one of the preceding claims, wherein resolutions of the image received on the image sensor are different in the first and second directions.

7. Apparatus as claimed in any one of the preceding claims, further comprising an asymmetric aperture stop in the projection module having a first numerical aperture in a third direction orthogonal to the projection axis and a second numerical aperture different from the first numerical aperture in a fourth direction orthogonal to both the third direction and the projection axis.

8. Apparatus as claimed in claim 7, wherein the asymmetric aperture stop is incorporated in the projection module.

9. Apparatus as claimed in claim 7 or claim 8, wherein the asymmetric aperture stop comprised in the projection module provides a higher lighting energy utilization in the third direction and a pattern with an image having sufficient sharpness for height measurement in the fourth direction.

10. Apparatus as claimed in any one of claims 7 to 9, wherein the projection module for producing the pattern further comprises a grating having a pitch direction comprising periodic patterns spaced from one another and a fringe direction orthogonal to the pitch direction, and an asymmetric aperture stop comprised in the projection module is configured such that its numerical aperture in a direction parallel to the fringe direction is higher than its numerical aperture in a direction parallel to the pitch direction.