Claims

1. A method for assessing the quality of a multi-channel micro- and/or subwavelength-optical projection unit (28), comprising the following steps:

- illuminating at least a predefined portion of the multi-channel micro- and/or subwavelength-optical projection unit (28) so that an image is generated by at least two channels of the predefined portion of the multi-channel micro- and/or subwavelength-optical projection unit (28);
- capturing the image generated by the predefined portion of the multi-channel micro- and/or subwavelength-optical projection unit (28);
- analyzing the image;
- determining at least one characteristic quantity based on the analysis of the image, wherein a value of the characteristic quantity is associated with at least one characteristic feature of the multi-channel micro- and/or subwavelength-optical projection unit (28), at least one defect of the multi-channel micro- and/or subwavelength-optical projection unit (28) and/or at least one defect class of the multi-channel micro- and/or subwavelength-optical projection unit (28); and
- assessing the quality of the multi-channel micro- and/or subwavelength-optical projection unit (28) based on the at least one characteristic quantity;

wherein the image of the multi-channel micro- and/or subwavelength-optical projection unit (28) is analyzed via a statistical method and via a machine learning module,

wherein the machine learning module comprises a pre-trained artificial neural network,

wherein the machine learning module has been pre-trained with labelled training data, wherein the labelled training data comprises sample images generated by the predefined portion of a sample optical projection unit, and wherein the labelled training data comprises the at least one characteristic quantity corresponding to the respective sample images and/or the quality class of the respective sample projection unit, and

wherein the at least one characteristic quantity corresponding to the respective sample images is obtained by applying the statistical method to the sample images.

2. The method of claim 1, characterized in that the at least one characteristic quantity comprises at least one of sharpness, dark level, uniformity, brightness fluctuations and local defects.

3. The method according to any one of the preceding claims, characterized in that the multi-channel micro- and/or subwavelength-optical projection unit (28) is categorized into one of at least two quality classes based on the at least one characteristic quantity.

4. The method according to any one of the preceding claims, characterized in that the multi-channel micro- and/or subwavelength-optical projection unit (28) comprises several micro- and/or subwavelength-optical elements (30).

5. The method of claim 4, wherein the multi-channel micro- and/or subwavelength-optical projection unit (28) comprises several micro-lenses and/or subwavelength-lenses.

6. The method of claim 4 or 5, wherein the optical elements (30) have a size, a curvature, a masking and/or a position in the multi-channel micro- and/or subwavelength-optical projection unit (28), the size, the curvature and/or the position being at least one of the at least one characteristic feature of the projection unit (28).

7. The method according to any one of claims 4 to 6, characterized in that the optical elements (30) form an array, the array having a distance between two neighboring optical elements (30) being at least one of the at least one characteristic feature of the multi-channel micro- and/or subwavelength-optical projection unit (28).

8. The method according to any one of the preceding claims, characterized in that the quality of the multi-channel micro- and/or subwavelength-optical projection unit (28) is assessed during manufacturing of the multi-channel micro- and/or subwavelength-optical projection unit (28).

9. The method of claim 8, wherein the quality of the multi-channel micro- and/or subwavelength-optical projection unit (28) is assessed end-of-line.

10. The method according to claim 8 or 9, characterized in that manufacturing parameters are adapted based on the quality assessment of the multi-channel micro- and/or subwavelength-optical projection unit (28).

11. The method of claim 10, wherein at least one of the characteristic features is adapted based on the quality assessment of the multi-channel micro- and/or subwavelength-optical projection unit (28).

12. A test system for assessing the quality of a multi-channel micro- and/or subwavelength-optical projection unit (28), comprising an illumination unit (12), an image capturing device (18), an image analysis module (24) and a control module (22), wherein the control module (22) is configured to cause the test system (10) to perform the method according to any one of the preceding claims.

13. The test system of claim 12, characterized in that the test system (10) comprises a device under test (14).

14. The test system of claim 13, wherein the device under test (14) is the multi-channel micro- and/or subwavelength-optical projection unit (28).

15. A computer program comprising instructions which, when the program is executed by a processing unit of the control module (22) of the test system (10) according to any one of claims claim 12 to 14, cause the test system (10) to carry out the steps of the method according to any one of the claims 1 to 11.