

CLAIMS

1. A position sensor comprising an optical system configured to deliver radiation to an alignment mark on a substrate and to collect diffracted or scattered radiation from the substrate, and to process the collected radiation to derive at least one position-sensitive signal therefrom, wherein the optical system is operable to deliver, collect and process radiation selectively in a first wavelength range and/or in a second wavelength range, wherein the radiation of the first wavelength range and the second wavelength range share a common optical path in at least some portion of said optical system, while the radiation of the first wavelength range is processed by a first processing sub-system and the radiation of the second wavelength range is processed by a second processing sub-system.
2. A position sensor as claimed in claim 1 wherein said first wavelength range includes radiation with a wavelength shorter than 800 nm and said second wavelength range includes infrared radiation with wavelength longer than 1000 nm.
3. A position sensor as claimed in claim 2 wherein said second wavelength range includes infrared radiation with wavelength longer than 1500 nm.
4. A position sensor as claimed in any preceding claim wherein said optical system includes an illumination system for combining radiation of both the first and second wavelength ranges from one or more radiation sources into said common optical path and said common optical path further includes a common objective lens for delivering and collecting said radiation of both the first and second wavelength ranges to the alignment mark, the objective lens being included in said common optical path.
5. A position sensor as claimed in claim 4 wherein a spectral filter is provided to split the radiation of the first and second wavelength ranges collected by said common objective lens for delivery to the first and second processing sub-systems.
6. A position sensor as claimed in any of claims 1 to 3 wherein said optical system includes a first objective lens for delivering and collecting radiation of the first wavelength range and a second objective lens for delivering and collecting radiation of the second wavelength range.
7. A position sensor as claimed in claim 6 wherein said optical system includes an illumination system for combining radiation of both the first and second wavelength ranges from a plurality of radiation sources into said common optical path for delivering radiation to the first and second objective lenses.

8. A position sensor as claimed in claim 6 or 7 wherein a spectral filter is provided to split the radiation of the first and second wavelength ranges from said common optical path for delivery to the first and second objective lenses.

5 9. A position sensor as claimed in claim 4 wherein a first half or quarter wave plate is positioned in the path of the radiation of the first wavelength range between said spectral filter and the first interferometric subsystem, and a second half or quarter wave plate is positioned in the path of the radiation of the second wavelength range between said spectral filter and the second interferometric subsystem.

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10. A position sensor as claimed in any preceding claim wherein a plurality of position-sensitive signals are obtained by processing the collected radiation in at least one of said wavelength ranges, each position-sensitive signal being obtained using radiation having different characteristics.

15 11. A position sensor as claimed in claim 10 wherein said radiation having different characteristics includes radiation having different wavelengths within said first wavelength range.

12. A position sensor as claimed in claim 10 or 11 wherein said radiation having different characteristics includes radiation having different wavelengths within said second wavelength range.

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13. A method of manufacturing devices wherein a device pattern is applied to a substrate using a lithographic process, the method including positioning the applied pattern by reference to measured positions of one or more marks formed on the substrate, the measured positions being obtained using a position sensor as claimed in any preceding claim.

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14. A method as claimed in claim 13 wherein different device patterns are applied to different layers on the substrate, and wherein said measured positions are obtained using the first wavelength range for patterning a first layer and using the second wavelength range for a second layer.

30 15. A lithographic apparatus for use in applying a pattern to a substrate, the lithographic apparatus including a position sensor as claimed in any of claims 1 to 12 and a controller configured for causing the position sensor to measure the position of one or more alignment marks using a radiation in a selected one or both of said wavelength ranges, and for using the measured position of the target structure to control the positioning of one or more patterns applied to the substrate.

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