WHAT IS CLAIMED IS:

1. An exposure apparatus that exposes a substrate, comprising:

a stage configured to hold and move the substrate;

a projection optical system configured to project a pattern of a mask onto the substrate held by the stage; and

a controller configured to control exposures of the substrate in accordance with a step-and-repeat method while performing step movements of the stage and controlling a position of the stage in a first direction along an optical axis of the projection optical system,

wherein the controller is configured to obtain a step size of the step movements, and determine a correction value for correcting the position of the stage in the first direction in accordance with the obtained step size.

2. The apparatus according to claim 1, wherein the controller is configured to determine a correction formula of the step size based on a plurality of correction formulas corresponding to a plurality of step sizes and determines the correction value by using the determined correction formula.

3. The apparatus according to claim 2, wherein the plurality of correction formulas include a corection formula expressing a relationship between a step size, a position of a shot rejection, and a correction value.

4. The apparatus according to claim 3, wherein the plurality of correction formulas include a correction formula expressing a relationship between a step direction, a step size, and a correction value.

5. The apparatus according to claim 2, wherein the controller is configured to determine the correction formula of the step size by interpolating parameters of correction formulas of two step sizes preceding and succeeding a step size among the plurality of step sizes.

6. The apparatus according to claim 5, wherein in a case in which the step

size is smaller than the minimum step size of the plurality of step sizes, the controller determines the correction formula of the minimum size step as the correction formula of the step size, and

in a case in which the step size is larger than the maximum step size the plurality of step sizes, the controller determines the correction formula of the maximum step size as the correction formula of the step size.

7. An exposure method of exposing a substrate executed by an exposure apparatus having a stage configured to hold and move the substrate, and a projection optical system configured to project a pattern of a mask onto the substrate held by the stage, the apparatus performs exposures of the substrate in accordance with a step-and-repeat method while performing step movements of the stage and controlling a position of the stage in a first direction along an optical axis of the projection optical system, the method comprising:

obtaining a step size of the step movements;

determining a correction value for correcting the position of the stage in the first direction in accordance with the obtained step size;

measuring a position of the stage in the first direction after performing a step movement with the obtained step size;

reflecting the determined correction value on a drive command value of the stage for the control of the position of the stage in the first direction;

performing the control of the position of the stage in the first direction based on a measurement value obtained in the measuring and the drive command value in which the determined correction value is reflected; and

exposing the shot region after the completion of the control of the position of the stage in the first direction.

8. The method according to claim 7, further comprising determining, in advance, a correction formula of the step size based on a plurality

of correction formulas corresponding to a plurality of step sizes, and determining the correction value by using the determined correction formula.

9. The method according to claim 8, wherein the plurality of correction formulas include a correction formula expressing a relationship between a step size, a position of a shot region, and a correction value.

10. The method according to claim 9, wherein the determining the correction value includes

performing actual measurement which repeatedly performing the following for each shot region for each of the plurality of step sizes:

(a) measuring the position of the stage in the first direction after performing a step movement with the step size,

(b) controlling driving of the stage in the first direction so that the position of the stage is close to a target position based on a result of the measurement, and

(c) measuring the position of the stage in the first direction after the completion of the control and calculating a drive residual that is a difference between the measured position and the target position, and

calculating the plurality of correction formulas based on the drive residual of each shot region obtained for each of the plurality of step size by the actual measurement.

11. A method of manufacturing an article, comprising:

exposing a substrate by using an exposure apparatus defined in any one of claims 1 to 6; and

developing the substrate exposed in the exposing,

wherein an article is manufactured from the developed substrate.

12. The apparatus according to claim 1, wherein the controller is configured to determine the correction value in accordance with a positon of a shot region on

the substrate.

13. The apparatus according to claim 1, wherein the controller is configured to determine the correction value in accordance with a step direction of the step movement.

14. The apparatus according to claim 1, wherein the step movement includes movement of the stage in a second direction intersecting with the first direction to move a shot region of the substrate to a position for measurement in the first direction.

15. The apparatus according to claim 1, wherein a plurality of correction formulas corresponding to each of a plurality of step sizes are obtained in advance, by controlling the position of the stage in the first direction so that the position of the stage is close to a target position, and checking a difference between the target position and the position of the stage in the first direction after the control, and the correction value corresponding to the obtained step size is determined based on at least one of the plurality of correction formulas.

16. The method according to claim 7, wherein a plurality of correction formula s corresponding to each of a plurality of step sizes are obtained in advance, by controlling the position of the stage in the first direction so that the position of the stage is close to a target position, and checking a difference between the target position of the position of the stage in the first direction after the control, and the correction value corresponding to the obtained step size is determined based on at least one of the plurality of correction formulas.

17. An exposure method for exposing a first substrate by an exposure apparatus in accordance with a step-and-repeat method, the exposure method comprising:

a movement step of performing a step movement of a stage of the exposure apparatus on which a second substrate is held;

a first detection step of detecting, after the step movement, a position of the second substrate on the stage in an optical axis direction that is a direction along an optical axis of a projection optical system of the exposure apparatus;

a first control step of controlling a position of the stage in the optical axis direction so that the second substrate is close to a target position in the optical axis direction based on the position of the second substrate in the optical axis direction detected in the first detection step;

a second detection step of detecting a position of the second substrate in the optical axis direction after the first control step;

a determination step of determining a correction formula for obtaining a correction value to be used for controlling the position of the stage in the optical axis direction based on a difference between the position of the second substrate in the optical axis direction detected in the second detection step and the target position;

a third detection step of performing a step movement of the stage on which the first substrate is held, and detecting a position of the first substrate on the stage in the optical axis direction after the step movement;

a second control step of controlling the position of the stage in the optical axis direction so that the first substrate is close to the target position in the optical axis direction based on the position of the first substrate in the optical axis direction detected in the third detection step and the correction value obtained by using the correction formula determined in the determination step; and

an exposure step of exposing the first substrate after the second control step.

18. The exposure method according to claim 17, wherein the correction formula is a formula for obtaining the correction value based on a position of an exposure region in a plane of the first substrate.

19. The exposure method according to claim 17, wherein the movement step, the first detection step, the first control step, and the second detection step are repeated while changing a step size of the step movement in the movement step, and the determination step determines a plurality of correction formulas in accordance with the step size.

20. The exposure method according to claim 19, wherein the second control step controls the position of the stage based on a correction formula corresponding to a step size of the step movement of the stage holding the first substrate among the plurality of correction formulas.

21. The exposure method according to claim 19, wherein the second control step controls the position of the stage based on a correction formula corresponding to a step size closest to a step size of the step movement of the stage holding the first substrate among the plurality of correction formulas.

22. The exposure method according to claim 19, wherein the second control step controls the position of the stage based on a first correction formula corresponding to a first step size of the step movement of the stage holding the first substrate among the plurality of correction formulas, wherein the first correction formula is obtained based on a second correction formula corresponding to a second step size larger than the first step size and a third correction formula corresponding to a third step size smaller than the first step size.

23. The exposure method according to claim 22, wherein the first correction formula is obtained by interpolating using the second correction formula and the third correction formula.

24. The exposure method according to claim 17, wherein the movement step, the first detection step, the first control step, and the second detection step are repeated while changing a step direction of the step movement in the

movement step, and the determination step determines a plurality of correction formulas in accordance with the step direction.

25. The exposure method according to claim 24, wherein the second control step controls the position of the stage based on a correction formula corresponding to a step direction of the step movement of the stage holding the first substrate among the plurality of correction formulas.

26. The exposure method according to claim 17, wherein the movement step, the first detection step, the first control step, and the second detection step are repeated such that the first detection step and the second detection step detect a position of the second substrate in the optical axis direction at a plurality of positions in a plane of the second substrate, and the determination step determines a plurality of correction formulas based on a plurality of the differences corresponding to the plurality of positions.

27. The exposure method according to claim 17, wherein the stage performs the step movement in a direction along a plane perpendicular to the optical axis direction.

28. An exposure apparatus that exposes a first substrate in accordance with a step-and-repeat method,

a stage configured to hold and move a substrate;

a projection optical system for projecting a pattern of a mask onto the substrate held on the stage;

a detector configured to detect a position in an optical axis direction of the projection optical system of the substrate held on the stage; and

a controller configured to control exposures of the substrate;

wherein the controller is configured to:

control the stage on which a second substrate is held to perform a step movement;

perform, after the step movement, a first detection for detecting a position of the second substrate on the stage in an optical axis direction that is a direction along an optical axis of the projection optical system;

perform a first control for controlling a position of the stage in the optical axis direction so that the second substrate is close to a target position in the optical axis direction based on the detected position of the second substrate in the optical axis direction;

perform, after the first control, a second detection for detecting a position of the second substrate in the optical axis direction;

determine a correction formula for obtaining a correction value to be used for controlling the position of the stage in the optical axis direction based on a difference between the position of the second substrate in the optical axis direction detected in the second detection and the target position;

perform a third detection for performing a step movement of the stage on which the first substrate is held, and detecting a position of the first substrate on the stage in the optical axis direction after the step movement;

perform a second control for controlling the position of the stage in the optical axis direction so that the first substrate is close to the target position in the optical axis direction based on the position of the first substrate in the optical axis direction detected by the third detection and the correction value obtained by using the determined correction formula; and

expose the first substrate after the second control.

29. A determination method for determining a correction formula for obtaining a correction value to be used for controlling a position of a stage in an optical axis direction of a projection optical system of an exposure apparatus for exposing a substrate in accordance with a step-and-repeat method, the determination method comprising:

a movement step of performing a step movement of the stage on which the substrate is held;

a first detection step of detecting, after the step movement, a position of the substrate on the stage in the optical axis direction;

a first control step of controlling a position of the stage in the optical axis direction so that the substrate is close to a target position in the optical axis direction based on the position of the substrate in the optical axis direction detected in the first detection step;

a second detection step of detecting a position of the substrate in the optical axis direction after the first control step; and

a determination step of determining the correction formula based on a difference between the position of the substrate in the optical axis direction detected in the second detection step and the target position.

30. An article manufacturing method for exposing a first substrate by an exposure apparatus in accordance with a step-and-repeat method, and manufacturing an article from the first substrate, the article manufacturing method comprising:

a movement step of performing a step movement of a stage of the exposure apparatus on which a second substrate is held;

a first detection step of detecting, after the step movement, a position of the second substrate on the stage in an optical axis direction that is a direction along an optical axis of a projection optical system of the exposure apparatus;

a first control step of controlling a position of the stage in the optical axis direction so that the second substrate is close to a target position in the optical axis direction based on the position of the second substrate in the optical axis direction detected in the first detection step;

a second detection step of detecting a position of the second substrate in

the optical axis direction after the first control step;

a determination step of determining a correction formula for obtaining a correction value to be used for controlling the position of the stage in the optical axis direction based on a difference between the position of the second substrate in the optical axis direction detected in the second detection step and the target position;

a third detection step of performing a step movement of the stage on which the first substrate is held, and detecting a position of the first substrate on the stage in the optical axis direction after the step movement;

a second control step of controlling the position of the stage in the optical axis direction so that the first substrate is close to the target position in the optical axis direction based on the position of the first substrate in the optical axis direction detected in the third detection step and the correction value obtained by using the correction formula determined in the determination step;

an exposure step of exposing the first substrate after the second control step;

a developing step of developing the first substrate exposed in the exposure step; and

a manufacturing step of manufacturing the first substrate developed in the developing step.