

the measurement position 32 by 100 μm in the substrate thickness direction in the case where the magnetic-disk glass substrate has a substrate thickness of 0.635 mm. In the case where the substrate thickness is different, the distance from the measurement position 32 to the measurement positions 31 and 32 respectively in the substrate thickness direction may be changed. For example, in the case of a magnetic-disk glass substrate having a substrate thickness of T (mm), the distance may be set to $100 (\mu\text{m}) \times (L/0.635)$.

As a measurement device for measuring the shapes of the outer circumferential edge surface of the glass substrate G at the measurement positions 31 to 33, a device is used that can obtain outlines 31a, 32a and 33a distinctly from each other at the measurement positions 31 to 33 of the side wall surface 11w. From this point, it is preferable that the stylus 3 of the measurement device has a spherical surface having a radius of curvature of 0.4 mm or less. At the time of measurement, the stylus 3 is disposed so as to be opposed to each of the measurement positions 31 to 33 on the measurement wall 11w of the glass substrate G, and performs the measurement on those positions in succession.

The respective outlines 31a to 33a of the measurement positions 31 to 33 are obtained by rotating the glass substrate G by one cycle in a state in which the stylus 3 is disposed so as to be opposed to the measurement positions 31 to 33. An inscribed circle and a circumscribed circle are respectively obtained based on the center derived by the least squares method with respect to the three obtained outlines 31a to 33a, and a circumscribed circle C2 that is in contact with the outermost side and an inscribed circle C1 that is in contact with the innermost side are determined. The radius difference R between the circumscribed circle C2 and the inscribed circle C1 is derived as the cylindricity of the side wall surface 11w.

The cylindricity of the side wall surface 11w is adjusted by chamfering processing with a formed grindstone, edge surface grinding processing, and brushing, for example.

value). Levels 1 and 2 are acceptable for practical purposes for a HDD of 500 kTPI.

Level 1: 20 nm or less

Level 2: more than 20 nm to 30 nm or less

5 Level 3: more than 30 nm to 40 nm or less

Level 4: more than 40 nm

[0062] [Table 1]

	Roundness (μm)	Shape evaluation value (μm)	Evaluation result
Comp. Ex. 2	1.7	1.0	Level 4
Comp. Ex. 1	1.5	1.3	Level 3
Work. Ex. 1	1.5	1.0	Level 2
Work. Ex. 2	1.0	0.8	Level 2
Work. Ex. 3	1.0	0.5	Level 1
Work. Ex. 4	0.8	0.3	Level 1

[0063] It was confirmed from the evaluation results in Table 1 that if the roundness exceeded 1.5 μm (comparative example 2), fluttering characteristics were large and not acceptable. In addition, in the case where the shape evaluation value exceeded 1 μm (comparative example 2), even if the roundness was 1.5 μm or less, fluttering characteristics were not favorable. On the other hand, in the case where the roundness was 1.5 μm or less and the shape evaluation value was 1 μm or less (working examples 1 to 4), fluttering characteristics were favorable. It should be noted that as shown in the working examples 3 and 4, in the case where the shape evaluation value was 0.5 μm or less, it was confirmed that fluttering characteristics were particularly favorable. As shown in the working examples 1 to 4, it is conceivable that in the case where fluttering characteristics were favorable, an error was unlikely to occur when a magnetic signal was written to or read out from the magnetic disk of the HDD, and positioning accuracy using a servo of the HDD was favorable.

[0064] It should be noted that when a magnetic-disk glass substrate having a roundness of 1.7 μm and a shape evaluation value of 0.5 μm (comparative example 3) was prepared and fluttering characteristic values were measured

[0068] [Table 3]

	Difference in radius of curvature (mm)					
	Work. Ex. 1		Work. Ex. 7		Work. Ex. 8	
	A surface	B surface	A surface	B surface	A surface	B surface
0 to 30 degrees	0.005	0.006	0.002	0.003	0.003	0.011
30 to 60 degrees	0.004	0.005	0.002	0.004	0.010	0.010
60 to 90 degrees	0.004	0.006	0.001	0.003	0.009	0.004
90 to 120 degrees	0.005	0.009	0.004	0.002	0.011	0.004
120 to 150 degrees	0.005	0.009	0.002	0.001	0.004	0.002
150 to 180 degrees	0.008	0.010	0.003	0.002	0.004	0.003
180 to 210 degrees	0.006	0.009	0.001	0.003	0.010	0.001
210 to 240 degrees	0.004	0.007	0.003	0.004	0.003	0.004
240 to 270 degrees	0.005	0.008	0.002	0.005	0.004	0.002
270 to 300 degrees	0.003	0.008	0.003	0.003	0.012	0.003
300 to 330 degrees	0.003	0.007	0.005	0.001	0.009	0.005
330 to 360 degrees	0.003	0.006	0.005	0.004	0.004	0.007
Max. value of differences	0.010		0.005		0.012	

[0069] [Table 4]

	Max. value of differences in radii of curvature (mm)	Variation in shape evaluation value (μm)
Work. Ex. 1	0.010	0.10
Work. Ex. 7	0.005	0.07
Work. Ex. 8	0.012	0.16

[0070] Next, samples (working examples 9 to 11) were produced by performing edge surface grinding under the production conditions of the working example 1 except that a resin bond grindstone having a different grindstone hardness was used. It should be noted that the lower the grindstone hardness is, the smaller the cylindricity is. The cylindricity was calculated as shown in FIGS. 4 and 5. That is, outlines were obtained at the central position of the side wall surface in the substrate thickness direction and the positions spaced apart upward and downward by 100 μm from the central position, the radii of inscribed circles of the three outlines were derived, the difference between the maximum value and the minimum value of the radii of the inscribed circles of the three outlines was derived, and the radius difference was used as the cylindricity of the side wall surface. All measurements were performed using a roundness/cylindrical shape measurement device.

A magnetic layer and the like were formed on the magnetic-disk glass substrates of the working examples 9 to 11, and magnetic disks were produced.

Each of the magnetic disks was incorporated in a 2.5-inch type HDD having a disk rotation rate of 7200 rpm together with a DFH head, and after magnetic signals were recorded at a track density of 500 kTPI, servo signal reading testing was performed in a region of a radius position of 30.4 mm to a radius position of 31.4 mm.

[Evaluation criterion]

The number of servo signal reading errors in the HDD was evaluated. Table 5 shows the results. The magnetic disks in which the error count is 30 or less are acceptable for practical purposes.

[0071] [Table 5]

	Cylindricity (μm)	Error count
Work. Ex. 9	6	25
Work. Ex. 10	5	15
Work. Ex 11	3	12

[0072] It was confirmed from the evaluation results in Table 5 that although the comparative example 9 was acceptable for practical purposes, there were a larger number of servo signal reading errors in the case where the cylindricity exceeded 5 μm (comparative example 9) compared to the case where the cylindricity was 5 μm or less (working examples 10 and 11).

[0073] Next, the above-described processing conditions were changed as appropriate to produce two types of glass substrate having a substrate thickness of 0.5 mm (the length of the side wall surface on the outer circumferential side was 0.3 mm) (comparative example 1A and working example 1A, respectively). The working example 1A and the comparative example 1A were produced such that the roundness and shape evaluation value of the working example 1A and the comparative example 1A were the same as those of the working example 1 and the comparative example 1. When flutter was evaluated for these examples and improvement widths resulting from a reduction in the shape evaluation value were compared, the improvement width from the comparative example 1A to the working example 1A was greater than the improvement width from the comparative example 1 to the

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300 to 330 degrees	0.003	0.007	0.005	0.001	0.009	0.005
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