

KES

Removal in Grindings

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Explanation



1. Scope of Application

This standard specifies the removal in grindings (Grinding Allowance) of the finishing surface (the finishing surface of cylindrical grinding, inner surface grinding and flat surface grinding) in steel grinding for which the removal in grinding has not been specially specified.

2. Meaning of Terminology

Principal of terminology used in this standard shall be as follows:

(1) Removal in grinding (grinding allowance)

The value of mass allowance left on the work piece enabling it to be finished economically according to the specified dimensions, shape and surface roughness.

(2) Previous work

The cutting work on the work piece that results in the work piece with specified grinding allowance.

3. Kind of Removal in Grinding

The Kind of the removal in grinding specified in this standard is as follows:

Removal in grindings of cylinders (grinding with central support or chuck support)

Removal in grindings of inner surface (grinding with chuck support)

Removal in grindings of flat surface (grinding with chuck support and table support)

4. Removal in Grindings of Cylinder

4.1 Previous Work

Previous work shall be done by lathe.

4.2 Removal in Grinding

4.2.1 The removal in grindings for each diameter of the work piece that is to be grind finished without heat treatment after the primary grinding shall conform to Table 1(1).

4.2.2 The removal in grindings for each diameter of the work piece that is to be grind finished after quenching and tempering after the primary grinding shall conform to Table 1(2).

4.3 Previous Work Dimension

The previous work dimension shall be calculated by adding the removal in grinding of 4.2 to the maximum finishing dimension in the diameter of grinding surface expressed as a rounded value of up to one decimal.

Table 1 Removal in Grinding for Each Diameter of Cylinder

(1) The work pieces without heat treatment after the previous work

Distance for End of Cylinder l Diameter D	16 or less	Over 16 up to 25	Over 25 up to 40	Over 40 up to 63	Over 63 up to 100	Over 100 up to 160	Over 160 up to 250	Over 250 up to 400	Over 400 up to 630	Over 630 up to 1000	Over 1000 up to 1600
Over 6 up to 10	0.1	0.2	0.2	0.3	0.3	—	—	—	—	—	—
Over 10 up to 18	0.1	0.1	0.2	0.2	0.3	0.3	—	—	—	—	—
Over 18 up to 30	0.1	0.1	0.2	0.2	0.2	0.3	0.4	—	—	—	—
Over 30 up to 50	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.4	—	—	—
Over 50 up to 80	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.5	—	—
Over 80 up to 120	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.5	0.6	—
Over 120 up to 180	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.6	0.7
Over 180 up to 250	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.6
Over 250 up to 315	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.6
Over 315 up to 400	—	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.5	0.6
Over 400 up to 500	—	—	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

(2) The work pieces quenched and tempered after the previous work

Distance for End of Cylinder l Diameter D	16 or less	Over 16 up to 25	Over 25 up to 40	Over 40 up to 63	Over 63 up to 100	Over 100 up to 160	Over 160 up to 250	Over 250 up to 400	Over 400 up to 630	Over 630 up to 1000	Over 1000 up to 1600
Over 6 up to 10	0.2	0.2	0.2	0.3	0.5	—	—	—	—	—	—
Over 10 up to 18	0.2	0.1	0.2	0.3	0.4	0.5	—	—	—	—	—
Over 18 up to 30	0.2	0.1	0.2	0.3	0.4	0.5	0.6	—	—	—	—
Over 30 up to 50	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.7	—	—	—
Over 50 up to 80	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.6	0.8	—	—
Over 80 up to 120	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.7	0.9	—
Over 120 up to 180	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.6	0.8	1.1
Over 180 up to 250	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.6	0.8	1.0
Over 250 up to 315	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.6	0.7	0.9
Over 315 up to 400	—	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7	0.9
Over 400 up to 500	—	—	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.8

Remarks 1. The allowable error of the previous work dimension shall be as follows:

When the removal in grinding is 0.2 mm or less: ± 0.05 mmWhen the removal in grinding is 0.3 mm or more: ± 0.1 mm

2. D shall be the basic finishing dimension in the diameter of ground surface.

l shall be determined by dividing the total length of the grinding surface by 2 if the grinding surface is positioned at the center in the shaft direction. Otherwise it shall be the maximum length from the nearest end of the cylinder.

Example: The previous work dimension in Fig. 1 is the value after the quenching and tempering (unit: mm)

Calculation:

Maximum dimension of grind finishing	50+0.050	30+0.041
Rounded value of up to one decimal: (A)	50.1	30.0
Removal in grindings according to Table 1(2): (B)	0.3	0.3
Basic dimension of previous work: (A+B)	50.4	30.3
Allowable error of previous work dimension according to Remark 1 of Table 1	± 0.1	± 0.1
Limit of previous work dimension	50.4 ± 0.1 or 50 ^{+0.5} _{+0.3}	30.3 ± 0.1 or 30 ^{+0.4} _{+0.2}

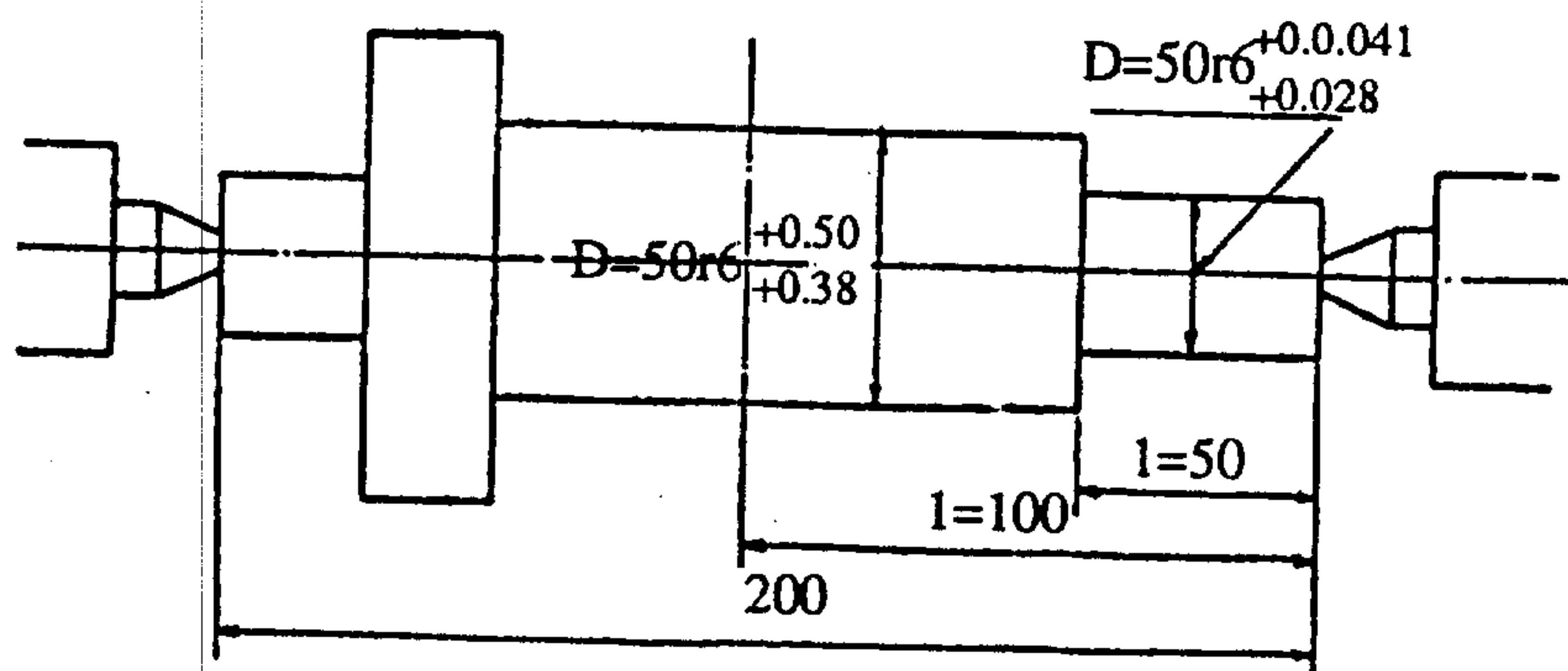


Fig. 1 Example of Cylindrical Grinding

5. Removal in Grinding of Inner Surface

5.1 Previous Work

Previous work shall be in accordance with lathe and boring machine.

5.2 Removal in Grinding

5.2.1 The removal in grindings for each diameter of the work piece that is to be grind finished without heat treatment after primary working shall conform to Table 2(2). In this case, the thickness of the mass in the radial direction shall be 1/10 or more of inside diameter. If it is 1/10 or less of inside diameter, the removal in grindings can be increased up to twice the value in Table 2(2).

Table 2. Removal in Grinding for Each Diameter of Inner Surface

(1) The work pieces without heat treatment after the previous work

Unit: mm

Distance for End of Cylinder L Diameter D	16 or less	Over 16 up to 25	Over 25 up to 40	Over 40 up to 63	Over 63 up to 100	Over 100 up to 160	Over 160 up to 250	Over 250 up to 400	Over 400 up to 630	Over 630 up to 1000	Over 1000 up to 1600
Over 6 up to 10	0.1	0.2	0.2	—	—	—	—	—	—	—	—
Over 10 up to 18	0.2	0.1	0.2	0.2	—	—	—	—	—	—	—
Over 18 up to 30	0.2	0.1	0.2	0.2	0.2	—	—	—	—	—	—
Over 30 up to 50	0.2	0.2	0.2	0.2	0.2	0.4	—	—	—	—	—
Over 50 up to 80	0.2	0.2	0.2	0.2	0.2	0.4	0.3	—	—	—	—
Over 80 up to 120	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	—	—	—
Over 120 up to 180	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	—	—
Over 180 up to 250	—	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	—
Over 250 up to 315	—	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5
Over 315 up to 400	—	—	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5
Over 400 up to 500	—	—	—	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6

(2) The work pieces quenched and tempered after the previous work

Unit: mm

Distance for End of Cylinder L Diameter D	16 or less	Over 16 up to 25	Over 25 up to 40	Over 40 up to 63	Over 63 up to 100	Over 100 up to 160	Over 160 up to 250	Over 250 up to 400	Over 400 up to 630	Over 630 up to 1000	Over 1000 up to 1600
Over 6 up to 10	0.2	0.2	0.2	—	—	—	—	—	—	—	—
Over 10 up to 18	0.2	0.2	0.3	0.3	—	—	—	—	—	—	—
Over 18 up to 30	0.3	0.3	0.3	0.3	0.3	—	—	—	—	—	—
Over 30 up to 50	0.3	0.3	0.3	0.3	0.3	0.4	—	—	—	—	—
Over 50 up to 80	0.4	0.4	0.4	0.4	0.4	0.4	0.4	—	—	—	—
Over 80 up to 120	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	—	—	—
Over 120 up to 180	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	—	—
Over 180 up to 250	—	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.7	—
Over 250 up to 315	—	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.8
Over 315 up to 400	—	—	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.8
Over 400 up to 500	—	—	—	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8

Remarks 1. The allowable error of the previous work dimension shall be as follows:

When the removal in grinding is 0.2 mm or less: ± 0.05 mmWhen the removal in grinding is 0.3 mm or more: ± 0.1 mm

2. D shall be the basic finishing dimension in the diameter of the grinding surface.

L shall be the total length of the grinding surface.

5.3 Previous Work Dimension

The previous work dimension shall be calculated by subtracting the removal in grinding according to 5.2 from the minimum finishing dimension in the diameter of grinding surface expressed as a rounded value of up to one decimal.

Example: The previous work dimension in Fig. 2 is the value after the quenching and tempering (unit: mm).

Calculation:

Minimum dimension of grind finishing	100-0.052
Rounded value of up to one decimal: (A)	99.9
Removal in grindings according to Table 2(2): (B)	0.5
Basic dimension of previous work: (A-B)	99.4
Allowable error of previous work dimension according To Remark 1 of Table 2	± 0.1
Limit of previous work dimension	99.4 ± 0.1 or $100 \begin{smallmatrix} -0.5 \\ -0.7 \end{smallmatrix}$

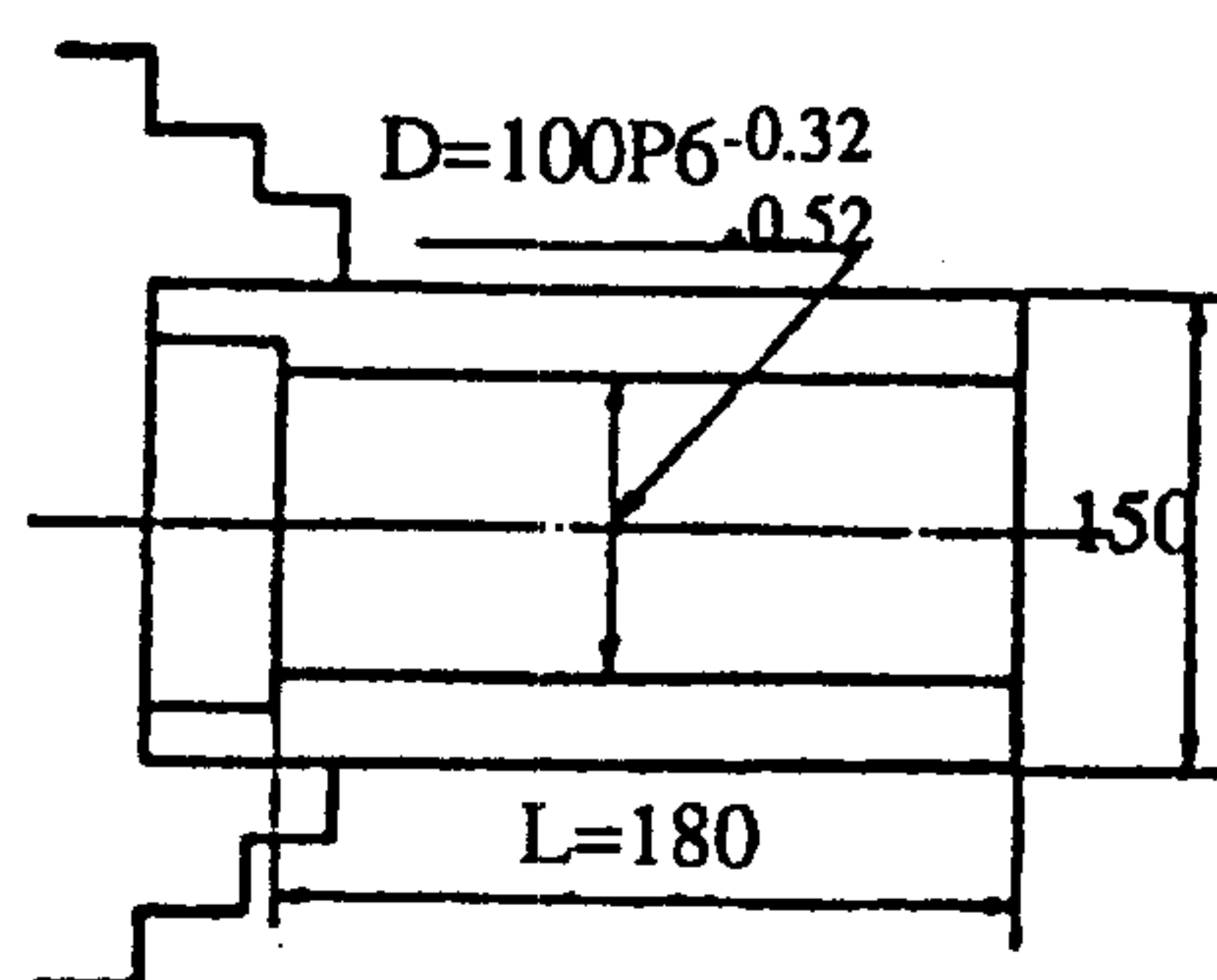


Fig. 2 Example of Inner Surface Grinding

6. Removal in Grinding of Flat Surface

6.1 Previous Work

Previous work shall be in accordance with shaper, planer, milling machine, etc.

6.2 Removal in grinding

6.2.1 The total removal in grindings of both sides of the work piece that is to be grind finished without heat treatment after the previous work shall conform to Table 3(1). In this case, the thickness of the mass shall be 1/10 or more of the width. If it is 1/10 or less of the width, the removal in grinding can be limited up to twice the value in Table 3(2).

Table 3 Total Removal in Grinding of Both Sides of Flat Surface

(1) The work pieces without heat treatment after the previous work

Unit: mm

Length L Width W	16 or less	Over 16 up to 25	Over 25 up to 40	Over 40 up to 63	Over 63 up to 100	Over 100 up to 160	Over 160 up to 250	Over 250 up to 400	Over 400 up to 630	Over 630 up to 1000	Over 1000 up to 1600
to 20	0.2	0.2	0.2	0.3	0.3	0.3	—	—	—	—	—
Over 20 up to 36	0.2	0.2	0.3	0.3	0.3	0.4	0.4	—	—	—	—
Over 36 up to 60	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5	—	—	—
Over 60 up to 100	—	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5	—	—
Over 100 up to 160	—	—	—	0.4	0.4	0.4	0.4	0.5	0.5	0.6	—
Over 160 up to 240	—	—	—	—	0.4	0.4	0.4	0.5	0.5	0.6	0.7
Over 240 up to 360	—	—	—	—	0.5	0.5	0.5	0.5	0.6	0.7	0.8
Over 360 up to 500	—	—	—	—	—	0.5	0.5	0.5	0.6	0.7	0.8
Over 500 up to 630	—	—	—	—	—	—	0.6	0.6	0.6	0.7	0.8
Over 630 up to 800	—	—	—	—	—	—	—	0.6	0.6	0.7	0.8
Over 800 up to 1000	—	—	—	—	—	—	—	0.7	0.7	0.7	0.8

(2) The work pieces quenched and tempered after the previous work

Unit: mm

Length L Width W	16 or less	Over 16 up to 25	Over 25 up to 40	Over 40 up to 63	Over 63 up to 100	Over 100 up to 160	Over 160 up to 250	Over 250 up to 400	Over 400 up to 630	Over 630 up to 1000	Over 1000 up to 1600
to 20	0.3	0.3	0.4	0.4	0.5	0.5	—	—	—	—	—
Over 20 up to 36	0.3	0.3	0.4	0.4	0.5	0.5	0.6	—	—	—	—
Over 36 up to 60	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.7	—	—	—
Over 60 up to 100	—	0.4	0.4	0.4	0.5	0.5	0.6	0.8	0.8	—	—
Over 100 up to 160	—	—	—	0.5	0.5	0.5	0.6	0.8	0.8	1.0	—
Over 160p to 240	—	—	—	—	0.6	0.6	0.6	0.8	0.9	1.0	1.2
Over 240 up to 360	—	—	—	—	0.7	0.7	0.7	0.8	0.9	1.0	1.2
Over 360 up to 500	—	—	—	—	—	0.8	0.8	0.8	0.9	1.0	1.2
Over 500 up to 630	—	—	—	—	—	—	0.8	0.9	0.9	1.0	1.2
Over 630 up to 800	—	—	—	—	—	—	—	0.9	0.9	1.0	1.2
Over 800 up to 1000	—	—	—	—	—	—	—	1.0	1.0	1.0	1.3

Remarks 1. The allowable error of the previous work dimension shall be as follows:

When the removal in grinding is 0.2 mm: ± 0.05 mm

When the removal in grinding is 0.3 mm or more: ± 0.1 mm

2. W shall be the basic value of the width of the work piece.

L shall be the total length of the work piece.

6.3 Previous Work Dimension

The previous work dimension shall be calculated by adding the removal in grinding after finishing in accordance with 6.2 to the maximum finishing dimension in the thickness of the work piece expressed as a rounded value of up to one decimal.

Example: The previous work dimension in Fig. 3 is the value after the quenching and tempering (unit: mm)

Calculation

	Surface A	Surface B
Maximum dimension of grind finishing	120+0.04	60+0.05
Rounded value of up to one decimal	120.0	60.1
Removal in grindings according to Table 3(2)	0.4	0.5
Basic previous work dimension	120.4	60.6
Allowance of previous work dimension according to Remark 1 of Table 3	± 0.1	± 0.1
Limit of previous work dimension	120.4 ± 0.1 or 120 ^{+0.5} _{+0.3}	60.6 ± 0.1 60 ^{+0.7} _{+0.5}