
**Superabrasives — Limit deviations and
run-out tolerances for grinding wheels
with diamond or cubic boron nitride**

*Superabrasifs — Écartes limites et tolérances de battement pour
les meules à base de diamant et de nitrure de bore*

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Foreword

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Superabrasives — Limit deviations and run-out tolerances for grinding wheels with diamond or cubic boron nitride

1 Scope

This International Standard applies to all rotating grinding tools with diamond or cubic boron nitride with metal, vitrified or resinoid bonded cores, and circular bores for mounting the grinding tool on a clamping flange as well as to grinding points with cylindrical spindle for mounting in collets. It contains the significant limit deviations and run-out tolerances of these grinding tools.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 286-1:1988, *ISO system of limits and fits — Part 1: Bases of tolerances, deviations and fits*

ISO 286-2:1988, *ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

For further terms and definitions, see also ISO 286-1. It should be noted, however, that some of the terms are defined in a more restricted sense than in common usage.

3.1 size

number expressing, in a particular unit, the numerical value of a linear dimension

3.1.1 basic size nominal size

size from which the limits of size are derived by the application of the upper and lower deviations

3.1.2 actual size

size of a feature, obtained by measurements

3.1.3 limits of size

two extreme permissible sizes of a feature, between which the actual size should lie, the limits of size being included

3.1.3.1

maximum limit of size

greatest permissible size of a feature

3.1.3.2

minimum limit of size

smallest permissible size of a feature

3.2

deviation

algebraic difference between a size (actual size, limit of size, etc.) and the corresponding basic size

3.2.1

limit deviations

upper deviation and lower deviation

3.2.1.1

upper deviation

algebraic difference between the maximum limit of size and the corresponding basic size

3.2.1.2

lower deviation

algebraic difference between the minimum limit of size and the corresponding basic size

3.3

size tolerance

difference between the maximum limit of size and the minimum limit of size, i.e. the difference between the upper deviation and the lower deviation

NOTE The tolerance is an absolute value without sign.

4 Limit deviations and run-out tolerance abbreviations

See Table 1.

Table 1 — Limit deviations and run-out tolerance abbreviations

Symbol	Designation	
	Abrasive product	Mounted points
T_D	Limit deviations of outside diameter	Limit deviations of outside diameter
T_E	Limit deviations of thickness at bore	
T_H	Limit deviations of bore diameter	
T_J	Limit deviations of contact surface diameter	
T_K	Limit deviations of recess diameter	
T_L		Limit deviations of overall length
T_{L4}		Limit deviations of reduced length of spindle
T_{PL}	Limit deviations of circular run-out tolerance, axial	
T_R	Limit deviations of the radii	
T_{RL}	Limit deviations of circular run-out tolerance, radial	Limit deviations of circular run-out tolerance, radial
T_{Sd}		Limit deviations of spindle diameter
T_{S1}		Limit deviations of reduced diameter of spindle
T_T	Limit deviations of overall thickness	Limit deviations of thickness
T_U	Limit deviations of thickness of superabrasive section	
T_W	Limit deviations of rim width	
T_X	Limit deviations of depth of superabrasive section	Limit deviations of depth of superabrasive section
T_α	Limit deviations of angles	

5 Straight, recessed, tapered and hubbed grinding wheels

5.1 Grinding wheels for peripheral grinding

5.1.1 Designations

See Table 2.

Table 2

Designation	Sketch	Basic core shape
Straight grinding wheel		1
Hubbed wheel		3
Tapered wheel		4
Grinding wheel recessed on one side		6

Table 2 (continued)

Designation	Sketch	Basic core shape
Grinding wheel recessed on both sides		9
Double hubbed wheel		14

5.1.2 Limit deviations and run-out tolerances for grinding wheels for peripheral grinding

5.1.2.1 Limit deviations T_D of the outside diameter, circular run-out tolerance, axial T_{PL} , and circular run-out tolerance, radial T_{RL}

The limit deviations T_D of the outside diameter, the circular run-out tolerance, axial T_{PL} , and circular run-out tolerance, radial T_{RL} , as specified in Table 3, apply to the respective range of diameters D .

Table 3

Dimensions in millimetres

Outside diameter D	T_D	T_{PL}	T_{RL}
$D \leq 3$	$\pm 0,1$	0,05	0,03
$3 < D \leq 6$	$\pm 0,15$		
$6 < D \leq 30$	$\pm 0,2$		
$30 < D \leq 120$	$\pm 0,3$		
$120 < D \leq 400$	$\pm 0,5$		0,05
$D > 400$	$\pm 0,8$		

5.1.2.2 Limit deviations T_H of the hole diameter

The limit deviations T_H of the hole diameters, as specified in Table 4, correspond to the tolerance zone H7 in accordance with ISO 286-2:1988, Table 6, and apply to the respective range of hole diameters H .

Table 4

Dimensions in millimetres

Bore diameter H	T_H
$H \leq 3$	+0,010 0
$3 < H \leq 6$	+0,012 0
$6 < H \leq 10$	+0,015 0
$10 < H \leq 18$	+0,018 0
$18 < H \leq 30$	+0,021 0
$30 < H \leq 50$	+0,025 0
$50 < H \leq 80$	+0,030 0
$80 < H \leq 120$	+0,035 0
$120 < H \leq 180$	+0,040 0
$180 < H \leq 250$	+0,046 0
$250 < H \leq 315$	+0,052 0
$315 < H \leq 400$	+0,057 0
$400 < H \leq 500$	+0,063 0

5.1.2.3 Limit deviations T_T of overall thickness and T_U of thickness of superabrasive section

The limit deviations T_T of the overall thickness and T_U of the thickness of the superabrasive section, as specified in Table 5, apply to the respective ranges of thickness T and U .

Table 5

Dimensions in millimetres

Thicknesses T and U	T_T	T_U
T or $U < 30$	$\pm 0,2$	$\pm 0,2$
$30 < T$ or $U \leq 120$	$\pm 0,5$	$\pm 0,3$
$120 < T$ or $U \leq 400$	$\pm 0,8$	$\pm 0,5$
$400 < T$ or $U \leq 500$	$\pm 1,0$	$\pm 0,8$

5.1.2.4 Limit deviations T_X of depth of superabrasive section

The limit deviations T_X of the depth of superabrasive section, as specified in Table 6, apply to the respective range of depths of the superabrasive section X .

Table 6

Dimensions in millimetres

Depth of superabrasive section X	T_X^a
$0,5 \leq X \leq 1$	$+0,2$ 0
$1 < X \leq 6$	$+0,2$ $-0,1$
$6 < X \leq 30$	$+0,3$ $-0,2$
^a Excluding electroplated single layer.	

5.1.2.5 Limit deviations T_E of thickness at bore

For grinding wheels with one recess (see type 6), or grinding wheels with two recesses (see type 9), the limit deviations T_E of thickness at bore, as specified in Table 7, apply to the respective range of thickness at bore E .

Table 7

Dimensions in millimetres

Thickness at bore E	T_E
$E \leq 6$	$\pm 0,1$
$6 < E \leq 30$	$\pm 0,2$
$30 < E \leq 120$	$\pm 0,3$

5.1.2.6 Limit deviations T_J of contact surface diameter and T_K of recessed diameter

The limit deviations T_J of contact surface diameter (see types 3, 4, 14) and T_K of the recessed diameter (see types 6, 9), as specified in Table 8, apply to the respective range of outside diameters D .

Table 8

Dimensions in millimetres

Outside diameter D	T_J, T_K
$6 \leq D \leq 120$	± 1
$D > 120$	± 2

5.1.2.7 Limit deviations T_R of the radii

The limit deviations T_R of the radii, as specified in Table 9 (see, e.g., shapes of abrasive sections F, FF and Q, shown in Figures 1 to 3), apply to the respective range of radii R .

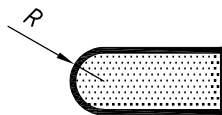


Figure 1 — Shape F



Figure 2 — Shape FF

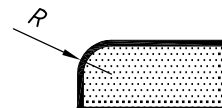


Figure 3 — Shape Q

Table 9

Dimensions in millimetres

Radius R	T_R
$R \leq 3$	$\pm 0,2$
$3 < R \leq 6$	$\pm 0,5$
$6 < R \leq 30$	$\pm 1,0$

5.1.2.8 Limit deviations T_α of angles

The limit deviations T_α of angles, as specified in Table 10 (see, e.g., the shape of abrasive sections B and E – Figures 4 and 5), apply to the respective range of angles α .

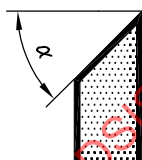


Figure 4 — Shape B



Figure 5 — Shape E

Table 10

Values in degrees

Angle α	T_α
$\alpha \leq 50$	$\pm 0,5$
$50 < \alpha \leq 120$	± 1

5.2 Grinding wheels for face grinding

5.2.1 Designations

See Table 11.

Table 11

Designation	Sketch	Basic core shape
Straight grinding wheel		1
Cylinder wheel		2
Hubbed wheel		3
Tapered wheel		4

Table 11 (continued)

Designation	Sketch	Basic core shape
Straight cup wheel		6
Double cup wheel		9
Taper cup wheel		11
Dish wheel		12 (20°)

Table 11 (continued)

Designation	Sketch	Basic core shape
Dish wheel		12 (45°)
Hubbed dish wheel		13
Taper cup wheel with two core angles		15

5.2.2 Limit deviations and run-out tolerances for grinding wheels for face grinding

5.2.2.1 Limit deviations T_D of the outside diameter, circular run-out tolerance, axial T_{PL} , and circular run-out tolerances, radial T_{RL}

The limit deviations T_D of the outside diameter, the circular run-out tolerances, axial T_{PL} , and the circular run-out tolerances, radial T_{RL} , as specified in Table 12, apply to the respective range of outside diameters D .

Table 12

Dimensions in millimetres

Outside diameter D	T_D	T_{PL}, T_{RL}
$D \leq 30$	$\pm 0,3$	0,03
$30 < D \leq 120$	$\pm 0,4$	
$120 < D \leq 300$	$\pm 0,5$	
$D > 300$	$\pm 0,8$	0,05

5.2.2.2 Limit deviations T_H of the hole diameter

The limit deviations T_H of the hole diameter, as specified in Table 13, correspond to the tolerance zone H7 in accordance with ISO 286-2:1988, Table 6, and apply to the respective range of hole diameters, H .

Table 13

Dimensions in millimetres

Bore diameters H	T_H
$H \leq 3$	$+0,010$ 0
$3 < H \leq 6$	$+0,012$ 0
$6 < H \leq 10$	$+0,015$ 0
$10 < H \leq 18$	$+0,018$ 0
$18 < H \leq 30$	$+0,021$ 0
$30 < H \leq 50$	$+0,025$ 0
$50 < H \leq 80$	$+0,030$ 0
$80 < H \leq 120$	$+0,035$ 0
$120 < H \leq 180$	$+0,040$ 0
$180 < H \leq 250$	$+0,046$ 0
$250 < H \leq 315$	$+0,052$ 0
$315 < H \leq 400$	$+0,057$ 0
$400 < H \leq 500$	$+0,063$ 0

5.2.2.3 Limit deviations T_T of the overall thickness, T_U of the thickness of superabrasive section and T_W rim width

The limit deviations T_T of the overall thickness, T_U of the thickness of superabrasive section and T_W rim width, as specified in Table 14, apply to the respective range of nominal size of the overall thickness T , the thickness of superabrasive section U , and rim width W .

For $T < 0,03 D$ of basic core shape 1 to 4, the limit deviation T_T shall only apply in the positive range.

Table 14

Dimensions in millimetres

Range of nominal size T, U, W	T_T, T_U, T_W
$T \text{ or } U \text{ or } W \leq 30$	$\pm 0,2$
$30 < T \text{ or } U \text{ or } W \leq 120$	$\pm 0,3$
$120 < T \text{ or } U \text{ or } W \leq 400$	$\pm 0,5$
$T \text{ or } U \text{ or } W > 400$	$\pm 0,8$

5.2.2.4 Limit deviations T_E of the thickness at bore

The limit deviations T_E of the thickness at bores for grinding wheels with one side recessed (see basic core shapes 6, 11, 12, 13, 15) or grinding wheels with two sides recessed, as specified in Table 15, apply to the respective range of thickness at bore E .

For $E < 0,2 T$ of basic core shape 6 to 15, the limit deviations T_E shall only apply in the positive range.

Table 15

Dimensions in millimetres

Thickness at bore E	T_E
$E \leq 6$	$\pm 0,1$
$6 < E \leq 30$	$\pm 0,2$
$30 < E \leq 120$	$\pm 0,3$
$120 < E \leq 230$	$\pm 0,5$

5.2.2.5 Limit deviations T_X of the depth of superabrasive section

The limit deviations T_X of the depth of superabrasive section, as specified in Table 16, apply to the respective depth of superabrasive section X .

Table 16

Dimensions in millimetres

Depth of superabrasive section X	T_X
$0,5 \leq X \leq 1$	$+0,2$ 0
$1 < X \leq 6$	$+0,2$ $-0,1$
$6 < X \leq 30$	$+0,3$ $-0,2$

5.2.2.6 Limit deviations T_J of the contact surface diameter and T_K of the recess diameter

The limit deviations T_J of the contact surface diameter and T_K of the recess diameter, as specified in Table 17, apply to the respective range of outside diameter D .

Table 17
Dimensions in millimetres

Outside diameter D	T_J, T_K
$D \leq 400$	± 1
$D > 400$	± 2

6 Mounted points

6.1 Designation

See Table 18.

Table 18

Designation	Sketch	Basic core shape
Mounted points		1

6.2 Limit deviations and circular run-out tolerances

6.2.1 Limit deviations T_D of the outside diameter, T_T of the thickness, T_X of the depth of superabrasive section, and circular run-out tolerance, axial T_{RL}

The limit deviations T_D of the outside diameter, T_T of the thickness, T_X of the depth of superabrasive section and the circular run-out tolerance, axial T_{RL} , as specified in Table 19, apply to the respective ranges of nominal sizes of outside diameter D , thickness, T and depth of superabrasive section X .

Table 19

Dimensions in millimetres

Nominal sizes T, D, X	T_D	T_T	T_X^a	T_{RL}
$0,5 \leq T \text{ or } D \text{ or } X \leq 3$	$\pm 0,15$	$\pm 0,1$	$\begin{smallmatrix} +0,2 \\ 0 \end{smallmatrix}$	$\pm 0,03$
$3 < T \text{ or } D \text{ or } X \leq 6$	$\pm 0,2$		$\begin{smallmatrix} +0,2 \\ -0,1 \end{smallmatrix}$	
$6 < T \text{ or } D \text{ or } X \leq 30$	$\pm 0,5$		$\begin{smallmatrix} +0,3 \\ -0,2 \end{smallmatrix}$	
^a T_X excluding electroplated single layer.				

6.2.2 Limit deviations T_{Sd} of the spindle diameter and T_{S1} of the reduced diameter of spindle

The limit deviations T_{Sd} of the spindle diameter, as specified in Table 20, correspond to the tolerance zone g6 in accordance with ISO 286-2:1988, Table 21, and apply to the respective ranges of diameters S_d . The limit deviations T_{S1} of the reduced spindle apply to the respective range of diameter of the reduced spindle diameter S_1 .

Table 20

Dimensions in millimetres

Diameter S_d, S_1	T_{Sd}	T_{S1}
$1 \leq S_d \text{ or } S_1 \leq 3$	$\begin{smallmatrix} -0,002 \\ -0,008 \end{smallmatrix}$	$\pm 0,1$
$3 < S_d \text{ or } S_1 \leq 6$	$\begin{smallmatrix} -0,004 \\ -0,008 \end{smallmatrix}$	
$6 < S_d \text{ or } S_1 \leq 10$	$\begin{smallmatrix} -0,005 \\ -0,014 \end{smallmatrix}$	$\pm 0,2$
$10 < S_d \text{ or } S_1 \leq 18$	$\begin{smallmatrix} -0,006 \\ -0,017 \end{smallmatrix}$	
$18 < S_d \text{ or } S_1 \leq 30$	$\begin{smallmatrix} -0,007 \\ -0,020 \end{smallmatrix}$	$\pm 0,5$