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

Superabrasifs de précision — Écarts limites et tolérances de battement pour les meules à base de diamant et de nitrure de bore

Reference number
ISO 22917:2016(E)

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 29, *Small tools*, Subcommittee SC 5, *Grinding wheels and abrasives*.

This second edition cancels and replaces the first edition (ISO 22917:2004), which has been technically revised with the following changes:

a) form E added;

b) dimensions for $d_{\min}$ revised;

c) dimensions for l_1 partly revised.

Precision 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 precision 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 documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes — Part 1: Basis of tolerances, deviations and fits*

ISO 286-2:2010, *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes — Part 2: Tables of standard tolerance classes and limit deviations for holes and shafts*

3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 286-1 and the following apply.

NOTE 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* (3.1.3) are derived by the application of the upper and lower *deviations* (3.2)

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* (3.1.2) 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* (3.1) (actual size, limit of size, etc.) and the corresponding *basic size* (3.1.1)

3.2.1
limit deviations
upper deviation and lower deviation

3.2.1.1
upper deviation
algebraic difference between the *maximum limit of size* (3.1.3.1) and the corresponding basic size

3.2.1.2
lower deviation
algebraic difference between the *minimum limit of size* (3.1.3.2) and the corresponding basic size

3.3
size tolerance
difference between the *maximum limit of size* (3.1.3.1) and the *minimum limit of size* (3.1.3.2), i.e. the difference between the *upper deviation* (3.2.1.1) and the *lower deviation* (3.2.1.2)

Note 1 to entry: 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	

Table 1 *(continued)*

Symbol	Designation	
	Abrasive product	Mounted points
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 — Designations for grinding wheels for peripheral grinding

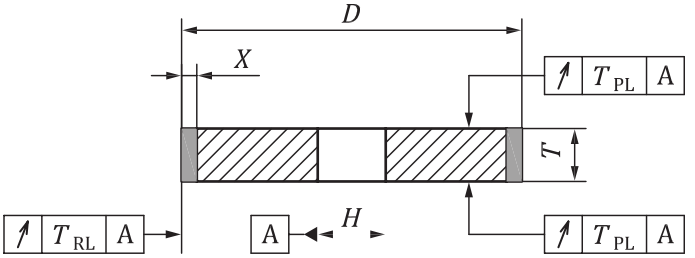
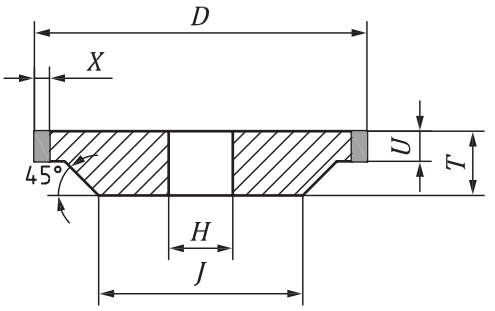
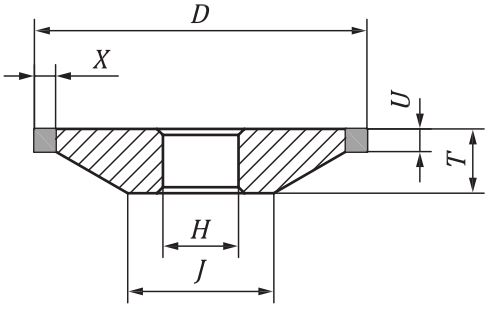
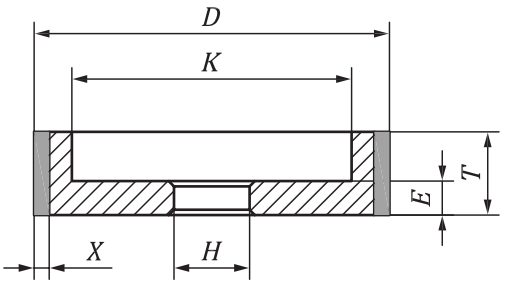
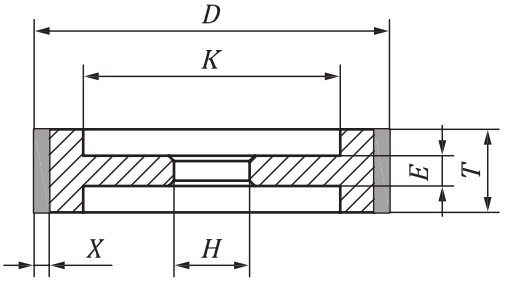
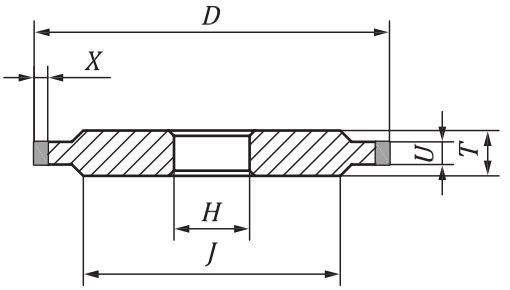
Designation	Sketch	Basic core shape
Straight peripheral wheel		1
Single hubbed wheel		3
Wheel tapered one side		4

Table 2 *(continued)*

Designation	Sketch	Basic core shape
Grinding wheel recessed on one side		6
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 of the outside diameter, T_D, circular run-out tolerance, axial, T_{PL}, and circular run-out tolerance, radial, T_{RL}

The limit deviations of the outside diameter, T_D, 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 — Limit deviations and run-out tolerances of the outside diameter for grinding wheels for peripheral grinding

Dimensions in millimetres

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

5.1.2.2 Limit deviations of the bore diameter, T_H

The limit deviations of the bore diameters, T_H, as specified in Table 4, correspond to the tolerance zone H7 in accordance with ISO 286-2:2010, Table 6, and apply to the respective range of bore diameters, H.

Table 4 — Limit deviations and run-out tolerances of the bore diameter for grinding wheels for peripheral grinding

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 of overall thickness, T_T, and of thickness of superabrasive section, T_U

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

Table 5 — Limit deviations of the overall thickness and the thickness of the superabrasive section for grinding wheels for peripheral grinding

Dimensions in millimetres

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

5.1.2.4 Limit deviations of depth of superabrasive section, T_X

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

Table 6 — Limit deviations of the depth of the superabrasive section for grinding wheels for peripheral grinding

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 of thickness at bore, T_E

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

Table 7 — Limit deviations of thickness at bore for grinding wheels for peripheral grinding

Dimensions in millimetres

Thickness at bore E	T_E
$E \leq 6$	±0,3
$6 < E \leq 30$	±0,3
$30 < E \leq 120$	±0,3

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

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

Table 8 — Limit deviations of contact surface diameter and recessed diameter for grinding wheels for peripheral grinding

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 of the radii, T_R

The limit deviations of the radii, T_R, 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.

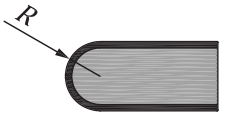


Figure 1 — Shape F

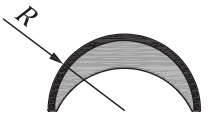


Figure 2 — Shape FF

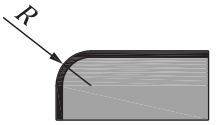


Figure 3 — Shape Q

Table 9 — Limit deviations of radii for grinding wheels for peripheral grinding

Dimensions in millimetres

Radius R	T_R
$R \leq 3$	±0,2
$3 < R \leq 6$	±0,2
$6 < R \leq 30$	±0,2

5.1.2.8 Limit deviations of angles, T_α

The limit deviations of angles, T_α, 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.

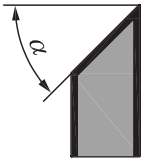


Figure 4 — Shape B

Figure 5 — Shape E

Table 10 — Limit deviations of angles for grinding wheels for peripheral grinding

Values in degrees

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

5.2 Grinding wheels for face grinding

5.2.1 Designations

See Table 11.

Table 11 — Designations for grinding wheels for face grinding

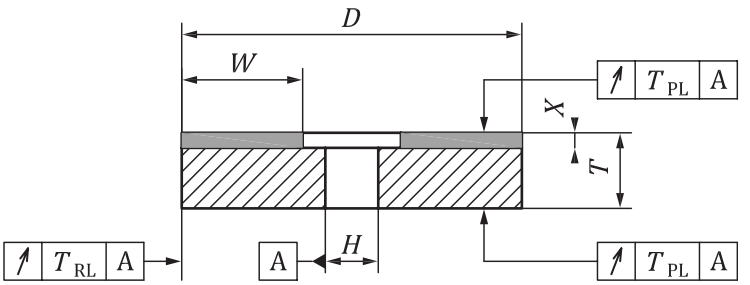
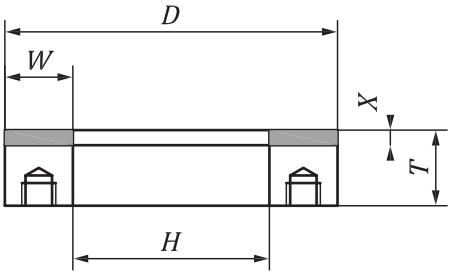
Designation	Sketch	Basic core shape
Straight grinding wheel		1
Cylinder wheel		2

Table 11 *(continued)*

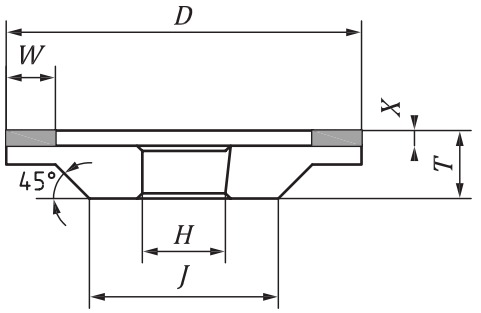
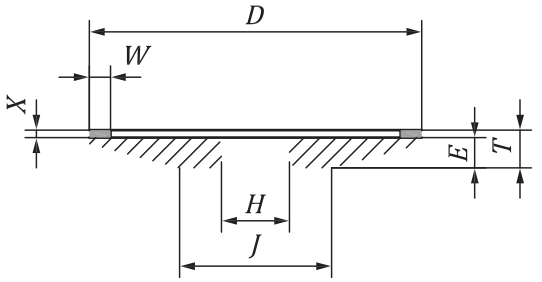
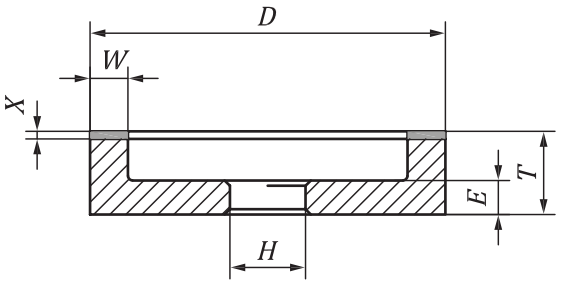
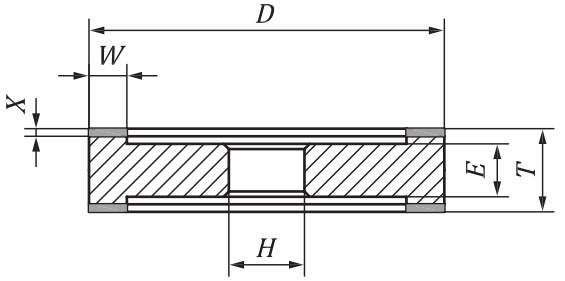
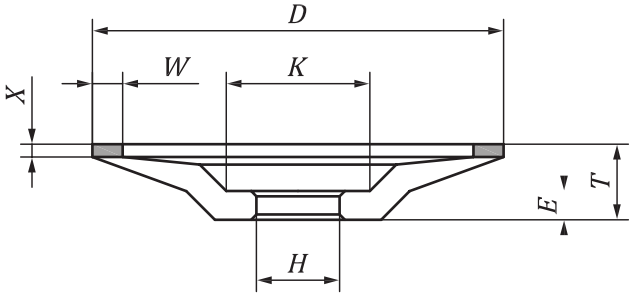
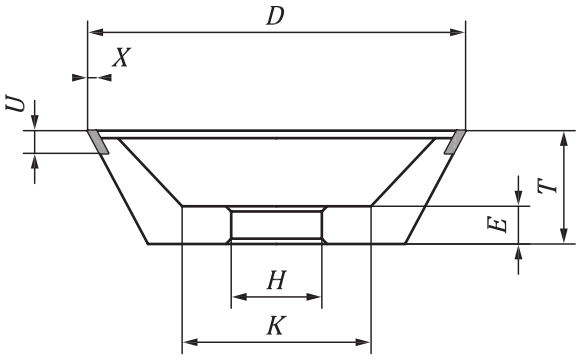
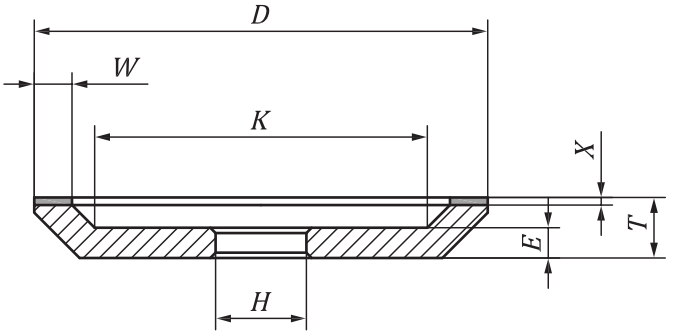
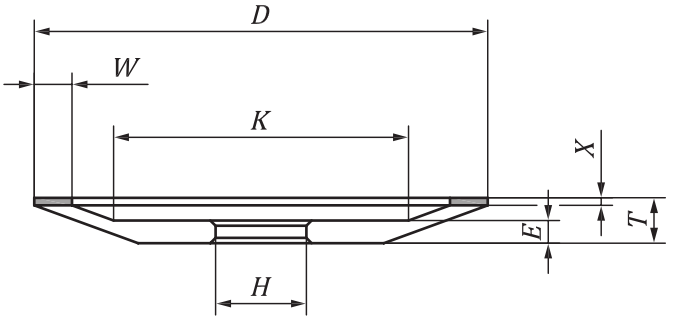
Designation	Sketch	Basic core shape
Single hubbed wheel		3
Wheel tapered one side		4
Straight cup wheel		6
Double cup wheel		9
Concave double-angle cup wheel		10

Table 11 *(continued)*

Designation	Sketch	Basic core shape
Taper cup wheel		11
Taper cup wheel		12
Taper cup wheel		13

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

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

The limit deviations of the outside diameter, T_D, 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 — Limit deviations and run-out tolerances of the outside diameter for grinding wheels for face grinding

Dimensions in millimetres

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

5.2.2.2 Limit deviations of the bore diameter, T_H

The limit deviations of the bore diameter, T_H, as specified in Table 13, correspond to the tolerance zone H7 in accordance with ISO 286-2:2010, Table 6, and apply to the respective range of bore diameters, H.

Table 13 — Limit deviations and run-out tolerances of the bore diameter for grinding wheels for face grinding

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

The limit deviations of the overall thickness, T_T, of the thickness of superabrasive section, T_U, and rim width, T_W, 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 — Limit deviations of the overall thickness, the thickness of the superabrasive section and the rim width for grinding wheels for face grinding

Dimensions in millimetres

Range of nominal size T, U, W	T_T, T_U, T_W
T or U or $W \leq 30$	±0,3
$30 < T$ or U or $W \leq 120$	±0,3
$120 < T$ or U or $W \leq 400$	±0,3
T or U or $W > 400$	±0,3

5.2.2.4 Limit deviations of the thickness at bore, T_E

The limit deviations of the thickness at bores, T_E, 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 — Limit deviations of thickness at bore for grinding wheels for face grinding

Dimensions in millimetres

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

5.2.2.5 Limit deviations of the depth of superabrasive section, T_X

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

Table 16 — Limit deviations of the depth of the superabrasive section for grinding wheels for face grinding

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 of the contact surface diameter, T_J, and of the recess diameter, T_K

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

Table 17 — Limit deviations of contact surface diameter and recessed diameter for grinding wheels for face grinding

Dimensions in millimetres

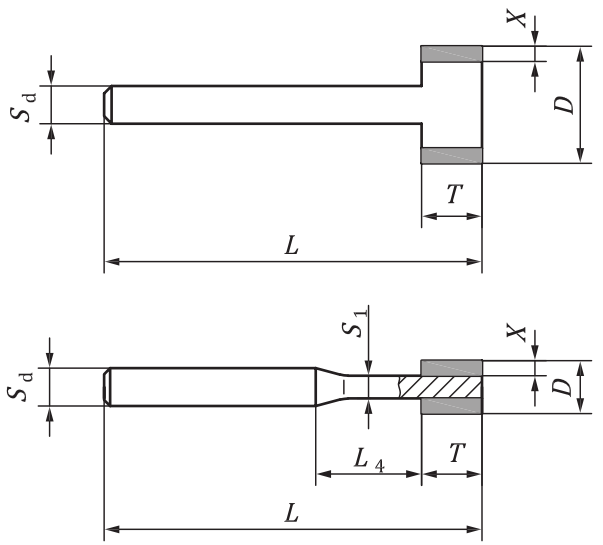
Outside diameter D	T_J, T_K
$D \leq 400$	±1
$D > 400$	±2

6 Mounted points

6.1 Designation

See Table 18.

Table 18 — Designation of mounted points

Designation	Sketch	Basic core shape
Mounted points		1

6.2 Limit deviations and circular run-out tolerances

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

The limit deviations of the outside diameter, T_D, of the thickness, T_T, of the depth of superabrasive section, T_X, 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 — Limit deviations of the outside diameter, the thickness and the depth of the superabrasive section and run-out tolerances

Dimensions in millimetres

Nominal sizes T, D, X	T_D	T_T	T_X[a]	T_{RL}
$0,5 \le T$ or D or $X \le 3$	±0,15	±0,1	+0,2 0	0,03
$3 < T$ or D or $X \le 6$	±0,2		+0,2 −0,1	
$6 < T$ or D or $X \le 30$	±0,5	±0,2	+0,3 −0,2	

[a] T_X excluding electroplated single layer.

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

The limit deviations of the spindle diameter, T_{Sd}, as specified in Table 20, correspond to the tolerance zone g6 in accordance with ISO 286-2:2010, Table 21, and apply to the respective ranges of diameters, S_d. The limit deviations of the reduced spindle, T_{S1}, apply to the respective range of diameter of the reduced spindle, S_1.

Table 20 — Limit deviations of the spindle diameter and of the reduced diameter

Dimensions in millimetres

Diameter S_d, S_1	T_{Sd}	T_{S1}
$1 \le S_d$ or $S_1 \le 3$	−0,002 −0,008	±0,1
$3 < S_d$ or $S_1 \le 6$	−0,004 −0,008	
$6 < S_d$ or $S_1 \le 10$	−0,005 −0,014	±0,2
$10 < S_d$ or $S_1 \le 18$	−0,006 −0,017	
$18 < S_d$ or $S_1 \le 30$	−0,007 −0,020	±0,5

6.2.3 Limit deviations of the overall length, T_L, and of the reduced length of spindle, T_{L4}

The limit deviations of the overall length, T_L, and of the reduced length of the spindle, T_{L4}, as specified in Table 21, apply to the respective ranges of the overall lengths, L, and the reduced lengths of the spindle, L_4.

Table 21 — Limit deviations of the overall length and the reduced length of spindle

Dimensions in millimetres

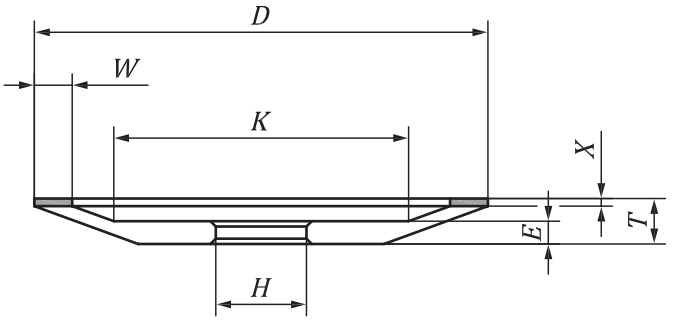
Lengths L, L_4	T_L, T_{L4}
L or $L_4 \leq 120$	±1

7 Superabrasives with metal core for hand-held grinding

7.1 Designation

See Table 22.

Table 22 — Designation of superabrasives with metal core for hand-held grinding

Designation	**Sketch**	**Basic core shape**
Taper cup wheel		13

7.2 Limit deviations and run-out tolerances

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

The limit deviations of the outside diameter, T_D, of the overall thickness, T_T, the circular run-out tolerance, axial, T_{PL}, and the circular run-out tolerance, radial, T_{RL}, as specified in Table 23, apply to the respective ranges of nominal outside diameters, D.

Table 23 — Limit deviations of the outside diameter and the overall thickness, and circular run-out tolerances, axial and radial

Dimensions in millimetres

Outside diameters D	T_D	T_T	T_{PL}	T_{RL}
$30 \leq D \leq 120$	±0,8	±0,5	0,02	0,03
$120 < D \leq 230$	±1,2			

7.2.2 Limit deviations of the bore diameter, T_H

The limit deviations of the bore diameter, T_H, as specified in Table 24, correspond to the tolerance zone H7 in accordance with ISO 286-2:2010, Table 6, and apply to the respective ranges of bore diameters, H.

Table 24 — Limit deviations of the bore diameter

Dimensions in millimetres

Bore diameters H	T_H
$6 \le H \le 10$	$^{+0,015}_{0}$
$10 < H \le 18$	$^{+0,018}_{0}$
$18 < H \le 30$	$^{+0,021}_{0}$
$30 < H \le 50$	$^{+0,025}_{0}$
$50 < H \le 80$	$^{+0,030}_{0}$

7.2.3 Limit deviations of the depth of superabrasive section, T_X

The limit deviations of the depth of the superabrasive section, T_X, as specified in Table 25, apply to the respective depths of superabrasive section, X.

Table 25 — Limit deviations of the depth of superabrasive section

Dimensions in millimetres

Depth of superabrasive section X	T_X
$0,5 \le X \le 1$	$^{+0,2}_{0}$
$1 < X \le 6$	$^{+0,2}_{-0,1}$
$6 < X \le 30$	$^{+0,3}_{-0,2}$

7.2.4 Limit deviations of the rim width, T_W

The limit deviations of the rim width, T_W, as specified in Table 26, apply to the respective ranges of nominal size of rim width, W.

Table 26 — Limit deviations of the rim width

Dimensions in millimetres

Rim width W	T_W
$W \le 30$	±0,2
$30 < W \le 120$	±0,3
$120 < W \le 400$	±0,5
$W > 400$	±0,8

7.2.5 Limit deviations of the thickness at bore, T_E

The limit deviations of the thickness at bore, T_E, as specified in Table 27, apply to the respective ranges of nominal size of thickness at bore, E.

Table 27 — Limit deviations of the thickness at bore

Dimensions in millimetres

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

7.2.6 Limit deviations of the contact surface diameter, T_J, and of the recess diameter, T_K

The limit deviations of the contact surface diameter, T_J, and of the recess diameter, T_K, as specified in Table 28, apply to the respective range, of nominal size, J and K.

Table 28 — Limit deviations of the contact surface and of the recess diameter

Dimensions in millimetres

Diameters J, K	T_J, T_K
J or $K \leq 3$	±1
$3 < J$ or $K \leq 6$	
$6 < J$ or $K \leq 30$	
$30 < J$ or $K \leq 120$	
$120 < J$ or $K \leq 400$	

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