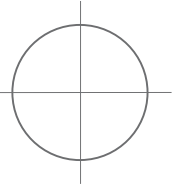


Norms and standards

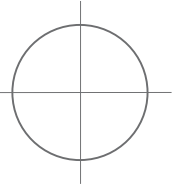
DIN 5401:2002-08											
Grade	Notional sizes		Max. sizes ^e	t_{DWS}/V_{DWS}	R_s^f	V_{DwL}^e	V_{DwA}^e	I_G/S_T	Grade range/split ^g		
	mm		μm	μm	μm	μm	μm	μm	μm		
	over	to		max.	max.	max.	max.				
G3	-	12,7	± 5,32	0,08	0,01	0,13	-	0,5	-5 to -0,5	0	0,5 to 5
G5	-	12,7	± 5,63	0,13	0,014	0,25	-	1	-5 to -1	0	1 to 5
G10	-	25,4	± 9,75	0,25	0,02	0,5	-	1	-9 to -1	0	1 to 9
G16 ^a	-	25,4	± 11,4	0,4	0,025	0,8	-	2	-10 to -2	0	2 to 10
G20 ^a	-	38,1	± 11,5	0,5	0,032	1	-	2	-10 to -2	0	2 to 10
G28 ^a	-	50,8	± 13,7	0,7	0,05	1,4	-	2	-12 to -2	0	2 to 12
G40	-	100	± 19	1	0,06	2	-	4	-16 to -4	0	4 to 16
G80 ^b	-	100	± 14	2	0,1	-	4,0	4	-12 to -4	0	4 to 12
G100	-	150	± 47,5	2,5	0,1	5	-	10	-40 to -10	0	10 to 40
G200	-	150	± 72,5	5	0,15	10	-	10	-60 to -10	0	10 to 60
G300 ^a	-	25,4	± 70	10	0,2	-	20	20	-60 to -20	0	20 to 60
G300 ^c	25,4	50,8	± 105	15	0,2	-	30	30	-90 to -30	0	30 to 90
G300	50,8	75	± 140	20	0,2	-	40	40	-120 to -40	0	40 to 120
G500 ^d	-	25,4	± 75	25	-	-	50	50	-50	0	50
G500	25,4	50,8	± 112,5	25	-	-	75	75	-75	0	75
G500	50,8	75	± 150	25	-	-	100	100	-100	0	100
G500	75	100	± 187,5	32	-	-	125	125	-125	0	125
G500	100	125	± 225	38	-	-	150	150	-150	0	150
G500	125	150	± 262,5	44	-	-	175	175	-175	0	175
G600 ^d	All		± 200	-	-	-	400	-	-	0	-
G700 ^d	All		± 1000	-	-	-	2000	-	-	0	-



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For the application of this norm the following terms apply:

Terms:	Explanation:
Notional diameter of the balls (D_w)	The diameter figure used for the general description of a ball size.
Individual diameter of a ball (D_{ws})	The distance between parallel levels that touch the surface of the ball.
Mean diameter of a ball (D_{wm})	Arithmetic mean calculated from a ball's largest and smallest individual diameter (D_{ws}).
Ball diameter fluctuation (VD_{ws})	Difference between a ball's largest and smallest individual diameter (D_{ws}).
Ball shape deviation (tD_{ws})	Radial distance in each equatorial level between two concentric circles that enclose the profile with the smallest possible gap, measured using the least squares collocation method (LSC).
Batch	A specific quantity of balls produced under the same conditions that have largely similar properties.
Average ball diameter of a batch (D_{wmL})	Arithmetic mean calculated from the largest/smallest average ball diameter (D_{wm}) in a batch.
Ball diameter variation within a batch (VD_{wL})	Difference between the largest/smallest average ball diameter (D_{wm}) in a batch. Note: This parameter applies only to balls in classes G3 to G200, excluding G80.
Grade tolerance (ST)	Range in which ' D_{wmL} ' is allowed to fluctuate within a grade. Note: The grade tolerance (ST) is identical in its amount to grade interval (IG).
Ball diameter variation within a grade (VD_{wa})	Difference between the largest/smallest average ball diameter (D_{wm}) within a grade. Note: This parameter applies only to balls in classes G300 to G700 and G80.
Grade interval (I_G)	Amount in which the permitted deviation of the ball's notional diameter is evenly sub-divided.
Class (G)	Specific combination of tolerances of size, shape, surface roughness and diameter spread. Note: Each class is identified with a number preceded by the letter G. For conversion of the accuracy class codes the versions of the standards from 1978 to 1993 and 2002, see appendix C.
Grade (S)	Distance of (in the case of VD_{wL}) a batch's or (in the case of Vd_{wA}) part of a batch's average ball diameter from the ball's notional diameter (D_w), rounded to a whole-number multiple of the grade interval (I_G).
Maximum deviation	In terms of this norm, the maximum limiting deviation of the average ball diameter (D_{wm}) from the ball's notional diameter (D_w).



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For the application of this norm the following terms apply:

Terms:	Explanation:
Surface roughness (R_a)	<p>In terms of this norm, any deviations from a geometrically perfect surface, with shape deviation and undulation not being counted.</p> <p>Note: The limits indicated in table 3 relate to the arithmetic average of the deviation of the roughness profile from the middle line (R_a).</p>
Undulation (MD_w)	<p>In terms of this norm, chance or periodic deviations of the ball surface from the ideal ball shape.</p> <p>Note: Undulation should be measured using the vibration velocity method and sub-divided into undulation bands using Fourier analysis.</p>