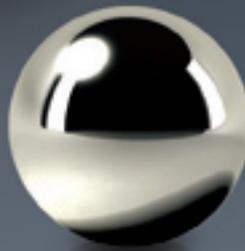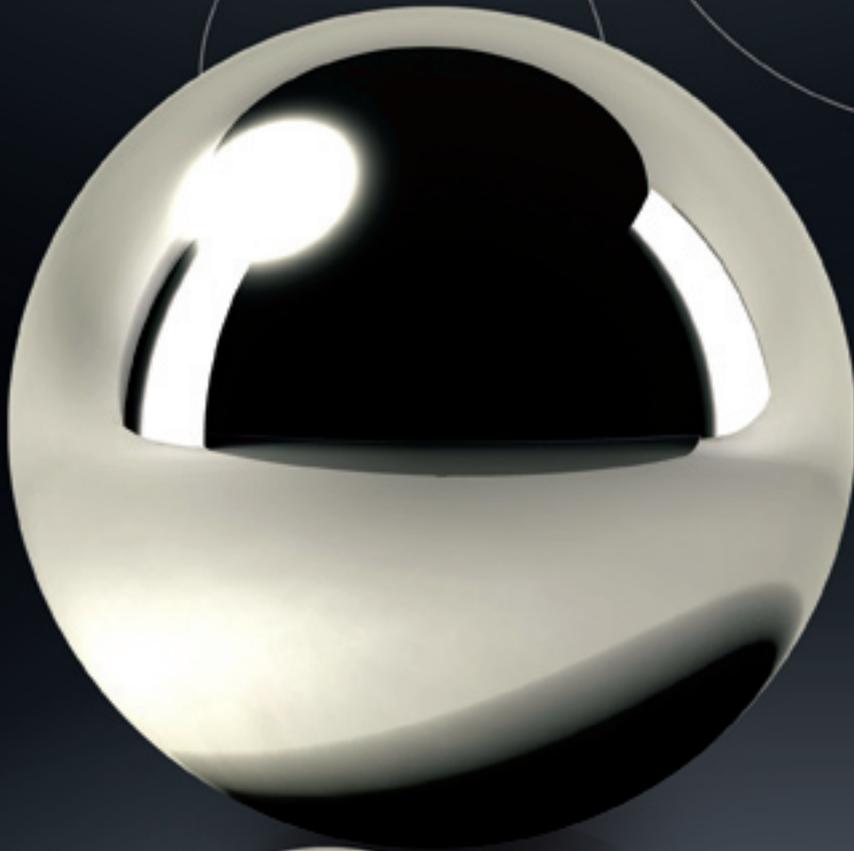# PRECISION BALLS

DEFINITIONS

Nominal ball diameter, D_w
Diameter value which is used for the purpose of general identification of a ball size.

Mean diameter of a ball D_{wm}
Arithmetic mean of the largest and smallest diameter of a single ball.

Lot mean diameter D_{wmL}
Arithmetic mean of the largest and smallest ball diameter D_{wm} in a batch.

Ball grade G
A specific combination of dimensional tolerances, shape tolerances, surface roughness and sorting tolerances. Each grade is identified by number that is preceded by the letter G.

Class interval IG
Amount in which the permissible deviation of the nominal ball diameter is uniformly subdivided.

Lot/Batch
A definite quantity of balls that have been manufactured under identical conditions and which all exhibit practically the same properties.

Surface roughness Ra
Characteristic value giving the surface roughness.

Class S
Difference between the mean ball diameter of a batch (for V_{DwL}) or part of a batch (for V_{DwA}) and the nominal ball diameter D_w, rounded to an exact multiple of the class interval IG.

Class tolerance ST
Permissible range for D_{wmL} within a class. The value of the class tolerance ST is identical to the class interval IG.

Deviation from spherical form t_{Dws}
The greatest radial distance in every equatorial plane between a sphere circumscribed around the ball surface and any point on the ball surface.

Variation of the ball diameter within a batch V_{DwL}
Difference between the largest and smallest mean ball diameter D_{wm} within a batch. Only applies to grades G3 to G200 (except G80).

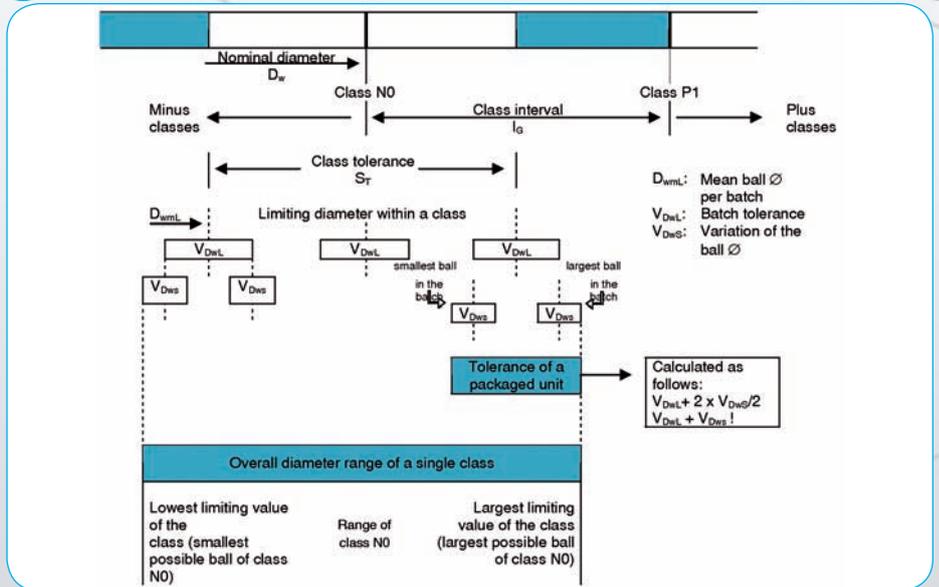**Variation of the ball diameter within a class V_{DwA}**
Difference between the largest and smallest mean ball diameter within a class. Applies to grades G80, G500 -G700 and for all types of special materials.
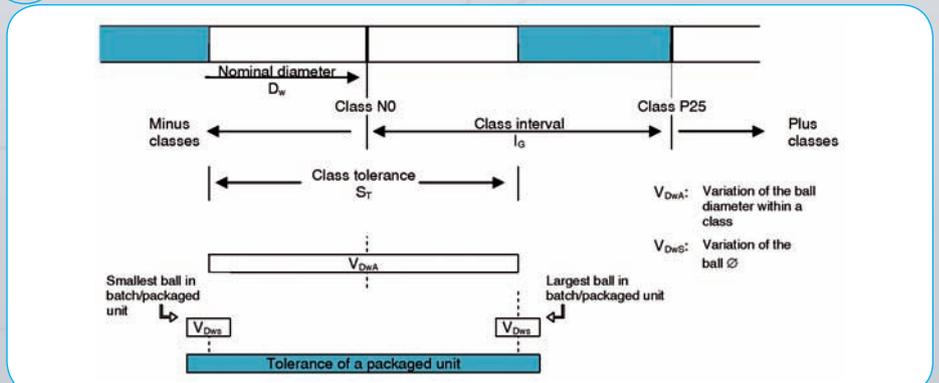
Ball diameter variation V_{Dws}
Difference between the largest and smallest diameter of a single ball.

Grading parameter V_{DWL}

Grading parameter V_{DWA}

DIMENSIONAL AND CONTOUR ACCURACY

ACCORDING TO DIN 5401

Grade	Dw Nominal size (mm) above	Dw Nominal size (mm) up to	Dw Limiting dimensions (μm)	tDws VDws (μm) max	Ra (μm) max	VDwL (μm) max	VDwA (μm) max	IG ST (μm)	Classification range and grading (μm)		
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	-

[a] By agreement with the manufacturer you can get half the sort interval values for classes G16, G20, G28 and G300 in special circumstances.
[b] Not defined in ISO 3290, class is equivalent to the former class IV according to DIN 5401:1978-01.
[c] Not defined in ISO 3290, class is equivalent to the standard accuracy for unhardened rustless balls according to DIN 5401-2: 1993-11.
[d] Not defined in ISO 3290, classes are equivalent to the former classes V to VII according to DIN 5401:1978-01.