



Precision classes and tolerance tables of GMN High precision ball bearings

The tolerances for dimensional, form and running accuracy of GMN high precision ball bearings are specified in international (ISO 492) and national standards (DIN 620). GMN high precision ball bearings are manufactured to precision class 4 and class 2 (P4 and P2) as well as ABEC 7 and ABEC 9.

For special applications, e. g. vacuum pumps, gyroscopes as well as measuring engineering and optical systems, GMN manufactures bearings to the internal tolerance classes HG (high precision) and UP (ultra precision). Apart from the requirements mentioned, the tolerance classes contain additional selection criteria.

Inner ring limits in micron

d Bore diameter, nominal [mm]	over to	2.5 10	10 18	18 30	30 50	50 80	80 120
Δ_{dmp} Deviation of a single mean bore diameter	P4	0 / -4.0	0 / -4.0	0 / -5.0	0 / -6.0	0 / -7.0	0 / -8.0
	HG	0 / -3.0	0 / -3.0	0 / -3.0	0 / -5.0	0 / -5.0	-
	UP	0 / -3.0	0 / -3.0	0 / -3.0	0 / -3.0	0 / -4.0	-
	P2	0 / -2.5	0 / -2.5	0 / -2.5	0 / -2.5	0 / -4.0	0 / -5.0
Δ_{ds} Bearing series 60, 62 Variation of a single bore diameter	P4	0 / -4.0	0 / -4.0	0 / -5.0	0 / -6.0	0 / -7.0	0 / -8.0
	HG	0 / -3.0	0 / -3.0	0 / -3.0	0 / -5.0	0 / -5.0	-
	UP	0 / -3.0	0 / -3.0	0 / -3.0	0 / -3.0	0 / -4.0	-
	P2	0 / -2.5	0 / -2.5	0 / -2.5	0 / -2.5	0 / -4.0	0 / -5.0
$V_{dp\ max}$ Bearing series 618, 619 Variation of bore diameter in a single radial plane - out of roundness	P4	4.0	4.0	5.0	6.0	7.0	8.0
	HG	3.0	3.0	3.0	5.0	5.0	-
	UP	3.0	3.0	3.0	3.0	4.0	-
	P2	2.5	2.5	2.5	2.5	2.5	5.0
$V_{dp\ max}$ Bearing series 60, 62 Variation of bore diameter in a single radial plane - out of roundness	P4	3.0	3.0	4.0	5.0	5.0	6.0
	HG	3.0	3.0	3.0	5.0	5.0	-
	UP	3.0	3.0	3.0	3.0	4.0	-
	P2	2.5	2.5	2.5	2.5	4.0	5.0
$V_{dmp\ max}$ Variation of mean bore diameter in several planes - taper	P4	2.0	2.0	2.5	3.0	3.5	4.0
	HG	2.0	2.0	2.0	3.0	3.0	-
	UP	2.0	2.0	2.0	2.0	2.5	-
	P2	1.5	1.5	1.5	1.5	2.0	2.5
$K_{ia\ max}$ Radial runout of assembled bearing inner ring	P4	2.5	2.5	3.0	4.0	4.0	5.0
	HG	2.0	2.0	2.0	2.0	3.0	-
	UP	1.5	1.5	1.5	2.0	2.0	-
	P2	1.5	1.5	2.5	2.5	2.5	2.5
$S_d\ max$ Inner ring reference face runout with bore - side runout	P4	3.0	3.0	4.0	4.0	5.0	5.0
	HG	3.0	3.0	3.0	4.0	4.0	-
	UP	2.0	2.0	2.0	2.0	2.0	-
	P2	1.5	1.5	1.5	1.5	1.5	2.5
$S_{ia\ max}$ Assembled bearing inner ring face runout with raceway -axial runout	P4	3.0	3.0	4.0	4.0	5.0	5.0
	HG	3.0	3.0	4.0	4.0	4.0	-
	UP	2.0	2.0	2.5	2.5	2.5	-
	P2	1.5	1.5	2.5	2.5	2.5	2.5
Δ_{BS} Single bearing Deviation of a single width of the inner ring - width tolerance	P4	0 / -40	0 / -80	0 / -120	0 / -120	0 / -150	0 / -200
	HG	0 / -40	0 / -80	0 / -120	0 / -120	0 / -150	-
	UP	0 / -25	0 / -80	0 / -120	0 / -120	0 / -150	-
	P2	0 / -40	0 / -80	0 / -120	0 / -120	0 / -150	0 / -200
Δ_{BS} Matched bearing Deviation of a single width of the inner ring - width tolerance	P4	0 / -250	0 / -250	0 / -250	0 / -250	0 / -250	0 / -380
	HG	0 / -250	0 / -250	0 / -250	0 / -250	0 / -250	-
	UP	0 / -250	0 / -250	0 / -250	0 / -250	0 / -250	-
	P2	0 / -250	0 / -250	0 / -250	0 / -250	0 / -250	0 / -380
$V_{BS\ max}$ Inner ring width variation	P4	2.5	2.5	2.5	3.0	4.0	4.0
	HG	2.0	2.0	2.0	2.0	2.0	-
	UP	2.0	2.0	2.0	2.0	2.0	-
	P2	1.5	1.5	1.5	1.5	1.5	2.5



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All GMN high precision ball bearings are also available in compliance with the American ABMA standards. The relationship between the various standards is explained below.

ISO	DIN	ABMA
class 4	P4	ABEC 7
class 2	P2	ABEC 9

The following tolerance symbols are laid down in DIN ISO 1132-1.

Outer ring limits in micron

D Outside diameter, nominal [mm]	over to	6 18	18 30	30 50	50 80	80 120	120 150	150 180
ΔD_{mp} Deviation of a single plane mean outside diameter	P4	0 / -4.0	0 / -5.0	0 / -6.0	0 / -7.0	0 / -8.0	0 / -9.0	0 / -10.0
	HG	0 / -3.0	0 / -3.0	0 / -3.0	0 / -4.0	0 / -4.0	-	-
	UP	0 / -3.0	0 / -3.0	0 / -3.0	0 / -4.0	0 / -4.0	-	-
	P2	0 / -2.5	0 / -4.0	0 / -4.0	0 / -4.0	0 / -5.0	0 / -5.0	0 / -7.0
ΔD_s Bearing series 60, 62 Variation of a single outside diameter	P4	0 / -4.0	0 / -5.0	0 / -6.0	0 / -7.0	0 / -8.0	0 / -9.0	0 / -10.0
	HG	0 / -3.0	0 / -3.0	0 / -3.0	0 / -4.0	0 / -4.0	-	-
	UP	0 / -3.0	0 / -3.0	0 / -3.0	0 / -4.0	0 / -4.0	-	-
	P2	0 / -2.5	0 / -4.0	0 / -4.0	0 / -4.0	0 / -5.0	0 / -5.0	0 / -7.0
$V_{Dp \max}$ Bearing series 618, 619 Variation of outside diameter in a single radial plane - out of roundness	P4	4.0	5.0	6.0	7.0	8.0	9.0	10.0
	HG	2.0	2.0	2.0	4.0	4.0	-	-
	UP	2.0	2.0	2.0	4.0	4.0	-	-
	P2	2.5	4.0	4.0	4.0	5.0	5.0	7.0
$V_{Dp \max}$ Bearing series 60*, 62* Variation of outside diameter in a single radial plane - out of roundness	P4	3.0	4.0	5.0	5.0	6.0	7.0	8.0
	HG	2.0	2.0	2.0	4.0	4.0	-	-
	UP	2.0	2.0	2.0	4.0	4.0	-	-
	P2	2.5	4.0	4.0	4.0	5.0	5.0	7.0
$V_{Dmp \max}$ Variation of mean outside diameter in several planes - taper	P4	2.0	2.5	3.0	3.5	4.0	5.0	5.0
	HG	1.0	1.0	1.0	2.0	2.0	-	-
	UP	1.0	1.0	1.0	2.0	2.0	-	-
	P2	1.5	2.0	2.0	2.0	2.5	2.5	3.5
$K_{ea \max}$ Radial runout of assembled bearing outer ring	P4	3.0	4.0	5.0	5.0	6.0	7.0	8.0
	HG	2.0	2.0	2.0	3.0	3.0	-	-
	UP	2.0	2.0	2.0	3.0	3.0	-	-
	P2	1.5	2.5	2.5	4.0	5.0	5.0	5.0
$S_D \max$ Variation of outside surface generatrix inclination with outer ring reference face - side runout	P4	4.0	4.0	4.0	4.0	5.0	5.0	5.0
	HG	4.0	4.0	4.0	4.0	5.0	-	-
	UP	2.0	2.0	2.0	2.0	2.5	-	-
	P2	1.5	1.5	1.5	1.5	2.5	2.5	2.5
$S_{ea \max}$ Assembled bearing outer ring face runout with raceway - axial runout	P4	5.0	5.0	5.0	5.0	6.0	7.0	8.0
	HG	5.0	5.0	5.0	5.0	5.0	-	-
	UP	2.0	2.0	2.0	2.0	2.5	-	-
	P2	1.5	2.5	2.5	4.0	5.0	5.0	5.0
ΔC_S Single bearing Deviation of single width of the outer ring - width tolerance	P4	Identical to ΔB_S for the inner ring of the same bearing						
	HG							
	UP							
	P2							
ΔC_S Matched bearing Deviation of single width of the outer ring - width tolerance	P4	Identical to ΔB_S for the inner ring of the same bearing						
	HG							
	UP							
	P2							
$V_{CS \max}$ Outer ring width variation - width variation	P4	2.5	2.5	2.5	3.0	4.0	5.0	5.0
	HG	2.0	2.0	2.0	2.0	2.0	-	-
	UP	2.0	2.0	2.0	2.0	2.0	-	-
	P2	1.5	1.5	1.5	1.5	1.5	2.5	2.5

* For bearings with shields (Z, ZZ) $V_{Dp \max}$ is not restricted.