



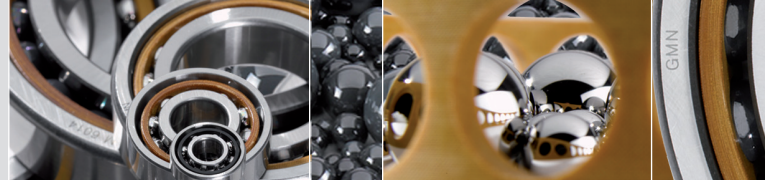
## New GMN Precision Classes P4+ and UP+ TOLERANCES

The tolerances for dimension, shape and running accuracy of high precision ball bearings are specified in national and international standards. GMN high precision ball bearings in P4+

and UP+ are manufactured on the basis of precision classes P4 and P2. These tolerance classes correspond to the ISO and ABMA classifications (tolerance symbols per DIN ISO 1132-1).

### Inner ring dimensions in $\mu\text{m}$

d Nominal bore diameter [mm]	over	2.5	10	18	30	50	80
	up to	10	18	30	50	80	120
$\Delta_{dmp}$ Deviation of mean bore diameter in one plane	P4+ UP+	0 / -4.0 0 / -3.0	0 / -4.0 0 / -3.0	0 / -5.0 0 / -3.0	0 / -6.0 0 / -3.0	0 / -7.0 0 / -4.0	0 / -8.0 -
$\Delta_{ds}$ Bearing series 60, 62 Difference between a single bore diameter and the nominal value of the bore	P4+ UP+	0 / -4.0 0 / -3.0	0 / -4.0 0 / -3.0	0 / -5.0 0 / -3.0	0 / -6.0 0 / -3.0	0 / -7.0 0 / -4.0	0 / -8.0 -
$V_{dp\ max}$ Bearing series 618, 619 Difference between largest and smallest bore diameter in one plane – out of roundness	P4+ UP+	2.5 -	2.5 -	2.5 -	2.5 -	2.5 -	5.0 -
$V_{dp\ max}$ Bearing series 60, 62 Difference between largest and smallest bore diameter in one plane – out of roundness	P4+ UP+	2.5 2.0	2.5 2.0	2.5 2.0	2.5 2.0	4.0 3.0	5.0 -
$V_{dmp\ max}$ Difference between largest and smallest mean bore diameter in different planes	P4+ UP+	1.5 1.5	1.5 1.5	1.5 1.5	1.5 1.5	2.0 2.0	2.5 -
$K_{ia\ max}$ True running of the inner ring in the assembled bearing – radial runout	P4+ UP+	1.5 1.5	1.5 1.5	2.5 1.5	2.5 2.0	2.5 2.0	2.5 -
$S_d\ max$ Plane running of the face side with respect to the bore – side runout	P4+ UP+	1.5 1.5	1.5 1.5	1.5 1.5	1.5 1.5	1.5 1.5	2.5 -
$S_{ia\ max}$ Plane running of the face side with respect to the raceway, in the assembled bearing – axial runout	P4+ UP+	1.5 1.5	1.5 1.5	2.5 2.5	2.5 2.5	2.5 2.5	2.5 -
$\Delta_{BS}$ Single bearing Deviation of a single inner ring from nominal dimension – width tolerance	P4+ UP+	0 / -40 0 / -40	0 / -80 0 / -80	0 / -120 0 / -120	0 / -120 0 / -120	0 / -150 0 / -150	0 / -200 -
$\Delta_{BS}$ Paired bearing Deviation of a single inner ring from nominal dimension – width tolerance	P4+ UP+	0 / -250 0 / -250	0 / -250 0 / -250	0 / -250 0 / -250	0 / -250 0 / -250	0 / -250 0 / -250	0 / -380 -
$V_{BS\ max}$ Variation of inner ring width – width variation	P4+ UP+	1.5 1.5	1.5 1.5	1.5 1.5	1.5 1.5	1.5 1.5	2.5 -



## New GMN Precision Classes P4+ and UP+ TOLERANCES

Comparison of international tolerance standards  
(tolerance symbols per DIN ISO 1132-1)

ISO 492	DIN 620	ABMA
class 4	P4	ABEC 7
class 2	P2	ABEC 9

### Outer ring dimensions in $\mu\text{m}$

D Nominal outside diameter [mm]	over	6	18	30	50	80	120	150
	up to	18	30	50	80	120	150	180
$\Delta_{Dmp}$ Deviation of mean outside diameter in one plane	P4+ UP+	0 / -4.0 0 / -3.0	0 / -5.0 0 / -3.0	0 / -6.0 0 / -3.0	0 / -7.0 0 / -4.0	0 / -8.0 0 / -5.0	0 / -9.0 -	0 / -10.0 -
$\Delta_{Ds}$ Bearing series 60, 62 Difference between a single outside diameter and nominal value	P4+ UP+	0 / -4.0 0 / -3.0	0 / -5.0 0 / -3.0	0 / -6.0 0 / -3.0	0 / -7.0 0 / -4.0	0 / -8.0 0 / -5.0	0 / -9.0 -	0 / -10.0 -
$V_{Dp\ max}$ Bearing series 618, 619 Difference between largest and smallest outside diameter in one plane - out of roundness	P4+ UP+	2.5 -	4.0 -	4.0 -	4.0 -	5.0 -	5.0 -	7.0 -
$V_{Dp\ max}$ Bearing series 60, 62 Difference between largest and smallest outside diameter in one plane - out of roundness	P4+ UP+	2.5 2.0	4.0 2.0	4.0 2.5	4.0 3.0	5.0 3.0	5.0 -	7.0 -
$V_{Dmp\ max}$ Difference between largest and smallest mean outside diameter in different planes	P4+ UP+	1.5 1.0	2.0 1.5	2.0 1.5	2.0 2.0	2.5 2.0	2.5 -	3.5 -
$K_{ea\ max}$ True running of the outer ring in the assembled bearing - radial runout	P4+ UP+	1.5 1.5	2.5 2.0	2.5 2.0	4.0 3.0	5.0 3.0	5.0 -	5.0 -
$S_{D\ max}$ Variation of generatrix gradient with respect to the reference face surface – side runout	P4+ UP+	1.5 1.5	1.5 1.5	1.5 1.5	1.5 1.5	2.5 2.5	2.5 -	2.5 -
$S_{ea\ max}$ Plane running of the face side with respect to the raceway, in the assembled bearing – axial runout	P4+ UP+	1.5 1.5	2.5 2.5	2.5 2.5	4.0 4.0	5.0 5.0	5.0 -	5.0 -
$\Delta_{CS}$ Single bearing Deviation of a single outer ring width from nominal dimension – width tolerance	P4+ UP+	Identical with $\Delta_{BS}$ of the inner ring of the same bearing						
$\Delta_{CS}$ Paired bearing Deviation of a single outer ring width from nominal dimension – width tolerance	P4+ UP+	Identical with $\Delta_{BS}$ of the inner ring of the same bearing						
$V_{CS\ max}$ Variation of outer ring width – width variation	P4+ UP+	1.5 1.5	1.5 1.5	1.5 1.5	1.5 1.5	2.5 2.5	2.5 -	2.5 -