

3 Inner rings

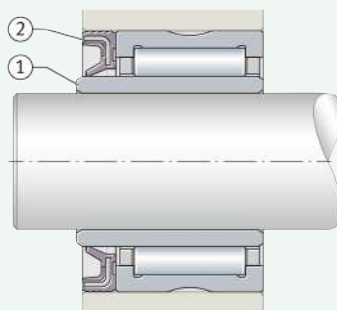


Inner rings are used where:

- the shaft cannot be used as a rolling bearing raceway for needle roller and cage assemblies, drawn cup needle roller bearings with open ends, drawn cup needle roller bearings with closed ends and needle roller bearings (it cannot be hardened and ground)
- needle roller bearings must be combined with wider inner rings in order to allow larger axial displacements of the shaft in relation to the housing (e.g. in bearings with a non-locating bearing function)
- optimum running surfaces are required for seal lips ➤ 992 | ① 1 and ➤ 994 | ④ 4.

① 1
Wider inner ring, outside surface
used as raceway for seal lip

- ① Inner ring IR
- ② Sealing ring G



3.1 Product design

Design variants

The bearing components are available as:

- inner ring IR ➤ 992 | ② 2
- inner ring LR ➤ 993 | ③ 3.

Inner rings IR

The raceway is precision machined

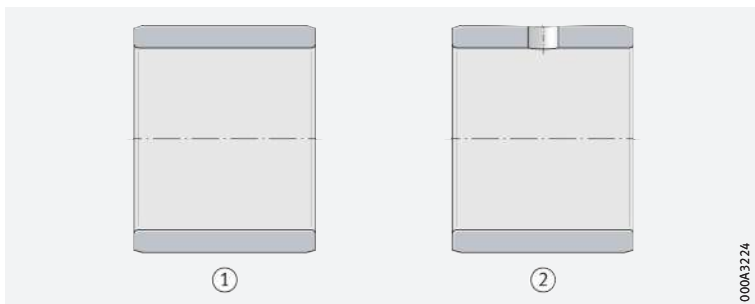
Inner rings IR are made from hardened rolling bearing steel and have precision machined raceways ➤ 992 | ② 2. Chamfers on the end faces facilitate the matching of the rings with the needle roller and cage assembly or of the bearing ring with the needle roller set and prevent damage to the seal lips of the bearings. Inner rings are available with and without a lubrication hole ➤ 992 | ② 2. Rings with a lubrication hole have the suffix IS1 ➤ 995 | 3.5, ➤ 998 | ④ 4.

Inner rings are also available by agreement with several lubrication holes.



② 2
Inner rings IR

- ① Inner ring without lubrication hole
- ② Inner ring with lubrication hole



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X-life premium quality

Inner rings IR are supplied in the X-life design. The quality of the inner rings corresponds to the quality of X-life needle roller bearings. X-life inner rings include the suffix XL in the designation ➤996| 6.



X-life indicates a high product performance density and thus a particularly significant benefit to the customer. Further information on X-life ➤10.

Inner rings with the machining allowance “z” (special design)

z = a material allowance for finish grinding of the rings after fitting, where there are high demands on running accuracy

Inner rings are also available as a special design with a machining allowance “z” on the raceway. These inner rings have the suffix VGS ➤995| 3.5. The size of the machining allowance is dependent on the diameter of the inner ring raceway ➤993| 1. The raceway is finish ground once the rings have been fitted, if high demands are placed on the running accuracy of the bearings.



Machining allowance

Raceway diameter F mm		Machining allowance z mm	Preground raceway diameter F _{VGS}
over	incl.		
–	50	0,1	F _{VGS} = F + z (tolerance h7 ⑥)
50	80	0,15	
80	180	0,2	
180	250	0,25	
250	315	0,3	
315	400	0,35	
400	500	0,4	

Inner rings LR

The raceway is ground

Inner rings LR are produced from rolling bearing steel and are hardened ➤993| 3. The bore and running surface are ground. The end faces are not ground (turned) and the edges are broken. These rings have larger tolerances than the inner rings IR. As a result, they are particularly suitable for applications that allow larger width tolerances and less demanding requirements for axial runout. It is here that they give particularly economical bearing arrangements.



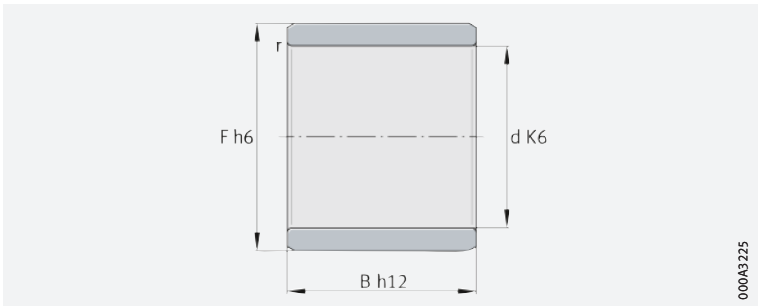
Catalogue HR 1 does not contain separate product tables for inner rings LR. Available inner rings LR are listed in the product tables for drawn cup needler roller bearings with open ends and with closed end ➤900| 1.

For other available dimensions, please consult Schaeffler.



Inner ring LR

- d = bore diameter
- F = raceway diameter
- B = width



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Advantages
of wider inner rings

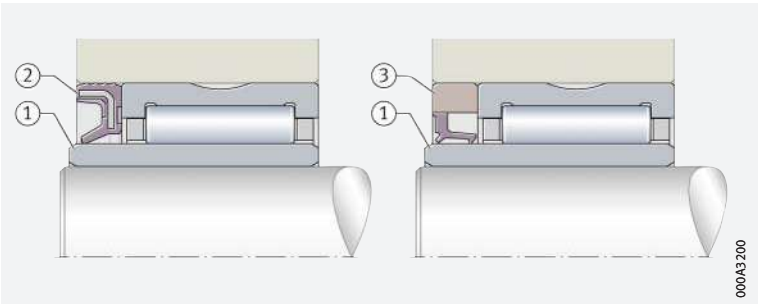
Wider inner rings

The inner rings are available in several widths within the respective bore diameters ➤998| . Wider inner rings:

- permit larger axial displacements of the shaft in relation to the housing
- can be used as the running surface for the lips of contact seals, for example when using sealing rings G, GR and SD ➤994| .

4
Wider inner ring,
also used
as running surface
for sealing rings

- 1 Wider inner ring IR
- 2 Sealing ring G
- 3 Sealing ring SD



3.2 Temperature range

Limiting values

The operating temperature of the inner rings is limited by the dimensional stability of the ring material ➤994| .

2
Permissible temperature ranges

Operating temperature	Inner rings
	–30 °C to +120 °C



In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

3.3 Internal clearance

CN for the combination
of needler roller
bearing/inner ring

The radial internal clearance is dependent on the bearing design used in combination with the inner ring. When combined with Schaeffler needle roller bearings, inner rings have a radial internal clearance of CN ➤994| .

C2 to C3
for the combination
of drawn cup needle
roller bearing with open ends
or closed end/inner ring

When combined with Schaeffler drawn cup needle roller bearings with open ends or closed end, inner rings have an internal clearance of C2 to C3, depending on the raceway diameter ➤994| .



The values for radial internal clearance correspond to DIN 620-4:2004 (ISO 5753-1:2009). These are valid for bearings which are free from load and measurement forces (without elastic deformation).

3
Radial internal clearance

Nominal bore diameter		Radial internal clearance							
d		C2 (Group 2)		CN (Group N)		C3 (Group 3)		C4 (Group 4)	
mm		µm		µm		µm		µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
–	24	0	25	20	45	35	60	50	75
24	30	0	25	20	45	35	60	50	75
30	40	5	30	25	50	45	70	60	85
40	50	5	35	30	60	50	80	70	100

continued ▼

3
Radial internal clearance

Nominal bore diameter d mm		Radial internal clearance							
		C2 (Group 2)		CN (Group N)		C3 (Group 3)		C4 (Group 4)	
		μm		μm		μm		μm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
50	65	10	40	40	70	60	90	80	110
65	80	10	45	40	75	65	100	90	125
80	100	15	50	50	85	75	110	105	140
100	120	15	55	50	90	85	125	125	165
120	140	15	60	60	105	100	145	145	190
140	160	20	70	70	120	115	165	165	215
160	180	25	75	75	125	120	170	170	220
180	200	35	90	90	145	140	195	195	250
200	225	45	105	105	165	160	220	220	280
225	250	45	110	110	175	170	235	235	300
250	280	55	125	125	195	190	260	260	330
280	315	55	130	130	205	200	275	275	350
315	355	65	145	145	225	225	305	305	385
355	400	100	190	190	280	280	370	370	460
400	450	110	210	210	310	310	410	410	510
continued ▲									

3.4 Tolerances



The tolerances for the dimensional and running accuracy of inner rings IR correspond to tolerance class Normal in accordance with ISO 492:2014. Tolerance values in accordance with ISO 492 ►122|8.

3.5 Suffixes

For a description of the suffixes used in this chapter ►995|4 and **medias** interchange ►<https://www.schaeffler.de/std/1D52>.

4
Suffixes and corresponding descriptions

Suffix	Description of suffix	
C2	Radial internal clearance C2 (smaller than normal)	Standard or special design, depending on the rolling bearing used
C3	Radial internal clearance C3 (larger than normal)	
C4	Radial internal clearance C4 (larger than C3)	
EGS	Surface ground free from spiral marks for rotary shaft seals to DIN 3760 and DIN 3761	Special design, available by agreement
IS1	With lubrication hole	Standard for IR inner rings within certain limits
VGS	Machining allowance “z” on raceway ►993  1	Special design, available by agreement

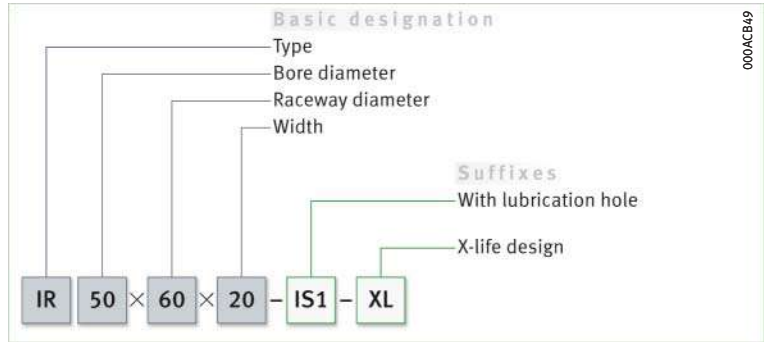
3.6 Structure of bearing designation

The designation of inner rings follows a set model. Examples ▶996| 5 and ▶996| 6.

5
Inner ring LR:
designation structure



6
Inner ring IR
with lubrication hole:
designation structure



3.7 Design of bearing arrangements

Axial location of inner rings

Always locate inner rings axially on both sides

The bearing rings must not be allowed to undergo lateral creep. In order to reliably prevent axial displacements of the inner rings on the shaft where a tight or loose fit is present, these must be located axially on both sides. On one side, the rings can be abutted against a shaft shoulder and, for location on the opposing side, retaining rings, spacer rings or shaft nuts are suitable ▶996| 7.

Design of adjacent parts

The abutment shoulders for the rings should be sufficiently high and perpendicular to the bearing axis. The transition from the bearing seat to the abutment shoulder must be designed with rounding to DIN 5418 or an undercut to DIN 509. In this instance, the minimum values for the chamfer dimensions in the product tables must be observed ▶998| 11.

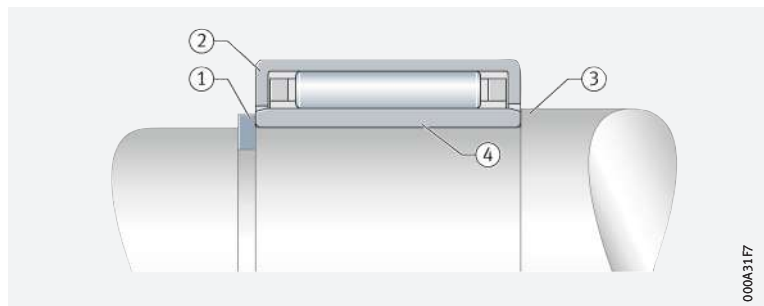
The overlap between the retaining rings and the end faces of the bearing rings must be sufficiently large ▶996| 7.

The maximum chamfer dimensions for the inner rings in accordance with DIN 620-6 must be taken into consideration.



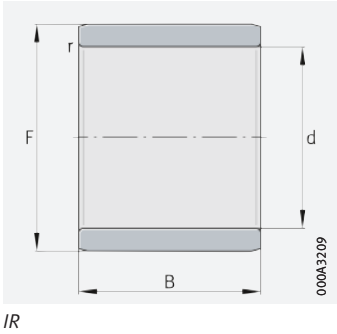
7
Inner ring axially located
on both sides

- Retaining ring
- Drawn cup needle roller bearing with open ends HK
- Shaft shoulder
- Inner ring IR





Inner rings
Without lubrication hole



d = 5 – 25 mm

Main dimensions				Mass m ≈ g	Designation ► 995 3.5 ► 996 3.6 X-life ► 993	Deviations for raceway F	
d	F	B	r min.			upper μm	lower μm
5	8	12	0,3	2,8	IR5×8×12-XL	-7	-23
	8	16	0,3	3,7	IR5×8×16-XL	-7	-23
6	9	12	0,3	3	IR6×9×12-XL	-7	-23
	9	16	0,3	4,3	IR6×9×16-XL	-7	-23
7	10	10,5	0,3	3,1	IR7×10×10,5-XL	-7	-23
	10	12	0,3	3,6	IR7×10×12-XL	-7	-23
	10	16	0,3	4,9	IR7×10×16-XL	-7	-23
8	12	10,5	0,3	5	IR8×12×10,5-XL	-4	-18
	12	12,5	0,3	5,9	IR8×12×12,5-XL	-4	-18
9	12	12	0,3	4,4	IR9×12×12-XL	-4	-18
	12	16	0,3	6	IR9×12×16-XL	-4	-18
10	13	12,5	0,3	5,2	IR10×13×12,5-XL	-4	-18
	14	13	0,3	7,4	IR10×14×13-XL	-4	-18
	14	16	0,3	9,2	IR10×14×16-XL	-4	-18
	14	20	0,3	11,5	IR10×14×20-XL	-4	-18
12	15	12	0,3	5,7	IR12×15×12-XL	-4	-18
	15	12,5	0,3	6,1	IR12×15×12,5-XL	-4	-18
	15	16	0,3	7,6	IR12×15×16-XL	-4	-18
	15	16,5	0,3	8,1	IR12×15×16,5-XL	-4	-18
	15	22,5	0,3	10,9	IR12×15×22,5-XL	-4	-18
	16	13	0,3	8,5	IR12×16×13-XL	-4	-18
	16	16	0,3	10,7	IR12×16×16-XL	-4	-18
	16	20	0,3	13,5	IR12×16×20-XL	-4	-18
	16	22	0,3	14,9	IR12×16×22-XL	-4	-18
14	17	17	0,3	9,5	IR14×17×17-XL	-4	-18
15	18	16	0,3	9,4	IR15×18×16-XL	-4	-18
	18	16,5	0,3	9,8	IR15×18×16,5-XL	-4	-18
	19	16	0,3	12,9	IR15×19×16-XL	0	-12
	19	20	0,3	16,3	IR15×19×20-XL	0	-12
	20	13	0,3	13,5	IR15×20×13-XL	0	-12
	20	23	0,3	24,4	IR15×20×23-XL	0	-12

medias ► <https://www.schaeffler.de/std/1E7F>



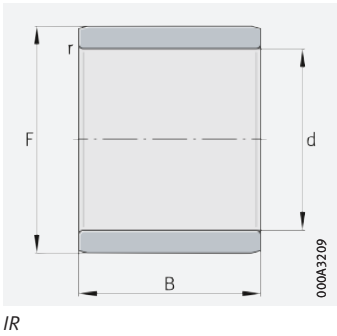
Main dimensions				Mass m ≈ g	Designation ► 995 3.5 ► 996 3.6 X-life ► 993	Deviations for raceway F	
d	F	B	r min.			upper μm	lower μm
17	20	16	0,3	10,6	IR17×20×16-XL	0	-12
	20	16,5	0,3	11,1	IR17×20×16,5-XL	0	-12
	20	20	0,3	13,5	IR17×20×20-XL	0	-12
	20	20,5	0,3	13,8	IR17×20×20,5-XL	0	-12
	20	30,5	0,3	20,6	IR17×20×30,5-XL	0	-12
	21	16	0,3	15	IR17×21×16-XL	0	-12
	21	20	0,3	18	IR17×21×20-XL	0	-12
	22	13	0,3	14,9	IR17×22×13-XL	0	-12
	22	16	0,3	18,4	IR17×22×16-XL	0	-12
	22	23	0,3	27,1	IR17×22×23-XL	0	-12
	24	20	0,6	33,8	IR17×24×20-XL	0	-12
20	24	16	0,3	15	IR20×24×16-XL	0	-12
	24	20	0,3	21,3	IR20×24×20-XL	0	-12
	25	17	0,3	25	IR20×25×17-XL	0	-12
	25	20	0,3	27,5	IR20×25×20-XL	0	-12
	25	20,5	0,3	27,4	IR20×25×20,5-XL	0	-12
	25	26,5	0,3	38	IR20×25×26,5-XL	0	-12
	25	30	0,3	40,4	IR20×25×30-XL	0	-12
	25	38,5	0,3	52,5	IR20×25×38,5-XL	0	-12
	28	20	0,6	45,2	IR20×28×20-XL	0	-12
22	26	16	0,3	18,2	IR22×26×16-XL	0	-12
	28	17	0,3	29,5	IR22×28×17-XL	0	-12
	26	20	0,3	23	IR22×26×20-XL	0	-12
	28	20	0,3	35	IR22×28×20-XL	0	-12
	28	20,5	0,3	36	IR22×28×20,5-XL	0	-12
	28	30	0,3	54,4	IR22×28×30-XL	0	-12
25	29	20	0,3	25,9	IR25×29×20-XL	0	-12
	29	30	0,3	39,3	IR25×29×30-XL	0	-12
	30	17	0,3	27,4	IR25×30×17-XL	0	-12
	30	20	0,3	32,8	IR25×30×20-XL	0	-12
	30	20,5	0,3	33,4	IR25×30×20,5-XL	0	-12
	30	26,5	0,3	46	IR25×30×26,5-XL	0	-12
	30	30	0,3	53	IR25×30×30-XL	0	-12
	30	32	0,3	56	IR25×30×32-XL	0	-12
	30	38,5	0,3	64,5	IR25×30×38,5-XL	0	-12
	32	22	0,6	52,5	IR25×32×22-XL	+5	-4

medias ► <https://www.schaeffler.de/std/1E80>





Inner rings
Without lubrication hole



d = 28 – 70 mm

Main dimensions				Mass m ≈ g	Designation ► 995 3.5 ► 996 3.6 X-life ► 993	Deviations for raceway F	
d	F	B	r min.			upper μm	lower μm
28	32	17	0,3	24,5	IR28×32×17-XL	+5	−4
	32	20	0,3	28,5	IR28×32×20-XL	+5	−4
	32	30	0,3	43,5	IR28×32×30-XL	+5	−4
30	35	13	0,3	25	IR30×35×13-XL	+5	−4
	35	16	0,3	34	IR30×35×16-XL	+5	−4
	35	17	0,3	36	IR30×35×17-XL	+5	−4
	35	20	0,3	39	IR30×35×20-XL	+5	−4
	35	20,5	0,3	39,7	IR30×35×20,5-XL	+5	−4
	35	26	0,3	50,4	IR30×35×26-XL	+5	−4
	35	30	0,3	58,5	IR30×35×30-XL	+5	−4
	37	18	0,6	50	IR30×37×18-XL	+5	−4
32	37	22	0,6	61,6	IR30×37×22-XL	+5	−4
	37	20	0,3	42	IR32×37×20-XL	0	−9
	37	30	0,3	62	IR32×37×30-XL	0	−9
	40	20	0,6	68	IR32×40×20-XL	0	−9
33	40	36	0,6	124	IR32×40×36-XL	0	−9
	37	13	0,3	21,9	IR33×37×13-XL	0	−9
35	40	17	0,3	37,8	IR35×40×17-XL	0	−9
	40	20	0,3	44,2	IR35×40×20-XL	0	−9
	40	20,5	0,3	46,1	IR35×40×20,5-XL	0	−9
	40	30	0,3	67,1	IR35×40×30-XL	0	−9
	42	36	0,6	117,2	IR35×42×36-XL	0	−9
	43	22	0,6	82	IR35×43×22-XL	0	−9
38	43	20	0,3	48,1	IR38×43×20-XL	0	−9
	43	30	0,3	73,6	IR38×43×30-XL	0	−9
40	45	17	0,3	42,5	IR40×45×17-XL	0	−9
	45	20	0,3	50,8	IR40×45×20-XL	0	−9
	45	20,5	0,3	51,8	IR40×45×20,5-XL	0	−9
	45	30	0,3	84	IR40×45×30-XL	0	−9
	48	22	0,6	91,6	IR40×48×22-XL	0	−9
	48	40	0,6	170	IR40×48×40-XL	0	−9
	50	22	1	118	IR40×50×22-XL	0	−9
42	47	20	0,3	52,8	IR42×47×20-XL	−5	−19
	47	30	0,3	81	IR42×47×30-XL	−5	−19

medias ► <https://www.schaeffler.de/std/1E81>



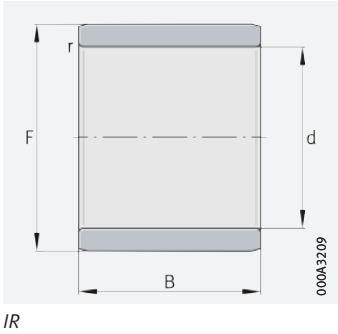
Main dimensions				Mass m ≈ g	Designation ► 995 3.5 ► 996 3.6 X-life ► 993	Deviations for raceway F	
d	F	B	r min.			upper μm	lower μm
45	50	25	0,6	70,8	IR45×50×25-XL	-5	-19
	50	25,5	0,3	75,1	IR45×50×25,5-XL	-5	-19
	50	35	0,6	101	IR45×50×35-XL	-5	-19
	52	22	0,6	89	IR45×52×22-XL	0	-11
	52	40	0,6	164	IR45×52×40-XL	0	-11
	55	22	1	129	IR45×55×22-XL	0	-11
50	55	25	0,6	78	IR50×55×25-XL	0	-11
	55	35	0,6	112	IR50×55×35-XL	0	-11
	58	22	0,6	115	IR50×58×22-XL	0	-11
	58	40	0,6	208	IR50×58×40-XL	0	-11
	60	25	1	162	IR50×60×25-XL	0	-11
	60	28	1,1	181	IR50×60×28-XL	0	-11
55	60	25	0,6	85,5	IR55×60×25-XL	-10	-21
	60	35	0,6	121	IR55×60×35-XL	-10	-21
	63	25	1	141	IR55×63×25-XL	-10	-21
	63	45	1	256	IR55×63×45-XL	-10	-21
	65	28	1,1	198	IR55×65×28-XL	-10	-21
60	68	25	1	152	IR60×68×25-XL	-10	-21
	68	35	0,6	213	IR60×68×35-XL	-10	-21
	68	45	1	276	IR60×68×45-XL	-10	-21
	70	25	1	195	IR60×70×25-XL	-10	-21
	70	28	1,1	215	IR60×70×28-XL	-10	-21
65	72	25	1	141	IR65×72×25-XL	-10	-21
	72	45	1	259	IR65×72×45-XL	-10	-21
	73	25	1	164	IR65×73×25-XL	-10	-21
	73	35	1	231	IR65×73×35-XL	-10	-21
	75	28	1,1	229	IR65×75×28-XL	-10	-21
70	80	25	1	221	IR70×80×25-XL	-10	-26
	80	30	1	267	IR70×80×30-XL	-10	-26
	80	35	1	312	IR70×80×35-XL	-10	-26
	80	54	1	488	IR70×80×54-XL	-10	-26

medias ► <https://www.schaeffler.de/std/1E82>





Inner rings
Without lubrication hole



d = 75 – 380 mm

Main dimensions				Mass m ≈ g	Designation ➤ 995 3.5 ➤ 996 3.6 X-life ➤ 993	Deviations for raceway F	
d	F	B	r min.			upper μm	lower μm
75	85	25	1	238	IR75×85×25-XL	-4	-17
	85	30	1	287	IR75×85×30-XL	-4	-17
	85	35	1	336	IR75×85×35-XL	-4	-17
	85	54	1	520	IR75×85×54-XL	-4	-17
80	90	25	1	253	IR80×90×25-XL	-4	-17
	90	30	1	304	IR80×90×30-XL	-4	-17
	90	35	1	355	IR80×90×35-XL	-4	-17
	90	54	1	556	IR80×90×54-XL	-4	-17
85	95	26	1	277	IR85×95×26-XL	-14	-27
	95	36	1	388	IR85×95×36-XL	-14	-27
	100	35	1,1	582	IR85×100×35-XL	-14	-27
	100	63	1,1	1 054	IR85×100×63-XL	-14	-27
90	100	26	1	294	IR90×100×26-XL	-14	-27
	100	30	1	340	IR90×100×30-XL	-14	-27
	100	36	1	406	IR90×100×36-XL	-14	-27
	105	35	1,1	610	IR90×105×35-XL	-14	-27
	105	63	1,1	1 110	IR90×105×63-XL	-14	-27
95	105	26	1	313	IR95×105×26-XL	-14	-27
	105	36	1	431	IR95×105×36-XL	-14	-27
	110	35	1,1	657	IR95×110×35-XL	-14	-27
	110	63	1,1	1 170	IR95×110×63-XL	-14	-27
100	110	30	1,1	350	IR100×110×30-XL	-14	-27
	110	40	1,1	505	IR100×110×40-XL	-14	-27
	115	40	1,1	797	IR100×115×40-XL	-14	-27
110	120	30	1	409	IR110×120×30-XL	-14	-32
	125	40	1,1	840	IR110×125×40-XL	-7	-22
120	130	30	1	442	IR120×130×30-XL	-7	-22
	135	45	1,1	1 044	IR120×135×45-XL	-7	-22
130	145	35	1,1	855	IR130×145×35-XL	-17	-37
	150	50	1,5	1 690	IR130×150×50-XL	-17	-37
140	155	35	1,1	917	IR140×155×35-XL	-17	-37
	160	50	1,5	1 800	IR140×160×50-XL	-17	-37

medias ➤ <https://www.schaeffler.de/std/1E83>



Main dimensions				Mass m ≈ g	Designation ➤ 995 3.5 ➤ 996 3.6 X-life ➤ 993	Deviations for raceway F	
d	F	B	r min.			upper μm	lower μm
150	165	40	1,1	1 122	IR150×165×40-XL	-27	-52
160	175	40	1,1	1 200	IR160×175×40-XL	-27	-52
170	185	45	1,1	1 441	IR170×185×45-XL	-25	-46
180	195	45	1,1	1 510	IR180×195×45-XL	-25	-46
190	210	50	1,5	2 410	IR190×210×50-XL	-40	-66
200	220	50	1,5	2 518	IR200×220×50-XL	-40	-66
220	240	50	1,5	2 753	IR220×240×50-XL	-55	-86
240	265	60	2	4 600	IR240×265×60-XL	-55	-86
260	285	60	2	4 980	IR260×285×60-XL	-69	-107
280	305	69	2	6 100	IR280×305×69-XL	-69	-107
300	330	80	2,1	9 200	IR300×330×80-XL	-69	-107
320	350	80	2,1	9 800	IR320×350×80-XL	-83	-127
340	370	80	2,1	10 200	IR340×370×80-XL	-83	-127
360	390	80	2,1	10 900	IR360×390×80-XL	-128	-182
380	415	100	2,1	16 700	IR380×415×100-XL	-122	-172

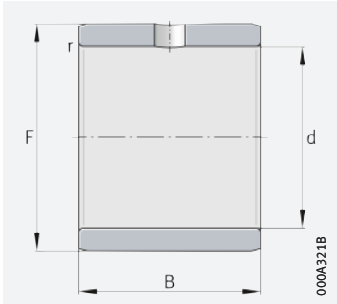
medias ➤ <https://www.schaeffler.de/std/1E84>





Inner rings

With lubrication hole



IR..-IS1

d = 6 – 50 mm

Main dimensions				Mass m ≈ g	Designation ➤ 995 3.5 ➤ 996 3.6 X-life ➤ 993	Deviations for raceway F	
d	F	B	r min.			upper μm	lower μm
6	10	10	0,3	3,7	IR6×10×10-IS1-XL	-7	-23
8	12	10	0,3	4,8	IR8×12×10-IS1-XL	-4	-18
10	14	12	0,3	7,3	IR10×14×12-IS1-XL	-4	-18
12	16	12	0,3	7,9	IR12×16×12-IS1-XL	-4	-18
15	20	12	0,3	12,2	IR15×20×12-IS1-XL	0	-12
20	25	16	0,3	24	IR20×25×16-IS1-XL	0	-12
25	30	16	0,3	25,7	IR25×30×16-IS1-XL	0	-12
30	38	20	0,6	77	IR30×38×20-IS1-XL	+5	-4
35	42	20	0,6	63,9	IR35×42×20-IS1-XL	0	-9
40	50	20	1	106	IR40×50×20-IS1-XL	0	-9
45	55	20	1	117	IR45×55×20-IS1-XL	0	-11
50	55	20	0,6	62,5	IR50×55×20-IS1-XL	0	-11
	60	20	1	128	IR50×60×20-IS1-XL	0	-11

medias ➤ <https://www.schaeffler.de/std/1E85>