



# Rod ends requiring maintenance

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## Rod ends requiring maintenance

SKF manufactures rod ends requiring maintenance with a steel/steel or a steel/bronze sliding contact surface combination.

Steel/steel rod ends consist of a rod end housing and a steel/steel radial spherical plain bearing from the standard assortment, where the outer ring is secured in the housing. These rod ends are available with a female thread (→ **fig. 1**), male thread (→ **fig. 2**) or a welding shank (→ **fig. 3**).

Steel/bronze rod ends consist of a rod end housing and a steel/bronze spherical plain bearing. These bearings have an inner ring made of steel and an outer ring made of bronze. The bearing is held in position by staking the housing on both sides of the outer ring. These rod ends are available with a male or female thread.

SKF supplies rod ends with a threaded shank with a right-hand thread as standard. With the exception of rod ends with the designation suffix VZ019, all rod ends are also available with a left-hand thread. They are identified by the designation prefix L.

## Dimensions

The dimensions of SKF rod ends requiring maintenance are in accordance with the standards listed in **table 1**.

Male and female threads of SKF rod ends are in accordance with ISO 965-1:1998, except for rod ends with female thread having the designation suffix /VZ019, which is in accordance with ISO 8139:2009.

## Tolerances

SKF rod end inner ring dimensional tolerances are in accordance with ISO 12240-4:1998. The tolerances for the steel/steel rod end inner rings are listed in **table 3** and the tolerances for steel/bronze rod end inner rings are listed in **table 2**.

The symbols used in these tables are explained in the following:

- d nominal bore diameter
- $\Delta_{dmp}$  deviation of the mean bore diameter from the nominal
- $\Delta_{Bs}$  deviation of the single inner ring width from the nominal

Fig. 1

Rod end with a female thread

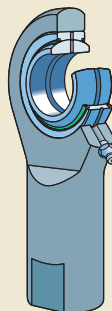


Fig. 2

Rod end with a male thread

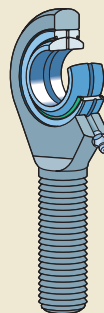
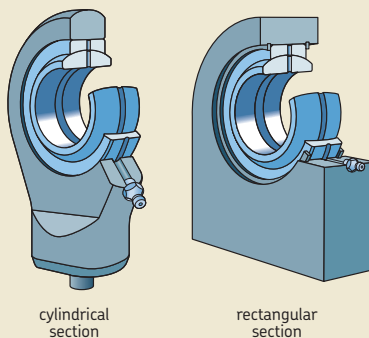


Fig. 3

Rod ends with a welding shank



## Radial internal clearance

The clearance values for steel/steel rod ends are in accordance with dimension series E and EH of ISO 12240-4:1998, as far as they have been standardized. The values are listed in **table 4** on **page 170**.

The clearance values for steel/bronze rod ends are in accordance with dimensions series K of ISO 12240-4:1998 and are listed in **table 5** on **page 170**.

## Materials

SKF rod end housings for bearings that require maintenance are made of the materials listed in **table 6** on **page 170**.

The materials used for steel/steel radial spherical plain bearings incorporated in SKF rod ends are provided in the section *Materials* on **page 102**.

The bearings incorporated in the steel/bronze rod ends have an outer ring made of bronze and an inner ring made of bearing steel which has been hardened and ground.

Table 1

Standards	
Series	Standards
SA(A) SI(A)	ISO 12240-4:1998 dimension series E, EH ISO 12240-4:1998 dimension series E, EH
SC SCF	ISO 12240-4:1998 dimension series E –
SIJ SIR SIQG	ISO 8133:2006 – ISO 8132:2006
SAKAC SIKAC SIKAC/VZ019	ISO 12240-4:1998 dimension series K ISO 12240-4:1998 dimension series K ISO 8139:2009, ISO 12240-4:1998

Table 2

### Inner ring dimensional tolerances for steel/bronze rod ends

Bore diameter d over incl.		SIKAC and SAKAC series			
		$\Delta_{dmp}$ high	low	$\Delta_{Bs}$ high	low
mm		$\mu\text{m}$		$\mu\text{m}$	
–	<b>6</b>	12	0	0	–120
<b>6</b>	<b>10</b>	15	0	0	–120
<b>10</b>	<b>18</b>	18	0	0	–120
<b>18</b>	<b>30</b>	21	0	0	–120

Table 3

### Inner ring dimensional tolerances for steel/steel rod ends

Bore diameter d over incl.		SA(A), SI(A), SIJ, SIR, SC and SCF series				SIQG series			
		$\Delta_{dmp}$ high	low	$\Delta_{Bs}$ high	low	$\Delta_{dmp}$ high	low	$\Delta_{Bs}$ high	low
mm		$\mu\text{m}$		$\mu\text{m}$		$\mu\text{m}$		$\mu\text{m}$	
–	<b>10</b>	0	–8	0	–120	–	–	–	–
<b>10</b>	<b>18</b>	0	–8	0	–120	18	0	0	–180
<b>18</b>	<b>30</b>	0	–10	0	–120	21	0	0	–210
<b>30</b>	<b>50</b>	0	–12	0	–120	25	0	0	–250
<b>50</b>	<b>80</b>	0	–15	0	–150	30	0	0	–300
<b>80</b>	<b>120</b>	0	–20	0	–200	35	0	0	–350
<b>120</b>	<b>180</b>	0	–25	0	–250	40	0	0	–400
<b>180</b>	<b>250</b>	0	–30	0	–300	46	0	0	–460

## Rod ends requiring maintenance

### Permissible operating temperature range

The permissible operating temperature range for SKF rod ends requiring maintenance depends on the rod end housing, the bearing, the bearing seals and the grease used for lubrication. The values for the permissible operating temperature range are listed in **table 7**.

The load carrying capacity of the rod end is reduced at temperatures above 100 °C. For temperatures below 0 °C, check to be sure that the fracture toughness of the rod end housing is adequate for the intended application.

Table 4

#### Radial internal clearance for steel/steel rod ends

Bore diameter d		Radial internal clearance	
over	incl.	Normal min	max
mm		µm	
–	12	16	68
12	20	20	82
20	35	25	100
35	60	30	120
60	90	36	142
90	140	42	165
140	240	50	192

Table 5

#### Radial internal clearance for steel/bronze rod ends

Bore diameter d		Radial internal clearance	
over	incl.	Normal min	max
mm		µm	
–	6	5	50
6	10	7	61
10	18	8	75
18	30	10	92

Table 6

#### Housing materials for rod ends requiring maintenance

Series	Size	Material	Material No.
SA(A)	6 to 80	Heat treatable steel C45V zinc coated and chromatinized	1.0503
SI(A)	6 to 80	Heat treatable steel C45V zinc coated and chromatinized	1.0503
SC	20 to 80	Construction steel S 355 J2G3 (St 52-3 N)	1.0570
SCF	20 to 80	Construction steel S 355 J2G3 (St 52-3 N)	1.0570
SIQG	12 to 63 70 to 200	Heat treatable steel C45 EN-GJS-400-15	1.0503 –
SIJ	12 to 50 60 to 100	Heat treatable steel C45 EN-GJS-400-15	1.0503 –
SIR	25 to 80 90 to 120	Heat treatable steel C45 EN-GJS-400-15	1.0503 –
SAKAC	5 to 12 14 to 30	Free-machining steel 9 SMnPb 28 K zinc coated and chromatinized Heat treatable steel C35N	1.0718 1.0501
SIKAC	5 to 12 14 to 30	Free-machining steel 9 SMnPb 28 K zinc coated and chromatinized Heat treatable steel C35N	1.0718 1.0501

SKF reserves the right to use similar material or material of higher strength.

## Fatigue strength

In all applications where a rod end is subjected to alternating loads, loads that vary in magnitude or where failure of a rod end is dangerous, make sure that the selected rod end has sufficient fatigue strength.

## Relubrication facilities

SKF rod ends requiring maintenance are provided with a grease fitting or a lubrication hole in the rod end housing. Relubrication via the pin is also possible. Exceptions are steel/steel rod ends in the SA .. E and SI .. E series and a few smaller rod ends as indicated in the product tables. The type and design of relubrication facilities in the rod end housing are listed in **table 8**.

Table 7


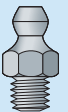

### Permissible operating temperature range for rod ends requiring maintenance

Series	Permissible operating temperature range <sup>1)</sup>	
	from	incl.
—	°C	
<b>Steel/steel rod ends</b>		
SA .. E(S)	-50	+200
SA(A) .. ES-2RS	-30	+130
SI .. E(S)	-50	+200
SI(A) .. ES-2RS	-30	+130
SIQG .. ES	-50	+200
SIJ .. ES	-50	+200
SIR .. ES	-50	+200
SC(F) .. ES	-50	+200
<b>Steel/bronze rod ends</b>		
SAKAC .. M	-30	+180
SIKAC .. M (/VZ 019)	-30	+180

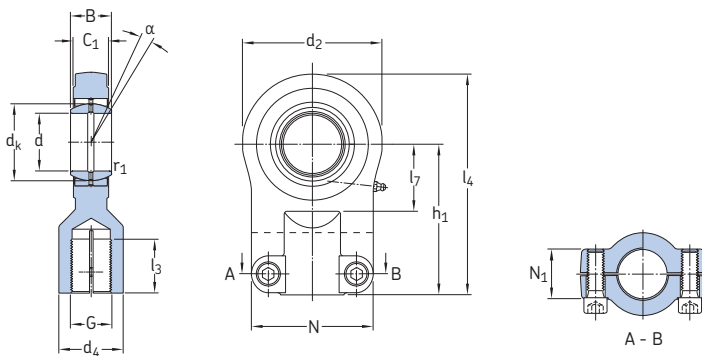
<sup>1)</sup> Permissible operating temperature range of the grease must be considered.

Table 8

### Relubrication facilities for rod ends requiring maintenance

Series	Size	Relubrication facilities Design	
<b>Steel/steel rod ends</b>			
SA .. ES	15 to 20	Lubrication hole diameter 2,5 mm	
SI .. ES	15 to 20		
SI .. ES	15 to 20		
SIJ .. ES	16 to 20		
SC .. ES	20		
SA(A) .. ES(-2RS)	25 to 80	Grease fitting in accordance with DIN 71412: 1987	
SI(A) .. ES(-2RS)	25 to 80		
SIJ .. ES	25 to 100		
SIR .. ES	25 to 120		
SIQG .. ES(A)	12 to 200		
SC .. ES	25 to 80		
SCF .. ES	20 to 80		
<b>Steel/bronze rod ends</b>			
SAKAC .. M	6 to 30	Grease fitting in accordance with DIN 3405: 1986	
SIKAC .. M (/VZ 019)	6 to 30		

**Rod ends with a female thread, for hydraulic cylinders, steel/steel**  
**d 12 – 70 mm**



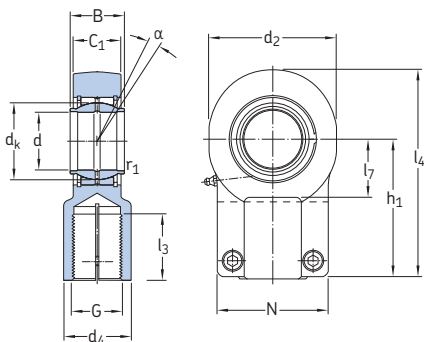
SI(LJ) .. ES

Principal dimensions					Angle of tilt	Basic load ratings		Mass	Designations		
d	d <sub>2</sub> max	G 6H	B	C <sub>1</sub> max	h <sub>1</sub>	α	C	C <sub>0</sub>	Rod end with right-hand thread	left-hand thread <sup>1)</sup>	
						degrees	kN		kg	-	
12	36	M 10×1,25	10	8	42	3	10,8	21,2	0,14	SIJ 12 E <sup>2)</sup>	SILJ 12 E <sup>2)</sup>
	33	M 12×1,25	12	11	38	4	10,8	22	0,11	SIQG 12 ESA <sup>3)</sup>	SILQG 12 ESA <sup>3)</sup>
16	45	M 12×1,25	14	11	48	3	21,2	23,5	0,25	SIJ 16 ES	SILJ 16 ES
	41	M 14×1,5	16	14	44	4	17,6	32,5	0,21	SIQG 16 ES	SILQG 16 ES
20	55	M 14×1,5	16	13	58	3	30	51	0,40	SIJ 20 ES	SILJ 20 ES
	48	M 16×1,5	20	17,5	52	4	30	43	0,40	SIQG 20 ES	SILQG 20 ES
25	65	M 16×1,5	20	17	68	3	48	73,5	0,68	SIJ 25 ES	SILJ 25 ES
	57	M 16×1,5	20	23,5	50	7	48	52	0,49	SIR 25 ES	SILR 25 ES
	59	M 20×1,5	25	22	65	4	48	69,5	0,66	SIQG 25 ES	SILQG 25 ES
30	80	M 20×1,5	22	19	85	3	62	112	1,35	SIJ 30 ES	SILJ 30 ES
	65	M 22×1,5	22	28,5	60	6	62	78	0,77	SIR 30 ES	SILR 30 ES
32	71	M 27×2	32	28	80	4	65,5	100	1,20	SIQG 32 ES	SILQG 32 ES
35	79	M 28×1,5	25	30,5	70	6	80	118	1,20	SIR 35 ES	SILR 35 ES
40	98	M 27×2	28	23	105	3	100	146	2,40	SIJ 40 ES	SILJ 40 ES
	95	M 35×1,5	28	35,5	85	7	100	200	2,10	SIR 40 ES	SILR 40 ES
	90	M 33×2	40	34	97	4	100	176	2,00	SIQG 40 ES	SILQG 40 ES
50	122	M 33×2	35	30	130	3	156	216	3,80	SIJ 50 ES	SILJ 50 ES
	118	M 45×1,5	35	40,5	105	6	156	280	3,60	SIR 50 ES	SILR 50 ES
	110	M 42×2	50	42	120	4	156	270	3,50	SIQG 50 ES	SILQG 50 ES
60	160	M 42×2	44	38	150	3	245	405	8,50	SIJ 60 ES	SILJ 60 ES
	132	M 58×1,5	44	50,5	130	6	245	325	6,00	SIR 60 ES	SILR 60 ES
63	134	M 48×2	63	53,5	140	4	255	375	6,80	SIQG 63 ES	SILQG 63 ES
70	156	M 65×1,5	49	55,5	150	6	315	450	9,40	SIR 70 ES	SILR 70 ES

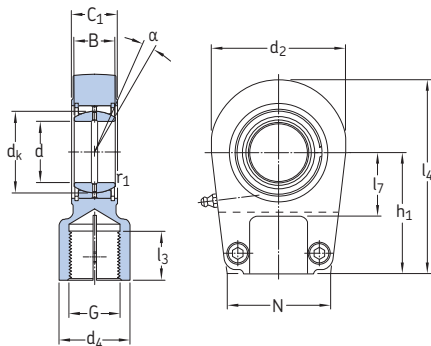
<sup>1)</sup> Check availability of rod ends with left-hand thread.

<sup>2)</sup> No relubrication facilities.

<sup>3)</sup> Can only be relubricated via the outer ring.



SI(L)QG..ES



SI(L)R..ES

**Dimensions**

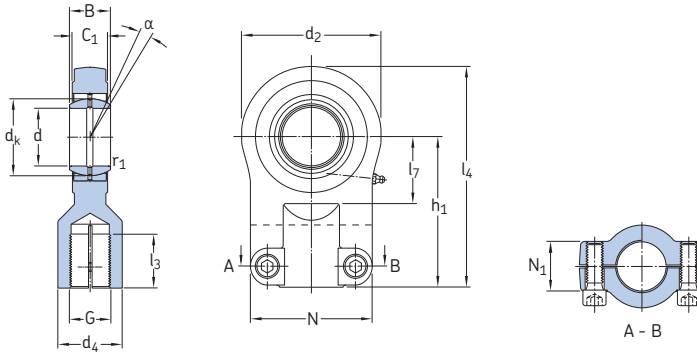
**Cylinder bolt with internal hexagon (ISO 4762:1998)**

d	dk	d4 max	l3 min	l4 max	l7 min	N max	N1 max	r1 min	Size	Tightening torque
mm									-	Nm
12	18	17	15	62	16	40	13	0,3	M 6	10
	18	17	17	55	13	33	11	0,3	M 5	5,5
16	25	21	17	70,5	20	45	13	0,3	M 6	10
	23	22	19	64,5	17	41	14	0,3	M 6	9,5
20	29	25	19	85,5	25	55	17	0,3	M 8	25
	29	26,5	23	77	21	48	18	0,3	M 8	23
25	35,5	30	23	100,5	30	62	17	0,6	M 8	25
	35,5	26	17	79,5	27	42	23,5	0,6	M 8	23
	35,5	31	29	97	26	55	18	0,6	M 8	23
30	40,7	36	29	125	35	80	19	0,6	M 10	45
	40,7	33	23	93,5	29	47	28,5	0,6	M 8	23
32	43	38	37	116,5	31	67	23	0,6	M 10	46
35	47	41,5	29	110,5	37	59	30,5	0,6	M 10	46
40	53	45	37	155	45	90	23	0,6	M 10	45
	53	50,5	36	133,5	44	67	35,5	0,6	M 10	46
	53	47	46	143	40	81	28	0,6	M 10	46
50	66	55	46	192,5	58	105	30	0,6	M 12	80
	66	62,5	46	164,5	54	89	40,5	0,6	M 12 <sup>1)</sup>	79 <sup>1)</sup>
	66	58	57	175,5	49	97,5	33	0,6	M 12	79
60	80	68	57	230	68	134	38	1	M 16	160
	80	76,5	59	202,5	64	91	50,5	1	M 16 <sup>1)</sup>	46 <sup>1)</sup>
63	83	70	64	213,5	61	116	40	1	M 16 <sup>1)</sup>	195 <sup>1)</sup>
70	92	87,5	66	234,5	74	101	55,5	1	M 16 <sup>1)</sup>	79 <sup>1)</sup>

<sup>1)</sup> Bolts, position of bolts, and tightening torque may vary.

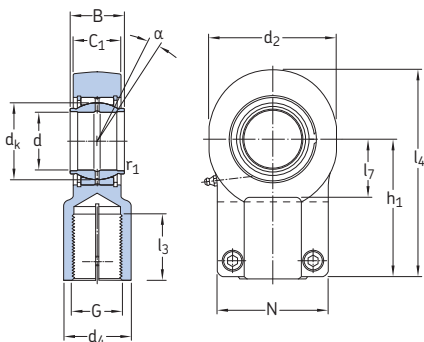


**Rod ends with a female thread, for hydraulic cylinders, steel/steel**  
**d 80 – 200 mm**

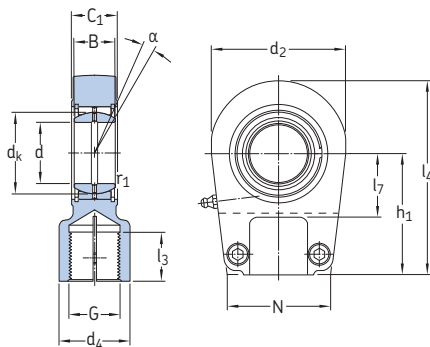


SI(LJ) .. ES

Principal dimensions						Angle of tilt	Basic load ratings		Mass	Designations	
d	d <sub>2</sub> max	G 6H	B	C <sub>1</sub> max	h <sub>1</sub>	α	C	C <sub>0</sub>		Rod end with right-hand thread	left-hand thread
mm						degrees	kN		kg	-	
<b>80</b>	205	M 48×2	55	47	185	3	400	610	14,5	<b>SIJ 80 ES</b>	<b>SILJ 80 ES</b>
	178	M 80×2	55	60,5	170	6	400	560	13,0	<b>SIR 80 ES</b>	<b>SILR 80 ES</b>
	170	M 64×3	80	68	180	4	400	600	14,5	<b>SIQG 80 ES</b>	<b>SILQG 80 ES</b>
<b>100</b>	240	M 64×3	70	57	240	3	610	780	29,5	<b>SIJ 100 ES</b>	<b>SILJ 100 ES</b>
	232	M 110×2	70	70,5	235	7	610	950	30,0	<b>SIR 100 ES</b>	<b>SILR 100 ES</b>
	212	M 80×3	100	85,5	210	4	610	930	28,0	<b>SIQG 100 ES</b>	<b>SILQG 100 ES</b>
<b>120</b>	343	M 130×3	85	90,5	310	6	950	2 450	84,0	<b>SIR 120 ES</b>	<b>SILR 120 ES</b>
<b>125</b>	268	M 100×3	125	105	260	4	950	1 430	43,0	<b>SIQG 125 ES</b>	<b>SILQG 125 ES</b>
<b>160</b>	328	M 125×4	160	133	310	4	1 370	2 200	80,0	<b>SIQG 160 ES</b>	<b>SILQG 160 ES</b>
<b>200</b>	420	M 160×4	200	165	390	4	2 120	3 400	165	<b>SIQG 200 ES</b>	<b>SILQG 200 ES</b>



SI(L)QG..ES



SI(L)R..ES

**Dimensions**

d	dk	d <sub>4</sub> max	l <sub>3</sub> min	l <sub>4</sub> max	l <sub>7</sub> min	N max	N <sub>1</sub> max	r <sub>1</sub> min	Cylinder bolt with internal hexagon (ISO 4762:1998)	
									Size	Tightening torque
mm									-	Nm
<b>80</b>	105	90	64	287,5	92	156	47	1	M 20	310
	105	103,5	81	267,5	79	126	60,5	1	M 20 <sup>1)</sup>	195 <sup>1)</sup>
	105	91	86	272,5	77	150	50	1	M 20 <sup>1)</sup>	390 <sup>1)</sup>
<b>100</b>	130	110	86	360	116	190	57	1	M 24	530
	130	140	111	362,5	103	167	70,5	1	M 24 <sup>1)</sup>	390 <sup>1)</sup>
	130	110	96	324	97	180	65	1	M 24 <sup>1)</sup>	670 <sup>1)</sup>
<b>120</b>	160	175	135	493	138	257	86	1	M 24 <sup>1)</sup>	670 <sup>1)</sup>
<b>125</b>	160	135	113	407	118	202	75	1	M 24 <sup>1)</sup>	670 <sup>1)</sup>
<b>160</b>	200	165	126	490	148	252	85	1	M 24 <sup>1)</sup>	670 <sup>1)</sup>
<b>200</b>	250	215	161	623	193	323	106	1,1	M 30 <sup>1)</sup>	1 350 <sup>1)</sup>

<sup>1)</sup> Bolts, position of bolts, and tightening torque may vary.