



# 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

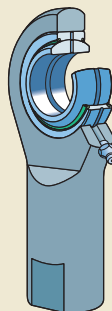


Fig. 2

Rod end with a male thread

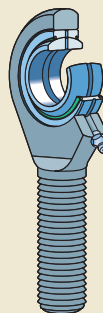
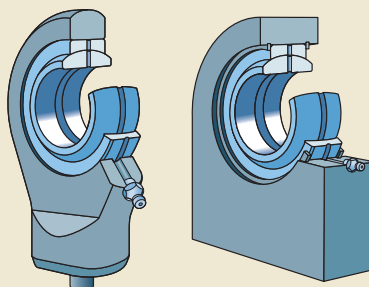


Fig. 3

Rod ends with a welding shank



cylindrical section

rectangular section

## 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		$\mu\text{m}$				$\mu\text{m}$			
–	<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


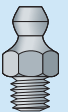

### Permissible operating temperature range for rod ends requiring maintenance

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

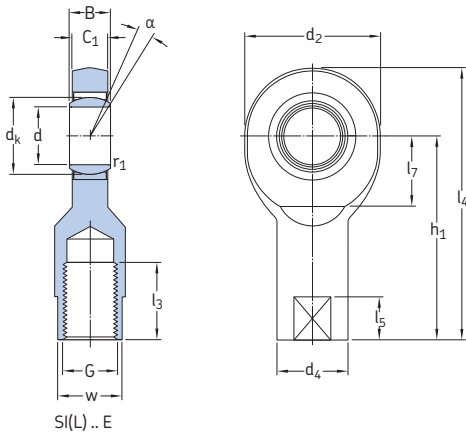
<sup>1)</sup> Permissible operating temperature range of the grease must be considered.

Table 8

### Relubrication facilities for rod ends requiring maintenance

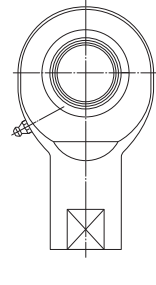
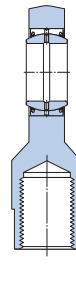
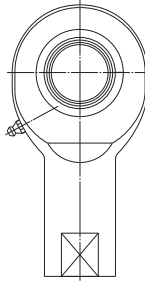
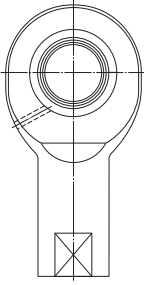
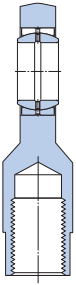
Series	Size	Relubrication facilities Design	
<b>Steel/steel rod ends</b>			
SA .. ES	15 to 20	Lubrication hole diameter 2,5 mm	
SI .. ES	15 to 20		
SI .. ES	15 to 20		
SIJ .. ES	16 to 20		
SC .. ES	20		
SA(A) .. ES(-2RS)	25 to 80	Grease fitting in accordance with DIN 71412: 1987	
SI(A) .. ES(-2RS)	25 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, steel/steel**  
**d 6 – 80 mm**



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	–	
6	22	M 6	6	4,5	30	13	3,4	8,15	0,023	SI 6 E <sup>1)</sup>	SIL 6 E <sup>1)</sup>
8	25	M 8	8	6,5	36	15	5,5	12,9	0,036	SI 8 E <sup>1)</sup>	SIL 8 E <sup>1)</sup>
10	30	M 10	9	7,5	43	12	8,15	19	0,065	SI 10 E <sup>1)</sup>	SIL 10 E <sup>1)</sup>
12	35	M 12	10	8,5	50	10	10,8	25,5	0,11	SI 12 E <sup>1)</sup>	SIL 12 E <sup>1)</sup>
15	41	M 14	12	10,5	61	8	17	37,5	0,18	SI 15 ES	SIL 15 ES
17	47	M 16	14	11,5	67	10	21,2	44	0,25	SI 17 ES	SIL 17 ES
20	54	M 20×1,5	16	13,5	77	9	30	57	0,36	SI 20 ES	SIL 20 ES
25	65	M 24×2	20	18	94	7	48	90	0,65	SI 25 ES	SIL 25 ES
30	75	M 30×2	22	20	110	6	62	116	1,00	SI 30 ES	SIL 30 ES
35	84	M 36×3	25	22	130	6	80	134	1,40	SI 35 ES-2RS	SIL 35 ES-2RS
40	94	M 39×3	28	24	142	6	100	166	2,20	SIA 40 ES-2RS	SILA 40 ES-2RS
	94	M 42×3	28	24	145	6	100	166	2,30	SI 40 ES-2RS	SIL 40 ES-2RS
45	104	M 42×3	32	28	145	7	127	224	2,90	SIA 45 ES-2RS	SILA 45 ES-2RS
	104	M 45×3	32	28	165	7	127	224	3,20	SI 45 ES-2RS	SIL 45 ES-2RS
50	114	M 45×3	35	31	160	6	156	270	4,10	SIA 50 ES-2RS	SILA 50 ES-2RS
	114	M 52×3	35	31	195	6	156	270	4,50	SI 50 ES-2RS	SIL 50 ES-2RS
60	137	M 52×3	44	39	175	6	245	400	6,30	SIA 60 ES-2RS	SILA 60 ES-2RS
	137	M 60×4	44	39	225	6	245	400	7,10	SI 60 ES-2RS	SIL 60 ES-2RS
70	162	M 56×4	49	43	200	6	315	530	9,50	SIA 70 ES-2RS	SILA 70 ES-2RS
	162	M 72×4	49	43	265	6	315	530	10,5	SI 70 ES-2RS	SIL 70 ES-2RS
80	182	M 64×4	55	48	230	5	400	655	15,0	SIA 80 ES-2RS	SILA 80 ES-2RS
	182	M 80×4	55	48	295	5	400	655	19,0	SI 80 ES-2RS	SIL 80 ES-2RS

<sup>1)</sup> No relubrication facilities.



SI(L)..ES

$d \leq 20 \text{ mm}$

$d \geq 25 \text{ mm}$

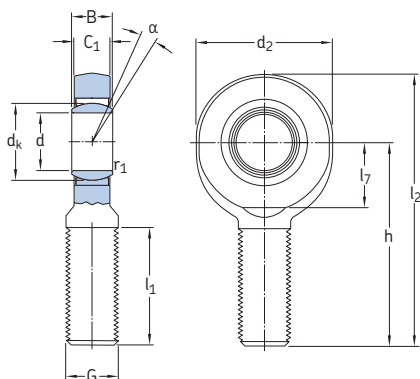
SI(L)A..ES-2RS  
SI(L)..ES-2RS

### Dimensions

d	$d_k$	$d_4$ ≈	$l_3$ min	$l_4$ max	$l_5$ ≈	$l_7$ min	$r_1$ min	w h14
6	10	11	11	43	8	10	0,3	9
8	13	13	15	50	9	11	0,3	11
10	16	16	15	60	11	13	0,3	14
12	18	19	18	69	12	17	0,3	17
15	22	22	21	83	14	19	0,3	19
17	25	25	24	92	15	22	0,3	22
20	29	28	30	106	16	24	0,3	24
25	35,5	35	36	128	18	30	0,6	30
30	40,7	42	45	149	19	34	0,6	36
35	47	49	60	174	25	40	0,6	41
40	53	58	65	191	25	46	0,6	50
	53	58	65	194	25	46	0,6	50
45	60	65	65	199	30	50	0,6	55
	60	65	65	219	30	50	0,6	55
50	66	70	68	219	30	58	0,6	60
	66	70	68	254	30	58	0,6	60
60	80	82	70	246	35	73	1	70
	80	82	70	296	35	73	1	70
70	92	92	80	284	40	85	1	80
	92	92	80	349	40	85	1	80
80	105	105	85	324	45	98	1	90
	105	105	85	389	45	98	1	90



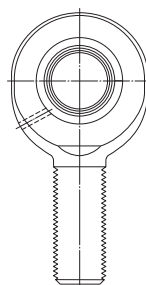
**Rod ends with a male thread, steel/steel**  
**d 6 – 80 mm**



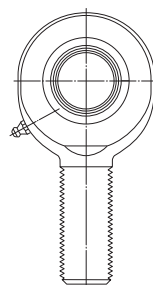
SA(L) .. E



SA(L) .. ES



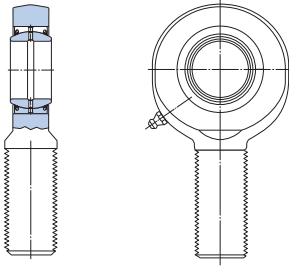
d ≤ 20 mm



d ≥ 25 mm

Principal dimensions			Angle of tilt		Basic load ratings		Mass	Designations			
d	d <sub>2</sub> max	G 6g	B	C <sub>1</sub> max	h	α		C	C <sub>0</sub>	Rod end with right-hand thread	left-hand thread
mm			degrees		kN		kg		-		
6	22	M 6	6	4,5	36	13	3,4	8,15	0,017	SA 6 E <sup>1)</sup>	SAL 6 E <sup>1)</sup>
8	25	M 8	8	6,5	42	15	5,5	12,9	0,029	SA 8 E <sup>1)</sup>	SAL 8 E <sup>1)</sup>
10	30	M 10	9	7,5	48	12	8,15	18,3	0,053	SA 10 E <sup>1)</sup>	SAL 10 E <sup>1)</sup>
12	35	M 12	10	8,5	54	10	10,8	24,5	0,078	SA 12 E <sup>1)</sup>	SAL 12 E <sup>1)</sup>
15	41	M 14	12	10,5	63	8	17	28	0,13	SA 15 ES	SAL 15 ES
17	47	M 16	14	11,5	69	10	21,2	31	0,19	SA 17 ES	SAL 17 ES
20	54	M 20x1,5	16	13,5	78	9	30	42,5	0,32	SA 20 ES	SAL 20 ES
25	65	M 24x2	20	18	94	7	48	78	0,53	SA 25 ES	SAL 25 ES
30	75	M 30x2	22	20	110	6	62	81,5	0,90	SA 30 ES	SAL 30 ES
35	84	M 36x3	25	22	130	6	80	110	1,30	SA 35 ES-2RS	SAL 35 ES-2RS
40	94	M 39x3	28	24	150	6	100	140	1,85	SAA 40 ES-2RS	SALA 40 ES-2RS
	94	M 42x3	28	24	145	6	100	140	1,90	SA 40 ES-2RS	SAL 40 ES-2RS
45	104	M 42x3	32	28	163	7	127	200	2,45	SAA 45 ES-2RS	SALA 45 ES-2RS
	104	M 45x3	32	28	165	7	127	200	2,55	SA 45 ES-2RS	SAL 45 ES-2RS
50	114	M 45x3	35	31	185	6	156	245	3,30	SAA 50 ES-2RS	SALA 50 ES-2RS
	114	M 52x3	35	31	195	6	156	245	3,90	SA 50 ES-2RS	SAL 50 ES-2RS
60	137	M 52x3	44	39	210	6	245	360	5,70	SAA 60 ES-2RS	SALA 60 ES-2RS
	137	M 60x4	44	39	225	6	245	360	6,25	SA 60 ES-2RS	SAL 60 ES-2RS
70	162	M 56x4	49	43	235	6	315	490	7,90	SAA 70 ES-2RS	SALA 70 ES-2RS
	162	M 72x4	49	43	265	6	315	490	10,0	SA 70 ES-2RS	SAL 70 ES-2RS
80	182	M 64x4	55	48	270	5	400	585	12,0	SAA 80 ES-2RS	SALA 80 ES-2RS
	182	M 80x4	55	48	295	5	400	585	14,5	SA 80 ES-2RS	SAL 80 ES-2RS

<sup>1)</sup> No relubrication facilities.



SA(L)A..ES-2RS

**Dimensions**

d	d <sub>k</sub>	l <sub>1</sub> min	l <sub>2</sub> max	l <sub>7</sub> min	r <sub>1</sub> min
mm					
6	10	16	49	10	0,3
8	13	21	56	11	0,3
10	16	26	65	13	0,3
12	18	28	73	17	0,3
15	22	34	85	19	0,3
17	25	36	94	22	0,3
20	29	43	107	24	0,3
25	35,5	53	128	30	0,6
30	40,7	65	149	34	0,6
35	47	82	174	40	0,6
40	53	86	199	46	0,6
	53	90	194	46	0,6
45	60	92	217	50	0,6
	60	95	219	50	0,6
50	66	104	244	58	0,6
	66	110	254	58	0,6
60	80	115	281	73	1
	80	120	296	73	1
70	92	125	319	85	1
	92	132	349	85	1
80	105	140	364	98	1
	105	147	389	98	1