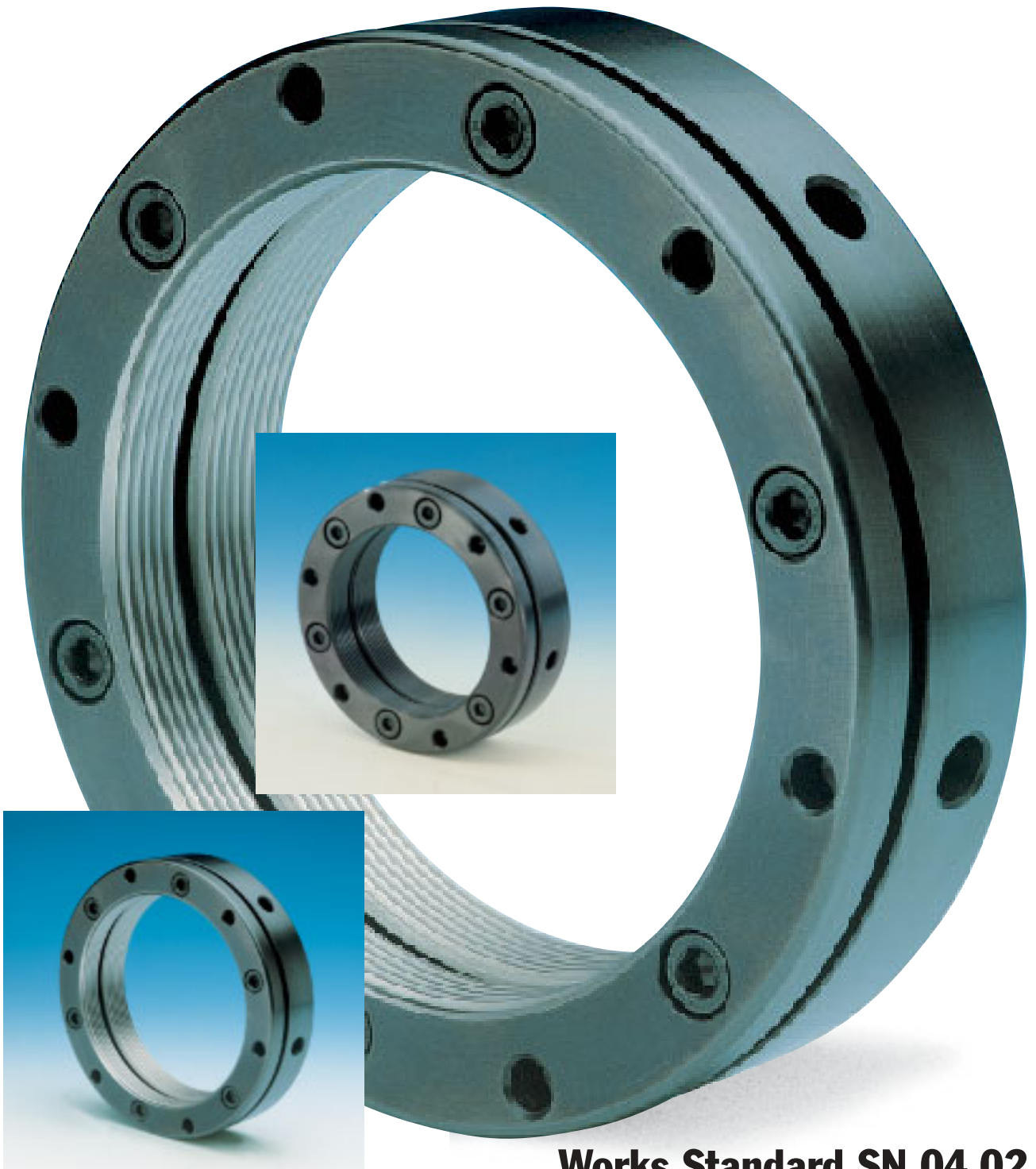




SPIETH Locknuts

Series MSR – MSA



Works Standard SN 04.02
SN 04.04

SPIETH Locknuts Series MSR-MSA

■ SPIETH locknuts offer a range of special system and production related technical benefits.

■ Under high levels of dynamic stress, the good axial rigidity, high axial load capacity and the outstanding locking properties offered by this locknut series are of decisive importance.

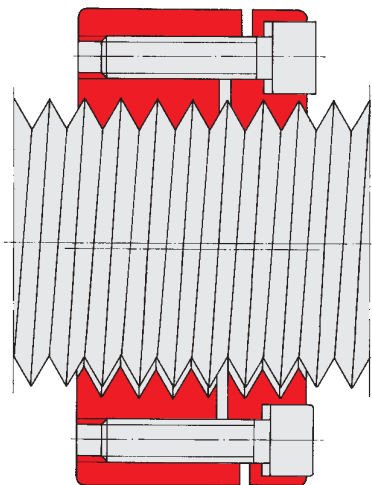
■ Simple connecting elements, no grooves, locking plates etc.

■ The nut used for mounting roller bearings plays an important part in determining the quality of the entire bearing.

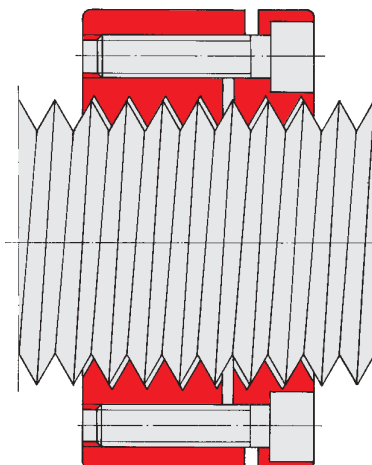
■ The locknut contact surface can be adjusted simply and precisely at any axial position.

■ The produced high standard of run-out accuracy is retained when mounted and can be improved – if necessary – by setting individual adjustment.

Functional principle:



Screwing on the locknut, the existence of thread flank play allows the nut to tilt. The contact surface of the nut can come to rest positioned at an incline.



Thread flank play eliminated, the locknut is centred and can no longer tilt. The nut's contact surface has aligned at right-angles to the spindle axis.

The principle is shown in a simplified diagram with enlarged thread flank play.



SPIETH locknut series MSR



SPIETH locknut series MSA

Fields of application:

MSR and MSA series locknuts are precision nuts whose system-specific benefits can be used in every mechanical engineering sector. Where fast-spinning and/or dynamic stressed spindles are used, the precision of the locknuts, their axial rigidity and high level of dynamic safety ensure optimum results for the entire bearing

system. Repeated precision adjustments can be carried out using the locknut on the same spindle. The locknut can simply and precisely assume the function of shaft collar or lay-on surface. Even if there are only demands for a high security of the connection, these locknuts can be ideally applied.

Benefits:

The locknut is designed rotationally symmetric without any imbalancing properties such as grooves, slots etc. The clamping screws distributed evenly around the centre (in a circle) together with the ideally configured elastic diaphragm of the locknut will result in even clamping forces all around the spindle thread. These clamping forces ensure intensive contact between the thread flanks of the nut and spindle, resulting in a high degree of axial rigidity around the entire periphery of the nut (eliminating soft spots). Adaptation of little imperfect shapes and surface compression on the thread occurring in conventional nuts as a result of subjection to operating loads are anticipated by the design feature of the SPIETH locknuts. The resulting

reduction in axial pretension caused by the named anticipation is simply compensated during mounting by applying a higher moment of pretension. The end face of the locknut can be aligned until completely free of play. Little errors in the run-out accuracy of the connecting components can be compensated – if necessary – by individual adjustment of the clamping screws. Unilateral tensions are often the cause of poor concentricity in mounted spindles. Despite a spindle thread produced to ISO standards, flank play can be restricted during mounting right down to zero, so permitting precision adjustment of the locknut's contact surface.

Execution:

These locknuts are made of steel and burnished. The metric ISO thread is manufactured to the tolerance class „fine“ (tolerance class 5H, DIN 13, parts 21- 25) in a single work process

together with the end face of the locknut. The built-in clamping screws are cheese-head screws to ISO 4762 which can be manipulated using an ISO 2936 screwdriver.

Connecting components:

The metric bolt thread must be produced to tolerance class „medium“ (tolerance class 6g, DIN 13, parts 21- 25), for higher precision requirements to tolerance class „fine“ (tolerance class 4h, DIN 13, parts 21- 25). The contact surfaces of the connecting compo-

nents are essential to optimum function and must be manufactured with particular care and precision.

To avoid surface seizure, the finish of the contact surfaces should have a level of surface roughness as low as possible.

Application:

The locknut is deformable in the axial direction and must therefore be handled with care. The clamping screws should only be tightened when the locknut has been screwed completely onto the spindle thread. If these instructions are ignored, inadmissible plastic deformation could destroy the locknut.

5. Then secure the locknut by evenly tightening the clamping screws. Where stringent demands are made on spindle concentricity, it is possible to adjust the concentricity after testing by tightening the clamping screws individually. This method can also be used to eliminate any unilateral tensions caused as a result of minimal axial run-out errors in the connecting elements.

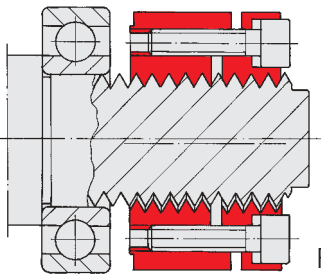


Fig. 1

Assembly

1. Carefully clean the locknut and connecting elements and wet slightly with low-viscosity machine oil.
2. Screw the locknut onto the spindle thread. Wait before screwing it in completely (Fig. 1).
3. Tighten the clamping screws evenly in diagonal sequence while turning the locknut backwards and forwards, until flank play is almost eliminated (indicated by a tight fitting feel when turning the locknut Fig. 2).

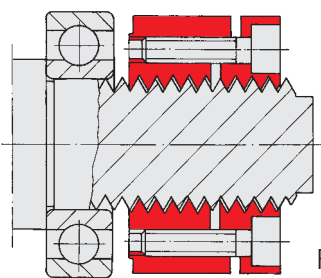


Fig. 2

4. Now tighten the locknut against the end contact surface initially by exerting a high level of preliminary torque. Then release again and finally tighten using the prescribed degree of preliminary torque (Fig. 3). This sequence prevents subsequent seizure at the contact surfaces (thread flanks, end contact surfaces)

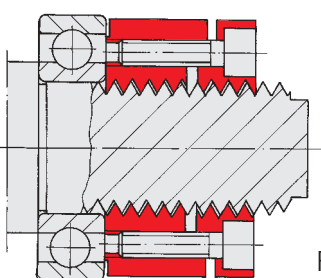


Fig. 3

Dismantling

First relieve the tension of the clamping screws slightly in diagonal sequence. Only then should the clamping screws be completely released. This prevents the total tension of the diaphragm from working on the last clamping screw to be released and causing a jamming effect.

Once a locknut has been secured on a spindle thread, after removal it may only be used again on the same spindle. Adjustment processes carried out between the spindle and locknut can otherwise lead to problems when using on a different spindle.

A set of mounting instructions is provided with every delivery for first-time users. Further copies can be provided on request.

Explanations

Clamping screws:

Cheese-head screws with a hexagon socket in compliance with ISO 4762 strength class 12.9.

M_A: Tightening torque per clamping screw. The tightening torque is based on a friction coefficient

$\mu = 0.14$. As the effective friction coefficients depend on a range of factors which are often beyond the control of the manufacturer, values specified here are without commitment and are made in the form of recommendations.

Setting an axial pretension force:

The axial pretension of a screw connection often plays a decisive role for successful function, and must therefore be set with particular accuracy. However, in most assembly workshops, direct measurement of this variable is not possible, raising the need for indirect methods of setting. For this purpose the locknut pretension moment is calculated corresponding to the required pretension force. This factor can be determined using the following formula:

The locking process strains the spindle thread with the effect of an intensive surface contact (= high axial rigidity). At the same time, this serves to relieve tension on the end contact surface of the locknut. This effect can be simply compensated by setting an increased pretension torque during mounting. This higher pretension torque is ascertained using the allowance B relative to the required pretension force F_v.

$$M_v = \frac{(F_v + B) \cdot (A + \mu_A \cdot r_A)}{1000} \text{ [Nm]}$$

M_v = Pretension moment of the locknut [Nm]

F_v = Required axial pretension force of the screw connection [N]

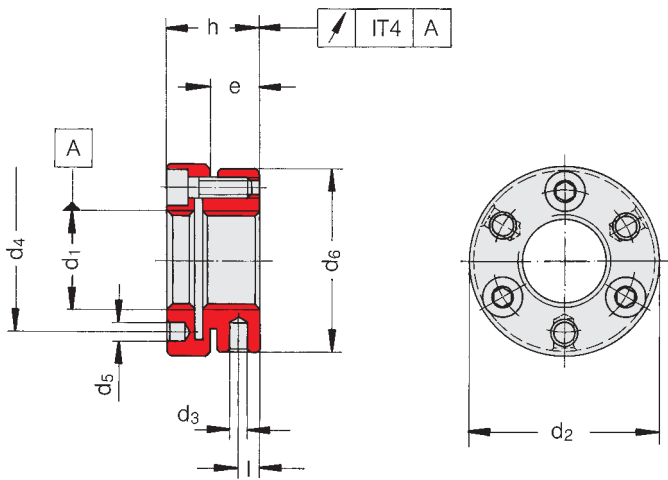
B = Locknut-specific allowance [N], compensates face end relief due to the locking process

A = Constant [mm], includes the calculation factors for the respective thread diameter (see table)

μ_A = Friction coefficient for the end contact surface of the locknut.
Approximate value $\mu_A = 0,1$ steel/stell

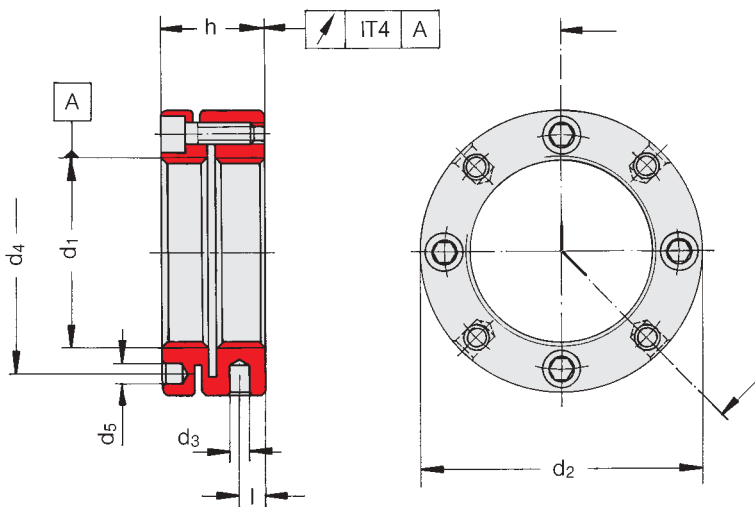
r_A = Effective friction radius for the end contact surface of the locknut [mm]

SPIETH Locknuts Series MSR



Designation of a locknut
with $d_1 = M 40 \times 1,5$:
Locknut MSR 40 x 1,5

MSR	Dimensions in mm									Clamping screws			Calculation factor A mm	Locknut-specific allowance B N	Adm. axial operating stress		Mass moment of inertia J kg cm ²
	d ₁	d ₂	d ₃ ¹⁾	d ₄	d ₅ ¹⁾	d ₆	h	l	e	ISO 4762	M _A	No.			dyn.	stat.	
ISO - 5H	h11	H11															
10 · 0,75	24	2,5	17	3,2	22	14	3	6,5	M3	2	3	0,672	2457	12	16	0,025	
10 · 1	24	2,5	17	3,2	22	15	3	6,5	M3	2	3	0,703	2457	12	15	0,027	
12 · 1	26	3	19	3,2	25	14	3	6,5	M3	2	3	0,819	2438	14	19	0,037	
12 · 1,5	26	3	19	3,2	25	15	3	6,5	M3	2	3	0,881	2438	13	18	0,040	
14 · 1,5	32	4	22,5	4,3	30	16	3	7	M4	2,9	3	0,997	2995	17	22	0,096	
15 · 1	33	4	23,5	4,3	31	16	3	7	M4	2,9	3	0,992	2984	19	25	0,108	



The admissible operating loads specified in the table are guideline values calculated with a safety factor of 1.6

- under static stress relative to the minimum yield point,
- under dynamic stress relative to the minimum alternate strength.

Subject to changes.

Special versions:

On request, by sending of an explanatory sketch.

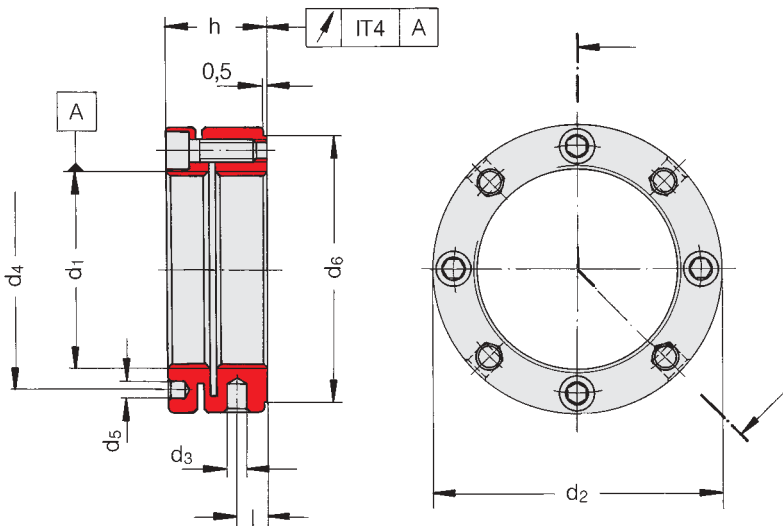
MSR	Dimensions in mm							Clamping screws			Calculation factor A mm	Locknut-specific allowance B N	Adm. axial operating stress		Mass moment of inertia J kg cm ²
	d ₁	d ₂	d ₃ ¹⁾	d ₄	d ₅ ¹⁾	h	l	ISO 4762	M _A	No.			dyn.	stat.	
ISO - 5H	h11	H11													
16 · 1,5	34	4	24,5	4,3	18	5	M4	2,9	4	1,112	3962	17	22	0,147	
17 · 1	35	4	25,5	4,3	18	5	M4	2,9	4	1,108	3947	19	25	0,164	
18 · 1,5	36	4	26,5	4,3	18	5	M4	2,9	4	1,228	3931	19	25	0,183	
20 · 1	40	4	30,5	4,3	18	5	M4	2,9	4	1,281	3900	22	29	0,283	
20 · 1,5	40	4	30,5	4,3	18	5	M4	2,9	4	1,344	3900	18	28	0,283	
22 · 1,5	40	4	30,5	4,3	18	5	M4	2,9	4	1,459	3869	23	32	0,270	
24 · 1,5	42	4	32,5	4,3	18	5	M4	2,9	4	1,575	3838	25	35	0,323	
25 · 1,5	45	5	36,5	4,3	20	6,5	M4	2,9	4	1,633	3822	33	47	0,488	
26 · 1,5	45	5	36,5	4,3	20	6,5	M4	2,9	4	1,690	3806	34	49	0,479	
28 · 1,5	46	5	38,5	4,3	20	6,5	M4	2,9	4	1,805	3775	36	53	0,504	
30 · 1,5	48	5	40,5	4,3	20	6,5	M4	2,9	4	1,921	3744	38	57	0,588	
32 · 1,5	50	5	42,5	4,3	22	7	M4	2,9	4	2,037	3713	44	64	0,743	
35 · 1,5	53	5	45,5	4,3	22	7	M4	2,9	4	2,210	3666	47	66	0,914	
38 · 1,5	58	5	48,5	4,3	22	7	M4	2,9	4	2,449	3619	50	75	1,337	

SPIETH Locknuts Series MSR

MSR	Dimensions in mm						Clamping screws			Calculation factor	Locknut-specific allowance	Adm. axial operating stress		Mass moment of inertia	
	d ₁	d ₂	d ₃ ¹⁾	d ₄	d ₅ ¹⁾	h	l	ISO 4762	MA			No.	A		B
	ISO - 5H	h11	H11						Nm		mm	N	kN	kN	kg cm ²
40 · 1,5	58	5	50,5	4,3	22	7	M4	2,9	4	2,500	3588	49	66	1,254	
42 · 1,5	60	5	52,5	4,3	22	7	M4	2,9	4	2,617	3557	49	66	1,412	
45 · 1,5	68	6	58	4,3	22	6,5	M4	2,9	6	2,789	5265	53	84	2,494	
48 · 1,5	68	6	59,5	4,3	25	9	M4	2,9	6	2,962	5195	70	94	2,631	
50 · 1,5	70	6	61,5	4,3	25	9	M4	2,9	6	3,079	5148	71	94	2,909	
52 · 1,5	72	6	63,5	4,3	25	9	M4	2,9	6	3,196	5101	72	96	3,207	
55 · 1,5	75	6	66,5	4,3	25	9	M4	2,9	6	3,369	5031	72	96	3,690	
55 · 2	75	6	66,5	4,3	25	9	M4	2,9	6	3,430	5031	78	96	3,690	
58 · 1,5	82	6	72,5	5,3	26	9	M5	6	6	3,541	8077	103	161	5,811	
60 · 1,5	84	6	74,5	5,3	26	9	M5	6	6	3,655	8001	105	163	6,317	
60 · 2	84	6	74,5	5,3	26	9	M5	6	6	3,718	8001	104	163	6,317	
62 · 1,5	86	6	76,5	5,3	28	10,5	M5	6	6	3,774	7925	123	186	7,331	
65 · 1,5	88	6	78,5	5,3	28	10,5	M5	6	6	3,948	7811	129	177	7,708	
65 · 2	88	6	78,5	5,3	28	10,5	M5	6	6	4,007	7811	127	177	7,708	
68 · 1,5	95	8	83	5,3	28	9,5	M5	6	6	4,121	7696	133	223	11,048	
70 · 1,5	95	8	85	5,3	28	9,5	M5	6	6	4,238	7620	136	203	10,500	
70 · 2	95	8	85	5,3	28	9,5	M5	6	6	4,297	7620	134	203	10,500	
72 · 1,5	98	8	86	6,4	28	8,5	M6	10	6	4,354	10692	124	170	11,822	
75 · 1,5	100	8	88	6,4	28	8,5	M6	10	6	4,525	10530	121	160	12,346	
75 · 2	100	8	88	6,4	28	8,5	M6	10	6	4,583	10530	126	160	12,346	
80 · 2	110	8	95	6,4	32	11	M6	10	6	4,873	10260	162	258	22,033	
85 · 2	115	8	100	6,4	32	11	M6	10	6	5,168	9990	170	262	25,660	
90 · 2	120	8	108	6,4	32	11	M6	10	6	5,453	9720	178	265	29,615	
95 · 2	125	8	113	6,4	32	11	M6	10	6	5,744	9450	185	268	34,017	
100 · 2	130	8	118	6,4	32	11	M6	10	6	6,033	9180	193	271	38,838	
105 · 2	135	8	123	6,4	32	11	M6	10	6	6,321	8910	203	274	44,097	
110 · 2	140	8	128	6,4	32	11	M6	10	6	6,616	8640	212	280	49,814	
115 · 2	145	8	133	6,4	36	13	M6	10	6	6,900	8370	248	329	64,164	
120 · 2	155	8	140	6,4	36	13	M6	10	6	7,193	8100	272	408	89,668	
125 · 2	160	8	148	6,4	36	13	M6	10	6	7,474	7830	281	412	99,722	
130 · 3	165	8	153	6,4	36	13	M6	10	6	7,895	7560	285	405	110,500	
140 · 3	180	10	165	6,4	36	12	M6	10	8	8,475	9360	302	476	160,977	
150 · 3	190	10	175	6,4	36	12	M6	10	8	9,050	8640	325	489	192,954	
160 · 3	205	10	185	8,4	40	14	M8	25	8	9,633	14520	377	552	301,314	
170 · 3	215	10	195	8,4	40	14	M8	25	8	10,213	13200	399	560	353,347	
180 · 3	230	10	210	8,4	40	14	M8	25	8	10,789	11880	420	648	477,504	
190 · 3	240	10	224	8,4	40	14	M8	25	8	11,362	10560	444	656	550,330	
200 · 3	245	10	229	8,4	40	14	M8	25	8	11,948	9240	467	578	544,727	

1) The number of holes for spanner corresponds to the number of clamping screws.

SPIETH Locknuts Series MSA



Designation of a locknut with $d_1 = M 20 \times 1$:
Locknut MSA 20 x 1

The admissible operating loads specified in the table are guideline values calculated with a safety factor of 1.6

- under static stress relative to the minimum yield point,
- under dynamic stress relative to the minimum alternate strength.

The locknuts of series MSA with reduced contact surface and in some cases smaller outside diameters relative to

the MSR series are particularly suited for mounting angular ball bearings and cylinder roller bearings of ISO diameter series 9.

Subject to changes.
Special versions:
On request, by sending of an explanatory sketch.

MSA	Dimensions in mm							Clamping screws			Calculation factor	Locknut-specific allowance	Adm. axial operating stress		Mass moment of inertia				
	d ₁	d ₂	d ₃ ¹⁾	d ₄	d ₅ ¹⁾	d ₆	h	l	ISO 4762	M _A			No.	A		B	dyn.	stat.	J
																	kN	kN	
ISO - 5H	h11	H11							Nm		mm	N							
20 · 1	35	4	27,5	3,2	31	17	5	M3	2	5	1,281	3938	23	31	0,142				
25 · 1,5	40	4	32,5	3,2	36	19	6,5	M3	2	5	1,633	3859	35	49	0,265				
30 · 1,5	45	5	37,5	3,2	41	19	6,5	M3	2	5	1,921	3780	39	56	0,400				
35 · 1,5	53	5	45,5	4,3	48	22	7	M4	2,9	4	2,210	3666	47	66	0,904				
40 · 1,5	58	5	50,5	4,3	54	22	7	M4	2,9	4	2,500	3588	50	68	1,242				
45 · 1,5	64	6	54	4,3	59	23	7	M4	2,9	5	2,789	4388	58	78	1,888				
50 · 1,5	69	6	59	4,3	64	24	8	M4	2,9	6	3,079	5148	63	85	2,563				
55 · 1,5	73	6	64	4,3	69	24	8	M4	2,9	6	3,369	5031	59	79	3,001				
60 · 1,5	78	6	69	4,3	74	24	8	M4	2,9	6	3,655	4914	61	81	3,758				
65 · 1,5	83	6	74	4,3	79	24	8	M4	2,9	7	3,948	5597	94	124	4,611				
70 · 1,5	93	8	83	5,3	88	27	9	M5	6	6	4,238	7620	136	178	9,094				
75 · 1,5	98	8	88	5,3	93	27	9	M5	6	6	4,525	7430	138	183	10,866				
80 · 2	103	8	93	5,3	98	28	10	M5	6	6	4,873	7239	148	196	13,397				
85 · 2	112	8	100	6,4	106	30	10	M6	10	6	5,168	9990	172	228	21,260				
90 · 2	117	8	105	6,4	111	30	10	M6	10	6	5,453	9720	174	230	24,650				
95 · 2	122	8	110	6,4	116	30	10	M6	10	6	5,744	9450	176	232	28,384				
100 · 2	130	8	118	6,4	123	32	11	M6	10	6	6,033	9180	205	271	38,620				
105 · 2	135	8	123	6,4	128	32	11	M6	10	6	6,321	8910	207	274	43,852				
110 · 2	140	8	128	6,4	133	32	11	M6	10	6	6,616	8640	212	280	49,539				
120 · 2	155	8	140	6,4	145	36	13	M6	10	6	7,193	8100	308	408	89,148				
130 · 3	165	8	153	6,4	155	36	13	M6	10	6	7,895	7560	306	405	109,890				
140 · 3	180	10	165	6,4	170	36	12	M6	10	8	8,475	9360	359	476	160,150				
150 · 3	190	10	175	6,4	180	36	12	M6	10	8	9,050	8640	369	489	191,977				
160 · 3	205	10	185	8,4	195	40	14	M8	25	8	9,633	14520	417	552	300,080				
170 · 3	215	10	195	8,4	205	40	14	M8	25	8	10,213	13200	423	560	351,919				
180 · 3	230	10	210	8,4	220	40	14	M8	25	8	10,789	11880	489	648	475,748				
190 · 3	240	10	224	8,4	230	40	14	M8	25	8	11,362	10560	495	656	548,328				
200 · 3	245	10	229	8,4	235	40	14	M8	25	8	11,948	9240	436	578	542,596				

¹⁾ The number of holes for spanner corresponds to the number of clamping screws.

Note:

Other locknuts conforming to our works standard are available:

SN 04.03 – Series MSW for particularly high axial operating stress levels.

Assembly examples

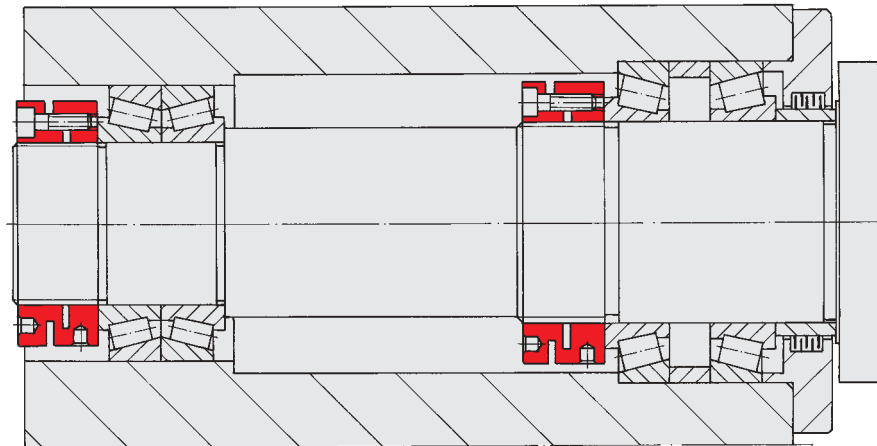


Fig. 4:

In tapered roller bearings, minimal axial run-out and a high level of axial rigidity and dynamic safety form a major contribution to perfect bearing operation:

Radial stress applied to the tapered roller bearing generates axial forces (axial rigidity). Due to a lack of axial pretension (not allowed on taper roller bearings), the intrinsic safety of the locknut is extremely important (realized without any friction at the end face).

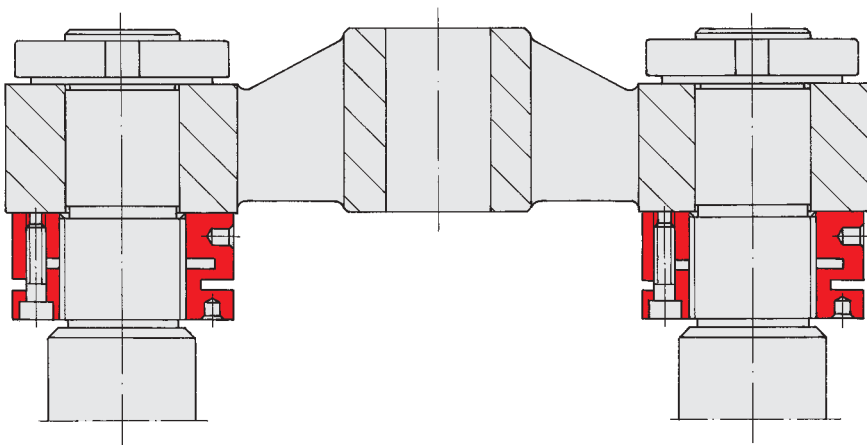


Fig. 5:

Locknut used as an adjustable lay-on surface for a machine superstructure. During assembly, the back-lash free nut enables precise adjustment of the height of the end surface. The precise right-angled positioning of the end contact surface of the locknut ensures that no distortion of the machine superstructure takes place when tightening the counter nuts.

Assembly examples

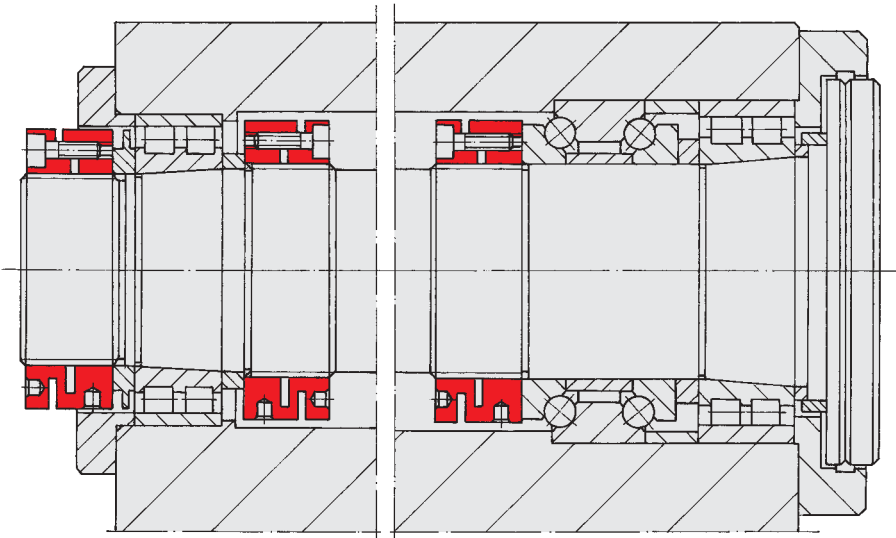


Fig. 6:
Main spindle bearing in a lathe:
The locknut ensures a high level of
axial rigidity and good concentricity.

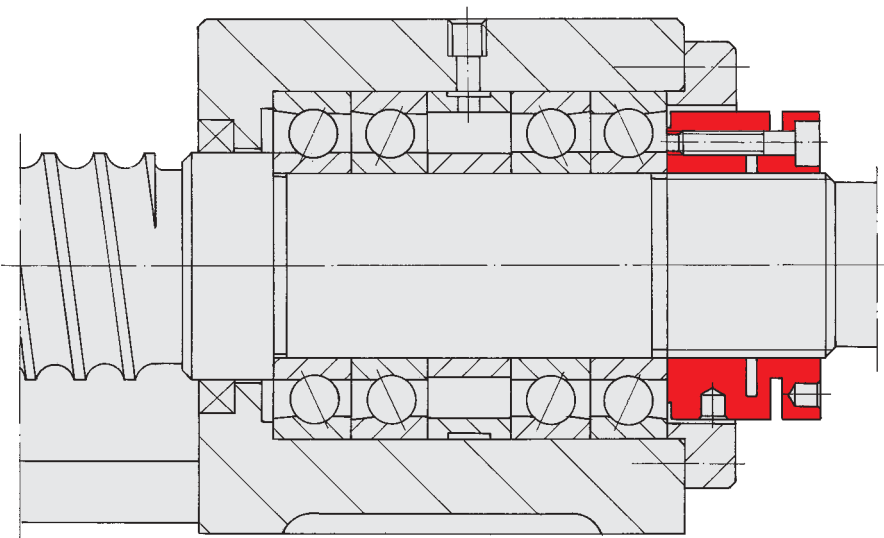


Fig. 7:
The bearing of the ball roller spindle
receives a high degree of axial rigidity
while assembling by using a locknut.
Under high dynamic operating
conditions, the dynamic safety of the
locknut represents a particular
advantage.

Assembly examples

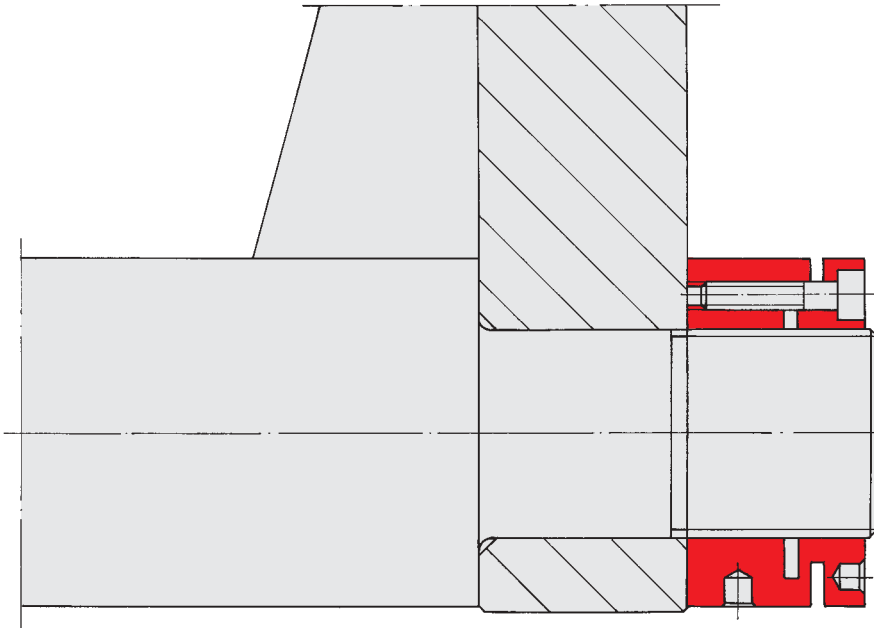


Fig. 8:
End plate of column framework. The precisely right-angled lay-on surface of the locknut guarantees even subjection of the bolt thread to strain (devoid of flexural torque). This is of particular importance in situations involving dynamic stress.

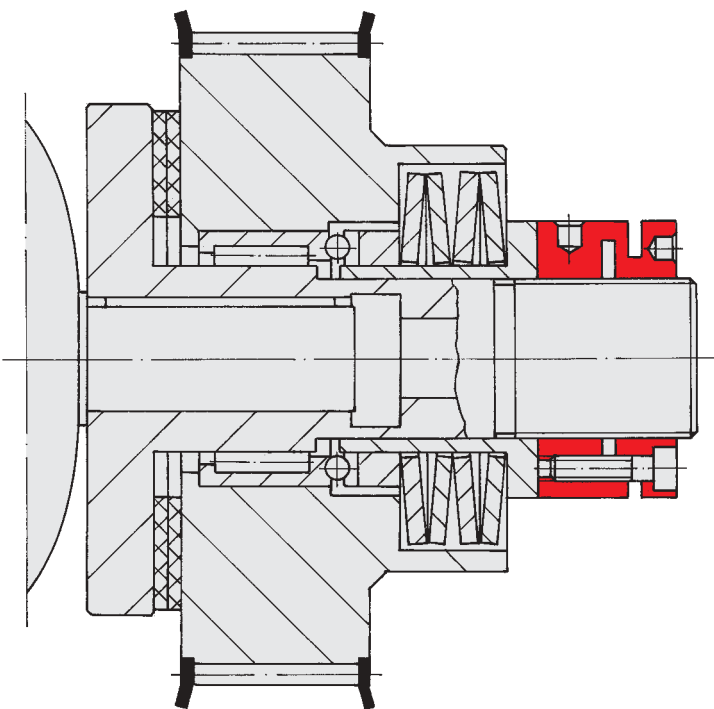


Fig. 9:
The pretension of the spring on a friction clutch is precisely and continuously variable adjusted here by using a locknut. The reliable locking function is of particular importance here.

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SPIETH-MASCHINENELEMENTE
GmbH & Co KG
Alleenstrasse 41 · D-73730 Esslingen
phone +49 (0)711 930730-0 · fax +49 (0)711 930730-7
web: www.spieth-maschinenelemente.de
email: info@spieth-maschinenelemente.de