

Original version of the design guide



| For | Series | Components |
|---|---------------------|--|
| Spieth locknuts (precision locknuts) | MSR from M10 to M55 | MSR 10x0.75; MSR 10x1; MSR 12x1; MSR 12x1.5; MSR 14x1.5; MSR 15x1; MSR 16x1.5; MSR 17x1; MSR 18x1.5; MSR 20x1; MSR 20x1.5; MSR 22x1.5; MSR 24x1.5; MSR 25x1.5; MSR 26x1.5; MSR 28x1.5; MSR 30x1.5; MSR 32x1.5; MSR 35x1.5; MSR 38x1.5; MSR 40x1.5; MSR 42x1.5; MSR 45x1.5; MSR 48x1.5; MSR 50x1.5; MSR 52x1.5; MSR 55x1.5; MSR 55x2 |

The Design Guide is also available for download at www.spieth-me.de. In case of any questions, please contact Spieth-Maschinenelemente GmbH & Co. KG directly.

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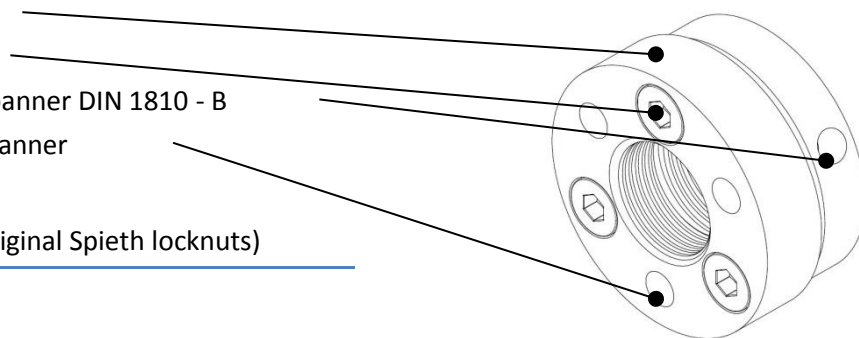
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1 Description of Spieth Locknuts

1.1 Structure

- Spieth locknut bodies
- Spieth clamping screws
- Radial boreholes for pin spanner DIN 1810 - B
- Axial boreholes for face spanner



Identifying features (for original Spieth locknuts)

- Spieth logo
- Name
- Batch number
- Locking torque M_s for clamping screws

Fig. 1: Schematic representation similar to Spieth MSR series locknuts

Spieth MSR series locknuts are assemblies consisting of locknut bodies and clamping screws. The thread inside the locknut body is interrupted by a groove, separating the locknut body into a load and a locking part. A diaphragm connects load and locking part.

1.2 Mode of action

Spieth locknuts are precision locknuts. Due to their design they provide a maximum of precision, combined with utmost locking properties.

Spieth MSR series locknuts have been designed as all-purpose precision locknuts (e.g., for locking high-quality fastenings, shaft bearings, or spindle bearings).

Despite their compact design and the high axial loads occurring here, Spieth-locknuts guarantee permanent pretension and a rigid and precisely aligned contact with the bearing for an immaculately supported spindle.



Fig. 2: Illustration similar to Spieth MSR locknuts

Spieth MSR series locknuts are frictionally engaged one-piece locknuts. Load part and locking part of the locknut body approach each other purely along an axis via the elastic diaphragm. Actuating the tensioning / clamping screws arranged in axial direction causes load part and locking part to approach each other purely along an axis. Since the locking part has been designed as a stable ring, a 360° tessellation using several thread turns is used to achieve a frictionally engaged clamping on the shaft thread. Tessellation converts the bolt force directly into a contact force evenly distributed across the entire circumference. Owing to system characteristics, this automatically aligns the end face at a right angle.

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| Order No. | Name | Geometry | Load capacity | Precision |
|------------|------------|--|--|--|
| | | Thread \varnothing d_1 5H x pitch [-]x[mm] | Adm. stat. axial load $F_{ax,stat}$ [kN] | Axial run-out t_{plan} (=IT4) [μ m] |
| K-10104001 | MSR 40x1.5 | M40x1.5 | 66 | 7 |
| K-10104201 | MSR 42x1.5 | M42x1.5 | 66 | 7 |
| K-10104501 | MSR 45x1.5 | M45x1.5 | 84 | 7 |
| K-10104801 | MSR 48x1.5 | M48x1.5 | 94 | 7 |
| K-10105001 | MSR 50x1.5 | M50x1.5 | 94 | 7 |
| K-10105201 | MSR 52x1.5 | M52x1.5 | 96 | 8 |
| K-10105501 | MSR 55x1.5 | M55x1.5 | 96 | 8 |
| K-10105502 | MSR 55x2 | M55x2 | 96 | 8 |

Axial loads $F_{ax,stat}$ apply for shaft threads with a tolerance of 6g or higher and a minimum material strength of 700 N/mm².

In case of dynamic loads, approx. 75% of the static axial load $F_{ax,stat}$ is admissible.

3 Design of Spieth Locknuts

Spieth MSR series locknuts are made of steel with high material strength (approx. 375N/mm²). The body is bronzed with fine-turned, bare functional surfaces.

Spieth locknuts MSR 10x0.75 to MSR 15x1 have a reduced contact diameter d_6 .

The contact surface is produced together with the thread in one process to ensure maximum form and location quality.

The metric ISO thread is produced as per the "fine" tolerance class (tolerance zone 5H, DIN 13 Part 21 ... 25) and needs to cover the entire thread length of the shaft thread.

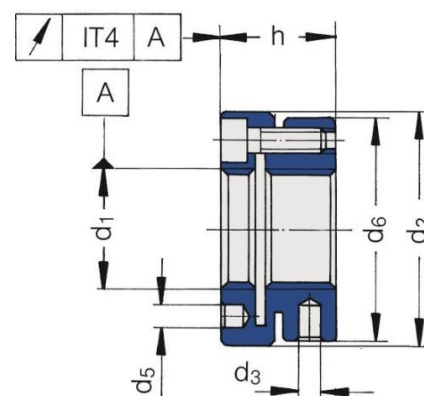


Fig. 3: Sectional view Spieth locknut > M80

Caution!

The locknut is deformable in the axial direction and must therefore be handled with care. The clamping screws may only be tightened when the locknut has been screwed completely onto the spindle thread. Otherwise, inadmissible ductile deformation may occur and render the locknut unusable.

Caution!

Only use Spieth locknuts with original Spieth clamping screws; otherwise, malfunctions with far-reaching consequences of loss may result in which case Spieth-Maschinenelemente GmbH & Co. KG assumes no liability or warranty.

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Table 2: Design-relevant data of Spieth locknuts

| Name | Shaft side (thread) | Access side (available space) | | Bearing side | Mass-related properties | |
|-------------|--|--------------------------------------|-----------------------|---|-------------------------|---|
| | Thread \varnothing d_1 5H x pitch [-] x [mm] | Outer \varnothing d_2 [mm] | Length h [mm] | Supported contact \varnothing d_6 [mm] | Weight m [kg] | Moment of inertia J [kg cm ²] |
| MSR 10x0.75 | M10x0.75 | 24 | 14 | 22 | 0.028 | 0.025 |
| MSR 10x1 | M10x1 | 24 | 15 | 22 | 0.031 | 0.027 |
| MSR 12x1 | M12x1 | 26 | 14 | 25 | 0.034 | 0.037 |
| MSR 12x1.5 | M12x1.5 | 26 | 15 | 25 | 0.038 | 0.04 |
| MSR 14x1.5 | M14x1.5 | 32 | 16 | 30 | 0.059 | 0.096 |
| MSR 15x1 | M15x1 | 33 | 16 | 31 | 0.062 | 0.108 |
| MSR 16x1.5 | M16x1.5 | 34 | 18 | 34 | 0.076 | 0.147 |
| MSR 17x1 | M17x1 | 35 | 18 | 35 | 0.078 | 0.164 |
| MSR 18x1.5 | M18x1.5 | 36 | 18 | 36 | 0.083 | 0.183 |
| MSR 20x1 | M20x1 | 40 | 18 | 40 | 0.105 | 0.283 |
| MSR 20x1.5 | M20x1.5 | 40 | 18 | 40 | 0.106 | 0.283 |
| MSR 22x1.5 | M22x1.5 | 40 | 18 | 40 | 0.098 | 0.27 |
| MSR 24x1.5 | M24x1.5 | 42 | 18 | 42 | 0.105 | 0.323 |
| MSR 25x1.5 | M25x1.5 | 45 | 20 | 45 | 0.142 | 0.488 |
| MSR 26x1.5 | M26x1.5 | 45 | 20 | 45 | 0.137 | 0.479 |
| MSR 28x1.5 | M28x1.5 | 46 | 20 | 46 | 0.135 | 0.504 |
| MSR 30x1.5 | M30x1.5 | 48 | 20 | 48 | 0.143 | 0.588 |
| MSR 32x1.5 | M32x1.5 | 50 | 22 | 50 | 0.166 | 0.743 |
| MSR 35x1.5 | M35x1.5 | 53 | 22 | 53 | 0.177 | 0.914 |
| MSR 38x1.5 | M38x1.5 | 58 | 22 | 58 | 0.221 | 1.34 |
| MSR 40x1.5 | M40x1.5 | 58 | 22 | 58 | 0.202 | 1.25 |
| MSR 42x1.5 | M42x1.5 | 60 | 22 | 60 | 0.211 | 1.41 |
| MSR 45x1.5 | M45x1.5 | 68 | 22 | 68 | 0.294 | 2.49 |
| MSR 48x1.5 | M48x1.5 | 68 | 25 | 68 | 0.305 | 2.63 |
| MSR 50x1.5 | M50x1.5 | 70 | 25 | 70 | 0.316 | 2.91 |
| MSR 52x1.5 | M52x1.5 | 72 | 25 | 72 | 0.328 | 3.21 |
| MSR 55x1.5 | M55x1.5 | 75 | 25 | 75 | 0.3425 | 3.69 |
| MSR 55x2 | M55x2 | 75 | 25 | 75 | 0.352 | 3.69 |

| Name | Tool for radial boreholes | Divided circle for axial boreholes | Radial boreholes for tool | Axial boreholes for tool | Your custom use case (please fill in all applicable fields) | | | |
|------------|---------------------------|------------------------------------|--|--|---|---------------|--------------|---|
| | Hook spanner DIN 1810 [-] | \varnothing d ₄ [mm] | Amount x \varnothing n x d ₃ [-]x[mm] | Amount x \varnothing n x d ₅ [-] x [mm] | Required pretension F _V [kN] | Factor A [mm] | Factor B [N] | Calculated pretensioning torque M _V [Nm] |
| MSR 30x1.5 | B 45-50 | 40.5 | 4x5 | 4x4.3 | | 1.921 | 3744 | |
| MSR 32x1.5 | B 45-50 | 42.5 | 4x5 | 4x4.3 | | 2.037 | 3713 | |
| MSR 35x1.5 | B 52-55 | 45.5 | 4x5 | 4x4.3 | | 2.21 | 3666 | |
| MSR 38x1.5 | B 58-62 | 48.5 | 4x5 | 4x4.3 | | 2.449 | 3619 | |
| MSR 40x1.5 | B 58-62 | 50.5 | 4x5 | 4x4.3 | | 2.5 | 3588 | |
| MSR 42x1.5 | B 58-62 | 52.5 | 4x5 | 4x4.3 | | 2.617 | 3557 | |
| MSR 45x1.5 | B 68-75 | 58 | 6x6 | 6x4.3 | | 2.789 | 5265 | |
| MSR 48x1.5 | B 68-75 | 59.5 | 6x6 | 6x4.3 | | 2.962 | 5195 | |
| MSR 50x1.5 | B 68-75 | 61.5 | 6x6 | 6x4.3 | | 3.079 | 5148 | |
| MSR 52x1.5 | B 68-75 | 63.5 | 6x6 | 6x4.3 | | 3.196 | 5101 | |
| MSR 55x1.5 | B 68-75 | 66.5 | 6x6 | 6x4.3 | | 3.369 | 5031 | |
| MSR 55x2 | B 68-75 | 66.5 | 6x6 | 6x4.3 | | 3.43 | 5031 | |

5.3 Locking Spieth Locknuts

Lock the locknut by tightening the clamping screws stepwise and crosswise until you have reached specified locking torque M_s (written on the component and/or in Table 4). This interlocks the thread flanks of the locknut's locking part and load part with the shaft thread. Intense clamping of the thread flanks during the locking process causes a high level of axial rigidity on the locknut.

This slightly reduces the pretension. However, the degree of this end face strain relief is reproducible and is easily compensated by using a pretensioning torque M_v to be calculated as per Formula 1 (see Section 9).

Table 4: Assembly-related data for tightening the clamping screws to lock the locknuts

| Name | Tool | Clamping screws | Locking torque M _s | | |
|-------------|--------------|-------------------------|--|--|---|
| | ISK size [-] | Amount x thread [-]x[-] | 1. Step (= 50%) M _{S050} [Nm] | 2. Step (= 75%) M _{S075} [Nm] | Final torque (=100%) M _{S100} [Nm] |
| MSR 10x0.75 | 2.5 | 3 x M3 | 1.0 | 1.5 | 2.0 |
| MSR 10x1 | 2.5 | 3 x M3 | 1.0 | 1.5 | 2.0 |
| MSR 12x1 | 2.5 | 3 x M3 | 1.0 | 1.5 | 2.0 |
| MSR 12x1.5 | 2.5 | 3 x M3 | 1.0 | 1.5 | 2.0 |

Design Guide

MSR from M10 to M55

| Name | Tool | Clamping screws Amount x thread [-]x[-] | Locking torque M _S | | |
|------------|-----------------|--|--|--|---|
| | ISK size [-] | | 1. Step (= 50%) M _{S050} [Nm] | 2. Step (= 75%) M _{S075} [Nm] | Final torque (=100%) M _{S100} [Nm] |
| MSR 14x1.5 | 3 | 3 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 15x1 | 3 | 3 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 16x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 17x1 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 18x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 20x1 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 20x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 22x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 24x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 25x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 26x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 28x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 30x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 32x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 35x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 38x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 40x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 42x1.5 | 3 | 4 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 45x1.5 | 3 | 6 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 48x1.5 | 3 | 6 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 50x1.5 | 3 | 6 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 52x1.5 | 3 | 6 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 55x1.5 | 3 | 6 x M4 | 1.5 | 2.2 | 2.9 |
| MSR 55x2 | 3 | 6 x M4 | 1.5 | 2.2 | 2.9 |

Use a commercial-grade screwdriver, a screw bit or a spanner with hexagon socket as drive geometry (as for eliminating the locknut's play) to lock the locknut.

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