# Design Guide

MSR from M10 to M55

SPIETH
Aus Prinzip präziser

# 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 |

## About the design guide for Spieth Locknuts

This design guide enables safe and efficient handling of Spieth locknuts and provides valuable information on choice, dimensioning, and assembly of your locknut connection.

## Notices

This design guide is based on the operating instructions whose recommendations and notices must be followed for dimensioning and design.

Please visit www.spieth-me.de for design guide and operating instructions.

For machine documentation you can use component-specific design and/or assembly data sheets as a template. These are also available at www.spieth-me.de.

The basic requirement for working safely is compliance with all safety notices. They can be identified by the following symbols:

| Caution! |
|---|

In addition to the notices in these instructions, local accident prevention guidelines and national health and safety regulations also apply.

## Table of Contents

# Design Guide

MSR from M10 to M55

SPIETH
Aus Prinzip präziser

# 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

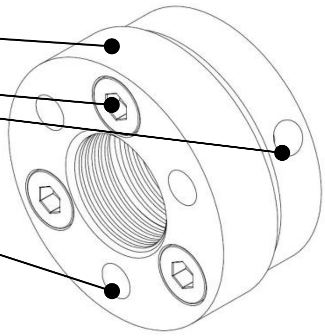

Fig. 1: Schematic representation similar to Spieth MSR series locknuts

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.

## 2 Choice for Your Use Case

The material's yield strength with a safety margin of 1.6 is used for the admissible static axial load.

In general, a locknut is compatible with a bearing load if it can absorb the permanent axial limit load which is specified on the bearings and based on the yield strength.

> Please note:
>
> The details about the maximum load capacity of all Spieth products are based on the material's yield strength. The reason for this is that Spieth-Maschinenelemente GmbH & Co. KG only accepts elastic deformation of its products. In particular with precision locknuts, ductile deformation causes a loss of pretensioning and/or safety and therefore means that the connection failed. With products from other manufacturers, calculations are often based on tensile strength so a direct comparison of performance data is not possible.

Table 1: Application-relevant data of Spieth locknuts

| Order No. | Name | Geometry | Load capacity | Precision |
|---|---|---|---|---|
| | | Thread Ø<br>$d_1$ 5H x pitch<br>[-]x[mm] | Adm. stat. axial load<br>$F_{ax,stat}$<br>[kN] | Axial run-out<br>$t_{plan}$ (=IT4)<br>[µm] |
| K-10101001 | MSR 10x0.75 | M10x0.75 | 16 | 4 |
| K-10101002 | MSR 10x1 | M10x1 | 15 | 4 |
| K-10101201 | MSR 12x1 | M12x1 | 19 | 5 |
| K-10101202 | MSR 12x1.5 | M12x1.5 | 18 | 5 |
| K-10101401 | MSR 14x1.5 | M14x1.5 | 22 | 5 |
| K-10101501 | MSR 15x1 | M15x1 | 25 | 5 |
| K-10101601 | MSR 16x1.5 | M16x1.5 | 22 | 5 |
| K-10101701 | MSR 17x1 | M17x1 | 25 | 5 |
| K-10101801 | MSR 18x1.5 | M18x1.5 | 25 | 5 |
| K-10102001 | MSR 20x1 | M20x1 | 29 | 6 |
| K-10102002 | MSR 20x1.5 | M20x1.5 | 28 | 6 |
| K-10102201 | MSR 22x1.5 | M22x1.5 | 32 | 6 |
| K-10102401 | MSR 24x1.5 | M24x1.5 | 35 | 6 |
| K-10102501 | MSR 25x1.5 | M25x1.5 | 47 | 6 |
| K-10102601 | MSR 26x1.5 | M26x1.5 | 49 | 6 |
| K-10102801 | MSR 28x1.5 | M28x1.5 | 53 | 6 |
| K-10103001 | MSR 30x1.5 | M30x1.5 | 57 | 6 |
| K-10103201 | MSR 32x1.5 | M32x1.5 | 64 | 7 |
| K-10103501 | MSR 35x1.5 | M35x1.5 | 66 | 7 |
| K-10103801 | MSR 38x1.5 | M38x1.5 | 75 | 7 |

| Order No. | Name | Geometry<br>Thread Ø<br>$d_1$ 5H x pitch<br>[-]x[mm] | Load capacity<br>Adm. stat. axial load<br>$F_{ax,stat}$<br>[kN] | Precision<br>Axial run-out<br>$t_{plan}$ (=IT4)<br>[µm] |
|---|---|---|---|---|
| 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.

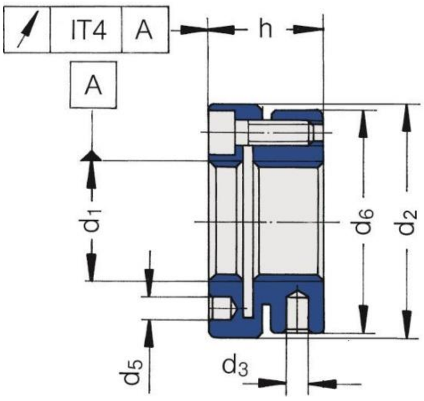

Fig. 3: Sectional view Spieth locknut > M80

> 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.

Table 2: Design-relevant data of Spieth locknuts

| Name | Shaft side (thread) | Access side (available space) | | Bearing side | Mass-related properties | |
|---|---|---|---|---|---|---|
| | Thread Ø $d_1$ 5H x pitch [-] x [mm] | Outer Ø $d_2$ [mm] | Length h [mm] | Supported contact Ø $d_6$ [mm] | Weight m [kg] | Moment of inertia J [kg cm²] |
| 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 |

# 4 Dimensioning of Locknut Connections

Pretensioning torque $M_V$ of the locknut induces pretension on the bearing of the associated machine part. According to the recommendations of the bearing manufacturer, add the recommended pretension to the operating load and ensure that the sum of these two forces stays below the locknut's admissible static axial load.

Normally, a design of the shaft thread as per tolerance class "medium" (tolerance zone 6g, DIN 13 Part 21 ... 25) suffices. To leverage the locknuts' capabilities with higher accuracy requirements, we recommend designing the shaft thread as per tolerance class "fine" (tolerance zone 4h, DIN 13 Part 21 ... 25).

The rigidity of the shaft influences the locknut's required assembly pretension and locking force. All the details about pretensioning and locking processes have been established using a solid shaft. If a hollow shaft is used, the resulting pretension and locking forces may deviate. In case of doubt, please contact Spieth-Maschinenelemente GmbH & Co. KG.

Normally, the contact surfaces of the bearing inner rings comply with the requirements of a precise connection. For spacer sleeves and/or other special connecting components, we recommend designing the end face as per the bearing manufacturers' requirements in terms of roughness depth and form and location tolerances. This can help to avoid unwanted surface subsidence and associated pretension loss.

The overall rigidity of the connection between bearing, locknut, and shaft is influenced by a large number of parameters. They include not only characteristic material values but also the actual dimensions of the components used. Therefore, connection rigidity and resulting suitable revolution speed for locknuts depend on the case at hand. In case of any questions, please contact Spieth-Maschinenelemente GmbH & Co. KG.

# 5 How to Assemble Spieth Locknuts

## 5.1 Precision-centering and aligning Spieth Locknuts

Reduce the assembly clearanceby slightly tightening all clamping screws. This automatically centers the locknut and aligns the end face in a right angle to the shaft axis.

Use a commercial-grade screwdriver, a screw bit or a spanner with hexagon socket as drive geometry for removing the locknut's clearance and for tightening it.

The low tightening torque of the clamping screws while eliminating play has no influence on the acting axial load.

## 5.2 Tightening Spieth locknuts

Tightening the locknut axially interlocks the connecting components. Normally, pretensioning torque $M_V$ is based on the bearing's pretension force $F_V$, specified by the manufacturer. If custom pretension force is given for the thread drive, adjust pretensioning torque $M_V$ of the locknut accordingly.

For custom pretensioning (e.g., a bearing or a hub), calculate required pretensioning torque $M_V$ according to Formula 1 in Section 9 for your custom use case and enter it in Table 3.

To reduce subsidence in general, first tighten the locknut with an increased pretensioning torque $M_V = (1.2 \text{ to } 1.5) \cdot M_V$ against the planar support and then undo it before then using the relevant pretensioning torque $M_V$. When tightening via the axial mounting holes, the maximum permissible preload torque is limited to $M_{Ve}$ = 20 Nm for sizes M10 and M12.

To tighten the nut (if it is accessible radially), you need a commercial-grade hook spanner DIN 1810 Shape B (see Table 3 for size recommendations).

If the locknut is only accessible axially (because of your available space), use axial assembly boreholes $d_5$ for a tool customised to your shaft geometry or for an adjustable face spanner.

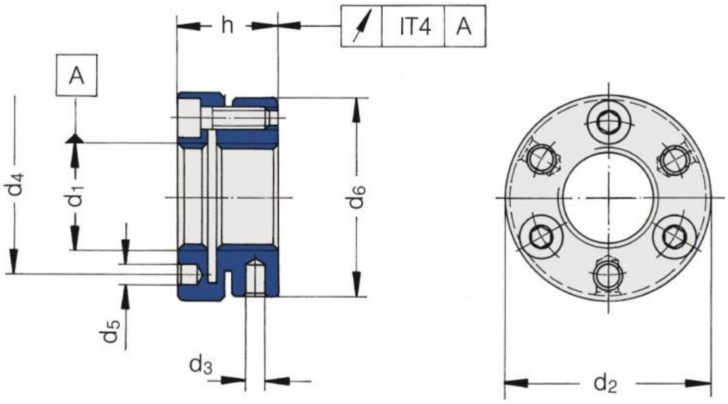


Fig. 4: Sectional view of Spieth locknut > M80

Table 3: Assembly-related data for tightening Spieth locknuts to pretension the bearings

| 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 [-] | Ø $d_4$ [mm] | Amount x Ø n x $d_3$ [-]x[mm] | Amount x Ø n x $d_5$ [-] x [mm] | Required pretension $F_V$ [kN] | Factor A [mm] | Factor B [N] | Calculated pretensioning torque $M_V$ [Nm] |
| MSR 10x0.75 | B 20-22 | 17 | 3x2.5 | 3x3.2 | | 0.672 | 2457 | |
| MSR 10x1 | B 20-22 | 17 | 3x2.5 | 3x3.2 | | 0.703 | 2457 | |
| MSR 12x1 | B 25-28 | 19 | 3x3 | 3x3.2 | | 0.819 | 2438 | |
| MSR 12x1.5 | B 25-28 | 19 | 3x3 | 3x3.2 | | 0.881 | 2438 | |
| MSR 14x1.5 | B 30-32 | 22.5 | 3x4 | 3x4.3 | | 0.997 | 2995 | |
| MSR 15x1 | B 34-36 | 23.5 | 3x4 | 3x4.3 | | 0.992 | 2984 | |
| MSR 16x1.5 | B 34-36 | 24.5 | 4x4 | 4x4.3 | | 1.112 | 3962 | |
| MSR 17x1 | B 34-36 | 25.5 | 4x4 | 4x4.3 | | 1.108 | 3947 | |
| MSR 18x1.5 | B 34-36 | 26.5 | 4x4 | 4x4.3 | | 1.228 | 3931 | |
| MSR 20x1 | B 40-42 | 30.5 | 4x4 | 4x4.3 | | 1.281 | 3900 | |
| MSR 20x1.5 | B 40-42 | 30.5 | 4x4 | 4x4.3 | | 1.344 | 3900 | |
| MSR 22x1.5 | B 40-42 | 30.5 | 4x4 | 4x4.3 | | 1.459 | 3869 | |
| MSR 24x1.5 | B 40-42 | 32.5 | 4x4 | 4x4.3 | | 1.575 | 3838 | |
| MSR 25x1.5 | B 45-50 | 36.5 | 4x5 | 4x4.3 | | 1.633 | 3822 | |
| MSR 26x1.5 | B 45-50 | 36.5 | 4x5 | 4x4.3 | | 1.69 | 3806 | |
| MSR 28x1.5 | B 45-50 | 38.5 | 4x5 | 4x4.3 | | 1.805 | 3775 | |

| 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 [-] | Ø $d_4$ [mm] | Amount x Ø n x $d_3$ [-]x[mm] | Amount x Ø 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

SPIETH
Aus Prinzip präziser

| 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 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.

## 6 Operating Spieth Locknuts

Spieth locknuts provide permanently precise pretensioning and positioning of the bearing on a threaded spindle. Visually inspecting the locknuts and/or checking the clamping screws during general maintenance tasks means maintenance-free operation.

## 7 Disassembling Spieth Locknuts

If handled correctly, Spieth locknuts can be reused several times. Due to the adjustments made, once a locknut has been locked onto a spindle thread you can only reuse it on the same thread after they have been disassembled.

> Caution!
>
> Unlock all the clamping screws stepwise and crosswise to avoid overstraining the screws. Otherwise, the screws may fracture or the locknut or its adjoining components may be damaged.

To disassemble, proceed in reverse assembly order.

- 1. Unlock: Unlock by undoing the clamping screws stepwise and crosswise.
- 2. Undo: Undo locknut from system using suitable tools.
- 3. Unscrew: Unscrew locknut by hand from threaded spindle.

If used as intended the diaphragm will open the interlocked thread flanks during unlocking. This restored joint play makes it easy to unscrew the locknut manually without damaging the threaded spindle.

> Please note:
>
> Following complete disassembly, slightly (manually) tighten the loosened clamping screws until they are flush. In any case, avoid tightening the clamping screws without a fully covered nut thread.

To enable later reuse, clean, preserve, and store Spieth locknuts correctly. If non-original Spieth spare parts are used, Spieth-Maschinenelemente GmbH & Co. KG assumes no liability or warranty.

## 8 Disposing of Spieth Locknuts

You can easily reorder Spieth locknuts by entering the component designation imprinted on the nut body and the batch number.

Locknut body and clamping screws of a Spieth locknuts are made of steel. At the end of their operating life, clean metal parts and dispose of as scrap metal.

> Please note:
>
> For environmental reasons, please comply with applicable statutory regulations and guidelines when disposing of these products.

## 9 Calculating Pretensioning Torque $M_V$ of Spieth Locknuts

Calculating pretensioning torque $M_V$ takes into account the friction in the nominal thread and on the contact surface. It is based on a friction coefficient of $\mu_A$ = 0.1. As the friction ratio occurring on the contact areas depends on a variety of factors, the calculated values are a non-committal recommendation.

Furthermore, Factor B mentioned above, specified in Table 3, and specific to the locknut, is taken into account for compensating end face strain relief.

$$T_P = \frac{(F_V + B) \cdot (A + \mu_A \cdot r_A)}{1000}$$ (Formula 1)

| | | | |
|---|---|---|---|
| with | $M_V$ | [Nm] | Pretensioning torque of the locknut |
| | $F_V$ | [N] | Required axial pretensioning force of the screw connection |
| | B | [N] | Allowance specific for locknut, compensates end face strain relief of the locking process |
| | A | [mm] | Constant; includes calculation factors for the relevant thread (catalogue value) |
| | $\mu_A$ | [-] | Friction coefficient for the end face of the locknut (approximated value $\mu_A$ = 0.1 steel/steel) |
| | $r_A$ | [mm] | Effective friction radius for end face of the locknut |

> Please note:
>
> Visit www.spieth-me.de to use our online calculator and easily calculate your pretensioning torque $M_V$