THORSTEN BROER
RÜST- UND SCHMIEDETECHNIK

FEUERBACHER
SPANNKEILE DBGM

58332 Schwelm/Germany · Max-Klein-Str. 2 a · Tel. (+49) 23 36 - 91 43 83 · Fax (+49) 23 36 - 8 37 75 · www.th-broer.de

Instructions for Feuerbacher Tensioning Keys

1.0 Versions, Spare Parts Lists and Application Areas

2.0 Mounting and Dismounting of Tensioning Keys

3.0 Service and Maintenance

4.0 General

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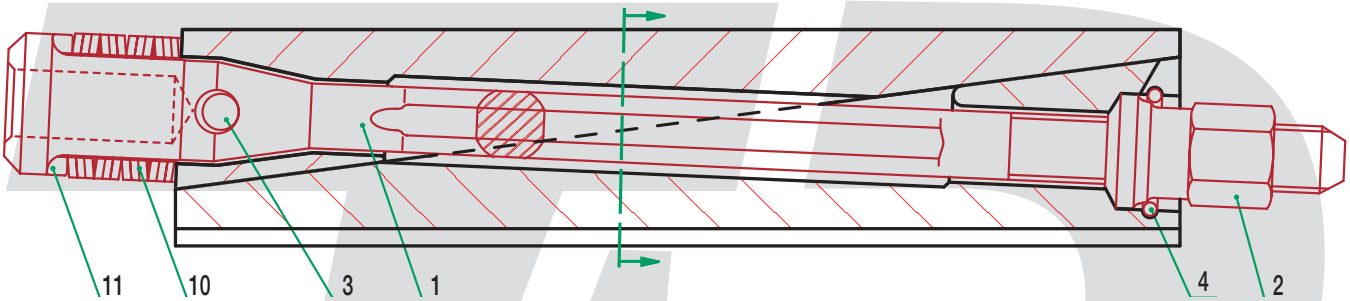
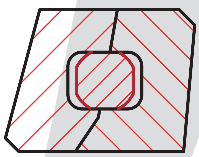
1.0

Versions, Spare Parts Lists and Application Areas

1.1 Feuerbacher Tensioning Key "SB Version"

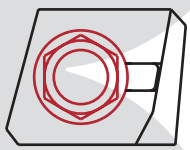


cross section



1 = tensioning screv
2 = nut
3 = taper pin
4 = retaining ring
10 = cup springs
11 = spacing ring

nut



Application area:

The version "SB" of our Feuerbacher tensioning keys is provided with a positive pitch, a tensioning screw effective at cross-section, and outer cup springs.

Tensioning keys of the version "SB" are particularly suited for modern drop forging hammers.

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Versions, Spare Parts Lists and Application Areas

1.1.1 Data sheet Version "SB"

Maximum forging energy kJ	Tensioning key dimensions mm			Tensioning key Version "SB" type number	Max. die length mm	Thread size	Tightening torque Nm	Tensioning key weight approx. kg
	h Height	**b** Width	**L** Length					
32	50	64	300	**50.300 SB**	- 420	M20	360-380	7
32	50	72	400	**50.400 SB**	- 520	M20	360-380	11
40	55	72	360	**55.360 SB**	- 500	M24	530-560	11
40	55	72	400	**55.400 SB**	- 520	M22	450-480	12
40	55	93	500	**55.500 SB**	- 650	M24	530-560	18
80	60	85	400	**60.400 SB**	- 520	M22	450-480	15
80	60	93	500	**60.500 SB**	- 700	M27	570-600	20
100	60	94	550	**60.550 SB**	- 750	M27	570-600	23
100	60	95	600	**60.600 SB**	- 800	M27	570-600	25
100	60	96	700	**60.700 SB**	- 900	M27	570-600	30
130	70	96	500	**70.500 SB**	- 700	M27	570-600	24
130	70	100	550	**70.550 SB**	- 750	M27	570-600	30
130	70	104	600	**70.600 SB**	- 800	M27	570-600	30
130	70	112	700	**70.700 SB**	- 900	M27	570-600	34
130	70	120	800	**70.800 SB**	- 1000	M27	570-600	52
>160	80	102	600	**80.600 SB**	- 850	M30	600	36
>160	80	112	700	**80.700 SB**	- 900	M30	600	39
>160	80	122	800	**80.800 SB**	- 1000	M30	600	60
>160	90	122	500	**90.500 SB**	- 750	M30	600	40
>160	90	126	600	**90.600 SB**	- 900	M30	600	50
>160	90	128	700	**90.700 SB**	- 1000	M30	600	60
>160	90	128	800	**90.800 SB**	- 1100	M30	600	67

Feuerbacher Tensioning Keys are also available in other measures.
Please contact us for further information.

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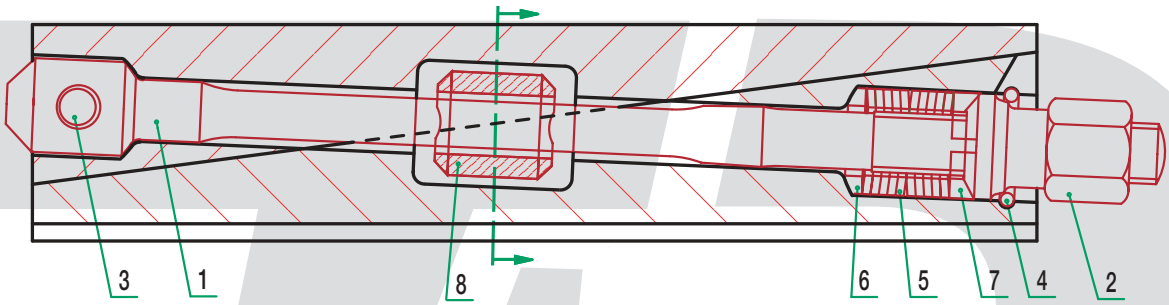
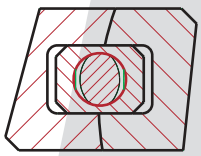
Versions, Spare Parts Lists and Application Areas

1.2 Feuerbacher Tensioning Key Version ”D”

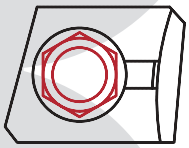


1 = tensioning screw
2 = nut
3 = taper pin
4 = retaining ring
5 = cup washers
6 = spherical face washe
7 = guide bush
8 = damper

cross section



nut



Application area:

With the Feuerbacher tensioning key version ”D” the displacement tendencies of the tensioning key halves absorb each other by means of a damper (block). This applies to application at the upper die, in particular.

Due to the inner cup springs this tensioning key version is particularly suited for presses.

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Versions, Spare Parts Lists and Application Areas

1.2.1 Data sheet Version "D"

Maximum forging energy kJ*	Tensioning key dimensions mm			Tensioning key Version **"D"** type number	Max. die length mm	Thread size	Tightening torque Nm	Tensioning key weight approx. kg
	h Height	**b** Width	**L** Length**					
32	50	64	300	**50.300 D**	- 420	M18	270	7
40	55	72	360	**55.360 D**	- 500	M20	360	11
80	60	93	500	**60.500 D**	- 700	W1"	600	21
100	60	100	550	**60.550 D**	- 800	W1"	600	25
100	70	96	500	**70.500 D**	- 700	W1"	600	25
130	70	103	550	**70.550 D**	- 800	W1"	600	30
160	90	122	500	**90.500 D**	- 700	M30	600	41
160	90	128	550	**90.550 D**	- 800	M30	600	47

* press capacity up to 6000 tons ** available up to 800 mm

Feuerbacher Tensioning Keys are also available in other measures.
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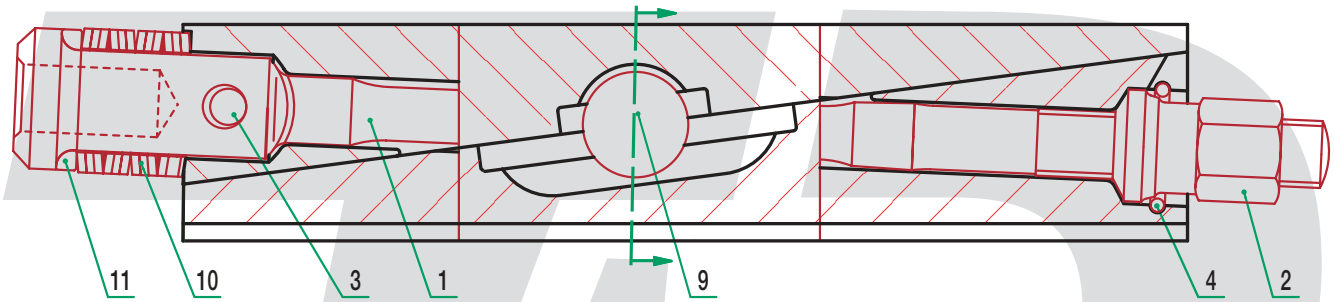
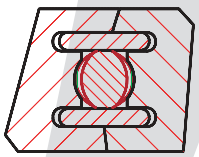
Versions, Spare Parts Lists and Application Areas

1.3 Feuerbacher Tensioning Key Version ”TD”

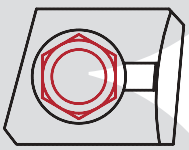


1 = screw
2 = nut
3 = taper pin
4 = retaining ring
9 = Damper plates
10 = cup-springs
11 = distance ring

screw head



nut



Application area:

The version ”TD” of our Feuerbacher tensioning keys is provided with a concave/convex pitch, an inner damper system and outer cup springs.

Tensioning keys of the version ”TD” are no longer supplied for new plants.

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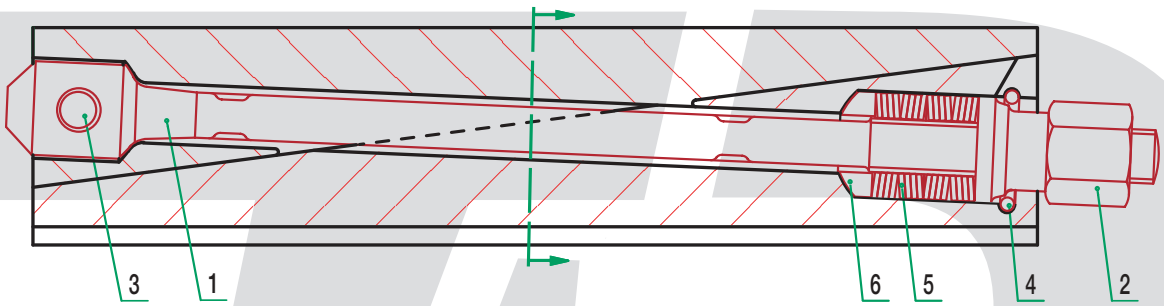
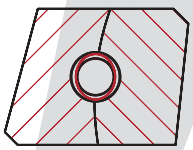
Versions, Spare Parts Lists and Application Areas

1.4 Feuerbacher Tensioning Key "Standard-Version"

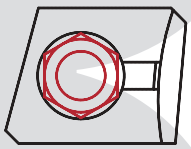


screw head



1 = screw
2 = nut
3 = taper pin
4 = retaining ring
5 = cup-springs
6 = spherical disk

nut



Application area:

The "Standard-Version" of our Feuerbacher tensioning keys is provided with a concave/convex pitch and inner cup springs.

Feuerbacher tensioning keys of the "Standard-Version" will only be applied within plants that have been working with this tensioning key version for years.

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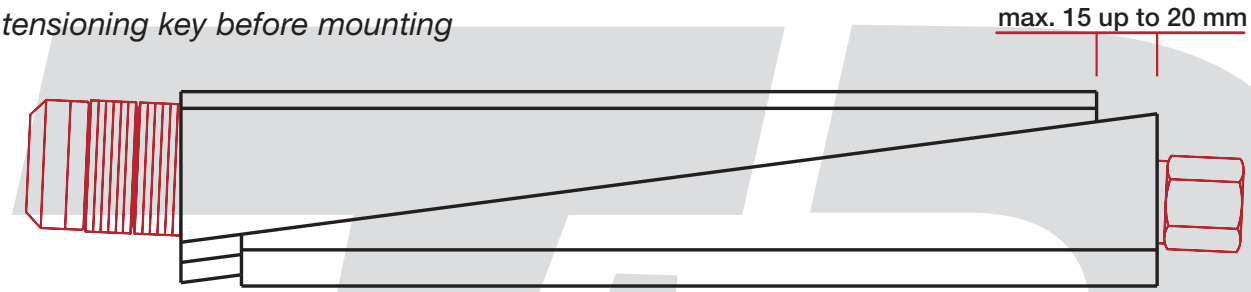
2.0

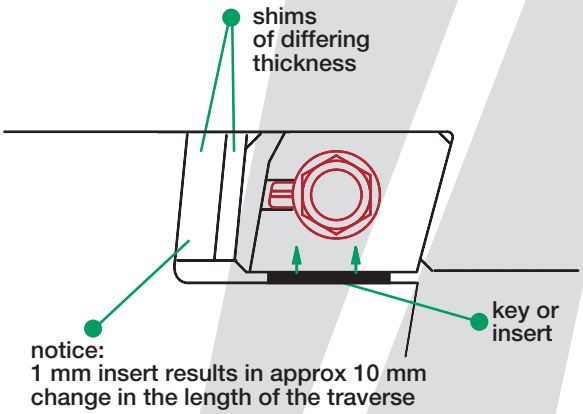
Mounting and Dismounting of Tensioning Keys

2.1 Mounting

- side 1 -

tensioning key before mounting





Prior to mounting, the thread of the screw is to be cleaned/blown completely dry with compressed air.

The tensioning key halves should be turned back by approx. 15 - 20 mm.

Mounting should be carried out by 2 men.

Mounting the tensioning key into the machine. At the upper die, the tensioning key should be pressed to the bottom of the ram by means of wedges.

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2.0

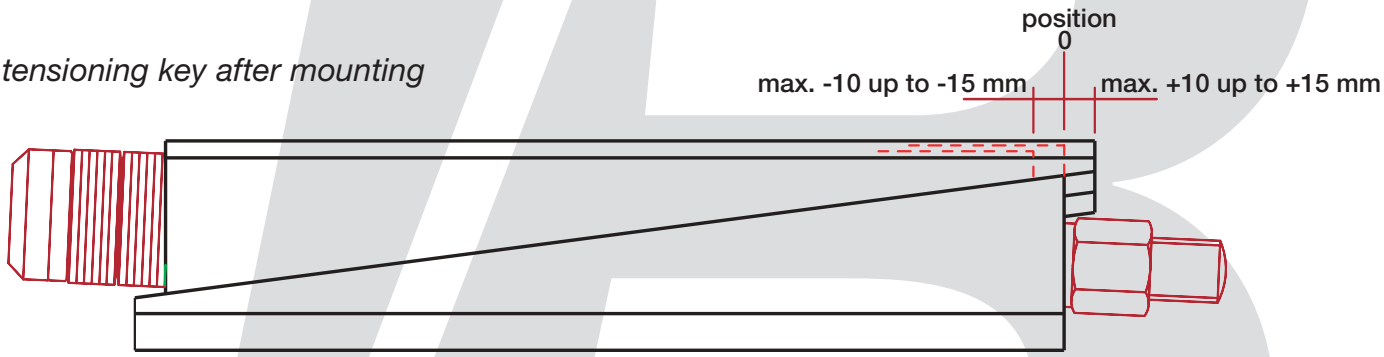
Mounting and Dismounting of Tensioning Keys

2.1 Mounting

- side 2 -

One man takes charge of controlling the hammer, the other one takes charge of tightening the nut. The use of a clutched or electric screw driver is by all means possible but the necessary torque will have to be controlled by a torque spanner. Cf. details in the table of dimensions.

tensioning key after mounting



After some initial setting hits, the nut can usually still be tightened further.

The sequence of setting hits and tightening is now to be repeated several times (8 - 10 repeats) until the nut can no longer be tightened further.

During forging the tightening torque must be controlled regularly.

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2.0

Mounting and Dismounting of Tensioning Keys

2.2 Dismounting

Prior to dismounting, the thread of the screw is to be cleaned/blown completely dry with compressed air.

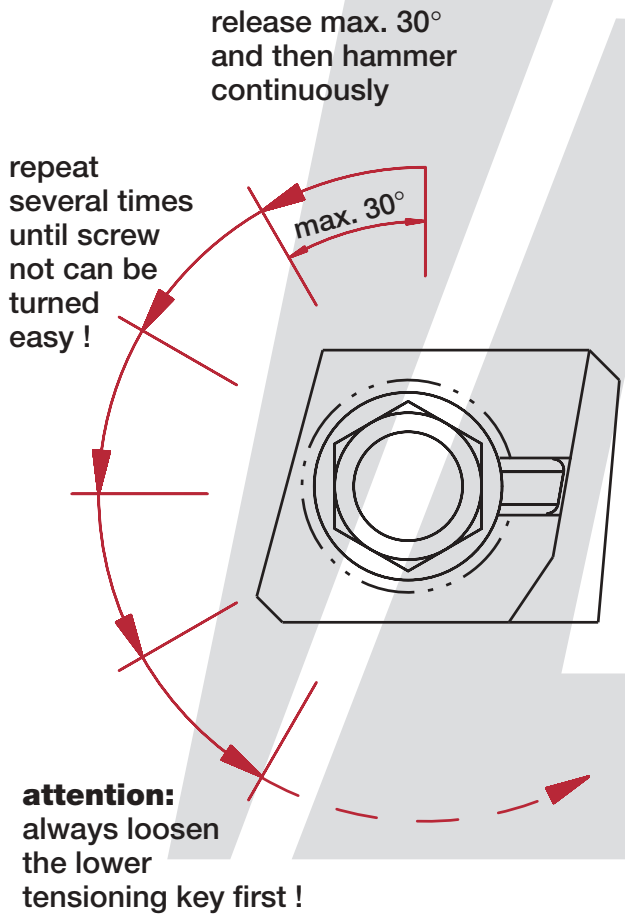
Dismounting should be carried out by two men. One man takes charge of controlling the hammer, the other one takes charge of unscrewing the nut with a ratchet.

The use of a clutched or electric screw driver is **not** advisable, as this will load the tightening system or the taper pin excessively. **Do not try in any way to dismount the tensioning key by unscrewing the nut by force.** This will damage the thread and taper pin.

After some initial setting hits, the nut can usually not yet be turned more than a tiny fraction of its perimeter (approx. 30°).

The sequence of setting hits and unscrewing will have to be repeated several times (8 -15 repeats) until the nut can be turned a larger bit without using much force.

After that turn the nut back until the thread is exposed as much as possible. Then clean the thread with compressed air from the scales and check for damages.



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2.0

Mounting and Dismounting of Tensioning Keys

2.3 Tightening Torques

Please refer to the respective table of dimensions for exact tightening torques.

Please note the following:

Version ”D” or ”Standard-Version”
Inner cup springs.

The torques indicated should not be exceeded. Otherwise the cup springs can become overloaded, and the cup springs will jump to ‘Block’.

Version ”TD” / ”SB”
Outer cup springs.

The torques indicated should at least be reached during tightening. The tension force of the tensioning screw will only be transferred to the tensioning key halves via the cup springs.

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3.0

Service and Maintenance

3.1 General Service

Feuerbacher tensioning keys are **wearable parts.** The lifetime of the tensioning key halves and of the component parts will largely depend on service and maintenance.

Scoring on the Surfaces
Scores and notches on the outer or inner surfaces are **process-related.** This is confirmed by the latest research according to the finite element method. Nitration or hard facing of the surfaces will remove the problem in the short term only.

Intervals for Servicing
For application in two-shift operations we recommend exchanging the tensioning keys for servicing / visual inspection within the setup schedule together with the dies.

3-4 weeks' intervals are sufficient between general servicing.

A serial number is engraved on the face of the key halves to enable retracing the manufacturing sequence in accordance with ISO 9000. Such labelling is not suited for the avoidance of mix-ups, and we therefore recommend providing the tensioning keys with clear markings on the top side.

Service Procedure
Disassembling of the tensioning key into its two halves.

Baked-on spray residues and slight protuberances at the scores and notches are only sanded by means of a grinding stone (fine, approx. 30 mm), a rubber abrasive roll or a swinging sander. Do not in any way grind out the notches or scores completely. Grinding out will change the geometry of the tensioning key and can impair the functioning of the entire tensioning key.

Visual inspection of all components of the tensioning key with regard to apparent wear. The thread in the nut can be improved/sanded with a tap.

Sand the thread in the tensioning screw with a steel brush or thread file. The thread must **not** be reworked with a die corresponding to DIN, as a higher inner diameter will be applied at the groove of the thread. The respective root radii can be taken from a separate listing of thread sizes. Mind the correct layering of the cup springs during assembly.

The threads and inner surfaces of the tensioning keys should be lubricated with plenty of graphite grease or copper pastes, prior to assembly.

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Service and Maintenance

3.2 Tensioning Screw Mounting/Dismounting/Service

Dismounting

The tensioning key must be disassembled into its two halves to enable the tensioning screw to be removed.

Then knock out the taper pin and pull out the tensioning screw from the key half.

Improving the Thread

Sand the thread in the tensioning screw with a steel brush or thread file.

The thread must **not** be improved with a die corresponding to DIN, as a higher inner diameter will be applied at the groove of the thread. The respective root radii can be taken from a separate listing of thread sizes.

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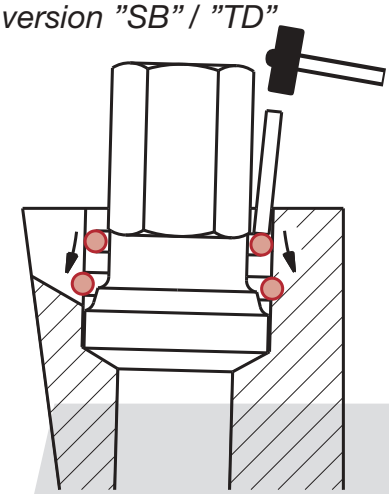
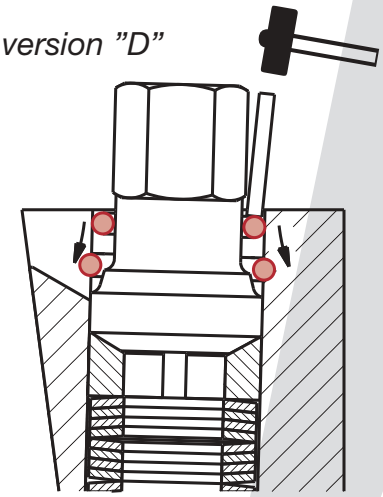
Service and Maintenance

3.3 Mounting and Servicing of the Nut and of the Retaining Ring

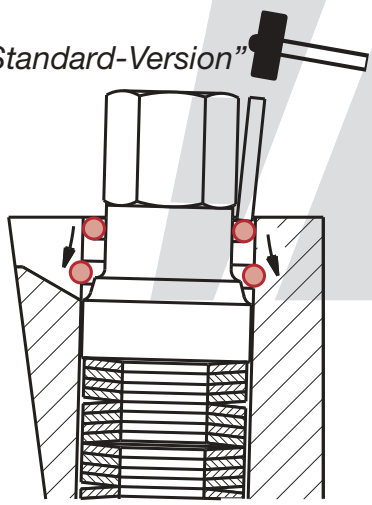
version "SB" / "TD"



version "D"



"Standard-Version"



Mounting

The tools required are a mandrel and a hammer.

To mount the nut and the retaining ring, the tensioning key half must be tightened upright into a vice.

The nut is applied before mounting the retaining ring.

The retaining ring is driven into the designated groove with a metal strip and a hammer.

Servicing of the Nut

First the tensioning key is disassembled into its 2 halves.

The nut can remain in the tensioning key half for servicing. That half of the tensioning key which carries the nut is tightened upright into a vice.

The nut will then be fixed with a screw wrench, and the thread can be sanded by means of an appropriate tap.

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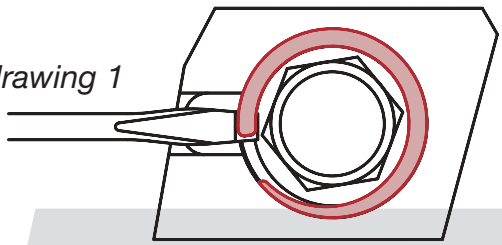
3.0

Service and Maintenance

3.4 Dismounting the Nut and the Retaining Ring

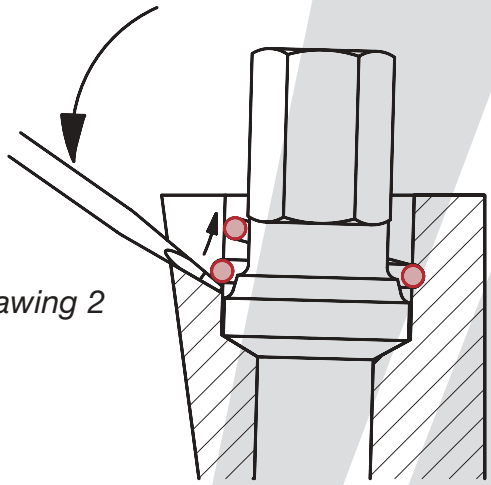
drawing 1



The tools required are two slot screwdrivers.

First the tensioning key is disassembled into its 2 halves.

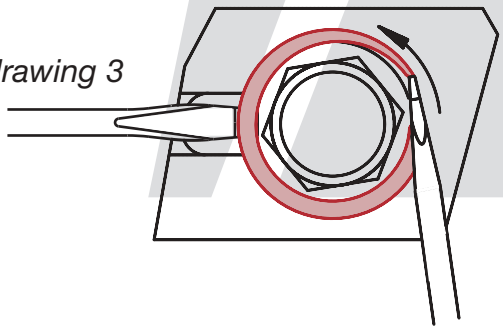
drawing 2



To dismount the nut and the retaining ring, the tensioning key half must be tightened upright into a vice.

To dismount the retaining ring, the retaining ring must be turned into starting position (*drawing 1).* Following that the retaining ring is lifted out of the groove by means of a screw driver (*drawing 1 and 2).*

drawing 3



The retaining ring is then moved clockwise with a second screw driver (*drawing 3).* After approx. half a rotation the ring will jump upwards out of the groove and can be removed.

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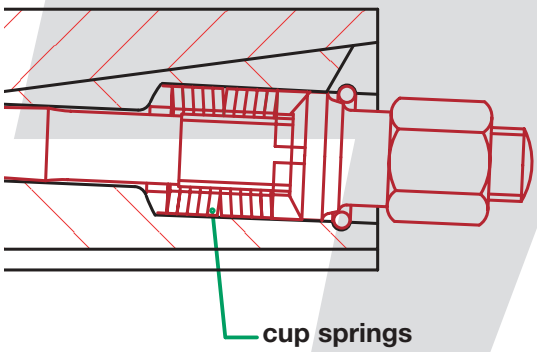
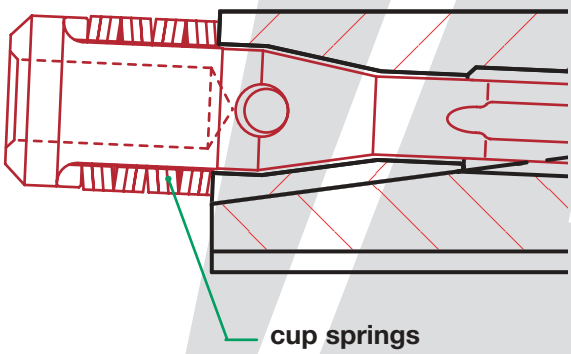
Service and Maintenance

3.5 Cup Springs

”Standard-Version” and version ”D”



version ”SB” and version ”TD”



The **correct mounting** (layering) of the cup springs is to be observed.

The relevant data on the mounting of the respective cup springs can be ordered from us at short notice.

If the mounting of the cup springs is not carried out correctly, this can lead to restricted functioning of the tensioning key. Furthermore, worn cup springs can in the medium term lead to heightened wear of the other components as well.

Wear of the cup springs can be controlled by layering the cup springs in accordance with the diagram provided. The height of the assembly can subsequently be measured with a calliper gauge. In case of excessive deviations the assembly should be substituted by a new one.

If you wish, we will send you a drawing that illustrates the mounting and dimensions of the cup springs for the tensioning keys used by you.

Tensioning Keys with Inner Cup Springs
(”Standard-Version” and version ”D”).

Tensioning Keys with Outer Cup Springs
(Version ”SB” und version ”TD”).

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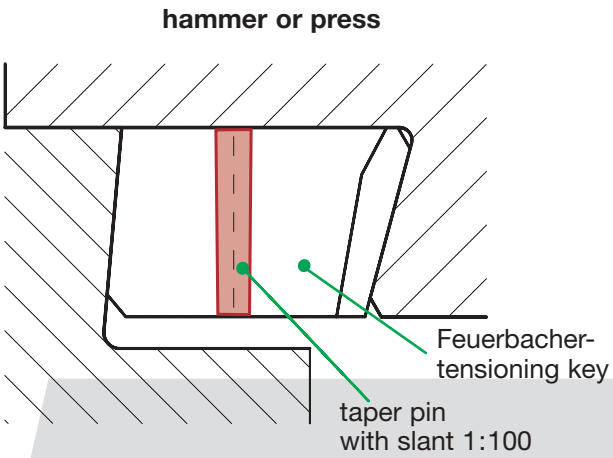
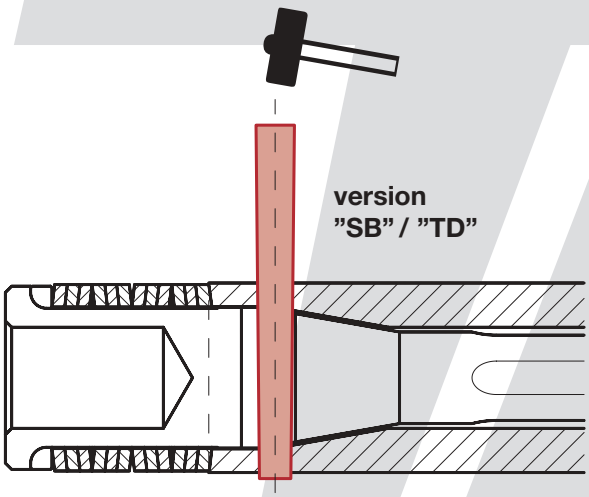
3.6 Mounting of Taper Pins

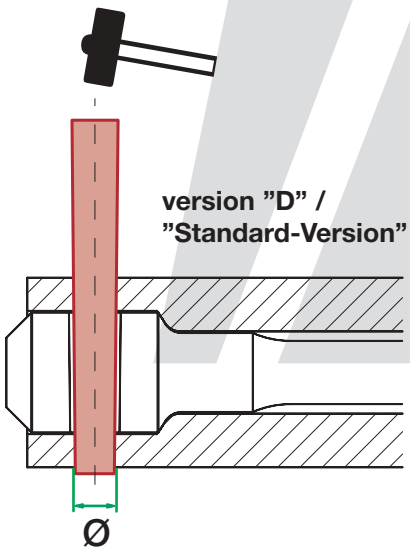


The taper pin is driven in with a hammer.



The slant 1 : 100 at the taper pins is in line with the bearing area of the tensioning keys.

The overlaying ends of the taper pins are cut off and subsequently sanded flush with the surface.



The tempered taper pins have a diameter Ø of :

10 mm, 13 mm, 16 mm, 18 mm.

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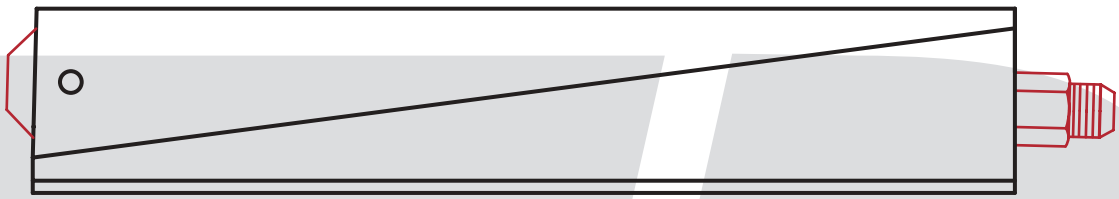
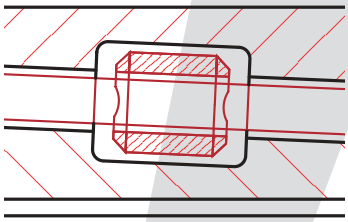
Service and Maintenance

3.7 Disassembling of the Tensioning Keys

"Standard-Version" and version "D"

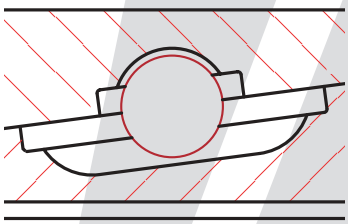


version "D"



Tensioning Keys without Inner Damper System *("Standard-Version" and version "SB")*. These tensioning keys can be separated from each other by simply turning the nut. For a visual inspection of these designs there is no need to knock the taper pin out.

version "TD"



Tensioning Keys with Inner Damper System *(version "D", version "TD")*. With these tensioning keys the taper pin is knocked out as a first work step. After that the tensioning screw is turned by 90°. Then the tensioning key can be separated by turning the nut.

version "SB" and version "TD"

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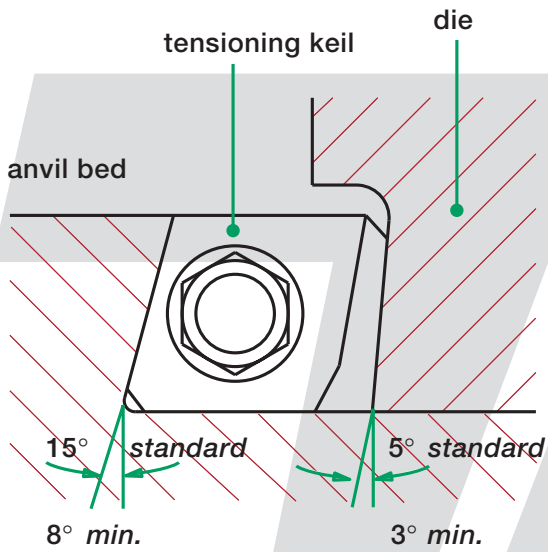
General

4.1 Hammer and Die Slants Angles at Tension Side of Die, Hammer or Press

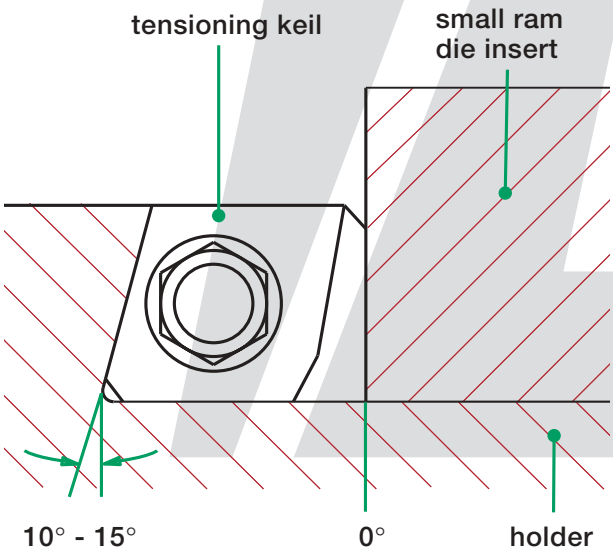


Dies, Die Holders

Our Feuerbacher tensioning keys have got 5° and 15° in standard configuration.

Other configurations are possible if required for special applications. The difference between hammer press side and slanted die bottom should not be less than 5° for dies. The lowest possible slant at the anvil bed side is 8°, and 3° at the die side.

Should there be any work done at the die side with a slant of 0°, this will be possible as well. For detailed information on such application please contact us at your earliest convenience.



Smaller Rams, Die Inserts

For smaller rams and for die inserts in die holders, in particular, it is possible to work with a 0° slant at the die side. In this case the difference between the two tensioning surfaces should not be below 10°.

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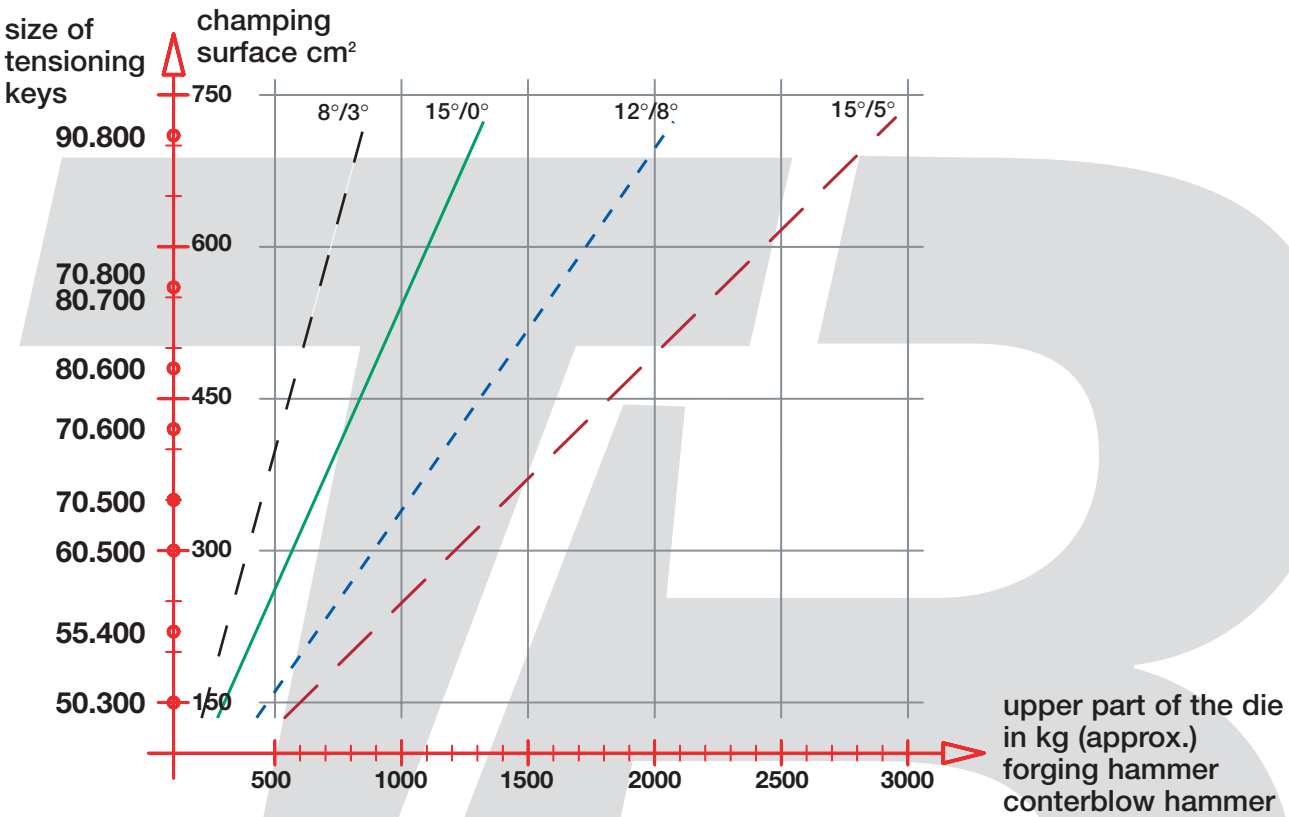
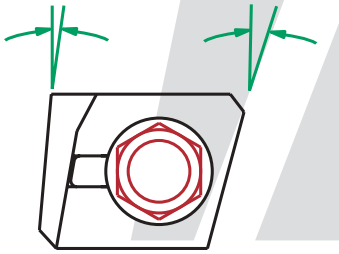
General

4.2 Guiding valves size of Tensioning Keys / weight forging-die for version "SB"





line	die angle α	ram / anvil angle β	tension force kg per cm²
— — — —	3°	8°	ca. 1,2 kg
———	0°	15°	ca. 1,8 kg
- - - - -	8°	12°	ca. 2,8 kg
— — —	5°	15°	ca. 4,0 kg

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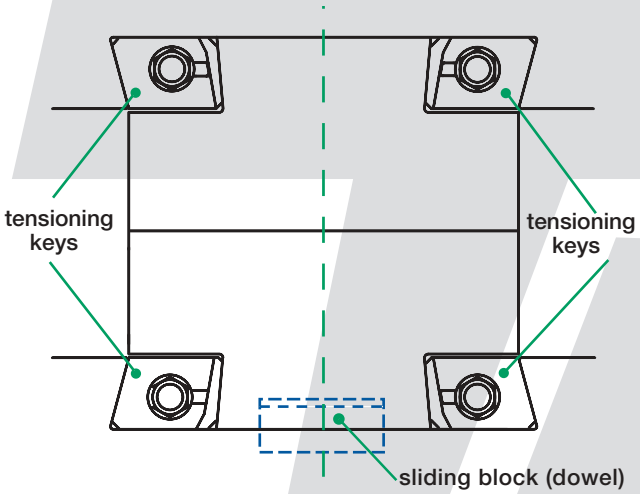
General

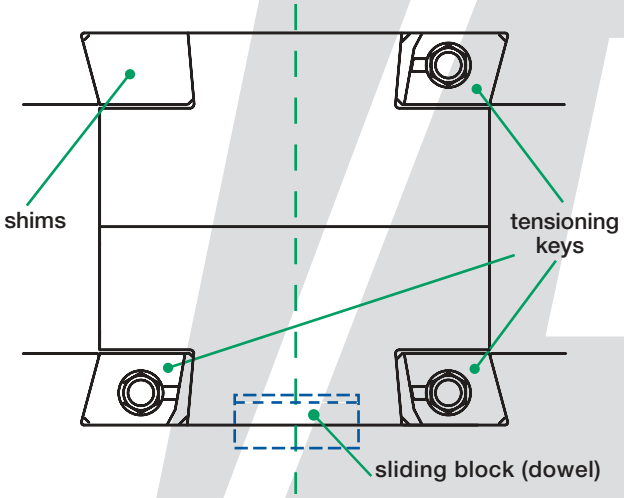
4.3 Applications

- side 1 -



Mounting 2 tensioning keys at the top

Mounting 2 tensioning keys at the bottom



Mounting shims and 1 tensioning key at the top

Mounting 2 tensioning keys at the bottom

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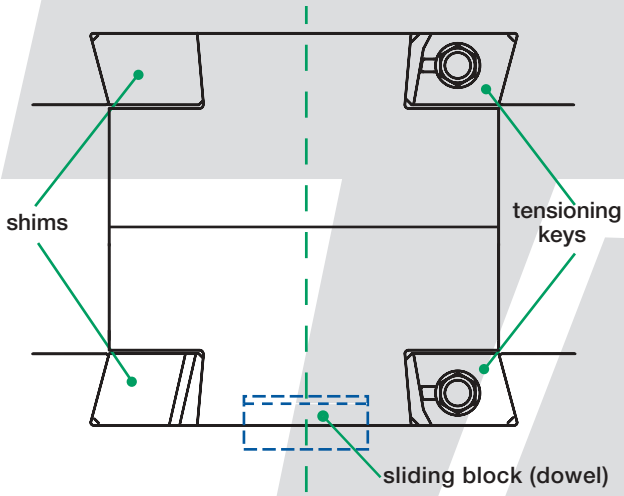
4.3 Applications

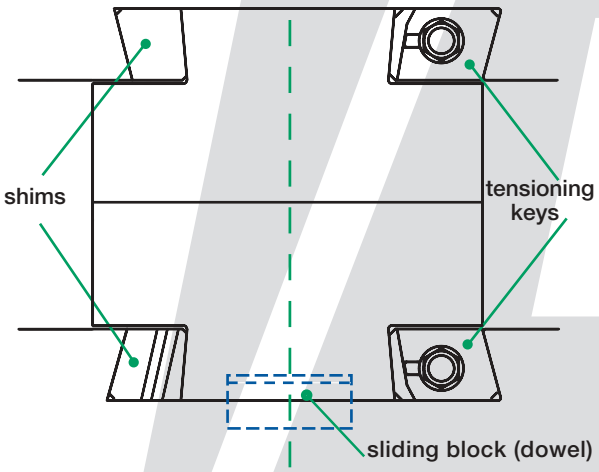
- side 2 -



Mounting shims and 1 tensioning key at the top

The die is installed in the centre of the tool room. The inserts have the same dimension as the tensioning keys.

Mounting shims and 1 tensioning key at the bottom



Mounting shims and 1 tensioning key at the top

The die is installed excentric in the tool room. The die contour is located in the centre. The inserts are slimmer than the tensioning keys (depending on the breadth of the die).

Mounting shims and 1 tensioning key at the bottom

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4.4 Taps / Threading Die

The threads in tensioning screws as used by us have an altered root radius for technical reasons. The threads in the nuts correspond to the respective DIN standards.

Die	Root Radius	Inner Diameter of Die for Recutting (min)
W16 x 1/11“	R 0,4	13,9 mm
M18	R 0,6	16,1 mm
M20	R 0,6	18,1 mm
M22	R 0,6	20,1 mm
M24	R 0,6	21,3 mm
W7/8“ x 1/9“	R 0,6	20,4 mm
W1“	R 0,8	23,1 mm
M27	R 0,8	24,9 mm
M30	R 0,8	27,2 mm

If you wish, you can purchase the respective threading dies for improving the tensioning screws from us.

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4.5 Tools / Auxiliary Materials

Mounting of Tools

The following tools are required for the proper mounting of Feuerbacher tensioning keys:

-clutched screw driver or ratchet (for mounting or dismounting)

-torque spanner up to approx. 800 Nm

-a long spanner socket (min 100mm) with the right width across flats, with the thread of the tensioning screw being exposed inside

Tools / Auxiliary Materials for Service and Maintenance

Please refer to the separate listing for the exact dimensioning of tools for improving the tensioning screw and nut within the scope of servicing.

Only graphite or Cu-containing greases suited for warm operation should be used as lubricants.

We will be pleased to assist you with the purchase of all appropriate tools and auxiliary materials.

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General

4.6 Customs Number or Commodity Codes for Feuerbacher Tensioning Keys and Spare Parts

European Union

Within the European Union it is permitted to declare:
Feuerbacher Tensioning Keys **and all** Spare Parts for Feuerbacher Tensioning Keys under the following commodity code:

8466 1038

The respective weights can estimated.

Customs Areas outside the EU

Outside the EU the following customs number is to be indicated:
Feuerbacher Tensioning Keys and Full Spare Parts Packs for Feuerbacher Tensioning Keys:

8466 1038

In case of delivery of individual spare parts, the following customs numbers are to be used:

Tensioning Screw	**7318 1590**
Nut	**7318 1630**
Taper Pin	**7318 2400**
Cup Spring	**7320 9030**
Spherical Disc	**7318 1630**
Guidance Socket	**7318 2200**
Damper / Damper Plate	**7326 9097**
Retaining Ring	**7318 2100**
Distance Ring	**7318 2200**

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4.7 Utility Patents and Trademarks

The tensioning keys of versions ”D”, ”TD”, ”SB” und ”DK” and their details are all protected by utility patents.
The tensioning keys of versions ”D”, ”TD”, ”SB” und ”DK” and their component parts must not be copied. They are our exclusive intellectual property.

The terms **”Feuerbacher Tensioning Key”** and the Feuerbacher logo are our registered trademarks.

We reserve the right to make occasional amendments to the information provided in this publication without prior notice.

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