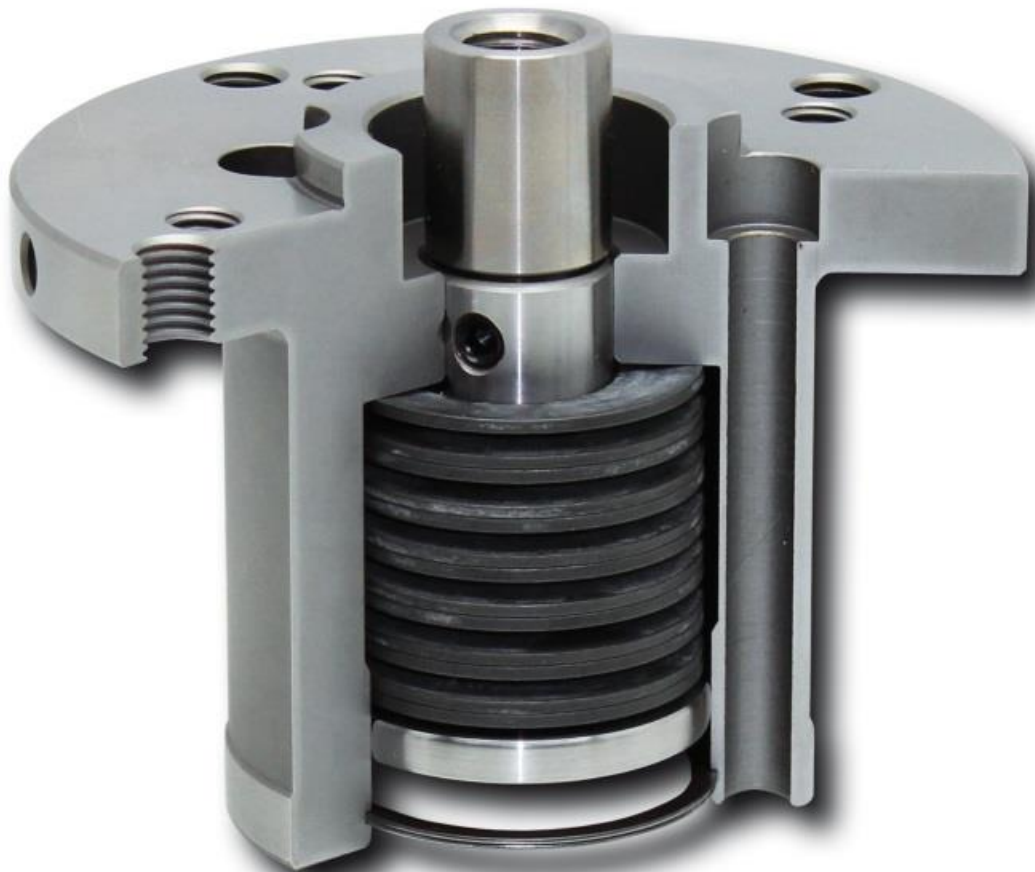


**Installation and operating instructions for
spring force actuator FUSR**

E 01.789



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RINGSPANN® Spannzeuge	Installation and operating instructions for spring force actuator FUSR			E 01.789	
As of: 25.02.2021	Version : 16	Signed: KUBM	Checked: SCHV	Number of pages: 15	Page: 2

Important

Before installation and commissioning of the product takes place, these installation and operating instructions must be read carefully. Notes of caution and hazard warnings are to be paid particular attention to.

These installation and operating instructions apply on condition that the product meets the selection criteria for its proper use. The selection and dimensioning of the product are not the subject of these installation and operating instructions.

If these installation and operating instructions are not observed or are interpreted wrongly, this shall invalidate any product liability and warranty of RINGSPANN GmbH; the same also applies in the case that our product is taken apart or changed.

These installation and operating instructions are to be kept in a safe place and must, in the event of onward delivery of our product – be it individually or as part of a machine – be passed on along with the product so that the user has access to them.

Safety information

- The installation and commissioning of our product may only be carried out by trained personnel.
- Repair work may only be performed by the manufacturer or by authorised RINGSPANN agencies.
- If there is suspected malfunctioning, the product, or the machine into which it is built, must be taken out of operation immediately and RINGSPANN GmbH or an authorised RINGSPANN agency is to be informed.
- The power supply is to be switched off during work on electrical components.
- Rotating parts must be secured by the buyer against unintentional touching.
- In the case of supplies made to a foreign country, the safety regulations applicable in that country are to be taken into consideration.

RINGSPANN® Spannzeuge	Installation and operating instructions for spring force actuator FUSR			E 01.789	
As of: 25.02.2021	Version : 16	Signed: KUBM	Checked: SCHV	Number of pages: 15	Page: 3

Contents

1. General notes

- 1.1. General safety instructions
- 1.2. Special safety instructions
- 1.3. Other applicable documents

2. Design, cross section and clamping principle

3. Intended use

4. Impermissible use

5. Technical prerequisite for reliable operation

6. Condition as delivered

7. Installation and putting into operation

- 7.1. Installation in the balancing machine
- 7.2. Selecting the appropriate adapter for the clamping device
- 7.3. Assembly of the clamping device
 - 7.3.1 Tightening torque for tension elements
- 7.4. Disassembly of the clamping device

8. Maintenance and repair

9. Storage

10. Technical data

- 10.1 Note on calculation of the theoretically transmittable torque

RINGSPANN® Spannzeuge	Installation and operating instructions for spring force actuator FUSR			E 01.789	
As of: 25.02.2021	Version : 16	Signed: KUBM	Checked: SCHV	Number of pages: 15	Page: 4

1. General notes

1.1 General safety instructions

The following hazard notices and warnings are used in these installation and operating instructions:



Warning!

This symbol indicates a situation where there is a risk of injury or danger for life or physical condition.



Caution!

This symbol indicates risks for the RINGSPANN product described and thus for equipment and machinery.



Note!

This symbol indicates notices, user tips and useful information.

- Only use RINGSPANN products in a technically impeccable condition.
- Consider all notices written on the product.
- Comply with the intended use.
- Before commissioning, ascertain and document that the machine the RINGSPANN product is to be built into is compliant with the country-specific regulations, rules of safety and standards.
- Perform a risk analysis for all parts and equipment of the machine with which safe operation of the RINGSPANN products is associated.

1.2 Special safety instructions



Warning!

The spring pack is pre-loaded. In the event of improper disassembly, there is risk to life and limb.

We therefore recommend that disassembly is carried out solely by RINGSPANN GmbH.

If it is disassembled by the customer, any warranty claims shall be ruled out.

RINGSPANN® Spannzeuge	Installation and operating instructions for spring force actuator FUSR			E 01.789	
As of: 25.02.2021	Version : 16	Signed: KUBM	Checked: SCHV	Number of pages: 15	Page: 5

1.3 Other applicable documents

Catalogue "Precision Clamping Devices" (leaflet 10) with further technical information in the appendix

VDI 2230 Systematic calculation of highly stressed screw connections
 Cylindrical screw connections
 An excerpt from VDI 2230 can also be found in the appendix of Catalogue 10



Note!

The current version of RINGSPANN data sheets and RINGSPANN catalogues can be found at www.ringspann.com

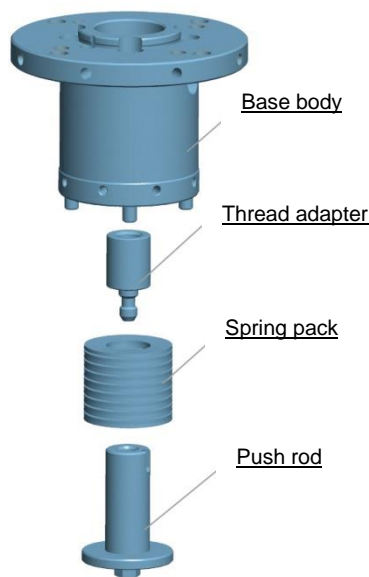
RINGSPANN® Spannzeuge	Installation and operating instructions for spring force actuator FUSR			E 01.789	
As of: 25.02.2021	Version : 16	Signed: KUBM	Checked: SCHV	Number of pages: 15	Page: 6

2. Design, cross section and clamping principle

As a clamping force unit, spring force actuators FUSR connect RINGSPANN precision clamping fixtures with the spindle connection of balancing machines.

The spring force actuators, deliverable in different sizes, bridges large clamping ranges through the addition of various precision clamping fixtures.

To balance the spring force actuators with precision clamping fixtures, eight threaded bores are available radially. The machine-sided installation of the spring force actuator is carried out via four screws M 8.



The spring force actuator for balancing machines consists of the base body, spring pack, push rod and thread adapter.

The assembly is carried out via the flange connection of the spring force actuator specially designed for balancing machines.

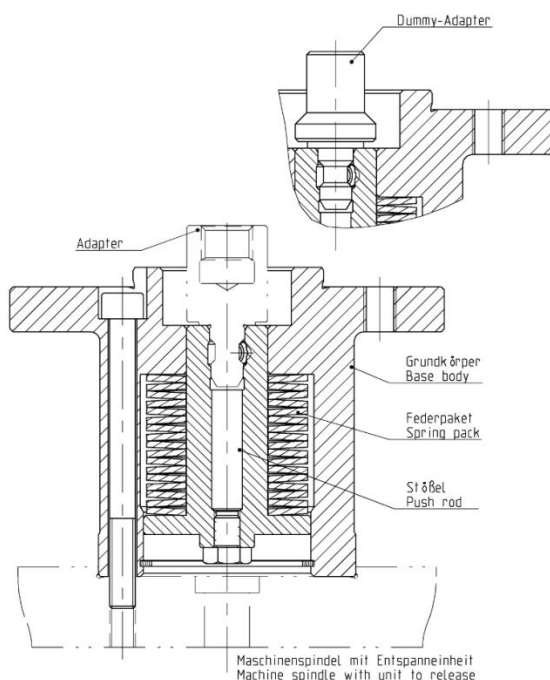
By replacing the enclosed thread adapter for each size, the connection is carried out with the various complete clamping fixtures. See 7.2



Note!

The appropriate adapter is NOT a part of the FUSR spring mechanism.

Therefore in case of order an extra order item.



By taking away the machine-sided axial relaxing force, the spring force acts on the push rod. It drives axially and operates the clamping element of the clamping fixture that is connected with the push rod via the adapter.

RINGSPANN® Spannzeuge	Installation and operating instructions for spring force actuator FUSR			E 01.789	
As of: 25.02.2021	Version : 16	Signed: KUBM	Checked: SCHV	Number of pages: 15	Page: 7

3. Intended use

The spring force actuator FUSR is solely intended to operate RINGSPANN precision clamping fixtures.

The spring force actuator FUSR is solely intended for balancing applications.

The spring force actuator is designed for a vertical arrangement.

4. Impermissible use / Warning signs



Warning!

Applications that deviate from those specified in chapter 3. **Intended use** are not permissible.

5. Technical prerequisite for reliable operation



Attention!

Before putting it into operation, it must be ensured that the mass inertia moment of the clamping workpiece is lower than the transmissible torque. The transmissible torque is determined by the spring force of the spring force actuator. It is lower than the maximum values specified in the catalogue.

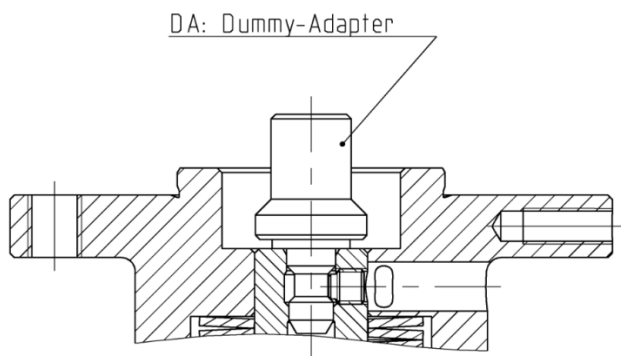
The acceleration must be reduced if necessary.

6. Condition as delivered

The spring force actuator is delivered fully assembled. The spring force actuator is wetted on all sides with anti-corrosive oil and covered in Branorost paper.

A dummy adapter (DA) is inserted and clamped with a set screw.

The screws M8 for the connection with the spindle connection of the balancing machine are enclosed.

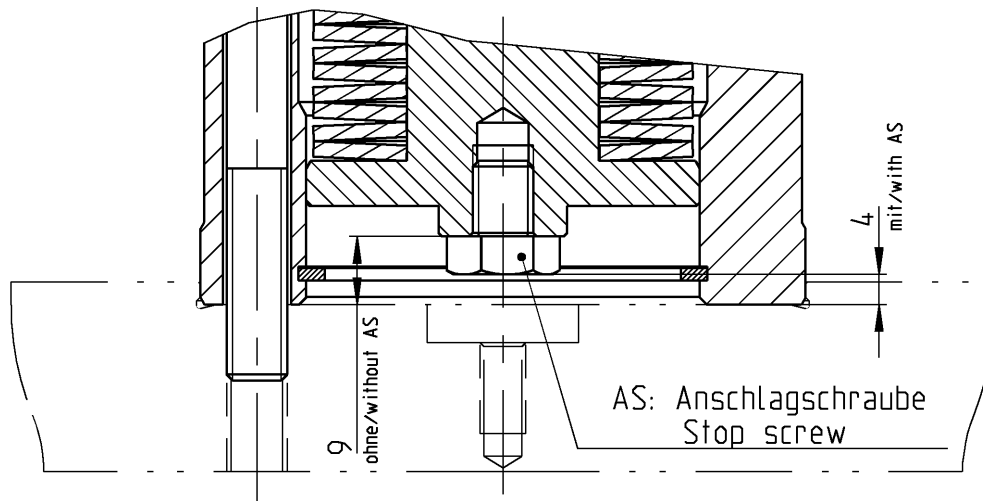


RINGSPANN® Spannzeuge	Installation and operating instructions for spring force actuator FUSR			E 01.789	
As of: 25.02.2021	Version : 16	Signed: KUBM	Checked: SCHV	Number of pages: 15	Page: 8

7. Installation and putting into operation

7.1 Installation in the balancing machine

In the condition as delivered, there is a stop screw (AS) at the underside of the central push rod. By removing the stop screw (AS), length differences of the machine-sided unit to release can be compensated.




- Clean interfaces at the machine spindle or adapter flange and clamping fixture thoroughly. All centring diameters and touching surfaces must be free of adhesions and even.
- Drive in the push rod of the machine's unit to release.
- The spring force actuator is equipped with a 0° marking. This is aligned to the 0° marking of the balancing spindle.
- Place the spring force actuator on the machine connection of the balancing spindle.
- Insert and turn in enclosed screws M8.
- Tighten screws crosswise with a pre-set torque wrench.
Screw tightening torque 24 Nm.
- Drive out the push rod of the machine's unit to release.
- The dummy adapter remains in the spring force actuator until a clamping device is used and it is mounted on the spring force actuator.

RINGSPANN® Spannzeuge	Installation and operating instructions for spring force actuator FUSR			E 01.789	
As of: 25.02.2021	Version : 16	Signed: KUBM	Checked: SCHV	Number of pages: 15	Page: 9

7.2 Selecting the appropriate adapter for the clamping device

The spring force actuator is equipped with a dummy adapter for the transport and storage. The dummy adapter has the sole task of ensuring that the set screw is screwed in sufficiently deep for the adapter attachment. This ensures that the set screw and the edge of the entry bore are not compressed and damaged when relaxing.


Before mounting the clamping device onto the spring force actuator, the right adapter must be selected. This is carried out according to the following table:

	<p>Note! The appropriate adapter is NOT a part of the FUSR spring mechanism. Therefore in case of order an extra order item.</p>
---	--

Größe / Size	FUSR 70	FUSR 90	FUSR 120	FUSR 160	FUSR 185
BKDF 6 / 7	3187-025008-0/0				
BKDF 12 / 18	3187-025009-0/0				
BKDF 19 / 27		3187-035000-0/0			
BKDF 32			3187-038000-0/0 3187-038003-0/0 *)		
BKDF 43 / 44 / 54			3187-038004-0/0 3187-038005-0/0 *)		
HKDF 4 / 6 / 7 / 12		3187-025010-0/0			
HKDF 19			3187-025012-0/0		
HKDF 30 / 40				3187-038002-0/0	
HKDF 60					3187-045000-0/0
BKFF 35		3187-025011-0/0			
BKFF 44 / 56			3187-025012-0/0		
BKFF 79				3187-025015-0/0 3187-025016-0/0 *)	
BKFF 110					3187-025019-0/0 3187-025018-0/0 *)
HKFF 40 / 45 / 55			3187-025013-0/0		
HKFF 66 / 76			3187-025014-0/0		
HKFF 86 / 96				3187-025017-0/0	
HKFF 106 / 114 / 124 / 134					3187-083000-0/0
HKFF 150					3187-079000-0/0

*) Adapter for pretensioning the taper bushings of the BKDF and BKFF series.

In order to cover the entire clamping range of 2.4 mm of the respective taper collets of sizes BKDF 32 to BKDF 54 and BKFF 79 or BKFF 110 when using FUSR spring balancers, special threaded adapters (marked with *) in the table above) are used.



Hinweis!

The spring accumulators have a usable stroke of approx. 7 mm. As the stroke increases, the spring forces and thus the transmittable torques decrease. The change in diameter of the taper bushings is max. 1.2 mm. In order to be able to use the clamping range between 1.2 mm and 2.4 mm for the sizes BKDF 32 to BKDF 54 and BKFF 79 or BKFF 110, the taper collets are preloaded by half of the total clamping range when using the threaded adapters marked *).

The following table shows the clamping ranges when using the corresponding thread adapters:

Size	Clamping range Taper collet	FUSR	Clamping range of the taper collet in connection with the spring force actuator	Clamping range of the preloaded taper collet in combination with the spring force actuator
BKD 32	51,60 – 54,00	120	Thread adapter 3187-038000-000000	Thread adapter 3187-038003-000000
	53,60 – 56,00		51,60 – 52,80	52,80 – 54,00
	55,60 – 58,00		53,60 – 54,80	54,80 – 56,00
	57,60 – 60,00		55,60 – 56,80	56,80 – 58,00
	59,60 – 62,00		57,60 – 58,80	58,80 – 60,00
	61,60 – 64,00		59,60 – 60,80	60,80 – 62,00
BKDF 43	63,60 – 66,00	120	Thread adapter 3187-038004-000000	Thread adapter 3187-038005-000000
	65,60 – 68,00		63,60 – 64,80	64,80 – 66,00
	67,60 – 70,00		65,60 – 66,80	66,80 – 68,00
	69,60 – 72,00		67,60 – 68,80	68,80 – 70,00
			69,60 – 70,80	70,80 – 72,00
BKDF 44	71,60 – 74,00	120	Thread adapter 3187-038004-000000	Thread adapter 3187-038005-000000
	73,60 – 76,00		71,60 – 72,80	72,80 – 74,00
	75,60 – 78,00		73,60 – 74,80	74,80 – 76,00
	77,60 – 80,00		75,60 – 76,80	76,80 – 78,00
	79,60 – 82,00		77,60 – 78,80	78,80 – 80,00
			79,60 – 80,80	80,80 – 82,00

Size	Clamping range Taper collet	FUSR	Clamping range of the taper collet in connection with the spring force actuator	Clamping range of the preloaded taper collet in combination with the spring force actuator
BKDF 54		120	Thread adapter 3187-038004-000000	Thread adapter 3187-038005-000000
	81,60 – 84,00		81,60 – 82,80	82,80 – 84,00
	83,60 – 86,00		83,60 – 84,80	84,80 – 86,00
	85,60 – 88,00		85,60 – 86,80	86,80 – 88,00
	87,60 – 90,00		87,60 – 88,80	88,80 – 90,00
	89,60 – 92,00		89,60 – 90,80	80,80 – 92,00
	91,60 – 94,00		91,60 – 92,80	92,80 – 94,00
	93,60 – 96,00		93,60 – 94,80	94,80 – 96,00
	95,60 – 98,00		95,60 – 96,80	96,80 – 98,00
	97,60 – 100,00		97,60 – 98,80	98,80 – 100,00
	99,60 – 102,00		99,60 – 100,80	100,80 – 102,00
	101,60 – 104,00		101,60 – 102,80	102,80 – 104,00
	103,60 – 106,00		103,60 – 104,80	104,80 – 106,00
	105,60 – 108,00		105,60 – 106,80	106,80 – 108,00
	107,60 – 110,00		107,60 – 108,80	108,80 – 110,00
	109,60 – 112,00		109,60 – 110,80	110,80 – 112,00
	111,60 – 114,00		111,60 – 112,80	112,80 – 114,00
	113,60 – 116,00		113,60 – 114,80	114,80 – 116,00
	115,60 – 118,00		115,60 – 116,80	116,80 – 118,00
	117,60 – 120,00		117,60 – 118,80	118,80 – 120,00
119,60 – 122,00	119,60 – 120,80	120,80 – 122,00		
121,60 – 124,00	121,60 – 122,80	122,80 – 124,00		
123,60 – 126,00	123,60 – 124,80	124,80 – 126,00		
125,60 – 128,00	125,60 – 126,80	126,80 – 128,00		
127,60 – 130,00	127,60 – 128,80	128,80 – 130,00		
129,60 – 132,00	129,60 – 130,80	130,80 – 132,00		
BKFF 79		160	Thread adapter 3187-025015-000000	Thread adapter 3187-025016-000000
	35,40 – 33,40		35,40 – 34,40	34,40 – 33,40
	37,20 – 35,20		37,20 – 36,20	36,20 – 35,20
	39,00 – 37,00		39,00 – 38,00	38,00 – 37,00
	40,80 – 38,80		40,80 – 39,80	39,80 – 38,80
	42,60 – 40,60		42,60 – 41,60	41,60 – 40,60
	44,40 – 42,40		44,40 – 43,40	43,40 – 42,40
	46,20 – 44,20		46,20 – 45,20	45,20 – 44,20
	48,00 – 46,00		48,00 – 47,00	47,00 – 46,00
	49,80 – 47,80		49,80 – 48,80	48,80 – 47,80
	51,60 – 49,60		51,60 – 50,60	50,60 – 49,60
BKFF 110		185	Thread adapter 3187-025019-000000	Thread adapter 3187-025018-000000
	53,80 – 51,40		53,80 – 52,60	52,60 – 51,40
	56,00 – 53,60		56,00 – 54,80	54,80 – 53,60
	58,20 – 55,80		58,20 – 57,00	57,00 – 55,80
	60,40 – 58,00		60,40 – 59,20	59,20 – 58,00
	62,60 – 60,20		62,60 – 61,40	61,40 – 60,20
	64,80 – 62,40		64,80 – 63,60	63,60 – 62,40
	67,00 – 64,60		67,00 – 65,80	65,80 – 64,60
	69,20 – 66,80		69,20 – 68,00	68,00 – 66,80
	71,40 – 69,00		71,40 – 70,20	70,20 – 69,00
	73,60 – 71,20		73,60 – 72,40	72,40 – 71,20

7.3 Assembly of the clamping device

- Screw the adaptor suitable to the clamping fixture with the drawbar of the respective clamping device.
- Bring the push rod of the spring force actuator into the upper position. See drawn illustrations.
- Turn out the set screw (GS) until the dummy adapter (DA) is free.
- Remove dummy adapter.
- Place the clamping fixture, with adapter, on the spring force actuator. Additionally, clean interfaces at the spring force actuator and clamping fixture thoroughly. All centring diameters and touching surfaces must be free of adhesions and be even.
- Align the 0° markings on the clamping fixture and spring force actuator to one another.
- Insert, turn in and tighten the fastening screws of the clamping device crosswise with the pre-set torque wrench according to the table below.
- Fix adapter using the set screw (GS). Tightening torque max. 17 Nm
Required wrench size of the tool SW 4.

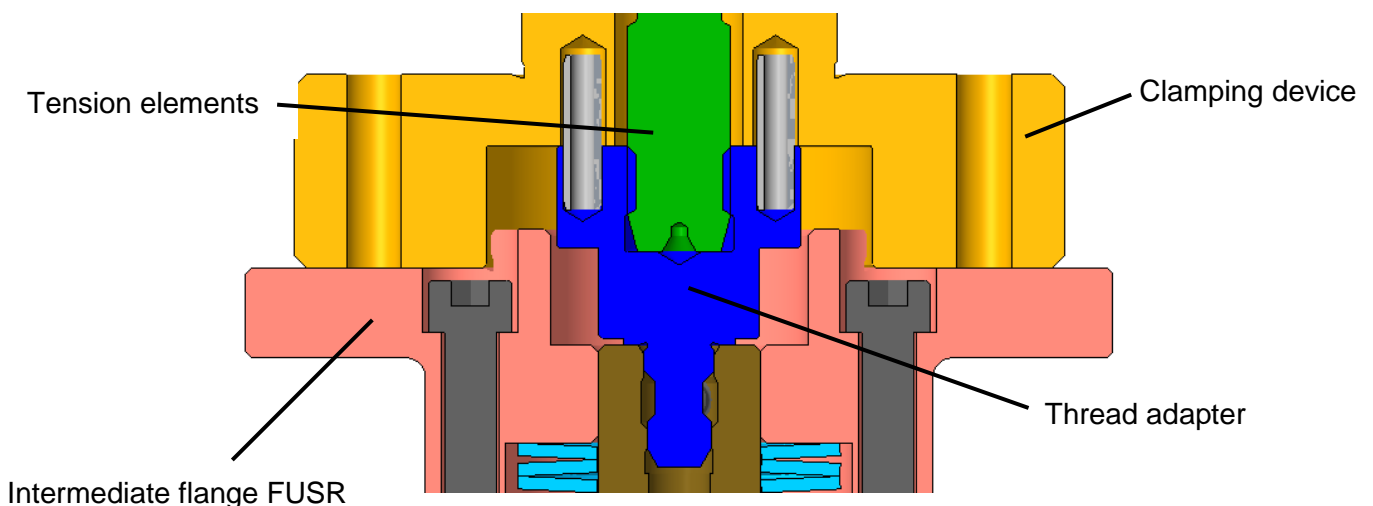
7.3.1 Tightening torque for tension elements

When mounting the thread adapters with the appropriate clamping tool, the tension elements are subject to a max. tightening torque.

These also apply if the clamping element is changed without dismantling the entire clamping fixture. For example, with the clamping elements of the BKDF clamping fixtures.

Tension elements are: Tie bolt, tie plate, cap screws in connection with thread adapter, etc..

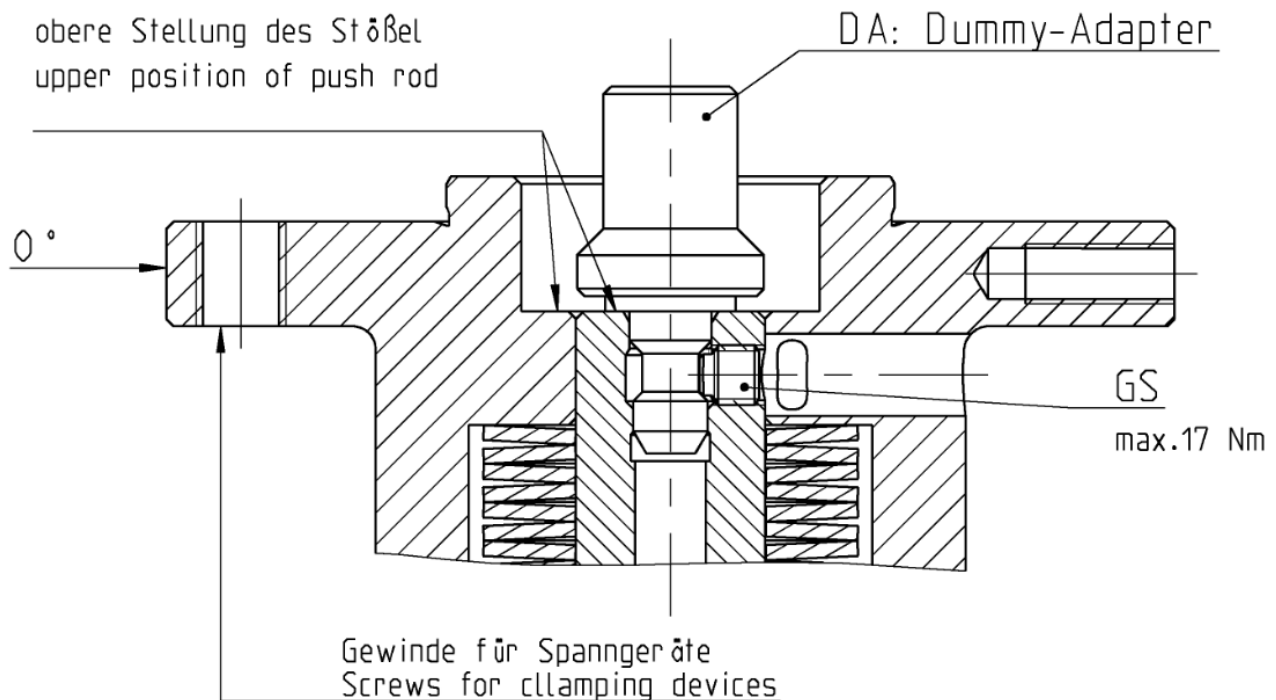
Thread size on tension element of the clamping device	Max. Tightening torque
M5	5 Nm
M8	20 Nm
M12	51 Nm
M16 or larger	60 Nm



RINGSPANN® Spannzeuge	Installation and operating instructions for spring force actuator FUSR			E 01.789	
As of: 25.02.2021	Version : 16	Signed: KUBM	Checked: SCHV	Number of pages: 15	Page: 13

7.4 Disassembly of the clamping device

- Bring the push rod of the spring force actuator with the relaxing device in the machine spindle into the upper position. Clamping device is relaxed.
- Turn the set screw (GS) back until the adapter is completely free. (approx. 1 – 1.5 revolutions)
Required wrench size of the tool SW 4.
- Evenly loosen the fastening screws.
- The clamping device can now be taken off the spring force actuator.
- Insert dummy adapter (DA) and lock again using the set screw (GS).
- The spring force actuator can now be relaxed. The dummy adapter is hereby drawn in a few mm.



RINGSPANN® Spannzeuge	Installation and operating instructions for spring force actuator FUSR			E 01.789	
As of: 25.02.2021	Version : 16	Signed: KUBM	Checked: SCHV	Number of pages: 15	Page: 14

8 Maintenance and repair

General instructions

The deployment and ambient conditions for the spring force actuator and the RINGSPANN clamping fixtures and clamping elements operated above it are different for each application. RINGSPANN is therefore unable to provide any information on the wear behaviour of the spring force actuator.



Warning!

The spring pack is pre-loaded. In the event of improper disassembly, there is risk to life and limb.

We therefore recommend that disassembly is carried out solely by RINGSPANN GmbH.

If it is disassembled by the customer, any warranty claims shall be ruled out.

9. Storage

If the spring force actuator should remain on the balancing machine with the precision clamping fixture, the spring force actuator clamps the clamping fixture. Therefore, either the enclosed control ring (for special clamping fixtures) or a workpiece should always be clamped.

If the spring force actuator is to be put into storage, the clamping fixture is to be taken off in advance and the dummy adapter inserted. Lightly oil the spring force actuator with anti-corrosive oil (no wax), cover in anti-tarnish paper and store in a stable box.

Renew the corrosion protection every 6 months.

RINGSPANN® Spannzeuge	Installation and operating instructions for spring force actuator FUSR			E 01.789	
As of: 25.02.2021	Version : 16	Signed: KUBM	Checked: SCHV	Number of pages: 15	Page: 15

10. Technical data

Min. clamping force of the integrated spring force actuator: 2300 N

Transmissible torques: depend on the respective clamping device

Required force to loosen: 4000N

Spring force actuator FUSR 90 with reduced clamping force

e.g. 3109-085003-000000, 3109085006-000000, 3109-135006-000000

Min. clamping force of the integrated spring force actuator: 1850 N

Transmissible torques: depend on the respective clamping device

Required force to loosen: 2400N

10.1 Note on calculation of the theoretically transmittable torque

Mandrel - clamping device (example clamping device) (size = BKDF 19)

F_{max} = max. actuating force - see catalogue "Precision Clamping Devices". (20.000 N)

M_{max} = max. torque of the size - see catalogue "Precision Clamping Devices". (114 Nm)

F_f = min. Force FUSR - see chapter 10 (2.300 N)

M_{th} = theor. transmittable torque in Nm

$$M_{th} = \frac{F_f}{F_{max}} * M_{max}$$

$$M_{th} = \frac{2.300N}{20.000N} * 114Nm = 13,1Nm$$

Example

Chuck - clamping device (example clamping device / size = HKFF 76)

F_{max} = max. actuating force - see catalogue "Precision Clamping Devices". (20.000 N)

M_{max} = max. torque of the size - see catalogue "Precision Clamping Devices". (190 Nm)

D_{max} = max. clamping Ø of the size - see catalogue "Precision Clamping Devices". (60,5 mm)

D = Clamping Ø - Example (55,0 mm)

F_f = min. Force FUSR - see chapter 10 (2.300 N)

M_{th} = theor. transmittable torque in Nm

$$M_{th} = \frac{F_f * M_{max} * D}{F_{max} * D_{max}}$$

$$M_{th} = \frac{2.300N * 190Nm * 55mm}{20.000N * 60,5mm} = 19,8Nm$$

Example