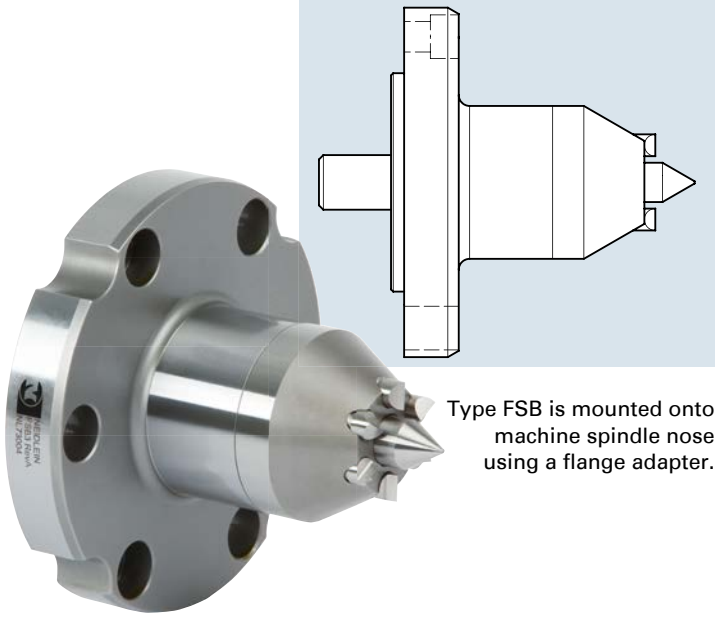
# Face Drivers FSB / SB

## Clamping tools for tooling between centers

The entire surface of the work piece can be tooled and finished by clamping with a maximum of torque transmission. NEIDLEIN face drivers are mechanical clamping systems which are suited for soft/green as well as hard tooling.

Face drivers of type FSB/SB are power-operated by the thrust of the tailstock. Work pieces are clamped centrically using a movable center pin. This way different centerings can be adjusted, thus ensuring a constant datum-point at the end face of work piece.

**Type FSB** with flange-retainer



Type FSB is mounted onto machine spindle nose using a flange adapter.

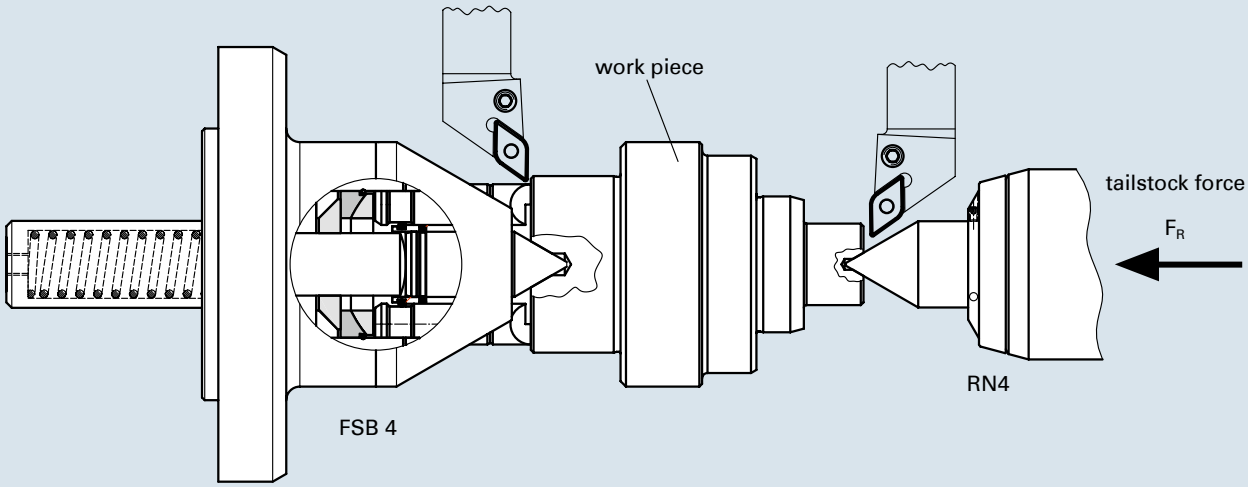
**Type SB** with MK- or cylindrical retainer


Type SB with taper shank and extracting nut for fast mounting into machine spindle.

**NEIDLEIN face drivers FSB / SB with movable center pins ensure:**

- a maximum of torque transmission, thus achieving high metal removing rates
- datum-point at the end face of work piece stable datum-point in case of different centerings
- extended tool-life of driving devices and cutting tools due to vibration-free running
- true run-out accuracy up to 0.02 mm maximum
- clamping force is triggered by tailstock
- fixed center pin/fixed datum-point in clamped state
- compensating driving devices/ideal clamping of work piece
- simple handling

**Type FSB** with flange-retainer




## Clamping principle

The center pin located on the side of the tailstock pushes the work piece against the movable center pin of the face driver. The center pin will draw back until the surface of the work piece bears against the drive pins. In this state the clamping bolt is clamped over the power flow in order to ensure a fixed datum-point during the entire tooling process.

The drive pins are "floatingly", thus compensating for variations in work piece, squareness and surface finish. The entire surface of the workpiece can now be finished in one single clamping. Please check page 6 and 7 for metal removing rates to be obtained as well as for the tailstock forces required. Compatible standard drive pins and center pins are listed on page 16 to 21.

We will be glad to design clamping devices suitable for your work pieces.

## **Technical data – type FSB** face driver




| cat. no. | type | d | d1 | center Ø | d2 | d3 | d5 | d6 | l1 | l2 | drive pin | fastening screw type | fastening screw pcs | clamping Ø D1 | clamping Ø D2 | clamping Ø D3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **73012** | **FSB 01** | 48 | 22 | 0 - 5 | 6 | 160 | 25 | 133.4 | 115 | 28 | 3 | M12 | 3 | 8 | 11 | 17 |
| **73001** | **FSB 0** | 48 | 22 | 0 - 3 | 8 | 160 | 25 | 133.4 | 115 | 28 | 3 | M12 | 3 | 6 | 11 | 19 |
| **73011** | **FSB 11** | 42 | 6 | 0 - 6 | 6 | 160 | 25 | 133.4 | 115 | 28 | 3 | M12 | 3 | 11 | 14 | 20 |
| **73002** | **FSB 1** | 48 | 8 | 0 - 8 | 8 | 160 | 25 | 133.4 | 115 | 28 | 3 | M12 | 3 | 13 | 18 | 26 |
| **73003** | **FSB 2** | 70 | 14 | 2 - 14 | 10 | 160 | 25 | 133.4 | 115 | 23 | 6 | M12 | 3 | 26 | 31 | 36 |
| **73004** | **FSB 3** | 70 | 18 | 2 - 18 | 10 | 160 | 25 | 133.4 | 115 | 33 | 6 | M12 | 3 | 34 | 39 | 44 |
| **73009** | **FSB 35** | 80 | 14 | 2 - 14 | 15 | 160 | 25 | 133.4 | 115 | 33 | 6 | M12 | 3 | 29 | 39 | 49 |
| **73005** | **FSB 4** | 90 | 24 | 3 - 24 | 15 | 160 | 32 | 133.4 | 115 | 72 | 6 | M12 | 3 | 39 | 49 | 59 |
| **73010** | **FSB 45** | 100 | 28 | 3 - 28 | 15 | 160 | 32 | 133.4 | 115 | 72 | 6 | M12 | 3 | 49 | 59 | 69 |
| **73006** | **FSB 5** | 132 | 35 | 6 - 35 | 20 | 160 | 45 | 133.4 | 115 | 164 | 6 | M12 | 3 | 69 | 84 | 99 |
| **73008** | **FSB 55** | 182 | 35 | 3 - 35 | 20 | 220 | 45 | 171.4 | 115 | 165 | 6 | M16 | 3 | 110 | 125 | 140 |
| **73007** | **FSB 6** | 212 | 35 | 3 - 35 | 20 | 250 | 45 | 210 | 115 | 165 | 6 | M20 | 3 | 140 | 155 | 170 |
| **73013** | **FSB 7** | 255 | 50 | 25 - 48 | 20 | 290 | 50 | 250 | 132 | 165 | 6 | M20 | 6 | 180 | 195 | 210 |
| **73014** | **FSB 75** | 302 | 50 | 25 - 48 | 20 | 348 | 50 | 310 | 132 | 165 | 6 | M20 | 6 | 230 | 245 | 260 |
| **73016** | **FSB 8** | 360 | 80 | 30 - 76 | 30 | 440 | 78 | 394 | 190 | 262 | 6 | M20 | 6 | 270 | 290 | 310 |
| **73015** | **FSB 85** | 410 | 80 | 30 - 76 | 30 | 490 | 78 | 444 | 190 | 262 | 6 | M20 | 6 | 320 | 340 | 360 |

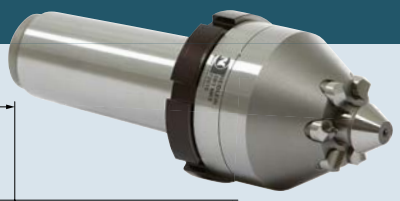
- All face drivers are supplied without drive pins. (Drive pins see page 16-20)
- Types FSB 01/0 are supplied with center body, all other types without center pin. (Center pins see page 21)
- Retaining elements for face drivers see brochure 2.0

It is the purpose of a flange-adapter to provide stable junction to the spindle machine. We supply these flange adapters for various sizes of spindle noses either in standard size (DIN 55028) or for spindle noses specific to manufacturer of machine-tools. Thus face drivers of range FSB can be used on different machines. Driving devices and center pins can be exchanged front view on the machine without any effort.

Upon request and depending on the tooling direction of the machine the face driver can be equipped optionally with drive pins for counter-clockwise tooling (SR/tooling direction M3), for clockwise tooling (SL/tooling direction M4) or for both tooling directions (NV = bi-directional).

Apart from the clamping diameters listed in the table under D1, D2, D3 we can also supply intermediate dimensions upon request. We can as well make extra-large center pins or mushroom centers appropriate to oversized centerings in work pieces.

## Technical data – type SB face driver






| cat. no. | type | MK | d | d1 | center Ø | d2 | d3 | l1 | l2 | l3 | drive pin | clamping Ø D1 | D2 | D3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **72016** | **SB 01** | 3 | 48 | 22 | 0 - 5 | 6 | M28 x 1.5 | 87 | 61 | 14 | 3 | 8 | 11 | 17 |
| **72017** | **SB 01** | 4 | 48 | 22 | 0 - 5 | 6 | M35 x 1.5 | 87 | 74 | 16 | 3 | 8 | 11 | 17 |
| **72018** | **SB 01** | 5 | 48 | 22 | 0 - 5 | 6 | M48 x 1.5 | 87 | 97 | 19 | 3 | 8 | 11 | 17 |
| **72001** | **SB 0** | 3 | 48 | 22 | 0 - 3 | 8 | M28 x 1.5 | 87 | 61 | 14 | 3 | 6 | 11 | 19 |
| **72002** | **SB 0** | 4 | 48 | 22 | 0 - 3 | 8 | M35 x 1.5 | 87 | 74 | 16 | 3 | 6 | 11 | 19 |
| **72003** | **SB 0** | 5 | 48 | 22 | 0 - 3 | 8 | M48 x 1.5 | 87 | 97 | 19 | 3 | 6 | 11 | 19 |
| **72019** | **SB 11** | 3 | 42 | 6 | 0 - 6 | 6 | M28 x 1.5 | 80 | 61 | 14 | 3 | 11 | 14 | 20 |
| **72020** | **SB 11** | 4 | 42 | 6 | 0 - 6 | 6 | M35 x 1.5 | 80 | 74 | 16 | 3 | 11 | 14 | 20 |
| **72021** | **SB 11** | 5 | 42 | 6 | 0 - 6 | 6 | M48 x 1.5 | 80 | 97 | 19 | 3 | 11 | 14 | 20 |
| **72004** | **SB 1** | 3 | 48 | 8 | 0 - 8 | 8 | M28 x 1.5 | 80 | 61 | 14 | 3 | 13 | 18 | 26 |
| **72005** | **SB 1** | 4 | 48 | 8 | 0 - 8 | 8 | M35 x 1.5 | 80 | 74 | 16 | 3 | 13 | 18 | 26 |
| **72006** | **SB 1** | 5 | 48 | 8 | 0 - 8 | 8 | M48 x 1.5 | 80 | 97 | 19 | 3 | 13 | 18 | 26 |
| **72007** | **SB 2** | 4 | 70 | 14 | 2 - 14 | 10 | M35 x 1.5 | 80 | 74 | 16 | 6 | 26 | 31 | 36 |
| **72008** | **SB 2** | 5 | 70 | 14 | 2 - 14 | 10 | M48 x 1.5 | 80 | 97 | 19 | 6 | 26 | 31 | 36 |
| **72009** | **SB 3** | 4 | 70 | 18 | 2 - 18 | 10 | M35 x 1.5 | 80 | 74 | 16 | 6 | 34 | 39 | 44 |
| **72010** | **SB 3** | 5 | 70 | 18 | 2 - 18 | 10 | M48 x 1.5 | 80 | 97 | 19 | 6 | 34 | 39 | 44 |
| **72011** | **SB 4** | 5 | 90 | 24 | 3 - 24 | 15 | M48 x 1.5 | 104 | 97 | 19 | 6 | 39 | 49 | 59 |
| **72012** | **SB 4** | 6 | 90 | 24 | 3 - 24 | 15 | M70 x 1.5 | 104 | 134 | 20 | 6 | 39 | 49 | 59 |
| **72013** | **SB 5** | 6 | 132 | 35 | 3 - 35 | 20 | M70 x 1.5 | 135 | 134 | 20 | 6 | 69 | 84 | 99 |
| **72015** | **SB 55** | 6 | 182 | 35 | 3 - 35 | 20 | M70 x 1.5 | 140 | 134 | 20 | 6 | 110 | 125 | 140 |
| **72014** | **SB 6** | 6 | 212 | 35 | 3 - 35 | 20 | M70 x 1.5 | 140 | 134 | 20 | 6 | 140 | 155 | 170 |

- Face driver with cylindrical shank upon request.
- All face drivers are supplied without drive pins. (Drive pins see page 16-20)
- Types SB 01/0 are supplied with center body, all other types without center pin. (Center pins see page 21)

Type series SB with MK retainer is embedded directly in the machine spindle and removed by means of an extracting nut. Driving devices and center pins can be exchanged front view on the machine without any effort.

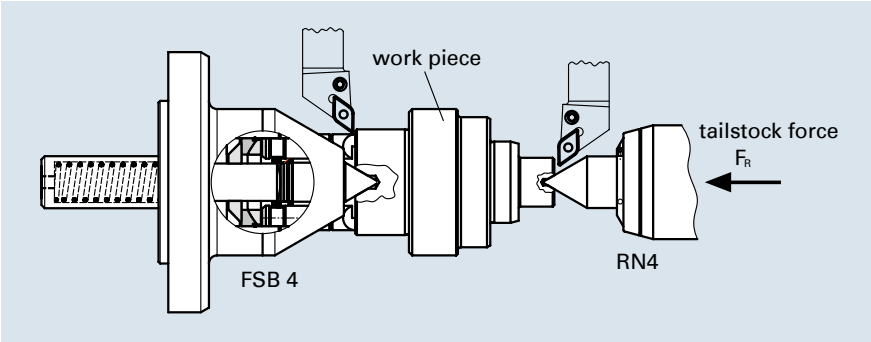
If necessary and depending on the tooling direction of the machine the face driver can be equipped optionally with drive pins for counter-clockwise tooling (SR/tooling direction M3), for clockwise tooling (SL/tooling direction M4) or for both tooling directions (NV = bi-directional).

Apart from the clamping diameters listed in the table under D1, D2, D3 we also supply intermediate dimensions upon request. We also make extra-large center pins or mushroom centers appropriate to oversized centerings in work pieces.

# Face Drivers FSB / SB: Calculations

## Tailstock force / maximum chip cross section of metal removing

Principle: the tailstock force pushes the work piece agianst the movable center pin of the face driver. The center pin will draw back until the surface of the work piece bears against the drive pins.




- **tailstock force $F_R$:**
  The force onto the face driver required for metal removing is calculated on the basis of the empirical formula:

$$F_R = [(q_{max} \times 1000 \times \frac{D}{d}) + 1000] \times m$$

| | | |
|---|---|---|
| $F_R$ | [N] | tailstock force |
| $q_{max}$ | [mm²] | maximum of chip cross section for metal removing |
| D | [mm] | cutting diameter |
| d | [mm] | clamping diameter |
| m | [-] | material factor (see adjustment-chart below) |

- **maximum chip cross section $q_{max}$:**
  At a given tailstock force, maximum chip cross section is calculated as follows:

$$q_{max} = \frac{\frac{F_R}{m} - 1000}{1000 \times \frac{D}{d}}$$

**Explanatory notes:**

The calculations refer to tooling against the face driver. In case of tooling against tailstock the calculated chip cross section is reduced by approx. 40 %. The first chip, however, should always be machined toward the face driver, in order to achieve an ideal penetration of the drive pins. Ratio D/d should not exceed 2, otherwise it would work inefficiently.

- **material factor m adjustment chart:**

| material factor m | 1.4 | 1.2 | 1.1 | 1.0 | 0.8 |
|---|---|---|---|---|---|
| Rm [N/mm²] | 1000 | 800 | 700 | 600 | 400 |
| examples | 42CrMo4 | 16MnCr5 | C 15E (Ck 15) | S355J0 | S235J0 |
| | | 25CrMo4 | C 45E (Ck 45) | 35S20 | |

## Chisel load of drive pins

**Keep the chisel load within the following range: 250 - 350 N per mm chisel length**

- **the chisel load is calculated as follows:**

$$BS = \frac{F_R}{n \times s}$$

| | | |
|---|---|---|
| BS | [N/mm] | chisel load |
| $F_R$ | [N] | tailstock force |
| n | [ - ] | number of drive pins |
| s | [mm] | chisel length |

- **exemplification:**
  turning with FSB 3 face driver, 6 drive pins, respective length of chisel 4 mm, tailstock force 7200 N

$$BS = \frac{7200N}{6 \times 4mm} = 300\,\frac{N}{mm}$$

## Calculation example for type FSB / SB

**Specific data of machine and work piece:**

| | |
|---|---|
| maximum tailstock force: | 10000 N |
| material of work piece: | C15E |
| diameter of work piece, side of face driver: | Ø 48 mm |
| turning diameter: | Ø 90 mm |

**Selection of face driver:**
Face driver FSB 3/clamping diameter 44 mm
6 drive pins: chisel length 4 mm each

- **tailstock force $F_R$:**
  In order to ensure sufficient pull-in power (see chisel load of drive pins) a tailstock force of approx. 7200 N has to be supplied.

$$BS = \frac{F_R}{n \times s} \longrightarrow F_R = 300\,\frac{N}{mm} \times 6 \times 4mm = 7200\,N$$

**Determination of material factor m:**
as per adjustment chart material factor: m (C15E) = 1.1

- **maximum chip cross section $q_{max}$:**
  The maximum chip cross section (at the ultimate turning-Ø) is calculated as follows:

$$q_{max} = \frac{\frac{7200N}{1{,}1} - 1000}{1000 \times \frac{90mm}{44mm}} = 2{,}71mm^2$$

**Explanatory notes:**

This calculation refers to tooling against the face driver. The calculated chip cross section refers to the ultimate turning diameter. In case of further tooling toward pivot of work piece, even larger chip cross sections can be achieved (▸ formula), commensurate with turning diameter.