# Face Drivers FFB / FFBH

Clamping tools for tooling between center pins

The entire surface of work piece can be completely machined with one single clamping and with a maximum of torque transmission. NEIDLEIN face drivers are mechanical clamping systems, suitable for soft/green tooling and hard turning likewise.
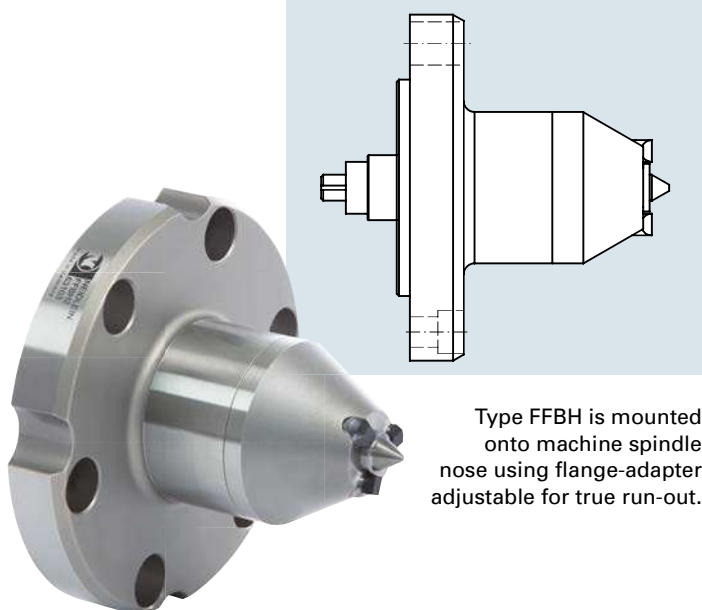
Face drivers of type FFB/FFBH are power-operated on the side of the machine spindle as well as the side of the tailstock. The work pieces are clamped centrically by the fixed center pin. This operation results in high true run-out accuracy.
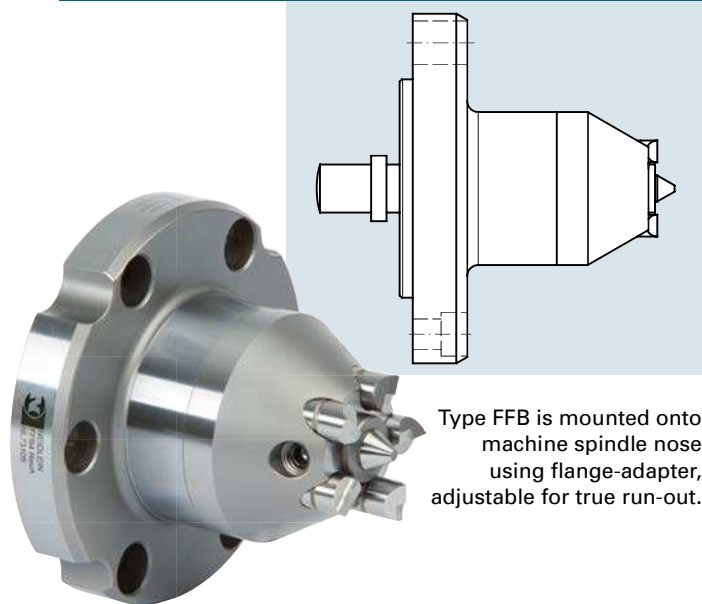
Type FFB is mounted onto machine spindle nose using flange-adapter, adjustable for true run-out.

Drive pins of type FFBH are hydraulically activated and compensated, thus achieving excellent true run-out accuracy.

Type FFBH with flange-mount

Type FFBH is mounted onto machine spindle nose using flange-adapter adjustable for true run-out.

NEIDLEIN face drivers type FFB / FFBH with fixed center pin ensure:

- maximum of torque transmission, thus achieving a high rate of metal removing

- datum-point location in center of workpiece ensures constant measures of length

- true run-out accuracy up to 0.005 mm maximum

- extended service life of drive pins and cutting tools due to vibration-free running

- fixed clamping location

- compensating driving devices/ideal clamping of work piece

- easy handling

Type FFB / FFBH with flange-mount

power operation
by clamping cylinder

work piece

tailstock force

F_S

F_R

FFB 2

RN3
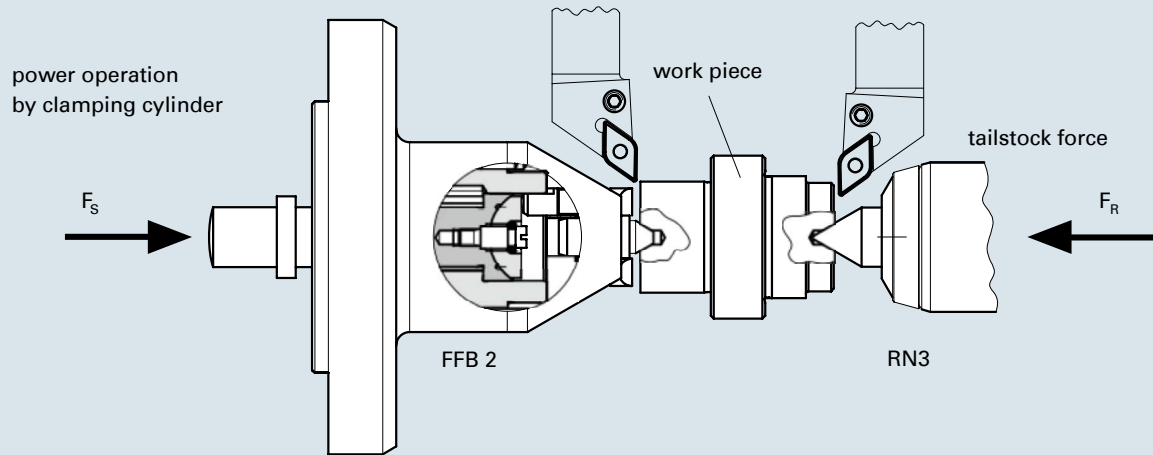
Clamping principle

The center pin located on the side of the tailstock pushes the work piece against the fixed center pin of the face driver. The motion of the drive pins against the surface of the work piece is initiated by the clamping cylinder mounted into the machine. The drive pins are "floatingly" suspended, thus compensating irregularities with regard to possible unevenness of the surface of work pieces. The datum-point of work pieces on the machines is determined by the size of the center hole. The entire surface of work piece can now be tooled in one single clamping.

See page 12 and 13 with data for achievable removal of material and the thrust requested. The appropriate standard drive pins and center pins can be found in brochure 1.2.

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

Technical data – type FFB face driver

Type FFB 01/0
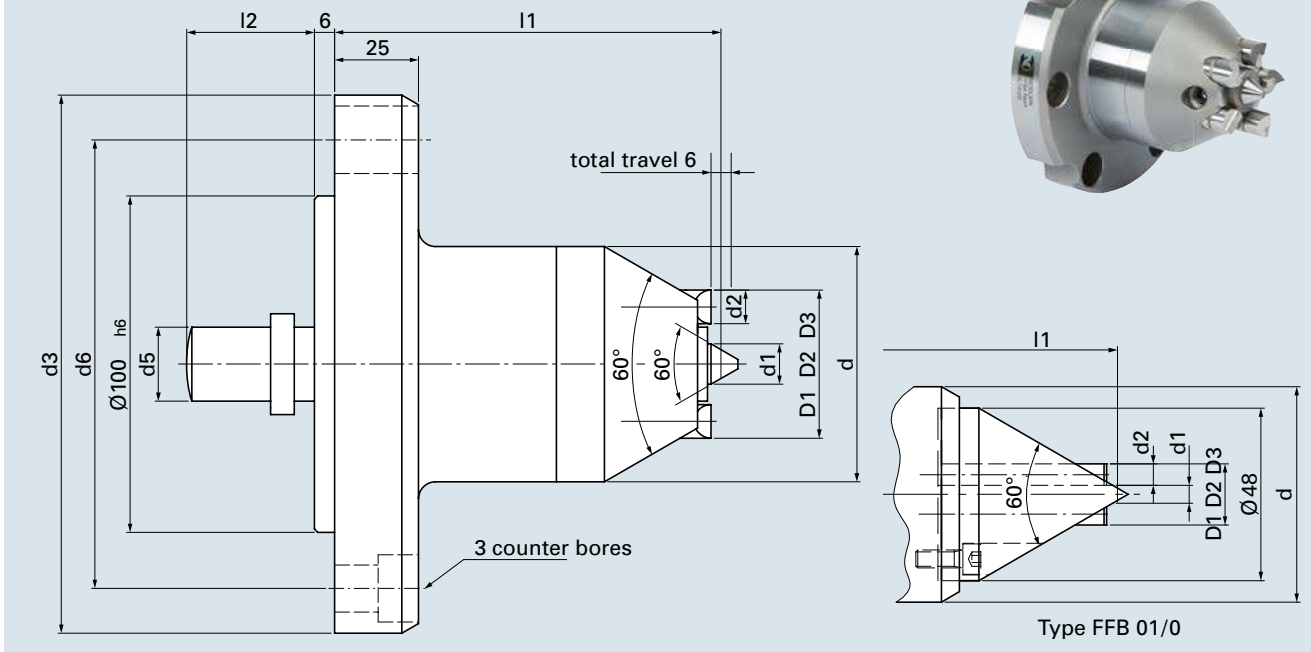
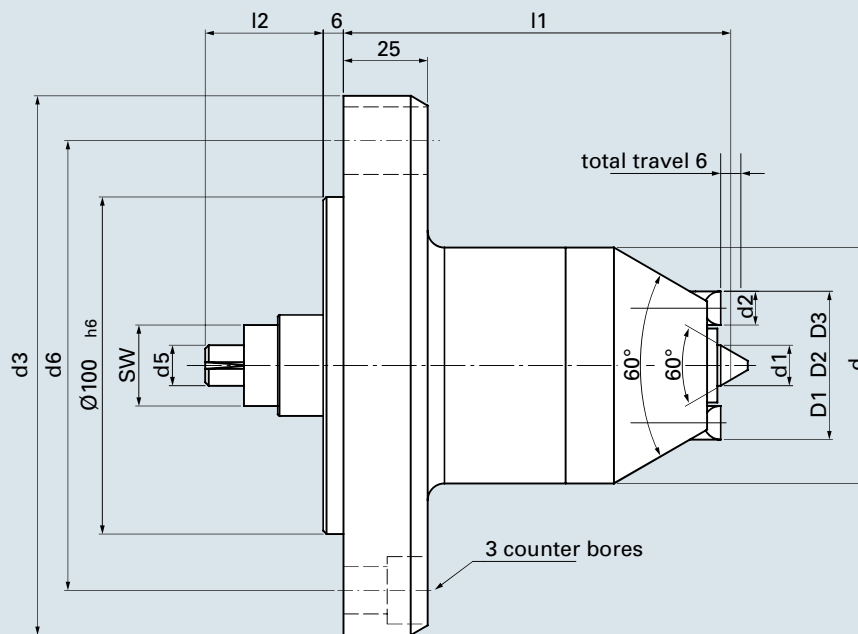| cat. no.	type	d	d1	center Ø	d2	d3	d5	d6	l1	l2	drive pin	fastening screw		clamping diameter		
												type	pcs	D1	D2	D3
73101	FFB 01	60	5	1 - 5	6	160	18	133.4	115	38	3	M 12	3	8	11	17
73112	FFB 0	60	3	1 - 3	8	160	18	133.4	115	38	3	M 12	3	6	11	19
73111	FFB 11	42	7.8	2 - 6.5	6	160	12	133.4	115	38	3	M 12	3	11	14	20
73102	FFB 1	48	9.8	4 - 8.5	8	160	18	133.4	115	38	3	M 12	3	13	18	26
73103	FFB 2	70	10	4 - 9	10	160	22	133.4	115	38	3	M 12	3	26	31	36
73104	FFB 3	70	12	6 - 11	10	160	22	133.4	115	38	3	M 12	3	34	39	44
73113	FFB 35	80	10	4 - 9	15	160	22	133.4	115	38	3	M 12	3	29	39	49
73105	FFB 4	90	16	10 - 15	15	160	25	133.4	115	38	5	M 12	3	39	49	59
73106	FFB 45	100	16	10 - 15	15	160	25	133.4	115	54	5	M 12	3	49	59	69
73107	FFB 5	132	16	10 - 15	15	160	25	133.4	115	54	5	M 12	3	69	84	99
73108	FFB 55	182	16	10 - 15	15	220	40	171.4	155	54	5	M 16	3	110	125	140
73109	FFB 6	220	16	10 - 15	15	250	40	210	171	54	5	M 20	3	140	155	170

● All face drivers are supplied without drive pins.
● Types FFB 01/0 are supplied with center body, all other types without center pin.

It is the purpose of an adjustable flange-adapter to provide stable junction to the spindel machine. We supply these flange adapters for various sizes of spindle noses in standard size (DIN 55028) or for spindle noses specific to machine-tool manufacturer. Thus face drivers of range FFB can be used all-purpose 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 enlisted 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 FFBH face driver

3 counter bores

cat. no.	type	d	d1	center Ø	d2	d3	SW	d5	d6	l1	l2	drive pin	fastening screw		clamping diameter		
													type	pcs	D1	D2	D3
63102	FFBH 1	70	9.8	4 - 8.5	8	160	24	12	133.4	115	35	3	M 12	3	13	18	26
63103	FFBH 2	70	10	4 - 9	10	160	24	12	133.4	115	35	3	M 12	3	26	31	36
63104	FFBH 3	70	12	6 - 11	10	160	24	12	133.4	115	35	3	M 12	3	34	39	44
63106	FFBH 4	90	16	10 - 15	15	160	34	12	133.4	132	35	5	M 12	3	39	49	59
63107	FFBH 45	100	16	10 - 15	15	160	34	12	133.4	132	35	5	M 12	3	49	59	69
63108	FFBH 5	132	16	10 - 15	20	160	34	12	133.4	149	35	5	M 12	3	69	84	99

● All face drivers are supplied without drive pins and without center pins.

Technical data – type FFBH hydraulic unit
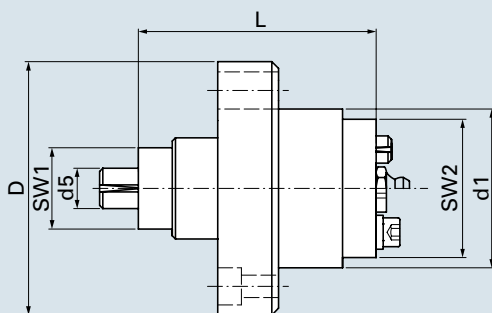
| cat. no.	type	SW1	d5	L	d1	SW2	D
63102HE	FFBH 1	24	12	70.5	47	41	75
63102HE	FFBH 2	24	12	70.5	47	41	75
63102HE	FFBH 3	24	12	70.5	47	41	75
63106HE	FFBH 4	34	12	70.5	65	59	93
63106HE	FFBH 45	34	12	70.5	65	59	93
63108HE	FFBH 5	34	12	70.5	87	81	131

The general explanatory notes for this face driver type FFBH can be obtained from the sheet "technical data – type FFB". For safe and smooth operation of face driver we recommend exchange of hydraulic unit after 1500 operating hours.

Furthermore, we offer the option for professional maintenance of the exchanged hydraulic units in our production plant.

FFB / FFBH-Face Drivers: Calculations

Force of clamping cylinder/ maximum chip cross section

Principle: the tailstock force pushes the work piece against the fixed center pin of the face driver. The drive pins are activated by the clamping cylinder mounted into the machine.
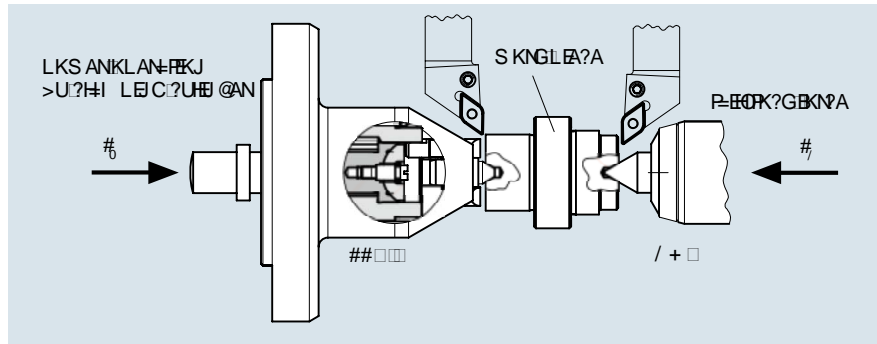
- **force of clamping cylinder F_S:**
  The force onto the face driver required for metal removing is calculated on the basis of the empirical formula:

$$F_S = [(q_{max} \times 1100 \times \frac{D}{d}) + 1300] \times m$$

F_S	[N]	force of clamping cylinder
q_{max}	[mm²]	maximum of chip cross section
D	[mm]	cutting diameter
d	[mm]	clamping diameter
m	[-]	material factor (see adjustment-chart below)

- **maximum chip cross sectio q_{max}:**
  At a given force of clamping cylinder, the maximum chip cross section is calculated as follows:

$$q_{max} = \frac{\frac{F_S}{m} - 1300}{1100 \times \frac{D}{d}}$$

- **tailstock force F_R:**
  In case of tooling against the face driver the tailstock force has to be approx. 20% more than the force of the clamping cylinder F_S.

In case of tooling against the tailstock, the tailstock should be approx. 40-50% higher than the force of the clamping cylinder, if not, then the chip cross section should be reduced by approx. 30%. (as there is an addition of force of clamping cylinder and cutting force).

Explanatory notes:

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:**

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

BS	[N/mm]	chisel load
F_S	[N]	force of clamping cylinder
n	[-]	number of drive pins
s	[mm]	chisel length

● **exemplification:**
turning with FFB 3 face driver, 3 drive pins respective length of chisel 7 mm, force of clamping cylinder 6300 N

$$\textit{chisel load} = \frac{6300\,N}{3 \times 7\,mm} = 300\,\frac{N}{mm}$$

FFB / FFBH-calculation example

Specific data of machine and work piece:
maximum force of clamping cylinder: 12000 N
material of work piece: 16MnCr5
diameter of work piece,
side of face driver: Ø 62 mm
tooling diameter: Ø 120 mm

Selection of face driver:
Face driver type FFB 4/clamping diameter
Ø 59 mm 5 drive pins each 7.5 mm chisel length

● **force of clamping cylinder F_s:**
In order to ensure sufficient entrainment (see chisel load of drive pins), a clamping cylinder force of approx. 11250 N is needed.

$$BS = \frac{F_S}{n \times s} \longrightarrow F_S = 300\,\frac{N}{mm} \times 5 \times 7,5\,mm = 11250\,N$$

Calculation of material factor m:
As per adjustment chart material factor: m (16MnCr5) = 1.2

● **maximum chip cross section q_{max}:**
The maximum chip cross section (at OD-Ø) is calculated as follows:

$$q_{max} = \frac{\frac{11250\,N}{1,2} - 1300}{1100 \times \frac{120\,mm}{59\,mm}} = 3,61\,mm^2$$

Explanatory notes:

The calculated clamping diameter refers to the extreme outer tooling diameter. In case of further tooling toward pivot of work piece, even larger chip cross sections can be achieved (formula), commensurate with turning diameter.