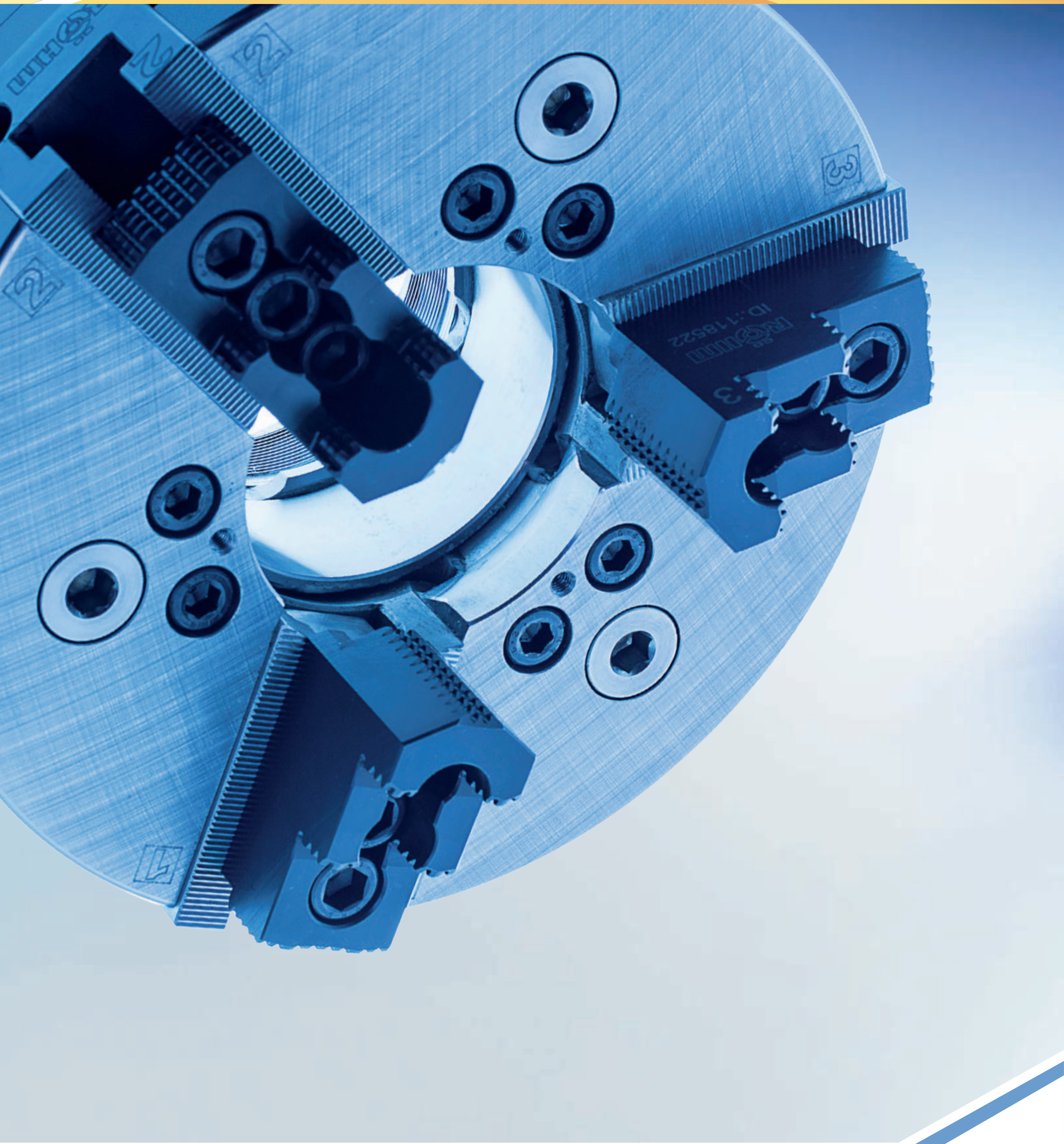
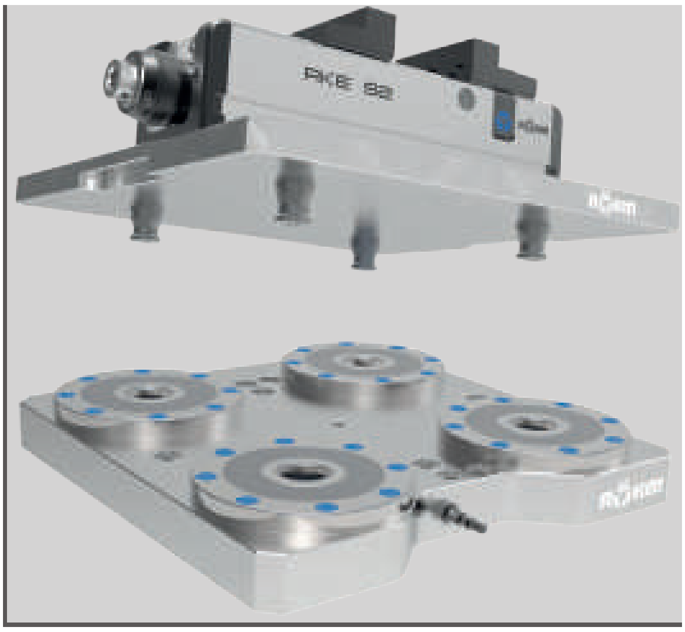


POWER CHUCKS
CYLINDERS / STEADY RESTS

EDITION 8.1

RÖHM
driven by technology

EASYLOCK zero point clamping system



Palletising systems such as the EASYLOCK zero point clamping system from RÖHM achieve a considerable productivity increase. This modular system meets the requirements of customer-specific solutions with the best-possible utilisation of machine capacity. Although the machine tool had to stop for the set-up time until now, the workpiece can now be clamped and positioned on the pallet outside the machine tool. The set-up time is now only limited to loading and unloading the pallet, which happens in seconds. If multiple manufacturing processes are necessary for machining, then the pallet including the workpiece can be used without zero point loss. Due to the robust and rust-resistant construction, EASYLOCK zero point clamping can be used throughout, starting with machining up to the measuring machines.

THE BENEFITS AT A GLANCE

INCREASED PRODUCTIVITY

- Free machine capacity through reduction of set-up time by up to 90%
- Very rapid change of workpiece and clamping fixtures on tilt-free clamping and positioning with long insert

HIGH PRECISION

- Repeat accurancy of < 0.005 mm thanks to precision balls
- Positive-locking self-inhibition unaffected by tensile and lateral forces

HIGHEST MODULARITY

- Modular base carrier design variants for maximum flexibility
- Flexible extension options

The pin system

HOW IT WORKS

With the RÖHM EASYLOCK zero point clamping system, the clamping pin is the interface between the machine table and the workpiece or fixture. The exact positioning guarantees secure clamping. At the same time the resulting machining forces are transferred via the clamping pin to the pressure cup. The high-precision pressure cups of the EASYLOCK system ensure an absolutely secure hold of the workpiece or fixture. The high locking and holding forces make the system suitable for all kinds of use.

Machining with EASYLOCK?

EASYLOCK is ideally suited to all machining processes like grinding, milling, drilling and measuring.

What is meant by holding force?

Holding force is the force at which the pallet still rests securely on the clamping system. This force must not be exceeded during machining.

What is meant by repeat accuracy?

The repeat accuracy gives the tolerance range for the recorded workpiece references when the workpiece is removed and subsequently reclamped. The repeat accuracy of the EASYLOCK system is around < 0.005 mm.

REDUCED SET-UP TIMES BY UP TO 90%

Without palletising system


Machine run-time

Set-up of the workpiece

With EASYLOCK zero point clamping system


Simultaneous set-up on the pallet

Machine run-time

Additional machine capacity

Pallet exchange

Power-operated clamping devices

To ensure safe operation of power-operated clamping devices, particularly of chucks, on heavy-duty lathes with high speeds certain criteria must be observed:

1. Whenmounting the power chuck and the clamping cylinder on the lathe, the following safety requirements must be met:

1.1 The machine spindle may only start when the clamping pressure has been built up in the actuating cylinder and the clamping has been carried out in the permissible working area.
1.2 Unclamping may only be possible when the machine spindle has completely stopped.
1.3 In case of a clamping energy failure, the workpiece must be firmly clamped until the spindle is completely stopped. (The Röhm safety cylindersmeet this requirement.)
1.4 In case of a current failure and upon return of the current supply the actual control position may not be changed.
1.5 In case of a clamping energy failure the machine spindle must be stopped by a signal.

2. The safety instructions given in the respective operation manual must be precisely followed.

3. After havingmounted the chuck and before starting the operation, the function of the chuck must be checked.

Two important points are:

3.1 **Clamping force**

The clamping force (±15%) stated for the clamping devicemust be reached atmax. actuating force/pressure.

3.2 **Stroke control**

A safety range must be provided for the stroke of the clamping piston in the front and rear end position. The machine spindle may only start after the clamping piston has crossed the safety range.

Only limit switches meeting the requirements for safety limit switches in accordance with VDE 0113/12.73 section 7.1.3 may be used for monitoring the clamping path.

4. If themax. speed of the lathe exceeds themax. speed of the clamping device or clamping cylinder, the machine must be equipped with a speed limitation device.
5. When the clamping device has been changed, the stroke control must be adjusted to the new condition.
6. When calculating the required clamping force formachining a workpiece, the centrifugal force of the clamping jaws must be considered.
7. A reliable operation of the power chuck can only be guaranteed when themaintenance instructions contained in the instruction manual are precisely followed.

In particular the following points must be observed:

7.1 For the lubrication only the lubricants recommended in the operation manual shall be used. (An unsuitable lubricant can reduce the clamping force by more than 50%).
7.2 The lubricationmust reach all surfaces to be lubricated.
(At the narrow fits of themounting parts a high pressure is required for pressing-in the lubricant. For those purpose a pressure gun must be used).
7.3 In order to distribute the grease evenly, actuate the clamping piston several times to its end positions, repeat the lubrication and then check the clamping force.

Power-operated clamping devices

8. Before restarting a serial machining operation and in between the maintenance intervals the clamping force should be checked by means of a load cell. ”Only regular checks ensure optimum reliability”.

9. It is recommended to move the clamping piston several times to its end positions after 500 clamping strokes at the latest. (In this way any lubricant pushed away will be returned to the pressure surfaces. The pressure force is thus maintained for a longer period of time.)

10. When using special clamping jaws the following instructions must be observed:

  10.1 The clamping jaws should be designed in such a way that their weight and height is as low as possible. The clamping point should as possible be as close to the frontside of the chuck. (Clamping points at a larger distancemay cause a higher surface pressure in the jaw guiding mechanism and may thus reduce the clamping force considerably.)

  10.2 In case the special jaws are for constructional reasons wider and/or higher than the step jaws assigned to the clamping device, the resulting higher centrifugal forcesmust be considered when calculating the required clamping pressure and the rated speed.

For calculating the rated speed for a certainmachining task the following formula is to be applied:

$$n_{max.} = \sqrt{\frac{F_{spo} - F_{spz}}{m \cdot r_c \cdot a}} \cdot \frac{30}{\pi}$$

Fspo = initial clamping force with the chuck at standstill (N)
F spz = required clamping force with the chuck at standstill for a certain machining task (N)
n max. = max. admissible speed (min 1)
m = mass of the entire jaw unit (kg) (base and top jaw)
rc = center of gravity radius of the entire jaw unit (m)
a = number of jaws

  10.3 Welded jaws should not be used. If required, the welding seamsmust be checked as to their centrifugal and clamping force capacity.

  10.4 Themounting screwsmust be arranged in such a way that the highest possible useful moment is reached.

11. Themax. speedmay only be used atmax. applied actuating force and with properly functioning chucks.
12. In case of high speeds the chucks may only be used below a protective hood with sufficiently large dimensions.
13. For power chucks with a jaw quick-change feature internal to the chuck a safety device is required which revents the machine spindle from rotating when the clamping jaws are released.
14. After a collision the clamping devicemust be checked for fissures before being used again.
15. Worn or damaged jaw fixing bolts must be replaced. Only use bolts of quality 12.9.

Power-operated clamping devices

Determining the required gripping force of a power chuck and the corresponding operating power

I) Calculating the gripping force F_{spz} (without considering the effects of angular speed) required for the job (machining operation).

II) Determining the chuck's initial gripping force F_{spo} with spindle stationary (taking into account the centrifugal forces of the jaws).

III) Determining the operating power required to provide the initial gripping force F_{spo}.

Definition of gripping force

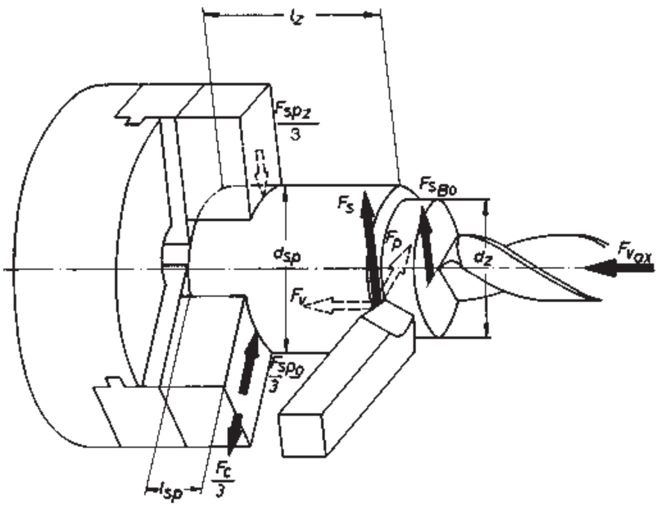
Progress in machining techniques has made it necessary for safety reasons not only to determine the **necessary gripping force** but also to know and consider its change with increasing angular speed.

The forces and moments generated by the machining operation must be properly absorbed and transmitted by the chuck. The chuck accomplishes this task mainly by **producing a gripping force:**

This gripping force is the arithmetic sum of the radial forces exerted on the workpiece by the jaws. The initial gripping force F_{spo} produced when the chuck is stationary can be measured at any time and is therefore control-lable. (Denoted by 'total gripping force' in the gripping force / operating power diagrams).

The figures given in the catalogue refer only to chucks that are fully and correctly lubricated and in a properly serviced condition. Many factors act on the clamping point during any machining operation. A precise specification of these factors in the form of universally applicable tables is not possible in this context.

In most cases it is sufficient in practice to use a simplified formula containing the fundamental determining factors (crude determination).



F_s	= Main cutting force on radially applied tool
F_{sBo}	= Cutting force on axially applied tool (drill)
F_{vax}	= Feeding force on axially applied tool
F_{spz}	= Required total gripping force (without considering the effects of angular speed
F_c	= Centrifugal force of the jaws = Loss of gripping force (see gripping force/speed diagram of each chuck Typee
F_{spo}	= (Total) initial gripping force with the chuck stationary
l_z	= Distance betwwen machining and clamping points
d_z	= Machining diameter
d_{sp}	= Chucking diameter
l_{sp}	= Chucking length

Power-operated clamping devices

A Turning

I) Calculating the required gripping force F_{spz}

The gripping force required depends on the Type of work to be performed.
The cutting force on the turning tool has three basic components:
Main cutting force Fs - feeding force Fv - passive force (static force) Fp.
During turning, the feeding force Fv and the passive force (static force) Fp are mainly absorbed by the jaw faces in contact with the seated workpiece. The remaining main cutting force produces a moment (Fs x dz/2) which must be absorbed by the chuck and transmitted by friction at the clamping point.
The moment produced by the main cutting force during turning determines the gripping force required:

$$\boxed{F_{spz} = \frac{F_s \cdot S_z}{\mu sp} \cdot \frac{d_z}{d_{sp}}} \quad (1)$$

where:
F_{spz} = gripping force required for a specific job with the chuck stationary
F_s = main cutting force

chucking ratio $\frac{d_z}{d_{sp}} = \frac{\text{machining diameter}}{\text{chucking}}$

μsp = cucking coefficient (friction between jaw and workpiece)

S_z = safety factor

The feeding force and passive components, Fv and Fp, are not included in this formula. If necessary for extreme conditions, they are included in the safety factor Sz.

The **main cutting force Fs** is calculated from feed, depth of cut and material.

$$\boxed{F_s = s \cdot t \cdot k_c} \quad (2)$$

where:
s = feed, mm/rev.
t = depth of cut, mm
k_c = specific cutting force, kN/mm2

The product s x t (feed.depth of cut) = chip cross-section (can be obtained from Table 1).

Determining the chip cross section [mm2] Table 1

Feed (mm)	Depth of cut t (mm)									
	2	3	4	5	6	7	8	9	10	12
0,16				0,8	0,96	1,12	1,28	1,44	1,6	1,92
0,20			0,8	1,0	1,2	1,4	1,6	1,8	2,0	2,4
0,25		0,75	1,0	1,25	1,5	1,75	2,0	2,25	2,5	3,0
0,32	0,64	0,96	1,28	1,6	1,96	2,24	2,56	2,88	3,2	3,84
0,40	0,8	1,2	1,6	2,0	2,4	2,8	3,2	3,6	4,0	4,8
0,50	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	6,0
0,63	1,26	1,89	2,52	3,15	3,78	4,41	5,04	5,67	6,3	7,56
0,80	1,6	2,4	3,2	4,0	4,8	5,6	6,4	7,2	8,0	9,6
1,0	2,0	3,0	4,0	5,0	6,0	7,0	8,0	9,0	10,0	12,0
1,25	2,5	3,75	5,0	6,25	7,5	8,75	10,0	11,25	12,5	15,0
1,60	3,2	4,8	6,4	8,0	9,6	11,2	12,8	14,4	16,0	19,2

The specific cutting force kc as a function of feed can be obtained from Table 2.

Power-operated clamping devices

Specific cutting force k_C [kN/mm^2] Table 2

Specific cutting force k_c at feed s and a setting angle of 45°								
Material		Strength B kN/mm²	Feed s [mm]					
			0,16	0,25	0,4	0,63	1,0	1,6
Steels	St 42	sino 0,50	2,60	2,40	2,20	2,05	1,90	1,80
	St 50	0,52	3,50	3,10	2,75	2,45	2,15	1,95
	St 60	0,62	3,05	2,80	2,60	2,40	2,20	2,05
	C 45	0,67						
	C 60	0,77						
	St 70	0,72	4,35	3,80	3,30	2,90	2,50	2,20
	18 CrNi 6	0,63						
	42 CrMo 4	0,73	4,35	3,90	3,45	3,10	2,75	2,45
	16MnCr5	0,77	3,75	3,30	2,95	2,60	2,30	2,05
	Mn, CrNi	0,85-1,00	3,70	3,40	3,10	2,80	2,55	2,35
	Mn-austentic st.		5,40	4,90	4,40	4,00	3,60	3,30
Cast iron materials	St 42	0,30-0,50	2,30	2,10	1,95	1,80	1,70	1,60
	St 42	0,50-0,70	2,55	2,35	2,20	2,05	1,90	1,80
	St 42	HB 2,00	1,50	1,35	1,20	1,10	1,00	0,90
	St 42	HB 2,00-2,50	2,05	1,80	1,60	1,45	1,30	1,15
NE-ferrous metals	Cast bronze		2,55	2,35	2,20	2,05	1,90	1,80
	Gunmetal		1,10	1,00	0,90	0,80	0,70	0,65
	Brass	HB 0,80-1,20	1,20	1,10	1,00	0,90	0,80	0,75
	Cast alumin.	0,30-0,422,60	1,10	1,00	0,90	0,80	0,70	0,65

The chucking ratio $\frac{d_z}{d_{sp}}$ can either be determined from the specified working conditions or obtaines from Table 3.

Chucking ratio Table 3

	Depth of cut-Ø d_z [mm]														
Feed-Ø d_{sp} (mm)	**20**	**40**	**60**	**80**	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**500**	**600**	**700**	**800**
20	1,0	2,0	3,0	4,0											
40	0,5	1,0	1,5	2,0	2,5	3,8									
60	0,33	0,67	1,0	1,3	1,7	2,5	3,3	4,2							
80	0,25	0,5	0,75	1,0	1,3	1,9	2,5	3,1	3,8	4,4					
100	0,2	0,4	0,6	0,8	1,0	1,5	2,0	2,5	3,0	3,5	4,0				
150	0,13	0,27	0,4	0,53	0,67	1,0	1,3	1,7	2,0	1,3	2,7	3,3	4,0		
200		0,2	0,3	0,4	0,5	0,75	1,0	1,3	1,5	1,8	2,0	2,5	3,0	3,5	4,0
250		0,16	0,24	0,32	0,4	0,6	0,8	1,0	1,2	1,4	1,6	2,0	2,4	2,8	3,2
300			0,2	0,27	033	0,5	0,67	0,83	1,0	1,2	1,3	1,7	2,0	2,3	2,7
350			0,17	0,23	0,29	0,43	0,57	0,72	0,86	1,0	1,1	1,4	1,7	2,0	2,3
400				0,2	0,25	0,38	0,5	0,62	0,75	0,87	1,0	1,3	1,5	1,8	2,0
500				0,16	0,2	0,3	0,4	0,5	0,6	0,7	0,8	1,0	1,2	1,4	1,6
600					0,17	0,25	0,33	0,42	0,5	0,58	0,67	0,83	1,0	1,2	1,3
700						0,21	0,29	0,36	0,43	0,5	0,57	0,71	0,86	1,0	1,1
800						0,19	0,25	0,31	0,37	0,44	0,5	0,62	0,75	0,87	1,0

The chucking coefficient µsp accounts for the friction existing between the gripping surface of the jaws and the workpiece in the zone of contact. It is influenced by
- the pattern of the gripping surfaces of the jaws
- the surface quality of the workpiece
- the material.

The chucking coefficient can be obtained from Table 4.

Note:
Forces aremore efficiently transmitted by a snug fit than by edge or saddle-Typee seats.

Chucking coefficient µsp for steel parts Table 4

Surface workpiece	**Smooth**	**Gripping surface of jaws Siamond style**	**Serrated**
smooth machine finish ground	0,07	0,12	0,20
rough to medium machine finish	0,10	0,20	0,35
unmachined	0,15	0,30	0,45
Corrections:	Al, alloy = 0,95 Brass = 0,90 Gray cast iron = 0,80		

Power-operated clamping devices

Safety factor S_Z

The magnitude of the safety factor Sz depends on the degree of accuracy with which the influencing parameters, such as load, chucking coefficient etc., can be determined and on the degree of safety required.
It should be $\geqq$ 2 wherever possible.

Safety factor S_Z (approximate)
Table 5

Influencing parameters	**Safety factor S_Z** New chucks	 Older chucks **serviced regularly**
a) overhung chucking $l_z \leq d_{sp}$ b) no radial support from tailstock c) tool applied radially d) no axial seating of workpiece against jaws e) ratio: chucking length to distance between cutting and clamping points $\frac{l_z}{l_{sp}} \leq 3$	$\geqq$ 2.0	$\geqq$ 2.4
$\frac{l_z}{l_{sp}} \geq 3 \leq 6$	$\geqq$ 4.0*	$\geqq$ 4.8*

* Lower safety factors can be applied if the workpiece is supported in the tailstock or axially seated against the jaws.

Superimpositions of alternating forces are neglected because their influence is very small in comparison with the total gripping force required.

The safety factors so determined are applicable if the following requirements are met:
Chuck in perfect condition, no damage, adequately lubricated (operating instructions followed to the letter).

No allowance has been made for the following loads acting on the chuck:
a) Unbalanced forces and moments produced by unsymmetrical workpieces
b) Weight of workpiece

For a precise calculation of the gripping force required for a given job, use VDI Recommendation 3106. Available from:
Beuth-Verlag GmbH, Kamekestraße 8, D-50672 Köln, Germany.

II)
At high speeds, the gripping force of the rotating lathe chuck is greatly influenced by the centrifugal forces of the jaws. These forces must be taken into account when determining the initial gripping force Fspo

The applicable formula is:

$$\boxed{F_{SPO} = S_{SP} \times (F_{SPZ} \pm F_C)}$$

The + sign applies to external gripping.
The - sign applies to internal gripping.

Power-operated clamping devices

Where:

F_c = experimentally determined total centrifugal force of the chuck jaws obtained from the gripping forcespeed diagram. The gripping force curves refer to the hard, stepped jaws of the chuck.
S_{sp} = safety factor for the initial gripping force in accordance with VDI Recommendation 3106 ≥ 1,5

If extremely heavy top jaws (special jaws) are used, the centrifugal forces Fc can be calculated using VDI Recommendation 3106.

III)
The operating power bears a given relationship to the total gripping force, depending on the Typee of chuck employed. The values for the operating power can be obtained from the gripping force/operating power diagram.

In special cases where the centrifugal forces of the jaws are very high in comparison with the initial gripping force and power chucks with standard top jaws cannot be used, certain operations can be done with aluminium top jaws of special strength.

Calculation (example)
Having:

1. Workpiece and machining data:

Material		= C 45
Chucking diameter: (roughed)	d_{sp}	= 60 mm Ø
Machining diameter:	d_z	= 20 mm Ø
Feed:	s	= 0,5 mm
Depth of cut:	t	= 5 mm
Distance cutting/clamp. points:	l_z	= 50 mm
Speed:	n	= 3000 min^{-1}

2. Chuck data:
KFD 200 power chuck
Jaws with diamond style gripping surface Condition of chuck: new (no special influencing parameters)
External gripping with UB-538-04 top jaws at mid-position of gripping range.

Find:
1) Required gripping force F_{spz} = total gripping force required (without the effect of angular speed

2) Initial gripping force F_{spo} = (total) initial gripping force with the chuck stationary

3) Operating power

Power-operated clamping devices

Solution

1) Main cutting force
(Formula 2)

$s \cdot t$ **= from Table 1**
k_C **= from Table 2**

$$F_s = s \cdot t \cdot k_C$$
$$= 0{,}5 \cdot 5 \cdot 2{,}50 = 6{,}25 \text{ kN}$$

2) Required gripping force
(Formula 1)

$$F_{spz} = \frac{F_s \cdot S_z}{\mu sp} \cdot \frac{d_z}{d_{sp}}$$

$$= \frac{6{,}25 \text{ kN} \cdot 2{,}0 \cdot 0{,}33}{0{,}20} \approx 21{,}00 \text{ kN}$$

Safety factor S_z = from Table 5
Chucking coeff. μsp = from Table 4

Chucking ratio $\frac{d_z}{d_{sp}}$ = from Table 3

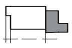
3) Obtain the loss of the gripping force from the gripping force speed diagram for KFD 200. At a speed of 3000 rpm: Fc = 18 kN. See diagram below.

4) Initial gripping force $F_{spo} = S_{sp} \cdot (F_{spz} + F_c)$ (Formula 3) = 1,5 · (21 kN + 18 kN) = 58,50 kN
S_{sp} determined in accordance with VDI Recommendation 3106 Fc obtained from diagram below

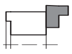
5) Obtain operating power from ”gripping force/operating power” diagram for KFD 200. For a gripping force of 58,50 kN the operating power is ~ 29,00 kN (next page)

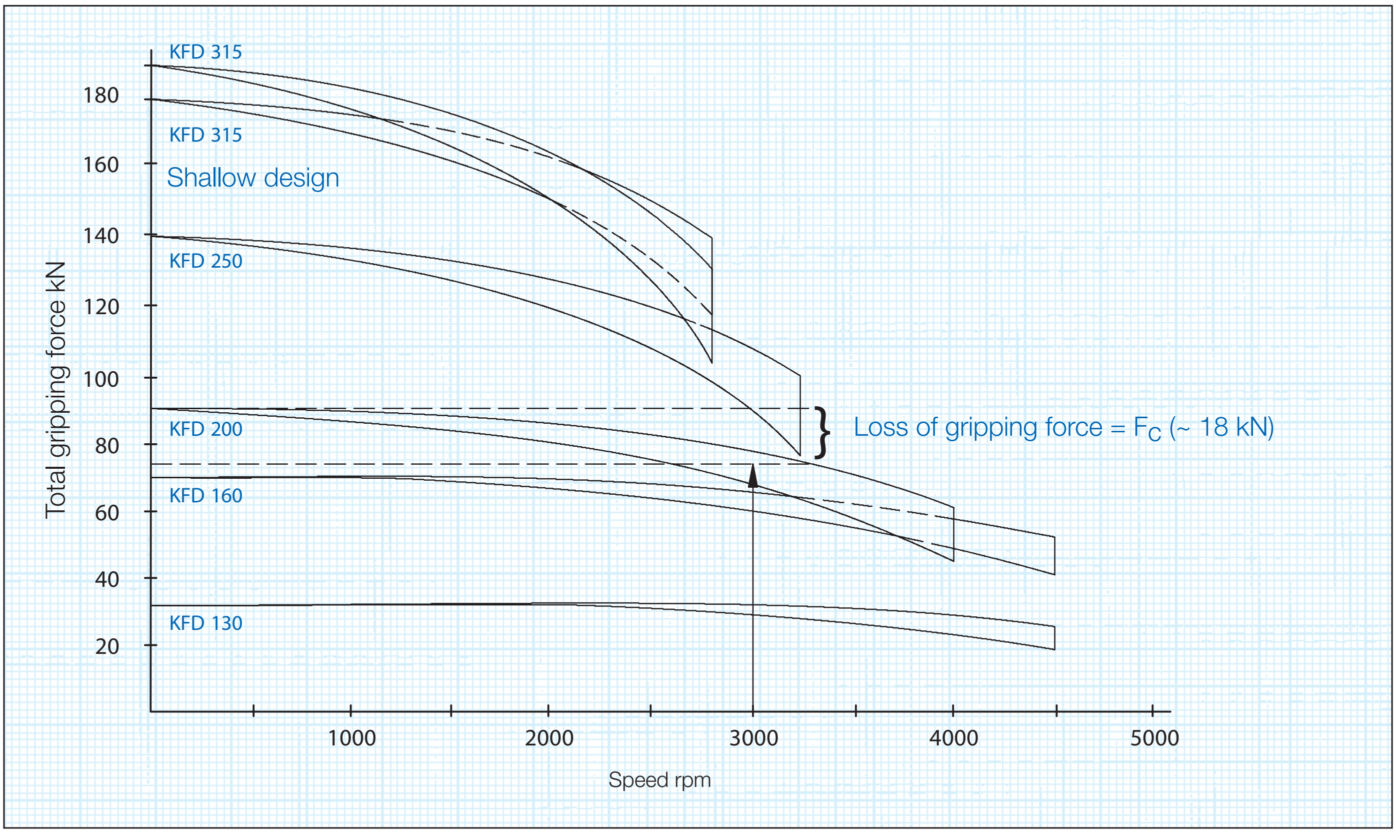
Gripping force/speed diagram for KFD 3-jaw chucks

upper curve:
min. centrifugal
force of top jaw



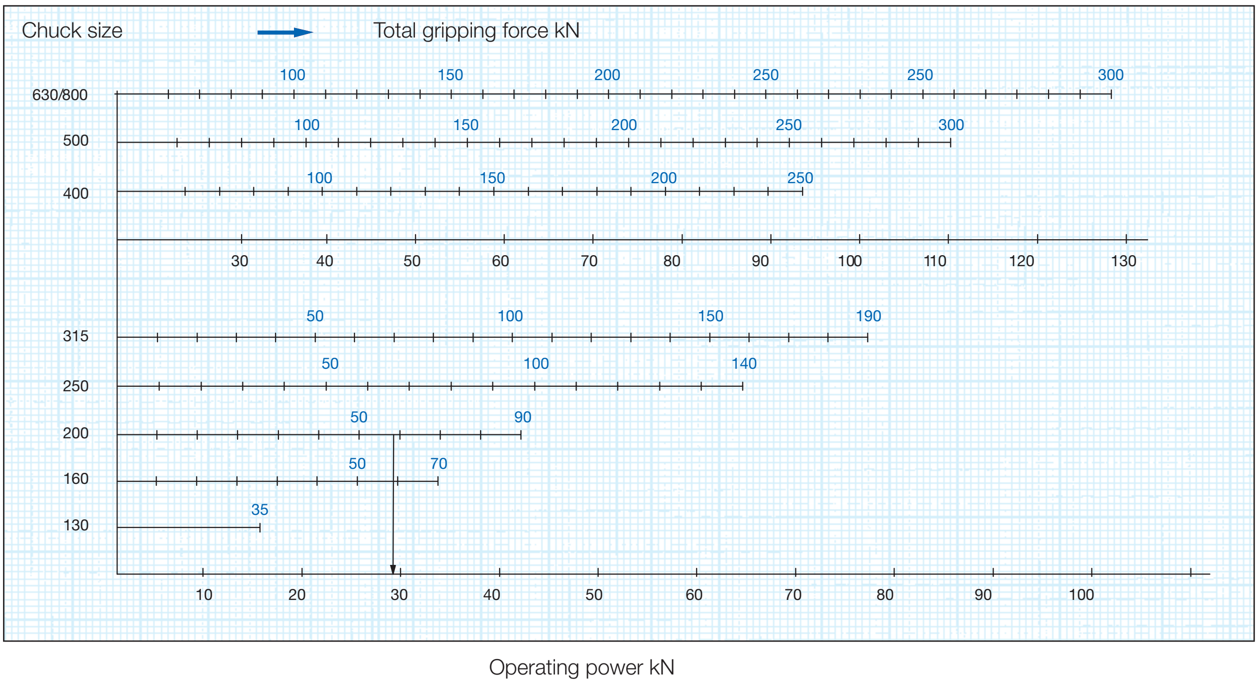
lower curve:
max. centrifugal
force of top jaw





Power-operated clamping devices

Gripping force/operating power diagram KFD 3-jaw chuck



B. Drilling

1. Drilling in solid material (Top lip twist drill, point angle ≧120°)

I)

The gripping force required is determined by the Typee of work to be performed. The calculation described below applies to freely chucked work, i. e. workpieces which are not axially seated against the jaws. In this situation the components FsBo (cutting force) and Fvax (feeding force) acting on the workpiece give the resultant FR to determine the gripping force.

The cutting force FsBo can be calculated from

$$\boxed{F_{sBo} = s \cdot t \cdot k_c} \quad (4)$$

where:

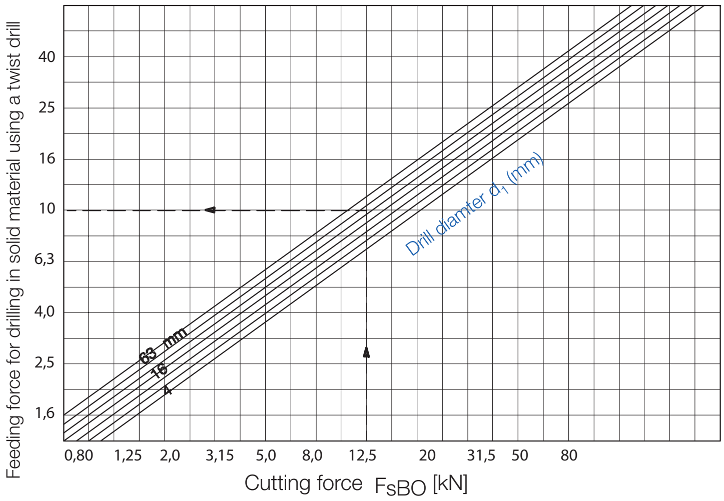
s = feed, mm/rev.

t = depth of cut, mm = $\frac{\text{drill diameter}}{2}$

kc = specific cutting force kN/mm^2

The feeding force Fvax bears a given relationship to thecutting force and can be directly obtained from Table 6.

Feeding force Fvax
Table 6



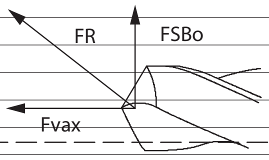
Power-operated clamping devices

The two components F_{SBo} and F_{vax} give the resultant force F_R

$$F_R = \sqrt{F_{SBo}^2 + F_{vax}^2}$$

The amount of the resultant force F_R can be obtained directly from Table 7. Intermediate values will have to be determined by interpolation.

Resultant force F_R KN
Table 7



Cutting force F_{SBo} [kN]	1,2	1,4	1,6	1,8	2,0	2,5	3,0	3,5	4,0	4,5	5,0	6,0	7,0	8,0	9,0	10,0	12,0	14,0	16,0	18,0	20,0	25,0	30,0	35,0	40,0
50																					53,9	55,9	58,3	61,0	64,0
45																				48,5	49,2	51,5	54,1	57,0	
40																			43,1	43,9	44,7	47,2	50,0	53,2	
35																		37,7	38,5	39,4	40,3	43,0	46,1		
30																	32,3	33,1	34,0	35,0	36,1	39,1	42,4		
25																26,9	27,7	28,7	29,7	30,8	32,0	35,4			
20															21,9	22,4	23,3	24,4	25,6	26,9	28,3				
15												16,2	16,6	17,0	17,5	18,0	19,2	20,5	21,9						
10												11,7	11,2	12,8	13,5	14,1	15,6	17,2							
9,0											10,3	10,8	11,4	12,0	12,7	13,5									
8,0											9,4	10,0	10,6	11,3	12,0	12,8									
7,0									8,1	8,3	8,6	9,2	9,9	10,6											
6,0								6,9	7,2	7,5	7,8	8,5	9,2	10,0											
5,0							5,8	6,1	6,4	6,7	7,0	7,8													
4,5							5,4	5,7	6,0	6,4	6,7	7,5													
4,0							5,0	5,3	5,7	6,0	6,4	7,2													
3,5						4,3	4,6	4,9	5,3	5,7	6,1														
3,0						3,9	4,2	4,6	5,0	5,4	5,8														
2,5				3,1	3,2	3,5	3,9	4,3	4,7	5,1															
2,0			2,6	2,7	2,8	3,2	3,6	4,0																	
1,8		2,3	2,4	2,5	2,7	3,1	3,5																		
1,6	2,0	2,1	2,3	2,4	2,6	3,0	3,4																		
1,4	1,8	2,0	2,1	2,3	2,4	2,9																			
1,2	1,7	1,8	2,0	2,2	2,3	2,8																			
1,0	1,6	1,7	1,9	2,1	2,2																				
0,8	1,4	1,6	1,8	2,0	2,2																				

Feeding force F_{vax} [kN]

Place resultant force F_R for drilling in solid material in the known formula for determining the required gripping force Fspz:

$$F_{spz} = \frac{F_R \cdot S_z}{\mu sp} \cdot \frac{d_z}{d_{sp}}$$

where:

F_{spz} = gripping force required for a given job with the chuck stationary.
F_R = resultant force of cutting force and feeding force

Chucking ratio $\frac{d_z}{d_{sp}} = \frac{\text{cutting dia.}}{\text{chucking dia}}$ where $d_z = \frac{\text{drill dia.}}{2}$

μsp = chucking coefficient (friction between jaw and workiece)
S_z = safety factor

II and III

Continue the calculation - from determination of the initial gripping force Fspo to determination of operating power and the pressure required - exactly as described in Section A) Turning, II) and III).

Power-operated clamping devices

Calculation (example):

Having:

1. Workpiece and machining data.

Material = C 45
Chucking dia. d_{sp} (roughed) = 60 mm
Drill dia. (in solid mat.) = 30 mm
Feed s = 0,3 mm
Deepth of cut t = 15 mm
Speed n = 200 min^{-1}

2. Chuck data

Power chuck KFD 200
Jaws with diamond style gripping surface
External gripping with UB 538-04 top jaws at mid position of gripping range
Chuck in new condition (no special influencing parameters)

Find:

1. Required gripping force F_{spz}
2. Initial gripping force F_{spo}
3. Operating power

Solution:

1. Cutting force (Formula 4)

$F_{sBo} = s \cdot t \cdot kc = 0{,}3 \cdot 15 \cdot 2{,}70 = 12{,}10$ kN
$s \cdot t$ from Table 1 (or calculated)
k_c from Table 2

2. Required gripping force

$$F_{spz} = \frac{F_R \cdot S_Z}{\mu sp} \cdot \frac{d_Z}{d_{sp}} = \frac{15{,}70 \cdot 2{,}0}{0{,}2} \cdot 0{,}25 = 39{,}25 \text{ kN}$$

Obtain resultant force F_R from Table 7 (after first obtaining F

Chucking ratio $\frac{d_z}{d_{sp}}$ from Table 3 (or calculated).

3. Check if any effective centrifugal forces act on the jaws at a speed of n = 200 min-1.
As this is not the case in this example, we have:

4. Initial gripping force $F_{spo} = S_{sp} . F_{spz}$ $= 1{,}5 \cdot 39{,}25$ kN
Ssp from VDI recommendation 3106 = 59,00 kN

5. Obtain operating power from the ”gripping force/operating power” diagram for KFD 200.
For a gripping force of 59,00 kN the operating power is 29 kN

6. For boring (using a boring cutter) the calculation described under ”A. Turning” applies analogously.

The headquarters: our main plant in Sontheim/Brenz

The RÖHM main plant is located in Sontheim/Brenz. In this ultra-modern production facility comprising 41,000 m² optimum conditions have been achieved in order to solve the extensive range of discerning construction and production tasks making the company even better, faster and more efficient in the future.

Sontheim/Brenz

Sontheim I All national and international activities are planned and coordinated at the administrative headquarters in Sontheim. Thanks to the excellent infrastructure and transport routes, this location is ideal for a company relying on perfect product quality as well as maximum flexibility. Furthermore, the region around Sontheim offers another key basis for the success of our company: it is rich in quality awareness and motivated employees with the result that we are ideally prepared for the challenges of the future. The main plant uniquely unites mass production, serial production and customised individual production under a single roof.

Key locations for the company: Dillingen and St. Georgen

Such strong growth on the part of the RÖHM Group is also obviously associated with higher requirements on development and production capacities. The demands of today and tomorrow can be complied with the two facilities in Dillingen and St. Georgen.


Dillingen/Danube


St. Georgen

Plant Dillingen/Danube | This branch plant in Dillingen was put into operation by the RÖHM Group as early as 1953. Thanks to extremely positive development, the plant is subject to constant expansion and modernisation. For this reason, new modern production facilities were built in 1982 and 1991. In 2007 RÖHM built a new production hall for two portal turning and milling machines. This enables machining of workpieces up to 4 metres in length which will secure a leading market position for RÖHM in the future. More than 300 employees are primarily involved in engineering and manufacturing lathechucks, machine vices and special clamping equipment for turning and milling machinery as well as for machining centres.

Engineering and sales department St. Georgen | Apart from standard mandrels, tailor-made solutions for a wide variety of requirements are also manufactured here in this small but accomplished high-tech forge. RÖHM retains mechanical or power-operated mandrels, sliding jaw mandrels and hydraulic mandrels for its customers for tensioning workpieces in drill holes or interior contours.