HAINBUCH

Installation manual

EN

Jaw module

Table of contents

»Translation of original installation manual«

1 General

1.1 Information about this manual

This manual enables safe and efficient handling of the clamping device.

The manual is a component of the clamping device and must be kept in the immediate vicinity of the clamping device where it is accessible for personnel at all times. Personnel must have carefully read and understood this manual prior to starting all tasks. The basic prerequisite for safe work is compliance with all the safety instructions and handling instructions in this manual.

Illustrations in this manual are provided for a basic understanding and may deviate from the actual model of the clamping device.

It is assumed that the reader is familiar with standard procedures, such as cleaning the mounting surfaces.

1.2 Explanation of symbols

Safety instructions

Safety instructions are indicated by symbols in this operating manual. The safety instructions are introduced by signal words that express the scope of the hazard.

The safety instructions must be strictly adhered to. You must act prudently to prevent accidents, personal injury, and material damage.

DANGER

… indicates an imminent dangerous situation than can result in death or serious injury if it is not avoided.

WARNING

… indicates a possible dangerous situation that can result in death or serious injury if it is not avoided.

CAUTION

… indicates a possible dangerous situation that can result in minor or light injury if it es not avoided.

NOTE

… indicates a possible dangerous situation that can result in material damage if it is not avoided.

Tips and recommendations

… indicates useful tips and recommendations, as well as information for efficient and trouble-free operation.

1.3 Limitations of liability

All information and instructions in this operating manual have been provided under due consideration of applicable standards and regulations, the current state of technology, as well as our many years of experience.

The manufacturer assumes no liability for damage due to:

- Failure to follow the instructions in the manual
- Non-intended use
- Deployment of untrained personnel
- Unauthorized conversions
- Technical changes
- Use of non-approved spare parts

The actual scope of delivery can vary from the explanations and graphic representations provided in this manual in the case of special versions, if supplemental order options are desired, or on the basis of the latest technical changes.

The agreed obligations in the delivery contract, the general terms and conditions, as well as delivery conditions of the manufacturer, and the statutory regulations valid at the time the contract was concluded, apply.

1.4 Balance quality

CAUTION!

Our clamping devices are balanced with balance quality G = 16, in one level n = 1.

The data on the rotation balance refers to rotationally symmetrical workpieces.

The clamping of not rotationally symmetrical workpieces may not be clamped and/or only be clamped after consultation with the manufacturer.

Balancing bolts and balancing weights at the clamping devices may not be removed / disassembled!

1.5 Max. RPM

CAUTION!

The maximum permissible speed is marked on the product.

By the combination of a clamping device and an add on clamping device a reduction of the maximum permissible speed may be necessary.

- Of all RPMs of the groups specified, the **lowest given RPM** must always be used.

Note that the clamping force is influenced by the centrifugal force of the clamping elements.

- If necessary, adjust the machining force!

1.6 Copyright

1.7 Scope of delivery

All tools and accessories that are not included in the scope of delivery are marked as optional.

In scope of delivery:

- 1 Jaw module

Optionally the scope of delivery includes:

- Top jaws
- Soft jaws

1.8 Spare parts

WARNING!

Safety risk if the wrong spare parts are used!

Incorrect or defective spare parts can cause damage, malfunction, or total failure; they can also impair safety.

- Only use manufacturer's original spare parts.

Only purchase spare parts from authorized dealers or direct from the manufacturer. Addresses are in the appendix.

1.9 Warranty terms

The warranty terms are included in the manufacturer's terms and conditions.

2 Safety

This section provides an overview o fall the important safety aspects for optimal protection of personnel, as well as for safe and trouble-free operation.

2.1 Responsibility of the customer

The product is used in industrial applications. Consequently the owner of the product is subject to legal industrial safety obligations.

In addition to the safety instruction in this manual, generally valid safety and accident protection guidelines, and environmental protection guidelines as well as the machines' manual must be adhered to and complied with for the area of implementation of the device.

Note in particular that the status scans of the machine must be adjusted to the respective product.

DANGER!

Risk of injury due to thrown out parts!

Incorrect machine settings may lead to the throwing out of parts.

- The status scans the machine must be set to the respective clamping device.
- Regularly check the status scans of the machine, see chapter »Maintenance Schedule«. If the end position can not be reached the product may no longer be used.
- Observe the operating instructions of the machine.

WARNING!

Risk of injury!

Declining operating force, for example by declining energy supply, may cause serious personal injury.

- The product may be used only on machines where it is ensured, that during use, the operating force does not drop.

2.2 Personnel requirements

WARNING!

Danger of injury due to insufficient qualification!

Improper handling of the clamping device can cause serious injury or material damage.

- Only have activities performed by personnel who are qualified to perform these activities.

The following qualifications are cited in the operating manual for the various activity areas.

- **Specialized personnel**
  are personnel who due to their specialized training, skills, and experience, as well as knowledge of the applicable regulations, are capable of executing the tasks assigned to them and of recognizing and avoiding possible hazards on their own.
- **Hydraulic specialist**
  The hydraulic specialist has been trained for the particular task area in which he is active and is familiar with the relevant standards and regulations. Due to his specialized training and experience the hydraulic specialist can perform tasks on hydraulic equipment and recognize and avoid possible dangers on his own.
- **Electric specialist**
  The electric specialist has been trained for the particular task area in which he is active and is familiar with the relevant standards and regulations.
  Due to his specialized training and experience the electric specialist can perform tasks on electric equipment and recognize and avoid possible dangers on his own.

Only persons from whom it can be expected that they reliably execute their work are considered as personnel. Persons whose capability to react is impaired, for instance through drugs, alcohol, or medication, are not approved.

- Comply with age-specific and job-specific regulations that are applicable at the installation site when selecting personnel.

2.3 Intended use

The clamping device is designed for installation in a machine tool according to CE compliant. Within the machine tool the clamping device is designed exclusively for O.D. clamping.

The clamping device may not be used for I.D. clamping.

The clamping device should only be mounted, operated, maintained, and cleaned by instructed, specialized personnel.

Intended use also includes compliance with all the instructions in this manual.

The clamping device is to be used for the case of application contractually agreed between the producer/deliverer and the user, as well as such cases of application described in the product description which are also in accordance with the technical values.

The safe function of the clamping device is, as far as it can be foreseen, guaranteed when it is used for the intended purpose in accordance with the appropriate safety regulations.

Any use that extends beyond the intended use, or any other use of the clamping device is considered to be misuse and can cause dangerous situations.

WARNING!

Danger due to misuse!

Misuse of the clamping device can cause dangerous situations.

Particularly refrain from the following uses of the clamping device:

- Use in machines other than machine tools.
- Use in machine tools with technical data other than that specified on the clamping device.
- Use for I.D. clamping.

Claims of any type due to damage arising from non-intended use are excluded.

Unintended and improper use of the Power Chuck is for example

- If workpieces are not clamped properly

- If safety regulations are disregarded and persons are working at the clamping device without additional protective devices e.g. for machining.
- If the clamping device is used for machines or tools for which it is not intended.

2.4 Personal protective equipment

Wearing of personal protective equipment is required to minimize health hazards when working with the device.

- Always wear the protective equipment necessary for the respective task when working with the device.
- Follow the instructions that have been posted in the work area.

Always wear

For all tasks always wear:

Protective work clothing

is tight-fitting work clothing with low resistance to tearing, with tight sleeves, and without projecting parts. It is primarily used to protect against entanglement by moving machine parts.

Do not wear rings, chains, or other jewelry.

Safety footwear

for protection against heavy falling parts and slipping on slippery substrates.

For special tasks wear

Special protective equipment is required when executing special tasks. Separate reference is made to this equipment in the specific sections of this manual. This special protective equipment is explained below:

Hard hat

to protect against falling and flying parts and materials.

Protective goggles

to protect eyes from flying parts and liquid splashes.

Protective gloves

to protect hands from friction, abrasion, puncture wounds, or deeper injuries, as well as from contact with hot surfaces.

2.5 Special dangers

In the following section residual risks are cited that occur due to installation of the clamping device in a machine tool. In each case the residual risks that have been determined based on a risk analysis of the machine must be specified by the customer.

- Follow the safety instructions listed here and the warnings in the other sections of this manual to reduce health hazards and to avoid dangerous situations.

Moving parts

WARNING!

Danger of injury due to moving parts!

Rotating parts of the clamping device can cause serious injuries.

- Do not reach into moving parts or handle moving parts during operation.
- Note the gap dimensions of moving parts.
- Do not open covers when the device is in operation.
- Be aware of afterrun time:
  Prior to opening the covers ensure that all parts have come to a standstill.
- Wear tight-fitting protective work clothing in the danger zone.

Wrong clamping of the workpiece

WARNING!

Danger of injury due to incorrect clamping of the workpiece!

Incorrect workpiece clamping may lead to the ejection of the workpiece and result in serious injuries.

Under dimensioned parts can lead to incorrect clamping!

- Do random checks of the unmachined workpieces on dimensional accuracy.

Too low axial clamping force can lead to the reduction of radial clamping force!

Too high axial clamping force can lead to damage of the components of the clamping device!

- Check and adjust, if necessary, the axial clamping force regularly.

Changing parts

WARNING!

Danger of injury due to changing parts!

When operating the clamping device with changing parts [top jaws, soft top jaws] there is a higher danger of crushing injuries due to the stroke of movable components of the clamping device.

2.6 Further warnings

WARNING!

Risk of injury!

Never reach for the clamping device while the spindle is rotating. Before starting to work on the mandrel, make sure the machine spindle cannot be put in motion.

WARNING!

Risk of injury!

By repeated reworking or wear and tear of the clamping surfaces sharp edges and burrs may appear and lead to severe cutting damages.

CAUTION!

Damage of the adaptation clamping device!

Only loosen the adaptation clamping device in non-rotating condition!

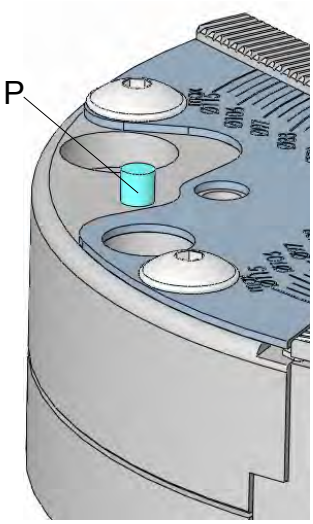


Fig. 1

CAUTION!

Damage of the indicator pin!

By careless handling of the jaw module the indicator pin and its mechanism may be damaged.

If the indicator pin protrudes:

- Do not place the jaw module onto its front side.
- Avoid introduction of force to the indicator pin.

2.7 Clamping force

The achieved clamping force can vary due to the maintenance condition of the clamping device [state of lubrication and degree of contamination] [see chapter »Maintenance«].

The clamping force must be checked at regular intervals. This requires the use of static clamping force measuring devices.

CAUTION!

Damages due to excessive draw and compressive force!

An excessive draw force and/or compressive force may damage the clamping device and/or the drawtube adapter.

- The max. draw force and compressive force may not be exceeded.

2.8 Screws

Moving parts

WARNING!

Danger of injury due to screws and stud screws being accelerated out of the device!!

Screws and stud screws radially attached to the product can be accelerated out of the device and cause severe injuries.

- At the product radially mounted screws and stud screws which were loosened for assembly and maintenance must be re-tightened with the correct tightening torque!
  The tightening torque is given at the product itself, near the screw or threaded pin, and/or given in chapter »Bolt torque«.
- All screws or stud screws that are not marked with a tightening torque specification are tightened with the prescribed tightening torque and locked [medium-strength bonding] in the factory and should only be unscrewed after consultation with the manufacturer. If in doubt you must contact the manufacturer immediately do determine the subsequent procedure.

2.9 Functionality

NOTICE!

With high contamination of the clamping device the functionality is no longer guaranteed.

- The cleaning and maintenance intervals must be observed.

2.10 Implementation limits

Naturally, limits are also set for the jaw modules in their implementation.

In this regard, the first limit that must be considered is the max. workpiece length that can be processed without the aid of a steady rest or a tailstock. This is twice the clamping diameter of the workpiece, maximum.

The second limit is the maximum workpiece mass of 38 kg.

The third limit is the minimal clamping length. This is 6 mm for soft, smooth top jaw as well as for hard, grooved jaws. The limit for hard, axial, and radial grooves jaw is 8.5 mm. Under the limit, secure workpiece clamping is not possible.

The fourth limit relative to the forces acting on the jaw module is not so easy to determine.

A simplified calculation procedure, as well as an example, are provided below; these have been put together on the basis of **VDI** Directive **3106**. They are provided as an aid to the user for evaluating whether the implementation he is planning is within the range of the permissible.

In the case of borderline machining tasks, to be on the safe side, you must execute the calculation procedure specified in **VDI** Directive **3106** yourself. This directive can be procured through Beuth Verlag GmbH.

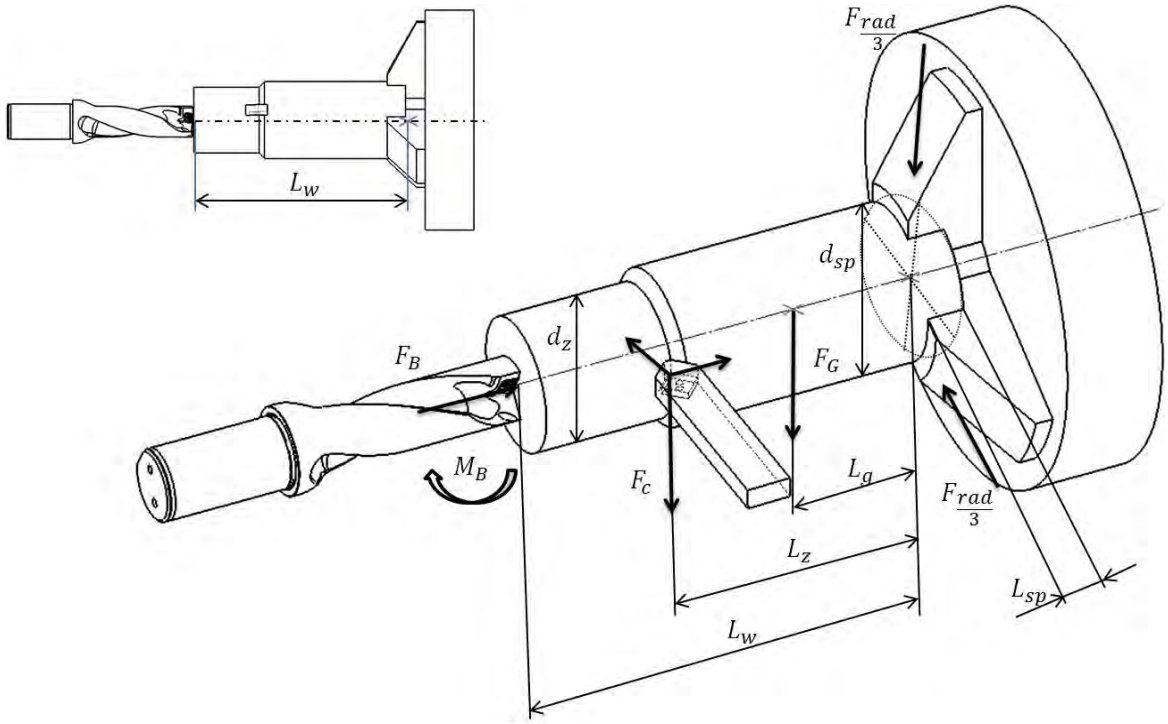
The underlying approach for the simplified calculation is to determine whether the necessary clamping force for absorbing the external forces and torques equals the maximum radial clamping force engraved on the jaw module.

The forces and torques acting on the jaw module are essentially the machining forces and torques that must be absorbed, the weight force of the workpiece itself, and the centrifugal forces due to the jaw weight.

2.10.1 Nomenclature

Short description	Unit	Explanation
F_{rad}	N	Radial clamping force
F_{raderf}	N	Required radial clamping force
F_{sz}	N	Clamping force for the location of the machining
F_{sk}	N	Clamping force for preventing the workpiece from levering out
F_{fz}	N	Clamping force contingency for rotation compensation
d_z	mm	Machining ø turning operation
D_s	mm	Hole diameter
d_{sp}	mm	Clamping diameter
F_c	N	Cutting force, turning operation
F_B	N	Feed force, drilling operation
M_B	Nmm	Torque, drilling operation
μ_a	-	Coefficient of friction in the axial direction
μ_t	-	Coefficient of friction in the radial direction
a_p	mm	Depth of cut, turning operation
f	mm	Feed / turn turning operation Feed / cutting edge drilling operation
f_n	mm	Feed / turn drilling operation
L_z	mm	Distance, machining point - clamping position
L_g	mm	Distance, center of gravity - workpiece - clamping position
L_w	mm	Workpiece length
F_G	N	Weight force, workpiece
L_{sp}	mm	Clamping length
m	kg	Mass of the top jaws including T-slot nut and screws
rs	mm	Distance center of mass, top jaws - axis of rotation
q	kgm	Constant of the respective jaw module
kc	N/mm²	Specific cutting force
n	1/min	Speed
m_w	kg	Workpiece mass
p	-	Machining code
c	-	Contact factor

The following sketch is provided for graphic illustration of the forces and torques used below in the calculating examples:



FG/[N] = workpiece mass / [kg] x 9.81 / [m/s2]

Fig. 2

For calculation of the required radial force F_{raderf}, subsequently the use of different factors is necessary; these factors are provided in tables 1 bis 4.

2.10.2 Coefficients of friction

For workpieces of a material other than steel, the values shown must be multiplied with the correction values specified below.

For hardened steel as the material, the values of the smooth jaws always apply for ground workpiece surfaces.

NOTE

Clamping of hardened materials or materials with extremely high strength values [R_m > 1300 N/mm2] is not permitted!

- Clamping of these materials is only permitted with soft jaws!

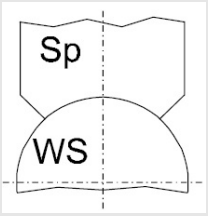
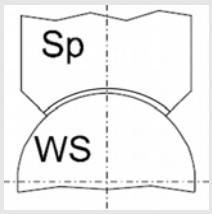
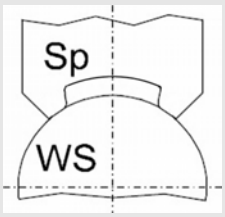
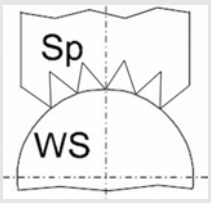
Workpiece surface	Jaw clamping surface			
				
	Soft, smooth top jaws	**hard, grooved jaw**	**hard, axial, and radial grooves jaw**	**hard claw jaw**
Finely finished, ground	μ_t = 0.06 μ_a = 0.08	μ_t = 0.07 μ_a = 0.09	μ_t = 0.10 μ_a = 0.15	Individual upon request!
Smoothed to roughed	μ_t = 0.10 μ_a = 0.13	μ_t = 0.11 μ_a = 0.15	μ_t = 0.17 μ_a = 0.25	
Rough machined or unmachined	μ_t = 0.14 μ_a = 0.16	μ_t = 0.16 μ_a = 0.18	μ_t = 0.24 μ_a = 0,30	
Material correction values	Aluminum alloys = 0,97 Ms 58 = 0,92 GG-18 = 0,80			

Table 1: Friction coefficient for steel workpieces

2.10.3 Forms of contact

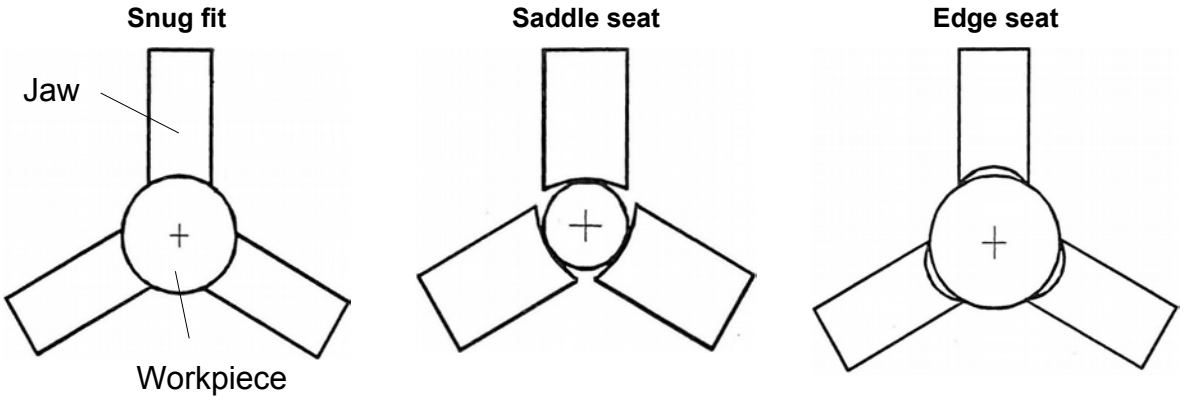


Fig. 3: Forms of contact between smooth top jaws and workpiece

Contact case	
Snug fit	The clamping level diameter corresponds to the clamping diameter on the workpiece.
Saddle seat	The clamping level diameter is greater than the clamping diameter on the workpiece.
Edge seat	The clamping level diameter is less than the clamping diameter on the workpiece.

Designation - jaw	Part no.	Clamping level diameter
hard, grooved jaw #1	10723/0001	1. side Ø25;Ø34, Ø43;Ø52 2. side Ø61;Ø70
hard, grooved jaw #2	10723/0002	Ø79; Ø88
hard, grooved jaw #3	10723/0003	Ø97; Ø106
hard, grooved jaw #4	10723/0012	1. Side Ø26;Ø34, Ø43;Ø52 2. Side Ø60;Ø70
hard, grooved jaw #5	10723/0013	Ø79; Ø89
hard, grooved jaw #6	10723/0014	Ø97; Ø107
hard, axial, and radial grooves jaw #1	10723/0004	Ø25; Ø70
hard, axial, and radial grooves jaw #2	10723/0005	Ø34;Ø79
hard, axial, and radial grooves jaw #3	10723/0006	Ø43; Ø88
hard, axial, and radial grooves jaw #4	10723/0007	Ø52; Ø97
hard, axial, and radial grooves jaw #5	10723/0008	Ø61; Ø106
hard, axial, and radial grooves jaw #6	10723/0009	Ø35; Ø79
hard, axial, and radial grooves jaw #7	10723/0010	Ø43; Ø89
hard, axial, and radial grooves jaw #8	10723/0011	Ø62; Ø106
Soft, smooth top jaw, short	10724/0001	
Soft, smooth top jaw, long	10724/0002	

Table 2: Clamping level diameter

Contact factor c	Machining conditions	Snug fit and saddle seat	Edge seat
Soft top jaw, smooth	Dry	1.5	1.0
	Wet or MQL *	2.5	1.2
hard, grooved jaw	Dry	1.5	1.0
	Wet or MQL *	2.5	1.2
hard, axial, and radial grooves jaw	Dry	1.0	1.0
	Wet or MQL *	1.0	1.0

Table 3: Contact factor c

* Wet machining: Use of cooling lubricant [CLF]
MMS [MQL]: Use of minimum quantity lubrication

2.10.4 Specific cutting forces

Specific cutting forces kc [N/mm²]

Corresponding to the relatively imprecise classification of the materials, these are guide values. Thus, in some case greater deviations relative to the real values can be present.

For deviating workpiece materials, or for machining tasks in the limit area of the jaw module, the respective kc values of the material that will be machined must be precisely determined, or requested from the supplier of the material.

Workpiece materials		Specific cutting forces kc [N/mm²] bei f=0,1mm[1,2,3]	Specific cutting forces kc [N/mm²] bei f=0,5mm[4,5]
Gray cast iron	e.g. EN-GJL-250	1980	1260
Nodular cast iron [unhardened]	e.g. EN-GJS-400-15	2120	1190
Unalloyed/low-alloy construction steels [with average strength] / case-hardened steels [unhardened]	e.g.: S235JR [1.0037] S275JR [1.0044] Ck10 [1.1121] 16MnCr5 [1.7131] 18CrNi8[1.5920]	2920	1840
Unalloyed/low-alloy construction steels [unhardened, with high strength]	S355J2G3 [1.0570] E360 [1.0070]	3350	2000
Heat-treated steels [prehardened]	C45 [1.0503] C60 [1.0601] 42CrMo4 [1.7225] 34CrNiMo6 [1.6582]	2850	1960
Unalloyed/low-alloy tool steels [unhardened]	C105W1 [1.1545]	3100	2100
Machining steels	35S20 [1.0726] 60S20 [1.0728]	1700	1480
Stainless steels		3600	2450
Hardened steels		4800	
Aluminum wrought-alloy <16%Si		1340	900
Aluminum cast-alloy <16%Si		1520	1000
Brass		1300	850

Table 4: Specific cutting forces kc / [N/mm²]

1 For feeds, between 0.1 and 0.5 mm must be interpolated.
For feeds >0.5 mm, the values of column f=0.5 mm must be used.
2 For drilling operations with double-edged tools $f=f_n/2$
3 For feeds between 0.05 and 0.1 mm, the value at f=0.1 with 20% contingency must be used.
4 For feeds, between 0.1 and 0.5 mm must be interpolated.
For feeds >0.5 mm, the values of column f=0.5 mm must be used.
5 For drilling operations with double-edged tools $f=f_n/2$

	Mass m / [kg] and distance rs from the center of mass of the top jaws to the axis of rotation / [m]					
	Distance center of mass rs in the smallest position					
	top jaws	counter bore	clamping range	rs min. [m]	rs max. [m]	Mass [kg]
Module size 145	hard, grooved jaw #1	all	25-79	0,0420	0,0465	0,665
	hard, grooved jaw #2	all	79-97	0,0428	0,0473	0,647
	hard, grooved jaw #3	all	97-115	0,0427	0,0472	0,610
	hard, grooved jaw #4	all	26-79	0,0420	0,0465	0,665
	hard, grooved jaw #5	all	79-99	0,0428	0,0473	0,647
	hard, grooved jaw #6	all	97-117	0,0427	0,0472	0,610
Module size 215	hard, grooved jaw #1	25	25-107	0,0420	0,0825	0,665
	hard, grooved jaw #1	34	34-110			
	hard, grooved jaw #1	43	43-117			
	hard, grooved jaw #1	52	52-124			
	hard, grooved jaw #1	61	61-133			
	hard, grooved jaw #1	70	70-145			
	hard, grooved jaw #2	79	79-155	0,0428	0,0833	0,647
	hard, grooved jaw #2	88	88-166			
	hard, grooved jaw #3	97	97-175	0,0427	0,0832	0,610
	hard, grooved jaw #3	106	106-185			
	hard, grooved jaw #4	26	26-107	0,0420	0,0825	0,665
	hard, grooved jaw #4	34	34-110			
	hard, grooved jaw #4	43	43-117			
	hard, grooved jaw #4	52	52-124			
	hard, grooved jaw #4	60	60-134			
	hard, grooved jaw #4	70	70-146			
	hard, grooved jaw #5	79	79-155	0,0428	0,0833	0,647
	hard, grooved jaw #5	89	89-167			
	hard, grooved jaw #6	97	97-175	0,0427	0,0832	0,610
	hard, grooved jaw #6	107	107-186			

Table 5a: Hard, grooved jaws – mass m / [kg] and distance rs from the center of mass of the top jaws to the axis of rotation / [m]

	Mass m / [kg] and distance rs from the center of mass of the top jaws to the axis of rotation / [m]					
	Distance center of mass rs in the smallest position					
	top jaws	counter bore	clamping range	rs min. m	rs max. m	Mass kg
Module size 145	hard, axial, and radial grooves jaw #1	25	25-34	0,0419	0,0465	0,808
		70	70-79			
	hard, axial, and radial grooves jaw #2	34	34-42	0,0421	0,4660	0,782
		79	79-89			
	hard, axial, and radial grooves jaw #3	43	43-52	0,0429	0,0474	0,713
		88	88-98			
	hard, axial, and radial grooves jaw #4	52	52-60	0,0429	0,0474	0,697
		97	97-107			
	hard, axial, and radial grooves jaw #5	61	61-69	0,0430	0,0475	0,677
		106	106-116			
	hard, axial, and radial grooves jaw #6	35	35-43	0,0421	0,4660	0,782
		79	79-89			
	hard, axial, and radial grooves jaw #7	43	43-52	0,0429	0,0474	0,713
		89	89-99			
	hard, axial, and radial grooves jaw #8	62	62-71	0,0430	0,0475	0,677
		106	106-116			
Module size 215	hard, axial, and radial grooves jaw #1	25	25-103	0,0419	0,0825	0,808
		70	70-148			
	hard, axial, and radial grooves jaw #2	34	34-108	0,0421	0,0826	0,782
		79	79-158			
	hard, axial, and radial grooves jaw #3	43	43-119	0,0429	0,0834	0,713
		88	88-167			
	hard, axial, and radial grooves jaw #4	52	52-126	0,0429	0,0834	0,697
		97	97-177			
	hard, axial, and radial grooves jaw #5	61	61-135	0,0430	0,0835	0,677
		106	106-187			
	hard, axial, and radial grooves jaw #6	35	35-110	0,0421	0,0826	0,782
		79	79-158			
	hard, axial, and radial grooves jaw #7	43	43-119	0,0429	0,0834	0,713
		89	89-168			
	hard, axial, and radial grooves jaw #8	62	62-137	0,0430	0,0835	0,677
		106	106-187			

Table 5b: Hard, axial and radial grooved jaws – m / [kg] and distance rs from the center of mass of the top jaws to the axis of rotation / [m]

	Mass m / [kg] and distance rs from the center of mass of the top jaws to the axis of rotation / [m]			
	Distance center of mass rs in the smallest position			
	top jaws	rs min./m	rs max./m	Mass/kg
Module size 145	Soft, smooth top jaw, short	0,0397	0,0442	0,767
	Soft, smooth top jaw, long	0,0445	0,0490	0,894
Module size 215	Soft, smooth top jaw, short	0,0397	0,0802	0,767
	Soft, smooth top jaw, long	0,0445	0,0850	0,894

Table 5c: Soft, smooth top jaws - mass m [kg] and distance rs from the center of mass of the top jaws to the axis of rotation / [m]

Constant q of the jaw modules [kgm]	BM 145/65	q = 0.041 kgm
	BM 215/65	q = 0.064 kgm
	BM 215/80	q = 0.093 kgm
	BM 215/100	q = 0.093 kgm

Table 6: Constant q of the jaw modules [kgm]

Principle

For safe machining, the following must apply at all times:

1. $F_{rad} \geq F_{raderf}$

AND

2. $F_c \leq 4.500$ N
   [when using soft, smooth top jaws or hard, grooved jaws]
   and/or
   Fc ≤ 7.500 N
   [When using hard, axial and radial grooved jaws]

2.10.5 Determination of the required clamping force

Determination of the required clamping force F_{raderf} under speed

The equations apply for longitudinal turning operations, as well as face turning operations. Drilling operations on the face of the workpieces can also be calculated. Overlaid, simultaneous processing, e.g. through multiple tools or turrets, must also be mathematically overlaid, i.e. the required radial clamping forces of the individual machining procedures must be added.

However drilling and turning jobs are rarely overlaid; because as a rule, they cannot run simultaneously, due to opposite directions of rotation.

For the calculation, the point with the highest forces, i.e. the most unfavorable torque of the machining must serve as the mathematical basis. If in doubt, a check of multiple cutting edge engagement situations is required to determine the most unfavorable.

μ_a, μ_t	From table 1
c	From table 3
kc	From table 4
m, r_s	From table 5
q	From table 6

$$F_{raderf} = 1{,}6 * c * (1{,}6 * (F_{sz} + F_{sk}) + F_{fz})$$

The leading factor 1.6, in this regard, is the required safety factor due to clamping force fluctuations. Moreover, the factor 1.6 takes the fluctuations in machining that occur force into account.

$$F_{sz} = 1{,}3 * \sqrt{\left(\frac{(F_c * d_z + 2M_B)}{d_{sp} * \mu_t}\right)^2 + \left(\frac{F_c + F_B}{\mu_a}\right)^2}$$

Turning [inside & outside]

$$F_c = 1{,}3 * ap * f * kc$$

Drilling

[full drilling, two-edged tool, centric in the direction of the workpiece axis]

$$F_B = 0{,}45 * D_B * f_n * kc$$

$$M_B = \frac{f_n * D_B^2 * kc}{5700}$$

For calculation of the machining forces, a degree of blunting that corresponds to a wear mark width of 0.3 mm is taken into account.

$$F_{sk} = \frac{\sqrt{(F_c * L_z + F_G * L_g)^2 + (F_c * p)^2}}{(0{,}325 * (0{,}67 * L_{sp} + \mu_a * d_{sp}))}$$

Longitudinal turning: $p = \frac{dz}{2}$

Face turning/plunging: $p = L_z$

$$F_{fz} = 3 * (m * r_s + q) * (\frac{\pi * n}{30})^2$$

In accordance with the principle defined above, this means that the radial clamping force of the jaw module must at least equal the calculated, required radial clamping force $F_{rader}f$, in order to execute this machining task using the jaw module.

If this condition is not satisfied, then the jaw module is not suitable. The machining task must not be executed.

For clamping and machining of workpieces with greater concentricity errors and face runout, note that the clamping cross section fluctuates significantly. The resulting punctiform increase of the cutting force must be considered separately.

2.10.6 Sample calculation

Applied to a concrete example

Longitudinal turning of an offset shaft of 16MnCr5 [rough machined clamping diameter].

Workpiece data

- Clamping diameter d_{sp} = 150 mm
- Workpiece length L_w =80mm
- Machining diameter - turning operation
  d_z = 148,0 mm
- Workpiece mass m_w = 11,1 kg
  → $F_G = m_w * 9{,}81$ m/s2
  → F_G = 109 N

Process data

- Speed n=250 1/min
- Feed f=0,25 mm
- Depth of cut a_p=1,0 mm
- Use of cooling lubricant

Jaw module

- Jaw module size 215/65
- Jaws used: grooved jaw#2; counter bore 88
  edge seat because clamping level diameter = 88 mm
  ø88 mm < ø150 mm

The first condition, namely that the workpiece length must be equal to two times the clamping diameter, is satisfied.

The second condition, namely that the workpiece mass must not exceed 38 kg, is satisfied.

The third condition, namely that the workpiece must be clamped in at least 6 mm, would also be satisfied with a clamping length of 7 mm

To check the fourth condition, the required radial clamping force must be determined.

μ_a ,μ_t	From table 1
c	From table 3
kc	From table 4 [interpolated for f=0.25]
m, r_s	From table 5
q	From table 6

$$F_{raderf} = 1,6 * c * (1,6 * (F_{sz} + F_{sk}) + F_{fz})$$

$$F_{sz} = 1,3 * \sqrt{\left(\frac{(F_c * d_z + 2M_B)}{d_{sp} * \mu_t}\right)^2 + \left(\frac{F_C + F_B}{\mu_a}\right)^2}$$

From table 1: $\mu_t = 0,16$, $\mu_a = 0,18$

$$F_{sz} = 1,3 * \sqrt{\left(\frac{818\text{N} * 148\text{mm}}{150\text{mm} * 0,16}\right)^2 + \left(\frac{818\text{N}}{0,18}\right)^2} = 8.826\ N$$

Turning:

$$F_C = 1,3 * 1,0\,mm * 0,25\,mm * 2515\frac{N}{mm^2} = 818\text{N}$$

Thus the condition, Fc ≤ 4,500 N is satisfied.

Drilling:

Here not relevant, because drilling is not intended. Consequently

$$M_B = 0\ Nmm$$

$$F_B = 0\ N$$

$$F_{sk} = \frac{\sqrt{(F_c * L_z + F_G * L_g)^2 + (F_c * p)^2}}{(0,325 * (0,67 * Lsp + \mu_a * dsp))}$$

$$F_{sk} = \frac{\sqrt{(818\text{N} * 80\text{mm} + 109\text{N} * 40\text{mm})^2 + \left(818\text{N} * \left(\frac{148\text{mm}}{2}\right)\right)^2}}{(0,325 * (0,67 * 7\text{mm} + 0,18 * 150\text{mm}))}$$

$$F_{sk} = \frac{92.391\ Nmm}{10,30\ mm} = 8.970\ N$$

L_Z=L_W=80 mm, because the shaft on the front end should be longitudinally turned.

L_g = 40 mm, because the center of gravity is in the middle of the longitudinal workpiece axis.

L_{SP} = 7 mm, corresponds to the full clamping length with selected top jaws

$$p = (\frac{d_z}{2}) = \frac{148}{2}$$,

because longitudinal turning operation

$$F_{fz} = 3 * (m * rs + q) * (\frac{\pi * n}{30})^2$$

$$F_{fz} = 3 * (0{,}647kg * 0{,}0833m + 0{,}064kgm) * (\frac{\pi * 250 \frac{1}{min}}{30})^2$$

$$F_{fz} = 242\text{N}$$

r_s = r_s max = 0,0833

[Always choose r_s max from table 5a]

With these intermediate calculation results now F_{raderf} can be calculated as follows:

$$F_{raderf} = 1{,}6 * 1{,}2 * (1{,}6 * (F_{sz} + F_{sk}) + F_{fz})$$

$$F_{raderf} = 1{,}6 * 1{,}2 * (1{,}6 * (8.826 + 8.970) + 242) = 55.134\text{N}$$

$$F_{raderf} = 55\text{kN}$$

Result of the sample calculation

The required radial clamping force F_{raderf} is below the maximum radial clamping force of the jaw module and the cutting force F_c is below 4,500 N.

The planned machining can be executed at appropriate charging with the required axial clamping force. The axial clamping force is proportional to the radial clamping force and can be determined based on the values inscribed on the jaw module for F_{axmax} and F_{radmax} through interpolation, or it is specified in the diagram under chapter 3.2.1. In the calculated example, an axial charging of at least F_{ax}=41 kN, is required, which results in a radial clamping force of F_{rad}=55 kN.

The value is close to the limit value. Consequently it must be ensured that the jaw module is in good condition relative to degree of contamination and lubrication.

A check of the radial clamping force through a suitable clamping force gauge must be executed in advance of the machining as a precautionary measure. The values determined in this process must be within the range shown in chapter 3.2.1 »Clamping force diagram - jaw module size 145/215« shown for RPM.

2.11 Types of use

2.11.1 Use in manual loading and clamping

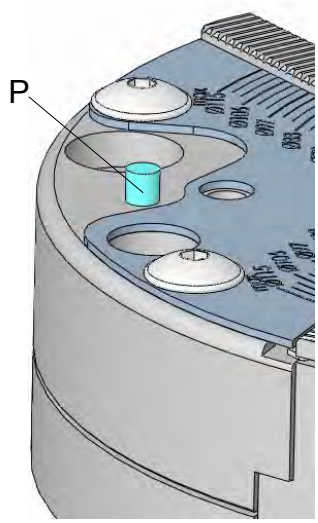


Fig. 4

DANGER!

Risk of injury due to thrown out parts!

The clamping of diameters that are outside the permissible clamping range may result in throwing out parts.

- For each clamping the indicator [P] must always be checked, so that safe clamping is ensured, see chapter 6.61 »Impermissible clamping«

2.11.2 Use in automatic mode

Unlike manual loading of the workpiece, you can only check the pin during assembly. Consequently, the end position sensing must be extended with the residual stroke sensing.

The position of the residual stroke sensing element must be positioned somewhat upstream of the mechanical actuation element, to compensate for tolerances. Therefore the residual stroke sensing element must be set +0.7 mm upstream of the axial end position of the assembled chuck. Preferably a machine with a position measuring system on the clamping cylinder is used for this.

For machines without a position measuring system read chapter 4.5 »Automatic mode« on page 57.

Adjustment of the jaws – see chapter 4.6 »Selecting jaws« from page 59.

2.12 Jaws

Material fracture

DANGER!

Danger of injury due to material fracture!

Through fracture of wear parts [screws & jaws] parts can fly off and cause severe injury.

The life span of wear parts is limited.

- Have the mounting screws of the jaws checked for wear or crack formation regularly, and if necessary replace them with equivalent wear parts.
- High rigidity material [< 1300 N/mm^2] may not be clamped with hard clamping jaws.

Wrong jaws

DANGER!

Danger of injury due to selection of the wrong jaws!

Through the fracture of wear parts or loosening of screws or jaws, parts can fly off and cause severe injury.

- Pay attention to the correct screw length when assembling the top jaws.
- Only use screws of quality class 12.9.
- Pay attention to the inscriptions on the jaws.

Machining the jaws

DANGER!

Danger of injury due to incorrectly machined jaws!

The use of incorrectly machined jaws can result in severe injury.

- Clamping jaws are machined at the sole responsibility of the customer, see chapter »6.3.3 Machining soft jaws to size«
- When machining clamping levels in soft jaws, do not cut off the screw heads as well!
- Repairs on jaws through welding is not permitted.

2.13 Environmental protection

NOTE!

Environmental hazard due to incorrect handling!

Incorrect handling of environmentally hazardous substances, particularly improper disposal, can cause significant environmental damage.

- Always comply with the instructions cited below
- If environmentally harmful substances should inadvertently get into the environment, initiate suitable measures immediately. If in doubt notify the responsible municipal authority about the damage.

The following environmentally harmful substances are used:

Lubricants

Lubricants like greases and oils can contain toxic substances. Ensure that they do not get into the environment.

The device must be disposed of by a specialized disposal company.

To achieve trouble-free operational performance of the clamping device only use HAINBUCH lubricants. See the appendix for reference addresses.

3 Technical data

3.1 General information

The jaw module is available in different sizes and variants.

Information about e.g.

- dimensions
- weight

you will find on the corresponding drawing that you can order at HAINBUCH.

For examples some technical data:

NOTE!

Concentricity of 0.020 mm considerable only for the turned soft jaws.

Assembly accuracy at rotating clamping devices:

- Runout 0.005 mm between chuck and jaw module.

Runout on the chuck must be taken into account.

Mounting repeatability in stationary clamping devices: 0.003 mm at the jaw module.

3.1.1 Variant RD

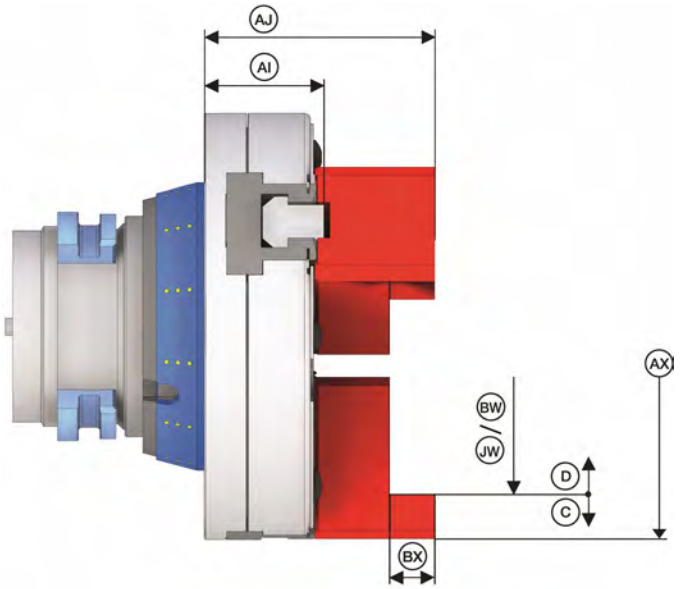


Fig. 5

Chuck size		65		80	100
Jaw module size		145	215		
Concentricity [mm]		0,020			
Clamping range [mm]	A	See overview top jaws			
Speed n max. [1/min]		5000	3000		
max. max. actuating force at unscrewing the jaws [KN]		45			45
max. draw force axial [KN]		45			45
max. clamping force radial [KN]		60			
Release stroke radial [mm]	C	1,1			1,8 / 2,5
Clamping reserve radial [mm]	D	0,8			1,0 / 1,27
Stroke per jaw [mm]	AT	1,9			2,8 / 3,77
Variant of gear cutting		1,5 x 60° [serration]			
max. permissible boring-Ø [mm]	BW	115	200		
max. permissible boring depth [mm]	BX	15			
Vibration circle-Ø	AX	~149	~220		
Length without jaws [mm]	AI	37,5			
Length with jaws [mm]	AJ	77			
Weight [kg]		6,3	11,3	12,6	14,5
On stock		✓	✓	✓	✓
Order no.		10721/0001	10721/0002	10721/0003	10721/0004

3.1.2 Variant SE

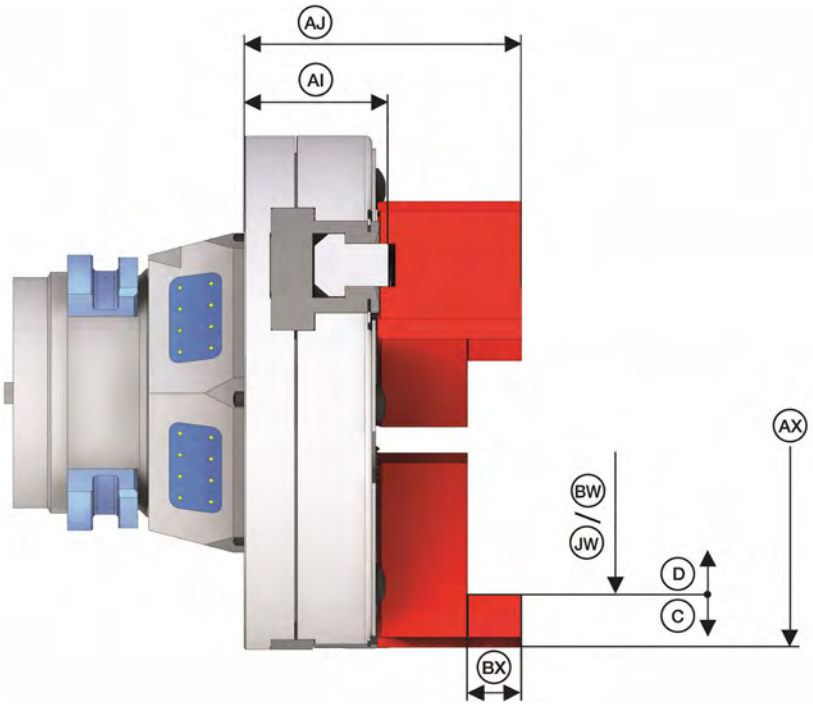


Fig. 6

Chuck size		65	65	100
Jaw module size		145	215	
Concentricity [mm]		0,020		
Clamping range [mm]	A	See overview top jaws		
Speed n max. [1/min]		5000	3000	
max. actuating force at unscrewing the jaws [KN]		45		45
max. draw force axial [KN]		45		45
max. clamping force radial [KN]		60		
Release stroke radial [mm]	C	1,1		1,8 / 2,5
Clamping reserve radial [mm]	D	0,8		1,0 / 1,27
Stroke per jaw [mm]	AT	1,9		2,8 / 3,77
Variant of gear cutting		1,5 x 60° [serration]		
max. permissible boring-Ø [mm]	BW	115	200	
max. permissible boring depth [mm]	BX	15		
Vibration circle-Ø	AX	~149	~220	
Length without jaws [mm]	AI	37,5		
Length with jaws [mm]	AJ	77		
Weight [kg]		6,3	11,3	14,5
On stock		✓	✓	✓
Order no.		10720/0001	10720/0002	10720/0003

Corresponding top jaws, see»"Optional Accessories«.

3.2 Clamping force diagram

In the diagrams, the effects of friction and the clamping diameter are included.

NOTE!

The measured values for the radial clamping force F_{rad} may not leave the permitted area. Under optimal conditions, the values for F_{rad} are below the top, in bad conditions above the lower limit.

- If the measured clamping forces are outside the allowed range, the maintenance is mandatory to perform. After servicing, the clamping forces have to be re-examined.
- If the clamping force even after the maintenance is not in the permitted area please contact the manufacturer.

Metering example 1:

With an axial force F_{ax} of 30 kN the radial clamping force F_{rad} is, depending on the maintenance state fo the clamping device, in the range between 31.5 kN and 42 kN; it must not be smaller than 31.5 kN nor higher than 42 kN.

Metering example 2:

At a required clamping force F_{rad} of 50 kN, the axial clamping force Fax to be initiated is 38 kN.

3.2.1 Clamping force diagram – jaw module size 145/215

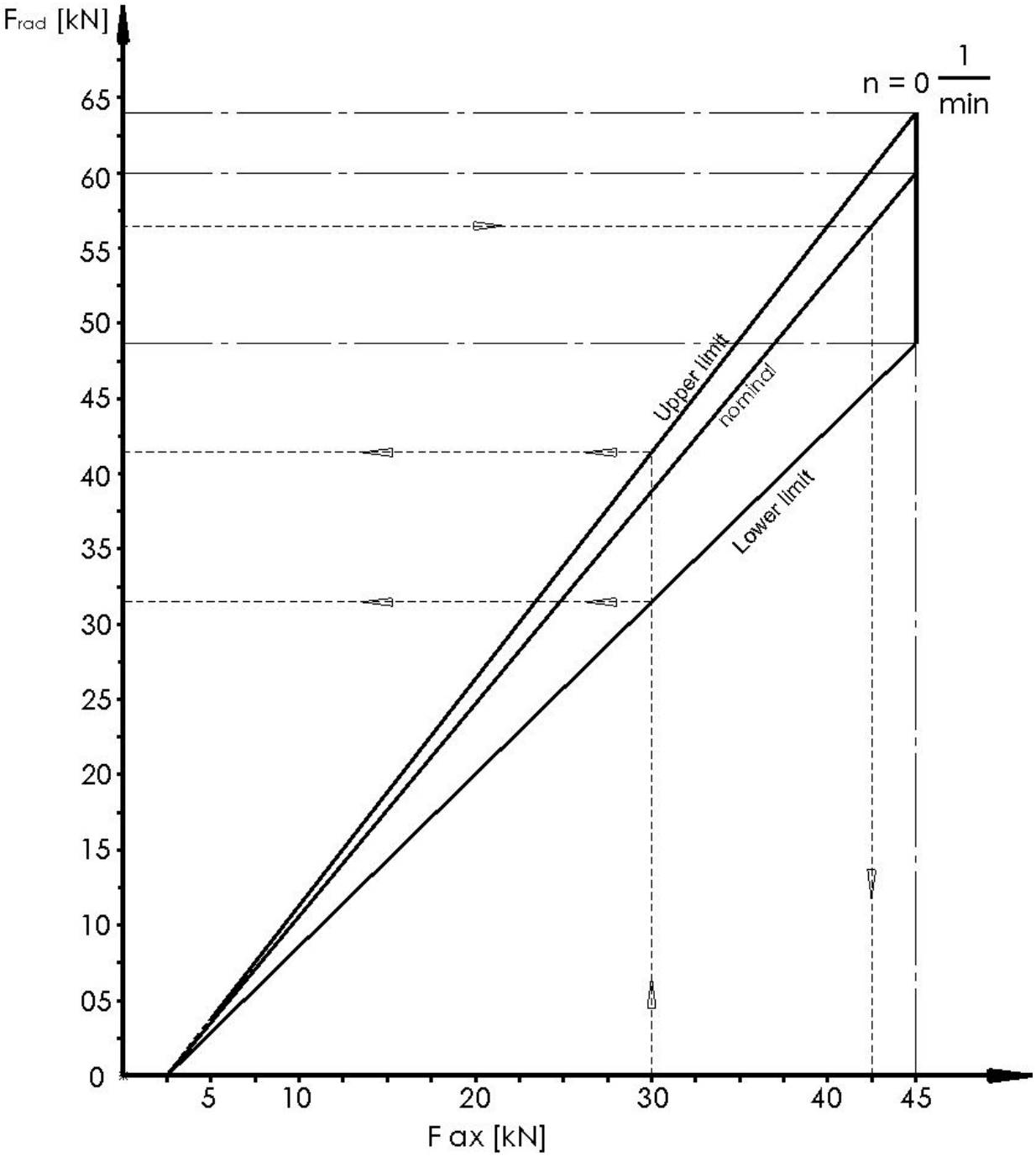


Fig. 7

3.2.2 Clamping force RPM diagram – jaw module size 145 – hard, grooved jaw

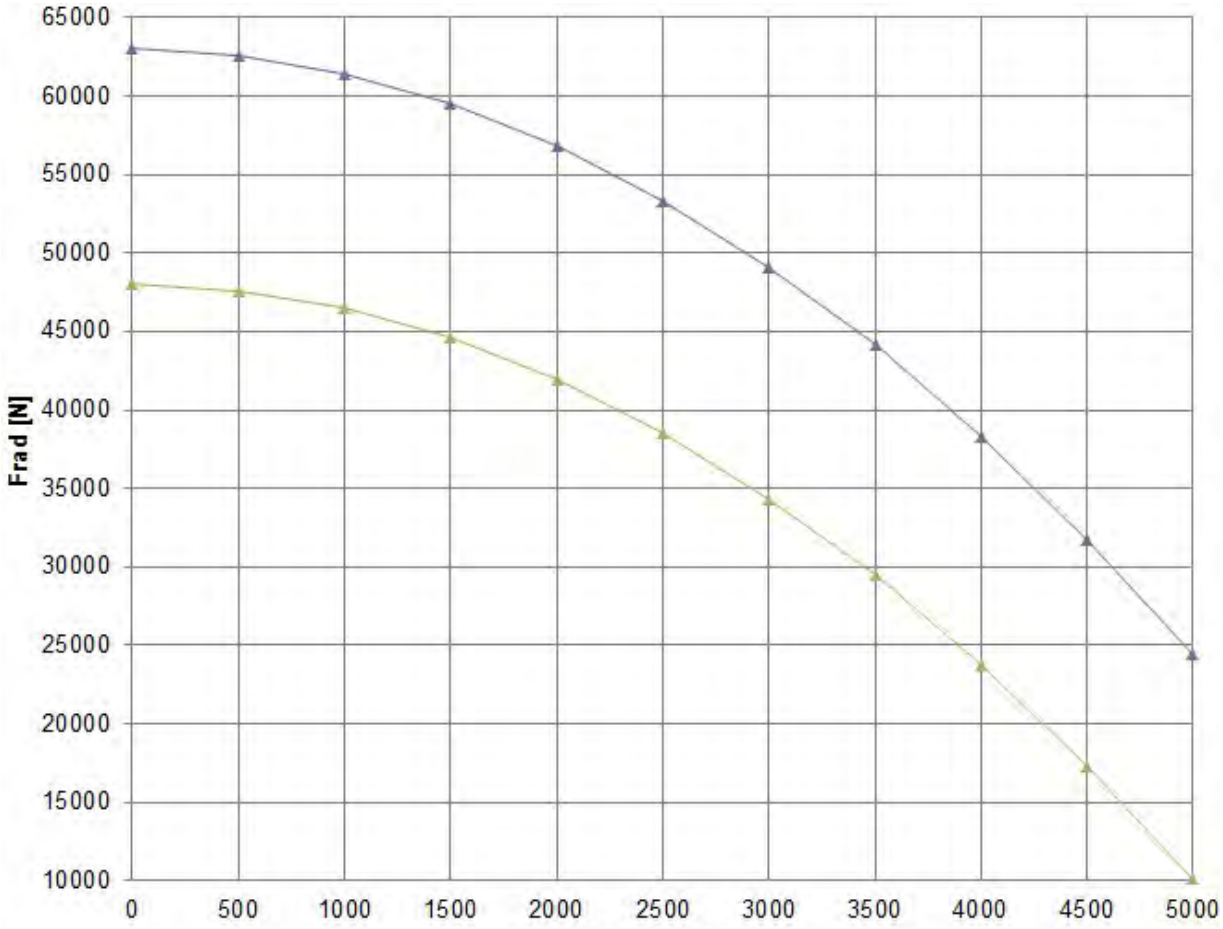


Fig. 8 - RPM [min -1]

NOTE!

Lower limit value is relevant for determination of the permissible machining force.

3.2.3 Clamping force RPM diagram – jaw module size 145 – hard, axial, and radial grooves jaw

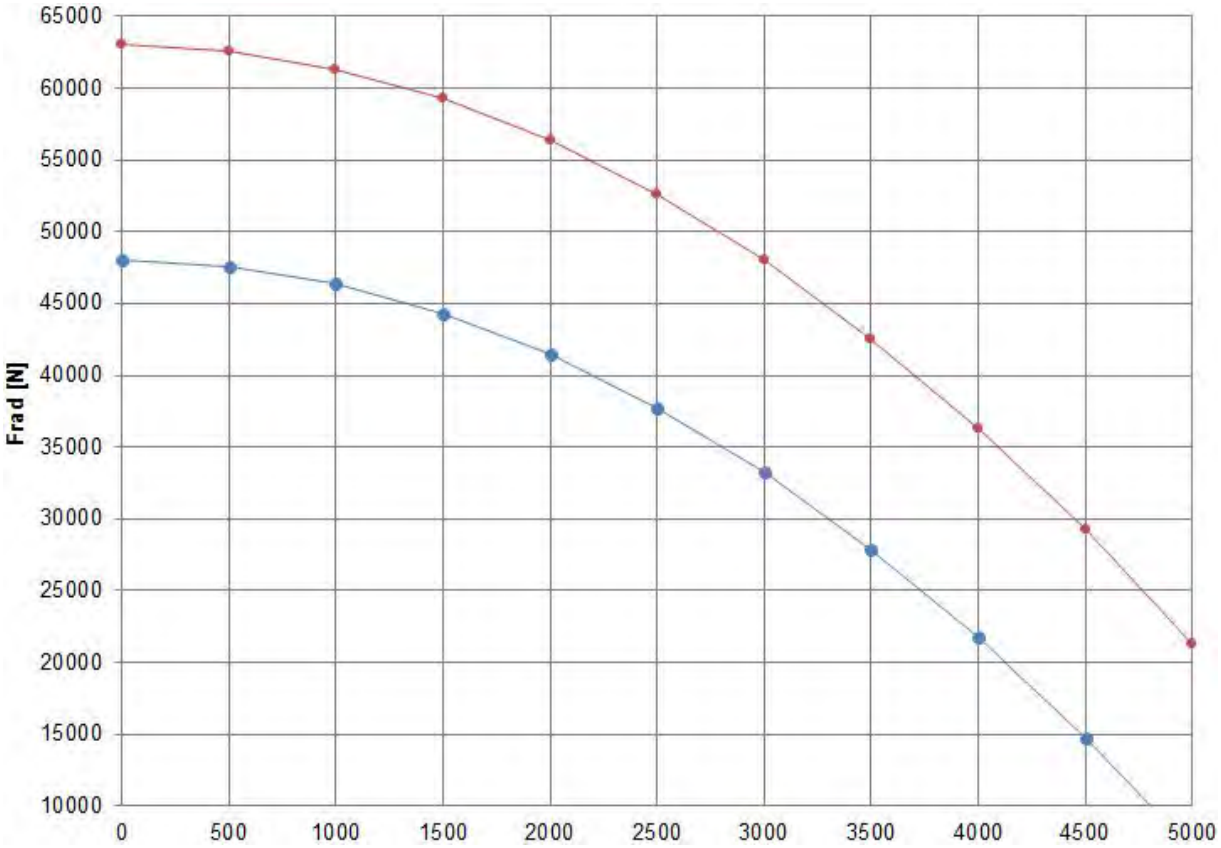


Fig. 9 - RPM [min -1]

Hard, axial, and radial grooves jaw #1 25-30 / 70-79 max.

Hard, axial, and radial grooves jaw #1 25-30 / 70-79 min.

NOTE!

Lower limit value is relevant for determination of the permissible machining force.

3.2.4 Clamping force RPM diagram - jaw module size 145 – soft top jaws

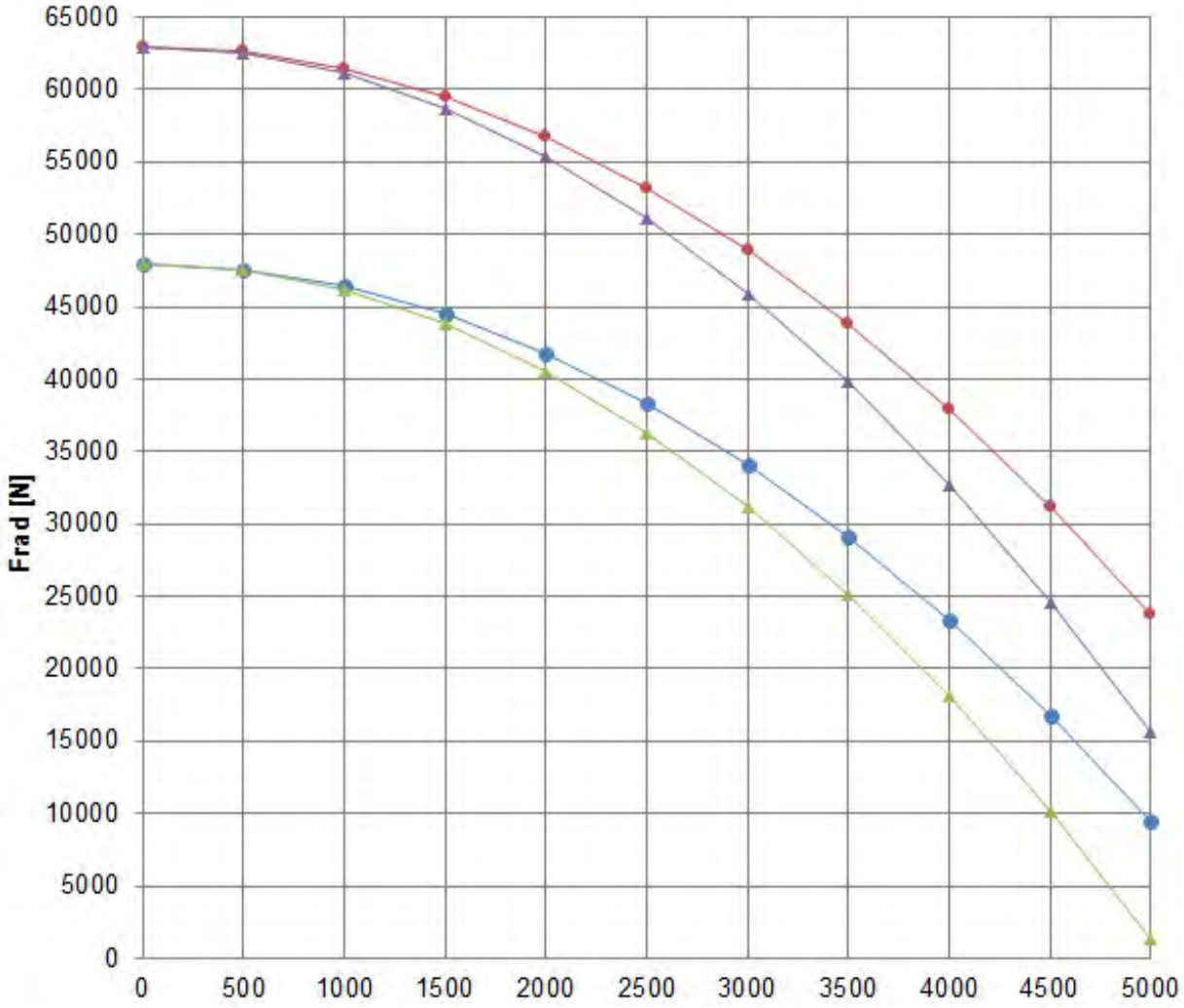


Fig. 10 - RPM [min $^{-1}$]

- Soft, smooth top jaws short max.
- Soft, smooth top jaws long max.
- Soft, smooth top jaws short min.
- Soft, smooth top jaws long min.

NOTE!

Lower limit value is relevant for determination of the permissible machining force.

3.2.5 Clamping force RPM diagram – jaw module size 215 – hard, grooved jaw

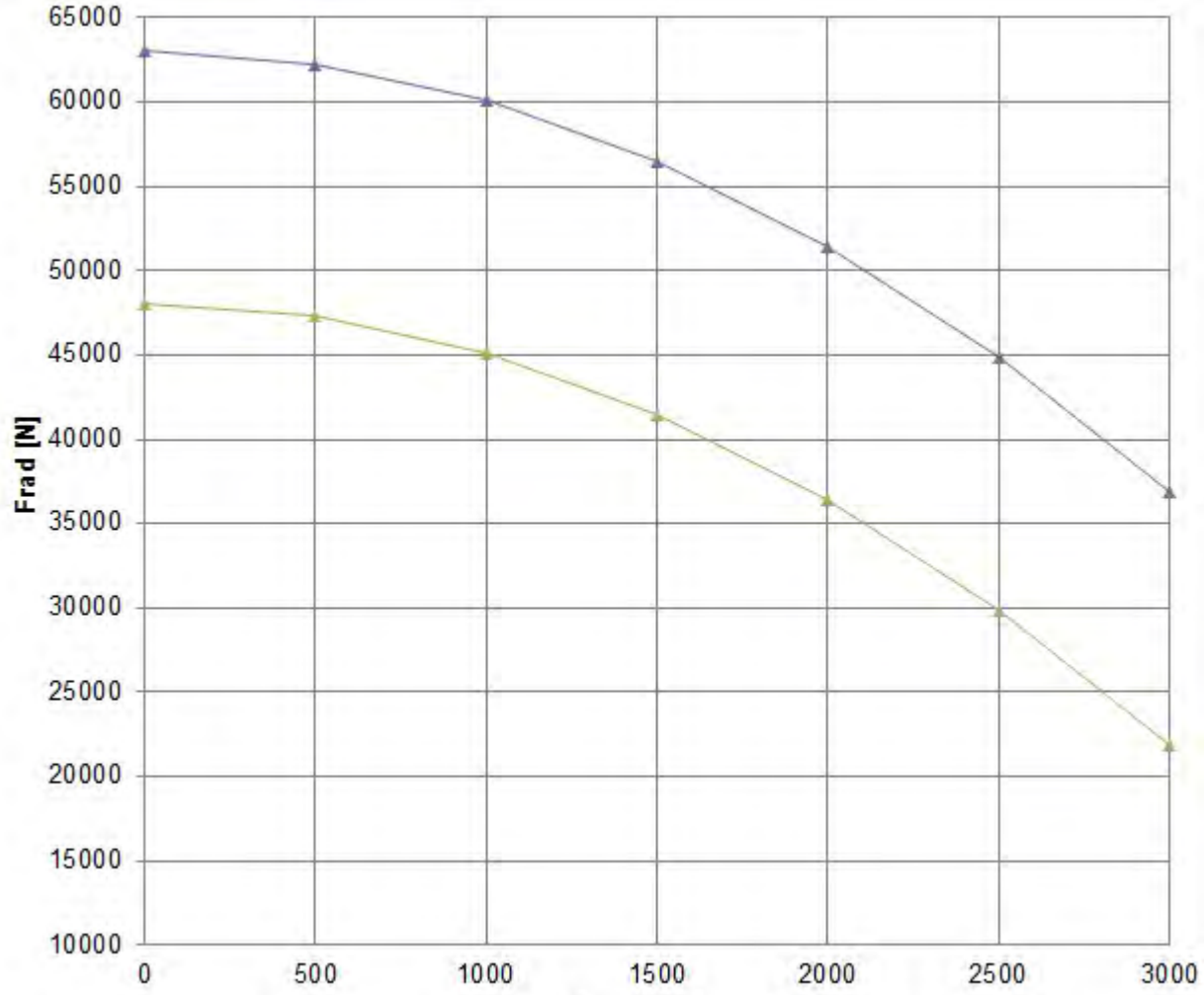


Fig. 11 - RPM [min -1]

NOTE!

Lower limit value is relevant for determination of the permissible machining force.

3.2.6 Clamping force RPM diagram – jaw module size 215 – hard, axial, and radial grooves jaw

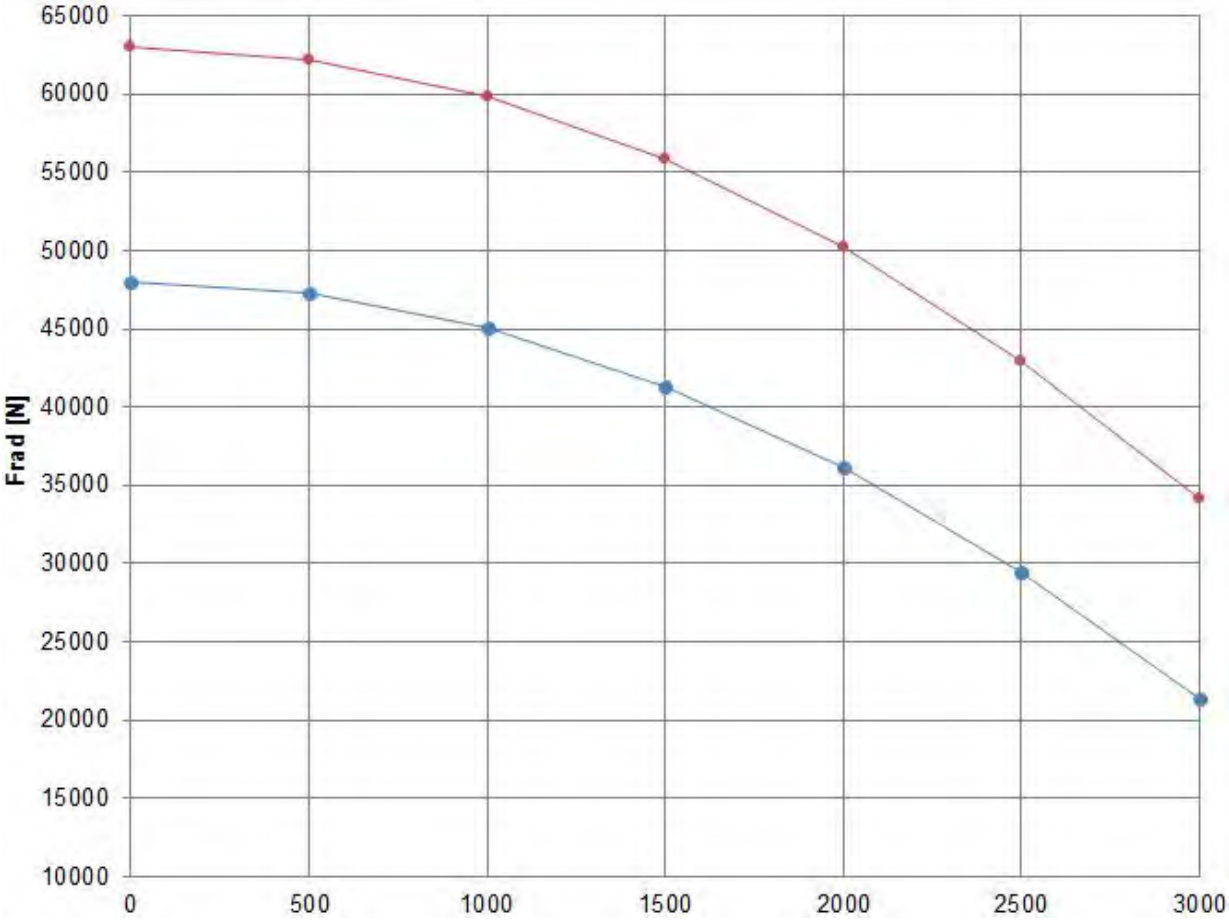


Fig. 12 - RPM [min -1]

hard, axial, and radial grooves jaw #1: 25-146 max.

hard, axial, and radial grooves jaw #1: 25-146 min.

NOTE!

Lower limit value is relevant for determination of the permissible machining force.

3.2.7 Clamping force RPM diagram - jaw module size 215 – soft top jaws

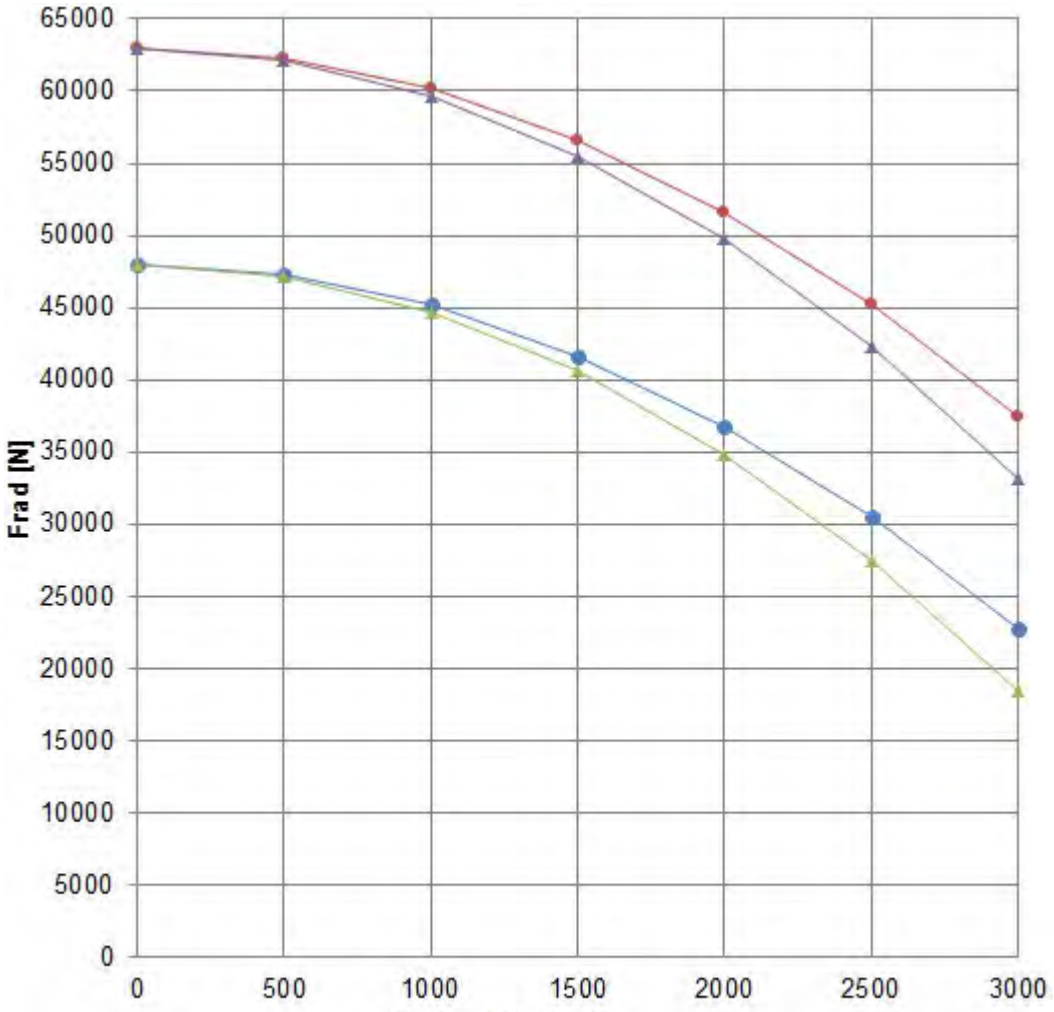


Fig. 13 - Speed [RPM]

- Top jaw 1 soft short max.
- Top jaw 1 soft short min.
- Top jaw 2 soft long max.
- Top jaw 2 soft long min.

NOTE!

Lower limit value is relevant for determination of the permissible machining force.

3.3 Calculation of the centrifugal force

3.3.1 Calculation: center of gravity distance of the jaw

$$l_s = \frac{H \times L \times \left(\frac{L}{2}\right) - h \times l \times \left(\frac{l}{2}\right)}{H \times L - h \times l}$$

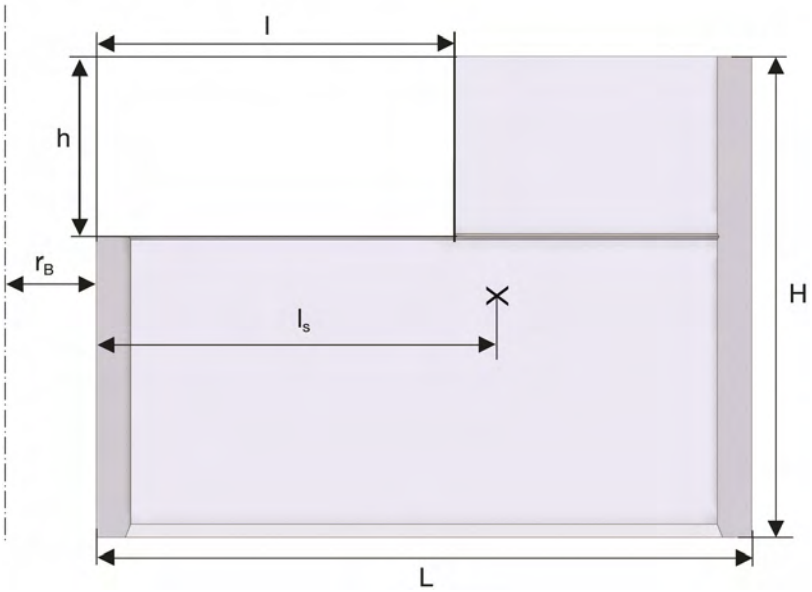


Fig. 14

Example

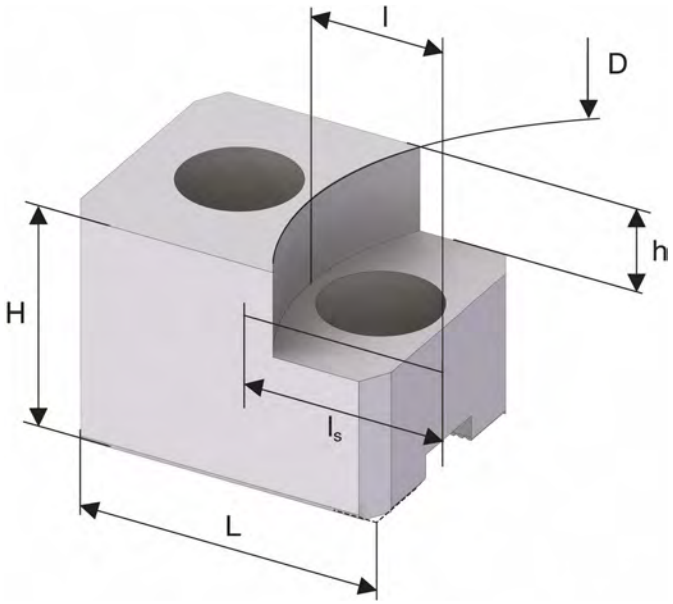


Fig. 15

Example:

$$l_s = \frac{40\text{mm} \times 55\text{mm} \times \left(\frac{55\text{mm}}{2}\right) - 15\text{mm} \times 25\text{mm} \times \left(\frac{25\text{mm}}{2}\right)}{40\text{mm} \times 55\text{mm} - 15\text{mm} \times 25\text{mm}}$$

$$l_s = 30.58\text{mm}$$

3.3.2 Calculation of the jaw centrifugal forces

Variables

F_z = *centrifugal force*
m_G = *weight base jaw*
r_G = *center of gravity distance base jaw*
r_B = *radial situation*
m_B = *weight top jaw*
l_S = *CG position top jaw*
m_N = *weight sliding block*
l_N = *CG position sliding block*
m_{Sch} = *weight pair of screws*
l_{Sch} = *CG position pair of screws*

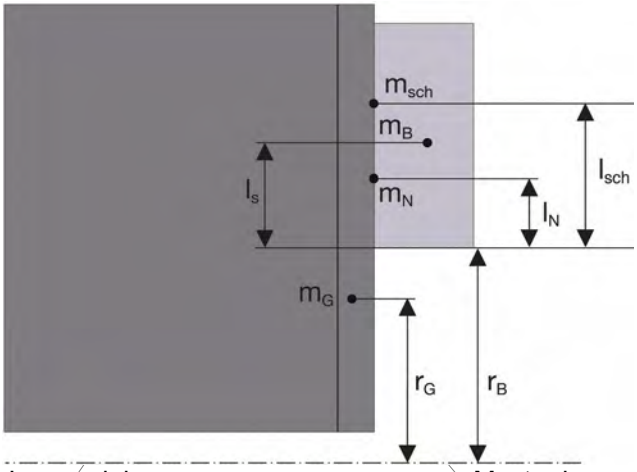


Fig. 16

Formula:

Base furmula

$$F_z = \left(\frac{\pi \times n}{30}\right)^2 \times m \times r$$

Base formula jaw module

$$F_z = \left(\frac{\pi \times n}{30}\right)^2 \times (m_G \times r_G + r_B \times (m_B + m_N + m_{Sch}) + m_B \times l_s + m_N \times l_N + m_{Sch} \times l_{Sch})$$

$$F_z = 3 \times \left(\left(\frac{\pi \times 3000\,min^{-1}}{30s^{-1}}\right)^2 \times (0{,}343\,kg \times 0{,}0401\,m + 0{,}012\,m \times (0{,}468\,kg + 0{,}090\,kg + 0{,}092\,kg) + 0{,}468kg \times 0{,}03058\,m + 0{,}09\,kg \times 0{,}03166\,m + 0{,}092kg \times 0{,}0305\,m)\right)$$

F_z = 12289 N

3.3.3 Radial clamping force

Radial clamping force F_{RAD}

$$F_{RAD} = F_{RAD\ Stat} - F_Z$$

Example

$$F_{RAD} = 60000\text{N} - 12289\text{N}$$
$$F_{RAD} = 47711\text{N}$$

3.4 Operating conditions

Environment	Specification	Value	Unit
	Temperature range	15 - 65	°C

Mechanical actuating

In each possible operating condition the maximum draw force and compressive force may not be exceeded!

WARNING!

Risk of injury!

Exceeding the permissible technical data can result in serious personal injury and material damage.

- The technical data [labeling on the product, the associated instruction manual] must be complied with and may not be modified by the operator!

3.5 Power specifications

NOTE!

Material damage if the power specifications do not agree!

If the power specifications of clamping device, machine adapter and machine do not agree, severe damage extending to total damage can occur.

- Only operate clamping devices and adapters in machines with the same power specifications.

Information on maximum clamping force and draw-tube force is provided on the jaw module.

- If the power values become unreadable through the abrasive effect, please refer from the manual and/or get in contact to the manufacturer.

3.6 Check

Static test	Used coefficient: **1.25**

3.7 Dimensional sheet

Dimension sheets for the respective product can be requested from HAINBUCH.

3.8 Type designation

Fig. 17

The type designation is on the jaw module and includes the following information:

1 ID no. [marked with the # symbol] e.g. #10721/0004

2 Type designation and size e.g. Jaw module 215 size100 RD

4 Structure and function

4.1 Overview RD

1. Top jaw
2. Base body
3. Locking screw
4. Coupling
5. CENTREX interface
6. Master jaw
7. Slot nut
8. Indicator pin clamping reserve

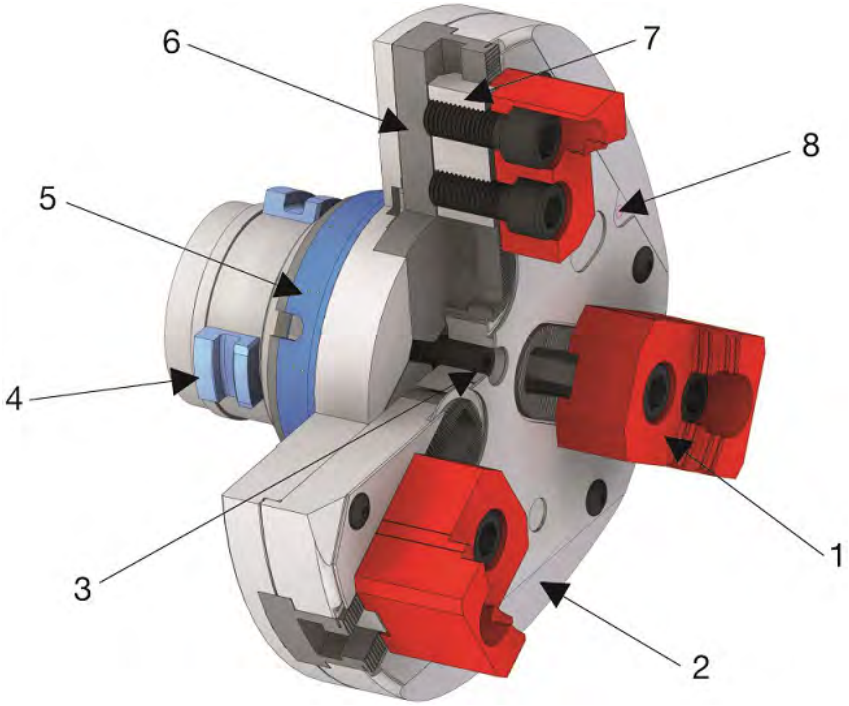


Fig. 18 *

4.2 Overview SE

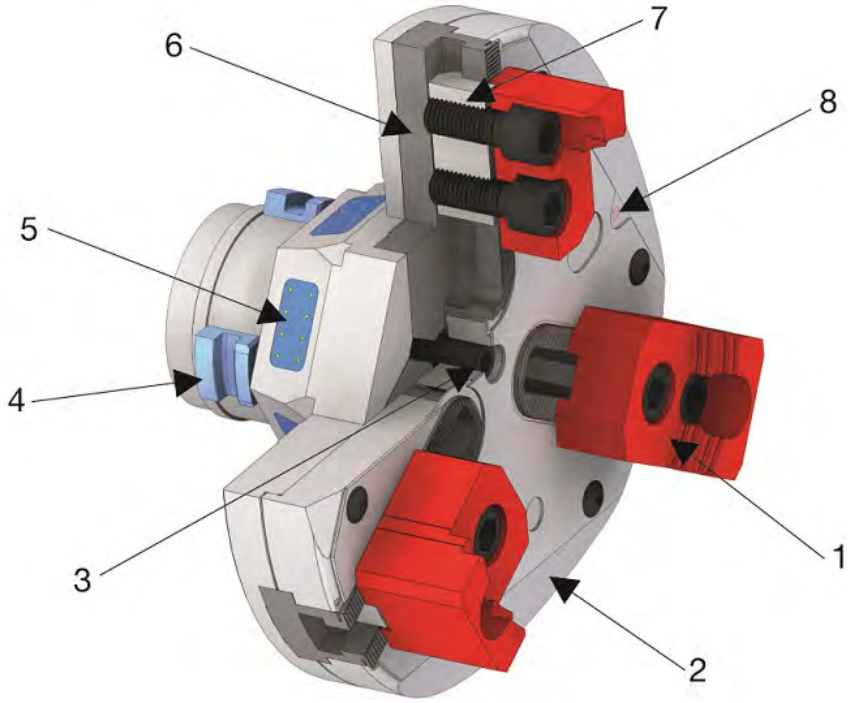


Fig. 19 *

* View as an example

4.3 Brief description

The jaw module is an adaption clamping device for the use of jaws.

By using the jaw module the diameter clamping range of the base clamping device can be expanded. As a base clamping device for adapting the jaw module – depending on the model [RD / SE] the SPANNTOP [RD] or TOPlus [SE] can be used.

Key advantages

- Minimal interference contour
- Dead-length clamping
- Rotating and stationary use
- Only external clamping possible
- Can be used as a pick-up chuck on sub spindles
- Milling between the jaws possible

CAUTION!

Risk of injury!

Risk of component fracture when using the jaw module for I.D. clamping.

- Use the jaw module only for O.D. clamping!

4.4 Optional Accessories

The accessories described here are not included in the scope of delivery.

Specially developed segmented clamping bushings match to the respective maximum RPM are available for each clamping device. Trouble-free and precise function of HAINBUCH clamping devices is only ensured when using original HAINBUCH segmented clamping bushings.

Lubricating grease and grease gun are required for cleaning and preservation of the clamping device. The lubricating grease is also specially matched for protection of the vulcanized segments of the segmented clamping bushings and increase their service life and elasticity by a significant factor.

4.4.1 Jaws

The jaw module can be used with hard jaws or with soft top jaws.

Hard jaws

The top jaws are used for workpiece clamping.

They can be adjusted within their clamping area on the base jaw and thus adjusted for the different clamping diameters.

Hard, grooved jaws

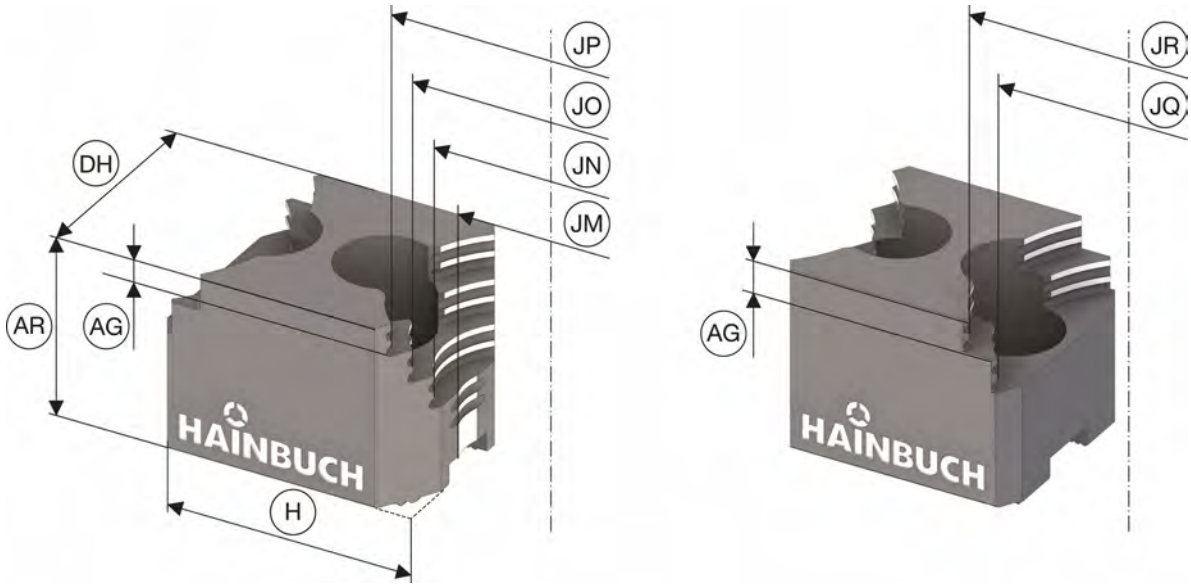


Fig. 20 - 10723/0001 + 10723/0012

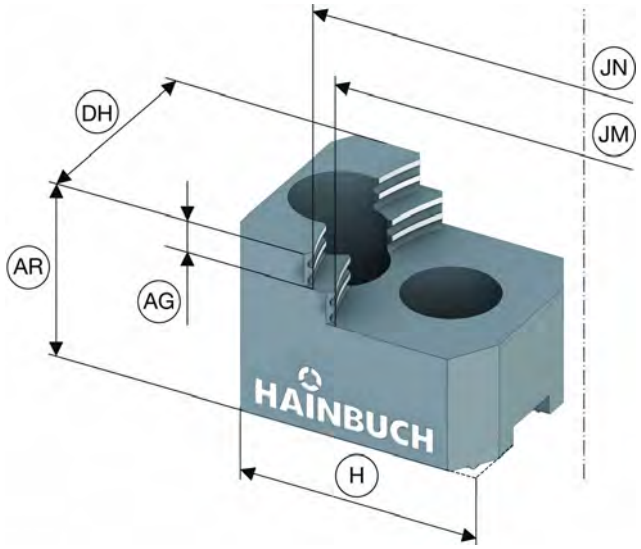


Fig. 21 - 10723/0002 + 10723/0003 + 10723/0013 + 10723/0014

Product		Hard groove jaws					
		#1	#2	#3	#4	#5	#6
Size		145 / 215	145 / 215	145 / 215	145 / 215	145 / 215	145 / 215
Type of gearing		1,5x60°	1,5x60°	1,5x60°	1,5x60°	1,5x60°	1,5x60°
Length [mm]	H	55	55	55	55	55	55
Jaw height [mm]	AR	40	40	40	40	40	40
Jaw width [mm]	DH	45	45	45	45	45	45
Clamping range size145 [mm]		25 - 79	79 - 97	97 - 115	26 - 79	79 - 99	97 - 117
Clamping range size 215 [mm]		25 - 145	79 - 166	97 - 185	26 - 146	79 - 166	97 - 186
Ø Clamping level 1 Side 1 [mm]	JM	25	79	97	26	79	97
Ø Clamping level 2 Side 1 [mm]	JN	34	88	106	34	89	107
Ø Clamping level 3 Side 1 [mm]	JO	43	-	-	43	-	-
Ø Clamping level 4 Side 1 [mm]	JP	52	-	-	52	-	-
Ø Clamping level 1 Side 2 [mm]	JQ	61	-	-	60	-	-
Ø Clamping level 2 Side 2 [mm]	JR	70	-	-	70	-	-
max. clamping length [mm]	AG	7	7	7	7	7	7
In stock		✓	✓	✓	✓	✓	✓
Order no.		10723/ 0001	10723/ 0002	10723/ 0003	10723/ 0012	10723/ 0013	10723/ 0014

Table 7: Hard groove jaws

Hard, axial, and radial grooves jaws

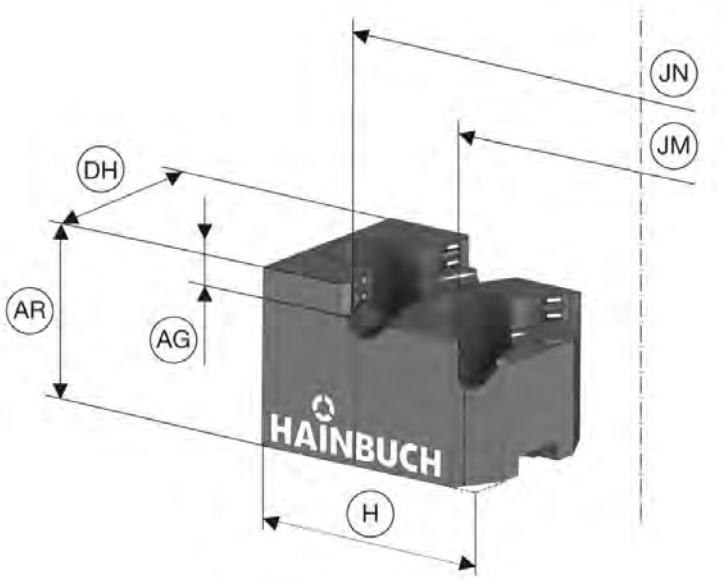


Fig. 22
10723/0004 - 10723/0005 - 10723/0006 - 10723/0007 – 10723/0008

Product		Hard, axial, and radial grooves jaw				
		Jaw #1	Jaw #2	Jaw #3	Jaw #4	Jaw #5
Size		145 / 215	145 / 215	145 / 215	145 / 215	145 / 215
Size of the radial grooves		0,8x3	0,8x3	0,8x3	0,8x3	0,8x3
Length [mm]	H	63	60	55	55	55
Jaw height [mm]	AR	40	40	40	40	40
Jaw width [mm]	DH	45	45	45	45	45
Ø Clamping level 1 [mm]	JM	25	34	43	52	61
Ø Clamping level 2 [mm]	JN	70	79	88	97	106
max. clamping length [mm]	AG	7	7	7	7	7
Clamping range size 145 clamping level 1 [mm]		25-33	34-42	43-52	52-60	61-69
Clamping range size 145 clamping level 2 [mm]		70-79	79-89	88-98	97-107	106-116
Clamping range size 215 clamping level 1 [mm]		25-101	34-108	43-119	52-126	61-135
Clamping range size 215 clamping level 2 [mm]		70-146	79-158	88-167	97-177	106-187
In stock		✓	✓	✓	✓	✓
Order no.		10723/0004	10723/0005	10723/0006	10723/0007	10723/0008

Table 8: Hard, axial, and radial grooves jaws 1/2

Product		Hard, axial, and radial grooves jaw		
		Jaw #6	Jaw #7	Jaw #8
Size		145 / 215	145 / 215	145 / 215
Size of the radial grooves		0,8x3	0,8x3	0,8x3
Length [mm]	H	60	55	55
Jaw height [mm]	AR	46	46	46
Jaw width [mm]	DH	45	45	45
Ø Clamping level 1 [mm]	JM	35	43	62
Ø Clamping level 2 [mm]	JN	79	89	106
max. clamping length [mm]	AG	10	10	10
Clamping range size 145 clamping level 1 [mm]		35-43	43-52	62-71
Clamping range size 145 clamping level 2 [mm]		78-89	89-99	106-116
Clamping range size 215 clamping level 1 [mm]		35-110	43-119	62-137
Clamping range size 215 clamping level 2 [mm]		79-158	89-168	106-187
In stock		✓	✓	✓
Order no.		10723/0009	10723/0010	10723/0011

Table 9: Hard, axial, and radial grooves jaws 2/2

Soft, smooth jaw

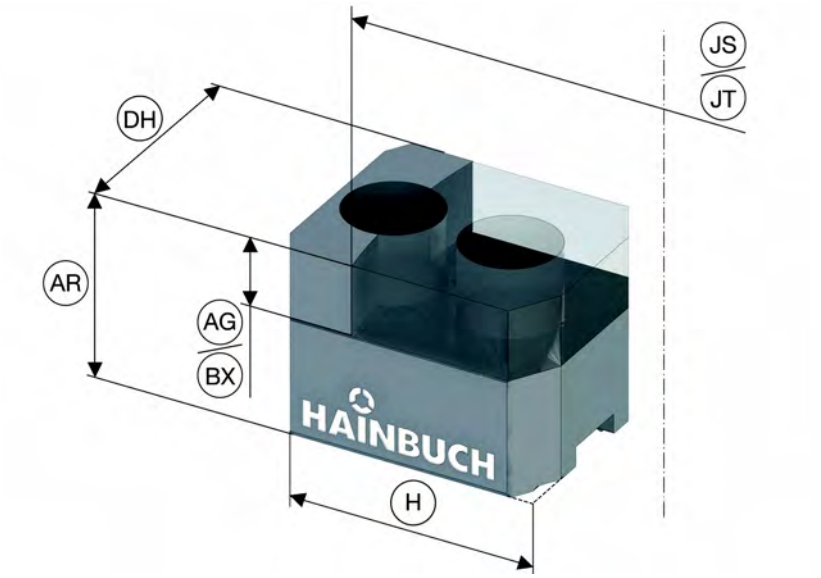


Fig. 23

The soft jaws can be bored up to the given value, see table. They can be ordered with order number 10724/0001 and/or 10724/0002 from HAINBUCH, see overview.

CAUTION!

Risk of injury!

When boring the soft jaws remind the chapter »Boring the jaws«!

- Risk of component rupture by failure to observe!

Product		Soft, smooth jaw	
		Short	Long
Size		145 / 215	145 / 215
Type of gearing		1,5x60°	1,5x60°
Length [mm]	H	55	65
Jaw height [mm]	AR	40	40
Jaw width [mm]	DH	45	45
Clamping range size145 [mm]		25 – 118 max. clamping force 25 – 131 min. clamping force	25 – 126 max. clamping force 25 – 140 min. clamping force
Clamping range size 215 [mm]		25 – 186 max. clamping force 25 – 200 min. clamping force	25 – 195 max. clamping force 25 – 209 min. clamping force
max. clamping length [mm]	AG	15	15
max. permissible turning-Ø [mm]	BW	131 / 200	140 / 209
max. permissible turning depth [mm]	BX	15	15
In stock		-	✓
Order no.		10724/0001	10724/0002

Table 10: Soft, smooth jaw

4.4.2 Special grease

Fig. 24

The special grease has the order number 2085/0005; it can be ordered from HAINBUCH.

4.5 Automatic mode

Machines <u>with</u> position measuring system

For adjustment of machines with position measuring system read chapter 2.11.2.

Machines <u>without</u> position measuring system, however with limit switches

For adjustment of machines without a position measuring system on the clamping cylinder, a trial workpiece with an appropriately machined adjustment diameter can be used.

For this, the adjustment diameter is clamped in the desired clamping step and the end position switch is adjusted until the end position switch signals that the end position is reached.

When this occurs the end position is correctly adjusted!

Procedure

- Select the next smaller clamping step appropriate for your workpiece diameter, with which you can cover your clamping diameter including the tolerances.
- Incrementally start to turn the smaller diameter of this specified clamping range on the trial workpiece. The tolerance for the diameter is 0/-0.1 mm.
- Now mount the 3 jaws at the tooth position specified in the table.
  Tooth position 0 is the smallest tooth setting on the module, tooth position 2 means a setting of 2 teeth further to the outside.
- To clamp the trial workpiece, lower the clamping pressure to 1/3 of the maximum clamping force.
- Now, if you want to clamp the trial workpiece, this represents the smallest setting of the module to which the end position switch must be set. In this position the switch must send the STOP signal to the spindle.

Example

Chuck size:	65/80
Jaw module size:	215
Jaws:	Radial grooved jaws
Workpiece diameter Ø:	60 mm Tolerance +0,6/-0 mm.
Selected clamping step in accordance with Table 14:	52 mm, tooth position 3;
Range:	+0,73/-1,94 mm; the clamping step 43mm covers only +2.79/-0.19 mm.
Alternatively you can also check smaller clamping steps, e.g.:	Clamping level 35 Range +2,27/-0,77 at tooth position 10.

You can now mount the #4 jaws in tooth position 3. Now if you want to clamp the trial workpiece with the incrementally turned diameter of 58.06 mm, then the display pin must not project.

Limit switch adjustment

In accordance with the example cited above:

Precisely in the position for the clamped trial workpiece, with the incrementally turned clamping ø 58.06 0/-0.1, now the end position switch is moved from the maximum position toward the switching cam until the switching cam sends a signal for spindle stop.

Workpiece batches with major tolerance fluctuations may require special clamping jaws. These can be ordered from HAINBUCH.

Checking the clamping range

Through the upstream residual stroke, the useful range of the clamping steps is reduced.

- Check whether the specified, reduced clamping range [see Tables 8-34] is greater than your workpiece dimensions, including your tolerances.
- In this regard, pay attention to the chuck size.

4.6 Selecting jaws

Due to the different clamping steps in the top jaws, as well as the adjustability via the serration, various possibilities arise for selection of an appropriate clamping step.

Check whether your clamping diameter, including its tolerances, can be covered with the next smaller clamping step.

If not, check the coverage on the next smaller clamping step.

In addition, the clamping step that is closest to your workpiece diameter, including tolerances, also generates a smaller inertia loss [see tables in chapter 3.2.2].

Example

- Workpiece diameter 90 mm
  with a tolerance +0.5 mm to -0.5 mm
- Jaw module 100/215 RD

Examination of clamping step 89 mm:

Here the clamping range is 87.17 mm to 93.62 mm

The selection is suitable!

For a 65/215 jaw module the clamping range from 87.97 mm to 97.04 would also be possible due to the lesser stroke in tooth position »0«.

Tabellen

4.6.1 Selection of radial grooved jaws

Size jaw module	Counter bore: 25mm		Clamping range [workpiece] [mm]	
	Part no.: #1 10723/0004		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	25	0	24.18 - 26.67	23.57 - 28.88
	27.03.16	1	26.42 - 29.06	25.76 - 31.37
	29.72	2	28.8 - 31.56	28.11 - 33.94
	32.24	3	31.29 - 34.13	30.56 - 36.58
215	34.83	4	33.86 - 36.78	33.11 - 39.27
	37.49	5	36.49 - 39.47	35.73 - 42
	40.19	6	39.18 - 42.2	38.4 - 44.77
	42.94	7	41.91 - 44.97	41.12 - 47.56
	45.71	8	44.67 - 47.77	43.88 - 50.38
	48.52	9	47.47 - 50.59	46.66 - 53.22
	51.34	10	50.28 - 53.42	49.47 - 56.07
	54.18	11	53.12 - 56.28	52.31 - 58.94
	57.04	12	55.97 - 59.15	55.15 - 61.82
	59.92	13	58.84 - 62.03	58.02 - 64.71
	62.8	14	61.72 - 64.93	60.9 - 67.61
	65.7	15	64.62 - 67.83	63.79 - 70.52
	68.6	16	67.52 - 70.74	66.68 - 73.44
	71.52	17	70.43 - 73.66	69.59 - 76.36
	74.43	18	73.34 - 76.58	72.51 - 79.29
	77.36	19	76.27 - 79.51	75.43 - 82.23
	80.29	20	79.2 - 82.44	78.36 - 85.17
	83.23	21	82.13 - 85.38	81.29 - 88.11
	86.17	22	85.07 - 88.33	84.23 - 91.06
	89.11	23	88.01 - 91.27	87.17 - 94.01
	92.06	24	90.96 - 94.22	90.11 - 96.96
	95.01	25	93.91 - 97.18	93.06 - 99.92
	97.97	26	96.86 - 100.13	96.01 - 102.87
	100.92	27	99.82 - 103.09	98.97 - 105.84

Table 11: Axial and radial grooved jaws - counter bore 25 mm

Size jaw module	Counter bore: 34mm		Clamping range [workpiece] [mm]	
	Part no.: #2 10723/0005		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	34	0	33.23 - 35.57	32.65 - 37.64
	36.15	1	35.34 - 37.81	34.72 - 39.97
	38.42	2	37.56 - 40.14	36.91 - 42.39
	40.78	3	39.89 - 42.57	39.21 - 44.87
215	43.22	4	42.3 - 45.06	41.6 - 47.42
	45.73	5	44.79 - 47.61	44.07 - 50.01
	48.29	6	47.33 - 50.21	46.6 - 52.65
	50.91	7	49.93 - 52.85	49.18 - 55.33
	53.56	8	52.56 - 55.53	51.8 - 58.04
	56.25	9	55.24 - 58.24	54.47 - 60.77
	58.96	10	57.95 - 60.97	57.17 - 63.53
	61.71	11	60.68 - 63.73	59.89 - 66.31
	64.47	12	63.44 - 66.51	62.65 - 69.11
	67.26	13	66.22 - 69.31	65.42 - 71.92
	70.06	14	69.02 - 72.13	68.21 - 74.75
	72.88	15	71.83 - 74.96	71.02 - 77.59
	75.72	16	74.66 - 77.8	73.85 - 80.45
	78.56	17	77.5 - 80.66	76.68 - 83.31
	81.42	18	80.35 - 83.52	79.53 - 86.18
	84.29	19	83.22 - 86.39	82.39 - 89.07
	87.16	20	86.09 - 89.28	85.26 - 91.95
	90.05	21	88.97 - 92.17	88.14 - 94.85
	92.94	22	91.86 - 95.06	91.03 - 97.75
	95.84	23	94.75 - 97.97	93.92 - 100.66
	98.74	24	97.66 - 100.87	96.82 - 103.57
	101.65	25	100.56 - 103.79	99.73 - 106.49
	104.56	26	103.48 - 106.71	102.64 - 109.41
	107.48	27	106.39 - 109.63	105.56 - 112.34

Table 12: Axial and radial grooved jaws - counter bore 34 mm

Size jaw module	Counter bore: 35mm		Clamping range [workpiece] [mm]	
	Part no.: #6 10723/0009		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	35	0	34.21 - 36.61	33.61 - 38.73
	37.21	1	36.37 - 38.9	35.74 - 41.1
	39.52	2	38.65 - 41.28	37.99 - 43.55
	41.92	3	41.02 - 43.73	40.33 - 46.07
215	44.4	4	43.47 - 46.25	42.76 - 48.64
	46.93	5	45.98 - 48.83	45.25 - 51.25
	49.52	6	48.55 - 51.45	47.81 - 53.91
	52.15	7	51.17 - 54.11	50.41 - 56.6
	54.82	8	53.82 - 56.8	53.06 - 59.32
	57.52	9	56.51 - 59.52	55.74 - 62.07
	60.25	10	59.23 - 62.27	58.45 - 64.84
	63.01	11	61.98 - 65.04	61.19 - 67.63
	65.79	12	64.75 - 67.83	63.95 - 70.43
	68.58	13	67.53 - 70.64	66.73 - 73.26
	71.39	14	70.34 - 73.46	69.53 - 76.09
	74.22	15	73.16 - 76.3	72.35 - 78.94
	77.06	16	76 - 79.15	75.18 - 81.8
	79.91	17	78.84 - 82.01	78.03 - 84.66
	82.77	18	81.7 - 84.88	80.88 - 87.54
	85.64	19	84.57 - 87.75	83.75 - 90.43
	88.52	20	87.45 - 90.64	86.62 - 93.32
	91.41	21	90.33 - 93.53	89.5 - 96.22
	94.3	22	93.22 - 96.43	92.39 - 99.12
	97.2	23	96.12 - 99.34	95.29 - 102.03
	100.11	24	99.03 - 102.25	98.19 - 104.95
	103.02	25	101.94 - 105.16	101.1 - 107.87
	105.94	26	104.85 - 108.08	104.02 - 110.79
	108.86	27	107.77 - 111.01	106.93 - 113.72

Table 13: Axial and radial grooved jaws - counter bore 35 mm

Size jaw module	Counter bore: 43mm		Clamping range [workpiece] [mm]	
	Part no. #3 10723/0006 #7 10723/0010		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	43	0	42.13 - 44.74	41.47 - 46.99
	45.38	1	44.48 - 47.17	43.8 - 49.48
	47.83	2	46.9 - 49.66	46.2 - 52.02
	50.33	3	49.39 - 52.21	48.67 - 54.61
215	52.89	4	51.93 - 54.8	51.2 - 57.24
	55.5	5	54.52 - 57.43	53.77 - 59.9
	58.14	6	57.15 - 60.1	56.39 - 62.6
	60.81	7	59.81 - 62.79	59.04 - 65.32
	63.52	8	62.5 - 65.52	61.73 - 68.06
	66.25	9	65.23 - 68.26	64.44 - 70.83
	69	10	67.97 - 71.03	67.18 - 73.61
	71.77	11	70.73 - 73.81	69.94 - 76.41
	74.56	12	73.52 - 76.62	72.72 - 79.22
	77.37	13	76.32 - 79.43	75.51 - 82.05
	80.18	14	79.13 - 82.26	78.32 - 84.89
	83.02	15	81.96 - 85.1	81.15 - 87.74
	85.86	16	84.8 - 87.95	83.98 - 90.6
	88.71	17	87.65 - 90.81	86.83 - 93.47
	91.58	18	90.51 - 93.68	89.69 - 96.35
	94.45	19	93.38 - 96.56	92.55 - 99.23
	97.33	20	96.25 - 99.44	95.43 - 102.12
	100.21	21	99.14 - 102.34	98.31 - 105.02
	103.11	22	102.03 - 105.23	101.2 - 107.92
	106.01	23	104.92 - 108.14	104.09 - 110.83
	108.91	24	107.83 - 111.04	106.99 - 113.74
	111.82	25	110.73 - 113.96	109.9 - 116.66
	114.73	26	113.65 - 116.87	112.81 - 119.58
	117.65	27	116.56 - 119.79	115.73 - 122.51

Table 14: Axial and radial grooved jaws - counter bore 43 mm

Size jaw module	Counter bore: 52mm		Clamping range [workpiece] [mm]	
	Part no.: #4 10723/0007		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	52	0	51.18 - 53.64	50.56 - 55.77
	54.25	1	53.4 - 55.95	52.76 - 58.14
	56.57	2	55.7 - 58.31	55.03 - 60.55
	58.95	3	58.06 - 60.73	57.37 - 63.02
215	61.39	4	60.47 - 63.2	59.77 - 65.53
	63.87	5	62.94 - 65.72	62.23 - 68.09
	66.4	6	65.45 - 68.27	64.72 - 70.67
	68.96	7	68 - 70.86	67.26 - 73.29
	71.56	8	70.59 - 73.48	69.84 - 75.94
	74.19	9	73.2 - 76.13	72.45 - 78.61
	76.84	10	75.85 - 78.81	75.09 - 81.3
	79.52	11	78.52 - 81.5	77.75 - 84.02
	82.23	12	81.21 - 84.22	80.44 - 86.75
	84.95	13	83.93 - 86.96	83.15 - 89.51
	87.69	14	86.66 - 89.71	85.88 - 92.27
	90.45	15	89.41 - 92.48	88.62 - 95.05
	93.22	16	92.18 - 95.26	91.39 - 97.85
	96	17	94.96 - 98.05	94.16 - 100.65
	98.8	18	97.75 - 100.86	96.95 - 103.47
	101.61	19	100.56 - 103.68	99.75 - 106.3
	104.43	20	103.38 - 106.51	102.57 - 109.13
	107.26	21	106.2 - 109.34	105.39 - 111.98
	110.1	22	109.04 - 112.19	108.23 - 114.83
	112.95	23	111.88 - 115.04	111.07 - 117.69
	115.8	24	114.74 - 117.9	113.92 - 120.56
	118.66	25	117.6 - 120.77	116.77 - 123.43
	121.53	26	120.46 - 123.64	119.64 - 126.31
	124.41	27	123.33 - 126.52	122.51 - 129.19

Table 15: Axial and radial grooved jaws - counter bore 52 mm

Size jaw module	Counter bore: 61mm		Clamping range [workpiece] [mm]	
	Part no.: #5 10723/0008		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	61	0	60.14 - 62.71	59.49 - 64.91
	63.34	1	62.46 - 65.08	61.79 - 67.33
	65.73	2	64.83 - 67.51	64.14 - 69.8
	68.16	3	67.25 - 69.98	66.55 - 72.3
215	70.64	4	69.71 - 72.49	69 - 74.85
	73.17	5	72.22 - 75.04	71.5 - 77.42
	75.72	6	74.76 - 77.61	74.03 - 80.03
	78.31	7	77.34 - 80.22	76.6 - 82.66
	80.92	8	79.94 - 82.86	79.19 - 85.32
	83.56	9	82.57 - 85.52	81.82 - 88
	86.23	10	85.23 - 88.2	84.47 - 90.7
	88.91	11	87.91 - 90.9	87.14 - 93.41
	91.62	12	90.61 - 93.61	89.83 - 96.15
	94.34	13	93.32 - 96.35	92.54 - 98.9
	97.08	14	96.06 - 99.1	95.27 - 101.66
	99.84	15	98.81 - 101.87	98.02 - 104.44
	102.61	16	101.57 - 104.64	100.78 - 107.23
	105.39	17	104.35 - 107.43	103.55 - 110.03
	108.18	18	107.13 - 110.23	106.33 - 112.84
	110.98	19	109.93 - 113.04	109.13 - 115.66
	113.8	20	112.74 - 115.87	111.94 - 118.49
	116.62	21	115.56 - 118.69	114.75 - 121.32
	119.45	22	118.39 - 121.53	117.58 - 124.17
	122.29	23	121.23 - 124.38	120.41 - 127.02
	125.14	24	124.07 - 127.23	123.26 - 129.88
	127.99	25	126.92 - 130.09	126.11 - 132.74
	130.85	26	129.78 - 132.95	128.96 - 135.61
	133.72	27	132.65 - 135.82	131.83 - 138.49

Table 16: Axial and radial grooved jaws - counter bore 61 mm

Size jaw module	Counter bore: 62mm		Clamping range [workpiece] [mm]	
	Part no.: #8 10723/0011		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	62	0	61.12 - 63.74	60.46 - 65.98
	64.38	1	63.49 - 66.16	62.8 - 68.44
	66.81	2	65.9 - 68.63	65.2 - 70.95
	69.29	3	68.36 - 71.13	67.65 - 73.49
215	71.81	4	70.86 - 73.68	70.14 - 76.06
	74.36	5	73.4 - 76.25	72.67 - 78.67
	76.94	6	75.98 - 78.86	75.23 - 81.3
	79.56	7	78.58 - 81.49	77.83 - 83.95
	82.2	8	81.21 - 84.15	80.45 - 86.63
	84.86	9	83.86 - 86.83	83.1 - 89.33
	87.55	10	86.54 - 89.53	85.77 - 92.05
	90.25	11	89.24 - 92.25	88.47 - 94.78
	92.98	12	91.96 - 94.99	91.18 - 97.53
	95.72	13	94.69 - 97.74	93.91 - 100.3
	98.47	14	97.44 - 100.5	96.65 - 103.08
	101.24	15	100.21 - 103.28	99.41 - 105.87
	104.02	16	102.98 - 106.07	102.19 - 108.67
	106.82	17	105.77 - 108.87	104.97 - 111.48
	109.62	18	108.57 - 111.69	107.77 - 114.3
	112.44	19	111.39 - 114.51	110.58 - 117.13
	115.26	20	114.21 - 117.34	113.4 - 119.97
	118.09	21	117.04 - 120.18	116.22 - 122.81
	120.94	22	119.87 - 123.02	119.06 - 125.67
	123.78	23	122.72 - 125.88	121.9 - 128.53
	126.64	24	125.57 - 128.74	124.75 - 131.39
	129.5	25	128.43 - 131.6	127.61 - 134.27
	132.37	26	131.3 - 134.48	130.48 - 137.14
	135.24	27	134.17 - 137.35	133.35 - 140.03

Table 17: Axial and radial grooved jaws - counter bore 62 mm

Size jaw module	Counter bore: 70mm		Clamping range [workpiece] [mm]	
	Part no.: #1 10723/0004		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	70	0	69.03 - 71.92	68.29 - 74.37
	72.62	1	71.64 - 74.56	70.89 - 77.04
	75.27	2	74.28 - 77.23	73.52 - 79.73
	77.95	3	76.95 - 79.93	76.18 - 82.44
215	80.65	4	79.64 - 82.64	78.87 - 85.18
	83.37	5	82.35 - 85.38	81.57 - 87.92
	86.11	6	85.08 - 88.13	84.3 - 90.69
	88.86	7	87.83 - 90.89	87.04 - 93.47
	91.63	8	90.6 - 93.68	89.8 - 96.26
	94.42	9	93.38 - 96.47	92.58 - 99.07
	97.22	10	96.17 - 99.28	95.37 - 101.89
	100.03	11	98.98 - 102.09	98.17 - 104.71
	102.85	12	101.79 - 104.92	100.98 - 107.55
	105.68	13	104.62 - 107.76	103.81 - 110.39
	108.51	14	107.45 - 110.6	106.64 - 113.25
	111.36	15	110.3 - 113.46	109.48 - 116.11
	114.22	16	113.15 - 116.32	112.33 - 118.97
	117.08	17	116.01 - 119.18	115.19 - 121.85
	119.95	18	118.88 - 122.06	118.06 - 124.73
	122.83	19	121.75 - 124.94	120.93 - 127.61
	125.71	20	124.63 - 127.82	123.8 - 130.5
	128.59	21	127.51 - 130.71	126.69 - 133.4
	131.49	22	130.4 - 133.61	129.58 - 136.3
	134.38	23	133.3 - 136.51	132.47 - 139.2
	137.28	24	136.2 - 139.41	135.37 - 142.11
	140.19	25	139.1 - 142.32	138.27 - 145.02
	143.1	26	142.01 - 145.23	141.18 - 147.93
	146.01	27	144.92 - 148.15	144.09 - 150.85

Table 18: Axial and radial grooved jaws - counter bore 70 mm

Size jaw module	Counter bore: 79mm		Clamping range [workpiece] [mm]	
	Part no.: #2 10723/0005 #6 10723/0009		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	79	0	77.98 - 81.01	77.2 - 83.56
	81.74	1	80.72 - 83.76	79.93 - 86.33
	84.5	2	83.47 - 86.54	82.68 - 89.12
	87.28	3	86.24 - 89.32	85.44 - 91.92
215	90.07	4	89.02 - 92.12	88.22 - 94.73
	92.87	5	91.82 - 94.93	91.02 - 97.55
	95.68	6	94.63 - 97.76	93.83 - 100.38
	98.51	7	97.45 - 100.59	96.64 - 103.22
	101.35	8	100.29 - 103.43	99.47 - 106.07
	104.19	9	103.13 - 106.28	102.31 - 108.93
	107.04	10	105.98 - 109.14	105.16 - 111.8
	109.91	11	108.84 - 112.01	108.02 - 114.67
	112.77	12	111.7 - 114.88	110.88 - 117.55
	115.65	13	114.58 - 117.76	113.75 - 120.44
	118.53	14	117.45 - 120.65	116.63 - 123.33
	121.42	15	120.34 - 123.54	119.51 - 126.22
	124.31	16	123.23 - 126.44	122.4 - 129.12
	127.21	17	126.13 - 129.34	125.3 - 132.03
	130.11	18	129.03 - 132.24	128.19 - 134.94
	133.02	19	131.93 - 135.15	131.1 - 137.85
	135.93	20	134.84 - 138.06	134.01 - 140.77
	138.84	21	137.75 - 140.98	136.92 - 143.69
	141.76	22	140.67 - 143.9	139.83 - 146.61
	144.68	23	143.59 - 146.82	142.75 - 149.54
	147.61	24	146.51 - 149.75	145.67 - 152.47
	150.53	25	149.44 - 152.68	148.6 - 155.4
	153.46	26	152.37 - 155.61	151.53 - 158.33
	156.4	27	155.3 - 158.55	154.46 - 161.27

Table 19: Axial and radial grooved jaws - counter bore 79 mm

Size jaw module	Counter bore: 88mm		Clamping range [workpiece] [mm]	
	Part no.: #3 10723/0006		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	88	0	86.97 - 90.03	86.18 - 92.61
	90.77	1	89.74 - 92.82	88.94 - 95.41
	93.56	2	92.52 - 95.61	91.72 - 98.21
	96.36	3	95.31 - 98.42	94.51 - 101.03
215	99.17	4	98.12 - 101.24	97.31 - 103.86
	101.99	5	100.94 - 104.07	100.13 - 106.7
	104.83	6	103.77 - 106.91	102.96 - 109.55
	107.67	7	106.61 - 109.76	105.79 - 112.4
	110.52	8	109.45 - 112.61	108.64 - 115.26
	113.37	9	112.31 - 115.47	111.49 - 118.13
	116.24	10	115.17 - 118.34	114.35 - 121.01
	119.11	11	118.04 - 121.22	117.21 - 123.89
	121.99	12	120.91 - 124.1	120.09 - 126.78
	124.87	13	123.79 - 126.99	122.97 - 129.67
	127.76	14	126.68 - 129.88	125.85 - 132.57
	130.65	15	129.57 - 132.78	128.74 - 135.47
	133.55	16	132.47 - 135.68	131.64 - 138.37
	136.45	17	135.37 - 138.59	134.54 - 141.28
	139.36	18	138.28 - 141.5	137.44 - 144.19
	142.27	19	141.18 - 144.41	140.35 - 147.11
	145.19	20	144.1 - 147.33	143.26 - 150.03
	148.1	21	147.01 - 150.25	146.18 - 152.95
	151.02	22	149.93 - 153.17	149.1 - 155.88
	153.95	23	152.86 - 156.09	152.02 - 158.81
	156.88	24	155.78 - 159.02	154.94 - 161.74
	159.81	25	158.71 - 161.96	157.87 - 164.67
	162.74	26	161.64 - 164.89	160.8 - 167.61
	165.67	27	164.58 - 167.83	163.73 - 170.55

Table 20: Axial and radial grooved jaws - counter bore 88 mm

Size jaw module	Counter bore: 89mm		Clamping range [workpiece] [mm]	
	Part no.: #7 10723/0010		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	89	0	87.97 - 91.04	87.17 - 93.62
	91.78	1	90.74 - 93.83	89.94 - 96.42
	94.57	2	93.53 - 96.63	92.73 - 99.24
	97.38	3	96.33 - 99.44	95.53 - 102.06
215	100.19	4	99.14 - 102.27	98.33 - 104.89
	103.02	5	101.97 - 105.1	101.15 - 107.74
	105.86	6	104.8 - 107.94	103.99 - 110.59
	108.7	7	107.64 - 110.8	106.82 - 113.44
	111.56	8	110.49 - 113.65	109.67 - 116.31
	114.42	9	113.35 - 116.52	112.53 - 119.18
	117.29	10	116.21 - 119.39	115.39 - 122.06
	120.16	11	119.09 - 122.27	118.26 - 124.94
	123.04	12	121.96 - 125.16	121.14 - 127.83
	125.93	13	124.85 - 128.05	124.02 - 130.73
	128.82	14	127.74 - 130.94	126.91 - 133.63
	131.71	15	130.63 - 133.84	129.8 - 136.53
	134.61	16	133.53 - 136.74	132.7 - 139.44
	137.52	17	136.43 - 139.65	135.6 - 142.35
	140.43	18	139.34 - 142.56	138.51 - 145.26
	143.34	19	142.25 - 145.48	141.42 - 148.18
	146.26	20	145.17 - 148.4	144.33 - 151.1
	149.18	21	148.09 - 151.32	147.25 - 154.03
	152.1	22	151.01 - 154.24	150.17 - 156.96
	155.02	23	153.93 - 157.17	153.09 - 159.89
	157.95	24	156.86 - 160.1	156.02 - 162.82
	160.88	25	159.79 - 163.03	158.95 - 165.75
	163.82	26	162.72 - 165.97	161.88 - 168.69
	166.75	27	165.66 - 168.91	164.81 - 171.63

Table 21: Axial and radial grooved jaws - counter bore 89 mm

Size jaw module	Counter bore: 97mm		Clamping range [workpiece] [mm]	
	Part no.: #4 10723/0007		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	97	0	95.95 - 99.06	95.15 - 101.68
	99.81	1	98.76 - 101.88	97.96 - 104.51
	102.64	2	101.58 - 104.72	100.77 - 107.35
	105.47	3	104.41 - 107.56	103.6 - 110.2
215	108.32	4	107.25 - 110.41	106.44 - 113.06
	111.17	5	110.1 - 113.26	109.29 - 115.92
	114.03	6	112.96 - 116.13	112.14 - 118.79
	116.89	7	115.82 - 119	115 - 121.67
	119.77	8	118.69 - 121.88	117.87 - 124.55
	122.65	9	121.57 - 124.76	120.75 - 127.44
	125.53	10	124.45 - 127.65	123.63 - 130.33
	128.42	11	127.34 - 130.54	126.51 - 133.23
	131.32	12	130.23 - 133.44	129.4 - 136.13
	134.21	13	133.13 - 136.34	132.3 - 139.04
	137.12	14	136.03 - 139.25	135.2 - 141.95
	140.03	15	138.94 - 142.16	138.11 - 144.86
	142.94	16	141.85 - 145.08	141.02 - 147.78
	145.85	17	144.76 - 147.99	143.93 - 150.7
	148.77	18	147.68 - 150.91	146.85 - 153.62
	151.69	19	150.6 - 153.84	149.77 - 156.55
	154.62	20	153.53 - 156.77	152.69 - 159.48
	157.55	21	156.45 - 159.69	155.61 - 162.41
	160.48	22	159.38 - 162.63	158.54 - 165.35
	163.41	23	162.31 - 165.56	161.47 - 168.28
	166.34	24	165.25 - 168.5	164.41 - 171.22
	169.28	25	168.19 - 171.44	167.34 - 174.16
	172.22	26	171.12 - 174.38	170.28 - 177.11
	175.16	27	174.06 - 177.32	173.22 - 180.05

Table 22: Axial and radial grooved jaws - counter bore 97 mm

Size jaw module	Counter bore: 106mm		Clamping range [workpiece] [mm]	
	Part no.: #5 10723/0008 #8 10723/0011		Chuck Gr. 65/80	Chuck Gr. 100
	Clamping-ø in clamping position	Tooth position		
145 / 215	106	0	104.93 - 108.1	104.11 - 110.77
	108.87	1	107.8 - 110.98	106.98 - 113.65
	111.75	2	110.67 - 113.86	109.85 - 116.54
	114.63	3	113.56 - 116.75	112.73 - 119.43
215	117.52	4	116.44 - 119.65	115.62 - 122.33
	120.42	5	119.34 - 122.55	118.51 - 125.24
	123.32	6	122.24 - 125.45	121.4 - 128.14
	126.22	7	125.14 - 128.36	124.31 - 131.06
	129.13	8	128.05 - 131.27	127.21 - 133.97
	132.05	9	130.96 - 134.19	130.12 - 136.89
	134.96	10	133.87 - 137.11	133.04 - 139.81
	137.89	11	136.79 - 140.03	135.96 - 142.74
	140.81	12	139.72 - 142.96	138.88 - 145.67
	143.74	13	142.64 - 145.89	141.8 - 148.6
	146.67	14	145.57 - 148.82	144.73 - 151.54
	149.6	15	148.5 - 151.75	147.66 - 154.47
	152.54	16	151.44 - 154.69	150.6 - 157.41
	155.47	17	154.38 - 157.63	153.53 - 160.36
	158.41	18	157.32 - 160.57	156.47 - 163.3
	161.36	19	160.26 - 163.52	159.41 - 166.25
	164.3	20	163.2 - 166.46	162.36 - 169.19
	167.25	21	166.15 - 169.41	165.3 - 172.14
	170.2	22	169.09 - 172.36	168.25 - 175.09
	173.15	23	172.04 - 175.31	171.2 - 178.05
	176.1	24	175 - 178.26	174.15 - 181
	179.05	25	177.95 - 181.22	177.1 - 183.96
	182.01	26	180.9 - 184.17	180.06 - 186.91
	184.96	27	183.86 - 187.13	183.01 - 189.87

Table 23: Axial and radial grooved jaws - counter bore 106 mm

4.6.2 Selection of grooved jaws

Size jaw module	Counter bore: 25 mm Part no.: #1 10723/0001		Clamping-ø in clamping position [mm]	
	Clamping-ø in clamping position [mm]	Tooth position	Chuck size 65/80	Chuck size 100
145 / 215	25	0	23.93 - 27.12	23.11 - 29.81
	27.89	1	26.81 - 30.03	25.98 - 32.74
	30.81	2	29.72 - 32.95	28.88 - 35.67
	33.73	3	32.64 - 35.89	31.8 - 38.62
215	36.67	4	35.58 - 38.84	34.73 - 41.57
	39.62	5	38.52 - 41.79	37.68 - 44.53
	42.58	6	41.47 - 44.75	40.63 - 47.5
	45.54	7	44.43 - 47.72	43.59 - 50.47
	48.51	8	47.4 - 50.69	46.55 - 53.44
	51.48	9	50.37 - 53.66	49.52 - 56.42
	54.45	10	53.34 - 56.63	52.49 - 59.39
	57.43	11	56.32 - 59.61	55.46 - 62.37
	60.41	12	59.29 - 62.59	58.44 - 65.36
	63.39	13	62.27 - 65.57	61.42 - 68.34
	66.37	14	65.26 - 68.56	64.4 - 71.32
	69.35	15	68.24 - 71.54	67.38 - 74.31
	72.34	16	71.22 - 74.53	70.37 - 77.3
	75.33	17	74.21 - 77.52	73.35 - 80.29
	78.31	18	77.2 - 80.5	76.34 - 83.27
	81.3	19	80.19 - 83.49	79.33 - 86.26
	84.29	20	83.18 - 86.48	82.32 - 89.25
	87.28	21	86.16 - 89.47	85.31 - 92.25
	90.27	22	89.16 - 92.47	88.3 - 95.24
	93.26	23	92.15 - 95.46	91.29 - 98.23
	96.25	24	95.14 - 98.45	94.28 - 101.22
	99.25	25	98.13 - 101.44	97.27 - 104.22
	102.24	26	101.12 - 104.43	100.26 - 107.21
	105.23	27	104.12 - 107.43	103.26 - 110.2

Table 24: Grooved jaws - counter bore 25 mm

Size jaw module	Counter bore: 26 mm Part no.: #4 10723/0012		Clamping-ø in clamping position [mm]	
	Clamping-ø in clamping position [mm]	Tooth position	Chuck size 65/80	Chuck size 100
145 / 215	26	0	24.97 - 28.04	24.18 - 30.66
	28.79	1	27.74 - 30.86	26.94 - 33.51
	31.62	2	30.56 - 33.72	29.75 - 36.38
	34.48	3	33.41 - 36.59	32.59 - 39.27
215	37.36	4	36.29 - 39.49	35.46 - 42.18
	40.26	5	39.18 - 42.4	38.35 - 45.1
	43.17	6	42.09 - 45.32	41.25 - 48.03
	46.1	7	45.01 - 48.25	44.17 - 50.97
	49.03	8	47.93 - 51.19	47.09 - 53.92
	51.97	9	50.87 - 54.13	50.03 - 56.87
	54.92	10	53.82 - 57.08	52.97 - 59.82
	57.87	11	56.77 - 60.04	55.92 - 62.78
	60.83	12	59.72 - 63	58.88 - 65.74
	63.79	13	62.68 - 65.96	61.83 - 68.71
	66.75	14	65.65 - 68.93	64.8 - 71.68
	69.72	15	68.61 - 71.9	67.76 - 74.65
	72.69	16	71.58 - 74.87	70.73 - 77.63
	75.66	17	74.55 - 77.84	73.7 - 80.6
	78.64	18	77.53 - 80.82	76.67 - 83.58
	81.61	19	80.5 - 83.8	79.65 - 86.56
	84.59	20	83.48 - 86.78	82.63 - 89.54
	87.57	21	86.46 - 89.76	85.61 - 92.52
	90.55	22	89.44 - 92.74	88.59 - 95.5
	93.54	23	92.42 - 95.72	91.57 - 98.49
	96.52	24	95.41 - 98.71	94.55 - 101.47
	99.5	25	98.39 - 101.69	97.53 - 104.46
	102.49	26	101.37 - 104.68	100.52 - 107.45
	105.48	27	104.36 - 107.67	103.5 - 110.43

Table 25: Grooved jaws - counter bore 26 mm

Size jaw module	Counter bore: 34mm		Clamping-ø in clamping position [mm]	
	Part no.: #1 10723/0001 #4 10723/0012		Chuck size 65/80	Chuck size 100
	Clamping-ø in clamping position [mm]	Tooth position		
145 / 215	34	0	33.17 - 35.67	32.55 - 37.87
	36.3	1	35.43 - 38.04	34.77 - 40.32
	38.69	2	37.79 - 40.5	37.1 - 42.83
	41.16	3	40.23 - 43.02	39.52 - 45.41
215	43.7	4	42.75 - 45.6	42.02 - 48.04
	46.3	5	45.32 - 48.23	44.58 - 50.7
	48.94	6	47.95 - 50.9	47.19 - 53.41
	51.62	7	50.62 - 53.61	49.85 - 56.14
	54.33	8	53.32 - 56.34	52.54 - 58.9
	57.08	9	56.05 - 59.1	55.26 - 61.68
	59.84	10	58.81 - 61.89	58.01 - 64.48
	62.63	11	61.59 - 64.69	60.79 - 67.3
	65.44	12	64.39 - 67.51	63.58 - 70.13
	68.26	13	67.21 - 70.34	66.4 - 72.98
	71.1	14	70.04 - 73.19	69.23 - 75.84
	73.95	15	72.89 - 76.05	72.07 - 78.71
	76.81	16	75.74 - 78.92	74.92 - 81.59
	79.69	17	78.61 - 81.8	77.79 - 84.47
	82.57	18	81.49 - 84.69	80.66 - 87.37
	85.46	19	84.38 - 87.58	83.55 - 90.27
	88.35	20	87.27 - 90.48	86.44 - 93.18
	91.26	21	90.17 - 93.39	89.34 - 96.09
	94.17	22	93.08 - 96.3	92.25 - 99.01
	97.08	23	95.99 - 99.22	95.16 - 101.93
	100	24	98.91 - 102.15	98.07 - 104.86
	102.93	25	101.83 - 105.07	101 - 107.79
	105.86	26	104.76 - 108.01	103.92 - 110.73
	108.79	27	107.69 - 110.94	106.85 - 113.66

Table 26: Grooved jaws - counter bore 34 mm

Size jaw module	Counter bore: 43mm		Clamping-ø in clamping position [mm]	
	Part no.: #1 10723/0001 #4 10723/0012		Chuck size 65/80	Chuck size 100
	Clamping-ø in clamping position [mm]	Tooth position		
145 / 215	43	0	42.22 - 44.57	41.63 - 46.63
	45.16	1	44.34 - 46.8	43.72 - 48.93
	47.4	2	46.55 - 49.1	45.91 - 51.3
	49.73	3	48.85 - 51.48	48.19 - 53.74
215	52.13	4	51.22 - 53.92	50.54 - 56.23
	54.58	5	53.66 - 56.42	52.95 - 58.77
	57.09	6	56.15 - 58.96	55.43 - 61.35
	59.64	7	58.68 - 61.54	57.95 - 63.97
	62.23	8	61.26 - 64.16	60.52 - 66.61
	64.86	9	63.88 - 66.81	63.12 - 69.29
	67.52	10	66.53 - 69.49	65.76 - 71.99
	70.21	11	69.2 - 72.19	68.43 - 74.72
	72.92	12	71.9 - 74.92	71.13 - 77.47
	75.65	13	74.63 - 77.67	73.85 - 80.23
	78.4	14	77.37 - 80.43	76.59 - 83.01
	81.17	15	80.14 - 83.22	79.34 - 85.81
	83.96	16	82.92 - 86.01	82.12 - 88.62
	86.76	17	85.71 - 88.82	84.91 - 91.44
	89.57	18	88.52 - 91.64	87.71 - 94.27
	92.4	19	91.34 - 94.48	90.53 - 97.11
	95.23	20	94.17 - 97.32	93.36 - 99.96
	98.08	21	97.01 - 100.17	96.2 - 102.82
	100.93	22	99.87 - 103.03	99.05 - 105.69
	103.79	23	102.73 - 105.9	101.9 - 108.56
	106.66	24	105.59 - 108.77	104.77 - 111.44
	109.54	25	108.47 - 111.66	107.64 - 114.33
	112.43	26	111.35 - 114.54	110.52 - 117.22
	115.31	27	114.24 - 117.44	113.41 - 120.12

Table 27: Grooved jaws - counter bore 43 mm

Size jaw module	Counter bore: 52mm		Clamping-ø in clamping position [mm]	
	Part no. #1 10723/0001 #4 10723/0012		Chuck size 65/80	Chuck size 100
	Clamping-ø in clamping position [mm]	Tooth position		
145 / 215	52	0	51.26 - 53.5	50.7 - 55.45
	54.05	1	53.28 - 55.61	52.69 - 57.64
	56.19	2	55.38 - 57.81	54.77 - 59.9
	58.4	3	57.57 - 60.07	56.93 - 62.22
215	60.68	4	59.83 - 62.4	59.17 - 64.6
	63.03	5	62.15 - 64.78	61.47 - 67.03
	65.42	6	64.52 - 67.21	63.83 - 69.5
	67.86	7	66.95 - 69.68	66.25 - 72.01
	70.35	8	69.42 - 72.2	68.71 - 74.56
	72.88	9	71.93 - 74.75	71.21 - 77.14
	75.44	10	74.48 - 77.33	73.74 - 79.75
	78.03	11	77.06 - 79.95	76.31 - 82.39
	80.65	12	79.67 - 82.58	78.91 - 85.05
	83.29	13	82.3 - 85.25	81.54 - 87.73
	85.96	14	84.96 - 87.93	84.2 - 90.44
	88.65	15	87.64 - 90.64	86.87 - 93.16
	91.36	16	90.35 - 93.36	89.57 - 95.89
	94.09	17	93.07 - 96.1	92.28 - 98.65
	96.83	18	95.8 - 98.85	95.02 - 101.41
	99.59	19	98.56 - 101.62	97.77 - 104.19
	102.36	20	101.32 - 104.4	100.53 - 106.99
	105.14	21	104.1 - 107.19	103.3 - 109.79
	107.94	22	106.89 - 109.99	106.09 - 112.6
	110.74	23	109.69 - 112.81	108.89 - 115.42
	113.56	24	112.51 - 115.63	111.7 - 118.25
	116.39	25	115.33 - 118.46	114.52 - 121.09
	119.22	26	118.16 - 121.3	117.35 - 123.94
	122.06	27	121 - 124.15	120.18 - 126.79

Table 28: Grooved jaws - counter bore 52 mm

Size jaw module	Counter bore: 60mm		Clamping-ø in clamping position [mm]	
	Part no. #4 10723/0012		Chuck size 65/80	Chuck size 100
	Clamping-ø in clamping position [mm]	Tooth position		
145 / 215	60	0	59.15 - 61.69	58.51 - 63.87
	62.31	1	61.44 - 64.04	60.78 - 66.27
	64.68	2	63.79 - 66.45	63.11 - 68.72
	67.09	3	66.19 - 68.9	65.49 - 71.21
215	69.56	4	68.63 - 71.39	67.93 - 73.73
	72.06	5	71.12 - 73.92	70.4 - 76.3
	74.6	6	73.65 - 76.49	72.92 - 78.89
	77.18	7	76.21 - 79.08	75.47 - 81.51
	79.78	8	78.8 - 81.7	78.06 - 84.16
	82.41	9	81.42 - 84.35	80.67 - 86.83
	85.06	10	84.07 - 87.02	83.31 - 89.52
	87.74	11	86.74 - 89.72	85.97 - 92.23
	90.44	12	89.43 - 92.43	88.66 - 94.95
	93.15	13	92.14 - 95.16	91.36 - 97.7
	95.89	14	94.86 - 97.9	94.08 - 100.46
	98.63	15	97.61 - 100.66	96.82 - 103.23
	101.4	16	100.36 - 103.43	99.57 - 106.01
	104.17	17	103.13 - 106.22	102.34 - 108.81
	106.96	18	105.92 - 109.01	105.12 - 111.61
	109.76	19	108.71 - 111.82	107.91 - 114.43
	112.57	20	111.52 - 114.63	110.71 - 117.25
	115.39	21	114.33 - 117.46	113.53 - 120.09
	118.21	22	117.16 - 120.29	116.35 - 122.93
	121.05	23	119.99 - 123.14	119.18 - 125.78
	123.89	24	122.83 - 125.98	122.02 - 128.63
	126.75	25	125.68 - 128.84	124.86 - 131.49
	129.6	26	128.54 - 131.7	127.72 - 134.36
	132.47	27	131.4 - 134.57	130.58 - 137.23

Table 29: Grooved jaws - counter bore 60 mm

Size jaw module	Counter bore: 61mm		Clamping-ø in clamping position [mm]	
	Part no. #1 10723/0001		Chuck size 65/80	Chuck size 100
	Clamping-ø in clamping position [mm]	Tooth position		
145 / 215	61	0	60.14 - 62.71	59.49 - 64.91
	63.34	1	62.46 - 65.08	61.79 - 67.33
	65.73	2	64.83 - 67.51	64.14 - 69.8
	68.16	3	67.25 - 69.98	66.55 - 72.3
215	70.64	4	69.71 - 72.49	69 - 74.85
	73.17	5	72.22 - 75.04	71.5 - 77.42
	75.72	6	74.76 - 77.61	74.03 - 80.03
	78.31	7	77.34 - 80.22	76.6 - 82.66
	80.92	8	79.94 - 82.86	79.19 - 85.32
	83.56	9	82.57 - 85.52	81.82 - 88
	86.23	10	85.23 - 88.2	84.47 - 90.7
	88.91	11	87.91 - 90.9	87.14 - 93.41
	91.62	12	90.61 - 93.61	89.83 - 96.15
	94.34	13	93.32 - 96.35	92.54 - 98.9
	97.08	14	96.06 - 99.1	95.27 - 101.66
	99.84	15	98.81 - 101.87	98.02 - 104.44
	102.61	16	101.57 - 104.64	100.78 - 107.23
	105.39	17	104.35 - 107.43	103.55 - 110.03
	108.18	18	107.13 - 110.23	106.33 - 112.84
	110.98	19	109.93 - 113.04	109.13 - 115.66
	113.8	20	112.74 - 115.87	111.94 - 118.49
	116.62	21	115.56 - 118.69	114.75 - 121.32
	119.45	22	118.39 - 121.53	117.58 - 124.17
	122.29	23	121.23 - 124.38	120.41 - 127.02
	125.14	24	124.07 - 127.23	123.26 - 129.88
	127.99	25	126.92 - 130.09	126.11 - 132.74
	130.85	26	129.78 - 132.95	128.96 - 135.61
	133.72	27	132.65 - 135.82	131.83 - 138.49

Table 30: Grooved jaws - counter bore 61 mm

Size jaw module	Counter bore: 70mm		Clamping-ø in clamping position [mm]	
	Part no. #1 10723/0001 #4 10723/0012		Chuck size 65/80	Chuck size 100
	Clamping-ø in clamping position [mm]	Tooth position		
145 / 215	70	0	69.07 - 71.84	68.36 - 74.19
	72.51	1	71.57 - 74.37	70.85 - 76.76
	75.06	2	74.1 - 76.95	73.37 - 79.35
	77.64	3	76.67 - 79.55	75.93 - 81.98
215	80.24	4	79.27 - 82.17	78.52 - 84.63
	82.88	5	81.89 - 84.83	81.14 - 87.3
	85.54	6	84.54 - 87.5	83.78 - 90
	88.22	7	87.21 - 90.2	86.45 - 92.71
	90.92	8	89.91 - 92.91	89.13 - 95.44
	93.64	9	92.62 - 95.64	91.84 - 98.19
	96.37	10	95.35 - 98.39	94.57 - 100.95
	99.12	11	98.1 - 101.15	97.31 - 103.72
	101.89	12	100.85 - 103.92	100.06 - 106.51
	104.67	13	103.63 - 106.71	102.83 - 109.3
	107.46	14	106.41 - 109.51	105.61 - 112.11
	110.26	15	109.21 - 112.32	108.41 - 114.93
	113.07	16	112.02 - 115.14	111.21 - 117.76
	115.89	17	114.83 - 117.96	114.03 - 120.59
	118.72	18	117.66 - 120.8	116.85 - 123.43
	121.56	19	120.5 - 123.64	119.68 - 126.28
	124.4	20	123.34 - 126.49	122.52 - 129.14
	127.25	21	126.19 - 129.35	125.37 - 132
	130.11	22	129.04 - 132.21	128.22 - 134.87
	132.98	23	131.91 - 135.08	131.09 - 137.75
	135.85	24	134.78 - 137.96	133.95 - 140.63
	138.72	25	137.65 - 140.84	136.83 - 143.51
	141.61	26	140.53 - 143.72	139.7 - 146.4
	144.49	27	143.41 - 146.61	142.59 - 149.29

Table 31: Grooved jaws - counter bore 70 mm

Size jaw module	Counter bore: 79 mm		Clamping-ø in clamping position [mm]	
	Part no.: #2 10723/0002 #5 10723/0013		Chuck size 65/80	Chuck size 100
	Clamping-ø in clamping position [mm]	Tooth position		
145 / 215	79	0	78.03 - 80.92	77.28 - 83.37
	81.62	1	80.64 - 83.56	79.89 - 86.03
	84.27	2	83.28 - 86.23	82.52 - 88.71
	86.94	3	85.94 - 88.91	85.18 - 91.42
215	89.63	4	88.62 - 91.62	87.85 - 94.14
	92.34	5	91.33 - 94.34	90.55 - 96.88
	95.07	6	94.05 - 97.08	93.27 - 99.63
	97.81	7	96.79 - 99.83	96 - 102.4
	100.57	8	99.54 - 102.6	98.75 - 105.18
	103.34	9	102.31 - 105.38	101.51 - 107.97
	106.13	10	105.09 - 108.18	104.29 - 110.77
	108.92	11	107.88 - 110.98	107.08 - 113.59
	111.73	12	110.68 - 113.79	109.88 - 116.41
	114.55	13	113.49 - 116.62	112.69 - 119.24
	117.37	14	116.32 - 119.45	115.51 - 122.08
	120.2	15	119.15 - 122.29	118.33 - 124.93
	123.05	16	121.98 - 125.13	121.17 - 127.78
	125.9	17	124.83 - 127.99	124.01 - 130.64
	128.75	18	127.68 - 130.85	126.87 - 133.51
	131.61	19	130.54 - 133.72	129.72 - 136.38
	134.48	20	133.41 - 136.59	132.59 - 139.25
	137.36	21	136.28 - 139.47	135.46 - 142.14
	140.23	22	139.16 - 142.35	138.33 - 145.02
	143.12	23	142.04 - 145.24	141.21 - 147.92
	146.01	24	144.93 - 148.13	144.1 - 150.81
	148.9	25	147.82 - 151.02	146.99 - 153.71
	151.8	26	150.72 - 153.92	149.89 - 156.62
	154.7	27	153.62 - 156.83	152.78 - 159.52

Table 32: Grooved jaws - counter bore 79 mm

Size jaw module	Counter bore: 88mm		Clamping-ø in clamping position [mm]	
	Part no.: #2 10723/0002		Chuck size 65/80	Chuck size 100
	Clamping-ø in clamping position [mm]	Tooth position		
145 / 215	88	0	87 - 89.98	86.23 - 92.49
	90.7	1	89.69 - 92.69	88.92 - 95.22
	93.42	2	92.4 - 95.42	91.62 - 97.96
	96.15	3	95.13 - 98.17	94.34 - 100.72
215	98.9	4	97.87 - 100.93	97.08 - 103.5
	101.66	5	100.63 - 103.7	99.84 - 106.28
	104.44	6	103.4 - 106.48	102.61 - 109.08
	107.23	7	106.19 - 109.28	105.39 - 111.88
	110.03	8	108.98 - 112.09	108.18 - 114.7
	112.84	9	111.79 - 114.91	110.98 - 117.53
	115.66	10	114.61 - 117.73	113.8 - 120.36
	118.49	11	117.43 - 120.57	116.62 - 123.2
	121.33	12	120.27 - 123.41	119.45 - 126.05
	124.17	13	123.11 - 126.26	122.29 - 128.91
	127.02	14	125.96 - 129.12	125.14 - 131.77
	129.88	15	128.81 - 131.98	127.99 - 134.64
	132.74	16	131.67 - 134.85	130.85 - 137.51
	135.61	17	134.54 - 137.72	133.72 - 140.39
	138.49	18	137.42 - 140.6	136.59 - 143.28
	141.37	19	140.3 - 143.49	139.47 - 146.17
	144.26	20	143.18 - 146.38	142.35 - 149.06
	147.15	21	146.07 - 149.27	145.24 - 151.96
	150.04	22	148.96 - 152.17	148.13 - 154.86
	152.94	23	151.86 - 155.07	151.03 - 157.76
	155.84	24	154.76 - 157.98	153.93 - 160.67
	158.75	25	157.67 - 160.88	156.83 - 163.58
	161.66	26	160.57 - 163.8	159.74 - 166.5
	164.57	27	163.49 - 166.71	162.65 - 169.42

Table 33: Grooved jaws - counter bore 88 mm

Size jaw module	Counter bore: 89mm		Clamping-ø in clamping position [mm]	
	Part no.: #5 10723/0013		Chuck size 65/80	Chuck size 100
	Clamping-ø in clamping position [mm]	Tooth position		
145 / 215	89	0	87.99 - 90.98	87.22 - 93.5
	91.71	1	90.69 - 93.7	89.92 - 96.24
	94.43	2	93.41 - 96.44	92.63 - 98.99
	97.17	3	96.15 - 99.19	95.36 - 101.75
215	99.92	4	98.89 - 101.95	98.11 - 104.53
	102.69	5	101.66 - 104.73	100.86 - 107.32
	105.48	6	104.44 - 107.52	103.64 - 110.12
	108.27	7	107.22 - 110.32	106.42 - 112.93
	111.07	8	110.02 - 113.13	109.22 - 115.75
	113.89	9	112.83 - 115.96	112.03 - 118.58
	116.71	10	115.65 - 118.78	114.84 - 121.41
	119.54	11	118.48 - 121.62	117.67 - 124.26
	122.38	12	121.32 - 124.47	120.51 - 127.11
	125.23	13	124.16 - 127.32	123.35 - 129.97
	128.08	14	127.02 - 130.18	126.2 - 132.83
	130.94	15	129.87 - 133.04	129.05 - 135.7
	133.81	16	132.74 - 135.92	131.92 - 138.58
	136.68	17	135.61 - 138.79	134.79 - 141.46
	139.56	18	138.48 - 141.67	137.66 - 144.35
	142.44	19	141.37 - 144.56	140.54 - 147.24
	145.33	20	144.25 - 147.45	143.42 - 150.13
	148.22	21	147.14 - 150.35	146.31 - 153.03
	151.12	22	150.04 - 153.25	149.21 - 155.94
	154.02	23	152.94 - 156.15	152.1 - 158.84
	156.92	24	155.84 - 159.06	155.01 - 161.75
	159.83	25	158.75 - 161.97	157.91 - 164.67
	162.74	26	161.65 - 164.88	160.82 - 167.58
	165.66	27	164.57 - 167.8	163.73 - 170.5

Table 34: Grooved jaws - counter bore 89 mm

Size jaw module	Counter bore 97mm		Clamping-ø in clamping position [mm]	
	Part no. #3 10723/0003 #6 10723/0014		Chuck size 65/80	Chuck size 100
	Clamping-ø in clamping position [mm]	Tooth position		
145 / 215	97	0	95.98 - 99.02	95.19 - 101.58
	99.75	1	98.72 - 101.78	97.93 - 104.36
	102.52	2	101.49 - 104.56	100.69 - 107.14
	105.3	3	104.26 - 107.35	103.47 - 109.94
215	108.1	4	107.05 - 110.15	106.25 - 112.75
	110.9	5	109.85 - 112.96	109.05 - 115.57
	113.71	6	112.66 - 115.78	111.85 - 118.4
	116.53	7	115.48 - 118.61	114.67 - 121.24
	119.37	8	118.31 - 121.45	117.5 - 124.08
	122.2	9	121.14 - 124.29	120.33 - 126.93
	125.05	10	123.99 - 127.14	123.17 - 129.79
	127.91	11	126.84 - 130	126.02 - 132.66
	130.77	12	129.7 - 132.87	128.88 - 135.53
	133.63	13	132.56 - 135.74	131.74 - 138.4
	136.5	14	135.43 - 138.61	134.61 - 141.28
	139.38	15	138.31 - 141.5	137.48 - 144.17
	142.26	16	141.19 - 144.38	140.36 - 147.06
	145.15	17	144.07 - 147.27	143.25 - 149.95
	148.04	18	146.96 - 150.17	146.13 - 152.85
	150.94	19	149.86 - 153.07	149.03 - 155.76
	153.84	20	152.76 - 155.97	151.93 - 158.66
	156.74	21	155.66 - 158.88	154.83 - 161.57
	159.65	22	158.57 - 161.79	157.73 - 164.48
	162.56	23	161.47 - 164.7	160.64 - 167.4
	165.48	24	164.39 - 167.61	163.55 - 170.32
	168.39	25	167.3 - 170.53	166.47 - 173.24
	171.31	26	170.22 - 173.46	169.39 - 176.17
	174.24	27	173.14 - 176.38	172.31 - 179.09

Table 35: Grooved jaws - counter bore 97 mm

Size jaw module	Counter bore: 106mm		Clamping-ø in clamping position [mm]	
	Part no.: #3 10723/0003		Chuck size 65/80	Chuck size 100
	Clamping-ø in clamping position [mm]	Tooth position		
145 / 215	106	0	104.96 - 108.05	104.16 - 110.65
	108.8	1	107.75 - 110.85	106.95 - 113.46
	111.6	2	110.55 - 113.66	109.75 - 116.28
	114.42	3	113.36 - 116.49	112.56 - 119.11
215	117.24	4	116.19 - 119.32	115.38 - 121.95
	120.07	5	119.02 - 122.16	118.2 - 124.8
	122.92	6	121.85 - 125	121.04 - 127.65
	125.76	7	124.7 - 127.86	123.88 - 130.51
	128.62	8	127.55 - 130.72	126.73 - 133.37
	131.48	9	130.41 - 133.58	129.59 - 136.25
	134.35	10	133.28 - 136.46	132.46 - 139.12
	137.22	11	136.15 - 139.33	135.33 - 142.01
	140.1	12	139.03 - 142.22	138.2 - 144.89
	142.99	13	141.91 - 145.1	141.08 - 147.78
	145.87	14	144.8 - 148	143.97 - 150.68
	148.77	15	147.69 - 150.89	146.86 - 153.58
	151.66	16	150.58 - 153.79	149.75 - 156.48
	154.57	17	153.48 - 156.7	152.65 - 159.39
	157.47	18	156.39 - 159.6	155.55 - 162.3
	160.38	19	159.29 - 162.51	158.46 - 165.21
	163.29	20	162.2 - 165.43	161.37 - 168.13
	166.21	21	165.12 - 168.34	164.28 - 171.05
	169.12	22	168.03 - 171.26	167.2 - 173.97
	172.04	23	170.95 - 174.19	170.12 - 176.9
	174.97	24	173.87 - 177.11	173.04 - 179.82
	177.89	25	176.8 - 180.04	175.96 - 182.75
	180.82	26	179.73 - 182.97	178.89 - 185.69
	183.75	27	182.66 - 185.9	181.82 - 188.62

Table 36: Grooved jaws - counter bore 106 mm

Size jaw module	Counter bore: 107mm		Clamping-ø in clamping position [mm]	
	Part no.:#6 10723/0014		Chuck size 65/80	Chuck size 100
	Clamping-ø in clamping position [mm]	Tooth position		
145 / 215	107	0	105.96 - 109.05	105.16 - 111.65
	109.8	1	108.75 - 111.86	107.95 - 114.47
	112.61	2	111.56 - 114.67	110.75 - 117.29
	115.43	3	114.37 - 117.5	113.57 - 120.13
215	118.26	4	117.2 - 120.33	116.39 - 122.97
	121.09	5	120.03 - 123.18	119.22 - 125.82
	123.94	6	122.87 - 126.03	122.06 - 128.67
	126.79	7	125.72 - 128.88	124.9 - 131.53
	129.64	8	128.58 - 131.74	127.76 - 134.4
	132.51	9	131.44 - 134.61	130.62 - 137.28
	135.38	10	134.31 - 137.49	133.48 - 140.15
	138.25	11	137.18 - 140.37	136.36 - 143.04
	141.13	12	140.06 - 143.25	139.23 - 145.93
	144.02	13	142.94 - 146.14	142.12 - 148.82
	146.91	14	145.83 - 149.03	145 - 151.72
	149.81	15	148.72 - 151.93	147.89 - 154.62
	152.7	16	151.62 - 154.83	150.79 - 157.52
	155.61	17	154.52 - 157.74	153.69 - 160.43
	158.51	18	157.43 - 160.65	156.59 - 163.34
	161.42	19	160.33 - 163.56	159.5 - 166.26
	164.33	20	163.25 - 166.47	162.41 - 169.18
	167.25	21	166.16 - 169.39	165.33 - 172.1
	170.17	22	169.08 - 172.31	168.24 - 175.02
	173.09	23	172 - 175.23	171.16 - 177.95
	176.01	24	174.92 - 178.16	174.08 - 180.87
	178.94	25	177.85 - 181.09	177.01 - 183.8
	181.87	26	180.78 - 184.02	179.94 - 186.74
	184.8	27	183.71 - 186.95	182.87 - 189.67

Table 37: Grooved jaws - counter bore 107 mm

5 Transporting, packaging and storing

5.1 Safety instructions for transporting

Unbalanced package

WARNING!

Danger of falling due to an unbalanced package

Packed goods can have an unbalanced package. If attached incorrectly the package can tip and cause life-threatening injuries.

- Note the markings on the packages.
- Attach the crane hook in such a manner that it is located above the center of gravity.
- Carefully lift and see if the load tilts. If necessary change the attachment.

5.2 Symbols on the packaging

Fragile

Identifies packages with fragile or sensitive contents.

Handle the packed goods with care; do not allow them to fall, and do not subject them to impact.

Protect from moisture

Keep packed goods dry and protected against moisture.

5.3 Transport inspection

Check delivery immediately upon receipt to ensure that delivery is complete and to identify any transport damage.

Proceed as follows it there is apparent external damage:

- Do not accept the delivery, or only accept it with reservation.
- Note the extend of transport damage on the transport documents or on the transport company's delivery ticket.
- Submit a complaint.

Report any defect as soon as it is detected. Claims for damage compensation can only be enforced during the applicable periods for giving notice of lack of conformity.

5.4 Packaging

About the packaging

Individual packages are packed according to the expected transport conditions. Environmentally-friendly materials have been used exclusively for the packaging.

Packaging should protect the specific components from transport damage, corrosion, and other damage until installation. Therefore do not destroy the packaging, remove it just before installation.

The packed goods are sealed in foil airtight and packed in cartons. See the »Technical Data« section for the specific weight of the respective sizes.

Handling packaging materials

Dispose of packaging materials in accordance with the respectively valid statutory regulations and local guidelines.

NOTE!

Improper disposal causes environmental damage!

Packaging materials are valuable raw materials and in many cases they can be reused, or they can be effectively treated and recycled.

- Dispose of packaging materials in an environmentally responsible manner.
- Comply with locally applicable disposal guidelines. If necessary commission a specialized company to dispose of packaging.

5.5 Storing

Under certain circumstances instructions for storage and subsequent storage are affixed to the packages that extend beyond the requirements cited here.

Comply with these instructions accordingly.

Storage of packages

Only store packages under the following conditions:

- Do not store outdoors.
- Store in a dry and dust-free location
- Do not expose to aggressive media
- Protect from direct sunlight
- Avoid mechanical vibration
- Storage temperature: 15 bis 35 °C
- Relative humidity: max. 60 %
- For storage periods longer than 3 months:
  - Check the general condition of all parts and the packaging at regular intervals.
  - Touch up or re-apply anti-corrosion agents as needed

Subsequent storage of the clamping device

Only re-store the clamping device under the following conditions:

- Thoroughly clean the clamping device prior to subsequent storage [see section »Cleaning«]
- Thoroughly oil and grease the clamping device. [see section »Cleaning«]
- Store the clamping device in airtight foil
- The clamping device must be stored securely in position. If this is not guaranteed, use a suitable container for the clamping device or equip the shelf with a circumferential securing edge.

6 Assembly

6.1 Pre-consideration

- Screws are tightened according to the size of the screw and the general torque, see »Maintenance« To avoid axis-parallel warpage under load and to get stiffness turn in the screws evenly.
- To avoid precision error clean the screw joint surfaces and also the mating surfaces, see »Maintenance«.
  The ex works wetting of the plate surfaces and the clamping element is only corrosion protection. It's not functionally lubricated.
- Avoid too much lubricant on the bearing surface, as this can cause face runout.
- Seal rings [e.g. o-ring, quad-ring seal] and sealing surfaces must be lubricated.
  Note the information in the chapter »Maintenance«.
- Note that the function surfaces [plate surface, mating surface, cone surface and seal surface] may not be damaged.

CAUTION!

Wear safety shoes during the assembly and maintenance work.

Make sure that the starting of the spindle is impossible.

6.2 Preparation

The total weight of the jaw module depends on the size and can be as much as 15 kg.

NOTE!

Material damage due to falling of the jaw module!

When mounting the jaw module can fall and be damaged e.g. may cause material damage at the machine.

- Two people are always required for this task.
- Always handle carefully with the jaw module
- Always wear safety footwear.

6.2.1 Preparation of the machine for assembly

Before assembling the jaw module to the base end-stop of the clamping device must be disassembled.

Special tools required:

- Allen wrench SW5/SW6
- Changing fixture

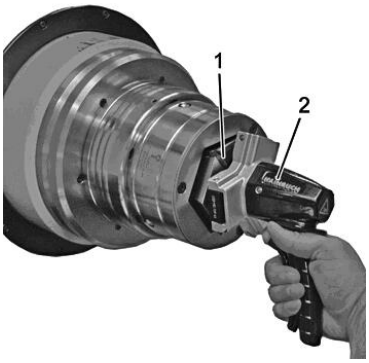


Fig. 25

1. Remove the assembled clamping head [1] with a suitable changing fixture [2].

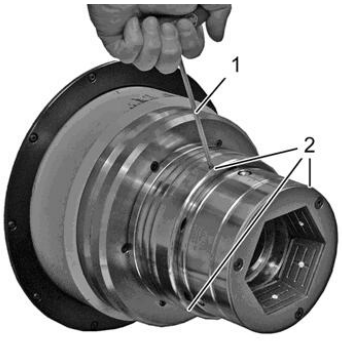


Fig. 26

2. Loosen the three clamping screws for the ground end-stop [2] in the circumference of the clamping device with an allen wrench [1].

Fig. 27

3. Remove the base end-stop [1].

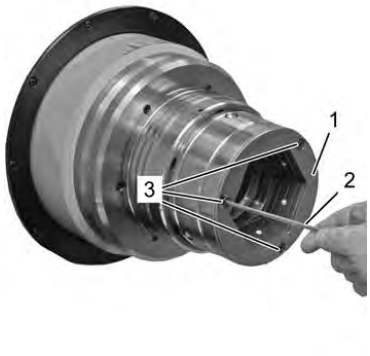


Fig. 28

For assembling to a TOPlus chuck:

4. Loosen the three countersunk screws [3] at the plate [1] by using an allen wrench [2].
5. Remove the plate [1].

6.2.2 Preparation of the jaw module

WARNING

A deviation from the procedures listed below can lead to spin out of the workpieces.

- Follow exactly the steps mentioned below!

Special tools required:

- Allen wrench SW5/SW6

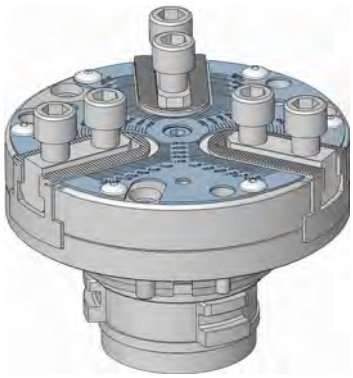


Fig. 29

1. Place the jaw module *) in standing condition on the work bench.

Make sure that the jaw module stands safe and may not fall.

*) delivery condition

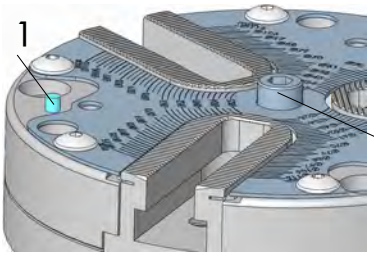


Fig. 30

2. Unscrew the centric operating screw [2] with the torque of 20 Nm until the pin [1] protrudes [approx. 4 mm].

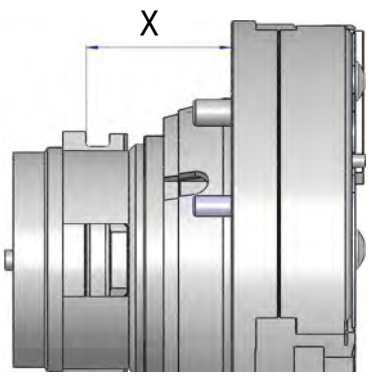


Fig. 31

Size 65/80 [clamping device]:

- Control measure X: ≥ 44,45 mm

Size 100 [clamping device]:

- Control measure X: ≥ 55,45 mm

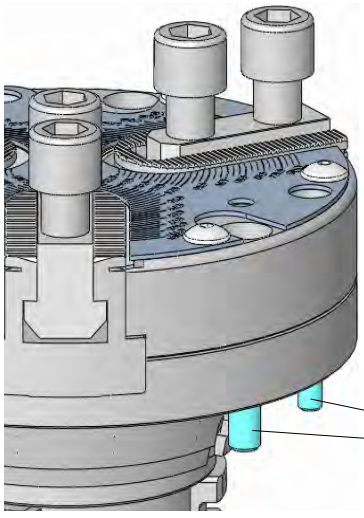


Fig. 32

3. Remove the mounting screws [3]:
   - either the mounting screws 3xM6 at SPANNTOP nova or TOPlus
   - or the fixing screws 3xM8 at SPANNTOP mini or TOPlus mini

The jaw module is prepared for the assembly.

6.3 Installation

WARNING!

Danger of injury due to unintentional start-up of a machine spindle!

Unexpected start up of a machine spindle can cause severe injury.

- Only run the machine in set-up mode or jog mode.
- Set the axial clamping force of the machine tool on the lowest setting.
- Always remove immediately all the tools and wrenches from the clamping device after use.
- Unscrew all eye bolts from the clamping device and remove them from the interior of the machine.
- Prior to switching on automatic mode close all protective doors or hoods that are present on the machine tool.

WARNING!

Danger of injury due to vertical suspended spindle!

Bending into the machine work are when assembling overhead can cause severe head injuries.

- Secure components prior to overhead assembly.
- For assembly on a vertically suspended spindle always use a suitable mounting aid.

6.3.1 Assembly of the jaw module

Special tools required:

- Allen wrench SW5 / SW6

WARNING!

Risk of injury of thrown out workpieces!

A deviation from the previously mentioned procedure for »preparing the jaw module« can lead to spinning out of the workpieces.

- Follow the steps mentioned in the chapter »Preparation of the jaw module« exactly!

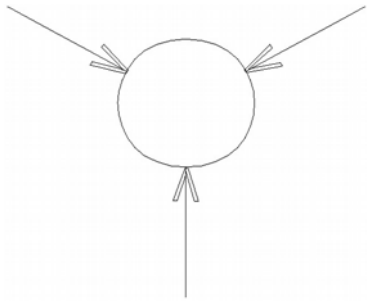


Fig. 33

1. Put the machine into set-up mode.
2. Remove all tools from the machine's interior.
3. Reduce the clamping pressure of the machine to lowest level.
4. Move the drawtube of the machine into back end position [clamping reserve].

Fig. 34

Note
- the position of the torsional safety at model RD.
- the position of the mounting screws at model SE.

1. Place the jaw module on the chuck.

Fig. 35

2. Screw in the 3 mounting screws
   - 3xM6 at SPANNTOP nova / TOPlus and/or.
   - 3xM8 at SPANNTOP mini / TOPlus mini
   and tighten them firmly with the correct tightening torque, see chapter »Maintenance«.

Fig. 36

3. Screw in the central screw till end to connect the jaw module with the coupling of the clamping device.

WARNING!

Test condition of the adjustment dimension:
- clamping device in clamping reserve
- with the engaged coupling

The central screw must now be
- at size 65/80 **approx. 6,5 mm**
- at size 100 **approx. 10,0 mm**

lower than the cover plate.

Please refer to »Control of the stroke position«.

4. Tighten the central actuating screw with the torque **20 Nm**.

The jaw module is assembled.

CAUTION!

Risk of injury!

When assembled incorrect, the clamping force may not be sufficiently transferred.

Too low clamping force can lead to the ejection of the workpiece.

- Make sure that the central screw is mounted correctly.
- Move the machine into release position!

State of release position: mounted CORRECT

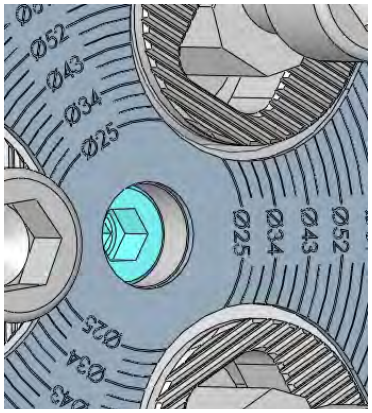


Fig. 37

Central screw deepened.

Values see page 96.

State of release position: : mountend WRONG:

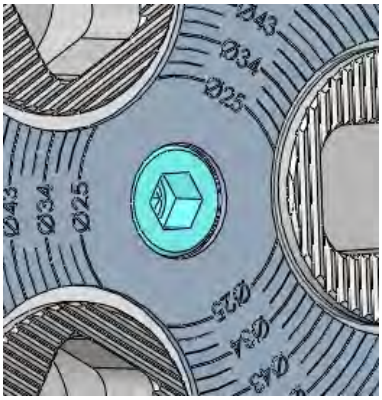


Fig. 38

Central screw is approx. flush and/or variies at

- Size 65/80 for approx. 2.5 mm
- Size 100 for approx. 3.75-4.75 mm

from the values [see page 96].

NOTE!

The test values may vary lightly due to the single tolerances.

6.3.2 Assembly of the jaws

Special tools required:

- Allen wrench SW10

1. Put the machine into set-up mode.
2. Remove all tools from the machine's interior.
3. Reduce the clamping pressure of the machine to lowest level.
4. Move the drawtube of the machine into front end position [release position].

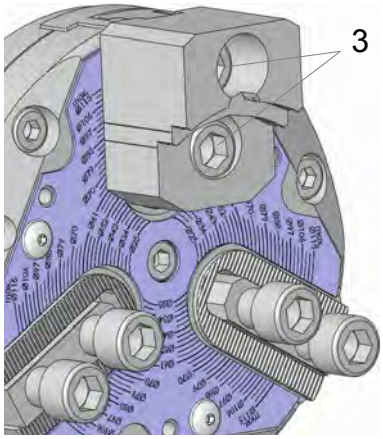


Fig. 39

NOTE!

Material damage due to incorrect tightening torque!

By incorrect tightening torque components can be damaged.

- Notice the permissible [maximum] torque.

5. Assemble the top jaws
   - Put on the top jaws.
   - Position the jaws by the marking and the scale on the cover plate.

NOTE!

The scale is only a rough estimate.

- If necessary approach to the required clamping position by multiple correcting.
- Make sure that all jaws are mounted in the same radial location.

   - Tighten the screws [3] with the tightening torque of **130 Nm**.

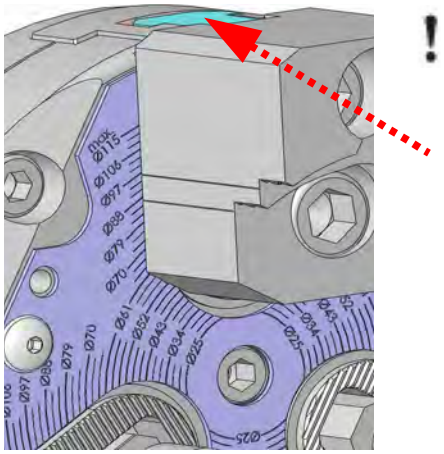


Fig. 40

NOTE!

Material damage caused by exceeding the maximum position!

By exceeding the maximum position, the strength of the component is no longer ensured.

- In greatest position the slot nut must maximum be flush with the outer diameter of the base jaws!

When inserting the top jaws and pushing into the smallest position the specified clamping diameter is achieved.

Example: Jaw module size145 clamping-Ø 79

- Screw the top jaws onto the slot nut without tightening, so the top jaw is still movable
- Push the top jaws completely inside to the end-stop
- Pull back until they engage to the next possible gearing
- Tighten the top jaws.

The clamping diameter of 79 mm is reached.

When clamping beginning at Ø 82 the top jaw can be set by 1 tooth to the outside. The clamping range is increased by 3 mm.

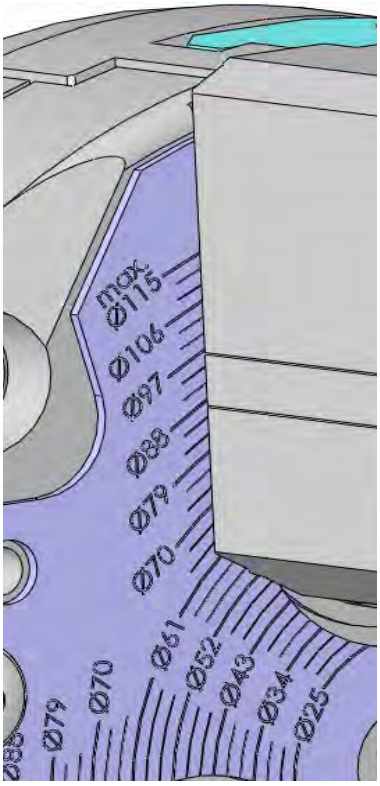


Fig. 41

Reading example:

The top jaw is offset by 3 points outward and is located approximately at clamping ø 88 mm and/or 97 mm.

A workpiece with

- clamping diameter + 2x release stroke → 88 + (2x1,1)
  = 90,2
- clamping diameter + 2x release stroke → 97 + (2x1,1)
  = 99,2

can be clamped.

6.3.3 Boring the soft jaws

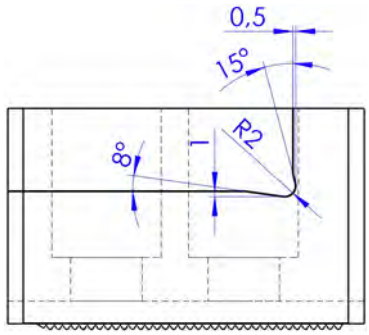


Fig. 42

Special tools required:

- Allen wrench SW10

NOTE!

Material damage due to component fragmentation!

Incorrect boring of the soft jaw can cause component failure.

- Observe the max. boring contour!
- The specified radius must be **strictly** complied with!

NOTE!

Material damage due to component fragmentation!

If soft jaws are machined in such a manner that an edge seat is generated [see chapter 2.10.3], then as is the case with a workpiece clamping, clamping force peaks occur in the jaws. This results in premature jaw fracture.

- A contingency for the minimal shoulder width is strictly required [see diagram on page 101].

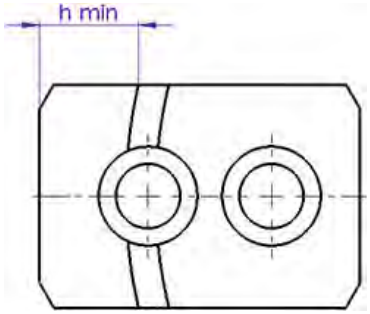


Fig. 43

Soft, smooth top jaws can be machined by the user himself to meet individual requirements.

However the justifiable machining geometries are also subject to limits that must be complied with under all circumstances, otherwise the jaws can break under load.

Based on the diagram below, on one hand the minimal shoulder width »h« can be determined at a given cutting force and clamping force [Metering example 1].

On the other hand, with a jaw that has already been machined and planned cutting force, the maximum clamping force that would still be justifiable, without damaging the chuck jaw can be determined.

NOTE!

This acceptable value is not equivalent to the clamping force to be determined that is the minimal necessary to safely clamp the component.

- **Both** criteria must be satisfied independently of each other!

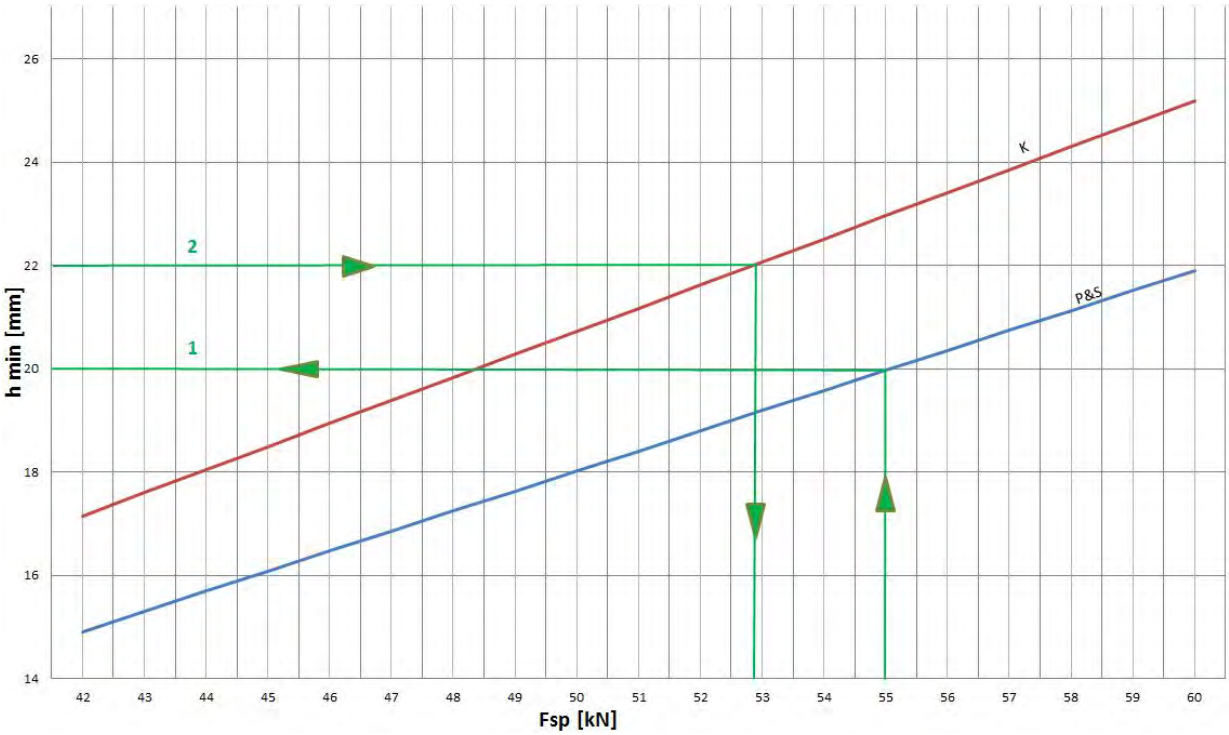


Fig. 44 [6] - minimal shoulder width h_{min}

Metering example 1 At a required clamping force of 55 kN and snug fits, the shoulder width must be at least h=20 mm.

Metering example 2 At a shoulder width of h=22 the soft, smooth top jaws must be operated at a clamping force of max. 52.8 kN.

Always assemble the soft jaws in suitable position for workpiece clamping.

- To minimize the centrifugal loss:
  Screw the jaws as far as possible to the fulcrum.

1. Put the machine into set-up mode.
2. Remove all tools from the machine's interior.
3. Reduce the clamping pressure of the machine to lowest level.
4. Move the drawtube of the machine into front end position.
5. Adjust the clamping force to the level in which the workpiece will be clamped to achieve the best possible concentricity.
   Pay attention to the maximum allowed clamping force!

6 1 = example 1
2 = example 2
K =light edge seat
P&S = snug fit and saddle seat

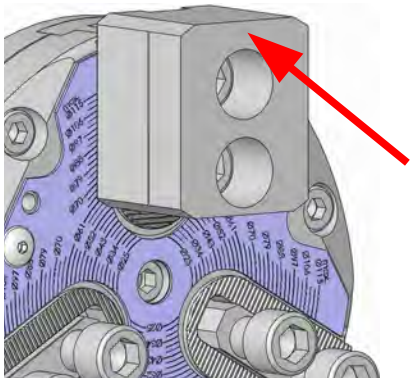


Fig. 45

NOTE!

Material damage due to component fragmentation!

Component fragmentation due to wrong boring of the big diameters.

- When boring the big diameters
  - from ø190 to ø 200 mm for size 215
  - from ø105 to ø 115 mm for size 145

  the jaws must be assembled with the wide side facing out!

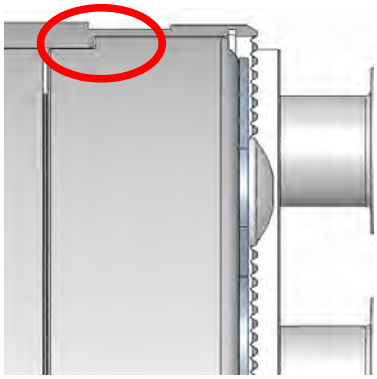


Fig. 46

6. Set the jaws in their future clamping position by inserting a round material in the center of the jaws.
   - The clamping position is reached when the base jaws are flush with the outside of the circumference.
     A reserve clamping stroke is ensured.
7. Bore the jaws in the usual way.

NOTE!

Material damage due to lack of precision!

Clamping jaws for highest repeatability must be bored and/or grinded out in the clamping device under clamping pressure.

When boring and/or grinding out make sure, that the loading ring or loading plug is clamped by the top jaws and not from the base jaws.

8. Check the position of the base jaws and the reserve stroke by a test clamping.

6.4 Workpiece

WARNING!

Risk of injury due to thrown out parts!

During clamping of the workpiece and the processing parts can be thrown and cause severe injuries and property damage.

- Check the clamping diameter of the workpiece.
- Only clamp workpieces that meet the dimensional requirements.
- For clamping very long workpieces use in addition a tailstock / a steady rest for support.
- Do not exceed the maximum permissible axial clamping force.
- Make sure that the applied axial clamping force is set correctly [neither too high nor too low].

- Check the correct retaining force of the workpiece using a plastic hammer or a clamping force measuring device.

6.5 Tests

NOTE!

Material damage due to damaged adaptation clamping device!

A damaged, incomplete, or unbalanced adaption clamping device can significantly damage or even destroy the machine tool and the workpiece.

- Only use complete and properly assembled adaptation clamping devices.
- If in doubt contact the manufacturer.

Ensure the following points prior to each installation and start-up of the adaption clamping device:

- The adaption clamping device must be undamaged.
- The coupling slider are undamaged and can be moved inwards and outwards.
- All cylindrical screws of the adaptation clamping device must be present and tightened with the proper tightening torque.
- The set RPM of the machine tool should not exceed the maximum permissible speed of the adaption clamping device; see chapter »Max. RPM«.
- The maximum drawtube force specified on the perimeter of the adaptation clamping device must not be exceeded.
- The clamping pressure of the machine is sufficiently high to clamp the workpiece securely.
  Of all the specified draw forces and pressure forces the lowest values are always to be used.
- All assembly tools must be removed from the interior of the machine.
- Adaptation clamping device and workpiece must be compatible – check the clamping diameter regularly.
- The workpiece is clamped by a sufficient clamping force.

6.6 Control of the stroke position

WARNING!

Crushing danger from moving parts!

Crushing danger from moving parts during controlling the stroke position!

Gaps, caused while controlling the stroke position, can cause severe injury.

- Only do the controlling of the stroke position with assembled changing parts.
- Only run the machine in set-up mode or jog mode.
- Do not reach into moving parts or handle moving parts during operation.
- Note the gap dimensions of moving parts.
- Wearing of gloves / [PSA] is required!

6.6.1 Not allowed clamping

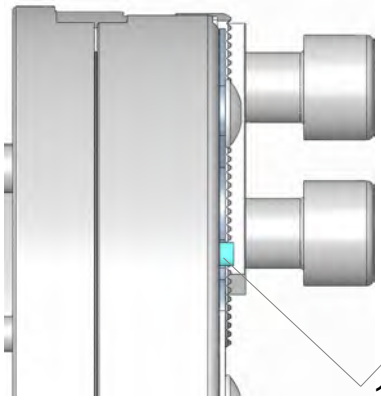


Fig. 47

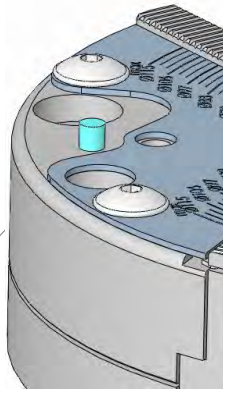


Fig. 48

NOTE!!

In clamping position the pin may not produde.

- If the pin is visible: put the jaws inwards

6.6.2 Jaw positions

Release position

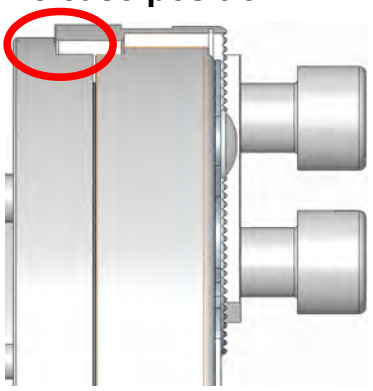


Fig. 49

In release position the base jaw protrudes healthy.

Offset correlates to the release stroke

See technical data – value »C«.

Clamping position

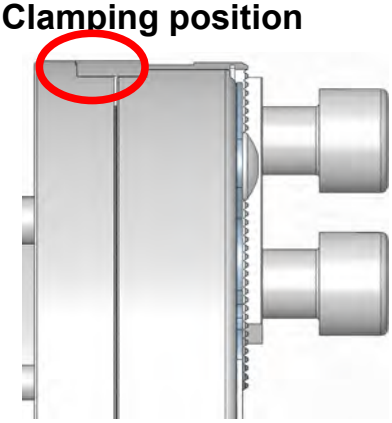


Fig. 50

In ideal clamping position the base jaw flushes.

Clamping reserve

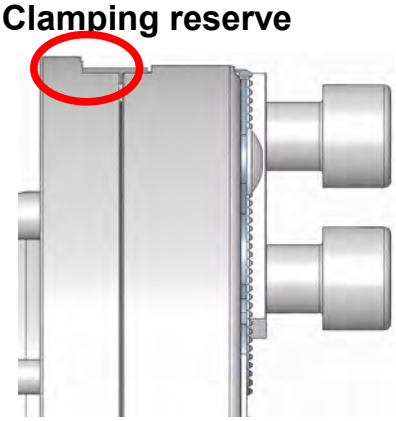


Fig. 51

In clamping reserve the base jaw is deepened healthy.

When <75% of the clamping reserve is reached further clamping is prohibited.

- Readjust the jaws inwards.

Offset correlates to the clamping reserve

See technical data – value »D«.

NOTE!

The offset values may vary due to the single tolerances.

6.7 Activities after production is concluded

1. Move the clamping device into unclamped position.
2. Switch off the machine tool and safeguard it from being switched on again.
3. Open the protective door or hood.
4. Clean the clamping device and a possibly mounted add on clamping device and adapter of chips and production residues using a soft, lint-free cloth and oil them lightly.
5. Close the protective door or hood.

7 Disassembly

If there is break in production that lasts longer than 3 days, the clamping device must be disassembled and properly stored in accordance with the manufacturer's specifications [see section »Transport, packaging, storage«].

Prior to disassembling:

- Put the machine in set up mode.
- Remove fuels and auxiliary materials, as well as residual processing materials and dispose of these items in an environmentally-responsible manner.

7.1 Safety

Safeguarding against restart

DANGER!

Life-threatening danger if restarted without authorization

When disassembling there is danger of the energy supply being switched on inadvertently. This poses a life-threatening hazard for persons in the danger zone.

- Prior to starting the tasks switch off all energy supplies and safeguard them from being switched on again.

WARNING!

Danger of injury due to falling components!

When mounting components can fall and cause severe injury and material damage.

- Two people are always required for this task.
- Use a crane.
- For assembly on a vertically suspended spindle always use a suitable mounting aid.

7.2 Disassembly of the jaw module

WARNING!

Danger of injury due to vertical suspended spindle!

Bending into the machine work are when assembling overhead can cause severe head injuries.

- Secure components prior to overhead assembly.
- For assembly on a vertically suspended spindle always use a suitable mounting aid.

7.2.1 Disassembling the jaws

Special tools required:

- Allen wrench SW10

1. Put the machine tool in set-up mode.
2. Remove all tool from the interior of the machine.
3. Set the clamping pressure of the machine on the lowest setting.
4. Move the drawtube of the machine into the front stop position [release position].
5. Loosen and remove the screws [3].

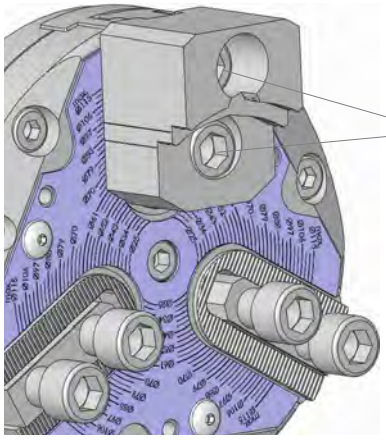


Fig. 52

6. Remove the top jaws.

The jaws are disassembled.

7.2.2 Disassembling the jaw module

WARNING!

Danger of injury due to vertical suspended spindle!

Bending into the machine work are when assembling overhead can cause severe head injuries.

- Secure components prior to overhead assembly.
- For disassembly from a vertically suspended spindle always use a suitable mounting aid.

- Special tools required:
  - Allen wrench SW5 / SW6

1. Put the machine tool in set-up mode.
2. Set the clamping pressure of the machine on the lowest setting.
3. Move the drawtube of the machine into the front stop position [release position].

Fig. 53

4. Turn back the central screw until the pin protrudes. The coupling jaws are actuated and release the coupling of the chuck. The jaw module is uncoupled.

Fig. 54

5. Loosen and remove the 3 mounting screws by using the allen wrench.

Fig. 55

6. Remove the jaw module from the clamping device.

The jaw module is disassembled.

7.3 Subsequent storage of the clamping device

The clamping device must be cleaned and treated with corrosion protection for subsequent storage [see section »Cleaning«].

NOTE!

The storage conditions are specified in the section »Transport, packaging and storage«.

7.4 Disposal

If a return or disposal agreement has not been concluded, then recycle disassembled components.

CAUTION!

Risk of injury due to leaking fluids!

Hydraulically or pneumatically operated clamping devices may contain residues of liquids. Uncontrolled leakage of fluids can lead to severe injuries.

- Open the pressure relief screw and drain remaining liquid.
- Discard the liquid.

NOTE!

Improper disposal causes environmental damage!

Lubricants and other auxiliary materials are subject to treatment as special waste, and should only be disposed of by approved specialist companies!

NOTE!

Composite materials!

For disposal clamping devices which include composite materials [mineral cast, CFK] must be returned at HAINBUCH!

Local municipal authorities or specialized disposal companies provide information on environmentally-responsible disposal.

8 Maintenance

Environmental protection

Comply with the following instructions for environmental protection when performing maintenance work:

- At all lubricating points where lubricant is applied by hand, remove escaping, used, or excess grease, and dispose of it in accordance with applicable local regulations.
- Collect used oil in suitable containers and dispose of it in accordance with applicable local regulations.

8.1 General

Cleanliness of the appropriate end-stop as well as the guidance diameters are conditions for reaching the concentricity and perpendicularity tolerances. Clean these surfaces with an appropriate cleaner.

WARNING!

Risk of injury!

Always comply with the safety data sheets and guidelines provided by the manufacturer.

CAUTION

Danger of injury due to loss of clamping force!

Fouling of the clamping device can cause the clamping device to lose considerable clamping force.

- Always comply with the maintenance and cleaning intervals specified in this manual.
- In conjunction with the maintenance intervals, regularly check the maintenance status of the clamping device through clamping force measurements.

8.2 Cleaning

NOTE!

Material damage if cleaned with compressed air!

Cleaning the product with compressed air can force metal chips into thread and grooves. This can damage or even destroy the product.

- Never clean the clamping device with compressed air!

- Auxiliary material required:
  - Ester-free, non-polar cleaning agent
  - Soft, lint-free cloth

1. Clean all the components with cleaning agent and a cloth; remove all oil and grease residues.

8.3 Preservation

NOTE!

The jaw module is permanently lubricated and must usually not be relubricated.

If a lubricating during service / maintenance work is required, please note the following points:

- Significant degradation of the efficiency if not lubricated.
- When lubricating with universal grease the efficiency already worsened in a short period.
- When lubrication with special grease there is almost no loss in efficiency.

- Special tools required:
  - Special grease 2085/0003
  - Soft, lint-free cloth

1. Hone all the bearing surfaces of the jaw module with an oil stone.
2. Lightly grease all cylindrical screws. Remove excess grease with a cloth.
3. Screw all cylindrical screws into the jaw module again and tighten them hand tight.

For subsequent storage tightening the cylindrical screws hand tight suffices. This facilitates re-commissioning and protects the cylindrical screws.

4. Lightly grease all interior and outer surfaces of the jaw module. Remove excess grease with a cloth.
5. Pack the jaw module airtight in foil. Place it on a level, impact-free storage location and safeguard it from falling.

8.4 Use of lubricant

With the usage of lubricant you may only use grease that corresponds to the requirements concerning bond, pressure-stability and solubility in lubricating coolant. In addition no dirt particles may be in the grease; they cause run errors if they come in in-between two mating surfaces.
We recommend for this the following lubricant:

HAINBUCH grease

See optional Accessories

Alternatives:

Lubricant	Manufacturer	Product
Universal grease	OKS	OKS 265
	MicroGleit	GP 355
	Klüber	QNB 50
	Zeller & Gmelin	DIVINOL SD24440
	Bremer & Leguill	RIVOLTA W.A.P.
Special grease	Klüber	MICROLUBE GL 261

8.5 Maintenance schedule

Maintenance tasks are described in the sections above that are required for optimal and trouble-free operation.

If increased wear is detected during regular inspections, then reduce the required maintenance intervals according to the actual indications of wear.

Contact the manufacturer, [see the service address on the back] if you have questions concerning maintenance tasks and intervals.

By using the clamping device in the 3-shift operating it should be maintained as follows:

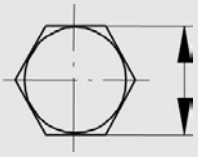
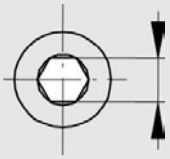
Interval	Maintenance task
Daily	Visual inspection and complete cleaning in case of heavy contamination [see section »Cleaning«]
Before each shift	Testing of status scans. If not reached see chapter »Trouble shooting«.
Weekly	Clean the jaw module [see section »Cleaning«]
After latest 1600 operation hours	Lubricate the jaw module with special grease [see section »Use of lubricant«]

8.6 Bolt torque

Metric ISO thread

The guide values for bolt tightening torque for achieving the highest permissible pre-tension for metric ISO thread are specified in Nm in the table.

- Total friction coefficient μ_{tot} = 0,12

Diameter	 [mm]	 [mm]	Torque for screw quality 10.9 [Nm]
M 4	7	3	4
M 5	8	4	7
M 6	10	5	12
M 8	13	6	25
M 10	17	8	50
M 12	19	10	100
M 16	24	14	220
M 20	30	17	400
M 24	36	19	600

The table shows the prescribed values.

Knowledge of the applicable guidelines and configuration criteria are the prerequisites.

9 Trouble shooting

Possible fault causes and the tasks to correct these faults are described in the following section.

If faults occur more frequently, the maintenance intervals must be shortened to correspond to the actual system load.

Contact the manufacturer if there are faults that cannot be corrected by following the instructions below; see the service address on the back of this operating instruction.

9.1 Safety

Trouble shooting

The following always applies:

1. For faults that pose a direct danger for personnel and or property immediately execute the emergency-stop function of the machine.
2. Determine the cause of the fault.
3. If correction of the fault requires work in the danger zone, put the machine in set-up mode.
4. Immediately inform the responsible parties at the installation site of the fault.
5. Depending on the type of fault, either have authorized specialized personnel correct the fault, or correct it yourself.

   The trouble shooting table provided below lists personnel who are authorized to correct the fault.

6. If there is a fault that was not caused by the clamping device the cause of the fault may be in the machine area. See the operating manual for the machine in this regard.

9.2 Trouble shooting table

The faults and causes described in the fault table are based both on the clamping device as well as the adapted jaw module.

Fault	Possible cause	Fault correction	Corrected by
Status scan not successful or end positions are not reached	Contamination in the coupling area	Contact the machine manufacturer	Machine manufacturer
Clamping force is too low	Workpiece is under-dimensioned	Replace with a suitable clamping head	Specialist
	Insufficient hydraulic pressure on the clamping cylinder	Check the machine-side hydraulic aggregate	Hydraulic specialist
	Defective clamping cylinder or blocked draw tube	Contact the machine manufacturer	Machine manufacturer
Dimensional deviation on the workpiece	Concentricity error of the clamping unit	Check the concentricity on the clamping taper and correct it if necessary	Specialist
	False assembly of the jaws	Check the distance value and correct if necessary.	Specialist
Dimensional deviation on the workpiece	Contaminated clamping taper	Remove the jaw module and clean the clamping taper of the clamping device	Specialist
Formal defect on the workpiece	Elastic deformation of feedstock that is subject to formal defects. After machining, the workpiece returns to its original form.	Use feedstock with fewer formal defects.	Specialist
Workpiece drops out	Wrong assembly of the jaw module	Disassemble and reassemble the jaw module, see chapter »Control of the stroke position«.	Specialist

9.3 Start-up after corrected fault

After correcting the fault execute the following steps to start up again:

1. Reset the emergency-stop device
2. Acknowledge the fault on the machine tool controller
3. Ensure that no one is in the danger zone
4. Start the machine tool

10 Appendix

10.1 Service Hotline

Order Hotline

Quickly ordered and delivered. A call is all it takes: +49 7144. 907-333

Schedule Hotline

Current status of your order? Just call: +49 7144. 907-222

24h emergency call

Has there been a crash or other technical emergency?
Our experts are at your service around the clock: +49 7144. 907-444

10.2 Representatives

The sales partners and service employees listed below are available for further consultation or support.

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Index

EC Declaration of conformity

EG-Konformitätserklärung im Sinne der EG-Richtlinie 2006/42/EG über Maschinen [Anhang II A] /
EC Declaration of conformity according to EC directive 2006/42/EC on machinery [Annex II A]

Original-Konformitätserklärung / Translation of original declaration of conformity

Hersteller / *manufacturer*: HAINBUCH GmbH Spannende Technik
Erdmannhäuser Straße 57
71672 Marbach
Deutschland

Diese Erklärung bezieht sich nur auf die Maschine in dem Zustand, in dem sie in Verkehr gebracht wurde; vom Endnutzer nachträglich angebrachte Teile und/oder nachträglich vorgenommene Eingriffe bleiben unberücksichtigt. Die Erklärung verliert ihre Gültigkeit, wenn das Produkt ohne Zustimmung umgebaut oder verändert wird.
This declaration relates exclusively to the machinery in the state in which it was placed on the market, and excludes components which are added and/or operations carried out subsequently by the final user. The declaration is no more valid, if the product is modified without agreement.
Hiermit erklären wir, dass die nachstehend beschriebene Maschine
Herewith we declare, that the machinery described below

Produktbezeichnung / *product denomination:* **Jaw module**

allen einschlägigen Bestimmungen der Maschinenrichtlinie 2006/42/EG entspricht.
is complying with all essential requirements of the Machinery Directive 2006/42/EC.

Angewandte harmonisierte Normen / *Harmonised Standards used*:

- EN ISO 12100:2011-03 — Sicherheit von Maschinen – Allgemeine Gestaltungsleitsätze
  Safety of Machinery – Basic concepts
- DIN EN 1550:1997 — Sicherheitsanforderungen für die Gestaltung und Konstruktion von Spannfuttern für die Werkstückaufnahme /
  Safety requirements for the design and construction of work holding chucks

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen /
The person authorized to compile the relevant technical documentation:
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Konstruktionsleitung
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09.2016 Part no.: 80001/0194_en Subject to technical changes