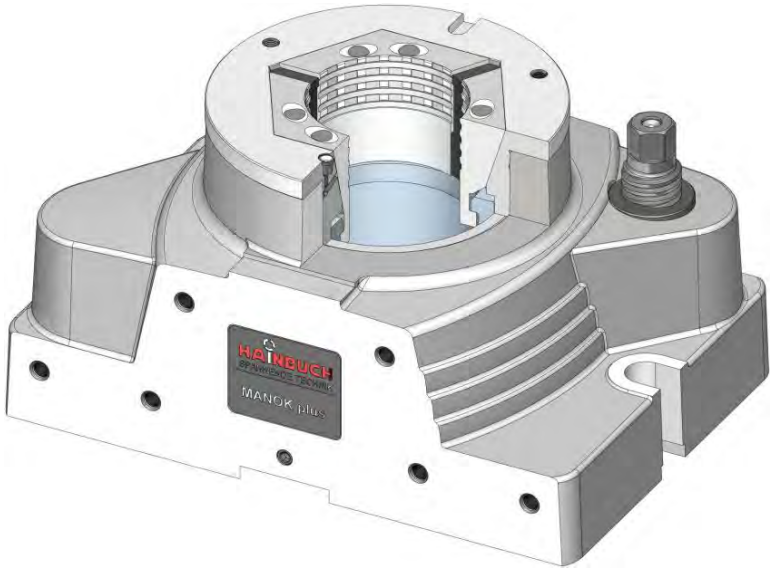
HAINBUCH
SPANNENDE TECHNIK



Installation manual

EN

MANOK
MANOK plus

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 Max. RPM

CAUTION!

The product is designed for stationary use and may not be used for rotating machining!

1.5 Copyright

This manual is protected by copyright and is provided exclusively for internal purposes.

Delivery of the operating manual to third parties, duplication in any form – including excerpts – as well as exploitation and/or communication of the content, are not permitted [except for internal use] without written approval from the manufacturer.

Actions to the contrary make damage compensation mandatory. We reserve the right to enforce additional claims.

1.6 Scope of delivery

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

The scope of delivery of the clamping device:

- 1 MANOK / MANOK Plus
- 1 Key

Optionally the scope of delivery of the clamping device includes:

- Clamping head
- Chuck jaw
- MANDO Adapt

1.7 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.

1.8 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 device is used in industrial applications. Consequently the owner of the device 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.

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 on a machine table.

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.

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 turning machining.
- Use with technical data other than that specified on the clamping device.

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

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.

Horizontal / lying parts

WARNING!

Danger of injury due to horizontal parts!

Before transporting the clamping device in horizontal condition:

- Put the clamping device on a non-slip pad
- Screw in the eye bolts

Suspended loads

WARNING!

Life-threatening danger due to suspended loads!

Some clamping devices must be lifted with a crane. When lifting the clamping device there is a life-threatening hazard due to falling parts or parts swinging out of control.

- Never step under suspended loads.
- Comply with the instructions concerning the intended attachment points. Ensure that the sling gear is securely seated!
- Do not attach lifting gear in projecting components.
- Only use approved hoists and sling gear with sufficient bearing capacity.
- Do not use rope and belts that are torn or frayed.

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 after-run 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 work piece

Clamping position

Position
with workpiece

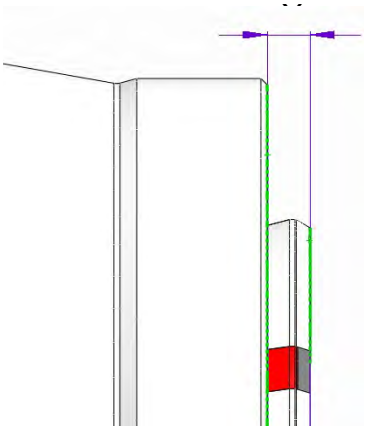


Fig. 1

End position

End position
without workpiece

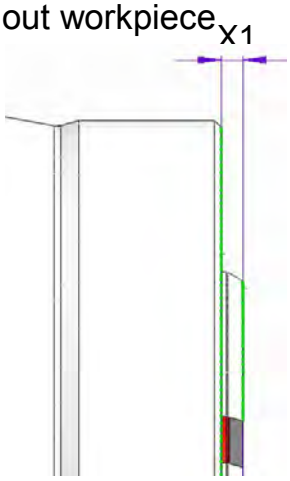


Fig. 2

WARNING!

Danger of injury due to incorrect clamping of the work piece!

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

The use of more than 75% of the clamping reserve stroke may lead to wrong clamping.

- Do not exceed the maximum permissible clamping reserve stroke.
  Calculation basis: [**X-X1**] x 75%
- Check the workpiece blanks dimension randomly.

Missing changing parts

WARNING!

Danger of injury due to missing changing parts!

When operating the clamping device without changing parts [segmented clamping bushing, clamping heads, work piece end-stops] there is a higher danger of crushing injuries due to the stroke of movable components of the clamping device.

- The clamping process may not be initiated without assembled segmented clamping bushing and/or work piece end-stop.

Parts with sharp edges

WARNING!

Risk of injury!

When screwing in individual components such as for example work piece end-stops, threaded adapters and similar devices that are equipped with an external thread or wear caused by burrs, there is risk of cutting.

- The operation must be done only by qualified personnel.
- Wearing of gloves / [PSA] is required!

CAUTION!

Risk of injury!

A special use-dependent or job-based design can result in variations in the clamping strokes and thus the clamping force.

- The notes on the associated clamping situations or product drawing must always be observed

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!

Falling down of the clamping device or its parts can cause severe bruises and fractures.

The dead weight of the clamping device or its parts can lead to high physical stress.

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.

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.

- 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 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

Variant	Size	Weight [kg]	Dimensions [l x w x h in mm]	Clamping force $F_{rad.}$ max. [kN]	Draw force F max. [kN]	Torque max [Nm]
MANOK	42	15	214 x 159 x 124	80	35	50
	52	15	214 x 159 x 124	90	40	60
	65	13	214 x 159 x 124	105	45	70
	80	26	264 x 210 x 140	115	50	62
	100	22	264 x 210 x 140	150	65	80
MANOK Plus	65	22	257 x 175 x 136	105	45	100
	65 SE	22	257 x 175 x 136	120 [105]	45	100

F_{rad} max. can only be reached in lubricated condition.
In unlubricated condition F_{rad} max. is much lower.

WARNING!

Risk of injury!

Using false technical data can lead to serious personal injury and property damage.

- The technical data [label on the product, assembly drawing] must be observed and may not be modified by the operator!

3.2 Clamping force MANOK / MANOK plus

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.

Example for size 42/52:

With an axial torque of 35 kN the radial clamping force F_{rad} is, depending on the maintenance state of the clamping device, in the range between 29,5 kN and 62,5 kN; it must not be smaller than 29,5 kN or higher than 62,5 kN.

3.2.1 Clamping force diagram – MANOK size 42

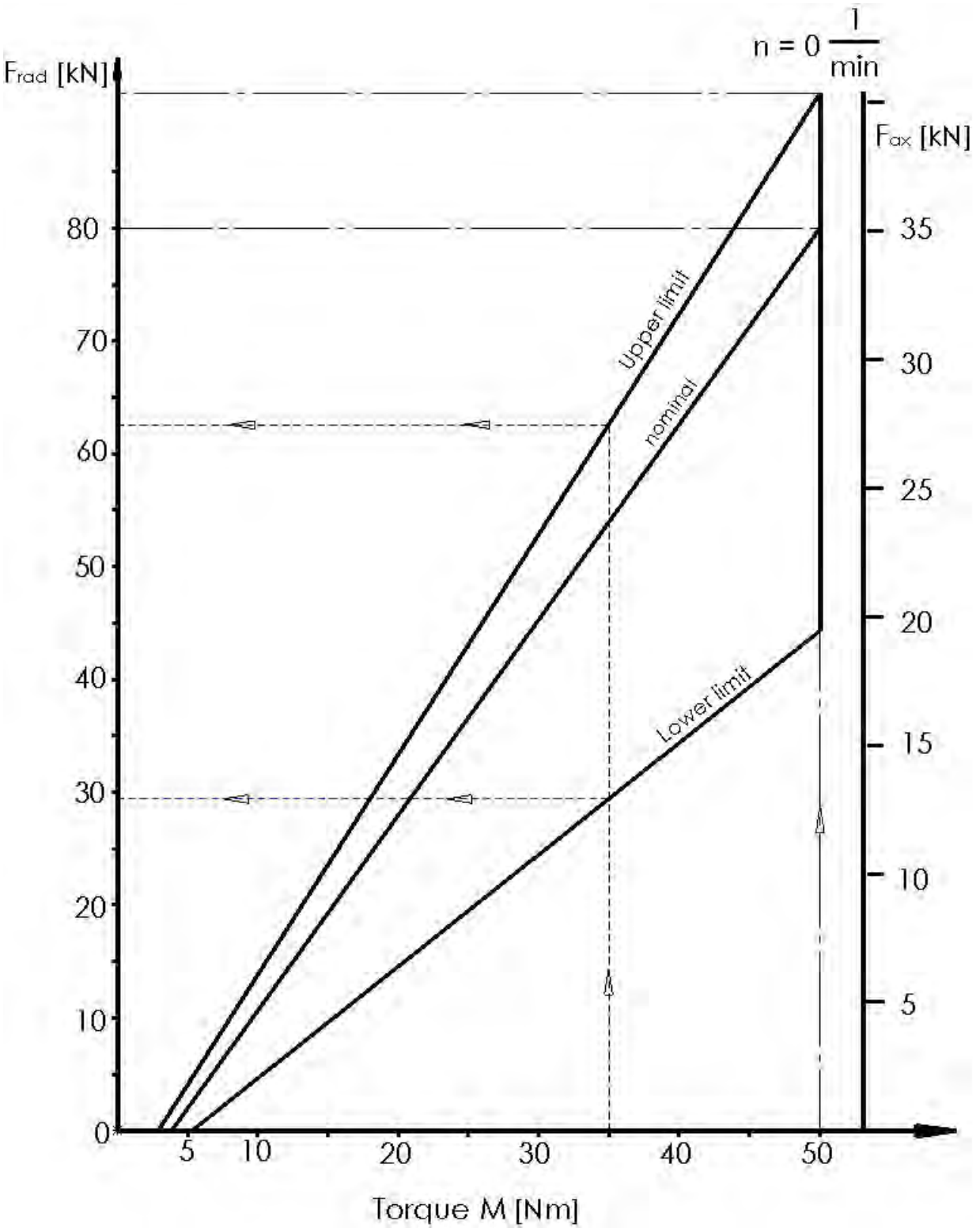


Fig. 3

3.2.2 Clamping force diagram – MANOK size 52/65

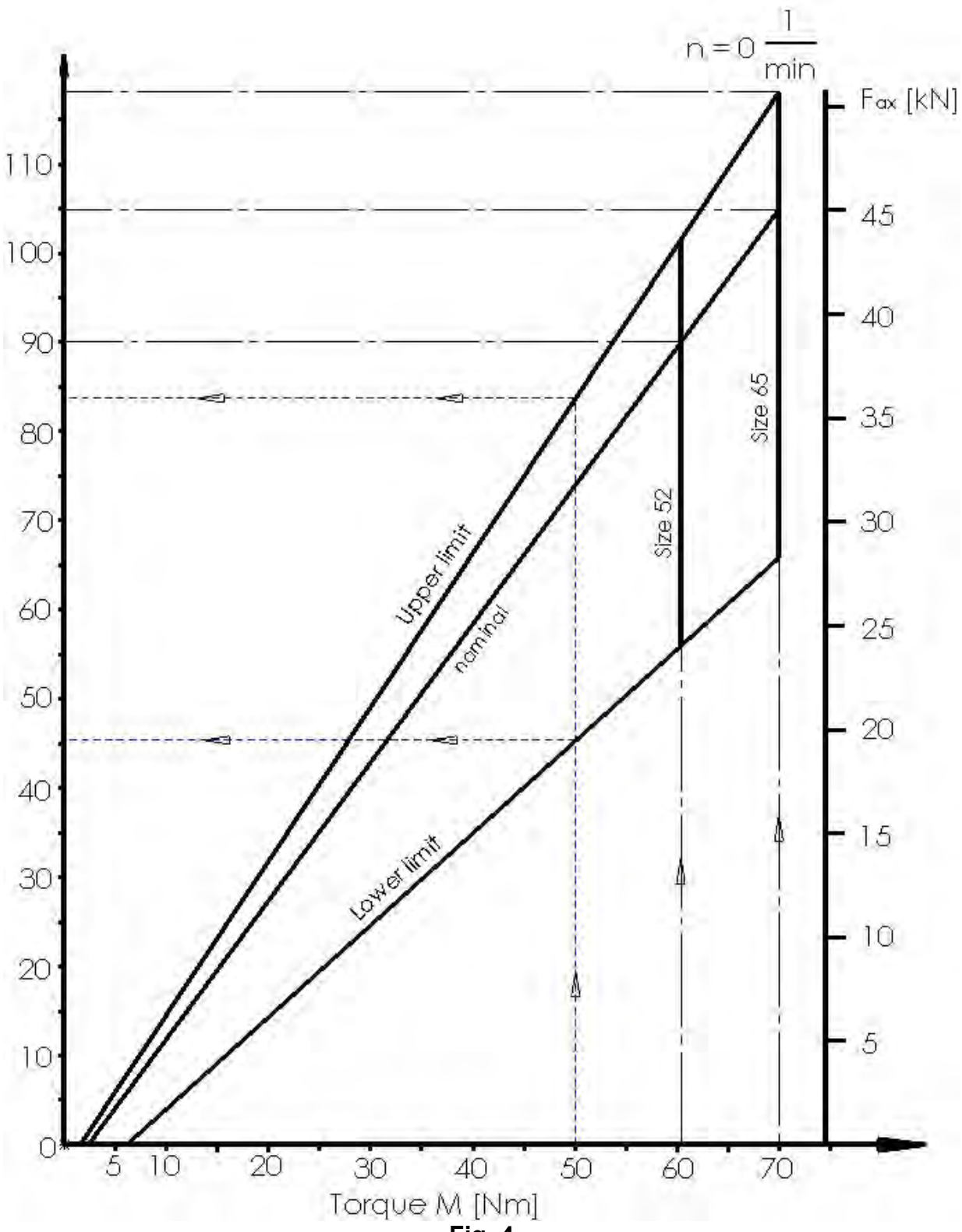


Fig. 4

3.2.3 Clamping force diagram – MANOK plus size 65 RD/SE

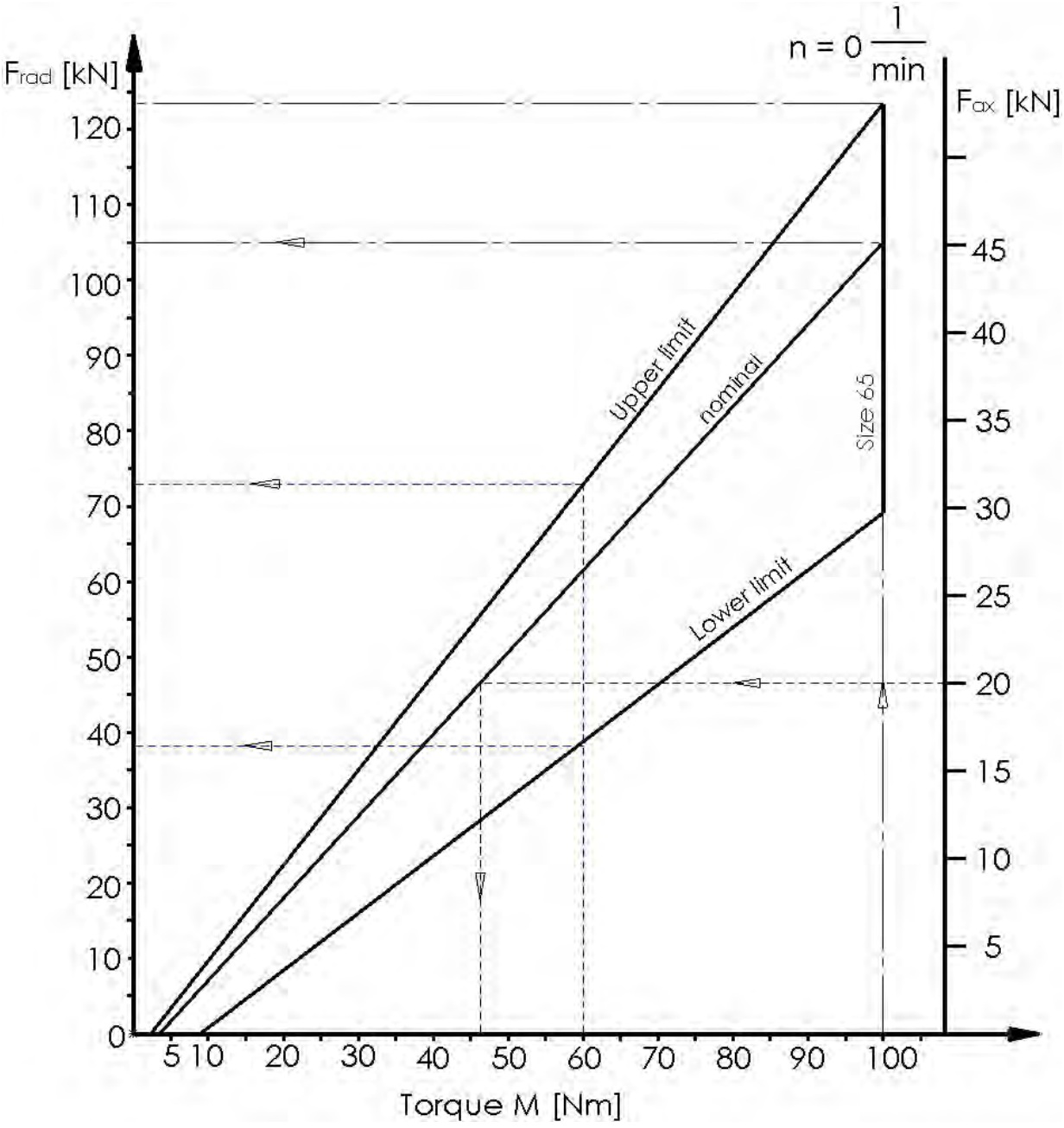


Fig. 5

NOTE!

When using adaptation clamping devices the axial force F_{ax} is required.

Example:

- With required F_{ax} 20 kN a torque of ~46 Nm must be initiated.

3.2.4 Clamping force diagram – MANOK size 80/100

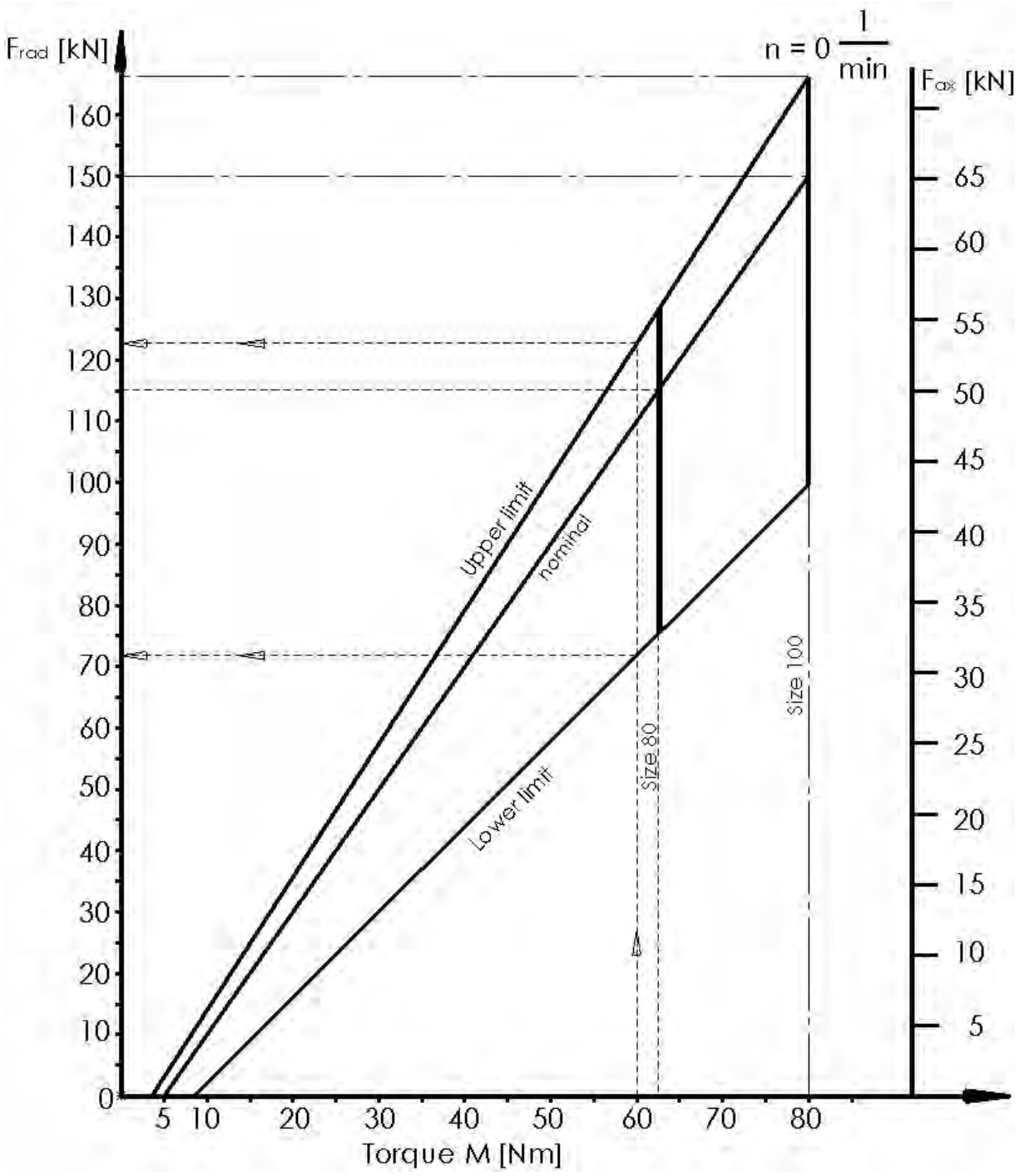


Fig. 6

3.3 Draw forces MANOK plus

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

Example for size 65:

With a torque of 40 Nm depending on the maintenance state of the clamping device the axial draw force F_{ax} is at about 15 kN.

Draw force diagram – MANOK plus size 65

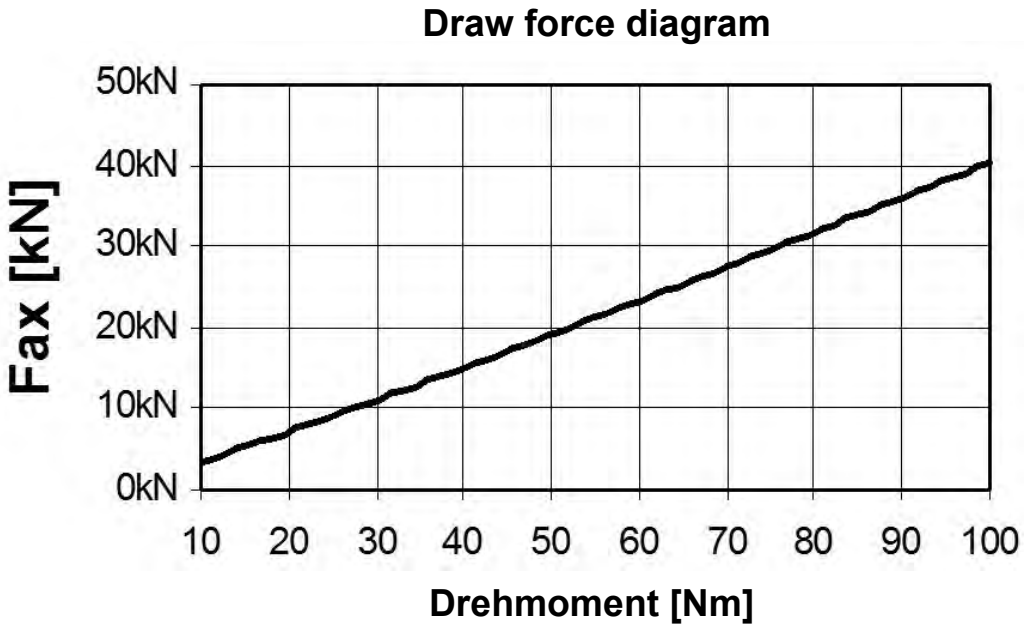


Fig. 7

3.4 Clamping forces – adaptation clamping element on MANOK plus

3.4.1 MANOK plus – size 65 SE

Add on clamping elements MANDO Adapt + jaw module

Size	Clamping diameter	bridging region	Operating torque max.	Axial force max.	Radial force max.
MANOK plus SE 65	Ø 4-65 mm	± 0.50 mm	100 Nm	45 kN	**120 kN**
MANDO Adapt – XXS	Ø 8-13 mm	± 0.15 mm	22 Nm	10 kN	42 kN
MANDO Adapt – XS	Ø 13-18 mm	± 0.25 mm	22 Nm	10 kN	42 kN
MANDO Adapt – S	Ø 16-21 mm	± 0.25 mm	22 Nm	10 kN	42 kN
MANDO Adapt – 0	Ø 20-28 mm	± 0.25 mm	22 Nm	10 kN	42 kN
MANDO Adapt – 1	Ø 26-38 mm	± 0.25 mm	22 Nm	10 kN	42 kN
MANDO Adapt – 2	Ø 36-54 mm	± 0.35 mm	44,5 Nm	20 kN	85 kN
MANDO Adapt – 3	Ø 50-80 mm	± 0.35 mm	55,5 Nm	25 kN	105 kN
MANDO Adapt – 4	Ø 70-100 mm	± 0.50 mm	78 Nm	35 kN	150 kN
Jaw module 145	Ø 25-115 mm	± 0.50 mm	64 Nm	29 kN	60 kN
Jaw module 215	Ø 25-195 mm	± 0.50 mm	46 Nm	29 kN	60 kN

3.4.2 MANOK plus – size 65 RD

Add on clamping elements MANDO Adapt + jaw module

Size	Clamping diameter	bridging region	Operating torque max.	Axial force max.	Radial force max.
MANOK plus RD 65	Ø 4-65 mm	± 0.50 mm	100 Nm	45 kN	**105 kN**
MANDO Adapt – XXS	Ø 8-13 mm	± 0.15 mm	22 Nm	10 kN	42 kN
MANDO Adapt – XS	Ø 13-18 mm	± 0.25 mm	22 Nm	10 kN	42 kN
MANDO Adapt – S	Ø 16-21 mm	± 0.25 mm	22 Nm	10 kN	42 kN
MANDO Adapt – 0	Ø 20-28 mm	± 0.25 mm	22 Nm	10 kN	42 kN
MANDO Adapt – 1	Ø 26-38 mm	± 0.25 mm	22 Nm	10 kN	42 kN
MANDO Adapt – 2	Ø 36-54 mm	± 0.35 mm	44,5 Nm	20 kN	85 kN
MANDO Adapt – 3	Ø 50-80 mm	± 0.35 mm	55,5 Nm	25 kN	105 kN
MANDO Adapt – 4	Ø 70-100 mm	± 0.50 mm	78 Nm	35 kN	150 kN
Jaw module 145	Ø 25-115 mm	± 0.50 mm	64 Nm	29 kN	60 kN
Jaw module 215	Ø 25-195 mm	± 0.50 mm	64 Nm	29 kN	60 kN

3.5 Operating conditions

	Specification	Value	Unit
Environment	Temperature range	15 - 65	°C

Mechanical actuating

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

3.6 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 clamping device and the adapter.

3.7 Dimensional sheet

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

3.8 Type designation

The type designation is on the product and includes the following information:

1 ID no. [marked with the # symbol]
2 Maximum speed [rpm]
3 Maximum clamping force [kN]

Fig. 8

4 Structure and function

4.1 Overview and brief description MANOK

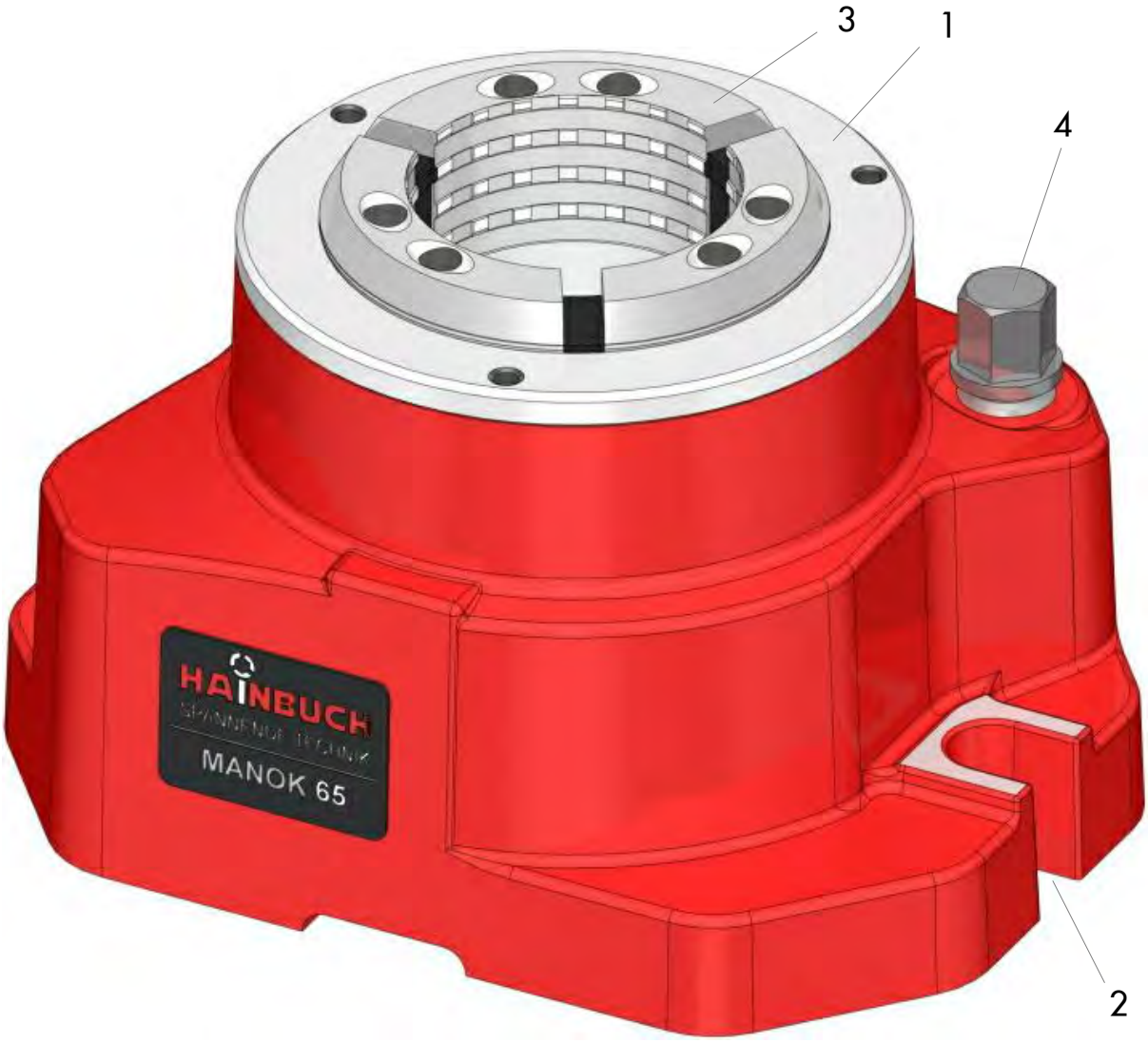


Fig. 9

1. Clamping element reception
2. Position of the mounting screws
3. Clamping head [optional]
4. Actuating screw

Brief description

It isn't just the price-performance ratio of this little giant that is impressive. With its incredible holding power, precision and rigidity, MANOK has already surprised many users who never would have imagined that this kind of quality could be found in a manual clamping device. Not only that, but our little chuck is extremely easy to change. You can use the same clamping heads that you have already been using on your lathes for years. Pretty practical, don't you think?

And speaking of practical, you can use the manual changing fixture EasyGrip or the pneumatic one to change clamping heads quickly and easily. It's a breeze! In addition, you can also mount an end-stop to the MANOK in no time at all. Simply fasten the inside end-stop directly onto your machine tool table or mount a front end-stop on the face of the clamping taper. That's it.

But this little power package isn't just practical and economical it is also extremely versatile. After all,the possible applications of MANOK are almost limitless. Sometimes one can only dream of that much clamping force in such simple package. The integrated actuation lever makes this possible: It functions as an accumulator and acts as an anti vibration device during milling operations for example.

4.2 Overview and brief description MANOK plus

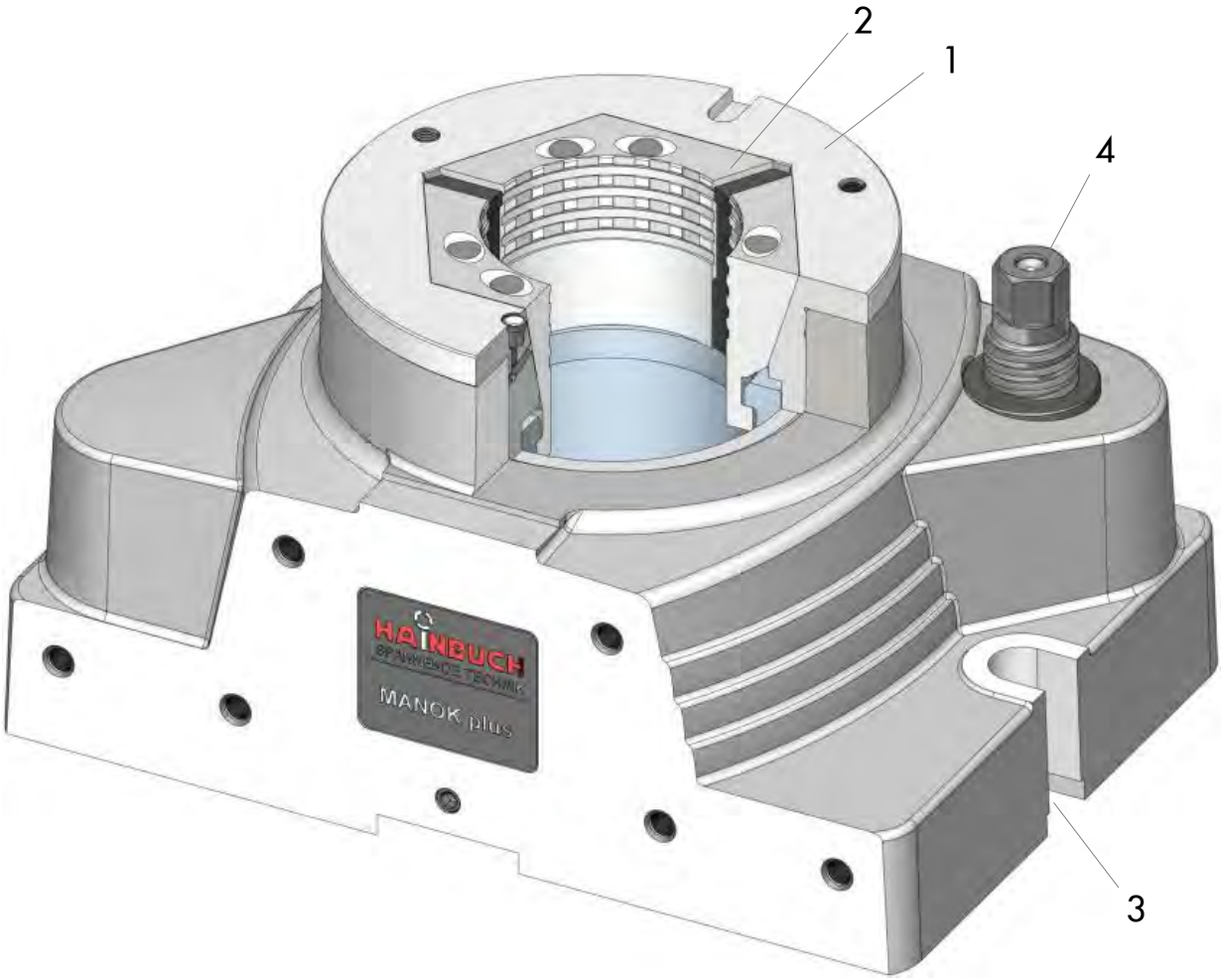


Fig. 10

1. Clamping element reception
2. Clamping head [optional]
3. Position of the mounting screws
4. Actuating screw

Brief description

Users were already full of enthusiasm for the first version of this manual stationary chuck. Not only because of the precision, grip, rigidity, and the optimum accessibility on 5-axis machines. With MANOK, the cost/efficiency ratio is extremely good and it scores »a plus« with those for whom money counts.

About »plus« ... there is now a new type, MANOK plus. It offers you the same qualities as MANOK, and many more options as well: because with MANOK plus the releasing action works mechanically and not through springs as with MANOK. This integrated forced opening allows a higher releasing force. For example it allows full use of all SPANNTOP adaptions which you have already in use on your lathe. Within only two minutes MANDO Adapt, the mandrel adapter, is mounted. Also with the jaw adapter, the mounting takes only two minutes for having twice the clamping range.

It goes without saying that with MANOK plus you can use all clamping heads and end-stops which were already in use on the lathe. Alignment surfaces and fixing grooves are part of the standard product, as well as the integrated end-stop. An added benefit: you can now even fit MANOK plus horizontally and thus use it also for the machining of longer work pieces or bars. Locating grooves ensure a simpler and more exact orientation on the machine table. In addition, the optional adjustable overload device allows clamping with a »fine touch«.

The highlights

- stable clamping due to pull-back effect
- MANDO Adapt and jaw adapter can be used
- high clamping forces
- end-stops, clamping heads, and chuck adaptations from the lathe can be used
- finely milled surface for horizontal applications
- working with radially aligned work piece holders is possible
- utilization as a universal clamping device

4.3 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.

4.3.1 Changing fixture

Fig. 11

Manual changing fixture

The pins of the changing fixture are inserted in the matching holes in the clamping head. The changing fixture is tensioned via hand force. The clamping head is firmly clamped in the changing fixture and can be inserted into the mounted clamping device with the aid of the changing fixture.

Fig. 12

Pneumatic changing fixture

The pins of the changing fixture are inserted in the matching holes in the clamping head. The changing fixture is tensioned via compressed air. The clamping head is firmly clamped in the changing fixture and can be inserted into the mounted clamping device with the aid of the changing fixture.

4.3.2 Clamping head

Fig. 13

The clamping heads are used to accommodate the work piece that will be machined. They consists of hard steel and rubber segments that are connected via a vulcanizing process.

Depending on the requirements of the work piece there are clamping heads in different sizes and with different profiles and bores.

4.3.3 Clamping head

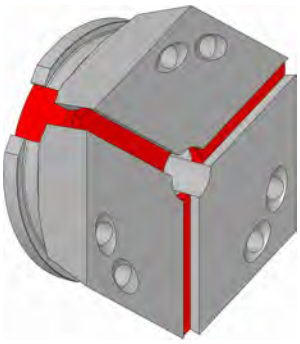


Fig. 14

The clamping heads are used to accommodate the work piece that will be machined. They consists of hard steel and rubber segments that are connected via a vulcanizing process.

Depending on the requirements of the work piece there are clamping heads in different sizes and with different profiles and bores.

4.3.4 Work piece end-stop

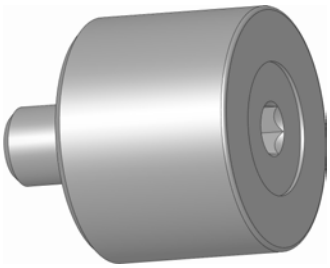


Fig. 15

The work piece end-stop is manufactured with a end-stop dimension according to the customers request. In combination with the clamping head and the chuck it provides a functional unit.

4.3.5 Grease

Fig. 16

The universal grease for chuck and mandrel lubrication is supplied in a 1000g can. The order number for the universal grease is 2085/0003; it can be ordered from HAINBUCH.

4.3.6 Grease gun

Fig. 17

The grease gun is filled with universal grease, which is pressed into the clamping device. The grease gun has a pointed mouthpiece. The order number for the grease gun is 2086/0004; it can be ordered from HAINBUCH.

4.3.7 Key

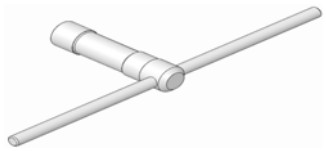


Fig. 18

The key has the order number 10684/0001; it can be ordered from HAINBUCH.

4.3.8 Add on clamping elements

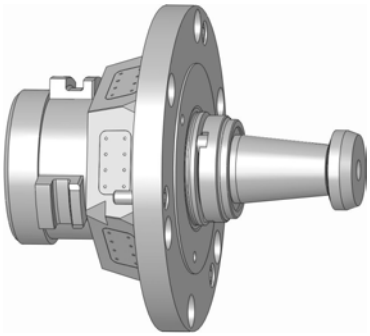


Fig. 19

- Mandrel MANDO Adapt T211
  - The CENTREX quick change-over interface allows a µ-accurate adaption of the adapt clamping device without adjusting the B-Top3 chuck.
  - Clamping range Ø 20 - 80 mm possible by four sizes of mandrel
  - Vibration damping by vulcanized segmented clamping bushings
  - Work piece stabilization by axial traction to the work piece end-stop
  - wide bridging area by vulcanized clamping elements

The MANDO Adapt can be ordered at HAINBUCH.

4.3.9 Jaw module

Fig. 20

The jaw module is an adaptation clamping element for using clamping jaws.

It can be used to extend the clamping range of the base clamping device. As a base clamping device for adapting the jaw module is used – depending on the version [RD / SE] – the SPANNTOP [RD] or TOPlus [SE] chuck.

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

5 Transporting, packaging, 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.

Transport!

- For transport always use a suitable clamping means / crane.
- Make sure that a rolling / falling of the clamping device is not possible.

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 Unpacking and inner-company transportation

The clamping device is packed vertically and has threaded bores in the end face.

To safely lift the clamping device out of the package it must be hooked into a crane depending on the weight.

For transporting with transport trolley the clamping device must be positioned in standing condition. Make sure that a non-slip pad has been laid.

All tools and optional accessories which are not in scope of delivery, are marked as optional in the installation manual

- Two people are required for this task.
- Special tools required:
  - Crane from weight more than 15 kg
  - Lifting eye bolt

Fig. 21

1. Screw lifting eye bolts into the thread in the end face of the clamping device.
2. Hook the load-handling equipment into the lifting eye bolts.
3. Use a crane to carefully lift the clamping device out of the transport packaging and put it down on a stable, level substrate.

5.5 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.

5.6 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

WARNING!

During the initial installation of the clamping device severe injuries may occur.

- The initial installation must be done only by qualified personnel.
- All screws remaining in the clamping must be tightened firmly.
- All tools and keys must be removed after installation.

6.1 Pre-consideration

- Screws are tightened according to the size of the screw and the general torque.
  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.
- The insertion of lubricant is provided only on the mechanical surfaces. Pay attention to the instructions for lubricants in the chapter »Maintenance«.
- 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 Installation

WARNING!

Danger of injury due to unintentional startup of the tool spindle!

Unexpected start up of the tool spindle can cause severe injury.

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

WARNING!

Risk of injury!

By operating the clamping device without changing parts [clamping head, segmented clamping bushing, work piece end-stops ...] there is an increased risk of crushing injuries by the stroke of the moving components of the clamping device.

By uncontrolled discharge of the clamping process [e.g. by incorrect installation of the energy supply or faulty programming] there is an increased danger.

WARNING!

Risk of injury!

Bending in the working area of the machine can cause severe head injuries!

CAUTION!

Risk of injury!

Unexpected start up of the tool spindle can cause severe injury.

- Make sure that the system is pressure-free and that a restart of the machine can be excluded!

Risk of injury!

Contamination of the mechanism can influence/reduce the stroke, thus the clamping force is reduced and thus, the work piece is not properly tightened and can be thrown out.

- Clean the product regularly [see chapter »Maintenance and service«].

Risk of injury!

If the clamping pressure is too low clamped work piece may be thrown out.

If the clamping pressure is too high severe damages of the components of the clamping device may occur the throwing out of the work piece.

- Before operation set the operation pressure back to operation level.
- The operating pressure should be checked and adjusted regularly!
- The dimension of the work pieces should be checked regularly [clamping-ø]!

Transport!

- For transport always use a suitable clamping means / crane.
- Make sure that a rolling / falling of the clamping device is not possible.

6.2.1 Assembly of the MANOK

Two people are required for this task.

Special tools required:

- Allen wrench
- Crane and eye bolts from weight 15 kg

1. Put the stationary chuck on the machine table.
2. Screw in the 2 mounting screws through the stationary chuck into the machine table and tighten them firmly according to the manufacturers order.

6.2.2 Assembly of the MANOK plus

Two people are required for this task.

Special tools required:

- Allen wrench
- Crane and eye bolts from weight 15 kg

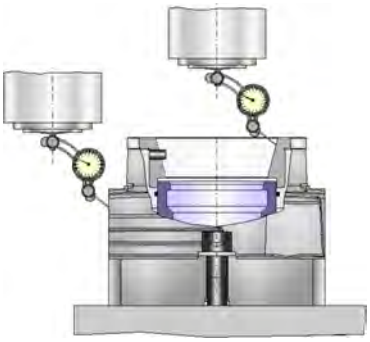


Fig. 22

1. Place the stationary chuck on the machine table.
2. Screw the mounting screws through the stationary chuck into the machine table and tighten them only finger tight.
3. Adjust the MANOK plus once [max. 0.005 mm].
4. Tighten the mounting screws firmly according to the manufacturers order.

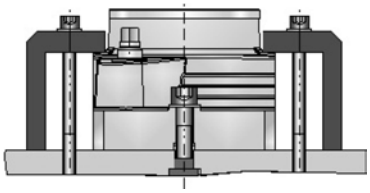


Fig. 23

5. With external machining two clamps may be assembled.

6.2.3 Installing the base end-stop

If the MANOK or MANOK plus will be used as end-stop chuck the base end-stop must be mounted.

Special tools required:

- Allen wrench
- Mounting bolt or suitable cylindrical screw

Fig. 24

1. Take the clamping head out of the taper.
2. Unscrew the clamping screws [see section »Disassembling the base end-stop«].
3. Screw the mounting bolt clockwise into the threaded bore in the center of the base end-stop.

Screw the mounting bolt into the base end-stop so that the polished side of the base end-stop is pointing up.

Fig. 25

4. Use the mounting bolt to insert the base end-stop into the clamping device in such a manner that the lateral fixing pin of the base end-stop is aligned flush with the fixing groove in the centering disk.

NOTE!

Material damage is possible if the clamping screws are tightened too forcefully!

Tightening the clamping screws too forcefully can damage or destroy them. The base end-stop can no longer be clamped in.

- Tighten the clamping screws by hand.
- Do not screw in beyond the resistance.

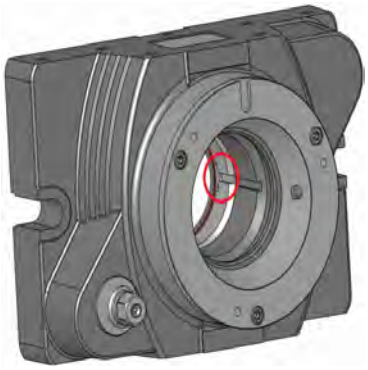


Fig. 26

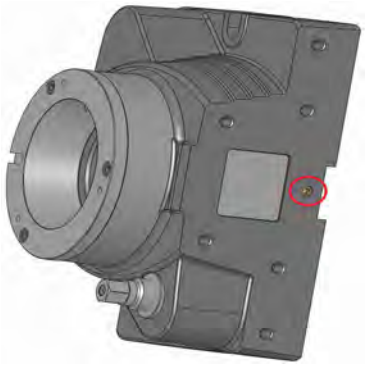


Fig. 27

5. Tighten all clamping screws of the base end-stop in the clamping device clockwise by using an allen wrench until a resistance is noticeable.

Pay attention to the maximum tightening torque!

The base end-stop is now secured.

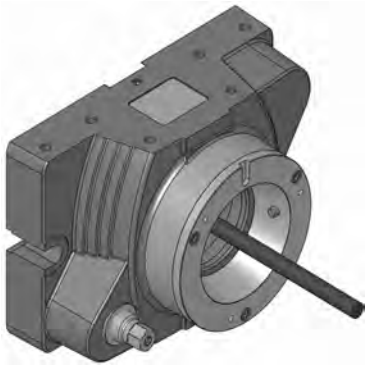


Fig. 28

6. Unscrew the mounting bolt counterclockwise.

6.2.4 Assembly of the clamping head

The insertion of the clamping head is only possible in release position of the stationary chuck.

Special tools required:

- Changing fixture

1. Clean the clamping cone in the clamping element reception and the housing.

WARNING!

Squeezing danger!

Squeezing danger while actuating the changing fixture.

- Do not reach inside the moving parts!

2. Place the changing fixture on the clamping head by inserting the pins parallel to the axis of the changing fixture in the frontal exchange holes of the clamping head. By pressing the changing fixture, the clamping head clamps in the coupling area
3. Put the clamping head in the clamping element reception / housing.
4. Loosen the changing fixture with light pressure in axial direction and pull the changing fixture out of the clamping head.

6.3 Work piece

WARNING!

Risk of injury due to thrown out parts!

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

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

CAUTION

Risk of injury!

When placing the work piece:

- Make sure that the hands / fingers may not be clamped between the flange and the work piece!

6.4 Inspections

NOTE!

Material damage due to damaged clamping devices!

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

- Only install undamaged, complete, and precisely balanced clamping devices.
- If in doubt contact the manufacturer.

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

- All cylindrical screws of the clamping device must be present and tightened with the proper tightening torque.
- The balance screws of the clamping device must all be present and undamaged.
- All rubber segments must be intact; this means that they are neither torn, nor are they porous at any point.
- All edges and bearing surfaces are intact; this means that they are neither broken nor do they show any signs of wear.
- The set speed of the machine tool should not exceed the maximum permissible speed of the clamping device.
- The maximum draw tube force specified on the perimeter of the clamping device must not be exceeded.
- The clamping pressure of the machine must be sufficiently high.
- All mounting tools must be removed from the interior of the machine.

- Clamping device and work piece must be compatible –check the clamping diameter regularly.
- The work piece must be clamped into the clamping device with sufficient work piece tension.
- Do a pressure loss test and a measurement of clamping force.

6.5 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 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 adaptation 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, subsequent storage, disposal

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 Disassembling the clamping device

7.2.1 Disassembly of the clamping head

The ejection of the clamping head is only possible in release position of the stationary chuck.

Special tools required:

- Changing fixture

DANGER!

Squeezing danger!

Squeezing danger while actuating the changing fixture.

- Do not reach inside the moving parts!

1. Place the changing fixture on the clamping head by inserting the pins parallel to the axis of the changing fixture in the frontal exchange holes of the clamping head. By pressing the changing fixture, the clamping head clamps in the coupling area
2. Remove the clamping head out of the clamping element reception / housing.
3. Loosen the changing fixture with light pressure in axial direction and pull the changing fixture out of the clamping head.
4. Clean the clamping cone in the clamping element reception and the housing.

7.2.2 Disassembling the base end-stop

If the MANOK or MANOK plus will be used as through-bore chuck the base end-stop must be disassembled.

- Example for use: bar machining on both sides
  if necessary us a stationary support and/or tail stock center

Special tools required:

- Allen wrench
- Mounting bolt or suitable allen screw

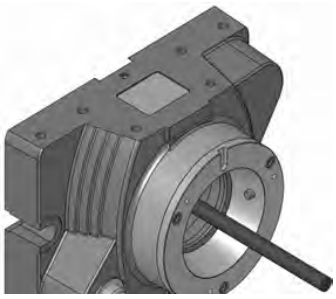


Fig. 29

1. Take the clamping head out of the taper of the clamping element reception.
2. Insert the mounting bolt and screw it clockwise into the threaded bore in the center of the base end-stop.

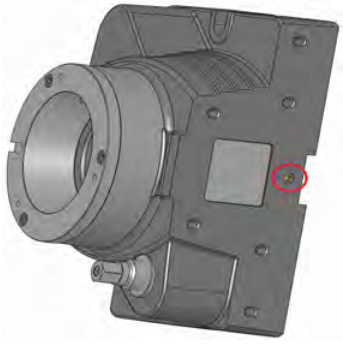


Fig. 30

NOTE!

Material damage if the clamping screws are loosened incorrectly!

Tightening the clamping screws too forcefully can damage or destroy them. The base end-stop can no longer be clamped in.

- Loosen the clamping screws by hand.
- Do not unscrew beyond the resistance.

3. Carefully loosen all clamping screws with an allen wrench counterclockwise until resistance is tangible.
   The base end-stop is now loosened.

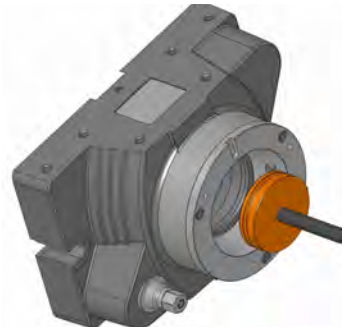


Fig. 31

4. Carefully pull out the base end-stop straight from the front.

7.2.3 Disassembly of the MANOK

Two people are required for this task.

Special tools required:

- Allen wrench
- Crane and eye bolts from weight 15 kg

1. Loosen and remove the mounting screws.
2. Remove the stationary chuck from the machine table.

Clean the mounting surfaces of the stationary chuck and the machine table after each disassembly!

7.2.4 Disassembly of the MANOK plus

Two people are required for this task.

Special tools required:

- Allen wrench
- Crane and eye bolts from weight 15 kg

1. Loosen and remove the clamps which fixes the stationary chuck on the machine table.
2. Loosen and remove the mounting screws.
3. Remove the stationary chuck from the machine table.

Clean the mounting surfaces of the stationary chuck and the machine table after each disassembly!

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.

CAUTION

Danger of injury due to improper handling of cleaners!

Improper handling of cleaners can cause health impairments.

- Always comply with the safety data sheets and guidelines provided by the manufacturer of the cleaning agent for handling/using the cleaners.

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.

NOTE!

Material damage due to use of the wrong cleaning agent/cleaner!

Seals and clamping elements can be damaged due to use of the wrong seals and clamping elements.

- Do not use any solvents that contain ester or polar solvents for cleaning purposes.

Risk of injury!

Slipping while the lubricating with a grease gun can lead to severe cuts!

8.2 Cleaning

NOTE!

Material damage if cleaned with compressed air!

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

- Never clean the clamping device with compressed air!

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

Clean all the components listed below with cleaning agent and a cloth; remove all oil and grease residues:

- Taper reception
- Coupling area
- Mounting surfaces of the stationary chuck
- Mounting surfaces of the machine table

8.3 Preservation

- Special tools required:
  - Universal grease 2085/0003
  - Grease gun
  - Oil stone
  - Soft, lint-free cloth

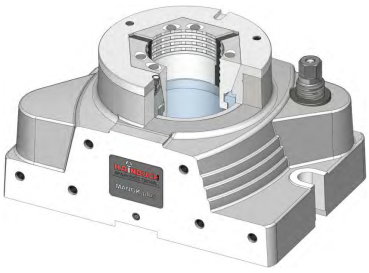


Fig. 32

1. Hone all the bearing surfaces of the clamping device with an oil stone.
2. Lightly grease all cylindrical screws. Remove excess grease with a cloth.
3. Lightly grease all bearing surfaces of the clamping device Remove excess grease with a cloth.
4. Pack the clamping device 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 product information

Alternatives:

Lubricant	Manufacturer	Product
Universal grease	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.

Interval	Maintenance task
Daily	Visual inspection and complete cleaning in case of heavy contamination [see section »Cleaning«]
Weekly	Clean the taper reception and coupling area [see section »Cleaning«]
Every 6 months	Completely disassemble and clean the clamping unit [see section »Cleaning«]

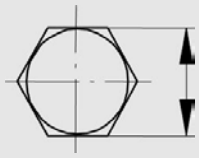
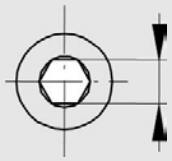
For proper operation of the coolant feed a prefiltering with duplex filter (mesh size 100 µm, PI 3754] is necessary. The duplex filter is mounted on the coolant cleaning system.

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

Fault	Possible cause	Fault correction	Corrected by
Clamping head cannot be replaced	The change gap between the clamping head coupling and work piece end-stop is insufficient.	Rework the work piece end-stop	Specialist
Clamping device does not open or the release stroke is insufficient.	Fouling between the draw mechanism and the clamping unit	Remove the clamping head, move the drawtube back and clean the coupling area [see section »Disassembling the clamping head«].	Specialist
Clamping force is too low	Work piece is under-dimensioned	Replace with a suitable clamping head	Specialist
Dimensional deviation on the work piece	Contaminated coupling area	Clean the coupling area of the clamping unit [see section »Cleaning«].	Specialist
	Contaminated clamping taper	Remove the clamping head and clean the clamping taper [see section »Cleaning«].	Specialist
Formal defect on the work piece	Elastic deformation of feedstock that is subject to formal defects. After machining, the work piece returns to its original form.	Use feedstock with fewer formal defects. Use a clamping head with several sharp teeth in the clamping surface.	Specialist
	Clamping force ist too high	Reduce the clamping force to the correct level for the clamping device and the work piece.	Specialist

Fault	Possible cause	Fault correction	Corrected by
Marks on the clamping surface	Point or linear work piece clamping	Replace with a clamping head that has a smoother clamping surface	Specialist
	Wrong clamping head type	Replace the clamping head	Specialist
	Excessive dimen-sional difference between the work piece diameter and the clamping bore	Replace with a clamping head that has a suitable clamping bore	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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11 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: **MANOK / MANOK plus**

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:
HAINBUCH GmbH Spannende Technik
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Marbach, 01 November 2014	Konstruktionsleitung / Head of engineering
Ort, Datum / Place, Date	Vorname Name, Funktion / First name, last name and function of signatory

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