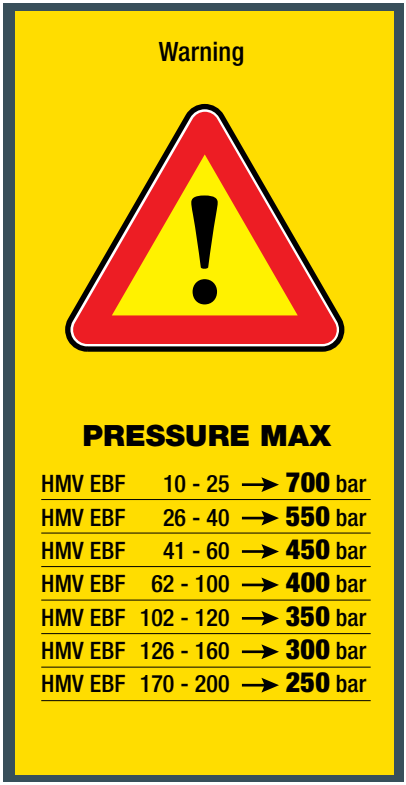
Brand of **NTN Group**

Type: HMV...EBF

HYDRAULIC NUT

Operating Instructions

Important information



EC Declaration of Conformity

EC Declaration of Conformity

according to appendix II A of the EC machinery directive 2006/42/EC

We hereby certify that the machine describes as follows is in its conception, construction and form put by us into circulation is in accordance with all the relevant essential health and safety requirements of the EC machinery directive 2006/42/EC.

Manufacturer's name:	**NTN Europe**
Street:	1, rue des Usines
City:	F-74000 ANNECY, France

Description of the hydraulic nut:

Type:	HMV…EBF
Thread size:	Metric / trapezoid / pipe thread
Manufacturing date:	-----

Applicable harmonized standards:

EN ISO 12100:2010	- Risk assessment and risk reduction -
EN 1005-2:2003+A1:2008	- Safety of machinery - Human physical performance -
EN ISO 4413:2010	- Hydraulic fluid power – General rules and safety requirements for systems and their components -

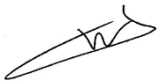
Authorised to compile the technical file:	**NTN Europe**
Street:	1, rue des Usines
City:	F-74000 ANNECY, France

We hereby declare that the special technical information for this machine were provided after annex VII, part A, and to obligate us to transfer these on demands to the market supervisory authorities.

This declaration is no longer valid if the machine is modified without our consent. The declaration of conformity also loses its validity if the service life of the safety components used is exceeded.

Personal data of the signer: Frédéric GELLOZ
General Manager Engineering Europe
Industry & Aerospace

ANNECY, 28.09.2022



Signature

UK Declaration of Conformity

UK Declaration of Conformity

according to annex II A of the - The Supply of Machinery (Safety) Regulations 2008 -

We hereby certify that the machine describes as follows is in its conception, construction and form put by us into circulation is in accordance with all the relevant essential health and safety requirements of the - The Suppy of Machinery (Safety) Regulations 2008 (No 1597) -

Manufacturer's name:	**NTN Europe**
Street:	1, rue des Usines
City:	F-74000 ANNECY, France

Description of the hydraulic nut:

Type:	HMV…EBF
Thread size:	Metric / trapezoid / pipe thread
Manufacturing date:	-----

Applicable designated standards:

EN ISO 12100:2010	- Risk assessment and risk reduction -
EN 1005-2:2003+A1:2008	- Safety of machinery - Human physical performance -
EN ISO 4413:2010	- Hydraulic fluid power – General rules and safety requirements for systems and their components -

Authorised to compile the technical file:	**NTN Europe**
Street:	1, rue des Usines
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Personal data of the signer:

Frédéric GELLOZ
General Manager Engineering Europe
Industry & Aerospace

ANNECY, 28.09.2022

Signature

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1. General information

1.1 Information on the operating instructions

Tip

- These operating instructions are regarded as an integral part of the hydraulic nut and must therefore be delivered with the component.
- The operating instructions are to be kept accessible in the immediate vicinity of the hydraulic nut for staff to refer to at any time.
- These operating instructions must be read through carefully before commencing any work.
- They serve as instructions for the proper use of the component.

The operating instructions provide information about:

- the dangers and instructions for safe handling of the hydraulic nut,
- the structure and description of the components,
- the workings of the hydraulic nut,
- fundamental technical specifications,
- transport, assembly and installation of the hydraulic nut
- measures to establish operational readiness and operational safety,
- operation of the hydraulic nut,
- action in the event of malfunctions and their rectification,
- maintaining and repairing the hydraulic nut
- commissioning and decommissioning the hydraulic nut.

The operating instructions contain important information for

- avoiding potential hazards,
- operating the hydraulic nut safely and economically,
- minimising costs for repairs and outages,
- increasing the reliability and service life of the hydraulic nut.

Tip

- For better explanation, illustrations in these operating instructions may be shown not to scale and differ from the actual model.

Tip

- Information contained in the separate operating instructions, in particular safety information, must be followed!

1.2 Responsibility of the operating company

1.2.1 Legal responsibility

The operating company bears the responsibility for the hydraulic nut in the public/legal and commercial sense.

In addition, the operating company is responsible for the hydraulic nut always being in a faultless technical condition. In particular, it bears the risks of ownership and operation, and the responsibility for managing the raw materials, auxiliary materials and operating materials required for operating the hydraulic nut, as well as disposal.

1.2.2 Occupational health & safety

The operator is fully responsible for the operational safety of the hydraulic nut. The hydraulic nut is used in a commercial area. The company operating the hydraulic nut is therefore subject to the statutory duties of occupational health & safety. Along with the advice for health & safety in this user manual, also comply with the safety, accident prevention, and environmental protection regulations applicable to the area where the hydraulic nut is used.

As such, the following applies in particular:

- The operating company must familiarise itself with the applicable health & safety provisions and, in a hazard analysis, identify the specific working conditions where the hydraulic nut is used.
- This must be implemented in the form of operating instructions for the hydraulic nut.
- Throughout the entire period of using the hydraulic nut, the operating company must check whether the operating and working instructions that it has been provided with meet the up-to-date regulations and, where required, adjust them.
- The operating company appoints the safety officer.
- The operating company provides the necessary personal protection equipment.

1.2.3 Personnel

The operating company is responsible for the prompt and sufficient provision of qualified personnel. The operating company must provide personnel with the required protective equipment.

The operating company must ensure that all employees dealing with the hydraulic nut have read and understood the operating instructions.

1.2.4 Operational management

The operator must clearly regulate and define the responsibilities for installation, operation, maintenance and repair of the hydraulic nut and monitor correct execution.

In addition, the operating company shall check compliance with the applicable health & safety provisions and these operating instructions.

The operating company shall arrange for the following tasks to be performed by trained, specialist staff:

- Reporting of malfunctions or particular incidents to persons specified by the operating company.
- Shutting down of the hydraulic nut if persons or the machine/system are endangered due to malfunctions or special incidents.

1.2.5 Maintenance

The operator must ensure that the maintenance intervals described in this operating manual are observed.

1.3 Instructing personnel

Personnel entrusted with the hydraulic nut must receive regular instruction from the operating company in the following subjects:

- Training of the personnel concerned for the intended use as well as for correct operation, maintenance, fault rectification and repair.
- Instructing operating staff in the location, function and handling of safety equipment as well as in the wearing of personal protective equipment.
- Information about action in the event of hazards and accidents.

For better traceability, the execution of the instruction must be recorded.

1.4 Abbreviations, symbols and technical terms

Along with the hazard symbols, see chapter 2.2 Warnings, symbols and markings, the advice symbol is used for highlighting information on operating the system.

1.4.1 Abbreviations

The following abbreviations are used in these operating instructions:

Abbreviation	Meaning
NTN	NTN Europe
PPE	Personal protective equipment

Tab. 1 1: Explanation of abbreviations

1.4.2 Representation of different information

The following symbols are used in these operating instructions:

Representation	Meaning
(1)	numbered action step
▶	symbolised action steps
→	Result after performing action steps
•	Enumeration
-	Enumeration, subgroup
Italic text	Indicates preconditions that must be fulfilled before an action description
Chapter «Heading/Reference»	Refers to a section in this manual or further applicable documents
	Along with the advice symbol, information on operating the system and useful tips for operation are provided.

Tab. 1 2: Representation of Information

1.5 Conformity/standards and directives

This hydraulic nut has been designed and built according to state-of-the-art technology and recognised safety regulations. Conformity of the hydraulic nut with EU guidelines and standards is confirmed through the CE declaration.

1.6 Warranty and liability

The «General Terms and Conditions of Sale and Delivery» of the NTN always apply.

The manufacturer excludes warranty and liability claims in the event of personal injury and damage to property if they are attributable to one or more of the following causes:

- Use not as intended.
- Operating the hydraulic nut without or with non-functional safety and protective equipment.
- Failure to observe warning and safety instructions
- Improper handling during transport, storage, assembly, installation, commissioning, operation, set-up, maintenance and repair.
- Unauthorised structural changes to the hydraulic nut.
- Defective supervision and maintenance of parts subject to wear.
- Maintenance and servicing work not performed in good time.
- Maintenance and servicing work not performed properly.
- Disasters caused by foreign bodies and force majeure.
- Vandalism.

Tip

- Conformity in accordance with the Machinery Directive 2006/42/EC and the CE marking becomes invalidated if unauthorised alterations to the hydraulic nut are made.

1.7 Target groups

These operating instructions are aimed at all authorised users of the hydraulic nut. The operator of the hydraulic nut determines who is authorised as a user. Every user of the hydraulic nut must have read and understood the operating instructions before commencing activity and be able to apply the contents.

Since the requirements for these users depend strongly on their activity, the following distinctions are made:

1.7.1 Operating company

The operating company is the contractual partner of the manufacturer. The operating company can be legally obliged by the manufacturer to comply with conditions when purchasing the hydraulic nut.

1.7.2 User

The user is an individual authorised by the operating company, who is instructed in the normal operation of the hydraulic nut.

1.7.3 Service technician

The service technician is a specialist of the operating company authorised and instructed by NTN or a customer-service technician of the manufacturer.

2. Markings, abbreviations and warning texts

Read the safety chapter completely before use in order to identify hazards and prevent injuries.

Keep the instructions ready to hand on/near the hydraulic nut and ensure that they are always available!

2.1 Identification of the hydraulic nut

Manufacturer	SNR
Type designation	HMV…EBF
Thread size	……
Year of manufacture (encrypted)	……
Weight (kg)	……

Tab. 2 1: Identification of the hydraulic nut

CE marks
The hydraulic nut meets the requirements of the applicable EU Directives.

2.2 Warnings, symbols and markings

2.2.1 Definition of warning information

A warning is used to warn of a situation that can lead to injuries or death.

Warnings are identified signal words and colour backgrounds that indicate the extent of the hazard.

2.2.2 Identifying warning advice

All warning advice is identifiable on the signal word. A corresponding background colour is used according to the degree of risk of the dangerous situation:

Representation	Meaning
DANGER!	Identifies a risk that, if it cannot be avoided, leads to death or serious injury.
WARNING!	Identifies a risk that, if it cannot be avoided, may lead to death or serious injury.
CAUTION!	Identifies a risk that, if not avoided, may lead to slight to moderate injuries.
NOTE!	Indicates an act to prevent damage to property on the system.

Tab. 2 2: Warning advice signal word

2.2.3 Identifying warning symbols

The following warning symbols are used in the operating instructions and/or on the hydraulic nut to warn of risks of injury.

General warning of danger!

Warning: Suspended load!

Warning: Danger of crushing!

Warning: Hand injury!

Warning: Obstacles on the floor!

Warning: Components under high pressure!

2.2.4 Identifying hazard symbols

The following hazard symbols are used in the operating instructions but not on the machine/system and warn of injuries and environmental risks.

Warning of substances that damage health or the environment!

Warning of acute or long-term water-hazardous substances. Ensure environ-mentally sound disposal!

2.2.5 Symbols for personal protective equipment (PPE)

For some work on the device, it is necessary to wear personal protective equipment (PPE). Warning notices in these operating instructions indicate the protective equipment to be used.

Use hand protection!

Use safety shoes!

Use eye protection!

2.3 Basic safety instructions

Residual risks are those potential imminent hazards which the hydraulic nut possesses due to its mode of operation. Residual risks therefore cannot be removed, rather minimised by protective measures.

Even if all safety regulations are observed, there is a residual risk when operating the hydraulic nut.

All persons working with the hydraulic nut must be aware of these residual risks and follow the instructions in order to prevent accidents or damage.

The following basic warning and safety instructions apply to all life phases of the hydraulic nut.

The following basic safety instructions apply in general to all life phases of the hydraulic nut. Additional preceding safety instructions can be found at the start of a chapter in the sub-chapter 'Safety Information'.

WARNING!

Occupational diseases and work-related health hazards if the local accident prevention regulations are not followed!

- The operating company shall ensure compliance with local accident prevention regulations.

WARNING!

Failure to observe the operating instructions.

All persons employed on the hydraulic nut must have read and understood the operating instructions and all other safety instructions before putting the hydraulic nut into operation.

- The operator must regularly instruct the persons employed on the hydraulic nut on the function and dangers arising from the hydraulic nut

WARNING!

Squeezing or crushing between moving parts.

Physical and hand/finger injuries between moving parts.

- Do not reach between moving and fixed parts.
- Instruct personnel about special danger points.

WARNING!

Dangerous surfaces.

Surfaces and sharp edges on the product can cause injury to hands and fingers.

- ▶ The operator must regularly instruct the persons employed on the hydraulic nut of the dangers posed by the device.
- ▶ Wear personal protective equipment

WARNING!

Lack of protection due to PPE not being worn!

Various injuries by not wearing personal protective equipment!

- ▶ Always wear the prescribed personal protective equipment when working with the hydraulic nut.

CAUTION!

Insufficient lighting or visibility.

Inadequate lighting leads to various types of injury.

- ▶ The operating company is responsible for sufficient lighting in the working and transport areas!

CAUTION!

Risk of injury due to slipping, tripping and falling.

Soiled floors can cause accidents due to tripping or slipping.

- ▶ Do not leave any materials or tools lying on walkways or driveways.
- ▶ Immediately absorb/remove oil and other slippery materials in walking areas; use oil binding agents.

2.4 Hydraulic energy

WARNING!

Warning: Components under high pressure.

Ejection of the hydraulic line and materials due to poor fastening.

- Inspect all connections before commissioning.
- Follow the manufacturers connection specifications.
- Use of hydraulic lines in accordance with the manufacturer's specifications

The hydraulic nut must be connected to a hand pump according to the Technical Specifications (→ section Technical Specifications).

In order to ensure that hazards caused by hydraulic energy are ruled out as far as possible, the hydraulic nut may only be connected to the hydraulic pump by an appropriately qualified person.

The hydraulic nut was designed, assembled and tested according to all regulations applicable at the time of construction and assembly.

Work on the hydraulic nut must be performed by qualified specialists.

Damage to the hydraulic nut must first be repaired before it can be reused.

Operating the hydraulic nut with defective components is prohibited!

Should you detect or suspect damage to the components of the hydraulic nut, disconnect them from the hydraulic manual pump immediately. The hydraulic nut may only be reconnected to the manual pump if the damage has been rectified by a qualified specialist and the hydraulic nut has been checked for its safe condition in accordance with current regulations.

2.5 Personal protective equipment

If personal protective equipment (PPE) is required to be worn, this is indicated through corresponding symbols in the warnings of these operating instructions.

The required personal protective equipment is to be provided by the operating company and always kept operational.

WARNING!

Required protective equipment.

Injuries due to not wearing personal protective equipment!

▶ Always wear the necessary personal protective equipment for all work with the hydraulic nut

The following personal protective equipment must be used for all work on/with the hydraulic nut:

- Safety shoes, at least category S1
- Suitable protective gloves
- Safety goggles

Additional personal protective equipment is also required for various work, in particular for inspection and maintenance work. This includes, among other things:

- Protective gloves when handling cleaning agents; please refer to the safety data sheet for the cleaning agent.
- Protective gloves when handling lubricants; please refer to the safety data sheet for the lubricant.

2.6 Organisational measures

2.6.1 Conduct in the event of danger and accidents

If an accident occurs despite all the safety measures taken, the employees must be instructed on the behaviour in the event of an accident, see chapter *1.3 Instructing personnel.*

This includes the following information about:

- Treating victims
- Emergency numbers
- First Aid stations

2.7 Safety policy

The use of the hydraulic nut HMV ....EBF can cause dangerous injuries and impair safety if not handled properly.

Based on the risk assessment, the following safety concept has been developed for the hydraulic nut in order to guarantee safety during all work. This consists of:

- The safety-related installations and functions
- The safety instructions for operation

The safety policy is supplemented by the usage entitlements of the individual users/ operators of the hydraulic nut, see chapter *1.7 Target groups.*

2.7.1 Safety-related equipment and functions

The safety equipment and function serves to protect the health of the employees. In the case of the hydraulic nut, this is achieved by means of an «emergency stop feature». A leakage groove interrupts the further extension beyond the maximum stroke. With the oil leakage established in this way, no further movement is possible.

In addition, the safety policy is based on compliance with intended use, *see chapter 3.1 Intended use*, of the hydraulic nut and observing existing residual hazards.

2.7.2 Safety instructions for operation

Safety information in these operating instructions is assigned to the position of the respective activity that contains the hazard potential.

In addition, further safety information can be found at the start of the chapter in the sub-chapter «Safety Information».

Hazards that cannot be directly assigned to an activity but apply generally are described in chapter *2.3 Basic safety instructions.*

Tip

- In addition to the safety information in these operating instructions, the safety information in the operating instructions for the hydraulic manual pump must also be observed!

3 Description of the hydraulic nut

3.1 Intended use

The hydraulic nut HMV...EBF is designed exclusively for the simple mounting and dismounting of rolling bearings with tapered bore.

By means of hydraulic pressure, the roller bearings to be mounted can be pushed into the desired position safely and without much effort.

The hydraulic nut is to be used exclusively within the performance limits listed in chapter *4 Spare parts, accessories and technical data.*

3.2 Improper use

Improper use includes in particular:

- Any use other than that described in chapter *3.1 Intended use* and the further use of the hydraulic nut as described without the written consent of the manufacturer.
- Any use other than described in further operating instructions.
- Operation outside technical thresholds.
- Unauthorised changes or renovations as well as manipulation.
- Use, installation, operation, servicing or repair in another way or manner other than as described.
- Work performed by unqualified personnel.
- Use of unsuitable or unacceptable materials, working or operating supplies, or accessories.
- Failure to follow safety and operating instructions, health & safety and accident prevention regulations or applicable statutory regulations.
- Failure to eliminate malfunctions in a timely fashion that could negatively impact safety.
- Use of spare and accessory parts other than originals not the same in terms of quality and function.
- Operation of the hydraulic nut with protective and safety devices that are incomplete and/or bypassed.
- Use of unclean hydraulic oil. Dirt and oil residues must always be removed immediately. Make sure there is no air in the hydraulic system.

- To protect against excessive pressure, only use a hand pump to actuate the hydraulic nut. A pressure gauge must always be connected to check the working pressure.
- Move the annular piston further out of the ring body than the yellow marking.
- Operating the hydraulic nut if it is not in a faultless condition, without awareness of safety and dangers, and without regard for all instructions in documentation.
- Operation of the hydraulic nut in potentially explosive areas.

3.3 Changes to the hydraulic nut

The hydraulic nut is designed and built in line with the latest technology and accepted safety regulations. Nevertheless, dangers to the life and limb of the user or third parties or negative effects on the hydraulic nut or other property can occur during use.

WARNING!

Unauthorised modifications, additions and conversions to the ma-chine/system!

It is prohibited to make unauthorised changes to the hydraulic nut without the approval of NTN. The operating company shall ensure compliance with local accident prevention regulations.

- ▶ Before making any technical changes or extensions to the hydraulic nut, obtain the written consent of the manufacturer.
- ▶ This also applies to fitting components from other manufacturers.

The safe operation of a hydraulic nut results from a combination of:

- Preventing risks due to an inherently safe design.
- Minimising/preventing residual hazards by installing safety-related functions and equipment.
- Blocking hazards with protective equipment.
- Preparing operating instructions for the hydraulic nut by including the requirements from the risk assessment.
- Labelling hazards with symbols and warnings on the hydraulic nut
- Using the prescribed personal protective equipment (PPE).
- Operating the hydraulic nut only in a technically perfect condition, in accordance with its intended use, safety-consciously and aware of the dangers.
- Complying with further provisions of the manufacturer.
- Operating the hydraulic nut in accordance with the operating instructions.
- Immediate rectification of faults which may impair safety.
- Complying with provisions for the operating company such as a risk assessment and operating instructions for the workplace.

3.4 Limitation of liability

All information and notes in this manual have been compiled taking into account the applicable standards and regulations, the state of the art and our many years of knowledge and experience.

The manufacturer accepts no liability for damages due to:

- Failure to comply with these operating instructions and the overall technical documentation,
- Unintended use of the hydraulic nut or parts thereof,
- The use of personnel not specifically trained,
- Unauthorised conversions,
- Technical changes,
- Use of non-permitted raw, auxiliary and operating materials.

The actual scope of delivery may deviate from the explanations and illustrations described here in the case of special versions, the use of additional order options or due to the latest technical changes.

In all other respects, the contractually agreed obligations, the General Terms and Conditions as well as the manufacturer's delivery conditions and the legal regulations valid at the time of conclusion of the contract shall apply.

3.5 Assembly and function

3.5.1 Layout overview

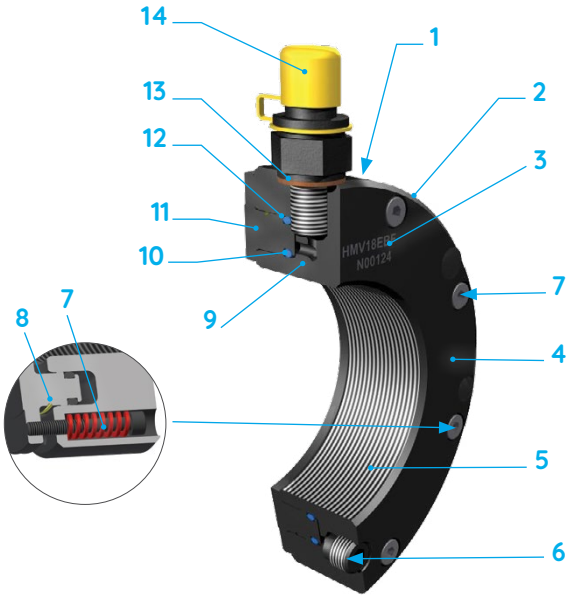


Fig. 3 1: Overview of the hydraulic nut

Item	Description
1	Outer shell
2	Jacket surface with cross-milling
3	Labelling
4	Front face
5	Nut thread in ring body (fine / trapezoidal thread)
6	Sealing screw with ball
7	Pin with pressure spring
8	Marking for maximum permissible stroke
9	Ring body
10	Toroidal ring (inside)
11	Annular piston
12	Toroidal ring (outside)
13	Sealing ring
14	Hydraulic connection with cap (quick coupling)
15	Mounting lever (see below)

The hydraulic nut consists of the main components ring body and annular piston. The ring body is equipped with an internal thread, which is used for screwing onto a shaft or sleeve thread. The annular piston is guided in the circumferential groove of the front face. A free space is created between the piston and the ring body, as the hydraulic oil is distributed evenly and exerts pressure on the piston.

Two toroidal rings are inserted in the annular piston to seal the pressure chamber.

The hydraulic nut HMV...EBF is used exclusively for mounting roller bearings (taper 1:12 / 1:30) on tapered shafts, adapter or withdrawal sleeves.

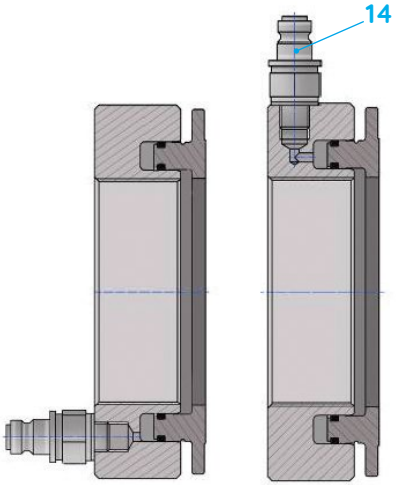


Fig. 3 2: Can be connected to front face or jacket surface

For the connection of a hydraulic line, one threaded hole G1/4 each is provided on the face and the jacket side. The threaded hole on the front side is sealed at the factory with a sealing screw with ball (pos. 6). A quick coupling (pos. 14) is screwed into the threaded hole on the jacket surface.

In order to simplify the screwing of the hydraulic nut onto the shaft or sleeve thread, the jacket surface is provided with cross-milling (cording).

In addition, the assembly lever (pos. 15) supplied as standard can be used to turn the nut more easily. This serves as a mounting aid and is inserted / screwed into the specially provided blind holes / threaded holes of the jacket surface.

Inside the hydraulic nut are circumferential pins with pressure springs (pos. 9). These ensure the automatic return of the annular piston and at the same time contribute to the return of the oil into the reservoir of the hydraulic pump.

Manual pushing back of the piston is superfluous.

3.5.2 Connections / holes

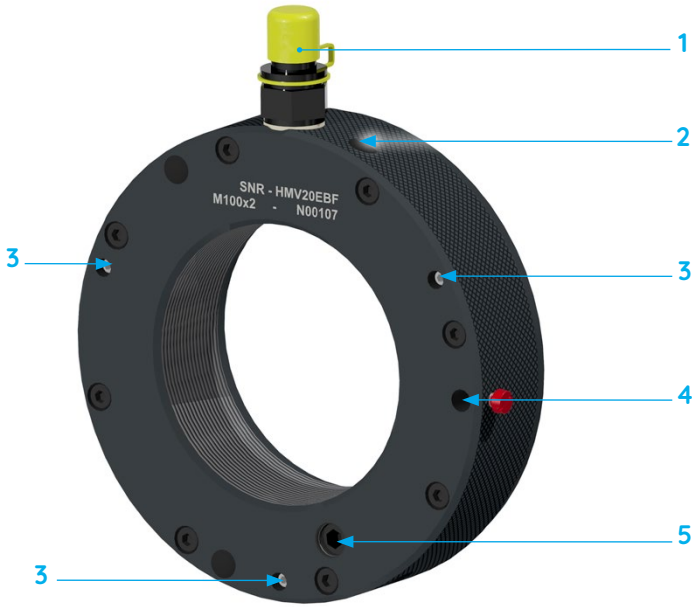


Fig. 3 3: Overview of connections and holes

Item	Description
1	Connection hydraulic line G1/4 (jacket surface) *(Quick connection factory fitted)*
2	Basic holes for mounting lever
3	Threaded holes for dismantling the annular piston *(Threaded pin factory fitted)*
4	Hole for dial gauge
5	Connection hydraulic line G1/4 (front face) *(Factory closed)*

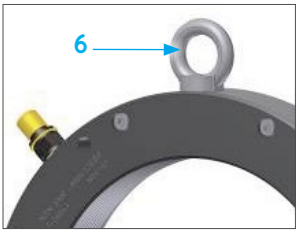


Fig. 3 4: Eye bolt connection

Hydraulic nuts from size HMV60EBF upwards are equipped with additional threaded holes on the jacket surface. The factory-fitted eye bolt (pos. 6) is mounted here for better handling.

3.5.3 Functional description

The oil pressure generated by a hydraulic pump provides an axial feed of the annular piston within the ring body. The displacement pushes the roller bearing to its tapered seat. For the exact positioning of the roller bearing, the displacement should be determined with the aid of a dial gauge.

By releasing the pump pressure, the annular piston is automatically pushed back into its initial position by spring force. The oil automatically flows back into the reservoir of the hydraulic pump.

4 Spare parts, accessories and technical data

4.1 Spare parts

Fig. 4 1: Spare parts for hydraulic nut

Pos	Item		Remark
1	TOOL HMV BALL PLUG 1/4	Sealing plug with ball *	
2	TOOL HMV NIPPLE 1/4	Hydraulic connection *	Comprising: 1x quick coupling with cover 1x adapter thread 1x sealing ring
3	TOOL HMV SW 1/4	Sealing ring for hydraulic connection *	
4	TOOL HMV TBAR 11x150 TOOL HMV TBAR 16x200	Mounting lever	HMV10EBF - HMV58EBF: 11x150 HMV60EBF - HMV200EBF: 16x200
5	TOOL HMV EBO M12 TOOL HMV EBO M16	DIN 580 ring washer	HMV60EBF - HMV130EBF: M12 HMV134EBF - HMV200EBF: M16
6	TOOL HMV... PISTON SEALS	Piston seal kit	Comprising: 1x toroidal ring (inside) 1x toroidal ring (outside)
7	TOOL HMV... SET-PSK	Compression spring set	Bond the screws flush

* Parts included in delivery

4.2 Accessories

Order designation	Item
TOOL PUMP SET 700B-0.3L / Pump with accessories	Hydraulic pump with 0.3 l oil volume Including hydraulic line, connection nipple, pressure gauge (analogue), 0.3 l pre-filled with hydraulic oil max. working pressure 700 bar
TOOL PUMP SET 700B-0.9L / Pump with accessories	Hydraulic pump with 0.9 l oil volume Including hydraulic line, connection nipple, pressure gauge (analogue), 0.9 l pre-filled with hydraulic oil max. working pressure 700 bar
TOOL PUMP GAUGE 700	Pressure gauge up to max. 700 bar (analogue)
TOOL HYDRAULIC OIL 1L	Hydraulic fluid 1.0 l
TOOL FEELER GAUGES 100 TOOL FEELER GAUGES 150 TOOL FEELER GAUGES 300	Feeler gauge (length 100 mm) Feeler gauge (length 150 mm) Feeler gauge (length 300 mm)
TOOL DIAL GAUGE 050	Dial gauge for a displacement distance up to 5 mm
TOOL DIAL GAUGE 100	Dial gauge for a displacement distance up to 10 mm
TOOL DIAL EXTENSION SET	Extension adapter set for dial gauge

4.3 Technical data HMV...EBF

Designation	Type	
Nut thread	HMV 10 EBF to HMV 40 EBF HMV 41 EBF to HMV 200 EBF	ISO 965/III-1980, Tolerance class 6H ISO 2901-1977, Tolerance class 7H
Recommended hydraulic hand pump for roller bear-ing mounting	HMV 10 EBF to HMV 54 EBF HMV 56 EBF to HMV 92 EBF HMV 94 EBF to HMV 200 EBF	TOOL PUMP SET 700B-0,3L TOOL PUMP SET 700B-0,9L TOOL PUMP SET 1500B-2,5L
Thread size of eye bolt	HMV 60 EBF to HMV 130 EBF > HMV 130 EBF	M12 M16
Tightening torque sealing screw with ball		45 Nm
Max. operating pressure * at max. permissible piston stroke	HMV 10 EBF to HMV 25 EBF HMV 26 EBF to HMV 40 EBF HMV 41 EBF to HMV 60 EBF HMV 62 EBF to HMV 100 EBF HMV 102 EBF to HMV 120 EBF HMV 126 EBF to HMV 160 EBF HMV 170 EBF to HMV 200 EBF	700 bar 550 bar 450 bar 400 bar 350 bar 300 bar 250 bar

* The required operating pressure for mounting and dismounting rolling bearings depends on various factors such as bearing size, bearing seat quality, number of contact surfaces and the weight of the rolling bearing.

4.4 Dimensions table

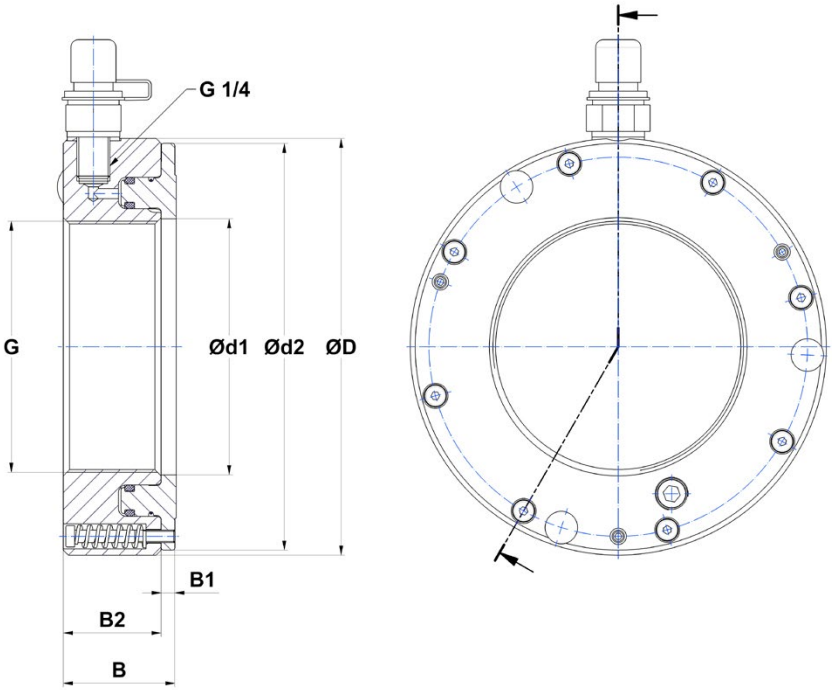


Fig. 4 2: Dimensional diagram

4.4.1 Dimensions table HMV

Size	Thread	Outer diameter mm	Total width mm	Piston diameter mm	Permitted piston stroke mm	Flange width mm	Body width mm	Diameter mm	Piston surface mm²	Weight kg
	G	**D**	**B**	**max. d2**		**B1**	**B2**	**d1**		
HMV 10 EBF	M 50x1.5	114	43	112	5	5	38	52	2800	2.8
HMV 11 EBF	M 55x2	120	43	118	5	5	38	57	3100	3.1
HMV 12 EBF	M 60x2	125	43	123	5	5	38	62	3300	3.3
HMV 13 EBF	M 65x2	130	43	128	5	5	38	67	3500	3.4
HMV 14 EBF	M 70x2	135	43	133	5	5	38	72	3700	3.6
HMV 15 EBF	M 75x2	140	43	138	5	5	38	77	3900	3.8
HMV 16 EBF	M 80x2	145	43	143	5	5	38	82	4100	3.9
HMV 17 EBF	M 85x2	150	43	148	5	5	38	87	4300	4.1
HMV 18 EBF	M 90x2	156	43	152	5	5	38	92	4400	4.3
HMV 19 EBF	M 95x2	162	43	158	5	5	38	97	4800	4.5
HMV 20 EBF	M 100x2	166	44	162	5	6	38	102	4800	4.7
HMV 21 EBF	M 105x2	172	44	168	5	6	38	107	5200	5.0
HMV 22 EBF	M 110x2	178	44	174	5	6	38	112	5700	5.3
HMV 23 EBF	M 115x2	182	44	178	5	6	38	117	5600	5.4
HMV 24 EBF	M 120x2	188	44	184	5	6	38	122	6100	5.6
HMV 25 EBF	M 125x2	192	44	188	5	6	38	127	6000	5.7
HMV 26 EBF	M 130x2	198	44	194	5	6	38	132	6500	6.0
HMV 27 EBF	M 135x2	204	44	200	5	6	38	137	7000	6.3
HMV 28 EBF	M 140x2	208	45	204	5	7	38	142	6900	6.5
HMV 29 EBF	M 145x2	214	46	210	5	7	39	147	7400	6.9
HMV 30 EBF	M 150x2	220	46	216	5	7	39	152	7900	7.3
HMV 31 EBF	M 155x3	226	46	222	5	7	39	157	8500	7.7
HMV 32 EBF	M 160x3	232	47	228	6	7	40	162	9000	8.2
HMV 33 EBF	M 165x3	238	47	234	6	7	40	167	9600	8.5
HMV 34 EBF	M 170x3	244	48	240	6	7	41	172	10200	9.0
HMV 36 EBF	M 180x3	256	48	252	6	7	41	182	11400	9.8
HMV 38 EBF	M 190x3	270	50	266	7	8	42	192	12000	11.3
HMV 40 EBF	M 200x3	282	51	278	8	8	43	202	12500	12.4
HMV 41 EBF	Tr 205x4	288	51	284	8	8	43	209	12800	12.8
HMV 42 EBF	Tr 210x4	294	52	290	8	8	44	212	13100	13.6
HMV 43 EBF	Tr 215x4	300	52	296	8	8	44	219	13300	14.0
HMV 44 EBF	Tr 220x4	306	52	302	8	8	44	224	13600	14.5
HMV 45 EBF	Tr 225x4	312	53	308	8	8	45	229	13900	15.2
HMV 46 EBF	Tr 230x4	318	53	314	8	8	45	234	14200	15.7
HMV 47 EBF	Tr 235x4	326	54	322	9	8	46	239	15600	16.8
HMV 48 EBF	Tr 240x4	330	55	326	9	9	46	244	16400	17.2

Size	Thread	Outer diameter mm	Total width mm	Piston diameter mm	Permitted piston stroke mm	Flange width mm	Body width mm	Diameter mm	Piston surface mm²	Weight kg
	G	**D**	**B**	**max. d2**		**B1**	**B2**	**d1**		
HMV 50 EBF	Tr 250x4	342	55	338	9	9	46	254	17000	18.2
HMV 52 EBF	Tr 260x4	356	56	352	9	9	47	264	17500	20.2
HMV 54 EBF	Tr 270x4	368	57	364	10	9	48	274	18100	21.7
HMV 56 EBF	Tr 280x4	380	58	376	10	9	49	284	19800	23.3
HMV 58 EBF	Tr 290x4	390	58	386	10	9	49	294	20400	24.0
HMV 60 EBF	Tr 300x4	410	61	406	10	10	51	304	23900	29.2
HMV 62 EBF	Tr 310x5	420	62	416	11	10	52	314	24600	30.9
HMV 64 EBF	Tr 320x5	430	63	426	11	10	53	324	25300	32.1
HMV 66 EBF	Tr 330x5	440	63	436	12	10	53	334	26000	33.0
HMV 68 EBF	Tr 340x5	450	64	446	12	10	54	344	26700	34.4
HMV 69 EBF	Tr 345x5	460	64	456	12	10	54	349	30200	36.5
HMV 70 EBF	Tr 350x5	470	66	466	12	10	56	354	31000	39.8
HMV 72 EBF	Tr 360x5	480	66	476	13	10	56	364	33400	40.7
HMV 73 EBF	Tr 365x5	485	68	481	13	11	57	369	33800	42.4
HMV 74 EBF	Tr 370x5	490	68	486	13	11	57	374	34300	42.9
HMV 76 EBF	Tr 380x5	500	69	496	14	11	58	384	35100	44.6
HMV 77 EBF	Tr 385x5	505	69	501	14	11	58	389	35500	45.1
HMV 80 EBF	Tr 400x5	530	71	526	14	11	60	404	35300	52.8
HMV 82 EBF	Tr 410x5	545	72	541	14	11	61	414	36900	57.0
HMV 84 EBF	Tr 420x5	555	72	551	14	11	61	424	39300	57.9
HMV 86 EBF	Tr 430x5	565	73	561	14	11	62	434	41700	59.9
HMV 88 EBF	Tr 440x5	575	73	571	14	12	62	444	40900	60.8
HMV 90 EBF	Tr 450x5	590	75	586	15	12	64	454	45100	66.3
HMV 92 EBF	Tr 460x5	600	76	596	15	12	64	464	46000	68.3
HMV 94 EBF	Tr 470x5	610	77	606	15	12	65	474	48600	70.4
HMV 96 EBF	Tr 480x5	620	77	616	16	12	65	484	50400	71.7
HMV 98 EBF	Tr 490x5	640	78	636	16	12	66	494	54300	79.9
HMV 100 EBF	Tr 500x5	650	79	646	16	12	67	504	55300	82.4
HMV 102 EBF	Tr 510x6	660	80	656	17	12	68	514	56300	85.7
HMV 104 EBF	Tr 520x6	670	81	666	17	13	68	524	57200	88.3
HMV 106 EBF	Tr 530x6	680	82	676	17	13	69	534	50500	90.4
HMV 108 EBF	Tr 540x6	690	82	686	17	13	69	544	52300	91.9
HMV 110 EBF	Tr 550x6	705	83	701	17	13	70	554	55200	98.0
HMV 112 EBF	Tr 560x6	715	84	711	18	13	71	564	56100	100.3
HMV 114 EBF	Tr 570x6	725	85	721	18	13	72	574	57000	103.2
HMV 116 EBF	Tr 580x6	735	85	731	18	13	72	584	57900	104.8

Size	Thread	Outer diameter mm	Total width mm	Piston diameter mm	Permitted piston stroke mm	Flange width mm	Body width mm	Diameter mm	Piston surface mm²	Weight kg
	G	**D**	**B**	**max. d2**		**B1**	**B2**	**d1**		
HMV 120 EBF	Tr 600x6	760	86	756	19	13	73	604	65200	113.1
HMV 126 EBF	Tr 630x6	790	88	786	19	14	74	634	68100	120.8
HMV 130 EBF	Tr 650x6	810	89	806	19	14	75	654	70100	125.7
HMV 134 EBF	Tr 670x6	840	90	836	22	14	76	674	80800	139.6
HMV 138 EBF	Tr 690x6	860	91	856	22	14	77	694	83000	145.2
HMV 142 EBF	Tr 710x7	880	93	876	23	15	78	714	85200	152.9
HMV 150 EBF	Tr 750x7	920	94	916	23	15	79	754	89600	162.4
HMV 160 EBF	Tr 800x7	970	96	966	25	16	80	804	95100	175.6
HMV 170 EBF	Tr 850x7	1030	99	1026	26	16	83	854	115600	203.2
HMV 180 EBF	Tr 900x7	1100	103	1096	28	17	86	904	153900	247.5
HMV 190 EBF	Tr 950x8	1150	103	1146	28	17	86	954	161800	261.0
HMV 200 EBF	Tr 1000x8	1200	105	1196	30	17	88	1004	169600	279.0

Tab. 4 1: Dimensions table HMV 10 - 200

4.4.2 Dimensions table HMVC

Size	Thread	Turns per	Outer diameter inch	Total width inch	Piston diameter inch	Permitted piston stroke inch	Flange width inch	Body width inch	Diameter inch	Piston surface inch²	Weight Kg
HMVC...EBF	**G**		**D**	**B**	**max. d2**		**B1**	**B2**	**d1**		
10	1.967	18	4.5	1.7	4.4	0.20	0.20	1.5	2.0	4.4	6.3
11	2.157	18	4.7	1.7	4.6	0.20	0.20	1.5	2.2	4.8	6.8
12	2.360	18	4.9	1.7	4.8	0.20	0.20	1.5	2.4	5.1	7.2
13	2.548	18	5.1	1.7	5.0	0.20	0.20	1.5	2.6	5.4	7.6
14	2.751	18	5.3	1.7	5.2	0.20	0.20	1.5	2.8	5.8	7.9
15	2.933	12	5.5	1.7	5.4	0.20	0.20	1.5	3.0	6.1	8.3
16	3.137	12	5.7	1.7	5.6	0.20	0.20	1.5	3.2	6.4	8.7
17	3.340	12	5.9	1.7	5.8	0.20	0.20	1.5	3.4	6.7	9.1
18	3.527	12	6.1	1.7	6.0	0.20	0.20	1.5	3.6	6.8	9.5
19	3.730	12	6.4	1.7	6.2	0.20	0.20	1.5	3.8	7.5	10.0
20	3.918	12	6.5	1.7	6.4	0.20	0.24	1.5	4.0	7.5	10.4
21	4.122	12	6.8	1.7	6.6	0.20	0.24	1.5	4.2	8.1	11.0
22	4.325	12	7.0	1.7	6.9	0.20	0.24	1.5	4.4	8.8	11.6
24	4.716	12	7.4	1.7	7.2	0.20	0.24	1.5	4.8	9.4	12.4
26	5.106	12	7.8	1.7	7.6	0.20	0.24	1.5	5.2	10.1	13.2
28	5.497	12	8.2	1.8	8.0	0.20	0.28	1.5	5.6	10.7	14.3
30	5.888	12	8.7	1.8	8.5	0.20	0.28	1.5	6.0	12.3	16.0
32	6.284	8	9.1	1.9	9.0	0.24	0.28	1.6	6.4	14.0	18.0
34	6.659	8	9.6	1.9	9.4	0.24	0.28	1.6	6.8	15.8	19.9
36	7.066	8	10.1	1.9	9.9	0.24	0.28	1.6	7.2	17.7	21.5
38	7.472	8	10.6	2.0	10.5	0.28	0.31	1.7	7.6	18.5	24.9
40	7.847	8	11.1	2.0	10.9	0.31	0.31	1.7	8.0	19.4	27.3
44	8.628	8	12.0	2.0	11.9	0.31	0.31	1.7	8.8	21.1	31.9
46	9.125	8	12.5	2.1	12.4	0.31	0.31	1.8	9.2	21.9	34.7
48	9.442	6	13.0	2.2	12.8	0.35	0.35	1.8	9.6	25.4	37.8
52	10.192	6	14.0	2.2	13.9	0.35	0.35	1.9	10.4	27.2	44.4
56	11.004	6	15.0	2.3	14.8	0.39	0.35	1.9	11.2	30.7	51.4
60	11.785	6	16.1	2.4	16.0	0.39	0.39	2.0	12.0	37.0	64.4
64	12.562	6	16.9	2.5	16.8	0.43	0.39	2.1	12.8	39.2	70.8
68	13.339	5	17.7	2.5	17.6	0.47	0.39	2.1	13.5	41.4	75.7
72	14.170	5	18.9	2.6	18.7	0.51	0.39	2.2	14.3	51.8	89.7
76	14.957	5	19.7	2.7	19.5	0.55	0.43	2.3	15.1	54.4	98.2
80	15.745	5	20.9	2.8	20.7	0.55	0.43	2.4	15.9	54.8	116.4
84	16.532	5	21.9	2.8	21.7	0.55	0.43	2.4	16.7	60.8	127.7
88	17.319	5	22.6	2.9	22.5	0.55	0.43	2.4	17.5	63.4	134.1
92	18.107	5	23.6	3.0	23.5	0.59	0.47	2.5	18.3	71.3	150.6
96	18.894	5	24.4	3.0	24.3	0.63	0.47	2.6	19.1	78.2	158.0
100	19.682	5	25.6	3.1	25.4	0.63	0.47	2.6	19.8	85.7	181.6
106	20.867	4	26.8	3.2	26.6	0.67	0.51	2.7	21.0	78.3	199.4
112	22.048	4	28.1	3.3	28.0	0.71	0.51	2.8	22.2	87.0	221.1
120	23.623	4	29.9	3.4	29.8	0.75	0.51	2.9	23.8	101.0	249.2
126	24.804	4	31.1	3.5	30.9	0.75	0.55	2.9	25.0	105.6	266.4
134	26.379	4	33.1	3.5	32.9	0.87	0.55	3.0	26.5	125.3	307.8
142	27.961	3	34.6	3.7	34.5	0.91	0.59	3.1	28.1	132.1	337.1
150	29.536	3	36.2	3.7	36.1	0.91	0.59	3.1	29.7	138.9	358.1
160	31.504	3	38.2	3.8	38.0	0.98	0.63	3.1	31.7	147.4	387.1
170	33.473	3	40.6	3.9	40.4	1.02	0.63	3.3	33.6	179.2	448.0
180	35.441	3	43.3	4.1	43.1	1.10	0.67	3.4	35.6	238.6	545.6
190	37.410	3	45.3	4.1	45.1	1.10	0.67	3.4	37.6	250.8	575.3

Tab. 4 2: Dimensions table HMVC 10 - 190

5 Transport

5.1 Safety instructions

In order to prevent serious injuries or death, follow the warning advice in this section.

WARNING!

Risk of death under suspended loads.

When lifting, lowering and suspending loads, the is a danger to life from falling or uncontrolled moving parts.

- Never stand under suspended loads.
- Observe the information about the intended attachment points.
- Do not attach slings to protruding components.
- Only use permitted lifting devices, load handling devices and slings with sufficient load-bearing capacity.
- Load handling attachments must not be damaged.

WARNING!

Crushing by uncontrolled moving parts.

- Observe attachment points and weights.
- When transporting several components together, pay attention to possible move-ment of components relative to each other.

WARNING!

Crash when components break.

If components are not strong enough, they may break during transport and cause fatal injuries.

- Attach the sling only to the supplied eye bolt.
- Observe the information about the intended attachment points!

5.2 General information

5.2.1 Performing transport inspection

Check the delivery immediately on receipt for completeness and transport damage. Proceed as follows in the event of externally visible transport damage:

- Do not accept the delivery, or only do so under reservation.
- Note the extent of the damage on the transport documents or on the transporter's delivery note.
- Instigate a claim.

Tip

- Claim for every defect as soon as it is identified. Claims for compensation can only be asserted within the applicable claim period.

5.3 Transporting and storing

NOTE!

Damage caused by improper transport.

Incorrect transport may lead to substantial damage. bserve attachment points and weights.

- ▶ When unloading the packages and with in-house transport, always proceed with extreme care and attention.
- ▶ Observe symbols on the packaging.
- ▶ Only use attachment points provided.
- ▶ Do not remove packaging until immediately before starting assembly.

5.3.1 Packaging

Individual packages are to packed according to the expected transport conditions. Only environmentally friendly materials have been used for packaging. The packaging is intended to protect the individual components from transport damage, corrosion and other damage until assembly. Therefore, do not destroy the packaging and only remove it just before assembly.

5.3.2 Handling packaging materials

If no return has been agreed for the packaging, separate the materials by size and type and send for reuse or recycling.

5.3.3 Transport of packages by crane

WARNING!

Crushing of body parts.

- ▶ Never hold parts of the body between moving and fixed parts.
- ▶ Never stand under the suspended load or when lowering it.

Packages with attachment eyelets can be transported directly by crane under the following conditions:

- The crane and lifting device must be designed for the weight of the package.
- The operator must be entitled to operate the crane.
- Attaching
  - ▶ Attach ropes, straps or multi-point suspension gear to the attachment points.
  - ▶ Ensure that the package is hanging straight, if necessary, note the off-centre centres of mass.
  - ▶ Start transport.

5.3.4 Transport by forklift truck

WARNING!

Crushing of body parts.

- ▶ Never hold parts of the body between moving and fixed parts.
- ▶ Never stand under the suspended load or when lowering it.

Packages with attachment eyelets can be transported directly by forklift truck under the following conditions:

- The forklift truck must be designed for the weight of the packages.
- When using ropes, belts or multi-point hangers, a sling hook must be provided on the fork.
- The operator must be entitled to operate the forklift truck.

- Attaching
  - ▶ Attach ropes, straps or multi-point suspension gear to the attachment points.
  - ▶ Ensure that the package is hanging straight, if necessary, note the off-centre centres of mass.
  - ▶ Start transport.

5.3.5 Transport by hand

⚠ WARNING!

Crushing of body parts.

- ▶ Never hold limbs between moving and fixed parts when setting down.
- ▶ Wear prescribed PPE.

Manual transport is possible under the following conditions:

- The weight of the hydraulic nut is less than the permissible values of the local accident prevention regulations.

  → If this value is higher, transport must be carried out with the help of a second person.

- The floor must be level and there must be no objects or steps on the traffic route.
- At the place of storage, the hydraulic nut must be secured against rolling away or falling over.

6 Assembly and installation

6.1 Safety instructions

In order to prevent serious injuries or death, observe the warning advice in this section.

WARNING!

Improper use of load transport equipment.

- When using means of transport observe the safety instructions in chapter *5.1 Safe-ty instructions*

WARNING!

Crushing of body parts.

When the hydraulic nut is set down on uneven ground, it may roll or tip over and cause fatal injuries. ever hold limbs between moving and fixed parts when setting down.

- Wear the prescribed personal protective equipment during transport work.
- Leave sufficient clearance to adjacent machines/systems to avoid the risk of crushing.

6.2 Procedure for the assembly of roller bearings

Tip

- Connect the hydraulic nut to a hydraulic hand pump.
- Check that there is sufficient hydraulic oil or top it up. Follow the operating instructions of the hand pump.

NOTE!

Tilting can cause damage to the threads.

- Place the hydraulic nut at a right angle to the thread.

After the roller bearing has been pushed by hand as far as possible onto its tapered seat, the hydraulic nut must be screwed onto the thread of the shaft journal or sleeve. When attaching, make sure that the internal and external threads are centred and aligned with each other. The use of an assembly paste is recommended. In order to simplify the application of larger hydraulic nuts, the beginning of the thread is marked on the face of the ring body (from HMV90EBF).

6.3 Bleeding the hydraulic nut

Tip

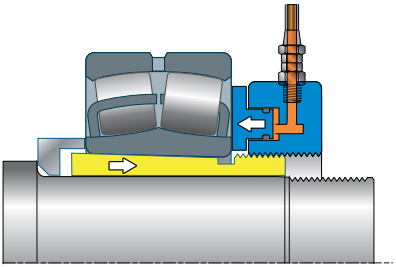
- When using the hydraulic nut for the first time and after each disassembly of a hydraulic connection, the hydraulic system must be bled.

To do this, screw the hydraulic nut over the entire length of the thread onto the shaft or sleeve thread and connect the hydraulic line to the hydraulic connection provided.

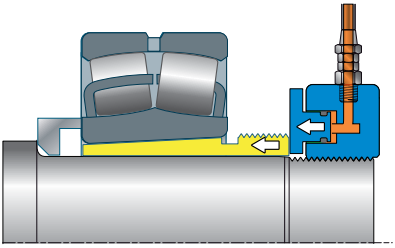
Turn the sealing screw with ball (pos. 6), see chapter 3.5.1 Layout overview, to the highest position and loosen slightly. Now pump oil into the system with the hydraulic pump until the hydraulic oil emerges without bubbles. Then tighten the sealing screw again (max. tightening torque 45 Nm).

6.4 Possible mounting/dismounting situations for rolling bearings with tapered bore

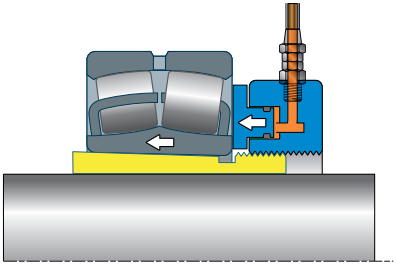
6.4.1 Assembly



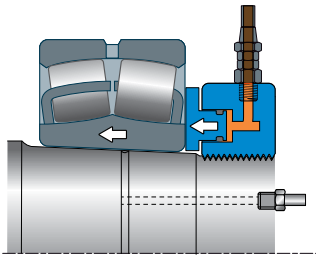
Mounting a rolling bearing on an adapter sleeve on a cylindrical shaft.
The rolling bearing is supported against a stop ring or shaft shoulder.



Mounting a bearing on a withdrawal sleeve on a cylindrical shaft with thread.
Bearing supported against a stop ring or shaft shoulder.

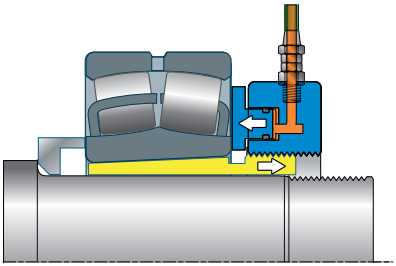


Mounting a bearing on an adapter sleeve on cylindrical shaft.

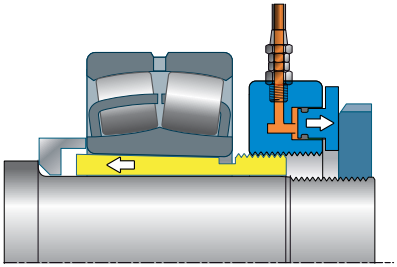


Mounting a bearing on tapered shaft seat

6.4.2 Dismantling



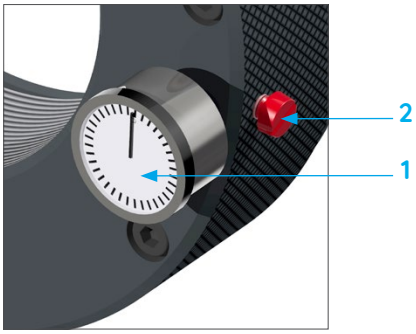
Dismounting a rolling bearing on a withdrawal sleeve. The hydraulic nut is acting against the inner ring.



Dismounting a rolling bearing on a adapter sleeve. The hydraulic nut is acting against a nut mounted on the shaft.

6.5 Positioning / axial displacement

6.5.1 Use of a dial gauge



When mounting a roller bearing, a dial gauge (pos. 1) can be used to measure the axial displacement.

To fix the dial gauge against slipping out, turn the plastic screw (pos. 2) on the clamping shaft of the dial gauge.

6.5.2 Assembling the dial gauge

Insert the dial gauge into the opening of the hydraulic nut and push it into the bore until the measuring insert rests with pretension on the measuring surface of the annular piston. Finally, lock the dial gauge with the hydraulic nut using the plastic screw (pos. 2). Turn the setting ring of the dial gauge to the zero position and select axial displacement.

Tip

- The axial displacement depends on the clearance group and the size of the rolling bearing.
- The values for spherical roller bearings are given in the table in chap. *12.1 Table for radial clearance reduction / axial displacement.*

7 Commissioning / use

7.1 Preparation before first commissioning

Before commissioning the hydraulic nut for the first time, all system parts are to be checked for availability, completeness and function.

7.1.1 Mechanical check points

WARNING!

Visual inspection of the assemblies for mobility.

▶ Check all moving assemblies for mobility.

- Has the hydraulic nut been assembled according to assembly specifications?
- Can rotating and linear moving components move unhindered in the required space?

7.1.2 Safety technology check points

- Are all safety devices complete and undamaged?
- Is the safety marking complete and undamaged?

7.1.3 Hydraulic check points

WARNING!

Injury caused by components under high pressure.

Ejection of the pressure lines and materials due to poor fastening.

▶ Check all connections and lines for leaks before commissioning.
▶ Follow the manufacturer's connection procedures.

- Is the pressure connection connected?
- Is there sufficient hydraulic oil available?
- Is a hand pump used exclusively?
- Is the hand pump stable?

7.2 Use

7.2.1 Safety instructions

After checking the hydraulic nut, it can be put into operation for the first time.

In order to prevent injuries or death during operation, follow the warning advice in this section.

WARNING!

Crushing of body parts.

The hand and/or fingers may be pinched or squeezed when moving the hydraulic nut.

- ▶ Maintain a sufficient distance from the moving assemblies or third parties.
- ▶ Regularly train personnel in handling the hydraulic nut

NOTE!

Damage to the hydraulic nut caused by stress.

- ▶ A circumferential yellow marking on the annular piston indicates that the maximum permissible stroke has been reached. As soon as this mark is aligned with the rear face of the ring body, the ring piston must not be pumped out of the ring body any further.

7.2.2 Assembly

Screw the hydraulic nut against the roller bearing until the annular piston is in full and even contact with the bearing. The piston must be in its initial position and completely inserted into the ring body. In order to absorb the support forces occurring during the displacement process via the thread, an overlap with the counter thread of at least 85 % must be ensured.

Connect the hydraulic line to the hydraulic connection provided.

7.2.3 Pressure build-up

Hydraulic oil is now pumped into the hydraulic nut using a hand pump. The annular piston pushes the roller bearing onto the sleeve or the tapered bearing seat. The pumping process is continued until the selected axial displacement distance is reached.

A final check of the end bearing clearance in the unloaded condition is recommended (with feeler gauge).

Tip

- The axial displacement depends on the clearance group and the size of the rolling bearing.
- The values for spherical roller bearings are cited in the table in chapter *12.1 Table for radial clearance reduction / axial displacement*

7.2.4 Dismantling

To disassemble the hydraulic nut, open the pressure relief valve to allow the nut to be removed. The annular piston automatically returns to its initial position and presses the hydraulic oil out of the hydraulic nut into the hand pump tank.

The hydraulic nut can now be removed.

The inserted unit must now be fixed with a lock nut and a locking plate.

8 Troubleshooting and fault elimination

8.1 Safety instructions

In order to prevent death or serious injury when detecting and rectifying malfunctions, the safety information in this section must be followed.

WARNING!

Improper fault rectification.

Improper fault rectification can lead to personal injury and property damage.

- ▶ All work on the equipment of the hydraulic nut may only be performed by qualified specialists in compliance with national regulations
- ▶ Ensure sufficient free space for assembly before starting the work.
- ▶ Ensure order and cleanliness at the assembly location! Loose components and tools in piles or left lying around can cause accidents.
- ▶ If components have been removed, ensure correct assembly, reattach all fasten-ers and observe bolt tightening torques.

Tip

- Personal protective equipment must always be worn in accordance with the activity.
- The personal protective equipment to be worn during work is indicated separately in the warning notices.

8.2 Action in the event of malfunctions

The possible causes of malfunctions and the work for rectifying them is described in the following chapter. With recurring malfunctions, the maintenance intervals are to be shortened according to the actual load.

The manufacturer is to be contacted with malfunctions that cannot be rectified with the following advice.

Listing or foreseeing all potential malfunctions or irregularities is not possible. When a malfunction occurs, it is important:

- ▶ To keep calm!
- ▶ To find out about the type and extent of the irregularities.

Depending on the nature of the fault, it may be more advantageous for the hydraulic nut to switch it on without pressure. This decision must be made by the operating personnel according to the situation. The top priority must always be:

Safety of personnel and the system!

Essential tasks of the operating personnel are:

- Promptly identifying malfunctions.
- Locating malfunctions.
- Taking measures for preventing consequential damage.
- Introducing measures for rectifying the malfunction.
- Before dismantling components and during cleaning work, the assembly concerned must be depressurised and brought into a retracted state.
- Ensure compliance with the permitted data.

9 Repair

9.1 Safety instructions

To avoid serious injury or death during maintenance and repair, the following section must be followed carefully.

The safety instructions in chapter 2 Markings, abbreviations and warning texts must be observed.

WARNING!

Injury caused by components under high pressure.

Ejection of pressure lines and materials by working under high pressure.

- ▶ Disconnect the pressure supply before working on the hydraulic nut.

WARNING!

Non-compliance with the regulations when transporting components.

- ▶ When transporting components, follow the safety instructions under *chap. 4 Transport!*

WARNING!

Improper conduct of the repair personnel.

- ▶ Have repair work performed only by authorised personnel.
- ▶ Always keep sufficient distance from moving parts during the test run.

CAUTION!

Injuries due to slipping, tripping and falling.

Inadequate lighting leads to various types of injury.

- ▶ Do not leave any materials or tools lying on walkways or driveways.
- ▶ Immediately absorb/remove oil and other slippery materials in walking areas; use oil binding agents.

9.2 Care and maintenance

In order to ensure the proper and safe functioning of the hydraulic nut and the hydraulic components, dirt and oil residues should be removed from the surfaces after each use.

Check hydraulic connections and threads for possible damage.

After use, the hydraulic connections must also be closed with the caps and protected against dirt.

Make sure that the hydraulic oil used is clean and meets the required specifications (ISO 11158). The pump tank must always be filled with sufficient hydraulic oil.

If hydraulic oil leaks from the hydraulic nut during use, the toroidal rings could be defective.

Tip

- To replace the toroidal rings, the hydraulic nut should be sent to NTN.
- For further information please contact NTN.

WARNING!

Injuries due to liquid splashing out when cleaning the hydraulic nut.

- ▶ Drain the hydraulic fluid from the hydraulic nut and disconnect it from the pressure supply.
- ▶ Wear personal protective equipment.

Remark

The type and frequency of cleaning the hydraulic nut depends on the environmental conditions, for example the place of installation, pollution in the surrounding air, and climate.

- Regularly clean all displays and connections to guarantee constant legibility and usability.
- Clean the hydraulic nut and the environment immediately if operating materials escape or are spilt.
- Do not leave tools and spare parts lying around the hydraulic nut.

9.3.1 Cleaning process

- Before cleaning the hydraulic nut, all openings into which no water/cleaning agent may penetrate for safety or functional reasons must be covered or closed. Remove the covers after cleaning.
- Follow the safety datasheet for the cleaning agent.
- Do not use inflammable or corrosive liquids for cleaning.
- Wear protective gloves and goggles!
- Do not leave tools and spare parts lying around the system.
- After cleaning, check all leads for leaks, loose connections, abrasion or damage.

9.4 Maintenance

Tip

- Detailed information on inspection can be found in the documentation of the respective manufacturer.

Meaningful maintenance intervals for the hydraulic nut depend on many factors. The following, among others, affect the maintenance intervals:

- Environmental conditions
- Quality of operating materials
- Number of actuations
- Downtimes
- Required availability of the hydraulic nut
- Operator's maintenance policy

NTN recommends working out an individual maintenance plan together with customer service technicians. This is the only way to guarantee safe and economic operation on a permanent basis. The hydraulic nut must also be inspected, even if it does not exhibit any defects. The aim of maintenance is to identify and rectify predictable defects in good time to prevent unplanned hydraulic nut downtime.

9.4.1 Maintenance plan

Tip

- The hydraulic nut is maintenance-free. Apart from the following checks, no further maintenance work is required.

Pos	Article	Notice
1	Hydraulic nut	General visual inspection for damage and leakage before or after commissioning
2	Pressure supply (hand pump)	Checking the fill quantity before or after commissioning
3	Compression springs	Replacement 10 years after initial commissioning
4	Retainer screws	Replacement 10 years after initial commissioning

9.4.2 After maintenance

The following steps must be followed after maintenance:

- Carefully dismantle all safety devices and check for function.
- Check that all previously loosened screw connections are tight.
- Ensure that all tools, materials and other equipment have been removed from the work area.
- Tidy work area.

9.4.3 Maintenance of additionally purchased components

Tip

- For maintenance instructions for the hand pump, refer to the documentation of the respective manufacturer.

9.5 Repair

NOTE!

Improper repair work.

Improper assembly and disassembly work can lead to material damage.

- Have troubleshooting and repairs undertaken by specialists.
- Before starting all assembly and dismantling work on individual parts, follow the corresponding advice and devise a work schedule from it that the work, especially constantly recurring activities, is based on.
- Only use original spare parts.

10 Taking in and out of service

When taken out of service, the component is shut down for an undefined period. Temporary shut-down is referred to as conservation, while final decommissioning is referred to as liquidation.

Tip

When taking out of service,

- consideration is to be given to preventing substances affecting the environment and other hazards being released from the system,
- contents and waste are properly and harmlessly recycled or, as may apply, removed.

10.1 Decommissioning

10.1.1 Always observe the following

- Components that have been temporarily shut down are to be secured against unauthorised use.

10.1.2 Storage and preserving

- Ideally, components should be permanently preserved.
- Sensitive components are to be protected by packaging.
- Preserved components are to be stored in a dry condition and under cover.

10.1.3 Putting back into service

Recommissioning is the transfer of the system from the idle state to operation after decommissioning. The procedure corresponds to that of the first commissioning.

WARNING!

Non-compliance with the regulations when transporting components.

▶ When transporting components, follow the safety instructions under chap. *5 Transport!*

11 Dismantling and disposal

11.1 Safety instructions

To avoid serious injury or death during disassembly and disposal, the warnings in this section must be observed carefully.

WARNING!

Non-compliance with the regulations when transporting components.

- When transporting components, follow the safety instructions under chap. *5 Transport!*

WARNING!

A failure to observe instructions and the warning and safety instructions.

Risk to life or risks of various injuries from unknown dangers.

- Observe all warnings according to the operating instructions.

WARNING!

Crushing and shearing by moving assemblies.

Injuries to limbs.

- Wear the prescribed personal protective equipment during dismantling work.
- Provide personnel with regular training and point out particular dangers.

11.2 General information

Dismantling can take place for the purpose of recycling or also disposal.

11.3 Disposal

All dismantled components and substances are to be sorted according to their type of material:

- Metal
- Plastic
- Oils / lubricants
- Residual waste
- Cardboard/paper

etc. and disposed of by a specialist disposal company.

WARNING!

Release of harmful and environmentally hazardous substances if not properly disposed of.

Warning of damage to health and/or environmental damage.

- ▶ Instruct personnel about potential hazards (see safety data sheet) and promote increased awareness.
- ▶ Observe safety and hazard notices.
- ▶ Wear prescribed PPE.
- ▶ Dispose of all materials properly and environmentally in accordance with national disposal regulations.

12 Annexes

12.1 Table for radial clearance reduction / axial displacement

Nominal dimension of the bearing hole [mm]		Radial clearance before installation, air group according to ISO 5753 [mm]						Reduction of the radial clearance [mm]		Movement on the cone 1:12 [mm]		Check value of the smallest radial clearance after installation [mm]		
d		Normal		C3		C4				Sleeve		Bearing clearance group		
>	≤	min	max	min	max	min	max	min	max	min	max	normal	C3	C4
24	30	0.03	0.04	0.04	0.055	0.055	0.075	0.01	0.015	0.15	0.2	0.015	0.025	0.04
30	40	0.035	0.05	0.05	0.065	0.065	0.085	0.015	0.02	0.25	0.3	0.015	0.03	0.045
40	50	0.045	0.06	0.06	0.08	0.08	0.1	0.02	0.025	0.35	0.4	0.02	0.035	0.055
50	65	0.055	0.075	0.075	0.095	0.095	0.12	0.025	0.03	0.4	0.45	0.025	0.045	0.065
65	80	0.07	0.095	0.095	0.12	0.12	0.15	0.035	0.04	0.5	0.6	0.03	0.055	0.08
80	100	0.08	0.11	0.11	0.14	0.14	0.18	0.04	0.05	0.6	0.7	0.03	0.06	0.09
100	120	0.1	0.135	0.135	0.17	0.17	0.22	0.055	0.065	0.8	0.9	0.035	0.07	0.105
120	140	0.12	0.16	0.16	0.2	0.2	0.26	0.065	0.075	0.9	1	0.045	0.085	0.125
140	160	0.13	0.18	0.18	0.23	0.23	0.3	0.075	0.09	1	1.2	0.04	0.09	0.14
160	180	0.14	0.2	0.2	0.26	0.26	0.34	0.08	0.1	1.1	1.4	0.04	0.1	0.16
180	200	0.16	0.22	0.22	0.29	0.29	0.37	0.09	0.11	1.2	1.5	0.05	0.11	0.18
200	225	0.18	0.25	0.25	0.32	0.32	0.41	0.11	0.13	1.5	1.8	0.05	0.12	0.19
225	250	0.2	0.27	0.27	0.35	0.35	0.45	0.12	0.14	1.6	1.9	0.06	0.13	0.21
250	280	0.22	0.3	0.3	0.39	0.39	0.49	0.13	0.16	1.6	2.1	0.06	0.14	0.23
280	315	0.24	0.33	0.33	0.43	0.43	0.54	0.15	0.18	1.9	2.4	0.06	0.15	0.25
315	355	0.27	0.36	0.36	0.47	0.47	0.59	0.16	0.19	2.1	2.5	0.08	0.17	0.28
355	400	0.3	0.4	0.4	0.52	0.52	0.65	0.18	0.22	2.3	3	0.08	0.18	0.3
400	450	0.33	0.44	0.44	0.57	0.57	0.72	0.21	0.25	3	3.6	0.08	0.19	0.32
450	500	0.37	0.49	0.49	0.63	0.63	0.79	0.21	0.26	3.3	4	0.19	0.23	0.35
500	560	0.41	0.54	0.54	0.68	0.68	0.87	0.24	0.3	3.7	4.6	0.17	0.25	0.36
560	630	0.46	0.6	0.6	0.76	0.76	0.98	0.26	0.33	4	5.1	0.13	0.27	0.43
630	710	0.51	0.67	0.67	0.85	0.85	1.09	0.3	0.37	4.6	5.7	0.14	0.3	0.48
710	800	0.57	0.75	0.75	0.96	0.96	1.22	0.34	0.43	5.3	6.7	0.14	0.32	0.53
800	900	0.64	0.84	0.84	1.07	1.07	1.37	0.37	0.47	5.7	7.3	0.17	0.37	0.6
900	1000	0.71	0.93	0.93	1.19	1.19	1.52	0.41	0.53	6.3	8.2	0.18	0.4	0.66

Tab. 12 1: Table for radial clearance reduction / axial displacement

Tip

- Slide the roller bearing onto the tapered bearing seat and screw the hydraulic nut by hand onto the thread of the shaft or sleeve until it is fully in contact with the bearing. The hydraulic nut is in the home position. Connect the hydraulic pump to the hydraulic nut and use hydraulic pressure to move the roller bearing to the appropriate end position.
- After reaching the end point, the radial internal clearance should always be checked with a feeler gauge. For this purpose, the pump pressure must be released at the pump until the annular piston has reached its initial position again.

12.2 Selection table for hydraulic nuts

12.2.1 For disassembly / assembly with withdrawal sleeve

HMV.. EBF Size	Thread Hydraulic Nut	Shaft-Ø mm	Bearing Bore mm	WITHDRAWAL SLEEVE								
10	**M50x1.5**	40	45	AH2309	AH309							
11	**M55x2**	45	50	AHX 2310	AHX310							
12	**M60x2**	45	50	AH2310	AH310							
12	**M60x2**	50	55	AHX 2311	AHX311							
13	**M65x2**	50	55	AH2311	AH311							
13	**M65x2**	55	60	AHX 2312	AHX312							
14	**M70x2**	55	60	AH2312	AH312							
14	**M70x2**	60	65	AH 2313G	AH 313G							
15	**M75x2**	60	65	AH2313	AH313							
15	**M75x2**	65	70	AHX 2314G	AH 314G							
16	**M80x2**	65	70	AHX 2314	AH314							
16	**M80x2**	70	75	AHX 2315G	AH 315G							
17	**M85x2**	65	70	AH2314								
17	**M85x2**	70	75	AHX 2315	AH315							
18	**M90x2**	70	75	AH2315								
18	**M90x2**	75	80	AHX 2316	AH316							
19	**M95x2**	75	80	AH2316								
19	**M95x2**	80	85	AHX 2317	AHX 317							
20	**M100x2**	80	85	AH2317	AH 317							
20	**M100x2**	85	90	AHX 2318	AHX 318	AHX 3218						
21	**M105x2**	85	90	AH2318	AH318							
21	**M105x2**	90	95	AHX 2319	AHX 319							
22	**M110x2**	90	95	AH2319	AH319							
22	**M110x2**	95	100	AHX 2320	AHX320	AHX 3120	AHX 3220					

HMV.. EBF Size	Thread Hydraulic Nut	Shaft-Ø mm	Bearing Bore mm	WITHDRAWAL SLEEVE									
23	**M115x2**	95	100	AH320									
23	**M115x2**	105	110	AH 24122									
24	**M120x2**	95	100	AH2320									
24	**M120x2**	105	110	AHX 2322G	AH 3122	AHX 3222G							
25	**M125x2**	100	110	AH3122									
25	**M125x2**	105	110	AHX 2322	AHX 3222								
25	**M125x2**	115	120	AH 24024									
26	**M130x2**	100	110	AH2322	AH322								
26	**M130x2**	110	120	AH3024									
26	**M130x2**	115	120	AHX 2324G	AH 24124	AHX 3024	AHX 3124	AHX 3224G					
27	**M135x2**	115	120	AHX 2324	AHX 3224								
27	**M135x2**	125	130	AH 24026									
28	**M140x2**	110	120	AH2324	AH3124								
28	**M140x2**	120	130	AH3026									
28	**M140x2**	125	130	AHX 2326G	AH 24126	AHX 3026	AHX 3126	AHX 3226G					
29	**M145x2**	125	130	AHX 2326	AHX 3226								
29	**M145x2**	135	140	AH 24028									
30	**M150x2**	120	130	AH2326	AH3126								
30	**M150x2**	130	140	AH3028									
30	**M150x2**	135	140	AHX 2328G	AH 24128	AHX 3028	AHX 3128	AHX 3228G					
31	**M155x3**	135	140	AHX 2328	AHX 3228								
31	**M155x3**	145	150	AH 24030									
32	**M160x3**	130	140	AH2328	AH3128								
32	**M160x3**	140	150	AH3030									
32	**M160x3**	145	150	AHX 2330G	AH 24130	AHX 3030	AHX 3130G	AHX 3230G					
33	**M165x3**	145	150	AHX 2330	AHX 3130	AHX 3230							
34	**M170x3**	140	150	AH2330	AH3130								
34	**M170x3**	150	160	AH 2332G	AH 24032	AH 24132	AH3032	AH 3132G	AH 3232G				
36	**M180x3**	150	160	AH2332	AH3132	AH3232							
36	**M180x3**	160	170	AH 2334G	AH 24034	AH 24134	AH3034	AH 3134G	AH 3234G				
38	**M190x3**	160	170	AH2334	AH3134	AH3234							
38	**M190x3**	170	180	AH 2236G	AH 2336G	AH X2336G	AH 24036	AH 24136	AH3036	AH 3136G	AH 3236G		
40	**M200x3**	170	180	AH2236	AH2336	AH3136	AH3236						
40	**M200x3**	180	190	AH 2238G	AH 2338G	AH 24038	AH 24138	AH 3038G	AH 3138G	AH 3238G			
41	**Tr205x4**	180	190	AH3038									
42	**Tr210x4**	180	190	AH2238	AH2338	AH3138	AH3238						
42	**Tr210x4**	190	200	AH 24040	AH 24140	AH 3040G							
43	**Tr215x4**	190	200	AH3040									
44	**Tr220x4**	190	200	AH2240	AH2340	AH3140	AH3240						
46	**Tr230x4**	200	220	AOH 24044	AOH 24144	AH 3044G	AOH 3044G						
47	**Tr235x4**	200	220	AH3044	AOH 3044								
48	**Tr240x4**	200	220	AH2244	AOH 2244	AH2344	AOH 2344	AH3144	AOH 3144				
50	**Tr250x4**	220	240	AOH 24048									
52	**Tr260x4**	220	240	AH2248	AOH 2248	AH2348	AOH 2348	AOH 24148	AH3048	AOH 3048	AH3148	AOH 3148	
54	**Tr270x4**	240	260	AOH 24052									
56	**Tr280x4**	240	260	AH 2252G	AOH 2252G	AH 2352G	AOH 2352G	AOH 24052G	AOH 24152	AH3052	AOH 3052	AH 3152G	AOH 3152G
58	**Tr290x4**	240	260	AH2252	AOH 2252	AH2352	AOH 2352	AH3152	AOH 3152				
58	**Tr290x4**	260	280	AOH 24056									
60	**Tr300x4**	260	280	AH 2256G	AOH 2256G	AH 2356G	AOH 2356G	AOH 24056G	AOH 24156	AH3056	AOH 3056	AH 3156G	AOH 3156G
62	**Tr310x5**	260	280	AH2256	AOH 2256	AH2356	AOH 2356	AH3156	AOH 3156				
62	**Tr310x5**	280	300	AOH 24060									
64	**Tr320x5**	280	300	AH 2260G	AOH 2260G	AOH 24060G	AOH 24160	AH3060	AOH 3060	AH 3160G	AOH 3160G	AH 3260G	AOH 3260G
66	**Tr330x5**	280	300	AH2260	AOH 2260	AH3160	AOH 3160	AH3260	AOH 3260				

HMV.. EBF Size	Thread Hydraulic Nut	Shaft-Ø mm	Bearing Bore mm	WITHDRAWAL SLEEVE									
66	**Tr330x5**	300	320	AOH 24064									
68	**Tr340x5**	300	320	AH 2264G	AOH 2264G	AOH 24064G	AOH 24164	AH 3064G	AOH 3064G	AH 3164G	AOH 3164G	AH 3264G	AOH 3264G
69	**Tr345x5**	300	320	AH3064	AOH 3064								
70	**Tr350x5**	300	320	AH2264	AOH 2264	AH3164	AOH 3164	AH3264	AOH 3264				
72	**Tr360x5**	320	340	AOH24068	AOH 24168	AH 3068G	AOH 3068G	AH 3168G	AOH 3168G	AH 3268G	AOH 3268G		
73	**Tr365x5**	320	340	AH3068	AOH 3068								
74	**Tr370x5**	320	340	AH3168	AOH 3168	AH3268	AOH 3268						
76	**Tr380x5**	340	360	AOH24072	AOH 24172	AH 3072G	AOH 3072G	AH 3172G	AOH 3172G	AH 3272G	AOH 3272G		
77	**Tr385x5**	340	360	AH3072	AOH 3072								

Tab. 12 2: Table for disassembly / assembly with withdrawal sleeve

12.2.2 For disassembly / assembly with clamping sleeve

HMV.. EBF Size	Hy-drau-lic nut thread	Shaft-Ø mm	Bearing Bore mm	CLAMPING SLEEVE [H00]	[H300]	[H2300]	[H3900]	[H3000]	[H3100]	[H3200]	[H39]	[H30]	[H31]	[H32]
10	**M50x1.5**	45	50	H210	H310	H2310								
11	**M55x2**	50	55	H211	H311	H2311								
12	**M60x2**	55	60	H212	H312	H2312								
13	**M65x2**	60	65	H213	H313	H2313								
14	**M70x2**	60	70	H214	H314	H2314								
15	**M75x2**	65	75	H215	H315	H2315								
16	**M80x2**	70	80	H216	H316	H2316								
18	**M90x2**	80	90	H218	H318	H2318								
19	**M95x2**	85	95	H219	H319	H2319								
20	**M100x2**	90	100	H220	H320	H2320			H3120					
21	**M105x2**	95	105	H221	H321	H2321								
22	**M110x2**	100	110	H222	H322	H2322			H3122					
24	**M120x2**	110	120			H2324		H3024	H3124					
26	**M130x2**	115	130			H2326		H3026	H3126					
28	**M140x2**	125	140			H2328		H3028	H3128					
30	**M150x2**	135	150			H2330		H3030	H3130					
32	**M160x3**	140	160			H2332		H3032	H3132					
36	**M180x3**	150	170			H2334		H3034	H3134					
36	**M180x3**	160	180			H2336	H3936	H3036	H3136					
38	**M190x3**	170	190			H2338	H3938	H3038	H3138					
48	**Tr240x4**	220	240			H2348	H3948	H3048	H3148					
56	**Tr280x4**	260	280			H2356	H3956	H3056	H3156					
60	**Tr300x4**	280	300				H3960	H3060	H3160	H3260				
64	**Tr320x5**	300	320				H3964	H3064	H3164	H3264				

HMV.. EBF	Hy-drau-lic nut thread	Shaft-Ø	Bearing Bore	CLAMPING SLEEVE										
Size		mm	mm	[H00]	[H300]	[H2300]	[H3900]	[H3000]	[H3100]	[H3200]	[H39]	[H30]	[H31]	[H32]
72	**Tr360x5**	340	360				H3972	H3072	H3172	H3272				
76	**Tr380x5**	360	380				H3976	H3076	H3176	H3276				
80	**Tr400x5**	380	400				H3980	H3080	H3180	H3280				
84	**Tr420x5**	400	420				H3984	H3084	H3184	H3284				
88	**Tr440x5**	410	440				H3988	H3088	H3188	H3288				
92	**Tr460x5**	430	460				H3992	H3092	H3192	H3292				
96	**Tr480x5**	450	480				H3996	H3096	H3196	H3296				
100	**Tr500x5**	470	500								H39/500	H30/500	H31/500	H32/500
106	**Tr530x6**	500	530								H39/530	H30/530	H31/530	H32/530
112	**Tr560x6**	530	560								H39/560	H30/560	H31/560	H32/560
120	**Tr600x6**	560	600								H39/600	H30/600	H31/600	H32/600
126	**Tr630x6**	600	630								H39/630	H30/630	H31/630	H32/630
134	**Tr670x6**	630	670								H39/670	H30/670	H31/670	H32/670
150	**Tr750x7**	710	750								H39/750	H30/750	H31/750	H32/750
160	**Tr800x7**	750	800								H39/800	H30/800	H31/800	H32/800
170	**Tr850x7**	800	850									H30/850	H31/850	
180	**Tr900x7**	850	900									H30/900	H31/900	
190	**Tr950x8**	900	950									H30/ 950	H31/ 950	
200	**Tr1000x8**	950	1000									H30/ 1000	H31/ 1000	

Tab. 12 3: Table for disassembly / assembly with clamping sleeve

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