Products: Mounting

Products: Mounting

Mounting tool sets

Socket wrenches

FITTING-TOOL-ALU-10-50

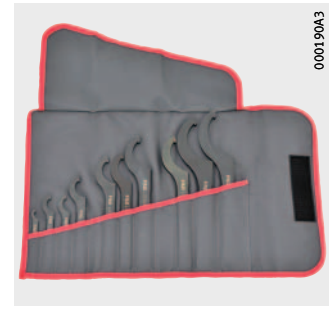
LOCKNUT-SOCKET

Hook and double hook wrenches

Hook wrenches

LOCKNUT-HOOK

LOCKNUT-HOOK-KM0-16-SET



Double hook wrenches

LOCKNUT-DOUBLEHOOK

Double hook wrench set

LOCKNUT-DOUBLEHOOK-..-SET

Mechanical extractors

Two-arm extractors

Two-arm extractor set

PULLER-2ARM,
PULLER-2ARM-SEPARATOR

PULLER-2ARM-SET

Three-arm extractors

PULLER-3ARM

Hydraulic extractors

PULLER-HYD

Three-section extraction plates

PULLER-TRISECTION

Features

These mechanical tools are designed for the mounting and dismounting of bearings. The mounting forces are transmitted by the form fit effect.

Mounting tool sets

The mounting tool sets are suitable for the simple mounting of rolling bearings with a bore of up to 50 mm, *Figure 1*. They can also be used for the mounting of sleeves, intermediate rings, seals and similar parts.

A mounting tool set contains mounting sleeves made from aluminium and mounting rings made from plastic.

Figure 1
Mounting tool set

An error frequently made during mounting is to transmit the mounting forces through the rolling elements and raceways. This error can be avoided by driving the inner ring onto the shaft or driving the outer ring into the housing by applying hammer blows to an appropriate mounting sleeve. The precision parts are matched to each other, ensuring that the forces are uniformly transmitted to the end faces of the bearing rings.

Scope of delivery

Mounting tool set comprising 33 mounting rings for bearing bore 10 mm to 50 mm and outside diameter up to 110 mm
3 mounting sleeves
1 recoilless hammer, mass 1 kg
1 case

Ordering designation

FITTING-TOOL-ALU-10-50

Also available as individual parts.

Further information

- TPI 216, Tools for the Mechanical Mounting and Dismounting of Rolling Bearings
- Enquiries: industrial-services@schaeffler.com, +49 2407 9149-66.

Socket wrenches

Socket wrenches LOCKNUT-SOCKET are suitable for the simple tightening and loosening of locknuts on shafts, adapter sleeves and withdrawal sleeves. They require less space on the circumference of the nut than hook wrenches and allow the use of ratchets and torque wrenches, *Figure 2*.

Figure 2
Socket wrench and torque wrench

For increased reliability, socket wrenches should be secured using a locking pin and rubber ring. They therefore have a hole for the locking pin and a groove for the rubber ring. The locking pin and rubber ring are included in the scope of delivery.

Socket wrenches are available in sizes suitable for locknuts KM0 to KM20. Other sizes and special solutions are available by agreement.

Scope of delivery

1 socket wrench
1 locking pin
1 rubber ring

Ordering example

Socket wrench, suitable for locknut KM5

Ordering designation

LOCKNUT-SOCKET-KM5

Special sizes available by agreement.

Further information

- TPI 216, Tools for the Mechanical Mounting and Dismounting of Rolling Bearings
- Enquiries: industrial-services@schaeffler.com, +49 2407 9149-66.

Hook and double hook wrenches

These wrenches are used to move locknuts or extraction nuts for the mounting or dismounting of rolling bearings or withdrawal sleeves.

Hook wrenches

A hook wrench LOCKNUT-HOOK can be used to dismount not only bearings but also withdrawal sleeves with the aid of extraction nuts.

Hook wrenches are available in sizes suitable for locknuts KM0 to KM40, suitable for diameters from 16 mm to 245 mm.

Ordering example: Hook wrench, suitable for locknuts KM18, KM19 and KM20

Ordering designation: **LOCKNUT-HOOK-KM18-20**

These wrenches can be used for the mounting and dismounting of small bearings on shaft seats, adapter sleeves or withdrawal sleeves. In addition to the sizes stated here, other sizes are available by agreement.

Ordering example: Set comprising ten hook wrenches

Ordering designation: **LOCKNUT-HOOK-KM0-16-SET**

Hook wrenches can also be ordered as a set. The set comprises ten hook wrenches of sizes KM0 to KM16 in a roll-up pouch and is suitable for diameters from 16 mm to 100 mm.

Double hook wrenches

Double hook wrenches LOCKNUT-DOUBLEHOOK are intended for the mounting of spherical roller bearings and self-aligning ball bearings with a tapered bore, *Figure 3*. The individual wrenches are available as a set.

Figure 3
Double hook wrenches

The double hook wrench sets contain a torque wrench. This allows a precisely defined tightening torque to be achieved at the start of the mounting operation.

Double hook wrench sets are suitable for several sizes of locknuts. There is one set each for locknuts KM3 to KM8 and for locknuts KM9 to KM15. All the parts in the scope of delivery are also available individually.

Each double hook wrench is engraved with the torsion angles for the appropriate spherical roller bearings and self-aligning ball bearings. The drive-up distance and reduction in radial internal clearance can thus be precisely set.

Scope of delivery	Several double hook wrenches 1 torque wrench 1 mounting lever 1 user manual 1 case 1 mounting paste (20 g)
Ordering example	4 double hook wrenches, suitable for locknuts KM3 to KM8
Ordering designation	**LOCKNUT-DOUBLEHOOK-KM3-8-SET**
Ordering example	5 double hook wrenches, suitable for locknuts KM9 to KM15
Ordering designation	**LOCKNUT-DOUBLEHOOK-KM9-15-SET**

Mechanical extractors

Mechanical extractors can be used to dismount small and medium sized rolling bearings that are located with a tight fit on a shaft or in a housing. The bearing can be dismounted without damage if the extractor is in contact with the tightly fitted bearing ring.

In the case of mechanical extractors, the extraction force is normally applied by means of threaded spindles.

In addition to the two-arm and three-arm devices as well as a hydraulic pressure tool, special solutions are also possible.

For the dismounting of larger bearings, hydraulic extractors should be used, see page 26.

Two-arm and three-arm extractors

Two-arm and three-arm extractors, *Figure 4*, *Figure 5* and tables, page 25, are used for the extraction of complete rolling bearings or tightly fitted inner rings.

The two-arm extractor PULLER-2ARM and three-arm extractor PULLER-3ARM can also be used to extract other parts such as gears.

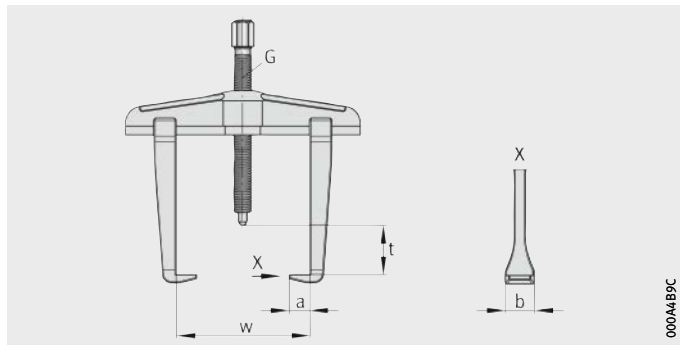


Figure 4
Two-arm extractor, dimensions of gripper

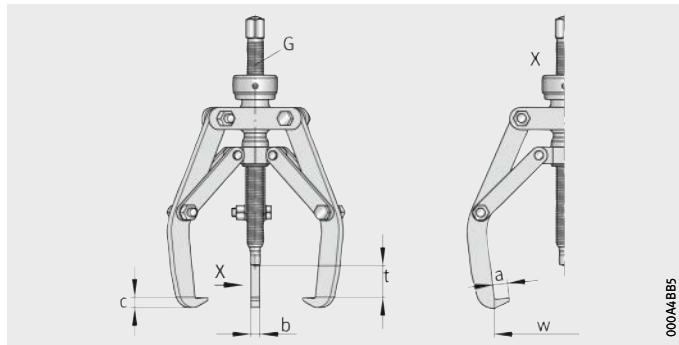


Figure 5
Three-arm extractor, dimensions of gripper

Available two-arm extractors

Designation	Grip span w mm	Grip depth t mm	Dimensions a mm	Dimensions b mm	Extraction force kN
PULLER-2ARM90	90	100	15	22	30
PULLER-2ARM130	130	100	15	22	30
PULLER-2ARM160	160	150	24	30	50
PULLER-2ARM200	200	150	24	30	50
PULLER-2ARM250	250	200	32	36	75
PULLER-2ARM350	350	200	32	36	75
PULLER-2ARM-SEPARATOR45	45	65	2,5	12^{+1}	10
PULLER-2ARM-SEPARATOR90	90	100	2,5	14^{+1}	40
PULLER-2ARM-SEPARATOR150	150	150	2,5	28^{+1}	40

Available two-arm extractor set

Designation: **PULLER-2ARM-SET**
Two-arm extractors included
PULLER-2ARM130, **PULLER-2ARM200**, **PULLER-2ARM350**
Accessories included
Narrow extraction hook for size 130 and 200, tube of spindle grease, carry case

Available three-arm extractors

Designation	Grip span w mm	Grip depth t mm	Dimensions a mm	Dimensions b mm	Extraction force kN
PULLER-3ARM160	160	100	14^{+1}	15^{+1}	45
PULLER-3ARM230	230	165	19^{+1}	22^{+1}	100
PULLER-3ARM310	310	235	19^{+1}	22^{+1}	100
PULLER-3ARM430	430	240	20^{+2}	30^{+2}	150
PULLER-3ARM660	660	340	22^{+2}	34^{+2}	150

Further information

- TPI 216, Tools for the Mechanical Mounting and Dismounting of Rolling Bearings
- Enquiries: industrial-services@schaeffler.com, +49 2407 9149-66.

Hydraulic extractors

Hydraulic extractors, see tables, are used where higher extraction forces are required.

These devices allow rolling bearings, gears, sleeves and many other shrink fitted parts to be quickly and easily dismounted.

For larger grip depths, the XL design or longer extraction arms are available as accessories.

Operating personnel can be protected by means of a safety grid or a safety cover.

The advantageous features of hydraulic extractors are as follows:

- parts under mechanical load made from high quality chromium-molybdenum steel
- smooth-running, chromium plated piston made from hardened and tempered steel
- stroke travel adjustable by means of standard adapter
- screw thread for setting of optimum grip depth
- simple centring by spring-loaded steel cone
- simple conversion to two-arm operation in case of insufficient space for three arms
- optimum operating position due to rotatable pump hand lever or separate pump.

Available hydraulic extractors with integral hand pump

Designation	Extraction force	Grip span		Grip depth		Stroke length
		Standard	XL	Standard	XL	
	kN	mm	mm	mm	mm	mm
PULLER-HYD40	40	200	–	165	–	55
PULLER-HYD60(-XL)	60	200	260	165	210	82
PULLER-HYD80(-XL)	80	260	300	210	240	82
PULLER-HYD100(-XL)	100	250	280	185	210	82
PULLER-HYD120(-XL)	120	300	330	240	280	82
PULLER-HYD200(-XL)	200	360	380	275	330	82
PULLER-HYD250(-XL)	250	410	440	315	380	110
PULLER-HYD300(-XL)	300	540	540	405	610	110

Available hydraulic extractors with separate hand pump

Designation	Extraction force	Grip span		Grip depth		Stroke length
		Standard	XL	Standard	XL	
	kN	mm	mm	mm	mm	mm
PULLER-HYD400(-XL)	400	580	1 000	420	635	125

Further information

- TPI 216, Tools for the Mechanical Mounting and Dismounting of Rolling Bearings
- Enquiries:
  industrial-services@schaeffler.com, +49 2407 9149-66.

Three-section extraction plates

Three-section extraction plates PULLER-TRISECTION, see table, can be used with hydraulic and mechanical extractors.

These allow the extraction of complete bearings, tightly fitted inner rings and other components.

The load carrying capacity is matched to the maximum extraction force of the hydraulic extractors used in each case. In order to prevent damage to the bearing during extraction, the geometrical form of the three extraction segments means that they grip the bearing on the inner ring only.

The extraction plates can be fitted under the bearing with just a few movements.

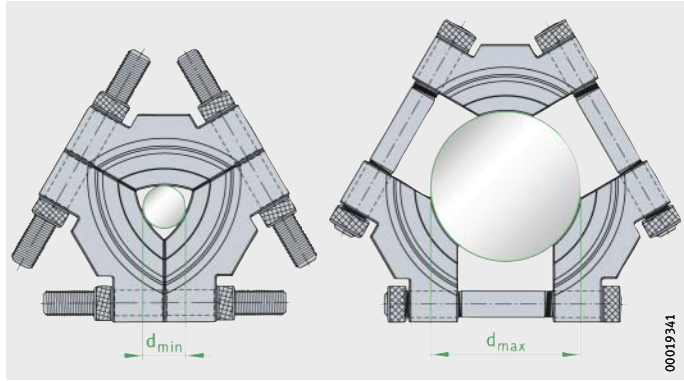


Figure 6
Maximum and minimum diameter of extraction plates, see table

Available three-section extraction plates

Designation	Dimensions		Recommended for extractor	
	d_{min} [1] mm	d_{max} [1] mm	PULLER-HYD	PULLER-3ARM
PULLER-TRISECTION-50	12	50	–	160
PULLER-TRISECTION-100	26	100	40, 60, 80, 100	230
PULLER-TRISECTION-160	50	160	80, 100, 120, 175, 200	310
PULLER-TRISECTION-260	90	260	175, 200, 250, 300	430
PULLER-TRISECTION-380	140	380	250, 300, 400	660

[1] $\overline{d_{min}}$ and d_{max}, *Figure 6*.

Further information

- TPI 216, Tools for the Mechanical Mounting and Dismounting of Rolling Bearings
- Enquiries: industrial-services@schaeffler.com, +49 2407 9149-66.

Hydraulic nuts

HYDNUT

Hand pumps

Single stage

PUMP1000-0,7L

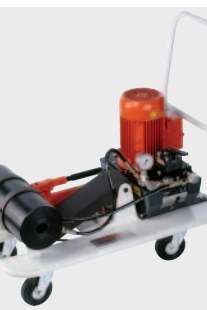
Twin stage

PUMP1000-4L, PUMP1000-8L, PUMP1600-4L, PUMP1600-8L, PUMP2500-4L, PUMP2500-8L

Mobile hydraulic unit

Tool set

TOOL-RAILWAY-AGGREGATE



TOOL-RAILWAY-AXLE

Hydraulic press
Sealing cap tool

TOOL-RAILWAY-SEALCAP-PRESS

TOOL-RAILWAY-SEALCAP

Connectors, accessories

Adapters and reduction nipples
Rapid push fit coupling

PUMP.NIPPLE,
PUMP.ADAPTER

PUMP1600.VALVE-NIPPLE,
PUMP1600.VALVE-SOCKET

Digital manometer
Manometer

PUMP1000.MANO-DIGI

PUMP1000.MANO-G1/2,
PUMP1600.MANO-G1/2

Sleeve connector

PUMP.SLEEVE-CONNECTOR

Features

Hydraulic tools can be used to apply large forces. These tools are therefore particularly suitable for the mounting and dismounting of large bearings or parts with a tapered bore. Hydraulic nuts are used as a mounting tool. Pressure can be generated using hand pumps.

Software Mounting Manager

The program Mounting Manager gives assistance in selecting the correct mounting of bearings and offers the following options:

- It shows various mechanical and hydraulic mounting methods.
- It calculates the data required for mounting in relation to reduction in radial internal clearance, drive-up distance and start pressure.
- It gives advice on mounting.
- It generates a list of the accessories and tools required.

It also contains a library with references to publications giving further information and an electronic learning system.
The program Mounting Manager is available online at http://mountingmanager.schaeffler.com/startApp.do

Mounting method

Bearings with a tapered bore are mounted either directly on the tapered shaft or journal or by means of an adapter sleeve or withdrawal sleeve on the cylindrical shaft. The internal clearance is set either by measurement of the axial drive-up distance or by conventional means using feeler gauges.

Measurement of the axial drive-up distance

For measurement of the drive-up distance, a dial gauge is screwed into the hydraulic nut. The dial gauge is preloaded and the measurement sensor then precisely follows the displacement of the press ring. This value corresponds to the displacement of the rolling bearing on the tapered seat.

Measurement of the reduction in radial internal clearance

When the bearing is driven onto the tapered seat, the inner ring is expanded and the radial internal clearance is thereby reduced. This reduction in radial internal clearance is an indication of the tight fit of the bearing. Measurement is carried out using a feeler gauge.

Hydraulic nuts

Hydraulic nuts HYDNUT, *Figure 1* and table, are used to press components with a tapered bore onto their tapered seat. Presses are mainly used if the drive-up forces required cannot be applied using other accessories, e.g. shaft nuts or pressure screws.

Figure 1
Hydraulic nut with dial gauge

The main applications are as follows:

- Rolling bearings with a tapered bore can be mounted and dismounted.

  Bearings can be seated directly on a tapered shaft, an adapter sleeve or a withdrawal sleeve. The hydraulic nut can also be used for the dismounting of adapter or withdrawal sleeves.
- Components such as couplings, gears and ships' propellers can be mounted and dismounted.

Available hydraulic nuts

Designation	Design	Application
HYDNUT50..-E to **HYDNUT200..-E**	With metric fine pitch thread to DIN 13	Standardised adapter and withdrawal sleeves
HYDNUT205..-E to **HYDNUT1180..-E**	With trapezoidal thread to DIN 103	With metric dimensions
HYDNUT90-E-INCH to **HYDNUT530-E-INCH**	With inch size thread to ABMA "Standards for Mounting Accessories, Section 8, Locknut Series N-00"	Sleeves with inch dimensions
HYDNUT100-HEAVY to **HYDNUT900-HEAVY**	Increased capacity design with smooth bore	For high mounting forces, for example in shipbuilding

Scope of delivery

The scope of delivery comprises the hydraulic nut, accessories and user manual, *Figure 2*.

① Hydraulic nut
② Knurled screws
③ Screw plug
④ Grub screws
⑤ Hand lever
⑥ Connection nipple
⑦ Replacement seals and red ring
⑧ User manual

Figure 2
Scope of delivery
Hydraulic nut

Scope of delivery

1 hydraulic nut
2 replacement seals
1 red ring
1 screw plug
3/5 grub screws
1 connection nipple
3 knurled screws
1 hand lever
1 user manual

Ordering designation

HYDNUT

Further information

- TPI 196, FAG Hydraulic Nuts
- Enquiries:
  industrial-services@schaeffler.com, +49 2407 9149-66.

Pressure generation devices

Pressure generation devices are available in various designs: from the hand pump via the mobile hydraulic unit to the hydraulic press, see tables.

Application Hand pump

Designation	Application
PUMP1000-0,7L	■ Mounting and dismounting of rolling bearings ■ For driving hydraulic nuts up to HYDNUT395 or HYDNUT300-HEAVY
PUMP1000-4L	■ Mounting and dismounting of rolling bearings ■ Mounting and dismounting of components such as ships' propellers ■ For driving hydraulic nuts up to HYDNUT800
PUMP1600-4L	■ Mounting and dismounting of rolling bearings ■ Mounting and dismounting of components such as rudder splines and rudder blades
PUMP2500-4L	■ Mounting and dismounting of bearings ■ Mounting and dismounting of components such as gears and couplings

Application Mobile hydraulic unit

Designation	Application
TOOL-RAILWAY-AGGREGATE	■ Mounting and dismounting of tapered roller bearing units (TAROL)

Application Hydraulic press

Designation	Application
TOOL-RAILWAY-SEALCAP-PRESS	■ Mounting and dismounting of seals on tapered roller bearing units (TAROL)

Further information

■ TPI 195, FAG Pressure Generation Devices.

Hand pumps

Hand pumps have a single stage or twin stage pump with a manometer.

Single stage pump

The hand pump PUMP1000-0,7L has an oil container with a volume of 0,7 l. The maximum oil pressure is 1 000 bar, see table.

A digital manometer is available as an accessory.

Available single stage pump

Designation	Maximum oil pressure bar
PUMP1000-0,7L	1 000

Twin stage pump

The twin stage pumps, *Figure 3* and table, have a high delivery rate up to 50 bar and then switch automatically to the high pressure stage. This gives a high work rate.

Figure 3
Twin stage pump, 4-l oil container

Where there is an increased oil requirement, the twin stage pumps are available with an 8-l oil container (suffix 8L). If the type of mounting of the adapter or withdrawal sleeve requires a separate oil supply, a two-way valve is available (suffix D).

For pumps with an oil pressure of 1 000 bar and a connector, digital manometers are also available as accessories.

Available twin stage pumps

Designation	Maximum oil pressure bar
PUMP1000-4L	1 000
PUMP1600-4L	1 600
PUMP2500-4L	2 500

Mobile hydraulic unit

The mobile hydraulic unit, *Figure 4*, is used for the mounting and dismounting of tapered roller bearing units, also known as TAROL units. These units are used as wheelset bearings in rail vehicles such as goods wagons and passenger carriages.

The mobile unit has a valve-controlled, double direction pressure cylinder driven by a motor pump. The pressure cylinder is adjustable in height.

When making enquiries or placing orders, information on the power connection is required.

Figure 4
Mobile hydraulic unit

Ordering designation **TOOL-RAILWAY-AGGREGATE**

Tool set

Tool sets are produced for a specific application, *Figure 5*. When making enquiries or placing orders, information on the bearing type and installation drawings (shaft, housing, additional parts) are required.

Figure 5
Tool set

Ordering designation **TOOL-RAILWAY-AXLE**

Hydraulic press

The hydraulic press, *Figure 6*, is used for the mounting and dismounting of seals on tapered roller bearing units, also known as TAROL units. In addition, a matching tool set is required for each bearing type.

Figure 6
Hydraulic press

Ordering designation **TOOL-RAILWAY-SEALCAP-PRESS**

Sealing cap tool

Sealing cap tools are bearing-specific and include all the parts for mounting and dismounting of the seal. For dismounting, the parts required are an adapter ring, a punch and the appropriate press-out segments. For mounting of the new seal, a support and the appropriate press-in ring are supplied.

Ordering designation **TOOL-RAILWAY-SEALCAP**

Further information

- TPI 195, FAG Pressure Generation Devices
- TPI 156, Tapered Roller Bearing Units TAROL – Mounting, Maintenance, Repair
- Enquiries: industrial-services@schaeffler.com, +49 2407 9149-66.

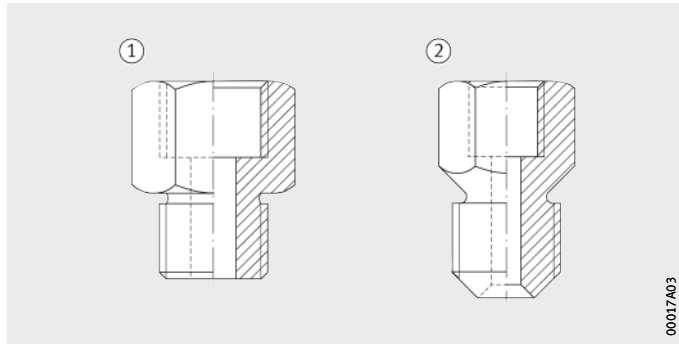
Connectors, accessories

Various connectors and accessories are available for use with the devices for hydraulic mounting and dismounting.

Adapters and reduction nipples

Adapters and reduction nipples are matched to the threads of high pressure hoses and pipes, *Figure 7* and tables.

Adapters and reduction nipples of type A (with sealing ring) are suitable for oil pressures up to 800 bar, *Figure 7*. Type B (with blade sealing) is suitable for oil pressures up to 2 500 bar, *Figure 7*.



① Type A
② Type B

Figure 7
Adapters and reduction nipples

Available adapters and reduction nipples

Designation	Designation
PUMP.NIPPLE-A-G1/4-G1/8	**PUMP.NIPPLE-A-G3/4-G1/8**
PUMP.NIPPLE-B-G1/4-G1/8	**PUMP.NIPPLE-B-G3/4-G1/8**
PUMP.NIPPLE-A-G1/4-G1/2	**PUMP.NIPPLE-A-G3/4-G1/4**
PUMP.NIPPLE-B-G1/4-G1/2	**PUMP.NIPPLE-B-G3/4-G1/4**
PUMP.NIPPLE-A-G1/4-G3/4	**PUMP.NIPPLE-A-G3/4-G3/8**
PUMP.NIPPLE-B-G1/4-G3/4	**PUMP.NIPPLE-B-G3/4-G3/8**
PUMP.NIPPLE-A-G1/4-M14	**PUMP.NIPPLE-A-M18×1,5-G1/4**
PUMP.NIPPLE-B-G1/4-M14	**PUMP.NIPPLE-A-M18×1,5-G3/8**
PUMP.NIPPLE-A-G1/4-M18×1,5	**PUMP.NIPPLE-A-M18×1,5-G3/8**
PUMP.NIPPLE-A-G3/8-G1/4	–
PUMP.NIPPLE-B-G3/8-G1/4	–

Available adapters

Designation	Designation
PUMP.ADAPTER-A-G1/4	**PUMP.ADAPTER-A-G3/4**
PUMP.ADAPTER-B-G1/4	**PUMP.ADAPTER-B-G3/4**

Rapid push fit coupling

A suitable connecting nipple is always included in the delivery of a hydraulic nut. Each hand pump with an oil pressure up to 1 600 bar is supplied with a rapid push fit coupling. The rapid push fit coupling allows rapid connection and disconnection of a hose and is suitable for oil pressures up to 1 600 bar, *Figure 8* and table.

After the coupling has been fitted, the high pressure hose must be secured to the connection point by means of a chain or cord.

① Nipple
② Socket

Figure 8
Rapid push fit coupling

Available nipple and socket

Designation	Threaded connector inch	Component
PUMP1600.VALVE-NIPPLE	$G^{1}/_{4}$	Nipple
PUMP1600.VALVE-SOCKET	$G^{1}/_{4}$	Socket

Manometer

In addition to the manometer with digital display, there are three analogue manometers with an indicator, see table.

When selecting a manometer, pay attention to the maximum oil pressure.

Available manometers

Designation	Threaded connector inch	Maximum oil pressure bar
PUMP1000.MANO-DIGI	$G^{1}/_{4}$	1 000
PUMP1000.MANO-G1/2	$G^{1}/_{2}$	1 000
PUMP1600.MANO-G1/2	$G^{1}/_{2}$	1 600

Sleeve connectors

Sleeve connectors can be used at pressures up to 800 bar.

The connector to the pump holder is $G^{1}/_{4}$. The connector to the consumer device is available in the sizes M6, M8, $G^{1}/_{8}$ and $G^{1}/_{4}$. For other thread sizes, a reduction nipple can be used.

Check the oil pressure using a manometer.

Ordering example: Sleeve connector with a connector $G^{1}/_{8}$ on the consumer device side

Ordering designation: **PUMP.SLEEVE-CONNECTOR-G1/8**

Thermal mounting, induction heating devices

Tabletop devices

HEATER50

HEATER100

HEATER200

Standalone devices

HEATER400

HEATER800

HEATER1600

Thermal mounting, induction heating devices

Features

Induction heating devices HEATER with mains frequency technology are used to heat rolling bearings and other components with a cylindrical bore where a tight fit on the shaft or in the housing is intended.

Adequate expansion of the bearings is achieved in most cases at +80 °C to +100 °C. During the heating operation, the maximum heating temperature must be observed. The temperature of rolling bearings must not normally exceed +120 °C, in order to prevent changes to the structure and hardness of the bearing. In all devices for heating, the temperature can be steplessly controlled.

Wear protective gloves during mounting and dismounting of heated parts.

Induction heating devices HEATER

The induction heating devices HEATER for rolling bearings up to a mass of 1 600 kg have been improved further in terms of their performance capability and safety compared with their predecessors. They can also be used to heat sealed and greased rolling bearings. In addition to the tabletop devices HEATER50 to HEATER200, the range also includes the standalone devices HEATER400 to HEATER1600 for larger rolling bearings.

The scope of delivery of the induction heating devices HEATER covers a basic setup, *Figure 1*.

① Heating device
② Slewing ledge
③ Temperature sensor
④ Lifting tool
⑤ User manual

Figure 1
Scope of delivery
Heating device HEATER200

The rolling bearing to be heated is either suspended from the ledge or is laid horizontally on the sliding table, *Figure 2*.

① Slewing ledge
② U-shaped core
③ Rolling bearing
④ Sliding table

Figure 2
Heating of rolling bearing

Advantages of FAG heating devices

The advantages of the induction heating devices are:

- very safe operation
- high reliability (TÜV certified)
- effective, energy-efficient heating (high efficiency level)
- uniform, controlled heating
- automatic demagnetisation
- simple operation
- high cost-effectiveness through selection of the device size most suitable for the particular application.

Operating modes

The induction heating devices can be operated in the following modes:

- temperature control
- time control
- ramp control
- delta-T control.

Thermal mounting, induction heating devices

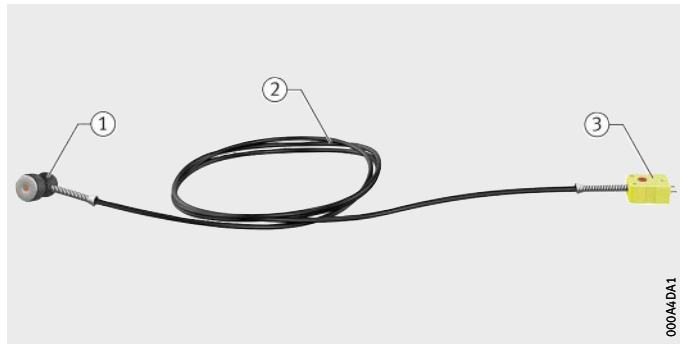
Accessories

The functional scope of an induction heating device can be extended by the use of accessories.

Temperature sensor

Two temperature sensors can be connected to each induction heating device. The sensor head of the temperature sensor is magnetic and is positioned on the component. The signal is fed via the cable and plug to the device, *Figure 3*.

The induction heating devices HEATER50 and HEATER100 are supplied with one temperature sensor. If two temperature sensors are used, it is possible to operate the heating method with delta-T control.



① Sensor head
② Cable
③ Plug

Figure 3
Temperature sensor

Ledge

Each induction heating device is supplied with one ledge. This ledge has the same cross-section as the U-shaped core and allows maximum power to be achieved.

In order to heat rolling bearings of a smaller inside diameter, ledges with smaller cross-sections are available.

Adapter posts

For the tabletop devices HEATER50, HEATER100 and HEATER200, adapter posts are available. These are always placed in pairs on the U-shaped core and thus increase the inner height. With the aid of adapter posts, it is also possible to heat workpieces with a small inside diameter and a large outside diameter.

Further information

- TPI 200, FAG Heating Devices for the Mounting of Rolling Bearings
- Enquiries: industrial-services@schaeffler.com, +49 2407 9149-66.

FAG Heating Manager

The software FAG Heating Manager is a user-friendly tool for selection of the optimum heating device for the heating of rolling bearings.

Once the rolling bearing to be heated has been selected, the bearing type, dimensions, mass and the suitable heating device are displayed, *Figure 4*.

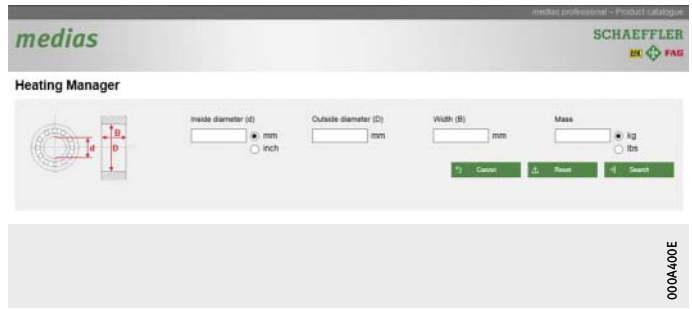
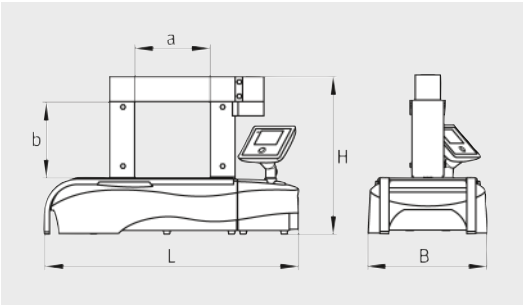


Figure 4
FAG Heating Manager

The FAG Heating Manager is available online at www.schaeffler.de, menu item Mediathek.

Heating devices HEATER

Product range



Dimension table			
Characteristics		Unit	**HEATER50** 
Operating voltage	U	VAC	110 to 230
Frequency	F	Hz	50 to 60
Power consumption	P	kVA	3
Current rating	I	A	13
Residual magnetism	H	A/cm	< 2
Operating duration	ED	%	100
Mass	m	kg	18
Length	L	mm	450
Width	B	mm	210
Height	H	mm	250
Dimension	a	mm	120
Dimension	b	mm	140
Maximum rolling bearing mass	m	kg	50
Maximum mass of other component	m	kg	40
Maximum width	b	mm	120
Minimum inside diameter [1)]	d	mm	55
Minimum inside diameter with accessories	d	mm	10
Maximum inside diameter (lying flat)	d	mm	300
Maximum outside diameter	D	mm	400 (with **LEDGE-55**)

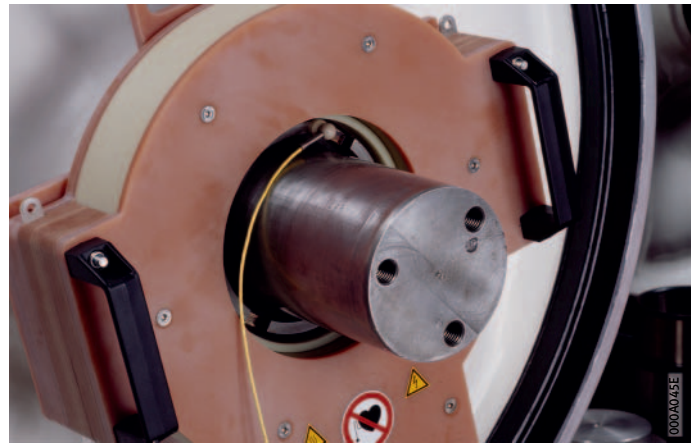
1) When using the ledge included in the scope of delivery.

HEATER100	HEATER200	HEATER400	HEATER800	HEATER1600
				
110 to 230	400 to 480	400 to 480	400 to 480	400 to 480
50 to 60	50 to 60	50 to 60	50 to 60	50 to 60
3,7	8	12,8	25,2	40
16	20	32	63	100
< 2	< 2	< 2	< 2	< 2
100	100	100	100	100
35	86	157	280	650
540	695	850	1 080	1 500
275	330	420	500	800
310	370	950	1 250	1 600
180	210	300	430	690
180	210	330	490	700
100	200	400	800	1 600
80	150	300	600	1 200
180	210	330	400	650
70	100	120	150	220
15	20	35	50	90
400	500	900	1 400	1 900
500 (with **LEDGE-70**)	600 (with **LEDGE-100**)	1 000 (with **LEDGE-120**)	1 500 (with **LEDGE-150**)	2 000 (with **LEDGE-220**)

Medium frequency technology

HEAT-INDUCTOR, HEAT-GENERATOR

HEAT-INDUCTOR



Thermal mounting and dismounting, medium frequency technology

Features

Induction units based on medium frequency technology are, in contrast to induction heating devices, suitable not only for thermal mounting but also for dismounting. Furthermore, they can be used for the heating of very large and heavy components.

Adequate expansion of the bearings is achieved in most cases at +80 °C to +100 °C. During the heating operation, the maximum heating temperature must be observed. The temperature of rolling bearings must not normally exceed +120 °C, in order to prevent changes to the structure and hardness of the bearing. In all devices for heating, the temperature can be steplessly controlled.

Wear protective gloves during mounting and dismounting of heated parts.

Induction units with medium frequency technology

Due to their high flexibility and compact construction, these units can also be used for mobile operation. They can therefore be used, for example, at construction sites for wind turbines or for other large components that are difficult to transport.

Application

Examples of the use of medium frequency technology include:

- heating of medium-sized to large bearings for mounting and dismounting
- heating of housings prior to mounting of a bearing
- batch dismounting of bearing inner rings of cylindrical roller bearings and labyrinth rings, for example in the case of wheelset bearings in rail vehicles
- dismounting of bearing inner rings from traction motors in rail vehicles
- heating of large components, for example bearings or machine supports in wind turbines
- heating of roll rings and couplings, for example in steelworks
- loosening of shrink fit connections of gears.

Thermal mounting and dismounting, medium frequency technology

The units comprise a generator and an inductor that is positioned on the workpiece. Depending on the requirements, a rigid or flexible inductor is used. Depending on the application, flexible inductors are positioned in the bore or on the outside diameter of the workpiece, *Figure 1*. Flexible inductors are suitable for the heating of bearing inner rings or of large components such as machine supports in wind turbines. The length of the inductor is defined as a function of the dimensions of the workpiece.

Figure 1
The flexible inductor can be wrapped around the component

Flexible inductors

The flexible inductors are available in two designs that differ mainly in their geometrical characteristics but also in their maximum operating duration, see table.

Technical data on flexible inductors

Designation		Inductor HEAT-INDUCTOR	
		-..M-D15	-..M
Cooling system	–	Air cooling	
Length	m	12 – 16	12 – 40
Diameter	mm	approx. 18	approx. 20
Minimum bending radius	mm	80	150
Mass without plug	kg/m	approx. 0,6	approx. 1
Permissible temperature of work-piece surface	°C	+180	
Maximum temperature at push fit connector	°C	+90	
Maximum operating duration	–	≦ 10 min	∞
Connection of inductor and generator	–	Push fit connector	

The flexible inductors are available in various lengths, see table.

Ordering designations and lengths

Ordering designation	Length m
HEAT-INDUCTOR-12M-D15	12
HEAT-INDUCTOR-14M-D15	14
HEAT-INDUCTOR-16M-D15	16
HEAT-INDUCTOR-12M	12
HEAT-INDUCTOR-16M	16
HEAT-INDUCTOR-20M	20
HEAT-INDUCTOR-24M	24
HEAT-INDUCTOR-27M	27
HEAT-INDUCTOR-30M	30
HEAT-INDUCTOR-40M	40

Rigid inductors

Rigid inductors are particularly suitable for batch production, *Figure 2*. In such cases, the emphasis is less on flexibility and more on short set-up times and high process reliability.

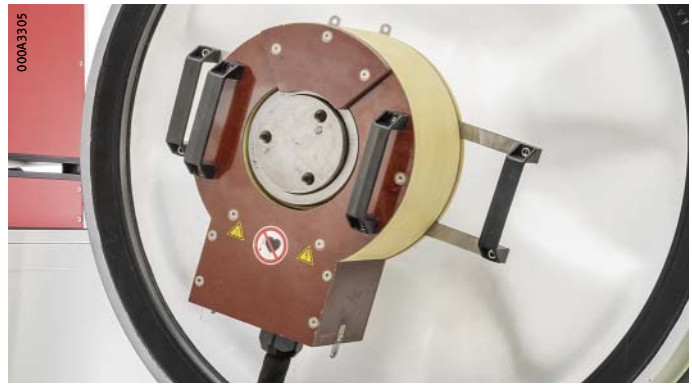


Figure 2
Rigid inductor for dismounting of wheelset bearings

Thermal mounting and dismounting, medium frequency technology

Generators

Compared with preceding models, the generators are of a significantly more compact and lighter design and are thus even more suitable for mobile operation. They are available in two performance variants and two voltage versions, *Figure 3* and tables, page 55.

Figure 3
Generators

Technical data of generators with voltage rating of 400 V

Designation		Generator HEAT-GENERATOR	
		20-2	40-2
Cooling	–	Open circuit ventilation	
Mains voltage	V	3×380 – 3×440	
Mains frequency	Hz	50 – 60	
Voltage tolerance	–	±10%	
Connector plug CEE	A	32	63
Line-side fuse protection	A	32	63
Effective power	kW	20[1)]	40[1)]
Output frequency	kHz	10 – 25	
Length of mains connection cable	m	5	
Width	mm	277	365
Depth (with mains connection cable)	mm	610	
Height (with grips)	mm	540	695
Mass	kg	30	55

1) Valid for voltage rating of 400 V.

Technical data of generators with voltage rating of 480 V

Designation		Generator HEAT-GENERATOR	
		20-2-480V	40-2-480V
Cooling	–	Open circuit ventilation	
Mains voltage	V	3×460 – 3×500	
Mains frequency	Hz	50 – 60	
Voltage tolerance	–	±10%	
Connector plug CEE	A	32	63
Line-side fuse protection	A	32	63
Effective power	kW	20[1)]	40[1)]
Output frequency	kHz	10 – 25	
Length of mains connection cable	m	5	
Width	mm	277	365
Depth (with mains connection cable)	mm	610	
Height (with grips)	mm	540	695
Mass	kg	30	55

1) Valid for voltage rating of 480 V.

Digital control

Digital control is carried out by means of a 7″ TFT display and has the following characteristics:

- presentation of temperature patterns on the display
- storage and export of temperature patterns by means of an integrated temperature recorder
- separate registration for operator and service operator, with different access rights
- alarm functions for protection of the workpiece against overheating
  - temperature increase alert
  - temperature alarm on overshoot
- user languages: German and English
- remote access possible via an Ethernet interface.

Thermal mounting and dismounting, medium frequency technology

Advantages

The advantages of the heating device with medium frequency technology are as follows:

- suitable for mounting
- suitable for dismounting
- operating frequency from 10 kHz to 25 kHz
- efficiency of the generator higher than 90%
- low energy requirements
- short heating times
- time and temperature control as well as other operating modes
- automatic demagnetisation
- flexible and rigid inductors available
- inductors suitable for use either inside or outside the component
- lower mains connection power than heating devices with mains frequency
- almost silent
- air-cooled system.

Configuration

Each of the light and compact devices is designed for the specific application. It can be equipped, depending on the workpiece, with flexible or rigid inductors.

For enquiries, the following data are required:

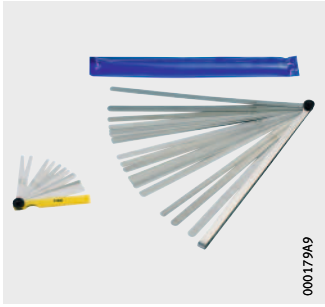
- bearing dimensions, if possible with drawings
- representation of the adjacent construction
- data on the fit conditions
- description of the mounting process and its frequency
- power supply data
- ambient conditions
- your address.

Further information

- TPI 217, Induction Units with Medium Frequency Technology
- Enquiries:
  industrial-services@schaeffler.com, +49 2407 9149-66.

Feeler gauges

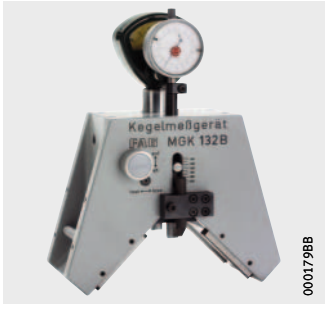
FEELER-GAUGE-100,
FEELER-GAUGE-300



Taper gauges

MGK133

MGK132



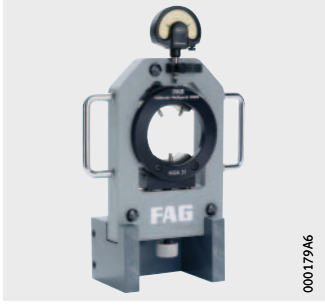
Snap gauges

SNAP-GAUGE

Enveloping circle gauges

MGI21

MGA31



Visual inspection device

TOOL-RAILWAY-INSPECTION-DEVICE

Axial clearance gauge

Adapter set

TOOL-RAILWAY-CLEARANCE-BASIC

TOOL-RAILWAY-CLEARANCE. TOP

Features

Feeler gauges and measurement gauges can be used to check the production of bearing seats and the mounting of bearings.

Feeler gauges

Feeler gauges FEELER GAUGE, see table, are used to measure the radial internal clearance, especially in mounting on tapered shaft seats and on adapter and withdrawal sleeves.

Available feeler gauges

Designation	Feeler length mm	Feeler thickness mm		
FEELER-GAUGE-100	100	0,03	0,08	0,14
		0,04	0,09	0,16
		0,05	0,1	0,18
		0,06	0,12	0,2
		0,07	–	–
FEELER-GAUGE-300	300	0,03	0,12	0,2
		0,04	0,13	0,25
		0,05	0,14	0,3
		0,06	0,15	0,35
		0,07	0,16	0,4
		0,08	0,17	0,45
		0,09	0,18	0,5
		0,1	0,19	–

Taper gauges

These gauges are used to inspect tapered bearing seats in production facilities. This is necessary to ensure a good match between the fit surfaces of the bearing and bearing seat. Gauges are available for different taper angles.

Taper gauge for taper 1:12 and 1:30

The taper gauge MGK133 is used for the measurement of external tapers 1:12 and 1:30 with a taper diameter of 27 mm to 205 mm.

The reproducibility of the measurement results is less than 1 µm.

The gauge rests on the workpiece with four hardened and polished pins. The position of the gauge on the taper is defined by these pins and a stop. The stop can be attached to either the front or back of the gauge.

The gauge has two movable measuring brackets. One of these is in contact with the small taper diameter, the other with the large taper diameter. There is a fixed spacing between the measuring brackets. The deviation of the taper diameter from the nominal value is displayed in both measurement planes by a precision indicator.

The gauge is set using a reference taper (available by agreement).

Ordering designation: Available by agreement

Taper gauge for taper angle 0° to 6°

The taper gauge MGK132 is used for the measurement of external tapers with a taper angle of 0° to 6° and a taper diameter of 90 mm to 360 mm.

The reproducibility of the measurement results is less than 1 µm.

The gauge rests on the workpiece with four hardened, ground and lapped ledges. The ledges form an angle of 90°. The position of the gauge on the taper is defined by a stop on the front or back of the gauge.

The measurement slide runs between the support ledges. A dial gauge in the housing acts against the measurement slide and displays the deviation of the taper diameter from the nominal value. The deviation of the taper from the nominal value is displayed by a precision indicator on the measurement slide.

The gauge is set using a reference taper (available by agreement).

Ordering designation: Available by agreement

Snap gauges

Snap gauges SNAP GAUGE, see table, can be used to check the diameter of cylindrical workpieces directly on the machine tool. The snap gauge is also used to set the enveloping circle gauge MGI21.

The snap gauge functions as a comparator gauge. It is set using shims. The deviation from the set value can then be determined.

Available snap gauges

Designation	Diameter range	
	min. mm	max. mm
SNAP-GAUGE-30/60	30	60
SNAP-GAUGE-60/100	60	100
SNAP-GAUGE-100/150	100	150
SNAP-GAUGE-150/200	150	200
SNAP-GAUGE-200/250	200	250
SNAP-GAUGE-250/300	250	300

Shims for numerous diameters are available as accessories.

Ordering example: Snap gauge for shaft diameter 120 mm
Ordering designation: **SNAP-GAUGE-100/150**

Ordering example: Shim for shaft diameter 120 mm
Ordering designation: **SNAP-GAUGE.MASTER120**

Enveloping circle gauges

Enveloping circle gauges, see table, can be used to set the radial internal clearance or preload of cylindrical roller bearings.

Available enveloping circle gauges

Designation	Design	For bearings	
		from	to
MGI21	For cylindrical roller bearings with separable inner ring	NNU4920-K	NNU4948-K
		NNU4920	NNU4948
MGA31	For cylindrical roller bearings with separable outer ring	NN3006-K	NNU3048-K
		N1006-K	N1048-K

Bearings with separable inner rings

The enveloping circle gauge MGI21 is used to measure, by means of two hardened and precision ground surfaces, the internal enveloping circle of a roller and cage assembly. One measurement surface is movable.

Before measurement, the gauge is set to the internal enveloping circle of the roller and cage assembly. This setting operation requires a snap gauge such as SNAP GAUGE.

After mounting of the outer ring together with the roller and cage assembly, the enveloping circle diameter is then determined using the gauge MGI in a comparative measurement.

In the case of a bearing with a tapered bore, the enveloping circle measurement is used to calculate its position on the tapered seat of the shaft. During mounting, the bearing is driven to this position. This results in the internal clearance or the preload.

In the case of bearings with a cylindrical bore, preground inner rings (suffix F12) are used and are finish ground to the required bearing diameter.

Ordering example: Enveloping circle gauge for cylindrical roller bearings NNU4920

Ordering designation: **MGI21-NNU4920**

Bearings with separable outer rings

The enveloping circle gauge MGA31 is used to measure, by means of two hardened and precision ground surfaces, the external enveloping circle of the roller and cage assembly.

The gauge is set to the raceway diameter of the mounted outer ring. This dimension is determined using a conventional internal gauge.

The tapered shaft with the premounted inner ring and roller and cage assembly is then inserted in the gauge. The shaft is driven axially by the hydraulic method until the required radial internal clearance or preload is achieved.

Ordering example: Enveloping circle gauge for cylindrical roller bearings NN3006-K

Ordering designation: **MGA31-NN3006**

Visual inspection device

In the reconditioning of wheelset bearings for rail vehicles (TAROL units), the bearing inner rings are subjected to visual examination after dismounting and cleaning. In order to check the condition of components, a device with a light and magnifying lens is used to visually assess the raceways, rings and all rolling elements.

Axial clearance gauge

The bearing is mounted on the gauge by means of the adapter set. The dial gauge is positioned on the end face of the outer ring and set to zero. By means of an eccentric mechanism, the bearing is raised by its inner ring and the axial clearance present can be read from the dial gauge.

Base device

The base device is suitable for all TAROL units. It comprises a frame and the measuring unit with a dial gauge.

Ordering example: Axial clearance gauge for TAROL units

Ordering designation: **TOOL-RAILWAY-CLEARANCE-BASIC**

Bearing-specific adapter set

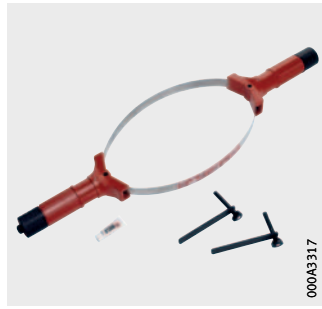
The adapter set facilitates the precise positioning of the bearing on the base device.

Ordering example: Adapter set for TAROL unit F-578116.TAROL100/175-R-TVP

Ordering designation: **TOOL-RAILWAY-CLEARANCE.TOP-100/175**

Transport and mounting tool

BEARING-MATE



Mounting paste

ARCANOL-MOUNTINGPASTE

Anti-corrosion oil

ARCANOL-ANTICORROSIONOIL

Accessories

Features

Accessories are used to assist in the storage, transport and mounting of rolling bearings.

Transport and mounting tool

The transport and mounting tool BEARING MATE, see table, is an accessory for the easy handling of medium-sized and large rolling bearings. It can also be used in the heating of bearings prior to mounting.

The tool comprises two handles and two steel strips. The steel strips are tightly clamped on the outer ring of the bearing. During the transport of spherical roller bearings and self-aligning ball bearings, tilting of the inner rings is prevented by the brackets supplied.

The bearing together with the tool is carried by either two people or by means of a crane. While it is being transported by crane, the bearing is suspended by the tool using the carrying slings and can be rotated into any position required.

During heating by means of an induction heating device HEATER, the bearing can remain in the tool. It expands to the same extent as the bearing. During heating by means of an induction device with medium frequency technology, the flexible inductor must not be in direct contact with the BEARING MATE.

The tool can be used for bearings up to a mass of 500 kg and at temperatures of up to +160 °C.

Available tools

Designation	Bearing outside diameter mm		Mass of tool kg
	from	to	
BEARING-MATE250-450	250	450	6,3
BEARING-MATE450-650	450	650	6,4
BEARING-MATE650-850	650	850	6,5

Ordering example: Transport and mounting tool for bearings with an outside diameter from 250 mm to 450 mm with two short brackets

Ordering designation: **BEARING-MATE250-450**

Accessories

Accessories, brackets

2 long brackets to prevent tilting of the inner rings of spherical roller bearings

Ordering designation **BEARING-MATE-LOCKBAR270**

Accessories, pack of small parts

Pack of small parts

Ordering designation **BEARING-MATE.SERVICE-KIT**

Mounting paste

The mounting paste, see table, facilitates the sliding into place of bearing rings and prevents stick/slip effects, scoring, wear and fretting corrosion. It also gives protection against corrosion.

The operating temperature range is between –30 °C and +150 °C.

The paste is resistant to water, water vapour and many alkaline and acidic media.

Available mounting pastes

Designation	Container
ARCANOL-MOUNTINGPASTE-70G	Tube containing 70 g
ARCANOL-MOUNTINGPASTE-250G	Tube containing 250 g
ARCANOL-MOUNTINGPASTE-400G	Cartridge containing 400 g
ARCANOL-MOUNTINGPASTE-1KG	Can containing 1 kg

Anti-corrosion oil

This oil gives protection of bearings that have been unpacked. It also gives long term protection against corrosion of bright metallic surfaces, for example on devices and machinery, during storage indoors.

In general, it is not necessary to wash the anti-corrosion oil out of rolling bearings. It gives neutral behaviour towards conventional rolling bearing greases and oils.

The oil can be removed using alkaline solvents or neutral cleaning agents.

Ordering example Spray can containing 0,4 l

Ordering designation **ARCANOL-ANTICORROSIONOIL-400G**