

**INSTALLATION,
REMOVAL
AND MAINTENANCE
INSTRUCTIONS FOR
RAILWAY
APPLICATIONS**

TIMKEN

**130MM AP2 CARTRIDGE
JOURNAL BEARING
ASSEMBLY**

**TRAINSET 44
MEDHA**

TIMKEN

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TIMKEN CARTRIDGE BEARINGS

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**INSTALLATION AND REMOVAL INSTRUCTIONS
FOR RAILWAY APPLICATIONS**

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130MM CARTRIDGE TYPE JOURNAL BEARING ASSEMBLY

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FOREWORD

This instruction book represents the installation, removal and maintenance recommendations of The Timken Company for the cartridge bearing assembly as shown on drawings E-59773

It is a guide to the proper care and procedure that should be followed for the installation, lubrication, and maintenance of Timken Cartridge bearings as applied to railway equipment.

A Timken Cartridge bearing correctly applied and properly lubricated will give reliable, trouble-free service.

The periodic attention recommended should be scheduled for convenience, with other phases of equipment maintenance.

As a part of continuing improvements in services that we offer to our customers, we can provide bearing overhaul services. Please contact our Timken representative for more details.

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GENERAL INFORMATION

GENERAL INFORMATION

INTRODUCTION

This Timken cartridge bearing is a self-contained, preassembled, preadjusted, prelubricated, enclosed tapered roller bearing unit. It is applied to and removed from the axle using tools specifically designed for the purpose, without exposing the bearing elements, or lubricant to contamination or damage.

The preassembled cartridge bearing reduces the number of separate parts to be applied to the axle assembly to a minimum.

This manual covers the installation and removal instructions for the NP737217FSA-90020 bearing assembly.

The contents of this manual include Timken recommendations for the method of installation, removal, maintenance, inspection and storage of Timken cartridge bearings and associated parts.

Following the instructions in this manual will help ensure the Timken cartridge bearing gives reliable and trouble-free service.

The maintenance or inspection intervals for the bearing and associated parts should be planned appropriately in such a way that they coincide with other planned phases of the vehicle maintenance.

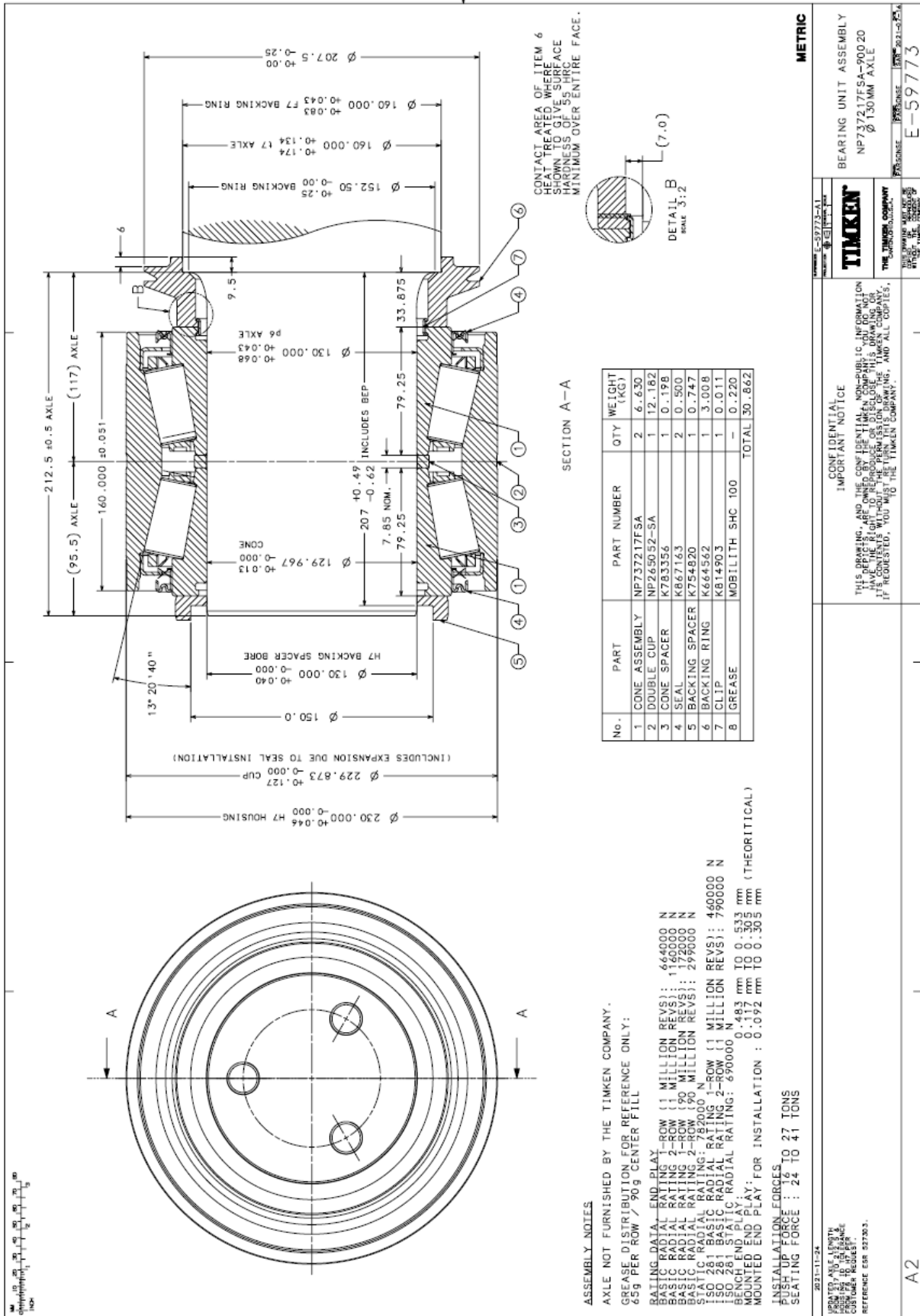
Tools and devices for mounting, dismounting and maintenance of Timken tapered roller bearings can be manufactured according to designs which are available from the Timken Company.

CAUTION

Failure to follow these cautions may result in property damage.

The products catalogued in this manual are application specific. Any use in applications other than those intended could lead to equipment failure or to reduced equipment life. Use of improper bearing fits may cause damage to equipment.

Figure GI-1 Bearing unit assembly – E-59773



BOM DETAILS – NP737217FSA-90020 – REFER FIGURE GI-1

REF	DESCRIPTION	QTY	PART NO	WEIGHT/ UNIT (KG)*
1	CONE ASSEMBLY	2	NP737217FSA	6.630
2	DOUBLE CUP	1	NP265052SA	12.182
3	CONE SPACER	1	K783356	0.198
4	SEAL	2	K867163	0.500
5	BACKING SPACER	1	K754820	0.747
6	BACKING RING	1	K664562	3.008
7	CLIP	1	K814903	0.011
8	GREASE	1	MOBILITH SHC100	0.220
			TOTAL	30.862

* WEIGHT BASED ON NOMINAL COMPONENT DIMENSIONS

BENCH END PLAY: 0.483mm – 0.533mm

MOUNTED END PLAY: 0.117mm – 0.305mm (THEORITICAL)

MOUNTED END PLAY: 0.092mm – 0.305mm (INSTALLATION)

**BEARING - INSTALLATION
AND REMOVAL**

BEARING INSTALLATION AND REMOVAL

EQUIPMENT

Bearings may be installed or removed with a bearing press, wheel press, or with portable jacks, depending on requirements and availability of equipment. A description of how to use Timken's portable press is included in Appendix 1.

Bearing maintenance operations should be carried out in a dedicated location using machines and tools designed for roller bearing installation and removal.

BEARING OR WHEEL PRESSES


Where the bearing is applied by a bearing press or wheel press a guide tube is fastened to the end of the axle and a separate assembly sleeve is to be used as shown in figure BIR – 1. The details of the assembly sleeve will be provided in Appendix 2. However, the design of all parts shown should be reviewed for suitability for the specific press equipment in use and modified where required.

To ensure that bearings are properly seated, bearing or wheel presses should be equipped with a calibrated pressure gauge so that the specified pressure can be maintained for a short period, otherwise bearings may not be properly seated.

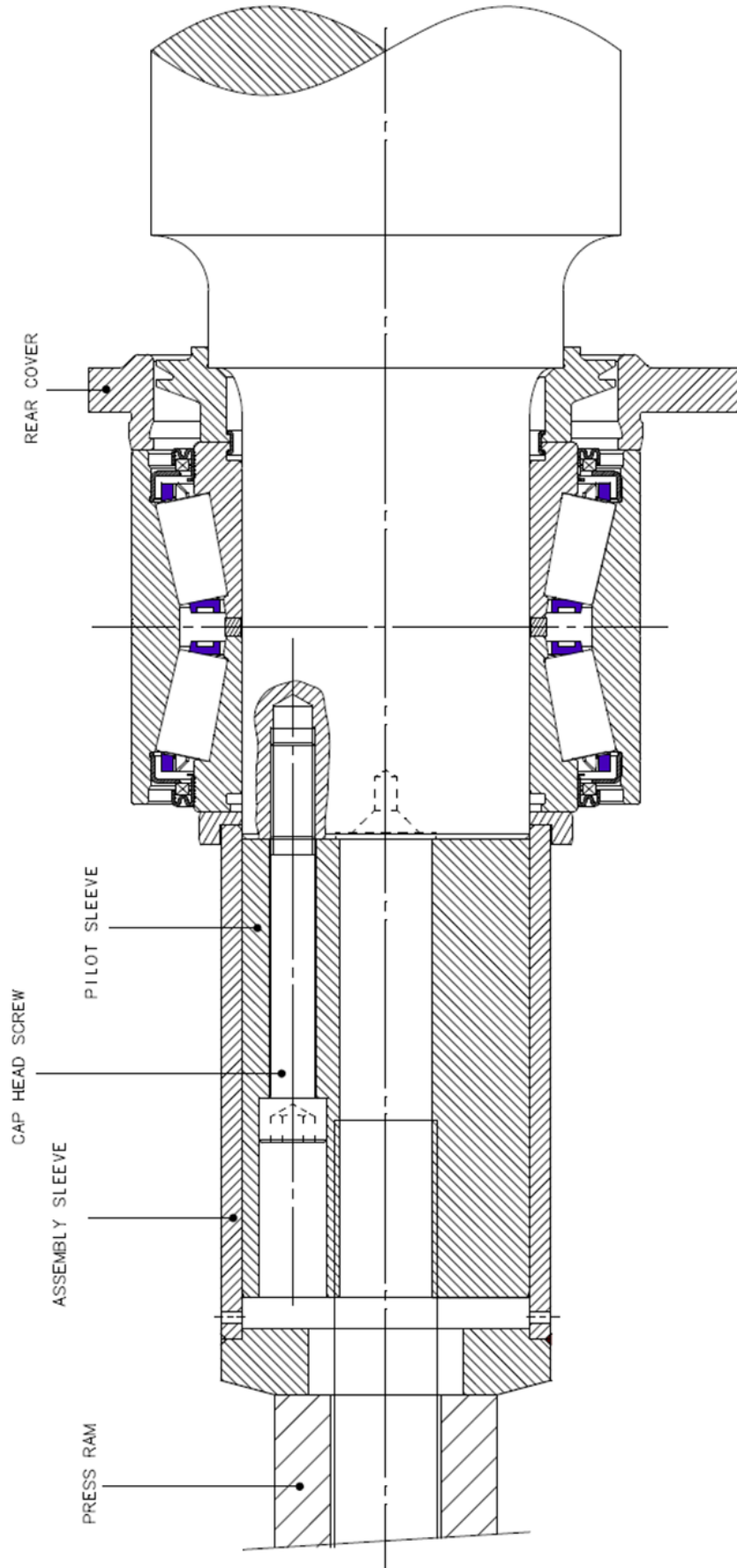
Bearing presses or wheel presses should be checked with a load cell to be sure that the ram pressure, as indicated by the gauge, is correct in the tonnage range and for the piston travel required for applying cartridge bearings to axles.

When bearing or wheel presses are used for bearing removal, the equipment shown in Figure BIR-2 should be used. Again, this typical arrangement is based on a Timken designed press and the details of the pulling shoe insert are shown in Appendix 2. The withdrawal plate and puller rods required to attach the fixture to the bearing press should be designed to suit the specific press equipment in use and the available space due to the wheelset design conditions.

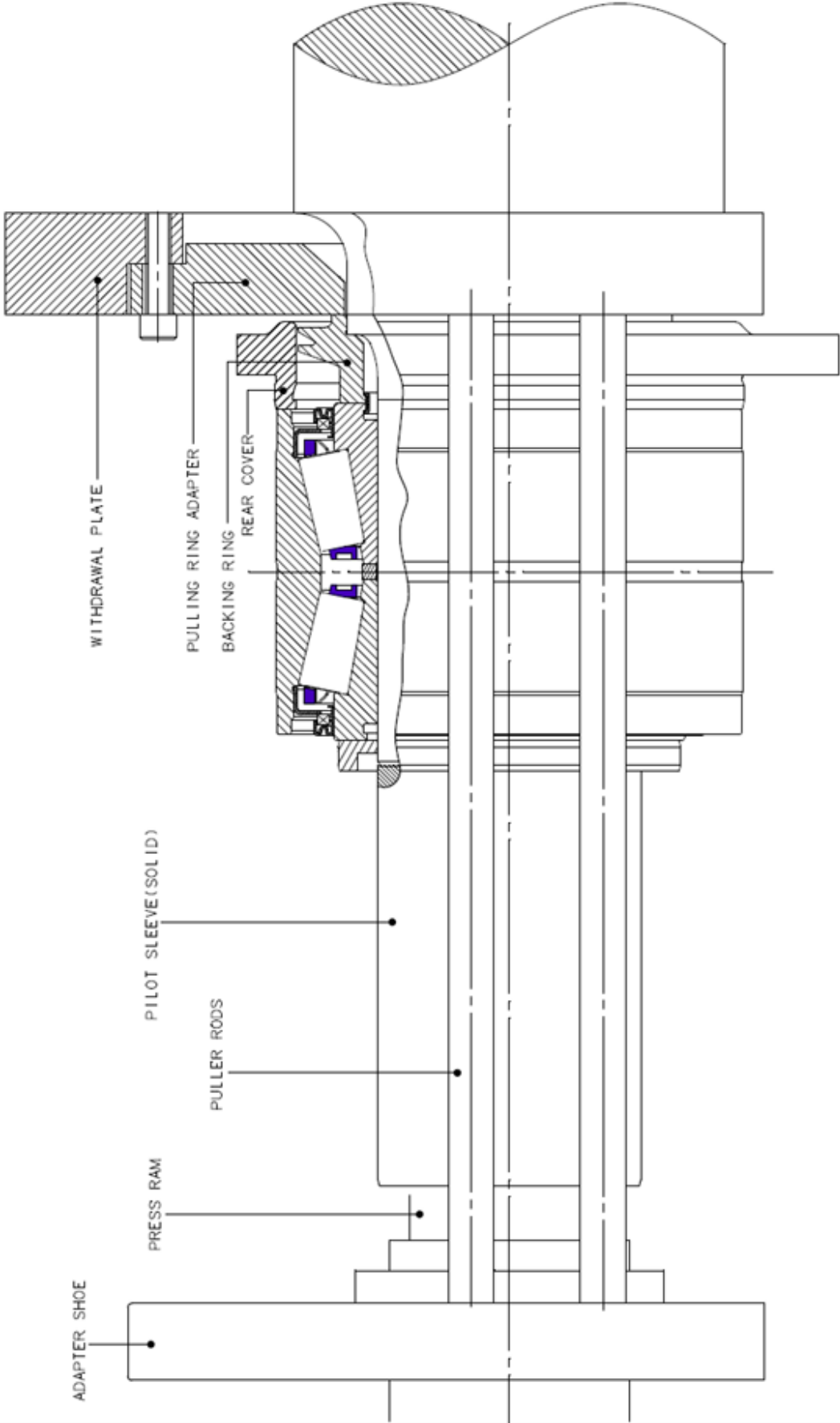
<p>CAUTION <i>Failure to follow these cautions may result in property damage.</i></p>
<p>Use of improper bearing fits may cause damage to equipment. Do not use damaged bearings. The use of a damaged bearing can result in equipment damage.</p>

<p> Warning <i>Failure to follow these warnings may result in property damage.</i></p>
<p>Tensile stresses can be very high in tightly fitted bearing components. Attempting to remove such components by cutting the cone (inner race) may result in a sudden shattering of the component causing fragments of metal to be forcefully expelled. Always use properly guarded presses or bearing pullers to remove bearings from shafts, and always use suitable personal protective equipment, including safety glasses.</p>

BEARING INSTALLATION - Figure BIR-1 TYPICAL ARRANGEMENT



**BEARING REMOVAL - Figure BIR-2
TYPICAL ARRANGEMENT**



PORTABLE JACKS

Portable jacks consisting of an assembly sleeve, withdrawal plate, puller rods, and a pulling ring adapter, may be used for bearing installation and removal using similar tooling arrangements to that used with bearing/wheel presses, illustrated in Figures BIR-1 and 2. Details of the parts are shown in Appendix 2.

These jacks can have hand or electrically operated hydraulic pumps, which are available commercially to suit production requirements.

The hydraulic ram or jack used should have sufficient travel to install or remove the bearings in one operation without the use of intermediate blocking.

Portable fixtures may be supported on a "dolly" or shop truck.

AXLES

Before proceeding with the bearing installation, the axles should be checked under uniform conditions of temperature to make sure that the bearings can be applied without difficulty and that the axle is to specification.

Axles should be checked on the bearing seat diameters, shoulders and radii with proper gauges to determine that finished axle dimensions are within prescribed tolerances, see Figure BIR-3 to obtain proper fit of the cone assembly, backing ring etc.

Micrometers used to measure the bearing seat diameters of axles should be checked for accuracy with a disc micrometer standard.

Micrometers and disc standards should be of the same temperature as the axle. Axle diameters should not be checked while the axles are heated due to machining.

Axle bearing seat diameters, shoulders, and radii should have a smooth machined and rolled, or ground finish, and must be free from sharp corners, burrs, nicks, tool marks, scratches, or corrosion.

Axle bearing seat diameters should be concentric with the wheel seat diameters.

Axle journals should be protected if there is a possibility of damage or deformation resulting from mis-handling, or uneven pressures being applied to the axle ends.

CAUTION

Failure to follow these cautions may result in property damage.

Axle bearing seat diameters, shoulders, and radii should have a smooth machined and rolled or ground finish, and must be free from sharp corners, burrs, nicks, tool marks, scratches, or corrosion. Axle bearing seat diameters should be concentric with the wheel seat diameters. Axle journals should be protected from damage or deformation resulting from mishandling, in particular, damage to the axle ends. All steel chips, dirt, and grease must be cleaned out of the lathe centres and bolt holes in the ends of the axle before applying the bearings. Axles that have become magnetized must be demagnetised before bearings are applied.

APPLYING THE BEARING - a general description

Timken cartridge bearings must be pressed on the axle.

Note: To avoid damaging the grease, heat must not be applied to the bearing cone assemblies to facilitate installation.

Note: Rear cover should be assembled before installation of the bearing assembly.

Before installing the bearing assembly on to the axle, the hydraulic equipment should be checked to make sure that the ram travel is sufficient to seat the bearings on the axle.

The hydraulic system should be checked for leaks. The fluid reservoir should be full to ensure that the press rams will extend to their limit of travel.

Note: Coat the bearing seats of the axle with Molykote TP42 or equivalent. DO NOT USE WHITE LEAD. Lead compounds may be detrimental to lubricating greases by acting as an oxidation catalyst.

A thin coating of a quick-drying rust preventative must be applied to the “journal fillet” (the portion of the axle between the bearing seat and the axle shoulder) (Figure BIR-3). The rust preventative used must not contain lead or other compounds which may be detrimental to lubricating greases. Rust preventative must be used in accordance with the manufacturer’s instructions. The portion of the axle wheel hub and the backing ring seat is assumed to be painted.

PRESSING BEARING ASSEMBLIES ON AXLES

Place the wheel and axle assembly in a wheel press or bearing press, in position to press the bearing assembly on to the axle. Or support the axle in appropriate blocks to allow a portable press to be used.

Fit the pilot sleeve onto the end of the axle, using the screws to hold it in position. Slide the bearing assembly over the pilot as far as it will go and place the assembly sleeve behind the bearing assembly. (Figure BIR-1). Apply pressure to the end of the assembly sleeve until the bearing assembly is correctly seated.

To ensure that the bearing is firmly seated against the axle abutment, the pressure indicated on the gauge during pressing-on should be increased by 50%. This 50% increase should be applied after the surge of pressure indicates on the gauge that the bearing assembly has contacted the axle abutment. This seating load pressure should be within the limits shown in Table A.

Note: Caution should be used when applying the seating load, otherwise damage may be caused to the backing rings or sealing rings. On no account should the momentary seating load applied be any more than the maximum pressure specified in Table A.

PRESSING LOAD (tonnes)	SEATING LOAD (tonnes)
16 - 27	24 - 41

Table A. Pressure to be applied when installing bearings.

Rotate the bearing assembly to ensure that it will turn freely at initial application. New bearing assemblies are preadjusted at the factory. No adjustment is necessary at installation.

After the press rams have been retracted, roll the wheel and axle assembly out of the press. Remove the assembly sleeves and bearing pilot sleeves.

Fitting the bearings by means of portable jacks is carried out in accordance with the operating instructions of the equipment.

These jacks can be hand or electrically operated, pumps and jacks are available commercially to suit production requirements.

The hydraulic ram or jack used should have sufficient travel to install or remove the bearings in one operation without the use of intermediate blocking.

Note: After bearing installation, follow the guidelines specified by the OEM builder for fitment of the endcap and cap screws

To fit the second bearing to the opposite end of the wheelset, care must be taken to ensure that the first bearing fitted is not subjected to further transmitted pressure.

CHECKING BEARING MOUNTED END PLAY (BEARING ONLY)

Check the bearing mounted endplay with a dial indicator mounted on a magnetic base. Place the magnetic base on an appropriate part of the axle (for example the wheel if fitted) and position the indicator stem against the face of the cup, marking the position on the cup.

With the dial indicator in position, pull hard but steadily on the bearing cup and oscillate at the same time. Without releasing the pressure, steady the cup so that the indicator stem contacts the marked spot, and note the reading on the indicator dial.

Then push the bearing cup hard and oscillate as before, turn the cup until the stem of the indicator contacts the marked spot, and without releasing the pressure take a second reading. The difference between the two readings is the amount of mounted end play in the bearing.

Note: The reference load used for adjustment during bearing assembly at Timken is 150kg. Since it is difficult to apply an equivalent load during checking of the mounted end play slightly lower values may be measured.

If bearing end play as indicated by the dial indicator is less than Minimum "MEP at installation" or more than Maximum "MEP at installation", remove the bearing assembly from the axle and consult a Timken representative.

Minimum and Maximum end play values are shown in Table C.

Bench End Play (mm)	Mounted End Play (mm)
0.483 – 0.533	0.092 – 0.305

Table C. Bench End Play and Mounted End Play

INITIAL LUBRICATION

This Timken cartridge bearing is pre-lubricated at the factory. No additional lubricant is to be added after the bearing is applied to the axle.

BEARING REMOVAL - a general description

Note: Before disassembling the bearing, remove the front cover and the endcap assembly, loosen the screws of the rear cover and slide the bush out - follow the guidelines specified by the OEM builder.

Whenever bearing assemblies that have been in service are removed from the axles, the bearings should be disassembled, cleaned, inspected, and repaired by a competent bearing repair facility or sent to Timken for service before the equipment is returned to operation.

The bearing assemblies may be removed with a bearing press, wheel press, or with portable jacks. Thirty to forty tonnes pressure is sometimes required to break the bearing fit.

Pressure must only be applied to the backing ring to remove the bearing. If bearings are to be removed along with the wheels, a suitable shoe must be used to make contact between the wheel hub and backing ring withdrawal face.

When bearings are removed from the axle, a pilot sleeve should be fastened to the end of the axle or to the press ram to keep the bearing parts together and protect them from damage. Do not drop the bearing assembly when removing it from the pilot sleeve.

After the bearing assembly is removed from the axle, a cardboard insert or a similar device should be inserted in the bore of the bearing assembly to hold the internal bearing parts in place.

REMOVING THE BEARING

Special device drives should be removed prior to the removal of the wheel and axle assembly from the bogie frame.

Thoroughly clean the bores of the housings, remove all rust or corrosion and apply a heavy coating of grease to the bores.

Bend the tabs of the bolt locking plate away from the heads of the bolts. Remove the bolts, locking plate, and axle end cap. Fit the Pilot Sleeve to the axle end.

A withdrawal and pulling ring adapter, which fits behind the backing ring as shown in Figure BIR-2 is used to remove the bearings when it is desirable to remove the bearings without removing the wheels.

Ensure that the withdrawal plate and pulling shoe insert is of the correct size for the bearing to be removed. Proper contact with the backing ring and puller alignment is necessary for efficient bearing removal.

Position the withdrawal plate behind the rear face of the backing ring. To ensure maximum contact area it may be necessary to hold the plate down in position behind the backing ring until the initial pressure has been applied. Extend the ram to remove the bearing assembly from the axle.

**FRAME OR BOGIE
ASSEMBLY AND DISASSEMBLY**

GENERAL

Note: Care should be exercised in applying or removing vehicle frames to prevent damage to the bearings.

After the vehicle bogie frames are removed from the wheel and axle assemblies, the housings should be removed from the bearings for cleaning and inspection.

Vehicle frames, bolsters and other bogie parts should be inspected and repaired before the bogies are reassembled.

If required, match the side frames. Mismatched side frames are detrimental to roller bearing performance.

The housing bore and the outside surfaces of the bearing cup must be free from dirt and other foreign material that may prevent the housings from seating properly on the bearings.

Wheel and axle assemblies should only be installed in side frames of the proper size for which they were designed.

FRAME OR BOGIE ASSEMBLY

Bearing housing bores and the outside surfaces of bearing cups must be clean and free from dirt or corrosion.

Coat the ID of the housing with a thin coat of mounting paste as mentioned in the installation and removal section.

Ensure that the bearing housings are applied correctly and properly seated on the bearing assembly.

If the bearing assembly has had previous service, the original load zone may be recognised by the imprint of the housing contact on the bearing cup, or a new load zone location may have been indicated on the outside of the bearing cup by marking the cup when the bearing was disassembled and inspected. Position the housing on the bearing so that a new wear surface on the bearing cup will be in the load zone.

FRAME OR BOGIE DISASSEMBLY

Remove control devices from the axle lever assembly.

Note: Care should be exercised to prevent damage from striking the bearings with the bogie frames.

Whenever a frame is disassembled the bearings and associated parts should be inspected as outlined under Service Inspection and in accordance with Shop Practice disassembly instructions.

CAUTION

When handling axle assemblies with housings on the bearings, care should be exercised to prevent the housings from slipping off the bearings.

**Warning**

Failure to follow these warnings may result in property damage.

When handling axle assemblies with bearing housings on the bearings, care should be exercised to prevent the components from becoming dislodged.

SERVICE INSPECTION

GENERAL

Bearings and housings should be given a visual inspection at terminals, and when equipment is on repair track or in the shop for wheel turning or for other reasons. In case of any damage, the housings must be disassembled.

Inspect Bearings for:

1. Overheating and/or roughness when bearing is rotated.
2. Excessive lubricant leakage and broken, loose, or missing parts such as bolts, blocked drain holes, loose or defective seals, cracked or broken cups or housings.
3. Damage or distortion to the outside of the bearing.

If any wheel set has a loose or missing part such as bolts, seals or axle end caps, that wheel set has to be removed from service and follow procedure in accordance with instructions in Bearing Installation and Removal section.

Examine the outside of the bearing for damage or distortion.

When possible, re-check bearings mounted end play in accordance with instructions in the Bearing Installation section of this manual. If mounted end play is outside the limits specified it must be removed from service and repaired, replaced or sent to Timken for service before the equipment is returned to operation.

Defective parts must be repaired or replaced before the equipment is returned to service.

The required tools, facilities, and spare parts should be available at terminals for the inspection, lubrication and maintenance.

BEARING RUNNING TEMPERATURE

The running temperature of the bearing is checked by on board sensors. A set of temperature limits and a corresponding reaction plan shall be established and observed during operation. Any bearing exceeding the limits in the established plan shall be removed and repaired before the criteria should be removed from service and repaired, replaced or sent to Timken for service before the equipment is returned to operation.

LUBRICANT CONTAMINATION

Lubricant containing water is destructive to roller bearings, causing rapid wear. All possible precautions should be taken to prevent water from entering the bearing assembly.

If the equipment has been submerged or operated through water of such a depth that the water could have entered the bearings, the bearing assemblies must be removed from the axle, disassembled, cleaned, inspected, and replacements or repairs made as necessary.

Drain pipes or holes must be located so that drainage will not be directed at the bearing assemblies.

When cleaning the exterior of equipment, the stream of water should not be directed at the bearing seals.

When sandblast or shot blast cleaning of the vehicle, a shield should be provided to protect both the front and rear of the bearing assemblies from sand or shot.

Tunnel cleaning machines, high pressure sprays, sandblast or shot blast cleaning of roller bearing equipped axle assemblies is not recommended.

Grease for roller bearing lubrication must be kept covered and in the container in which it was shipped.

SUBSEQUENT LUBRICATION IN SERVICE

The bearing for this application is supplied pre-greased. **NO** additional lubrication is required to be added to the bearing assembly in service.

BEARING SERVICE INTERVAL

Information regarding service intervals as recommended by the Timken Company is located in the Bearing Disassembly section.

The recommended bearing overhaul interval for this bearing assembly is **1,200,000km** or **eight years** (whichever occurs sooner).

DISPLACED HOUSINGS

A housing out of position causes a load concentration on the bearing and if continued in service for any length of time may result in serious bearing damage.

ACCIDENTAL DAMAGE

Bearing assemblies under equipment involved in derailment or collision, or subject to damage by fire, floods, or other causes, must be removed from service for inspection and repaired, replaced or sent to Timken for service before the equipment is returned to operation

After the removal of the bearings, all axles must be checked that they are straight in an axle lathe or other suitable equipment. A bent axle will cause premature bearing damage due to the oscillating movement and uneven load distribution in the bearing.

Note: Bearing housings must be inspected for damage and distortion; all necessary rectification must be made before being returned to service. A damaged bearing housing/adaptor may cause damage to the bearing due to load concentration. A bogie that is damaged or distorted will impose undesirable loads on the bearings, which may cause premature bearing damage.

SHOP PRACTICE

SHOP PRACTICE

BEARING INSPECTION AT FRAME OR BOGIE DISASSEMBLY

Note: Frames must not be permitted to strike the roller bearings when removing the frames from wheel and axle assemblies.

Remove the housings and clean the outside surface of the bearings. Sandblast or shot blast cleaning of roller bearing equipped axle assemblies is not recommended without protecting the bearing assembly.

Housings should be cleaned and inspected for excessive wear. Housings worn to the extent that proper load distribution on the bearing is affected should be repaired or replaced.

Rotate the bearing assemblies to detect any abnormal condition and visually check the outside of the bearing assembly for broken, loose, or missing parts. See Service Inspection Instructions section for more details.

Check the bearing mounted endplay, refer to Bearing Installation and removal section for more details.

Whenever the bearing assemblies are removed from the axle, due to excessive endplay or roughness, the bearings should be disassembled, cleaned, inspected, and reassembled in accordance with instructions or sent to Timken for service.

CAUTION <i>Failure to follow these cautions may result in property damage.</i>
Use of improper bearing fits may cause damage to equipment. Do not use damaged bearings. The use of a damaged bearing can result in equipment damage.

WHEEL TURNING

Wheel turning lathes or wheel truing machines may be used for turning wheels.

It is not necessary to remove the bearing assembly during wheel turning, **but the bearing assembly must be suitably protected to prevent any steel chips from damaging or entering the bearing.**

Lathe centres are typically lubricated with heavy grease.

DO NOT USE WHITE LEAD.

When wheel and axle assemblies are removed from the bogie for wheel turning, the bearing assemblies should be inspected in accordance with the Frame disassembly instructions.

After the wheel turning operation has been completed, clean the end faces and centre holes and bolt holes of the axle.

WHEEL RENEWAL

When worn or defective wheels are to be removed from the wheel and axle assemblies, if the roller bearings are to be removed, they must be removed separately using portable fixtures, refer to Bearing Installation and Removal Section.

Any time a bearing is removed from the axle the bearing should be disassembled, cleaned, inspected, and reassembled in accordance with instructions or sent to Timken for service.

ELECTRIC WELDING

Whenever it is necessary to do any electric welding on cars, or wheel and axle assemblies equipped with Timken bearings, the ground cable must be clamped to or near the part being welded.

Note: Do not allow electric current to pass through the bearing as it can damage the bearing.

STORAGE AND SHIPMENT

STORAGE AND SHIPMENT

STORAGE

Equipment with bearings applied

Note: Failure to observe the following instructions could result in damage to the bearing.

- When vehicles with roller bearings applied are placed in storage the brakes should be set, or the wheels chocked to prevent the equipment from moving.
- When a vehicle is in storage for one year, the car should be moved at least one car length or the bearings should be rotated several revolutions to distribute the lubricant over the bearing surfaces.
- If the equipment has been submerged in flood water of such a depth that the water could have entered the bearing, the bearings should be removed from the axle, disassembled, cleaned, inspected, and reassembled in accordance with instructions or sent to Timken for service..

Wheel and axle assemblies with bearings applied

Wheel and axle assemblies with roller bearings applied must be handled with care. Damage may result if the bearings are permitted to strike other objects.

When wheel and axle assemblies with roller bearings applied are not stored on track, the wheels should be flange to flange and not overlapped.

When axle assemblies with roller bearings applied are in storage for one year, the bearings should be rotated several revolutions to distribute lubricant over the bearing surfaces.

Wheel and axle assemblies with bearings applied should be used in the order in which they were stored, oldest stock first.

Bearing assemblies and component parts

Unmounted roller bearings and component parts must be stored in an area that is clean and well protected from moisture, excess heat or direct sunlight (UV rays).

Roller bearing assemblies with grease and seals fitted should be used within two years of assembly. Bearing assemblies stored for longer than this shall be disassembled, cleaned, inspected, and reassembled in accordance with instructions or sent to Timken for service prior to being installed.

A periodic inspection of stored roller bearings should be made. Any undesired condition should be corrected immediately.

Stored roller bearing assemblies or component parts that have been subjected to moisture or show evidence of moisture entering the bearings must be disassembled, cleaned, inspected, and reassembled in accordance with instructions or sent to Timken for service.

Roller bearings, either new or used, that are placed in storage as individual parts or as bearing assemblies, should be used in the order in which they were stored, oldest stock first.

Note: New roller bearings and component parts should not be removed from the shipping package until they are to be installed onto an axle or assembled as a bearing assembly.

When new roller bearing parts are removed from storage it is not necessary to clean the protective coating from the parts that have been retained in their original packaging.

SHIPPING

Wheel and Axle Assemblies with Roller Bearings Applied

When wheel and axle assemblies with roller bearings applied are shipped by rail, the wheel car should be equipped with a wheel rack that prevents objects or other wheel axle assemblies from striking the bearings. Certain wheel racks for plain bearing axles cannot be used because the wheel flange of adjacent wheel and axle assemblies will contact and damage the roller bearing assembly.

When loading or unloading wheel and axle assemblies with roller bearings applied, wooden boards should be placed between the bearing cups and the wheel flanges of adjacent wheel and axle assemblies to protect the bearings from damage.

Bearing assemblies and component parts

When bearing assemblies and component parts are shipped they must be protected from damage, dirt, dust and moisture.

New bearing assemblies and component parts should be shipped in their original packaging.

Bearing assemblies and component parts that have had previous service should be wrapped in special purpose paper impregnated with an appropriate preservative or other suitable protective wrapping, and packed in sturdy cartons for shipment.

Overseas Shipping Instructions

Below-deck cargo

When Timken bearing-equipped locomotives or cars are shipped overseas, it is recommended that roller bearing-equipped bogies or axle assemblies are loaded separately below deck to help avoid exposure to adverse environmental conditions.

Bogies should be raised up onto suitable bogie frames to avoid transferring the weight of the axle onto the bearings during shipping.

Deck cargo

If transporting Timken bearing equipped cars or bogies above deck, great care must be taken to protect the equipment from exposure to salt water and other adverse environmental conditions.

Cars and locomotives with bogies applied must be blocked up under the bogie frames to remove the weight of the bogie, as well as the load on the centre plate, from the bearings. Bogies should be raised up onto suitable bogie frames to avoid transferring the weight of the axle onto the bearings during shipping.

General

After the equipment has been unloaded, each bearing assembly must be examined to make sure, that the housing is properly seated on the bearing cup before the equipment is placed in service. Bearing assemblies showing evidence of direct contact with seawater should be further examined by removing the axle end caps. If evidence of seawater contamination is found inside the axle end cap, or any other damage is observed, the bearing should not be placed in service.

TYPICAL MOBILE BEARING PRESS

TYPICAL BEARING INSTALLATION AND REMOVAL PRESS

Bearings may be installed or removed with a bearing press, wheel press, or with portable jacks, depending on requirements and availability of equipment. Mobile press equipment designed specifically for this purpose is available. The figure below shows a typical example of such equipment.



The press equipment selected should typically have the following features:

- Pulling capacity adjustable up to 100t max.
- Optimized controls to allow use by a single operator.
- Mounted on mobile trolley with built in lift for alignment with bearing centreline.
- Hydraulic pump with sufficient capacity and calibrated gauge to enable control.
- Interchangeable tools to adapt to the interfaces of the subject bearings including,
 - Pulling shoe insert
 - Guide tube & cap screw assembly
 - Installing tube adapter ring

For safe use of press equipment always follow the press manufacturer's instructions alongside the contents of this bearing installation manual..



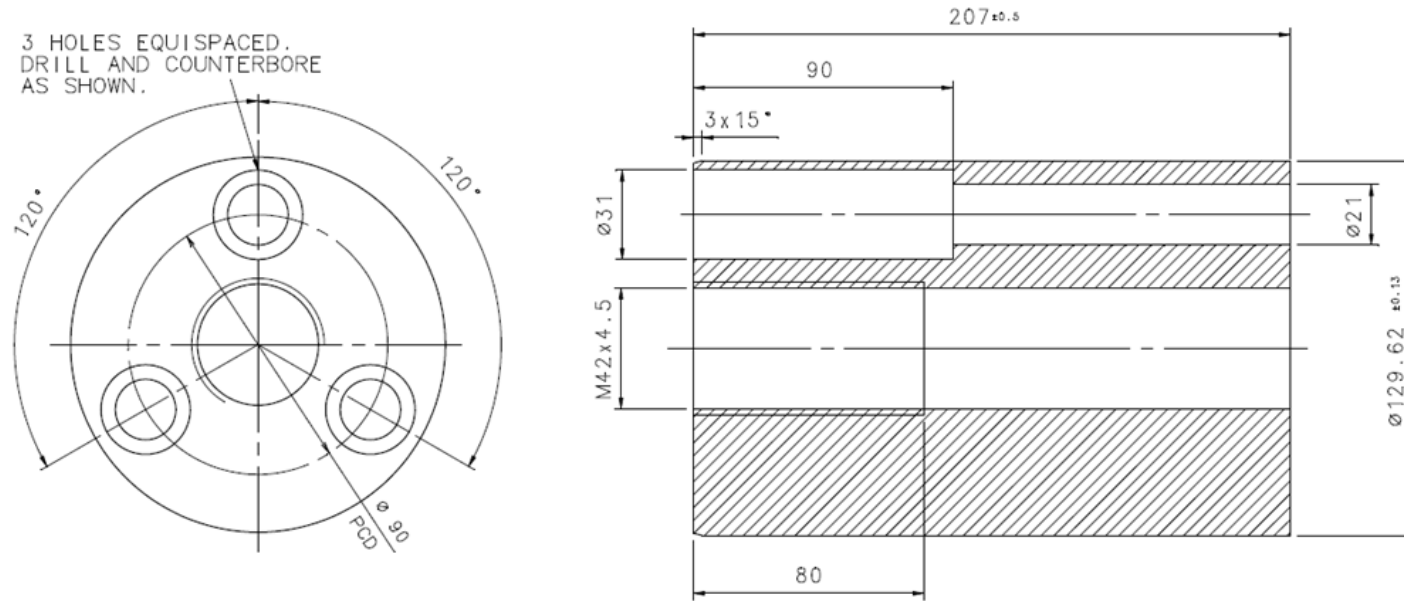
WARNING

Failure to follow these warnings may result in property damage.

Tensile stresses can be very high in tightly fitted bearing components. Attempting to remove such components by cutting the cone (inner race) may result in a sudden shattering of the component causing fragments of metal to be forcefully expelled. Always use properly guarded equipment to install bearings and always use suitable personal protective equipment, including safety glasses.

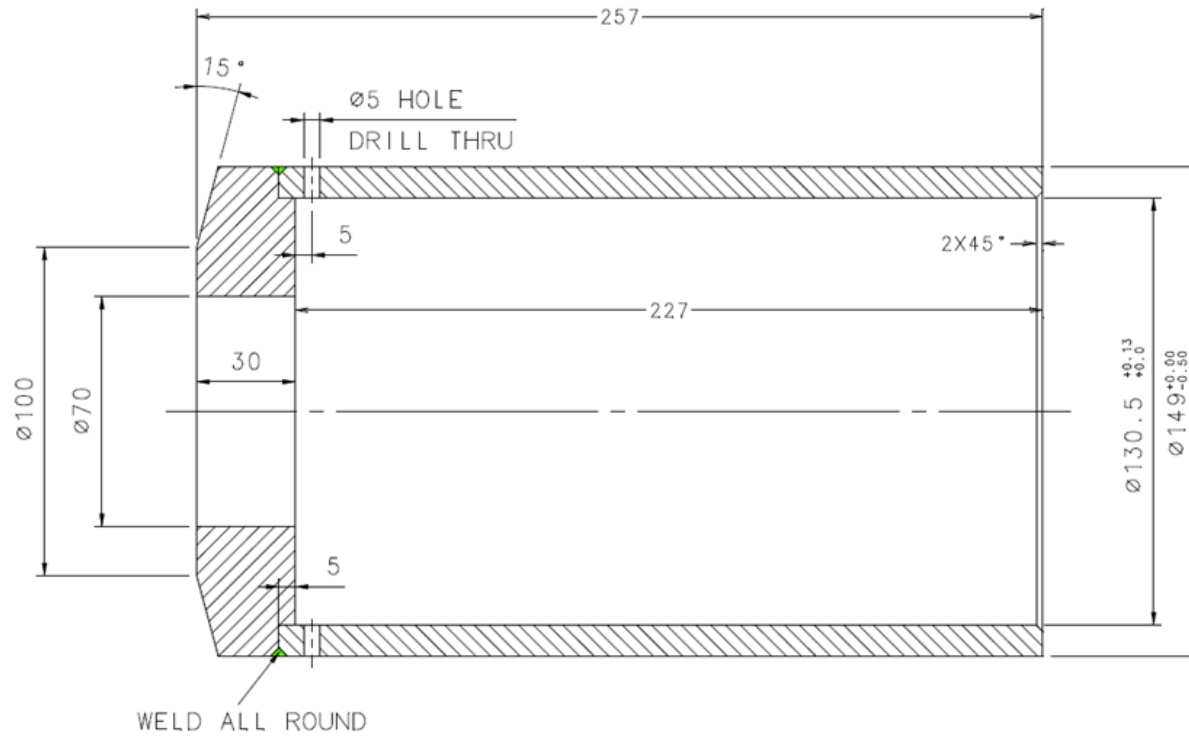
APPENDIX 2**BEARING INSTALLATION AND REMOVAL TOOLS
FOR TIMKEN 130mm AP2 CARTRIDGE TYPE BEARINGS****TOOL LIST:**

ITEM	NO. OFF
Guide tube	1
Assembly Sleeve	1
Pulling shoe adapter	1
Cap screw (Hexagon Socket head) M20x160L	3



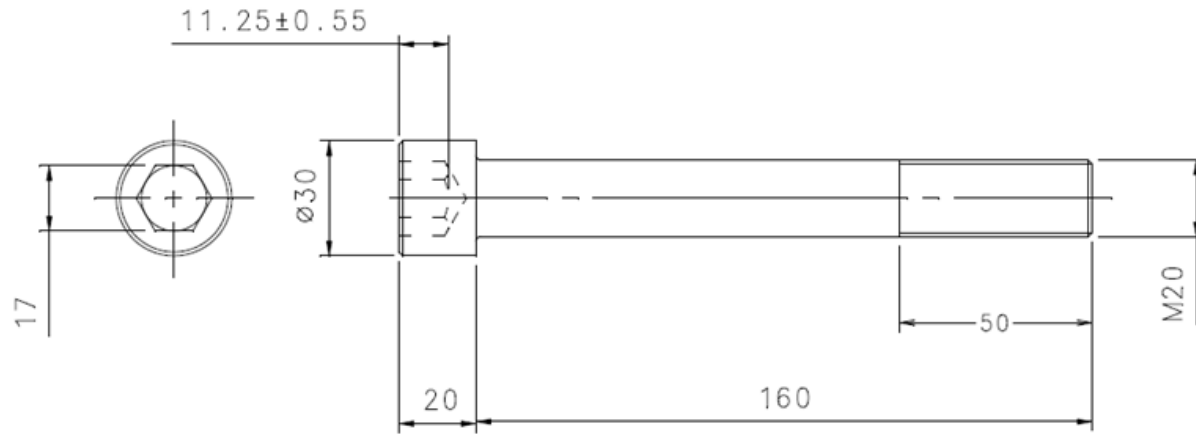
MATERIAL: STEEL BS 080M40 OR EQUIVALENT
 TREATMENT: ZINC PHOSPHATE TO BS3189 1991 (ISO 9717) Znph r7f min.
 DIMENSION ON DRAWING ARE FINISHED SIZES AFTER TREATMENT
 BREAK ALL SHARP CORNERS 1X45° MAX
 ALL UNTOLERANCED DIMENSIONS TO BE ±0.25
 6.3/√ SURFACE FINISH UNLESS OTHERWISE STATED
 REFERENCED ON FIGURE BIR - 1.

GUIDE TUBE



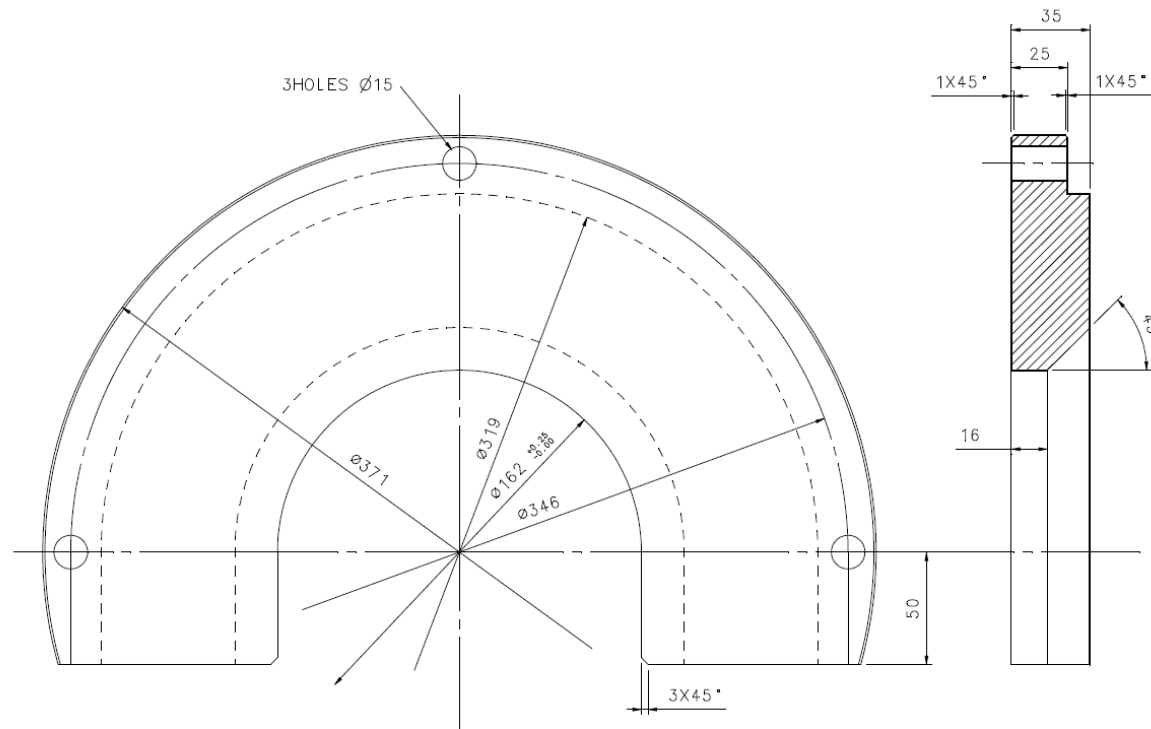
MATERIAL: STEEL BS 080M40 OR EQUIVALENT
 TREATMENT: ZINC PHOSPHATE TO BS3189 1991 (ISO 9717) Znph r7f min.
 DIMENSION ON DRAWING ARE FINISHED SIZES AFTER TREATMENT
 BREAK ALL SHARP CORNERS $1 \times 45^\circ$ MAX
 ALL UNTOLERANCED DIMENSIONS TO BE ± 0.25
 $\sqrt{6.3}$ SURFACE FINISH UNLESS OTHERWISE STATED
 REFERENCED ON FIGURE BIR - 1.

ASSEMBLY SLEEVE



SPECIFICATION: ISO GRADE 12.9 STEEL TO BS:4168

HEXAGON SOCKET HEAD CAP SCREW M20x160L



MATERIAL: STEEL BS 080M40 OR EQUIVALENT
 TREATMENT: ZINC PHOSPHATE TO BS3189 1991 (ISO 9717) Znph r7f min.
 DIMENSION ON DRAWING ARE FINISHED SIZES AFTER TTREATMENT
 BREAK ALL SHARP CORNERS 1X45° MAX
 ALL UNTOLERANCED DIMENSIONS TO BE ±0.25
 6.3/√ SURFACE FINISH UNLESS OTHERWISE STATED
 REFERENCED ON FIGURE BIR – 2.

PULLING SHOE ADAPTER