

# Service Manual

## Transfer Case MVG1650

MARMON-HERRINGTON TRANSFER CASE

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Contents

1 Preface ..... 4

    1.1 Contact Information ..... 5

2 Safety ..... 6

    2.1 Signal words and symbols ..... 6

    2.2 General safety instructions ..... 7

3 Notes on Repairs and Assembly..... 8

    3.1 General Notes..... 8

    3.2 Cleaning the MH product ..... 8

    3.3 Dismantling the MH product ..... 8

    3.4 Assembling the MH product..... 8

    3.5 Cleaning parts..... 9

    3.6 Reusing Parts ..... 9

    3.7 Replacing Parts ..... 9

    3.8 Reworking parts..... 10

    3.9 Cleanliness specifications for transmissions with hydraulic components..... 10

4 Technical Data ..... 11

    4.1 Oil ..... 11

        4.1.1 Oil grade ..... 11

        4.1.2 Oil quantity..... 11

    4.2 ID Tag..... 12

5 Settings ..... 12

6 Tightening Torques ..... 13

7 Workshop Equipment ..... 14

    7.1 Special tools..... 14

    7.2 Standard tools and fixtures ..... 15

    7.3 Standard Consumables..... 16

8 Preparatory Activities ..... 17

    8.1 Draining oil ..... 17

9 Dismantling ..... 19

    9.1 Removing the breather ..... 19

    9.2 Removing the Indicator Switches and Speedo Sensor ..... 19



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9.3	Removing the Temperature Sensor*	23
9.4	Removing the Emergency Steer Pump	23
9.5	Removing the Flanges and the Ports	25
9.6	Removing and Disassembling the PTO	29
9.6.1	Removing The Flange	29
9.6.2	Removing PTO	30
9.6.3	Dismantling PTO	32
10	Assembly	38
10.1	Assembling and installing PTO	38
10.1.1	Assembling PTO	38
10.1.2	Fitting PTO	43
10.1.3	Fitting Flange (PTO)	47
10.2	Installing Pots and Fitting Flanges	48
10.3	Mounting the Piston Pump	52
10.4	Installing the Temperature Sensor	54
10.5	Installing the Speedo Sensor and Gear Indicators	54
10.6	Installing The Breather	63
11	Follow Up Activities	63
11.1	Installing Screw plug of Front Axle Drive	63
11.2	Filling Oil	63
12	Appendix	64
12.1	Change Log	64

## 1 Preface

The Present Document gives directions to the trained personnel to repair the **Marmon Herrington (MH) MVG1650 Transfer Case**.

Customary tools and devices, which are workshop standard, are supposed to be available.

Disassembly of and assembly of one version only is explained in this document. Differing working sequences of other possible versions can easily be recognized by the skilled professional. For such jobs, see enclosed sectional and perspective views.

The repair of the component may require changed working sequences and/or differing adjustment or checking of data, according to the technical development of the product over the years.

Therefore, we recommend rendering your MH product only to the hands of properly trained personnel.

Damages caused by improperly or unprofessionally executed repair work by untrained personnel and the resulting consequences are excluded from any contractual liability.

This also applies when NON-ORIGINAL-PARTS are being used.

### **General Working Directions**

The company repairing M-H Components is in any case responsible for all aspects of safety.

The valid safety regulations and legal directives must be obeyed to avoid injury of persons and damage of the product during maintenance and repair.

The proper repair of the M-H Product requires adequately trained personnel. To undergo training is the obligation of the repairer.

Always ensure professional and clean working conditions. Components shall always be cleaned before disassembly.

The use of indicated tools is a precondition.

After disassembly, all parts must be cleaned. This applies, in particular, to corners, nooks and oil catchers in housings and covers.

Carefully remove old sealing compound.

Clean surfaces thoroughly before sealing.

Lubrications bores, grooves and pipes are to be checked to be free from obstructions. They must be free from deposits, contamination, and preservatives. The latter applies particularly for new parts.

Parts that are being damaged during disassembly are to be replaced by new ones.

E.g.: radial oil seals, o-rings, groove-rings, seal cups, protection cap, etc.

Parts as bearings, thrust washers, synchromesh parts etc., which are liable to normal wear must be checked by the skilled professional. They must judge if a part can be reused or not.

Parts, which have a shrink fit, must be driven to their end position after cooling down to assure perfect seating. Before pressing-in parts like shafts, bearings etc. both contact surfaces must be oiled/lubricated.

On the assembly all given adjustment tolerances, check data and tightening torques have to be observed. M-H Components are to be filled with oil after the repair. Observe filling instructions and lubrication chart. After filling, the oil drain and oil level plugs must be tightened to correct torque.

**Use Original M-H Parts only!**

1.1 Contact Information

**Parts Department:**

**Parts Department:**

Phone: (502) 253 0277 x 1 / (800) 227 0727 x 1  
Email: [partsales@marmon-herrington.com](mailto:partsales@marmon-herrington.com)  
Website: [marmon-herrington.com/contact-parts](http://marmon-herrington.com/contact-parts)

**Service and Warranty Department:**

**Service and Warranty Department**

Phone: (502) 253 0277 x 3 / (800) 227 0727 x 3  
Email: [warranty@marmon-herrington.com](mailto:warranty@marmon-herrington.com)  
Website: [marmon-herrington.com/contact-service-warranty](http://marmon-herrington.com/contact-service-warranty)

**Additional Manuals**

Manual	Manual #
Parts Manual	MM1T65
Service Manual	MM2T65
Installation Manual	MM3T65


## 2 Safety

### 2.1 Signal words and symbols

This document contains particularly highlighted safety instructions which are marked with one of the following signal words depending on the severity of the danger.


#### **DANGER**

##### DANGER

The signal word DANGER indicates a dangerous situation that, if not prevented, will lead to a severe injury or death.  Information as to how the danger can be prevented.


#### **WARNING**

##### WARNING

The signal word WARNING indicates a dangerous situation that, if not prevented, can lead to a severe injury or death.  Information as to how the danger can be prevented.

#### **CAUTION**

##### CAUTION


The signal word CAUTION indicates a dangerous situation that, if not prevented, can lead to a slight or moderate injury.  Information as to how the danger can be prevented.


#### **NOTICE**

The signal word NOTICE indicates a situation that, if not prevented, *can* lead to property damage.

Information as to how the property damage can be prevented.

*The following symbols are additionally used:*

 This symbol refers to additional, safety-relevant information.

 This symbol indicates information concerning special workflows, methods, application of aids, etc.

## 2.2 General safety instructions

Read all safety instructions and information. Failure to comply with safety instructions and information may lead to property damage, serious injuries, or death.

### Intended Use

The Marmon-Herrington (MH) product is exclusively intended for the application as defined in the contract and as agreed on the time of delivery. Any other or extended form of use does not comply with this definition of intended use. The intended use includes compliance with this documentation and other applicable documents, in order to avoid malfunctions and damage in operation.

The MH product is designed and produced in line with state-of-the-art technology. The MH product in its delivery status is safe to operate. However, the MH product may pose dangers if improperly used by unauthorized, untrained, and uninstructed staff or if not used according to its intended use. Also, please read and follow any attached documentation on case before use of product. If any questions or concerns, contact Marmon-Herrington.

Figures might deviate from the MH product and are not drawn to scale. No conclusions can be drawn with regard to size and weight.

### Installation, Commissioning, Maintenance, and Repair

Perform assembly, commissioning, maintenance, and repair work exclusively according to this documentation and other applicable documents.

Observe the following points:

- Employ authorized, trained, and instructed staff.
- Observe technical provisions.
- Only use genuine MH spare parts.
- Only use genuine MH accessories.
- Only use genuine MH special tools.
- Unauthorized changes and modifications lead to the expiry of the operator's license, warranty or guarantee.

In case of damage, contact MH and have the following information on the product ready:

- Type of Product
- Part Number
- Serial number
- Operating hours
- Description of damage

Observe safety instructions, valid safety regulations and legal conditions to prevent malfunctions and damage.

The country-specific safety regulations, accident prevention regulations and environmental protection provisions apply additionally.

Wear safety-relevant workwear for all work. Depending on the work, also wear personal protective equipment.

After completing the work, check correct function and functional security.

## 3 Notes on Repairs and Assembly

### 3.1 General Notes

- Please read this documentation prior to starting repair or assembly work.
- Prior to starting repair or assembly work, please find out whether MH Service Information on the MH product is available. MH Service Information may contain tests or supplements to the product or to repair processes, which may not be included in this documentation. The MH-Service Information is available at the MH Website
- In case of doubt, always contact the relevant expert departments of MH Parts/Service.
- Please ensure that all work on the MH product is performed expertly and under clean conditions.
- Use the specified special tools and equipment intended for the working procedures described.
- Please perform all work according to the working procedure described.
- Cover opened MH products to prevent entry of foreign matter.
- Cover parts that have been removed and that are reusable and protect them against dirt and damage.
- After completion of work and inspections, specialized staff must ensure that the MH product is again functioning perfectly and is safe to operate.

### 3.2 Cleaning the MH product

Clean the MH product with an appropriate cleaning agent prior to repair or assembly works.

Pressure washing is acceptable if all air ports and breathers are plugged prior to application of pressure washer. Avoid water into case, regardless if case is filled with oil or not.

### 3.3 Dismantling the MH product

Reusable parts must be clearly assigned to the dismantled MH-product and the assemblies defined in this documentation. The assignment makes sure that reusable parts (e.g. gear parts, spacers or shims, electronic components) are not mixed up.

Assemblies which must not be disassembled or are only available as spare parts assemblies are described accordingly. Please refer to the spare parts catalog for the MH product.

Inspect the parts during disassembly in order to find a potential cause of damage.

### 3.4 Assembling the MH product

Assemble the MH product in a clean work environment. The order of work steps, configuration data, and tightening torques must be retained. Use the special tools specified in the work steps.

#### Bearings

The provisions for assembly of the bearings are described in the respective work step. Each bearing integrated must be lubricated with operating oil after assembly.

#### Sealing compound

Sealing compound is only to be used when described as such in the work step (refer to Section Operating supplies and auxiliary materials). Please observe the manufacturer guidelines and processing instructions.





Apply the sealing compound thinly and evenly. Keep oil ducts and oil bores free of sealing compound. When assembling the parts, no sealing compound must enter the oil ducts or oil bores.

### Retaining agents

Retaining agents are only to be used when described as such in the work step (refer to Section Operating supplies and auxiliary materials). Please observe the manufacturer guidelines and processing instructions.

### Oil

Fill the MH product with oil before operation. For the procedure and approved oil grades, refer to the document valid for the MH product, the type plate, and/or the latest List of Lubricants TE-ML. These documents are available at all MH Services Partner and here [www.marmon-herrington.com](http://www.marmon-herrington.com)

## 3.5 Cleaning parts

- Clean all reusable parts.
- Clean lined clutch disks with a lint-free cloth only.
- Remove sealing compound residues on sealing faces or retaining agent residues, e.g., in tapped holes or on splines.
- Clean joining surfaces.
- Clean blind holes and blind hole threads.
- Lubricating bores, oil bores, oil ducts, bores for oil press fits and lubricating grooves must be free from dirt, preservatives and foreign matter. Check for free passage.
- Hose assemblies, tubes and joining elements must be free from dirt, oil and damage. Check for free passage. Replace damaged parts.
- Clean all cavities and reliefs.
- Remove preservatives from new parts.

## 3.6 Reusing Parts

Authorized, specialized staff assess whether parts can be reused. Replace parts

- if they are damaged
- if they are worn, e. g. bearings, shims, clutches, thrust washers, etc.
- if they have a permanent deformation
- if they have been overheated during operation or during disassembly.

Only replace with original MH parts or MH-approved parts. Please refer to the spare parts catalog for the MH product.

## 3.7 Replacing Parts

The following parts must always be replaced:

- Bolts with reduced shank and seals
- Single-use parts
- Sealing rings
- Safety plates
- Shaft sealing rings

Only replace with original MH parts or MH-approved parts. Please refer to the spare parts catalog for the MH product.

### 3.8 Reworking parts

Specialized staff should assess whether parts need to be reworked.

Minor damage on reusable components can be removed and reworked with suitable special tools if the component's function is not impaired.

Minor damage includes:

- Indentation marks on sealing faces
- Score marks or burrs caused by the disassembly of the MH product
- Fretting corrosion
- Paint and corrosion damage

If rework is needed on spacer washers or shims because of clearance settings, ensure that the reworked surface is level with the starting face and has the same surface quality.

Debur all edges that can cause chip formation during the assembly process or represent a risk of injury for the specialized staff. Remove burrs or other similar instances of unevenness.

### 3.9 Cleanliness specifications for transmissions with hydraulic components

Ensure cleanliness when performing repair and assembly works at hydraulic systems. This applies to the following areas in particular:

- hydraulic shift control unit,
- oil pump,
- oil filters (pressure filters),
- oil supply,
- valve housing,
- oil feed flange.

This includes meaning no dirt or other particulates are to enter into the hydraulic components.

The following requirements must be observed for the work process and the workshop equipment:

- Install separate cleaning processes for outer transmission parts and for parts of the hydraulic system.
- Avoid using mechanical stroke and blow processes. In case it cannot be avoided: Use impact adapter with large stroke/impact face.
- Parts made of Fe metals must be demagnetized.
- Only use cleaning cloths which do not fray.
- When applying operating supplies and auxiliary materials, only use high-quality, wear-resistant brushes whose bristles do not fall out (e.g. silicone brushes).
- Use operating supplies and auxiliary materials with the specified purity only (e.g. lubricants, sealing compounds, compressed air for inspection processes, etc.).
- Cover operating supplies and auxiliary materials before and after use.
- Store and transport ready-to-install components and assembly groups when properly covered.
- Fixtures must be designed and used in such a way that mechanical damage of the part or the MH product is excluded and the fixture does not suffer from excessive wear.
- Avoid the utilization of easily distributable auxiliary materials in assembly (e.g. wood, Styrofoam, fiber plates, waxed paper).

- Chip-cutting machining and the blowing out of parts with compressed air has to be performed in a separate room and must not be performed in the assembly area.

Observe the following specifications for the workshop equipment:

- Design support surfaces for parts and tools in such a way that no deposits may accumulate (e.g. grate, perforated sheet metal).
- The work surfaces must be abrasion-proof and easy to clean (e. g. V4A sheets with rubber pads).
- If possible, make sure that work surfaces do not have any inaccessible corners and recesses.
- The workshop equipment (cabins, racks, workbenches, etc.) and its respective arrangement in the room must always be designed in such a way that proper cleaning of the room and floor is possible.
- It must be possible to properly clean the floor (e.g. through abrasion-proof sealing).
- Vacuum the floor regularly – avoid sweeping or blowing as that can scatter particulates
- Regularly wet-clean the floor.

## 4 Technical Data


### 4.1 Oil

#### 4.1.1 Oil grade

#### NOTICE

Damage to MH product due to incorrect oil possible.


⇒ Only use oils listed in the valid MH List of Lubricants.

 Observe the information on the ID plate.

Based on the expected operating conditions, oils according to the MH List of Lubricants TE-ML 19 and TE-ML 13 have been released for these transmission oils.

The latest MH List of Lubricants can be obtained from all MH Service Centers and viewed at [www.marmon-herrington.com](http://www.marmon-herrington.com).

#### 4.1.2 Oil quantity

 The quantities specified are reference values. The correct oil quantity is determined by means of the oil filler hole (oil overflow).

Unit	Comment	Oil quantity
TC 27 L	without differential	approx. 6.0 liters (12.7 pints)
	with differential	approx. 5.3 liters (11.2 pints)
TC 27 S	without differential	approx. 6.6 liters (13.9 pints)
	with differential	approx. 5.9 liters (12.4 pints)

Tab. 2 Oil quantity



## 4.2 ID Tag

The ID Tag shows the most important transfer case data.

<b>MARMON-HERRINGTON</b>			
MODEL	1		
SN	2	S/O	3
CUST. P/N	4		

- 1 Product Model
- 2 Serial Number
- 3 Sales Order Number
- 4 Customer Part Number (if applicable)

## 5 Settings

Designation	Dimensions	Measuring instrument	Comment Chapter/Section
Theoretical PTO adjusting distance	21.90 mm („s“ rounded up to 5 mm)	Caliper	•Fitting PTO, page 47

## 6 Tightening Torques

Designation	Tightening torque	Measuring instrument	Comment Chapter/Section
Cap screw M14x1.5	120 Nm	Torque wrench	•Fitting PTO, page 47
Hexalobular driving screw M14 x 1.5	120 Nm	Torque wrench	•Fitting PTO, page 47
Collar nut M33 x 1.5	1,080 Nm	Torque wrench	•Fitting flange (PTO), page 51
Collar nut M38 x 1.5	1,080 Nm	Torque wrench	•Installing pots and fitting flanges, page 51
Hexalobular driving screw M8	20 Nm	Torque wrench	•Mounting the piston pump, page 55
Temperature sensor	34 Nm	Torque wrench	•Installing the temperature sensor, page 56
Pulse sensor	43 Nm	Torque wrench	•Installing the pulse sensor and the pressure switches, page 57
Pressure switch	43 Nm	Torque wrench	•Installing the pulse sensor and the pressure switches, page 57
Breather	12 Nm	Torque wrench	•Mounting the breather, page 65
Screw plug M14 x 1.5	25 Nm	Torque wrench	•Installing screw plug of front axle drive, page 66



## 7 Workshop Equipment

### 7.1 Special tools

The required quantity is listed. Please inquire as to packaging unit before ordering. Parts and Drawings are available through Marmon-Herrington

**Specialty Tool Table**

<b>MH Part #</b>	<b>Description</b>
MT946520	Flange Lock Mechanism
MT946521	Disassembly Device
MT946522	Extracting Device
MT946523	Locating Pin
MT946524	Driver Tool
MT946525	Handle
MT946526	Assembly Fixture
MT946527	Straight Edge (285mm)
MT946528	Air Pressure Test Device
MT946529	Clamping Screw
MT946530	Mounting Fixture
MT946531	Bush
MT946532	Bush
MT946533	Bush

## 7.2 Standard tools and fixtures

To repair this MH product use the following standard tools and fixtures. Contact Marmon-Herrington for information on tools and fixtures.

**Standard Tool Table**

<b>Tool</b>	<b>Description</b>
Torque Wrench(es)	Capable of 0.6-3000 Nm
Internal Snap Ring Pliers	Sizes I1 through I4
Internal 90° Snap Ring Pliers	Sizes I1 through I4
External Snap Ring Pliers	Sizes A1 through A4
External 90° Snap Ring Pliers	Sizes A1 through A4
Two-Arm Extractor	
Lifting Strap	500 kg Capacity, 4m Length
Heat Gun	
Pry Bar	
Dead Blow Hammer	Clamping Screw
Slide Hammer	Mounting Fixture
Dial Indicator Base	Magnetic Base
Dial Indicator	
Pair of Parallel Gage Blocks	70mm Height
Pair of Parallel Gage Blocks	100mm Height
Digital Caliper	150 mm Length
Digital Depth Gage	300 mm Depth
Socket Wrenches	
External Hexalobular Socket Set	
Sand Paper	Various grits, for cleaning surfaces
Flat Scrape	To remove sealing compound and such
Polishing Cloth	Smoothing and Cleaning Surfaces (lint free)
Foam Roller	For applying sealing compound

**Standard Fixtures Table**

<b>Fixture/Part #</b>	<b>Description</b>
Engine Stand	Norco 78125A
MT946534	Fix T-case to Engine Stand



### 7.3 Standard Consumables

To repair this MH product use the following consumables.

**Standard Fixtures Table**

Item	Description
Denatured Alcohol	To Clean Surfaces
Stabutherm GH 461	Grease
Loctite 518	Sealing Compound
Loctite 243	Threadlocker



## 8 Preparatory Activities

### 8.1 Draining oil

Requirements:

- The vehicle is parked horizontally in any direction.
- The engine is switched off.
- Transmission has operating temperature.

**⚠ CAUTION**

Risk of burn injuries due to contact with hot surfaces. Slight or moderate injury possible. Wear protective gloves.

**⚠ CAUTION**

Risk of burn injuries due to contact with hot oil. Slight or moderate injury possible. Wear protective goggles. Wear protective gloves.



Observe the environmental regulations (refer to Section General safety instructions, page 7).

1. Thoroughly clean the screw plug (1).
2. Place a suitable container under the screw (1).
3. Remove screw plug (1) and sealing ring.
4. Completely drain oil into the container.



plug

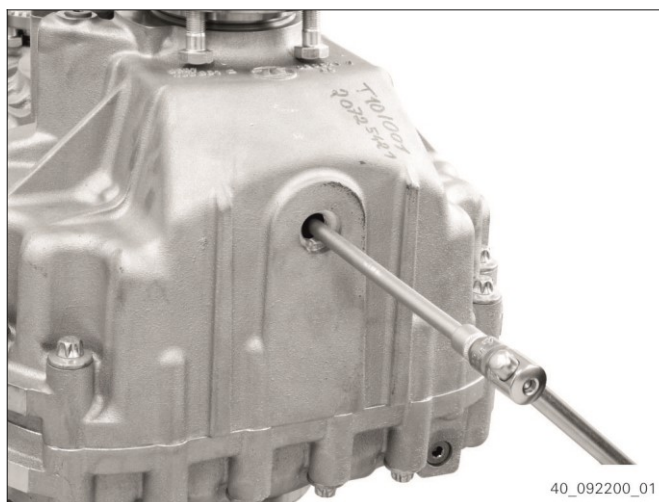
Fig. 21



Loosening the screw plug of the front axle drive

5. Loosen screw plug.

Fig. 22



## 9 Dismantling

### 9.1 Removing the breather

It is highly recommended that an the transfer case is attached to engine stand and proper adapter plate, as shown in instructions.

1. Remove breather by hand

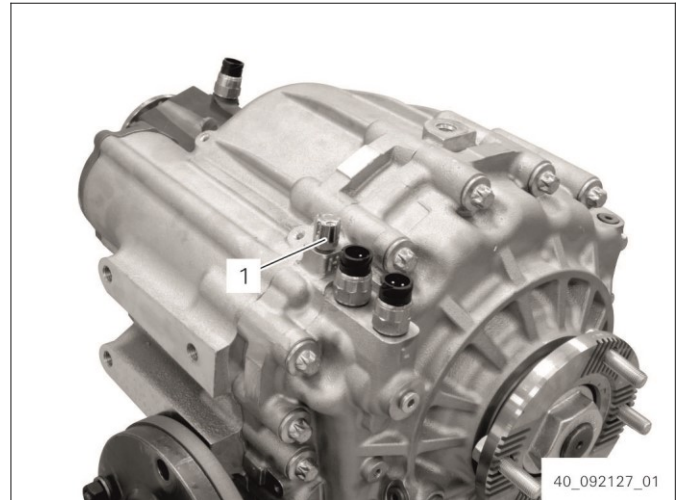


Figure 1

### 9.2 Removing the Indicator Switches and Speedo Sensor

1. Remove pressure switches (1).
2. Remove sealing ring.

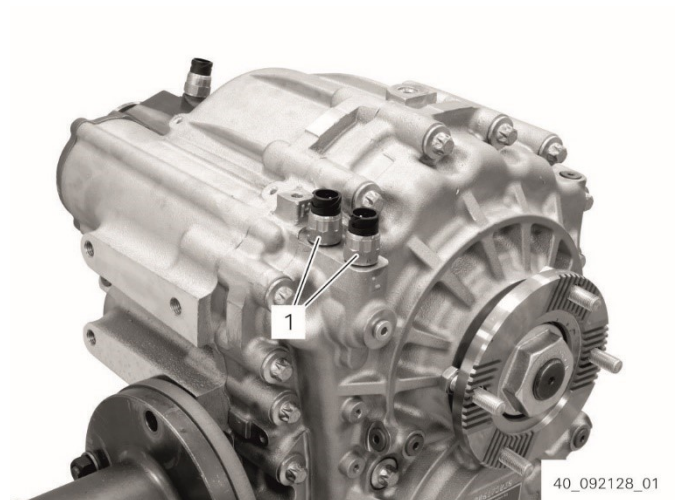


Figure 2

3. Lift Pins out of hole using magnet

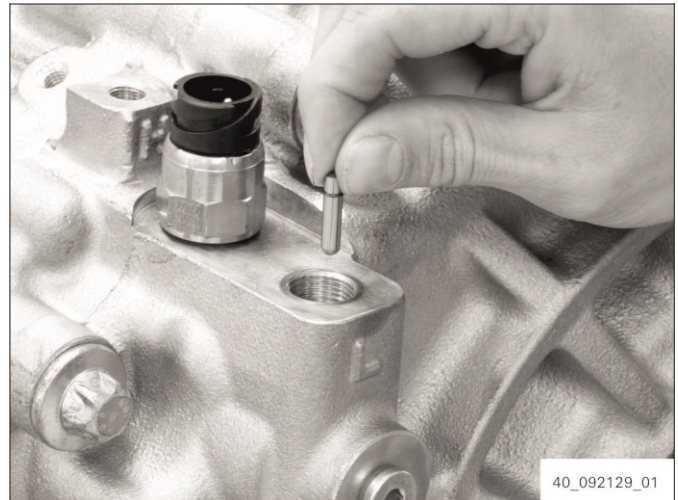


Figure 3

4. Remove Front Axle Indicator Switch
5. Remove Sealing Ring

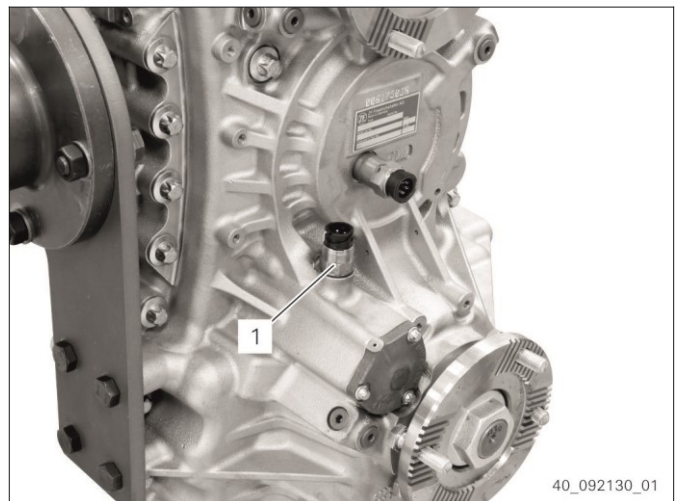


Figure 4



6. Lift pin out of hole using magnet

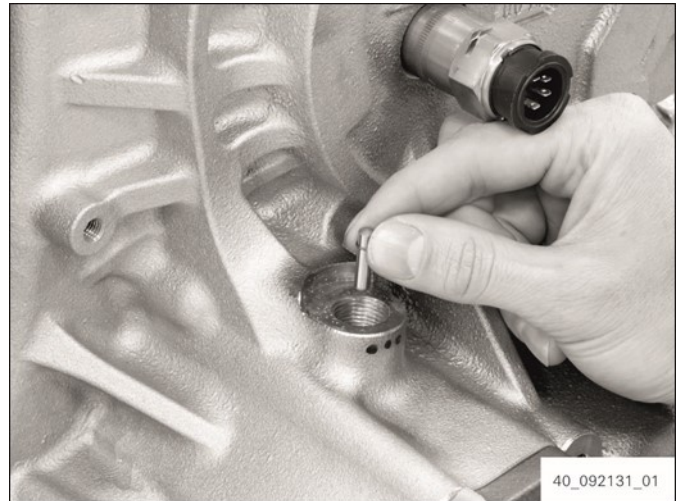


Figure 5

7. For PTO equipped cases, loosen the PTO Indicator (1)
8. Remove Sealing Ring

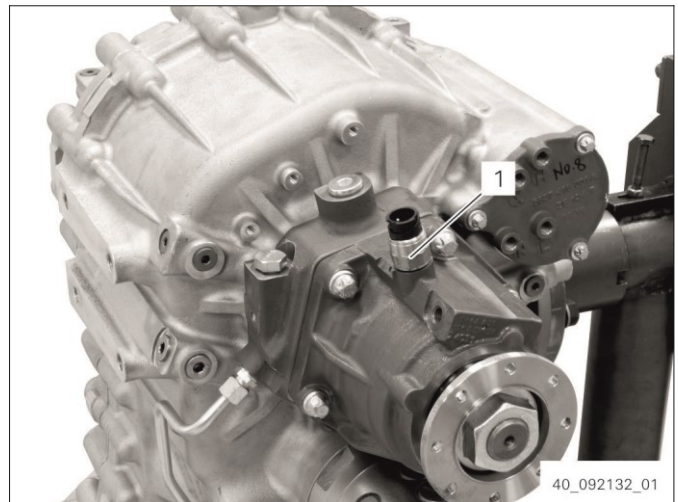


Figure 6



9. Lift Pin out of hole using a magnet



Figure 7

10. Remove the speedo sensor (1)

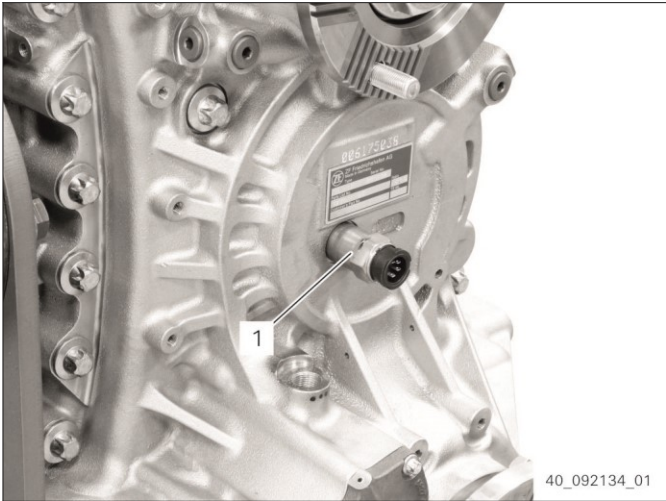


Figure 8



## 9.3 Removing the Temperature Sensor\*

1. Remove the temperature sensor (1)  
\*On equipped cases

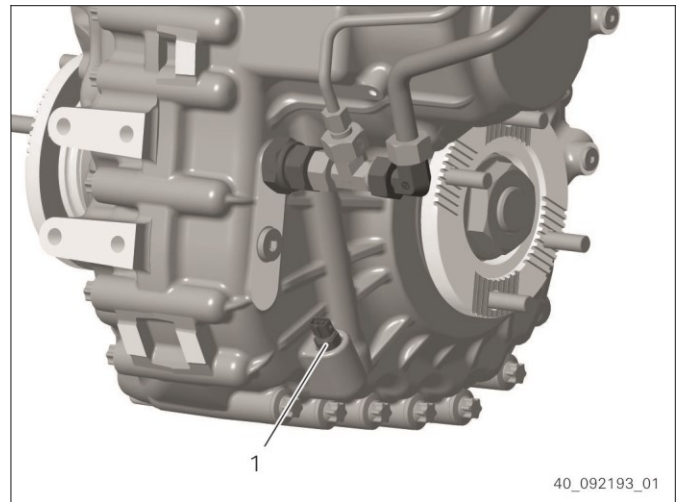


Figure 9\

## 9.4 Removing the Emergency Steer Pump

1. Remove hexalobular screws securing pump to case (x4)
2. Remove Piston Pump (1)

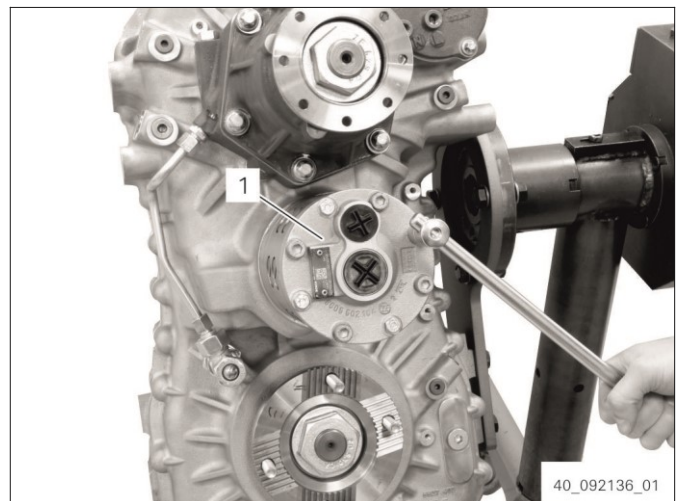


Figure 10



3. Remove Coupling Sleeve (1)



Figure 11

4. Remove O-Ring (1)



Figure 12



## 9.5 Removing the Flanges and the Ports

### Recommended Tools

- MT946520 Locking mechanism
- MT946521 Disassembly device
- MT946522 Extracting device

### Removing the Flange and the Pot (Rear Output)

1. Fix rear output flange using MT946520
2. Make sure the the next two steps are done immediately one after the other.
3. Heat collar nut to 120° C (250°F) max

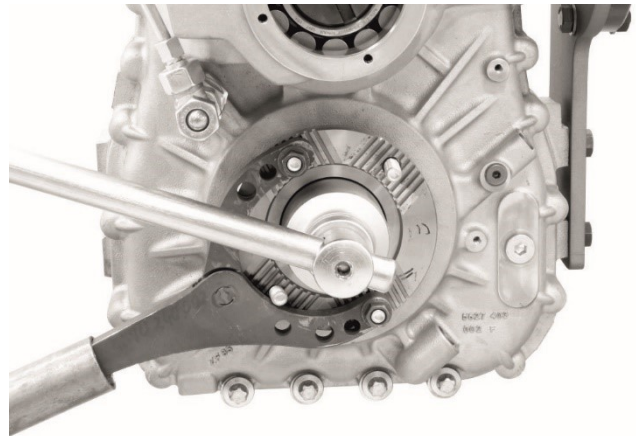
#### CAUTION

Risk of burn injuries due to contact with hot surfaces.

Slight or moderate injury possible.

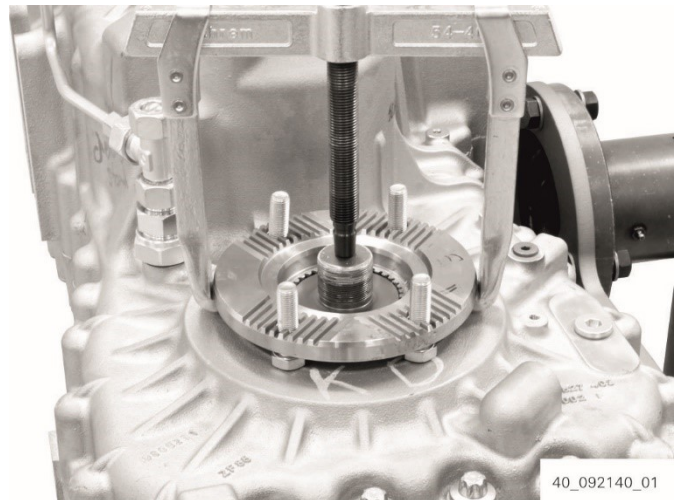
⇒ Wear protective gloves.

4. Unfasten Collar Nut
5. Remove Flanged Nut using two armed extractor



40\_092139\_01

Figure 13



40\_092140\_01

Figure 14

6. Use MT946521 [Disassembly device] and MT946522 [Extracting device] to pull pot out of the housing. Pot and shaft seals are to be considered damaged after this process

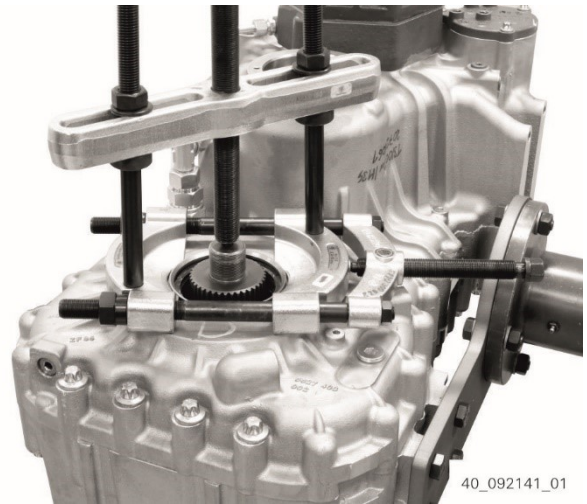


Figure 15

## Removing the flange and the Pot (Front Output)

7. Fix front output flange using MT946520
8. Make sure the next two steps are done immediately one after the other.
9. Heat collar nut to 120°C (250°F) max

### CAUTION

Risk of burn injuries due to contact with hot surfaces.

Slight or moderate injury possible.

⇒ Wear protective gloves.

10. Unfasten Collar Nut

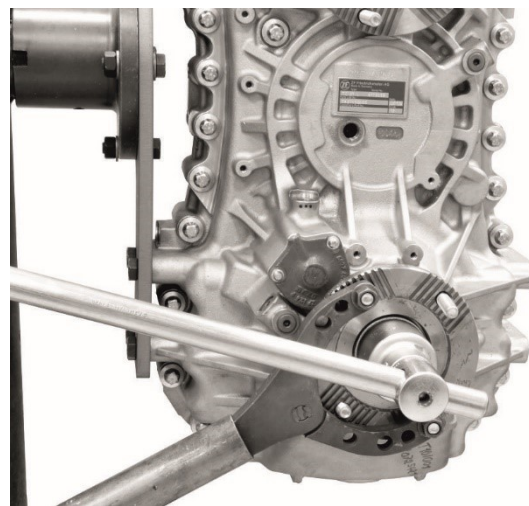


Figure 16



11. Remove flange using two-armed extractor

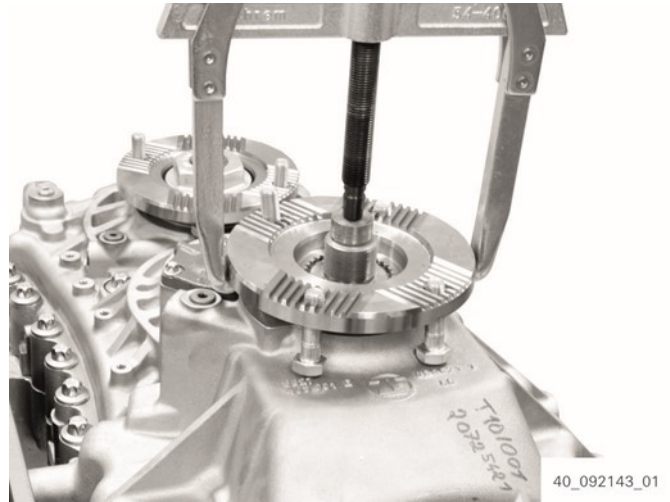


Figure 17

12. Use MT946521 [Disassembly device] and MT946522 [Extracting device] to pull pot out of the housing. The Pot and shaft seals are damaged

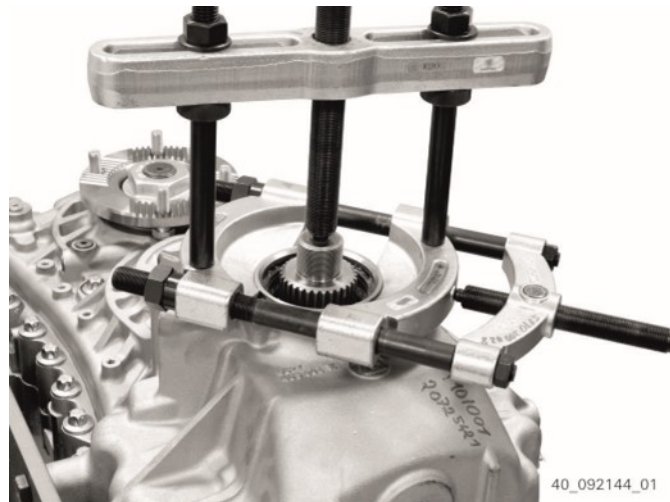


Figure 18

## Remove flange and Pot (Input)

13. Fix front output flange using MT946520
14. Make sure the the next two steps are done immediately one after the other.
15. Heat collar nut to 120°C (250°F) max

### CAUTION

Risk of burn injuries due to contact with hot surfaces.

Slight or moderate injury possible.

⇒ Wear protective gloves.

16. Unfasten Collar Nut

17. Use MT946521 [Disassembly device]and MT946522 [Extracting device] to pull pot out of the housing. The Pot and shaft seals are damaged

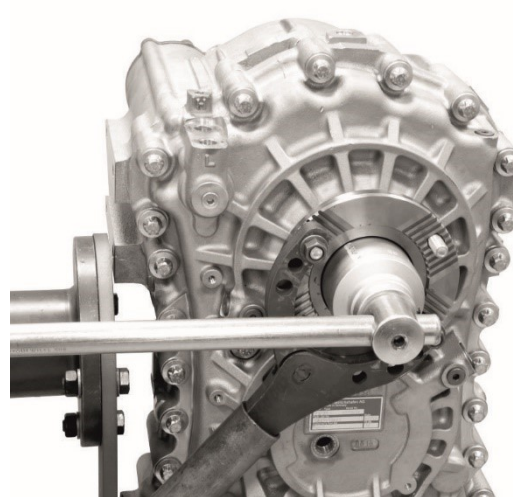


Figure 19

40\_092145\_01

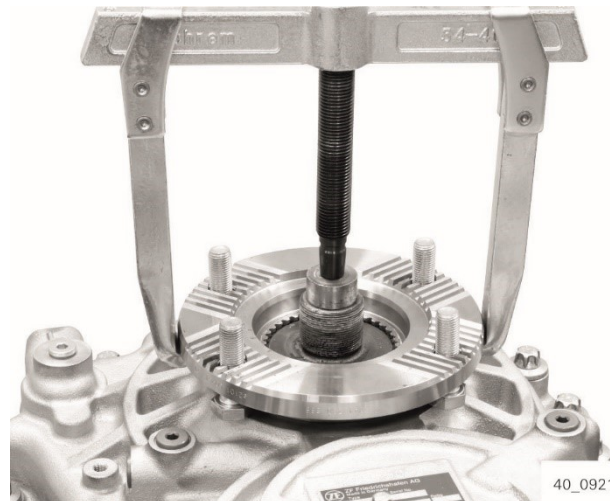


Figure 20

40\_092146\_01

## 9.6 Removing and Disassembling the PTO

### 9.6.1 Removing The Flange

#### Special Tools

- MT946520 Locking Mechanism
  1. Fix front output flange using MT946520
  2. Make sure the next two steps are done immediately one after the other.
  3. Heat collar nut to 120° C (250°F) max

#### CAUTION

Risk of burn injuries due to contact with hot surfaces.

Slight or moderate injury possible.

⇒ Wear protective gloves.

4. Unfasten Collar Nut

5. Remove flange using Two-Armed Extractor  
!If Removing PTO Unit, Leave flange in Installed Position!

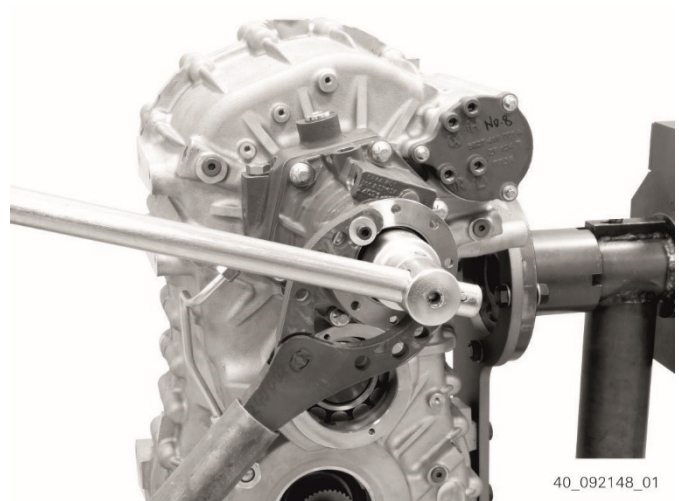


Figure 21



Figure 22



## 9.6.2 Removing PTO

### Special Tools

- MT946523 Locating pin
  1. Remove the two opposite hexalobular screws indicated (1)

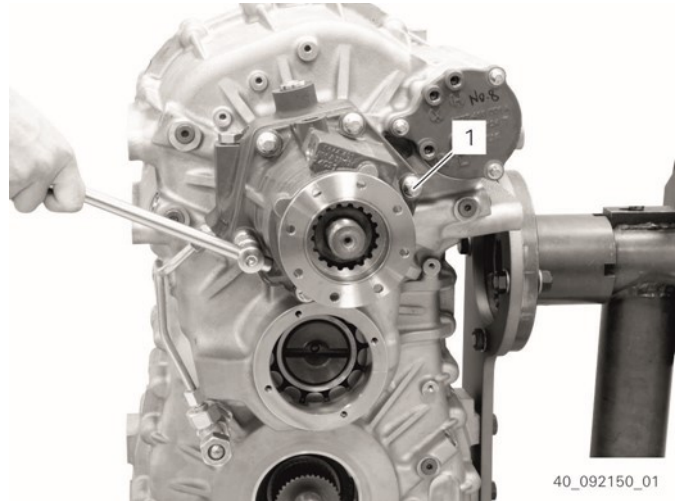


Figure 23

2. Insert and screw in two MT946523 locating pins until fully seated

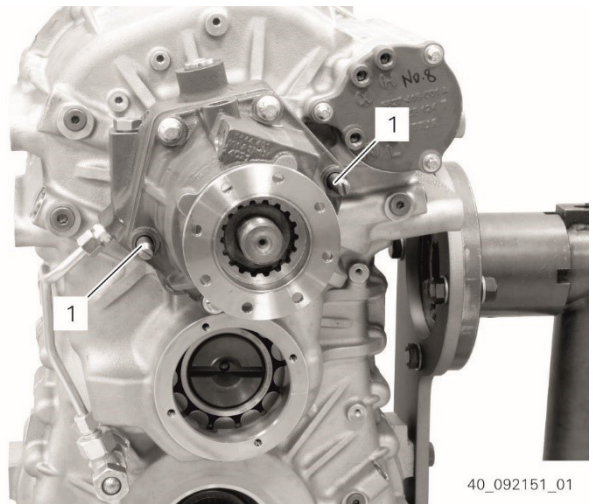


Figure 24

## CAUTION

Risk of impact injuries due to PTO being under spring compression. Slight or moderate injury possible. Do not stand directly behind PTO during disassembly and follow disassembly instructions carefully.

3. Loosen the remaining hexalobular screws evenly one full rotation
4. If necessary, give housing a slight hit with plastic deadblow until PTO loosens from case. PTO is free when flange can be moved freely by hand
5. Remove the remaining hexalobular screws evenly and carefully
6. Remove PTO

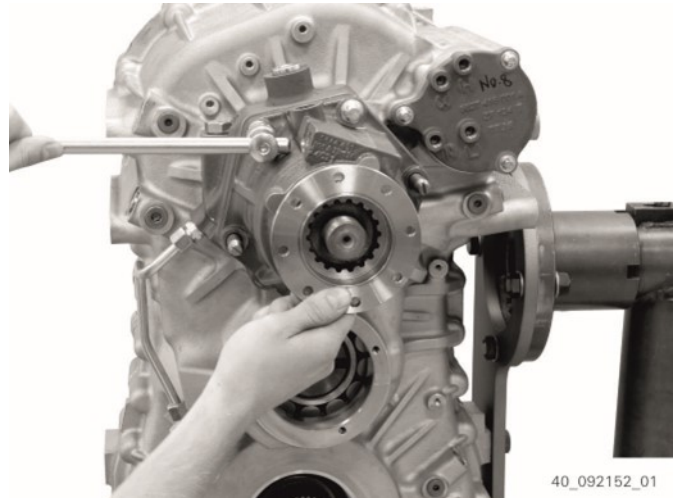


Figure 25

7. Remove Adjustment plates
8. Remove the two MT946523 [Locating Pin] (1)

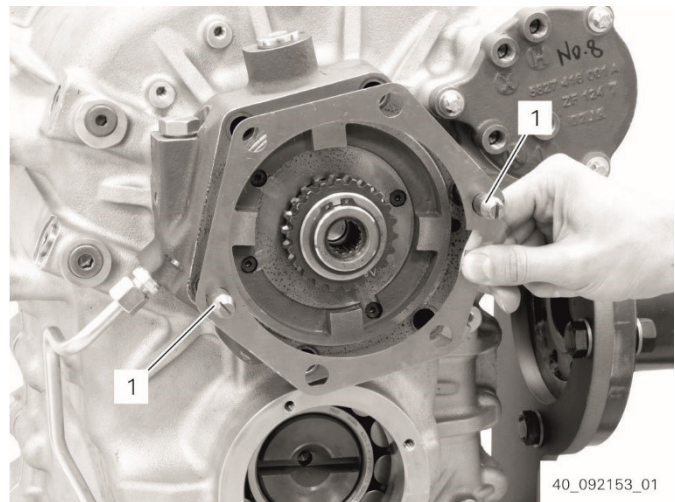


Figure 26

9. Remove Needle Cage (1)

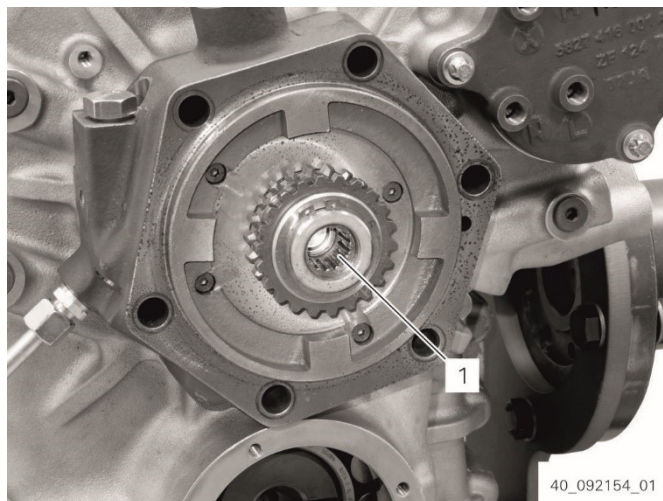


Figure 27

9.6.3 Dismantling PTO

1. Remove Compression Spring



Figure 28





2. Remove flange using two-armed extractor



40\_092156\_01

Figure 29

3. Remove Retaining Ring

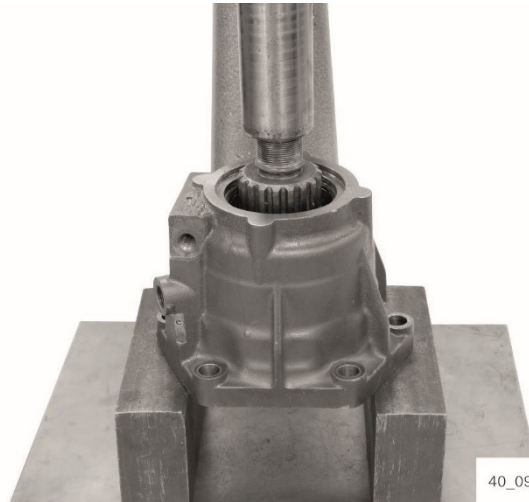


40\_092157\_01

Figure 30



4. Support Housing using blocks
5. Force output shaft, gearshift sleeve, and annular piston out of housing



40\_092158\_01

Figure 31

6. Remove retaining ring



40\_092159\_01

Figure 32

7. Remove spacer washer



40\_092160\_01

Figure 33

8. Lift annular piston off the gearshift sleeve



40\_092161\_01

Figure 34



9. Remove O-Rings (1)

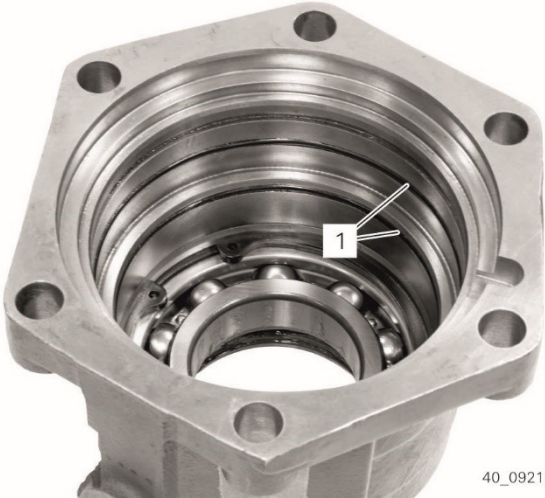


Figure 35

40\_092162\_01

10. Remove retaining ring

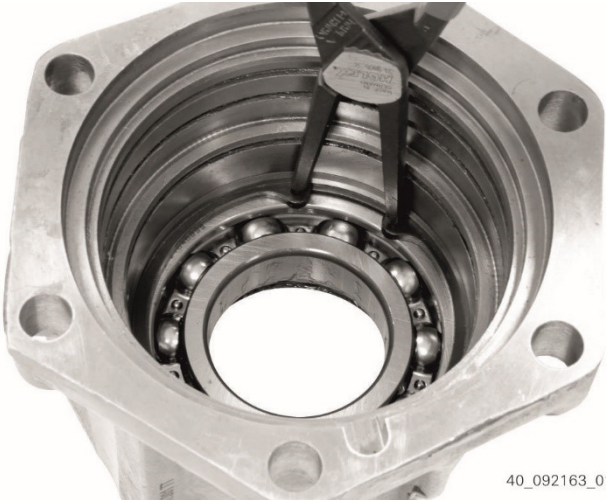
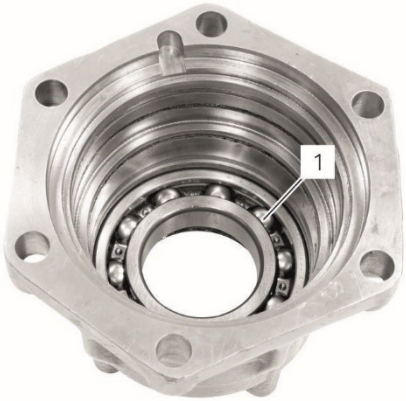


Figure 36

40\_092163\_01



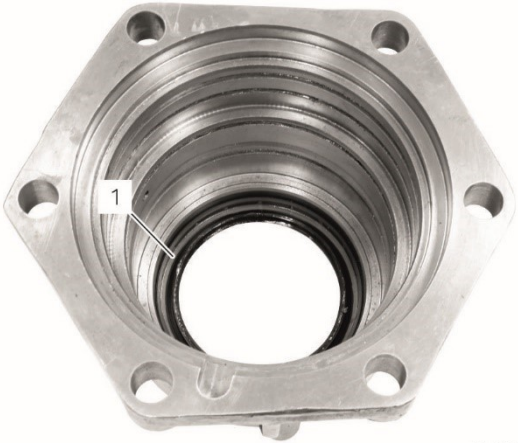
11. Remove ball bearing (1)



40\_092164\_01

Figure 37

12. Remove shaft seal (1)



40\_092165\_01

Figure 38

## 10 Assembly

### 10.1 Assembling and installing PTO

#### 10.1.1 Assembling PTO

##### *Special Tools*

- MT946524 Driver tool
- MT946525 Handle
- MT946526 Assembly fixture

##### *Operating Supplies and Auxiliary Materials*

- Denatured Alcohol
  - Stabutherm GH 461
1. Slide shaft seal with seal lip and dust lip, with the opening facing the oil chamber, onto MT946524 (Driver Tool)
  2. Apply Denatured Alcohol to outer diameter of shaft seals
  3. Use MT946524 driver tool and MT946525 (handle) to insert shaft seal into housing until fully seated
  4. Apply Stabutherm GH 461 to the inside of the shaft seal

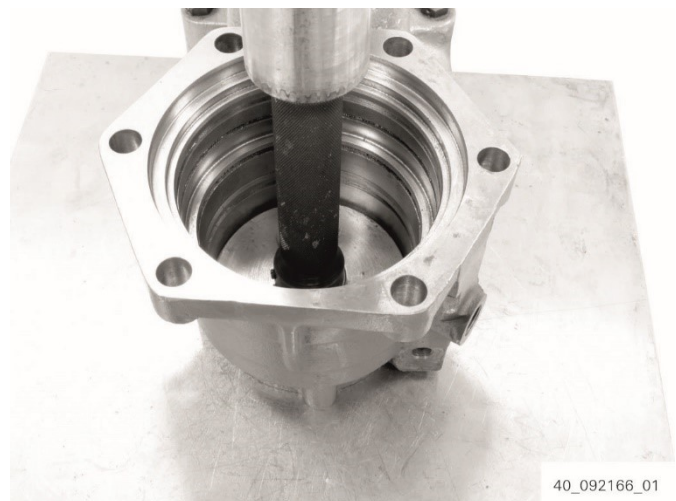


Figure 39

5. Press ball bearing onto the output shaft

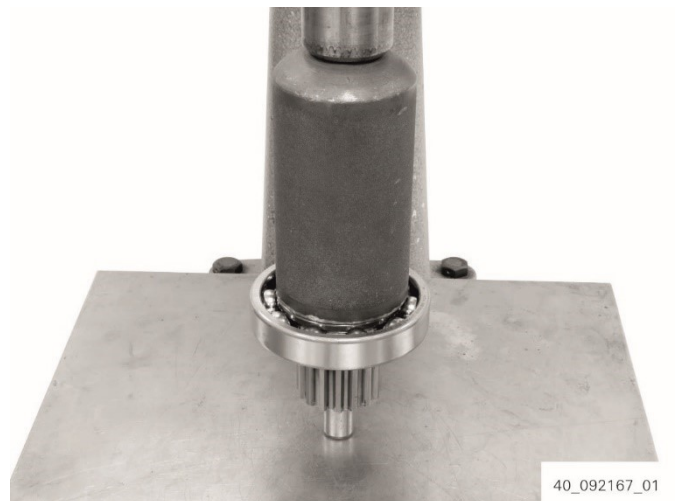
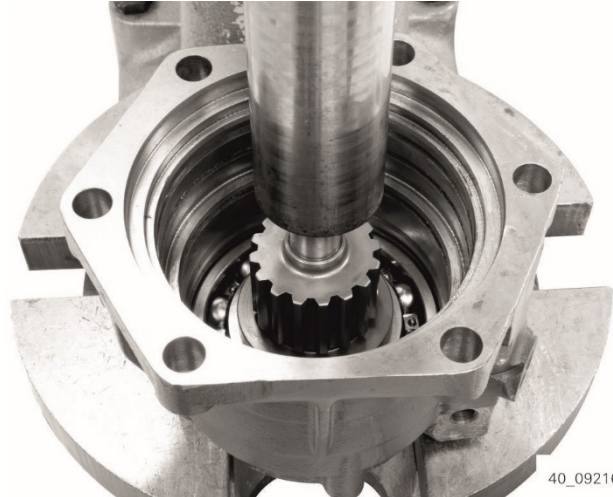


Figure 40





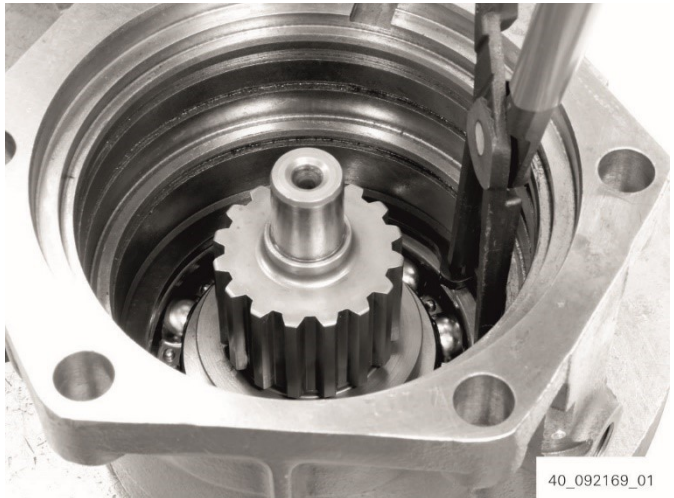
6. Force output shaft into housing with the thread facing downwards



40\_092168\_01

Figure 41

7. Insert retaining ring into lower annular groove



40\_092169\_01

Figure 42



8. Apply oil to O Rings and Insert into PTO Housing (1)

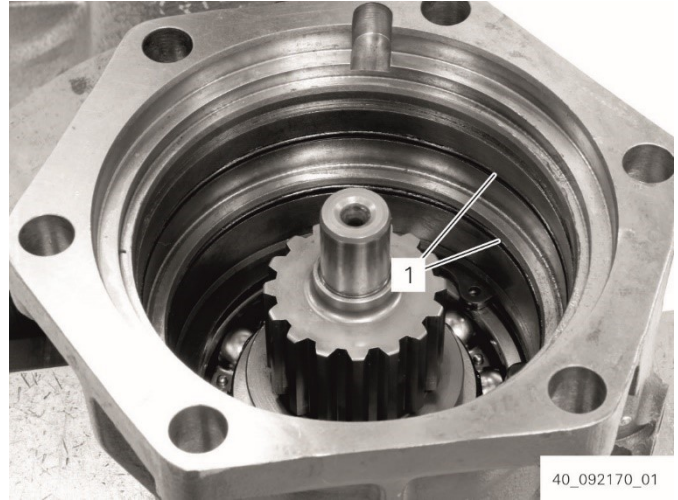


Figure 43

9. Slide annular piston onto the gearshift sleeve



Figure 44





10. Slide on spacer ring



40\_092160\_01

Figure 45

11. Insert Retaining Ring

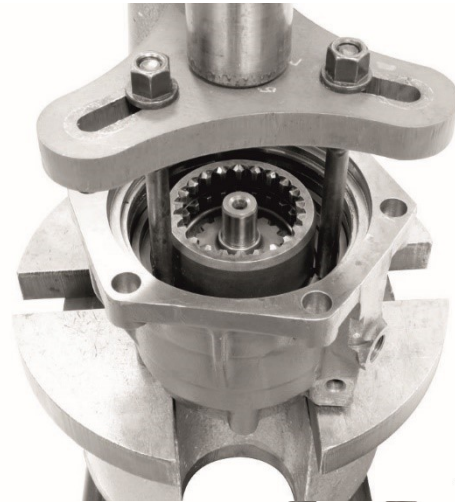


40\_092159\_01

Figure 46



12. Slide gearshift sleeve onto output shaft
13. Use MT946526 to force annular piston into housing until fully seated



40\_092171\_01

14. Insert Retaining Ring



40\_092157\_01

## 10.1.2 Fitting PTO

### Special Tools

- MT946527 Straightedge
- MT946528 Test device
- MT946523 Locating pin
- MT946529 Clamping screw

### Operating supplies and auxiliary materials:

- Loctite 518

### Adjusting PTO Shift System

1. Fasten intermediate housing with two cap screws(M14x1.5x70 to 90mm) Tighten to 120 Nm. This allows for housing to be in contact position for measurement

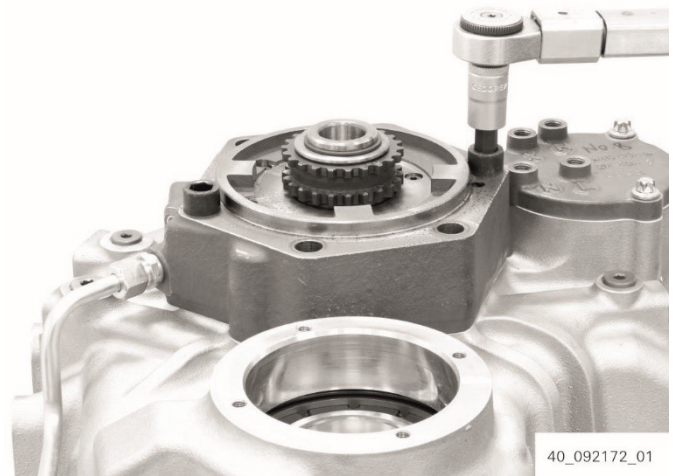


Figure 47

2. Place set of parallel gage blocks on mounting face of the intermediate housing. Put on MT946527
3. Adjust theoretical PTO adjusting distance 21.90mm ("s" rounded up to 5mm). Measure distance A from mounting face of intermediate housing to front face of sleeve. Distance A = e.g. 22.86 mm

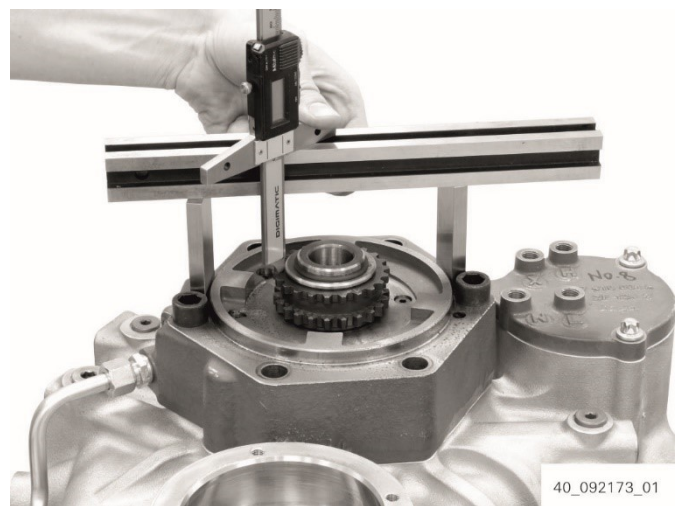


Figure 48

4. Apply  $8.5 \pm 0.5$  bar ( $123 \pm 7$  psi) to PTO using MT946528
5. Place set of parallel gage blocks on mounting face of housing. Place MT946527 straight edge on top of gage blocks
6. Measuring distance B from mounting face of housing to front face of gearshift sleeve. (e.g. 1.30mm)  
! Measure at several points and calculate the average !

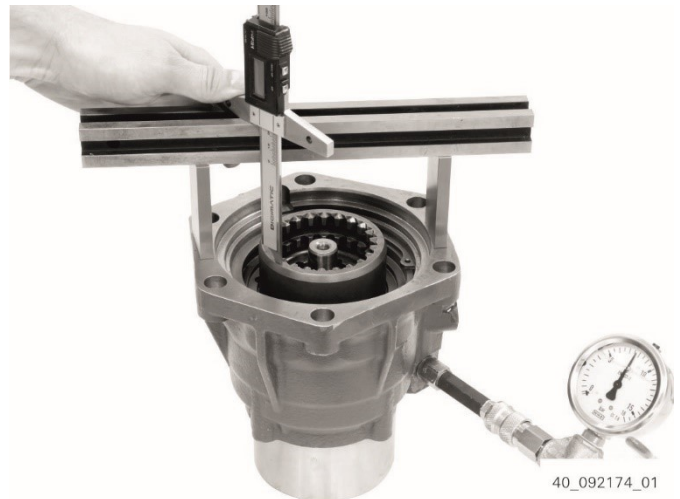


Figure 49

7. Calculate thickness of shim using the Formula on the right. Prepare shim stack to nearest .05mm of calculation
8. Insert Needle Cage (1)

$(Distance A + Distance B) - PTO\ Setting = Shim\ Stack$

Example

$$(22.86mm + 1.30mm) - 21.90mm = 2.26\ mm$$

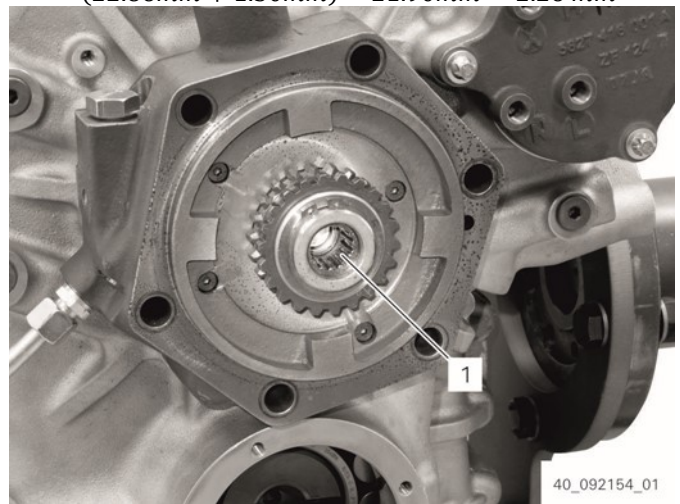


Figure 50







14. Screw in MT946529
15. Slide on PTO Housing
16. Use MT946529, bring PTO to fully seat evenly. During tightening, rotating output shaft to help engage PTO splines with input splines.

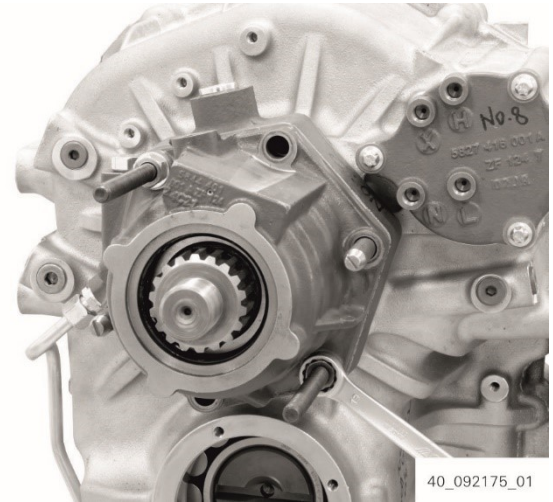


Figure 53

17. Install two of the hexalobular driving screws, tightening to 120 Nm (89 lb<sub>f</sub>-ft)
18. Remove the two MT946529 and two MT946523 from housing
19. Install remaining 4 hexalobular screws, tightening to 120 Nm (89lb<sub>f</sub>-ft)

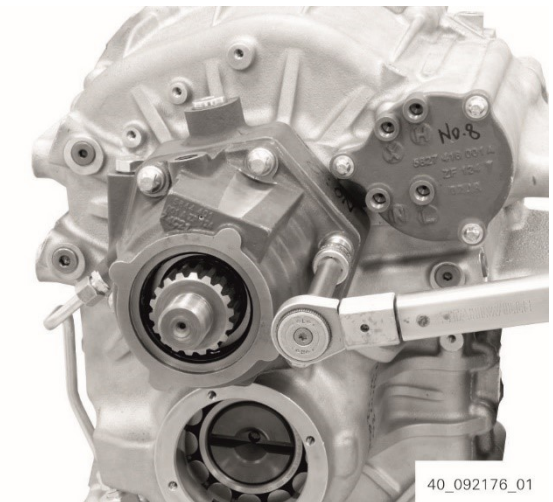


Figure 54

## 10.1.3 Fitting Flange (PTO)

### Special Tools

- MT946520 Locking mechanism

### Operating Supplies and Auxiliary Materials

- Loctite 243
  1. Make sure the next two steps are done immediately one after the other.
  2. Heat flange up to Max 120°C (250° F) ‘

### **CAUTION**

Risk of burn injuries due to contact with hot surfaces.  
Slight or moderate injury possible.  
⇒ Wear protective gloves.

3. Slide on Flange and Let Cool Down

4. Apply Loctite 243 to threads of collar nut
5. Bolt on collar nut by hand
6. Fix flange using MT946520
7. Tighten collar nut to 1080 Nm (797 lb<sub>r</sub>-ft)

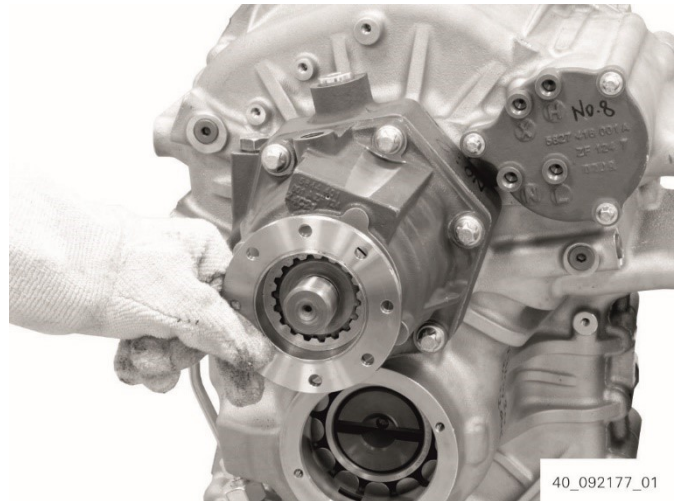


Figure 55

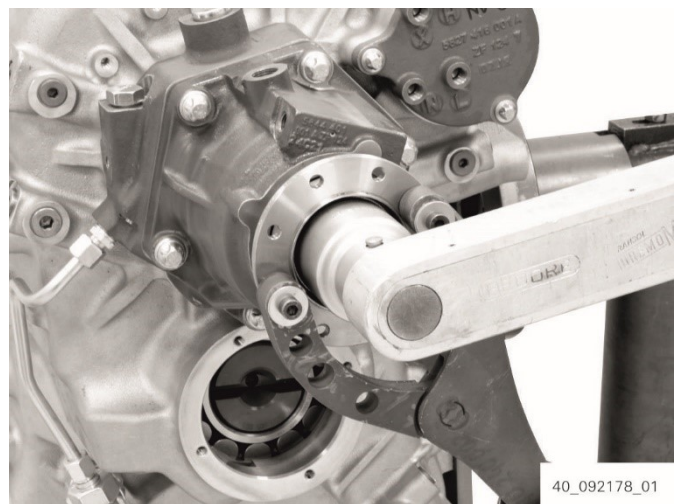


Figure 56

## 10.2 Installing Pots and Fitting Flanges

### Special tools

- MT946530 Mounting fixture
- MT946531 Bush
- MT946520 Locking mechanism
- MT946532 Bush
- MT946533 Bush

### Operating supplies and auxiliary materials

- Stabutherm GH 461
- Loctite 243

### Installing Pot and Fitting Flange (Front Output)

1. Apply Stabutherm GH 461 to the inside of shaft seals.
2. Apply LOCTITE 243 to the outer diameter of the pot.
3. Bolt MT946530 [Mounting fixture] onto shaft.
4. Insert pot into the housing until contact is obtained using MT946531 [Bush] and MT946530 [Mounting fixture].

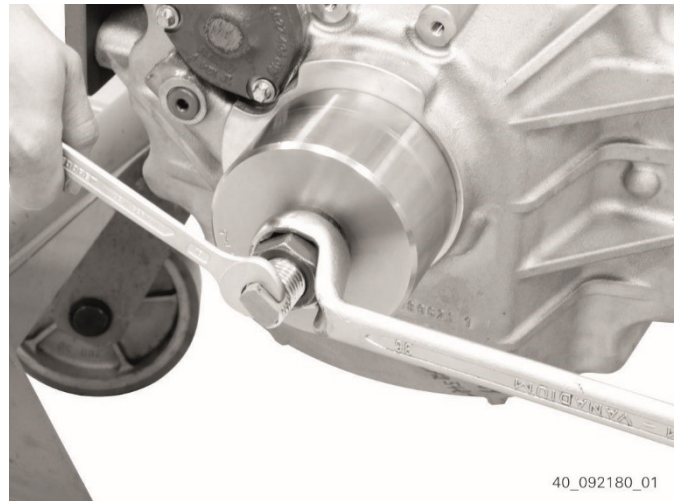


Figure 57

5. Push hexagon screws through flange
6. Make sure the next two steps are done immediately one after the other.
7. Heat flange up to Max 120°C (250° F)

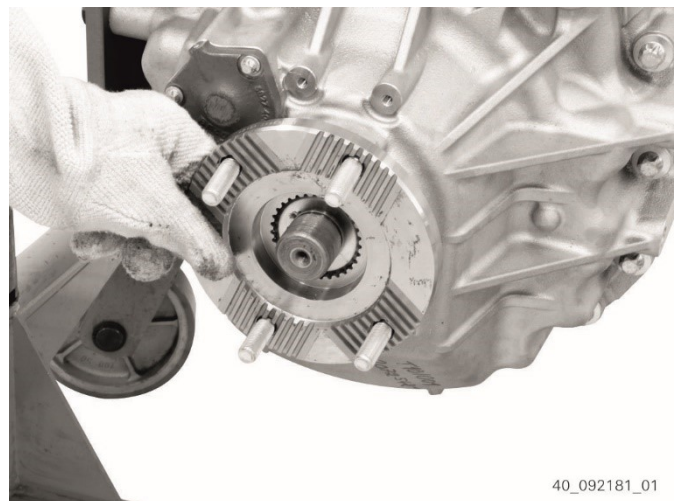


Figure 58

### CAUTION

Risk of burn injuries due to contact with hot surfaces.

Slight or moderate injury possible.

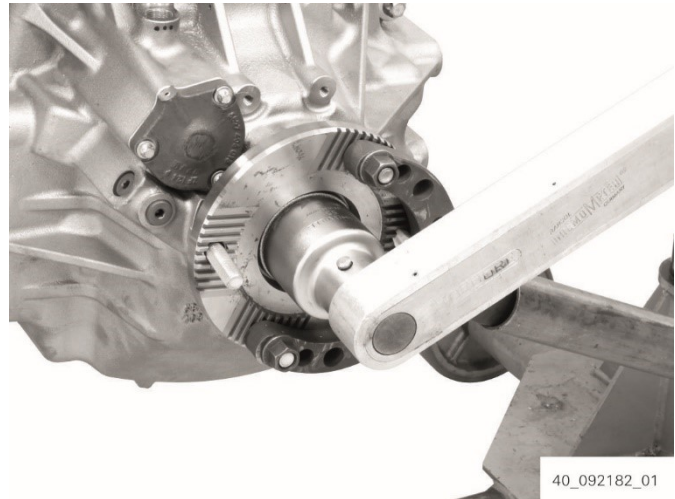
⇒ Wear protective gloves.

8. Slide on Flange and Let Cool Down





9. Apply Loctite 243 to the thread of the collar nut.
10. Bolt on collar nut by hand.
11. Fix flange using MT946520 [Locking mechanism].
12. Tighten collar nut. Tightening torque: 1,080 Nm (797 lbf-ft)

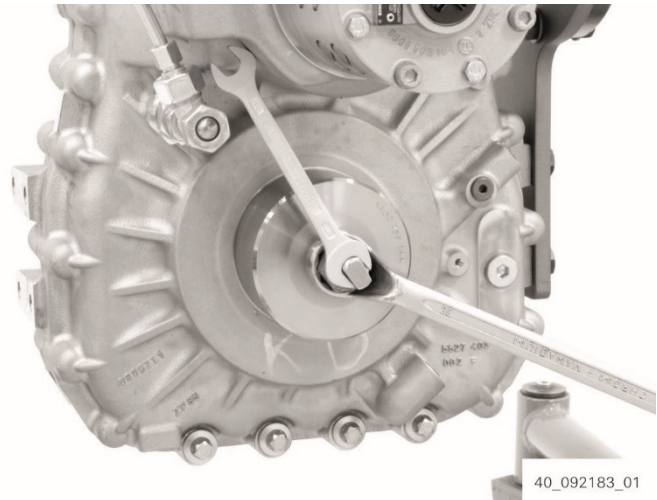


40\_092182\_01

Figure 59

## Installing Pot and Fitting Flange (Rear Output)

13. Apply Stabutherm GH 461 to the inside of shaft seals.
14. Apply Loctite 243 to the outer diameter of the pot.
15. Bolt MT946530 [Mounting fixture] onto shaft.
16. Insert pot into the housing until contact is obtained using MT946532 [Bush] and MT946530 [Mounting fixture]



40\_092183\_01

Figure 60

17. Push hexagon screws through flange
18. Make sure the the next two steps are done immediately one after the other.
19. Heat flange up to Max 120°C (250° F)

**⚠ CAUTION**

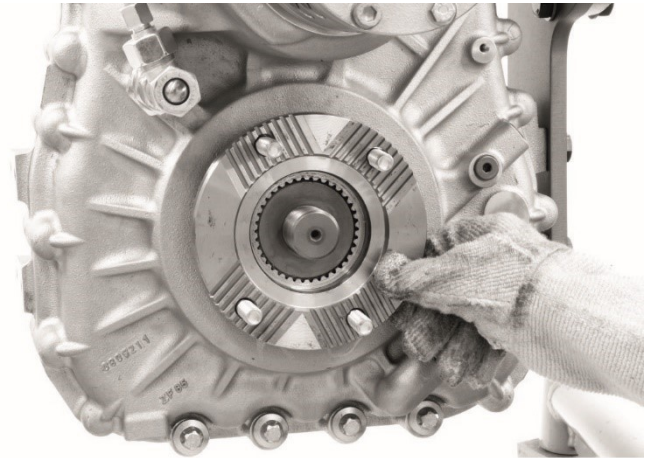
Risk of burn injuries due to contact with hot surfaces.

Slight or moderate injury possible.

⇒ Wear protective gloves.

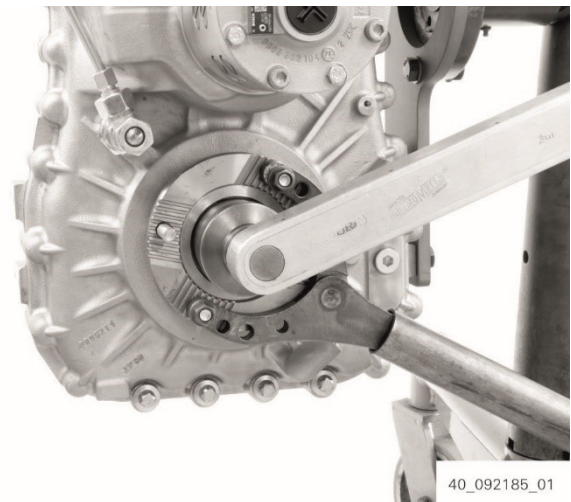
20. Slide on Flange and Let Cool Down

21. Apply Loctite 243 to the thread of the collar nut.
22. Bolt on collar nut by hand.
23. Fix flange using MT946520 [Locking mechanism].
24. Tighten collar nut. Tightening torque: 1,080 Nm (797lb<sub>r</sub>-ft)



40\_092184\_01

Figure 61



40\_092185\_01

Figure 62

## Installing Pot and Fitting Flange (Input)

25. Apply STABUTHERM GH 461 to the inside of shaft seals.
26. Apply LOCTITE 243 to the outer diameter of the pot.
27. Bolt MT946530 [Mounting fixture] onto shaft.
28. Insert pot into the housing until contact is obtained using MT946533 [Bush] and MT946530 [Mounting fixture].

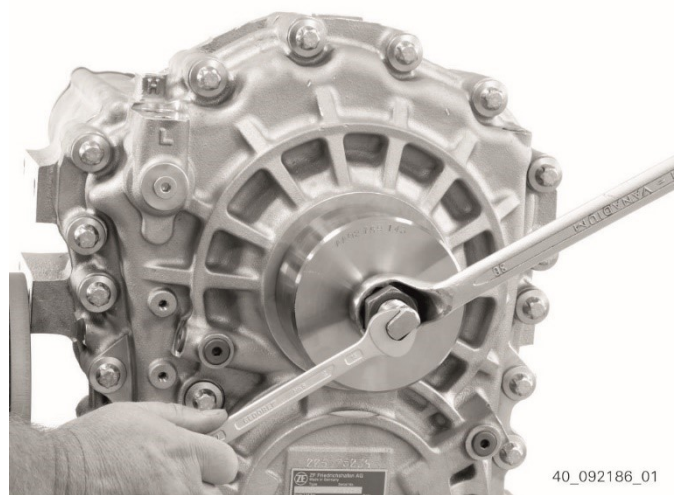


Figure 63

28. Push hexagon screws through flange
29. Make sure the the next two steps are done immediately one after the other.
30. Heat flange up to Max 120°C (250° F)

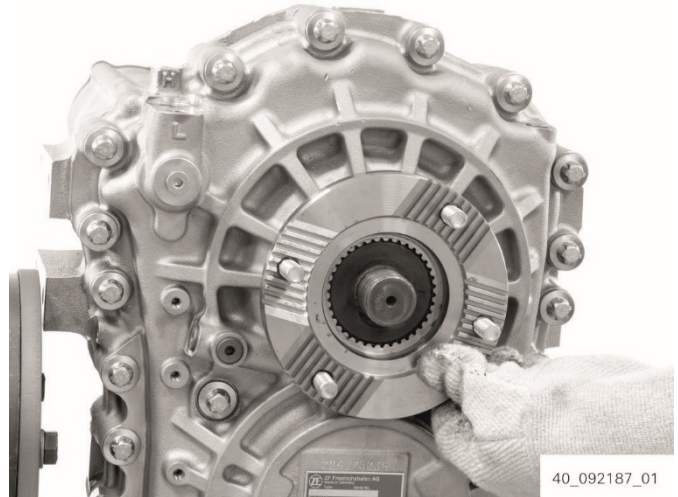
### CAUTION

Risk of burn injuries due to contact with hot surfaces.

Slight or moderate injury possible.

⇒ Wear protective gloves.

31. Slide on Flange and Let Cool Down





32. Apply Loctite 243 to the thread of the collar nut.
33. Bolt on collar nut by hand.
34. Fix flange using MT946520 [Locking mechanism].
35. Tighten collar nut. Tightening torque: 1,080 Nm (797 lbr-ft)

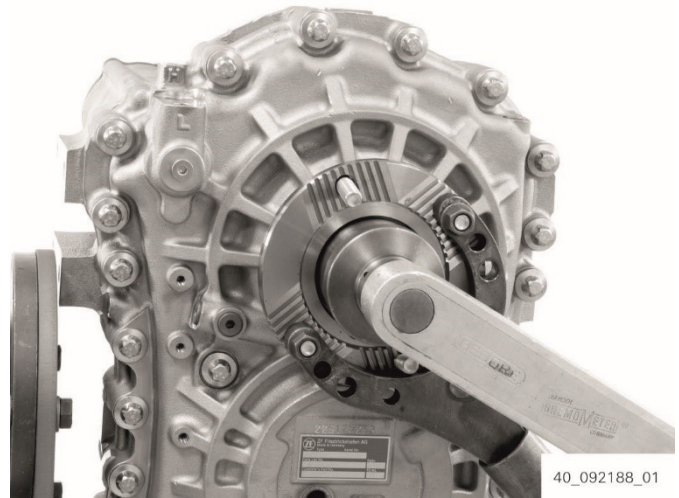


Figure 64

## 10.3 Mounting the Piston Pump

1. Apply oil to O-ring
2. Insert O-ring (1)



40\_092159\_01

Figure 65



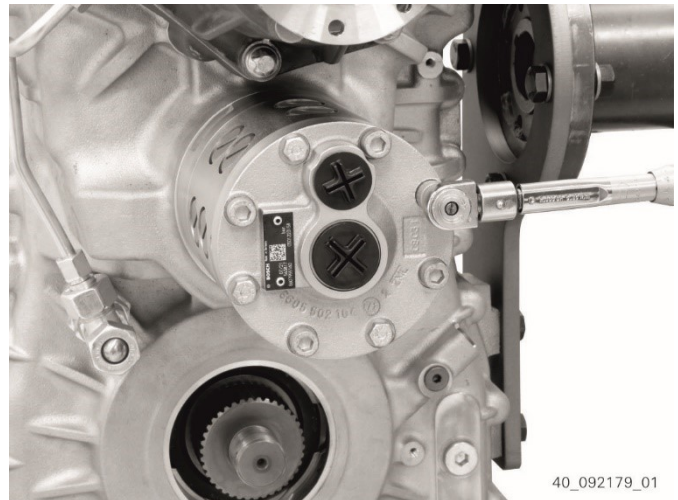
2. Slide coupling sleeve (1) onto piston pump



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Figure 66

3. Fix piston pump with hexalobular driving screws. Tighten to 20 Nm (15 lb-ft)



40\_092179\_01

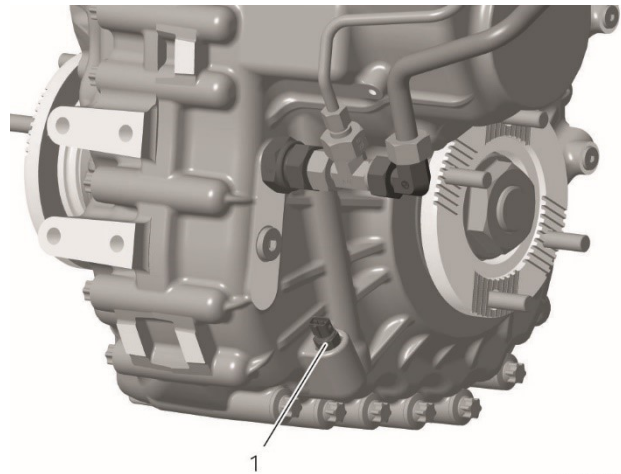
Figure 67



## 10.4 Installing the Temperature Sensor

1. Turn in temperature sensor with o-ring and tighten to 34 Nm (25 lb<sub>r</sub>-ft)

On equipped cases



40\_092193\_01

Figure 68

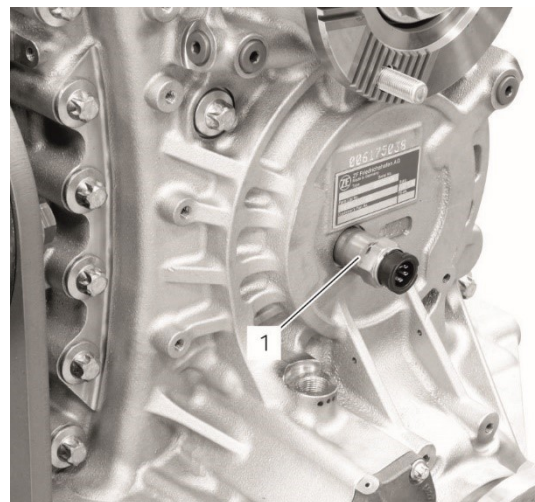
## 10.5 Installing the Speedo Sensor and Gear Indicators

### Special Tools

- MT946528 Test device
- AA01.304.497 Multimeter

### Install Speedo Sensor

1. Turn in the Pulse sensor (1) and tighten to 43 Nm (32 lb<sub>r</sub>-ft)



40\_092134\_01

Figure 69

## Install Gear Indicators

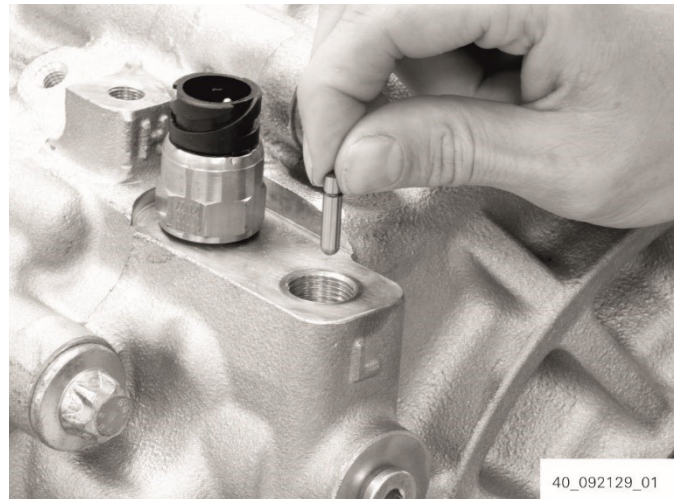
2. Insert snap ring (1) into annular groove of the pin.



40\_092135\_01

Figure 70

3. Depending on the variant, push pin or pins into the holes with snap ring towards top of case.



40\_092129\_01

Figure 71



4. Depending on the variant turn in pressure switch or pressure switches (1) with sealing ring and tighten. Tightening torque: 43 Nm (32 lb<sub>r</sub>-ft)  
 Low Gear Indicator Installed on forward of case (next to L boss)  
 High Gear Indicator (if equipped) installed on rearward portion of case (next to H boss)

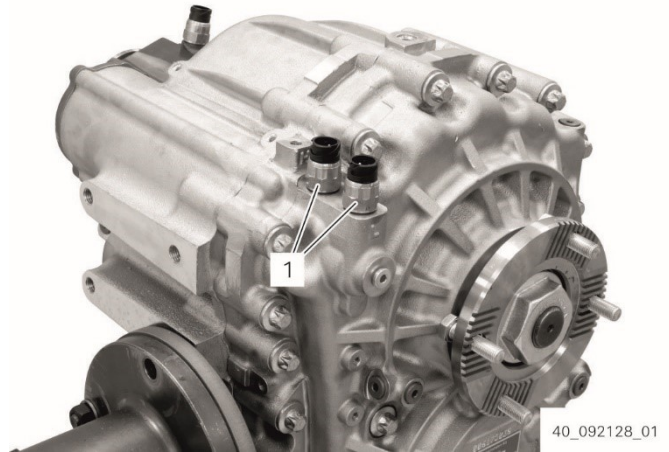


Figure 72

5. Apply 8.5 bar ( $\pm 0.5$  bar) compressed air to shift position (L) using MT946528 [Test device].
6. Rotate flange until shift system engages.
7. Check continuity from contact 1 to contact 2 or from contact 1 to contact 3 using AA01.304.497 [Multimeter].

The pressure switch allows a signal to pass when gear is engaged. If the pressure switch does not allow a signal to pass when gear is engaged, check pressure switch. If pressure switch okay, check shifting by measuring rotation of input vs rotation of output

8. Release compressed air.

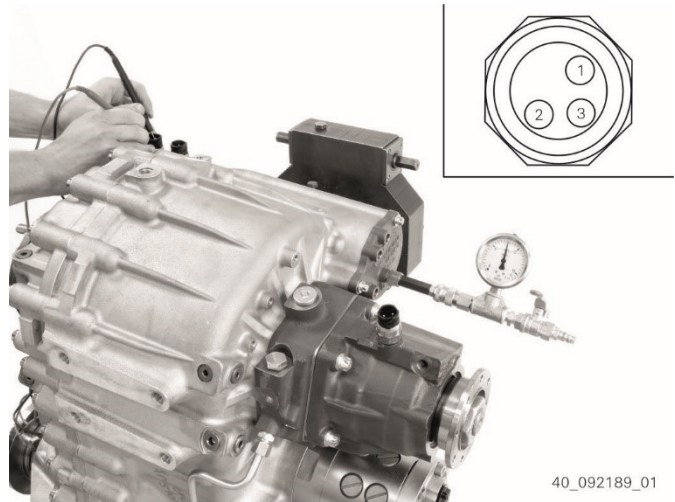


Figure 73

9. For variant with spring-operated shift system use AA01.304.497 [Multimeter] to check continuity from contact 1 to contact 2 or from contact 1 to contact 3.  
 The pressure switch does not allow a signal to pass.  
 If pressure switch allows a signal to pass, check pressure switch.

## Checking Gear Shift System for Leak Tightness

1. Apply 8.5 bar ( $\pm 0.5$  bar) compressed air to Low shift port using MT946528 [Test device].
2. Close shut-off valve.
3. Wait 3 minutes.
4. Read pressure.

After the waiting time, there should be no discernible pressure loss in system. If the pressure drops, use leak spray to find and repair the leak.

5. Repeat for High and Neutral ports

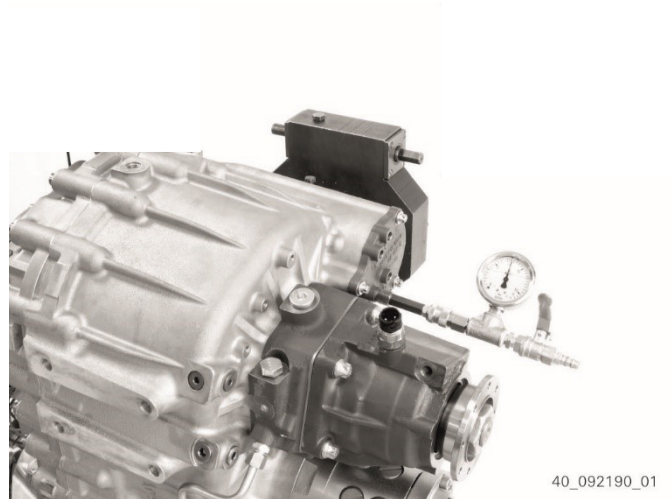


Figure 74

## Install FAE Indicator

6. Insert snap ring (1) into annular groove of the pin.



Figure 75



7. Slide pin into FAE Indicator hole with snap ring towards top of case

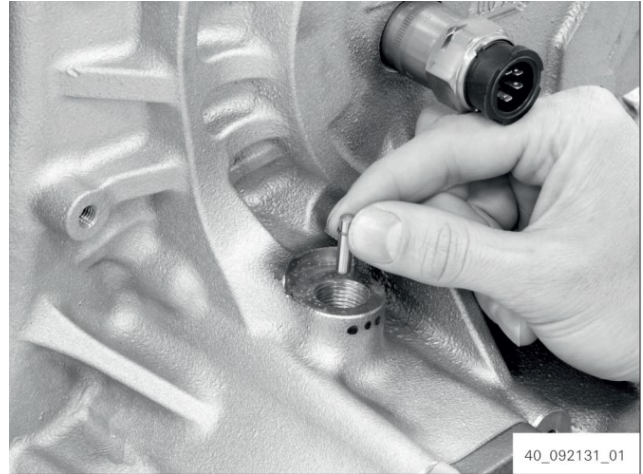


Figure 76

8. Install Indicator Switch (1) with sealing ring and tighten. Tightening torque: 43 Nm (32 lbf-ft)

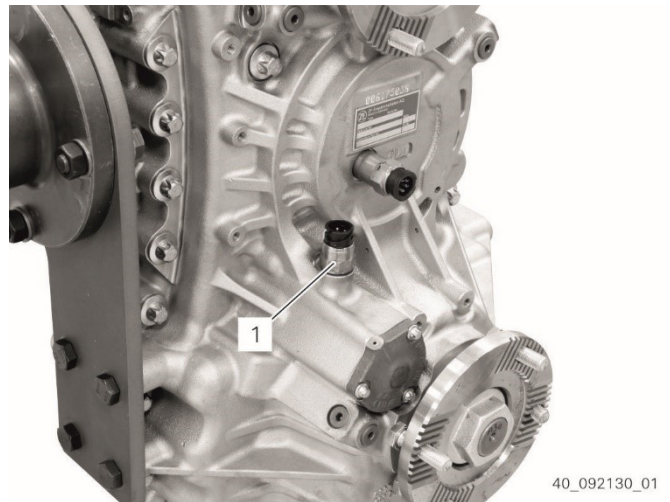


Figure 77

## Check Front Axle Engage Indicator function

1. Apply 8.5 bar ( $\pm 0.5$  bar) compressed air to Xshift position using MT946528 [Test device].
2. Rotate front output flange until gearshift sleeve engages.

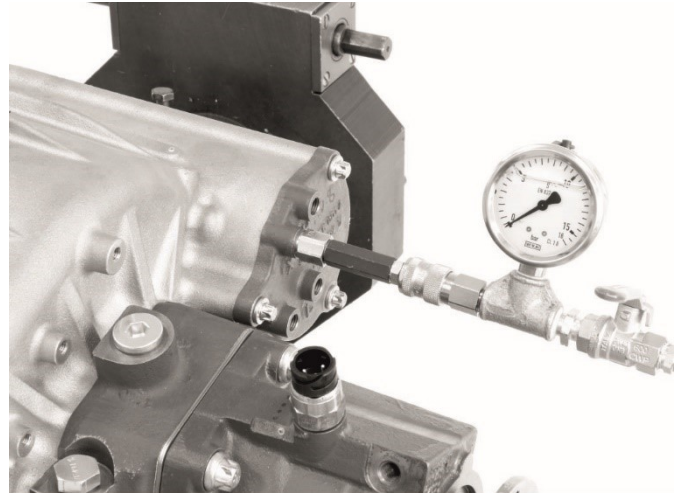


Figure 78

3. Check continuity from contact 1 to contact 2 or from contact 1 to contact 3 using AA01.304.497 [Multimeter].
4. The Indicator switch should allow a signal to pass. If the pressure switch does not allow a signal to pass, check pressure switch.
5. Release compressed air.
6. Check continuity from contact 1 to contact 2 or from contact 1 to contact 3 using AA01.304.497 [Multimeter].  
The indicator switch should not allow a signal to pass

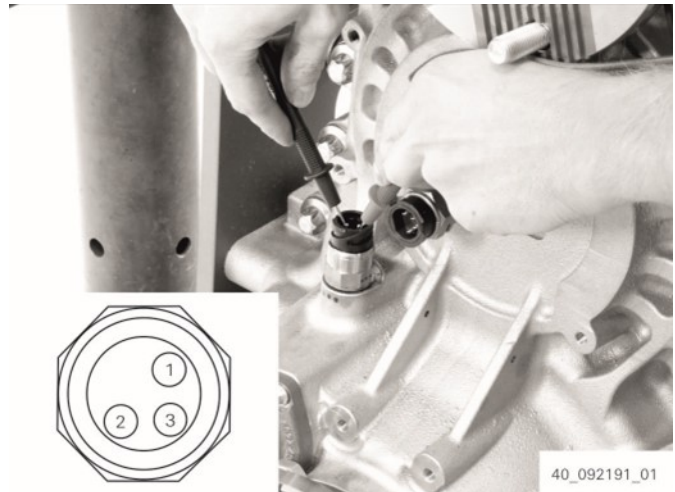


Figure 79

## Checking Front Axle Engagement for Leaks

1. Apply 8.5 bar ( $\pm 0.5$  bar) compressed air to Low shift port using MT946528 [Test device].
2. Close shut-off valve.
3. Wait 3 minutes.
4. Read pressure.

After the waiting time, there should be no discernible pressure loss in system. If the pressure drops, use leak spray to find and repair the leak.

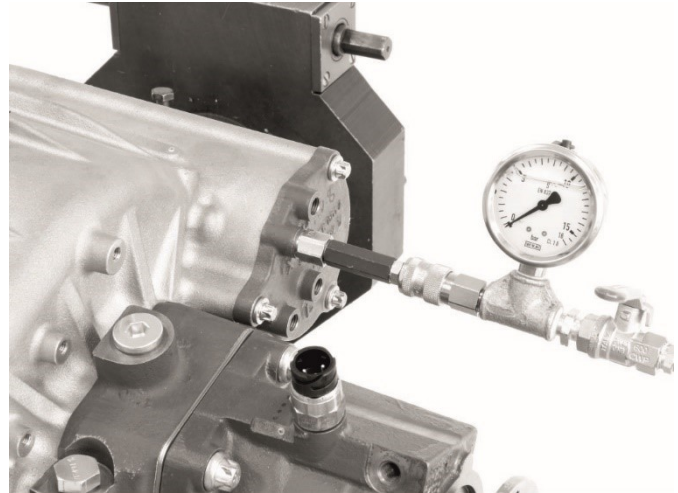


Figure 80

## Installing PTO Indicator Switch

1. Insert snap ring (1) into annular groove of the pin.



Figure 81

40\_092135\_01





1. Slide pin into FAE Indicator hole with snap ring towards top of case



Figure 82

2. Install Indicator Switch (1) with sealing ring and tighten. Tightening torque: 43 Nm (32 lbf-ft)

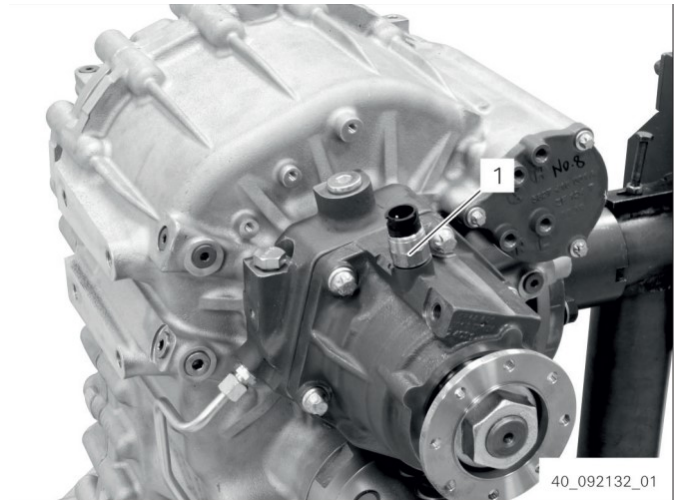


Figure 83

### Check PTO Indicator Switch

1. Apply 8.5 bar ( $\pm 0.5$  bar) compressed air to Xshift position using MT946528 [Test device].
2. Rotate front output flange until gearshift sleeve engages.
3. Check continuity from contact 1 to contact 2 or from contact 1 to contact 3 using AA01.304.497 [Multimeter].
4. The Indicator switch should allow a signal to pass. If the pressure switch does not allow a signal to pass, check pressure switch.
5. Release compressed air.
6. Check continuity from contact 1 to contact 2 or from contact 1 to contact 3 using AA01.304.497 [Multimeter].  
The indicator switch should not allow a signal to pass

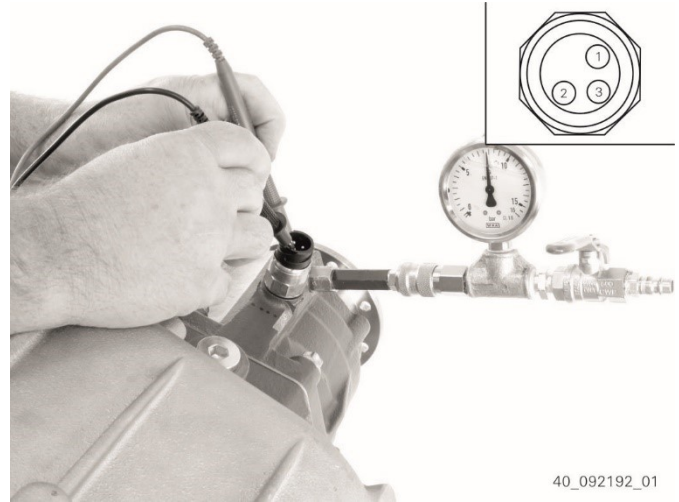


Figure 84

### Check PTO Shift System for Leaks

7. Apply 8.5 bar ( $\pm 0.5$  bar) compressed air to PTO shift port using MT946528 [Test device].
  8. Close shut-off valve.
  9. Wait 3 minutes.
  10. Read pressure.
- After the waiting time, there should be no discernible pressure loss in system. If the pressure drops, use leak spray to find and repair the leak.

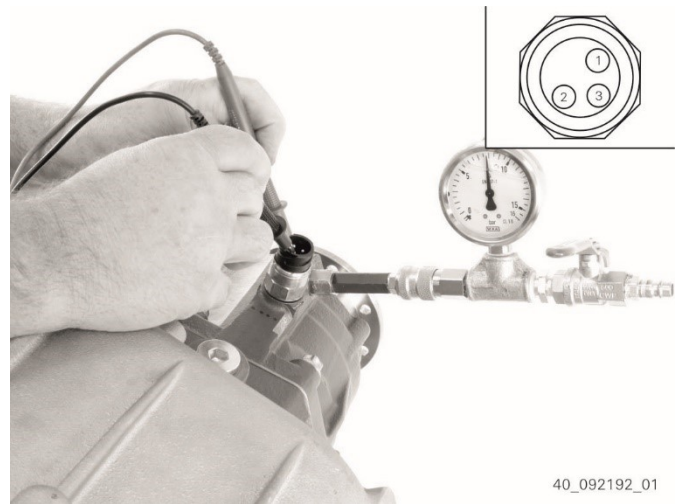


Figure 85



## 10.6 Installing The Breather

1. Bolt in breather (1) and tighten to 12 Nm (9 lbr-ft)



Figure 86

## 11 Follow Up Activities

### 11.1 Installing Screw plug of Front Axle Drive

1. Turn in screw plug and tighten to 25 Nm (18 lbr-ft)

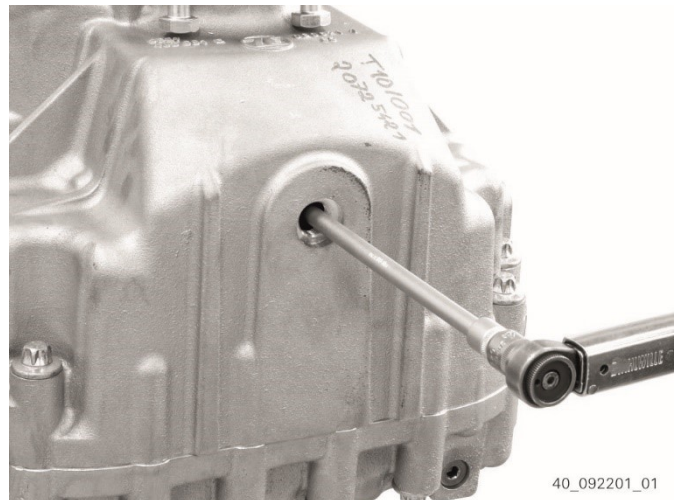


Figure 87

### 11.2 Filling Oil

Fill with oil according to Operating Instructions before commissioning the unit



## 12 Appendix

### 12.1 Change Log

#### **REV A – 14 Apr 2023**

- Initial Release