

## GROUP 4 DISASSEMBLY AND ASSEMBLY

### 1. CONTROL VALVE

#### 1) DISASSEMBLY

(1) Loosen the cap screws and take off the gear shift housing.

※ Special tool  
Socket spanner TX-27      5873 042 002

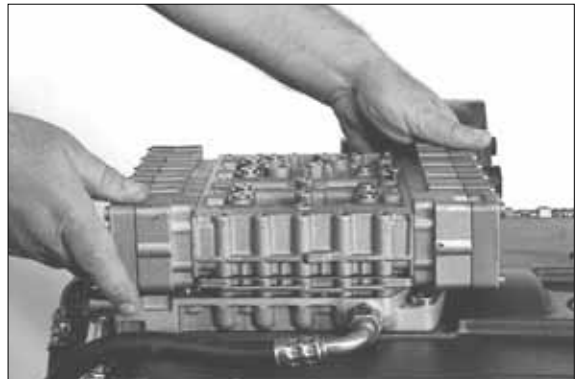


Figure 1001

(2) Separate the hose lines from the duct plate. Loosen the cap screws as well as the gasket from the transmission housing.

※ Special tool  
Socket spanner TX-40      5873 042 004

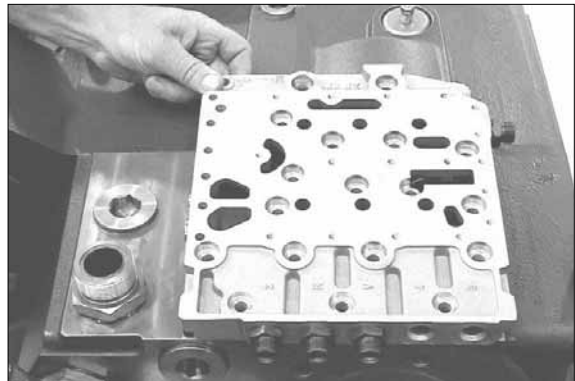


Figure 1002

(3) Mark the installation position of the wiring harness to the valve block.

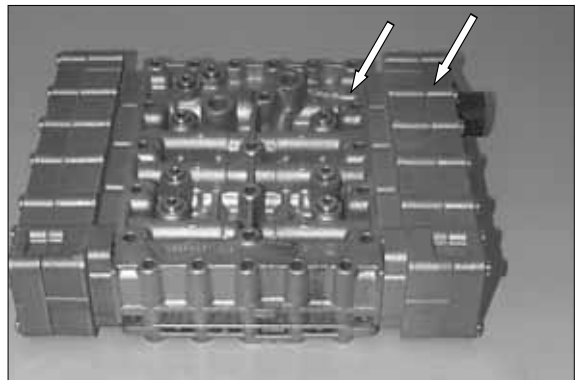


Figure 1003

(4) Loosen the cap screws.  
Separate duct plate and intermediate plate from the valve block.

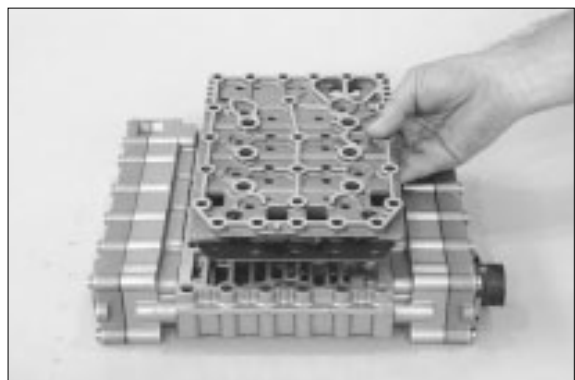


Figure 1004

(5) Remove the retaining clamp

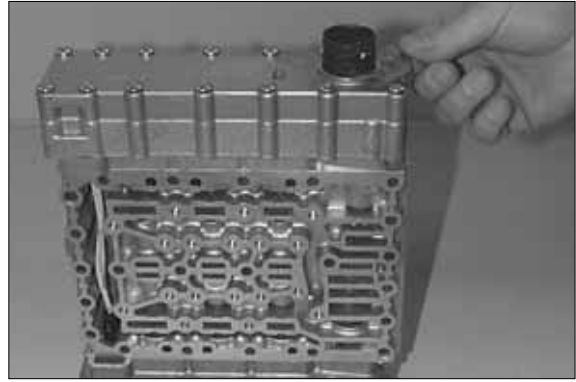


Figure 1005

(6) Loosen the cap screws and take off the cover.  
Remove the opposite cover.

※ Special tool  
Socket spanner TX-27      5873 042 002



Figure 1006

(7) Remove the wiring harness.

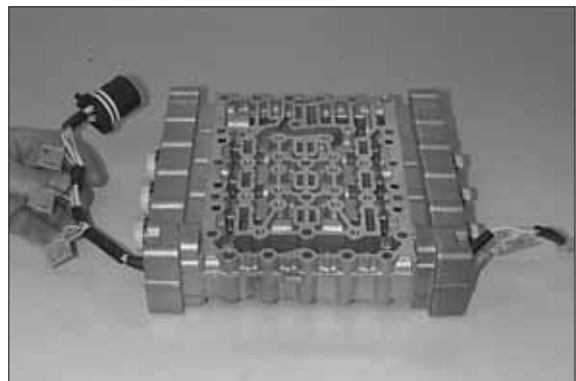


Figure 1007

(8) Loosen the cap screws, remove the fixing plates and the pressure controllers.

※ Special tool  
Socket spanner TX-27      5873 042 002

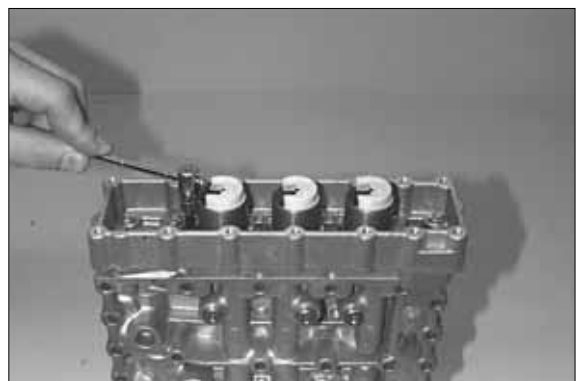


Figure 1008

(9) Loosen two cap screws and fasten the housing preliminarily by means of adjusting screws(housing is preloaded). Then loosen the remaining cap screws.

※ Special tool  
Adjusting screws                    5870 204 036

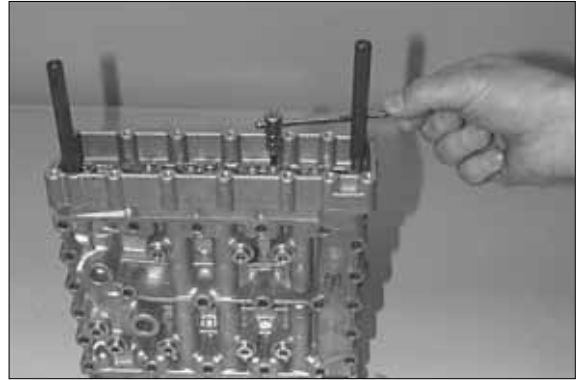


Figure 1009

(10) Separate the housing from the valve housing by equally loosening the adjusting screws.

※ Special tool  
Adjusting screws                    5870 204 036

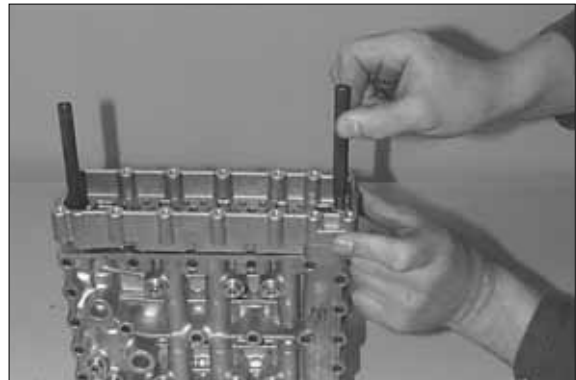


Figure 1010

(11) Remove the single components.

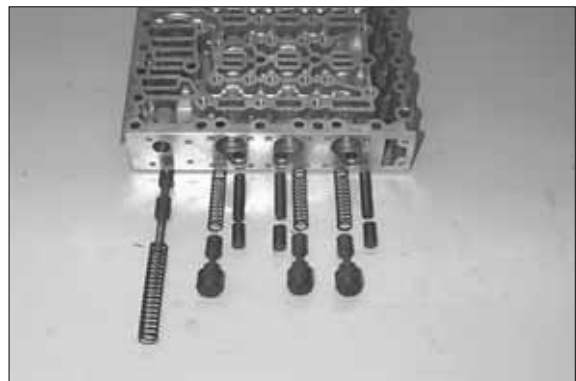


Figure 1011

(12) Remove the opposite pressure controllers, the housing as well as single components analogously.

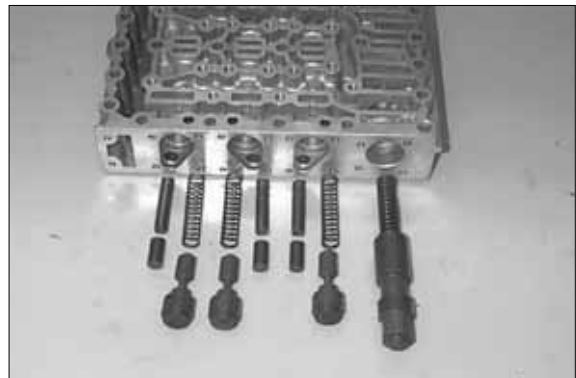


Figure 1012

## 2) ASSEMBLY

- ※ All single components are to be checked for damage and replaced, if required.  
Prior to installation check the mobile parts in the housing for functionality.  
Pistons can be replaced individually.  
Oil the single components prior to installation.  
Place the orifices, with the concave side showing upwards, until contact.
- ※ Installation position, see arrows.

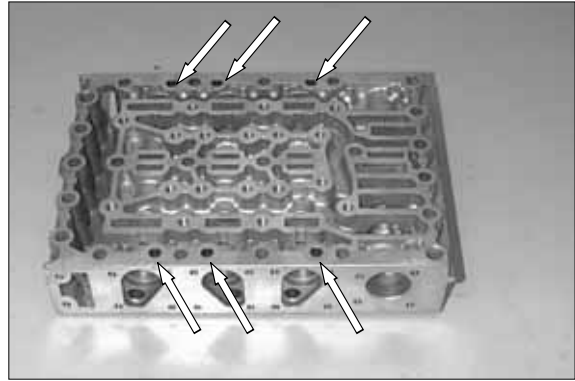


Figure 1013

- (1) Opposite figure shows the following single components.
- 1 Vibration damper  
(3EA, Piston & comp spring)
  - 2 Follow-on slide  
(3EA, Piston & comp spring)
  - 3 Pressure reducing valve  
(1EA, Piston & comp spring)

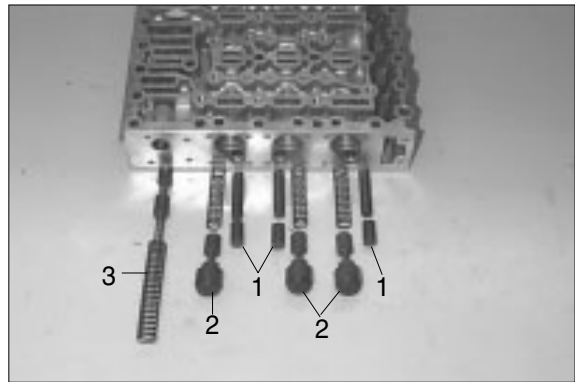


Figure 1014

- (2) Install the single components according to figure 1014.
- ※ Preload the compression springs of the follow-on slides and fasten the pistons preliminarily by means of cylindrical pins  $\varnothing 5.0\text{mm}$ (assembly aid), see arrows/ Figure 1015.

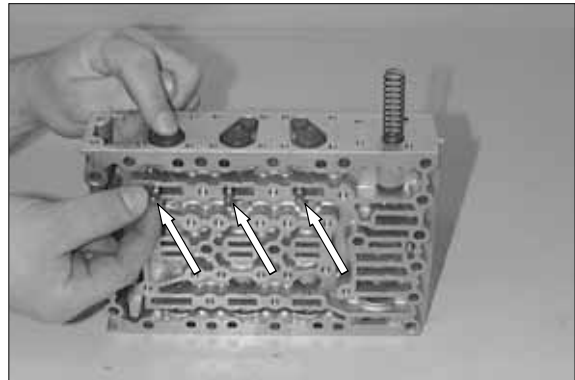


Figure 1015

- (3) Install two adjusting screws.  
Assemble gasket(arrow) and housing cover(Figure 1016).  
Then place the housing cover by means of adjusting screws equally until contact (Figure 1017).
- ※ Special tool  
Adjusting screws 5870 204 036

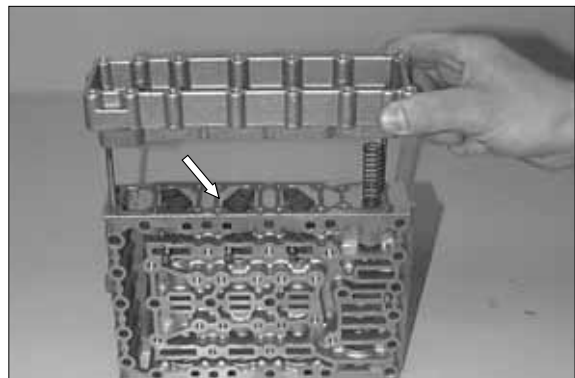


Figure 1016

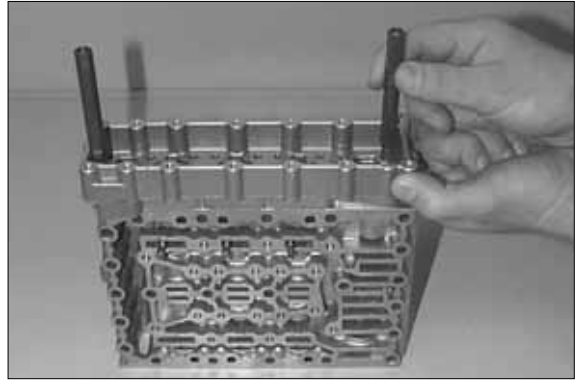


Figure 1017

- (4) Preload the pistons and remove the adjusting screws(assembly aid) again.

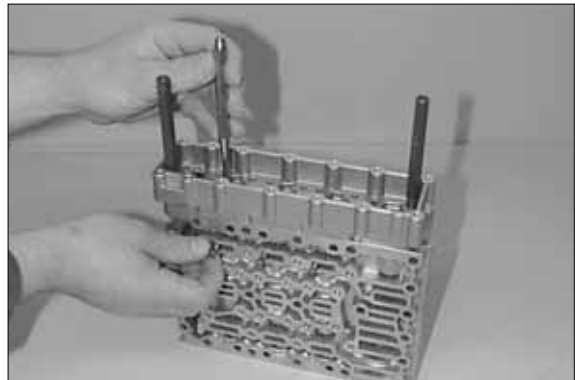


Figure 1018

- (5) Fasten the housing cover with cap screws.  
 · Torque limit : 0.76kgf · m(5.53lb · ft)

※ Special tool

Socket spanner TX-27      5873 042 002

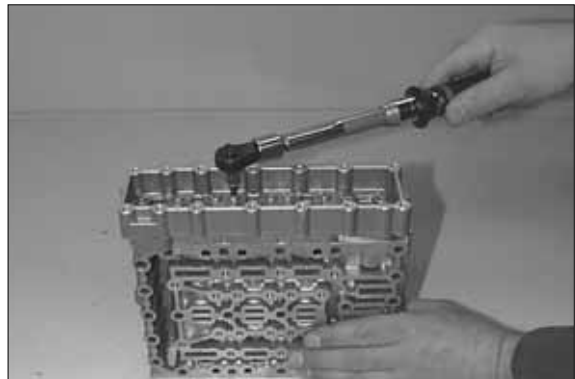


Figure 1019

- (6) Assemble the pressure controllers and fasten them by means of fixing plates and cap screws.

※ Install the fixing plate with the neck showing downwards.

Observe radial installation position of the pressure controllers, see Figure.

· Torque limit : 0.56kgf · m(4.06lb · ft)

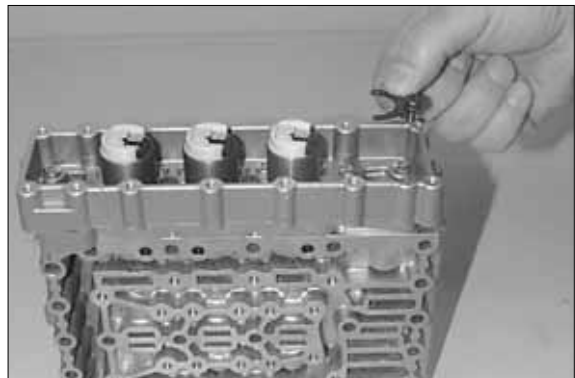


Figure 1020

**Preassemble the opposite side :**

(7) The opposite figure shows the following single components :

- 1 Main pressure valve  
(1EA, Piston & comp spring)
- 2 Follow-on slide  
(3EA, Piston & comp spring)
- 3 Vibration damper  
(3EA, Piston & comp spring)

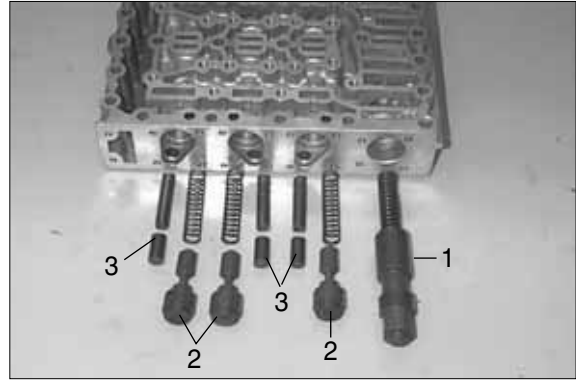


Figure1021

(8) Install the single components according to Figure 1021.

Preload the compression springs of the follow-on slides and fasten the piston preliminarily by means of cylindrical pins  $\varnothing 5\text{mm}$ (assembly aid), see arrows.

Install two adjusting screws.

Assemble the gasket(arrow 1) and the housing cover and place them equally until contact by means of adjusting screws.

Then fasten the housing cover with cap screws.

- Torque limit :  $0.76\text{kgf} \cdot \text{m}$ ( $5.53\text{lb} \cdot \text{ft}$ )

Remove the cylindrical pins(assembly aid) again.

※ Special tool

Adjusting screws                      5870 204 036

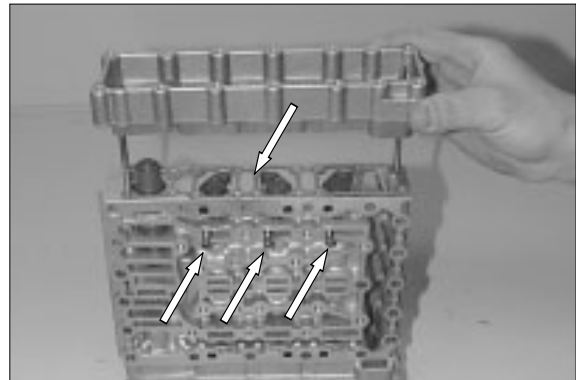


Figure1022

(9) Assemble the pressure controllers and fasten them by means of fixing plates and cap screws.

※ Install the fixing plates with the neck showing downwards.

Observe radial installation position of the pressure controllers, see Figure.

- Torque limit :  $0.56\text{kgf} \cdot \text{m}$ ( $4.06\text{lb} \cdot \text{ft}$ )

※ Special tool

Socket spanner TX-27                5873 042 002

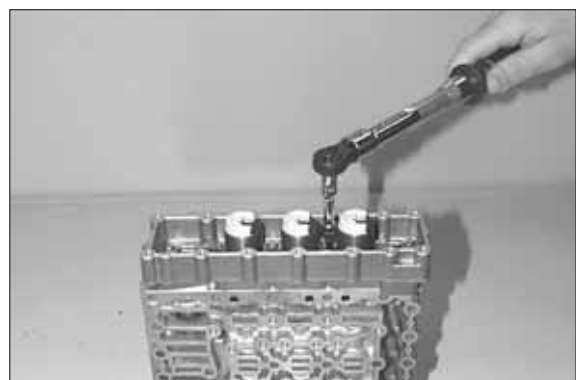


Figure1023

(10) Assemble the wiring harness and connect the pressure controllers(6EA).

※ Pay attention to the installation position of the wiring harness, also see markings (Figure 1003).

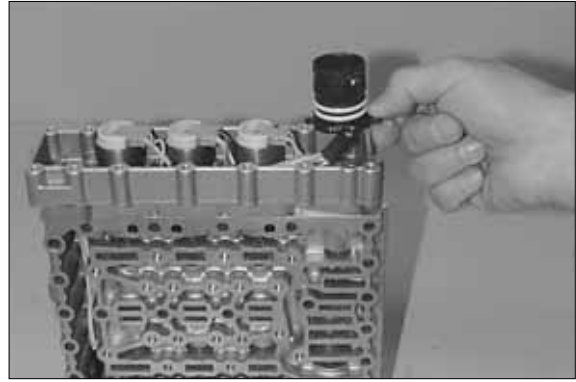


Figure1024

(11) Put on the flat gasket(arrow).

Assemble the plug socket with the slot showing to the lug of the cover until contact.

Fasten the cover by means of cap screws.

• Torque limit : 0.76kgf · m(5.53lbf · ft)

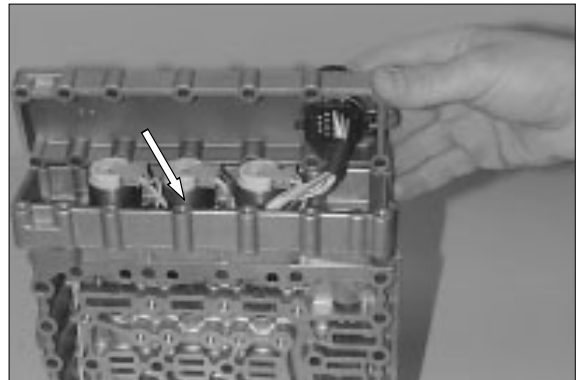


Figure1025

(12) Fasten the plug socket a retaining clamp.

Install the opposite cover.



Figure 1026

(13) Screens(6EA) are to be flush mounted into the bores of the intermediate sheet, see arrows.

※ Observe the installation position-the screens are showing upwards(to the duct plate)

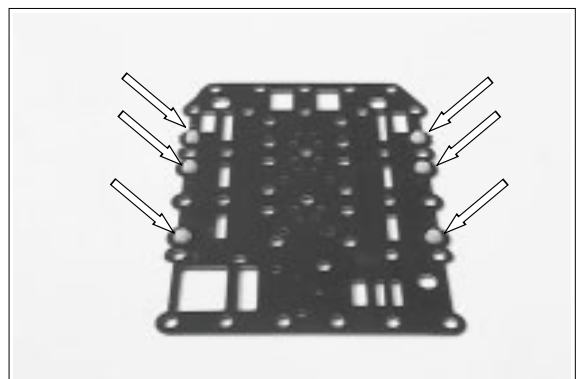


Figure1027

- (14) Install two adjusting screws.  
Place the intermediate sheet with the screens showing upwards.

※ Special tool  
Adjusting screws                    5870 204 063

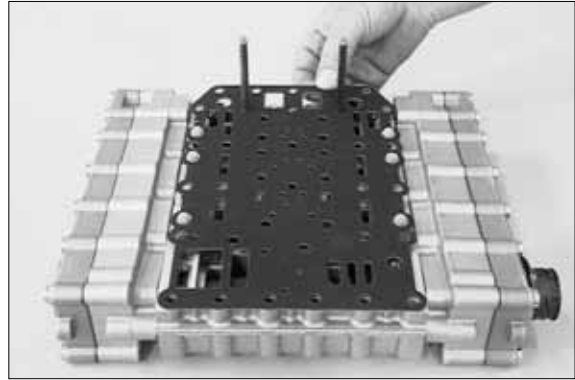


Figure1028

- (15) Put on the duct plate and fasten it equally by means of cap screws.

· Torque limit : 0.97kgf · m(7.01lbf · ft)

※ Special tool  
Socket spanner TX-27            5873 042 002

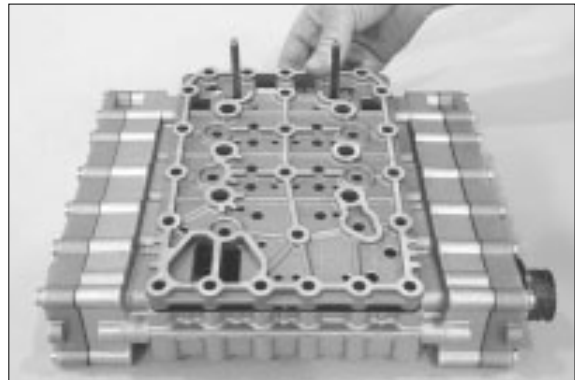


Figure1029

- (16) Provide the screw plugs(8EA) with new O-rings and install them.

· Torque limit : 0.61kgf · m(4.43lbf · ft)

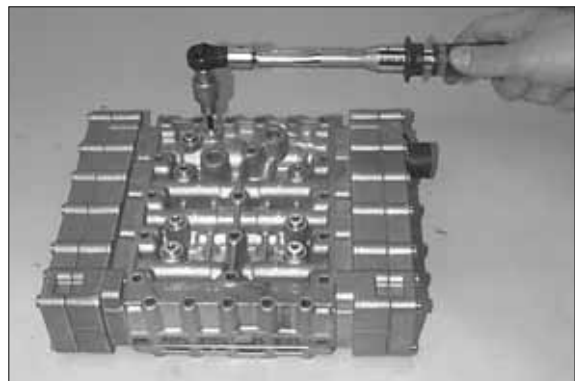


Figure1030

**Preassemble the duct plate(Figure 1031)**

- (17) Install connection pipes 1~4.

Install screw plugs 5 and 6.

· Torque limit

Plug(M10 × 1) : 0.61kgf · m(4.43lbf · ft)

Plug(M14 × 1.5) : 4.08kgf · m(29.5lbf · ft)

※ Always install new O-rings.

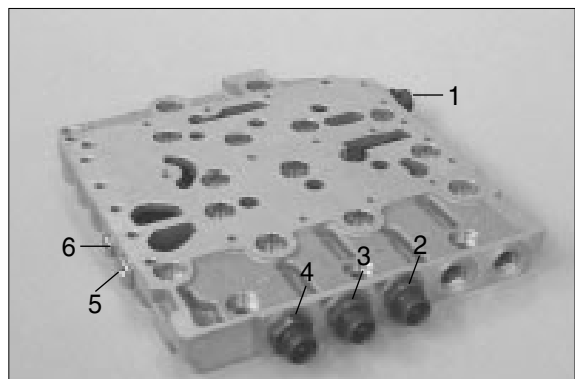


Figure1031



**Installation of the Hydraulic Control Unit(HCU-94)(Figure1032~1036) :**

(18) Provide the screw plug with a new O-ring and install it.

· Torque limit

M26 × 1.5 : 8.16kgf · m(59.0lbf · ft)

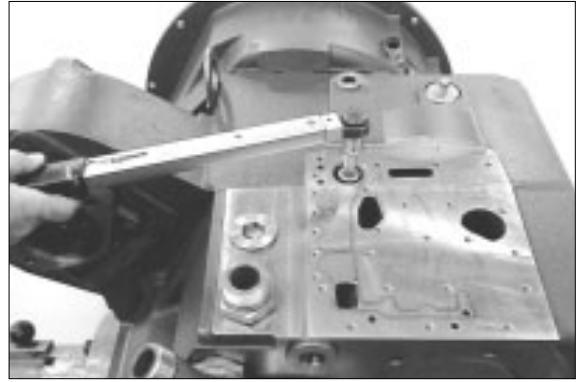


Figure 1032

(19) Install two adjusting screws.  
Put on the gasket(arrow).

※ Special tool

Adjusting screws M8 5870 204 011

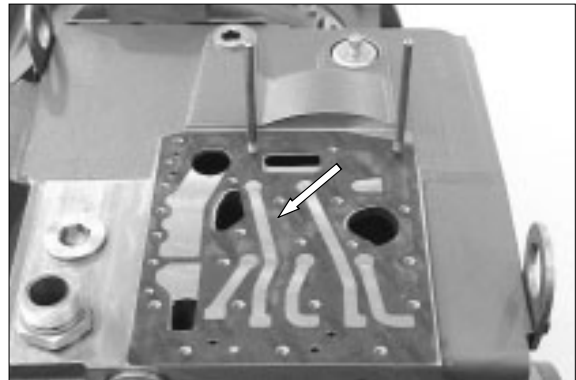


Figure 1033

(20) Put on the duct plate and fasten it equally by means of cap screws.

· Torque limit

M8/10.9 : 2.35kgf · m(16.7lbf · ft)

※ Special tool

Socket spanner TX-40 5873 042 004

Torque spanner Slipper 5870 203 043

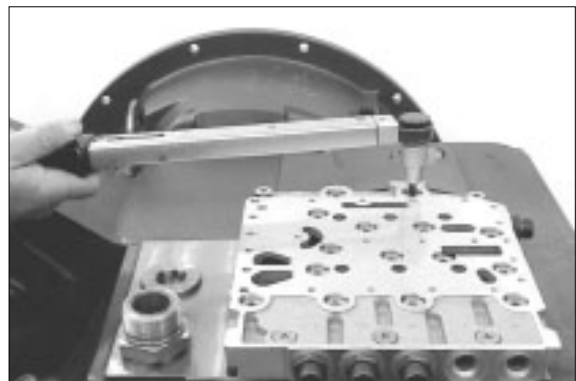


Figure 1034

(21) Install 2 adjusting screws(M6).  
Put on the gasket(arrow).

※ Special tool

Adjusting screws M6 5870 204 063

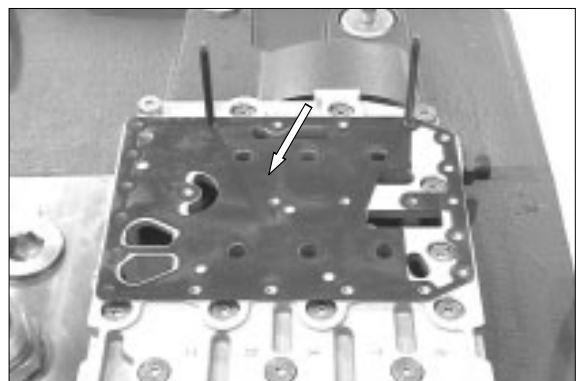


Figure 1035

(22) Fasten the complete valve block equally by means of cap screws(6pcs. M6 × 100 & 17pcs. M6 × 76mm).

**▲ Observe position of the cap screws (M6 × 100), see arrow.**

· Torque limit : 1.22kgf · m(8.85lbf · ft)

※ Special tool

Socket spanner TX-27      5873 042 002

Torque spanner slipper      5870 203 043

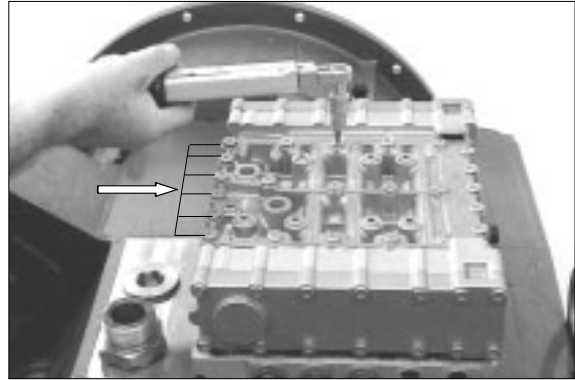


Figure 1036

Following to this all pressure lines are to be installed.

※ Installation of the lines differs depending on the version.

Observe the parts list of parts manual.

## 2. TRANSMISSION

### 1) DISASSEMBLY

(1) Fasten the complete transmission to the assembly truck.

※ Special tool

Assembly truck 5870 350 000

Holding fixture 5870 350 071



Figure 1

(2) Remove the plug (arrow) and drain the oil. Then remove the oil cylinder.



Figure 2

(3) Remove all oil pipes, the complete gear shift system and the duct plate.

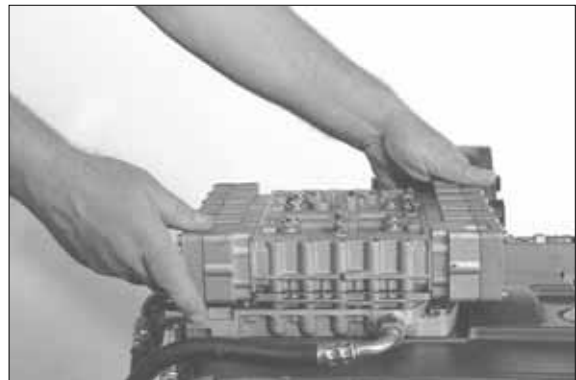


Figure 3

### Converter drive

(1) By means of the lifting tackle separate the torque converter from the transmission.

※ Special tool

Eybolts assortment 5870 204 002

Lifting chain 5870 281 047



Figure 4

(2) Loosen the bolt connection and by means of the forcing screws(3EA) separate the cover from the converter bell.

※ Special tool  
Forcing screws 5870 204 005

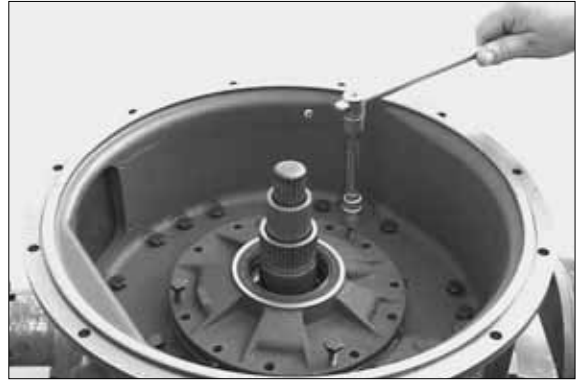


Figure 5

(3) By means of the extractor pull the oil supply flange out of the converter bell.

※ Special tool  
Extractor 5870 000 089



Figure 6

(4) Remove the converter safety valve(arrow 1), if required.

※ Converter safety valve is fixed by means of slotted pin(arrow 2).



Figure 7

(5) Loosen the bolt connection(M8 and M12) and by means of lifting tackle and pry bar set separate the coverter bell from the transmission housing.

※ Special tool  
Eyebolts assortment 5870 204 002  
Pry bar set 5870 345 036  
Lifting chain 5870 281 047



Figure 8

(6) Remove the rectangular ring (arrow).



Figure 9

(7) Press the input shaft out of the spur gear bearing. Remove the released bearing inner ring and the spur gear.

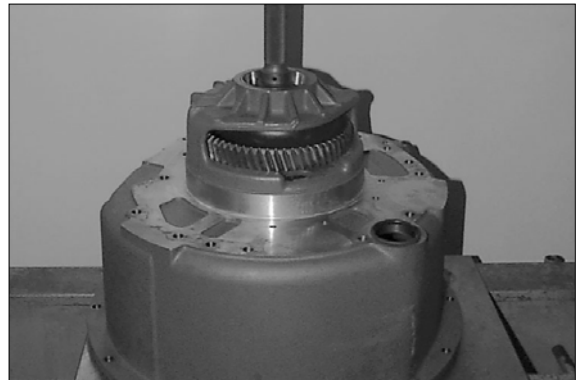


Figure 10

(8) Press off the bearing inner ring from the spur gear.

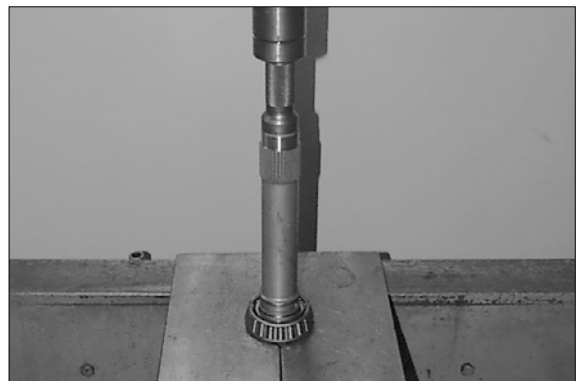


Figure 11

(9) Remove the converter pressure back-up valve.



Figure 12

- (10) Remove the inductive transmitter.  
9 = n - Engine

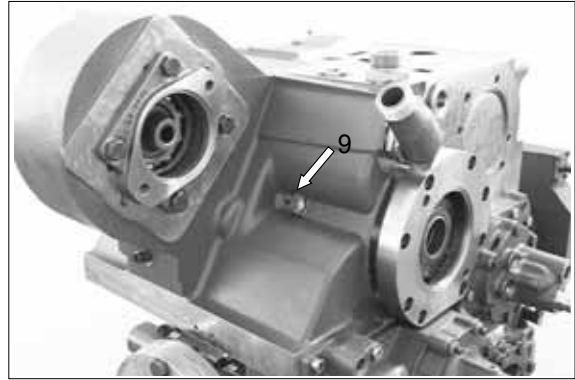


Figure 13

### Input shaft - pump/power take-off

- (1) Loosen the cap screw.



Figure 21

- (2) Remove the cap screw and clamping plate.



Figure 22

- (3) Press the input shaft out of the bearing.
- ※ Pay attention to released input shaft as well as shims.
  - ※ Special tool  
Extractor
- 5870 000 065



Figure 23

- (4) Snap out the rectangular ring (arrow 1) and remove both shims (arrow 2).

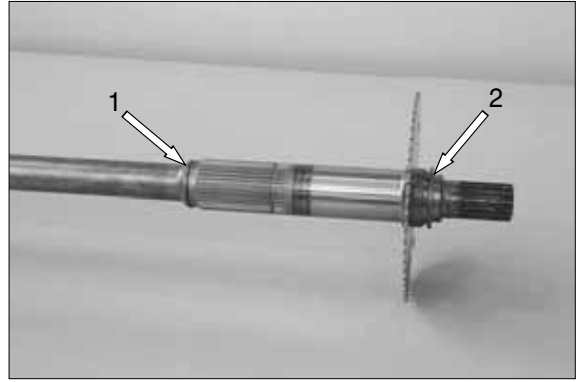


Figure 24

### Transmission pump

- (1) Loosen the cap and hexagon screws (depending on the version) respectively and separate the pump flange from the housing.



Figure 25

- (2) Loosen the cap screws (4EA / M8). Position the extractor on the transmission pump and fasten it by means of screws (M8 × 65) to the transmission pump. Then pull out the pump from the housing bore.

※ Extracting is supported by slightly tapping onto the transmission housing.

※ Special tool

Extractor

5870 000 089

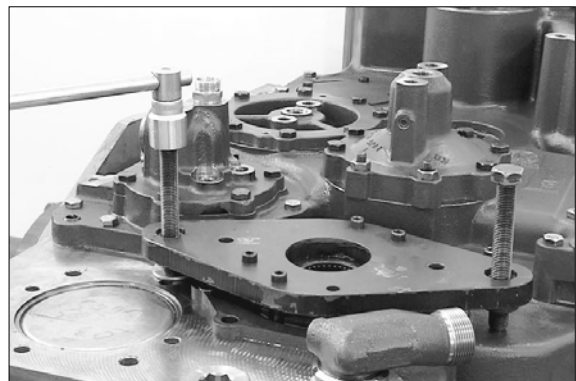


Figure 26

### Remove the ball bearing and the driver (Figure 28~29)

- (3) Snap out the retaining ring.



Figure 28

- (4) Press out the driver with ball bearing from the bearing bore.  
Then separate the ball bearing from the driver.

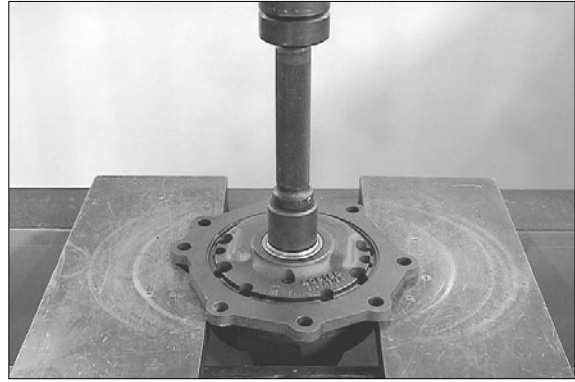


Figure 29

- (5) Loosen the cap screws, take off the pump cover and remove the rotor set.

**▲ If marks due to running-in are found on the pump housing or housing cover, the complete pump is to be replaced.**

Then assemble the rotor set with the chamfer on the tooth tip showing downwards and install the housing cover again.

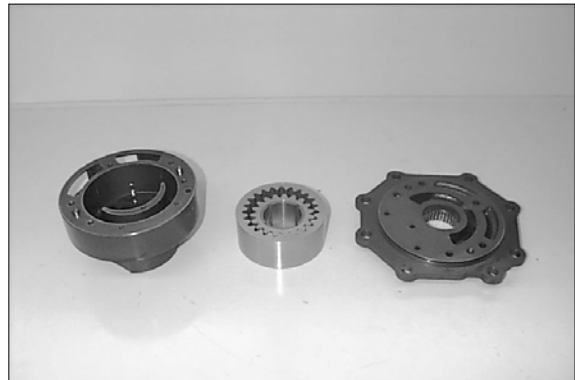


Figure 30

- Torque limit(M8/8.8) : 2.35kgf · m(17.0lbf · ft)
- Torque limit(M6/8.8) : 0.97kgf · m(7.01lbf · ft)



## Layshaft

- (1) Remove the sealing cover and loosen the hexagon screw.

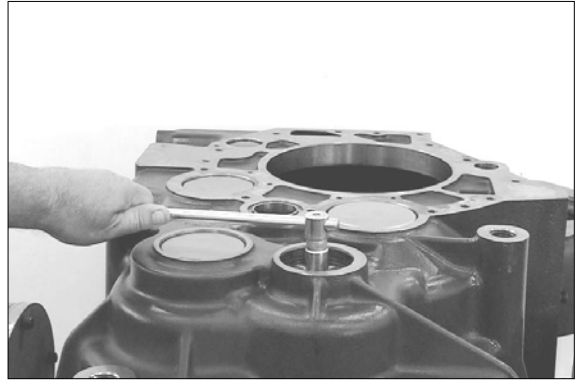


Figure 38

- (2) Expel the idler shaft by means of the striker from the housing bore and layshaft bearing respectively.

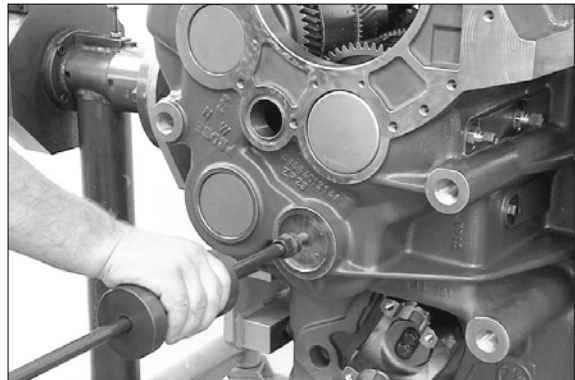


Figure 39

## Removal of inductive and speed transmitter(Figure 40~41)

- 14 = n - Turbine
- 5 = n - Internal speed input
- 13 = n - Output(Speed transmitter)

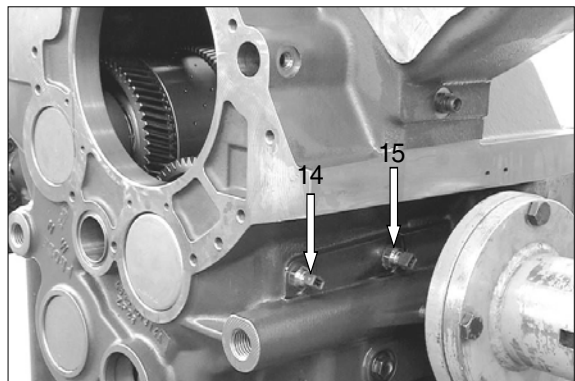


Figure 40

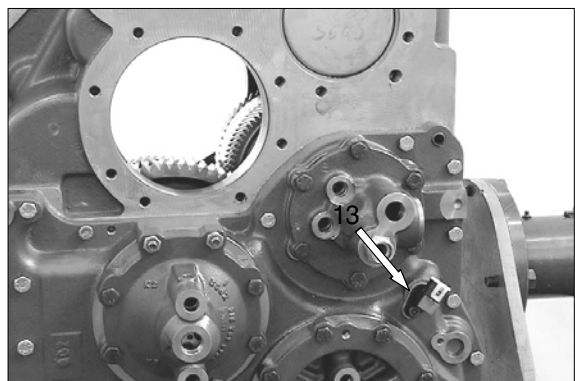


Figure 41

## Output

### Converter side :

Remove the lock plate. Loosen hexagon screws and take off the output flange. Rotate the housing by 180° and remove the output flange on the housing rear side.



Figure 42

## Removal of the clutches and layshaft

(1) Loosen the hexagon screws and expel the bearing cover KV/K1 by means of the striker from the housing bore. Remove the bearing cover KR/K2 (arrow) analogously.

※ Mark the installation location of the bearing cover.

※ Special tool

Threaded insert 5870 204 069

Striker 5870 650 014

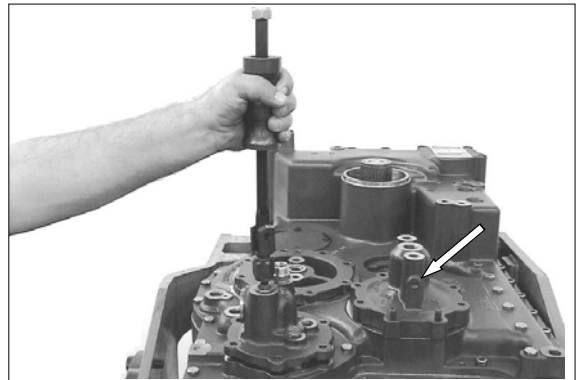


Figure 46

(2) Pull out the bearing cover K4/K3 by means of the forcing screws from the housing bore.

※ Special tool

Forcing screws 5870 204 005

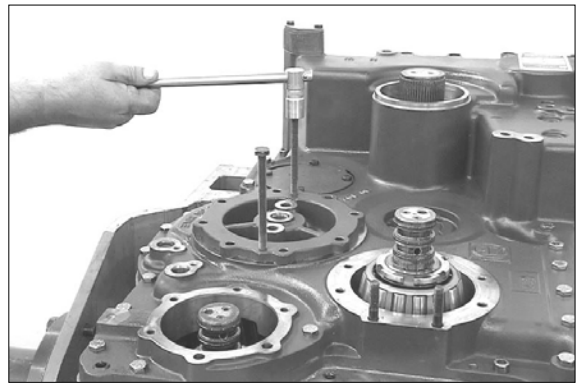


Figure 47

(3) Separate the bearing inner ring from bearing cover K4/K3.

※ Special tool

Three-armed puller 5870 971 003

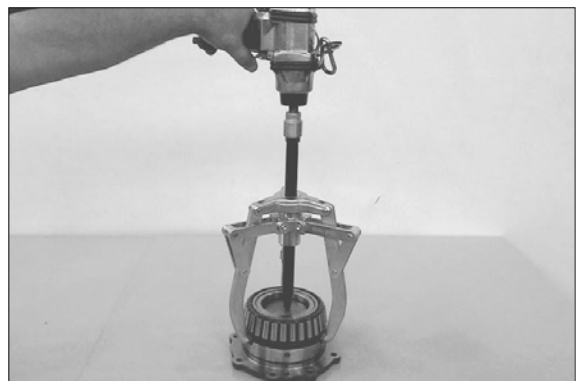


Figure 48

- (4) Loosen the bolt connection.  
Separate the housing cover from the housing by equally tightening both forcing screws (arrow 1 and 2) as well as the threaded spindle (arrow 3).

※ Special tool  
Internal hex spanner, size 8 5870 290 003  
Forcing screws 5870 204 005  
Lifting tackle 5870 281 061

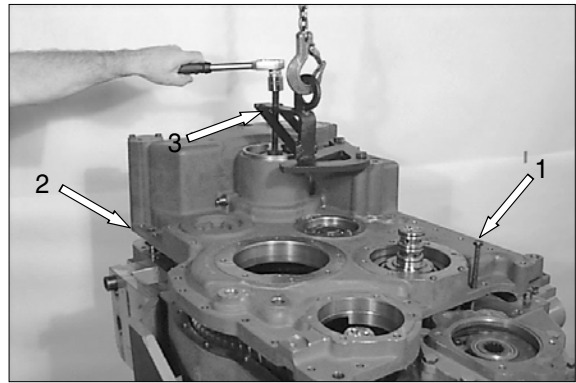


Figure 49

- (5) Expel the output shaft from the output gear.

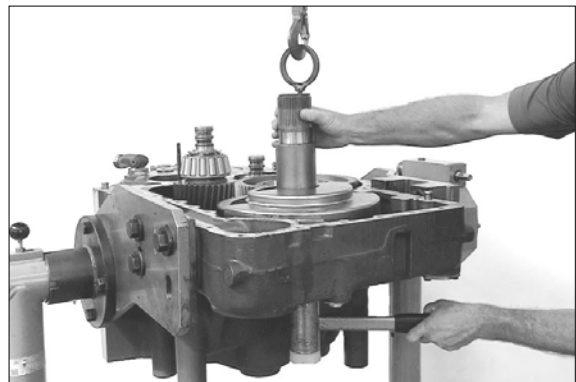


Figure 50

- (6) Loosen the hexagon screws and remove the oil baffle.  
Lift the output gear out of the transmission housing (Figure).

※ Special tool  
Stop washer 5870 100 054  
Eyebolts assortment 5870 204 002



Figure 51

- (7) Remove the bearing inner ring from the output gear.

※ Special tool  
Three-armed puller 5870 971 003



Figure 52

- (8) Take the roller bearing out of the housing bore and remove the oil baffle (arrow).

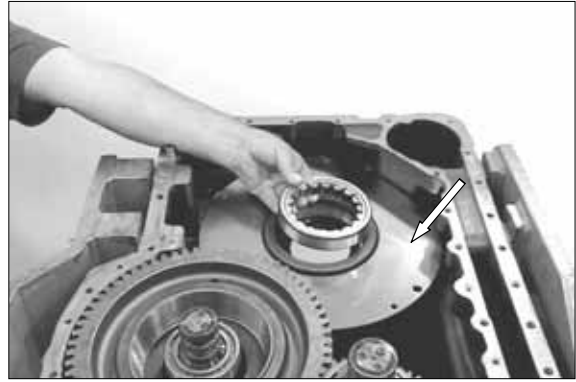


Figure 53

### Remove the multi-disc clutches

- ※ For removal of the single clutches observe the following sequence :  
K4/K3    KR/K2    KV/K1.  
For removal of clutch K4/K3, lift the clutch KR/K2 slightly and move it in direction of the arrow, see figure.
- ※ Special tool  
Eyebolts assortment            5870 204 002

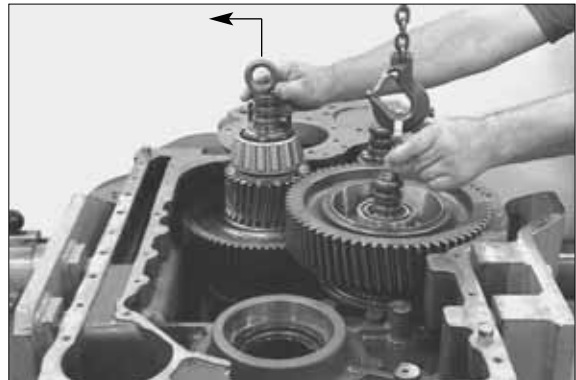


Figure 54

- (9) Opposite figure shows the clutches when removed.



Figure 55

- (10) Remove the layshaft gear.



Figure 56

## Dismantling of the Multi-Disc Clutch K3/K4

(1) By means of clamping ring(S) fasten the clutch to the assembly truck.

※ Special tool  
Clamping ring 5870 654 033



Figure 62

(2) Pull off the roller bearing from the disc carrier.

※ Special tool  
Three-armed puller 5870 971 002



Figure 63

(3) Separate spur gear K3 from the disc carrier.



Figure 64

(4) Pull off the bearing inner ring from the disc carrier.

※ Special tool  
Rapid grip 5873 012 012  
Basic tool 5873 002 001



Figure 65

- (5) Squeeze out the snap ring.  
Remove the end shim and disc set K3.



Figure 66

- (6) Rotate disc carrier by 90°.  
Loosen the slotted nut.

- ※ Special tool  
Slotted nut wrench           5870 401 118  
Slotted nut wrench           5870 401 115



Figure 67

- (7) Rotate disc carrier by 90°.  
Pull off the taper roller bearing.

- ※ Special tool  
Gripping insert               5873 011 012  
Basic tool                       5873 001 000



Figure 68

- (8) Pull off the spur gear K4 from the disc carrier.

- ※ Special tool  
Three-armed puller           5870 971 003



Figure 69

(9) Remove the ring.



Figure 70

(10) Pull off the taper roller bearing.

※ Special tool  
Three-armed puller            5870 971 002



Figure 71

(11) Squeeze out the snap ring.  
Remove the end shim and the disc set K4.



Figure 72

(12) Preload the compression spring by means of fixture(S).  
Squeeze out the snap ring and the released single components.  
Remove the opposite single components (K3 side) analogously.

※ Special tool  
Pressure piece                    5870 345 072



Figure 73

- (13) Separate both pistons by means of compressed air from the disc carrier.

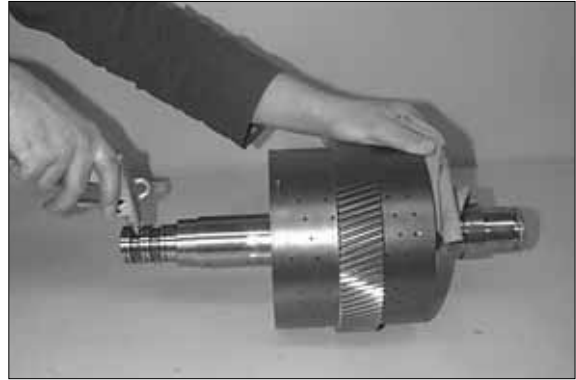


Figure 74

### Dismantling of the multi-disc clutch KR/K2

- (1) Fasten the clutch by means of clamping ring(arrow) on the assembly truck.

※ Special tool  
Clamping ring                    5870 654 033

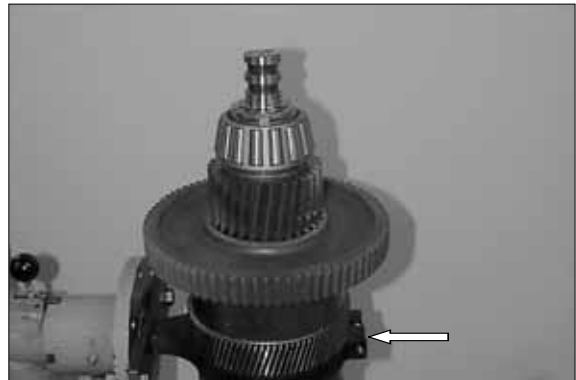


Figure 75

- (2) Rotate disc carrier by 90°.  
Loosen the slotted nut.

※ Special tool  
Slotted nut wrench            5870 401 099

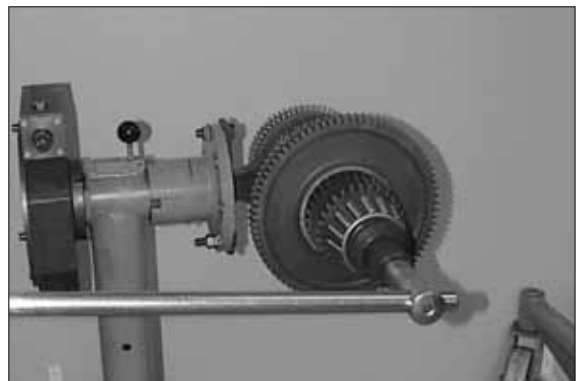


Figure 76

- (3) Pull off the taper roller bearing from the disc carrier.

※ Special tool  
Gripping insert                5873 012 018  
Basic tool                        5873 002 001



Figure 77



- (4) Press off the spur gear K2 from the disc carrier.

▲ Pay attention to released disc carrier.

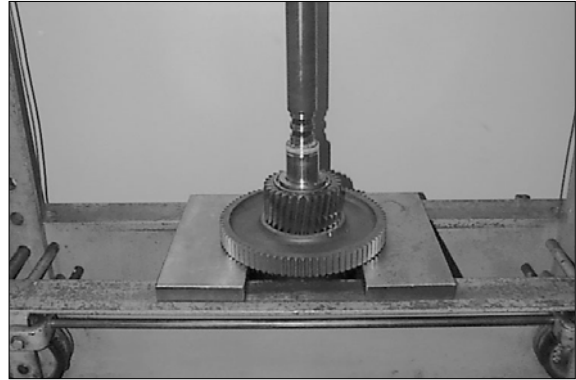


Figure 78

- (5) Fasten the disc carrier by means of clamping ring(S).  
Pull off the taper roller bearing from the disc carrier.

※ Special tool

Clamping ring                    5870 654 033

Gripping insert                5873 012 019

Basic tool                        5873 002 001



Figure 79

- (6) Squeeze out the snap ring.  
Remove the end shim and disc set K2.



Figure 80

- (7) Rotate disc carrier by 90°.  
Loosen the slotted nut.

※ Special tool

Slotted nut wrench            5870 401 099



Figure 81

(8) Pull off the taper roller bearing from the disc carrier.

※ Special tool

Gripping insert 5873 002 044

Basic tool 5873 002 001



Figure 82

(9) Fasten spur gear KR by means of clamping ring (arrow) and pull it from the disc carrier.

※ Collar of the clamping ring must show upwards (to the spur gear).

※ Special tool

Three-armed puller 5870 971 003

Clamping ring 5870 654 045

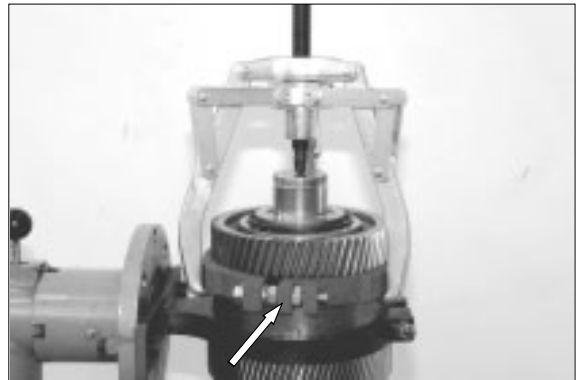


Figure 83

(10) Remove the ring.



Figure 84

(11) Squeeze out the snap ring.

Remove end shim and disc set KR.



Figure 85

(12) Pull off the taper roller bearing from the disc carrier.

※ Special tool

Gripping insert 5873 012 013

Basic tool 5873 002 001

Remove both piston (like described in figure 73 and 74)



Figure 86

### Dismantling of the multi-disc clutch KV/K1

(1) Fasten clutch by means of clamping ring to the assembly truck.

Loosen the slotted nut (Figure 87).

※ Special tool

Clamping ring 5870 654 033

Slotted nut wrench 5870 401 118

Slotted nut wrench 5870 401 099



Figure 87

(2) Pull off the taper roller bearing from the disc carrier.

※ Special tool

Gripping insert 5873 001 023

Basic tool 5873 001 000



Figure 88

(3) Remove the shim.



Figure 89

(4) Pull off spur gear K1 from the disc carrier.

※ Special tool

Three-armed puller 5870 971 003



Figure 90

(5) Opposite figure shows the spur gear bearing K1.

Bearing(1) can only be obtained as complete part.

▲ If it is necessary to remove the clutch-pack-sided ball bearing (arrow or Figure 93 and 94), the complete bearing(1) has to be removed.

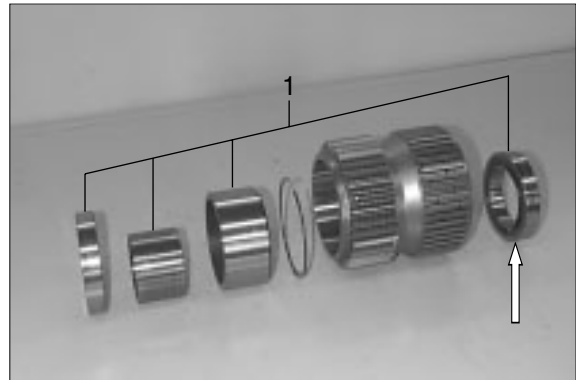


Figure 91

(6) Take off the bush.



Figure 92

(7) Pull off the ball bearing from the disc carrier (Figure 93 and 94).

※ Pay attention to released balls.



Figure 93



Figure 94

- (8) Squeeze out the snap ring.  
Remove end shim and disc set K1.



Figure 95

- (9) Rotate disc carrier by 90°.  
Loosen the slotted nut.

- ※ Special tool  
Slotted nut wrench           5870 401 118  
Slotted nut wrench           5870 401 115



Figure 96

- (10) Pull off the taper roller bearing from the disc carrier.

- ※ Special tool  
Gripping insert               5873 001 034  
Basic tool                       5873 001 000



Figure 97

(11) Pull off spur gear KV from the disc carrier.

- ※ Special tool  
Three-armed puller            5870 971 003



Figure 98

(12) Remove the ring.



Figure 99

(13) Pull off the taper roller bearing from the disc carrier(Figure 100).  
Squeeze out the snap ring.  
Remove end shim and disc set KV.  
Remove both pistons(like described in Figure 73 and 74).

- ※ Special tool  
Gripping insert            5873 001 034  
Basic tool                    5873 001 000



Figure 100

## 2) ASSEMBLY

### Assembly of the multi-disc clutch K4/K3

The following sketch shows the clutch sectioning

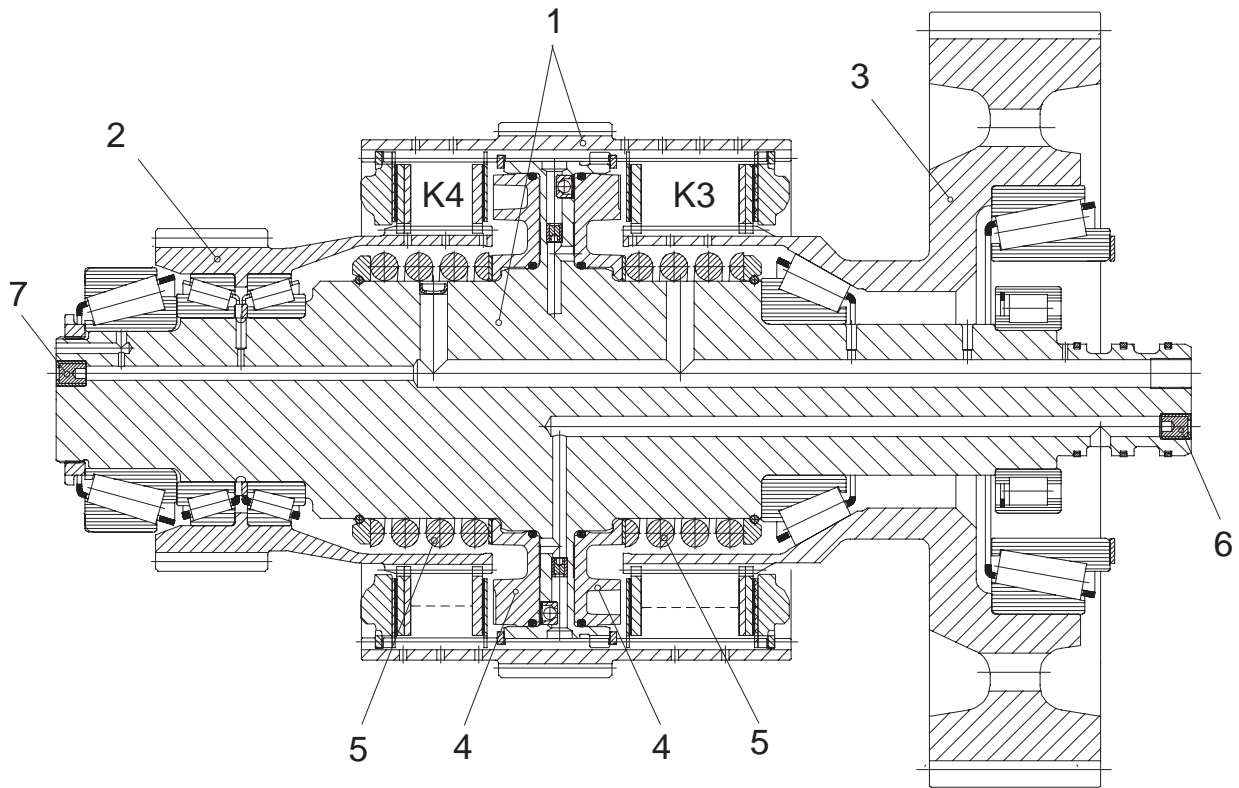


Figure 127

- |   |                    |    |                      |   |                    |
|---|--------------------|----|----------------------|---|--------------------|
| 1 | Disc carrier(assy) | K4 | Multi-disc clutch K4 | 5 | Compression spring |
| 2 | Spur gear K4       | K3 | Multi-disc clutch K3 | 6 | Plug 2EA           |
| 3 | Spur gear K3       | 4  | Piston               | 7 | Plug 1EA           |

※ Observe the installation position of the single components for the following assembly.

- (1) Lift the disc carrier with the K4-side showing downwards into the clamping ring(S) and fasten it.  
Rotate disc carrier by 180°.

※ Special tool  
Clamping ring                    5870 654 033

▲ To install new disc carriers the finished bores have to be sealed with plugs.  
Installation position, see arrow, Figure 128 and 129.

※ Special tool  
Hand inserting tool            5870 320 014  
Ratchet spanner                5870 320 018

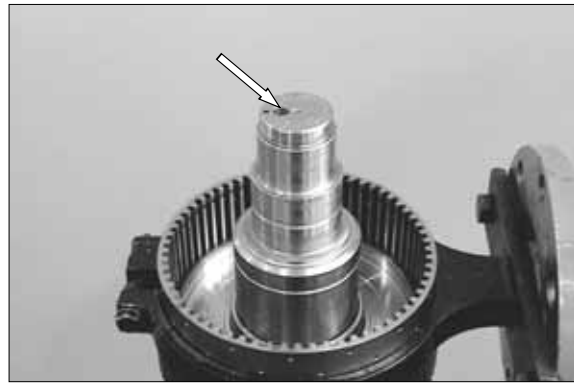


Figure 128

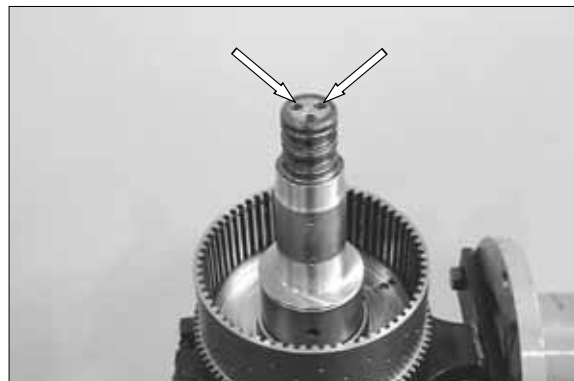


Figure 129

- (2) Flush-mount the drain valve (arrow) with the chamfer showing downwards.

※ Special tool  
Inserting tool                    5870 320 019

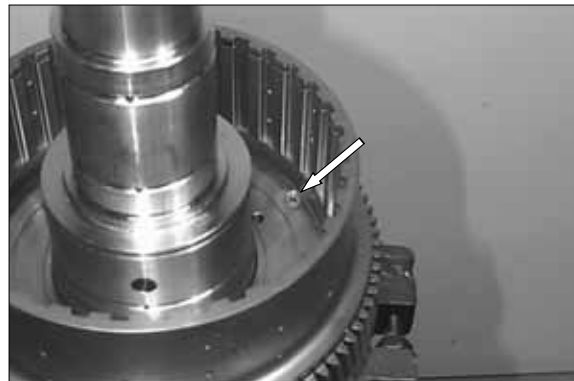


Figure 130

- (3) Put both O-rings **scroll-free** into the annular grooves of the piston, see arrows.

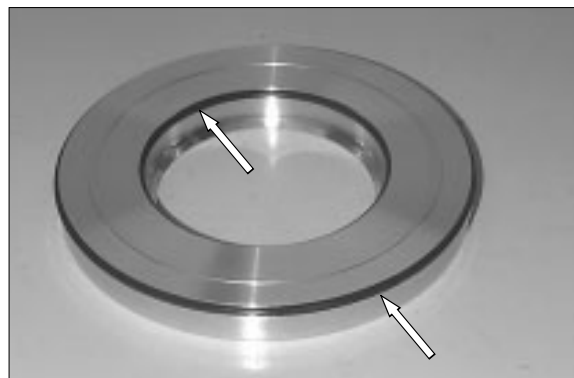


Figure 131



(4) Oil the O-rings and the piston contact surface.

Install K3 piston **equally** until contact.

※ Observe the installation position of the piston, see figure.



Figure 132

(5) Install spacer and compression spring.



Figure 133

(6) Place guide ring, with the chamfer(arrow) showing upwards, over the compression spring and install the snap ring.

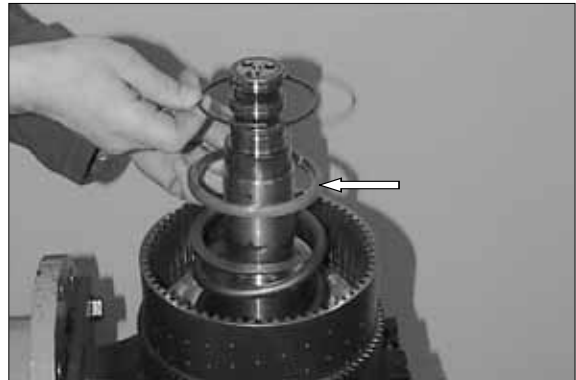


Figure 134

(7) Lift the disc carrier out of the clamping ring. Preload the compression spring by means of fixture(S) and engage the snap ring into the annular groove of the disc carrier(arrow), see Figure 135.

※ Special tool

Fixture 5870 345 072

Clamping fixture 5870 654 036

Install the drain valve, piston and compression spring on the opposite side(clutch K4) analogously(Figure 130~135).

Then lift the disc carrier with the K4-side showing downwards into the clamping ring and fasten it. Rotate disc carrier by 180°.



Figure 135

## Disc Components K4

※ Below sketch or table shows the standard version as to the installation position of the single components. Obligatory is the respective spare parts list.

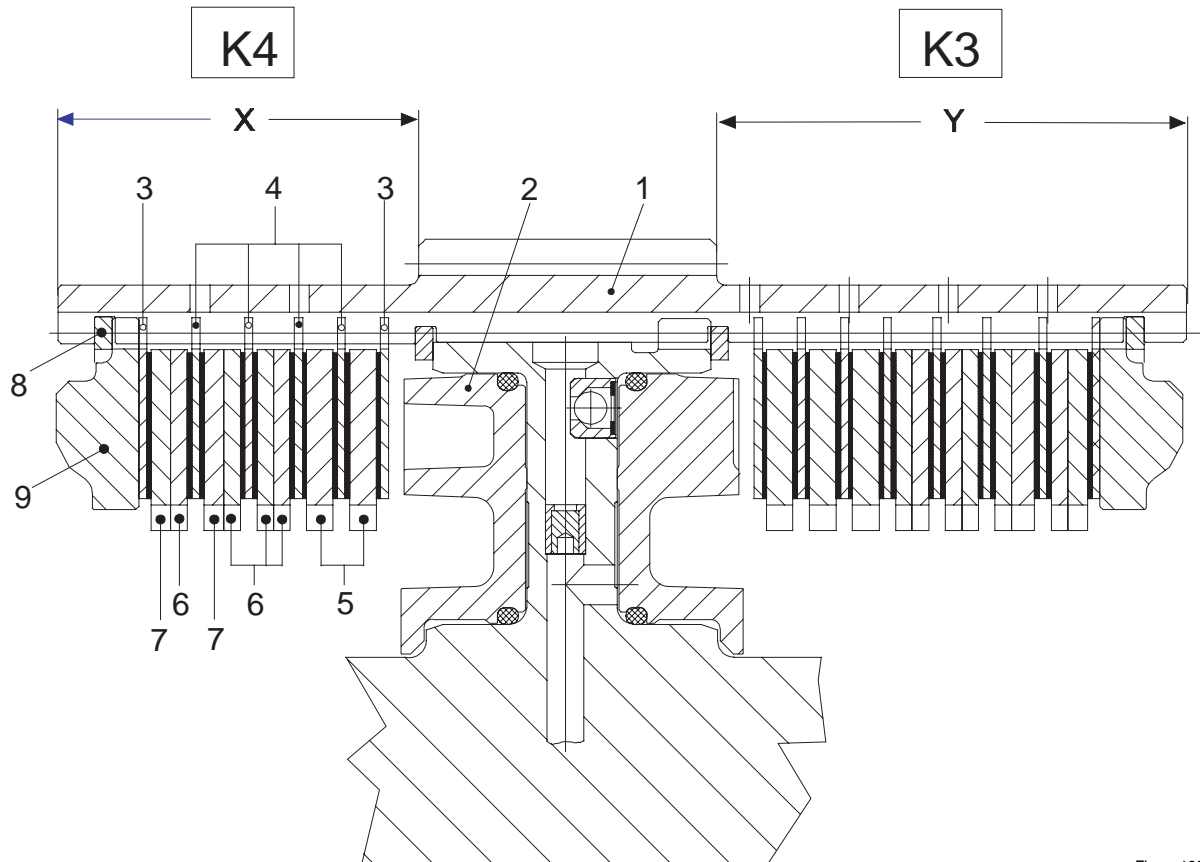


Figure 136

Position	Description	Quantity	s(mm)	Remarks
1	Disc carrier	1		
2	Piston	1		
3	Outer clutch disc	2	1.85	Coated on one side
4	Outer clutch disc	4	2.5	Coated on both sides
5	Inner clutch disc	2	4.0	
6	Inner clutch disc	4	2.5	
7	Inner clutch disc	2	2.5~4.0	Optional
8	Snap ring	1	2.10~3.10	Optional
9	End shim	1		
Number of friction surfaces : 10				
Disc clearance : 2.2 ~ 2.4mm				

※ Install the outer clutch discs position 3 with uncoated side showing to the piston and end shim respectively. The respective clutch side can be seen on the length of the disc carrier, see sketch.

K4 Dimension X (short disc carrier side)

K3 Dimension Y (long disc carrier side)

**Check disc clearance  $K_4=2.2\sim 2.4\text{mm}$**   
**(Figure 137~139)**

※ In order to ensure a perfect measuring result, the disc set is first of all to be installed without oil.

(1) Install disc set according to sketch or table (Page 3-114).



Figure137

(2) Install the end shim and fasten it by means of the snap ring.

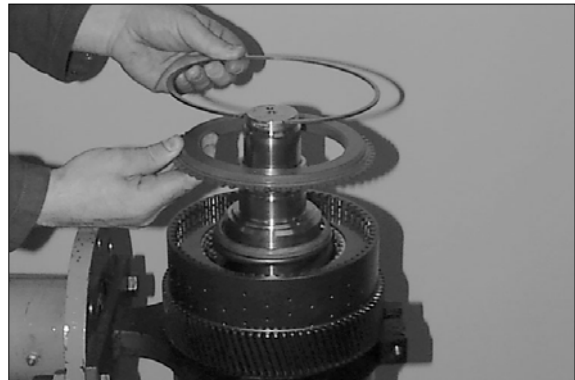


Figure138

(3) Press on end shim with approximately 100N(10kg) and set dial indicator to "Zero".

Then press end shim against snap ring (upwards) and read disc clearance on the dial indicator.

※ If the required disc clearance differs, it has to be corrected with the adequate inner clutch disc or/and snap ring, see table/position 7 and position 8.

Upon setting of disc clearance, remove the disc set, oil the clutch discs and reinstall them.

Special tool

※ Magnetic stand                      5870 200 055  
Dial indicator                         5870 200 057

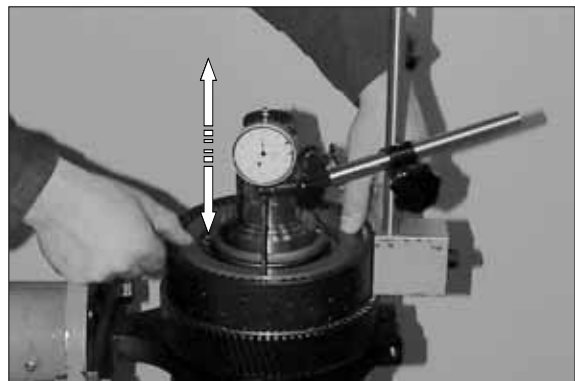


Figure139

**Preassemble and install spur gear K4 (Figure 140~144) :**

(1) Opposite figure shows the single components of spur gear K4.

- 1 Bearing inner ring
- 2 Bearing outer ring
- 3 Ring
- 4 Spur gear

Locate both bearing outer rings(2) until contact.

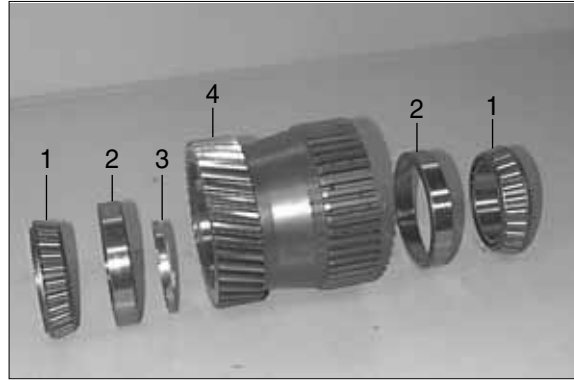


Figure140

(2) Heat the bearing inner ring and install it until contact.



Figure141

(3) Install the ring(3).



Figure142

(4) Assemble the spur gear until all inner clutch discs are located.



Figure143

(5) Heat the bearing inner ring (spur gear bearing) and locate it until contact.

**▲ Use safety gloves.**



Figure144

(6) Heat the bearing inner ring (clutch bearing) and install it until contact.

**▲ Use safety gloves.**



Figure145

### Clutch Components K3

※ Below sketch or table shows the standard version as to the installation position of the single components. Obligatory is the respective spare parts list.

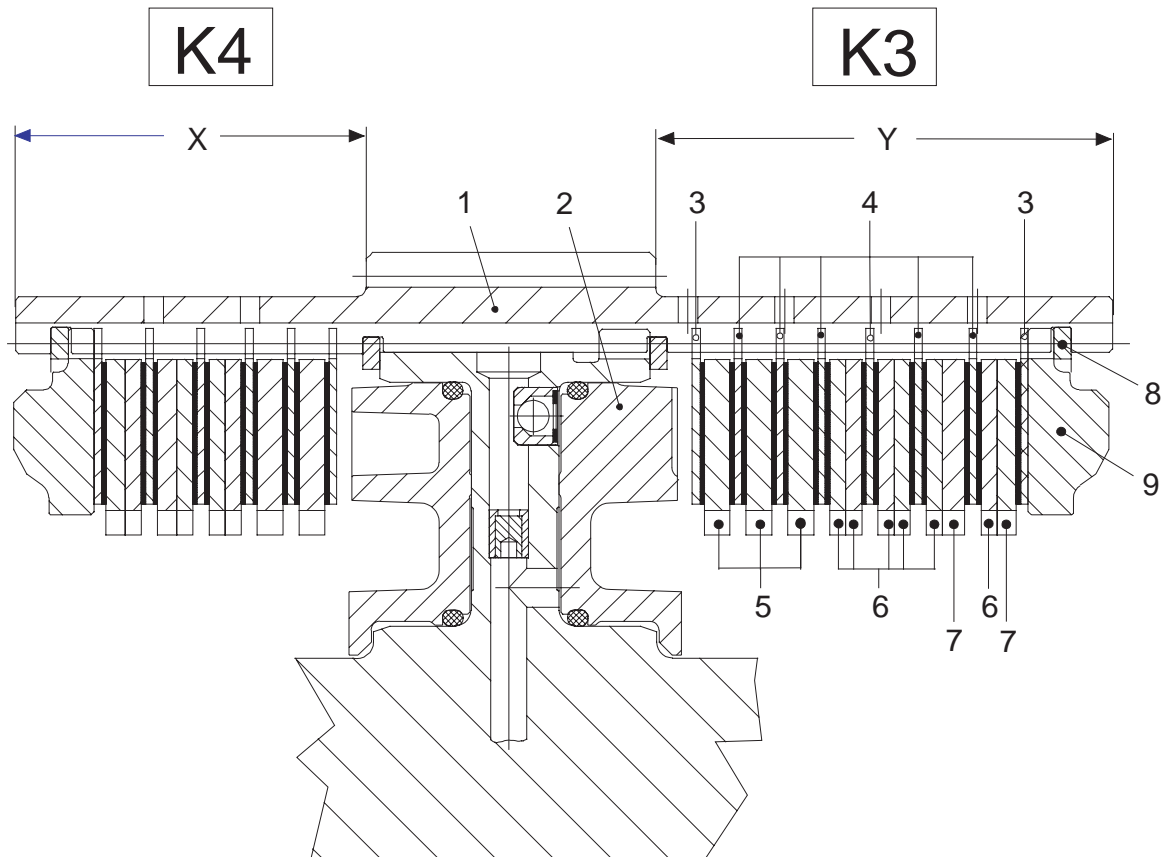


Figure146

Position	Description	Quantity	s(mm)	Remarks
1	Disc carrier	1		
2	Piston	1		
3	Outer clutch disc	2	1.85	Coated on one side
4	Outer clutch disc	6	2.5	Coated on both sides
5	Inner clutch disc	3	4.0	
6	Inner clutch disc	6	2.5	
7	Inner clutch disc	2	2.5~4.0	Optional
8	Snap ring	1	2.10~3.10	Optional
9	End shim	1		
Number of friction surfaces : 14				
Disc clearance : 2.2 ~ 2.4mm				

※ Install the outer clutch discs position 3 with uncoated side showing to the piston and end shim respectively. The respective clutch side can be seen on the length of the disc carrier, see sketch.

K3 Dimension Y (long disc carrier side)

K4 Dimension X (short disc carrier side)

**Check disc clearance  $K_3=2.2\sim 2.4\text{mm}$**   
**(Figure 147~149)**

※ In order to ensure a perfect measuring result, the disc set is first of all to be installed without oil.

(1) Install disc set according to sketch or table (Page 3-118).



Figure 147

(2) Install the end shim and fasten it by means of the snap ring.



Figure 148

(3) Press on end shim with approximately 100N(10kg) and set dial indicator to "Zero".

Then press end shim against snap ring (upwards) and read disc clearance on the dial indicator.

※ If the required disc clearance differs, it has to be corrected with the adequate inner clutch disc or/and snap ring, see table/position 7 and position 8.

Upon setting of disc clearance, remove the disc set, oil the clutch discs and reinstall them.

※ Special tool

※ Magnetic stand                      5870 200 055

Dial indicator                          5870 200 057

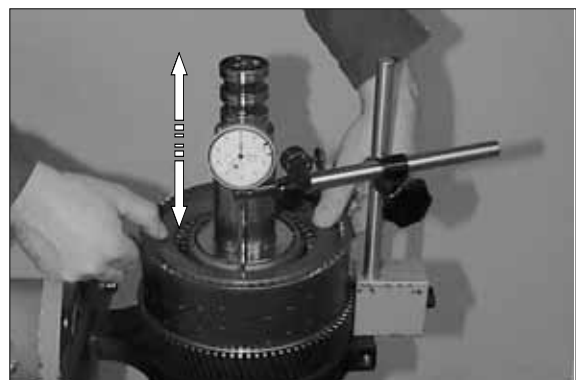


Figure 149

- (4) Heat the bearing inner ring and install it until contact.

▲ Use safety gloves.



Figure 150

- (5) Lift the disc carrier out of the clamping ring(S).

To ensure the exact locating of the single components, preload the bearing with 100KN(10t) (Figure 151)

▲ Support on the lower as well as upper bearing inner ring.  
Use pressure pieces(S).

※ Special tool

Pressure piece 5870 506 096



Figure 151

- (6) Lift the disc carrier with the K4-side showing downwards into the clamping ring(S) and fasten it.

Rotate disc carrier by 90°.

Install the slotted nut.

※ Observe installation position of the slotted nut. Collar(∅ 60mm) must show to the bearing inner ring, also see sketch/page 3-111. Oil the thread.

· Tightening torque : 56.1kgf · m(406lbf · ft)

※ Special tool

Clamping ring 5870 654 033

Slotted nut wrench 5870 401 118

Slotted nut wrench 5870 401 115



Figure 152



- (7) Install the bearing outer ring into spur gear K3 until contact.



Figure 153

- (8) Assemble the spur gear until all inner clutch discs are located.



Figure 154

- (9) Heat the roller bearing and locate it until contact.

**▲ Use safety gloves.**



Figure 155

- (10) Install the bearing inner ring.



Figure 156

(11) Check function of the clutches K3 and K4 by means of compressed air.

※ Closing or opening of the clutches is clearly audible when the single parts have been installed adequately.



Figure 157

(12) Snap-in and lock the rectangular rings (3EA, see arrows).



Figure 158

## Assembly of the multi-disc clutch KR/K2

The following sketch shows the clutch sectioning.

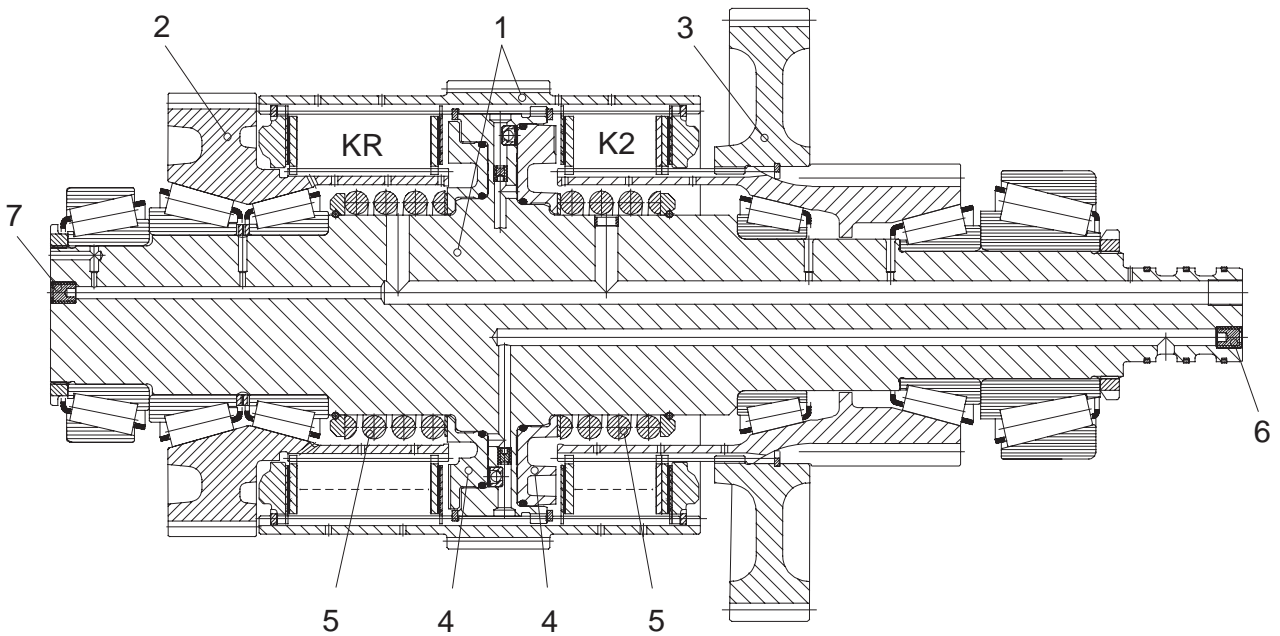


Figure159

- |   |              |    |                      |   |                    |
|---|--------------|----|----------------------|---|--------------------|
| 1 | Disc carrier | K4 | Multi-disc clutch KR | 5 | Compression spring |
| 2 | Spur gear KR | K3 | Multi-disc clutch K2 | 6 | Plug 2EA           |
| 3 | Spur gear K2 | 4  | Piston               | 7 | Plug 1EA           |

※ Observe the installation position of the single components for the following assembly.

- (1) Lift the disc carrier with the KR-side showing downwards into the clamping ring and fasten it.  
Then rotate disc carrier by 180°.

▲ To install new disc carriers the finished bores have to be sealed with plugs.  
Installation position, see arrow, Figure 160~161.

※ Special tool	
Clamping ring	5870 654 033
Hand mounting tool	5870 320 014
Ratchet	5870 320 018

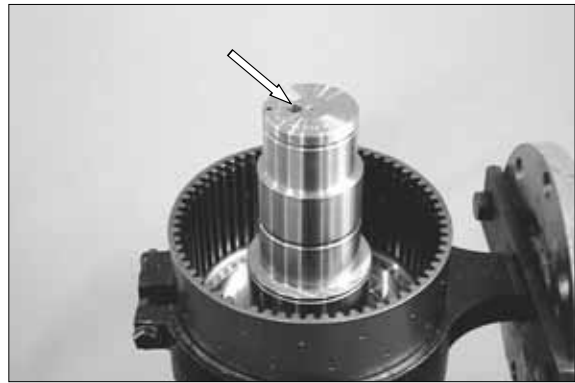


Figure 160

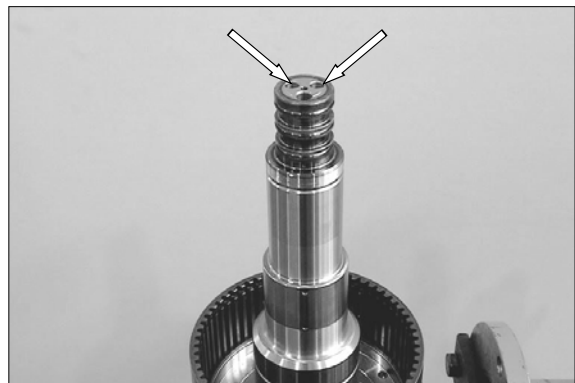


Figure 161

- (2) Flush-mount the drain valve(arrow) with the chamfer showing downwards.

※ Special tool	
Inserting tool	5870 320 019

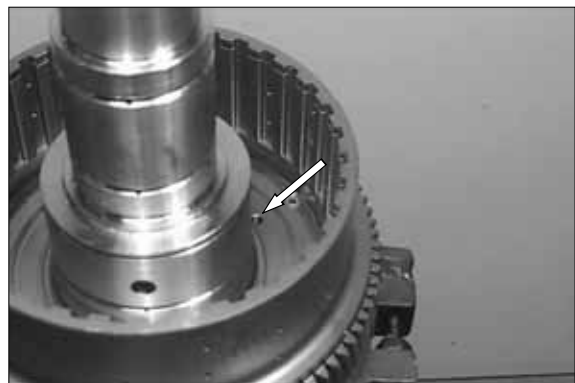


Figure 162

- (3) Put both O-rings **scroll-free** into the annular grooves of the piston, see arrows.

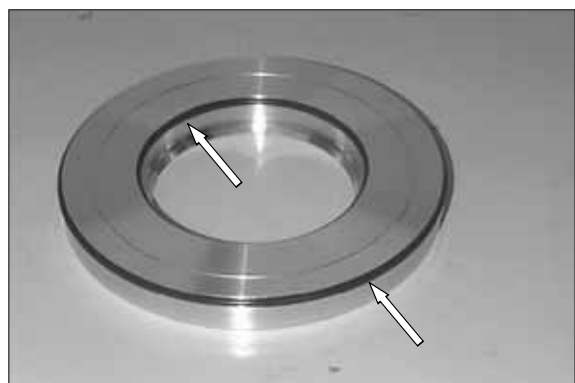


Figure 163

(4) Oil the O-rings and the piston contact surface.

Install K2 piston **equally** until contact.

※ Observe the installation position of the piston, see figure.



Figure 164

(5) Install spacer and compression spring.



Figure 165

(6) Place guide ring, with the chamfer (arrow) showing upwards, over the compression spring and install the snap ring.



Figure 166

(7) Lift the disc carrier out of the clamping ring. Preload the compression spring by means of fixture and engage the snap ring into the annular groove of the disc carrier (arrow), see Figure 167.

Install the drain valve, piston and compression spring on the opposite side (clutch K4) analogously (like figure 162~167).

Then lift the disc carrier with the KR-side showing downwards into the clamping ring and fasten it. Rotate disc carrier by 180°.



Figure 167

※ Special tool

Pressure piece                      5870 345 072

Clamping fixture                    5870 654 036

## Disc Components KR

※ Below sketch or table shows the standard version as to the installation position of the single components. Obligatory is the respective spare parts list.

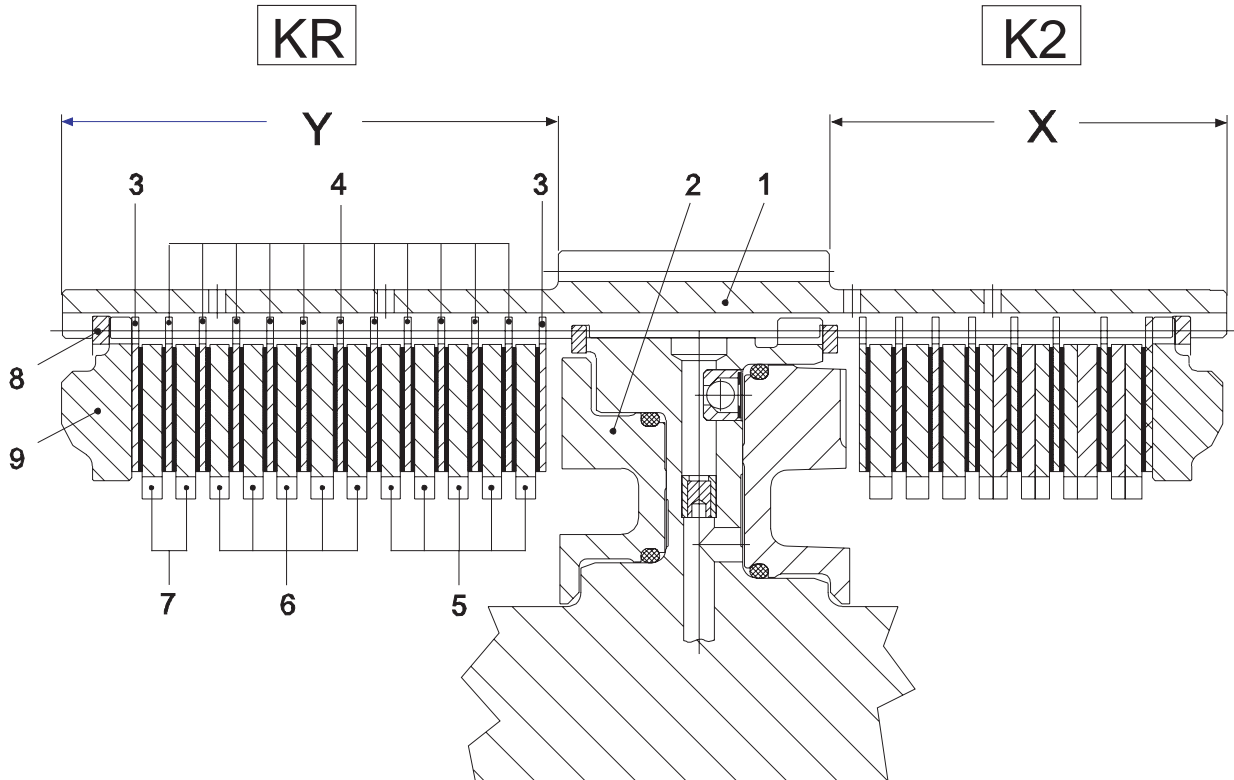


Figure 168

Position	Description	Quantity	s(mm)	Remarks
1	Disc carrier	1		
2	Piston	1		
3	Outer clutch disc	2	1.85	Coated on one side
4	Outer clutch disc	11	3.35	Coated on both sides
5	Inner clutch disc	5	2.5	
6	Inner clutch disc	5	3.0	
7	Inner clutch disc	2	2.5~4.0	Optional
8	Snap ring	1	2.10~3.10	Optional
9	End shim	1		
Number of friction surfaces : 24				
Disc clearance : 2.8 ~ 3.0mm				

※ Install the outer clutch discs position 3 with uncoated side showing to the piston and end shim respectively. The respective clutch side can be seen on the length of the disc carrier, see sketch.

KR Dimension X (long disc carrier side)

K2 Dimension Y (short disc carrier side)

**Check disc clearance KR=2.8~3.0mm  
(Figure 169~171)**

※ In order to ensure a perfect measuring result, the disc set is first of all to be installed without oil.

(1) Install disc set according to sketch or table (Page 3-126).

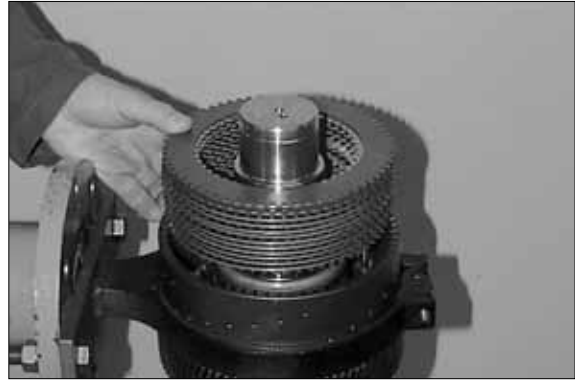


Figure 169

(2) Install the end shim and fasten it by means of the snap ring.



Figure 170

(3) Press on end shim with approximately 100N(10kg) and set dial indicator to "Zero".

Then press end shim against snap ring (upwards) and read disc clearance on the dial indicator.

※ If the required disc clearance differs, it has to be corrected with the adequate inner clutch disc or/and snap ring, see table/position 7 and Position 8.

Upon setting of disc clearance, remove the disc set, oil the clutch discs and reinstall them.

※ Special tool

Magnetic stand                      5870 200 055

Dial indicator                        5870 200 057

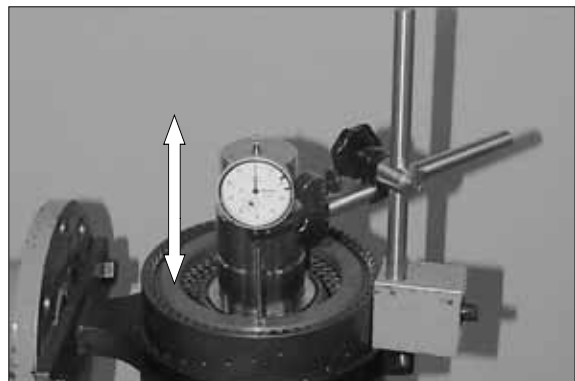


Figure 171

**Preassemble and install spur gear KR  
(Figure 172~176) :**

(1) Opposite figure shows the single components of spur gear KR.

- 1 Bearing inner ring(75×37mm)
- 2 Ring
- 3 Spur gear
- 4 Bearing inner ring(75×41mm)

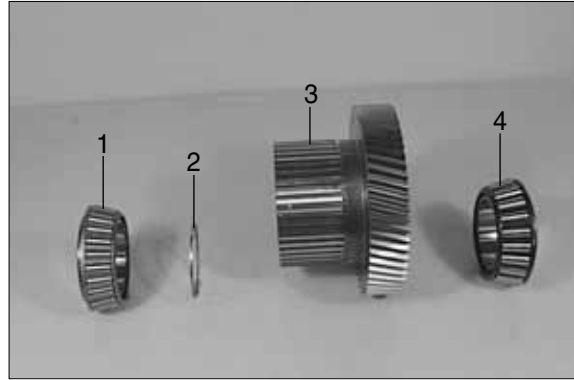


Figure 172

(2) Heat the bearing inner ring(75×37mm) and install it until contact.

**▲ Use safety gloves.**



Figure 173

(3) Assemble the spur gear until all inner clutch discs are located.



Figure 174

(4) Install the ring.



Figure 175



(5) Heat the bearing inner ring(75×41mm) and locate it until contact.

**▲ Use safety gloves.**



Figure 176

(6) Heat the bearing inner ring(clutch bearing) and locate it until contact.

**▲ Use safety gloves.**



Figure 177

## Disc Components K2

※ Below sketch or table shows the standard version as to the installation position of the single components. Obligatory is the respective spare parts list.

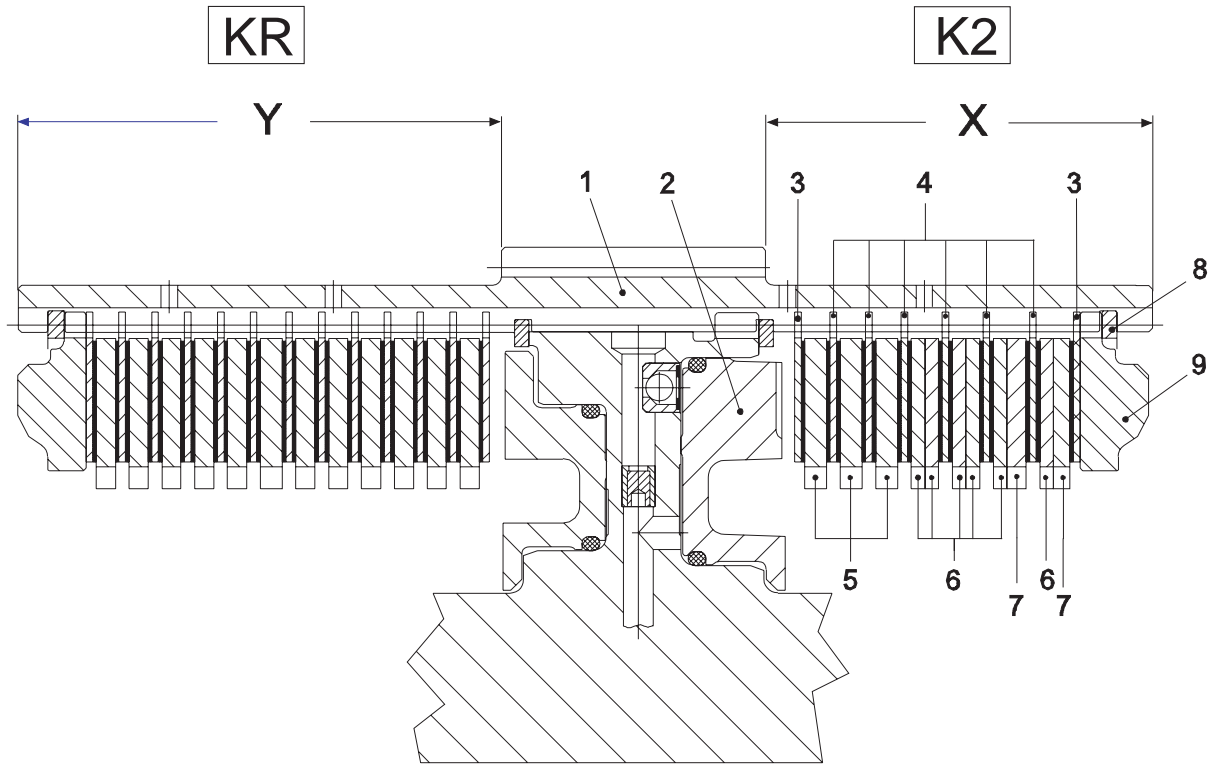


Figure 178

Position	Description	Quantity	s(mm)	Remarks
1	Disc carrier	1		
2	Piston	1		
3	Outer clutch disc	2	1.85	Coated on one side
4	Outer clutch disc	6	2.5	Coated on both sides
5	Inner clutch disc	3	4.0	
6	Inner clutch disc	6	2.5	
7	Inner clutch disc	2	2.5~4.0	Optional
8	Snap ring	1	2.10~3.10	Optional
9	End shim	1		
Number of friction surfaces : 14				
Disc clearance : 2.2 ~ 2.4mm				

※ Install the outer clutch discs position 3 with uncoated side showing to the piston and end shim respectively. The respective clutch side can be seen on the length of the disc carrier, see sketch.

K2 Dimension X (short disc carrier side)

KR Dimension Y (long disc carrier side)

**Check disc clearance  $K_2=2.2\sim 2.4\text{mm}$**   
**(Figure 179~181)**

※ In order to ensure a perfect measuring result, the disc set is first of all to be installed without oil.

(1) Install disc set according to sketch or table (Page 3-130).



Figure 179

(2) Install the end shim and fasten it by means of the snap ring.



Figure 180

(3) Press on end shim with approximately 100N(10kg) and set dial indicator to "Zero".

Then press end shim against snap ring (upwards) and read disc clearance on the dial indicator.

※ If the required disc clearance differs, it has to be corrected with the adequate inner clutch disc or/and snap ring, see table/position 7 and position 8.

Upon setting of disc clearance, remove the disc set, oil the clutch discs and reinstall them.

※ Special tool

Magnetic stand                      5870 200 055

Dial indicator                        5870 200 057

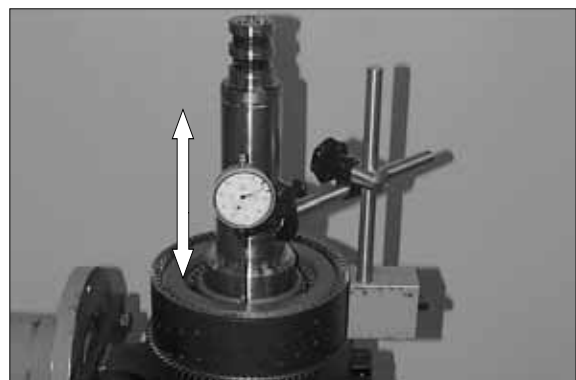


Figure 181

**Preassemble and install spur gear K2 (Figure182~186) :**

- (1) Undercool gear 1 (approx -80°C) and heat gear 2 (approx 120°C). Engage the snap ring (arrow), preload it and join both components by means of hydraulic press until the snap ring engages into the annular groove of gear 2.

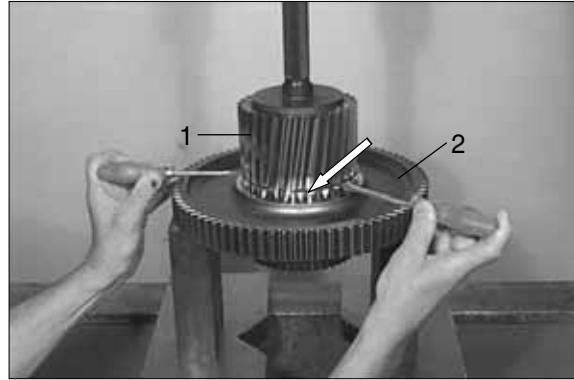


Figure 182

- (2) Opposite figure shows the single components of the spur gear bearing.

- 1 Bearing inner ring
- 2 Spur gear assy
- 3 Bearing inner ring

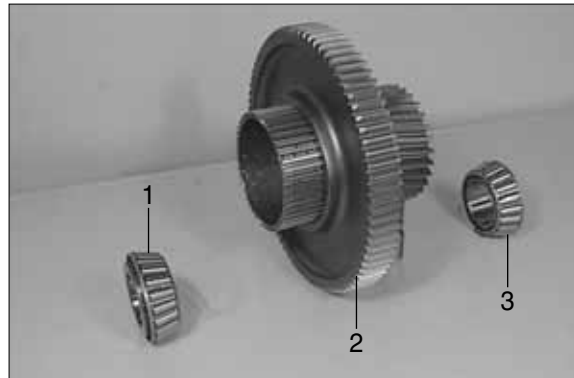


Figure 183

- (3) Heat the bearing inner ring and install it until contact.

**▲ Use safety gloves.**



Figure 184

- (4) Assemble the spur gear until all inner clutch discs are located.



Figure 185

(5) Heat the bearing inner ring(spur gear bearing) and install it until contact.

**▲ Use safety gloves.**



Figure 186

(6) Heat the bearing inner ring(clutch bearing) and locate it until contact.

**▲ Use safety gloves.**



Figure 187

(7) Lift the disc carrier out of the clamping ring.

To ensure the exact locating of the single components, preload the bearing with 100KN(10t) (Figure 188)

**▲ Support on the lower as well as upper bearing inner ring.  
Use pressure pieces(S).**

※ Special tool

Pressure piece

5870 506 096



Figure 188

- (8) Lift the disc carrier into the clamping ring and fasten it.

Rotate disc carrier by 90°.

**K2-side :**

Install the slotted nut.

- ※ Observe installation position of the slotted nut. Chamfer must show to the bearing inner ring, also see sketch/page 3-123. Oil the thread.

· Torque limit : 56.1kgf · m(406lbf · ft)

- ※ Special tool

Clamping ring                      5870 654 033

Slotted nut wrench                5870 401 099

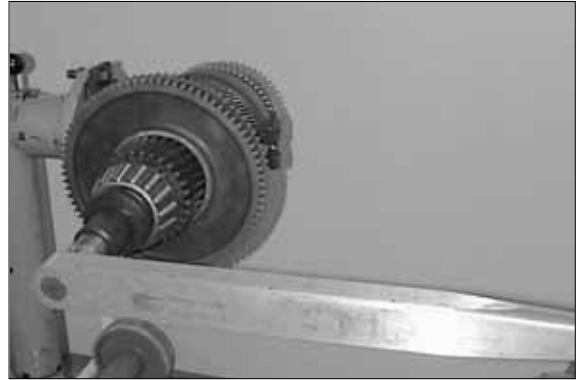


Figure 189

**KR-side :**

Install the slotted nut.

- ※ Observe installation position of the slotted nut. Collar(  $\varnothing$  76mm) must show to the bearing inner ring, also see sketch/page 3-123. Oil the thread.

· Torque limit : 56.1kgf · m(406lbf · ft)

- ※ Special tool

Slotted nut wrench                5870 401 099



Figure 190

- (9) Check function of the clutches K3 and K4 by means of compressed air(Figure 191).

- ※ Closing or opening of the clutches is clearly audible when the single parts have been installed adequately.

Snap-in and lock the rectangular rings (3EA, see arrows).

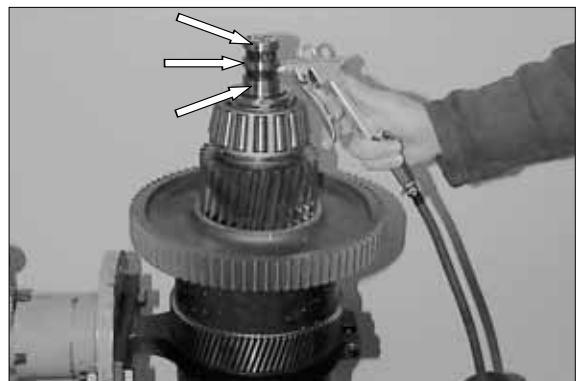


Figure 191

## Assembly of the multi-disc clutch KV/K2

The following sketch shows the clutch sectioning

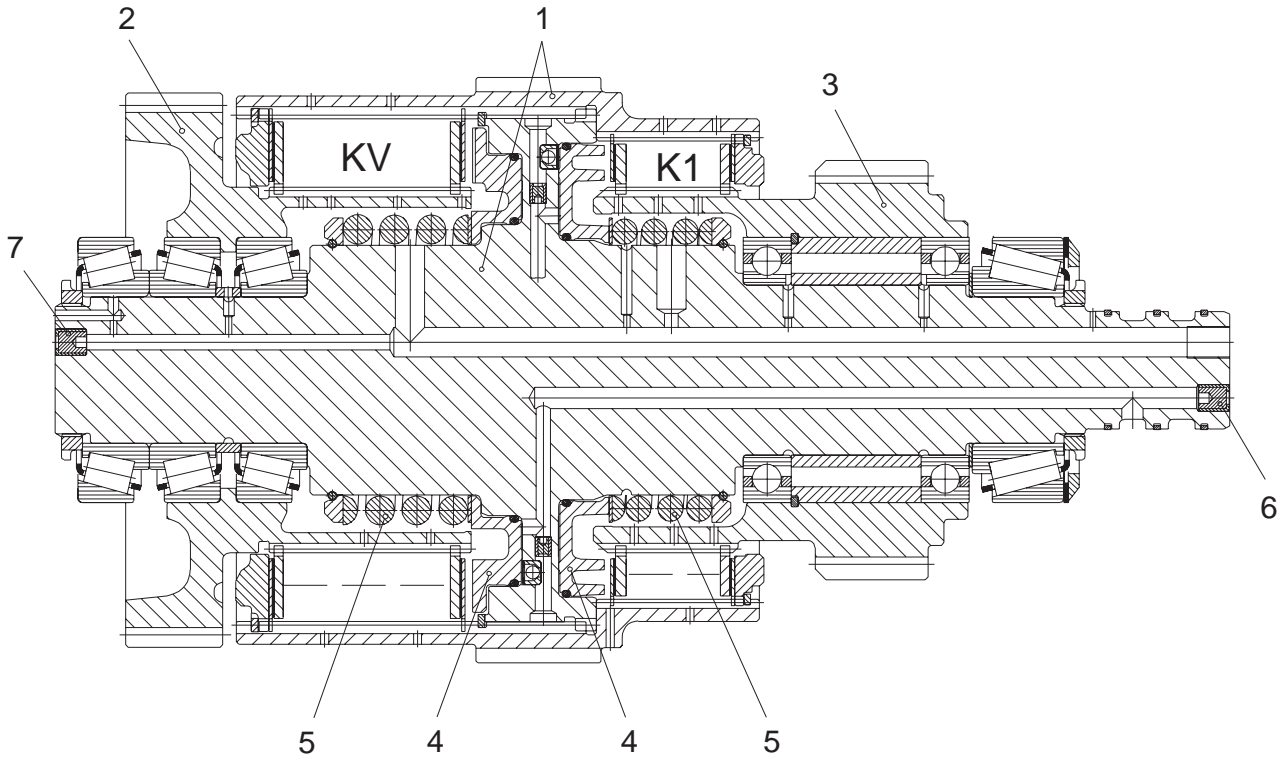


Figure 192

1	Disc carrier	KV	Multi-disc clutch KV	5	Compression spring
2	Spur gear KV	K1	Multi-disc clutch K1	6	Plug 2EA
3	Spur gear K1	4	Piston	7	Plug 1EA

※ Observe the installation position of the single components for the following assembly.

- (1) Lift the disc carrier with the KV-side showing downwards into the clamping ring(S) and fasten it.  
Then rotate disc carrier by 180°.

▲ To install new disc carriers the finished bores have to be sealed with plugs.  
Installation position, see arrow, Figure193~194.

- ※ Special tool  
Hand mounting tool            5870 320 014  
Ratchet spanner                5870 320 018

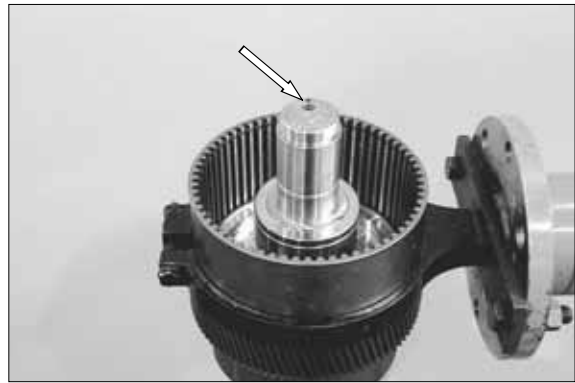


Figure 193



Figure 194

- (2) Flush-mount the drain valve(arrow) with the chamfer showing downwards.

- ※ Special tool  
Inserting tool                5870 320 019

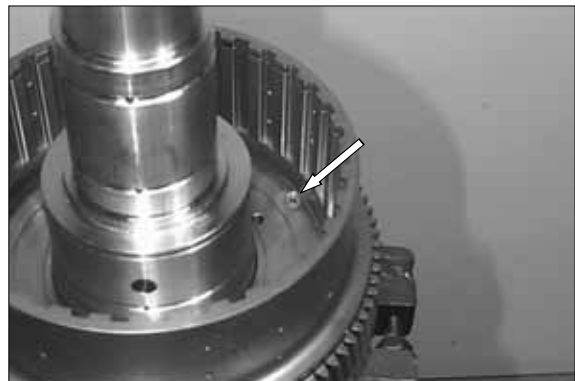


Figure 195

- (3) Put both O-rings **scroll-free** into the annular grooves of the piston, see arrows.

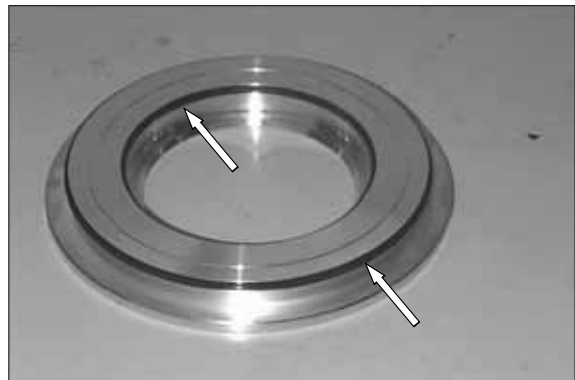


Figure 196



(4) Oil the O-rings and the piston contact surface.

Install K1 piston **equally** until contact.

※ Observe the installation position of the piston, see figure.



Figure 197

(5) Install spacer and compression spring.



Figure 198

(6) Place guide ring, with the chamfer (arrow) showing upwards, over the compression spring and install the snap ring.



Figure 199

(7) Lift the disc carrier out of the clamping ring. Preload the compression spring by means of fixture and engage the snap ring into the annular groove of the disc carrier (arrow), see figure 200.

Install the drain valve, piston and compression spring on the opposite side (clutch KV) analogously.

Then lift the disc carrier with the KV-side showing downwards into the clamping ring and fasten it.

Rotate disc carrier by 180°.



Figure 200

※ Special tool

Pressure piece 5870 345 072

Clamping fixture 5870 654 036

## Disc Components KV

※ Below sketch or table shows the standard version as to the installation position of the single components. Obligatory is the respective spare parts list.

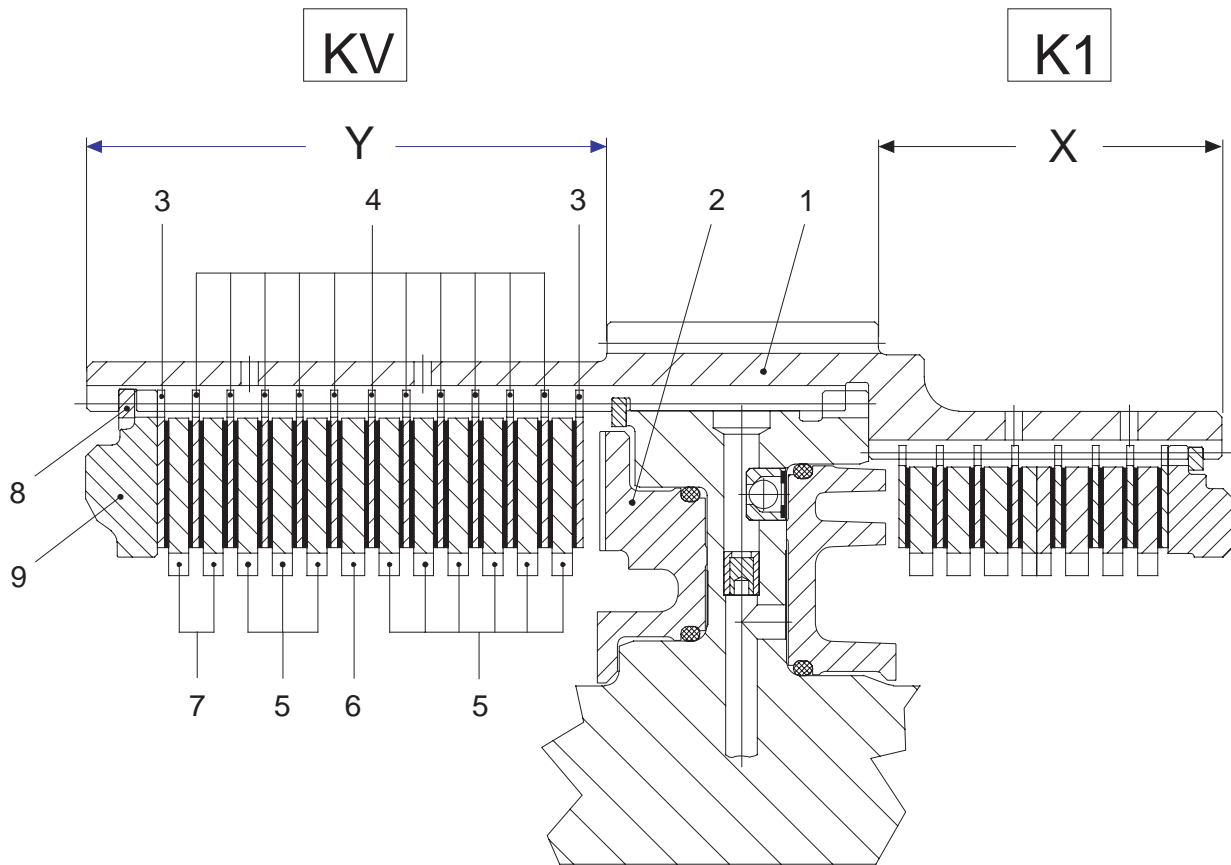


Figure 201

Position	Description	Quantity	s(mm)	Remarks
1	Disc carrier	1		
2	Piston	1		
3	Outer clutch disc	2	1.85	Coated on one side
4	Outer clutch disc	11	2.5	Coated on both sides
5	Inner clutch disc	9	3.5	
6	Inner clutch disc	1	4.0	
7	Inner clutch disc	2	2.5~4.0	Optional
8	Snap ring	1	2.10~3.10	Optional
9	End shim	1		
Number of friction surfaces : 24				
Disc clearance : 2.8 ~ 3.0mm				

※ Install the outer clutch discs position 3 with uncoated side showing to the piston and end shim respectively. The respective clutch side can be seen on the length and  $\phi$  of the disc carrier respectively, see sketch.

KV Dimension Y (long disc carrier side and large  $\phi$  respectively)

K1 Dimension X (short disc carrier side and small  $\phi$  respectively)

**Check disc clearance KV=2.8~3.0mm  
(Figure 202~204)**

※ In order to ensure a perfect measuring result, the disc set is first of all to be installed without oil.

(1) Install disc set according to sketch or table (Page 3-138).

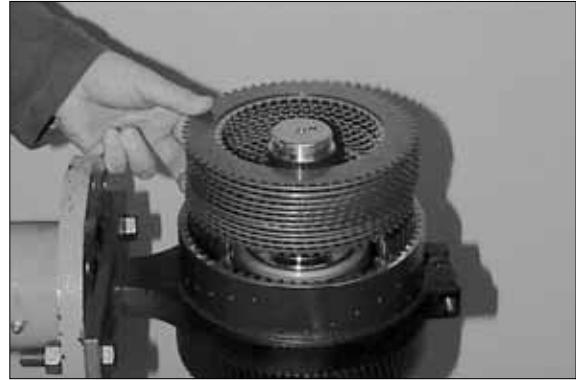


Figure 202

(2) Install the end shim and fasten it by means of the snap ring.



Figure 203

(3) Press on end shim with approximately 100N(10kg) and set dial indicator to "Zero".

Then press end shim against snap ring (upwards) and read disc clearance on the dial indicator.

※ If the required disc clearance differs, it has to be corrected with the adequate inner clutch disc or/and snap ring, see table/position 7 and position 8.

Upon setting of disc clearance, remove the disc set, oil the clutch discs and reinstall them.

※ Special tool

Magnetic stand                      5870 200 055

Dial indicator                        5870 200 057

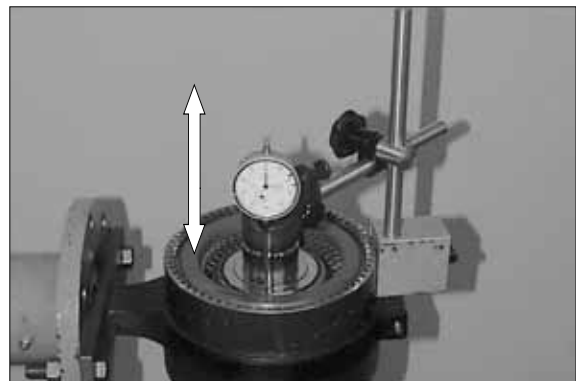


Figure 204

**Preassemble and install spur gear KV  
(Figure 205~209) :**

(1) Opposite figure shows the single components of spur gear KV.

- 1 Bearing inner ring
- 2 Bearing outer ring
- 3 Ring
- 4 Spur gear

Install both bearing outer rings(2) until contact.

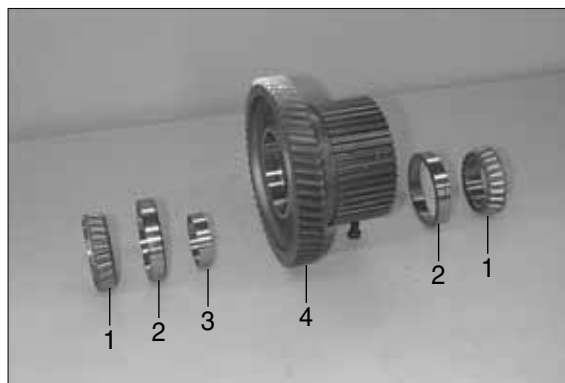


Figure 205

(2) Heat the bearing inner ring and install it until contact.

**▲ Use safety gloves.**



Figure 206

(3) Install the ring.

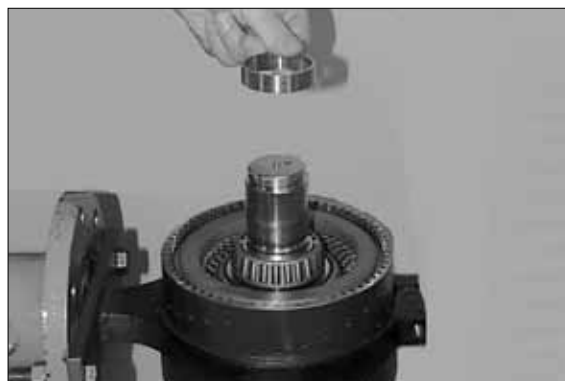


Figure 207

(4) Assemble the spur gear until all inner clutch discs are located.



Figure 208

(5) Heat the bearing inner ring (spur gear bearing) and locate it until contact.

**▲ Use safety gloves.**



Figure 209

(6) Heat the bearing inner ring (clutch bearing) and locate it until contact.

**▲ Use safety gloves.**

Rotate disc carrier by 180°.



Figure 210

## Disc Components K1

※ Below sketch or table shows the standard version as to the installation position of the single components. Obligatory is the respective spare parts list.

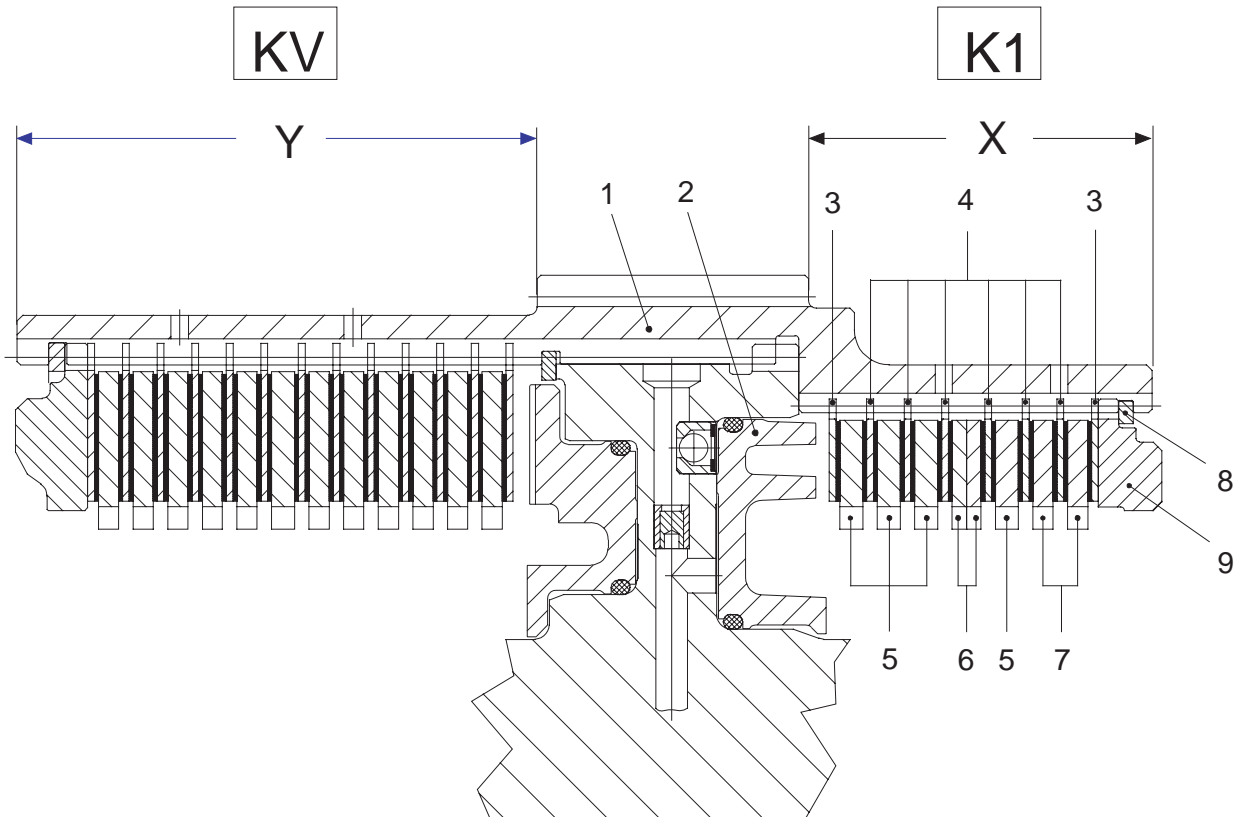


Figure 211

Position	Description	Quantity	s(mm)	Remarks
1	Disc carrier	1		
2	Piston	1		
3	Outer clutch disc	2	1.85	Coated on one side
4	Outer clutch disc	6	2.5	Coated on both sides
5	Inner clutch disc	4	4.0	
6	Inner clutch disc	2	2.5	
7	Inner clutch disc	2	2.5~4.0	Optional
8	Snap ring	1	2.1~2.5	Optional
9	End shim	1		
Number of friction surfaces : 14				
Disc clearance : 2.2 ~ 2.4mm				

※ Install the outer clutch discs position 3 with uncoated side showing to the piston and end shim respectively. The respective clutch side can be seen on the length and  $\varnothing$  of the disc carrier respectively, see sketch.

K1 Dimension X (short disc carrier side and small  $\varnothing$  respectively)

KV Dimension Y (long disc carrier side and large  $\varnothing$  respectively)

**Check disc clearance KV=2.2~2.4mm  
(Figure 212~214)**

※ In order to ensure a perfect measuring result, the disc set is first of all to be installed without oil.

(1) Install disc set according to sketch or table (Page 3-142).



Figure 212

(2) Install the end shim and fasten it by means of the snap ring.



Figure 213

(3) Press on end shim with approximately 100N(10kg) and set dial indicator to "Zero".

Then press end shim against snap ring(upwards) and read disc clearance on the dial indicator.

※ If the required disc clearance differs, it has to be corrected with the adequate inner clutch disc or/and snap ring, see table/position 7 and position 8.

Upon setting of disc clearance, remove the disc set, oil the clutch discs and reinstall them.

※ Special tool

Magnetic stand                      5870 200 055

Dial indicator                        5870 200 057

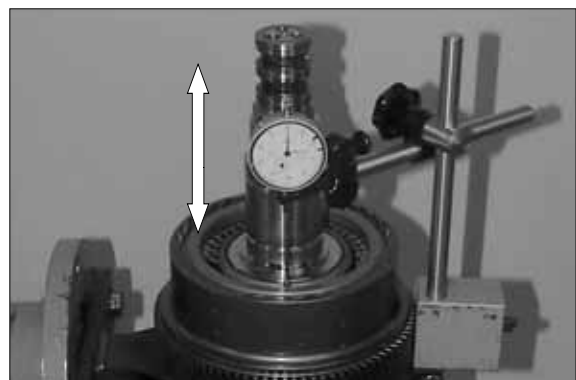


Figure 214

**Preassemble and install spur gear K1  
(Figure 215~222) :**

(1) Opposite figure shows the single components of spur gear K1.

- 1 Ball bearing(assy)
- 2 Snap ring
- 3 Spur gear

※ Prior to installation of the single components, align the disc set by means of the spur gear radially and center it, see figure 216.

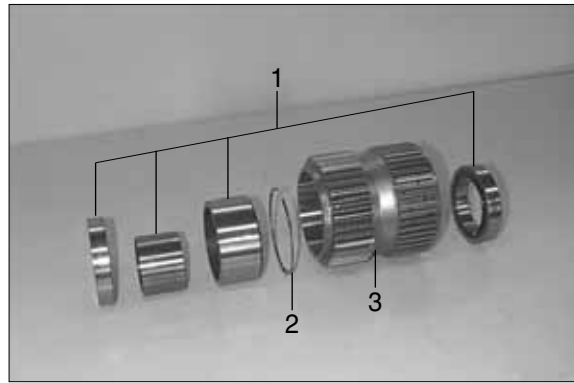


Figure 215



Figure 216

(2) Install the ring.



Figure 217

(3) Install the bush with collar (arrow) on face end showing to the snap ring.



Figure 218



(4) Press in the ball bearing until contact.

- ※ Install the ball bearing with the lubricating groove (arrow) showing downwards. Put the press-in tool only to the bearing outer ring.



Figure 219

(5) Heat the second ball bearing and install it until contact.

- ※ Lubricating groove (arrow), must show upwards.

▲ Use safety gloves.



Figure 220

(6) Assemble the bush.



Figure 221

(7) Heat the spur gear to approximately 120°C and assemble it until all inner clutch discs are located.

▲ Use safety gloves.



Figure 222

(8) Install shim  $s = 1.20\text{mm}$



Figure 223

(9) Heat the bearing inner ring and install it until contact.

**▲ Use safety gloves.**



Figure 224

(10) Lift the disc carrier out of the clamping ring (S). To ensure the exact locating of the single components, preload the bearing with 100KN(10t) (Figure 225).

**▲ Support on the lower as well as upper bearing inner ring.  
Use pressure pieces(S).**

※ Special tool

Pressure pieces

5870 506 096



Figure 225

(11) Lift the disc carrier into the clamping ring (S). Rotate disc carrier by 90°. Install the slotted nut.

- ※ Observe installation position of the slotted nut. Collar(  $\varnothing$  60mm) must show to the taper roller bearing also see sketch/page 3-135. Oil the thread.

- Torque limit : 56.1kgf · m(406lbf · ft)

- ※ Special tool

- Slotted nut wrench 5870 401 118

- Slotted nut wrench 5870 401 099

Install the opposite slotted nut(KV-side) analogously.

- ※ Special tool

- Slotted nut wrench 5870 401 118

- Slotted nut wrench 5870 401 115

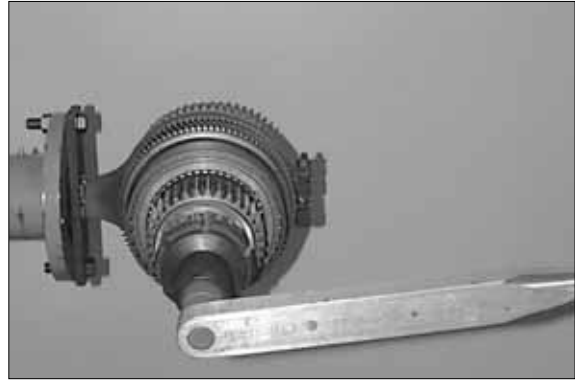


Figure 226

(12) Check function of the clutches KV and K1 by means of compressed air.

- ※ Closing or opening of the clutches is clearly audible when the single parts have been installed adequately.



Figure 227

(13) Snap-in and lock the rectangular rings (3EA, see arrows).



Figure 228

## Installation of layshaft gear, multi-disc clutches and output gear

(1) Opposite figure shows the single components of the layshaft gear bearing.

- 1 Bearing inner ring(2EA)
- 2 Ring
- 3 Layshaft gear

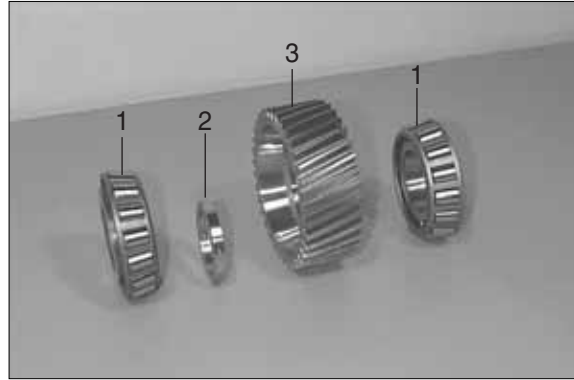


Figure 229

(2) Position layshaft gear(assy) in the housing.

- ※ Only when the clutches are installed, the idler shaft can be mounted.



Figure 230

(3) Insert the bearing outer rings KV/K1, KR/K2 and K3/K4 into the housing bores until contact, see arrows.

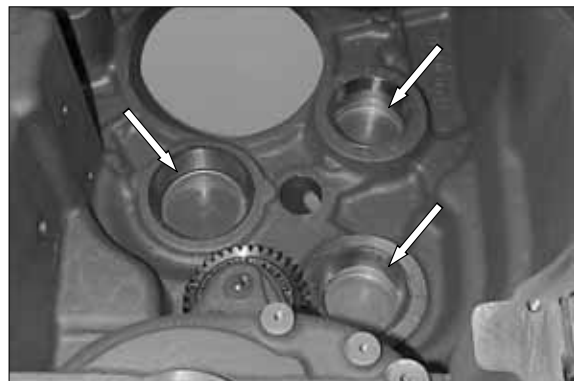


Figure 231

(4) Position clutch KV/K1 by means of lifting tackle.

- ※ Special tool  
Eyebolts assortment      5870 204 002



Figure 232

(5) Position clutch KR/K2.

- ※ Special tool
- Eyebolts assortment           5870 204 002



Figure 233

(6) Check the installation position of the layshaft gear(arrow) once again and correct it, if required.

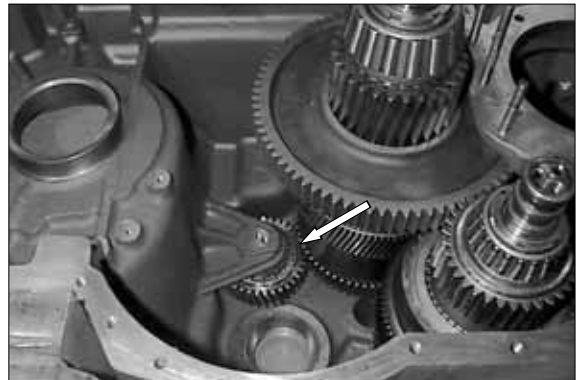


Figure 234

(7) Fasten the spur gear K3 by means of fixture and eyebolt(arrow) axially.

- ※ Spur gear fixing prevents the clutch discs from dislocating when the clutch is lifted in.
- ※ Special tool
- Assembly fixture               5870 345 033
- Eyebolt                         5870 204 066



Figure 235

(8) Lift the clutch KR/K2 slightly, move it in direction of the arrow and position clutch K3/K4.

Then remove the fixture(Figure 235) again.

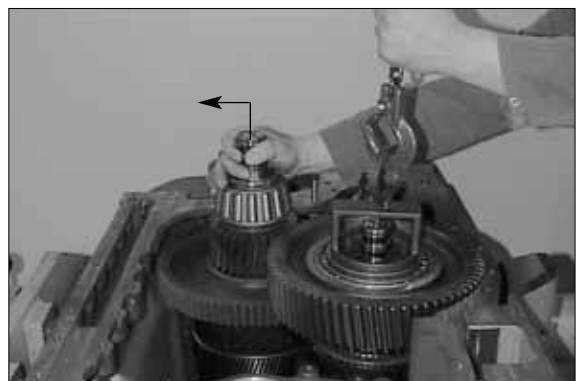


Figure 236

(9) Insert the bearing outer ring into the housing bore until contact.

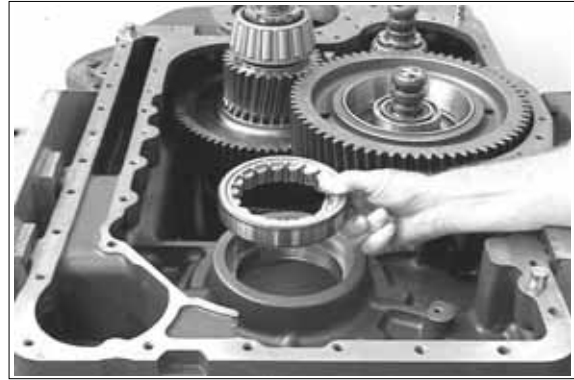


Figure 237

(10) Heat the bearing inner ring and install it until contact.

▲ Use safety gloves.

※ Observe installation position-collar (arrow) shows to the spur gear. Install the bearing inner ring after cooling down subsequently (press).



Figure 238

(11) Position the oil baffle.



Figure 239

(12) Install the output gear by means of lifting tackle.

※ Special tool  
Stop washer 5870 100 054  
Eyebolts assortment 5870 204 002



Figure 240

(13) Position upper oil baffle and fasten both plates by means of hexagon screws(4EA).

※ Install washers.

Secure hexagon screws with loctite(Type No.243).

· Torque limit : 2.35kgf · m(16.7lbf · ft)

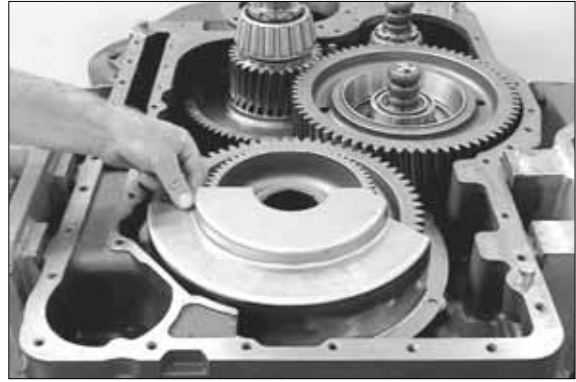


Figure 241

### Preassembly and mounting of the housing cover

#### Note to figure 242 and 243 :

Depending on the transmission version, differences as regards the single components and their installation position are possible.

Obligatory is the respective parts list.

(1) Install the sealing cover(arrow).

※ Wet the sealing surface with Loctite(Type No.262).

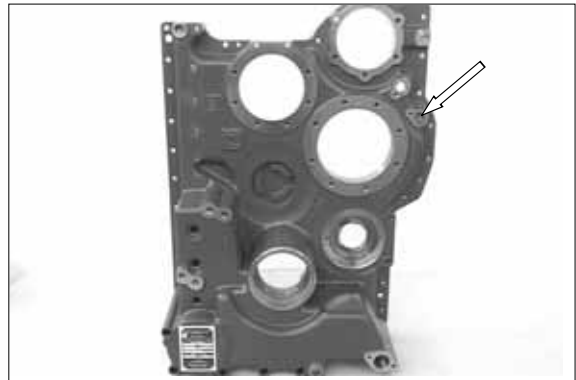


Figure 242

(2) Insert the O-ring into the annular groove of the cover and fasten the cover by means of hexagon screws.

※ Wet the thread of the hexagon screws with loctite(Type No.574). Observe the installation position of the cover, see figure.

· Torque limit : 2.35kgf · m(16.7lbf · ft)



Figure 243

(3) Wet the mounting face with sealing compound(Loctite, Type No.574).

By means of the lifting tackle place the housing cover on the transmission housing until contact.

※ Special tool

Lifting tackle

5870 281 055



Figure 244

- (4) Install both cylindrical pins (arrow 1 and 2) and the slotted pin (arrow 3).

Then fasten the housing cover by means of hexagon and cap screws.

- Torque limit M10/8.8 :

4.69kgf · m (33.9lbf · ft)

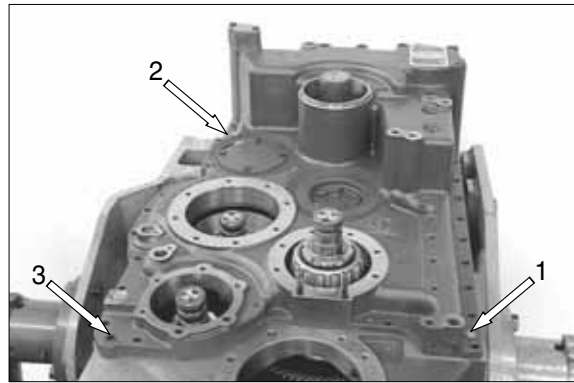


Figure 245

**Adjust the bearing preload of clutch K4/K3 = 0.0~0.05mm (Figure 248~250)**

- ※ For installation of a new bearing cover, both finished bores have to be sealed by means of a plug. Finished bores are located opposite (180°) to each other, also see arrow/ Figure 246 and 247.

1 Bearing cover-K4/K3

2 Plug (Konig)

(S) Special tool

- ※ Special tool

Hand mounting tool 5870 320 014

Ratchet spanner 5870 320 018

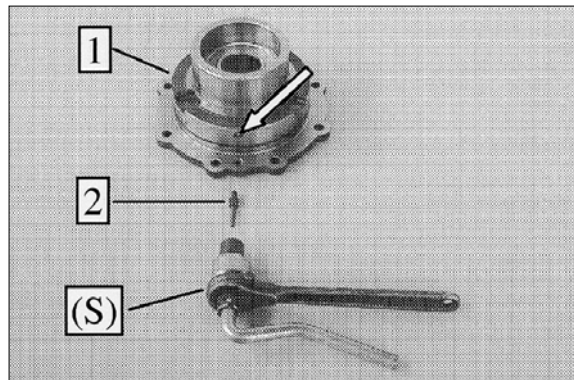


Figure 246

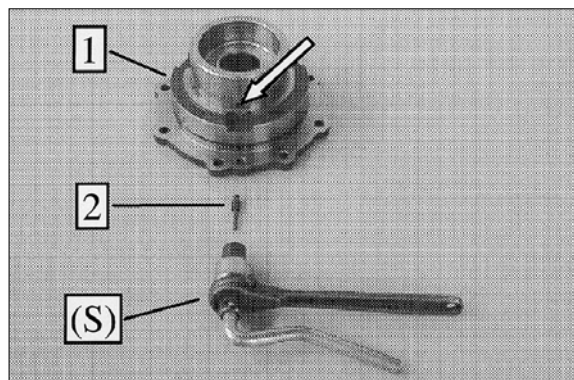


Figure 247



**Housing dimension :**

- (1) Press on equally the bearing inner ring and determine Dimension I, from the mounting face to the bearing inner ring.

Dimension I e.g ..... 43.65mm

- ※ Take several measuring points and determine the mean value.

Then remove the bearing inner ring again.

- ※ Special tool

Measuring shaft                    5870 200 022

Digital depth gauge                5870 200 072

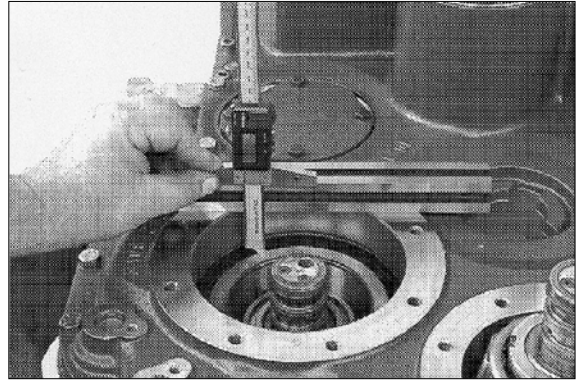


Figure 248

**Cover dimension :**

- (2) Determine Dimension II, from the mounting face until contact/bearing inner ring.

Dimension II e.g ..... 42.12mm

- ※ Special tool

Straightedge                        5870 200 022

Gauge blocks                        5870 200 067

Digital depth gauge                5870 200 072

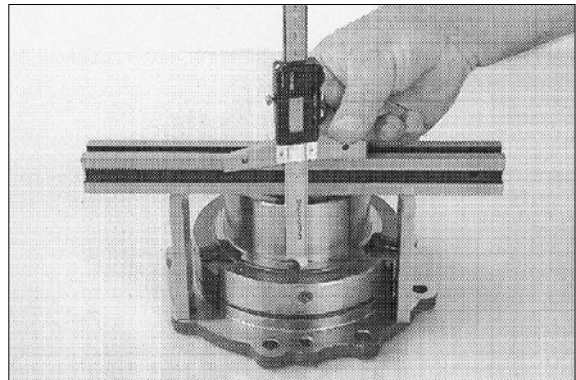


Figure 249

**Example :**

Dimension I ..... 43.65mm

Dimension II ..... - 42.12mm

Difference ..... = 1.53mm

Bearing preload ..... e.g. + 0.02mm

**Resulting shim(s) ..... s = 1.55mm**

- (3) Put on the shim.



Figure 250

- (4) Heat the bearing inner ring and place it until contact.

- ▲ Use safety gloves.

- ※ Install the bearing inner ring after cooling down subsequently (press).



Figure 251

- (5) Grease the rectangular rings(3EA, arrows) and centrally align them.

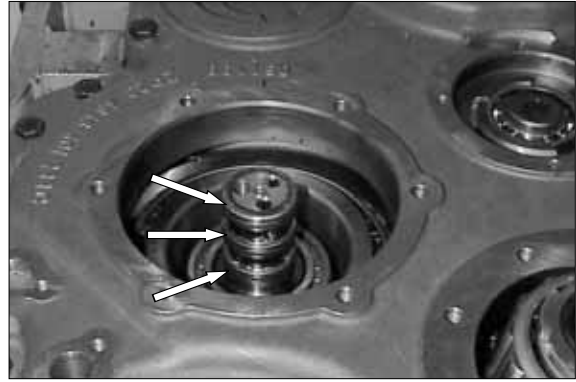


Figure 252

- (6) Install the O-ring(arrow) and grease it.  
Heat the inner diameter of the bearing cover(bearing seat).

※ Special tool

Hot-air blower 230V                    5870 221 500

Hot-air blower 115V                   5870 221 501



Figure 253

- (7) Install two adjusting screws.  
Assemble the bearing cover and tighten it equally until contact by means of hexagon screws.

· Torque limit(M10/8.8) :  
4.69kgf · m(33.9lbf · ft)

※ Observe the radial installation position.

※ Special tool

Adjusting screws                    5870 204 007



Figure 254

- (8) Check the function of **both** clutches by means of compressed air.

※ In case of a decisive pressure loss, the possible cause might be the breakage of one or several rectangular rings(see arrow , Figure 252).

Replace the rectangular rings, if required.

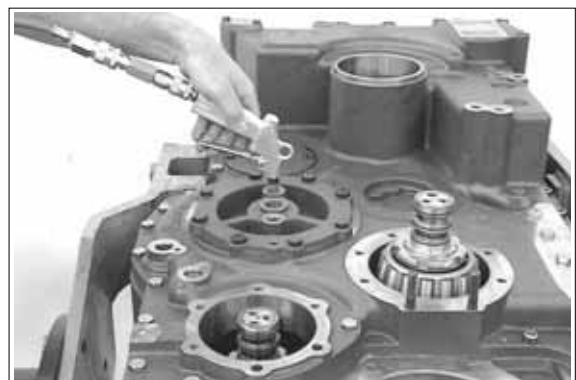


Figure 255

**Adjust the bearing preload of clutch KR/K2  
= 0.0~0.05mm(Figure 258~262)**

- ※ For installation of a new bearing cover, both finished bores have to be sealed by means of a plug.  
Finished bores are located opposite(180°) to each other, also see arrow/Figure 256 and 257.

1 Bearing cover-KR/K2

2 Plug

(S) Special tool

- ※ Special tool

Hand mounting tool                    5870 320 014

Ratchet spanner                        5870 320 018

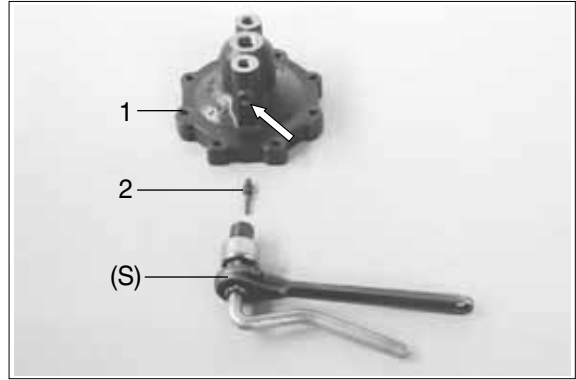


Figure 256

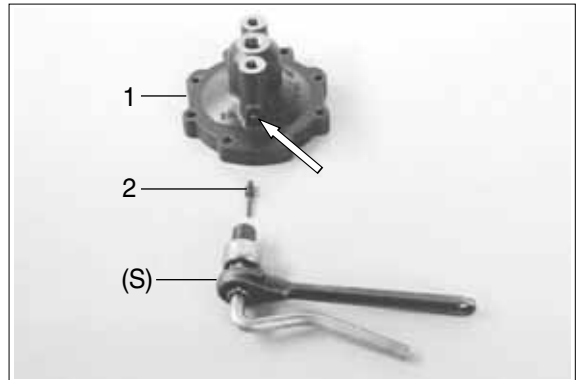


Figure 257

(1) Install both studs(arrow).

- ※ Wet the thread with loctite(Type No. 243).  
· Torque limit(M10) : 1.33kgf · m(9.59lbf · ft)

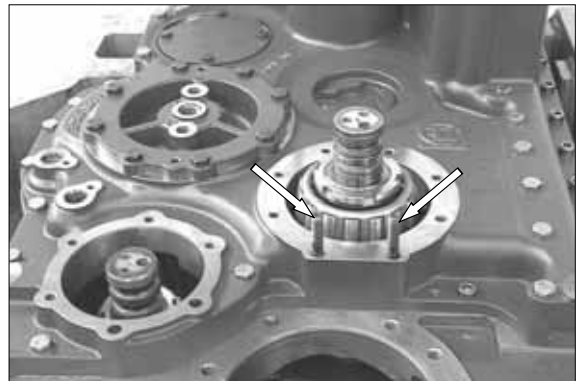


Figure 258

(2) Install the bearing outer ring until contact.

- ※ Pay attention to exact contact.



Figure 259

**Housing dimension :**

- (3) Determine Dimension I, from the bearing outer ring to the mounting face.  
Dimension I e.g ..... 16.13mm

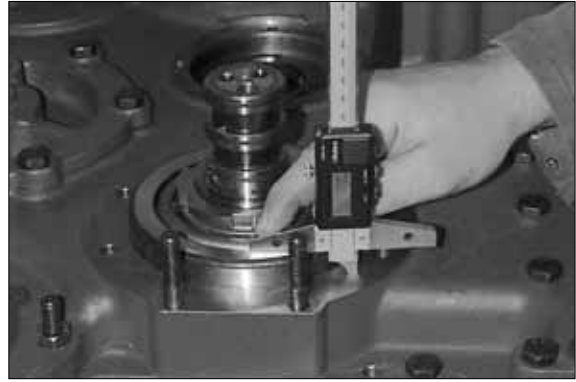


Figure 260

**Cover dimension :**

- (4) Determine Dimension II, from the contact/bearing outer ring to the mounting face.  
Dimension II e.g ..... 17.75mm

※ Special tool  
Digital depth gauge                    5870 200 072

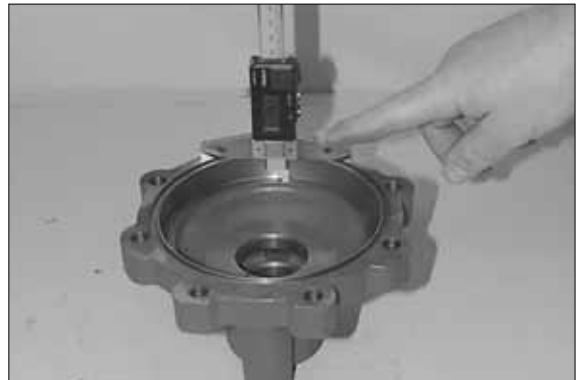


Figure 261

**Example :**

Dimension II ..... 17.75mm  
Dimension I ..... - 16.13mm  
Difference ..... = 1.62mm  
Bearing preload ..... e.g. + 0.03mm  
**Resulting shim(s) ..... s = 1.65mm**

- (5) Fix the shim with assembly grease into the cover. Install the O-ring(arrow).



Figure 262

- (6) Grease the rectangular rings(arrows) and centrally align them.

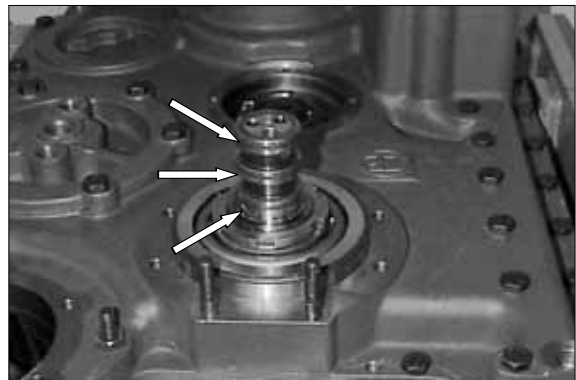


Figure 263

(7) Pull the bearing cover equally until contact.

· Torque limit(M10/8.8) :

4.69kgf · m(33.9lbf · ft)

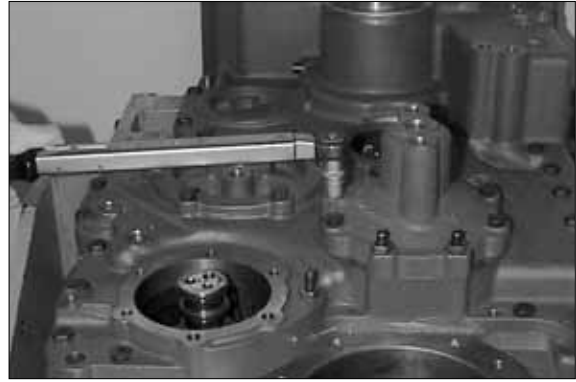


Figure 264

(8) Check the function of both clutches by means of compressed air.

※ In case of a decisive pressure loss, the possible cause might be the breakage of one or several rectangular rings(see Figure 263).

Replace the rectangular rings, if required.



Figure 265

**Adjust the bearing preload of clutch KV/K1 = 0.0~0.05mm(Figure 267~270)**

※ For installation of a new bearing cover, both finished bores have to be sealed by means of a plug.

Installation position, see arrows/Figure 266.

- 1 Bearing cover-KV/K1
- 2 Plug
- (S) Special tool

※ Special tool

- Hand mounting tool            5870 320 014
- Ratchet spanner                5870 320 018

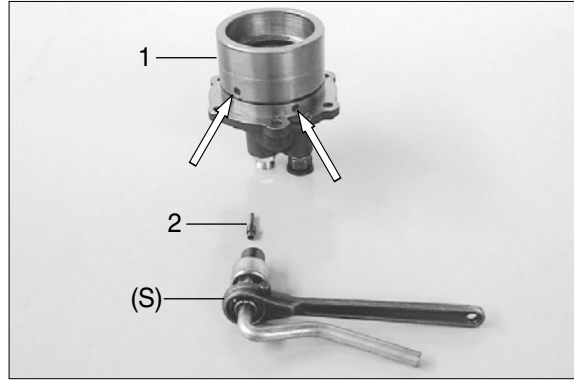


Figure 266

- (1) Put the bearing outer ring over the bearing inner ring.

**Housing dimension :**

Press on equally the bearing outer ring and determine Dimension I, from the mounting face to the bearing outer ring.

Dimension I e.g ..... 52.67mm

※ Take several measuring points and determine the mean value.

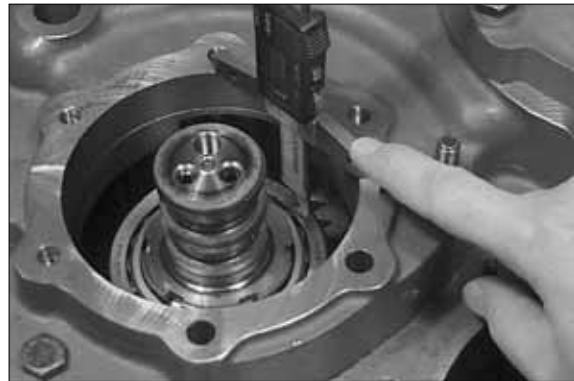


Figure 267

- (2) Put the ring with the chamfer showing downwards into the bearing cover.



Figure 268

**Cover dimension :**

- (3) Determine Dimension II, from the mounting face to the ring.

Dimension II e.g ..... 50.75mm

※ Special tool

Digital depth gauge                    5870 200 072

Gauge blocks                            5870 200 067



Figure 269

**Example :**

Dimension I ..... 52.67mm

Dimension II ..... - 50.75mm

Difference ..... e.g. 1.92mm

Bearing preload ..... + 0.03mm

**Resulting shim(s) ..... s = 1.95mm**

- (4) Put in the shim.



Figure 270

- (5) Install the bearing outer ring until contact.  
Assemble the O-ring(arrow).



Figure 271

- (6) Grease the rectangular rings(arrows) and centrally align them.

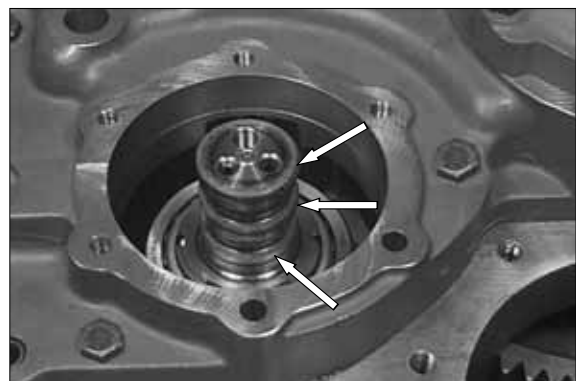


Figure 272

(7) Heat the bearing bore.

※ Special tool

Hot-air blower 230V            5870 221 500

Hot-air blower 115V         5870 221 501

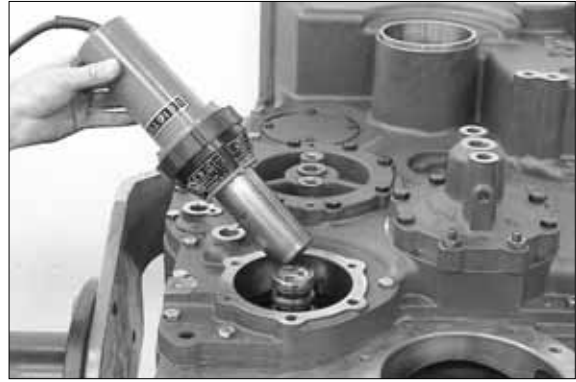


Figure 273

(8) Install two adjusting screws.

Place the bearing cover until contact and fasten it by means of hexagon screws.

※ Observe the radial installation position, see figure.

※ Special tool

Adjusting screws            5870 204 007

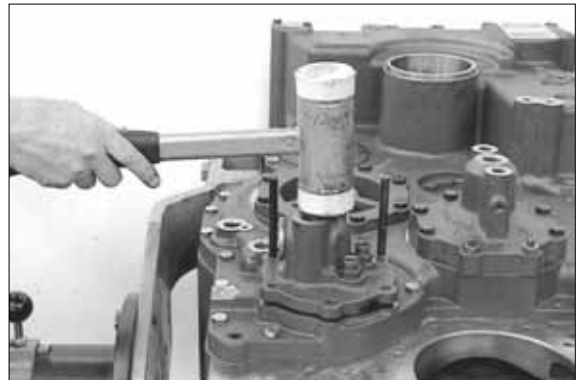


Figure 274

(9) Check the function of **both** clutches by means of compressed air.

※ In case of a decisive pressure loss, the possible cause might be the breakage of one or several rectangular rings (see arrow, Figure 272).

Replace the rectangular ring(s), if required.

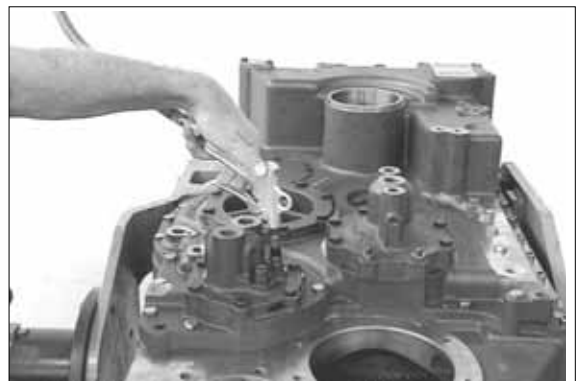


Figure 275



## Output

### Installation of the output shaft

(1) Heat the inner diameter of the output gear.

※ Special tool

Hot-air blower 230V            5870 221 500

Hot-air blower 115V         5870 221 501

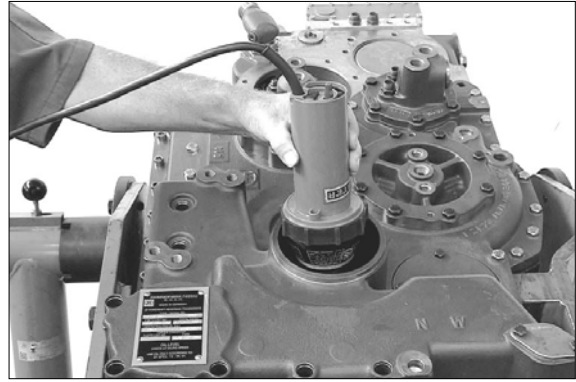


Figure 276

(2) Assemble the output shaft with the long gearing showing downwards until contact.



Figure 277

(3) Rotate the transmission housing into the vertical position(90°).

By means of the mounting tool the output shaft has preliminarily to be fixed axially(Figure 278 and 279) at the converter side.

※ Special tool

Mounting tool                    5870 048 265

Then rotate the transmission housing back again(90°).



Figure 278



Figure 279

**Adjust the axial play of the output bearing = 0.3~0.5mm(Figure 280~282)**

- (4) Determine Dimension I, from plane face/ housing to end face/output shaft.

Dimension I e.g ..... 66.90mm

※ Special tool

Digital depth gauge                    5870 200 072



Figure 280

- (5) Measure Dimension II, from plane face/ housing to contact face/ball bearing.

Dimension II e.g ..... 64.20mm

**Example :**

Dimension I ..... 66.90mm

Dimension II ..... - 64.20mm

Difference ..... = 2.70mm

Required axial play ..... e.g. - 0.40mm  
(0.3~0.5mm)

**Resulting shim ..... s = 2.30mm**



Figure 281

- (6) Install the shim.



Figure 282

- (7) Install the ball bearing(Figure 283) and pull it until contact by means of the output flange (Figure 284).

Then remove the output flange again.



Figure 283

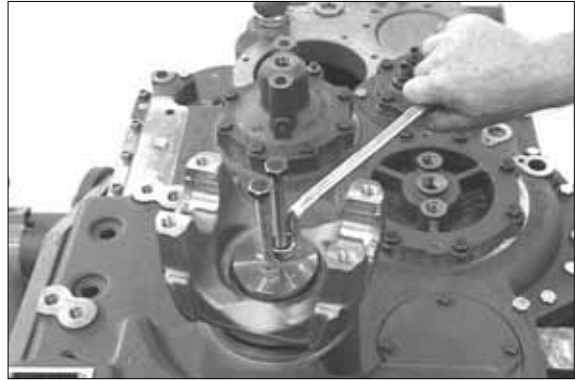


Figure 284

(8) Fasten the ball bearing by means of retaining ring.

※ Clamping pliers 5870 900 021



Figure 285

(9) Remove the converter-side mounting tool again.

Install the shaft seal, (arrow) with the sealing lip showing to the oil sump.

※ Using of the specified mounting tool(S), results in the exact installation position (without retaining ring = 20mm). Grease the sealing lip.

※ Special tool  
Mounting tool 5870 048 265

※ Depending on the version different shaft seals can be used :  
Outer diameter rubber-coated-wet it with spirit. Outer diameter metallic-wet it with sealing compound(Loctite, Type No. 574).



Figure 286

## Output Flange

(1) Press on the screen sheet (arrow) until contact.

※ Observe the installation position, see figure 288.

※ Special tool

Pressing bush

5870 506 138

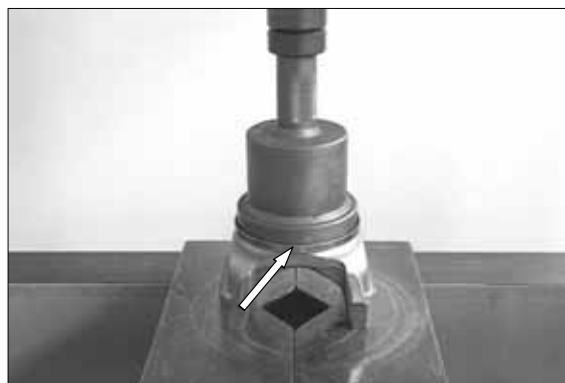


Figure 287

1 Screen sheet

2 Output flange

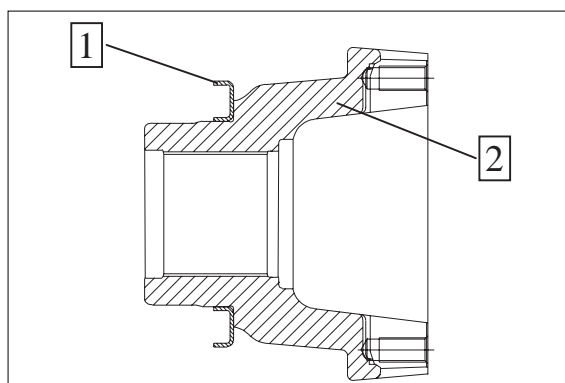


Figure 288

Adjust gap size  $X = 0.3\sim 0.8\text{mm}$   
 (Figure 289~292) :

- X Gap size
- 1 Shim
- 2 O-ring.

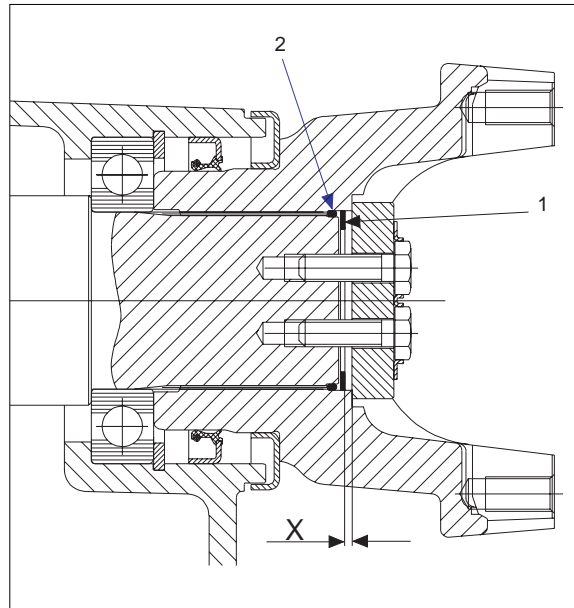


Figure 289

(1) Install the output flange until contact.

Measure Dimension I, from the plane face of the output flange to the end face of the output shaft.

Dimension I e.g. .... 37.00mm

※ Special tool

Digital depth gauge                      5870 200 072

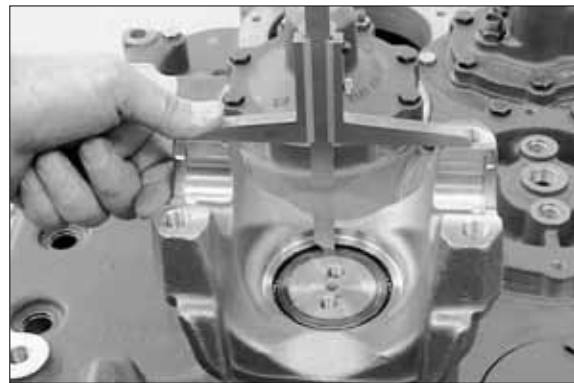


Figure 290

(2) Measure Dimension II, from the plane face to the collar of the output flange.

Dimension II e.g. .... 36.00mm

**Example :**

Dimension I ..... 37.00mm

Dimension II ..... - 36.00mm

Difference ..... = 1.00mm

Gap size X ..... e.g. - 0.50mm  
 (0.3~0.8mm)

**Resulting shim ..... s = 0.50mm**

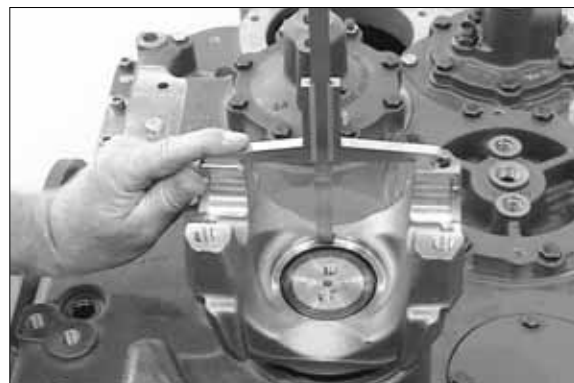


Figure 291

- (3) Place the O-ring(arrow) into the space between output flange and shaft(see also Figure 289) and put on the shim.

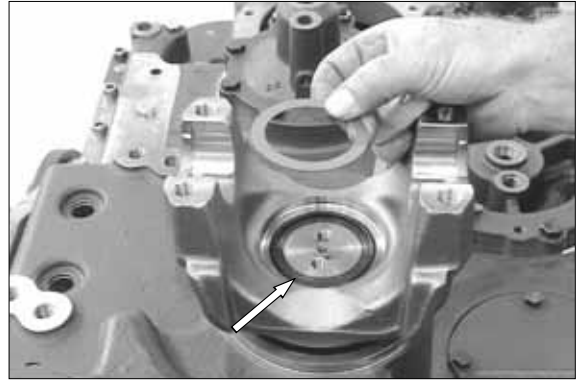


Figure 292

- (4) Put on the washer and fasten the output flange by means of hexagon screws.

- Torque limit(M10/8.8) :  
4.69kgf · m(33.9lbf · ft)



Figure 293

- (5) Fasten the hexagon screws by means of the lock plate.

- ※ Specail tool  
Mounting tool                    5870 057 009  
Handle                                5870 260 002



Figure 294

### Output Flange(Converter side)

(1) Install the shaft seal(arrow) with the sealing lip showing to the oil sump.

- ※ Using of the specified mounting tool, results in the exact installation position (With retaining ring = 7.0mm). Grease the sealing lip.

※ Special tool  
Mounting tool 5870 048 265

- ※ Depending on the version different shaft seals can be used :  
Outer diameter rubber-coated-wet it with spirit. Outer diameter metallic-wet it with sealing compound(Loctite, Type No. 574).



Figure 302

(1) Press the screen sheet(arrow) over the collar of the output flange until contact.

- ※ Observe the installation position, see figure 304.

※ Special tool  
Pressing bush 5870 506 138

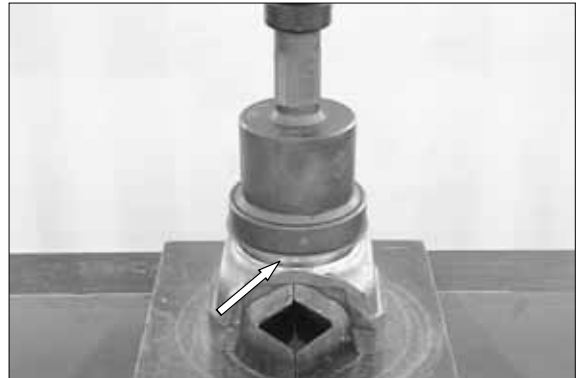


Figure 303

- 1 Screen sheet
- 2 Output flange

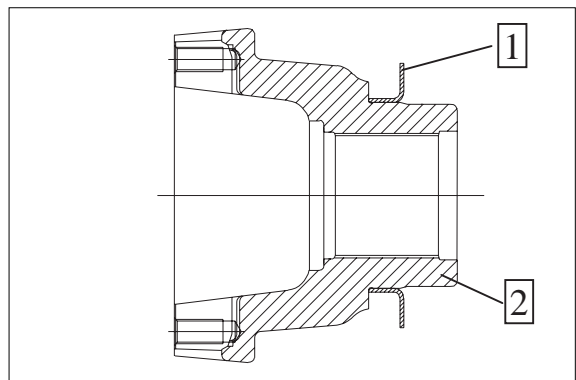


Figure 304

(2) Install the output flange until contact.

- ※ Setting of the gap size as well as fixing of the output flange is identical with the installation of the output flange at the transmission rearside, see page 3-165 and 3-166.



Figure 305

### Installation of the idler shaft

(1) Align the layshaft gear and the single components centrally.  
Heat the layshaft gearing(Figure 306).

- ※ Special tool  
Hot-air blower 230V            5870 221 500  
Hot-air blower 115V         5870 221 501



Figure 306

(2) Install the adjusting screw.

- ※ Special tool  
Adjusting screws            5870 204 007



Figure 307

(3) Install the idler shaft until contact.



Figure 308



(4) Remove the adjusting screw and fasten the axle by means of hexagon screw.

※ Wet the thread of the hexagon screw with Loctite(Type No. 243).

· Torque limit(M10/8.8) :

4.69kgf · m(33.9lbf · ft)



Figure 309

(5) Insert the sealing covers(arrow), with the concave side showing downwards, flush to the housing surface.

※ Wet contact face with Loctite(Type No. 262).

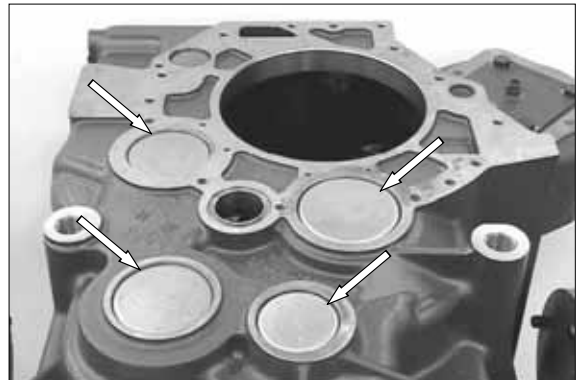


Figure 310

## Transmission pump

- (1) Press the needle sleeve (arrow), with the reinforced coating towards the press-in tool until contact.

※ Special tool

Mounting tool 5870 058 041

Handle 5870 260 002

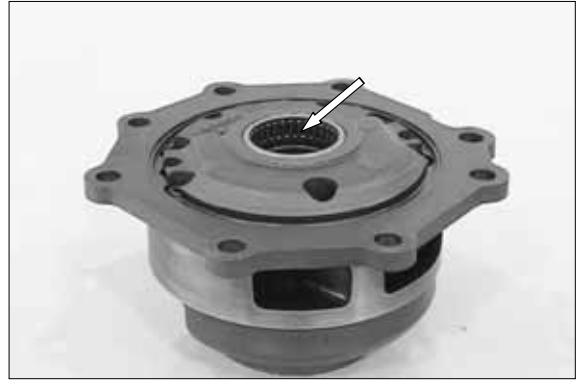


Figure 329

- (2) Snap the V-Rings (3EA) into the recess of the driver (internal gearing). Install the key (arrow).



Figure 330

- (3) Press the ball bearing over the collar of the driver until contact.



Figure 331

- (4) Install the ball bearing and driver respectively and press it until contact.

※ Pay attention to align the key to the keyway.



Figure 332

(5) Fasten the ball bearing by means of retaining ring.

※ Special tool

Set of internal pliers 5870 900 013



Figure 333

(6) Install the O-ring(arrow) and grease it.



Figure 334

(7) Heat the housing bore.

※ Special tool

Preheating bush 5870 801 006

Hot-air blower 230V 5870 221 500

Hot-air blower 115V 5870 221 501

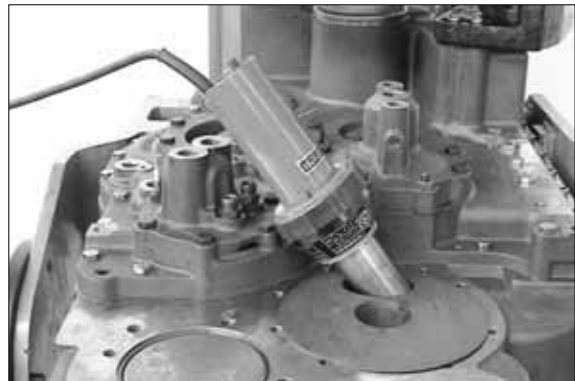


Figure 335

(8) Install two adjusting screws and assemble the pump until contact.

※ Observe the radial installation position.

※ Special tool

Adjusting screws 5870 204 021



Figure 336

(9) Put the O-ring(arrow) into the annular groove of the pump flange.

- ※ Depending on the transmission version, differences as regards the version and fastening of the pump flange are possible. Obligatory is the respective parts list.



Figure 337

(10) Fasten the pump flange and the pump respectively by means of hexagon screws.

- ※ Wet thread of both hexagon screws (position, see arrows) with Loctite, Type No. 574(through holes).

· Torque limit(M12/8.8) :  
8.06kgf · m(58.3lbf · ft)

Then rotate the transmission housing by 90°.

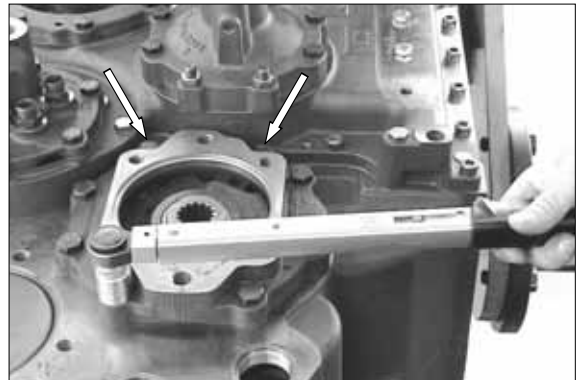


Figure 338

(11) Snap-in and lock the rectangular ring (arrow).

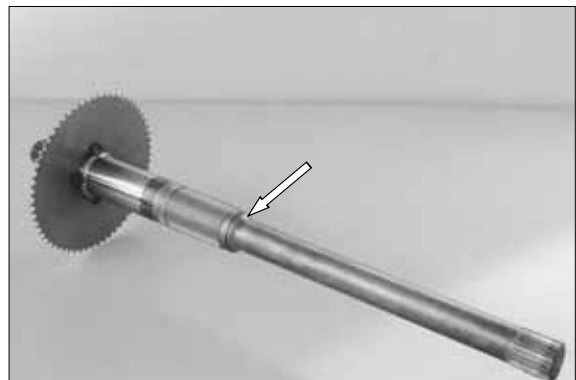


Figure 339

(12) Install **both** shims(each 2.0mm thick)

- ※ Use assembly grease.



Figure 340

(13) Heat the bevel bearing inner ring.

※ Special tool

Hot-air blower 230V            5870 221 500

Hot-air blower 115V         5870 221 501



Figure 341

(14) Install the input shaft until contact.



Figure 342

(15) Fasten the input shaft by means of clamping plate and cap screw (arrow).

· Torque limit(M10/8.8) :

3.26kgf · m(23.6lbf · ft)

※ Wet thread of the cap screw with Loctite (Type No. 243).



Figure 343

### Input-Converter Bell

※ To install a new converter bell the finished bores(3EA) have to be sealed with plugs. Installation position, see arrow, Figure 344.

※ Special tool  
Lever riveting tongs            5870 320 016



Figure 344

(1) Locate the bearing outer ring into the housing bore until contact and install the bearing inner ring, see arrow.



Figure 345

(2) Install the spur gear(arrow) with the long collar showing upwards and position it.



Figure 346

(3) Heat the spur gear bore(arrow).

※ Special tool  
Hot-air blower 230V            5870 221 500  
Hot-air blower 115V            5870 221 501



Figure 347

(4) Install the input shaft until contact.



Figure 348

(5) Heat the bearing inner ring and install it until contact.

▲ Use safety gloves.



Figure 349

(6) Install the bearing outer ring until contact.



Figure 350

(7) Snap in the rectangular ring (arrow) into the annular groove of the input shaft and lock it.

Then grease the rectangular ring and centrally align it.



Figure 351

(8) Install the converter safety valve (arrow 1) and fasten it by means of slotted pin (arrow 2).

※ Flush-mount slotted pin to recess.

Put the O-ring (arrow 3) into the annular groove.

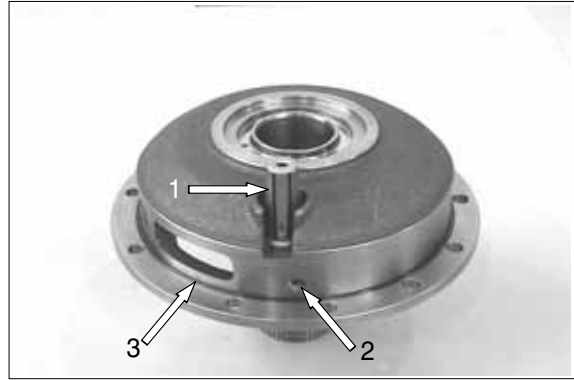


Figure 352

(9) Press the needle bearing (arrow), with the reinforced coating towards the press-in tool into the bore of the bearing cover until contact.

※ Special tool

Mounting tool 5870 058 051

Handle 5870 260 002



Figure 353

(10) Flush-mount the shaft seal (arrow) with the sealing lip showing (downwards) to the oil sump.

※ Wet the outer diameter with spirit.

Grease the sealing lip.

※ Special tool

Mounting tool 5870 048 030



Figure 354

※ Make the following steps (Figure 355~358) in direct time sequence to secure the precise contact of the oil supply flange.

(11) Heat the housing bore.

※ Special tool

Preheating bush 5870 801 006

Hot-air blower 5870 221 500

Hot-air blower 5870 221 501



Figure 355



(12) Install two adjusting screws and put in the oil supply flange until contact.

※ Observe the radial installation position.

※ Special tool

Adjusting screws                      5870 204 007

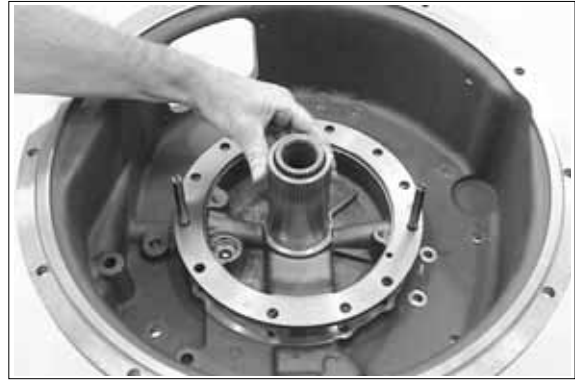


Figure 356

(13) Place the O-ring (arrow) with assembly grease into the annular groove of the bearing cover.

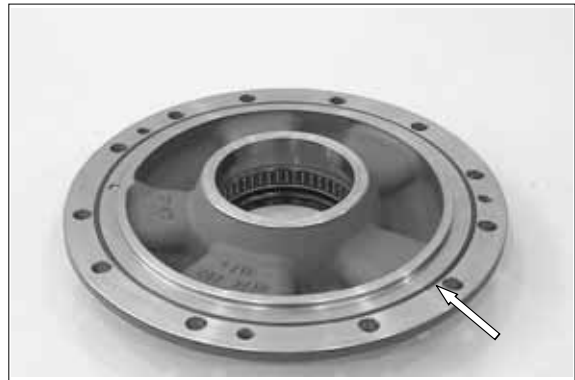


Figure 357

(14) Put on the bearing cover and fasten it by means of hexagon screws.

· Torque limit(M10/8.8) :

4.69kgf · m(33.9lbf · ft)



Figure 358

(15) Install the single components according to the opposite figure.

1 Screw plug : 15.3kgf · m(110lbf · ft)

2 Screw plug : 2.55kgf · m(18.4lbf · ft)

3 Temperature sensor :

2.55kgf · m(18.4lbf · ft)

and screw plug respectively (depending on the version) :

3.57kgf · m(25.8lbf · ft)



Figure 359

※ Always install new O-ring.

**Converter pressure back-up valve  
(Figure 360~361)**

- (1) Install the slotted pin(6 × 50mm) until contact.



Figure 360

- (2) Assemble piston and compression spring. Provide screw plug with a new O-ring and install it.

- Torque limit(M36 × 1.5) :  
13.3kgf · m(95.9lbf · ft)

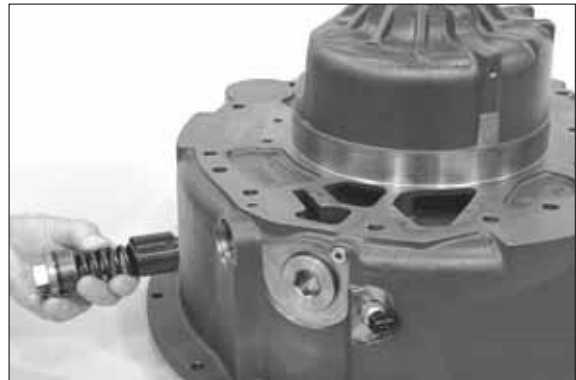


Figure 361

- (3) Fasten the gasket and cover plate by means of hexagon screws(install the washers).

- Torque limit(M6/8.8) :  
0.97kgf · m(7.0lbf · ft)



Figure 362

- (4) Install two adjusting screws and put on the gasket(arrow 1). Put the O-ring(arrow 2) into the annular groove.

- ※ Special tool  
Adjusting screws 5870 204 021

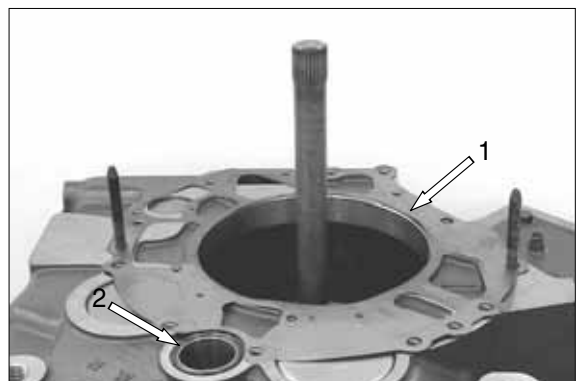


Figure 363

(5) Install the converter bell by means of lifting tackle until contact.

※ Slight rotary motions of the input shaft facilitate the installation(protect teeth from damage). Observe the radial installation position.

※ Special tool

Lifting tackle 5870 281 047

Eyebolts assortment 5870 204 002



Figure 364

(6) Fasten the converter bell by means of hexagon screws.

· Torque limit(M8/10.9) :

3.47kgf · m(25.1lb · ft)

· Torque limit(M12/10.9) :

11.7kgf · m(84.8lb · ft)



Figure 365

(7) Fasten flexible plate(3EA) by means of hexagon screws(install the washers).

※ Wet thread of the hexagon screws with Loctite(Type No. 243).

· Torque limit(M10/8.8) :

4.69kgf · m(33.9lb · ft)

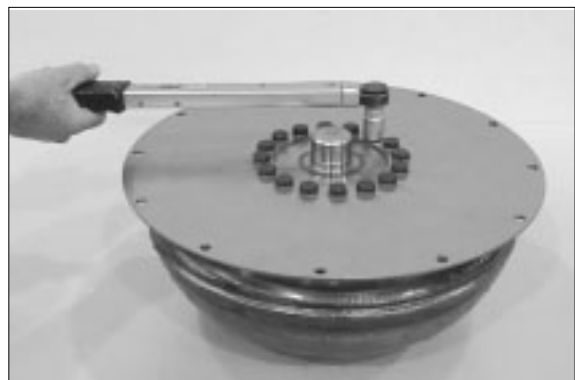


Figure 366

(8) Install the rectangular ring(arrow) into the annular groove and lock it.

Then grease the rectangular ring and centrally align it.



Figure 367

(9) Assemble converter by means of lifting tackle until contact(Figure 368).

※ At a control dimension < 43mm, the exact installation position of the converter is ensured, see Figure 369.

※ Special tool

Eyebolts assortment                    5870 204 002

Lifting chain                                5870 281 047

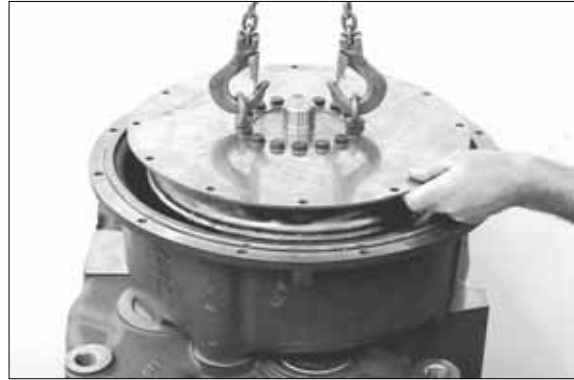


Figure 368

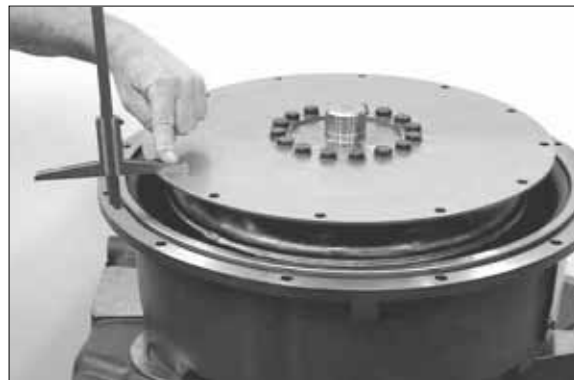


Figure 369

⚠ Until installation of the transmission, fix the converter axially, see Figure 370.



Figure 370

## Coarse Filter

(1) Install filter(assy) into the housing bore.

※ Oil the sealing(arrow).

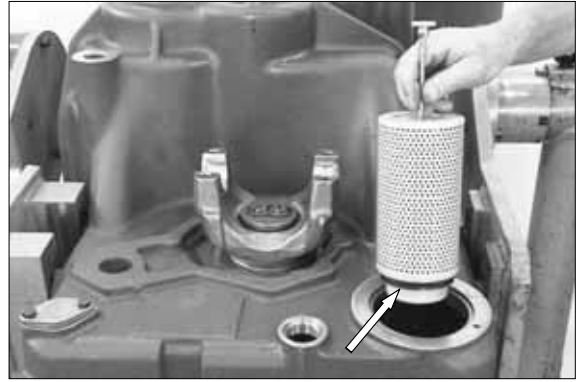


Figure 371

(2) Fasten the cover by means of hexagon screws(install the washers).

※ Install the new O-ring(arrow).

• Torque limit(M8/8.8) :

2.35kgf · m(17.0lbf · ft)



Figure 372

## Inductive and speed transmitters

(1) Following sketches show the installation position of the single inductive and speed transmitters.

- |                          |                        |
|--------------------------|------------------------|
| 14 Inductive transmitter | n-Turbine              |
| 9 Inductive transmitter  | n-Engine               |
| 5 Inductive transmitter  | n-Internal speed input |
| 13 Speed transmitter     | n-Output               |

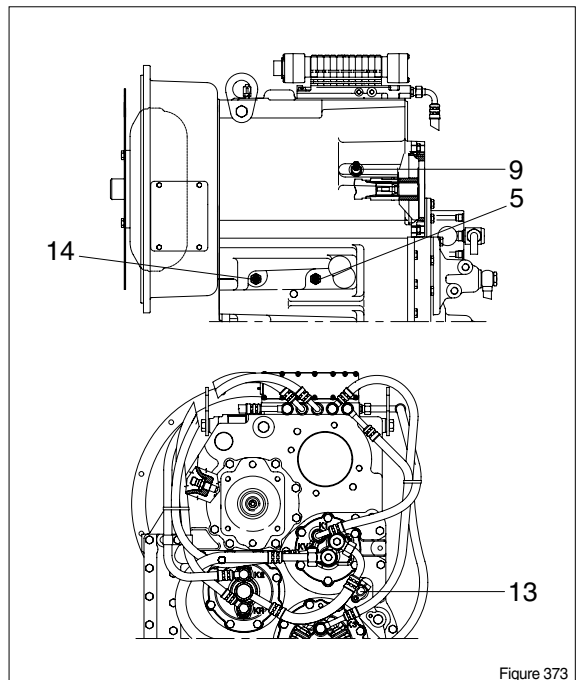


Figure 373

※ The following figures describe the installation and setting respectively of the inductive transmitter n-Engine(9). Installation of the inductive transmitter n-Turbine(14) and n-internal speed input(5) is to be made analogously.

**Observe the different setting dimensions "X" :**

**▲ Inductive transmitter n-Engine(9)**

**X = 0.5<sup>+0.3</sup>mm**

**Inductive transmitter n-Turbine(14)**

**X = 0.5<sup>+0.3</sup>mm**

**Induct. transmitter n-int. speed input(5)**

**X = 0.3±0.1mm**

**Adjust Dimension "X" by means of shim ring(s) (Figure 376~381)**

(1) Measure Dimension I on the inductive transmitter, from contact face to screw-in face.

※ Dimension I e.g ..... 30.00mm

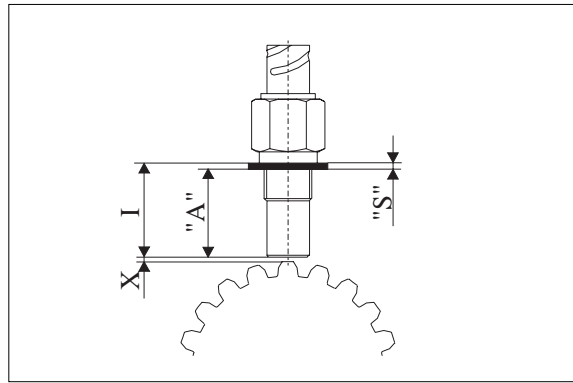


Figure 375



Figure 376

(2) Turn in the counting disc radially until one **tooth tip is centrally to the inductive transmitter bore.**

Turn the plug gauge until contact. Locate anvil at the tooth tip and lock it by means of threaded pin(Figure 377 and 378).

※ Special tool  
Plug gauge 5870 200 104

※ Special tool  
Plug gauge 5870 200 104



Figure 377

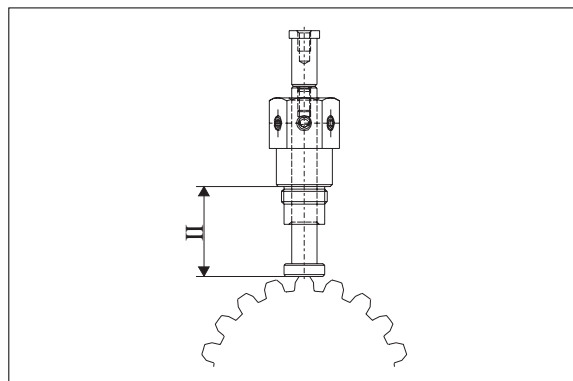


Figure 378



**Install speed transmitter n-Output/Speedo (13)(Figure 382~387)**

- 1 Housing
- 2 Spur gear K3
- 3 Disc carrier
- 13 Speed transmitter(Hall sensor)
- X Setting dimension "X" =1.0 + 0.5mm**

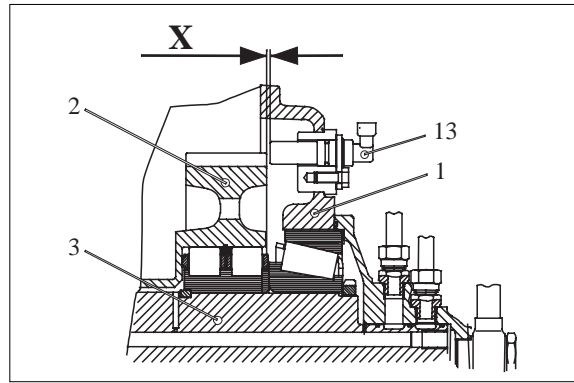


Figure 382

(1) Opposite figure shows the speed transmitter(Hall sensor).



Figure 383

(2) Determine Dimension I, from the housing face to spur gear K3.

Dimension I e.g ..... 39.70mm

- ※ Special tool
- Digital depth gauge                      5870 200 072



Figure 384

(3) Measure Dimension II, from the contact face to the mounting face.

Dimension II e.g ..... 40.00mm

- ※ Special tool
- Digital depth gauge                      5870 200 072



Figure 385



**Example "B<sub>1</sub>":**

Dimension I	<u>39.70mm</u>
Dimension X(1.0 <sup>+0.5</sup> mm)	- <u>1.20mm</u>
<b>Results in installation dimension</b>	<b>= 38.50mm</b>

**Example "B<sub>2</sub>":**

Dimension II	<u>40.00mm</u>
Installation dimension A	- <u>38.50mm</u>
<b>Results in shim(s)</b>	<b>s = 1.50mm</b>

- (4) Install shims(3EA, s = 0.50mm) and grease the O-ring(arrow).

- (5) Fasten the speed transmitter by means of cap screw.

- Torque limit(M8/8.8) :  
2.35kgf · m(17.0lbf · ft)

- ※ Installation position of the speed transmitter, also see page 3-181.

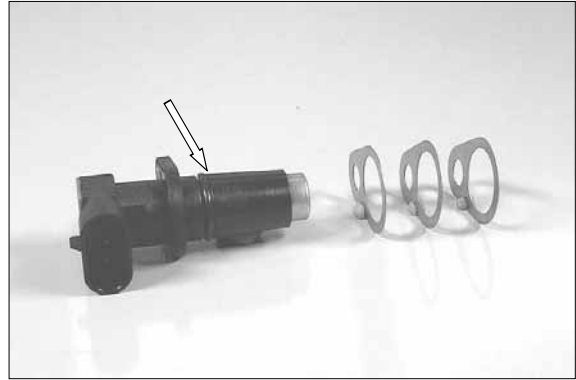


Figure 386

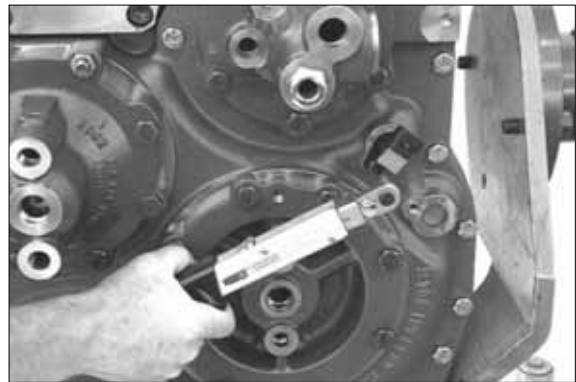


Figure 387