DANA SPICER®
Off-Highway Products

Service Manual

6000 EHO

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TSM-0238E
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VERSION TRACKING

FILE NAME	REVISION	DATE	CHANGES DESCRIPTION
TSM-0238E_Rev.00 6000 EHO	Rev. 00	05/11/2019	Document issued
TSM-0238E_Rev.01 6000 EHO	Rev. 01	21/01/2020	- Updated Disassembly & Assembly p. 97. - Added AS0010012800 p. 153. - Added AS0010012900 p. 153.
TSM-0238E_Rev.02 6000 EHO	Rev. 02	17/09/2020	- Update Operation of the Valve p. 28 - Electric Solenoid Controls p. 29 - Added Clutch packs assembly intructions p. 64 - Update Assembly p. 112

MANUAL APPLICABILITY AND SUPPORTED MODELS

MODELS
6000 EHO

INTRODUCTION

FOREWORD

This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the SPICER OFF-HIGWAY PRODUCTS product.

Extreme care has been exercised in the design, selection of materials, and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspection at stated intervals, and such adjustments as may be indicated, will be reimbursed many times in low cost operation and trouble-free service.

In order to become familiar with the various parts of the product, its principle of operation, troubleshooting and adjustments, it is urged that the mechanic studies the instructions in this manual carefully and uses it as a reference when performing maintenance and repair operations.

Whenever repair or replacement of component parts is required, only Dana Incorporated approved parts as listed in the applicable parts manual should be used. Use of “will-fit” or non-approved parts may endanger proper operation and performance of the equipment. Dana Incorporated does not warrant repair or replacement parts, nor failures resulting from the use of parts which are not supplied or approved by Dana Incorporated.

IMPORTANT:

ALWAYS FURNISH THE DISTRIBUTOR WITH THE SERIAL AND MODEL NUMBER WHEN ORDERING PARTS.

⚠ CAUTION

TOWING OR PUSHING

Before towing the vehicle, be sure to lift the driven axle wheels off the ground or disconnect the driveline to avoid damage to the transmission during towing.

Because of the design of the hydraulic system, the engine cannot be started by pushing or towing.

SAFETY PRECAUTIONS

To reduce the chance of personal injury and/or property damage, the following instructions must be carefully observed.

Proper service and repair are important to the safety of the service technician and the safe reliable operation of the machine. If replacement parts are required, the parts must be replaced by spare parts which have the same part number or with equivalent parts. DO NOT USE A SPARE PART OF LESSER QUALITY.

The service procedures recommended in this manual are effective methods for performing service and repair.

Some of these procedures require the use of tools specifically designed for the purpose.

Accordingly, anyone who intends to use a spare part, service procedure or tool, which is not recommended by Dana Incorporated, must first determine that neither his safety nor the safe operation of the machine will be jeopardized by the spare part, service procedure or tool selected.

IMPORTANT:

IT IS IMPORTANT TO NOTE THAT THIS MANUAL CONTAINS VARIOUS ‘CAUTIONS AND NOTICES' THAT MUST BE CAREFULLY OBSERVED IN ORDER TO REDUCE THE RISK OF PERSON AL INJURY DURING SERVICE OR REPAIR, OR THE POSSIBILITY THAT IMPROPER SERVICE OR REPAIR MAY DAMAGE THE UNIT OR RENDER IT UNSAFE. IT IS ALSO IMPORTANT TO UNDERSTAND THAT THESE ‘CAUTIONS AND NOTICES' ARE NOT EXHAUSTIVE, BECAUSE IT IS IMPOSSIBLE TO WARN ABOUT ALL POSSIBLE HAZARDOUS CONSEQUENCES THAT MIGHT RESULT FROM FAILURE TO FOLLOW THESE INSTRUCTIONS.

⚠ CAUTION

When maintenance works require welding, disconnect both connectors from the transmission controller and from the valve unit, before any welding is started.

⚠ DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates an imminently hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a situation which, if not avoided, may result in damage to components.
NOTICE	Indicates information which may make product service easier to perform.

CLEANING AND INSPECTION

⚠ DANGER

Care should be exercised to avoid skin rashes, fire hazards, and inhalation of vapors when using solvent type and alkali cleaners.

CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and agitated slowly until parts are thoroughly cleaned of all old lubricants and foreign materials.

Thoroughly dry all cleaned parts immediately by using moisture-free compressed air or soft lint-free absorbent wiping rags free of abrasive materials such as metal filings, contaminated oil, or lapping compound.

BEARINGS

Remove bearings from cleaning fluid and strike larger side of cone flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture-free compressed air. Be careful to direct air stream across bearings to avoid spinning. DO NOT SPIN BEARINGS WHEN DRYING. Bearings may be rotated slowly by hand to facilitate the drying process.

HOUSINGS, COVERS, AND CAPS

Clean interior and exterior of housings, bearing caps, etc., thoroughly. Cast parts may be cleaned in hot solution tanks with mild alkali solutions, providing these parts do not have ground or polished surfaces. Parts should remain in solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water. Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with steam cleaner.

All parts cleaned must be thoroughly dried immediately by using moisture-free compressed air or soft lint-free absorbent wiping rags, free of abrasive materials such as metal filings, contaminated oil, or lapping compound.

INSPECTION

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

BEARINGS

Carefully inspect all rollers, cages, and cups for wear, chipping, or nicks to determine fitness of bearings for further use. DO NOT REPLACE A BEARING CONE OR CUP INDIVIDUALLY without replacing the mating cup or cone at the same time. After inspection, dip bearings in clean light oil and wrap in clean lint-free cloth or paper to protect them until installed.

OIL SEALS, GASKETS AND RETAINING RINGS

Replacement of spring load oils seals, “O” rings, metal sealing rings, gaskets and snap rings is more economical when the unit is disassembled than premature overhaul to replace these parts at a future time.

Further loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly. Sealing members should be handled carefully, particularly when being installed.

Cutting, scratching or curling under of lips of seals seriously impairs its efficiency.

When assembling new metal type sealing rings, these should be lubricated with a coat of chassis grease to stabilize rings in their grooves for ease of assembly of mating members. Lubricate all “O” rings and seals with recommended type Automatic Transmission Fluid before assembly.

GEARS AND SHAFTS

If Magna-Flux or a dye penetrant process is available, use this process to check parts. Examine teeth and the ground/ polished surfaces of all gears and shafts carefully for wear, pitting, chipping, nicks, cracks, or scoring. If gear teeth are cracked or show spots where case hardening is worn through, replace with new gear. Small nicks may be removed with suitable hone stone. Inspect shafts to make certain they are not sprung, bent, or have twisted splines.

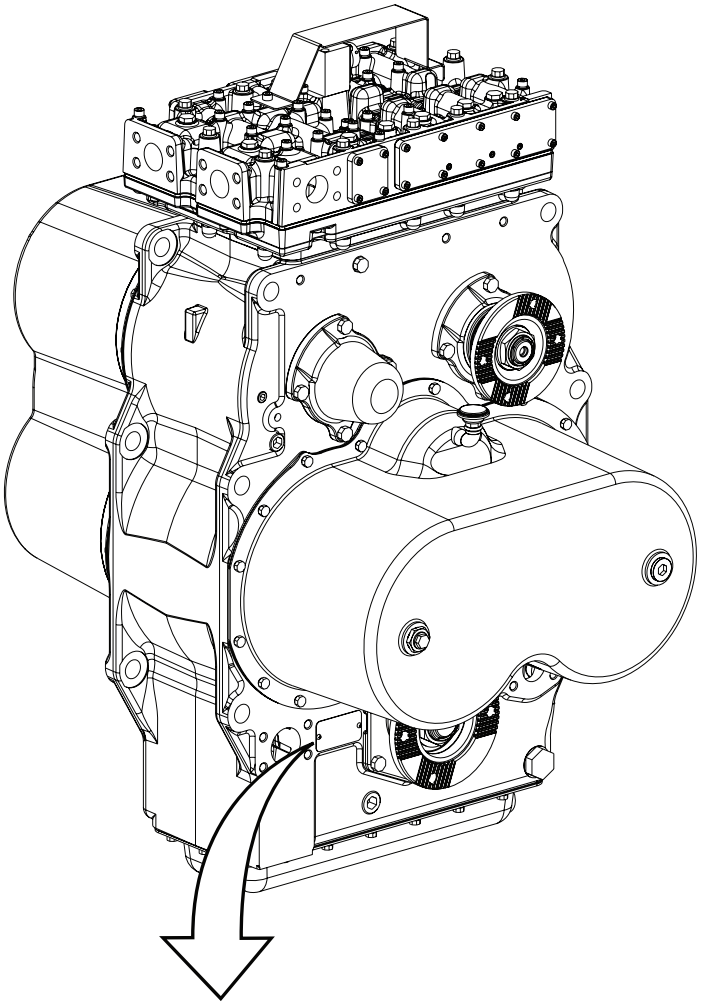
HOUSINGS, COVERS, AND CAPS

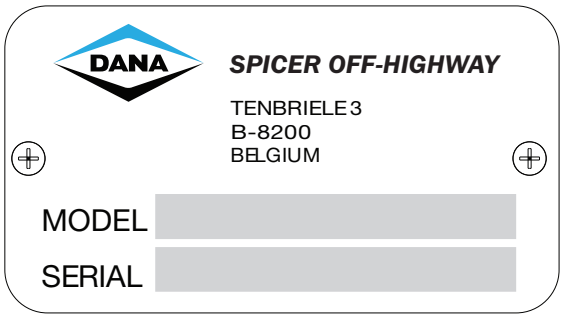
Inspect housings, covers, and caps to be certain they are thoroughly cleaned and that mating surfaces, bearing bores, etc. are free from nicks or burrs. Check all parts carefully for evidence of cracks or conditions which can cause oil leaks or failures.

SPECIFICATIONS

IDENTIFICATION TAG

The nameplate contains both the model and serial number of the unit.





GENERAL SPECIFICATIONS

Weight (dry).	891.52 kg / 1965.46 lb
Length (maximum).	800 mm / 314.96" in
Width (maximum).	633.22 mm / 249.29" in
Height (maximum).	1134.54 mm / 446.66" in
Oil Capacity.	32 Liters / 8,5 US Gallons

* Without cooler and hydraulic lines. Consult equipment operator's manual for complete system capacity.

TORQUE CHARTS

TORQUE SPECIFICATIONS FOR LUBRICATED OR PLATED THREADS						
NOM. SIZE	Grade 8.8		Grade 10.9		Grade 12.9	
	Coarse thread		Coarse thread		Coarse thread	
	[Nm]	Lbf-ft	[Nm]	Lbf-ft	[Nm]	Lbf-ft
M5x0.8	[5-6]	3.7-4.4	[7-8]	5.2-5.9	[8-10]	5.9-7.4
M6x1	[8-10]	5.9 -7.4	[12-15]	8.9-11.1	[13-16]	9.6-11.8
M8x1.25	[20-25]	14.8-18.4	[30-35]	22.1-25.8	[35-40]	25.8-29.5
M10x1.5	[40-50]	29.5 -36.9	[60-65]	44.3-47.9	[65-75]	47.9-55.3
M12x1.75	[68-75]	50.2-55.3	[100-110]	73.8-81.1	[115-130]	85-96
M14x2	[110-125]	81-92	[150-175]	111-129	[180-210]	133-155
M16x2	[170-190]	125-140	[240-275]	177-203	[280-320]	207-236
M20x2.5	[320-360]	236-266	[450-500]	332-369	[525-600]	387-443
M24x3	[570-650]	420-479	[800-900]	590-664	[900-1050]	664-774
M30x3.5	[1150-1300]	848-959	[1600-1800]	1180-1328	[1850-2100]	1364-1549
M36x4	[2000-2250]	1475-1660	[2749-3149]	2028-2323	[3249-3699]	2397-2729

TORQUE SPECIFICATIONS FOR LUBRICATED OR PLATED THREADS						
NOM. SIZE	GRADE 8.8		Grade 10.9		Grade 12.9	
	Coarse thread		Coarse thread		Coarse thread	
	[Nm]	Lbf-ft	[Nm]	Lbf-ft	[Nm]	Lbf-ft
M8x1	[23-28]	17-20	[34-39]	25-28	[41-46]	30-34
M10x1	[47-57]	35-42	[71-81]	52-60	[84-94]	62-69
M10X 1.25	[44-54]	32-40	[67-77]	49-57	[79-89]	58-66
M12x1.25	[82-92]	60-68	[120-130]	89-96	[143-158]	105-116
M12x 1.5	[78-88]	58-65	[117-127]	86-94	[138-153]	101-112
M14x1.5	[128-143]	94-105	[193-208]	142-153	[220-250]	162-184
M16x1.5	[215-228]	159-169	[293-308]	216-227	[350-370]	258-273
M18x1.5	[300-320]	221-236	[433-448]	319-330	[500-540]	369-398
M18x2	[280-300]	207-221	[413-428]	304-315	[470-510]	347-376
M20x1.5	[410-450]	302-332	[595-645]	439-476	[683-758]	503-559
M22x1.5	[560-600]	413-443	[795-845]	586-623	[923-998]	681-736
M24x1.5	[720-800]	531-590	[1040-1140]	767-841	[1195-1345]	882-992
M24x2	[690-770]	509-568	[990-1090]	730-804	[1145-1295]	845-955
M27x1.5	[1070-1150]	789-848	[1530-1630]	1129-1202	[1775-1925]	1309-1420

TORQUE CHARTS

TORQUE SPECIFICATIONS FOR LUBRICATED OR PLATED THREADS								
NOM. SIZE	Grade 5				Grade 8			
	Fine thread		Coarse thread		Fine thread		Coarse thread	
	[Nm]	Lbf-ft	[Nm]	Lbf-ft	[Nm]	Lbf-ft	[Nm]	Lbf-ft
43556	[12-15]	43778	[11-14]	43746	[15-18]	41579	[12-15]	43778
42491	[22-27]	16-20	[16-22]	42705	[38-43]	28-32	[35-41]	26-30
43680	[35-39]	26-29	[31-34]	23-25	[50-56]	37-41	[45-49]	33-36
42552	[56-61]	41-45	[50-56]	37-41	[79-87]	58-64	[70-77]	52-57
43497	[87-95]	64-70	[77-85]	57-63	[122-134]	90-99	[108-119]	80-88
42614	[123-136]	91-100	[111-122]	82-90	[174-191]	128-141	[156-172]	115-127
43682	[173-191]	128-141	[153-168]	113-124	[224-268]	180-198	[216-237]	159-175
43558	[302-332]	223-245	[271-298]	200-220	[427-470]	315-347	[382-420]	282-310

Torque specifications for plugs		
NPFT Nom. Size	O-ring ports	
	[Nm]	lbf-ft
5/16x24	[4-7]	43588
3/8x24	[7-11]	43682
7/16x20	[9-14]	43745
1/2x20	[14-18]	41548
9/16x18	[16-20]	42339
3/4x16	[27-34]	20-25
7/8x14	[41-47]	30-35
1 1/16x12	[61-68]	45-50
1 5/16x12	[88-102]	65-75
1 5/8x12	[102-115]	75-85
1 7/8x12	[102-115]	75-85

Torque specifications for plugs		
METRIC Nom. Size	O-ring ports	
	[Nm]	lbf-ft
M10x1	[8-9]	43652
M12x1.5	[14-18]	41518
M14x1.5	[16-20]	42339
M16x1.5	[27-34]	20-25
M18x1.5	[34-41]	25-30
M22x1.5	[48-60]	35-44
M26x1.5	[61-68]	45-50
M27x2	[81-89]	60-66
M33x2	[112-140]	83-103

Torque specifications for plugs		
Nom. Size	Pipe Plugs	
	[Nm]	Lbf-ft
1/16x27	[7-9]	43651
1/8x27	[9-14]	43745
1/4x18	[20-27]	15-20
3/8x18	[34-41]	25-30
1/2x14	[41-47]	30-35
3/4x14 or 10	[54-61]	40-45
1x11 1/2	[68-75]	50-55
1 1/4x11 1/2	[81-88]	60-65

Torque specifications for plugs		
METRIC Nom. Size	Permanent Plugs	
	Nm	Lbf-ft
M18x1.5 6H	[25-30]	34-41
M26x1.5 6H	[45-50]	61-68

Torque specification		
NFPT Nom. Size	Elastic Stop Nuts	
	Nm	Lbf-ft
1.00x20	[542-610]	150-200
1.25x18	[407-474]	200-250
1.50x18	[271-339]	300-350
1.75x12	[203-271]	400-450

HYDRAULIC COOLER LINES SPECIFICATIONS

Lines and Fittings (Minimum).	31,75 mm / 1"1/4 internal diameter
Continuous Operating Temperature.	Ambient to 120°C / 248°F
Continuous Pressure.	20 bar / 290 PSI continuous pressure
Conformance.	SAE J1019 and SAE J517, 100RI

PRESSURE AND TEMPERATURE SPECIFICATIONS

Normal Operating Temperature.	82-93ºC / 180-200ºF.
	Measured at temperature check port converter out
Maximum Temperature.	120ºC / 248ºF
Regulator Pressure.	Vehicle in Neutral & Port 31*
	At 600 RPM minimum: 12,4 bar 180 PSI
	At no load GOV. speed: 12,4 bar 180 PSI
Pump Flow.	See at the torque converter manual.
Lube Pump Flow.	See at the torque converter manual.
Clutch Pressure.	1st clutch: Port 41*
	2nd clutch: Port 42*
	3rd clutch: Port 43*
	Forward High clutch: Port 44*
	Forward Low clutch: Port 45* Reverse clutch: Port 46*
	At 2200 RPM:
	12.4 to 15.1 bar (180 to 220 PSI)
Filter Bypass Valve.	See Technical Specs of Converters
To cooler Pressure.	Port 37*
	2 bar (29 PSI) minimum at 2000rpm
	5.5 bar (79.7 PSI)at no load governed speed
Clutch Leakage.	Neutral: N1 - N2 - N3 - N4 between 6 - 12 l/min; 1.58 - 3.17 GPM
	Forward: F1 - F2 - F3 - F4 between 13 - 21 l/min; 3.43 - 5.54 GPM
	Reverse: R1 - R2 - R3 - R4 between 13 - 21 l/min; 3.43 - 5.54 GPM
Converter leakage.	See Technical Specs of Converters
Safety Valve Cracking Pressure.	See Technical Specs of Converters
Converter Out Pressure.	See Technical Specs of Converters
Lock-up Pressure.	See Technical Specs of Converters

* Refer to Connection points p. 19 for check port identification.

† All pressures and flows to be measured with oil temperature 82-93ºC / 180-200ºF.

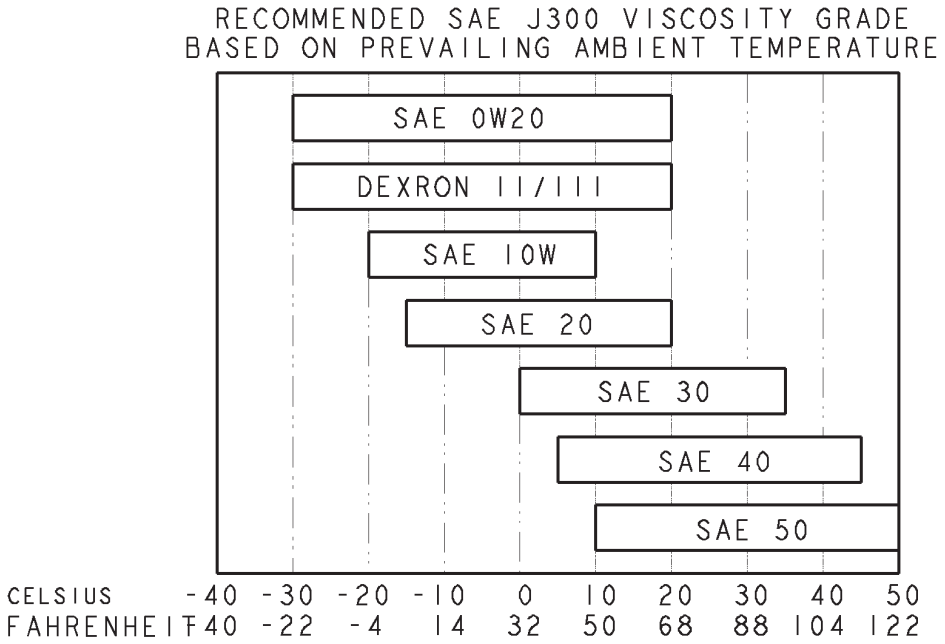
ELECTRICAL SPECIFICATIONS

Solenoid Valves.	Fwr - Rev - 1st - 2nd - 3rd - 4th
	Coil Resistance: 24V - 92 +7-4 Ω at 20°C / 68°F
Ouput Speed Sensor.	Type: Magneto resistive sensor
	Sensing Distance: 0–1.8 mm / 0–0.07"
	Sensor Signal: Generates a square current with a fixed amplitude changing between 7 and 14 mA.

MAINTENANCE

OIL SPECIFICATION

RECCOMENDED LUBRICANTS



1 - The lubricant must be designed for transmission use. Engine oil is not allowed.

2 - Transmission lubricant must be qualified by one of the following specifications in order of preference:

- CATERPILLAR T0-4
- JOHN DEERE J20 C,D
- MIL-PRF-2104G
- DEXRON I ID OR DEXRON I I I*

3 - For the use of Dexron lubricants in combination with graphitic friction plates (used in i 000 series, hr36000, t 40000) a specific engineering approval is required.

4 - For electronic modulated transmissions (like the TE series) only Dexron III is approved.

5 - gl-5 oils are not approved.

6 - Multi-viscosity lubricants are approved.

7 - Preferred oil viscosity: select a lubricant with a viscosity grade that fully covers the prevailed ambient temperature on the oil application chart. Example: ambient temperature from -10 °C (14 °F) to 20 °C (68 °F): select 10W30 when multiple viscosity grades are suitable, select the grade where the ambient temperature is closest to the middle of the viscosity range. Example: for ambient temperature of 20 °C (68 °F), SAE 30 is preferred over SAE 40 or SAE 50.

8 - Fire resistant fluid - see vehicle manufacturers recommendations.

9 - Sump preheaters- before operating the transmission fluid must be preheated to a minimum temperature according the viscosity grade, to assure sufficient pumping viscosity.

10 - Warm-up- for full load transmission functionality, a minimum sump temperature of 20 °C (68 °F) is required. Before reaching 20 °C (68 °F) sump temperature only neutral gear or unloaded driving is allowed, not exceeding 1500 engine rpm and not exceeding half throttle.

11 - Extended oil change interval - extended oil service life may result when using synthetic fluids. Appropriate change intervals should be determined for each transmission by measuring oil oxidation and wear metals, over time, to determine a baseline. Wear metal analysis can provide useful information but a transmission should not be removed from service based solely on this analysis.

12 - Any deviation from this chart must have written approval from the application engineering department of Dana Incorporated.

*Dexron is a registered trademark of General Motors Corp.

MAINTENANCE INTERVALS

Daily

Check oil level daily with engine running at idle (600 RPM) and oil at 82 - 93°C [180-200°F].

Maintain oil level at full mark.

Normal oil change interval

The first change of oil and filter element must be done at 100 hours.

Drain and refill system every 1000 hours for average environmental and duty cycle conditions. Severe or sustained high operating temperature or very dusty atmospheric conditions will result in accelerated deterioration or contamination.

Judgement must be used to determine the required change intervals for extreme conditions.

Every 1000 hours:

- Change oil filter element.
- Drain oil at 65-93°C [150–200°F] and refill system as follows:

1 - Before draining oil it is mandatory to loosen the oil filling plug or the breather (if present), and wait until the internal pressure is completely released. Remove the oil draining plug and drain oil only when the pressure is completely released. Drain transmission.

2 - Remove and discard filter.

3 - Install new filter.

4 - Refill transmission to FULL mark.

5 - Run engine at 500 - 600 RPM to prime converter and lines.

6 - Recheck level with engine running at 500 - 600 RPM and add oil to bring level to LOW mark. When oil temperature is hot 82.2-93.3°C [180-200°F] make final oil level check and adjust if necessary to bring oil level to FULL mark.

Extended oil change interval

Extended oil service life may result when using synthetic fluids. Appropriate change intervals should be determined for each transmission by measuring oil oxidation and wear metals, over time, to determine a baseline. Wear metal analysis can provide useful information but a transmission should not be removed from service based solely on this analysis.

SERVICING MACHINE AFTER COMPONENT OVERHAUL

The transmission and its allied hydraulic system are important links in the driveline between the engine and the wheels. The proper operation of either unit depends greatly on the condition and operation of the other. Therefore, whenever repair or overhaul of one unit is performed, the balance of the system must be considered before the job can be considered complete.

After the overhauled or repaired transmission has been installed in the machine, the oil cooler, and connecting hydraulic system must be thoroughly cleaned. This can be accomplished in several manners and a degree of judgement must be exercised as to the method employed.

The following are considered the minimum steps to be taken:

1 - Drain entire system thoroughly.

2 - Disconnect and clean all hydraulic lines. Where feasible hydraulic lines should be removed from machine for cleaning.

3 - Replace oil filter element.

4 - The oil cooler must be thoroughly cleaned. The cooler should be “back flushed” with oil and compressed air until all foreign material has been removed. Flushing in direction of normal oil flow will not adequately clean the cooler. If necessary, cooler assembly should be removed from machine for cleaning, using oil, compressed air, and steam cleaner for that purpose.

IMPORTANT:

NEVER USE FLUSHING COMPOUNDS FOR CLEANING PURPOSES.

5 - Reassemble all components and use only type oil (See chapter Reccomended lubricants p. 15). Fill the transmission through filler opening until fluid comes up to FULL mark on transmission dipstick.

- Remove filler plug and fill oil until FULL mark.
- Run engine two minutes at 500 - 600 RPM to prime torque converter and hydraulic lines.
- Recheck level of fluid in transmission with engine running at idle (500 - 600 RPM).
- Add quantity necessary to bring fluid level to LOW mark on dipstick.
- Recheck with hot oil 82.2 - 93.3°C [180 – 200°F].
- Adjust oil level to FULL mark on dipstick.

6 - Recheck all drain plugs, lines, connections, etc… for leaks and tighten where necessary.

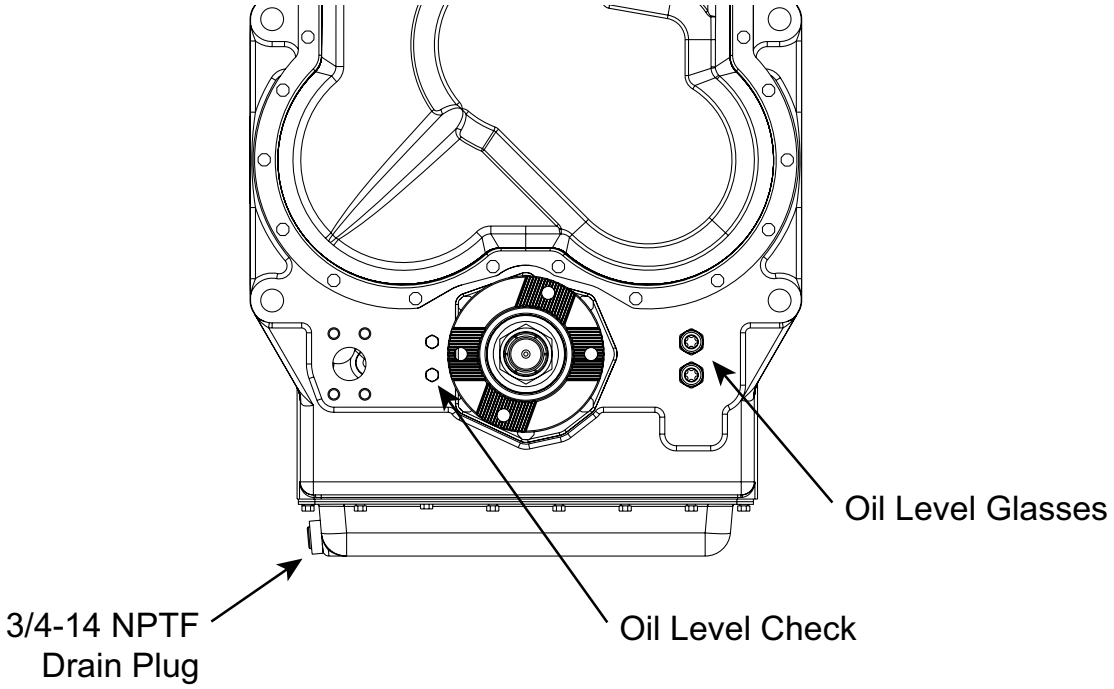
FILLING INSTRUCTIONS

Fill torque converter and transmission through filler opening until fluid comes up to LOW mark on transmission dipstick.

NOTE:

If the dipstick is not accessible oil level check plugs are provided. (See below)

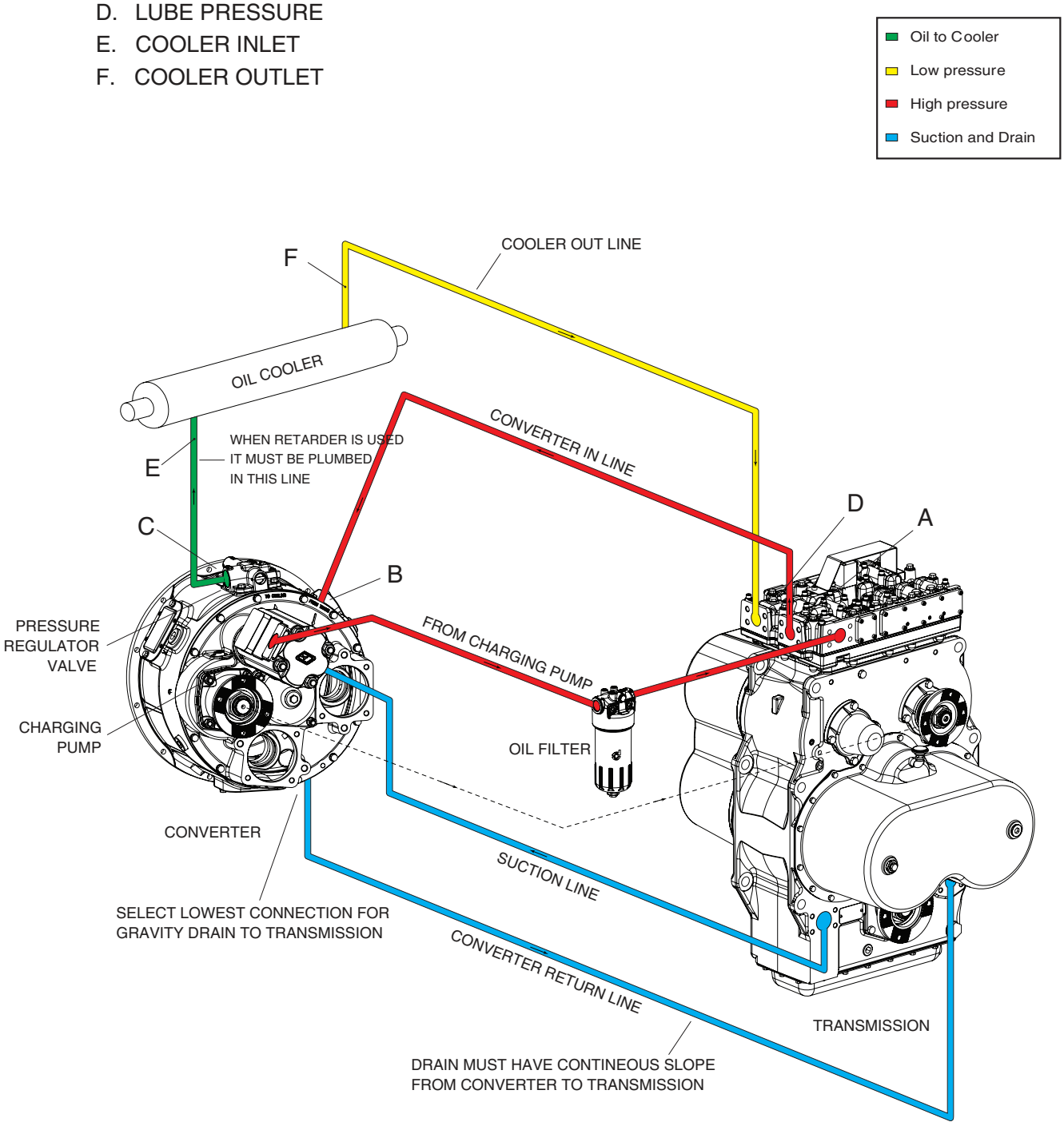
1 - Remove LOWER check plug, fill until oil runs from LOWER oil level hole. Replace filler and level plug.
2 - Run engine two minutes at 500-600 RPM to prime torque converter and hydraulic lines. Recheck level of fluid in transmission with engine running at idle. (500-600 RPM)
3 - Add quantity necessary to bring fluid level to LOW mark on dipstick or runs freely from LOWER oil level check plug hole.
4 - Install oil level plug or dipstick. Recheck with hot oil (82 - 93° C) [180 - 200° F]
5 - Bring oil level to full mark on dipstick or runs freely from UPPER oil level plug.



INSTALLATION DETAIL

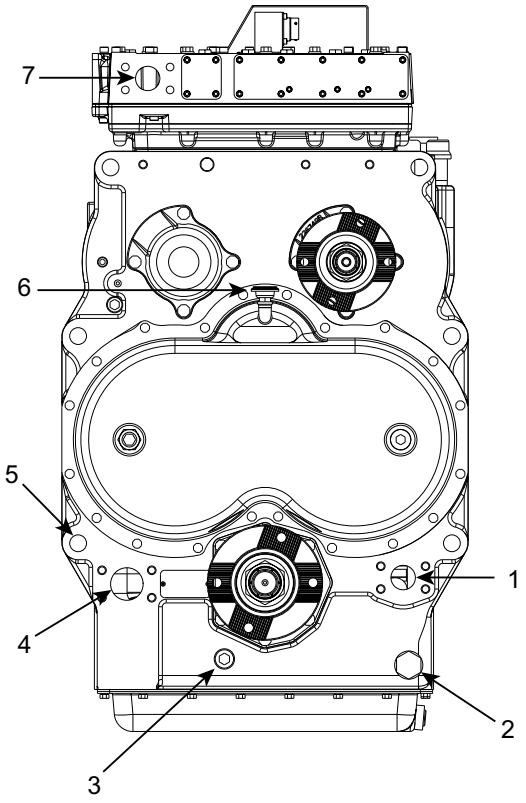
PLUMBING DIAGRAM

CHECK POINTS
A. CLUTCH PRESSURE
B. CONVERTER INLET
C. CONVERTER OUTLET
D. LUBE PRESSURE
E. COOLER INLET
F. COOLER OUTLET



CONNECTION POINTS

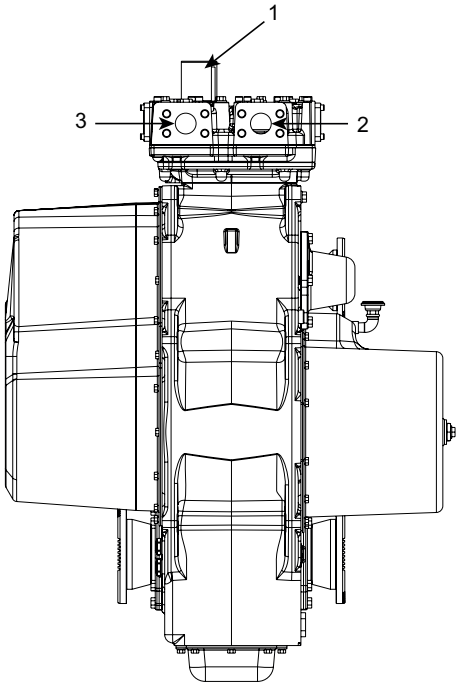
FRONT VIEW



1 - Port 22 Drain Connection Ø38 Split Flange
2 - 1.3125 O-ring Port
3 - 1 NPTF Threads Optional Dipstick
4 - Port 80 Suction Line Ø50.8 Split Flange
5 - Ø26,12-26,44 6 Mounting Holes
6 - Breather
7 - Port 16 Pressure Regulator In Ø38 Split Flange

CONNECTION POINTS

SIDE VIEW

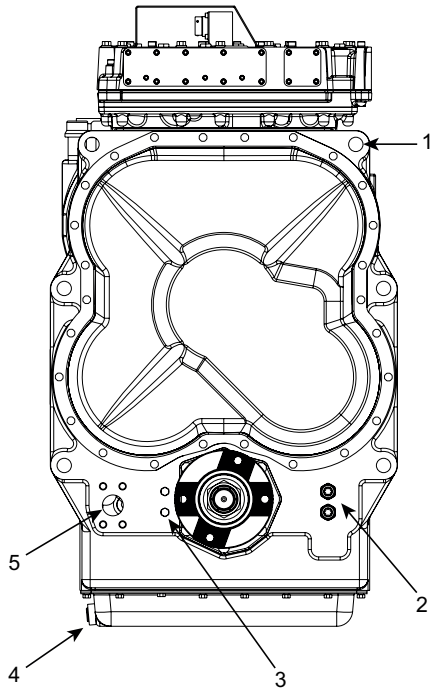


1 - Valve connector Deutch HD34-18-14 PE

2 - Port 23 Pressure Regulator OUT Ø38 Split Flange

3 - Port 83 Lube IN Ø38 Split Flange

REAR VIEW



1 - Ø26,12-26,44 6 Mounting Holes

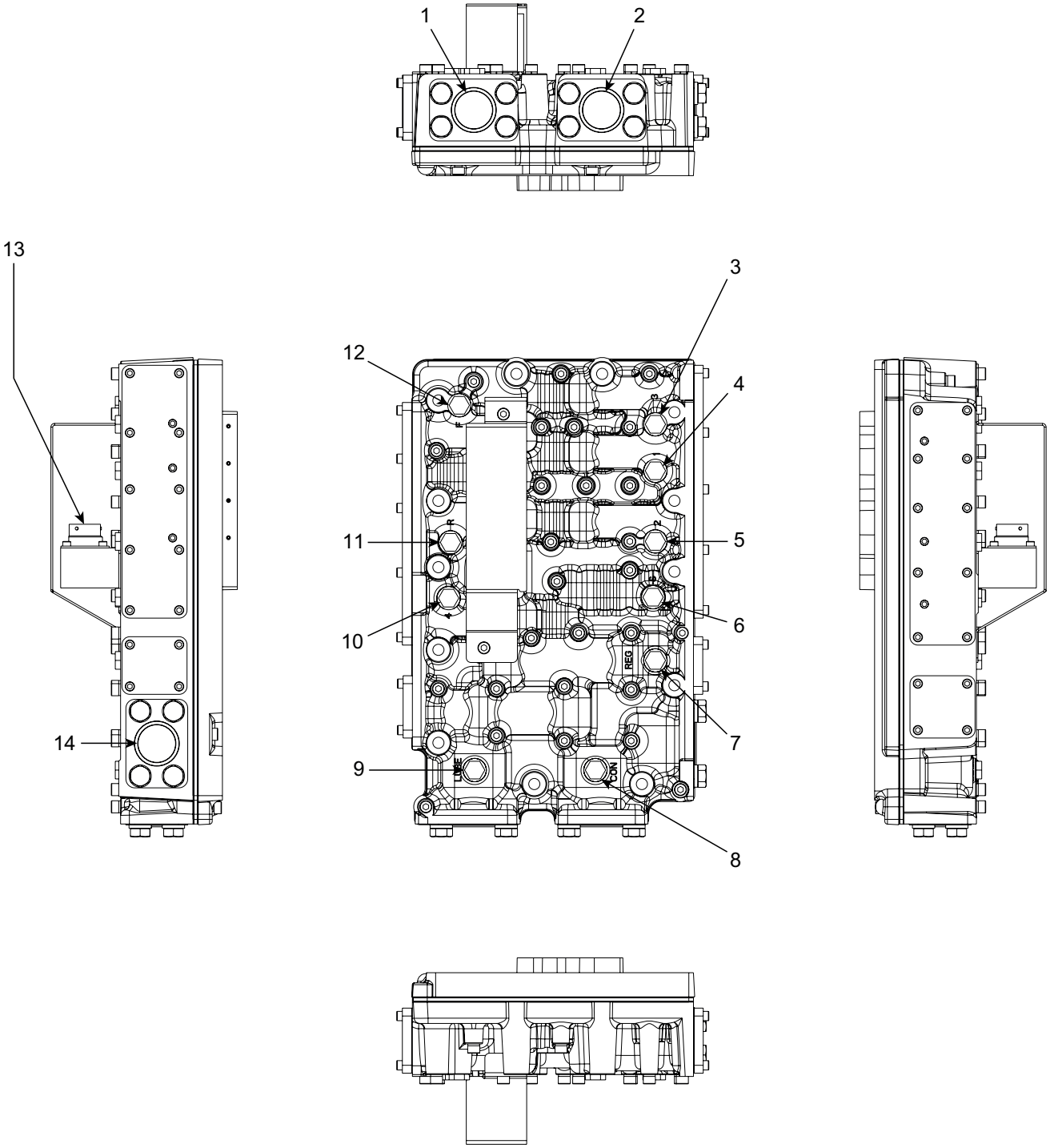
2 - Oil Level Glasses

3 - Oil Level Check

4 - 3/4-14 NPTF Drain Plug

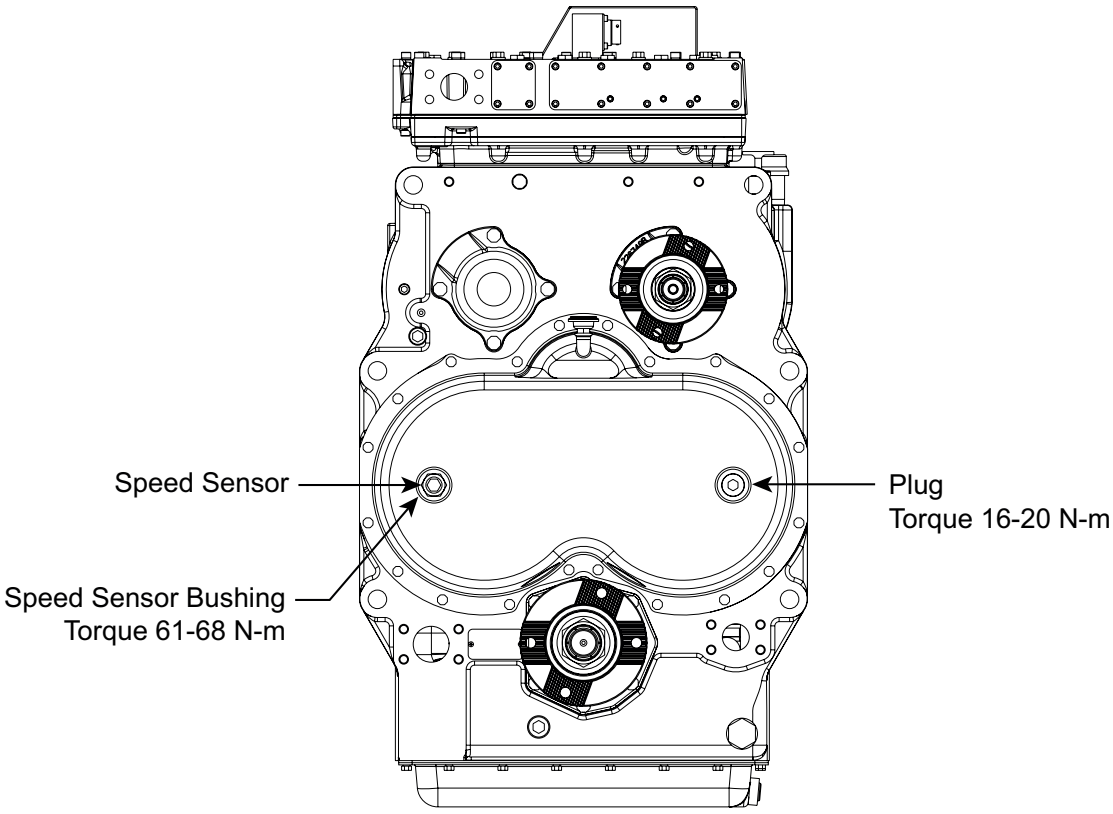
5 - Port 22 Transmission Drain Ø38 Split Flange

CHECK POINTS CONTROL VALVE



1 - From cooler Ø38 split flange
2 - To converter Ø38 split flange
3 - Port 43 3rd clutch pressure M14 x 1.5
4 - Port 41 1st clutch pressure M14 x 1.5
5 - Port 42 2nd clutch pressure M14 x 1.5
6 - Port 36 Solenoid pressure M14 x 1.5
7 - Port 31 Regulated pressure M14 x 1.5
8 - Port 37 Converter in pressure M14 x 1.5
9 - Port 34 Lube pressure M14 x 1.5
10 - Port 44 4th clutch pressure M14 x 1.5
11 - Port 46 Rev clutch pressure M14 x 1.5
12 - Port 45 Fwd clutch pressure M14 x 1.5
13 - 14 Pole deutz connector HD34-18-14PN mating parts specs connector deutz HD36-18-14SN contact (female) deutz 0462-209-16141
14 - From charging pump Ø38 split flange

SPEED SENSOR INSTALLATION



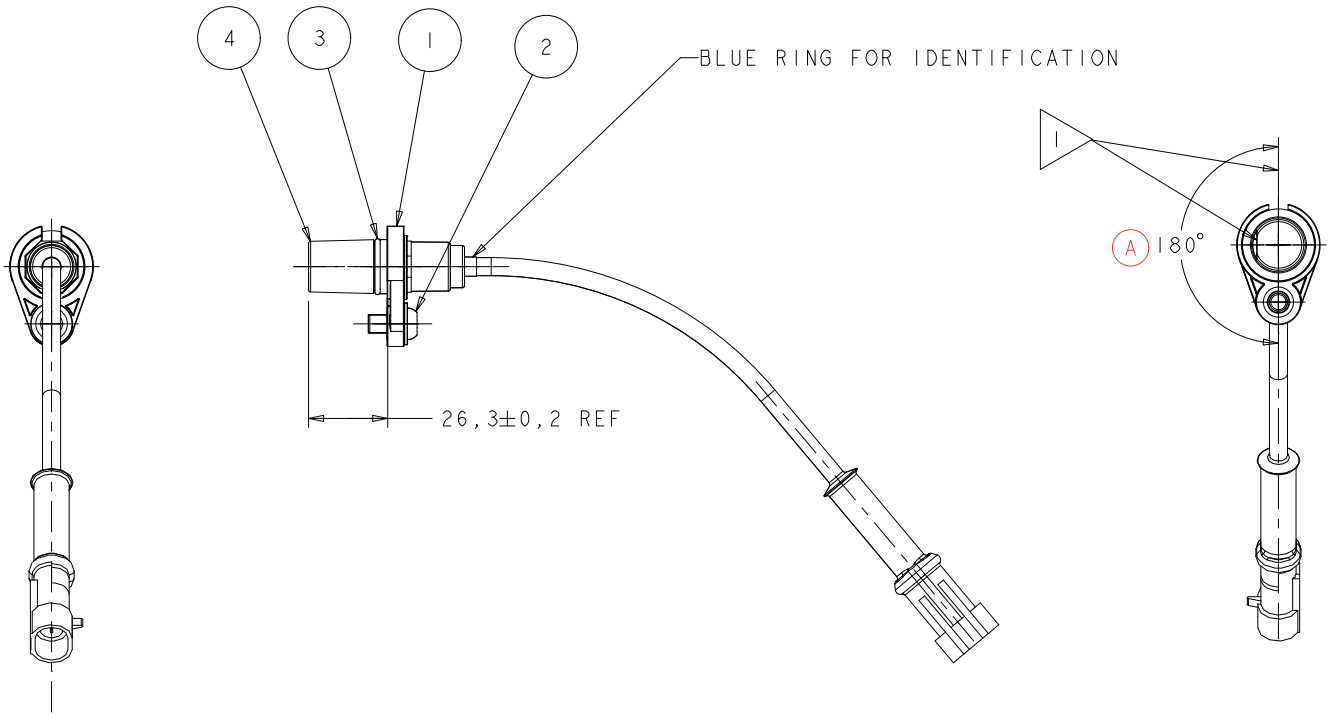
The magneto resistive sensor generates a square wave current with a fixed amplitude changing between 7 mA and 14 mA. The sensor has an integrated AMP superseal 2-pin connector. The two pins are numbered 1 and 2.

The following table shows the relation between wire color, pin number and connection.

Pin.	Function	Connection
1.	Current Input	Hot Wire
2.	Current Output	Ground Wire

⚠ CAUTION

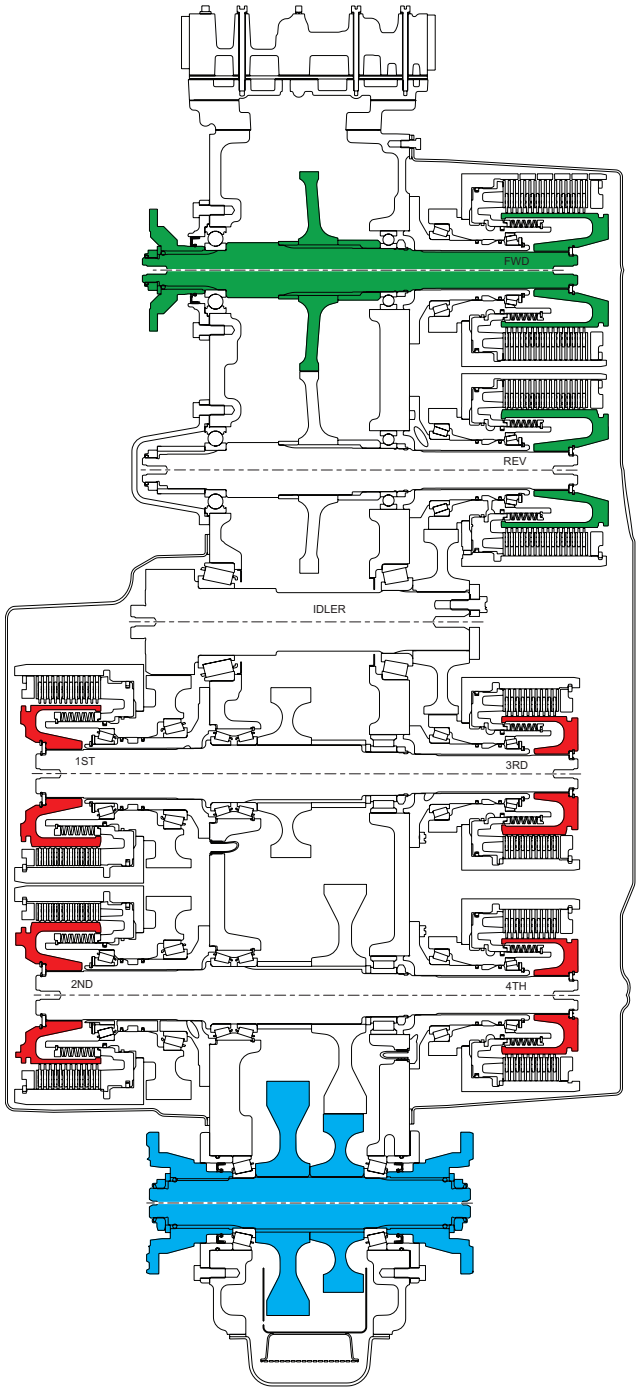
The sensor wires have a polarity. Be sure to correctly observe sensor polarities as wrong connections will deactivate the sensor!.



1	Position of clamp must be 180° in relation to position sign on speed sensor clamp must be fixed

Item	Description	Qty
1	Support speed sensor	1
2	Screw	1
3	O-ring DIA 15x1.8	1
4	Assy speed sensor AMP	1

Transmission model.	ASSY Part Nr	Connector	Type	X Position
6000	4209752	AMP 2 pins	Drum speed	180°


FWD
REV
IDLER
1ST
3RD
2ND
4TH

INPUT SHAFT AND DIRECTIONAL CLUTCHES

The turbine shaft driven from the turbine transmits power to the directional clutches (fwd/rev).

These clutches consist of a drum with internal splines and a bore to receive a hydraulic actuated piston.

The piston is oil-tight by the use of sealing rings. The steel discs with outer diameter teeth, and friction discs with inner diameter teeth, are alternated until the required total is achieved.

An end plate is then inserted and secured with a retainer ring. A hub with outer diameter splines is inserted into the friction discs with teeth on the inner diameter. The discs and hub are free to increase in speed or rotate in the opposite direction as long as no pressure is present in that specific clutch.

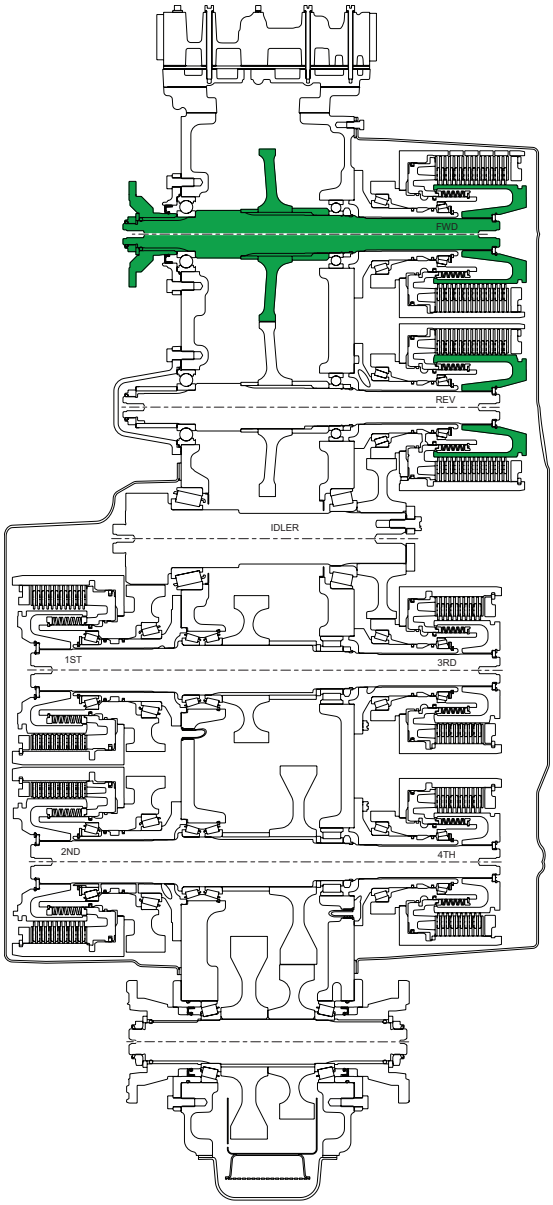
To engage the clutch, the solenoid will direct oil under pressure through tubes and passages to the selected clutch shafts.

Oil sealing rings are located on the clutch shafts. These rings direct the oil through a drilled passage in the shaft to the desired clutch.

Pressure of the oil forces the piston and discs against the end plate. The discs with teeth on the outer diameter clamping against discs with teeth on the inner diameter enables the drum and hub to be locked together and allows them to drive as one unit.

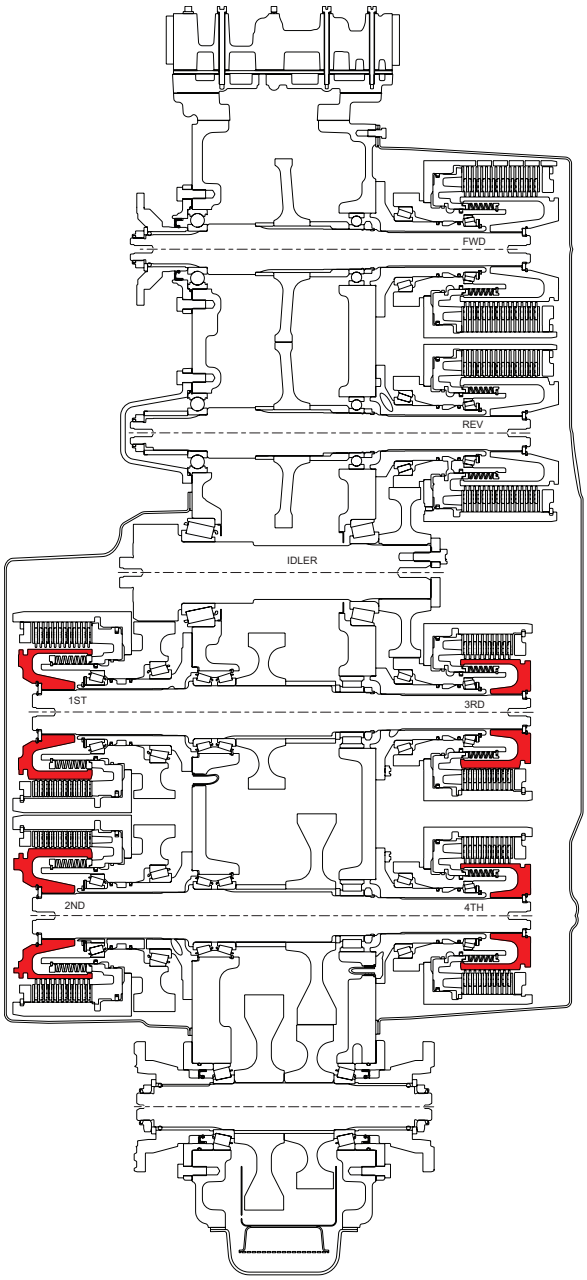
When the clutch is released, a return spring will push the piston back and oil will drain back via the shift spool.

The engagement of all range and directional clutches is modulated and idraulic controlled. This means that clutch pressure is built up gradually. This will enable the unit to make forward, reverse shifts while the vehicle is still moving and will allow smooth engagement of drive.



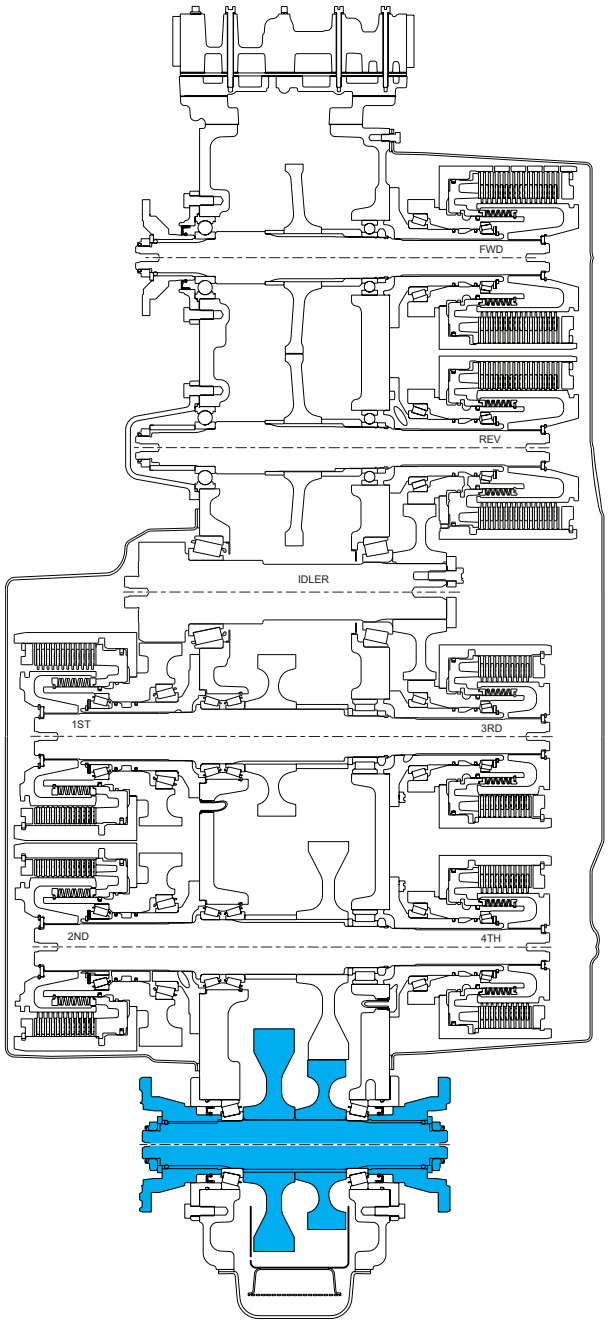
RANGE CLUTCHES

Once a directional clutch is engaged, power is transmitted to the range clutches. Operation and actuation of the directional clutches is similar to the range clutches. The engagement of the directional and range clutches is modulated.



OUTPUT SECTION

With a range clutch engaged, power is finally transmitted to the output shaft. Output rotation is the opposite to input rotation when the forward clutch is engaged.



TRANSMISSION CONTROLS

OPERATION OF THE VALVE

The transmission is controlled by the control valve. The control valve is mounted on top of the transmission.

The function of the control valve assembly is to direct oil under pressure to the desired directional and speed clutches.

The control valve has 6 solenoids and 5 shift spools.

1st gear can be selected by activating the 1st solenoid. The 1st solenoid will then allow a pilot pressure of 8,5 bar to move the 1st shift spool. Due to this movement of the shift spool, the 1st clutch is fed with oil under 12.4 bar regulator pressure. The same priciple is valid for 2nd, 3rd & 4th gear.

There is one 3-position shift spool for FWD, Neutral, or Rev.To ensure that only 1 direction can be selected. The directional shift spool is held in Neutral by means of springs as a safety feature. You need to apply pressure to select either FWD or REV. When both FWD & REV are selected the resulting force is 0 and the spool stays in Neutral position.

When the pressure is directed to one of the direction positions, the oil is guided to the modulator before entering the clutch. The modulator achieves a gradual pressure increase instead of an abrupt increase.

When pressure is applied initially a spool moves and uncovers a vent, which, because if its discharge or bleeding of fl uid produces a low pressure. At the same time, fl uid fl ows through a restrictor passageway to an accumulator and as the pressure builds up in the accumilator, it moves the spool back towards its initial position, causing a gradual increase in pressure.

The direction or speed clutch assembly consists of a drum with internal gear teeth and a bore to receive a hydraulically actuated piston. A piston is inserted into the bore of the drum. The piston is “oil tight” by the use of sealing rings. A friction disc with internal teeth is inserted into the drum and rests against the piston. Next, a disc with splines at the outer diameter is inserted. Discs are alternated until the required total is achieved. After inserting the last disc, a series of springs and pins are assembled in such a manner that these springs rest on theeth of the piston. A heavy backup plate is then inserted and secured by a snap ring. A hub with ID and OD splines is inserted into the splines of the discs with theeth on the inner diameter and the splined shaft extending through the clutch support. This hub is retained by a snap ring. The discs and inner shaft are free to increase in speed or rotated in the opposite direction as long as no pressure is present in the direction or speed clutch.

To engage the clutch, as previously stated, the control valve is placed in the desired position. This allows oil under pressure to fl ow from the control valve through a tube in the transmission case to a chosen clutch. Once into the drum, oil is directed through a drilled hole into the rear side of the piston bore. Pressure of the oil forces the piston and discs over against the heavy backup-up plate. The discs, with teeth on the outer diameter, clamping against discs with teeth on inner diameter, enables the clutch drum and drive shaft to be locked together and allow them to turn as a unit.

There are bleed holes in the clutch drums which allow quick escape for oil when the pressure to the piston is released.

The transmission gear train consists of six shafts:

1 - Input shaft

2 - Reverse shaft

3 - Idler shaft

4 - First & third shaft

5 - Second & fourth shaft

6 - Output shaft

A screen mounted in a frame is positioned on the bottom of the transmission case to screen out any foreign material. This screen is covered by the sump pan. This pan is provided with magnets to catch any metallic particles.

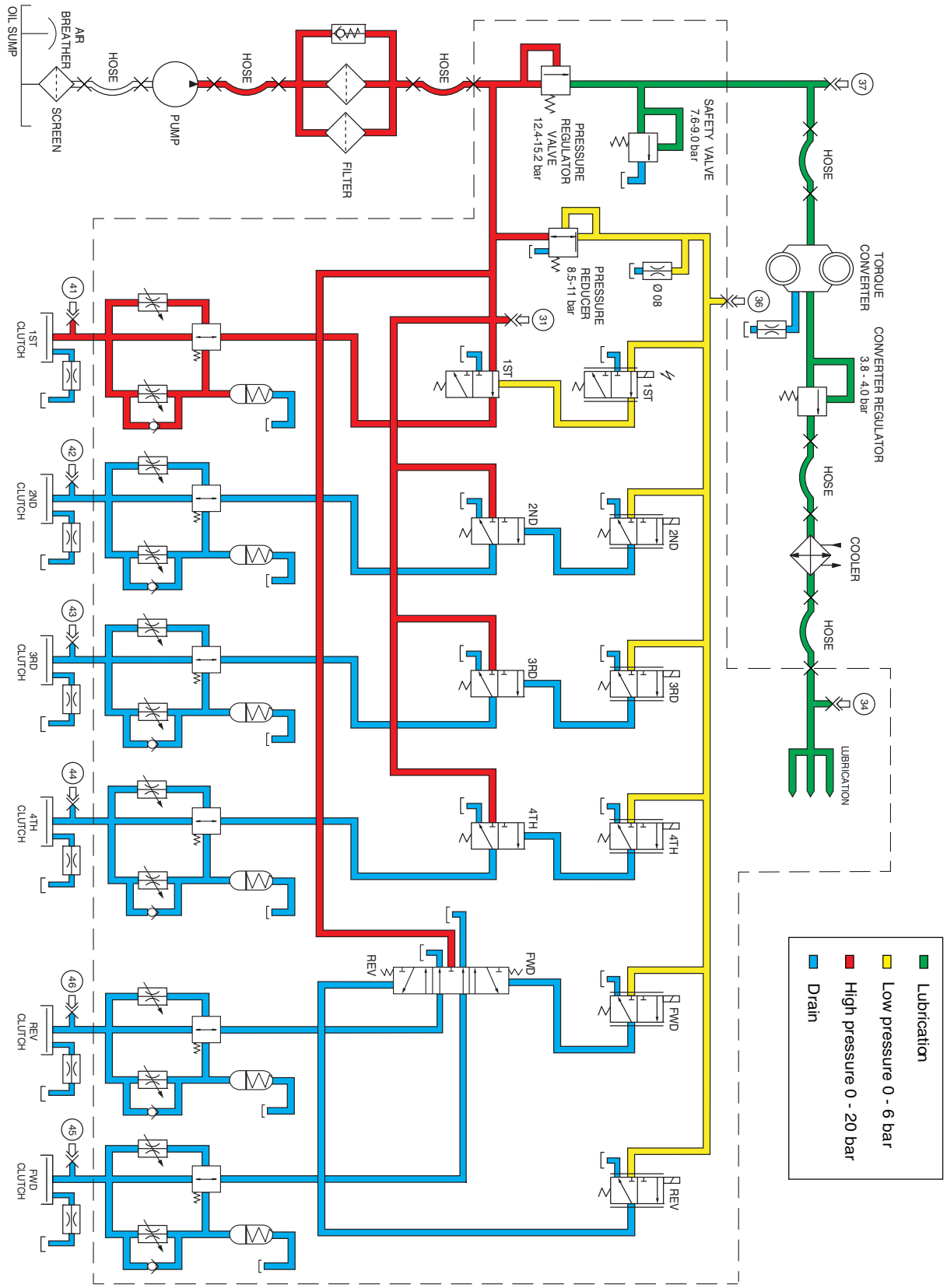
Some transmissions may have an axle declutching unit as optional equipment. This unit consists of a split output shaft with a sliding splined sleeve to engage or disengage the axle. This is accomplished by manually shifting a lever in the operator compartiment, which is mechanically connected to the shift fork on the clutching unit sliding sleeve. This unit, ofcourse, is only used on four wheel drive machines. On the front drive only or the rear drive only, the output shaft is a one piece type and an output fl ange assembled only on the required end.

ELECTRIC SOLENOID CONTROLS

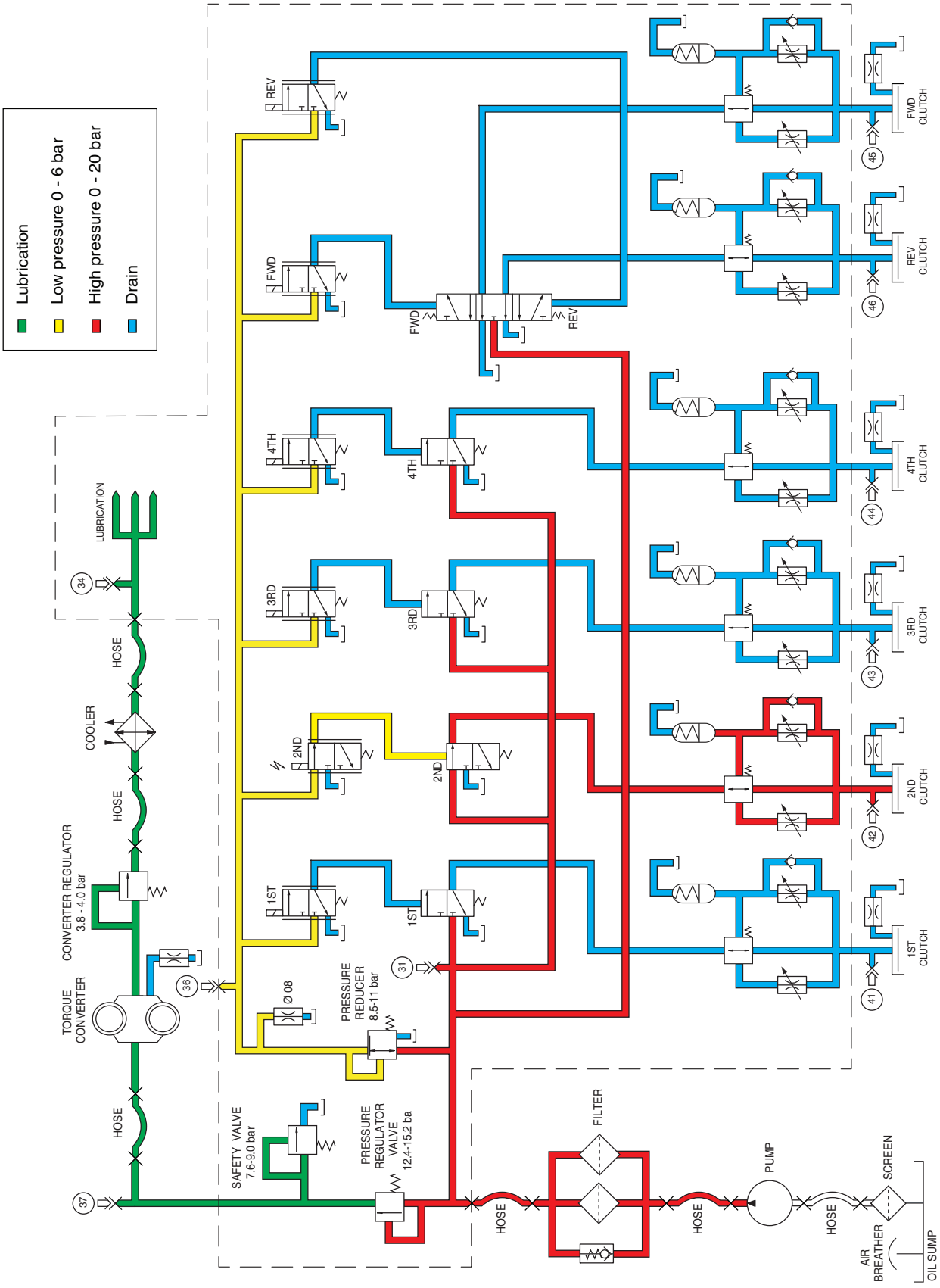
Transmission gear	Activated Selector valve	Activated Proportional valve	Activated Clutches
Forward 4	-	Fwd, 4th	Forward, 4th
Forward 3	-	Fwd , 3rd	Forward, 3rd
Forward 2	-	Fwd, 2nd	Forward, 2nd
Forward 1	-	Fwd, 1st	Forward, 1st
Neutral 4	-	4th	4th
Neutral 3	-	3rd	3rd
Neutral 2	-	2nd	2nd
Neutral 1	-	1st	1st
Reverse 4	-	Rev, 4th	Reverse, 4th
Reverse 3	-	Rev, 3rd	Reverse, 3rd
Reverse 2	-	Rev, 2nd	Reverse, 2nd
Reverse 1	-	Rev, 1st	Reverse, 1st

POWER FLOWS, SOLENOIDS AND HYDRAULIC CIRCUITS

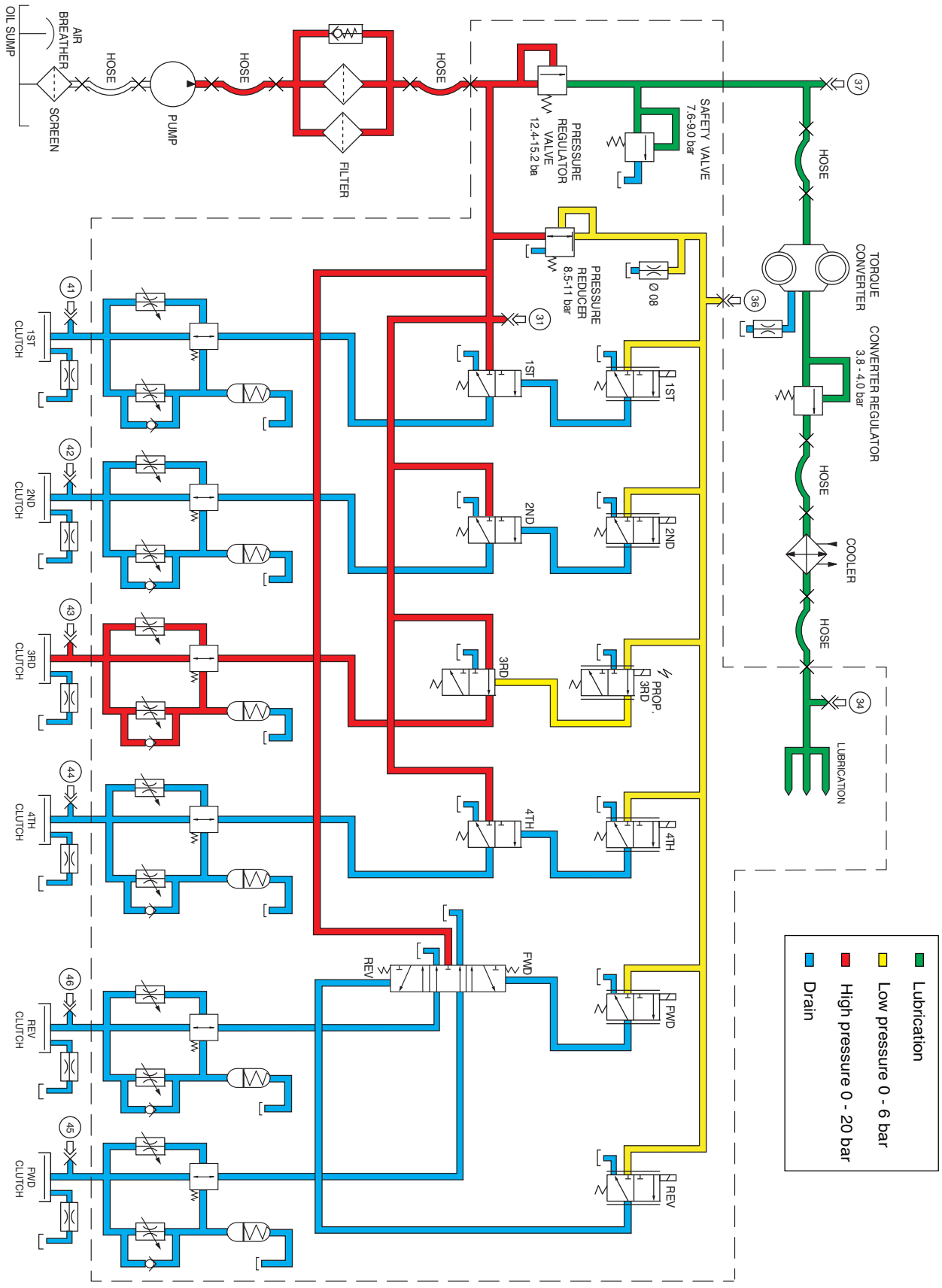
NEUTRAL 1ST CLUTCH



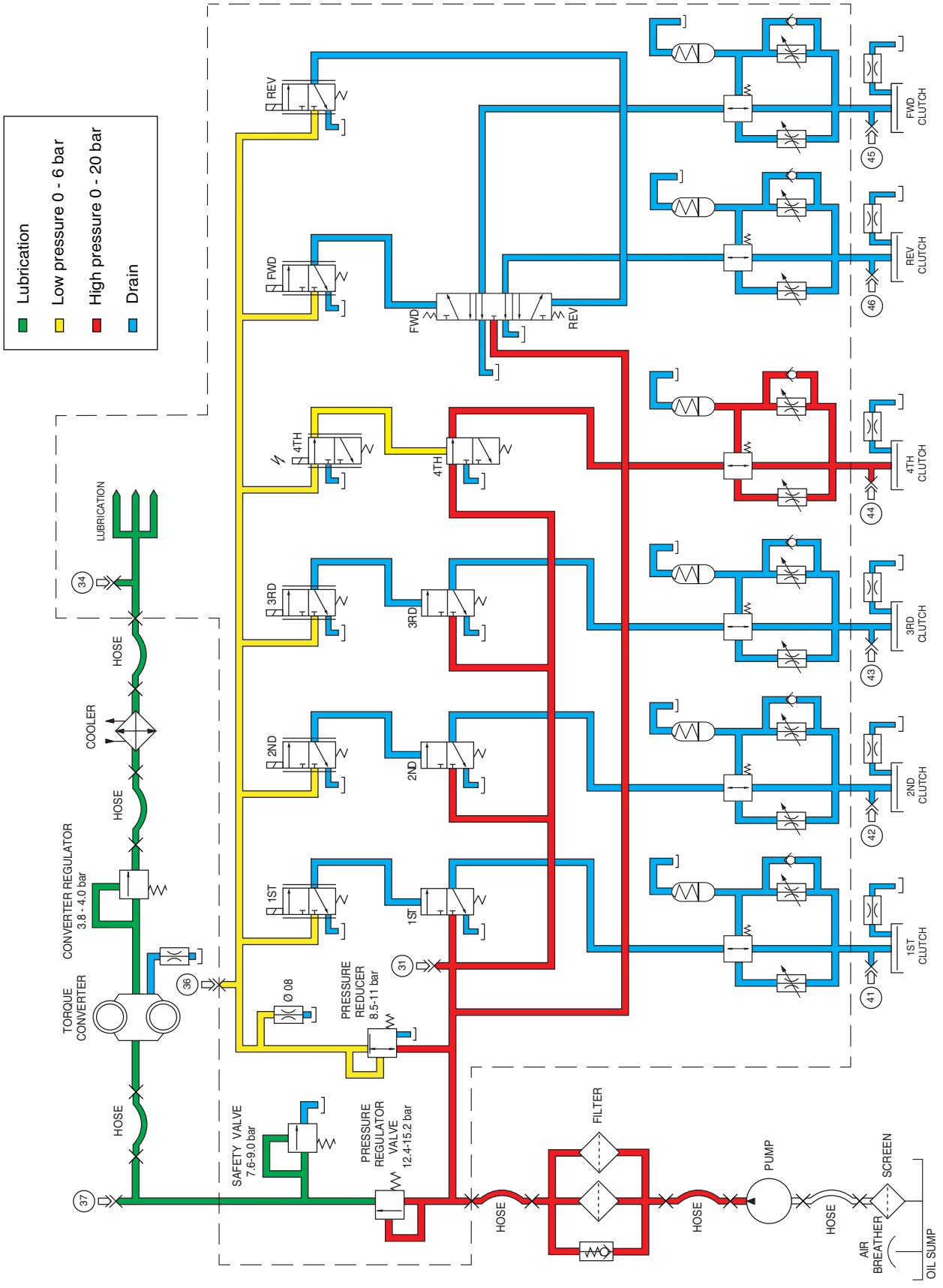
NEUTRAL 2ND CLUTCH



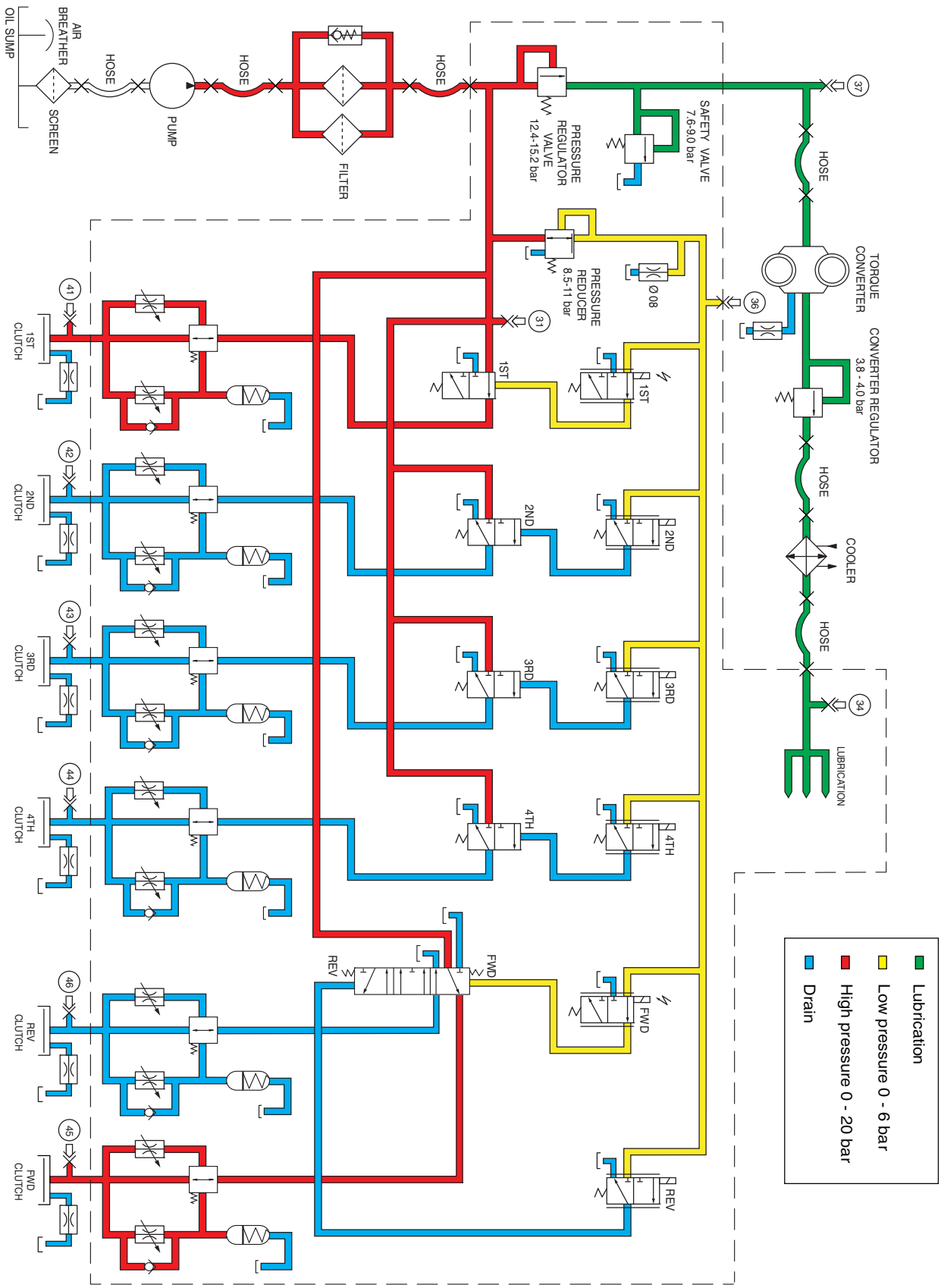
NEUTRAL 3RD CLUTCH



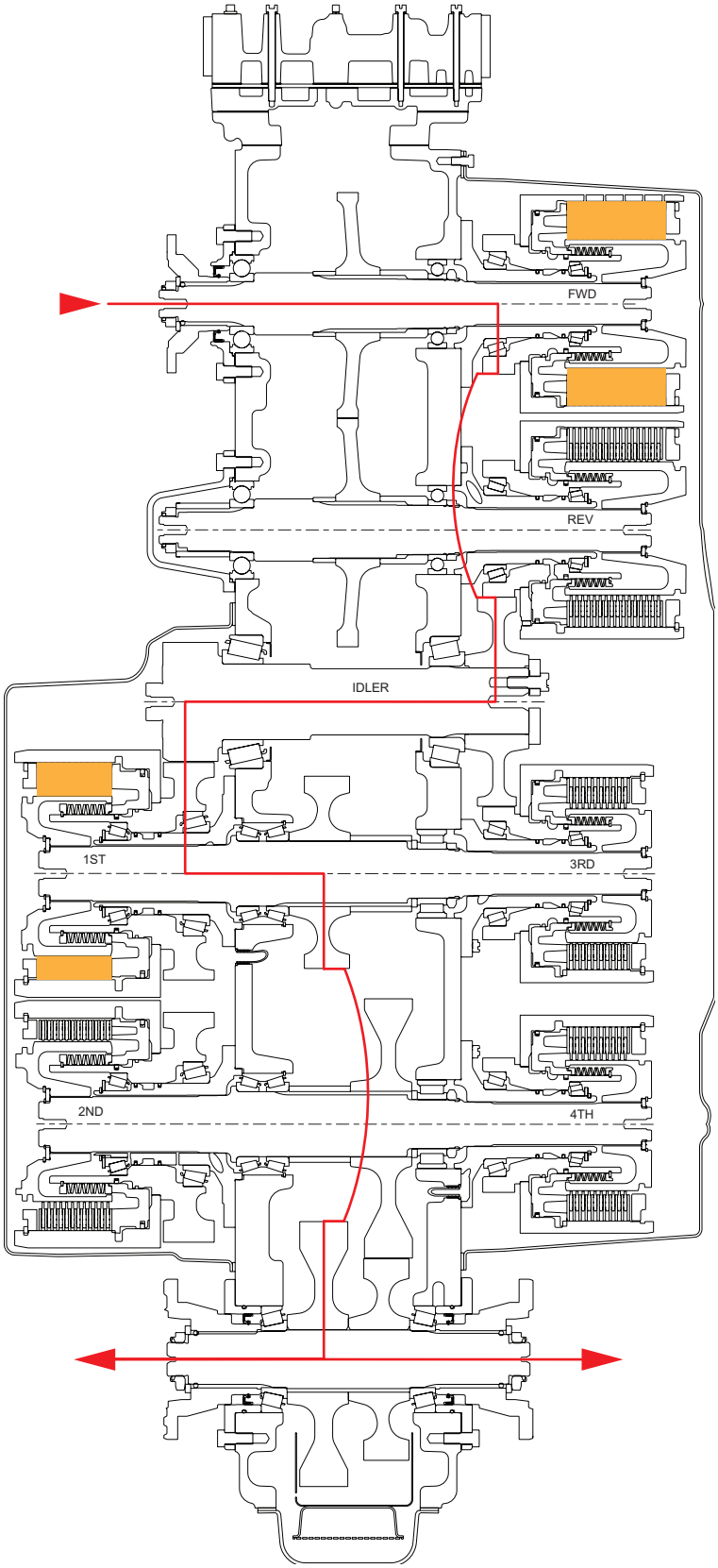
NEUTRAL 4TH CLUTCH



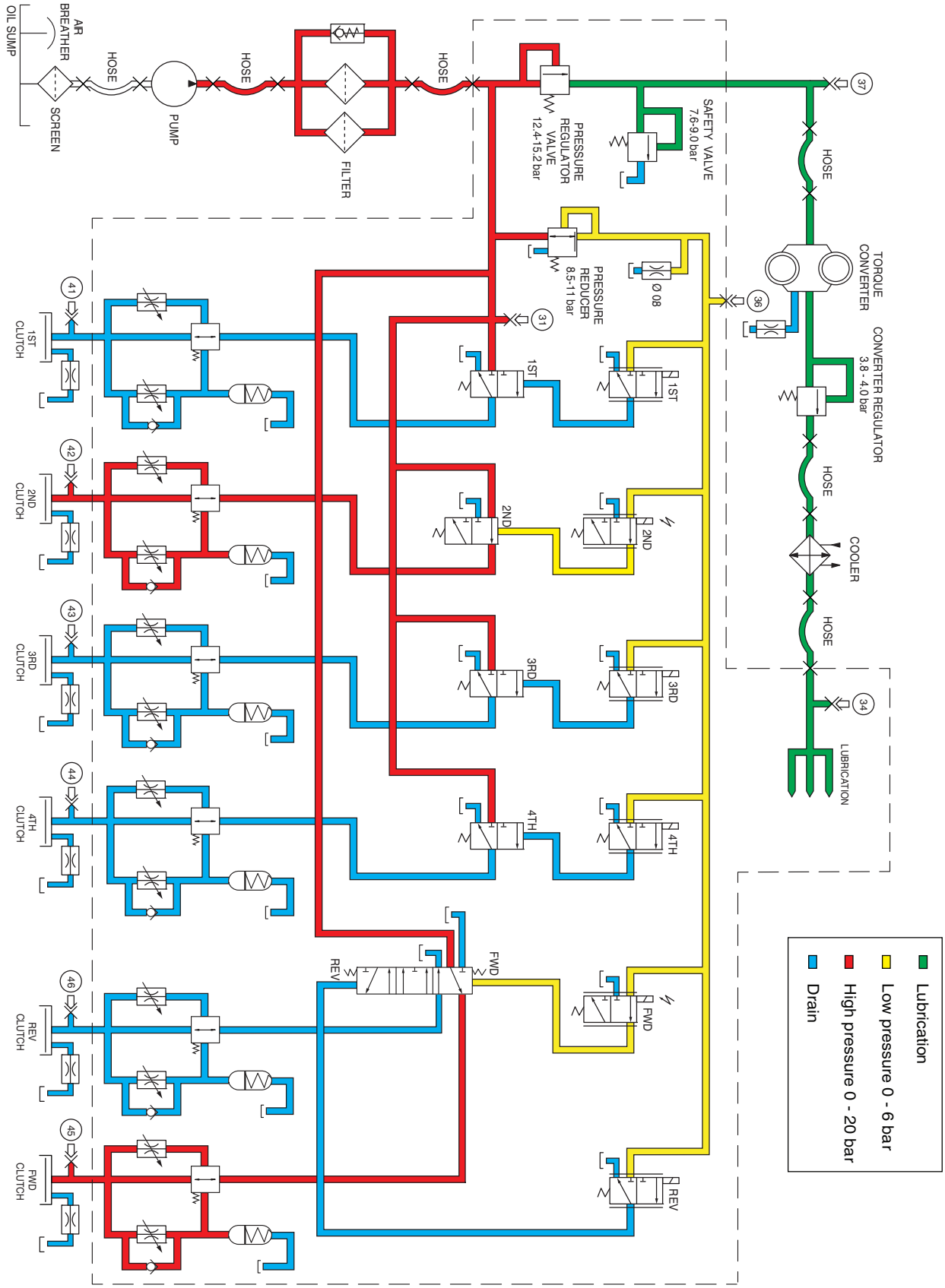
FORWARD 1ST SPEED



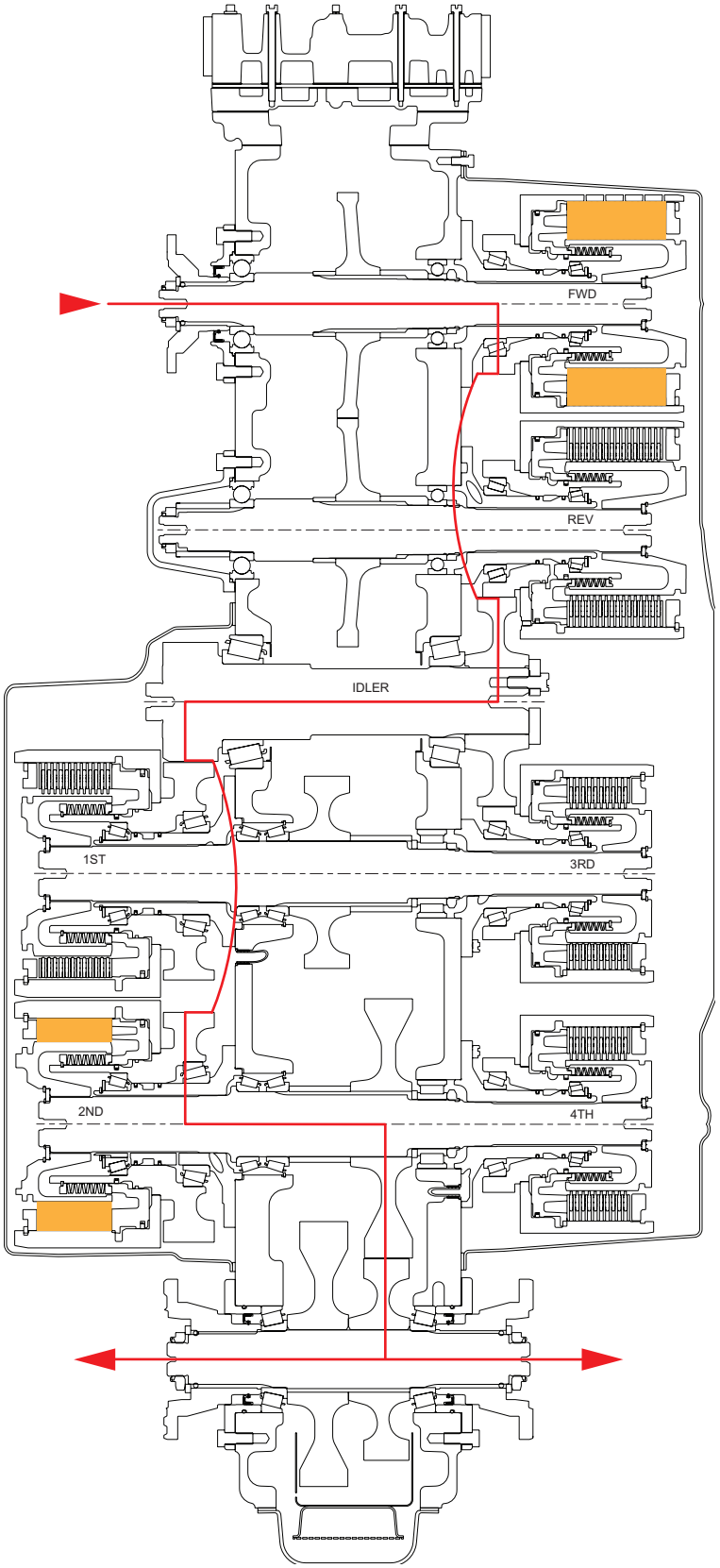
FORWARD 1ST SPEED (CONTINUED)



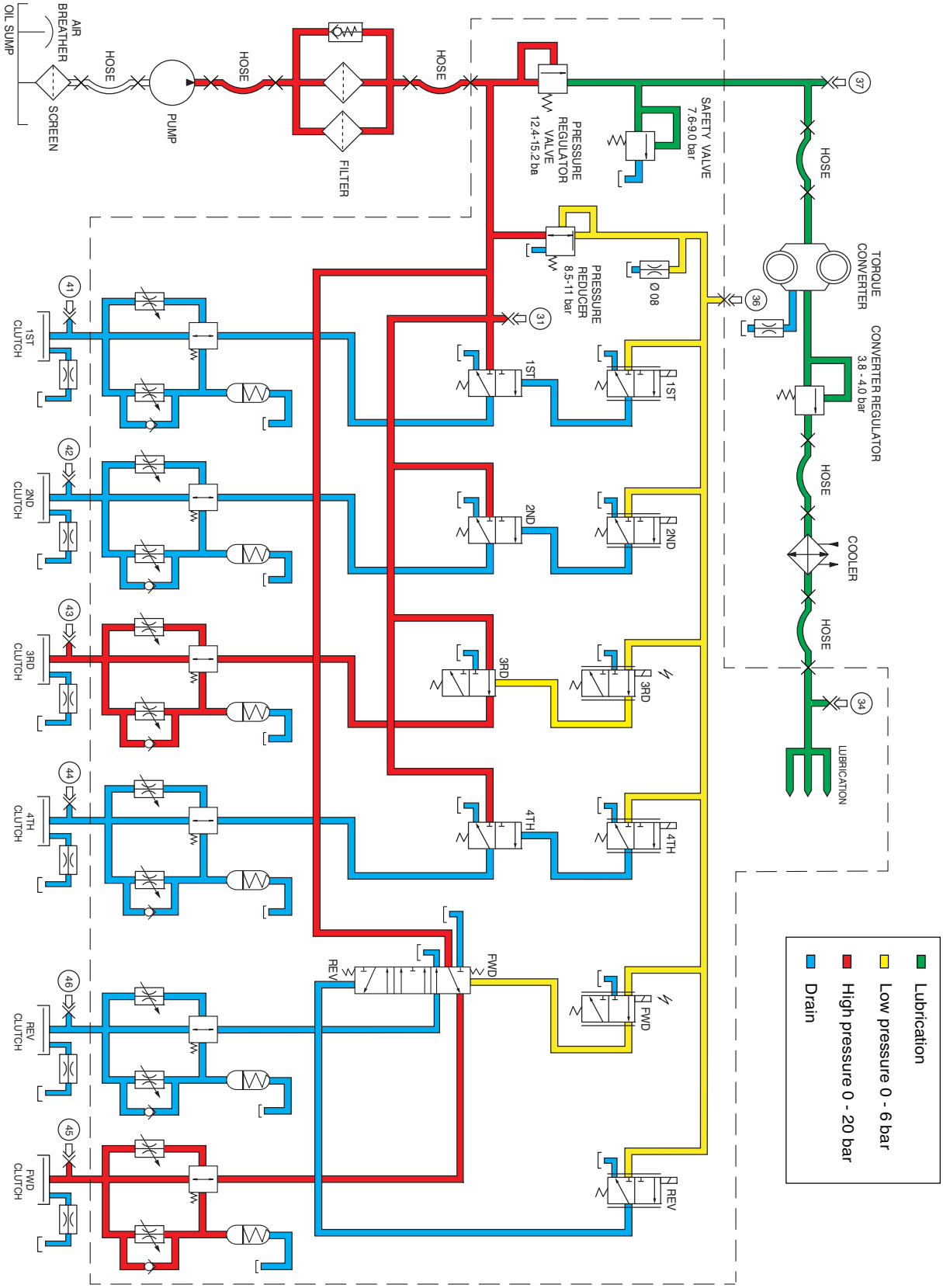
FORWARD 2ND SPEED



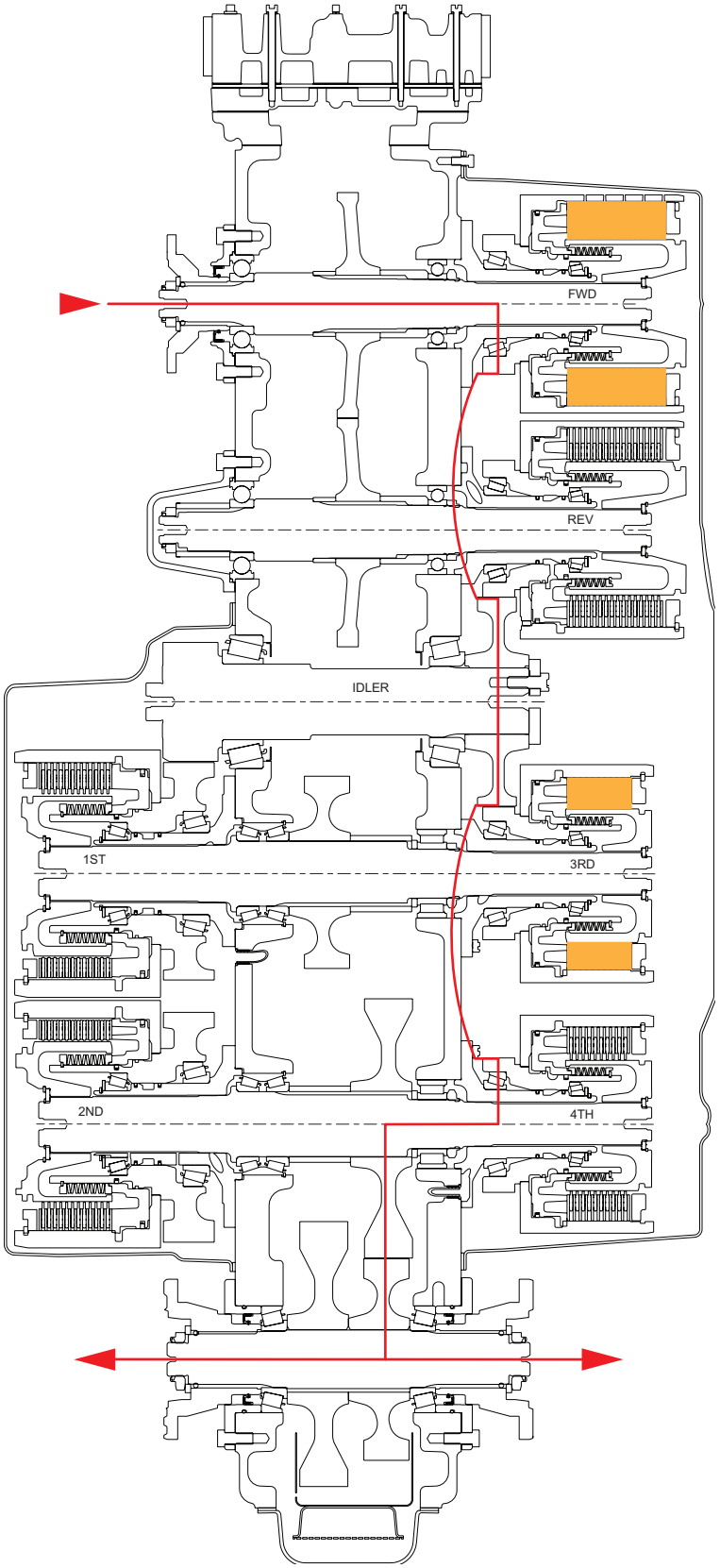
FORWARD 2ND SPEED (CONTINUED)



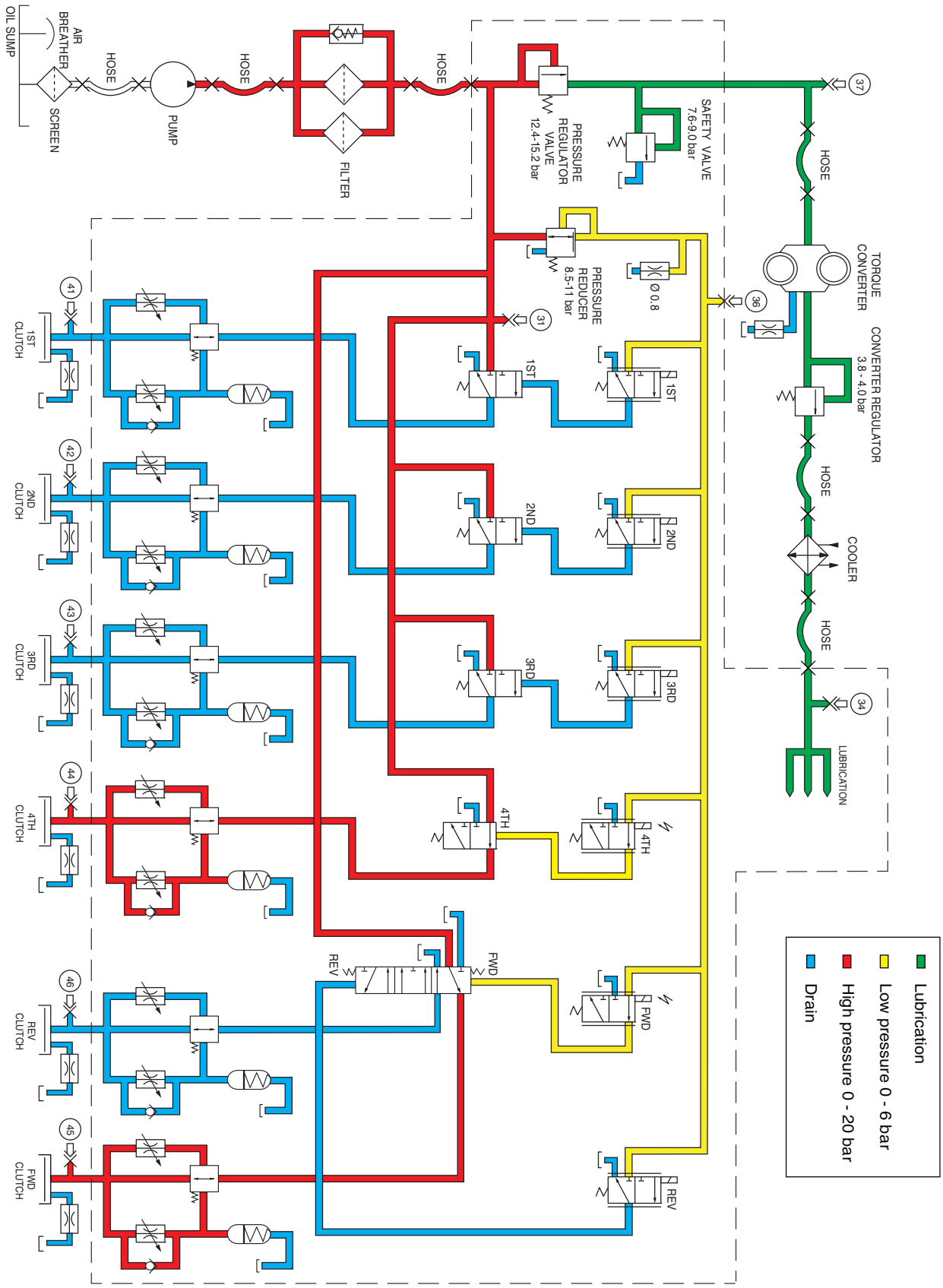
FORWARD 3RD SPEED



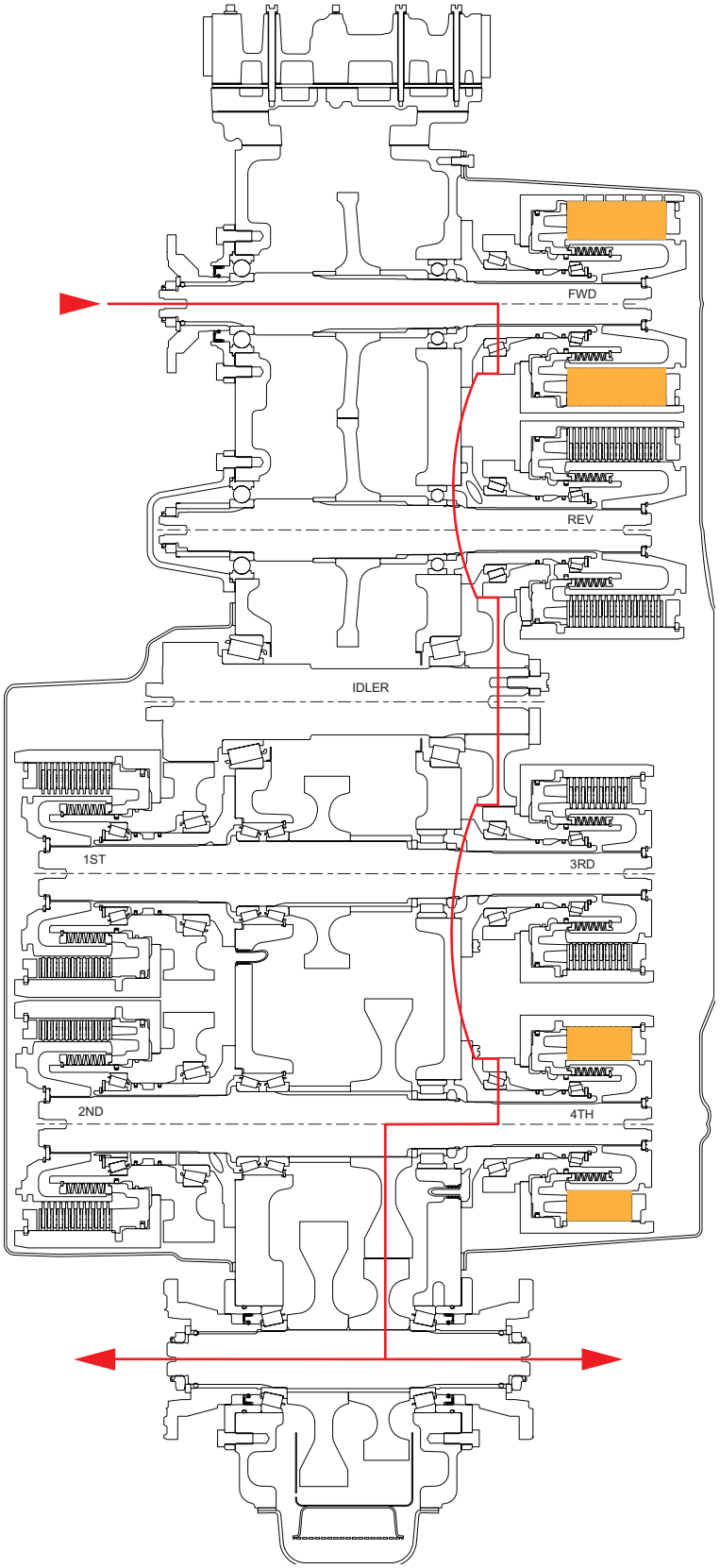
FORWARD 3RD SPEED (CONTINUED)



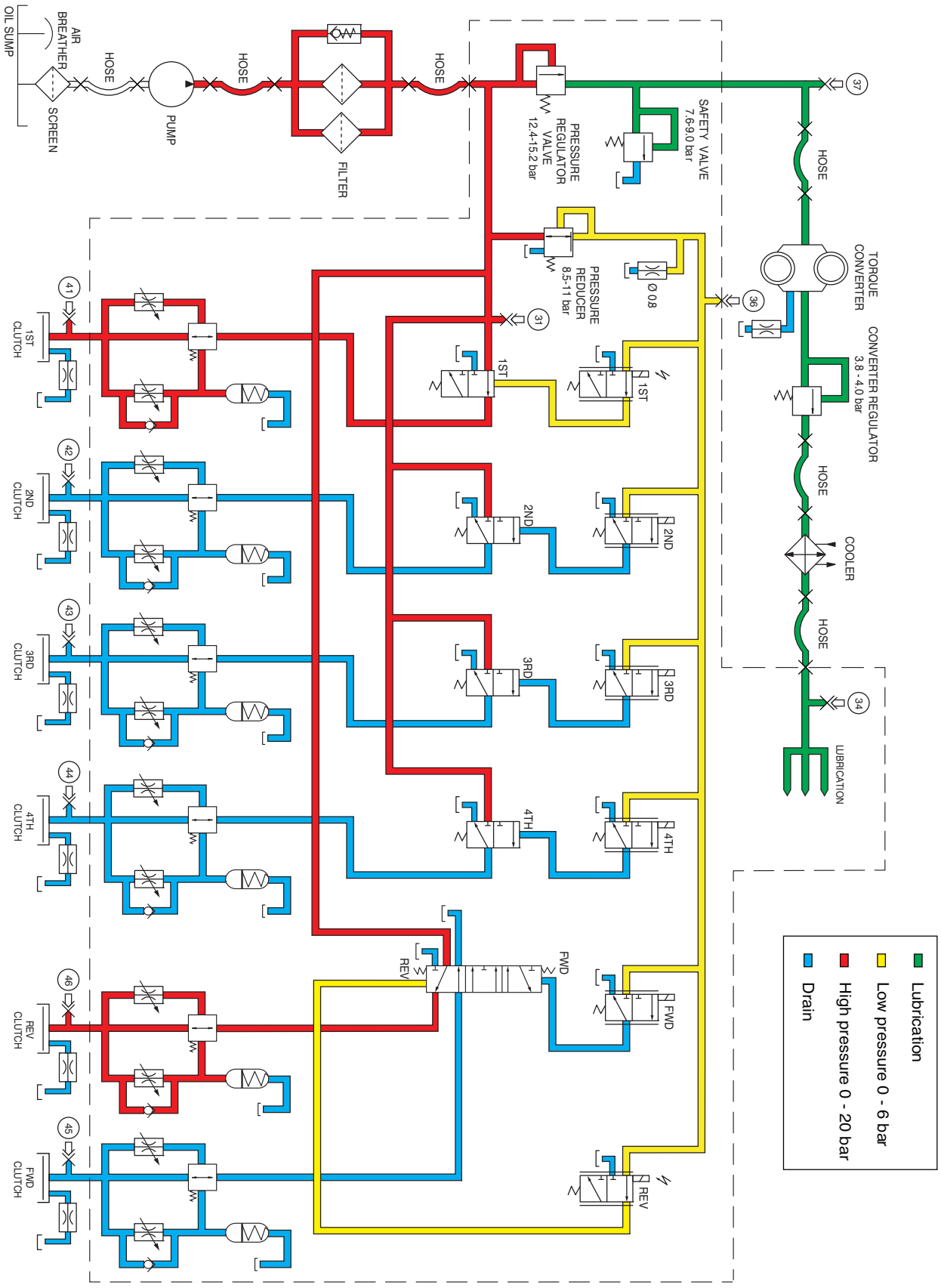
FORWARD 4TH SPEED



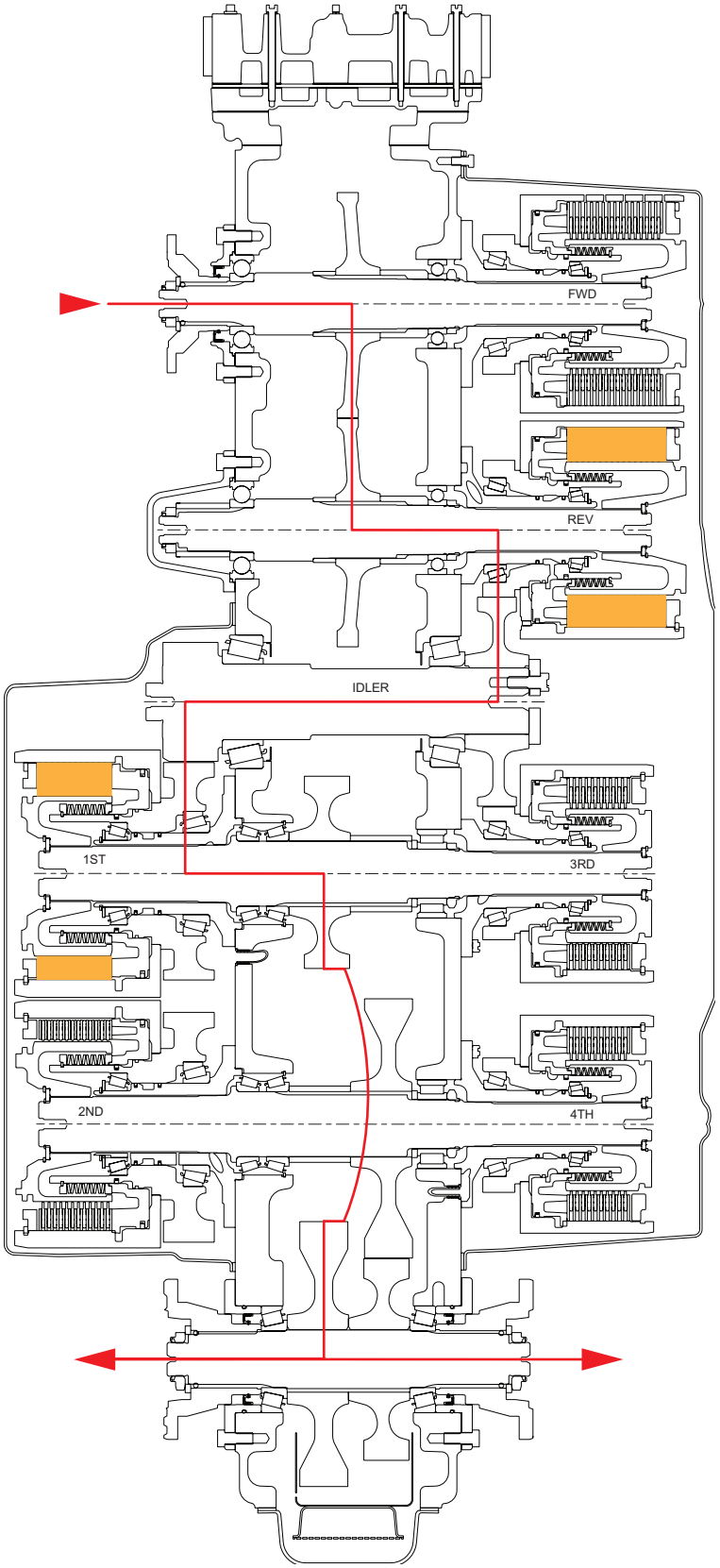
FORWARD 4TH SPEED (CONTINUED)



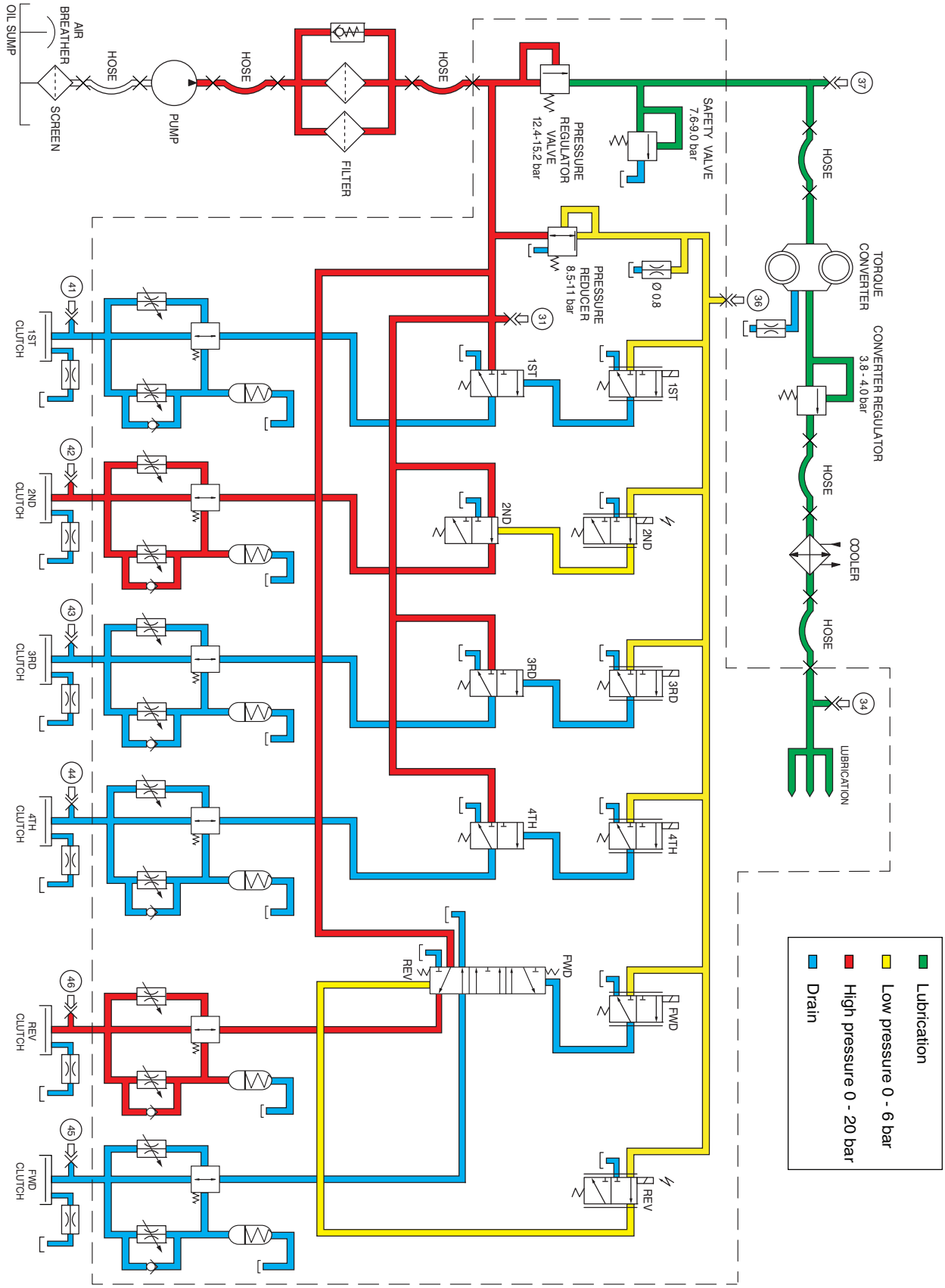
REVERSE 1ST SPEED



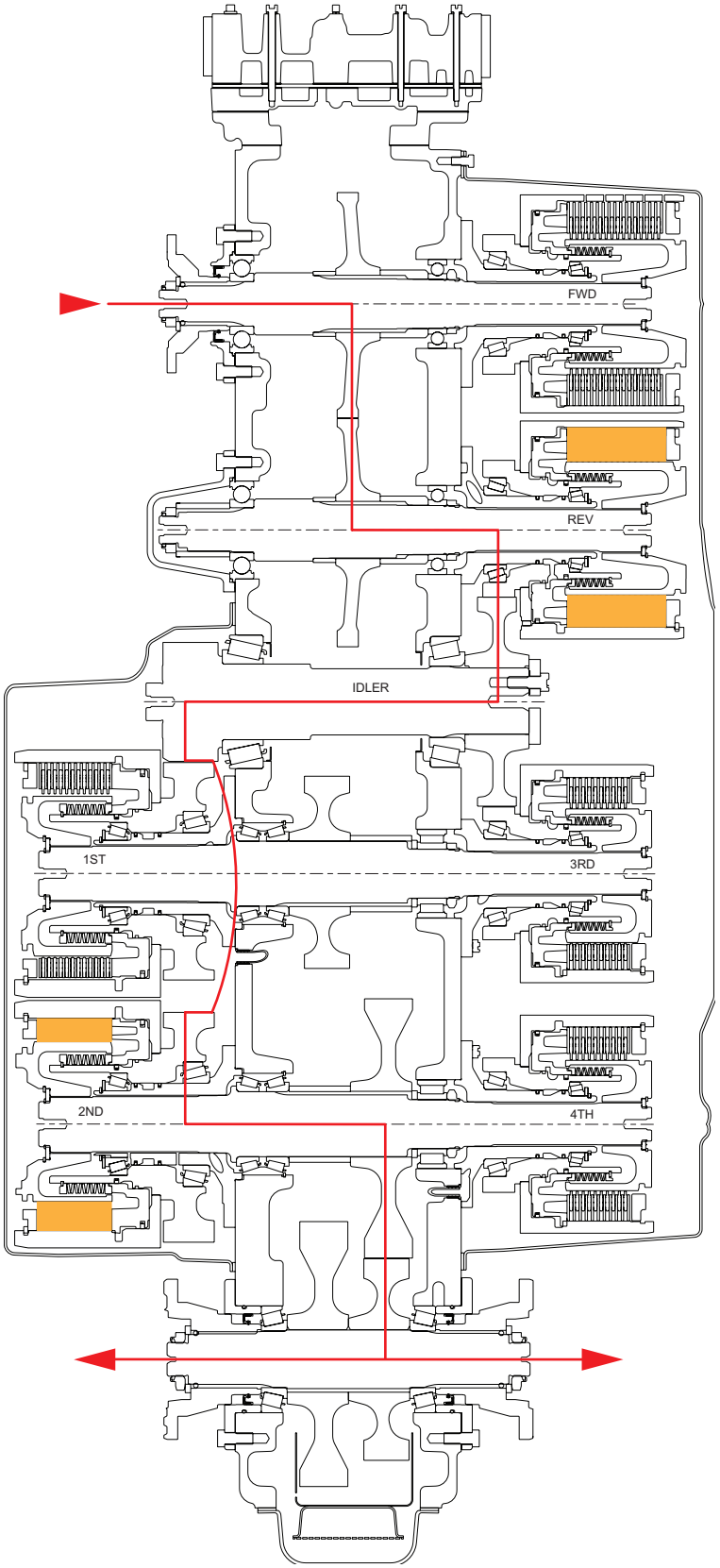
REVERSE 1ST SPEED (CONTINUED)



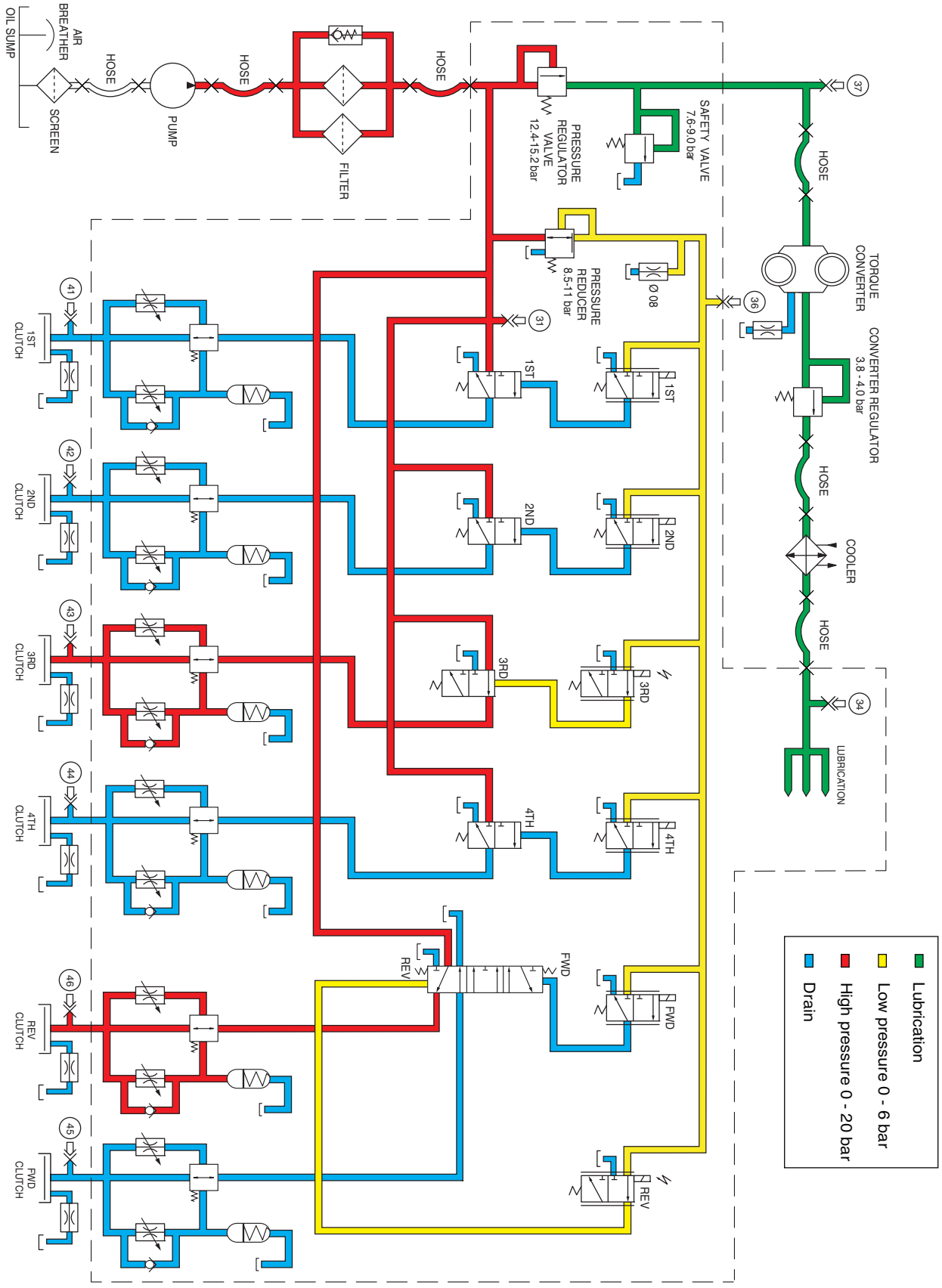
REVERSE 2ND SPEED



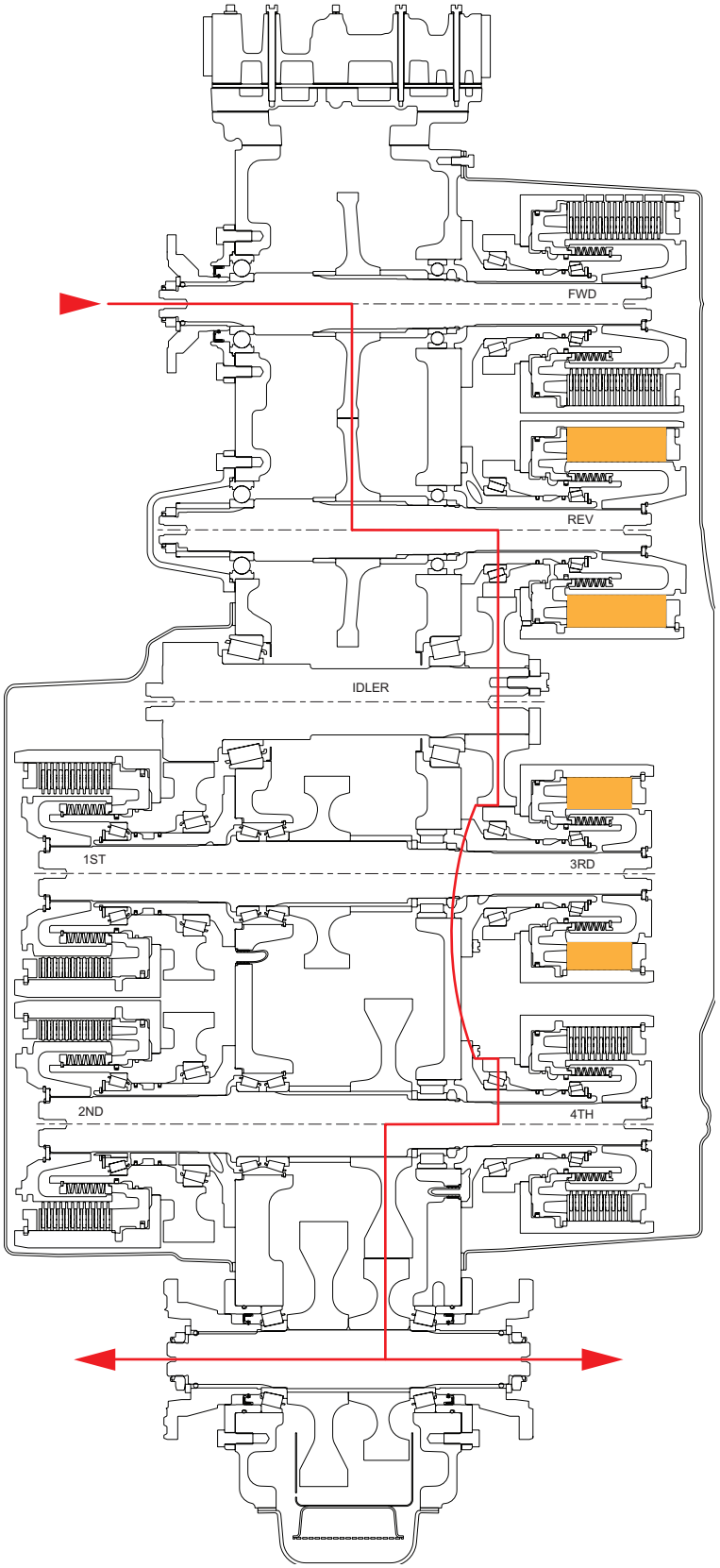
REVERSE 2ND SPEED (CONTINUED)



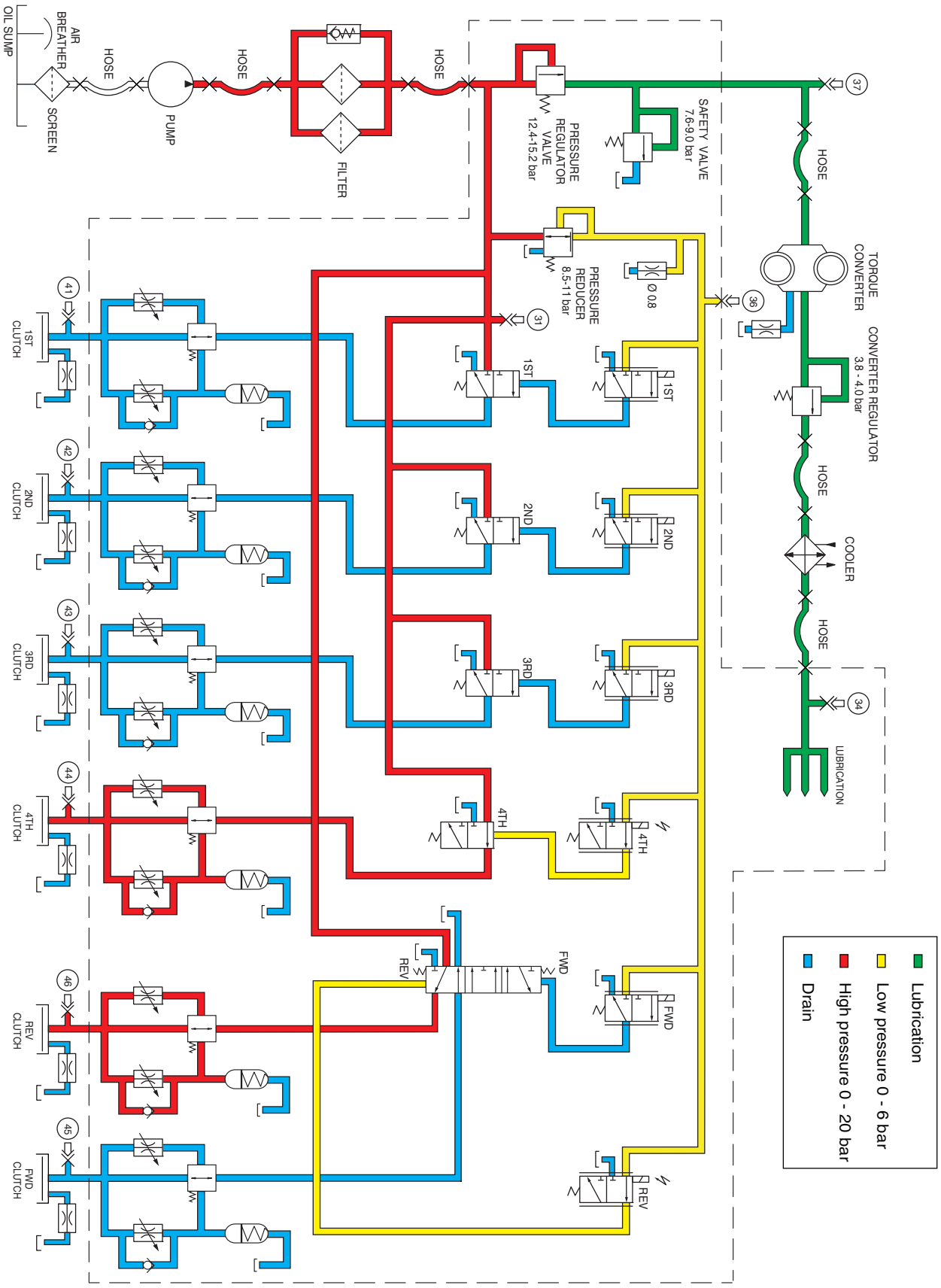
REVERSE 3RD SPEED



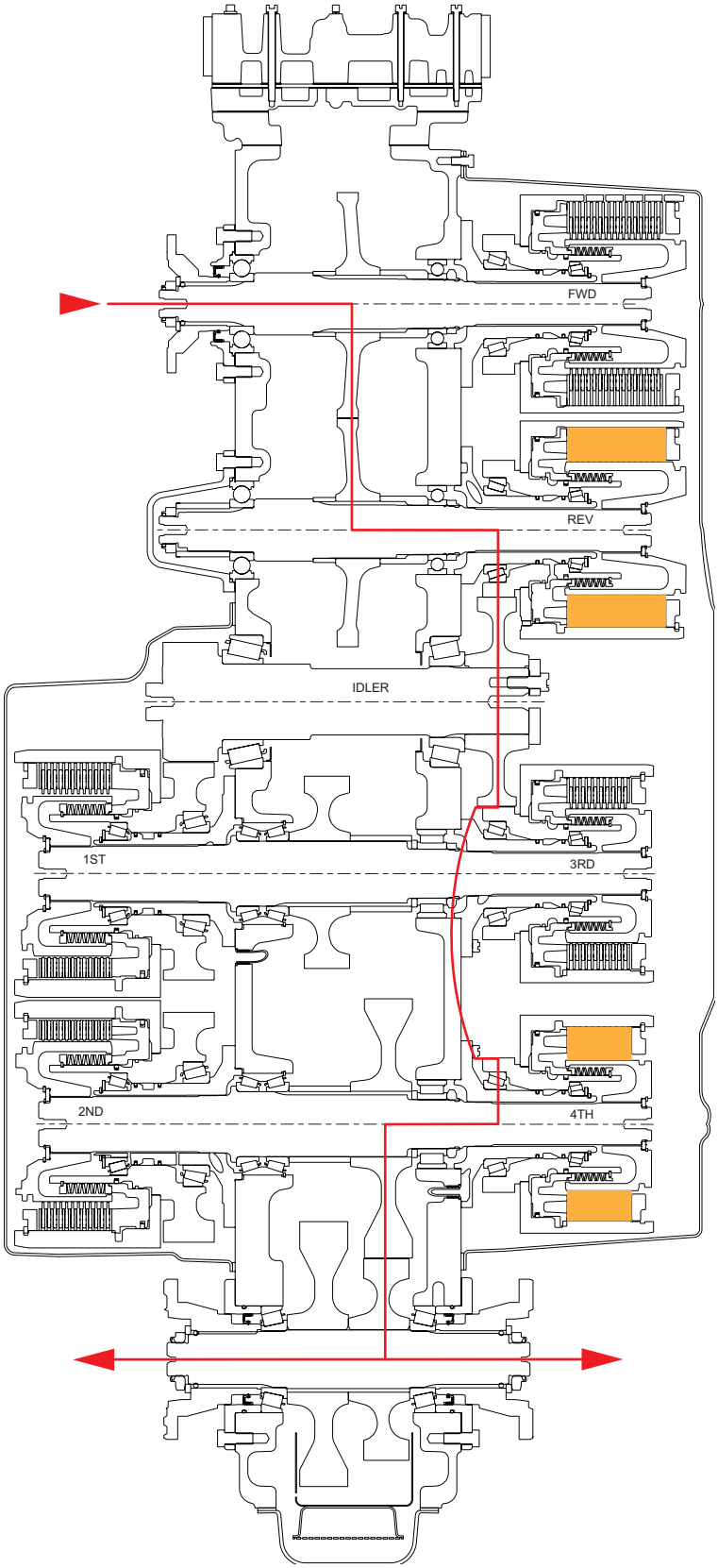
REVERSE 3RD SPEED (CONTINUED)



REVERSE 4TH SPEED



REVERSE 4TH SPEED (CONTINUED)



TROUBLESHOOTING

The following information is presented as an aid to isolate and determine the specific problem areas in a transmission that is not functioning correctly.

When troubleshooting a “transmission” problem, it should be kept in mind that the transmission is only the central unit of a group of related powertrain components. Proper operation of the transmission depends on the condition and correct functioning of the other components of the group. Therefore, to properly diagnose a suspected problem in the transmission, it is necessary to consider the transmission fluid, charging pump, torque converter, transmission assembly, oil cooler, filter, connecting lines, and controls, including the engine, as a complete system.

By analysing the principles of operation together with the information in this section, it should be possible to identify and correct any malfunction which may occur in the system.

TRANSMISSION PROBLEMS

6000 Transmission troubles fall into three general categories:

1 - Mechanical problems.

2 - Hydraulic problems.

3 - Electrical problems.

In addition to the mechanical and electrical components, all of which must be in the proper condition and functioning correctly, the correct functioning of the hydraulic circuit is most important. Transmission fluid is the “life blood” of the transmission. It must be supplied in an adequate quantity and delivered to the system at the correct pressures to ensure converter operation, to engage and hold the clutches from slipping, and to cool and lubricate the working components.

TROUBLESHOOTING PROCEDURES

INPUT SHAFT AND DIRECTIONAL CLUTCH PROBLEMS

Stall Test

⚠ CAUTION

Do not operate the converter at stall condition longer than 30 seconds at one time, shift to neutral for 15 seconds and repeat the procedure until desired temperature is reached. Excessive temperature 120°C [250°F] maximum will cause damage to transmission clutches, fluid, converter, and seals.

A stall test to identify transmission, converter, or engine problems.

Use following procedure:

1 - Put the vehicle at standstill, apply the parking brake, and block the wheels.

2 - Select “Manual Mode” Drive.

3 - Put the directional control lever in FORWARD (or REVERSE, as applicable).

4 - Select the highest speed.

5 - With the engine running, slowly increase engine speed to approximately one-half throttle and hold until transmission (converter outlet) oil temperature reaches the operating range. Always check that vehicle is not moving while increasing engine RPM.

TRANSMISSION PRESSURE CHECKS

Transmission problems can be isolated by the use of pressure tests. When the stall test indicates slipping clutches, then measure clutch pack pressure to determine if the slippage is due to low pressure or clutch plate friction material failure.

In addition, converter charging pressure and transmission lubrication pressure can also be measured.

MECHANICAL AND ELECTRICAL CHECKS

Prior to checking any part of the system for hydraulic function (pressure testing), the following mechanical and electrical checks should be made:

- Check the parking brake and inching pedal for correct adjustment.
- Be sure all lever linkage is properly connected and adjusted in each segment and at all connecting points.
- The controls are actuated electrically. Check the wiring and electrical components.
- Be sure that all components of the cooling system are in good condition and operating correctly. The radiator must be clean to maintain the proper cooling and operating temperatures for the engine and transmission. Air clean the radiator, if necessary.
- The engine must be operating correctly. Be sure that it is correctly tuned and adjusted to the correct idle and maximum no-load governed speed specifications.

CHECK POINT

Also, before checking the transmission clutches, torque converter, charging pump, and hydraulic circuit for pressure and rate of oil flow, it is important to make the following transmission fluid check:

Check oil level in the transmission. The transmission fluid must be at the correct (full level). All clutches and the converter and its fluid circuit lines must be fully charged (filled) at all times.

⚠ CAUTION

The transmission fluid must be at operating temperature of 82 - 93 °C [180 - 200°F] to obtain correct fluid level and pressure readings.

NEVER attempt to make these checks with cold oil.

To raise the oil temperature to this specification it is necessary to either operate (work) the vehicle or run the engine with the converter at “stall”.

⚠ DANGER

Be careful the vehicle does not move unexpectedly when operating the engine and converter at stall rpm.

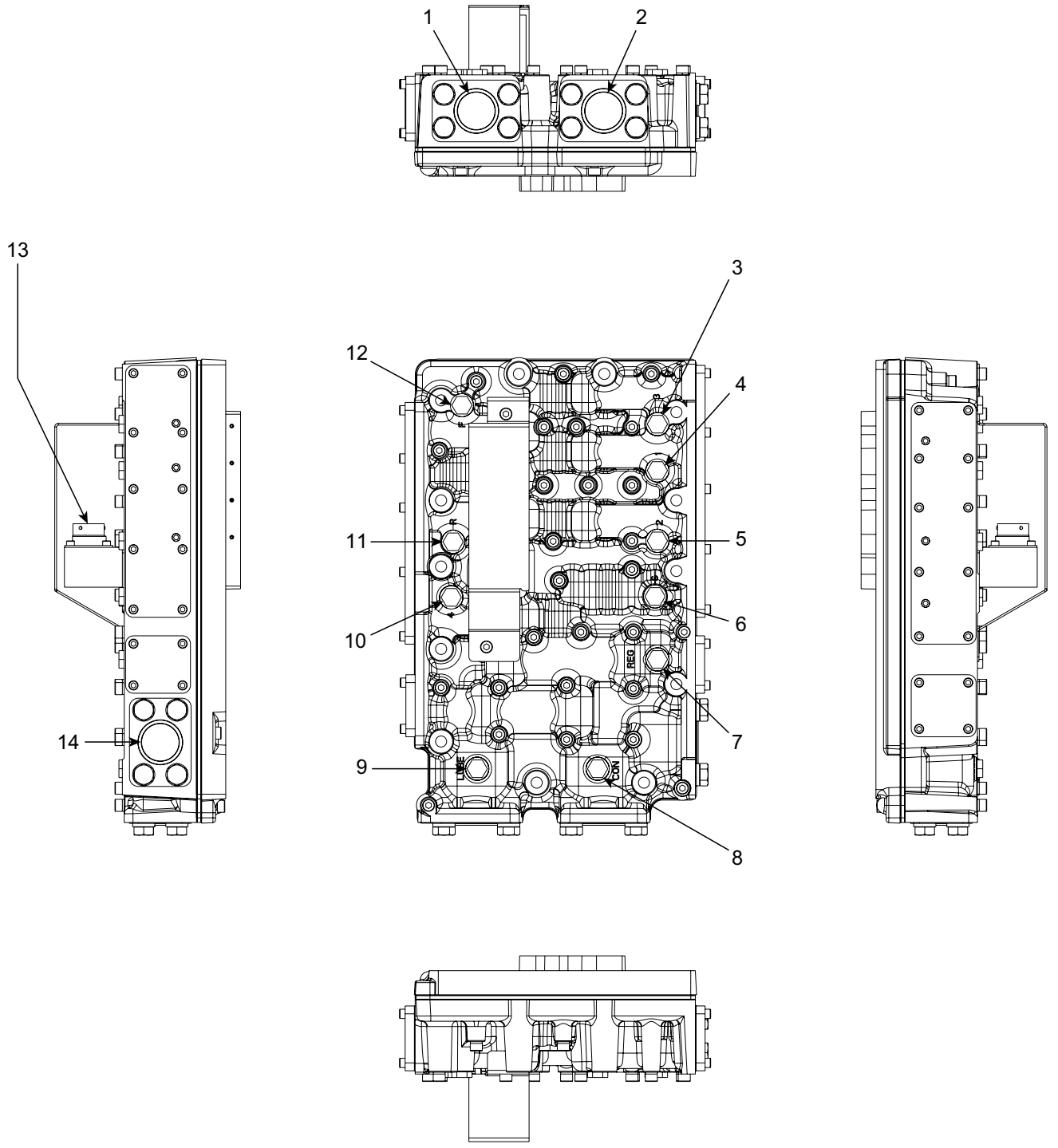
NUMBERING OF PORTS FOR HYDRAULIC CIRCUIT DIAGRAMS

PORTS	PRESSURE CHECK PORTS	TEMPERATURE CHECK PORTS
1	31 Regulated Clutch pressuure	71 To Cooler
2	32 To Cooler	72
3	33 From Cooler	73
4	34 Lube	74
5	35 Pump	75
6	36 Solenoid	76
7	37 Converter In	77
8	38	78
9	39	79
10	40	80
11 To Cooler	41 1st Clutch	81
12 From Cooler	42 2nd Clutch	82
13 To Remote Filter (on Transmission)	43 3rd Clutch	83
14 From Transmission (on Remote Filter)	44 FWD High	84
15 To Transmission (on Remote Filter)	45 FWD Low	85
16 From remote Filter (on Transmission)	46 REV Clutch	86
17 Air/Hydr Disconnect - 4WD	47 Disconnect Clutch	87
18 To Pump	48 Clutch Return Line	88
19 Air/Hydr Inching	49 SAHR Brake Release	89
20 Air/Hydr Disconnect - 2WD	50 VFS 1st	90
21 From Pump	51 VFS 2nd	
22 Drain	52 VFS 3rd	
23 From Regulator	53 VFS High	
24 SAHR brake Release	54 VFS FWD	
25 Range - Shift	55 VFS REV	
26 Diff. Lock	56 System Pressure (after Total Neutral)	
27 Power Brake Supply	57 Pilot Pressure	
28 Clutch Return Line	58 Pressure Check Range Clutches	
29 From Pump for Brake Release	59 Pressure Check Direct. Clutches	
30	60 Pressure Intensifier 1st	
	61 Pressure Intensifier 2nd	
	62 Pressure Intensifier 3rd	
	63 Pressure Intensifier High	
	64 Pressure Intensifier FWD	
	65 Pressure Intensifier REV	
	66	

NOTE:

For ports drawings see chapter Installation detail p. 18

CHECK POINTS CONTROL VALVE



1 - From cooler Ø38 split flange
2 - To converter Ø38 split flange
3 - Port 43 3rd clutch pressure M14 x 1.5
4 - Port 41 1st clutch pressure M14 x 1.5
5 - Port 42 2nd clutch pressure M14 x 1.5
6 - Port 36 Solenoid pressure M14 x 1.5
7 - Port 31 Regulated pressure M14 x 1.5
8 - Port 37 Converter in pressure M14 x 1.5
9 - Port 34 Lube pressure M14 x 1.5
10 - Port 44 4th clutch pressure M14 x 1.5
11 - Port 46 Rev clutch pressure M14 x 1.5
12 - Port 45 Fwd clutch pressure M14 x 1.5
13 - 14 Pole deutz connector HD34-18-14PN mating parts specs connector deutz HD36-18-14SN contact (female) deutz 0462-209-16141
14 - From charging pump Ø38 split flange

TROUBLESHOOTING GUIDE

Refer to the following troubleshooting guide for the diagnosis of typical transmission troubles.

LOW CLUTCH PRESSURE

Cause.	Remedy
Low oil level.	Fill to proper level
Clutch pressure regulating valve stuck open.	Clean valve spool and housing
Faulty charging pump.	Replace pump
Broken or worn clutch shaft or piston sealing rings.	Replace sealing rings

LOW CHARGING PUMP OUTPUT

Cause.	Remedy
Low oil level.	Fill to proper level
Suction screen plugged.	Clean suction pump
Defective charging pump.	Replace pump

OVERHEATING

Cause.	Remedy
Worn oil sealing rings.	Remove, disassemble, & rebuild converter assembly
Worn charging pump.	Replace charging pump
Low oil level.	Fill to proper level
Dirty oil cooler.	Clean cooler
Restriction in cooler lines.	Change cooler lines

LACK OF POWER

Cause.	Remedy
Low engine RPM at converter stall.	Tune engine check governor
See the Overheating section above and make same checks.	Make corrections as explained in “Overheating”

SPEED SENSOR STATIC STANDALONE TEST

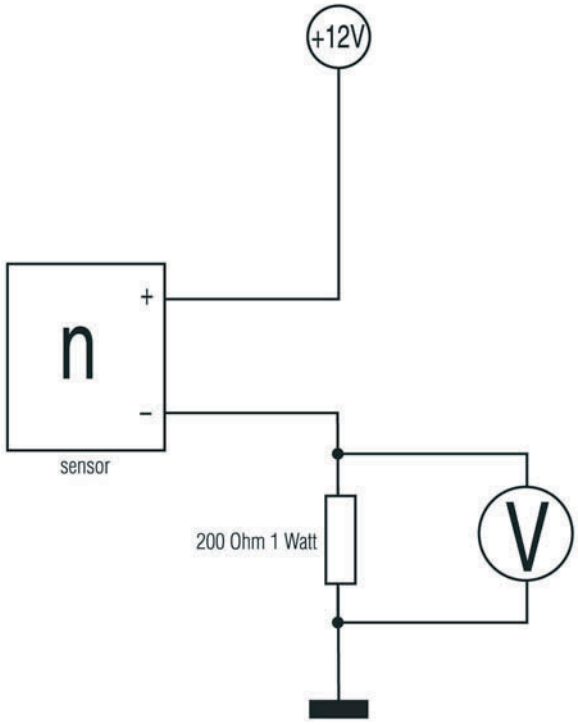
In order to be able to sense the currents, a series resistor of e.g. 200 Ohm must be used. This resistor is integrated in the controller.

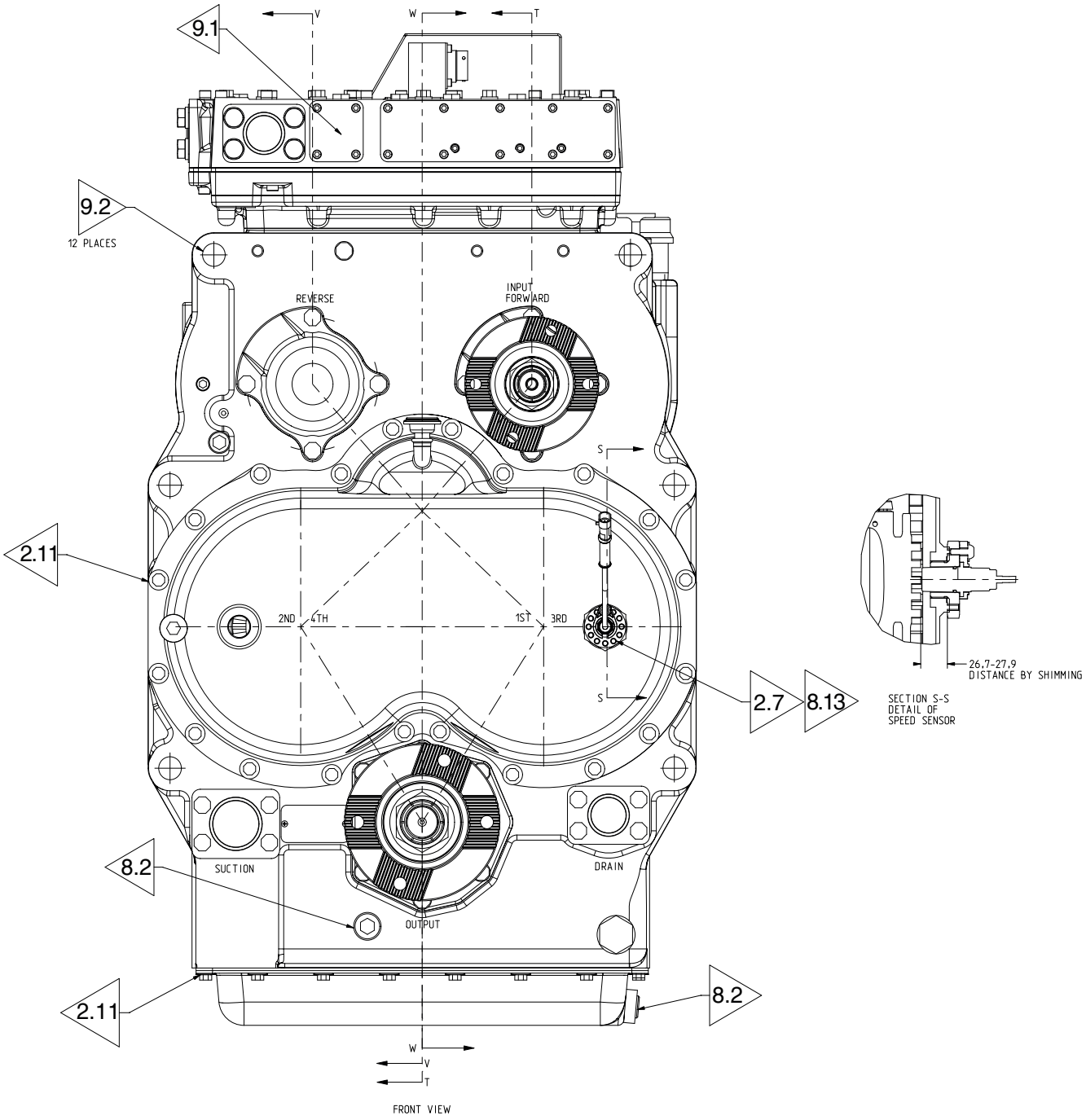
When the sensor is tested separately, resistor must be integrated in sensor connector as per below schematic.

The idea is to connect the sensor to an external power source and measure the DC voltage across the series resistor.

The voltage reading should be either 1.2V (from the 7mA ± 1mA current level) or 2.6 –3.0V (for the 14mA ± 1mA current level).

By slowly moving gear teeth or a metal part in front of the sensor (1.8 mm max. distance), toggling between the two levels should be noticed.




9.1
V
W
T
9.2
12 PLACES
REVERSE
INPUT
FORWARD
S
2.11
2ND
4TH
1ST
3RD
S
2.7
8.13
26.7-27.9
DISTANCE BY SHIMMING
SECTION S-S
DETAIL OF
SPEED SENSOR
8.2
SUCTION
DRAIN
OUTPUT
2.11
8.2
W
V
T
FRONT VIEW

2.7	Torque to 45-50 lbs-ft (61–68 Nm)
2.11	Torque to 25-30 lbs.ft (34-41 Nm)
8.2	Apply Loctite 577,when threads are without coating
8.13	Apply Loctite 638
9.1	WARNING :HEAVY SPRING LOAD !!!!! Use the correct tools to assemble and disassemble this item
9.2	Only use the specified lifting locations to lift the transmission or subassemblies

⚠ CAUTION

HEAVY SPRING LOAD.

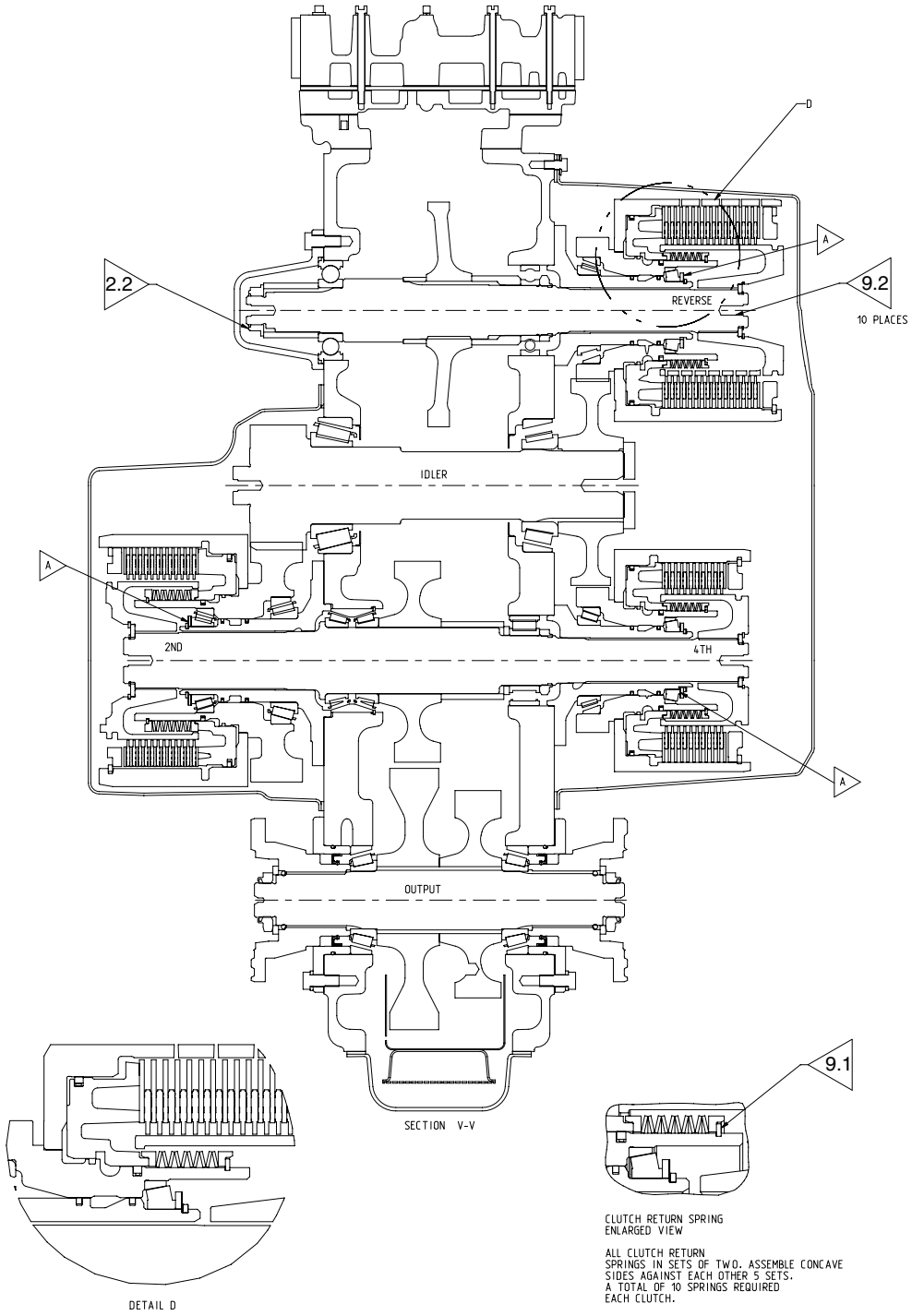
A	CLUTCH TAPER BEARING ADJUSTMENT

Adjust taper bearings as a bench sub-assembly with the clutch support in a vertical orientation and the clutch drum up using the following procedure:

1 - Use the thickest washer and snap ring to start procedure one notch in washer and one notch in snap ring. Position washer on clutch support aligning tang on washer with notch in support.

2 - CHeck snap ring in snap ring groove. If ring will not go in groove, remove washer and install a two notch washer and again use the one notch snap ring. If ring still does not go in snap ring groove, remove washer and install a three notch washer and again use the one notch snap ring.

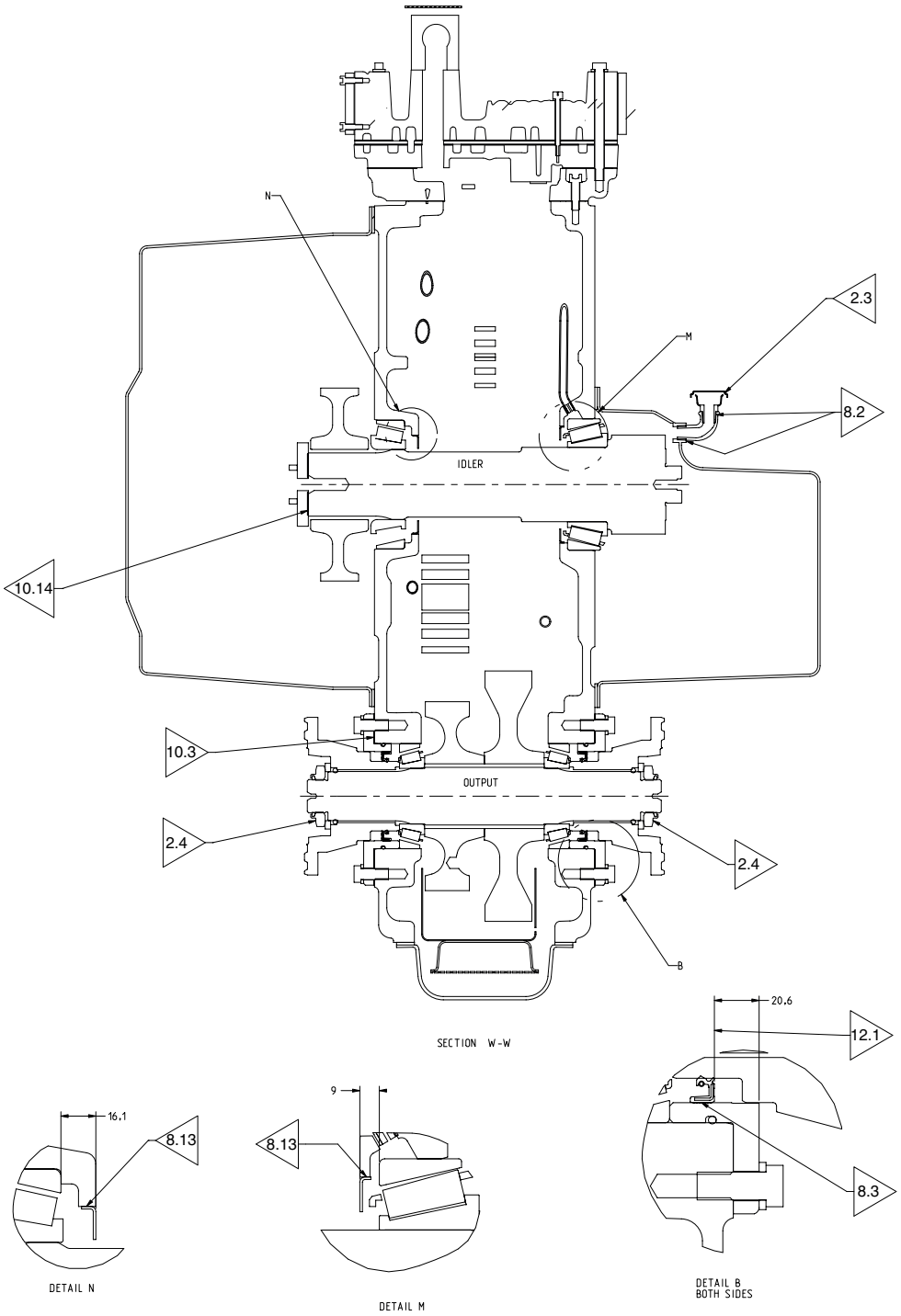
3 - If the one notch snap ring still not seat properly in the ring groove, repeat step 2 using the two notch snap ring and start with the one notch washer (thickest). When the ring fit in the ring groove check the clutch to support the clutch endplay. Endplay can be 0,0000 (line to line) to a maximum of 0,102 mm (0,004") loose (endplay). After selection of proper snap ring and tanged washer, do not intermix parts prior to re-assembly on transmission.



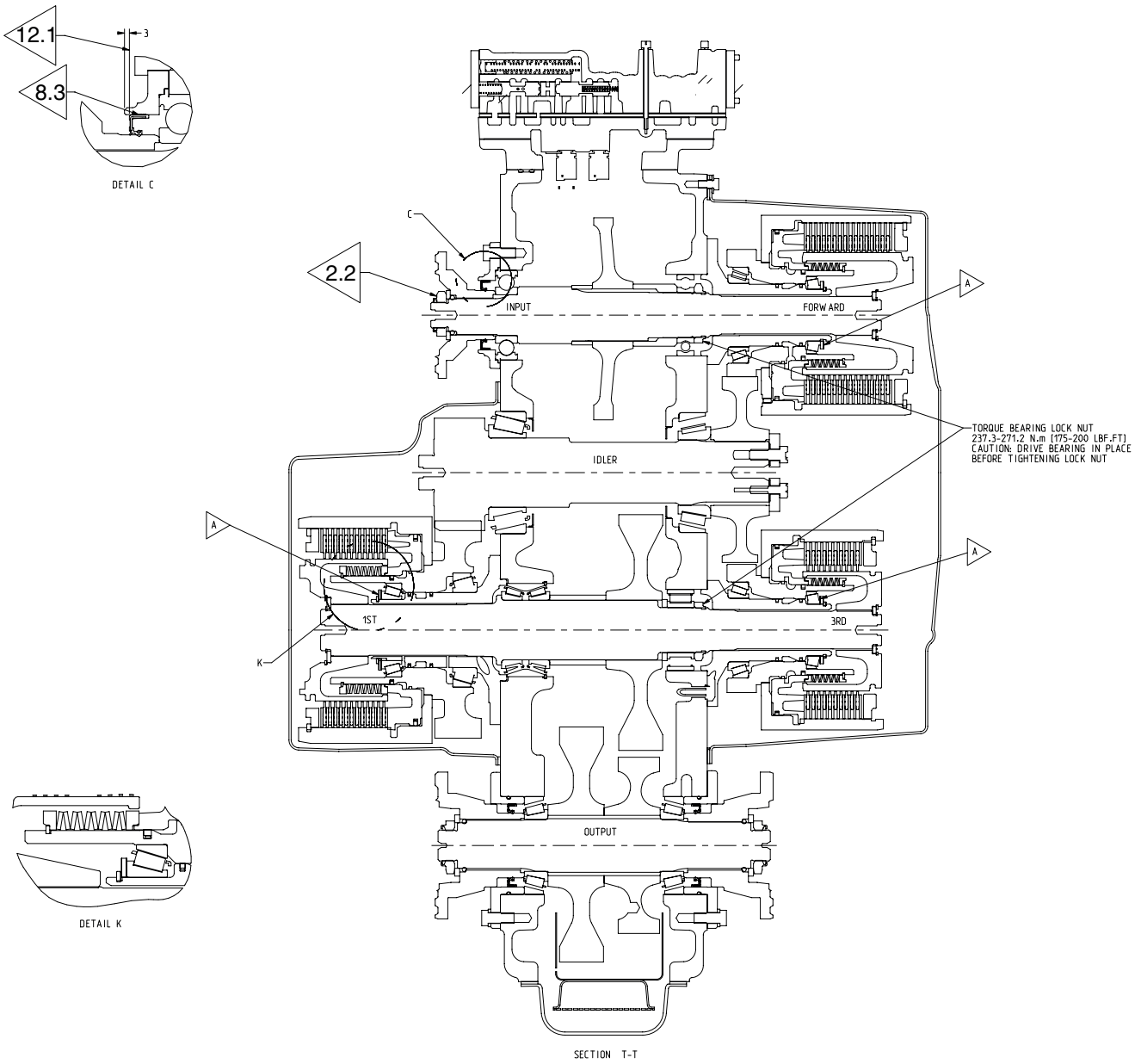
2.2	Torque to 200-250 lbs-ft (271 - 340 Nm)
9.1	WARNING :HEAVY SPRING LOAD ! Use the correct tools to assemble and disassemble this item
9.2	Only use the specified lifting locations to lift the transmission or subassemblies

⚠ CAUTION

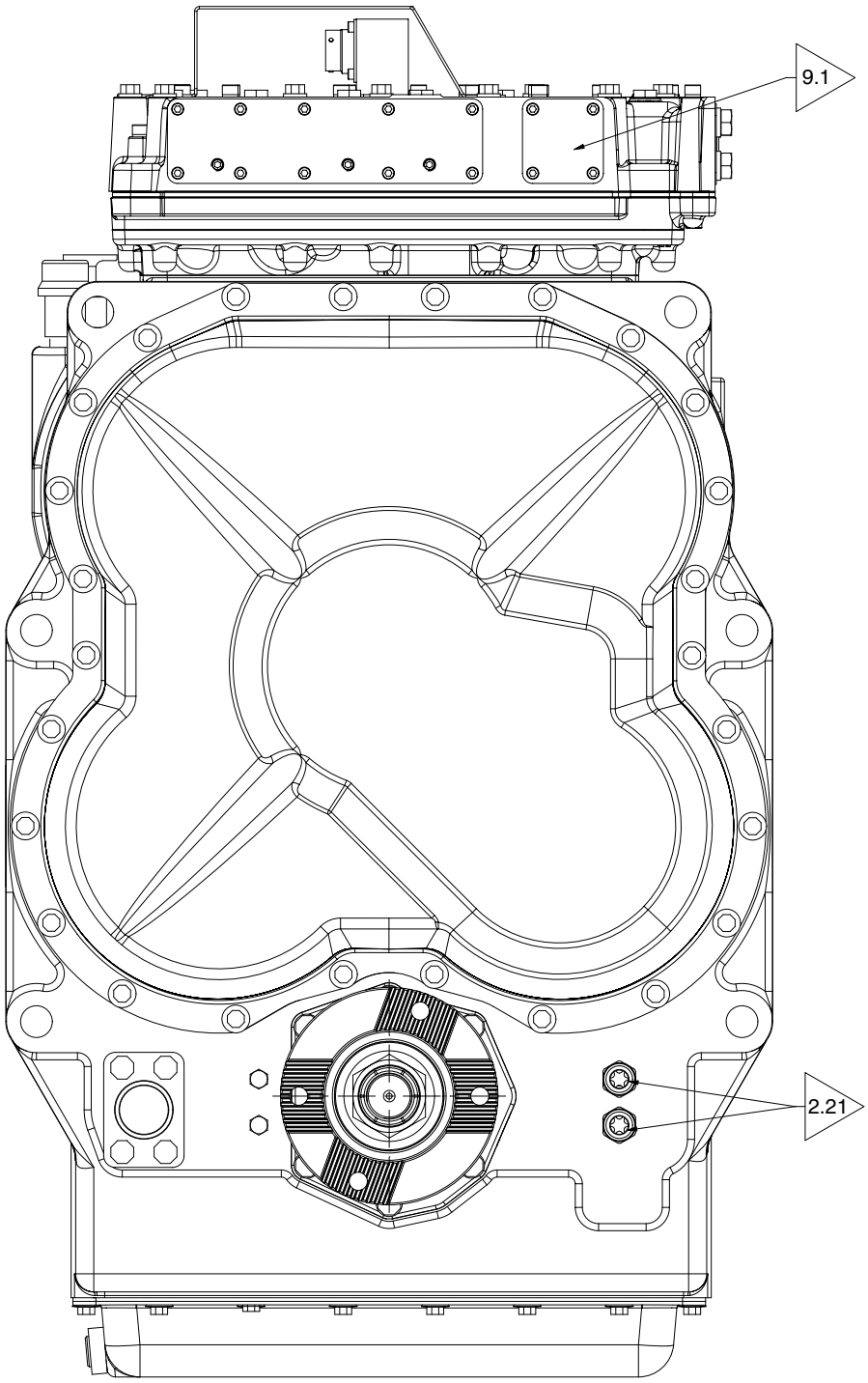
WARNING :HEAVY SPRING LOAD



2.3	Torque to 10-15 lbs-ft (14 - 20 Nm).
2.4	Torque to 250-300 lbs-ft (339 - 407 Nm).
8.2	Apply Loctite 577,when threads are without coating
8.13	Apply Loctite 638
10.3	Shim bearings to produce 6-8 lbs-inch (0.68 – 0.90 Nm) preload
10.14	Shim bearings to produce 6-10 lbs-inch (0.68 – 1.13 Nm) preload
12.1	Seals must be pressed in perpendicularly on shaft axis from this side.



2.2	Torque to 200-250 lbs-ft (271 - 340 Nm)
12.1	Seals must be pressed in perpendicularly on shaft axis from this side.

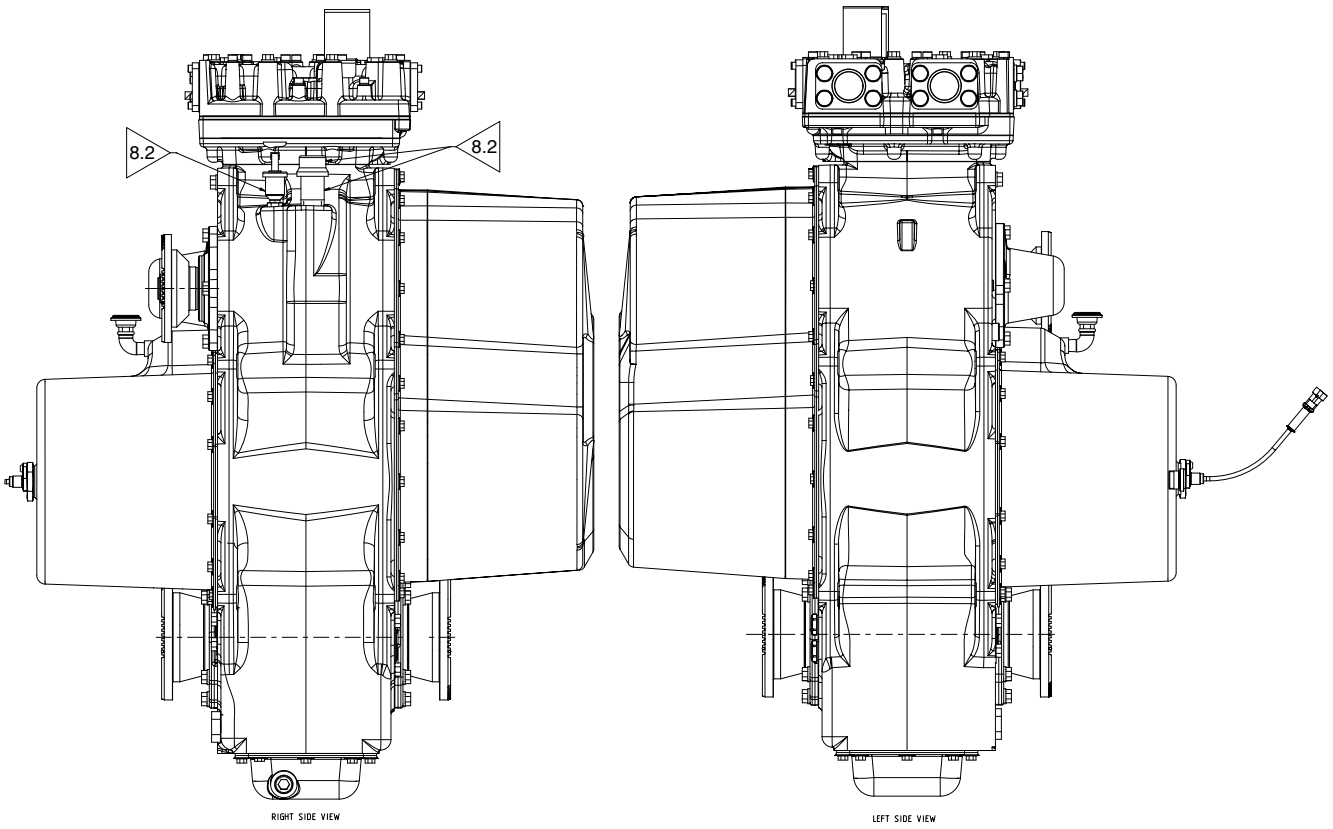


REAR VIEW

2.21	Torque to 20-25 lbs.ft (27-34Nm)
9.1	WARNING :HEAVY SPRING LOAD! Use the correct tools to assemble and disassemble this item

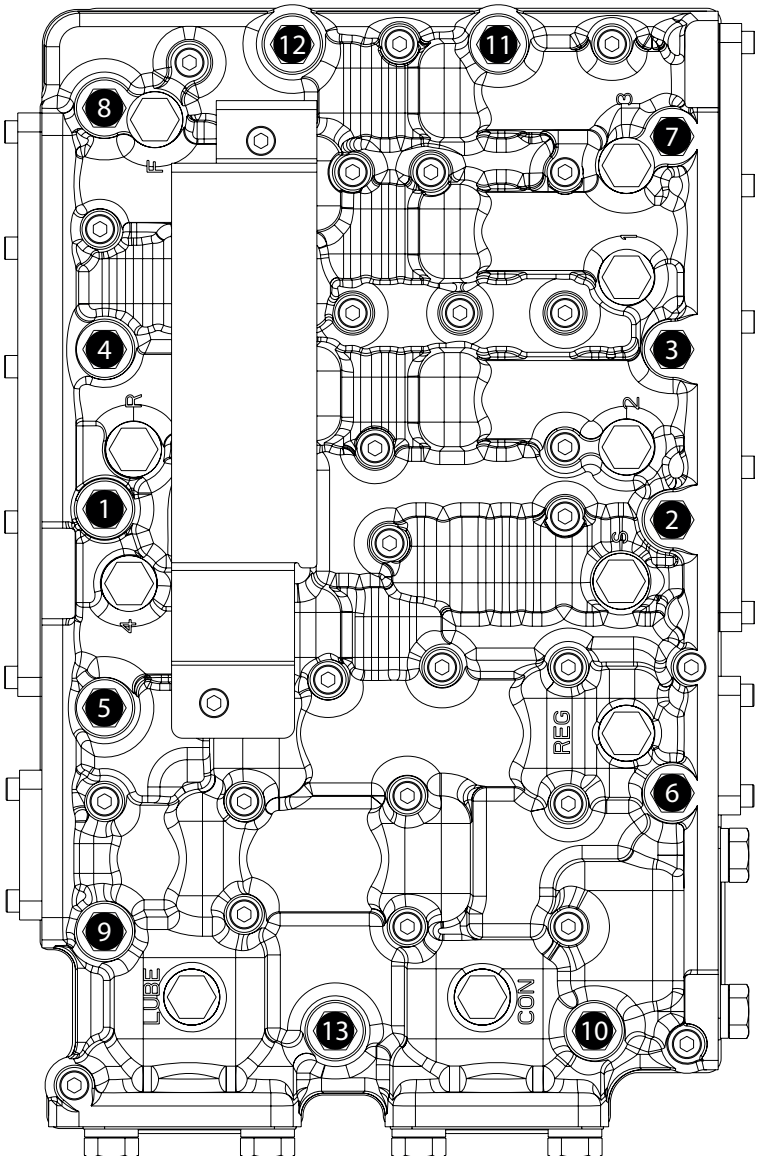
⚠ CAUTION

WARNING :HEAVY SPRING LOAD



8.2	Apply Loctite 577,when threads are without coating

CONTROL VALVE ASSEMBLY INSTRUCTIONS



1 - Install adaptor valve on transmission by twelve (12) screws and torque 59 N·m.

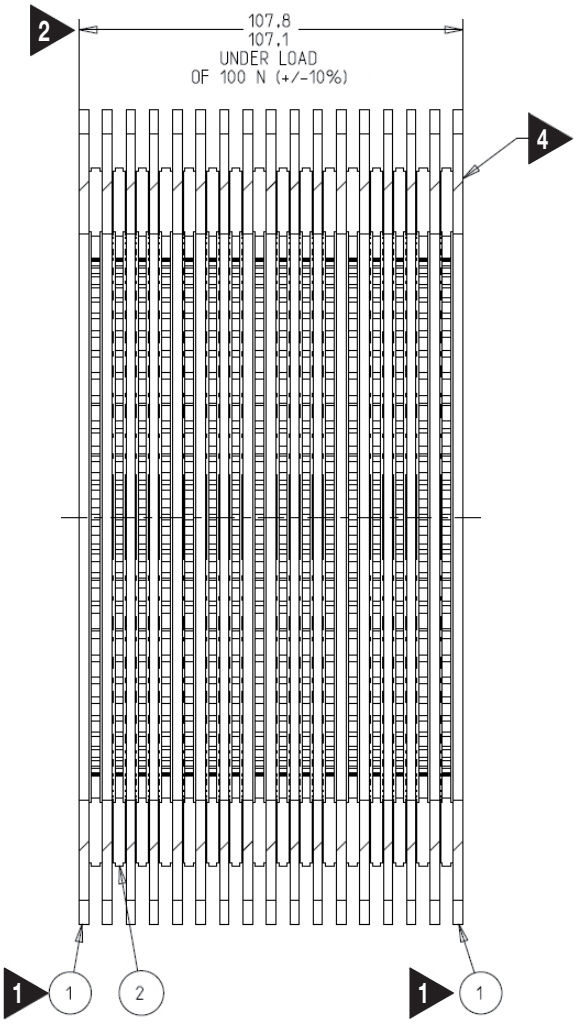
2 - Install new gasket and valve body.

3 - Install thirteen (13) bolts and hand-tighten in the numerical sequence indicated on the drawing

4 - Then torque all thirteen (13) bolts twice to 50–56 N·m in the correct sequence.

CLUTCH PACKS ASSEMBLY INTRUCTIONS

ASSEMBLY INSTRUCTIONS FOR FORWARD AND REVERSE CLUTCH DISCS PACK



1	Start with disc-separator outer alternate with plate-friction end with disc-separator outer
2	Adjusting assembly clutch disc pack: replacing disc-separator outer to reach the overall dimension
3	The sequence to assemble the shim-separators
4	Assembly must be packed securely for transport and must be forseen by partnumber on top

1 - Disc-Separator Outer – Qty. 17

2 - Plate-Friction – Qty. 16

3	SHIM POSITION																	
	BOTTOM	SEPARATOR																TOP
QUANTITY		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1 SHIM																		X	
2 SHIMS										X								X	
3 SHIMS										X				X				X	
4 SHIMS						X				X				X				X	
5 SHIMS		X				X				X				X				X	

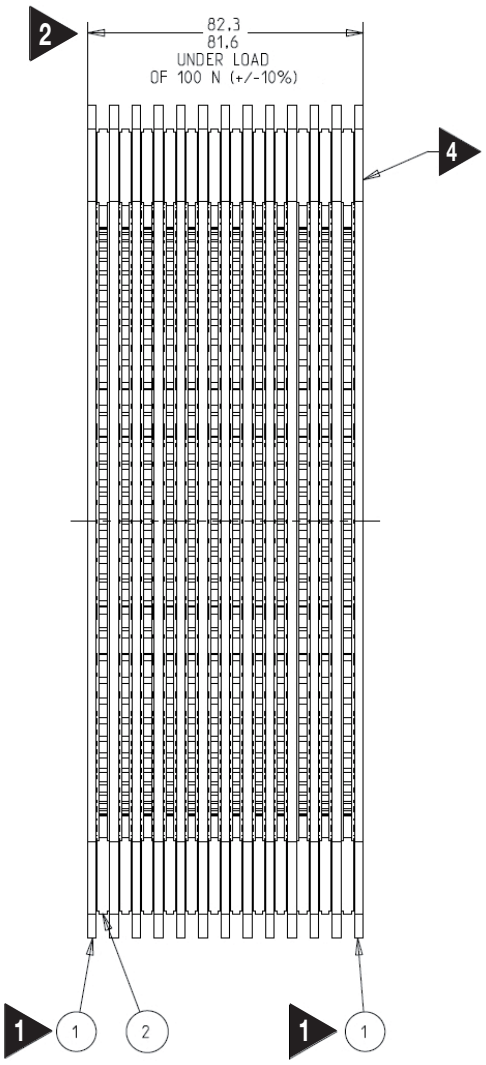
NOTE:

One to five shims could be required to reach the proper thickness of the clutch pack.

Below chart, is indicating the position of the shims within the pack considering the needed quantity.

Shim-separator (s) will replace Disc-separator Outer in the pack.

ASSEMBLY INSTRUCTIONS FOR 1ST AND 2ND CLUTCH DISCS PACK



1	Start with disc-separator outer alternate with plate-friction end with disc-separator outer
2	Adjusting assembly clutch disc pack: replacing disc-separator outer to reach the overall dimension
3	The sequence to assemble the shim-separators
4	Assembly must be packed securely for transport and must be forseen by partnumber on top

1 - Disc-Separator Outer – Qty. 13

2 - Plate-Friction – Qty. 12

3	SHIM POSITION														
	BOTTOM	SEPARATOR													TOP
QUANTITY		1	2	3	4	5	6	7	8	9	10	11	12	13	
1 SHIM														X	
2 SHIMS								X						X	
3 SHIMS								X			X			X	
4 SHIMS					X			X			X			X	
5 SHIMS		X			X			X			X			X	

NOTE:

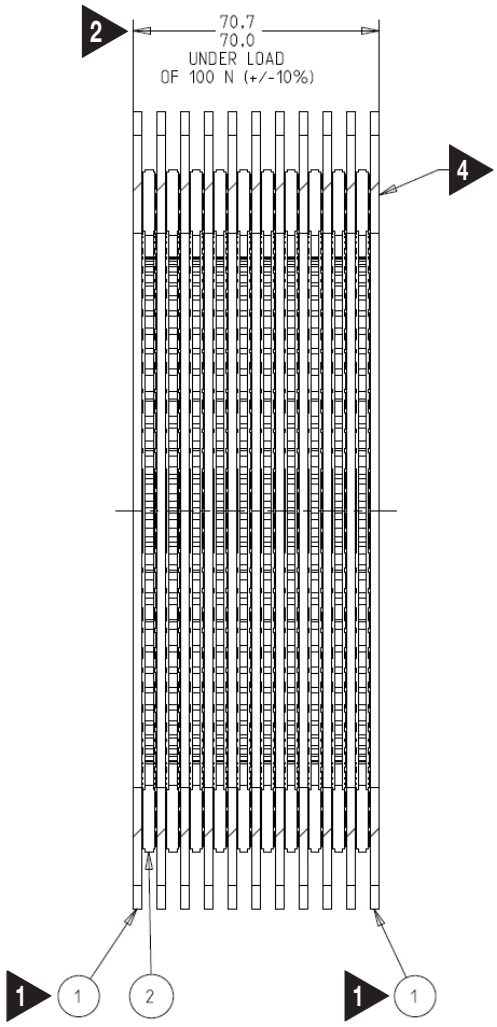
One to five shims could be required to reach the proper thickness of the clutch pack.

Below chart, is indicating the position of the shims within the pack considering the needed quantity.

Shim-separator (s) will replace Disc-separator Outer in the pack.

CLUTCH PACKS ASSEMBLY INTRUCTIONS

ASSEMBLY INSTRUCTIONS FOR 3RD AND 4TH CLUTCH DISCS PACK



1	Start with disc-separator outer alternate with plate-friction end with disc-separator outer
2	Adjusting assembly clutch disc pack: replacing disc-separator outer to reach the overall dimension
3	The sequence to assemble the shim-separators
4	Assembly must be packed securely for transport and must be forseen by partnumber on top

1 - Disc-Separator Outer – Qty. 11

2 - Plate-Friction – Qty. 10

3	SHIM POSITION											
	BOTTOM	SEPARATOR										TOP
QUANTITY		1	2	3	4	5	6	7	8	9	10	11	
1 SHIM												X	
2 SHIMS							X					X	
3 SHIMS							X			X		X	
4 SHIMS				X			X			X		X	
5 SHIMS		X		X			X			X		X	

NOTE:

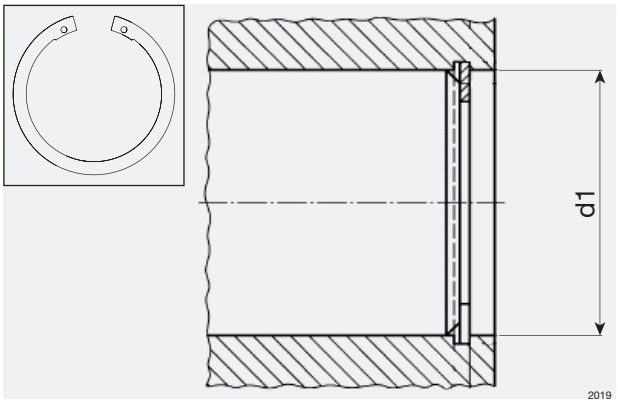
One to five shims could be required to reach the proper thickness of the clutch pack.

Below chart, is indicating the position of the shims within the pack considering the needed quantity.

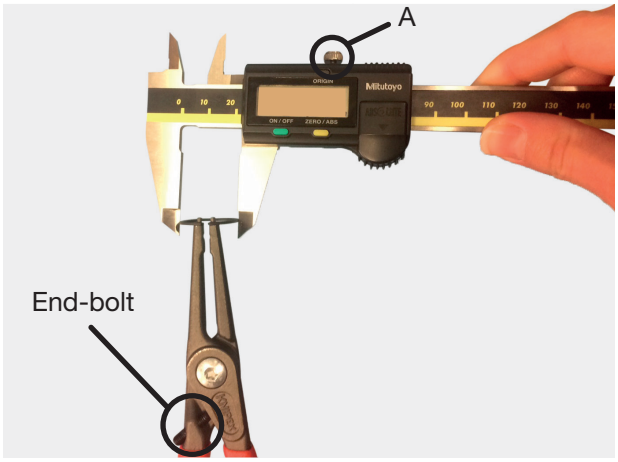
A Shim-separator (s) will replace a Disc-separator Outer in the pack.

END-STOP PLIER SETTING

RETAINING SNAP RING FOR BORES



1 - Measure the bore diameter of circlip (or snapring) "d1";
2 - Pre-set the caliber at value "Dmin" ("Dmin"= "d1" x 0,99);
3 - Fix it with the screw on caliber (see picture - Point A);
4 - Put the snap ring into the plier;
5 - Close it until the end-stop bolt allows;
6 - Adjust the end-bolt in order to match the external diameter of the snap ring with "Dmin" value;
7 - Scrap the snap ring used for the end-stop plier calibration.



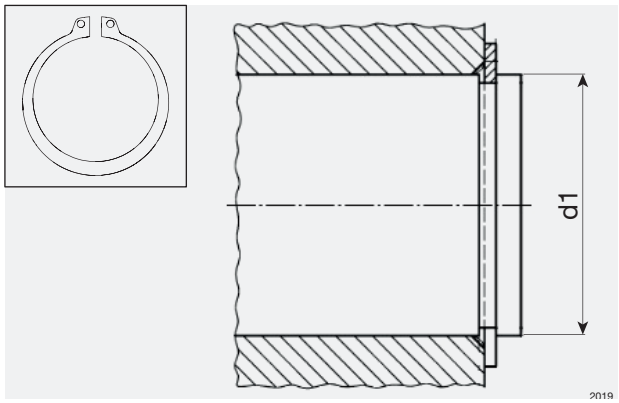
⚠ CAUTION

This procedure is aligned with DIN standard. In any case, DIN 472 regulation prevails.

⚠ CAUTION

Snap ring replacement is mandatory if they are removed without pre-setted plier.

RETAINING SNAP RING FOR SHAFTS



1 - Measure the shaft diameter of circlip (or snapring) "d1";
2 - Pre-set the caliber at value "Dmax" ("Dmax"= "d1" x 1,01);
3 - Fix it with the screw on caliber (see picture - Point A);
4 - Put the snap ring into the plier;
5 - Open it until the end-stop bolt allows:
6 - Adjust the end-bolt in order to match the internal diameter of the snap ring with "Dmax" value;
7 - Scrap the snap ring used for the end-stop plier calibration.

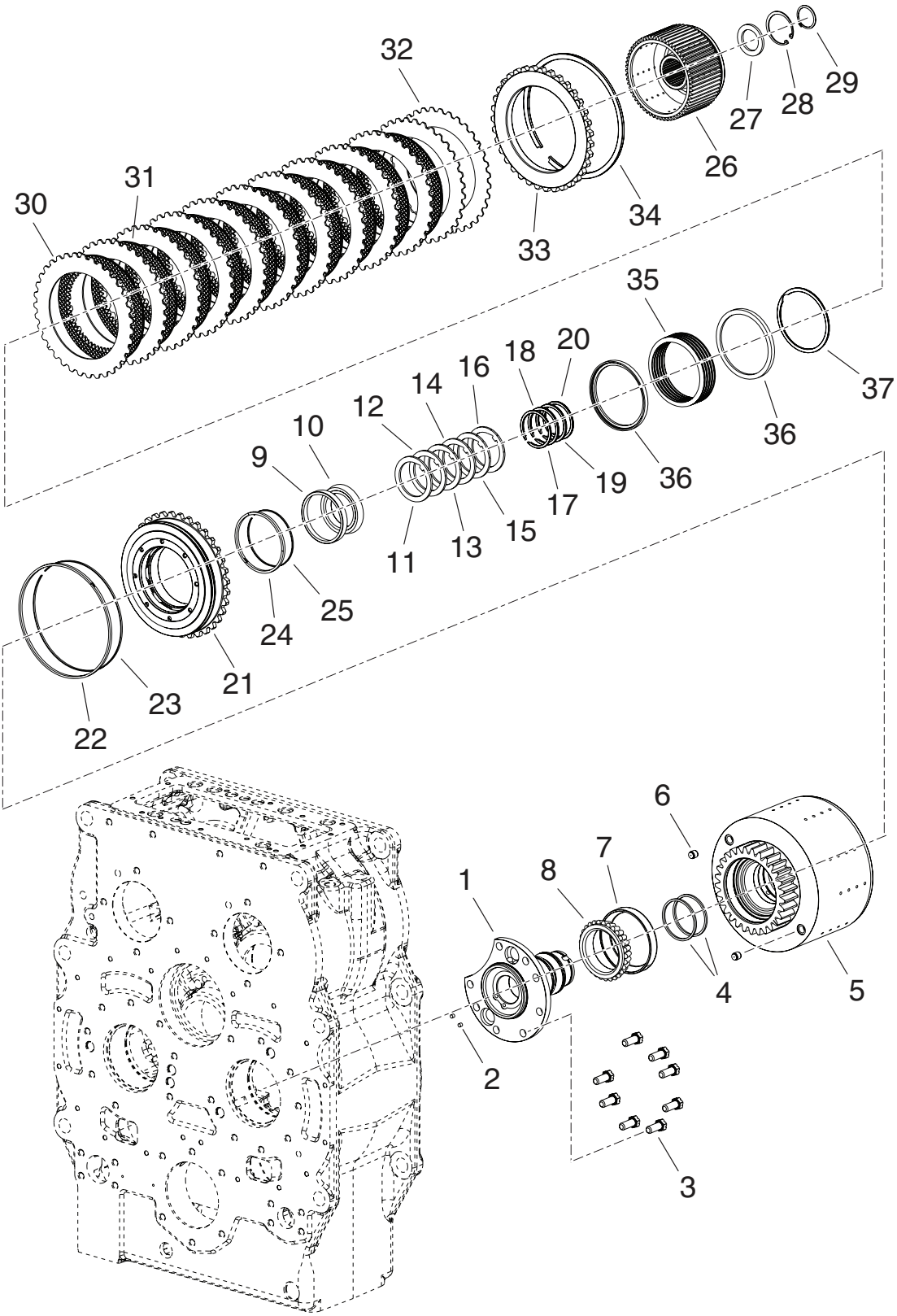
⚠ CAUTION

This procedure is aligned with DIN standard. In any case, DIN 471 regulation prevails.

⚠ CAUTION

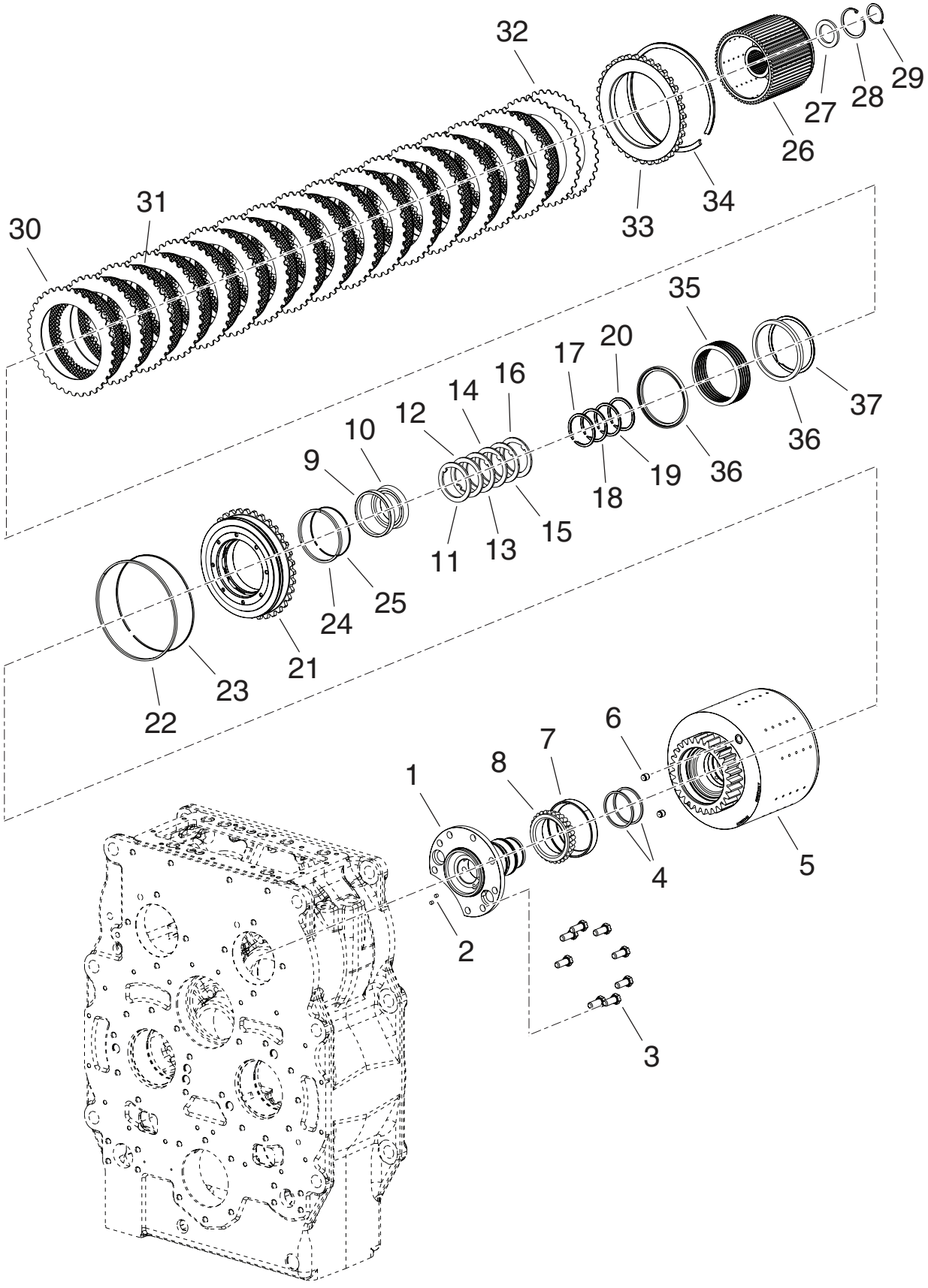
Snap ring replacement is mandatory if they are removed without pre-setted plier.

GROUP-3RD & 4TH CLUTCH



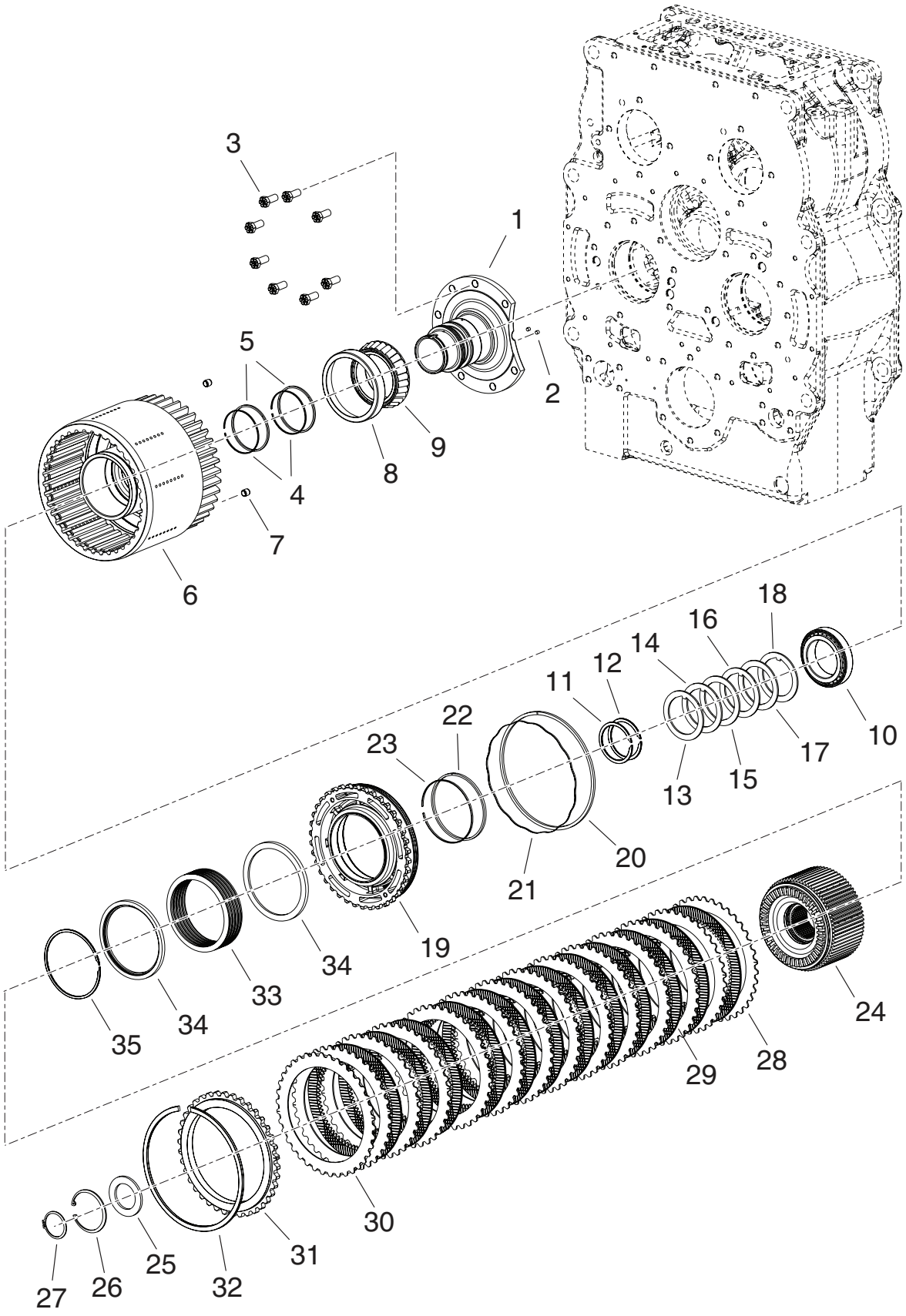
ITEM	DESCRIPTION	QTY
1	CLUTCH SUPPORT ASSY 7.750 DIA.	1
2	PLUG-EXPANSION DIA 6	2
3	CAPSCREW	8
4	RING-PISTON	2
5	ASSY-GEAR, DRUM, AND BLEED ORIFICE	1
6	PLUG-ORIFICE BLEED	2
7	CUP-TAPER ROLLER BEARING	1
8	CONE-TAPER ROLLER BEARING	1
9	CUP-TAPER ROLLER BEARING	1
10	CONE-TAPER ROLLER BEARING	1
11	WASHER-KEYED .149-.150	A/R
12	WASHER-KEYED .147-.148	A/R
13	WASHER-KEYED .145-.146	A/R
14	WASHER-KEYED .143-.144	A/R
15	WASHER-KEYED .141-.142	A/R
16	WASHER-KEYED .139-.140	A/R
17	RING-RETAINING EXTERNAL TYPE	A/R
18	RING-SNAP	A/R
19	RING-SNAP	A/R
20	RING-SNAP	A/R
21	PISTON-CLUTCH	1
22	RING-PISTON OUTER	1
23	SPRING-PISTON RING EXPANDER OUTER	1
24	RING-PISTON	1
25	SPRING-PISTON RING EXPANDER INNER	1
26	HUB-CLUTCH	1
28	SNAP RING-INTERNAL	1
27	WASHER-CLUTCH HUB	1
29	RING-SNAP	1
30	ASSY-CLUTCH PACK SHIMMED	1
31	PLATE-FRICTION	10
32	SHIM-SEPARATOR OUTER	A/R
33	PLATE-END	1
34	RING-SNAP	1
35	SPRING-BELLEVILLE DISC ASSY	1
36	RETAINER-SNAP RING	2
37	RING-SNAP	1

GROUP-FORWARD AND REVERSE CLUTCH



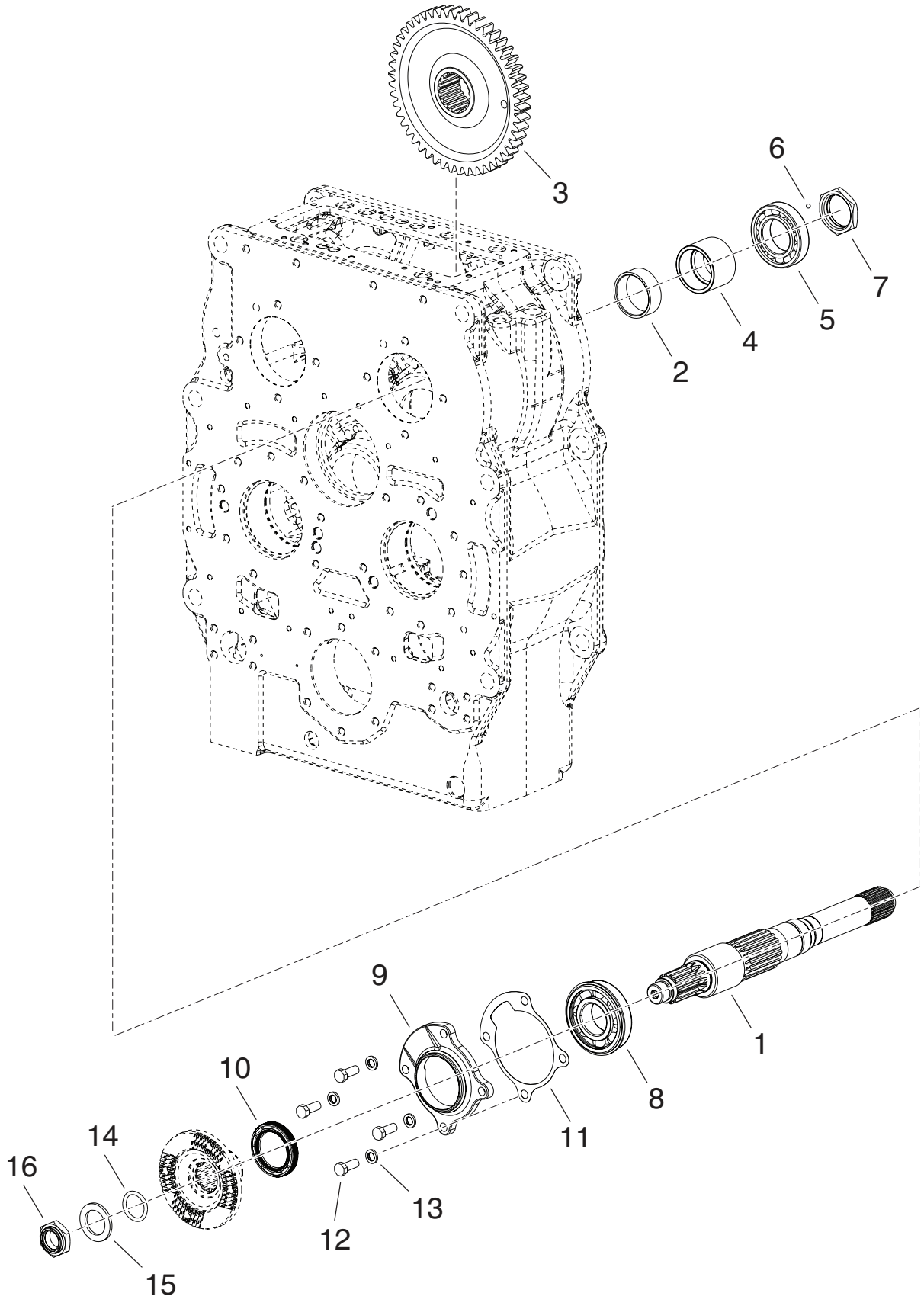
ITEM	DESCRIPTION	QTY
1	CLUTCH SUPPORT ASSY 7.750 DIA.	1
2	PLUG-EXPANSION DIA 6	2
3	CAPSCREW	8
4	RING-PISTON	2
5	ASSY-GEAR, DRUM, AND BLEED ORIFICE	1
6	PLUG-ORIFICE BLEED	2
7	CUP-TAPER ROLLER BEARING	1
8	CONE-TAPER ROLLER BEARING	1
9	CUP-TAPER ROLLER BEARING	1
10	CONE-TAPER ROLLER BEARING	1
11	WASHER-KEYED .149-.150	A/R
12	WASHER-KEYED .147-.148	A/R
13	WASHER-KEYED .145-.146	A/R
14	WASHER-KEYED .143-.144	A/R
15	WASHER-KEYED .141-.142	A/R
16	WASHER-KEYED .139-.140	A/R
17	RING-RETAINING EXTERNAL TYPE	A/R
18	RING-SNAP	A/R
19	RING-SNAP	A/R
20	RING-SNAP	A/R
21	PISTON-CLUTCH	1
22	RING-PISTON OUTER	1
23	SPRING-PISTON RING EXPANDER OUTER	1
24	RING-PISTON INNER	1
25	SPRING-PISTON RING EXPANDER INNER	1
26	HUB-CLUTCH	1
28	SNAP RING-INTERNAL	1
27	WASHER-CLUTCH HUB	1
29	RING-SNAP	1
30	ASSY-CLUTCH PACK SHIMMED	1
31	PLATE-FRICTION	16
32	SHIM-SEPARATOR OUTER	A/R
33	PLATE-END	1
34	RING-SNAP	1
35	SPRING-BELLEVILLE DISC ASSY	1
36	RETAINER-SNAP RING	2
37	RING-SNAP	1

GROUP-1ST & 2ND CLUTCHES



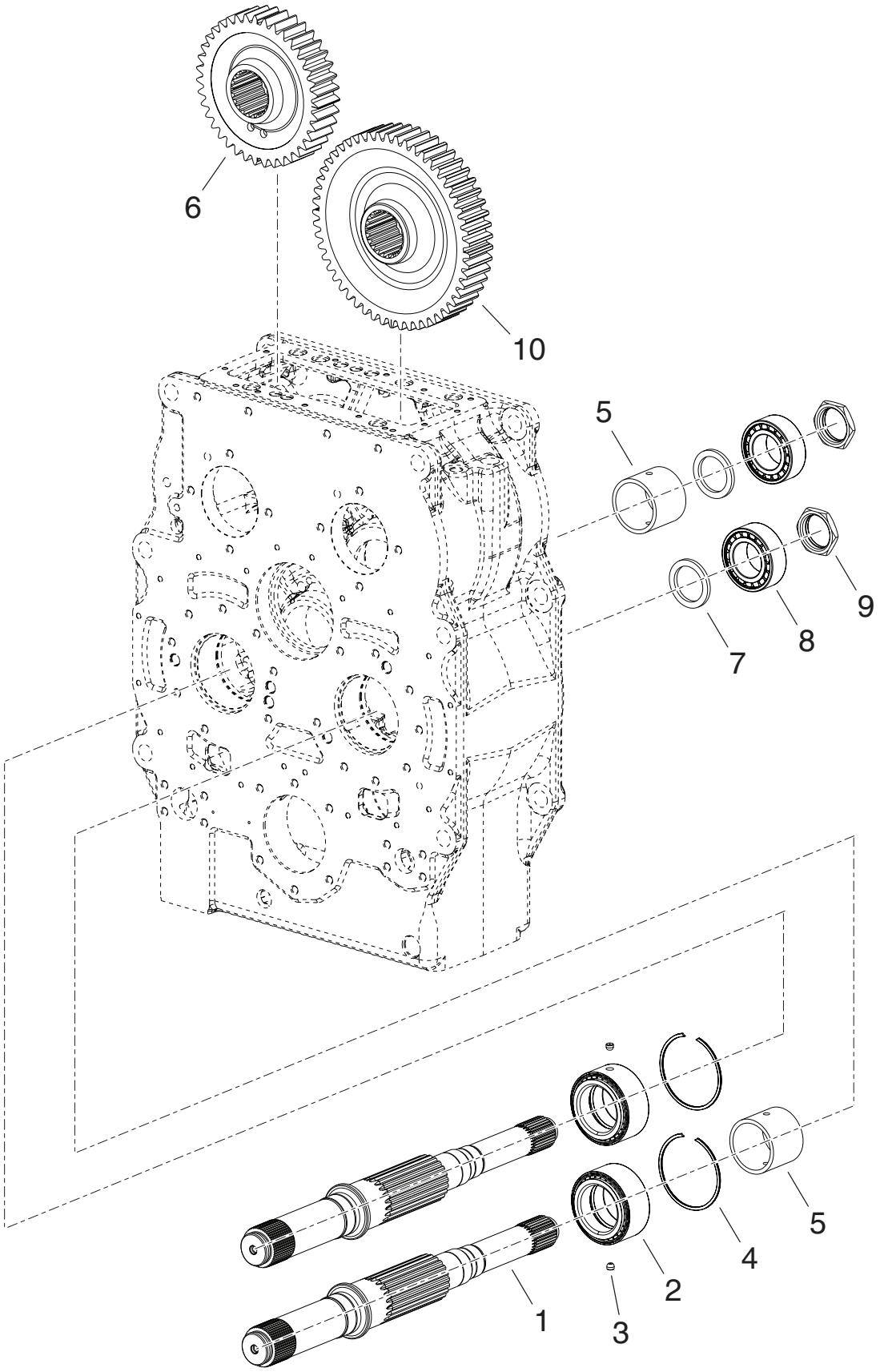
ITEM	DESCRIPTION	QTY
1	CLUTCH SUPPORT ASSY 7.750 DIA.	1
2	PLUG-EXPANSION DIA 6	2
3	CAPSCREW	8
4	RING-PISTON	2
5	RING-PISTON	2
6	ASSY-GEAR, DRUM, AND BLEED ORIFICE	1
7	PLUG-ORIFICE BLEED	2
8	CUP-TAPER ROLLER BEARING	1
9	CONE-TAPER ROLLER BEARING	1
10	BEARING-TAPER ROLLER	1
11	RING-RETAINING EXTERNAL TYPE	A/R
12	RING-SNAP	A/R
13	SPACER	A/R
14	SPACER	A/R
15	WASHER-KEYED	A/R
16	WASHER	A/R
17	WASHER	A/R
18	WASHER	A/R
19	PISTON-CLUTCH	1
20	RING-PISTON	1
21	SPRING-PISTON RING EXPANDER OUTER	1
22	RING-PISTON INNER	1
23	SPRING-PISTON RING EXPANDER INNER	1
24	HUB-CLUTCH	1
25	WASHER-CLUTCH HUB	1
26	RING-RETAINING	1
27	RING-RETAINING EXTERNAL TYPE	1
28	ASSY-CLUTCH PACK SHIMMED	1
29	PLATE-FRICTION	12
30	SHIM-SEPARATOR OUTER	A/R
31	PLATE-END	1
32	RING-SNAP	1
33	SPRING-BELLEVILLE	1
34	WASHER-SNAP RING RETAINER	2
35	RING-SNAP	1

GROUP-FORWARD/REVERSE SHAFT



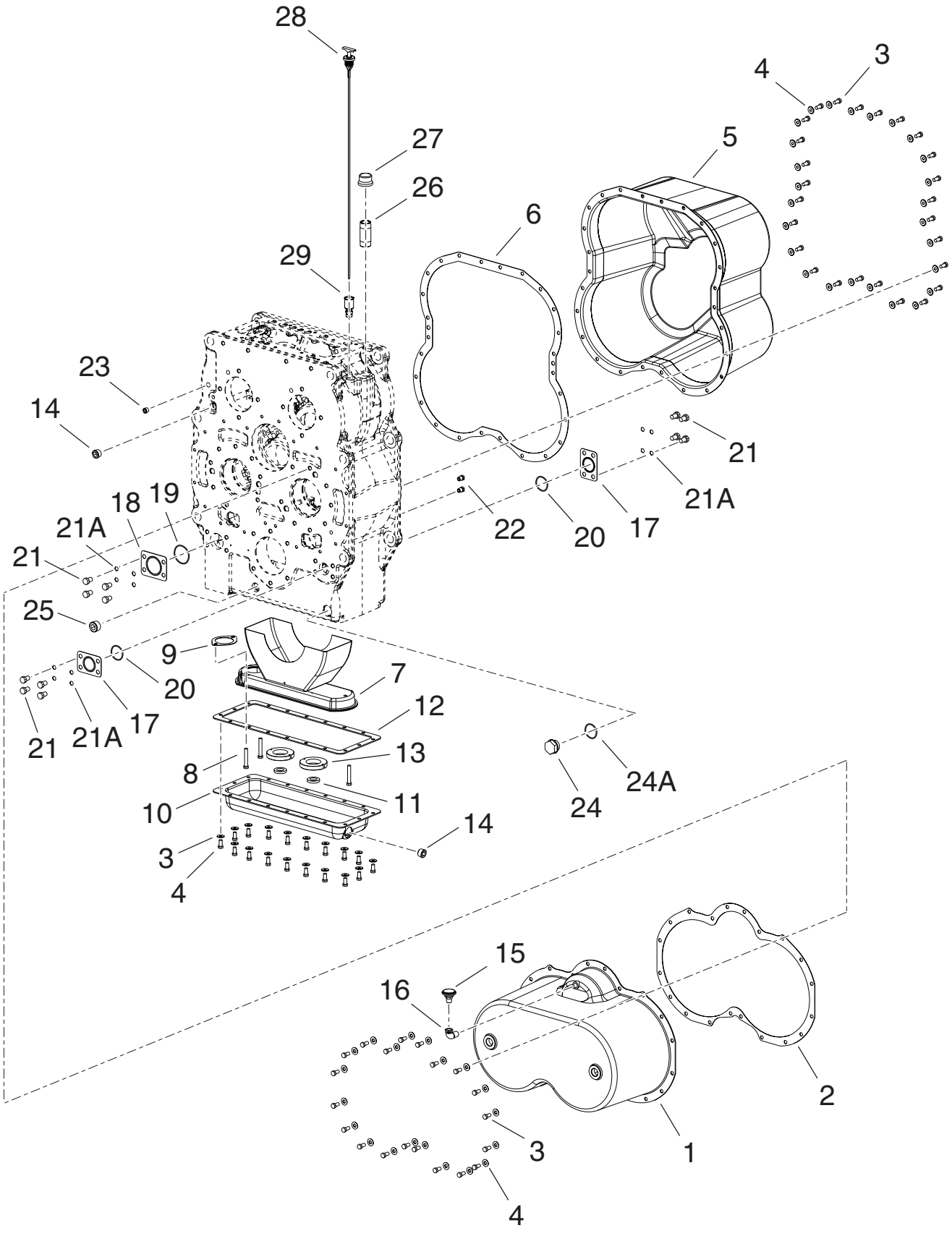
ITEM	DESCRIPTION	QTY
1	SHAFT-INPUT AND REVERSE	1
2	SPACER	1
3	INPUT GEAR 50T	1
4	SPACER	1
5	BEARING-BALL	1
6	BALL	1
7	NUT-NYLON INSERT	1
8	BEARING-BALL	1
9	INPUT BRG CAP (OPEN)	1
10	OIL-SEAL	1
11	BEARING CAP GASKET	1
12	CAPSCREW	4
13	Not used in this model	
14	O-RING	1
15	WASHER-FLANGE	1
16	NUT-FLANGE	1

GROUP-1ST/3RD & 2ND/4TH SHAFT



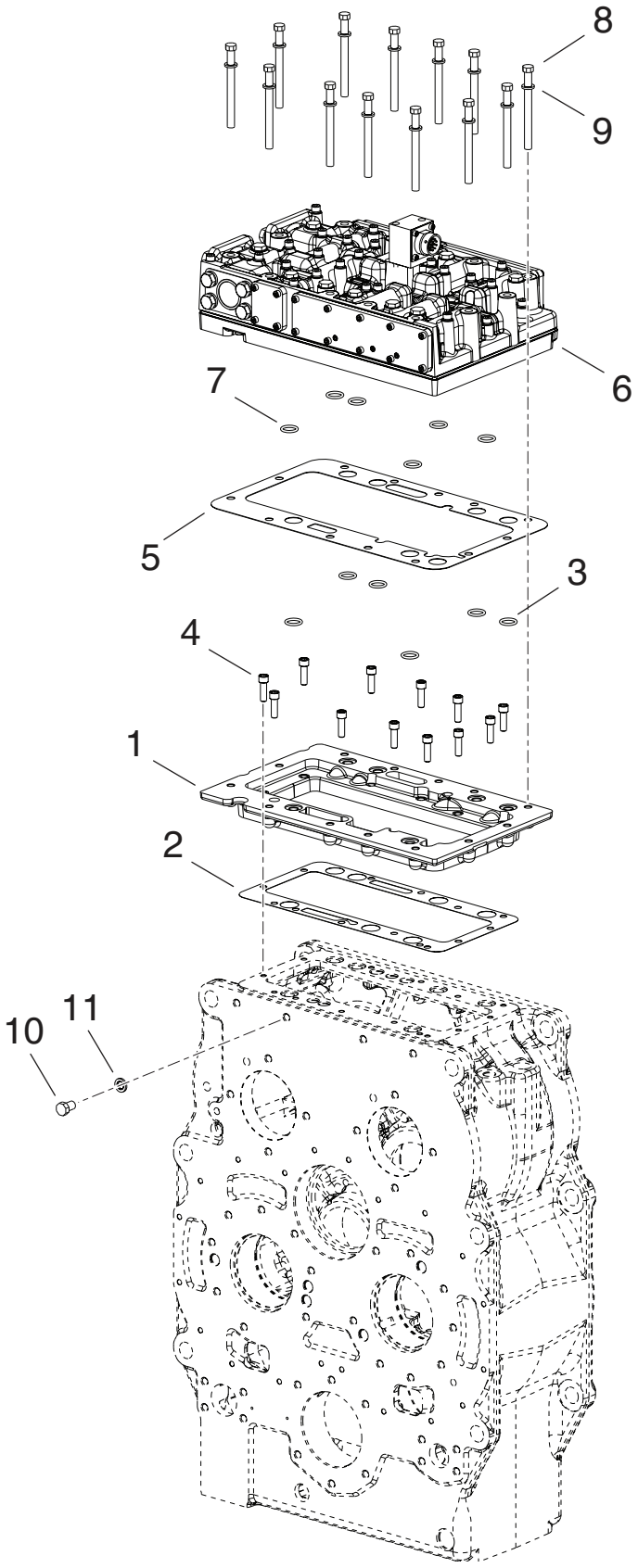
ITEM	DESCRIPTION	QTY
1	SHAFT-1ST/3RD AND 2ND/4TH	2
2	ASSEMBLY-TAPERED BEARING	2
3	PIN-BEARING LOCK	2
4	SNAP RING	2
5	SPACER	2
6	GEAR-OUTPUT	1
7	WASHER	2
8	CYLINDRICAL ROLLER BEARING	2
9	NUT-NYLON INSERT	2
10	GEAR-OUTPUT	1

GROUP-BASE PARTS



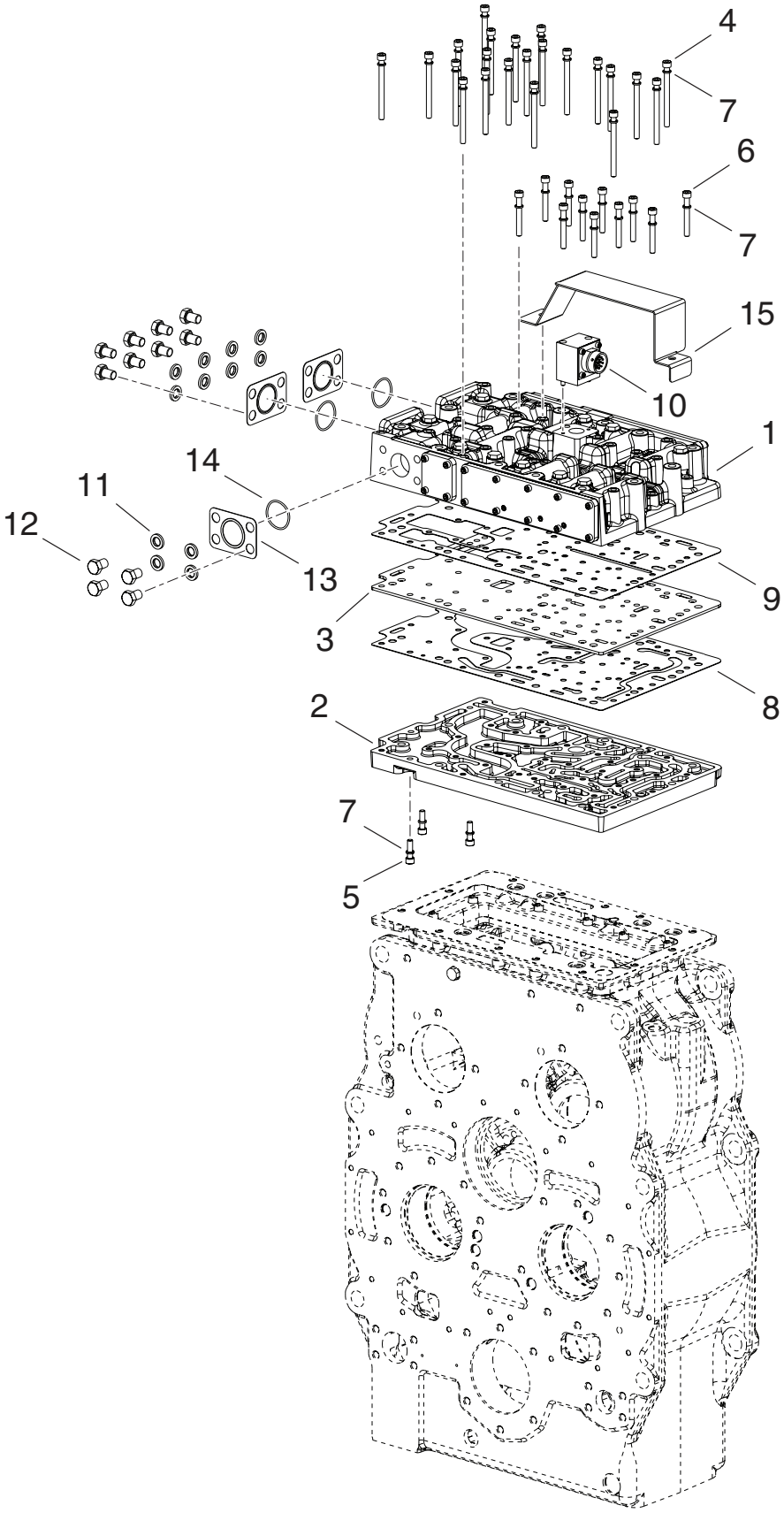
ITEM	DESCRIPTION	QTY
1	COVER-1ST AND 2ND CLUTCH	1
2	GASKET-1ST & 2ND CLUTCH COVERT	1
3	CAPSCREW	64
4	BELLEVILLE WASHER	64
5	COVER-INPUT, REV, 3RD AND 4TH CLUTCH	1
6	GASKET - FWD - REV - 3RD & 4TH CLUTCH COVER	1
7	ASSY-OIL SUMP SCREEN & BAFFLE	1
8	CAPSCREW	3
9	GASKET-OIL SUMP FRAME	1
10	ASSY-OIL SUMP	1
11	WASHER	2
12	GASKET-OIL SUMP	1
13	MAGNET-SUMP	2
14	PLUG	2
15	AIR-BREATHER	1
16	FITTING-ELBOW 90 DEGREE STREET	1
17	COVER-SPLIT FLANGE	2
18	COVER-SPLIT FLANGE	1
19	O-RING	1
20	O-RING	2
21	CAPSCREW	12
21A	LOCKWASHER	12
22	PLUG	2
23	PLUG	1
24	PLUG	1
24A	O-RING	1
25	PLUG	1
27	FITTING-PIPE CAP	1
26	NIPPLE-PIPE	1
28	DIPSTICK	1
29	ASSY-DIPSTICK HOUSING	1

ASSY-CONTROL VALVE



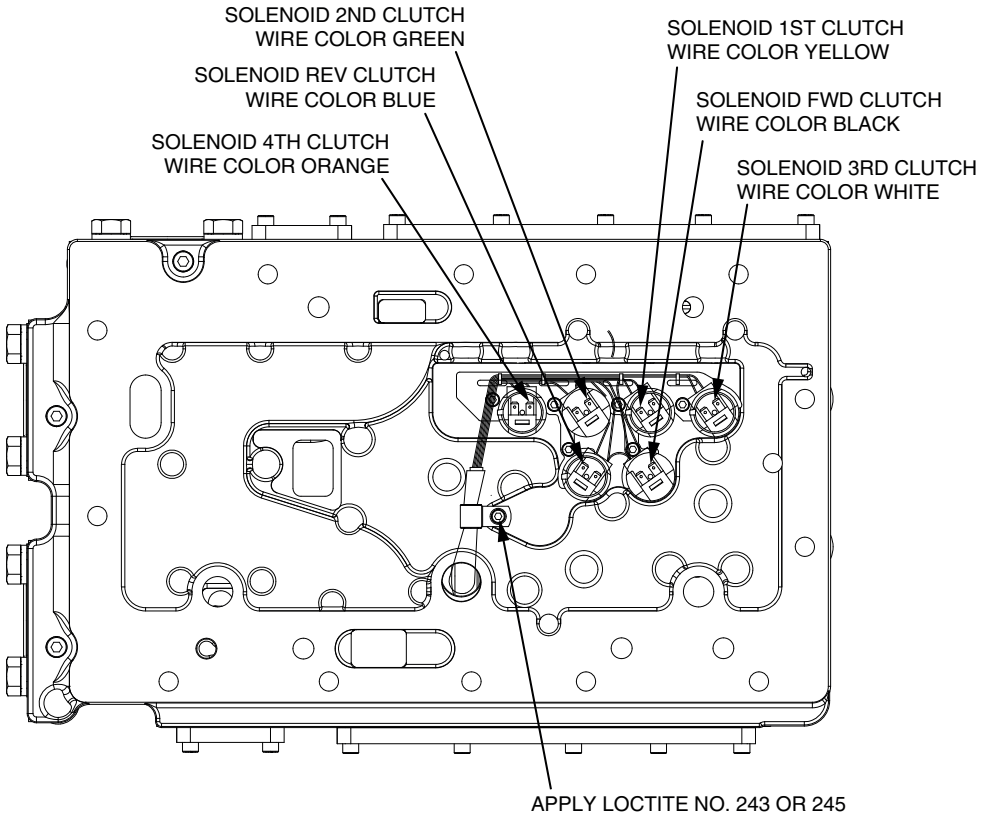
ITEM	DESCRIPTION	QTY
1	ADAPTOR-VALVE	1
2	CONTROL COVER GASKET	1
3	O-RING	6
4	CAPSCREW	12
5	GASKET CONTROL VALVE	1
6	ASSY-CONTROL VALVE	1
7	O-RING	6
8	CAPSCREW	13
9	LOCKWASHER	13
10	CAPSCREW	1
11	LOCKWASHER	1

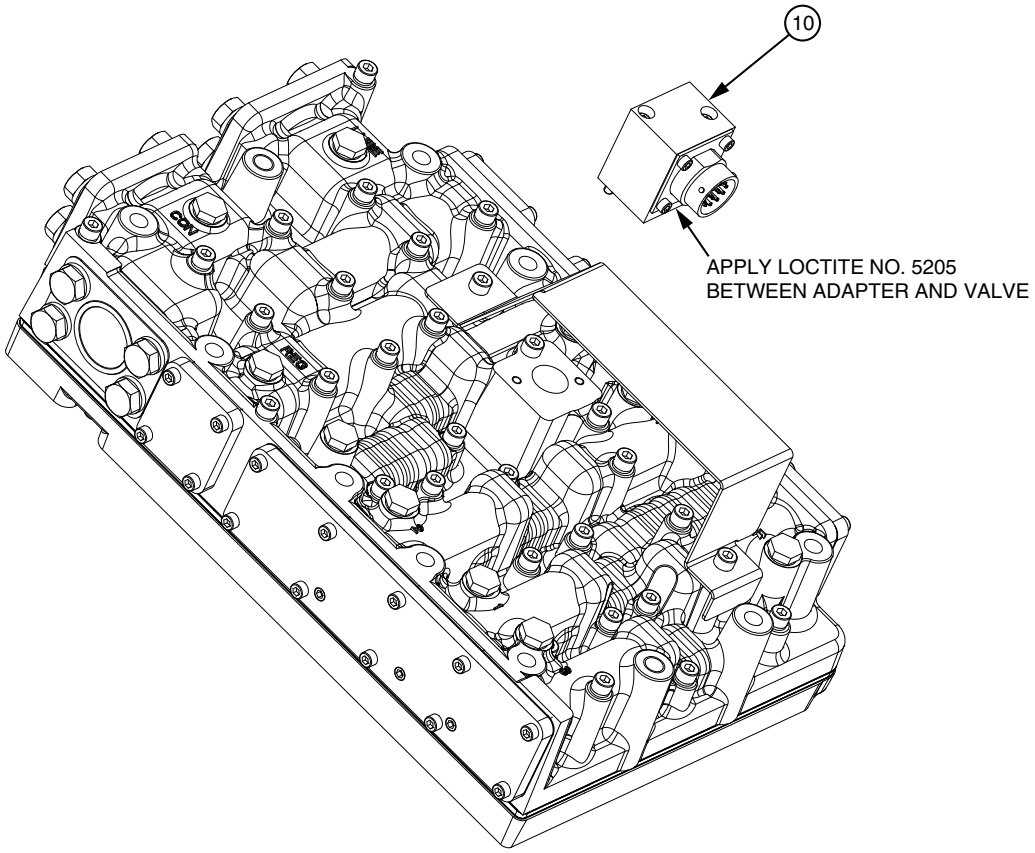
ASSY-CONTROL VALVE - 2



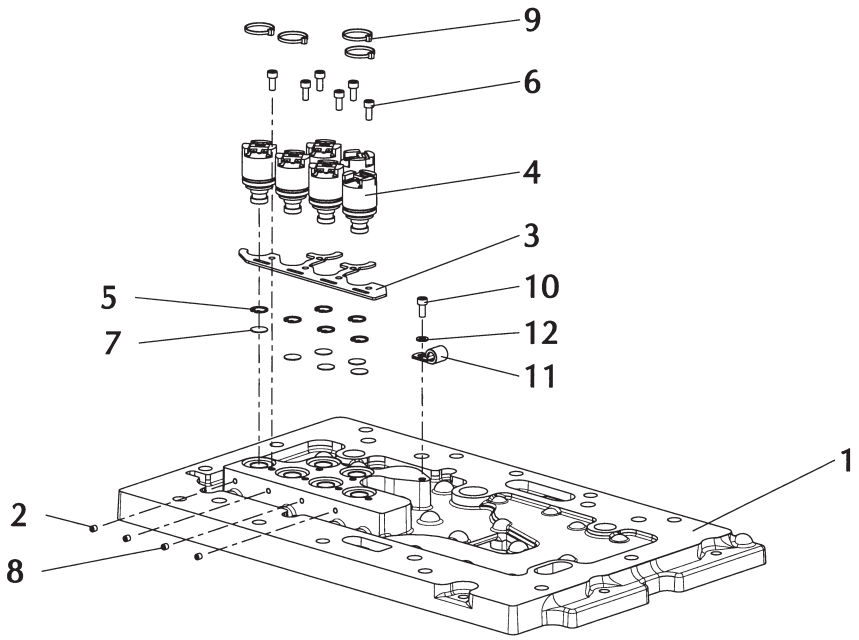
ITEM	DESCRIPTION	QTY
1	ASSY-CONTROL VALVE WITH VARIABLE RESTRICTIONS	1
2	ASSEMBLY-SOLENOID PLATE	1
3	PLATE-SPACER	1
4	SCREW M8X100	22
5	CAPSCREW	3
6	CAPSCREW	11
7	LOCKWASHER	36
8	GASKET PLATE SPACER TO PLATE SOLENOID	1
9	GASKET SPOOL BODY TO PLATE SPACER	1
10	GROUP-WIRING HARNESS	1
11	LOCKWASHER	12
12	CAPSCREW	12
13	COVER-SPLIT FLANGE	3
14	O-RING	3
15	COVER-PROTECTION	1

ASSY-CONTROL VALVE - 2



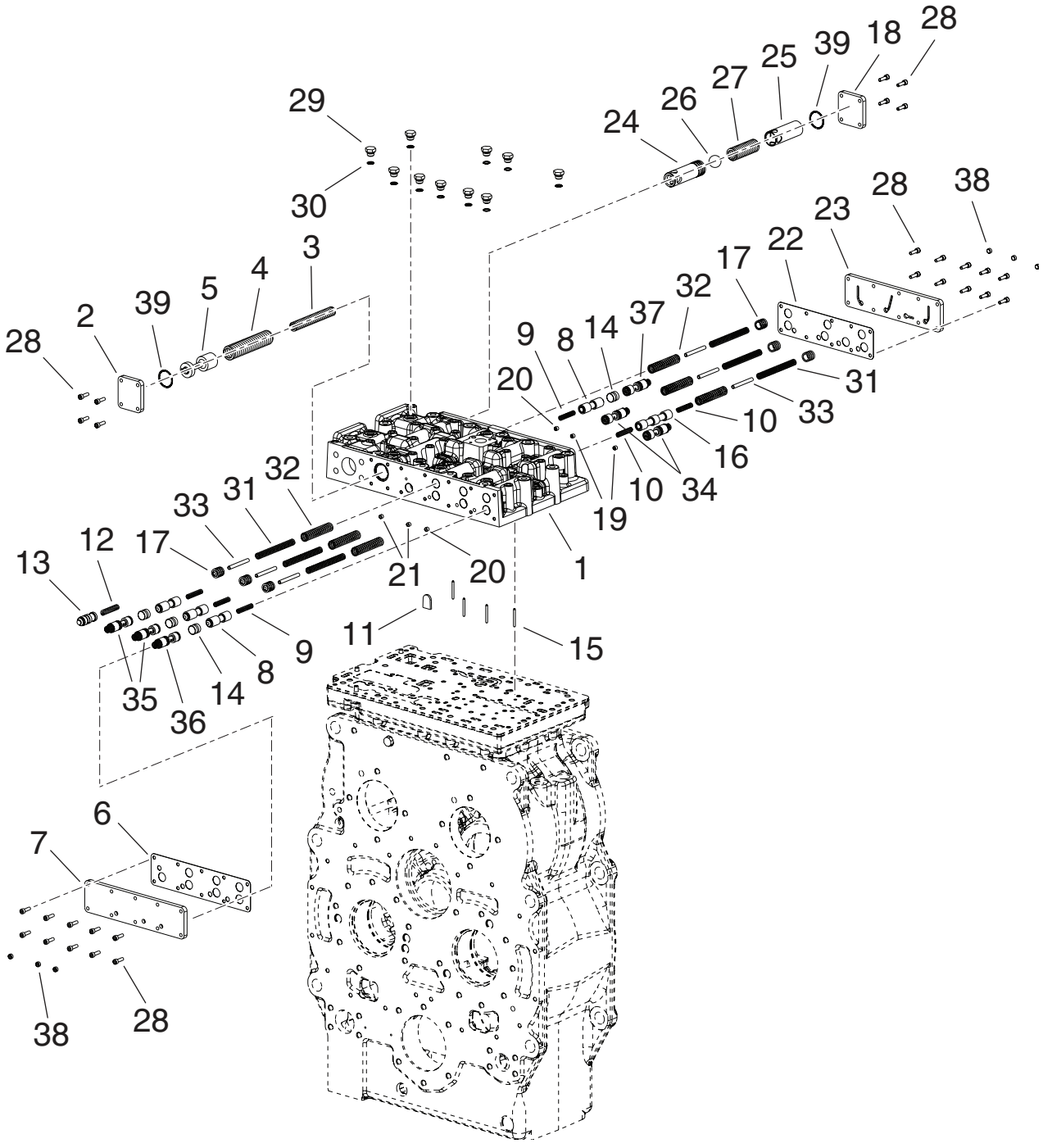


ASSY-SOLENOID PLATE



ITEM	DESCRIPTION	QTY
1	PLATE-SOLENOID NON TOTAL NEUTRAL	1
2	SCREW	3
3	CLAMP-SOLENOID	1
4	SOLENOID 24V	6
5	RING-SNAP	6
6	SCREW M5	6
7	DISC-FILTER	6
8	PLUG-RESTRICTION DIA. 0,8	1
9	STRAP 2,4 X 200 MM	4
10	SCREW M5	1
11	CLAMP WIRING	1
12	LOCKWASHER	1

ASSY-CONTROL VALVE WITH VARIABLE RESTRICTIONS

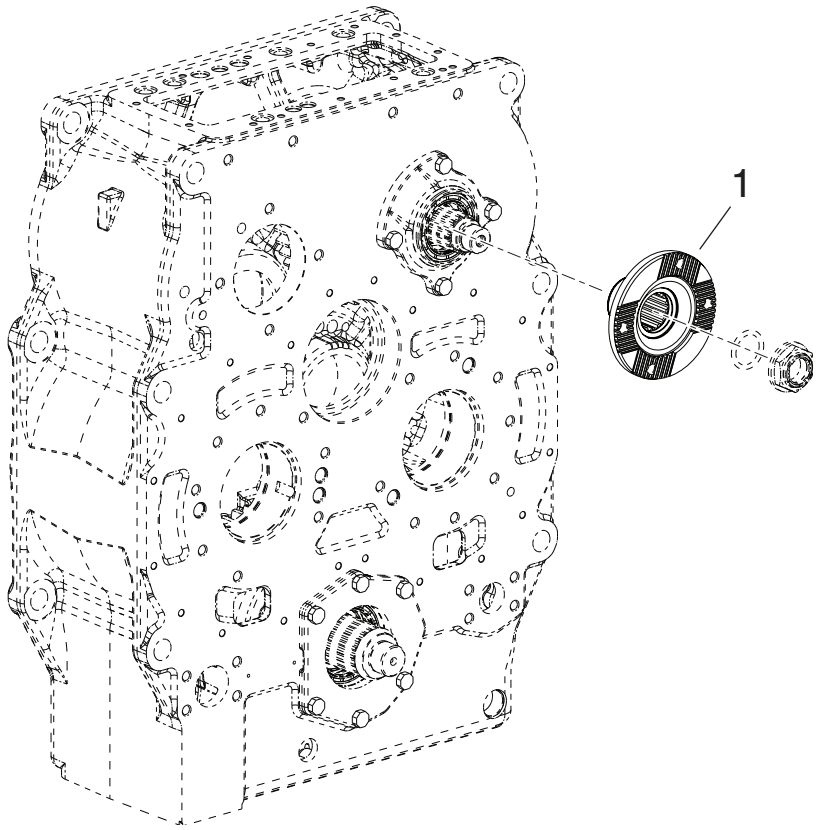


ASSY-CONTROL VALVE WITH VARIABLE RESTRICTIONS

ITEM	DESCRIPTION	QTY
1	SPOOL-BODY NON TOTAL NEUTRAL	1
2	COVER PRESSURE REGULATOR	1
3	SPRING-INNER	1
4	SPRING-OUTER	1
5	SPOOL REGULATOR	1
6	GASKET COVER RANGE SPOOLS	1
7	COVER-RANGE SPOOLS	1
8	SPOOL-OFF/ON	4
9	SPRING	4
10	SPRING-SPOOL SLECTOR	2
11	PLATE-SEPARATER	1
12	SPRING PRESSURE REDUCER	1
13	SPOOL-PRESSURE REDUCER	1
14	SPOOL-STOP	4
15	PARALLEL PIN	4
16	SPOOL-FWD/N/REV	1
17	SPOOL-ACCUMULATOR	6
18	COVER-SAFETY VALVE	1
19	PLUG-RESTRICTION 5/16-24UNF DIA .032 FWD-REV	2
20	PLUG-RESTRICTION 5/16-24UNF DIA .045 3RD-4TH	2
21	PLUG-RESTRICTION 5/16-24UNF DIA .042 1ST-2ND	2
22	GASKET COVER DIRECTION SPOOLS	1
23	COVER-DIRECTION SPOOLS	1
24	SEAT-SAFETY VALVE	1
25	SAFETY VALVE SPACER	1
26	BALL	1
27	SPRING-SAFETY VALVE	1
28	SCREW	28
29	PLUG-SCREW TYPE	10
30	O-RING	10
31	SPRING MIDDLE SOFT ACCUMULATOR	6
32	SPRING-HELICAL	6
33	PIN-STOP HARD ACCUMULATOR	6
34	ASSY-MODULATOR SPOOL	2
35	ASSY-MODULATOR SPOOL	2
36	ASSY-MODULATOR SPOOL	1
37	ASSY-MODULATOR SPOOL	1
38	PLUG	6

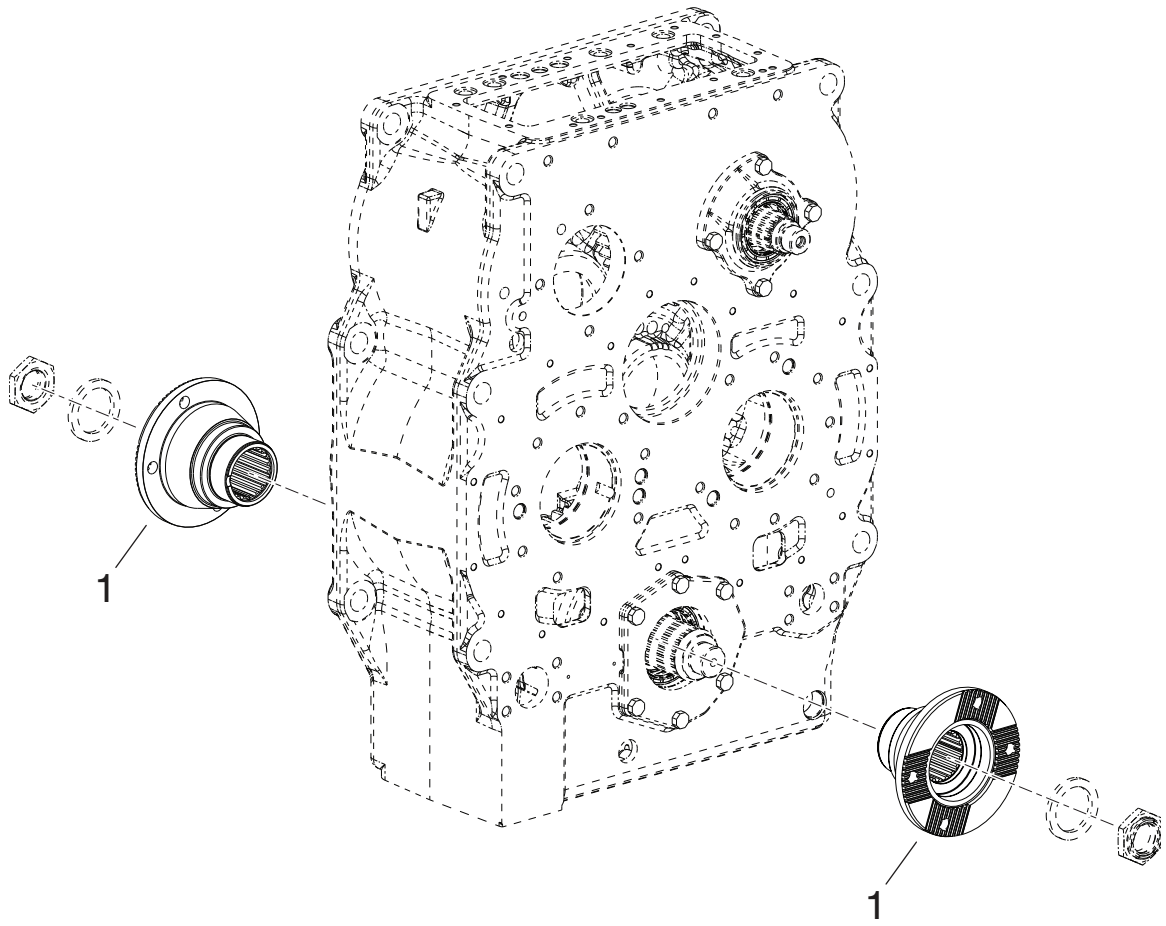
ITEM	DESCRIPTION	QTY
39	O-RING	2

FLANGE-CROSS SERRATED 155KV70



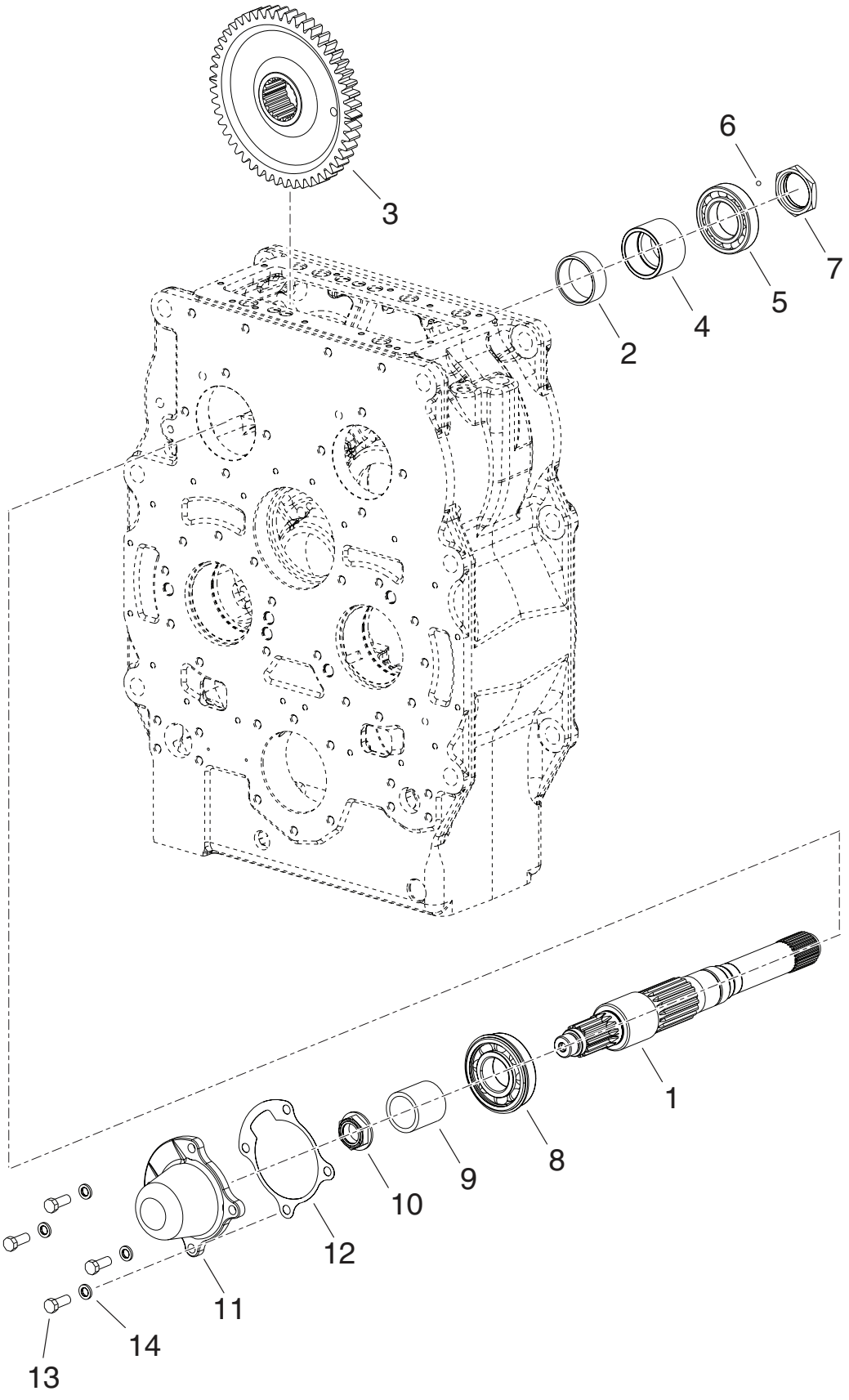
ITEM	DESCRIPTION	QTY
1	FLANGE-CROSS SERRATED 155KV70	1

FLANGE-CROSS SERRATED 180KV70



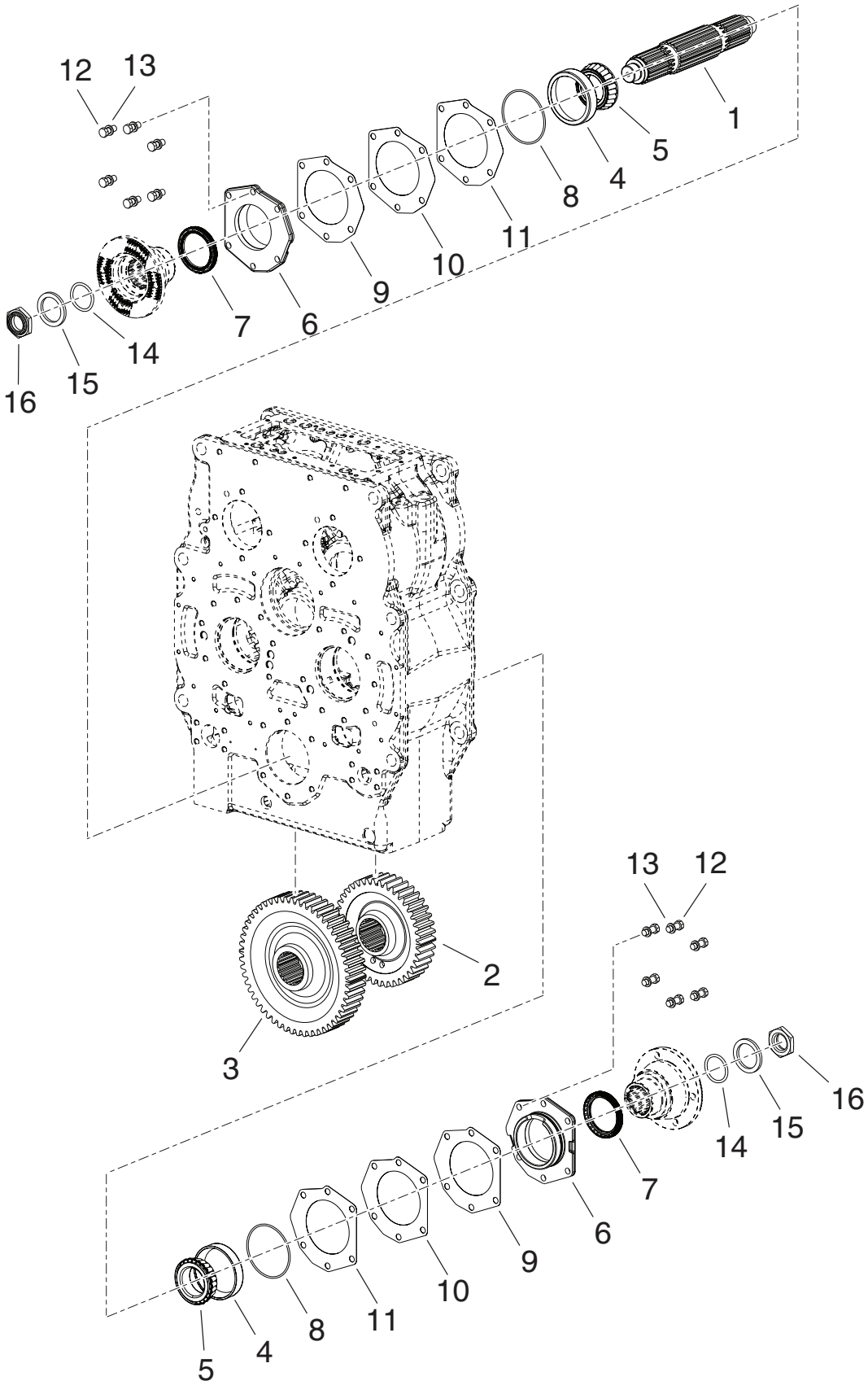
ITEM	DESCRIPTION	QTY
1	FLANGE-CROSS SERRATED 180KV70	2

GROUP-FORWARD SHAFT



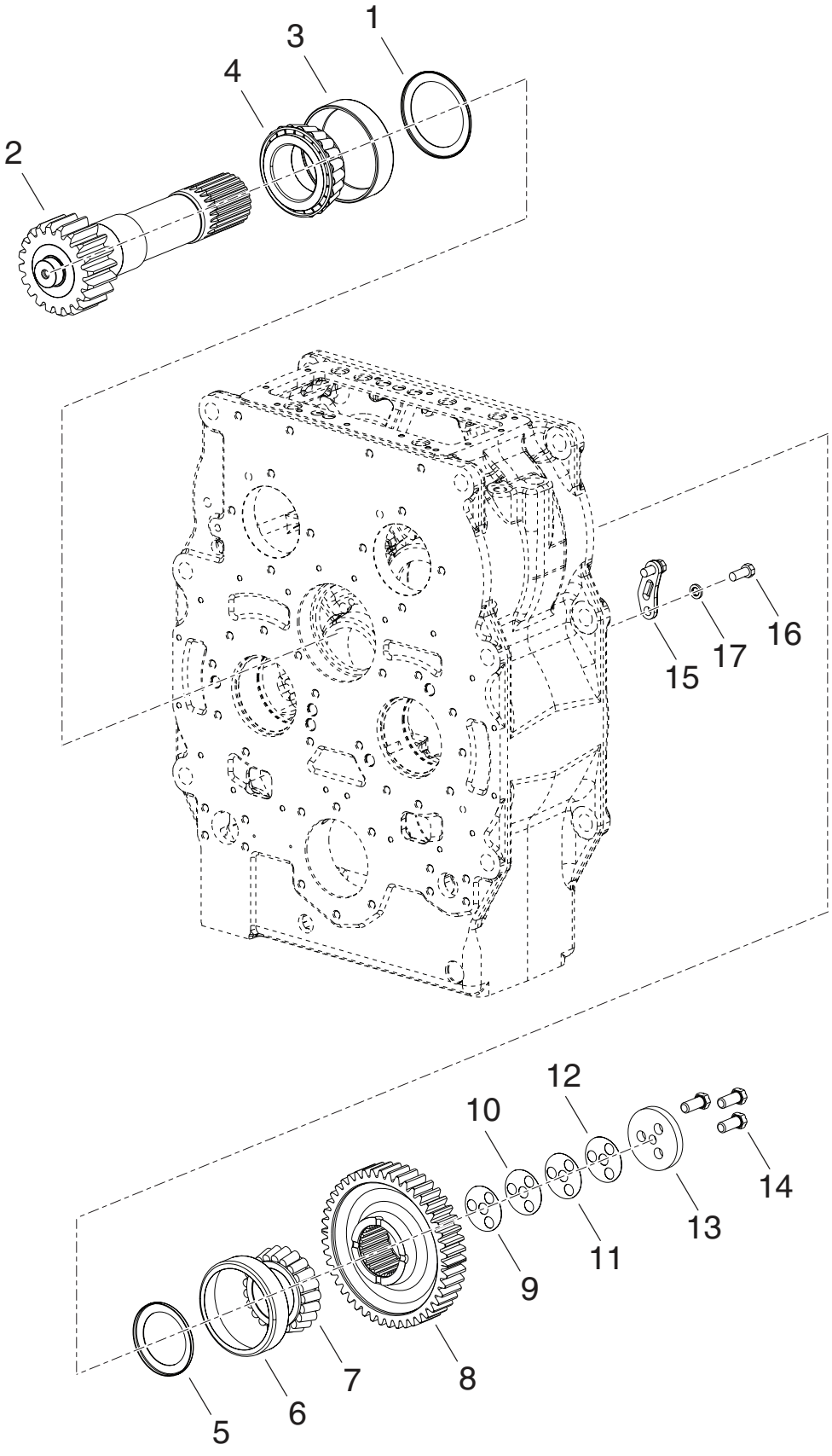
ITEM	DESCRIPTION	QTY
1	SHAFT-INPUT AND REVERSE	1
2	SPACER	1
3	INPUT GEAR 50T	1
4	SPACER	1
5	BEARING-BALL	1
6	BALL	1
7	NUT-NYLON INSERT	1
8	BEARING-BALL	1
9	SPACER	1
10	NUT-FLANGE	1
11	REV. BRG. CAP	1
12	BEARING CAP GASKET	1
13	CAPSCREW	4
14	Not Used On This Model	

GROUP-OUTPUT SHAFT



ITEM	DESCRIPTION	QTY
1	SHAFT-OUTPUT	1
2	GEAR-2ND AND 4TH 41T	1
3	GEAR-1ST AND 3RD 54T	1
4	CUP-BEARING	2
5	CONE-BEARING	2
6	ASSY-BRG.CAP AND OIL SEAL	2
7	SEAL-OIL - PART OF ITEM 6	1
8	O-RING-BEARING CAP	2
9	SHIM-BEARING CAP .004	A/R
10	SHIM-BEARING CAP .007	A/R
11	SHIM-BEARING CAP .010	A/R
12	SCREW-BEARING CAP	12
13	Not Used On This Model	
14	O-RING FLANGE	2
15	WASHER-FLANGE	2
16	NUT-FLANGE	2

GROUP-IDLER SHAFT



ITEM	DESCRIPTION	QTY
1	BAFFLE-IDLER BRG OIL	1
2	SHAFT-IDLER 20T	1
3	CUP-FRONT BEARING	1
4	CONE-FRONT BEARING	1
5	BAFFLE-REAR BEARING OIL	1
6	CUP-REAR BEARING	1
7	CONE-REAR BEARING	1
8	GEAR-IDLER 46T	1
9	SHIM-RETAINING PLATE .004	A/R
10	SHIM-RETAINING PLATE .007	A/R
11	SHIM-RETAINING PLATE .010	A/R
12	SHIM-RETAINING PLATE .020	A/R
13	PLATE-GEAR RETAINER	1
14	CAPSCREW-RETAINING PLATE	3
15	PLATE-IDLER SHAFT LUBE	1
16	SCREW-IDLER SHAFT LUBE PLATE CAP	2
17	Not Used On This Model	

DISASSEMBLY

FIGURE 1: Cover photo.

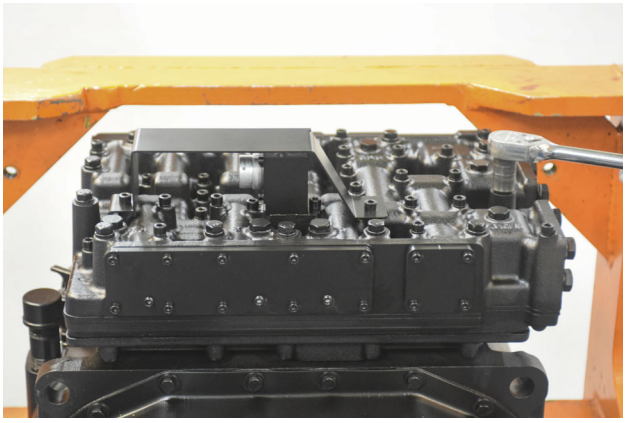


FIGURE 2: Remove 13x cap-screws + washers (size 5/8).

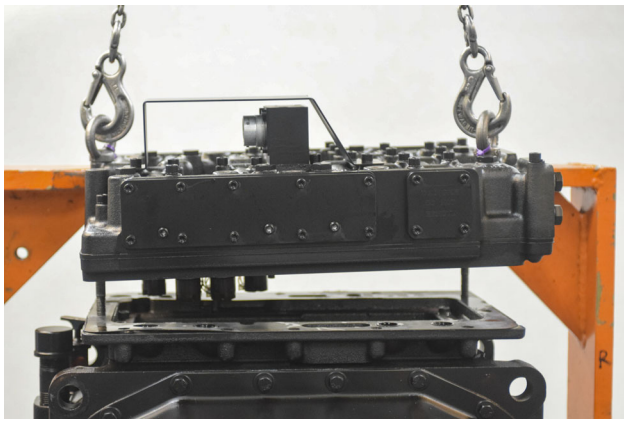


FIGURE 3: Remove valve using 2x eyebolt (M14) and 2x guide pins.

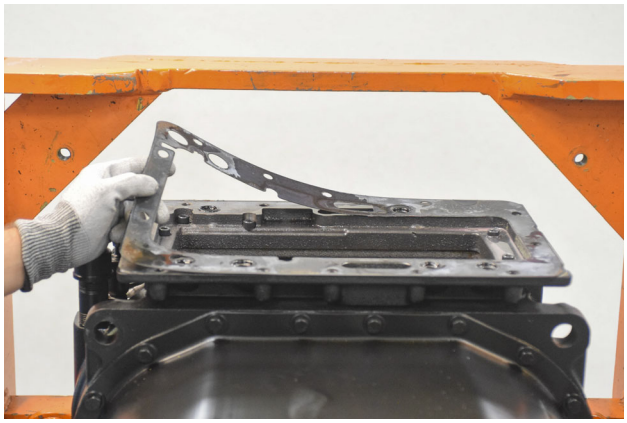


FIGURE 4: Remove gasket.

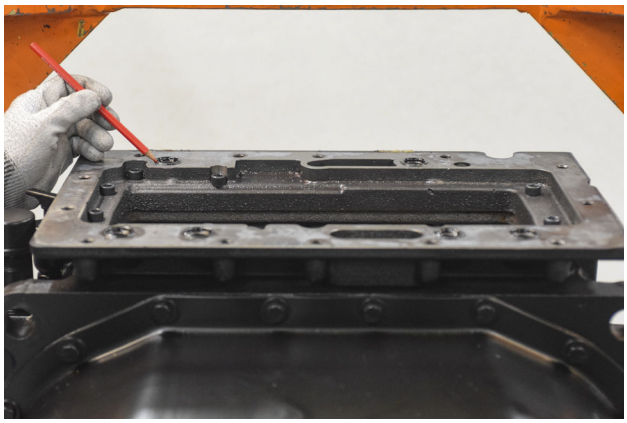


FIGURE 5: Remove 6x O-rings.

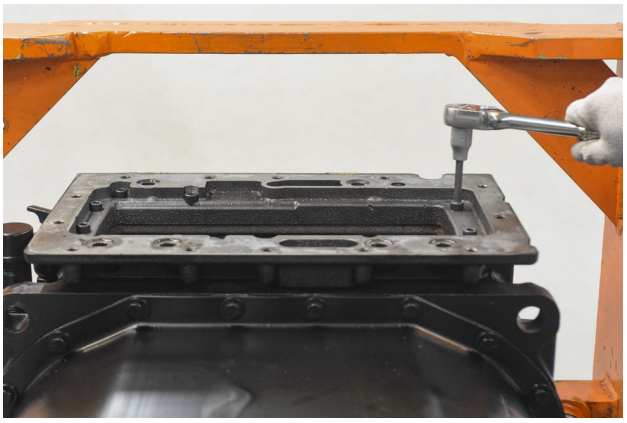


FIGURE 6: Remove 12x cap-screws (size 8).

FIGURE 7: Remove adaptor plate.

FIGURE 8: Remove gasket.

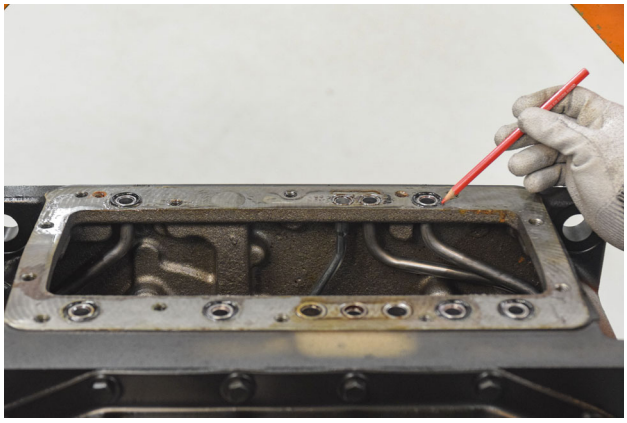


FIGURE 9: Remove 6x O-rings.

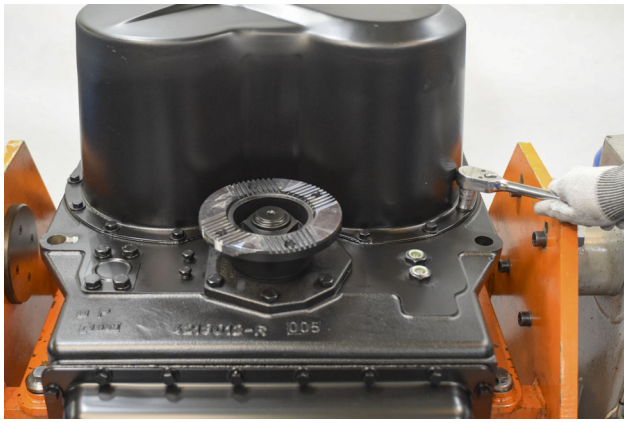


FIGURE 10: Remove 26x cap-screws + washers (size 9/16).

FIGURE 11: Remove cover.

FIGURE 12: Remove gasket.

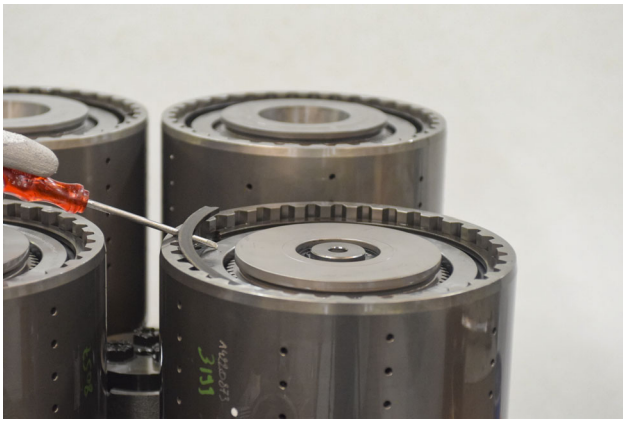


FIGURE 13: Remove snap-ring.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

⚠CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in p. 64.

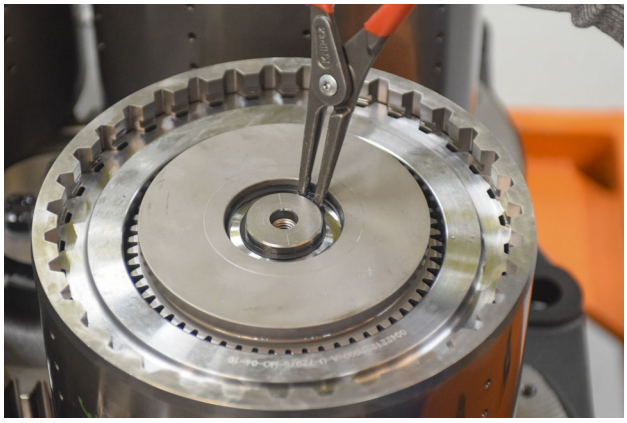


FIGURE 14: Remove snap-ring.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

⚠CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in p. 64.

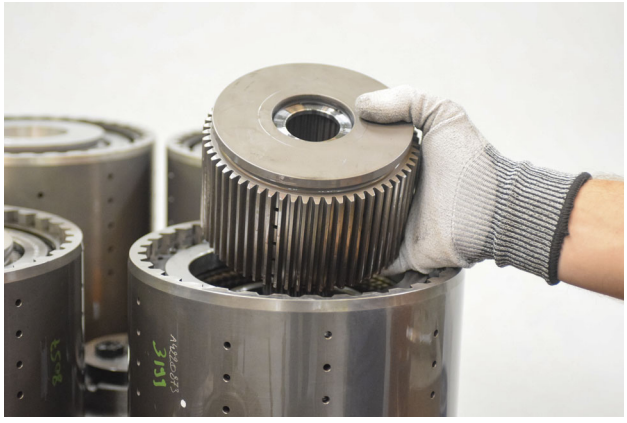


FIGURE 15: Remove hub-assembly.

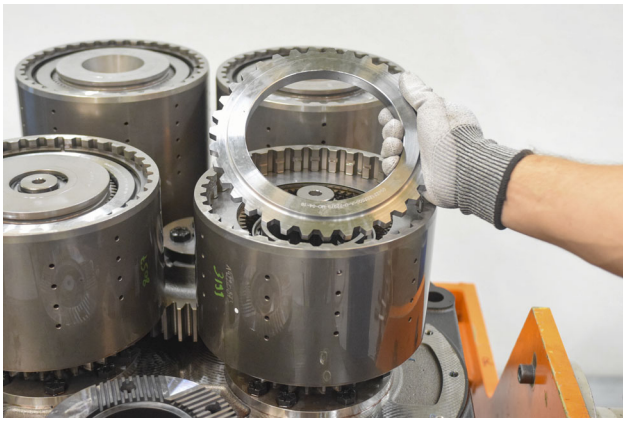


FIGURE 16: Remove endplate.

FIGURE 17: Remove discs + shims.

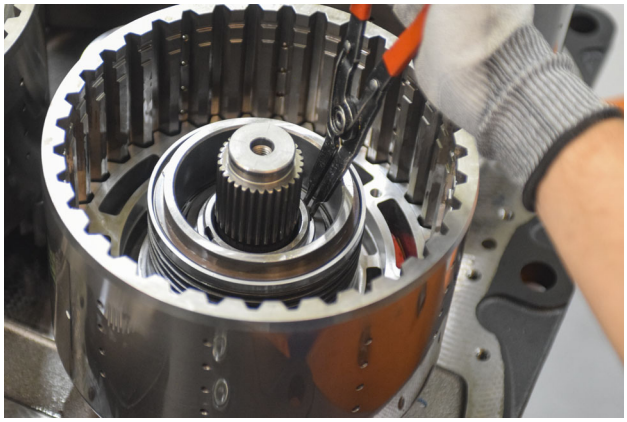


FIGURE 18: Remove snap-ring.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

⚠CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in p. 64.

FIGURE 19: Remove spacer.

FIGURE 20: Using special tool AS0010012800 (see drawing AS0010012800 p. 153), push belleville washers down and remove snapring.

FIGURE 21: Remove snapring, spacer, Belleville washers and spacer.

FIGURE 22: Remove piston, use two guide pins.

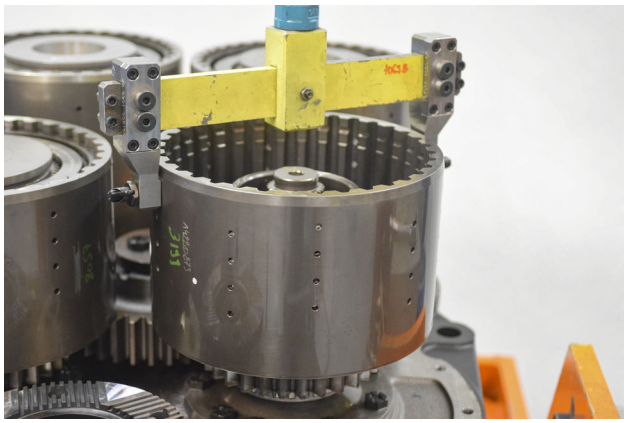


FIGURE 23: Remove clutch-assembly using special tool TG1500106700 (see drawing TG1500106700 p. 149).

FIGURE 24: Remove 8x cap-screws (size ¾).

FIGURE 25: Remove clutch support-assembly.

NOTE:

1st 2nd 3rd 4th forward and reverse are disassembled in a similar manner. The 1st and 2nd clutches are larger than the others, using special tool TG1500106500 (see drawing TG1500106500 p. 144) to lift 1st and 2nd clutch. Clutch being disassembled is the 4th clutch.

NOTE:

All clutch parts removed must be kept together. The clutch retainer ring, washer, taper bearings, drum and clutch support must be kept together for proper reassembly. Mark each part removed to match with the clutch support. These parts must be reassembled on the same support they were removed from. If taper bearings, clutch support or clutch drum are to be replaced, reassemble with new parts as explained later in the manual.

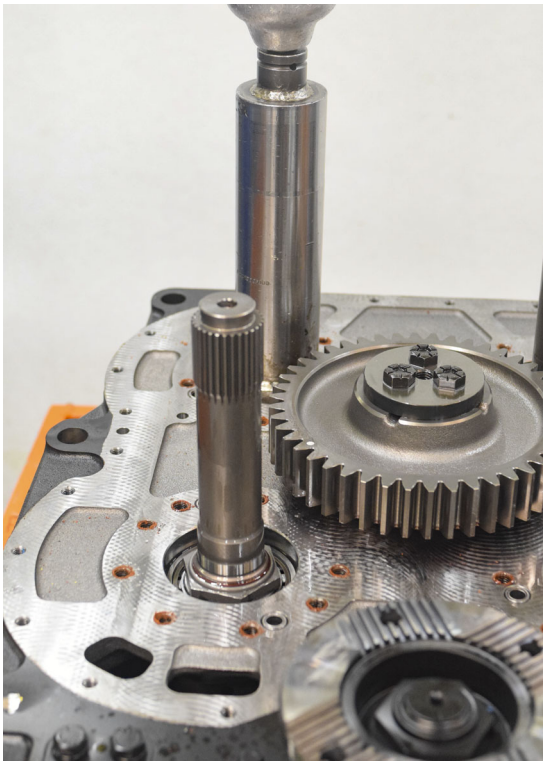


FIGURE 26: Remove 4x nylon nut using special tool AS0010005000 (see drawing AS0010005000 p. 140).

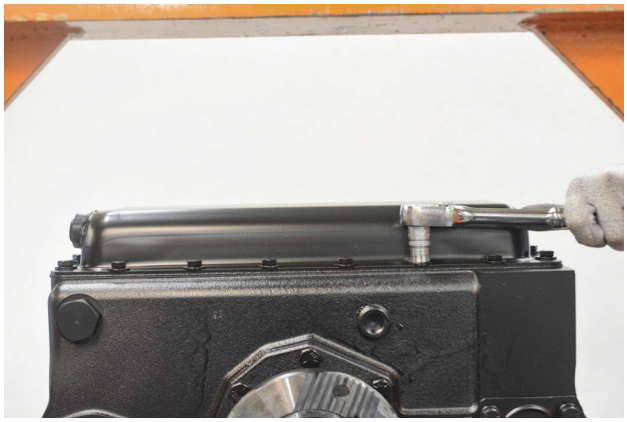


FIGURE 27: Remove 18x cap-screws (size 9/16).

FIGURE 28: Remove cover.

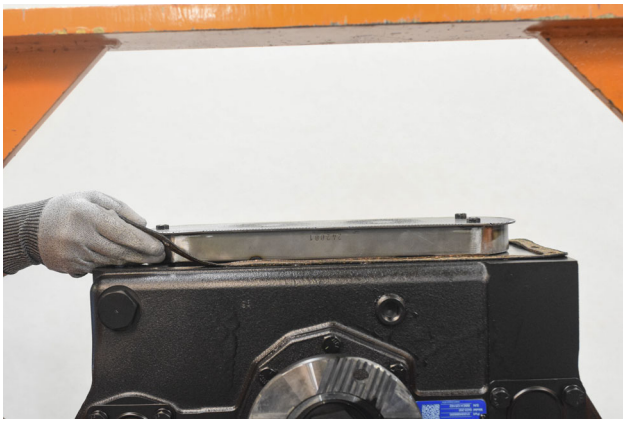


FIGURE 29: Remove gasket.

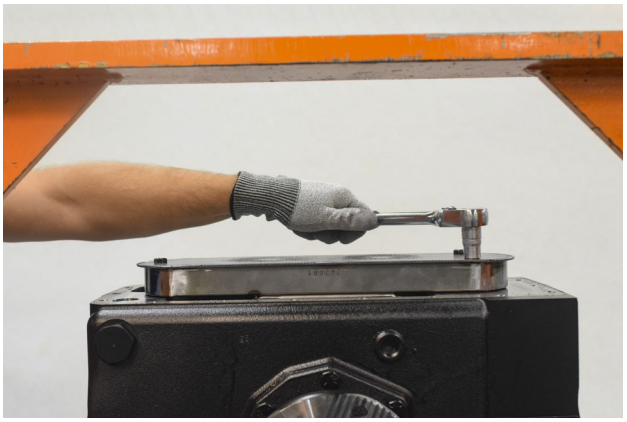


FIGURE 30: Remove 3x cap-screw (size 9/16).

FIGURE 31: Remove baffle.

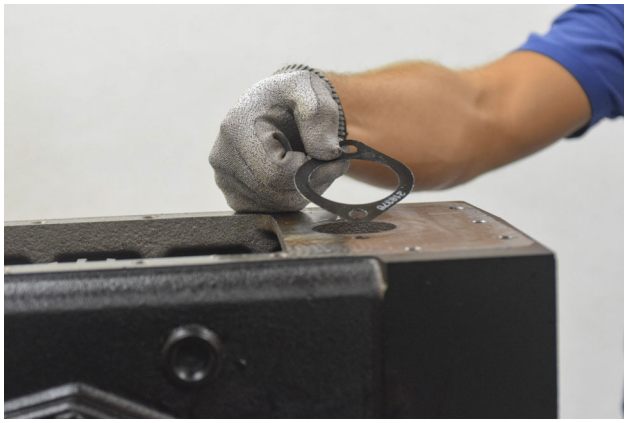


FIGURE 32: Remove gasket.

FIGURE 33: Remove 20x cap-screws + washers (size 9/16).

FIGURE 34: Remove cover.

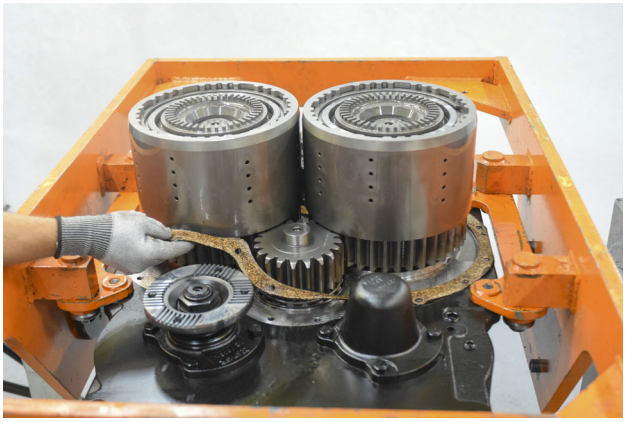


FIGURE 35: Remove gasket.

FIGURE 36: Remove 4x cap-screws (size ¾).

FIGURE 37: Remove Reverse cap.

FIGURE 38: Remove gasket.

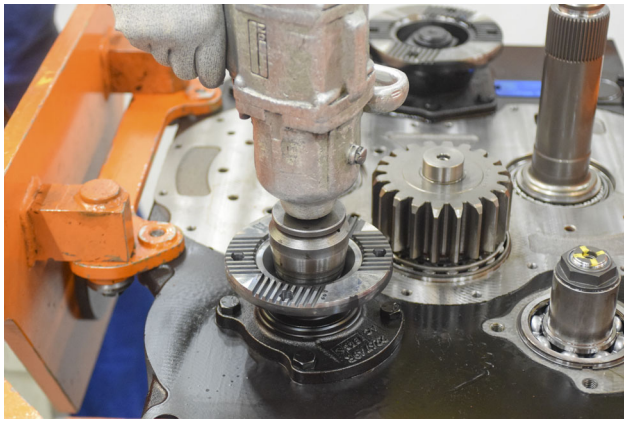


FIGURE 39: Loosen nylon nut.

FIGURE 40: Remove nylon nut, spacer and O-ring.

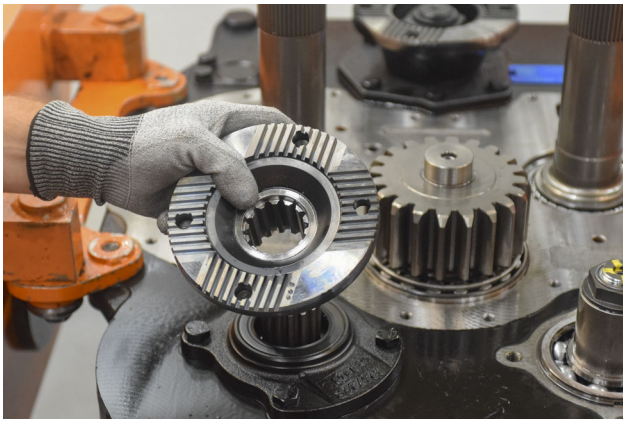


FIGURE 41: Remove flange.

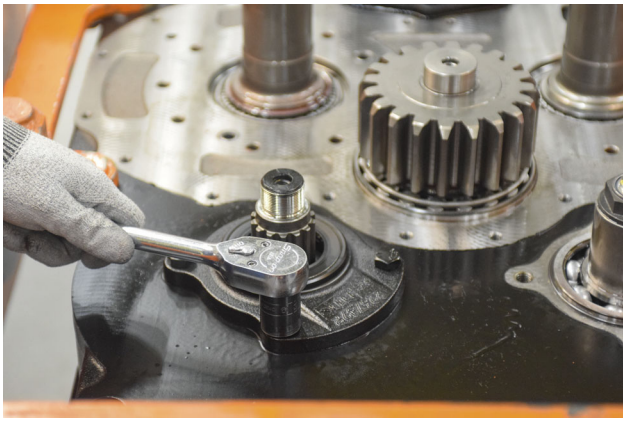


FIGURE 42: Remove 4x cap-screws (size ¾).

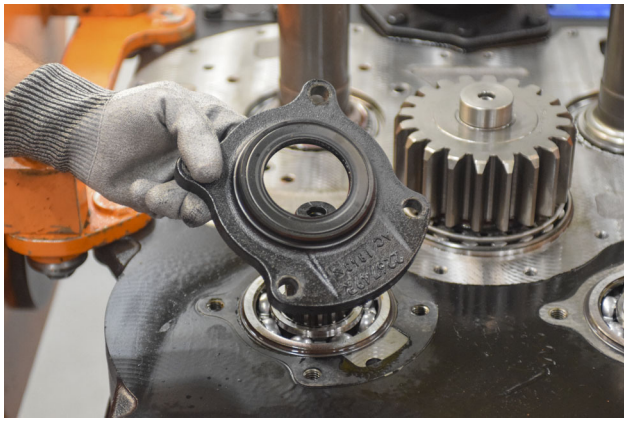


FIGURE 43: Remove input cap.

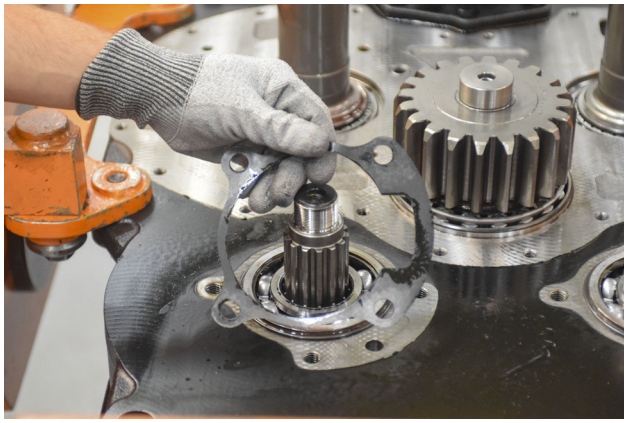


FIGURE 44: Remove gasket.

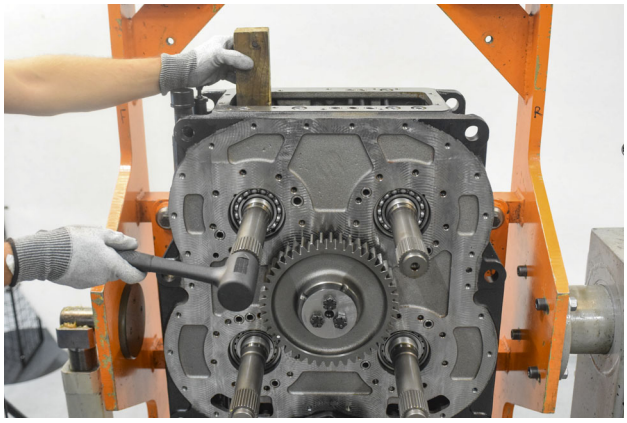


FIGURE 45: Prevent gear from moving and tap on forward shaft.

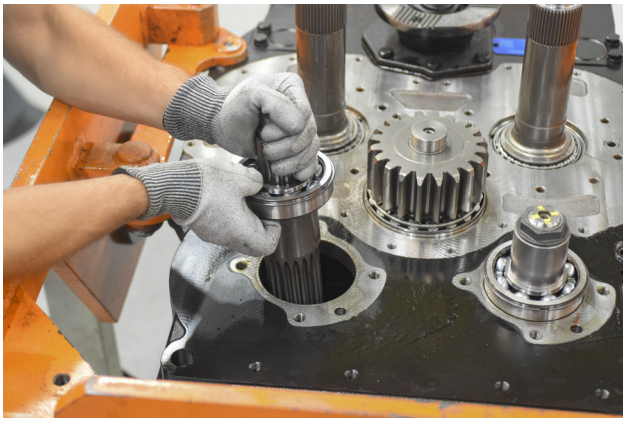


FIGURE 46: Remove input shaft.

FIGURE 47: Remove gear and spacer.

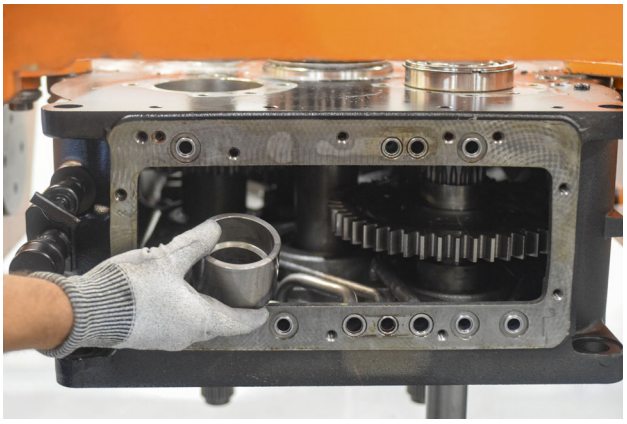


FIGURE 48: Remove spacer.

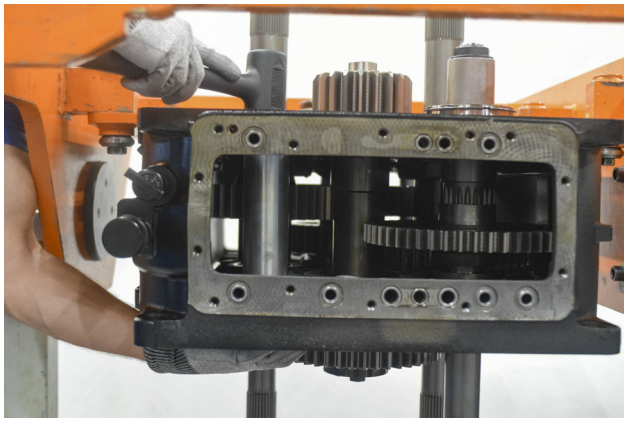


FIGURE 49: Tap out bearing + ball.

FIGURE 50: Remove bearing + ball.

NOTE:

Forward and reverse shafts are disassembled in a similar manner.

FIGURE 51: Loosen nut.

FIGURE 52: Remove nut, spacer and O-ring.

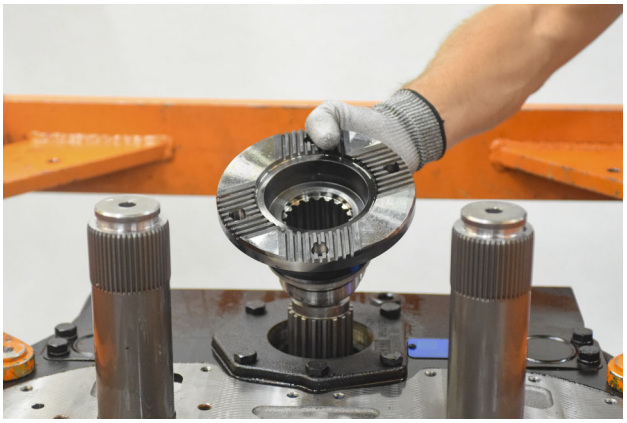


FIGURE 53: Remove output flange.

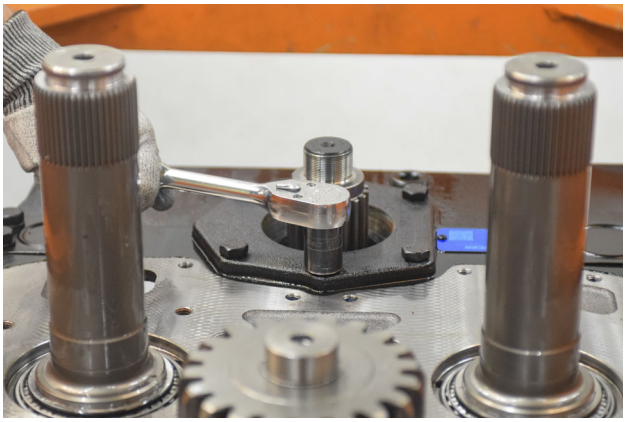


FIGURE 54: Remove 6x cap-screw (size ¾).

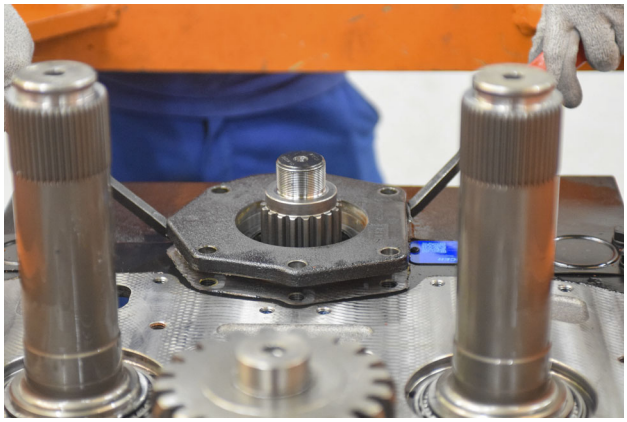


FIGURE 55: Remove front output cap.

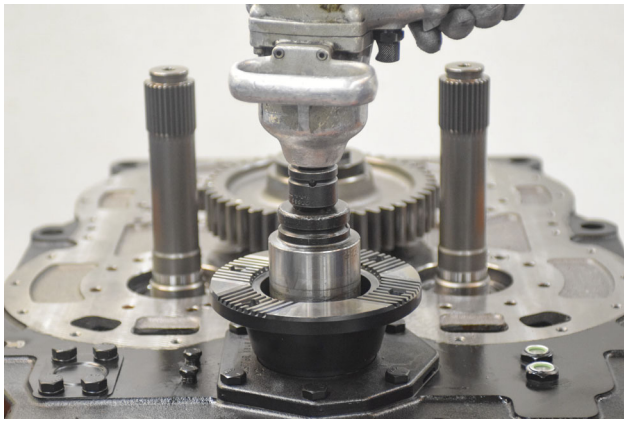


FIGURE 56: Loosen nut.

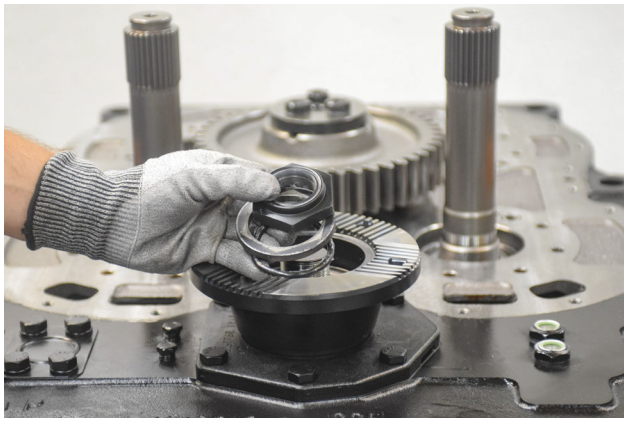


FIGURE 57: Remove nut, spacer and O-ring.

FIGURE 58: Remove flange.

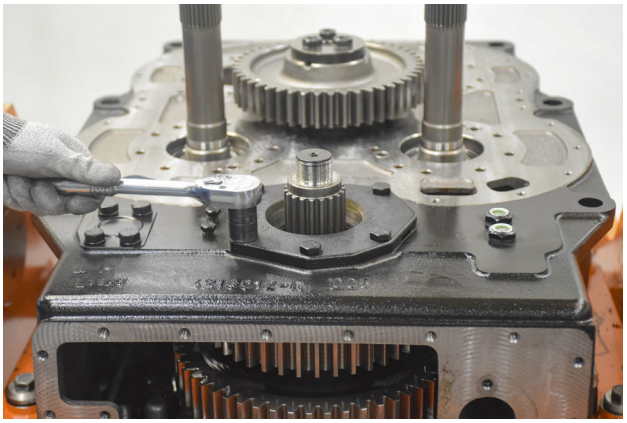


FIGURE 59: Remove 6x cap screws (size ¾).

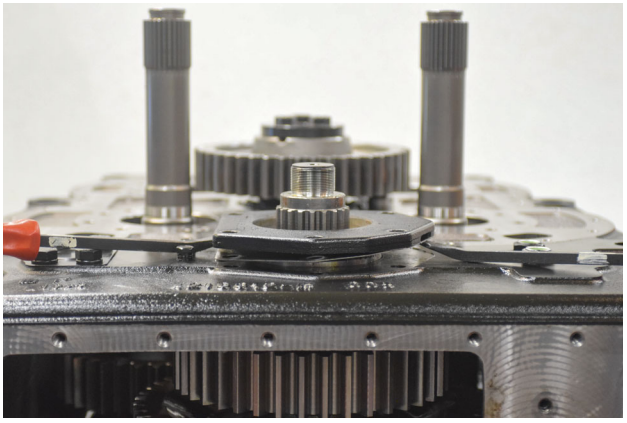


FIGURE 60: Remove rear output cap + shims.

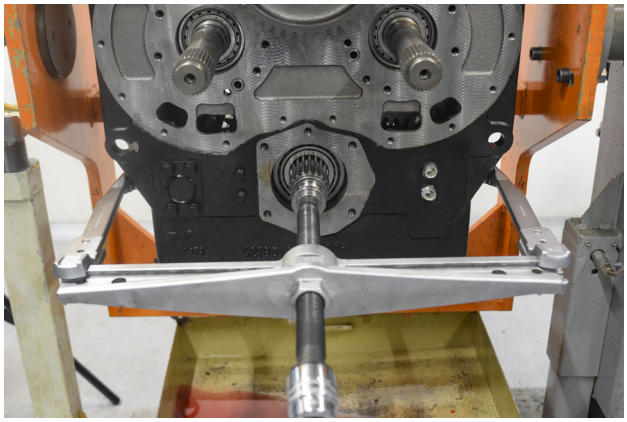


FIGURE 61: Remove output shaft + bearing assembly.

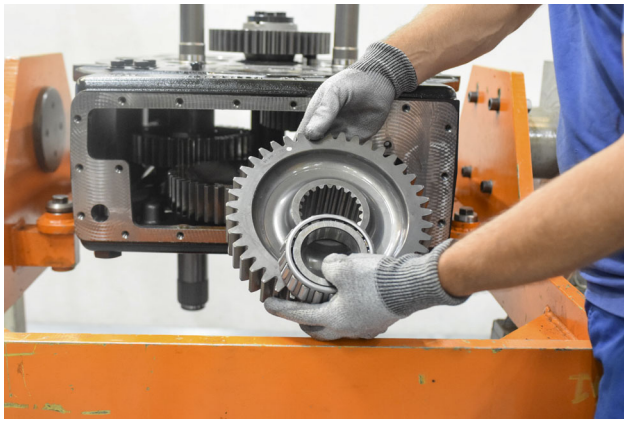


FIGURE 62: Remove small output gear + bearing cone.

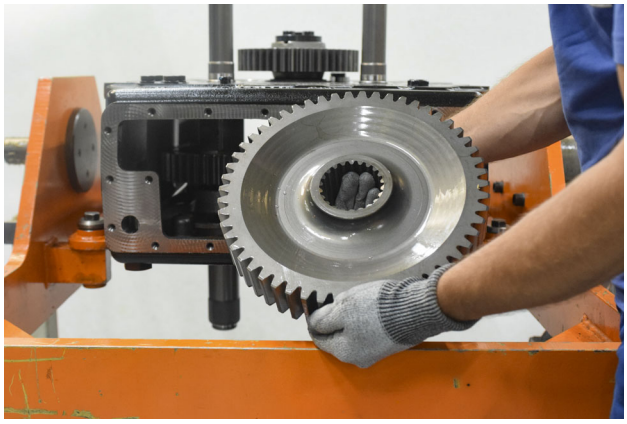


FIGURE 63: Remove big output gear.

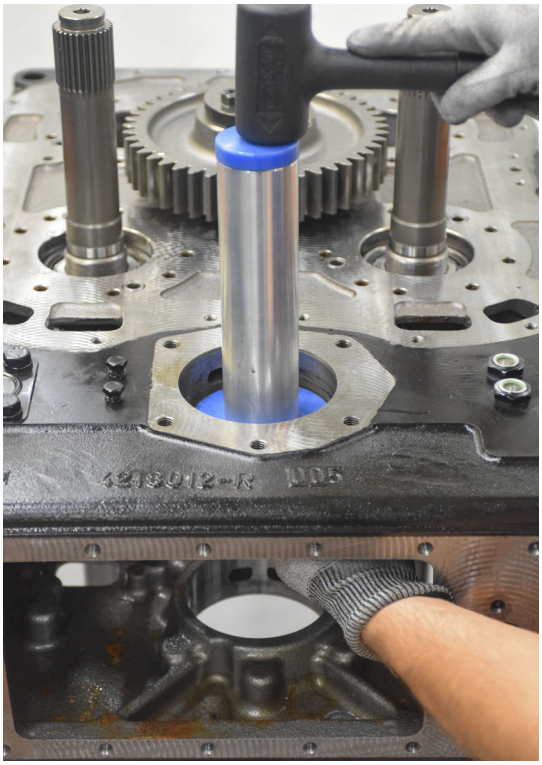


FIGURE 64: Remove bearing cup.

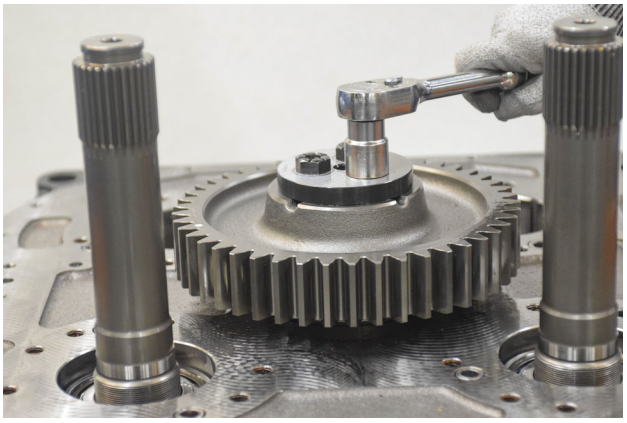


FIGURE 65: Remove 3x cap screws (size 7/8).

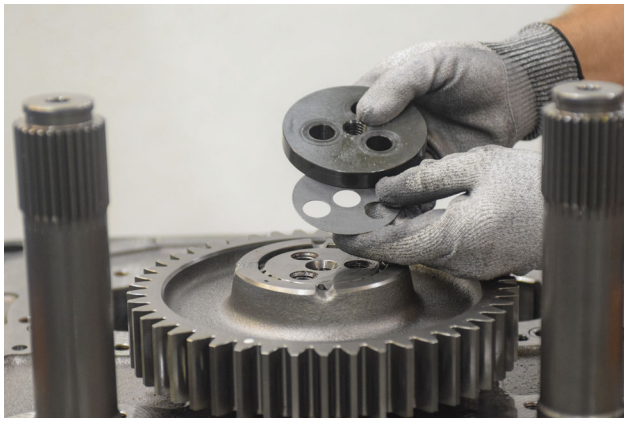


FIGURE 66: Remove spacer and shims.

FIGURE 67: Remove gear.

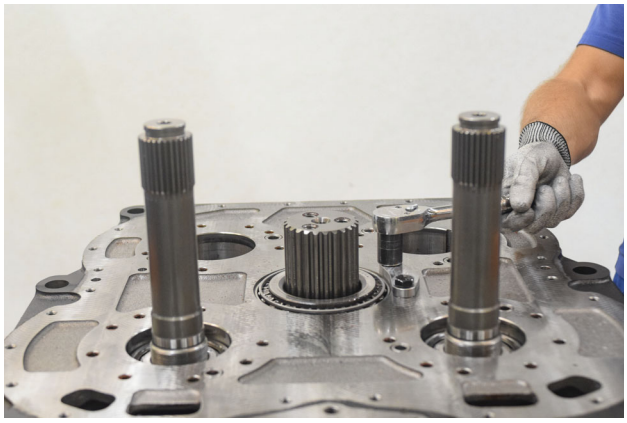


FIGURE 68: Remove 2x cap screws (side ¾).

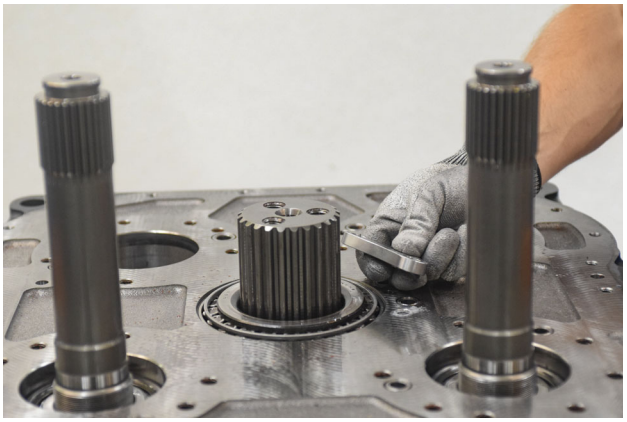


FIGURE 69: Remove lube plate.

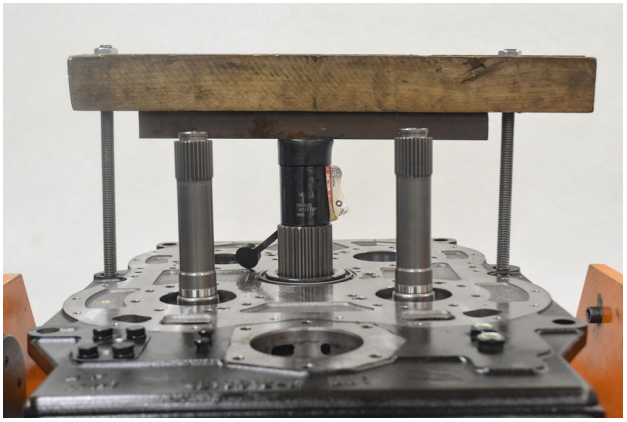


FIGURE 70: Remove idler shaft (prevent shaft from dropping!).

FIGURE 71: Remove bearing cone.

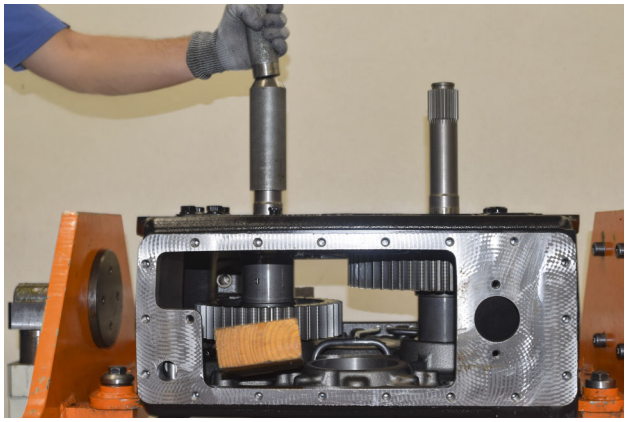


FIGURE 72: Prevent gear from moving and tap out 1/3 shaft.

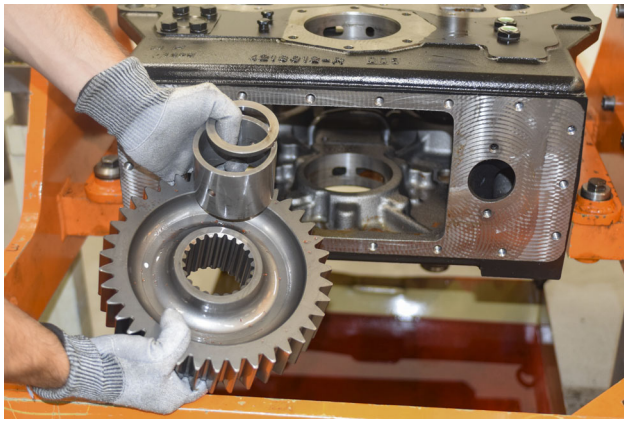


FIGURE 73: Remove 2x spacers and gear.

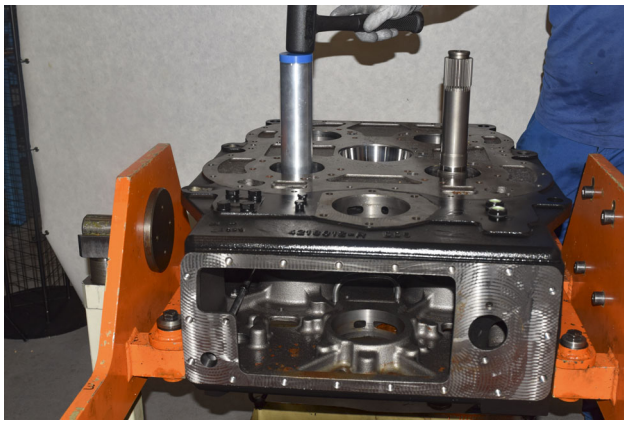


FIGURE 74: Tap out bearing.

NOTE:

2/4de shaft is removed in a similar way.

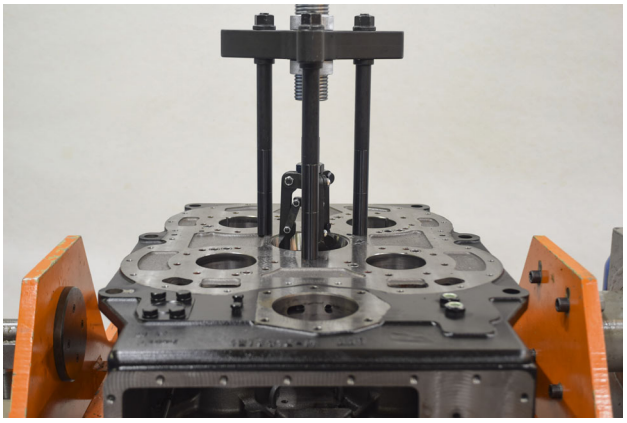


FIGURE 75: Remove bearing cup.

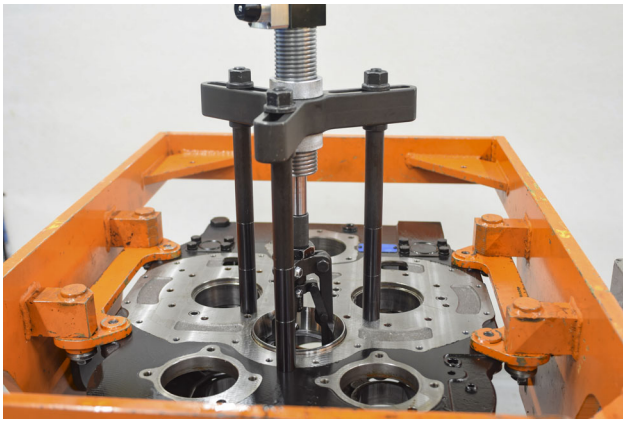


FIGURE 76: Remove bearing cup.

ASSEMBLY

FIGURE 77: Install bearing cup.

FIGURE 78: Install bearing cup.

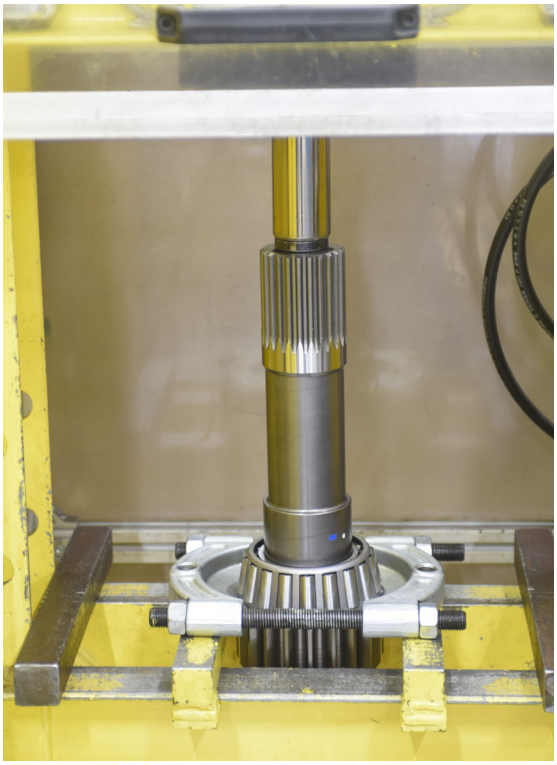


FIGURE 79: Remove bearing cone idler shaft.

FIGURE 80: Install bearing (heat to 120°C).

FIGURE 81: Lower idler shaft into transmission case (eyebolt M12).

⚠WARNING

Wear protective garments when handling hot objects.
Use heat resistant gloves to pick up hot objects.
Keep body parts and clothes away from heat source.

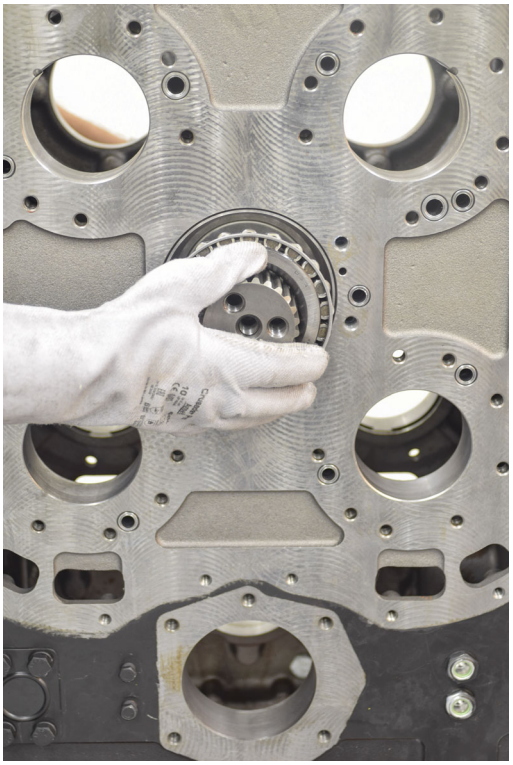


FIGURE 82: Secure idler shaft and install bearing (heat to 120°C).

⚠WARNING

Wear protective garments when handling hot objects.
Use heat resistant gloves to pick up hot objects.
Keep body parts and clothes away from heat source.

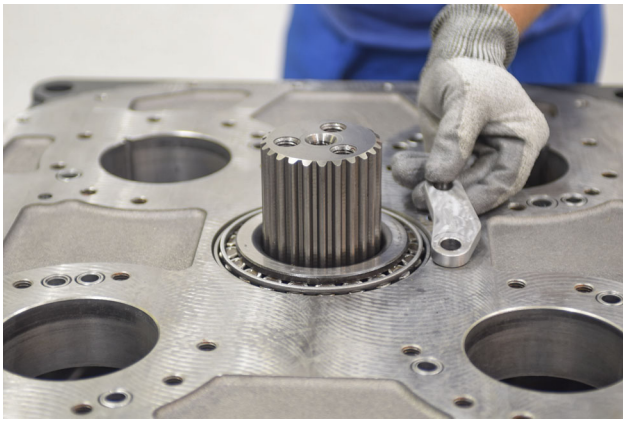


FIGURE 83: Install lube plate.

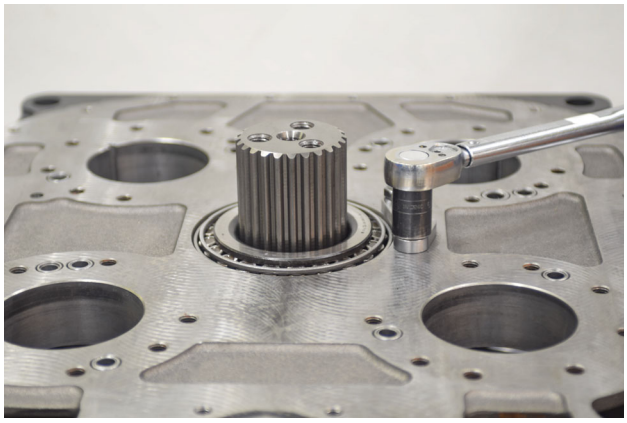


FIGURE 84: Install 2x cap screws with Loctite 243 torque to 57-63 ft·lbs (size ¾).

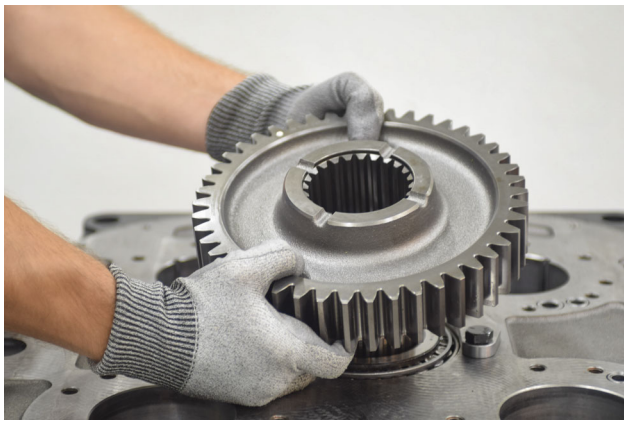


FIGURE 85: Install gear (groove on top).

FIGURE 86: Install shims and spacer.

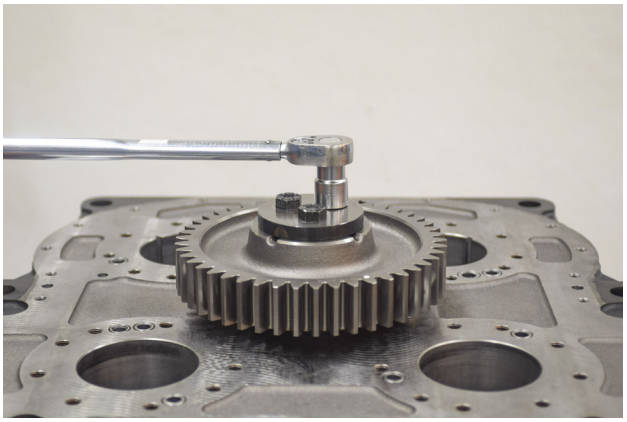


FIGURE 87: Install 3x cap screw, torque to 113-124 ft·lbs (precoated, size 7/8).

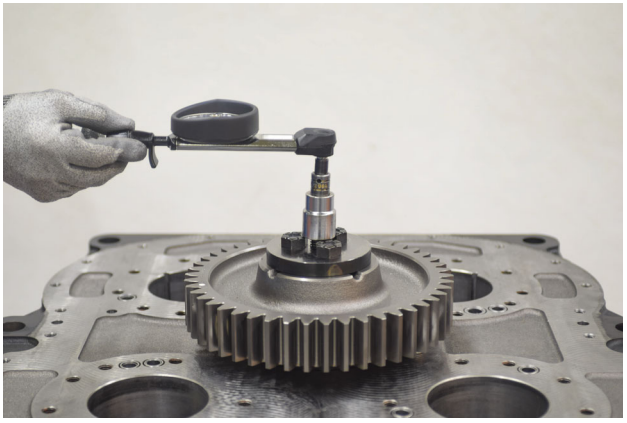


FIGURE 88: Measure rolling torque when using new bearings, rolling torque must be 6 to 10 inch lbs.
Add shims for less rolling torque, remove shims for more rolling torque.

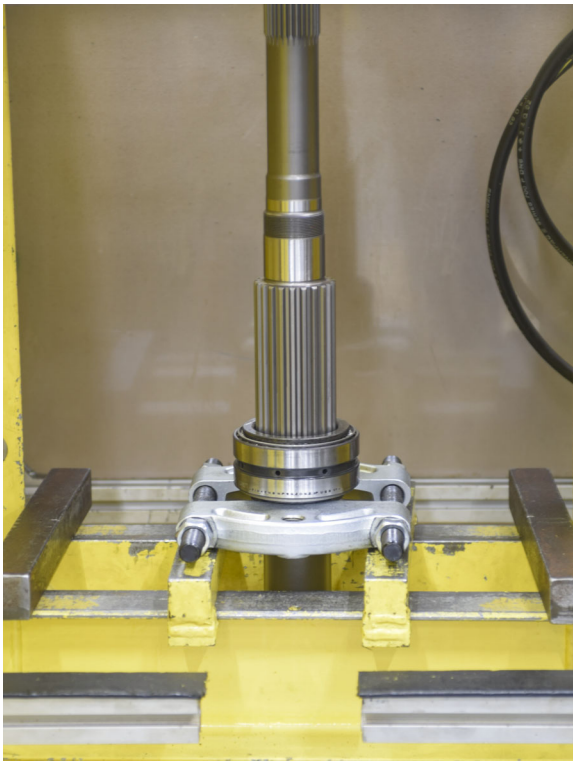


FIGURE 89: Remove bearing from 1/3rd shaft and 2/4th shaft.

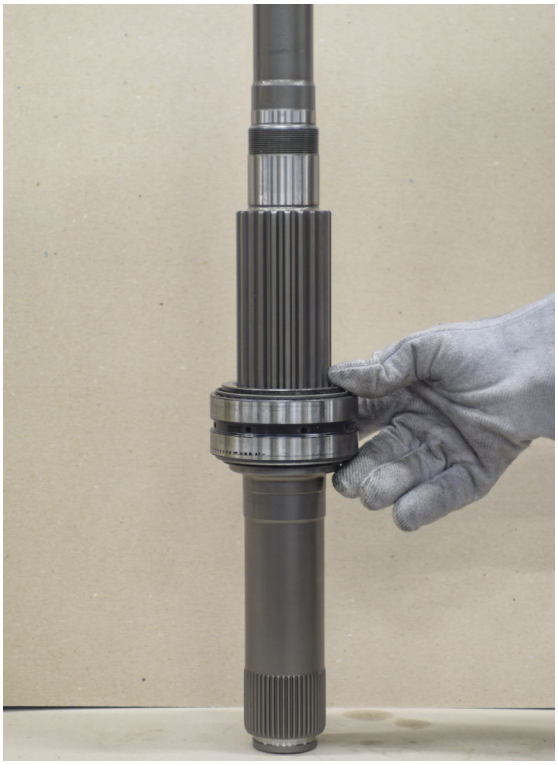


FIGURE 90: Install bearing on 1/3rd shaft and 2/4th shaft (heat bearing to 120°C).

⚠WARNING

Wear protective garments when handling hot objects.
Use heat resistant gloves to pick up hot objects.
Keep body parts and clothes away from heat source.

position 1st/3rd

FIGURE 91: Press the double taper bearing assembly on the shaft tight against shoulder on shaft.

⚠CAUTION

These bearings are in matched sets and under on circumstances can any of the four (4) parts de changed or mixed up with another bearing. Position the 1st /3rd gear in the transmission case with long hub of gear toward the input side of the case. Insert shaft into shaft bore and through the 1st/3rd gear. Align double taper bearing lock pin with notch in bearing bore.

position 2nd/4th

FIGURE 92: Press the double taper bearing assembly on the shaft tight against shoulder on shaft.

⚠CAUTION

These bearings are in matched sets and under on circumstances can any of the four (4) parts de changed or mixed up with another bearing. Install the long spacer on the 2nd/4th shaft against the double taper bearing. Position the 1st / 3rd gear in the transmission case with long hub of gear toward the input side of the case. Align double taper bearing lock pin with notch in bearing bore. Use shaft pusher. Push shaft assembly in case until taper bearing shoulders in bore of case. Do not remove shaft pusher. On opposite end of the shaft install bearing spacer(washer) against the gear. Drive rear bearing tight against washer.

NOTE:

Bearings must de driven in tight. Check long spacer on shaft. When spacer can not be turned by hand, stack up between the front and rear bearing is tight. DO NOT attempt to draw bearing up tight with bearing lock nut.

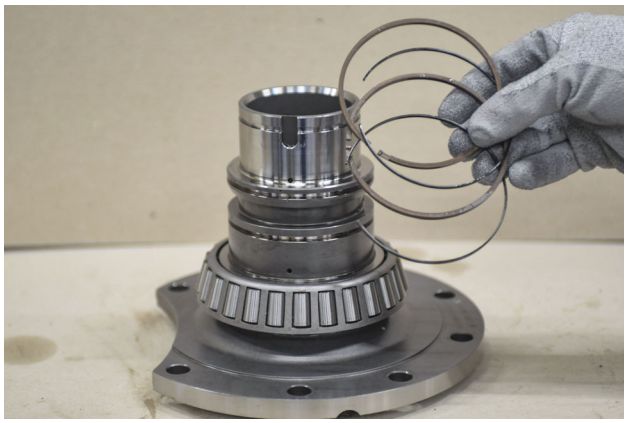


FIGURE 93: Remove piston rings and expansion rings.

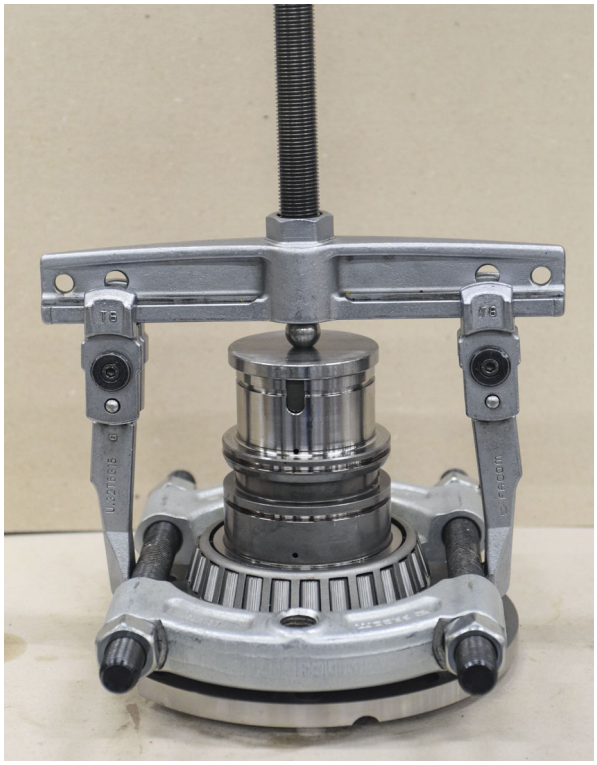


FIGURE 94: Remove bearing.

FIGURE 95: Install bearing (heat to 120°C).

⚠WARNING

Wear protective garments when handling hot objects.
Use heat resistant gloves to pick up hot objects.
Keep body parts and clothes away from heat source.

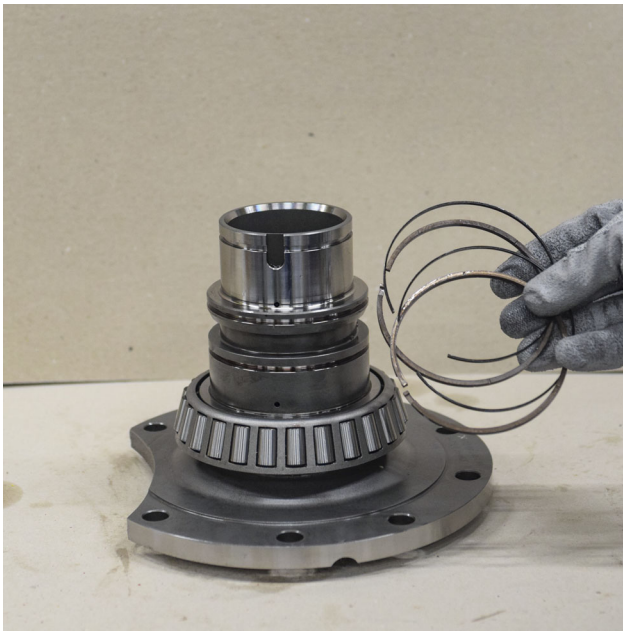


FIGURE 96: Install piston rings and expansion rings.

NOTE:

All clutch supports are assembled and disassembled in a similar way,.

⚠WARNING

Do not mix parts from different clutches.

FIGURE 97: Install clutch support, align with 8x cap screws and tap clutch support down before driving the cap screws.

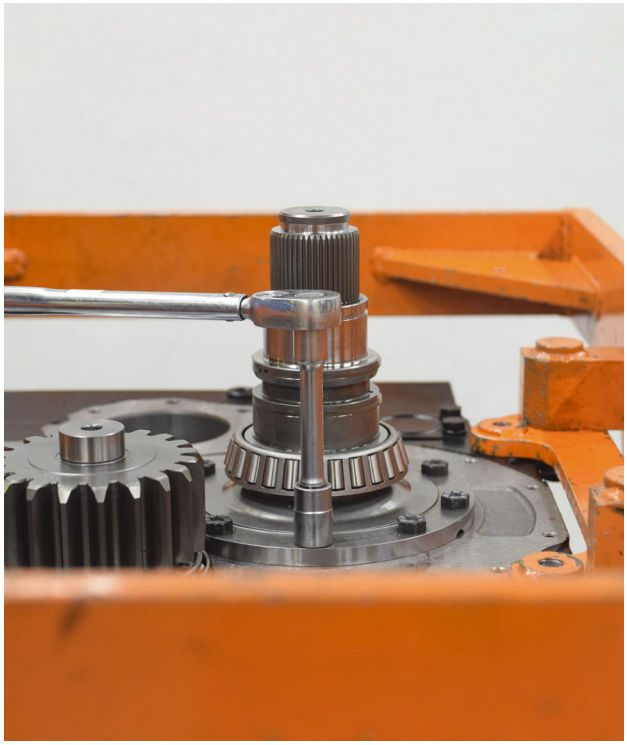


FIGURE 98: Tighten 8x cap screws to 80-88 ft·lbs (cap screws should be precoated, size ¾).

FIGURE 99: On the rear side install spacer and bearing (sharp inner radius of bearing is assembled to the top).

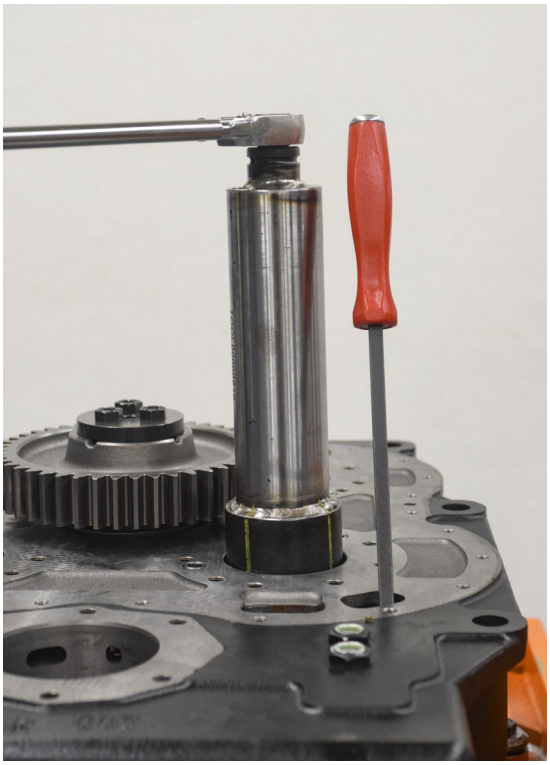


FIGURE 101: Prevent shaft from moving and Install nylon nut, torque to 175-200 ft·lbs using special tool AS0010005000 (see drawing AS0010005000 p. 140).

FIGURE 100: Tap bearing in position using special tool AS0010004200 (see drawing AS0010004200-000-001 p. 154).

FIGURE 102: Install clutch support assembly, align with 8x cap screws and tap clutch support down before driving the cap screws.

FIGURE 103: Tighten 8x cap screws to 80-88 ft·lbs (cap screws should be precoated, size ¾).

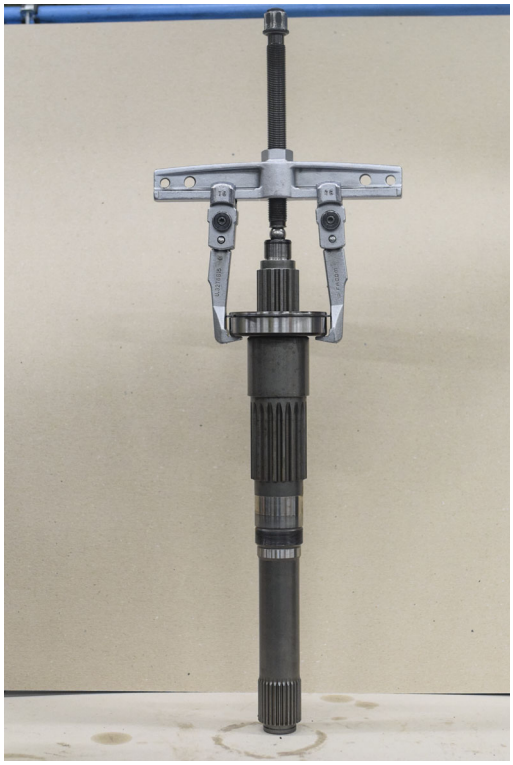


FIGURE 104: Remove bearing.

NOTE:

1/3rd shaft is assembled in a similar way, no spacer is installed on top of the gear, also long hub is placed to the input side of the case. Install long spacer underneath small spacer!.

FIGURE 105: Install bearing (heat to 120°C).

FIGURE 107: Remove seal.

⚠WARNING

Wear protective garments when handling hot objects.
Use heat resistant gloves to pick up hot objects.
Keep body parts and clothes away from heat source.

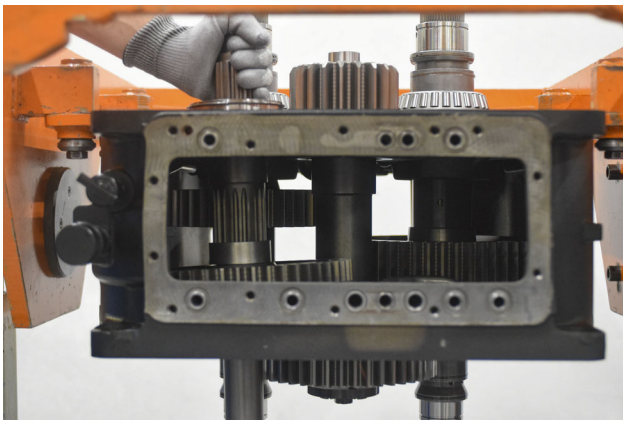


FIGURE 106: Position forward gear with hub to rear side of case, position spacer on top of the gear. Insert shaft into shaft bore and through the spacer and forward gear. Pull the shaft from the other side into position.

FIGURE 108: Install new seal, apply Loctite 641 using special tools AS0010006200 (see drawing AS0010006200-000-001 p. 156) and AS0010005900 (see drawing AS0010005900-000-001 p. 155).

FIGURE 109: Install gasket.

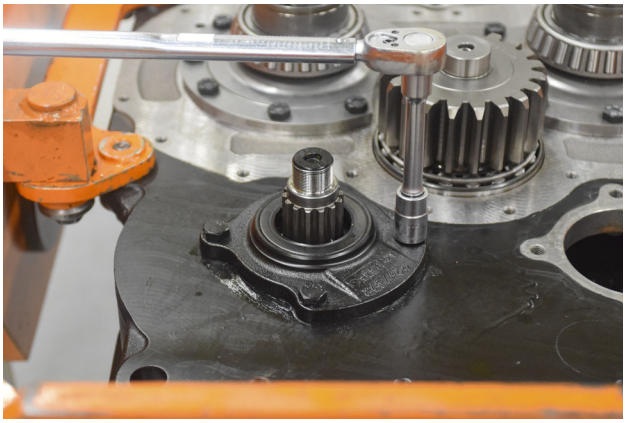


FIGURE 110: Install input cap + 4x cap screws, torque to 57-63 ft·lbs (size ¾).

FIGURE 111: Install flange.

FIGURE 112: Install O-ring, washer and nylon nut.

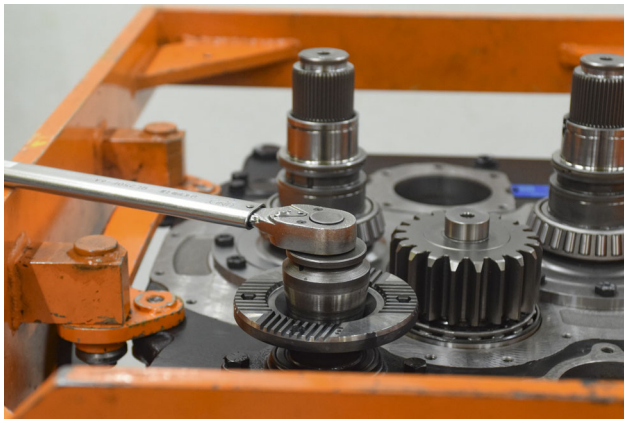


FIGURE 113: Block input shaft and torque nylon nut to 150-175 ft·lbs

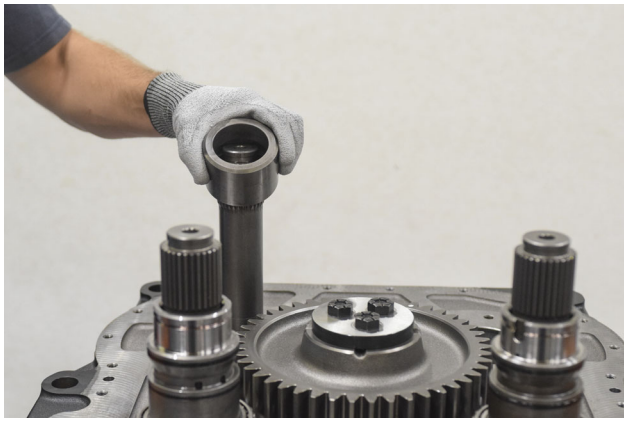


FIGURE 114: Install spacer.

FIGURE 115: Install bearing + lock ball, align bearing lock ball with notch in bearing bore.

FIGURE 116: Tap bearing in position using special tool AS0010004200 (see drawing AS0010004200-000-001 p. 154).

FIGURE 117: Prevent shaft from moving and Install nylon nut, torque to 175-200 ft·lbs using special tool AS0010005000 (see drawing AS0010005000 p. 140).

FIGURE 118: Install clutch support assembly, align with 8x cap screws and tap clutch support down before driving the cap screws.

FIGURE 119: Tighten 8x cap screws to 80-88 ft·lbs (cap screws should be precoated, size ¾).

NOTE:

Reverse shaft is assembled in a similar way.

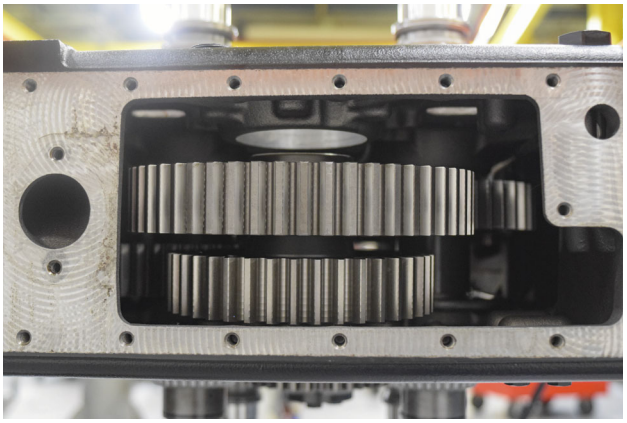


FIGURE 120: Position output gears, both hubs to the input side of the case.

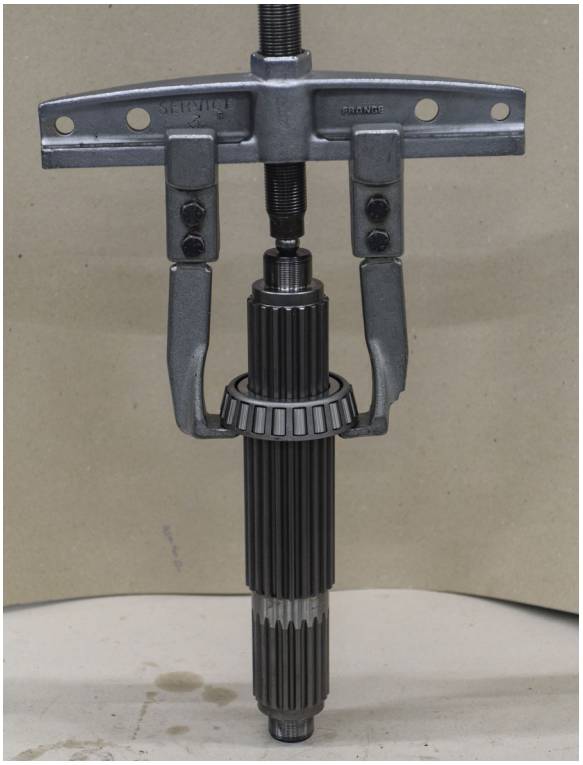


FIGURE 121: Remove bearing.

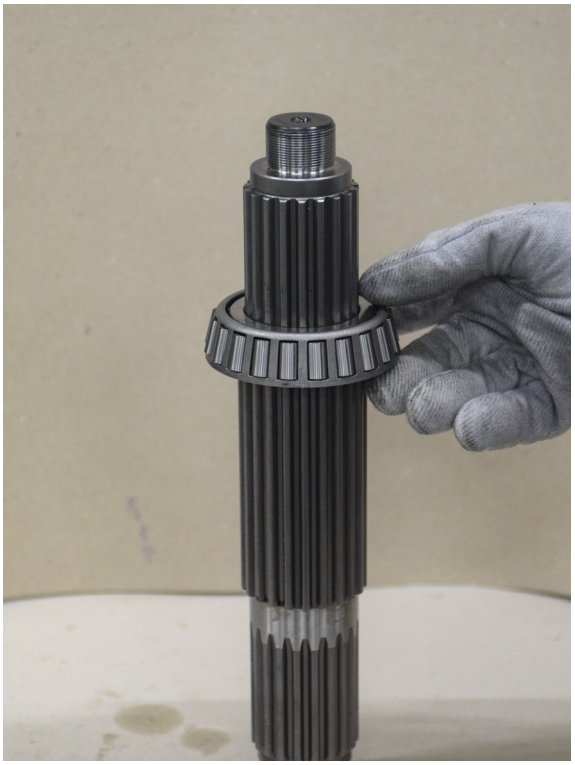


FIGURE 122: Install bearing (heat to 120°C).

FIGURE 123: Lower shaft into bore hole through output gears.

⚠WARNING

Wear protective garments when handling hot objects.
Use heat resistant gloves to pick up hot objects.
Keep body parts and clothes away from heat source.

FIGURE 124: Install bearing cup using speial tool AS0010009800 (see drawing AS0010009800 p. 142).

FIGURE 125: Remove O-ring.

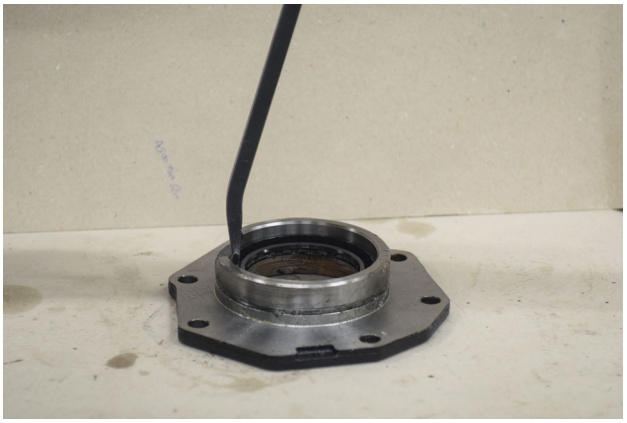


FIGURE 126: Remove oil-seal.

FIGURE 127: Install oil-seal.

FIGURE 128: Install O-ring.

FIGURE 129: Install bearing cap +6x cap screws torque to 57-63 ft·lbs using special tools AS0010006400 (see drawing AS0010006400-000-001 p. 157) and AS0010005900 (see drawing AS0010005900-000-001 p. 155).

FIGURE 130: Install bearing cone (heat to 120°C).

⚠WARNING

Wear protective garments when handling hot objects.
Use heat resistant gloves to pick up hot objects.
Keep body parts and clothes away from heat source.

FIGURE 131: Install bearing cup using special tool AS0010009800 (see drawing AS0010009800 p. 142).

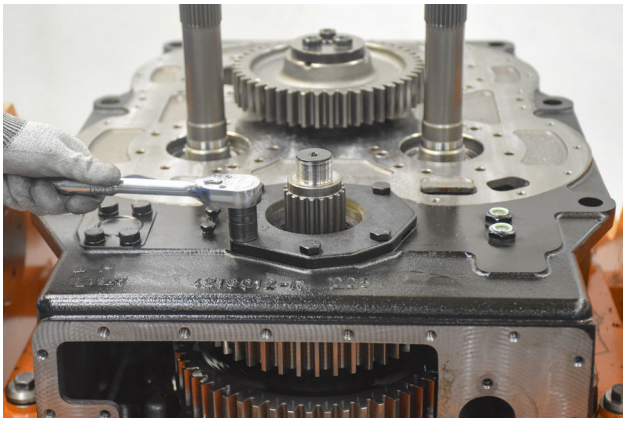


FIGURE 132: Install bearing cap, shims and 6x cap screws torque to 57-63 ft·lbs (size ¾) When new bearings are used follow the shimming procedure as followed. Do not tighten cap screws. Using an inch pound torque wrench on the output flange nut, determine the amount of torque required to turn the gear train. Tighten cap screws to 57-63 ft·lbs It must take 6 to 8 inch lbs. more torque to turn the gear train with cap screws torque than when bolts were loose. Add or remove shims from bearing cap to adjust preload when needed.

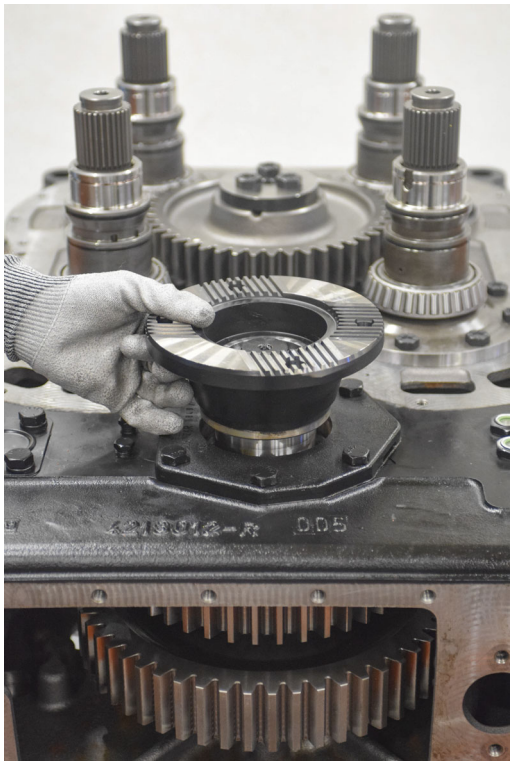


FIGURE 133: Install flange.

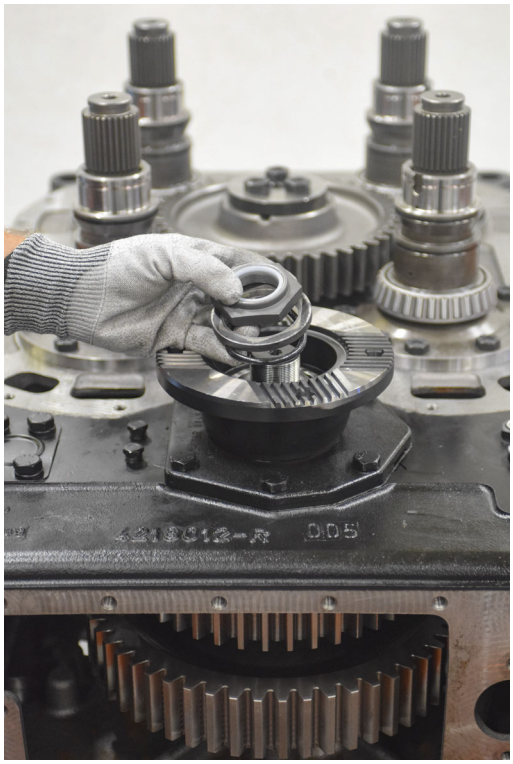


FIGURE 134: Install O-ring, washer and nylon nut.

FIGURE 135: Torque nylon nut to 250-300 ft·lbs

NOTE:

Repeat for other side.

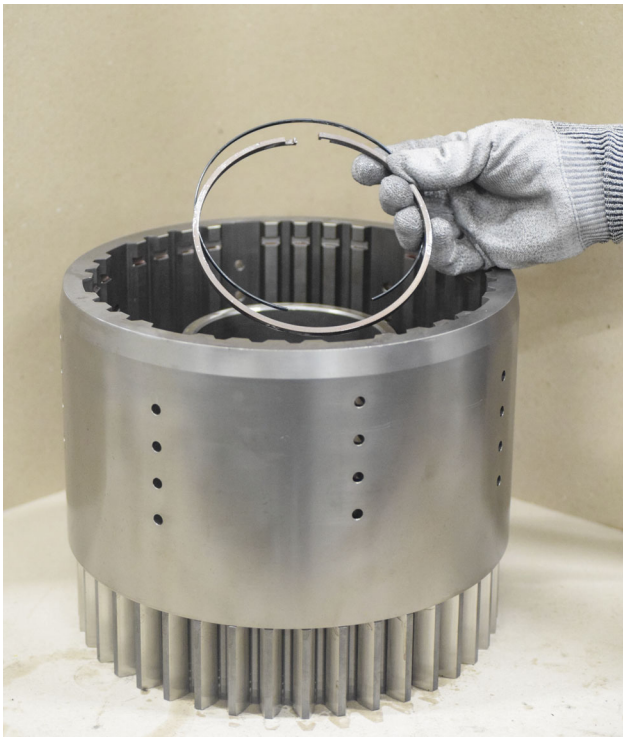


FIGURE 136: Remove inner piston ring and expander.

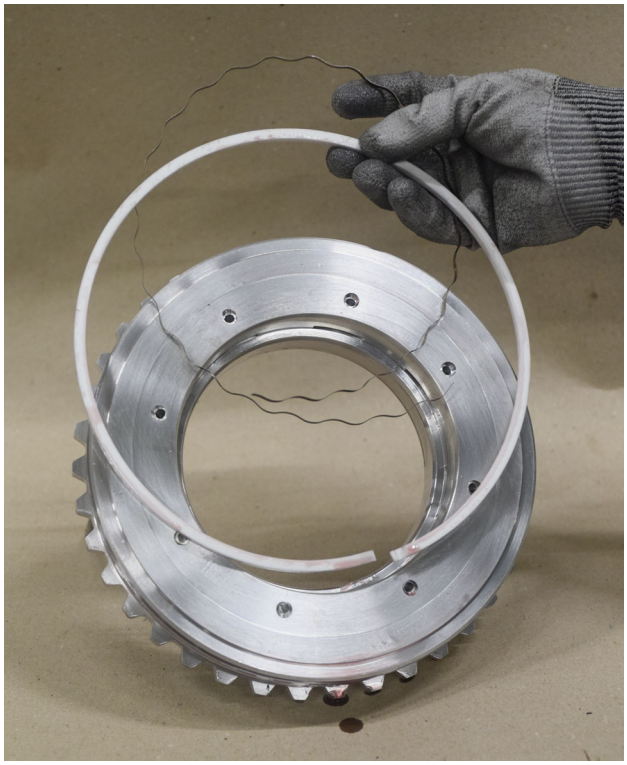


FIGURE 137: Remove outer piston ring and expander.

FIGURE 138: Remove bearing cone.

FIGURE 139: Remove bearing cup.

FIGURE 140: Remove bearing cup.

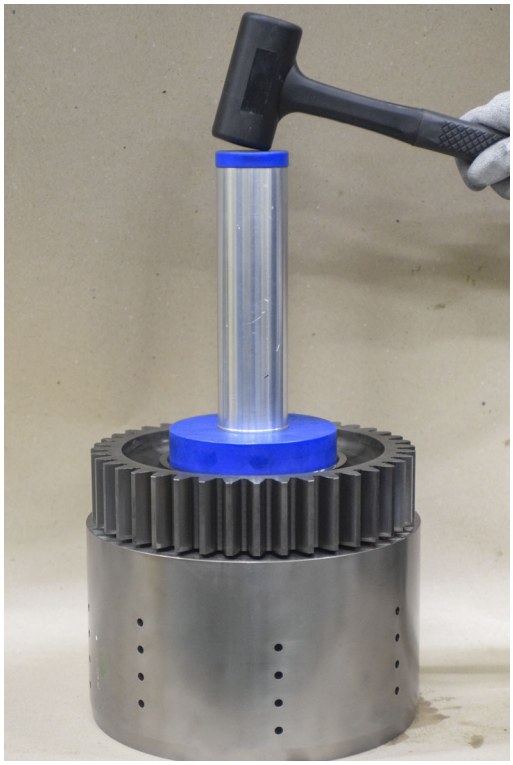


FIGURE 141: Install bearing cup.

FIGURE 142: Install bearing cup.

FIGURE 143: Install inner piston ring and expander.

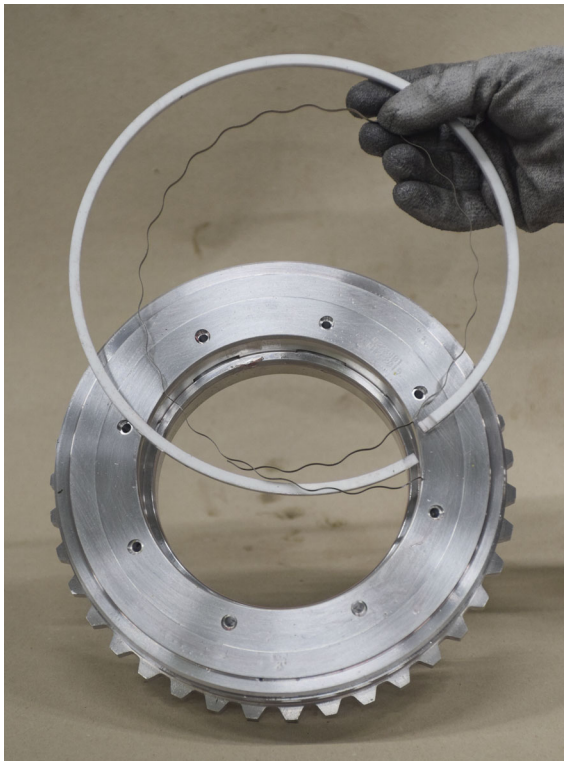


FIGURE 144: Install outer piston ring and expander.

FIGURE 145: Install piston, use two guide pins.

FIGURE 146: Install spacer, Belleville washers, spacer and snapring.

FIGURE 147: Using special tool AS0010012900 (see drawing AS0010012900 p. 153), push Belleville washers down and install snapring in position.

FIGURE 148: Grease and size clutch support piston rings and install clutch assembly using special tool TG1500106500 (see drawing TG1500106500 p. 144).

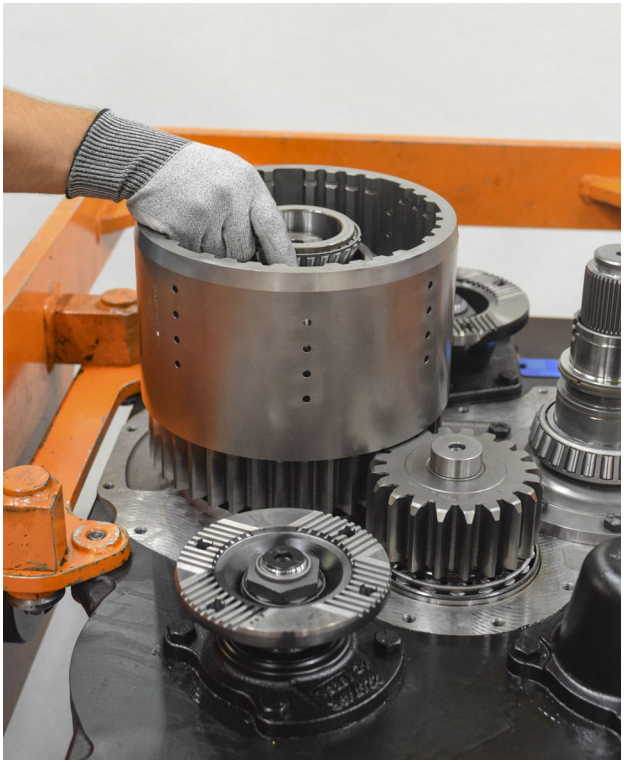


FIGURE 149: Install bearing.

FIGURE 150: Install washer and snap-ring, when using new bearings follow shimming procedure below.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

⚠CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in p. 64.

FIGURE 151: Assure bearings are seated by tapping outer cone and rotating drum assembly on support. Select a snap-ring and washer that snaps into position and measure the load on the bearing. Value must be between .000 to a maximum .002 loose (end play). Adjust snap-ring and washer if needed. See chart for snap-ring and washer thickness.

FIGURE 152: Install hub assembly.

FIGURE 153: Install snap-ring.

FIGURE 154: Installing clutch discs: Complete discs packs are supplied with an adjusted total thickness (pre-shimmed). Keep discs as ordered in the pack (from bottom to top). Start installing the bottom steel disc next to the piston, alternate friction and steel discs. In case clutch discs are mixed up, follow the assembly instructions at Clutch packs assembly instructions p. 64 to check the pack thickness, the pack shimming and position of the shims into the clutch pack.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

⚠CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in p. 64.

FIGURE 155: Install endplate.

FIGURE 156: Install snap-ring.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

⚠ CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in p. 64.

NOTE:

1st 2nd 3rd 4th forward and reverse are assembled in a similar manner. The 1st and 2nd clutches are larger than the others, using special tool TG1500106700 (see drawing TG1500106700 p. 149) to lift Forward, reverse, 3th and 4th clutch. Clutch being assembled is the 1th clutch. Different amounts of discs are mounted, check parts list for correct amount, for shimming of clutch packs refer to Clutch packs assembly intructions p. 64.

FIGURE 157: Install gasket.

FIGURE 158: Install cover, use 2x guide pins.

FIGURE 159: Install 20x cap screws + washers, torque to 23-25 ft·lbs (cap screws should be precoated, size 9/16).

FIGURE 160: Install baffle + gasket.

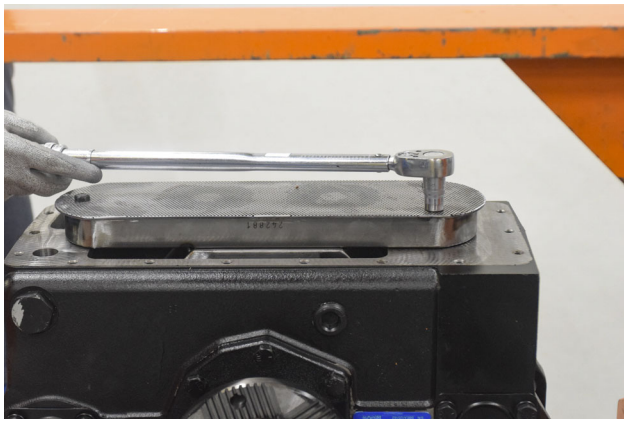


FIGURE 161: Install 3x cap screws, apply Loctite 243, torque to 23-25 ft·lbs (size 9/16).

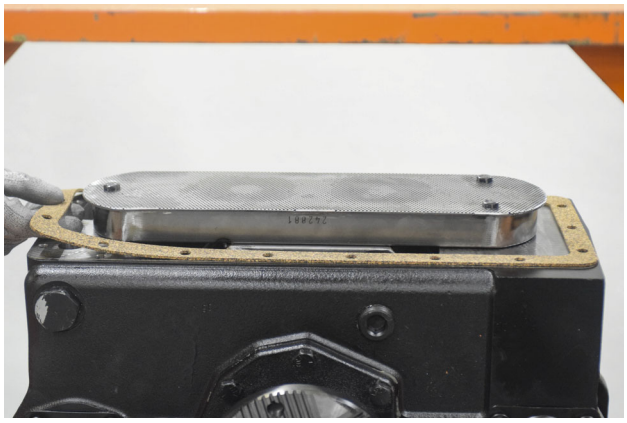


FIGURE 162: Install gasket.

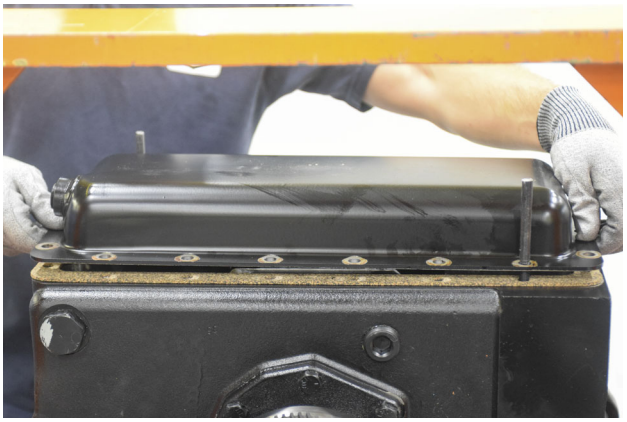


FIGURE 163: Install sump + sump magnets, use 2x guide pins.

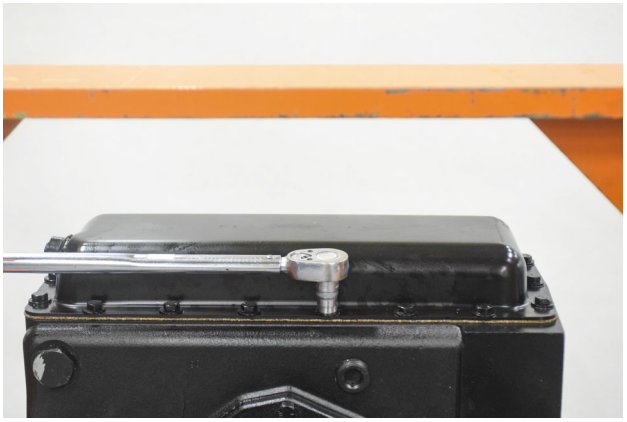


FIGURE 164: Install 18x cap screws + washers, torque to 23-25 ft·lbs (cap screws should be precoated, size 9/16).

FIGURE 165: Install gasket.

FIGURE 166: Install cover, use 2x guide pins.

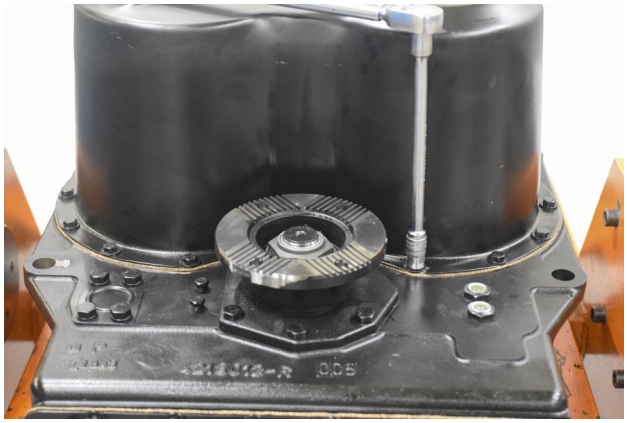


FIGURE 167: Install 26x cap screws + washers, torque to 23-25 ft·lbs (cap screws should be precoated, size 9/16).

FIGURE 168: Install 6x O-rings + gasket.

FIGURE 169: Install adaptor plate, use 2x guide pins.

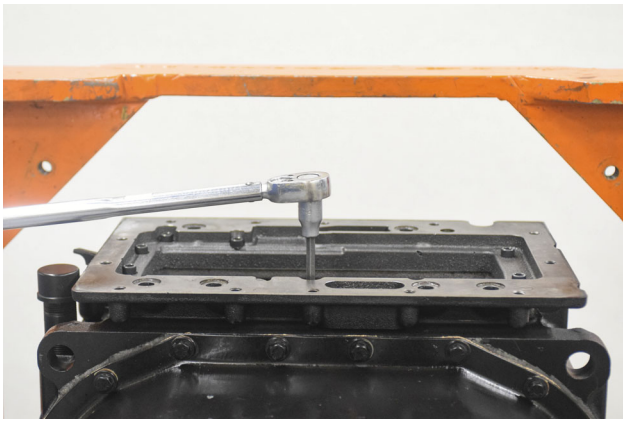


FIGURE 170: Install 12x cap screws, apply Loctite 243, torque to 41-46 ft·lbs (size 8).

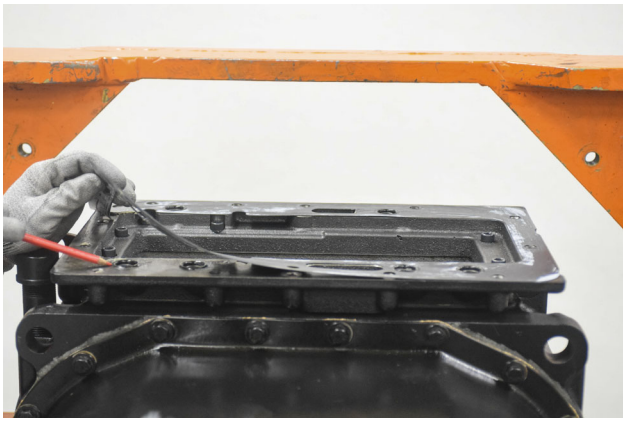


FIGURE 171: Install 6x O-rings + gasket.

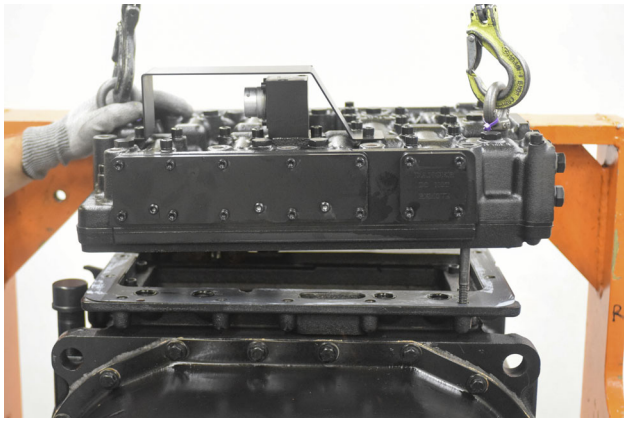


FIGURE 172: Install valve using 2x eyebolts (M14) use 2x guide pins.

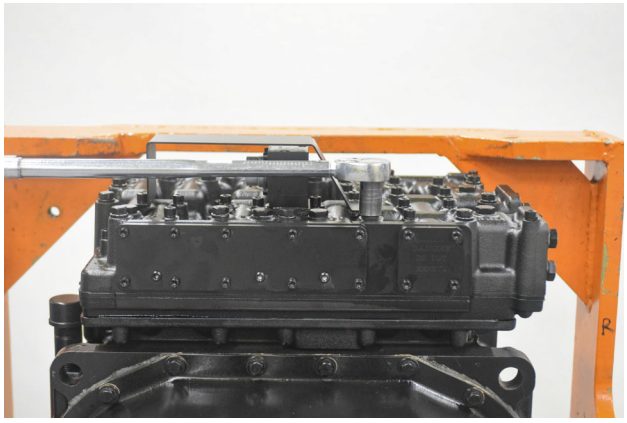
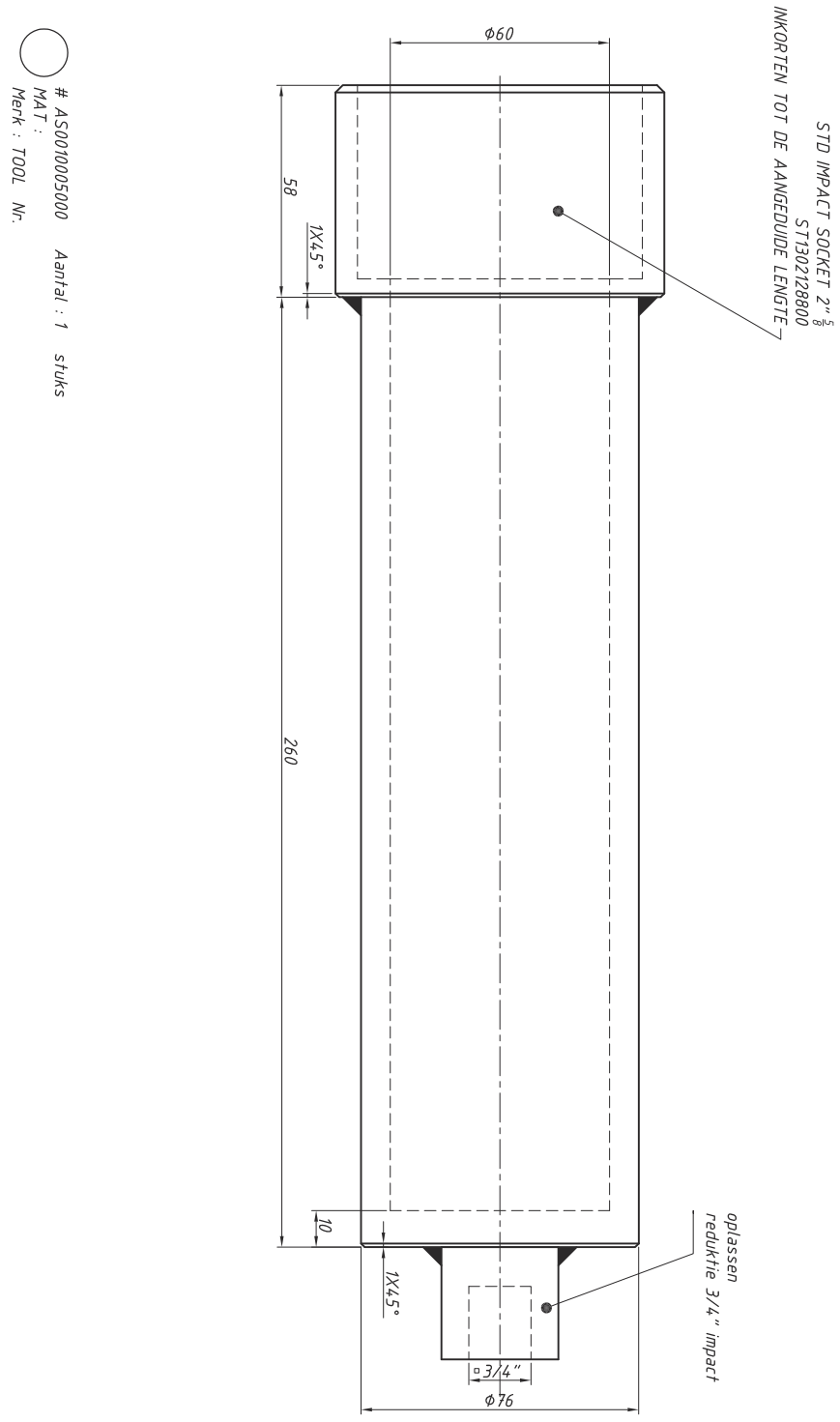


FIGURE 173: Install 13x cap screws + washers, torque to 41-46 ft·lbs (size 5/8).

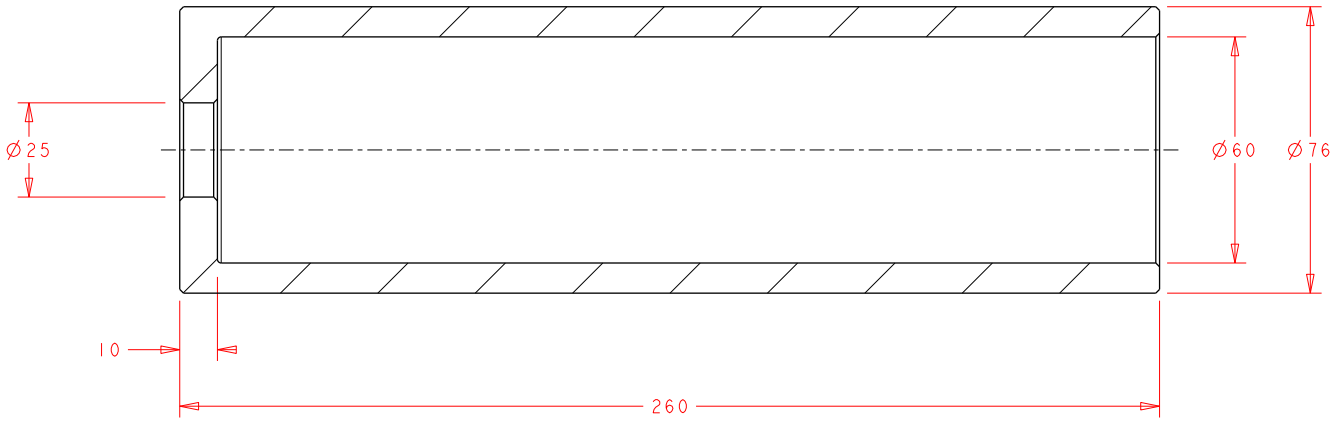
SPECIAL TOOLS

AS0010005000

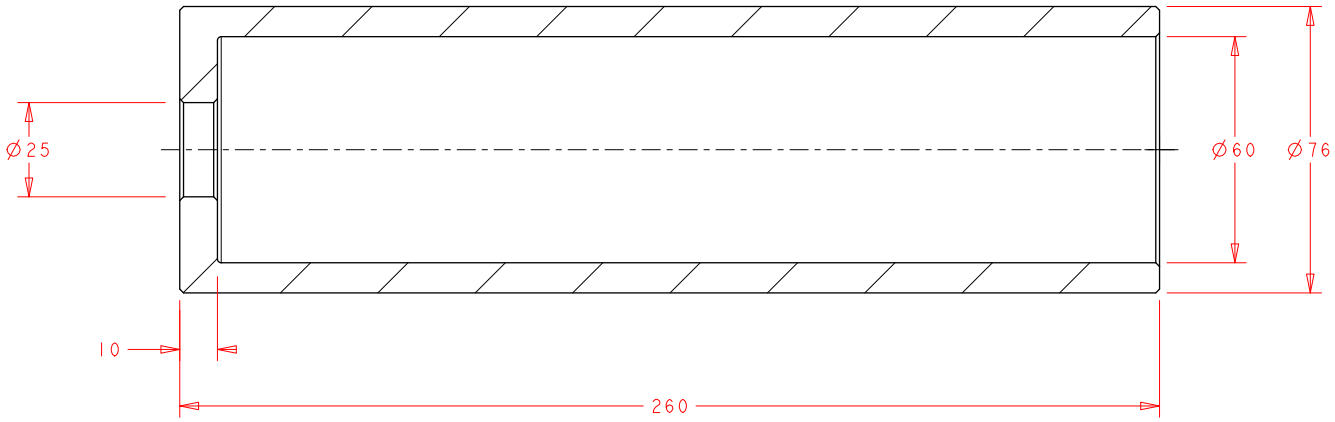
AS0010005000-000-001



AS0010005000-000-002

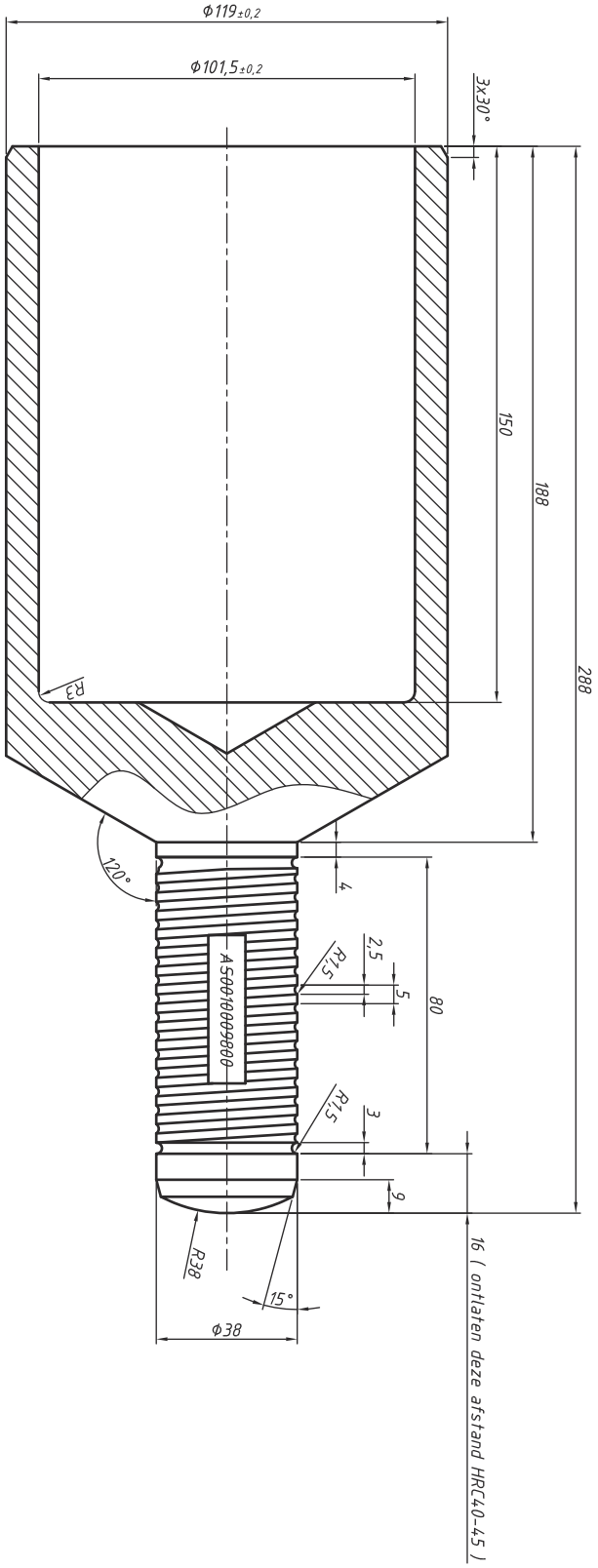


TOOL00000516_A



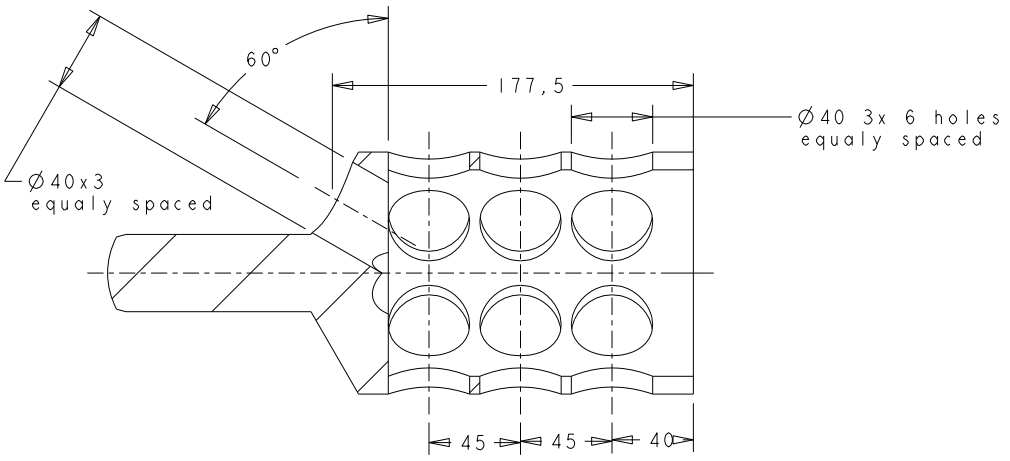
AS0010009800

AS0010009800-000-001

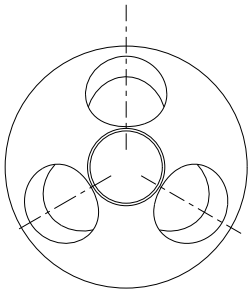


1 # AS0010009800 Aantal : 1 stuks
MAT : SAE8620 CEM HARD HRC 60+/-2
Merk : TOOL & DET Nr.
Niet aangeduide hoeken breken : 0,5x45°

AS0010009800-000-002

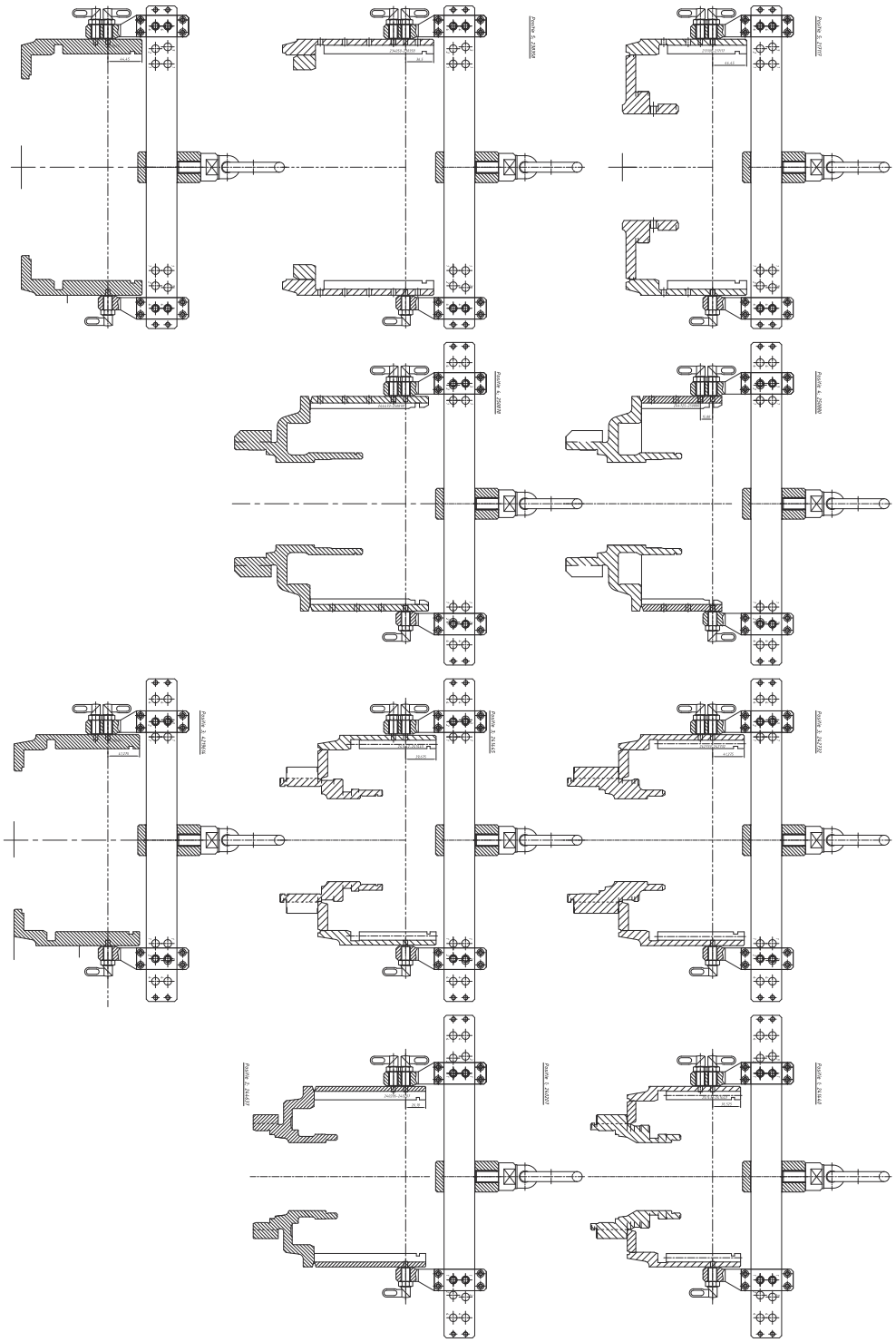


SECTION A-A
SCALE 1:2



TG1500106500

TG1500106500-000-001



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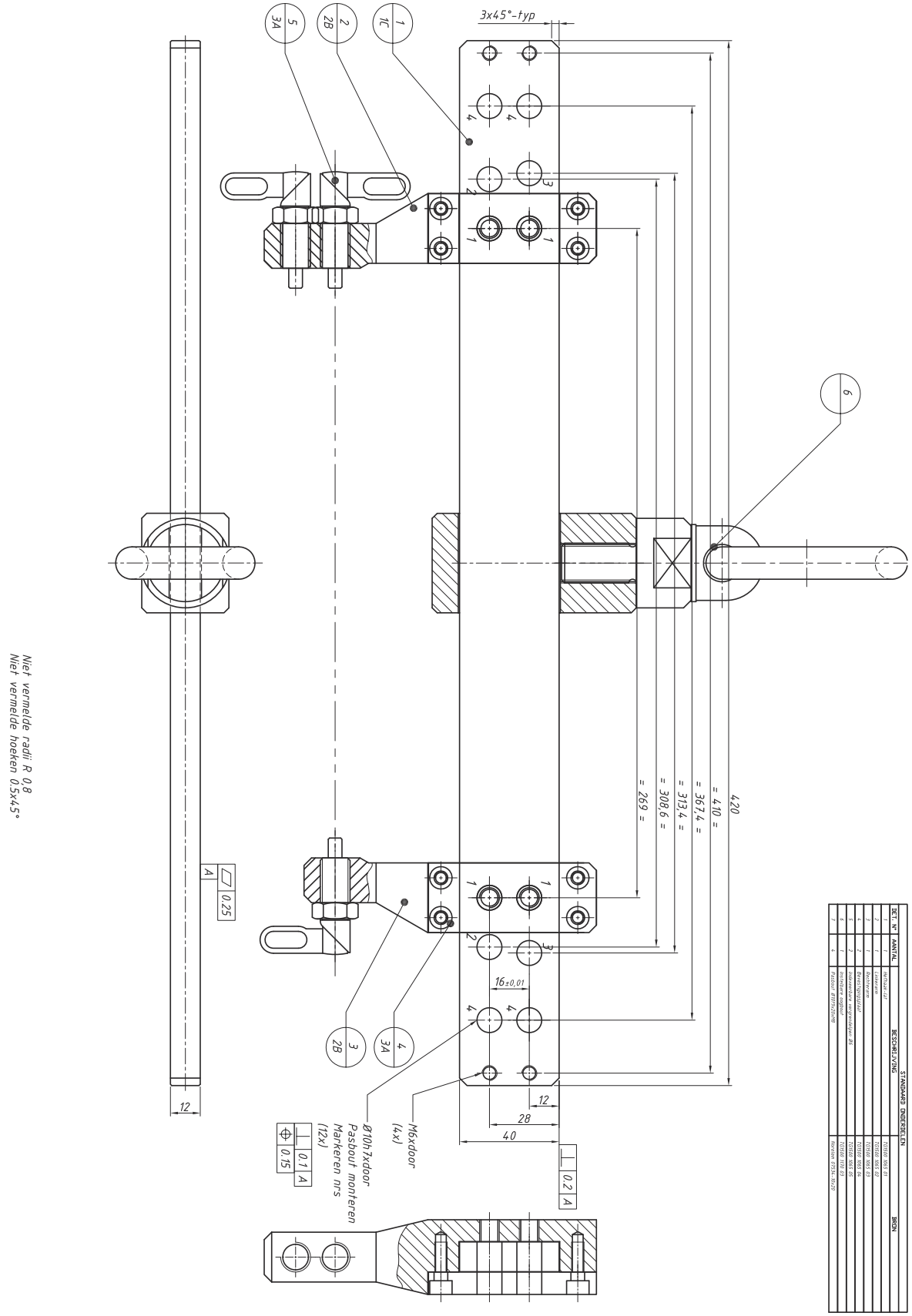

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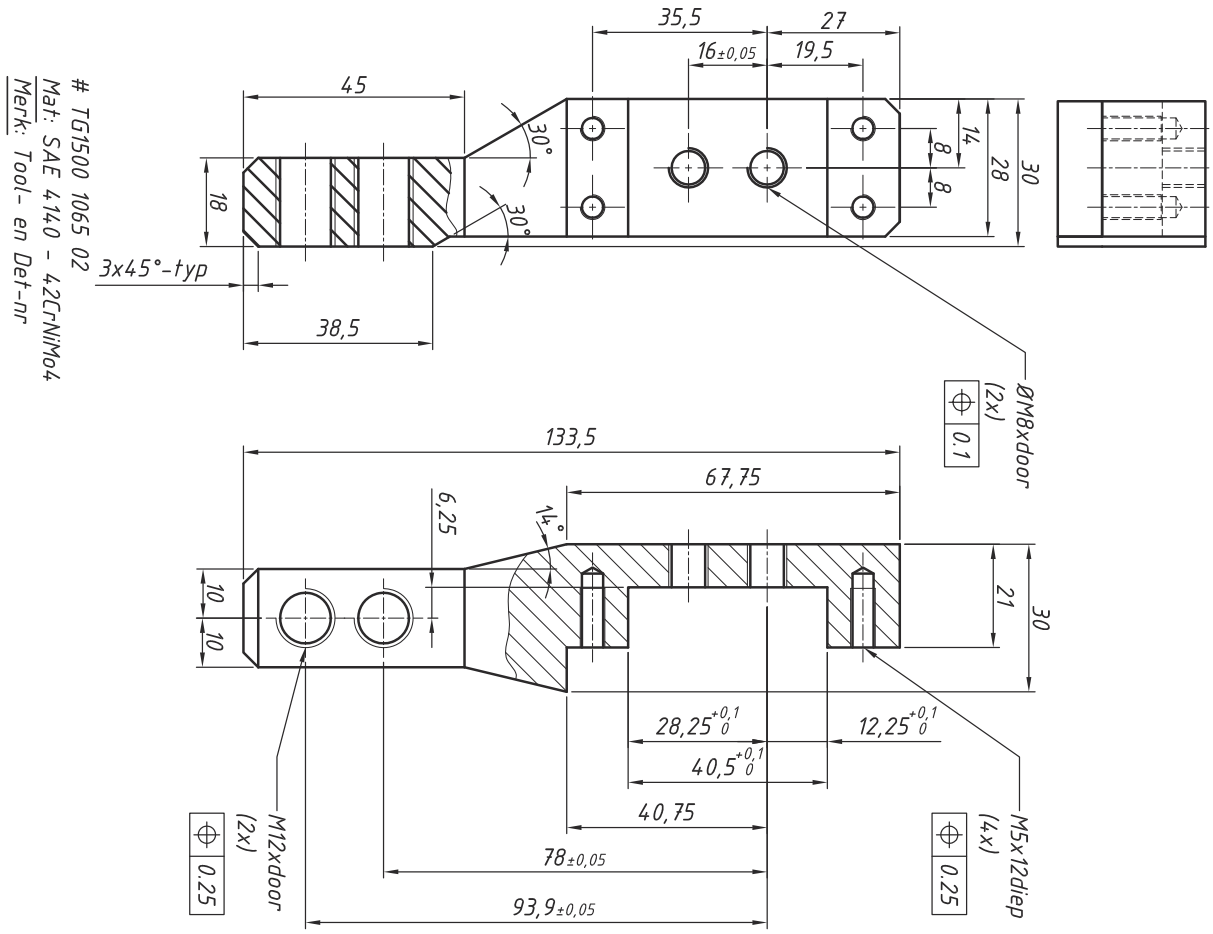
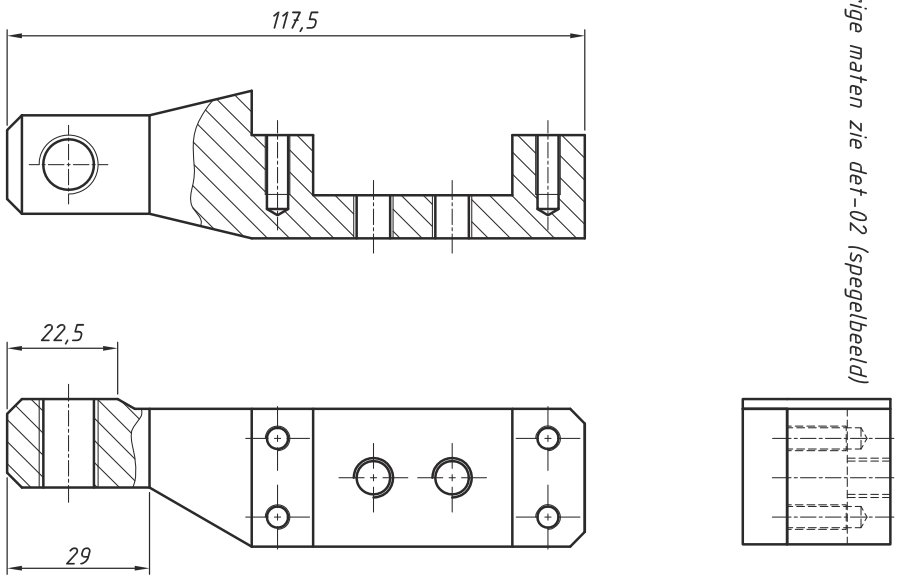
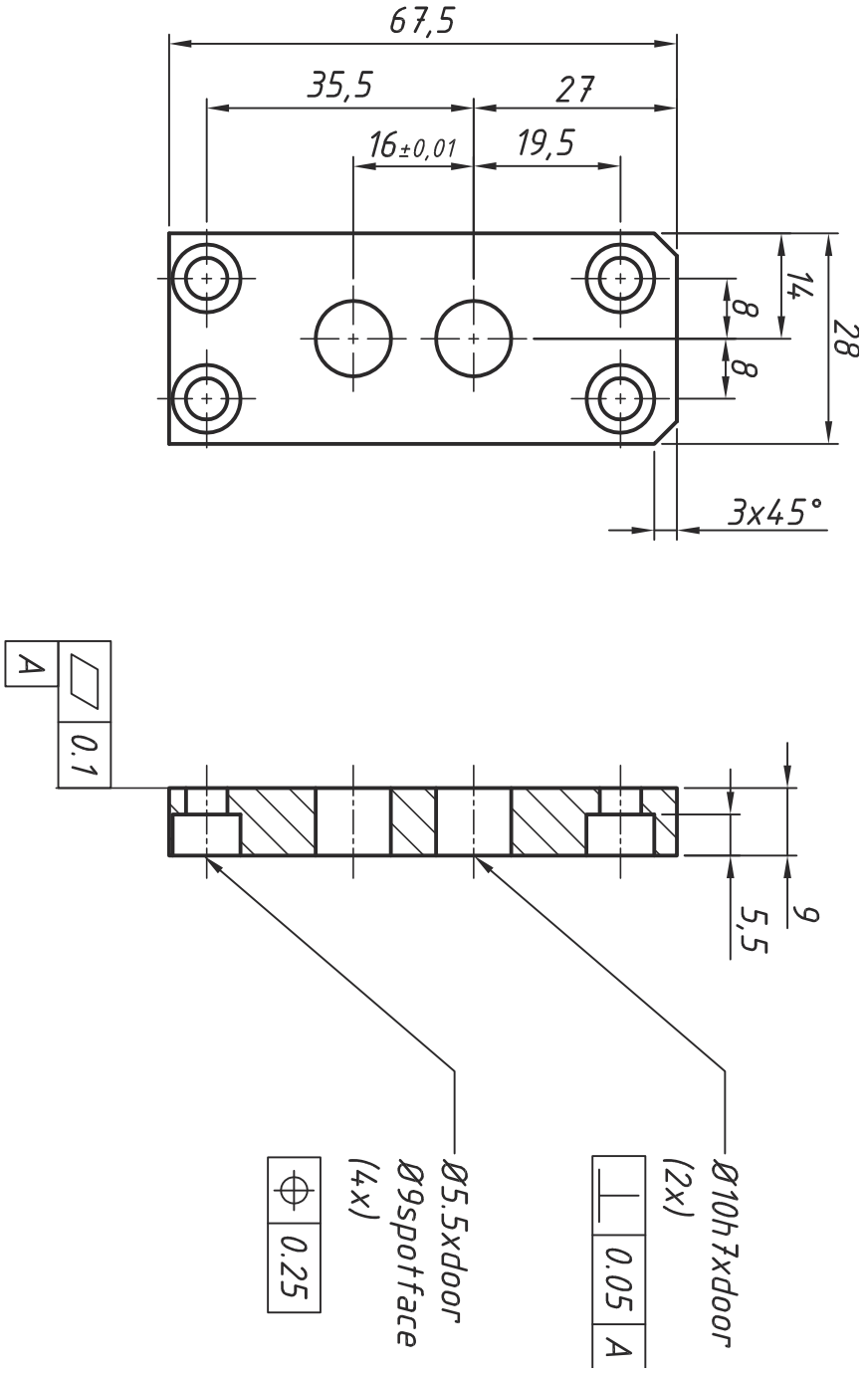




TG1500106500-000-004

Niet vermelde radii R 0,8
Niet vermelde hoeken 0.5x45°



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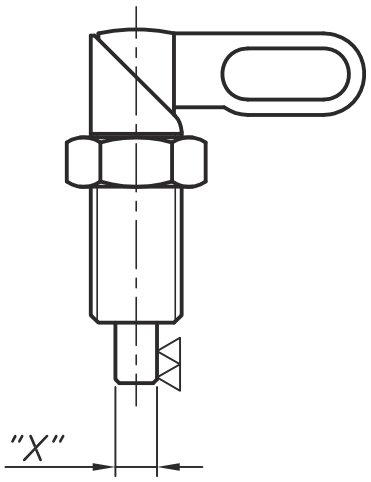

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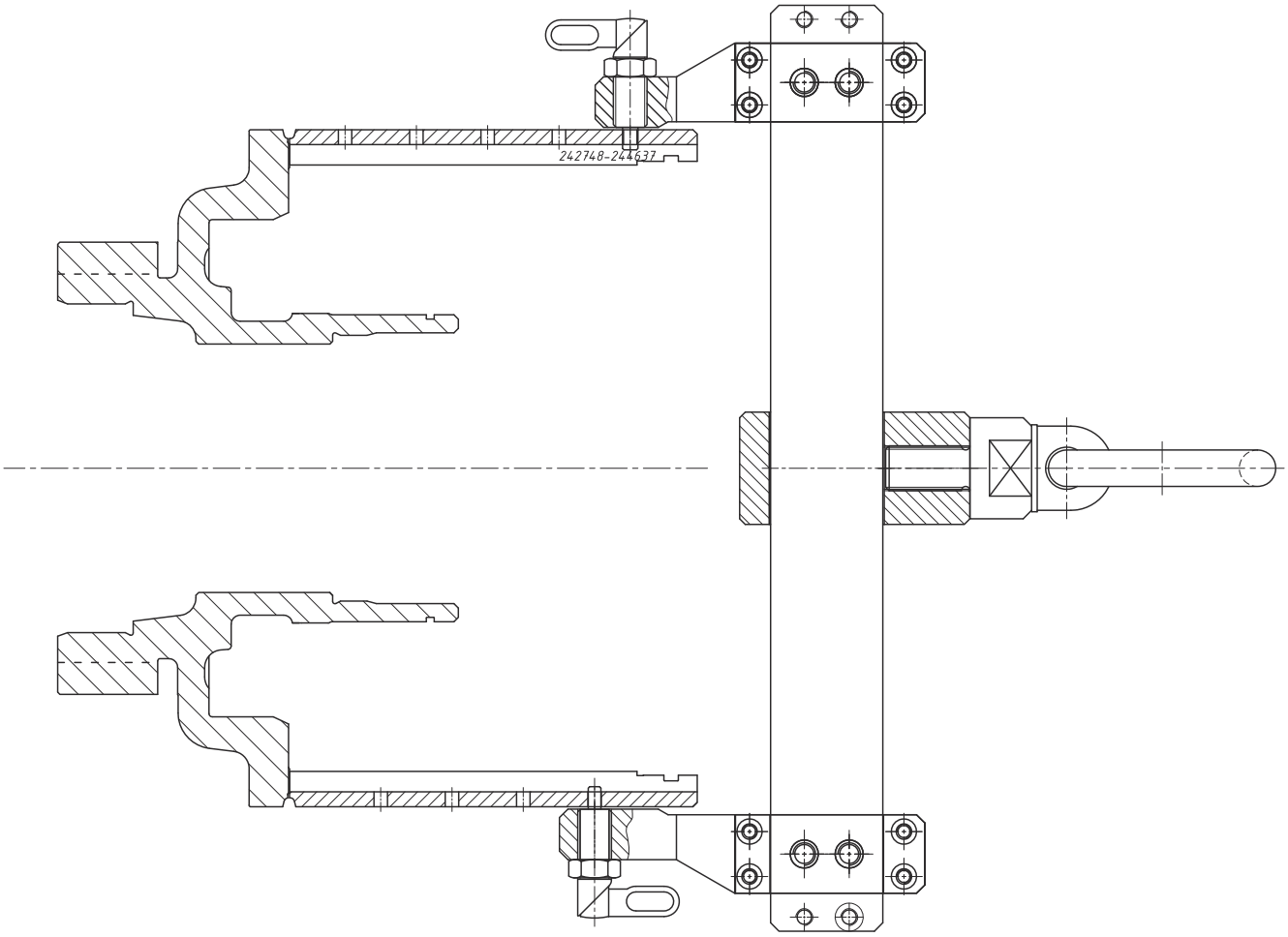
Make from: Norelem 03099-070612
Ø "X": Ø6 0/-0.1

TG1500106700

TG1500106700-000-001



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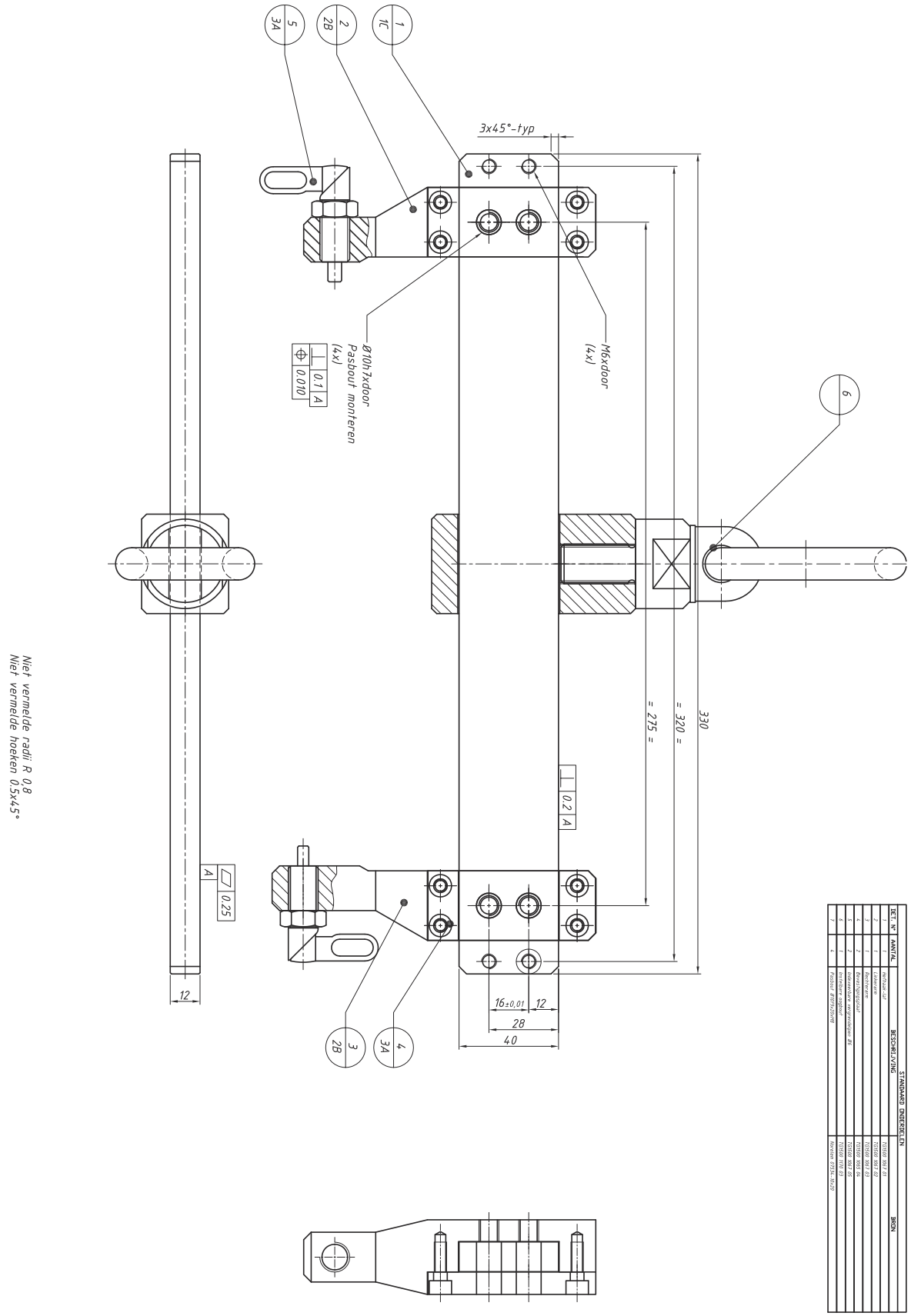
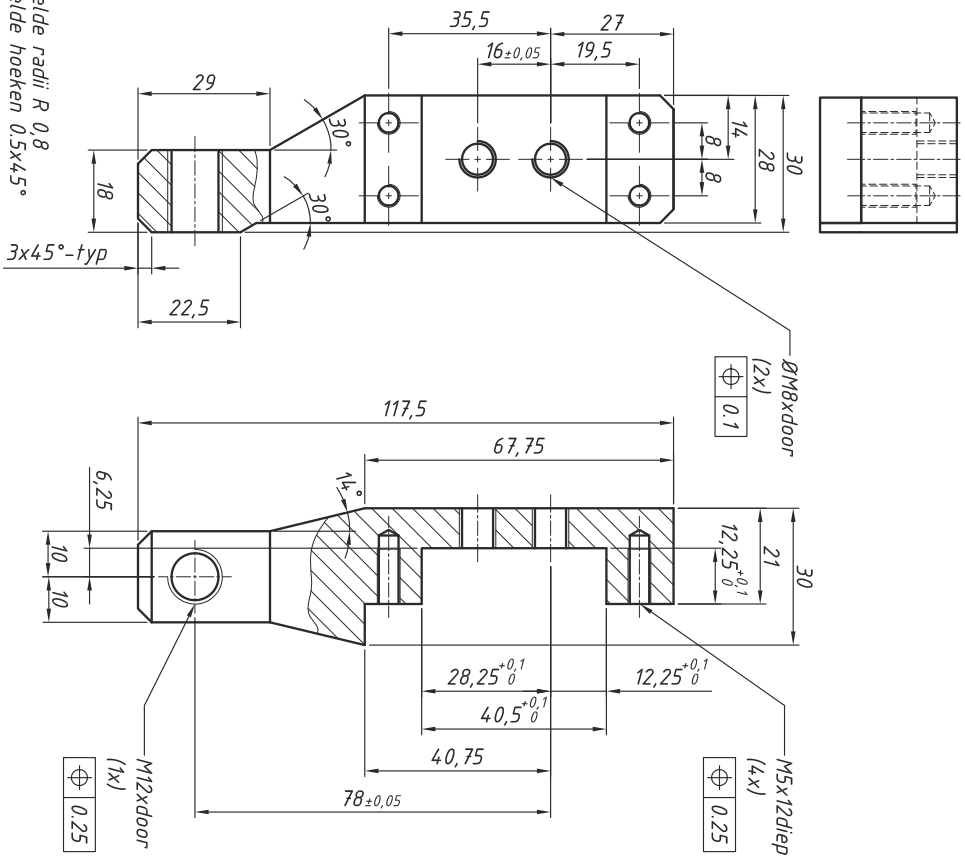


TG1500106700-000-003

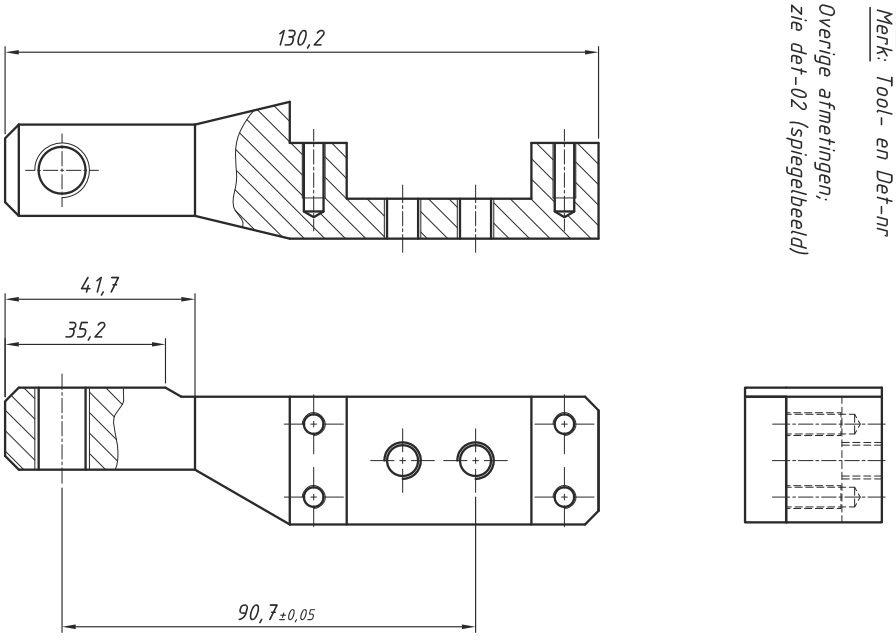
TG1500 1067 02
Mat: SAE 4140 - 42CrNiMo4
Merk: Tool- en Det-nr

Niet vermelde radii R 0,8
Niet vermelde hoeken 0.5x45°



TG1500 1067 03
Mat: SAE 4140 - 42CrNiMo4
Merk: Tool- en Det-nr

Overige afmetingen;
zie det-02 (spiegelbeeld)



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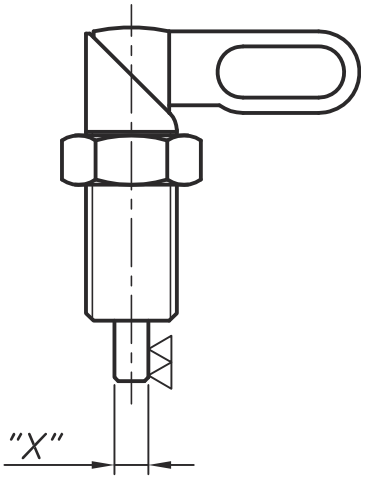

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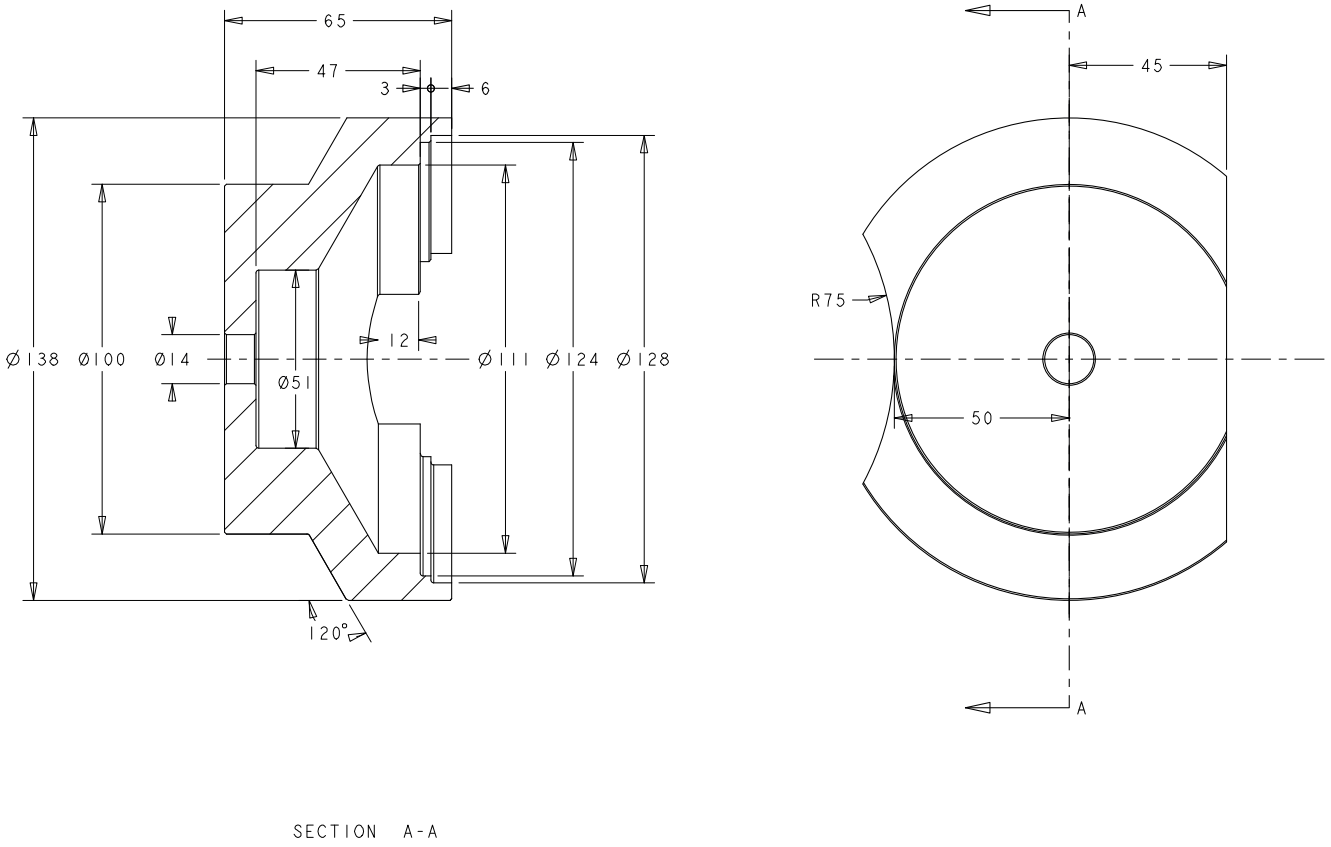
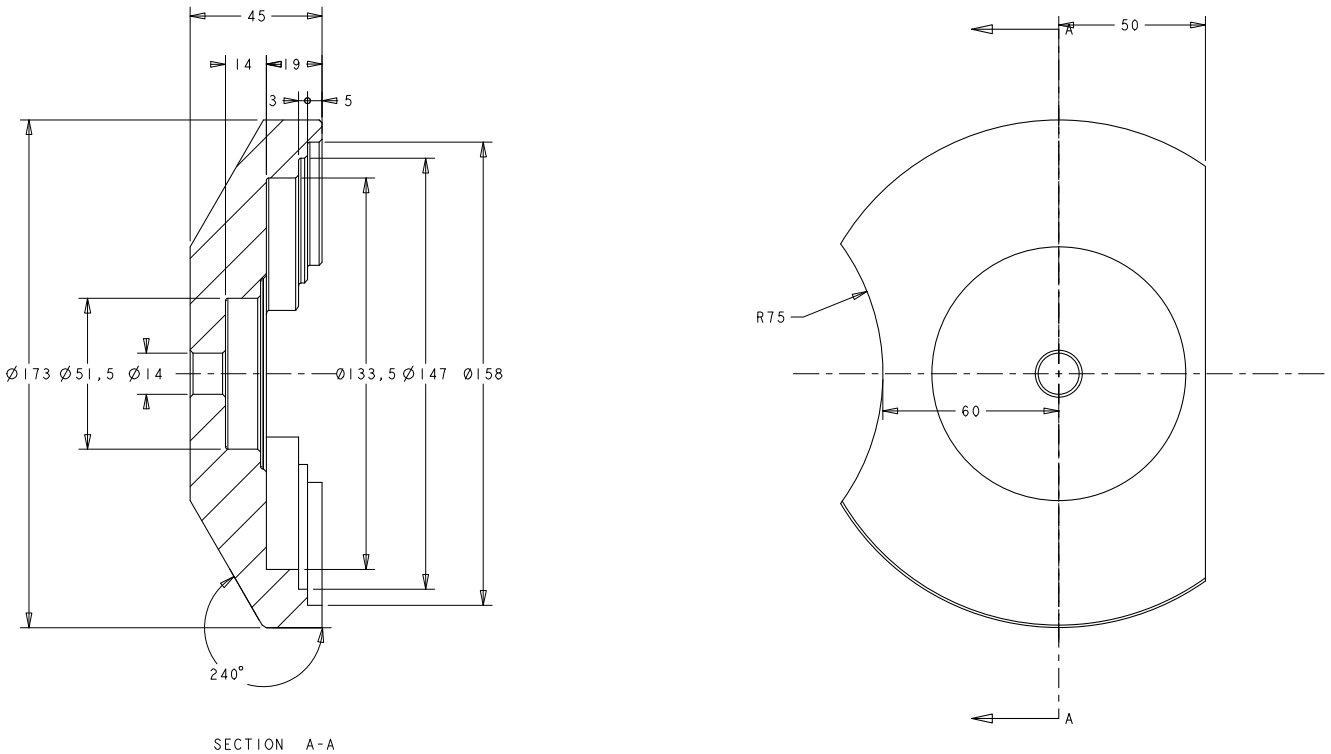
Make from: Norelem 03099-070512
Ø "X": Ø4.4 0/-0.1

AS0010012800



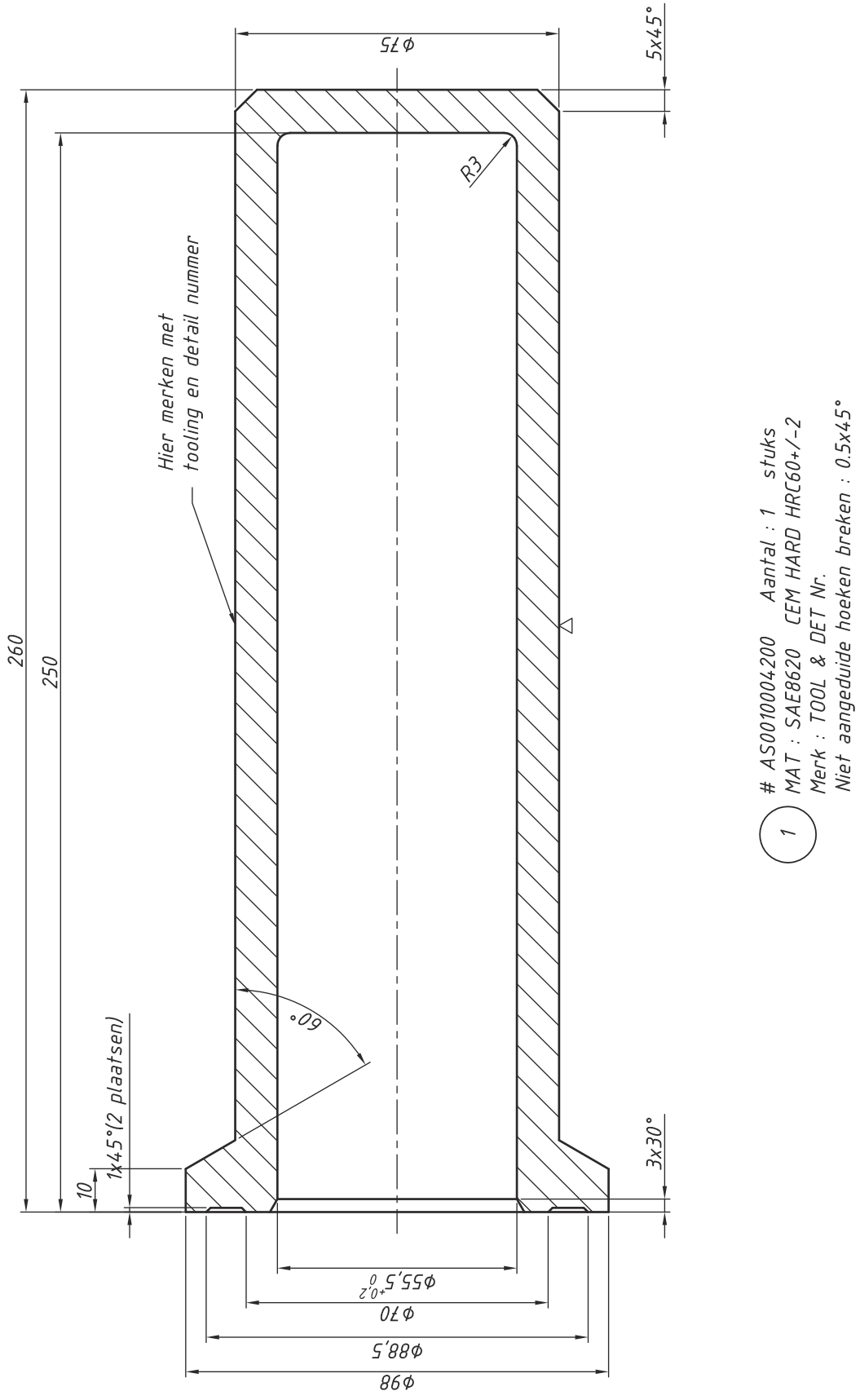
SECTION A-A

AS0010012900

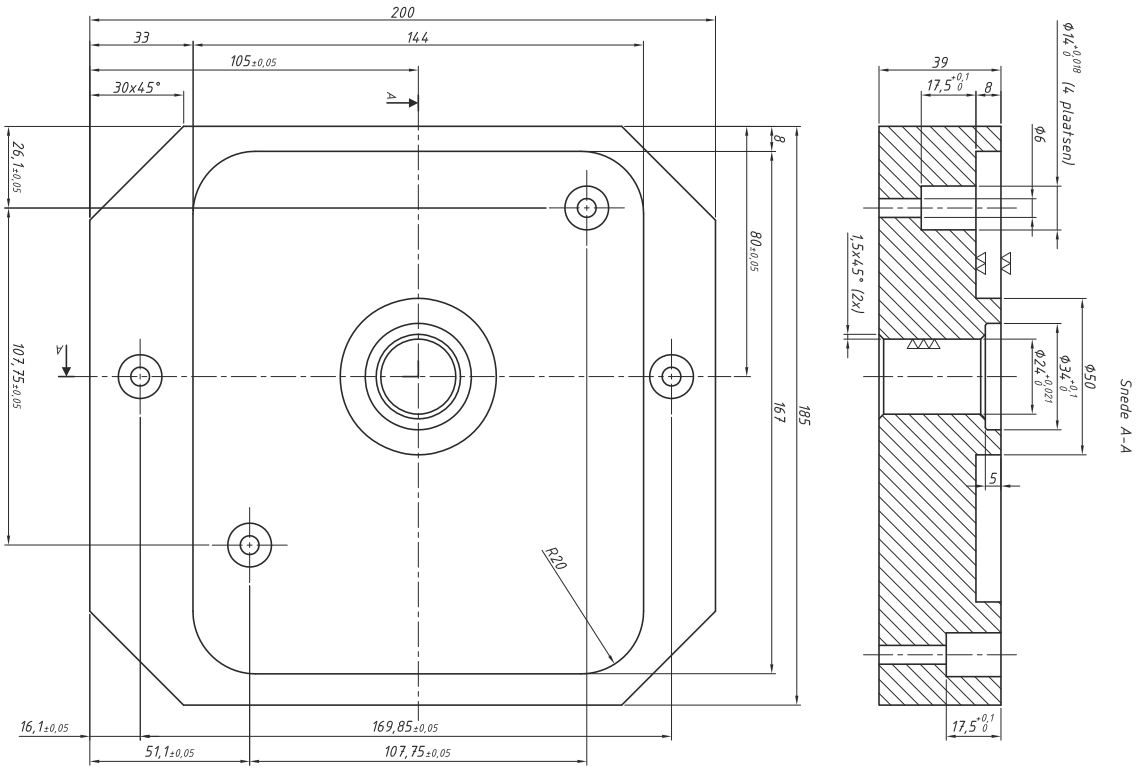


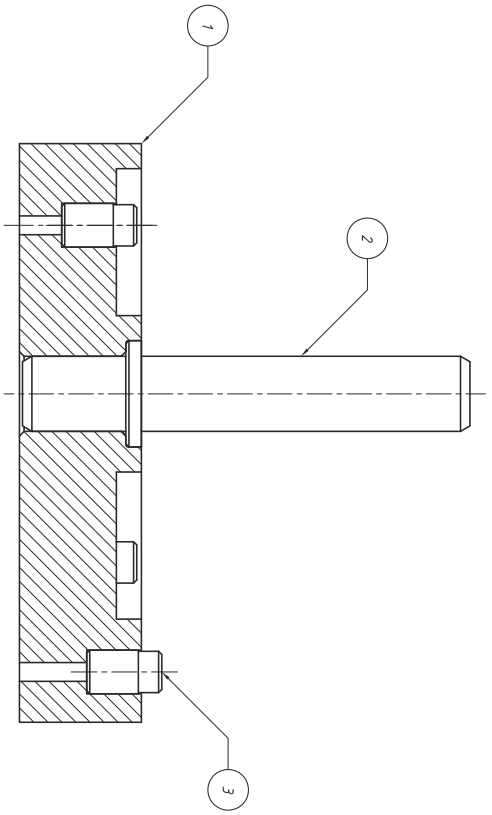
SECTION A-A

AS0010004200-000-001



AS0010005900-000-001

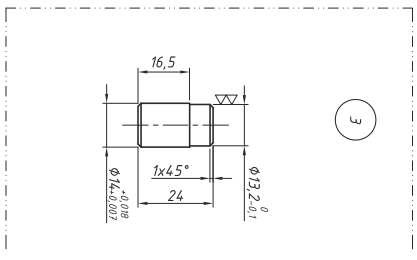




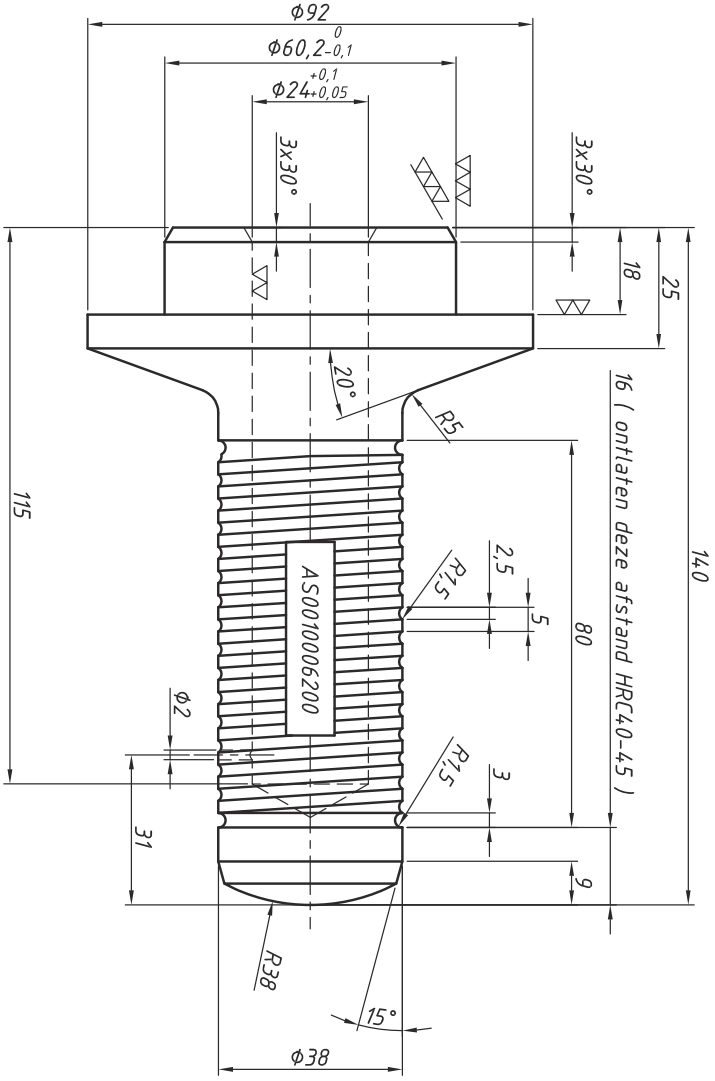
1

AS0010005901 Aantal : 1 Stuk(s)
Mat : 42CrMo4 (SAE4140)
Gasnitreren HV 600-700 (55-62 HRC)
Inzetdiepte : 0,1 à 0,2 mm diep
Merk : TOOL Nr.
Niet aangeduide hoeken breken : 0,5x45°
Niet aangeduide radiussen : R=0,8

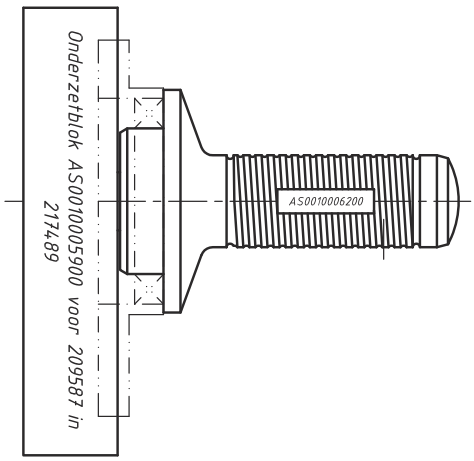
Optioneel :
MAT SAE8620 carbonitreren HRC 55-62

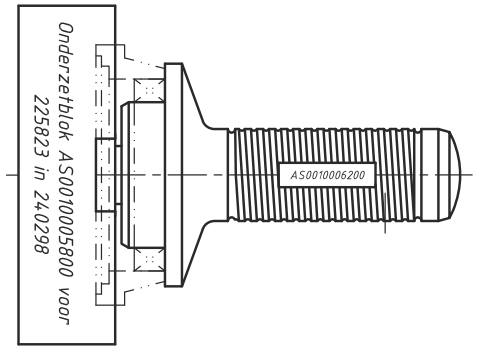


AS0010006200-000-001

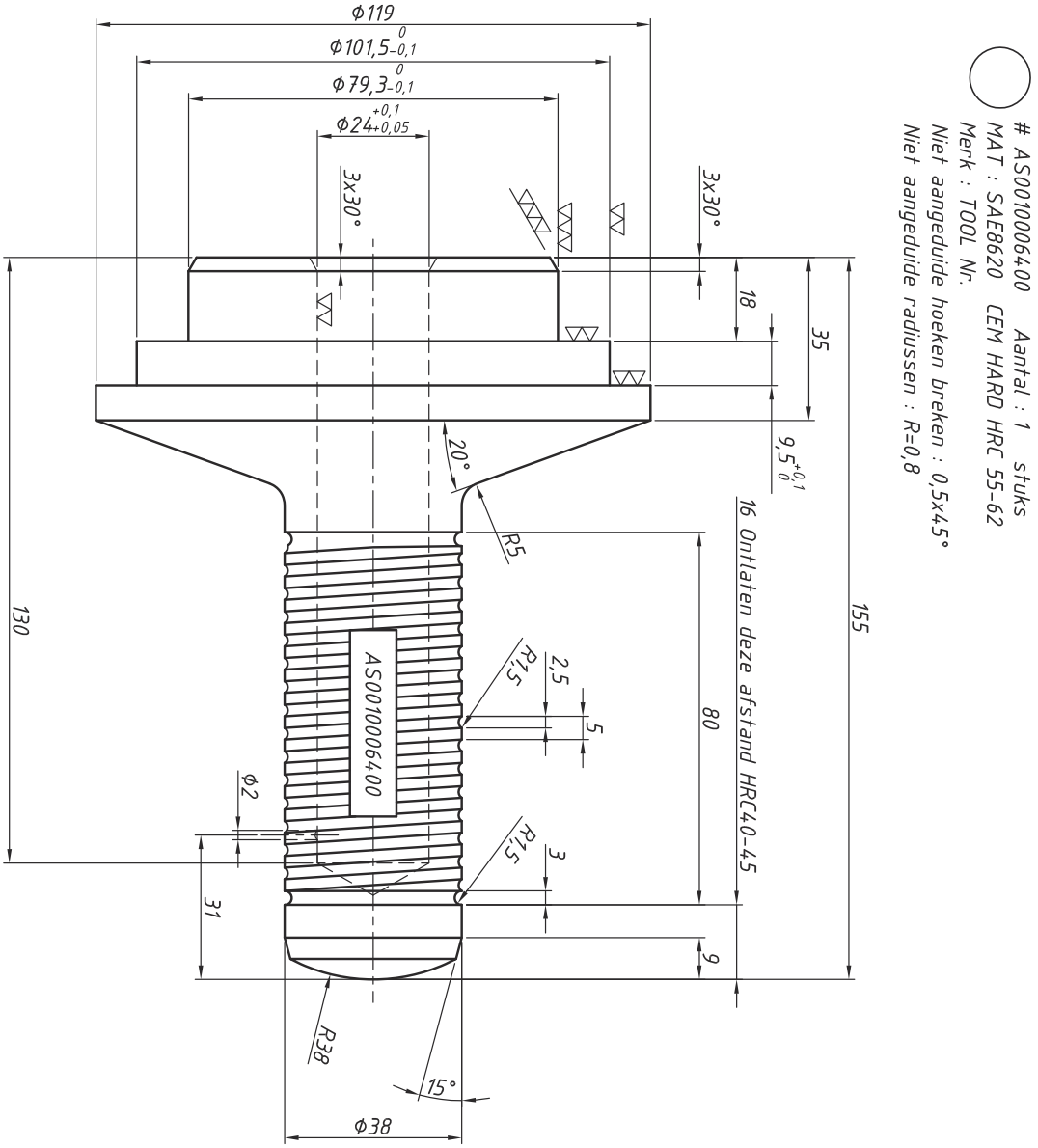


AS0010006200 Aantal : 1 stuks
MAT : SAE8620 CEM HARD HRC 55-62
Merk : TOOL Nr.
Niet aangeduide hoeken breken : 0,5x45°
Niet aangeduide radiussen : R=0,8

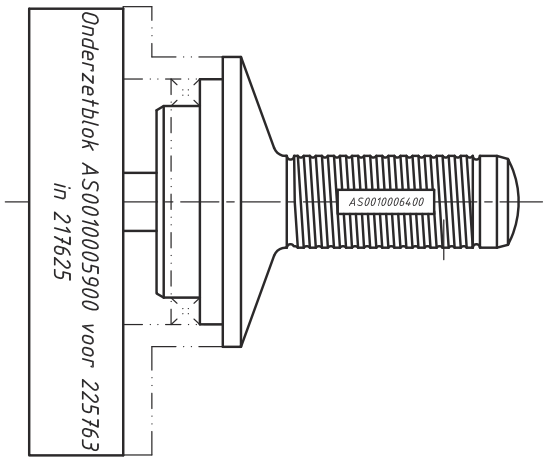




AS0010006400-000-001



AS0010006400 Aantal : 1 stuks
MAT : SAE8620 CEM HARD HRC 55-62
Merk : TOOL Nr.
Niet aangeduide hoeken breken : 0,5x45°
Niet aangeduide radiussen : R=0,8



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