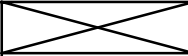


# 40. Power transmission

	Clutch
<b>41.</b>	Turbine clutch HiShift
<b>42.</b>	Gearbox
	Quick-shift gear, DPS
<b>44.</b>	Reverse shuttle 4WD clutch
<b>45.</b>	Final drives
<b>46.</b>	Power take-off

<b>41. Clutch</b>		Model	Code	Page
	2.1.2004	T120–T190 M120–M150	410	1

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### 411. Repair instructions of the clutch

#### Changing torsional damper:

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#### Hydraulic coupling (Hi–Trol)

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## Technical data

### Tightening torques

Clutch–flywheel .....	23 Nm
Pump shaft drive flange–flywheel .....	46 Nm
Release bearing tube guide sleeve–fuel tank, –659477 .....	46 Nm
Engine–fuel tank .....	80 Nm
Flange joint, propeller shaft .....	35 Nm

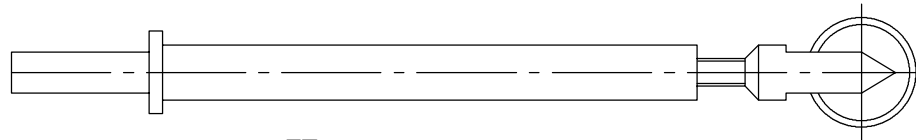
**Special tools**

**Part no** ..... **Description**

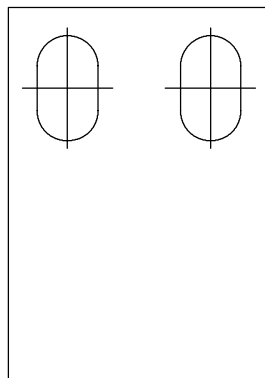
**Locally prepared tools**

ET 893470            Support roller for splitting tractor

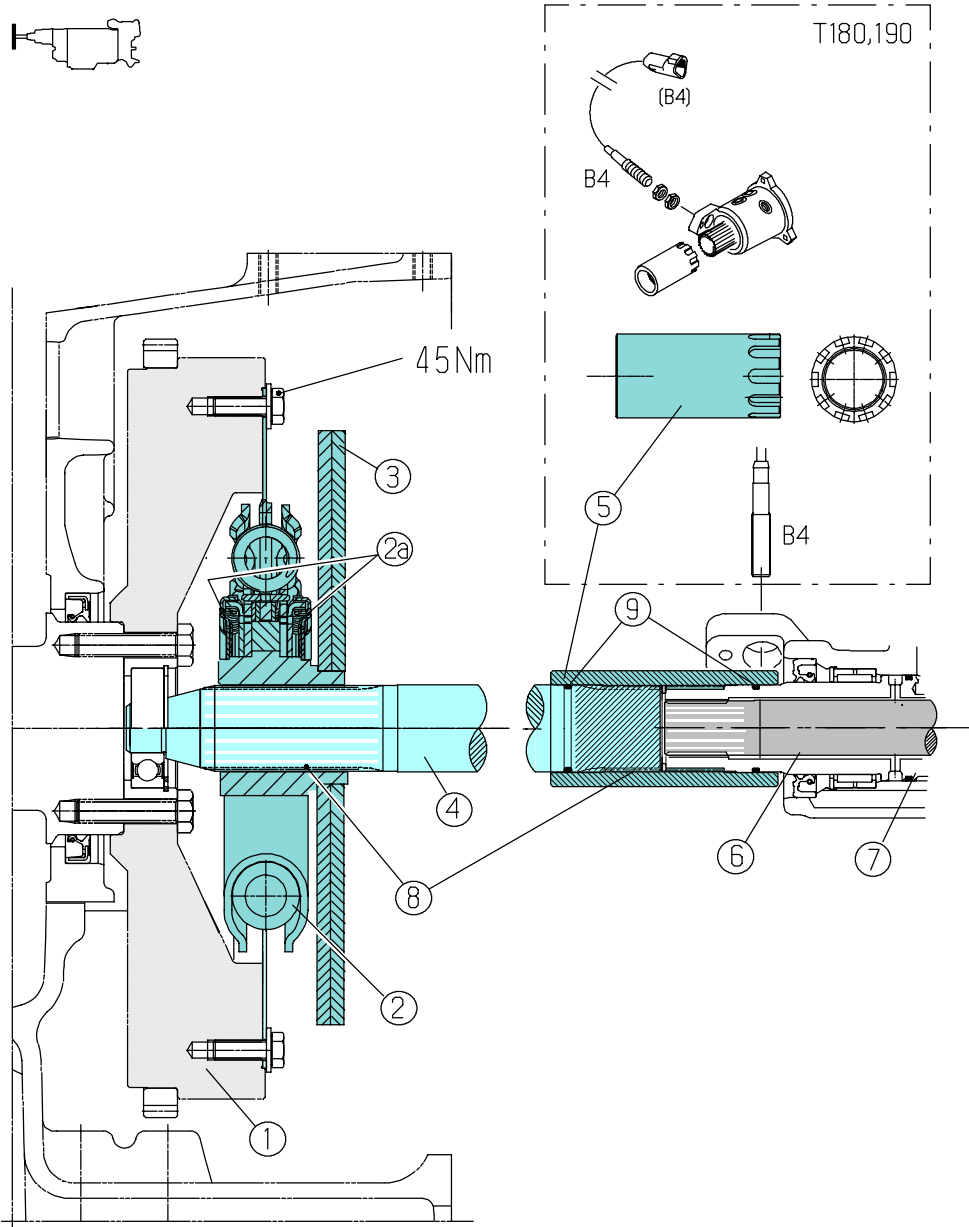
ET 893480            Support plate (2 pcs)



ET 893470



ET 893480



*Drive disc on flywheel*

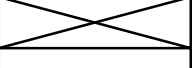
- 1) Flywheel (HiTech)
- 2) Damper springs
  - These springs damper the shocks between the engine and the transmission.
- 2a) Small damper springs
  - Damper so-called idle running vibrations in the transmission.
- 3) Torsional damper.
  - Plates increase the mass, and damp the vibrations
- 4) Drive shaft
- 5) Coupling sleeve

T180, T190: the engine speed sensor has been placed in front of the DPS.

The coupling sleeve has grooves for the sensor.

The twist of the PTO shaft cannot be measured as earlier at flywheel, because the damping springs in the torsional damper are elastic.

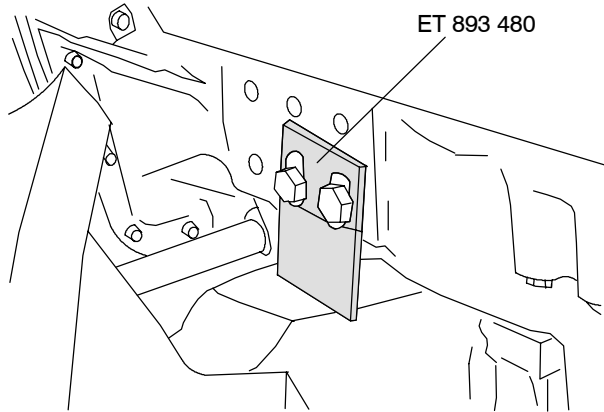
- 6) PTO / hydr. pump shaft.
  - For manufacturing reasons the splines of the PTO shaft has been transferred from the clutch shaft to the input shaft of the DPS (Note the different lengths of the new shafts).
  - The PTO drive shaft cannot be removed from the front end without taking away first the DPS.
- 7) Input shaft for DPS
- 8) Pressure-proof grease to the splines of the shafts
- 9) O-ring (2x)
  - Function as oil seals (the space of the DPS input shaft is under lubrication pressure).

41. Clutch		Model	Code	Page
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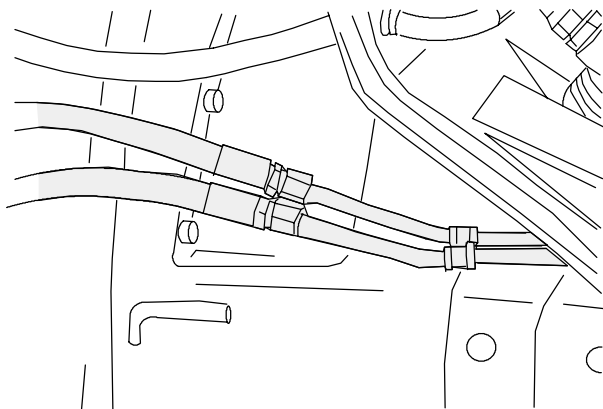
## Changing drive disc

**Note!** Instructions below are for a tractor with a hydraulic coupling (Hi-Trol). For tractors without hydraulic coupling the same instructions applies. On E-models it is necessary to disconnect the sensor wires when splitting the tractor.

### Splitting tractor at clutch

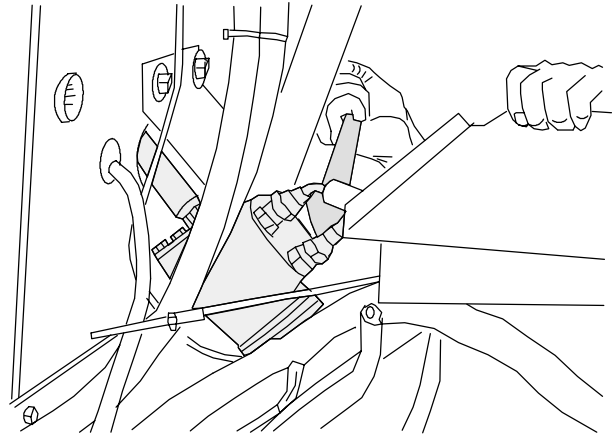


1. Fit support plates ET 893 480 on both sides to prevent pivoting. Remove all engine casing plates.



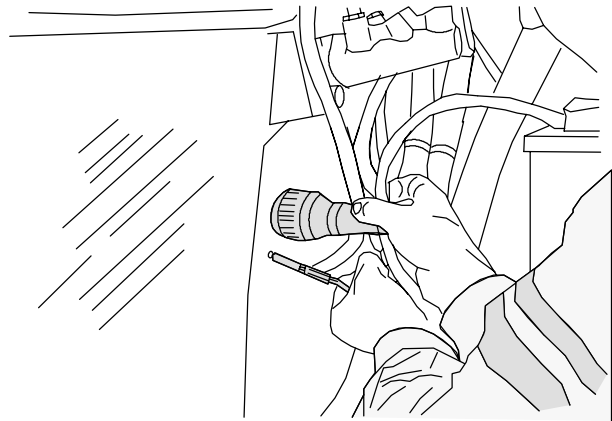
2. Remove the stop control cable wire from the injection pump. Disconnect the oil cooler hoses on the left hand side of the tractor.

3. Disconnect the fuel hoses from the tank (on right hand side). Disconnect the fuel gauge wires (fold sound insulation plate to one side when disconnecting the wires).

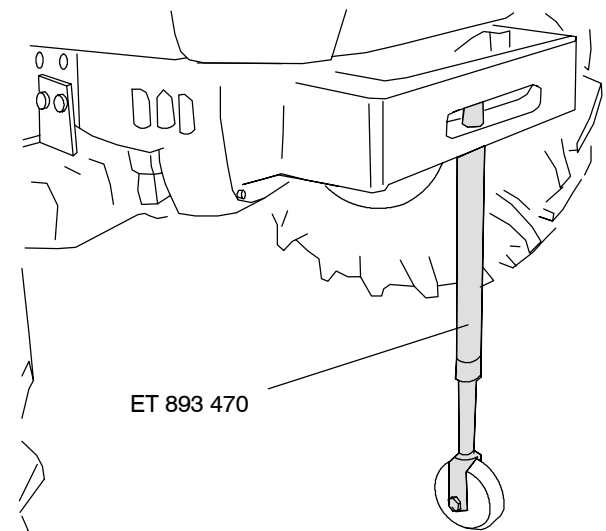


4. Disconnect the steering cylinder oil hoses from the steering valve (mark hoses for easier refitting).

5. Disconnect the heater hoses from the cab front wall and from the pipe to the coolant pump.



6. Disconnect the throttle control cable and the socket from the cab front wall on the right hand side. Disconnect the cab earth lead from the front wall and disconnect the cable to the starter motor.

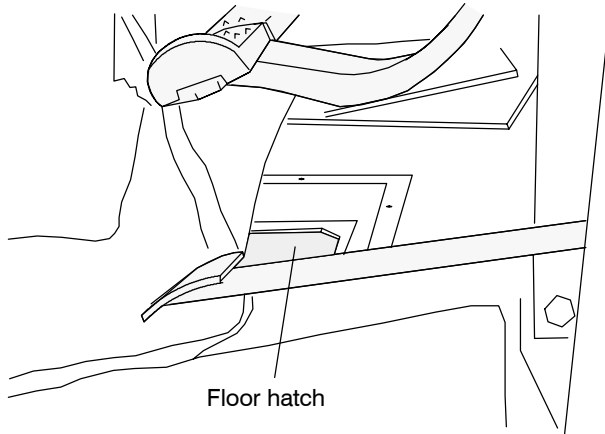


7. Fit support ET 893 470 under the front ballast weight bracket. Fit a support (with rollers) under the front frame rear edge.

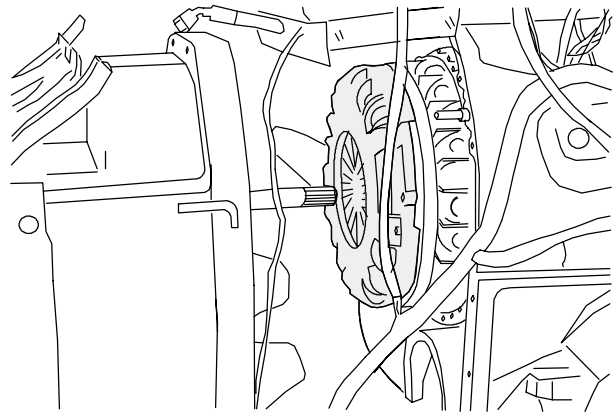
**Note!** Six-cylinder engine is rear-heavy. Other engines are almost balanced and must be supported at both ends.

**Assembling tractor at clutch**

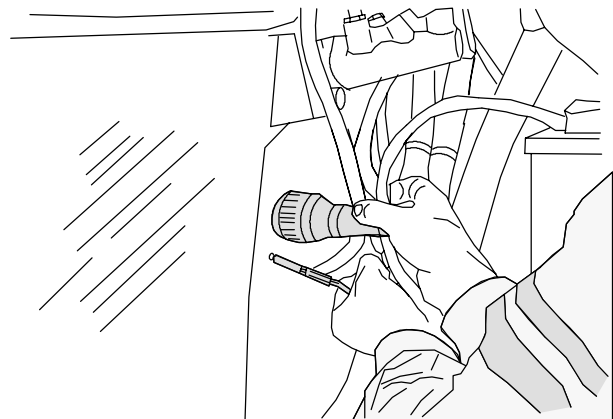
1. Push the pump drive shaft backwards fully home. Push the clutch shaft backwards until it engages into the coupling sleeve. **Important!** The pump drive shaft should be fitted in the correct way. The end which has a marking groove (and letter E) should be turned to the engine side.



**Note!** If necessary, guide the coupling sleeve through the floor hatch. Grease splines with pressure-resistant grease.



1. Push the units together so that the shafts engage. If necessary, rotate the flywheel so that the splines engage.
2. Tighten the bolts to correct torque.
3. Connect the oil cooler hoses on the left hand side. Connect the fuel hoses and the fuel gauge wires (on the right hand side).
4. Connect the cab earth lead to the cab front wall. Connect the hoses to the steering valve according to the marks. Connect the starter motor cable.

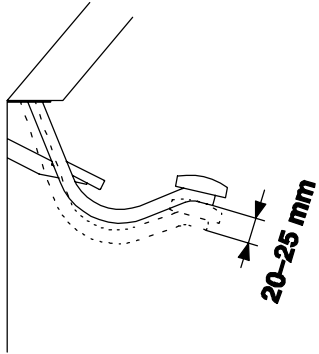


5. Fit the throttle cable and the socket to the front wall on the right hand side.
6. Connect the windscreen washer hose and cable connector. Connect the heater hoses.
7. Connect the stop control to the injection pump.
8. Adjust the clutch (**see instr 2A**). Remove all supports. Fit the engine hood plates.
9. Connect the propeller shaft front flange joint. Fit the guard under the tractor.

**Note!** Fit the floor hatch if opened.

<b>41. Clutch</b>	<del>2.1.2004</del>	Model	Code	Page
	<del>2.1.2004</del>	<b>T120–T190 M120–M150</b>	<b>411</b>	<b>3</b>

### Checks and adjustments



1. Pedal free travel should be 20–25 mm, when the clutch is correctly adjusted.

## Hydraulic coupling (Hi–Trol)

Hi–Trol–models have a hydraulic coupling between the flywheel and the mechanical clutch.

**Note!** See figure 4 on page 410/6 (Voith).

**Oil quality and oil volume in hydraulic couplings**, see page 130/4.

### Removing hydraulic coupling Voith:

- split the tractor at the clutch (**see instr 411 1A**)
- remove the mechanical clutch and its fixing plate
- drain the oil from the hydraulic coupling through the draining plug.
- unscrew the bolts on the outer sphere of the coupling. If necessary, use extractor screws (there are threaded holes for this purpose).

When fitting the hydraulic coupling the screws must be tightened evenly to **25 Nm**.

**Note!** **0,2 litre** oil remain in the later Voith coupling (666066–) when the coupling is emptied through the draining hole while the coupling is attached to the flywheel. The draining plug can be removed and fitted via the hole in the tractor frame when the plug is in the upper position. For instance oil checking and topping up is possible without splitting the tractor frame.

## Checking function of hydraulic coupling

Normally the hydraulic coupling does not need any maintenance or adjustments. If there is doubt that the coupling does not function properly, it can be checked as follows:

1. Warm up the engine to normal working temperature by driving the tractor about 15–30 min (not any stall–test)
2. Check the pulling power (crawling) of the coupling at engine idling speed (750 r/min). The pulling power of the coupling is determined so that when gear H1 is engaged the tractor is stationary when brake pedals are pressed lightly.

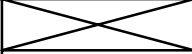
### Stall–test

- apply the parking brake
- engage the highest gear H4
- declutch and move the hand throttle lever to max revs (front position) and check the resultant R.P. M. Max stall–test period is 10 seconds. The right value is **1100–1250 r/min** (Voith) or **950–1250 r/min (6800: over 1200 r/min)** (Transfluid).

**Note!** Do not repeat a new stall–test immediately after the previous test because this will cause overheating on the hydraulic coupling and also the stall value becomes faulty

The hydraulic coupling characteristics can be changed by changing oil level in the coupling. The coupling becomes softer when oil is reduced and vice versa. Too high stall value indicates that there is not enough oil in the hydraulic coupling.



<b>42. Gearbox</b>		Model	Code	Page
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Fitting gearbox .....	17

### 424. Repair instructions of the differential

Reconditioning differential .....	1
-----------------------------------	---

## Technical data

Number of gears	
– forwards	36
– reverse	36

### Oil

(common to transmission and hydraulics).

Viscosity and quality grade: see page 130/2.

Oil volume: see page 130/2.

Warning lights for gearbox oil pressure and temperature. Oil cooler as standard.

Pressure lubrication for input shaft and bevel pinion shaft.

Lubricating oil pressure–relief valve, opening pressure . . . . . 0,2 MPa

Suction strainer, degree of separation . . . . . 125 µm

Pressure filter, filtration capacity . . . . . β<sub>10</sub>=75

Number of teeth	T120, T130	T140	T160, T170	T180, T190
– bevel pinion shaft/crown wheel 40km/h	Z8/Z42	Z11/Z37	Z9/Z38	Z9/Z38
– bevel pinion shaft/crown wheel 50km/h	Z9/Z38		Z11/Z37	
Gears for 4WD:				
– in front end of bevel pinion shaft 40km/h	Z29	Z33	Z29	Z29
– in front end of bevel pinion shaft 50km/h	Z33		Z33	
– in front end of transmission shaft 40km/h	Z45	Z41	Z45	Z45
– in front end of transmission shaft 50km/h	Z41		Z41	

### Differential

– number of differential pinions . . . . . 4 kpl . . . . . 4 kpl . . . . . 4 kpl . . . . . 4 kpl

Tractors with ground speed PTO; there is a coupling, selector fork and shaft for PTO in the gearbox.

## Tightening torques

### Gearbox

Bevel pinion shaft ring nuts (+transmission shaft ring nut)	270 Nm
Input shaft front end cover	21–25 Nm
Layshaft front end cover	21–25 Nm
Gearbox side cover screws	50 Nm

### Differential

Crown wheel fixing bolts	110 Nm
Differential bearing cover screws	40–50 Nm

### Frame joints

Gearbox–fuel tank:	
– upper studs	270–330 Nm
– lower hexagonal socket–head screws	125 Nm
Gearbox–reverse shuttle	21–25 Nm
Gearbox–power take–off:	
– upper studs (8 pcs)	270–330 Nm
– lower studs (6 pcs)	72–88 Nm
Gearbox–brake housing	270–330 Nm
Propeller shaft flange joints	35 Nm

## Settings

### Gearbox

Pinion shaft rolling resistance measured with torsion meter at front end of shaft (without differential)	1,7–2,3 Nm
Input shaft end float	0,025–0,075 mm
Layshaft end float	0,025–0,075 mm

### Differential

Differential bearing preload measured with torsion meter at front end of bevel pinion shaft	
=pinion shaft rolling resistance+	+0,6–1,7 Nm (Z7/40, Z8/42)
	+0,8–2,2 Nm (Z9/38)
	+1,0–2,8 Nm (Z11/37)
Tooth backlash, pinion/crown wheel	0,175–0,325 mm

### Sealing compounds and locking fluids used

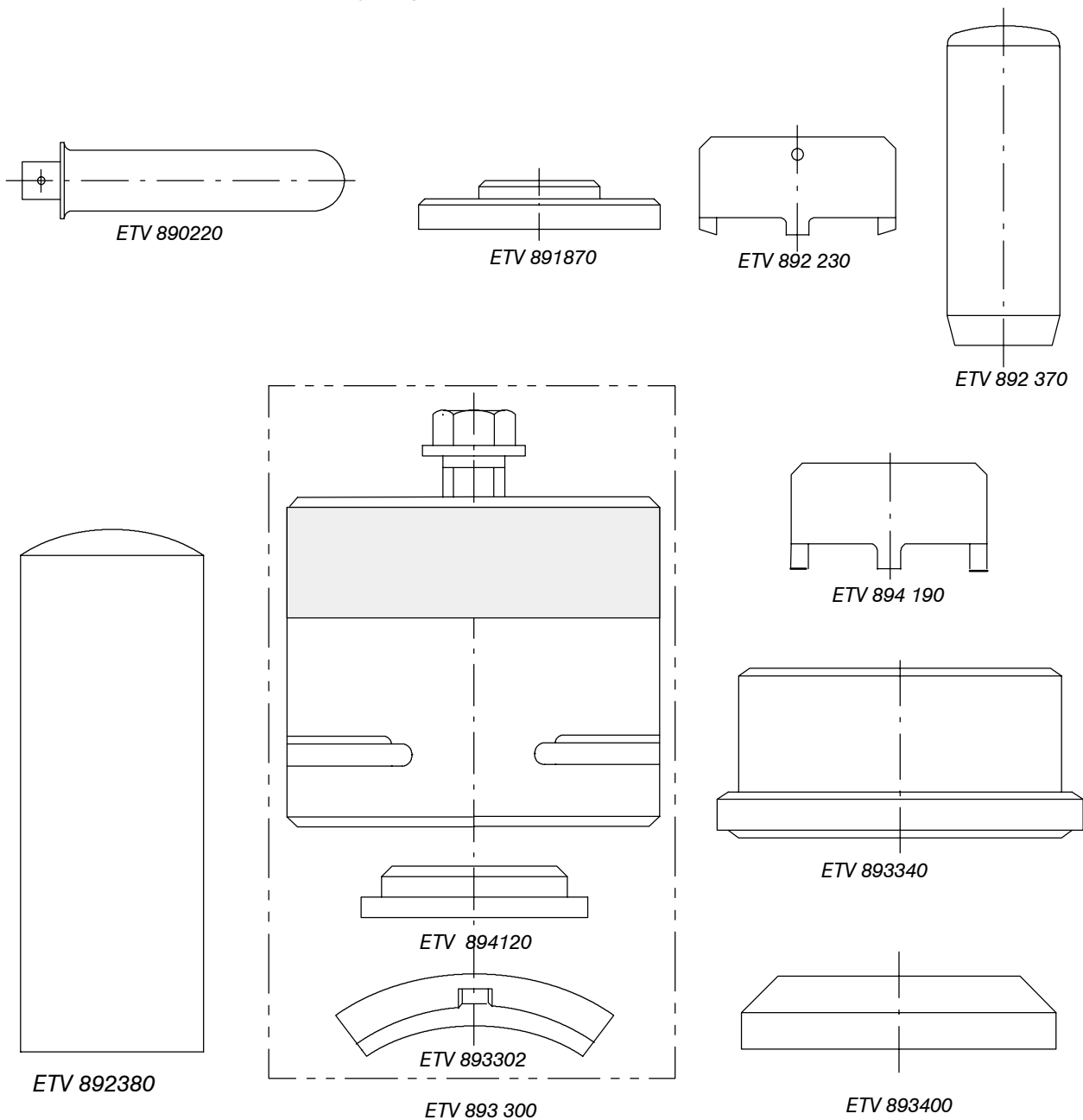
Reverse shuttle–gearbox, sealing Hylosil RTV Grade 102 Black
Power take–off–gearbox, sealing Hylosil RTV Grade 102 Black
Brake housings–gearbox, sealing Hylosil RTV Grade 102 Black
Side cover–gearbox, sealing Hylosil RTV Grade 102 Black
Threads on selector fork rails (+transmission shaft ring nut), Loctite 242
Crown wheel fixing bolts, Loctite 273

**Special tools**

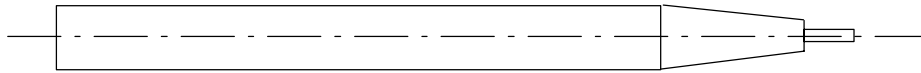
- ETV 890 220 Universal handle
- ETV 891 870 Plate for fitting thrust bearing for differential side of gear
- ETV 892 230 Socket spanner for bevel pinion shaft ring nut
- ETV 894 190 Socket spanner for 4WD clutch drum nut
- ETV 892 370 Sleeve for fitting input shaft front end bearing
- ETV 892 380 Sleeve for fitting bevel pinion shaft front end bearing
- ETV 893 300 Sleeve for fitting input shaft rear end bearing
- ETV 893 340 Puller for differential bearings
- ETV 893 400 Plate for fitting bearing race, pinion shaft rear bearing
- ETV 893 400 Plate for fitting differential bearings
- ETV 894 050 Drift for fitting locking pins for selector forks
- ETV 894 080 Drift for fitting selector fork rail for LL-range
- ETV 894 120 Counter hold for puller ETV 893300.

**Locally prepared tools**

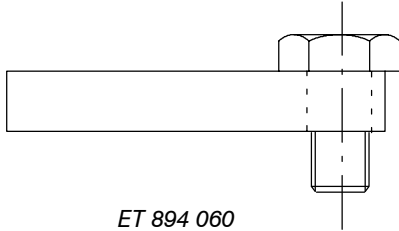
- ET 894 060 Press tool adjusting selector forks



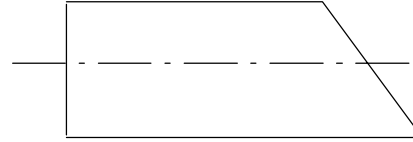
<b>42. Gearbox</b>		Model	Code	Page
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ETV 894 050



ET 894 060



ETV 894 080



ETV 894 120

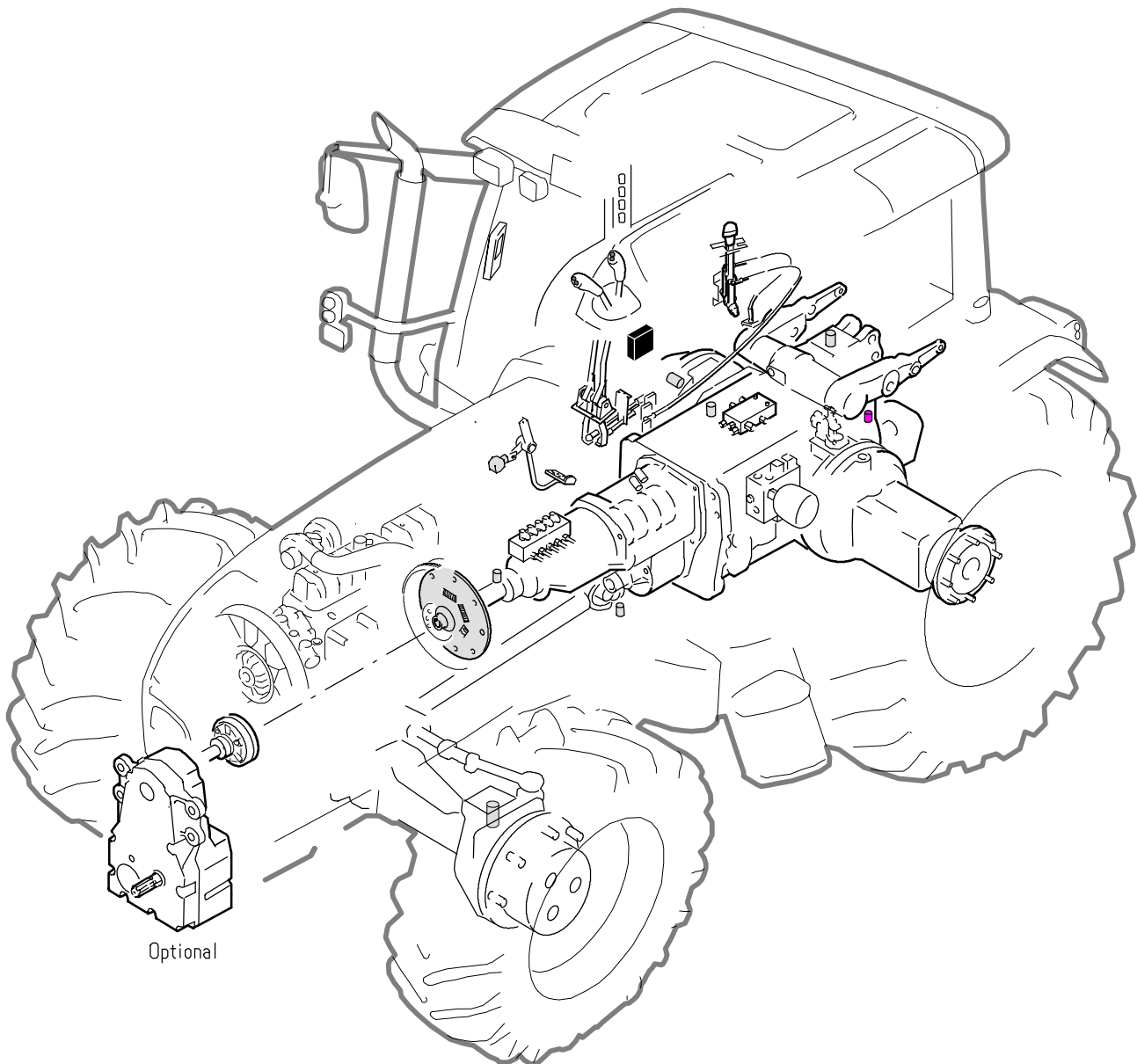
## Gearbox, description

Position of the gearbox is shown in the figure below. Reverse shuttle and quick-shift gear are attached to the front of the gearbox. Power take-off is attached to the rear end. Rear axles are attached to the both sides of the gearbox. Differential is fitted in the rear part of the gearbox housing.

The gearbox is operated mechanically with a speed gear lever and range gear lever on the right hand side of the driver's seat. Gearbox has three ranges (LL–M–H) and four speed gears. The reverse shuttle is operated with a separate lever.

The quick-shift gear doubles the number of speeds. The Delta Powershift gear triplicates the number of speeds.

The gearbox is fully synchronized (except LL-range). Gear wheels have helically cut teeth. Pressure lubrication. Separate reverse shuttle.



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