SERVICE MANUAL

F106.6 / F106.6A / F156.6 / F156.6A

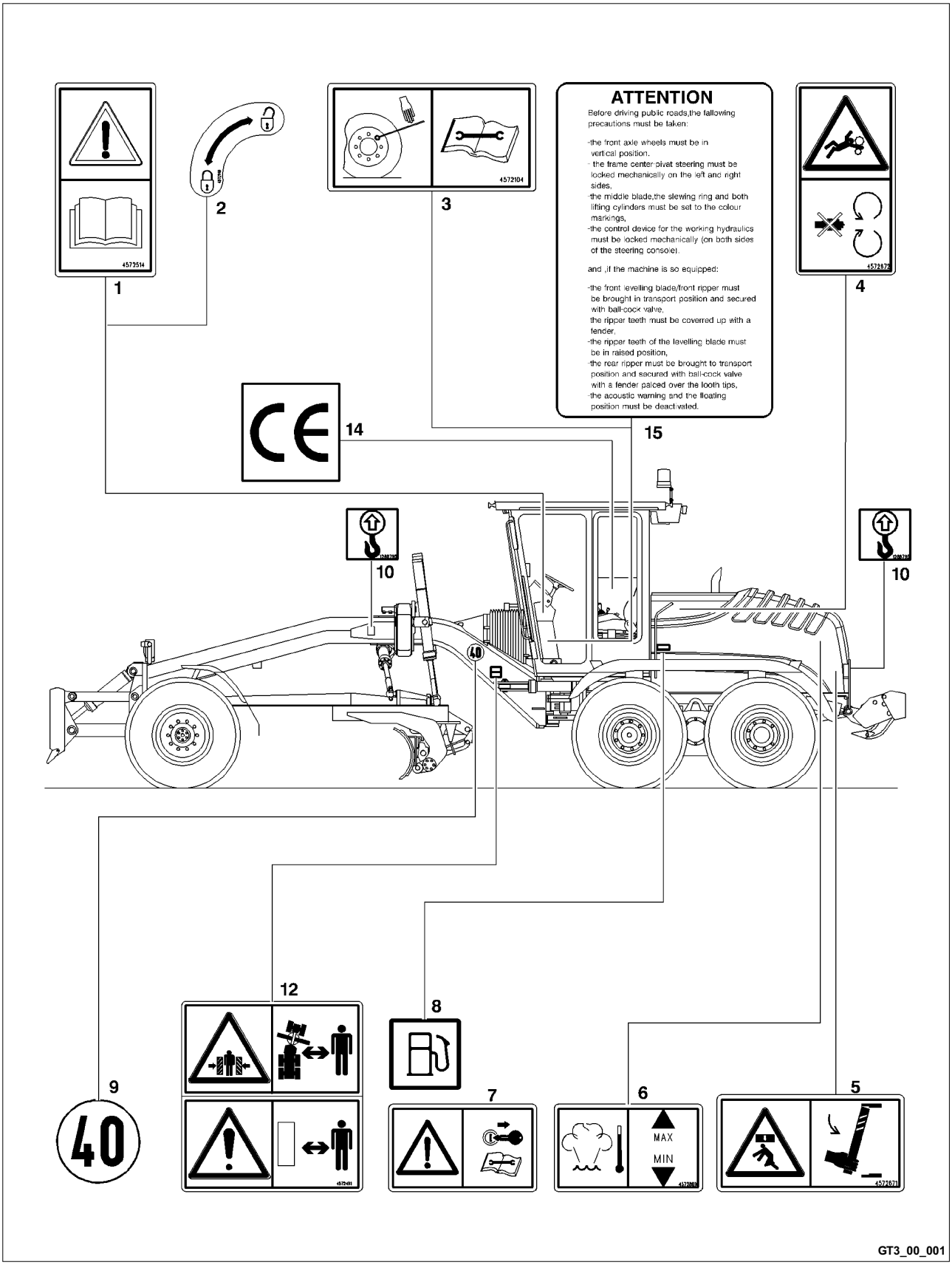
Grader

Print No. 87726937A

CONSTRUCTION

2 WARNING AND INSTRUCTION PLATES

2.1 Left side of vehicle



SEAT BELT

Fasten your seat belt before every trip.

Do not pass the seat belt over rigid or breakable objects, for example a bunch of keys or spectacles. This could result in bodily injuries.

The seat belt must always lie firmly against the body and should not catch on anything.

The belt buckle guide should not be obstructed (for example, with papers), otherwise the buckle tongue will not engage.

Seat belts that are damaged, or which were stressed during an accident and have therefore been stretched, must be replaced.

ADJUSTING THE STEERING COLUMN

Do not adjust the steering column while driving.
Your attention will be distracted - RISK OF ACCIDENT!

Before adjusting the steering column:

- Stop the machine
- Gear lever in neutral position
- Apply the hand brake

4.3 Electrical system

Risk of injury from battery acid and gases.

Wear protective goggles, work gloves and close-fitting work clothes.

BEFORE WORKING ON THE ELECTRICAL SYSTEM

Switch off the engine.

Turn the electrical system key switch to the **0** and take out the key.

Turn the battery main switch to the **OFF** position and remove the control lever.

Disconnect the control units and control console from the on-board electrical system.

Before working on the electrical system, when there is a possibility of tools, spare parts, etc. touching electric wires and contacts, disconnect the batteries.

- Disconnect the negative terminal first, then the positive.

When work is complete:

- connect the positive terminal first, then the negative.

Read and apply the ‘Operating instructions-Alternator, control units and control console’.

Read and pay attention to the section ‘Inspection and maintenance - General information’.

Use only measuring instruments for carrying out voltage tests and continuity checks. Do not use test lamps.

Do not ‘short to ground’.

The resulting short circuit will cause damage to the alternator or to the electronics.

ALTERNATOR

Never disconnect the electrical connections at the alternator, regulator or battery while the engine is running.

This will damage the alternator and regulator.

When connecting the batteries, do not mix up the cables (check the polarities).

Use only measuring instruments for carrying out voltage tests and continuity checks.

Do not use test lamps.

Do not ‘short to ground’.

The resulting short circuit will cause damage to the alternator and regulator.

When the engine is started, the alternator is actuated (pre-excited) by an electronic circuit. This ensures that the alternator is able to deliver power.

This circuit is part of the main electronic system in the control console.

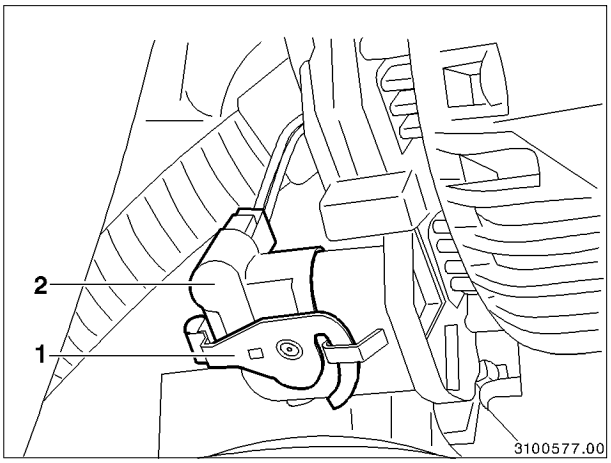
A LED (charge indicator) on the control console indicates whether the alternator is functioning correctly. This LED must light up when the key switch is turned to the On position; it should go off once the engine is running.

If this is not the case, then there is a fault in the alternator electrical circuit or in the control console.

To prevent further damage, the cause of the fault must be found and resolved as quickly as possible.

Contact your dealer’s service department.

5.1.5 Alternator connector



Release clamp (1) and pull out connector (2) from the alternator.

After completing all the above steps, welding work can be carried out on the machine (see and follow the instructions in the paragraphs ‘Welding work, safety instructions’ and ‘Welding information’).

When the welding work is completed, restore the connections for all electronic components. To do this, follow the above steps in the reverse order.

CAUTION: *Failure to follow the above procedure will void the warranty and the manufacturer will not be liable for any resulting damage.*

4.1 Ratios

F106.6 / F106.6A ratios

Direction of travel	Transmission		Tandem axle				Total
	Gear	Ratio	Ring gear and pinion	Planetary gear transmission	Chain drive	Total	
Forward	1.	5.636	3.111	3.421	1.421	15.123	85.235
	2.	3.728					56.380
	3.	2.374					35.903
	4.	1.570					23.744
	5.	1.023					15.471
	6.	0.676					10.223
Reverse	1.	5.344	3.111	3.421	1.421	15.123	80.819
	2.	2.251					34.043
	3.	0.970					14.670

F156.6 / F156.6A ratios

Direction of travel	Transmission		Tandem axle				Total
	Gear	Ratio	Ring gear and pinion	Planetary gear transmission	Chain drive	Total	
Forward	1.	5.202	2.818	6.00	1.167	19.731	102.641
	2.	3.367					66.434
	3.	2.191					43.231
	4.	1.418					27.979
	5.	0.944					18.626
	6.	0.611					12.056
Reverse	1.	4.939	2.818	6.00	1.167	19.731	97.451
	2.	2.078					40.001
	3.	0.895					17.659

13 CAB

Noise-insulated driver's cab supported flexibly on rear frame.
Cab can be entered on either side through a lockable sliding door.
To provide a comfortable working environment, tinted windows with roller sun blinds and a heater are available.
Ventilation is by air recirculation or outside air; with outside air, the air is drawn in through a filter system.

Optionally, the cab can be equipped with an air conditioning system.

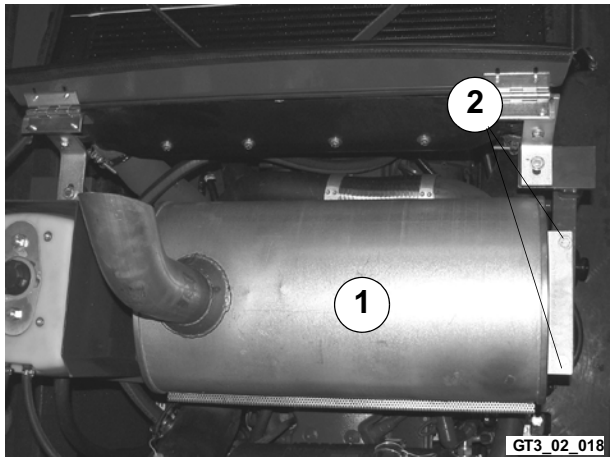
14 ELECTRICAL SYSTEM

	F106.6 / F106.6A	F1056.6 / F156.6A
Operating voltage	24 V	24 V
Battery	2 x 92 Ah	2 x 92 Ah
Alternator	70 A	70 A
Starter	4.0 kW	4.0 kW

STEP 4

Remove exhaust muffler

Disconnect the pipes from the exhaust muffler (**1**).
Loosen the mounting bolts (**2**) and remove the exhaust muffler.

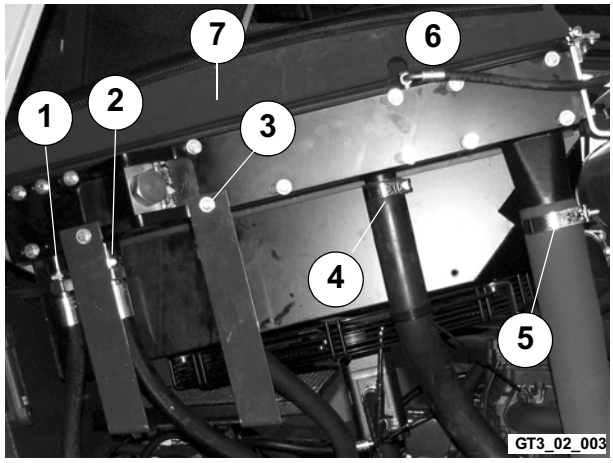


STEP 5

Remove heat exchanger - RIGHT SIDE

Disconnect pipes (**1** to **6**) from heat exchanger (**7**).

1. Hydraulic fluid outlet pipe
2. Transmission oil inlet pipe
3. Transmission oil outlet pipe
4. Coolant outlet pipe
5. Charge air cooling inlet pipe
6. Pipe to coolant expansion reservoir



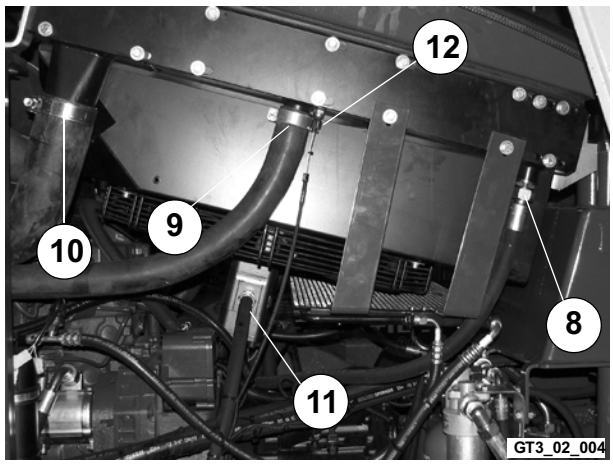
STEP 6

Remove heat exchanger - LEFT SIDE

Disconnect pipes (**8** to **12**) from heat exchanger.

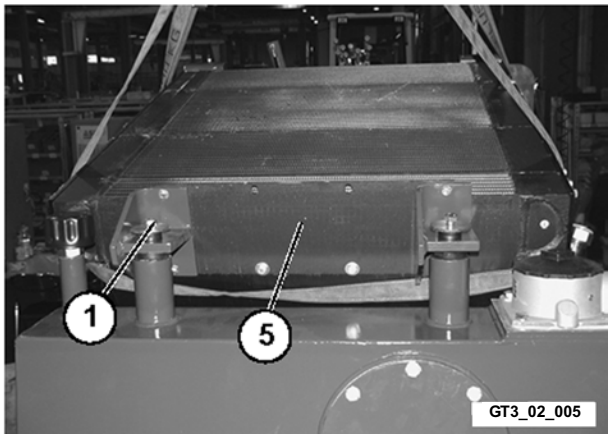
8. Hydraulic fluid inlet pipe
9. Coolant inlet pipe
10. Charge air cooling outlet pipe

Disconnect the oil lines from the hydraulic fan motor (**11**).
Disconnect the electrical line from coolant temperature sensor (**12**).



STEP 7

Attach the heat exchanger (**5**) to the lifting gear.
Loosen the 4 bolts (**1**) attaching the heat exchanger to the brackets.
Raise the heat exchanger and remove.



1.5 Important Notes

Oil level check (see 2.6):

During the cold start phase, the engine must run for about 2 - 3 min on idle and the mark on the oil dipstick must be above the cold start mark.

The oil level in the transmission must be checked with the engine idling and with the transmission warm (80 to 90 °C).

Depending on the installation condition, the oil level in the transmission rises substantially when the engine is stopped.

The ZF fine filter must be replaced at each oil change. ZF also recommends starting the automatic calibration of the actuators (AEB).

Automatic calibration must be started after the initial installation of the transmission and electronics by the manufacturer, and whenever the transmission or the electronic system is replaced due to damage.

When starting the diesel engine, always put the driving switch in neutral position.

When the engine is running and the transmission is in neutral, the parking brake must be engaged or the service brake applied to prevent the vehicle from rolling.

Before starting off, release the parking brake.

A gear can only be engaged from neutral if the transmission is at the programmed initial speed (turbine rotational speed).

Neutral position of the driving switch is not allowed at the higher vehicle speeds (speeds greater than walking pace). Either a suitable gear must be engaged or the brakes applied immediately.

Reversing (standard):

Reverse gears must be selected either with the vehicle stopped or At very low vehicle speeds.

Above the programmed reversing speed limit, the EST-37 electronic control unit places the vehicle in neutral, and the vehicle continues to move in the original direction.

The gear is only selected in the new direction when the reversing speed and transmission initial speed (turbine rotational speed) are below the programmed limits.

The programmed values are specific to the customer and can therefore vary from the standard values. Refer to the operating and maintenance instructions for the correct procedure to be followed!

When the engine is switched off, although a gear may be selected with the driving switch, there is no power flow between transmission and engine, i.e. the transmission is on idle.

The parking brake must therefore be fully applied!

If leaving the vehicle, secure it by placing chocks at the wheels.

Towing speed should never be more than 10 km/h, and the towing distance not greater than 10 km.

This limit must be applied in all cases, otherwise the transmission will be damaged as there is no oil supply.

If the vehicle is faulty and needs to be transported over a long distance, it is best to load it onto a low-bed trailer.

Operating temperature permitted downstream of the converter is at least 65 °C, and 100 °C in continuous operation, with up to 120 °C for brief periods.

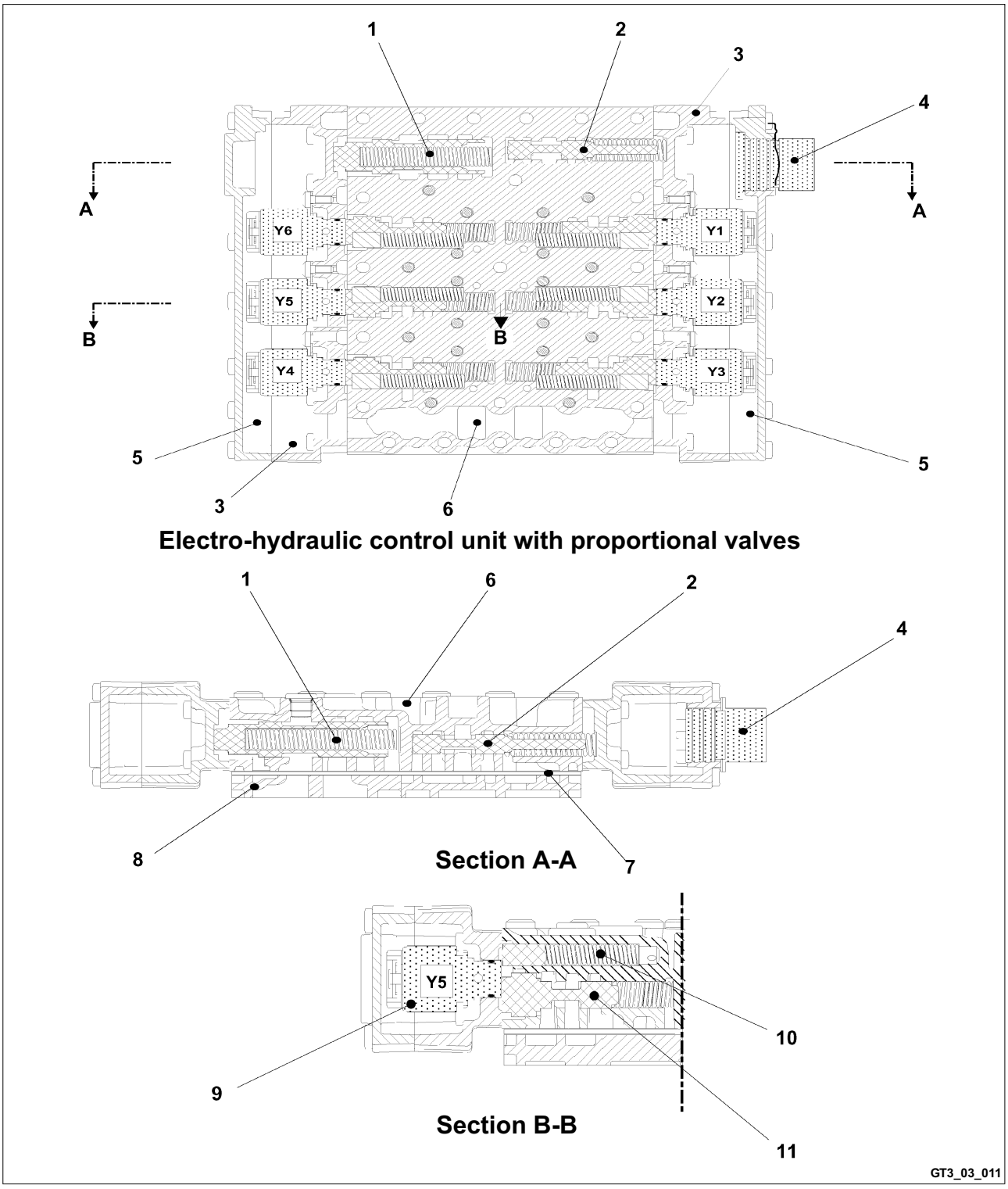
Sump temperature 60-90 °C.

If there is an anomaly in the transmission, stop the vehicle and call for qualified assistance.

Measures to protect the ZF electronics when working on the vehicle electrical system:

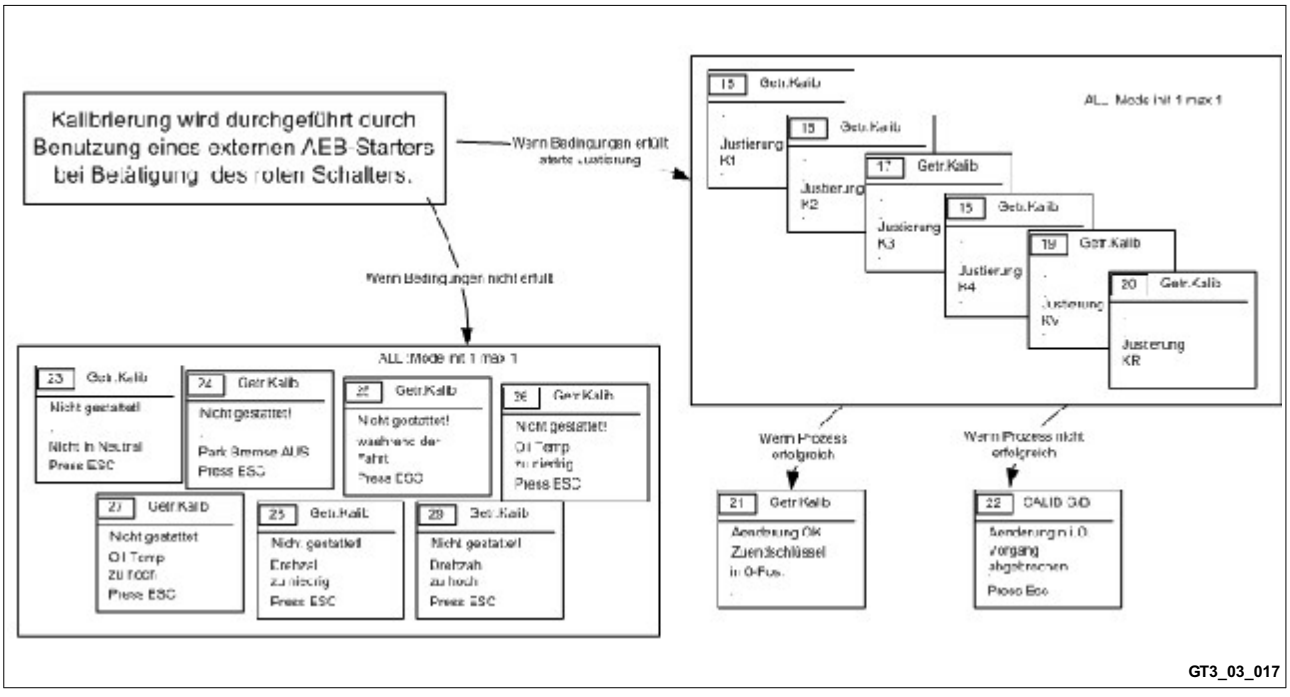
When carrying out any of the following operations, the ignition must be switched off and the control unit connector disconnected from the ZF electronics:

- Work on the vehicle’s electrical system.
- Welding operations on the vehicle.
- Insulation tests on the electrical system.



1. Main pressure valve 16 + 2.5 bar
2. Pressure reducing valve 9 bar
3. Housing
4. Connector (wiring harness)
5. Cover
6. Valve block
7. Intermediate plate
8. Transfer plate
9. Pressure regulator
10. Vibration damper
11. Slide valve

	Original transmission information by CAN	Text information on display
AEB sub-code:	1: Fault present	
	2: Shift lever not in N position	Not allowed Not in neutral Press ESC
	3: Parking brake not applied	Not allowed Parking brake OFF Press ESC
	4: Output speed not 0	Not allowed when vehicle moving Press ESC
	5: Transmission oil temperature below specified range	Not allowed Oil temp. too low Press ESC
	6: Transmission oil temperature above specified range	Not allowed Oil temp. too high Press ESC
	7: Engine rpm below specified range	Not allowed rpm too low Press ESC
	8: Engine rpm above specified range	Not allowed rpm too high Press ESC
	0: default	



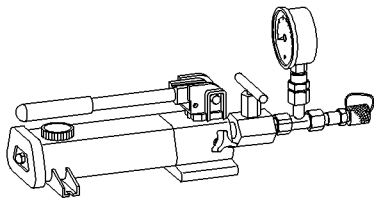
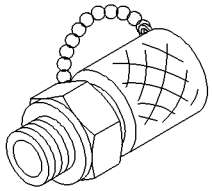
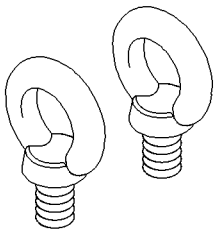
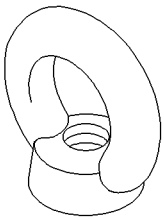
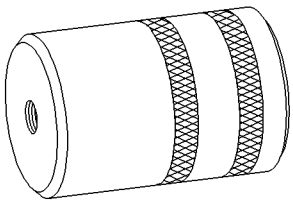
5.1 International units of measurement

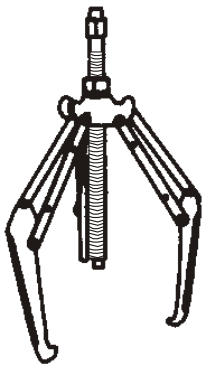
NOTE:	*Mass per unit of length in kg/m²* *Mass per unit of surface area in t/m²*

Term	Formal symbol	new	old	Conversion	Note
Mass	m	kg (kilogram)	kg		
Force	F	N (Newton)	kp	1 kp = 9.81 N	
Work	A	J Joule)	kpm	0.102 kpm = 1 J = 1 Nm	
Power	P	KW	HP/PS (DIN)	1 HP = 0.7355 W 1 KW = 1.36 HP	
Torque	T	Nm (Newton-metre)	kpm	1 kpm = 9.81 Nm	T (Nm) = F (N).r (m)
Moment of torque	M	Nm (Newton-metre)	kpm	1 kpm = 9.81 Nm	M (Nm) = F (N).r (m)
Pressure (overpressure)	pÜ	bar	atü	1.02 atü = 1.02 kp/cm² = 1 bar = 750 torr	
Rotational speed	n	rpm			

5.2 Comparison table for units of measurement

25.40	=	1 in (inch)
1 kg (kilogram)	=	2.205 lb (pounds)
9.81 Nm (1 kpm)	=	7.233 lbf x ft (pound force foot)
1.356 Nm (0.138 kpm)	=	1 lbf x ft (pound force foot)
1 kg/cm	=	5.560 lb/in (pound per inch)
1 bar (1.02 kp/cm²)	=	14.233 psi (pound force per square inch lbf/in²)
0.070 bar (0.071 kp/cm²)	=	1 psi (lbf/cm²)
1 litre	=	0.264 gallon (Imp.)
4.456 litres	=	1 gallon (Imp.)
1 litre	=	0.220 gallon (Imp.
3.785 litres	=	1 gallon (US)
1609.344 m	=	1 mile (land mile)
0 °C (Celsius)	=	+32 °F (Fahrenheit
0 °C (Celsius)	=	273.15 Kelvin)

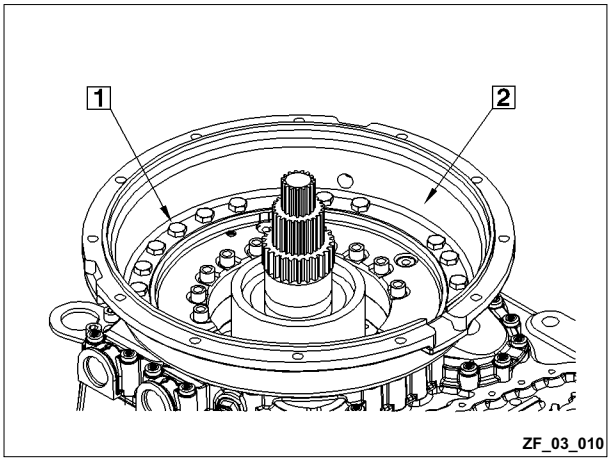
Serial No.	Illustration	Designation Order number	Qty.	Section/ illustration
11		**HD hand pump** **5870 287 007**	1	5/5 12/9
12		**Mini measurement coupling (M12x1.5)** **5870 950 101**	1	5/5 12/9
13		**Ring bolt M20** **0636 804 003**	1	7/1 7/5 10/13 10/18
14		**Ring nut M12** **0664 462 774**	1	7/1 7/5 10/13 10/18
16		**Handle** **5870 260 010**	1	7/6 10/12

Serial No.	Illustration	Designation Order number	Qty.	Section/ illustration
18		**<u>Three-arm puller</u>** **5870 971 001** Span 85 mm Throat depth 65 mm **5870 971 002** Span 130 mm Throat depth 105 mm **5870 971 003** Span 230 mm Throat depth 150 mm **5870 971 004** Span 295 mm Throat depth 235 mm **5870 971 005** Span 390 mm Throat depth 270 mm **5870 971 006** Span 640 mm Throat depth 300 mm	1	Universal

9.3 Pressure oil pump

STEP 1

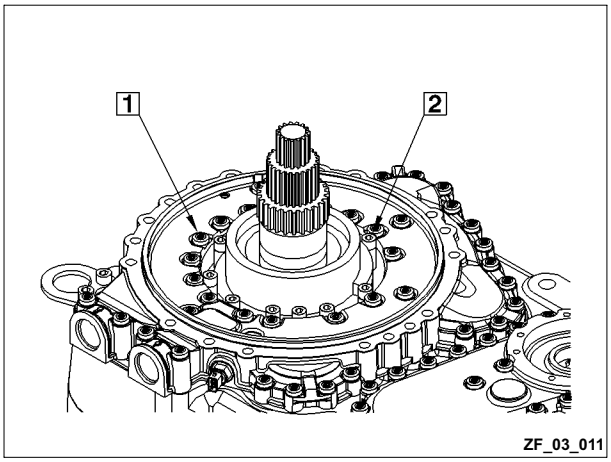
Loosen the bell housing / oil feed housing union (1) and remove bell housing (2).



STEP 2

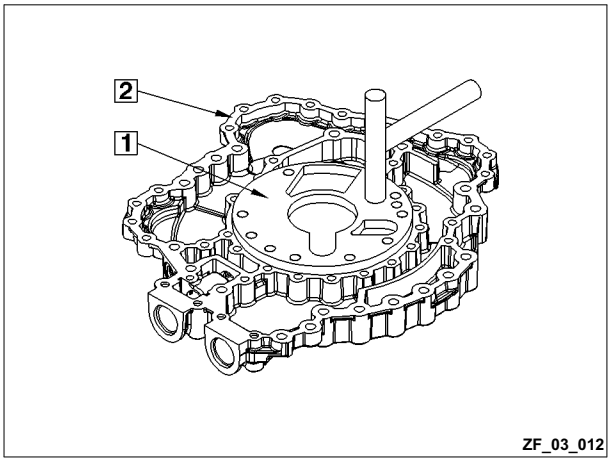
Loosen the union (1) between oil feed housing / transmission housing front section using the Torx screws and union (2) between pressure oil pump / transmission housing front section using the cap bolts.

NOTE: *Separate oil feed housing and pressure oil pump from transmission housing front section.*



STEP 3

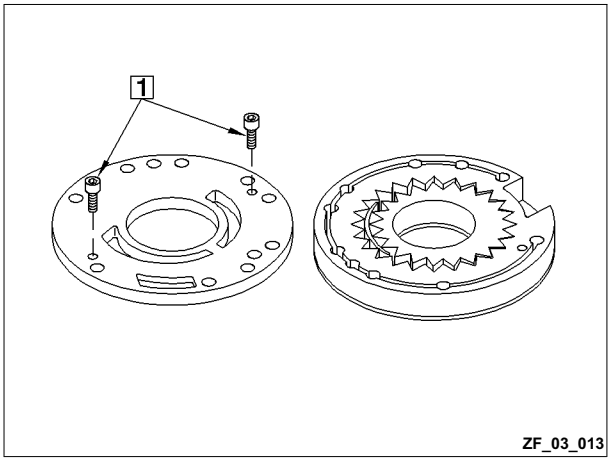
Separate pressure oil pump (1) from oil feed housing (2).



STEP 4

Loosen both cap bolts (1) and take out control disk.

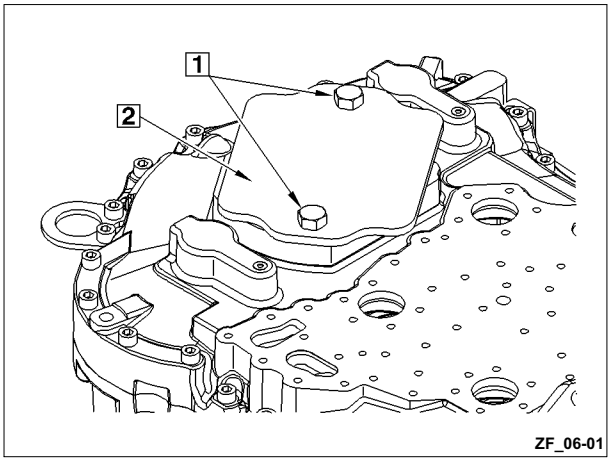
NOTE: *If any galling is found in the pump housing or on the controxl disk, the complete pressure oil pump must be replaced.*



12 DISASSEMBLY OF POWER TAKE-OFFS

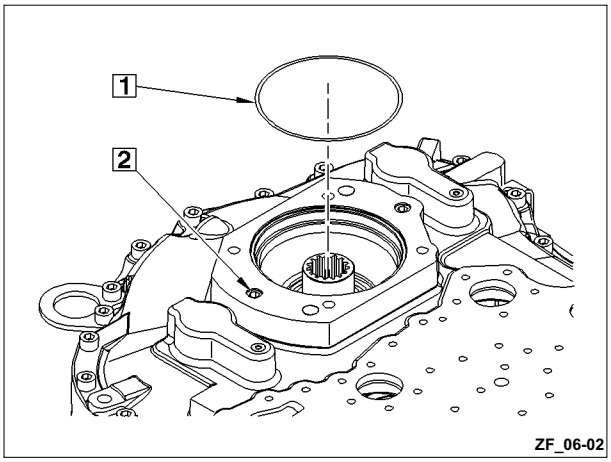
STEP 1

Loosen hexagon head bolts (1), remove cover (2).



STEP 2

Take O-ring (1) out of cover andloosen cap bolts (2).

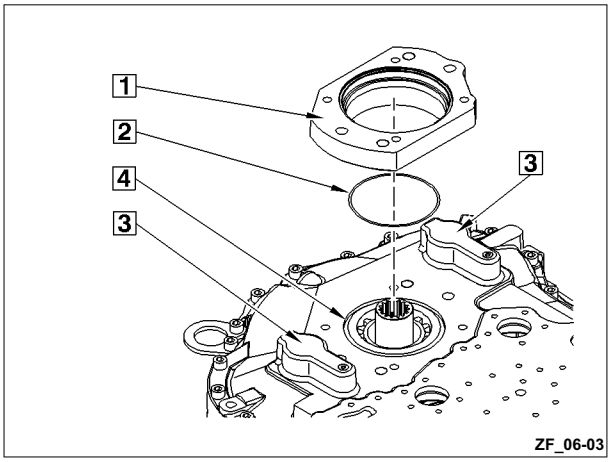


STEP 3

Remove flange (1) and O-ring (2).

Looen hexagon nuts and remove the two covers (3) with O-rings.

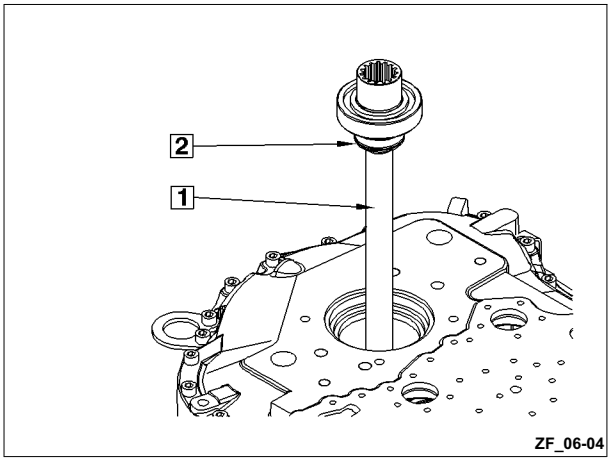
Pry off circlip (4) and remove.



STEP 4

Pull pump shaft (1) out of housing bore.

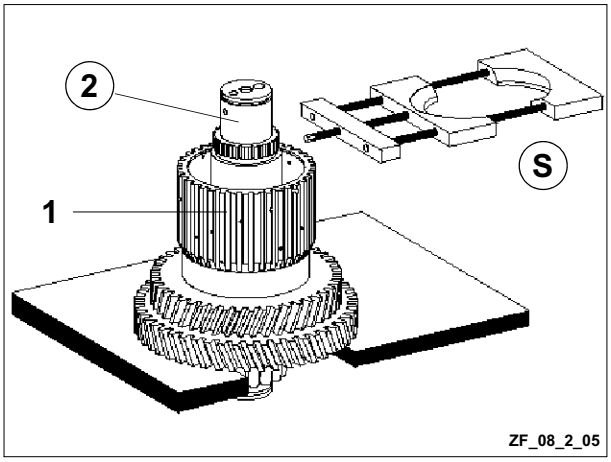
Pry off plain compression ring (2).



STEP 5

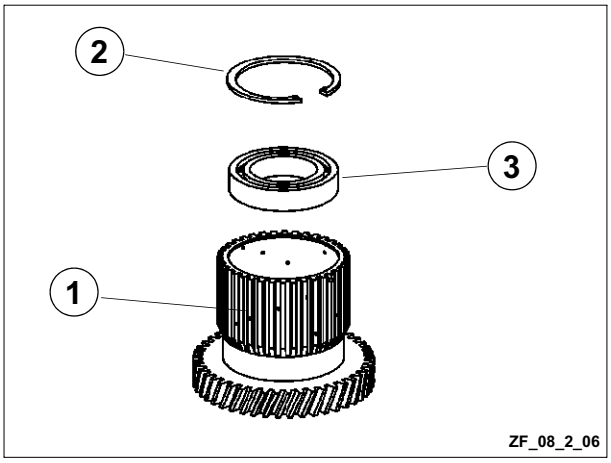
Fix idler gear (1) using separator (S) and remove from clutch shaft (2).

(S) Separator.....5870 300 028



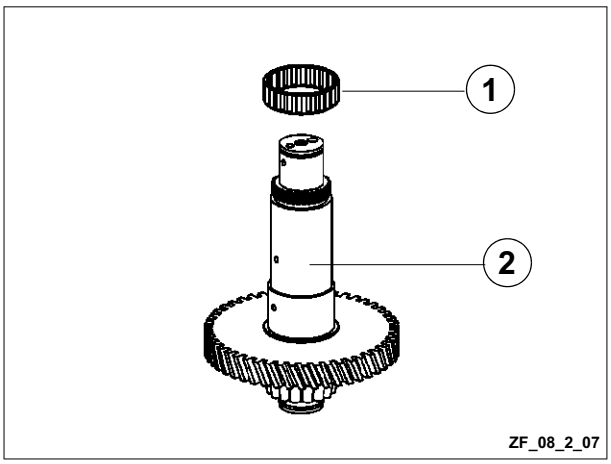
STEP 6

Pry circlip (2) out of idler gear (1) and remove ball bearing (3).



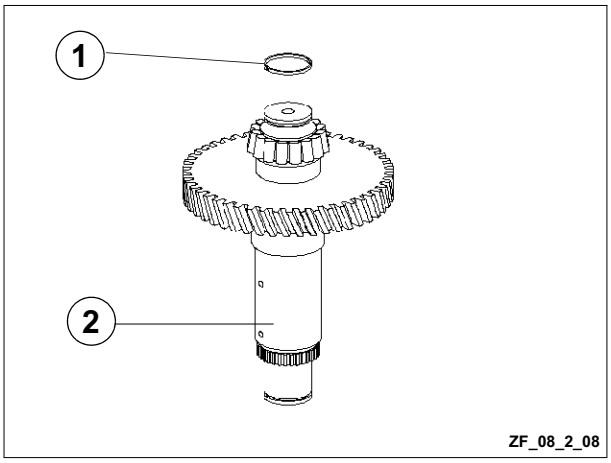
STEP 7

Remove needle cage (1) from shaft (2).



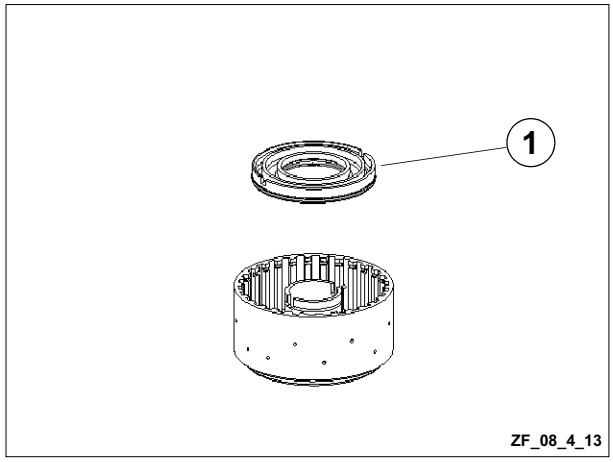
STEP 8

Turn shaft (2) through 180° and pry off piston ring (1).



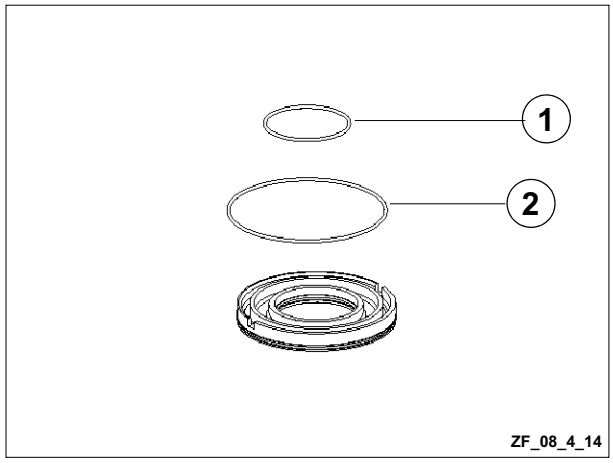
STEP 13

Raise piston (1) out of bore in plate support using compressed air, and remove.



STEP 14

Remove both O-rings (1 and 2).

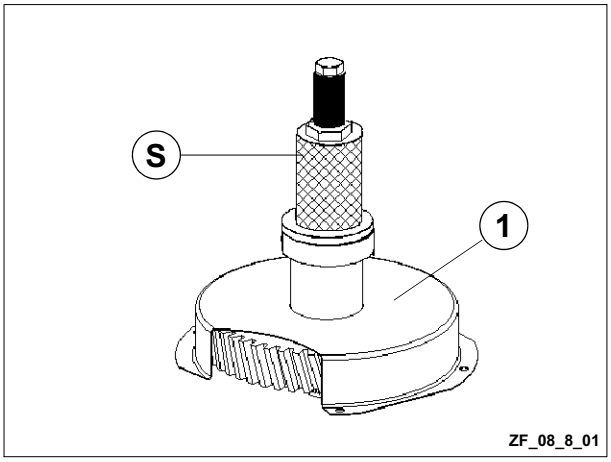


14.8 Drive shaft

STEP 1

Pull tapered roller bearing (inner race) away from output shaft and remove oil screen plate (1).

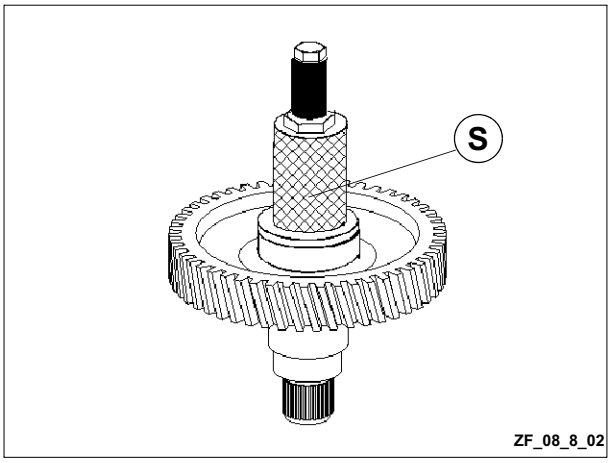
(S) Basic unit.....5873 001 000
(S) Gripper 5873 001 058
or
(S) Quick gripper.....5873 011 011



STEP 2

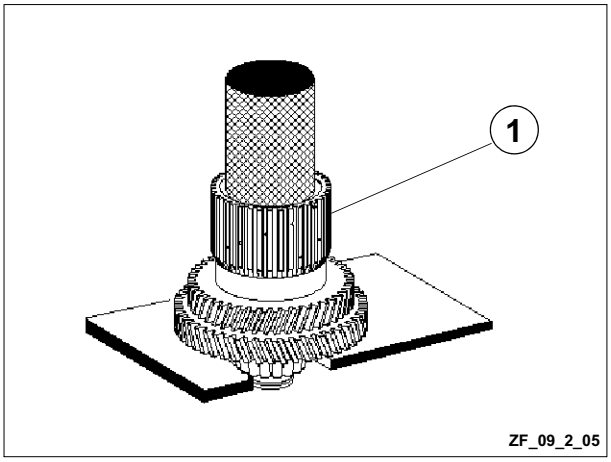
Turn output shaft through 180° and remove tapered roller bearing (inner race).

(S) Basic unit.....5873 001 000
(S) Gripper 5873 001 058
or
(S) Quick gripper.....5873 011 011



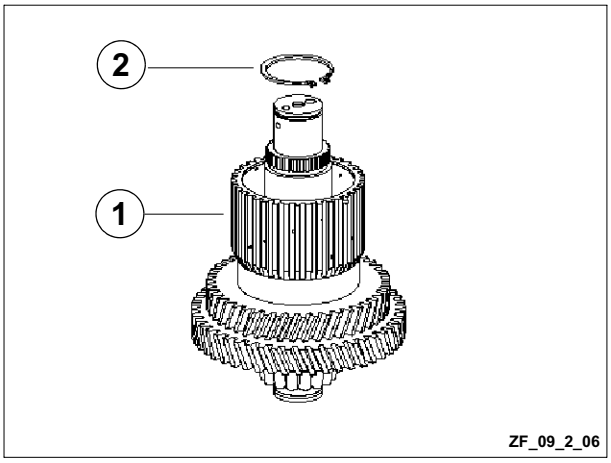
STEP 5

Press the pre-assembled idler gear (1) into position.



STEP 6

Fasten idler gear (1) with circlip (2).

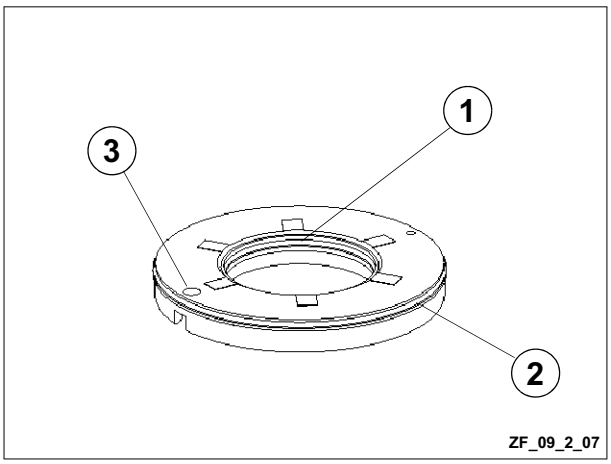


STEP 7

Insert both O-rings (1 and 2) in the recesses in the piston, and lubricate.

1 = 75 x 3
2 = 142 x 3

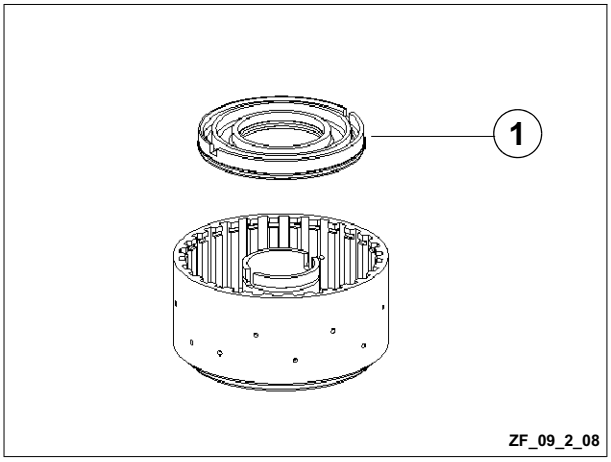
NOTE: *Check the function of drain valve (3) - the ball should not stick!*



STEP 8

Insert piston (1) in the plate support.

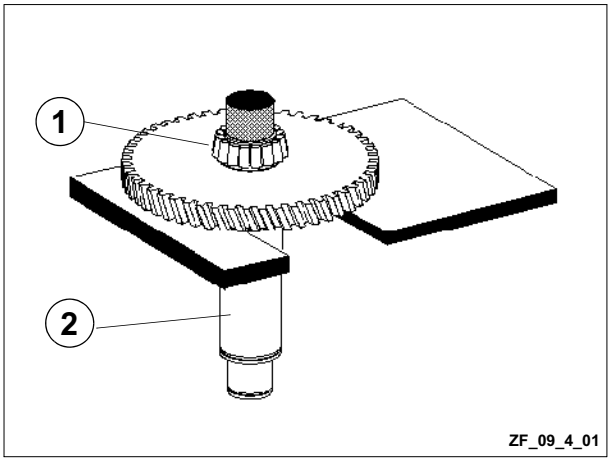
NOTE: *Note the installation position - see picture.*



15.4 Coupling K2

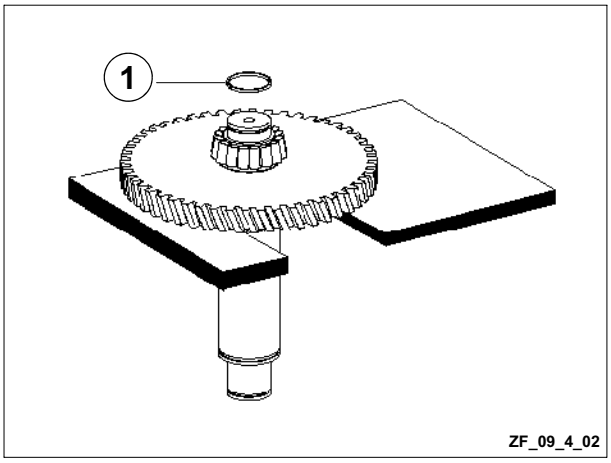
STEP 1

Press tapered roller bearing inner race (1) into position on shaft (2).



STEP 2

Mount piston ring (1).

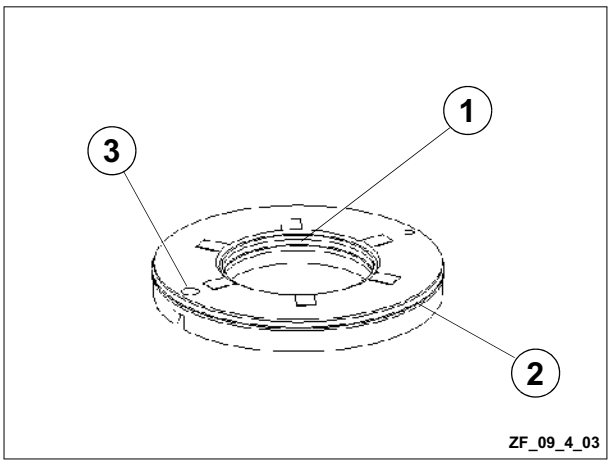


STEP 3

Insert both O-rings (1 and 2) in the recesses in the piston, and lubricate.

1 = 75 x 3
2 = 142 x 3

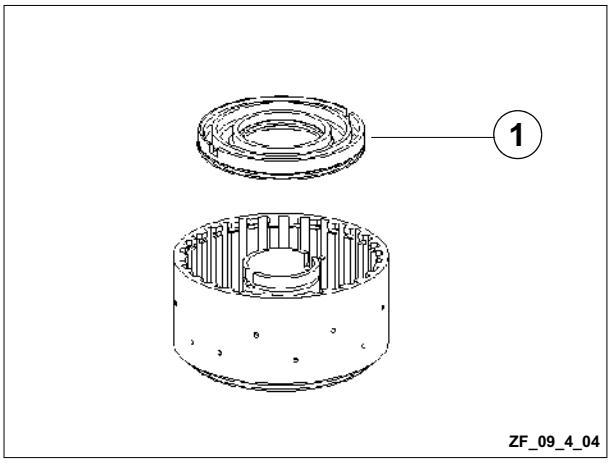
NOTE: *Check the function of drain valve (3) - the ball should not stick!*



STEP 4

Insert piston (1) in the plate support.

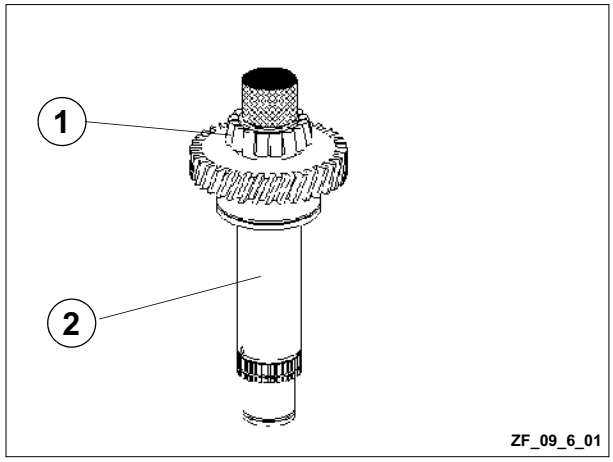
NOTE: *Note the installation position - see picture.*



15.6 Coupling K4

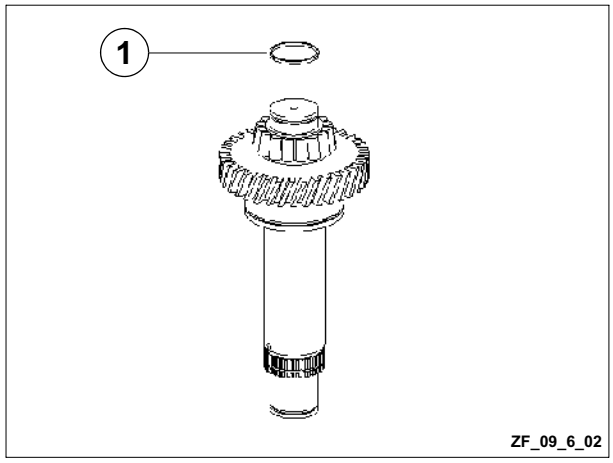
STEP 1

Press tapered roller bearing inner race (1) into position on shaft (2).



STEP 2

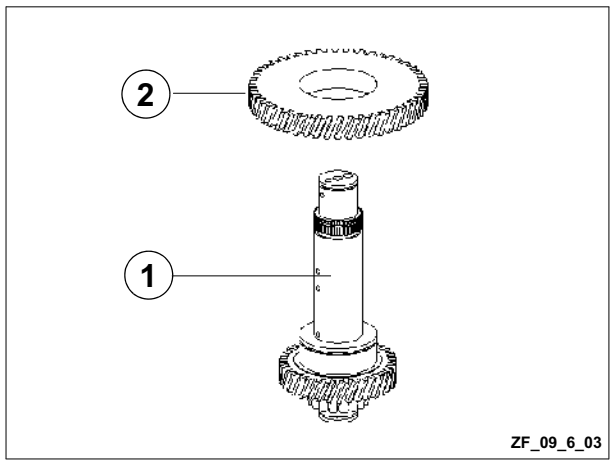
Mount piston ring (1).



STEP 3

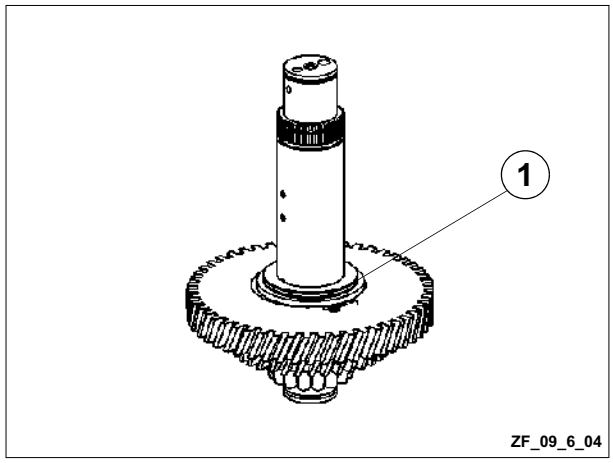
Tightening torque Chill the shaft (1) (to about -80 °C), heat gear wheel (2) (to about +120 °C) and mount in position.

CAUTION: *Wear protective gloves!*



STEP 4

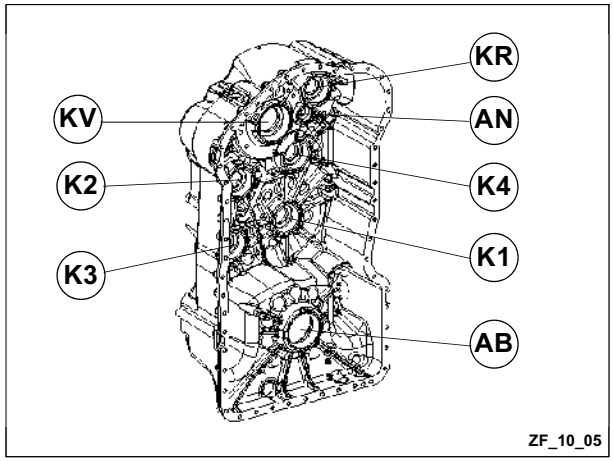
NOTE: Secure gear wheel with circlip - 80 x 2.5 - (1).



STEP 4

NOTE: *At the replacement parts service, lubricating oil pipes (1 and 2) are only supplied complete with the housing rear section.*
Available individually on request.
Can only be mounted using the ZF special tool (see also Step 1)!

(S) Rolling tool.....5870 600 006
(S) Lubricant.....5870 451 006



STEP 5

Insert all bearing outer races in the bearing bores in both housing sections.

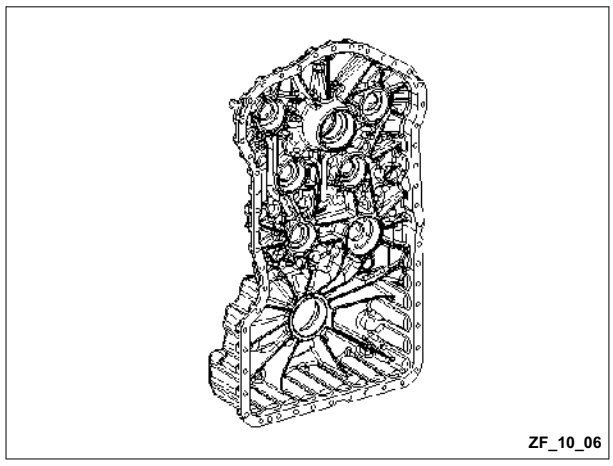
Housing front section:
AN = Drive
AB = Output
KV = Forward coupling
KR = Reverse coupling
K1 = 1st gear coupling
K2 = 2nd gear coupling
K3 = 3rd gear coupling
K4 = 4th gear coupling

STEP 6

Housing rear section:
See legend at Step 5.

NOTE: *Insert all bearing outer races with mounting grease in the bearing bores.*

NOTE: *If the tapered roller bearings for the couplings, drive and output shafts are not to be replaced (not recommended by ZF), the existing pairing (bearing outer race / bearing inner race) must be retained (see Paragraph 12.7 Steps 9 and 11).*



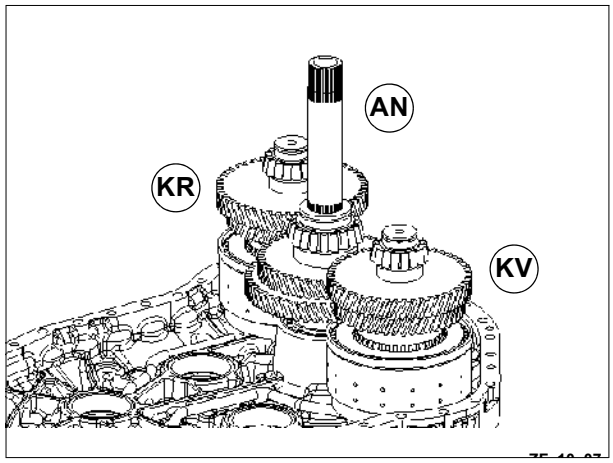
STEP 7

CAUTION: *Due to installation conditions, it is not possible to install individual couplings without using the special tool.*
Otherwise, there is a risk of injury!

Install the couplings using the housing rear sections (see Steps 6 to 13).

NOTE: *The housing rear section is lifted off again later.*

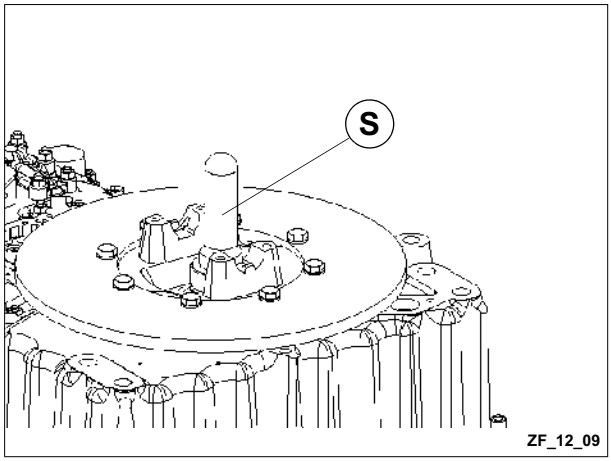
Insert coupling KR, drive shaft AN and coupling KV together in the housing rear section.



STEP 4

Fasten the locking plate with installer tool (S).

(S) Installer tool 5870 057 011
(S) Handle 5870 260 002

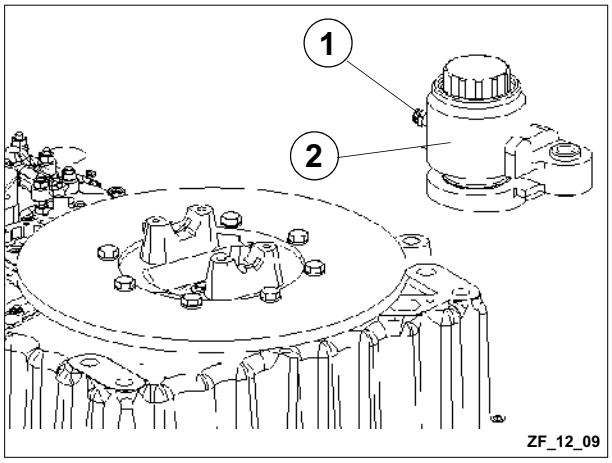


STEP 5

Connect HD pump to connection (1) and apply a pressure of about 80 bar to parking brake (2) and bring into position at the console.

(S) HD hand pump 5870 287 007
(S) Mini measurement coupling .. 0501 207 939 (M10x1)
(S) Mini measurement coupling .. 5870 950 101
..... (M12x1.5)

NOTE: *Inspect threaded stud (1).*

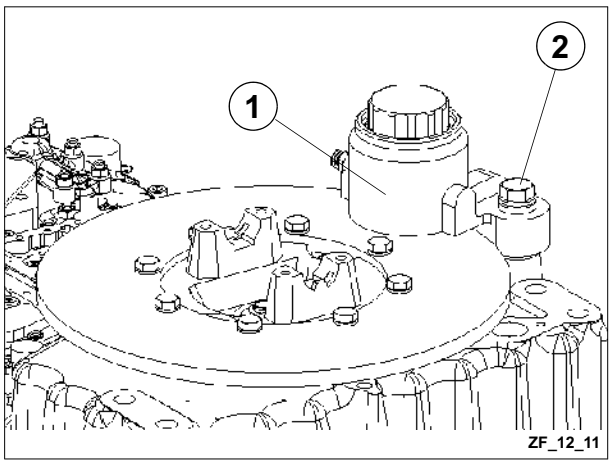


STEP 6

Fasten parking brake type FSG-75 (1) to console with the hexagon head bolts.

Tightening torque (M16x1.5/10.9x85) ..... 300 Nm

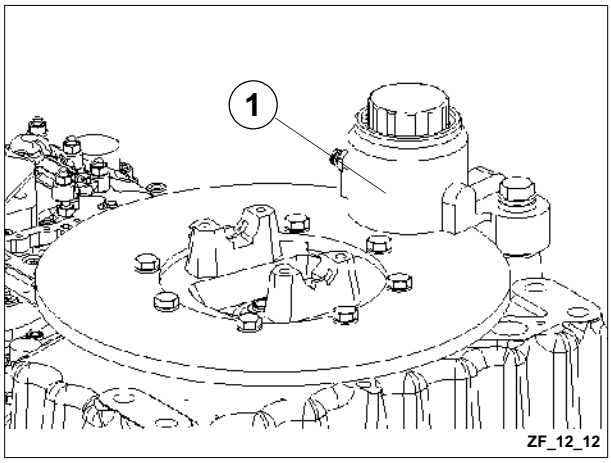
NOTE: *For all installation, assembly, function, and maintenance information and setting instructions for the parking brake (1), see the original documentation of provided by KNOTT (Section 17).*



NOTE: *Types:*
M-90 - mechanically operated
FSG-75 - hydraulically operated
FSG-90/110 - hydraulically operated

FSG-75/90
air gap 0.5 - 1.5 mm
nominal air gap 1.0 mm

FSG-110
air gap 1.5 - 2.0 mm
nominal air gap 1.7 mm



19.2 Pressure oil pump

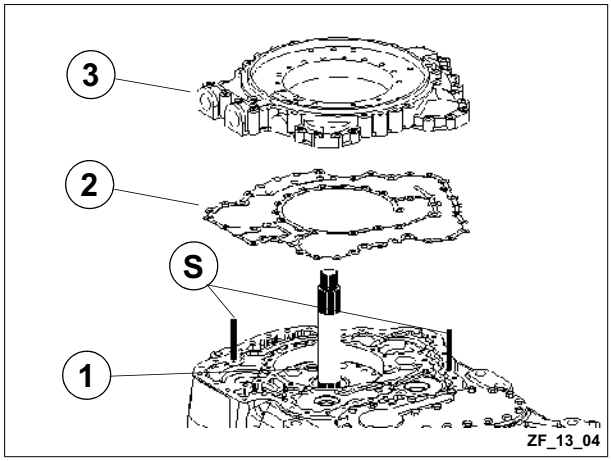
STEP 4

Place pressure relief valve (1) in position in the housing bore.

Mount the two adjusting screws (S) and place flat seal (2).

NOTE: *Apply mounting grease!*

(S) Adjusting screws (M8).....5870 204 011

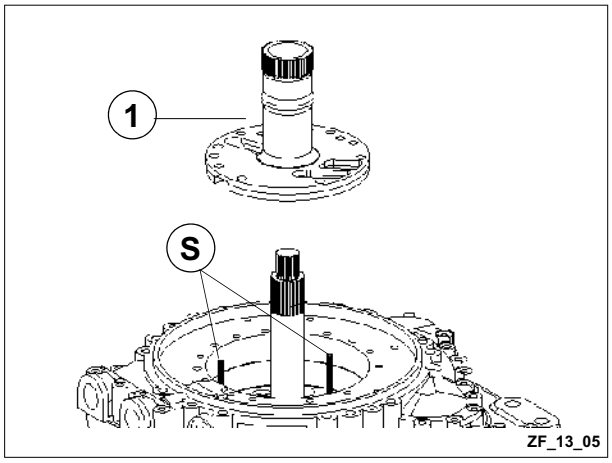


STEP 5

Mount the two adjusting screws (S) and insert stator shaft (1).

NOTE: *Note the radial installation position!*

(S) Adjusting screws (M10).....5870 204 007

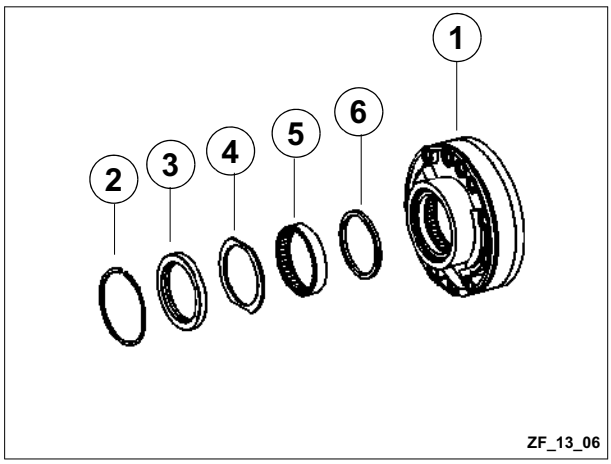


STEP 6

NOTE: *If signs of galling are found in the pump housing or on the control disk, the pump must be replaced in full.*

Parts 1 to 6 should be replaced.

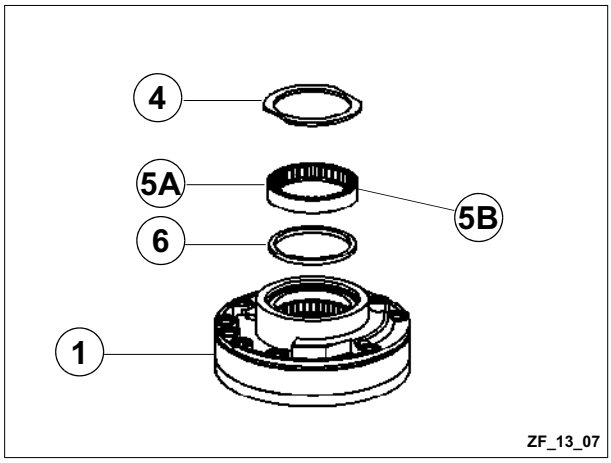
1 = Pump housing with rotor
2 = Snap ring
3 = Shaft seal (75x90x10)
4 = Support disk (95x76x84x3)
5 = Needle bearing complete (bearing outer race and needle bearing)
6 = Ring (75x84x4.6)



STEP 7

Mount the following parts in the pump housing (1).

6 = Ring
5A = Bearing outer race
5B = Needle bearing
4 = Support disk



STEP 3

Mount oil drain screw (1) with new O-ring 35x2.

Tightening torque (M38x1.5) ..... 80 Nm

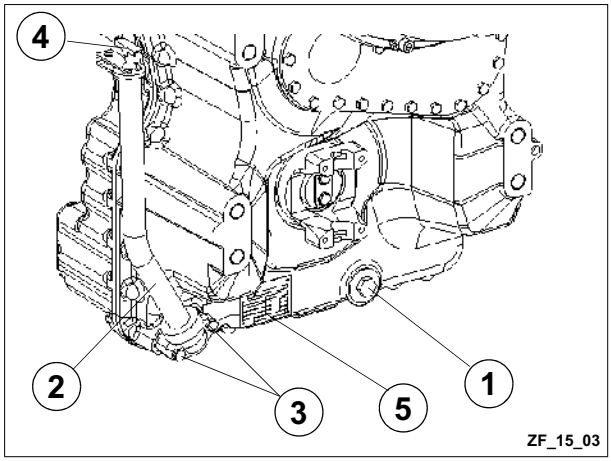
Bring oil dipstick tube (2) and its seal into position on the housing front section and fasten with hexagon head bolts (3).

Tightening torque (M8/8.8x50) ..... 34 Nm

Fasten the oil dipstick (4) in the dipstick tube.

Attach model plate (5) to the housing front section.

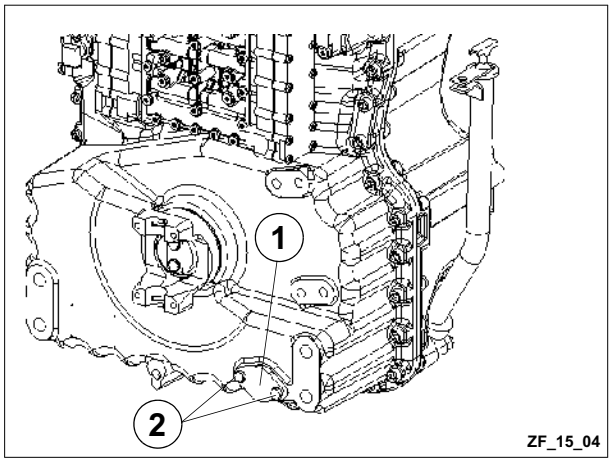
NOTE: *Stick it on with Loctite No. 5069.*



STEP 4

Bring cover (1) and gasket into position on the housing front section and fasten with hexagon head bolts (2).

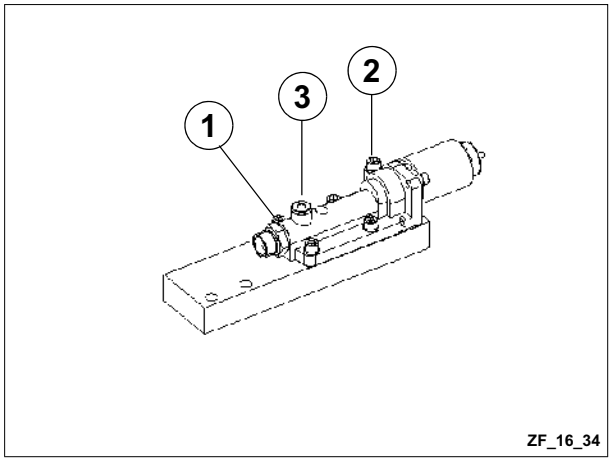
Tightening torque (M8/8.8x18) ..... 23 Nm



STEP 31

Fasten WK valve with cap bolts (1 and 2) and mount screw plug (3) with new O-ring 8x1.5.

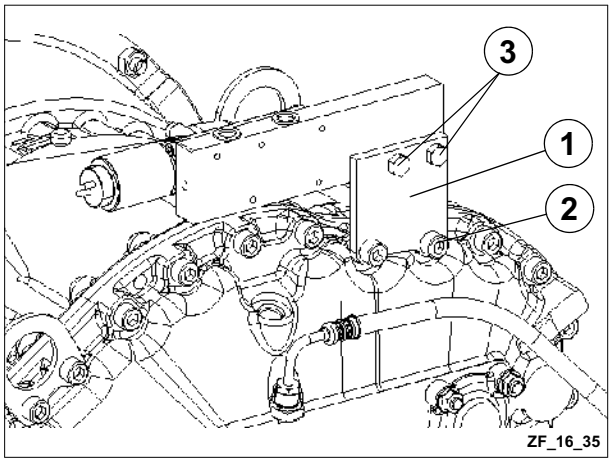
Tightening torque
Cap bolts (M5/8.8x40)..... 9.5 Nm
Cap bolts (M5/8.8x20)..... 9.5 Nm
Screw plug (10x1)..... 6.0 Nm



STEP 32

Fasten plate (1) to housing with cap bolts (2).
Tightening torque (M10/8.8x65)..... 46 Nm

Fasten WK valve to plate (1) with hexagon bolts and hexagon nuts (3).
Tightening torque (M8/8.8x40)..... 25 Nm

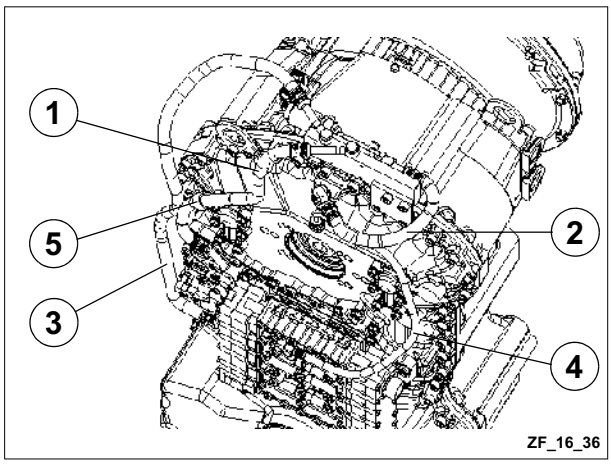


STEP 33

Mount hoses with new O-rings:

1 = System pressure to WK valve
2 = System pressure to WK
3 = Return line to sump
4 = Power take-off lubricating line (see Section 11, Step 6)
5 = Hose clamp

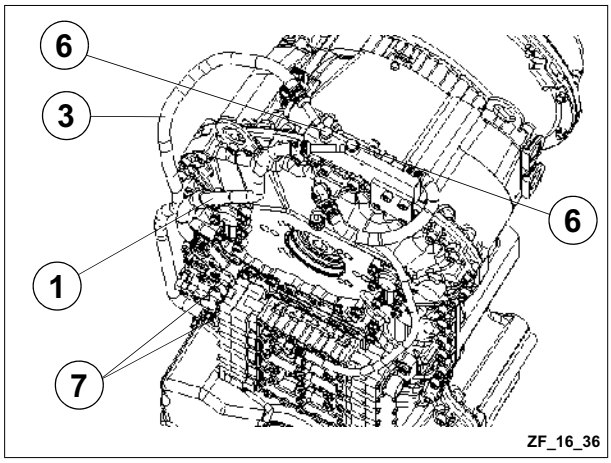
Tightening torque Hose (1)
Banjo bolt (6) (M12x1.5)..... 35 Nm
Banjo bolt (7) (M16x1.5)..... 45 Nm



Tightening torque Hose (2)
Connection fitting L12A-M (M16x1.5)..... 46 Nm
Hose..... 35 Nm

Tightening torque Hose (3)
Banjo bolt (6) (M12x1.5)..... 35 Nm
Banjo bolt (7) (M16x1.5)..... 45 Nm

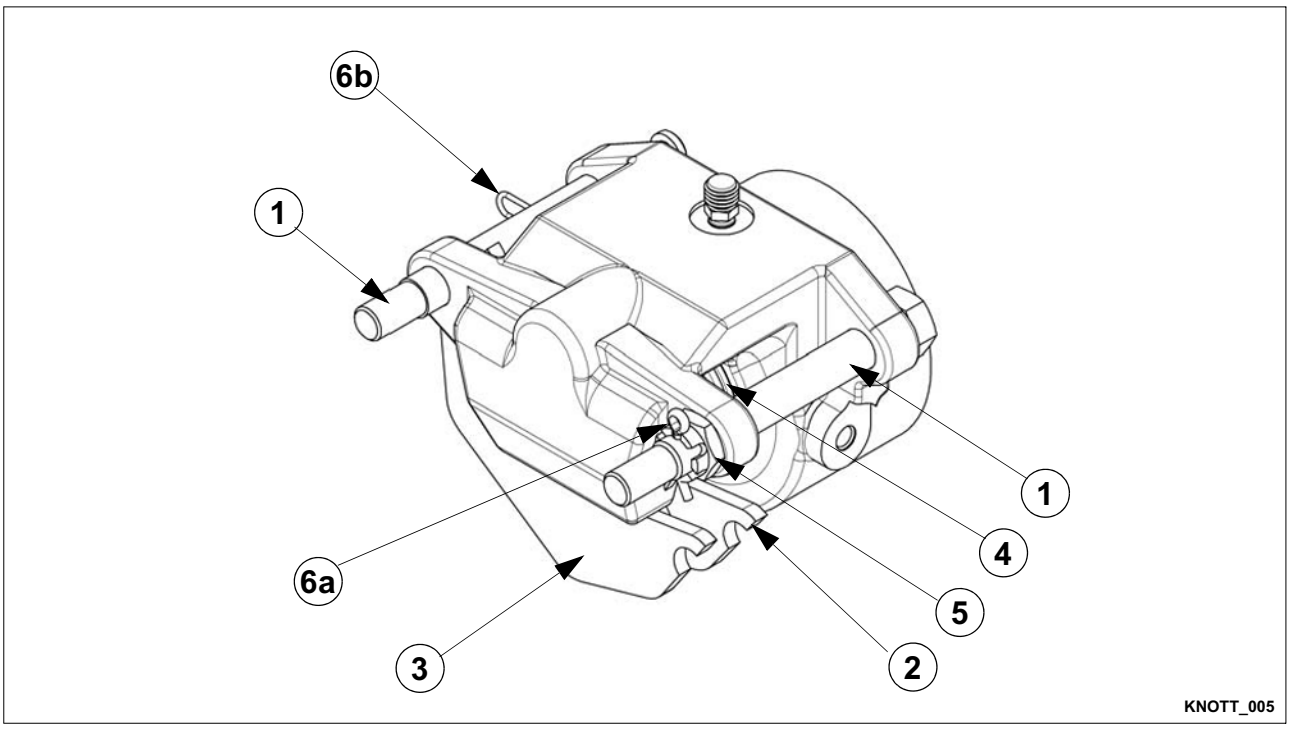
Insert threaded bushing with O-ring 23x2 in the housing.
Tightening torque
Threaded bushing (M26x1.5)..... 80 Nm



3. Loosen the screw cap and remove.

4. Loosen the SW 24 locknut and turn the adjusting screw anti-clockwise with an SW 8 Allen key until the thrust pin can be pressed fully into the piston.

5. With a suitable screwdriver, turn (or lever) the thrust pin back into position at the piston.



Replacing the brake lining carrier

1 Guide pin
2 Brake lining carrier
3 Brake lining carrier
4 Permanent magnets
5 Castle nut
6a Cotter pin
6b Retaining clip

NOTE: *If it is not possible to replace the brake lining carrier as described above (too little room available), the brake must be removed completely. To do this, pull the two guide pins out of the brake carrier.*

CAUTION: *Check the pressure line. If the pressure line is too short, it must be detached in order to allow the brake to be removed.*

Before detaching the pressure line, carry out an emergency release of the parking brake.

7. Replace the brake lining carrier and insert the guide pin back into the brake carrier.
   If you have removed the brake completely due to lack of available space, this must be re-installed again and both guide pins inserted.

1.3 General disassembly/assembly instructions

The axle should be inspected and/or repaired only by specialised personnel who have a thorough knowledge of the product, and who follow the corresponding safety instructions (accident prevention).

Before starting work, the axle should be thoroughly cleaned to remove any deposits, grease and/or accumulated dirt.

To prevent possible damage, all components removed from the axle must be cleaned with a suitable cleaning agent. Check the parts for wear. If there is any damage, cracking, corrosion or other defects that could impair axle function, replace them.

In particular, all parts that are in constant movement (bearings, gears, shafts) and their seals (O-rings, gaskets) must be inspected for wear, as these are subject to greater stress. It is recommended to change the seals at each maintenance or repair operation.

Note that the components of bevel gear pairs must always be replaced in pairs.

Always use the specified replacement parts and screws. Use metric tools for metric screws and UK tools for UK screws.

As described in the disassembly instructions, certain operations are final for some of the axle components, i.e. these components must be replaced each time, as they are destroyed by the removal process. The individual steps must be followed exactly as described, in order to avoid impairing the correct function of the entire assembly.

Before starting disassembly and assembly work, read through the following instructions carefully.

Shaft sealing rings

When assembling the shaft seals, do the following:

- Clean the shaft thoroughly, and inspect the areas of the seal rings that come into contact with the shaft for any signs of deformation or damage.
- Insert the seal ring such so that the lip is facing in the direction of the oil flow.
- Lubricate the lip (preferably with grease), and 3/4 fill the recesses in the rings with grease.
- When mounting the rings, use a suitable press-on tool. Do not strike the rings directly with a hammer.
- Do not damage the rings when mounting on the shaft.

O-rings

Grease the O-rings before pressing into position. Avoid rolling them.

Shim washers

For adjustments, use appropriate shim washers. These must be measured individually. Measuring the entire pack, or taking the dimension stamped on the disks, will not always give the actual value: it must therefore be checked.

Bearings

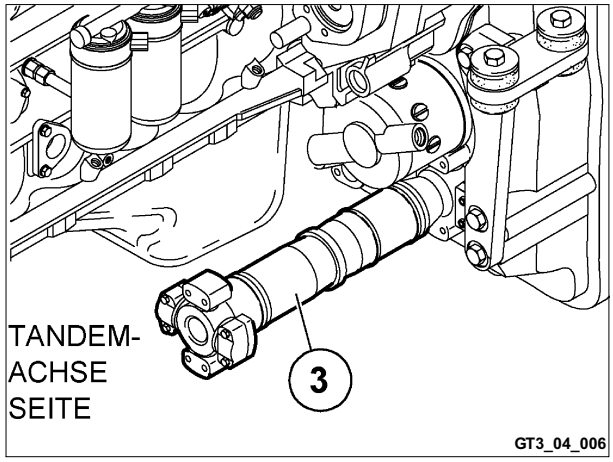
For correct mounting on the shaft, it is recommended beforehand to heat the bearing to 80 °C - 90 °C in an oven. It should then be mounted in the bearing seat, where it should be allowed to cool. Always use a suitable extracting tool to remove bearings. Before mounting, clean, inspect and lubricate the bearing.

Roll pins

Before mounting grooved pins, check that the grooves are pointing in the direction of force. There is no special mounting direction for spiral roll pins.

STEP 4

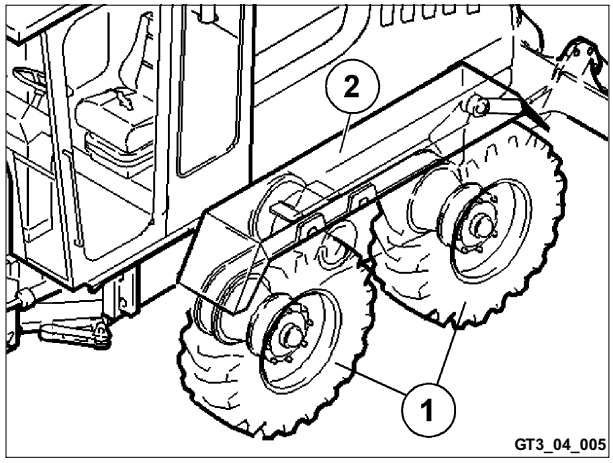
Connect the transmission shaft (**3**) (on tandem axle side) and tighten the bolts.



STEP 5

Install the mudguards (**2**) and tighten the bolts.

Mount the rear wheels (**1**) and tighten the nuts.



NOTES:

3.3 Hydraulic diagram

1. Pump assembly
10. Hydraulic fluid tank
25. Pressure limiting valve, purge circuit
60. Wheel motor
62. 6/2 way valve for front wheel drive
63. Flow divider (hydr. differential lock in forward travel)
64. Solenoid valve block Y8.1/Y8.2 for all-wheel ON/OFF
65. Pressure limiting valve pre-load 1.5 bar
66. Purge and feed pressure valve 16 bar
67. Feed pressure filter
68. Pressure reservoir 0.75 l for purge circuit
69. Distributor block with nozzle

4.2 Installation

CAUTION: *Heavy parts should be lifted and handled using lifting gear with sufficient carrying capacity.*

Individual parts and assemblies should be secured and held with a firm harness and suitable fastenings.

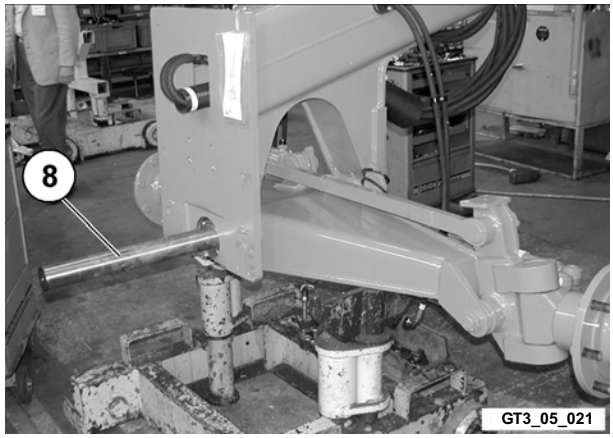
No one should be standing near the load being lifted.

STEP 1

Position the front axle so that the holes in the front frame are aligned with those in the front axle.

Push the bolt (**8**) in a little way.

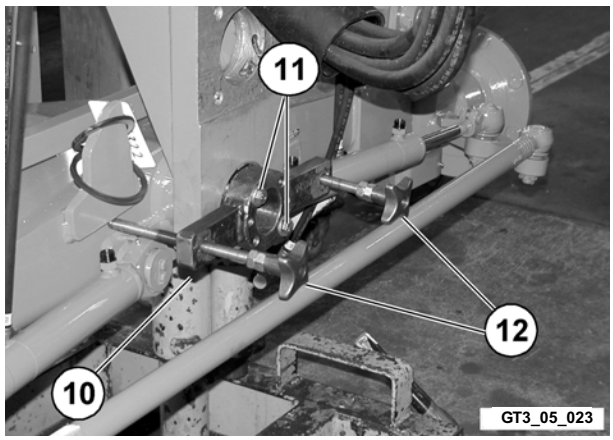
NOTE: *The vehicle is shown without equipment.*



STEP 2

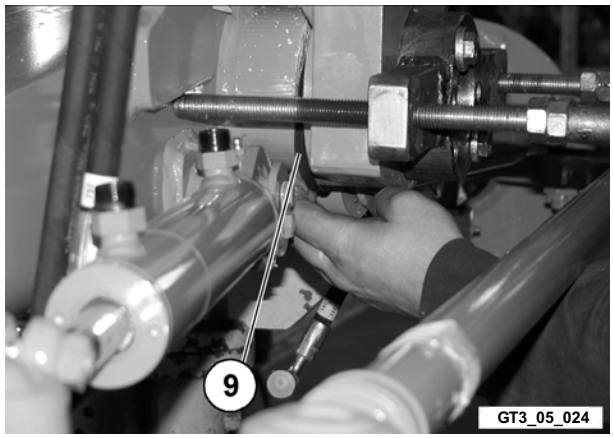
Insert the special tool (**10**) and fasten to the front frame with bolts (**11**).

Using the bolts of the special tool (**12**), push the front axle forward as far forward as possible, to make as much room as possible between front frame and front axle.



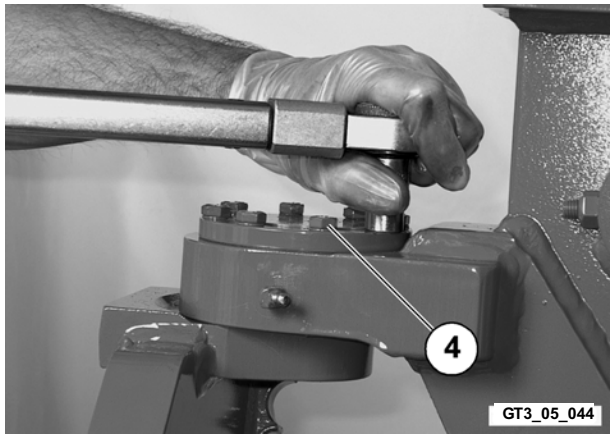
STEP 3

Push the spacers (**9**) in, to create the specified gap between front frame and front axle.



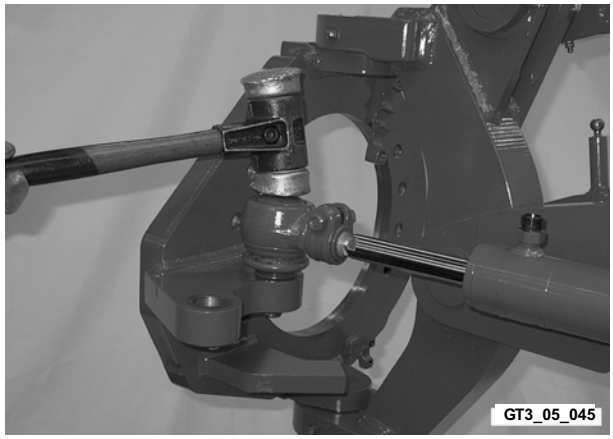
STEP 9

Insert bolts (**4**) and tighten to the specified torque (see par. 5.2.6.)



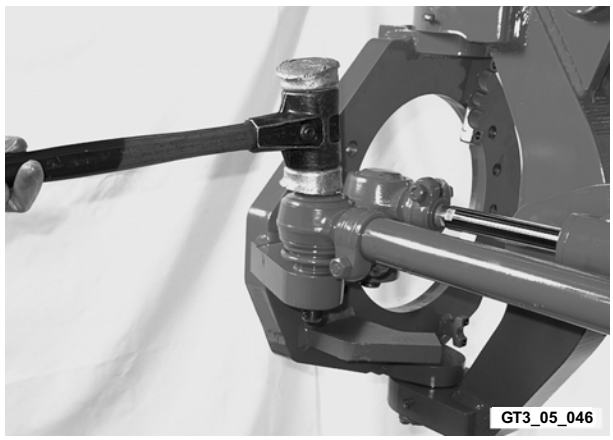
STEP 10

Insert steering cylinder bolt and secure with the castle nut and cotter pin.



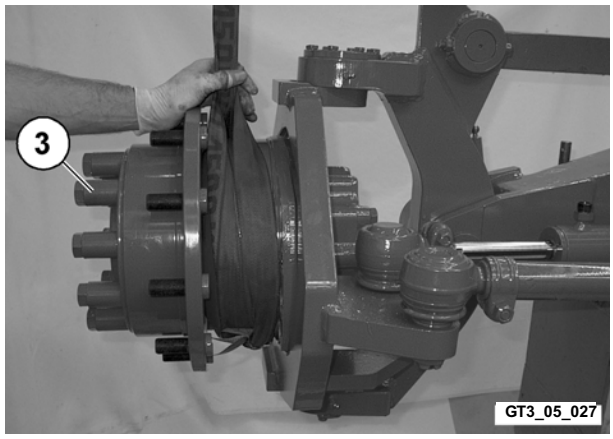
STEP 11

Insert cylinder rod and secure with the castle nut and cotter pin.



STEP 12

Mount the transmission (**3**).



5.2.2 Assembly

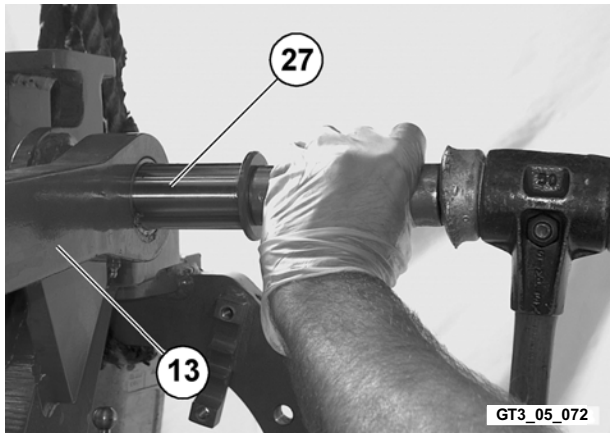
NOTE: *Some of the illustrations may show a different axle. Nevertheless, the working procedures are the same.*

STEP 1

Mount the hub carrier (on camber cylinder side).

Place cylinder rod (**13**). Place wheel camber cylinder (stem inside the hub carrier).

Knock in bolt (**27**) until flush.



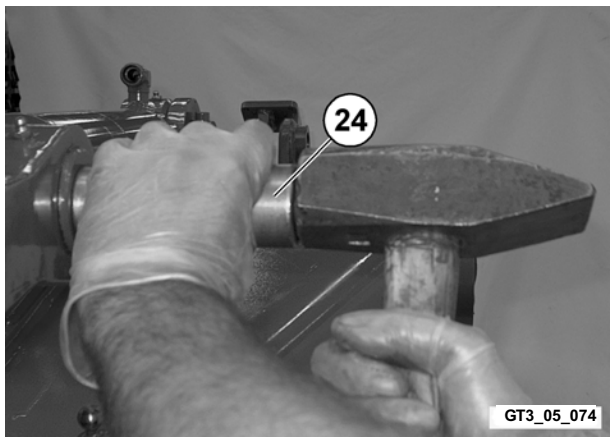
STEP 2

Tighten bolt with screw (**26**) and nut (**28**).

STEP 3

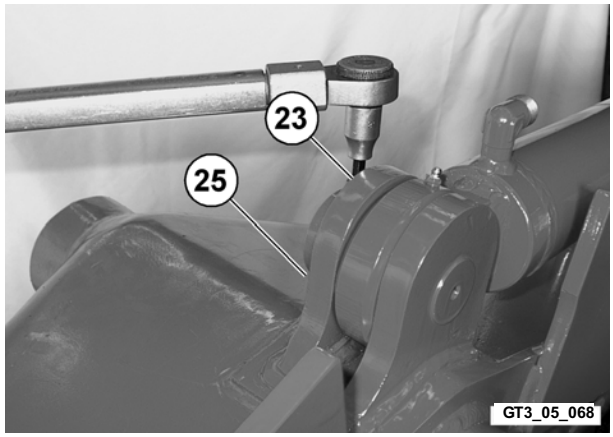
Place wheel camber cylinder (cylinder liner between axle casing plates).

Knock in bolt (**24**) until flush.



STEP 4

Tighten bolt with screw (**23**) and nut (**25**).

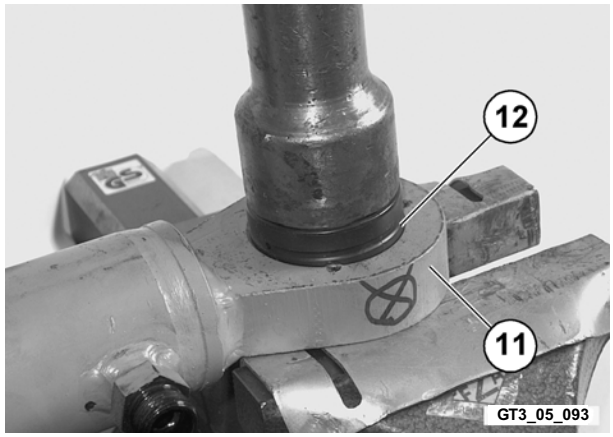


5.3.2 Assembly

NOTE: *Some of the illustrations may show a different axle. Nevertheless, the procedures are the same.*

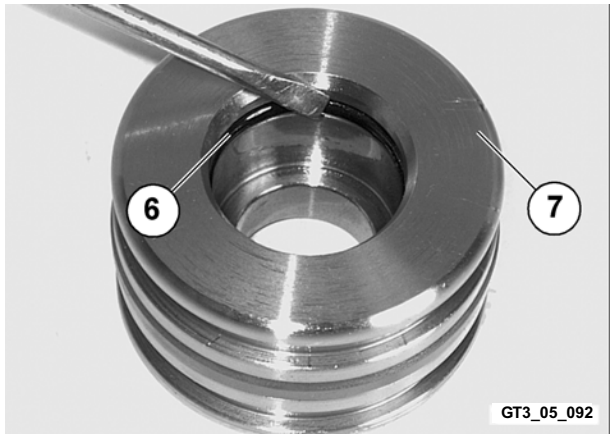
STEP 1

Insert joint bearing (**12**) in cylinder liner (**11**).



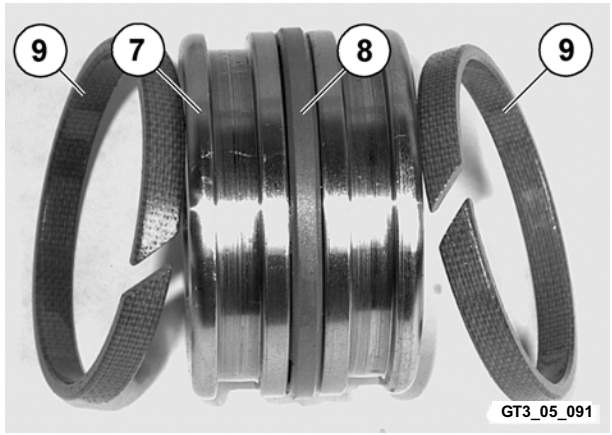
STEP 2

Mount O-ring (**6**) on piston (**7**).



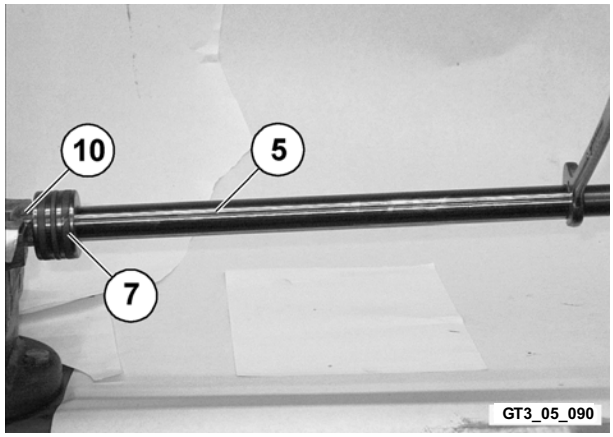
STEP 3

Mount rings (**9**) on piston (**7**).



STEP 4

Install nut (**10**), the complete piston (**7)** and stem (**5**).

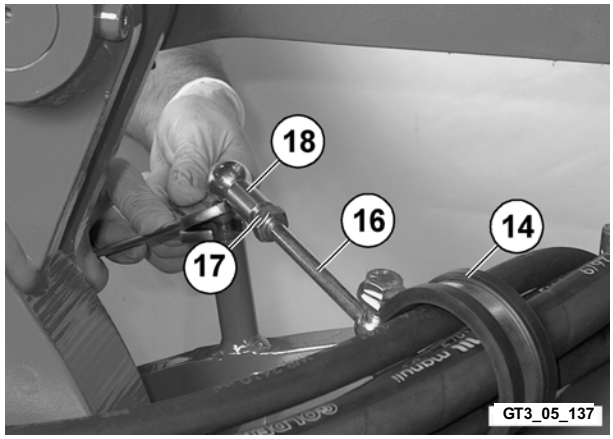


NOTES:

STEP 9

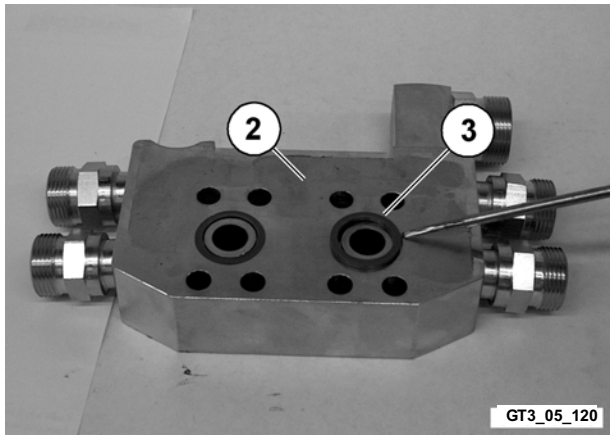
Mount clamp (**14**) on the hoses.

Mount joint (**18**) on the axle, with pull rod (**16**) and nut (**17**).



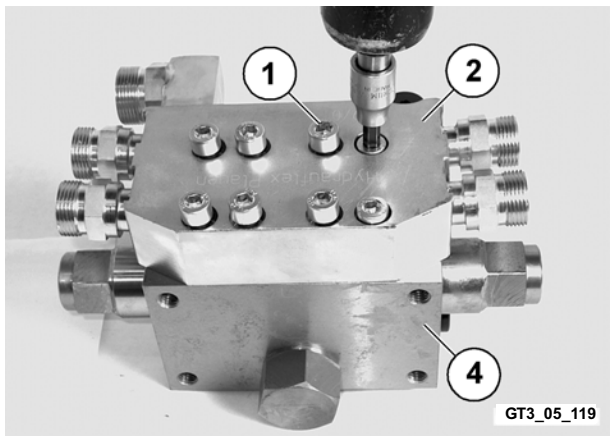
STEP 10

Place O-ring (**3**) on valve (**2**).



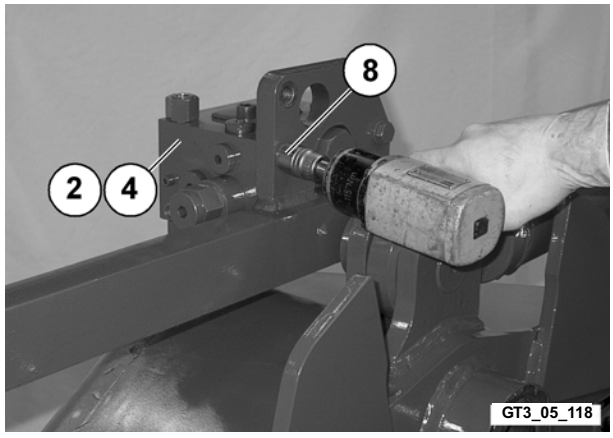
STEP 11

Connect valve (**2**) to block (**4**) using screws (**1**).



STEP 12

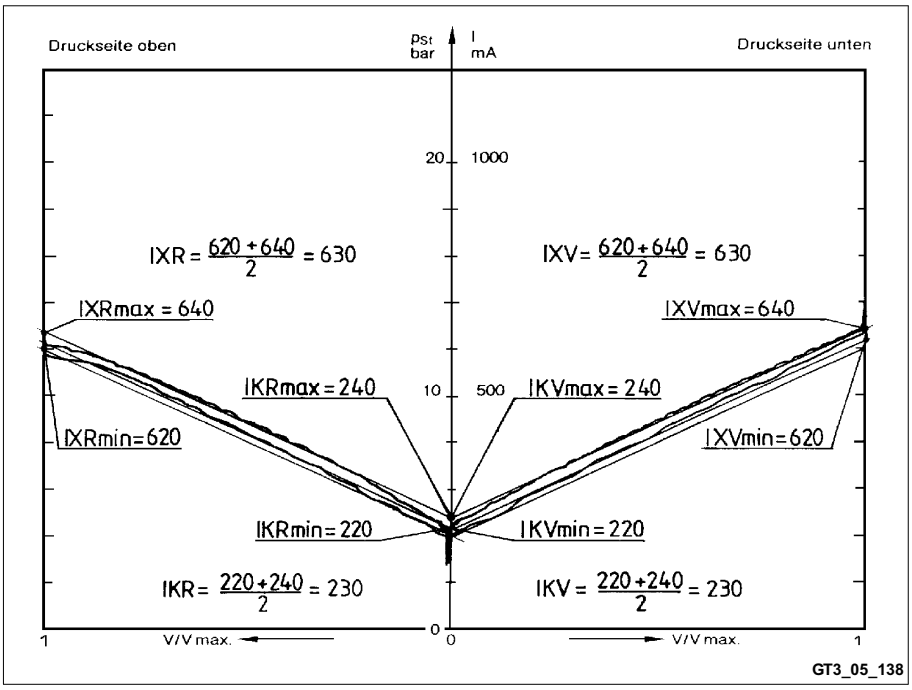
Fasten the block (**4**) and attached valve (**2**) to the frame using screws (**8**).



6.3 Individual settings of individual pump values according to pump characteristics (acceptance report)

IXV = Maximum current value for pump deflection - forward travel
IKV = Initial current value for pump deflection - forward travel
IXR = Maximum current value for pump deflection - reverse travel
IKR = Initial current value for pump deflection - reverse travel

To enter these pump characteristic values into the FWD control, you must have the acceptance report from Hydromatik for the particular pump installed.



Pump characteristics

6.7 Error codes sent by the FWD control

For error codes from the FWD control (5150 to 5158), see Section 10 ‘Electrical’, paragraph 4.4 ‘All-wheel control error codes’.

6.8 Fault table

Fault	Possible cause	Check and remedy
No tractive force at front wheels	No power supply to FWD control	Check the fuse, test the power supply
	Faulty On/Off switch	Check the signal from the switch; repair or replace it
	Faulty FWD control	Check the FWD switch-on function, replace if necessary
	Pressure cut-off valve faulty	Check pressure cut-off Replace valve if faulty
	a high-pressure limiting valve is faulty	Check whether high pressure builds up on one side Replace valve if faulty
	Faulty purge valve	repair or replace it
	Feed pressure too low or absent	Check feed pressure at measuring point (MS), set the feed pressure limiting valve, or replace it
	On/Off solenoid valve faulty	Check FWD shift pressure at measuring point (1), replace valve
	6/2 way valve faulty	repair or replace it
	Wheel motor faulty	repair or replace it
	Pump drive faulty *(	replace pump

*)

CAUTION: *If the pump drive is faulty, i.e. the axial piston pump is not being driven when the diesel engine is running, the vehicle should not be driven, even with the all-wheel drive switched off.*

1.1.2 Installation

CAUTION: *Heavy parts should be lifted and handled using lifting gear with sufficient load capacity.*

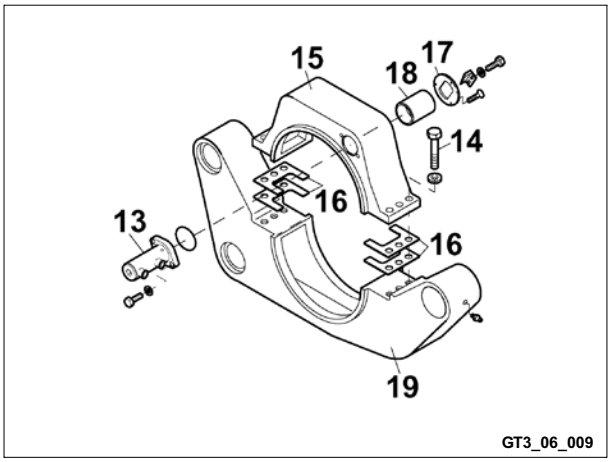
Individual parts and assemblies should be secured and held with a firm harness and suitable hooks.

No one should be standing near the load being lifted.

STEP 1

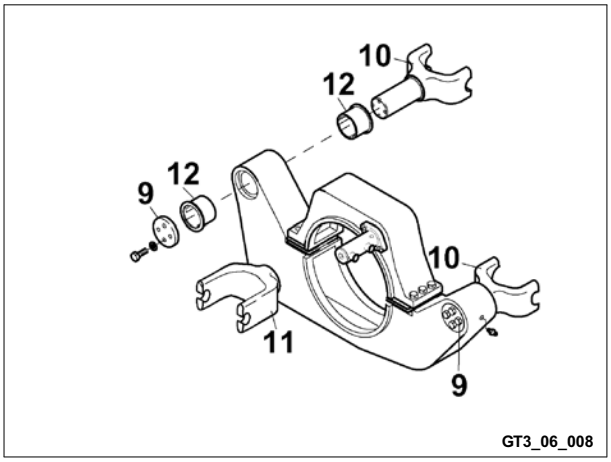
Secure the seat lower section (**19**) with lifting gear and raise till it touches the front frame.
Insert bushing (**18**), spacer (**17**) and seat upper section (**15**).
Insert spacers (**16**), raise the seat upper section and set down on the lower section (**19**). Tighten the mounting bolts (**14**).

Install the hydraulic cylinder that locks the seat and tighten the mounting bolts.



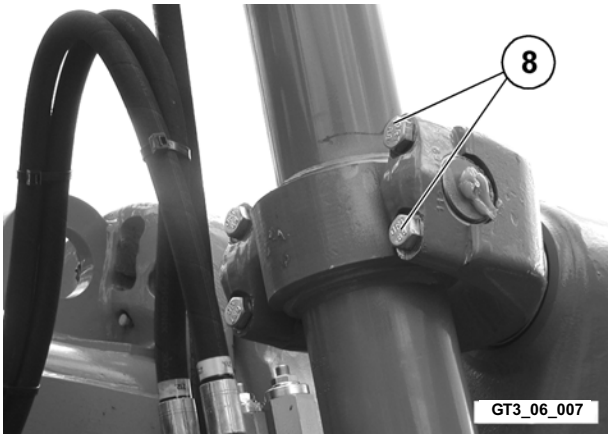
STEP 2

Insert bushings (**12**), forks (**10**) of the lift cylinders, and forks (**11**) of the swing cylinders. Mount the covers (**9**). Tighten the bolts.



STEP 3

Bring the lift cylinder into position with the lifting gear.
Mount the bushings and covers.
Tighten the mounting bolts (**8**).



1.2.2 Assembly

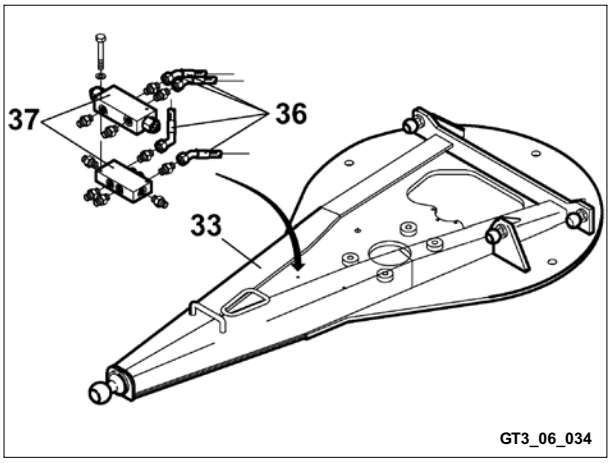
CAUTION: *Heavy parts should be lifted and handled using lifting gear with sufficient load capacity.*

Individual parts and assemblies should be secured and held with a firm harness and suitable hooks.

No one should be standing near the load being lifted.

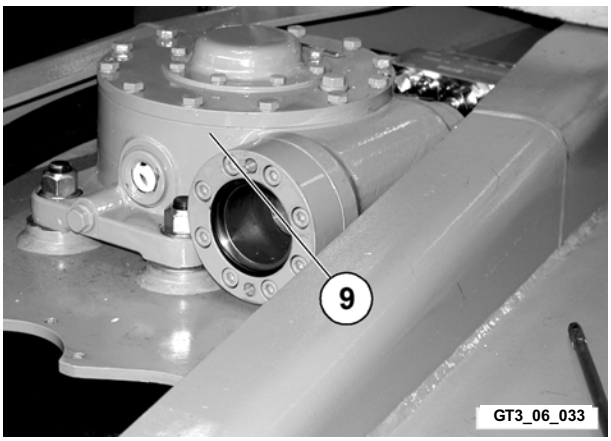
STEP 1

Fasten pull rod (**33**) to a bogie with sufficient load capacity.
Insert the two brake valves (**37**) and tighten.
Insert and connect the lines (**36**).



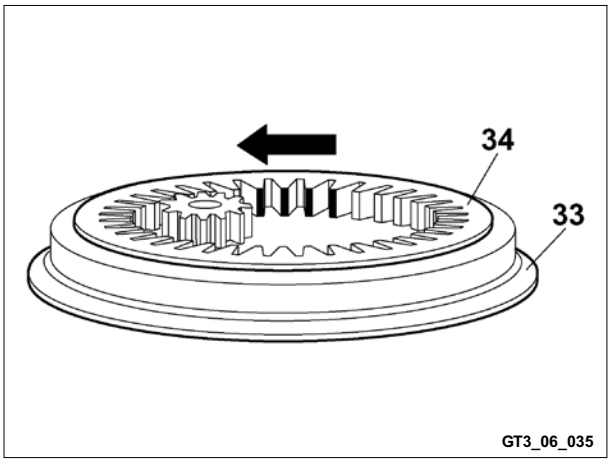
STEP 2

Install the endless screw transmission (**9**) and tighten the four bolts.



STEP 3

Turn the pull rod through 180°.
Mount the turntable (**34**) and fasten with four bolts offset at 90°.
Rotate the turntable through a complete turn. Bring the colour-coded teeth up to the gear wheel, and check that there is a gap of 0.030 mm between the teeth.



2.1.2 Installation

CAUTION: *Heavy parts should be lifted and handled using lifting gear with sufficient load capacity.*

Individual parts and assemblies should be secured and held with a firm harness and suitable hooks.

No one should be standing near the load being lifted.

STEP 1

Bring the front equipment into position with the lifting gear.

Fasten the front equipment to the front frame and tighten the bolts.

Tightening torque ..... 450 Nm

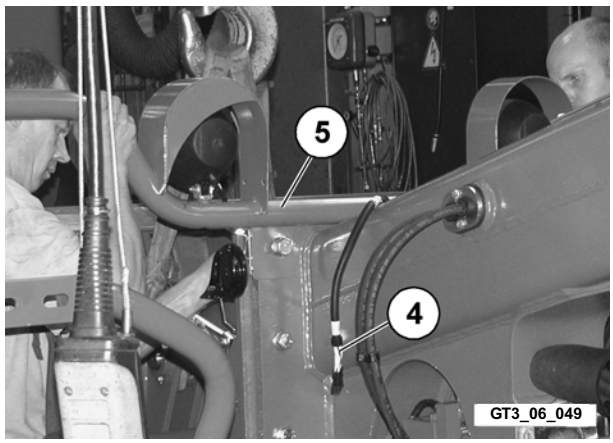
STEP 2

Mount the light bar (**5**).

Tighten the two mounting bolts.

Tightening torque ..... 450 Nm

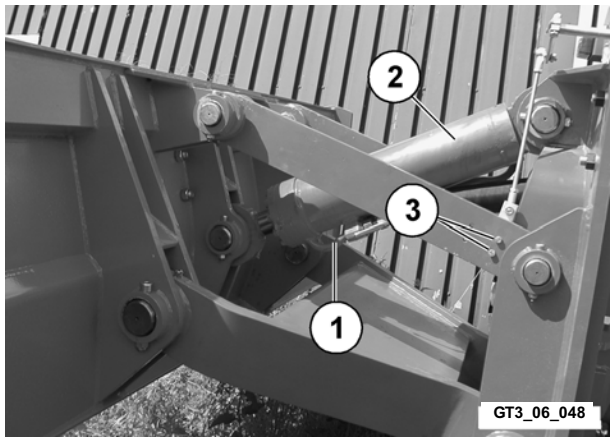
Connect wiring connector (**4**).



STEP 3

Mount the test rod for the front equipment positioning. Insert the two bolts (**3**).

Connect hydraulic lines (**1**) of the front frame to front equipment lift cylinder (**2**).



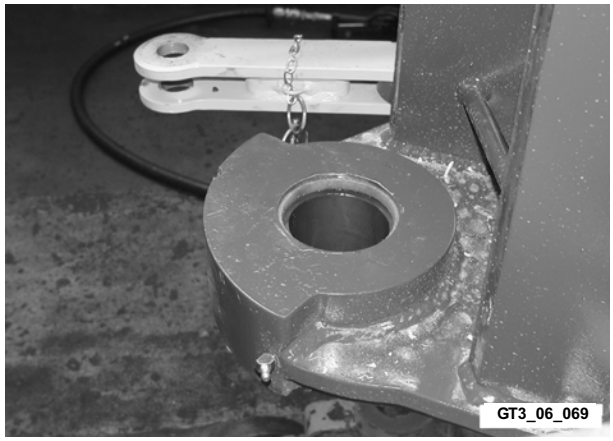
4.1.2 Installation

CAUTION: *Heavy parts should be lifted and handled using lifting gear with sufficient load capacity.*

Individual parts and assemblies should be secured and held with a firm harness and suitable hooks.

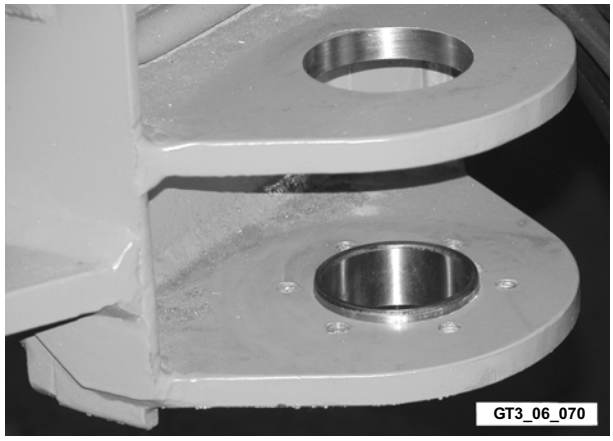
No one should be standing near the load being lifted.

NOTE: *Before detaching the front and rear frames, we recommend removing the cab and the operating platform (see paragraph 11).*



STEP 1

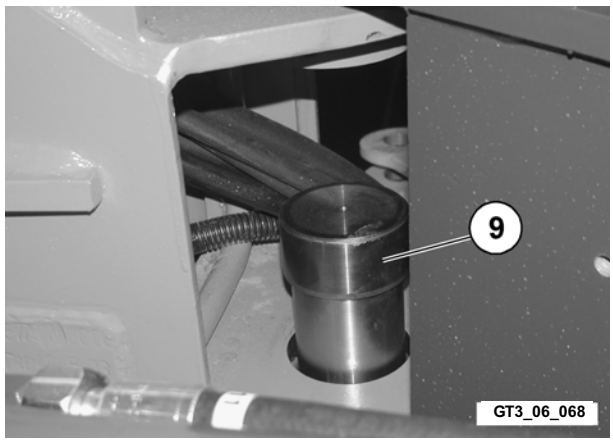
The bushings in the front and rear frame must be lubricated and undamaged.



STEP 2

IMPORTANT: *Use a suitable drift punch for driving bolts.*

Drive in the lower frame connecting pin (**9**).



STEP 3

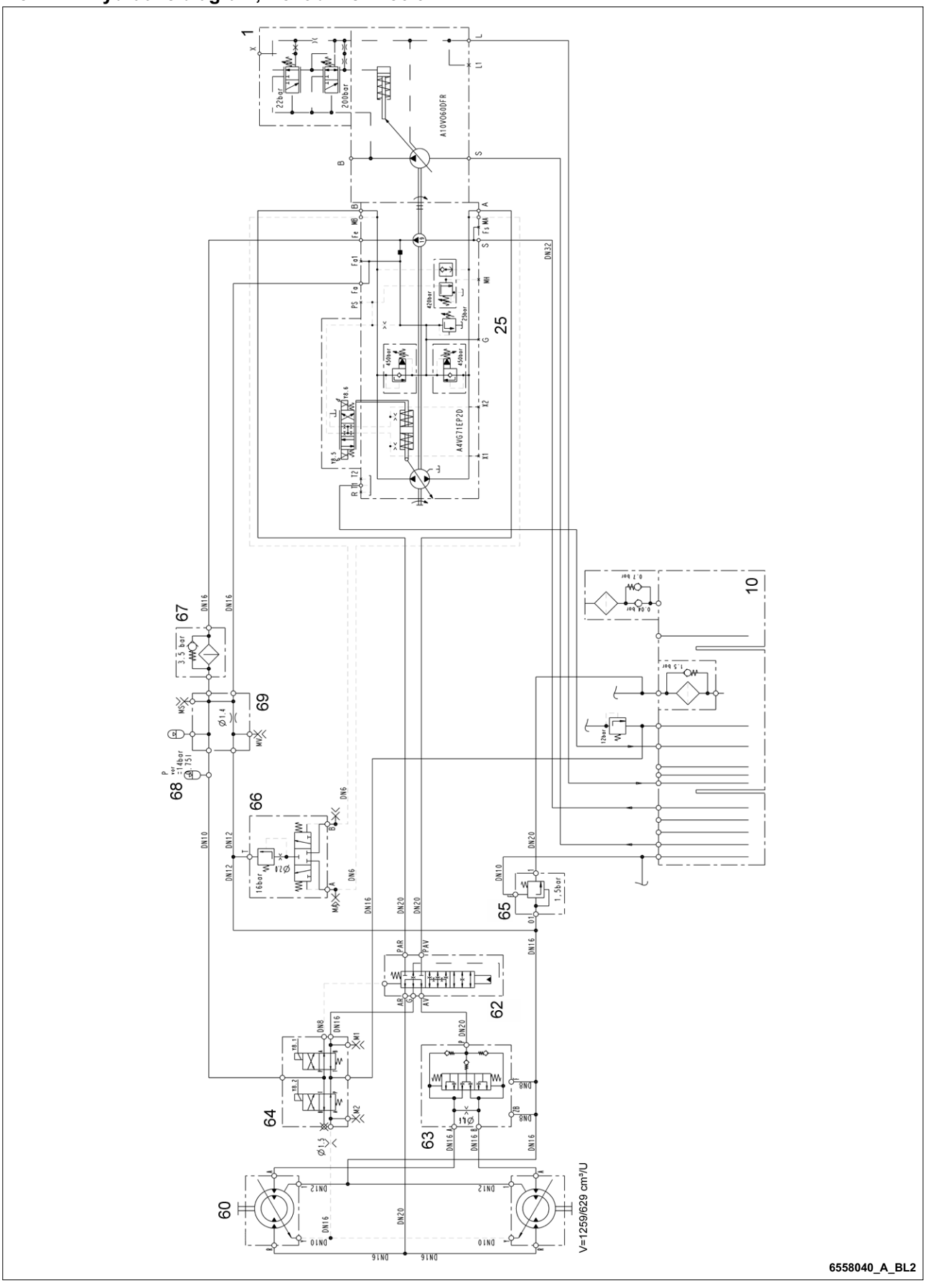
Using two appropriately machined bolts of the correct length, centre the lower frame connecting pin on the flange and drive in fully.

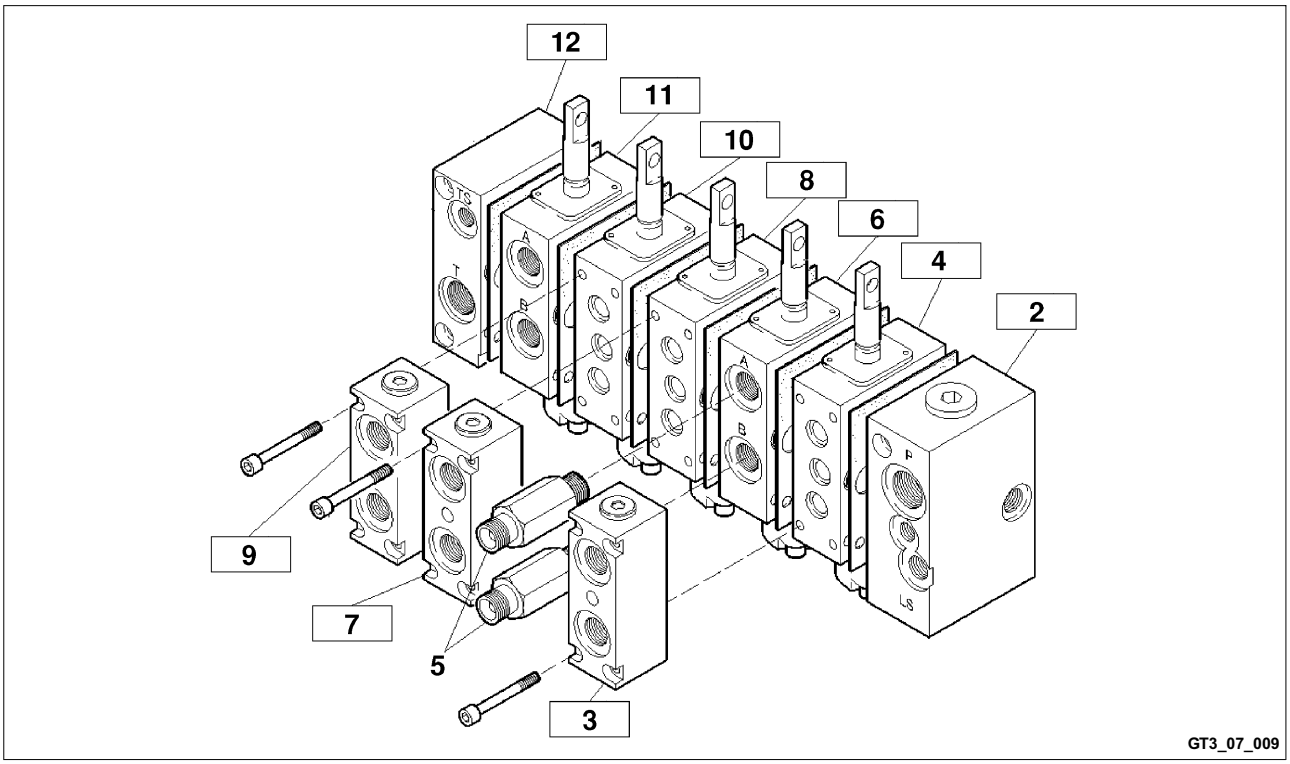
2 WIRING DIAGRAMS FOR HYDRAULIC SYSTEM

2.1 Hydraulic diagram F106.6

Item	Designation
1	Pump assembly
4	Gear pump
10	Hydraulic tank
11	4-circuit cooler
12	Fan motor
20	Steering servo control
21	Steering / emergency steering collector block with pressure switches S17 (2.5 bar) and 17.6 (2.5 bar)
22	steering cylinder
23	Emergency steering pump
25	Pressure limiting valve, purge circuit
30	LS valve block
31	Control block, lower installation position
32	Control block, upper installation position
36	Lowering control valve, blade tilt cylinder
40	Brake valve with pressure switch S18 (4 bar)
41	Brake valve with pressure switch S17.1 (90 bar) Cut-in pressure 120 +8 bar Shutoff pressure 150 -8 bar
42	Pressure reservoir, brake system
43	Pressure reservoir, parking brake (30 bar)
44	Pressure reservoir, parking brake (90 bar)
45	Parking brake, solenoid valve with pressure switch S16 (80 bar)
46	Connecting piece with nozzle ∅ 0.8 mm
47	Parking brake release pressure (150 bar)
48	Wet multi-disk brake (max. operating pressure 60 bar)
79	Blade lift cylinder, right
80	Blade lift cylinder, right
81	Lowering control valve
82	Scraper blade cylinder
83	Hydraulic cylinder, articulated steering
84	Blade tilt adjustment cylinder
85	Hydraulic cylinder, blade extend
86	Hydraulic cylinder, blade swivel
87	Rotary oil feed rotor
88	Hydraulic cylinder, wheel camber
89	Hydraulic cylinder, rear scarifier
90	Hydraulic motor, blade turn
91	Lowering control valve, blade turn
92	Hydraulic cylinder, detent pin

2.5.2 Hydraulic diagram, front drive F156.6A

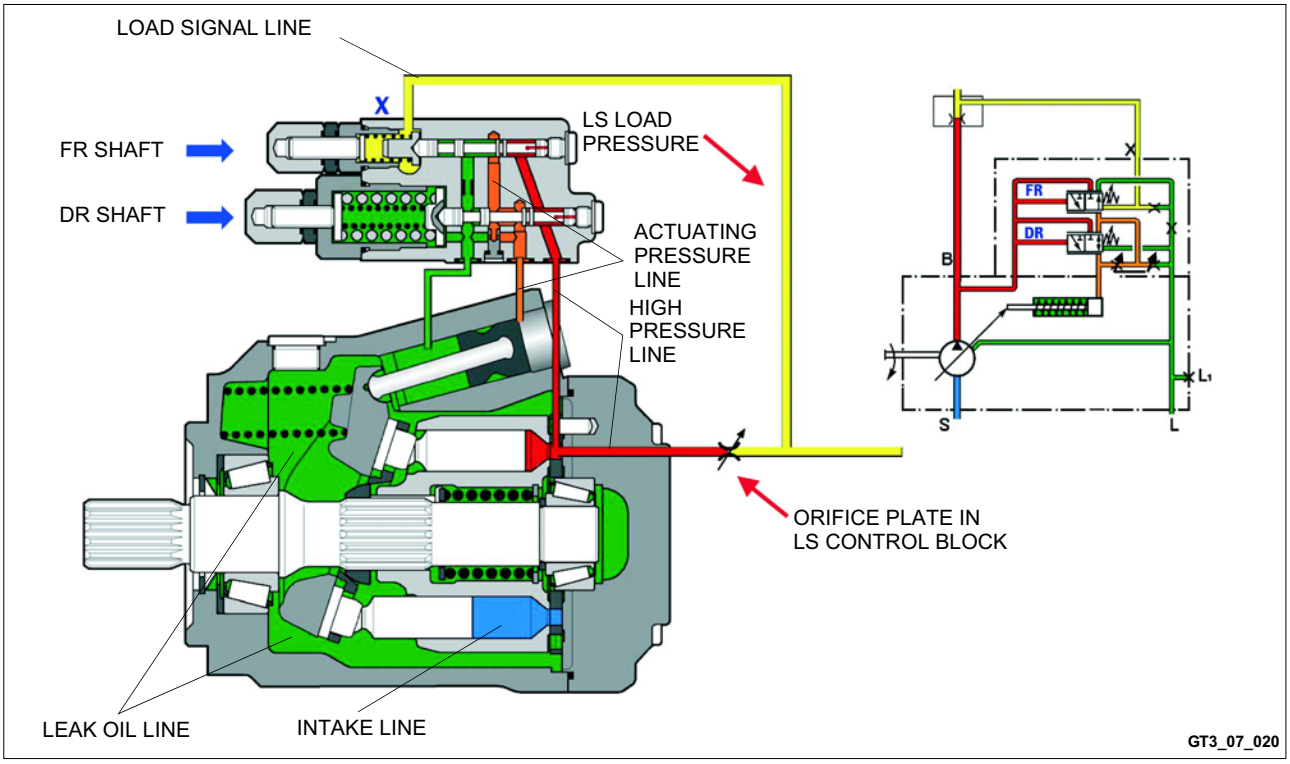




Item	Description	Function
2	Inlet element	P; LS; TS - connection
3	Replenishing valve	
4	Control valve element with load holding valve	Extend blade
5	Connection extension	
6	Control valve element with A/B/T connection	Tilt angle adjustment (blade)
7	Replenishing valve	
8	Control valve element with load holding valve	Articulated steering
9	Replenishing valve	
10	Control valve element with load holding valve	Scraper blade
11	Control valve element with load holding valve	Blade lift, left
12	Outlet element	T; TS - outlet

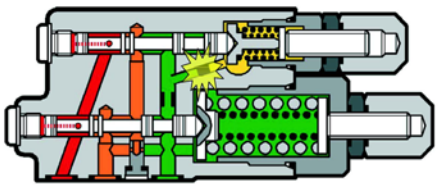
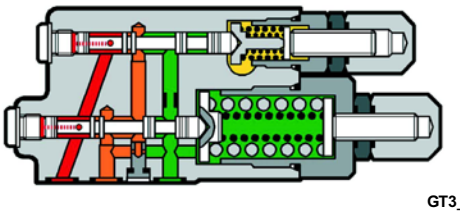
Pressure regulator DR

The pressure regulator sets the maximum permitted pump pressure. On the piston/ DR shaft of the pressure regulator, the pump pressure is applied to one side. Counteracting this pressure is the adjusted spring force of the regulator spring. If the pump pressure exceeds the allowed value (200 bar), the piston is pushed against the spring force and creates a direct connection between the pump pressure channel and the swash plate adjustment piston. In this way, the pressure regulator prevents further deflection, or starts backward deflection of the adjustment pump (pressure shutoff), and holds this position until the pump pressure is below set pressure value of the pressure regulator.



Regulator types DFR and DFR1

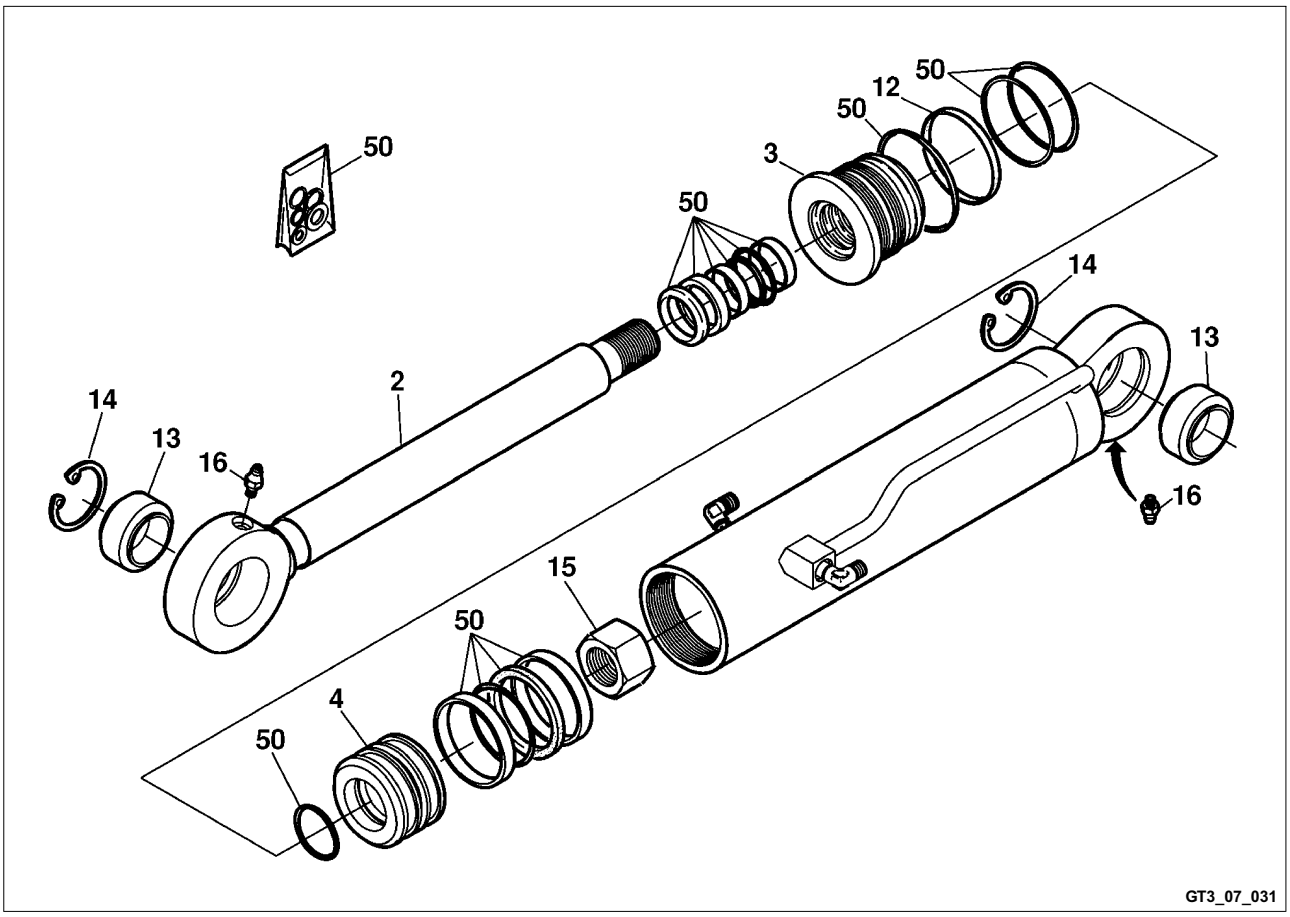
The following illustration shows the difference between regulator types DFR and DFR1.

DFR design With load relief plate. (DFR: Standard: Ø 0.35 mm)	
DFR1 design Without load relief plate. (DFR1: closed, no hole)	 GT3_07_021

4.10 Blade tilt cylinder (tilt angle adjustment cylinder)

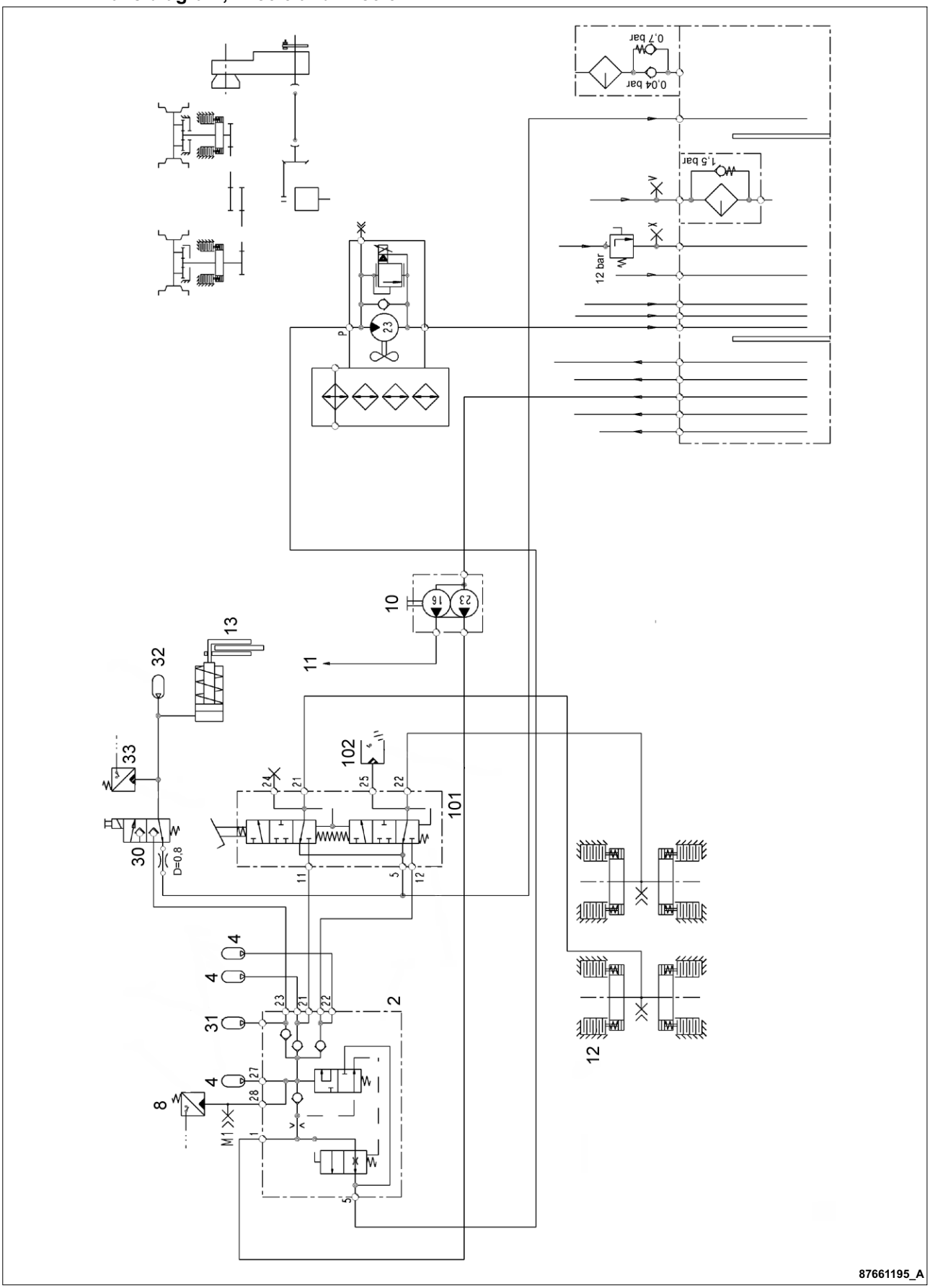
Technical data

Piston Ø ..... 100 mm
Piston rod Ø ..... 50 mm
Lift ..... 300 mm
Min. useful length ..... 615 mm
Max. useful length ..... 915 mm
Useful lift ..... 315 mm
Housing side - pin with joint bearing Ø..... 50 mm
Piston rod side - pin with joint bearing Ø.. 50 mm



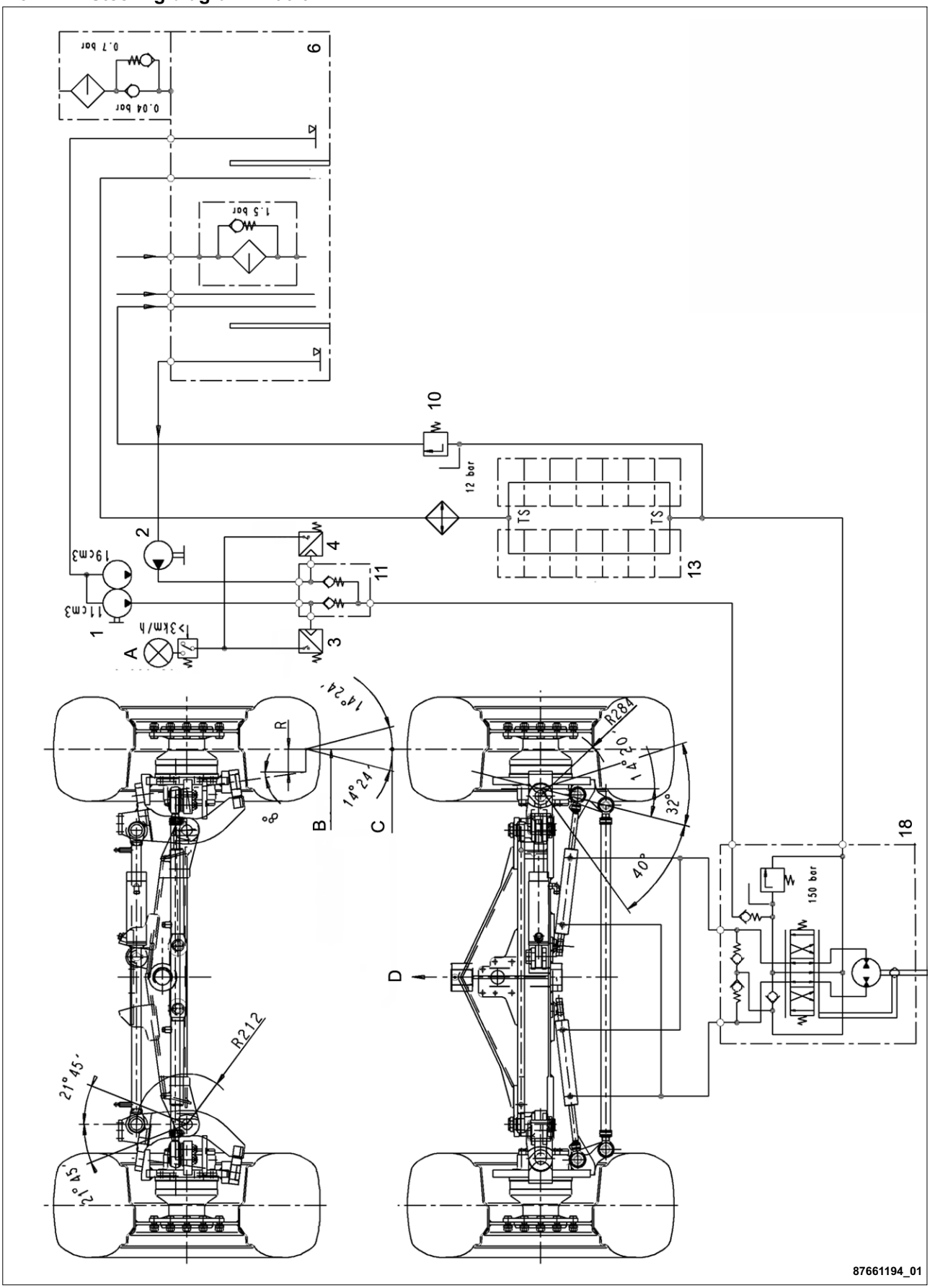
2. Piston rod
3. Guide
4. Piston
12. Circlip
13. Joint bearing
14. Circlip
15. Hexagon nut
16. Lubricating nipple
50. Seal set

1.4.2 Brake diagram, F156.6 and F156.6A

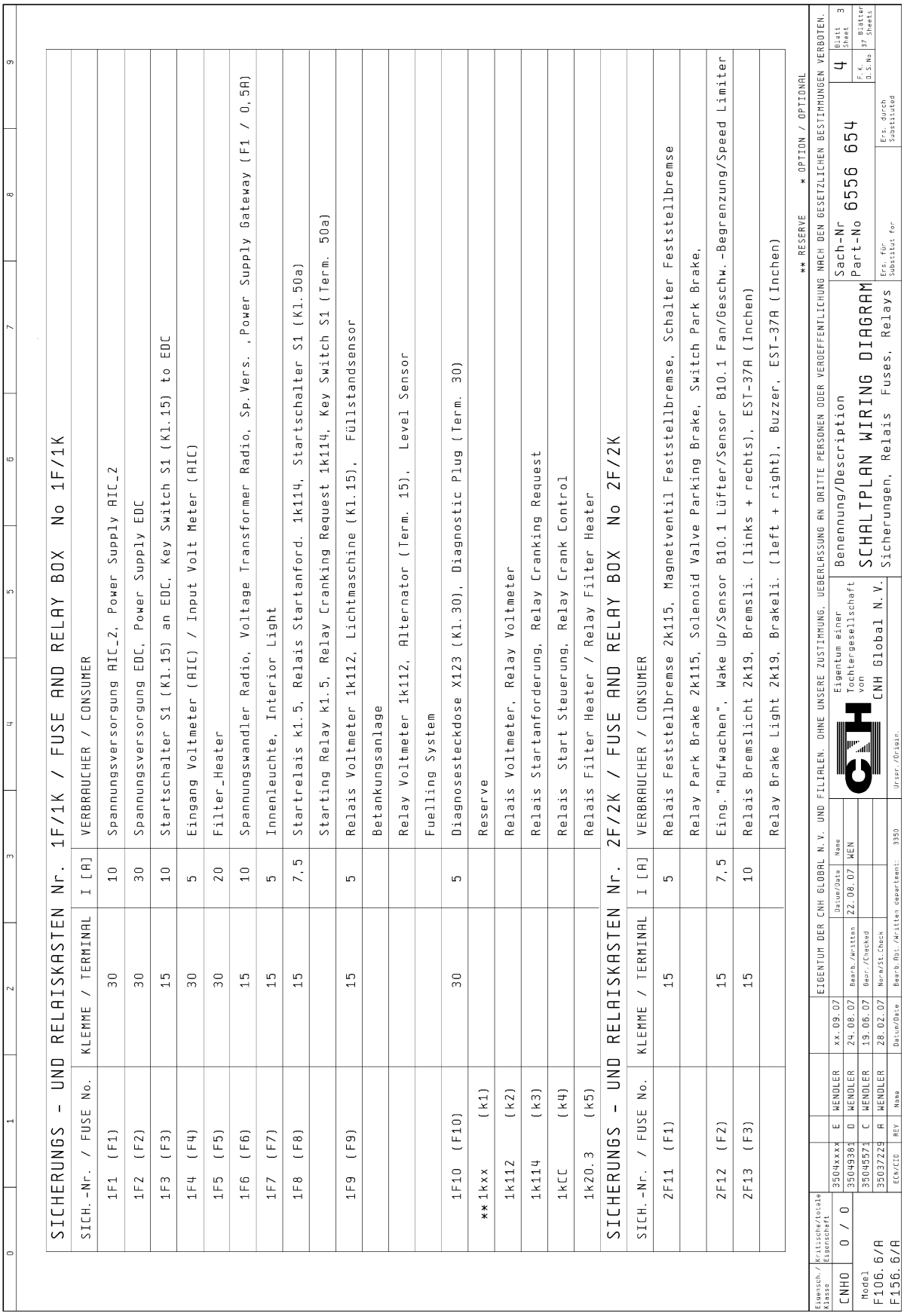


NOTES:

1.5.2 Steering diagram F106.6A



2.2 Sheet 3 - Fuse and relay box No. 1/2



SICHERUNGS - UND RELAISKASTEN Nr. 1F/1K / FUSE AND RELAY BOX No 1F/1K

SICH.-Nr. / FUSE No.	KLEMME / TERMINAL	I [A]	VERBRAUCHER / CONSUMER
1F1 (F1)	30	10	Spannungsversorgung AIC_2, Power Supply AIC_2
1F2 (F2)	30	30	Spannungsversorgung EDC, Power Supply EDC
1F3 (F3)	15	10	Startschalter S1 (K1.15) an EDC, Key Switch S1 (K1.15) to EDC
1F4 (F4)	30	5	Eingang Voltmeter (AIC) / Input Volt Meter (AIC)
1F5 (F5)	30	20	Filter_Heater
1F6 (F6)	15	10	Spannungswandler Radio, Voltage Transformer Radio, Sp.Vers. ,Power Supply Gateway (F1 / 0,5A)
1F7 (F7)	15	5	Innenleuchte, Interior Light
1F8 (F8)	15	7,5	Startrelais k1.5, Relais Startanford. 1k114, Startschalter S1 (K1.50a)
			Starting Relay k1.5, Relay Cranking Request 1k114, Key Switch S1 (Term. 50a)
1F9 (F9)	15	5	Relais Voltmeter 1k112, Lichtmaschine (K1.15), Füllstandsensor
			Betankungsanlage
			Relay Voltmeter 1k112, Alternator (Term. 15), Level Sensor
			Fuelling System
1F10 (F10)	30	5	Diagnosesteckdose X123 (K1.30), Diagnostic Plug (Term. 30)
**1kxx (k1)			Reserve
1k112 (k2)			Relais Voltmeter, Relay Voltmeter
1k114 (k3)			Relais Startanforderung, Relay Cranking Request
1kCC (k4)			Relais Start Steuerung, Relay Crank Control
1k20.3 (k5)			Relais Filter Heater / Relay Filter Heater

SICHERUNGS - UND RELAISKASTEN Nr. 2F/2K / FUSE AND RELAY BOX No 2F/2K

SICH.-Nr. / FUSE No.	KLEMME / TERMINAL	I [A]	VERBRAUCHER / CONSUMER
2F11 (F1)	15	5	Relais Feststellbremse 2k115, Magnetventil Feststellbremse, Schalter Feststellbremse
			Relay Park Brake 2k115, Solenoid Valve Parking Brake, Switch Park Brake,
2F12 (F2)	15	7,5	Eing."Aufwachen", Wake Up/Sensor B10.1 Lüfter/Sensor B10.1 Fan/Geschw.-Begrenzung/Speed Limiter
2F13 (F3)	15	10	Relais Bremslicht 2k19, Bremsli. (links + rechts), EST-37A (Inchen)
			Relay Brake Light 2k19, Brakeli. (left + right), Buzzer, EST-37A (Inchen)

** RESERVE * OPTION / OPTIONAL

Eigensch./Klasse: CNHO 0 / 0 — Kritische/lokale Eigenschaft

Model: F106.6/A, F156.6/A

REV	Name	Datum/Date
E	WENDLER	xx.09.07
D	WENDLER	24.08.07
C	WENDLER	19.06.07
B	WENDLER	28.02.07
ECN/CID	Name	Datum/Date
3504xxxx	35049381	35045571
35037229		

Bearb./Written: WEN 22.08.07
Gepr./Checked:
Norm/St.Check:
Bearb Abt./Written department: 3350

Eigentum einer Tochtergesellschaft von CNH Global N.V.

Benennung/Description: SCHALTPLAN WIRING DIAGRAM
Sicherungen, Relais Fuses, Relays

Sach-Nr Part-No 6556 654

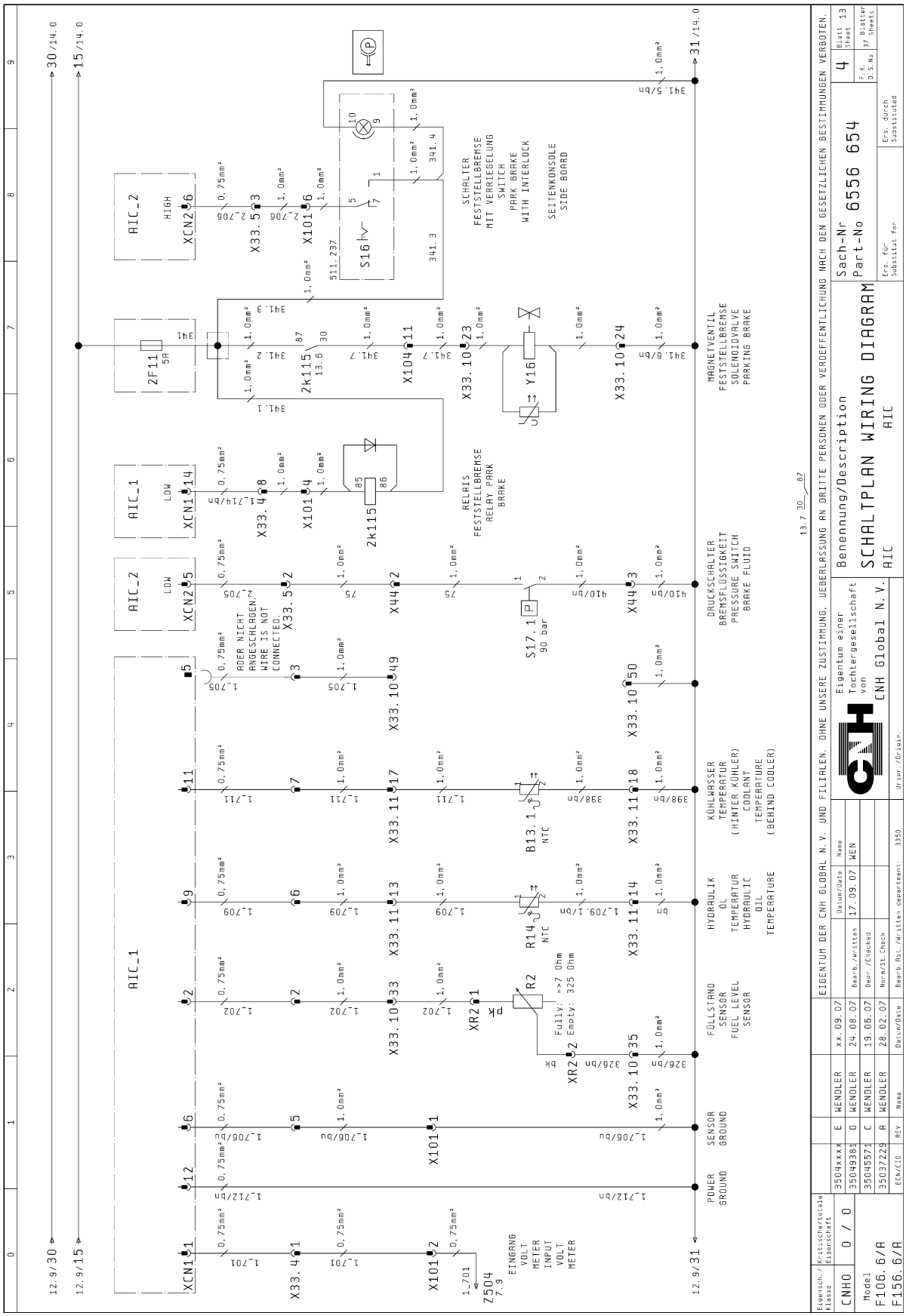
Ers. für Substitut for

Ers. durch Substituted

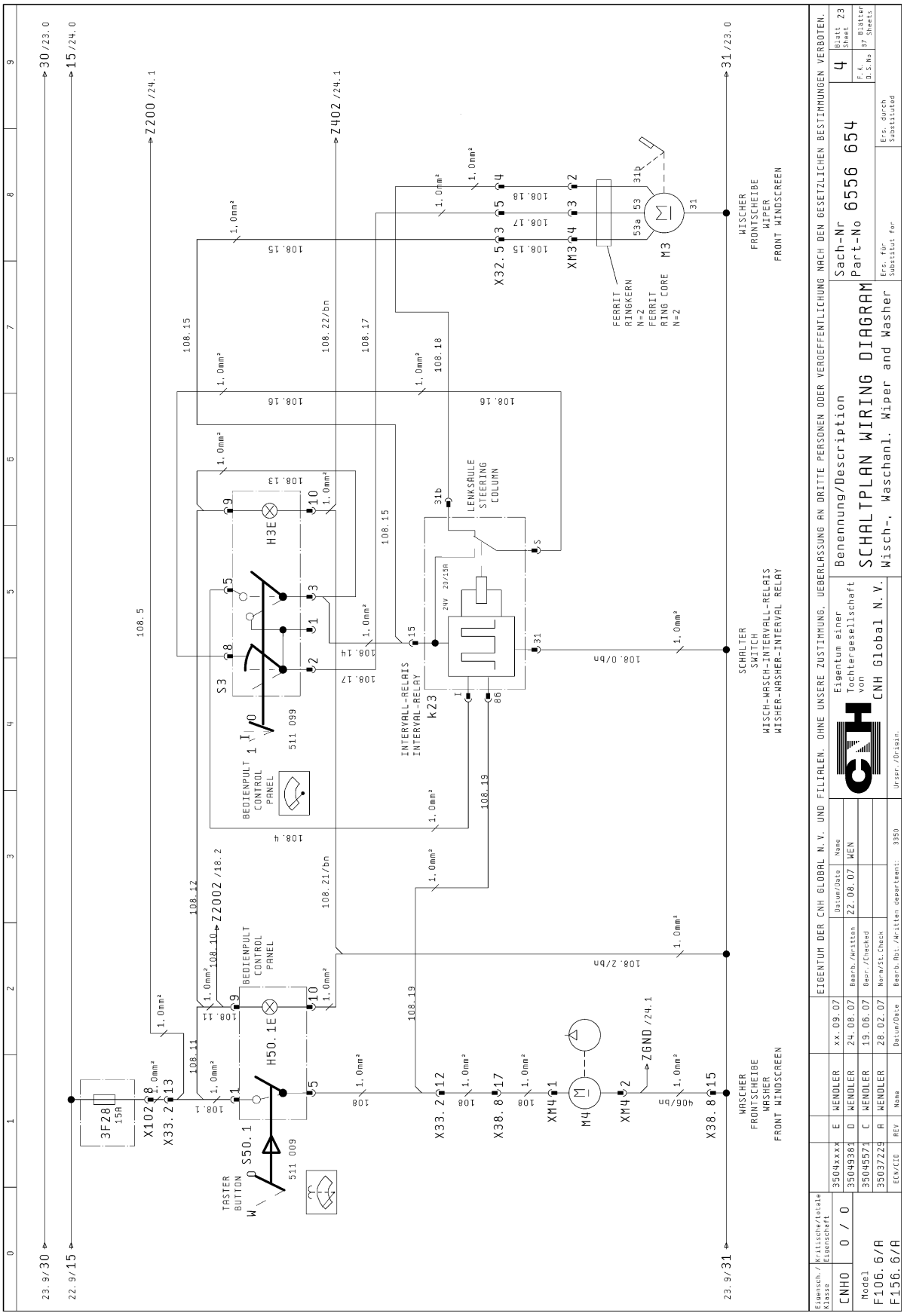
Blatt Sheet 4 von 37 Blätter Sheets

F.K. D.S.No

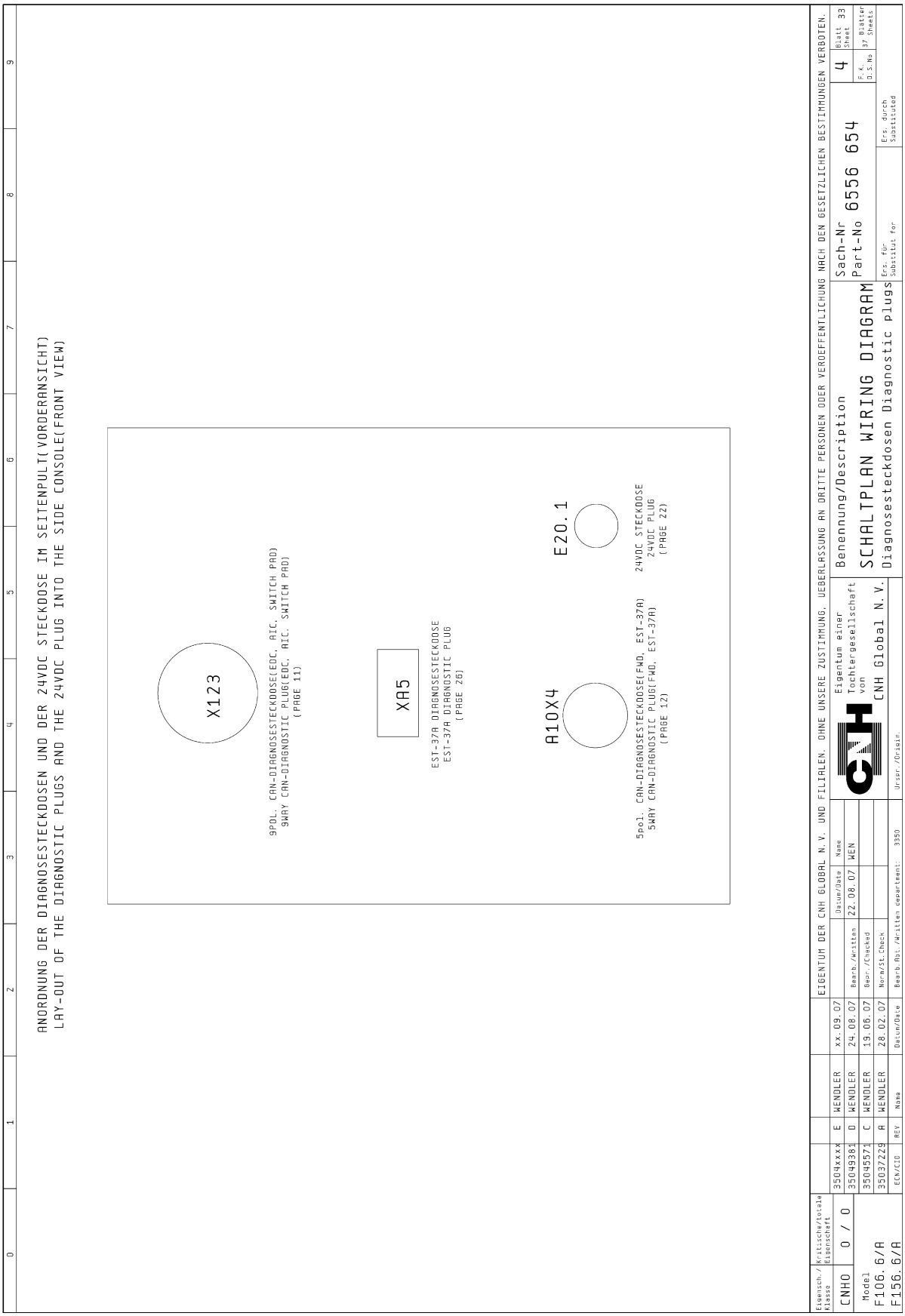
2.12 Sheet 13 - Ground AIC_1, voltmeter, fill level sensor, hydraulic fluid/coolant temperature, brake alert pressure switch, parking brake switch / solenoid



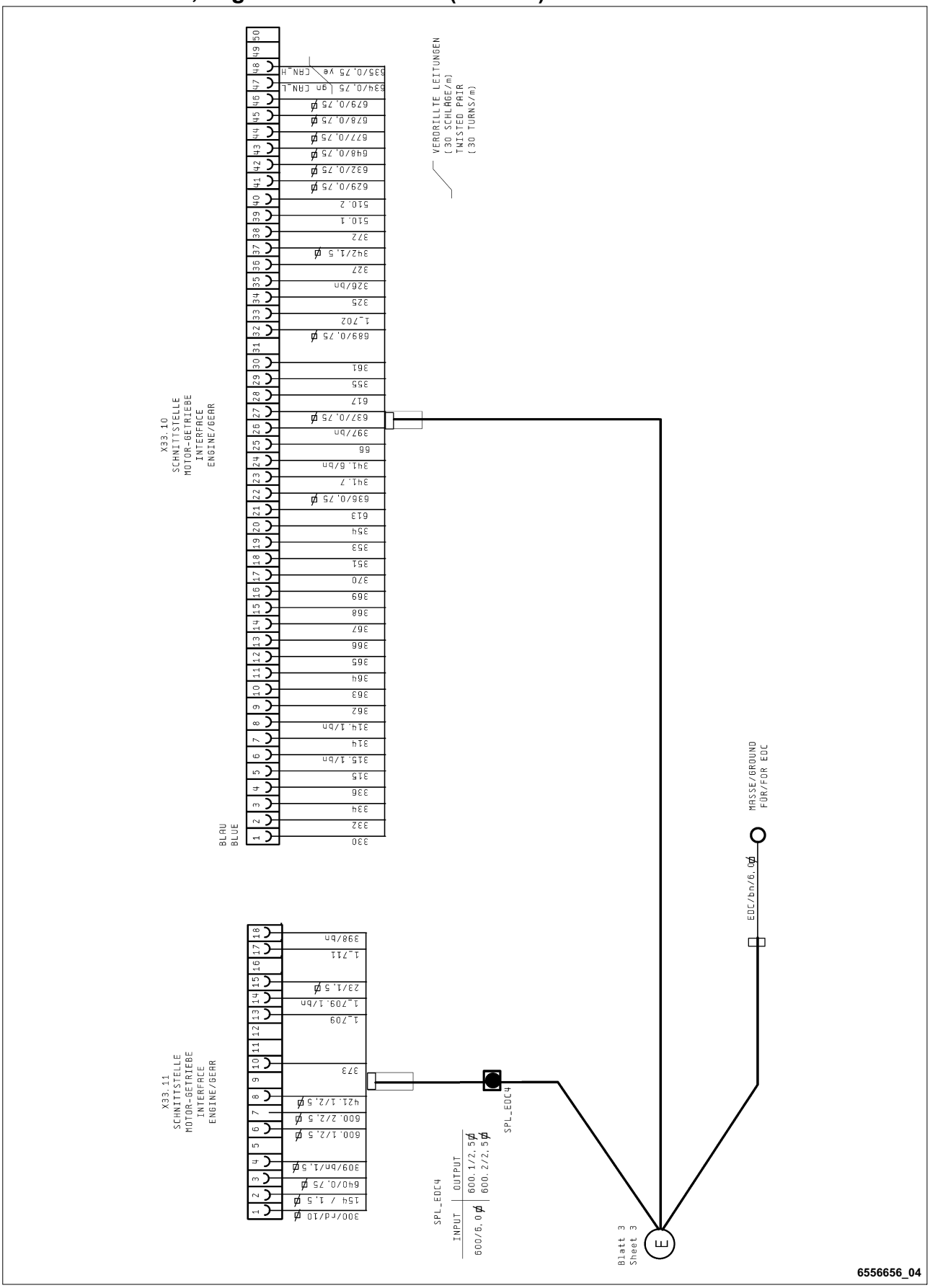
2.22 Sheet 23 - Wiper/washer system (front)



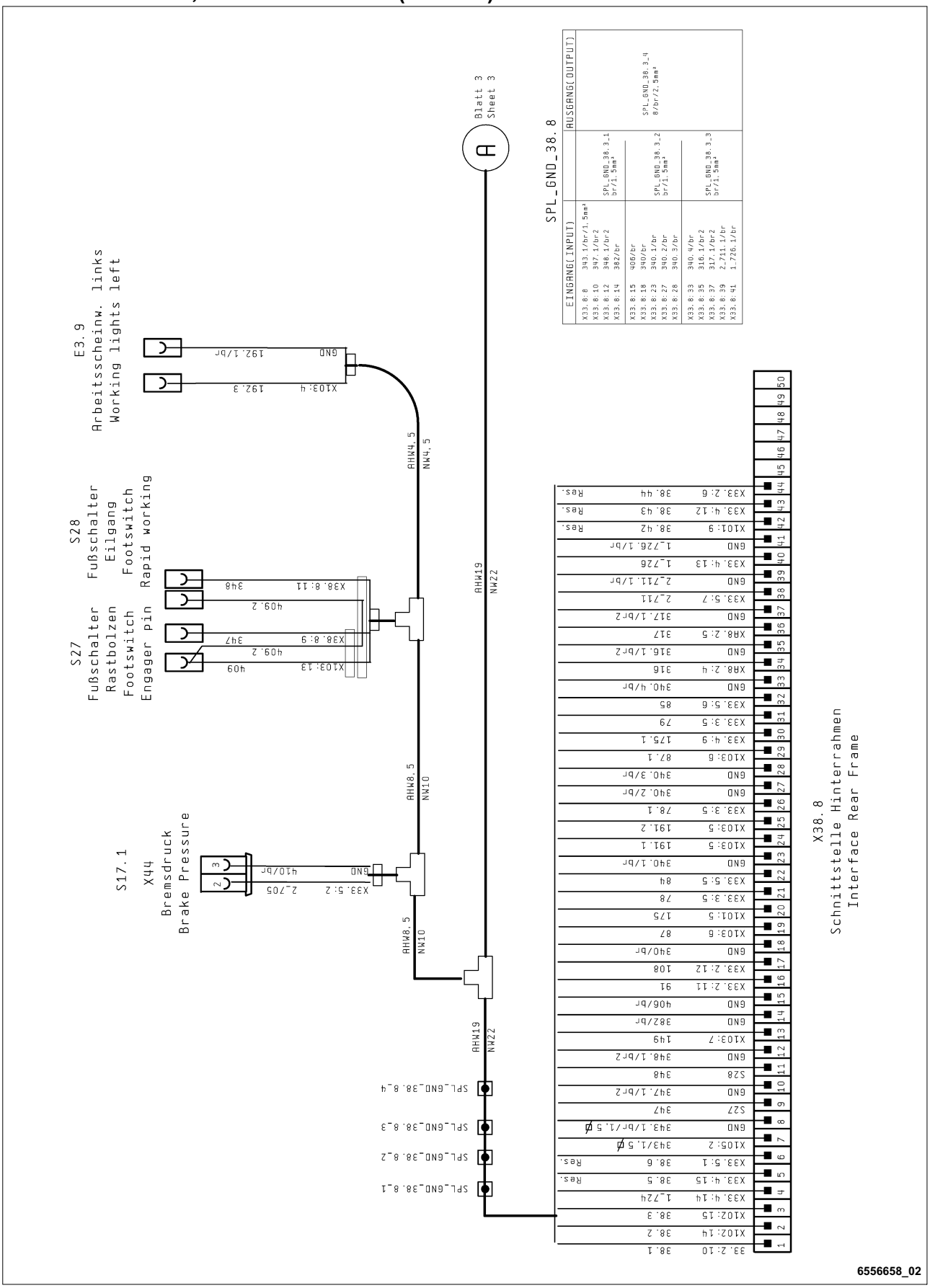
2.32 Sheet 33 - Layout of diagnostic sockets / 24VDC socket in side console (front view)



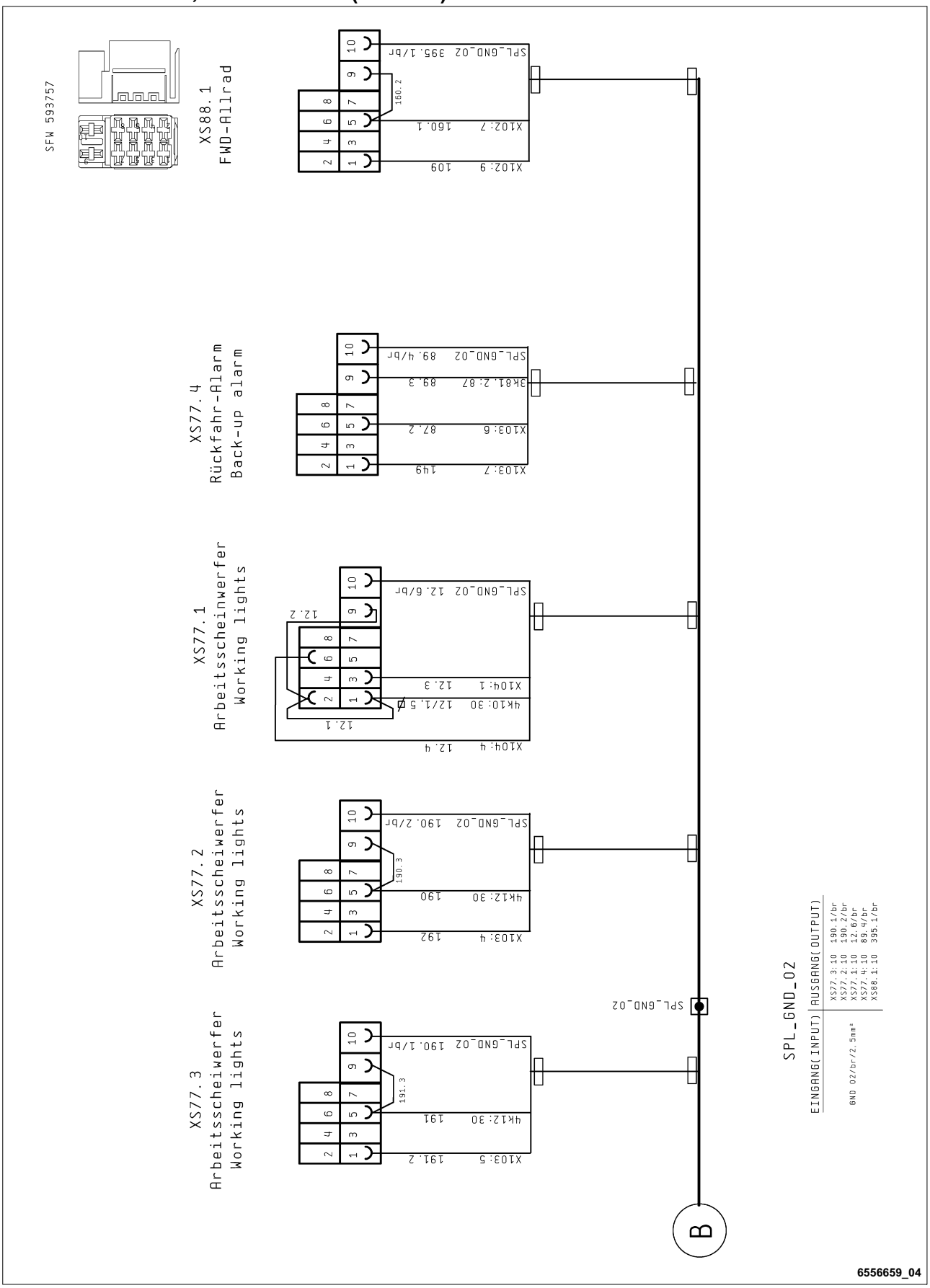
3.6 Cable set, engine - transmission (Sheet 4)



3.16 Cable set, driver's cab floor (Sheet 2)



3.26 Cable set, side console (Sheet 4)



4.2.1 Vehicle error codes

code	Warning level	Meaning	Corrective action
1310	yellow	Hydraulic fluid filter blocked	Change filter
1311	yellow	Engine air filter blocked	Change filter
1312	yellow	Hydraulic fluid temperature above normal value	1. Set vehicle mode 2. Allow engine to run at current idle speed (800 - 1,100 rpm) 3. Check brake system 4. Check cooling fins for foreign matter
1313	red	Hydraulic fluid temperature too high	
1314	yellow	Transmission fluid temperature above normal value	
1315	red	Transmission fluid temperature too high)	
1316	red	Brake pressure too low	1. Set vehicle mode 2. Allow engine to run at current idle speed (800 - 1,100 rpm) 3. Check brake system pressure 4. Check brake system for leaks
1317	red	Steering pressure too low	1. Set vehicle mode 2. Allow engine to run at current idle speed (800 - 1,100 rpm) 3. Check that steering is functioning correctly 4. Check steering for leaks
1318	yellow	Engine coolant temperature above normal value	1. Set vehicle mode 2. Allow engine to run at current idle speed (800 - 1,100 rpm) 3. Check fan function 4. Check cooling fins for foreign matter
1319	red	Engine coolant temperature too high - value critical	
1320	red	Engine oil pressure too low	1. Set vehicle mode 2. Check engine oil level 3. Check oil pressure sensor
1322	yellow	Engine oil pressure above normal value	1. Check that engine oil is correct type 2. Check oil pressure sensor
1323	yellow	Battery voltage too low	Check charging system
1324	yellow	Battery voltage too high	
1325	red	Engine oil temperature too high	1. Set vehicle mode 2. Allow engine to run at current idle speed (800 - 1,100 rpm) 3. Check sensor
1327	yellow	Vehicle movement at high idle speed	AIC automatically resets idle speed to normal
1328	yellow	Vehicle movement when switching to low idle speed	AIC automatically resets idle speed to normal
1329	yellow	WIF sensor not available	Check wiring, replace WIF sensor
1331	red	Charging system voltage too low - value critical	1. Set vehicle mode 2. Check charging system

code	Warning level	Meaning	Corrective action
3227	yellow	Injection processor error - switch off engine	Clock error or power supply open. Check power supply or replace EDC if fault recurs
3228	yellow	Injection processor error - switch off engine	EDC fault, reset EDC. If this does not clear the error, replace EDC
3229	yellow	Injection processor error - switch off engine	Internal EDC fault or 'TEST MODE' duration too long. Check 'TEST MODE' parameters or replace EDC if fault recurs
3230	yellow	Injection processor error - switch off engine	Faulty SPI Bus user, timing problem due to software error. Replace EDC if fault recurs (return the EDC for testing)
3231	yellow	Injection processor error - switch off engine	EDC fault. Replace EDC if fault occurs again
3232	yellow	Injection processor error - switch off engine	
3233	yellow	Injection processor error - switch off engine	
3234	yellow	Injection processor error - switch off engine	
3238	red	Communication fault in processor CJ940	Electrical fault or internal EDC fault causing communication fault on SPI bus. Replace EDC if fault cannot be cleared
3242	red	Recovery blocked	Electronic fault, different hardware faults (EDC internal) or configuration problem. Analyse which errors caused recovery (read off HWEMonnumRecovery mark and compare with the value in the related table). If fault occurs repeatedly, re-program the EDC. If fault occurs continuously, replace EDC
3243	red	Recovery blocked	
3244	red	Recovery visible	
3245	yellow	Watchdog control mark for communication monitoring	Watchdog module or CPU of EDC faulty (for example, functional fault in CPU clock), fault on SPI bus. If the fault occurs only occasionally (i.e. injection function is still available), the fault can be ignored or the error code cleared from the fault memory. If fault occurs continuously, the injection function is blocked and the EDC must be replaced
3246	yellow	Safety shutoff tracks at initialisation	Watchdog shutoff tracking faulty. If the fault occurs again after EDC initialisation: Replace EDC
3247	yellow	Safety shutoff tracks at initialisation	Electronic fault, EDC internal fault. If the fault occurs again after EDC initialisation: Replace EDC
3248	yellow	Safety shutoff tracks at initialisation	

code	Warning level	Meaning	Corrective action
4349	yellow	Short circuit to ground at DLM output	Code possible only if additional ZF diagnosis module connected to TCU
4350	yellow	Short circuit on battery + at DLM output	
4351	yellow	Short circuit on battery + at DLM warning lamp	
4352	yellow	Open circuit at DLM warning lamp	