MH4.6
TECHNICAL SPECIFICATIONS

ENGINE	
Make	IVECO
Model	NEF F4BE0484E*D601
Type	Diesel, 4-stroke, direct injection, turbocharged with aftercooler (turbo)
Net power at flywheel at 2000 rpm^{-1} (80/1269/EC)	83 kW
Number of cylinders	4 in-line
Total displacement	3900 cm^3
Bore x Stroke	102 x 120 mm
ELECTRICAL SYSTEM	
Voltage of operation	24 V
Batteries (Capacity/Voltage)	2 x 100 Ah / 12 V
Alternator (Current/Voltage)	70 A / 24 V
Starter motor (Power)	4 kW
HYDRAULIC SYSTEM	
Equipment/travel control pump	
Maximum output	182 l/min
Maximum operating pressure	35 MPa
Upperstructure swing control circuit	
Maximum output	90 l/min
Maximum operating pressure	20 MPa
Hydraulic cylinders (bore x stroke)	
Lifting (triple articulation)	105 x 980 mm
Lifting (monobloc)	105 x 980 mm
Arm	110 x 1140 mm
Bucket	90 x 995 mm
Positioner (triple articulation version only)	145 x 730 mm
TRANSMISSION	
Type	with variable displacement hydraulic motor and two-speed synchronized gearbox
Travel speeds	
Working	
Slow	0 ÷ 3.5 km/h
Fast	0 ÷ 8.8 km/h
Transfer	
Slow	0 ÷ 13.6 km/h
Fast	0 ÷ 34.5 km/h
Maximum climbable gradient	
Working	80 %
Transfer	15 %
TURRET SWING	
Swing motor	axial pistons
Swing brake	automatic operation, disc-type
Final reduction	oil-immersed planet. reduction
Bullgear	in grease bath
Swing speed	8.0 rpm^{-1}

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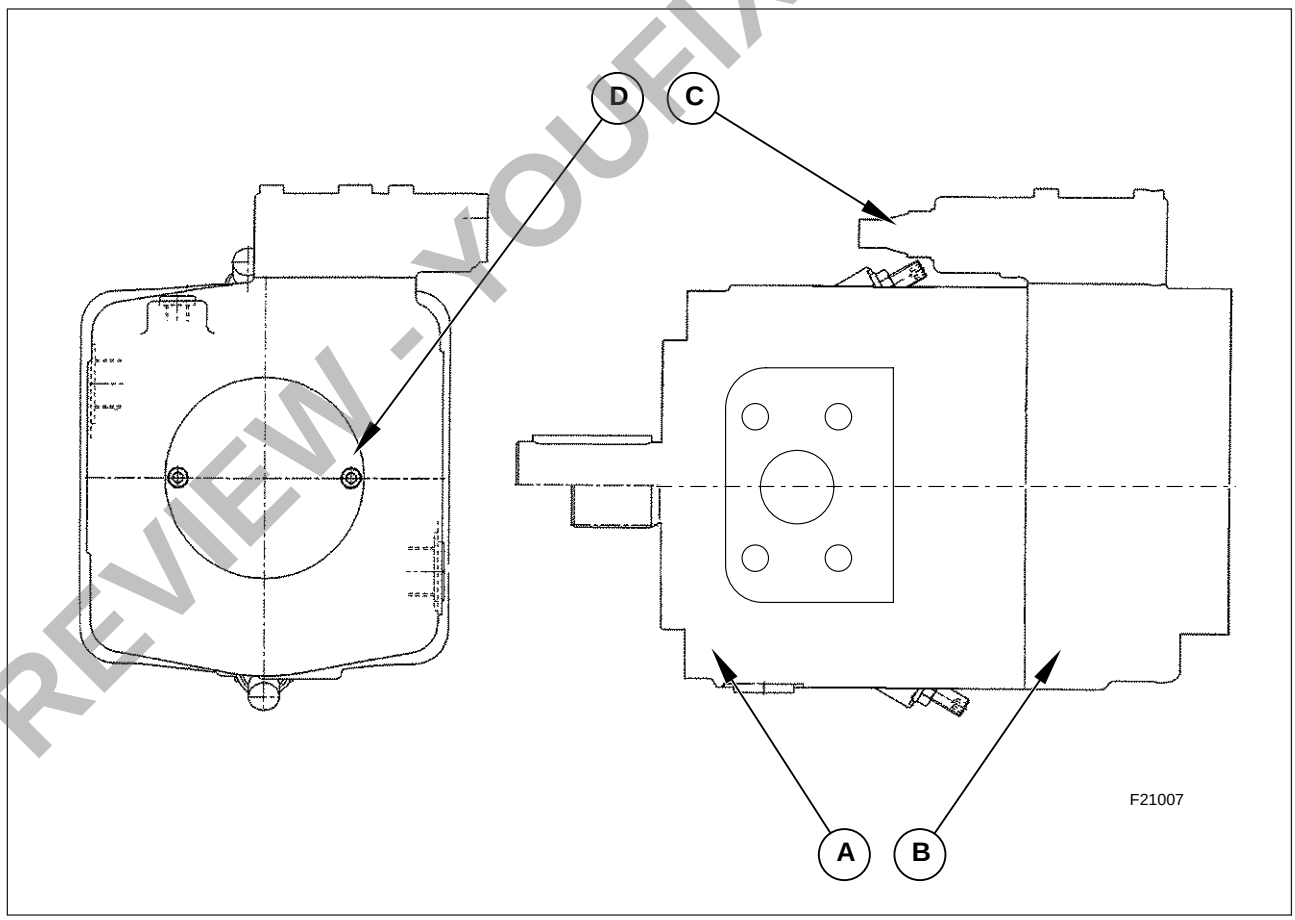
MH4.6

MAIN PUMP

The main pump (A11VO95 LE2S) is of a variable displacement swashplate axial piston type. The displacement is proportionate to the revolution speed and the displacement. The position of the swashplate allows a continuous variation of the displacement. The pump includes, essentially:

A. Rotor group
B. Valve plate
C. Regulator
D. Pump support plate

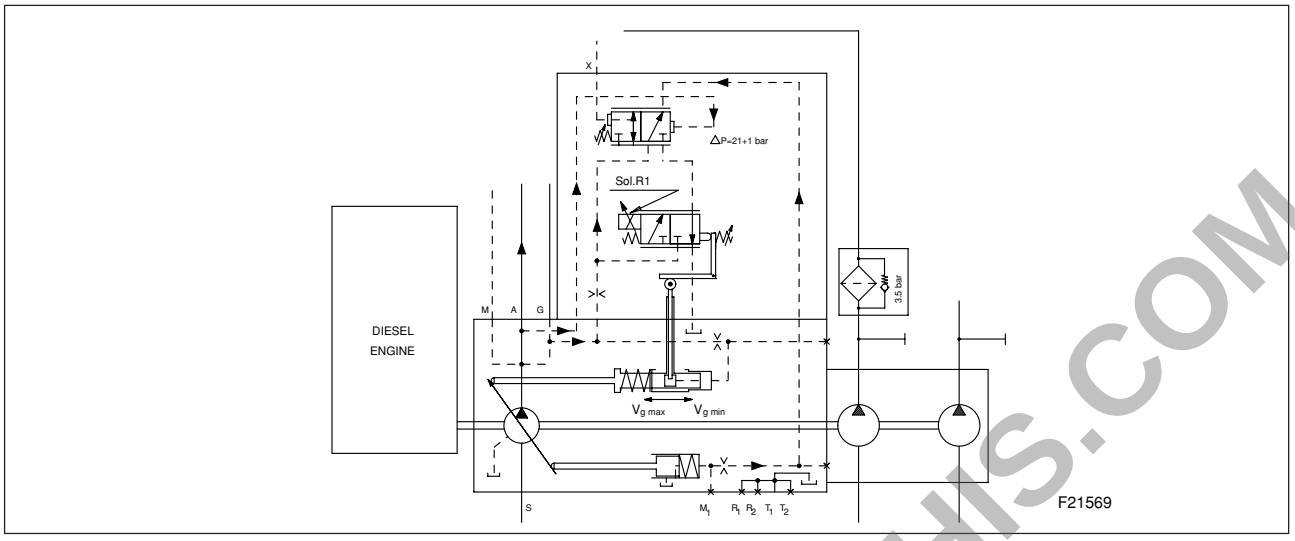
When the drive shaft rotates, oil is sucked by the movement of the pistons sliding along swashplate through the inlet ports of the valve plate.
When the pistons reach the bottom dead center (cylinder chamber totally filled with oil) the relevant cylinders where they slide are communicating with the delivery port of the valve plate. While the shaft rotates, the oil sucked by the retracting movement of the piston during the inlet phase, is pushed-out during the pushing movement of the piston itself, in the compression phase. The alternating movement of the pistons, occurring in a sequence for all 9 pistons due to the rotation of the shaft, causes the pressurised hydraulic oil to exit into the feeding delivery piping. The delivery of the pump is proportionate to the r.p.m. and the inclination angle of the swashplate where the pistons slide and it can be changed from a maximum to a minimum.
The speed of the pump depends upon the r.p.m of the engine to which it is mechanically connected.



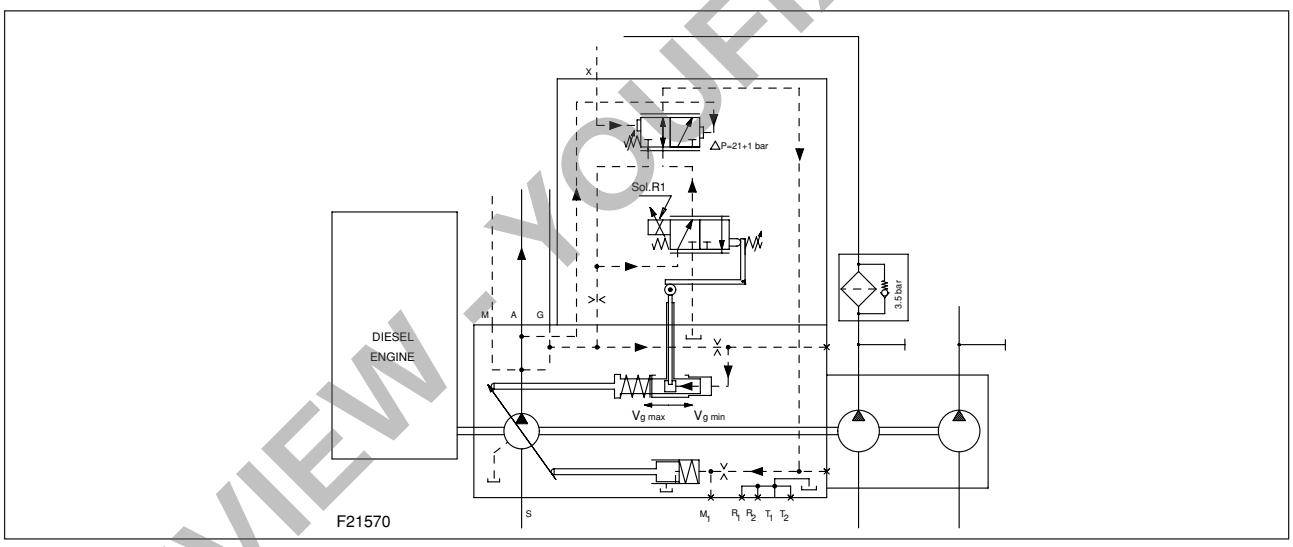
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Operation of main pump with spools in neutral position



Operation of main pump with intervention of regulator



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DISASSEMBLY OF MAIN PUMPS

NOTE:
Observe the following notices when carrying out repair work on hydraulic components.

- Close all ports of the hydraulic components.
- Replace all removed seals.
- Check all seals and sliding surfaces for wear.

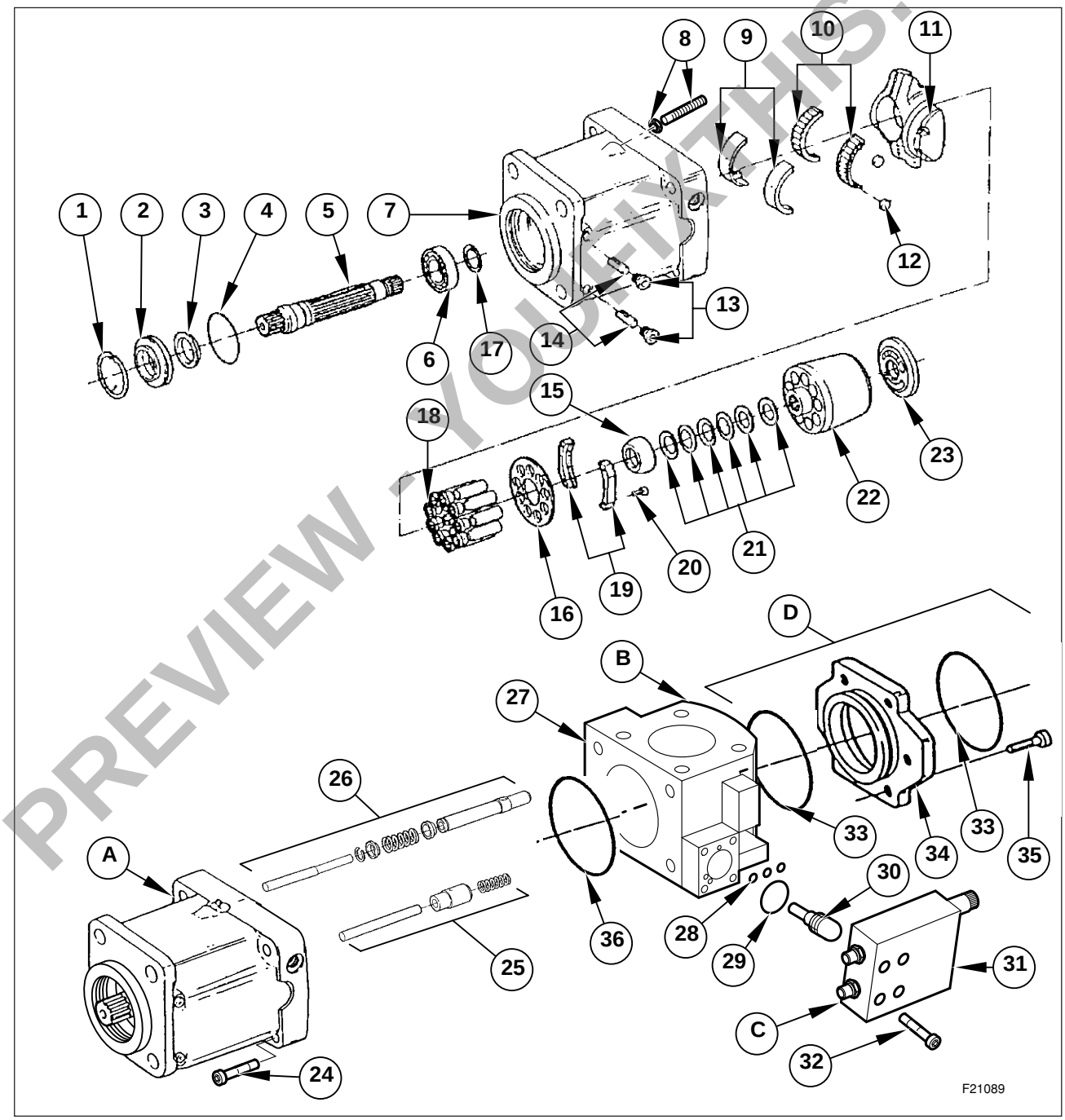
WARNING

Rework of sealing area f. ex. with abrasive paper, can damage surface.

- Fill up main pump with hydraulic oil before start-up.

WARNING

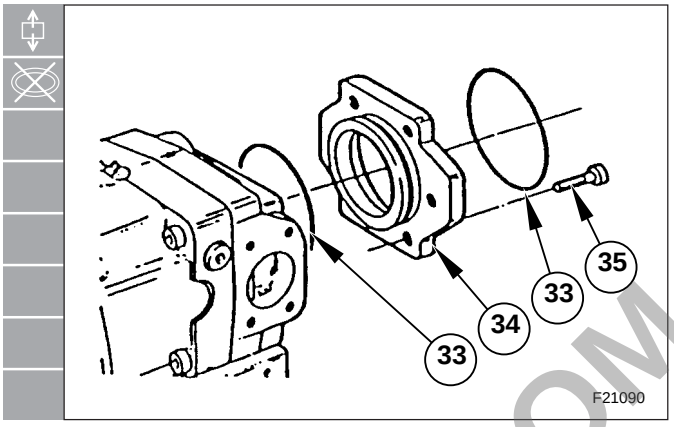
The approximate weight of the main pump (without oil) is: 53 kg.



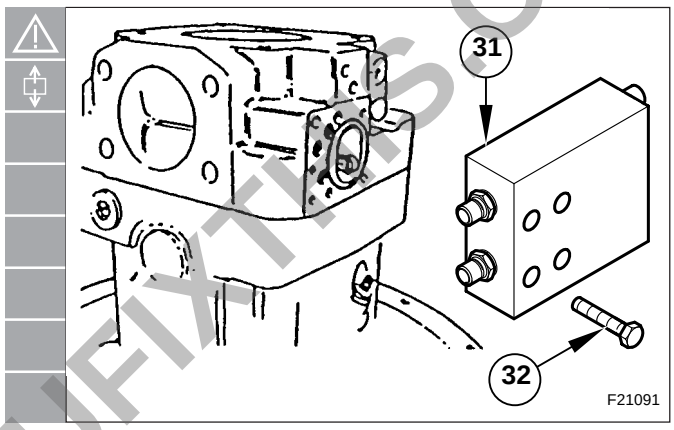
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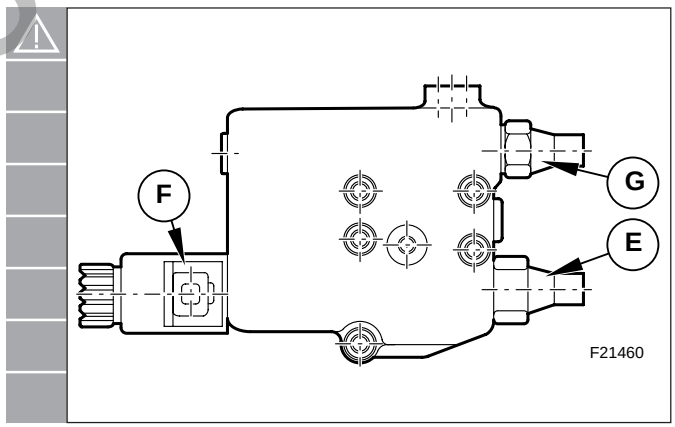
1. Unscrew screws (**35**), remove pump support (**34**) and remove O-rings (**33**).



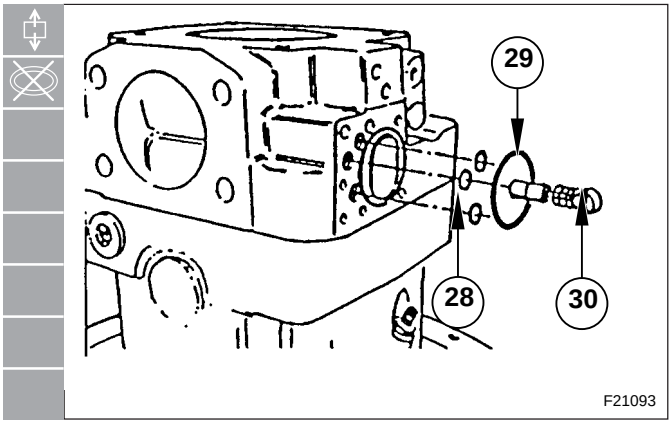
2. Unscrew the fixing screws (**32**) and remove regulator housing (**31**), be sure that the sealing surface is not damaged.



3. Do not change the set of adjusting screws.
E. Power control,
F. Solenoid **R1**,
G. load-sensing valve.



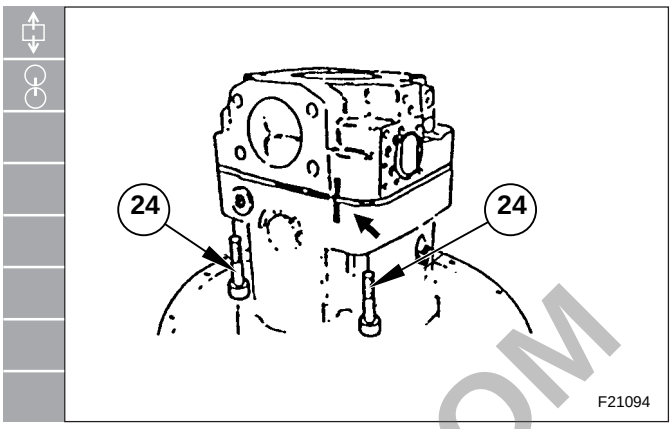
4. Remove O-rings (**28**) and (**29**), measuring piston (**30**) with bush and spring.



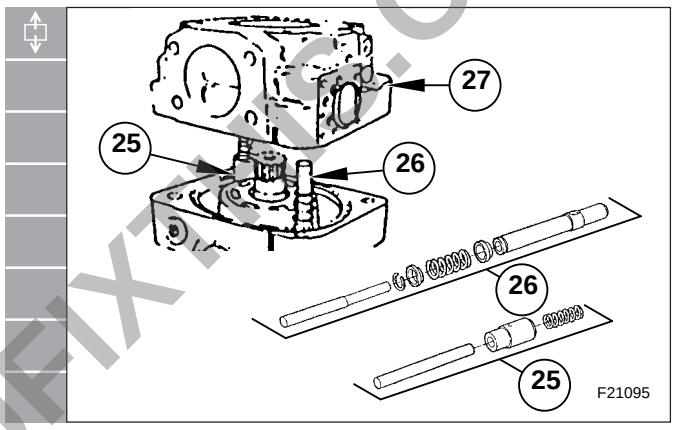
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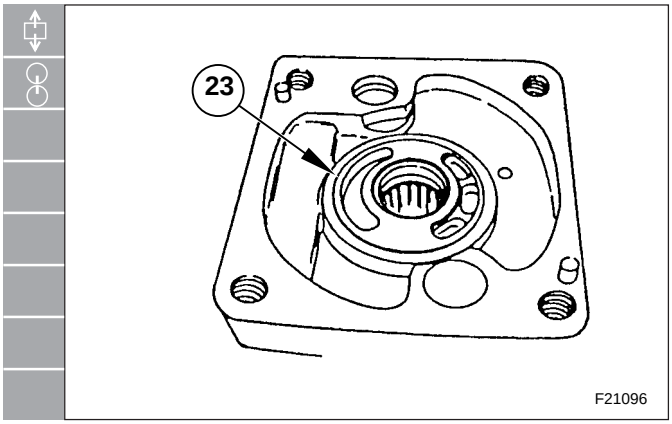
5. Mark position of the connection plate. Loosen connection screws (**24**) of fixing plate.



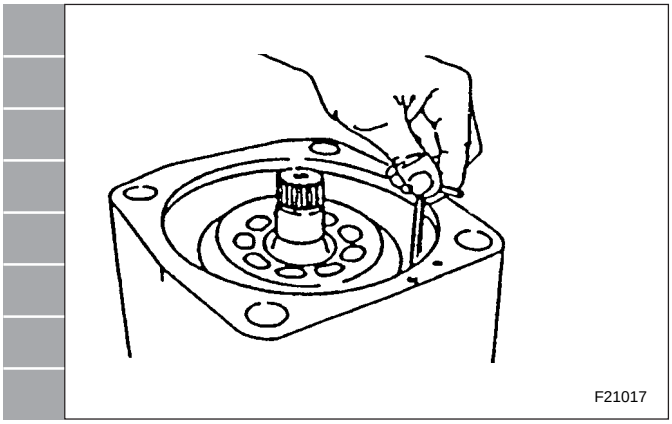
6. Remove port plate (**27**) with control plate. Take counterpiston (**25**) and swashplate control piston (**26**) out.



7. Mark position of control plate (**23**), then remove it.



8. Loosen the screws fixing retaining segments.



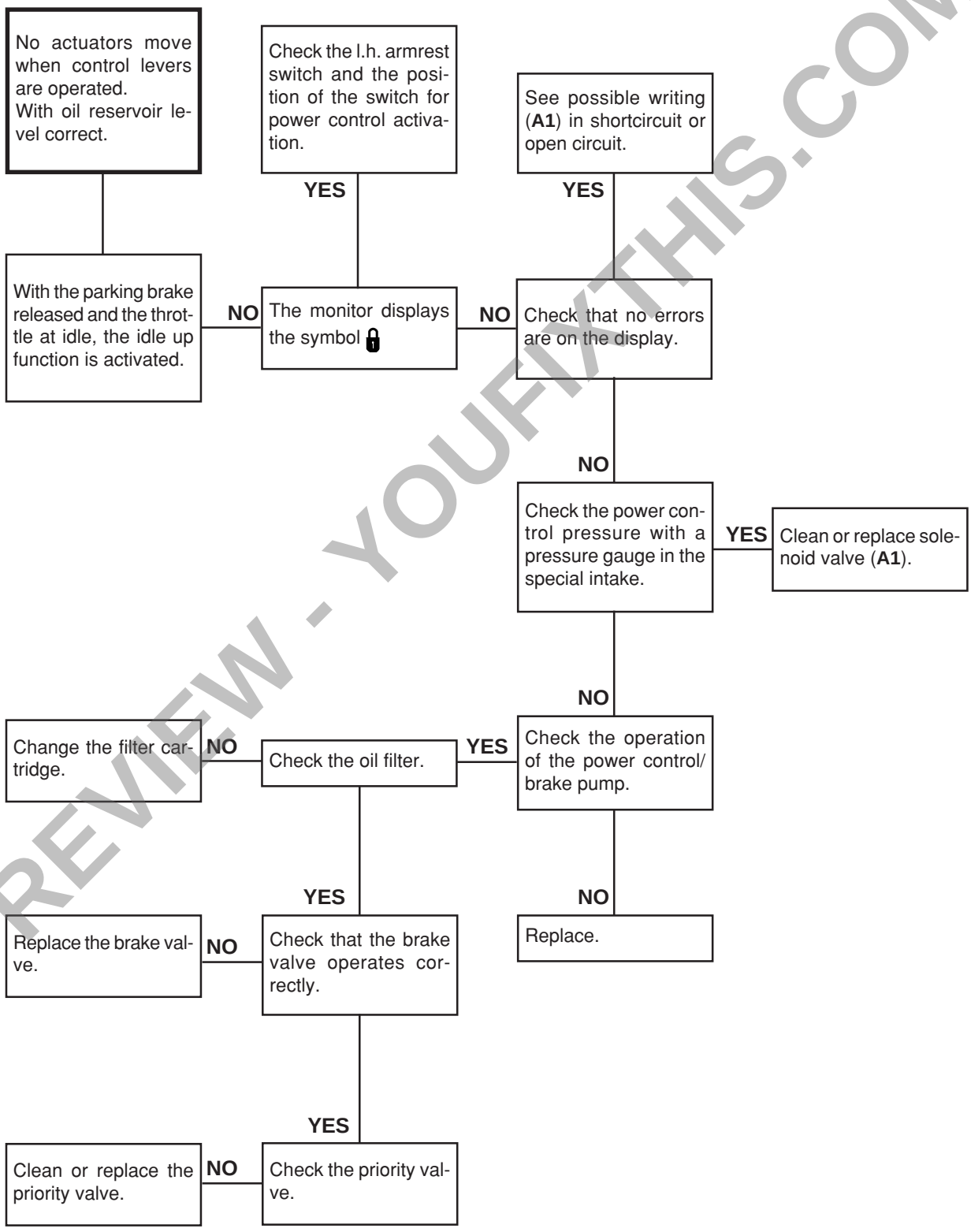
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HYDRAULIC SYSTEM TROUBLESHOOTING

• For the hydraulic system general diagram, refer to the diagram attached at the end of section 7.

NO ACTUATORS MOVE WHEN CONTROL LEVERS ARE OPERATED



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ELECTRICAL SYSTEM TROUBLESHOOTING

• For the electrical system general diagram, refer to the diagram attached at the end of section 8.

CHECKS ON ELECTRICAL PARTS

Fuse check

In the following charts are listed the 2 groups of fuses located in the machine.
• list of the link fuses in the battery compartment;
• list of the ISO fuses behind the cab seat.

Maxi fuse link	Function
1 - 40 Amp	V battery
2 - 20 Amp	Fuel electrical pump
3 - 50 Amp	Feeding: electrical stop, starter relay, sedimentor sensor, engine water level sensor
4 - 80 Amp	Alternator protection
5 - 40 Amp	Feeding: power of machine check electronic card, voltage reducer
6 - 40 Amp	Feeding: fuses ISO 1,3,4,5,6,7,8,10,14,15

Fuses ISO	Function
1 - 10 Amp	Feeding of electronic card for console shift
2 - 10 Amp	Battery direct feeding for electronic cards and monitor
3 - 10 Amp	Feeding of electronic card for mechanical transmission check (APC50)
4 - 5 Amp	Feeding of rotating beacon
5 - 10 Amp	Feeding of working lights
6 - 3 Amp	Feeding of tipping warning system and quick connection
7 - 10 Amp	Feeding of heated seat
8 - 10 Amp	Feeding of cigarette-lighter
9 - 10 Amp	Feeding 12 volt (radio and socket)
10 - 15 Amp	Feeding of air conditioning system
11 - 10 Amp	Feeding of electronic card for diesel engine rev check
12 - 5 Amp	Feeding of electronic card for hydraulic system check
13 - 20 Amp	Feeding of key on
14 - 10 Amp	Feeding of steering column
15 - 5 Amp	Feeding of electronic card for windshield wiper check
16 - 10 Amp	Lower beams
17 - 10 Amp	Upper beams
18 - 5 Amp	Parking lights
19 - 5 Amp	Parking lights
20 - 10 Amp	Feeding of card and console

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SAFETY PRECAUTIONS

GENERALITIES

Read the Operation and Maintenance Instruction Manual carefully before starting, operating, maintaining, fuelling or servicing the machine.
Carefully read the explanation to each and all safety signs in the special section of this Manual before starting, operating, maintaining, fuelling or servicing the machine.
Machine-mounted safety plates are colour coded yellow with black borders when they refer to points where special **ATTENTION** must be paid and failure to observe them may cause a serious **DANGER** to the integrity of machine operators. They are white with red borders and black lettering when they refer to a **FORBIDDEN** practice.
It is fundamental that all machine operators know very well the meaning of each safety plate as this considerably decreases operating hazards and accidents.
Do not allow unauthorised personnel to operate or service this machine.
Do not wear rings, wrist watches, jewellery, loose or hanging garments, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can get caught in moving parts. Wear certified safety clothes such as: hard hat, no-slip footwear, heavy gloves, ear protection, safety glasses , reflector vests, respirators every time the job requires it. Ask your employer about safety regulations in force and protective equipment.
Always keep the operator's compartment, step plates, grab-rails and handles clean and clear of foreign objects, oil, grease, mud or snow to minimise the danger of slipping or stumbling. Remove mud or grease from your shoes before operating the machine.
Do not jump on or off the machine. Always keep both hands and one foot, or both feet and one hand in contact with steps and/or grab rails.
Do not use controls or hoses as hand holds. Hoses and controls are movable parts and do not provide solid support. Besides, controls may be inadvertently moved and cause unexpected movement of the machine or its attachments.
Never operate the machine or its attachments from any position other than sitting in the driver's seat. Keep head, body, limbs, hands and feet inside the operator's compartment at all times to reduce exposure to external hazards.
Be careful of possible slippery conditions of the steps and hand rails as well as of the ground around the machine. Wear protective boots or shoes with the soles made of highly no-slip rubber.
Do not leave the machine until it has come to a complete stop.
Always check height, width and weight limitations which may be encountered in the working site and ensure the machine does not exceed them.
Assess exact paths of gas ducts, water mains, telephone lines, sewers, overhead and underground electric lines and all other possible obstacles.
Such paths should be opportunely defined by competent Authorities. If necessary, require that the service is interrupted or said installations are moved prior to starting the work.
You must know the working capacity of the machine.
Define the rear upperstructure swing area and provide for opportune barriers to prevent access into it.
Never exceed machine lifting capacity.
Remain within the limits shown in the loading capacity chart located on the machine.

STARTING

Never start or operate a failed machine. Walk all around the machine before mounting.
Before operating the machine, make sure that any possible dangerous condition has been properly removed. Before starting machine, check that steering and attachment controls are in the neutral position and the safety lever is in the LOCK position. Immediately report any malfunction of parts or systems to the maintenance managers for proper action.
Prior to starting the engine, check, adjust and lock the driver's seat for maximum riding comfort and control accessibility. Prior to operating the machine and/or its attachments, check that bystanders are outside the machine operating range. Sound the horn.
Obey all hand signals, safety indications and signs.
Due to the presence of flammable fluids, never check fuel level, refuel, charge the batteries or use the starting fluid in the presence of smoking materials, open flames or sparks.
Ensure that nobody is within the excavator operating area before starting the machine, swinging the upper structure or moving in any direction.
Adjust all rear-view mirrors for maximum visibility of the area behind the machine.
Ensure that engine speed is appropriate to the job to be carried out.
If any hydraulic control or system exhibits erratic performance or responds abnormally, have the machine checked for air in the system.
Air in these circuits may cause incorrect movements with consequent accident hazard. Refer to the Operation and Maintenance Instruction Manual about corrective action to be taken.

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AVOID ACCIDENTS

Most accidents, whether they occur in industry, on the farm, at home or on the highway, are caused by the failure of some individuals to follow simple and fundamental safety rules or precautions. For this reason MOST ACCIDENTS CAN BE PREVENTED by recognising the real cause and doing something about it before the accident occurs.
Regardless of the care used in the design and construction of any type of equipment there are conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.
Carefully read indications, cautions and safety warning quoted in the "SAFETY RULES" section.
A careful operator is the best insurance against an accident.
The complete observance of one simple rule would prevent many thousand serious injuries each year.
That rule is:
Never attempt to clean, oil or adjust a machine while it is in motion.

ATTENTION

On machines having hydraulically, mechanically and/or cable controlled equipment (such as showels, loaders, dozers, scrapers etc.) be certain the equipment is lowered to the ground before servicing, adjusting and/or repairing.
If it is necessary to have the equipment partially or fully raised to gain access to certain items, be sure the equipment is suitably supported by means other than the hydraulic lift cylinders, cable and/or mechanical device used for controlling the equipment.

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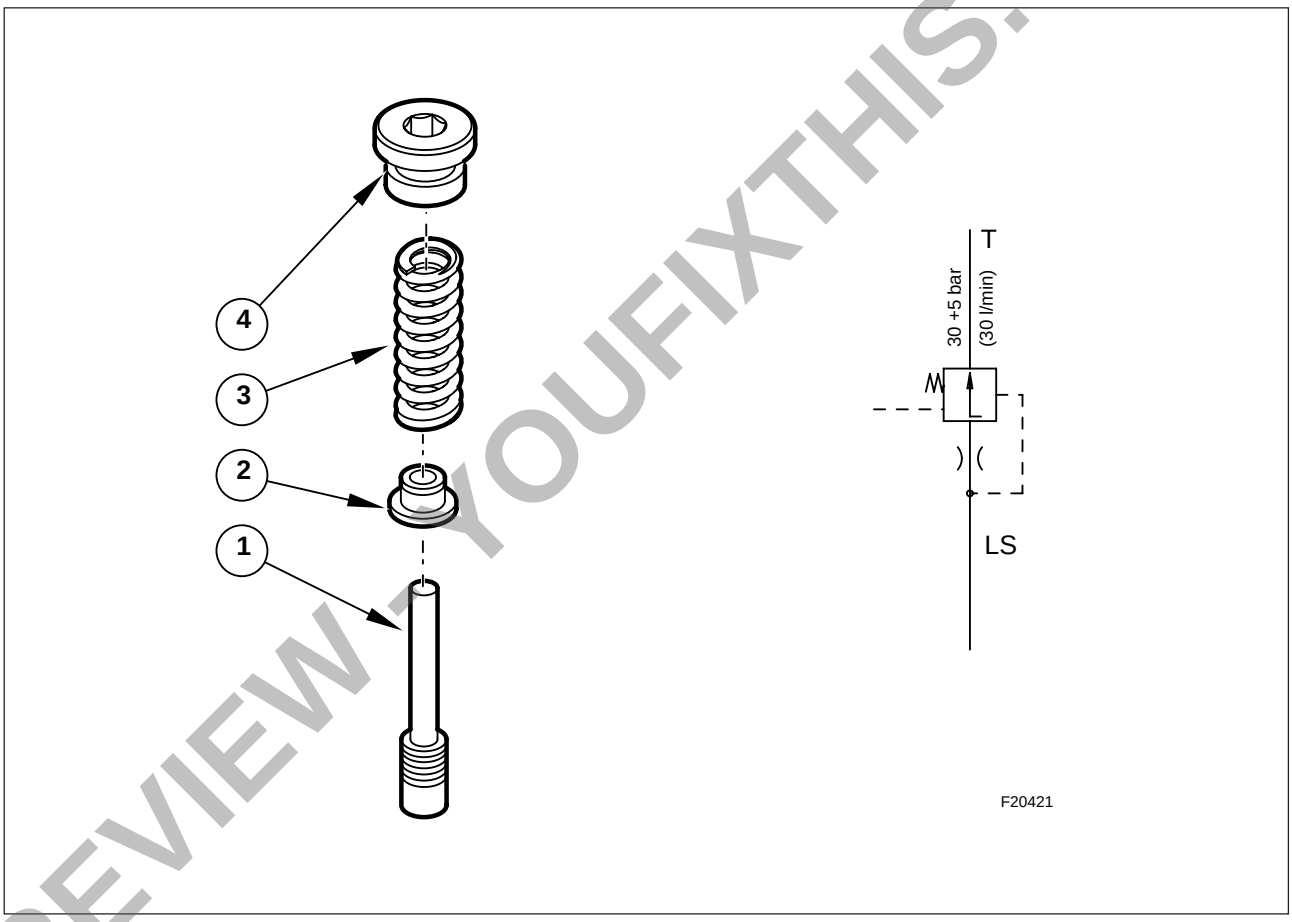
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UNLOADING VALVE

The unloading valve is included in the monobloc body 5M7 and is made up of a body (**1**) which keeps oil at disposal for control user.

Function
Main pump never stops sending oil to control valve. Unloading valve discharges oil directly when no control is used and guarantees a minimum quantity of oil for the control if used; this allows a prompt response at control operation.

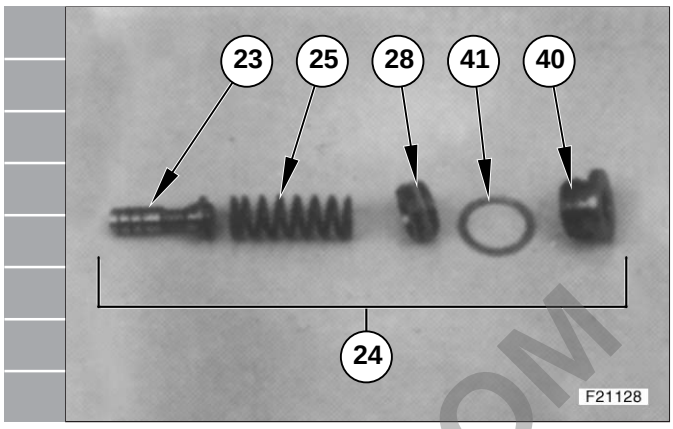


1. Spool
2. Spring guide
3. Spring
4. Plug

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23. The pressure relief valve (**24**) is now dismantled.



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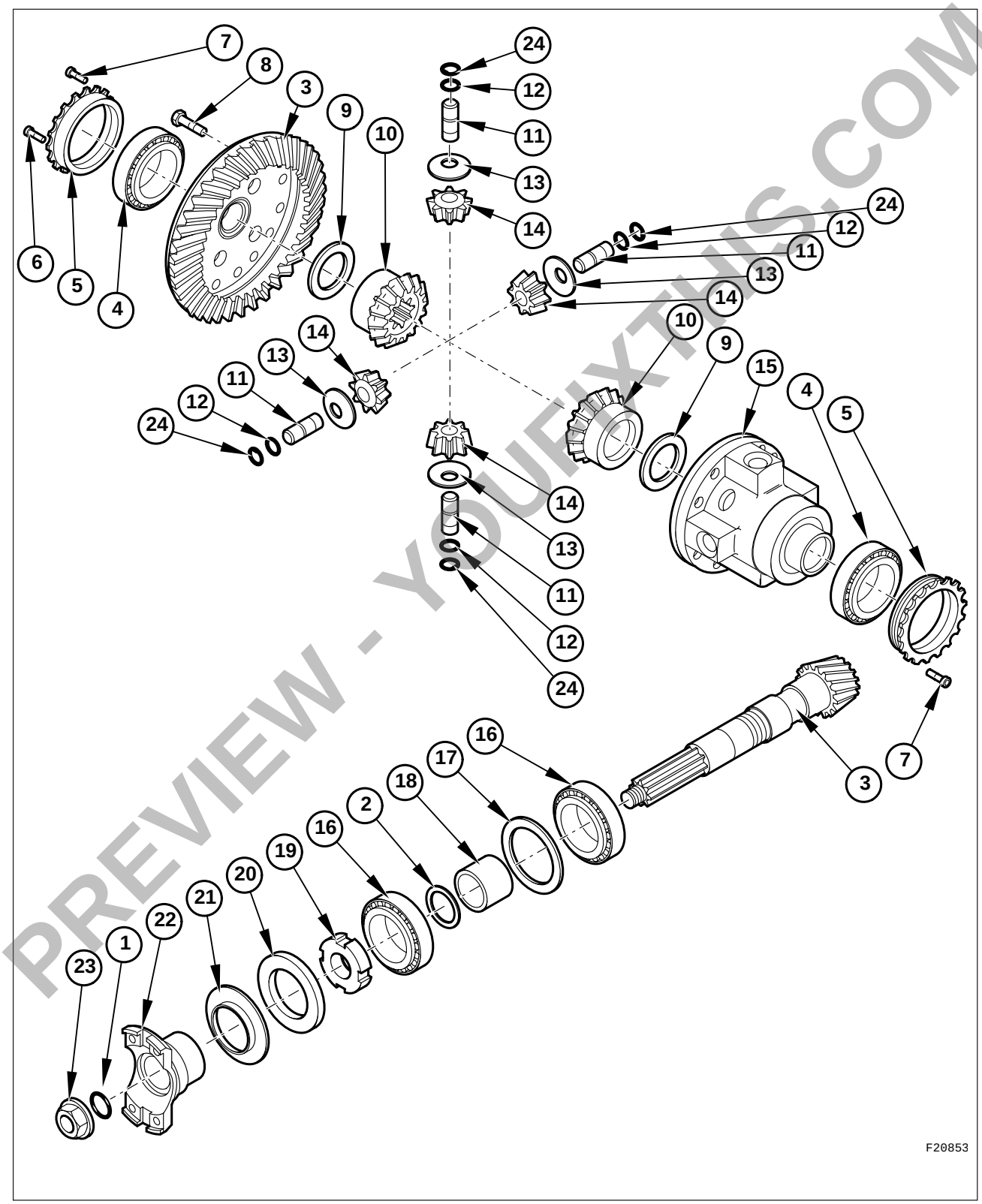
1. Retaining ring
2. Shim
3. Shaft seal
4. Motor housing
5. Motor retaining screw
6. Plug
7. Plug
8. Adjustment screw
9. Nut
10. Rotary unit assembly
11. Seal
12. Regulator unit assembly
13. Screw
14. Brake valve assembly
15. Screw
16. Retaining ring
17. Shim
18. Bearing
19. Adjustment washer
20. Bearing
21. Shaft
22. Return plate
23. Plate screw
24. Central pin
25. Spring
26. Shim
27. Pistons
28. Piston seal
29. Cylinder
30. Pin
31. Pilot articulation
32. Screw
33. Cover
34. O-ring
35. O-ring
36. Screw
37. Slider
38. Slider seals
39. Plunger
40. Regulator unit housing
41. Pin
42. Positioning rod
43. Spring
44. Selection bushing
45. Spring
46. O-ring
47. Belleville washer
48. Control unit
49. Screw
50. Valve seat
51. Ball
52. Valve
53. Bushings
54. O-ring
55. Ring
56. O-ring
57. O-ring
58. Valve
59. Spool
60. Ball
61. Spring
62. Spring
63. Plug
64. Valve housing
65. O-ring
66. Ring
67. Spring retainer
68. Spring
69. Spring retainer
70. Spool
71. Valve seat
72. Pin
73. O-ring
74. Ring
75. Valve housing
76. O-ring
77. Plug
78. Plug
79. Plug
80. Plug
81. Screw
82. O-ring
83. Plug
84. Plug
85. O-ring
86. Spring
87. Cone-shaped pin
88. Spring
89. Cone-shaped pin
90. Brake valve
91. Plug
92. Brake valve housing
93. O-ring
94. O-ring
95. Cone-shaped pin
96. Spring
97. Cone-shaped pin

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FRONT DIFFERENTIAL AND PINION

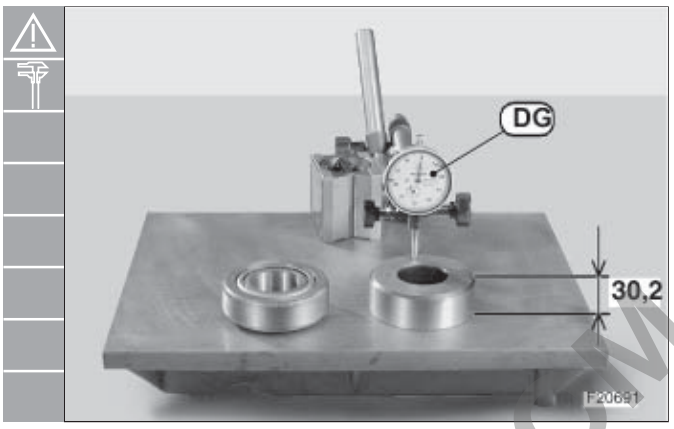
The differential has the purpose of changing the relative rotation speed of the two wheels (right and left) when travelling in an non straight direction. The differential provides, also, a reduction of the r.p.m. input through a bevel gear unit.



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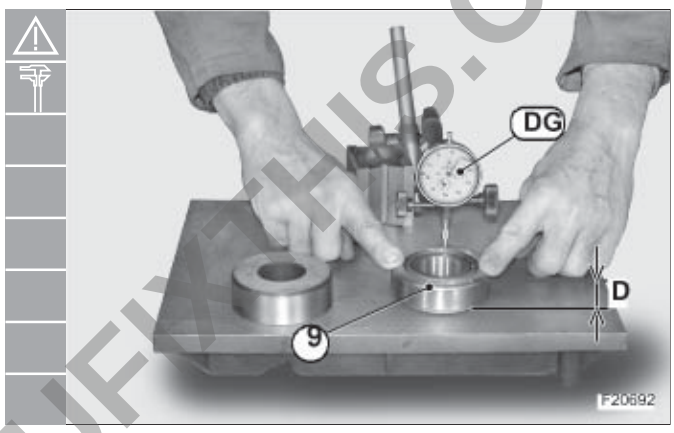
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1. Using a surface plate, reset a centesimal comparator "**DG**" and place it on the measurement ring 380001190 (with a thickness of 30.2 mm).
Preset the comparator to approx. 2 mm.



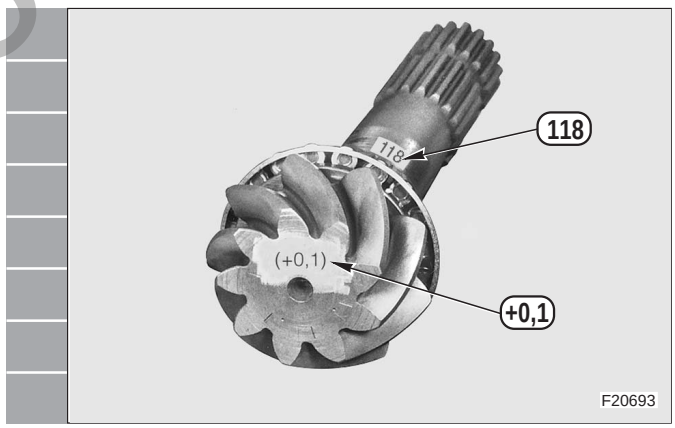
2. Bring the internal bearing (**9**), complete with its thrust block, under the comparator "**DG**".
Determine overall thickness (**D**) of the bearing checking the discrepancy between this size and the size of the measurement ring.

NOTE:
Press the thrust block in the centre and take several measurements while rotating the thrust block.



3. Check the nominal size (**118**) marked on the pinion and add or subtract the indicated variation: (**+0,1**).
Determine dimension (**X**):

$$X=118+0.1=118.1$$



4. Determine the value S_1 of the shims of the inner bearing thrust block:

$$S_1=Q-(118.1+D)$$

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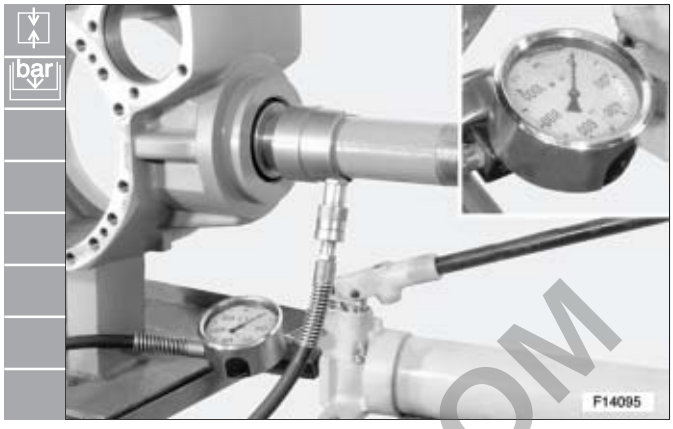
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PROBLEM	CAUSE	CORRECTION
Noise during coast and under power the same	Wheel bearings damaged	Replace and adjust.
Noise under power greater than during coast	Low oil level	Refill oil to proper level.
	Incorrect lubricant	Replace all the sealing rings of the axle and of the master cylinder which have touched the incorrect fluid and the hoses. If the incorrect fluid has entered the axle and has mixed with the lubricant, replace all sealing rings and O-rings.
	Ring and pinion worn	Inspect through top cover. Replace and adjust.
	Worn ring and pinion bearings	Replace and adjust.
	Worn planetary gears or bearings	Replace.
Noise during coast greater than under power	Loose pinion nut	Inspect ring, pinion and pinion bearings. If undamaged, retighten nut.
	Only pinion bearing damaged	Replace.
Noise during turn (without NoSpin)	Worn spider and/or side gears	Replace.
A "Stick slip" noise when going from forward to reverse	Worn or damaged cardanshaft	Inspect and replace as described in vehicle's service manual.
	Loose wheel	Inspect for wheel and wheel stud damage. Replace if needed and retorque lugnuts.

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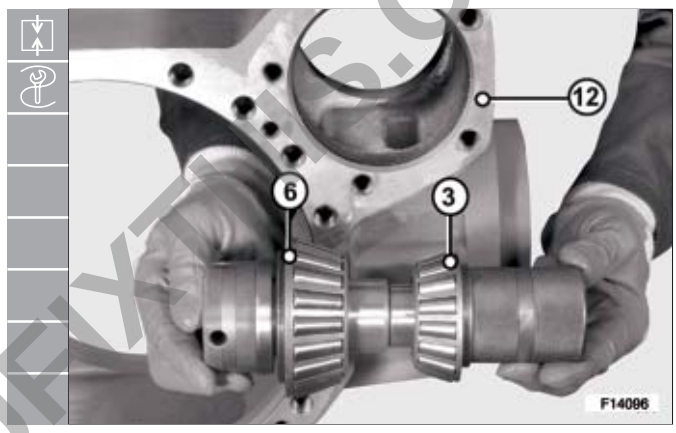
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2. Connect the tension rod to the press and move the thrust blocks of the bearings into the seats. Disconnect the press and remove the tension rod.

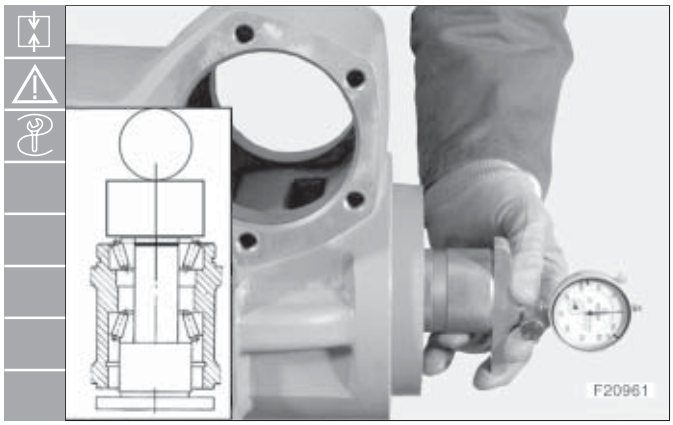


NOTE:
Before starting the next stage, make sure that the thrust block has been completely inserted into its seat.

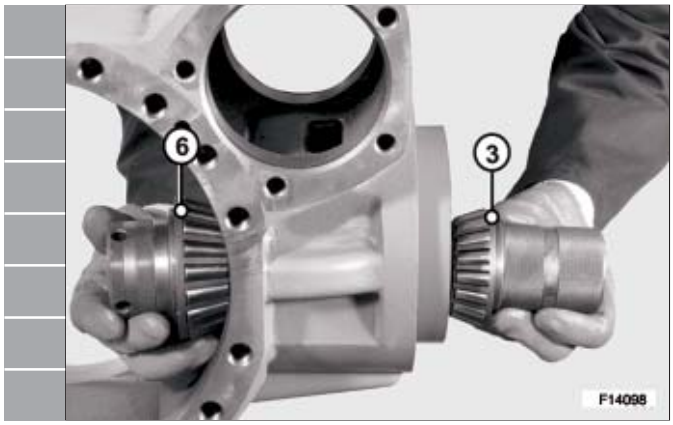
3. Introduce tool 380001201 complete with bearings (**3**) and (**6**) into the main body (**12**).



4. Introduce the tracer of a depth comparator into either side hole of tool 380001201. Reset the comparator with a preload of about 3 mm.



5. Remove the comparator and take out tool and bearing kits from the main body.
Reinstall every part, also introducing a distance piece (**8**) between bearings (**3**) and (**6**). Tighten the entire pack by hand.



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17. With a plastic mallet separate differential case (**5**) and hub (**23**).

NOTE:
Note down the coupling marks.



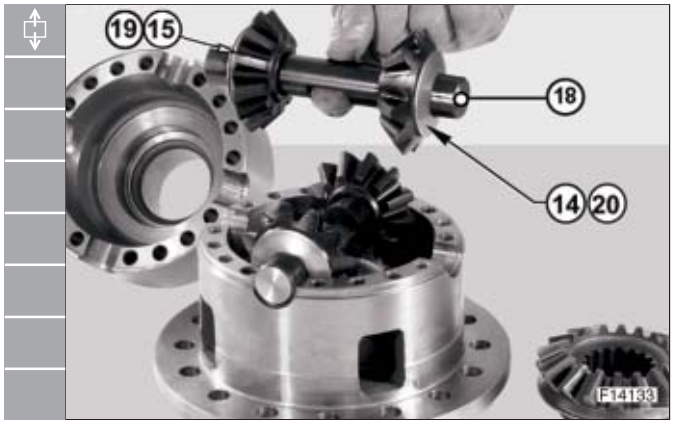
18. Remove differential hub (**23**).



19. Remove shim (**22**) and first planetary gear (**21**).



20. Remove pivot (**18**) with planetary gears (**15**) and (**19**) and shim ball washers (**14**) and (**20**).

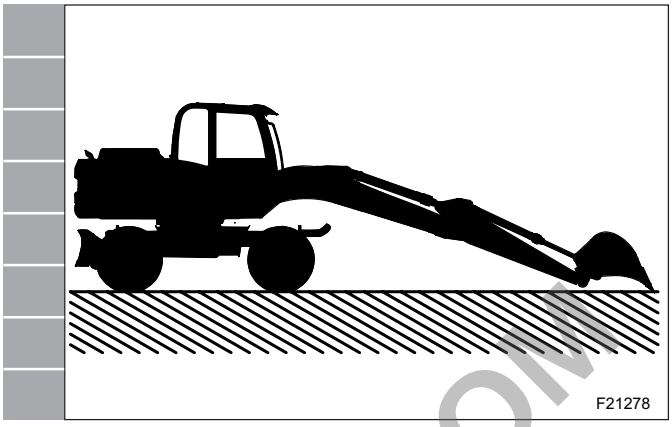


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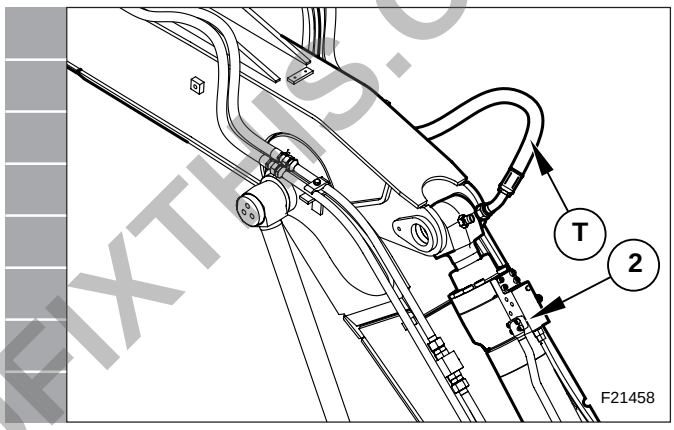
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REMOVAL

1. Place the machine on level ground. Lower the bucket to the ground and set the front-end attachment.
Stop the engine.



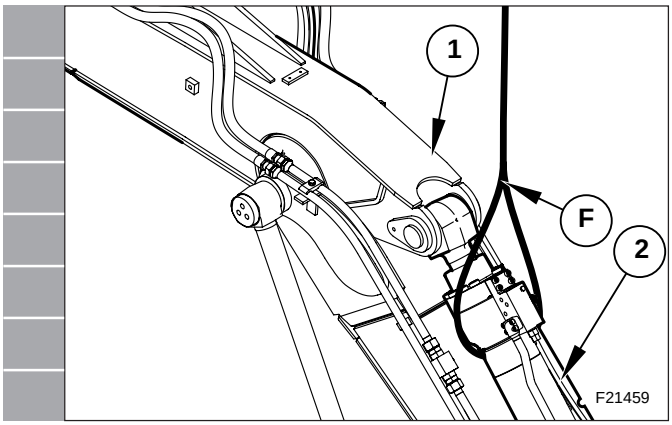
2. Disconnect lubrication hose (**T**) from positioning cylinder stem end (**2**).



3. With a rope (**F**) connect positoning cylinder (**2**) with a hoist.

WARNING

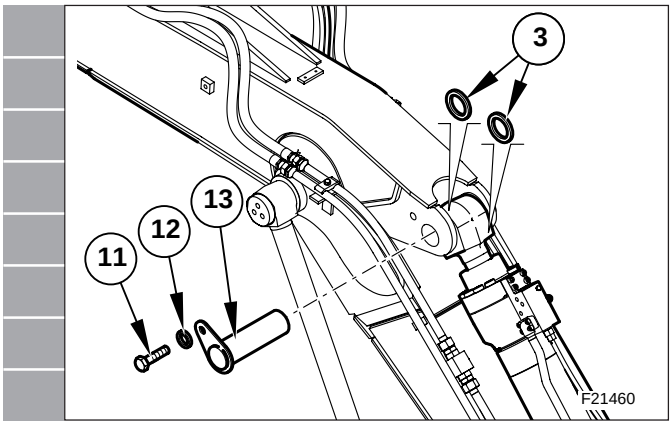
Weight of positioning cylinder: MH4.6.
Weight of positioning cylinder: MHPlusC.



4. Untighten and remove screw (**11**) with relative washer (**12**).
With a hammer remove pin (**13**). Collect shims (**3**).

WARNING

Prevent personal injuries. When removing the hinge pins with a hammer, some metal chips might fly away. Be properly protected with glasses, helmets, etc.

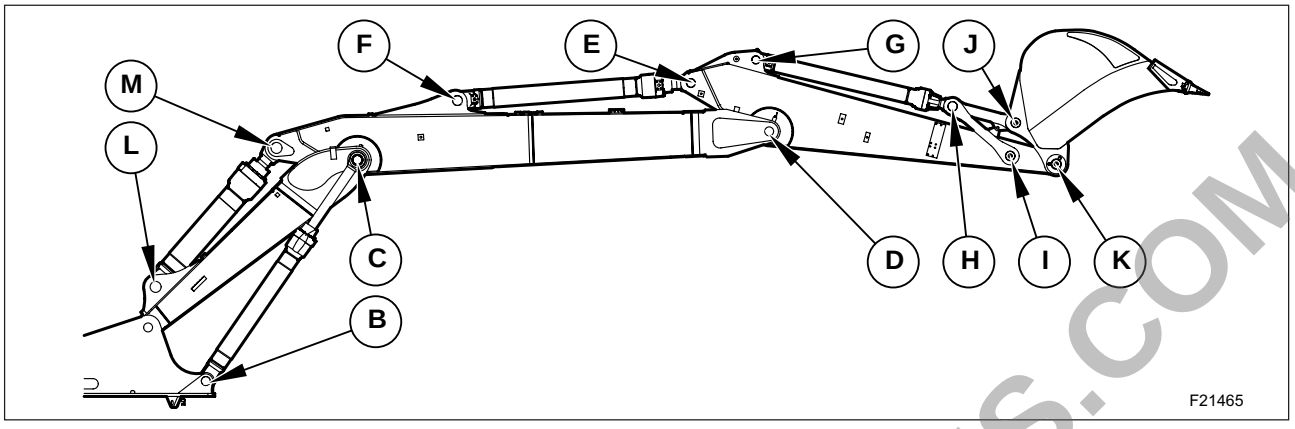


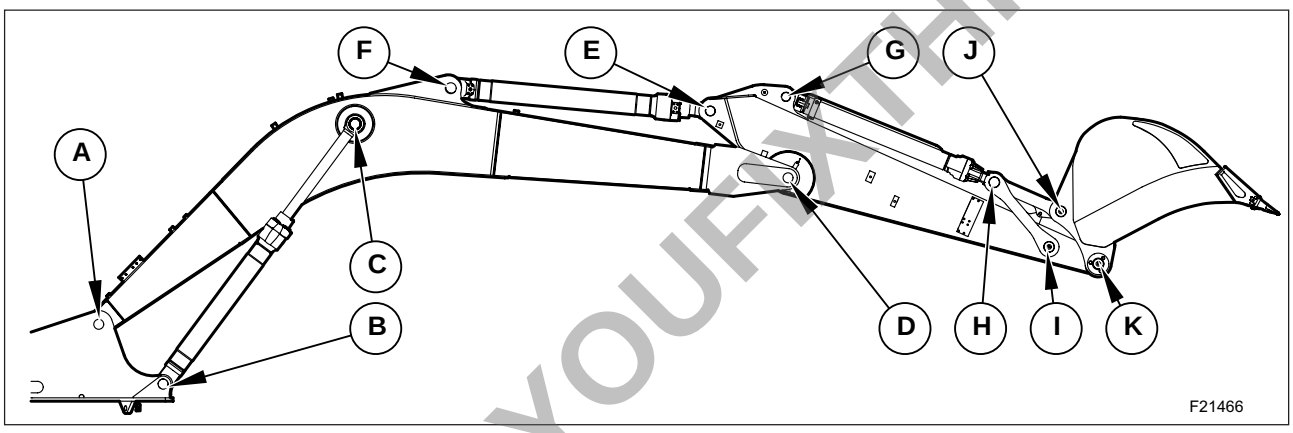
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MHPlusC

PINS AND BUSHINGS





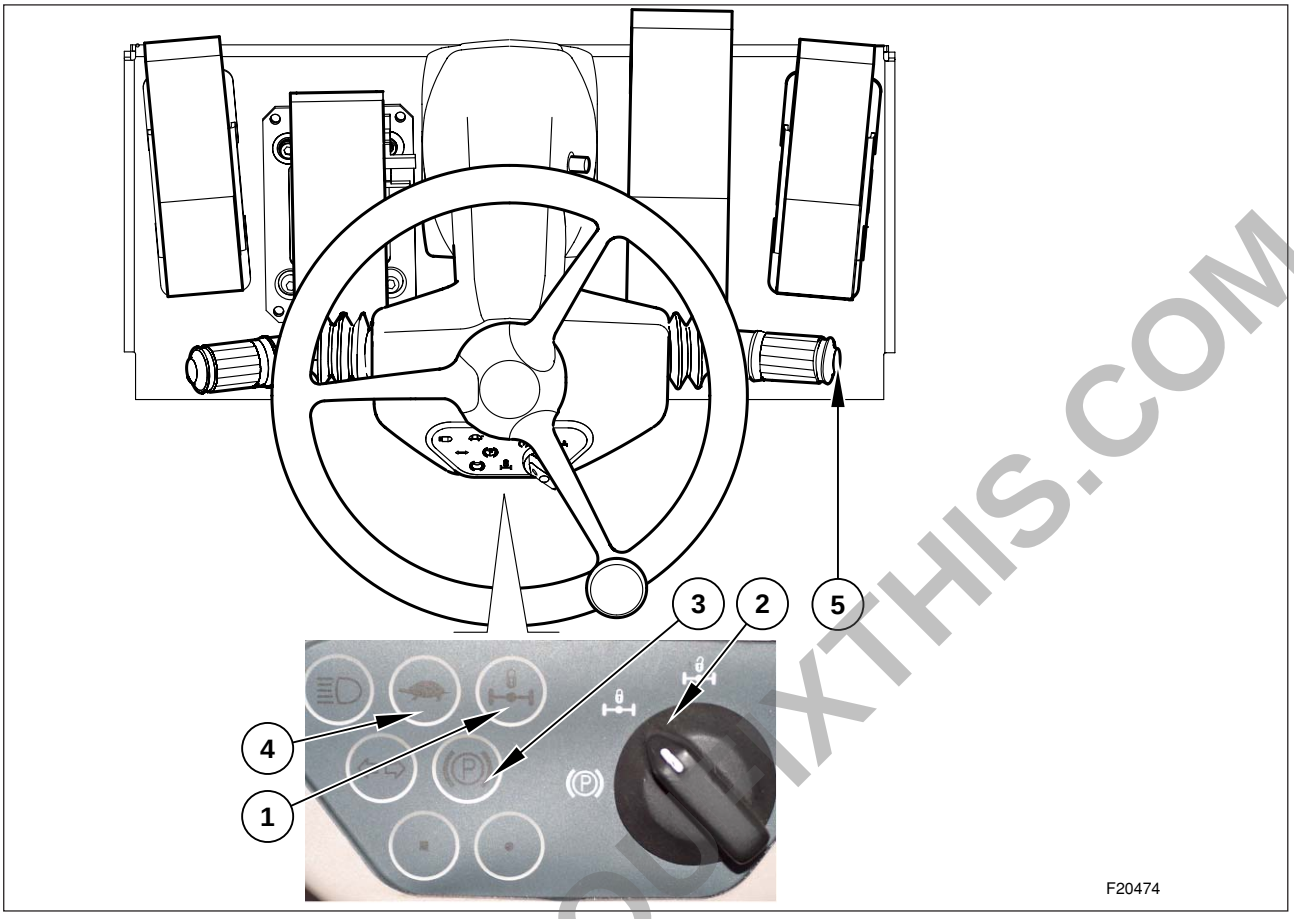
Unità: mm

Index	Measuring part	Pin		Bushing		Remedy
		Dimension	Limit	Dimension	Limit	
A	Boom foot	80	79	80	81,5	
B	Boom cylinder bottom side	80	79	80	81,5	
C	Boom cylinder rod side	80	79	80	81,5	
D	Boom top	71	70	71	72,5	
E	Arm cylinder rod side	75	74	75	76,5	
F	Arm cylinder bottom side	75	74	75	76,5	
G	Bucket cylinder bottom side	71	70	71	72,5	Replacement
H	Bucket cylinder rod side	71	70	71	72,5	
I	Link “B” arm side	65	64	65	66,5	
J	Link “A” bucket side	80	79	80	81,5	
K	Bucket arm side	80	79	80	81,5	
L	Positioner cylinder bottom side	80	79	80	81,5	
M	Positioner cylinder rod side	80	79	80	81,5	

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SWITCHES AND INDICATORS PANEL



1. **Axle lock indicator**
   The actuation of this indicator shows that the axle lock is applied.
2. **Switch for parking brake and axle lock**
   With the electric board under tension, the release of brake (P) is not possible when turning the switch. Also, the engine cannot be started. With the engine running you can:
   - position (P): operate the parking brake;
   - position : release the parking brake and have the front axle locked;
   - position : release the parking brake and have the front axle unlocked.
3. **Parking brake indicator**
   The actuation of this indicator shows that the parking brake is applied.
4. **Slow speed indicator**
   The actuation of this indicator shows that the slow speed has been engaged.
5. **Lever for travel mode selection**
   The vertical shift of the selector allows to select slow or fast travel.

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Check of solenoid valves

The chart herebelow contains the list of the solenoid valve coils, the location on the machine, the functions for which they are used and the electrical and hydraulic identification letters.
A first check of the correct connection of the coils of the solenoid valves herebelow, (except those with the symbol "*") is carried out each time the start-up key is turned to **ON** (when the logo FK is shown on the monitor).
As an alternative, each time a coil is activated, the system is able to detect if it is correctly connected. In case of failure the display shows whether it is a short circuit or an open circuit.

Location	Description	Function
Solenoid valve group in the battery box	* Solenoid valve A1	Pilot control enable
	Solenoid valve A2	Travel pedal enable
	Solenoid valve A3	Selection between equipment and blade-stabilizers functions
	Solenoid valve A4	Selection between equipment and blade-stabilizers functions
	Solenoid valve C1	User swing to the left
	Solenoid valve C2	User swing to the right
	Solenoid valve G1	Travel speed reducer (Creeper speed)
Below the operator's seat	Solenoid valve H1	Selection between positioner and non control valve spool function
	Solenoid valve H2	Selection between positioner and non control valve spool function
Below boom connection	Solenoid valve L1	User quick connection
On swing motor	Solenoid valve F1	Release of swing motor brake
Carriage solenoid valve group	Solenoid valve D1	Right stabilizer selection
	Solenoid valve D2	Selection between left stabilizer and tortoise on travel motor
	Solenoid valve D3	Selection between front and rear user
	Solenoid valve D4	Selection for front axle oscillation lock
	Solenoid valve E1	Hydraulic brake control
	Solenoid valve "A"	Parking brake release
	Solenoid valve "B"	Selection between 1st or 2nd mechanical speed
	Solenoid valve "C"	Clutch control

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