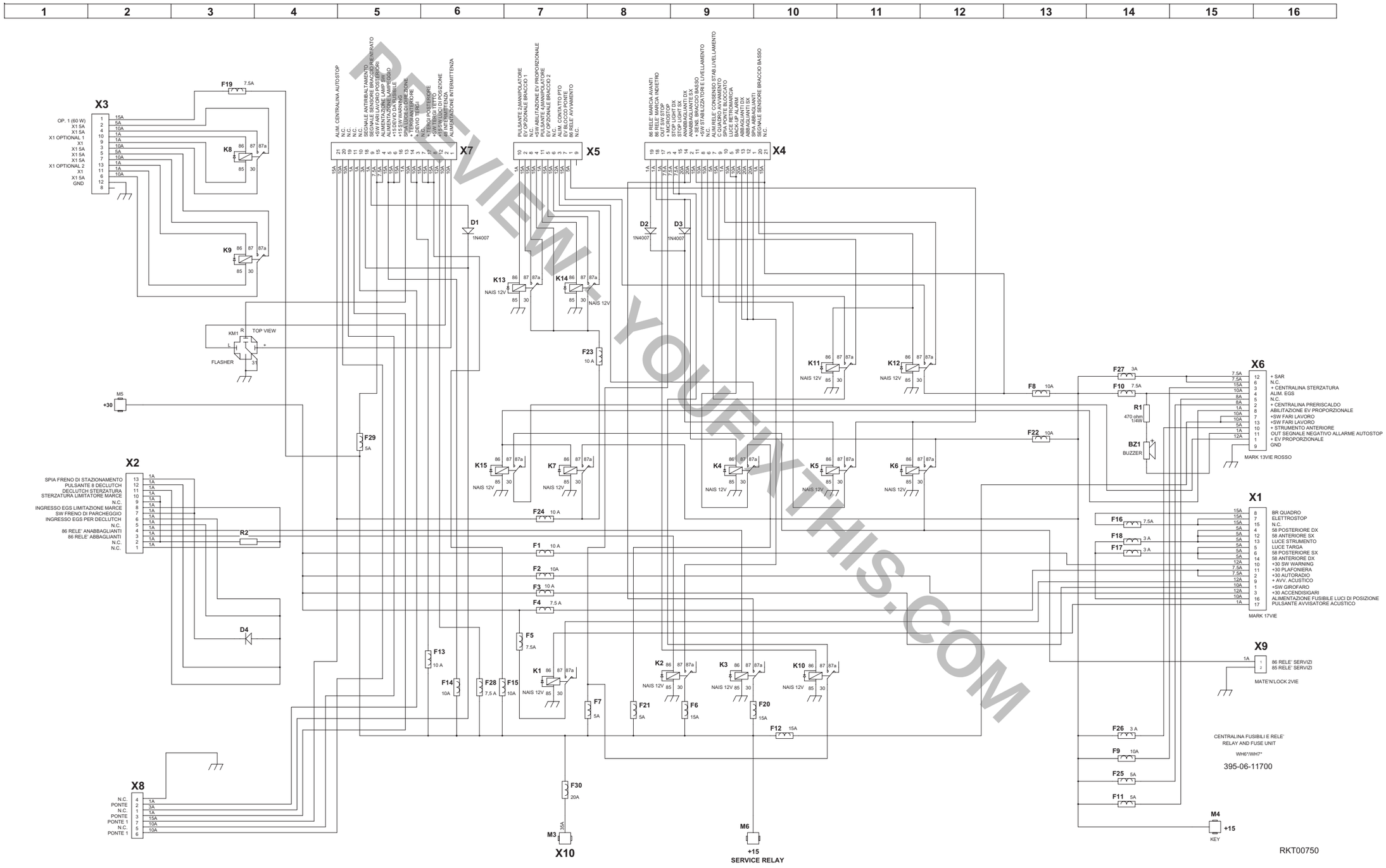
ELECTRICAL DIAGRAMS

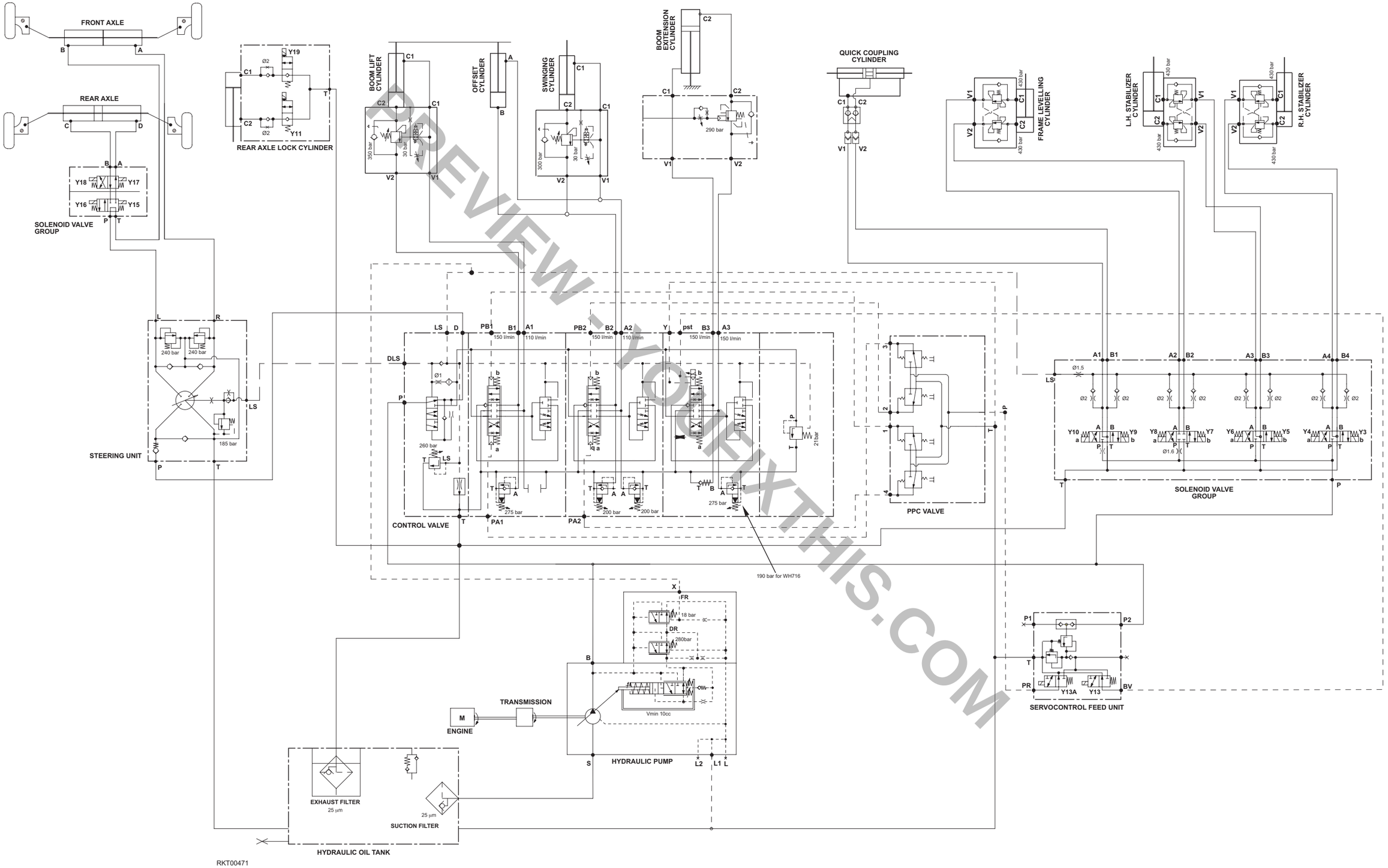
FUSE CENTRE



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HYDRAULIC DIAGRAM



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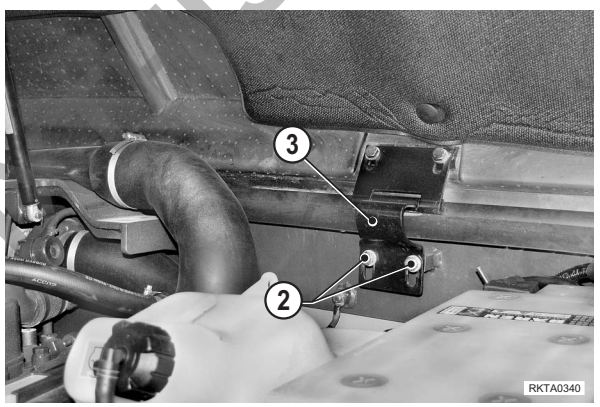
ENGINE HOOD

Removal

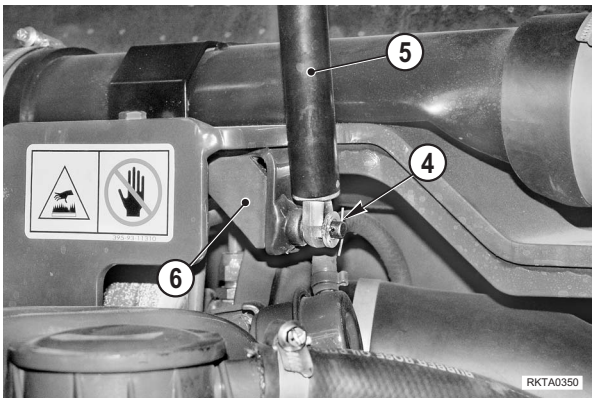
1 -Lift the engine hood (1).



2 -While supporting the engine hood, loosen and remove the screws (2) retaining the hinges (3).



3 -Remove the cotter pin (4), the backing washer, and disconnect the gas damper (5) from its support (6).



4 -Lower the hood and place an anti-slip block (A) between lower edge of hood and body; then, strap the hood and connect it a hoist.

5 -Remove the hood (1). [*1]



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STANDARD TIGHTENING TORQUE

The following charts give the standard tightening torques of bolts and nuts.
Exceptions are given in section of «Disassembly and Assembly».

1. STANDARD TIGHTENING TORQUE OF BOLTS AND NUT

Thread diameter of bolts (mm)	Pitch of bolts (mm)	Width across flat (mm)		8.8		10.9	
				kgm	Nm	kgm	Nm
6	1	10	8	0.96±0.1	9.5±1	1.3±0.15	13.5±1.5
8	1.25	13	6	2.3±0.2	23±2	3.2±0.3	32.2±3.5
10	1.5	17	8	4.6±0.5	45±4.9	6.5±0.6	63±6.5
12	1.75	19	10	7.8±0.8	77±8	11±1	108±11
14	2	22	12	12.5±1	122±13	17.5±2	172±18
16	2	24	14	19.5±2	191±21	27±3	268±29
18	2.5	27	14	27±3	262±28	37±4	366±36
20	2.5	30	17	38±4	372±40	53±6	524±57
22	2.5	32	17	52±6	511±57	73±8	719±80
24	3	36	19	66±7	644±70	92±10	905±98
27	3	41	19	96±10	945±100	135±15	1329±140
30	3.5	46	22	131±14	1287±140	184±20	1810±190
33	3.5	50	24	177±20	1740±200	250±27	2455±270
36	4	55	27	230±25	2250±250	320±35	3150±350
39	4	60	—	295±33	2900±330	410±45	4050±450

This torque table does not apply to bolts or nuts which have to fasten nylon or other parts non-ferrous metal washer.

★ **Nm (newton meter): 1 Nm = 0.102 kgm**

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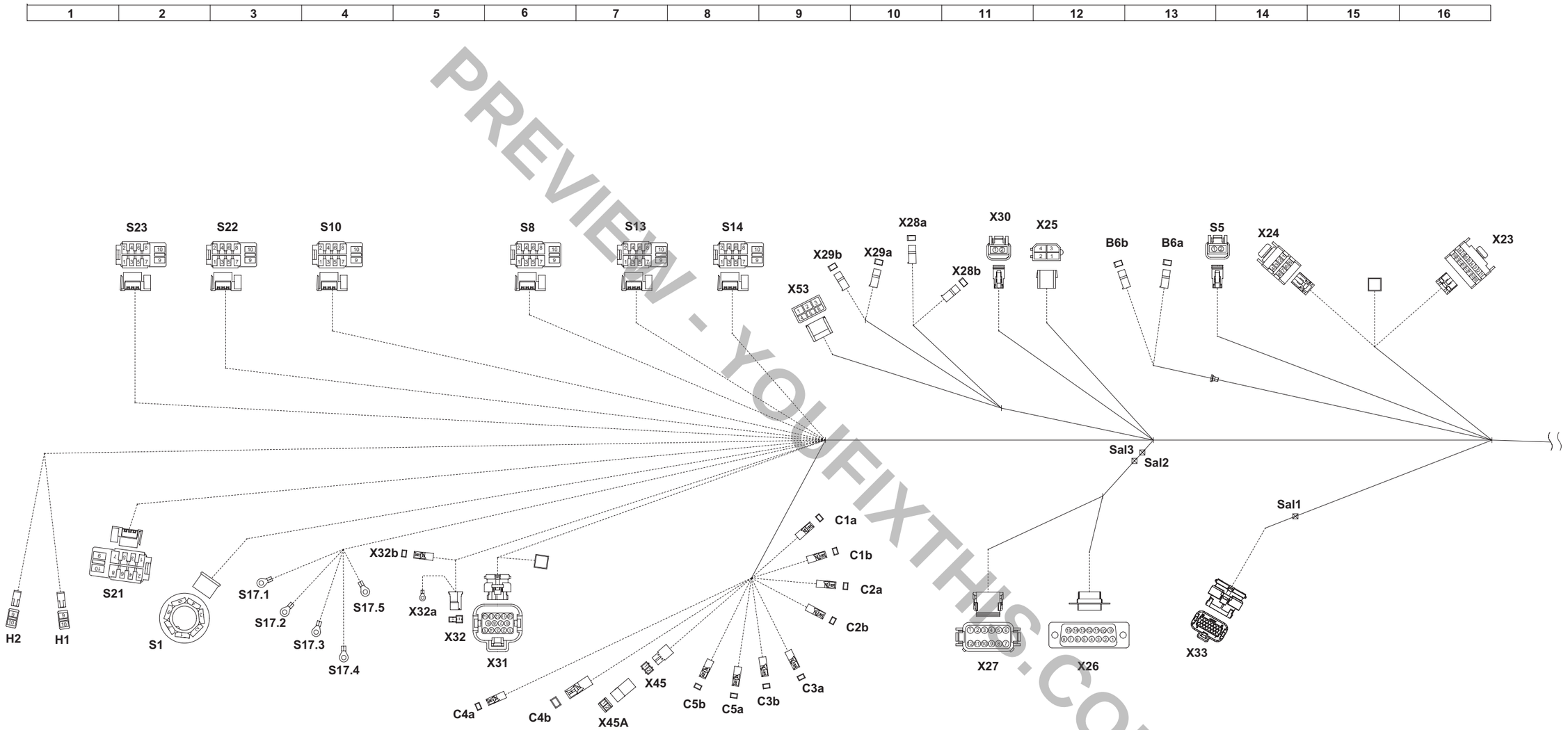
STANDARD SPECIFICATIONS

• ASPIRATED ENGINES

Machine model			WH609 - WH613	
Engine			4D104E-1	
Check item	Test conditions	Unit	Standard value	Permissible value
Engine speed (no load condition)	Maximum speed Minimum speed Operating speed	rpm rpm rpm	2500 1050 –	2500±50 1050 +50 0 –
Exhaust gas colour	Abrupt acceleration At maximum speed	Bosch index	<2.5 <2.5	<2.5 <2.5
Valve lash	Intake (20 °C) Exhaust (20 °C)	mm mm	0.30±0.05 0.55±0.05	0.30±0.05 0.55±0.05
Compression pressure (oil SAE30)	Oil temperature 69÷72 °C (Engine speed)	bar (rpm)	–	–
Pressure in housing (oil SAE30)	Water at operating temperature At maximum speed	mm H_2O	5–10 50.0	5–10 50.0
Engine oil pressure	At maximum speed At minimum speed	bar (kPa) bar (kPa)	3.5 (350) 0.7 (70)	–
Engine oil temperature	All speeds	°C	Max. 120	Max. 120
Injection advance	B.T.D.C.	mm	1.35	1.35±0.05

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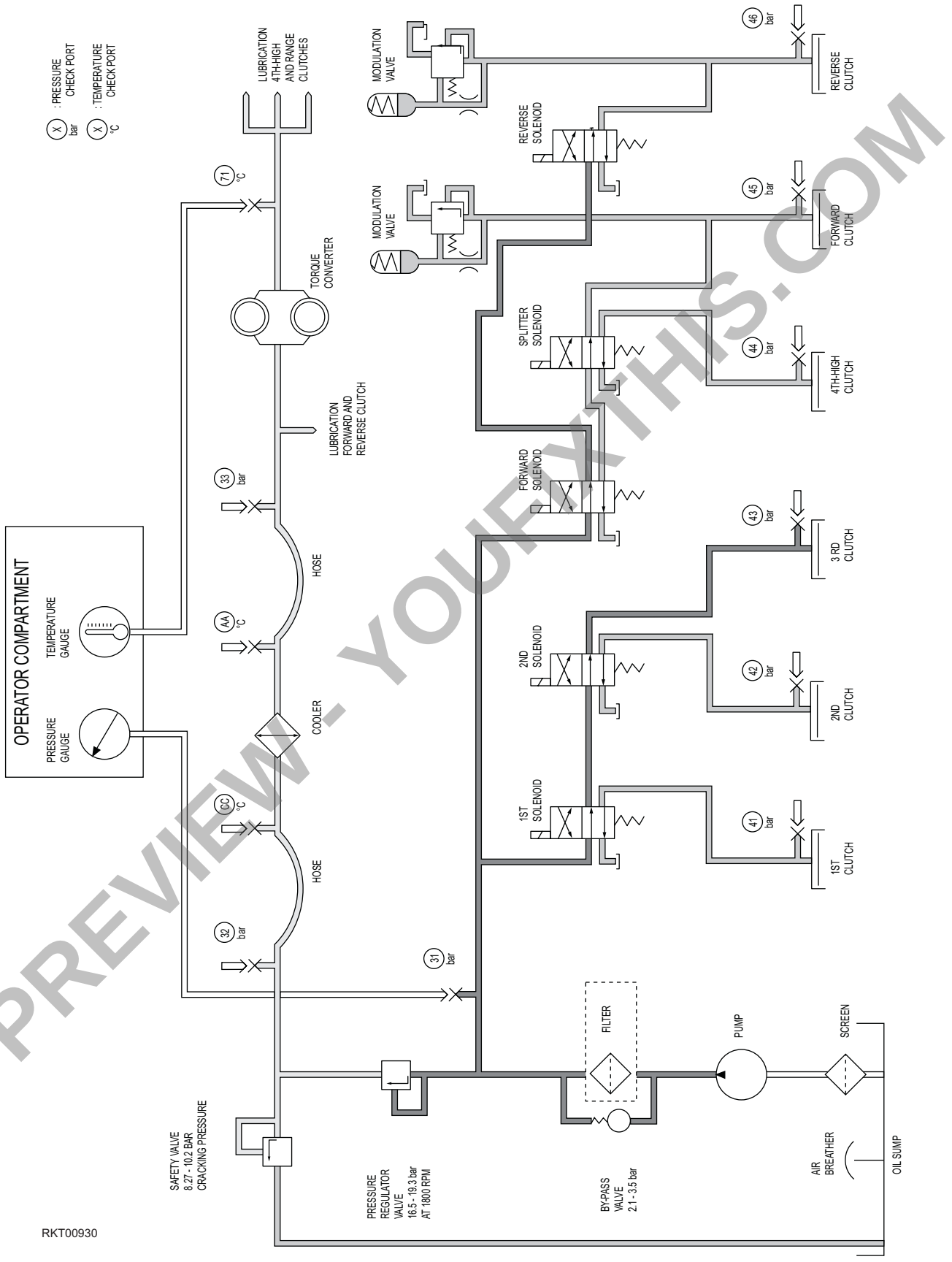
CAB WIRING (1/2)



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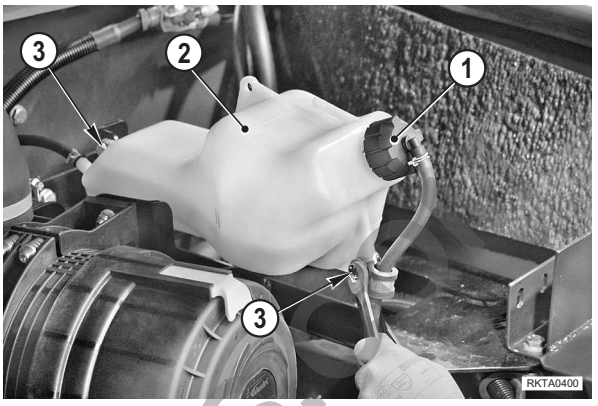
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AIR FILTER

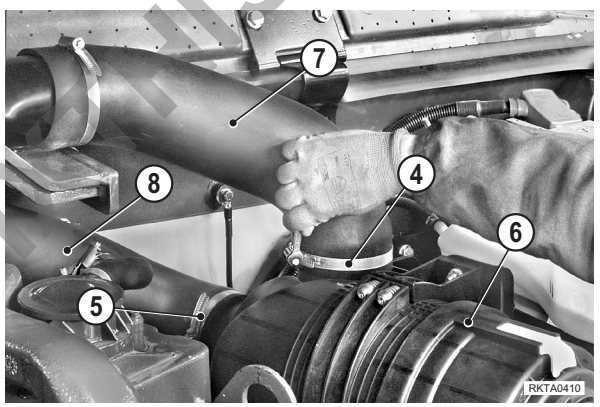
Removal

1 - Unscrew and remove the cap (1) from the surge tank (2).

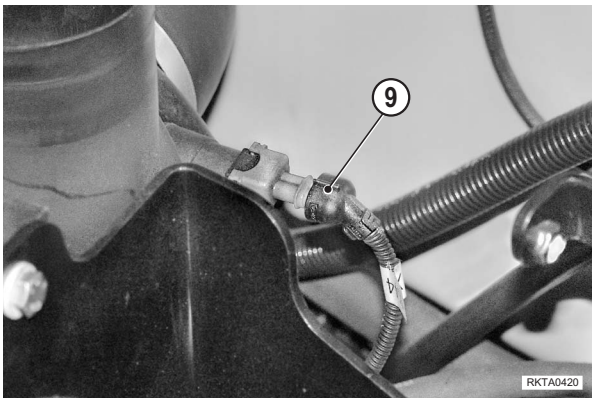
2 - Loosen and remove the screws (3), remove the surge tank (2), and position the tank aside.



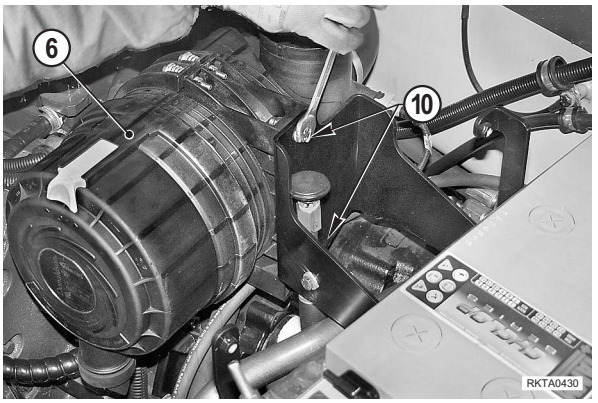
3 - Loosen the clamps (4), (5) and disconnect the outside air inlet hose (7) and engine intake hose (8) from the filter (6).



4 - Disconnect the air cleaner clogging sensor connector (9).



5 - Loosen and remove the screws (10) together with washers and nuts and remove the filter (6).

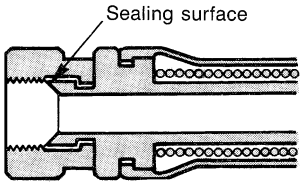


Installation

- To install, reverse the removal procedure.

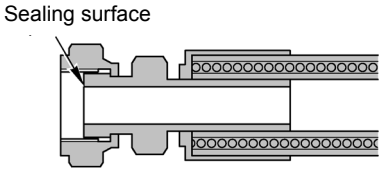
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2. TIGHTENING TORQUE FOR NUTS OF FLARED



Use these torques for nut part of flared.

Thread diameter of nut part (mm)	Width across flats of nut part (mm)	TIGHTENING TORQUE	
		kgm	Nm
1/2” - 20	17	2.6±0.5	25.5±4.9
9/16” - 18	17	4±0.5	39.2±4.9
3/4” - 16	22	6.7±2	65.7±19.6
7/8” - 14	27	8±2	78.5±19.6
1.1/16 - 12	32	9.7±3	95.15±29.4
1.5/16 - 12	38	17±3	166.7±29.4
1.5/8 - 12	50	20±5	196.2±49
22	27	8±2	78.5±19.6
33	41	20±5	196.2±49



Thread diameter of nut part (mm)	Width across flats of nut part (mm)	TIGHTENING TORQUE	
		kgm	Nm
9/16” - 18	17	2.3–2.5	23–25
11/16” - 16	22	3.4–3.9	33–38
13/16” - 16	24	5.2–5.8	51–57
1” - 14	30	8.2–9.2	80–90
1.3/16 - 12	36	12.2–13.3	120–130
1.7/16 - 12	41	15.3–17.3	150–170
1.11/16 - 12	50	18.4–20.4	180–200
2” - 12	57	20.4–24.4	200–240

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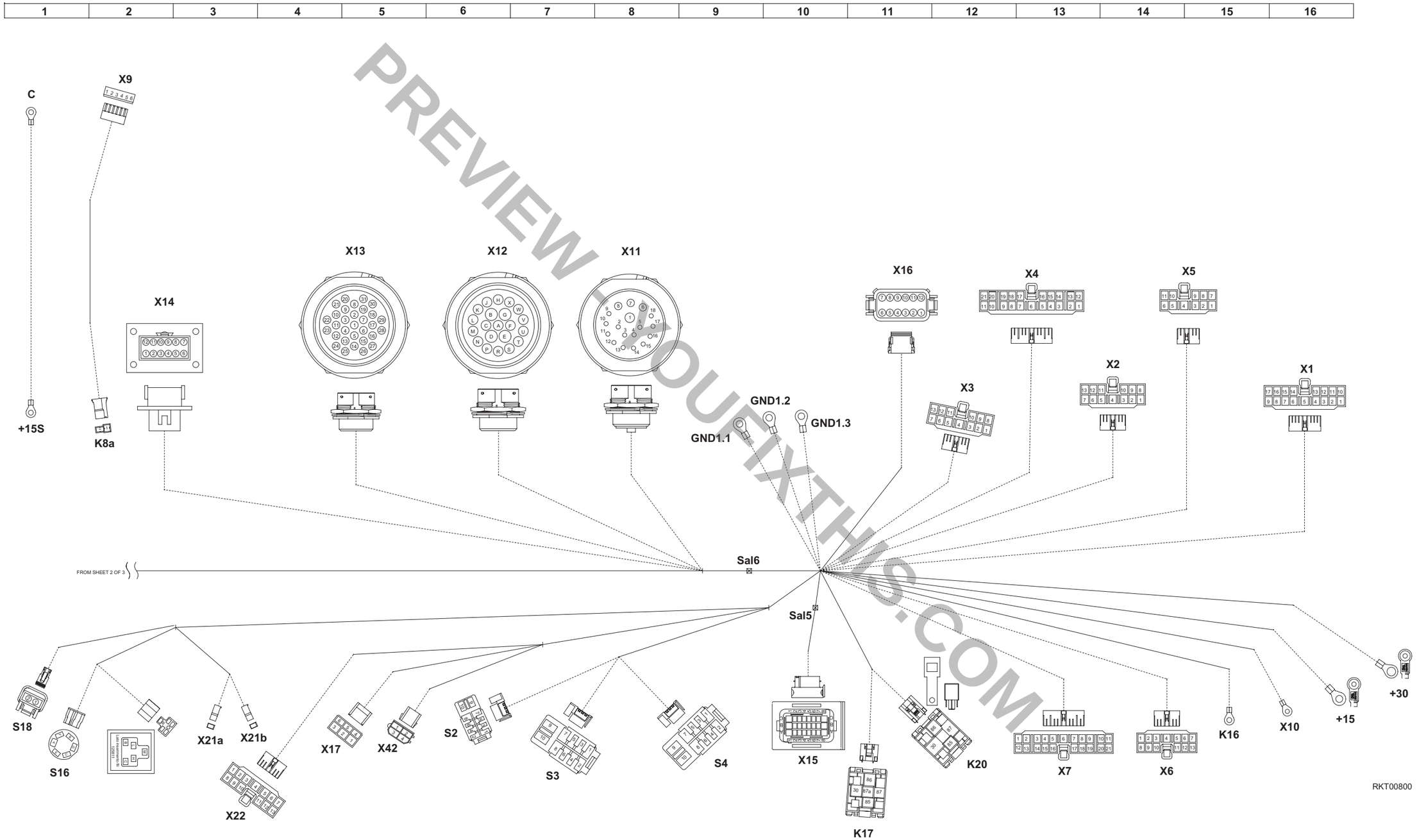
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• TURBO ENGINES

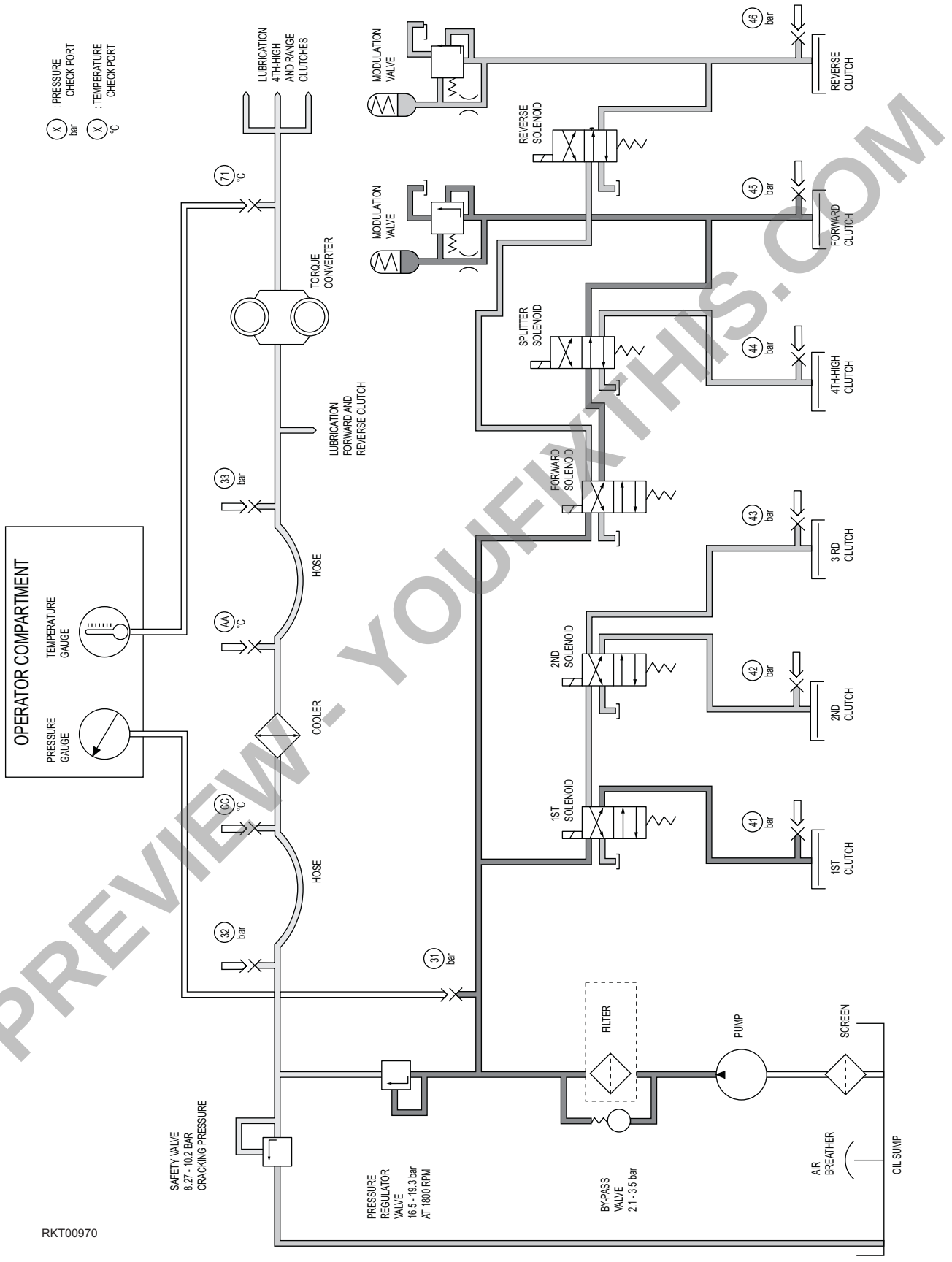
Machine model			WH609 - WH613 - WH713 WH714 - WH714H - WH716	
Engine			S4D104E-1	
Check item	Test conditions	Unit	Standard value	Permissible value
Engine speed (no load condition)	Maximum speed Minimum speed Operating speed	rpm rpm rpm	2500 1050 –	2500±50 1050±50 –
Exhaust gas colour	Abrupt acceleration At maximum speed	Bosch index	1.5 1.5	1.5 1.5
Valve lash	Intake (20 °C) Exhaust (20 °C)	mm mm	0.30±0.05 0.55±0.05	0.30±0.05 0.55±0.05
Compression pressure (oil SAE30)	Oil temperature 69÷72 °C (Engine speed)	bar (rpm)	–	–
Pressure in housing (oil SAE30)	Water at operating temperature At maximum speed	mm H_2O	5–10 50.0	5–10 50.0
Engine oil pressure	At maximum speed At minimum speed	bar (kPa) bar (kPa)	3.5 (350) 0.7 (70)	–
Engine oil temperature	All speeds	°C	Max. 120	Max. 120
Injection advance	B.T.D.C.	mm	1.00	1.00±0.05

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CAB WIRING (2/2)



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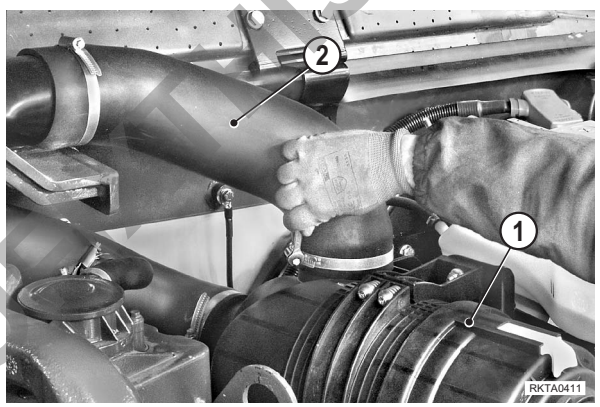
TURBOCOMPRESSOR (only if equipped)

Removal

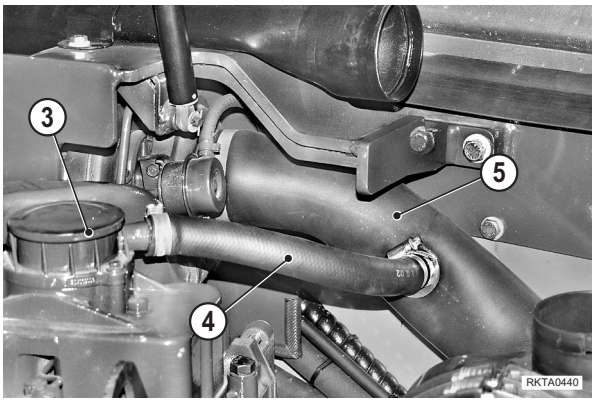
1 - Remove the engine hood.
(For details, see "ENGINE HOOD").



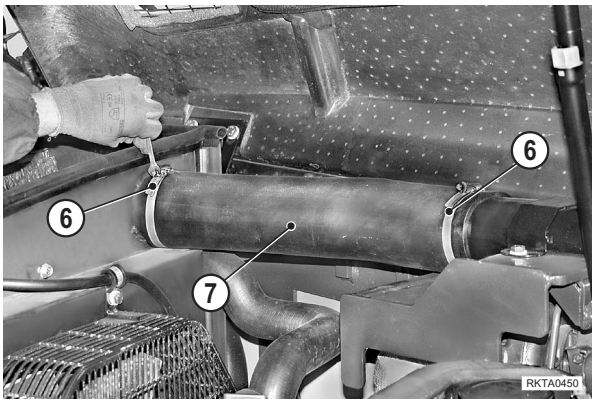
2 - Disconnect the outside air inlet hose (2) from the air cleaner (1).



3 - Disconnect the hose (4) from the oil vapour bleed valve (3) and remove the air cleaner-to-turbocompressor hose (5).



4 - Loosen the clamps (6) and remove the hose (7).



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• MACHINE MODELS WH609 - WH613 WITH ASPIRATED ENGINE

Machine model				WH609 - WH613	
Classification	Check item	Test conditions	Unit	Standard value	Permissible value
Engine speed (load condition)	With stalled converter	• Max. engine speed • Hydraulic oil temperature: 45–55 °C • Converter oil temperature: 80°C • Machine in 2nd gear • Service brakes: applied	rpm	1850	1850–2100
	With stalled converter and hydraulic system in load condition	• Max. engine speed • Hydraulic oil temperature: 45–55 °C • Converter oil temperature: 80°C • Machine in 2nd gear • Service brakes: applied • Equipment crate curl at end of travel and steering at end of travel		1350	1350–2100
	With hydraulic system in load condition	• Max. engine speed • Hydraulic oil temperature: 45–55 °C • Converter oil temperature: 80°C • Parking brakes: applied • Equipment crate curl at end of travel and steering at end of travel		2450	2450–2550

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REVISED PAGES

The affected pages are indicated by the use of the following marks. It is requested that necessary actions be taken to these pages according to table below.

Mark	Indication	Action required
○	Page to be newly	Add
●	Page to be replaced	Replace
( )	Page to be delete	Discard

Pages having no marks are those previously revised or made additions.

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	00-1			10-16			10-59			20-13			20-56	
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	00-3			10-18			10-61			20-15			20-58	
	00-4			10-19			10-62			20-16			20-59	
	00-5			10-20			10-63			20-17			20-60	
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IMPORTANT SAFETY NOTICE

Proper service and repair is extremely important for the safe operation of your machine.
The service and repair techniques recommended by Komatsu Utility and describe in this manual are both effective and safe methods of operation. Some of these operations require the use of tools specially designed by Komatsu Utility for the purpose.

To prevent injury to workers, the symbol ⚠ is used to mark safety precautions in this manual. The cautions accompanying these symbols should always be carefully followed. If any danger arises or may possibly arise, first consider safety, and take necessary steps to face.

SAFETY

GENERAL PRECAUTIONS

Mistakes in operation extremely dangerous.
Read all the Operation and Maintenance Manual carefully BEFORE operating the machine.

1. Before carrying out any greasing or repairs, read all the precautions written on the decals which are suck on the machine.
2. When carrying out any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
   - Always wear safety glasses when hitting parts with a hammer.
   - Always wear safety glasses when grinding parts with a grinder, etc.
3. If welding repairs are needed, always have a trained, experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, glasses, cap and other clothes suited for welding work.
4. When carrying out any operation with two or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR signs on the controls in the operator's compartment.
5. Keep all tools in good condition and learn the correct way to use them.
6. Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.

PREPARATIONS FOR WORK

7. Before adding or making any repairs, park the machine on hard, level ground, and block the wheels to prevent the machine from moving.
8. Before starting work, lower outrigger, bucket or any other work equipment to the ground. If this is not possible, use blocks to prevent the work equipment from falling down. In addition, be sure to lock all the control levers and hang warning sign on them.
9. When disassembling or assembling, support the machine with blocks, jacks or stands before starting work.
10. Remove all mud and oil from the steps or other places used to get on and off the machine. Always use the handrails, ladders or steps when getting on or off the machine.
    Never jump on or off the machine.
    If it is impossible to use the handrails, ladders or steps, use a stand to provide safe footing.

PRECAUTIONS DURING WORK

11. When removing the oil filler cap, drain plug or hydraulic pressure measuring plugs, loosen them slowly to prevent the oil from spurting out.
    Before disconnecting or removing components of the hydraulic circuit and engine cooling circuit, first remove the pressure completely from the circuit.
12. The water and oil in the circuits are not hot when the engine in stopped, so be careful not to get burned.
    Wait for the oil water to cool before carrying out any work on the cooling water circuits.
13. Before starting work, remove the leads from the battery. Always remove the lead from the negative (–) terminal first.

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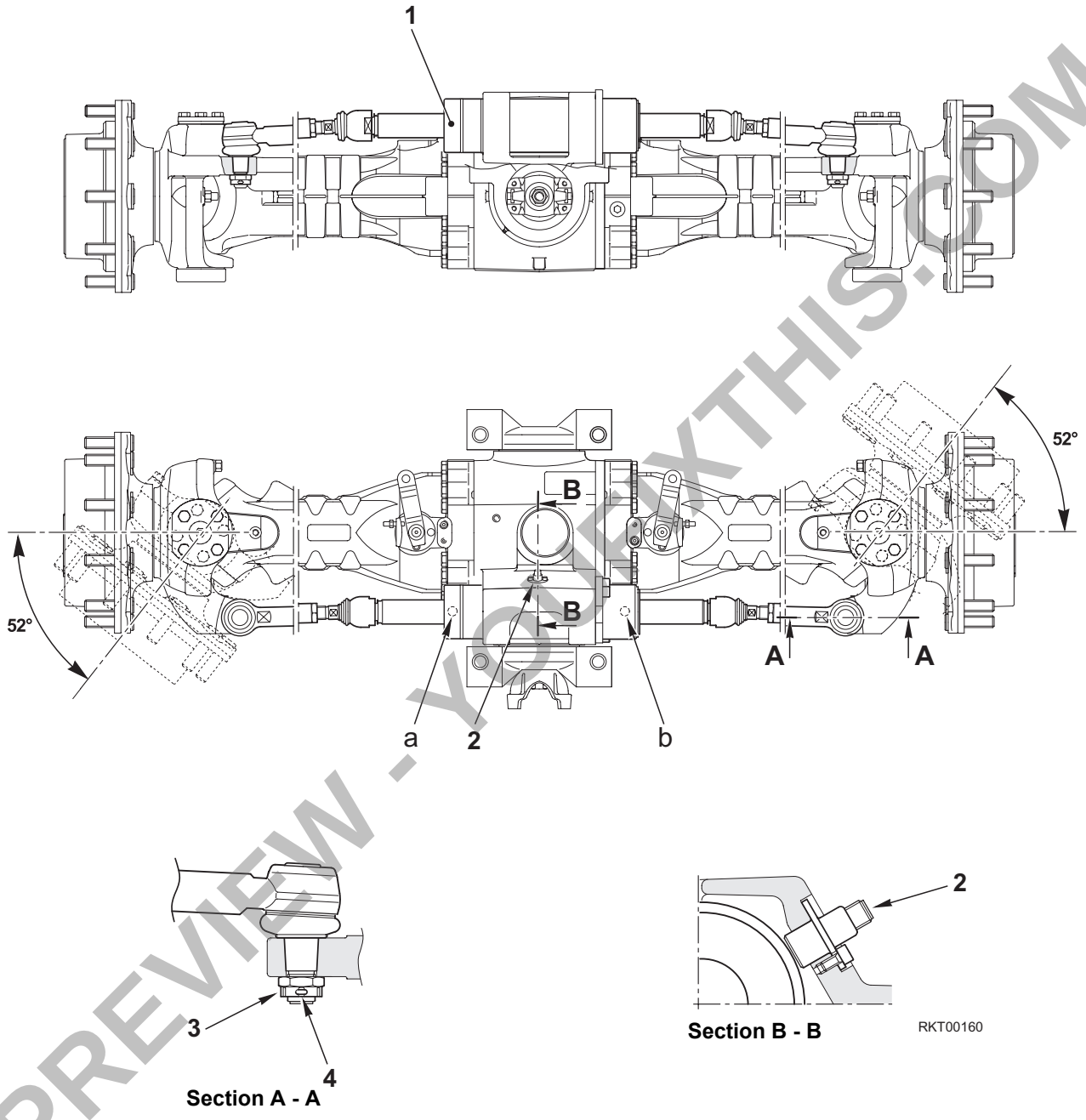
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	30-22			30-84			30-146			30-208			30-270	
	30-23			30-85			30-147			30-209			30-271	
	30-24			30-86			30-148			30-210			30-272	
	30-25			30-87			30-149			30-211			30-273	
	30-26			30-88			30-150			30-212			30-274	
	30-27			30-89			30-151			30-213			30-275	
	30-28			30-90			30-152			30-214			30-276	
	30-29			30-91			30-153			30-215			30-277	
	30-30			30-92			30-154			30-216			30-278	
	30-31			30-93			30-155			30-217			30-279	
	30-32			30-94			30-156			30-218			30-280	
	30-33			30-95			30-157			30-219			30-281	
	30-34			30-96			30-158			30-220			30-282	
	30-35			30-97			30-159			30-221			30-283	
	30-36			30-98			30-160			30-222			30-284	
	30-37			30-99			30-161			30-223				
	30-38			30-100			30-162			30-224			90-1	
	30-39			30-101			30-163			30-225			90-2	
	30-40			30-102			30-164			30-226			90-3	
	30-41			30-103			30-165			30-227			90-4	
	30-42			30-104			30-166			30-228			90-5	
	30-43			30-105			30-167			30-229			90-6	
	30-44			30-106			30-168			30-230				
	30-45			30-107			30-169			30-231				
	30-46			30-108			30-170			30-232				
	30-47			30-109			30-171			30-233				
	30-48			30-110			30-172			30-234				
	30-49			30-111			30-173			30-235				

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STEERING CYLINDER



1. Steering cylinder
2. Centering sensor
3. Nut
4. Cotter pin

a. b Port - From ST1 solenoid valve group (T Port)
b. a Port - From steering unit (R Port)

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5 - Start the engine, operate at 1500 rpm and start a light steering manoeuvre, making sure that pressure increases.

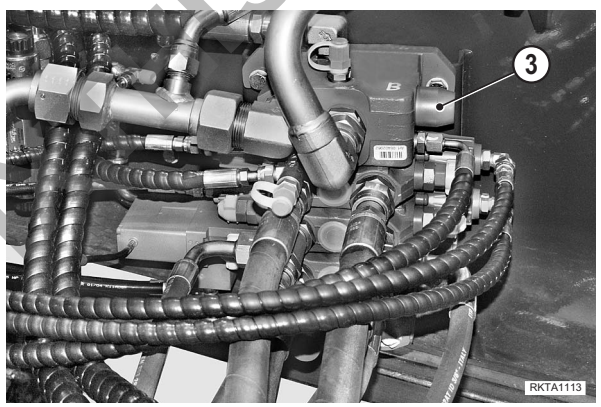
6 - Continue steering until full steering is obtained and make sure that the pressure increases to normal value when the steering wheel is forced.

★ Normal pressure:
WH609 - WH613: 180±5 bar
WH713 - WH714 - WH714A - WH716: 185±7 bar

7 - Ensure that no pressure variation exceeding 5 bar is experienced when increasing to MAX speed.

★ If pressure fails to reach normal value, perform the steering system pressure calibration procedure. (For details, please refer toe "CALIBRATING THE PRESSURE OF THE STEERING SYSTEM").

★ If the pressure displayed on the pressure gauge shows no variation when turning the steering wheel, and the effort needed to execute the steering operation is high, inspect the operation of the priority valve (3).



• Inspection of priority valve operation

1 - Remove the valve plug (4), spring (5), and stem (6) from the priority valve (3).

★ Note down the assembly sequence.

2 - Detach the plug (7) and remove the ball (8) of the inner valve and remove the spring (9).

3 - Check the hole (10) and nozzle (11) for being clean.

4 - Reinstall the spring (9), ball (8) and plug (7).

Plug: Loctite 542

Plug: 20 Nm

★ Do not allow Loctite to penetrate inside the hole (10).

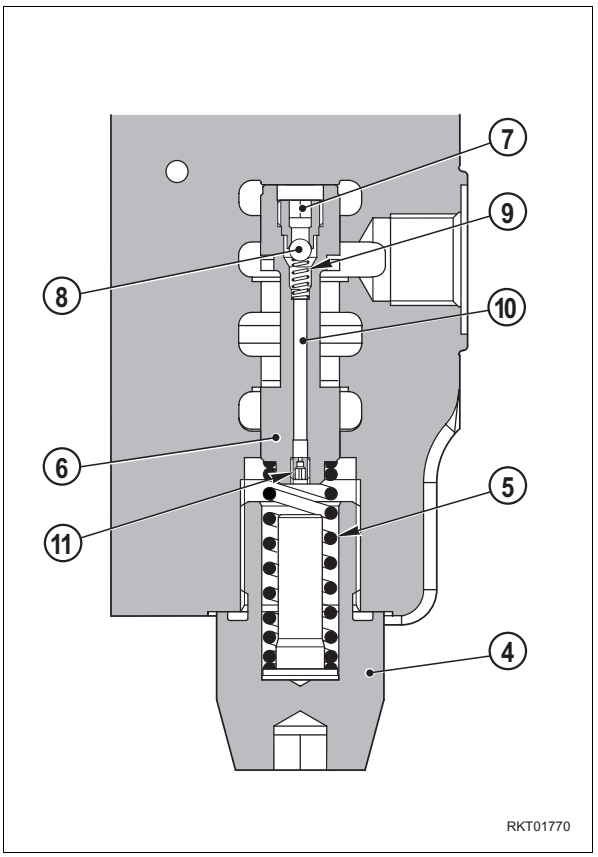
★ Remove any excess Loctite from the valve stem (6).

5 - Lubricate the valve stem (6) and seat it, making sure it slides freely.

6 - Introduce the valve spring (5) and install the valve plug (4).

Plug: 100 Nm

7 - Start the engine, perform a few steering manoeuvres, and if the malfunction is not eliminated, replace the complete valve stem.



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PRECAUTIONS TO BE TAKEN WHEN WORKING

★ When dismantling or installing a part, always take the following general precautions.

1. Precautions for removal operations

- If not otherwise indicated, lower the work equipment until it rests on the ground.
- If the coolant liquid contains an anti-freeze substance, follow the instructions given for drainage.
- After having removed flanges and tubes, insert plugs to prevent impurities from entering.
- Before removing a cylinder, fully retract the piston and tie it with wire.
- Use a sufficiently large container to collect the oil.
- Before removing a part from the machine, check the alignment reference marks which show the correct installation position. If necessary add further marks to avoid incorrect installation.
- While dismantling the connectors, always grasp them firmly to avoid undue strain on the wiring.
- If necessary, attach markers to the wires and tubes to avoid muddling them up during installation.
- Check the number and height of the adjustments to a given clearance and store them in a safe place.
- When raising the machine or some parts of it, use adequate equipment for the weight of the part concerned.
- When using screws or eyebolts to remove items of the machinery, screw them alternately, and as deeply as they will go.
- Before removing a piece, clean the surrounding area and, after removal, cover the area to prevent dirt or dust from gaining entrance

2. **Precautions to be taken during installation**

- Tighten nuts and screws with the specified tightening torques.
- Install the flexible hoses, taking care not to entangle or twist them.
- Bend the cotter pins and stops in such a way as to secure them.
- When coating the threads with adhesives, clean the piece to remove oil and grease, then apply just enough adhesive to cover the threading in a uniform manner.
- When applying a liquid sealant, clean the surface involved, remove residual oil and grease, check that there are no dents or dirt, then apply the liquid sealant in a uniform manner.
- Clean all the parts, remove dirt, rust, burrs, or dents.
- Apply a film of engine oil over all the moving parts.
- Apply a film of anti-friction grease (ASL800040) over all surfaces assembled with pressure, to avoid sticking.
- After having mounted the snap-rings, check that they are firmly positioned in their seatings.
- When installing electrical system jacks, remove any oil, dust or water that may have penetrated into them, then connect them firmly.
- If using eyebolts, check that they are not distorted, screw them in fully, and then align the eye with the hoisting hook.
- Mount the flanges in a uniform manner, and tighten the screws in criss-cross sequence, to avoid excessive pull on one side only.

3. Precautions to be taken on completion of removal and installation operations

- If the coolant liquid has been drained away, close the drainage plug and add new liquid up to normal level. Start the engine to circulate the liquid throughout the cooling system and then top up the level once more.
- When the hydraulic equipment has been dismantled, add engine oil to the indicated level. Start up the engine to circulate the oil in the hydraulic circuits, and then top up to the indicated level.
- If hoses or hydraulic equipment, such as hydraulic cylinders, pumps, motors, solenoid valves and valves, are removed for repairs or substitution, bleed air from the hydraulic circuits after having re-assembled the machine.
- For details, see “20. CONTROL AND ADJUSTMENTS”.
- After having re-assembled cylinder joints or cylinders, or work equipment articulations, lubricate thoroughly.

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REAR AXLE

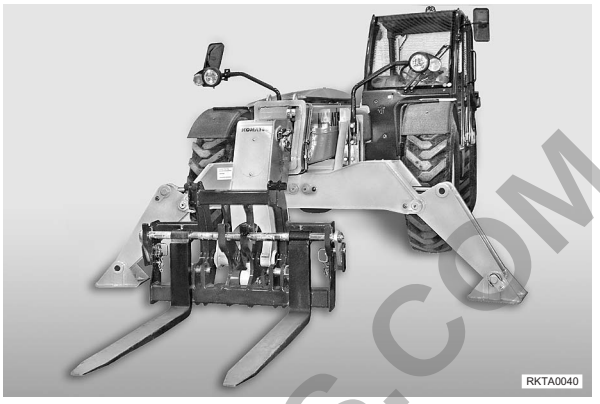
Preparation

- **Machine with outriggers**

1 - Fully lower the boom; lower and slightly force the outriggers to the ground, and stop the engine.

- **Machine without outriggers**

1 - Fully lower the boom, apply the parking brakes, and stop the engine.

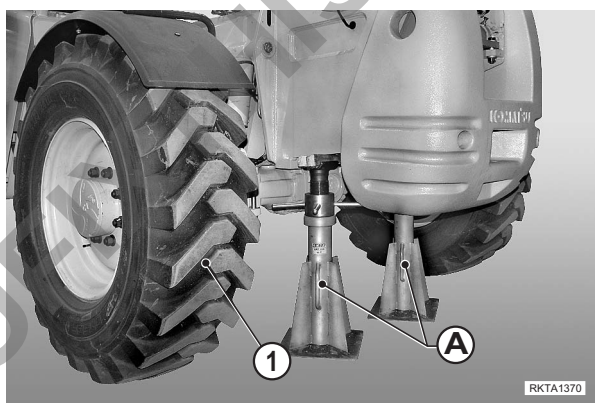


Removal

1 - Install two screw jacks "**A**" under the frame.

★ If the machine is equipped with additional ballasts, install the screw jacks under the rear ballast, together with anti-slip blocks.

2 - Raise the "**A**" jacks equally, enough to lift and remove the wheels (1). [*1]



3 - Install a safety stand "**B**" under the ballast.

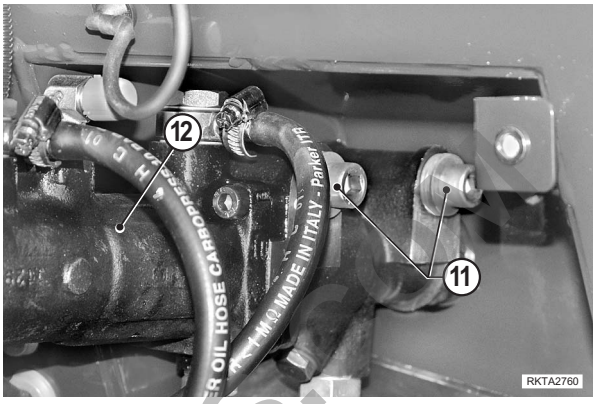


4 - Loosen and remove the nuts and remove the fenders (2).



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6 -Loosen and remove the screws (11) and remove the pump (12). [*2]



Installation

- To install, reverse the removal procedure.

[*1]

★ Perform the braking circuit bleed procedure. (For details, see "20 TESTING AND ADJUSTMENTS").

[*2]

★ Ensure that the thrust arm centres the piston seat.

★ When bleeding is complete, check the pedal pretravel and check the position of the microswitch. (For details, see "20 TESTING AND ADJUSTMENTS").

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Assembly

- To assemble, reverse the disassembly procedure.

[*1]

Screws: 35 – 39 Nm

[*2]

Filter: 27 – 34 Nm

[*3]

Screws: 35 – 41 Nm

[*4]

Regulator assembly: 61 – 68 Nm

[*5]

Position two studs to ease the centring of clutch shafts and sealing elements.
Do not use screws to force the installation.

Screws: 40 – 50 Nm

[*6]

Screws: 5 – 7 Nm

[*7]

Nuts: 22 – 27 Nm

[*8]

Screws: 40 – 50 Nm

[*9]

Nuts: 389– 407 Nm

[*10]

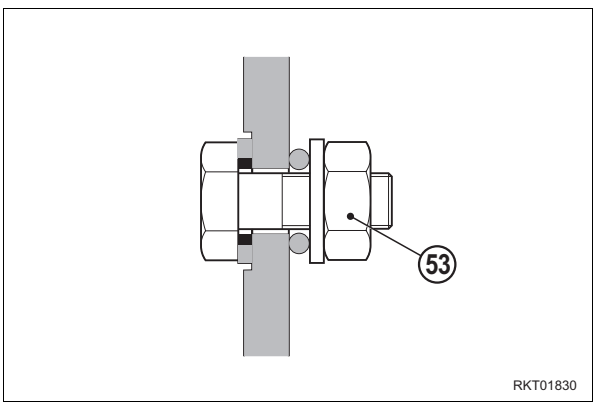
Screws: 170 – 190 Nm

[*11]

Nut: Loctite 270

[*12]

Screw: Loctite 243



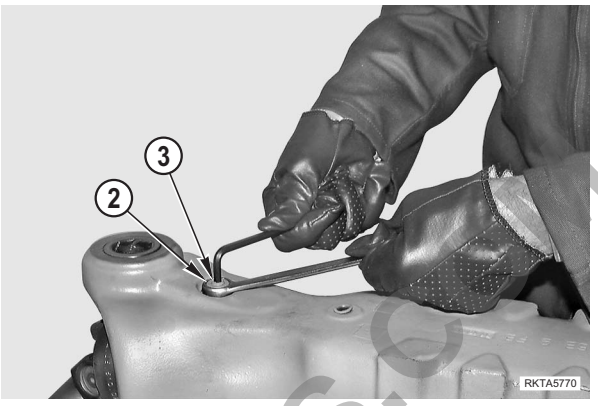
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- **Cardan shaft**

1 - Remove the steering case.
(For details, see "Steering case").

★ For front axle: introduce compressed air (approx. 7 bar) in the braking circuit.

2 - Unloose and remove the top and bottom check nuts (2) from the dowels (3).

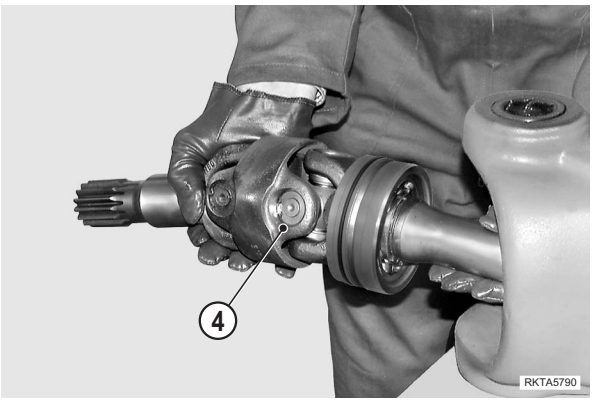


3 - Remove top and bottom check dowels (3).

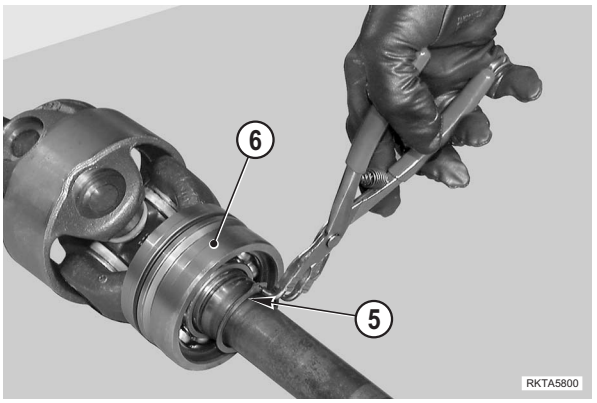


4 - Remove the u-joint (4).

★ To remove the u-joint use, if necessary, a plastic hammer or a lever.



5 - Remove the snap ring (5) from the bushing unit (6).



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