CONTENTS

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 symbols and are 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.

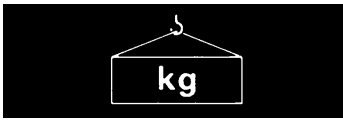
PREPARATIONS FOR WORK

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.

HOISTING INSTRUCTIONS



⚠ Heavy parts (25 kg or more) must be lifted with a hoist etc. In the **Disassembly and Assembly** section, every part weighing 25 kg or more is clearly indicated with the symbol kg

1. If a part cannot be smoothly removed from the machine by hoisting, the following checks should be made:
   - Check for removal of all bolts fastening the part to the relative parts.
   - Check for any part causing interference with the part to be removed.

2. Wire ropes

1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

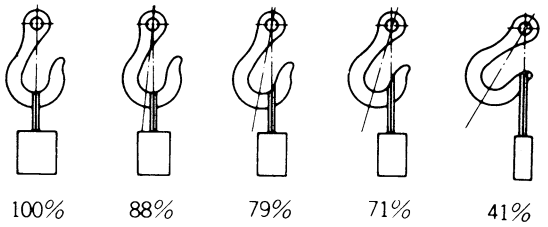
WIRE ROPES
(Standard «S» or «Z» twist ropes without galvanizing)

Rope diameter (mm)	Allowable load (tons)
10.0	1.0
11.2	1.4
12.5	1.6
14.0	2.2
16.0	2.8
18.0	3.6
20.0	4.4
22.4	5.6
30.0	10.0
40.0	18.0
50.0	28.0
60.0	40.0

The allowable load value is estimated to be one-sixth or one-seventh of the breaking strength of the rope used.

2) Sling wire ropes from the middle portion of the hook. Slinging near the edge of the hook may cause the rope to slip off the hook during hoisting, and a serious accident can result.

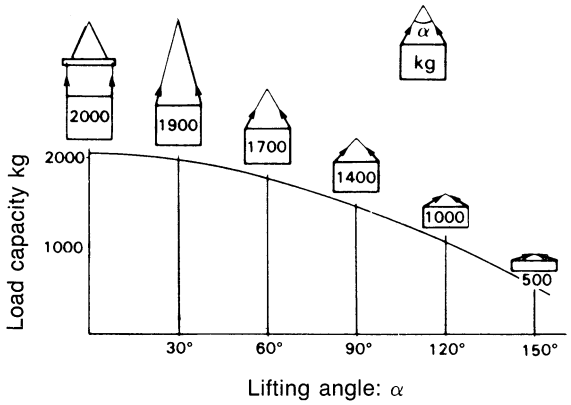
Hooks have maximum strength at the middle portion.



3) Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound on to the load.

⚠ Slinging with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can cause dangerous accidents.

4) Do not sling a heavy load with ropes forming a wide hanging angle from the hook.
When hoisting a load with two or more ropes, the force subjected to each rope will increase with the hanging angles.
The table below shows the variation of allowable load (kg) when hoisting is made with two ropes, each of which is allowed to sling up to 1000 kg vertically, at various handing angles.
When two ropes sling a load vertically, up to 2000 kg of total weight can be suspended.
This weight becomes 1000 kg when two ropes make a 120° hanging angle.
On the other hand, two ropes are subjected to an excessive force as large as 4000 kg if they sling a 2000 kg load at a lifting angle of 150°.



In the wiring diagrams various colour and symbols are employed to indicate the thickness of wires.
This wire code table will help you understand WIRING DIAGRAMS.
Example: R–N 1.5 indicates a cable having a nominal number 1.5 and red coating with black stripe.

CLASSIFICATION BY THICKNESS

Nominal number	Copper wire			Cable O.D. (mm)	Current rating (A)
	Number strands	Ø of strands (mm)	Cross section (mm)		
0.5	16	0.20	0.35	1.55	3.5
1	14	0.30	0.99	2.80	11
1.5	21	0.30	1.48	3.35	14
2.5	35	0.30	2.47	3.80	20
4	56	0.30	3.95	4.60	28
6	84	0.30	5.93	5.20	37

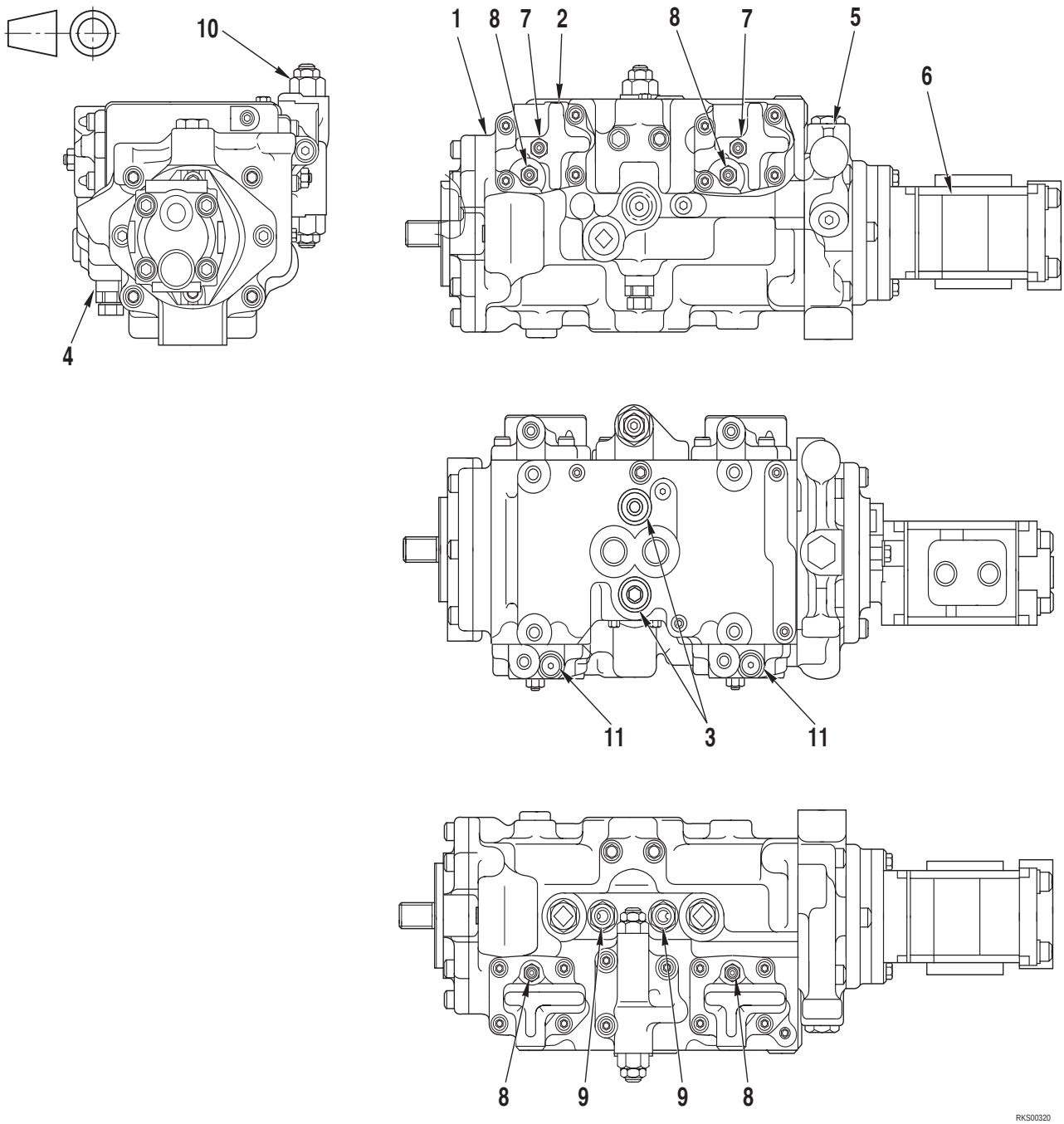
CLASSIFICATION BY COLOUR AND CODE

	Primary	Auxiliary									
Code	A	A–B	A/B	A–G	–	A–N	A/N	A–R		A–V	A/V
Colour	Light Blue	Light Blue – White		Light Blue–Yellow		Light Blue–Black		Light Blue–Red		Light Blue–Green	
Code	B	B–G	–	B–N	B/N	B–R	B/R	–	–	–	–
Colour	White	White–Yellow		White–Black		White–Red		–		–	
Code	C	C–B	C/B	C–L	–	C–N	C/N	–	–	–	–
Colour	Orange	Orange–White		Orange–Blue		Orange–Black		–		–	
Code	G	G–N	G/N	–	G/R	–	–	–	–	–	–
Colour	Yellow	Yellow–Black		Yellow–Red		–		–		–	
Code	H	H–L	–	H–N	–	H–R	H/R	–	–	–	–
Colour	Grey	Grey–Blue		Grey–Black		Grey–Red		–		–	
Code	L	–	L/B	L–G	L/G	L–N	L/N	L–R	L/R	–	–
Colour	Blue	Blue–White		Blue–Yellow		Blue–Black		Blue–Red		–	
Code	M	M–B	M/B	M–N	–	M–V	–	–	–	–	–
Colour	Brown	Brown–White		Brown–Black		Brown–Green		–		–	
Code	N	–	–	–	–	–	–	–	–	–	–
Colour	Black	–		–		–		–		–	
Code	R	R–G	–	R–N	R/N	R–V	–	–	–	–	–
Colour	Red	Red–Yellow		Red–Black		Red–Green		–		–	
Code	S	S–G	–	S–N	S/N	–	–	–	–	–	–
Colour	Pink	Pink–Yellow		Pink–Black		–		–		–	
Code	V	V–B	V/B	V–N	V/N	–	–	–	–	–	–
Colour	Green	Green–White		Green–Black		–		–		–	
Code	Z	Z–B	–	Z–N	Z/N	–	–	–	–	–	–
Colour	Violet	Violet–White		Violet–Black		–		–		–	

COMPOSITION OF THE COLOURS

The coloration of two-colour wires is indicated by the composition of the symbol listed.
Example: G–V = Yellow-Green with longitudinal colouring
G/V = Yellow-Green with transversal colouring

HST PUMP LPV40 + 40 (SK815-5 – SK815-5 turbo HIGH FLOW)



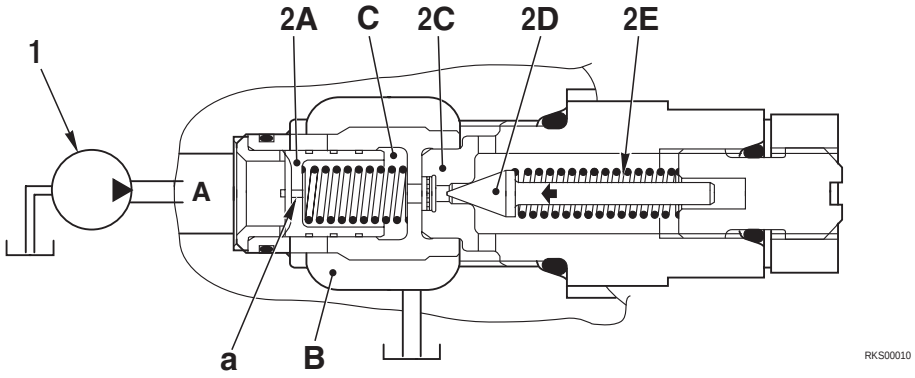
1. Piston pump
2. Control piston
3. Suction safety valve
4. Charge safety valve
5. Charge pump
6. Work equipment pump
7. Adjustment screw (Neutral position)
8. Adjustment screw (Max. displacement)
9. Adjustment screw (Pump power control)
10. AS valve
11. Shuttle valve

STRUCTURE

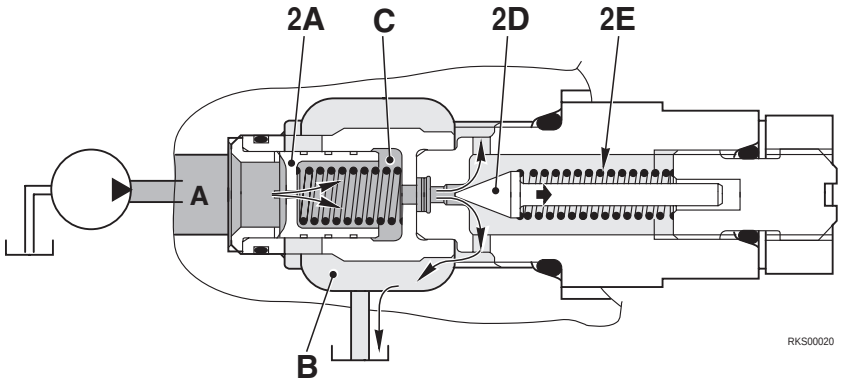
This pump is composed of variable swash plate type tandem piston pumps (1), control pistons (2), suction safety valves (3), charge safety valve (4), charge pump (5), work equipment gear pumps (6), and adjustment screws (7), (8), (9), AS valve (10), and shuttle valves (11).

FUNCTION

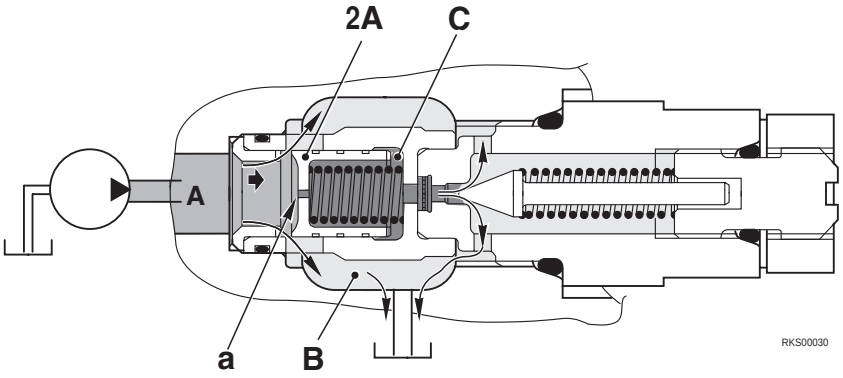
- Port **A** is connected to the charge circuit.
  Port **B** is connected to the tank drain circuit.
  The pressurized oil fills port **C** through orifice **a** in valve (**2A**).
  Poppet (**2D**) is in tight contact with valve seat (**2C**)



- If abnormal pressure is generated in the circuit or the shuttle valve of **HST** motor is at neutral and the oil pressure at ports **A** and **C** reaches the pressure set by spring (**2E**), poppet (**2D**) is pushed to → direction, and oil at **C** is relieved to port **B** and pressure of the oil at **C** reduce.



- When the pressure of the oil at port **C** goes down, a differential pressure is occured between ports **A** and **C** because of orifice **a** in valve (**2A**).
  Valve (**2A**) is pushed to → direction by oil pressure at port **A**, and oil at port **A** is relieved to port **B**.
  In this way, the pressure in the charge circuit is prevented from going any higher.



CLSS

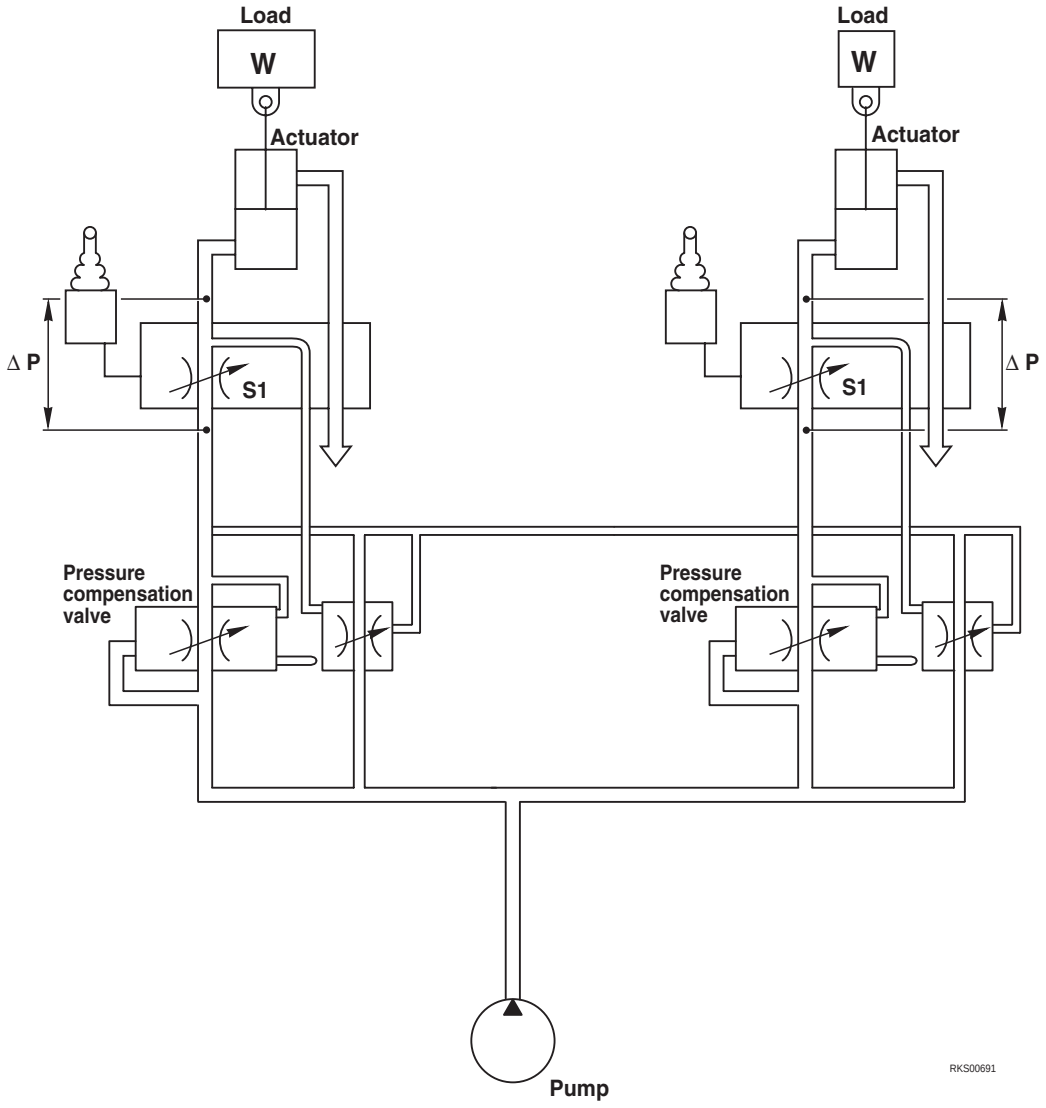
1. OUTLINE

Features

- CLSS stands for Closed center Load Sensing System, and has the followings characteristics.
  1 - Controlability, not influenced by load.
  2 - Controllable digging force at fine control range.
  3 - Easy simultaneous operation by spool opening proportional flow dividing function.

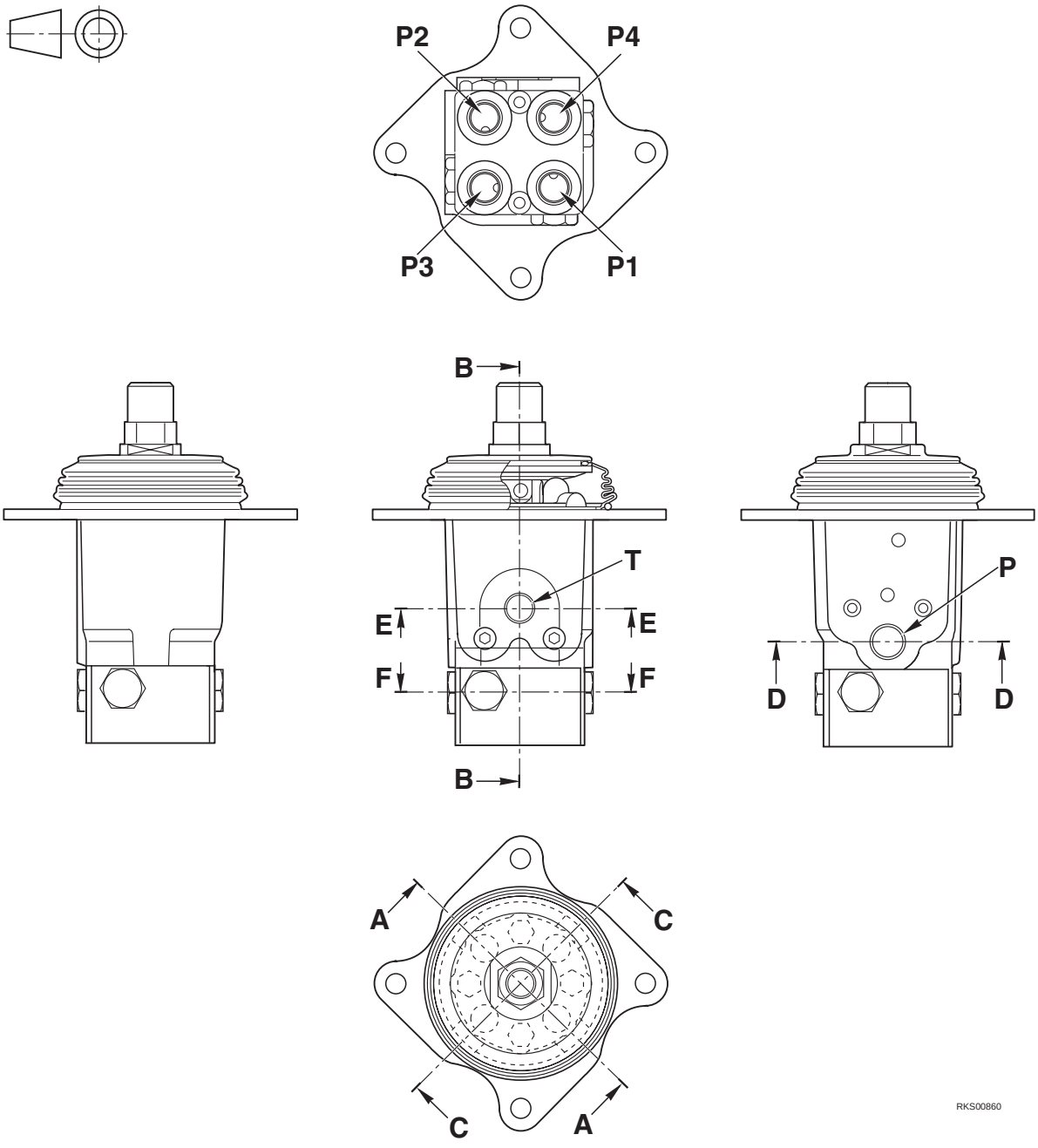
2. PRESSURE COMPENSATION CONTROL

A valve (pressure compensation valve) is installed to the inlet port side of the control valve to balance the load.
When there is compound operation of the actuators, this valve acts to make pressure difference Δ**P** constant for the upstream flow (inlet port) and downstream flow (outlet port) of the notch of each spool.
In this way, the flow of oil from the pump is divided in proportion to area of opening S1 and S2 of each valve.



L.H. PPC VALVE (STANDARD)

TRAVEL CONTROL

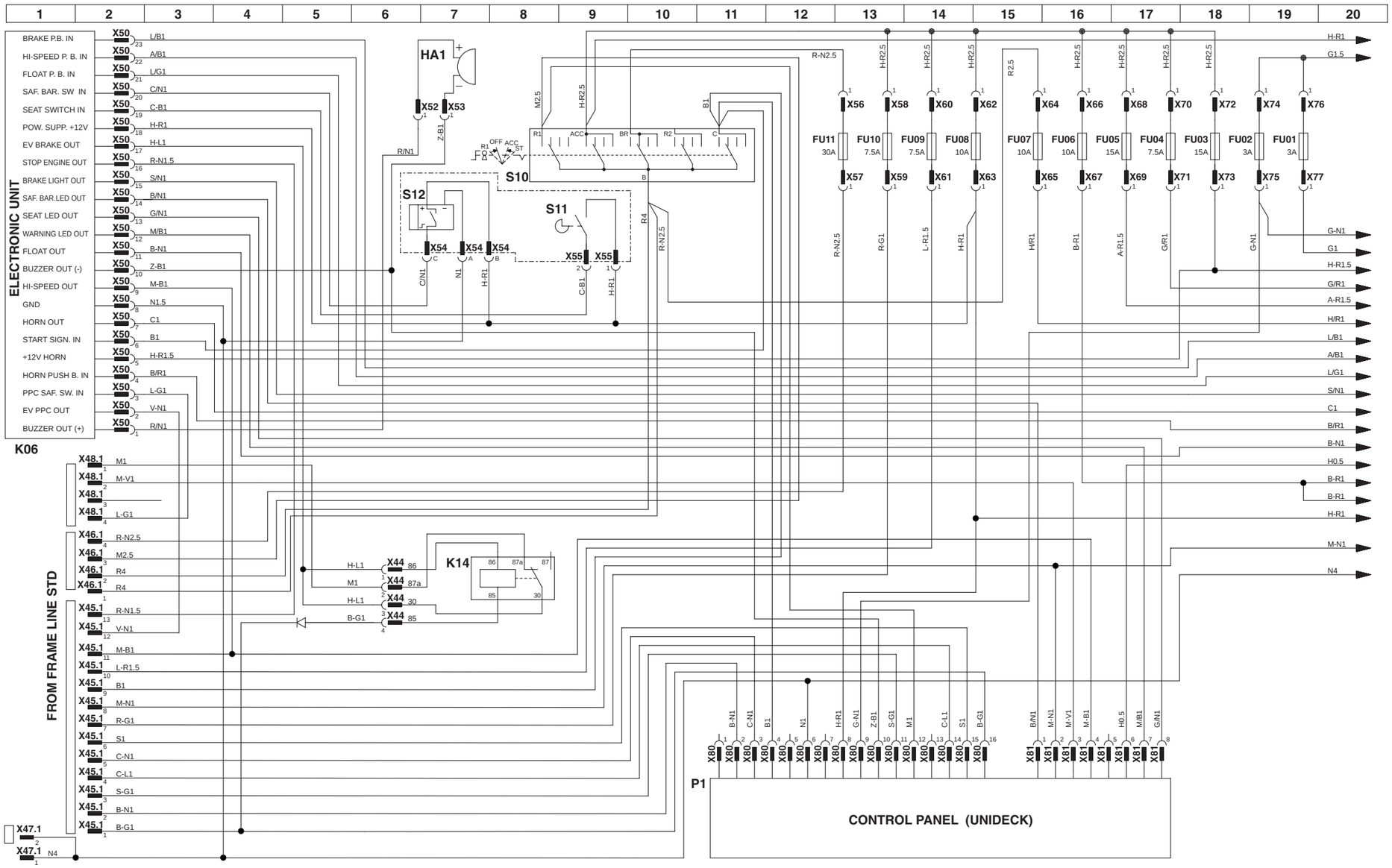


P1 port - To hydraulic pump (DA2 port)
P2 port - To hydraulic pump (DB2 port)
P3 port - To hydraulic pump (DA1 port)
P4 port - To hydraulic pump (DB1 port)
P port - From solenoid valve group ST1
T port - To hydraulic tank

FUNCTION

P1 L.H. travel forward
P2 L.H. travel reverse
P3 R.H. travel forward
P4 R.H. travel reverse
★ When acting control lever, two ports are pressurized contemporarily (i.e.: travel forward pressurize P1 and P3 ports).

ELECTRICAL DIAGRAM (CABIN LINE STANDARD) (2/5)



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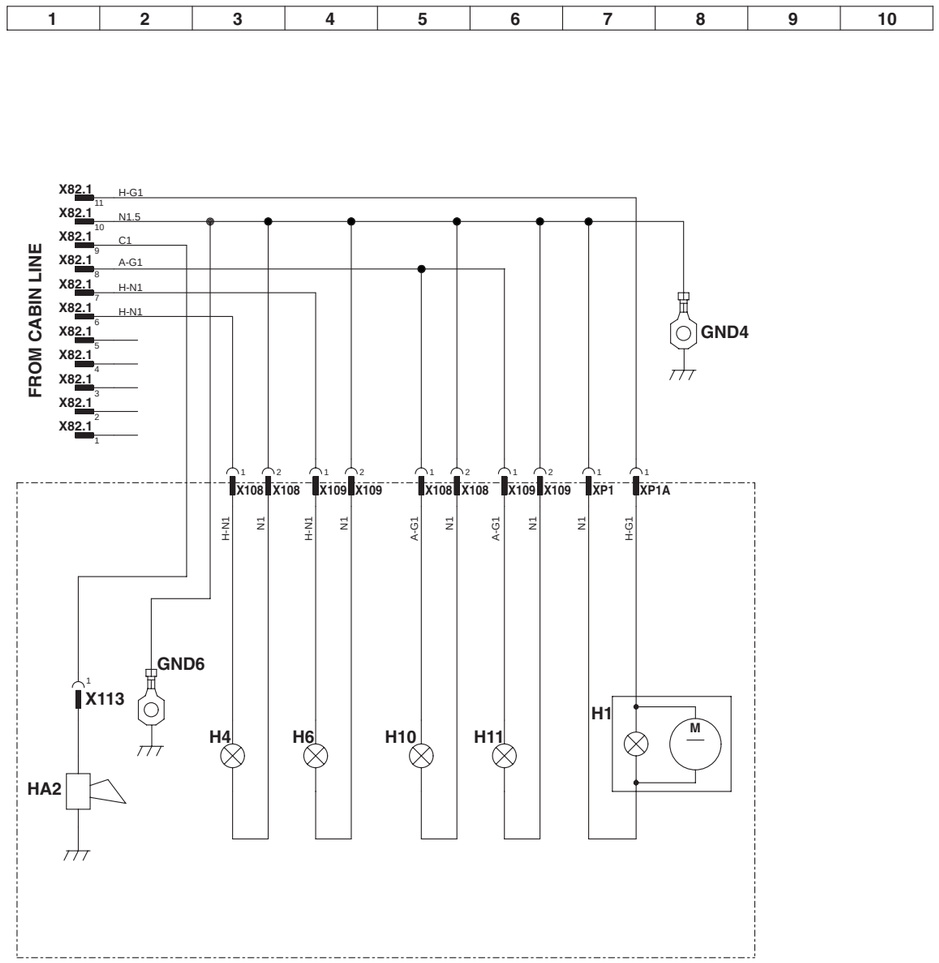
ELECTRICAL DIAGRAM (TOP-CABIN LIGHT LINE OPTIONAL) (2/2)



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COMPONENTS

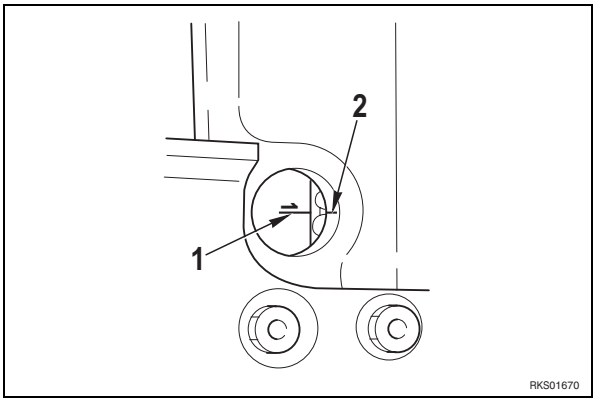
D1 Horn ground
GND4 C6 ground terminal
H4 Left front work lamp
H6 Right front work lamp
H10 Left rear work light
H11 Right rear work light
HA2 Horn
X82.1 11 way connector
XP1 12V socket

ADJUSTMENT OF VALVE CLEARANCE

★ Adjust the clearance between valve and rockers to the following values:

Unit: mm

With engine cold	Suction valves	Exhaust valves
	0.20	0.20



1 - Remove the intake filter and the valve cover.

2 - Turn the drive shaft in the normal direction of rotation until the line (1) marked as no. 1 on the flywheel is in alignment with the reference notch (2) on the flywheel housing.

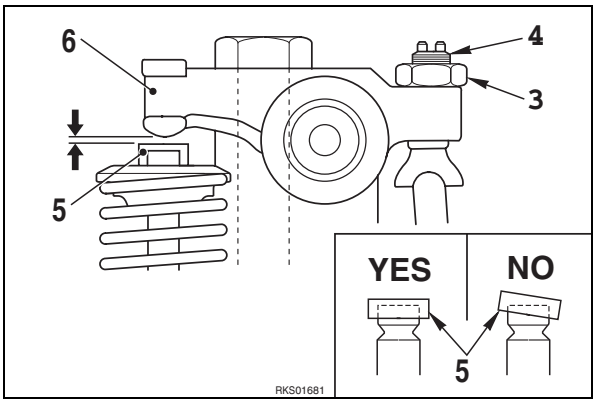
★ If the cylinder is in a compression stroke, the valves do not move when the drive shaft is rotated slightly. If the valves do move, rotate the drive shaft by one turn and realign the reference marks (1) and (2).

3 - Loosen the lock nut (3) and unscrew the adjustment screw (4) by approximately 1 turn.

★ Check that the valve cap (5) is lying flat on the valve stem and that there is no lop-sided wear.

1 - If the valve caps (5) are damaged, replace them with new ones.

2 - Make sure that the valve caps fit perfectly and are lying flat on the valve stem.



4 - Insert the feeler gauge **B1** between the rocker (6) and the valve cap (5).
Rotate the adjusting screw (4) until it rubs against the feeler gauge **B1**.
Secure this position with the nut (3).

Lock nut: 25.5±2.5 Nm

★ After locking the nut (3), check the valve clearance again.

5 - After adjusting the No. 1 cylinder, rotate the drive shaft 180° each time and adjust the valve clearance of the other cylinders according to the ignition sequence.

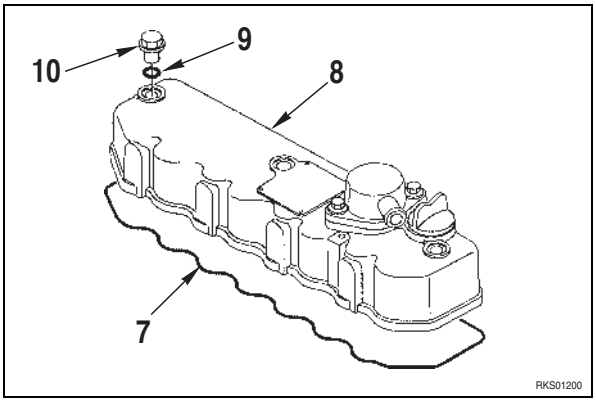
★ Ignition sequence: 1 - 3 - 4 - 2.

Assembly of the valve cover

1 - Check the condition of the gasket (7) of the valve cover (8), and the O-rings (9). Thoroughly clean the contact surface on the cylinder heads.

2 - Replace the valve cover (8) and mount the O-rings (9) and the lock nuts (10).

Lock nuts for cover: 25±3 Nm

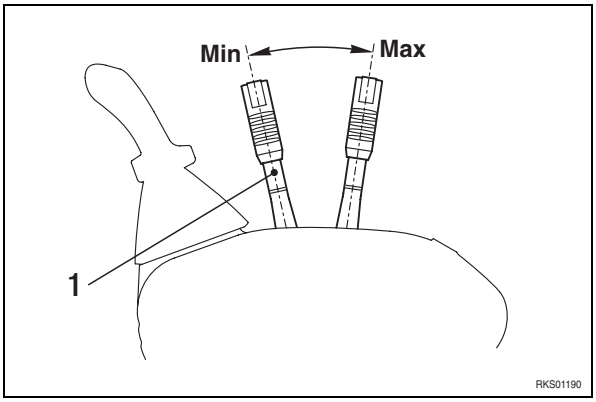


ADJUSTING THE STROKE OF THE ACCELERATOR CABLES

★ Conditions for the adjustment:
- Engine: stopped
- Working equipment: resting on the ground
- Cab: raised

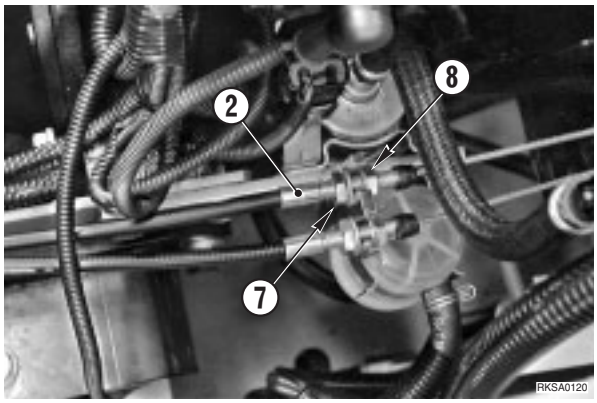
★ If the protective sheaths need to be substituted, block the lever (or pedal) side of the sheaths in an intermediate position before carrying out the adjustment.

1 - Place the accelerator command lever (1) in low idling position.



2 - Temporarily block the protective sheath (2) in an intermediate position and block the retainer (3) at approx. 1 mm from the injection pump lever (4).

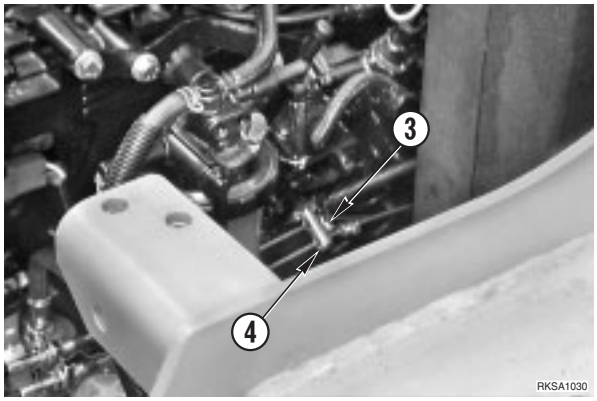
3 - Put the accelerator command lever (1) into the high idling position.

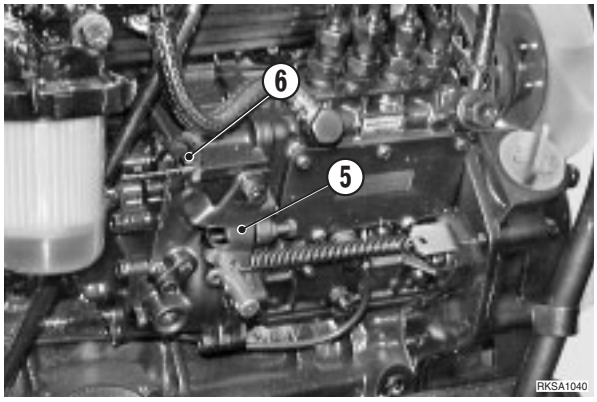


4 - Use the nuts (7) and (8) to reset the position of the injection pump lever (5) to approx. 0.5 mm from the high idling adjustment screw (6).

5 - Bring the accelerator command lever back to the low idling position and check that the retainer (3) has sufficient clearance.

6 - Repeat the same procedure for the accelerator pedal cable.





VALVE CALIBRATION

1. HST valve calibration

1 - Loosen the nut (1), taking care not to move the adjustment screw (2).

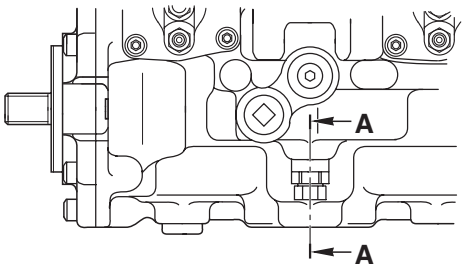
2 - Adjust the working pressure of the HST valve, proceeding as follows:

- To INCREASE pressure, turn the screw (2) in a CLOCKWISE direction.
- To REDUCE pressure, turn the screw (2) in a COUNTER-CLOCKWISE direction.

★ One complete turn of the screw (2) varies the pressure by 15.5 bar.

3 - Tighten the nut (1) and check that the working pressure remains within permissible limits.

Nut: 58.8–78.5 Nm



TOP VIEW

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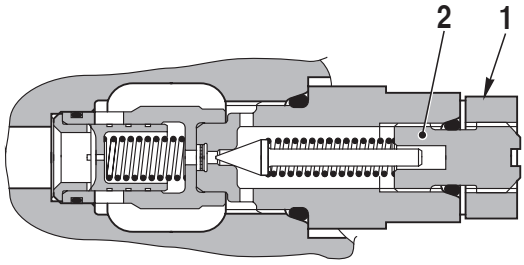

Section A - A

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2. AS valve calibration (only for SK815-5 and SK815-5 turbo)

- **Pressure adjustment at low idling**

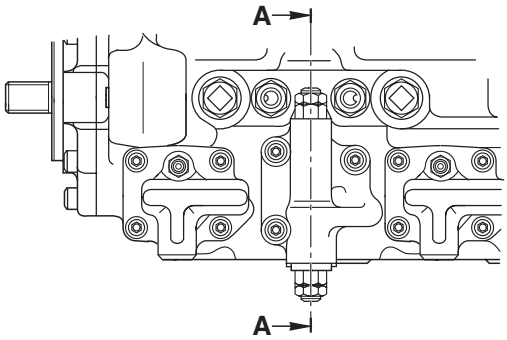
1 - Loosen the nut (1), and adjust the working pressure of the AS valve (with the engine at low idling), proceeding as follows:

- To INCREASE pressure, turn the screw (2) in a CLOCKWISE direction.
- To REDUCE pressure, turn the screw (2) in a COUNTER-CLOCKWISE direction.

★ One complete turn of the screw (2) varies the pressure by 3.37 bar.

3 - Tighten the nut (1) and check that the working pressure remains within permissible limits.

Nut: 34.3–58.8 Nm



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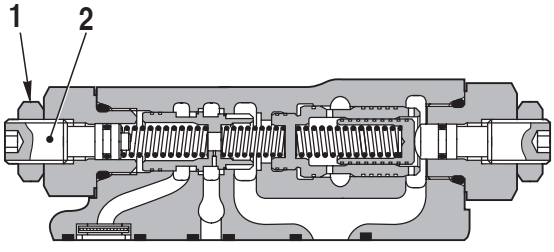

Section A - A

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PRECAUTIONS TO BE TAKEN WHILE 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 (Lithium EP MS2 NLGI 2) 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.

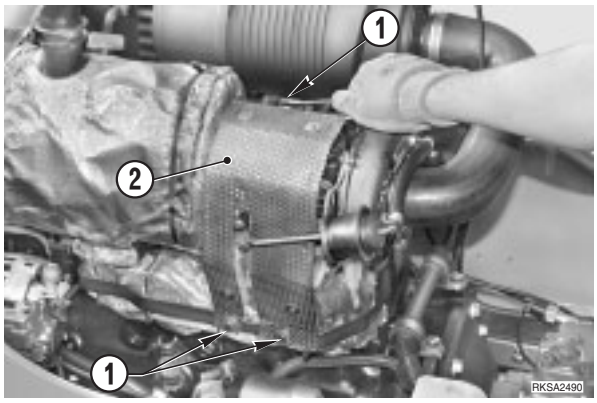
- If the coolant liquid has been drained away, close the drainage plug and add new liquid up to normal level. Start the engine to circulate the liquid throughout the cooling system and then top up the level once more.
- When the hydraulic equipment has been dismantled, add engine oil to the indicated 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. TESTING AND ADJUSTMENTS».

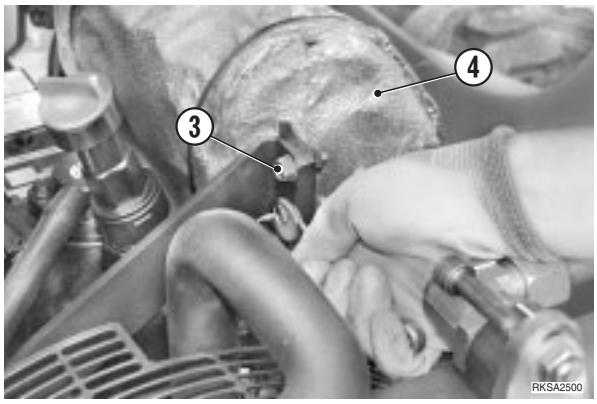
- After having re-assembled cylinder joints or cylinders, or work equipment articulations, lubricate thoroughly.

REMOVAL OF THE MUFFLER (SK815-5 turbo)

1 - Loosen the screws (1) of protection (2) and remove it.



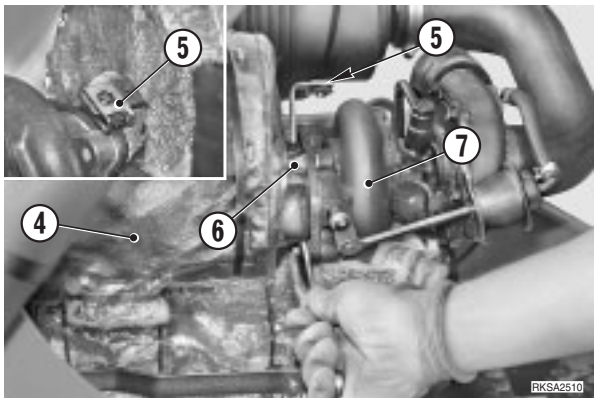
2 - Loosen and remove the screws (3) fixing the muffler (4).



3 - Mark the position of bracket (5).
Remove the four nuts (6) fixing the muffler (4) to the turbocharger (7).

4 - Loose the screws (8).

5 - Remove the muffler (4).
★ A new seal (9) should be fitted each time the muffler is removed.



INSTALLATION OF THE MUFFLER

- To install, reverse removal procedure.